Omya Australia Pty Ltd

Bajool Marble Mine

Noise Impact Assessment

<table>
<thead>
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Executive Summary

On behalf of Omya Australia Pty Ltd, Acouras Consultancy has been commissioned to assess the potential for noise impact associated with the operation Bajool Marble Mine. The purpose of this report is to undertake a noise survey of the existing environmental conditions, assess the noise impact from the current operational activities of the quarry and the assess the potential noise impact from the expansion of the Wells Waste Rock Emplacement Area (WREA) in accordance with:

- The QLD DEHP Environmental Authority Permit No. EPML00657813.
- Queensland Government Department of Environment and Heritage Protection noise guidelines, such as:
  - Planning for Noise Control.
  - Noise and vibration from blasting.
- World Health Organization.
- Relevant Australian Standard, such as:
  - AS2187.2-2006 Explosives: Storage and Use (Part 2—Use of Explosives).

The site has the potential to generate noise at the sensitive receivers, which includes the existing operations:

- Crusher Plant facilities, includes the primary and secondary crusher plant, screen (open).
- Milling plant facilities including vertical roller, screen/sorter and bagging area.
- Wells Quarry, includes excavator use and haul truck movement.
- Waste Rock Emplacement Area (WREA), includes, screening/reclaimer and front end loader.
- Blasting operations.
- Other equipment, pit pumps, movement of vehicles etc.

As part of the assessment site visits were undertaken and noise surveys conducted of the existing background noise levels, as detailed in Section 3.1 at a location representative of the nearest noise sensitive receivers. The outcome of the environmental noise survey has been used to establish the noise criteria through applying the DEHP guidelines. Refer Section 3.3 of this report. Provided the operational noise levels achieve the DEHP criteria as given in Table 5, the EA noise limits (Table 4), sleep disturbance and background noise creep limits and acoustic quality objectives would be achieved.
During the site visit attended noise measurements were also conducted to obtain acoustic data on the operation of various fixed plant and mobile plant currently operating on the site. The data collected from the noise measurements and from other source documents have been used for input into the noise impact assessment. Meteorological data collected from the Omya weather station located on the site and annual weather data has been used for atmospherically parameters in the noise model software.

Noise predictions of the operations have been completed using noise-modelling software CADNA. The predictions indicate noise levels at the receiver would comply with the DEHP noise limit for both daytime and night time (24hrs) operations. The predicted noise levels are cumulative and are based on all quarrying activities operating simultaneously which would be considered a worst-case scenario and realistically unlikely to occur.

Further to this the assessment indicates that due to the topography of the WREA site, the new profile of the terrain resulting from the expansion would provide improved acoustic attenuation between site and adjacent receivers. This has the benefit of reducing noise levels below those currently generated from existing activities. Therefore, we conclude that there would be no increase to noise impact to the nearest receiver.

Based on the current operational activities and the assessment it is anticipated that the operational noise from the existing activities and from the expansion is mostly likely inaudible and would not cause a noise impact at the nominated receiver. Also, there is no intention to change or increase to the operation activities for the site.

Based on the modelling results (Table 13) the predicted noise level associated with the site’s blasting activities at a Ka factor of 10 shows the site to be fully compliant with its EA noise limits. When the model is run using higher Ka factors, it has shown there is the potential for air blast over pressure level higher than the EA noise limits. Section 4.8.2 provides an overview of Omya’s current controls in place to ensure no environmental nuisance.
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1 Introduction

The following report has been prepared by Acouras Consultancy on behalf of Omya Australia Pty Ltd to assess the potential for noise impact associated with the Bajool Marble Mine. The purpose of this report is to undertake a noise survey of the existing environmental conditions, assess the noise impact from the current operational activities of the quarry and the assess the potential noise impact from the expansion of the Wells Waste Rock Emplacement Area (WREA).

1.1 Quarry Location

The quarry is situated in the side of Mt McCamley, which is located 17km south of the village of Bajool, midway between Rockhampton and Gladstone in Central Queensland. 

An aerial photo of Bajool Marble Mine location, mining lease and surround lots are shown in Figure 1 below.

![Figure 1 – Aerial Photo, Mining Lease and Lots](image-url)
1.2 Nearby Receivers

The quarry is surrounded by rural areas where the background noise levels are dominated by natural vegetation noise generated by the wind. The “Environmental Management Plan” (Draft) dated the 22 March 2017 identifies the following three (3) nearest noise sensitive residential dwellings (refer to Figure 2):

R1 – B.J. & H.F McCamley “Fern Hills” The Fern Hills residence is located 3.5km from the primary crusher (closest noise producing piece of plant).

R2 – A.E. & G.P. Stunzer “Prior Park” The Prior Park homestead is located 3.2km from the nearest mining operation, and the residence is acoustically shielded by an intervening ridge.

R3 – O. & J.L. Stunzer “Prior Park” Communication is maintained on an ongoing basis and no complaints have been reported regarding noise or vibrations from residence of Prior Park.

There is one residence at R4 and one residence at R5 located closer to the quarry. These two residences are on Omya owned land and are either vacant or used as mine staff housing.
1.3 Sources of Noise emissions

Activities and operations at the site with potential to generate noise at the sensitive receivers includes:

- **Crusher Plant:**
  - a. Primary and secondary crusher.
  - b. Screen (open).
  - c. Front end loader.
  - d. Loading of stockpiles.

- **Milling plant:**
  - a. Vertical Roller Mill.
  - b. Bagging Silos.
  - c. Forklifts.

- **Wells Quarry:**
  - a. Excavator.
  - b. Haul vehicles.
  - c. Blasting.

- **Waste Rock Emplacement Area**
  - a. Screening/Reclaimer.
  - b. Front end loader.

- **Other equipment:**
  - a. Pit pumps.
  - b. Movement of vehicles at weighbridge/turnaround, entry/exit etc.

For the proposed Wells Waste Rock Emplacement Area (WREA) expansion of the would be no additional plant or equipment. A list is of equipment and noise levels are detailed in Section 4.2.
2 Noise Standards and Guidelines

The following standards and guidelines are applicable to this project:

- Queensland Government Department of Environment and Heritage Protection Environmental Authority Permit No. EPML00657813.
- Queensland Government Department of Environment and Heritage Protection “Planning for Noise Control”.
- Queensland Government Department of Environment and Heritage Protection “Noise and vibration from blasting”.

2.1 QLD DEHP Noise Guidelines

The assessment of potential noise impact from the operation of the site has been conducted in general accordance the Environmental Authority Permit No. EPML00657813 (refer to Appendix D) and relevant noise guidelines provided by DEHP.

The following sections outline the assessment guidelines that are applicable to the operation of the site.
2.1.1 DEHP Guideline for Activities with Noise Impact (ESR/2015/1838)

The DEHP guideline ESR/2015/1838 for provides guidance on the appropriate method of identifying, quantifying and evaluating the Environmentally Relevant Activities (ERA) associated with the site. The guideline identifies three key areas that are to be addressed in the application process:

- Identify the environmental values of the receiving acoustic environment including the identification of any nearby sensitive places.
- Identify the possible impacts due to the proposed activity and all associated risks to environmental values.
- Identify the strategies to mitigate the identified risks to the environmental values.

Where background creep is likely, the guideline refers to Section 10 of the Environmental Protection (Noise) Policy which states that:

(2) To the extent that it is reasonable to do so, noise from an activity must not be—

(a) for noise that is continuous noise measured by $L_{A90,T}$—more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$; or

(b) for noise that varies over time measured by $L_{Aeq,adj,T}$—more than 5 dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

2.1.2 Environmental Protection Regulation (ERA 33)

Operational activities of the site have not significantly changed since Omya has taken control of the site in the 1980’s. The noise impact assessment of the site will ensure that the operations fully comply with ERA 33 from the Environmental Protection Regulation. From the Environmental Protection Regulation (EPR) Part 8, the following states the definition of ERA 33 that is relevant to this site:

33 Crushing, milling, grinding or screening

(1) Crushing, milling, grinding or screening (the relevant activity) consists of crushing, grinding, milling or screening more than 5000t of material in a year.

(2) The activity includes crushing waste, other than putrescible waste, to extract resources for reuse or recycling.

(3) The relevant activity does not include—

(a) crushing, grinding, milling or screening agricultural products for the purpose of a farming operation; or

(b) an activity to which section 16, 55 or 61 would apply, if the activity were carried out within a stated threshold under that section.

Editor’s note—section 16 (Extractive and screening activities), 55 (Regulated waste recycling or reprocessing) or 61 (Waste incineration or thermal treatment)

(4) There is no aggregate environmental score for the relevant activity.
2.1.3 Planning for Noise Control

The QLD DEHP “Planning for Noise Control” provides guidance on the recommended noise limits operational activities such as those associated with the quarrying. The DEHP procedure takes into account three (3) factors:

1. The control and prevention of background noise creep.
2. The containment of variable noise levels and short-term noise events,
3. The setting of noise levels that should not be exceeded to avoid sleep disturbance.

This assessment takes into regard to this guidance when defining the site-specific noise criteria for the assessment operational activities (both fixed and mobile).

2.1.4 Noise and Vibration from Blasting

The blasting operations have the potential to cause unacceptable noise and vibration impacts the sensitive receivers and can cause substantial damage to structures.

This QLD DEHP guideline provides a set of criteria to assess the impacts of blasting that can be associated with activities in mining, quarrying, construction and other operations. Note this assessment does not include the predictions for ground vibration due to blasting.

<table>
<thead>
<tr>
<th>Blasting limits</th>
<th>Sensitive or commercial place criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface mining</td>
<td>9am to 3pm Monday to Friday and 9am to 1pm Saturday</td>
</tr>
<tr>
<td>Airblast overpressure</td>
<td>115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time</td>
</tr>
<tr>
<td>Ground vibration peak particle velocity</td>
<td>5 mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time</td>
</tr>
</tbody>
</table>

Notes 1-Under exceptional circumstance blasting may extend to 5pm

Notes 2-No Blasting on Sunday and Public Holidays
2.2 Criteria for Sleep Disturbance (WHO & DEHP)

To provide an objective assessment of the likelihood that the operational noise may potentially cause an impact on the health of nearby sensitive receivers, guidance is contained in the World Health Organization (WHO 1999) Guidelines for Community Noise (Eds B. Berglund, T. Lindvall, D.H. Schwela. Geneva: WHO) and the QLD DEHP “Planning for Noise Control”.

The WHO provides the following generic guidance concerning the onset of health effects from noise.

- **At night, sound pressure levels at the outside façades of living spaces should not exceed 45 dB L<sub>10</sub> and 60 dB L<sub>1max</sub> so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.**

Other factors that may be important in assessing the extent of impacts on sleep include:

- how often high noise events will occur.
- time of day (normally between 10pm and 7am).
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods).

The QLD DEHP also suggest that for transient noise events during the night hours, the indoor maximum instantaneous value should not exceed the limit more than 10-15 times per night. Table 2 gives the number of events that can occur corresponding to the probability of 10 percent awakening for partially closed windows.

<table>
<thead>
<tr>
<th>Max L&lt;sub&gt;pA&lt;/sub&gt; (dBA)</th>
<th>42</th>
<th>52</th>
<th>57</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of events (n)</td>
<td>32</td>
<td>10</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2—Permissible Maximum Noise Events for Partially Closed Windows<sup>1</sup>

<sup>1</sup> Refer to QLD DEHP “Planning for noise control” Table 8: Number of permissible noise events for various external maximum noise levels for partially closed windows (10% probability of awakening)
3 Existing Noise Environment

3.1 Noise Survey Methodology & Equipment
An unattended noise survey was carried out at the site to measure the background and ambient noise levels. Nose monitoring was conducted between Tuesday 24th to Tuesday 31st October 2017. The monitor was positioned at the location as shown in Figure 1. The position was selected to provide an environmental noise survey that would be considered representative of the nearest residential property located to the south (R3).

Measurements were conducted using the following equipment:
- SVAN 977 Type 1 Real time Analyser/Noise Logger. Serial No. 34135.
- SVAN SV30A Type 1 Sound Level Calibrator. Serial No. 31830.

Noise monitoring was conducted in general accordance with DEHP “Noise Measurement Manual” and Australian standard AS 1055.1-1997: Acoustics-Description and measurement of environmental noise-General procedures.

The noise analyser was calibrated immediately before and after measurements were taken with no discernible differences between these two recorded levels. The sound analyser is Type 1 and complies with Australian standard AS1259.2: 1990.

3.2 Summary of Ambient and Background Noise Levels
Table 3 presents a summary of the measured background noise level and the allowable intrusive noise limit for this project in accordance with the DEHP “Planning for Noise Control” and the Environmental Authority (EA). For the purpose of the assessment, the background noise level has been determined using the RBL in accordance with the method given in the DEHP.

<table>
<thead>
<tr>
<th>Day</th>
<th>Time Period</th>
<th>$L_{eq \ (hr)}$</th>
<th>RBL (min $L_{90, 1hr}$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday to Saturday</td>
<td>Day (07:00-18:00)</td>
<td>54</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Evening (18:00-22:00)</td>
<td>53</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>Night (22:00-07:00)</td>
<td>52</td>
<td>43</td>
</tr>
<tr>
<td>Sundays and Public Holidays</td>
<td>Day (09:00-18:00)</td>
<td>50</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Evening (18:00-22:00)</td>
<td>51</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Night (22:00-09:00)</td>
<td>49</td>
<td>44</td>
</tr>
</tbody>
</table>
3.3 Environmental Authority Noise Limits

According to Table N1 of the Environmental Authority (Permit No. EPML00657813), the following Table 4 summaries the allowable noise limit for the operation of the site.

<table>
<thead>
<tr>
<th>Noise Level</th>
<th>Monday to Saturday</th>
<th>Sundays and Public Holidays</th>
</tr>
</thead>
<tbody>
<tr>
<td>measured as</td>
<td>7am-6pm</td>
<td>6pm-10pm</td>
</tr>
<tr>
<td>( L_{A10}, ) adj 10mins</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>( L_{A1}, ) adj 10mins</td>
<td>55</td>
<td>55</td>
</tr>
</tbody>
</table>

3.4 DEHP Operational Noise Limits

Based on the Queensland Department of Environment and Heritage Protection (DEHP) “Planning for Noise Control”, the objective method to assess noise from operation of the quarry has been applied. The Planning Noise Level (PNL) is the estimated sound pressure level for different noise category areas containing residences as defined in Table 3 of the guideline.

Table 5 presents a summary of the measured background noise level (RBL) and the allowable noise limit for this project in accordance with the DEHP. The PNL category for this site is Z1, which is described as “Very rural, purely residential. Less than 40 vehicles an hour”

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Existing Noise Levels</th>
<th>Specific Noise Level, ( L_{Aeq, 1hr} ) ( =\text{min} L_{A90,1 hr} + 3 )</th>
<th>QLD DEHP, ( L_{eq,1hr} )</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day (07:00-18:00)</td>
<td>54 45</td>
<td>48</td>
<td>40</td>
<td>35</td>
</tr>
<tr>
<td>Evening (18:00-22:00)</td>
<td>53 45</td>
<td>48</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>Night (22:00-07:00)</td>
<td>52 43</td>
<td>46</td>
<td>30</td>
<td>33</td>
</tr>
</tbody>
</table>

Provided the operational noise levels achieve the DEHP criteria as given in Table 5, the EA noise limits would also be achieved.

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\(^2\) Planning Noise Level (PNL) as defined in Table 3 of DEHP “Planning for noise control”.
3.5 Background Noise Creep (EPP Noise 2008)

For the operation of the site, the EPP provides background creep criteria and the acoustic quality objectives for the operation of a site to comply with. Table 5 presents the background noise creep criteria determined based on the measured background noise monitoring.

Table 6— Controlling Background Creep Noise Limit, dBA

<table>
<thead>
<tr>
<th>Period</th>
<th>RBL</th>
<th>Continuous Noise Sources, $L_{Aeq,adj,1hr}$</th>
<th>Variable Noise Sources $L_{Aeq,adj,1hr}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day (07:00-18:00)</td>
<td>45</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Evening (18:00-22:00)</td>
<td>45</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Night (22:00-07:00)</td>
<td>43</td>
<td>43</td>
<td>48</td>
</tr>
</tbody>
</table>

Table 7 provides the recommended acoustic quality to be achieved at a residential receiver. The policies intention is that the acoustic quality objectives be progressively achieved over the long term.

Table 7— Acoustic Quality Objectives, dBA

<table>
<thead>
<tr>
<th>Sensitive receptor</th>
<th>Time of day</th>
<th>Acoustic quality objectives (measured at the receptor) dB(A)</th>
<th>Environmental value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dwelling (for outdoors)</td>
<td>daytime and evening</td>
<td>$L_{Aeq,adj,1hr}$ $L_{A10,adj,1hr}$ $L_{A1,adj,1hr}$</td>
<td>health and wellbeing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50 $L_{A10,adj,1hr}$ $L_{A1,adj,1hr}$</td>
<td>health and wellbeing</td>
</tr>
<tr>
<td>Dwelling (for indoors)</td>
<td>daytime and evening</td>
<td>35 $L_{A10,adj,1hr}$ $L_{A1,adj,1hr}$</td>
<td>health and wellbeing, in relation to the ability to sleep</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 $L_{A10,adj,1hr}$ $L_{A1,adj,1hr}$</td>
<td>health and wellbeing, in relation to the ability to sleep</td>
</tr>
</tbody>
</table>

Provided the operational noise levels achieve the DEHP criteria as given in Table 5, the background noise creep limits and acoustic quality objectives would be achieved.

3.6 Local Meteorology

During the monitoring period any data influenced by adverse weather condition, such as high wind and rainfall has been excluded. Meteorological data used was taken from the onsite weather station operated by Omya to track the local meteorological conditions, such as wind speed, wind direction and rainfall events. The meteorological events during the noise survey period have been recorded and are presented in Appendix B of this report. The location of the weather station is shown in Figure 2.
4 Noise Impact Assessment

4.1 Description of Operations

The quarry activities are currently undertaken within the following approved times.

<table>
<thead>
<tr>
<th>Activity/Process</th>
<th>Times</th>
<th>Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quarrying</td>
<td>6:00 am - 6:00 pm</td>
<td>Monday to Sunday</td>
</tr>
<tr>
<td>Blasting</td>
<td>9:00 am - 3:00 pm</td>
<td>Monday to Friday</td>
</tr>
<tr>
<td></td>
<td>9:00 am - 1:00 pm</td>
<td>Saturday</td>
</tr>
<tr>
<td>Crushing</td>
<td>24 hours</td>
<td>Monday to Sunday</td>
</tr>
<tr>
<td>Milling</td>
<td>24 hours</td>
<td>Monday to Sunday</td>
</tr>
<tr>
<td>Loading and Transport</td>
<td>24 hours</td>
<td>Monday to Sunday</td>
</tr>
</tbody>
</table>

4.2 Operational Noise Sources

The potential sources of noise from mining and related activities are as follows:

- Drilling and blasting;
- Operation of mobile equipment;
- Product loading and road haulage;
- Operation of onsite Equipment;
- Crushing and screening operations; and
- The stone dust mill.

The location of the various operational equipment and activities are presented in Figure 3.
Figure 3 – Operational Activities

3 Figure 2.1 from “Environmental Management Plan” (Draft) dated the 22 March 2017
4.3 Source Noise Data

Source noise data for the various activities was determined through attended noise measurements made on site of various fixed plant and mobile equipment listed in Table 9 and Table 10. In addition to the attended noise measurements, source noise data were also referenced from AS 2436-2010 (Table A1) and the UK Department for Environment, Food and Rural Affairs (DEFRA) “Noise Database for Predictions of Noise on Construction and Open Sites”.

Table 9 — Operational Noise Level of Fixed Plant and Equipment, dBA

<table>
<thead>
<tr>
<th>Location</th>
<th>Equipment/Activity</th>
<th>Description</th>
<th>Equivalent Sound Power Level, $L_{eq}$ dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crusher Plant</strong></td>
<td>Primary &amp; Secondary Crusher (Open)</td>
<td>JW 55HD/MMO 5154-0728</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>Screening (Open)</td>
<td>1.8x48 BB RIPL FLO-A2122</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>Tipping from Conveyer</td>
<td>-</td>
<td>130 ($L_{max}$)</td>
</tr>
<tr>
<td><strong>Milling Plant</strong></td>
<td>Vert Roller Mill (New)</td>
<td>MTW 175 Trapezium Mill</td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>Blower (enclosure)</td>
<td>PDA</td>
<td>122</td>
</tr>
<tr>
<td></td>
<td>Shaker/Sorter (open)</td>
<td>Redwave 200 Rox CC 2W</td>
<td>115</td>
</tr>
<tr>
<td><strong>Waste Rock Emplacement Area</strong></td>
<td>Screening /reclaiming</td>
<td>Koestrack Frontier K6(91 kW)</td>
<td>120</td>
</tr>
<tr>
<td><strong>Wells Quarry</strong></td>
<td>Excavator</td>
<td>Komatsu RC450LC-8 (45T)</td>
<td>107</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bousan BX300L (35T)</td>
<td>104</td>
</tr>
<tr>
<td></td>
<td>Pit Pump</td>
<td>Sykes HH160i (1.8kW to 2.7kW)</td>
<td>120</td>
</tr>
<tr>
<td><strong>Northern Quarry</strong></td>
<td>Pit Pump</td>
<td>Isuzu 4BB1</td>
<td>118</td>
</tr>
</tbody>
</table>
Table 10 — Operational Noise Level of Mobile Equipment, dBA

<table>
<thead>
<tr>
<th>Location</th>
<th>Equipment/Activity</th>
<th>Description</th>
<th>Equivalent Sound Power Level, dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haul Road</td>
<td>Movement of Haul Truck</td>
<td>HM400-2 (40T)</td>
<td>109 (L_{max} passby)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HM400-3 (40T)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road grader</td>
<td>-</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>Truck Water Cart</td>
<td>Mack B06647</td>
<td>107</td>
</tr>
<tr>
<td>Milling Plant</td>
<td>Loading</td>
<td>Forklift</td>
<td>106</td>
</tr>
<tr>
<td>Waste Rock Emplacement Area</td>
<td>Wheeled front end loader+beeper</td>
<td>Komatsu WA 480-6</td>
<td>115</td>
</tr>
<tr>
<td>Crusher Plant</td>
<td>Wheeled front end loader+beeper</td>
<td>Komatsu WA 480-6</td>
<td>115</td>
</tr>
<tr>
<td>Weighbridge/ Turnaround area</td>
<td>Vehicle movement</td>
<td>Semi-trailer/B Double (eg, Western Star or Kenworth)</td>
<td>108 (L_{max} passby)</td>
</tr>
</tbody>
</table>

4.4 Vehicle Movements

The movement of vehicles enter/exiting the site of the quarry is based on the following current operation (5 days a week):

- Five (5) “truck and dogs”, each taking four (4) loads per day of bulk stone to Gladstone. Approximately 100 vehicles out and 100 vehicles in per week.
- Twenty (20) “B’Doubles” dispatches. Approximately 20 vehicles out and 20 vehicles in per week.
- Ten (10) bulk tankers (B’Double). Approximately 10 vehicles in and 10 vehicles out per week.
- Based on a 300t/hr rate, there would be approximately seven (7) haul loads per hour from the pit to crusher.

There is to be no proposal to change vehicle movements in the current operation or for the WREA expansion.
4.5 Noise Modelling

Noise modelling has been completed to predict current noise emissions from the marble quarry. All calculations have been conducted based on site noise measurements and source data detailed in the previous section 4.3 and any adjustments for tonal and impulsive noise have been included in the noise model. Noise modelling software CadnaA (version 4.5.149) and the CONCAWE method for predicting noise propagation has been used for the assessment. To quantify potential worst-case scenario, the following noise enhancing metrological parameters have been assessed in the model:

- Source to receiver maximum wind of 3m/s.
- Prevailing wind direction as given in Figure 4.
- Temperature inversion of 3°/100m.

![Annual Wind Rose for 2016](image)

*Figure 4 – Annual Wind Rose for 2016*

Given that some equipment operates 24 hours a day, day and night time period has been considered to determine the impact during these time periods. The terrain heights for the quarry site and surround area has been obtained from the operator.
4.6 Current Operations

4.6.1 Predicted Noise Results

The following noise predictions for the current operation activities associated with the quarry have been calculated the nearest affected receivers as identified in this report. The following scenarios have been considered:

- Day time operation noise of all *stationary plant*. Refer to Figure 5.
- Night time operation noise of *stationary plant* that operate 24 hours. Refer to Figure 6.
- Day time operation noise of all *mobile vehicles*. Refer to Figure 7.
- Night time operation noise of *mobile vehicles* that operate 24 hours. Refer to Figure 8.

The following Table 11 is the results of the current noise emissions from the operation of the quarry.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Time</th>
<th>Receiver</th>
<th>Predicted Noise Level, (L_{eq, 1hr}) dBA</th>
<th>DEHP Noise Limit (L_{eq, 1hr}) dBA (Day/Evening/Night)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stationary Plant</strong></td>
<td>Day</td>
<td>R3</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td><strong>Mobile Plant / Vehicles</strong></td>
<td>Day</td>
<td>R3</td>
<td>22</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total Cumulative</strong></td>
<td>Day</td>
<td></td>
<td><strong>31</strong></td>
<td><strong>35</strong></td>
</tr>
<tr>
<td><strong>Stationary Plant</strong></td>
<td>Evening/Night</td>
<td>R3</td>
<td>24</td>
<td>35</td>
</tr>
<tr>
<td><strong>Mobile Plant / Vehicles</strong></td>
<td>Evening/Night</td>
<td>R3</td>
<td>&lt;10</td>
<td>35</td>
</tr>
<tr>
<td><strong>Total Cumulative</strong></td>
<td>Evening / Night</td>
<td></td>
<td><strong>24</strong></td>
<td><strong>35</strong></td>
</tr>
</tbody>
</table>

4.6.2 Discussion

The predictions indicate noise levels at the receiver would comply with the DEHP noise limit for daytime and night time (24hrs) operation. The predicted noise levels are cumulative and are based on activities operating simultaneously which would be considered a worst-case scenario and realistically unlikely to occur. Based on the current operation, our opinion is the operation noise is mostly likely inaudible and would not cause a noise impact at the nominated receiver. Also, there is no intention to change or increase to the operation activities for this part of site.
Figure 5 – Day Time Operation Noise Model
Figure 6 – Night Time (24hr) Operation Noise Model
Figure 7 – Day Time Vehicle Movements Noise Model
Figure 8 – Night Time Vehicle Movements Noise Model
4.7 Wells Waste Rock Emplacement Area Expansion

4.7.1 Predicted Noise Results

The quarry is proposing an expansion of the Wells Waste Rock Emplacement Area (WREA) which is located at the southern end of the quarry site. This section provides a review of the proposed expansion and the predicted noise at the receiver. The expansion would not include any additional equipment or change in operation activities of the site.

The proposed expansion is shown in Figure 9 below, which would increase the area and move the operation closer to the residence of O. & J.L. Stunzer “Prior Park” (R3).

![Figure 9 – Proposed Expansion of WREA (supplied by Omya)](image)

Noise predictions have been completed to assess the impact of both the existing operations and the WREA expansion.
The following Table 12 is the results of the current noise emissions from the operation of the quarry compared the proposed expansion area. The noise model contour is presented in Figure 10.

**Table 12 – Predicted Noise at WREA Expansion**

<table>
<thead>
<tr>
<th>Noise Source</th>
<th>Receiver</th>
<th>Receiver Noise Level, $L_{eq, 1 hr}$ dBA</th>
<th>DEHP Noise Limit $L_{eq, 1 hr}$ dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Current</td>
<td>Expansion</td>
</tr>
<tr>
<td>Screening /reclaiming</td>
<td>R3</td>
<td>27</td>
<td>22</td>
</tr>
<tr>
<td>Wheeled front end loader (Komatsu) + beeper</td>
<td>R3</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td><strong>Total Cumulative</strong></td>
<td></td>
<td><strong>28</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

**4.7.2 Discussion**

For the current operation of the WREA site and the proposed expansion, the predictions indicate noise levels at the receiver would actually reduce. Our analysis indicates that due to the topography of the WREA site, the new profile of the terrain would provide improved acoustic attenuation. Therefore, we conclude that there would no change in the noise impacting the nearest receiver. Also, there is no intention to modify the operation activities of the site and therefore the noise levels predicted in Section 4.6 (Table 11) would not change.
Figure 10 – WREA Expansion Noise Model
4.8 Blasting Noise Levels

4.8.1 Predicted Noise Results

Blasting is anticipated to occur on average 1 to 2 blasts per month. The following are the parameters for a typical blast on site:

- Hole diameter: 89mm
- Hole spacing: 2.6m burden and 3m spacing,
- Explosives: 60kg/hole to 100kg/hole,
- Total blast tonnage: 4 to 7.5 tonne,
- Delays between each hole,
- All holes are stemmed.
- Average powder factor 0.6kg/bcm to 0.75kg/bcm

Any blasting would occur in a fully confined blast hole, minimising the potential for excessive blast overpressure. Assuming blasting could occur anywhere within the Wells quarry, the separation distance from the nearest sensitive receptor (R3) could range from 1500m at the furthest point to 1200m at the nearest point.

The prediction of the airblast levels is non-linear and can be complicated due to the variability of rock types. For the prediction of air blast overpressure, the following equation has been applied as referenced in Appendix J of the Australian Standard AS 2187.2-2006:

\[ P = Ka \left( \frac{R}{Q^{1/3}} \right)^a \]

where:
- \( P \) = pressure (kPa), converted to dB(Linear) using \( 20 \times \log (P/P_o) \), where \( P_o \) is the reference air pressure of 20 mPa.
- \( Q \) = explosive charge mass (kg)
- \( R \) = distance from charge (m)
- \( Ka \) = site constant for confined blast, 10 to 100
- \( a \) = site exponent, -1.45

Table 13 on the following page presents the predicted maximum airblast noise level based on the charge mass and the distance to the nearest receiver.
### Table 13 — Predicted Noise Level from Blasting, $L_{\text{max}}$ dB

<table>
<thead>
<tr>
<th>Charge Mass (Kg)</th>
<th>Distance (m)</th>
<th>Noise Limit $L_{\text{max}}$ dB (Linear)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1200</td>
<td>1500</td>
</tr>
<tr>
<td>40</td>
<td>102-122 dB</td>
<td>97-117 dB</td>
</tr>
<tr>
<td>100</td>
<td>106-126 dB</td>
<td>101-121 dB</td>
</tr>
<tr>
<td>200</td>
<td>109-129 dB</td>
<td>104-124 dB</td>
</tr>
<tr>
<td>300</td>
<td>111-131 dB</td>
<td>106-126 dB</td>
</tr>
</tbody>
</table>

### 4.8.2 Discussion

Omya’s Environmental Authority compliance is based upon the receipt of community complaints. When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe.

If noise monitoring indicates there has been a breach of the EA limits, Omya will immediately implement abatement measures to minimise any further environmental nuisance. To date, the Mine has not received any noise related public complaints.

Based on the modelling results, in Table 13, the predicted noise level associated with the site’s blasting activities at a $K_a$ factor of 10 shows the site to be fully compliant with its EA noise limits. When the model is run using higher $K_a$ factors, it has shown there is the potential for airblast over pressure level higher than the EA noise limits.

Omya currently implements numerous controls in line with Australian Standard AS 2187.2-2006 to manage its blasting activities to ensure the impact of its blasts are minimised, these include the following:

- Optimising blast design (changing burden and spacing) by altering drilling patterns, and adjusting maximum instantaneous charge (effective charge mass per delay).
- Using survey methods, as appropriate, to ensure burden is adequate.
- Keeping face heights to a practical minimum.
- Ensuring stemming type and length is adequate.
- Eliminating exposed detonating cord.
- Orientating faces where possible so that they do not face directly towards residences.
- Varying the direction of initiation.
- Exercising strict control over the burden, spacing and orientation of all blastholes.
Due to the uncertainty in estimating airblast noise levels, it is recommended that attended noise measurements be considered in determining the actual blast noise levels at the receiver so that a specific noise management plan can be developed if required. Blast monitoring should include the following details (but not limited to):

- The size of the blast in terms of the number of blastholes and the quantity of explosives in each blasthole.
- The date and time of the blast.
- The location of the measurement transducers (geophones, accelerometers, microphones).
- The location of the blast in relation to the quarry.
- The location of any structures and/or persons who may be affected by the blast.
- The measured airblast values including the peak airblast levels.
5 Conclusion

On behalf of Omya Australia Pty Ltd, Acouras Consultancy has been commissioned to assess the potential for noise impact associated with the operation Bajool Marble Mine. The purpose of this report is to undertake a noise survey of the existing environmental conditions, assess the noise impact from the current operational activities of the quarry and the assess the potential noise impact from the expansion of the Wells Waste Rock Emplacement Area (WREA) in accordance with the QLD DEHP Environmental Authority Permit No. EPML00657813.

As part of the assessment site visits were undertaken and noise surveys conducted of the existing background noise levels, as detailed in Section 3.1 at a location representative of the nearest noise sensitive receivers. The outcome of the environmental noise survey has been used to establish the noise criteria through applying the DEHP guidelines. Refer Section 3.3 of this report. Provided the operational noise levels achieve the DEHP criteria as given in Table 5, the EA noise limits (Table 4), sleep disturbance and background noise creep limits and acoustic quality objectives would be achieved.

During the site visit attended noise measurements were also conducted to obtain acoustic data on the operation of various fixed plant and mobile plant currently operating on the site. The data collected from the noise measurements and from other source documents have been used for input into the noise impact assessment. Meteorological data collected from the Omya weather station located on the site and annual weather data has been used for atmospherically parameters in the noise model software.

The predictions indicate noise levels at the receiver would comply with the DEHP noise limit for daytime and night time (24hrs) operation. The predicted noise levels are cumulative and are based on activities operating simultaneously which would be considered a worst-case scenario and realistically unlikely to occur. Based on the current operation, our opinion is the operation noise is mostly likely inaudible and would not cause a noise impact at the nominated receiver. Also, there is no intention to change or increase to the operation activities for the site.

For current operation of the WREA site and the proposed expansion, the predictions indicate noise levels at the receiver would actually reduce. Our analysis indicates that due to the topography of the WREA site, the new profile of the terrain would provide improved acoustic attenuation. Therefore, we conclude that there would no change in the noise impacting the nearest receiver. Also, there is no intention to modify the operation activities of the site and therefore the noise levels predicted in Section 4.6 would not change.

Based on the modelling results (Table 13) the predicted noise level associated with the site’s blasting activities at a Ka factor of 10 shows the site to be fully compliant with its EA noise limits. When the model is run using higher Ka factors, it has shown there is the potential for air blast over pressure level higher than the EA noise limits. Section 4.8.2 provides an overview of Omya’s current controls in place to ensure no environmental nuisance.
Appendix A – Acoustic Terminology

Decibel, dB: A dimensionless unit which denotes the ratio between two quantities that are proportional to power, energy or intensity. One of these quantities is a designated reference by which all other quantities of identical units are divided. The sound pressure level in decibels is equal to 10 times the logarithm (to the base 10) of the ratio between the pressure squared divided by the reference pressure squared. The reference pressure used in acoustics is 20 micro Pascals.

A-WEIGHTING: A measure of sound pressure level designed to reflect the response of the human ear, which does not respond equally to all frequencies. To describe sound in a manner representative of the human ear’s response it is necessary to reduce the effects of the low and high frequencies with respect to medium frequencies. The resultant sound level is said to be A-weighted, and the units are in decibels (dBA). The A-weighted sound level is also called the noise level.

Sound Pressure Level, $L_p$ (dB), of a sound: 20 times the logarithm to the base 10 of the ratio of the r.m.s. sound pressure to the reference sound pressure of 20 micro Pascals. Sound pressure level is measured using a microphone and a sound level meter, and varies with distance from the source and the environment.

Ambient Noise/Sound: All noise level present in a given environment, usually being a composite of sounds from many sources far and near. Traffic, HVAC, masking sound or even low-level background music can contribute to ambient level of noise or sound.

Percentile Level - $L_{90}$, $L_{10}$, etc: A statistical measurement giving the sound pressure level which is exceeded for the given percentile of an observation period, e.g. $L_{90}$ is the level which is exceeded for 90% of a measurement period. $L_{90}$ is commonly referred to as the "background" sound level.

Background Noise ($L_{90}$): The sum total of all unwanted residual noise generated from all direct and reflected sound sources in a space that can represent an interface to, or interfere with good listening and speech intelligibility.

Rating Background Level – RBL: Method for determining the existing background noise level which involves calculating the tenth percentile from the $L_{A90}$ measurements. This value gives the Assessment Background Noise Level (ABL). Rating Background Level is the median of the overall ABL.

$L_{AEQ,T}$: Equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, within a measurement time interval $T$, has the same A-weighted sound energy as the actual time-varying sound.
Appendix B – Omaya Weather Station Data
Appendix C – Noise Logger Results

Bajool Marble Quarry, QLD - Tuesday, 24 October 2017

Bajool Marble Quarry, QLD - Wednesday, 25 October 2017

Bajool Marble Quarry, QLD - Thursday, 26 October 2017
Bajool Marble Quarry, QLD - Friday, 27 October 2017

Bajool Marble Quarry, QLD - Saturday, 28 October 2017

Bajool Marble Quarry, QLD - Sunday, 29 October 2017
Bajool Marble Quarry, QLD - Monday, 30 October 2017

Bajool Marble Quarry, QLD - Tuesday, 31 October 2017
Appendix D – Environmental Authority Permit

Agency interest: Noise

N1 Subject to requirement of conditions N2 and N3 noise from the mining activity must not cause an environmental nuisance, at any sensitive place.

N2 When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

N3 If the environmental authority holder can provide evidence through monitoring that the limits defined in Attachment 1 Table N1 Noise limits and Table N2 Airblast overpressure level are not being exceeded then the holder is not in breach of condition N1. Monitoring must include:
   (a) \( L_{A,eq,SD} \);  
   (b) the level and frequency of occurrence of impulsive or tonal noise;  
   (c) atmospheric conditions including wind speed and direction; and  
   (d) location, date and time of recording.

Note: See Attachment 1 for Table N1 Noise limits and Table N2 Airblast overpressure level.

N4 If monitoring indicates exceedance of the relevant limits in Attachment 1 Table N1 Noise limits and Table N2 Airblast overpressure level, then the environmental authority holder must:
   (a) address the complaint including the use of appropriate dispute resolution if required; or  
   (b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.

Note: See Attachment 1 for Table N1 Noise limits and Table N2 Airblast overpressure level.

N5 The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency’s Noise Measurement Manual.

N6 Subject to requirements of conditions N7 and N8 vibration from the mining activity must not cause an environmental nuisance, at any sensitive place.

N7 When requested by the administering authority, vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

N8 If the environmental authority holder can provide evidence through monitoring that the limits defined in Attachment 1 Table N3 Vibration limits, are not being exceeded then the holder is not in breach of condition N6. Monitoring must include:
   a) location of the blast(s) within the mining area (including which bench level); and  
   b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and  
   c) location, date and time of recording.
Promote the complaint including the use of appropriate dispute resolution if required; or
b) immediately implement vibration abatement measures so that vibration from the activity
does not result in further environmental nuisance.

Note: See Attachment 1 for Table N3 Vibration limits.
### NOISE

#### Table N1 – Noise limits

<table>
<thead>
<tr>
<th>Noise level measured as</th>
<th>Monday to Saturday</th>
<th>Sundays and public holidays</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7am - 6pm</td>
<td>8am - 6pm</td>
</tr>
<tr>
<td></td>
<td>6pm - 10pm</td>
<td>6pm - 10pm</td>
</tr>
<tr>
<td></td>
<td>10pm - 7am</td>
<td>10pm - 9am</td>
</tr>
</tbody>
</table>

**Noise measured at a ‘Noise sensitive place’**

<table>
<thead>
<tr>
<th>LAeq.100, 10 min</th>
<th>L150, 10 min</th>
<th>L100, 10 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>bg=5</td>
<td>bg=5</td>
<td>bg=0</td>
</tr>
<tr>
<td>bg=10</td>
<td>bg=10</td>
<td>bg=5</td>
</tr>
<tr>
<td>bg=15</td>
<td>bg=15</td>
<td>bg=10</td>
</tr>
</tbody>
</table>

**Noise measured at a ‘Commercial place’**

<table>
<thead>
<tr>
<th>LAeq.100, 10 min</th>
<th>L150, 10 min</th>
<th>L100, 10 min</th>
</tr>
</thead>
<tbody>
<tr>
<td>bg=10</td>
<td>bg=10</td>
<td>bg=5</td>
</tr>
<tr>
<td>bg=15</td>
<td>bg=15</td>
<td>bg=10</td>
</tr>
</tbody>
</table>

**NOTE:** The method of measurement and reporting of noise levels must comply with the latest editions of the Environmental Protection Agency’s Noise Manuals.

#### Table N2 – Airblast overpressure level

<table>
<thead>
<tr>
<th>Location</th>
<th>Monday to Friday 9 am - 3 pm</th>
<th>Saturday 9am - 1pm</th>
<th>Sundays and public holidays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitive place</td>
<td>Air blast overpressure level (linear peak): 115 dB for any 4 out of 5 consecutive blasts and a maximum of 120 dB (maximum)</td>
<td>No blasting to occur:</td>
<td></td>
</tr>
<tr>
<td>Commercial place</td>
<td>Air blast overpressure level (linear peak): 115 dB for any 4 out of 5 consecutive blasts and a maximum of 120 dB (maximum)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** The method of measurement and reporting of noise levels must comply with the latest editions of the Environmental Protection Agency’s Noise Manual.