HEGGIES

REPORT 10-4309-R8

Revision 0

White Bay Berth 4 Bulk Liquids Handling
Songa Crystal
Ship Noise Monitoring Report

PREPARED FOR

Sydney Ports Corporation
207 Kent Street
SYDNEY NSW 2000

5 JANUARY 2007

White Bay Berth 4 Bulk Liquids Handling

Songa Crystal

Ship Noise Monitoring Report

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EXECUTIVE SUMMARY

Heggies Pty Ltd (Heggies) has been commissioned by Sydney Ports Corporation (SPC) to conduct monitoring of noise emissions during the unloading of the Songa Crystal (a bulk liquids vessel) at White Bay Berth 4 (WB-4), as required by Clause M7.1(1a) of the EPA's Environment Protection Licence (Licence No. 12095).

Noise measurements were carried out at nearby residential receivers during Songa Crystal cargo handling operations during the early morning of 15 December 2006. The measured noise levels at Balmain, NSW were found to be often influenced by wind noise (primarily from the nearby trees) as a result of the southerly weather change that arrived between 2.15 am and 2.30 am. A reference noise measurement was therefore carried out in close proximity of the Songa Crystal vessel, where the noise environment was dominated by the WB-4 bulk liquids cargo handling noise sources. The reference level was then used to predict noise levels at the representative receivers in absence of the "wind in tree" noise for comparison with measured noise levels.

It was found that the measured and predicted $L_{Aeq(15minute)}$ noise levels exceeded the Licence imposed noise goals at representative locations in both Balmain and Pyrmont by 6 dBA and 1 dBA respectively. An $L_{Aeq(night)}$ exceedance of 14 dBA occurred in Balmain.

Bulk liquids terminal related maximum (L_{Amax}) noise levels were observed to cause an exceedance of up to 8 dBA at the representative monitoring location in Balmain, with no exceedance at the Pyrmont/Glebe location for the duration of the attended measurements.

Subject to feasibility, practicality and reasonability, the potential noise control measures that may be considered in order to meet the Licence imposed noise goals (as required by condition R4.1) and ensure noise amenity remains unchanged in the area would be implementation of an on-site noise management strategy. Noise impact mitigation measures have been evaluated in the Noise Impact Mitigation and Management Strategy (Document No. 10-4309R7-R1), with a list of mitigation measures considered feasible and reasonable identified in the Noise Impact Mitigation Action Plan.

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1 INTRODUCTION

Heggies Pty Ltd (Heggies) has been commissioned by Sydney Ports Corporation (SPC) to conduct monitoring of noise emissions during the unloading of the Songa Crystal (a bulk liquids vessel) at White Bay Berth 4 (WB-4), as required by Clause M7.1(1a) of the EPA's Environment Protection Licence (Licence No. 12095).

Noise measurements have been conducted during cargo handling operations at two locations considered representative of the potentially most exposed residential receivers. Measurements at both representative locations have been conducted during the unloading of cargo from the ship into road tanker trucks via on-board pumps. The measurements were conducted between 2.00 am and 5.15 am on 15 December 2006, and a southerly weather change occurred between 2.15 am and 2.30 am which, as a result of wind noise, influenced the noise measurements conducted after 2.30 am.

An additional "reference" noise measurement was carried out in close proximity to the Songa Crystal vessel, where the noise environment was dominated by the WB-4 based bulk liquids cargo handling noise sources. The reference noise level was then used to predict noise levels at the representative receivers in absence the of wind noise resulting from the southerly change.

The predicted noise levels correlated well with the measured levels, and were assessed against the noise goals set out in Table U1 of the Environment Protection Licence. Feasible and reasonable noise mitigation measures are discussed in broad terms, with the aim of minimising the noise impacts from the operations, where the noise goals are exceeded.

2 SITE DESCRIPTION

The White Bay Port facility is located at the southern end of the Balmain peninsula. The facility occupies approximately 40 hectares of waterfront land and forms a crescent around White Bay, with a water frontage of about 2,100 m in length.

The facility layout comprises the following main elements:

- Five multiple-use berths spread along the northern side of White Bay;
- Storage warehouse situated to the northeast of White Bay, Berth 4 (WB-4); and
- Internal road continuing from Robert Street providing truck access to storage areas of docks 1 to 6.

The Glebe Island facility which includes two multiple-use berths and two car terminal berths is located adjacent to the White Bay Port on a neighbouring peninsula south of White Bay.

Berth 4 is located approximately in the middle of the northern side of White Bay, as shown in **Figure 1**. To the north and northwest of the site is a mixture of residential dwellings consisting of 1 and 2 storey detached houses and terraces. A number of recently constructed 4 and 5 storey residential developments are situated directly west of Berth 4 and incorporate acoustic façade treatments to achieve satisfactory internal noise levels. In addition, buildings in direct view were designed to provide significant acoustical shielding to the rest of the development. The storage warehouse (on port land) to the northeast of WB-4 is about 20 m at the highest point and provides significant acoustic shielding to the residential properties directly behind. To the southeast of the site is Glebe Island, another working port area with four berths, two of which are currently used as car terminals and two as multiple-use berths. To the southeast of WB-4, about 550 m across the water, is the Pyrmont Peninsula, with a number of high-rise residential apartments near the waterfront.

2.1 Measurement Locations

The Noise Impact Assessment (NIA) Study (Report Number 10-4309R1 prepared by Heggies) for the proposed bulk liquid terminal operation has previously identified 5 Waite Street and 36 Refinery Drive as the most affected receiver locations within the Balmain / Rozelle and Pyrmont / Glebe areas respectively.

For the current study, in the Balmain / Rozelle area, monitoring was carried out only at 13 Donnelly Street (also assessed in the noise impact assessment) due to the availability of day/night access to the property boundary. Note that noise measurements at 13 Donnelly Street can be carried out off street, whereas at 5 Waite Street noise measurements require backyard access. Furthermore, the location at 13 Donnelly Street is in close proximity of 5 Waite Street. It is approximately the same distance away and is also directly exposed to unloading operations at WB-4. It is therefore considered to be of similar acoustical environment to that of 5 Waite Street, Balmain.

The monitoring location at 36 Refinery Drive, identified by the NIA as the most affected receiver in the Pyrmont / Glebe area, was found to be exposed to high levels of traffic related noise from the Anzac Bridge. Giba Park (a publicly accessible park situated at the top of the 4 level apartment complex at 2 Point Street) was therefore selected as the representative measurement location for the Pyrmont / Glebe area, as it allowed ship noise measurements to be taken in the relative absence of traffic noise. Giba Park is considered to be equivalent to level 5, 2 Point Street.

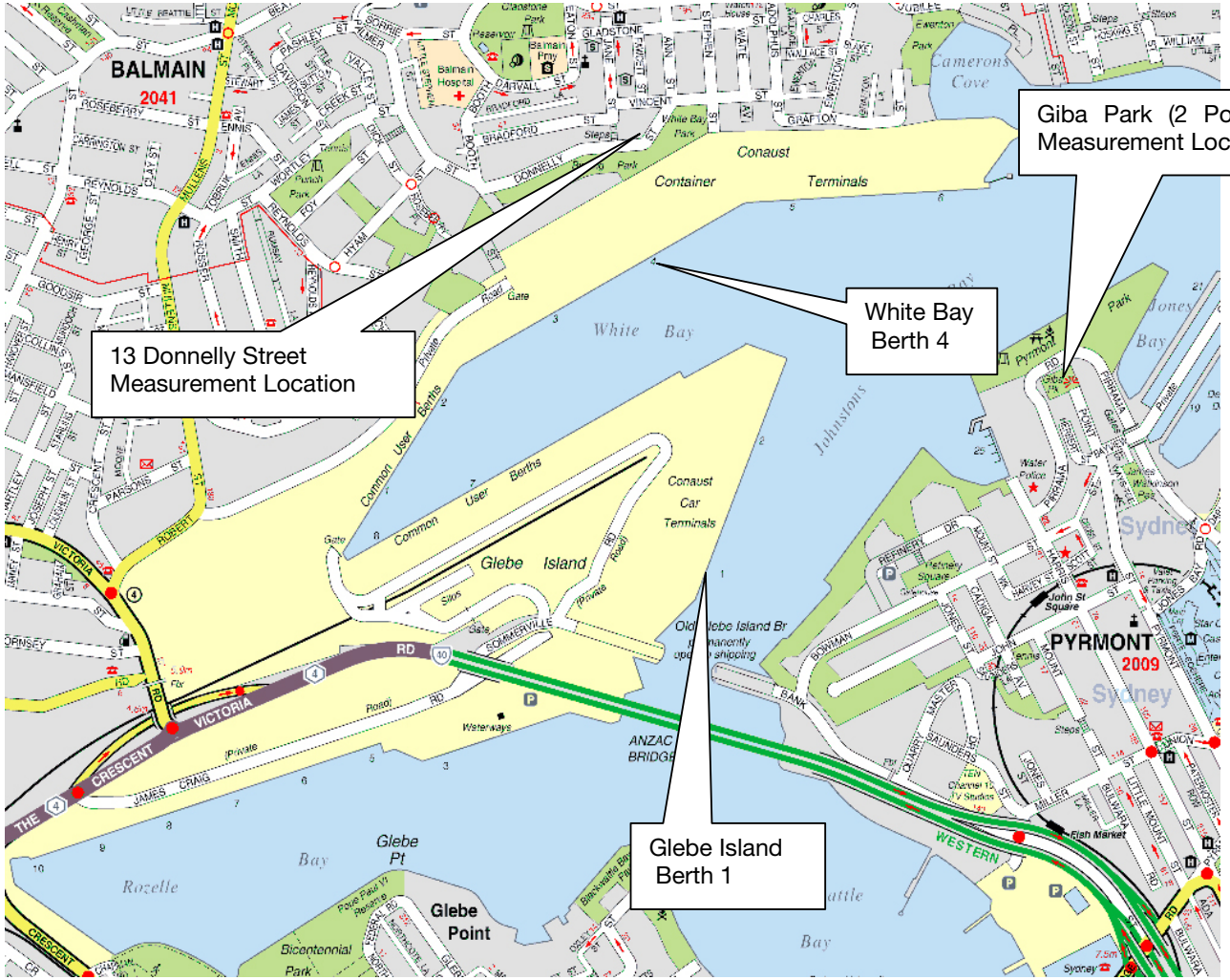
Given that the southerly change was influencing noise measurements at both the Balmain / Rozelle and Pyrmont / Glebe locations after 2.30 am, a reference measurement was carried out in close proximity to the bulk liquids vessel Songa Crystal, where the noise environment was dominated by the bulk liquids vessel related noise.

Table 1 summarises the receiver locations where measurements were conducted in each area and gives a brief description of each location. A more detailed description and photos of the selected monitoring locations are presented in **Appendix B** and **Appendix C.**

Table 1 Representative Receiver Locations

Location	Representative Receiver Location	Description
Balmain and Rozelle	13 Donnelly Street, Balmain	Ground level at the front of residence, about 7 m away from the facade
Pyrmont and Glebe	2 Point Street, Pyrmont	At Giba Park, on top of a 4 storey building at 2 Point Street (ie height equivalent of a 5 storey building)
Reference Measurement	White Bay Berth 4 Deck	On deck of White Bay Berth 4, and approximately 50 m from the engine room exhaust fan louvre, the main source of noise aboard the Songa Crystal

Figure 1 White Bay / Glebe Island Layout with Attended Noise Monitoring Locations



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3 EPA LICENCE NOISE GOALS

For the purpose of the bulk liquid cargo handling operations at White Bay Berth 4 (WB-4), the environment protection licence granted by the EPA sets out the project noise goals at the neighbouring residential communities. The noise goals are set out in Table U1 of the licence conditions and reproduced in **Table 2**.

Table 2 EPA License Noise Goals (Reproduced from Table U1)

Location	Night		
	LAeq(15minute)	**LAeq(night)**	**LA(max)**
Balmain and Rozelle	49 dBA	41 dBA	59 dBA
Pyrmont and Glebe	41 dBA	Not Applicable	51 dBA

Explanatory notes:

1. $L_{A(max)}$ means maximum A-weighted sound pressure level measured on fast time weighting during the time over which sound is measured.
2. All other acoustic terms including 'night' have the same meaning as in the INP.
3. Not Applicable: In instances where the amenity criteria $L_{Aeq(night)}$ has been determined to be a higher number than the intrusive criteria LAeq(15 minute) that the amenity criteria is less stringent than the intrusive criteria, then the amenity criteria becomes 'not applicable'. This is because compliance with the criteria will ensure compliance with the intrusive criteria will ensure compliance with the amenity criteria.

4 MEASUREMENT METHODOLOGY AND INSTRUMENTATION

The licence calls for L_{Aeq} (A-weighted equivalent continuous) sound pressure level measurements to be carried out at locations representative of those potentially most affected (ie, waterfront) locations during periods of inactivity (eg, ship Auxiliary Power Units (APUs) operating) and during unloading operations (eg, ship pumps and truck activity on the wharf in addition to APUs), in accordance with Clause M7.1 (2).

A window of opportunity to measure ship noise levels during periods of unloading inactivity exists immediately after the ship berths, while the unloading equipment is being set up (hoses unrolled and connected to the ship's manifold etc). The equipment setup phase usually lasts less than 2 hours, after which the unloading is continuous, with at least one road tanker being filled at any one time. Ship noise measurements during periods of activity can be measured at any time after unloading commences.

The previous ship noise monitoring report prepared by Heggies (Report Number 10-4309R2R1) concluded that measurements are best carried out at night (preferably after 1 am). Extraneous noise (not related to the subject activity) is generally at a minimum at this time and measurement results are consequently likely to be much more meaningful.

The bulk liquids ship Songa Crystal berthed at approximately 12:30 am on Friday, 15 December 2006. Measurements were conducted between 2.00 am and 5.15 am following the arrival of the vessel.

Attended noise level measurements were carried out at 1.5 m above ground level at 13 Donnelly Street and 1.5 m above ground level at Giba Park, located on top of the residential apartment complex at 2 Point Street, Pyrmont.

As a result of the southerly weather change that arrived between 2.15 am and 2.30 am, direct measurements of the bulk liquids unloading related noise at representative receivers were influenced by noise from wind in trees. A "reference" measurement was conducted in close proximity to the Songa Crystal, where the noise environment was dominated by bulk liquids unloading related noise. The "reference" measurement was then used as a basis for the estimation of WB-4 activity related noise at the receivers of interest (ie in absence of the wind in tree related noise).

An equivalent ship sound power level was therefore calculated based on the "reference" measurement and noise contributions related to the bulk liquids cargo handling were estimated at each noise sensitive location. The predicted noise levels were compared with measured of WB-4 activity related noise at the receivers of interest (ie predicted noise compared with measured in the presence of wind in tree related noise).

All items of acoustic instrumentation employed during the noise monitoring surveys were designed to comply with the requirements of AS IEC 61672.1 2004: "*Electroacoustics-Sound level meters-Specifications*" and carried appropriate and current NATA (or manufacturer) calibration certificates. Calibration was checked prior to and subsequent to the survey. Any drift in calibration was within 0.5 dBA and considered acceptable.

The survey instrumentation used during the studies is set out in **Table 3.**

Table 3 Noise Survey Instrumentation

Type	Serial Number	Instrument Description
2231	1323443	Brüel & Kjær Modular Precision Sound Level Meter
4165	1357396	Brüel & Kjær 12.5 mm Prepolarised Condenser Microphone
1625	1406825	Brüel & Kjær 1/3 – 1/1 Octave Filter Set
NC-73	11248308	Rion Calibrator

Environmental noise measurements were carried out with reference to the guidelines contained within the NSW Industrial Noise Policy 2000 (INP). In circumstances where it was not practical to carry out measurements at the potentially most affected receiver locations as predicted by the Noise Impact Assessment, locations of similar noise characteristics were chosen, as described in **Section 2.1.**

Given the relatively constant nature of noise related to the bulk liquids cargo handling operations, short-term measurements (of 15 minute duration) were considered to be sufficient to provide an estimate of the $L_{Aeq(night)}$ noise levels at the selected residential receivers. A brief description of acoustic terminology used in this report is presented in **Appendix A**.

Attended measurements during periods of activity were carried out during the early morning of 15 December, commencing at approximately 2:00 am, as extraneous ambient noise unrelated to port activities is generally at a minimum at this time. Three separate 15 minute measurements were carried out at the representative Balmain location during cargo handling operations at WB-4, at 2.30 am, 3.55 am and 4.50 am. At this location the 2.30 am measurement was significantly influenced by wind noise, however by 4.45 am the southerly change had reduced in strength and was not significantly influencing the noise measurements.

Two 15 minute noise measurements were carried out at the representative receiver at the Pyrmont site, at 2.00 am prior to the southerly change and at 4.25 am.

5 RESULTS AND ANALYSIS

The results of the 15 minute duration attended noise measurements are summarised in **Table 4**. Discussion of the results is presented in **Section 6** of this report. It should be noted that the measured noise levels presented below include noise from the bulk liquids cargo handling facility at WB-4 and after 2.30 am together with a contribution from noise from wind in trees.

Table 4 Measured Noise Levels - Unloading Activity

Address	Start Time	L_{Aeq} (15min)	L_{A90} (15min)	WB-4 Related L_{Amax} Range	Comments
13 Donnelly Street (Balmain / Rozelle)	2.30 am	59 dBA	56 dBA	None measured	Wind noise affecting L_{Aeq}, L_{A90} representative of ship noise
	3.55 am	57 dBA	54 dBA	None measured	
	4.50 am	55 dBA	54 dBA	58 dBA to 67 dBA	
Level 5, 2 Point Street (Pyrmont / Glebe)	2.00 am	46 dBA	45 dBA	None observed during monitoring period	Ship "just" audible
	4:25 am	47 dBA	44 dBA		Ship "just" audible

During the first measurement at 2 Point Street (at approximately 2:00 am), the measured noise levels were generally subject to noise from seagulls and occasional traffic noise from the Anzac Bridge. Due to the relatively high level of ambient noise and the fact that the ship was "just" audible, WB-4 related noise will be at or below the L_{A90} noise levels. During the second measurement at Point Street, the ambient noise environment was influenced by wind noise, with the ship "just" audible during lulls in the wind. The general city hum was estimated to be 45 dBA at this location.

At 13 Donnelly Street on the other hand, the measured noise levels appeared to be dominated by noise related to the bulk liquids unloading operations, in particular at 4.50 am when the southerly change had moderated. Noise from the ship's engine room ventilation fan was the dominant noise source, and was found to be constant in nature. Other vessel related noise resulted from the release of pressure from the oil cargo vessels on board the ship.

Noise measurements at both representative locations were potentially influenced by wind noise as a result of the southerly change that arrived between 2.15 am and 2.30 am. In order to confirm the contribution to the ambient by bulk liquids related noise, noise levels were predicted based on the reference measurement taken in close proximity of the Songa Crystal, where the noise environment was dominated by bulk liquids unloading related noise.

Noise from trucks was observed to be the main contributor to the maximum (L_{Amax}) noise level events. A summary of the L_{Amax} events at Balmain side are presented in **Table 5**. WB-4 related L_{Amax} events were not observed at the Pyrmont monitoring location.

Table 5 Summary of Attended L_{Amax} Noise Levels at 13 Donnelly Street, Balmain

L_{Amax} Source	L_{Amax} Range	Notes
Truck exhaust brakes	58 dBA – 67 dBA	Truck exhaust brake noise could be heard from trucks at arrival and immediately prior to departure from the site. The events last for approximately 1 second.

Table 6 presents the "reference" noise measurement carried out 50 m away from the bulk liquids vessel Songa Crystal, where the noise environment was dominated by bulk liquids cargo handling related noise.

Table 6 Songa Crystal "Reference" Noise Level

Location	Distance from Source	Height of Source	Start Time	LAeq
WB-4	50 m	16 m	03:10 am	68 dBA

Calculations performed from the reference measurements taken in close proximity of the Songa Crystal vessel indicate bulk liquids unloading related L_{Aeq} noise levels at the representative receivers at 13 Donnelly Street and 2 Point Street of 55 dBA and 42 dBA respectively, as summarised in **Table 7** below. As presented in the table the predicted levels at 13 Donnelly Street, Balmain agree with the measurements, each with L_{Aeq} levels of 55 dBA. At 2 Point Street, Pyrmont, the predicted levels are below the measured background or (L_{A90}) of 44 dBA, which is consistent with the ship noise "just" audible.

Table 7 Predicted Bulk Liquids Related Noise Levels at the Representative Receivers

Location	Distance from Source	Source SWL (LAeq)	Predicted LAeq
13 Donnelly Street, Balmain	170 m	110 dBA	55 dBA
2 Point Street, Pyrmont	660 m	110 dBA	42 dBA

An assessment of the predicted noise levels against the noise goals listed in the Licence Conditions are presented in **Table 8**, **Table 9** and **Table 10**.

Table 8 Assessment of Predicted Noise Levels Against LAeq(15minute) Noise Goals

Prediction Location	Measured / Predicted LAeq Noise Levels	LAeq(15 minute) Noise Goals	LAeq (15 minute) Exceedance of Licence Goals
13 Donnelly Street (Balmain / Rozelle)	55 dBA	49 dBA	6 dBA exceedance
Level 5, 2 Point Street (Pyrmont / Glebe)[1]	42 dBA	41 dBA	1 dBA exceedance

Table 9 Assessment of Predicted Noise Levels Against LAeq(night) Noise Goals

Prediction Location	Measured / Predicted LAeq Noise Levels	LAeq(night) Noise Goals	LAeq Exceedance of Licence Goals
13 Donnelly Street (Balmain / Rozelle)	55 dBA	41 dBA	14 dBA exceedance
Level 5, 2 Point Street (Pyrmont / Glebe)	42 dBA	N/A	N/A

Table 10 Assessment of (WB-4 Related) Measured Noise Levels Against LAmax Noise Goals

Measurement Location	Range of Maximum Measured Levels (LAmax Range)	LAmax Noise Goals	Range of Recorded LAmax Exceedances of the Licence Noise Goals
13 Donnelly Street (Balmain / Rozelle)	58 dBA – 67 dBA	59 dBA	Exceedance up to 8 dBA
Level 5, 2 Point Street (Pyrmont / Glebe)	N/A [1]	51 dBA	No Exceedance

Note 1 No LAmax events associated with the bulk liquids unloading activity at WB-4 were recorded during the 15 minute monitoring period at 2 Point Street, Pyrmont.

6 DISCUSSION

Predicted and measured $L_{Aeq(15\ min)}$ noise levels exceed the Licence imposed noise goals at the representative locations at both Balmain and Pyrmont by 6 dBA and 1 dBA respectively. An $L_{Aeq(night)}$ exceedance of 14 dBA was predicted at the Balmain representative receiver.

A comparison of the predicted noise levels based on Songa Crystal measurements with those predicted by the NIA model (based on Botany Treasure) indicates that the Songa Crystal is relatively a noisier vessel when compared with the Botany Treasure. This observation is supported by noise monitoring results of previously monitored bulk liquids ships to date.

In order to fulfill the requirement of Licence Condition R4.1, and in relation to compliance with Licence conditions O4.1 and O4.2, the potential in-concept noise control measures are discussed below for the sources identified during the attended monitoring.

Bulk liquids terminal related maximum (L_{Amax}) noise levels were observed to cause exceedances at the representative monitoring locations for the duration of the attended measurements by up to 8 dBA.

Based on observations, there is one significant noise source identified on the ship, namely the exhaust from the ship's engine room ventilation fan. This noise source is located approximately 18 m above sea level.

A Noise Impact Mitigation and Management Strategy (Document No. 10-4309R7-R1) has been prepared for the operation. Taking into consideration the infrequency and limited duration of the operation, expected costs, development times, uncertainty of effective outcome and the impact on flexibility in relation to ships that may be used in the operation, the implementation of ship specific engineering noise control measures is not considered practical nor reasonable within the Noise Impact Mitigation and Management Strategy. Instead, the document recommends an on-site mitigation management strategy be implemented based on operator awareness and procedures to identify and repair abnormally noisy equipment, as outlined within the Noise Impact Mitigation Action Plan.

7 CONCLUSION

Noise measurements were carried out during the Songa Crystal cargo handling operations on the early morning of 15 December 2006. The measured noise levels were found to be potentially influenced by the southerly weather change which arrived during the course of the measurements. A reference noise measurement was therefore carried out in close proximity to the Songa Crystal vessel, where the noise environment was dominated by the WB-4 based bulk liquids cargo handling noise sources. The reference noise level was then used to predict noise levels at the representative receivers, for comparison with the attended measurements.

It was found that $L_{Aeq(15minute)}$ measured and predicted noise levels exceed the Licence imposed noise goals at representative locations in both Balmain and Pyrmont by 6 dBA and 1 dBA respectively. An $L_{Aeq(night)}$ exceedance of 14 dBA occurs in Balmain.

Bulk liquids terminal related maximum (L_{Amax}) noise levels were observed to cause an exceedance of up to 8 dBA at the representative monitoring location in Balmain, with no exceedance at the Pyrmont/Glebe location for the duration of attended measurements.

Taking into consideration the infrequency and limited duration of the operation, expected costs, development times, uncertainty of effective outcome, and the impact on flexibility in relation to ships that may be used in the operation, the implementation of ship specific engineering noise control measures is not considered practical nor reasonable within the Noise Impact Mitigation and Management Strategy.

Subject to feasibility, practicality and reasonability, the potential noise control measures that may be considered in order to meet the Licence imposed noise goals (as required by Condition R4.1), and ensure noise amenity remains unchanged in the area would be implementation of an on-site noise management strategy. Noise impact mitigation measures have been evaluated in the Noise Impact Mitigation and Management Strategy (Document No. 10-4309R7-R1), with a list of mitigation measures considered feasible and reasonable identified in the Noise Impact Mitigation Action Plan.

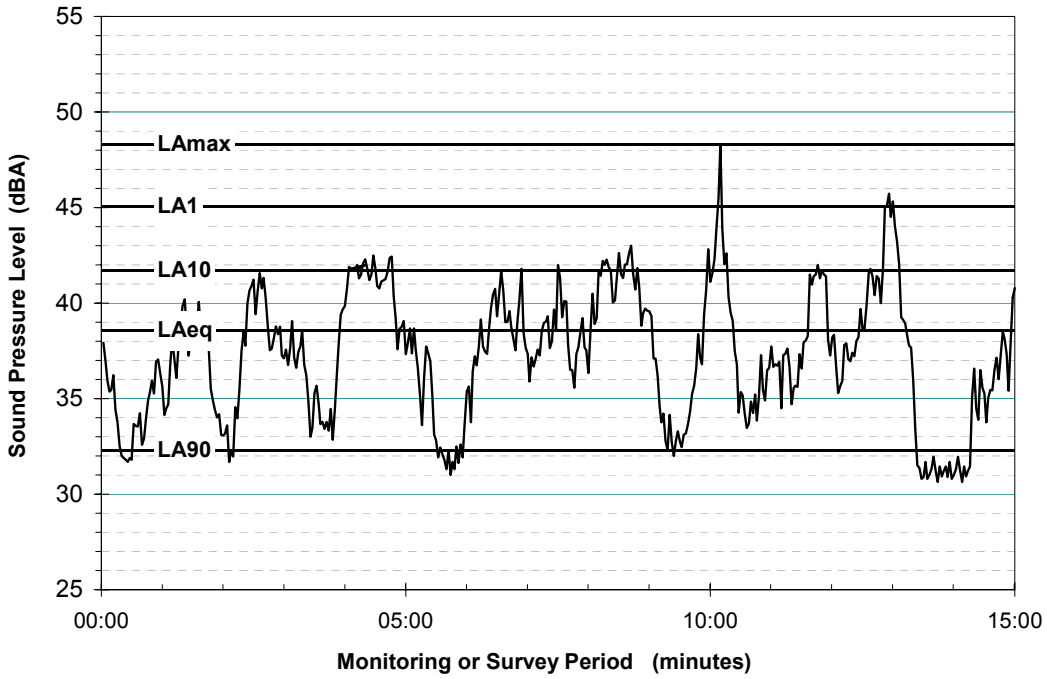
ACOUSTIC TERMINOLOGY USED IN THE REPORT

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 $L_{Aeq(15hour)}$ is the measurement parameter used to describe the road traffic noise level over the entire daytime (7.00 am to 10.00 pm) period. The $L_{Aeq(9hour)}$ is the measurement parameter used to describe the road traffic noise level over the entire night-time (10.00 pm to 7.00 am) period. Similarly, the $L_{Aeq(1hour)}$ is the measurement parameter used to describe the road traffic noise level during the loudest 1-hour period during the daytime or night-time periods.
- 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} noise level is the maximum A-weighted noise level associated with road traffic movements.

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
130 120 110	Threshold of pain Heavy rock concert Grinding on steel	Intolerable Extremely noisy
100 90	Loud car horn at 3 m Construction site with pneumatic hammering	Very noisy
80 70	Kerb side of busy street Loud radio or television	Loud
60 50	Department store General Office	Moderate to Quiet
40 30	Inside private office Inside bedroom	Quiet to 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).

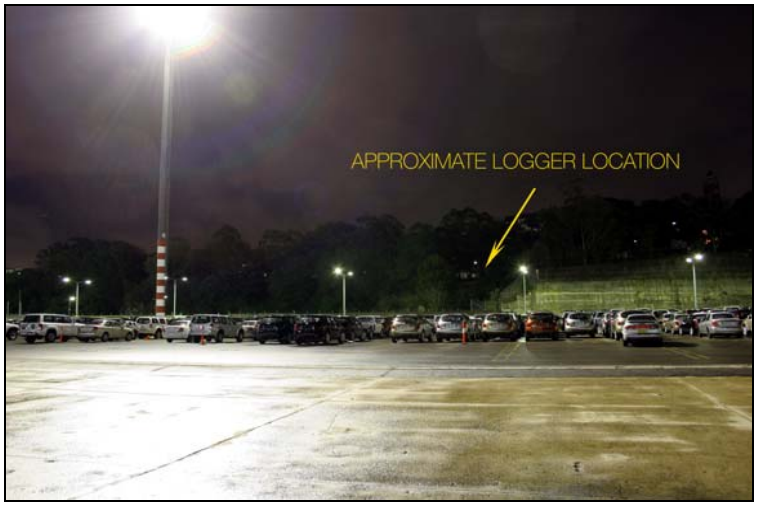
Sensitivity of People to Noise Level Changes

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

13 DONNELLY STREET, BALMAIN

The location is situated approximately 170 m away from and directly overlooking White Bay Berth 4 (across the park). It is elevated some 15 m above dock level. The measurement was conducted from street level (from a footpath) with Donnelly Street traffic less than 2 m away.

Aerial Photo showing the monitoring location at 13 Donnelly Street, relative to White Bay Berth 4 (WB-4).



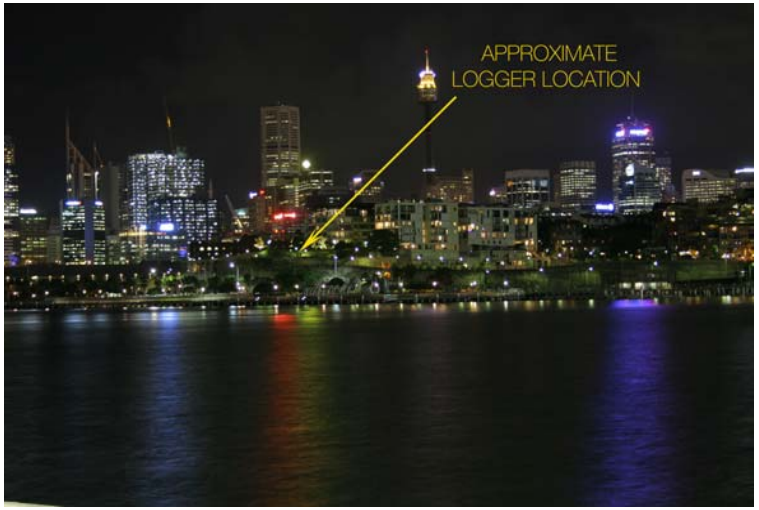
View from WB-4 deck towards 13 Donnelly Street

View from 13 Donnelly St towards the bulk liquids ship, berthed at WB-4

2 POINT STREET, PYRMONT

This monitoring location is situated approximately 660 m away from White Bay Berth 4 (across the bay). Monitoring was conducted at a height equivalent of a 5 storey building, on the cliffs edge. Pirrama Road encircles the park from west, north and east sides, approximately 15 m below.

Aerial Photo showing the monitoring location at 2 Point Street, relative to White Bay Berth 4 (WB-4).



View from WB-4 deck towards 2 Point Street

View from 2 Point Street towards the bulk liquids ship berthed at WB-4