ACOUSTICS AND AIR

WAGGA WAGGA HARNESS RACING

NOISE IMPACT ASSESSMENT

REPORT NO. 13330
VERSION A

SEPTEMBER 2014

PREPARED FOR

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DOCUMENT CONTROL

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A	Final	4 September 2014	Nic Hall	John Wassermann

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GLOSSARY OF ACOUSTIC TERMS

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

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

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

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

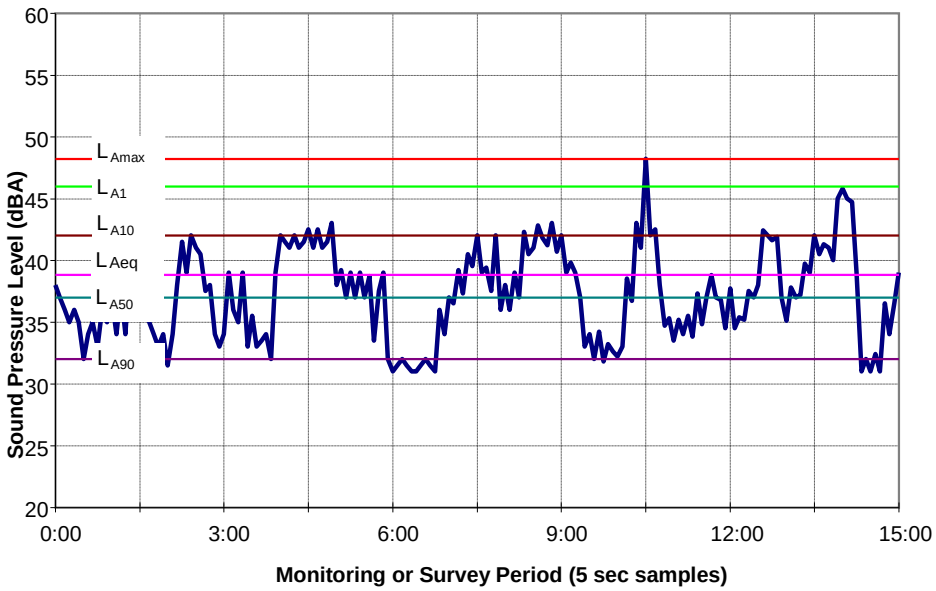
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

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

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

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

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION AND PROJECT DESCRIPTION

1.1 Introduction

The Wagga Wagga Harness Racing Club (WWHRC) are proposed to establish a new harness racing track on a parcel of rural land approximately 6 kilometres north of the Wagga Wagga CBD.

Wilkinson Murray Pty Ltd (WMPL) has been commissioned to conduct an assessment of potential noise impacts associated with the construction and operation of a new harness racing track.

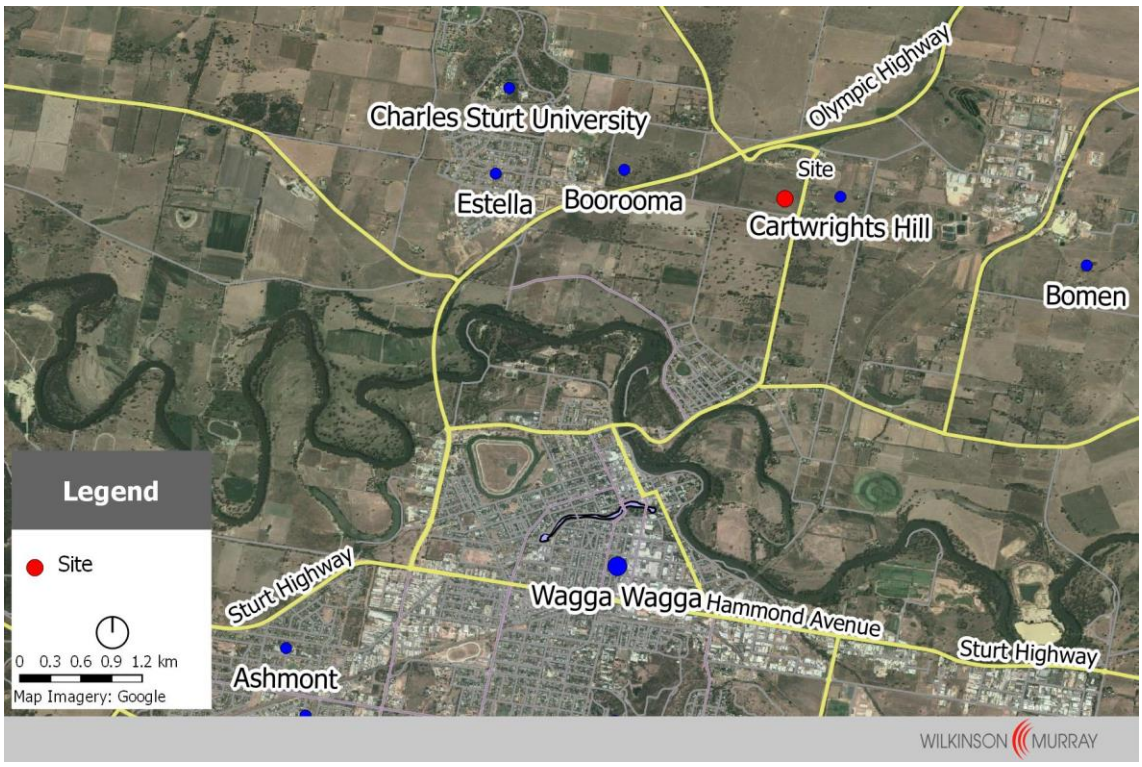
This assessment has been conducted in accordance with the following NSW EPA guidelines:

- *Noise Guide for Local Government* (EPA, 2013);
- *NSW Industrial Noise Policy* (EPA, 2000);
- *NSW Road Noise Policy* (DECCW, 2011); and,
- *Interim Construction Noise Guideline* (DECC, 2009)

1.2 Site Location

The site is located on the north western corner of the intersection of Hampden Avenue and Cooramin Street at Cartwrights Hill, approximately 6 kilometres to the north of Wagga Wagga. The site location is shown in Figure 1-1.

Figure 1-1 Site Location



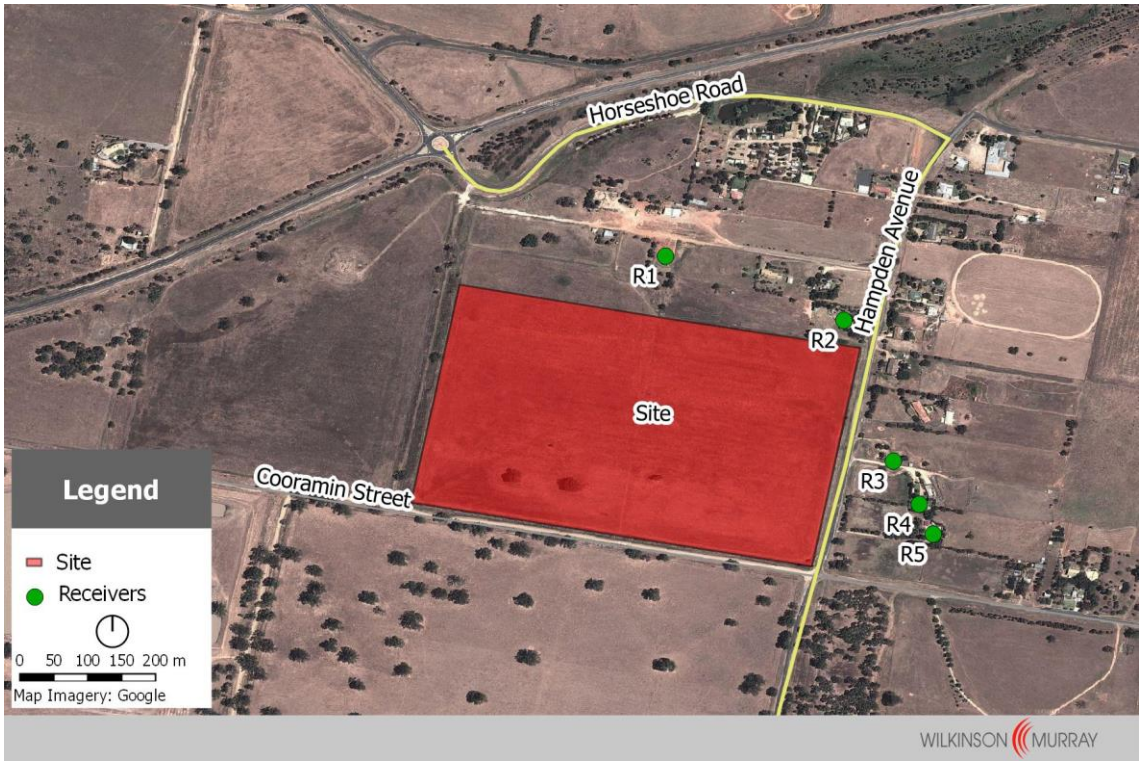
1.3 Surrounding Land Use and Sensitive Receivers

The land use surrounding the site is predominantly rural. The land to the south and west of the site is vacant rural land, while a number of rural dwellings are located to the north and east of the site. The most affected receivers have been identified and are presented in Table 1-1 and Figure 1-2.

Table 1-1 Sensitive Receivers

Receiver	Address
R1	404 Hampden Avenue
R2	390 Hampden Avenue
R3	371 Hampden Avenue
R4	369 Hampden Avenue
R5	355 Hampden Avenue

Figure 1-2 Sensitive Receivers



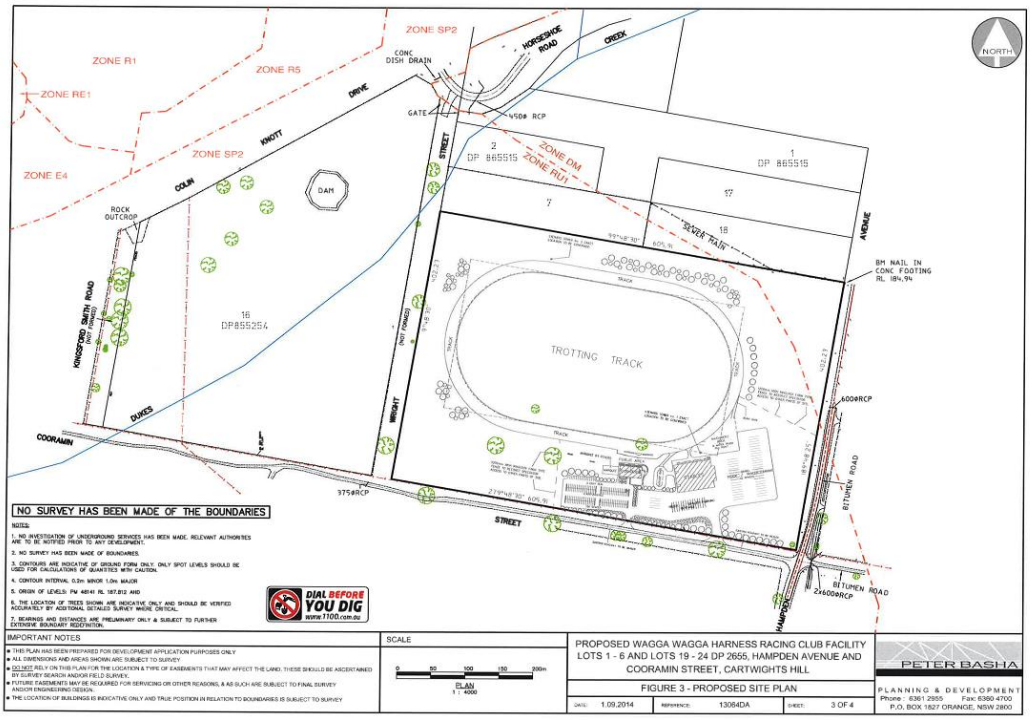
1.4 Project Description

The proposed project involves construction of the following:

- New harness racing track and support structures including track lighting, stewards towers and podium;
- Clubhouse including:
  - Lounge, function and meeting rooms and tote
  - Kitchen and bar facilities and associated cool room and dry store
  - Administration area comprising offices and reception
  - Male and female toilets
  - External grandstand style seating and elevated viewing platform
  - Broadcast box on first floor
- Stable complex comprising:
  - 89 stables
  - Public viewing aisles
  - Wash bays, swab bays and vet room
  - Male and female toilets and change rooms
  - Office, stewards room and owner's/trainer's room
- External support areas including parade ring, marquee area and machinery area; and,
- Vehicle areas including 150 space car-park and 60 space truck/trailer parking.

The proposed site plan is shown in Figure 1-3.

Figure 1-3 Site Plan



1.4.1 Typical Operations

The annual racing calendar for the WWHRC varies from year to year, and typically involves approximately 35 racing events per year.

To provide an indication of the typical hours of operation for the site, the 2014 racing calendar consists of:

- 20 daytime meetings, run during the hours 1.00pm til 6.00pm;
- 4 twilight meetings, run during the hours 5.30pm til 8.00pm; and,
- 11 night meetings, run during the hours 6.30pm and 10.30pm.

No events are expected to occur after midnight or before 7.00am.

Spectator attendance at regular race meetings is typically around 150 people. The WWHRC conducts two drawcard race meetings each year which are:

- The Carnival of Cups which is held in March and attracts approximately 2000 people; and,
- The Saturday Night May Meeting which attracts approximately 1000 people.

In addition to the race meetings identified above, it is hoped that the new facility attracts other events such as:

- Markets;
- Car shows;
- Social events and functions within the clubhouse building;
- Cycling races; and
- Other equine events such as gymkhanas and stock horse events.

1.5 Assessment Methodology

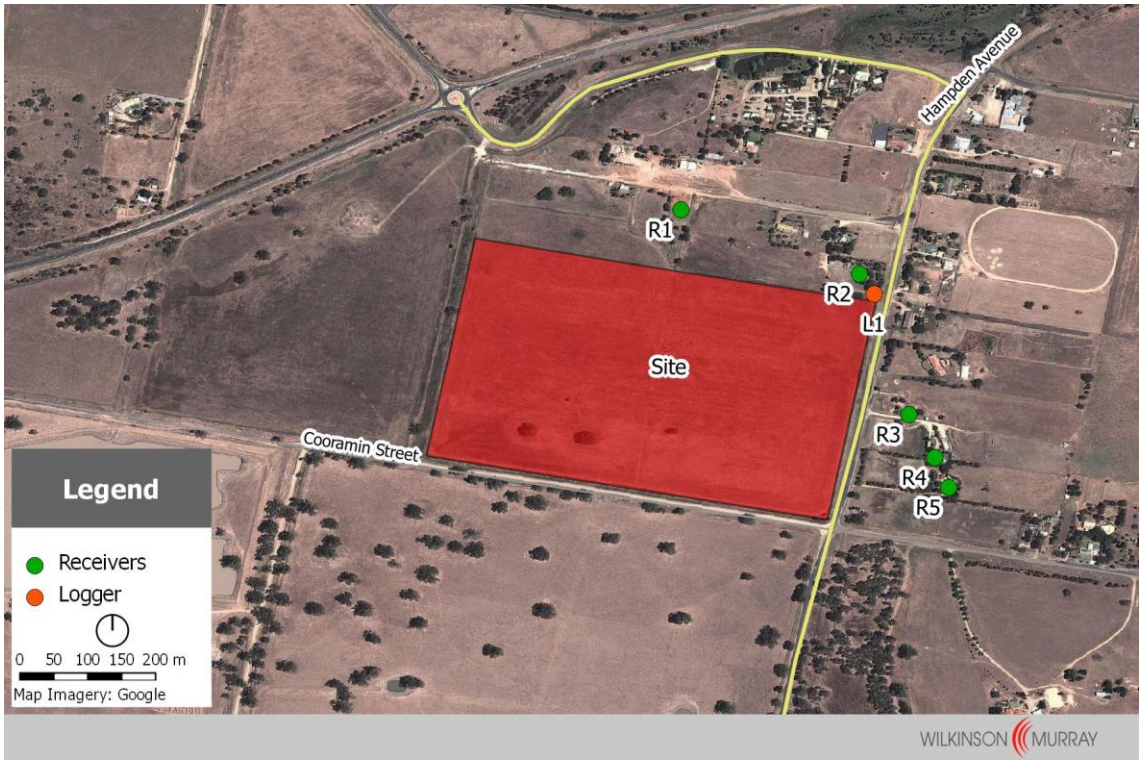
The focus of the following noise impact assessment is typical race meetings and other small events which attract in the order of 100 – 200 spectators/patrons. This represents the vast majority of the intended use of the proposed development.

Consideration will also be given to extraordinary events such as the two annual drawcard race meetings. The assessment of these events will not be as detailed as that for typical events, as it is only intended to provide a conservative estimate of maximum noise levels at receivers as opposed to demonstrating compliance with typical noise criteria. It is expected that noise levels at nearby receivers from extraordinary events will exceed typical noise criteria, and that an Events Noise Management Plan would be required to allow these events to be held.

2 EXISTING AMBIENT NOISE LEVELS

To establish existing noise levels in the area surrounding the development, unattended noise monitoring was conducted between 6 and 15 December 2013. The noise monitoring location is shown in Figure 2-1.

Figure 2-1 Noise Monitoring Location



The noise monitoring equipment used for these measurements consisted of an environmental noise logger set to A-weighted, fast response. This equipment is capable of remotely monitoring and storing noise level descriptors for later detailed analysis. The equipment calibration was checked before and after the survey and no significant drift was noted.

From the background noise levels (L_{A90}) the Rating Background Levels (RBLs) were determined using the methodology recommended in the NSW *Industrial Noise Policy*.

The existing ambient noise levels are presented in Table 2-1. Daily plots of the noise logger data are presented in Appendix A.

Table 2-1 Existing Ambient Noise Levels

Time Period	Noise Levels (dBA)	
	L_{Aeq}	RBL
Day (7.00am – 6.00pm)	54	36
Evening (6.00pm – 10.00pm)	54	33
Night (10.00pm – 7.00am)	50	29*

* The INP recommends that if the calculated RBL is less than 30 dBA, then it is set to 30 dBA.

3 NOISE CRITERIA

This section of the report discusses noise criteria appropriate for the assessment of noise emissions from the development.

3.1 Operational Noise Criteria

3.1.1 Noise Criteria for Harness Racing and Other Events

To assist local government to assess potential noise issues relating to developments, the NSW EPA has prepared the *Noise Guide for Local Government* (NGLG). The NGLG suggest that councils develop an intrusive noise criterion that limits the permissible level of noise from commercial or industrial premises to no more than the background noise level plus 5 dBA when measured over a 15 minute period ($L_{Aeq,\ 15min}$).

The background noise level is the Rating Background noise Level (RBL) during the relevant time period as presented in the previous section of this report. Table 3-1 presents the intrusive noise criteria for this project.

Table 3-1 Project Specific Intrusive Noise Criteria – All Residential Receivers

Time Period	RBL	Intrusiveness Criterion ($L_{Aeq,\ 15min}$)
Day (7.00am – 6.00pm)	36	41
Evening (6.00pm – 10.00pm)	33	38
Night (10.00pm – 7.00am)	30	35

The intrusive noise criterion has been developed to protect the acoustic amenity of residential receivers from noise emissions from activities which have the potential to operate on a continual basis and may be operating for the purposes of individual, rather than community benefit. For a development which is not expected to operate every day, and which has the potential to benefit the community, there is a case for the relaxation of noise goals.

WMPL recommends that an Events Noise Management Plan (ENMP) is developed to minimise any noise impacts on nearby residents while permitting the WWHRC to conduct occasional major events. The NGLG provides guidance, including a number of case studies, on a number of ways to develop an ENMP for a development of this kind. It should be noted that a critical factor in the success of an ENMP is that it is developed through consultation between WWHRC, Wagga Wagga City Council (WWCC) and the community, especially those residents who live near the development.

3.1.2 Noise Criteria for Activities Related to the Operation of Licenced Premises

The NSW Office of Liquor, Gaming and Racing (OLGR) noise condition states that:

> *"The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz-8kHz inclusive) by more than 5dB between 7.00am and 12.00 midnight at the boundary of any affected residence.*
>
> *The L_{A10} noise level emitted from the licensed premises shall not exceed the background noise level in any Octave Band Centre Frequency (31.5Hz-8kHz inclusive) between 12.00 midnight and 7.00am at the boundary of any affected residence.*
>
> *Notwithstanding compliance with the above, the noise from the licensed premises shall not be audible within any habitable room in any residential premises between the hours of 12.00 midnight and 7.00am.*

Background noise levels in octave bands previously measured by WMPL have been adopted for the development of assessment criteria for this project. The octave band levels have been corrected to align with the measured A-weighted RBLs. The octave band background noise levels are presented in Table 3-2.

Table 3-2 Background Noise Levels in Octave Bands

Time Period	RBL	Octave Band Background Level								
		31.5	63	125	250	500	1k	2k	4k	8k
Day (7.00am – 6.00pm)	36	40	45	41	38	34	27	27	17	16
Evening (6.00pm – 10.00pm)	33	37	42	38	35	31	24	24	14	13
Night (10.00pm – 7.00am)	30	34	39	35	32	28	21	21	11	10

As per the operating hours presented in Section 1.4.1 activities on the site are not proposed to occur past 12.00 midnight or before 7.00am. Therefore, in accordance with the OLGR noise condition, noise emissions associated with the operation of licenced areas of the development should comply with the criteria presented in Table 3-3.

Table 3-3 Licenced Premises Noise Criteria – All Residential Receivers

Time Period	Octave Band LA10 Criteria								
	31.5	63	125	250	500	1k	2k	4k	8k
Day (7.00am – 6.00pm)	45	50	46	43	39	32	32	22	21
Evening (6.00pm – 10.00pm)	42	47	43	40	36	29	29	19	18
Early Night (10.00pm – midnight)	39	44	40	37	33	26	26	16	15

3.1.3 Sleep Disturbance

Noise sources that operate over short durations at night have the potential to cause sleep disturbance despite complying with criteria based upon LAeq and LA10 noise descriptors. For this reason, the NGLG suggests that a screening test be applied such that if the LA1, 1min or LAmax noise levels do not exceed the background noise level by more than 15 dBA, then it is unlikely that the development has the potential to cause sleep disturbance.

The EPA's Application Notes state:

"Research on sleep disturbance is reviewed in the NSW Road Noise Policy. This review concluded that the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance.

From the research, the EPA recognised that the current sleep disturbance criterion of an $L_{A1,(1\ min)}$ not exceeding the $L_{A90,(15\ min)}$ by more than 15 dB(A) is not ideal. Nevertheless, as there is insufficient evidence to determine what should replace it, the EPA will continue to use it as a guide to identify the likelihood of sleep disturbance. This means that where the criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required."

Based on the measured night time RBLs, sleep disturbance criteria have been established and are summarised in Table 3-4.

Table 3-4 Project-Specific Sleep Disturbance Criteria

Time Period	RBL	Sleep Disturbance Noise Criteria, L_{Amax} (dBA)
Night (10.00pm – 7.00am)	30	45

Additionally the NSW Road Noise Policy states that from the research on sleep disturbance to date it can be concluded that:

- Maximum internal noise levels below 50-55dBA are unlikely to cause awakening reactions; and
- One or two noise events per night, with maximum internal noise levels of 65-70dBA, are not likely to affect health and wellbeing significantly.

Assuming that the typical noise reduction through a bedroom facade with normally open windows is 10dBA, then an external noise level of 60-65dBA is unlikely to cause sleep disturbance. As such it should be noted that the Project-specific sleep disturbance criterion is considerably lower than 60-65dBA.

3.2 Traffic Noise Criteria

The *NSW Road Noise Policy* (RNP) provides guidance on assessing road traffic noise impacts from traffic generating developments. The RNP road traffic noise assessment criteria for residential land uses are presented in Table 3-5.

In addition to the criteria in Table 3-5, the RNP advises that in cases where existing levels of road traffic noise exceed the applicable criteria, and that a development has the potential to increase road traffic noise levels; a an increase of up to 2 dBA represents a minor impact that is considered barely perceptible to the average person.

The most affected residents for road traffic noise increases resulting from this development are those on Hampden Avenue north of Cooramin Street and those on Horseshoe Road between Hampden Avenue and The Olympic Highway. Hampden Avenue and Horseshoe Road are classified as 'sub-arterial' roads by the RNP as they form a link between the Wagga Wagga CBD and the Olympic Highway.

Table 3-5 Road Traffic Noise Criteria

Road Category	Type of project/land use	Assessment Criteria - dBA	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway/ arterial/ sub-arterial roads	Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	$L_{Aeq,\ 15\ hour}$ 55 (external)	$L_{Aeq,\ 9\ hour}$ 50 (external)
	Existing residences affected by noise from **redevelopment** of existing freeway/arterial/sub-arterial roads	$L_{Aeq,\ 15\ hour}$ 60 (external)	$L_{Aeq,\ 9\ hour}$ 55 (external)
	Existing residences affected by **additional traffic** on existing freeway/arterial/sub-arterial roads generated by land use developments		
Local roads	Existing residences affected by noise from **new** local road corridors	$L_{Aeq,\ 1\ hour}$ 55 (external)	$L_{Aeq,\ 1\ hour}$ 50 (external)
	Existing residences affected by noise from **redevelopment** of existing local roads		
	Existing residences affected by **additional traffic** on existing local roads generated by land use developments		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads.

3.3 Construction Noise Criteria

The NSW EPA's *Interim Construction Noise Guidelines (ICNG)* recommends noise management levels (NML) to reduce the likelihood of noise impacts arising from construction activities.

The ICNG NML for residential receivers are shown in Table 3-6.

Table 3-6 ICNG Noise Management Levels for Residential Receivers

Time of Day	Management Level $L_{Aeq,15min}$	How to Apply
Recommended Standard Hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or Public Holidays	Noise affected RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: • times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences; • if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

It is expected that all construction activities will be conducted within standard construction hours. Based on the RBLs in Table 2-1, the construction noise management levels for this project are presented in Table 3-7.

Table 3-7 Project Specific Construction NML

Receiver	Acceptable $L_{Aeq,\ 15min}$ Noise Level (Standard daytime construction hours)
R1 – R5	46

4 OPERATIONAL NOISE ASSESSMENT

4.1 Noise Modelling Methodology and Assumptions

Operational noise emissions from the site were modelled using the "CadnaA" acoustic noise prediction software. Factors that were addressed in the noise modelling are:

- Noise source levels and locations;
- Shielding from structures;
- Noise attenuation due to geometric spreading;
- Ground absorption; and,
- Atmospheric absorption.

Based on observations of the existing WWHRC site, the dominant noise source associated with the operation of this facility during a typical race meeting is the noise from patrons and the Public Address (PA) system during races. In addition to the racing activities, the use of the car-parks is considered the next most significant source of nose.

Since peak noise levels generated by racing activities and use of the car-parks are not expected to occur concurrently, these noise sources have been assessed in isolation of each other.

4.2 Assessment of Noise from Typical Race Meetings

During a visit to the existing WWHRC track during a typical race meeting, it was noted that the noise from the PA system was dominant over that of the patrons during races, and the typical duration of elevated noise levels associated with races was less than five minutes. Therefore, the assessment of noise emissions during typical race meetings will focus on the PA system.

Continuous sound power levels of PA speakers at the existing WWHRC site were measured and found to be 97 dBA for each speaker. Since the longest race call is expected to be less than five minutes, the SWL of each speaker has been reduced by 5 dBA to account for them not being active for an entire 15 minute assessment period. It has been assumed that 10 PA speakers will be placed around the podium, mounting, pavilion and viewing areas.

The predicted noise levels at nearby receivers due to race activities are presented in Table 4-1.

Table 4-1 Predicted Receiver Noise Levels During Typical Race Meetings

Receiver	Predicted Level ($L_{Aeq, 15min}$)	Criteria			Exceedance
		Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	
R1	37	41	38	35	2
R2	36	41	38	35	1
R3	36	41	38	35	1
R4	34	41	38	35	-
R5	32	41	38	35	-

Review of Table 4-1 shows that the predicted noise levels at nearby receivers during typical race events exceed the night time criteria at R1 by 2 dBA and at R2 and R3 by 1 dBA. A 2 dBA

exceedance is considered minor and would be barely perceptible by the average person, whereas a 1 dBA exceedance is considered negligible and would not be noticeable by the average person.

Noise levels at receivers due to the operation of the PA can be mitigated by good PA system design. Since PA speakers are highly directional, they should be located in such a way that they point away from receivers. The site layout is well suited to this design concept as there are no sensitive receives to the south or west of the site. Therefore, the PA speakers should be located to the north and east of the spectator areas and point to the south and west.

It should be noted that the predicted noise levels in Table 4-1 represent the worst case noise levels expected at nearby receivers during typical race meetings. WMPL's experience of harness racing facilities of this size is that noise levels in between races are significantly lower than those during the running of races. This difference could be as much as 20 dBA; in which case, activities on the site would be inaudible at nearby receivers.

4.3 Assessment of Noise from Major Race Meetings

Since measurements of the PA system at the existing WWHRC were conducted during a typical race meeting, it is difficult to predict noise levels at receivers during major race meetings. Noise levels at receivers during these events are still expected to be dominated by the PA system, which would likely need to be operated at a greater amplification level due to the likely increase in crowd noise.

Since the major race meetings have approximately 10 times the number of spectators, it is reasonable to expect that the worst case $L_{Aeq,\ 15min}$ noise levels at nearby receivers could be as much as 10 – 15 dBA higher than those during a typical race meeting. For the purposes of assessing the worst case impacts, it has been assumed that noise levels at receivers during major race meetings is 15 dBA higher than those during a typical race meeting. The worst case predicted levels during major race meetings are presented in Table 4-2

Table 4-2 Predicted Receiver Noise Levels During Major Race Meetings

Receiver	Predicted Level ($L_{Aeq,\ 15min}$)	Criteria			Exceedance
		Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	
R1	52	41	38	35	17
R2	51	41	38	35	16
R3	51	41	38	35	16
R4	49	41	38	35	14
R5	47	41	38	35	12

Review of Table 4-2 show that worst case $L_{Aeq,\ 15min}$ noise levels at nearby receivers during major racing events could be as high as 52 dBA, exceeding the night time criterion by as much as 17 dBA. This is considered a significant exceedance and if this were to occur on a continual and regular basis, would have the potential to cause a noise impact.

However as previously discussed, it is considered that occasional major events could be held at the proposed site through an effective ENMP.

Similar to the case of typical race meetings, the predicted noise levels in Table 4-2 represent the worst case noise levels at receivers which are expected to occur only during races. In between races, the noise levels at receivers will be significantly lower. With approximately 2000 spectators, the difference between typical and maximum $L_{Aeq,\ 15min}$ noise levels would not be as pronounced due to greater noise emissions from the crowd. However, the difference could still be as high as 10 dBA.

4.4 Assessment of Noise from Licenced Areas

Patron noise from licensed areas should be assessed against the OLGR criteria established in Section 3.1.2. Noise levels at receivers due to patrons in licenced areas will be greatest when a significant number of patrons are in outdoor licenced areas.

To assess the likelihood of noise impacts due to patron activity in outdoor licenced areas, noise levels have been predicted at nearby receivers due to 50 people talking in raised voices and compared to the OLGR criteria applicable to the period 10.00pm til midnight. Fifty people talking in raised voices is considered appropriate for this assessment as the typical crown for a race meeting is 150 people and it is expected that everyone is talking at the same time. The L_{A10} sound power level at each octave band centre frequency of one person talking in a raised voice is presented in Table 4-3.

Table 4-3 Sound Power Level of Speech in Raised Voice

Source	dBA	Octave Band Sound Power Level – dBA (L_{A10})								
		31.5	63	125	250	500	1k	2k	4k	8k
One person talking in raised voice	79	60	60	60	70	74	76	70	64	60

The $L_{A10,\ 15min}$ noise levels and exceedances at nearby receivers due to 50 people talking in raised voices in the outdoor licenced areas of the site are presented at each octave band centre frequency in Table 4-4 and Table 4-5 respectively.

Table 4-4 Predicted Receiver Noise Levels due to Outdoor Licenced Areas

Receiver	Octave Band Noise Level – dBA ($L_{A10,\ 15min}$)								
	31.5	63	125	250	500	1k	2k	4k	8k
R1	19	19	9	10	18	27	20	5	0
R2	19	19	8	9	17	27	19	3	0
R3	19	19	10	10	18	27	20	6	0
R4	13	13	9	9	17	23	14	0	0
R5	11	10	8	9	17	22	13	0	0

Table 4-5 Predicted Exceedances due to Outdoor Licenced Areas after 10pm

Receiver	Octave Band Exceedances - dBA ($L_{A10, 15min}$)								
	31.5	63	125	250	500	1k	2k	4k	8k
R1	-	-	-	-	-	1	-	-	-
R2	-	-	-	-	-	-	-	-	-
R3	-	-	-	-	-	1	-	-	-
R4	-	-	-	-	-	-	-	-	-
R5	-	-	-	-	-	-	-	-	-

Review of Table 4-5 indicates that 1 dBA exceedances occur in the 1kHz octave band at R1 and R3 between 10.00pm and midnight due to patrons in outdoor licenced areas. A 1 dB exceedance is considered negligible. Therefore, the use of outdoor licences areas is predicted to comply with OLGR noise criteria during typical race meetings and small functions.

In a similar fashion to $L_{Aeq, 15min}$ operational noise levels at nearby receivers during major events, the $L_{A10, 15min}$ noise levels would also be expected to increase by a significant amount. There is a likelihood that this increase could be in the range of 10 – 15 dB, resulting in exceedances of the OLGR criteria by as much as 16 dB at 1kHz.

Noise emissions from patrons in licenced areas should also be considered in developing an ENMP for the site.

4.5 Assessment of Noise from Car-parks

Based on information in the traffic report for this development, the peak car-park activity in any 15-minute period is expected to be 33 vehicle movements. It has been assumed that 22 of these vehicles will belong to racegoers and will be parked in the public parking area. It is assumed that nine cars towing floats and two semi-trailers will also enter the truck/trailer parking during this period. The predicted noise levels at nearby receivers due to peak car-park activity is presented in Table 4-6

Table 4-6 Predicted Receiver Noise Levels due to Car-park Activities

Receiver	Predicted Level ($L_{Aeq, 15min}$)	Criteria			Exceedance
		Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	
R1	26	41	38	35	-
R2	29	41	38	35	-
R3	36	41	38	35	1
R4	35	41	38	35	-
R5	34	41	38	35	-

Review of Table 4-6 shows that the predicted noise levels at nearby receivers during peak car-park activities exceed the night time criterion at R3 by 1 dBA. This exceedance is considered negligible.

4.6 Assessment of Sleep Disturbance

The activity considered to have the greatest potential to cause sleep disturbance is truck movements in the car-park. At the conclusion of night races, there is potential for horse transport trucks to be loaded and depart from the site. The highest L_{Amax} noise levels associated with truck activities on the site are generated by air brakes. The L_{Amax} sound power level of truck air brakes can be as high as 120 dBA.

Maximum noise levels at nearby receivers due to truck air brakes have been predicted and are presented in Table 4-7.

Table 4-7 Predicted Maximum Noise Levels at Nearby Receivers

Receiver	Predicted Level (L_{Amax})	Criteria	Exceedance
		Night 10pm-7am	
R1	48	45	3
R2	53	45	8
R3	60	45	15
R4	58	45	13
R5	57	45	12

Review of Table 4-7 shows that the predicted L_{Amax} noise levels at nearby receivers exceed the established screening sleep disturbance criterion. However these levels are below the level of 60-65dBA which the NSW EPA would suggest is unlikely to cause sleep disturbance.

It should be noted that the predicted noise levels due to air brakes in Table 4-7 are based on a truck being operated at the eastern edge of the car-park. This is a worst case scenario. It is recommended that trucks are encouraged to park in the western most spaces in the truck/trailer parking area.

5 TRAFFIC NOISE ASSESSMENT

This section presents an assessment of potential traffic noise impacts from the development.

5.1 Existing Levels of Traffic Noise

Attended measurements of existing traffic noise levels were conducted on 6 December 2013. Measurements were conducted over 15 minute periods along Hampden Avenue and Horseshoe Road at locations approximately 15 metres and 9 metres from the edge of the road at the respective locations.

It should be noted that traffic noise levels along Horseshoe Road are also influenced by traffic travelling along the Olympic Highway. The setback from the Olympic Highway at the Horseshoe Road measurement location was approximately 90 metres.

The measured levels of traffic noise and the observed traffic volumes and mix (i.e. percent heavy vehicles) are presented in Table 5-1.

Table 5-1 Existing Traffic Noise Levels at Measurement Locations

Road	Measurement Setback [m]	Volume	Mix	L_{Aeq} Traffic Noise Level
Hampden Avenue	15	42	7	61
Horseshoe Road	9	22	5	61

To provide an estimate of the existing levels of traffic noise at receivers along Hampden Avenue and Horseshoe Road using noise descriptors consistent with the applicable RNP criteria, the measured noise levels have been adjusted to account for day and night time traffic volumes and the typical setback distances to the most affected residences. Façade corrections have also been applied in accordance with the RNP.

Annual Average Daily Traffic (AADT) volumes along Hampden Avenue, Horseshoe Road and the Olympic Highway have been estimated based off peak hourly traffic volumes taken from the traffic study completed for the development. The AADT volume estimates are based on a conservative assumption that peak hourly traffic volumes are approximately equal to 10% of the AADT volume. Further, day and night time traffic volumes are estimated based on a conservative assumption that day time traffic volumes account for 85% of the AADT volume. The estimated existing façade traffic noise levels at residential receivers are presented in Table 5-2.

Table 5-2 Existing Traffic Noise Levels at Residential Facades

Road	Minimum Receiver Setback [m]	AADT Volume	L_{Aeq} Traffic Noise Level	
			Day	Night
Hampden Avenue	25	2650	61	56
Horseshoe Road	18	1300	60	55

Review of the traffic noise levels in Table 5-2 show that the existing levels of traffic noise at the most affected receivers at or slightly above the applicable RNP criteria.

Notwithstanding the criterion the RNP also states where the criterion is exceeded an increase of 2dB represents a minor impact that is considered barely perceptible to the average person.

5.2 Predicted Traffic Noise Levels due to Development

The traffic study for the development states that approximately 60% of all vehicles accessing the site will do so via Hamden Avenue, north of Cooramin Street. Almost all of these vehicles will travel along Horseshoe Road to the Olympic Highway.

To predict and assess traffic noise levels due to the development, estimates must be made of incremental traffic volumes during the day (7.00am – 10.00pm) and night (10.00pm – 7.00am) periods. Therefore, it is assumed that the worst case traffic generation during the daytime period would correspond to all car-parking facilities being filled to capacity and emptied over the day. It is assumed that the worst case traffic generation during the night time period would correspond to all car-parking facilities being emptied during the night time period.

Based on a proposal for 210 parking spaces, the worst case predicted traffic noise levels at the most affected receivers along Hampden Avenue and Horseshoe Road, due to the development are presented in Table 5-3.

Table 5-3 Predicted Traffic Noise Levels with Development

Road	Predicted $L_{Aeq,\ period}$ Traffic Noise Levels					
	Without Development		With Development		Difference	
	Day	Night	Day	Night	Day	Night
Hampden Avenue	60.9	55.6	61.5	56.2	0.6	0.6
Horseshoe Road	57.8	52.5	58.5	53.1	0.7	0.7

Review of the traffic noise levels in Table 5-3 show that the development is predicted to increase traffic noise levels at nearby receivers by less than 1 dBA. This increase is not considered perceptible to the average person.

Accordingly, no mitigation or further assessment of traffic noise levels is warranted.

6 CONSTRUCTION NOISE ASSESSMENT

6.1 Typical Construction Equipment

Typical equipment expected to be used during the construction of the new harness racing facility have been identified and are presented in Table 6-1. The typical sound power level of each item based on previous measurements conducted by WMPL for similar equipment are also presented in Table 6-1.

It is important to note that a correction has been applied to the cumulative L_{Aeq} sound power level of all listed plant for each scenario since all pieces of equipment are not necessarily at their loudest simultaneously. Also, the sound power levels listed in Table 6-1 represent plant revving as opposed to idling.

Table 6-1 Typical Construction Plant Sound Power Levels

Plant	L_{Aeq} SWL (dBA)
Truck	105
Concrete Truck	109
3-6t Excavator	105
Mobile Crane	105
Grinder	100
Hand tools	99
Saw	100
Diesel Generator	88
Compressor	90
Welding	90

Noise modelling has assumed that for the typical worst cast operation, the cumulative L_{Aeq} sound power level of construction plant would be up to 106dBA.

6.2 Predicted Construction Noise Levels at Nearby Receivers

Construction activities associated with the establishment of the new track and buildings have been modelled to predict worst case construction noise levels at nearby receivers. Table 6-2 presents the predicted construction noise levels at nearby receivers.

Review of Table 6-2 shows that worst case construction noise levels are predicted to exceed the NMLs at R1 and R2 by 3 dBA and 2 dBA. Accordingly, all reasonable and feasible noise mitigation measures should be adopted for construction activities occurring in close proximity to these receptors.

The predicted construction noise levels in Table 6-2 are presented as a range for each receiver to reflect the fact that construction activities will be conducted at various locations on the site, thereby resulting in a wide range of construction noise levels at each receiver.

Table 6-2 Predicted Construction Noise Levels at Nearby Receivers

Receiver	Predicted Level	NML	Exceedance
R1	38-49	46	3
R2	35-46	46	-
R3	34-48	46	2
R4	33-45	46	-
R5	33-44	46	-

7 CONCLUSION

The WWHRC is proposing to establish a new harness racing facility on currently vacant rural land on Hampden Avenue, approximately 6 km north of the Wagga Wagga CBD.

WMPL have been commissioned to conduct a noise impact assessment for the proposed development. The assessment has been conducted in general accordance with relevant NSW Government guidelines and investigates noise associated with the construction and operation of the proposed harness racing facility.

The following recommendations have been provided to protect the acoustic amenity of nearby residents and allow the full potential of the site to be realised by the WWHRC and the local community:

- The PA system is designed to minimise noise 'spill' outside the site by:
    - Using directional speakers that are pointed away from the direction of nearby receivers; and
    - Favouring a greater number of lower powered speakers than fewer high powered speakers.
- A detailed Events Noise Management Plan is developed through consultation with local council and the community to effectively manage elevated noise levels at receivers during major events;

APPENDIX A

NOISE MEASUREMENT RESULTS

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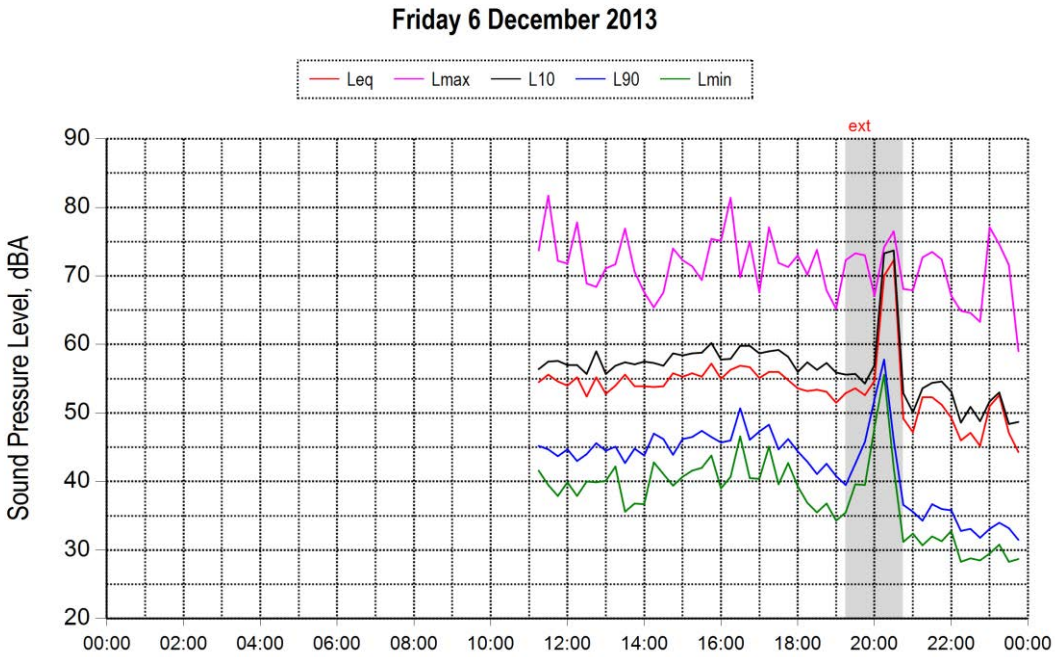
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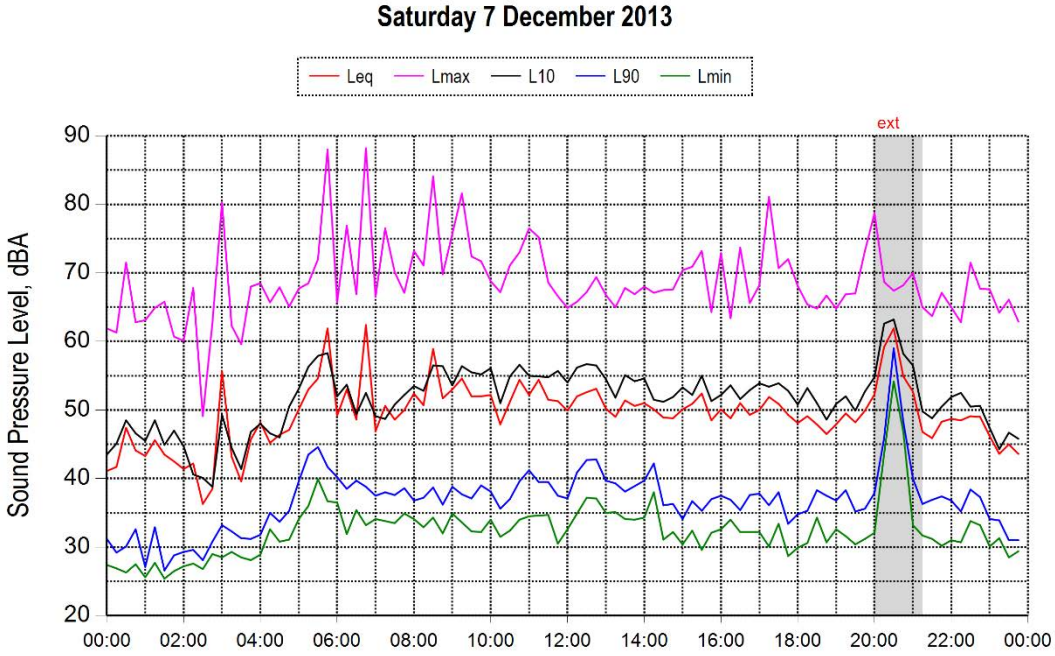
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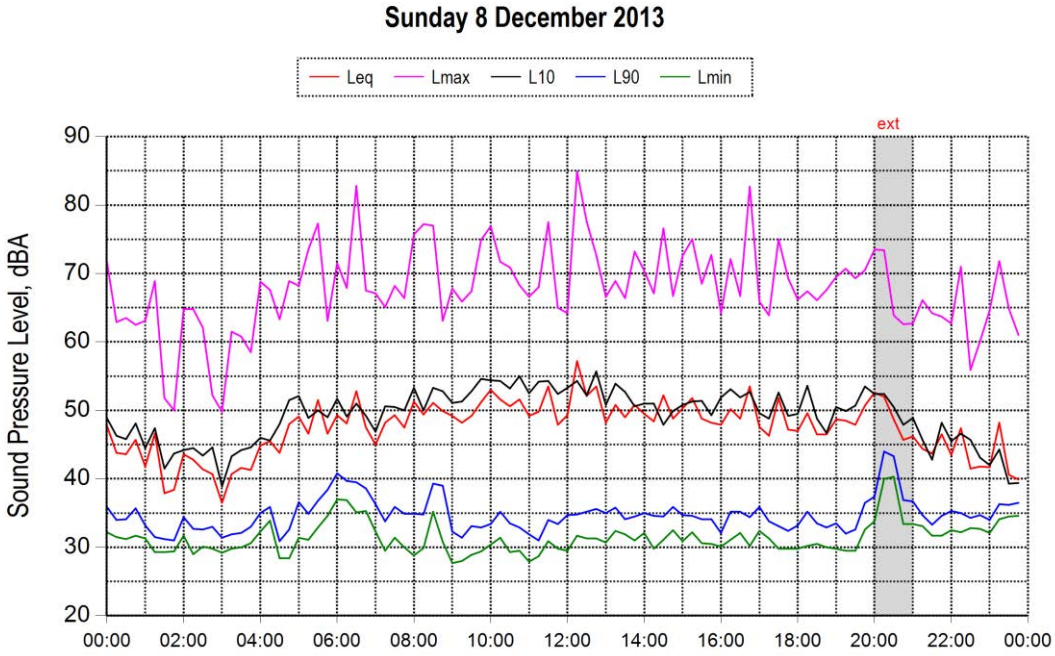
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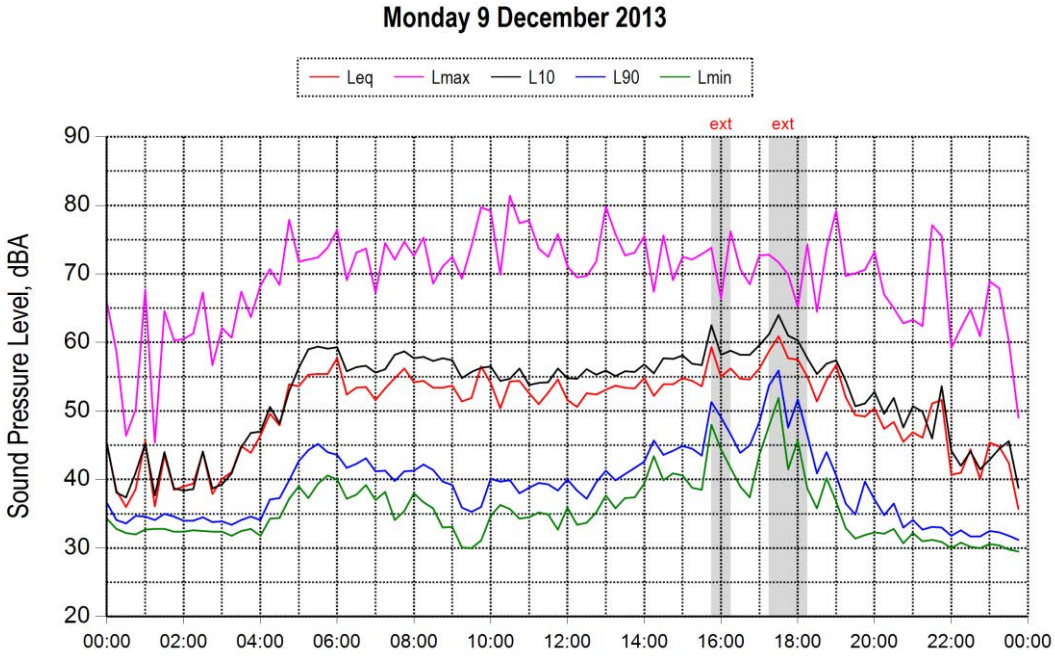
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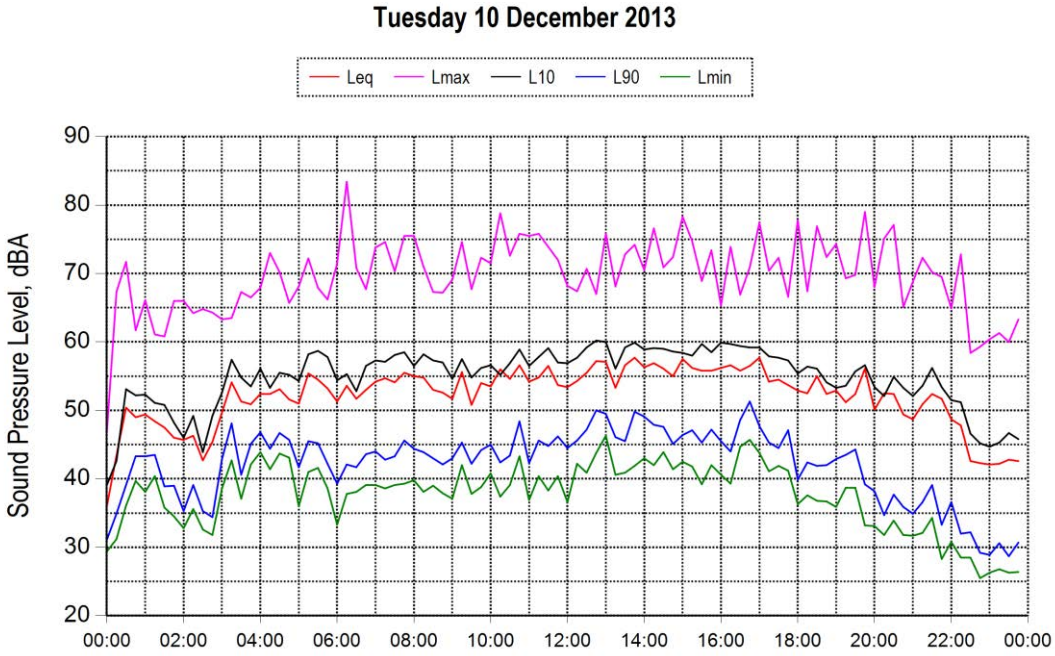
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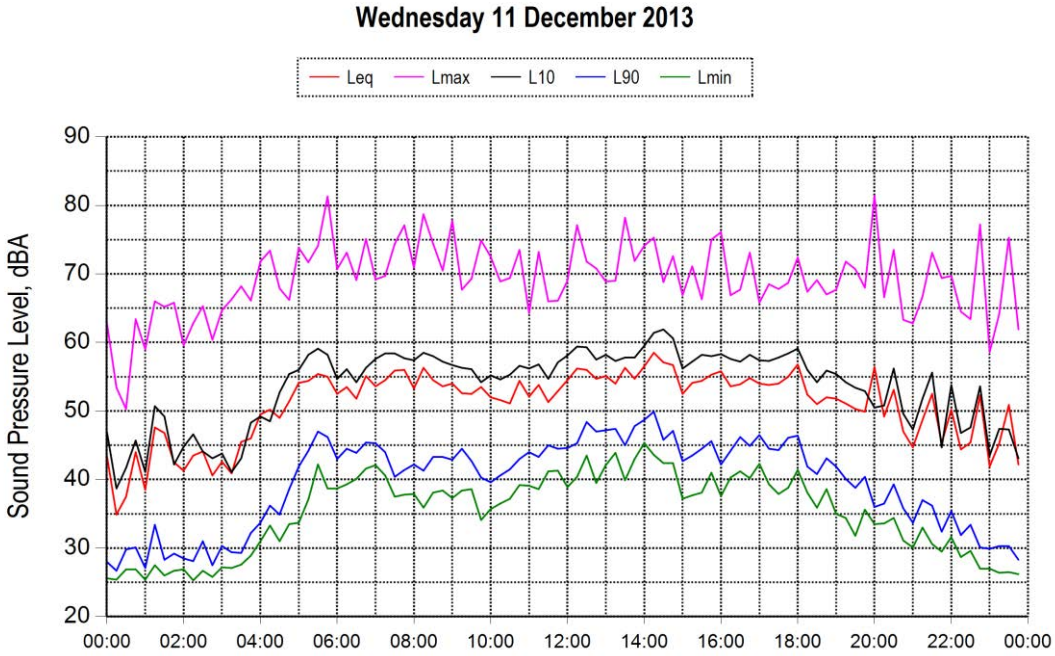
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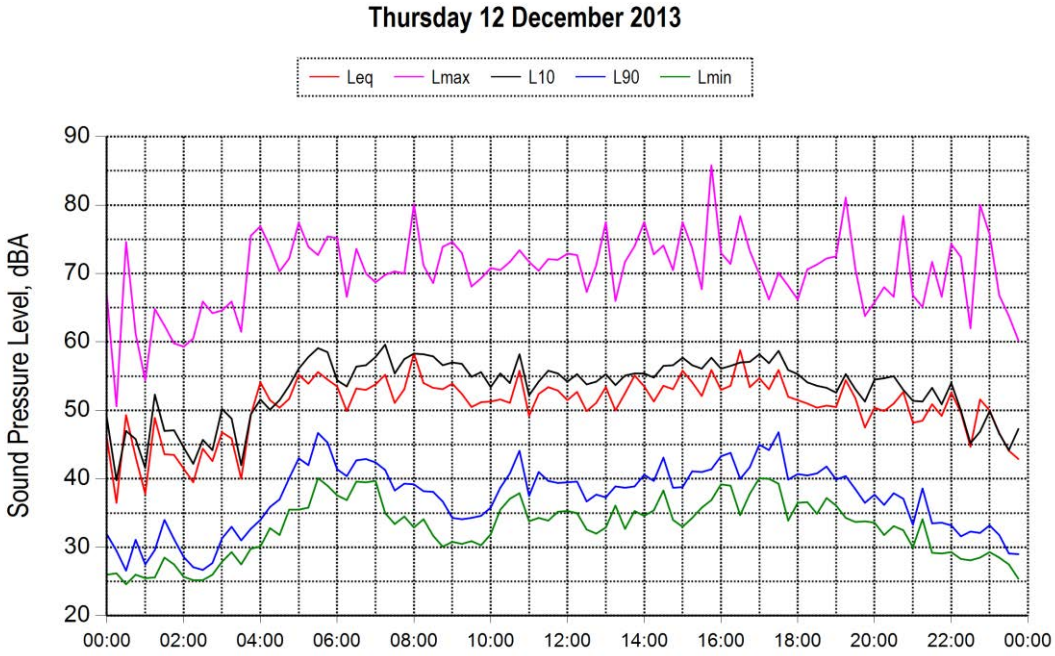
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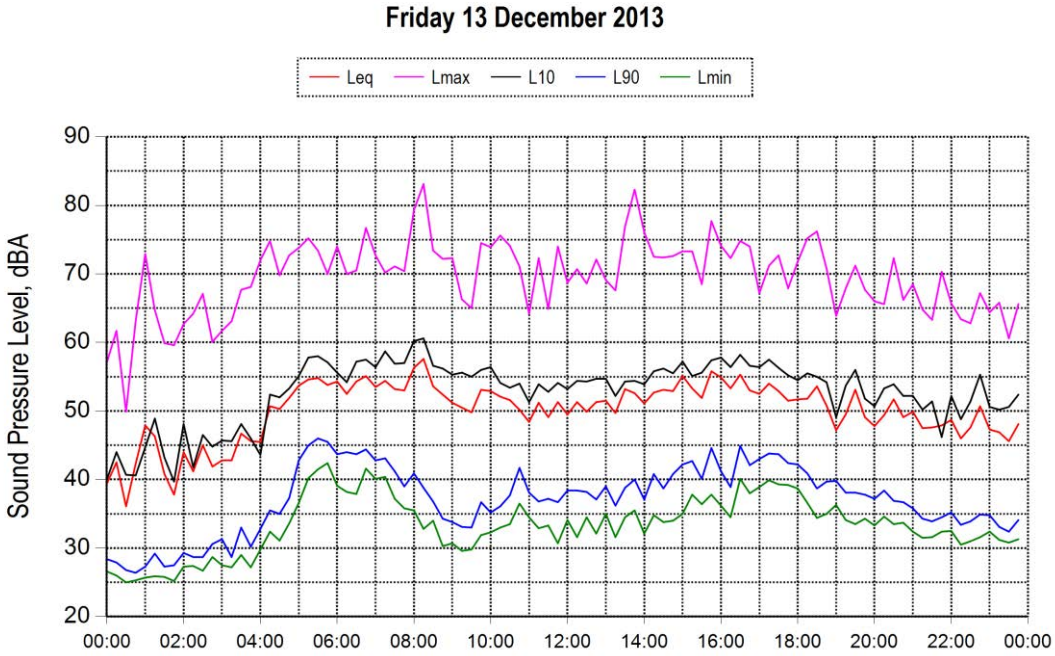
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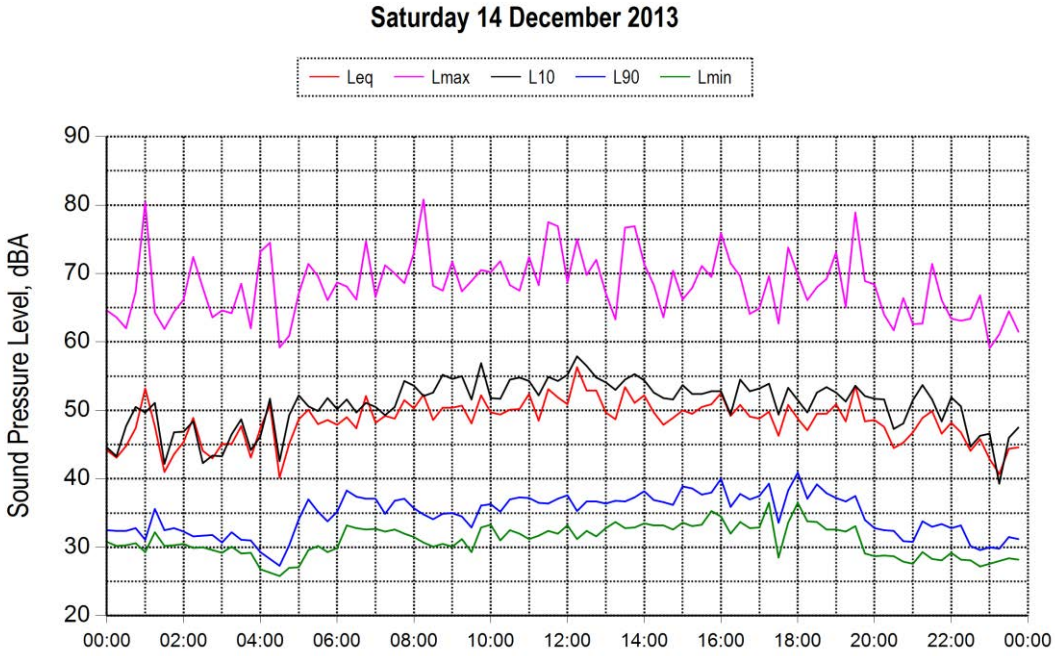
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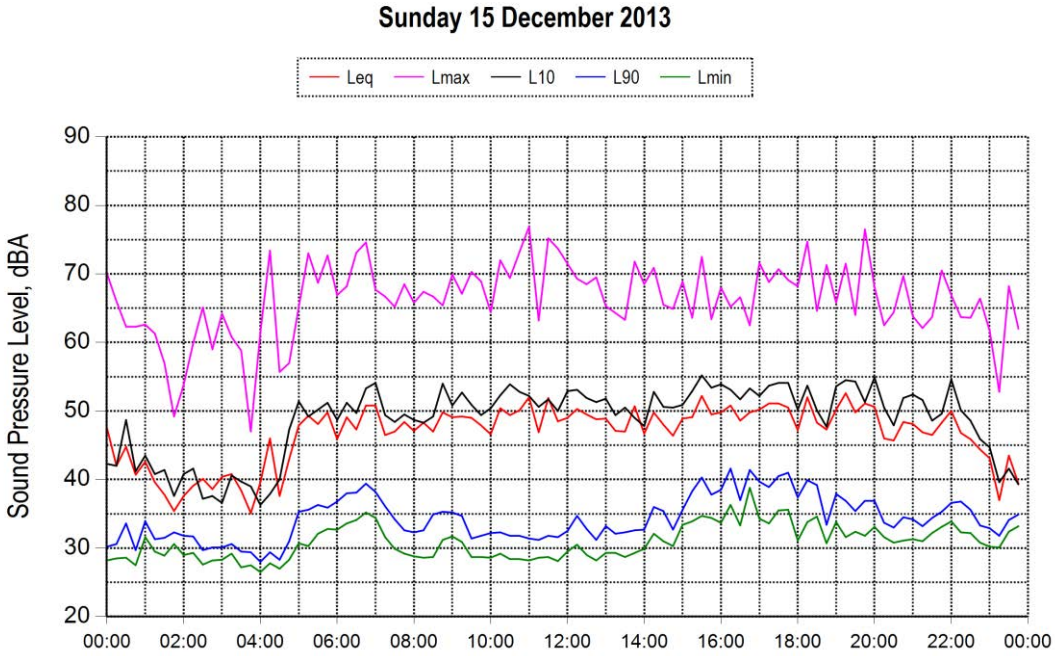
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