

SHELL COVE DEVELOPMENT PRECINCT A

NOISE & VIBRATION IMPACT ASSESSMENT OF BOAT RAMP CARPARK, DRY BOAT STACKING & BOAT MAINTENANCE

REPORT NO. 05135-BR
VERSION D

JUNE 2018

PREPARED FOR

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DOCUMENT CONTROL

Version	Status	Date	Prepared By	Reviewed By
A	Draft	26 October 2017	Barry Murray	Ben Lawrence
B	Draft	1 November 2017	Barry Murray	-
C	Draft	6 November 2017	Barry Murray	-
D	Final	20 June 2018	Barry Murray	-

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TABLE OF CONTENTS

	Page
GLOSSARY OF ACOUSTIC TERMS	
1 INTRODUCTION	1
2 PROPOSED DEVELOPMENT	1
2.1 Boat Ramp Carpark	1
2.2 Dry Boat Storage	2
2.3 Boat Maintenance Facility	3
3 EXISTING NOISE & NOISE CRITERIA	4
4 BOAT RAMP CARPARK NOISE ASSESSMENT	5
4.1 Noise Emission Levels	5
4.2 Calculation of Noise Levels at Residences	5
4.3 Carpark Noise Mitigation	6
4.4 Lots Affected	6
5 DRY BOAT STORAGE & BOAT MAINTENANCE NOISE ASSESSMENT	7
5.1 Noise Emission Levels	7
5.2 Calculation of Noise Levels at Residences	7
5.3 Mitigation of Dry Boat Storage and Boat Maintenance Noise	8
5.4 Lots Affected	9
6 OVERALL VIBRATION ASSESSMENT	9
7 CONCLUSION	10

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

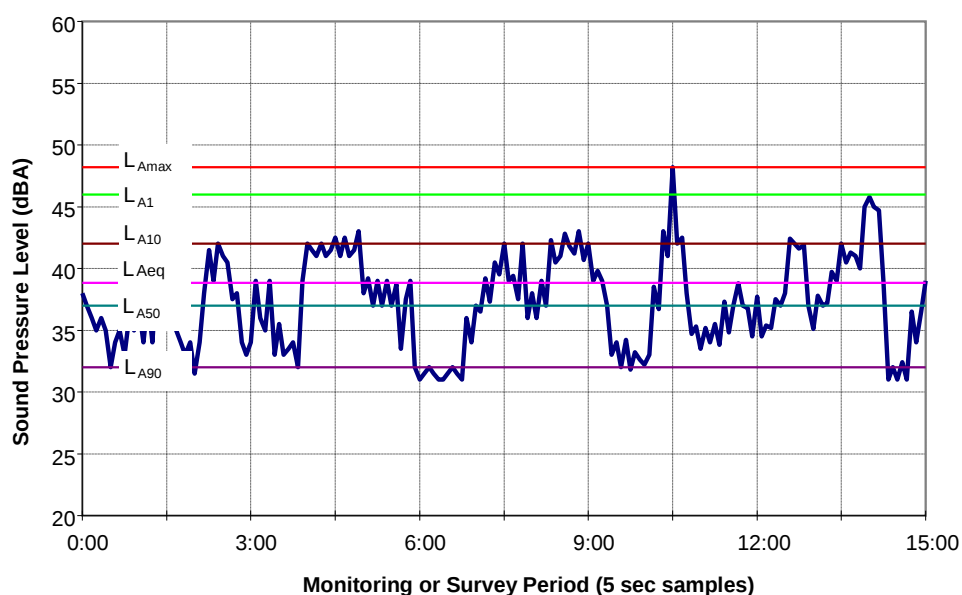
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

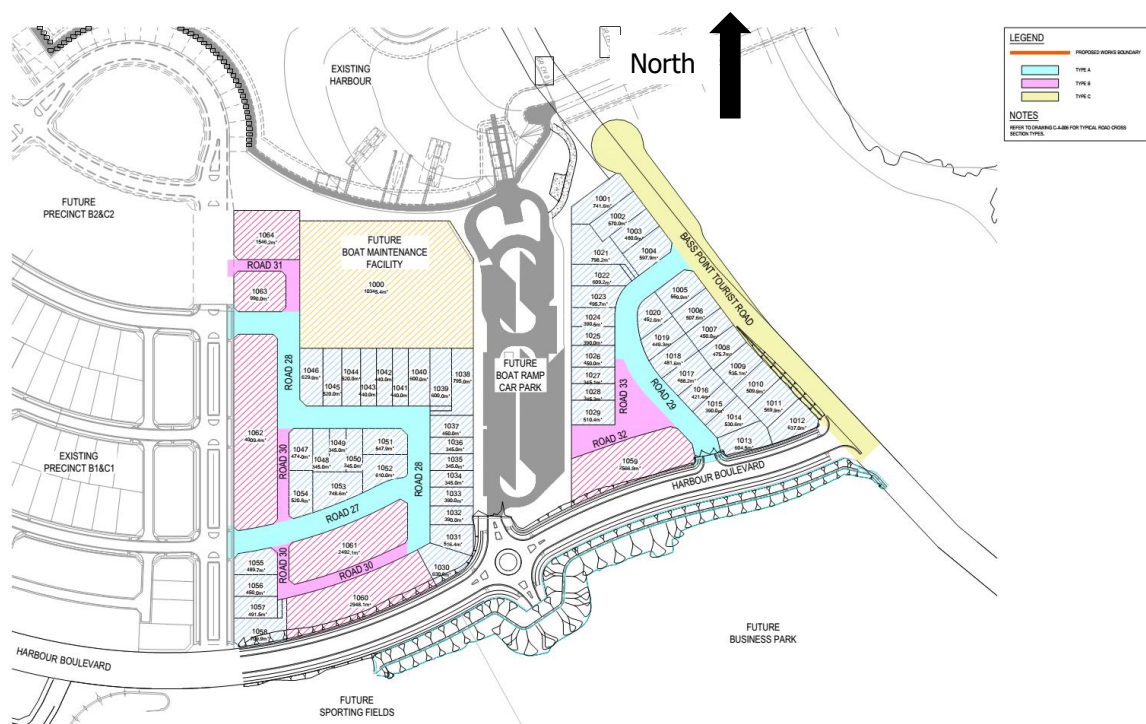
As part of the Shell Cove Boat Harbour Precinct development, it is proposed to develop a boat ramp with carpark, a dry boat storage area and a boat maintenance area.

This report provides an assessment of the noise impact associated with the operation of these facilities and advises on noise mitigation.

2 PROPOSED DEVELOPMENT

The Shell Cove Boat Harbour Precinct A development includes substantial residential development with residences close to the noise generating facilities. Figure 2-1 shows the overall plan.

Figure 2-1 Overall plan of Precinct A



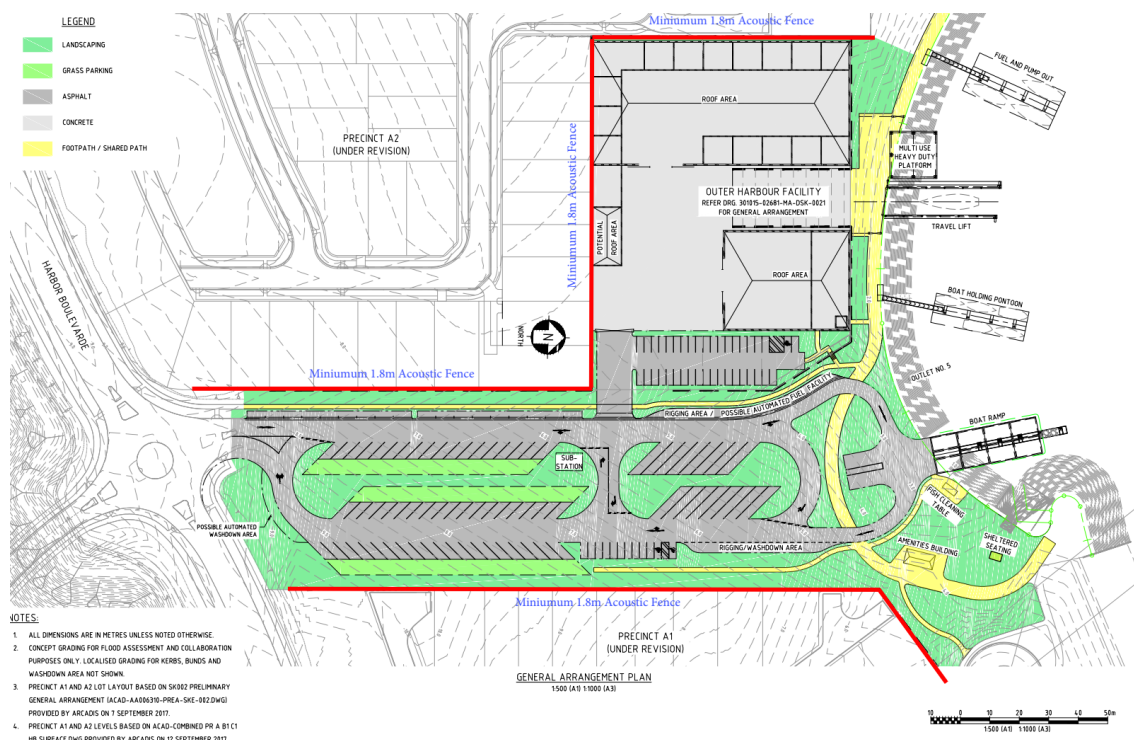
2.1 Boat Ramp Carpark

Figure 2-2 shows the carpark plan and its proximity to proposed residences. It is anticipated that the residences will be 2-storey buildings.

Cars will enter the carpark from Harbour Boulevard and will park in the carpark to allow boating activity to occur. It is expected that car activity will occur in the carpark in the daytime and night time in relation to the boating activity.

Residences are proposed on both the eastern and western sides of the carpark with the residential blocks adjacent.

Figure 2-2 Boat Ramp Carpark

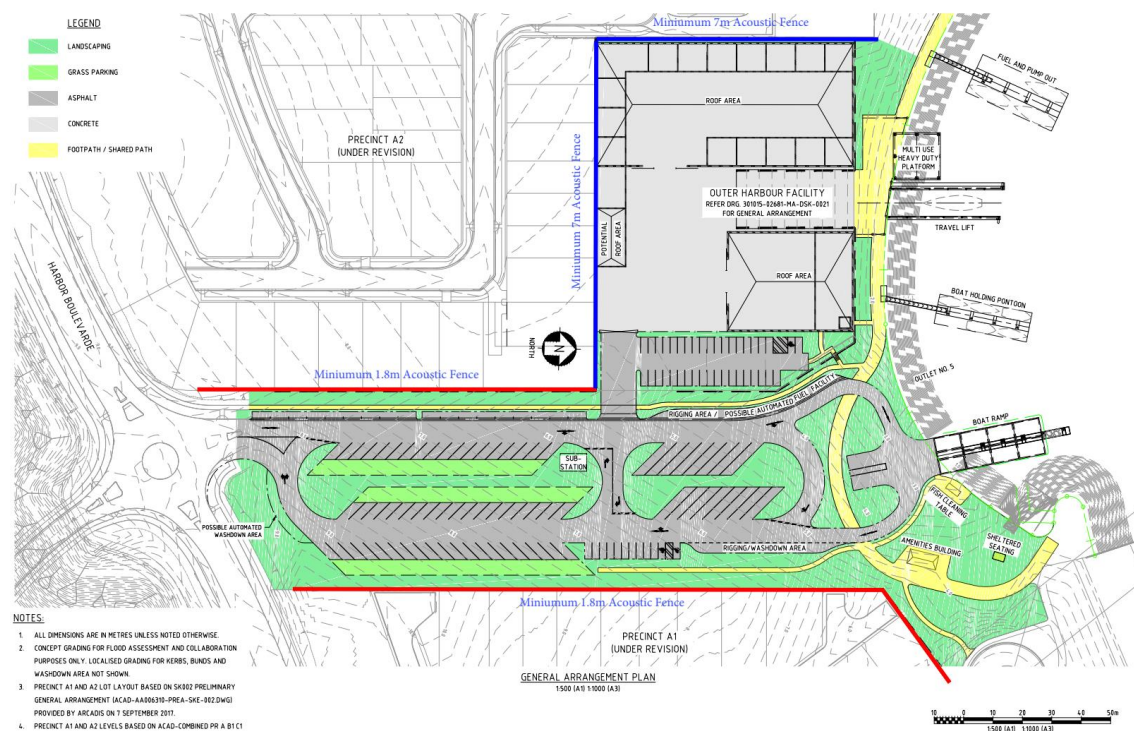


2.2 Dry Boat Storage

The dry boat storage area is shown in Figure 2-3. It is proposed that boats will be moved using a forklift, generally from the water up the ramp and into the storage area where they will be stacked.

Residences are proposed to the west of the boat storage area and also to the south, including to the south of the ramp.

Figure 2-3 Dry Boat Storage & Boat Maintenance



2.3 Boat Maintenance Facility

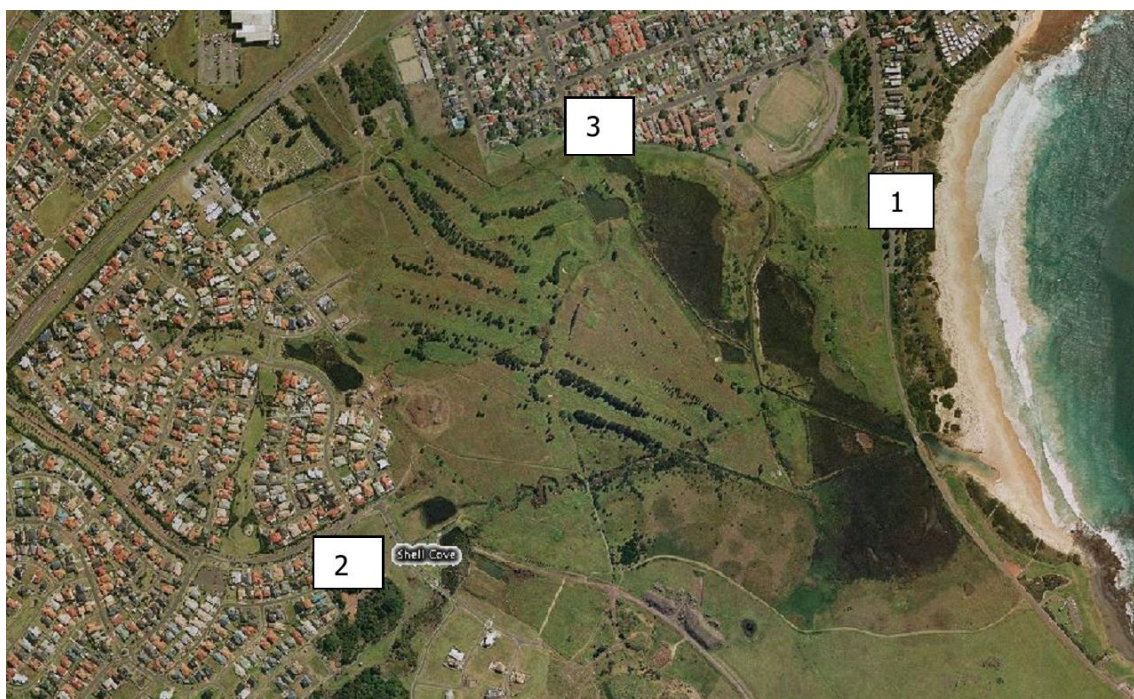
Figure 2-3 also shows a concept arrangement of the boat maintenance facility, subject to a future DA. Although some maintenance will be carried out inside the maintenance shed, a number of activities will occur outside. Hull cleaning will occur outside, and painting will occur inside.

The nearest proposed residences are to the south and west with their property adjacent to the boundary.

3 EXISTING NOISE & NOISE CRITERIA

The assessment of noise from all three facilities requires knowledge of the background noise. Background noise levels have previously been measured in 2005 at 65 Boollwarroo Parade, which is shown in Figure 3-1 as location 1. Table 3-1 shows the measured background noise levels. The background noise levels are expressed as Rating Background Levels (RBL) in accordance with the NSW *Industrial Noise Policy (INP)*.

Figure 3-1 Background Noise Measurement Location



Note: Location 1 is the background measurement location, 65 Boollwarroo Parade.

Table 3-1 Measured Background Noise Levels (2005, 65 Boollwarroo Pde)

Location	RBL (dBA)		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night Time (10pm-7am)
65 Boollwarroo Pde	42	46	44

It is noted from Table 3-1 that higher background noise levels were measured during night time and evening than daytime. The background noise level is dominated by noise of the ocean and this level does not vary in accordance with normal background noise temporal patterns. Given the variability, the lowest measured level, 42dBA, has been adopted for all periods, daytime, evening and night time.

In accordance with the *INP* both intrusiveness and amenity noise criteria should be set to assess the general noise impact of an industrial development. In this case, the intrusiveness criterion is the important criterion, given the intermittent nature of noise at the facilities being assessed. The $L_{Aeq,15min}$ noise criterion has therefore been determined at 47dBA, by adding 5dB to the 42dBA background noise level.

Apart from the overall noise measured using the L_{Aeq} descriptor, intermittent noise events may be generated within the carpark. The EPA policy for the assessment of such intermittent noise events at night time for sleep disturbance is to set a screening criterion equivalent to the background noise level plus 15dB. In this case, the screening criterion is 57dBA and this has been adopted as the assessment criterion.

4 BOAT RAMP CARPARK NOISE ASSESSMENT

It is anticipated that light vehicles will use the carpark 24-hours a day.

4.1 Noise Emission Levels

Given the type of activity proposed in the carpark, L_{Aeq} noise levels need to be assessed during all periods of the day and L_{Amax} noise levels need to be assessed at night time.

Wilkinson Murray has previously measured noise levels from cars moving within a carpark on a number of occasions. It is concluded that, on average, the sound power level $L_{Aeq,15min}$ noise level generated by a double car movement (car entering a carpark and car leaving a carpark) is 74dBA. This noise level has been adopted for the boat ramp carpark noise assessment.

In addition, Wilkinson Murray has carried out measurements of specific noise events associated with car activity in carparks to determine the L_{Amax} level and these as summarised in Table 4-1.

Table 4-1 Sound Power Levels of Car Activity

Event	L_{Amax} Sound Power Level (dBA)	
	Range	Energy Average
Car start	86 – 103	95
Car door closing	82 – 102	94
Car accelerating	90 – 101	97

The L_{Amax} level of 97dBA has been adopted as the sound power level for assessment of night time noise events.

4.2 Calculation of Noise Levels at Residences

It has been estimated that during a busy Saturday, up to 112 car movements per hour would occur during daytime and up to 50 car movements per hour during night time.

If the fence between the carpark and the nearby residences is not constructed so that it acts as a noise wall, there will be acoustic line of sight from the car activity to the residences. On this

basis, a level of $L_{Aeq,15min}$ 53dBA at daytime and 50dBA at night time has been calculated on the residential property. These levels exceed the 47dBA noise criterion.

L_{Amax} levels have also been calculated with a level of 64dBA being determined at the likely residential façade. This level exceeds the L_{Amax} sleep disturbance criterion by 7dBA.

4.3 Carpark Noise Mitigation

It is recommended that a noise fence at least 1.8m high (possibly up to 2.4m high) be constructed around the carpark, or at least along those sections of the boundary which separate the proposed residences from the development. This wall could be constructed using Colorbond, minimum 20mm timber, masonry or light weight concrete. With this fence in place, the noise levels expected will be reduced, as shown in Table 4-2.

Table 4-2 Predicted Noise Levels with 1.8 Metre Noise Fence

Time Period	Building Level	Predicted Noise Level (dBA)	
		$L_{Aeq,15min}$	L_{Amax}
Day	Ground	46	-
	First	53	-
Night	Ground	43	57
	First	50	64

Noise levels predicted at the ground floor will comply with the 47dBA noise criterion. However, at the first floor, both the $L_{Aeq,15min}$ and the L_{Amax} noise levels will exceed the appropriate criteria. It is therefore recommended that the first floor rooms of the residential buildings overlooking the carpark be mechanically ventilated or air-conditioned to allow the windows to be closed for noise control purposes, and that all windows overlooking the carpark (generally eastern windows for residences to the west and western windows for residences to the east, if constructed parallel to the boundary) be minimum 6mm glazing. No special window seals are required. On this basis, internal noise levels on the ground floor and first floor will comply with appropriate standards.

The recommended fence is shown in red in Figure 2-2.

Since use of the boat ramp, including rigging and derigging and flushing of engines, will occur further from the residences, noise from these boat activities will comply with the same noise criteria.

4.4 Lots Affected

The lots affected by carpark noise and which require noise mitigation on the first floor in accordance with section 4.3 are 1001, 1021-1029, 1061 (western boundary), 1031-1046 and 1064, as indicated in Figure 2-1.

5 DRY BOAT STORAGE & BOAT MAINTENANCE NOISE ASSESSMENT

As part of the boat storage process, boats will be moved with a forklift and stored during both daytime and night time. Boat maintenance will be limited to daytime hours.

5.1 Noise Emission Levels

The noise associated with dry boat storage will be that generated by the forklift used to move the boats. Although details are not available at this time as to the type of forklift, the L_{Aeq} sound power level of the forklift is expected to be 106dBA.

The assessment carried out is based on an assumption that the forklift will operate on the ramp and near the boat stacking area

Table 5-1 shows the sound power levels expected from the equipment to operate as part of boat maintenance.

Table 5-1 Boat Maintenance Sound Power Levels

Equipment	$L_{Aeq,15min}$ Sound Power Level (dBA)
Compressor	92
High pressure water cleaner	110
Engine testing	100
Boat hoist	82
Grinder	101

The noise of the high-pressure water cleaner used to clean boats will dominate noise levels from the boat maintenance area and this activity will occur outside.

During day, the forklift noise will add to the maintenance noise and, during night, only the forklift will operate. The sound power levels assume for modelling as shown in Table 5-2.

Table 5-2 Modelling Dry Boat Storage and Maintenance Sound Power Levels

Period	$L_{Aeq,15min}$ Sound Power Level (dBA)
Day	110 + 92 + 106
Night	106

5.2 Calculation of Noise Levels at Residences

It is assumed that the noisiest periods of activity at the boat maintenance facility will involve use of the high-pressure water cleaner while the compressor is operating. When this noise adds to the forklift operation, the noise levels in Table 5-3 have been predicted without special noise mitigation.

Table 5-3 Predicted Day & Night Noise Levels – no mitigation

Period	Predicted $L_{Aeq,15min}$ (dBA)	
	South	West
Day	69	63
Night	63	63

All of these predicted levels will exceed the 47dBA criterion.

5.3 Mitigation of Dry Boat Storage and Boat Maintenance Noise

It is recommended that an acoustic wall 7 metres above the hard stand at the top of the ramp (5m above the residential land) be constructed along the southern boundary and a similar wall 7 metres above the hard stand (6m above the residential land) be constructed along the western boundary. This wall would be best constructed using light weight concrete, dense concrete or masonry. Figure 2-3 includes the location of the proposed 7 metre walls, shown in red.

Table 5-4 shows the noise levels predicted with the wall in place, noting that the wall will reduce ground floor noise levels more than first floor levels.

Table 5-4 Predicted Noise Levels with a 7m Boundary Wall

Period	Floor	Predicted $L_{Aeq,15min}$ (dBA)	
		South	West
Day	Ground	53	49
	First	54	53
Night	Ground	47	47
	First	51	51

Since the predicted levels will still be above the 47dBA criterion with the wall, it will be necessary to ensure that residential windows facing the Dry Boat Storage area and the Boat Maintenance area will be of at least 6mm glazing, on both ground and first floors. Since the residences will be air-conditioned, this will allow noise control by closing the windows.

With the proposed mitigation, the predicted levels will comply with the internal equivalent of the 47dBA noise criterion.

If a building is constructed near the western boundary to house boat stacking, this building can be designed so as to avoid the need for the 7m wall in this area.

5.4 Lots Affected

The lots affected by noise from boat storage and maintenance activities and requiring 6mm glazing to rooms facing the operations are as follows:

- Lots to south: 1038-1046; and
- Lots to west: 1063-1064.

6 OVERALL VIBRATION ASSESSMENT

There is potential that vibration will be generated by activities at the development. In particular, during boat storage activities, it is possible that a boat may be dropped to the ground and within the boat maintenance area, dropping of heavy objects may also generate ground vibration. Ground vibration from general activities, such as forklift operations, would be below the ambient vibration and totally insignificant.

Nevertheless, even if heavy items are dropped on the ground, the groundborne vibration in this context will be insignificant and will even be imperceptible within 3 or 4 metres of such a drop.

The low level of vibration expected within the ground indicates that a detailed quantified vibration assessment is not required. No vibration impact on nearby residential developments is expected.

7 CONCLUSION

It is concluded that noise levels from the boat ramp carpark, dry boat storage facility and boat maintenance facility can comply with appropriate noise criteria at nearby residences if the following mitigation measures are implemented:

- A minimum 1.8 metre high acoustic wall is constructed on the boat ramp carpark boundary, at least between proposed residences and carpark, using Colorbond, minimum 20mm timber, masonry or light weight concrete, as shown in Figure 2-2. This wall is to be constructed along the boundary indicated before development of the dry boat stacking and boat maintenance facilities, and it can be modified later as required;
- The first floor and ground floor rooms overlooking the carpark (generally eastern rooms to residences to the west and western rooms to the residences to the east, for residences parallel to the boundary) be mechanically ventilated or air-conditioned to allow the windows to be closed and the windows in the same facades of these residences be of minimum 6mm glazing;
- Acoustic walls of height 7 metres above the hard stand of the boat maintenance facility and dry boat stacking be erected as shown in Figure 2-3, or this wall on the western boundary may be replaced by a boat stacking building; and
- The ground floor and first floor rooms on the northern side of residences proposed on the southern side of the boat maintenance facility and on the eastern side of the residences proposed on the western side of the dry boat storage area be mechanically ventilated or air-conditioned to allow the windows to be closed and the windows in the same facades of these residences be of minimum 6mm glazing.

It should be noted that residences beyond the boundary of Precinct A are considerably further away and will be afforded additional shielding from the proposed structures. Providing the mitigation measures here are implemented, noise levels from the activities assessed here will comply with relevant criteria.