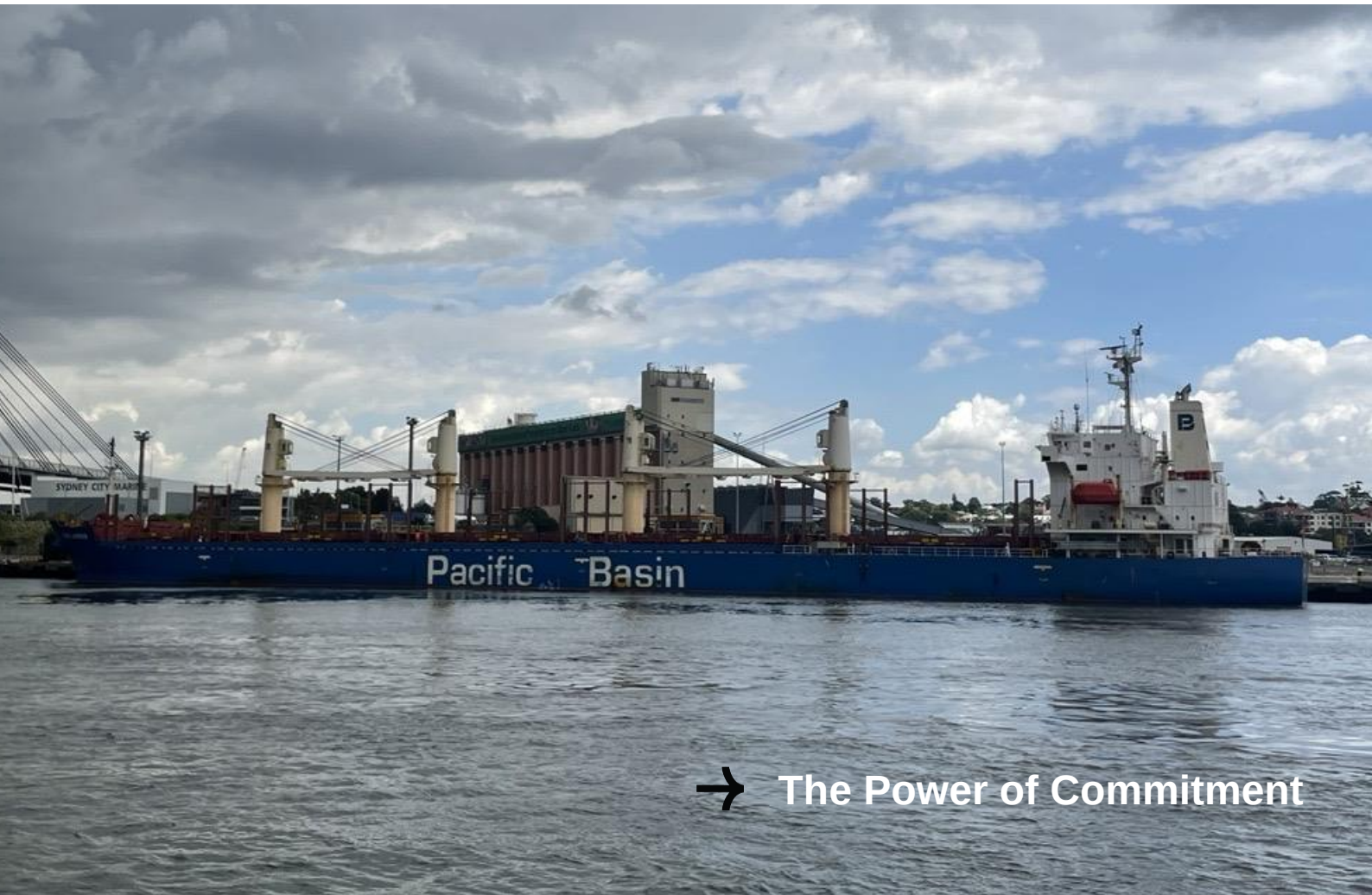
Compliance noise monitoring report

Glebe Island 1 – Otago Harbour

Port Authority of New South Wales

3/5 March 2023



The Power of Commitment

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1. Introduction

GHD Pty Ltd (GHD) has been engaged by Port Authority of New South Wales (Port Authority) to undertake compliance noise monitoring, as required by the *Port Noise Policy (Port Authority, 2020).*

This report provides the details of the compliance noise monitoring of the Otago Harbour general cargo vessel, while at berth at Glebe Island 1 (GI-1), which was undertaken on the 3 March 2023 for arrival measurements and night-time measurements and 5 March 2023 for daytime measurements. The noise monitoring methodology, noise limits for vessels at berth and the noise monitoring locations are detailed in Appendix A.

2. Noise monitoring details

Client	Vessel name / location	Engineer details	Sound level meter details	Sound level calibrator results	Equipment settings
Port Authority of New South Wales	Otago Harbour Glebe Island 1	Chris Gordon (GHD) – is a member employee of GHD, a member of the Australian Acoustical Society (AAS) a member firm of the Association of Australasian Acoustical Consultants (AAAC) – Bachelor of Engineering (Mechanical), UTS 2012 – Has over 12 years of professional experience in the field of acoustics.	Svantek 977 Type 1 Sound level meter SN: 36873 IEC 61672-3:2013 Compliant Manufactured prior 2019 1.5 m above ground level Free-field conditions	GRAS 42AG Class 1 Sound level calibrator SN: 278663 AS 60942:2003 Compliant Manufactured prior 2017	A-weighted Fast time response 15 minute intervals Pre and post calibration variation: Arrival – 0.1 dB Daytime – 0.1 dB Night – 0.0 dB

Date and time	Monitoring locations (see Appendix A for site map)	Meteorological conditions	Site observations
Arrival: 3 March 2023 11:25 to 12:11	**Location M09 –** 32 Refinery Drive, Pyrmont **Location M10 –** 2 Bowman Street, Pyrmont	Wind: < 2 m/s Rain: Nil	– Noise environment was dominated by road traffic on the Anzac Bridge – Vessel and tugs were audible above extraneous noise
Daytime: 5 March 2023 08:34 to 10:47		Wind: < 2 m/s Rain: Nil	– Noise environment was influenced by road traffic on the Anzac Bridge, small vessels passing between the vessel and the monitoring location, and pedestrians on the foreshore walking track and parkland – Vessel and tugs were audible above extraneous noise
Night-time: 3 March 2023 22:06 to 23:17		Wind: < 2 m/s Rain: 5 minute period of rain. Measurements were ceased during this period	– No loading/unloading operations were observed during the monitoring period. Vessel was barely audible, and traffic noise from Anzac Parade was dominant

3. Attended noise monitoring results

Location	Measurement time	$L_{Aeq(15\ min)}$	$L_{Ceq(15\ min)}$	$L_{Ceq} - L_{Aeq}$	$L_{A10(15\ min)}$	$L_{A90(15\ min)}$	L_{Amax}	Estimated vessel contribution[1], dBA
Arrival – 3 March 2023								
M09	11:25 to 11:40	57	77	20	60	53	-	Started measurement prior to arrival. Ambient noise levels were approx. **53 dBA**. Mainly dominated by traffic on Anzac Bridge and construction activities on the landside area adjacent to GLB2. There were quite a number of smaller vessels passing between the Otago Harbour and the measurement location.
	11:40 to 11:55	58	77	19	59	56	-	Pilot vessel arrived at 11:31, however there was no increase in ambient noise levels. Vessel started passing by the measurement location at 11:34 and was directly in line with the measurement location at 11:36:30. The dominant noise was from the tug when revving engine, with the noise level being about **60 dBA**.
	11:56 to 12:11	58	75	17	59	56	-	As the rear of vessel (location of exhaust) passed the measurement location, noise levels increased to **55-56 dBA**. As the vessel was pushed into the final position, noise levels were relatively consistent, approximately **56-57 dBA**.
Daytime – 5 February 2023								
M09	09:45 to 10:00	57	73	16	59	54	-	**Overall $L_{Aeq,\ 15\ min}$ vessel contribution** 54 dBA Consistent noise source. No significant max level events
	10:01 to 10:16	54	72	18	55	52	-	
	10:16 to 10:31	57	73	16	58	55	-	
	10:32 to 10:47	57	72	15	58	55	-	
M10	08:34 to 08:49	55	69	14	57	53	-	**Overall $L_{Aeq,\ 15\ min}$ vessel contribution** 54 dBA
	08:50 to 09:05	55	69	14	56	53	-	

	09:06 to 09:21	56	69	13	57	54	-	Consistent noise source. No significant max level events
	09:24 to 09:39	56	69	13	58	54	-	
Night-time –5 February 2023								
M09	22:06 to 22:21	51	72	21	53	50	No max events	**Overall $L_{Aeq,\ 15\ min}$ vessel contribution** 50 dBA
	22:27 to 22:42	51	71	20	53	50		
M09	22:46 to 23:01	51	70	19	52	50		**Overall $L_{Aeq,\ 15\ min}$ vessel contribution** 48 dBA
	23:02 to 23:17	52	71	19	53	50		
Note 1) Refer to standard methodology in Appendix A for method of estimating vessel contribution								

4. Assessment of modifying factors

Location	Measurement time	Low frequency noise		Tonal noise		Intermittent noise	
		Y/N	Penalty, dB	Y/N	Penalty, dB	Y/N	Penalty, dB
Arrival – 3 March 2023							
M09	11:25 to 11:40	Y	NA[1]	N	-	N	-
	11:40 to 11:55	Y	NA[1]	N	-	N	-
	11:56 to 12:11	Y	NA[1]	N	-	N	-
Daytime – 3 March 2023							
M09	09:45 to 10:00	Y	NA[1]	N	-	N	-
	10:01 to 10:16	Y	NA[1]	N	-	N	-
	10:16 to 10:31	Y	NA[1]	N	-	N	-
	10:32 to 10:47	Y	NA[1]	N	-	N	-
M10	08:34 to 08:49	N	NA[1]	N	-	N	-
	08:50 to 09:05	N	-	N	-	N	-
	09:06 to 09:21	N	NA[1]	N	-	N	-
	09:24 to 09:39	N	-	N	-	N	-
Night-time –5 March 2023							
M09	22:06 to 22:21	Y	NA[1]	N	-	N	-
	22:27 to 22:42	Y	NA[1]	N	-	N	-
M10	22:46 to 23:01	Y	NA[1]	N	-	N	-
	23:02 to 23:17	Y	NA[1]	N	-	N	-

Note 1) The Port Noise Policy does not currently apply the NPfI method modifying factor for low frequency noise. A 2 dB penalty for daytime and a 5 dB penalty for the evening/night-time period would apply when assessed in accordance with *Fact Sheet 3 Corrections for annoying noise characteristics* from the EPA's Noise Policy for Industry. Further investigation is currently being undertaken to determine impacts from low frequency noise from vessels.

5. Compliance assessment

Location	**Estimated vessel noise (GI-2), dBA (inclusive of any modifying factor penalties)**			**Vessel Noise Trigger Levels, dBA**			**Compliance**	
	Daytime $L_{Aeq(15\ hour)}$	**Night-time** $L_{Aeq(1\ hour)}$	**Night-time** L_{Amax}	**Daytime** $L_{Aeq(15\ hour)}$	**Night-time** $L_{Aeq(1\ hour)}$	**Night-time** L_{Amax}	**Day**	**Night**
M09	54	50	-	60	55	65	Yes	Yes
M10	54	48	-	60	55	65	Yes	Yes

Appendices

Appendix A

Standard methodology

1. Methodology

1.1 Attended noise monitoring methodology

The methodology for the attended compliance noise monitoring included the following:

– Identification of suitable noise monitoring locations. This was selected based on the location of the vessel, and identifying the nearest sensitive receivers in accordance with the locations detailed in Figure 2-1.

– Noise logging was conducted during the daytime and night-time, in accordance with the requirements of the *Port Noise Policy*

– A calibration check was performed on the noise monitoring equipment using a sound level calibrator with a sound pressure level of 94 dB) at 1 kHz. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The tolerance for each measurement is detailed in Section 2

– Noise monitoring was undertaken using a Svantek 977 or 979 environmental noise logger. The noise logger was programmed to accumulate L_{A90}, L_{A10}, $L_{Amax,}$ L_{Aeq} and L_{Ceq} noise descriptors continuously over the entire monitoring period. Details of the noise monitoring equipment are provided in the main body of the report

– Noise monitoring was undertaken during periods of time where average wind speeds were less than 5 m/s, or when rainfall did not occur.

– The data collected was downloaded and analysed to remove extraneous noise and determine the noise contribution from the vessel. Where required, this was done in accordance with techniques detailed in Section 7.1.1 of the Noise Policy for Industry, including:

  - Using frequency filtering techniques
  - Using other descriptors such as L_{A90}
  - Analysing data (or pausing meter) to determine noise levels during period without extraneous noise

– Noise monitoring was conducted by a competent Acoustic Engineer from GHD, with details provided in Section 2

All noise monitoring activities were undertaken and processed in accordance with the Noise Policy for Industry (EPA 2017) short-term monitoring method and Draft Approved Methods. All noise logger settings and descriptors used were based on this method.

1.2 Noise limits for vessels at berth

The noise trigger level for vessels at berth are defined in the Port Noise Policy and are presented in Table 1.1. These are assessed at the worst affected sensitive receiver. Note that these are proposed to be reviewed periodically to consider whether they can be lowered to reduce noise impacts from overall port operations. The anticipated ultimate noise trigger level is 50 dBA, following multiple 2 dBA reductions.

The trigger level is applicable at the worst affected sensitive receiver at the time of commencing this policy.

Table 1.1 Vessel Trigger Noise Levels (external) (Table 3 from Port Noise Policy)

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

1.3 Noise Policy for Industry Modifying Factors

The vessel trigger noise levels within the Port Noise Policy are assumed to be inclusive of modifying factors for annoying characteristics and requires these to be assessed in accordance with the NSW Noise Policy for Industry (NPfI), with the exception of low frequency noise. As outlined in the Port Noise Policy (Section 2.5, Appendix F) an approach to low frequency noise will be developed following review of vessel noise levels which will provide a statistical understanding of low frequency noise.

A summary of the modifying factors as presented in the NPfI are detailed in Table 1.2.

Table 1.2 Modifying factor corrections (Table C1 from Noise Policy for Industry)

Factor	Assessment / measurement	When to apply	Correction[1]	Comments
Tonal noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: – 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz – 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz – 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. **Note:** Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency noise **(penalty not currently applied to vessel noise)**	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10–160 Hz	Measure/assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and: – Where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period – Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dB and cannot be mitigated, a 5-dB(A) positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB(A) positive adjustment applies for the daytime period.	2 or 5 dB[2]	A difference of 15 dB or more between C and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.
Intermittent noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible	5 dB	Adjustment to be applied for night-time only.
Maximum adjustment	Refer to individual modifying factors	Where two or more modifying factors are indicated.	Maximum correction of 10 dB(A)[2]	

Factor	Assessment / measurement	When to apply	Correction[1]	Comments
			(excluding duration correction	

Notes:

1. Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.

2. Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

3. Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard, in Section C.2.4. The correction is determined using Table C.1 (Masking threshold, MT, and curves for determining the adjustment, K_t) and ranges between 0 and 6 dB.

4. Standard approaches for low frequency noise in the Noise Policy for Industry evaluate differences between A and C weighted levels. However, this is not suitable when considering mitigation of vessel engines and fans that inherently have low frequency noise. For example, many engines may trigger a correction factor for annoying characteristics even when the low frequency component is too quiet to cause annoyance. Furthermore, the difference between A and C weighted noise levels from vessels may vary significantly in different directions. Using the Noise Policy for Industry this would result in penalties being triggered in some directions and not others when the low frequency noise impact on community is relatively constant in all directions.

2. Site description

Figure 2-1 below shows the following:

– Berth locations
– Key receiver locations for each berth

3. Glossary of terms

Abbreviation	Definition
dB	Unit of measurement for Sound Pressure Level known as a decibel.
dB(A)	'A-weighted' decibel measurement. A-weighting is an adjustment made to noise measurement to approximate the response of the human ear.
Hertz (Hz)	Hertz is the unit of frequency, representing one cycle per second.
Low frequency noise	Noise containing high levels of energy in the low frequency range, defined as 10 Hz to 160 hz in the NPfI
$L_{Aeq(period)}$	Equivalent A-weighted sound pressure level is the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. This is considered to represent ambient noise.
$L_{Ceq(period)}$	Equivalent C-weighted sound pressure level is the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. The adjustment takes account of low-frequency components of noise within the audibility range of humans
$L_{A90(period)}$	The A-weighted sound pressure level that is exceeded for 90 per cent of the time over which a given sound is measured. This is considered to represent the background noise.
$L_{A10(period)}$	The arithmetic average of the sound pressure level that is exceeded for 10 per cent of the time specified. This is considered representative of the average maximum noise
L_{Amax}	The maximum sound pressure level of an event measured with a sound level meter satisfying AS IEC 61672.1-2004 set to 'A' frequency weighting and fast time weighting
Sensitive Receiver	A sensitive receiver can be defined as any dwelling; caretakers house; library; educational institution; religious facility; childcare centre; kindergarten; hospital; surgery or other medical institution including an institutional home; commercial and/or retail activity (such as any, hotel, motel, caravan park or tourist establishment).
Tonal noise	Noise containing a prominent frequency and characterised by a definite pitch

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