ADELIE

Glebe Island 7
Compliance Noise Monitoring Report

Prepared for:

Port Authority of New South Wales
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BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Port Authority of New South Wales (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

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DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.04309-R94-v1.0	24 March 2021	Nicholas Vandenberg	Aaron McKenzie	Aaron McKenzie

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1 Introduction

SLR Consulting Australia Pty Ltd (SLR Consulting) has been commissioned by the Port Authority of New South Wales (Port Authority of NSW) to conduct monitoring of noise emissions of the "Adelie" (a bulk carrier vessel) at Glebe Island 7 (GI-7), as required by the Glebe Island and White Bay Port Noise Policy, *Port Authority of NSW (2020)* which came into effect in January 2021.

Noise measurements were conducted whilst the ship was berthed at GI-7 and unloading using the onboard cranes and conveyors. A series of measurements were undertaken at a single location considered representative of the potentially most exposed residential receivers adjacent to Batty Street during the night-time period.

The measurements were conducted during the night time between 01:00 and 04:20 on the early morning of Monday 15 March 2021.

2 Site description

The Glebe Island Port facility is located north of Anzac Bridge between Johnsons Bay and White Bay on Glebe Island. The facility occupies approximately 40 hectares of waterfront land and forms a crescent around Glebe Island, with a water frontage of about 1,400 m in length.

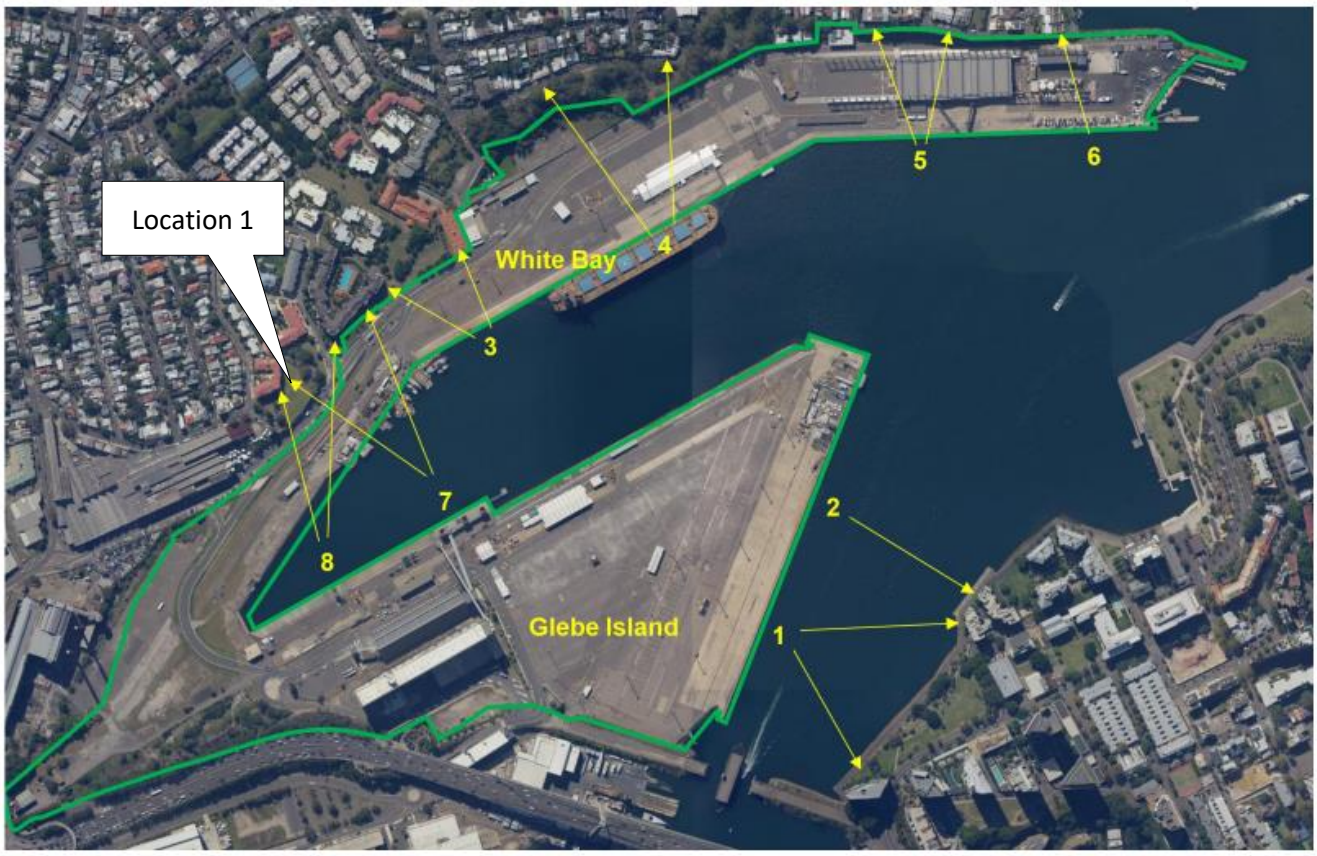
The facility layout comprises the following main elements:

- Two berths on the eastern side of Glebe Island designated GI-1 and GI-2, and two berths on the western side designated GI-7 and GI-8;
- Concrete/asphalt area previously used for vehicle storage; and
- Internal roads continuing from Sommerville Road providing truck access to the storage areas of Berths 1 to 2.
- The adjacent White Bay facility to the west of Glebe Island consists of 5 berths on the northern side of White Bay.

Berth 7 is located towards the western end Glebe Island, as shown in **Figure 1**.

Figure 1 also identifies the nearest receiver locations for each berth as identified in Appendix H – Noise Standard, which forms part of the Port Noise Policy and the measurement locations used.

Figure 1 Location of berths and nearest receivers to each berth



Note: Figure referenced from Appendix H of the Port Noise Policy

2.1 Noise Trigger Levels and Criteria

The noise trigger levels applicable at the worst affected sensitive receiver as outlined in the Port Noise Policy are reproduced in **Table 1**.

Table 1 Vessel Trigger Noise Level (external)

Environmental trigger applied to vessels at berth	Assessment Location	Day $L_{Aeq(15hour)}$[1] (7am to 10pm)	Night $L_{Aeq(1hour)}$ (10pm to 7am)	Night L_{Amax} (10pm to 7am)
Glebe Island 1 and 2	All sensitive receivers near the port	60 dBA	55 dBA	65 dBA
Glebe Island 7 and 8		60 dBA	55 dBA	65 dBA
White Bay 3		60 dBA	55 dBA	65 dBA
White Bay 4 (non-cruise)		60 dBA	55 dBA	65 dBA

Note 1: This includes a 5dBA allowance in the short term for vessels that cannot meet the night time vessel trigger noise level without restrictions to unloading speeds. The 24/7 goal is the median unloading noise level for vessels which is applied as the night time vessel trigger noise level

3 Measurement Methodology and Instrumentation

In accordance with the Port Noise Policy, compliance with the Noise Trigger Levels is required at all sensitive receivers to the port. The nearest receivers to each berth have been identified and measurements have been subsequently undertaken at the closest receiver to assess compliance as identified in the Port Noise Policy and shown in **Figure 1**. The noise measurements were undertaken during unloading operations with up to 4 cranes and the onboard conveyor system.

As these measurements were undertaken to gain an understanding on the different operating conditions, only one 15 minute measurement was undertaken for each scenario once the ship confirmed everything was operating for that scenario.

All acoustic instrumentation employed throughout the monitoring programme has been designed to comply with the requirements of AS IEC 61672.1 – 2013 *Electroacoustics—Sound level meters - Specifications* and carries current National Association of Testing Authorities (NATA) or manufacturer calibration certificates. Instrument calibration was checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA.

Noise measurements and assessments in this report have been prepared in accordance with Australian Standard AS 1055-2018 "Acoustics - *Description and Measurement of Environmental Noise"* and with reference to the Noise Policy for Industry (NPfI).

The survey instrumentation used during the studies is set out in **Table 2**.

Table 2 Noise Survey Instrumentation

Type	Serial Number	Instrumentation Description
2270	3029485	Brüel & Kjær Modular Precision Sound Level Meter
4189	3260622	Brüel & Kjær 12.5 mm Pre-polarised Condenser Microphone
SVAN	24604	SVAN Sound Level Calibrator

4 Results and Analysis

The results of the attended noise measurements are summarised in **Table 3**. The measured noise levels presented include noise from the ship as well as ambient noise unrelated to GI-7.

Table 3 Summary of Measurement Results – 15 March 2021

Location	Period/ Weather	Scenario	Start Time	LAeq	LCeq	LCeq - LAeq	LA10	LA90	GI-7 Related LAmax	Comments
Location 1	Night-time Calm weather conditions (slight breeze observed at Balmain from the SW) Temp 14°C	Scenario 1 Minimal equipment running 1 x ER generator	1:00	46	64	**19**[1]	46	45	45	*Site related noise events:* Generators only est 44 to 46 dBA Conveyors only - 51-54 dBA Cranes – 53 to 59 dBA Squeal – Crane 2 – up to 67 dBA Bangs – 58 to 64 dBA **Adelie** **Estimated contribution** **LAeq(1hour) <56 dBA** **LAmax 67 dBA** *Other noise events:* Occasional Traffic upto 58 dBA
		Scenario 2 Minimal equipment running 2 x ER generator	01:23	46	66	**19**[1]	47	45	45	
		Scenario 3 SUL belts running Boom/Transfer at normal speed Deck conveyor at 50% speed	01:46	49	71	**21**[1]	50	48	53	
		Scenario 4 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed	2:04	51	73	**22**[1]	52	50	53	
		Scenario 5 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed Crane No 2	2:23	53	68	15	54	52	64	
		Scenario 6 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed Crane No 1 & 2	2:40	54	69	15	55	52	61	

Location	Period/ Weather	Scenario	Start Time	LAeq	LCeq	LCeq - LAeq	LA10	LA90	GI-7 Related LAmax	Comments
		Scenario 7 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed Crane No 1, 2 & 3	2:57	55	70	15	56	53	64	
		Scenario 8 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed Crane No 1, 2, 3 & 4	3:16	56	72	**16**[1]	57	54	65	
		Scenario 9 SUL belts running Boom/Transfer at normal speed Deck conveyor at 80% speed Crane No 1 & 2	3:39	55	72	**18**[1]	56	53	67	
		Scenario 10 SUL belts running Boom/Transfer at normal speed Deck conveyor at 50% speed Crane No 3 & 4	4:05	54	72	**18**[1]	55	52	59	

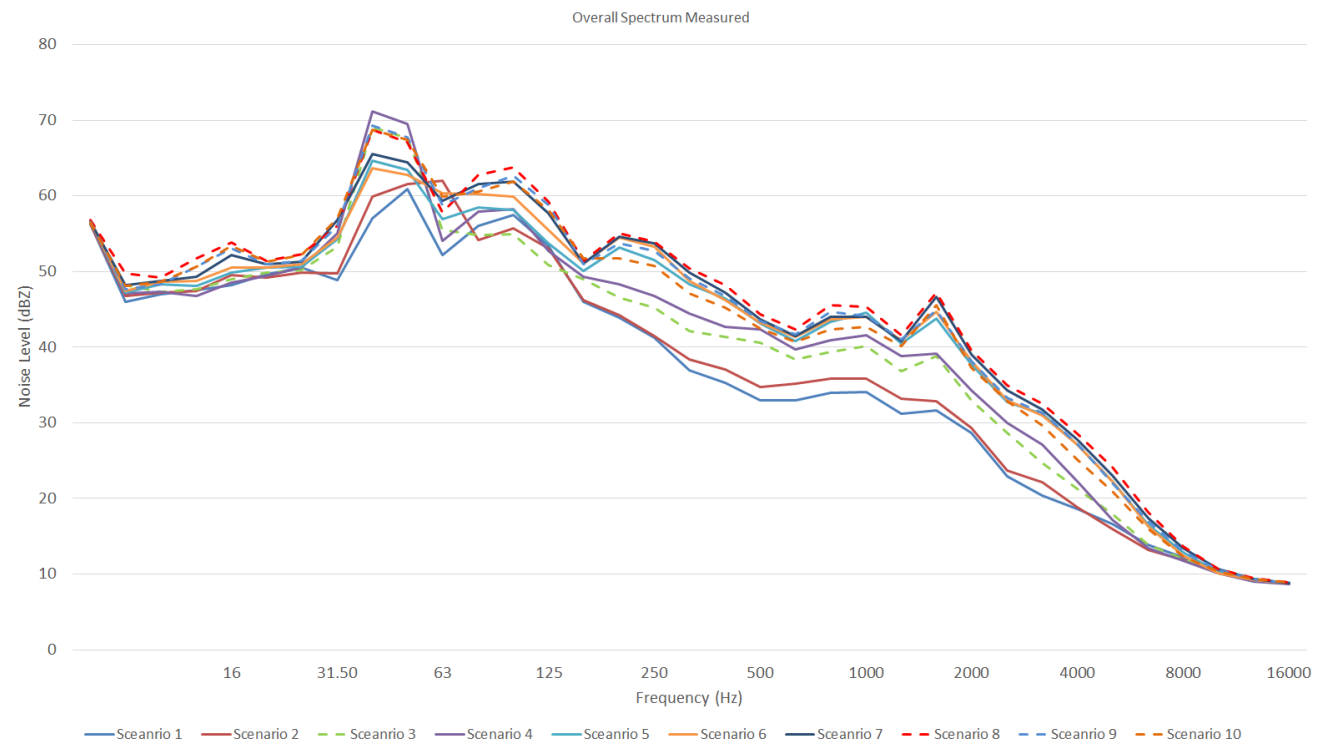
Note 1: Low frequency noise component identified if compared to NPfI.

4.1.1 Modifying Factors

The Port Noise Policy (Appendix F, Vessel Noise Guideline) makes reference to the NSW Environment Protection Authority NPfI (EPA 2017) for the assessment of annoying characteristics such as tonal noise.

The noise levels measured were not observed to be significantly tonal, however trigger a 5dB penalty for tonality at 1.6kHz for scenario 7, 8 and 10 as indicated in **Figure 2**. In each of these scenarios, crane 3 was operating which likely indicates that there is a more prominent tone associated with crane 3 and/or is masked by other noise sources for the other cranes.

Figure 2 Measured Spectrum for each measurement Location 1



The Port Noise Policy does not currently have a method for assessing low frequency noise. Low frequency noise impacts from shipping are currently under investigation and will be reviewed following collection of a database of ship low frequency noise data by the Port Authority.

If a low frequency penalty was to be applied in accordance with the NPfI, then a further 5dB penalty would be triggered for some of the measurements (as per **Table 3**).

Further measurements should be undertaken on the next occasion the ship is at Glebe Island to confirm the presence of low frequency and tonal noise.

Furthermore, the noise levels were also observed to be generally constant and therefore were not considered to be intermittent as defined in the NPfI.

5 Performance Assessment

5.1 Operations

Results of the operator attended noise measurements compared with the Vessel Noise Trigger Levels are given in **Table 4**.

Table 4 Compliance Assessment

Scenario	Estimated GI-7 Contribution			Vessel Noise Trigger Levels			Compliance	
	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(1hour)}$	Night L_{Amax}	Day $L_{Aeq(15hour)}$	Night $L_{Aeq(1hour)}$	Night L_{Amax}	Day	Night
Scenario 1	NA[1]	44-45	45	60 dBA	55 dBA	65 dBA	NA[1]	Yes
Scenario 2	NA[1]	44-45	45				NA[1]	Yes
Scenario 3	NA[1]	49	53				NA[1]	Yes
Scenario 4	NA[1]	51	53				NA[1]	Yes
Scenario 5	NA[1]	53	64				NA[1]	Yes
Scenario 6	NA[1]	54	61				NA[1]	Yes
Scenario 7	NA[1]	60[2]	64				NA[1]	**No**
Scenario 8	NA[1]	61[2]	65				NA[1]	**No**
Scenario 9	NA[1]	55	67				NA[1]	**No**
Scenario 10	NA[1]	59[2]	59				NA[1]	**No**

Note 1: No measurements undertaken during the daytime period.

Note 2: 5dB penalty for tonality applied as per the NPfI.

Note 3: Complies with the LAeq criteria however exceeds the LAmax criteria.

Table 4 indicates that compliance with the L_{Aeq} Vessel Noise Trigger Level was achieved at the nearest sensitive receiver locations for scenario 1 to 6 and Scenario 9, however an L_{Amax} exceedances was also measured during scenario 9. Scenario 7, 8 and 10 contained the presence of a tone at the 1/3 ocatve band that triggers a 5dB penalty to be applied and as a result exceed the Vessel Noise Trigger Level during the night-time period by up to 6 dB.

It is anticipated that if the whining noise associated with Crane 2 was mitigated, all measurement would comply with the daytime Vessel Noise Trigger Level.

6 Conclusion

Noise measurements were carried out whilst the Adelie was berthed at GI-7 during the night-time period on the 15 March 2021 and undertaking various unloading operational scenarios.

Noise measurements undertaken at Location 1 indicate that compliance with the vessel Noise Trigger Levels have been achieved during scenario 1 to Scenario 6 during the night-time with the onboard conveyor system operating and Crane 1 and Crane 2 operating.

The measured noise levels for scenario 7 and Scenario 10 were measured to be less than 55dBA, however triggered a 5dB penalty for tonality as pe the NPfI.

The measured noise level for Scenario 8 exceeded the Vessel Noise Trigger level prior to a penalty being applied for tonality.

The measured noise level for scenario 9 complied with the L_{Aeq} Vessel Noise Trigger Level, however exceeded the LAmax criteria by 1.5 dB.

APPENDIX A

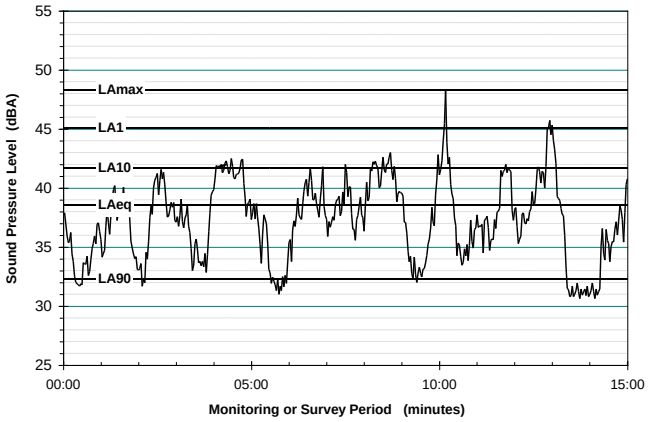
Acoustic Terminology

Typical Noise Indices

This Report makes repeated reference to certain noise level descriptors, in particular the L_{A10}, L_{A90} and L_{Aeq} and L_{Amax} noise levels.

- The L_{A10} is the A-weighted sound pressure level exceeded 10% of a given measurement period and is utilised normally to characterise typical maximum noise levels.
- The L_{Aeq} is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound over the same measurement period. The $L_{Aeq(period)}$ is the measurement parameter used to describe the average sound level over the period. For daytime the period is 7 am to 6 pm, for evening 6 pm to 10 pm, and for night-time 10 pm to 7 am.
- The L_{A90} noise level is the A-weighted sound pressure level exceeded 90% of a given measurement period and is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the "background" level.
- The L_{Amax} is simply the maximum noise level and is often represented by the $L_{A1(1min)}$, being the level exceeded 1% of 1 minute, ie the noise level exceeded for 0.6 of a second.

Graphical Display of Typical Noise Indices



Typical Noise Levels

The following table presents examples of typical noise levels.

Typical Noise Levels

Sound Pressure Level (dBA)	Typical Source	Subjective Evaluation
130	Threshold of pain	Intolerable
120	Heavy rock concert	Extremely noisy
110	Grinding on steel	
100	Loud car horn at 3 m	Very noisy
90	Construction site with pneumatic hammering	
80	Kerb side of busy street	Loud
70	Loud radio or television	
60	Department store	Moderate to
50	General Office	Quiet
40	Inside private office	Quiet to
30	Inside bedroom	Very quiet
20	Unoccupied recording studio	Almost silent

A-Weighting or dBA Noise Levels

The overall level of a sound is usually expressed in terms of dBA, which is measured using the "A-weighting" filter incorporated in sound level meters. These filters have a frequency response corresponding approximately to that of human hearing. People's hearing is most sensitive to sounds at mid frequencies (500 Hz to 4000 Hz), and less sensitive at lower and higher frequencies. Thus, the level of a sound in dBA is a good measure of the "loudness" of that sound. Different sources having the same dBA level generally sound about equally as loud, although the perceived loudness can also be affected by the character of the sound (eg the loudness of human speech and a distant motorbike may be perceived differently, although they are of the same dBA level).

Sensitivity of People to Noise Level Changes

A change of up to 3 dBA in the level of a sound is difficult for most people to detect, whilst a 3 dBA to 5 dBA change corresponds to a small but noticeable change in loudness. A 10 dBA change corresponds to an approximate doubling or halving in loudness.

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