The Acoustic Group
CONSULTING ACOUSTICAL AND VIBRATION ENGINEERS

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3 October 2018

SHOALHAVEN CITY COUNCIL
Environmental Planning & Assessment Act, 1979

DEVELOPMENT CONSENT NO: 18/1237 Dated: 27/8/19

These are the plans referred to in the above Development Consent

Note: Approval of the works shown on this plan is subject to compliance with the conditions of the Development Consent.

BBC Consulting Planners
55 Mountain Street
BROADWAY NSW 2007

Dear Sirs,

ACOUSTIC ASSESSMENT - HOSTING OF EVENTS
WILLINGA PARK, FORSTER DRIVE, BAWLEY POINT

The purpose of this report is to present the results, findings and recommendations of an acoustic assessment in relation to an application for the Hosting of Events at Willinga Park, Bawley Point.

Willinga Park is an equestrian centre that has been constructed to World/International standards and will feature some of the best facilities in Australia for the various disciplines of competition associated with equestrian events.

The general day-to-day operation of Willinga Park in acoustic terms is a non-event. Similarly, general routine activities that involve competitions in various equestrian disciplines by local or regional groups will not generate any significant noise emissions.

At times, the facility will host National and International events that will be open to the public and will involve competitors attending the site from around Australia and overseas.

Willinga Park contains expansive botanic gardens and sculptures, that in addition to the building design that has attracted critical acclaim and received Awards, has led to the provision of open days for members of the public to view the Park.

As set out in the Statement of Environmental Effects from BBC Consulting Planners, the Hosting of Events application seeks consent for the hosting of ticketed events open to the public with a crowd capacity generally above 1000 people, for which the Council have requested an acoustic assessment. We are advised that the Hosting of Events occurs over a number of days (e.g. 2-5 days) with the capacity of the event expressed with respect to the total number of persons, e.g. 5000 people over the entire event (i.e. over a number of days).

The original development application (DA 15/1659) for Willinga Park identified a staged development of the equestrian facility. The original development application (DA 15/1659) considered noise emission from the site in terms of criteria applied to industrial premises and nominated use of the EPA's general noise target of background +5 dB(A) when assessed as an LAeq level over any 15-minute period at any affected point on a residential property.

However, the subject site is not an industrial development that operates on a continuous basis day and night, but is an agricultural estate which includes facilities associated with the various equestrian "disciplines" (sports) that fall under the banner of Equestrian Australia (previously the Equestrian Federation of Australia).

Noise Criteria for Sporting Facilities

The application of general noise criteria applied to industrial premises is not applicable for the Hosting of Events. The EPA have utilised a sliding scale approach for sporting facilities with the events ratio concept being the preferred assessment procedure, as discussed below.

With respect to EPA noise policies in relation to sporting venues, and the intermittent and varied use of such venues, the EPA in the mid 1980's developed specific guidelines to cater for the operation of sporting venues that cannot be addressed by general industrial noise limits.

The EPA's guidelines for different noise emission sources in the mid-1980s (set out in the *Environmental Noise Control Manual*) accepted that sporting events may have a range of noise levels depending upon the classification of sport and have a different range of noise levels for different categories of sporting events.

For the major sporting venues, the primary issue of concern identified by the EPA relates to public address systems and in particular where such venues are used for music concerts.

There will be no concerts or similar occurring at Willinga Park for the proposed events.

With the change in EPA acoustic parameters used for assessment of noise in NSW (L10 to Leq) when the *Environmental Noise Control Manual* was discontinued, sections of the ENCM were progressively replaced by other EPA policies (*Environmental Criteria for Road Traffic Noise, Industrial Policy, Interim Construction Noise Guideline, Noise Policy for Industry*) non-industrial noise criteria have been provided in the Noise Control *Regulation* to the *Protection of the Environment Operations Act,* Noise Prevention Notices and the *Noise Guide for Local Government.*

The first version (2010) of the EPA's *Noise Guide for Local Government* in dealing with the variability of noise emission from different sporting events introduced the concept of an events ratio and provided by way of an example for motor sport different types of events that may occur over a year and a mechanism of considering the total noise and the number of events per year for a nominal cumulative events ratio not exceeding 50.

Appendix B provides an extract from the 2010 version of the EPA's Noise Guide for Local Government as Case study 2: Noise from a motor sport facility setting out the procedure/concept for the events ratio.

The events ratio only relates to the conduct of the sporting event and does not apply to traffic on site or on public roads.

As applied for major sporting venues that have intermittent maximum crowd capacities road traffic is normally subject to a traffic management plan with appropriate traffic controllers etc to manage the flow of traffic onto and around the site.

The EPA's events ratio procedure relies upon the identification of the background level. With respect to a separate development application for the Show Jumping Arena at Willinga Park an acoustic assessment report (for that application) contained the results of ambient noise monitoring to establish the background level at the nearest affected residential receiver.

For that assessment a site visit was carried out on Wednesday 9th May 2018 to inspect Willinga Park and the location of the Show Jumping Arena.

It was observed that the campdraft arena, show rings and polo cross fields, training arena, covered arena, stables, round yards and associated pavilions and ancillary buildings have been developed.

The stock management building and stockyards to the south-west of that building were under construction at the time of our site visit.

An inspection of the site indicated the Day Design logger location (from the original DA for Willinga Park) was in a shielded location and not representative of the acoustic environment of the nearest residential receivers.

As set out in the acoustic assessment accompanying the development application for the Show Jumping Arena, logger measurements conducted following our site visit have determined the appropriate background level for the nearest residential receiver on Forster Drive.

Measurement Techniques

To address the background levels applied to the nearest residential receptor (identified as reference location R1 at 122 Forster Drive) two loggers were deployed, one being on the western boundary immediately in line with the southern façade of the dwelling at 122 Forster Drive and a second logger 20 m from the Willinga Park manager's residence being approximately in line with the eastern boundary of location R1.
Ambient measurements were taken in accordance with the Australian Standard AS1055 *"Acoustics - Description and Measurement of Environmental Noise"* and the ambient background measurement procedures set out in Fact Sheet B of the EPA document identified as the *Noise Policy for Industry*.

The unattended sound level measurements were recorded using two NATA Calibrated Svan Type 1 Sound Level Meters Model 979 (serial no 35804 and 35808). The reference calibration level of each meter was checked prior to and after measurements using a Brüel & Kjær Sound Level Calibrator Type 4231 and exhibited no system drift. The calibration of the sound level meters to NATA requirements is current.

Measurement Results

The Acoustic Assessment for DA15/1659 nominated criteria based on the EPA *Industrial Noise Policy*.

Since DA 15/1659 was assessed, the EPA have replaced the *Industrial Noise Policy* with a new document identified as the *Noise Policy for Industry*. The two documents are basically the same but have some minor differences with respect to the amenity noise targets and the inclusion of a maximum level criterion for night time.

Attendance to the logger location used for the original DA revealed the position on the southern boundary of the subject site to be in bushland and on the western side of a ridge where it is expected to have a different acoustic environment to residence (reference Figure 1 in the acoustic report) that is further to the south and on the top of the ridge, and also different to the exposed so that the exposed position for the dwelling of 122 Forster Drive identified as R1.

Appendix C identifies the Day Design logger location relative to the two TAG logger locations with the red ellipse identifying the approximate location of the proposed Show Jumping Arena.

Appendix D sets out the logger results from Wednesday on 9 May 2018 to Sunday, 13 May 2018.

The background levels reveal a higher ambient background levels than for the original DA during the day and evening periods for both TAG logger locations, with lower background levels for the night time period.

The weather conditions prevailing at the site were suitable for the measurements up until Sunday, 13 May when the area was subject to strong winds that under EPA procedures require the exclusion of that measurement data.

For the ambient noise data available from both loggers in exposed positions, being west of the Day Design logger (which was in dense bush) indicates that the Rating Background Level that would apply for location R1 is 44 dB(A) for the daytime period and 40.5 dB(A) for the evening period.

Whilst the night time background level determined by the logger adjacent reference location R1 was 29 dB(A), Table 2.1 of the *Noise Policy for Industry* nominates the minimum assumed rating background noise level of 30 dB(A) to be used for assessment purposes.

We do not envisage any ticketed major equestrian or other events to occur after 10pm. Therefore, for consideration of the events ratio procedure the conservative approach has been adopted by utilising the evening rating background level of 40.5 dB(A) as the base background level for determination of the exceedance above the background.

Acoustic Findings

The primary issue of concern with respect to noise emission from the events is noise emitted from patrons when in attendance for an event and noise associated with the public address system.

Noise generated from horses and persons involved in the equestrian events is not considered to be a noise source of concern for any residential receivers.

To assist in ascertaining noise as the nearest residential receiver (identified as location R1) Appendix E1 presents a plan view identifying section lines for which sectional elevations have been prepared to the various areas for equestrian events. Appendix D2 presents the section from the Show Jumping Arena to location R1.

The sections in Appendices E2 & E3 reveal the Grand Prix, Show Jumping Arena and Covered Arena are displaced (in a horizontal plan) and elevated above location R1.

The Show Jumping Arena is not subject to any acoustic shielding by barriers or the like to R1 and will have a minimal degree of ground absorption of noise emitted from the arena to R1.

The Covered Arena is over the crest of the hill and subject to some acoustic shielding due to topography and significant acoustic shielding from the roof over the Covered Arena.

The Grand Prix Arena is located further down the western side of the main NE/SW ridge and experiences more acoustic shielding due to the topography but has an arena open to the sky.

The above three arenas have tiered seating with the spectators view away from residential reference location R1.

Working backwards from the ambient logger results provided for R1 reveals that in the evening, in which events may occur, the intrusive noise target of 45.5 dB(A) would apply for those events in that there would be no other events occurring on Willinga Park at the same time.

For the equestrian events one first considers noise from the PA system and then noise from the spectators.

Show Jumping Arena

The Show Jumping Arena development application considered a maximum of 1000 people (participant and members of the public) in attendance.

Allocating a distance of 650m from R1 to the centre of the show jumping arena would for hemispherical sound radiation (without any allowance for ground absorption) permit a sound power level of 109 dB(A) as a design source for the show jumping arena to satisfy the intrusive noise target. The sound power level is based upon a broad band noise in that for different sound source spectra the dB(A) sound power level will vary.

For the PA system we have considered 4 speakers on the eastern side of the arena serving the participants in the arena and 21 speakers creating a distributed sound system where the speakers are to be mounted above the tiered seating area and pointing in a downwards and westerly direction.

The nominal sound power level of 109 dB(A) gives rise to an effective sound power level of 95 dB(A) per speaker, for an equal distribution. This would lead to a maximum sound pressure level of 87 dB(A) at 1 metre from each speaker if the noise was radiated in all directions.

There is a directivity component for most speakers that would reduce the noise level to the rear of the speaker. The permissible level for each speaker could be increased with the provision of a solid baffle (0.6 – 1 sq. m area) behind each speaker to reduce the radiation of sound to the rear and improve the directivity attenuation of each speaker with respect to reference residential location 1.

The sound system for the Show Jumping Arena should have rms limiting to control the maximum level emitted from the speaker. It is recommended that the arena speakers be on a different power amplifier circuit to the tiered seating area with each circuit to have sperate rms limiting.

The final level of the two speaker systems should be set as part of compliance testing of the installation prior to the issue of an occupational certificate.

With respect to patron noise, the general procedure is to utilise a base sound power level for individual relative to different vocal strengths and for general conversation 50% of the people talking simultaneously. Such an approach may be suitable for general conversation but not for an event.

We have not had the opportunity to monitor a show jumping event to ascertain the noise level of the spectators.

However, for sporting events there is a general crowd murmur and intermittent cheers that involve the majority of the crowd. Such intermittent noise events are not of a continuous nature.

Utilising the general sound power level approach for different vocal strengths and the sample calculation set out in Appendix F1 the following dB(A) levels have been determined for refence location R1. As the Leq level is determined over a 15-minute period the intermittent noise of cheering has been considered at full capacity and a total of 1 minute duration (over 15 minutes) and 2 minutes (over 15 minutes).

TABLE 1: Patron Noise Levels from Show Jumping Arena at R1

Vocal Effort	Number of people	Percentage of people talking	LAeq	Duration	LAeq, 15 min
Normal	390	50%	24	15 min	24
Normal	1000	50%	31	15 min	31
Loud	390	100%	50	1 min	38
Loud	390	100%	50	2 min	41
Loud	1000	100%	54	1 min	42
Loud	1000	100%	54	2 min	45

For the use of the Show Jumping Arena under the Hosting of Events categories realises a larger crowd than for the Show Jumping DA.

We are advised that the Hosting of Events occurs over a number of days (e.g. 2-5 days) with the capacity of the event expressed with respect to the total number of persons over the entire event (i.e. over a number of days).

If one considers a maximum of 2000 people on any one day for the Show Jumping Arena, the levels set out in Table 1 for the 1000 patrons are increased by 3 dB. On this basis the crowd noise would from the graph in Appendix B4 increase the events ratio from 0.8 to 1.8 per event.

Allocating an additional 2 dB for the PA system that would need to be expanded to serve the larger crowd would result in the PA system 7 dB above the background.

Logarithmically adding the PA system and the crowd noise of 100% people in a loud cheer for a total of 2 minutes in the same 15-minute period result in a level 10.5 dB above the evening background level, leading to an events ratio of 2.8 per event.

These two examples identify the methodology for determining the total events ratio allocated to the Show Jumping Arena to which then the number of events (above 1000 people) per year are multiplied by the 2.8 to obtain the contribution of Hosting of Events at the Show Jumping Arena.

Grand Prix Arena

Adopting the same approach for the Grand Prix Arena, considering the additional attenuation due to distance to R1, the shielding by reason of the topography and the spectator stands the following noise emission levels have been determined.

TABLE 2: Patron Noise Levels from Grand Prix at R1

Vocal Effort	Number of people	Percentage of people talking	LAeq	Duration	LAeq, 15 min
Normal	1000	50%	26	15 min	26
Loud	1000	100%	37	1 min	25
Loud	1000	100%	37	2 min	28
Loud	2000	100%	40	1 min	28
Loud	2000	100%	40	2 min	31

For the PA system we have considered 20 speakers serving the hosting of events, angled down onto the crowd and to comply with the general background + 5 dB(A) limit we have nominated a maximum level of 95 dB(A) at 5 metres from any speaker.

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period in which the PA system is operating continuously at the above levels would result in a cumulative Leq, 15-minute level of background + 5 dB(A) resulting in an events ratio of 1.0 per event.

Covered Arena

Adopting the same approach for the Covered Arena, considering the attenuation due to distance to R1, the shielding by reason of the topography and the spectator stands, the following noise emission levels have been determined.

TABLE 3: Patron Noise Levels from the Covered Arena at R1

Vocal Effort	Number of people	Percentage of people talking	LAeq	Duration	LAeq, 15 min
Normal	1000	50%	28	15 min	28
Loud	1000	100%	41	1 min	23
Loud	1000	100%	41	2 min	32
Loud	2000	100%	44	1 min	26
Loud	2000	100%	44	2 min	35

For the PA system we have considered 20 speakers serving the hosting of events, angled down onto the crowd and to comply with the general background + 5 dB(A) limit we have nominated a maximum level of 85 dB(A) at 5 metres from any speaker. This level can be increased by the allocation of directivity when a speaker layout is determined (which for a conservative approach has been ignored in this case).

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period in which the PA system is operating continuously at the above levels would result in a cumulative Leq, 15-minute level of background + 5 dB(A) resulting in an events ratio of 1.0 per event.

Polocrosse Field

The Polocrosse Field is an open field with no spectator stands. For Polocrosse the spectators are located on the slightly elevated grassed area on the western side of the field. There is no shielding to location R1. For typical polocrosse events the number of patrons is significantly less than 1000. Under the Events DA for the International use of the polocrosse field the same combinations of patrons as for the other events results in the following noise emission levels.

TABLE 4: Patron Noise Levels from the Polocrosse Field at R1

Vocal Effort	Number of people	Percentage of people talking	LAeq	Duration	LAeq, 15 min
Normal	1000	50%	34	15 min	34
Loud	1000	100%	57	1 min	39
Loud	1000	100%	57	2 min	48
Loud	2000	100%	60	1 min	42
Loud	2000	100%	60	2 min	51

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period would realise an events ratio of 3.0

For the PA system we have considered 20 temporary speakers serving the hosting of events, angled down onto the crowd and to comply with the general background + 5 dB(A) a level of 85 dB(A) at 5 metres from any speaker.

Increasing the permissible speaker output to 85 dB(A) at 5 metres to accord with the Grand Prix Arena would be a level for an International event. The provision of speakers with baffles on the rear of highly directional speakers can reduce the level of noise to R1 (but for a conservative approach has been ignored in this case).

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period in which the PA system is operating continuously at the 85 dB(A) level would result in a cumulative Leq, 15-minute level of background + 21 dB(A) resulting in an events ratio of 6.3 per event.

Campdraft Arena

The Campdraft Arena has a covered spectator stand on the south western side of the arena and a raised mound on the western side of the arena. For general campdraft events the number of patrons is significantly less than 1000. Under the Events DA for the Campdraft Arena the same combinations of patrons as for the other events results in the following noise emission levels.

TABLE 5: Patron Noise Levels from the Campdraft Arena at R1

Vocal Effort	Number of people	Percentage of people talking	LAeq	Duration	LAeq, 15 min
Normal	1000	50%	35	15 min	35
Loud	1000	100%	58	1 min	40
Loud	1000	100%	58	2 min	49
Loud	2000	100%	61	1 min	43
Loud	2000	100%	61	2 min	52

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period would realise an events ratio of 3.5

For the PA system we have allocated 10 speakers on vertical poles in front of the spectator area directed down onto the spectators and speakers on the underside of the covered tiered seating directed down onto the spectators. The arena has four speakers on the eastern side of the arena directed to the west that cover the arena.

Utilising a speaker output to 85 dB(A) at 5 metres to accord with the Grand Prix Arena has been nominated for this DA Event assessment.

Taking the worst-case scenario of 2000 people cheering in a loud voice for 2 minutes in a 15-minute period in which the PA system is operating continuously at the 85 dB(A) level would result in a cumulative Leq, 15-minute level of background + 23 dB(A) resulting in an events ratio of 7.2 per event.

Gardens, Sculpture and Building Inspections

The events involving the view of the gardens, sculptures and buildings is not a noise generating event and would be well under the background + 5 dB(A) general limit that on an events ratio would be taken as less than 1.0 per event.

Conclusion

The Hosting of Events will involve the attendance of participants and members of the public generally exceeding 1000 persons at ticketed major events.

The sporting events are assessed under the EPA's events ratio procedure with a cumulative value for all such events not exceeding 50.

The events involving tours of Willinga Park for viewing the grounds, sculptures and building is not classified as a sporting event but if applied under the events ratio procedure would have an events ratio less than 1.

The basic PA systems for each arena is designed to satisfy the general background + 5 dB(A) limit. However, for major National or International events could be supplemented by additional speakers to cater for the larger capacity of the public.

The emission of noise from a crowd has been assessed for a loud cheer of 100% of the patrons for both 1 minute and 2 minutes of a 15-minute assessment period.

When the crowd noise at any individual facility (2000 people) using loud voice for 2 minutes and the PA system contribution considered to occur continuously over 15 minutes are added together an events ratio of 1.0 is obtained for the Grand Prix, 1.0 for the Covered Arena, 2.8 for the Show Jumping Arena, 6.3 for the Polocrosse Field and 7.2 for the Campdraft Arena.

From the above events ratio there are no acoustic issues with the Grand Prix or the Covered Arena.

Considering 12 events per year to be at the Show Jumping Arena gives rise to a total equivalent events of 33.6. If all events were restricted to the Polocrosse Field or the Campdraft Arena one could have 7 events a year.

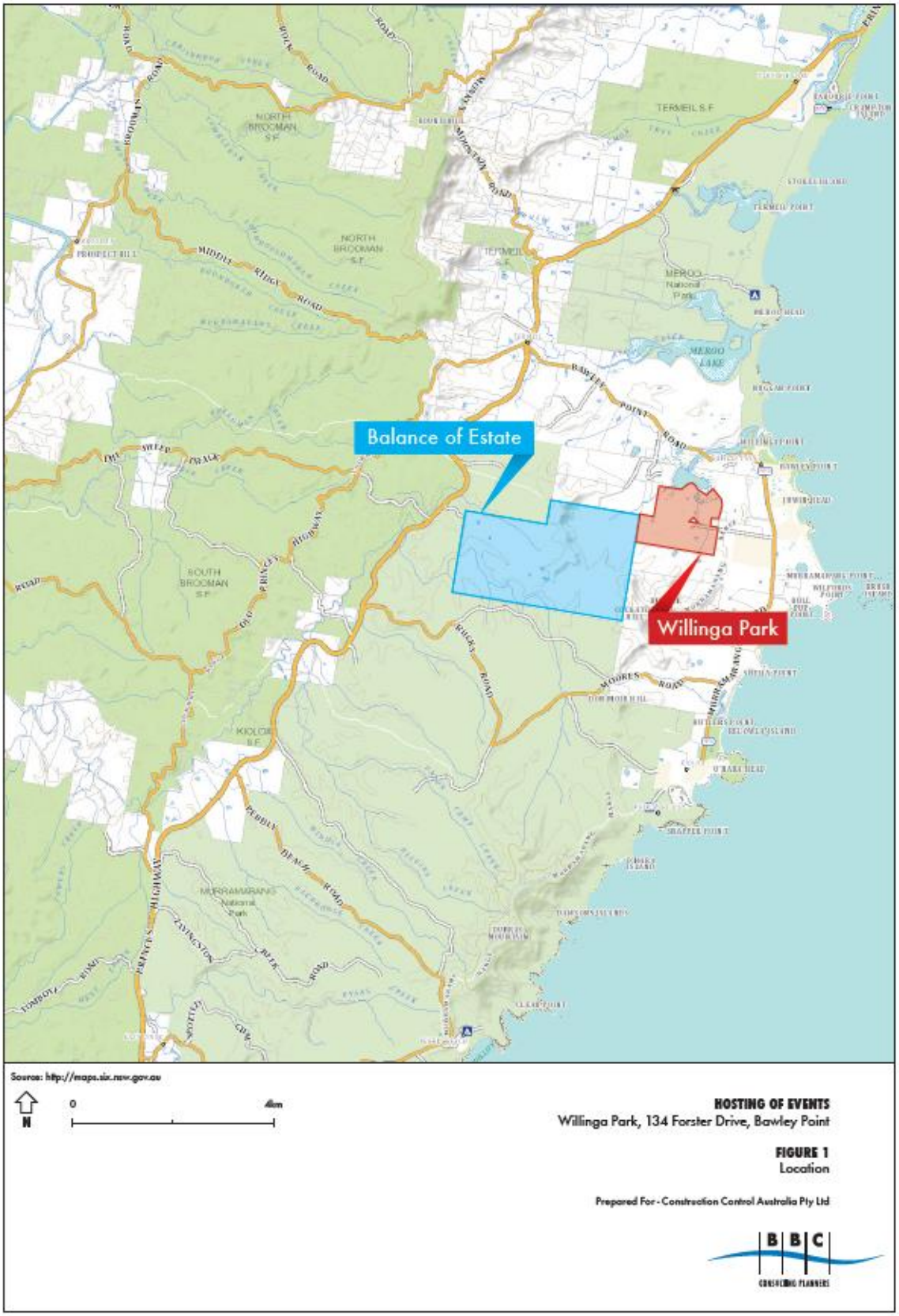
Utilising the events ratio for each discipline a program can be developed for the various sites to be below the EPA total allowance of 50 equivalent events.

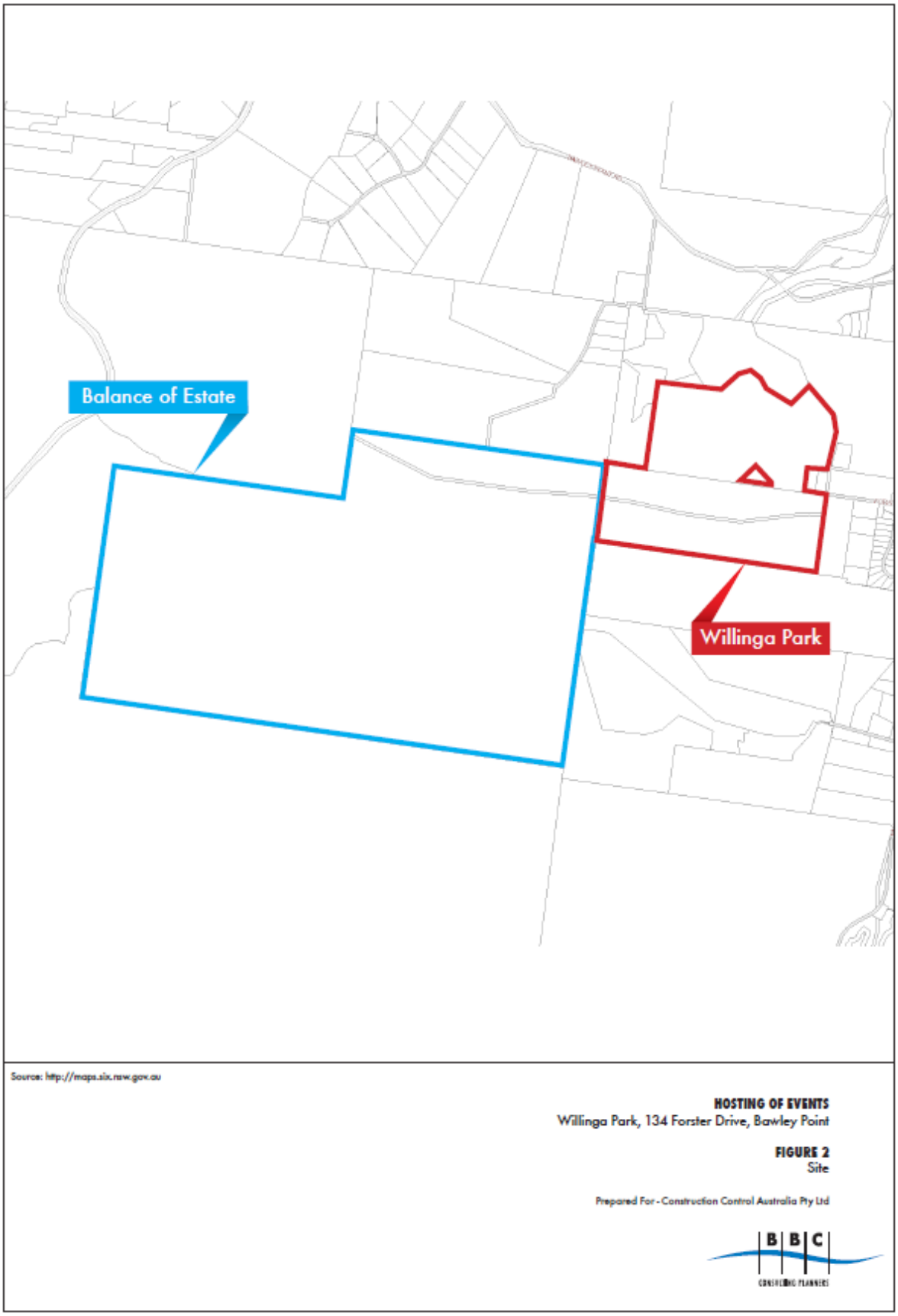
Yours faithfully,

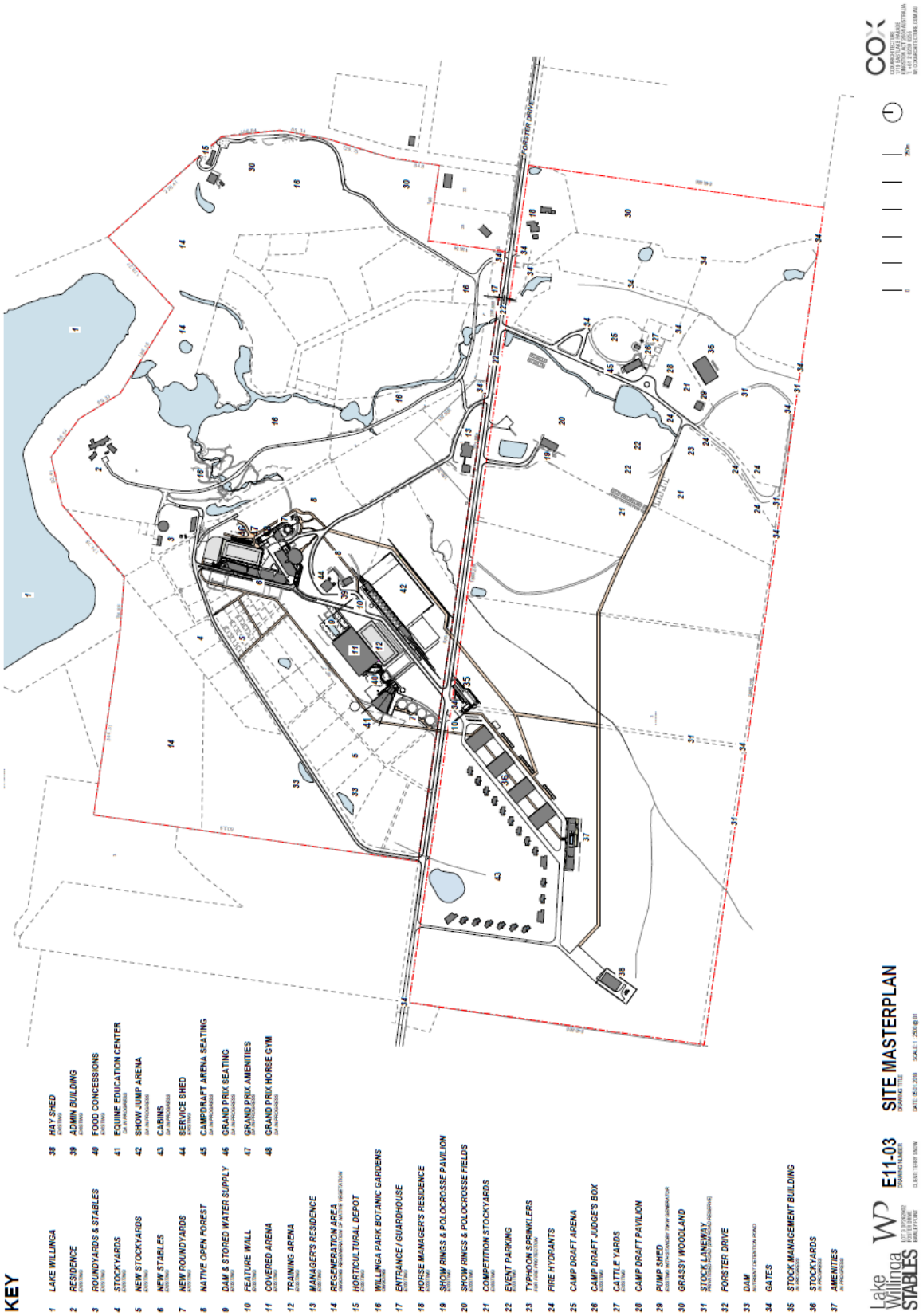
THE ACOUSTIC GROUP PTY LTD

STEVEN E COOPER

APPENDIX A:Site and Measurement Locations




Balance of Estate
Willinga Park
Source: http://maps.six.nsw.gov.au
HOSTING OF EVENTS
Willinga Park, 134 Forster Drive, Bawley Point
FIGURE 2
Site
Prepared For - Construction Control Australia Pty Ltd
B B C


KEY
1 LAKE WILLINGA
2 RESIDENCE
3 ROUNDYARDS & STABLES
4 STOCKYARDS
5 NEW STOCKYARDS
6 NEW STABLES
7 NEW ROUNDYARDS
8 NATIVE OPEN FOREST
9 DAM & STORED WATER SUPPLY
10 FEATURE WALL
11 COVERED ARENA
12 TRAINING ARENA
13 MANAGER'S RESIDENCE
14 REGENERATION AREA
15 HORTICULTURAL DEPOT
16 WILLINGA PARK BOTANIC GARDENS
17 ENTRANCE / GUARDHOUSE
18 HORSE MANAGER'S RESIDENCE
19 SHOW RINGS & POLOCROSSE PAVILION
20 SHOW RINGS & POLOCROSSE FIELDS
21 COMPETITION STOCKYARDS
22 EVENT PARKING
23 TYPHOON SPRINKLERS
24 FIRE HYDRANTS
25 CAMP DRAFT ARENA
26 CAMP DRAFT JUDGE'S BOX
27 CATTLE YARDS
28 CAMP DRAFT PAVILION
29 PUMP SHED
30 GRASSY WOODLAND
31 STOCK LANEWAY
32 FORSTER DRIVE
33 DAM
34 GATES
35 STOCK MANAGEMENT BUILDING
36 STOCKYARDS
37 AMENITIES
38 HAY SHED
39 ADMIN BUILDING
40 FOOD CONCESSIONS
41 EQUINE EDUCATION CENTER
42 SHOW JUMP ARENA
43 CABINS
44 SERVICE SHED
45 CAMPDRAFT ARENA SEATING
46 GRAND PRIX SEATING
47 GRAND PRIX AMENITIES
48 GRAND PRIX HORSE GYM
FORSTER DRIVE
Lake Willinga STABLES
E11-03
SITE MASTERPLAN
COX

APPENDIX B: Case Study 2 from EPA Noise Guide for Local Government (2010)

Case study 2: Noise from a motor sport facility

Council received inquiries about a proposal to establish a motor racing facility, which would involve drag racing and circuit racing. Council advised that any proposal for such a facility would require a noise assessment predicting noise impact from the proposed development. Council further advised that the noise assessment should be undertaken in two stages. The first stage would focus on site planning, thereby providing input into the facility location, siting and orientation. The second stage would address operational noise impacts.

In this scenario the noise assessment should assess:

- the sound power level of the different types of racing vehicle
- the number and type of events planned for the facility (e.g. drag racing, motocross, circuit racing, speedway or go-karts)
- the number and location of racing cars on the circuit and in any pit or warm-up areas
- potential meteorological effects on noise propagation and impacts in the surrounding area (the *NSW Industrial Noise Policy* (EPA 2000) provides guidance on this aspect).

The noise assessment should also identify the vehicle numbers on the track and their configuration with the potential to cause maximum noise impact. Noise modelling that is applied to each proposal should be compared with actual measurements that would serve to validate the model for this use.

Council also asked that the noise assessment provide noise mitigation strategies for the facility as well as predicted noise level reductions. Council expected that such an assessment would discuss the feasibility of the following noise mitigation and management options.

On-site noise mitigation

- Orient the track to use existing topography to reduce noise at noise-sensitive receivers.
- Locate very noisy racing track types (e.g. drag racing) furthest from noise-sensitive receivers and orient them to minimise noise.
- Use earth mounds and barriers.

Noise source controls

- Use effective mufflers on racing vehicles and require all vehicles to meet Confederation of Australian Motor Sport noise specifications.
- Implement a program for testing the noise of racing vehicles to ensure they meet racing association noise limits.

Operational noise controls

- Restrict times for practice and race days.
- Use respite periods during the racing schedule of an event.
- Limit of the number and type of events.

Receiver noise controls

In extreme situations and as a last resort, council could consider attaching development consent conditions requiring the proponent to implement noise controls at receiver locations such as:

- noise insulation for nearby houses
- where noise impacts are totally unacceptable, and the facility continues to operate, the proponent offering to acquire nearby property.

Legal advice should be sought if these types of condition are proposed.

Operational noise management plan

In addition to implementing many of the noise mitigation strategies mentioned above, council decided to ask the motor racing organisation to develop an ongoing noise management plan for events at the proposed facility. This noise management plan was included as a development consent condition, providing clear requirements for noise from the site and enabling council to regulate the operation of the facility. The noise management plan identified the number of events that would be allowed to occur at the facility, the noise monitoring program and the operator's complaint management system.

The event schedule (Table 3.1) for the motor racing facility was based on achieving a balance between how loud different racing events were likely to be and how often they occur. In this way council felt there was some control over the amount of noise nearby residents would be exposed to.

Using this approach, council decided that the maximum number of events that would be permitted in any 12-month period would be 50 with noise of background plus 5 dB. Where some events were likely to be noisier than this, then the number of events would reduce according to a ratio shown in Figure 3.4. The graph allows for an event multiplication factor to be assigned where noise from the event exceeds background plus 5 dB(A). For example, an event that exceeded the background by 8 dB(A) would count as two events, as the multiplication factor from Figure 3.4 is 2. The determination of an equivalent number of events from the graph was a way of capping the total amount of noise that adjacent residents would be exposed to over a year.

Differences between impacts from new versus existing facilities

The community is generally more sensitive to a new source of noise (e.g. from a new sporting facility at a greenfield site) than from existing facilities at the same noise level. This means that the same noise impact on the community from a new facility compared with an existing facility would occur only if the activity levels at the new facility were lower. In this case the proposal is for a new development. Therefore the number of events allowed for this new facility may be less than council might have approved for an existing facility of comparable size and proximity to residences.

The noise assessment report provided details of the expected noise levels from each type of racing event and how much the background noise level was likely to be exceeded. The noise impacts of drag racing in particular appeared to contribute a disproportionate amount to the 50 equivalent events allowed. Council suggested that the event schedule for the coming year be amended to include one drag racing event each year instead of the two proposed. This meant that the whole event schedule would not exceed the maximum of 50 equivalent events over the year. The type and number of events were included in the noise management plan.

The assessment noted that most racing events were held between 9 am and 5 pm, and up to ten late-night events up to 10 pm would be held each year. These operating times were also included in the proponent's noise management plan.

Council decided that a condition of development consent would be:

> *that the type, timing and number of events would be as specified in the facility's operational noise management plan approved as part of the application, and that these could be varied only following agreement by council.*

This condition provided certainty to the operator and the local community while allowing some flexibility.

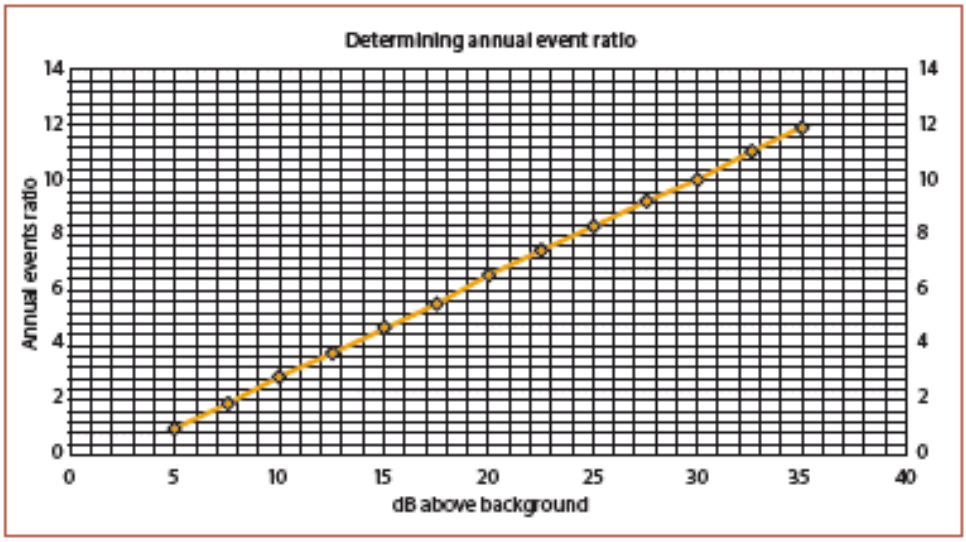
For existing motor sport facilities, where council is the ARA, council could regulate the activity under the POEO Act using a Noise Control Notice or a Prevention Notice to limit times of operation, noise levels and the way the activity is carried out.

A similar approach, balancing noise level against noise exposure, can be taken for other event-based activities such as target shooting ranges and lawful sporting events at specific sites.

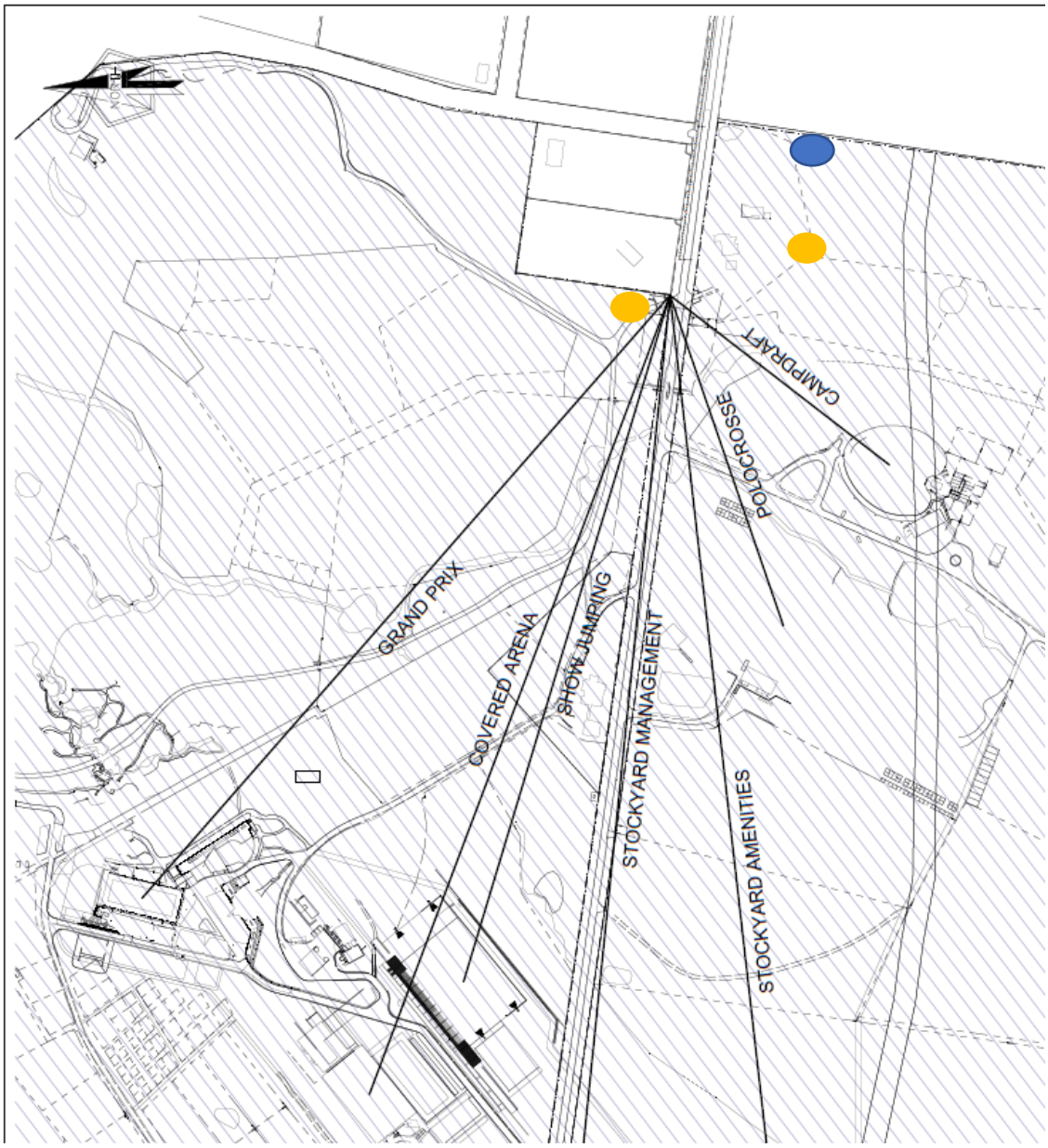
Table 3.1: Motor sport event schedule

Event description	Exceeds background by up to	Proposed no. of events x event multiplication ratio (from graph)	Equivalent no. of events	Amended equivalent events	Permitted no. of events
Super tourers	20 dB	3 x 6	18	18	3
Drag racing	30 dB	2 x10	20	10	1
Vintage series	10 dB	3 x 3	9	9	3
250/500 cc motorcycles	18 dB	2 x 6	12	12	2
Proposed number of events				49	9
Total equivalent events allowed				**50**	

Figure 3.4: Graph for determining event multiplication ratio from noise level



APPENDIX C: Logger Locations



Day Design Logger TAG Logger

APPENDIX D: Logger Results

Willinga Park

Job Number: 48.5299.R2
Instrumentation: SVAN 979 35804
Logger Location: North
Free Field: yes
Monitoring Period: Wednesday 9 May 2018 to Sunday 13 May 2018

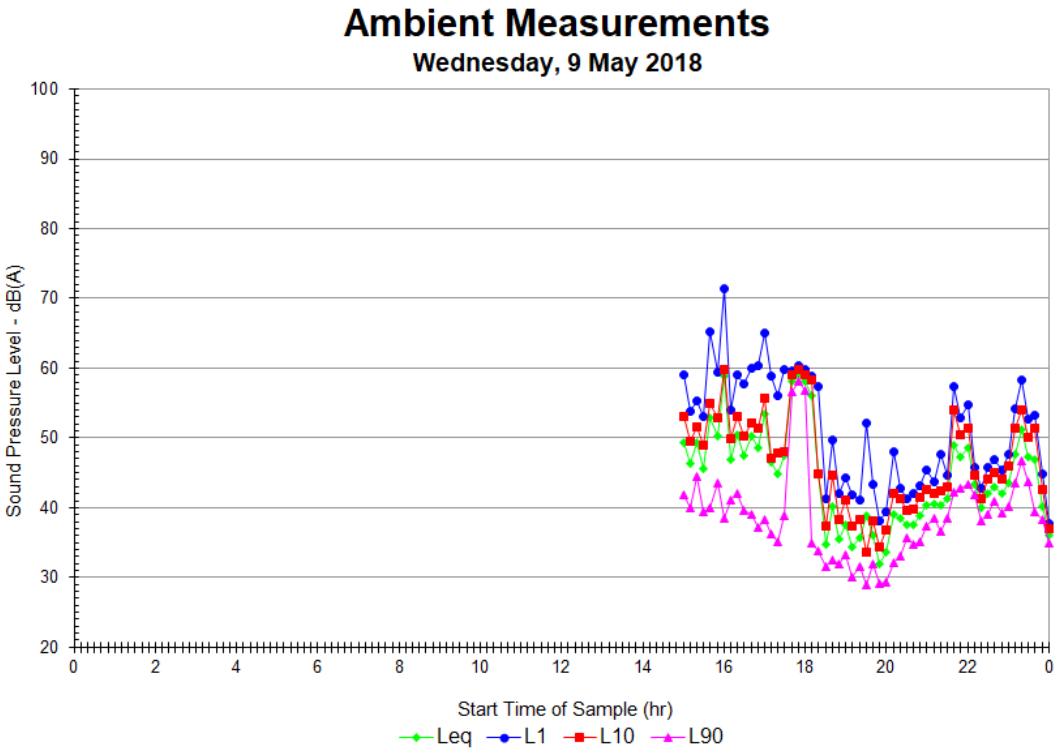
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's NOISE POLICY FOR INDUSTRY, 2017

Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm -	Night 10pm - 7am
Wednesday 9 May 2018	*	29.1	24.4	*	47.5	43.8
Thursday 10 May 2018	41.4	25.6	25.8	56.9	41.3	41.8
Friday 11 May 2018	44.7	40.5	32.5	56.3	48.6	50.9
Saturday 12 May 2018	46.0	45.2	43.0	58.0	54.6	52.7
Sunday 13 May 2018	43.9	43.1	*	54.2	50.5	*
RBL Median	**44.3**	**40.5**	**29.1**	-	-	-
Log Average	**-**	**-**	**-**	**56.6**	**50.3**	**49.4**

TRAFFIC NOISE MONITORING RESULTS
DECCW's NSW Road Noise Policy 2011

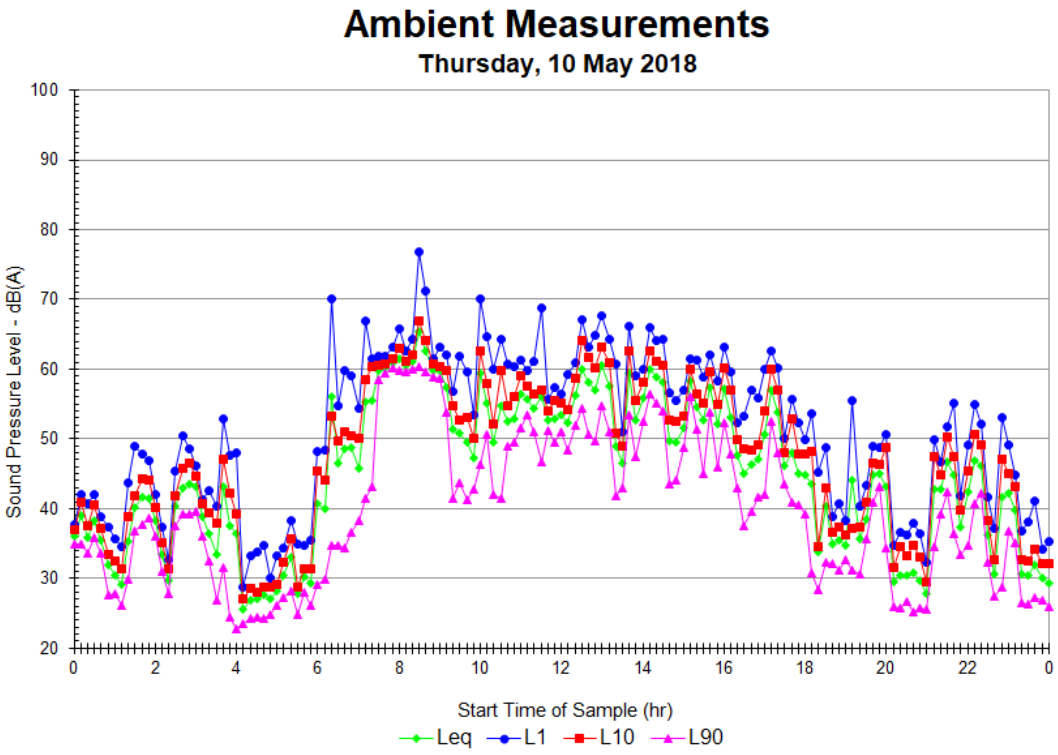
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 9 May 2018	*	46.3	57.3	*	52.6	32.7
Thursday 10 May 2018	58.1	44.3	64.7	38.9	48.4	31.2
Friday 11 May 2018	57.8	53.4	63.3	50.0	57.7	41.1
Saturday 12 May 2018	59.8	55.2	63.5	54.2	57.2	50.0
Sunday 13 May 2018	56.0	*	60.4	49.9	48.4	*
Log Average	**58.1**	**51.9**	**62.5**	**50.7**	**54.6**	**44.6**

* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning



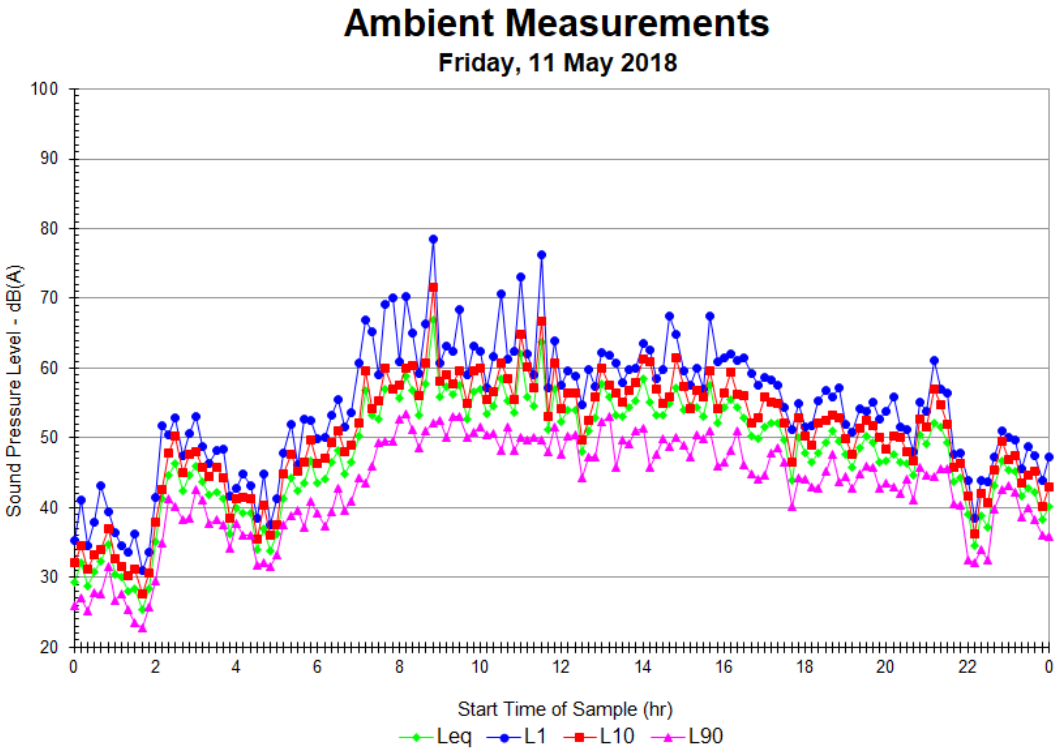
Willinga Park
SVAN 979 35804

48.5299.R2
North



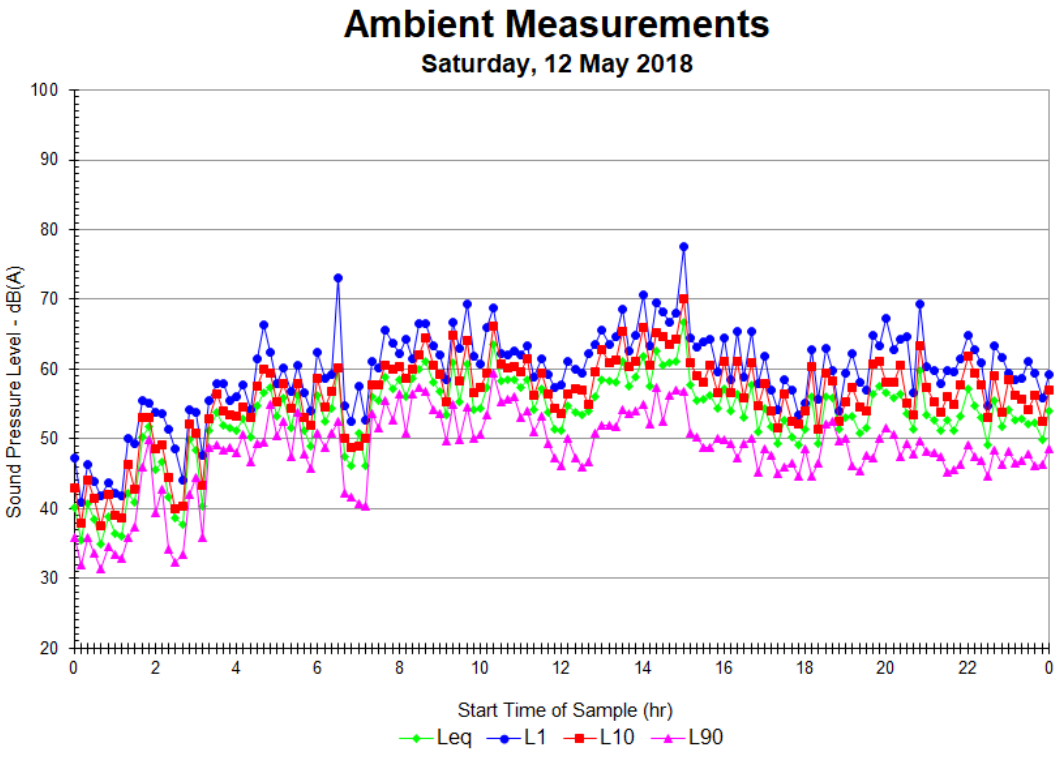
Willinga Park
SVAN 979 35804

48.5299.R2
North



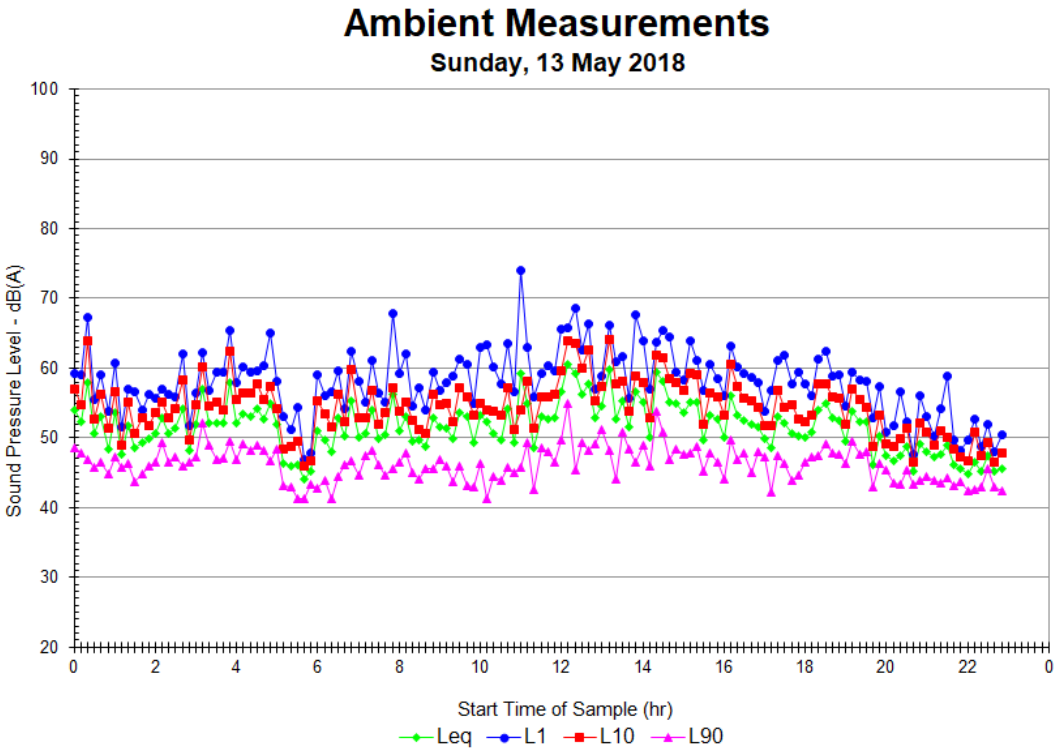
Willinga Park
SVAN 979 35804

48.5299.R2
North



Willinga Park
SVAN 979 35804

48.5299.R2
North



Willinga Park
SVAN 979 35804

48.5299.R2
North

Willinga Park

Job Number: 48.5299.R2
Instrumentation: SVAN 979 35808
Logger Location: Near Campcraft
Free Field: yes
Monitoring Period: Wednesday 9 May 2018 to Sunday 13 May 2018

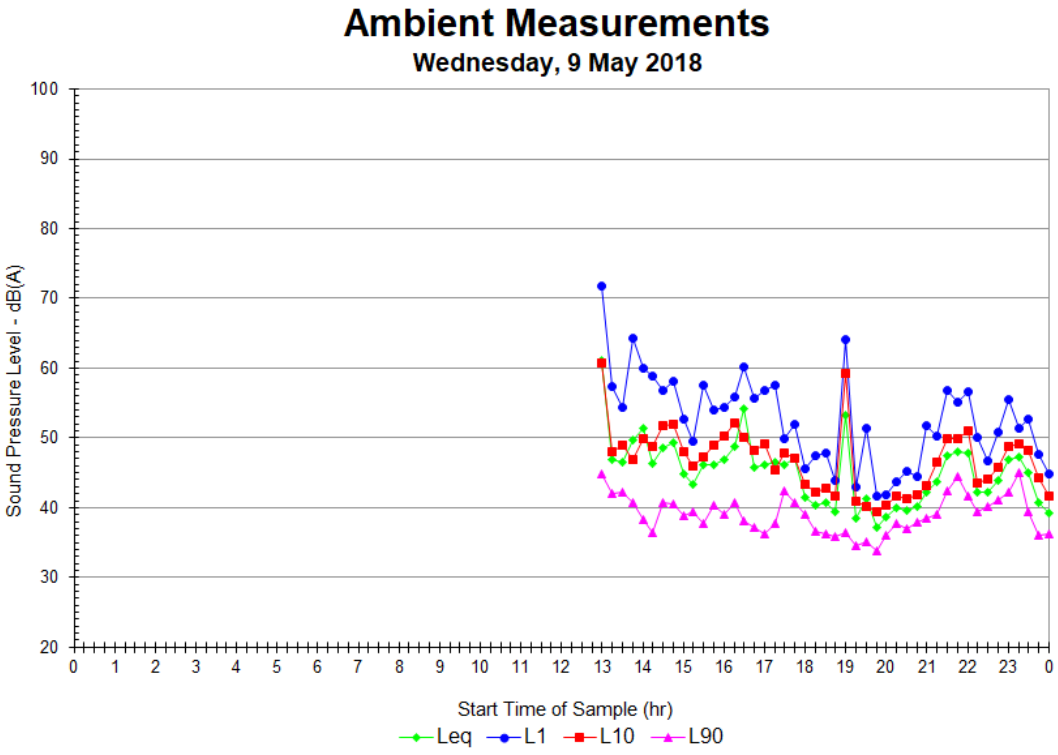
BACKGROUND AND AMBIENT NOISE MONITORING RESULTS
NSW EPA's NOISE POLICY FOR INDUSTRY, 2017

Day	L90 Background Noise Levels			Leq Ambient Noise Levels		
	Day 7am - 6pm	Evening 6pm - 10pm	Night 10pm - 7am	Day 7am - 6pm	Evening 6pm -	Night 10pm - 7am
Wednesday 9 May 2018	*	34.5	25.9	*	44.7	46.0
Thursday 10 May 2018	39.3	30.1	27.8	62.5	42.1	40.4
Friday 11 May 2018	43.5	39.2	32.4	52.7	48.2	51.4
Saturday 12 May 2018	45.3	44.8	43.4	58.5	55.8	54.8
Sunday 13 May 2018	42.7	43.7	39.1	54.9	51.9	46.3
RBL Median	**43.1**	**39.2**	**32.4**	-	-	-
Log Average	**-**	**-**	**-**	**58.7**	**51.1**	**50.3**

TRAFFIC NOISE MONITORING RESULTS
DECCW's NSW Road Noise Policy 2011

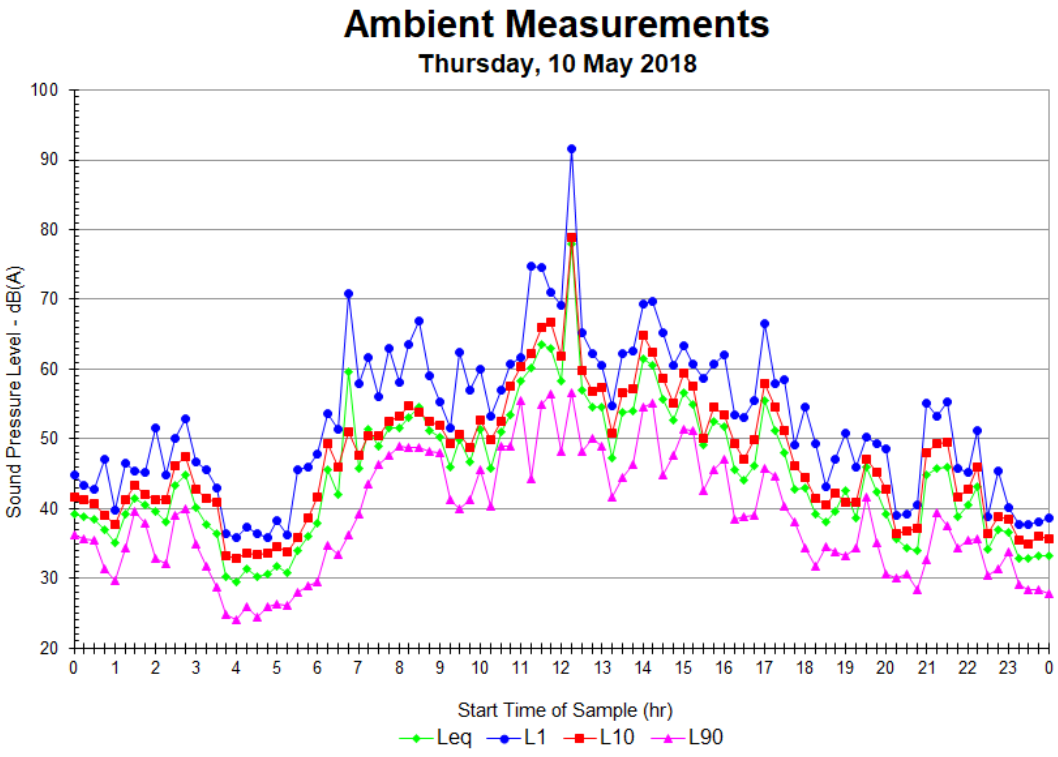
Day	Leq Ambient Noise Levels		Leq 1 Hr Noise Levels			
	Day 7am - 10pm	Night 10pm - 7am	Day - Max	Day - Min	Night - Max	Night - Min
Wednesday 9 May 2018	*	48.5	58.1	*	56.4	33.0
Thursday 10 May 2018	63.6	42.9	74.6	38.8	47.2	34.1
Friday 11 May 2018	54.4	53.9	59.1	49.8	60.0	40.3
Saturday 12 May 2018	60.4	57.3	66.2	55.7	60.2	53.3
Sunday 13 May 2018	56.8	48.8	60.2	49.8	50.7	44.7
Log Average	**60.2**	**52.8**	**68.5**	**51.6**	**57.3**	**47.2**

* indicates an incomplete set of data for a given time period
# Nighttime for a given day continues through to the following morning



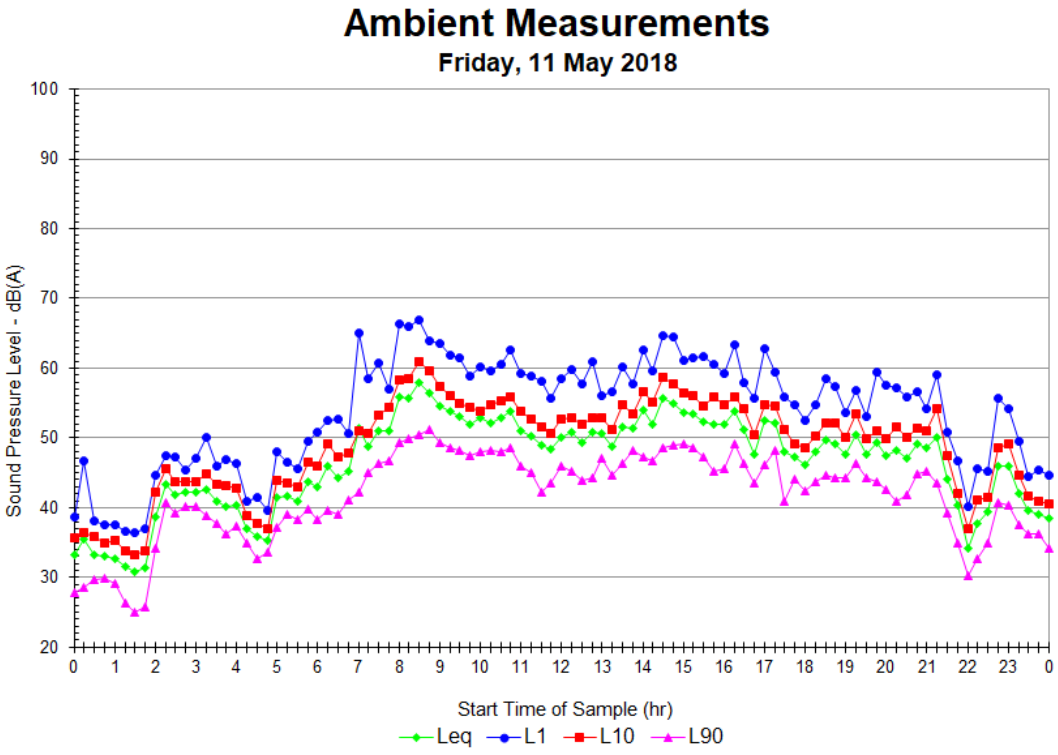
Willinga Park
SVAN 979 35808

48.5299.R2
Near Campcraft



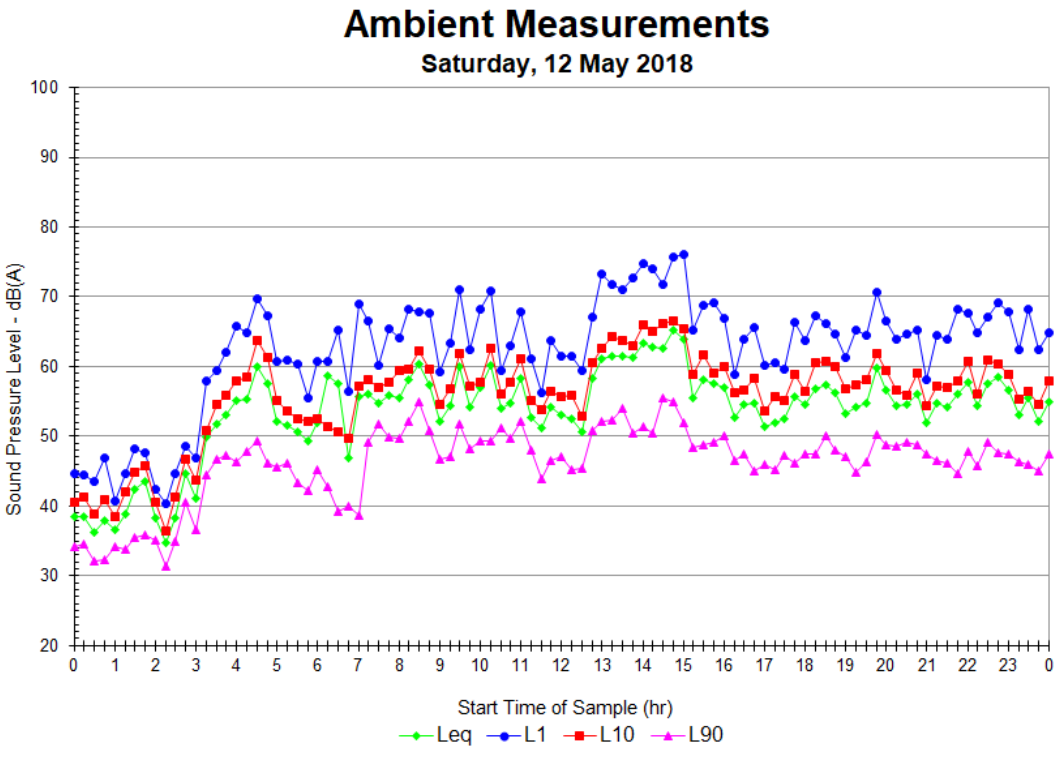
Willinga Park
SVAN 979 35808

48.5299.R2
Near Campcraft



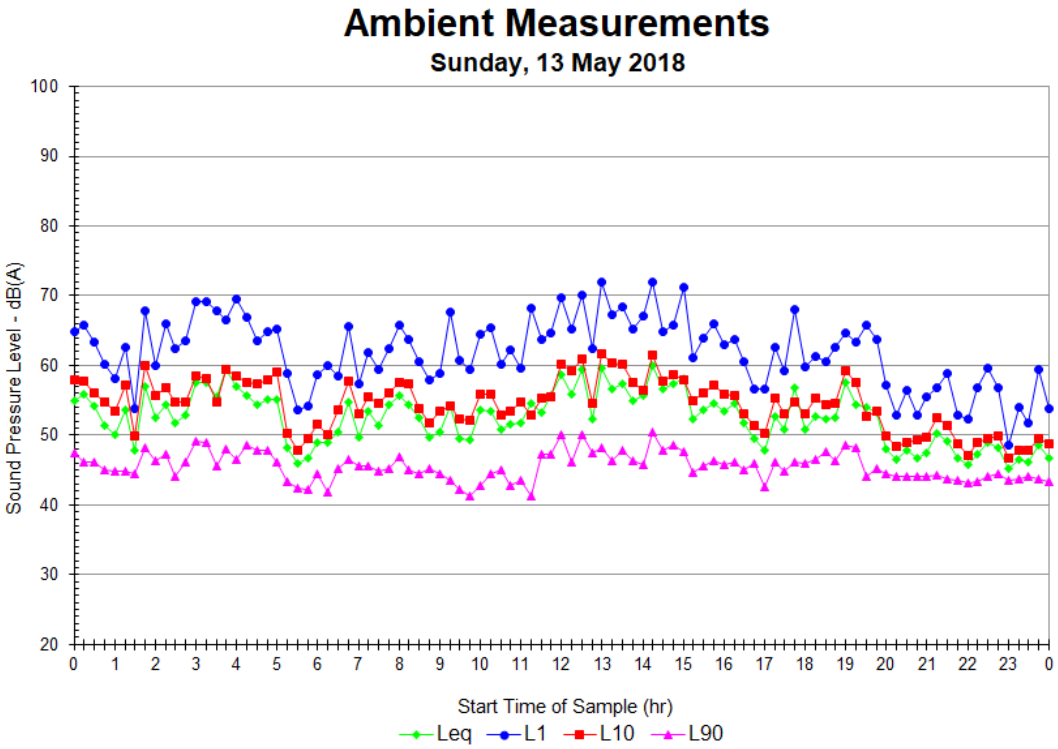
Willinga Park
SVAN 979 35808

48.5299.R2
Near Campcraft



Willinga Park
SVAN 979 35808

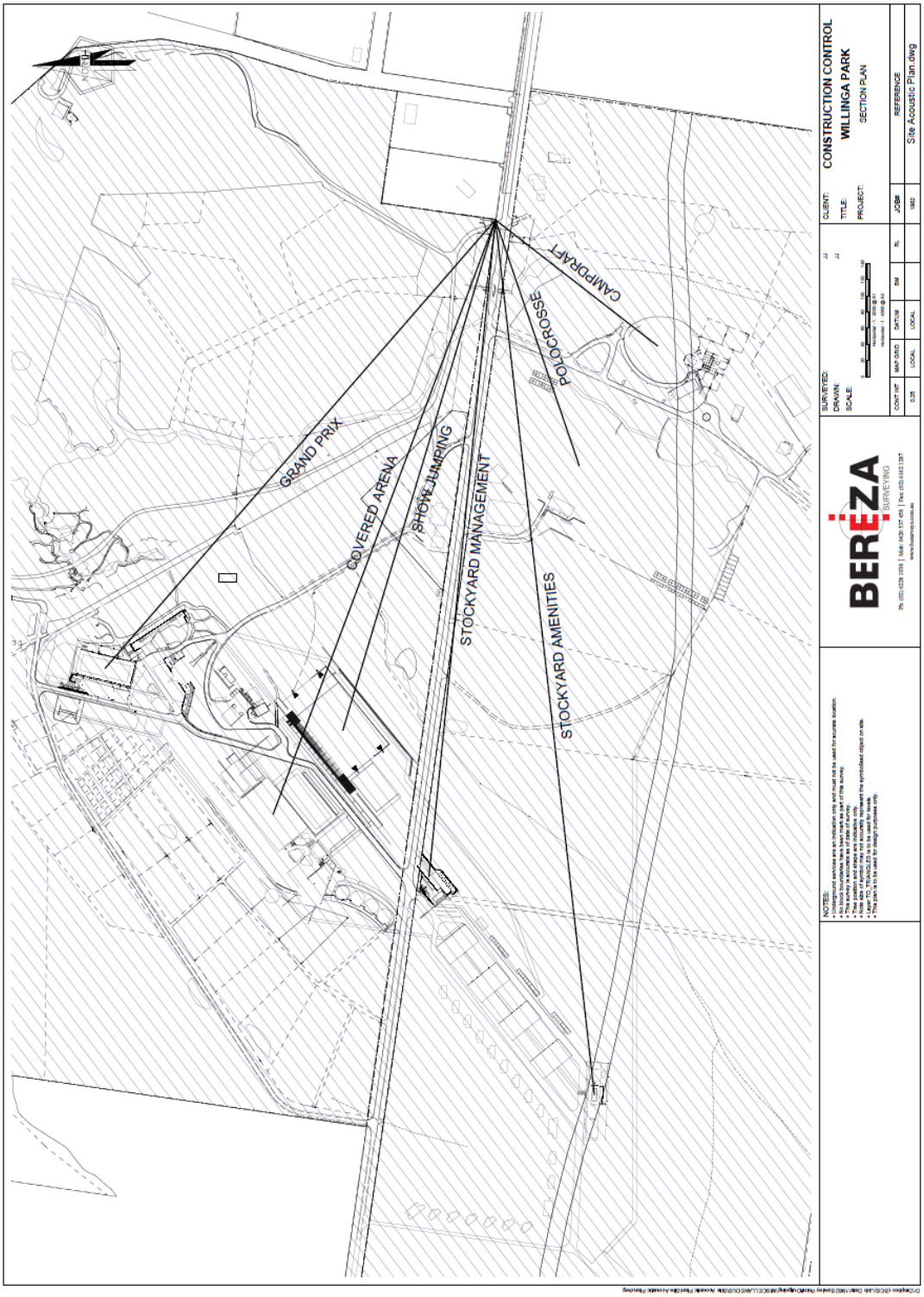
48.5299.R2
Near Campcraft

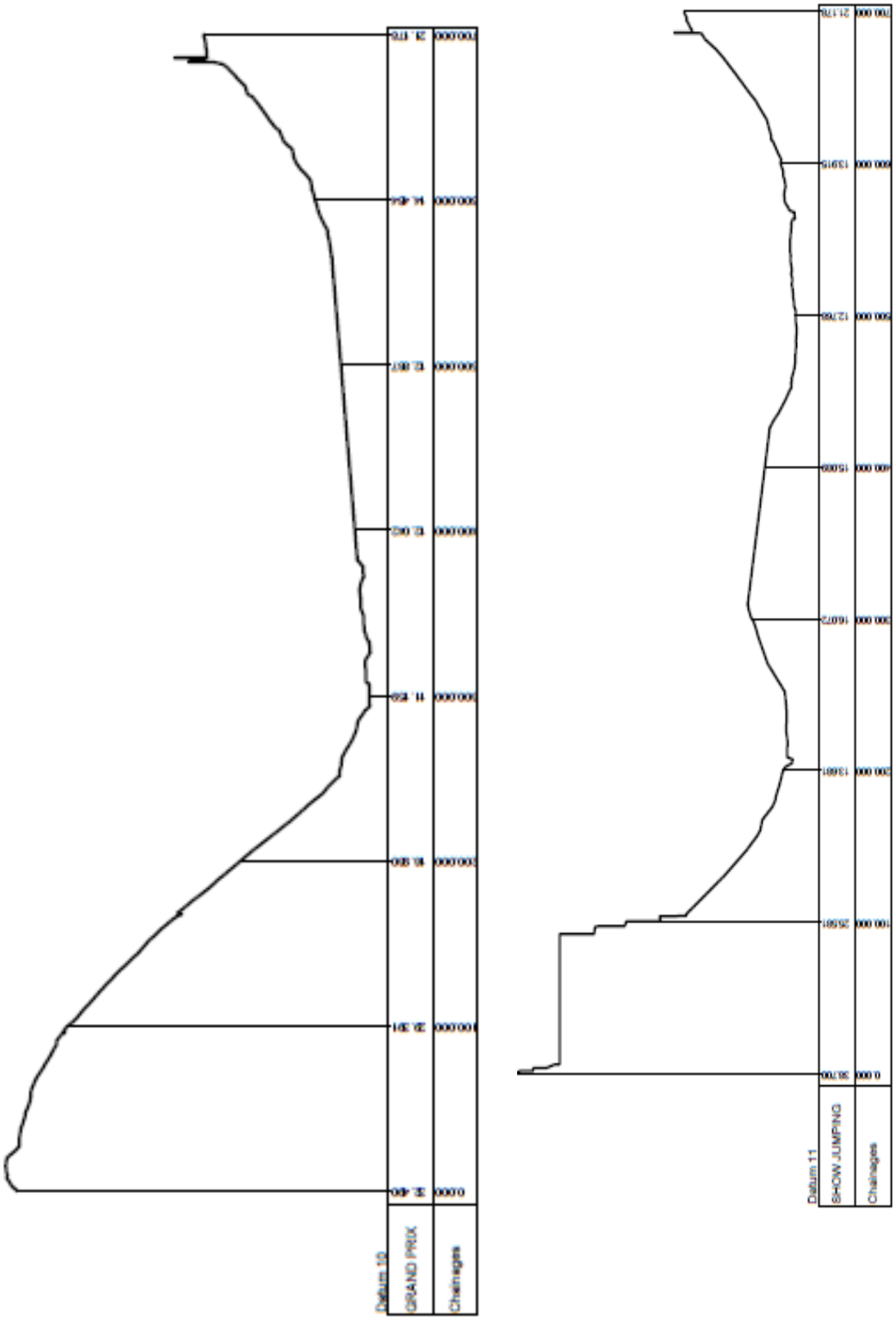


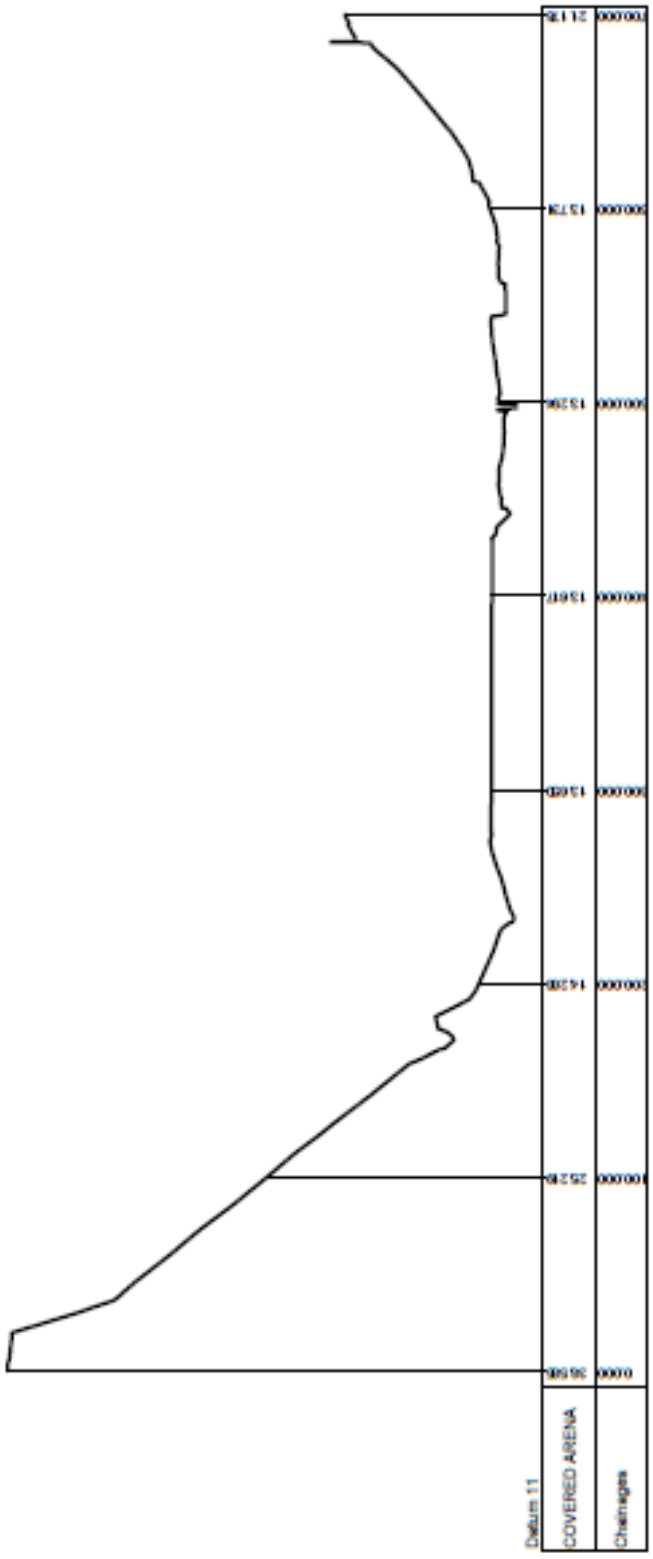
Willinga Park
SVAN 979 35808

48.5299.R2
Near Campcraft

APPENDIX E: Show Jumping Arena Location and Sectional Elevation to R1




Datum 10
GRAND PRIX
Chainages
Datum 11
SHOW JUMPING
Chainages


Datum 11
COVERED ARENA
Chainages

APPENDIX F: Patron Calculations

Show Jumping Arena Tiered Seating to location R1

Line			A-Weighted Octave Band Centre Frequency (Hz)								
		dB(A)	31	63	125	250	500	1k	2k	4k	8k
390 People – 50% talking in normal voice											
a.	195 Patrons (50% normal voices)	89	35	49	65	78	87	82	78	75	67
b.	Reflection off underside of roof		+3	+3	+3	+3	+3	+3	+3	+3	+3
c.	Distance attenuation + Lw to SPL		-65	-65	-65	-65	-65	-65	-65	-65	-65
d.	Contribution	27	-27	-13	3	16	25	21	17	13	5
390 People – 100% cheering in a loud voice											
e.	390 Patrons (100% loud voices)	112	39	57	74	87	103	109	106	100	87
f.	Reflection off underside of roof		+3	+3	+3	+3	+3	+3	+3	+3	+3
g.	Distance attenuation + Lw to SPL		-65	-65	-65	-65	-65	-65	-65	-65	-65
h.	Contribution (continuous noise)	50	-23	-5	12	25	41	47	44	38	25