RAPT CONSULTING

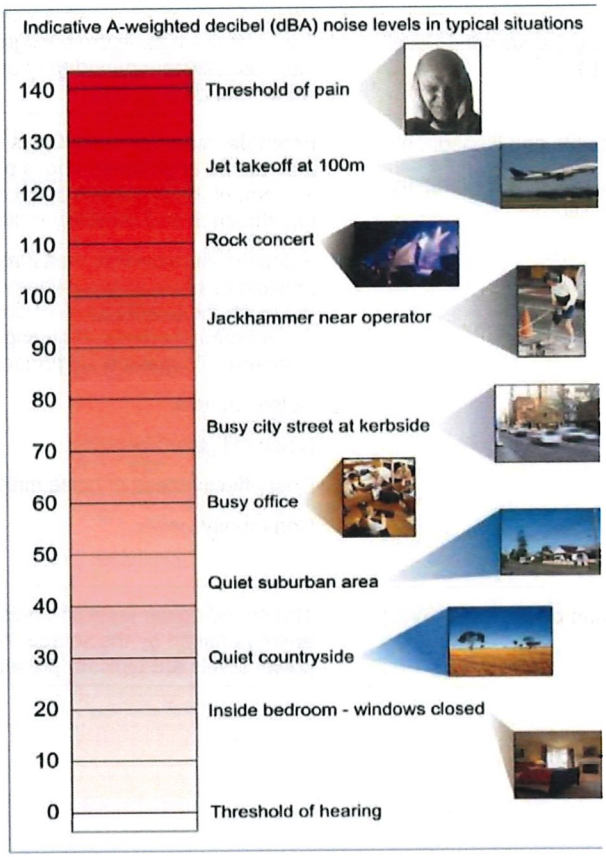
Barr Property and Planning

Noise Assessment – Part Lot 1131 DP 1057179
John Renshaw Drive, Black Hill, July 2018

Contents

Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources.
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.
Noise sensitive receiver	An area or place potentially affected by noise which includes:



	A residential dwelling. An educational institution, library, childcare centre or kindergarten. A hospital, surgery or other medical institution. An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. Commercial or industrial premises. A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: Noise impacts Noise mitigation benefits Cost effectiveness of noise mitigation Community views.
Sound power level (SWL)	The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in dB(A).

1. Introduction

Background

RAPT Consulting has been engaged to undertake a noise and vibration assessment for Barr Property and Planning as part of a development application for an industrial subdivision located at Part Lot 1131 DP 1057179 John Renshaw Drive, Black Hill. Correspondence received from the Department of Planning and Environment 28 May 2018, indicated a noise and vibration assessment was necessary to satisfy the requirements in Figure 1 below.

noise and vibration – including:

- a description of all potential noise and vibration sources during construction, including road traffic noise;
- a noise and vibration assessment in accordance with the relevant Environment Protection Authority guidelines; and
- a description and appraisal of noise and vibration mitigation, management and monitoring measures.

Figure 1Noise and Vibration Requirements

This noise assessment addresses the requirements outlined in Figure 1. Figure 2 shows an aerial image of the site and surrounding area.

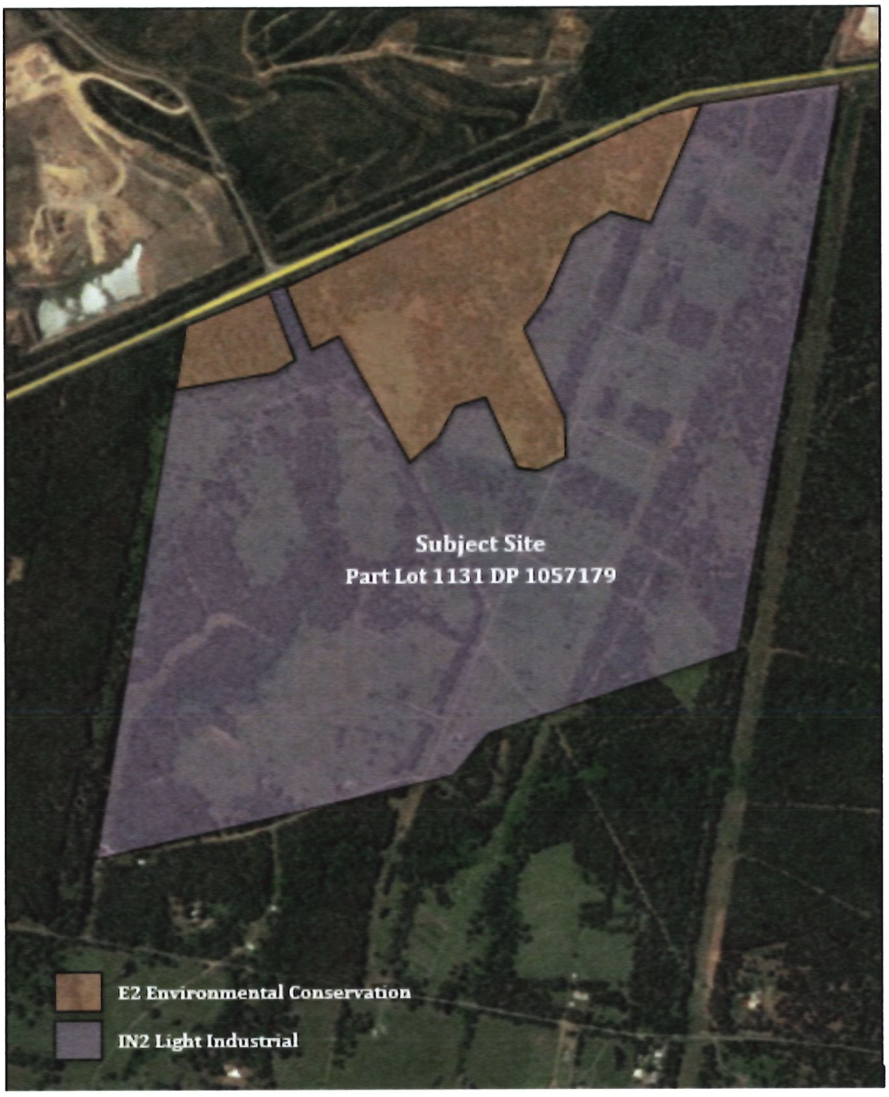


Figure 2 Site and Surrounding Area

The site is currently undeveloped and primarily used for agricultural purposes. John Renshaw drive borders the site to the north and the south boundary adjoins EH land. The M1 runs north and south to the east of the site. Additionally, the Beresfield Industrial Estate is located to the north east and Donaldson Mine is just north of the site.

1.1 Limitations

The purpose of this report is to provide an independent noise and vibration assessment for Barr Property and Planning as part of a development application for an industrial subdivision located at Part Lot 1131 DP 1057179 John Renshaw Drive, Black Hill.

It is not the intention of the assessment to cover every element of the ambient environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of

the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for noise and vibration were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

2.1 Ambient Noise Environment

To establish ambient and background noise levels, unattended monitoring for a period of one week was undertaken at the site from 3 July to 9 July 2018 using an RION NL-42 Type 2 noise logger within calibration. These loggers are capable of measuring continuous sound pressure levels and are able to record LAmin, LA90, LA10, LAmax and LAeq noise descriptors. The instrument was programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period. The site was selected as it was indicative of the overall ambient noise environment for the project and it presented as a secure location whereby minimising the risk of theft or vandalism to the monitoring equipment. The noise monitoring location is provided in Figure 3.

Figure 3 Noise Monitoring Location

During site visits it was noted that existing wildlife sources and underlying road traffic primarily described the ambient noise environment and was typical of a sub-urban area.

Logged data was reviewed and filtered to exclude any data affected by adverse weather conditions during the monitoring period. The cumulative background and ambient noise results are provided in Table 1 below.

Descriptor	Noise Level dB(A)	Time Interval
$L_{Aeq(15hr)}$	51	7:00am - 10:00pm
$L_{Aeq(9hr)}$	46	10:00pm – 7:00am
$L_{Aeq(24hr)}$	50	12:00am – 12:00am
$L_{Aeq(1hr)}$ Day	53	7:00am - 10:00pm
$L_{Aeq(1hr)}$ Night	50	10:00pm – 7:00am
L_{A90} Day	40	7:00am - 6:00pm
L_{A90} Evening	37	6:00pm - 10:00pm
L_{A90} Night	34	10:00pm - 6:00am

Table 1 Ambient and Background Noise Levels

3. Noise and Vibration Criteria

3.1 NSW Road Noise Policy (RNP)

The NSW Road Noise Policy (RNP) recommends various criteria for different road and residential developments and uses. Although it is not mandatory to achieve the noise assessment criteria in the RNP, proponents will need to provide justification if it is not considered feasible or reasonable to achieve them. Based on the definitions in the RNP, John Renshaw Drive and Black Hill Road are considered to be sub-arterial roads. Based on this, the following noise goals for residences taken from Table 3 of the RNP are provided in Table 2 Below.

Road Category	Day	Night
Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use development	60 $L_{Aeq(15hr)}$ External	55 $L_{Aeq(9hr)}$ External

Table 2 Road Noise Policy Goals

3.2 NSW Noise Policy for Industry (NPfI)

The NPfI provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

The intrusive noise criteria controls the relative audibility of operational noise compared to the background level at residential receivers. The amenity criteria limits the total level of extraneous noise for all receiver types. Both sets of criteria are calculated and, in the case of steady noise sources, the lower of the two in each time period normally apply. For noise sources with intermittent characteristics both noise criteria should be assessed independently.

The NPfI noise criteria are planning levels and are not mandatory limits required by legislation however the noise criteria assist the regulatory authorities to establish licensing conditions. Where noise criteria are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved negotiation is required between the regulatory authority to evaluate the economic, social and environmental costs and benefits of the development against the noise impacts. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development. Noise monitoring to determine compliance with the license condition is required.

Intrusive Criteria

The Intrusive criteria are determined by a 5 decibels addition to the measured (or adopted) background level with a minimum of 40 dB(A) for daytime and 35 dB(A) for evening and night. The NPfI recommends that the intrusive noise criteria for the evening period should not exceed the daytime period and the night-time period should not exceed the evening period. The intrusive noise criteria are only applicable to residential receivers.

Amenity Criteria

The amenity criteria are determined based on the overall acoustic characteristics of the receiver area, the receiver type and the existing level of noise excluding other noises that are uncharacteristic of the usual noise environment.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses, the existing level of noise from industry, commerce, and road traffic. For the amenity criteria the NPfI classifies the residential receivers as follows:

- Rural – An area with an acoustical environment that is dominated by natural sounds, having little or no road traffic.
- Suburban – An area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry.
- Urban – An area dominated by urban hum or industrial source noise or has through traffic with continuous traffic flows during peak periods or is near a commercial district.

Table 2.3 of the NPfI provides additional guidance on classifying residential receptors. Based on attended observations and the results of the noise monitoring, residences in the vinicnity of this development are considered sub-urban. Table 3 provides day, evening and night time operational noise goals for sub-urban and commercial premises.

	Day 7am to 6pm	Evening 6pm to 10pm	Night 10pm to 7am
Rating Background Level $L_{A90(Period)}$	40	37	34
Intrusiveness Criteria, $L_{Aeq(15min)}$	45	42	39
Amenity Criteria (Sub-Urban), $L_{Aeq(Period)}$	55	45	40
Project Amenity Noise Level $L_{Aeq(15min)}$	53	43	38
Project Specific Level Residential	**45 $L_{Aeq(15min)}$**	**42 $L_{Aeq(15min)}$**	**38 $L_{Aeq(15min)}$**
Commercial Premises (When in use)	**65**	**65**	**65**

Table 3 NPfI Operational Noise Goals

3.3 Construction Noise

Construction noise is assessed with consideration to DECCW Interim Construction Noise Guidelines (ICNG) (July 2009). The INCG is a non-mandatory guideline that is usually referred to by local councils and other NSW government entities when construction / demolition works require development approval. The ICNG recommend standard hours for construction activity as detailed in Table 4.

Work type	Recommended standard hours of work
Normal construction	Monday to Friday: 7 am to 6 pm. Saturday: 8 am to 1 pm. No work on Sundays or Public Holidays.
Blasting	Monday to Friday: 9 am to 5 pm. Saturday: 9 am to 1 pm. No work on Sundays or Public Holidays.

Table 4 ICNG Recommended Construction Hours

The ICNG provides noise management levels for construction noise at residential and other potentially sensitive receivers. These management levels are to be calculated based on the adopted rating background level (RBL) at nearby locations, as shown in Table 5.

Period	Management Level $L_{Aeq(15\ min)}$
Residential Recommended standard hours	Noise affected level: RBL + 10 Highly noise affected level: 75 dB(A)
Residential Outside recommended standard hours	Noise affected level: RBL + 5
Classrooms at schools and other educational institutions	Internal Noise Level 45 dB(A) (applies when properties are being used)
Offices, retail outlets	70 dB(A)

Table 5 ICNG Recommended Noise Management Levels

The above levels apply at the boundary of the most affected residences / offices or within 30 m from the residence where the property boundary is more than 30 m from the residence.

The *noise affected level* represents the point above which there may be some community reaction to noise. Where the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The *noise affected level* is the background noise level plus 10 dB(A) during recommended standard hours and the background noise level plus 5 dB(A) outside of recommended standard hours.

The *highly noise affected level* represents the point above which there may be strong community reaction to noise and is set at 75 dB(A). Where noise is above this level, the relevant authority may require respite periods by restricting the hours when the subject noisy activities can occur, considering:

- Times identified by the community when they are less sensitive to noise (such as mid-morning or mid-afternoon for works near residences).
- If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

Based on the above and the RBL determined from site monitoring, construction noise goals have been derived, as shown in Table 6.

Receiver	Within Recommended Standard Hours	Outside Recommended Standard Hours	
		Evening (6pm-10pm)	Night (10pm-7am)
Residential	50	42	39
Classrooms at schools and other educational institutions	45(internal)	45(internal)	45(internal)
Offices, retail outlets	70	70	70

Table 6 Construction Noise Goals dB(A) LAeq(15min)

3.4 Vibration Guidelines

Human Exposure

Vibration goals during the were sourced from the DECCW's *Assessing Vibration: a technical guideline*, which is based on guidelines contained in British Standard (BS) 6472–1992, *Evaluation of human exposure to vibration in buildings (1–80 Hz)*.

Intermittent vibration is assessed using the vibration dose value (VDV), fully described in BS 6472 – 1992. Acceptable values of vibration dose are presented in 7.

Location	Daytime [1]		Nighttime [1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas [2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

Table 7 Acceptable Vibration Values for Intermittent Vibration ($m/s^{1.75}$)

Building Damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to the following International Standards and Guidelines:

- British Standard BS7385.2 - 1993 *Evaluation and Measurement for Vibration in Buildings*, Part 2 - Guide to damage levels from ground borne vibration; and
- German Standard DIN 4150-3: 1999-02 Structural Vibration – Part 3: *Effects of vibration on structures*.

BS7385.2 – 1993 is utilised in this case in the assessment of potential building damage resulting from ground borne vibration produced by the proposed activity.

The recommended Peak Particle Velocity (PPV) guidelines for the possibility of vibration induced building damage are derived from the minimum vibration levels above which any damage has previously been encountered and are presented in Table 8.

Building Type	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures. Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures. Residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Table 8 Transient Vibration Guideline Values for Potential Building - Cosmetic Damage

Unlike noise which travels through air, the transmission of vibration is highly dependent on substratum conditions between the source/s and receiver. Also, dissimilar to noise travelling through air, vibration levels diminish quickly over distance, thus an adverse impact from vibration on the broader community is not typically expected. Vibration during works is considered an intermittent source associated with two main types of impact; disturbance at receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

4. Assessment of Potential Impacts

4.1 Construction

While it is unknown at this stage what specific industries will be at the subdivision, generally the typical construction activity on the proposed sub-division to be the building of a warehouse or facility of some nature. Therefore an assumed construction sequence would be:

- Excavation/Site preparation.
- Building of warehouse / facility

Table 9 provides general plant and machinery data that has been used to predict noise levels at the neighbouring properties. The noisiest data has been chosen for each piece of plant/machinery to present a worst-case scenario.

Plant Item	Activity Noise Level L_{Aeq} @ 10m	DEFRA Construction Noise Database	Anticipated Usage %
Excavation			
Dozer	80	Table 2 Ref 10	50
Tracked Excavator	79	Table 2 Ref 14	50
Articulated Dump Truck	74	Table 2 Ref 32	50
Roller	73	Table 2 Ref 38	50
Building			
Concrete Pump & Cement Mixer	67	Table 4 Ref 24	50
Poker Vibrator	69	Table 4 Ref 34	50
Mobile Telescopic Crane	67	Table 4 Ref 36	50
Diesel Generator	61	Table 4 Ref 75	90

Table 9 Plant and Equipment Noise Levels

At this stage it is unknown exactly where each proposed development within the subdivision will be located. However, each proponent will need to undertake its own construction noise assessment. With that said, the worst case in this instance would be during excavation works which would attenuate to 50 dB(A) meeting daytime construction goals at a distance of 360m.

Construction machinery would likely move about the study area altering noise for individual receivers. During any given period, the machinery items to be used in the study area would operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is

highly unlikely that all construction equipment would be operating at their maximum sound power levels at any one time. Certain types of construction machinery would be present in the study area for only brief periods during construction. Therefore, noise predictions are considered conservative. Based on the nature of the works distance to nearest receptors and the existing environment, compliance is expected for construction noise goals. However, a construction noise management plan is recommended to be implemented by future proponents to minimise potential construction noise impacts.

4.2 Project Construction Environmental Management Plan

A Project Construction Environmental Management Plan (PCEMP) could be prepared prior to the commencement of works and implemented through all phases of the proposed construction works. The PCEMP would provide the framework for the management of all potential noise impacts resulting from the construction works and would detail the environmental mitigation measures to be implemented throughout the construction works.

4.2.1 Planning and design of construction works

During the detailed planning, scheduling and design of the construction works the following noise management and mitigation measures are could be investigated and, as required, implemented prior to the commencement of noise generating works.

Notification before and during construction

- Affected neighbours to the construction works would be advised in advance of the proposed construction period at least 2 weeks prior to the commencement of works.
- Consultation and communication between the site(s) and neighbours to the site(s) would assist in minimising uncertainty, misconceptions and adverse reactions to noise.
- All site workers (including subcontractors and temporary workforce) should be familiar with the potential for noise impacts upon residents and encouraged to take all practical and reasonable measures to minimise noise during their activities.
- The constructor or site supervisor (as appropriate) should provide a community liaison phone number and permanent site contact so that the noise related complaints, if any, can be received and addressed in a timely manner.
- The constructor (as appropriate) should establish contact with the residents and communicate, particularly when noisy activities are planned.

Best practice measures when operating on construction site

- Construction works should adopt Best Management Practice (BMP) and Best Available Technology Economically Achievable (BATEA) practices as addressed in the ICNG. BMP includes factors discussed within this report and encouragement of a project objective to reduce noise emissions. BATEA practices involve incorporating the most advanced and affordable technology to minimise noise emissions.
- Ensure that all construction works scheduled for standard construction hours comply with the start and finish time.
- Where practical, simultaneous operation of dominant noise generating plant should be managed to reduce noise impacts, such as operating at different times or increase the distance between plant and the nearest identified receiver.

- High noise generating activities such as jack hammering should only be carried out in continuous blocks, not exceeding 3 hours each, with a minimum respite period of one hour between each block.
- Where possible, reversing beepers on mobile equipment would be replaced with low-pitch tonal beepers (quackers). Alternatives to reversing beepers include the use of spotters and designing the site to reduce the need for reversing may assist in minimising the use of reversing beepers.
- Equipment which is used intermittently should be shut down when not in use.
- All engine covers should be kept close while equipment is operating.
- The construction site would be arranged to minimise noise impacts by locating potentially noisy activities away from the nearest receivers wherever possible.
- Material dumps should be located as far as possible from the nearest receptors.
- Wherever possible, loading and unloading areas should be located as far as possible from the nearest receptors.
- Where possible, trucks associated with the work area should not be left standing with their engine operating in a street adjacent to a residential area.
- All vehicular movements to and from the site should comply with the appropriate regulatory authority requirement for such activities.

Complaints handling

Noise and vibration monitoring should be undertaken upon receipt of a complaint to identify and quantify the issue and determine options to minimise impacts.

- If valid noise/vibration data for an activity is available for the complainant property, from works of a similar severity and location, it is not expected that monitoring will be repeated upon receipt of repeated complaints for these activities, except where vibration levels are believed to be potentially damaging to the building.
- Any noise and vibration monitoring should be undertaken by a qualified professional and with consideration to the relevant standards and guidelines. Attended noise and vibration monitoring should be undertaken in the following circumstances:
- Upon receipt of a noise and/or vibration complaint. Monitoring should be undertaken and reported within a timely manner (say 3 to 5 working days). If exceedance is detected, the situation should be reviewed to identify means to reduce the impact to acceptable levels.

4.3 Construction Vibration

Vibration impacts discussed in this section essentially focus on potential structural damage to properties in close vicinity of the study area and/or potentially affected by construction activities.

Energy from construction equipment is transmitted into the ground and transformed into vibrations, which attenuates with distance. The magnitude and attenuation of ground vibration is dependent on the following:

- The efficiency of the energy transfer mechanism of the equipment (i.e. impulsive; reciprocating, rolling or rotating equipment)
- The Frequency content;

- The impact medium stiffness;
- The type of wave (surface or body)
- The ground type and topography.

Due to the above factors, there is inherent variability in ground vibration predictions without site-specific measurement data.

Due to the nature of the works the vibration risk is low. However, it is possible that local sensitive receivers may perceive construction vibration at times. The level of annoyance, however, would depend on individuals.

Table 10 outlines typical vibration levels for different plant activities sourced from the NSW RTA Publication *Environmental Noise Management Manual*.

Item	Peak Particle Velocity at 10m (mm/s)
Pile Boring	12-30
15 Tonne Compactor	7-8
7 Tonne Compactor	5-7
Roller	5-6
Dozer	2.5-4
Backhoe	1
Jackhammer	0.5

Table 10 Typical Vibration Levels - Construction Equipment

Table 10 indicates that vibration goals may can be met for buildings within 10 metres provided pile boring does not take place. Therefore, compliance with vibration goals to all residential and commercial receivers are expected to comply. While the nature of the works expected indicates the risk is low, it is important that this risk is captured and managed in the individual proponents project CNVMP.

4.4 Operational Noise

The specific industries and businesses that will occupy the site following the subdivision are not known at this stage and therefore it is not possible to accurately predict the cumulative noise impact on the community. However, it is expected that each proposed development within the industrial subdivision will need to undergo an acoustic assessment with consideration to the NSW NPfI and ICNG.

The subdivision is expected to occur in stages and although the timings for these is also currently unknown they will likely occur over a number of years. This means that the site should be treated as a whole for now and the Project Specific Noise Level (PSNL) established in section 3.2 should apply for residential receptors in the vicinity of the development.

As each new business moves in to each lot a noise impact assessment should take place on an industry/business specific basis.

While the specifics are not known at this stage it is considered that with diligent planning of each new business that occupies each lot and given that there is already an industrial presence in the area, that project noise goals can be met for future proponents within the development.

5. Conclusion

RAPT Consulting has undertaken a noise and vibration impact assessment for Barr Property and Planning as part of a development application for an industrial subdivision located at Part Lot 1131 DP 1057179 John Renshaw Drive, Black Hill.

The specific industries and business that will move into the subdivision are not known at this stage. Therefore, a quantitative assessment of operational and construction noise has not been possible. However, a noise survey and detailed derivation of noise criteria according to the NPfI and ICNG has been undertaken for the site.

A construction noise assessment has been undertaken representing a typical worst case location and recommendations made to manage construction activities to minimise any potential impact.

Despite the specifics not being known at this stage it is considered that with careful consideration and planning of each new business that occupies each lot, and given that there is already an industrial presence in the area, that project noise goals can be met and any potential impact to the community mitigated.

Should you have any further questions regarding this report, please do not hesitate to contact Greg Collins on 0488512224 or greg@raptconsulting.com.au.

Thank you,

Greg Collins

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