

Dixon Sand Pty Ltd

Old Northern Road Quarry, Maroota

**Noise monitoring report
June 2024**

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Definition of terms

Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation.
Decibel (dB)	A measure of sound equivalent to 20 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure, and 10 times the logarithm (to base 10) of the ratio of a given sound power to a reference power.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
dB(C)	Unit used to measure 'C-weighted' sound pressure levels, an adjustment made to sound level to approximate low frequency noise between 10 Hz and 200 Hz.
EPA	Environment Protection Authority
Extraneous noise	Noise resulting from activities that are not typical of the area such as construction, and traffic generated by holiday periods or special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Noise level statistics	<p>L_{A90} – The A-weighted sound pressure level exceeded 90% of the monitoring period. This is considered to represent the background noise.</p> <p>L_{Aeq} – The equivalent continuous A-weighted noise level—the level of noise equivalent to the energy average of noise levels occurring over a measurement period.</p> <p>L_{A1} – The A-weighted sound pressure level exceeded 1% of the monitoring period.</p> <p>L_{Amax} – The maximum A-weighted noise level associated with the measurement period.</p>
RBL	The Rating Background Level for each period is the medium value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period (day, evening and night)
Receiver	The land use at which noise is heard
SLM	Sound Level Meter
Sound Power Level (SWL)	The A-weighted sound power level is a logarithmic ratio of the acoustic power output of a source relative to 10^{-12} watts and expressed in decibels. Sound power level is calculated from measured sound pressure levels and represents the level of total sound power radiated by a sound source.
Sound Pressure Level (SPL)	<p>This is the level of noise, usually expressed in dB(A), as measured by a standard sound level meter (SLM) with a pressure microphone. The sound pressure level in dB(A) gives a close indication of the subjective loudness of noise.</p> <p>A technical definition for the sound pressure level, in decibels, is 20 times the logarithm (base 10) of the ratio of any two quantities related to a given sound pressure to a reference pressure (typically $20 \mu\text{Pa}$ equivalent to 0 dB).</p>
Tonal noise	Noise with perceptible and definite pitch or tone



1. Introduction

Dixon Sand Pty Ltd operates the Old Northern Road Quarry in Maroota, NSW (the Quarry). The Quarry is located off Old Northern Road, as illustrated in Figure 1.

Operations at the quarry include extraction of sand and sandstone blocks, processing by screening and grading and direct sales involving loading of trucks for shipment.

The Quarry operates under Development Consent 250-09-01 and Environment Protection Licence (EPL) 3916, which set noise limits for its operation and require noise monitoring to be completed on a six-monthly basis to ensure compliance with the conditions.

Hutchison Weller was commissioned by Dixon Sand to undertake the six-monthly noise monitoring in accordance with the conditions of consent, EPL and requirements of the Noise Management Plan.

This document outlines the consent conditions, monitoring methodology and results of the monitoring undertaken on 14 June 2024.

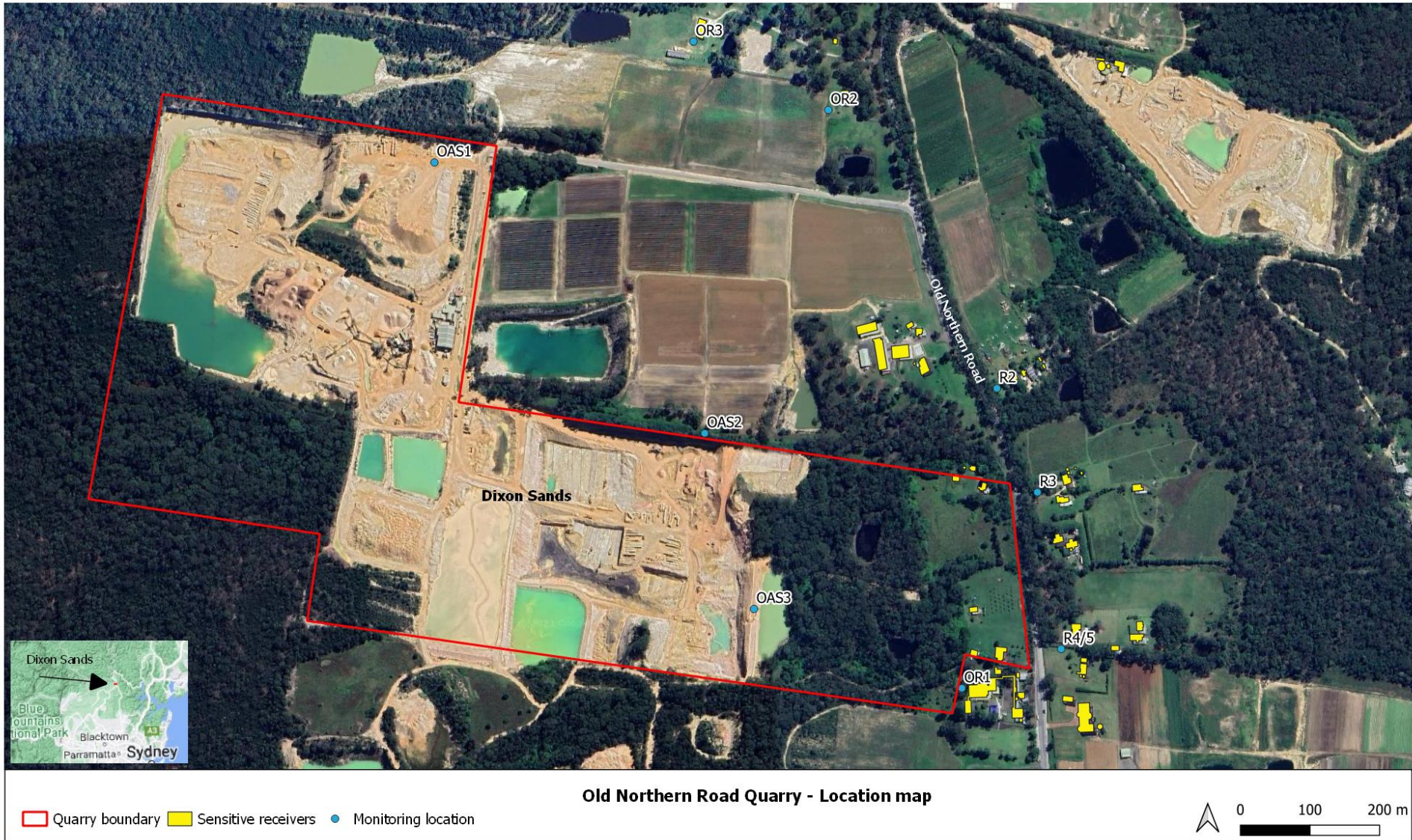


Figure 1 Location of the Quarry



2. Noise compliance criteria

Conditions 1 and 2 of Schedule 3 of development consent DA250-09-01 outline the Quarry operating hours and condition 3 defines the noise criteria for compliance. Environment Protection Licence (EPL) 3916

1. The Applicant must comply with the operating hours set out in Table 1.

Table 1 Operating hours

Activity	Permissible hours
Quarrying operations (excluding truck arrival, loading and dispatch)	7.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck arrival (unladen)	5.45 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Truck loading Truck dispatch Truck arrival (laden)	6.00 am to 6.00 pm Monday to Saturday At no time on Sundays or public holidays
Bund construction or rehabilitation works within 250 m of Maroota Public School	7.00 am to 6.00 pm Monday to Friday during school holiday periods unless otherwise approved in writing by the EPA
Maintenance	May be conducted at any time, provided that these activities are not audible at any privately-owned residence

2. The following activities may be carried out outside the hours specified in condition 1 above:
 - (a) delivery or dispatch of materials as requested by the NSW Police Force or other public authorities; and
 - (b) emergency work to avoid the loss of lives, property or to prevent environmental harm.

In such circumstances, the Applicant must notify the Secretary and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

3. The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land or at the Maroota Public School.

Table 2 Noise criteria dB(A)

Receiver	Averaging period	Shoulder (6.00 am to 7.00 am)	Day (7.00 am to 6.00 pm)
Any residence on privately owned land	LAeq (15 minute)	37	44
Any classroom at Maroota Public School	LAeq (1 hour)	-	45

Noise generated by the development is to be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions and modification factors) of the NSW Noise Policy for Industry (2017). Appendix 6 sets out the meteorological conditions under which these criteria apply and the requirements for evaluating compliance with these criteria.

However, the noise criteria in Table 2 do not apply if the Applicant has an agreement with the relevant landowner to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.



3. Monitoring methodology

Operator-attended noise monitoring was undertaken by Hutchison Weller, an independent acoustic specialist and Member of the Australian Acoustical Society. Monitoring locations included those described in the Quarry Noise Management Plan plus additional sensitive receivers, as illustrated in Figure 1 and summarised in Table 3.

Table 3 Monitoring locations

Receiver ¹	Address	Description
OR1	Maroota public school	Classroom closest to quarry operations
OR2	4624 Old Northern Road	Private residence
OR3	4634 Old Northern Road	Private residence
R2	4579 Old Northern Road	Private residence
R3	4567 Old Northern Road	Private residence
R4/5	4547 – 4543 Old Northern Road	Mid-point between private residence
OAS1	Lots 1 and 2 of the Quarry	At source monitoring, close to operations
OAS2	Lot 196 of the Quarry	At source monitoring, close to operations
OAS3	Lot 196 of the Quarry	At source monitoring, close to operations

Note 1: An agreement between Dixon Sand and receiver R1 is in place and, therefore, noise management levels defined by the development consent are not applicable.

Monitoring was conducted in accordance with procedures outlined in the Noise Policy for Industry and Section 6 of the Noise Management Plan.

At-receiver monitoring locations were within 30 metres of residential dwellings, whilst onsite measurement locations were selected for safe access and to be representative of the operations, without extraneous noise from sources such as traffic and insects.

Instrumentation included a Bruel & Kjaer Class 1 sound level meter (SLM), serial no. 3008237, field-calibrated prior to and following monitoring. The SLM was within current calibration, next due January 2025.

Monitoring was undertaken with the SLM set on a tripod at 1.5 metres above ground and measuring A-weighted sound pressure levels under fast response. Each measurement period was 15 minutes and recorded the LAeq, LA90 and LAm_{ax} statistics.

Meteorological data was recorded during each monitoring period adjacent to the Maroota public school, including wind speed, direction, temperature, relative humidity and sigma-theta (to establish the Pascall-Guifford stability category). This data was used to establish the meteorological conditions as being suitable for monitoring.

Where extraneous noise such as road traffic and fauna (insects/birds) were the dominant noise sources, making it impractical to discern the contribution of the Quarry to ambient noise levels, noise levels measured at alternative locations closer to the Quarry were utilised, in line with procedures outlined in Noise Policy for Industry (NSW EPA 2017). This involved extrapolation from the near-distance location to the sensitive receiver location, as described in Section 4.2.



4. Monitoring results

4.1 Attended measurements

Results of noise monitoring for each location are presented in Table 4 and Table 5.

In general, quarry operations were faintly audible from most locations, with traffic the dominant source of noise for residents on the Old Northern Road.

Quarry operations in June 2024 fell into three categories representing the main sources of noise. These were:

- Sand processing and truck loading (main plant, front end loaders, trucks)
- Extraction of bulk sandstone by rock saw
- Stockpile management with articulated dump trucks

Depending on the receiver location, these sources played a varying role in contributing to the total noise level.

Measured results indicated quarry operations during the shoulder period (from 6.00am to 7.00am) were faintly audible during breaks in traffic noise and complied with the noise criteria at all measurement locations.

On-site measurements were taken to determine the noise level of various noise sources without the influence of traffic noise. Measurements were undertaken over 15-minute periods to establish representative sound power levels of the operation to allow extrapolation to receiver locations where background noise was too high to discern quarry noise contributions. This is discussed further in Section 4.2.

During the day (standard hours), measurement at the school and residential receivers established traffic was the dominant source of noise in the area and heavily influenced measured LAeq, 15-minute noise levels. Quarry noise was faintly audible from time to time over the background level.

Estimated contributions of quarry noise on the total noise level indicated compliance with the noise limit. However, due to ambient noise (traffic, birds, breeze in trees), extrapolation from at-source measurements has been undertaken to support this assertion (See Section 4.2.)



Table 4 Monitoring results – Shoulder Period - 6.00am to 7.00am

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmx			
5.55am	OR3	37	58.9	34.9	81.7	<37	Site inaudible. Audible noise: Access road (71dBA), old northern road (38 to 45 dBA), and insects.	Overcast sky and calm to light breeze from S to N @ 0.7-1.4 km/h Temperature 7-8°C Neutral to Extremely unstable conditions (A to D class).
6.15am	OR2		48.7	40.9	60.7	<37	Site inaudible. Audible noise: Access road, old northern road, birds (56dBA) and insects.	
6.34am	R3		64.8	40.5	86.6	<37	Site inaudible. Dominant noise: Old Northern Road (defining average and maximums). Other audible noise dominant during lulls in road traffic noise: birds and insects.	
6.52am	R4/5		67.4	49.9	86.2	<37	Site inaudible. Dominant noise: Old Northern Road (defining average and maximums). Birds (52 to 58 dBA) dominant during lulls in road traffic noise. Van idling near sound level meter (SLM) 53 dBA.	



Table 5 Monitoring results – Day Period - 7.00am to 6.00pm

Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmx			
14/06/2024 8:10	OAS1 (Bottom of ledge West of Shed)	N/A	64.2	57.4	81.3	-	Plant noise (continuous) 80m away. Front end loader dumping sand 85-90m away. Truck passing front of SLM 71dBA, reversing 64 dBA, dumping rocks 70+ dBA. Hammering (sporadic) in workshop audible briefly 60 to 63 dBA. Front end loader dumping 65 to 68 dBA, Front end loader 2 passing by 80+ dBA.	Overcast sky and calm to light breeze. SW @ 3-4 km/h Temperature 8-11°C Slightly unstable to Moderately unstable conditions (B to C Class)
14/06/2024 8:41	OAS1 (Top of ledge NW of carpark)	N/A	65.1	62.7	81.3	-	Plant processing 108m away, 64 to 65 dBA. Truck dumping (impact) 96m away, 76 dBA. Hammering from the shed up to 81.3 dBA. Additional hammering from shed up to 65 dBA. Front end loader passing 43m away, 67 to 69 dBA.	
14/06/2024 9:15	OAS2	N/A	45.2	39.4	64.1	-	Distant plant noise audible for first 3 mins but not influencing the recorded noise level. No machines/equipment operating in the pit. Observed 3 machines idle 150m to 340m away, and staff in the pit. Then Front end loader entered the pit 156m away, 49 dBA. Other extraneous noises audible from the farm behind the SLM. Workers returned to the machinery 9mins into the measurement. Excavator operating and laying down sandstone blocks 300m away, impacts 51 to 58 dBA, general operational noise 46 to 49 dBA. FEL moving blocks around 195m away, 46 to 48 dBA, Cat truck moving 350m away 57dBA.	
14/06/2024 10:11	OAS3	N/A	45.7	43.7	56.6	-	Front end loader only. 160m away. Piling stock. Engine revs 47 dBA. Impacts 50 dBA.	
14/06/2024 10:15	OAS3	N/A	50.1	47.2	66.6	-	Cumulative measurement. First excavator grinding logs 170m away, 50 to 54 dBA, Second excavator popping logs 160m away (impacts) 62 dBA, 57 dBA, 55 dBA, 58 dBA. General engine excavator noise 54 dBA. Advised by Dixon Sands these activities will be conducted the whole day.	



Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmx			
14/06/2024 10:45	OR1 (School)	45	49.3	40.1	71.0	<45	Site inaudible. Dominant noise: birds and beep bird 65.8 dBA (coming from different directions). Other audible noise: Old Northern Road. Rustling leaves (wind). Occasional noise from the school.	Overcast sky and calm to light breeze from SW to WSW @ 2-4 km/h. Temperature 11-12°C Neutral to Extremely unstable conditions (A to D class)
14/06/2024 11:01	OR1 (School)	45	53.6	41.9	71.3	<45	Site inaudible. Audible noise: School bell 60 dBA, occasional children noise, continued bird noise, rustling leaves (wind). Old Northern Road 61 dBA, PF site west of SLM (or south of Dixon Sands) audible briefly.	
14/06/2024 11:16	OR1 (School)	45	54.6	42.3	72.1	<45	Site inaudible. Audible noise: birds, rustling leaves (wind), occasional music from school 58 dBA <10seconds, Old Northern Road, Squawker from PF site.	
14/06/2024 11:31	OR1 (School)	45	51.9	39.1	69.6	<45	Site Inaudible. Audible noise: birds, rustling leaves (wind), Old Northern Road, Insects.	
14/06/2024 12:01	OR3	44	44.9	39.0	58.2	39	Site audible - Processing plant near shed approx. 39 dBA. Pit activity inaudible. Other audible noise: Trucks on access road 48 to 50 dBA, distant laughter from the farm audible but not influencing noise levels.	
14/06/2024 12:22	OR2	44	46.7	38.3	59.1	41	Site audible - Processing plant 40 to 41 dBA. Pit activity inaudible. Other audible noise: Old Northern Road, light vehicles on access road 52 dBA, distant birds and insects.	
14/06/2024 12:42	R2	44	72.4	40.7	96.5	<44	Site inaudible. Dominant noise: Old Northern Road. Dual trucks up to 88 and 97 dBA (defining maximums). Other audible noise: birds and insects.	
14/06/2024 13:01	R3	44	70.1	40.6	92.4	<44	Site inaudible. Dominant noise: Old Northern Road. Trucks up to 92.4 dBA (defining maximums). Other audible noise: birds and insects.	



Time	Location	Noise criterion	Measured 15-minute noise level			Estimated LAeq, 15 min quarry contribution	Observations	Meteorological conditions
			LAeq	LA90	LAmix			
14/06/2024 13:19	R4/5	45	64.6	41.5	87.5	<45	Site inaudible. Dominant noise: Old Northern Road. Other audible noise: local civilians, school noise, birds and insects.	Overcast sky and calm to light breeze. Light drizzle towards the end of the 15min measurement. SSW @ 4.3 km/h Temperature 12°C Extremely unstable conditions (A class)



4.2 Extrapolated measurements

A conclusive noise level attributable to the Quarry was not possible in all locations due to ambient noise levels. Therefore, measurements captured on-site without substantial influence from extraneous noise were used to calculate sound pressure levels at each receiver.

Based on observations close to the quarry, the following plant and equipment was in use during the monitoring period.

1. Processing plant - conveyors and drives, screens, front end loaders, Moxies (plant to stockpile)
2. Pit – Excavator-mounted rock saw, excavators grinding and popping logs, front end loaders.

Measurements close to these plant items were undertaken to establish a representative noise model of the quarry operations. A summary of noise emission data for these items is presented in Appendix A.

Predictions of noise at nearby receivers were based on measured onsite noise levels and propagation methods described in ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*, which accounts for geometric spreading, air and ground absorption as well as barrier effects, assuming worst case meteorology of a gentle breeze from source to receiver and stable conditions.

Based on the above, modelled noise levels for each monitoring location are presented in Table 6. Results are shown for equipment operating in the pit, processing plant and stockpiling area (Moxy route).

Table 6 Extrapolated monitoring results to intermediate measurement locations

Location	Modelled noise level, dBA	Measured noise level, LAeq, 15 minute, dBA
OAS1	64.7	65
OAS2	44.7	45
OAS3	48.5	50

Modelled levels are within 0.5 to 1 dB of measured values and are suitably accurate to extrapolate to assessment locations. Modelled levels at assessment locations are presented in Table 7.

Extrapolated results indicate the Quarry demonstrates a contribution to the ambient noise environment that meets the noise limit for the day period in all locations.

Noise contour maps from the model are presented in Appendix B and illustrate noise propagation from the Quarry to all surrounding sensitive receiver locations.

Table 7 Extrapolated monitoring results

Receiver	Noise criteria		Extrapolated noise level, LAeq, 15 minute	Comment
	Shoulder	Day		
OR1	-	45	33	Predicted levels correlate well with measured levels and all locations shown to meet noise limits during the day period.
OR2	37	44	36	
OR3			35	
2			34	
3			33	
4/5			33	



4.3 Compliance summary

Results of attended monitoring and extrapolated noise levels demonstrate the following.

1. Observed operations during the day period were compliant with the noise limit at each receiver under the meteorological conditions at the time.
2. Observed operations during the shoulder period were compliant with the noise criteria at all receivers under the meteorological conditions at the time.



Appendix A. On-site measurements

Location	Plant item	Height, m	Sound Power Level, (third octave, Hz), dBA																													
			Sum	12.5	16	20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k
Process area	Screens, conveyors, FEL	4	113	40	55	72	65	75	80	88	91	89	91	94	95	95	96	98	100	99	101	102	103	104	103	102	100	99	97	93	89	85
Pit area	Rock saw	1.5	106	22	32	41	45	54	60	68	70	76	86	81	92	84	81	86	94	95	95	97	97	97	98	96	92	90	88	84	80	76
	FEL only	4	98	39	52	52	55	66	67	71	75	77	75	78	78	79	79	81	84	86	88	88	89	90	88	87	85	83	77	72	70	67
	Excavators (2) grinding and popping logs	4	103	39	52	53	56	66	69	71	76	80	82	85	90	88	88	84	89	92	94	93	92	93	93	91	91	88	84	81	75	68

Appendix B. Noise contours

