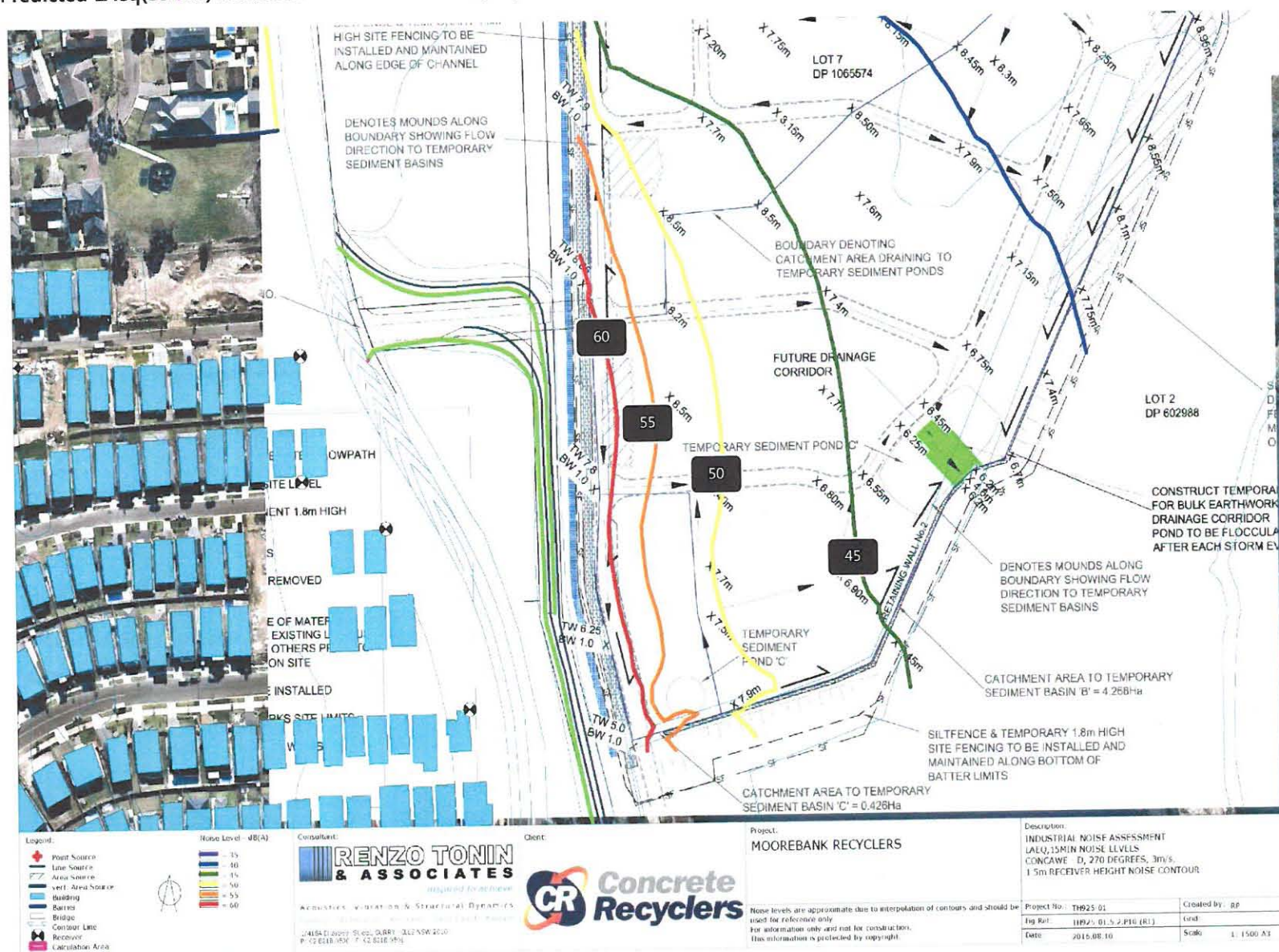


		Intrusive				Amenity		
Location	Address	RBL	Intrusive Criterion	Predicted LAeq(15min)	Exceedence Note 3	Acceptable Limit	Predicted LAeq(day) Note 4	Exceedence Note 3
Proposed Marina Development								
	West façade of building			59.0		65.0	57.0	-8.0
	Southern façade of building			59.3		65.0	57.3	-7.7
	Southern boundary Note 1			54.5		65.0	52.5	-12.5
Parks								
	Existing park at the eastern end of Elouera Crescent			52.0		55.0	50.0	-5.0
	Existing RE1 and RE2 zoned area on the eastern side of Georges River			44.5		55.0	42.5	-12.5
	Proposed RE1 zoned park at the eastern end of the proposed Marina Development			48.2		55.0	46.2	-8.8
	New Brighton Golf Course			44.9		55.0	42.9	-12.1
NOTES								

## NOTES

- 1 Predicted at 1.5m
- 2 Weekday background measurements are assumed to apply Monday to Saturday
- 3 A negative value means the predicted level is below the criterion
- 4 LAeq(day) assumed to be 2dB less than LAeq(15min)

Figure 9 Predicted LAeq(15min) industrial noise levels in the proposed Tanlane Development area



## 6.5 Predicted industrial noise level at the proposed Tanlane Development

128. In respect of the proposed Tanlane Development, as indicated in Table 3 above, the PSNL is 70 LAeq(day). Figure 9 above shows LAeq(15min) predicted noise levels in the proposed Tanlane Development land. From these must be subtracted 2dB(A) to convert them to an LAeq(day) as discussed in the previous paragraph. Figure 9 demonstrates the 70LAeq(day) criterion is complied with (the red contour representing the 60 LAeq(15min) level).
129. The impact of future industrial noise on the proposed Tanlane Development is discussed in the next section.

## 6.6 Comparison of results with Wilkinson Murray Report

130. In the Wilkinson Murray Report, the predicted LAeq(15min) intrusive noise levels are in the range 48-54dB(A) at dwellings in Georges Fair facing Brickmakers Drive. As evident in Figure 6 above, the predicted LAeq(15min) noise levels in this current assessment are in the range 43-52dB(A).
131. Whilst there are many differences in the two models, the higher noise levels predicted in the Wilkinson Murray Report are primarily due to two causes: 1) the use in the report of a 1.5m high noise barrier on the access road compared with the 4m high noise barrier adopted in the current assessment, and 2) the use in the report of a very low value for the Sound Reduction Index for the cladding used in the crusher and screening buildings.



## 7 Predicted road traffic noise levels and assessment of noise impact

132. Trucks exiting the Site from the up-ramp will turn left onto the bridge and will proceed to the Brickmakers Drive intersection. I understand that the installation of traffic lights or a give way sign is proposed at this intersection, however this is not of material impact as I have assumed trucks will stop at the intersection in any event and will then accelerate and turn right into Brickmakers Drive.
133. Similarly, trucks entering the Site will deviate left from Brickmakers Drive and proceed along the down-ramp to the Site.
134. The nearest potentially most affected sensitive receivers are:
- the existing dwellings situated at 52-60 Elouera Crescent with their backyards facing Brickmakers Drive, having an existing 2.5m masonry wall along their rear boundary;
  - the new dwellings on Horizon Circuit, the closest being No 71 (M8A); and,
  - the existing park at the eastern end of Elouera Crescent.
135. Noise from trucks associated with the Development when on the bridge and on Brickmakers Drive is assessed according to the RNP which involves the application of steps 1-4 in paragraph 102 above. According to Table 6 above, the applicable noise criterion for the sensitive receivers identified in the previous paragraph is numerically 60 LAeq(15hour).<sup>6</sup>
136. I would normally have placed an unattended logger at location M8A to measure the existing LAeq(15hour). However, for reasons previously explained at paragraph 63, it was not possible to do so and instead, an attended noise measurement was undertaken over a number of days from 7am-6pm which represents 11 hours out of the 15 hours required. As shown in Table 1 above, this value is 63.8dB(A).
137. However, I was able to derive a correction factor of -0.6dB(A) for 15 hours (because the LAeq for traffic is measured over 15 hours) by reference to the full day's measurements at 110 Travers Street (M8), the adjacent dwelling, at which almost a full week's set of data was obtained prior to the circumstances discussed at paragraph 63. The corrected value so obtained is 63.2 LAeq(15 hours) which is the value shown in column 3 in Table 10 below for No 71 Horizon Circuit.
138. I have assumed the existing traffic noise level at the existing park at the eastern end of Elouera Crescent is the same as at M8A, except that this noise level is free-field rather than façade corrected and therefore 2.5dB(A) must be subtracted from the RNP level measured at M8A. A value of  $(63.2 - 2.5 =) 60.7$  is therefore shown for the existing noise level at the eastern end of the park at a location which is a comparable distance from Brickmakers Drive as M8A.

<sup>6</sup> Being façade corrected for dwellings and free field for the park



139. In the case of M8A, I obtained the contribution of truck noise by measurement of 118 trucks arriving and departing the Concrete Recyclers Camellia plant on 16 August 2016. The noise level of each truck movement was measured at 23m from the centre line of Grand Avenue and Thakeray Street, Camellia which represents the same distance as the closest point of the façade of No 71 Horizon Circuit to Brickmakers Drive. The measurement location is opposite the junction of Grand Avenue and Thakeray Street congruent to the junction of Brickmakers Drive and the proposed bridge. Equipment used for noise measurement was an XL2 sound level meter as described in paragraph 60 above. Weather conditions were fine for measurement with nil wind. Annexed hereto in APPENDIX I are the results of those noise measurements.
140. In the case of the Elouera Crescent park, a noise model was constructed using CadnaA of truck traffic on Brickmakers Drive assuming 38 movements per hour (19 on each lane), 1.5m and 3.6m engine and exhaust heights and a speed of 30 kph (which is proposed here-in for trucks on this section of Brickmakers Drive).
141. The contribution values are shown in column 4 of Table 10. The total future noise level is shown in column 5 which is the logarithmic addition of columns 3 and 4. The increase from existing is shown in column 6 being the arithmetic difference between before and after, i.e. column 5 minus column 3.
142. Annexed hereto in APPENDIX I are the detailed calculations pertaining to these results.

**Table 10 Calculated traffic noise levels at No 71 Horizon Circuit (M8A) and Elouera Crescent Park**

1	2	3	4	5	6
Sensitive land use	Assessment criteria LAeq(15hour)	Existing LAeq(15hour)	Contribution LAeq(15hour)	Future LAeq(15hour)	Increase
No 71 Horizon Circuit	60	63.2 <sup>1</sup>	59.5	64.7	1.5
Existing park at the eastern end of Elouera Crescent	60	60.7 <sup>2</sup>	55.7	61.9	1.2

NOTES:

1 Façade Level

2 Free-field Level

143. As is evident from Table 10, the existing and future noise levels exceed the assessment criteria at both locations, however the increase in traffic noise level is less than 2dB(A) which satisfies the RNP criterion.
144. In respect of assessing traffic noise levels at the existing dwellings situated at 52-60 Elouera Crescent with their backyards facing Brickmakers Drive, I would normally have placed an unattended logger in the backyard of one of these premises to measure the existing LAeq(15hour). However, for reasons previously explained at paragraph 63, it was not possible to do so and instead I have to rely on calculated noise levels.
145. Firstly, it can be shown by calculation that if the contributing LAeq(15hour) is less than 55.8dB(A) then, regardless of the existing LAeq(15hour) noise level, there will neither be a

contribution which will cause the existing LAeq(15hour) to exceed 60dB(A) where the existing noise level is low nor an increase greater than 2dB(A) where the existing noise level is high.

146. Secondly, the contribution LAeq(15hour) from truck traffic associated with the development can be calculated using the same input assumptions as described in paragraph 140 above.
147. The results are shown in Table 11 in which it can be concluded that the contributing noise levels at each of the properties are all at or below 55.8LAeq(15hour) and therefore road noise impact is acceptable at these properties provided truck speed on Brickmakers Drive is limited to 30kph.

**Table 11 Calculated traffic contribution noise levels at residences on Elouera Crescent**

Location	Contribution LAeq(15hr)	Criterion LAeq(15hr)
52 Elouera Crescent	55.4	55.8
54 Elouera Crescent	55.8	
56 Elouera Crescent	55.7	
58 Elouera Crescent	55.8	
60 Elouera Crescent	52.4	

## 8 Recommended noise mitigation measures

148. This section deals with reasonable and feasible noise mitigation measures recommended for the Development.

### 8.1 Acoustic mitigation requirements for the Site

149. Firstly, in respect of the Site and the access road and ramps:

- i. the construction of 4-6m high perimeter noise mounds as depicted in Figure 5. The base of the noise mounds is referenced to the final graded site contours as depicted in the Lyle Marshall & Associates Pty Ltd drawing number 5018-13 Sheet 01 Issue A dated 25 July 2013 (the green mounds shown on that drawing should be disregarded).  
Alternatively, the new perimeter noise mounds could be a combination of noise walls on top of noise mounds of equivalent total height: e.g. a 6m mound may be constructed as a 3m mound + 3m wall.
- ii. the construction of an 8m high noise wall on the western and eastern sides of the main crusher building as depicted in Figure 5;
- iii. a limit of 38 truck movements per hour to and from the Site;
- iv. a signposted truck speed of 25kph on the ramps and access road;
- v. the excavator shall only work (i.e. involved in the picking up and unloading of material) at and around the point depicted in Figure 5 and no further southwards unless the 8m barrier is extended. However, the excavator may proceed at ground level to any location of the site when not working (for example when it is required to undergo maintenance in the workshop);
- vi. the front end loaders shall only work at ground level;
- vii. the cladding of the crusher and screen buildings shall be selected to have a Sound Reduction Index not less than the values shown in Table 8 except for an opening 5m wide by 4.5m high located 5m off the ground on the southern side of the building.
- viii. all doors to the crusher and screen buildings shall be kept closed at all times other than for momentary access;
- ix. any penetrations in the buildings for conveyor access shall be acoustically treated with conveyor belt curtains and acoustic screens to control noise. All other conveyors in and out of the crusher and screening buildings shall be enclosed and acoustically treated;
- x. acoustic walls shall be constructed on the up-ramp and down-ramp and the access road as depicted in Figure 8. The ramp walls shall be acoustically absorptive (NRC 0.6) on the side facing the centre of the ramp on which they are constructed or where the up-ramp and down-ramp walls directly face each other at the bottom section of the down-ramp.



## 8.2 Acoustic mitigation for No 71 Horizon Circuit and Elouera Crescent Park

150. In the case of No 71 Horizon Circuit and Elouera Crescent Park, as shown in Table 10 above, both the existing and future noise levels exceed the assessment criteria and the increase in traffic noise level is less than 2dB(A). Whilst the increase is acceptable, Step 3 of the assessment process as outlined in paragraph 102 above requires that feasible and reasonable mitigation measures ought be identified in any case.
151. The range of mitigation measures recommended in the RNP are:
- i. road design and traffic management
  - ii. quieter pavement surfaces
  - iii. in-corridor noise barriers/mounds
  - iv. at-property treatments or localised barriers/mounds
152. In respect of road design, quieter pavement surfaces, noise barriers and mounds at the roadside, these are not measures that are available to the proponent.
153. In respect of traffic management, it is recommended that a posted speed limit for trucks on Brickmakers Drive be imposed at 30kph.
154. In respect of the provision of localised barriers/mounds:
- a. there is already a fence located on the boundary of No 71 Horizon Circuit, however, this would not be effective for the upper windows of the dwelling; and,
  - b. a noise barrier or mound could be constructed on the eastern boundary of Elouera Crescent Park.
155. In respect of at-property treatment, this could involve the installation of thicker glazing to windows and/or mechanical ventilation and air-conditioning to the dwelling but would require the owner's consent.
156. Having regard to the marginal increase in noise levels being less than 2dB(A), it is my opinion that the imposition of a speed limit for trucks on Brickmakers Drive is a feasible and reasonable response to mitigate noise in the circumstances.

## 8.3 Mitigation measures required in the proposed Tanlane Development

157. I have concluded in paragraph 51 that the proposed Tanlane Development is not imminent. At such future time as the proposed Tanlane Development becomes imminent, there are engineering measures which can be incorporated within any future residential development on that site.
158. In the absence of measured background noise levels at the proposed Tanlane Development site, I assume the RBL would be in the range 42-45dB(A) similar to M7 and M8 on the other

side of Brickmakers Drive. On this basis the applicable intrusive noise goal would be 47-50LAeq(15min).

159. Reference to Figure 9 above identifies the 50LAeq(15min) level as a yellow contour. In order to reduce noise levels between that contour and the western boundary of the Tanlane land, the following engineering measures could be adopted:
- i. an acoustic wall at the western boundary on the top of the escarpment;
  - ii. avoiding the construction of dwellings immediately adjacent to the opening in the acoustic wall at the bridge location;
  - iii. the use of localised acoustic mounds in the area adjacent to the opening in the acoustic wall at the bridge location;
  - iv. the construction of single storey buildings along the western perimeter rather than two storey buildings;
  - v. the orientation of windows away from the industrial noise source;
  - vi. the use of at-property treatments such as thicker glazing and the use of mechanical ventilation and air-conditioning.
160. In my experience, I have used or have recommended all of these measures to protect dwellings from industrial, commercial and road noise developments. For example, I have designed acoustic walls on highways such as the M5, around child-care centres and around the outside entertainment areas of hotels, the planning of a residential subdivision adjacent to a major tile factory near Newcastle which involved limiting the heights of dwellings, the use of a large earth mound as an acoustic barrier and recommendations for at-property treatment. I have designed at-property treatments for many apartment buildings, such as for Mirvac to limit traffic noise.
161. Accordingly, should the proposed Tanlane Development become imminent, there are feasible and reasonable engineering measures which can be incorporated within any future residential development on that site.

## 9 Response to contentions

162. This section of the report addresses the applicants' noise contentions (as amended).

### 9.1 Council's further amended contentions

163. Council's further amended contentions in respect of noise are:

#### Noise

- 4 a. *The Development proposes a 1.5 m acoustic barrier adjacent to the Site access road, above the relevant ramps, in accordance with C.13(b), C.14 and Appendix D of the PAC Approval dated 11 September 2015. This is insufficient to mitigate noise given the height of trucks with engines as high as 1.5 m above ground and exhausts as high as 3.6 m above ground.*
- b. *The acoustic mitigation measures required by the PAC Approval dated 11 September 2015 do not address the likely impact of the Development on that part of the adjacent Tanlane Land to the north of the Site (lot 7 DP 1065574) which is zoned R3 Medium Density Residential. A barrier is required on the eastern side of the access road of 5-6 m in height. A Rezoning Application for the Tanlane Land is currently being assessed (RZ-2/2015), which aims to allow residential development as part of the proposed marina in the southern part of the Tanlane Land. No information has been provided in relation to the noise impacts of the Development on that proposed residential development or any noise mitigation measures.*
- c. *Recent background noise measurements completed by EMM at 14 Cotter Lane indicate that the criteria detailed in C11 of the PAC Approval dated 11 September 2015 are not appropriate for residential receivers at this location. Based on the EMM measurements the criterion applicable to this location is 46 dB(A). Additional noise mitigation measures to those currently documented will be required to meet this criterion.*

164. In respect of the three primary contentions:

- i. *that the 1.5m acoustic barriers shown in Figure 2 are insufficient, I have increased the heights of those acoustic barriers up to 4.0m.*
- ii. *that there was no assessment of noise impacts on the proposed Tanlane Development, I have stated my reasons why the proposed Tanlane Development is not imminent and should be treated as an industrial receptor. In the event the proposed Tanlane Development becomes imminent, I have outlined feasible and reasonable engineering measures in the last section that could be adopted at any proposed dwelling; and,*
- iii. *condition C11 of the PAC Approval does not appropriately address the recently recorded low background noise levels at 14 Cotter Lane in the Georges Fair subdivision and therefore additional noise mitigation measures will be required. I have conducted an*



extensive noise measurement survey and have recommended the additional noise mitigation measures that will be required.

## 9.2 Benedict Industries and Tanlane amended contentions

165. Benedict Industries and Tanlane amended contentions in respect of noise are:

### Noise

3 *The Development will have unacceptable acoustical impacts.*

### Particulars

- a. *As approved the noise impacts from the proposed Development to existing and future residences, particularly from trucks on the access road, will be excessive and will not satisfy establish noise criteria*

*As approved the noise impacts from the proposed Development to the planned marina precinct will be excessive and will not satisfy established noise criteria*

*To protect future residences and the planned marina precinct from excessive noise the Development will need to be substantially redesigned and would require:*

- i. *The enclosure of the ramps on the access road and Brickmakers Drive intersection and noise barriers to protect future residences from noise impacts; and*
- ii. *The site access road to be fully enclosed in the vicinity of the marina land to protect it from excessive noise and would also require that all noise generating activities within the Material Recycling Facility be fully enclosed.*

166. I assume that by "future residences" is meant the proposed Tanlane Development. I understand that there has been a rezoning request lodged by Tanlane with Council to allow residential uses within the proposed Marina Development. I therefore assume that "future residences" also means future residences in the proposed Marina Development.

167. In other words, the contentions are:

- a. Noise impacts from the Site and from trucks on the access road will be excessive and not satisfy established noise criteria:
  - i. at existing residences;
  - ii. at future residences in the proposed Tanlane Development;
  - iii. at future residences in the proposed Marina Development and,
  - iv. at the proposed Marina Development.
- b. As a consequence, additional noise mitigation measures will be required.

168. I have reassessed noise impacts from the Site and from trucks on the access road at existing residences and at the proposed Marina Development and have found noise impacts to be acceptable.
169. For reasons stated here-in at section 3.4, as the proposed residential development as part of the proposed Marina Development is prohibited, in my opinion, it is inappropriate to assess noise impact from the Development on that future use.
170. For reasons stated here-in at section 3.5, the proposed Tanlane Development is not imminent and should be treated as an industrial receptor. In the event the proposal becomes imminent, I have outlined feasible and reasonable engineering measures in the last section that could be adopted at any proposed dwelling.

## 10 Response to Ishac and Greer statement of evidence

171. I refer to the conclusions in the statement of evidence of Mr Najah Ishac and state as follows:

- i. in respect of paragraph 70, I have included here-in a comprehensive set of ambient noise data and have established appropriate noise criteria for all sensitive receiver locations;
- ii. in respect of paragraph 71, I have dealt here-in with the proposed Tanlane Development and the proposed Marina Development;
- iii. in respect of paragraph 72, I have proposed additional noise mitigation measures to ensure noise levels at the existing Georges Fair residential locations comply with the noise criteria;
- iv. in respect of paragraph 73, I have recommended reasonable and feasible noise mitigation measures which could be adopted in the event the proposed Tanlane Development becomes imminent;
- v. in respect of paragraph 74, I have stated reasons here-in why it is inappropriate to assess noise impact at any presently prohibited residential use in the proposed Marina Development; and,
- vi. in respect of paragraphs 75-76, I have addressed the mitigation measures required to ensure compliance with the noise criteria and therefore the additional noise control measures recommended by Mr Ishac are not necessary.

172. I refer to the issues and conclusion in the Executive Summary of the statement of evidence of Ms Gayle Greer and state as follows:

- i. in respect of paragraphs 2a and 2b, I have included here-in a comprehensive set of ambient noise data and have established appropriate noise criteria for all sensitive receiver locations;
- ii. in respect of paragraph 2c, if this relates to the proposed Tanlane Development and the proposed Marina Development, I have addressed these receivers;
- iii. in respect of paragraph 2d, I have proposed additional noise mitigation measures to ensure noise levels at the existing Georges Fair residential locations comply with the noise criteria. I have also assessed noise compliance at the proposed Marina Development if it becomes imminent and have predicted noise levels and possible



future noise mitigation options for the proposed Tanlane Development if it becomes imminent; and,

- iv. in respect of paragraph 3, I have proposed additional noise mitigation measures to ensure noise levels comply with the noise criteria.

## 11 Conclusion

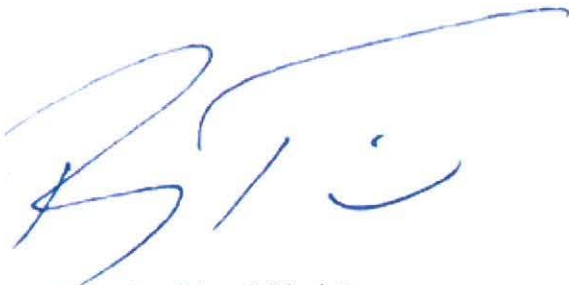
173. I am retained by Moorebank Recyclers Pty Ltd to assess potential noise impact arising from a proposal to construct and operate a demolition and construction waste recycling facility (**Development**) at Newbridge Road, Moorebank (**Site**).
174. The Development comprises a waste recycling facility with a processing capacity of 500,000 tonnes of masonry construction and demolition waste per year and would receive concrete, brick, asphalt, sandstone and sand.
175. On 11 September 2015, the Planning Assessment Commission (PAC) approved the Development subject to conditions (including a number of noise conditions) (**PAC Approval**).
176. The nearest existing potentially affected residential receivers are:
  - a. To the west, the residential estate in Georges Fair which is now fully constructed; and,
  - b. To the east, the residential area of Milperra in the Bankstown local government area.
177. The nearest existing potentially affected recreation areas are the New Brighton Golf Course, a recreational area on the eastern side of Georges River in the Bankstown local government area and a small recreational area at the eastern end of Elouera Crescent.
178. To the immediate north of the Site is land owned by Tanlane Pty Ltd (**Tanlane**). Benedict Industries Pty Ltd (**Benedict**) currently uses the land for sand extraction, dredging and recycling operations, a use which apparently is coming to a closure. Benedict proposes to construct a marina and related facilities on the southern portion of this land (**proposed Marina Development**). Tanlane is proposing to construct dwellings on the northern portion of the land (**proposed Tanlane Development**).
179. Tanlane and Benedict have appealed against the PAC Approval. The salient issues in respect of noise are noise impacts from the Development potentially affecting existing nearby residential dwellings (Georges Fair to the West and on the other side of Georges river to the East in Milperra), proposed future residential dwellings in the Tanlane subdivision to the north, a proposed marina immediately to the north and a number of recreational areas situated around the Site. In particular, the noise sources identified are trucks on Brickmakers Drive, trucks on the access road and ramps and fixed and mobile plant on the Site itself.
180. Whilst the PAC Approval required the Development to incorporate mounds on the perimeter of the Site and acoustic fencing on the ramps, it is contended that these measures are insufficient to result in acceptable noise impacts at the sensitive receptor locations identified in the previous paragraph. It is alleged that this is due, in part, to the ambient noise levels at the sensitive receptor locations being lower now than was forecast in the acoustic report submitted to the PAC.
181. I have conducted an extensive noise survey in 2016 to address the issue regarding the change in background noise levels. I have also remodelled and reassessed the noise emitted

from the site so as to ensure compliance of noise with both the NSW Industrial Noise Policy and the NSW Road Noise Policy.

182. As a consequence, I have recommended an increase in height of the noise walls on the access road and ramps to a maximum height of 1.5m at the top of the ramps and 4.0m on a section of the access road.

183. I have made a number of recommendations in respect of the noise mitigation measures to be used on the Site and for trucks on Brickmakers Drive to have a speed limit posting of 30kph.

184. I conclude that the predicted noise impacts associated with the Development will be acceptable provided that the recommendations in this report are implemented.



Signed and dated this date

Renzo Tonin



## APPENDIX A      Brief

**MARK MCDONALD & ASSOCIATES  
LAWYERS PTY LTD**

ABN: 31 109 593 731  
MARK MCDONALD-DIRECTOR  
Town Planning & Environment Lawyer  
Accredited Specialist Local Government & Planning Law



Our Ref: MGM/01/239

16 August 2016

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By Email

Dear Sir

**MOOREBANK RECYCLERS PTY LTD ATS LIVERPOOL CITY COUNCIL & ORS;  
LAND AND ENVIRONMENT COURT PROCEEDINGS 2016/159652 &  
2016/157848**

I refer to the above proceedings.

I am instructed by Moorebank Recyclers Pty Ltd (**Moorebank**) in respect of the above proceedings.

I am instructed to retain you to prepare an expert report in the above proceedings.

I note that my firm has previously provided you with a copy of the following documents:

1. Division 2 of Part 31 of the Uniform Civil Procedure Rules 2005 (**UCPR**);
2. The Expert Witness Code of Conduct at Schedule 7 of the UCPR;
3. The amended Statement of Facts and Contentions filed on behalf of Liverpool City Council (**Council**) in the above proceedings (**Council SOFAC**);
4. The amended Statement of Facts and Contentions filed on behalf of Benedict

Industries Pty Ltd and Tanlane Pty Ltd (**Benedict**) in the above proceedings (**Benedict SOFAC**);

5. Expert report of Najah Ishac dated 21 July 2016 (**Ishac Report**) which has been filed on behalf of Benedict in the above proceedings; and
6. Expert report of Gayle Greer dated 4 August 2016 (**Greer Report**) which has been filed on behalf of the Council in the above proceedings.

You report should:

- (a) respond to the contentions in respect of noise at paragraph 4 of the Council SOFAC;
- (b) respond to the contentions in respect of noise at paragraph 3 of the Benedict SOFAC; and
- (c) respond to the matters identified in the Ishac Report and the Greer Report.

Yours faithfully

A handwritten signature in blue ink that reads "Mark McDonald".

**Mark McDonald**  
**Townplanning & Environment Lawyer**  
Acc. Spec. (Loc. Govt. & Plan. Law)

## APPENDIX B Glossary of terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L <sub>Max</sub>	The maximum sound pressure level measured over a given period.
L <sub>Min</sub>	The minimum sound pressure level measured over a given period.



L <sub>1</sub>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L <sub>10</sub>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L <sub>90</sub>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L <sub>eq</sub>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain L <sub>eq</sub> sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

## APPENDIX C Curriculum vitae of Renzo Tonin



## Curriculum Vitae

**Renzo Tonin**

Managing Director

### Qualifications

- Ph.D. (Mech Eng), B.Sc (Hons.) University of Adelaide
- Fellow Australian Acoustical Society
- Fellow Engineers Australia
- Member Acoustical Society of America
- NPER, RPEQ
- NATA Accredited Signatory

### Appointments

- Honorary Affiliate - Woolcock Institute of Medical Research
- Standards Committee AV-002 Acoustics – Instrumentation and Measurement Techniques.

### Awards

- Australian Acoustical Society Award for Excellence in Acoustics 1988. "New Studios for Radio 2EA"
- Australian Acoustical Society Award for Excellence in Acoustics 1992. "Victoria Barracks 2nd Military District Band Practice Facility"

### Key Skills and Competencies

Dr Tonin's belief that high technology acoustics and dynamics engineering should form part of every day consulting has found acceptance with many clients. This is reflected in a strong company growth rate from private practice in November 1982 to one of the largest consulting companies specialising in acoustics engineering today.

His sponsored studies encompass such diverse activities as radio and TV studios, commercial buildings, ships, motor vehicles, trains, industrial complexes, power stations, product development, material handling plant, machine health monitoring, coal washeries, public buildings and auditoria.

His special interest is in the use of computer technology to solve problems in the fields of acoustics and dynamics.

He is a contributing author to the book "Environmental Modeling" which is a publication designed to bring together current expertise on modeling of the environment using computer based techniques.

His doctoral thesis addressed the use of laser 3D holography for the study of vibration. A distinguished international journal honored his work in this field by presenting one of his papers as a featured article.

His sponsored studies include the following; Industrial noise, construction noise & vibration, occupational noise, structural vibration, acoustic research & development, architectural acoustics, building mechanical services and expert representation in legal cases.

### Relevant Experience

#### ROADS AND MOTORWAYS

M5 and M5 East EIS, M4 motorway, Silverwater Road Extension, Princes Highway - Oak Flats to Dunmore EIS, Tomerong Bypass EIS, F2 Castlereagh Freeway, Phillip Parkway EIS, Liverpool to Hornsby Highway Strategy Study, Elizabeth Drive Upgrade, Western Sydney Orbital and Badgery's Creek Highway, M2 Motorway Noise Barriers, Albury Wodonga National Highway, M4 Western Motorway Via-Duct, Church Street to James Ruse Drive, Granville.

#### RAIL INFRASTRUCTURE

Epping to Chatswood Rail Line (ECRL); Very Fast Train (VFT); Perisher SkiTube; Tangara double-deck train acoustics; assessment and design of noise and vibration isolation systems of multiple suburban and inner city residential and commercial developments alongside or above railway lines and railway tunnels.

South-West Rail Link, SWRL Glenfield to Leppington Rail Line, GLRL (D&C);

Southern Sydney Freight Line ONVMP (Peer Review); Epping to Chatswood Rail Line, ECRL (Design Review); Very Fast Train (VFT); Perisher SkiTube;



**RAIL CORRIDOR DEVELOPMENTS**

Assessment and design of multiple suburban and inner city residential and commercial developments alongside or above railway lines and railway tunnels

**RAIL ROLLING STOCK**

Tangara double-deck train acoustics.

**PUBLIC HEARINGS AND INQUIRIES**

Possum Brush Quarry Inquiry, Mt Arthur South Inquiry, Rix's Creek Inquiry, F2 Castlereagh Freeway Inquiry, Bulga Mine Inquiry, Mt Flora Quarry Hearing, Cleary Bros Sand Mine Hearing.

**WIND FARMS**

Taralga Wind Farm NSW, Toora Wind Farm VIC, Winchelsea Wind Farm VIC, Glen Innes Wind Farm NSW, Gullen Range Wind Farm NSW, Cullerin Range Wind Farm NSW, Capital Wind Farm NSW, Woodlawn Wind Farm NSW, Crudine Ridge Wind Farm NSW.

**GOVERNMENT BUILDINGS**

Sydney Entertainment Centre sound reinforcement system, the Glebe Remand Centre floating floor project, Applied Arts & Sciences Stage II expansion, Geological & Mining Museum, the Mint and Barracks building refurbishment, Sydney Football Stadium and the Darling Harbour Development.

**HOTELS**

Observatory Hotel, Sydney Hilton, Sydney Regent, Ritz/Carlton, Sheraton Hyde park, Country Comfort Central, World Square, Hyde Park Plaza, Sheraton Hobart, Campbell St Hotel, Novotel Darling Harbour, Bullecourt place, La Galleria Kings Cross, Bayswater Hotel, Park Hyatt, Parramatta Hotel, Sheraton Airport Central, Chatswood Connection.

**COMMERCIAL TOWERS**

QV1 development Perth, Robt Jones Tower Auckland NZ, 135 King St, Australia Square refurbishment, Landmark, 545 Kent St, Metroplaza North Sydney, Airport Central Commercial, Chatswood Connection, Chatswood Interchange, 45 Clarence St.

**APARTMENT/RESIDENTIAL**

Raleigh Park, Quay West, Frenchs Forest, Port Jackson Tower, HighGate Kent St, Northborne Ave Canberra, Crown Street Apartments, Crown Gardens, Villa Development, 19-21 George St North Strathfield, Mark Foy's Warehouse Apartments, Frenchs Forest Medium Density, Linda St Hornsby, Camden Retirement Village, The Elan, 37 Glen St Milsons Point, Hawthornden Estate, Rockwall Apartments, Pavilion On The Harbour.

**SOUND SYSTEM DESIGN**

Sydney Entertainment Centre, Darling Harbour Convention Centre and Exhibition Halls, Darling Harbour Park Sound System, Baulkham Hills Entertainment Centre, Sydney Sports Stadium, Hallstrom Park Sports Complex, Homebush Sports Centre, NSW.

**ROTATING MACHINERY VIBRATION**

MOOREBANK RECYCLERS PTY LTD

TH925-01F03 EXPERT REPORT OF RENZO TONIN IN ACOUSTICS (R0)

Electricity Commission of NSW - Liddell Generating Station: Unit 2 multi-plane balance, Electricity Generating Authority - Investigation of high vibration levels of both Boiler Feed Pump and Turbine, Electricity Generating Authority - Investigation of cause of shaft bow and severe bearing damage in vertical cooling water pumps, ICI Olefines Plant - Sydney, APCL - Kandos NSW, CIG, Shell Clyde Refinery, Alcan Kurri Kurri, Water Board.

**STRUCTURAL DYNAMICS**

Munmorah Power Station - High density modal analysis of generator casing to locate source of excessive high frequency casing vibration, Hail Creek Coal Preparation Plant - FEA analysis of structural vibration in 7 storey industrial structure with respect to human vibration exposure and structural damage criteria, Vales Point Generating Station: Unit 3 fatigue investigation, Snowy Mountains Hydro-Electric Authority - Murray 2 Power Station - Pipeline vibration investigation, Electricity Generating Authority - Condenser tube vibration analysis, Electricity Generating Authority - Boiler feed pump booster low frequency vibration analysis, Gas Supply Authority - Pipework vibration analysis

**Professional History**

- 1982 - Director and Principal, Renzo Tonin & Associates Pty Ltd
- 1979-1982 - Associate Director and Sydney Office Manager, Vipac & Partners Pty Ltd
- 1976-1978 - Post graduate studies, University of Adelaide Mechanical Engineering Department

**Books**

- Environmental Modeling - Vol 1. Chapter 7. Environmental Noise Modeling. P Zannetti ed. Computational Mechanics Publications. 1993.

**Publications**

- Time-Averaged Holography For The Study of Three-Dimensional Vibrations. Journal of Sound and Vibration (1977) 52 (3), 315-323.
- General Theory of Time-Averaged Holography for the Study of Three- Dimensional Vibrations at a Single Frequency. Journal of the Optical Society of America (1978) 68 (7), 924-931.
- Analysis of 3-D Vibrations from Time-Averaged Holograms. Applied Optics (1978) 17 (23), 3713-3721. (Featured Article).
- Free Vibration of Circular Cylinders of Variable Thickness. Journal of Sound and Vibration (1979) 62 (2), 165-180.
- Determination of Ambient Noise Levels in the Presence of a Disturbing Noise Source Using a Directional Microphone. 10th International Congress on Acoustics (1980).

LIVERPOOL CITY COUNCIL V MOOREBANK RECYCLERS PTY LTD & ORS AND BENEDICT INDUSTRIES PTY LTD & ORS V MINISTER FOR PLANNING & ORS  
L&EC PROCEEDINGS NO 2016/159652 AND 2016/157848 | EXPERT EVIDENCE OF RENZO TONIN | ACOUSTICS

- Acoustic Requirements to Curb Rain Noise from Metal Deck Roofs. Bulletin Acoustics Australia (1985) 13 (1), 16.
- Estimating Noise Levels from Petrochemical Plants, Mines and Industrial Complexes. Acoustics Australia (1985) 13 (2), 59-67.
- Application of Modelling Techniques to Resolving a Dynamics Problem in a Building Structure. The First Australasian MSC Users Conference, June 1987.
- Vibration Isolation of Impacts in High-Rise Structures. The Second Australasian MSC Users Conference, Nov 1988.
- Future Noise and Vibration Control Methods for Building Services. 2nd CIBSE Australian Conference, Nov 26-28, 1991.
- Acoustic and Vibration Insulation in Buildings. Building Science Forum of Australia Seminar. 'Insulation, Thermal, Acoustic'. Aug 25, 1993.
- ENM Windows - Environmental Noise Model. Euro-noise '95 Software for Noise Control Conference. Lyon, France 21-23 March 1995.
- Modelling Virtual Noise for the Real Environment. Noise & Vibration Worldwide. June 1995. pp 10-12.
- A Method of Strategic Traffic Noise Impact Analysis. Proceedings of Internoise 96, August 1996, Liverpool UK, pp 2395-2400.
- ENM Windows - Environmental Noise Model. Air & Waste Management Association's 90th Annual Meeting & Exhibition, Toronto, Ontario, Canada, 1997.
- Validation of Environmental Noise Model (ENM Windows). Acoustics Australia Vol 25 (1997) No 2 pp 75-79.
- Acoustical Research in Australia. Acoustics Australia Vol 25 (1997) No 2 pp 49-63 (contributing editor).
- Heavy Vehicle Noise Reduction Study. Fifth International Congress on Sound and Vibration, Adelaide, South Australia, Dec, 1997, P Karantonis, N Ishac and R Tonin.
- Comparison of Occupational Noise Exposure Results Acquired from an In-Ear Probe Tube and an Artificial Ear, for Users of Tele-Communication Headsets. Seventh International Congress on Noise as Public Health Problem, 'Noise Effects '98', Sydney, NSW, November 1998, P Karantonis and R Tonin.
- Occupational Noise Management - Educating the Workforce. Australian Acoustical Society Conference Nov 1999. Pages 71-88. N Koolik, D Eager, R Tonin
- Sensitivity of Frequency Response to Type of Tubing, 11 AWES Workshop, Darwin 2004, A.W.Rofail, R.Tonin and D.Hanafi
- The BCA 2004 - A Plan For The Future. (Invited Paper) Australian Acoustical Society, Acoustics 2004 Proceedings, November 2004.
- What is offensive noise? A case study in NSW. Acoustics Australia 38(1) 2010
- Offensive Noise in Planning & Enforcement: Is there a Difference? Environmental Law News (55) 2010
- Sources of Wind Turbine Noise and Sound Propagation. Acoustics Australia 40(1) 2012
- RONDA - CPX Trailer Initial Test Results. R Tonin, A Szabo. Inter-noise 2014 Melbourne Australia
- Response to Simulated Wind Farm Infrasound Including Effect of Expectation. Wind Industry Forum 2015. Renzo Tonin and James Brett.
- Response to Simulated Wind Farm Infrasound Including Effect of Expectation. Sixth International Meeting on Wind Turbine Noise Glasgow, Scotland, 20th - 23rd April 2015. Renzo Tonin and James Brett.
- RONDA open frame CPX trailer - results of first trials. R Tonin, M Chung, M Gange. Inter-noise 2015 San Francisco USA
- The effect of infrasound and negative expectations to adverse pathological symptoms from wind farms. Renzo Tonin, James Brett and Ben Colagiuri. Journal of Low Frequency Noise, Vibration and Active Control 2016. Vol 35(1) 77-90

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## APPENDIX D      Liverpool City Council Zoning Map

(extracted from PAC Determination Report, 11 September 2015)



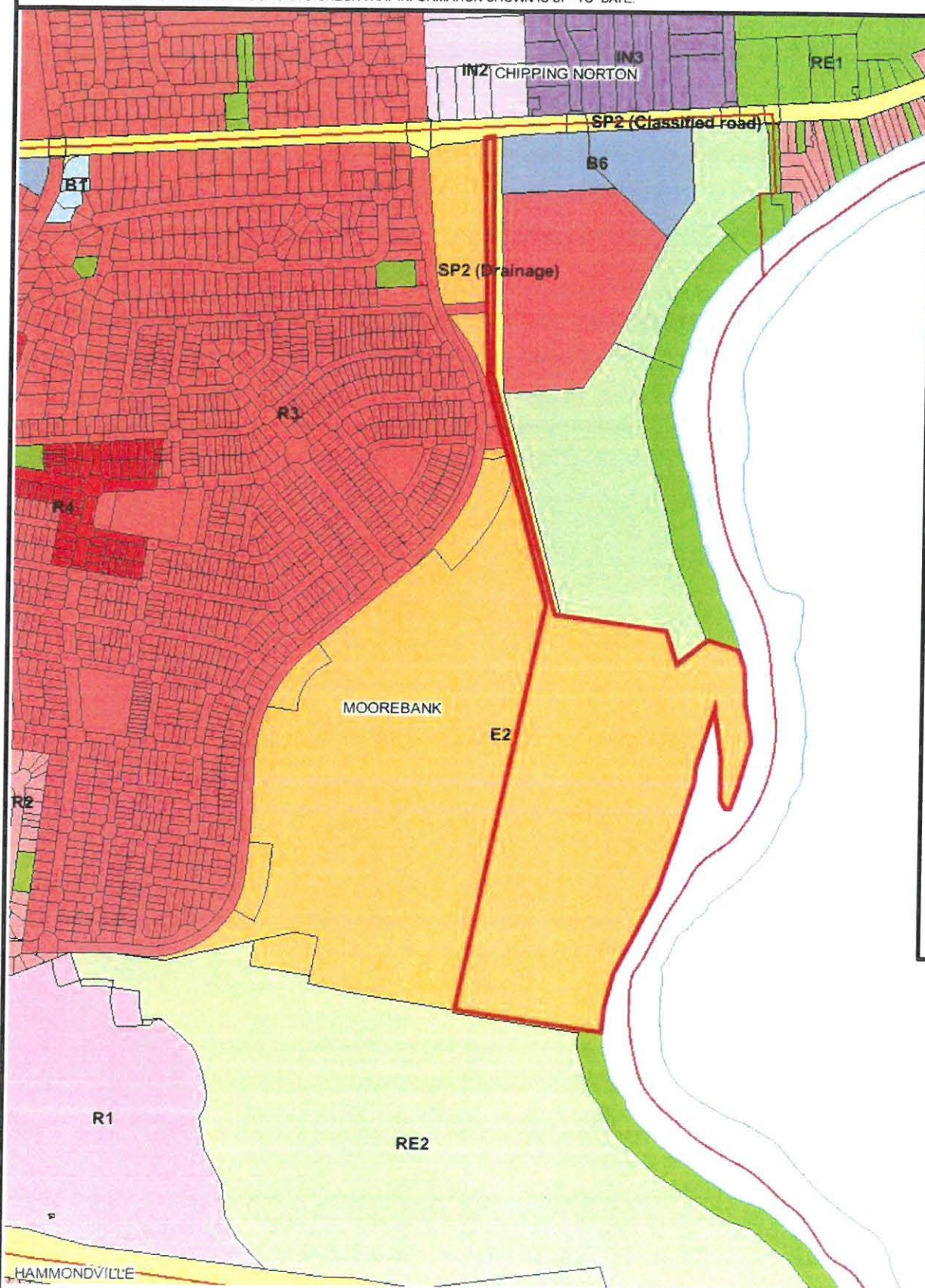
# LIVERPOOL CITY COUNCIL MAP REPORT

## DISCLAIMER

**Moorebank site – zoning**  
1. MAP DATA SUPPLIED BY LAND INFORMATION CENTRE, N.S.W. MAY, 1994 AND SUBSEQUENTLY MODIFIED AND UPDATED BY LIVERPOOL CITY COUNCIL. INFORMATION IS CURRENT FOR THE MAP AT DATE SHOWN.

2. EASEMENTS- SUITABLE EASEMENT DATA IS NOT CURRENTLY AVAILABLE AND EASEMENTS ARE NOT SHOWN. PLEASE REFER TO MICROFICHE COPIES OF THE APPROPRIATE DEPOSITED PLAN FOR LOCATION OF EASEMENTS.

3. ANY INFORMATION SHOWN ON THIS MAP IS CURRENT AT THE DATE OF ISSUE BELOW. HOWEVER THIS INFORMATION MAY BE SUBJECT TO AMENDMENT BY STATE ENVIRONMENTAL PLANNING POLICIES, REGIONAL ENVIRONMENTAL PLANS AND SUBSEQUENT LOCAL ENVIRONMENTAL PLAN 1997 AMENDMENTS. ANY PERSON USING THIS PLAN SHOULD CONTACT COUNCIL TO CHECK THAT INFORMATION SHOWN IS UP-TO-DATE.



## LEGEND

- Suburbs
- Waterways
- Lot Text
- Lot Boundary Lines
- lease
- LGA
- RDW
- stratum
- USL
- Lot Boundaries
- LLEP08 Zone**
- B1 Neighbourhood Centre
- B2 Local Centre
- B3 Commercial Core
- B4 Mixed Use
- B5 Business Development
- B6 Enterprise Corridor
- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- E3 Environmental Management
- IN1 General Industrial
- IN2 Light Industrial
- IN3 Heavy Industrial
- R1 General Residential
- R2 Low Density Residential
- R3 Medium Density Residential
- R4 High Density Residential
- R5 Large Lot Residential
- RE1 Public Recreation
- RE2 Private Recreation
- RU1 Primary Production
- RU2 Rural Landscape
- RU4 Primary Production Small Lots
- SP1 Special Activities
- SP2 Infrastructure
- S31 Sydney Regional Environmental Plan No.31
- W1 Natural Waterways



Scale is 1:10000

MAP PRODUCED BY:  
LIVERPOOL CC GIS

DATE OF ISSUE: Jun 16, 2015

## APPENDIX E      Equipment NATA calibration certificates





## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

# Certificate of Calibration Sound Level Meter

Calibration Date 22/08/2014

Job No RB271

Operator SD

Client Name RENZO TONIN & ASSOCIATES (NSW) PTY LTD

Client Address LEVEL 1 418A ELIZABETH ST SURRY HILLS NSW 2010

### Test Item

Instrument Make NTI  
Microphone Make GRAS  
Preamplifier Make NTI  
Ext'n Cable Make Nil  
Accessories Nil

Model XL2  
Model 40AE  
Model MA220  
Model N/A

Serial No A2A05312E0  
Serial No 164700  
Serial No 2356  
Serial No N/A

SLM Type	1
Filters Class	1

Temp deg C	24.1
RH %	34.7
Bar Pressure hPa	1026

#### Applicable Standards:

Australian Standard AS1259.1 1990 "Sound Level Meters Part 1: Non-integrating"

Australian Standard AS1259.2 1990 "Sound Level Meters Part 2: Integrating-averaging"

#### Applicable Work Instruction:

RWI-08 SLM Verification.doc

#### Traceability:

The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

Unless otherwise stated, the uncertainty of measurement is  $\pm 0.14$  dB. The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory  
Number 14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 24 Aug 2014

Template Document Name: RQT-02 (rev 57) SLM Verification





## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: [service@natacoustic.com.au](mailto:service@natacoustic.com.au) website: [www.natacoustic.com.au](http://www.natacoustic.com.au)  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

# Certificate of Calibration Sound Level Meter

Calibration Date 22/08/2014

Job No RB271

Operator SD

Client Name RENZO TONIN & ASSOCIATES (NSW) PTY LTD

Client Address LEVEL 1 418A ELIZABETH ST SURRY HILLS NSW 2010

### Test Item

Instrument Make NTI  
Microphone Make GRAS  
Preamplifier Make NTI  
Ext'n Cable Make Nil  
Accessories Nil

Model XL2  
Model 40AE  
Model MA220  
Model N/A

Serial No A2A05312E0  
Serial No 164700  
Serial No 2356  
Serial No N/A

SLM Type	1
Filters Class	1

Temp deg C	24.1
RH %	34.7
Bar Pressure hPa	1026

#### Applicable Standards:

Australian Standard AS1259.1 1990 "Sound Level Meters Part 1: Non-integrating"  
Australian Standard AS1259.2 1990 "Sound Level Meters Part 2: Integrating-averaging"

#### Applicable Work Instruction:

RWI-08 SLM Verification.doc

#### Traceability:

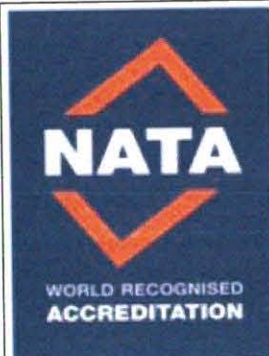
The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

Unless otherwise stated, the uncertainty of measurement is  $\pm 0.14$  dB. The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory  
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Date: 24 Aug 2014

Template Document Name: RQT-02 (rev 57) SLM Verification



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Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

# Certificate of Calibration Sound Level Meter

Calibration Date 8/09/2014

Job No RB273

Operator SD

Client Name RENZO TONIN & ASSOCIATES (NSW) PTY LTD

Client Address LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010

### Test Item

Instrument Make NTI  
Microphone Make GRAS  
Preamplifier Make NTI  
Ext'n Cable Make Nil  
Accessories Nil

Model XL2  
Model 40AE  
Model MA220  
Model N/A

Serial No A2A-05320-E0  
Serial No 164704  
Serial No 2200  
Serial No N/A

SLM Type	1
Filters Class	1

Temp deg C	24.8
RH %	43.3
Bar Pressure hPa	1024

#### Applicable Standards:

Australian Standard AS1259.1 1990 "Sound Level Meters Part 1: Non-integrating"  
Australian Standard AS1259.2 1990 "Sound Level Meters Part 2: Integrating-averaging"

#### Applicable Work Instruction:

RWI-08 SLM Verification.doc

#### Traceability:

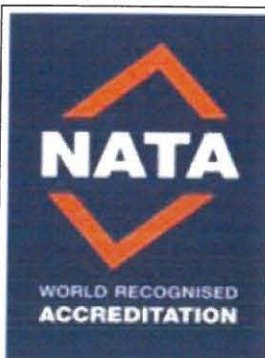
The tests, calibrations or measurements covered by this document have been performed in accordance with NATA requirements which include the requirements of ISO/IEC 17025 and are traceable to Australian national standards of measurement. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

Unless otherwise stated, the uncertainty of measurement is  $\pm 0.14$  dB. The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory  
Number 14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 8 Sept 2014

Template Document Name: RQT-02 (rev 57) SLM Verification





## NATAcoustic

### Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

## Certificate of Calibration Sound Level Meter

Calibration Date	10/10/2014	Job No	RB302	Operator	SD
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-05620-E0
Microphone Make	GRAS	Model	40AE	Serial No	165475
Preamplifier Make	NTI	Model	MA220	Serial No	002201
Ext'n Cable Make	NTI	Model	N/A	Serial No	N/A
Accessories	Nil	Firmware	N/A		

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	25.9	23.8
Rel. Humidity (%)	41.1	49.1
Air Pressure (kPa)	101.4	100.3

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013

#### Applicable Work Instruction:

RW-08 SLM & Calibrator Verification

#### Laboratory Equipment :

B&K2636 Measuring Amplifier SN 1135806  
B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with AS IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 13 Oct 2014

Template Document Name: RQT-05 (rev 28) SLM ISO Verification



## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

### Certificate of Calibration Sound Level Meter

Calibration Date	16/4/2015	Job No	RB355	Operator	SD
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

#### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-04313-D1
Microphone Make	ACO	Model	7052	Serial No	#43936
Preamplifier Make	NTI	Model	M2210	Serial No	#1584
Ext'n Cable Make	NTI	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	2.72

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	25.8	25.4
Rel. Humidity (%)	58.4	56.2
Air Pressure (kPa)	101.6	100.6

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013

#### Applicable Work Instruction:

RWI-08 SLM & Calibrator Verification

#### Laboratory Equipment:

B&K2636 Measuring Amplifier SN 1135806  
B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

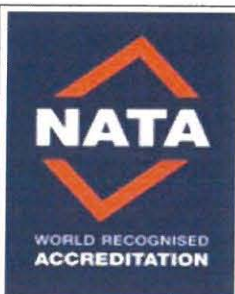
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of AS IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 23 April 2015

Template Document Name: RQT-05 (rev 33) SLM ISO Verification





## NATAcoustic

### Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street., Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

## Certificate of Calibration Sound Level Meter

Calibration Date	29/05/2015	Job No	RB367	Operator	SD
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-04105-D1
Microphone Make	ACO	Model	7052	Serial No	#44148
Preamplifier Make	NTI	Model	MA220	Serial No	#001060
Ext'n Cable Make	NTI	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	2.60

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	25.7	25.9
Rel. Humidity (%)	45.2	42.7
Air Pressure (kPa)	101.5	101.6

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013

#### Applicable Work Instruction:

RW-08 SLM & Calibrator Verification

#### Laboratory Equipment:

B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

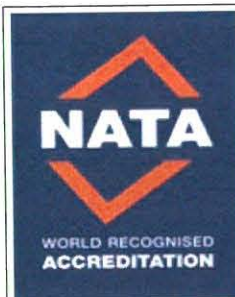
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of AS IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 29 May 2015

Template Document Name: RQT-05 (rev 37) SLM ISO Verification



## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

### Certificate of Calibration Sound Level Meter

Calibration Date	11/2/2016	Job No	RB440	Operator	SN
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

#### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-05386-E0
Microphone Make	GRAS	Model	40AE	Serial No	162565
Preamplifier Make	NTI	Model	MA220	Serial No	002358
Ext'n Cable Make	NTI	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	2.60

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	24.3	25.2
Rel. Humidity (%)	56.3	55.4
Air Pressure (kPa)	101.2	100.3

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013

#### Applicable Work Instruction:

RW1-08 SLM & Calibrator Verification

#### Laboratory Equipment:

B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

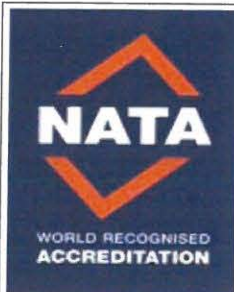
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of AS IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

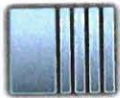
Authorized Signatory:

Print Name: Renzo Tonin

Date: 15 Feb 2016

Template Document Name: RQT-05 (rev 41) SLM ISO Verification





## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

### Certificate of Calibration Sound Level Meter

Calibration Date	9/5/2016	Job No	RB443	Operator	SN
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

#### Test Item

Instrument Make	NTI	Model	XL2	Serial No	#A2A-05060-E0
Microphone Make	NTI	Model	MC230	Serial No	#9172
Preamplifier Make	NTI	Model	MA220	Serial No	#002045
Ext'n Cable Make	Nil	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	3.03

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	24.5	25.0
Rel. Humidity (%)	55.0	56.0
Air Pressure (kPa)	101.0	101.0

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3:2013

#### Applicable Work Instruction:

RWI-08 SLM & Calibrator Verification

#### Laboratory Equipment:

B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

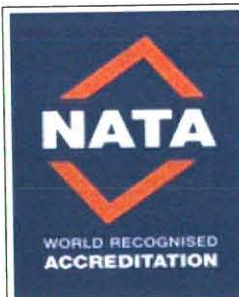
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the sound level meter to the full specifications of AS IEC 61672-1:2013 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013 or correction data for acoustical test of frequency weighting were not provided in the Instruction Manual and (b) because the periodic tests of IEC 61672-3:2013 cover only a limited subset of the specifications in AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 9th May 2016

Template Document Name: RQT-05 (rev 41) SLM ISO Verification



## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

### Certificate of Calibration Sound Level Meter

Calibration Date	3/6/2016	Job No	RB461	Operator	SN
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

#### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-05213-E0
Microphone Make	GRAS	Model	40AE	Serial No	164799
Preamplifier Make	NTI	Model	MA220	Serial No	RTA06-003
Ext'n Cable Make	Nil	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	2.6

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	24.0	24.0
Rel. Humidity (%)	55.0	56.0
Air Pressure (kPa)	101.0	101.0

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013

#### Applicable Work Instruction:

RW-08 SLM & Calibrator Verification

#### Laboratory Equipment :

B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

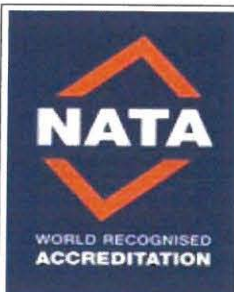
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with AS IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 11 June 2016

Template Document Name: RQT-05 (rev 41) SLM ISO Verification





## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

### Certificate of Calibration Sound Level Calibrator

Calibration Date 28/08/2015

Job No RB406

Operator SD

Client Name RENZO TONIN & ASSOCIATES (NSW) PTY LTD

Client Address LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010

#### Test Item

Calibrator Make Bruel & Kjaer  
Accessories N/A

Model Type 4231

Serial No 2162834

Class (1 or 2) 1

Temp deg C	24.7
RH %	35.8
Bar Pressure hPa	1014

#### Applicable Standards:

AS IEC 60942 2004 Australian Standard "Electroacoustics - Sound calibrators"

#### Applicable Work Instruction:

RWI-08 SLM & Calibrator Verification

#### Laboratory Equipment :

GRAS Power Module type 12AK SN 223244

B&K4226 Multifunction Acoustic Calibrator SN 2288472

Agilent Function Generator Model 33220A SN MY43004013

Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

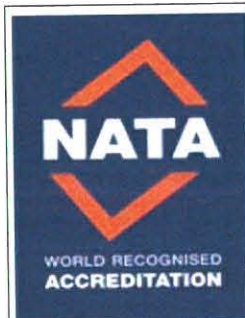
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory  
Number 14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 28 Aug 2015

Template Document Name: RQT-03 (rev 33) Calibrator Verification



## NATAcoustic

Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street., Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

# Certificate of Calibration Sound Level Calibrator

Calibration Date 18/08/2015

Job No RB400

Operator SD

Client Name RENZO TONIN & ASSOCIATES (NSW) PTY LTD

Client Address LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010

### Test Item

Calibrator Make Bruel & Kjaer

Model Type 4231

Serial No 2545601

Accessories N/A

Class (1 or 2) 1

Temp deg C	25.2
RH %	29.4
Bar Pressure hPa	1017.2

#### Applicable Standards:

AS IEC 60942 2004 Australian Standard "Electroacoustics - Sound calibrators"

#### Applicable Work Instruction:

RWI-08 SLM & Calibrator Verification

#### Laboratory Equipment :

GRAS Power Module type 12AK SN 223244

B&K4226 Multifunction Acoustic Calibrator SN 2288472

Agilent Function Generator Model 33220A SN MY43004013

Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025.

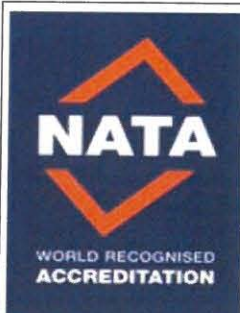
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

#### Scope:

This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.



NATA Accredited Laboratory  
Number 14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 18 Aug 2015

Template Document Name: RQT-03 (rev 33) Calibrator Verification



## NATAcoustic

### Acoustic Calibration & Testing Laboratory

Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA  
Ph: (02) 8218 0570 email: service@natacoustic.com.au website: www.natacoustic.com.au  
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

## Certificate of Calibration Sound Level Meter

Calibration Date	11/03/2015	Job No	RB335	Operator	SD
Client Name	RENZO TONIN & ASSOCIATES (NSW) PTY LTD				
Client Address	LEVEL 1 418A ELIZABETH ST SURRY HILLS 2010				

### Test Item

Instrument Make	NTI	Model	XL2	Serial No	A2A-02386-D2
Microphone Make	GRAS	Model	40AE	Serial No	#49589
Preamplifier Make	NTI	Model	MA220	Serial No	#2393
Ext'n Cable Make	NTI	Model	N/A	Serial No	N/A
Accessories	Nil			Firmware	2.72

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	25.5	26.0
Rel. Humidity (%)	48.1	46.3
Air Pressure (kPa)	101.0	101.0

#### Applicable Standards:

Periodic tests were performed in accordance with procedures from IEC 61672-3 :2013

#### Applicable Work Instruction:

RW1-08 SLM & Calibrator Verification

#### Laboratory Equipment :

B&K2636 Measuring Amplifier SN 1135806  
B&K4226 Multifunction Acoustic Calibrator SN 2288472  
Agilent Function Generator Model 33220A SN MY43004013  
Agilent Digital Multimeter Model 34401A SN MY41004386

#### Traceability:

Accredited for compliance with ISO/IEC 17025

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#### Scope:

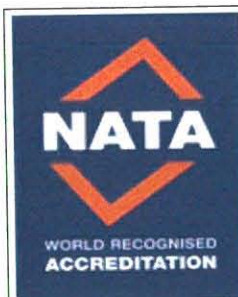
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

#### Uncertainty:

The uncertainty is stated at a confidence level of 95% using a k factor of 2.

#### Calibration Statement:

The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with AS IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of AS IEC 61672-1:2013.



NATA Accredited Laboratory Number  
14966

Authorized Signatory:

Print Name: Renzo Tonin

Date: 11 March 2015

Template Document Name: RQT-05 (rev 32) SLM ISO Verification





## Baumusterprüfbescheinigung

Type-examination Certificate

Ausgestellt für: NTi Audio AG  
*Issued to:* Im alten Riet 102  
9494 Schaan LIECHTENSTEIN

gemäß: Anlage 4 Modul B der Mess- und Eichverordnung vom 11.12.2014  
*In accordance with:* (BGBl. I S. 2010)  
Annex 4 Modul B of the Measures and Verification Ordinance dated 11.12.2014  
(Federal Law Gazette I, p. 2010)

Geräteart: Schallpegelmesser  
*Type of instrument:* Sound level meter

Typbezeichnung: **NTi Audio XL2-TA**  
*Type designation:*

Nr. der Bescheinigung: DE-16-M-PTB-0003  
*Certificate No.:*

Gültig bis: 05.04.2026  
*Valid until:*

Anzahl der Seiten: 9  
*Number of pages:*

Geschäftszeichen: PTB-1.63-4079415  
*Reference No.:*

Nr. der Stelle: 0102  
*Body No.:*

Zertifizierung: Braunschweig, 06.04.2016  
*Certification:*

Im Auftrag: Siegel  
*On behalf of PTB* Seal

Bewertung:  
*Evaluation:*

Im Auftrag  
*On behalf of PTB*

  
Dr. Ingolf Bork



  
Sonja Walther

Baumusterprüfbescheinigungen ohne Unterschrift und Siegel haben keine Gültigkeit. Diese Baumusterprüfbescheinigung darf nur unverändert weiterverbreitet werden. Auszüge bedürfen der Genehmigung der Physikalisch-Technischen Bundesanstalt.  
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## Zertifikatsgeschichte

History of the Certificate

<b>Zertifikats-Ausgabe</b> <i>Issue of the Certificate</i>	<b>Gesch.-Z.</b> <i>Reference No.</i>	<b>Datum</b> <i>Date</i>	<b>Änderungen</b> <i>Modifications</i>
DE-16-M-PTB-0003	PTB-1.63-4079415	06.04.2016	Erstbescheinigung <i>Initial certificate</i>

## Vorbemerkungen

Preliminary remarks

Für die in dieser Bescheinigung genannten Geräte gelten die folgenden wesentlichen Anforderungen gemäß

*For the instruments mentioned in this Certificate, the following essential requirements apply in accordance with*

§ 7 der Mess- und Eichverordnung vom 11.12.2014 (BGBl. I S. 2010).

*Section 6 of the Measures and Verification Act of 25.07.2013 (Federal Law Gazette – BGBl. I p. 2722) in connection with Section 7 of the Measures and Verification Ordinance of 11.12.2014 (Federal Law Gazette – BGBl. I, p. 2010).*

Für die Geräte werden zusätzlich folgende Spezifikationen angewendet:

*For the instruments, the following technical specifications will be applied additionally:*

- DIN EN 61672-1:2003-10: Elektroakustik – Schallpegelmesser – Teil 1: Anforderungen
- DIN 45657:2014-07: Schallpegelmesser - Zusatzanforderungen für besondere Messaufgaben
- DIN EN 61260:2003-03: Bandfilter für Oktaven und Bruchteile von Oktaven
- Welmec 7.2 „Softwareleitfaden“ (5/2011)

Ergebnis der Prüfung:

Der nachfolgend beschriebene technische Entwurf des Messgeräts entspricht den o. g. wesentlichen Anforderungen. Mit dieser Bescheinigung ist die Berechtigung verbunden, die in Übereinstimmung mit dieser Bescheinigung gefertigten Geräte mit der Nummer dieser Bescheinigung zu versehen.

*Conclusions of the examination: The measuring instrument's technical design which is described below complies with the above-mentioned essential requirements. With this Certificate, permission is given to attach the number of this Certificate to the instruments that have been manufactured in compliance with this Certificate.*

## Die Geräte müssen folgenden Festlegungen entsprechen:

The instruments must meet the following provisions:

## 1 Bauartbeschreibung

*Design of the instrument*

Schallpegelmesser (Klasse 1) der Bauart NTi Audio XL2-TA

### **bestehend aus:**

#### Hauptgerät:

Schallpegelmesser NTi Audio XL2-TA Audio- und Akustik-Analysator

Hardware-Version: D2 oder E0

Firmware-Version: V3.11

#### Integrale Komponenten:

Abgesetztes Mikrofon: M2230

Bestehend aus:

Mikrofonkapsel MC230

Mikrofonvorverstärker MA220

Mikrofonkabel ASD, 5 Meter

#### Optionale Komponenten:

Mikrofonwindschirm NTi Audio, schwarz, kugelförmig, Durchmesser 50 mm

Netzteil NTi Audio Exel Line

Mikrofonklemme MH01

Erweitertes Akustikpaket, als "Extend. Acoustic" im XL2-TA bezeichnet

Eingabe-Pad

#### Teilgerät:

Schallkalibrator der Bauart Larson Davis CAL200 (Akustischer Abgleich/Justierung)

#### Zusatzeinrichtungen:

Ersatzkapazität NTi-K65-15

### 1.1 Aufbau

*Construction*

Die Bauart besteht aus dem Hauptgerät NTi Audio XL2-TA und weiteren Komponenten, die integraler Bestandteil des Schallpegelmessgerätes sind. Dazu zählen insbesondere das Mikrofonkabel ASD (5 Meter) und das abgesetzte Mikrofon M2230, bestehend aus dem Vorverstärker MA220 und der Mikrofonkapsel MC230. Optional kann das NTi Audio Netzteil Exel Line, der Mikrofonwindschirm NTi Audio (50 mm), das Eingabepad und die Mikrofonklemme MH01 verwendet werden.

Die Bauart erfüllt die Anforderungen der Genauigkeitsklasse 1.

Der Schallkalibrator der Bauart CAL200 ist als Teilgerät dem Hauptgerät zugeordnet.

### 1.2 Messwertaufnehmer

*Sensor*

Als Messwertaufnehmer fungiert die Kombination aus einer Mikrofonkapsel und einem Mikrofonvorverstärker.



### **1.3 Messwertverarbeitung**

*Measurement value processing*

#### **- Hardware**

Die Messwertverarbeitung wird im Hauptgerät durchgeführt. Bestandteil der Baumusterprüfung ist die Hardware der Versionen D2 oder E0.

#### **- Software**

Für die Bauart ist die Schallpegelmesser-Firmware V3.11 Bestandteil der Baumusterprüfung.

### **1.4 Messwertanzeige**

*Indication of the measurement results*

Die Anzeige des Messergebnisses erfolgt als Sichtanzeige auf dem Display des Hauptgerätes.

### **1.5 Optionale Einrichtungen und Funktionen**

*Optional equipment and functions*

Optionale Einrichtungen sind in der Bauartbeschreibung in Abschnitt 1 gekennzeichnet. Nähere Informationen sind in den technischen Unterlagen, wie unter Abschnitt 1.6 aufgeführt, beschrieben.

### **1.6 Technische Unterlagen**

*Technical documents*

Die zu diesem Zertifikat gehörenden technischen Unterlagen sind im zugehörigen Zertifizierungsdokumentensatz in der PTB hinterlegt. Das Inhaltsverzeichnis des Zertifizierungsdokumentensatzes wurde dem Inhaber des Zertifikats zugeschickt.

*The technical documents relating to this Certificate are deposited at PTB in the respective Set of Certification Documents. The Table of Contents of the Set of Certification Documents was sent to the owner of the Certificate.*

Für die Verwendung und Prüfung wesentliche Angaben sind in der Bedienungsanleitung festgehalten. Die Bedienungsanleitung umfasst folgendes Dokument:

- Anleitung XL2-TA vom 18.01.2016 Version 3.11.00

### **1.7 Integrierte Einrichtungen und Funktionen, die nicht in den Geltungsbereich dieser Baumusterprüfbescheinigung fallen**

*Integrated equipment and functions which do not fall into the validity range of this Type-examination Certificate*

In den Geltungsbereich dieser Baumusterprüfbescheinigung fallen nur die in der Bauartbeschreibung in Abschnitt 1 genannten Einrichtungen und nur die in den gerätespezifischen Anforderungen (Abschnitt „Vorbemerkungen“) beinhalteten Funktionen.



## 2 Technische Daten

Technical data

(für eingestellten Freifeld-Übertragungskoeffizienten des Mikrofons $ M_f  = 42 \text{ mV/Pa}$ )	
Bezugswerte des Schalldruckpegels:	114 dB
Bezugsfrequenz:	1000 Hz

### 2.1 Nennbetriebsbedingungen

Rated operating conditions

#### - Messgröße

Measurand

Schalldruckpegel

#### - Messbereich

Measurement range

Für den Betrieb gelten die linearen Arbeitsbereiche, die in der in Abschnitt 1.6 festgelegten Bedienungsanleitung angegeben sind.

#### - Genauigkeitsklasse

Accuracy class

Schallpegelmesser der Genauigkeitsklasse 1 nach DIN EN 61672-1:2003-10

1/1 Oktavfilter der Genauigkeitsklasse 1 nach DIN EN 61260:2003-03

1/3 Oktavfilter der Genauigkeitsklasse 1 nach DIN EN 61260:2003-03

#### - Umgebungsbedingungen/Einflussgrößen

Environmental conditions / influence quantities

Das Gerät darf nur unter den in der Bedienungsanleitung (Abschnitt 1.6) festgelegten Umgebungsbedingungen eingesetzt werden.

### 2.2 Sonstige Betriebsbedingungen

Other operating conditions

-entfällt-



### **3 Schnittstellen und Kompatibilitätsbedingungen**

*Interfaces and compatibility conditions*

Die am Grundgerät vorhandenen Schnittstellen wurden im Rahmen der Baumusterprüfung auf ihre Rückwirkungsfreiheit geprüft. Die Schnittstellen dürfen eichtechnisch ungesichert bleiben. Die in der Bauartbeschreibung (Abschnitt 1) genannten Einzelkomponenten, Teilgeräte und Zusatzeinrichtungen sind untereinander kompatibel.

### **4 Anforderungen an Produktion, Inbetriebnahme und Verwendung**

*Requirements on production, putting into use and utilisation*

#### **4.1 Anforderungen an die Produktion**

*Requirements on production*

Der Hersteller muss sicherstellen, dass alle produzierten Einzelgeräte den vorgelegten Prüfmustern entsprechen.

#### **4.2 Anforderungen an die Inbetriebnahme**

*Requirements on putting into use*

Jedem Messgerät sind alle zur Bedienungsanleitung (Abschnitt 1.6) gehörigen Dokumente beizufügen.

Jedem Messgerät ist ein spezifisches Exemplar eines in Abschnitt 1 festgelegten Schallkalibrators beizufügen. Der Typ und die Fabriknummer des verwendeten Kalibrators sowie der anzuwendende Sollwert für die Justierung sind auf dem Hauptgerät anzugeben.

#### **4.3 Anforderungen an die Verwendung**

*Requirements for consistent utilisation*

Das Messgerät darf nur gemäß der in Abschnitt 1.6 festgelegten Bedienungsanleitung verwendet werden.

Zur Überprüfung oder Justierung der Empfindlichkeit des Messgeräts ist nur der nach Abschnitt 4.2 durch Typ und Fabriknummer festgelegte Kalibrator mit dem festgelegten Sollwert zu verwenden.

Für eine aus den möglichen Konfigurationen der Bauartbeschreibung (Abschnitt 1) gewählte Konfiguration des Messgeräts sind die zugehörigen, in der Bedienungsanleitung (Abschnitt 1.6) genannten Korrekturdaten zu berücksichtigen.

### **5 Kontrolle in Betrieb befindlicher Geräte**

*Checking of instruments which are in operation*

#### **5.1 Unterlagen für die Prüfung**

*Documents required for the test*

Bedienungsanleitung (siehe Abschnitt 1.6)