HARWOOD ACOUSTICS
ACOUSTICAL CONSULTING

Suite 627, 59 Junction Street, Nowra, NSW 2541 & Suite 673, 87 Baylis Street, Wagga Wagga, NSW 2650

P: 4421 4583
M: 0414 315 775

matthew@harwoodacoustics.com.au
www.harwoodacoustics.com.au

ABN: 12 654 492 823

Environmental Noise Compliance Assessment
Bass Point Quarry
2023 – Quarter Four

1 Bass Point Quarry Road,

Shell Cove, NSW 2529

Prepared for:-

Hanson Construction Materials Pty Ltd
Locked Bag 5260
Parramatta NSW 2124

Attention: Ms Chelsea Flood

Reference: 2402014E-R

Prepared by:-

Matthew Harwood MAAS
22nd February 2024

Document Control Page

Revision	Author	Released By	Date
Draft	MH	MH	22/02/2024
Final	MH	MH	23/02/2024

Harwood Acoustics Pty. Ltd. was engaged by Hanson Construction Materials Pty Ltd to carry out quarterly noise compliance testing for its Bass Point Quarry at 1 Bass Point Quarry Road, Shell Cove, NSW. This assessment relates to Quarter Four of 2023 and noise compliance testing was conducted in December 2023.

Accordingly, Harwood Acoustics Pty. Ltd. has prepared this report for the exclusive use of the Client identified on the title page. The report is prepared in accordance with the brief and scope of works agreed between the Client and Harwood Acoustics Pty. Ltd. and may not be suitable for use beyond that scope.

Harwood Acoustics Pty. Ltd. undertakes no duty nor accepts any responsibility to any third party who may rely upon this report.

Advice and recommendations provided in this report are in relation to acoustical issues only. No claims of expertise are made, and no liability is accepted, in relation to issues falling outside the field of acoustical consulting. These may include, but are not limited to, structural and waterproofing considerations, fire rating or thermal rating. Relevant authorities and / or experts should be consulted regarding areas other than acoustics.

TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY

Hanson Construction Materials Pty Ltd (Hanson) currently operates the Bass Point Quarry at 1 Bass Point Quarry Road, Shell Cove, NSW (the Quarry).

The Quarry is located at the eastern end of Bass Point Quarry Road adjacent to the Killalea Regional Park. The nearest residences are located toward the north west and west in the village of Shell Cove as shown in Figure 1.

The Quarry operates 24 hours per day, seven days per week under Project Approval 08_0143 issued by the Minister for Planning and Infrastructure on 28 January 2014 (the Approval). The Approval was most recently modified in November 2023 and the modification (Mod 3) was approved in December 2023. Reference to the Approval throughout this Report refers to the December 2023 version.

It was previously a requirement of the Approval that monthly environmental noise compliance monitoring be undertaken. Since late 2017 environmental noise compliance monitoring became a quarterly requirement.

Schedule 3 of the Approval provides specific noise criteria that must be met at specifically identified receptor locations whilst the Quarry is operating. Appendix 6 of the Approval provides guidelines and requirements in relation to compliance noise monitoring methodology.

The specific acoustical parameters that are required to be assessed under the Project Approval are the $L_{eq,\ 15\ min}$ parameter (being the energy average sound pressure level measured or assessed over a period of 15 minutes) and the $L_{1,1\ minute}$ which is the noise level that is exceeded for 1% percent of 1 minute, which is essentially close to the maximum noise level).

This report addresses those requirements.

Harwood Acoustics Pty. Ltd. staff visited the site and all residential receptors on Thursday 7 December to undertake attended noise compliance monitoring.

Noise measurements were taken in accordance with the requirements of the Approval and the level of noise emission from the operation of the Quarry was found to be well below acceptable noise limits at all receptor locations as detailed in this Report.

The ambient acoustical environment at all receptor locations is dominated by either neighbourhood noise, passing traffic, insects, weather or ocean noise, which is often the case depending on the time of year.

2. SITE AND DEVELOPMENT DESCRIPTION

2.1 Site Description

The Quarry is located adjacent to the Killalea Regional Park at the eastern end of Bass Point Quarry Road as shown in Figure 1 below.

The closest receptors to the site are in Shell Cove to the north west and west of the Quarry. Those identified in the Approval are receptors R4 through to R12 inclusive as detailed below.

All receptors are shown in Figure 1 and as follows:-

R4 – Sloop Avenue (cnr Cutter Parade)
R5 – Apollo Drive (cnr Clipper Avenue)
R6 – 1 Makaha Way
R7 – 44 Mystics Drive
R8 – 29 Hinchinbrook Drive
R9 – 23 Magnetic Ridge
R11 – 7 Joondalup Parkway
R12 – 3 Ranfurlie Parkway

Noise monitoring was also undertaken at an additional receptor – A1 – along Harbour Boulevard, in response to the substantial recent residential development in Shell Cove.

Figure 1. Location Plan – Bass Point Quarry, Shell Cove, NSW

(source: www.metromap.com.au image date 11/09/2022)

2.2 Development Description

Hanson's Bass Point Quarry is an extractive industry (hard rock quarry) supplying a range of products for projects such as building railways, roads, bridges, dams, airports, etc.

Primary activities at the site include the extraction, crushing, sorting and despatching of construction aggregates and this involves the use of the following plant and equipment:-

- Operation of the primary crusher
- Final product load out (dump trucks)[1]
- Load and haul pit operations (front end loader and two dump trucks)[2]
- Wash plant operations (generator, pump, wash plant and loader)[4]
- Operation of the secondary crusher
- Operation of the tertiary crusher
- Sales operations (loading product into road trucks for dispatch – loaders & trucks)[3]

Notes:-

1. CAT 777 and Komatsu 325 dump trucks
2. Komatsu WA 800 loader and CAT 777 dump trucks
3. Komatsu WA 500 loader, Volvo L 250 loader and various trucks, and
4. CAT 980 loader.

The above listed plant and machinery typically operates up until approximately 10 pm and constitutes full operation of the site. Normally, from approximately 10 pm the majority of operations cease with the exception of the secondary crushing plant and despatch loaders and trucks. On occasion, due to increased demand for aggregates, operating hours are regularly extended.

3. NOISE CRITERIA

Project specific noise limits and compliance testing conditions and methodology are derived from the Approval, and are as follows.

3.1 Acceptable Noise Limits

Schedule 3, Clause 3, Table 2 of the Approval sets noise criteria for each receptor location. Table 2 of the Approval is replicated in Table 1 below.

Table 1 Noise Criteria (Project Approval, Schedule 3 - Table 2)

Location	Day / Evening	Night	
	($L_{Aeq,\ 15\ min}$)	($L_{Aeq,\ 15\ min}$)	($L_{A1,\ 1\ min}$)
R4	44	44	54
R5	45	45	55
R6	42	42	52
R7	41	41	51
R8	35	35	45
R9	35	35	45
R11	45	45	55
R12	45	45	55
Any residential property within the Shell Harbour Marina Precinct (refer A1)	48	48	58
Shell Cove Primary School (when in use)	$L_{Aeq,\ 1\ hour}$ 40 (internal)	Not Applicable	

"Notes:

Noise generated by the project is to be measured in accordance with the relevant requirements of the NSW Industrial Noise Policy. Appendix 6 sets out the meteorological conditions under which these criteria apply, and the requirements for evaluating compliance with these criteria.

However, these criteria do not apply if the Applicant has a written agreement with the relevant landowner to exceed the criteria, and the Applicant has advised the Department in writing of the terms of this agreement."

3.2 Noise Compliance Assessment Methodology

Appendix 6 of the Approval provides conditions and assessment methodology that is to be adhered to during noise compliance monitoring, and states:-

"Applicable Meteorological Conditions

1. The noise criteria in Table 1 of the conditions are to apply under all meteorological conditions except the following:

(a) during periods of rain or hail,

(b) average wind speed at microphone height exceeds 5m/s,

(c) wind speeds greater than 3 m/s measured at 10 m above ground level, or

(d) temperature inversion conditions greater than 3°c/100 m.

Determination of Meteorological Conditions

2. Except for wind speed at microphone height, the data to be used for determining meteorological conditions must be that recorded by the meteorological station on or in the vicinity of the site.

Compliance Monitoring

4. Unless otherwise agreed with the Secretary, this monitoring is to be carried out in accordance with the relevant requirements for reviewing performance set out in the NSW Industrial Noise Policy (as amended from time to time), in particular the requirements relating to:

(a) monitoring locations for the collection of representative noise data;

(b) meteorological conditions during which collection of noise data is not appropriate;

(c) equipment used to collect noise date, and conformity with Australian Standards relevant to such equipment; and

(d) modifications to noise data collected including for the exclusion of extraneous noise and/or penalties for modifying factors apart from adjustments for duration."

3.2 Hanson Construction Materials' Noise and Blast Management Plan

Hanson operates its Bass Point Quarry under a Noise and Blast Management Plan, Rev 12.1, dated 9 September 2022. The following Sections of which are applicable to acoustical compliance testing.

Section 4.1 – General requirements

The noise measurement procedures employed throughout the monitoring program will be in accordance with the requirements of AS 1055 1997 "Acoustics – Description and Measurement of Environmental Noise" and the NSW EPA's Industrial Noise Policy, 2000 (INP) [since replaced by the Noise Policy for Industry, 2017].

Section 4.2 – Operator-attended noise surveys

Operator attended noise measurements and recordings will be conducted to quantify the intrusive noise emissions from quarrying and processing operations as well as the overall level of ambient noise.

The operator will quantify and characterise the maximum (L_{Amax}) and the average ($L_{Aeq(15\ minute)}$) intrusive noise level from quarrying and processing operations over a 15 minute measurement period.

Section 4.3 – Monitoring locations and intervals

*In order to check compliance, noise measurements will be carried out at the closest monitoring locations (R6, R7, R8, R9, R11 and R12) identified in Table 2, Schedule 3 of the Project Approval (replicated in **Section 2.1**). **Figure 1** (Appendix 2 of the Project Approval) shows the location of the closest adjoining residences identified in the Table 2 of the Project Approval.*

Noise measurements will be conducted quarterly (and in the event of a complaint) after all components of the project are operating in accordance with the DPE correspondence following review of the Noise and Blast Management Plans dated December 17 2015.

If non-compliance is identified, it will be addressed appropriately. This mat require unattended continuous noise logging in order to quantify the overall ambient noise levels resulting from quarrying and processing operations as well as from other environmental noise sources.

Noise emission from the Quarry to the closest adjoining residences is expected to decrease over the life of the quarry due to increasing topographic shielding as a result of lowering of the quarry floor over the life of the quarry. If in future, the quarry is seeking to reduce monitoring frequency (due to continual compliance with nominated criteria), approval must be sought form the Department of Planning and Environment.

4. MODIFYING FACTOR ADJUSTMENTS

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

Fact Sheet C of the Noise Policy for Industry 2017 outlines the correction factors to be applied to the source noise level at the receiver before comparison with the project noise trigger levels, to account for the additional annoyance caused by these modifying factors.

The modifying factor corrections should be applied having regard to:

- the contribution noise level from the premises when assessed/measured at a receiver location, and
- the nature of the noise source and its characteristics (as set out in this fact sheet).

Table C1 sets out the corrections to be applied. The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

In this instance the measured noise levels at all receptor locations during the evening and night time periods did not display characteristics requiring modifying factor adjustments.

5. MEASURED NOISE LEVELS

5.1 Noise Measurement Results

Harwood Acoustics Pty. Ltd. staff visited the Quarry and each of the receptor locations to carry out attended noise measurements during the evening and night time periods on Thursday 7 December 2023. Noise measurements were undertaken at each receptor location shown in Figure 1, between the hours of approximately 6.30 pm and 10.30 pm. During the noise survey, the weather was mild to warm and humid with temperatures of approximately 21 to 23 degrees Celsius. Skies were slightly overcast with a light breeze and wind speeds below 5 m/s for the majority of the survey.

Care was taken to avoid taking noise measurements, or pausing the sound level meter during wind gusts when necessary and as far as was reasonably practicable, as is often the case in Shell Cove, particularly near Killalea Regional Park.

The Quarry was in full operation throughout the entire noise survey. All measurements were also paused as trucks passed along the Haul Road, whenever this was practicable.

All measurements were carried out in accordance with Australian Standard AS 1055-1997 *'Acoustics - Description and measurement of environmental noise'* and the instrumentation used during the noise survey is shown in the attached Appendix A.

The results of the survey are shown in Tables 2, 3 and 4 below, where:-

- Table 2 shows the measured and predicted $L_{eq,\ 15\ minute}$ noise levels for assessment against the Intrusiveness criteria as required by the Project Approval,
- Table 3 shows the measured and predicted $L_{1,\ 1\ minute}$ noise levels for assessment against the Sleep Disturbance criteria as required by the Project Approval, and
- Table 4 shows the measurement parameters required to be recorded under the Management Plan.

Table 2 Measured & Estimated $L_{eq,\ 15\ minute}$ Noise Levels – 7 December 2023

Location / Time / Description	Noise Level (dBA)				Complies
	Measured Noise Level	Typical Extraneous Noise Sound Pressure Level	Estimated Quarry Noise Level $L_{eq,\ 15\ minute}$	Noise Limit $L_{eq,\ 15\ minute}$ Day, Evening & Night	
R4 – Sloop Avenue (6.40 – 6.55 pm) Quarry not audible	45 - 46	neighbourhood & insects 45 – 50 Lulls 37 - 38	<37	44	Yes
R5 – Apollo Drive (7.00 to 7.15 pm) Quarry not audible	44 – 45 [1]	Water treatment 44/45 Lulls 36 [1]	<36	45	Yes
R6 – 1 Makaha Way (7.50 to 8.05 pm) Quarry not audible	37 – 38	Neighbourhood noise 40 - 45 Lulls 35 - 36	<35	42	Yes
R7 – 44 Mystics Drive (8.08 to 8.23 pm) Quarry not audible	40 – 41	Neighbourhood & insects 40 - 45 Lulls 35 – 36	<35	41	Yes
R8 – 29 Hinchinbrook Drive (9.10 to 9.25 pm) Quarry not audible	39 - 40 [2]	Insects & neighbourhood 40 + Lulls 35 [2]	<35 [2]	35	Yes
R9 – 23 Magnetic Ridge (8.40 to 8.55 pm) Quarry not audible	37 – 38	insects & neighbourhood 37 - 40 Lulls 33 – 35	<35	35	Yes
R11 – 7 Joondalup Parkway (9.35 pm to 9.50 pm) Quarry not audible	39	Ocean & insects 40 + Lulls 38 – 39	<39	45	Yes
R12 – 3 Ranfurlie Parkway (9.55 to 10.10 pm) Distant hum	35 – 36 [3]	ocean 48 – 50 Lulls 32 – 33 [3]	<33	45	Yes
A1 – Harbour Boulevard (7.25 to 7.40) Quarry barely audible [4]	68 - 60 [4]	Ocean & Traffic 60 + lulls 45 – 46 [4]	<45	48	Yes

Notes to Table 2:-

1. *This location as specifically identified in the Approval is adjacent to a water treatment plant and the motor noise from the pump dominates the noise measurements. A full 15 minute noise measurement was taken at this location in spite of the pump noise, in accordance with the requirements of the approval, however additional short-term measurements were taken further from the pump to estimate the level of quarry noise in the absence of the treatment plant. Quarry noise was not audible or measurable in either location.*
2. *Insect noise dominated the measurements at this location, this is often the case in the summer months here as there is bushland at the south eastern extent of Hinchinbrook Drive. During lulls or fluctuations in the volume of insect noise the sound pressure levels were as low as 35 dBA whilst the Quarry was operating, but not audible. Historically noise levels at this location when ambient and extraneous noise is quiet, can be as low as 30 dBA and the quarry activity remains inaudible, or on occasion a distant hum.*
3. *During this survey there was a distant hum / rumble which appeared to be coming form the direction of the Quarry but can be ocean noise and it is often difficult to distinguish between the two. Occasionally mobile plant broadband reversing alarms are audible here when the ambient and extraneous noise levels are low, though that was not the case in this instance. If the audible rumble was exclusively noise from the quarry the measured noise levels are the time were still below the noise limit for this receptor.*
4. *Noise measurements were taken near to the closest residential receptor to the quarry (as the crow flies), as indicated in Figure 1 (A1) which for the Quarter 4, 2023 assessment was chosen to be 243 Harbour Boulevard.*

   This location is within the new Shell Harbour Marina Precinct and the appropriate acceptable noise limits for this area are derived from the Approval, which are shown in Table 2 in schedule 3 of the Project Approval, which are reiterated in Table 1 of this report.

   Measured L_{eq} noise levels at this location were dominated by passing traffic which it was not practicable to avoid and to a lesser extent, ocean noise. Underlying noise levels are dominated by surf and the measured level of 60 dBA is in no way reflective of the quarry despite the rumble of the primary crusher being audible on occasion.

   The instantaneous sound pressure levels during lulls of traffic and surf noise were observed to be 45 to 46 dBA whilst the quarry was operating, which is below the noise limit of 48 dBA $L_{eq,\ 15\ minute}$. These observed noise levels still contain extraneous noise and the contribution from the quarry is estimated to be lower still.

Table 3 Measured & Calculated $L_{1,\ 1\ minute}$ Noise Levels – 7 December 2023

Location / Description	Noise Level (dBA)				Complies
	Measured Noise Level $L_{1,\ 1\ minute}$	Typical Extraneous Noise	Estimated Quarry Noise Level $L_{1,\ 1\ minute}$	Acceptable Noise Limit $L_{1,\ 1\ minute}$ at night	
R4 – Sloop Avenue (10.50 pm)	37	-	<37	54	Yes
R5 – Apollo Drive (10.43 pm)	45	-	<45	55	Yes
R6 – 1 Makaha Way (10.33 pm)	38	-	<38	52	Yes
R7 – 44 Mystics Drive (10.30 pm)	38	-	<45	51	Yes
R8 – 29 Hinchinbrook Drive (10.25 pm)	42 - 43	-	<42	45	Yes
R9 – 23 Magnetic Ridge (10.18)	41	-	<41	45	Yes
R11 – 7 Joondalup Parkway (9.51)	40	-	<40	55	Yes
R12 – 3 Ranfurlie Parkway (10.11)	38	-	<38	55	Yes
A1 – Harbour Boulevard (10.37)	54 [1]	-	<57	58	Yes

5.2 Noise Assessment and Discussion

Tables 2 and 3 – Assessment of $L_{eq\ 15\ minute}$ and $L_{1,\ 1\ minute}$ noise levels.

The contribution of Quarry noise emission to the overall measured levels in Table 2 was estimated based on observations of the sound pressure level during lulls in extraneous and ambient noise, whilst the Quarry was operating, and the subjective audibility of the Quarry. In each instance these estimated levels are still considered to be conservatively high as they are likely to still include extraneous noise.

This is particularly the case where the Quarry is not audible and detailed notes are provided under Table 2 to describe the acoustical environment during the noise survey and individual measurements.

Regularly it is the case that the measured noise levels are not often significantly higher than the noise limit, irrespective of the fact that they are dominated by extraneous noise and are not representative of quarry noise emission. This is mostly the case in very calm weather conditions and calm seas, whereas during a strong breeze or big surf the measured noise levels at certain receptors can be significantly higher than the noise limits. In both instances,

the measured levels are not representative of the noise emission from the quarry as received at that location. Hence, the need for an estimated contribution.

During this particular survey, some of the measured noise levels were affected by, if not dominated by insect noise. As an example, this occurred at receptor R8 and despite the slightly elevated $L_{eq,\ 15\ minute}$ noise levels, the instantaneous sound pressure levels observed and measured during lulls (being fluctuations of insect noise) dropped as low as 35 dBA.

The estimated level of noise emission from the Quarry as shown in Table 2 is therefore given as < 35 dBA $L_{eq,\ 15\ minute}$. This assumes that the Quarry is operating during the observed "lulls", which it was. Though these observed sound pressure levels are still dominated by ambient noise and given the Quarry is not at all audible, the actual contribution of quarry noise at this location is likely to be lower still.

Sound pressure levels of extraneous noise are excluded from column 3 in Table 3 as the measured $L_{1,\ 1\ minute}$ noise level is far below the acceptable noise limit at each location, in every instance, irrespective of the contribution of Quarry noise.

During the 2023 quarter 4 survey, noise emission from the quarry was not audible at any receptor location with the exception of receptor R12 and A1. At receptor R12, as mentioned in the notes below Table 2, there was a distant hum / rumble evident during the measurement. This is often masked by surf noise and is similar subjectively, to the sound of waves. Regardless the observed sound pressure levels whilst the sounds were audible were below the noise limit. At Receptor A1 a similar noise was audible in lulls of traffic which again is indistinguishable from surf noise at times.

Compliance with the acceptable intrusiveness noise limits during the full operation of the quarry in the evening prior to 10 pm, also demonstrates compliance during the night time, with the same intrusive noise limits set during either the same or reduced operations as the night goes on.

Measurements and predictions therefore show that the level of noise emission from the operation of the Quarry during the noise survey was below the Project Approval noise limits at all receptor locations, at all times.

6. CONCLUSION

Environmental Noise Compliance testing was undertaken at Hanson's Bass Point Quarry in accordance with the requirements of the Project Approval 08_0143 for the third quarter of 2023.

The level of noise emission from the Quarry was found to be below the Project Approval noise limits at all times, at all receptor locations.

Matthew Harwood, MAAS

Director & Principal Consultant

Harwood Acoustics Pty. Ltd.

Attachments:-

Important Note
Appendix A – Noise Survey Instrumentation

Important Note

All products and materials suggested by Harwood Acoustics Pty Ltd are selected for their acoustical properties only.

Recommendations made in this report are intended to resolve acoustical problems only, therefore all other properties such as aesthetics, air flows, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, fumes, grout or tile cracking, loading, shrinkage, smoke, ventilation etc. are outside Harwood Acoustic's fields of expertise and ***must*** *be checked with the supplier or suitably qualified specialist before purchase.*

Disclaimer

While every reasonable effort has been made to ensure that this document is correct at the time of printing, Harwood Acoustics Pty Ltd, their Associates, Subcontractors and employees make no representation, undertake no duty and accept no responsibility to any third party who use or rely upon this document or the information contained in it. No guarantees are either expressed or implied.

This report has been prepared solely for use by the Client identified on the title page as per our agreement for providing noise assessment services; and is entitled to rely upon the findings in the report within the scope of work described in this report.

Although all due care has been taken in the preparation of this report, no warranty is given, nor liability accepted (except that required by law) in relation to the information contained within this document.

This report and information therein cannot be relied on or used by any third party. Any representation, statement, opinion or advice, expressed or implied in this report is made in good faith but on the basis that Harwood Acoustics Pty Ltd are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in any respect of any representation, statement, or advice referred to above.

No responsibility is accepted for the use of any part of the report in any other context or for any other purpose.

Opinions and judgements expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

Harwood Acoustics Pty Ltd reserves all copyright of intellectual property in any or all of Harwood Acoustics Pty Ltd documents. No permission, license or authority is granted by Harwood Acoustics Pty Ltd to any person or organisation to use any of Harwood Acoustics Pty Ltd documents for any purpose without the written consent of Harwood Acoustics Pty Ltd.

Noise Survey Instrumentation	Appendix A

The instrumentation used during the noise survey consisted of the following:-

Description	Model No.	Serial No.
Bruel and Kjaer Sound Level Meter	2250	3009198
Bruel and Kjaer Acoustical Calibrator	4321	3003242

The sound level meter conforms to Australian Standards AS IEC 61672.1-2004 : 'Electroacoustics - Sound level meters – Specifications' as a Class 1 precision sound level meter.

The calibration of the meter was checked before and after the measurement period. No significant system drift occurred over the measurement period. The sound level meter and calibrator have been checked, adjusted and aligned to conform to the factory specifications and issued with conformance certificates.