Wagga Wagga City Council

Levee upgrade

Noise and vibration assessment

April 2013

WATER | ENERGY & RESOURCES | ENVIRONMENT | PROPERTY & BUILDINGS | TRANSPORTATION

Glossary – acoustics

Sound Pressure Level	20 times the logarithm to the base 10 of the ratio of the RMS sound pressure to the reference sound pressure of 20 micropascals.
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.
LA1(Time)	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
LA10 (Time)	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
LA90 (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. LA90 (15 minute).
LAeq (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.
Ambient noise	The all-encompassing noise associated with a given environment. It is the composite of sounds from many sources, both near and far.
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. It is defined as the median value of: All the day assessment background levels over the monitoring period for the day. All the evening assessment background levels over the monitoring period for the evening. All the night assessment background levels over the monitoring period for the night.

Glossary – vibration – human response and building damage

Vibration	The term vibration refers to the oscillations of a mechanical system around its equilibrium position. Vibration can be measured in terms of its displacement, velocity or acceleration. The common units for velocity are millimetres per second (mm/s)
Ground borne Vibration	Ground borne vibration is vibration transmitted from source to receiver via the medium of the ground.
Peak Particle Velocity	Current practice for assessments of the risk of structural damage to buildings use measurements of Peak Particle Velocity (PPV), which is the maximum vector sum of three orthogonal time – synchronised velocity components regardless of whether these component maxima occurred simultaneously.
RMS	Root Mean Square.
Short-term Vibration	Vibration that occurs so infrequently that it does not cause structural fatigue nor does it produce resonance in the structure.
VDV	Vibration Dose Value (VDV) – As defined in BS6472 – 1992, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.

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1. Introduction

GHD was engaged by Wagga Wagga City Council to assess the potential noise and vibration impact from the proposed upgrade to the Wagga Wagga and North Wagga Wagga levees along the Murrambidgee River. The upgrade would improve the level of flood protection for Central and North Wagga Wagga.

1.1 Project description

Wagga Wagga City Council proposes to upgrade the Wagga Wagga and North Wagga Wagga levees along the Murrumbidgee River. These levees include the Main City Levee, North Wagga Wagga Levee and East Street (Bank Two) Levee.

The proposal is required to increase the level of flood protection for residents and businesses of Wagga Wagga.

The proposal would raise the Main City Levee to provide flood protection for up to a 100 year average recurrence interval (ARI) flood event, and would raise the North Wagga Wagga Levee and East Street (Bank Two) Levee to provide flood protection for up to a 20 year ARI flood event.

Key features of the proposal would include:

- Constructing the following levee types, with average increases in height of 66 centimetres to 83 centimetres:
  - Embankment levees.
  - Sheet pile levees.
  - Concrete wall levees.
  - Hybrid levees (embankment/sheet pile, embankment/gabion wall and embankment/box culvert).
- Constructing spillways to enable large floods (higher than the proposed level of flood protection) to enter the protected areas in a controlled manner.
- Upgrading levee crossings that are lower than the design flood protection level or that require structural improvement. These would include crossings for the Great Southern Railway, several major roads, and a number of minor roads and access roads.

Works would mostly involve earthworks to raise and extend the existing embankment levees, including:

- Increasing the height of the levees.
- Flattening batters.
- Improving compaction where necessary.

Other construction processes would include:

- Sheet pile installation.
- Erection of gabion walls.
- Raising and extending concrete retaining walls.
- Placement of box culverts on levee where necessary.
- Construction of rockfill mattress lined spillways.

- Raising road crossings.
- Construction of flood gate support walls, footings, flood gate assemblies (commissioning stage) and storage shed.

1.2 Scope of work

The noise and vibration assessment of the levee bank upgrade construction works involved the following tasks:

- Identification of noise and vibration sensitive receivers from aerial photography.
- Review of the proposed construction plan and program.
- Unattended noise monitoring at 6 sensitive receiver locations indicative of the local ambient noise environment.
- Assessment and filtering of noise data to remove invalid data due to extraneous noise or adverse weather conditions.
- Determination of construction noise and vibration criteria with consideration to the following Office of Environment and Heritage (OEH) guidelines:
  - Interim Construction Noise Guideline (2009).
  - Assessing Vibration: A Technical Guideline (2006).
- Based on information provided, a list of noise sources and their sound power characteristics during the proposed construction works was compiled.
- Noise modelling for proposed construction works was conducted using Computer Aided Noise Abatement (CadnaA) software to predict sound pressure levels emanating from the works.
- A desktop assessment of potential vibration impacts was undertaken based on proposed construction works.
- A desktop assessment was completed to evaluate the potential of road traffic noise impacts due to traffic generated from the proposed construction.
- In-principle recommendations for noise and vibration mitigation measures have been provided based on predicted noise and vibration levels.

2. Existing environment

2.1 Study area

The proposal is located adjacent to the Murrumbidgee River in Wagga Wagga, East Wagga Wagga, Kooringal and North Wagga Wagga (Figure 2-1).

The site of the project passes through several land use areas outlined in the City of Wagga Wagga's Local Environmental Plan (2010) including residential, public recreation, industrial and commercial areas.

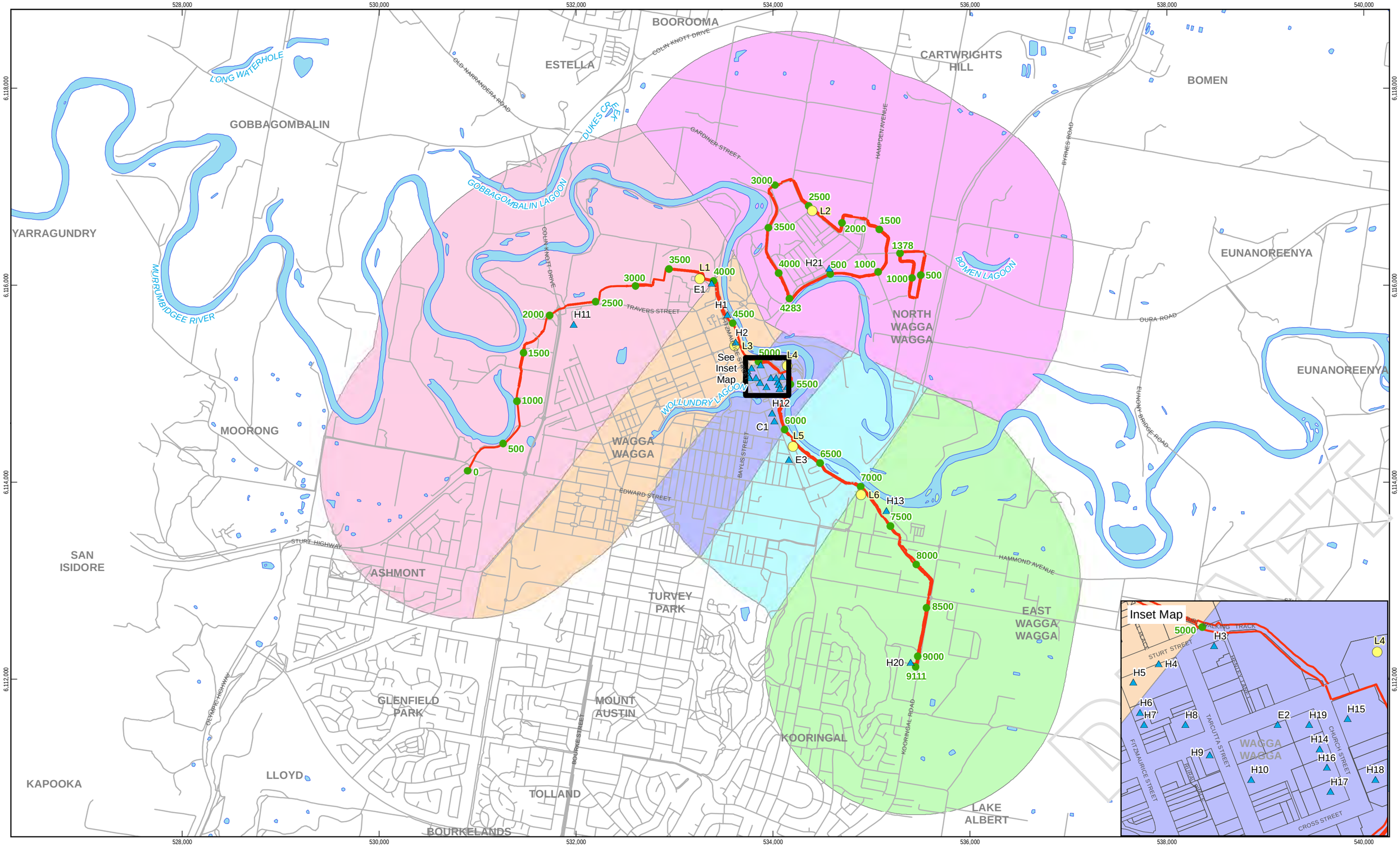
2.2 Sensitive receivers

Six sensitive Noise Catchment Areas (NCA 1 to NCA6) have been identified to represent those receivers with the greatest potential for adverse impact (Figure 2-1). The noise sensitive receivers located within these NCA's are primarily residential receivers.

Apart from residential receivers, the following sensitive receivers have been identified in Table 2-1 based on their proximity (within 200 m), of the proposed construction works. The locations of these receivers have also been identified in Figure 2-1.

Table 2-1 Sensitive noise and vibration receivers

Receiver	Receiver ID	Type
Pre-school –Galing Place	E1	Educational Facility
St Joseph's Primary School	E2	Educational Facility
Possums Pre-school	E3	Educational Facility
Wagga Wagga Baptist Church	C1	Church
Hampden Bridge	H1	Heritage Building
Prince of Wales Motor Inn	H2	Heritage Building
Riverine Club	H3	Heritage Building
Police station	H4	Heritage Building
Court House	H5	Heritage Building
Former CBC Bank	H6	Heritage Building
Former Post Office	H7	Heritage Building
Wesley Uniting Church	H8	Heritage Building
Department of Lands Building	H9	Heritage Building
Residence	H10	Heritage Building
Racecourse buildings	H11	Heritage Building
Cottage	H12	Heritage Building
Wagga Waterworks	H13	Heritage Building
Bishops House and presbytery	H14	Heritage Building
Former monastery	H15	Heritage Building
St Andrew's Manse	H16	Heritage Building
St Andrew's Presbyterian church	H17	Heritage Building
St John's Anglican church	H18	Heritage Building
St Michael's Catholic cathedral	H19	Heritage Building
Wagga Wagga General Cemetery	H20	Heritage Building
North Wagga Public School	H21	Heritage Building



1:35,000 Paper Size A3

0 200 400 800 1,200 1,600

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Wagga Levee Sensitive Receivers
- Noise Logger Locations
- Wagga Levee Chainages (metres)
- Wagga Levee Works
- Roads
- Noise Catchment Area 1
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5
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- Waterbodies
- Cadastre

GHD

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	A
Date	28 Nov 2012

Sensitive Receivers and Noise Catchment Areas

Figure 1

G:\23\14536\GIS\Maps\Deliverables\23_14536_01_SensitiveReceivers_RevA.mxd

Data source: WCC: Levee Works and chainages - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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2.3 Noise monitoring methodology

2.3.1 Unattended noise monitoring

Unattended noise monitoring was undertaken at six locations (L1 to L6) along the extent of the levee between 16/10/2012 and 30/10/2012 (Figure 2-1). The locations were considered to be good representations of the existing ambient noise environment and were identified by GHD as being a safe and secure place for equipment, minimising the risk of theft or vandalism.

Noise monitoring was undertaken using four (4) Rion NL- 21 and two (2) SVAN 955 environmental noise loggers. The noise loggers were programmed to accumulate L_{A90}, L_{A10}, L_{Aeq} and L_{Amax} noise descriptors continuously over sampling periods of 15 minutes for the entire monitoring period. Calibrations of the noise loggers were checked immediately before and after measurements using a Bruel & Kjaer 4231 sound level calibrator (serial number 2542101). The difference was within ± 0.5 dB.

The data collected by the loggers was downloaded and analysed and any invalid data removed. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s or when rainfall occurred (Source: INP). Concurrent hourly weather data were sourced from the Bureau of Meteorology's (BoM) Wagga Wagga weather station (station number 0725150) 9 km SE of Wagga Wagga.

Details of the noise logger locations are provided in Table 2-2.

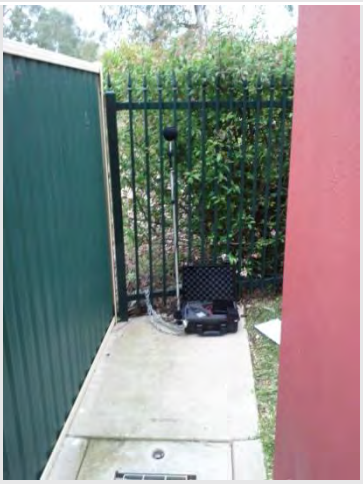
All sampling activities were undertaken with consideration of the specifications outlined in AS 1055 (1997) '*Description and Measurement of Environmental Noise'* and the NSW INP.

Table 2-2 Unattended noise logger details

	Location 1	Location 2
Monitoring Location	10 Galing St	138 Marah St
Logger Type/Serial number	RION NL-21/ 00376380	RION NL-21/ 00365349
Measurement commenced	16:00 16/10/2012	16:45 16/10/2012
Measurement ceased	10:45 30/10/2012	10:30 30/10/2012
Pre calibration	93.8	93.6
Post calibration	93.8	93.5
Frequency weighting/Time response	A/Fast	A/Fast
Photograph		

Table 2-3 Unattended noise logger details

	Location 3	Location 4
Monitoring Location	139 Fitzmaurice St	Wagga Wagga Beach Caravan Park
Logger Type/Serial number	RION NL-21/ 0368650	RION NL-21/ 00852196
Measurement commenced	17:30 16/10/2012	18:00 16/10/2012
Measurement ceased	11:00 30/10/2012	11:00 30/10/2012
Pre calibration	93.7	93.9
Post calibration	93.5	93.9
Frequency weighting/Time response	A/Fast	A/Fast
Photograph		

	Location 5	Location 6
Monitoring Location	The Lawson	49 Mason St
Logger Type/Serial number	SVAN 955/ 27622	SVAN 955/ 27621
Measurement commenced	19:00 16/10/2012	13:20 17/10/2012
Measurement ceased	11:30 30/10/2012	11:30 30/10.2012
Frequency weighting/Time response	A/Fast	A/Fast
Photograph		

2.3.2 Attended noise monitoring

Attended noise measurements were taken at each unattended noise monitoring location immediately after placement. Measurements were conducted for a period of 15 minutes in order to identify ambient noise sources and validate unattended monitoring data. Instantaneous noise levels for operator identified noise sources were observed and noted during measurements

Attended measurements were taken using a Bruel & Kjaer Sound Level Meter (SLM) (serial number 2506887). This is a Type 1 instrument which is capable of measuring continuous sound pressure levels and able to record L_{Amin}, L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors.

Field calibration was checked by GHD immediately before and after the measurement using a Bruel & Kjaer 4231 sound level calibrator (serial number 2542101). The difference was within ± 0.5 dB.

2.4 Summary of noise monitoring results

2.4.1 Unattended noise monitoring

A summary of the calculated Rating Background Level (RBL) L_{A90} (day, evening and night) and ambient L_{Aeq} (day, evening and night) noise levels for the monitoring period are provided in Table 2-4 to Table 2-9. Daily charts of the monitoring results are presented in Appendix A.

Table 2-4 Logger 1 - 10 Galing St - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Date	Rating Background Level (RBL) LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Tuesday-16-Oct-12	32	30	23	55	40	36
Wednesday-17-Oct-12	30	30	27	48	38	40
Thursday-18-Oct-12	30	30	26	55	42	47
Friday-19-Oct-12	30	32	27	53	41	38
Saturday-20-Oct-12	32	29	25	58	37	38
Sunday-21-Oct-12	28	27	22	42	41	45
Monday-22-Oct-12	34	32	26	53	41	48
Tuesday-23-Oct-12	34	32	28	51	42	40
Wednesday-24-Oct-12	30	36	28	51	41	40
Thursday-25-Oct-12	34	30	23	49	39	36
Friday-26-Oct-12	31	26	24	43	35	41
Saturday-27-Oct-12	30	28	25	52	36	39
Sunday-28-Oct-12	31	33	25	49	42	42
Monday-29-Oct-12	31	33	25	46	41	41
Tuesday-30-Oct-12	34	-	-	-	-	-
RBL and LAeq Overall	31	30	25	52	40	43

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

Table 2-5 Logger 2 - 138 Marah St - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Date	Background LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Tuesday-16-Oct-12	38	32	24	56	50	45
Wednesday-17-Oct-12	35	33	29	54	57	48
Thursday-18-Oct-12	32	33	26	56	54	43
Friday-19-Oct-12	33	37	28	53	63	43
Saturday-20-Oct-12	35	34	24	60	47	46
Sunday-21-Oct-12	35	33	25	48	44	44
Monday-22-Oct-12	37	31	24	52	46	43
Tuesday-23-Oct-12	34	30	28	51	46	43
Wednesday-24-Oct-12	32	38	28	53	48	46
Thursday-25-Oct-12	38	38	26	50	49	43
Friday-26-Oct-12	37	34	30	53	47	51
Saturday-27-Oct-12	35	34	24	53	47	45
Sunday-28-Oct-12	31	33	25	49	48	42
Monday-29-Oct-12	33	31	25	52	43	42
Tuesday-30-Oct-12	34	-	-	-	-	-
RBL and LAeq Overall	35	33	26	54	54	45

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

Table 2-6 Logger 3 - 139 Fitzmaurice St - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Date	Background LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Tuesday-16-Oct-12	43	37	30	49	48	46
Wednesday-17-Oct-12	40	40	33	61	48	48
Thursday-18-Oct-12	42	41	31	51	48	50
Friday-19-Oct-12	42	43	32	52	49	47
Saturday-20-Oct-12	40	44	32	50	50	50
Sunday-21-Oct-12	39	38	29	50	47	52
Monday-22-Oct-12	42	37	31	58	50	47
Tuesday-23-Oct-12	44	42	34	68	49	48
Wednesday-24-Oct-12	41	41	33	57	50	49
Thursday-25-Oct-12	43	42	31	52	49	51
Friday-26-Oct-12	43	41	33	52	48	51
Saturday-27-Oct-12	41	39	33	52	47	51
Sunday-28-Oct-12	40	41	32	49	49	52
Monday-29-Oct-12	42	42	32	55	48	47
Tuesday-30-Oct-12	43	-	-	55	-	-
RBL and LAeq Overall	42	41	32	58	49	50

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

Table 2-7 Logger 4 - Wagga Wagga Beach Caravan Park - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Date	Background LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Tuesday-16-Oct-12	-	36	32	-	51	43
Wednesday-17-Oct-12	39	37	32	48	46	44
Thursday-18-Oct-12	33	37	32	43	46	44
Friday-19-Oct-12	33	37	33	44	46	42
Saturday-20-Oct-12	40	38	31	50	45	47
Sunday-21-Oct-12	37	35	31	52	46	42
Monday-22-Oct-12	39	35	29	46	44	41
Tuesday-23-Oct-12	34	34	30	43	51	44
Wednesday-24-Oct-12	33	36	30	48	44	44
Thursday-25-Oct-12	40	38	33	61	59	46
Friday-26-Oct-12	41	37	36	65	57	53
Saturday-27-Oct-12	39	37	31	49	45	44
Sunday-28-Oct-12	33	32	30	44	45	43
Monday-29-Oct-12	34	33	31	48	42	42
Tuesday-30-Oct-12	36	-	-	-	-	-
RBL and LAeq Overall	36	36	31	56	51	46

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

Table 2-8 Logger 5 - The Lawson - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Logger 5	Background LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Wednesday-17-Oct-12	36	37	29	45	45	44
Thursday-18-Oct-12	30	35	30	47	50	44
Friday-19-Oct-12	31	36	32	48	46	46
Saturday-20-Oct-12	36	36	29	46	44	44
Sunday-21-Oct-12	33	36	30	46	44	42
Monday-22-Oct-12	39	36	27	46	49	43
Tuesday-23-Oct-12	32	33	31	44	46	45
Wednesday-24-Oct-12	30	35	29	45	48	43
Thursday-25-Oct-12	36	36	29	46	46	49
Friday-26-Oct-12	38	35	32	46	45	44
Saturday-27-Oct-12	37	34	25	44	43	44
Sunday-28-Oct-12	29	32	28	42	50	42
Monday-29-Oct-12	30	31	32	43	43	44
Tuesday-30-Oct-12	32	-	-	45	-	-
RBL and LAeq Overall	32	35	29	45	47	44

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

Table 2-9 Logger 6 - 49 Mason St - unattended noise monitoring results - background L_{A90} and ambient L_{Aeq} noise levels, dB (A)

Date	Background LA90 dB(A)			Ambient LAeq dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Wednesday-17-Oct-12	36	37	29	45	45	44
Thursday-18-Oct-12	30	35	30	47	50	44
Friday-19-Oct-12	31	36	32	48	46	46
Saturday-20-Oct-12	36	36	29	46	44	44
Sunday-21-Oct-12	33	36	30	46	44	42
Monday-22-Oct-12	39	36	27	46	49	43
Tuesday-23-Oct-12	32	33	31	44	46	45
Wednesday-24-Oct-12	30	35	29	45	48	43
Thursday-25-Oct-12	36	36	29	46	46	49
Friday-26-Oct-12	38	35	32	46	45	44
Saturday-27-Oct-12	37	34	25	44	55	44
Sunday-28-Oct-12	29	32	28	42	50	42
Monday-29-Oct-12	30	31	32	43	43	44
Tuesday-30-Oct-12	32	-	-	45	-	-
RBL and LAeq Overall	32	35	29	45	49	44

Note: '-'refers to invalid data that has been excluded from the data set due to adverse weather conditions or extraneous noise levels.

2.4.2 Attended noise monitoring results

A summary of the attended noise monitoring results are given in Table 2-10.

Table 2-10 Attended noise results, dB (A)

Location	Receiver Type	Address	Date	Measurement Time		Measured Noise Levels dB(A)			Observations
				Start	Stop	L90	L10	LAeq	
L1	Residential	10 Galing Pl	16/10/2012	15:52	16:07	36	43	40	Domestic noise e.g. barking dogs and poultry most dominant at this location. Birds and road traffic noise also observed
L2	Residential	138 Marah St	16/10/2012	16:26	16:41	38	45	45	Location dominated by domestic noise from dogs and cattle. Birds and road traffic noise also audible.
L31	Commercial/ Residential	139 Fitzmaurice St	16/10/2012	17:07	17:22	46	55	53	Area dominated by road traffic noise and noise from commercial operations e.g. air conditioners. Noise from recreational activities (i.e. joggers) also noted.
L4	Residential	Wagga Wagga Beach Caravan Park	16/10/2012	17:42	17:57	39	47	46	Recreational noise from boat activities and children playing observed. Road traffic noise also audible.
L5	Residential	The Lawson	16/10/2012	18:32	18:47	38	51	53	Location dominated by domestic noise, road traffic and recreational activity (i.e. joggers) noise.
L6	Residential	49 Mason St	17/10/2012	13:19	13:34	40	46	46	Domestic noise and road traffic noise observed at this location.

[1] Location L3 is a mixed receiver type area containing mainly commercial receivers but includes some residential receivers. E.g. The Prince of Wales Comfort Inn

3. Project specific criteria

3.1 Construction noise criteria

Construction noise criteria are sourced from the *Interim Construction Noise Guideline (ICNG)* (2009).

The recommended standard construction hours are as follows:

- Monday to Friday: 7 am to 6 pm.
- Saturday: 8 am to 1 pm.
- No work on Sundays or Public Holidays.

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

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

Based on the noise logging data, the constructive noise criteria for the recommended standard hours in each noise catchment area (NAC) are shown in Table 3-1. Note the ICNG construction noise criteria for commercial or industrial land use are independent of the RBL.

Table 3-1 Construction noise criteria at identified receivers

Receiver	Receiver Type	Background Level, LA90 (15min) dB(A)	ICNG Noise Affected Management Level, LAeq (15 min) dB(A)	ICING Highly Noise Affected Level, LAeq (15 min) dB(A)
NCA 1	Residential	31	41	75
NCA 2		35	45	75
NCA 31		42	52	75
NCA 4		36	46	75
NCA 5		32	42	75
NCA 6		32	42	75
NCA 3	Commercial	Not Applicable	70	
Educational institution		Not Applicable	552	
Places of Worship		Not Applicable	552	
Industrial		Not Applicable	75	

[1] NCA 3 is a mixed receiver type area containing mainly commercial receivers but includes some residential receivers. E.g. The Prince of Wales Comfort Inn.

[2] The internal noise management level for educational facilities in ICNG (45 dB(A)) has been adjusted to produce an external noise level. A conservative estimate of the difference between internal and external noise levels is 10 dB for buildings other than residences.

The *noise affected level* represents the point above which there may be some community reactions to noise. When the *noise affected level* is exceeded all feasible and reasonable work practices to minimise noise should be applied and all potentially impacted residents should be informed of nature of the works, expected noise levels, duration of works and a method of contract. For residential premises, the *noise affected level* is the background noise level plus 10 dB(A) during the recommended standard hours and the background noise level plus 5 dB(A) outside of the recommended standard hours.

Fore residential premises, the *highly noise affected* level represents the point above which there may be strong community reaction to noise is set at 75 dB (A). 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 reasonable, the impacted residence should be clearly explained the duration and anticipated noise levels of the works and any respite periods that will be provided.

3.2 Construction vibration criteria

Guidance of limiting vibration values for general construction activities is attained from reference to the following standards and guidelines:

- Human exposure: Office of Environment and Heritage (OEH) *Assessing vibration: A technical guidelines* (2006).
- Structural damage: - German Standard DIN 4150-3: 1999 *Structural Vibration – Part 3 Effects of vibration on structures*.

3.2.1 Human exposure

The OEH's publication, *Assessing vibration: A technical guideline 2006* outlines methods of assessing potential vibration impacts and is based on guidelines contained in DS 6472 – 1992, *Evaluation of human exposure to vibration in buildings (1-80 Hz).*

Typically, construction works generate ground vibration of an intermittent nature. Under BS 6472-1992 intermittent vibration is assessed using the Vibration Dose Value (VDV). Acceptable VDV's for residential receivers, as outlined in *Assessing Vibration: A technical guideline* 2006, are presented in Table 3-2. BS6472 outlines values which would cause minimal adverse reactions from the occupant and does not consider the short term duration of construction projects or working efficiency.

Table 3-2 Acceptable vibration dose values for intermittent vibration ($m/s^{1.75}$)

Location	Daytime1		Night-time1	
	Preferred Value	Maximum Value	Preferred Value	Maximum Area
Critical areas2	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational intuitions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.8	1.60

Note:

1. Daytime is 7:00 to 22:00 and night-time is 22:00 to 7:00
2. Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be need to assess intermittent values again the continuous or impulsive criteria for critical areas.

British Standard BS 5228-2:2009 *Code of practice for noise and vibration on construction and open sites – Part 2: Vibration*, recommends that the guidance values presented in Table 3-3 are more appropriate for construction works as it is easier to assess the intermittent vibration criteria against a peak value rather than a dose value.

Table 3-3 Guidance on effects of vibration levels

Vibration Level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30 mm/s	Vibration might be just perceptible in residential environments.
1.00 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10.0 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

3.2.2 Structural damage

Currently, there is no Australian Standard that sets the criteria for the assessment of building damage caused by vibration. Guidance of limiting vibration values is attained from reference to German Standard *DIN 4150-3: 1999-02 Structural Vibration – Part 3 Effects of vibration on structures.* Short-term vibration guideline values are presented in Table 3-4.

Table 3-4 Guidelines values for vibration velocity to be used when evaluating the effects of short-term vibration on structures

Line	Type of Structure	Guideline Values for Velocity, vi(t)1		
		Vibration at the Foundation at a Frequency of		
		1 to 10 Hz	10 to 50 Hz	50 to 100 Hz2
1	Buildings used for commercial purposed, industrial buildings, and buildings of similar design.	20	20 to 40	40 to 50
2	Dwellings and buildings of similar design and / or occupancy.	5	5 to 15	15 to 20
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order).	3	3 to 8	8 to 10

Note:

1. The term v_i refers to vibration levels in any of the x, y or z axis.
2. At frequencies above 100 Hz the values given in this column may be used as minimum values.

4. Construction noise impact assessment

4.1 Noise modelling software

Acoustic modelling was undertaken using Computer Aided Noise Abatement (CadnaA) Version 4 to predict the effects of construction noise generated by the proposed levee upgrade.

CadnaA is a computer program for the calculation, assessment and prognosis of noise propagations. CadnaA calculates environmental noise propagation according to ISO 9613-2, "*Acoustics – Attenuation of sound during propagation outdoors*". Ground absorption, reflection and relevant shielding objects are taken into account in the calculations.

The proposed upgrade works have been modelled based on available data at the time of the assessment.

4.2 Noise generating equipment

Noise source emissions included in the noise model were based on information provided by Wagga Wagga City Council and the GHD noise source database. Table 4-1 details the main items of noisy plant used in the model.

It should be noted that the magnitude of off-site noise impact associated with construction would be dependent upon a number of factors:

- The intensity and location of construction activities.
- The type of equipment used.
- Existing local noise sources.
- Intervening terrain.
- The prevailing weather conditions.

Table 4-1 Construction noise equipment sound power levels dB (A)

Construction Works	Noise Source	Sum dB(A)	Total
Embankments	Delivery trucks (truck and dog)	110	117
	Excavator (22T)	99	
	Grader	115	
	Water cart	107	
	Compactor	107	
	Delivery vehicles	93	
Sheet pile walls	Excavator with pile driving hammer (hydraulic hammer rig 240 mm diameter)	124	124
	Small crane (hiab crane truck)	78	
	Trenching machine/small excavator (5T)	99	
	Concrete truck	103	
	Delivery vehicles	93	
	Personnel vehicles	84	

Construction Works	Noise Source	Sum dB(A)	Total
Concrete walls	Concrete trucks	103	107
	Concrete pump and pipework	99	
	Delivery vehicles	93	
	Generator (H8)	94	
	Power tools	102	
	Personnel vehicles	84	
Gabion walls	Delivery trucks	110	110
	Backhoe	95	
	Delivery vehicles	93	
	Personnel vehicles	84	
Embankment/box culvert levee	Delivery vehicles	93	115
	Small mobile crane	78	
	Grader	115	
Spillways	Delivery trucks	110	116
	Excavator	99	
	Grader	115	
	Delivery vehicles	93	
	Personnel vehicles	84	
Levee crossings – Road Raising			
Road embankment and drainage construction	Scrapers	115	118
	Graders	115	
	Vibrating and static rollers	107	
	Backhoes	95	
	Trenching machines	99	
	Excavator	99	
Road pavement construction	Milling machine	111	117
	Compactor	107	
	Vibrating and static rollers	107	
	Concrete agitator trucks	108	
	Spray sealing equipment	105	
	Line marking plant	105	
	Bitumen spraying cart and asphalt paver	111	
	Bitumen trucks	105	
	Kerb extruding machine (light truck)	104	

4.3 Modelling methodology and configuration

For this assessment CadnaA modelling was used to determine the distance from the levee bank construction works within which sensitive receivers in the noise catchment areas would be noise affected and highly noise affected by the works.

Based on the eight construction activities outlined in Table 4-1 , eight scenarios have been modelled for the three levee banks (Main City Levee, North Wagga Wagga Levee and the East Street (Bank 2) Levee).

In these models it has been assumed that all construction equipment listed in Table 4-1 will be operating at maximum levels at the same time.

In fact, construction machinery will likely move about site altering noise impacts with respect to individual receivers. During any given period, the machinery items to be used at the site will operate a maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is highly unlikely that all construction equipment would be operating at maximum sound power levels at any one time and certain types of construction machinery will only be onsite for only brief periods during construction. Therefore predictions are considered to be conservative estimates.

The following assumptions were made with regard to the model configuration:

- A general ground absorption coefficient of 0.5 was used throughout the model.
- For daytime, atmospheric conditions of 20˚C and 70% humidity was used.
- ISO 9613-2 propagation algorithm assumes moderate downwind or temperature inversion conditions. This will lead to conservative results compared to neutral conditions.

4.4 Noise model results

Based on the construction criteria outlined in section 3.1 for each noise catchment area (NCA) Table 4-2 shows the distance from the levee construction works within which the receivers located within the NCA's would be noise affected by the works. The table also details the distance within which the receivers in the NCA's would be highly noise affected. Noise contour maps for these results are shown in Appendix B.

Table 4-2 Modelled Distances (m) from construction works at which receivers in noise catchment areas are noise affected and highly noise affected

Construction Works	Distance from Levee Construction Works (m)						
	Highly Affected Noise Criteria	Noise Affected Criteria					
	All NCA's – 75 dB(A)	NCA 1 – 41 dB(A)	NCA 2 – 45 dB(A)	NCA 3 – 52 dB(A)	NCA 4 – 46 dB(A)	NCA 5 – 42 dB(A)	NCA 6 – 42 dB(A)
Embankments	27	939	630	296	566	851	851
Sheet pile walls	53	1772	1225	628	1139	1609	1609
Concrete walls	10	329	211	96	188	296	296
Gabion walls	13	460	293	133	266	411	411
Embankment/Box culvert levee	22	772	510	236	458	697	697
Spillways	25	853	568	264	511	773	773
Levee Road Crossings and Road Raising - Road embankment and drainage construction	30	1034	699	331	627	941	941
Levee Road Crossings and Road Raising -Road pavement construction	27	939	630	296	566	851	851

The results outlined in Table 4-2 indicate that the majority of construction activities are expected to exceed the noise affected CNML of each NCA at a number of receivers between 250 and 1800 m of the works, depending on what activity is being undertaken. Furthermore, between 25 and 55 m of the works the results suggest that certain activities will exceed the highly noise affected level of 75 dB (A). Therefore, based on these predictions, it is recommended that the mitigation measures detailed in Section 6 be considered and implemented where reasonable and feasible to reduce noise impacts. It should be emphasised that the modelling undertaken for this assessment has been for the worst case and the predicted results are conservative.

5. Construction vibration assessment

Vibration impacts focus on potential structural damage in close proximity to construction activities. Furthermore, it is possible that local sensitive receivers may perceive construction vibration at times. The level of annoyance, however, will depend on individuals.

Table 5-1 outlines typical vibration levels for different plant activities sourced from the NSW Roads and Maritime Services (RMS) publication Environmental Noise Management Manual (ENMM) (2001).

Table 5-1 Typical vibration levels – construction equipment

Item	Peak Particle Velocity at 10 m (mm/s)
Piling	12-30
Loader Breaking Kerbs	6-8
15 Tonne Compactor	7-8
7 Tonne Compactor	5-7
Roller/Rock Hammer	5-6
Pavement Breaker	4.5-6
Dozer	2.5-4
Backhoe	1
Jackhammer	0.5
Excavators, Scrapers, Graders, etc	2.5[1]

[1] Based on levels derived at 8m from: Tynan, A.E. *Ground Vibrations. Damaging effects to Buildings*. Australian Road Research Board 1973

As stated in the ENMM, it can be assumed that the vibration level is inversely proportional to distance. Field variations show that the distance relationship generally varies between $d^{-0.8}$ and $d^{-1.6}$, rather than d^{-1}. On that basis, maximum vibration levels were estimated at each receiver using a factor of $d^{-0.8}$.

Based on the vibration levels stated in Table 5-1 and the list of construction equipment detailed in Section 4 the maximum potential vibration impacts of the sources associated with the project at various distances are shown in Table 5-2

Table 5-2 Estimated vibration impacts at the nearest receivers

Vibration Source	Distance to Source (m)/ Peak Particle Velocity (mm/s)					
	5	10	20	50	100	150
Roller	10.4	6.0	3.4	1.7	1.0	0.7
15 tonne Roller	13.9	8.0	4.6	2.2	1.3	0.9
7 tonne compactor	10.4	6.0	3.4	1.7	1.0	0.7
15 tonne compactor	13.9	8.0	4.6	2.2	1.3	0.9
Backhoe	1.7	1.0	0.6	0.3	0.2	0.1
Excavator/ Grader	3.6	2.1	1.2	0.6	0.3	0.2

5.1 Building damage

When compared to the structural vibration criteria outlined in Table 3-4, Table 5-2 indicates the following:

- Buildings classified as dwellings or buildings of similar construction (DIN4150-3 ‘line 2’ buildings) within 10 m of the source are expected to experience vibration above the 5 mm/s PPV recommended limit.
- Structures that, because of their particular sensitivity to vibration and are of great intrinsic value (such as heritage listed buildings under preservation order) (DIN4150-3 ‘line 3’ buildings) within 20 m of the source are expected to experience vibration above the 3mm/s PPV recommended limit.

In light of these findings it is therefore recommended that the mitigation measures outlined in Section 6 be considered and applied where reasonable and feasible. However, it is important to note that vibration levels exceeding those prescribed in DIN4150-3 do not always cause damage; therefore further investigations would be required.

5.2 Human perception

Humans are capable of detecting vibration at levels well below those causing risk of damage to buildings. The degrees of perception for humans are suggested by the vibration level categories given in BS5228:2009 and shown in Table 3-3. Based on the activities outlined in Section 4 and the conservative estimate detailed in Table 5-2, it is possible that construction vibration may be perceptible at times at distances up to 100m of the works. Therefore it is recommended that the mitigation measures detailed in Section 6 be considered and implemented where feasible and reasonable.

6. Recommendations

6.1 Noise mitigation

The following construction noise mitigation measures should be implemented to reduce the impact on the surrounding receivers:

- Construction activities would be scheduled during the recommended construction hours, unless otherwise assessed and approved.
- Where possible, less powerful or quieter generator units to be preferred. Mechanical plant that is acoustically treated should be preferred.

- All construction equipment and mechanical plant within the project site should be located as far from sensitive receptors as practicable.
- To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) should be used for all site equipment. Satisfactory compliance with occupational health and safety requirements would need to be achieved and a safety risk assessment may need to be undertaken to determine that safety is not comprised. Refer to Appendix C of the ICNG (2009) for more information.
- All equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made. Table 6-1 presents noise control methods and expected noise reductions according to Australian Standard AS 2346 – 2010 *Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.
- Maximise shielding between the nearest receptor and all the major construction equipment or mechanical plant. This may involve locating buildings or other items on site to shield the line of site from mechanical equipment to sensitive receptors.
- Piling can generate significant noise and vibration impacts depending on the adopted piling method. Bored or vibratory methods should be preferred where possible. Standard impact piling would lead to the highest impacts. In the case of impact piling, it is recommended that noise and vibration be monitored at the start of the works to verify impacts are acceptable.
- Where possible very high noise generating activities such as sheet piling in close proximity to sensitive receivers should be limited to the hours of 10 am to 3 pm.
- In the event that shift workers are impacted by the proposed works and the noise criteria cannot be achieved it is recommended that consideration be given to finding alternate temporary accommodation for these workers. Alternately, scheduling work to minimise impacts upon these receivers should be considered.

Table 6-1 Relative effectiveness of various forms of noise control dB (A)

Noise Control Method	Typical noise reduction dB(A)	Maximum noise reduction dB(A)
Distance	Approximately 6 per doubling of distance	
Screening	5 to 10	15
Acoustic Enclosures	15 to 25	50
Engine Silencing	5 to 10	20

6.2 Work ethics

All site workers would be sensitised to the potential for noise impacts on local residents and encouraged to take practical and reasonable measures to minimise the impact during the course of their activities. This would include:

- Avoid the use of loud radios.
- Avoid shouting and slamming doors.
- Where practical, machines would be operated at low speed or power and switched off when not being rather than left idling for prolonged periods.
- Keep truck drivers informed of designated vehicle routes, parking locations and delivery hours.

- Minimise reversing.
- Avoid dropping materials from height and avoid metal to metal contact on material.
- All engine covers would be kept closed while equipment is operating.

6.3 Community relations

Consultation and cooperation with the neighbours to the site will assist in minimising uncertainty, misconception and adverse reactions to noise. The following community relation measures would be implemented:

- The contractor would establish contact with receivers affected by construction noise and communicate the construction program and progress on a regular basis, particularly when noisy or vibration generating activities are planned. Communication with the receivers would be maintained throughout the construction period.
- The constructor would provide a community liaison phone number and permanent site contact so that noise complaints can be received and addressed in a timely manner.
- Upon receipt of a noise complaint, monitoring would be undertaken and reported as soon as possible. If exceedances are detected, the situation would be reviewed in order to identify means to attempt to reduce the impact to acceptable levels.

6.4 Compliance noise and vibration monitoring

Attended compliance noise or vibration monitoring should be undertaken to confirm the predicted noise or vibration levels upon receipt of a complaint. The ICNG guidelines state that complaint monitoring measurements should be taken at the complainant's location and the monitoring should cover the time of day when the impacts were reported to occur.

In the case that exceedances of the relevant annoyance criteria levels listed in this report are detected in relation to the complaint, the situation should be reviewed in order to identify means to minimise the impacts to residences.

Where construction activities generating vibration are to be undertaken at a distance of less than 30 m from any building or structure , vibration monitoring should be conducted during these activities at the most susceptible building. Where exceedances of the vibration criteria outlined in Section 3.2 are recorded, the situation should be reviewed in order to identify the measures that can be taken to minimise the impacts to buildings and prevent structural damage. The review may result in a requirement to modify work practices or use alternative, low-vibration methods and equipment.

In all cases, noise or vibration monitoring should be undertaken by a suitably qualified professional with in accordance with ICNG guidelines.

6.5 Building condition inspections (vibration)

Building Condition Inspections are recommended for any utility, structure or building when vibration generating activities such as vibratory rolling are planned within 50 m. Any utility, structure or building requiring a building inspection will be determined prior to construction works commencement.

Building condition inspection reports should also classify building structure and susceptibility to damage in accordance with the DIN4150-3 classifications. The resulting building classifications are to be used for determination of the applicable DIN4150-3 vibration criteria curves.

Condition inspections are to identify high-risk buildings where additional vibration restrictions and more stringent criteria may apply.

6.6 Human comfort impacts (vibration).

The construction works are considered short term by the OEH Assessing Vibration A Technical Guideline (AVTG), therefore where alternative non-vibration inducing construction methods are impractical, the following principles from the AVTG can be utilised to assist with minimisation of adverse reactions from the community.

- Confining vibration-generating operations to the least vibration-sensitive part of the day—which could be when the background disturbance is highest.
- Determining an upper level for vibration impact also considering what is achievable using feasible and reasonable mitigation.
- Consulting with the community regarding the proposed events

7. Conclusion

This noise and vibration assessment leads to the following conclusions, subject to the limitations outlined in Section 8:

- Baseline noise monitoring was conducted at six locations within the site area. The unattended noise logging locations were selected due to their proximity to the works and were considered representative of the acoustic environment for the nearest sensitive receivers.
- Based on the background noise monitoring results, construction and operational noise criteria have been determined and are given in Section 3.
- Calculated results indicate that the predicted construction noise levels at a number of receivers within the identified noise catchment areas are not expected to comply with the most stringent construction noise affected levels or the highly noise affected level of 75 dB(A). Therefore the mitigation measures detailed in Section 6 should be implemented where feasible and reasonable to reduce noise impacts.
- Where vibratory rollers are used as part of the construction works, vibration is expected to be perceptible at sensitive receivers within 100 m of the works and may exceed the structural damage criteria at structures located within 10 m of the works. To minimise the vibration impacts of the works it is recommended that mitigation measures outlined in Section 6 be implemented.

8. Limitations

This report has been prepared by GHD for Wagga Wagga City Council and may only be used and relied on by Wagga Wagga City Council for the purpose agreed between GHD and Wagga Wagga City Council as set out in section 0 of this report.

GHD otherwise disclaims responsibility to any person other than Wagga Wagga 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, including (but not limited to) those specifically detailed in Sections 4 and 5 GHD disclaims liability arising from any of the assumptions being incorrect.

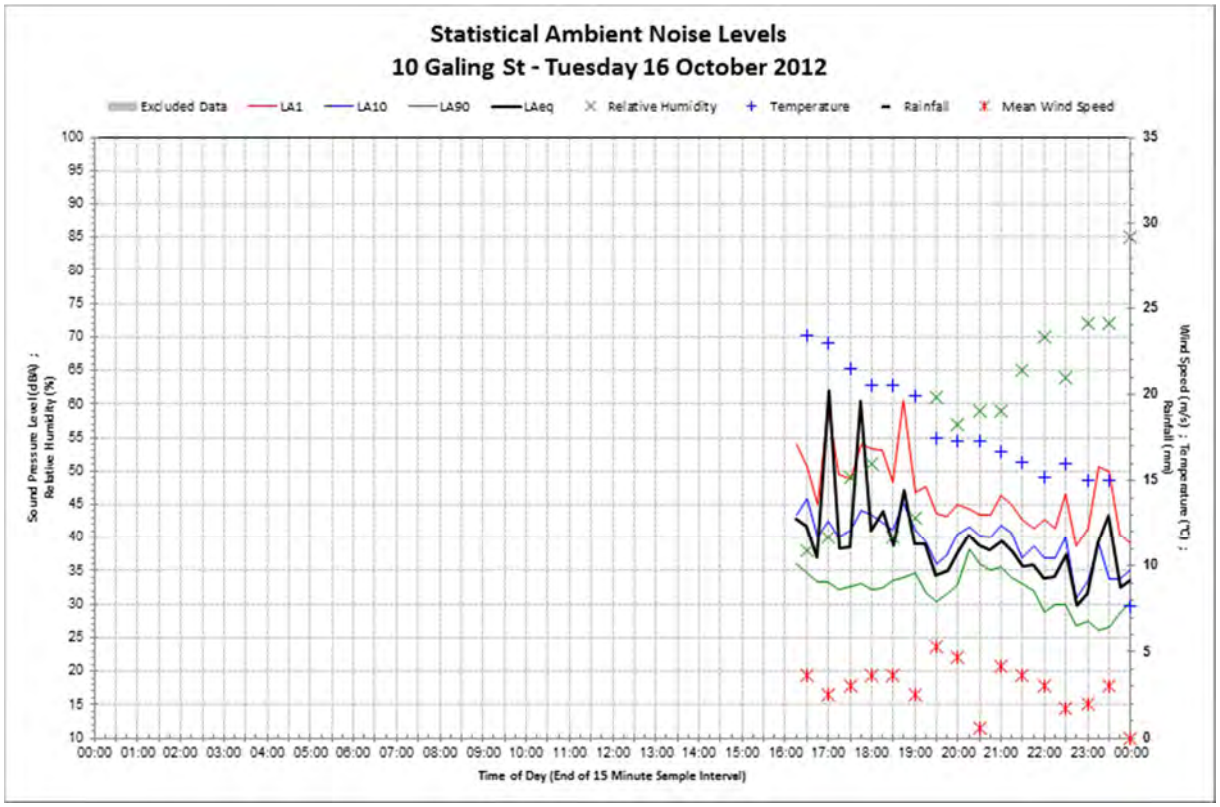
GHD has prepared this report on the basis of information provided by Wagga Wagga City Council and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

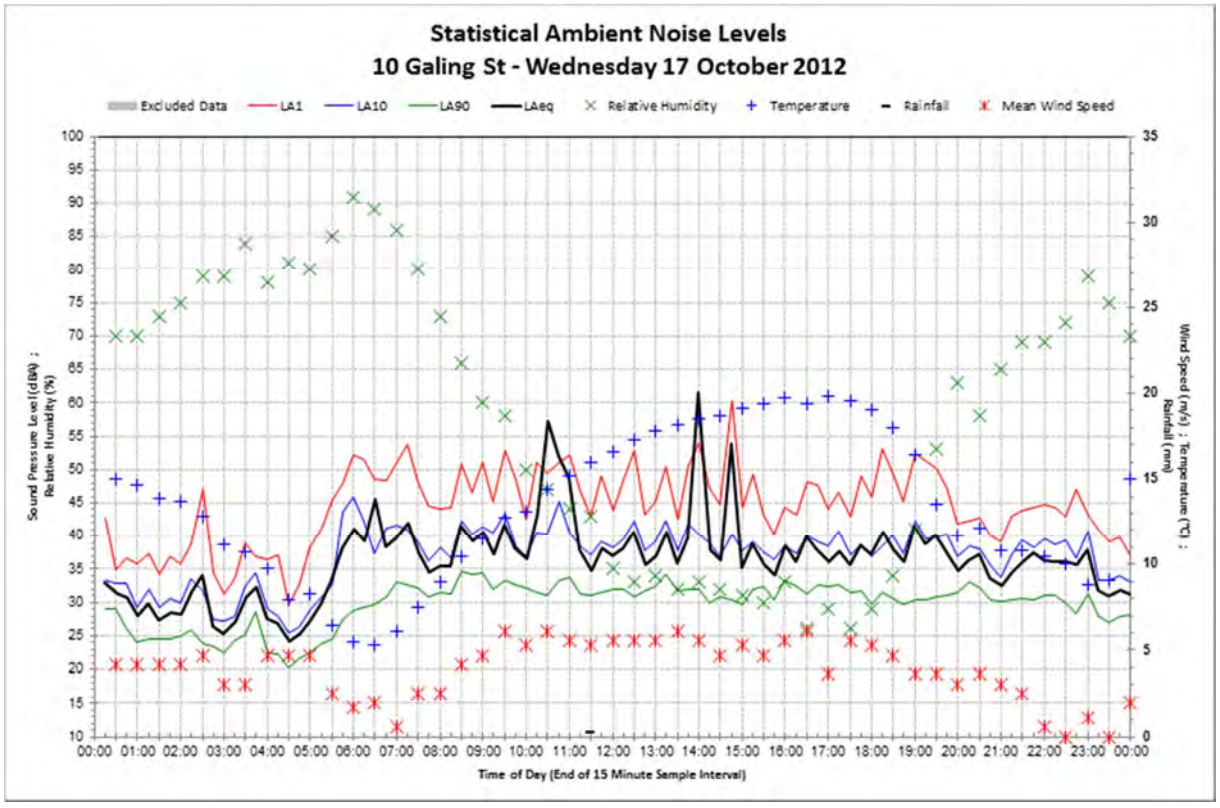
It is not the intention of the assessment to cover every element of the acoustical environment, but rather to conduct the assessment with consideration to the prescribed work scope.

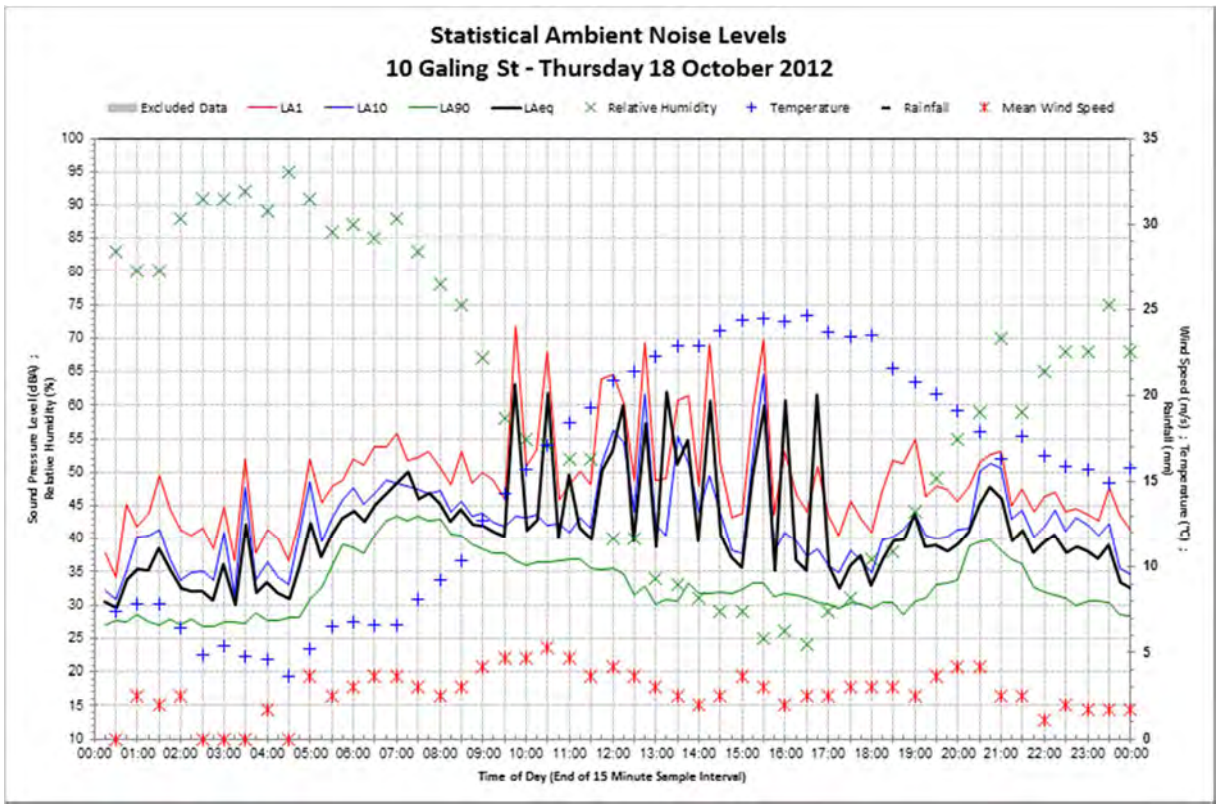
The findings of the acoustic assessment represent the findings apparent at the date and time of the monitoring and the conditions of the area at that time. It is the nature of environmental monitoring that not all variations in environmental conditions can be accessed and all uncertainty concerning the conditions of the ambient noise environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

Appendices

Appendix A – Noise monitoring charts



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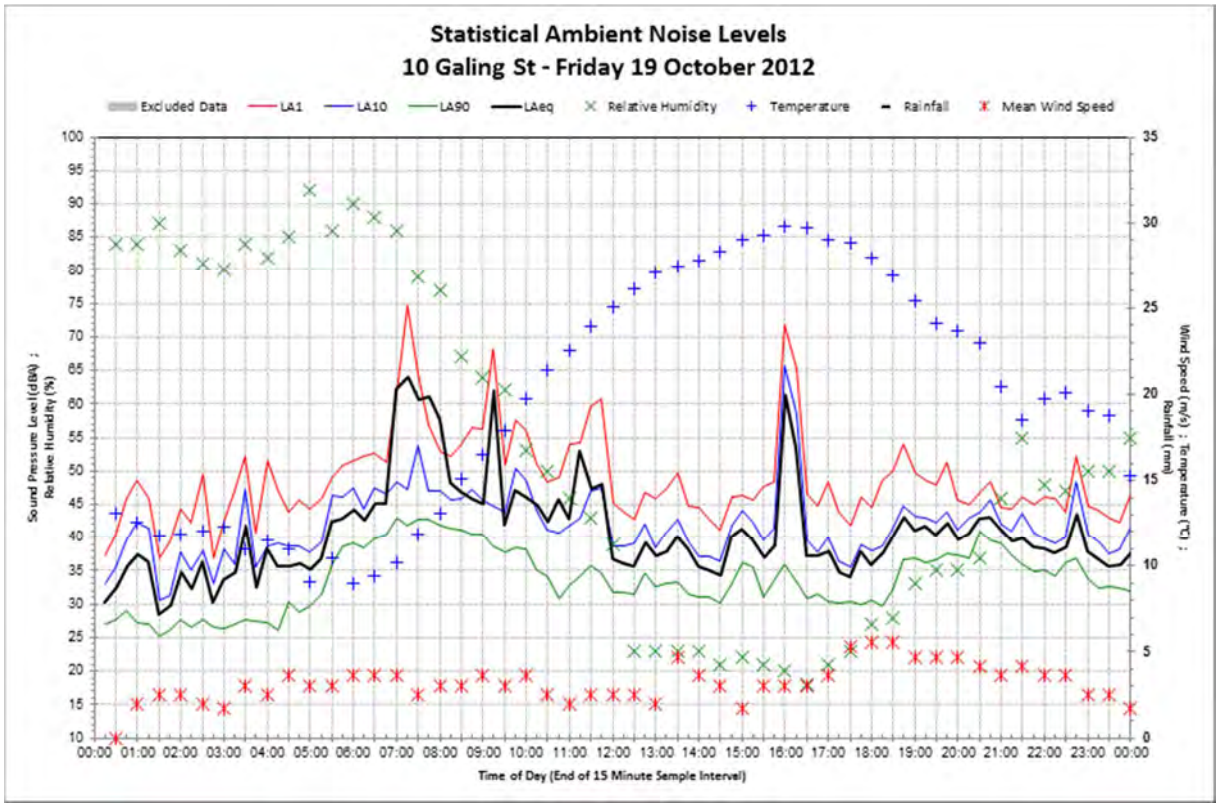
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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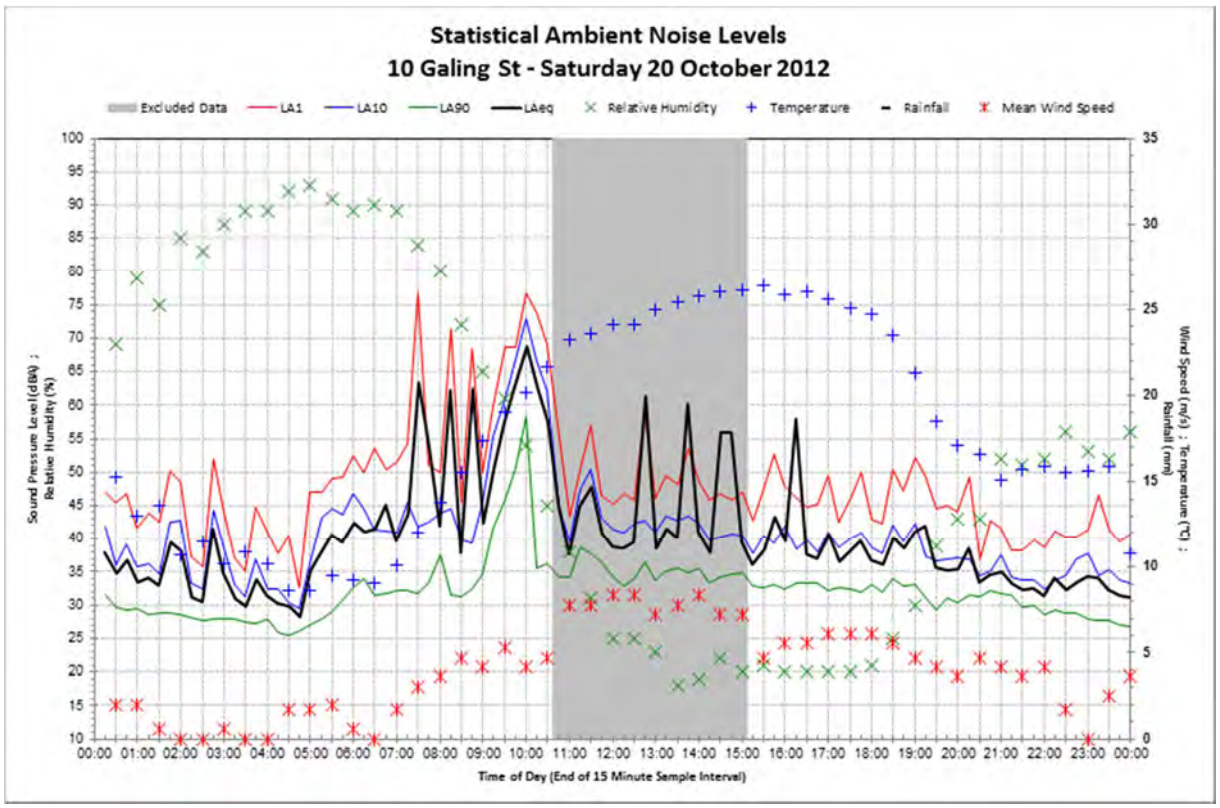
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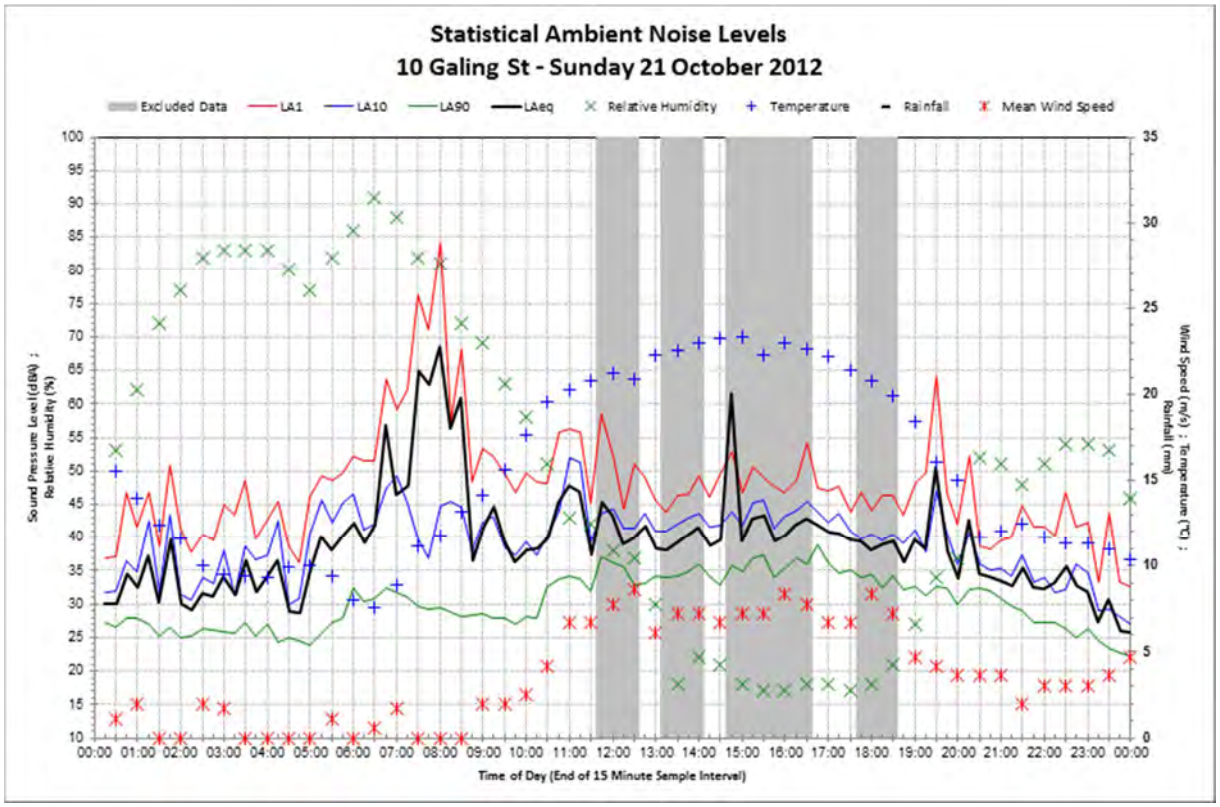
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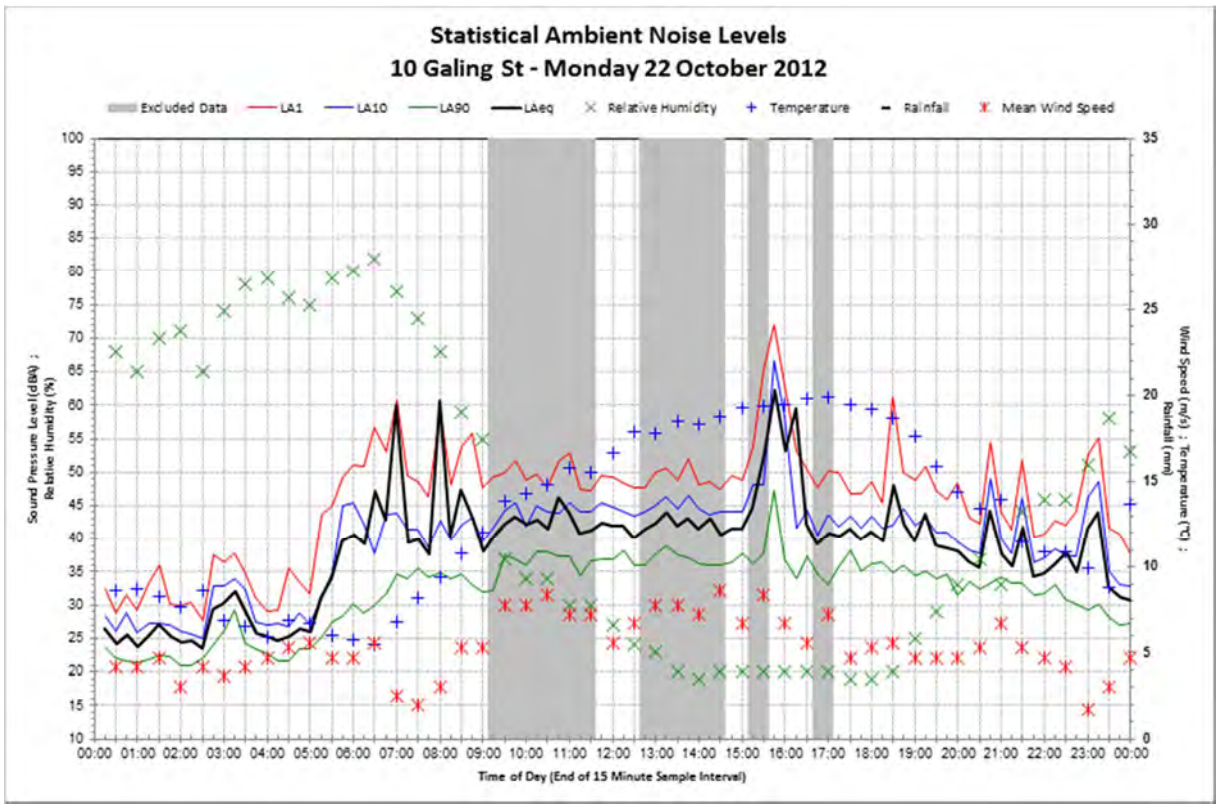
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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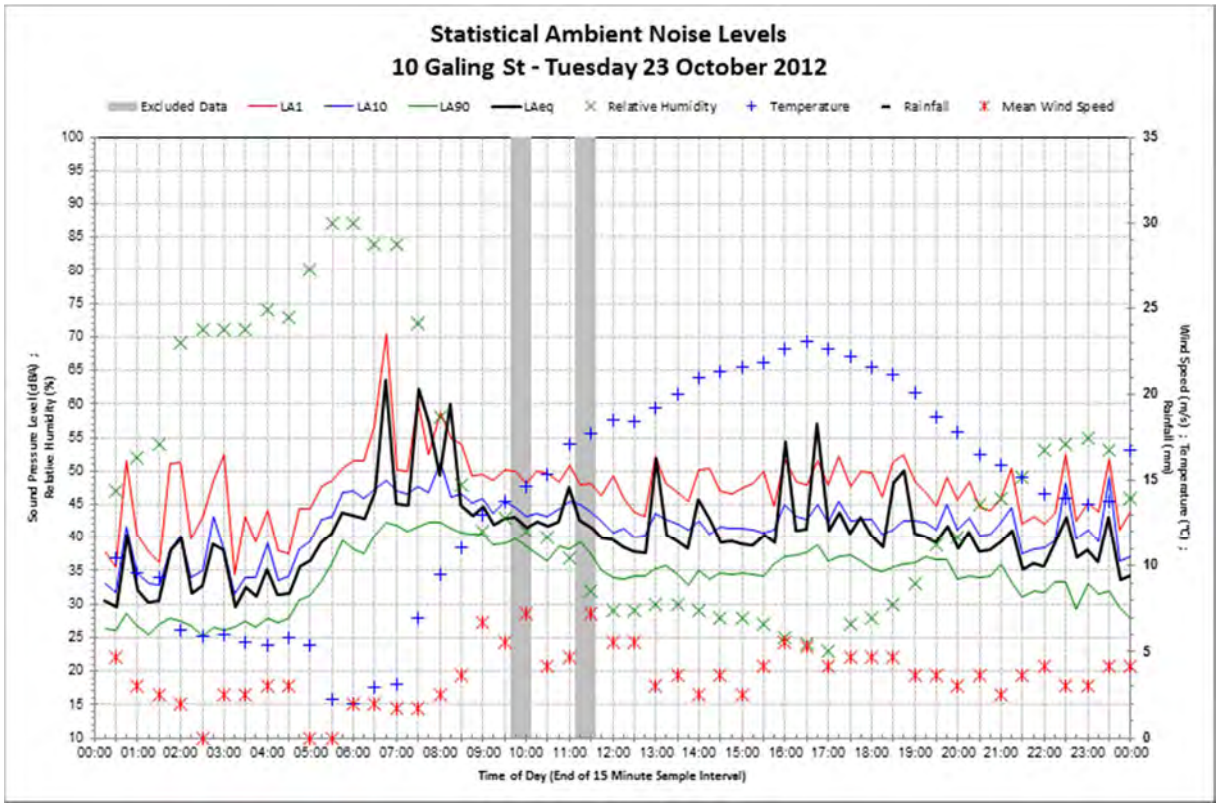
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Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
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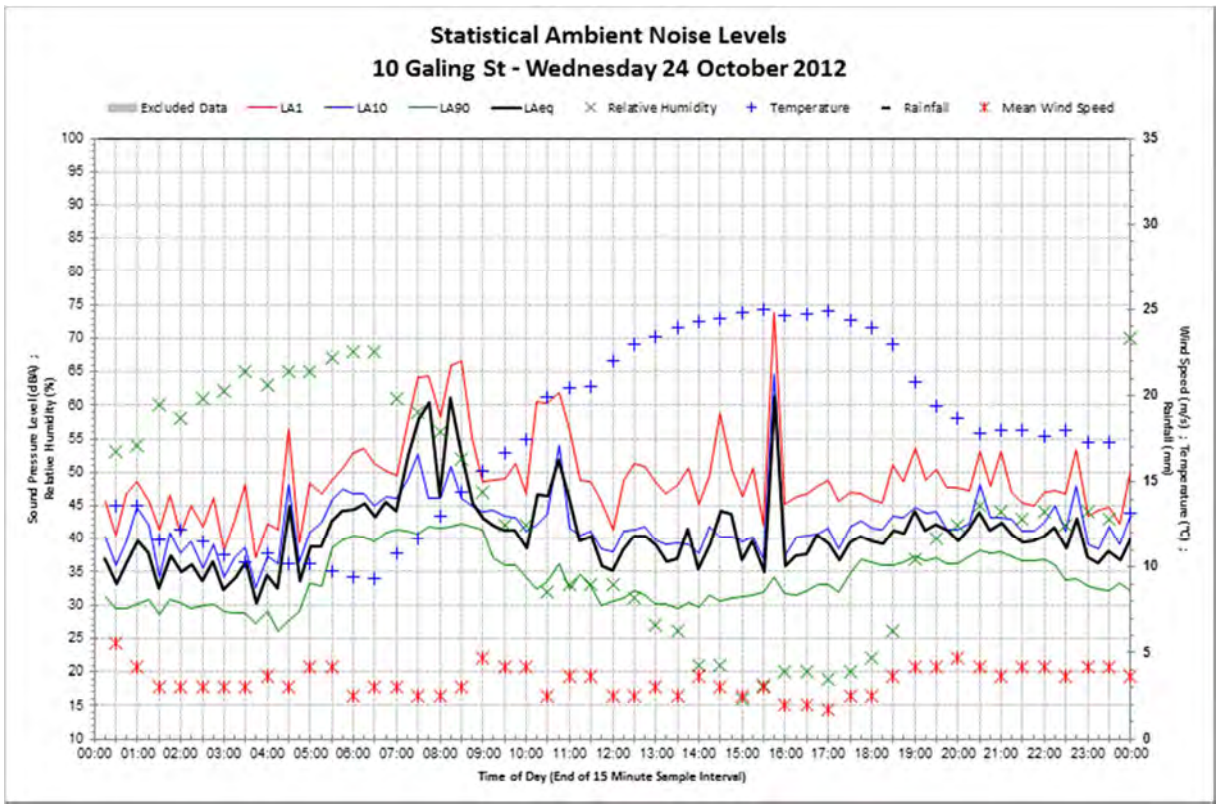
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Temperature
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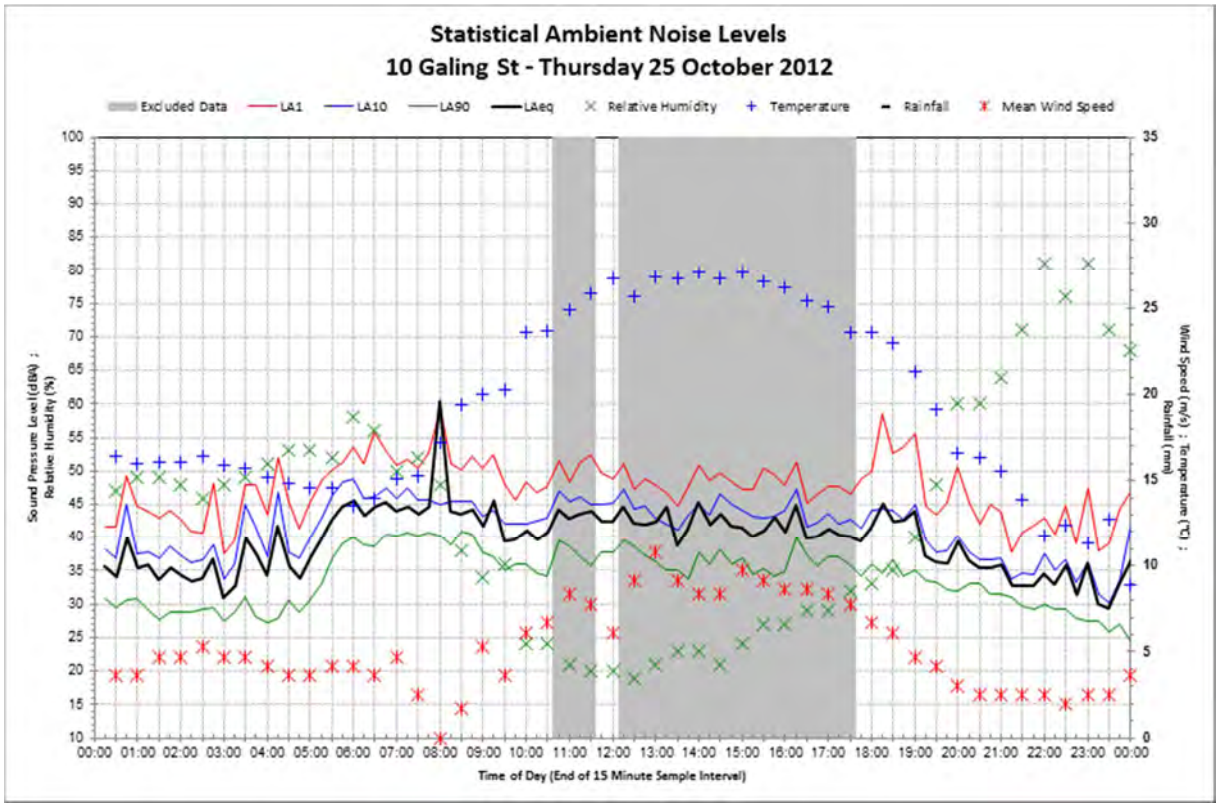
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)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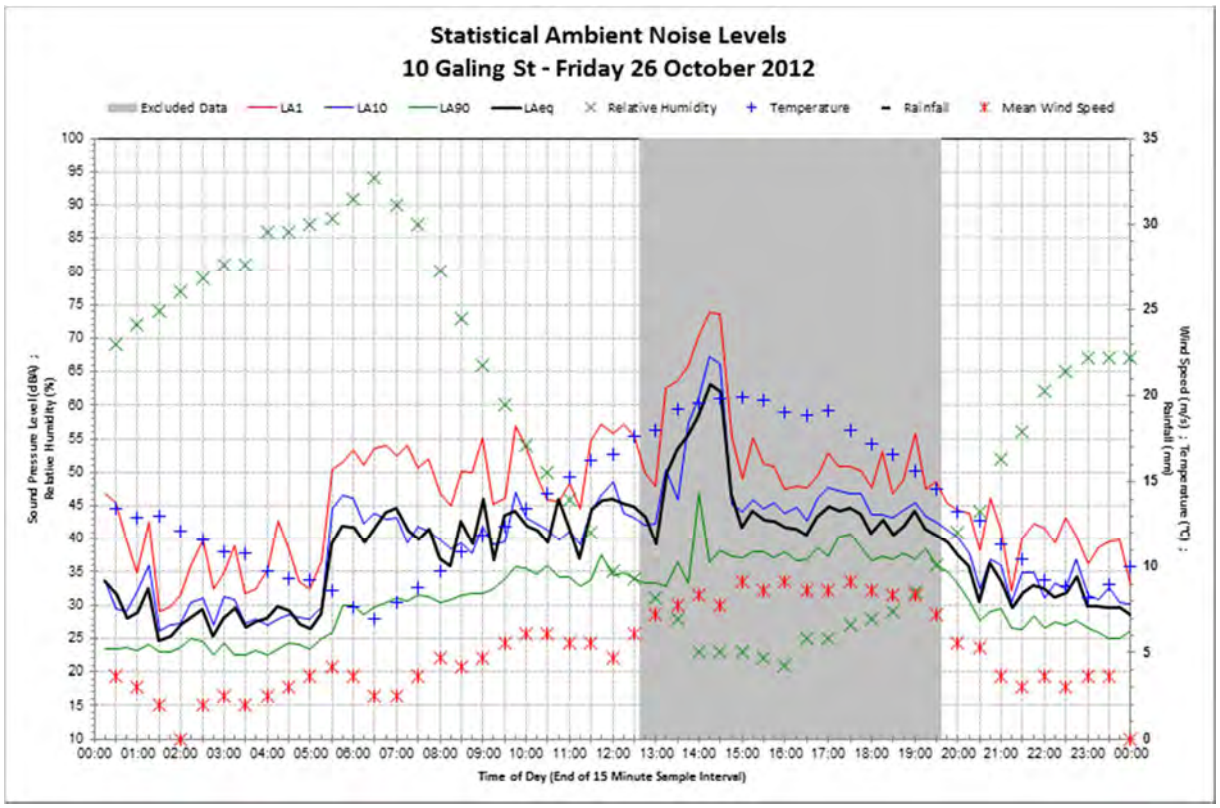
Time of Day (End of 15 Minute Sample Interval)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Temperature
Rainfall
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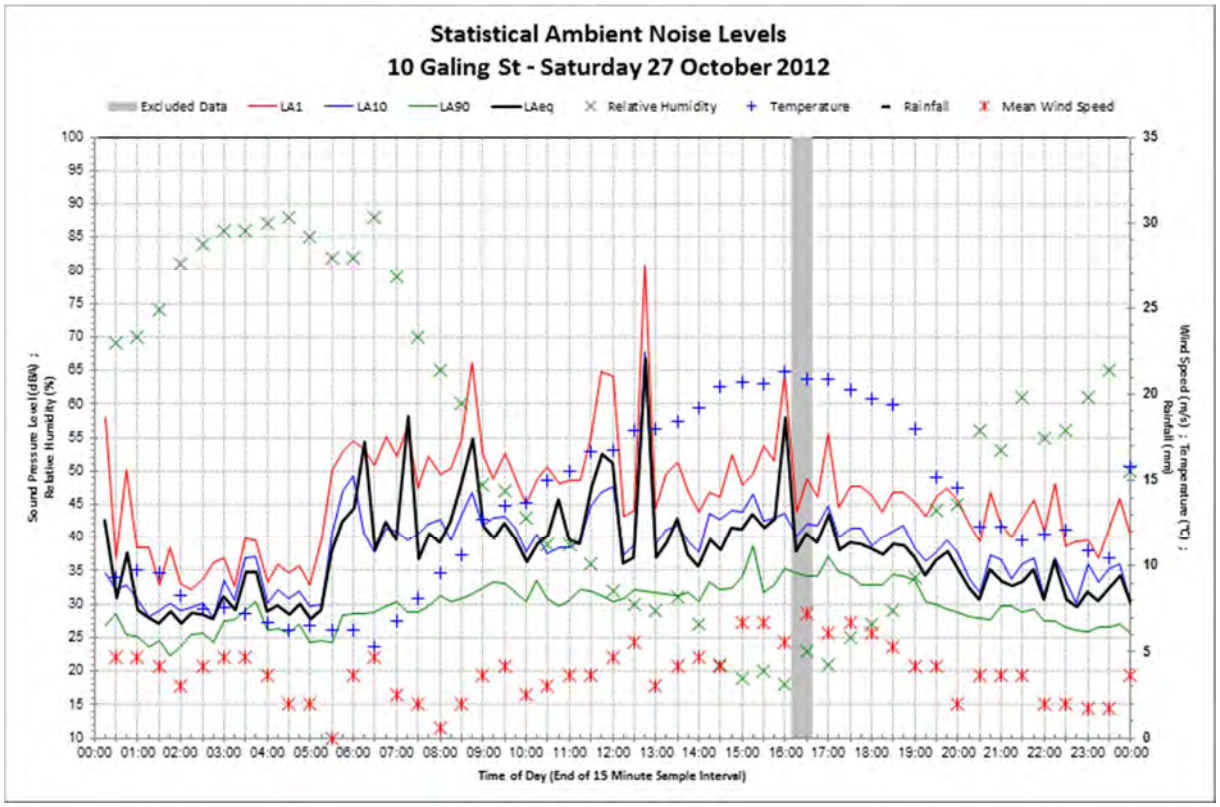
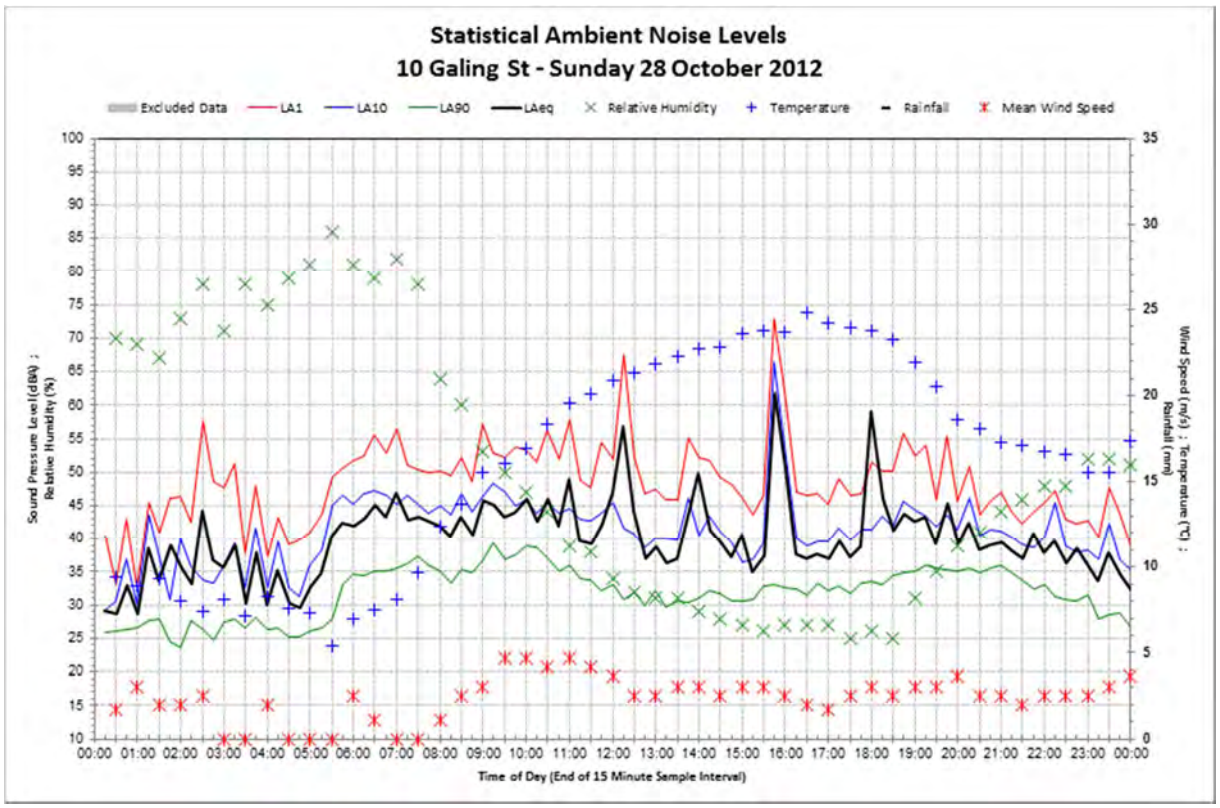
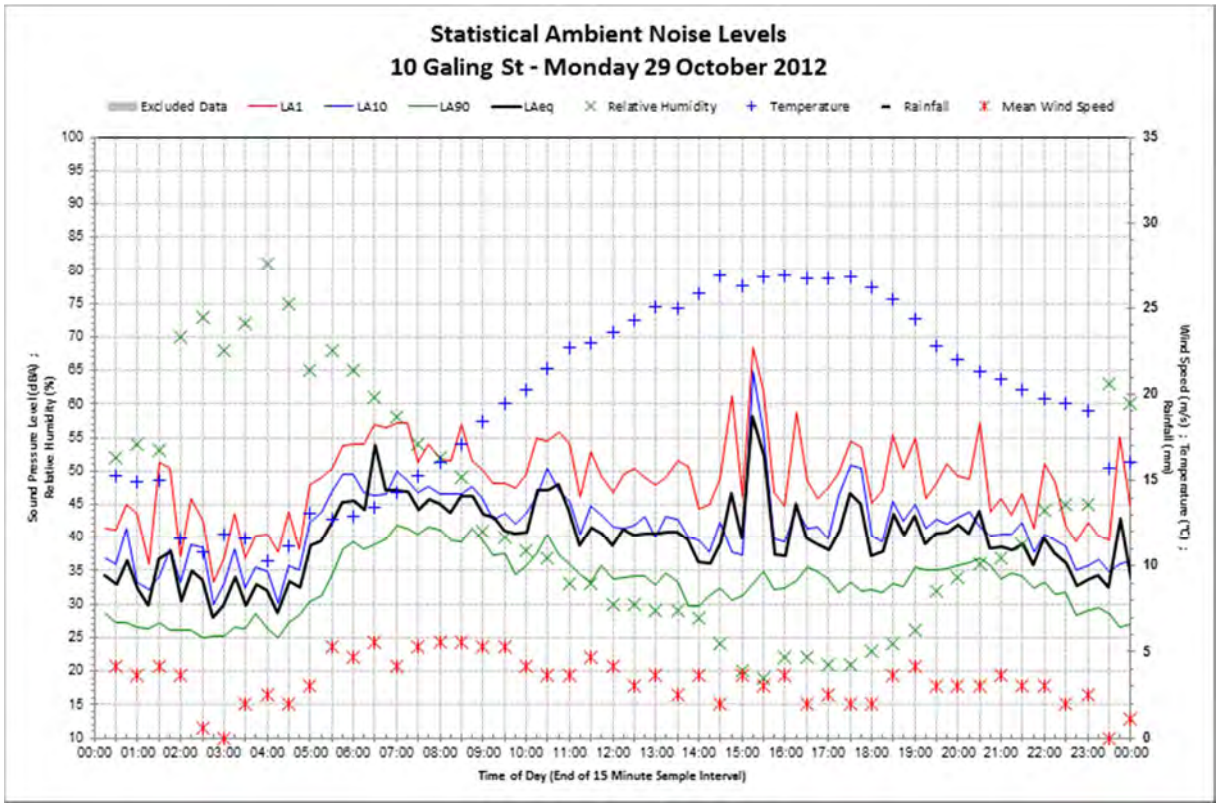
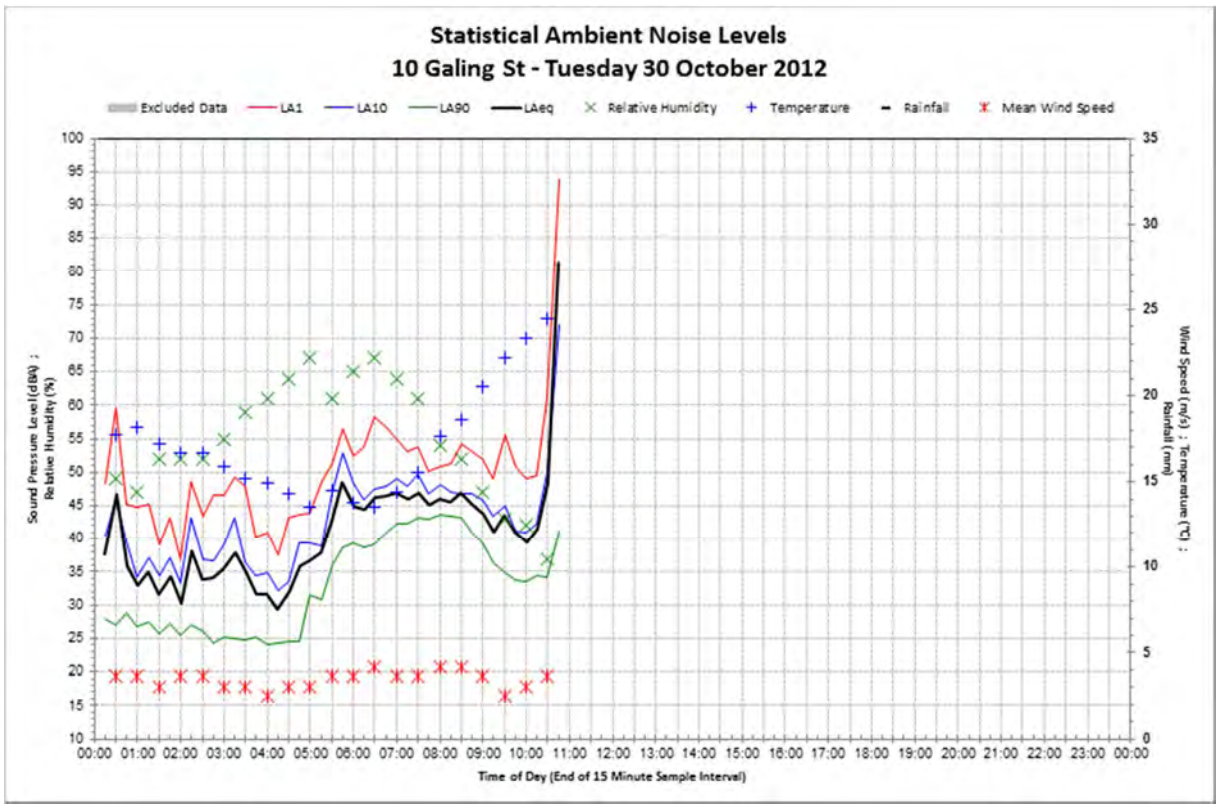
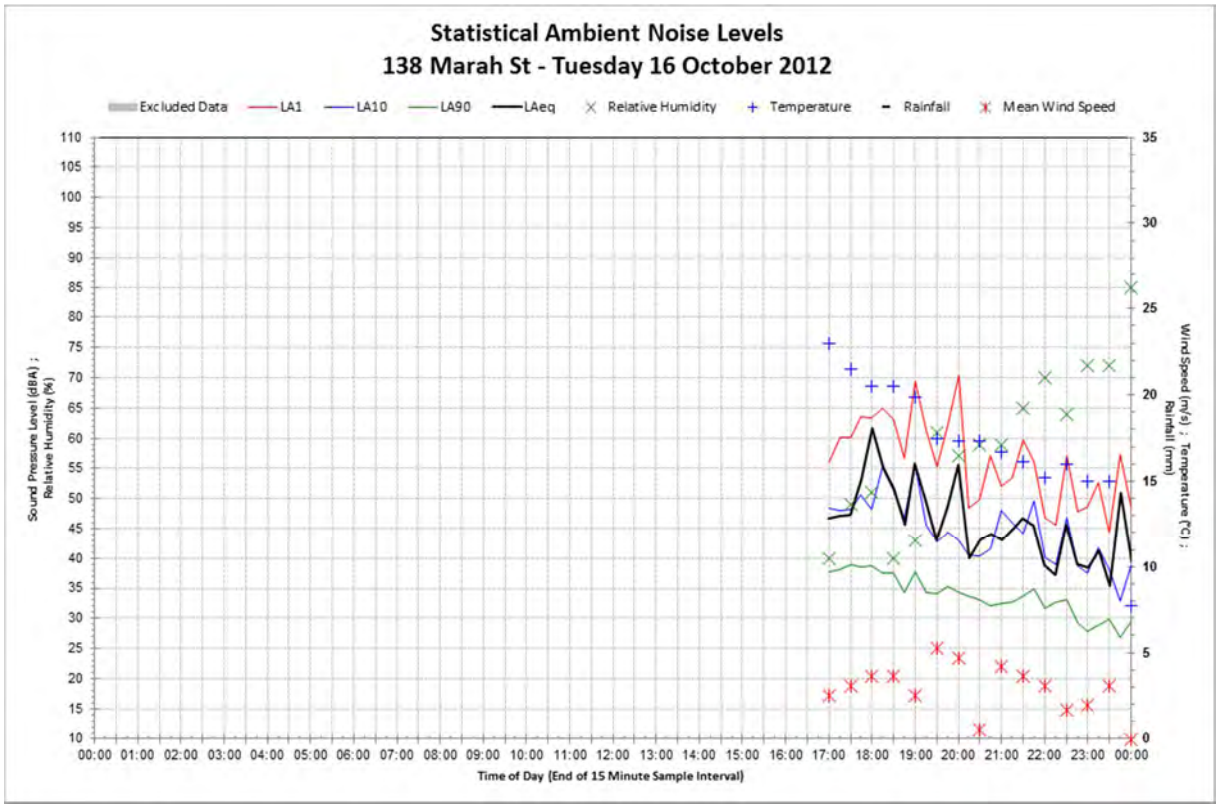
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

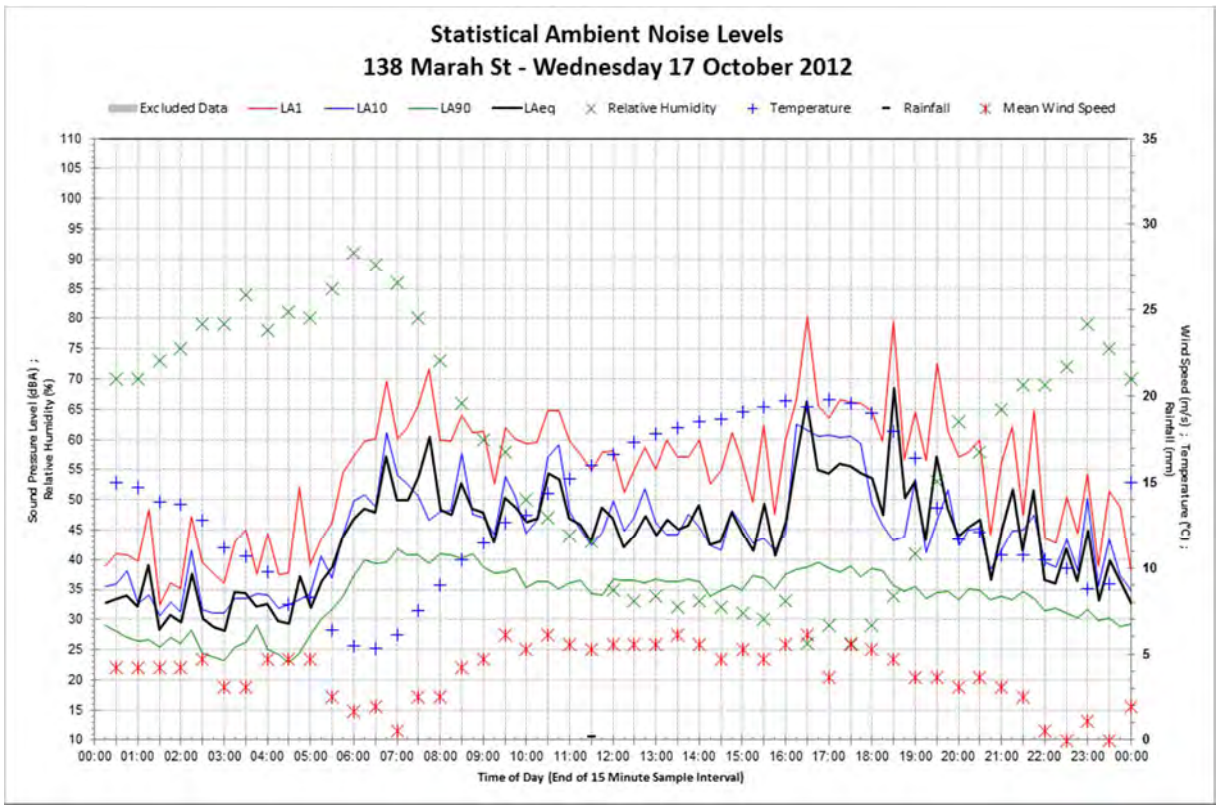

Statistical Ambient Noise Levels
10 Galing St - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

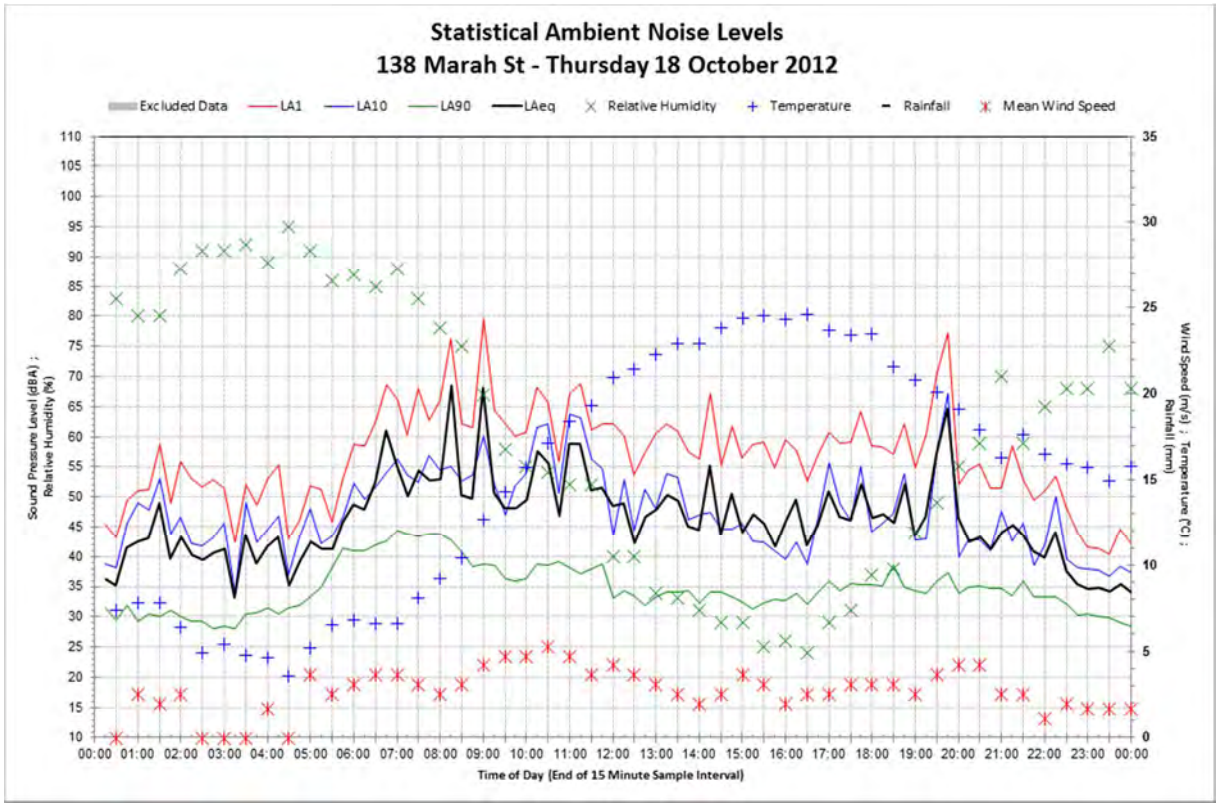

Statistical Ambient Noise Levels
10 Galing St - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

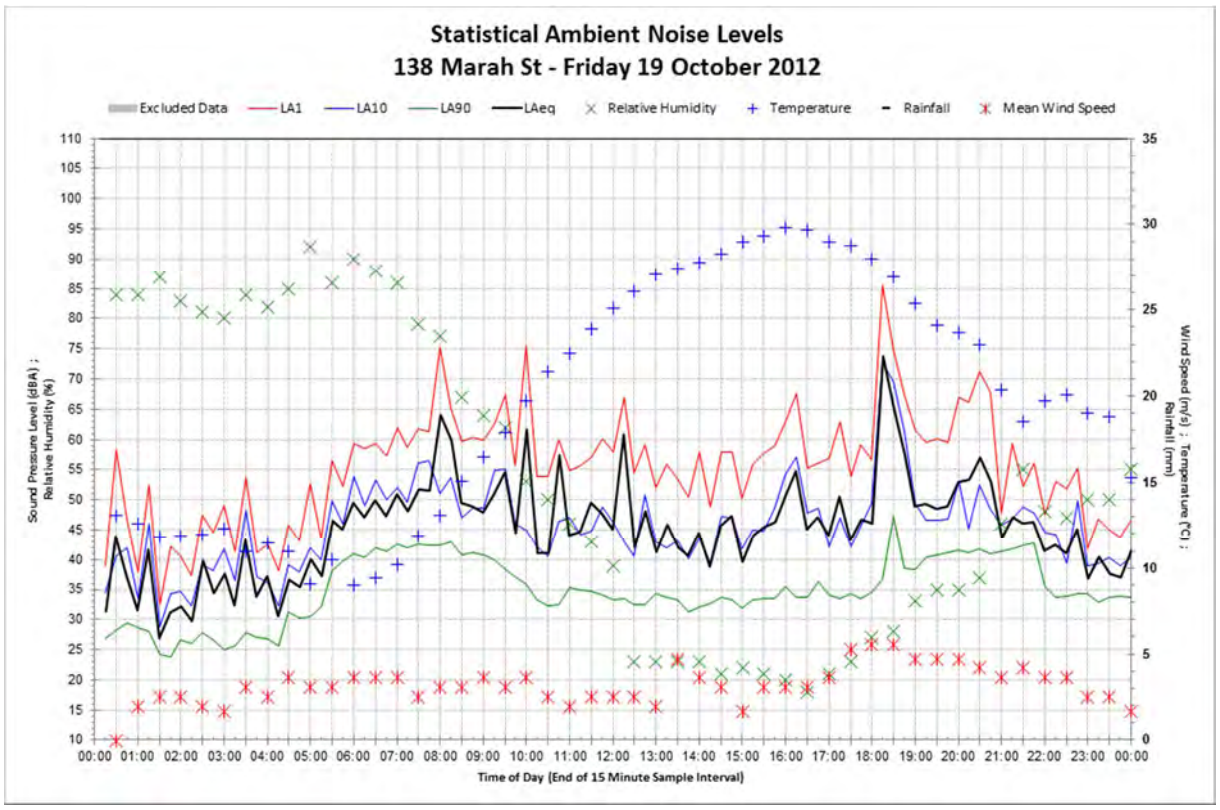

Statistical Ambient Noise Levels
10 Galing St - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

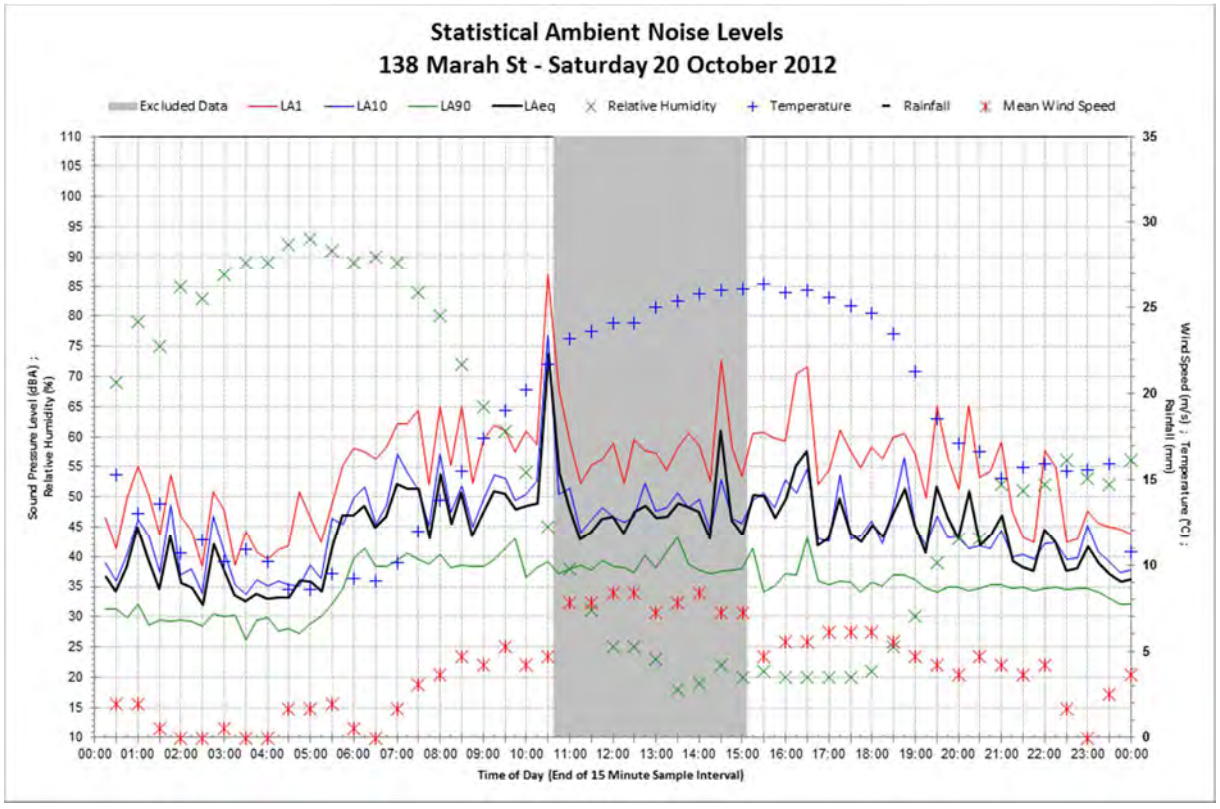

Statistical Ambient Noise Levels
10 Galing St - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

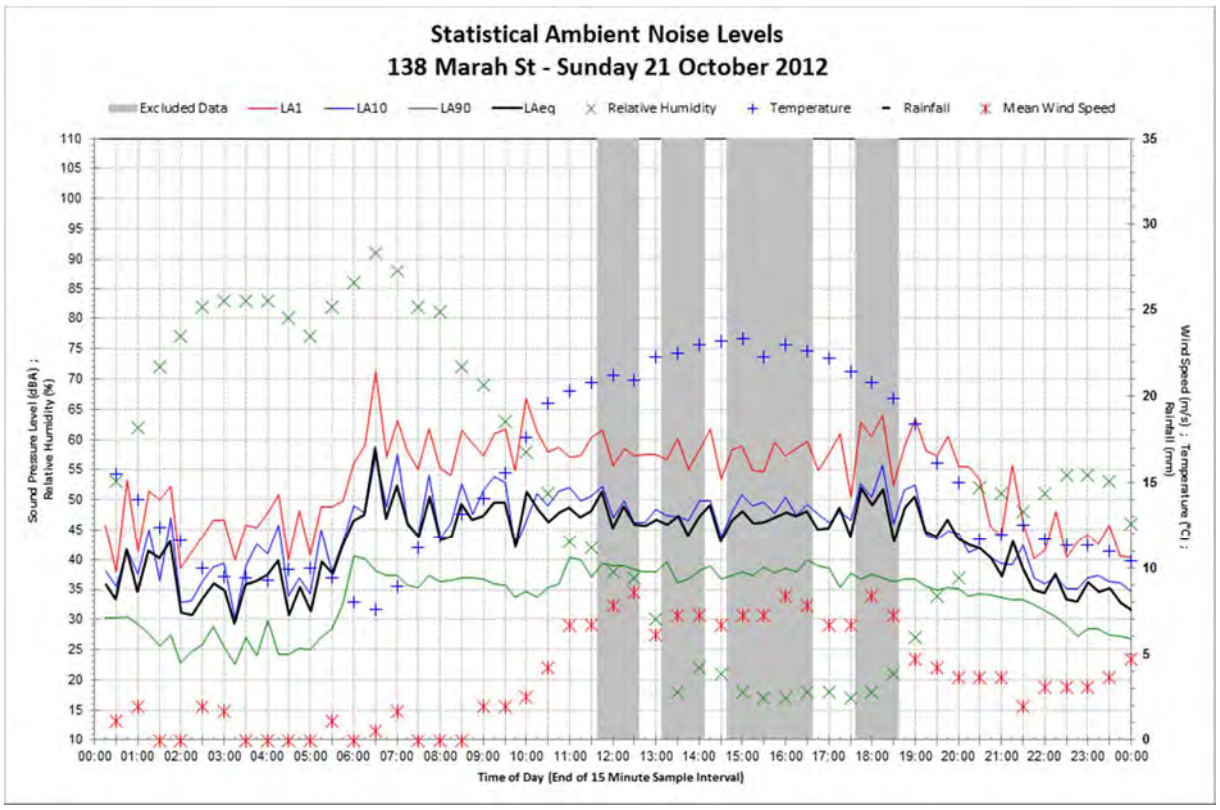

Statistical Ambient Noise Levels
138 Marah St - Tuesday 16 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

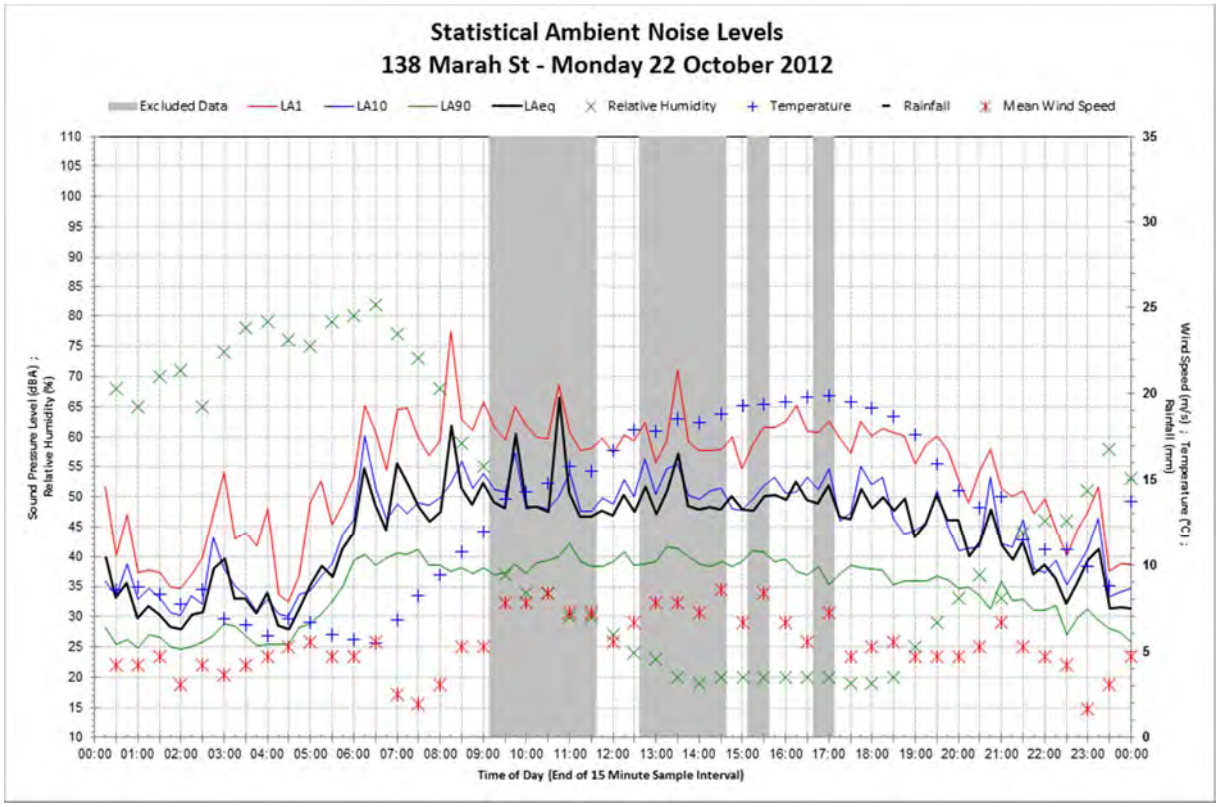

Statistical Ambient Noise Levels
138 Marah St - Wednesday 17 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

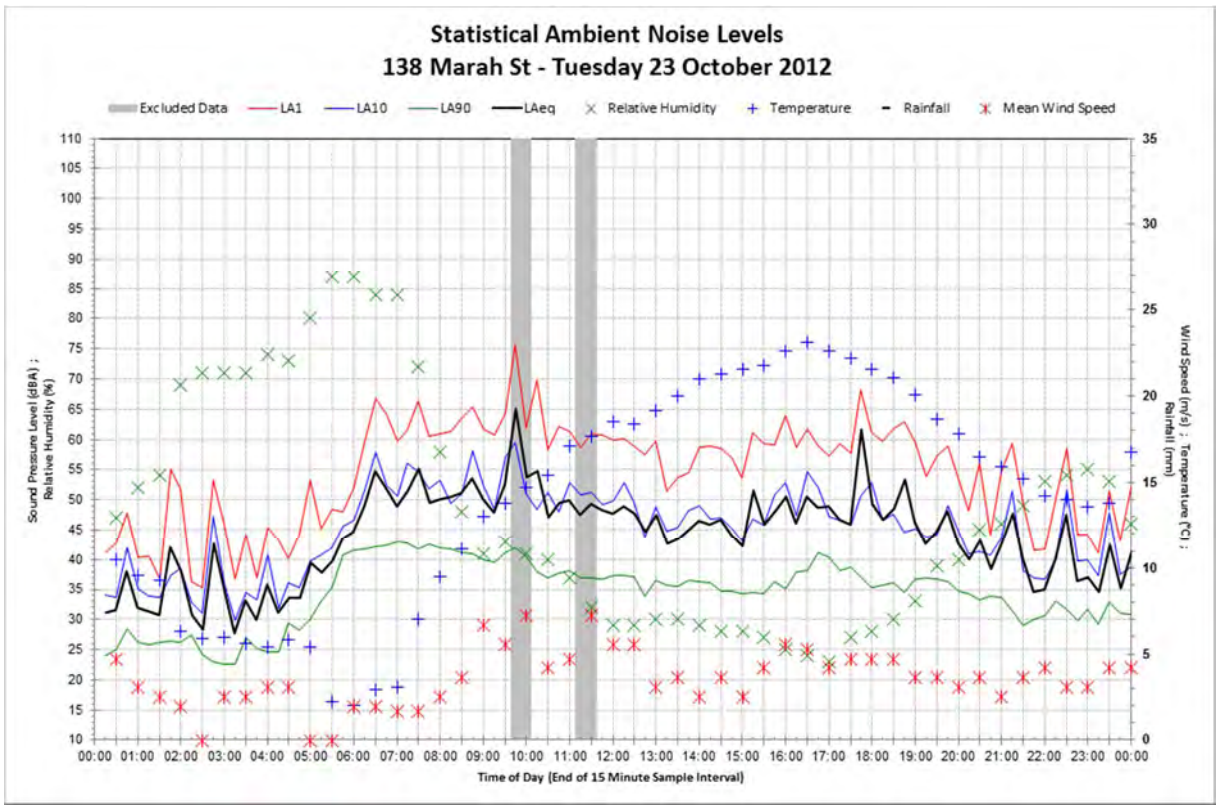

Statistical Ambient Noise Levels
138 Marah St - Thursday 18 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

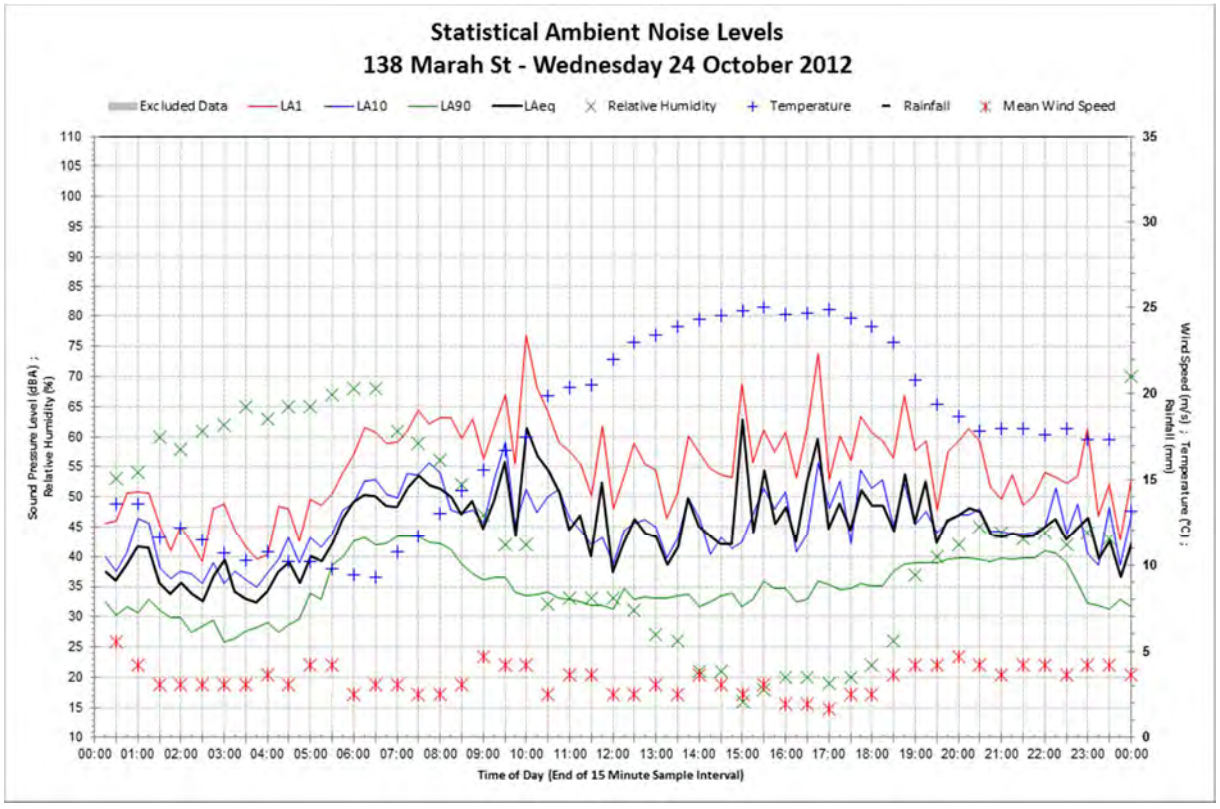

Statistical Ambient Noise Levels
138 Marah St - Friday 19 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

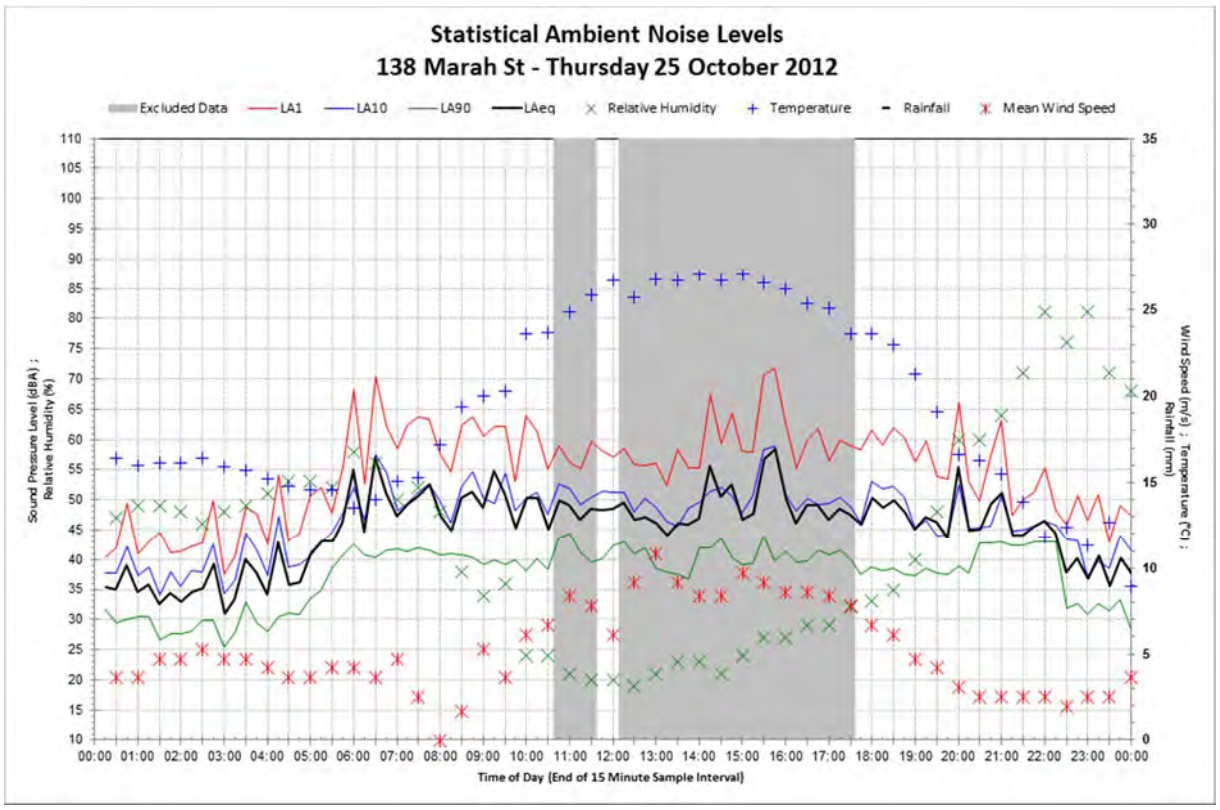

Statistical Ambient Noise Levels
138 Marah St - Saturday 20 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

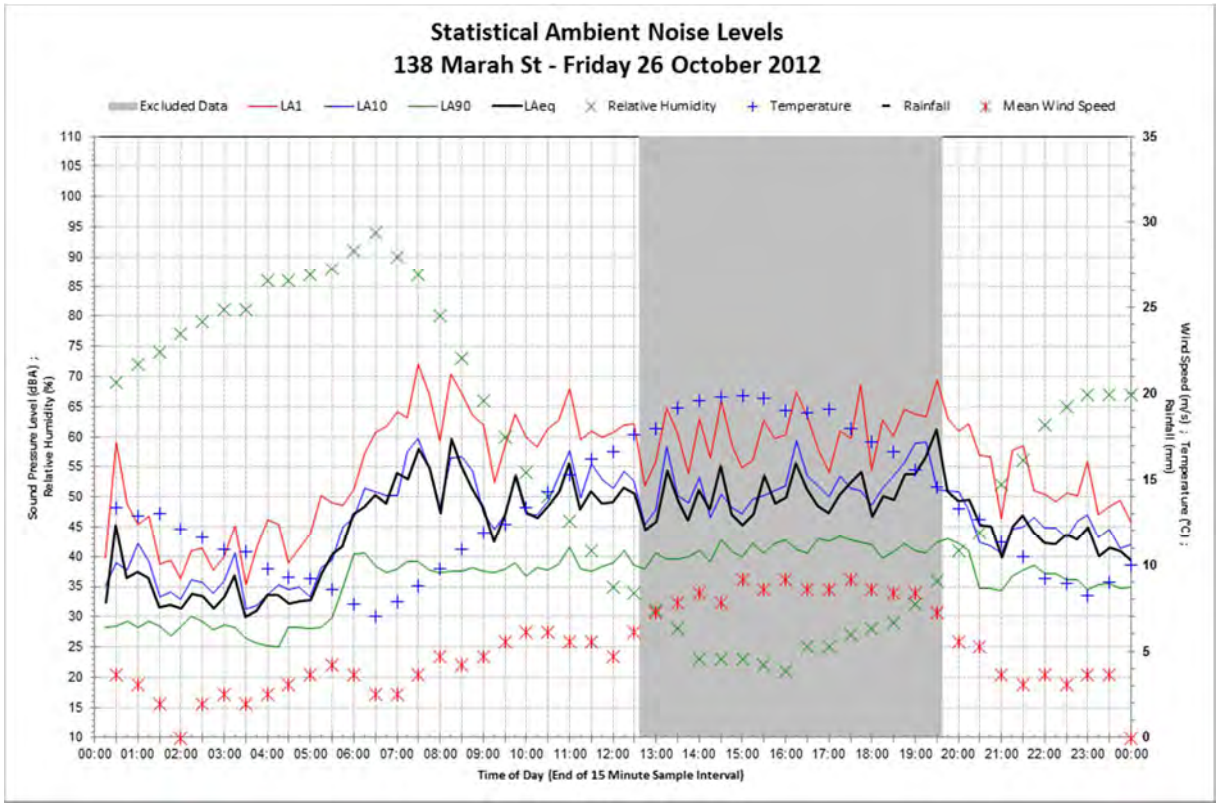

Statistical Ambient Noise Levels
138 Marah St - Sunday 21 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

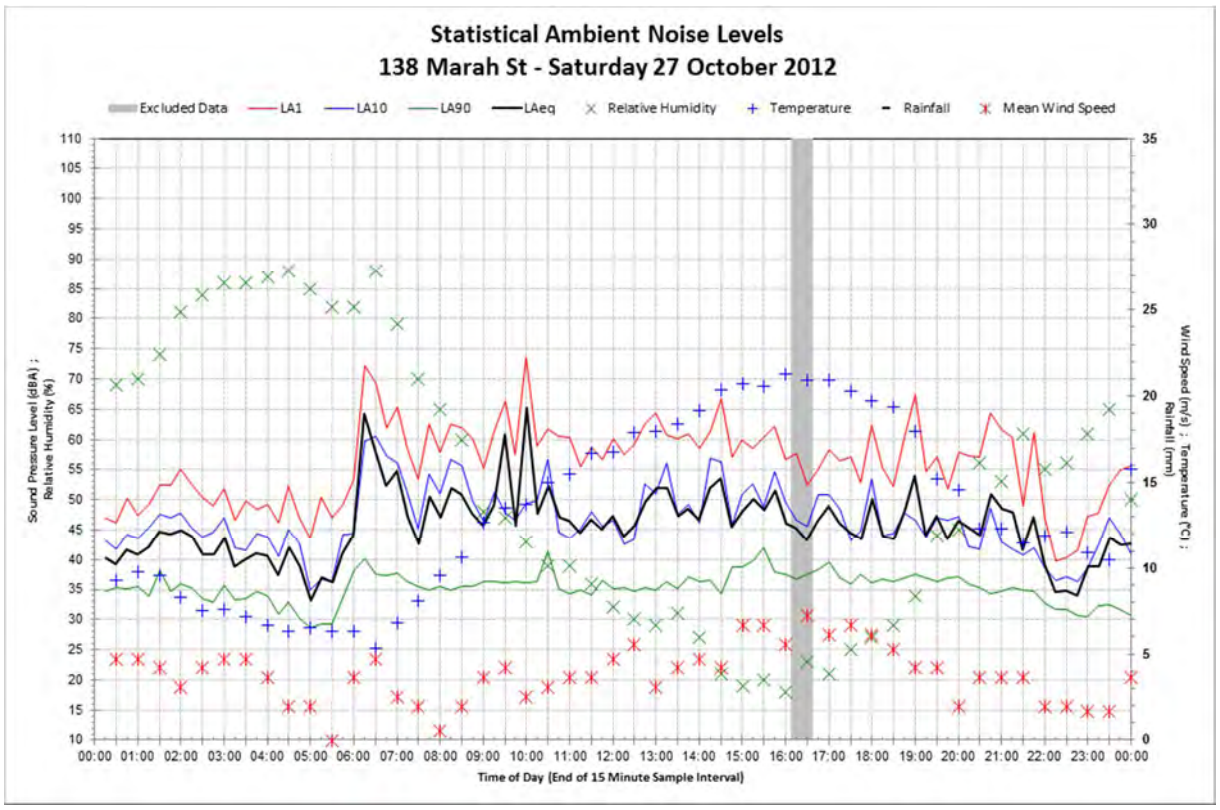

Statistical Ambient Noise Levels
138 Marah St - Monday 22 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

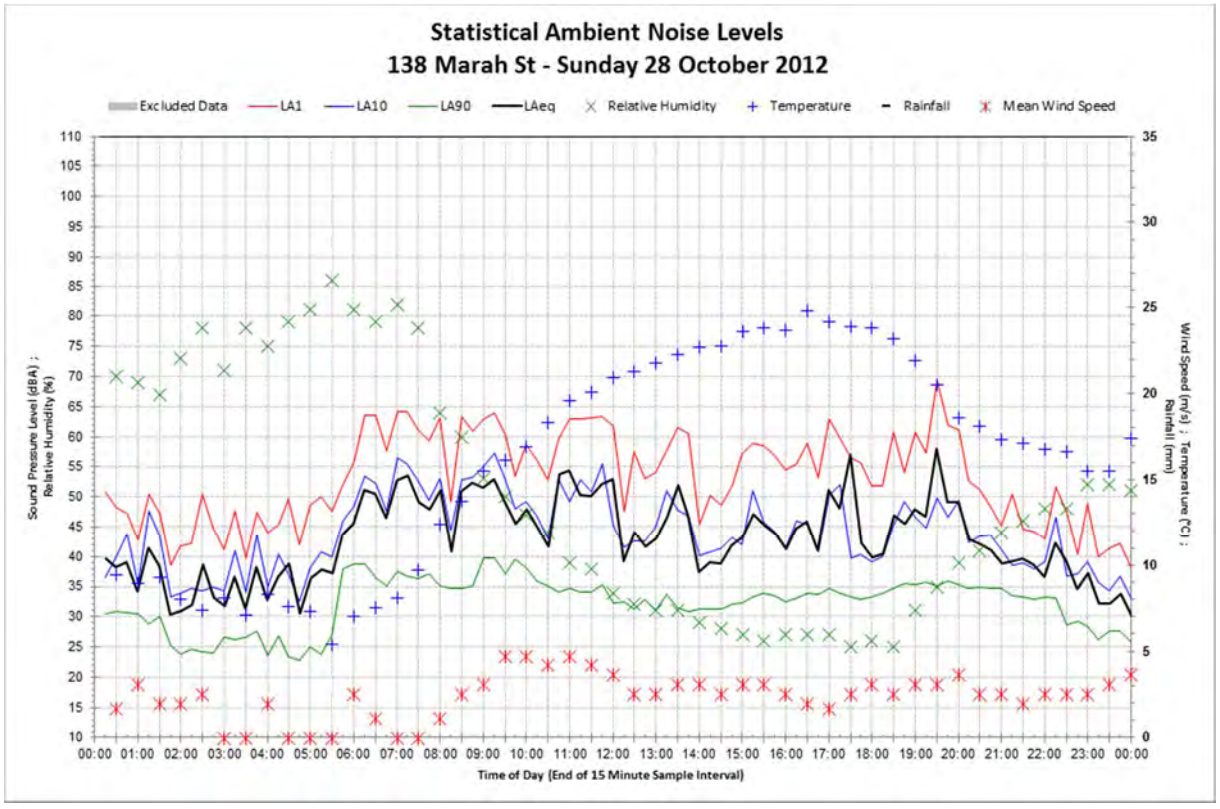

Statistical Ambient Noise Levels
138 Marah St - Tuesday 23 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

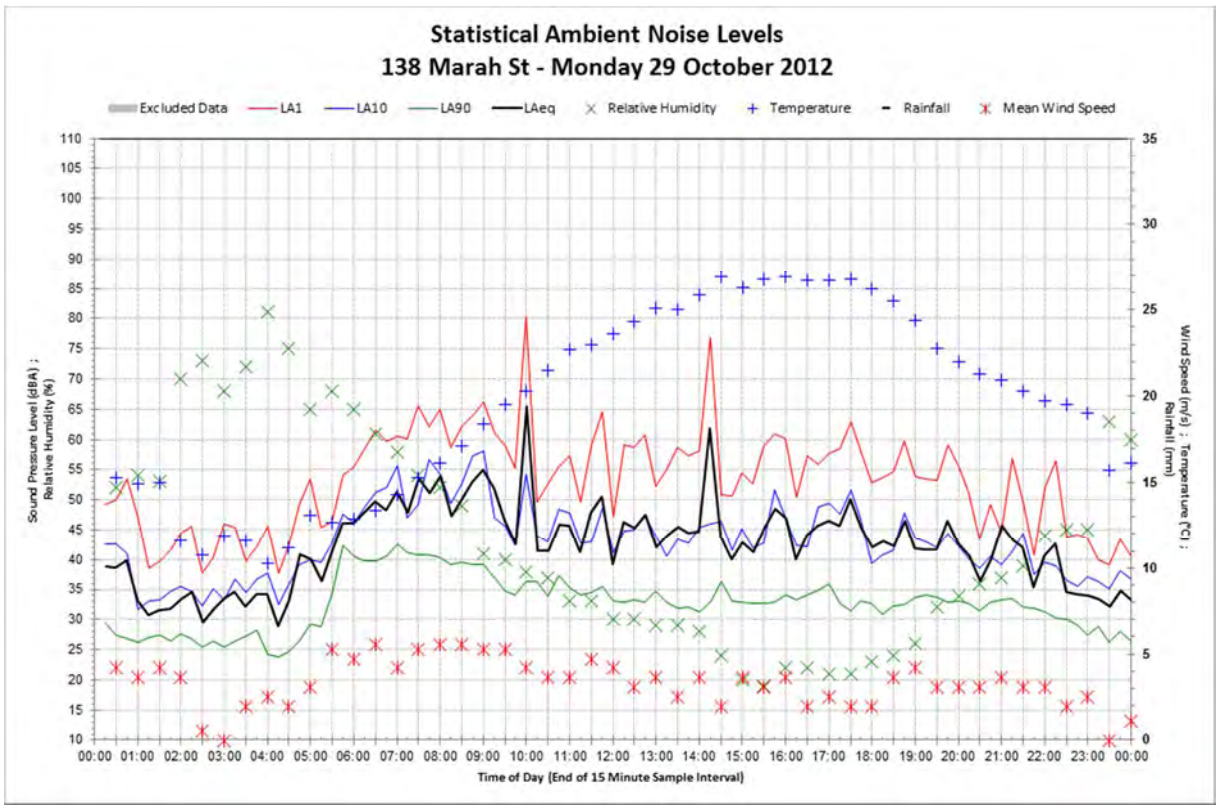

Statistical Ambient Noise Levels
138 Marah St - Wednesday 24 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

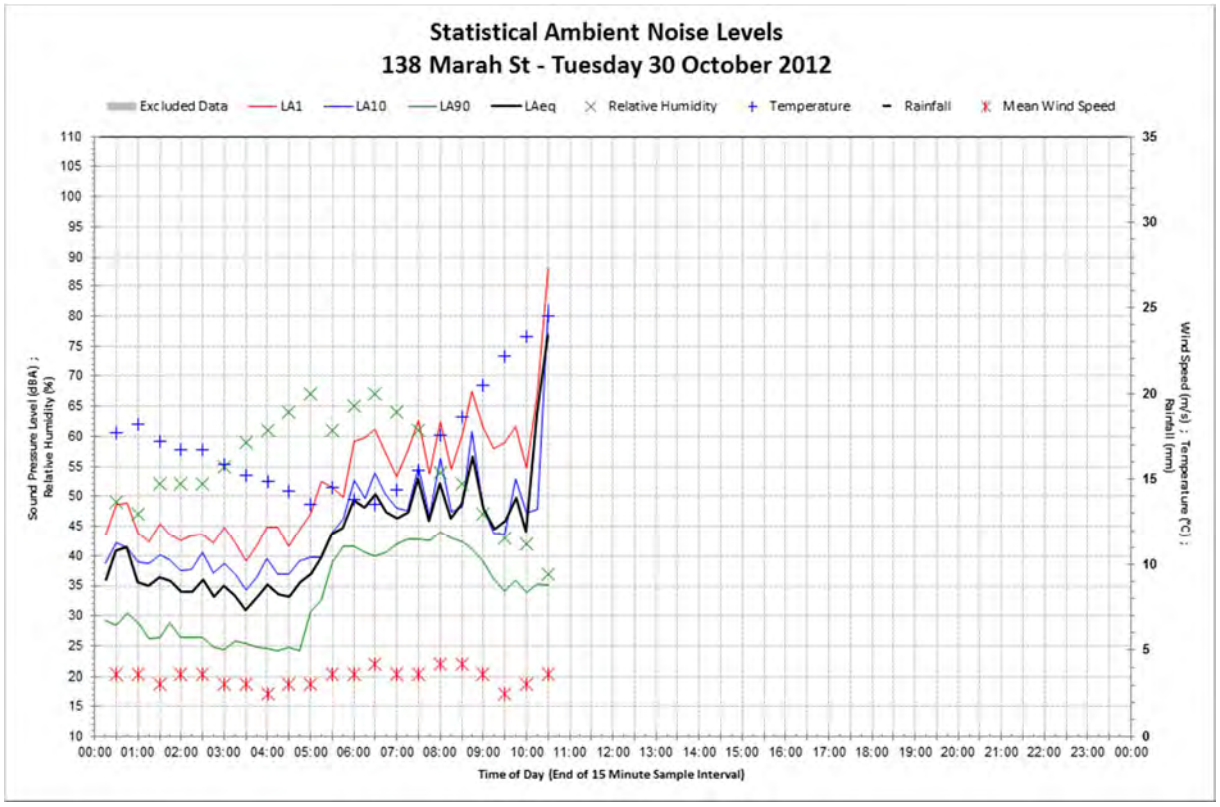

Statistical Ambient Noise Levels
138 Marah St - Thursday 25 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

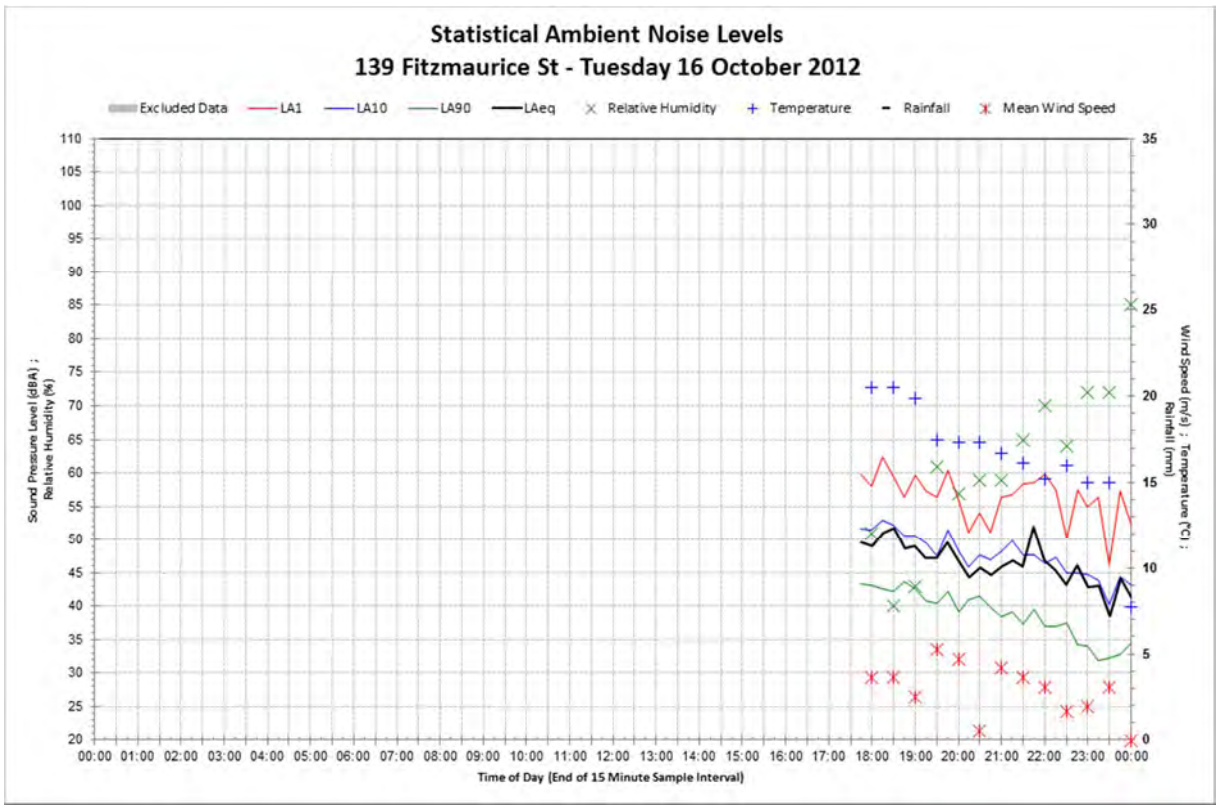

Statistical Ambient Noise Levels
138 Marah St - Friday 26 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

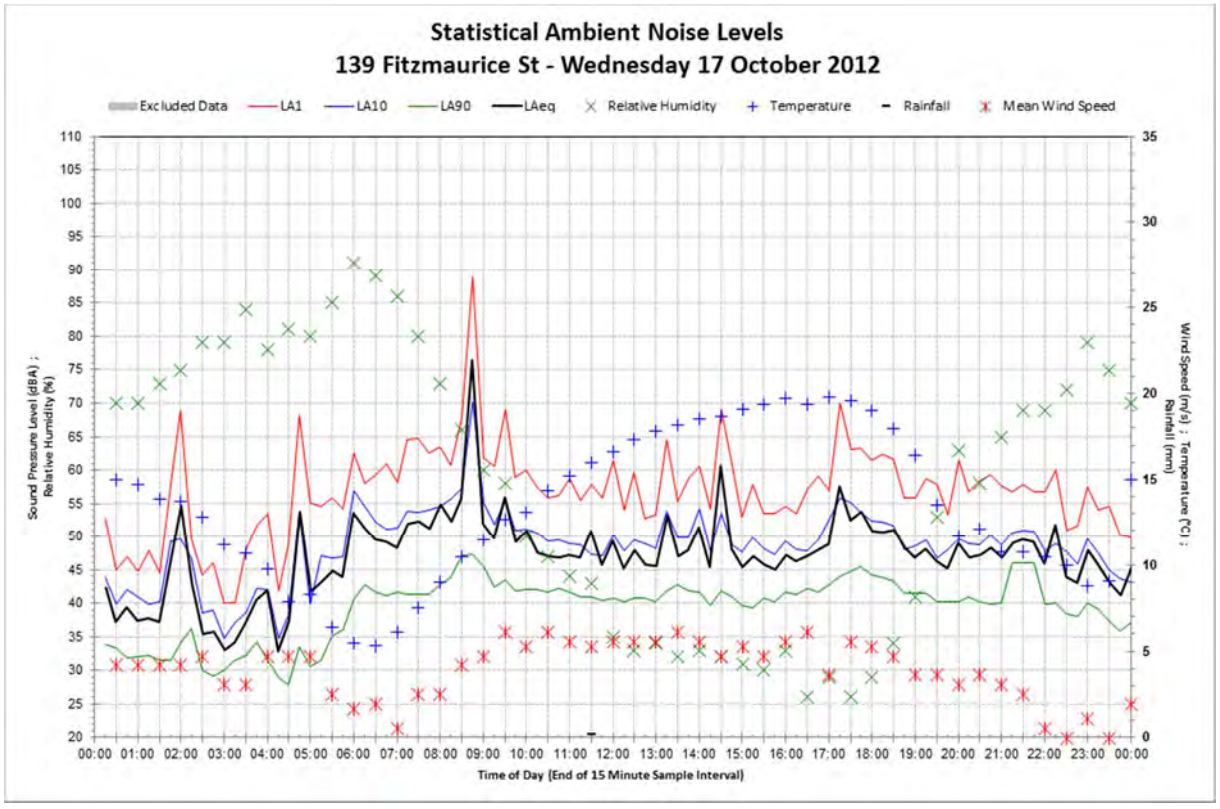

Statistical Ambient Noise Levels
138 Marah St - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

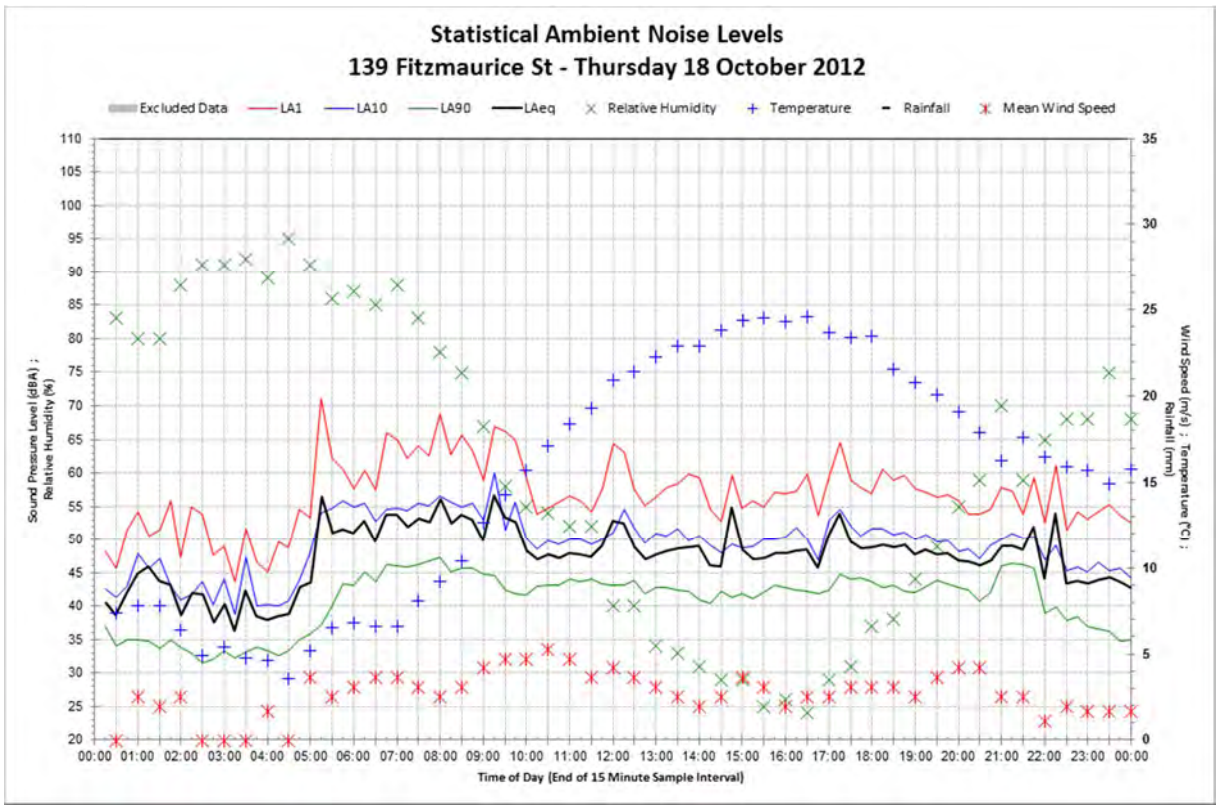

Statistical Ambient Noise Levels
138 Marah St - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

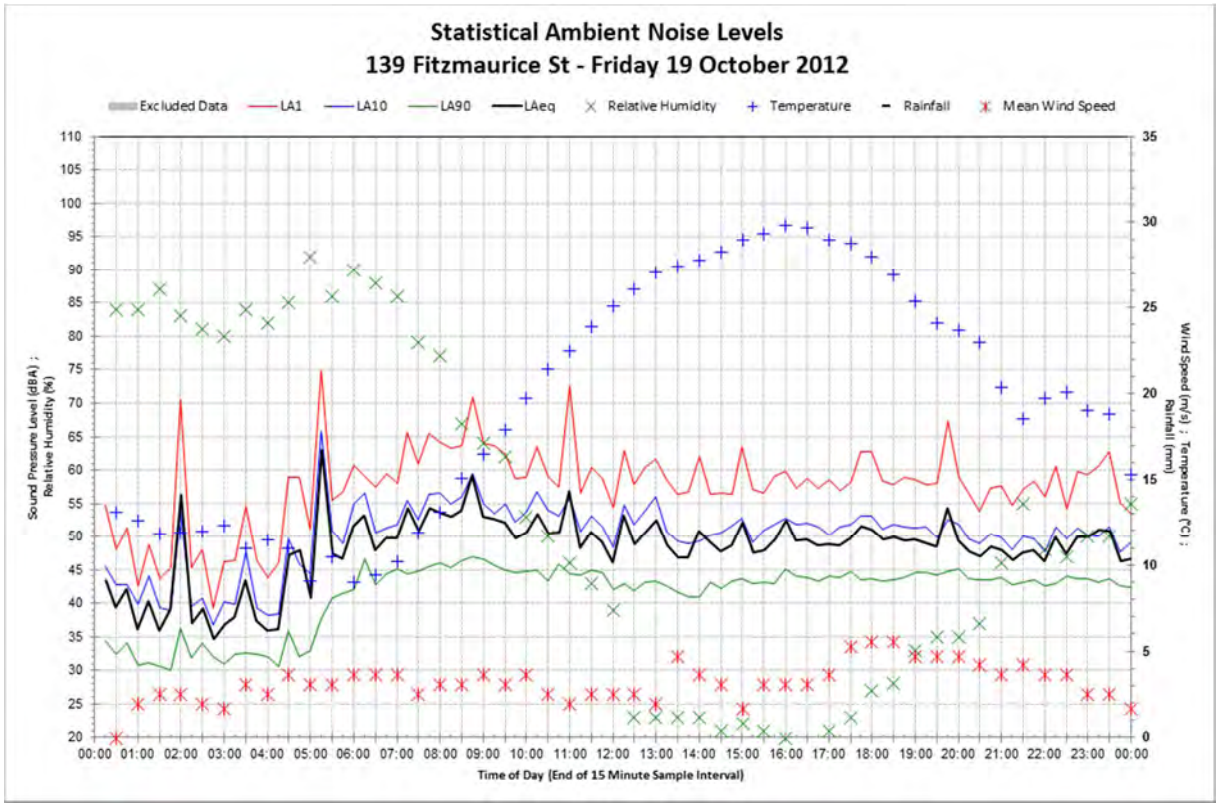

Statistical Ambient Noise Levels
138 Marah St - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

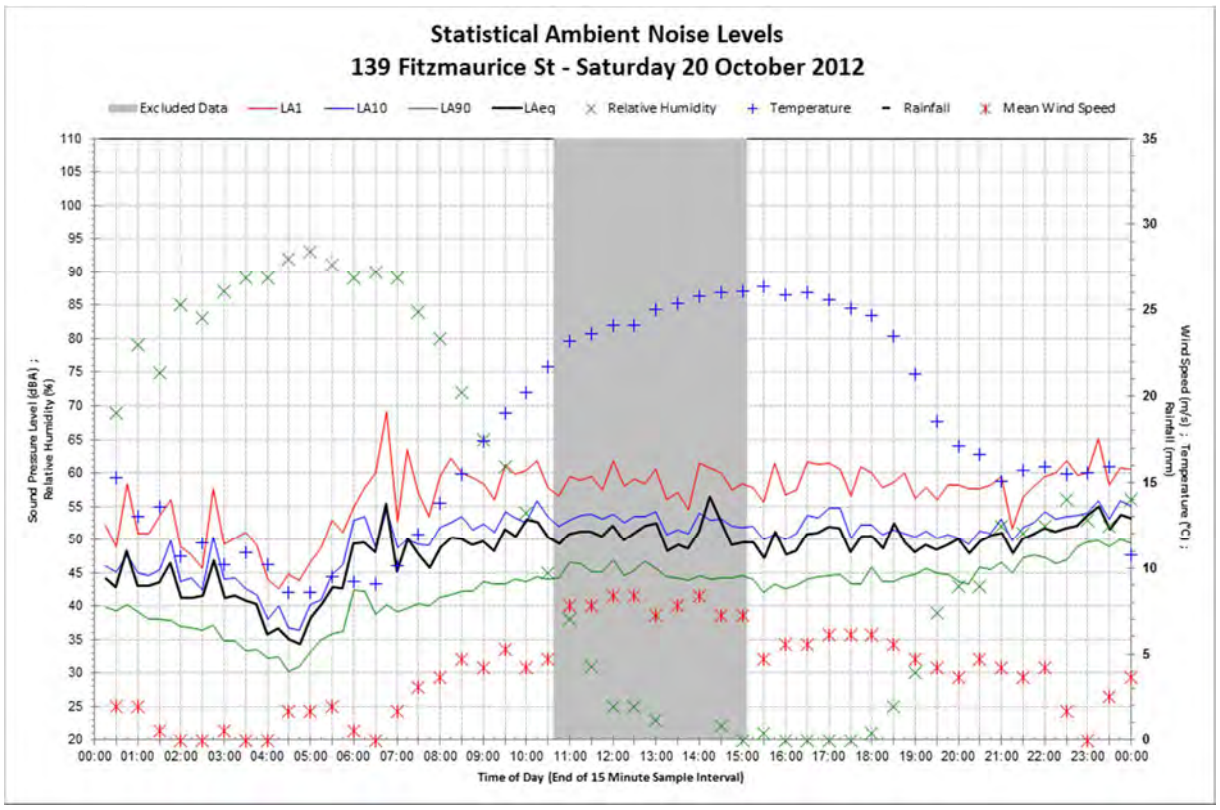

Statistical Ambient Noise Levels
138 Marah St - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

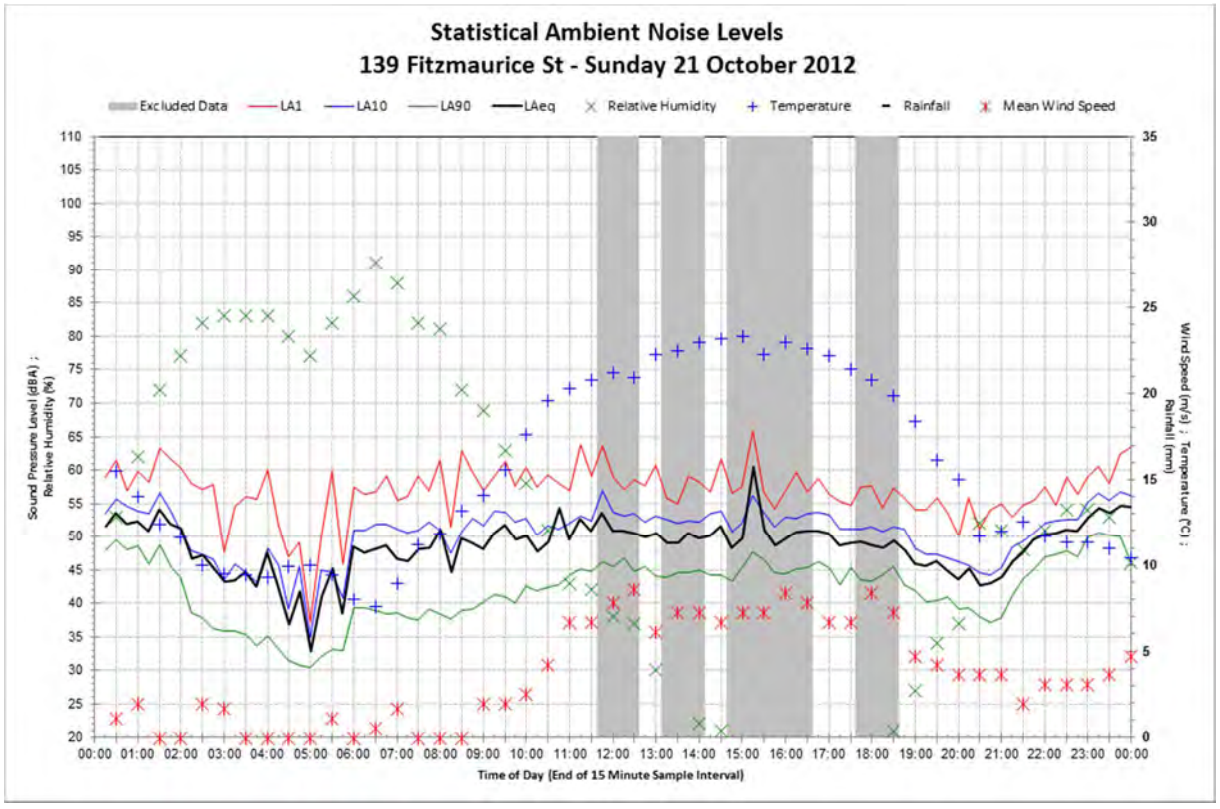

Statistical Ambient Noise Levels
139 Fitzmaurice St - Tuesday 16 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

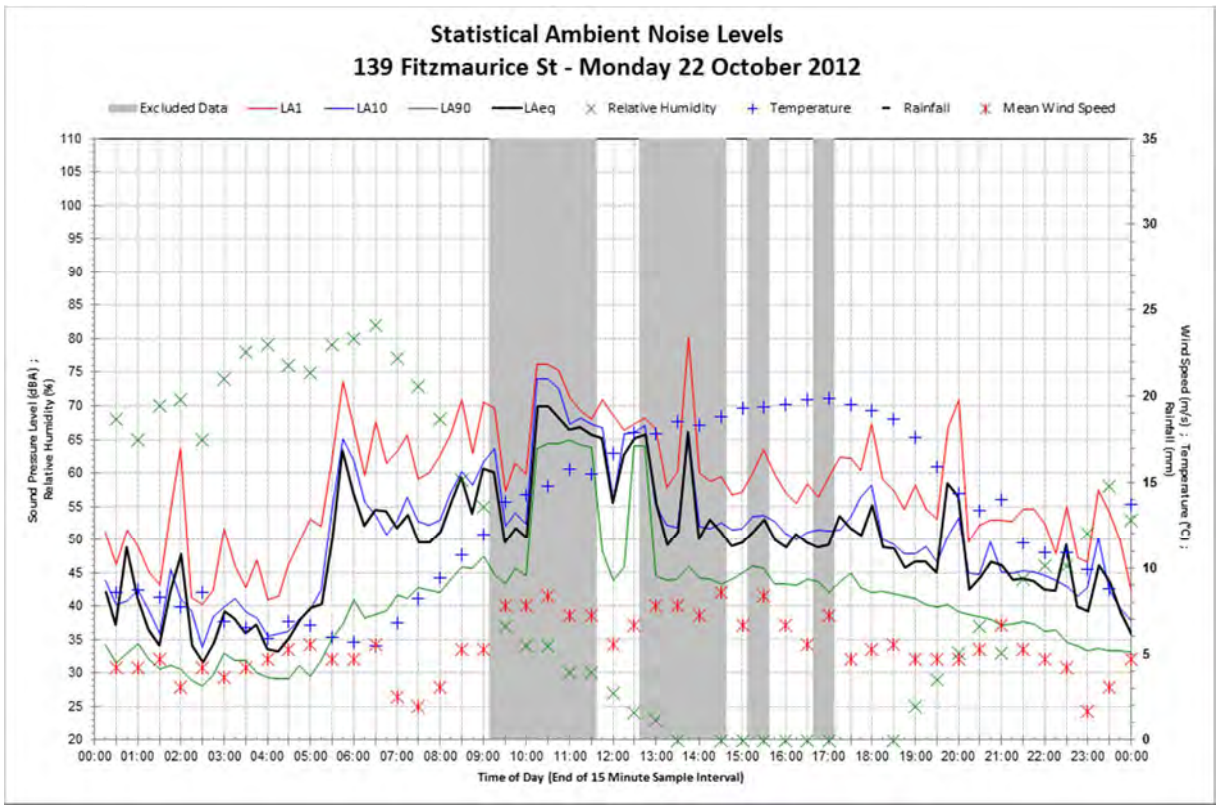

Statistical Ambient Noise Levels
139 Fitzmaurice St - Wednesday 17 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

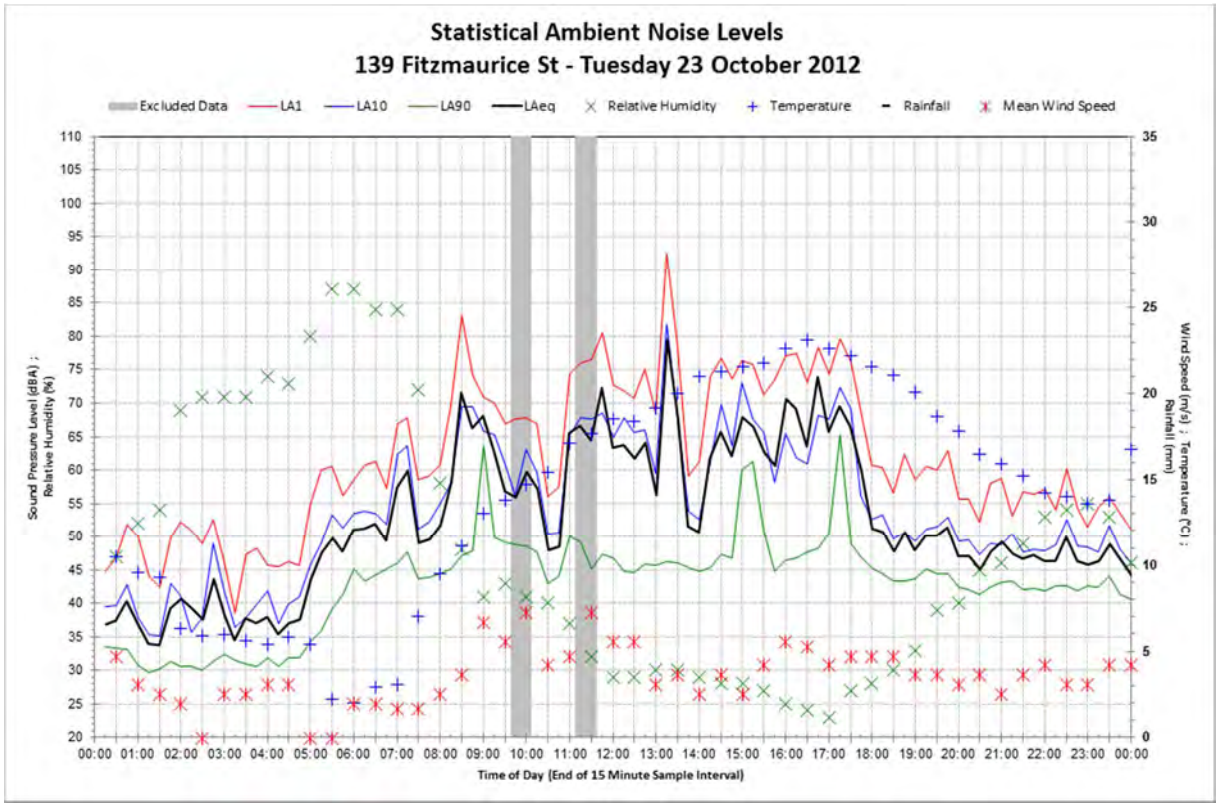

Statistical Ambient Noise Levels
139 Fitzmaurice St - Thursday 18 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Rainfall (mm) ; Temperature (°C) ;
Time of Day (End of 15 Minute Sample Interval)

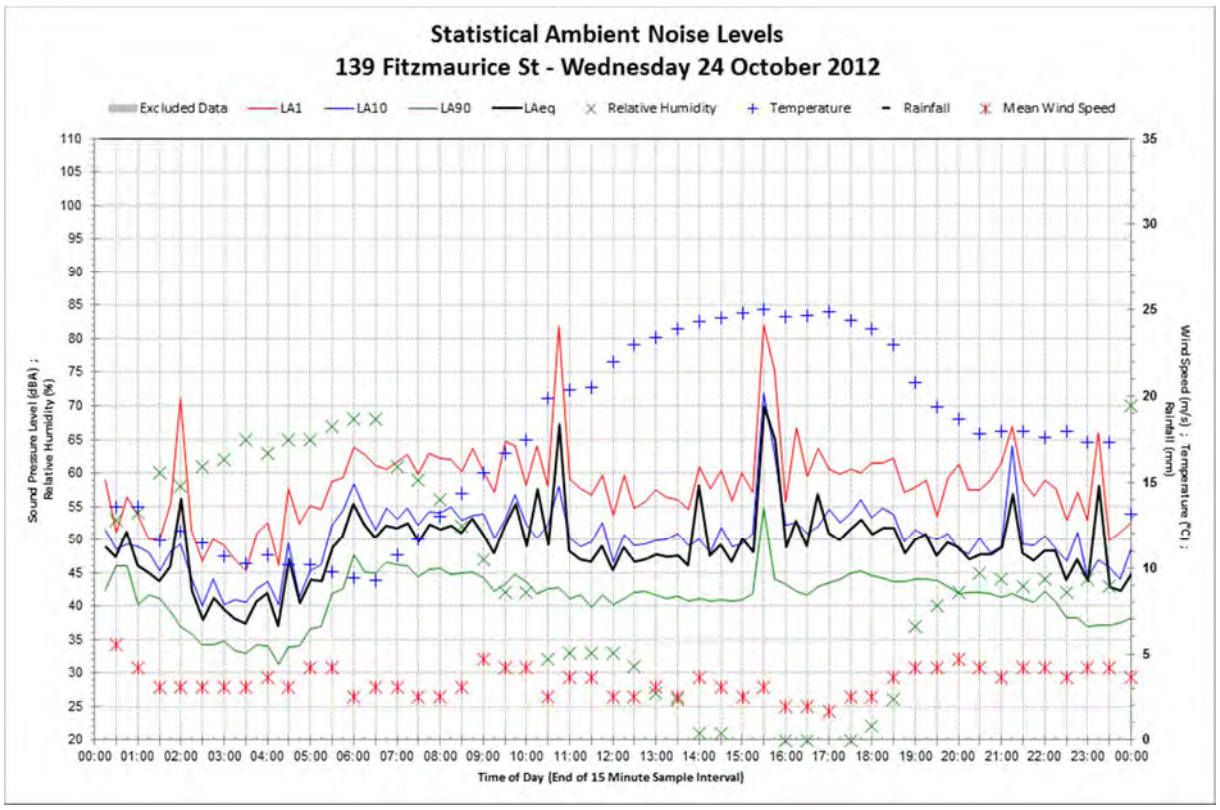

Statistical Ambient Noise Levels
139 Fitzmaurice St - Friday 19 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Rainfall (mm) ; Temperature (°C) ;
Time of Day (End of 15 Minute Sample Interval)

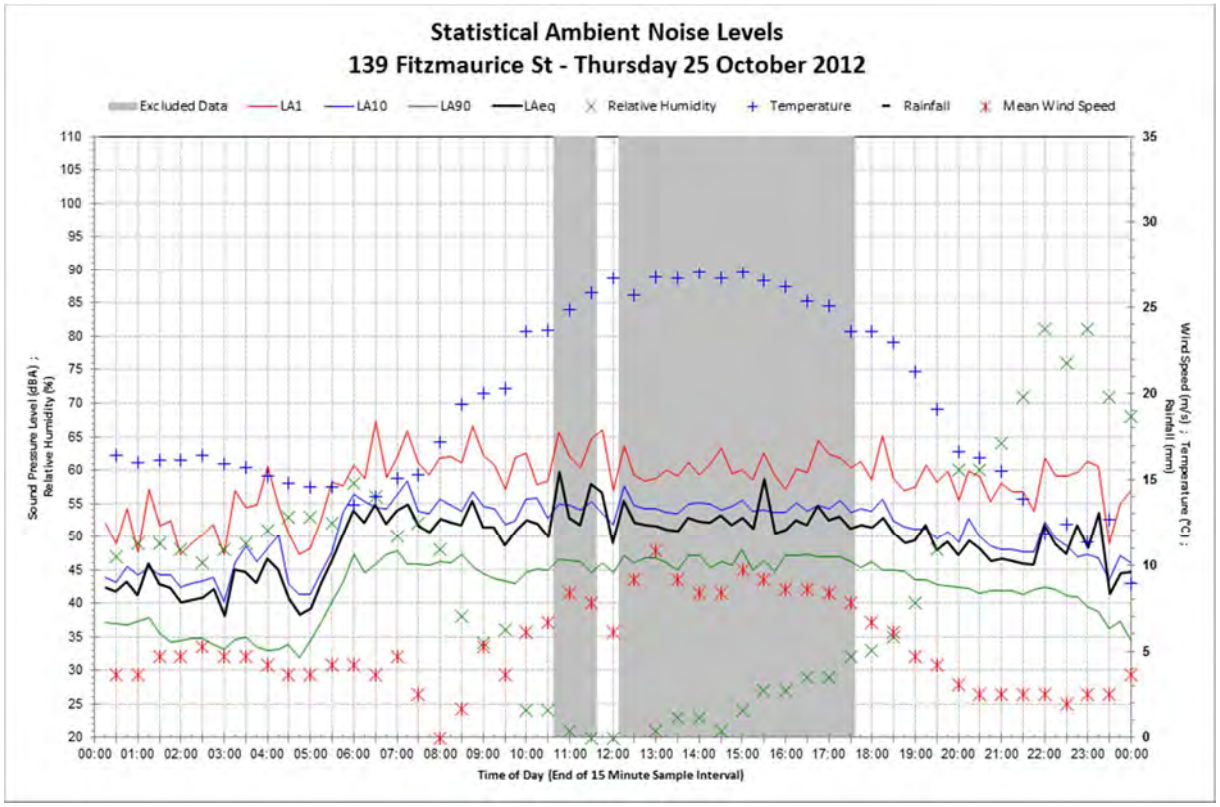

Statistical Ambient Noise Levels
139 Fitzmaurice St - Saturday 20 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

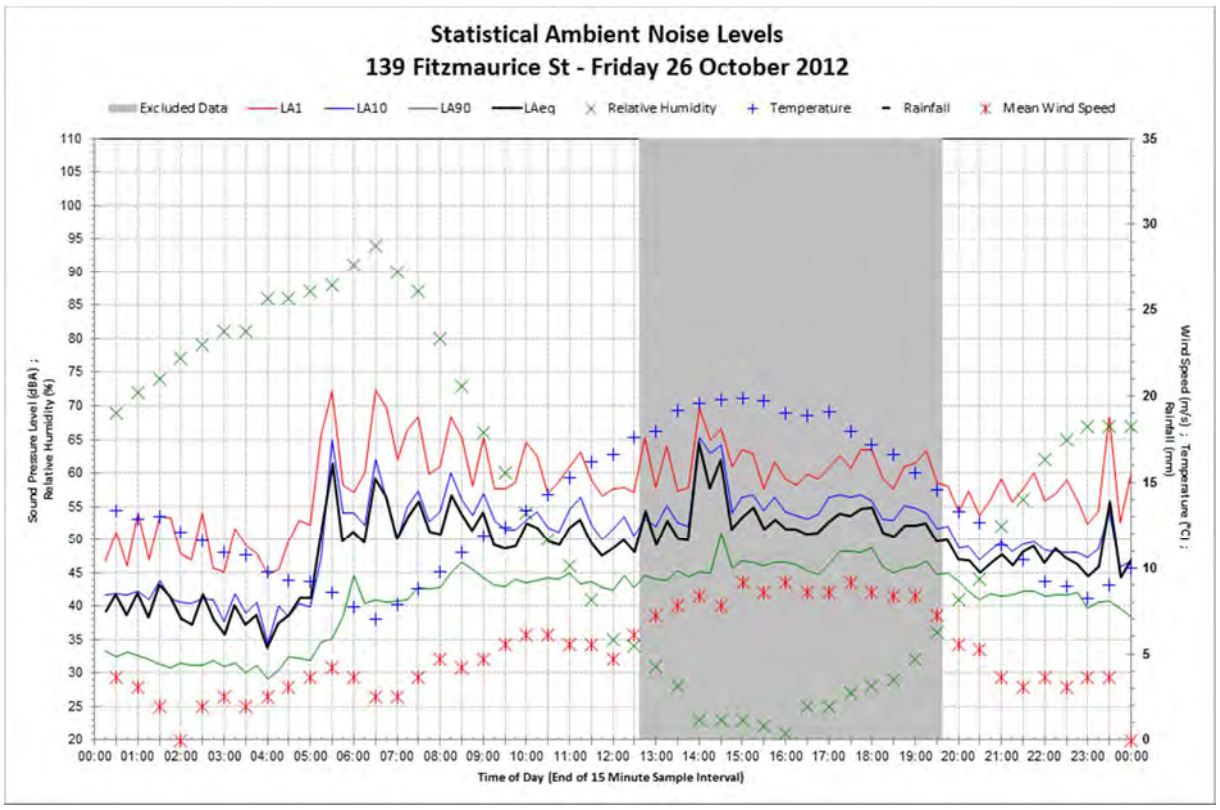

Statistical Ambient Noise Levels
139 Fitzmaurice St - Sunday 21 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

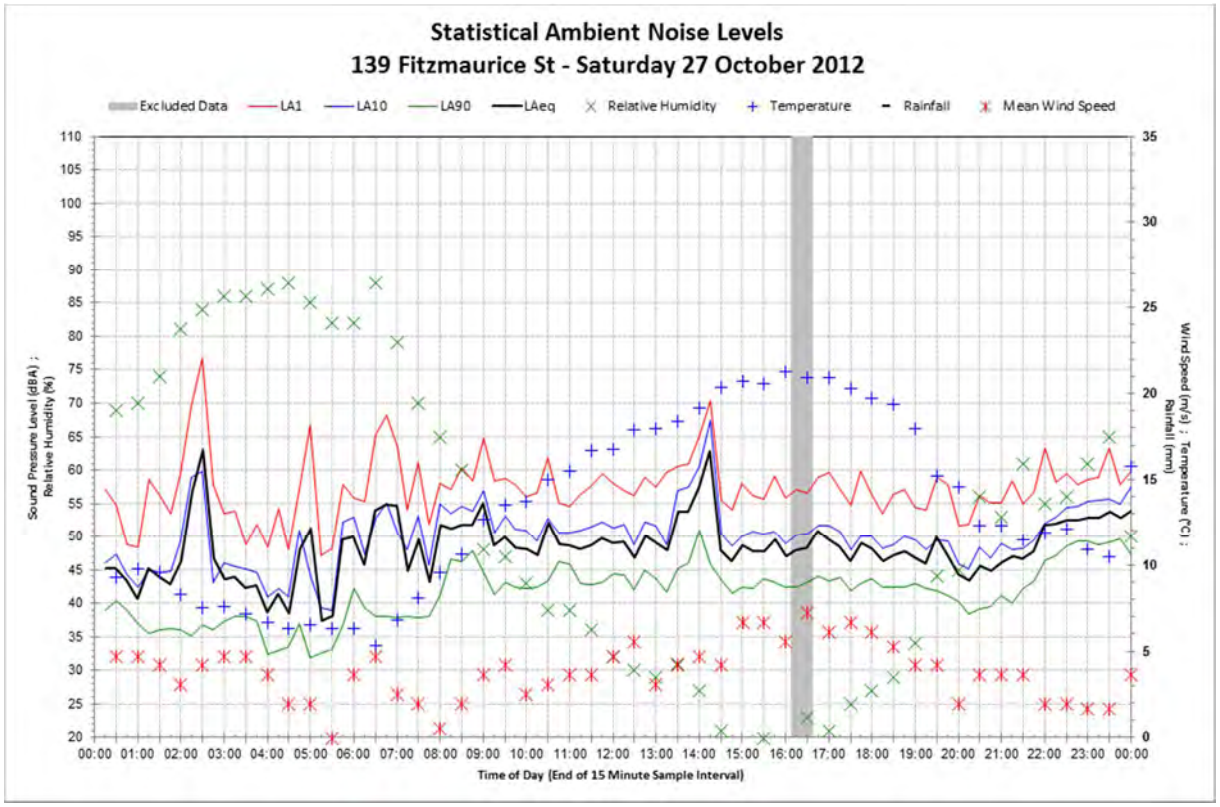

Statistical Ambient Noise Levels
139 Fitzmaurice St - Monday 22 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

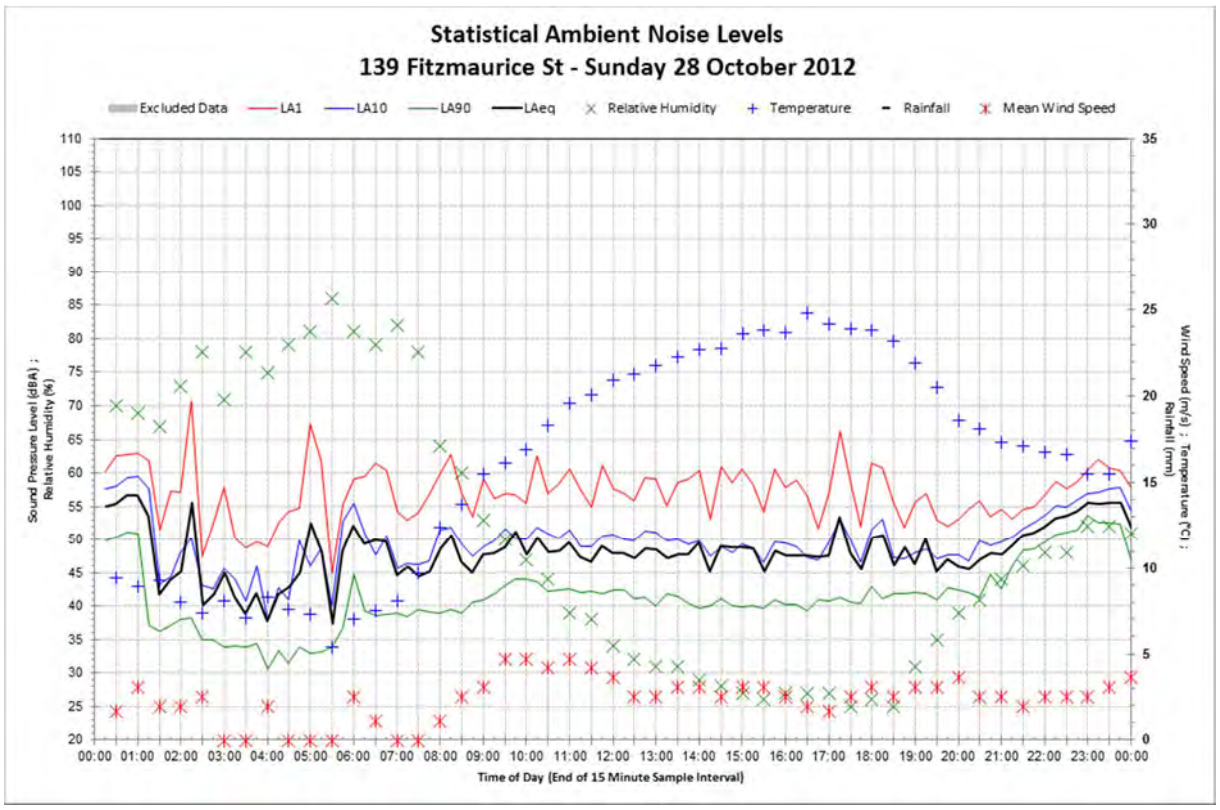

Statistical Ambient Noise Levels
139 Fitzmaurice St - Tuesday 23 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

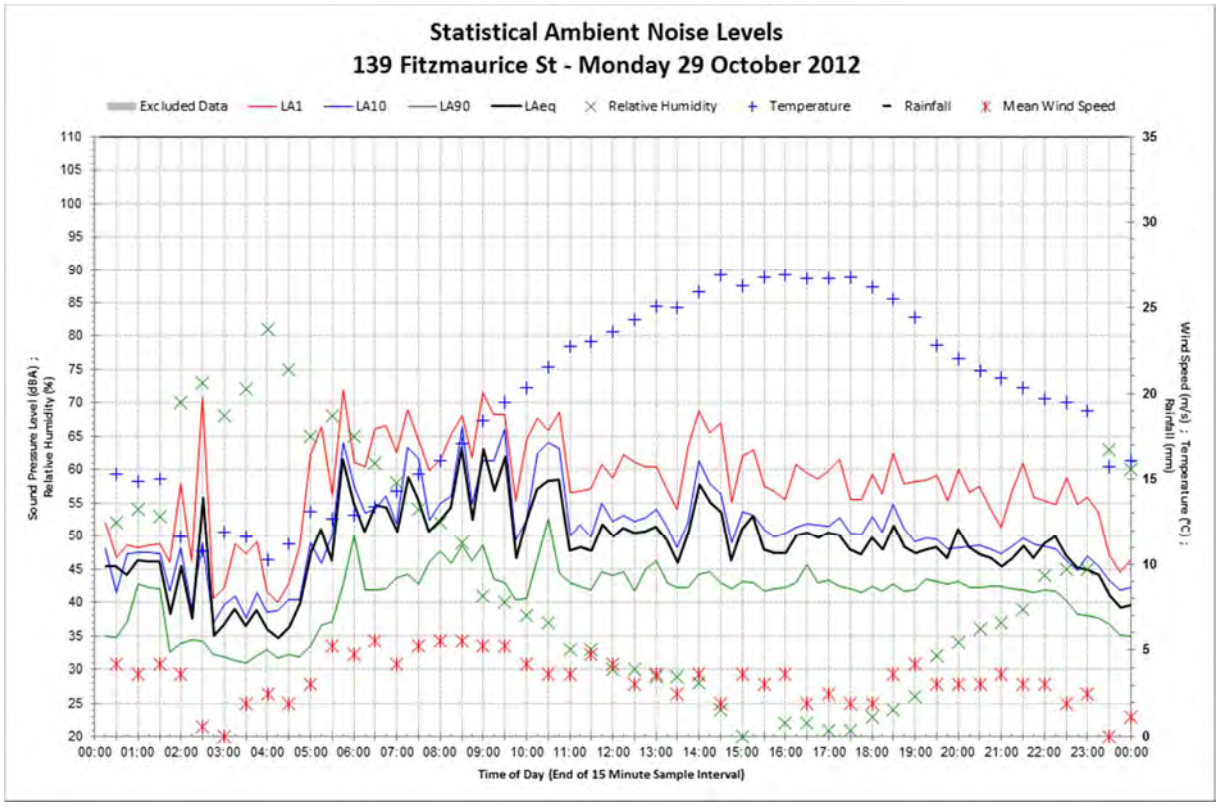

Statistical Ambient Noise Levels
139 Fitzmaurice St - Wednesday 24 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

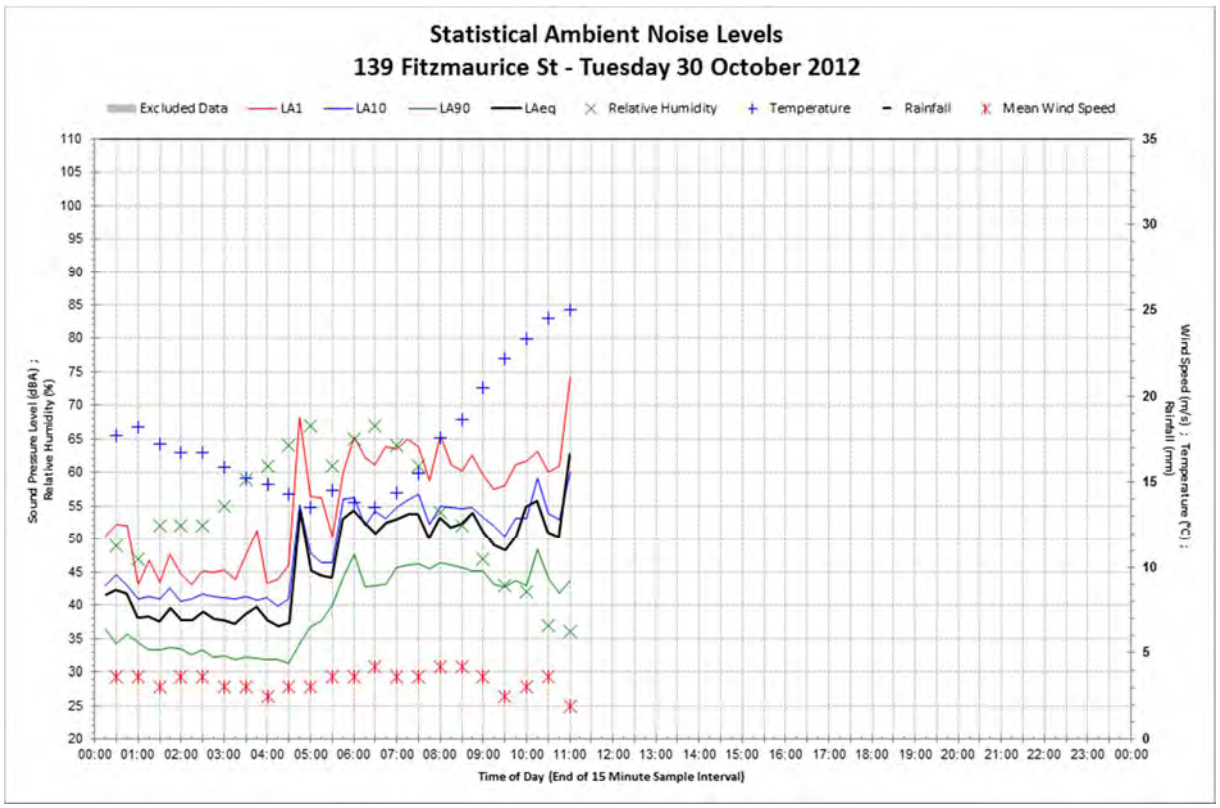

Statistical Ambient Noise Levels
139 Fitzmaurice St - Thursday 25 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

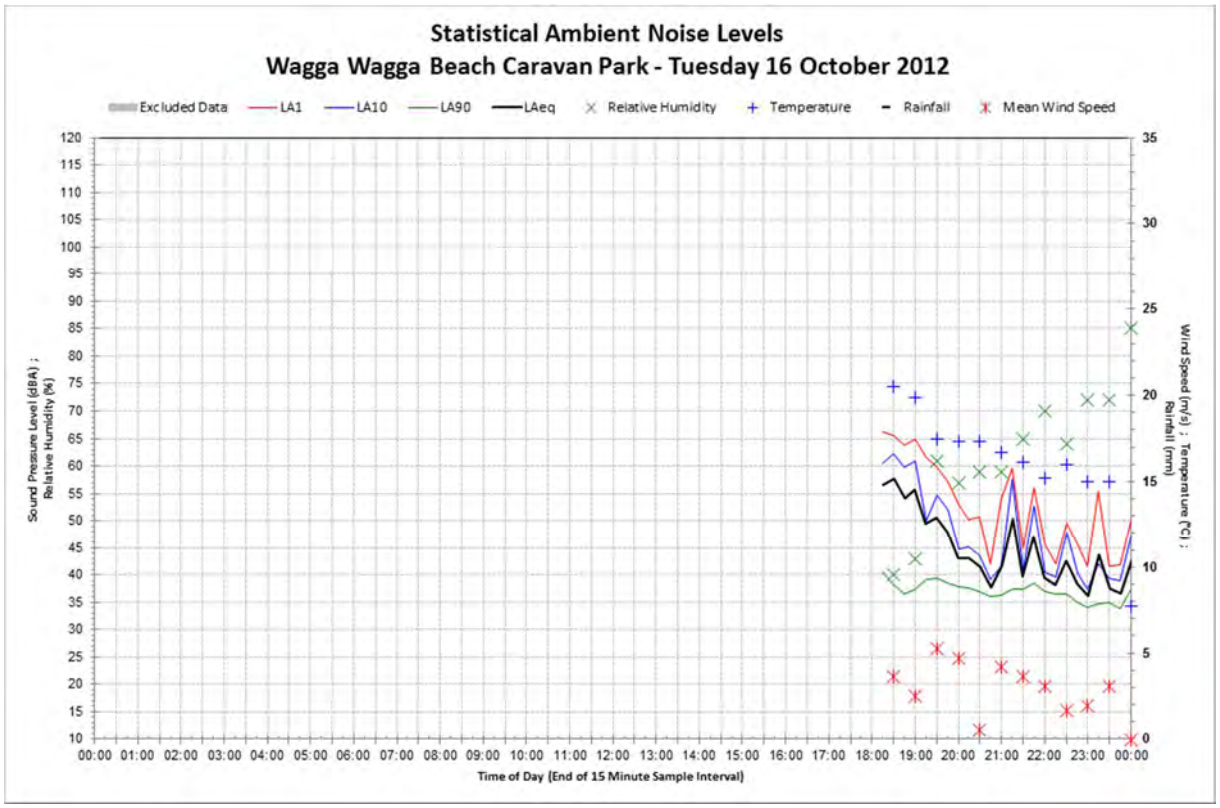

Statistical Ambient Noise Levels
139 Fitzmaurice St - Friday 26 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

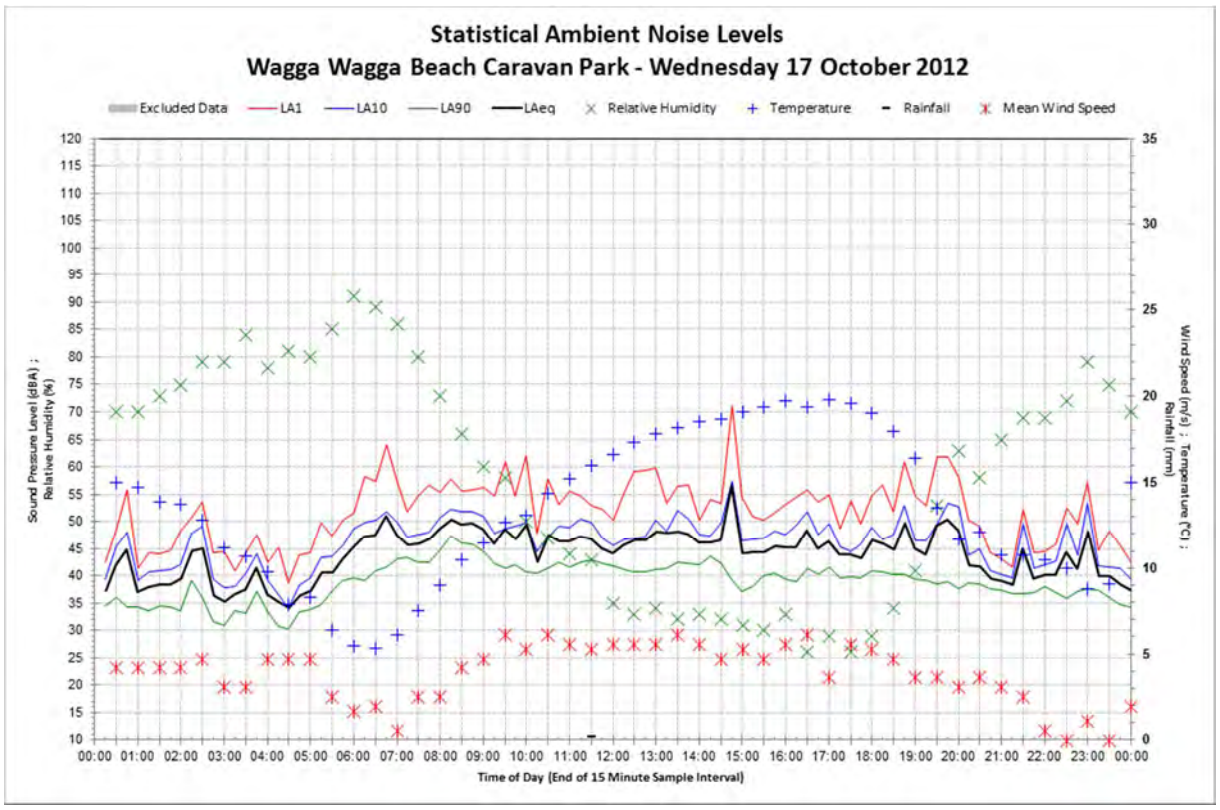

Statistical Ambient Noise Levels
139 Fitzmaurice St - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

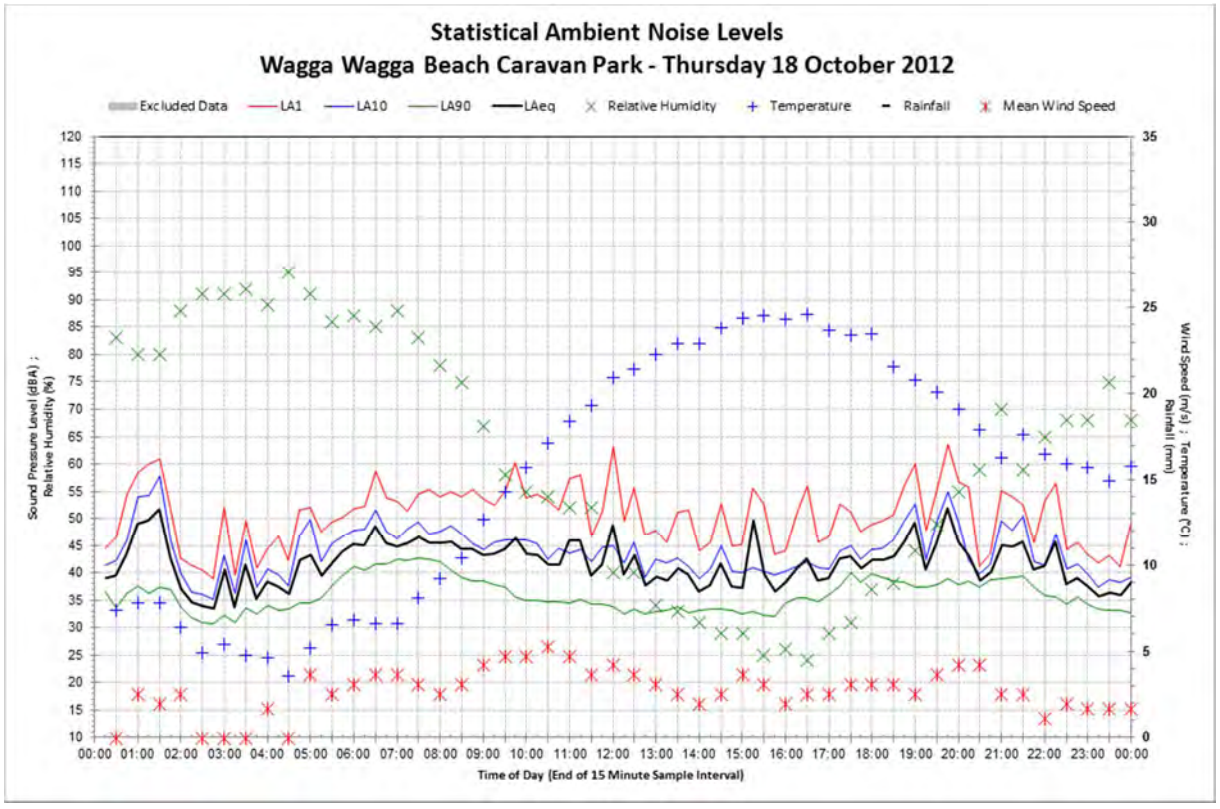

Statistical Ambient Noise Levels
139 Fitzmaurice St - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

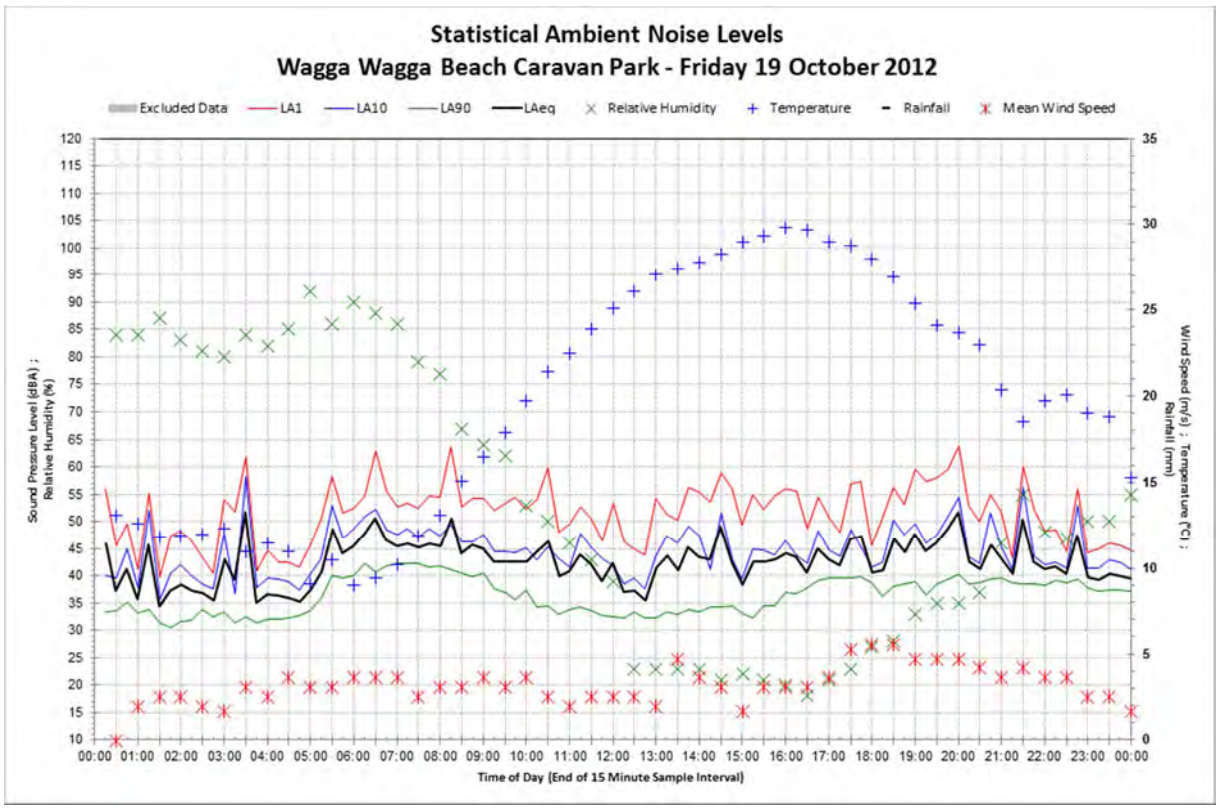

Statistical Ambient Noise Levels
139 Fitzmaurice St - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

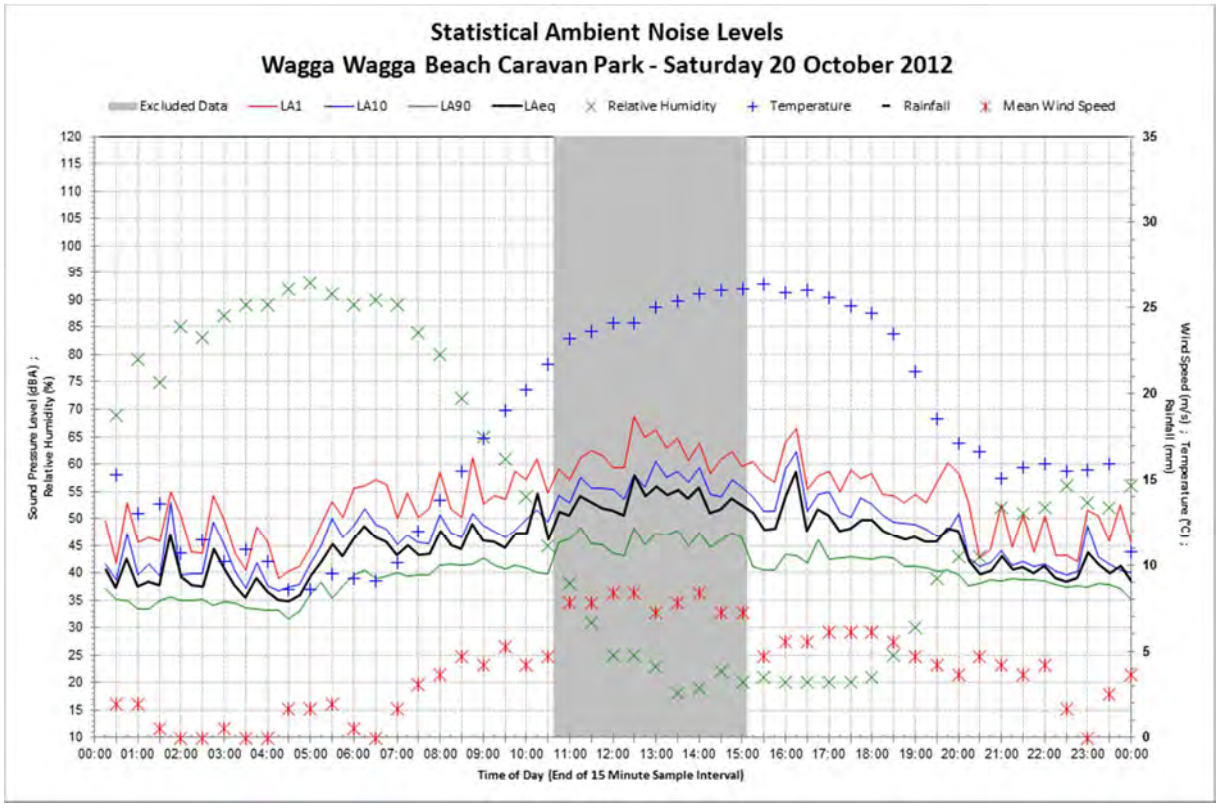

Statistical Ambient Noise Levels
139 Fitzmaurice St - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

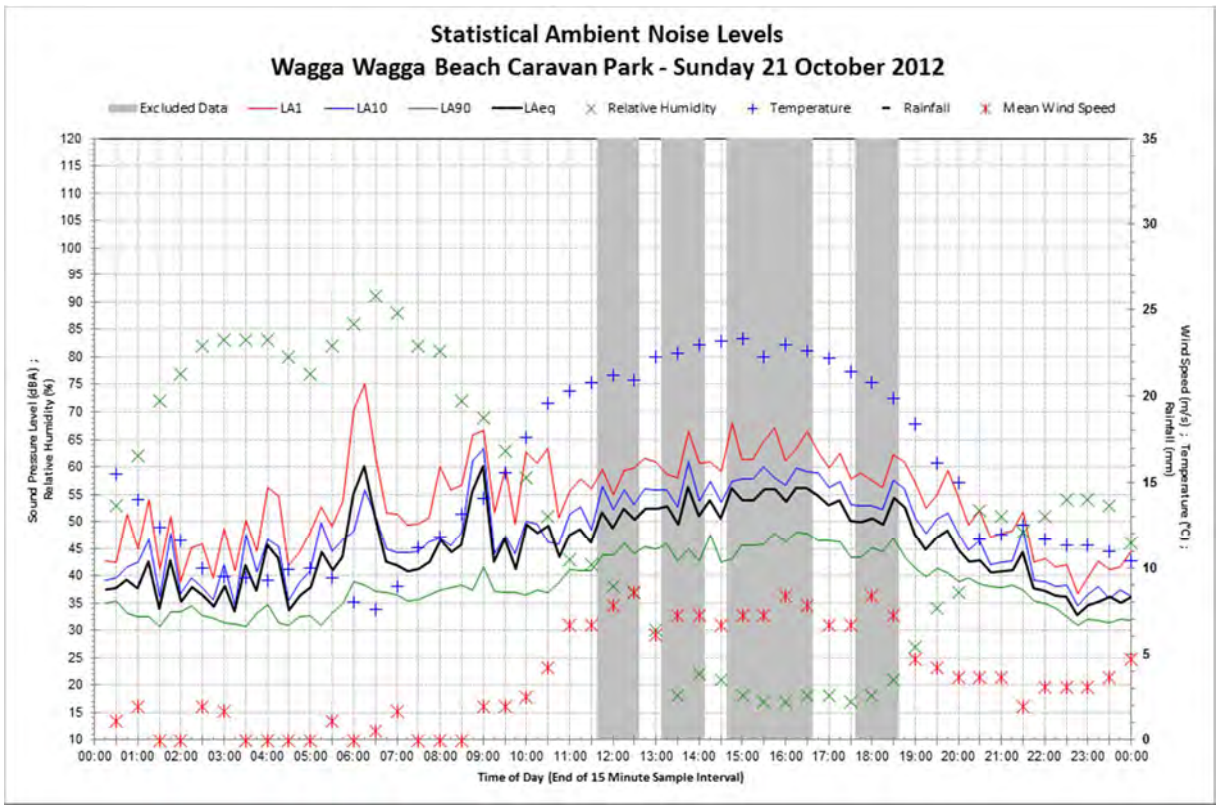

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Tuesday 16 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

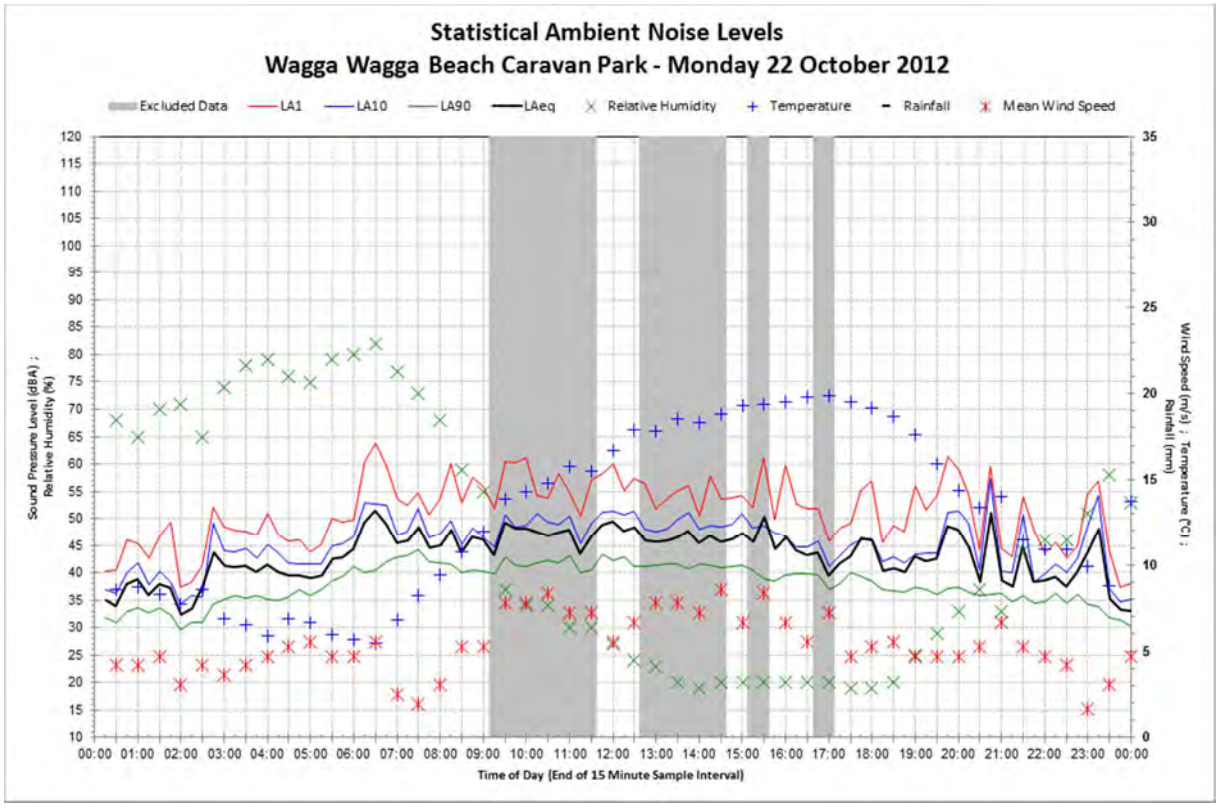

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Wednesday 17 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

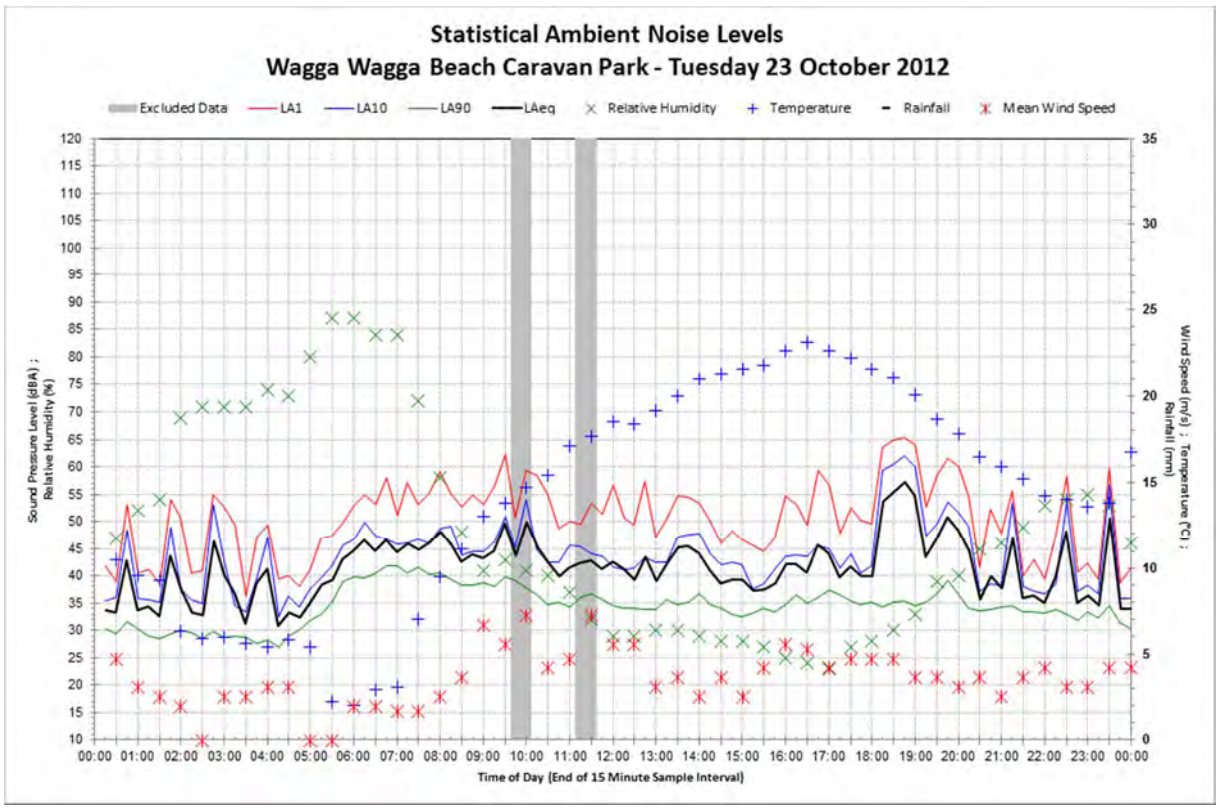

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Thursday 18 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

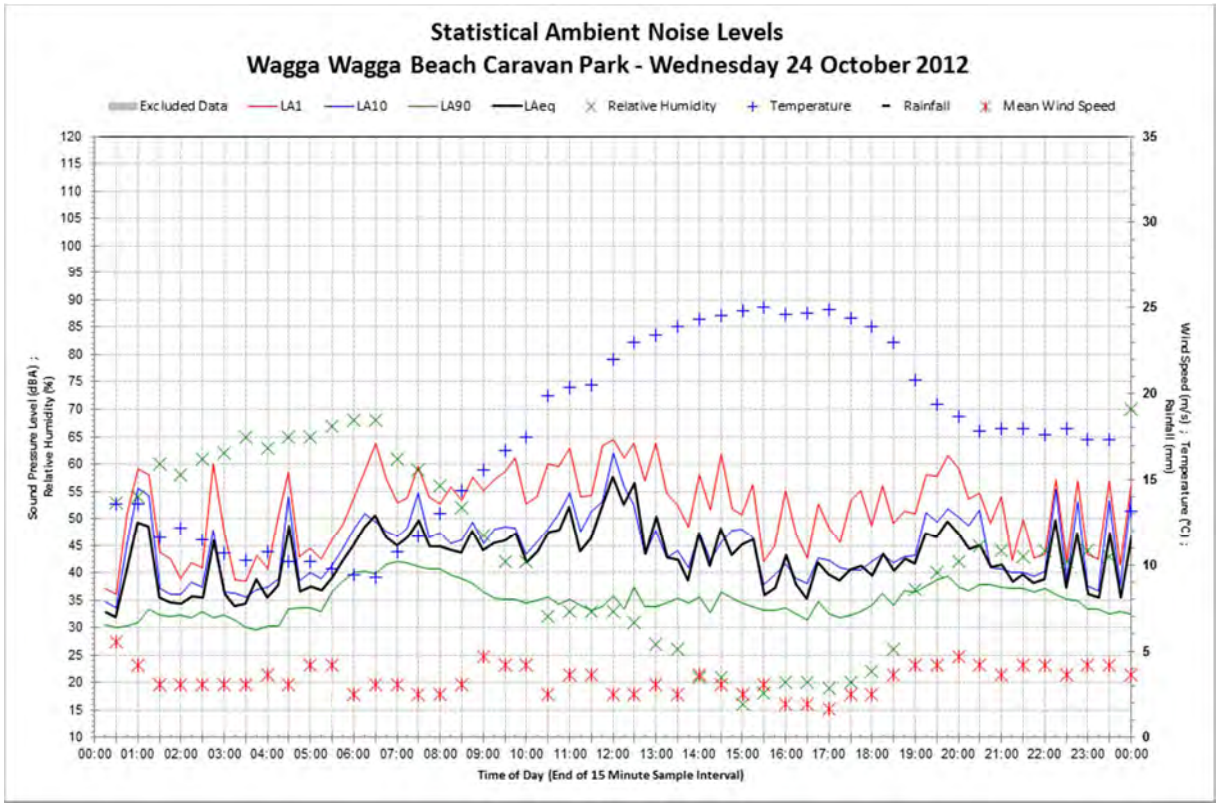

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Friday 19 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Rainfall (mm) ; Temperature (°C) ;
Time of Day (End of 15 Minute Sample Interval)

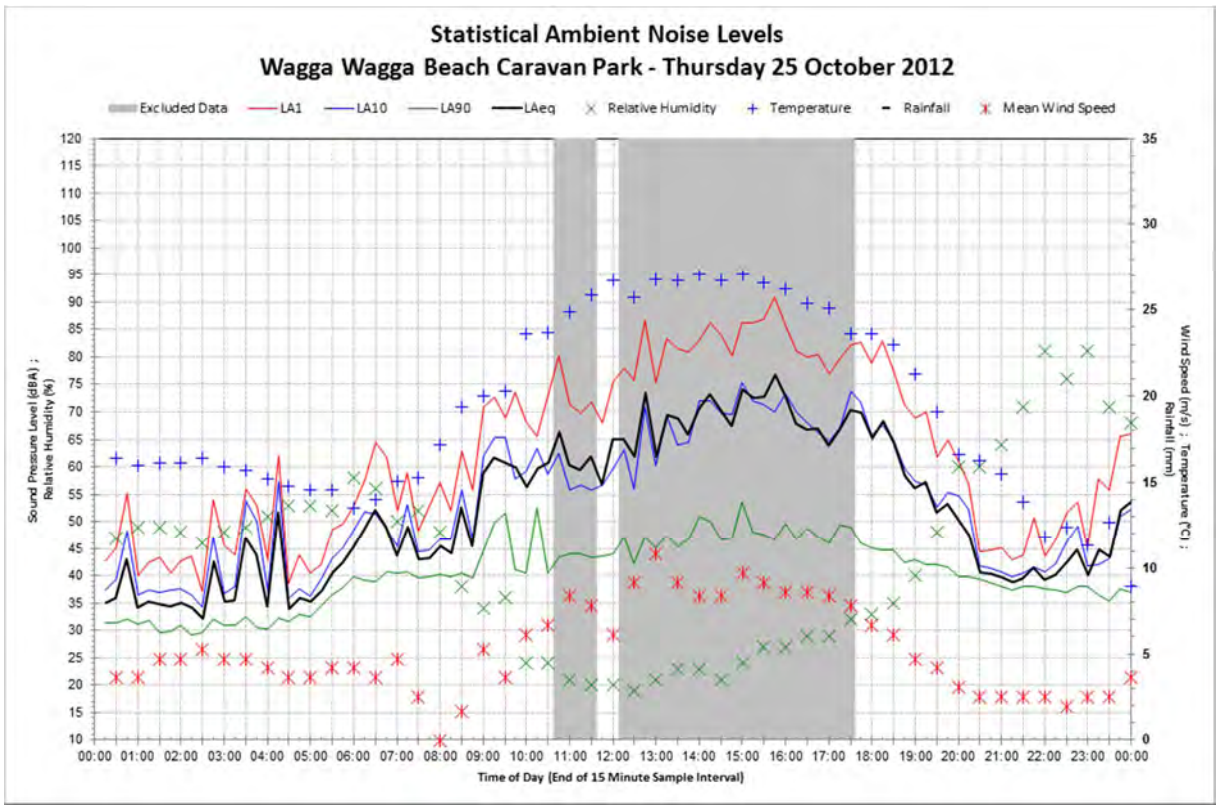

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Saturday 20 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Rainfall (mm) ; Temperature (°C) ;
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Sunday 21 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

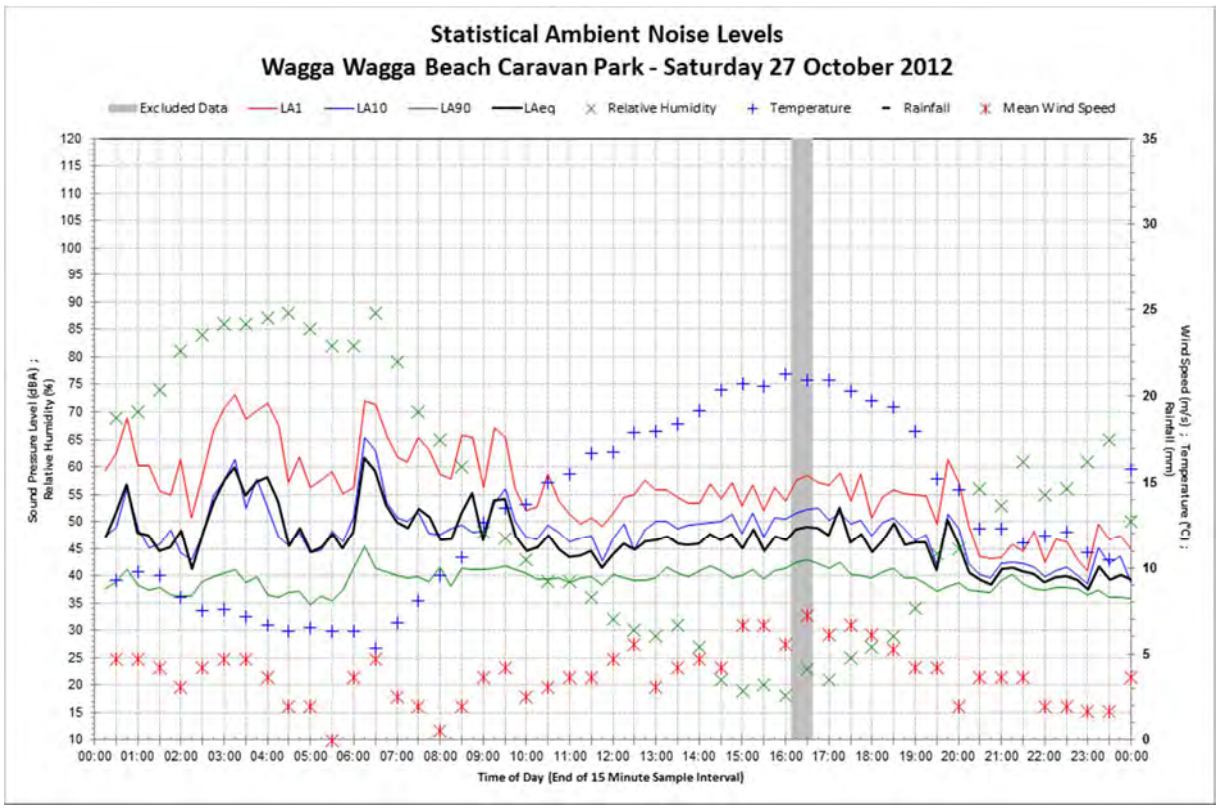

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Monday 22 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

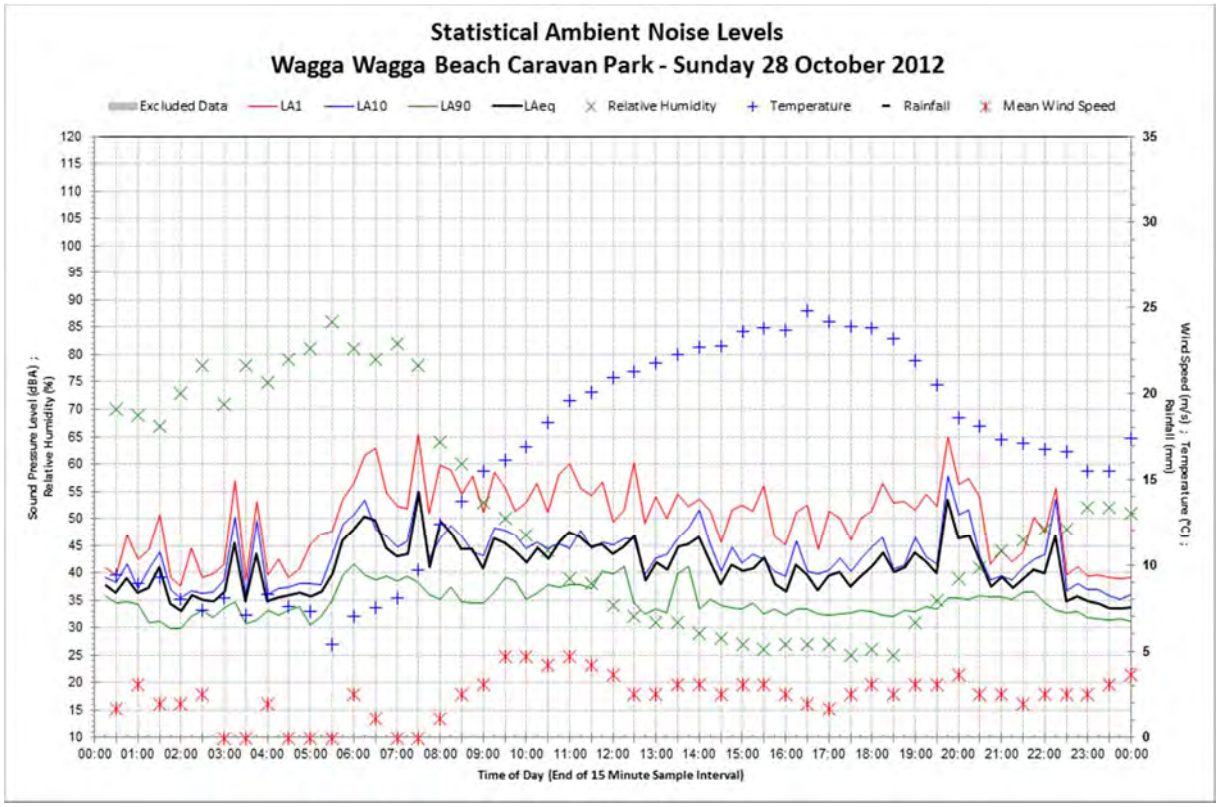

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Tuesday 23 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

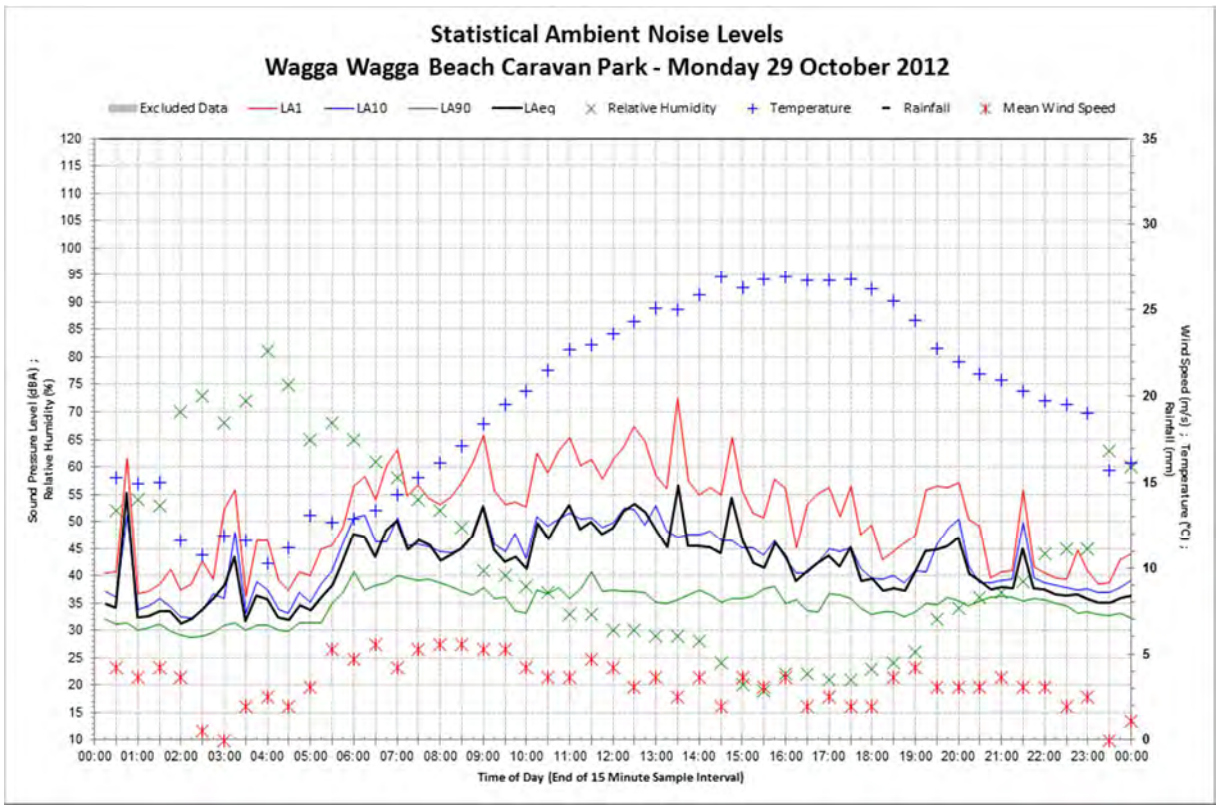

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Wednesday 24 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Thursday 25 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

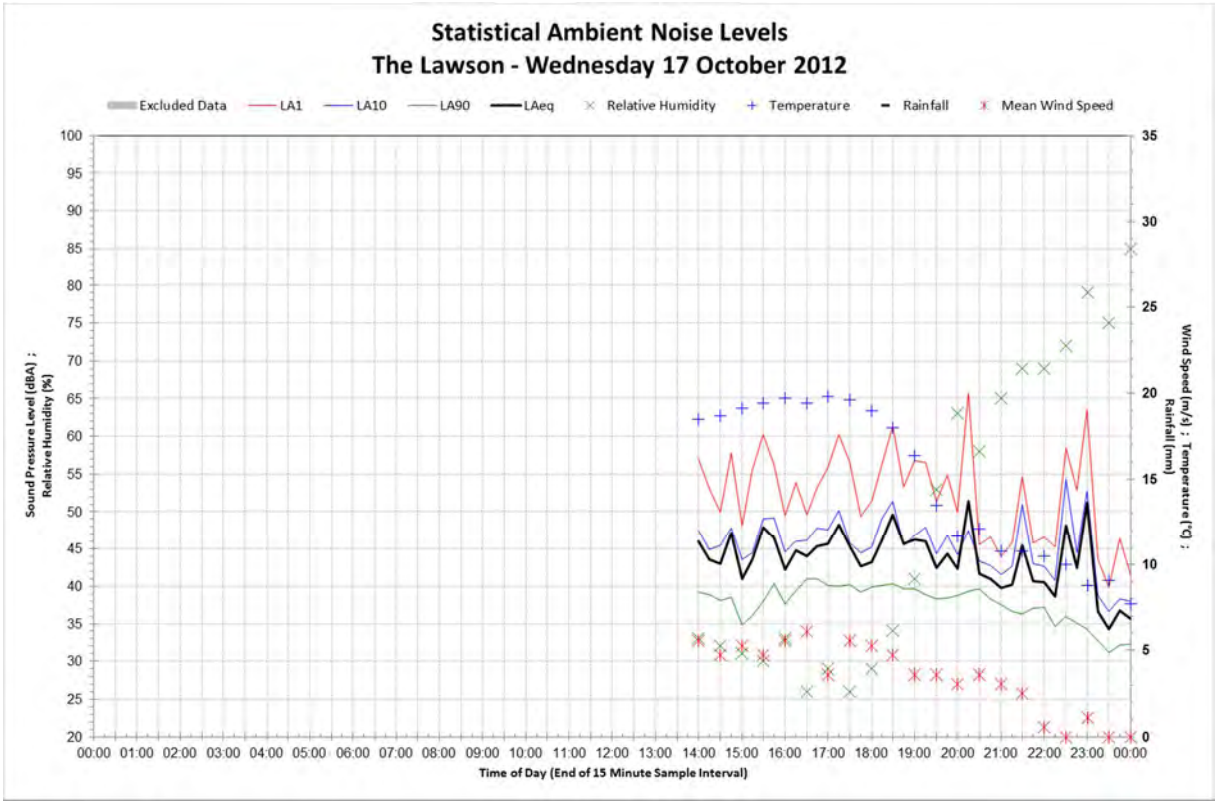

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Friday 26 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

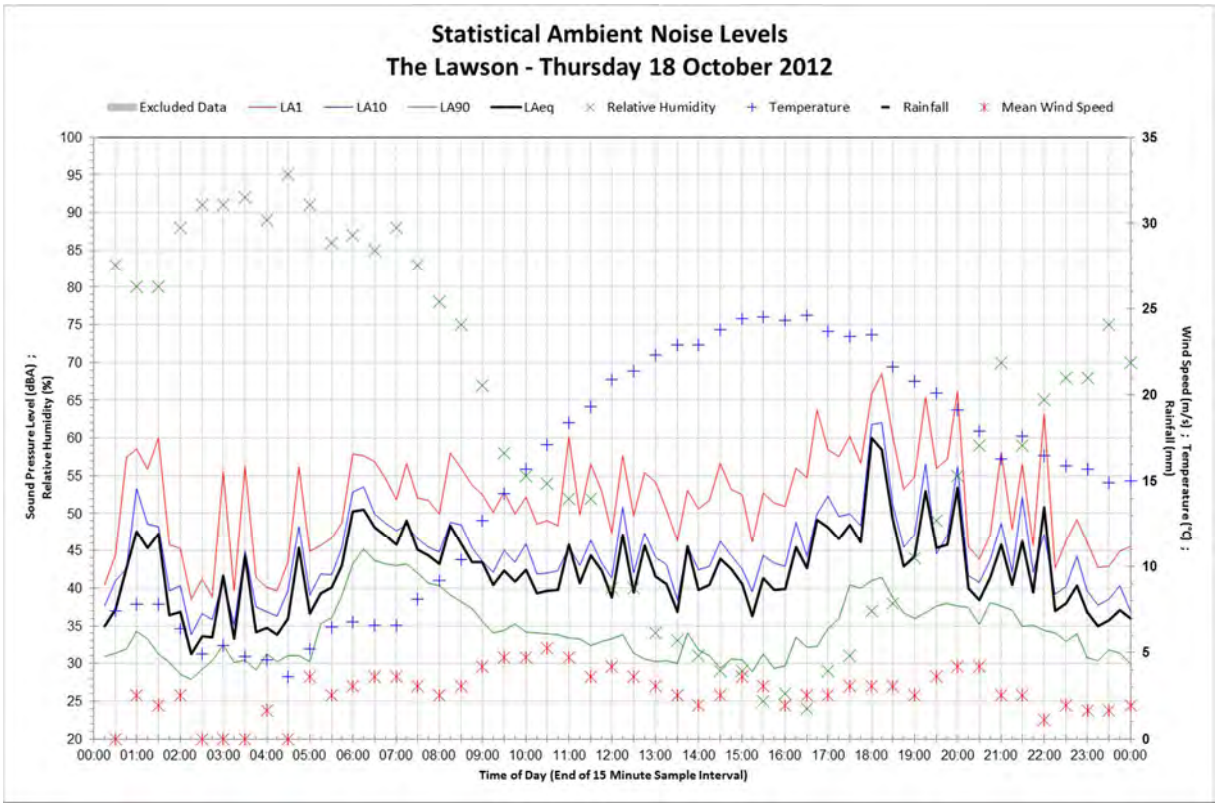

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

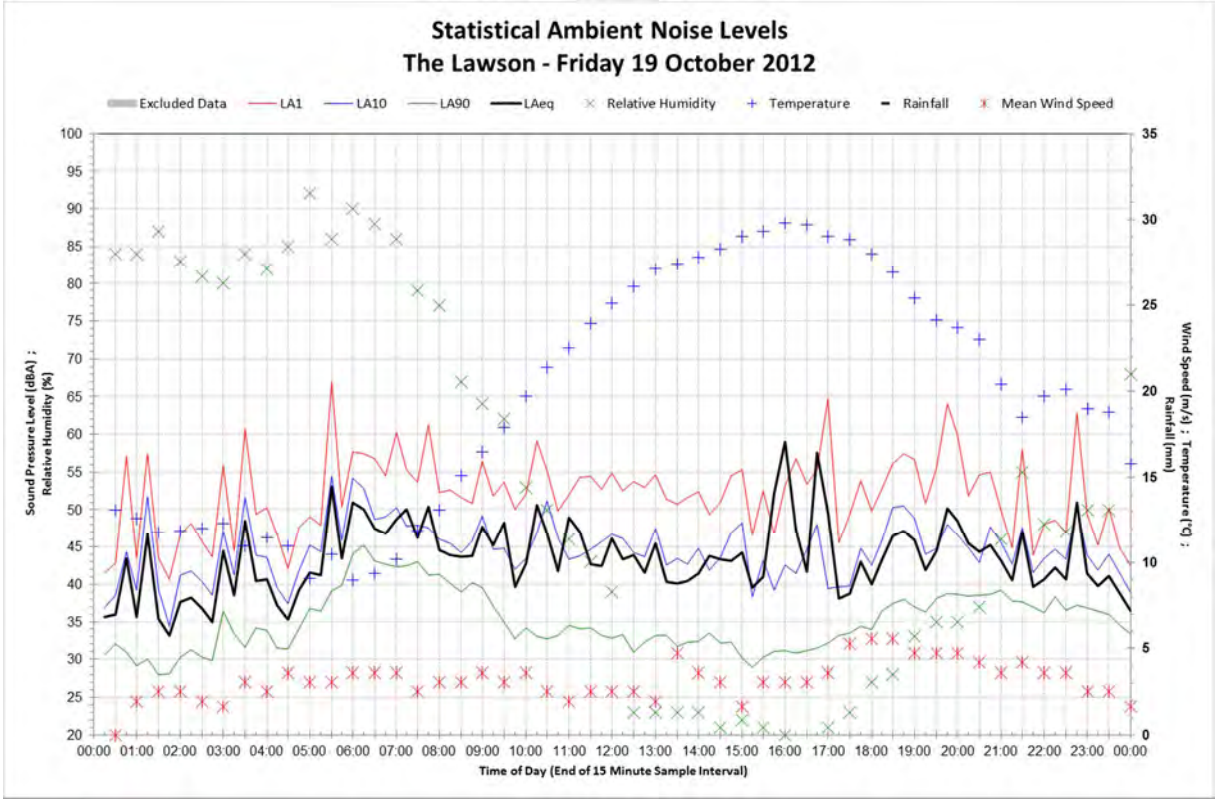

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

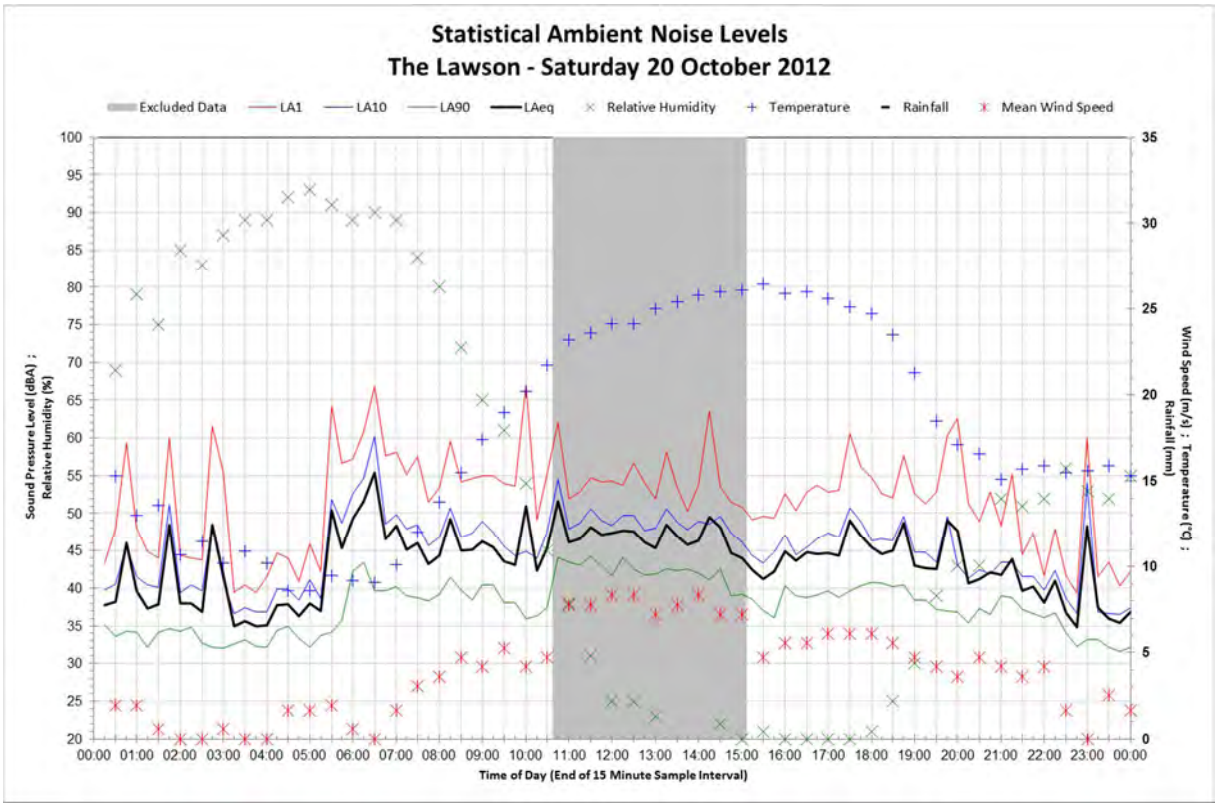

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

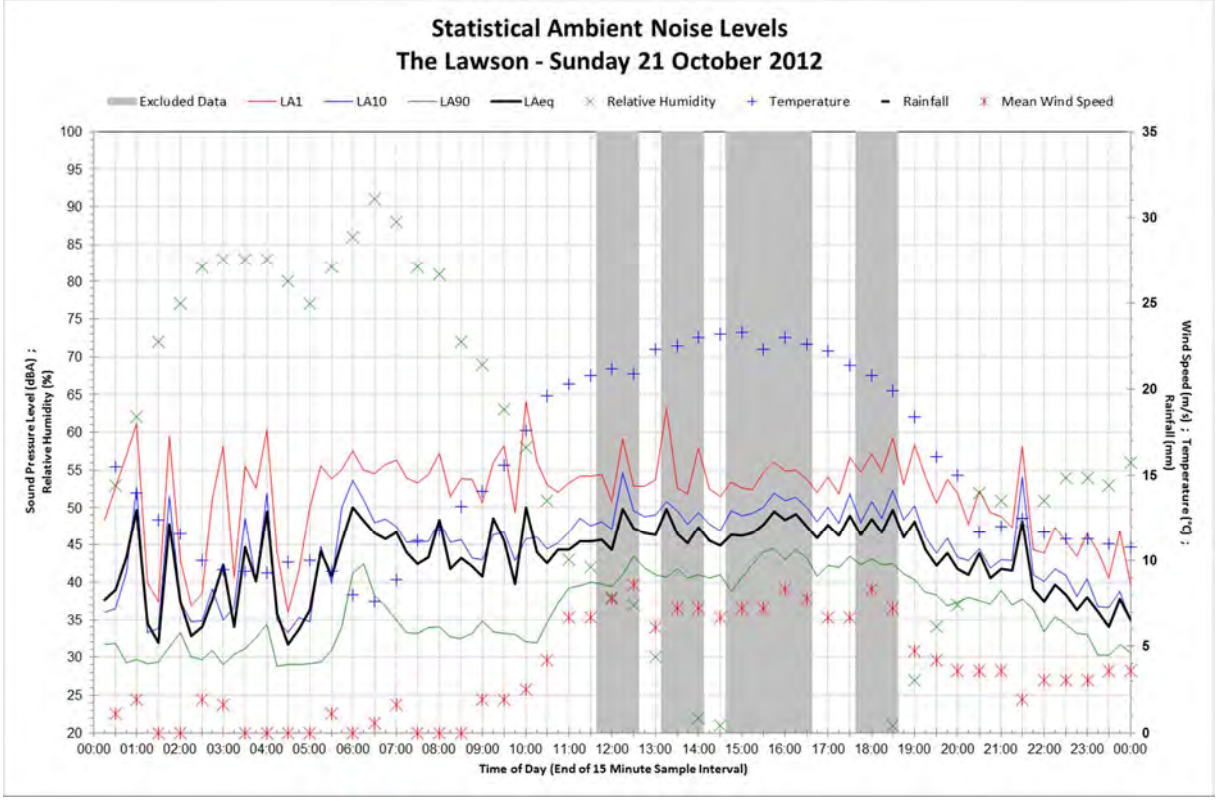

Statistical Ambient Noise Levels
Wagga Wagga Beach Caravan Park - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

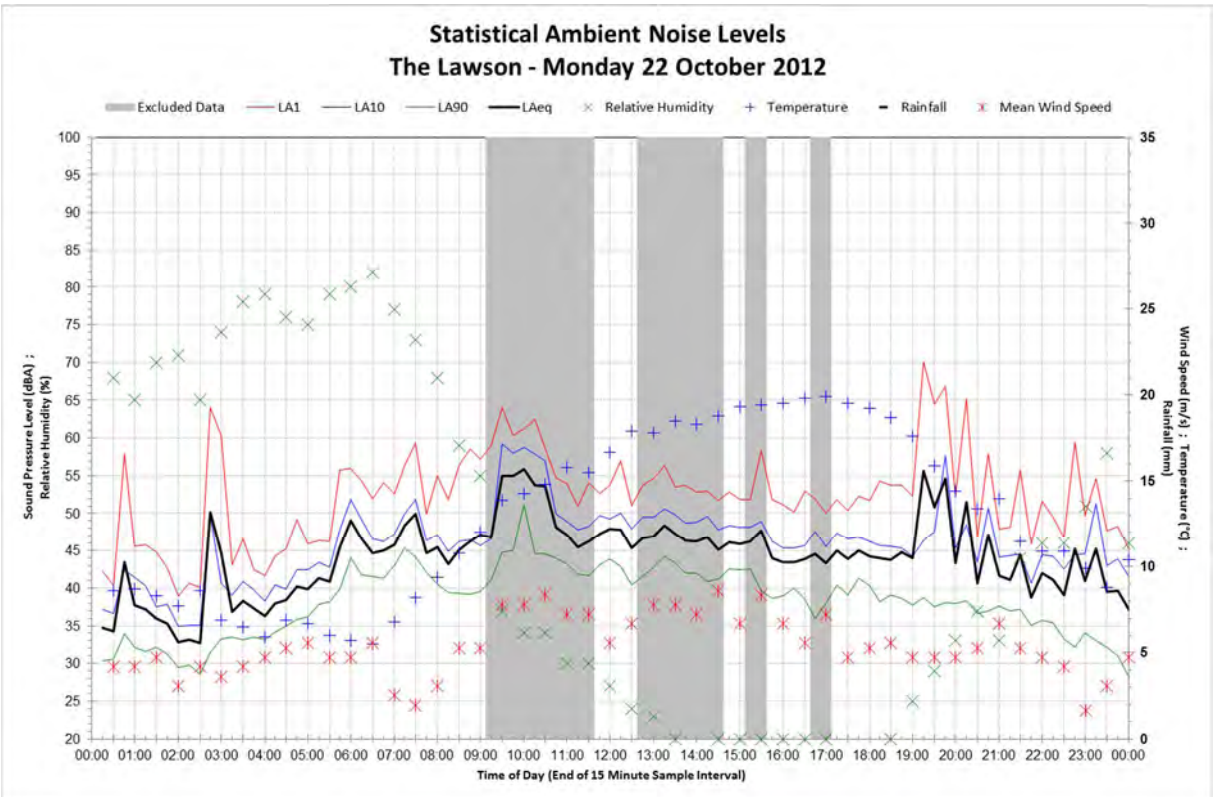

Statistical Ambient Noise Levels
The Lawson - Wednesday 17 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

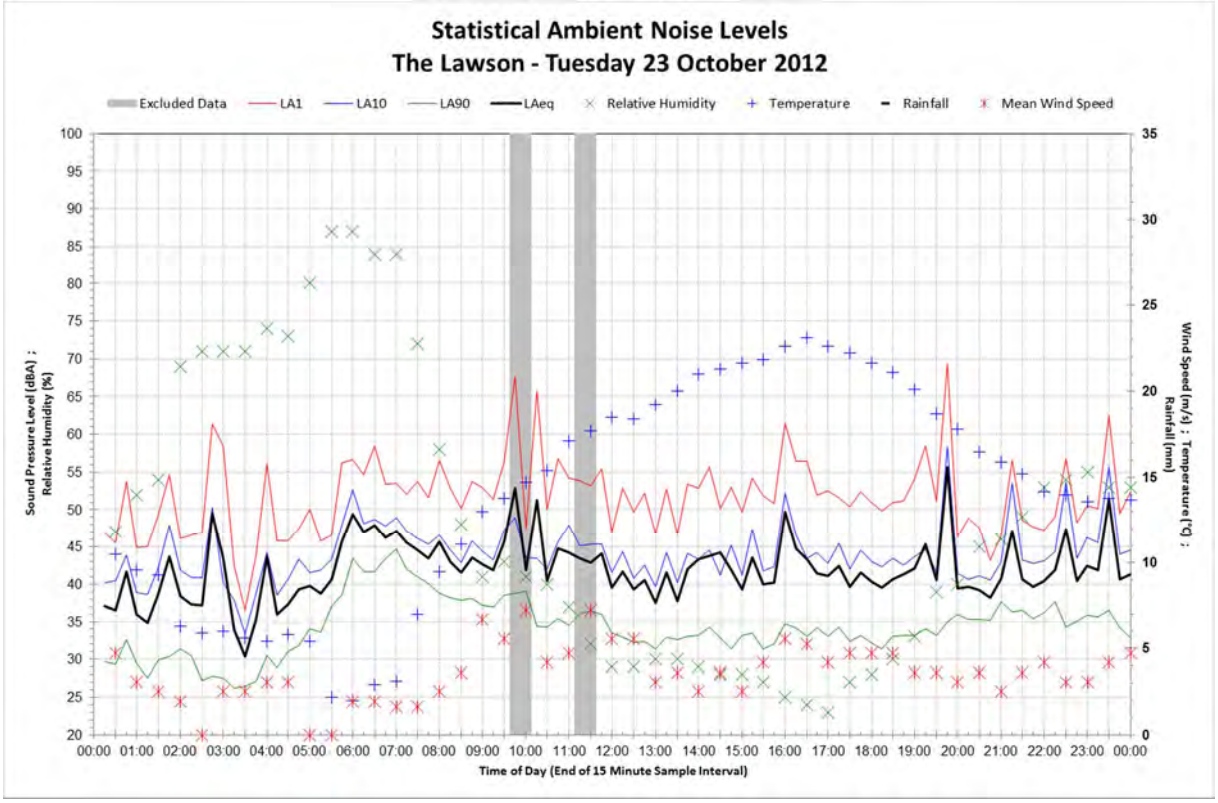

Statistical Ambient Noise Levels
The Lawson - Thursday 18 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

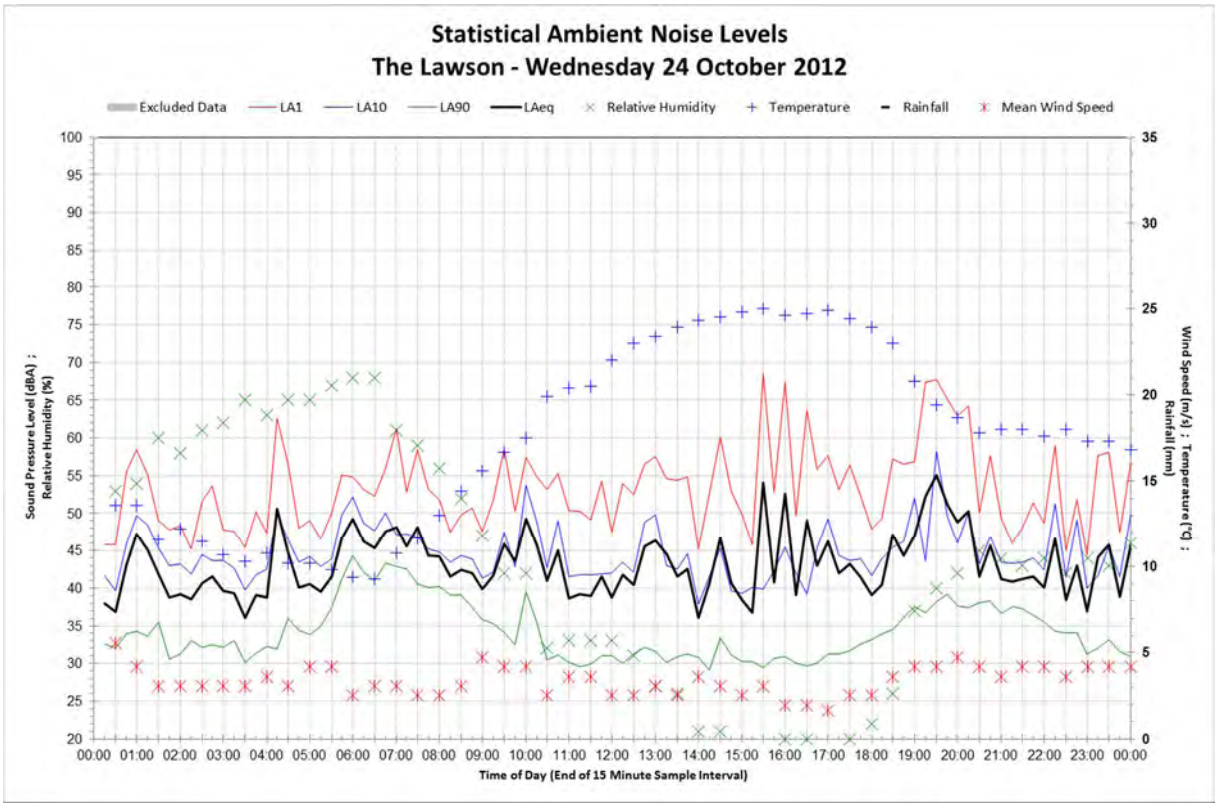

Statistical Ambient Noise Levels
The Lawson - Friday 19 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

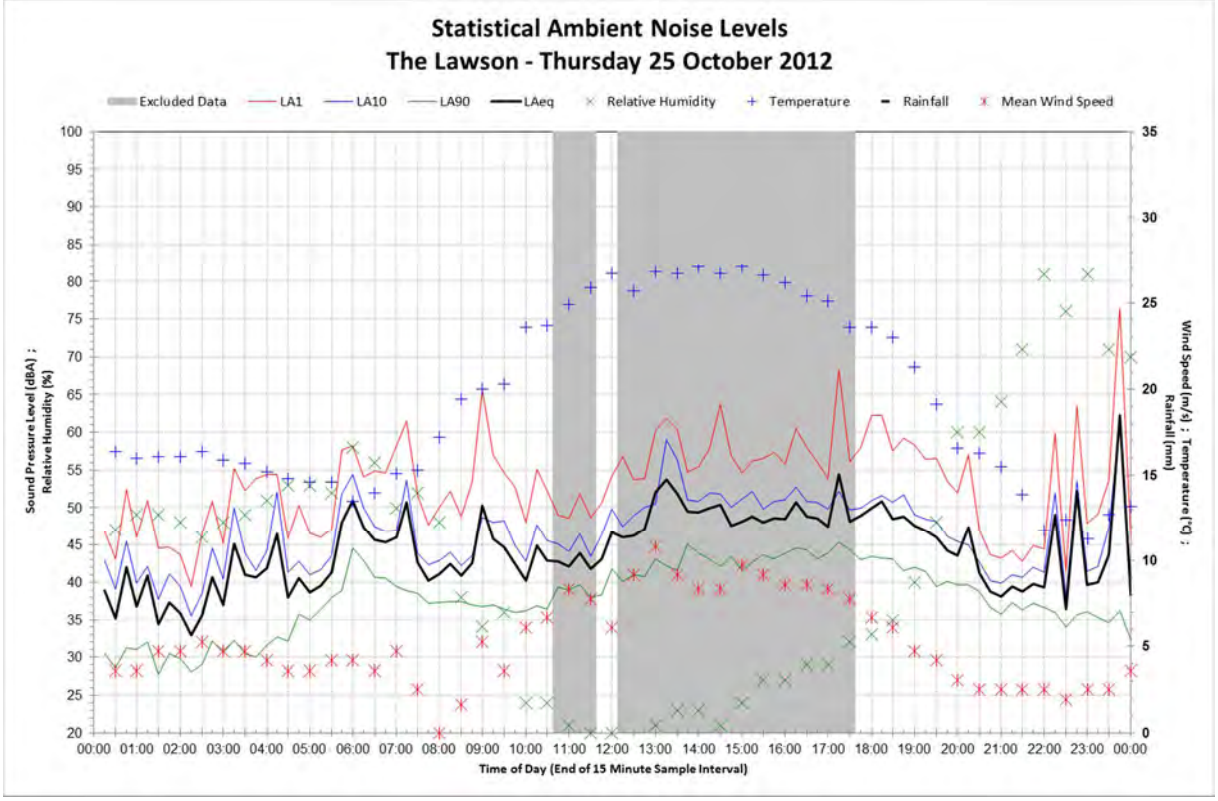

Statistical Ambient Noise Levels
The Lawson - Saturday 20 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

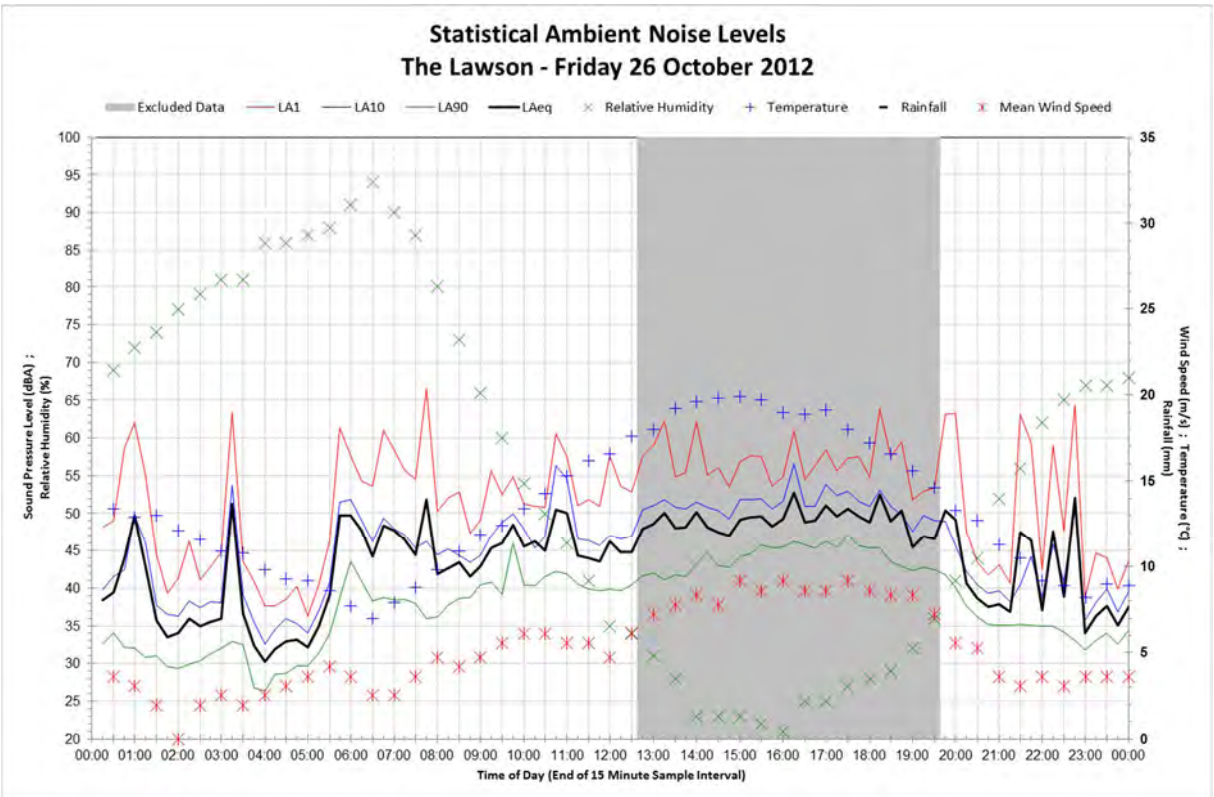

Statistical Ambient Noise Levels
The Lawson - Sunday 21 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

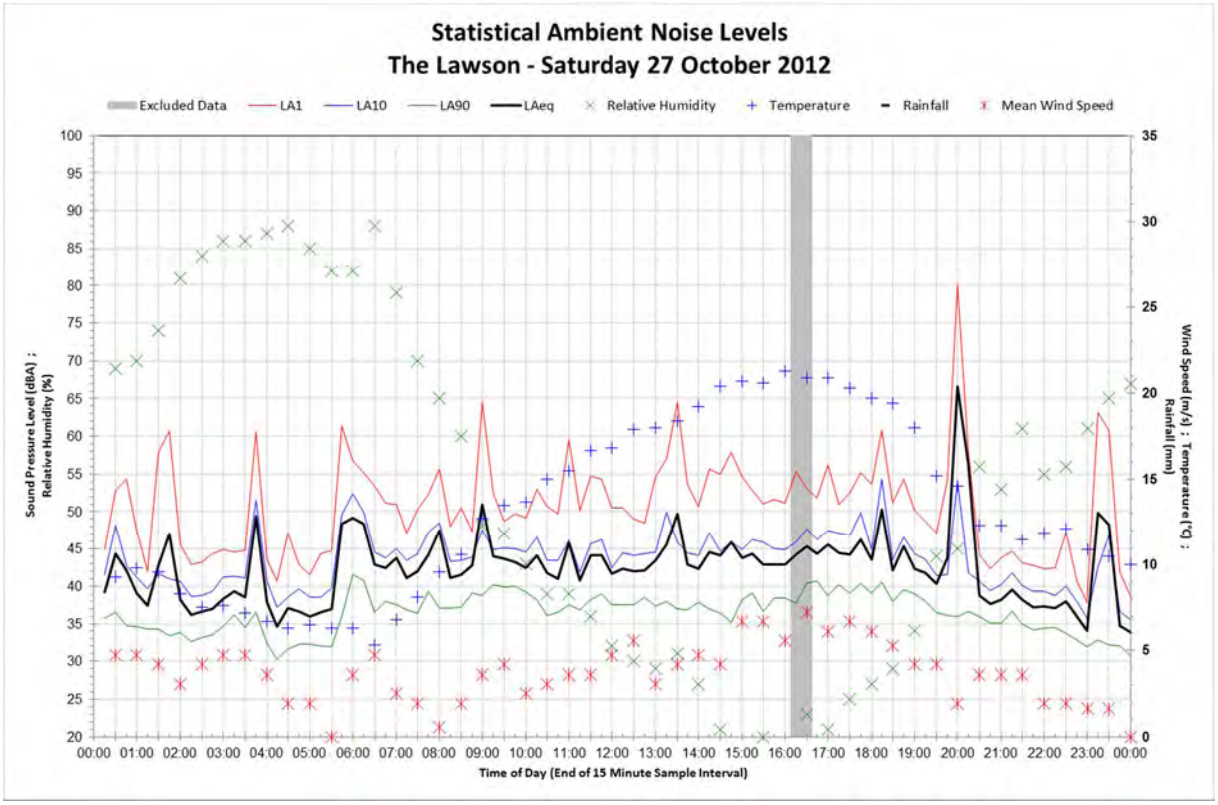

Statistical Ambient Noise Levels
The Lawson - Monday 22 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

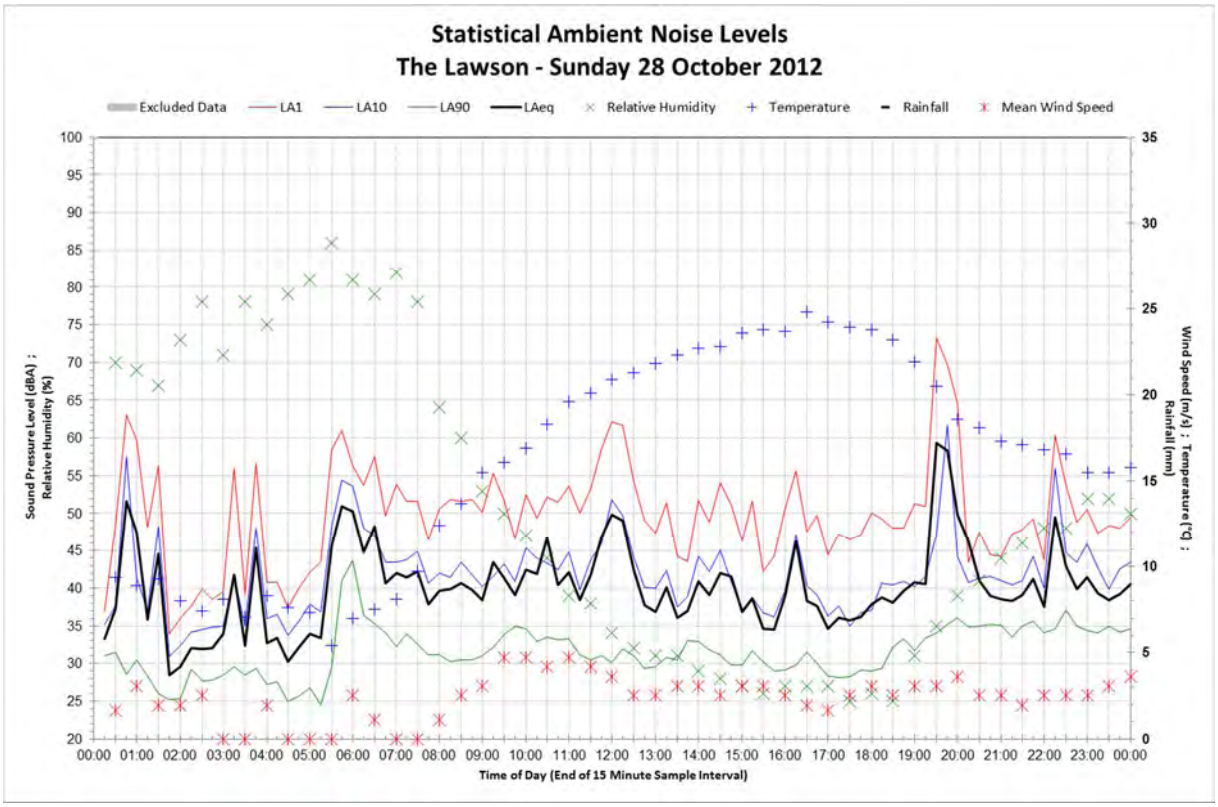

Statistical Ambient Noise Levels
The Lawson - Tuesday 23 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

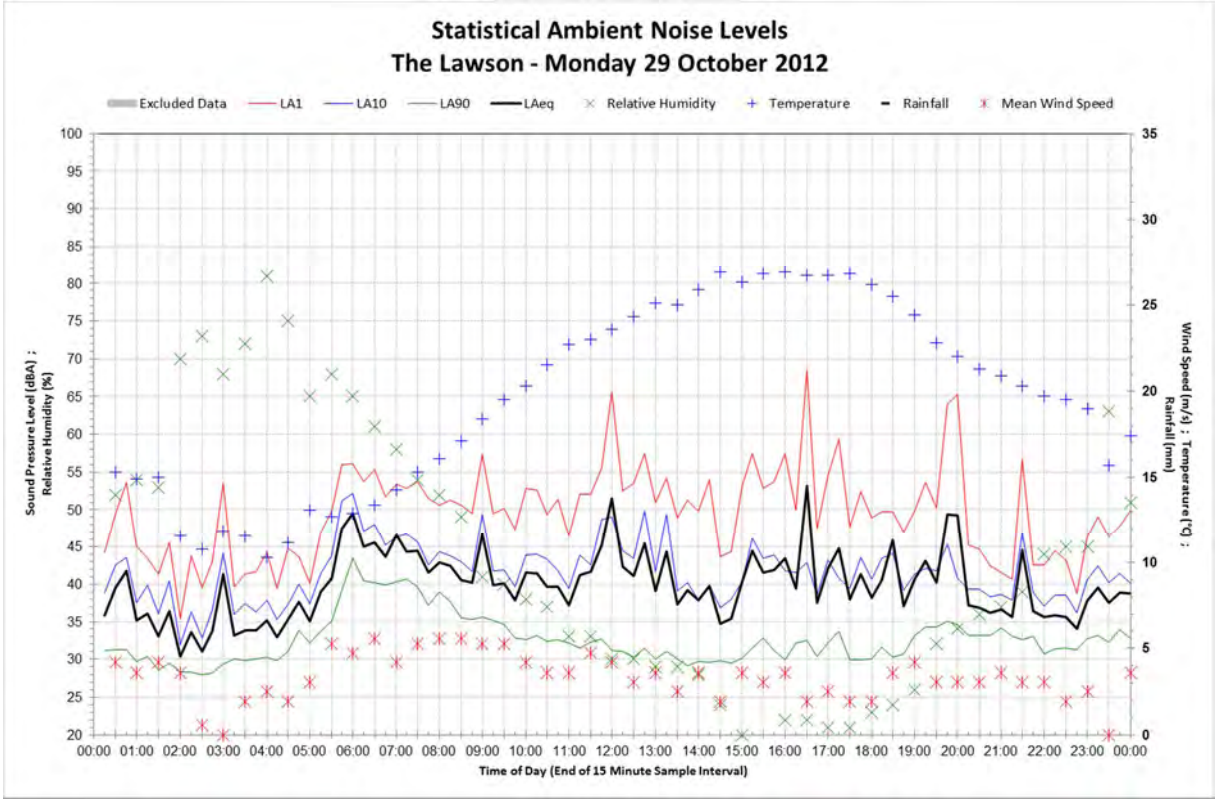

Statistical Ambient Noise Levels
The Lawson - Wednesday 24 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

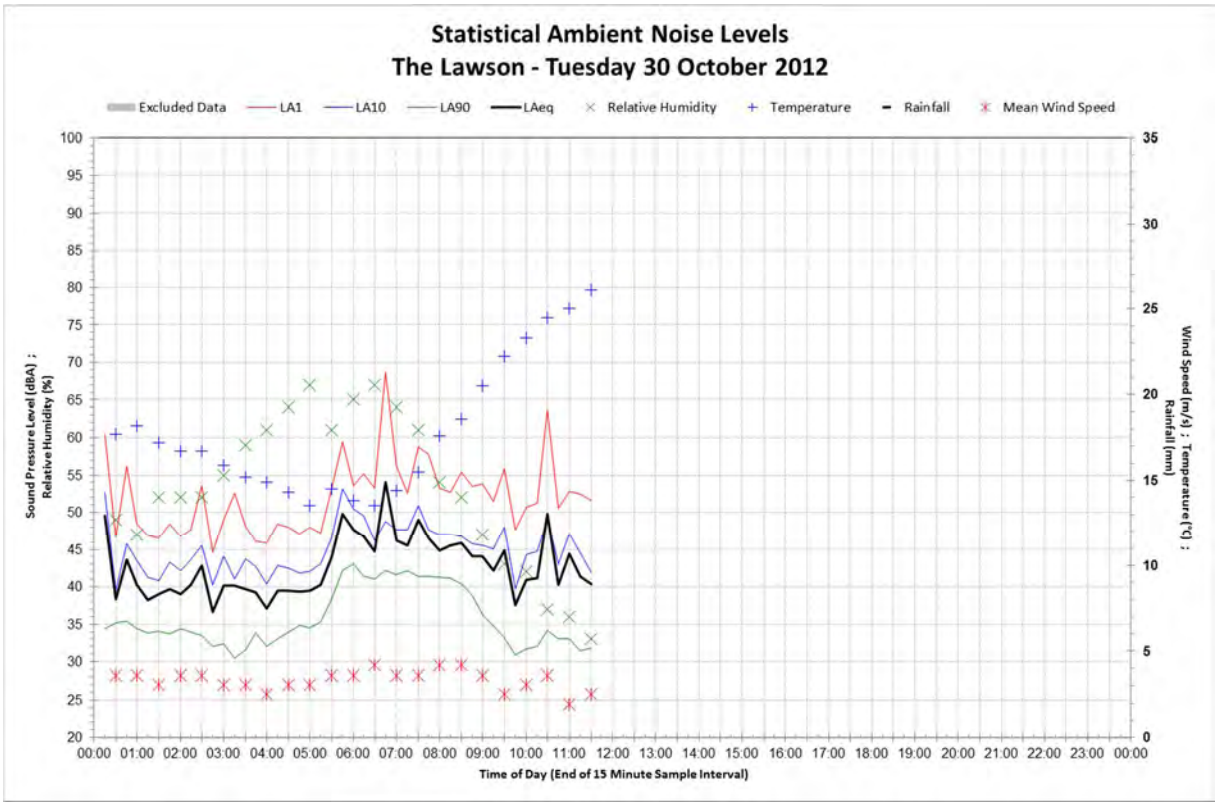

Statistical Ambient Noise Levels
The Lawson - Thursday 25 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

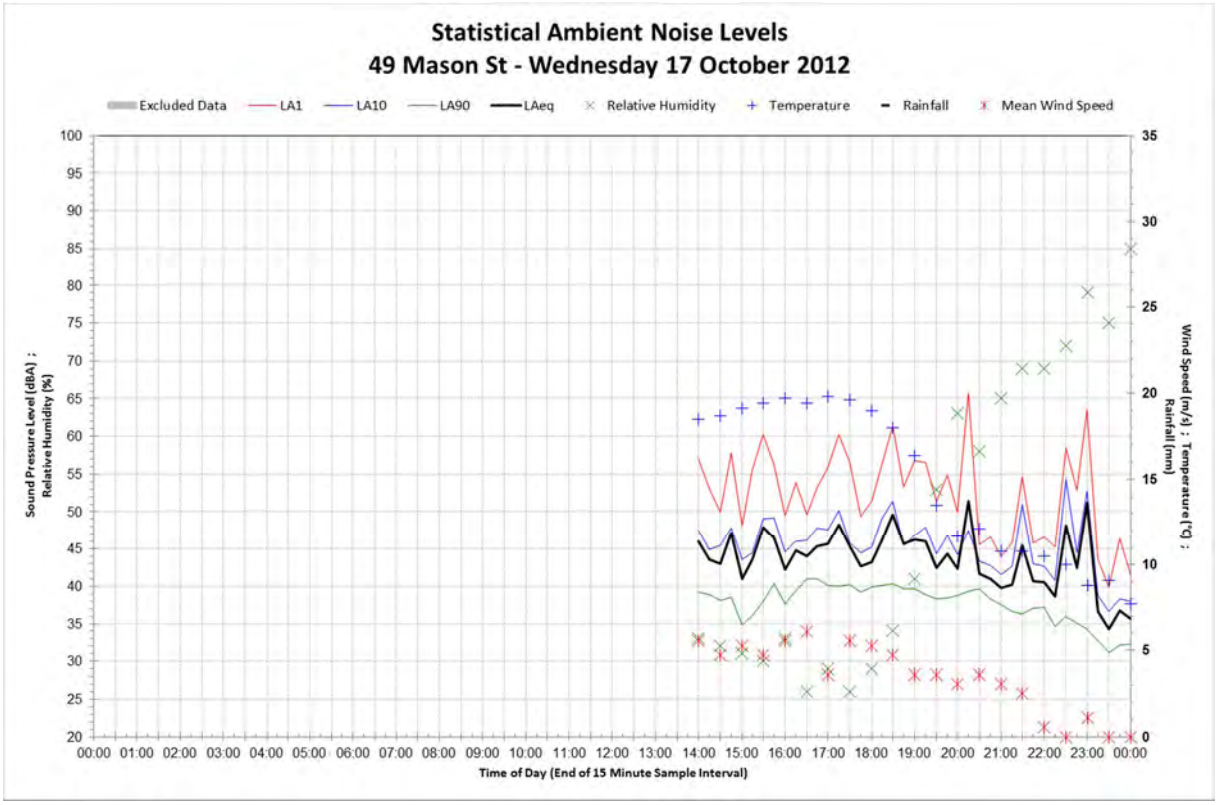

Statistical Ambient Noise Levels
The Lawson - Friday 26 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

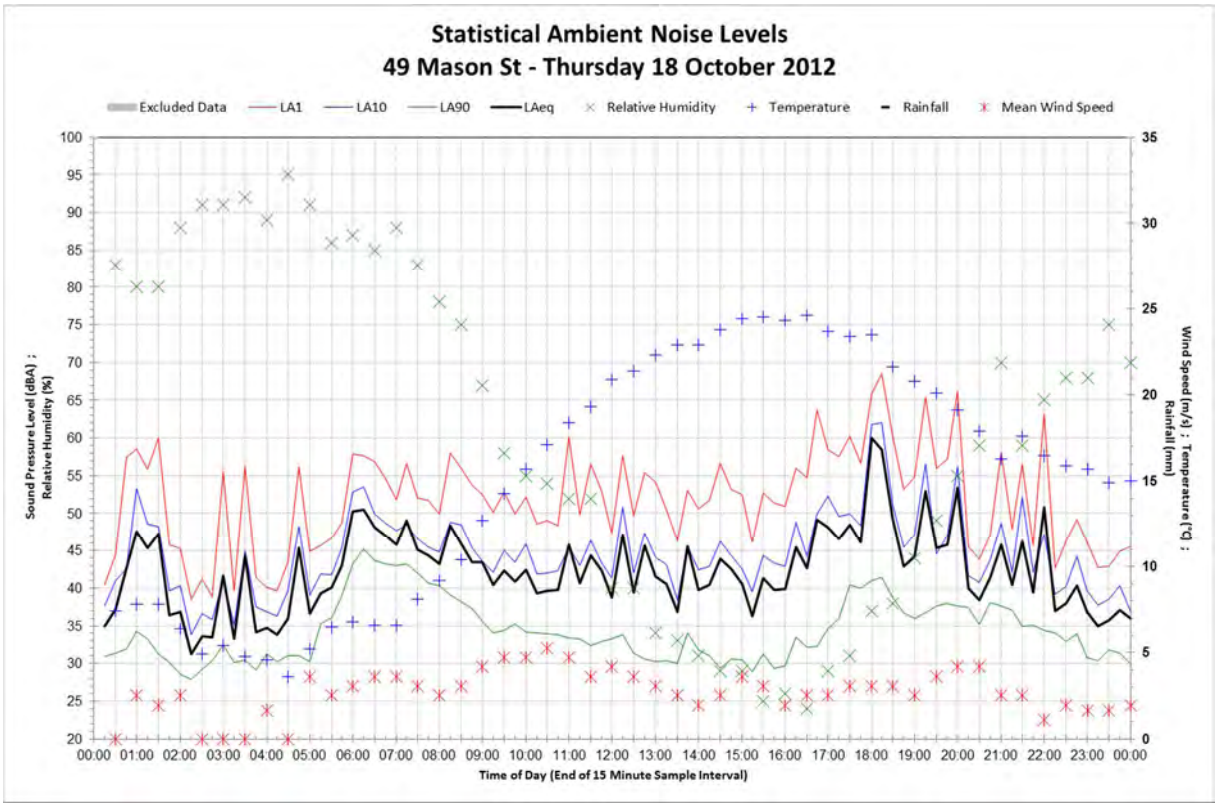

Statistical Ambient Noise Levels
The Lawson - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

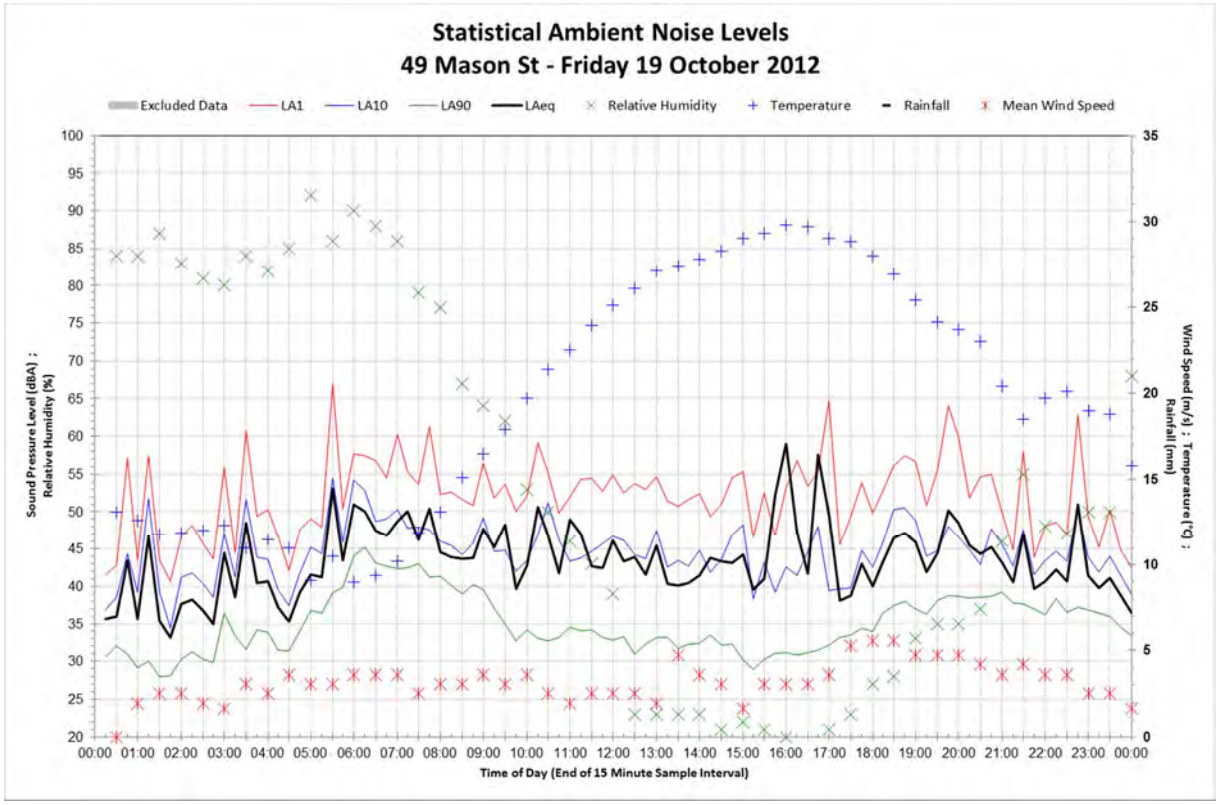

Statistical Ambient Noise Levels
The Lawson - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

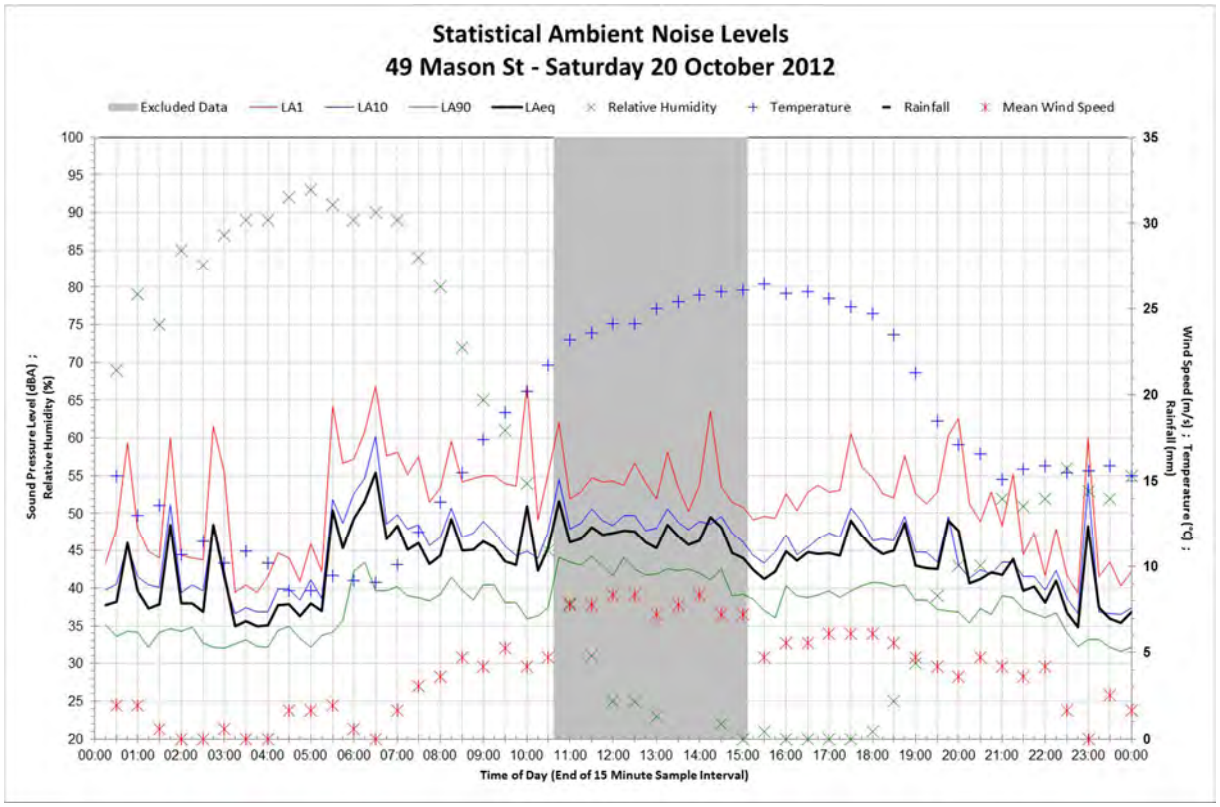

Statistical Ambient Noise Levels
The Lawson - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

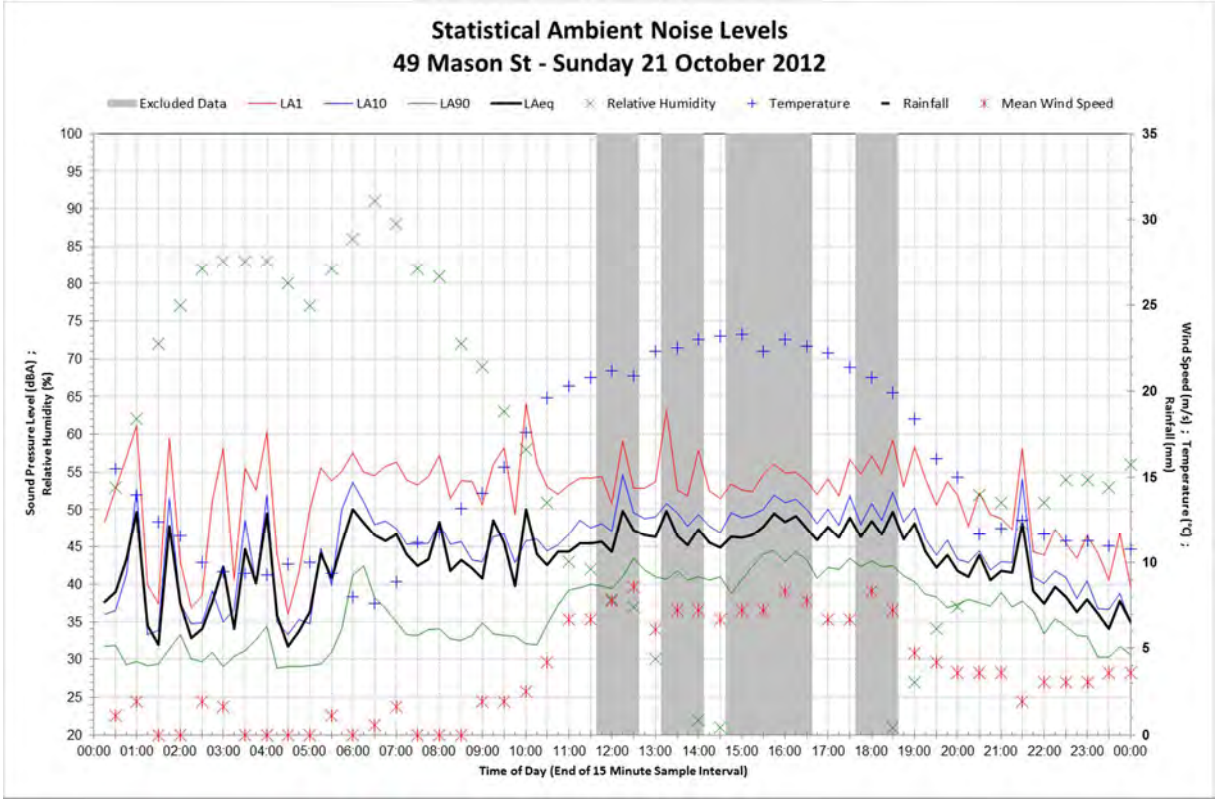

Statistical Ambient Noise Levels
The Lawson - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

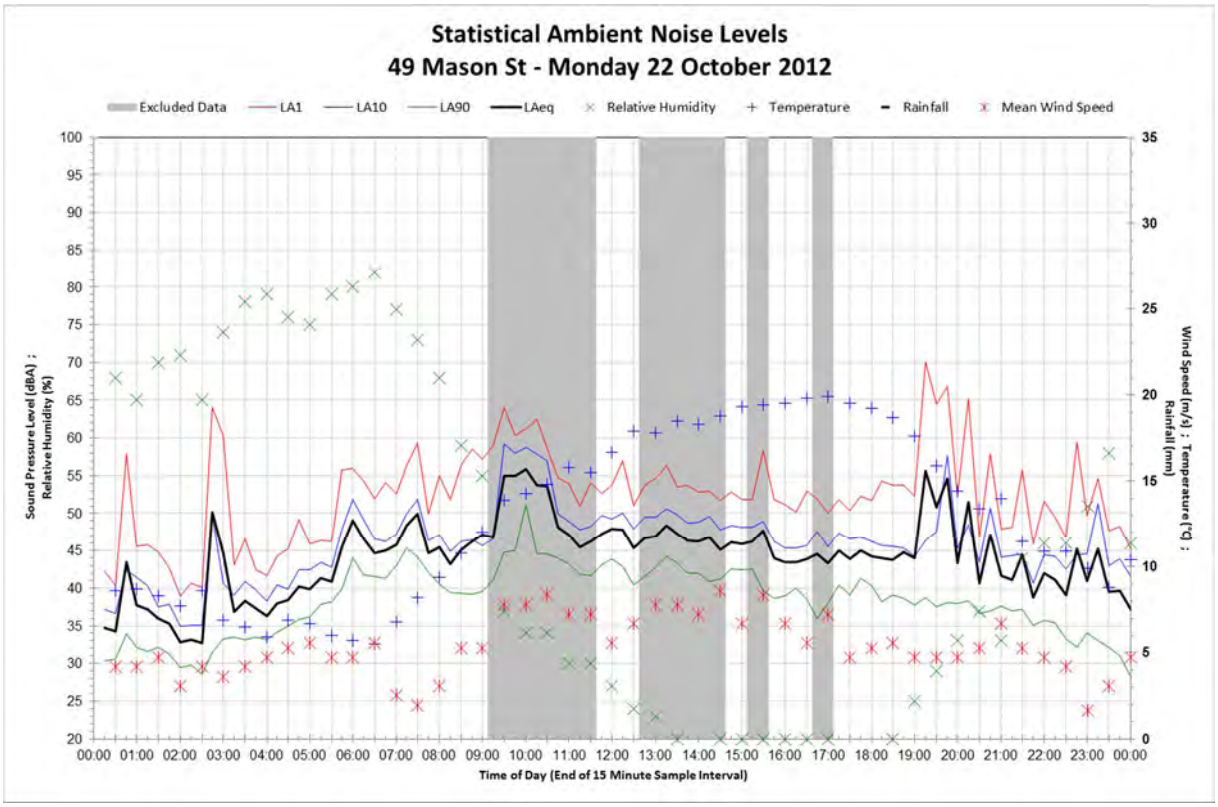

Statistical Ambient Noise Levels
49 Mason St - Wednesday 17 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

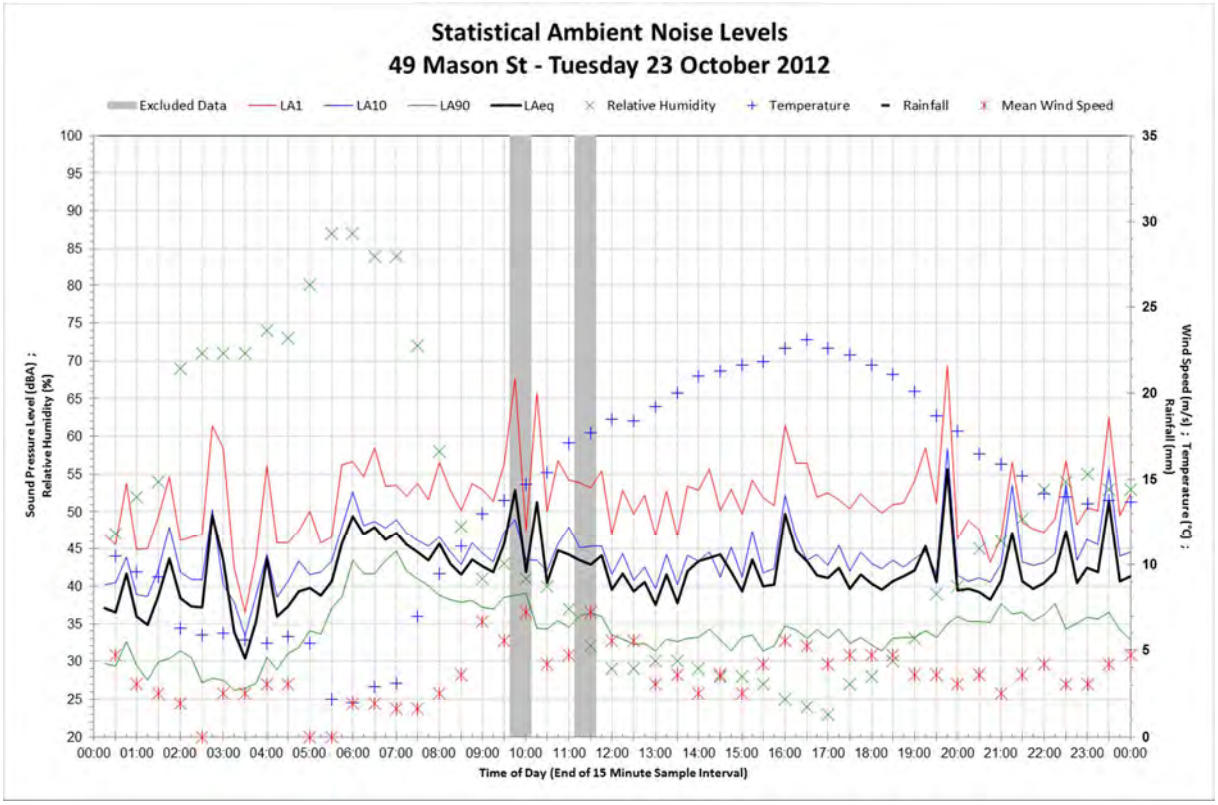

Statistical Ambient Noise Levels
49 Mason St - Thursday 18 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

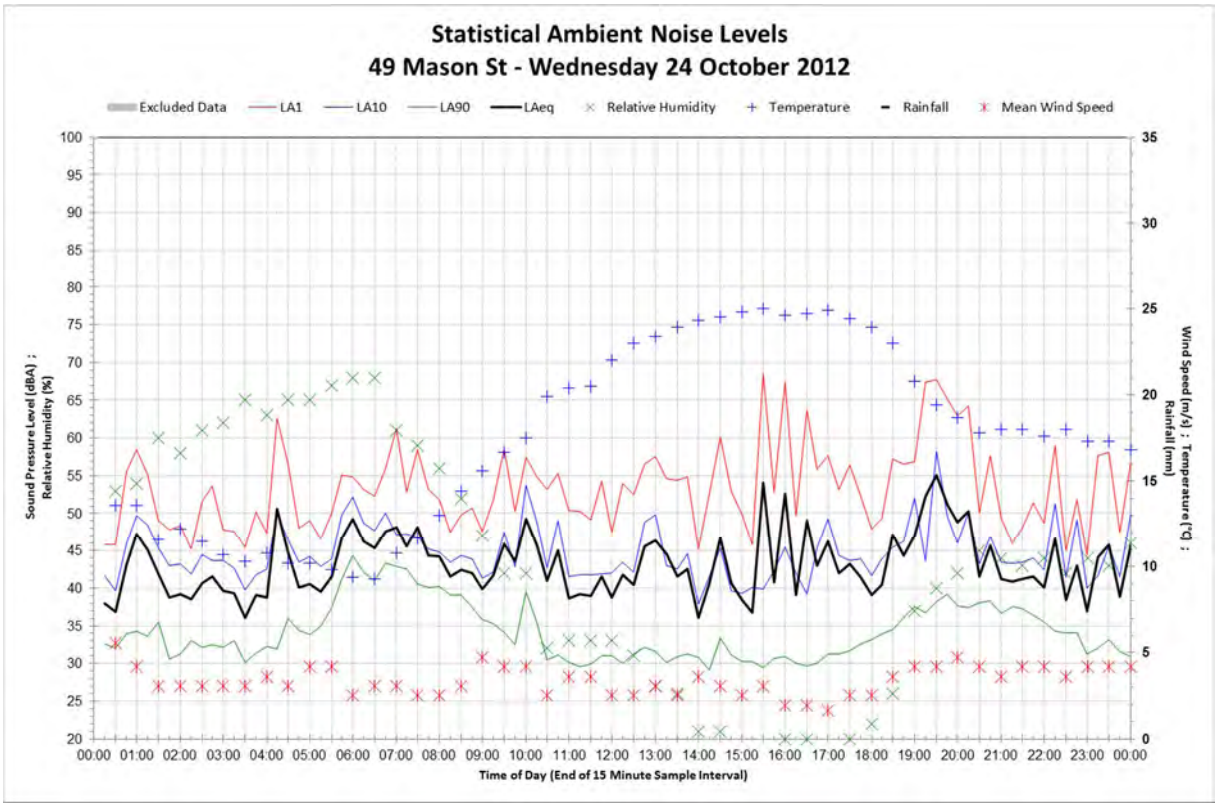

Statistical Ambient Noise Levels
49 Mason St - Friday 19 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

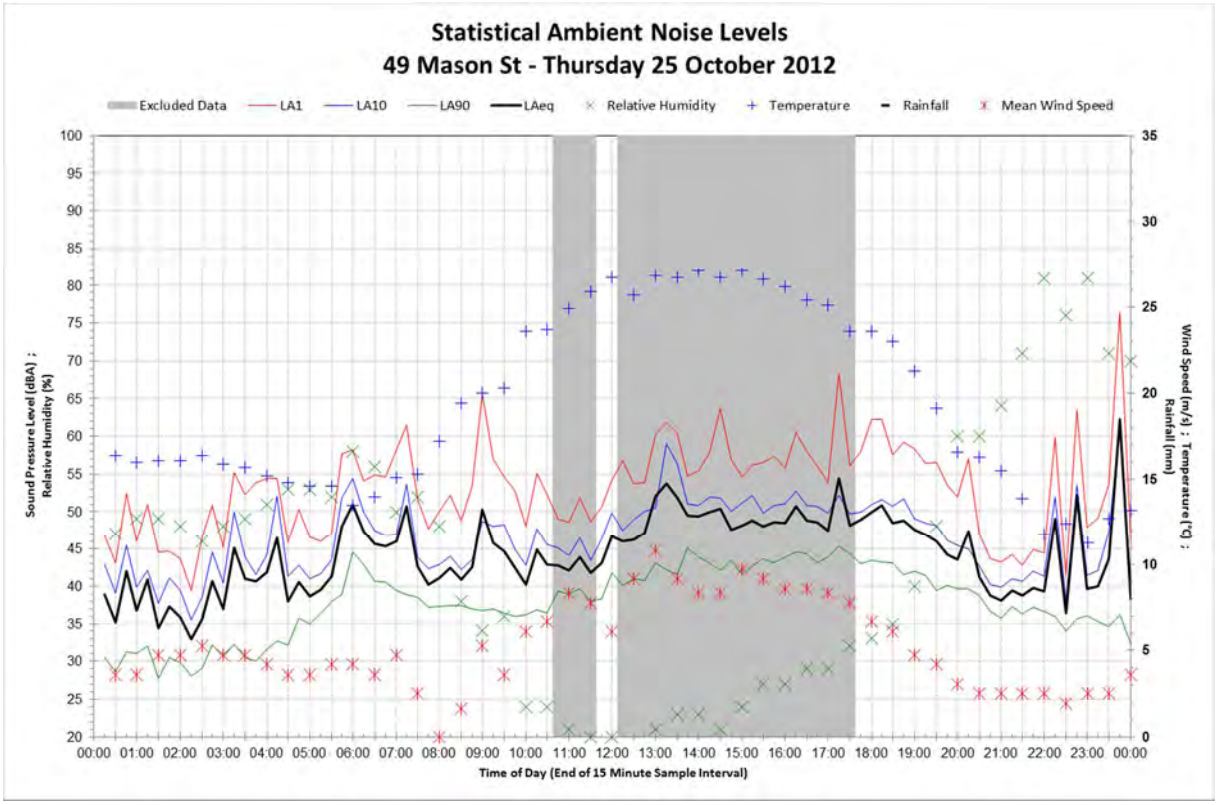

Statistical Ambient Noise Levels
49 Mason St - Saturday 20 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

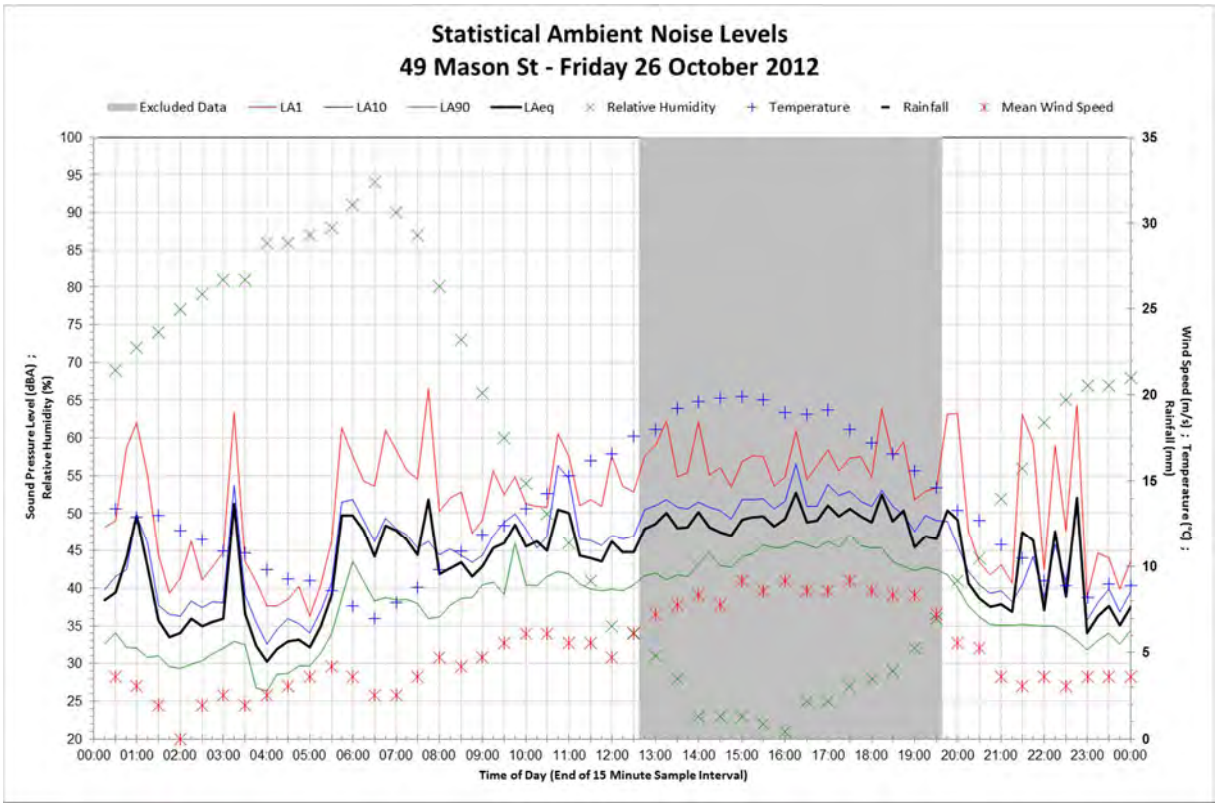

Statistical Ambient Noise Levels
49 Mason St - Sunday 21 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

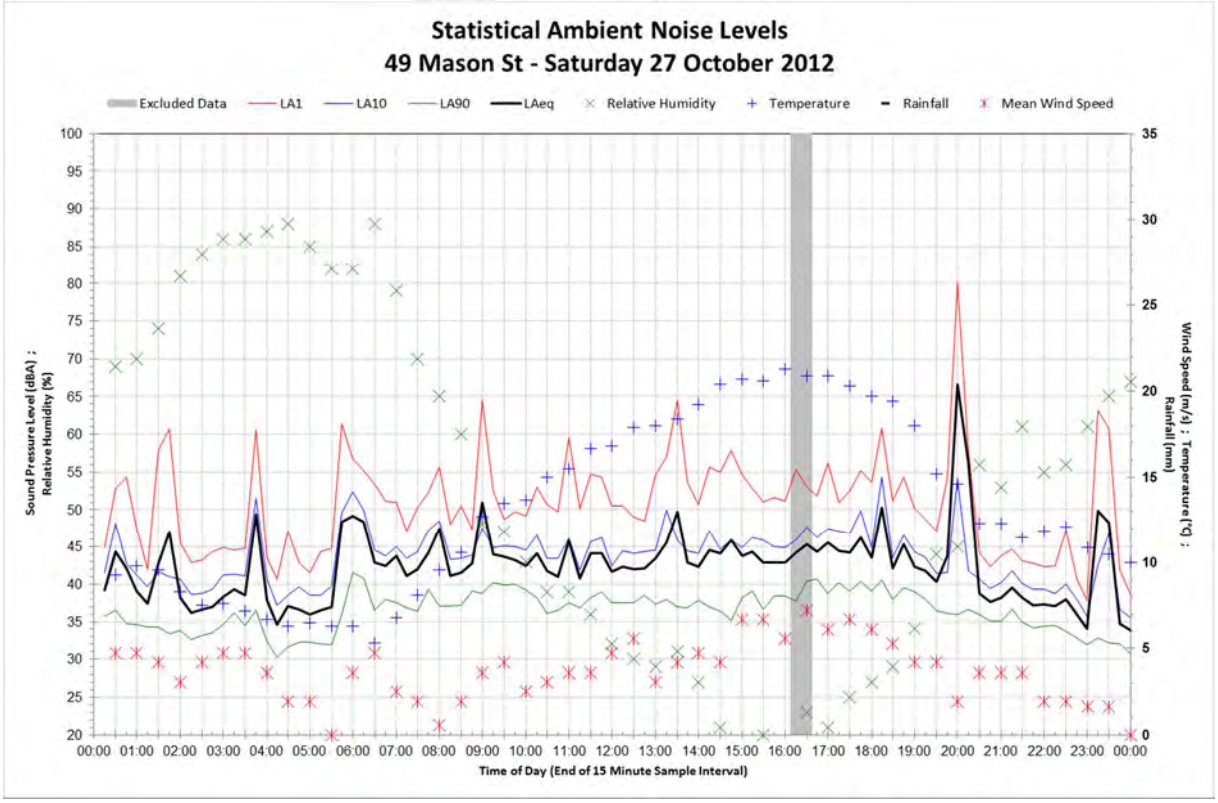

Statistical Ambient Noise Levels
49 Mason St - Monday 22 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

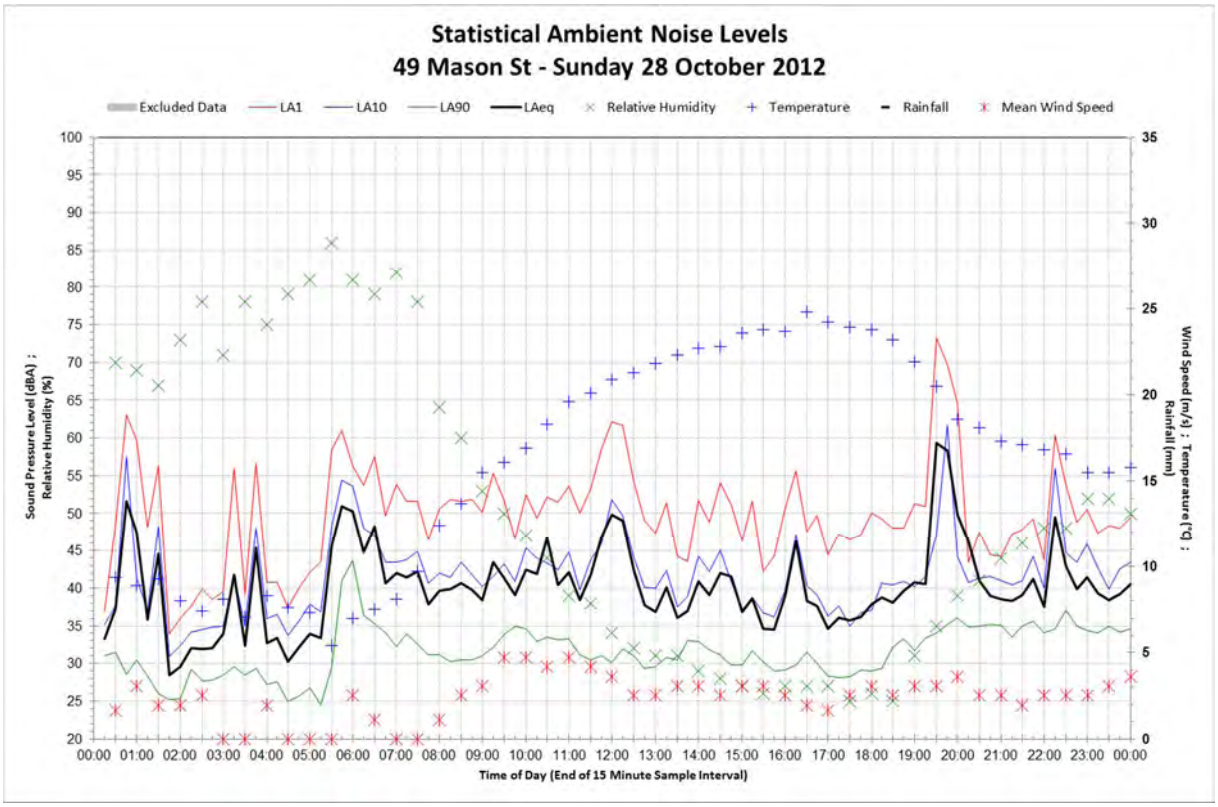

Statistical Ambient Noise Levels
49 Mason St - Tuesday 23 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

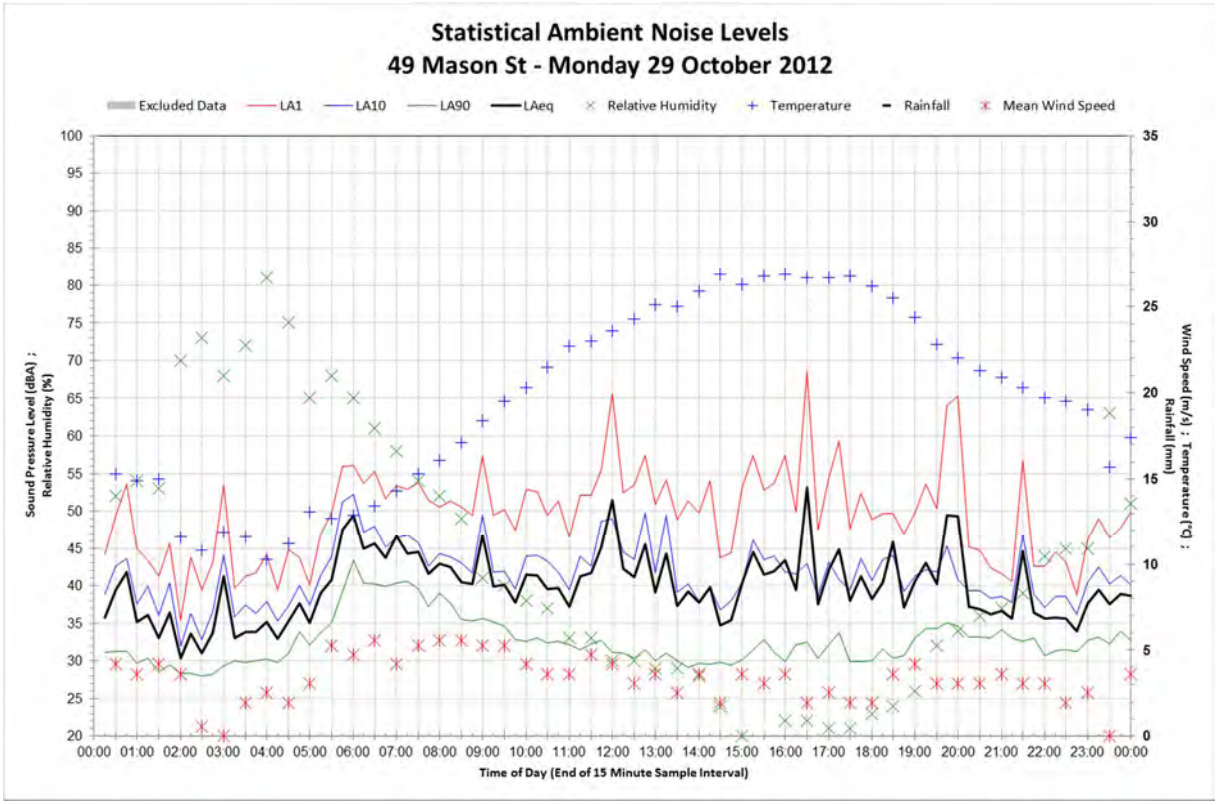

Statistical Ambient Noise Levels
49 Mason St - Wednesday 24 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

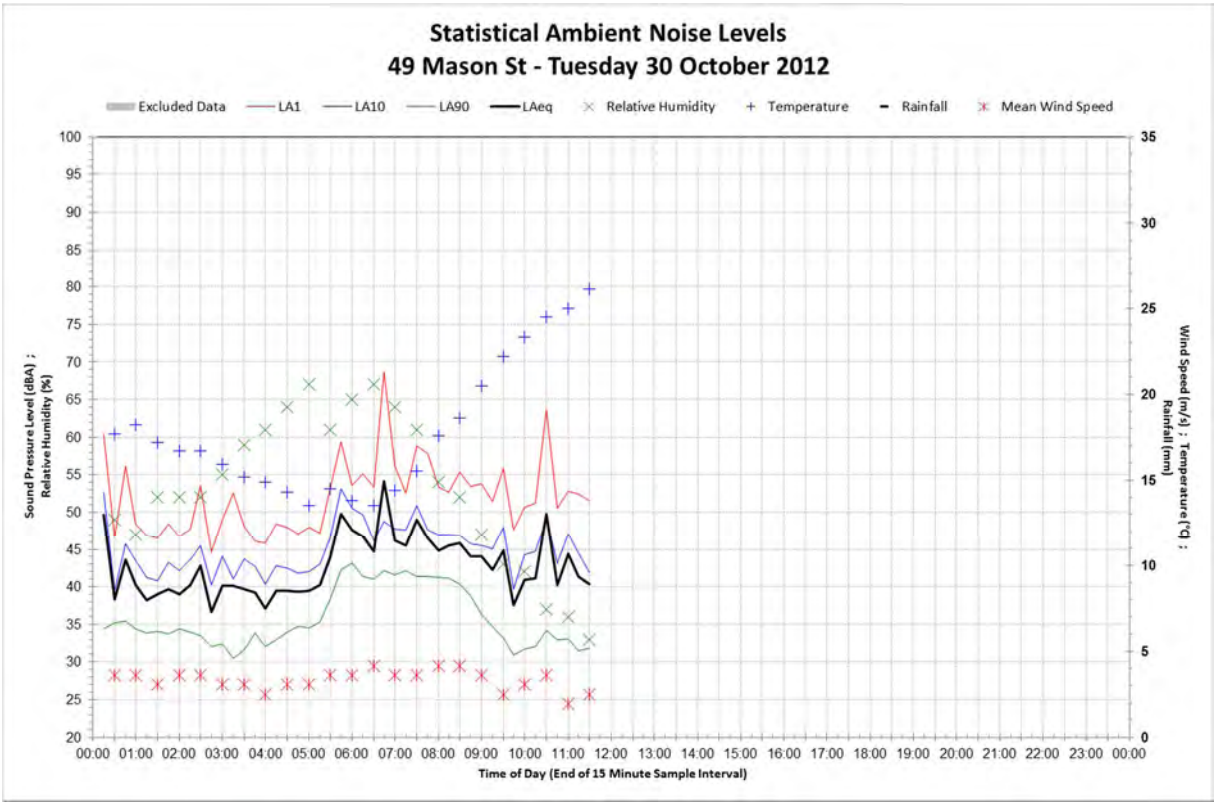

Statistical Ambient Noise Levels
49 Mason St - Thursday 25 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
49 Mason St - Friday 26 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
49 Mason St - Saturday 27 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
49 Mason St - Sunday 28 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
49 Mason St - Monday 29 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
49 Mason St - Tuesday 30 October 2012
Excluded Data
LA1
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

Appendix B – Noise contour charts

1:8,000 Paper Size A3

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling East Street (Bank 2) Levee Embankments

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 2-1

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

1:15,000 Paper Size A3

0 87.5 175 350 525 700

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling East Street (Bank 2) Levee Sheet Pile Walls

Figure 2-2

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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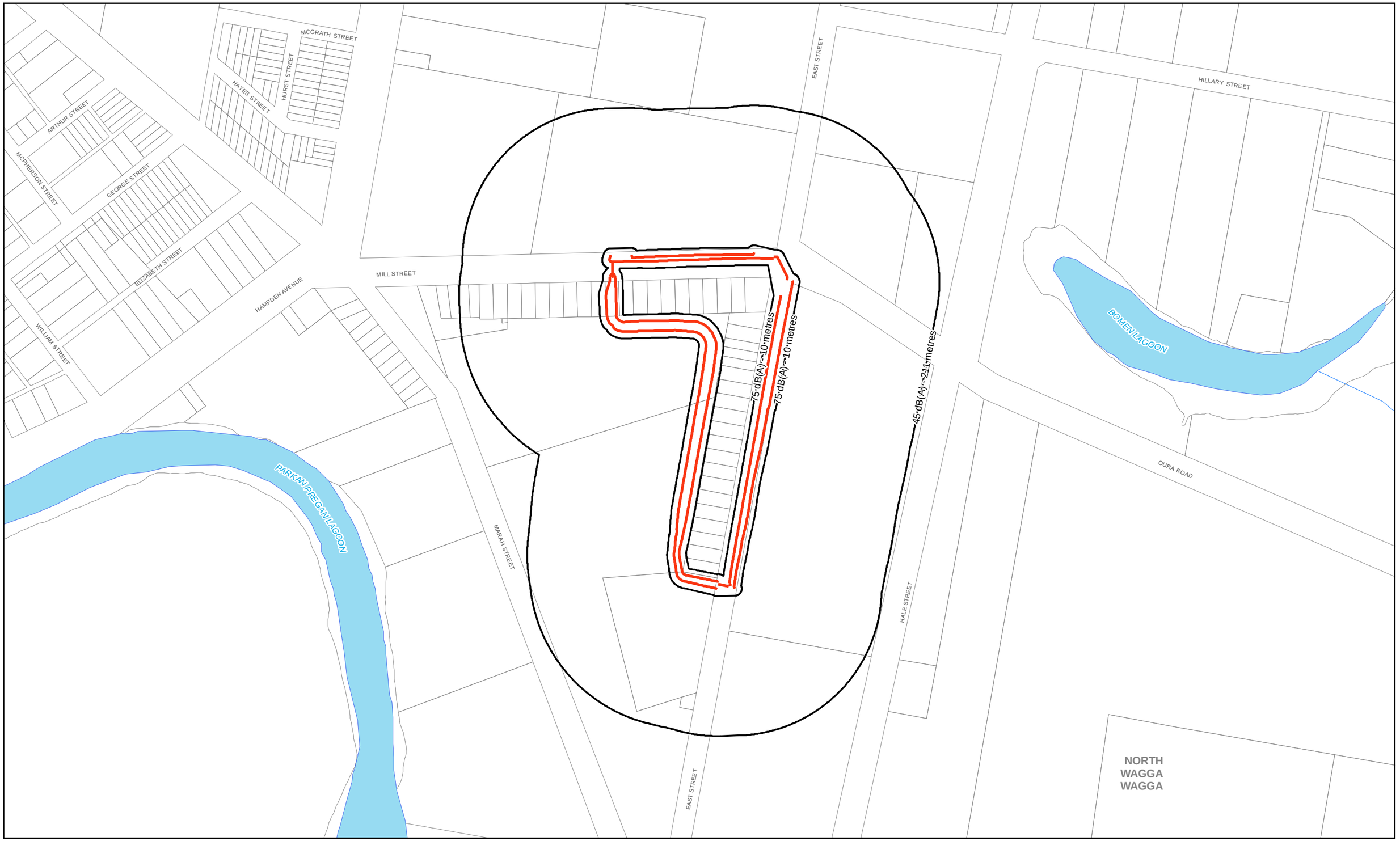

1:5,000 Paper Size A3

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling East Street (Bank 2) Levee Concrete Walls

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 2-3

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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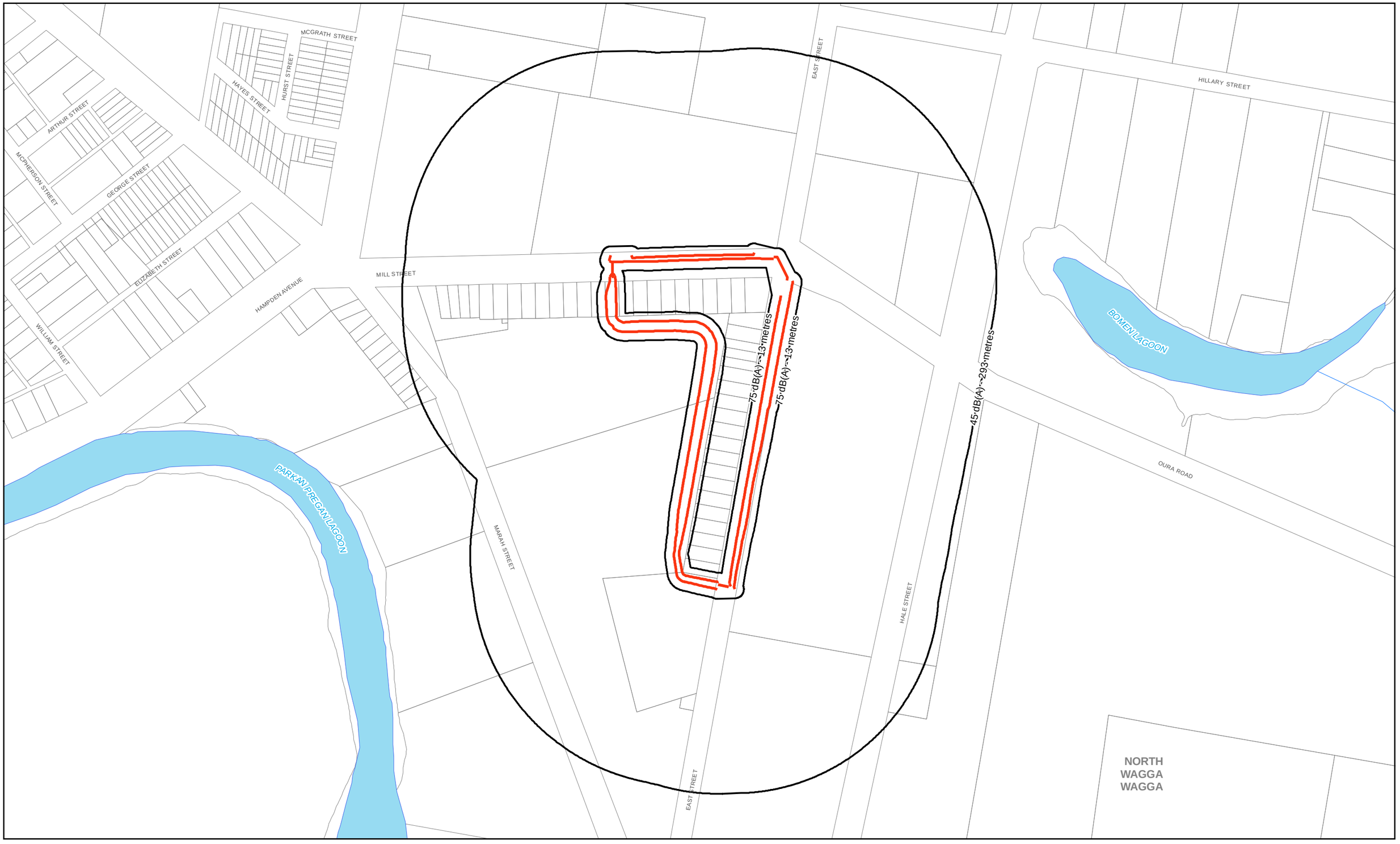


1:5,000 Paper Size A3

0 25 50 100 150 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling East Street (Bank 2) Levee Gabion Walls

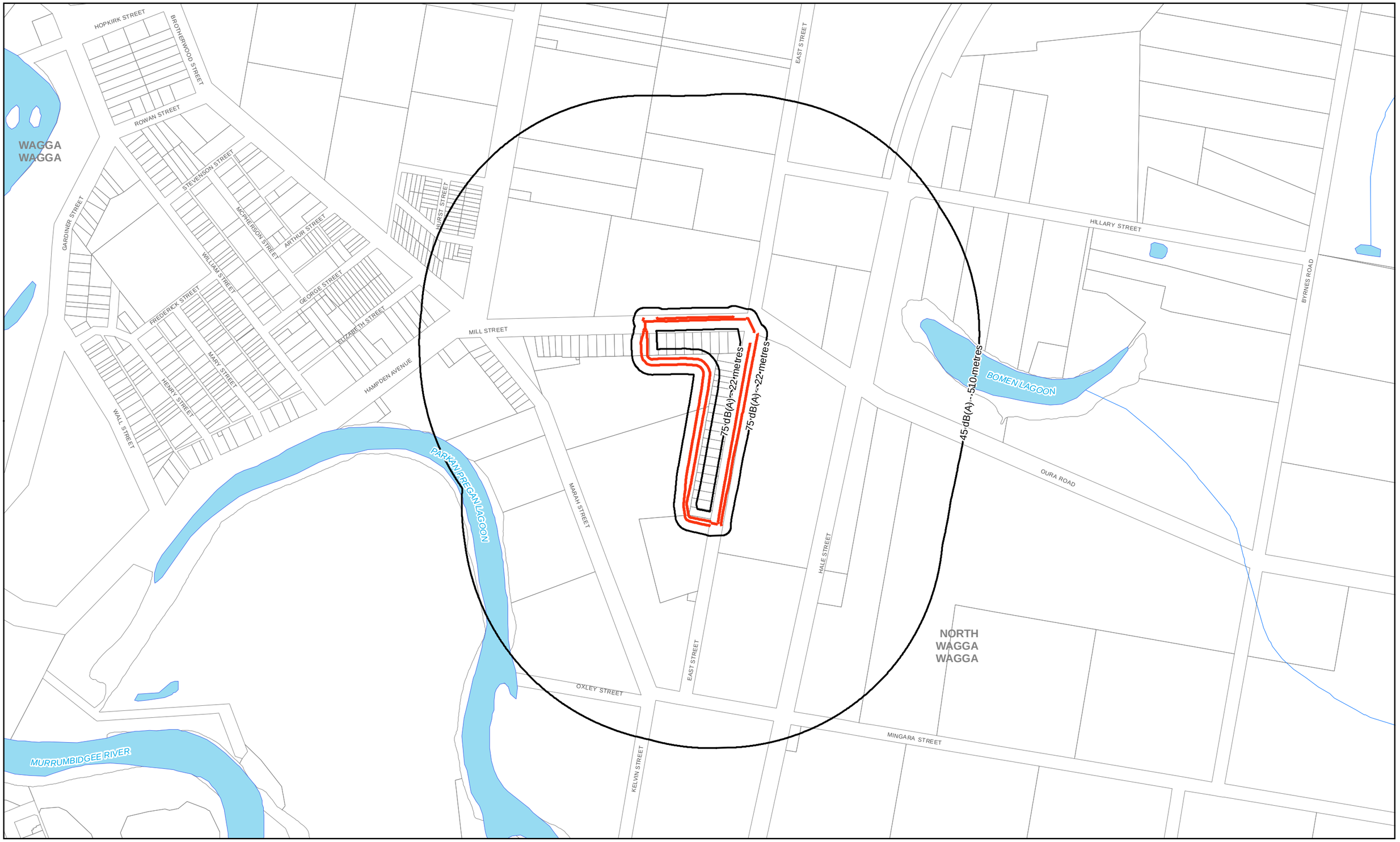
Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 2-4

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au



1:8,000 Paper Size A3

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling East Street (Bank 2) Levee Embankment/Box Culvert Levee

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 2-5

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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1:8,000 Paper Size A3

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling East Street (Bank 2) Levee Spillways

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 2-6

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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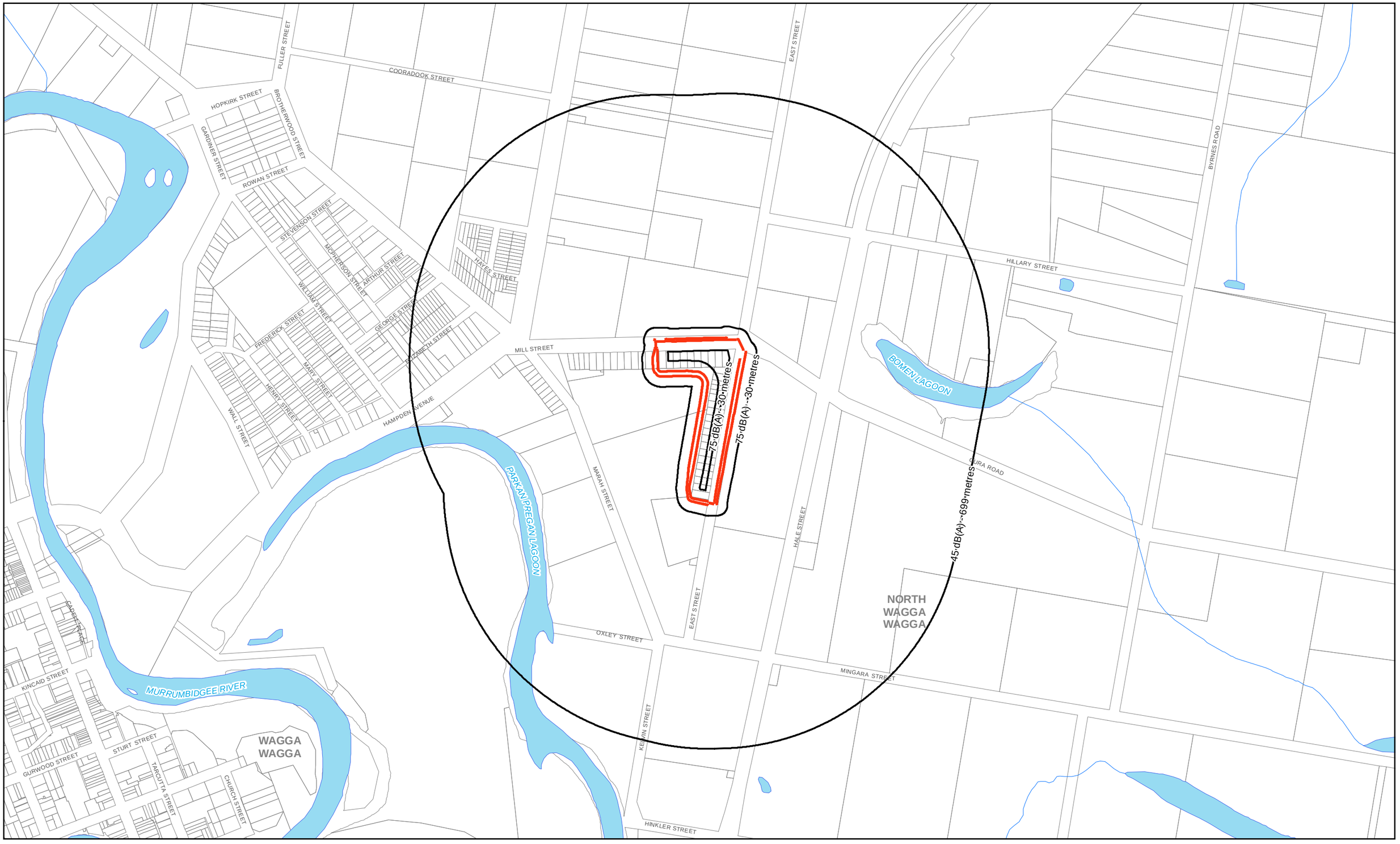


1:10,000 Paper Size A3

0 55 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling East Street (Bank 2) Levee
Levee Road Crossings & Road Raising Embankments

Figure 2-7

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au

1:9,000 Paper Size A3

0 50 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Levee - East Street Bank
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

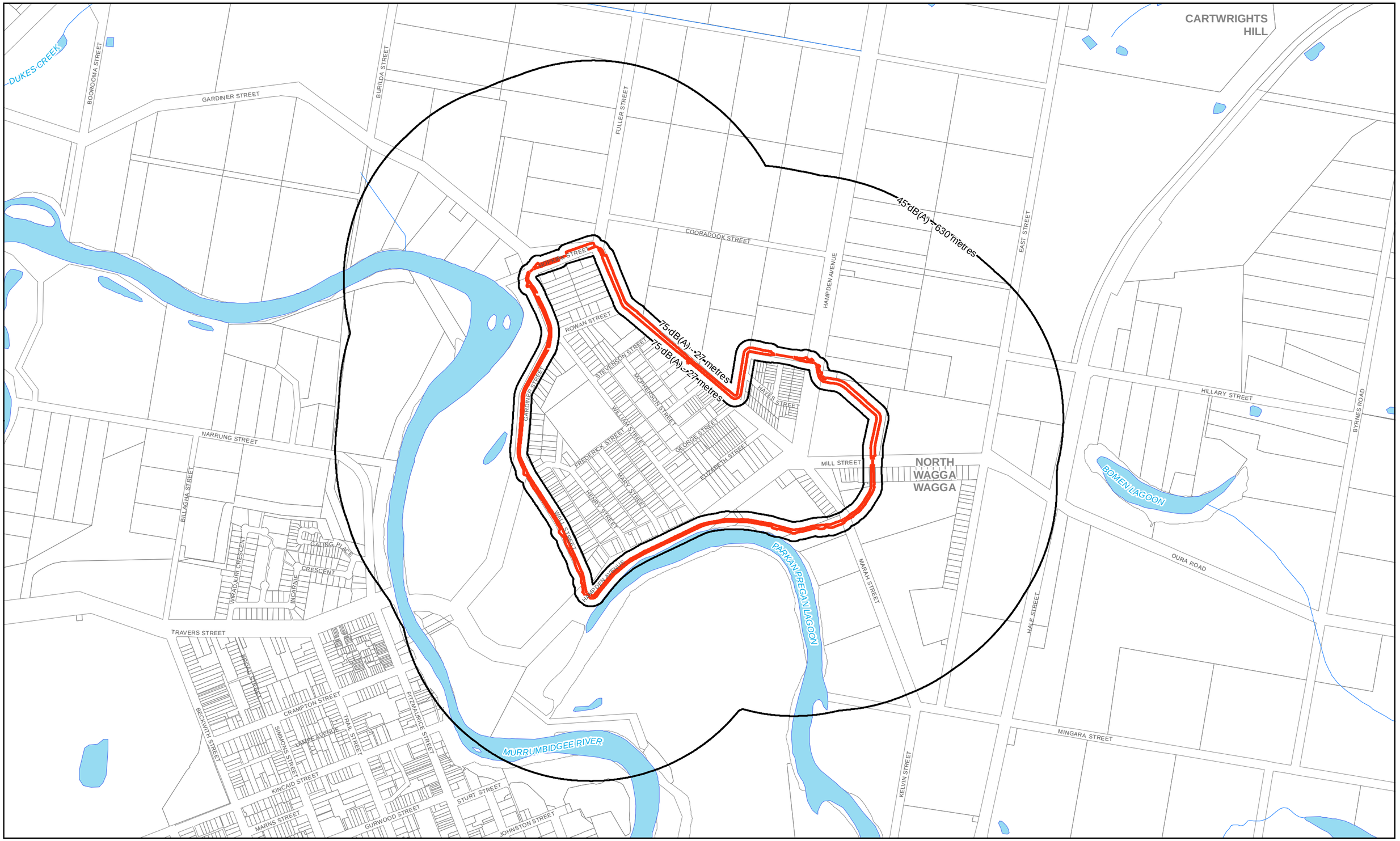
Noise Modelling East Street (Bank 2) Levee
Levee Road Crossings & Road Raising Pavements

Figure 2-8

G:\23\14536\GIS\Maps\Deliverables\23_14536_02_NoiseContours_EastStreetBank_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

Level 3, GHD Tower, 24 Honeysuckle Drive, Newcastle NSW 2300 **T** 61 2 4979 9999 **F** 61 2 4979 9988 **E** ntlmail@ghd.com **W** www.ghd.com.au



1:12,000 Paper Size A3

0 70 140 280 420 560

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number 23-14536
Revision 0
Date 22 Apr 2013

Noise Modelling North Wagga Wagga Levee Embankments

Figure 3-1

G:\23\14536\GIS\Maps\Deliverables\23_14536_03_NoiseContours_NorthWagga_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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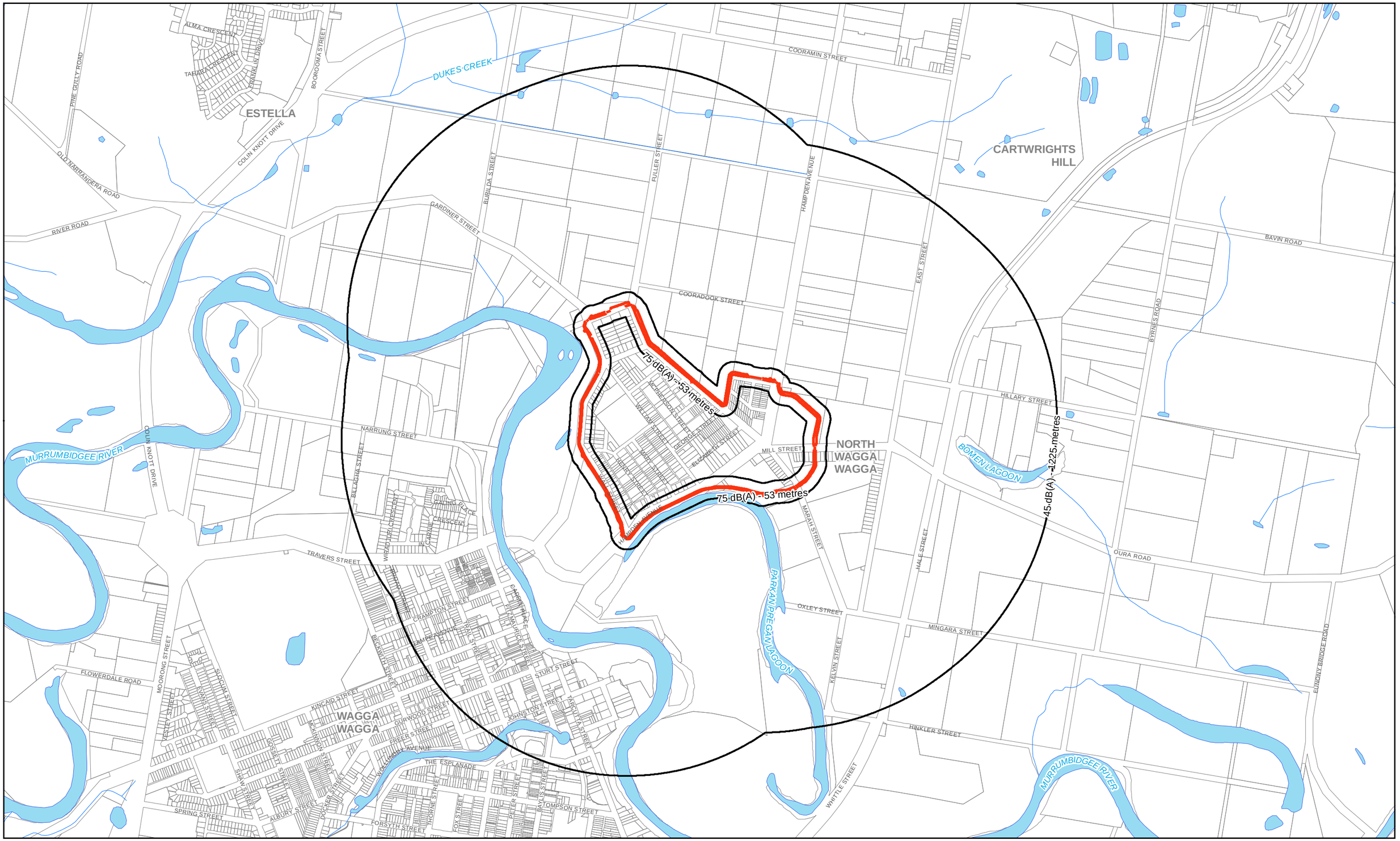

1:18,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling North Wagga Wagga Levee Sheet Pile Walls

Figure 3-2

G:\23\14536\GIS\Maps\Deliverables\23_14536_03_NoiseContours_NorthWagga_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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1:8,000 Paper Size A3

0 45 90 180 270 360

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling North Wagga Wagga Levee Concrete Walls

Figure 3-3

G:\23\14536\GIS\Maps\Deliverables\23_14536_03_NoiseContours_NorthWagga_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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1:9,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling North Wagga Wagga Levee Gabion Walls

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 3-4

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Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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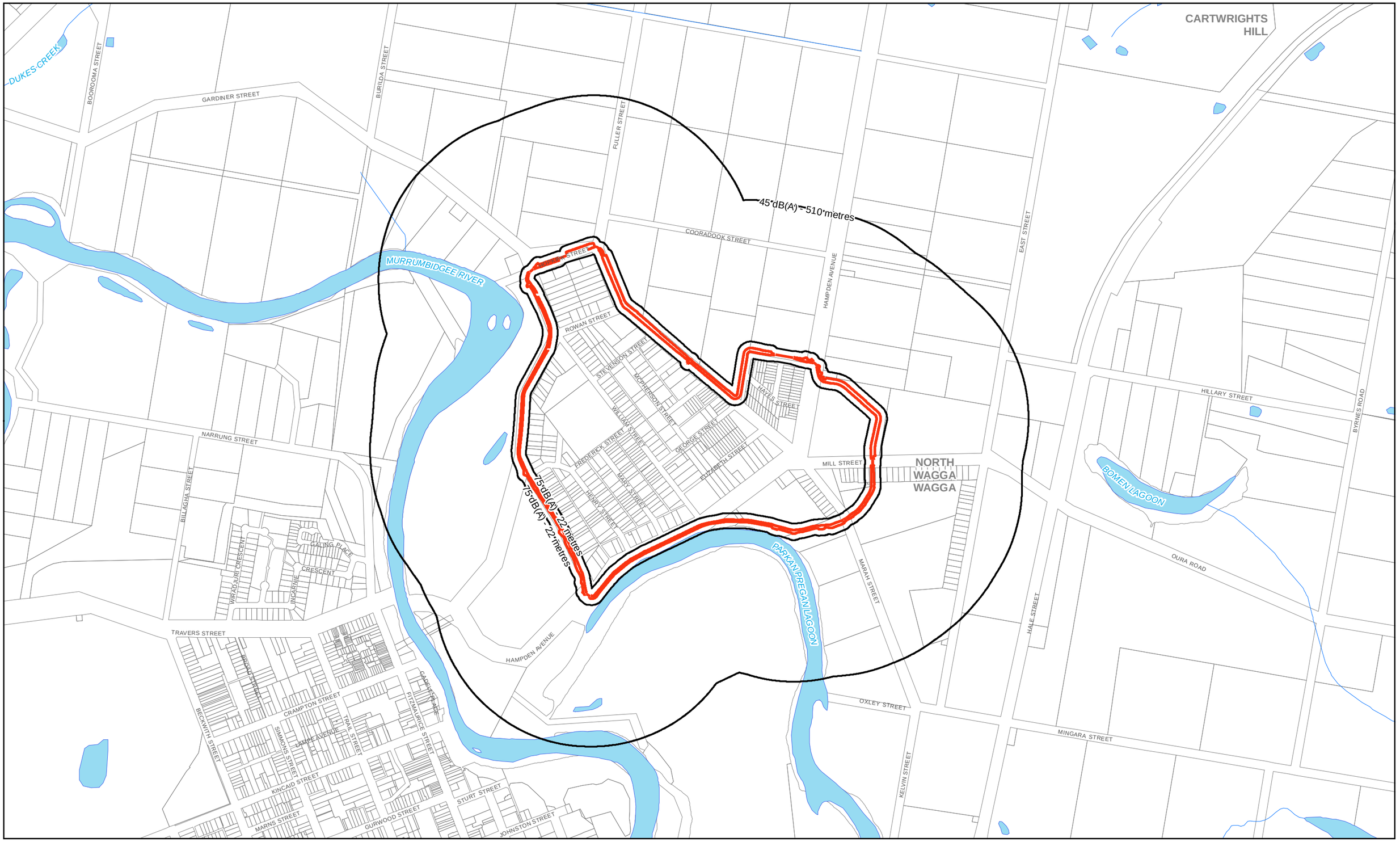

1:12,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling North Wagga Wagga Levee Embankment/Box Culvert Levee

Figure 3-5

G:\23\14536\GIS\Maps\Deliverables\23_14536_03_NoiseContours_NorthWagga_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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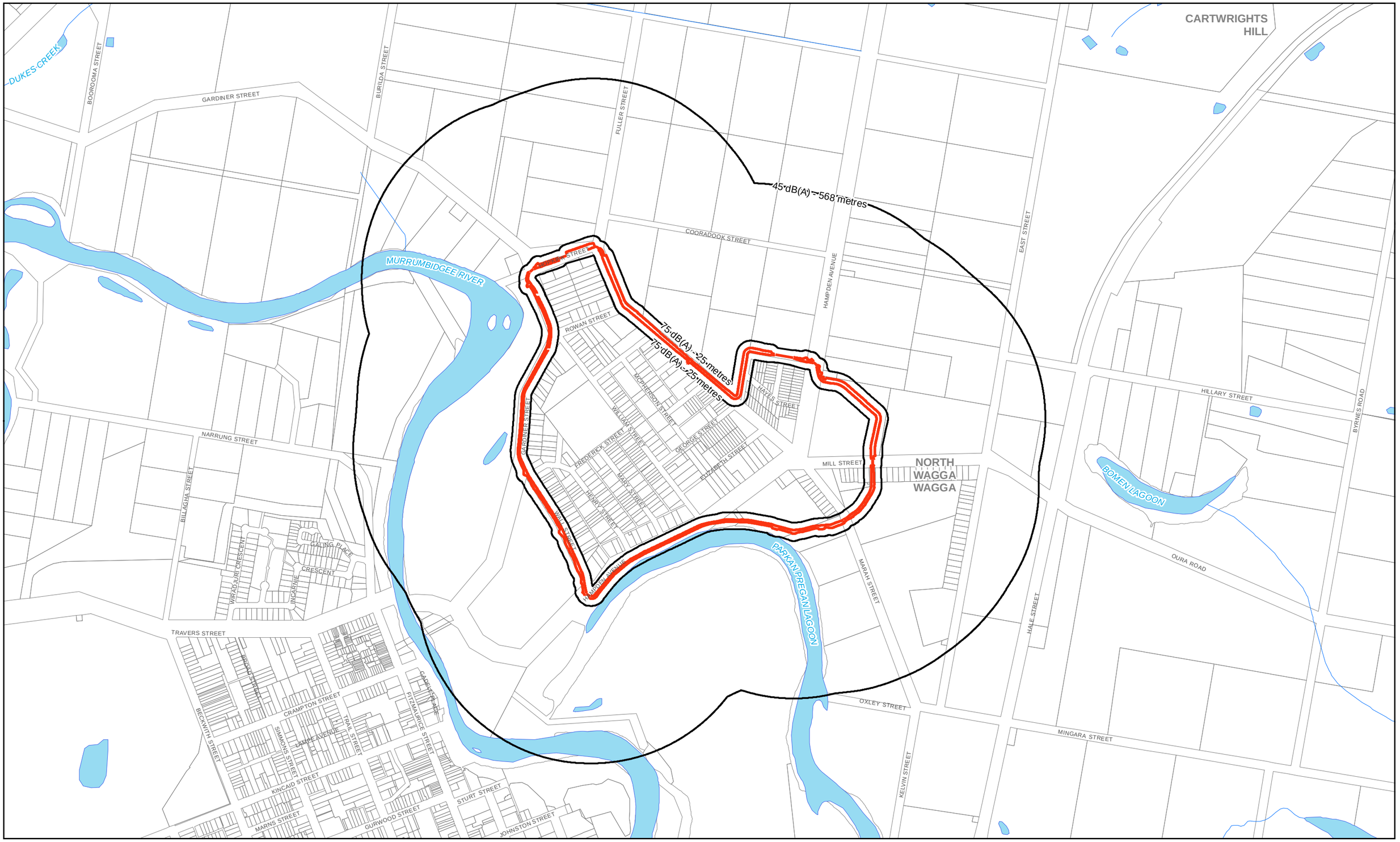

1:12,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling North Wagga Wagga Levee Spillways

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 3-6

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Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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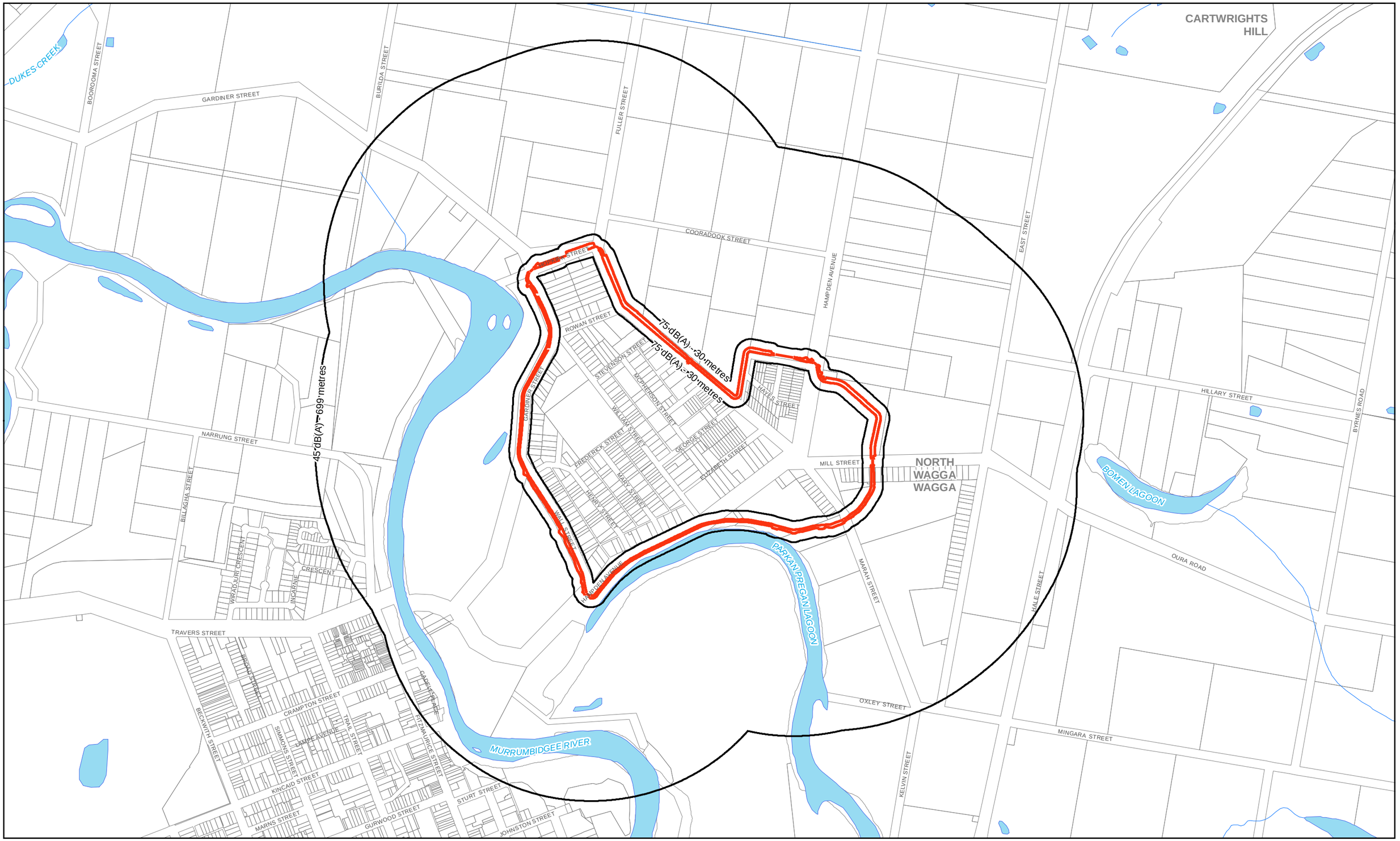

1:12,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling North Wagga Wagga Levee
Levee Road Crossing & Road Raising Embankment

Figure 3-7

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Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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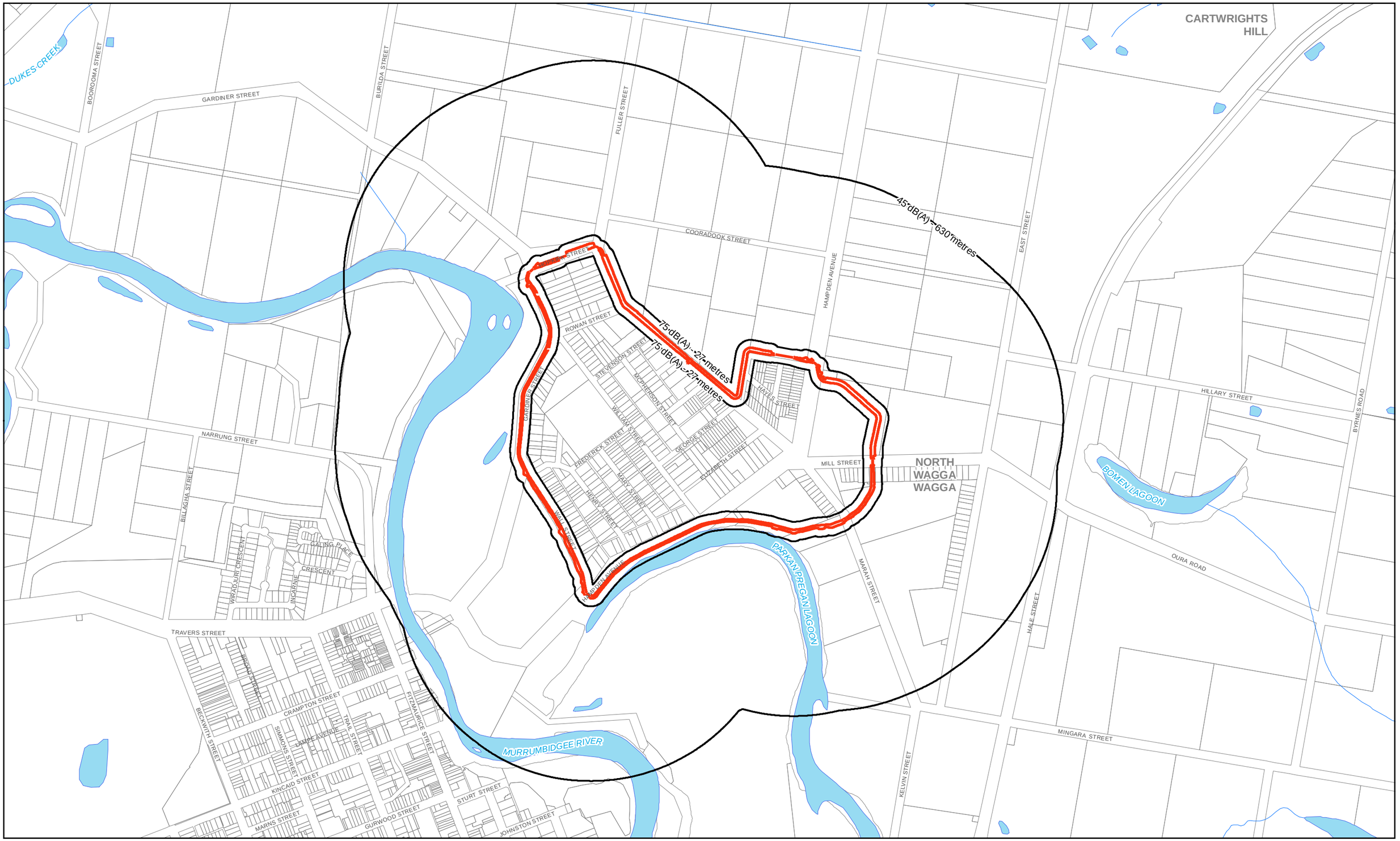

1:12,000 Paper Size A3

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- North Wagga Wagga Levee
- Watercourse
- Waterbody
- Cadastre

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling North Wagga Wagga Levee
Levee Road Crossing & Road Raising Pavement

Figure 3-8

G:\23\14536\GIS\Maps\Deliverables\23_14536_03_NoiseContours_NorthWagga_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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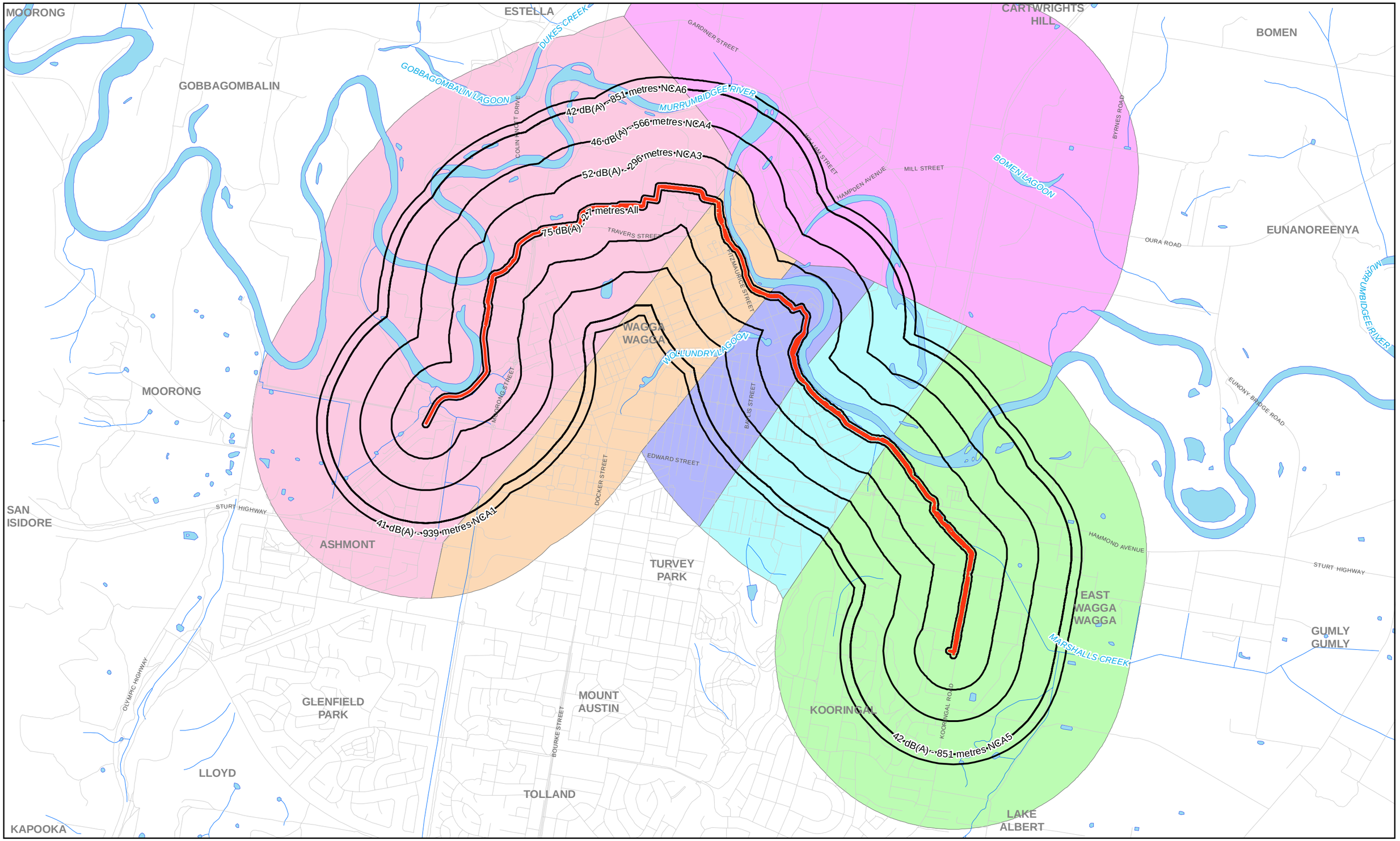

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Main City Levee
- Road
- Watercourse
- Waterbody
- Noise Catchment Area 1
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5
- Noise Catchment Area 6

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling Main City Levee Embankments

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 4-1

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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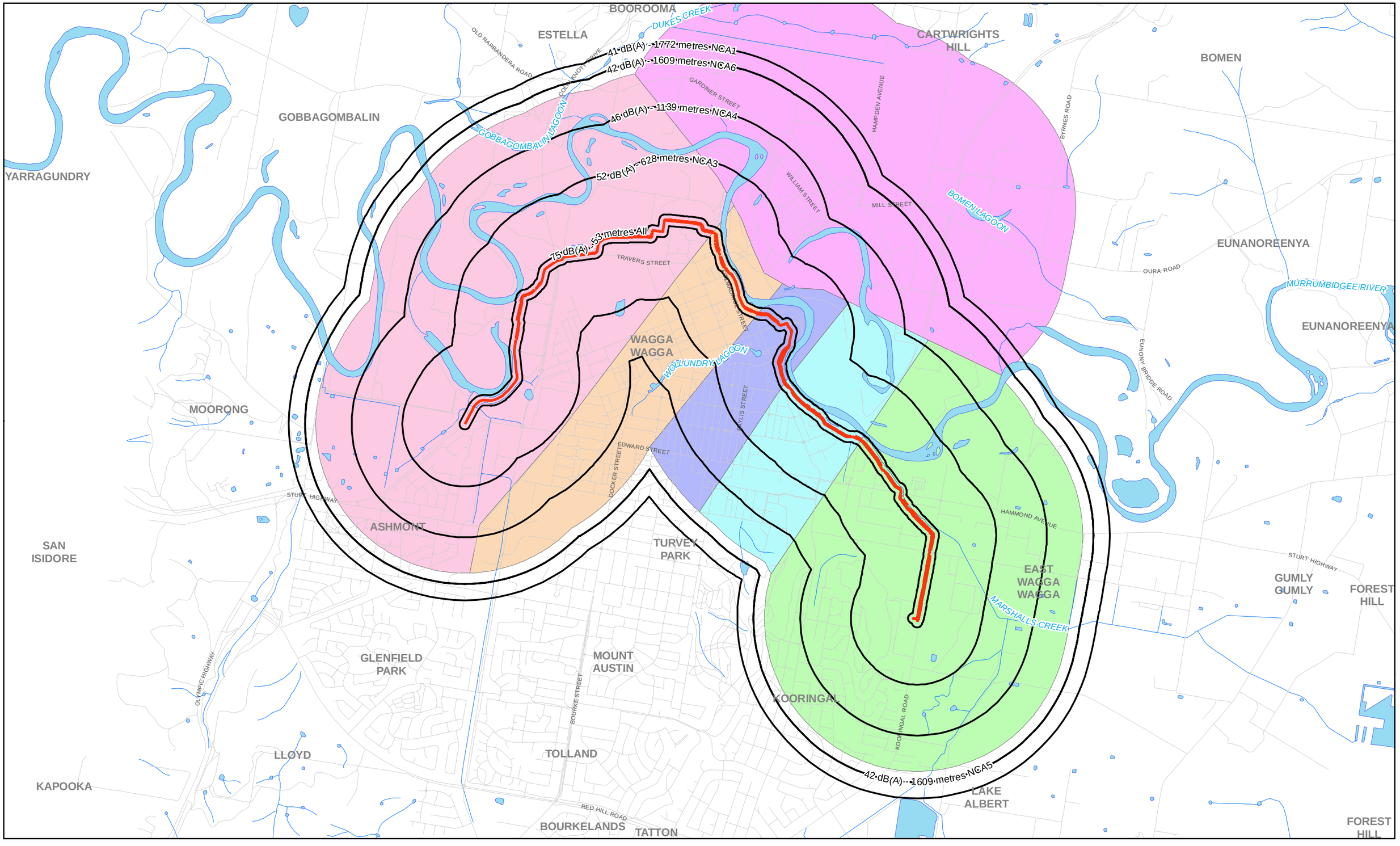

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Main City Levee
- Road
- Watercourse
- Waterbody
- Noise Catchment Area 1
- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5
- Noise Catchment Area 6

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling Main City Levee Sheet Pile Walls

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 4-2

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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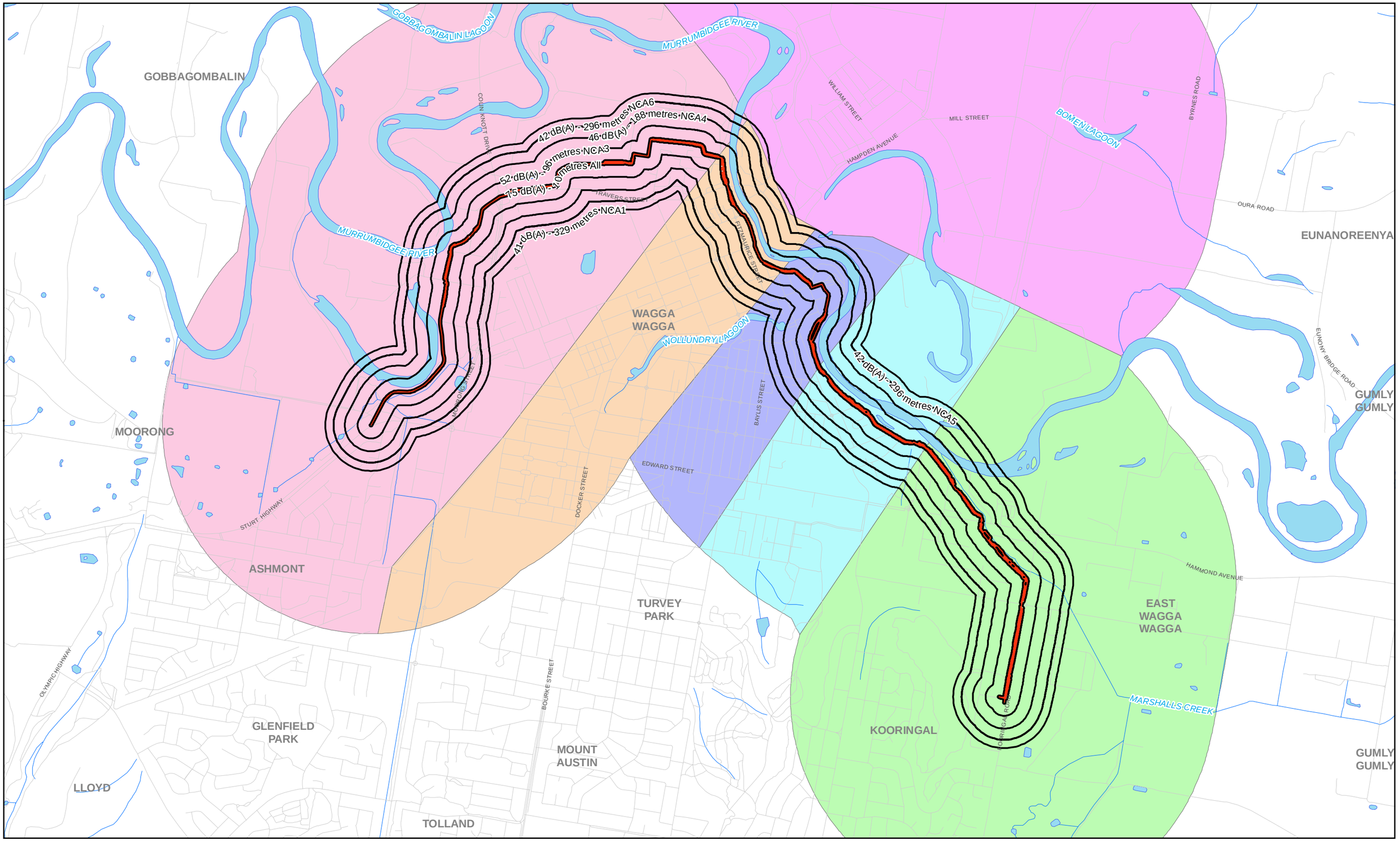

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Main City Levee
- Road
- Watercourse
- Waterbody
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- Noise Catchment Area 2
- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5
- Noise Catchment Area 6

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling Main City Levee Concrete Walls

Figure 4-3

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

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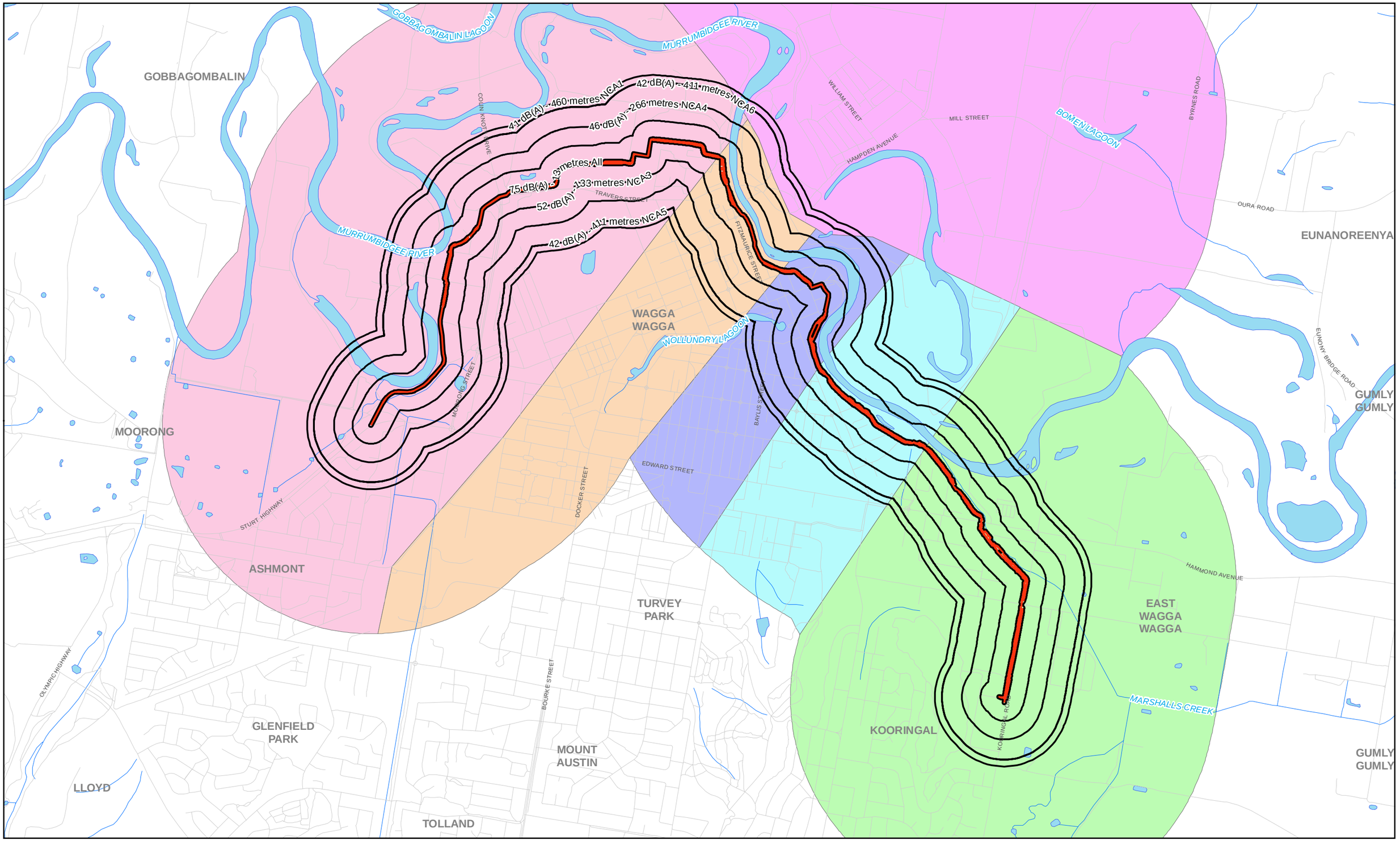

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

- Noise Modeling Contour
- Wagga Wagga Main City Levee
- Road
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- Waterbody
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- Noise Catchment Area 3
- Noise Catchment Area 4
- Noise Catchment Area 5
- Noise Catchment Area 6

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling Main City Levee Gabion Walls

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 4-4

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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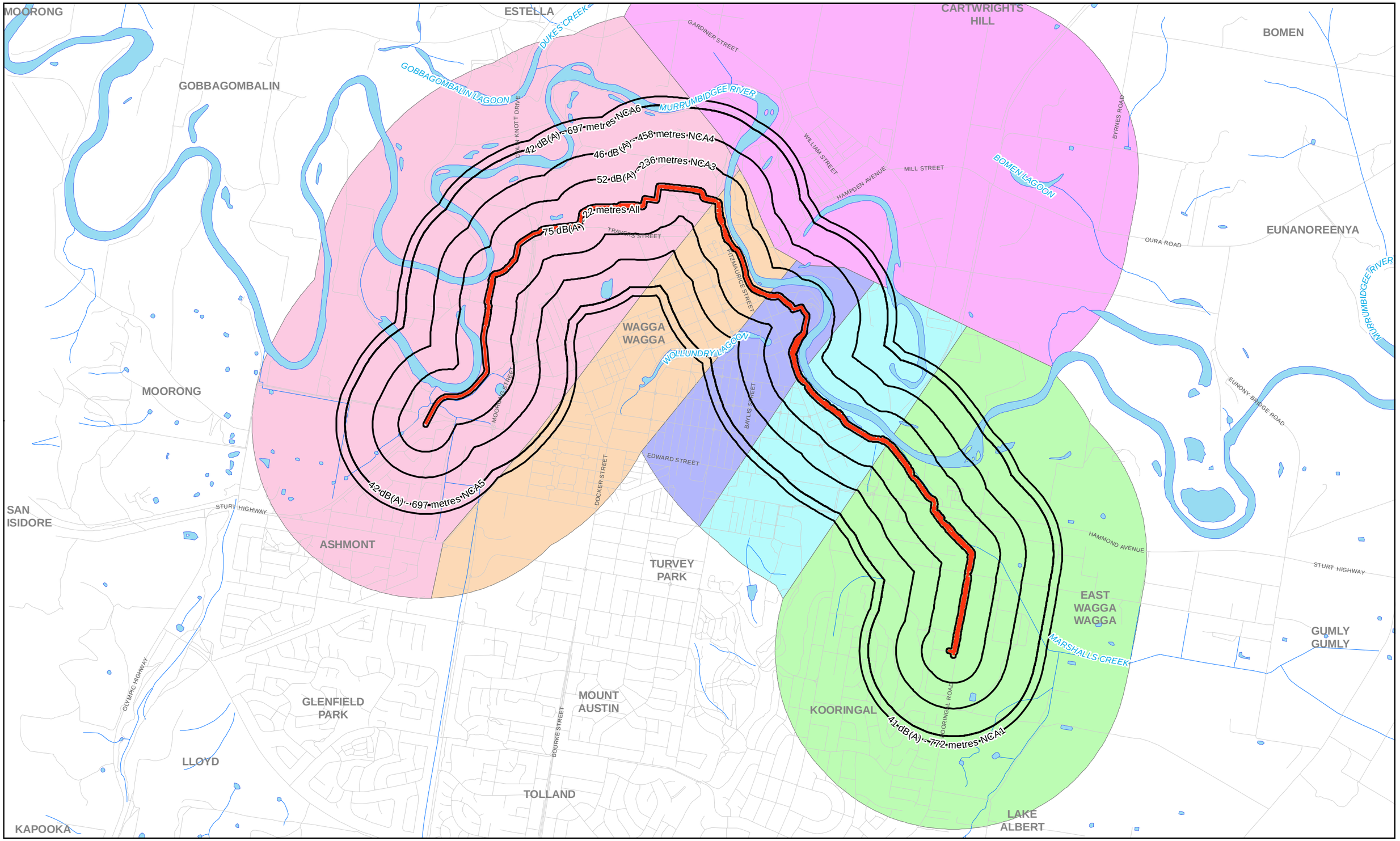

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

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- Watercourse
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- Noise Catchment Area 6

Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling Main City Levee Embankment/Box Culvert Levee

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 4-5

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

Data source: WCC: Levee Works - 2012; LPMA: DCDB - 2012. Created by:mabarnier

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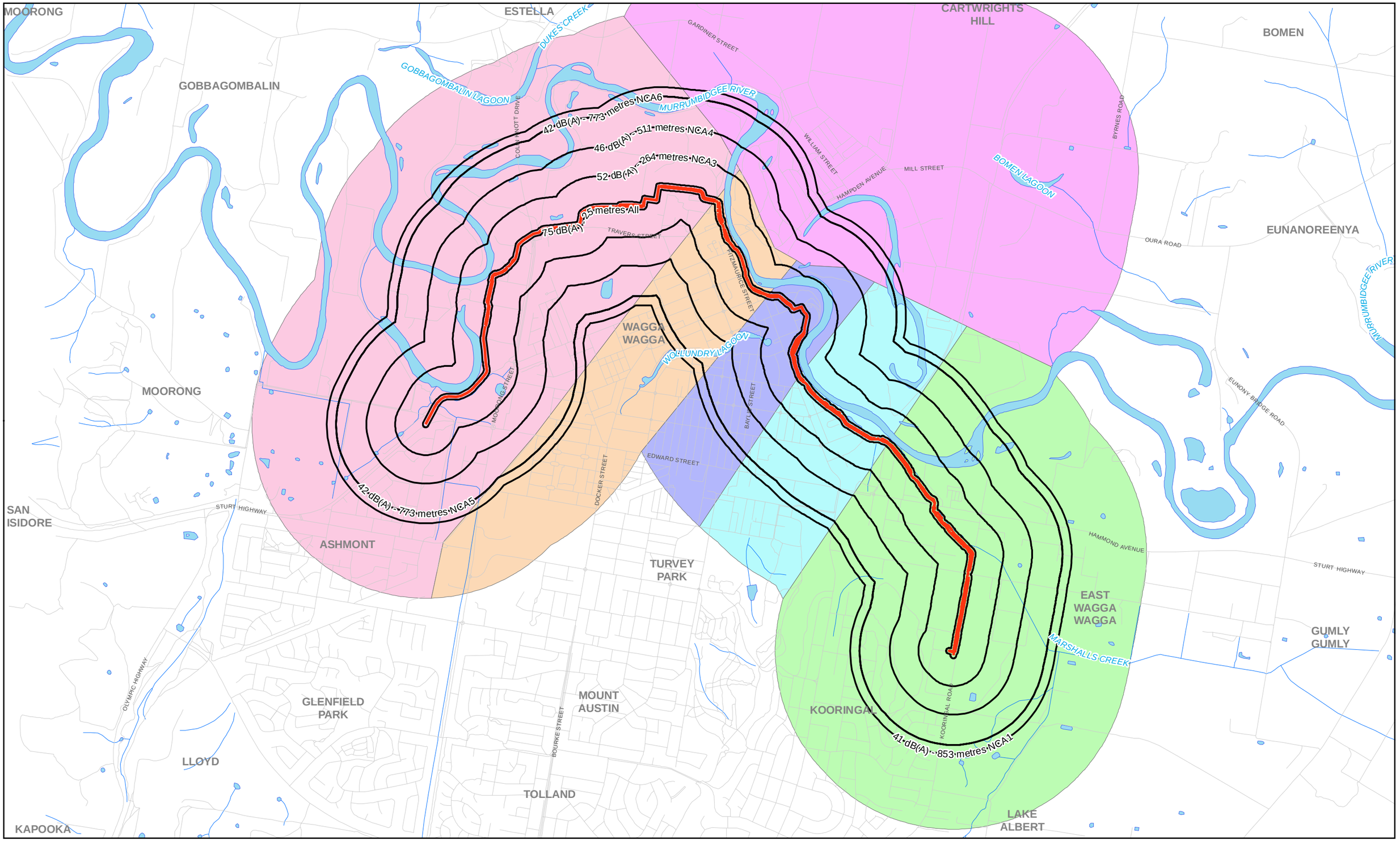

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

N

LEGEND

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Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Noise Modelling Main City Levee Spillways

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Figure 4-6

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

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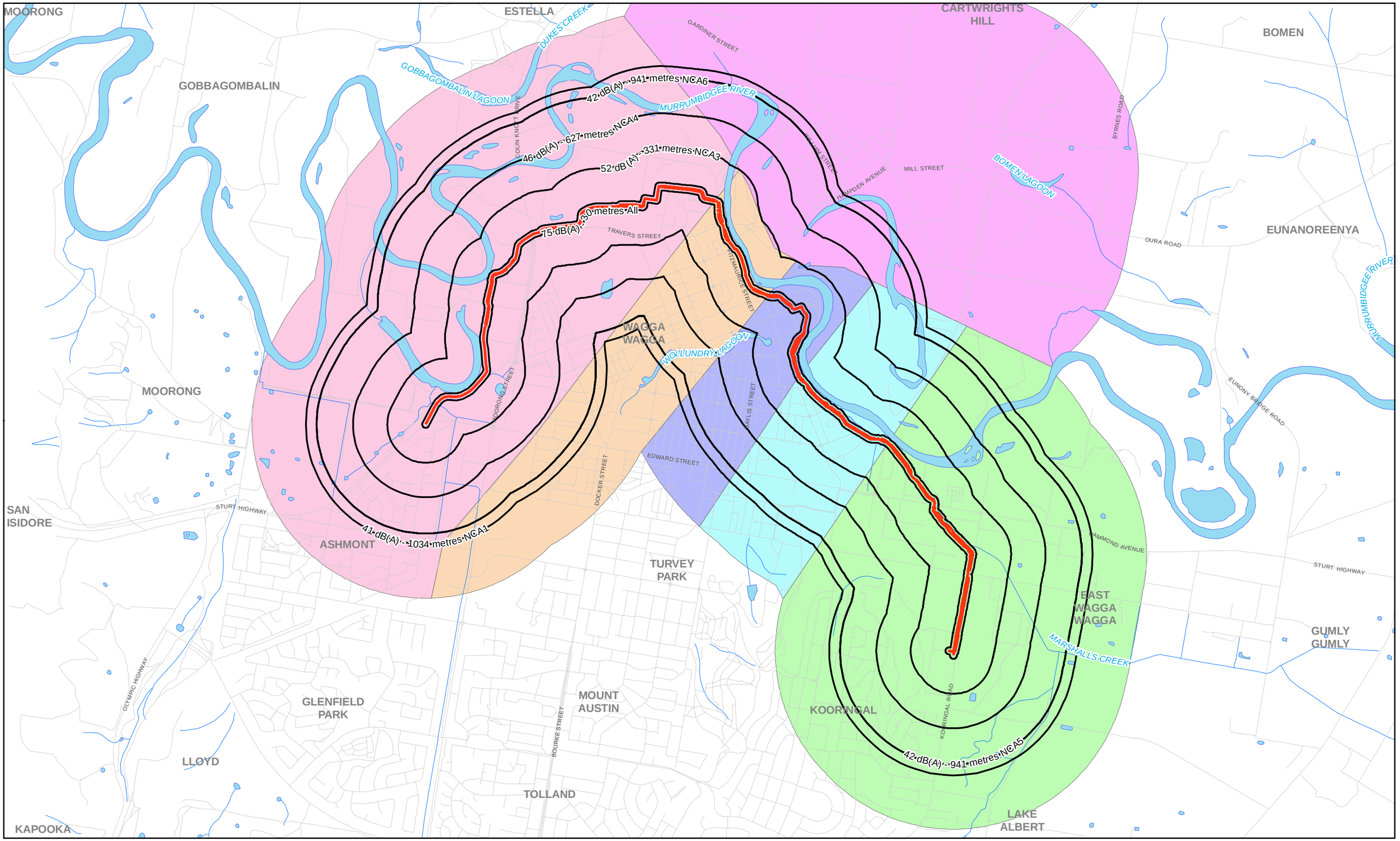

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Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 55

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Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number 23-14536
Revision 0
Date 22 Apr 2013

Noise Modelling Main City Levee
Levee Road Crossing & Road Raising Embankment

Figure 4-7

G:\23\14536\GIS\Maps\Deliverables\23_14536_04_NoiseContours_MainCityLevee_Rev0.mxd

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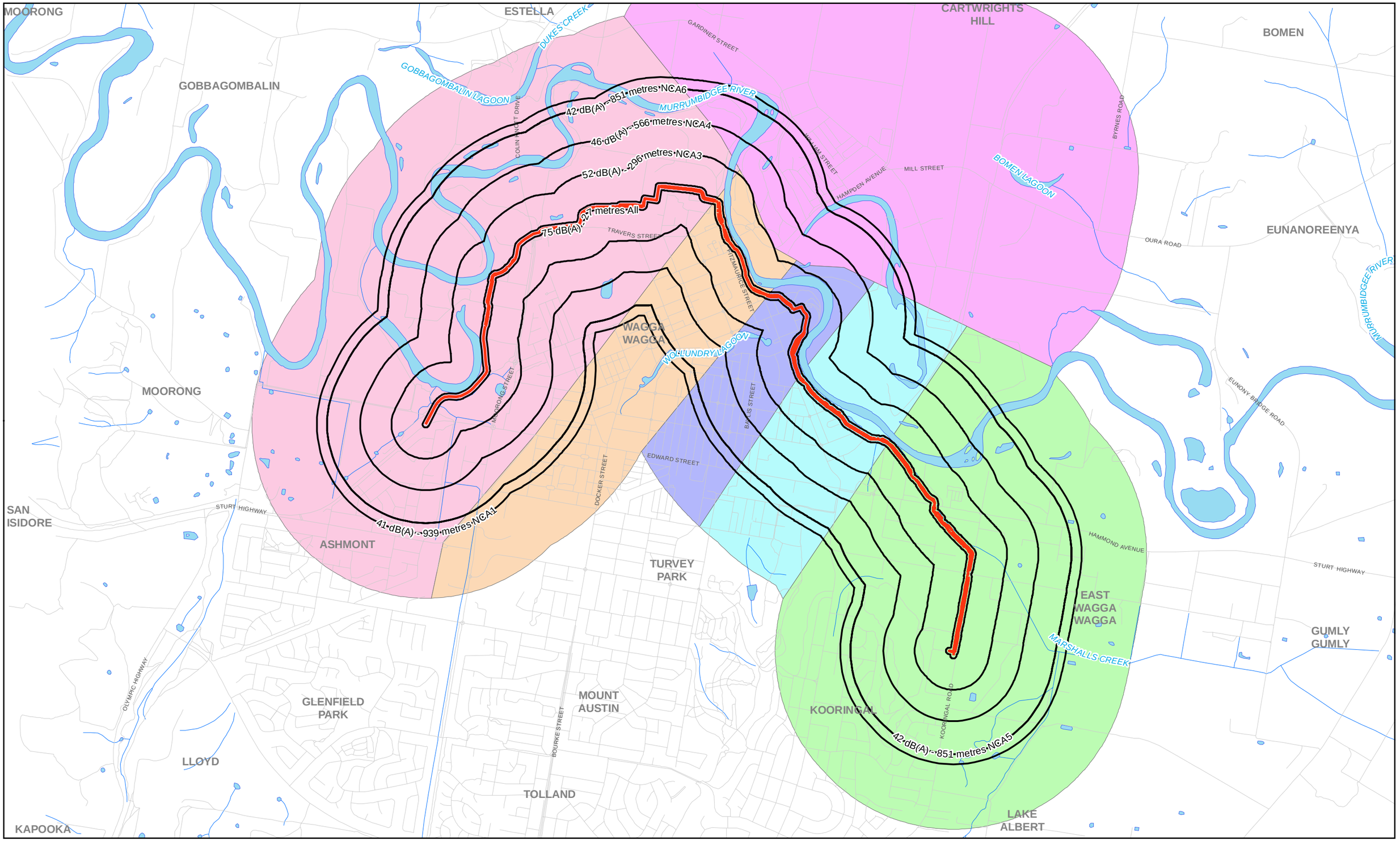

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Metres

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Horizontal Datum: GDA 1994
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Wagga Wagga City Council
Wagga Levee Upgrade - Noise & Vibration

Job Number	23-14536
Revision	0
Date	22 Apr 2013

Noise Modelling Main City Levee
Levee Road Crossing & Road Raising Pavement

Figure 4-8

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Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	L Basutu	V Chavand		S Farrell		23/04/2013

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