

# Annual Noise Monitoring Assessment 2022

Dunmore Lakes Sand Project  
Dunmore, NSW  
July 2022.



# Document Information

## Annual Noise Monitoring Assessment 2022

Dunmore Lakes Sand Project, Dunmore, NSW

July 2022

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# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral for Dunmore Lakes Sand Project (DLSP), at Dunmore, NSW.

The monitoring has been conducted in accordance with the Dunmore Lakes Sand Project Noise Management Plan V7 (NMP, 2021) and in general accordance with the Noise Policy for Industry (NPI). This assessment has been undertaken during July 2022 and forms the annual noise monitoring program to address conditions outlined in the Development Consent (DA 195-8-2004) with the commencement of Stage 5A.

This report summarises the operator-attended noise monitoring results measured at eight receivers in comparison to the relevant noise limits contained in the Development Consent and NMP.

The assessment has been conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Dunmore Lakes Sand Project Noise Management Plan V7 (NMP), 2021;
- Dunmore Lakes Sand Quarry Environmental Protection Licence No. 11147;
- Discussion Paper - Validation of Inversion Strength Estimation Method (EPA) 2014; and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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## 2 Noise Criteria

The DLSP Noise Management Plan (NMP), outlines the applicable noise criteria for residential receivers surrounding the operation, and are presented in **Table 1** and **Table 2**.

<b>Table 1 Consent Criteria</b>				
Receiver Location	Day	Evening	Night	Morning Shoulder
	(7am - 6pm)	(6pm - 10pm)	(10pm - 12am)	(6am - 7am)
	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
Dunmore Village residences – 31 Shellharbour Road	49	44	41	47
R20	49	44	38	47
R3, R11, R12, R13, R14, R15, R16, R17, R18, 79 Fig Hill Lane	48	43	38	48
R19	47	43	38	46
R4, R5, R6, R7, R8, R9, R10	47	43	38	43
Renton (183 James Road, Dunmore)	46	43	37	46
All other residences	40	35	35	35

Note 1: Referenced from DLSP NMPv7 Table 7.

<b>Table 2 Maximum Noise Trigger Levels</b>		
Receiver Location	Night	Morning Shoulder
	(10pm - 12am)	(6am - 7am)
	dB LAmax	dB LAmax
R1, R2, R3, R11, R12, R13, R14, R15, R16, R17 and R18	61	
R4, R5, R6, R7, R8, R9, R10	53	
R19	56	

Note 1: Referenced from DLSP NMPv7 Table 8.

The DLSP Environmental Protection Licence (EPL), outlines the applicable noise limits for residential receivers surrounding the operation, and are presented in **Table 3**.

<b>Table 3 EPL Noise Limits</b>					
Description	Address	Day	Evening	Night	Morning Shoulder
		(7am - 6pm)	(6pm - 10pm)	(10pm - 6am)	(6am - 7am)
		dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
Renton	James Road	46	43	37	46
Dunmore Village	31 Shellharbour Road	49	44	41	47
Stocker	Swamp Road	49	44	38	47

The EPL noise limits presented in **Table 4** apply under the following meteorological conditions:

- Wind speeds up to 3m/s at 10 metres above ground level; or
- Temperature inversion conditions of up 6°C/100m and wind speeds up to 2m/s at 10 metres above ground level.



### 3 Methodology

#### 3.1 Locality

DLSP is located at Dunmore near Shellharbour, NSW. Receivers in the locality surrounding DLSP are primarily rural and residential. Highway traffic is a dominant noise source for receivers as they are situated within 500m of the Princes Highway. The representative monitoring locations with respect to DLSP are presented in the locality plan in Figure 1. Table 4 and Table 5 presents the relevant noise criteria for each assessed receiver.

**Table 4 Attended Monitoring Locations and Consent Criteria**

ID <sup>2</sup>	Description <sup>3</sup>	Day <sup>1</sup>	Evening <sup>1</sup>	Night <sup>1</sup>	Morning Shoulder <sup>1</sup>
		dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)	dB LAeq(15min)
DN-6	Renton	46	43	37	46
DN-7	Dunmore Village	49	44	41	47
DN-8	Stocker (R20)	49	44	38	47
DN-9	R17	48	43	38	48
DN-10	R14	48	43	38	48
DN-11	R11	48	43	38	48
DN-12	R3	48	43	38	48
DN-13	R4	47	43	38	43

Note 1: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

Note 2: Referenced from DLSP NMPv7 Figure 3 and Figure 4.

Note 3: Referenced from DLSP NMPv7 Table 7.

**Table 5 Attended Monitoring Locations and Maximum Noise Trigger Levels**

ID <sup>2</sup>	Description <sup>3</sup>	Night	Morning Shoulder
		(10pm - 12am)	(6am - 7am)
		dB LAmax	dB LAmax
DN-9, DN-10, DN-11 and DN-12	R1, R2, R3, R11, R12, R13, R14, R15, R16, R17 and R18		61
DN-13	R4, R5, R6, R7, R8, R9, R10		53
DN6, DN7 and DN-8	Renton, Dunmore Village and Stocker		N/A

Note 1: Referenced from DLSP NMPv7 Table 8.

Note 2: Referenced from DLSP NMPv7 Figure 1, Figure 2, Figure 3 and Figure 4.

Note 3: Referenced from DLSP NMPv7 Table 7.

### 3.2 Assessment Methodology

The attended noise measurements were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the DLSP NMP. Noise measurements of two 15 minutes in duration during the day period and one 15 minute duration during the remaining periods were conducted at eight locations (DN-6, DN-7, DN-8, DN-9, DN-10, DN-11, DN-12, DN-13) using Svantek Type 1, 971 noise analysers between Tuesday 12 July 2022 and Thursday 14 July 2022 to satisfy the requirements of the NMP. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2019- Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed  $\pm 0.5$  dBA.

To understand meteorological conditions during the evening and night periods, direct measurement of temperature profile was undertaken at Trevethan Reserve, Minnamurra at 2m above ground level and at 50m above ground level using a weather balloon on Tuesday 12 July 2022. It is noted that due to high wind speeds during the morning shoulder periods between Wednesday 13 July 2022 and Thursday 14 July 2022 temperature measurements were unable to be obtained.

The results of the temperature measurements were used to determine the temperature lapse rate in general accordance with the Validation of Inversion Strength Estimation Method (2014). These measurements, in combination with the on site weather station provide a reference to validate the relevant meteorological conditions under which compliance is assessed.

Extraneous noise sources were excluded from the analysis to determine the dB LA<sub>eq(15min)</sub> DSLP noise contribution for comparison against the relevant criteria. In the event of quarry attributed noise being above criteria, prevailing meteorological conditions for the monitoring period are sourced from the onsite meteorological station and analysed in accordance with Fact Sheet A4 of the NPI to determine the stability category present at the time of each attended measurement.

Where the quarry is inaudible, the contribution is estimated to be at least 10dBA below the ambient noise level.



FIGURE 1  
LOCALITY PLAN

MAC180747

Dunmore Lakes Sand Project, Dunmore

**KEY**

- Receiver Locations
- Site Boundary



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## 4 Results

A summary of the operator attended measurements at location DN-6 to DN-13 are presented **Table 6** to **Table 13** and provide the following information:

- Monitoring location.
- Date, time and assessment period.
- Observed Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 1.5m above the ground measured at the monitoring location.
- Measured Temperature (Temp) in °C at 2.0m and 60.0m above ground level at a representative location.
- Average Wind Speed (WS, m/s), Wind Direction (WD) and Temperature (Temp) in °C at 10m above ground level at the on-site weather station.
- Atmospheric stability class derived from the on-site weather station.
- Calculated temperature inversion strength.
- Ambient measured noise levels LAeq(15min) and LA90(15min) in dB re 20µPa.
- DLSP LAeq(15min) and LAmax noise level contribution.
- Noise Limit LAeq(15min) and LAmax.

Results of the attended noise survey identified that the DLSP was audible for short durations during the measurements, however extraneous sources such as distant traffic, insects, livestock and birds were audible during the survey period and dominated the acoustic environment. Temperature data indicated that inversion strengths calculated from on-site measurements during the evening and night periods on Tuesday 12 July 2022 were within the development consent conditions (ie lower than 6°C/100m), although DSLP noise contributions were within the consent noise criteria. It is noted that temperate inversion data was unavailable during the morning shoulder periods due to increased wind speeds and unstable conditions.

**Table 6 DN-6 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology						Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp °C	60m Temp °C	Delta Temp °C	Lapse Rate °C/100m <sup>2</sup>	Stability Class <sup>1</sup>	
14/07/2022	Morning 06:27	2.9m/s SW 11°C	56	50	46	5.5	SW	N/A	N/A	N/A	N/A	D	Traffic 50-54
Wind in trees 56-66													
	Shoulder												Birds 53-57
													DLSP inaudible
													DLSP Contribution
													<40dB LAeq(15min)
12/07/2022	Day 15:22	0.5m/s N 16°C	57	50	46	1.9	E	N/A	N/A	N/A	N/A	E	Traffic 49-76
													DLSP inaudible
													DLSP Contribution
													<40dB LAeq(15min)
12/07/2022	Day 15:53	0.5m/s N 16°C	54	51	46	1.6	E	N/A	N/A	N/A	N/A	E	Traffic 47-68
													DLSP inaudible
													DLSP Contribution
													<41dB LAeq(15min)
12/07/2022	Evening 21:45	0.2m/s N 9°C	56	53	43	2.4	W	8.9	7.5	-1.3	-2.9	F	Insects <50
													Traffic 50-66
													DLSP inaudible
													DLSP Contribution
													<43dB LAeq(15min)
12/07/2022	Night 22:00	0.1m/s N 9°C	67	58	37	2.3	W	8.1	7.6	-0.4	-1	F	Insects <47
													Traffic 47-70
													DLSP inaudible
													DLSP Contribution
													<37dB LAeq(15min)

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 7 DN-7 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology					Description and SPL, dBA	
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>		Stability Class <sup>1</sup>
14/07/2022	Morning 06:02	2.8m/s SW 12°C	63	59	47	5	SW	N/A	N/A	N/A	N/A	D	Traffic 55-73
Shoulder													Wind in trees 50-70
													Train 60-62
													DLSP inaudible
													DLSP Contribution
													<47dB LAeq(15min)
12/07/2022	Day 14:42	0.3m/s E 16°C	61	57	49	2.5	E	N/A	N/A	N/A	N/A	E	Traffic 55-70
													DLSP inaudible
													DLSP Contribution
													<47dB LAeq(15min)
12/07/2022	Day 15:12	0.3m/s E 16°C	61	57	49	1.9	ESE	N/A	N/A	N/A	N/A	D	Traffic 56-81
													DLSP inaudible
													DLSP Contribution
													<47dB LAeq(15min)
12/07/2022	Evening 21:55	0.1m/s W 9°C	61	56	44	2.3	W	8.5	7.5	-1	-2	F	Traffic 55-71
													DLSP inaudible
													DLSP Contribution
													<44dB LAeq(15min)
12/07/2022	Night 23:07	0.1m/s W 7°C	58	51	41	2.3	W	8.2	7.3	-0.9	-2	E	Traffic 52-72
													DLSP inaudible
													DLSP Contribution
													<41dB LAeq(15min)

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 8 DN-8 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology					Stability Class <sup>1</sup>	Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>		
13/07/2022	Morning 06:39 Shoulder	2.8m/s W 10°C	60	47	47	3.2	WSW	N/A	N/A	N/A	N/A	D	Traffic 46-78 Insects 40-52 Wind in trees 42-48 Birds 40-44 DLSP inaudible
DLSP Contribution													<37dB LAeq(15min)
12/07/2022	Day 13:45	0.8m/s E 16°C	62	50	49	2.9	ESE	N/A	N/A	N/A	N/A	E	Traffic 45-80 Local residential noise 50-56 DLSP inaudible
DLSP Contribution													<40dB LAeq(15min)
12/07/2022	Day 14:15	0.8m/s E 16°C	64	51	49	3.1	ESE	N/A	N/A	N/A	N/A	D	Traffic 45-83 DLSP inaudible
DLSP Contribution													<41dB LAeq(15min)
12/07/2022	Evening 21:34	0.2m/s W 9°C	54	46	44	2.2	W	8.6	7.5	-1.1	-2.3	F	Traffic 44-74 DLSP inaudible
DLSP Contribution													<36dB LAeq(15min)
12/07/2022	Night 22:26	0.1m/s N 8°C	48	45	38	2.3	W	8.2	7.1	-1	-2.2	F	Aircraft 43-46 Traffic 44-55 DLSP inaudible
DLSP Contribution													<35dB LAeq(15min)

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.



**Table 9 DN-9 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology					Description and SPL, dBA	
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>		Stability Class <sup>1</sup>
13/07/2022	Morning 06:18 Shoulder	2.8m/s W 10°C	49	46	48/61	3.2	W	N/A	N/A	N/A	N/A	E	Traffic 44-60
Aircraft 47-49													
Wind in trees 44-54													
DLSP Contribution													DLSP inaudible
													<36dB LAeq(15min)
													<40dB LAmax
12/07/2022	Day 13:08	2.5m/s E 16°C	55	49	48	3	ESE	N/A	N/A	N/A	N/A	E	Traffic 40-75
DLSP Contribution													DLSP inaudible
													<39dB LAeq(15min)
12/07/2022	Day 13:38	2.5m/s E 16°C	53	48	48	3.2	ESE	N/A	N/A	N/A	N/A	D	Traffic 40-65
DLSP Contribution													DLSP inaudible
													<38dB LAeq(15min)
12/07/2022	Evening 21:14	0.1m/s W 9°C	51	45	43	2.4	W	9.1	7.8	-1.3	-2.7	F	Traffic 43-62
DLSP Contribution													DLSP inaudible
													<35dB LAeq(15min)
12/07/2022	Night 22:46	0.1m/s N 8°C	46	37	38/61	2.4	W	8.6	7.3	-1.3	-2.7	E	Insects 34-36
DLSP Contribution													Traffic 34-60
													DLSP inaudible
													<30dB LAeq(15min)
													<40dB LAmax

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 10 DN-10 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology						Description and SPL, dBA
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m	60m	Delta	Lapse Rate	Stability	
								Temp°C	Temp°C	Temp°C	°C/100m <sup>2</sup>	Class <sup>1</sup>	
13/07/2022 Morning Shoulder	06:00	2.8m/s W 10°C	49	46	48/61	2.7	W	N/A	N/A	N/A	N/A	D	Traffic 43-58 Wind in trees 44-48 DLSP inaudible
DLSP Contribution												<36dB LAeq(15min) <40dB LAmax	
12/07/2022 Day	12:34	0.1m/s E 18°C	53	46	48	2	E	N/A	N/A	N/A	N/A	C	Traffic 44-75 DLSP inaudible
DLSP Contribution												<36dB LAeq(15min)	
12/07/2022 Day	13:04	0.1m/s E 18°C	53	48	48	2.7	SE	N/A	N/A	N/A	N/A	D	Traffic 44-70 DLSP inaudible
DLSP Contribution												<38dB LAeq(15min)	
12/07/2022 Evening	20:50	0.1m/s W 9°C	57	45	43	1.3	W	8.9	8.1	-0.7	-1.6	E	Dog barking 51-83 Traffic 40-65 DLSP inaudible
DLSP Contribution												<35dB LAeq(15min)	
12/07/2022 Night	22:24	0.1m/s W 9°C	52	46	38/61	2.3	W	8.4	7.3	-1.1	-2.3	F	Traffic 50-49 Insects 50-52 DLSP inaudible
DLSP Contribution												<36dB LAeq(15min) <40dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 11 DN-11 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology					Description and SPL, dBA	
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m	60m	Delta	Lapse Rate		Stability
								Temp°C	Temp°C	Temp°C	°C/100m <sup>2</sup>		Class <sup>1</sup>
13/07/2022 Morning Shoulder	06:40	2m/s W 9°C	55	52	48/61	3.2	WSW	N/A	N/A	N/A	N/A	D	Traffic 49-75 Birds 49-56 DLSP inaudible
DLSP Contribution												<42dB LAeq(15min) <42dB LAmax	
12/07/2022 Day	11:57	1.2m/s E 16°C	59	55	48	1	ESE	N/A	N/A	N/A	N/A	B	Traffic 55-70 DLSP inaudible
DLSP Contribution												<45dB LAeq(15min)	
12/07/2022 Day	12:27	1.2m/s E 16°C	58	55	48	2	E	N/A	N/A	N/A	N/A	C	Traffic 55-68 Local residential noise 40-60 DLSP inaudible
DLSP Contribution												<45dB LAeq(15min)	
12/07/2022 Evening	20:30	0.2m/s W 9°C	48	43	43	1.9	W	9	8.2	-0.7	-1.6	F	Traffic 49-62 DLSP inaudible
DLSP Contribution												<33dB LAeq(15min)	
12/07/2022 Night	22:42	0.1m/s W 9°C	49	37	38/61	2.4	W	8.5	7.4	-1	-2.1	E	Traffic 40-63 DLSP inaudible
DLSP Contribution												<30dB LAeq(15min) <40dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 12 DN-12 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria		Observed Meteorology					Description and SPL, dBA	
			LAeq	LA90	LAeq(15min)/ LAmax	WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m	60m	Delta	Lapse Rate		Stability
								Temp°C	Temp°C	Temp°C	°C/100m <sup>2</sup>		Class <sup>1</sup>
13/07/2022 Morning Shoulder	06:18	1.1m/s W 9°C	71	49	48/61	3.2	W	N/A	N/A	N/A	N/A	E	Traffic 45-87 DLSP inaudible
DLSP Contribution												<39dB LAeq(15min) <40dB dB LAmax	
12/07/2022 Day	11:10	0.1m/s E 14°C	63	46	48	1	N	N/A	N/A	N/A	N/A	A	Traffic 65-79 Train 60-75 DLSP inaudible
DLSP Contribution												<36dB LAeq(15min)	
12/07/2022 Day	11:40	0.1m/s E 14°C	63	46	48	2.1	ESE	N/A	N/A	N/A	N/A	A	Traffic 65-76 DLSP inaudible
DLSP Contribution												<36dB LAeq(15min)	
12/07/2022 Evening	20:06	0.2m/s W 11°C	56	42	43	2.2	W	9.5	8.9	-0.6	-1.2	F	Traffic 40-74 Train 40-71 DLSP inaudible
DLSP Contribution												<32dB LAeq(15min)	
12/07/2022 Night	23:31	0.1m/s W 7°C	47	33	38/61	1.6	WSW	7.7	7.6	-0.1	-0.2	D	Traffic 33-69 DLSP inaudible
DLSP Contribution												<30dB LAeq(15min) <40dB LAmax	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

**Table 13 DN-13 - Attended Noise Monitoring Summary**

Date & Period	Time (hrs)	1.5m WS WD Temp	Descriptor		Consent Criteria LAeq(15min)/ LAmx	Observed Meteorology						Description and SPL, dBA	
			LAeq	LA90		WS (m/s) <sup>1</sup>	WD <sup>1</sup>	2m Temp°C	60m Temp°C	Delta Temp°C	Lapse Rate °C/100m <sup>2</sup>		Stability Class <sup>1</sup>
13/07/2022 Morning Shoulder	06:00	1.6m/s W 9°C	58	49	43/53	2.7	W	N/A	N/A	N/A	N/A	D	Traffic 46-75 Train 46-58 DLSP inaudible
DLSP Contribution												<39dB LAeq(15min) <40dB LAmx	
12/07/2022 Day	10:27	0.5m/s W 14°C	54	45	47	0.7	ENE	N/A	N/A	N/A	N/A	A	Traffic 40-71 Train 50-58 DLSP inaudible
DLSP Contribution												<35dB LAeq(15min)	
12/07/2022 Day	10:57	0.5m/s W 14°C	54	45	47	0.8	NNE	N/A	N/A	N/A	N/A	D	Traffic 40-69 Train 50-58 DLSP inaudible
DLSP Contribution												<35dB LAeq(15min)	
12/07/2022 Evening	19:37	0.2m/s W 11°C	54	44	43	2.1	W	10.7	8.9	-1.7	-3.6	F	Traffic 40-74 DLSP inaudible
DLSP Contribution												<34dB LAeq(15min)	
12/07/2022 Night	23:10	0.1m/s N 9°C	48	36	38/53	2.3	W	8.1	7.2	-0.9	-1.9	E	Traffic 36-67 DLSP inaudible
DLSP Contribution												<30dB LAeq(15min) <40dB LAmx	

Note 1: Data from on-site weather station.

Note 2: Calculated from 2m and 60m temperature.

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## 5 Noise Compliance Assessment

The compliance assessment summary for each monitoring location (DN-6, DN-7, DN-8, DN-9, DN10, DN11, DN12, DN-13) is presented in **Table 14** for the day and evening periods and **Table 15** for the night assessment period.

Table 14 Noise Compliance Assessment Summary								
Location	Estimated Noise Contribution			Criteria		Compliant		
	dB LAeq(15min)			dB LAeq(15min)				
	Day (Round 1)	Day (Round 2)	Evening	Day	Evening	Day (Round 1)	Day (Round 2)	Evening
DN-6	<40	<41	<43	46	43	✓	✓	✓
DN-7	<47	<47	<44	49	44	✓	✓	✓
DN-8	<40	<41	<36	49	44	✓	✓	✓
DN-9	<39	<38	<35	48	43	✓	✓	✓
DN-10	<36	<38	<35	48	43	✓	✓	✓
DN-11	<45	<45	<33	48	43	✓	✓	✓
DN-12	<36	<36	<32	48	43	✓	✓	✓
DN-13	<35	<35	<34	47	43	✓	✓	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.

**Table 15 Noise Compliance Assessment Summary**

Location	Estimated Noise Contribution				Criteria				Compliant			
	Night		Morning Shoulder		Night		Morning Shoulder		Night		Morning Shoulder	
	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax	dB LAeq(15min)	dB LAmax
DN-6	<37	N/A	<40	N/A	37	N/A	46	N/A	✓	N/A	✓	N/A
DN-7	<41	N/A	<47	N/A	41	N/A	47	N/A	✓	N/A	✓	N/A
DN-8	<35	N/A	<37	N/A	38	N/A	47	N/A	✓	N/A	✓	N/A
DN-9	<30	<40	<36	<40	38	61	48	61	✓	✓	✓	✓
DN-10	<36	<36	<36	<40	38	61	48	61	✓	✓	✓	✓
DN-11	<30	<40	<42	<42	38	61	48	61	✓	✓	✓	✓
DN-12	<30	<40	<39	<40	38	61	48	61	✓	✓	✓	✓
DN-13	<30	<40	<39	<40	38	53	43	53	✓	✓	✓	✓

Note: Day - the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays; Evening - the period from 6pm to 10pm; Night - the remaining periods and the morning shoulder period is from 6am to 7am.



## 6 Discussion

### 6.1 Discussion of Results - Location DN-6

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise was inaudible during all measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds, wind in trees and insects.

### 6.2 Discussion of Results - Location DN-7

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the west. DLSP noise was inaudible during the measurement periods and the noise contributions were calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, train and wind in trees.

### 6.3 Discussion of Results - Location DN-8

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 350m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds, local residential noise, wind in trees and insects.

### 6.4 Discussion of Results - Location DN-9

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 160m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, wind in trees, aircraft and insects.

## 6.5 Discussion of Results - Location DN-10

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 140m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, dogs barking, wind in trees and insects.

## 6.6 Discussion of Results - Location DN-11

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 150m to the east. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic, birds and local residential noise.

## 6.7 Discussion of Results - Location DN-12

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from the Princes Highway, approximately 470m to the west. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic and trains.

## 6.8 Discussion of Results - Location DN-13

The noise monitoring survey identified that the acoustic environment at this location is dominated by road traffic noise from Riverside Drive, approximately 10m to the west. DLSP noise was inaudible during the measurement periods with the noise contribution calculated (during short breaks in traffic) to be below the relevant noise criteria for all periods. Extraneous sources audible during the survey included traffic and trains.

## 7 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Boral for Dunmore Lakes Sand Project (DLSP), Dunmore, NSW.

Attended noise monitoring was undertaken between Tuesday 12 July 2022 and Thursday 14 July 2022 at eight representative monitoring locations. The assessment has identified that noise emissions generated by DLSP were inaudible during the assessment periods. DLSP contributed noise emissions were below the relevant criteria at all locations during all measurement periods thus satisfying the relevant consent conditions.

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# Appendix A - Glossary of Terms

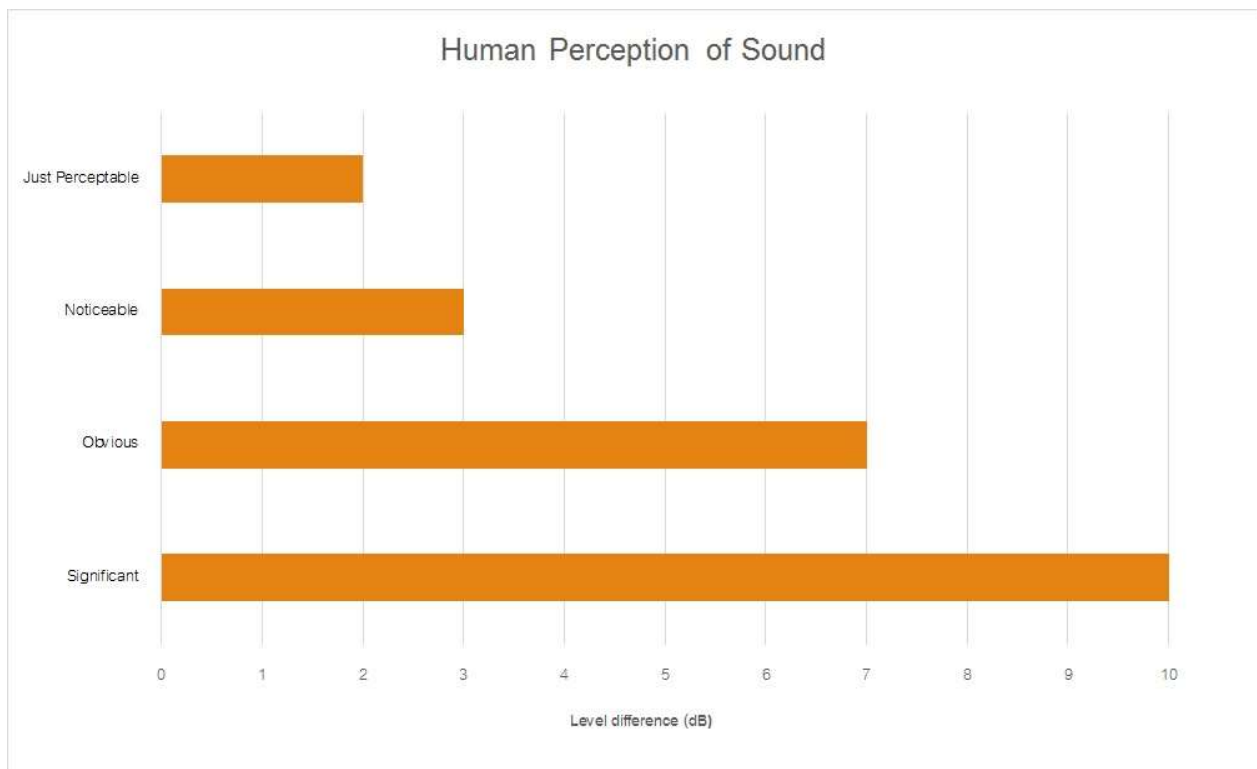
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Adverse Weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAm <sub>ax</sub>	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : $= 10 \cdot \log_{10} (W/W_0)$ <p>Where : W is the sound power in watts and W<sub>0</sub> is the sound reference power at 10-12 watts.</p>

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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