APPENDIX G – NOISE MANAGEMENT PLAN (INCL. ENVIRONMENTAL NOISE ASSESSMENT)
NOISE MANAGEMENT PLAN FOR SAND AND CLAY EXTRACTION

LOTS 5 & 6 (NO. 1728) GREAT NORTHERN HIGHWAY, BULLSBROOK, CITY OF SWAN

December 2017

PREPARED FOR:

BRIKMAKERS
260 KALAMUNDA ROAD
SOUTH GUILDFORD, WA, 6055
DOCUMENT CONTROL SHEET

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Project: Darling Downs
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EXECUTIVE SUMMARY

This Noise Management Plan has been generated in support of an application to approve the extraction of sand and clay from 1729 (Lots 5 & 6) Great Northern Highway, Bullsbrook. The proponent, Brikmakers, are leasing the site and seek relevant permissions and approvals to continue to extract the abundant sand and clay resource from the site.

The site is located in a rural location beyond the suburban fringe of the Perth Metropolitan Area. The site is not presently used for an active rural purpose and there is no residential dwelling currently within the property.

This application examines the noise impacts associated with different operational components of the extraction process, in relation to six residential properties within a 500m radius of the project.

An Environmental Noise Assessment has been compiled by Lloyd George, an acoustical consultant listed under the Association of Australasian Acoustical Consultants, to indicate the likely compliance of the extractive operations with Environmental (Noise) Regulations 1997.

The Acoustic Consultants outlined that with appropriate bunding of the extraction areas within the lot, the Environmental (Noise) Regulations 1997 can be complied with. In addition to Lloyd George’s noise management controls, there are an additional 10.
1. INTRODUCTION

1.1 PURPOSE
This Noise management plan has been generated by Site Environmental and Remediation Services (SERS) on behalf of Brikmakers in support of the development application to approve Sand and Clay Extraction on Lots 5 & 6 (1728) Great Northern Highway, Bullsbrook (Figure 1). The site and surrounding areas have been historically cleared for pastoral use, and are classified as 'rural' under the Metropolitan Regional Scheme (MRS) (refer to Figure 2 for MRS zoning).

Brikmakers are a major brick manufacturer in the Perth Metropolitan area. The use of resource from this site will provide a portion of the required resources to facilitate ongoing brick manufacturing. The site will be managed in accordance with Brikmakers management procedures used on similar sites and to industry best practices.

The standard Brikmakers process comprises the periodic excavation of material which is then appropriately stockpiled onsite. Sand that is extracted from the site will not be stockpiled and instead, carted out to immediate projects. Brikmakers is applying for and Extractive Industries License and approval for sand and clay extraction for a period of 10 years.

The proposed extraction area is located within the Western Australian Planning Commissions (WAPC) Statement of Planning Policy No.10. Basic Raw Materials (2000), as a Priority Resource Location. This management plan complies with the City of Swan Draft Bullsbrook Local Area Plan Discussion Paper (2017) whereby applications within a Priority Resource Area must supply impacts of noise and compatibility of the activity with resource extraction operations. As the proposed activity includes the extraction of sand and clay the buffer distance of 300 - 500m has been identified by City of Swan (2017).

Noise in Western Australia is governed by the Environmental Protection (EP) Act 1986, through the Environmental Protection (Noise) Regulations 1997. As defined by the EP Act 1986, noise includes vibrations of any frequency, whether transmitted through air or any other physical medium (EP, 1986). The following Environmental Noise Assessment and management controls have been developed to comply with these Regulations.

There are two possible sources of noise as a result of the extractive operations detailed in the proposal;
- Extraction of materials (moving and digging of the sand and clay)
- Trucks operating onsite (movement, reversing beepers, and accumulations of sound)

This document outlines the proposed works, risks associated and the noise management controls to be implemented in conjunction with this project.

1.2 EPA OBJECTIVE
The EPA’s environmental objective for the factor Social Surroundings is: “To protect social surroundings from significant harm” (EPA, 2016). Noise is considered an impact to social surroundings as it has the potential to unreasonably interfere with the health, welfare, convenience and comfort of people (EPA, 2016).
1.3 RELEVANT LEGISLATION
Relevant Legislation, guidelines and policies to the Noise Management Plan are as follows:

Legislation:
- Environmental Protection Act 1986

Regulation:
- Environmental Protection (Noise) Regulations 1997

Guideline:
- Environmental Factor Guidelines Social Surroundings 2016

Policy:
- State Planning Policy 2.4 Basic Raw Materials 2000

2. SITE HISTORY
2.1 SITE BACKGROUND
The site is located approximately 30 kilometres from the Perth CBD and is bounded by Walyunga Road to the north and Great Northern Highway to the west. Vehicle access to the site is via Great Northern Highway and Walyunga Road (Figure 1).

The site was historically used for the grazing of cattle. Therefore, the majority of the site has been previously cleared of vegetation. Several stands of native trees are located mostly to the west of Lot 5 and to the north of Lot 6. The remainder of the site consists of cleared paddock (grassed) areas. Several trees have been planted in the southern portion of the site. One small dam is located near the western boundary of the site. However, this dam does not contain surface water and will not be used as part of the project activities. There is a shed with a building attached which is located in the southern part of the site. The shed and building will be retained for use by a caretaker (Figure 3).

2.2 SOILS
The site is located within the Pinjarra Zone (Map Unit 213) (DPIRD, 2017). The Pinjarra Zone consists of alluvial deposits between the Bassendean Dunes Zone and the Darling Scarp, colluvial and shelf deposits adjacent to the Darling Scarp. Soils of the Pinjarra Zone are often described as clayey to sandy alluvial soils with wet areas (DPIRD, 2017).

Soils in the project area are part of the Forrestfield System (Map Unit 213Fo) (DPIRD, 2017). The Forrestfield System is described as undulating foot slopes of the Darling and Whicher Scarps. The soils of the project area are described as duplex, sandy gravels, pale deep sands and grey, deep sandy duplexes (DPIRD, 2017). These soils are sometimes considered to be alkaline (DPIRD, 2017). Soils in the project area may also be described as semi-wet to wet soils, with grey deep or pale deep sands and loams (DPIRD, 2017). As the majority of the overlying soils are sandy and free-draining, there is an extremely low probability of occurrence of acid sulphate soils (CSIRO, 2017).
Landforms of the Bullsbrook area are described as coastal plain with swamps and low slopes of <10% gradient (DPIRD, 2017). The geology of the site consists of unconsolidated sediments over sedimentary rocks (DPIRD, 2017).

2.3 CLIMATE
Perth weather is described as a Mediterranean climate, experiencing cold, wet winters and hot, dry summers (ABS, 2012). Dust lift is known to be more prevalent in hot, dry conditions.

Pearce RAAF base (site number 009053) is the closest BOM weather station, and sits approximately 8km north-east from the site. The mean 9am wind speed annually is 14.2km/h, highest wind speeds are seen in the summer months from November – March (BoM, 2017). The mean 3pm wind speed is 17.7km/h, the highest wind speeds at 3pm are in the summer between November – February (BoM, 2017).

2.4 TOPOGRAPHY
The site slopes naturally downwards towards the west. The highest point being in the south-eastern corner of the site. The lowest point is on the western boundary near Great Northern Highway.

The site currently has an elevation of approximately 60 metres AHD on the eastern side of the site (Lot 6) to an elevation of approximately 25 metres AHD on the western side of the site (Lot 5). The highest elevation is on the south-eastern corner.

2.5 SENSITIVE RECEPTORS
An Environmental Noise Assessment was completed by Lloyd George Acoustics assessing the noise impacts of the proposed extractions on nearby sensitive receptors. The locations of the receptors outlined in the assessment and their proximity to the site boundary is outlined in Table 1. Approximate distances have been taken from publicly available platforms (Nearmap, 2017). Refer to Figure 4 for a map of sensitive receptors. Note that the distance to operational areas are greater than those measuring proximity to the cadastral boundary, these can be found in Table 1.

The EPA guidelines for the Assessment of Environmental Factors No. 3 Separation Distances between Industrial and Sensitive Land uses states that 300-500m should be reserved as a buffer around an extraction site (EPA, 1997).

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Description</th>
<th>Location</th>
<th>Proximity to site boundary</th>
<th>Proximity to operations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Residential</td>
<td>1849 Great Northern Highway, Bullsbrook WA 6084</td>
<td>350m</td>
<td>620m</td>
</tr>
<tr>
<td>2</td>
<td>Residential</td>
<td>1825 Great Northern Highway, Bullsbrook WA 6084</td>
<td>200m</td>
<td>440m</td>
</tr>
</tbody>
</table>
3. NOISE ASSESSMENT CRITERIA

3.1 ASSESSMENT CRITERIA

Noise in Western Australia is governed by the Environmental Protection Act, 1986, through the Environmental Protection (Noise) Regulations 1997. Detailed criteria of the Regulations and Standards are outlined in Lloyd George Acoustic’s Environmental Noise Assessment, located in Appendix A.

The stage of removing overburden and developing noise bunds falls under the EPA definition for construction sites, whereby the process of removing or reinstating vegetation or topsoil for the purpose of, or in relation to a mining operation is undertaken (DER, 2016). This means the process falls under Regulation 13 – Construction Sites instead of the Environmental Protection (Noise) Regulations 1997. The procedures associated with these actions will now abide by the conditions listed in AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites are followed (DER, 2016).

4. ENVIRONMENTAL NOISE ASSESSMENT

4.1 COMPUTER MODELING METHODOLOGY

Lloyd George Acoustics, in consultation with SERS and Brikmakers, conducted an Environmental Noise Assessment for the site. Computer modeling calculated noise levels for various weather conditions and operating scenarios, but without the background noise usually present in field surveys. The software used for this assessment was SoundPLAN 7.4 with CONCAWE algorithms. The information input to the program to produce scenarios included Meteorological Information, Topographical data, Ground Absorption and Source sound power levels. Equipment noise generation levels were generated assuming that the equipment

<table>
<thead>
<tr>
<th></th>
<th>Type</th>
<th>Address</th>
<th>Distance</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Residential</td>
<td>1799 Great Northern Highway, Bullsbrook WA 6084</td>
<td>270m</td>
<td>380m</td>
</tr>
<tr>
<td>4</td>
<td>Residential</td>
<td>1763 Great Northern Highway, Bullsbrook WA 6084</td>
<td>400m</td>
<td>530m</td>
</tr>
<tr>
<td>5</td>
<td>Residential</td>
<td>1721 Great Northern Highway, Bullsbrook WA 6084</td>
<td>180m</td>
<td>270m</td>
</tr>
<tr>
<td>6</td>
<td>Residential</td>
<td>1683 Great Northern Highway, Bullsbrook WA 6084</td>
<td>470m</td>
<td>610m</td>
</tr>
<tr>
<td>7</td>
<td>Residential</td>
<td>151 Walyunga Road, Bullsbrook WA 6084</td>
<td>485m</td>
<td>650m</td>
</tr>
<tr>
<td>8</td>
<td>Industrial*</td>
<td>91 Walyunga Road, Bullsbrook WA 6084</td>
<td>105m</td>
<td>170m</td>
</tr>
<tr>
<td>9</td>
<td>Industrial</td>
<td>1686 Great Northern Highway, Upper Swan 6069</td>
<td>270m</td>
<td>330m</td>
</tr>
</tbody>
</table>

*Sensitive Receptor 8 is within an Industrial site and is therefore considered to be a caretaker’s residence, as with the premise at receptor 9 which operates as a salvage yard.
would be operating simultaneously, in addition to worst-case wind conditions to apply worst case scenarios to the project. Refer to Appendix A for the detailed Lloyd George Environmental Noise Assessment Methodology.

4.2 RESULTS
The Environmental Noise Assessment found that with the implementation of specific controls (found in section 5 of the Noise Management Plan) the processes associated with operation would not exceed standards outlined in the Environmental (Noise) Regulations 1997. Section 5.1 of the Assessment outlined in Appendix A confirms that daytime $L_{A10}$ assigned noise levels are achieved at all sensitive noise receiver locations (sensitive receptors). Noise regulations were exceeded within two receptors in the processes of removing overburden and creating noise bunds. As these processes are defined under Regulation 13 – Construction Sites, they are assessed by the AS 2436 – 2010 Guide to noise and vibration control on construction, demolition and maintenance sites, and therefore the regulations do not apply to these preparatory works.

5. NOISE MANAGEMENT CONTROLS

5.1 ACOUSTIC CONSULTANT MANAGEMENT CONTROLS
The Environmental Noise Assessment recommended that with the construction of appropriately sized noise bunds, requirements of the Environmental Protection (Noise) Regulations 1997 would be achieved. The bunds will be formed on the south and west extent of the project area shielding the extraction pits from surrounding receptors. The bunds surrounding the sand extraction pits will be 4m high, whilst the bunds on the western and southern sides of the clay extraction pit will be 6m high. It will be the responsibility of the Proponent and Site Manager to ensure the noise bunds are erected suitably.

5.2 ADDITIONAL MANAGEMENT CONTROLS
In addition to the management controls outlined in Lloyd George’s Acoustical Report, SERS has produced controls (refer to Table 2) for Brikmakers to follow in their extractive operations. These controls aim to reduce operational noise by considering appropriate facets of the operation and comply with Noise Regulations (1997).

**TABLE 2: ROLES AND RESPONSIBILITIES ASSOCIATED WITH NOISE REDUCING MANAGEMENT CONTROLS**

<table>
<thead>
<tr>
<th>Item</th>
<th>Management Controls</th>
<th>Roles and Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maintenance of retained vegetation on site and surrounding vegetation off-site</td>
<td>Proponent and Site Manager</td>
</tr>
<tr>
<td>2</td>
<td>Broad-band reversing ‘squawkers’ are used in replacement of tonal reversing beepers (a mixed frequency alarm will not carry as far as a beeper) (CoS, n.d.)</td>
<td>Proponent and Site Manager</td>
</tr>
<tr>
<td>3</td>
<td>Restrictions placed on the use of air-brakes</td>
<td>Site Manager</td>
</tr>
</tbody>
</table>

Lots 5 & 6 (No. 1728) Great Northern Highway - Noise Management Plan
4 | Excess revving is banned onsite | Site Manager
---|---|---
5 | Speed limits enforced onsite (10km/h) with signage | Site Manager
6 | Employee inductions will include noise reduction and mitigation techniques | Site Manager
7 | Noise complaint register to be implemented and updated | Site Manager
8 | Vehicle prestart checks and regular services to ensure malfunctions do not impact noise generation of operations | Site Manager
9 | Management actions will be amended to reflect noise objective (zero noise complaints) | Site Manager
10 | A copy of this management plan will be available in the site office for reference at all times | Site Manager

5.3 STAKEHOLDER CONSULTATION
Stakeholders are all parties who have an interest in the project. It is a requirement of formerly Department of Environment Regulation (DER), currently Department of Water and Environment Regulation, for proponents to carry out community engagement (DER, 2014). The relevant stakeholders of this project include:
- Sensitive receptors within 500m of the project area
- Residents of the Bullsbrook area
- Indirectly affected members of the public
- City of Swan
- Government departments (e.g. DWER, DMIRS)

5.4 ROLES AND RESPONSIBILITIES
The roles and responsibilities associated with the implementation of Noise Management controls have been outlined within the Table 2 in Section 5.2.

5.5 COMPLAINTS MANAGEMENT
Information regarding any complaints of exceedance noise events from community members or employees and contractors must be documented and passed onto the site supervisor for review and action as soon as possible. A record of complaints will be kept within a register in the site office. The register can be seen in Appendix B. This will document the following information:
- Name and contact details of the complainant
- Details of the noise exceedance occurrence and impacts associated
- Frequency of nuisance noise exceedance occurrence
- Duration of noise exceedance occurrence (date and time)
- Location of noise exceedance occurrence
- Mitigation strategies implemented
6. CONCLUSION

In the opinion of SERS, in consultation of Brikmakers and with support of Environmental Noise Assessment models by Lloyd George Acoustics, that with the successful implementation of all management controls outlined in this management plan, that noise impacts will be minimised to an acceptable level. This acceptable level is to comply with the Environmental (Noise) Regulations 1997. With roles and responsibilities of employees outlined, the accountability behind each management control is understood and implemented accordingly.

This Noise Management Plan is subject to ongoing review, as it is the aim of Brikmakers to achieve continuous improvement in this area of operation.

7. REFERENCES


City of Swan (n.d.) Reversing Alarms Health Services Information Fact Sheet City of Swan Health Services Accessed from https://www.swan.wa.gov.au/Services-support/Public-health/Noise/Noise-information-fact-sheets on 08/12/2017


Lloyd, D (2017) Lloyd George Acoustics Environmental Noise Assessment prepared for BGC Brikmakers for 1728 Great Northern Highway, Bullsbrook, Refer to Appendix A


FIGURE 1 – SITE LOCATION
FIGURE 1: Site Location
FIGURE 2 – SURROUNDING LAND USES
FIGURE 4 – SENSITIVE RECEPTORS
FIGURE 4: Buffer Zones for Sensitive Receptors

Legend
- Residential
- Site Boundary
- 300m Buffer
- 500m Buffer
- 1,000m Buffer
- Rural

Sources: Esri, HERE, Geocom, USGS, iMap, InCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri
APPENDIX A – LLOYD GEORGE ACOUSTICS
ENVIRONMENTAL NOISE ASSESSMENT
Environmental Noise Assessment
Darling Downs Clay Pit

1728 Great Northern Highway, Bullsbrook

Reference: 17114231-01

Prepared for:
BGC Brikmakers
This report has been prepared in accordance with the scope of services described in the contract or agreement between Lloyd George Acoustics Pty Ltd and the Client. The report relies upon data, surveys, measurements and results taken at or under the particular times and conditions specified therein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the Client. Furthermore, the report has been prepared solely for use by the Client, and Lloyd George Acoustics Pty Ltd accepts no responsibility for its use by other parties.
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Appendices

A Terminology
1 INTRODUCTION

This report presents the noise assessment of the proposed clay and sand pit operations on Lots 5 and 6 on D47584 (1728 Great Northern Highway, Bullsbrook) – refer Figure 1.1. The site is adjacent to Great Northern Highway and located approximately 30 km northeast of Perth.

The clay pit operations will be developed in four stages and will work in conjunction with the sand extraction pits to the west and north. The stockpiling area to the north will initially be extracted of sand by others and then used for clay stockpiling as the sand extraction process moves west.

Operations are proposed for Monday to Saturday 0700 to 1900 and would include:

- an excavator, haul trucks and dozer working in the clay pits;
- an excavator and road trucks in the sand pit to the west; and
- an excavator, loader, dozer and haul trucks working in the sand pit/stockpiling area to the north.

The various pits, stockpiling areas and closest noise sensitive receivers are presented in Figure 1-2. It should be noted that the sensitive receiver directly to the north of project is on an industrial site and therefore considered to be a caretaker’s residence.
CRITERIA

Environmental noise in Western Australia is governed by the Environmental Protection Act 1986, through the Environmental Protection (Noise) Regulations 1997 (the Regulations).

2.1 Overburden Removal and Development of Noise Bunds

This initial phase of the operations would be considered as construction under the Regulations with regulation 13, which refers to noise from construction sites, being applicable. As it is proposed to undertake this work during normal working hours (0700 to 1900 Monday to Saturday) the following regulation requirements apply:

Regulation 7 does not apply to ... construction work carried out between 0700 hours and 1900 hours on any day which is not a Sunday or public holiday if the occupier of the premises ... shows that –

a) The construction work was carried out in accordance with control of environmental noise practices set out in section 4 of AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites;
b) The equipment used on the premises was the quietest reasonably available; and

c) If the occupier was required to prepare a noise management plan ... in respect of the construction site –

   i. The noise management plan was prepared and given in accordance with the requirement, and approved by the Chief Executive Officer; and

   ii. The construction work was carried out in accordance with the management plan, excluding any ancillary measure.

### 2.2 Production Phase

For the production phase of the operations, regulation 7 defines the prescribed standard for noise emissions as follows:

“7. (1) Noise emitted from any premises or public place when received at other premises –

   (a) Must not cause or significantly contribute to, a level of noise which exceeds the assigned level in respect of noise received at premises of that kind; and

   (b) Must be free of –

      i. tonality;

      ii. impulsiveness; and

      iii. modulation,

      when assessed under regulation 9”

A “…noise emission is taken to significantly contribute to a level of noise if the noise emission ... exceeds a value which is 5 dB below the assigned level…”

Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:

   (a) The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission; and

   (b) The noise emission complies with the standard prescribed under regulation 7 after the adjustments of Table 2-1 are made to the noise emission as measured at the point of reception.

<table>
<thead>
<tr>
<th>Table 2-1 Adjustments Where Characteristics Cannot Be Removed</th>
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</thead>
<tbody>
<tr>
<td>Where Noise Emission is Not Music</td>
</tr>
<tr>
<td>-----------------------------------</td>
</tr>
<tr>
<td><strong>Tonal</strong></td>
</tr>
<tr>
<td>+ 5 dB</td>
</tr>
<tr>
<td><strong>Impulsiveness</strong></td>
</tr>
<tr>
<td>+ 10 dB</td>
</tr>
<tr>
<td><strong>Impulsiveness</strong></td>
</tr>
<tr>
<td>+ 15 dB</td>
</tr>
</tbody>
</table>

Note: The above are cumulative to a maximum of 15dB.
The baseline assigned levels (prescribed standards) are specified in Regulation 8 and are shown in Table 2-2.

### Table 2-2 Baseline Assigned Noise Levels

<table>
<thead>
<tr>
<th>Premises Receiving Noise</th>
<th>Time Of Day</th>
<th>Assigned Level (dB)</th>
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<tr>
<td></td>
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<td>$L_{A10}$</td>
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<tr>
<td>Noise sensitive premises: highly sensitive area¹</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>45 + influencing factor</td>
</tr>
<tr>
<td></td>
<td>0900 to 1900 hours Sunday and public holidays (Sunday)</td>
<td>40 + influencing factor</td>
</tr>
<tr>
<td></td>
<td>1900 to 2200 hours all days (Evening)</td>
<td>40 + influencing factor</td>
</tr>
<tr>
<td></td>
<td>2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)</td>
<td>35 + influencing factor</td>
</tr>
<tr>
<td>Noise sensitive premises: any area other than highly sensitive area</td>
<td>All hours</td>
<td>60</td>
</tr>
<tr>
<td>Commercial</td>
<td>All hours</td>
<td>60</td>
</tr>
<tr>
<td>Industrial</td>
<td>All hours</td>
<td>65</td>
</tr>
</tbody>
</table>

¹. **highly sensitive area** means that area (if any) of noise sensitive premises comprising —
   (a) a building, or a part of a building, on the premises that is used for a noise sensitive purpose; and
   (b) any other part of the premises within 15 metres of that building or that part of the building.

As detailed in Table 2-3, the influencing factor applicable at the noise sensitive premises, varies between 0 and 6 dB, due to Great Northern Highway being considered a major road (> 15,000 vehicles per day *February 2016 MRWA short term traffic north of Apple Street*). Note, the receiver numbers relate to *Figure 1-2*. 
### Table 2-3 Influencing Factor Calculation

<table>
<thead>
<tr>
<th>Receiver</th>
<th>Description</th>
<th>Within 100 metre Radius</th>
<th>Within 450 metre Radius</th>
<th>Total</th>
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<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>6 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>6 dB</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>6 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>6 dB</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>0 dB</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Industrial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Commercial Land</td>
<td>0 %</td>
<td>0 %</td>
<td>0 dB</td>
</tr>
<tr>
<td></td>
<td>Transport Factor</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td>2 dB</td>
</tr>
</tbody>
</table>

Note: Locations 8 and 9 are considered as a caretaker’s residence located on an Industrial land use and therefore attracts the Industrial assigned level.

Based on the proposed hours of operations, Table 2-4 shows the applicable assigned noise levels including the influencing factor and transport factor at each of the receiver locations.
### Table 2-4 Assigned Noise Levels

<table>
<thead>
<tr>
<th>Premises Receiving Noise</th>
<th>Time Of Day</th>
<th>Assigned Level (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$L_{A10}$</td>
</tr>
<tr>
<td>1</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>51</td>
</tr>
<tr>
<td>3</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>47</td>
</tr>
<tr>
<td>5</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>51</td>
</tr>
<tr>
<td>6</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>47</td>
</tr>
<tr>
<td>7</td>
<td>0700 to 1900 hours Monday to Saturday (Day)</td>
<td>45</td>
</tr>
<tr>
<td>8</td>
<td>All Hours</td>
<td>65</td>
</tr>
<tr>
<td>9</td>
<td>All Hours</td>
<td>65</td>
</tr>
</tbody>
</table>

It is noted that the assigned noise levels are statistical levels and therefore the period over which they are determined is important. The Regulations define the Representative Assessment Period (RAP) as a period of time of not less than 15 minutes, and not exceeding 4 hours, which is determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission. An inspector or authorised person is a person appointed under Sections 87 & 88 of the Environmental Protection Act 1986 and include Local Government Environmental Health Officers and Officers from the Department of Water and Environment Regulation. Acoustic consultants or other environmental consultants are not appointed as an inspector or authorised person. Therefore, whilst this assessment is based on a 4 hours RAP, which is assumed to be appropriate given the nature of the operations, this is to be used for guidance only.

It is further noted that under regulation 3, certain types of noise emission do not have to comply with the Regulations. In the case of this assessment these are:

(a) noise emissions from the propulsion and braking systems of motor vehicles operating on a road;

(g) noise emissions –

a. from a device for warning pedestrians installed at a pedestrian crossing on a road; or

b. from a device for warning of the passage of a train installed at a level crossing; or

c. from a safety warning device fitted to a building as a requirement of the Building Code as defined in the Building Regulations 2012 regulation 3; or

d. for the purpose of giving a warning required under the Mines Safety and Inspection Regulations 1995 regulation 8.26,
If every reasonable and practicable measure has been taken to reduce the effect of the noise emission consistent with providing an audible warning to people;

(h) noise emissions from –

a. a reversing alarm fitted to a motor vehicle, mobile plant, or mining or earthmoving equipment; or

b. a startup or movement alarm fitted to plant,

if

c. it is a requirement under another written law that such an alarm be fitted; and

d. it is not practicable to fit an alarm that complies with the written law under which it is required to be fitted and emits noise that complies with these Regulations;

It is considered that reversing alarms fitted to commercial vehicles and mobile plant e.g. HV trucks or loaders, are not exempt under the Regulations since they are not specifically required under another written law. The commonly used fixed noise output tonal reversing alarms also known as 'reversing beeper' emit, by their very nature, tonal and modulating noise at high levels. As such, this type of reversing alarm generally cannot comply with the Regulations even at distant receivers.

If deemed to be required, an alternative reversing alarm type should be considered. Such alternatives, which can more readily comply with the Regulations, include alarms emitting a broadband signal in-lieu of a tonal 'beep'.

3 METHODOLOGY

Computer modelling has been used to predict the noise impacts at various receivers. The advantage of modelling is that it is not affected by background noise sources and can provide the noise level for various weather conditions and operating scenarios if necessary.

The software used was SoundPLAN 7.4 with the CONCAWE algorithms selected. These algorithms have been selected as they include the influence of wind and atmospheric stability. Input data required in the model are:

- Meteorological Information;
- Topographical data;
- Ground Absorption; and
- Source sound power levels.

3.1 Meteorological Information

Meteorological information utilised is provided in Table 3-1 and is considered to represent worst-case conditions for noise propagation. At wind speeds greater than those shown, sound propagation may be further enhanced, however background noise from the wind itself and from local vegetation is likely to be elevated and dominate the ambient noise levels.
Table 3-1 Modelling Meteorological Conditions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Day (0700-1900)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (°C)</td>
<td>20</td>
</tr>
<tr>
<td>Humidity (%)</td>
<td>50</td>
</tr>
<tr>
<td>Wind Speed (m/s)</td>
<td>4</td>
</tr>
<tr>
<td>Wind Direction*</td>
<td>All</td>
</tr>
<tr>
<td>Pasquil Stability Factor</td>
<td>E</td>
</tr>
</tbody>
</table>

* Note that the modelling package used allows for all wind directions to be modelled simultaneously.

It is generally considered that compliance with the assigned noise levels needs to be demonstrated for 98% of the time, during the day and night periods, for the month of the year in which the worst-case weather conditions prevail. In most cases, the above conditions occur for more than 2% of the time and therefore must be satisfied.

3.2 Topographical Data

Topographical data was based on that provided by the client and publicly available e.g. GoogleEarth.

3.3 Ground Absorption

Ground absorption varies from a value of 0 to 1, with 0 being for an acoustically reflective ground (e.g. water or bitumen) and 1 for acoustically absorbent ground (e.g. sand). In this instance, as the area is predominantly rural, a value of 1.0 has been used as an average across the study area.

3.4 Source Sound Levels

The sound power levels used in the modelling are provided in Table 3-2.

Table 3-2 Source Sound Power Levels

<table>
<thead>
<tr>
<th>Description</th>
<th>Octave Band Centre Frequency (Hz)</th>
<th>Overall dB(A)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31.5</td>
<td>63</td>
</tr>
<tr>
<td>CAT D10 Dozer</td>
<td>104</td>
<td>105</td>
</tr>
<tr>
<td>45t Excavator (PC450)</td>
<td>106</td>
<td>112</td>
</tr>
<tr>
<td>70t Excavator (Volvo EC700Cl)</td>
<td>-</td>
<td>113</td>
</tr>
<tr>
<td>40t haul truck (HM400)</td>
<td>120</td>
<td>115</td>
</tr>
<tr>
<td>Komatsu WA500 Wheel Loader</td>
<td>109</td>
<td>122</td>
</tr>
<tr>
<td>Water cart</td>
<td>98</td>
<td>103</td>
</tr>
<tr>
<td>HV Truck moving at 25 km/h, L_{max}</td>
<td>113</td>
<td>108</td>
</tr>
</tbody>
</table>

Reference: 17114231-01.docx
With regards to the above, please note the following:

- All sources were modelled as point sources two metres above local ground;
- Source levels are based on measurements of equipment specified or of similar size/capacity; and,
- All levels represent $L_{10}$ noise levels with the exception of the HV truck which represents a $L_{\text{max}}$ level used in predicting truck pass by noise.

### 4 RESULTS

The predicted noise levels for each development stage are presented in the following sections, along with an assessment against the *Environmental Protection (Noise) Regulations 1997*.

At the start, topsoil and overburden will be scraped and pushed to the side to form noise bunds. These bunds are located south and west of the extraction pits and will be between 4 metres and 6 metres high. The exact location and height of the bunds is provided in Figure 4-1.

The clay pit operations will include a dozer and 70t excavator loading into 40t haul trucks. The pits will progress northward through Stages 1 to 4. The overall depth of excavation will vary from approximately 5 metres to 28 metres and will be excavated in 3 to 5 metres high benches. Therefore, it is assumed the plant excavating clay will always be working behind a nearly vertical face 5m high.

Clay will be stockpiled in the stockpile / loading area to the north of pit with trucks accessing site via the haul road to the west of the clay pit.

The sand pits operations will include a 40t excavator loading sand directly into road trucks. There are no crushing and screening facilities on site.

Based on the above, noise predictions were made for the following scenarios:

- Overburden removal, noise bund building and pit opening with 45t excavator, D10 dozer, WAS500 wheel loader and two 40t haul trucks. The mobile plant is assumed to be at existing ground level;
- Stage 1 excavation with plant on southern end and 5m below natural ground;
- Stages 2-3 excavation with plant mid-way and 5m below natural ground;
- Stage 4 excavation with plant on northern end and 5m below natural ground; and
- Clay and sand loading onto trucks with excavator. The water cart is also included in this scenario. Trucks are assumed to drive at a speed of 25 km/hr and at a rate of 14 trucks per hour. Any noise bunds required under Stages 1 to 4 were assumed to be in place before loading operations starts.
It is noted that Stages 1 to 4 all include the following sources:

- 70t Excavator and Dozer within clay pit excavating clay and loading dump trucks. Works close to pit face;
- Two 40t dump trucks carting clay to the stockpile/loading area;
- 40t excavator and road trucks in each of the sand pits
- One front end loader and one dozer managing the stockpile; and
- One water cart in stockpile area for dust control.

The predicted noise levels for each scenario are presented on Figures 4-2 to 4-5 and summarised in Table 4-1.

<table>
<thead>
<tr>
<th>Table 4-1 Predicted Noise Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receiver</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>9</td>
</tr>
</tbody>
</table>
Noise level $LA_{10} dB = 35$ Exceeds Regulations

<table>
<thead>
<tr>
<th>$LA_{10} dB$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.0</td>
</tr>
<tr>
<td>4.5</td>
</tr>
<tr>
<td>5.0</td>
</tr>
<tr>
<td>5.5</td>
</tr>
<tr>
<td>6.0</td>
</tr>
<tr>
<td>6.5</td>
</tr>
<tr>
<td>7.0</td>
</tr>
<tr>
<td>7.5</td>
</tr>
<tr>
<td>8.0</td>
</tr>
</tbody>
</table>

Figure 4-1

Seek and symbols
- Noise Bund

---

Clay & Sand Pit - 1728 Great Northern Highway, Bullsbrook

Location of Noise Bunds

Wind from All Directions

Lloyd George Acoustics
by Daniel Lloyd
info@gacoustics.com.au
(08) 9300 4188
Noise level $LA_{10} \, dB = 35$ Exceeds Regulations

Length Scale

Signs and symbols
- Point source
- Sensitive receiver

Clay & Sand Pit - 1728 Great Northern Highway, Bullsbrook
Predicted $LA_{10}$ Noise Levels - Overburden Removal

Wind from All Directions

Lloyd George Acoustics
by Daniel Lloyd
info@lgacoustics.com.au
(08) 9300 4188
Clay & Sand Pit - 1728 Great Northern Highway, Bullsbrook
Predicted $L_{A10}$ Noise Levels - Stage 1
Wind from All Directions
Clay & Sand Pit - 1728 Great Northern Highway, Bullsbrook
Predicted $L_{A10}$ Noise Levels - Stages 2 & 3
Wind from All Directions

Figure 4-4
Clay & Sand Pit - 1728 Great Northern Highway, Bullsbrook
Predicted \( L_{A10} \) Noise Levels - Stages 4
Wind from All Directions

Lloyd George Acoustics
by Daniel Lloyd
info@lgacoustics.com.au
(08) 9300 4188
5 ASSESSMENT

There were no noise sources that were found to be modulating or impulsive, however tonality may be present, particularly when the dozer is working close to natural surface. While this tonality may be masked by the other noise sources, we have assumed the relevant penalty would apply for the purposes of this assessment. For the purposes of modelling, it has been assumed that all the equipment in each scenario will be operating simultaneously. This, coinciding with worst-case wind conditions, is likely to be a rare occurrence and therefore the predictions are considered to be conservative.

5.1 Overburden Removal/Construction Phase

The construction phase would occur during normal working hours i.e. 0700 to 1900 Monday to Saturday. Although such activities are assessed under regulation 13, Table 5-1 compares the predicted noise levels, adjusted for tonality, against the assigned levels.

<table>
<thead>
<tr>
<th>Premises</th>
<th>$L_{A10}$ Assigned Level, dB</th>
<th>Adjusted Level, dB $L_{A10}$</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>47</td>
<td>42</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>44</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
<td>47</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>4</td>
<td>47</td>
<td>48</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>5</td>
<td>51</td>
<td>58</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>6</td>
<td>47</td>
<td>51</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>46</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>8</td>
<td>65</td>
<td>50</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
<tr>
<td>9</td>
<td>65</td>
<td>56</td>
<td>Noise managed as low as reasonably practicable</td>
</tr>
</tbody>
</table>

While it can be seen from the above table that the noise from the construction activity exceeds the daytime $L_{A10}$ assigned level at four receiver locations (4, 5, 6 & 7), construction activity is not required to comply with the regulation 7 assigned levels, however, under regulation 13, it must be demonstrated that the noise is being managed such that the emissions are as low as reasonably practicable. In this instance, this would be achieved by using well maintained equipment at all times. It should be noted that the noise level would reduce once the earth bunds are constructed.
5.2 Excavation Phase

The excavation phase of the operations would occur during normal daytime hours i.e. 0700 to 1900 Monday to Saturday. Table 5-2 compares the predicted noise levels, which have been adjusted for tonality, against the assigned levels for the daytime period.

<table>
<thead>
<tr>
<th>Premises Receiving Noise</th>
<th>$L_{A10}$ Assigned Level, dB</th>
<th>Adjusted Level*, dB $L_{A10}$</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Stage 1</td>
<td>Stages 2 &amp; 3</td>
</tr>
<tr>
<td>1</td>
<td>47</td>
<td>42</td>
<td>43</td>
</tr>
<tr>
<td>2</td>
<td>51</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>47</td>
<td>45</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>47</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>5</td>
<td>51</td>
<td>50</td>
<td>48</td>
</tr>
<tr>
<td>6</td>
<td>47</td>
<td>47</td>
<td>47</td>
</tr>
<tr>
<td>7</td>
<td>45</td>
<td>43</td>
<td>44</td>
</tr>
<tr>
<td>8</td>
<td>65</td>
<td>62</td>
<td>62</td>
</tr>
<tr>
<td>9</td>
<td>65</td>
<td>47</td>
<td>52</td>
</tr>
</tbody>
</table>

Note: *Level adjusted by +5dB for tonality

It can be seen from the above table that the daytime $L_{A10}$ assigned level is achieved at all receiver locations during all stages of the excavation phase. This assumes the conservative approach of all plant operating simultaneously and the wind blowing towards the receiver locations.

6 CONCLUSION

The results of this assessment have shown that, with construction of the noise bunds, the proposed clay and sand pit operations on Lots 5 and 6 on D47584 (1728 Great Northern Highway, Bullsbrook), would comply with the requirements of the Environmental Protection (Noise) Regulations 1997, between the hours 0700 to 1900 Monday to Saturday.
Appendix A

Terminology
The following is an explanation of the terminology used throughout this report.

**Decibel (dB)**
The decibel is the unit that describes the sound pressure and sound power levels of a noise source. It is a logarithmic scale referenced to the threshold of hearing.

**A-Weighting**
An A-weighted noise level has been filtered in such a way as to represent the way in which the human ear perceives sound. This weighting reflects the fact that the human ear is not as sensitive to lower frequencies as it is to higher frequencies. An A-weighted sound level is described as $L_A$ dB.

**Sound Power Level ($L_{w}$)**
Under normal conditions, a given sound source will radiate the same amount of energy, irrespective of its surroundings, being the sound power level. This is similar to a 1kW electric heater always radiating 1kW of heat. The sound power level of a noise source cannot be directly measured using a sound level meter but is calculated based on measured sound pressure levels at known distances. Noise modelling incorporates source sound power levels as part of the input data.

**Sound Pressure Level ($L_p$)**
The sound pressure level of a noise source is dependent upon its surroundings, being influenced by distance, ground absorption, topography, meteorological conditions etc and is what the human ear actually hears. Using the electric heater analogy above, the heat will vary depending upon where the heater is located, just as the sound pressure level will vary depending on the surroundings. Noise modelling predicts the sound pressure level from the sound power levels taking into account ground absorption, barrier effects, distance etc.

$L_{ASlow}$
This is the noise level in decibels, obtained using the A frequency weighting and the S time weighting as specified in AS1259.1-1990. Unless assessing modulation, all measurements use the slow time weighting characteristic.

$L_{AFast}$
This is the noise level in decibels, obtained using the A frequency weighting and the F time weighting as specified in AS1259.1-1990. This is used when assessing the presence of modulation only.

$L_{APeak}$
This is the maximum reading in decibels using the A frequency weighting and P time weighting AS1259.1-1990.

$L_{Amax}$
An $L_{Amax}$ level is the maximum A-weighted noise level during a particular measurement.

$L_{A1}$
An $L_{A1}$ level is the A-weighted noise level which is exceeded for one percent of the measurement period and is considered to represent the average of the maximum noise levels measured.

$L_{A10}$
An $L_{A10}$ level is the A-weighted noise level which is exceeded for 10 percent of the measurement period and is considered to represent the “intrusive” noise level.
\textit{L}_{\text{Aeq}}

The equivalent steady state A-weighted sound level ("equal energy") in decibels which, in a specified time period, contains the same acoustic energy as the time-varying level during the same period. It is considered to represent the "average" noise level.

\textit{L}_{90}

An \textit{L}_{90} level is the A-weighted noise level which is exceeded for 90 percent of the measurement period and is considered to represent the "background" noise level.

\textit{One-Third-Octave Band}

Means a band of frequencies spanning one-third of an octave and having a centre frequency between 25 Hz and 20,000 Hz inclusive.

\textit{L}_{\text{Amax, assigned level}}

Means an assigned level which, measured as a \textit{L}_{\text{A,Slow}} value, is not to be exceeded at any time.

\textit{L}_{\text{A1, assigned level}}

Means an assigned level which, measured as a \textit{L}_{\text{A,Slow}} value, is not to be exceeded for more than 1\% of the representative assessment period.

\textit{L}_{\text{A10, assigned level}}

Means an assigned level which, measured as a \textit{L}_{\text{A,Slow}} value, is not to be exceeded for more than 10\% of the representative assessment period.

\textit{Tonal Noise}

A tonal noise source can be described as a source that has a distinctive noise emission in one or more frequencies. An example would be whining or droning. The quantitative definition of tonality is:

the presence in the noise emission of tonal characteristics where the difference between -

(a) the A-weighted sound pressure level in any one-third octave band; and

(b) the arithmetic average of the A-weighted sound pressure levels in the 2 adjacent one-third octave bands,

is greater than 3 dB when the sound pressure levels are determined as \textit{L}_{\text{A,eq,T}} levels where the time period T is greater than 10\% of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as \textit{L}_{\text{A,Slow}} levels.

This is relatively common in most noise sources.

\textit{Modulating Noise}

A modulating source is regular, cyclic and audible and is present for at least 10\% of the measurement period. The quantitative definition of modulation is:

a variation in the emission of noise that —

(a) is more than 3 dB \textit{L}_{\text{A,fast}} or is more than 3 dB \textit{L}_{\text{A,fast}} in any one-third octave band;

(b) is present for at least 10\% of the representative.

\textit{Impulsive Noise}
An impulsive noise source has a short-term banging, clunking or explosive sound. The quantitative definition of impulsiveness is:

a variation in the emission of a noise where the difference between $L_{A\text{peak}}$ and $L_{A\text{Max slow}}$ is more than 15 dB when determined for a single representative event;

**Major Road**
Is a road with an estimated average daily traffic count of more than 15,000 vehicles.

**Secondary / Minor Road**
Is a road with an estimated average daily traffic count of between 6,000 and 15,000 vehicles.

**Influencing Factor (IF)**

$$= \frac{1}{10} (\% \ Type \ A_{100} + \% \ Type \ A_{450}) + \frac{1}{20} (\% \ Type \ B_{100} + \% \ Type \ B_{450})$$

where:

- $\% \ Type \ A_{100} =$ the percentage of industrial land within a 100m radius of the premises receiving the noise
- $\% \ Type \ A_{450} =$ the percentage of industrial land within a 450m radius of the premises receiving the noise
- $\% \ Type \ B_{100} =$ the percentage of commercial land within a 100m radius of the premises receiving the noise
- $\% \ Type \ B_{450} =$ the percentage of commercial land within a 450m radius of the premises receiving the noise
- Traffic Factor (maximum of 6 dB)
  - 2 for each secondary road within 100m
  - 2 for each major road within 450m
  - 6 for each major road within 100m

**Representative Assessment Period**
Means a period of time not less than 15 minutes, and not exceeding four hours, determined by an inspector or authorised person to be appropriate for the assessment of a noise emission, having regard to the type and nature of the noise emission.

**Background Noise**
Background noise or residual noise is the noise level from sources other than the source of concern. When measuring environmental noise, residual sound is often a problem. One reason is that regulations often require that the noise from different types of sources be dealt with separately. This separation, e.g. of traffic noise from industrial noise, is often difficult to accomplish in practice. Another reason is that the measurements are normally carried out outdoors. Wind-induced noise, directly on the microphone and indirectly on trees, buildings, etc., may also affect the result. The character of these noise sources can make it difficult or even impossible to carry out any corrections.

**Ambient Noise**
Means the level of noise from all sources, including background noise from near and far and the source of interest.

**Specific Noise**
Relates to the component of the ambient noise that is of interest. This can be referred to as the noise of concern or the noise of interest.

**Peak Component Particle Velocity (PCPV)**
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

**Peak Particle Velocity (PPV)**
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a peak response. Peak velocity is normally used for the assessment of structural damage from vibration.

**RMS Component Particle Velocity (PCPV)**
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and in one of the three orthogonal directions (x, y or z) measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

**Peak Particle Velocity (PPV)**
The maximum instantaneous velocity in mm/s of a particle at a point during a given time interval and is the vector sum of the PCPV for the x, y and z directions measured as a root mean square (rms) response. RMS velocity is normally used for the assessment of human annoyance from vibration.

**Chart of Noise Level Descriptors**

**Typical Noise Levels**
APPENDIX B – NOISE INCIDENT REGISTER
<table>
<thead>
<tr>
<th>Incident Date</th>
<th>Reported By (Name &amp; Contact Details)</th>
<th>Duration of Incident</th>
<th>Description of Incident</th>
<th>Location of Incident</th>
<th>Management Controls Employed</th>
<th>Date Completed</th>
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