Aircraft Noise Assessment

Eco-tourism Project, Williamtown, NSW.

Prepared for: Environmental Property Services Pty Ltd
June 2018
MAC160334RP1

Muller Acoustic Consulting

Document Information

Aircraft Noise Assessment

Eco-tourism Project, Williamtown, NSW

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Environmental Property Services (EPS) on behalf of the Worimi Local Aboriginal Lands Council (WLALC) to prepare an Aircraft Noise Assessment for the proposed Ecotourism Project to be established at Lot 227/DP1097995 Lavis Lane, Williamtown, NSW (the 'project').

This report presents the results, findings and recommendations of the Aircraft Noise Assessment and has been prepared to accompany the project's Development Application (DA) for submission to Port Stephens Council (PSC). A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**. The assessment has been undertaken in general accordance with the following policies and guidelines:

- Australian Standard (AS 2021:2015) Acoustics - Aircraft Noise Intrusion - Building Siting and Construction;
- Port Stephens Council 2010, Port Stephens Aircraft Noise Policy;
- Port Stephens Council 2015, Development Control Plan, Part B7 Williamtown RAAF Base – Aircraft Noise and Safety;
- State Environmental Planning Policy (SEPP) 2007 Development near rail corridors and busy roads – interim guideline (NSW Department of Planning 2007); and
- Australian Standard AS 2107:2016 - Acoustics - Recommended design sound levels and reverberation times for building interiors.

1.1 Background

The proposed project is located at Williamtown, approximately 2.7km south east of the Royal Australian Air Force (RAAF) Williamtown-Newcastle Airport and approximately 8km south west of Salt Ash Air Weapons Range (SAAWR). Four key areas of the project that have been included in this assessment include; visitors centre, accommodation cabins/lodges, the commons building and manager's residence.

It is proposed to construct an ecotourism facility in an area adjacent to Stockton Beach. The proposal is located in the vicinity of flight paths for Williamtown Airport (see **Figure 1**). The site is situated within Australian Noise Exposure Forecast (ANEF) 25-30 noise contours based on the latest available ANEF maps (ie ANEF2025) and is therefore deemed as being 'Conditionally Acceptable' for residential use in accordance with AS 2021:2015 Acoustics – Aircraft noise intrusion – Building siting and construction.

FIGURE 1

SITE PLAN AND ANEF

REF: MAC160334

0 150m

KEY	
NM1	ATTENDED LOCATION
L1	LOGGER LOCATION
	SITE LOCATION

MAC
Muller Acoustic Consulting

*Imagery Source : nearmaps

2 Noise Criteria

Port Stephens Aircraft Noise Policy (PSANP) (Port Stephens Council, 2010) provides Aircraft Noise Exposure Forecasts (ANEFs) contour charts for the RAAF Base at Williamtown and Salt Ash Air Weapons Range (2025 ANEF). The charts provide a single number measure of the noise exposure levels for aircraft within Port Stephens.

When developing the charts, the following factors are considered:

- The intensity, duration, total content and spectrum of audible frequencies in the noise of aircraft take-offs, approaches to landings and reverse thrust after landings; and
- The forecast frequency of aircraft types and movements on the various flight tracks.

Generally, ANEF (and ANEI) charts present 20, 25, 30, 35 and 40 contours. The greater the ANEF contour, the higher the noise exposure. A review of ANEFs from the PSANP (ANEF2025) (**Appendix B**) identifies that the project site lies within the 25-30 ANEF contour.

Table 2.1 of Australian Standard AS 2021:2015 "Acoustics - Aircraft Noise Intrusion - Building Siting and Construction" defines the acceptability of a variety of building types and land uses within varying ANEF categories. A summary of the acceptability of differing building types within various ANEF categories is reproduced from AS 2021:2015 in **Table 1**.

Table 1 Building Site Acceptability Based on ANEF Zones

Building Type	ANEF Zone of Site		
	Acceptable[1]	Conditional[2]	Unacceptable[3]
House, home unit, flat, caravan park	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Note 1: Acceptable. No need for the building to provide specific protection from aircraft noise.

Note 2: Conditional. Buildings within the ANEF zone which has a conditional status are required to comply with internal noise levels appropriate for the intended use of the space.

Note 3: Unacceptable. Building site classified as unacceptable should not normally be considered.

It is noted that Requirement B7.1 and Figure BJ of the Port Stephens Council Development Control Plan (DCP, 2015) identifies that tourist and visitor accommodation development on land within an ANEF contour of 25-30 is conditionally acceptable, but must satisfy the indoor design criteria outlined in AS 2021:2015.

The recommended indoor design sound levels (effective maximum levels) for various areas of residential dwellings are provided in Section 3 of AS 2021:2015 and are reproduced **Table 2.**

Table 2 Average Maximum – Indoor Design Sound Levels – Hotel, Motel, Hostel[1]

Area of Occupancy	Indoor Design Sound Level
Relaxing and Sleeping Areas	55dBA
Social Activities	70dBA
Service Activities, etc	75dBA

Note 1: Reproduced from Figure BK of the Port Stephens Council Development Control Plan (DCP, 2015).

3 Noise Assessment

3.1 Unattended Noise Monitoring Assessment

Unattended noise monitoring was completed at the western boundary of the project site between Monday 30 April 2018 to Sunday 6 May 2018 to quantify the noise environment and the influence of aircraft noise.

Unattended noise monitoring was conducted using a SVANTEK 958 Type 1 sound analyser, programmed to collect samples at 15-minute intervals with 'Fast' time weighting and 'A' frequency weighting. The analyser was calibrated before and after the monitoring period with no drift in calibration noted. Monitoring was conducted in general accordance with the procedures described in Australian Standard AS 1055, 1997 Acoustics - Description and Measurement of Environmental Noise. Data affected by adverse meteorological conditions has been excluded from the results in accordance with methodologies provided in the NPI.

The results of long-term unattended monitoring are provided in **Table 3**. **Appendix C** presents the noise logging charts for the assessment period.

Table 3 Noise Logging Results

Measurement Location	Measured Background Noise Level, LA_{90}, dBA			Measured LA_{eq}, dBA		
	Day	Evening	Night	Day	Evening	Night
L1	30	32	34	63	61	43

Note: Excludes periods of wind or rain affected data, meteorological data obtained from the Bureau of Meteorology at Williamtown RAAF (32.7939°S 151.8364°E 8m AMSL).

Note: Monday to Saturday: Day 7am to 6pm; Evening 6pm to 10pm; Night the remaining periods. On Sundays and Public Holidays, Day 8am to 6pm; Evening 6pm to 10pm; Night the remaining periods.

3.2 Attended Noise Monitoring Assessment

To quantify ambient aircraft noise contributions, and to supplement unattended noise measurements two operator-attended noise measurements of 15 minutes in duration were conducted at the subject site on Monday 30 April 2018 and 8 May 2018 using a Type 1, SVAN971 sound level meter. The noise surveys were conducted at the monitoring location in accordance with the procedures described in Australian Standard AS 1055:1997, "Acoustics - Description and Measurement of Environmental Noise". Instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2004- Electroacoustics - Sound level meters – Specifications, the drift in calibration did not exceed ±0.5dBA. Weather conditions at the time of the survey were calm and clear, and no rainfall.

Observations on-site identified the surrounding locality typical of a suburban and semi-rural environment with distant traffic noise, quad bike and aircraft audible. The results of the attended noise measurement and observations are summarised in **Table 4**.

Table 4 Operator-Attended Noise Survey Results

Location	Meteorology	Date/time	Primary Noise Descriptor (dBA re 20 µPa)			Description and SPL, dBA
			L_{Amax}	L_{Aeq}	L_{A90}	
NM1	21°C Dir: NE WS: 1.2/s	30/04/18 12:04	99	73	42	Birds 46 Traffic 65 to 86 Aircraft Noise 65 to 99
NM1	24°C Dir: NW WS: 0.5/s	8/05/18 11:31	94	76	41	Birds 42 – 46 Wind in trees 40 to 48 Quad bikes <65 to 78 Aircraft Noise 60 to 94

3.3 Methodology

Aircraft noise exposure levels were determined for the project site in accordance with AS 2021:2015.

Following the analysis of the ANEFs and flight paths, the RAAF Williamtown runway was identified as the main contributor to noise emissions at the project site. The distance coordinates derived as per Section 3.1.3 of AS 2021:2015 for the project with respect to the runway are summarised in **Table 5**.

Table 5 Relevant Distance Coordinates – Project Site, Williamtown

Distance Coordinate	RAAF Williamtown Runway
DS	295
DL/DT	3100

A review of all aircraft types using the runway for arrivals and departures has been completed. Taking into consideration the distances presented in **Table 5** and the methodologies for determining Aircraft Noise Levels (ANL) at the project site (as per Section 3.1.4 of AS 2021:2015), the aircraft type with the highest noise level was F/A 18 Hornet (afterburner assisted). Based on calculations Airservices Australia (2001) noise level data, the ANL for this aircraft at the project site was calculated to be 90dBA. The calculated ANL is generally consistent with in-field measured aircraft noise level contributions.

It should be noted that the noise levels for aircraft tabulated in AS 2021:2015 or Airservices Australia are average maximum levels and that a percentage of aircraft movements may produce noise levels that exceed the derived level as observed when compared with attended noise monitoring information and calculated ANLs. Furthermore, due to the variability and subjective responses to aircraft and other noises, it should be noted that this assessment and the design recommendations may not protect the most sensitive people.

3.4 Aircraft Noise Reduction

To quantify the building construction requirements for the project, indoor design sound levels in **Table 6** have been used to derive the Aircraft Noise Reduction (ANR) based on the measured average maximum value of 90dBA. This provides a small level of conservativeness to noise reduction calculations and improves the internal acoustic amenity of the proposed dwelling. **Table 6** presents the ANR values for this project.

Table 6 Aircraft Noise Reduction

Occupancy Type	Indoor Design Level dBA	Aircraft Noise Reduction dBA
Relaxing and Sleeping Areas	55	35

Technical note: As the calculated ANR for the project assumes that the windows and doors are closed to achieve internal criteria, requirements of the Building Code of Australia and AS 1668.2-2012 pertaining to provision of natural ventilation should be considered.

3.5 Required Acoustic Attenuation

Design plans for the project were supplied by EPS and Derive Architecture and Design (**Appendix D**). The minimum sound transmission index (Rw) based on each building element has been calculated to meet the relevant AS 2021:2015 internal criteria. The calculated minimum Rw values for each key building element for the project are summarised in **Table 7**.

Table 7 Calculated Weighted Sound Reduction Index Rw

Room	External Walls	Entry Doors	Glazing	Roof
Visitors centre	42	N/A	38	43
Accommodation cabins	41	33	35	40
Managers residence	41	33	35	40

3.5.1 Noise Controls

State Environmental Planning Policy (SEPP) 2007 *Development near rail corridors and busy roads – interim guideline* (NSW Department of Planning 2007) provides guidance on effective acoustic treatments of buildings and provides feasible and reasonable measures for construction which provides flexibility in the selection of measures to achieve required sound reduction indices (Rw).

Appendix C of SEPP 2007 provides standard acoustic treatment methods for residences based on noise control categories. These categories are defined by the Rw required and are reproduced in **Table 8**. **Appendix E** reproduces the Acoustic Treatments outlined in the Guideline.

Table 8 Acoustic Performance of Building Elements

Category of Noise Control Treatment	Rw of building elements (minimum assumed)				
	Frontage facade	Entry Doors	Windows / sliding doors	Roof	Floor
Category 1	38	28	24	40	29
Category 2	45	30	27	43	29
Category 3	52	33	32	48	50
Category 4	55	33	35	52	50
Category 5	55	40	43	55	50

Table 9 provides an indicative summary of building elements and minimum Category required to meet the associated attenuation levels. It is noted that alternative combinations of materials to those presented in the Guideline (Appendix E) may be adopted as long as they provide equivalent levels of attenuation.

Table 9 Noise Attenuation Category Recommendations

Building	External Walls	Entry Doors	Glazing	Roof
Accommodation cabins	Cat 2	Cat 3	Cat 4	Cat 2
Managers residence	Cat 3	Cat 3	Cat 4	Cat 2

3.5.2 Visitors Centre

For the visitors centre, construction materials proposed include 130mm precast concrete walls lined with 9mm CFC sheeting and R2 insulation. Windows on the centre are proposed to be constructed of 10.38mm viridian hush. The roof is proposed to be constructed of a 140mm concrete slab. The attenuation provided by these elements (or equivalent) are anticipated to be satisfactory to meet relevant criteria.

3.5.3 Accommodation Cabins and Managers Residence

The accommodation cabins and managers residence are proposed to be constructed of hard wood cladding, R2.5 sound screen batts and 15mm interior plywood. It is recommended that the external elements of these areas be reviewed to contain meet 41Rw which may be achieved by adopting 19mm hardwood cladding (external) inclusion of two layers of 10mm plywood (or equivalent to be 20mm thickness in total in place of the 15mm ply).

3.5.4 Commons Area

It is understood the commons area will contain an overhead canopy, and is likely the noise levels within this area on occasion will exceed the relevant criteria of 70dBA. The likelihood that the use of this space in coincidence with peak aircraft times would be infrequent, notwithstanding, it is recommended that a management plan be prepared to plan events outside of peak aircraft movement periods.

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4 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed an assessment of potential aircraft noise for the proposed Ecotourism Project to be established at Lot 227/DP1097995 Lavis Lane, Williamtown NSW.

The assessment has quantified the RAAF Base at Williamtown and Salt Ash Air Weapons Range aircraft noise emissions to the project site. The results of the assessment demonstrate that for relevant internal noise criteria to be satisfied, key building elements should be constructed of materials that provide an equivalent level of acoustic performance to the Rw values outlined in this report.

Furthermore, the recommended indoor design levels would not be achieved unless all windows and doors are closed. Therefore, requirements of the Building Code of Australia and AS 1668.2:2012 pertaining to provision of natural ventilation should be considered.

For the commons area, it is recommended that a management plan be prepared so that measures are in place to avoid use of the commons area during peak aircraft movements.

Based on the Noise Assessment results, it is recommended Council approve the project based on the noise attenuation requirements (and attached proposed plans) provided in this report.

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Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

Table A1 Glossary of Terms

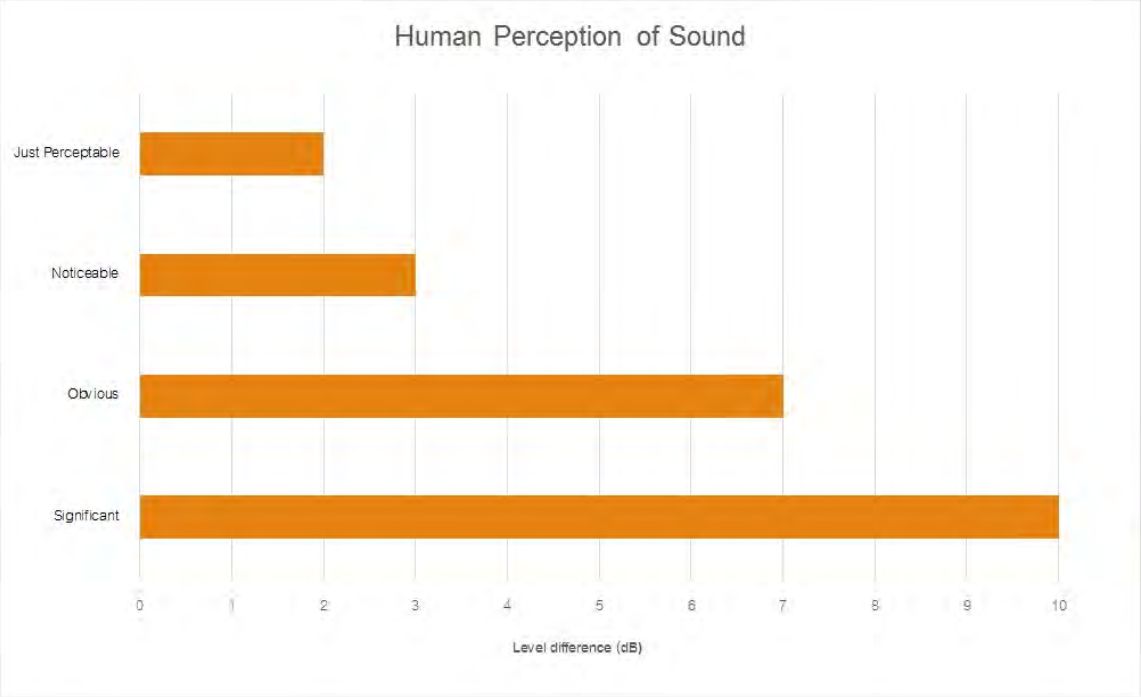
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by : = 10.log10 (W/Wo) Where : W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA

Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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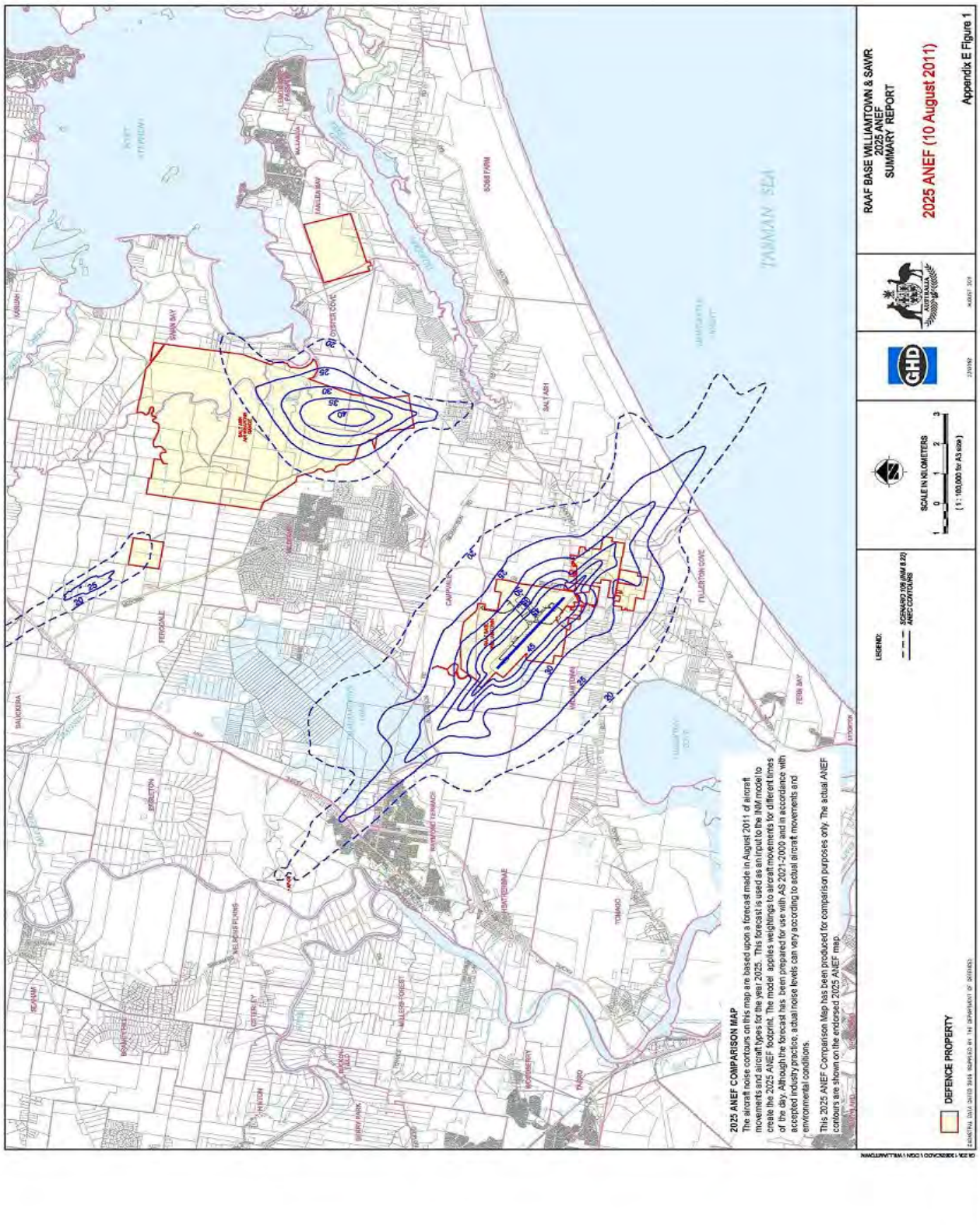
Appendix B – ANEF Contours

Part 6: Reference material

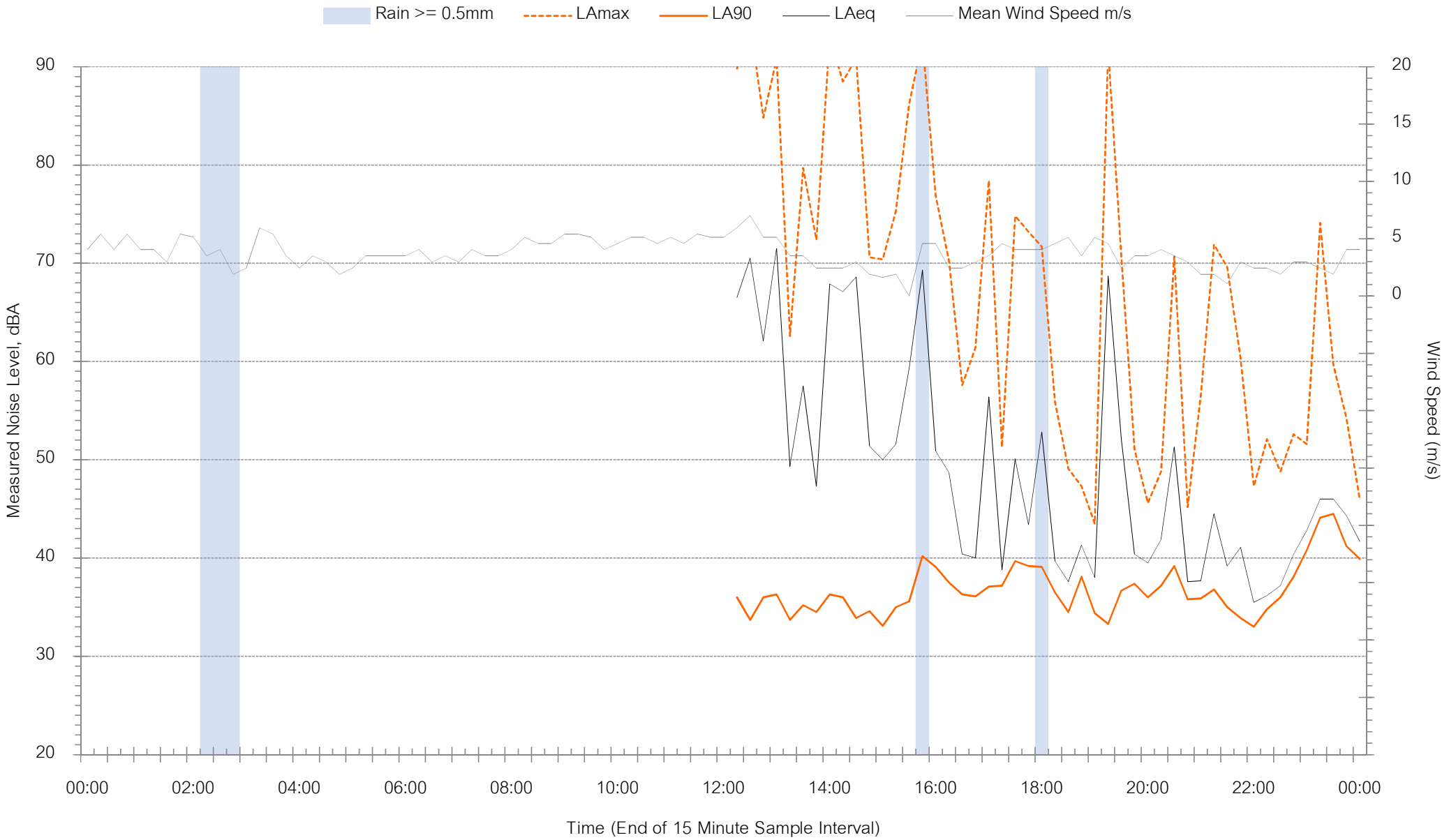
Appendix 1: RAAF Base Williamtown & Salt Ash Weapons Range 2025 ANEF map



Appendix C – Noise Logging Charts

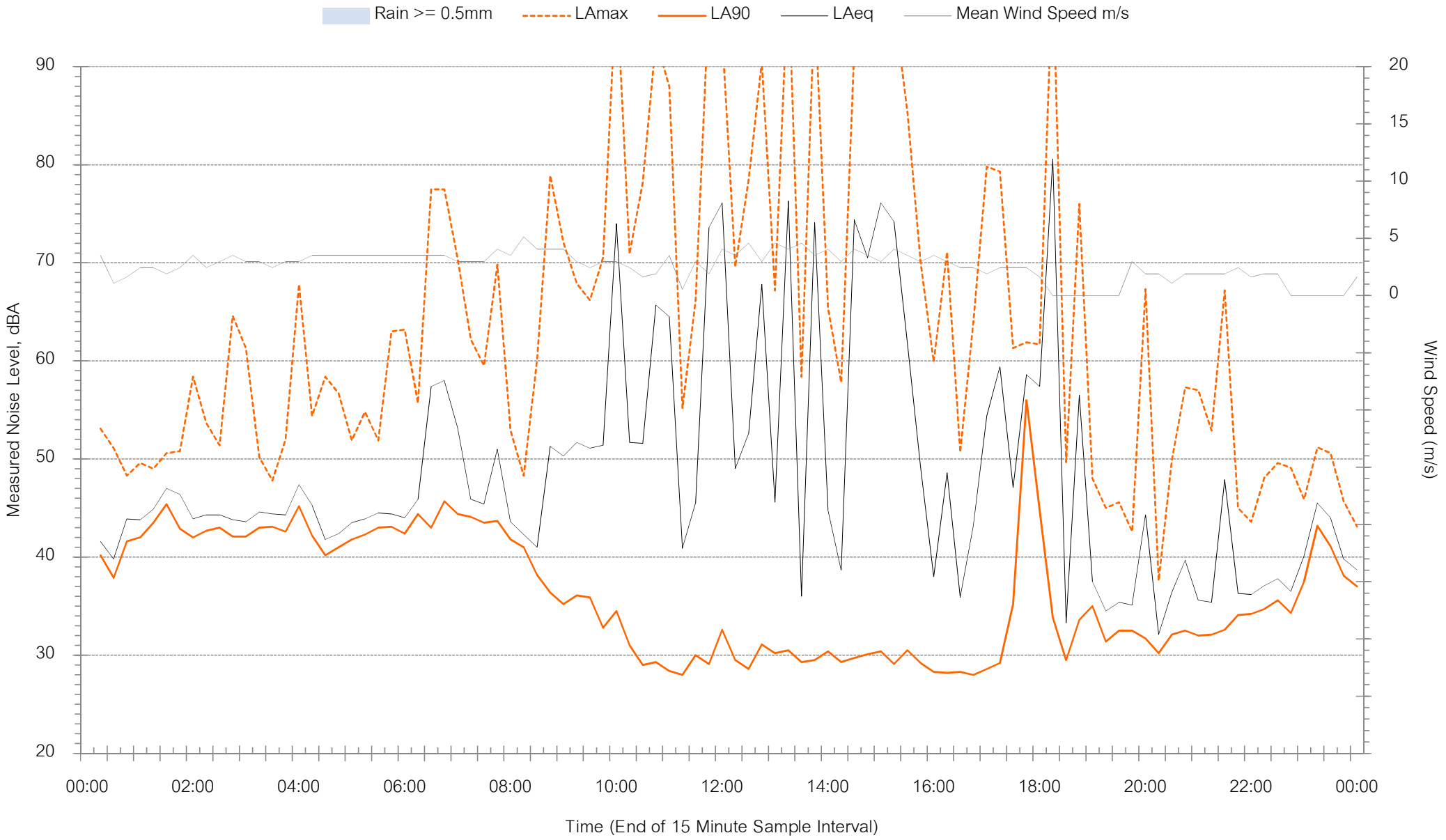
Background Noise Levels

Lavis Lane, Salt Ash - Monday 30 April 2018



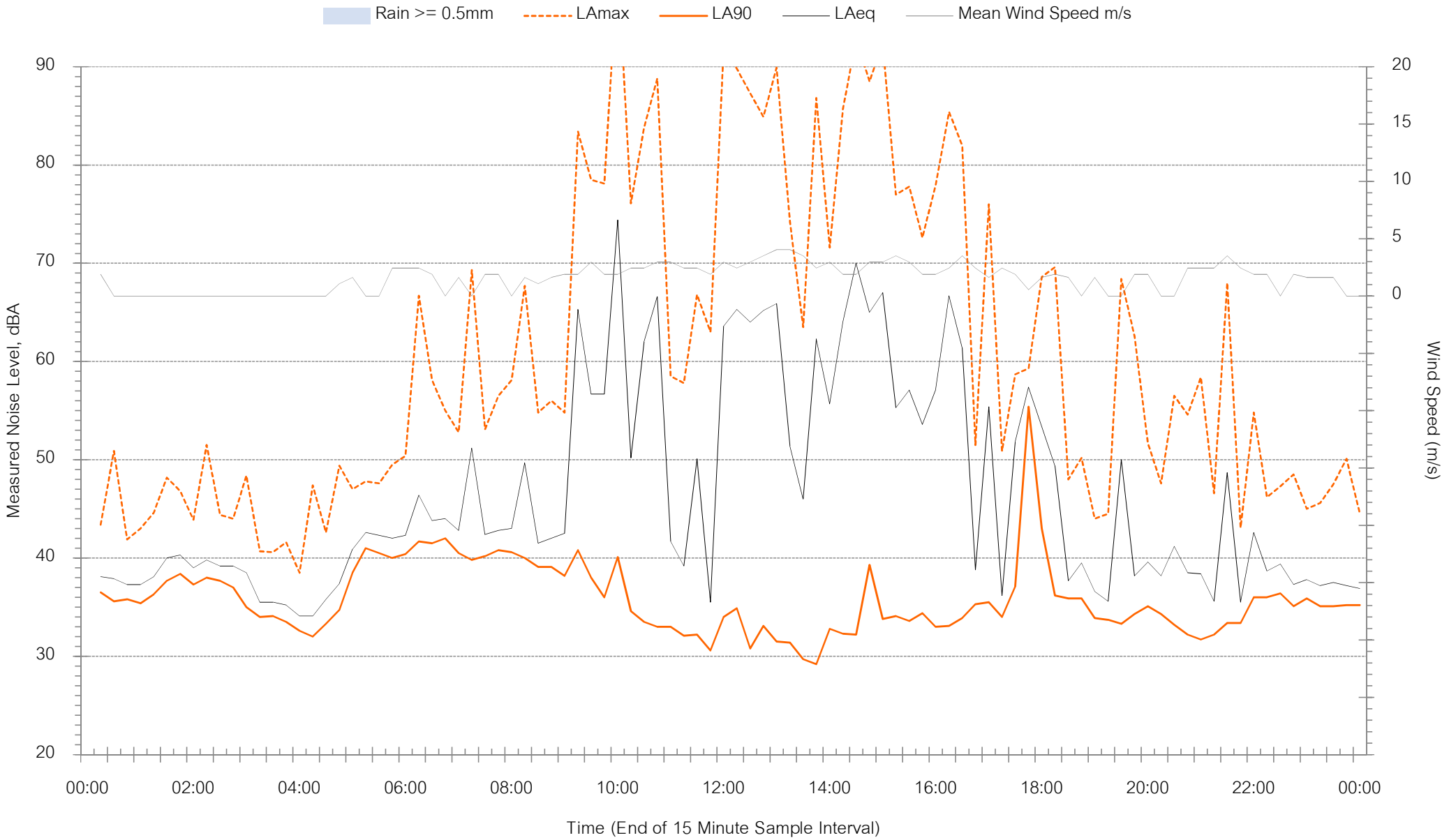
Background Noise Levels

Lavis Lane, Salt Ash - Tuesday 1 May 2018



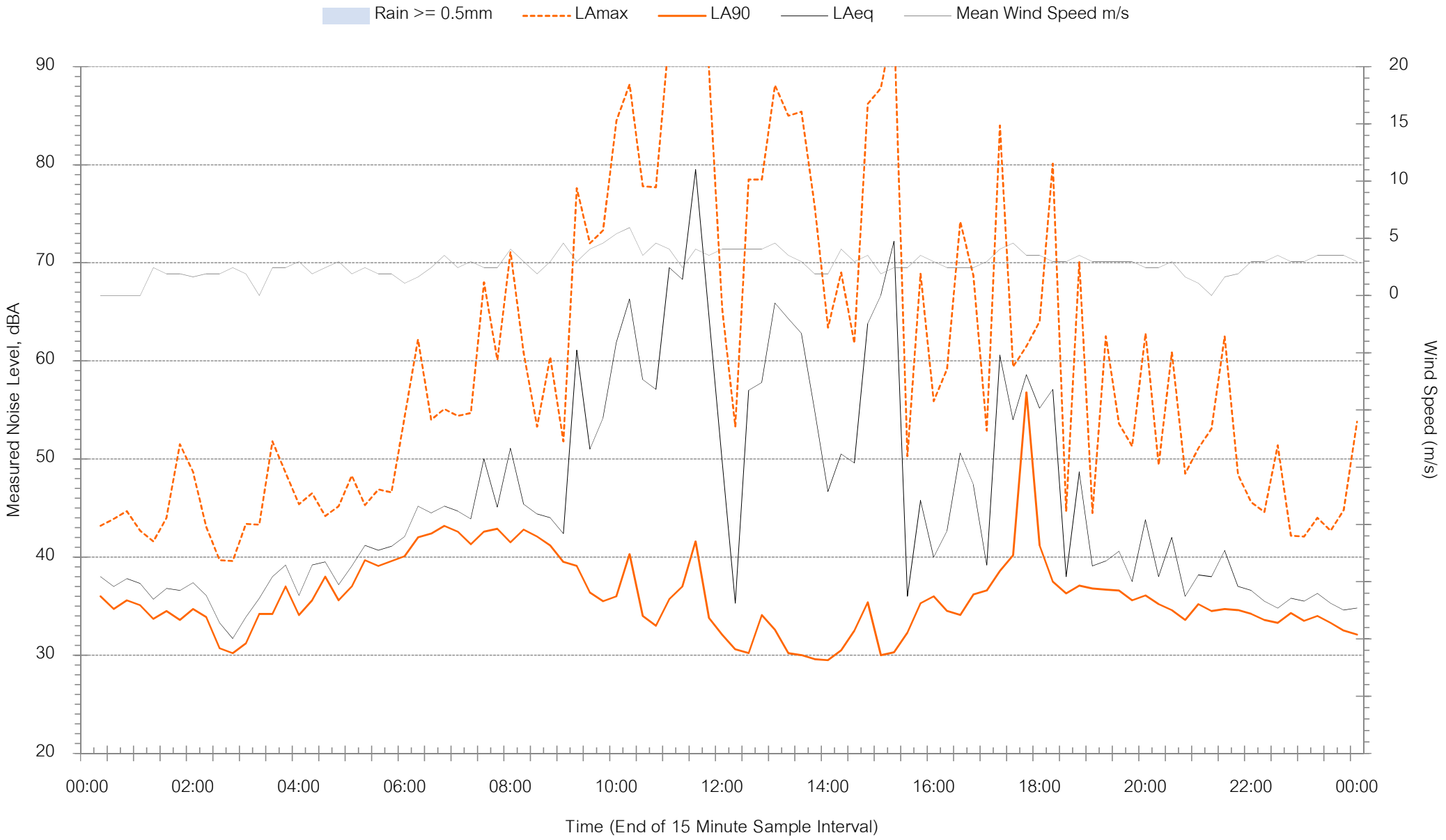
Background Noise Levels

Lavis Lane, Salt Ash - Wednesday 2 May 2018



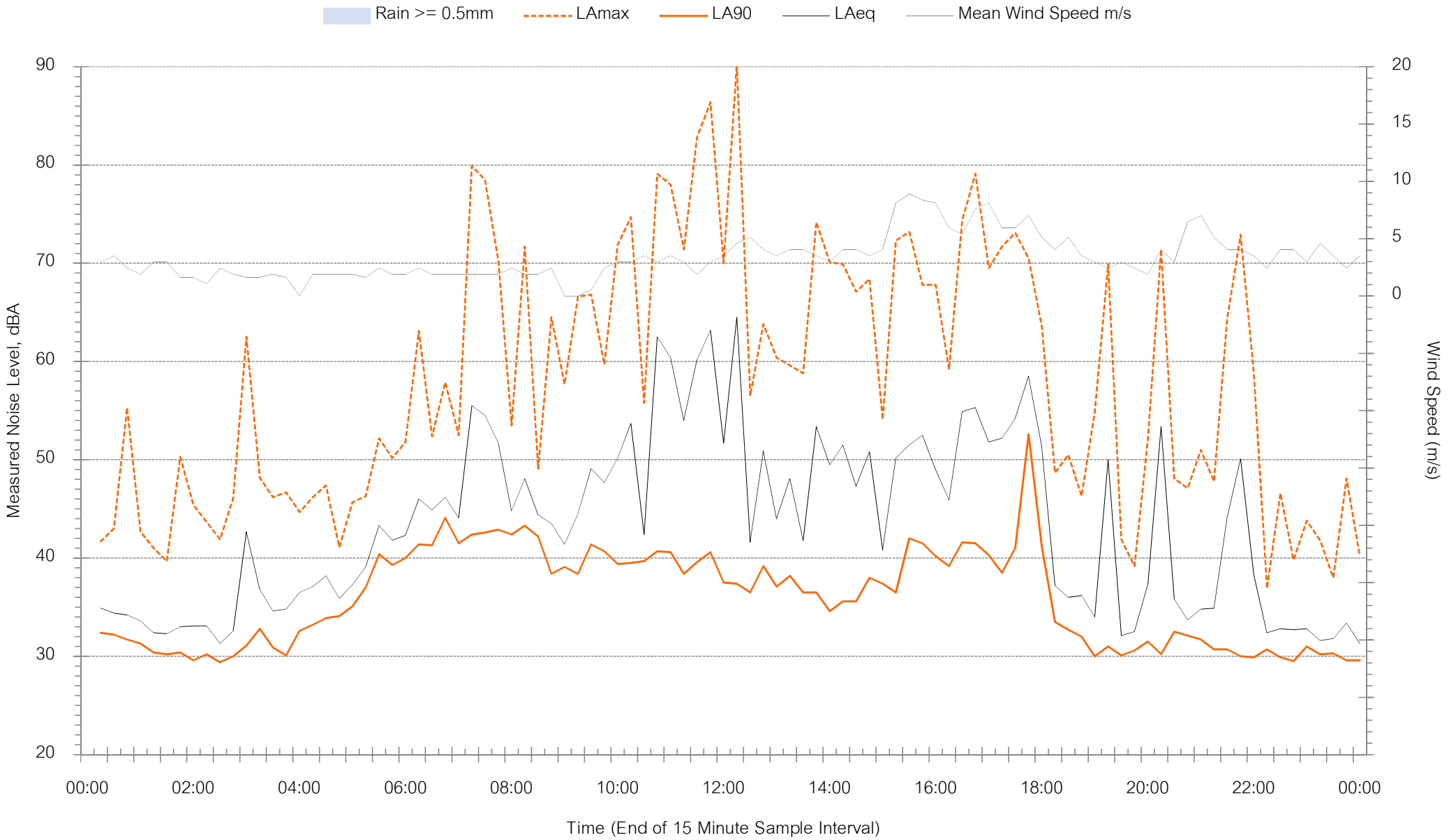
Background Noise Levels

Lavis Lane, Salt Ash - Thursday 3 May 2018



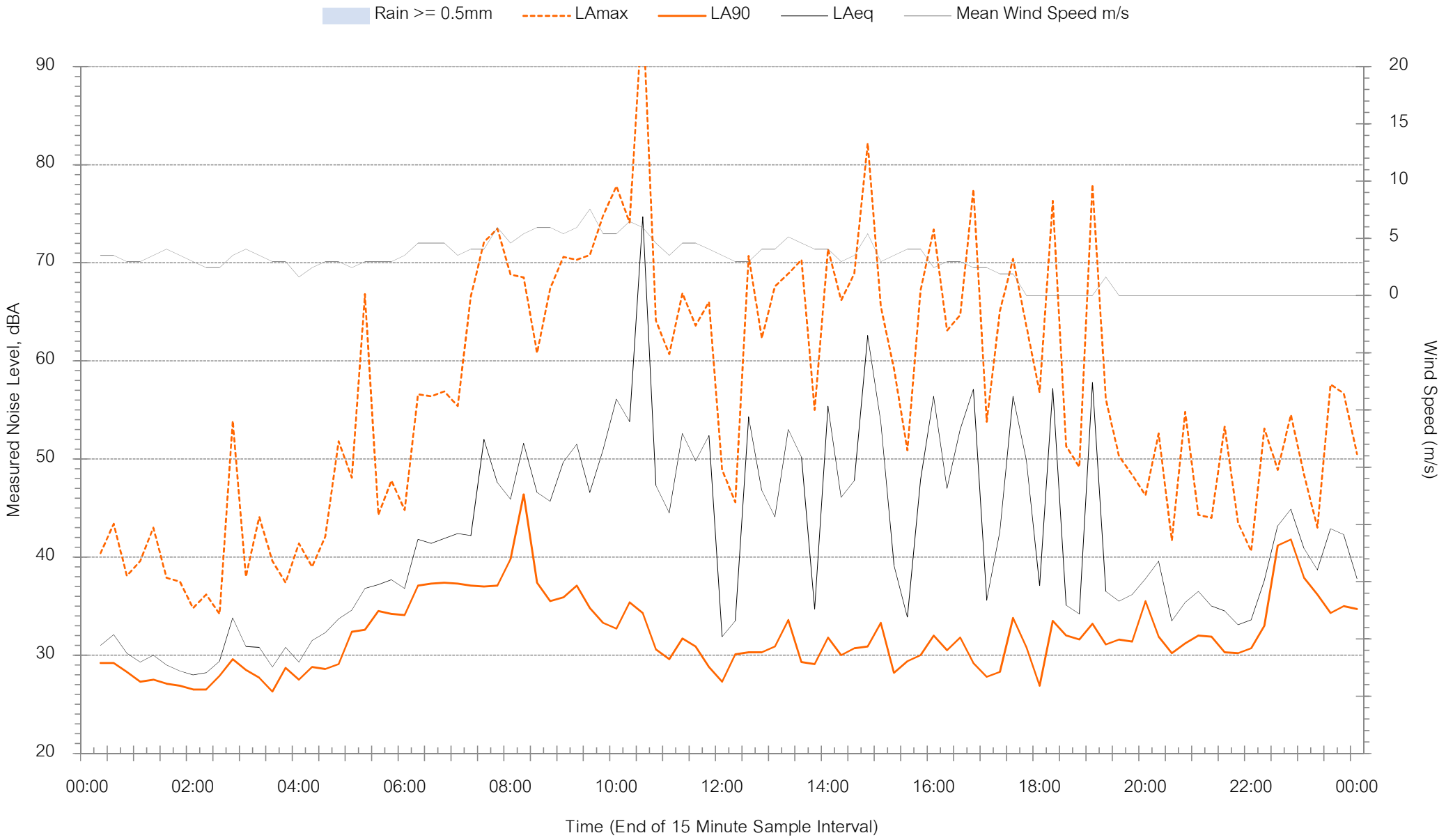
Background Noise Levels

Lavis Lane, Salt Ash - Friday 4 May 2018



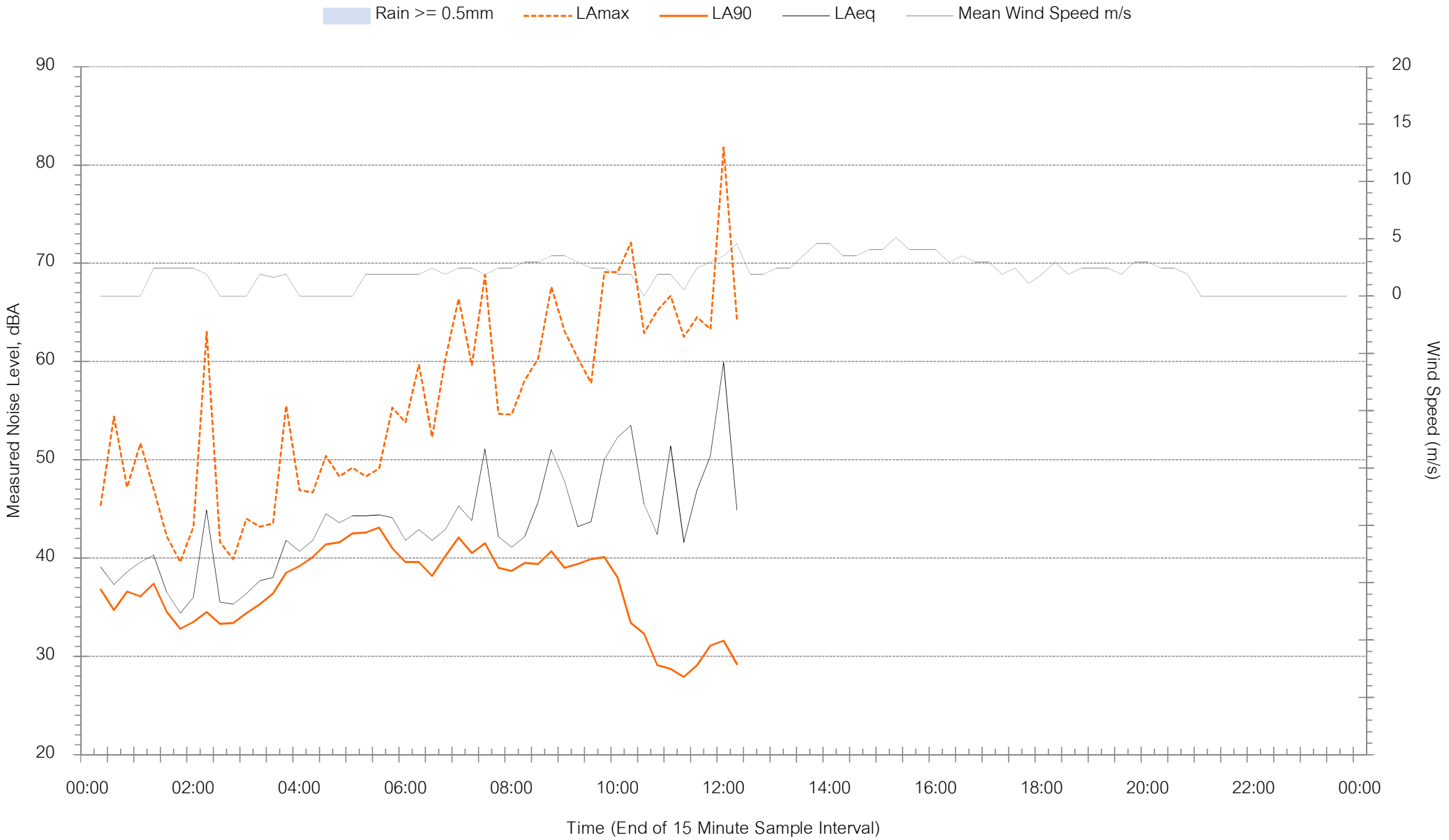
Background Noise Levels

Lavis Lane, Salt Ash - Saturday 5 May 2018

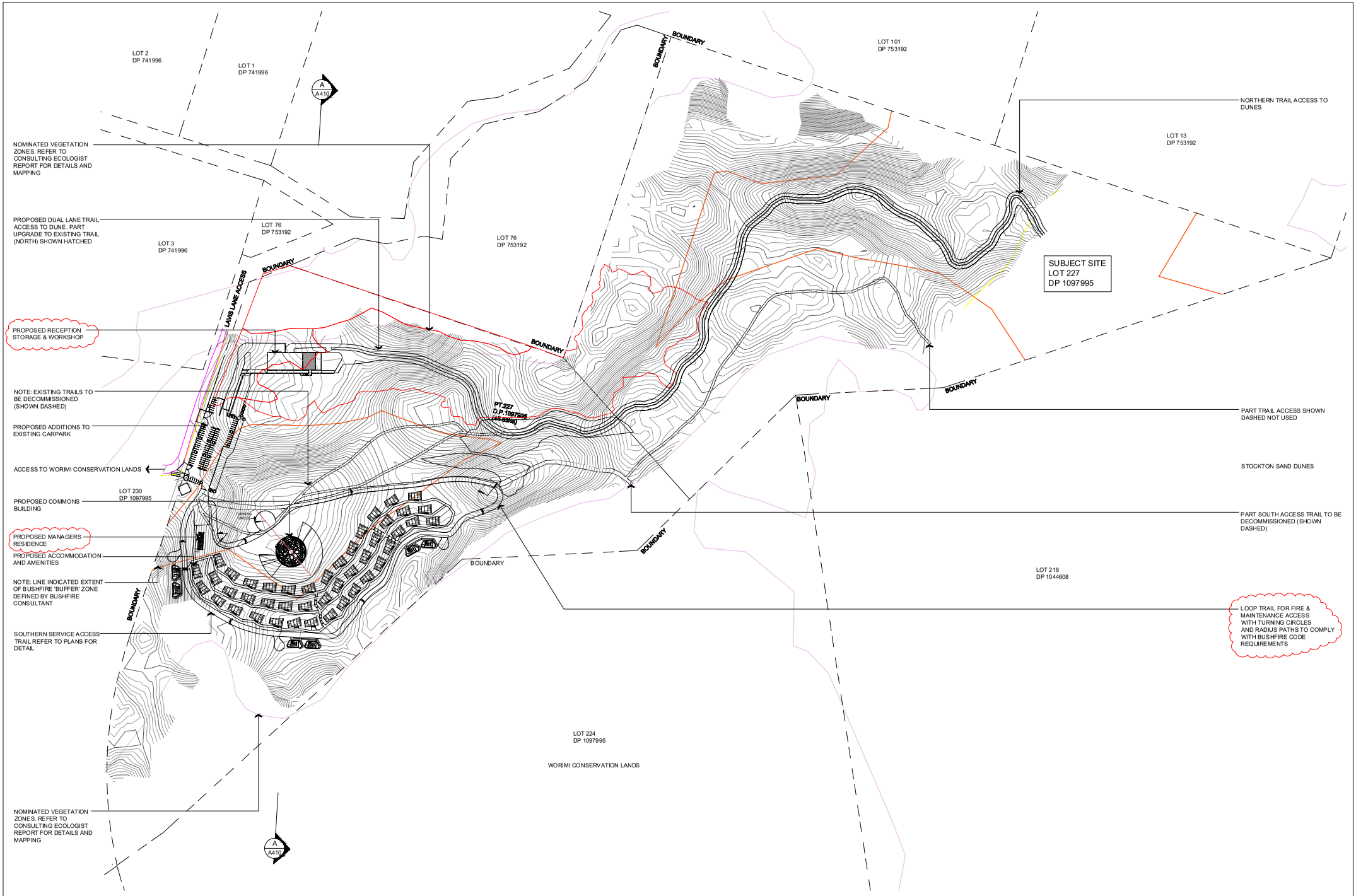


Background Noise Levels

Lavis Lane, Salt Ash - Sunday 6 May 2018



Appendix D – Proposed Site Plans



P1	PRELIMINARY ISSUE	14.06.17
P2	PRELIMINARY ISSUE	10.11.17
P3	PRELIMINARY ISSUE	01.12.17
A	ISSUE TO CONSULTANTS	30.05.18

CLIENT
WORIMI LALC

ADDRESS
LAVIS LANE, WILLIAMTOWN
LOT 227 IN DP1097995

DRAWING TITLE
SITE PLAN

PROJECT
DD239 WLALC VISITOR CENTRE

REF
DD239

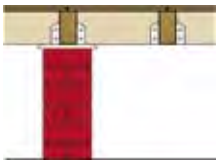
SCALE
1:2000@A1

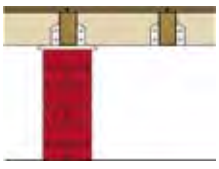
A001

DERIVE / ARCHITECTURE & DESIGN

NOMINATED ARCHITECT JASON ELSLEY (8819) ABN 62108838491

Appendix E – Acoustic Treatment Categories

Category No.	Building Element	Standard Constructions	sample
1	**Windows/Sliding Doors**	Openable with minimum 4mm monolithic glass and standard weather seals	
	Frontage Facade	**Timber Frame or Cladding:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally	
		Brick Veneer: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
		Double Brick Cavity: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R1.5 insulation batts in roof cavity.	
	Entry Door	35mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
2	**Windows/Sliding Doors**	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
3	**Windows/Sliding Doors**	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
4	**Windows/Sliding Doors**	Openable with minimum 10.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
5	**Windows/Sliding Doors**	Openable Double Glazing with separate panes: 5mm monolithic glass, 100mm air gap, 5mm monolithic glass with full perimeter acoustic seals.	
	Frontage Facade	**Double Brick Cavity Construction:** 2 leaves of 110mm brickwork separated by 50mm gap with cement render to the external face of the wall and cement render or 13mm plasterboard direct fixed to internal faces of the wall.	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joist using resilient mounts, R2 insulation batts in roof cavity	
	Entry Door	Special high performance acoustic door required - Consult an Acoustic Engineer	*Door to acoustic consultant's specifications*
	Floor	Concrete slab floor on ground	
6	**All**	Consult an Acoustic Engineer	

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