

Noise Assessment for the Proposed Bathurst Harness Racing Facility

At:-

College Road, Bathurst, NSW 2795.

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SUMMARY

An acoustical assessment of noise emissions from the proposed harness racing facility at College Road, Bathurst has been carried out. In addition to the proposed trotting track it is proposed to construct a clubhouse, stables, vehicle parking areas, and a kiosk. The exiting road traffic on College Road is low.

There is only one residential dwelling in the area which is close to the proposed site. Other residences at 146, 170, 182 and 233 College Road and 226 Gormans Hill Road are thought to be over 400 metres from the proposed track.

The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level. Hence in this case a **30 dBA** background noise level (L_{A90}) applies. This gives a noise goal ($L_{Aeq, 15 \text{ minute}}$), at the nearest residential area of **35 dBA** for 50 (or 52) sporting events per year.

The NSW Government has produced criteria for on-road traffic noise which provides noise assessment criteria for existing residences affected by additional traffic on existing sub-arterial roads (including collector roads) and local roads generated by land use developments. Here the criteria for existing sub-arterial roads ($L_{Aeq, 15 \text{ hour}}$) are **60 dBA for day-time** and ($L_{Aeq, 9 \text{ hour}}$) **55 dBA for night-time**.

A Noise Management Plan should be produced for the earthworks and construction phases.

For minor events it is anticipated that 125 vehicles will arrive or leave within any one hour time period mainly travelling along College Road from and towards Bathurst. For major events it is anticipated that the number of vehicles will be 761. The predicted noise level ($L_{Aeq, 9 \text{ hour}}$) for 125 vehicle movements is 51 dBA which meets the day and night time noise goal. For 761 vehicle movements the predicted noise level ($L_{Aeq, 9 \text{ hour}}$) is 57 dBA which meets the day time noise goal but marginally exceeds the night time goal. As this number of vehicles only occurs twice per year a significant impact is not predicted as long as local residents of College Road are kept well informed.

The calculated sound pressure level from the PA system, assuming a sound power level of 111 dBA (0 dB for loudspeaker directivity), is 47 dBA at 300 metres (the distance between the proposed PA locations and the nearest neighbouring premises in Ethelton Ave). This exceeds the 35 dBA noise goal by 12 dB. Hence mitigation is required. In College Road, at 400 metres the calculated sound pressure level from the PA system is 34 dBA (including -8 dB for loudspeaker directivity) and meets the noise goal. Crowd and on site traffic noise at minor meetings will not be above the 35 dBA noise goal at 300 metres. For major meetings crowd noise is likely to exceed the 35 dBA noise goal for short periods during races. As this only occurs twice per year no significant impact is predicted as long as all local residents are kept well informed.

Calculations show that all of the noise goals can be met at the proposed site with the use of a well designed public address system. The minor exception is for road traffic using College Road during the bi-annual major events.

1. INTRODUCTION

Noise and Sound Services was requested by Geolyse Pty Ltd of 154 Peisley Street, Orange NSW 2800 on behalf of Harness Racing NSW of 22 Meredith Street, Bankstown, NSW 2200 to carry out an independent and accurate acoustical assessment. This is for potential noise emissions from the proposed harness racing facility at College Road, Bathurst.

It is proposed to replace the existing harness racing facility which is at the Bathurst Showground, Kendall Avenue to the College Road site. The noise goals have been set inline with the NSW Government's Industrial Noise Policy.

2. HARNESS RACING OPERATION

2.1 Site Description

The proposed harness racing facility is on land bounded by College Road, Ethelton Avenue and the Main Western Railway Line, Bathurst – Encompassing Lot 14 in DP787842, Lot 10 in DP717095 and Lot 6 in DP540566.

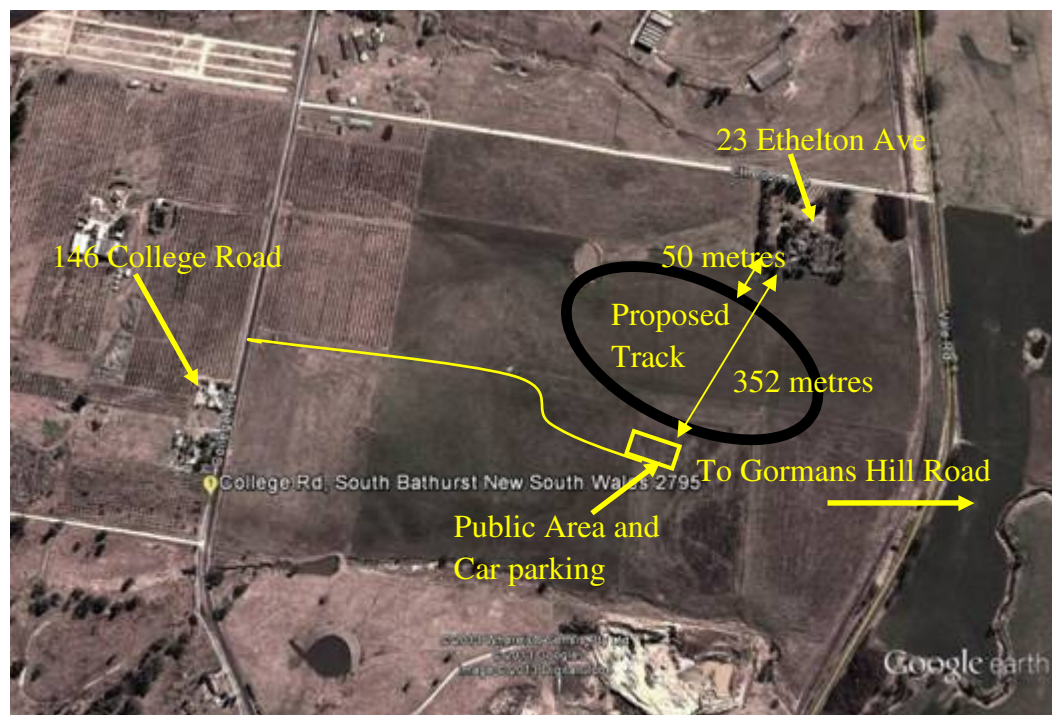


Figure 1. Site Plan Showing Approximate Location of the Proposed Track and Neighbouring Residential Premises. Not to Scale. All Dimensions are Approximate. Source: Google Earth.

In addition to the proposed trotting track it is proposed to construct a clubhouse, stables and vehicle parking areas. An outdoor food stall is in the form of a kiosk which is proposed to be situated between the clubhouse and the stables. For more details see McKinnon Design drawing number da1 for job number 11114, issue C dated 08/05/2013). Outdoor play equipment (when hired in), would be situated on the western side of the marquee. The children's entertainment area will only be operational at the very large meetings, approximately 5 times a year.

The exiting road traffic on College Road is low. The Geolyse Traffic Impacts Assessment (Ref: 211291_REO_003_DOCX) gives the relevant peak hour traffic volumes on College Road of:-

- Noon to 1:00 pm Southbound - 34 Vehicles per hour
- 5:00 pm to 6:00 pm Southbound - 8 Vehicles per hour
- 6:00 pm to 7:00 pm Northbound - 4 Vehicles per hour
- 10:00 pm to 11:00 pm Northbound - 1 Vehicle per hour

The area is rural with few residential premises in the neighbourhood. There is only one residential dwelling which is close to the proposed site, which is 23 Ethelton Avenue to the north/north-east of the site (see Figure 1 above). This is approximately 50 metres distance to the edge of the proposed track and approximately 352 metres distance to the proposed public area. Other residences at 146, 170, 182 and 233 College Road and 226 Gormans Hill Road are thought to be over 400 metres from the proposed track.

2.2 Site Operation

The proposed facility will be operative between the hours of 7:00 am and 11:00 pm. The facility is expected to have 52 meetings per year, 50 of these will have up to 300 attendees, with 2 of the meetings having between 1000 and 2000 attendees.

TABLE 1 – BREAKUP OF PROPOSED MEETINGS

Day or Night	Day of Week	Number of Meetings
Day	Thursday	2
	Friday	2
	Sunday	4
	Monday	1
Night	Wednesday	30
	Thursday	1
	Friday	6
	Saturday	5
	Monday	1

Source: Bathurst Harness Racing.

The two major events are the ‘Carnival of Cups’ on the 26th December and the ‘Gold Crown Final Night’ on the last Saturday in March. The breakup of the meetings by day of the week and day or night is provided in Table 1 above. The figures in the table show that Wednesday nights are the most common meetings scheduled with Tuesday being the only day of the week with no meetings.

Bathurst Harness Racing has stated that most attendees come to the site within a time frame of 30 minutes before the first race and leave 30 minutes after the last race. Staff and trainers normally arrive and depart 1 hour before the first race and 1 hour after the last race. This will mean that peak traffic flows will be from noon to 1:00 pm and 6:00 pm to 7:00 pm for day meetings and 5:00 pm to 6:00 pm and 10:00 pm to 11:00 pm for night meetings.

The race finish times can be variable. However the reported last race times from 1 July 2012 to March 2013 are shown in Table 2 below.

TABLE 2 – FINISH TIMES OF MEETINGS

Month	Date/ Finish Time							
July	4 th	11 th	18 th	25 th				
Finish (pm)	8:40	8:40	8:40	9:10				
August	1 st	6 th	11 th	15 th	22 nd	29 th		
Finish (pm)	8:40	5:43	7:10	9:10	9:40	10:37		
Sept	5 th	14 th	29 th					
Finish (pm)	9:10	10:00	9:30					
Oct	12 th	17 th	31 st					
Finish (pm)	10:00	9:10	8:43					
Nov	9 th	14 th	21 st	28 th				
Finish (pm)	10:00	9:40	9:40	10:10				
Dec	5 th	14 th	19 th	26 th				
Finish (pm)	10:37	10:42	10:40	10:38				
Jan	2 nd	11 th	19 th	26 th				
Finish (pm)	9:10	5:23	11:00	9:40				
Feb	8 th	13 th	20 th	27 th				
Finish (pm)	10:40	9:43	10:10	10:37				
Mar	6 th	13 th	20 th	21 st	21 st	25 th	27 th	30 th
Finish (pm)	10:40	10:12	10:12	10:17	10:50	6:00	10:42	9:43

Based on the above 40 meetings conducted since 1 July 2012, 24 meetings finished before 10.00 pm. Moving forward for the remaining months of April to June 2013 those finishing times would be expected again to finish before 10.00 pm and would be similar to the winter months of July and August. This would equate to 36 meetings out of the 52 finishing before 10.00 pm over the entire season (70%).

3. CRITERIA

In NSW the only mandatory regulation for noise is subjective and made under the Protection of the Environment Operations Act 1997. However there are objective, non mandatory NSW Government guidelines published by the Environment Protection Authority (EPA), division of the Department of Environment and Heritage. Scheduled premises can be issued with an Environment Protection licence which could include the provision of mandatory noise limits.

3.1 Protection of the Environment Operations Act 1997

Noise regulations are made under the Protection of the Environment Operations Act 1997 (POEO) NSW with the objective of controlling noise in residential areas ('neighbouring noise'). One of the main features of the Act is to allocate powers of enforcement for Councils, the police, the NSW Department of the Environment and Conservation and the Waterways Authority of NSW to prevent and minimise pollution including the emission of offensive noise.

The POEO Act defines offensive noise as noise that:

- (a) by reason of its level, nature, character or quality, or time at which it is made or any other circumstances:
 - i. is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or
 - ii. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or
- (b) is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in any circumstances prescribed by the regulations.

The POEO Act provides for a range of notices that may be issued when an unacceptable level of noise has been emitted.

3.2 Industrial Noise Policy

The assessment procedure for industrial noise sources given in the Industrial Noise Policy (2000) has two components:-

- **Controlling intrusive noise impacts; and**
- **Maintaining noise level amenity**

In assessing the noise impact of industrial or commercial noise sources all components must be taken into account for residential receivers, but, in most cases, only one will become the limiting criterion. The project-specific noise goals reflect the most stringent noise level requirement. It is derived from intrusive and amenity criteria and this is used to set a benchmark against which noise impacts and the need for noise mitigation are assessed.

3.1.1 Intrusive Noise Impacts

The NSW Government in their Industrial Noise Policy (2000) states that: - *‘The intrusiveness of an industrial noise source may generally be considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (represented by the L_{Aeq} descriptor) measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB.’* Thus, when considering the environmental consequence of noise from a specific source, any increase above the background sound pressure level, which exceeds 5 dB, may be offensive.

The perception of noise and its level of offensiveness depends greatly on the broader situation within which it occurs. Noise that might intrude into a resting or sleeping place may be found offensive whereas the same noise occurring in a market place or noisy working area may pass unnoticed. The concept of *‘background + 5 dB’* derives from this consideration.

The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level.

Where the noise source contains characteristics such as prominent tonal components, impulsiveness, intermittency, irregularity or dominant low-frequency, content adjustments to the measured level are applied to allow for the increase in the annoyance value.

3.1.2 Protecting Noise Amenity

In the Industrial Noise Policy it is stated that *‘To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.1.’*

The relevant parts of the NSW Government’s recommended levels are given in Table 3 below:-

TABLE 3 – RECOMMENDED NOISE LEVELS FROM INDUSTRIAL NOISE SOURCES

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} Noise Level (dBA)	
			Acceptable	Recommend Maximum
Residence	Rural	Day	50	55
		Evening	45	50
		Night	40	45
Residence	Suburban	Day	55	60
		Evening	45	50
		Night	40	45
Residence	Urban	Day	60	65
		Evening	50	55
		Night	45	50
Residence	Urban/Industrial Interface – for existing situations only	Day	65	70
		Evening	55	60
		Night	50	55
Commercial premises	All	When in use	65	70
Industrial premises	All	When in use	70	75

Hence the acceptable noise level ANL (L_{Aeq}) for rural areas is **50 dBA** day-time; **45 dBA** evening-time and **40 dBA** night-time. Day-time is defined as 07:00 to 18:00 hours, evening-time is 18:00 to 22:00 hours and night-time is defined as 22:00 hours to 07:00 hours.

3.1.3 Modifying Factor Adjustments

Where a noise source contains certain characteristics, such as tonality, impulsiveness, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same sound pressure level. A correction should be applied to both the intrusive and the amenity measurement before a comparison is made with the criteria. An abbreviated version of the correction factors is shown in Table 4 below:-

TABLE 4 – MODIFYING FACTOR CORRECTIONS

Factor	Assessment/ Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band or narrow band analysis	Level of one third octave band exceeds the level of the adjacent bands by 5 dB or more (above 400 Hz)	+ 5 dB	Narrow band frequency analysis may be required to precisely detect occurrence
Low Frequency Noise	Measurement of C-weighted and A-weighted Level	Measure/assess C and A-weighted levels over same time period. Correction to be applied if the difference between the two is 15 dB or more	+ 5 dB	C-weighted is designed to be more responsive to low frequency noise
Impulsive Noise	Time weighting fast and impulse	If the difference in the A weighted maximum levels between 'fast' and 'impulse' are greater than 2 dB	Apply the difference in measured levels as the correction up to a maximum of 5 dB	Impulse time weighting is characterised by a short rise time (35msec) compared to 125msec for 'fast'.
Intermittent Noise	Subjectively Assessed	Level varies by more than 5 dB	+ 5 dB	Adjustment to be applied for night time only

3.3 NSW Noise Guide For Local Government

Noise guidelines for a sporting event are provided in the form of a case study in the NSW Government's Noise Guide for Local Government (October 2010). In the case study (motor sport facility) the schedule is based on achieving a balance between how loud the events are likely to be and how often they occur. Where the noise level achieves the existing background noise level ($L_{A90, 15 \text{ minute}}$) plus 5 dB, fifty events would be acceptable in any 12-month period. Where the background noise level plus 5 dB cannot be achieved the number of allowable events is reduced.

The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level. Hence in this case a **30 dBA** background noise level (L_{A90}) applies. This gives a noise goal ($L_{Aeq, 15 \text{ minute}}$), at the nearest residential area of 35 dBA for 50 (or 52) events per year. The number of allowable events is reduced by a multiplication ratio as given in Part 3, page 3.29, Figure 3.4 of the Noise Guide Noise for Local Government (October 2010). This is reproduced in Table 5 below.

TABLE 5. EVENT MULTIPLICATION RATIOS

Noise Level above Background (dB)	Annual Event Ratio (AER)	Permitted Number of Annual Events (50/AER)
5	1	50
10	3	16
15	5.5	9
20	6.3	8
25	8.2	6
30	10	5
35	12	4

Source: Noise Guide Noise for Local Government (October 2010).

3.4 NSW Government Criteria for Road Traffic Noise

The NSW Government has produced criteria for on-road traffic noise - the NSW Road Noise Policy (RNP) July 2011. This provides noise assessment criteria for existing residences affected by additional traffic on existing sub-arterial roads and local roads generated by land use developments (Table 3 of the RNP).

Here the criteria for existing sub-arterial roads ($L_{Aeq, 15 \text{ hour}}$) are **60 dBA for day-time** (7:00 hours until 22:00 hours) and ($L_{Aeq, 9 \text{ hour}}$) **55 dBA for night-time** (22:00 hours until 07:00 hours). For local roads the criteria ($L_{Aeq, 1 \text{ hour}}$) are **55 dBA for day-time** (7:00 hours until 22:00 hours) and **50 dBA for night-time** (22:00 hours until 07:00 hours). In assessing noise level at residences, the noise level is to be measured at a height of 1.5 metre and 1 metre from the façade that is most exposed to traffic noise.

Bathurst Council's Development Engineer David McKellar has advised that: "College Road is a Collector Road through the residential area and beyond the residential area is a Rural Roadway." Collector roads are now referred to as sub-arterial roads in the new NSW Road Noise Policy – this is confirmed on the bottom of page 10 of the Policy. Hence this noise assessment is based on Council's advice, that College Road is a collector road through the residential area. Therefore the site specific on-road traffic noise criteria are **60 dBA for day-time** ($L_{Aeq, 15 \text{ hour}}$) and **55 dBA for night-time** ($L_{Aeq, 9 \text{ hour}}$).

3.5 Interim Construction Noise Guideline

A Noise Management Plan should be produced for the earthworks and construction phases. This should be in line with the NSW Government's document Interim Construction Noise Guideline (DECC 2009/265). The Noise Management Plan will need to be in conformance with the quantitative assessment method as given in Section 4 of guideline. Full details of the plant and machinery and proposed times of use that is proposed to be used will be required to complete this assessment. A geotechnical report that itemises equipment to be used for any earthworks and construction works will be required to complete the Noise Management Plan.

4. BACKGROUND AND SOURCE NOISE MEASUREMENTS

This section describes the existing background and ambient noise in the area and source noise measurements carried out at an existing harness racing facility.

4.1 Background Noise

Continuous monitoring of the existing background and ambient noise has been carried out by others, see Wilkinson Murray Report "*Bathurst Harness Racing – Track Relocation Report Number 12088 Version A dated July 2012*" and PKA Acoustic Consulting Report "*Acoustic Report Review Bathurst Harness Racing Project 213 008 dated March 2013*".

The Wilkinson Murray Report states that a rating background noise level (RBL) at 23 Ethelton Avenue, Bathurst was 38 dBA whereas the PKA Acoustic Consulting Report found Rating Background Levels of 27 dBA, 31 dBA and 32 dBA for night, evening and daytime respectively.

The existing background noise level can vary from week to week and month to month due to varying weather conditions, fauna activity and varying road traffic conditions. Hence, rather than carrying out a third set of measurement the default condition as follows has been adopted for this assessment. The NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level. Hence in this case a **30 dBA** background noise level (L_{A90}) applies. This provides maximum assessment benefit for residential neighbours, is only 1 dB or 2 dB less than the background found by PKA Acoustic Consulting, and hence does not significantly disadvantage the developer.

4.2 Source Noise Measurement – Instrumentation

The instrumentation used for the attended noise measurement consisted of a Brüel and Kjær sound level meter model 2250 (serial no. 2446904). This meter conforms to Australian Standard AS IEC 61672.1-2004: '*Electroacoustics - Sound level meters – Specifications*', as a class 1 precision sound level meter and has accuracy suitable for both field and laboratory use.

The calibration of the meter was checked before and after the measurement period with a Brüel and Kjær acoustical calibrator model 4231 (serial no. 2445349). No significant system drift occurred over the measurement periods. The sound level meter and calibrator have been checked, adjusted and aligned to conform to the Brüel and Kjær factory specifications within the last 24 months and issued with a conformance certificate. The internal test equipment used is traceable to the National Measurement Laboratory at C.S.I.R.O., Lindfield, NSW, Australia.

4.3 Noise Measurement Procedure – Harness Racing Event

Free field, attended sound pressure level measurements were taken at a Harness Racing Event at Menangle, NSW on Sunday 28th April 2013. This site was chosen as it is in a similar rural area to the proposed site. The 'A' frequency weighting and the 'fast' time weighting were used exclusively. The measurements were taken at approximately 165 metres from the position of the nearest loudspeaker. There were approximately 14 loudspeakers on the track but most were acoustically shielded by the facility building as shown in Figure 2 below.

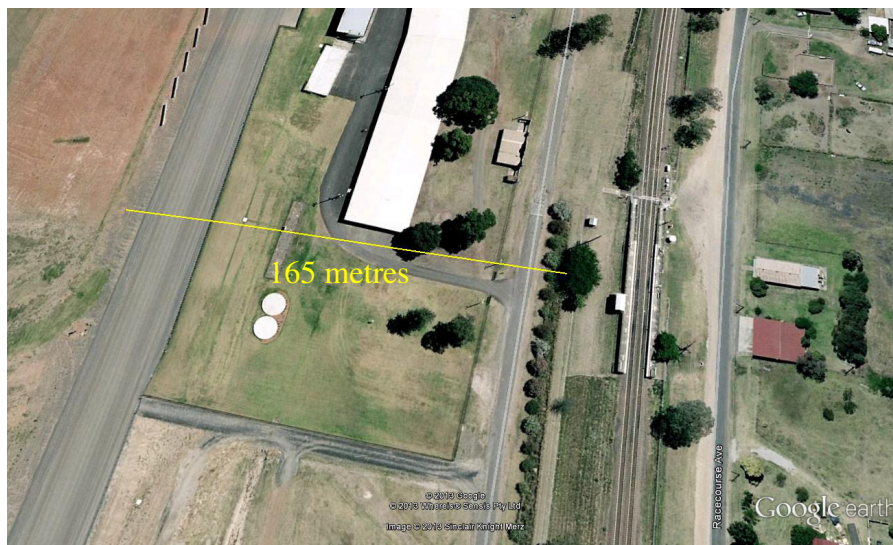


Figure 2. Site Plan Showing Approximate Location of Measurements at Menangle Race Track. Source: Google Earth.

The weather during the attended measurements was sunny, dry and warm (27°C) with negligible wind (mostly calm with occasional ground speeds easterly gusts less than 2 m/s). Care was taken to exclude any extraneous noise such as rail noise, station public address (PA) announcements, aircraft and nearby bird noise. The sound level meter was in pause mode during extraneous noise events.

4.4 Noise Measurement Procedure – Road Traffic

College Road, South Bathurst is a collector road which has a low flow rate of road traffic. Road traffic noise is highly predictable for relatively high flows rates using basic formulae as given, for example, in the Calculation of Road Traffic Noise from the UK Department of Transport and Welsh Office (1988). However low flow rates are not predictable using these formulae. Therefore free field, attended sound pressure level measurements were taken in College Road (approximately 220 metres south of Lloyds Road) on Thursday 25th April 2013 to establish the existing road traffic noise. This was at approximately 6 metres from the kerb (edge of the nature strip/residential properties) during two sample car drive-bys. The 'A' frequency weighting and the 'fast' time weighting were used exclusively. The weather during the attended measurements was sunny, dry and warm with negligible wind. These measurements were taken in terms of a summation (sound exposure level – L_{AE}) rather than an average (L_{Aeq}) of the drive by.

4.5 Noise Measurement Results – Harness Racing Event

The 15 minute energy average sound pressure level ($L_{Aeq, 15 \text{ minute}}$) at the Menangle Harness Racing Event on Sunday 28th April 2013 varied between 48 dBA with no racing or public address (PA) and 53/54 dBA with public address (PA) commentary and announcements. This was at a distance of approximately 165 metres and direct line-of-sight from one loudspeaker to the measurement point. During the racing the 2.7 minute energy average sound pressure level ($L_{Aeq, 2.7 \text{ minute}}$) from the PA increased to 57 dBA. The PA sound power level ($L_{Aeq, 15 \text{ minute}}$) is calculated to be approximately 111 dBA. The crowd noise was not audible at the 165 metre measurement position except for a few seconds near to the end of each race. The frequency of the noise was predominately in the octave bands centred 500 Hz to 4 kHz.

4.6 Noise Measurement Results – Road Traffic

The sound exposure level (L_{AE}) at approximately 6 metres from the kerb side was 75 dBA for both drive-bys.

5. SITE SPECIFIC NOISE GOALS AND PREDICTED NOISE LEVELS

This section covers the site specific noise goals and noise predictions for the proposed facility.

5.1 Noise Goals

As mentioned above the NSW Government state that where the existing background noise level at the receptor is less than 30 dBA, as may occur in a quiet suburban or rural area, then 30 dBA should be assumed to be the existing background noise level. Hence in this case a **30 dBA** background noise level (L_{A90}) applies. This gives a noise goal ($L_{Aeq, 15 \text{ minute}}$) for all residential areas of **35 dBA**.

5.2 Prediction of Noise Levels – Harness Racing Event

The noise level measurements have been used to calculate the noise level at the nearest residential premises using the International Standard ISO 9613-2 (1996(E)) '*Acoustic – Attenuation of sound during propagation outdoors...Part 2 General method of calculation*'. This incorporates geometric divergence ($20 \log_{10} (D1/D2)$) attenuation due to the ground effects and atmospheric absorption.

5.3 Prediction of On-Road Spectator Traffic Noise

The predictions of noise levels from road traffic using the proposed facilities have been calculated using basic formulae as given in the Calculation of Road Traffic Noise from the UK Department of Transport and Welsh Office (1988).

It is reported that spectator traffic will mainly travel along College Road from and towards Bathurst. For minor events it is anticipated that 125 vehicles will arrive or leave within any one hour time period. For major events it is anticipated that 761 vehicles will arrive or leave within any one hour time period. The predicted night time noise level ($L_{Aeq, 9 \text{ hour}}$) therefore, for 125 vehicle movements at an estimated distance of 12 metres from the nearest local residences and at a speed of 60 kilometres per hour, gives the results as shown in Table 6 below. The one hour average ($L_{Aeq, 1 \text{ hour}}$) will be 9 dB to 10 dB higher than the 9 hour average ($L_{Aeq, 9 \text{ hour}}$).

TABLE 6 – PREDICTED ROAD TRAFFIC NOISE LEVELS AT THE NEAREST RESIDENTIAL RECEIVERS

Maximum Predicted Vehicle Movements per hour using the Proposed Facilities	Road Traffic Noise Level at Nearest Residences ($L_{Aeq, 9 \text{ hour}}$)
125	51 dBA
761	57 dBA

The existing night time façade road traffic noise ($L_{Aeq, 1 \text{ hour}}$) is between 36 dBA for one vehicle in one hour to 42 dBA for four vehicles in one hour (see section 2.1 above).

A management plan and control is recommended to ensure that spectator vehicles are driven in a careful and quiet way whilst parking on site and when arriving and leaving the venue.

6. ASSESSMENT

The calculated sound pressure level from the PA system, assuming a sound power level of 111 dBA and 0 dB for directivity (i.e. direct line-of-sight), would be 47 dBA at 300 metres (the distance between the proposed PA locations and the nearest neighbouring premises). This exceeds the 35 dBA noise goal by 12 dB. Hence mitigation is required. At 400 metres the calculated sound pressure level from the PA system, assuming a sound power level of 111 dBA and -5 dB for directivity would be 34 dBA and meet the noise goal. Crowd and on site traffic noise at minor meetings will not be above the 35 dBA noise goal at 300 metres. For major meetings crowd noise is likely to exceed the 35 dBA noise goal for short periods during races. As this only occurs twice per year no significant impact is predicted as long as all local residents are kept well informed. Crowd noise at major meetings can be met at all times with the construction of a noise barrier (see section 7.2 below).

The predicted noise level ($L_{Aeq, 9 \text{ hour}}$) for 125 vehicle movements (along College Road and route to Bathurst) is 51 dBA which meets the day and night time noise goal, even though there will be a large increase in night time road traffic noise for a short period (e.g. 1 hour) after the close of the event. Here the 1 hour noise level ($L_{Aeq, 1 \text{ hour}}$) will be approximately 60 dBA and minor impact is predicted. For 761 vehicle movements the predicted noise level ($L_{Aeq, 9 \text{ hour}}$) is 57 dBA which meets the day time noise goal but marginally exceeds the night time goal. Outside night time noise levels ($L_{Aeq, 9 \text{ hour}}$) above 55 dBA are known to be the cause of annoyance and sleep disturbance. However, as this number of vehicles only occurs twice per year, only minor impact is predicted as long as all local residents along College Road are kept well informed with times and dates.

7. MITIGATION

Noise mitigation can be carried out at source, at the transmission path, at the receiver or a combination of these.

7.1 Noise Mitigation at Source

Noise mitigation at source is the preferred option. An investigation (by a professional PA specialist company) should be carried out to find a PA system that will adequately cover the audibility of the spectator's area whilst producing the lowest feasible sound power level. This would require a distributive multi-loudspeaker system; the loudspeakers should be situated as close to the audience as practicable (including in the clubhouse area), the loudspeakers can be selected to be highly directional and angled downwards to provide higher levels at the spectator's area whilst minimising sound spill. Electronic compression and peak limiting should be built in to the sound system to control audio dynamics. If a sound system with a sound power level of 99 dBA could be installed the noise goal could be met under neutral weather conditions.

7.2 Noise Mitigation at the Transmission Path

Noise mitigation at the transmission path would involve a sound barrier in the form of an earth bund. It is calculated that a 4 metre high barrier (earth bund or combination of earth bund and signage fence), 200 metres long (i.e. following the length of that side of the track) and situated strategically between the trotting track and the residence at 23 Ethelton Avenue will provide a calculated 6 dB sound attenuation under neutral weather conditions. Construction of the earth bund could be carried out during the proposed earthworks for the track. Any sound barrier must be without any holes or gaps including at the threshold.

7.3 Noise Mitigation at the Receiver

Noise mitigation at the receiver is the least favourable option as, in this case, it can only be used to sound insulate a dwelling's internal areas. However upgrading the glazing of the dwelling at number 23 Ethelton Avenue could significantly reduce the internal noise level, possibly down to inaudibility or near inaudibility within this residence. An acoustically insulated building must be kept virtually air tight to exclude external noise. Therefore mechanical ventilation or air-conditioning will be needed to provide fresh air to control temperatures. Specific ventilation requirements are outside of our scope of expertise, however the requirements for indoor-air quality are given in Australian Standard AS 1668.2 -2002, *"The use of ventilation and air-conditioning in buildings - Ventilation design for indoor air contaminant control."*

7.4 Community Relations

It is essential that the management of the venue maintains a good relationship with local residents. Information on any unusual events should be provided to all local neighbours well in advance of the proposed activities. This should include ensuring that all affected local residents are fully informed about event operations which are likely to occur, including times when the noise events will start and finish together with a telephone 'hot-line'. Finish times must then be strictly adhered to.

If people are informed of the times that events will start and finish, the stress and hence complaints can be significantly reduced (predictability). In addition a contact phone number should be given to local residents (controllability). Should a complaint occur it is imperative that the complainant is treated with the utmost courtesy even if the complainant appears to be stressed. All reasonably practical steps should be taken to reduce the noise in the event of a complaint. If it is not practical to reduce the noise, a full and fair explanation of the event taking place, the reason for the noise and the time when it will stop should be given to the complainant.

8. CONCLUSIONS

An acoustical assessment of noise emissions from the proposed harness racing facility at College Road, Bathurst has been carried out.

Calculations shows that all of the noise goals can be met at the proposed site with the use of a well designed public address system. The minor exception is for road traffic using College Road during the bi-annual major events.

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Important Note. All products and materials suggested by 'Noise and Sound Services' are selected for their acoustical properties only. All other properties such as air flows, aesthetics, chemical, corrosion, combustion, construction details, decomposition, expansion, fire rating, grout or tile cracking, loading, shrinkage, smoke, ventilation etc are outside of 'Noise and Sound Services' field of expertise and **must be** checked with the supplier or suitably qualified specialist before purchase.