REPORT

YIRIBANA LOGISTICS ESTATE

MAMRE ROAD, KEMPS CREEK

NOISE & VIBRATION IMPACT ASSESSMENT
RWDI # 2105533
July 1, 2022

SUBMITTED TO

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CONTENTS

1 INTRODUCTION

RWDI was commissioned by the GPT Group (the client) to conduct a noise and vibration assessment for the proposed warehouse estate (the Project) located on Lots 59-60 in DP 259135, Kemps Creek (the site).

The following report forms part of the State Significant Development Application (SSD 9138102) for the proposed warehouse and addresses the Secretary's Environmental Assessment Requirements (SEARs) relevant to the development issued November 2020.

This report supports an Environmental Impact Statement (EIS) prepared in respect of the proposal and should be read in conjunction with the EIS and development plans submitted with the SSDA.

The SEARs relevant to this report have been considered and are addressed as outlined in **Table 1-1**.

Table 1-1 Secretary's Environmental Assessment Requirements (SEARs)

Relevant SEARs	Response
a quantitative noise and vibration impact assessment for construction and operation of the development, including traffic noise, undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers	This report includes a description of potential noise sources associated with the development. Operational noise including traffic noise is addressed in **Section 5**. Construction noise and vibration is addressed in **Section 6**.
cumulative impacts of other existing and proposed developments	This assessment includes consideration of the cumulative noise impacts of the potential noise emissions from the development via the Amenity Noise Trigger mechanism of the EPA's *NPfI* (refer to **Section 4.1.1.1**).
details and justification of the proposed noise mitigation, management and monitoring measures	An assessment of potential impacts on proposed nearby residential receivers has been undertaken for operational noise and construction noise in **Section 5** and **Section 6,** respectively.

Noise from the operation of the proposal has been assessed in accordance with the NSW *Noise Policy for Industry* (NPfI), NSW EPA,2017, which is used to set trigger levels to manage cumulative noise.

- Construction noise has been assessed in accordance with the *Interim Construction Noise Guideline* (ICNG), DECC, 2009.
- Vibration from operation and construction has been assessed in accordance with *Assessing Vibration: A Technical Guideline*, DEC, 2006.
- Traffic noise associated with the site has been assessed in accordance with the NSW *Road Noise Policy* (RNP), DECCW, 2011

2 PROJECT DESCRIPTION

2.1 Site Location

The site is located at Lots 59-60 in DP 259135, Kemps Creek as shown in **Figure 2-1** below.

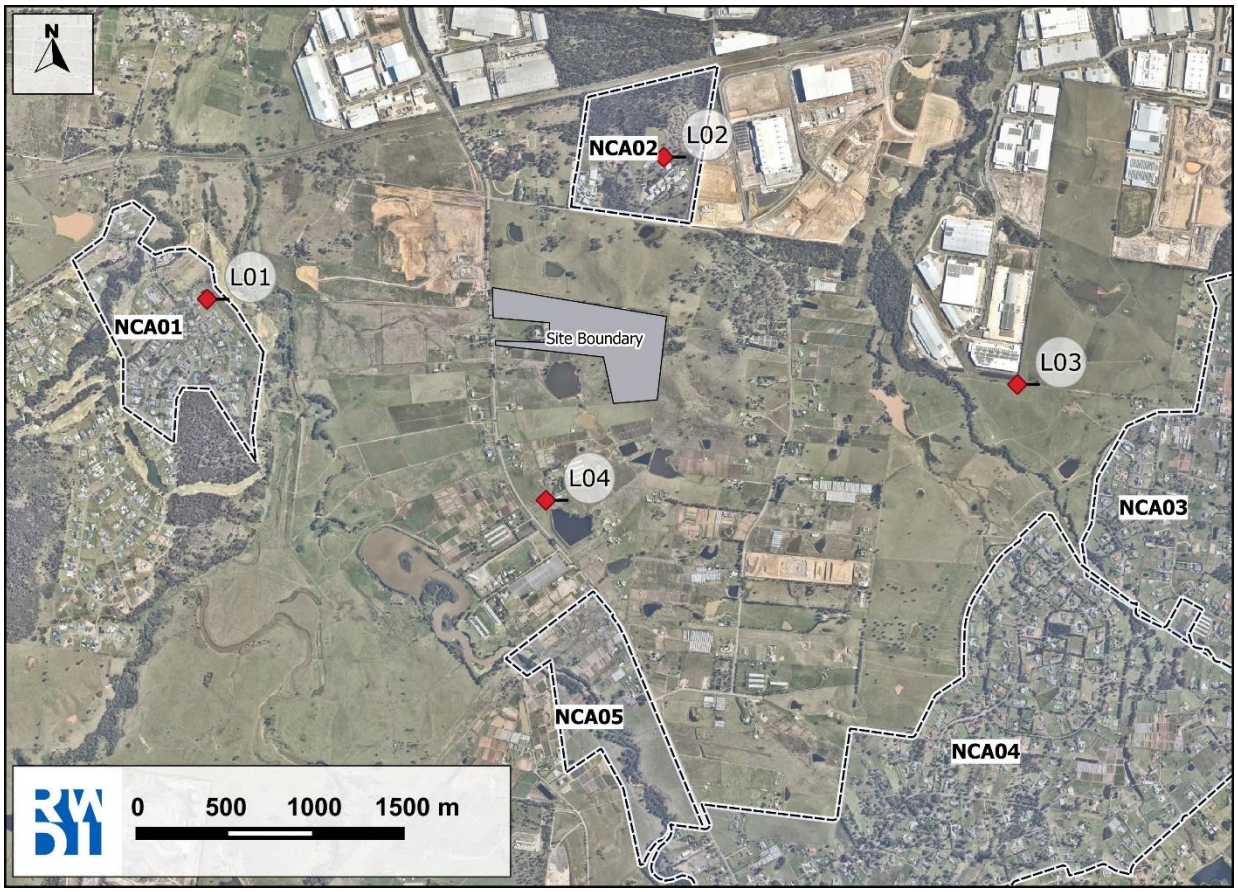


Figure 2-1 Site Location

Surrounding land uses currently comprise a predominantly rural typology, with a variety of rural dwellings, rural land, farm dams and scattered vegetation. Beyond this, the Oakdale South industrial estate is located approximately 1.3 km to the east of the site.

The site is bounded by Mamre Road to the west and agricultural uses to the north, south and east. It is assumed that historical land uses on the site include rural residential, grazing, dairy farming, poultry farming and horticulture. This land is identified for future employment land, as indicated by the recent rezoning of Mamre Road Precinct (MRP) to from RU2 Rural Landscape zone to IN1 General Industrial zoning under the State Environmental Planning Policy (Western Sydney Employment Area) 2009 (WSEA SEPP). The Mamre Road Precinct Development Control Plan map is presented below in **Figure 2-2**.

This assessment will consider impacts to the existing residential uses within the IN1 zone.

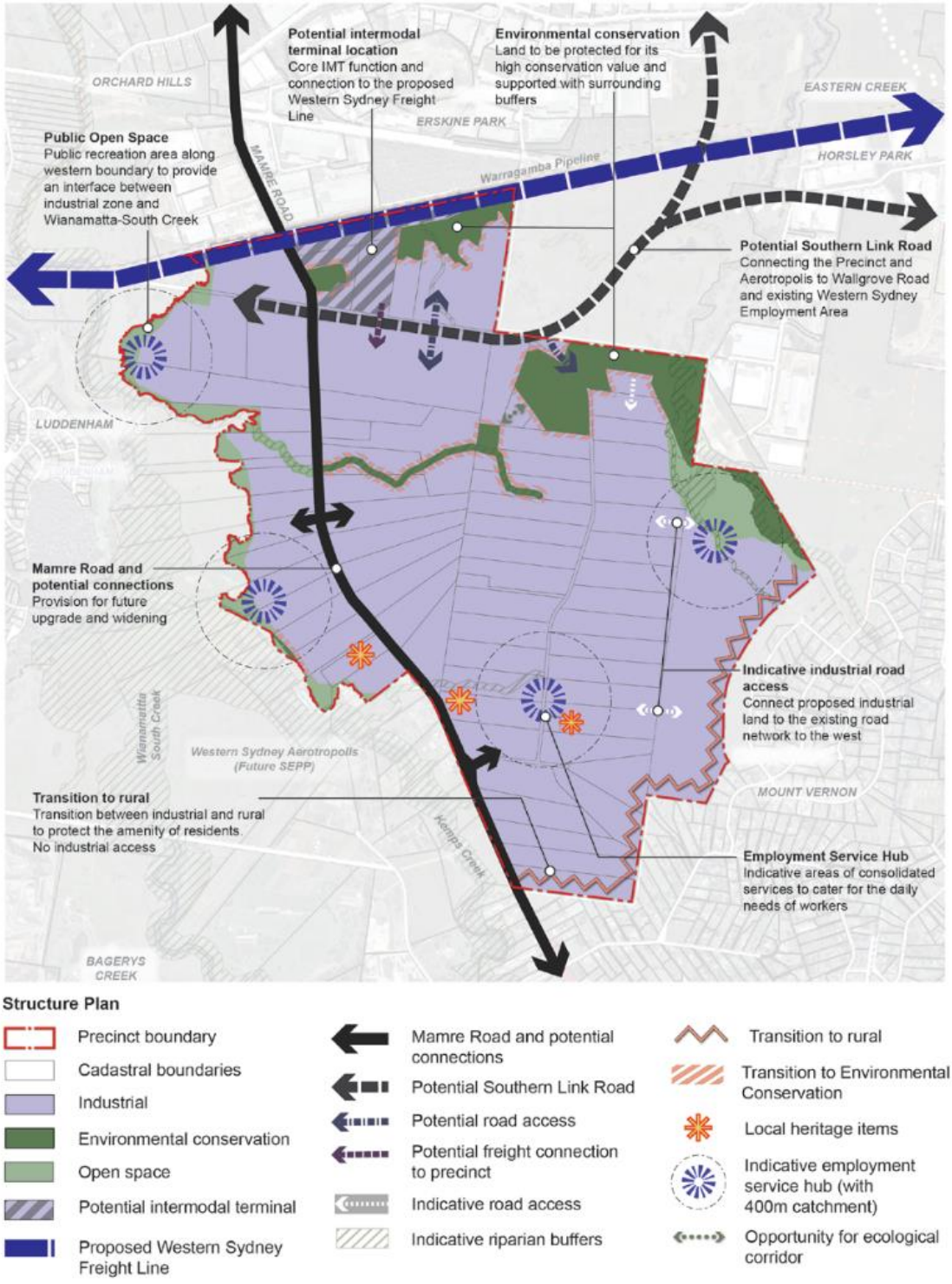


Figure 2-2 Mamre Road Precinct

The Ministerial Local Planning Direction 3.5 precludes future residential development, as the site is affected by the Western Sydney International Airport's ANEF 20 noise contours. The NSW Government has identified an opportunity for land uses which are not sensitive land uses to locate in this precinct, such as warehouse and logistics facilities.

2.2 Development Layout

Proposed layout for the site is presented in **Figure 2-3**.

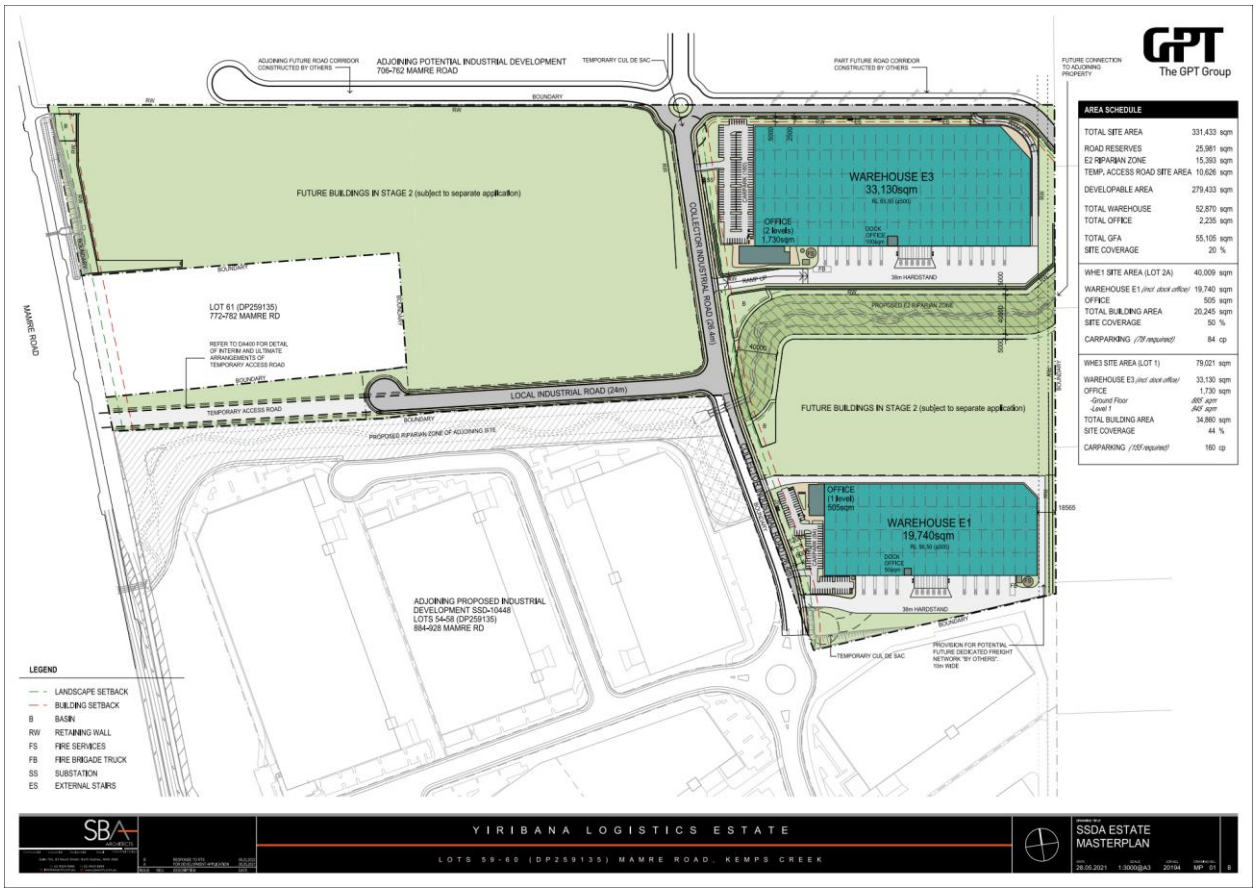


Figure 2-3 Site Layout

2.3 Proposed Development

Operational noise impacts for all warehouses (Masterplan) and construction of Warehouse 1&3 (Stage 1) have been assessed, as detailed below.

2.3.1 Stage 1

The detailed Stage 1 development application will seek consent for site preparation works, construction, fit out and operation of two (2) warehouse buildings for warehouse or distribution uses. Specifically, approval is sought for the:

- Construction and use of Warehouse 1 and 3 for the purposes of other manufacturing industries and/or warehouse and distribution centres which will operate 24 hours/day, seven days/week;
- Subdivision;
- Site preparation works including estate-wide clearing of all vegetation and dam-dewatering;
- Estate-wide bulk earthworks;
- Construction of retaining walls;
- Provision of site servicing infrastructure to allow the operation of the industrial unit for warehouse and distribution and/or other manufacturing industries;
- Internal road network (including North-South Collector Road and Temporary Access Road to Mamre Road until the ultimate connection is provided by the adjoining landowner);
- Associated carparking.

2.3.2 Hours of Operation

For the purpose of this assessment, it has been assumed that the development will operate 24 hours a day, 7 days a week.

3 EXISTING NOISE ENVIRONMENT

3.1 Noise Catchment Areas

The areas for assessment have been divided into five Noise Catchment Areas (NCAs). The NCAs group together sensitive receivers with similar existing noise environments. The NCAs and sensitive receivers in the area around the development are detailed in **Table 3-1** and are shown in **Figure 2-1**.

The nearest residential receivers are located in Twin Creeks and Mount Vernon approximately 1400 m west of the site in NCA01 and 3 km east in NCA03, respectively.

Additionally, there are two private education establishments and a senior living development approximately 2 km north of the site (NCA02). Both uses are within the Mamre Road Precinct and identified for future industrial land. In the interim, they will likely continue operating under their existing uses and are considered sensitive receivers for the purpose of this SSDA.

Lots on all sides of the site are future industrial buildings in various stages of development. These have been assessed as industrial receivers at a distance of 10 m, as this is the required setback specified in the Mamre Road Precinct Development Control Plan.

Table 3-1 Noise Catchment Areas (NCAs)

NCA	Direction from Development	Description
NCA01	West	Receivers to the west where noise environment is currently influenced by road traffic (Luddenham Road and Mamre Road), and other local traffic on the surrounding roads network. The closest residential receivers are 1.4 km from the site boundary.
NCA02	North	Receivers to the north where noise environment is primarily influenced by road traffic on Mamre Road. Notable sensitive receivers include two educational facilities (Mamre Anglican School, Emmaus Catholic College), one Aged Care living facility (Emmaus Retirement Village) and one Early Childhood facility (Little Smarties Early Learning Centre). The closest receivers are 550 m from the site boundary.
NCA03	East	Receivers to the east where noise environment is influenced by distant road traffic on Mamre Road, local traffic, and distant industrial activity. The closest residential receivers are 2.9 km from the site boundary.
NCA04	South East	Receivers to the south east where noise environment is influenced by distant road traffic on Mamre Road, local traffic, and distant industrial activity. The closest residential receivers are 2.1 km from the site boundary.
NCA05	South	Receivers to the south is influenced by distant road traffic on Mamre Road, local traffic, and distant industrial activity. The closest residential receivers are 1.1 km from the site boundary.

3.2 Established Ambient Background Levels

Noise monitoring data has been sourced from unattended background noise monitoring carried out as part of the following assessments:

- 1018022 *R01AB Mamre Road Kemps Creek ENV* (Acoustic Works, 2020) (SSD-9522)
- 610.15617-R2 *Oakdale West Estate DA Noise Impact Assessment*, (SLR, 2017) (SSD-7348)
- 630.11166 *Oakdale South Estate DA Noise Impact Assessment*, (SLR, 2015) (SSD-6917)
- 610.19127-R02 *Aspect Industrial Estate SSDA Noise and Vibration Impact Assessment* (SLR, 2021) (SSD-10448)

The results of the various unattended ambient noise surveys are presented in **Table 3-2** as the Rating Background Level (RBL) noise levels for the daytime, evening, and night time periods.

Locations of the noise loggers is presented above in **Figure 2-1**. Noise logging results for the three locations described below are attached as **Appendix A.**

Table 3-2 Measured Noise Levels

Noise Logger	Applicable Noise Logging Location	RBL (dBA) [1]		
		Daytime	Evening	Night Time
L01[3]	NCA01	36	33	30 (actual 28)[2]
L02[4]	NCA02	35	34	32
L03[5]	NCA03 and NCA04	39	46[6]	47[6]
L04[7]	NCA05	39	40[6]	32

Note 1: Daytime (6am – 7pm), Evening (7pm – 10pm), and Night time (10pm – 6am).
Note 2: Minimum RBL for 'Night time' used for assessment.
Note 3: Logger location 8 Medinah Avenue, Twin Peaks as part of 1018022 *R01AB Mamre Road Kemps Creek ENV* (Acoustic Works, 2020)
Note 4: Logger location Emmaus Retirement Village as part of 610.15617-R2 Oakdale West Estate DA Noise Impact Assessment, (SLR, 2017)
Note 5: Logger location Lot 5a/25 Ottelia Rd, Kemps Creek as part of 630.11166 Oakdale South Estate DA Noise Impact Assessment, (SLR, 2015)
Note 6: Daytime RBL used for Evening and Night time used as per *NPfI* methodology for high Evening and Night time levels.
Note 7: Logger location 864-882 Mamre Rd, Kemps Creek as part of 610.19127-R02 *Aspect Industrial Estate SSDA Noise and Vibration Impact Assessment* (SLR, 2021)

3.3 Meteorological Effects

At relatively large distances from a source, the resultant noise levels at receivers can be influenced by meteorological conditions, particularly temperature inversions and gradient winds. Where these factors are a feature of an area their effect on resultant noise levels should be considered.

The *NPfI* defines standard meteorological conditions and noise-enhancing meteorological conditions to be considered for the assessment. The definition of those conditions is provided in Table D1 of Fact Sheet D, which is reproduced in **Table 3-3** below.

Table 3-3 Standard and Noise-Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard Meteorological Conditions	Day/evening/night: stability categories A-D with wind speed up to 0.5 m/s at 10 m AGL.
Noise-Enhancing Meteorological Conditions	Daytime/evening: stability categories A-D with light winds (up to 3 m/s at 10 m AGL). Night time: stability categories A-D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Notes: m/s = metres per second; m = metres; AGL = above ground level; where a range of conditions is nominated, the meteorological condition delivering the highest predicted noise level should be adopted for assessment purposes. However, feasible and reasonable noise limits in consents and licences derived from this process would apply under the full range of meteorological conditions nominated under standard or noise-enhancing conditions as relevant. All wind speeds are referenced to 10m AGL. Stability categories are based on the Pasquill-Gifford stability classification scheme.

The *NPfI* provides two options when considering meteorological effects:

1. Conservatively adopt noise-enhancing meteorological conditions without processing meteorological data local to the site; or
2. Determine the significance of noise-enhancing meteorological conditions based on meteorological data local to the site and adopt significant noise-enhancing conditions for the assessment. Where noise-enhancing meteorological conditions are deemed non-significant, standard meteorological conditions may be adopted.

The second option has been adopted with refence to a previous meteorological analysis suitable for the project.

Assessment of prevailing weather conditions was carried for a neighbouring development located directly south (*Mirvac Projects Pty Ltd Aspect Industrial Estate*) by SLR Consulting in 2021 (ref. 610.19127-R02).

Outcomes of the metrological analysis determined that standard weather conditions should be used during the daytime and evening periods, with noise-enhancing weather conditions during the night time period. The night time noise-enhancing weather conditions defined as F-class temperature inversion with a 2 m/s source to receiver drainage flow.

4 OPERATIONAL NOISE & VIBRATION ASSESSMENT CRITERIA

4.1 Operational Noise Level Criteria

4.1.1 Noise Policy for Industry

The *Noise Policy for Industry* (NPfI) was released in 2017 and sets out the NSW Environment Protection Authority's (EPA's) requirements for the assessment and management of noise from industry in NSW.

4.1.1.1 Trigger Levels

The *NPfI* describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The intrusiveness of an industrial noise source is generally considered acceptable if the L_{Aeq} noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended amenity levels specified in the *NPfI* for that particular land use.

For this assessment, all NCAs have been assessed as 'rural' with recommended $L_{Aeq,period}$ amenity limits of 50 dBA day, 45 dBA evening and 40 dBA night time.

4.1.2 Project Noise Trigger Levels

The noise emission trigger levels for operational noise generated by the development are provided in bold below in **Table 4-1**. Amenity criteria presented in **Table 4-1** has been converted from a period level to 15-minute level by adding 3 dB, as per *NPfI* methodology.

Table 4-1 Project Noise Trigger Level (PNTLs)

NCA	Receiver Type	Period	ANL[1] $L_{Aeq,period}$	Measured RBL[2]	Criteria for New Sources	
					Intrusiveness $L_{Aeq,15min}$	Amenity[3,4] $L_{Aeq,15min}$
NCA01	Residential	Day	50	36	**41**	48
		Evening	45	33	**38**	43
		Night	40	28	**35**[7]	38
NCA02	Residential	Day	50	35	**40**	48
		Evening	45	34	**39**	43
		Night	40	32	**37**	38

NCA	Receiver Type	Period	ANL[1] $L_{Aeq,period}$	Measured RBL[2]	Criteria for New Sources	
					Intrusiveness $L_{Aeq,15min}$	Amenity[3,4] $L_{Aeq,15min}$
NCA03	Residential	Day	50	39	**44**	48
		Evening	45	46	44[5]	**43**
		Night	40	47	44[5]	**38**
NCA04	Residential	Day	50	39	**44**	48
		Evening	45	46	44[5]	**43**
		Night	40	47	44[5]	**38**
NCA05	Residential	Day	50	39	**44**	48
		Evening	45	40	44[5]	**43**
		Night	40	32	**37**	38
-	School Classroom	Noisiest 1-hour period when in use	35[6] internal	n/a	**45 external**	n/a
-	Industrial[8]	When in use	70	n/a	n/a	**68**

Note 1: ANL = "Amenity Noise Level" for receivers in a Rural area

Note 2: RBL = "Rating Background Level".

Note 3: Assuming existing noise levels are unlikely to decrease in the future.

Note 4: ANLs have been modified to account for approved and existing levels of industrial noise refer to Section 4.2.2.

Note 5: Project intrusiveness noise level for night time and Evening should be no greater than the project intrusiveness noise level for day as per *NPfI* methodology.

Note 6: ANL for school classrooms is internal criteria. On the basis that external noise levels are typically 10 dB higher than internal noise levels when windows are open, an external ANL of 45 dBA has been adopted for school classrooms.

Note 7: Minimum project intrusiveness noise level applied as per *NPfI* methodology.

Note 8: The NPfI does not require that intrusive noise be assessed at industrial premises. For industrial receivers, only the amenity criteria apply. Also, the NPfI states for isolated residences within an industrial zone the industrial amenity would apply.

4.2 Sleep Disturbance

Guidance for assessing the potential for sleep disturbance impacts on nearby residences is provided in Section 2.5 of the *NPfI*, which states:

> *Where the subject development/premises night time noise levels at a residential location exceed:*
>
> - $L_{Aeq,15min}$ 40 dBA or the prevailing RBL plus 5 dB, whichever is the greater, and/or
> - L_{Amax} 52 dBA or the prevailing RBL plus 15 dB, whichever is the greater,
>
> *a detailed maximum noise level event assessment should be undertaken.*

Based on the above, the night time sleep disturbance screening noise levels for the residential areas in the vicinity of the development is presented **Table 4-2**.

Table 4-2 Sleep Disturbance Screening Level

NCA	Period	Measured RBL $L_{A90\ (15minute)}$	Relevant RBL[1] plus 5 / 15 dB	Sleep Disturbance Screening Level	
				$L_{Aeq,15min}$	L_{AMAX}
NCA01	Night time	30[1]	35 / 45	**40**	**52**
NCA02		36	41 / 51	**41**	
NCA03		33	38 / 48	**40**	
NCA04		33	38 / 48	**45**	
NCA05		32	37 / 47	**40**	

Note 1: Minimum RBL for 'Night time' used for assessment.

Where the sleep disturbance screening noise level is predicted to be exceeded then a detailed maximum noise level event assessment should be undertaken. The detailed assessment should discuss the predicted level of the events, the exceedance of the screening level, existing maximum noise levels, and consider guidance from current literature regarding sleep disturbance, such as the *Road Noise Policy*.

5 OPERATIONAL NOISE ASSESSMENT

5.1 Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithm in CadnaA modelling software.

The noise model was constructed from a combination of aerial photography, existing ground topography, and design ground topography for the development. The local terrain, design of the development, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the operations of the development and surrounding environment. No buildings from any other the adjacent proposed or approved industrial developments have been included in this report.

Ground effect area or ground absorption has been modelled as 50% soft ground (G=0.5).

Noise modelling was conducted for day, evening and night time as the warehouses would be operating 24 hours per day. No shielding provided by future buildings surrounding the site have been included in the model.

Based on the analysis of prevailing weather conditions discussed in Section 3.3; the noise model includes standard weather conditions during the daytime and evening periods, with noise-enhancing weather conditions during the night period, using an F-class temperature inversion with a 2 m/s source to receiver drainage flow.

5.2 Modelled Sources

Noise sources including onsite vehicle movements, forklift operation and internal warehouse activity have been modelled throughout the development. As details of specific items and exact usage of warehouse facilities are not yet known, a conservative approach to modelling has been conducted.

The following noise level data for vehicle-related noise sources has been used for the assessment. These noise levels are taken from RWDI's internal database and external assessments of similar subject sites.

Appendix B presents the locations of modelled noise sources.

Table 5-1 Sound Power Reference Levels – dBA

Noise Source	Noise Characteristic	Sound Power Level
Forklift operational on hardstand	Quasi-steady	93 L_{Aeq}
Light Vehicles on site, up to speed of 40 km/h	Quasi-steady	90 L_{Aeq}
Medium Vehicle @ 10 km/h	Quasi-steady	91 L_{Aeq}
Medium Vehicle reversing @ 5 km/h	Quasi-steady	96 L_{Aeq}
Heavy Vehicle[1] @ 25 km/h	Quasi-steady	106 L_{Aeq}

Noise Source	Noise Characteristic	Sound Power Level
Heavy Vehicle[1], unloaded @ 10 km/h	Quasi-steady	106 L_{Aeq}
Heavy Vehicle[1], loaded @ 10 km/h	Quasi-steady	107 L_{Aeq}
Heavy Vehicle[1], reversing[2] @ 5 km/h	Quasi-steady	111 L_{Aeq}
Truck Idling	Quasi-steady	95 L_{Aeq}
Truck Engine Starting	Instantaneous	100 L_{Amax}
Truck Airbrake Release[2]	Instantaneous	115 L_{Amax}

Note 1: Heavy vehicle defined as any cargo vehicle with three or more axles with gross vehicle weight > 12,000 kg.

Note 2: Assume that reversing operation will not take more than 30 seconds for each vehicle, includes reversing alarm and air brake release.

5.3 Modelled Onsite Vehicle Movements

Estimated onsite vehicle movements were provided by the client on behalf of Ason Group.

The following 15-min traffic volumes during the day, evening, and night time periods are derived from the predicted 1-hour traffic data supplied by Ason Group. The hour with the greatest 'A-double' trucks was chosen as it represents the worse-case scenario with the highest operational traffic noise emissions.

The vehicle movements have been modelled to reflect realistic operations, with heavy vehicles accessing and manoeuvring on hardstand areas to load and unload items via forklift and light vehicles utilising carparking facilities.

Summary of vehicle movements is presented below in **Table 5-2**.

Table 5-2 Onsite Vehicle Movements

Warehouse	Assessment Period	Total Vehicles per 15min	Light Vehicles per 15min	Heavy Vehicles per 15min	Heavy Vehicle (HV) Breakdown			
					Rigid	Semi-trailer	B-double	A-double
Warehouse 1	Day	9	5	3	2	0	0	1
	Eve	4	3	1	1	0	0	0
	Night	11	9	2	1	0	0	1
Warehouse 3	Day	15	9	6	4	0	0	1
	Eve	7	5	2	1	0	0	0
	Night	19	15	4	3	0	0	1

5.4 Modelled Line Sources

Light vehicles are represented as line sources travelling 40 km/hr with a sound power level (SWL) of 90 dBA and a height of 0.5 m. Heavy vehicles on the access roads are represented as line sources travelling at 25 km/h with a sound power level of 106 dBA.

Heavy vehicle movements over hardstand and loading areas within each lot have been modelled travelling at 5 km/hr with a sound power level of 106 dBA. Locations where heavy vehicles require greater engine capacity, such as accelerating from a stationary position, cornering, or accessing entry/exit ramps have been modelled as line sources travelling 5 km/hr with a SWL of 111 dBA.

Heavy vehicles reversing into delivery docks, including reversing alarm and airbrake release have been modelled as a single line source with a SWL of 115 dBA at the location most affecting the nearest sensitive receiver within each lot. Duration of heavy vehicle reversing is assumed to be not greater than 30 seconds and includes reversing alarm and air-break release events.

Source height for heavy vehicles is 1.5 m with the exception of the reversing alarm and air-brake release modelled at 1 m.

5.5 Modelled Point Sources

Warehouse noise sources such as roof top mechanical plant and forklifts in hardstand areas have been modelled throughout the development.

Consistent with other developments external gas-powered forklifts have been modelled as point sources with a SWL of 93 dBA at 1 m in height. It has been assumed that forklifts would operate continuously during any one 15-minute period. One forklift for every two heavy vehicles onsite has been modelled operating externally in the hardstand areas for each of the warehouses.

Noise emissions associated with internal warehouse activity with a total reverberant sound pressure level of 75 dBA ($L_{Aeq,15min}$) have been modelled inside each warehouse (with roller doors open) to assess potential noise impacts to nearby receivers.

Point sources with a reference sound power level (80 SWL) have been modelled at rooftop locations around the development. Four sources have been allocated per warehouse.

5.6 Predicted Operational Noise Levels

The predicted operational noise levels are summarised in **Table 5-3**.

Table 5-3 Predicted Operational Noise Levels

Receiver Location	Time of Day	Predicted Noise Level[1] $L_{Aeq,15min}$	PTNL Criteria $L_{Aeq,15min}$	Exceedance
NCA01	Day	27	41	-
	Evening	23	38	-
	Night	26	38	-
NCA02	Day	<20	40	-
	Evening	<20	39	-
	Night	<20	37	-
NCA03	Day	<20	44	-
	Evening	<20	43	-
	Night	<20	38	-
NCA04	Day	<20	44	-
	Evening	<20	43	-
	Night	<20	38	-
NCA05	Day	22	44	-
	Evening	<20	43	-
	Night	21	37	-
Educational[2]	When in use	25	45	-
Industrial[3]	When in use	53	68	-

Note 1: Receiver with highest level within each NCA reported.
Note 2: Educational receiver located within NCA02.
Note 3: Results represent future industrial receivers located at subject site boundary.

The above assessment indicates that predicted noise from the proposal complies with the Project Trigger Levels at all receivers during all time periods.

Predictions have also been completed to the residential dwellings within the Mamre Road Precinct. As noted in the *NPfI*, isolated residential receivers within Industrial zoned land should be assessed as industrial receivers. Furthermore, it is expected that these receivers would no longer exist at the time of construction and operation. **Table 5-4** presents the range of levels experienced by these receivers and compares them against the industrial PNTL.

Table 5-4 Predicted Operational Noise Levels at Receivers within the Mamre Road Precinct.

Period	Minimum	Maximum	Industrial PNTL
Day	21	42	68
Evening	17	38	
Night	21	42	

Table 5-4 confirms that noise levels at the residential receivers within the Mamre Road Precinct are compliant with the PNTL for industrial receivers.

Exceedances of the residential project noise trigger levels are expected at the residential receivers located within the Mamre Road Precinct. However, these levels are below the industrial receiver project noise trigger levels. Thus, additional mitigation to resolve these exceedances is deemed not reasonable considering that it is expected that these receivers would likely be uninhabited or no longer existing at the time of the operation of the Project.

Figure 5-1 to **Figure 5-3** below presents the predicted noise contours for the three assessment periods. These figures also includes the location of the isolated receivers within the MRP. Noise levels for receivers can be deduced from the noise contours.

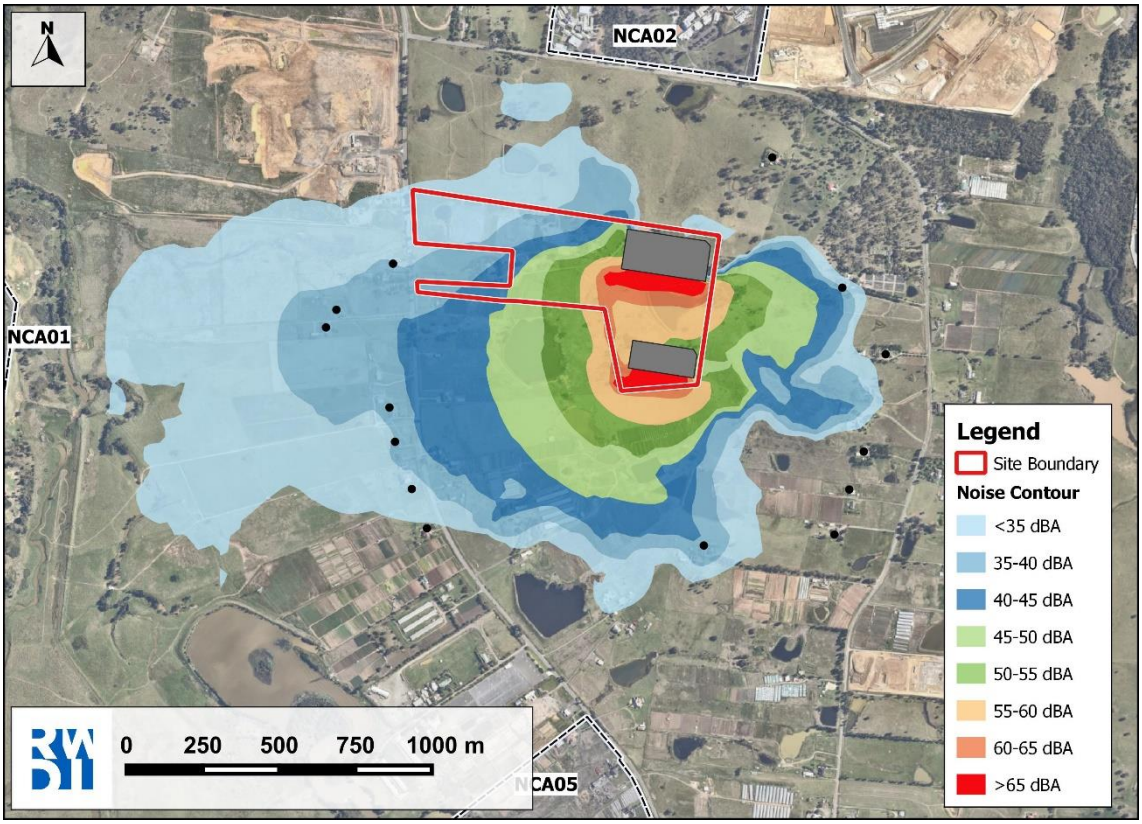


Figure 5-1 Predicted Noise Contour – Day

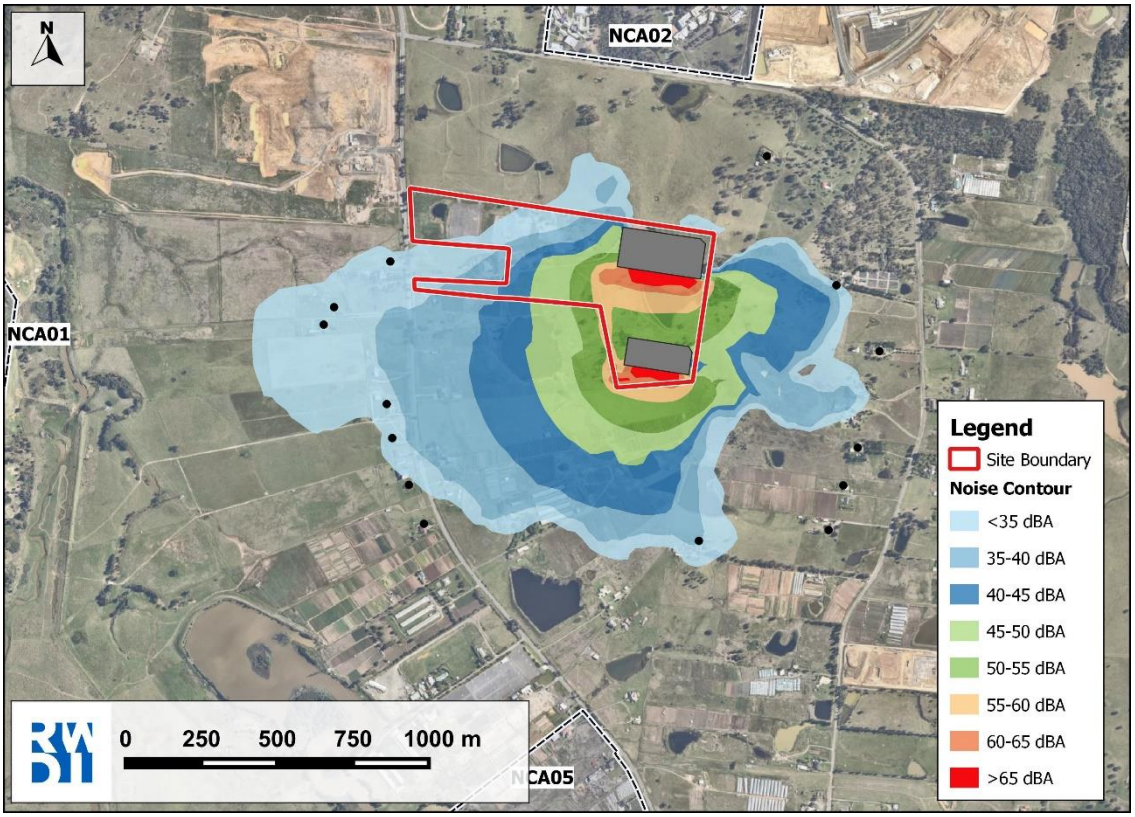


Figure 5-2 Predicted Noise Contour – Evening

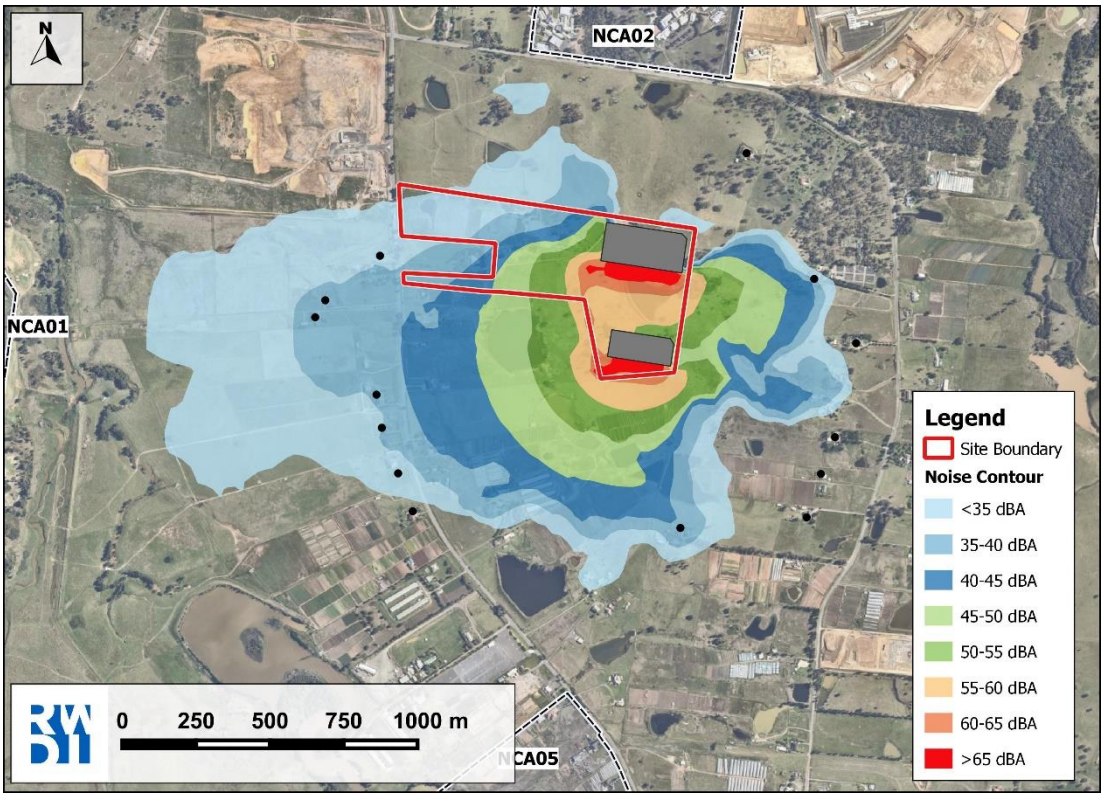


Figure 5-3 Predicted Noise Contour – Night

5.7 Sleep Disturbance

As the warehouses operate 24 hours per day, noise emissions during the night time period require an assessment for potential sleep disturbance at the nearest noise sensitive receivers. A summary of the L_{Amax} sound power levels of typical activities that may occur at the facility with the potential to cause sleep disturbance is presented in **Table 5-5**.

Table 5-5 Sleep Disturbance – L_{Amax} Sound Power Levels

Noise Source	L_{Amax} SWL (dBA)	Source Height
Truck Movement in Truck Parking Area	100	2 m
Airbrake in Truck Parking Area	115	2 m
Reversing Alarm	111	1 m
Roller Door	94	4 m
Forklift loading / unloading	100	2 m

The predicted night time L_{Amax} noise levels at the nearest receivers to the development are presented in **Table 5-6**.

Table 5-6 Summary of Predicted Sleep Disturbance Noise Levels

Receiver Location	L_{AFmax} Noise Level (dBA)		
	Criteria	Predicted	Exceedance
NCA01	52	37	-
NCA02		24	-
NCA03		22	-
NCA04		22	-
NCA05		28	-

The above assessment indicates that predicted night time L_{AFmax} noise levels from the proposal complies with the night time sleep disturbance goals at all receivers.

5.8 Cumulative Noise

Cumulative noise has been considered for residential receivers outside of the Mamre Road Precinct (NCA01-NCA05).

The project amenity noise level is the main mechanism of the *NPfI* for controlling the total noise level from all industrial noise sources affecting a receiver. **Table 5-7** presents the predicted noise levels and compares them against the project amenity noise level.

Table 5-7 Cumulative Noise Contribution - $L_{Aeq,15min}$

Receiver	Day	Evening	Night[1]
Project Amenity Noise Level (rural)	**48**	**43**	**38**
NCA01	27	23	26
NCA02	<20	<20	<20
NCA03	<20	<20	<20
NCA04	<20	<20	<20
NCA05	<20	<20	<20

From **Table 5-7**, predicted noise levels outside of the Mamre Road Precinct are more than 12 dB below the project amenity noise level for these receivers. As such, the contribution from the Project at the residential areas outside of the Mamre Road Precinct would not result in any significant increase to the amenity noise level at these receivers.

For example, for receivers in NCA01 the predicted noise level is 12 dBA less than the night time project amenity noise level (which inherently accounts for contribution from 3-4 other sources) and 17 dBA less than the night time recommended amenity noise level (which is the maximum for at the receiver type for all sources). This means an additional 17 and 52 sources of equal contribution would be required to exceed the night time project amenity noise level and recommended amenity noise level, respectively. However, the additional developments in the MRP will result in shielding of 5 to 10 dB in the noise transmission path to the receivers in all directions. **Figure 5-4** presents the location of the site relative to the other industrial lots in the MRP and residential receivers.

As such, noise from the Project would not be significant enough to contribute to the cumulative industrial noise at the residential receivers and any exceedances would be due to other premises located closer to these receivers.

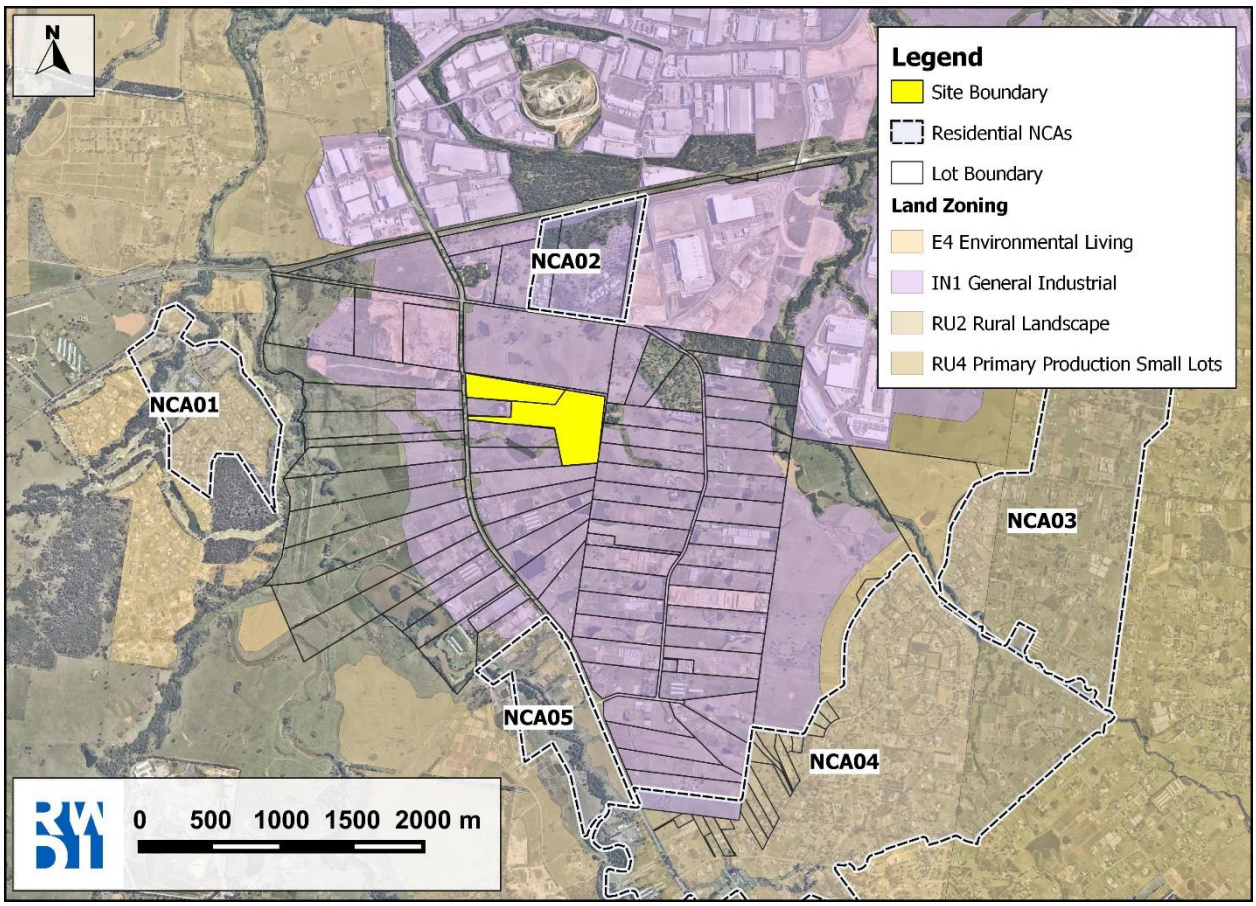


Figure 5-4 Site Location within MRP

6 CONSTRUCTION NOISE & VIBRATION IMPACT ASSESSMENT

6.1 Interim Construction Noise Guideline (DECC, 2009)

The NSW EPA *Interim Construction Noise Guideline (ICNG)* requires project-specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site-specific construction noise management plans, to be prepared in the detailed design phase.

Table 6-1 details the *ICNG* noise management levels.

Table 6-1 Interim Construction Noise Guideline Criteria

Time	NML	How to Apply
Recommended Standard Hours: Mon to Fri: 7am – 6pm Sat: 8am – 1pm Sun/Public Holidays: No Work	Noise Affected RBL+10dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measure L_{AEQ} is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially affected residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly Noise Affected 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours the very noisy activities can occur, taking into account: 1. Times identified by community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning, mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.

In addition, the following construction noise management levels $L_{Aeq,15min}$ are recommended for other receivers and areas:

- Industrial premises: external $L_{Aeq,15min}$ 75 dBA
- Classrooms at schools and other educational institutions: internal $L_{Aeq,15min}$ 45 dBA

Based on the above, presents the applicable noise management levels for construction activities at surrounding receivers that have been adopted for all applications.

Table 6-2 Site-specific Construction Noise Management Levels

Location		Construction Noise Management Level (NMLs) - $L_{Aeq,15min}$			Highly Noise Affected Noise Level – $L_{Aeq,15min}$
	Day Standard Hours[1]	Day OOH	Evening OOH[2]	Night OOH[3]	
NCA01	46	41	38	35	75
NCA02	45	40	39	37	
NCA03	49	44	44	44	
NCA04	49	44	44	44	
NCA05	49	44	44	37	
Industrial	-	75 external			-
Educational	-	45 internal			-

Note 1: Standard Hours (7am – 6pm Monday to Friday, 8am – 1am Saturday with no work on Sundays or Public Holidays)

Note 2: Evening OOH (6pm – 10pm)

Note 3: Night OOH (10pm – 7am)

6.2 Construction Noise & Vibration Guideline (RMS, 2016)

Minimum working distances for typical vibration intensive construction equipment are provided in the Roads and Maritime Services *Construction Noise & Vibration Guideline* (CNVG).

The minimum working distances presented in are for both cosmetic damage (from BS 7358) and human comfort (from the NSW EPA Vibration Guideline) and are based on empirical data which suggests that where works are outside the minimum distances, impacts are not considered likely.

Table 6-3 Recommended Minimum Working Distances from Vibration Intensive Equipment

Plant Item	Rating / Description	Minimum Distance	
		Cosmetic Damage (BS 7385)	Human Response (NSW EPA Guideline)
Vibratory Roller	< 50 kN (Typically 1-2t)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4t)	6 m	20 m
	< 200 kN (Typically 4-6t)	12 m	40 m
	< 300 kN (Typically 7-13t)	15 m	100 m
	> 300 kN (Typically 13-18t)	20 m	100 m
	> 300 kN (Typically > 18t)	25 m	100 m
Small Hydraulic Hammer	300 kg – 5 to 12t excavator	2m	7 m
Medium Hydraulic Hammer	900 kg - 12 to 18t excavator	7 m	23 m
Large Hydraulic Hammer	1600 kg - 18 to 34t excavator	22 m	73 m
Vibratory Pile Driver	Sheet Piles	2 m to 20 m	20 to 100 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

6.3 Proposed Construction Activities

6.3.1 Proposed Works

This report provides an assessment of the potential noise and vibration impacts associated with the proposed activities required in Stage 1, specifically the construction of Warehouse 1&3 and supporting road network. The construction noise and vibration assessment has considered the following construction activities:

Stage 1 *(Warehouse 1&3)*

- Site Clearing and Enabling Works
- Excavation and construction of retaining walls.
- Building construction

Stage 1 *(Roadworks)*

- Site Clearing and Enabling Works
- Construction of internal north-south road network
- Carpark construction

6.3.2 Construction Hours

Where possible, works would be completed during the standard daytime construction hours of Monday to Friday 7.00am to 6.00pm and Saturday 8.00am to 1.00pm. Where Out-of-Hours Works (OOHWs) are required (for emergency works, oversized equipment delivery, etc) it is likely that they would require separate approval.

6.4 Construction Noise Modelling

Noise modelling of the development site was undertaken using the CONCAWE noise prediction algorithm in CadnaA modelling software.

The noise model was constructed from a combination of aerial photography, existing ground topography, design ground topography and proposed design. The local terrain, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the construction works and surrounding environment.

Maximum sound power levels (SWLs) for the typical operation of construction equipment applied in the modelling are listed in **Table 6-4**. To assess construction noise levels against the NMLs, the maximum noise levels have been converted to equivalent $L_{Aeq,15min}$ noise emissions. Based on previous experience on large construction proposals, suitable adjustments of between 2 dB to 5 dB have been applied to convert the L_{Amax} noise levels into L_{Aeq} noise levels for assessment against the NMLs.

Table 6-4 Construction Noise Sources

Stage	Phase	Equipment	Operating minutes in 15-min period	Number of items in same location	Sound Power Level (dB)		
					Maximum Item (SWL)	L_{Aeq} Activity	L_{Amax} Activity
Stage 1 *(Warehouse 1&3)*	Site Establishment and Clearing	Chainsaw	5	1	108	**114**	118
		Dozer	15	2	110		
		Dump Truck (15 t)	15	1	98		
	Excavation	Dozer (D10)	15	2	115	**122**	123
		Dump Truck (15 t)	15	3	103		
		Excavator (40 t)	15	3	109		
		Piling Rig	1.5	1	116		
		Vibratory Roller (10-12 t)	15	1	109		
	Building Construction	Concrete Truck / Agitator	7.5	2	106	**114**	118
		Concrete Pump	15	1	106		
		Truck (12-15 tonne)	15	1	103		

Stage	Phase	Equipment	Operating minutes in 15-min period	Number of items in same location	Sound Power Level (dB)		
					Maximum Item (SWL)	L_{Aeq} Activity	L_{Amax} Activity
Stage 1 ***(Roadworks)***	Site Establishment and Clearing	Chainsaw	5	1	108	**111**	118
		Dozer	15	1	110		
		Dump Truck (15 t)	15	1	98		
		Concrete Truck	15	1	106		
	Construction of Internal Road	Scraper	15	2	108	**118**	121
		Grader	15	2	108		
		Compactor	15	2	108		
		Asphalt Paver	15	1	111		
		Concrete Truck	15	1	106		
		Vibratory Roller (10-12 t)	15	3	109		

Consistent with the requirements of the *ICNG*, and to inform the scheduling of construction activity and management of noise during the detailed design phase, the construction noise impacts are based on a worst-case assessment. The *ICNG* recommends that the realistic worst-case or conservative noise levels from the source should be predicted for assessment locations representing the most noise exposed residences or other sensitive land uses. For each receiver area the noise levels are predicted at the most noise-exposed location, which would usually be the closest receiver.

For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted at the most-exposed receiver as the noise levels presented in this report are based on a realistic worst-case assessment.

6.5 Predicted Construction Noise Impacts

Noise impacts have been quantitatively assessed of construction activities for the NCAs and future industrial buildings surrounding the site, the. The activities considered are described in **Table 6-4**.

The typical $L_{Aeq,15min}$ noise levels at the surrounding NCAs and future industrial developments (to be located at site boundary) are provided in **Table 6-5**. Each of the construction activities are representative of the 'noisiest' construction periods allowing for the simultaneous operation of noise intensive construction plant in close proximity.

Table 6-5 Predicted Construction Noise Impacts

Works	Stage	NCA	Noise Level – $L_{Aeq,15min}$ dBA					
			Noise Management Levels (NMLs)				Worst-case Predicted	Exceedance during Standard Hours
			Day Standard	Day OOH	Eve OOH	Night OOH		
Stage 1 *(Warehouse 1&3)*	Site Establishment and Clearing	NCA01	46	41	38	35	27	-
		NCA02	45	40	39	37	24	-
		NCA03	49	44	44	44	12	-
		NCA04	49	44	44	44	16	-
		NCA05	49	44	44	37	25	-
		Industrial	75				52	
		Education	45				25	
	Bulk Excavation and Retaining Walls	NCA01	46	41	38	35	35	-
		NCA02	45	40	39	37	32	-
		NCA03	49	44	44	44	20	-
		NCA04	49	44	44	44	24	-
		NCA05	49	44	44	37	33	-
		Industrial	75				60	
		Education	45				33	
	Building Construction	NCA01	46	41	38	35	27	-
		NCA02	45	40	39	37	24	-
		NCA03	49	44	44	44	12	-
		NCA04	49	44	44	44	16	-
		NCA05	49	44	44	37	25	-
		Industrial	75				52	
		Education	45				25	
Stage 1 *(Internal Road)*	Site Establishment and Clearing	NCA01	46	41	38	35	26	-
		NCA02	45	40	39	37	25	-
		NCA03	49	44	44	44	8	-
		NCA04	49	44	44	44	14	-
		NCA05	49	44	44	37	19	-

Works	Stage	NCA	Noise Level – $L_{Aeq,15min}$ dBA					
			Noise Management Levels (NMLs)				Worst-case Predicted	Exceedance during Standard Hours
			Day Standard	Day OOH	Eve OOH	Night OOH		
		Industrial	75				56	
		Education	45				23	
	Road Construction	NCA01	46	41	38	35	33	-
		NCA02	45	40	39	37	32	-
		NCA03	49	44	44	44	15	-
		NCA04	49	44	44	44	21	-
		NCA05	49	44	44	37	26	-
		Industrial	75				46	-
		Education	45				30	-

During standard construction hours, no exceedances of the NMLs are predicted at any residential receivers. There are no noise sensitive receivers that are considered to be Highly Noise Affected, i.e. with predicted noise levels exceeding 75 dB L_{Aeq}.

Industrial receivers to be located in the adjoining lots will not be subjected to noise impacts greater than the external Construction Noise Management Level of 75 dB L_{Aeq}.

Table 6-6 below presents the range of predicted construction noise levels at residential receivers within the Mamre Road Precinct.

Table 6-6 Predicted Construction Noise Levels at Receivers within the Mamre Road Precinct.

Works	Stage	Predicted Noise Level $L_{Aeq,15min}$	
		Min	Max
Stage 1 ***(Warehouse 1&3)***	Site Establishment and Clearing	23	42
	Bulk Excavation and Retaining Walls	31	50
	Building Construction	23	42
Stage 1 ***(Internal Road)***	Site Establishment and Clearing	19	41
	Road Construction	26	48

Table 6-6 indicates that the noise levels at some of the residential receivers within the Mamre Road Precinct could exceed the standard hours NML of NCA05, which would be the most representative, by 1 dB during bulk excavation works.

The *ICNG* describes strategies for construction noise mitigation and control that are applicable to this proposal. The strategies are designed to minimise, to the fullest extent practicable, noise during construction.

Where reasonable and feasible, preference should be given to scheduling construction works within the standard construction hours of:

- Monday to Friday 7.00am to 6.00pm.
- Saturday 8.00am to 1.00pm

Typically, any OOHWs would be subject to separate approval on a case-by-case basis.

Where construction noise levels are predicted to exceed the NMLs it is recommended that construction noise mitigation measures should be considered, where reasonable and feasible. Typical construction noise mitigation measures include the following:

- Avoiding the coincidence of noisy plant working simultaneously close together would result in reduced noise emissions.
- Equipment which is used intermittently is to be shut down when not in use.
- Where possible, equipment with directional noise emissions should be oriented away from sensitive receivers.
- Regular compliance checks on the noise emissions of all plant and machinery used for the proposal would indicate whether noise emissions from plant items were higher than predicted.

This also identifies defective silencing equipment on the items of plant.

- Where possible, heavy vehicle movements should be limited to standard construction hours.
- Non-tonal reversing alarms should be used on all items of plants and heavy vehicles used for construction.

6.6 Predicted Construction Vibration Impacts

Vibration intensive items of plant proposed for use during the construction of the development includes rock breaking, vibratory rollers, and pilling activity. These items of equipment are proposed to be used primarily during enabling works, earth works and construction of the road network.

Commercial developments surrounding the site may be operational at the time of construction. Site-specific vibration mitigation measures should be utilised where works requiring the use of vibration intensive items of plant are proposed within the minimum working distances outlined in **Table 6-3**.

6.7 Construction Noise & Vibration Mitigation Measures

Without mitigation, noise levels from construction activities have been predicted to exceed the noise management levels nominated in the guidelines at some surrounding receivers. Therefore, noise control measures are recommended to ensure that noise is reduced where feasible. The following project-specific mitigation measures are recommended.

- Selection of quietest feasible construction equipment;
- Use of saw cutting in preference to rock-breakers where feasible; and
- Localised treatment such as barriers, shrouds, and the like around fixed plant, such as pumps, generators, and concrete pumps.
- In addition, the following measures should be included in a Noise & Vibration Management Plan.
- *Plant Noise Audit* – Noise emission levels of all critical items of mobile plant and equipment should be checked for compliance with noise limits appropriate to those items prior to the equipment going into regular service. To this end, testing should be established with the contractor.
- *Operator Instruction* – Operators should be trained in order to raise their awareness of potential noise problems and to increase their use of techniques to minimise noise emission.
- *Equipment Selection* – All fixed plant at the work sites should be appropriately selected, and where necessary, fitted with silencers, acoustical enclosures, and other noise attenuation measures in order to ensure that the total noise emission from each work site complies with EPA guidelines.
- *Site Noise Planning* – Where practical, the layout and positioning of noise-producing plant and activities on each work site should be optimised to minimise noise emission levels.

The adoption of the above measures is aimed at working towards achieving the noise management levels established at surrounding receivers.

6.7.1 Community Liaison and General Approaches to Mitigation

An effective community relations programme should be put in place to keep the community that has been identified as being potentially affected appraised of progress of the works, and to forewarn potentially affected groups (e.g. by letterbox drop, meetings with surrounding owners/tenants, etc) of any anticipated changes in noise and vibration emissions prior to critical stages of the works, and to explain complaint procedures and response mechanisms. This programme should include a *Community and Stakeholder Engagement Strategy* developed specifically for the Project.

Close liaison should be maintained between the communities overlooking work sites and the parties associated with the construction works to provide effective feedback in regard to perceived emissions. In this manner, equipment selections and work activities can be coordinated where necessary to minimise disturbance to neighbouring communities, and to ensure prompt response to complaints, should they occur.

6.7.2 Noise & Vibration Management Plan

A Construction Noise & Vibration Management Plan for the site is recommended which should be prepared by the successful contractor. The plan should reference the findings of this assessment. Areas that should be addressed in plan include:

- Noise and vibration mitigation measures;
- Noise and vibration monitoring;
- Response to complaints**;**
- Responsibilities;
- Monitoring of noise emissions from plant items;
- Reporting and record keeping;
- Non-compliance and corrective action; and
- Community consultation and complaint handling.

7 ROAD TRAFFIC NOISE

This section of the report considers the potential impacts from additional traffic on the surrounding local road network.

The surrounding road network servicing the proposed development is located within the Mamre Road Precinct (MRP). Consideration of offsite road traffic noise is outside the scope of this assessment, as outcomes of the MRP Development Control Plan and several other key planning policies and strategies will determine the potential for traffic noise impacts at sensitive receiver locations.

7.1 NSW Road Noise Policy (2011)

Additional guidance for the assessment of noise from traffic on public roads are set out in the *Road Noise Policy (*RNP) (Department of Environment, Climate Change and Water, 2011).

Table 3 of the *RNP* is reproduced in **Table 7-1** and presents the relevant criteria for road use within the Project.

Table 7-1 Road Traffic Noise Assessment Criteria for Residential Land Uses

Type of Development	Assessment Criteria	
	Day (7am–10pm)	Night (10pm–7am)
Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	$L_{Aeq,15\ hour}$ 60 (external)	$L_{Aeq,9\ hour}$ 55 (external)

In addition, for existing residences and other sensitive land uses affected by additional traffic on existing roads and where the criterion is exceeded, any increase in the total traffic noise level should preferably be limited to 2 dB. The *RNP* considers that a 2 dB increase is typically not noticeable.

Existing road traffic noise levels on Mamre Road has been determined from the measured levels at Location L04 and is presented below in **Table 7-2**. This noise monitor is located approximately 115 m from Mamre Road.

Table 7-2 Measured Road Traffic Noise Level, Mamre Road

Period	Measured Noise Level
Day	$L_{Aeq,15\ hour}$ 52
Night	$L_{Aeq,9\ hour}$ 54

7.2 Off-site Traffic Movement

Estimates of projected traffic volumes associated with the development have been provided by the client and are produced below for reference.

While light and heavy vehicle movements within the GPT site are classified as part of the operational site noise, once they leave site and onto public roads, they are assessed under the NSW *Road Noise Policy* (RNP).

The existing annual average daily traffic volume for Mamre Road is approximately 18,000 vehicles per day as per RMS report '*Mamre Road upgrade*', dated 2017. In accordance with the RTA Guide to Traffic Generating Developments, the proposed warehouse development is predicted to produce an additional 4,594 vehicle movements per day, consisting of 3,270 light vehicles and 1,203 heavy vehicles.

Based on the hourly breakdown of site generated movements, approximately 80% of the traffic volume occurs during the day period of 7.00am to 10.00pm, this results in approximately 14,000 vehicle movements during the day and 4,000 movements during the night period of 10.00pm to7.00am

Table 7-3 below presents the existing traffic volume, additional traffic volume, and the estimated noise level increase.

Table 7-3 Relative Increase in Off-Site Road Noise Levels

Period	Existing Road Traffic Noise Level	Traffic Volume/period		Increase in Road Traffic Noise dB
		Existing	Additional	
Day 7.00am-10.00pm	52	14,000	3,569	1
Night 10.00pm-7.00am	54	4,000	1,025	1

Based on **Table 7-3**, the predicted increase in road traffic noise levels for receivers near Mamre Road is calculated to be 1 dB for both assessment periods and compliant with the road traffic noise criteria of the RNP. Noise impacts due to traffic generation associated with the proposed development is therefore expected to be negligible.

8 CONCLUSION

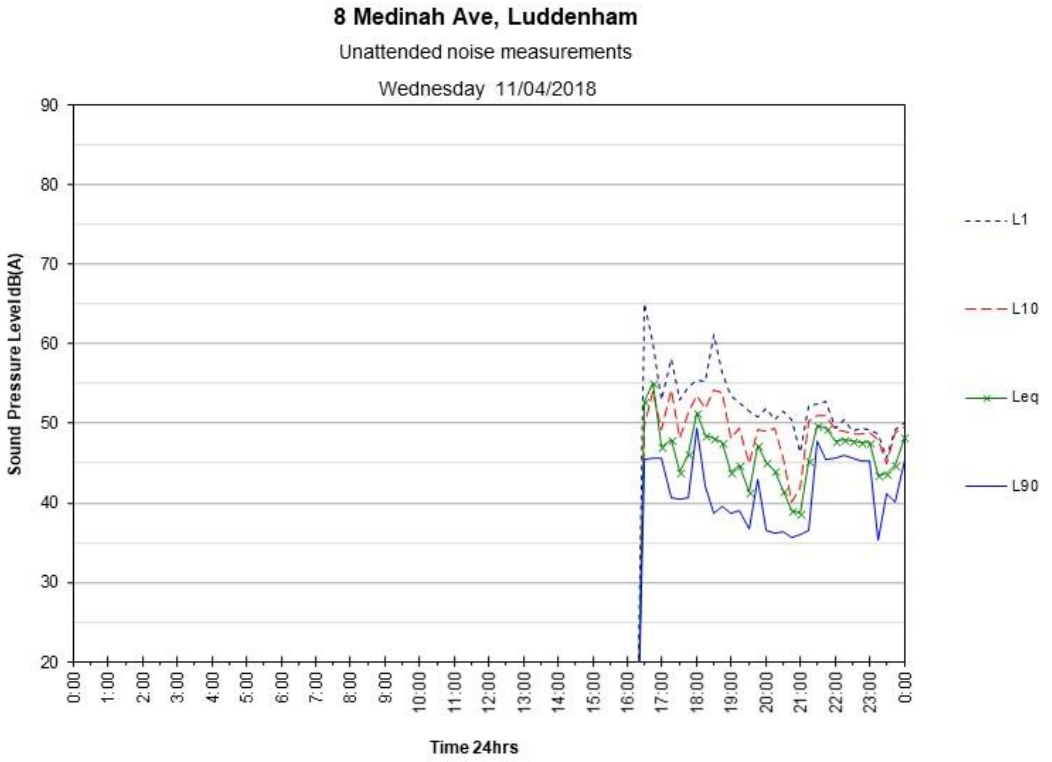
RWDI was engaged by the GPT Group to conduct a noise and vibration assessment for the proposed warehouse estate located on Lots 59-60 in DP 259135, Kemps Creek. Construction and operational noise and vibration, including traffic noise, has been quantitatively assessed in accordance with relevant Environment Protection Authority guidelines.

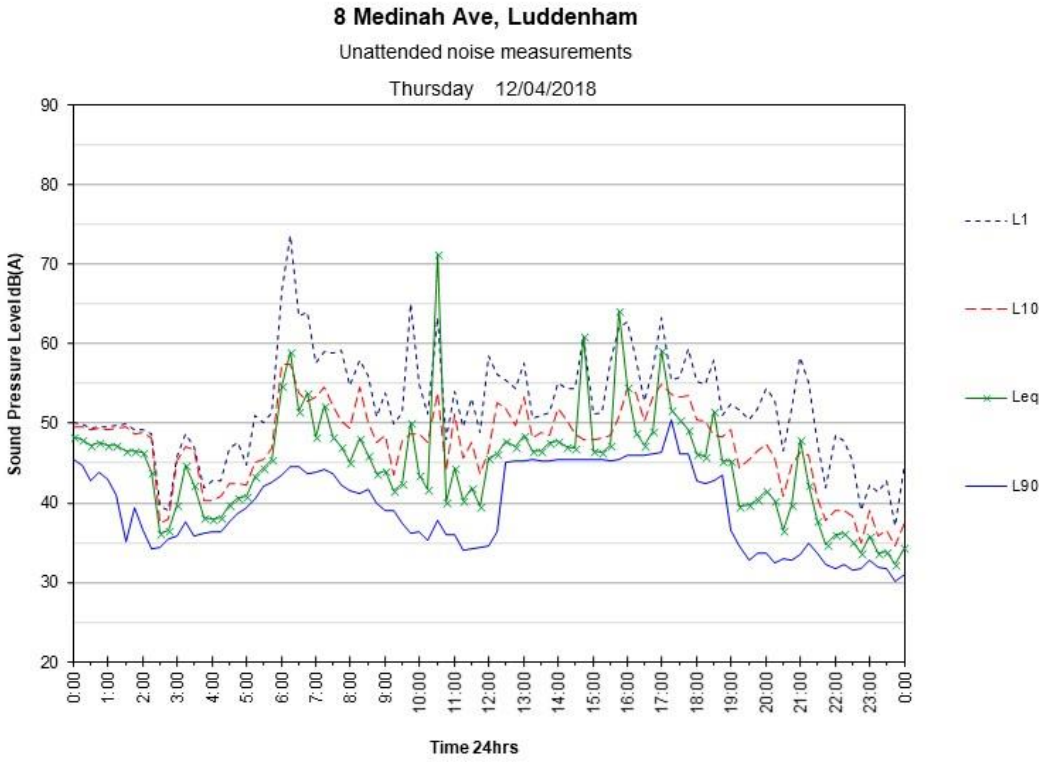
Based on the results of the investigation, the application for the masterplan is predicted to be acoustically satisfactory for both construction during 'standard hours' (Section 6) and 24-hour operations (Section 5).

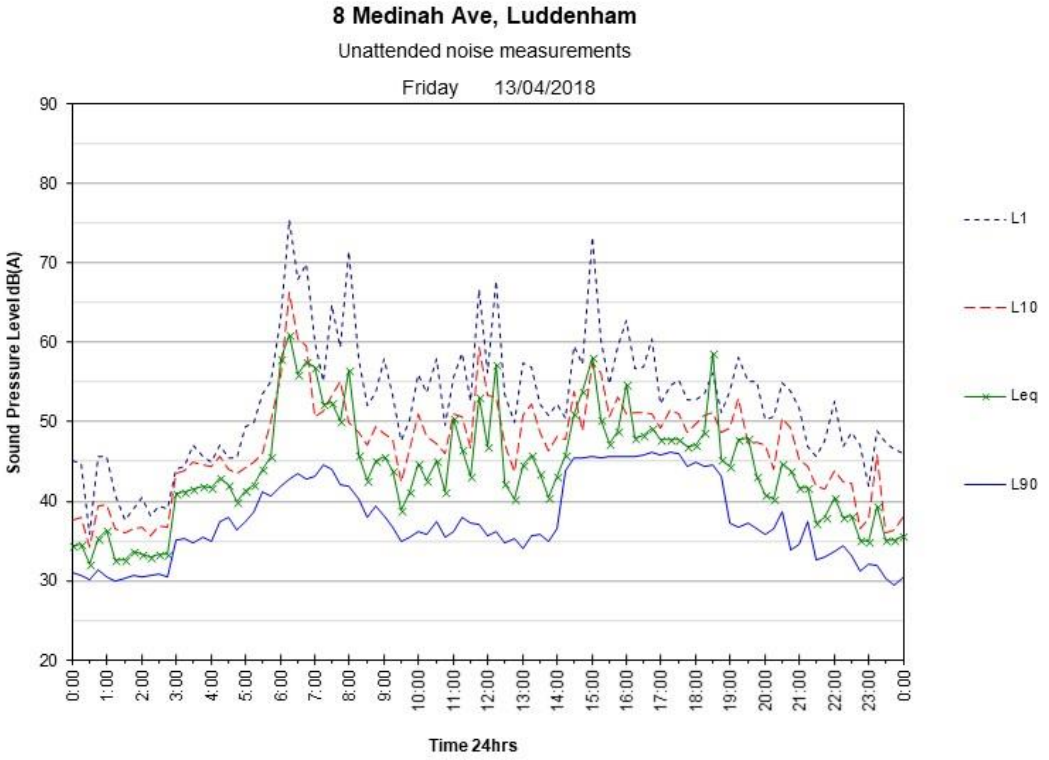
APPENDIX A

UNATTENDED NOISE MEASUREMENT GRAPHS

13.2 Noise Monitoring Charts



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Friday 13/04/2018
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80
70
60
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40
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L10
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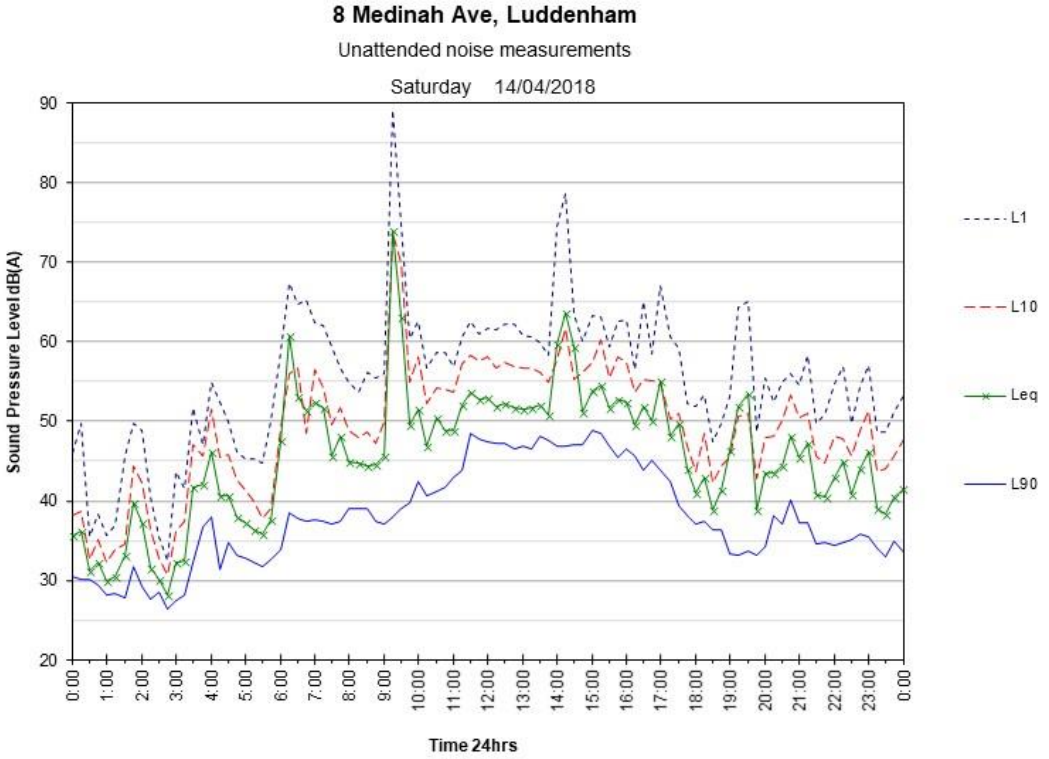
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Unattended noise measurements
Saturday 14/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
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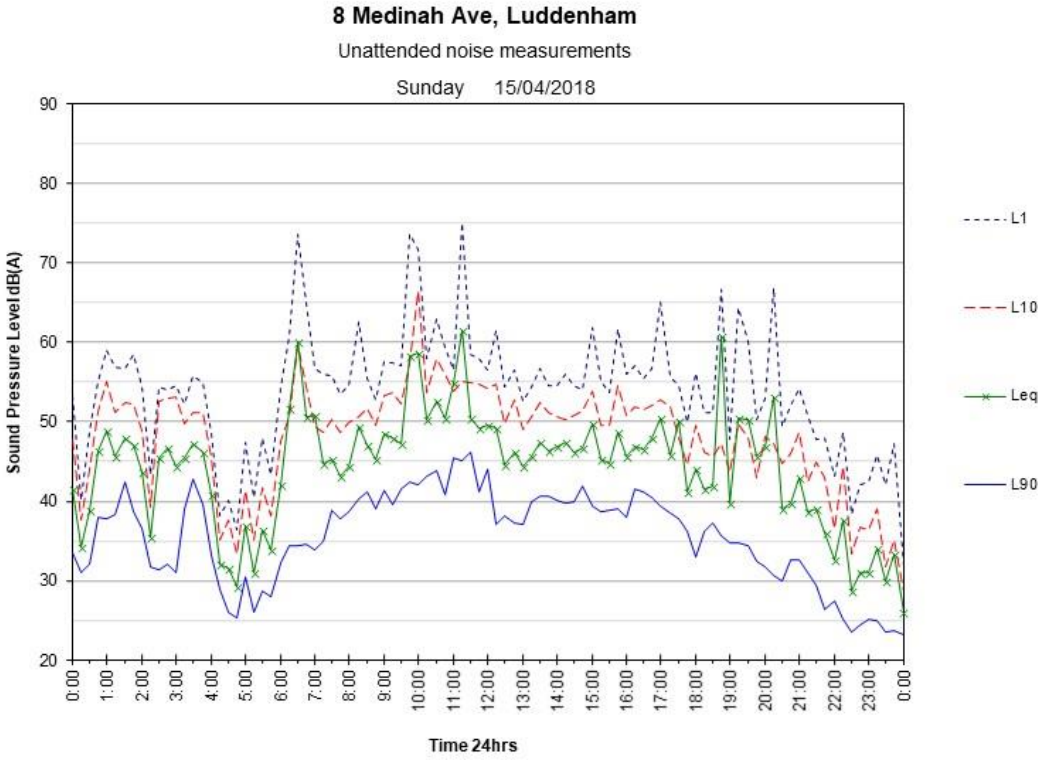
8 Medinah Ave, Luddenham
Unattended noise measurements
Sunday 15/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
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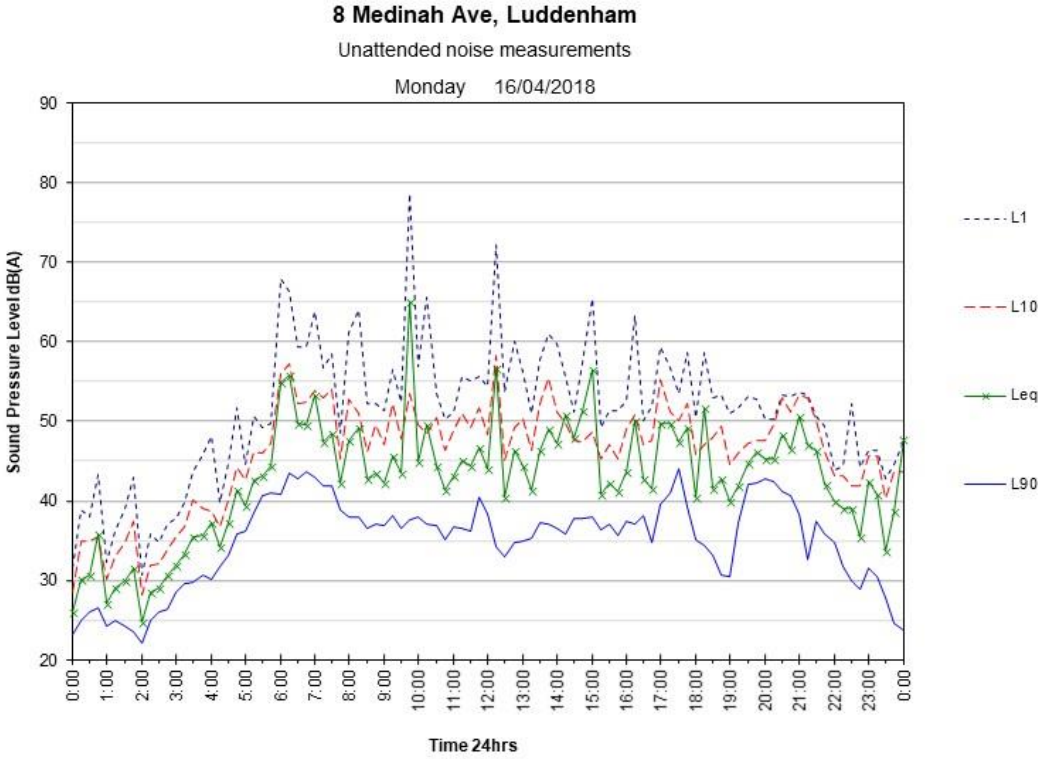
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


8 Medinah Ave, Luddenham
Unattended noise measurements
Monday 16/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
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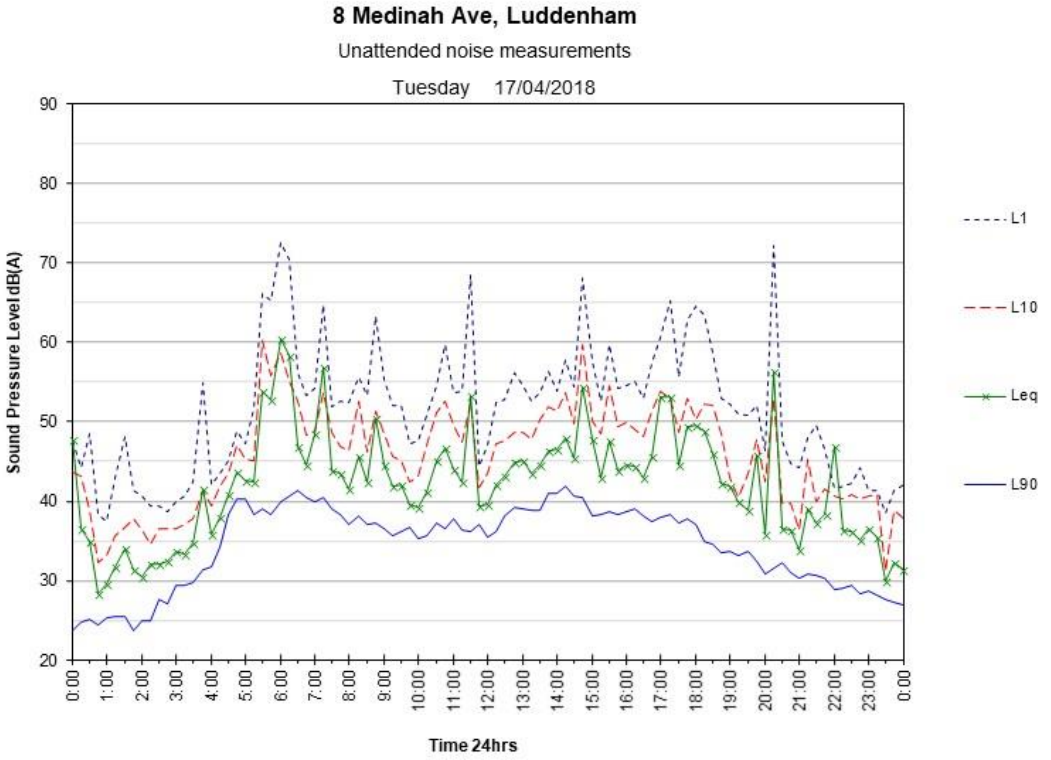
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


8 Medinah Ave, Luddenham
Unattended noise measurements
Tuesday 17/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
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14:00
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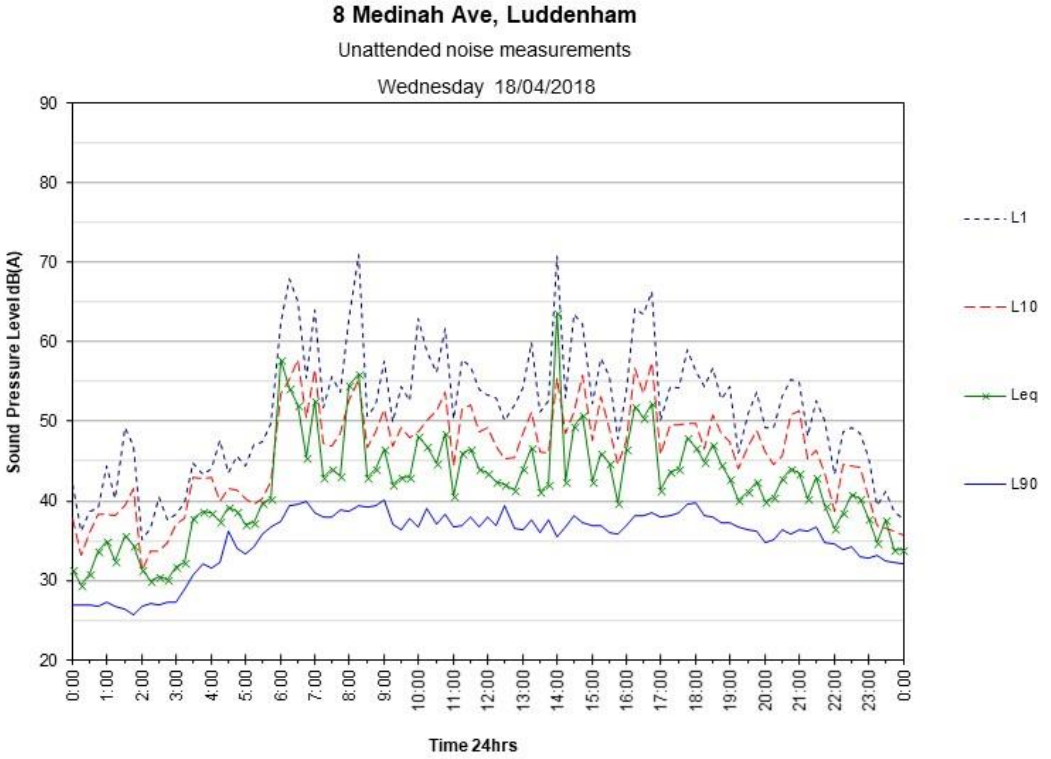
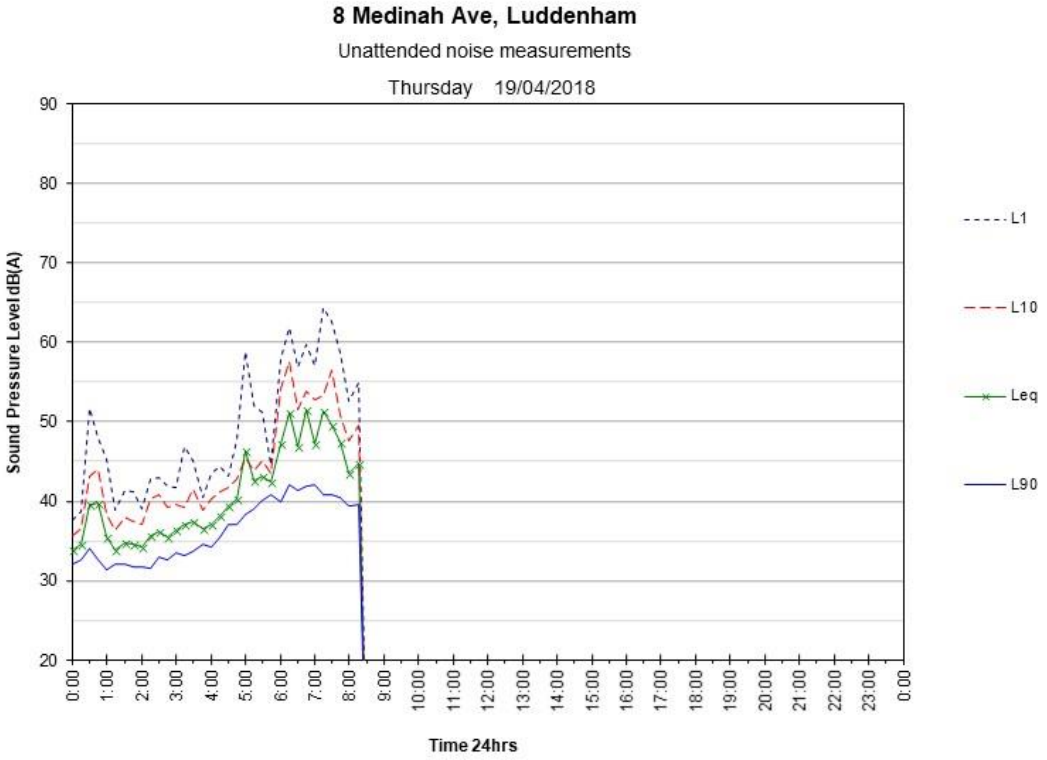
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90

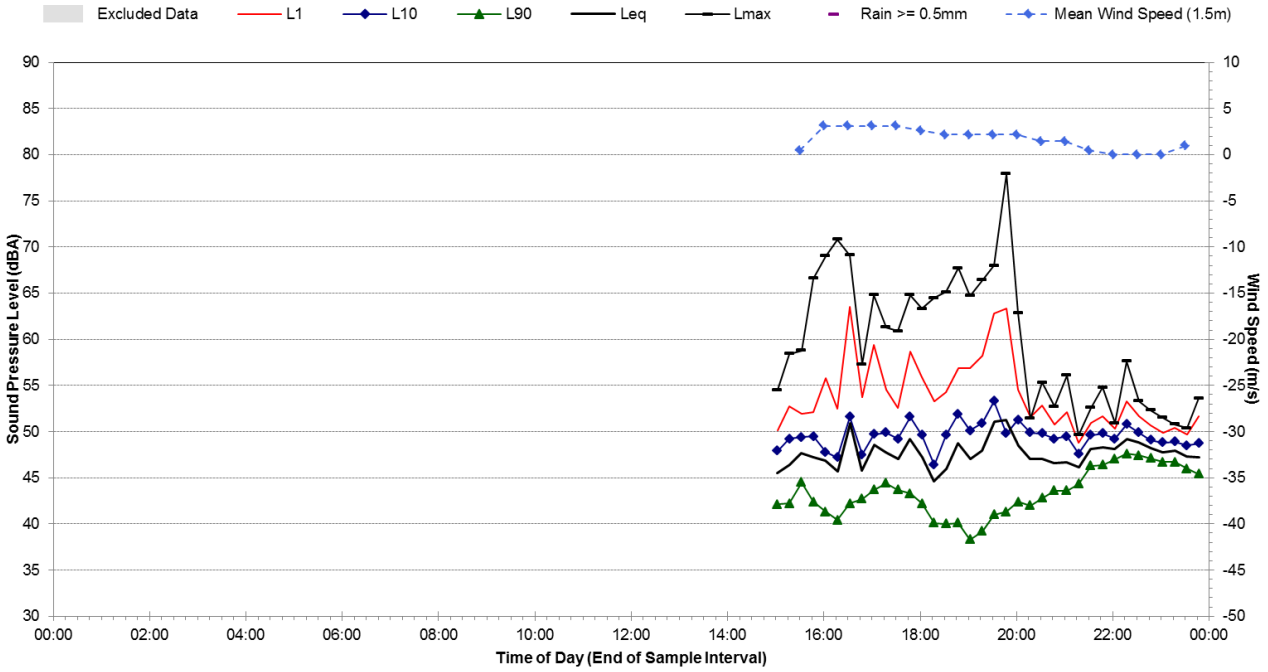

8 Medinah Ave, Luddenham
Unattended noise measurements
Wednesday 18/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90


8 Medinah Ave, Luddenham
Unattended noise measurements
Thursday 19/04/2018
Sound Pressure Level dB(A)
90
80
70
60
50
40
30
20
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
Leq
L90

L1 - Western Site Boundary - Ambient Noise Monitoring Results

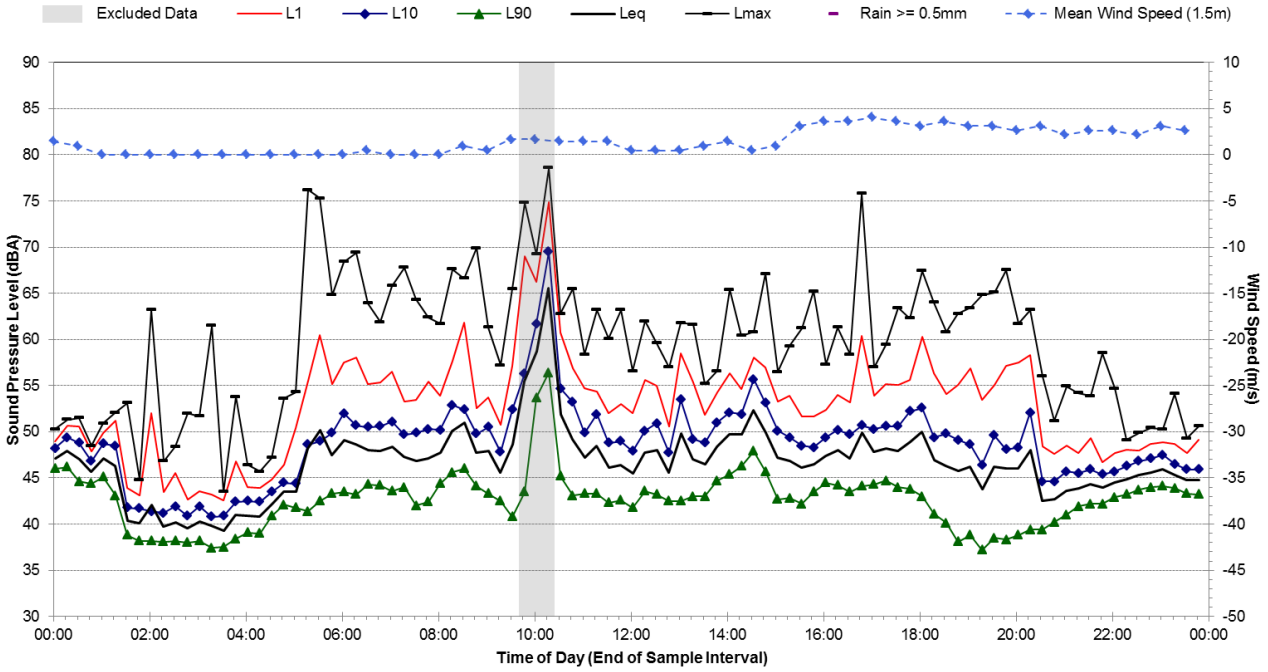
Statistical Ambient Noise Levels

L1 - Western Site Boundary - Monday, 9 November 2015



Statistical Ambient Noise Levels

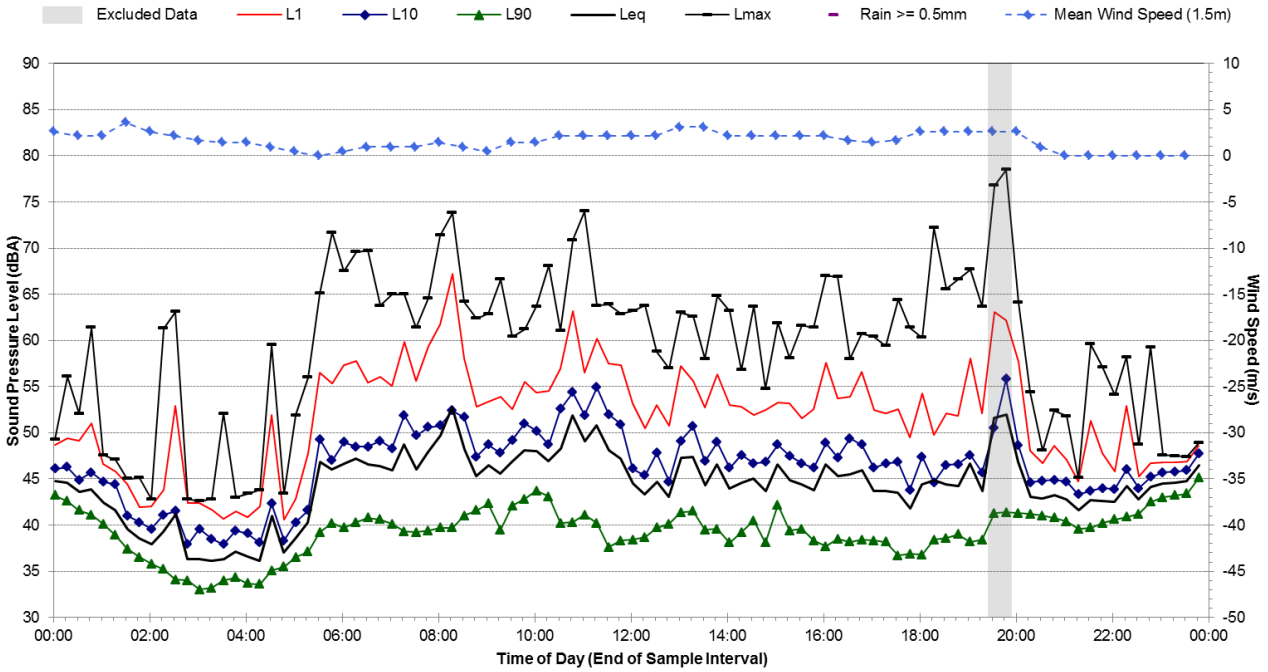
L1 - Western Site Boundary - Tuesday, 10 November 2015



L1 - Western Site Boundary - Ambient Noise Monitoring Results

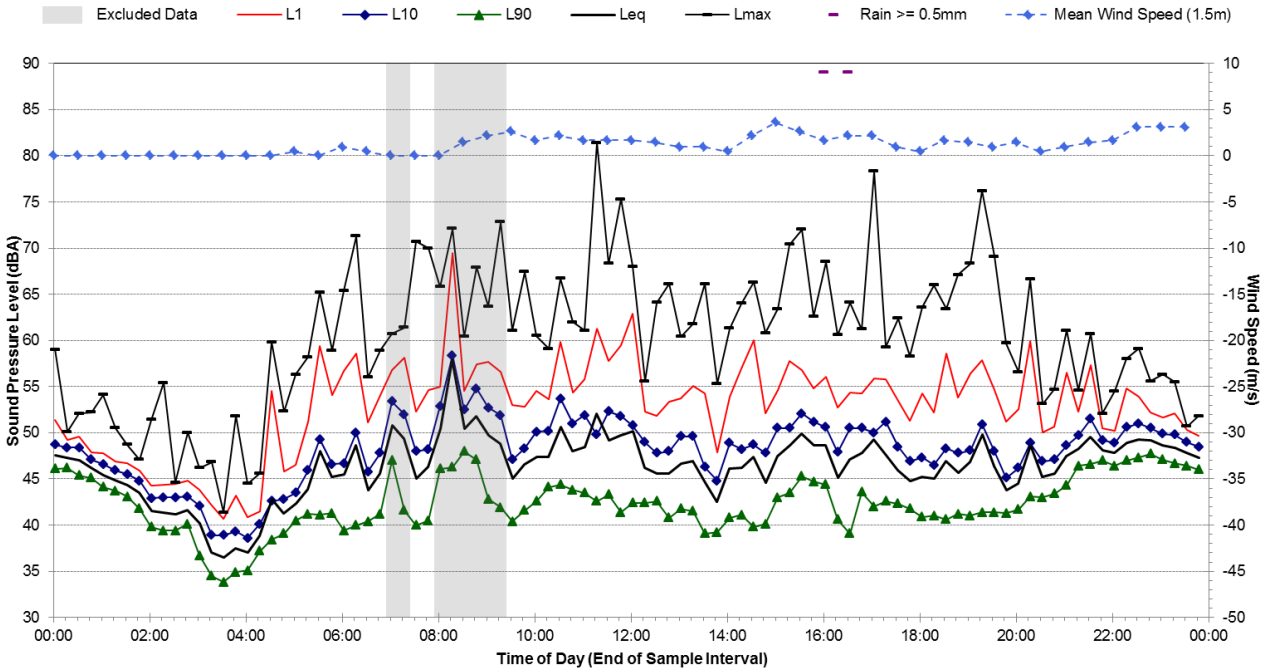
Statistical Ambient Noise Levels

L1 - Western Site Boundary - Wednesday, 11 November 2015



Statistical Ambient Noise Levels

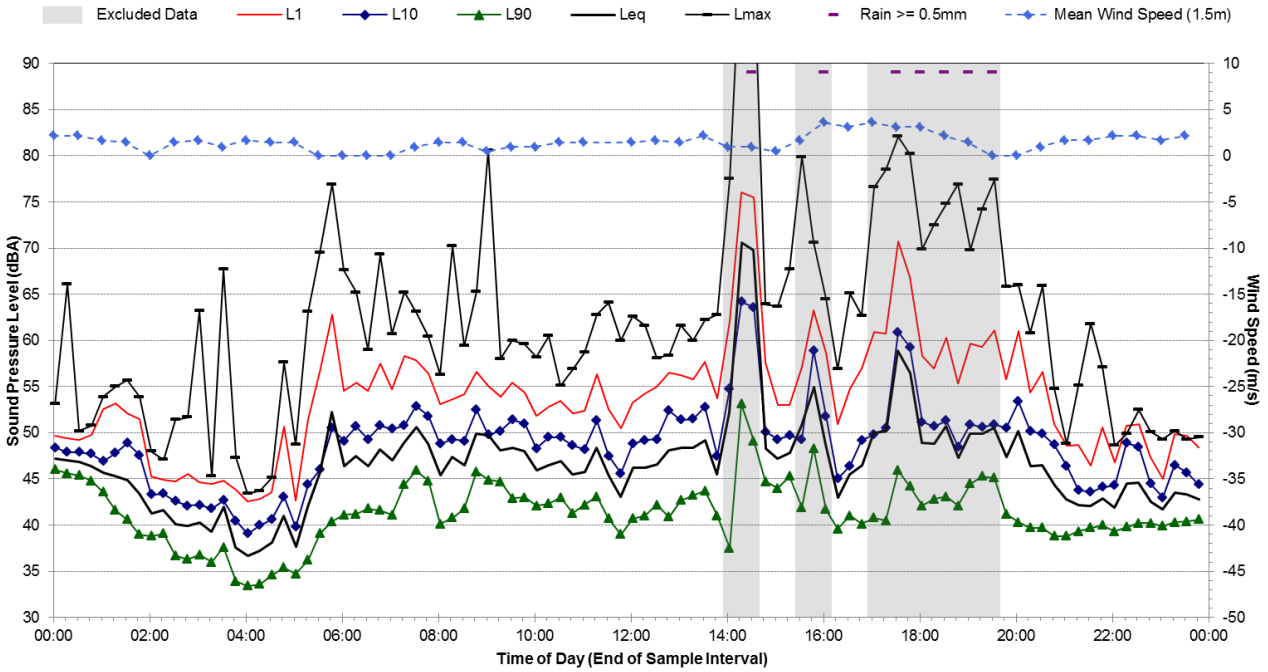
L1 - Western Site Boundary - Thursday, 12 November 2015



L1 - Western Site Boundary - Ambient Noise Monitoring Results

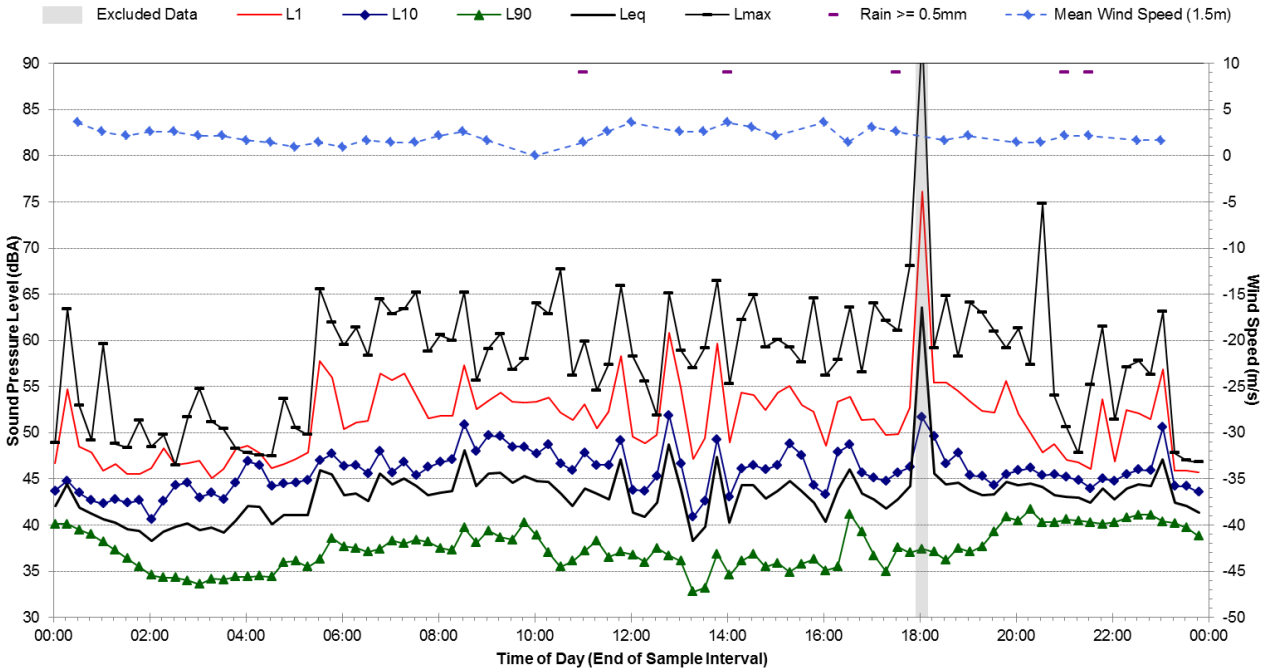
Statistical Ambient Noise Levels

L1 - Western Site Boundary - Friday, 13 November 2015



Statistical Ambient Noise Levels

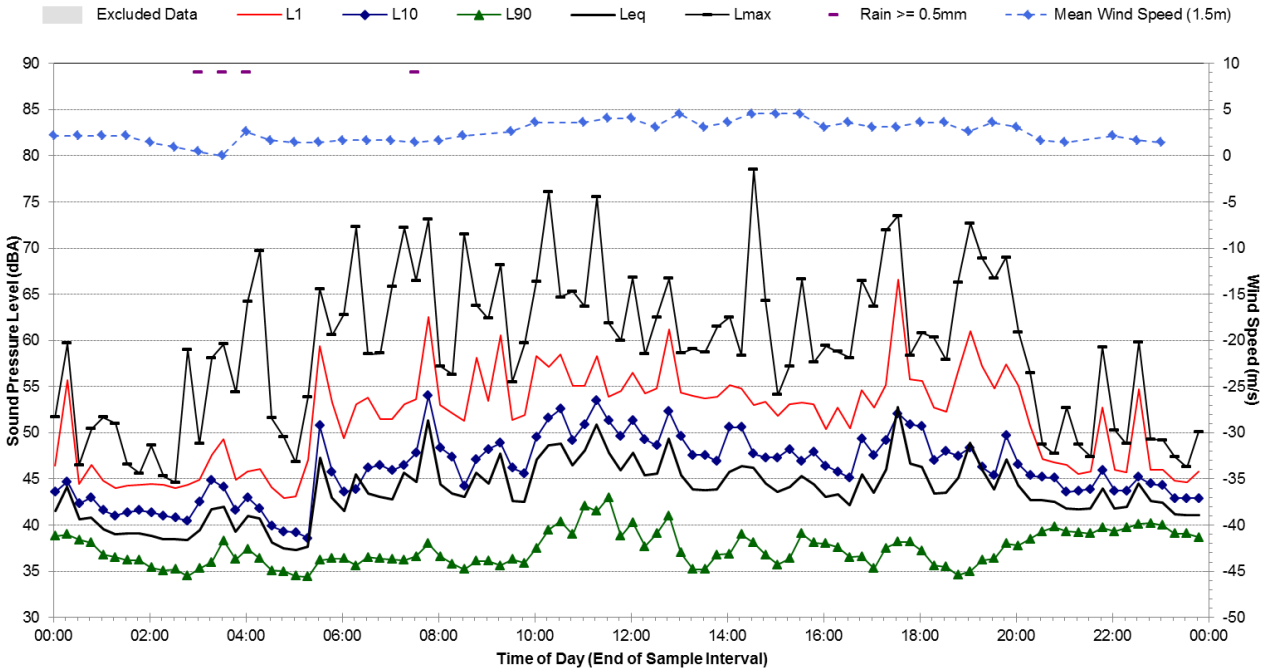
L1 - Western Site Boundary - Saturday, 14 November 2015



L1 - Western Site Boundary - Ambient Noise Monitoring Results

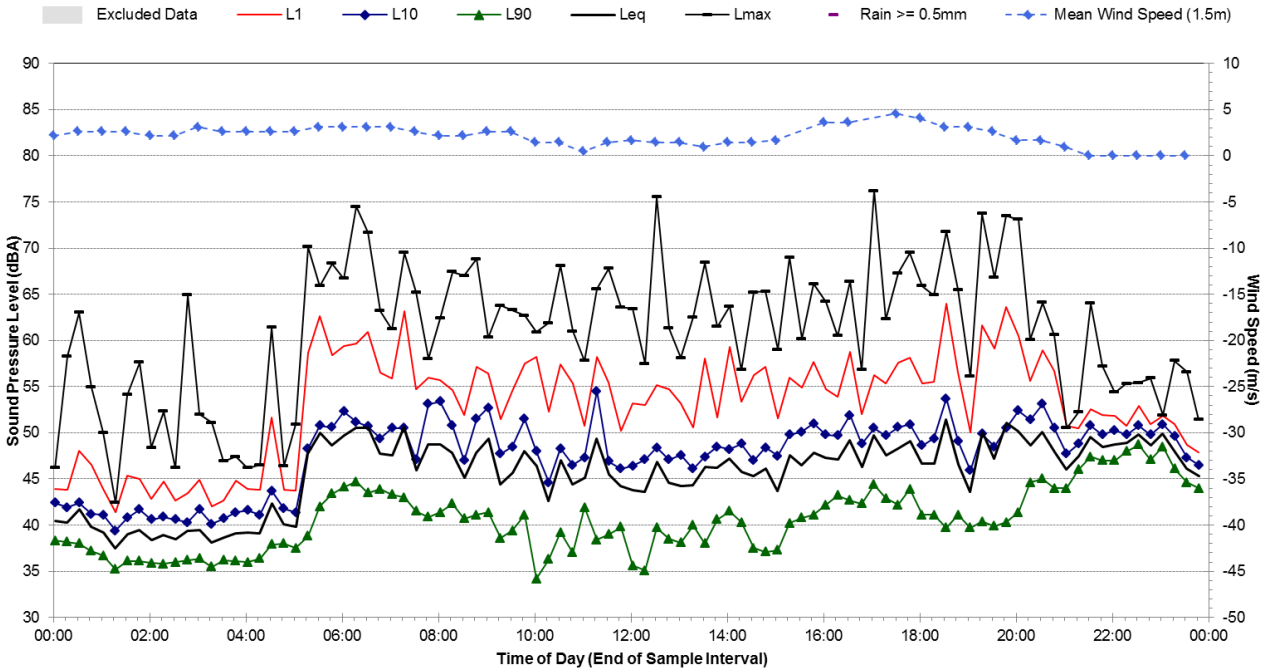
Statistical Ambient Noise Levels

L1 - Western Site Boundary - Sunday, 15 November 2015



Statistical Ambient Noise Levels

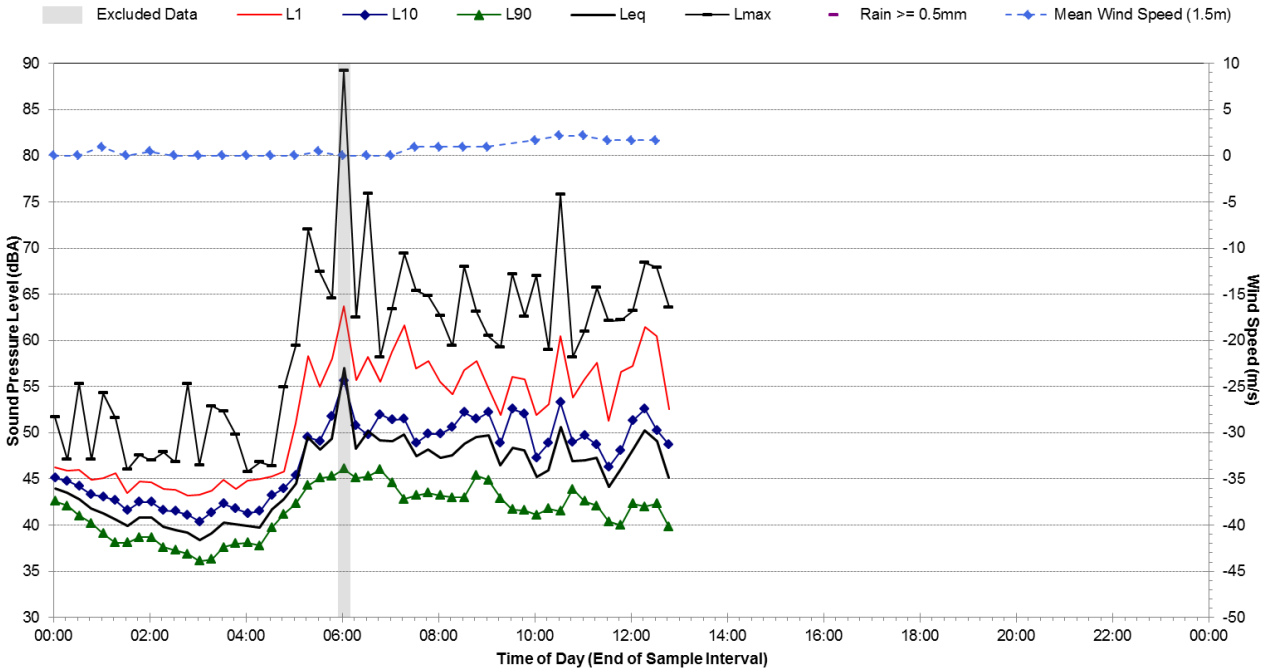
L1 - Western Site Boundary - Monday, 16 November 2015



L1 - Western Site Boundary - Ambient Noise Monitoring Results

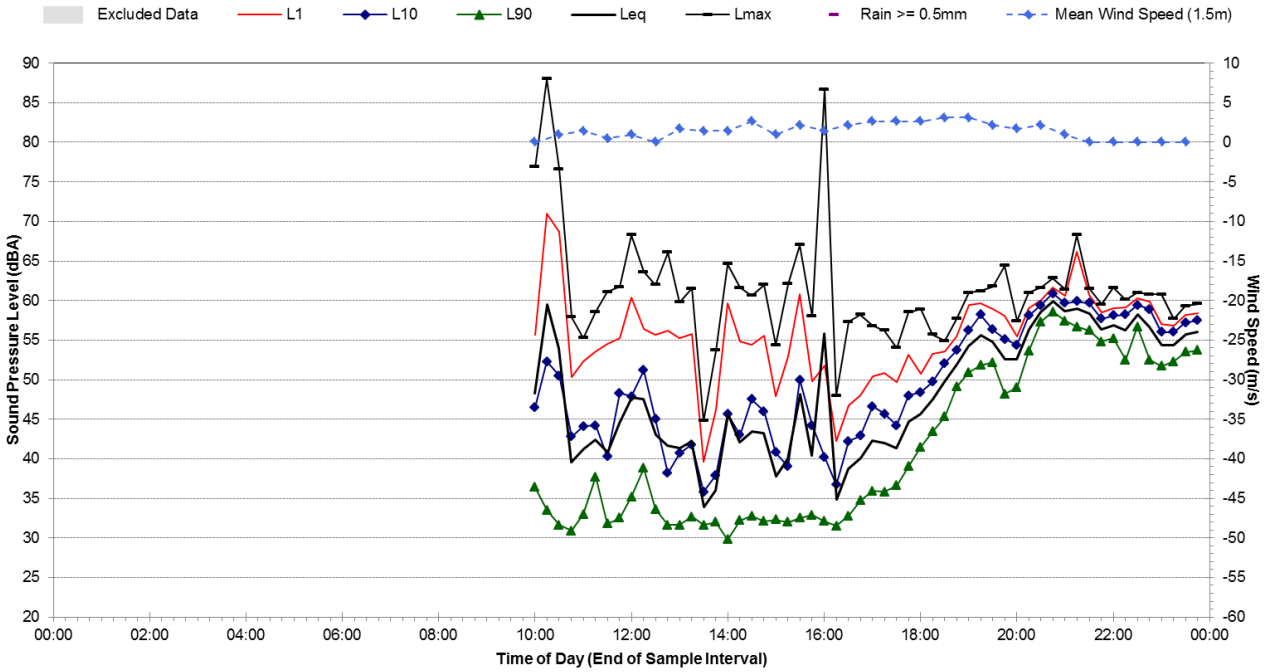
Statistical Ambient Noise Levels

L1 - Western Site Boundary - Tuesday, 17 November 2015



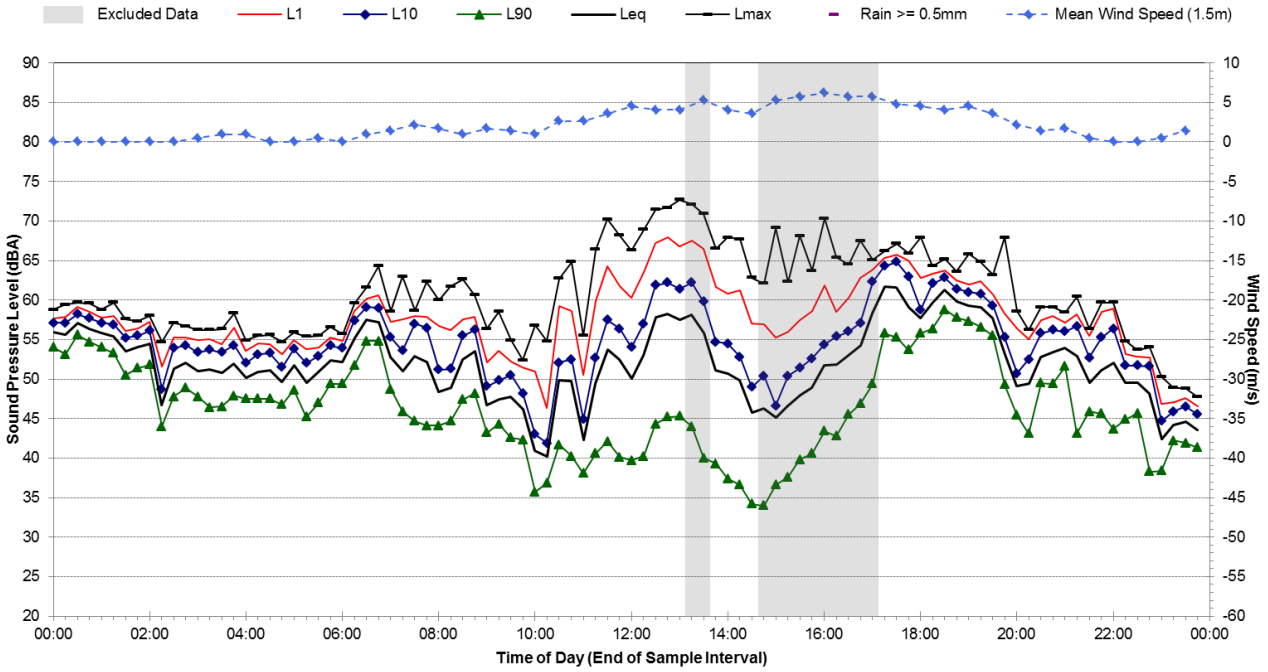
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Wednesday, 4 March 2015



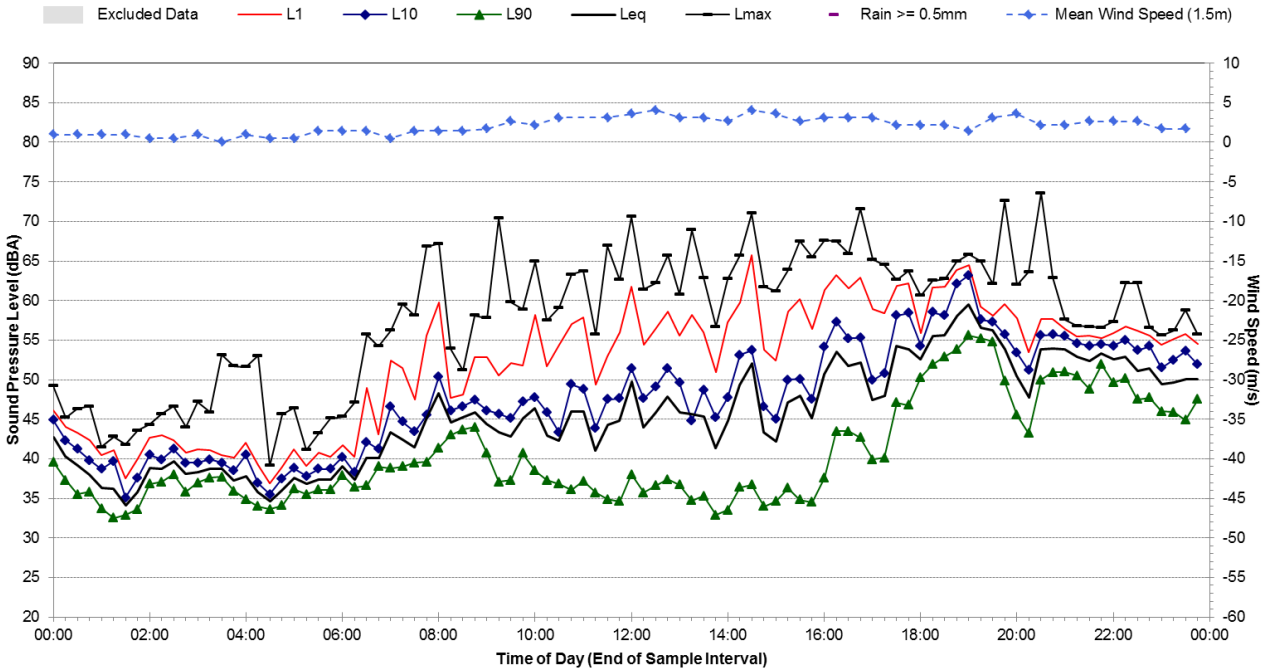
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Thursday, 5 March 2015



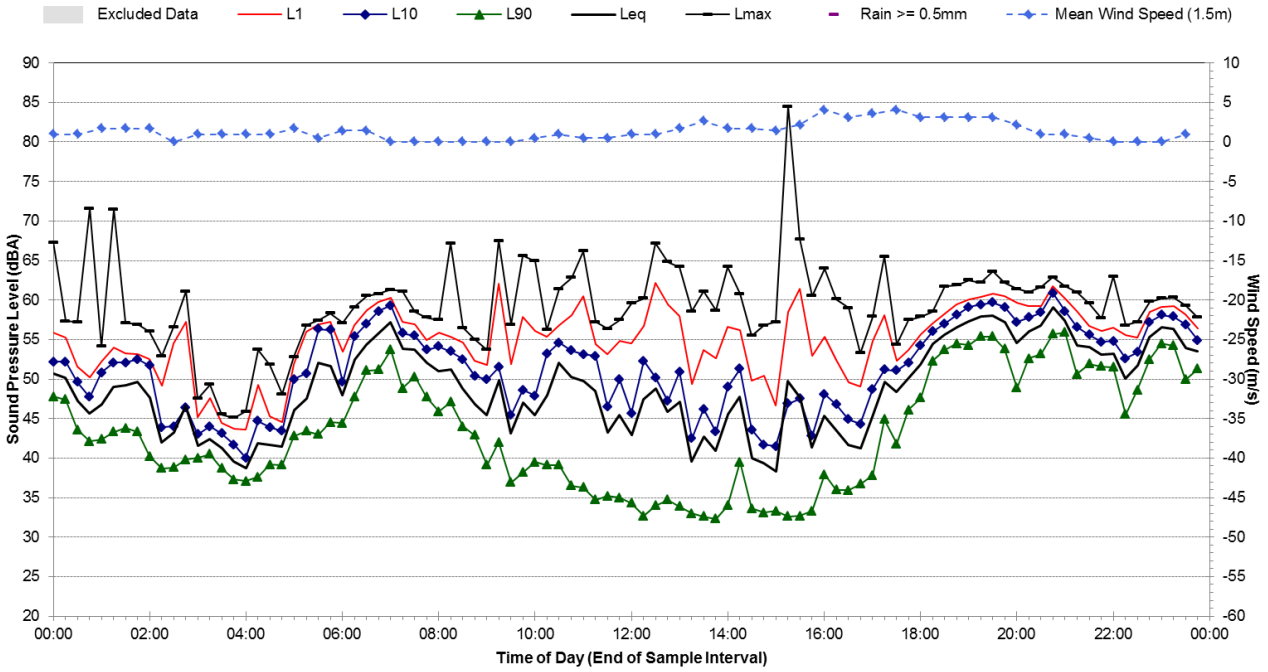
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Friday, 6 March 2015



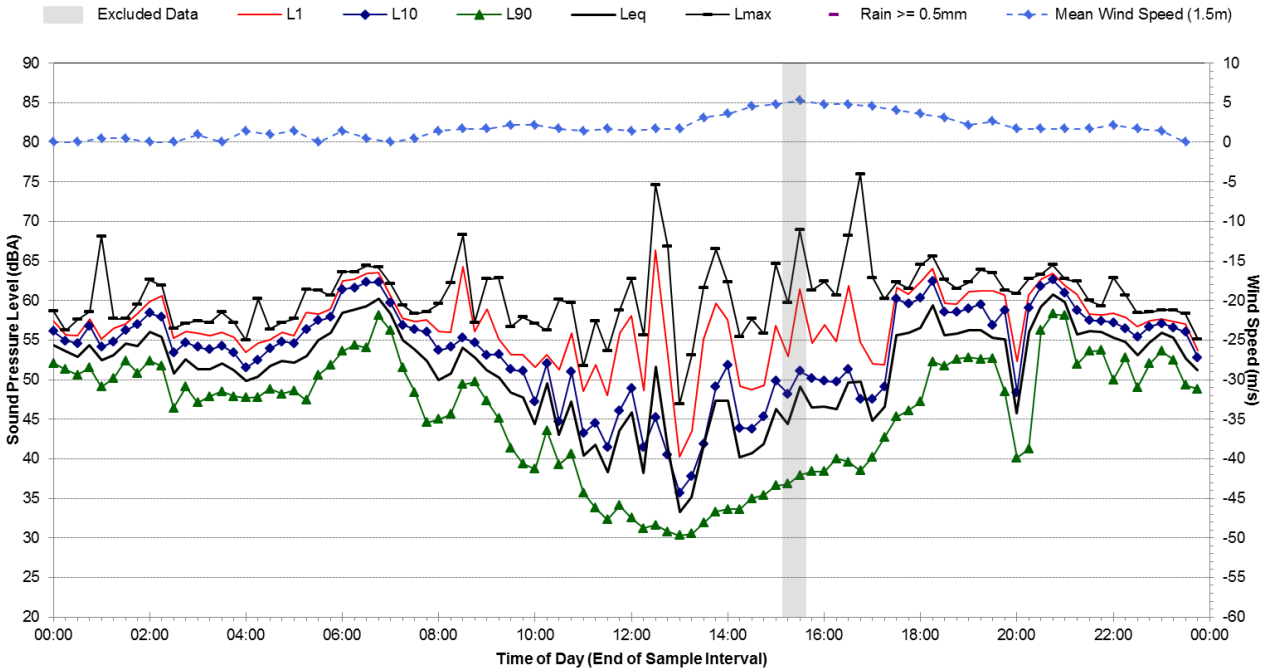
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Saturday, 7 March 2015



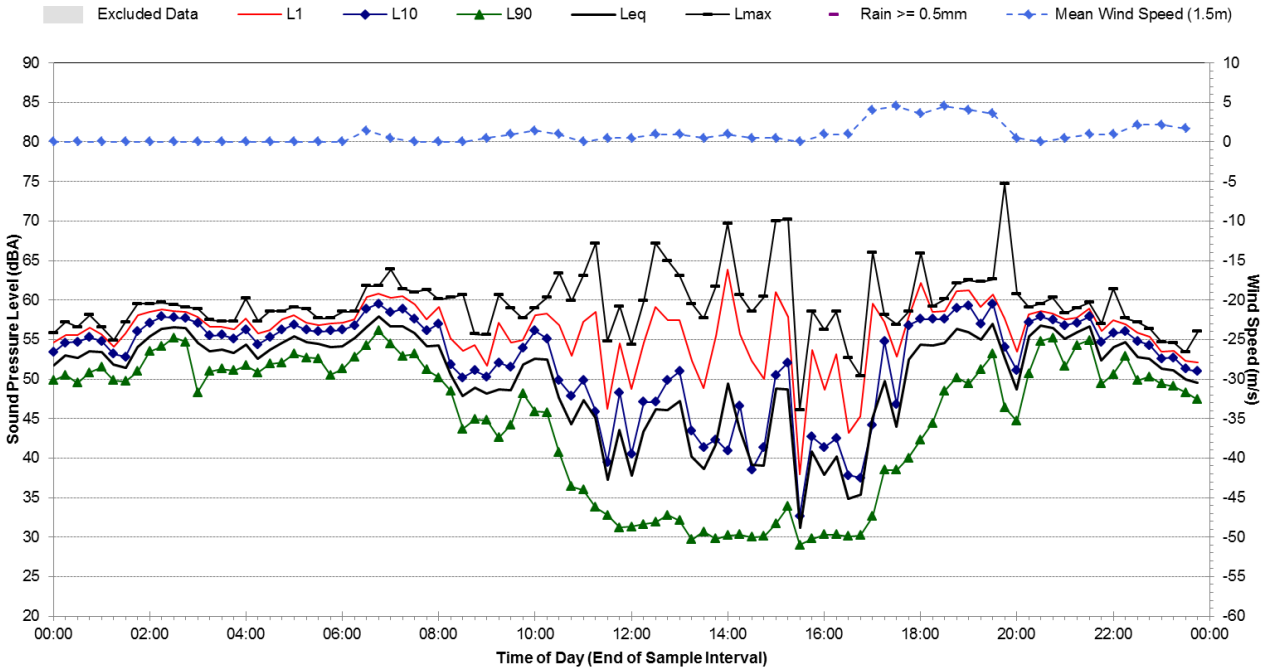
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Sunday, 8 March 2015



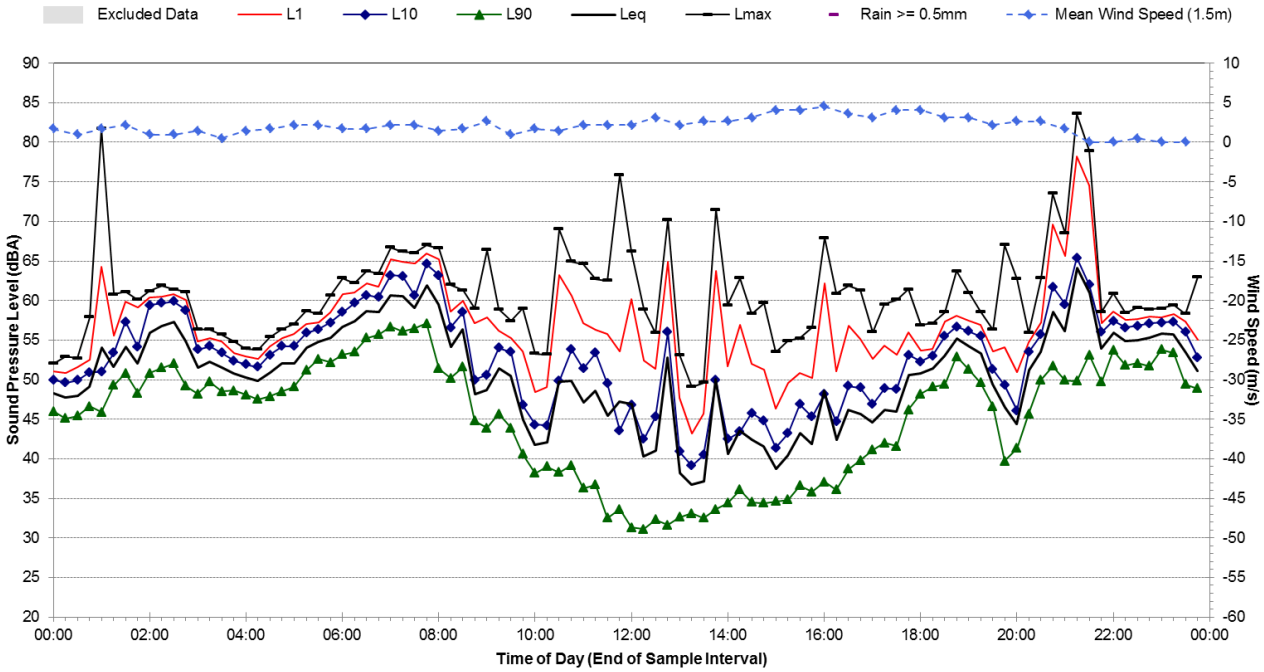
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Monday, 9 March 2015



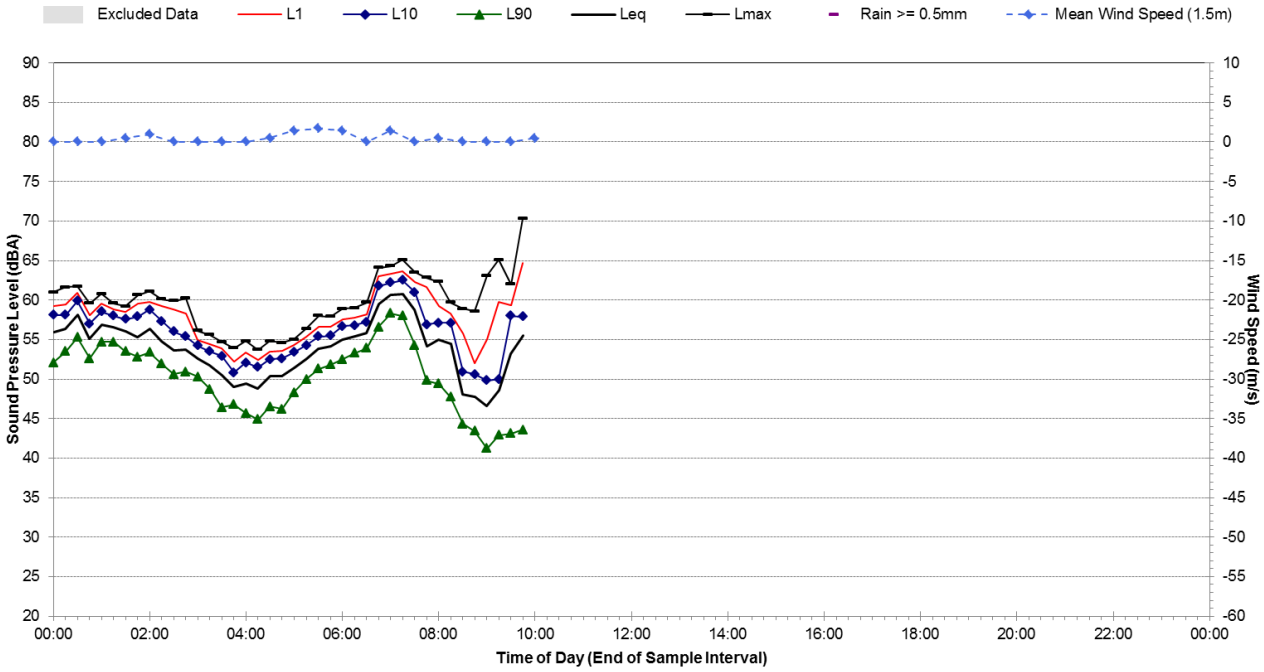
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Tuesday, 10 March 2015



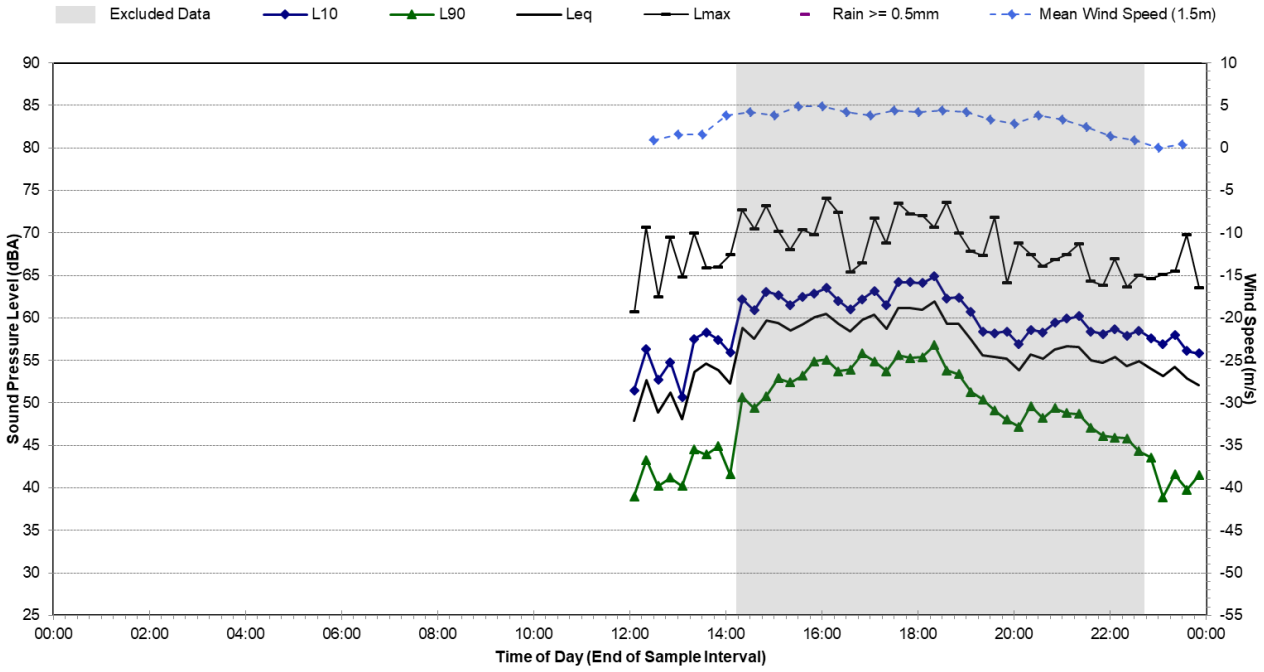
Statistical Ambient Noise Levels

L3 - Southern Site Boundary - Wednesday, 11 March 2015



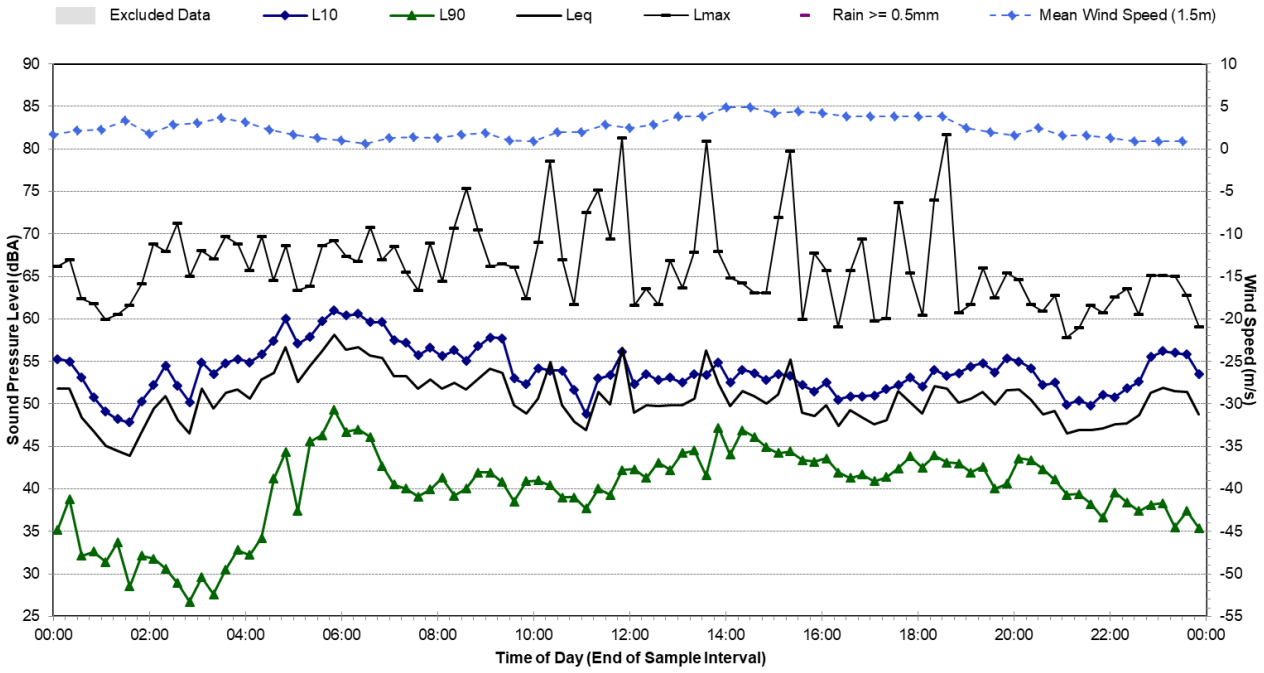
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Friday, 15 November 2019



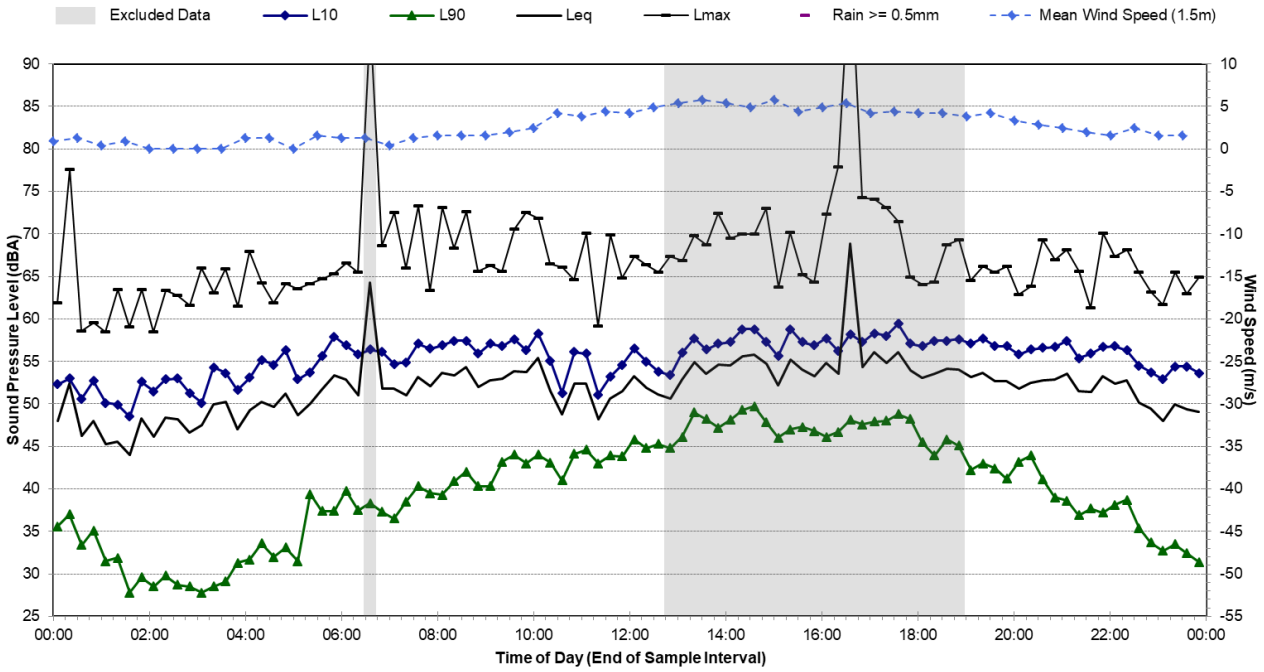
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Saturday, 16 November 2019



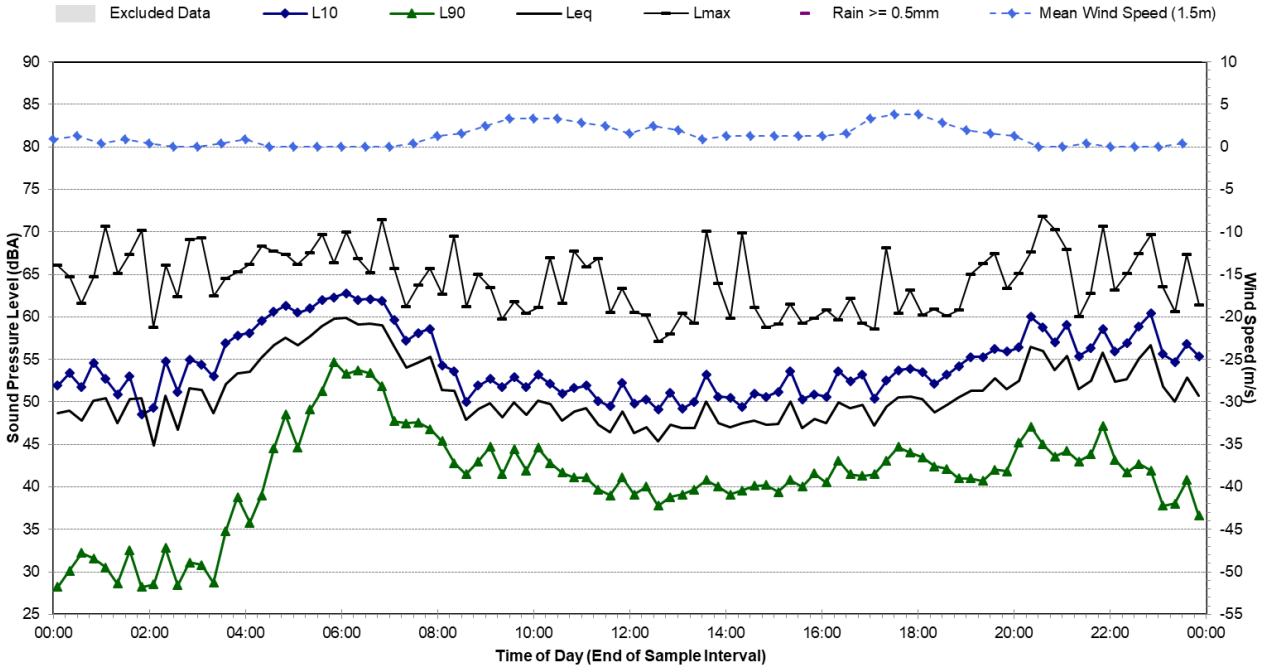
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Sunday, 17 November 2019



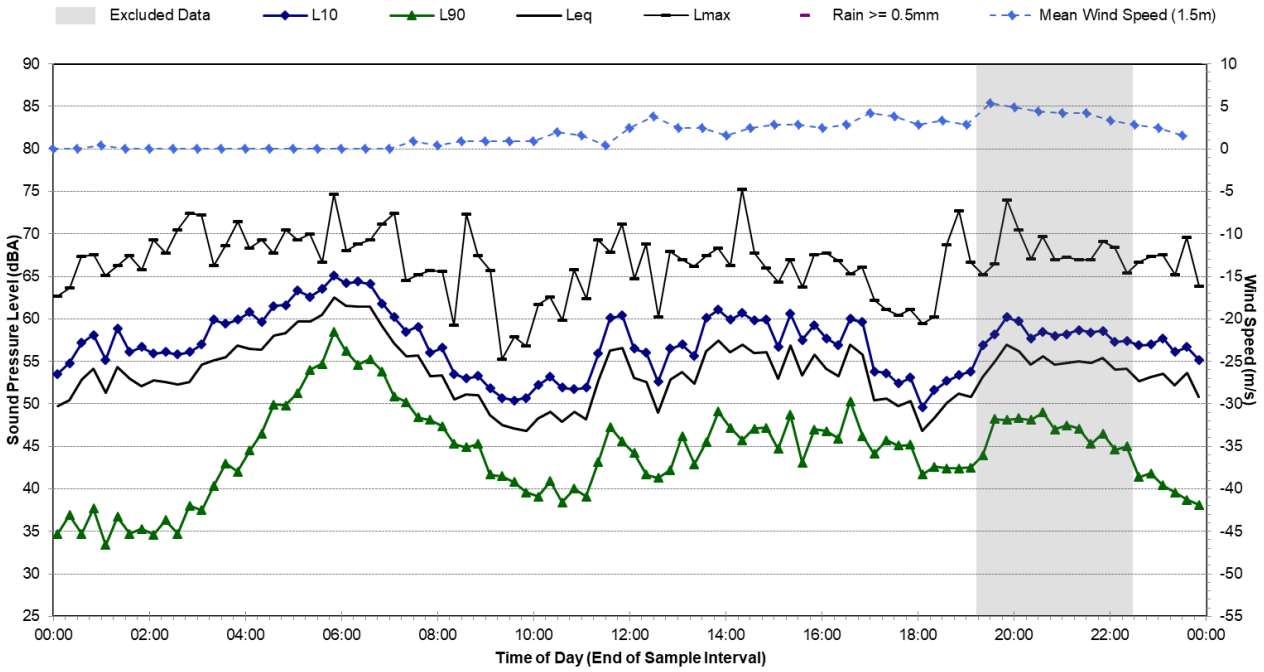
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Monday, 18 November 2019



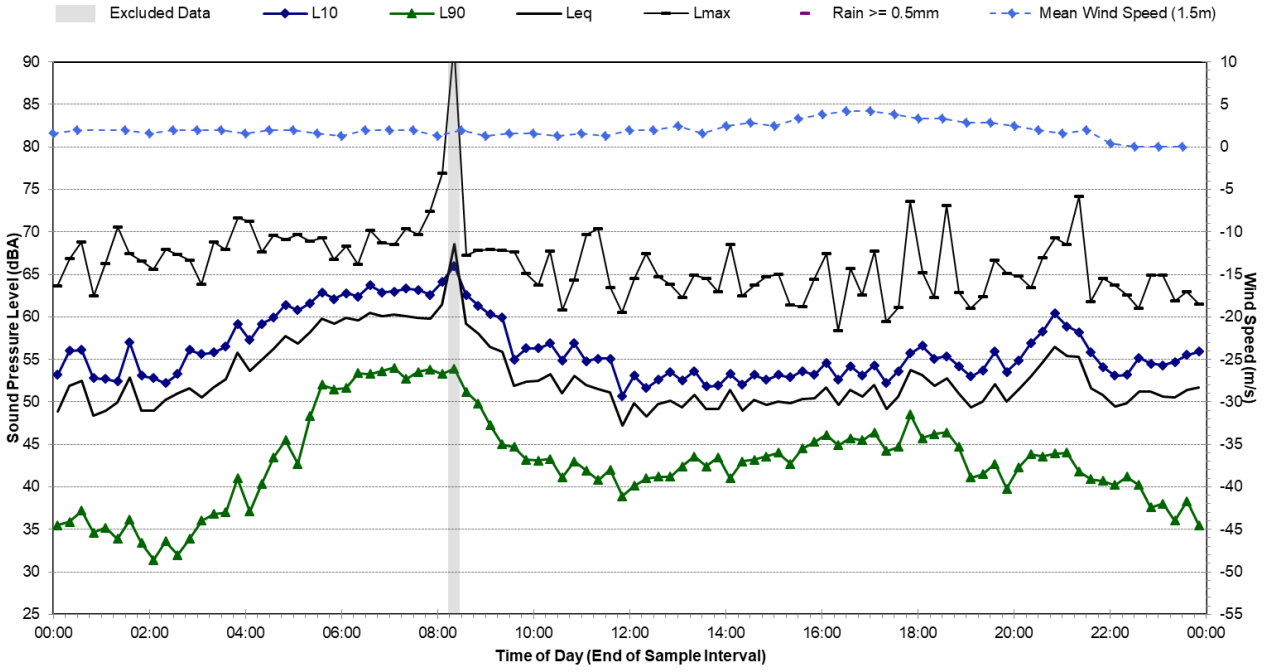
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Tuesday, 19 November 2019



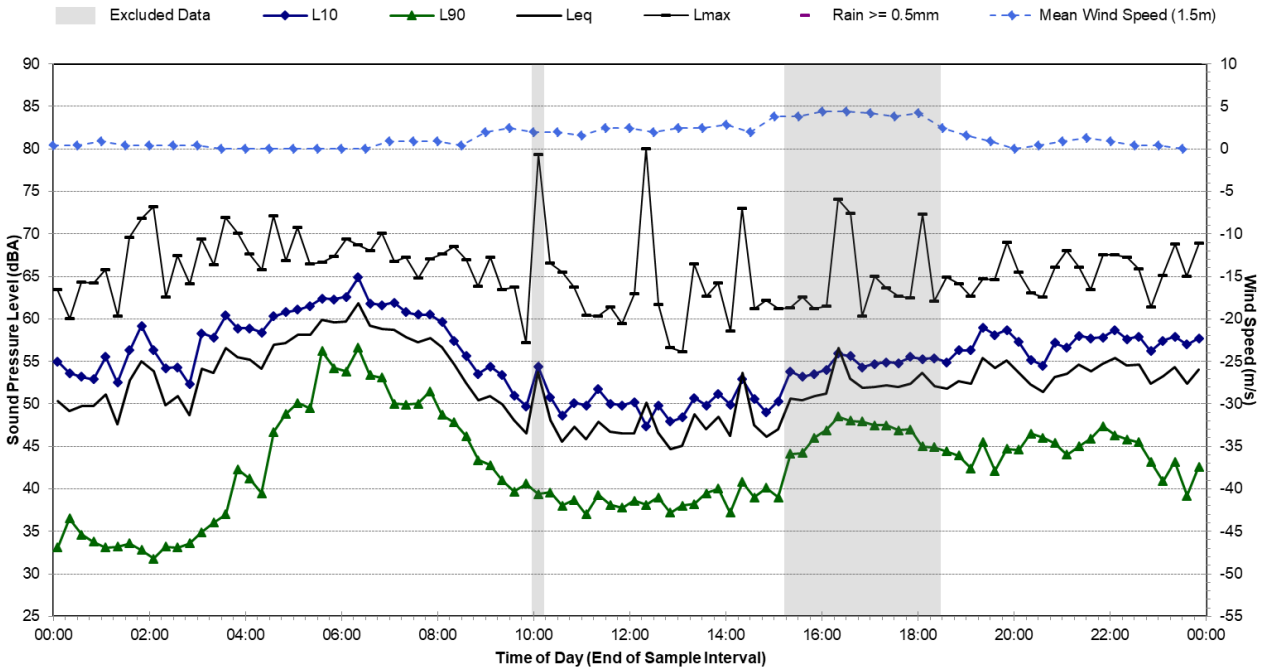
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Wednesday, 20 November 2019



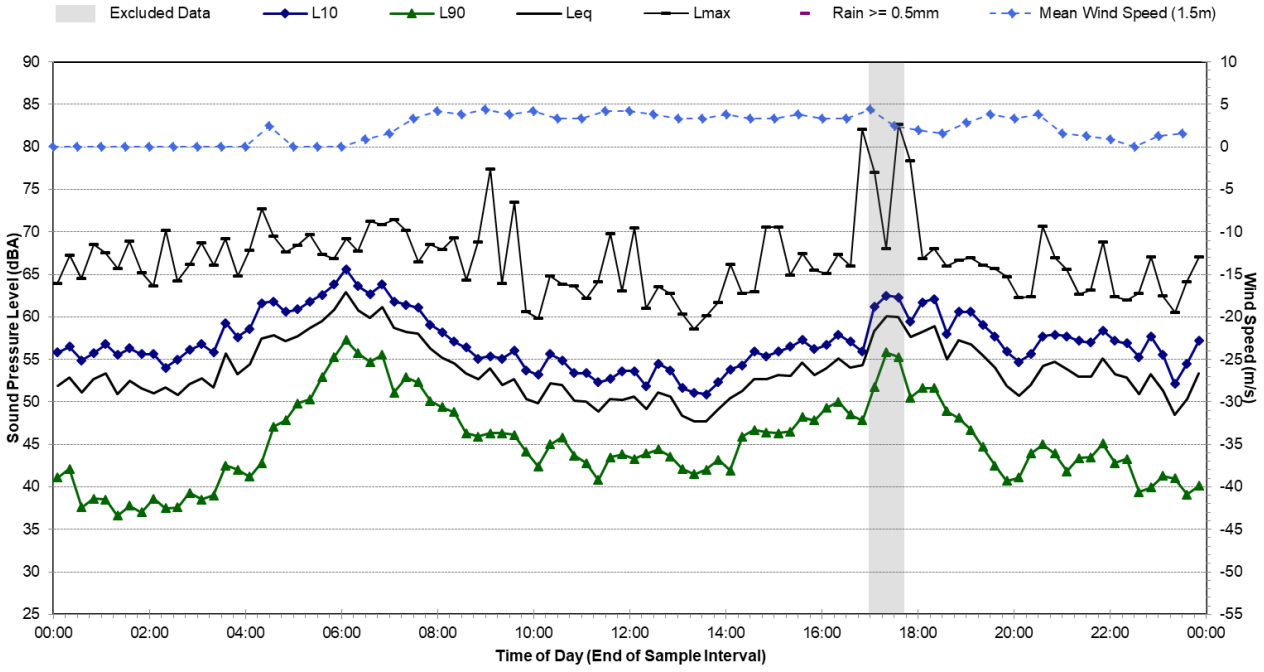
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Thursday, 21 November 2019



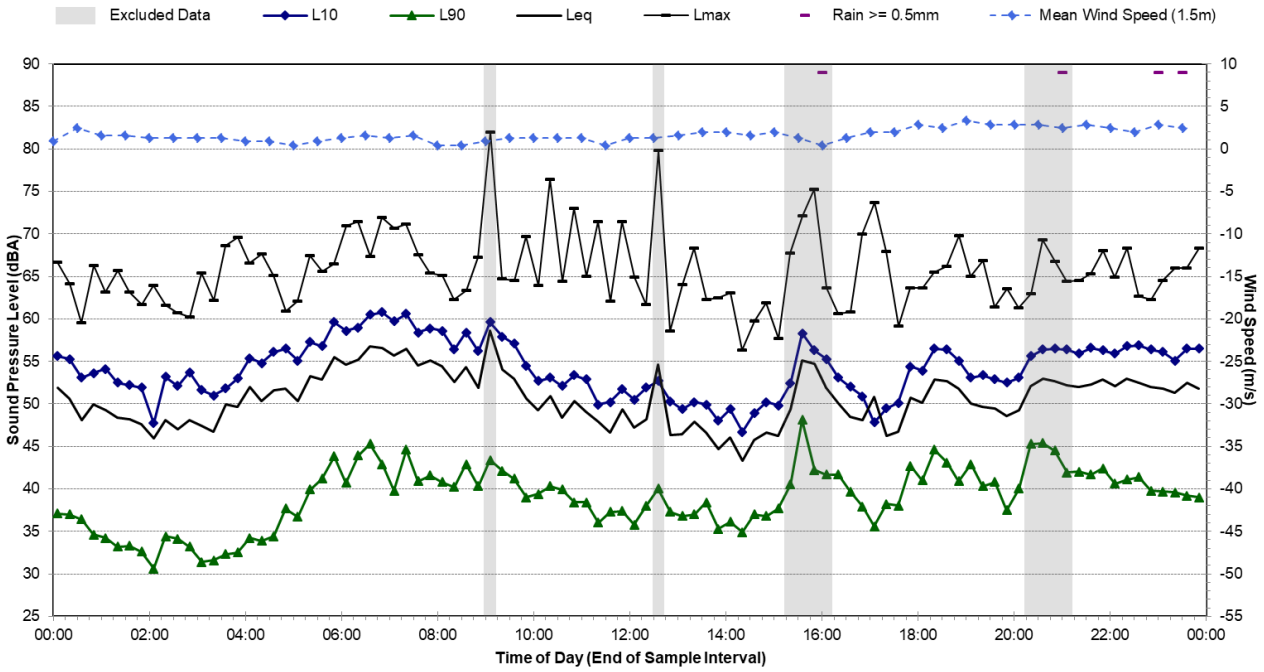
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Friday, 22 November 2019



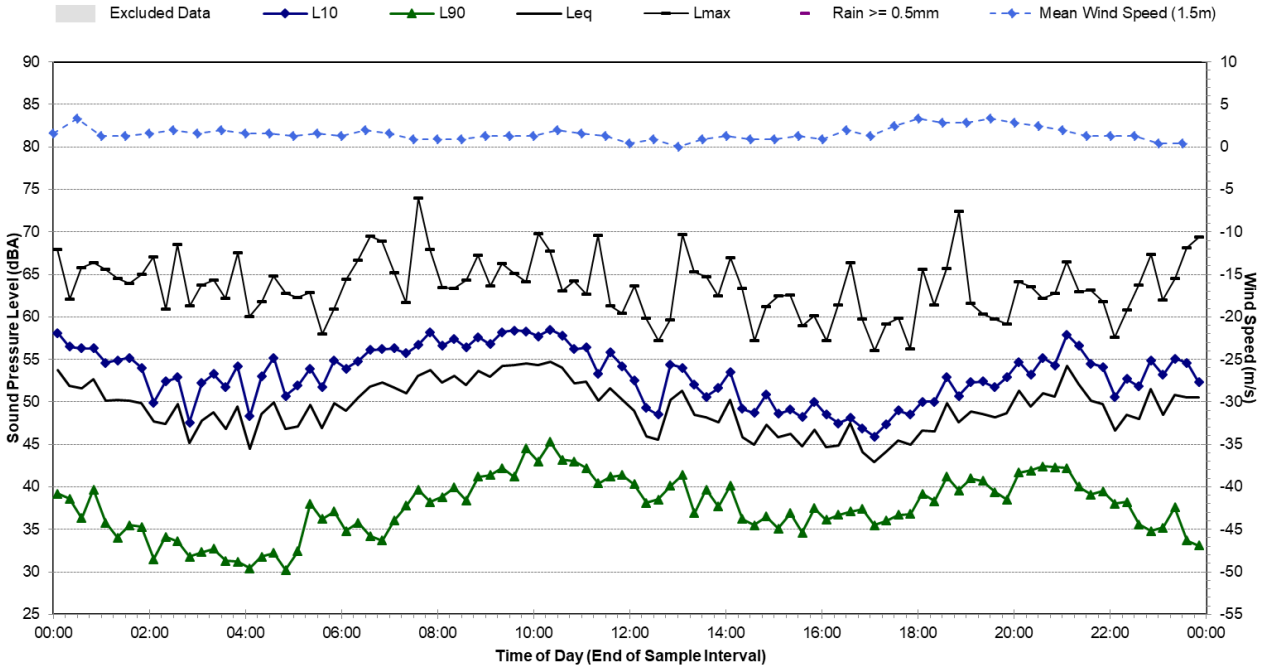
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Saturday, 23 November 2019



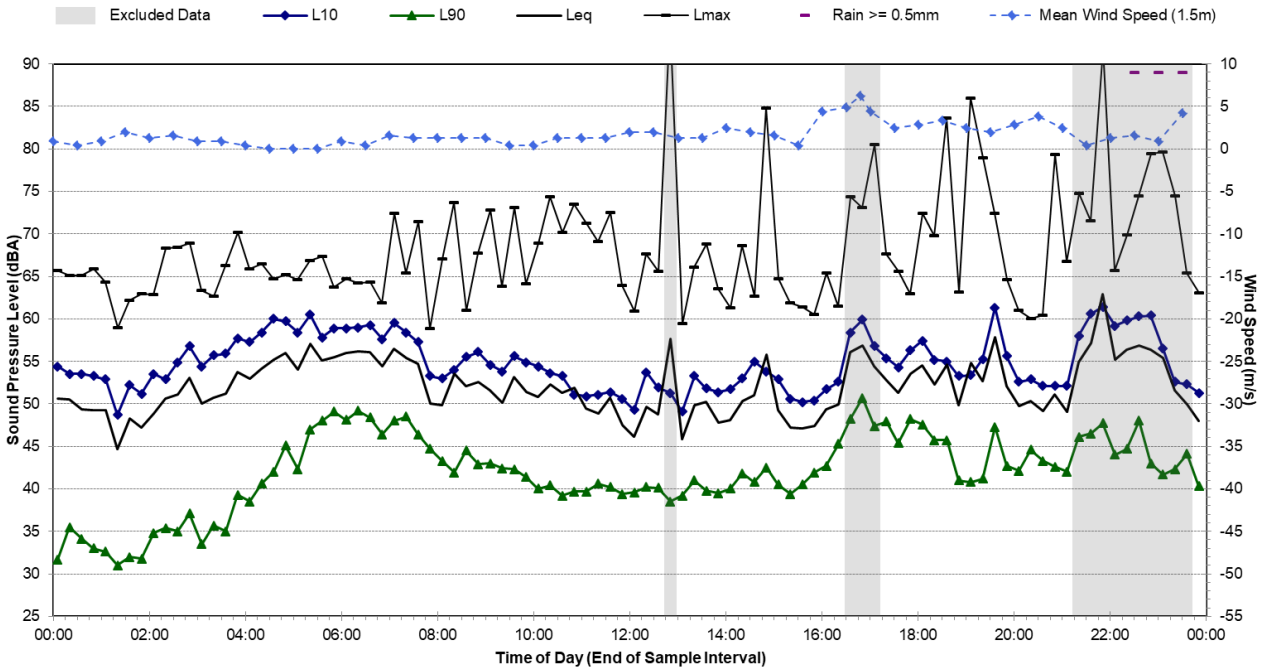
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Sunday, 24 November 2019



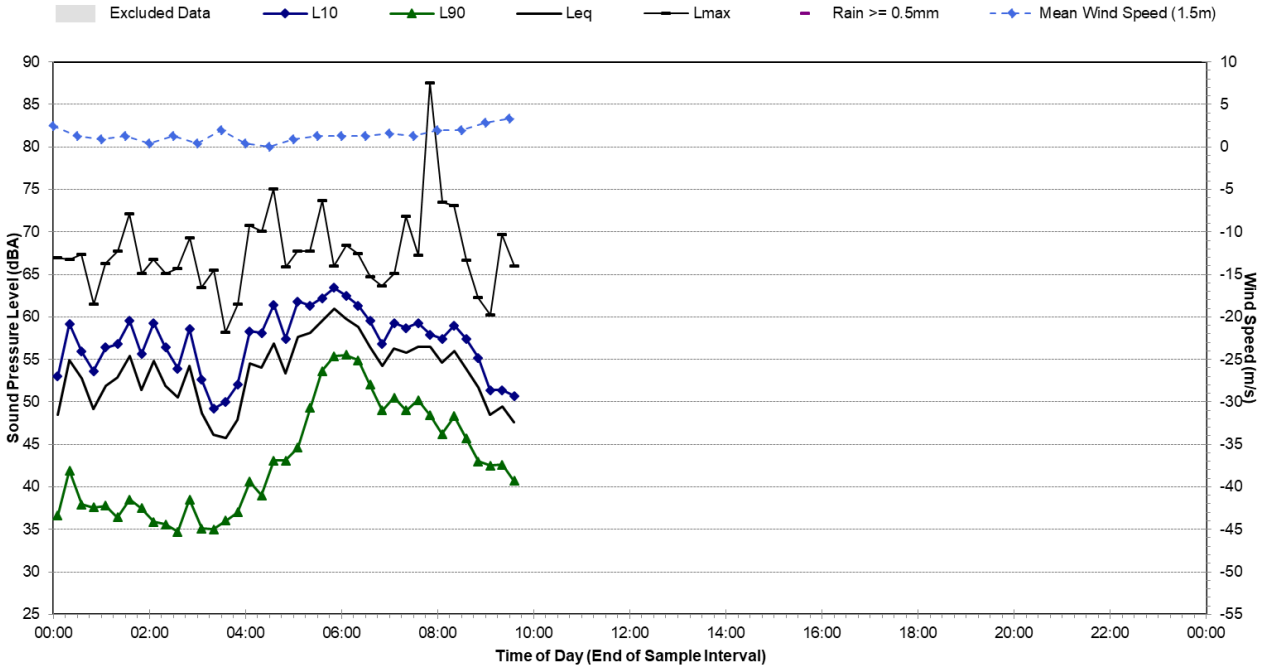
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Monday, 25 November 2019



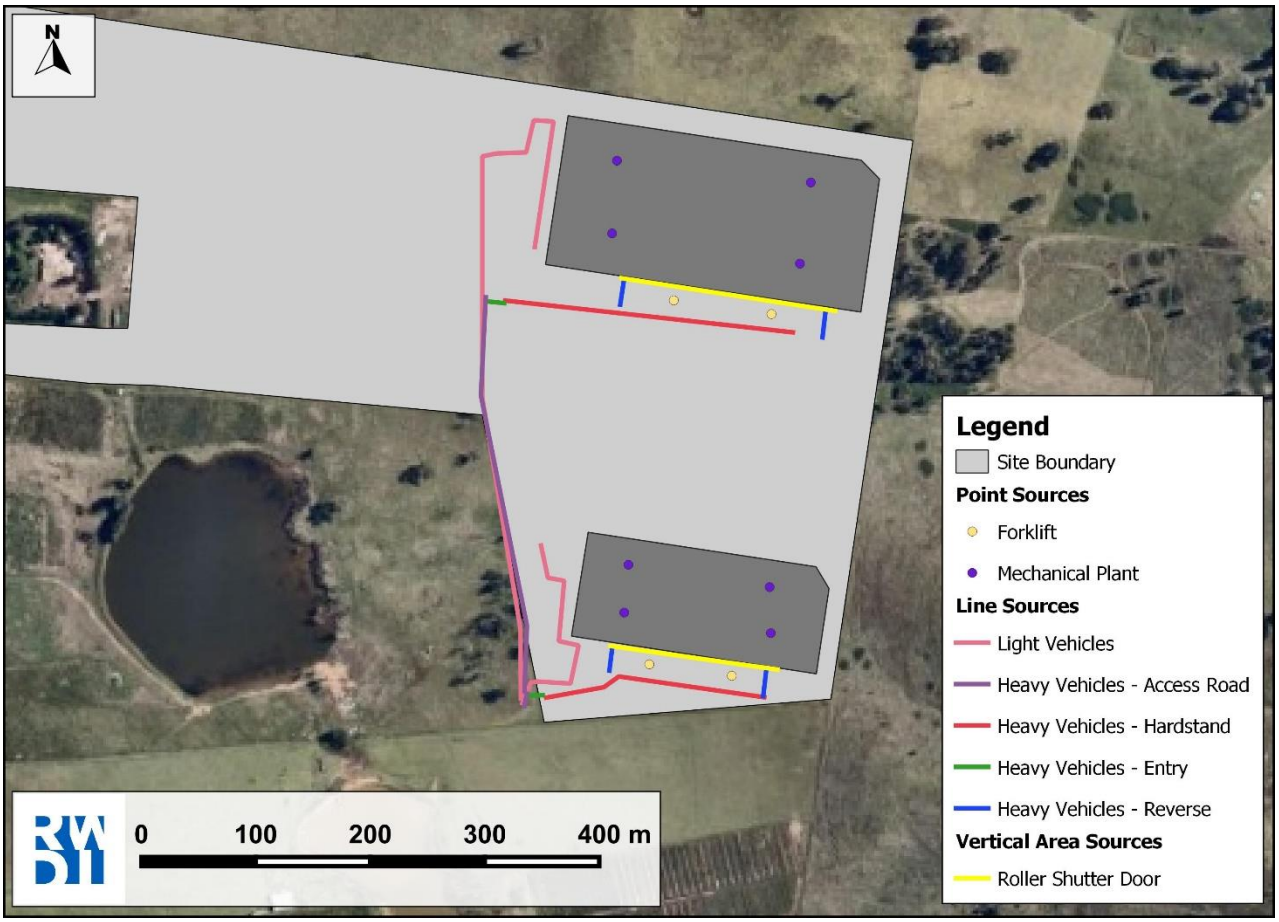
Statistical Ambient Noise Levels

L.04 - Lot 54 DP259135 – Southern Site Boundary - Tuesday, 26 November 2019



APPENDIX B

MODELLED NOISE SOURCE LOCATIONS


N
0
100
200
300
400 m
Legend
Site Boundary
Point Sources
Forklift
Mechanical Plant
Line Sources
Light Vehicles
Heavy Vehicles - Access Road
Heavy Vehicles - Hardstand
Heavy Vehicles - Entry
Heavy Vehicles - Reverse
Vertical Area Sources
Roller Shutter Door