



Coffs Harbour City Council

CHCC Coffs Stadium Grandstand Upgrade

Noise and Vibration Assessment

November 2017

Table of contents

1.	Introduction.....	1
1.1	Background.....	1
1.2	Purpose of this report.....	1
1.3	Scope.....	1
1.4	Limitations.....	2
1.5	Assumptions.....	2
2.	Existing environment.....	3
2.1	Unattended noise logging.....	5
3.	Noise criteria.....	7
3.1	Construction noise.....	7
3.2	Operational noise.....	10
4.	Impact assessment.....	13
4.1	Construction noise.....	13
4.2	Operational noise.....	18
5.	Noise mitigation measures.....	19
5.1	In-principle noise control methods.....	19
5.2	Mitigation measures.....	20
6.	Conclusion.....	23
7.	References.....	24

Table index

Table 2-1	Identified sensitive receivers.....	3
Table 2-2	Background logger details.....	5
Table 2-3	Summary of background monitoring results, dB(A).....	6
Table 3-1	Construction noise management levels at residential receivers.....	7
Table 3-2	Construction noise management levels at sensitive land uses other than residences.....	8
Table 3-3	ICNG CNMLs at identified receivers, dB(A).....	9
Table 3-4	RNP traffic noise target levels at residential receivers, dB(A).....	10
Table 3-5	Amenity Criteria.....	11
Table 3-6	Project specific operational noise criteria – daytime dB(A).....	12
Table 4-1	Noise modelling parameters.....	13
Table 4-2	Equipment sound power levels.....	14
Table 4-3	Predicted receiver levels.....	14

Table 5-1 Typical attenuations for source to receiver noise control methods20

Table 5-2 Mitigation measures for construction noise20

Figure index

Figure 2-1 Site location and sensitive receivers.....4

Figure 4-1 Predicted noise contours from vegetation/topsoil stripping and site preparation16

Figure 4-2 Predicted noise contours from piling and construction activities17

Appendices

Appendix A – Daily noise charts

Glossary

Term	Description
Ambient noise	The general environmental noise at a given location being the composite of sounds from many near and far sources.
Background noise	The underlying level of noise present in the ambient noise when extraneous noise is removed. This is described using the L_{A90} descriptor. (see also Rating background level)
CNML	Construction Noise Management Level
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
DECC	Department of Environment and Climate Change (NSW Government), later known as the Department of Environment Climate Change and Water, and now known as the Office of Environment and Heritage (OEH).
Decibel	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
ICNG	Interim Construction Noise Guideline (DECC, 2009).
L_{A90} (Time)	The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15 \text{ min})}$.
L_{Aeq} (Time)	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L_{Aeq} (1 hr)	The L_{Aeq} noise level for a one-hour period. It represents the highest tenth percentile hourly A-weighted L_{eq} during the period 7 am to 10 pm, or 10 pm to 7 am (whichever is relevant).
$L_{Aeq(15hr)}$	The L_{Aeq} noise level for the period 7:00 to 22:00 hours.
$L_{Aeq(9hr)}$	The L_{Aeq} noise level for the period 22:00 to 7:00 hours.
L_{Amax}	The maximum sound level recorded during the measurement period.
Mitigation	Reduction in severity.
Rating background level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period. This is the level used for assessment purposes.
Receiver	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receiver would be a home, work place, church, school or other place where people spend time.
SWL	Sound Power Level – represents the total noise output of the plant or equipment.

1. Introduction

1.1 Background

This noise assessment has been prepared to support a development application to Coffs Harbour City Council (Council) for the proposed expansion of the C.ex Coffs International Stadium, Stadium Drive, Coffs Harbour.

The proposal does not alter the overall capacity of the venue, however increases the amount of formal tiered seating for spectators from 936 to a minimum of 2758 and provides upgraded accessibility and amenities, new event administration and multi-purpose spaces, catering outlets, media facilities and improved environmental initiatives.

This report has been prepared by GHD Pty Ltd. The report has been prepared on behalf of Council as landowner of the Stadium.

1.2 Purpose of this report

This report presents an assessment of potential construction and operational noise impacts to nearby sensitive receivers due to the proposal, and forms an appendix to the Statement of Environmental Effects (GHD, October 2017). Mitigation measures are outlined where necessary.

1.3 Scope

- An initial desktop review of aerial photography was undertaken to identify noise sensitive receivers likely to be affected by construction activities.
- Long term unattended noise monitoring was conducted at 65 Stadium Drive, Coffs Harbour for a period of seven days. Background noise levels and corresponding noise criteria were derived from these measurements.
- Noise targets were determined with consideration to the following publications:
 - Department of Environment and Climate Change NSW (DECC) *Interim Construction Noise Guideline* (ICNG) (2009).
 - Department of Environment Climate Change and Water NSW (DECCW) *NSW Road Noise Policy* (RNP) (2011).
- A list of expected noise sources and their sound power levels (SWL) and any noise characteristics (tonality, impulsiveness, etc.) during the proposed works was compiled based on levels presented in relevant guidelines and from data collected for similar projects.
- Typical worst case impacts from proposed construction activities were predicted at the identified sensitive receivers with consideration to the ICNG using the ISO 9613 calculation algorithm implemented by CadnaA (version 2017) noise prediction software
- A high level assessment of project associated road traffic noise impacts due to increased vehicle movements during construction activities was undertaken.

- Comments have been provided regarding predicted construction and operational noise levels along with recommendations for reasonable and feasible noise mitigation measures.

1.4 Limitations

This report: has been prepared by GHD for Coffs Harbour City Council and may only be used and relied on by Coffs Harbour City Council for the purpose agreed between GHD and the Coffs Harbour City Council as set out in Section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Coffs Harbour City Council arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

1.5 Assumptions

Equipment proposed to be used for the construction works are not known at the time of this assessment, therefore GHD have assumed the equipment listed in Table 4-2 to be utilised over the course of the construction period based on experience from similar projects and advice presented in the *Construction Noise and Vibration Guideline* (CNVG) (Roads and Maritime 2016).

GHD have adopted typical sound power levels based on standard construction plant. The assessment assumes that the adopted levels are representative of the plant assumed.

It has been assumed construction works will be carried out during standard construction hours (Monday – Friday 7 am to 6 pm and Saturday 8 am to 1 pm).

It has also been assumed that the stadium operates at different times depending upon the event being held at the venue.

2. Existing environment

The existing C.ex Coffs International Stadium operates within a designated leisure area of Coffs Harbour and forms part of the Coffs Coast Sports and Leisure Park. The current and future operation of the stadium is guided by the Coffs Harbour Sports Facility Plan 2016.

The stadium has approval to be used for a range of sporting and entertainment events from an approval granted in 1993. Building Permit No. 623/93 was issued by Coffs Harbour City Council 12 July 1993.

Development Consent No. 0569/16 issued on 5 February 2016 also granted approval for the temporary use of land and associated temporary structures for various events and activities at the site.

The proposal involves the construction of two new grandstands adjacent to the existing grandstand. The receivers that will be most impacted by the construction of the proposal include the church precinct across Stadium Drive, sporting fields adjacent to the stadium, and individual residential receivers located to the south-west of the stadium. The receivers have been identified for the purpose of this assessment and are shown in Table 2-1 and Figure 2-1.

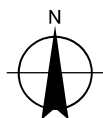
Table 2-1 Identified sensitive receivers

Receiver ID	Receiver type	Description	Easting	Northing
R01	Educational institution	Family Link Centre/child care	509026.2	6645305.2
R02	Place of worship	Harbour Church	509035.8	6645240.8
R03	Place of worship/Passive recreation area	Crematorium and Memorial Gardens	509143.7	6645229.8
R04	Active recreation	Sporting field	508961.3	6645434.3
R05	Active recreation	Sporting field	509298.9	6645354.6
R06	Hospital ward	GP Super clinic	508773.6	6645297.4
R07	Residential	Private residence	508738.0	6645211.0
R08	Residential	Private residence	509039.9	6645042.8
R09	Residential	Private residence	508894.6	6644922.3
R10	Residential	Private residence	508955.2	6644901.6



Paper Size ISO A4
0 25 50 75 100
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Coffs Harbour City Council
Coffs Harbour International Stadium
Noise Impact Assessment

Project No. 22-18717
Revision No. 0
Date 19/10/2017

Site location and sensitive receivers

Figure 2-1

2.1 Unattended noise logging

Long term unattended noise monitoring (background monitoring) was conducted for this project at 65 Stadium Drive, Coffs Harbour in order to set construction noise criteria for receivers in the area.

Noise monitoring equipment was within current NATA accredited calibration and conformed to the requirements of a Type 1 sound level meter, as set out in AS 1259.2 (1990) *Acoustics – Sound Level Meters – Integrating – Averaging* or AS IEC 61672.1 (2004) *Electro Acoustics - Sound Level Meters Specifications*.

Pre-measurement calibration checks were performed on the noise monitoring equipment using a sound level calibrator with a sound pressure level of 94 dB(A) at 1 kHz. At completion of the measurements, the meter's calibration was re-checked to ensure that the sensitivity of the noise monitoring equipment had not varied. The noise logger was found to be within the acceptable tolerance of ± 0.5 dB(A).

All sampling activities were carried out with consideration to the specifications outlined in AS 1055(1997) *Description and Measurement of Environmental Noise* and NSW *Industrial Noise Policy* (2000) (INP).

Logged data was reviewed to exclude any anomalous data and data potentially affected by adverse weather conditions. Meteorological data for the monitoring period in 30 minute intervals was sourced from the nearest Bureau of Meteorology weather station at Coffs Harbour Airport, station number 059151, located approximately 2 km to the east of the site. Monitoring equipment details are summarised in Table 2-2.

Table 2-2 Background logger details

Location	Measurement period	Equipment details	Equipment settings
65 Stadium Drive	9/10/2017 – 16/10/2017	Type 1, SVAN 977 S/N 36872	A-weighted Fast time response

2.1.1 Summary of noise monitoring results

Rating background levels and ambient noise levels recorded are summarised in Table 2-3. Daily noise level charts for the entire monitoring period are presented in Table 2-2. A description of the acoustic terms can be found in the glossary at the start of this report. There were several weather exclusions during evening and night time noise logging, however the noise assessment was assessed against day time criteria, for which there was sufficient background noise data recorded.

Table 2-3 Summary of background monitoring results, dB(A)

Date	Rating background level 90 th percentile L _{A90(15min)} , dB(A)			Ambient noise levels, L _{Aeq(period)} , dB(A)			Day-time road traffic noise (L _{Aeq} , 15hr)	Day-time road traffic noise (L _{Aeq} , 1hr)
	Day ¹	Evening ¹	Night ¹	Day ¹	Evening ¹	Night ¹		
Mon 9-Oct-2017	45	38	37	52	50	47	51	54
Tues 10-Oct-2017	45	38	36	54	49	48	53	54
Wed 11-Oct-2017	45	41	37	52	47	47	51	54
Thurs 12-Oct-2017	45	39	34	51	49	46	50	52
Fri 13-Oct-2017	45	39	34	50	49	56	50	51
Sat 14-Oct-2017	50	42	42	60	46	50	59	60
Sun 15-Oct-2017	47	-	35	53	-	46	53	54
Mon 16-Oct-2017	47	-	-	52	-	-	52	52
RBL	45	39	36	n/a	n/a	n/a	n/a	n/a
Leq Overall	n/a	n/a	n/a	54	48	50	n/a	54
L_{Aeq},15 hr overall	n/a	n/a	n/a				53	

Note 1: INP defines day, evening and night-time periods as:

- Day: the period from 7:00 am to 6:00 pm Monday to Saturday; or 8:00 am to 6:00 pm on Sundays and Public Holidays.
- Evening: the period from 6:00 pm to 10:00 pm.
- Night: the period from 10:00 pm to 7:00 am.

“-“ denotes data not available

“n/a” denotes not applicable.

3. Noise criteria

3.1 Construction noise

Construction noise criteria are sourced from the ICNG.

The recommended standard hours for construction activities are as follows:

- Monday to Friday: 7.00 am to 6.00 pm
- Saturday 8.00 am to 1.00 pm
- No work on Sundays or public holidays

The proposed construction activities are expected to occur during standard construction hours. However, the ICNG acknowledges that the following activities have justification to be undertaken outside the recommended construction hours:

- Emergency work
- The delivery of oversized plant or structures
- Works for which it can be demonstrated that there is a need to operate outside the recommended standard hours

A strong justification would typically be required for works outside the recommended standard hours. Where all feasible and reasonable practices have been applied for work outside standard hours and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the affected community. Table 3-1 outlines the noise management level relationship to RBL for residential receivers potentially impacted by the proposal.

Table 3-1 Construction noise management levels at residential receivers

Time of day	Management level (external) L _{Aeq} (15min)
Recommended standard hours: <ul style="list-style-type: none">• Monday to Friday 7:00 am to 6:00 pm• Saturday 8:00 am to 1:00 pm• No work on Sundays or public holidays	Noise affected: Rating background level plus 10 dB(A)
	Highly noise affected: 75 dB(A)
Outside recommended standard hours	Noise affected: Rating background level plus 5 dB(A)

Other sensitive land uses typically consider noise from construction to be disruptive when the properties are being used. Table 3-2 below presents the noise management levels for other sensitive land uses identified in the vicinity of the project.

Table 3-2 Construction noise management levels at sensitive land uses other than residences

Land use	Management level $L_{Aeq}(15min)$ (applies when properties are being used)
Classrooms at schools and other educational institutions	Internal noise level 45 dB(A)
Hospital wards and operating theatres	Internal noise level 45 dB(A)
Places of worship	Internal noise level 45 dB(A)
Passive recreation areas	External noise level 60 dB(A)
Active recreation areas	External noise level 65 dB(A)

A summary of the external project specific goals (ICNG construction noise management levels (CNML)) at the identified noise sensitive receiver types are outlined in Table 3-3.

.

Table 3-3 ICNG CNMLs at identified receivers, dB(A)

Receiver Type	Rating Background Level (RBL) $L_{A90}(\text{period})$ dB(A)			ICNG Management Level $L_{Aeq}(15\text{min})$ dB(A)				
	Day	Evening	Night	Highly noise affected	Standard construction hours (day) (RBL + 10)	Outside standard construction hours (day) ³ (RBL + 5)	Outside standard construction hours (evening) ³ (RBL + 5)	Outside standard construction hours (night) ³ (RBL + 5)
Residential	45	39	36	75	55	50	44	41
Classrooms at schools and other educational institutions (External) ¹	N/A ²			55 dB(A) (when in use)				
Hospital wards and operating theatres (External) ¹	N/A ²			55 dB(A) (when in use)				
Places of worship (External) ¹	N/A ²			55 dB(A) (when in use)				
Passive recreation areas (External)	N/A ²			60 dB(A) (when in use)				
Active recreation areas (External)	N/A ²			65 dB(A) (when in use)				

Note 1: Calculated external noise level assumes a typical 10 dB(A) reduction in noise from outside to inside the building

Note 2: N/A indicates not applicable

Note 3: Outside standard construction hours include:

For day time periods: 7 am – 8 am, 1 pm – 6 pm on Saturdays, and 7 am – 6 pm on Sundays/Public Holidays

For evening periods: 6 pm – 10 pm everyday

For night periods: 10 pm – 7 am everyday

The noise affected CNML represents the point above which there may be some community reaction to noise. Where the noise affected CNML is exceeded, all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted receivers should be informed of the nature of the works, expected noise levels, duration of works and a method of contact. The CNML for residential receivers is the background noise level plus 10 dB during recommended standard hours and the background noise level plus 5 dB outside of recommended standard hours.

The highly noise affected CNML represents the point above which there may be strong community reaction to noise. Where noise is above this level, any feasible and reasonable ways to reduce noise below this level should be carefully considered. If no quieter work method is feasible and/or reasonable, the duration and noise levels of the works and respite periods that would be provided should be clearly explained to the impacted receivers. The ICNG sets the highly affected CNML during standard hours at 75 dB(A) for residential receivers.

3.1.1 Construction traffic noise criteria

The NSW *Road Noise Policy* (RNP) provides non-mandatory road traffic noise target levels for land use developments with potential to create additional traffic on public roads. The road traffic noise target levels applicable to construction traffic along local roads are presented in Table 3-4.

Table 3-4 RNP traffic noise target levels at residential receivers, dB(A)

Type of development	Day (7:00 am – 10:00 pm)	Night (10:00 pm – 7:00 am)
Existing residences affected by additional traffic on existing local roads generated by land use developments.	L _{Aeq} (1 hour) 55 (external)	L _{Aeq} (1 hour) 50 (external)

The application notes for the RNP state that *‘for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion.’* This has been used to identify potential impacts as a result of noise produced by construction traffic and the potential for reasonable and feasible mitigation measures to be applied.

If road traffic noise increases during proposal construction are limited to 2 dB(A) above current levels, then the objectives of the RNP are met and no specific mitigation measures would be required.

3.2 Operational noise

The NPI provides guidance on the assessment of operational noise impacts. The guideline includes both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level, and to limit the total noise level from all sources near a receiver.

The NPI noise criteria are planning levels and are not mandatory limits required by legislation; however the noise criteria assist the regulatory authorities to establish licensing conditions and/or make approval decisions. Where noise criteria are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved, negotiation is required between the regulatory authority to evaluate the economic, social and environmental costs and benefits of the development against the

noise impacts. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development.

3.2.1 Intrusive criteria

The intrusive criteria are determined by a 5 dB(A) addition to the measured (or adopted) background level with a minimum of 35 dB(A) for day time (30 dB(A) for evening and night). The NPI recommends that the intrusive noise criteria for the evening period should not exceed the daytime period and the night-time period should not exceed the evening period. The intrusive noise criteria are only applicable to residential receivers.

The intrusive criteria can be summarised as follows:

$$L_{Aeq(15 \text{ minute})} \leq \text{rating background level} + 5 \text{ dB(A)}$$

Where the $L_{Aeq(15 \text{ minute})}$ is the predicted or measured L_{Aeq} from the site over a fifteen minute period at the receiver. This is to be assessed at the most affected point on or within the residential property boundary or if that is more than 30 metres from the residence, at the most affected point within 30 metres of the residence.

The intrusive criteria for this project is found by applying a 5 dB(A) addition to the RBL values obtained at the monitoring locations.

3.2.2 Amenity criteria

The amenity criteria aim to limit continual increases in noise levels from industrial noise sources and apply to all industrial noise sources apparent at the receiver location, rather than just the noise source from the proposed development. The amenity criteria covers sensitive receiver types including residential, educational, health, place of worship, recreational areas, commercial premises and industrial premises.

The amenity criterion is based on the land use of the area and the existing level of noise from industry, commerce and road traffic. With consideration to the NPI 'Noise Amenity Area' classification, the residential receivers identified in this assessment have been classified as 'urban'. A summary of the relevant amenity criteria based on land type is provided in Table 3-5.

Table 3-5 Amenity criteria

Type of Receiver	Indicative Noise Amenity Area	Time of Day	Recommended L_{Aeq} , Noise Level, dB(A)
			Acceptable
Residential	Urban	Day	60
		Evening	50
		Night	45

No modifying factor adjustment to the amenity criteria is required as existing industrial noise contributions from other sites is negligible.

3.2.3 Project noise trigger level

Project noise trigger levels for the receivers in the area are provided in table Table 3-6.

Table 3-6 Project noise trigger levels dB(A)

Criterion	Day	Evening	Night
Rating background level, L _{A90} (Period)	45	39	36
Intrusiveness criteria, L _{Aeq} (15min)	50	44	41
Amenity criteria (urban), L _{Aeq} (period)	60	50	45
Project trigger level L _{Aeq} (15min)	50	44	41

The NSW NPI requires that the noise level at residences be assessed at the most affected point on or within the residential boundary or, if this is more than 30 m from the residence, at the most-affected point within 30 m of the residence.

3.2.4 Sleep disturbance

The OEH, Noise Guide for Local Government (NGLG) provides guidelines for assessing sleep disturbance from short-term noise events. To assess potential disturbance during night-time hours (10.00 pm to 7.00 am), Section 2.4.5 of the NGLG recommends that L_{A1,1min} levels outside a bedroom window should not exceed the background level by more than 15 dB.

Given the proposal should not operate inside these hours, sleep disturbance is not applicable to the assessment and is therefore not discussed further.

3.2.5 Road traffic noise

The NSW *Road Noise Policy* (RNP) provides non-mandatory road traffic noise target levels for land use developments with potential to create additional traffic on public roads. As no additional traffic is anticipated as a result of the proposal, no further consideration of the RNP is considered necessary.

4. Impact assessment

A construction schedule has not yet been confirmed, though work is expected to begin in late 2017 and continue into 2018. It is anticipated that the building the two new grandstands will include the following general construction activities:

- Clearing of groundcover vegetation
- Topsoil stripping and site preparation
- General earthworks and construction
- Piling activities
- Transport and handling of soils and materials

4.1 Construction noise

Construction noise impacts have been predicted using noise modelling software CadnaA (version 2017) and implementing ISO 9613-2 – *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*. This algorithm considers the effect of topography, ground absorption and atmospheric absorption when predicting outdoor noise propagation. This algorithm predicts noise propagation under noise enhancing conditions such as a 2 m/s source to receiver wind. Predicted impacts are therefore considered to be a worst case scenario.

Modelling parameters are presented below in Table 4-1.

Table 4-1 Noise modelling parameters

Modelling parameter	Value
Modelling software	CadnaA (version 2017)
Prediction algorithm	ISO 9613 – 2 <i>Acoustics – Attenuation of sound during propagation outdoors</i>
Modelling period	Typical worst case operations where each item of equipment is running at full power simultaneously
Meteorology	ISO 9613 considers the presence of a well-developed moderate ground based temperature inversion, such as commonly occurs on clear, calm nights or 'downwind' conditions which are favourable to sound propagation
Ground absorption coefficient	G = 1 (soft, absorbing ground)
Terrain	2 m vertical resolution ground contour data
Receiver height	1.5 m above ground level

4.1.1 Modelling scenarios

For the purposes of modelling, construction activities for the project have been separated into two main stages including:

1. Vegetation/topsoil stripping and site preparation in the vicinity of the southern-most grandstand (closest grandstand to sensitive receivers)
2. Piling and construction in the vicinity of the southern-most grandstand

The equipment assumed to be utilised including sound power levels (SWLs) for each scenario are as follows.

Table 4-2 Equipment sound power levels

Scenario	Equipment	SWL dB(A) ¹
Vegetation/topsoil stripping and site preparation ²	Chainsaw	114
	Mulcher	116
	Dozer	116
	Excavator	110
	Backhoe/FEL	111
	Dump truck	110
Piling and construction ²	Bored piler or CFA ³	117
	Mobile crane x2	113
	Concrete truck	109
	Concrete pump	102
Included in all scenarios	Heavy vehicles x10 trips per day ⁴	108
	Light vehicles x30 per day ⁴	88
	Generator	103

Note 1: All SWLs sourced from the RMS Construction Noise and Vibration Guideline (August 2016) and represent the highest allowable noise levels for construction equipment.

Note 2: All equipment modelled was assumed to be operating simultaneously.

Note 3: This includes a 5 dB(A) penalty as bored piling rigs can produce a tonal annoyance.

Note 4: Heavy vehicle movements were spread out over the working day (1 vehicle per hour) whilst light vehicle movements were assumed to all occur within a peak morning or afternoon hour.

It has been assumed a bored piler or a continuous flight auger would be utilised for piling activities. In the event an impact piler is utilised in lieu of a bored piler, resultant noise levels at receivers could increase by up to 17 dB. In the event a vibratory piler is utilised, resultant noise levels at receivers could increase by up to 4 dB.

4.1.2 Results

A table of maximum noise level prediction for each identified receiver and assessed construction scenario is presented in Table 4-3.

Table 4-3 Predicted receiver levels

Receiver ID	CNML	Vegetation/topsoil stripping and site preparation	Piling and construction
R01	55	63	59
R02	55	59	56
R03	55	58	55
R04	65	60	58
R05	65	56	53
R06	55	52	50
R07	55	50	48
R08	55	51	49
R09	55	48	45
R10	55	48	45

Noise management levels are exceeded at three assessed receivers and vary between 2 and up to 10 dB higher than the prescribed management levels. However, it is anticipated receiver R02 (Harbour Church) would only be in use outside normal construction hours, and therefore no adverse impact is expected at this receiver.

The highly affected noise level of 75 dB(A) is not exceeded at any receiver.

Nevertheless, noise mitigation measures will be particularly important during activities that may cause an exceedance of the construction noise management levels, and are discussed in Section 5. Implementing noise mitigation measures, such as a temporary noise barrier, has the potential to decrease noise impact by up to 15 dB, potentially bringing the noise impacts down to below the construction noise management level for all receivers.

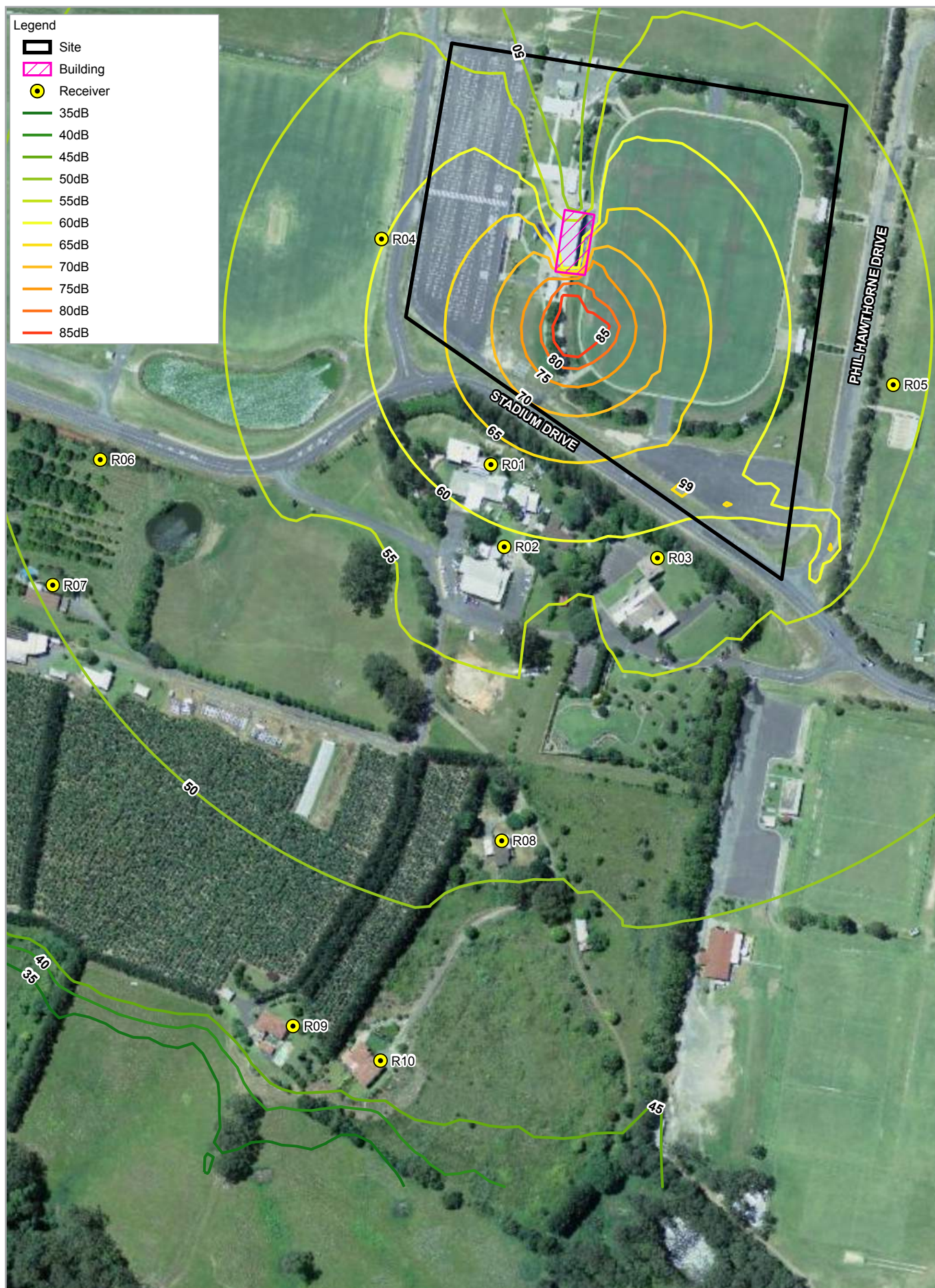
Figure 4-1 and Figure 4-2 below show the predicted noise contours from the operation of each construction scenario.

4.1.3 Construction traffic noise assessment

Construction has the potential to cause traffic noise impacts due to construction vehicles accessing site and the additional traffic on local roads. Unattended monitoring results summarised in Table 2-3 indicates that the existing road traffic noise on in the vicinity of Stadium Drive may already be within 2 dB of the relevant road traffic noise criteria presented in Table 3-4. Construction of the proposal would be considered to cause road traffic noise impacts if it were to increase existing road traffic noise levels by more than 2 dB.

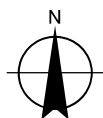
A high level construction traffic noise assessment was undertaken using the Roads and Maritime Construction Noise Estimator. Assuming the Results indicate that the additional construction traffic would increase existing road traffic noise levels by less than 1 dB, significantly less than the 2 dB threshold.

Heavy vehicle access to the site will be staggered and will vary in intensity throughout the project. Despite the construction traffic on major roads near to the proposal not being expected to cause adverse impacts it is good practice to apply standard mitigation measures regarding heavy vehicle movements as the noise emissions can occur along the entire transport route. Standard mitigation measures to reduce annoyance are discussed in Section 5.



Paper Size ISO A4
0 25 50 75 100
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

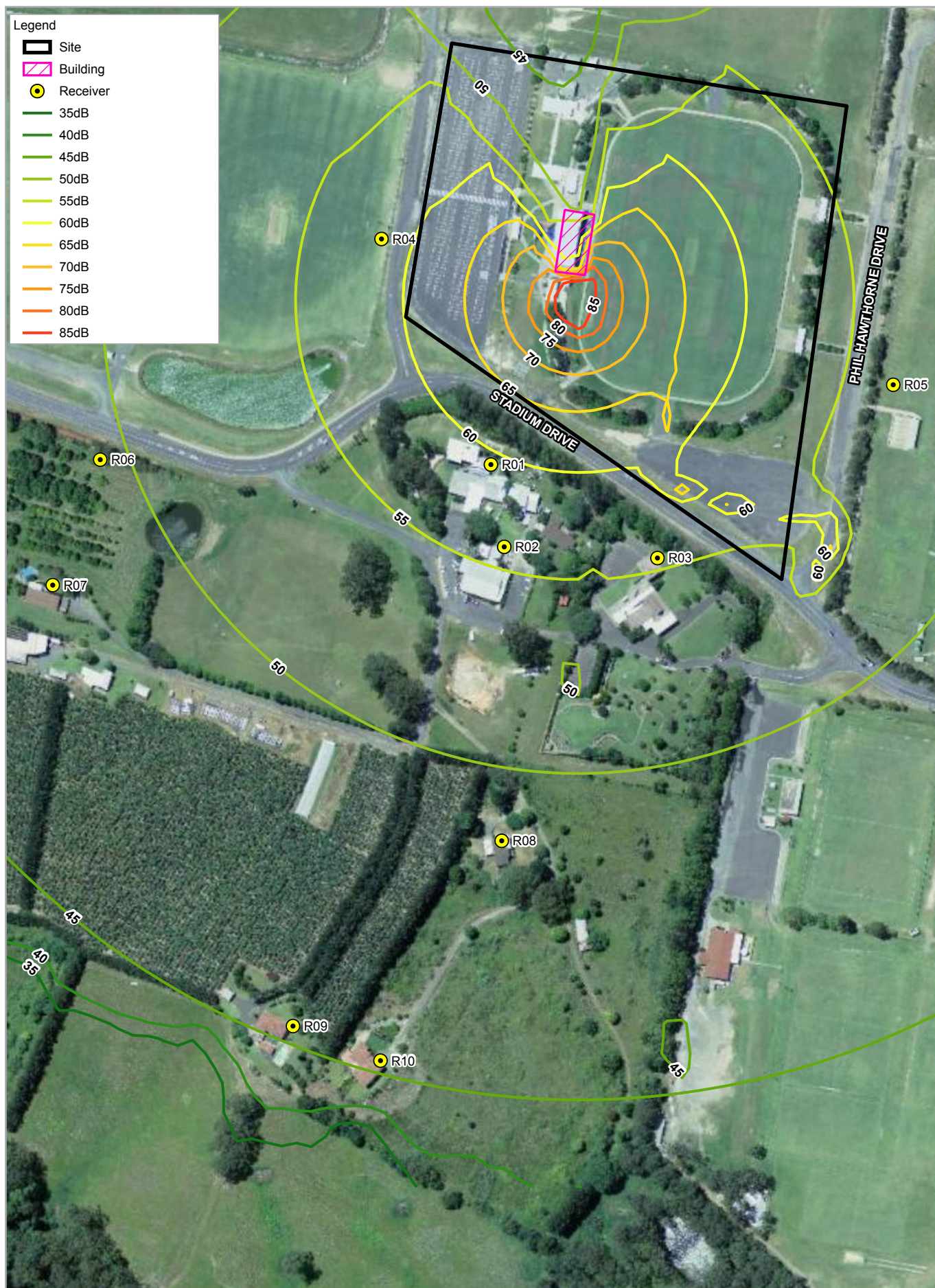


Coffs Harbour City Council
Coffs Harbour International Stadium
Noise Impact Assessment

**Predicted noise contours
from vegetation/topsoil
stripping and site preparation**

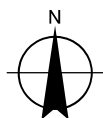
Project No. 22-18717
Revision No. 0
Date 19/10/2017

Figure 4-1



Paper Size ISO A4
0 25 50 75 100
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Coffs Harbour City Council
Coffs Harbour International Stadium
Noise Impact Assessment

Project No. 22-18717
Revision No. 0
Date 19/10/2017

**Predicted noise contours from
piling and construction activities**

Figure 4-2

4.2 Operational noise

The two new grandstands are proposed within an existing approved facility which currently operates as a sporting and entertainment venue with the potential to generate noise during events that may trigger intrusive and amenity criteria. The new grandstands will replace grassed hills that are currently used by spectators for viewing events at the venue. Coaches boxes and existing demountable buildings will also be replaced with new facilities built within the proposed grandstands. The two new grandstands will not increase the capacity of the stadium but merely formalise seating within the venue and as such the proposal is not anticipated to alter traffic generation rates to and from the stadium.

The proposed grandstands will be aligned with the existing grandstand towards the playing surface and will incorporate concrete tilt up panel walls and Hebel PowerPanels along the western façade. Given the high acoustic performance of these walls, they will act to block noise from those receivers to the south-west and absorb noise generated within the stadium. Currently, no attenuation is present between the grassed hills and nearby sensitive receivers. Any suggestion about the different absorption qualities of existing (grassed earth) against proposed surfaces (concrete and hebel) would be negligible. In summary the proposal is unlikely to change the current noise signature from the existing operations of the stadium.

5. Noise mitigation measures

5.1 In-principle noise control methods

In principle, there are three approaches to controlling construction noise.

- Control at the source
- Control on the source-to-receiver pathway
- Control at the receiver

5.1.1 Control at the source

Control at the source is considered to be the most cost-effective in the reduction of noise levels and as such should be given highest priority when considering mitigation options. The solutions available include:

- Substitution of equipment:
 - Substitution involves where reasonably practicable the use of less noisy equipment. This should be considered at the beginning of the construction phase, prior to any work being carried out. Equipment should be selected to meet the needs of the project or process it is required for and not be excessive.
- Modification of existing equipment:
 - Modification of equipment involves the addition of acoustic treatments to parts of the machinery. These include but are not limited to improved mufflers, stiffening of panels and surface coating of resonance dampening material. These options would often require discussion with the supplier and manufacturer of the equipment. A common modification is the fitting of residential grade exhaust silencers to construction equipment.
- Use and siting of equipment:
 - Plant should always be used in accordance with the manufacturer's instructions. Where possible the location of equipment should be away from noise-sensitive areas. This includes taking into consideration the emission direction of equipment and directing this away from noise sensitive receivers. Plant used intermittently should be shut down during the intervening periods or throttled down to a minimum. Dropping of material from height should be limited where possible, particularly the loading and unloading of scaffolding.
- Regular and effective maintenance.
 - Maintenance should be carried out to ensure equipment is running at optimal conditions. In addition, any equipment found to be requiring servicing or repair should be stood down until repaired.

5.1.2 Control along the path

There are two ways of mitigating noise along the transmission path:

- Increasing the distance between the source and receiver.
- Where distance is limited, screening of noise may be considered. In some circumstances it may also be possible to enclose the equipment during the operation.

Table 5-1 provides typical noise attenuation provided by noise control methods.

Table 5-1 Typical attenuations for source to receiver noise control methods

Control by	Nominal noise reduction possible, in total A-weighted sound pressure level LpA dB(A)
Distance	Approximately 6 for each doubling of distance
Screening	Normally 5 to 10, maximum of 15
Enclosure	Normally 15 to 25, maximum of 50

5.1.3 Control of noise at the receiver

While noise levels will exceed the highly affected level, these high intensity noise impacts will be relatively brief. Reasonable and feasible mitigation measures at the receiver for this project are limited to effective community consultation.

5.2 Mitigation measures

The noise mitigation measures detailed in Table 5-2 are based on the principles outlined in section 5.1 and are recommended where reasonable and feasible to reduce the impact on the surrounding receivers and sensitive land uses during construction.

Table 5-2 Mitigation measures for construction noise

Action required	Details
General controls	
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction should include: <ul style="list-style-type: none">• All relevant project specific and standard noise mitigation measures• Relevant licence and approval conditions• Permissible hours of work• Location of nearest sensitive receivers• Construction employee parking areas• Designated loading/ unloading areas and procedures• Site opening/closing times (including deliveries)• Environmental incident procedures
Behavioural practices	<ul style="list-style-type: none">• No swearing or unnecessary shouting or loud stereos/radios on site.• No dropping of materials from height, throwing of metal items and slamming of doors.
Implement community consultation measures	Contact will be established with the local residents and the construction program and progress communicated on a regular basis, particularly when noisy activities are planned. Affected receivers will be notified of the intended work, its duration and times of occurrence. This may include a local community update letters for specific construction activities and a project info line.

Action required	Details
	Specific notifications will be provided to receivers where the highly noise affected level of 75 dB(A) is predicted to be exceeded (particularly any receivers within 100 m line of sight from concrete sawing or 30 m line of sight from compaction activities).
Localised noise barrier	<p>A temporary barrier (such as an available commercial product or timber hoarding) may be used to intersect the line of sight between a noise source and a receiver.</p> <p>A noise barrier should be constructed of a material providing a surface mass equal or greater than 15 kg/m², and should be impervious from ground to the design height, with not holes or gaps to be effective.</p>
Implement complaints management measures	<p>Complaints will be managed in accordance with the procedure outlined below. Signage will clearly and visibly provide a contact number and name to receive complaints and enquiries about construction.</p> <p>Works have the potential to cause noise complaints from nearby receivers.</p> <p>The response would be to:</p> <ul style="list-style-type: none"> • Verbally respond to complainant. • Log the complaint and any actions taken with regards to the complaint within a complaints register. • Investigate the nature and reasons of the impact. • Investigate and implement further mitigation measures to minimise the impact.
Compliance noise monitoring	<p>Compliance noise monitoring should be undertaken in the event of a noise complaint.</p> <p>Measurements will typically be based on attended techniques so that construction noise sources can be readily identified.</p> <p>Any noise monitoring will be undertaken by a qualified professional and with consideration to the ICNG guidelines.</p>
Source controls	
Construction hours and scheduling	<p>All work to be undertaken within standard construction hours unless approval for work outside standard construction hours is granted.</p> <p>Work generating high noise levels should be scheduled during less sensitive time periods.</p> <p>No truck movements before 7.00 am or after 10.00 pm.</p> <p>For any work that would take place outside of normal construction hours:</p> <p>Undertake an assessment of the potential noise impacts associated with the proposed activities and outline specific mitigation measures.</p> <p>Residents potentially affected by such activities will be notified at least five days before hand.</p> <p>Minimise consecutive night time activities in the same locality and provide periods of quiet if activities occur for extended periods during the night.</p> <p>Conduct activities in a manner that eliminates or minimises the need for audible warning alarms.</p>

Action required	Details
Construction respite period	<p>High noise generating activities may only be carried out in continuous blocks, not exceeding three hours each, with a minimum respite period of one hour between each block.</p> <p>High noise refers to construction noise impacts which exceed the highly affected noise management level of 75 dB(A) L_{Aeq} (15-min) during standard construction hours.</p>
Equipment selection	Use quieter construction methods where reasonable and feasible.
Use and siting of plant	<p>Simultaneous operation of noisy plant within discernible range of a sensitive receiver is to be avoided.</p> <p>The offset distance between noisy plant and adjacent sensitive receivers is to be maximised.</p> <p>Plant used intermittently to be throttled down or shut down.</p> <p>Noise-emitting plant to be directed away from sensitive receivers.</p>
Plan worksites and activities to minimise noise	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site.
Minimise disturbance arising from delivery of goods to construction sites	<p>Loading and unloading of materials/deliveries is to occur during standard construction hours.</p> <p>Contractors are to avoid dropping materials from height where practicable, during loading and unloading.</p> <p>Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible.</p> <p>Drivers to be aware of noise made by additional heavy vehicles using local roads. Plan deliveries and removal of spoil to avoid congestion of local roads by haul trucks.</p>

6. Conclusion

Coffs Harbour City Council are proposing an expansion of the C. ex Coffs International Stadium, Stadium Drive, Coffs Harbour. The proposal does not alter the overall capacity of the venue, however increases the amount of formal tiered seating for spectators from 936 to a minimum of 2758 and provides upgraded accessibility and amenities, new event administration and multi-purpose spaces, catering outlets, media facilities and improved environmental initiatives.

Construction and operational noise impacts have been predicted related to the construction of the grandstands. This noise assessment leads to the following conclusions, subject to the limitations outlined in Section 1.3, Section 1.4, and Section 1.5.

- Construction will likely impact noise sensitive receivers for a period greater than three weeks, triggering the requirement of conducting a quantitative construction noise impact assessment in accordance with the DECC *Interim Construction Noise Guideline* (ICNG) (2009).
- Predictions indicate that during both construction scenarios assessed, construction noise management levels may be exceeded at the Family Link Centre and Harbour Church as well as the Crematorium. However, services at Harbour Church only occur during outside of construction hours, therefore it is unlikely there will be an adverse impact at this receiver.
- Community consultation will be an important measure to manage annoyance at all receivers, especially those exceeding the construction and operational noise management levels. Additionally, the use of temporary noise barriers are recommended to reduce the noise impacts at the most affected receivers, i.e. the Family Link Centre and Crematorium.
- Predictions indicate there will be no other exceedances of construction noise management levels at any other sensitive receiver.
- Predictions indicate that construction noise levels will not exceed the highly affected noise level of 75 dB(A) at any receiver.
- No operational impacts, over and above those already encountered, are anticipated following construction of the grandstands.

Construction vehicles are not envisaged to cause adverse noise impacts during the construction period, however it is good practice to apply standard mitigation measures regarding heavy vehicle movements, such as ensuring vehicles and mufflers are well maintained, as the noise emissions can occur along the entire transport route.

Mitigation measures are discussed in Section 5.

7. References

Australian Standards 2010, AS 2436 - 2010, *Guide to noise and vibration control on construction, demolition and maintenance sites*.

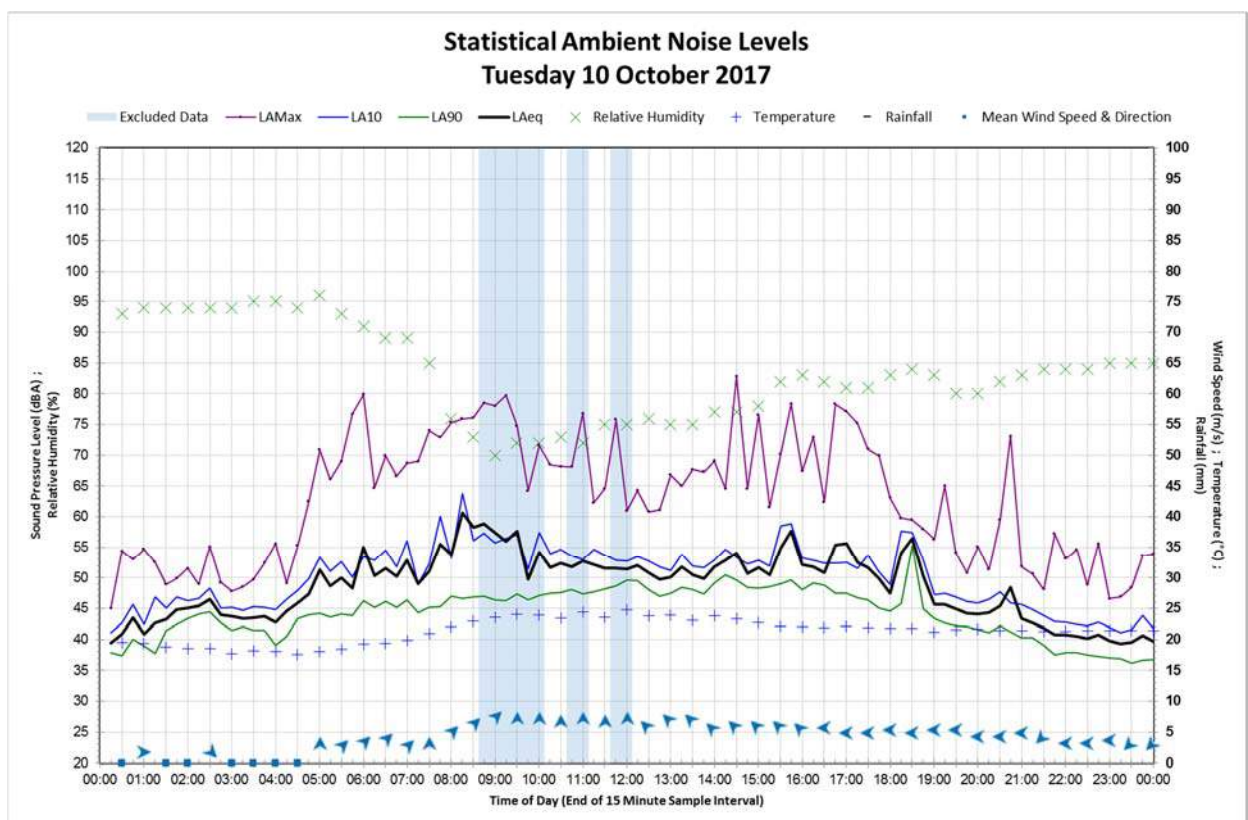
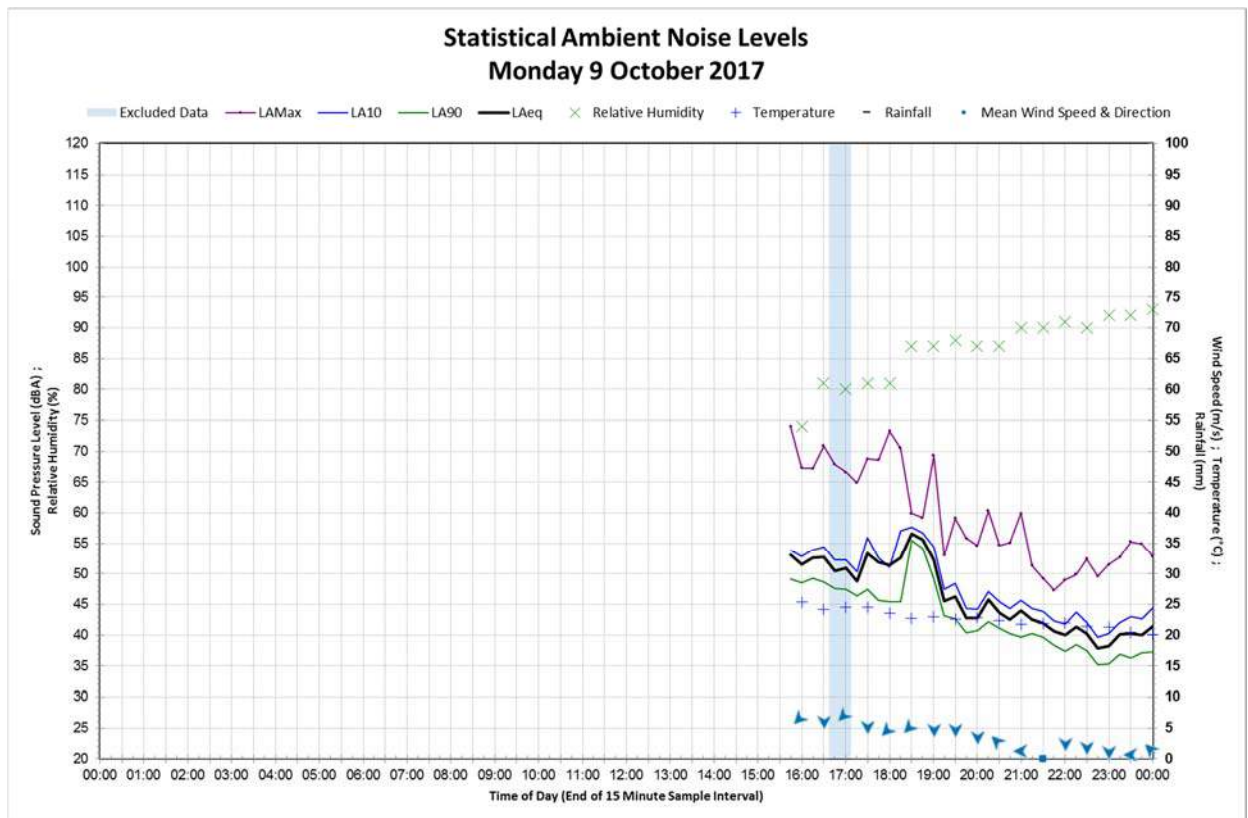
Department of Environment and Climate Change 2009, *Interim Construction Noise Guideline*, Sydney.

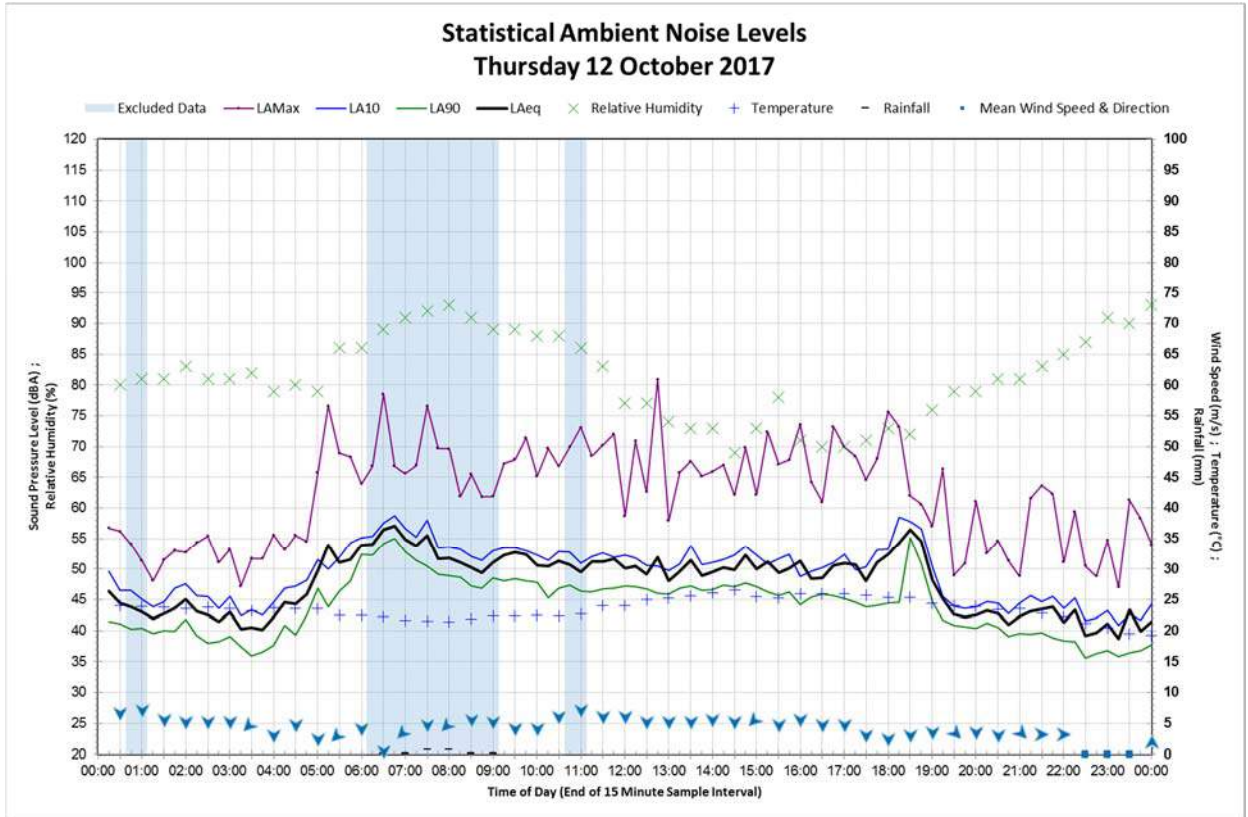
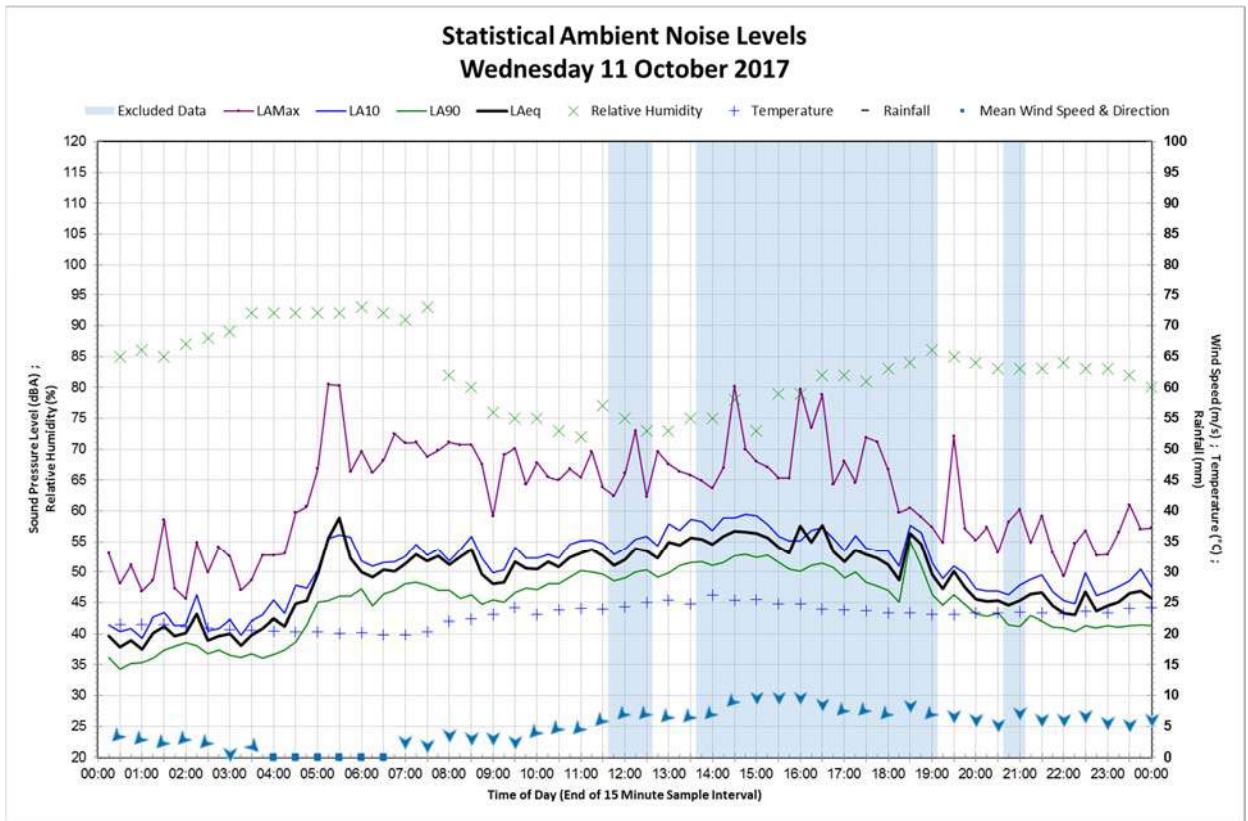
Department of Environment, Climate Change and Water 2011, *NSW Road Noise Policy*, Sydney.

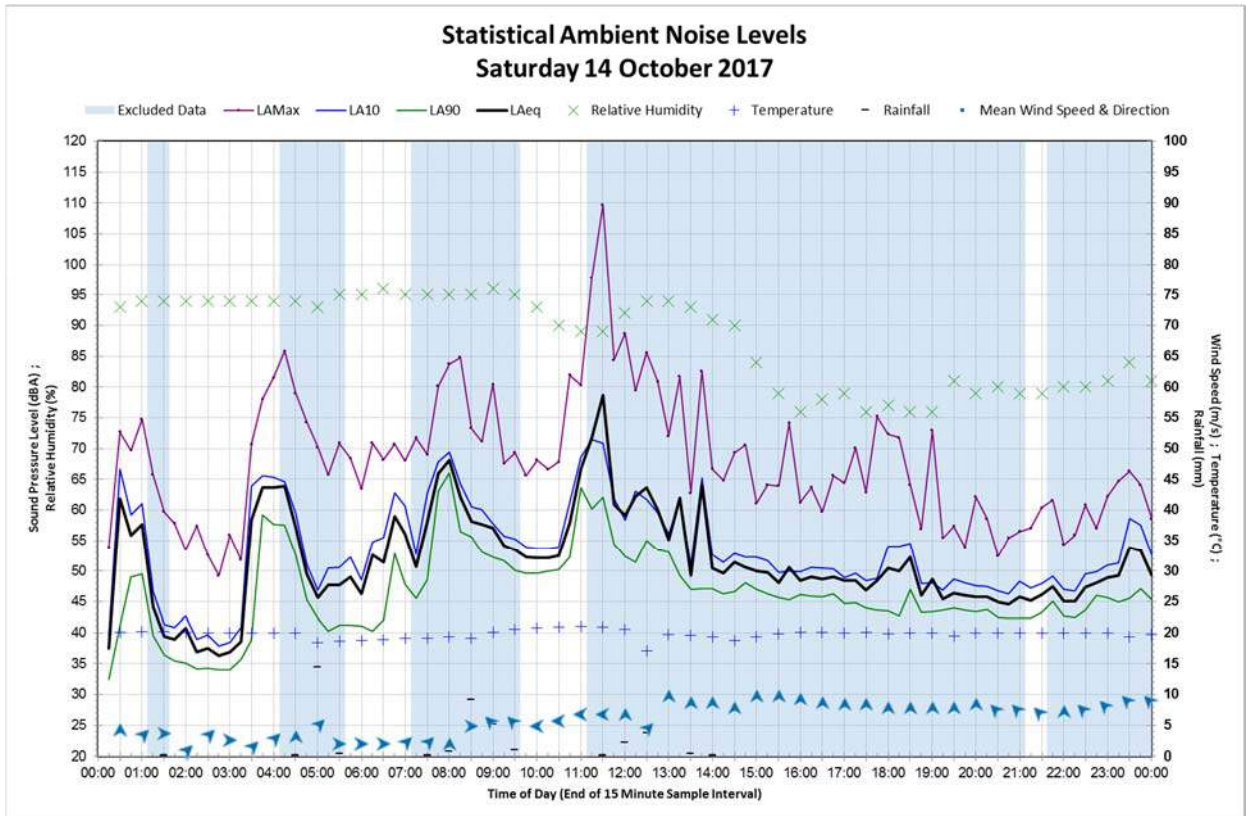
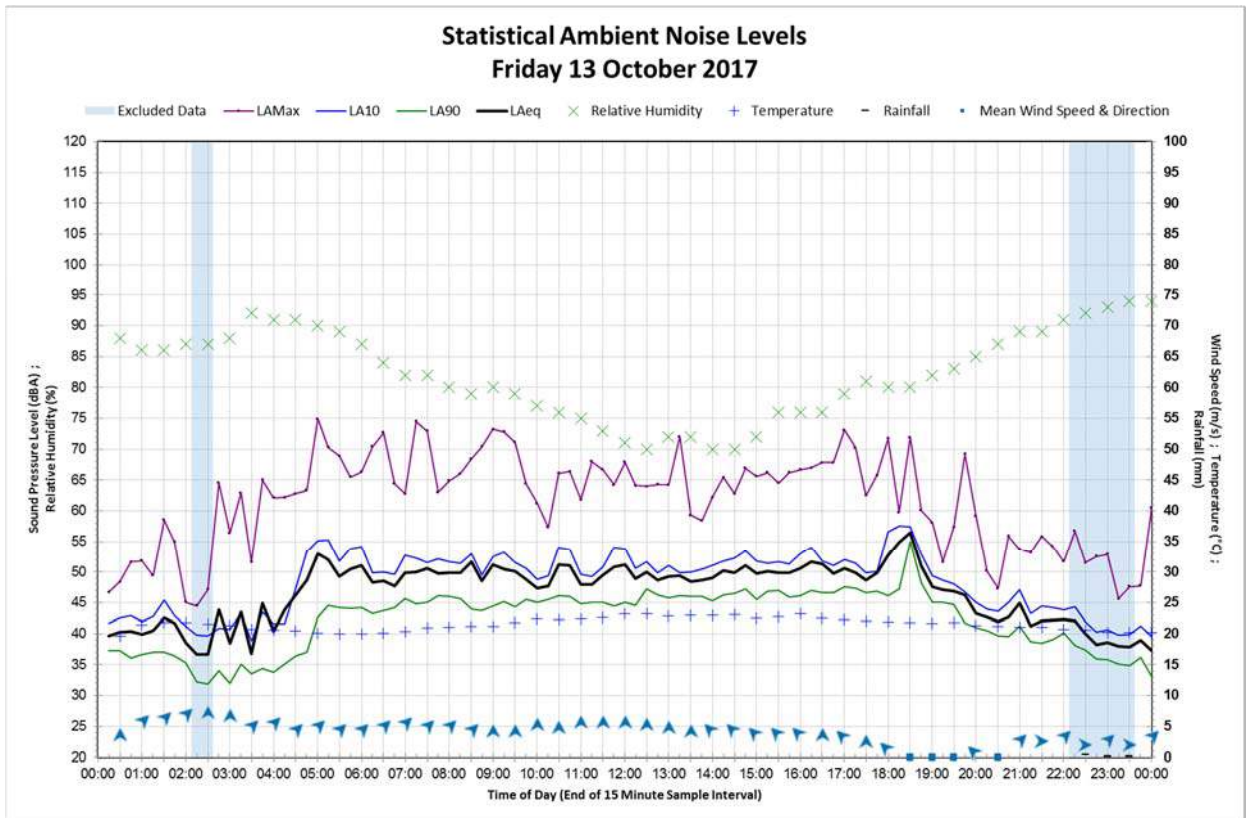
Roads and Maritime Services NSW 2016, *Construction Noise and Vibration Guideline*.

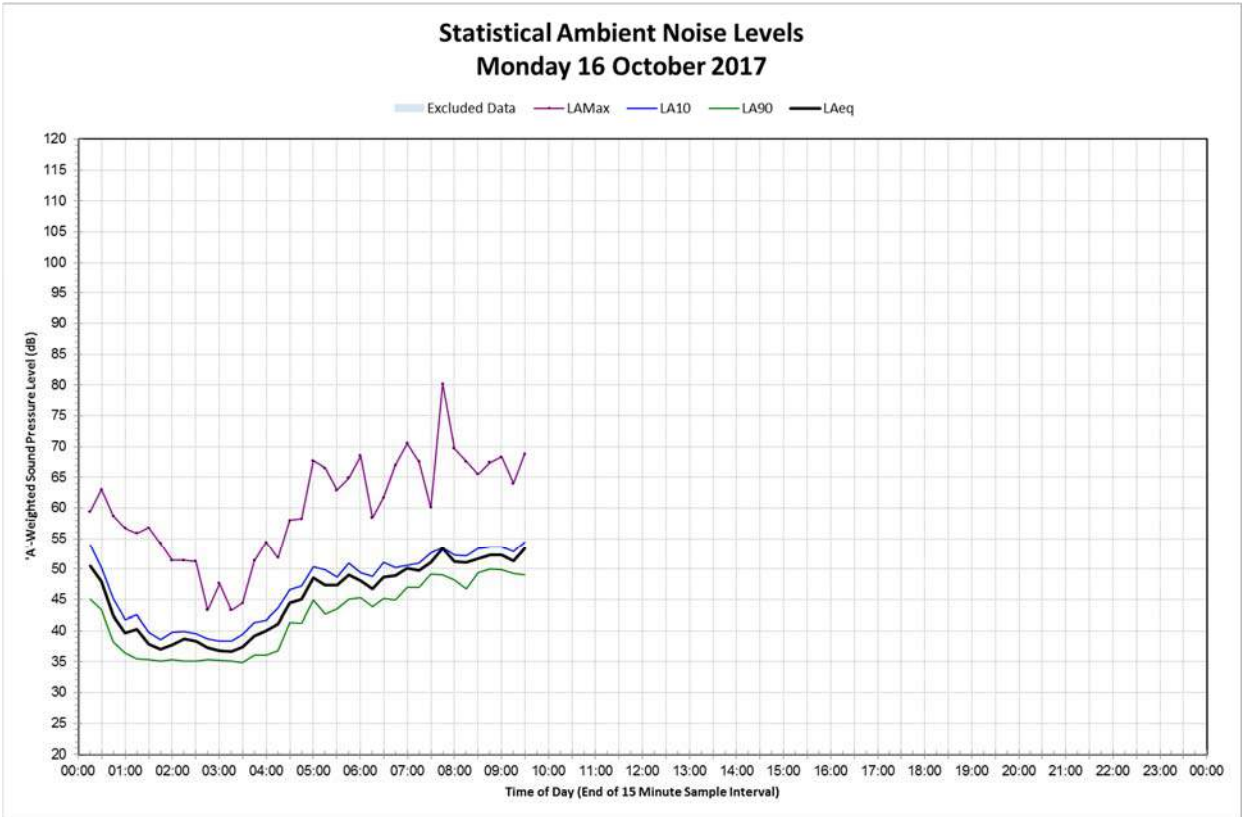
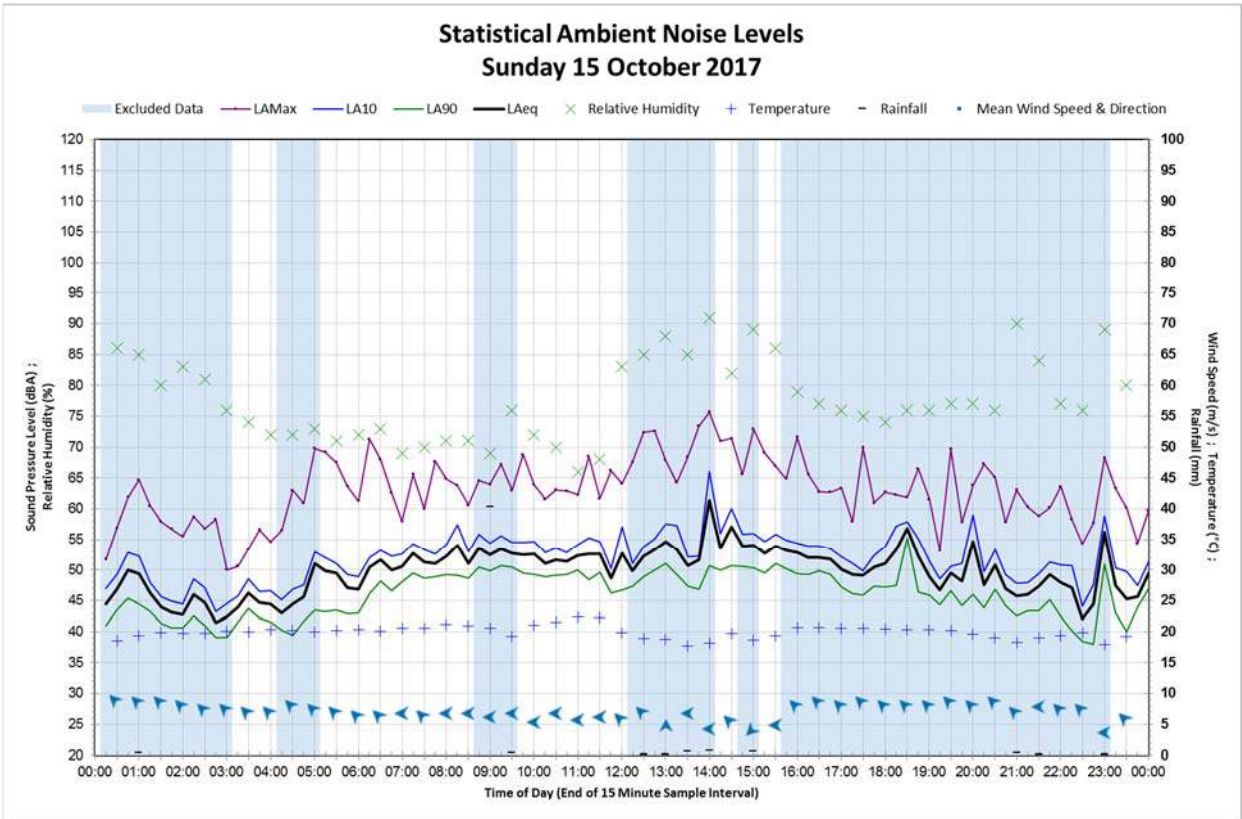
Appendices

Appendix A – Daily noise charts









GHD

230 Harbour Drive

COFFS HARBOUR NSW 2450

T: 61 2 6650 5600 F: 61 2 6650 5601 E: cfsmail@ghd.com

© GHD 2017

This document is and shall remain the property of GHD. The document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.

2218717-

66834/https://projects.ghd.com/OC/Newcastle/chcccoffsstadiumwest/Delivery/Documents/2218717-REP-A_NoiseImpactAssessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	E Potoczny	S Ritchie	<i>S Ritchie</i>	S Lawer	<i>S Lawer</i>	19/10/2017
1	E Potoczny	J Forrest	<i>J Forrest</i>	S Lawer	<i>S Lawer</i>	7/11/2017

www.ghd.com

