Annual Noise Monitoring Assessment 2024

Dunmore Lakes Sand Project
Dunmore, NSW
August 2024

Prepared for: Boral Resources (NSW) Pty Ltd
September 2024
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Muller Acoustic Consulting

Document Information

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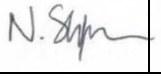
MAC180747-11RP2	13 September 2024	Nicholas Shipman		Rod Linnett	

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APPENDIX A – GLOSSARY OF TERMS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment (NMA) on behalf of Project Location 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 August 2024 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, EPL and NMP.

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

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- NSW Environment Protection Authority (EPA's), Approved Methods for the measurement and analysis of environmental noise in NSW, 2022;
- Dunmore Lakes Sand Extraction Project – Modification 2, Development Consent (DC), (DA #195-8-2004) November 2020;
- Dunmore Lakes Sand Project Noise Management Plan V7 (NMP), 2021;
- Dunmore Lakes Sand Quarry Environmental Protection Licence (EPL), (EPL #11147);
- Discussion Paper - Validation of Inversion Strength Estimation Method (EPA) 2014; and
- Standards Australia 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**.

1.1 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**.

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FIGURE 1

LOCALITY PLAN

MAC180747

Dunmore Lakes Sand Project, Dunmore

KEY

- Receiver Locations
- Weather Balloon Locations
- Site Boundary

0 100 200 300 400 500 m

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2 Noise Criteria

2.1 Development Consent

Condition 13 of the DLSP Development Consent (DA #195-8-2004) November 2020, outlines the applicable noise criteria and conditions for residential receivers surrounding the operation. The criteria outlined in the DC is reproduced below in **Table 1**.

Table 1 Development Consent Criteria

Receiver Location[1]	Day (7am - 6pm)	Evening (6pm - 10pm)	Night (10pm - 12am)	Morning Shoulder (6am - 7am)
	dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$	dB $L_{Aeq(15min)}$
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 DC Table 1 and DLSP NMPv7 Table 7.

2.2 Noise Management Plan

Condition 4.1.2 of the DLSP Noise Management Plan v7, 2021, outlines additional applicable noise criteria and conditions for residential receivers surrounding the operation. The criteria outlined in the NMP is reproduced below in **Table 2.**

Table 2 Maximum Noise Trigger Levels

Receiver Location	Night[1] (10pm - 12am)	Morning Shoulder[1] (6am - 7am)
	dB L_{Amax}	dB L_{Amax}
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.

Additional relevant noise conditions in relation to the attended monitoring program within the Noise Management Plan v7, 2021 have been reproduced below.

6.1.3 Attended Monitoring Program

Attended compliance noise monitoring will continue to be undertaken on an annual basis. Additional monitoring will also be undertaken during the first month of operation of each new extraction stage (i.e. Stages 5A and 5B). Monitoring must be conducted for one 15-minute period at each of the eight nominated locations during the morning shoulder (6.00 am – 7.00 am) and for two consecutive 15-minute periods at each of the eight nominated locations during the day (7.00 am – 6.00 pm).

The monitoring program will be reviewed as required so that noise impacts on privately-owned properties are suitably assessed.

In circumstances where the attended monitoring was affected by adverse weather conditions (i.e. when wind at microphone height exceeds 5 m/s or during rain), an additional set of monitoring will be conducted at the earliest opportunity. The operator must use a hand-held anemometer to determine wind speed at microphone height during attended monitoring.

Monitoring will be carried out in response to any sustained complaint during the assessment period in which the complaints occur.

6.1.4 Attended Monitoring Regulatory Requirements

Attended monitoring must be carried out in accordance with the regulatory requirements for reviewing performance as documented in the NPfI. The requirements relating to the following will be observed:

- *Monitoring locations for collection of representative data;*
- *Meteorological conditions during which noise monitoring shall be excluded (i.e. when wind at microphone height exceeds 5 m/s, or during rain);*
- *Instrumentation and conformity to International and Australian Standards; and*
- *Modifications to data, including penalties for modifying factors such as low-frequency noise.*

2.3 Environmental Protection Licence

Section L3 of the DLSP Environmental Protection Licence (EPL #11147), outlines the applicable noise limits for residential receivers surrounding the operation. The criteria outlined in the EPL is reproduced below in **Table 3** along with relevant noise conditions.

L3.1 Noise from the premises must not exceed the following limits:

Table 3 EPL Noise Limits

Location	Day (7am - 6pm)	Evening (6pm - 10pm)	Night (10pm - 6am)	Morning Shoulder (6am - 7am)
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$
Renton (DN-6)	46	43	37	46
Dunmore Village (DN-7)	49	44	41	47
Stocker (DN-8)	49	44	38	47

Note: The night-time noise limit for Dunmore Village was determined on the basis of predicted noise levels that would be attained after a noise reduction of 8 dB(A) for the loader and/or loading area.

L3.2 For the purposes of condition L3.1:

- *Shoulder is the period 6am to 7am Monday to Saturday;*
- *Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6 pm Sundays and Public holidays;*
- *Evening is defined as the period from 6pm to 10pm; and*
- *Night is defined as the period from 10pm to 6am.*

L3.3 Noise from the premised is to be measured at the most affected point on or within the residential boundary or at the most affected point within 30m of the dwelling (rural situations) where the dwelling is more than 30m from the boundary to determine compliance with the $LA_{eq(15\ minute)}$ noise limit in this condition.

The modification factors presented in Section 4 of the NSW Industrial Noise Policy must also be applied to the measured noise levels where applicable.

L3.4 The noise emission limits identified in this condition apply under meteorological conditions of:

- *wind speeds up to 3 m/s at 10metres above the ground level; or*
- *temperature inversions conditions of up to 6oC/100m and wind speeds up to 2m/s at 10 metres above ground level.*

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3 Methodology

3.1 Assessment Methodology

The attended noise measurements were conducted in general accordance with the procedures described in Standards Australia 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 20 August 2024 and Thursday 22 August 2024 to satisfy the relevant requirements. All acoustic instrumentation used carries appropriate and current NATA (or manufacturer) calibration certificates with records of all calibrations maintained by MAC as per Approved Methods for the measurement and analysis of environmental noise in NSW (EPA, 2022) and complies with AS/NZS 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 ±0.5dBA.

To understand meteorological conditions during calm conditions, direct measurement of temperature profile was undertaken at Trevethan Reserve, Minnamurra on Tuesday 20 August 2024 and at Fuller Drive, Dunmore on Wednesday 21 August 2024, at 2m above ground level and at 50m above ground level using a weather balloon.

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 $LA_{eq(15min)}$ 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.

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4 Results

4.1 Prevailing Meteorological Conditions

A summary of prevailing meteorological conditions is presented in **Table 4**.

Table 4 - Prevailing Meteorological Conditions

Date/Time	Boral Dunmore Onsite MET Station		Operator Measured Weather Monitoring						
	Wind Direction	Wind (m/s)	1.5m WS (m/s)	1.5m WD	2m Temp ˚C	60m Temp ˚C	Delta Temp ˚C	Lapse Rate ˚C/100m2	Stability Class2
20/08/2024 19:42	ESE	0.5	0.6	N	n/a	n/a	n/a	n/a	n/a
20/08/2024 20:00	NNW	0.1	0.2	N	n/a	n/a	n/a	n/a	n/a
20/08/2024 20:26	WSW	1.5	0.2	N	n/a	n/a	n/a	n/a	n/a
20/08/2024 20:45	WSW	1.5	0.4	N	n/a	n/a	n/a	n/a	n/a
20/08/2024 21:07	E	0.7	0.1	NE	n/a	n/a	n/a	n/a	n/a
20/08/2024 21:22	ENE	0.9	0.2	N	n/a	n/a	n/a	n/a	n/a
20/08/2024 21:31	E	1	0.5	NE	n/a	n/a	n/a	n/a	n/a
20/08/2024 22:24	NNW	0.8	0.5	NE	15	15	0	2.1	F
20/08/2024 22:25	NNW	0.8	0.1	N	14	16	2	2.2	F
20/08/2024 22:42	NNW	2.4	0.1	N	15	16	1	2.9	F
20/08/2024 22:49	NNW	2.7	0.5	W	15	17	2	2.4	F
20/08/2024 23:13	NNW	2.8	0.5	W	n/a	n/a	n/a	n/a	n/a
20/08/2024 23:18	NNW	2.8	0.3	W	n/a	n/a	n/a	n/a	n/a
20/08/2024 23:35	N	1.9	0.3	W	n/a	n/a	n/a	n/a	n/a
20/08/2024 23:36	N	1.9	0.5	W	n/a	n/a	n/a	n/a	n/a
21/08/2024 06:05	WNW	0.7	0.1	NW	11	12	1	1.6	F
21/08/2024 06:15	NW	0.6	0.1	N	11	12	1	1.5	E
21/08/2024 06:31	W	0.6	0.1	NW	11	12	1	1.5	E
21/08/2024 06:32	W	0.6	0.1	N	11	12	1	1.5	E
21/08/2024 07:00	WNW	0.3	0.1	N	12	12	0	1.5	F
21/08/2024 07:05	W	0.7	0.1	NW	12	12	0	1.4	E
21/08/2024 07:15	W	0.9	0.1	N	12	13	1	1.2	F
21/08/2024 07:20	W	0.9	0.1	NW	12	13	1	1	E
21/08/2024 07:33	WSW	1	0.1	N	12	13	1	0.8	E
21/08/2024 07:45	SW	0.5	0.1	NW	12	13	1	0.1	E
21/08/2024 07:48	SW	0.5	0.1	N	13	13	0	-0.2	E
21/08/2024 08:00	W	0.7	0.1	NW	13	13	0	1.9	E
21/08/2024 08:17	W	1.3	0.4	N	n/a	n/a	n/a	n/a	n/a
21/08/2024 08:25	W	1.4	0.1	W	n/a	n/a	n/a	n/a	n/a
21/08/2024 08:32	W	1.4	0.4	N	n/a	n/a	n/a	n/a	n/a
21/08/2024 08:40	WNW	0.9	0.5	W	n/a	n/a	n/a	n/a	n/a
21/08/2024 08:50	N	0.6	0.4	N	n/a	n/a	n/a	n/a	n/a
21/08/2024 09:05	NW	0.6	0.5	N	n/a	n/a	n/a	n/a	n/a
21/08/2024 09:23	NW	0.6	0.5	N	n/a	n/a	n/a	n/a	n/a

Table 4 - Prevailing Meteorological Conditions									
Date/Time	Boral Dunmore Onsite MET Station		Operator Measured Weather Monitoring						
	Wind Direction	Wind (m/s)	1.5m WS (m/s)	1.5m WD	2m Temp ˚C	60m Temp ˚C	Delta Temp ˚C	Lapse Rate ˚C/100m2	Stability Class2
21/08/2024 09:38	NE	1.3	0.5	N	n/a	n/a	n/a	n/a	n/a
22/08/2024 06:06	NE	1	0.1	W	11	14	3	5.1	G
22/08/2024 06:13	SW	1.5	0.1	N	11	14	3	5.3	G
22/08/2024 06:27	W	0.9	0.1	W	11	14	3	5.2	G
22/08/2024 06:30	W	0.9	0.1	N	11	14	3	5.4	G

Note 1: Data from on-site weather station.

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

The observed meteorological measurements were within the development consent conditions for all measurements.

4.2 Assessment Results – Location DN-6

The monitored noise level contributions and observed meteorological conditions at Location DN-6 are presented in **Table 5**.

Table 5 DN-6 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
21/08/2024	06:31 (Morning Shoulder)	68	56	54	52	49	WD: NW WS: 0.1m/s Stab: E	Traffic 49-56 Birds 45-68 Livestock <45 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<42
		DLSP Site $L_{Amax(15min)}$ Contribution						<42
21/08/2024	07:45 (Day)	66	55	54	51	49	WD: NW WS: 0.1m/s Stab: E	Traffic 49-58 Birds 45-66 Livestock 45-50 Insects <45 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<41
21/08/2024	08:00 (Day)	63	53	51	49	48	WD: NW WS: 0.1m/s Stab: E	Traffic 45-55 Birds 45-63 Livestock <45 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<39
20/08/2024	21:07 (Evening)	66	59	55	48	42	WD: NE WS: 0.1m/s Stab: n/a	Traffic 42-66 Livestock <40 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<38
20/08/2024	22:24 (Night)	66	58	54	42	37	WD: NE WS: 0.5m/s Stab: F	Traffic 36-66 Insects 35-40 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.3 Assessment Results – Location DN-7

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 6**.

Table 6 DN-7 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
21/08/2024	06:05 (Morning Shoulder)	71	67	65	62	59	WD: NW WS: 0.1m/s Stab: F	Traffic 59-71 Birds <55 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<43
		DLSP Site $L_{Amax(15min)}$ Contribution						<43
21/08/2024	07:05 (Day)	70	67	65	63	60	WD: NW WS: 0.1m/s Stab: E	Traffic 60-70 Birds <60 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<46
21/08/2024	07:20 (Day)	75	68	66	64	62	WD: NW WS: 0.1m/s Stab: E	Traffic 62-75 Birds <60 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<46
20/08/2024	21:31 (Evening)	67	60	56	49	40	WD: NE WS: 0.5m/s Stab: n/a	Traffic 40-67 Insects <40 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<39
20/08/2024	22:49 (Night)	79	60	56	44	36	WD: W WS: 0.5m/s Stab: F	Traffic 36-72 Train 35-79 Aircraft 35-48 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.4 Assessment Results – Location DN-8

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 7**.

Table 7 DN-8 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
22/08/2024	06:27 (Morning Shoulder)	83	64	64	55	52	WD: W WS: 0.1m/s Stab: G	Traffic 52-83 Birds 45-60 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<43
		DLSP Site $L_{Amax(15min)}$ Contribution						<43
21/08/2024	08:25 (Day)	83	68	65	48	44	WD: W WS: 0.1m/s Stab: n/a	Traffic 44-83 Birds 40-62 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<38
21/08/2024	08:40 (Day)	87	70	66	48	43	WD: W WS: 0.5m/s Stab: n/a	Traffic 43-87 Birds 40-65 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<38
20/08/2024	21:22 (Evening)	78	53	55	45	41	WD: N WS: 0.2m/s Stab: n/a	Traffic 41-78 Insects <41 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	23:13 (Night)	69	51	50	37	33	WD: W WS: 0.5m/s Stab: n/a	Traffic 33-69 Insects 30-35 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.5 Assessment Results – Location DN-9

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 8**.

Table 8 DN-9 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
22/08/2024	06:06 (Morning Shoulder)	69	55	53	50	47	WD: W WS: 0.1m/s Stab: G	Traffic 49-55 Birds 45-69 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<40
		DLSP Site $L_{Amax(15min)}$ Contribution						<40
21/08/2024	09:23 (Day)	72	55	53	50	46	WD: N WS: 0.5m/s Stab: n/a	Birds 47-72 Traffic 47-58 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<40
21/08/2024	09:38 (Day)	65	55	53	49	46	WD: N WS: 0.5m/s Stab: n/a	Birds 47-65 Traffic 47-62 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<39
20/08/2024	21:04 (Evening)	53	48	45	42	39	WD: N WS: 0.2m/s Stab: n/a	Traffic 39-53 Birds 39-46 Aircraft 39-44 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	23:36 (Night)	61	52	47	35	32	WD: W WS: 0.5m/s Stab: n/a	Traffic 32-61 Insects 30-35 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.6 Assessment Results – Location DN-10

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 9**.

Table 9 DN-10 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
22/08/2024	06:30 (Morning Shoulder)	78	55	55	48	46	WD: N WS: 0.1m/s Stab: G	Traffic 46-78 Birds 46-58 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<38
		DLSP Site $L_{Amax(15min)}$ Contribution						<38
21/08/2024	08:50 (Day)	63	47	46	42	40	WD: N WS: 0.4m/s Stab: n/a	Traffic 40-58 Birds 40-63 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
21/08/2024	09:05 (Day)	76	50	52	42	40	WD: N WS: 0.5m/s Stab: n/a	Traffic 40-76 Birds 40-60 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	20:45 (Evening)	55	47	45	40	37	WD: N WS: 0.4m/s Stab: n/a	Traffic 37-55 Birds <37 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	23:35 (Night)	62	44	41	34	32	WD: W WS: 0.3m/s Stab: n/a	Traffic 32-62 Birds 32-38 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.7 Assessment Results – Location DN-11

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 10**.

Table 10 DN-11 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
22/08/2024	06:13 (Morning Shoulder)	71	59	57	52	49	WD: N WS: 0.1m/s Stab: G	Traffic 49-58 Birds 49-71 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<42
		DLSP Site $L_{Amax(15min)}$ Contribution						<42
21/08/2024	08:17 (Day)	66	56	54	51	48	WD: N WS: 0.4m/s Stab: n/a	Birds 48-56 Traffic 48-66 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<41
21/08/2024	08:32 (Day)	72	55	54	50	47	WD: N WS: 0.4m/s Stab: n/a	Birds 48-56 Traffic 48-72 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<40
20/08/2024	20:26 (Evening)	62	55	52	45	41	WD: N WS: 0.2m/s Stab: n/a	Traffic 43-62 Birds 43-46 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	23:18 (Night)	64	52	48	35	33	WD: W WS: 0.3m/s Stab: n/a	Traffic 33-64 Birds 33-46 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.8 Assessment Results – Location DN-12

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 11**.

Table 11 DN-12 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
21/08/2024	06:32 (Morning Shoulder)	85	77	71	54	48	WD: N WS: 0.1m/s Stab: E	Traffic 48-85 Birds 48-54 Train 50-68 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<43
		DLSP Site $L_{Amax(15min)}$ Contribution						<43
21/08/2024	07:00 (Day)	87	76	71	54	48	WD: N WS: 0.1m/s Stab: F	Birds 51-54 Traffic 49-87 Train 50-62 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<44
21/08/2024	07:15 (Day)	84	77	72	56	52	WD: N WS: 0.1m/s Stab: F	Traffic 52-84 Birds 52-56 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<46
20/08/2024	20:00 (Evening)	85	70	67	44	42	WD: N WS: 0.2m/s Stab: n/a	Traffic 42-85 Birds 42-48 Train 44-68 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	22:42 (Night)	80	57	59	43	41	WD: N WS: 0.1m/s Stab: F	Ocean hum 41-55 Traffic 41-80 Birds 41-46 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

4.9 Assessment Results – Location DN-13

The monitored noise level contributions and observed meteorological conditions at Location DN-7 are presented in **Table 12**.

Table 12 DN-13 – Operator Attended Noise Monitoring Results

Date	Time (hrs)[1]	Descriptor (dBA re 20µPa)					Meteorology[2]	Description and SPL, dBA
		L_{Amax}	L_{A10}	L_{Aeq}	L_{A90}	L_{Amin}		
21/08/2024	06:15 (Morning Shoulder)	69	61	58	52	49	WD: N WS: 0.1m/s Stab: E	Traffic 49-69 Birds 49-56 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<42
		DLSP Site $L_{Amax(15min)}$ Contribution						<42
21/08/2024	07:33 (Day)	69	60	57	53	50	WD: N WS: 0.1m/s Stab: E	Traffic 48-69 Birds 48-56 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<43
21/08/2024	07:48 (Day)	67	60	57	53	49	WD: N WS: 0.1m/s Stab: E	Traffic 49-67 Birds 52-56 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<43
20/08/2024	19:42 (Evening)	63	58	53	43	41	WD: N WS: 0.6m/s Stab: n/a	Traffic 41-63 Train 42-58 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
20/08/2024	22:25 (Night)	67	52	47	39	37	WD: N WS: 0.1m/s Stab: F	Train 38-67 Traffic 38-58 Aircraft 38-40 Birds 38-44 Ocean hum <38 DLSP inaudible
		DLSP Site $L_{Aeq(15min)}$ Contribution						<35
		DLSP Site $L_{Amax(15min)}$ Contribution						<45

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; Morning Shoulder - the period from 6am to 7am; Night - the remaining periods.

Note 2: Data from on-site weather station or attended operator observations.

5 Discussion

5.1 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, livestock and insects.

5.2 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 all 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, trains, birds and aircraft.

5.3 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 all 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, birds and insects.

5.4 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 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, aircraft and insects.

5.5 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 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 and birds.

5.6 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 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 and birds.

5.7 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 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, ocean hum and passing trains.

5.8 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 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, aircraft, ocean hum and passing trains.

6 Conclusion

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

Attended noise monitoring was undertaken between Tuesday 20 August 2024 and Thursday 22 August 2024 at eight representative monitoring locations. The assessment has identified that the calculated noise emissions generated by DLSP were below the relevant criteria at all locations during all measurement periods, therefore satisfying the relevant consent conditions.

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

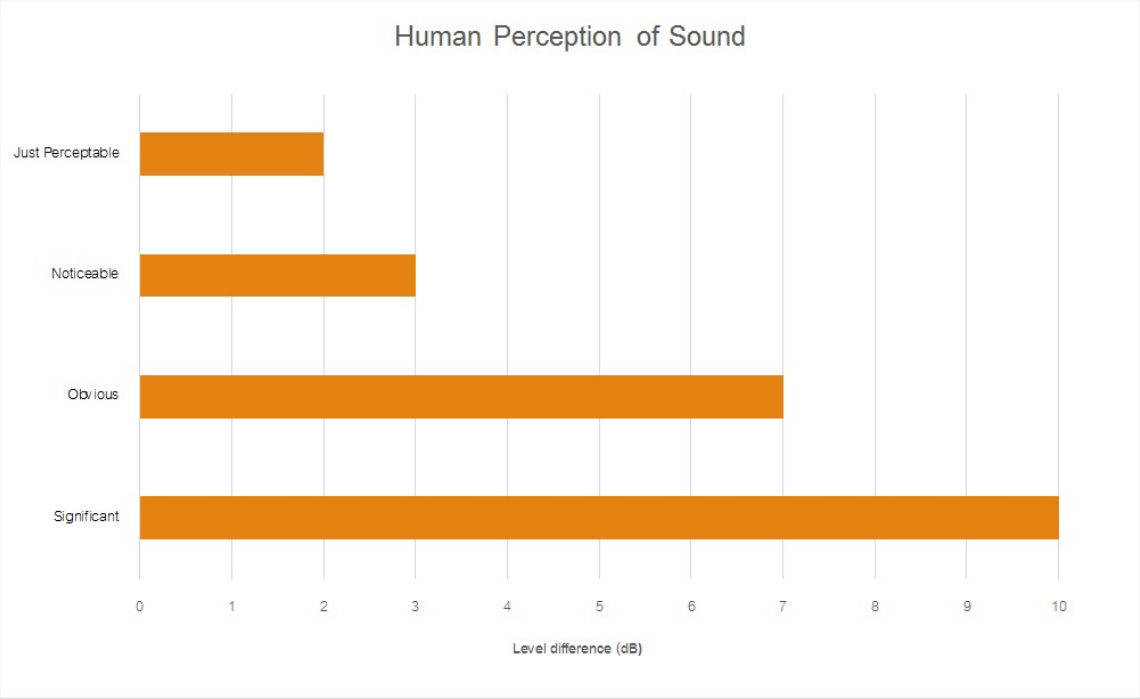
Table A1 Glossary of Acoustical Terms

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 L90 statistical noise levels.
Ambient Noise	The total noise associated with a given environment. Typically, a composite of sounds from all 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 sound.
Background Noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor
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 Z-weighted or decibels Linear (unweighted).
Extraneous Noise	Sound resulting from activities that are not typical of the area.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A sound level which is exceeded 10% of the time.
LA90	Commonly referred to as the background noise, this is the level exceeded 90% of the time.
LAeq	Represents the average noise energy or equivalent sound pressure level over a given period.
LAmax	The maximum sound pressure level received at the microphone during a measuring interval.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
RBL	The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period.
Sound power level (Lw or SWL)	This is a measure of the total power radiated by a source in the form of sound and is given by 10.log10 (W/Wo). Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.

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 Pressure 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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