Central Waste Recovery Facility

Noise impact assessment

Prepared for Central Waste Property Pty Ltd
March 2020

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Noise impact assessment

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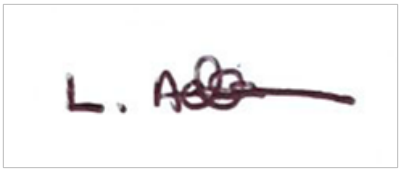

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11 March 2020

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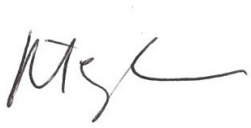

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11 March 2020

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1 Introduction

1.1 Overview

Central Waste Properties Pty Ltd (Central Waste) engaged EMM Consulting Pty Limited (EMM) to undertake a noise impact assessment for a proposed increase in throughput at the processing facility located at 8 Styles Street, Kurri Kurri (the site).

The site is located within an industrial area of Kurri Kurri, approximately 40 kilometres (km) north-west of Newcastle, NSW. The site comprises of Lot 5 DP1128108 and is operated as a commercial/industrial construction and demolition waste receipt and transfer facility. Central Waste is seeking approval to increase the throughput of the facility from the currently approved 29,500 tonnes per annum (tpa) to 90,000 tpa and extend operating hours.

The site is currently used as a waste receipt and transfer site and holds an existing environment protection license (EPL 13013) allowing the non-thermal treatment of general waste and waste storage. Soil and aggregate screening occur in the eastern side of the property and the site also consists of a weighbridge, mechanic shop and associated offices on the western side of the property.

The site is to be re-developed from a large open yard with one processing shed to a fully automated and enclosed processing plant. Finished products are to be stored in fire rated covered bunkers.

1.2 Assessment guidelines and requirements

This NVIA has been prepared in accordance with the relevant governmental assessment requirements, guidelines and policies, and in consultation with relevant government agencies.

The NVIA was prepared with reference to the methods outlined in:

- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI);
- NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP);
- NSW Department of Environment and Conservation (DEC) 2006, *Assessing Vibration: a technical guideline*; and
- Australian Standard AS 2436-2010 *Guide to Noise and Vibration Control on Construction, Maintenance and Demolition Sites*.

The NVIA has been prepared in accordance with the requirements of the NSW Department of Planning, Industry and Environment (DPIE). These were set out in the Secretary's Environmental Assessment Requirements (SEARs) for the project, issued on 10 January 2018. The SEARs identify matters which must be addressed in the EIS. To inform preparation of the SEARs, DPIE invited other government agencies to recommend matters to be addressed in the EIS. Specific noise or vibration related matters relevant to this NVIA were raised by the EPA. Copies of the government agencies' advice to DPIE were attached to the SEARs. Table 1.1 lists the individual requirements relevant to this NVIA and where they are addressed in this report.

Table 1.1 Noise and vibration assessment requirements

Relevant authority and assessment requirement	Section of report where addressed
DPIE	
The EIS must include an assessment of all potential impacts of the proposed development on the existing environment (including cumulative impacts if necessary) and develop appropriate measures to avoid, minimise, mitigate and/or manage these potential impacts. As part of the EIS assessment, the following matters must also be addressed: **Noise and vibration** - including:	-
- a description of all potential noise and vibration sources during construction and operation, including road traffic noise;	Sections 6 & 7
- a noise and vibration assessment in accordance with the relevant Environment Protection Authority guidelines; and	Section 6
- a description and appraisal of noise and vibration mitigation and monitoring measures.	Section 6
EPA	
The EPA's key information requirements for the proposal include an adequate assessment of potential noise impacts. In carrying out the assessment, the proponent should refer to the relevant guidelines as listed in Attachment B and any relevant industry codes of practice and best practice management guidelines.	Sections 6 & 7

Several technical terms are required for the discussion of noise and vibration. These are explained in the glossary.

2 Project and site description

2.1 Site description and existing operations

The site is located within an industrial area of Kurri Kurri, approximately 40 km north-west of Newcastle, NSW. The site comprises of Lot 5 DP1128108 and is operated as a commercial/industrial construction and demolition waste receipt and transfer facility.

The site is currently approved to operate between 7:00 am and 5:00 pm, Monday to Friday and 7:00 am to 2:00 pm on Saturdays. No operations are permitted on Sundays and Public Holidays.

The site is currently used as a waste receipt and transfer site and holds an existing environment protection license (EPL 13013) allowing the non-thermal treatment of general waste and waste storage. Soil and aggregate screening occurs in the eastern side of the property and has a weighbridge, mechanic shop and associated offices on the western side of the property.

Prior to 2005 the site was vacant. Approvals for a waste and recovery facility were received in 2008, and the current buildings and site layout was constructed prior to January 2014.

The facility and land were purchased by the current owners in 2015 to continue the processing of waste. The site currently undertakes waste processing and waste storage, which includes the receipt, processing and storage of inert waste, including building and demolition waste and virgin excavated natural material (VENM) in accordance with DA 8/2005/1088/1. Additional wastes generated or received, which are not licensed to be stored and processed on site, are transported to an appropriate licensed facility.

All wastes are transported to the site by truck where they are weighed and recorded through the weighbridge system. These wastes are unloaded in the unprocessed material stockpile area where the loads are tested and inspected to confirm their contents and to confirm the absence of contaminants, such as asbestos. The wastes are sorted and processed to separate the re-usable materials such as, cardboard, recovered aggregates, plastics and metals. The recovered materials may be used in construction activities such as road making, building, landscaping and construction works. Non-recoverable wastes are transported to a suitable facility with appropriate licensing.

Condition L6.1 of Schedule 2 of Development Consent 8/2005/1008/1 and Condition L3.1 of EPL 12891 detail the current noise limits for the nearest residential properties to the site. Both the Development Consent and the EPL refer to the same noise limits, which are reproduced from the EPL as follows:

L3.1 Noise from the premise must not exceed the sound pressure level (noise) limits presented in the table below. Note the limits represent the sound pressure level (noise) contribution, at the nominated locations in the table.

Location	*Day $L_{Aeq,15\ minute}$*	*Evening $L_{Aeq,15\ minute}$*	*Night $L_{Aeq,15\ minute}$*	*Night $L_{A1,1\ minute}$*
Residential Premises	*38*	*N/A*	*N/A*	*N/A*

2.2 Project description

Central Waste is seeking approval to increase the throughput of the facility from the currently approved 29,500 tonnes per annum (tpa) to 90,000 tpa as well as extend operating hours to allow for 24-hour operation.

The site has been re-developed from a large open yard with one processing shed to a fully automated and enclosed processing plant. Finished products are to be stored in fire rated covered bunkers. Site operations and current plant and equipment will remain unchanged as a result of the production increase. The increase in production will be achieved by increasing efficiencies of current internal processes.

2.3 Assessment locations

The nearest noise-sensitive receptor locations are residences located on Government Road, approximately 200 m north-west of the site. Representative assessment locations considered in the noise assessment are listed in Table 2.1 and are shown in Figure 4.1. These include residences, schools, places of worship, hospital and active recreation areas. These assessment locations are consistent with those used for the air quality impact assessment for the project.

Table 2.1 Assessment locations

ID	Receptor Type	Address
R1	Residential	4 Horton Road, Loxford
R2	Residential	7 McLeod Road, Loxford
R3	Residential	20 James Street, Kurri Kurri
R4	Classroom	Cnr Deakin and Standford Streets, Kurri Kurri
R5	Active recreation	Heddon Street, Kurri Kurri
R6	Residential	66 Northcote Street, Kurri Kurri
R7	Classroom	107 Lang Street, Kurri Kurri
R8	Place of worship	134 Maitland Street, Kurri Kurri
R9	Commercial	312 Lang Street, Kurri Kurri
R10	Active recreation	Northcote Street, Kurri Kurri
R11	Residential	122 Mitchell Avenue, Kurri Kurri
R12	Hospital	Hospital Road, Kurri Kurri
R13	Industrial	125 Mitchell Avenue, Kurri Kurri
R14	Industrial	Cnr Johnson Street and Mitchell Avenue, Kurri Kurri
R15	Active recreation	Boundary St, Kurri Kurri
R16	Hospital	Hospital Road, Kurri Kurri
R17	Active recreation	Government Road, Weston
R18	Industrial	130 Mitchell Avenue, Kurri Kurri
R19	Classroom	20-34 Sixth Street, Weston
R20	Residential	62 Government Road, Weston
R21	Industrial	142 Mitchell Avenue, Kurri Kurri
R22	Residential	86 Government Road, Weston

Table 2.1 Assessment locations

ID	Receptor Type	Address
R23	Residential	18 Hart Road, Loxford
R24	Industrial	129 Mitchell Avenue, Kurri Kurri
R25	Residential	72 Hart Road, Loxford
R26	Industrial	2 Styles Street, Kurri Kurri
R27	Industrial	4 Styles Street, Kurri Kurri
R28	Industrial	10 Styles Street, Kurri Kurri
R29	Industrial	147 Mitchell Avenue, Kurri Kurri
R30	Industrial	145 Mitchell Avenue, Kurri Kurri
R31	Industrial	1 Styles Street, Kurri Kurri
R32	Industrial	146 Mitchell Avenue, Kurri Kurri
R33	Industrial	152 Mitchell Avenue, Kurri Kurri
R34	Industrial	149 Mitchell Avenue, Kurri Kurri
R35	Residential	65 Government Road, Loxford
R36	Residential	67 Government Road, Loxford
R37	Residential	94C Government Road, Weston
R38	Residential	94B Government Road, Weston
R39	Residential	92 Government Road, Weston
R40	Residential	16 Hart Road, Loxford
R41	Residential	65 Government Road, Weston

The assessment locations represent those most likely to be affected by the project. Adherence with noise criteria at these locations would indicate that noise criteria will be met at other surrounding noise-sensitive locations.

3 Assessment methodology

3.1 Noise Policy for Industry (NPfI)

3.1.1 Assessing intrusiveness

For the assessment of intrusiveness, the background noise level must be determined. The intrusiveness noise trigger level essentially means that the equivalent continuous noise level (L_{Aeq}) of the source should not be more than 5 decibels (dB) above the representative or rating background level (RBL).

3.1.2 Assessing amenity

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail noise. Where the measured existing industrial noise approaches the recommended amenity noise level, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for new industrial developments is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

An extract from the NPfI that relates to the amenity noise criteria relevant to the project is given in Table 3.1.

Table 3.1 Amenity noise criteria - Recommended L_{Aeq} noise levels from industrial noise sources

Type of receptor	Indicative noise amenity area	Time of day[1]	Recommended amenity noise level, dBA
Residence	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
School classroom – internal	All	Noisiest 1-hour period when in use	35[2]
Place of worship - internal	All	When in use	40
Industrial premises	All	When in use	70
Active recreation	All	When in use	55
Hospital ward	All	Noisiest 1-hour	35 (internal) 50 (external)

Notes: Daytime 7 am to 6 pm; Evening 6 pm to 10 pm; Night-time 10 pm to 7 am. On Sundays and Public Holidays, Daytime 8 am - 6 pm; Evening 6 pm - 10 pm; Night-time 10 pm - 8 am. The L_{Aeq} index corresponds to the level of noise equivalent to the energy average of noise levels occurring over a measurement period.
Note 10 to Table 2.1 of the INP states "In the case where existing schools are affected by noise from existing industrial noise sources, the acceptable L_{Aeq} noise level may be increased to 40 dB $L_{Aeq,1\ hour}$.

3.1.3 Project noise trigger levels

Project noise trigger levels (PNTL) are generally equal to the lower of the derived intrusiveness and amenity criteria. To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI assumes that the $L_{Aeq,15\ minute}$ will be taken to be equal to the $L_{Aeq,period}$ + 3 dB, unless robust evidence is provided for an alternative approach for the particular project being considered.

3.1.4 Low frequency noise

Fact sheet C of the NPfI (EPA 2017) provides guidelines for applying modifying factor corrections to account for low frequency noise emissions. The NPfI specifies that a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels identifies the potential for an unbalanced spectrum and potential increased annoyance.

Where a difference of 15 dB or more between site 'C-weighted' and site 'A-weighted' noise emission levels is identified, the one-third octave noise levels recorded should be compared to the values in Table C2 of the NPfI (EPA 2017), which has been reproduced in Table 3.2 below.

Table 3.2 One-third octave low-frequency noise thresholds

	One-third octave $L_{Zeq,15\ minute}$ threshold level												
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**
dB (Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

The following modifying factor correction is to be applied where the site 'C-weighted' and site 'A-weighted' noise emission level is 15 dB or more and:

- where any of the one-third octave noise levels in Table 3.2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period; or
- where any of the one-third octave noise levels in Table 3.2 are exceeded by more than 5 dB and cannot be mitigated, a 5 dB positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2 dB positive adjustment applies for the daytime period.

3.2 Maximum noise level event assessment

In accordance with the NPfI methodology, the potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered.

The NPfI suggests that a detailed maximum noise level event assessment should be undertaken where the development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15\ minute}$ 40 dB or the prevailing RBL plus 5 dB (whichever is the greater); and/or
- L_{Amax} 52 dB or the prevailing RBL plus 15 dB (whichever is the greater).

Guidance regarding potential for sleep disturbance is also provided in the RNP. The RNP calls upon a number of studies that have been conducted into the effect of maximum noise levels on sleep. The RNP acknowledges that, at the current level of understanding, it is not possible to establish absolute noise level criteria that would correlate to an acceptable level of sleep disturbance. However, the RNP provides the following conclusions from the research on sleep disturbance:

- maximum internal noise levels (L_{Amax}) below 50 to 55 dB are unlikely to awaken people from sleep; and
- one or two noise events per night, with maximum internal noise levels (L_{Amax}) of 65 to 70 dB, are not likely to affect health and wellbeing significantly.

It is commonly accepted by acoustic practitioners and regulatory bodies that a facade including a partially open window will reduce external noise levels by 10 dB. Therefore, external noise levels in the order of 60 to 65 dB calculated at the facade of a residence is unlikely to cause awakening affects.

3.3 Road traffic noise

Assessment of potential noise impact is required from the predicted increase in operational road traffic to and from the site. The principle guidance for the assessment of road traffic noise impact on assessment locations is the RNP. Traffic routes for operational traffic related to the site consist of Styles Street, Mitchell Avenue (west of Styles Street), Government Road and Hart Road to the Hunter Expressway, north of Kurri Kurri or Mitchell Avenue (east of Styles Street) and then via a range of other major traffic routes travelling either southwards or and eastwards from Kurri Kurri.

Table 3.3 presents the road traffic noise assessment criteria for noise sensitive receptors reproduced from Table 3 and Table 4 of the RNP for road categories relevant to the operation of the site.

Table 3.3 Road traffic noise assessment criteria for residential land uses

Receiver type	Road category	Type of project/development	Assessment criteria – dB	
			Day (7 am to 10 pm)	Night (10 pm to 7 am)
Residence	Freeway/arterial/sub-arterial roads	Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments.	$L_{Aeq,15hr}$ 60 (external)	$L_{Aeq,9hr}$ 55 (external)
School	Any	Proposed road projects and traffic generating developments.	$L_{Aeq,1hr}$ 40 (internal) when in use	-
Place of worship	Any	Proposed road projects and traffic generating developments.	$L_{Aeq,1hr}$ 40 (internal) when in use	$L_{Aeq,1hr}$ 40 (internal) when in use

Additionally, the RNP states that where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2 dB after consideration of all feasible and reasonable mitigation.

In addition to meeting the assessment criteria (Table 3.3), any significant increase in total traffic noise at residential assessment locations must be considered. Assessment locations experiencing an increase in total traffic noise levels above those presented in Table 3.4 should be considered for mitigation.

Table 3.4 Road traffic relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dB	
		Day (7 am to 10 pm)	Night (10 pm to 7 am)
Freeway/arterial/sub-arterial roads and transit ways	New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq(15\text{-}hr)}$ + 12 (external)	Existing traffic $L_{Aeq(9\text{-}hr)}$ + 12 (external)

4 Existing environment

4.1 Existing ambient and background noise levels

A key element in assessing environmental noise impact from industry is to quantify the existing ambient acoustic environment, including any existing industrial noise where present. The locations of ambient noise monitoring used in this assessment are provided in Figure 4.1.

The existing acoustic environment (ie ambient noise) was characterised by long-term unattended and short-term attended noise monitoring undertaken in February 2016 at the locations shown in Figure 4.1. This data was supplemented by additional monitoring undertaken at the nearest potentially affected residence (refer Figure 4.1) in May 2019 and February 2020.

4.1.1 Unattended noise monitoring

Unattended noise monitoring was undertaken at three locations in Kurri Kurri from 11 to 24 February 2016 and 10 to 21 March 2019 as described in Table 4.1. The 2016 monitoring was completed using an ARL EL316 Type 1 environmental noise logger (s/n 16-306-036) and a Rion NL-42EX environmental logger (s/n 00-810-713). The 2019 monitoring was completed using an ARL EL316 Type 1 environmental noise logger (s/n 16-207-005).

The noise loggers were programmed to record statistical noise level indices continuously in 15-minute intervals, including the L_{Amax}, L_{A1}, L_{A10}, L_{A50}, L_{A90}, L_{A99}, L_{Amin} and the L_{Aeq}. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Table 4.1 EMM noise logging details

Location	Approximate position with respect to the site
NM1 - Hart Road	500 m to the north
NM3 - Burns Street	950 m to the south-east
NM5 – Government Road	200 m to the north-west

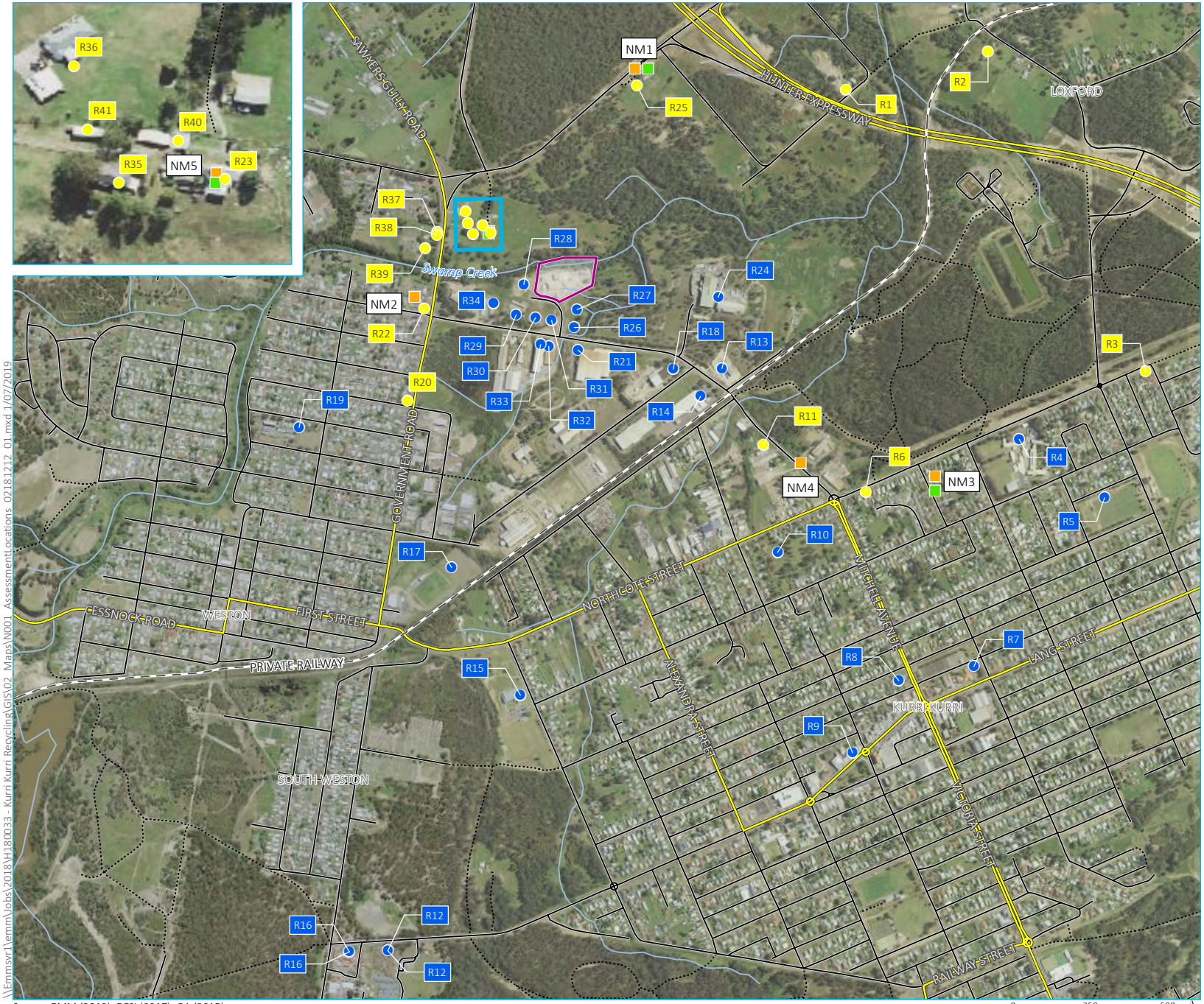
The Rating Background Levels (RBL) and ambient $L_{Aeq,period}$ noise levels derived from unattended noise monitoring are summarised in Table 4.2. The daily noise data and charts from noise logging are provided in Appendix A. The logging data was analysed in accordance with the NPfI, whereby data was excluded where rainfall and/or winds of greater than 5 m/s were recorded. This analysis was completed using weather data from the Bureau of Meteorology's (BoM) automatic weather station (AWS) at Cessnock Airport located approximately 13 km west of the site. This approach is consistent with recommendations of the NPfI.

Table 4.2 Unattended noise monitoring summary

Location	RBL, dB			Ambient noise level, $L_{Aeq,period}$, dB		
	Day	Evening	Night	Day	Evening	Night
NM1 - Hart Road	44	43	41	55	60	53
NM3 - Burns Street	41	39	35	60	56	48
NM5 – Government Road	44	43	39	54	48	47

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.

General industrial hum was audible at monitoring location NM2 however noise from the Central Waste site was not discernible. General industrial noise was also audible at NM5 with noise from the subject site discernible. Noise from site was not audible at any of the other off-site noise monitoring locations. As shown in Table 4.2, daytime background noise levels are similar at all three long-term, unattended noise monitoring locations. Hence, site noise did not significantly affect the background noise level during the daytime. The RBL is derived by analysis of the measured L_{90} statistical noise values, which capture noise present for 90% of the time. The site noise observed at two of the attended and unattended monitoring locations was not present more than occasionally and hence site noise did not influence the L_{90} and by extension did not alter the final daytime RBL. Further, the site does not currently operate during the evening or night-time and hence did not influence ambient noise levels during these periods.



KEY

- Site boundary
- Residential receptor
- Other receptor

Monitoring locations (offset for clarity)

- Attended monitoring location
- Unattended monitoring location
- Rail line
- Main road
- Local road
- Vehicular track
- Watercourse/drainage line

Source: EMM (2018); DFSI (2017); GA (2015)

0 250 500 m

GDA 1994 MGA Zone 56

N

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Noise monitoring and assessment locations

Central waste recovery facility
Noise impact assessment
Figure 4.1

EMM
creating opportunities

4.1.2 Attended noise monitoring

Attended noise measurements of 15-minutes duration were completed at several locations, including the three unattended monitoring locations. The attended noise surveys were conducted using a Brüel and Kjær Type 2250 one-third octave hand-held analyser (s/n 2759405). Field calibration of the instrument was undertaken using a Brüel and Kjær type 4230 calibrator (s/n 1442144 and 1276091). Attended measurements were conducted in accordance with Australian Standard (AS) 1055:2018 *Acoustics - Description and Measurement of Environmental Noise*.

Meteorological conditions throughout each survey period were generally calm and clear with no winds above 5 m/s at microphone height or rain events.

Table 4.3 presents the results of the attended noise measurements, description of the ambient noise environment and quantification of existing noise levels at nearby residences.

Several industrial developments currently operate in the area surrounding the site. Levels of existing industrial noise at each location have been quantified where possible.

Table 4.3 Attended noise monitoring summary

Location	Date	Start time	L_{eq}	L_{90}	L_{max}	Comments and typical levels (dB)
NM1 - Hart Road	11/2/16	13:00	55	45	85	Traffic on Hunter Expressway dominant. Insects consistent. Traffic on Hart Road. Birds, horses, residents audible.
NM2 - Tenth Street	11/2/16	13:45	51	46	69	Traffic on Government Road. Insects consistently audible. Industrial noise from east (42 dB) Birds, dogs barking, chainsaw and wind in trees audible.
NM3 - Burns Street	11/2/16	15:00	51	48	63	Insects and birds dominant. Idling truck, model plane, wind in trees and car pass-bys audible.
NM4 -Mitchell Avenue	11/2/16	15:30	66	55	80	Insects dominant. Car pass-bys consistent. Industrial noise (not site related).
NM3 – Burns Street	19/2/16	01:15	37	33	51	Traffic on Hunter expressway, insects and birds consistent. Industrial hum from north (not site related) consistent (≤30 dB). Occasional local traffic. Push bike and residents audible
NM4 – Mitchell Avenue	19/2/16	01:45	44	36	69	Traffic on Hunter expressway, insects and birds consistent. Occasional local traffic. Industrial hum (not site related) from south-west barely audible. Livestock and people audible
NM2 – Tenth Street	19/2/16	02:15	42	40	58	Traffic on Hunter expressway consistent. Industrial hum from east, consistent (39 dB). Traffic on Government Road frequent.
NM1 – Hart Road	19/2/16	02:45	47	40	70	Insects consistent. Traffic on Hunter Expressway very frequent. General industrial hum, consistent (42 dB) from south. Occasional local traffic.
NM5 – Government Rd	10/3/19	11:07	61	59	69	Insects and industrial noise (from south) consistent. Bird noise and resident noise frequent. Construction noise and distant road traffic noise occasional.
NM5 – Government Rd	20/2/2020	08:24	55	47	74	Dogs barking, traffic on Government Road and Hart Road, noise from residence, bird noise. Central Waste noise discernible; processing plant and occasional noise audible from mobile equipment $L_{Aeq,15\text{-}min}$ 46dB; impact noise from site to L_{Amax} 56

Results of operator-attended noise surveys at nearby locations to the site indicate that road traffic and, to a lesser extent, existing industrial operations are the main contributors to ambient noise levels in the vicinity of the site.

The measured site noise emission level at the nearest residence (NM5) from Central Waste was estimated to be $L_{Aeq,15minute}$ 46 dB and L_{Amax} 56. It is acknowledged that this level is above the current noise limit for the site of $L_{Aeq,15minute}$ 38 dB. However, the current noise limit for the site is well below that which would cause disturbance to nearby noise-sensitive receptors in accordance with the methodology provided in the NPfI. That is, the current noise limit is well below the project noise trigger levels (PNTLs) as defined by the NPfI and as based on recently measured background noise data (ie RBLs). In fact, the existing noise limit is below background noise levels, indicating that they are overly conservative. Additional information is provided in this regard in Section 5.1.1.

4.2 Meteorology

Noise propagation over distance can be significantly affected by the prevailing weather conditions. Of most interest are source to receiver winds, the presence of temperature inversions and drainage flow effects, as these conditions can enhance received noise levels. To account for these phenomena, the NPfI specifies the following two options in regard to meteorological analysis procedures to determine the prevalent weather conditions:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night; or

2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

4.2.1 Prevailing winds

The NPfI recommends consideration of wind effects if they are “significant”. The NPfI defines “significant” as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed below 3 m/s, which is considered to prevail for at least 30% of the time.

For the purposes of this assessment, noise-enhancing meteorological conditions have been adopted, as per NPfI procedures.

4.2.2 Temperature inversions

The NPfI states that the assessment of the impact of temperature inversions be confined to the night-time noise assessment period where temperature inversions occur. The occurrence of temperature inversions has been assumed for the night-time period and provides a conservative assessment approach.

4.2.3 Assessed meteorological conditions

Noise emission levels from operation of the project at all assessment locations have been calculated based on the meteorological parameters shown in Table 4.4.

Table 4.4 Weather conditions considered in noise modelling

Assessment Period	Meteorological condition	Air temperature	Relative humidity	Wind speed	Direction	Stability category
Day	Standard	20°C	70%	0.5 m/s	All	D class
	Noise Enhancing	20°C	70%	3 m/s	All	D class
Evening	Standard	10°C	90%	0.5 m/s	All	D class
	Noise Enhancing	10°C	90%	3 m/s	All	D class
Night	Standard	10°C	90%	0.5 m/s	All	D class
	Noise Enhancing	10°C	90%	2 m/s	All	F class

5 Noise criteria

5.1 Operational noise criteria

5.1.1 Project noise trigger levels

Noise from industrial sites or processes (eg onsite truck movements or material processing etc) in NSW is regulated by the local council, Department of Planning, Industry and Environment (DPIE) and/or the EPA and usually have a licence and/or development consent conditions stipulating noise limits. These limits are normally derived from project specific trigger or operational noise levels applied at assessment locations. They are based on EPA guidelines (ie NPfI or previous Industrial Noise Policy) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation.

The NPfI guidelines for assessing existing industrial facilities have been used for this assessment. With respect to the industrial noise trigger levels, the guidelines state:

> The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community.

Regarding decisions on developments, the NPfI also states:

> Planning decisions for proposed developments take into account social, economic and environmental factors. Noise impact is one factor taken into account and decisions can be made that result in residual noise impacts.

The objectives of noise trigger levels for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses. It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location.

To ensure these objectives are met, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The fundamental difference being intrusiveness noise levels apply over 15 minutes in any period (day, evening or night), whereas the amenity noise levels apply to the entire assessment period (day, evening or night).

i Intrusiveness noise levels

The intrusiveness noise trigger levels require that $L_{Aeq,15\ minute}$ noise levels from the site during the relevant operational periods do not exceed the RBL by more than 5 dB.

Table 5.1 presents the intrusive noise level determined for the site based on the adopted RBLs. Where assessment locations have been grouped together in the following tables, it has been assumed that the ambient acoustic environment at these assessment locations is similar. It is noted that intrusive noise levels are only applicable at residential assessment locations.

Table 5.1 Project intrusiveness noise levels

Assessment location	Measured RBL, dB			Project intrusiveness noise level dB, $L_{Aeq,15\ minute}$		
	Day[1]	Evening[1]	Night[1]	Day[1]	Evening[1]	Night[1]
R1, R2, R25[2]	44	43	41	49	48	46
R3, R6, R11[3]	41	39	35	46	44	40
R20, R22, R23, R35-41[4]	44	43	39	49	48	44

1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.
2. Background levels measured at NM1 have been adopted here.
3. Background levels measured at NM3 have been adopted here.
4. Background levels measured at NM5 have been adopted here.

It is noted that the measured daytime background noise at all long-term, unattended noise monitoring locations indicate a rating background level (RBL) of 41dB or above at surrounding residential locations. This equates to a minimum daytime project noise trigger level of $L_{Aeq,15minute}$ 46 dB. This level is 8 dB above the current daytime noise limit for the site; $L_{Aeq,15minute}$ 38 dB. Hence, the current noise limit for the site is well below that which would cause disturbance to nearby noise-sensitive receptors in accordance with the methodology provided in the NPfI. That is, the current noise limit is overly conservative based on recently measured background noise data.

ii Amenity noise levels

The assessment of amenity is based on noise levels specific to the land use. The noise levels relate only to industrial noise and exclude road or rail noise. Where the measured existing industrial noise approaches recommended amenity noise level, it needs to be demonstrated that noise levels from new industry will not contribute to existing industrial noise such that amenity noise levels are exceeded.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, the project amenity noise level for new industrial developments is the recommended amenity noise level (outlined in Table 2.2 of the NPfI) minus 5 dB.

Nearest residential assessment locations to the site have been categorised in the NPfI urban amenity category. As per the definitions provided in the NPfI, residential assessment locations were classified as "urban" since they were deemed to be in an environment that *"is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources"*.

The corresponding project amenity noise levels for the site are given in Table 5.2.

Table 5.2 Project amenity noise levels

Assessment location	Indicative area	Time period	Project amenity noise level dB, $L_{Aeq,period}$ (Recommended amenity noise level minus 5 dB)
All residential areas	Urban	Day	55
		Evening	45
		Night	40
Industrial premises	All	When in use	65
Commercial premises	All	When in use	60
School classroom[2]	All	Noisiest 1-hour period when in use	30 (internal) 40 (external)
Place of worship	All	When in use	35 (internal)
Hospital ward	All	When in use	30 (internal) 45 (external)
Active recreation area	All	When in use	50

Source: NSW NPfI (EPA 2017).

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.
2. As per NPfI notes, the acceptable noise level for school classrooms may be increased to $L_{Aeq,1\ hour}$ 40 dB (internal) where affected by existing industrial noise sources.

iii Project noise trigger level

The project-noise trigger level (PNTL) is the lower of the calculated intrusive or amenity noise level and is provided in Table 5.3 for all assessment locations.

To standardise the time periods for the intrusiveness and amenity noise levels, the NPfI assumes that the $L_{Aeq,15\ minute}$ will be taken to be equal to the $L_{Aeq,period}$ + 3 dB, unless robust evidence is provided for an alternative approach for the particular project being considered.

Table 5.3 Project noise trigger levels

Assessment location	Period[1]	Intrusive noise level dB, $L_{Aeq,15\ minute}$	Amenity noise level dB, $L_{Aeq,15\ minute}$	Project noise trigger level (PNTL), dB
Residential (R1, R2, R25)	Day	49	58	49 $L_{Aeq,15\ minute}$
	Evening	48	48	48 $L_{Aeq,15\ minute}$
	Night	46	43	43 $L_{Aeq,15\ minute}$
Residential (R3, R6, R11)	Day	46	58	46 $L_{Aeq,15\ minute}$
	Evening	44	48	44 $L_{Aeq,15\ minute}$
	Night	40	43	40 $L_{Aeq,15\ minute}$
Residential (R20, R22, R23, R35-41)	Day	49	58	49 $L_{Aeq,15\ minute}$
	Evening	48	48	48 $L_{Aeq,15\ minute}$
	Night	44	43	43 $L_{Aeq,15\ minute}$
Commercial (R9)	When in use	n/a	63	63 $L_{Aeq,15\ minute}$
Industrial (R13, R14, R18, R21, R24, R26-R34)	When in use	n/a	68	68 $L_{Aeq,15\ minute}$
Active recreation (R5, R10, R15, R17)	When in use	n/a	53	53 $L_{Aeq,15\ minute}$
School classroom[2] (R4, R7, R19)	Noisiest 1-hour period when in use	n/a	30 (internal) 40 (external)	30 $L_{Aeq,1\ hour}$ (internal) 40 $L_{Aeq,1\ hour}$ (external)
Place of worship (R8)	When in use	n/a	43	43 $L_{Aeq,15\ minute}$
Hospital ward (R12, R16)	Noisiest 1-hour	n/a	30 (internal) 45 (external)	30 $L_{Aeq,1\ hour}$ (internal) 45 $L_{Aeq,1\ hour}$ (external)

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays; Evening: 6 pm to 10 pm; Night: 10 pm to 7 am Monday to Saturday; 10 pm to 8 am Sundays and public holidays.

5.2 Maximum noise event levels

Table 5.4 provides the sleep disturbance criteria for the residential assessment locations based on the results of ambient noise monitoring.

Table 5.4 Maximum noise level event screening criteria

Assessment location	Assessment period[1]	Measured RBL, dB	Maximum noise level event screening criteria, dB	
			$L_{Aeq,15\ minute}$	L_{Amax}
R1, R2, R25	Night	41	46	56
R3, R6, R11	Night	35	40	52[2]
R20, R22, R23, R35-41	Night	39	44	54

Notes: 1. Night: 10 pm to 7 am Monday to Saturday, 10 pm to 8 am Sundays and public holidays.

2. The minimum $L_{Aeq,15\ minute}$ and L_{Amax} noise level event screening criteria have been adopted at this location, as per NPfI procedures.

5.3 Road traffic noise criteria

The road traffic noise criteria are described in Section 3.2.

Road traffic generated by the project will be relatively minor compared to existing traffic volumes on the proposed transport route. The potential for the relative increase criteria to be exceeded is, therefore, highly unlikely.

6 Operational noise assessment

6.1 Method overview

This section presents the methods and base parameters used to model and assess noise emissions from the site.

Quantitative modelling of operational noise was completed using the Brüel & Kjær Predictor noise prediction software utilising ISO 9613 calculation methods. This software calculates total noise levels at receptors from the concurrent operation of multiple noise sources. The model incorporates factors such as:

- the lateral and vertical location of plant and equipment;
- source-to-receptor distances;
- ground effects;
- atmospheric absorption;
- topography; and
- meteorological conditions.

Three-dimensional digitised ground contours of the site and surrounding land were incorporated to model topographic effects. Equipment was modelled at locations and heights representative of a typical operating scenario.

The model was used to predict noise levels at each of the assessment locations identified in Table 2.1 and shown in Figure 4.1. The modelling results were then compared against the relevant noise trigger levels described in Section 5.1.1 to determine potential impacts.

6.2 Acoustically significant plant and equipment

Table 6.1.summarises the operational noise sources and associated sound power levels used in the noise model. The equipment items and quantities are based on the current operations which are representative of what will occur when the throughput is increased. Most of the sound power data were obtained from noise measurements of existing activities at the site. Where this was not possible, sound power data has been obtained from an EMM database of similar plant and equipment.

Details of the operational scenario considered are presented in Table 6.1. Figures showing the indicative locations of assumed noise sources across the site are provided in Appendix B.

Table 6.1 Operational noise source sound power levels

Noise source	L_{Aeq} sound power level per unit, dB	Quantity[1]	Utilisation
Excavator[3] (for concrete working)	107	1	100% day only
Receival Shed[2] (materials handler, excavator to feed primary shredder)	109 day/106 night	1	100% day and night
Picking and Sorting Plant[2]	107	1	100% day and night
Ventilation fans[3]	90	1	100% day and night
Front End Loader (FEL)[3]	105	1	100% day and night
Transport truck (driving)[3]	103	4 day / 2 night	100% day and night
Transport truck (Idling)[3]	97	2	100% day and night
Forklift[3,4] / Bobcat[3]	85	1	100% day and night

Notes: 1. Within any 15-minute period.
2. Daytime sound power level measured during site visit, night-time sound power level inferred based on the assumption that less equipment would be operating inside the shed during this period.
3. Sourced from the EMM sound power level database for similar equipment.
4. Moving to 10 Styles Street in June 2020.

In addition to the sound power levels, quantities and utilisation assumptions provided in Table 6.1, main operating assumptions adopted for the purpose of modelling noise emissions are as follows:

- transport trucks are assumed to be driving on site for 7.5 minutes in any 15-minute period and idling for 7.5 minutes in any 15-minute period; and
- all onsite vehicle movements are 10 km/hr or less.

6.3 Noise mitigation and management measures

Noise mitigation measures currently implemented at the site include the following:

- Enclosed waste-receival sheds;
- Covered bunkers under the processing plant to store sorted waste;
- Plant and equipment are turned off when not in use;
- 10m high wall on site southern boundary;
- Vehicle speed on site is limited to 10 km/h; and
- Drop height is minimised, where practical, when placing products either on the stockpiles or in trucks.

Additional measures to be incorporated into the project include the following:

- Additional wall on the northern and eastern sides of the processing plant; and
- Minimal mobile plant to be used during the evening and night-time period.

These measures have been incorporated into the operational noise model for the site.

The proposed future growth in waste volumes will be more targeted and achieved mainly by use of large articulated trucks from waste transfer stations; third-party transfer stations (primarily from Sydney) or Central Waste's own transfer stations, or increased levels from Central Waste's skip-bin business. This means that truck arrivals to site, particularly during the night-time period, will be planned and be subject to pre-authorisation allowing Central Waste to more effectively control the number of deliveries on site at any point in time.

6.4 Noise model validation

Noise from existing operations was modelled and calibrated to the results of on and off-site operator-attended noise measurements. A calibration factor of -1 dB was utilised and predicted noise levels at the calibration points were within ±1 dB of measured results. Hence, the computer noise model was deemed appropriate for predicting noise emissions associated with the proposed development.

6.5 Applicability of modifying factors

Results of operator-attended noise surveys at the nearest residential location indicated existing ambient low frequency noise (LFN) levels above the thresholds provided in the NPfI. Although Central Waste was audible during this survey there were also other significant contributors to overall levels including traffic, dogs barking and noise from the residence. Operator-attended noise surveys were undertaken on-site, in close proximity to the receival shed and processing plant where noise emissions from these items was dominant. Based on the results of these surveys, and assuming a reduction due to distance only, the low frequency noise levels from the Central Waste site would be below the relevant thresholds at the nearest residences and hence, modifying factors are not applicable to site noise emissions. Operational noise modelling results.

Site noise emission levels have been predicted for proposed site operations under standard and noise enhancing meteorological conditions. The modelling results for noise emissions from the proposal are provided in Table 6.2.

Table 6.2 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted existing noise level, dB		Predicted future noise level, dB		Project noise trigger level (PNTL), dB
			Standard	Noise Enhancing	Standard	Noise Enhancing	
R1	Residential	Day	<30 $L_{Aeq,15\ minute}$	31 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	31 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	<30 $L_{Aeq,15\ minute}$	32 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R2	Residential	Day	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R3	Residential	Day	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R4	Classroom	Day	30 $L_{Aeq,1\ hour}$	33 $L_{Aeq,1\ hour}$	30 $L_{Aeq,1\ hour}$	33 $L_{Aeq,1\ hour}$	40 $L_{Aeq,1\ hour}$ (external)
R5	Active recreation	Day	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$

Table 6.2 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted existing noise level, dB		Predicted future noise level, dB		Project noise trigger level (PNTL), dB
			Standard	Noise Enhancing	Standard	Noise Enhancing	
R6	Residential	Day	33 $L_{Aeq,15\ minute}$	36 $L_{Aeq,15\ minute}$	33 $L_{Aeq,15\ minute}$	36 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	33 $L_{Aeq,15\ minute}$	36 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	32 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R7	Classroom	Day	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	40 $L_{Aeq,1\ hour}$ (external)
R8	Place of worship	Day	30 $L_{Aeq,15\ minute}$	32 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	32 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R9	Commercial	Day	<30 $L_{Aeq,15\ minute}$	30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	63 $L_{Aeq,15\ minute}$
R10	Active recreation	Day	35 $L_{Aeq,15\ minute}$	37 $L_{Aeq,15\ minute}$	34 $L_{Aeq,15\ minute}$	37 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$
R11	Residential	Day	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	37 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	37 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	35 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$
R12	Hospital	Day	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
		Evening	n/a	n/a	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
		Night	n/a	n/a	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
R13	Industrial	Day	43 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R14	Industrial	Day	43 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R15	Active recreation	Day	31 $L_{Aeq,15\ minute}$	34 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	30 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$
R16	Hospital	Day	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
		Evening	n/a	n/a	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
		Night	n/a	n/a	<30 $L_{Aeq,1\ hour}$	<30 $L_{Aeq,1\ hour}$	45 $L_{Aeq,1\ hour}$ (external)
R17	Active recreation	Day	36 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	35 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$
R18	Industrial	Day	46 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	47 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R19	Classroom	Day	38 $L_{Aeq,1\ hour}$	40 $L_{Aeq,1\ hour}$	37 $L_{Aeq,1\ hour}$	40 $L_{Aeq,1\ hour}$	40 $L_{Aeq,1\ hour}$ (external)
R20	Residential	Day	43 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	42 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$

Table 6.2 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted existing noise level, dB		Predicted future noise level, dB		Project noise trigger level (PNTL), dB
			Standard	Noise Enhancing	Standard	Noise Enhancing	
R21	Industrial	Day	48 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R22	Residential	Day	42 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	40 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	36 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R23	Residential	Day	46 $L_{Aeq,15\ minute}$	47 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	40 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R24	Industrial	Day	31 $L_{Aeq,15\ minute}$	34 $L_{Aeq,15\ minute}$	<30 $L_{Aeq,15\ minute}$	31 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R25	Residential	Day	35 $L_{Aeq,15\ minute}$	38 $L_{Aeq,15\ minute}$	34 $L_{Aeq,15\ minute}$	36 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	34 $L_{Aeq,15\ minute}$	36 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	30 $L_{Aeq,15\ minute}$	33 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R26	Industrial	Day	49 $L_{Aeq,15\ minute}$	50 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$	50 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R27	Industrial	Day	54 $L_{Aeq,15\ minute}$	54 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R28	Industrial	Day	56 $L_{Aeq,15\ minute}$	56 $L_{Aeq,15\ minute}$	55 $L_{Aeq,15\ minute}$	55 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R29	Industrial	Day	57 $L_{Aeq,15\ minute}$	58 $L_{Aeq,15\ minute}$	55 $L_{Aeq,15\ minute}$	56 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R30	Industrial	Day	58 $L_{Aeq,15\ minute}$	58 $L_{Aeq,15\ minute}$	56 $L_{Aeq,15\ minute}$	57 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R31	Industrial	Day	52 $L_{Aeq,15\ minute}$	52 $L_{Aeq,15\ minute}$	51 $L_{Aeq,15\ minute}$	51 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R32	Industrial	Day	52 $L_{Aeq,15\ minute}$	54 $L_{Aeq,15\ minute}$	51 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R33	Industrial	Day	53 $L_{Aeq,15\ minute}$	55 $L_{Aeq,15\ minute}$	52 $L_{Aeq,15\ minute}$	53 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R34	Industrial	Day	55 $L_{Aeq,15\ minute}$	56 $L_{Aeq,15\ minute}$	54 $L_{Aeq,15\ minute}$	56 $L_{Aeq,15\ minute}$	68 $L_{Aeq,15\ minute}$
R35	Residential	Day	44 $L_{Aeq,15\ minute}$	46 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R36	Residential	Day	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	37 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R37	Residential	Day	43 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	37 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R38	Residential	Day	43 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	37 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R39	Residential	Day	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	40 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$

Table 6.2 Predicted operational noise levels

Location	Receiver type	Period[1]	Predicted existing noise level, dB		Predicted future noise level, dB		Project noise trigger level (PNTL), dB
			Standard	Noise Enhancing	Standard	Noise Enhancing	
		Evening	n/a	n/a	40 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	37 $L_{Aeq,15\ minute}$	39 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R40	Residential	Day	45 $L_{Aeq,15\ minute}$	47 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	40 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$
R41	Residential	Day	43 $L_{Aeq,15\ minute}$	45 $L_{Aeq,15\ minute}$	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	49 $L_{Aeq,15\ minute}$
		Evening	n/a	n/a	42 $L_{Aeq,15\ minute}$	44 $L_{Aeq,15\ minute}$	48 $L_{Aeq,15\ minute}$
		Night	n/a	n/a	39 $L_{Aeq,15\ minute}$	41 $L_{Aeq,15\ minute}$	43 $L_{Aeq,15\ minute}$

Notes: 1. Day: 7 am to 6 pm Monday to Saturday; 8 am to 6 pm Sundays and public holidays, Evening: 6-10pm, Night-time: all other periods

Results of noise modelling demonstrate that noise levels are predicted to satisfy the relevant NPfI noise trigger levels at all assessment locations under standard and noise-enhancing meteorological conditions.

Further, the inclusion of the wall on the northern-side of the processing plant is predicted to result in reduced noise emissions at the nearest residential locations compared to existing daytime operations. With these factors taken into account, it is unlikely that project noise emissions would cause adverse impacts at the assessment locations.

6.6 Cumulative noise assessment

Potential cumulative noise impacts from existing and successive developments are considered by the NPfI procedures by ensuring that the appropriate noise trigger levels are established with a view to maintaining acceptable noise amenity levels. Therefore, the cumulative impact of the project with *existing* industrial noise sources has been assessed in the determination of the acceptable amenity levels at the assessment locations.

On this basis, the project is predicted to have a negligible impact on the existing ambient acoustic amenity and is not predicted to increase industrial noise levels above the relevant amenity criteria.

6.7 Maximum noise event assessment

Noise levels from the project during the night period with the potential to cause sleep disturbance at nearby residences have been assessed in accordance with the NPfI. Predicted $L_{Aeq,15\ minute}$ noise levels for the night period were taken from Table 6.2 and compared against the relevant sleep disturbance trigger levels.

Maximum noise levels from operations during the night period have also been assessed. Typical maximum noise events are likely to include reversing alarms and impacts associated with unloading activities (eg from truck tailgates). A typical conservative sound power level of L_{Amax} 121 dB has been used to predict potential sleep disturbance impacts at residential assessment locations.

Noise modelling results for the assessment of sleep disturbance are shown in Table 6.3 for standard and noise enhancing meteorological conditions. The assessment of sleep disturbance only applies to residential assessment locations.

Table 6.3 Predicted maximum noise levels (night period)

Residential assessment location	Predicted $L_{Aeq,15\ minute}$ noise level, dB		Predicted L_{Amax} noise level, dB		Maximum noise screening criteria, dB	
	Standard	Noise enhancing	Standard	Noise enhancing	$L_{Aeq,15\ minute}$	L_{Amax}
R1	<30	<30	37	42	46	56
R2	<30	<30	36	41	46	56
R3	<30	<30	27	32	40	52
R6	32	35	33	38	40	52
R11	35	38	40	45	40	52
R20	39	41	45	50	44	54
R22	36	38	43	48	44	54
R23	40	42	45	49	44	54
R25	30	33	40	45	46	56
R35	39	41	49	53	44	54
R36	37	39	44	48	44	54
R37	37	39	49	54	44	54
R38	37	40	49	54	44	54
R39	37	39	49	53	44	54
R40	40	42	45	49	44	54
R41	39	41	49	53	44	54

Results of noise modelling demonstrate that maximum noise level events are predicted to satisfy the relevant maximum noise level event screening criteria at all assessment locations under standard and noise-enhancing meteorological conditions.

Hence, it is unlikely that the project will cause sleep disturbance at any residential receivers.

7 Road traffic noise assessment

7.1 Site related traffic

The proposed modification will include an increase in site-generated traffic movements on the currently utilised transportation routes. Current and proposed daily traffic movements generated by the site are summarised in Table 7.1.

Table 7.1 Site generated traffic

Operation	Peak daily site-generated traffic movements			Peak hourly site-generated traffic movements		
	Heavy Vehicle	Light Vehicle	Total	Heavy Vehicle	Light Vehicle	Total
Current	124	30	154	12	13	25
Proposed	372 (+248)	50 (+20)	422 (+268)	36 (+24)	13 (+0)	49 (+24)

It is expected that the majority (approximately 75%) of traffic movements will be via Styles Street, Mitchell Avenue (west of Styles Street), Government Road and Hart Road to the Hunter Expressway, north of Kurri Kurri. The remainder (approximately 25%) will be via Mitchell Avenue (east of Styles Street) and then via a range of other major traffic routes either south or east from Kurri Kurri.

As there are no residences located on Mitchell Avenue, west of Styles Street, and road traffic increases on the Hunter Expressway, Government Road and Hart Road are all predicted to be negligible (ie less than 2% of existing volumes), road traffic noise from these locations has not been assessed further.

7.2 Existing traffic movements

Existing traffic volumes on Mitchell Avenue were referenced from the report *Central Waste Recycling Facility – Traffic Impact Assessment* (TIA) (EMM,2018). The TIA provides existing traffic volumes based on a six-hour traffic survey completed by EMM at the Mitchell Avenue/Styles Street intersection on 27 June 2018.

The existing daily traffic volumes for Mitchell Avenue, east of Styles Street, sourced from EMM's traffic report are shown in Table 7.2.

Table 7.2 Summary of existing daily traffic volumes

Road	Location	Existing average daily traffic	Existing average daily heavy vehicles	Percentage of heavy vehicles
Mitchell Avenue	East of Styles Street	3,660	186	5%

Notes: 1. Existing daily vehicle numbers have been sourced from the TIA (EMM 2018).

7.3 Assessment

On Mitchell Avenue, east of Styles Street, the nearest residential facades (roadside) that could be affected by an increase in road traffic noise are set back approximately 15 m (or greater) from the road in the 60 km/h speed zone. Results of the road traffic noise assessment are summarised in Table 7.3.

Table 7.3 Existing and future road traffic noise

Road section	Distance[1] (m)	Speed (km/h)	Road traffic noise level, dB			Criterion, dB	Change, dB
			Existing	Proposed	Future[2]		
Mitchell Ave (east of Styles Street)	≥15	60	57 $L_{Aeq,15\ hour}$	48 $L_{Aeq,15\ hour}$	57 $L_{Aeq,15\ hour}$	60 $L_{Aeq,15\ hour}$	<0.5

Notes: 1. Distance from the relevant road to the nearest residential facade found within the relevant speed zone.
2. Existing noise levels + proposed site-generated noise levels

Results of road traffic noise modelling show that road traffic noise levels are predicted to satisfy the relevant RNP noise requirements at the nearest potentially affected residences on Mitchell Avenue. The predicted increase in road traffic noise levels generated by the proposed increase in site movements is negligible (<0.5 dB). Therefore, road traffic noise impacts associated with the modification are unlikely at all residential receivers.

8 Conclusion

EMM has prepared a noise impact assessment to accompany an EIS for the proposed Central Waste Recycling Facility at Kurri Kurri, NSW. This assessment considered the potential for noise impacts during proposed operations, addressing the SEARs and has been prepared in accordance with the methodology outlined in the NPfI, as well as other relevant guidelines and standards.

PNTLs (noise criteria) have been established based on the results of ambient noise monitoring and methodology provided in the NPfI.

Findings of the assessment are summarised below.

- Operational noise levels were assessed for the daytime, evening and night-time period during standard and noise-enhancing weather conditions. The assessment found that noise from operation of the project is predicted to satisfy NPfI noise criteria for all periods at all assessment locations under standard and noise-enhancing meteorological weather conditions. Hence, it is unlikely that project noise emissions would cause adverse impacts at the nearest assessment locations.

- Noise modelling results show that maximum L_{Aeq} and L_{Amax} noise level screening criteria are predicted to be satisfied during standard and noise-enhancing meteorological conditions at all residential assessment locations. Hence, it is unlikely that the project will cause sleep disturbance at any residential receivers.

- Noise from site-generated traffic movements has been assessed. The assessment demonstrated that noise levels from the existing and additional traffic movements will satisfy the relevant RNP criteria. Therefore, road traffic noise impacts associated with the proposed modification are considered unlikely at the nearest residential receivers.

Glossary

Technical terms typically utilised in a noise assessment report are explained in Table G.1.

Table G.1 Glossary of acoustic terms and abbreviations

Abbreviation or term	
ABL	The assessment background level (ABL) is defined in the INP as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L_{A90} statistical noise levels.
Amenity noise criteria	The amenity noise criteria relate to the overall level of industrial noise. Where existing levels of industrial noise (excluding the subject development) approach the acceptable amenity noise criteria, then noise levels from new industries need to demonstrate that they will not be an additional contributor to existing industrial noise.
A-weighting	There are several different weightings utilised for describing noise, the most common being the 'A-weighting'. This attempts to closely approximate the frequency response of the human ear.
CEMP	Construction environment management plan
C-weighting	There are several different weightings utilised for describing noise, with the 'C-weighted' scale typically used to assess low frequency noise and is also utilised in the assessment of occupational noise.
Day period	Monday–Saturday: 7.00 am to 6.00 pm, on Sundays and public holidays: 8.00 am to 6.00 pm.
dB	Noise is measured in units called decibels (dB).
DP&E	Department of Planning and Environment
EA	Environmental assessment
EMM	EMM Consulting Pty Limited
EP&A Act	*Environmental and Planning Assessment Act 1979* (NSW)
EPA	The NSW Environment Protection Authority (formerly the Department of Environment, Climate Change and Water).
Evening period	Monday–Saturday: 6.00 pm to 10.00 pm, on Sundays and public holidays
ICNG	Interim Construction Noise Guideline
INP	Industrial Noise Policy
Intrusive noise criteria	The intrusive noise criteria refer to noise that intrudes above the background level by more than 5 dB. The intrusiveness criterion is described in detail in Section 3.1.1.
L_{A1}	The A-weighted noise level exceeded for 1% of the time.
L_{A10}	The A-weighted noise level which is exceeded 10% of the time. It is roughly equivalent to the average of maximum noise level.
L_{A90}	The A-weighted noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L_{Aeq}	The A-weighted energy average noise level. This is the equivalent continuous sound pressure level over a given period. The $L_{Aeq(15\text{-}minute)}$ descriptor refers to an L_{Aeq} noise level measured over a 15-minute period.
Linear peak	The peak level of an event is normally measured using a microphone in the same manner as linear noise (i.e. unweighted), at frequencies both in and below the audible range.
L_{Amax}	The maximum A-weighted sound pressure level received during a measurement interval.

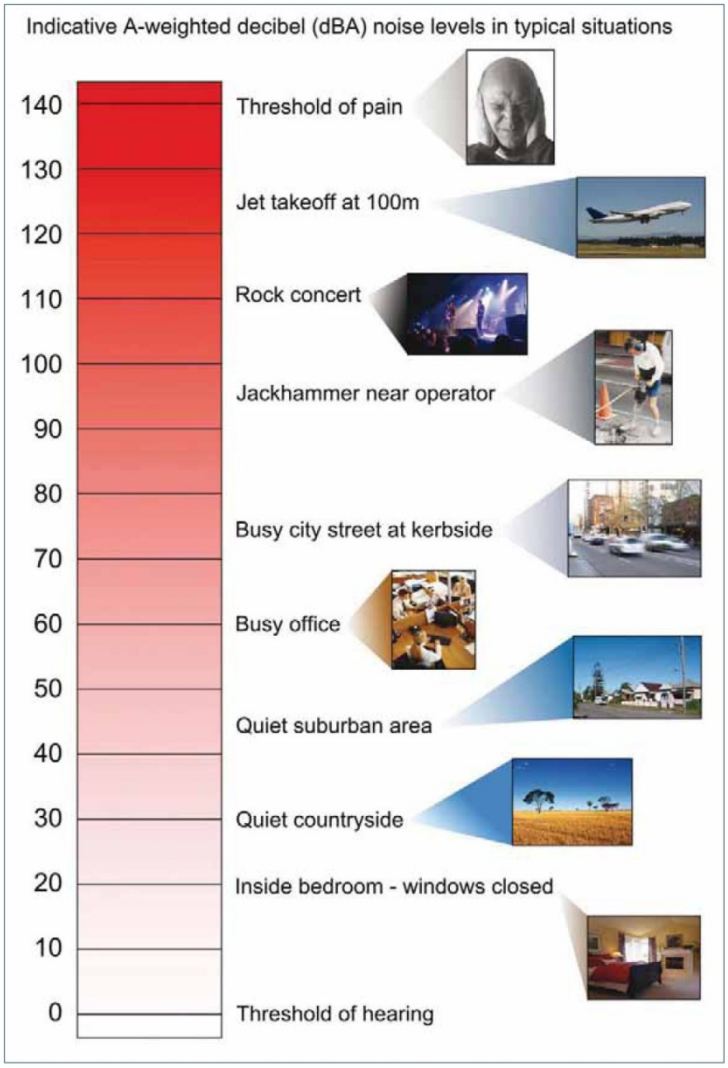
Table G.1 Glossary of acoustic terms and abbreviations

Abbreviation or term	
Night period	Monday–Saturday: 10.00 pm to 7.00 am, on Sundays and public holidays: 10.00 pm to 8.00 am.
NMP	Noise management plan
NPfI	Noise Policy for Industry
POEO Act	*Protection of the Environment Operations Act 1997* (NSW)
PNTL	Project noise trigger level
PSNL	The project-specific noise level (PSNL) is criteria for a particular industrial noise source or industry. The PSNL is the lower of either the intrusive noise criteria or amenity noise criteria.
RBL	The rating background level (RBL) is an overall single value 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 average background levels.
RNP	Road Noise Policy
SEARs	Secretary's environmental assessment requirements
Sound power level (L_w)	A measure of the total power radiated by a source. The sound power of a source is a fundamental property of the source and is independent of the surrounding environment.
Temperature inversion	A meteorological condition where the atmospheric temperature increases with altitude.

It is useful to have an appreciation of decibels (dB), the unit of noise measurement. Table G.2 gives an indication as to what an average person perceives about changes in noise levels. Examples of common noise levels are provided in Figure G.1.

Table G.2 Perceived change in noise

Change in sound level (dB)	Perceived change in noise
3	Just perceptible
5	Noticeable difference
10	Twice (or half) as loud
15	Large change
20	Four times (or quarter) as loud



Source: Road Noise Policy (Department of Environment, Climate Change and Water, 2011

Figure G.1 Common noise levels

References

Australian Standard AS 1055-1997, *Acoustics - Description and Measurement of Environmental Noise*

Australian Standard AS 2187.2 - 2006 "*Explosives* - Storage *and Use - Use of Explosives*"

BS 6472 – 2008 *"Evaluation of human exposure to vibration in buildings (1-80Hz)"*

BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2"

Department of Environment and Conservation NSW 2006, *Assessing Vibration: a technical guideline*

German Standard DIN 4150 Part 2 1975

NSW Department of Environment Climate Change and Water (DECCW) 2011, *Road Noise Policy* (RNP)

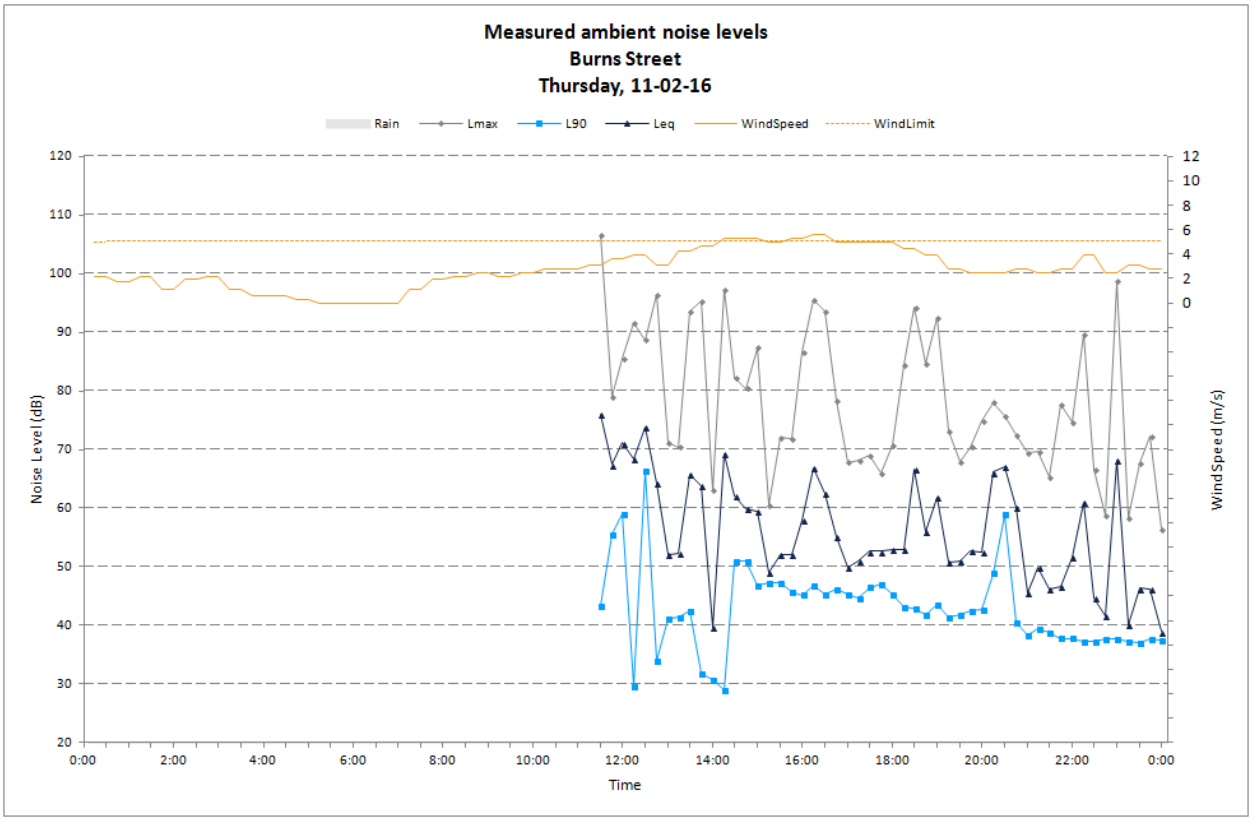
NSW Environment Protection Authority (EPA) 2000, *NSW Industrial Noise Policy* (INP)

NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI)

Voluntary Land Acquisition and Mitigation Policy (VLAMP) (NSW Government, 2018)

Appendix A

Noise logging charts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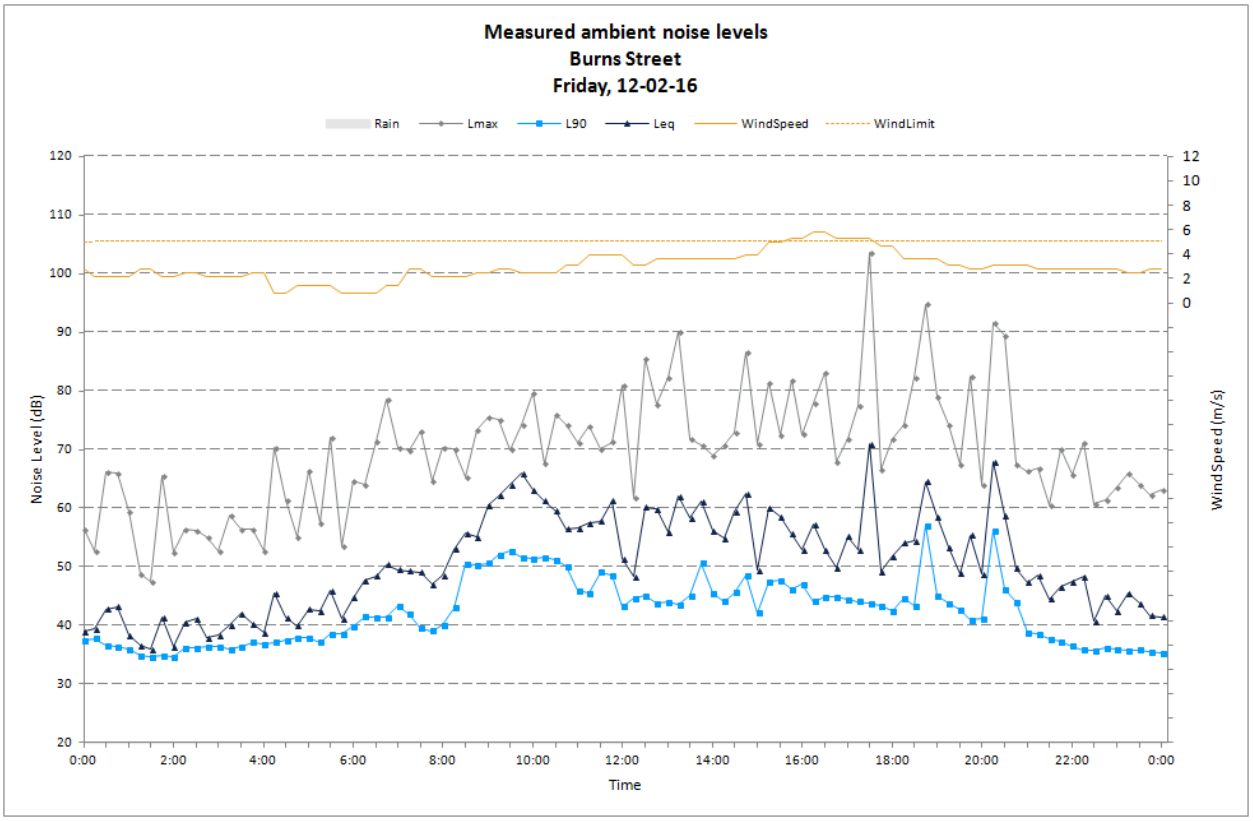
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time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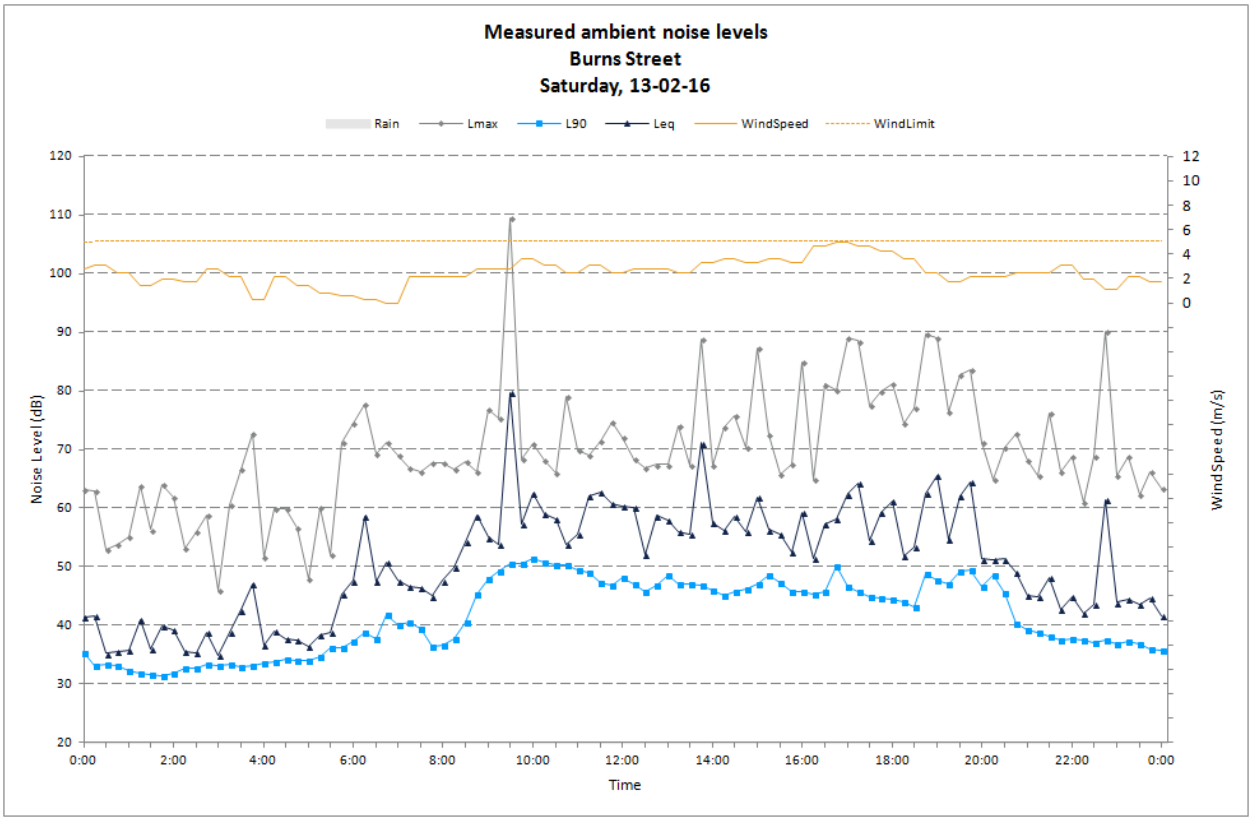
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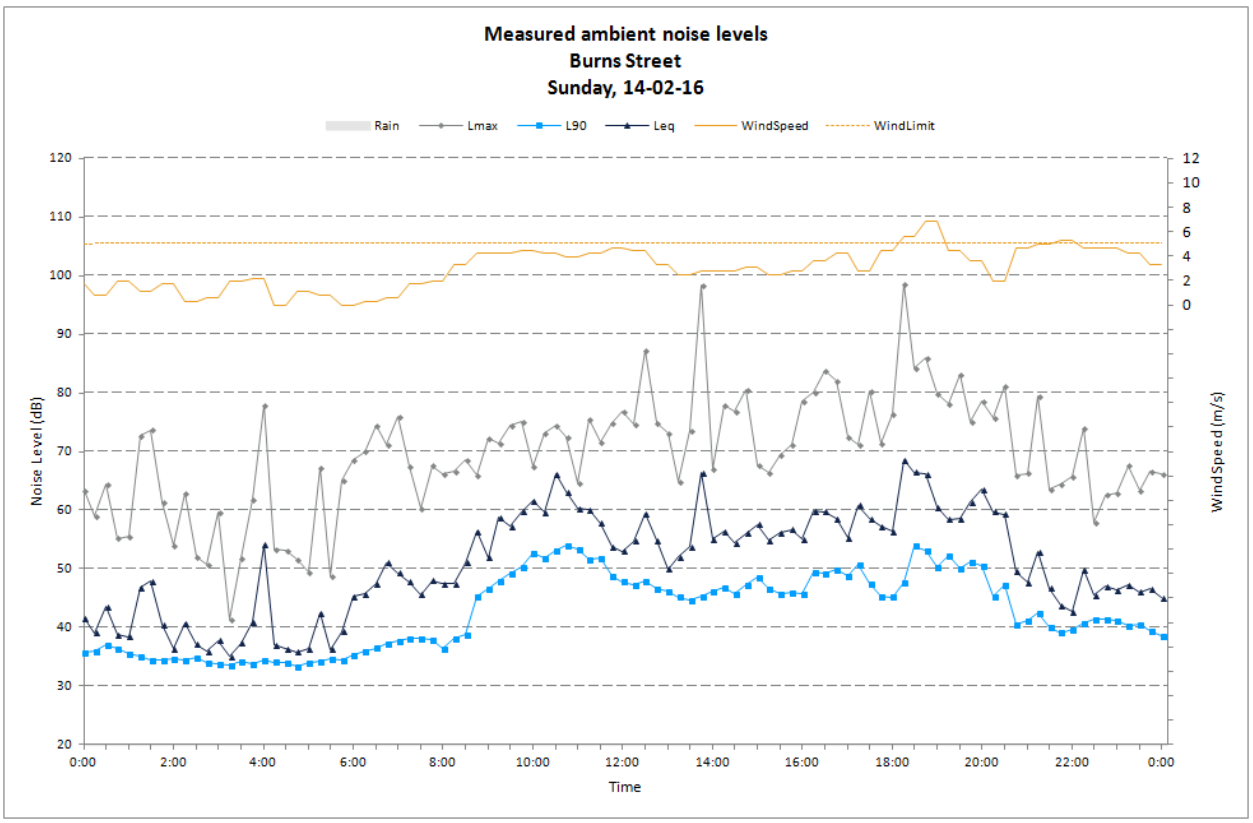
Time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WindLimit
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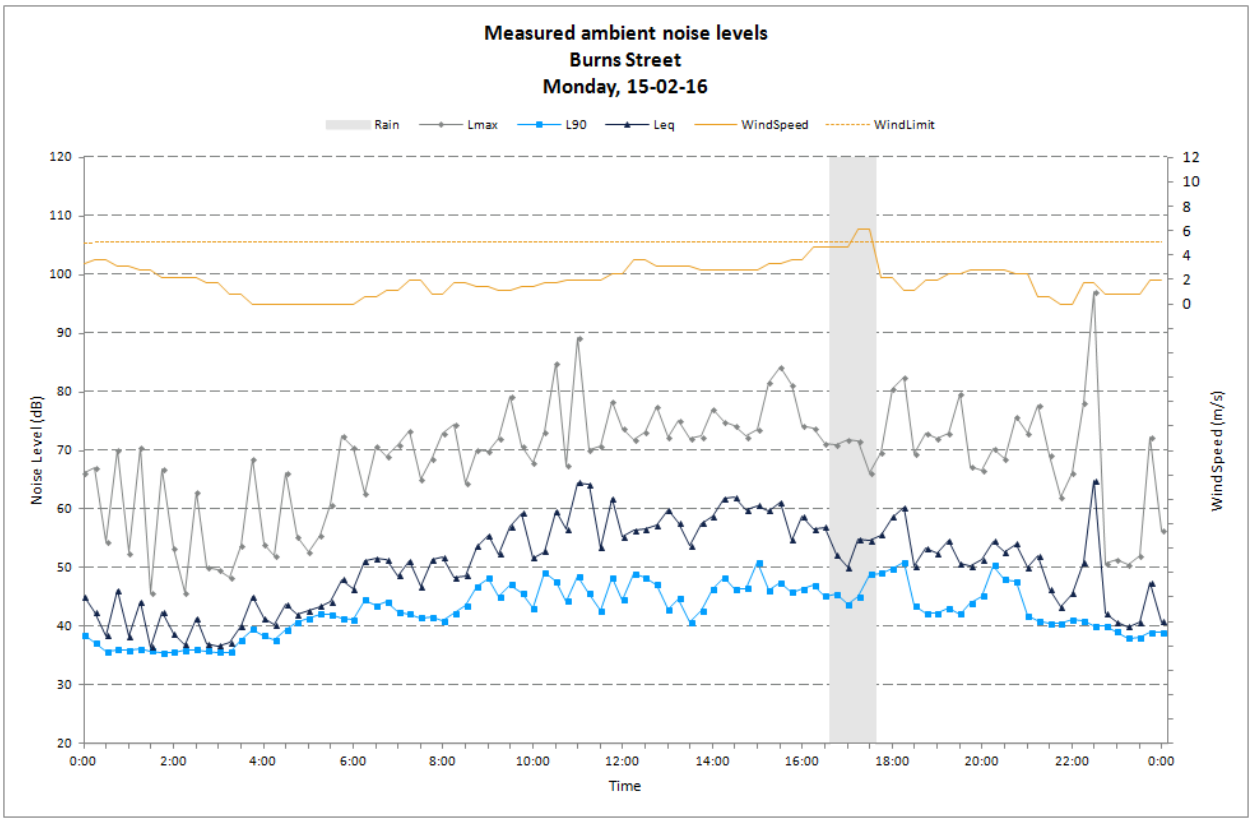
WindSpeed (m/s)
Time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Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
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100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
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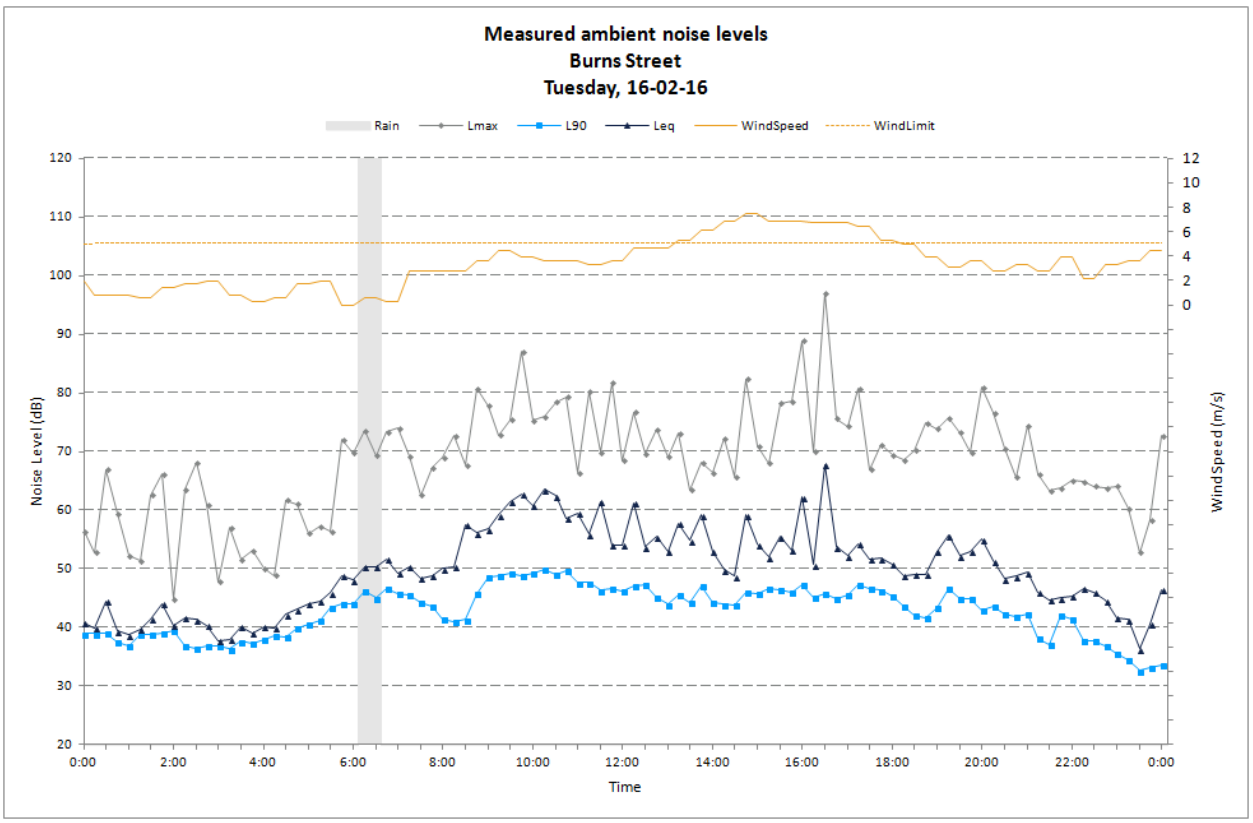
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Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
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110
100
90
80
70
60
50
40
30
20
12
10
8
6
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2
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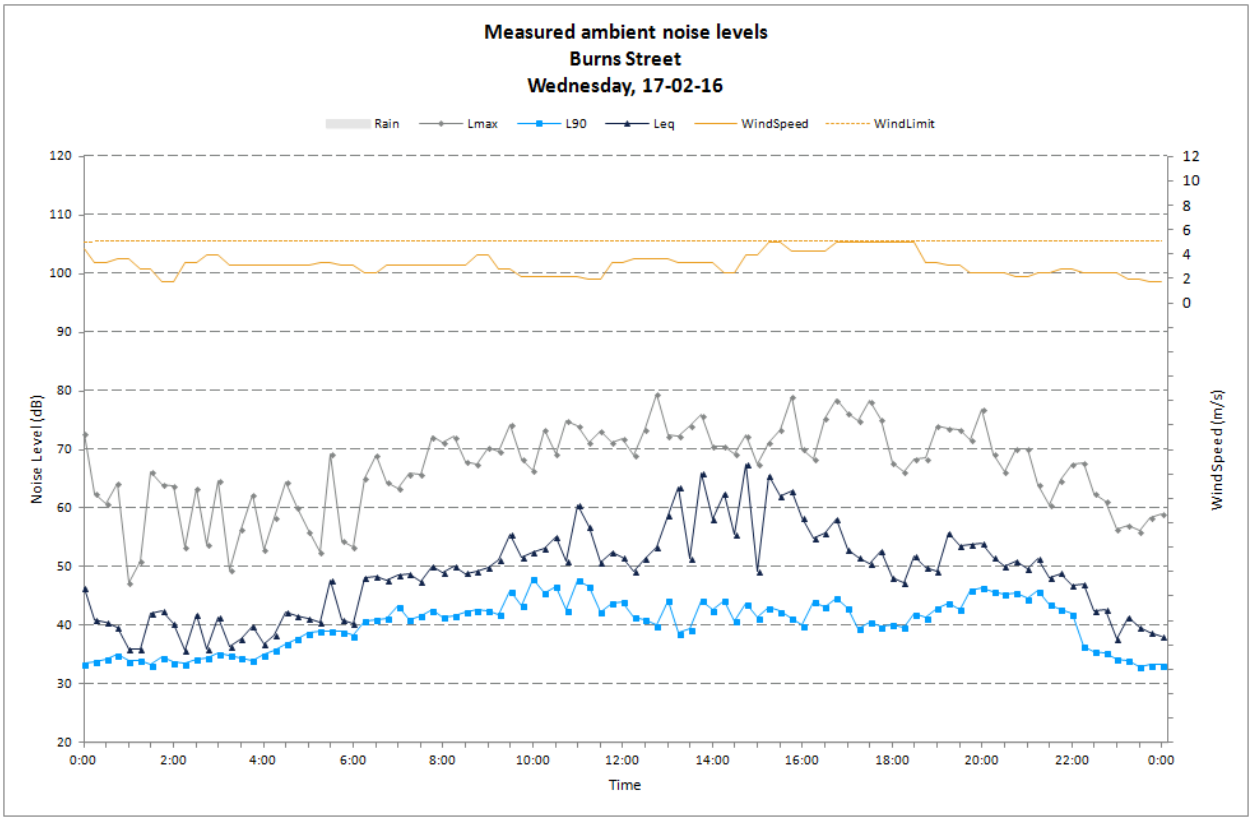
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WindSpeed
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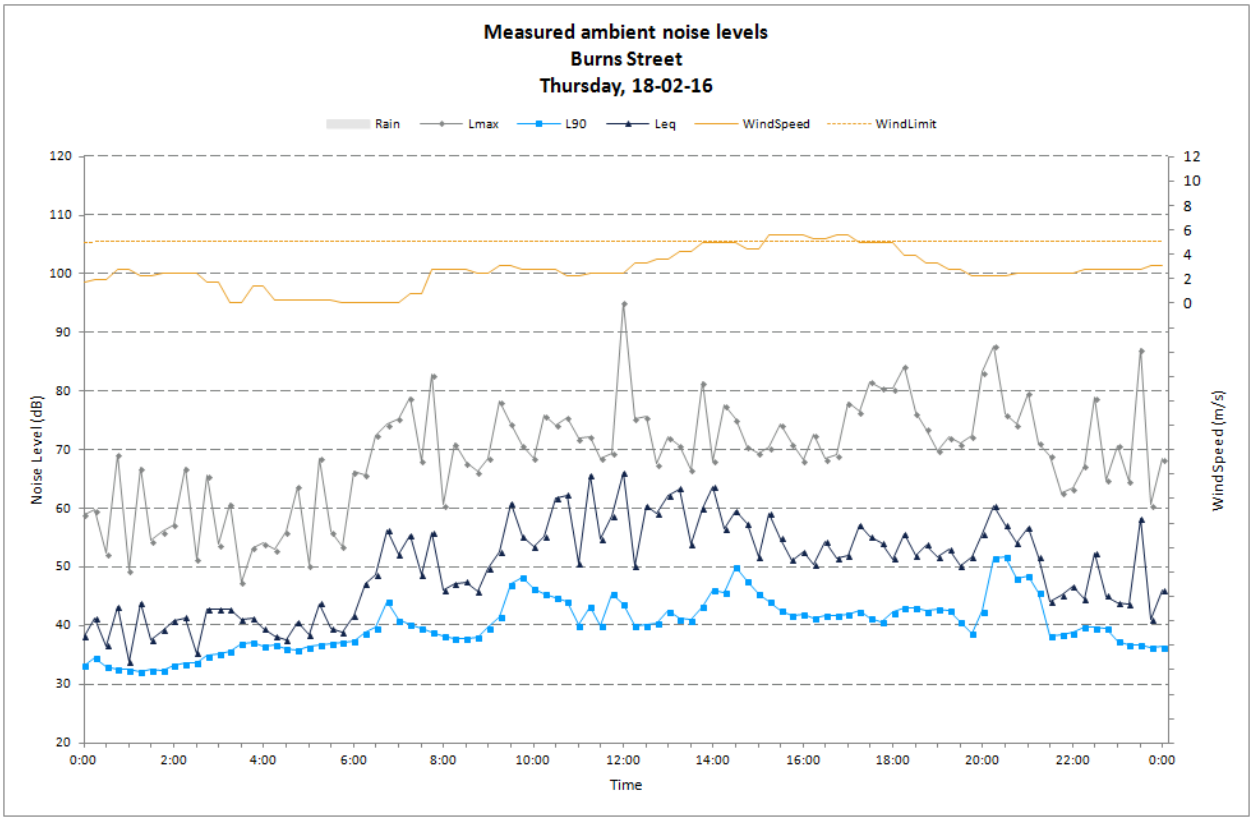
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WindSpeed
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WindSpeed (m/s)
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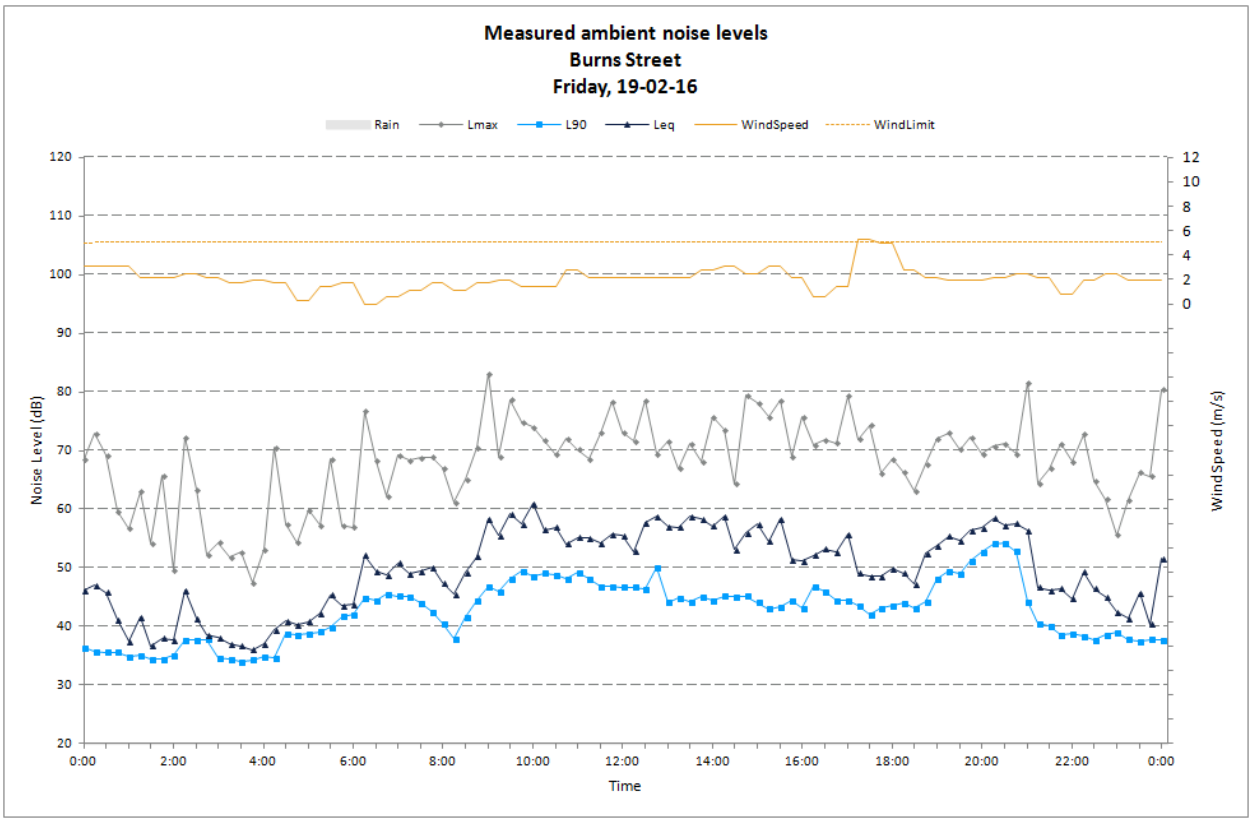
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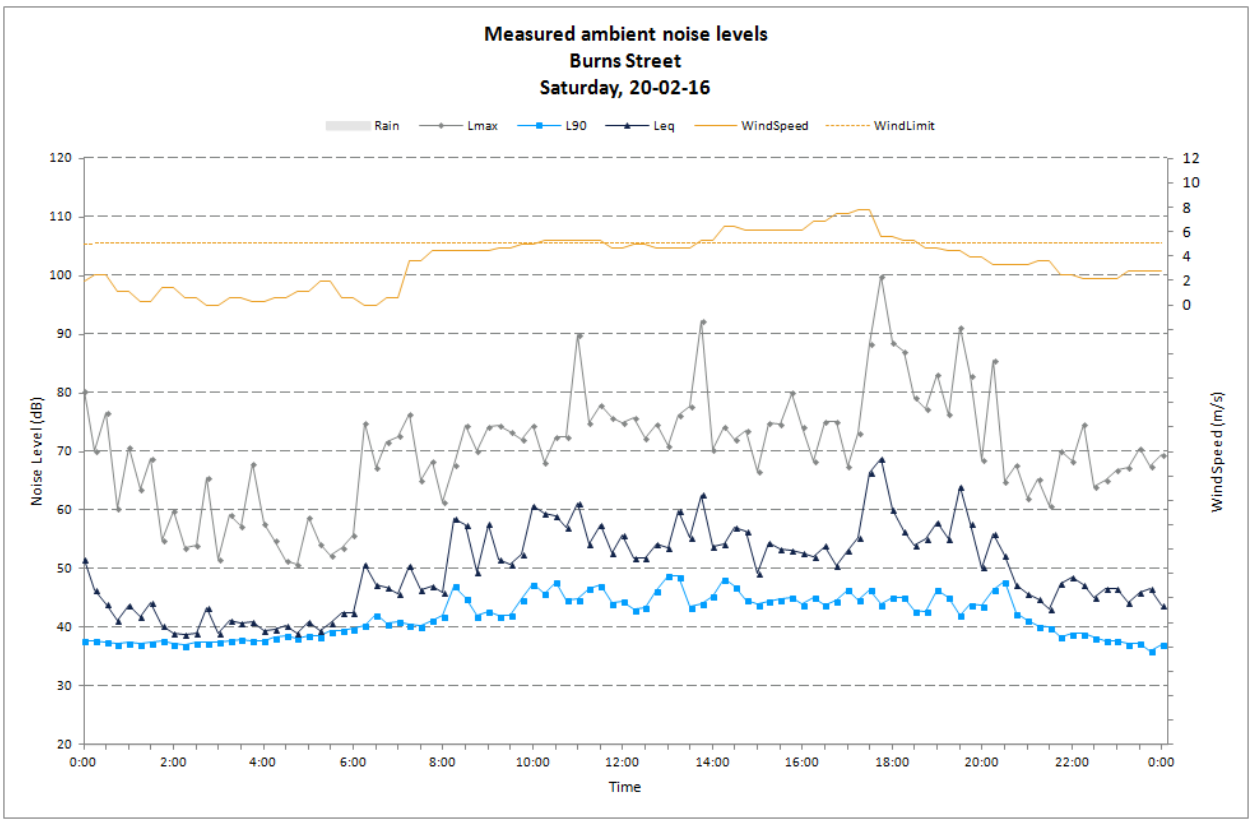
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Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
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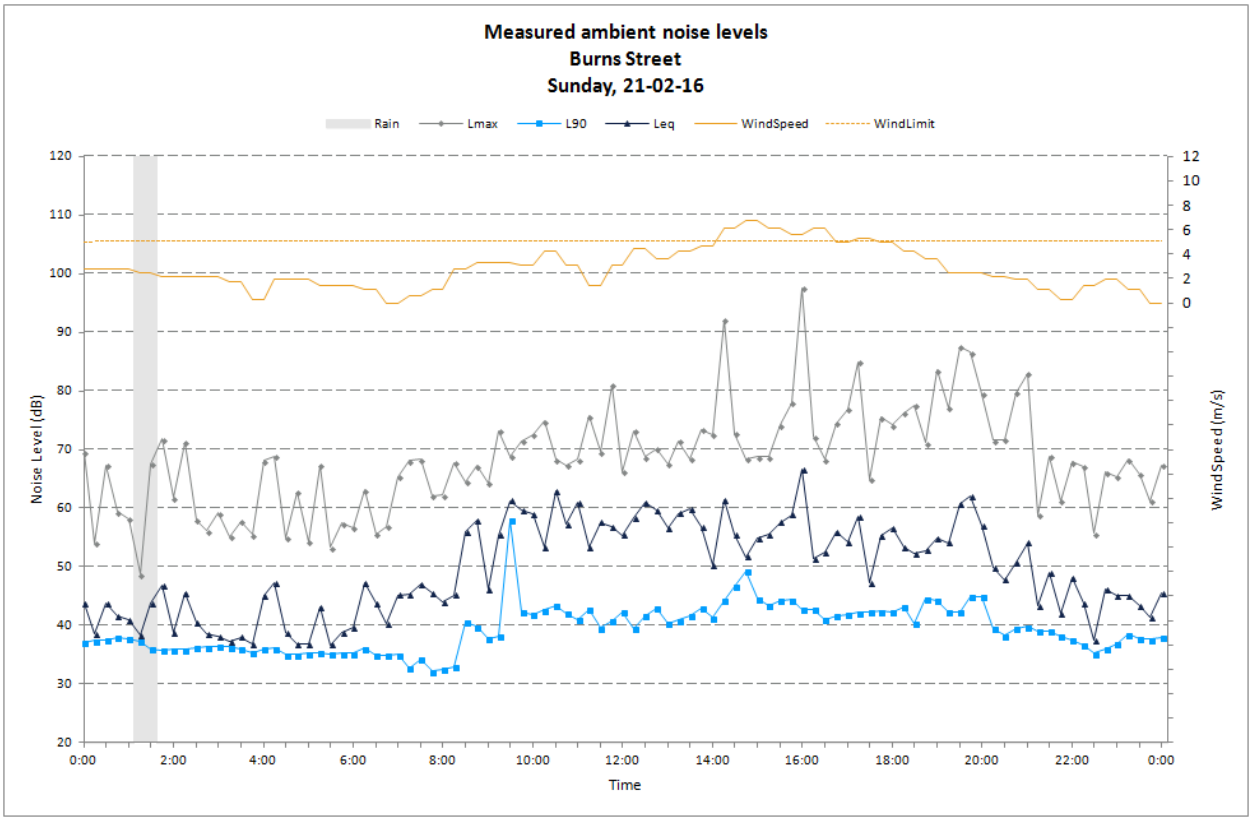
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Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
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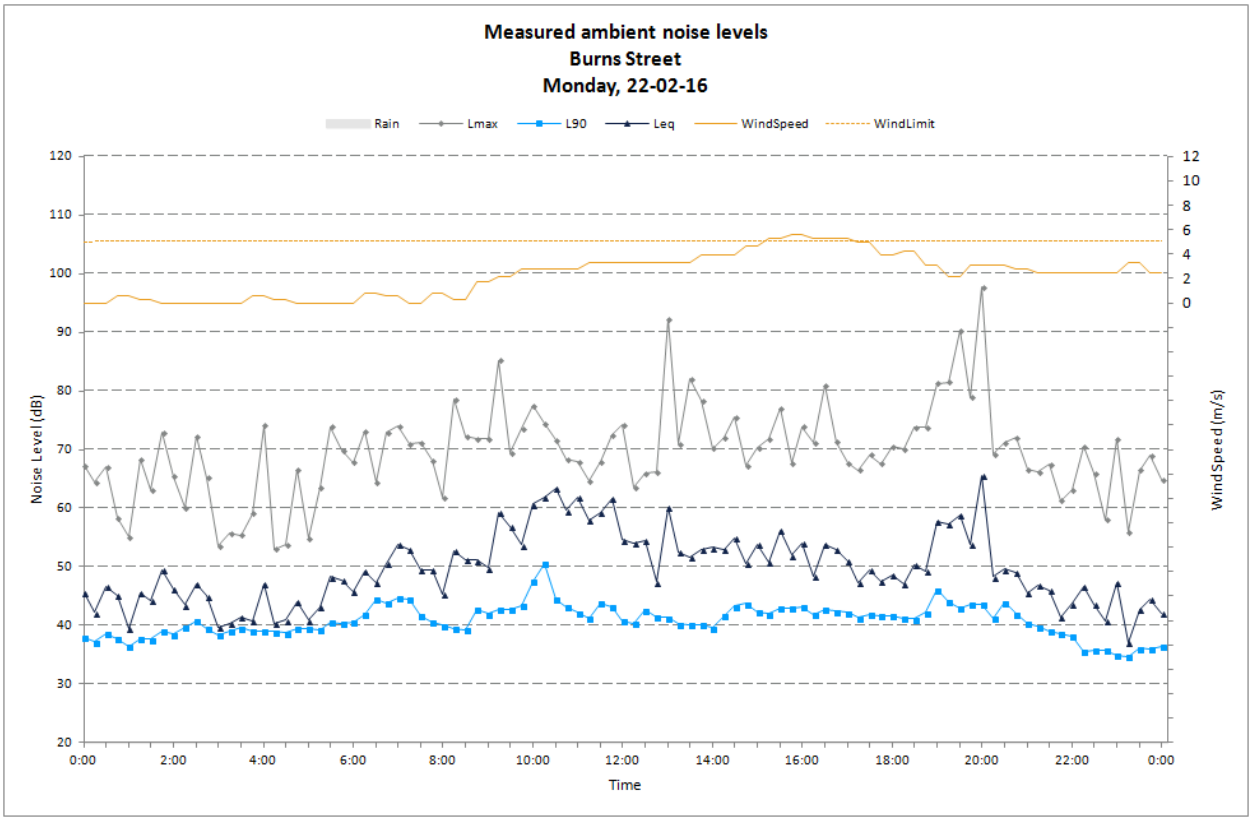
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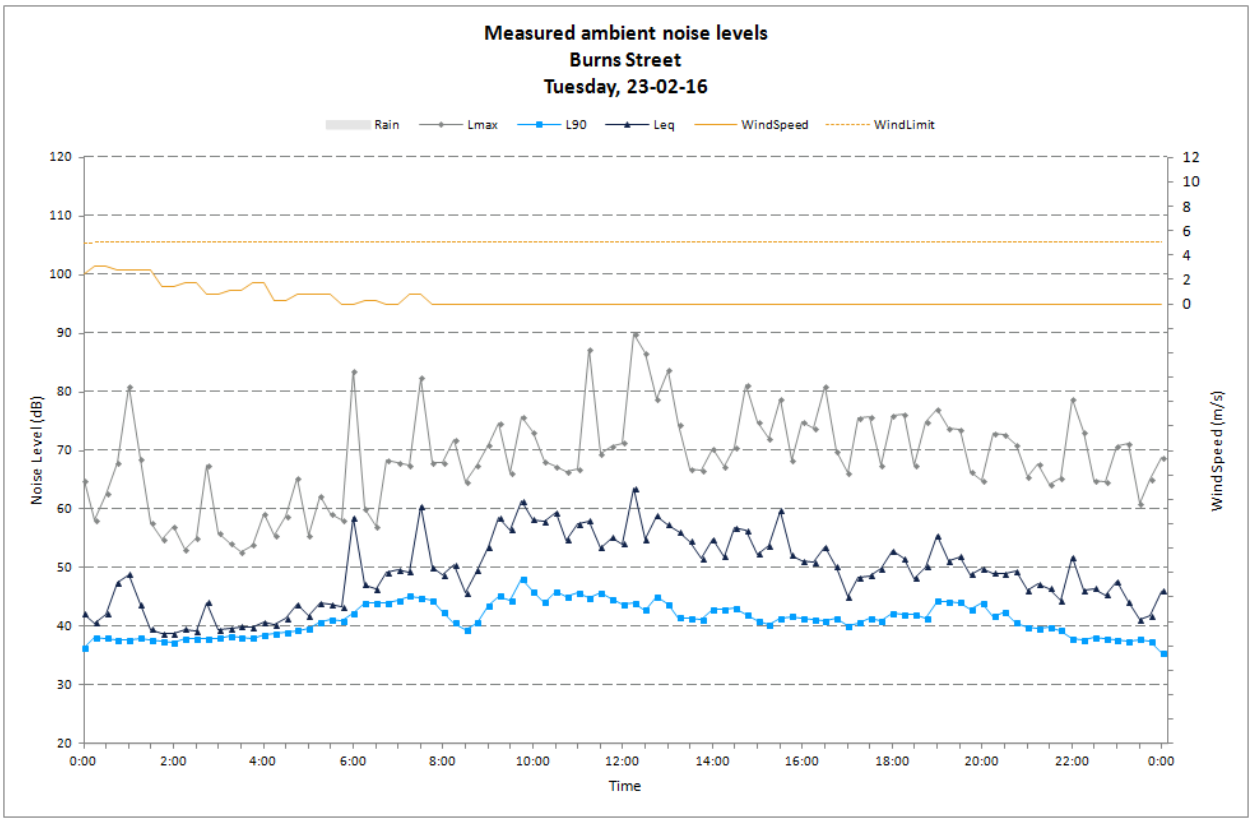
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Noise Level (dB)
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90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
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12:00
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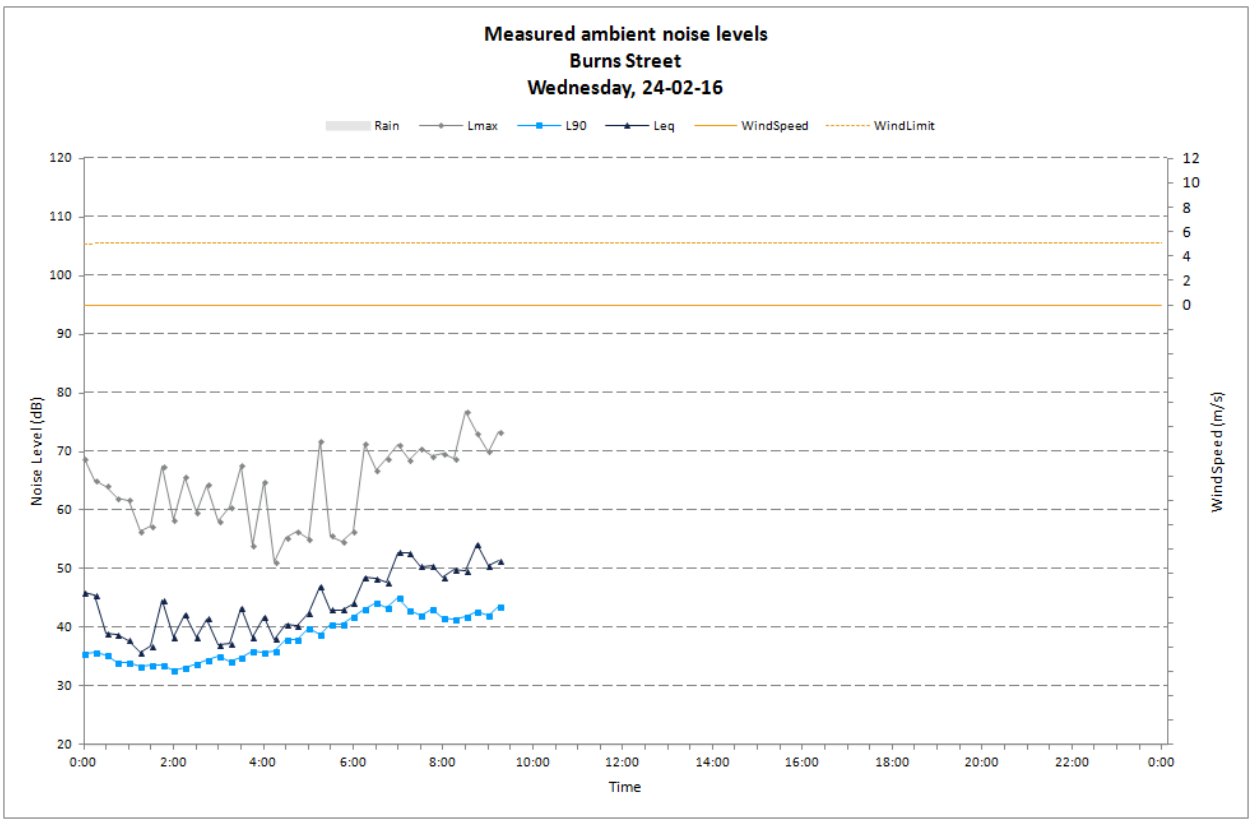
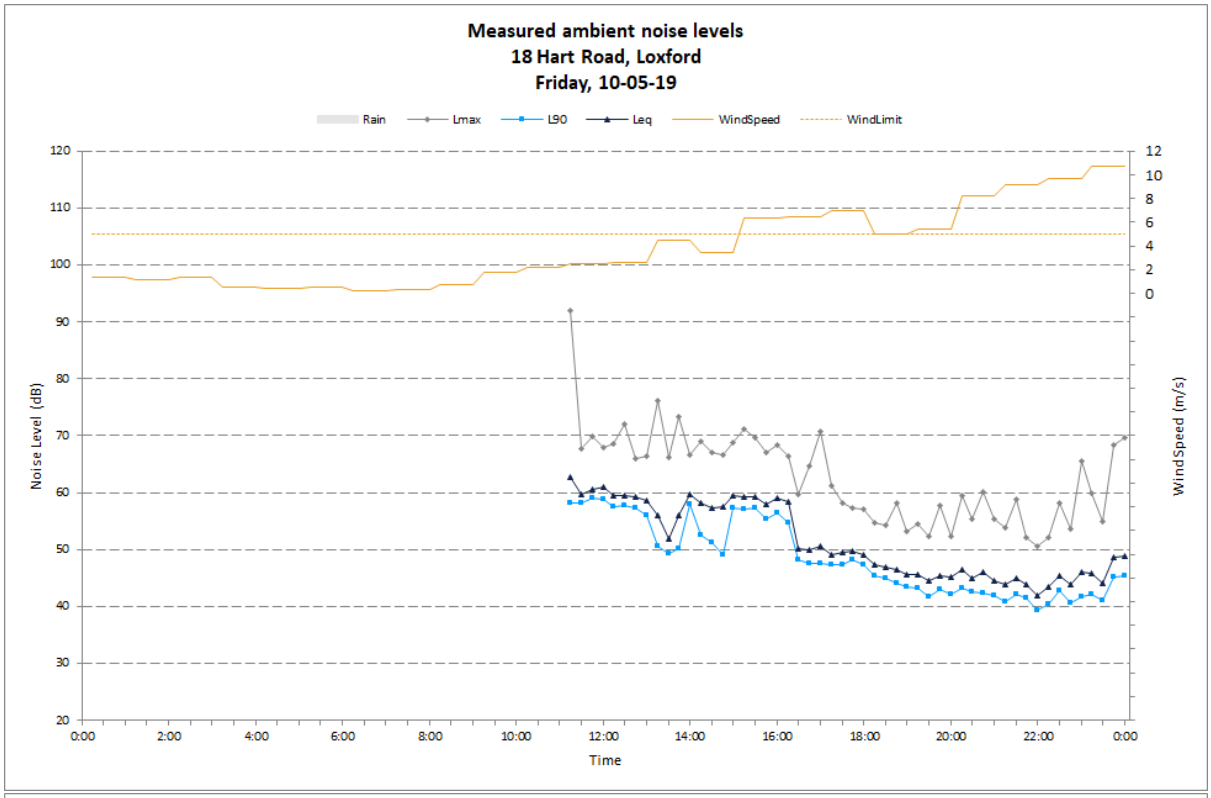
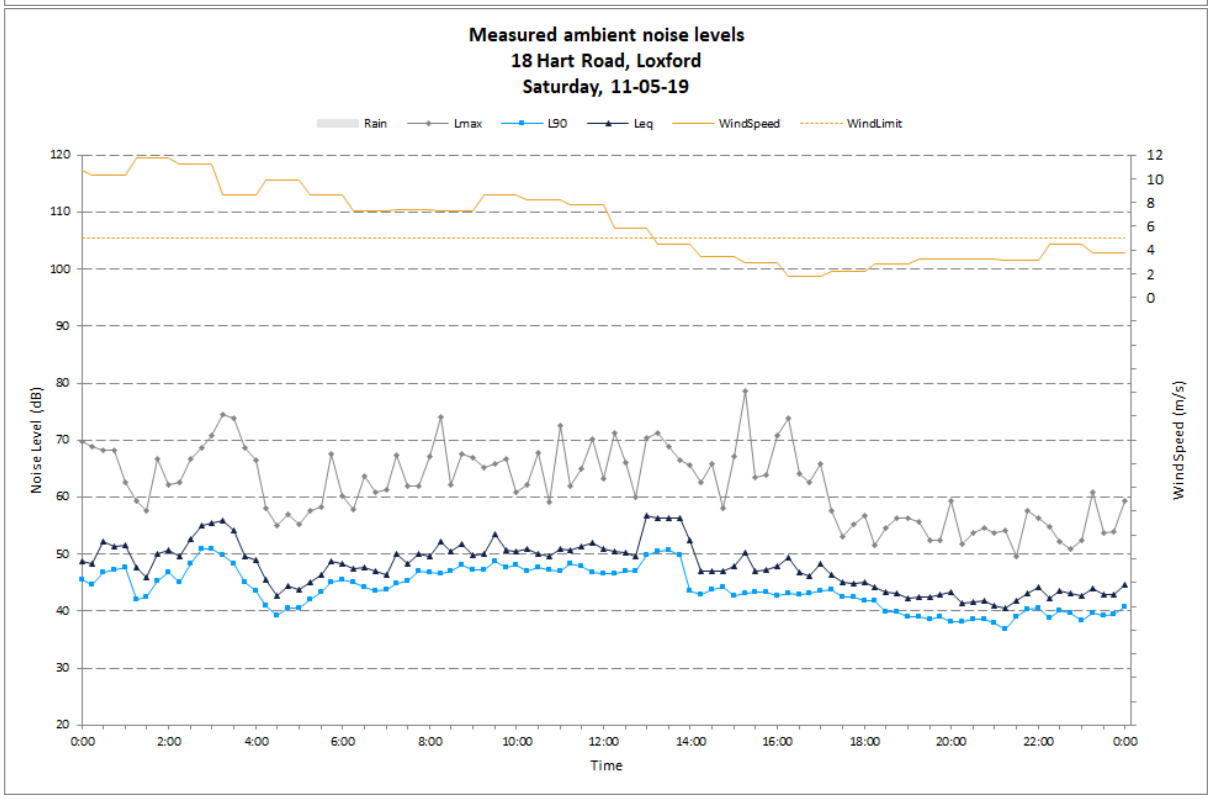
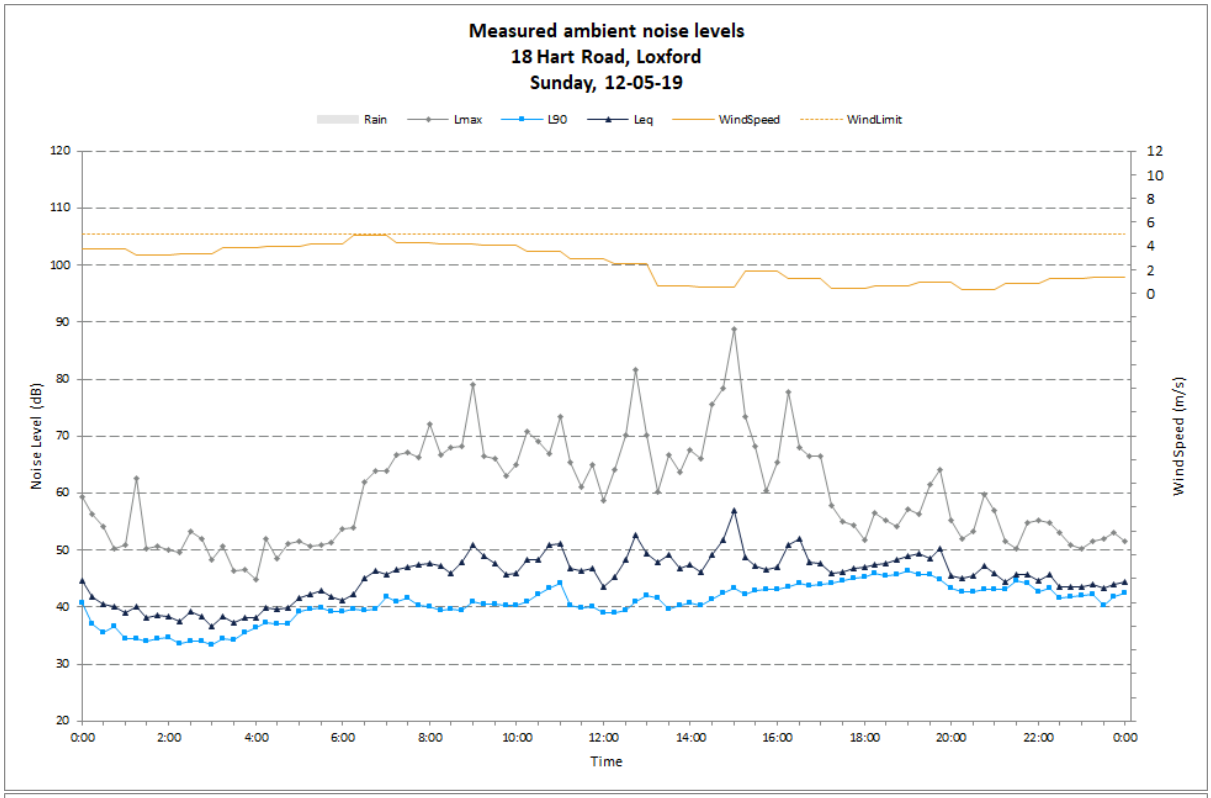
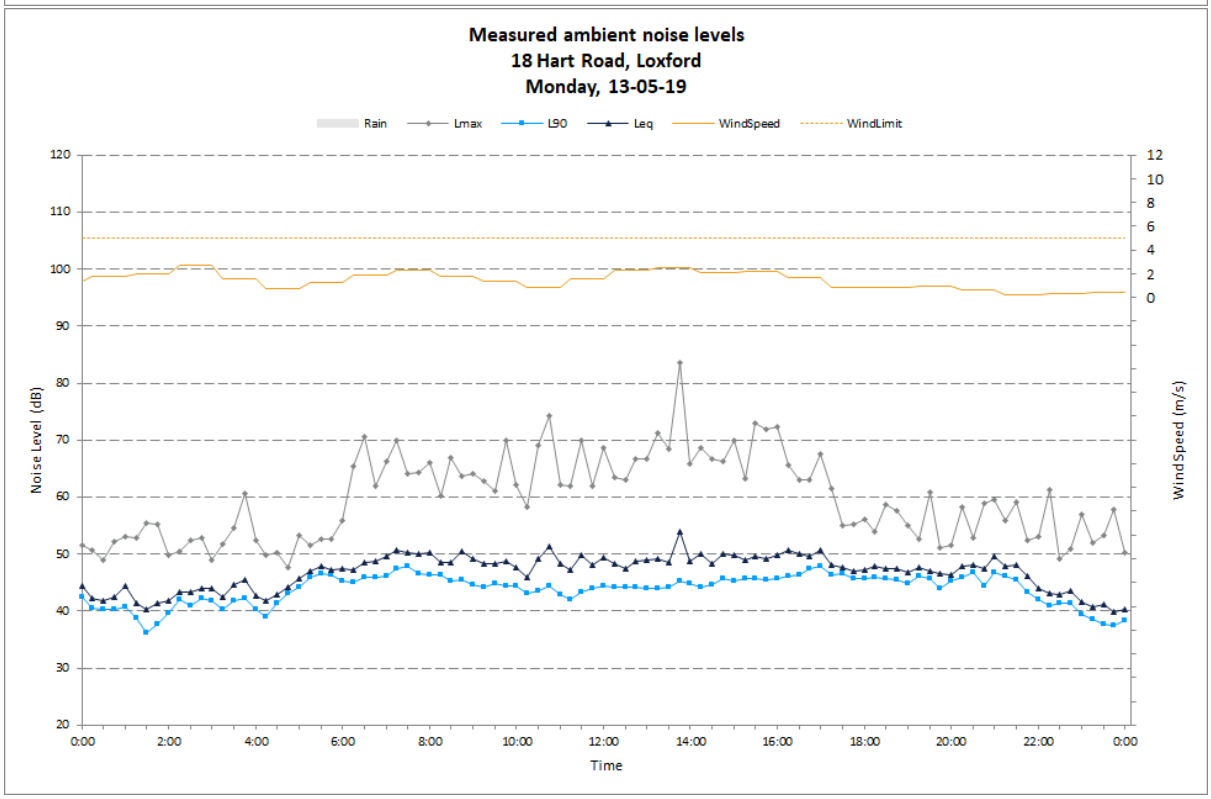
16:00
18:00
20:00
22:00
0:00

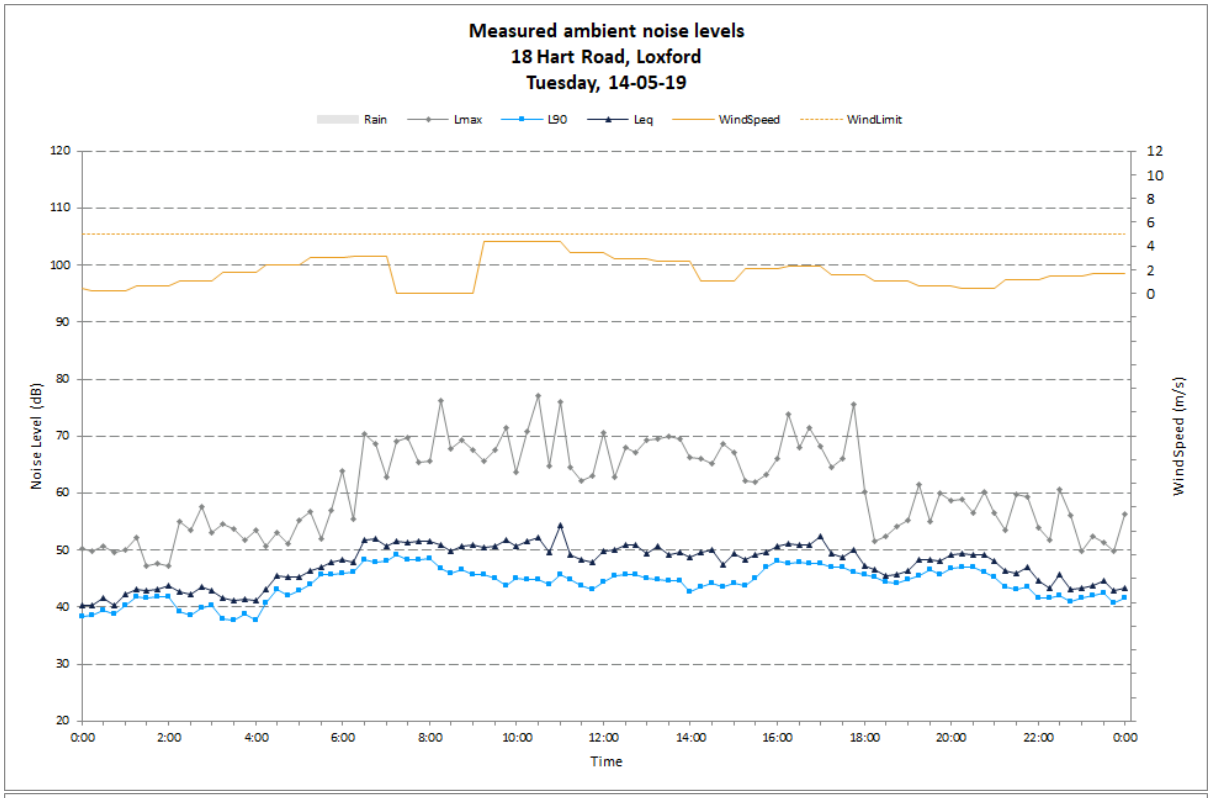

Measured ambient noise levels
Burns Street
Wednesday, 24-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

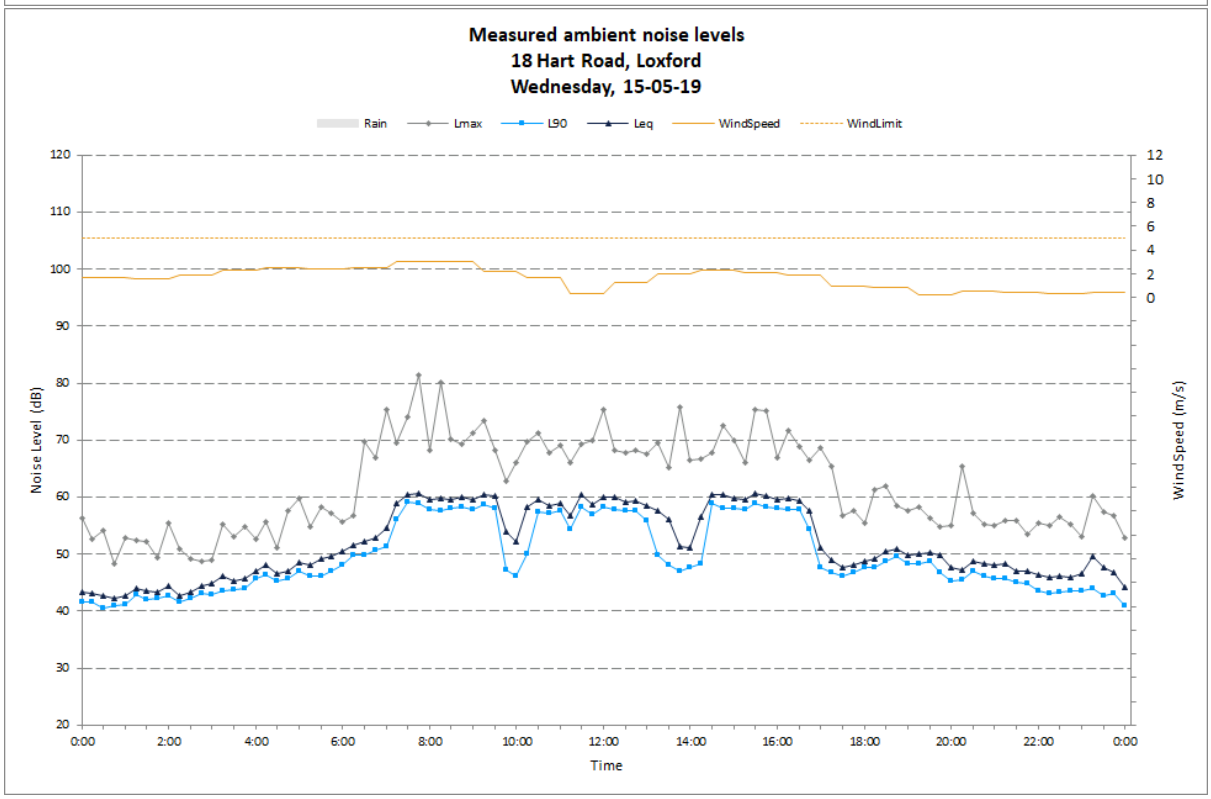

Measured ambient noise levels
18 Hart Road, Loxford
Friday, 10-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

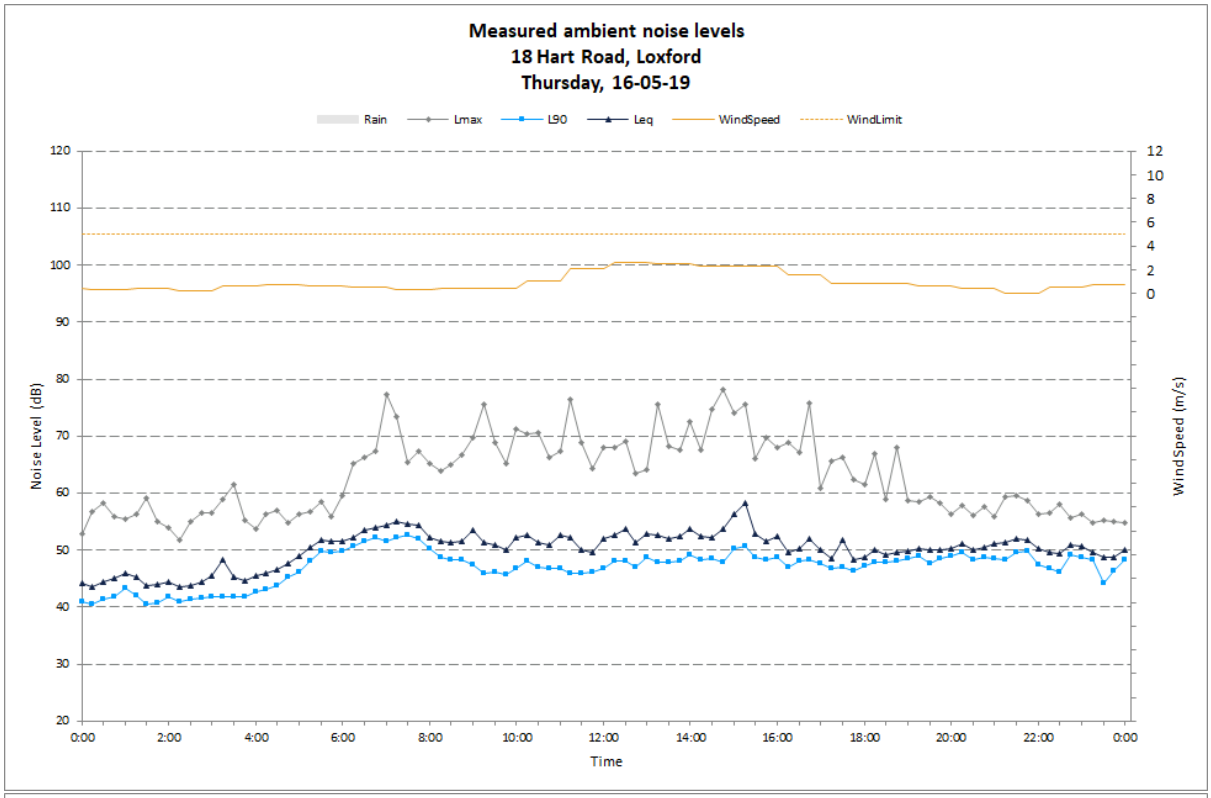

Measured ambient noise levels
18 Hart Road, Loxford
Saturday, 11-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

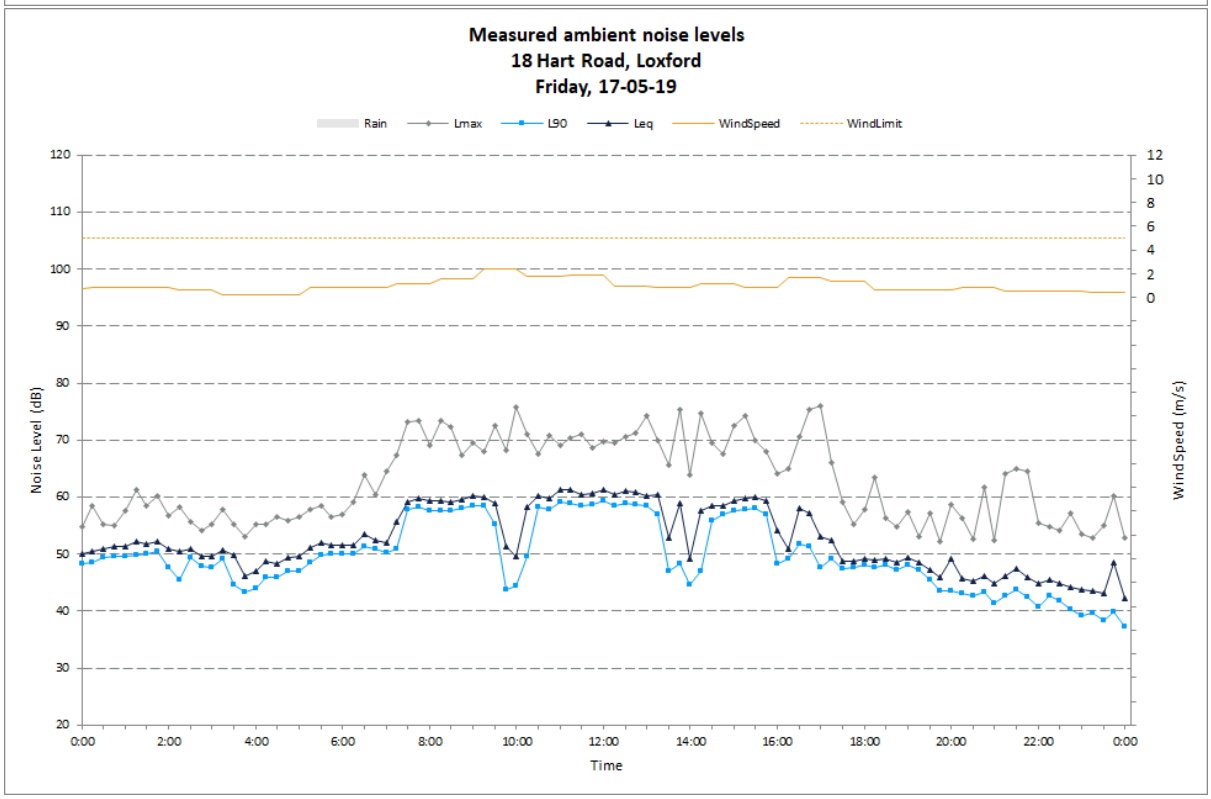

Measured ambient noise levels
18 Hart Road, Loxford
Sunday, 12-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

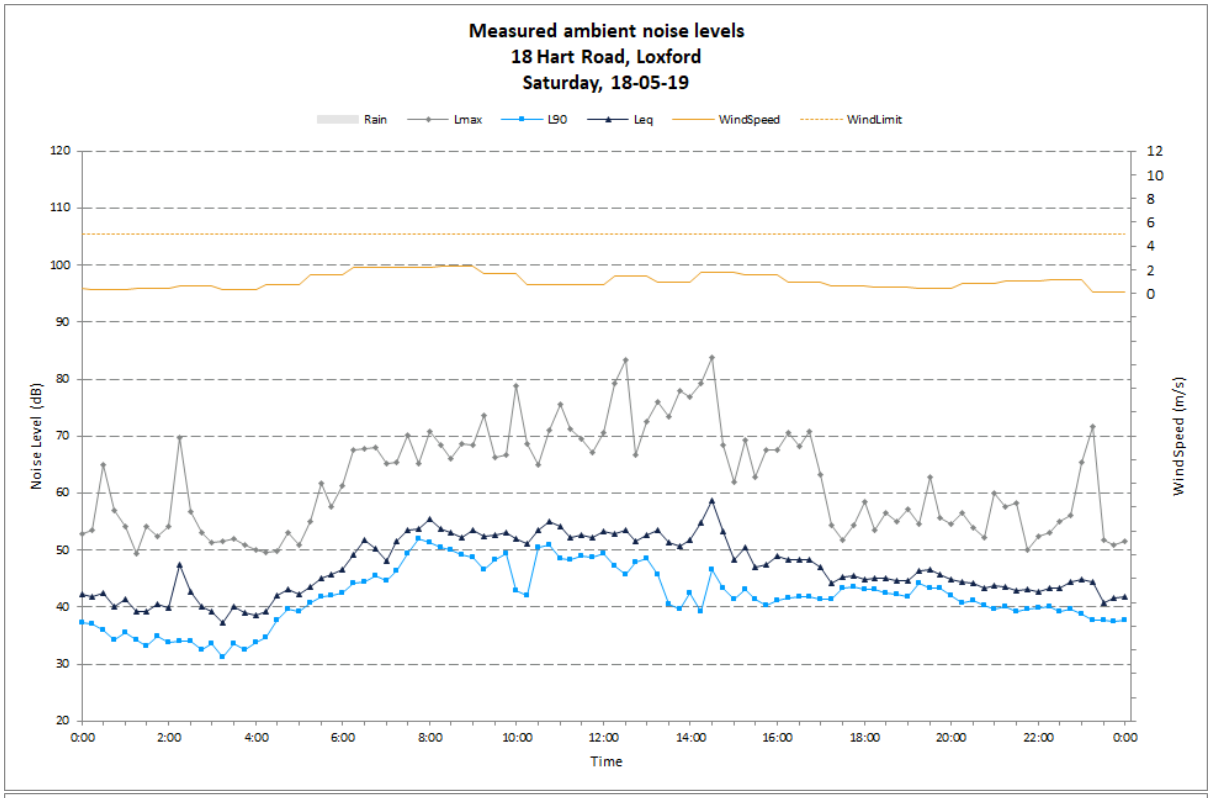

Measured ambient noise levels
18 Hart Road, Loxford
Monday, 13-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

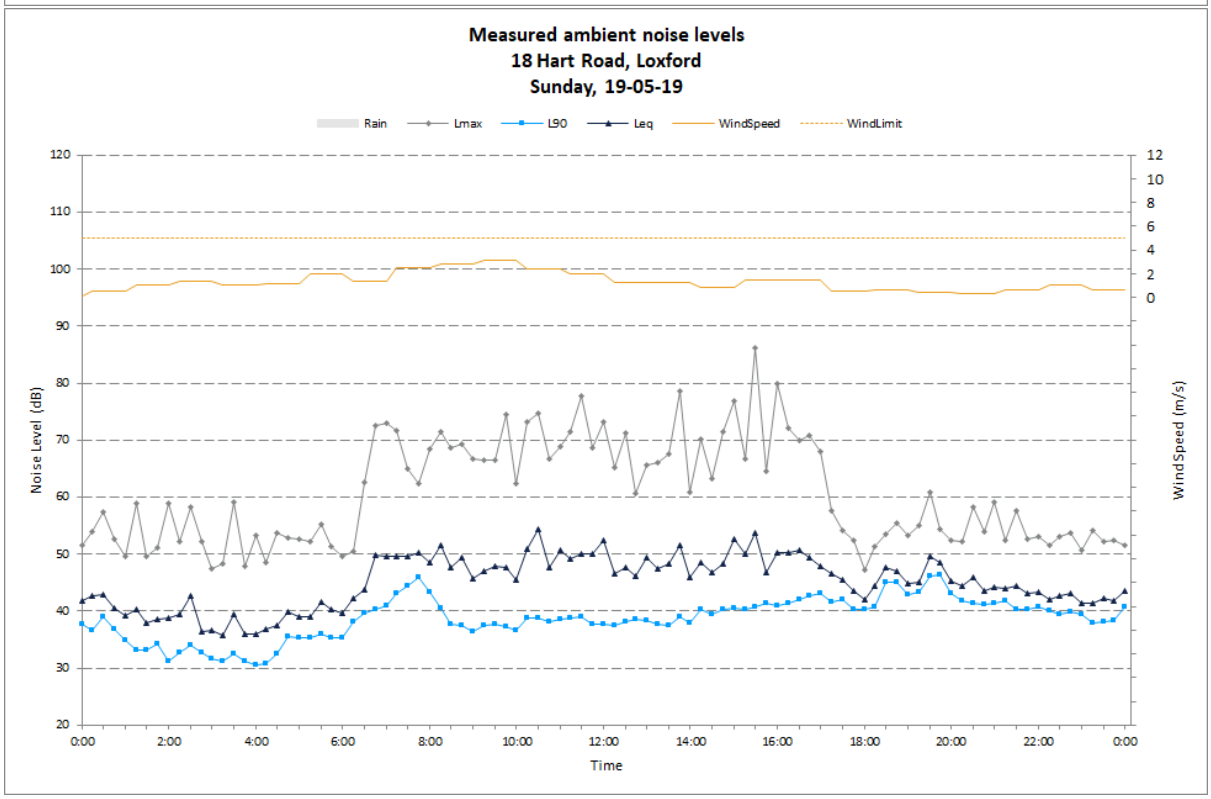

Measured ambient noise levels
18 Hart Road, Loxford
Tuesday, 14-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

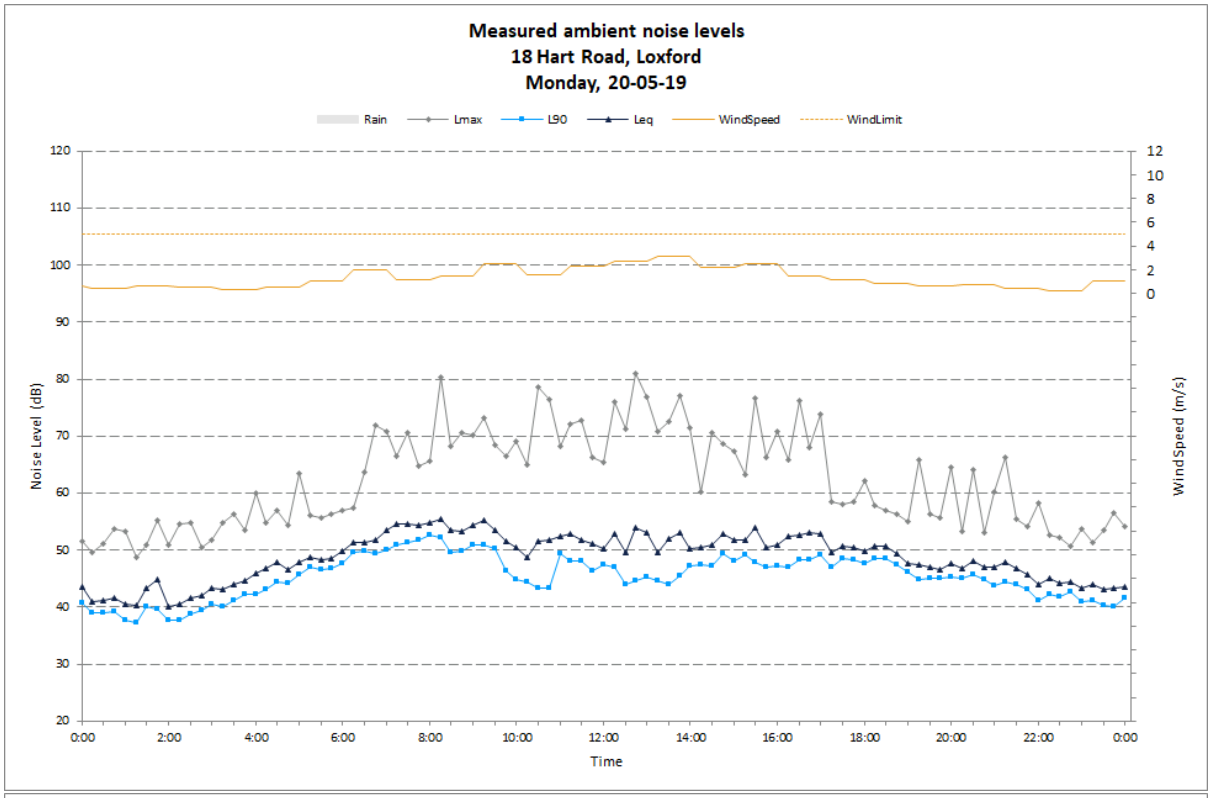

Measured ambient noise levels
18 Hart Road, Loxford
Wednesday, 15-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

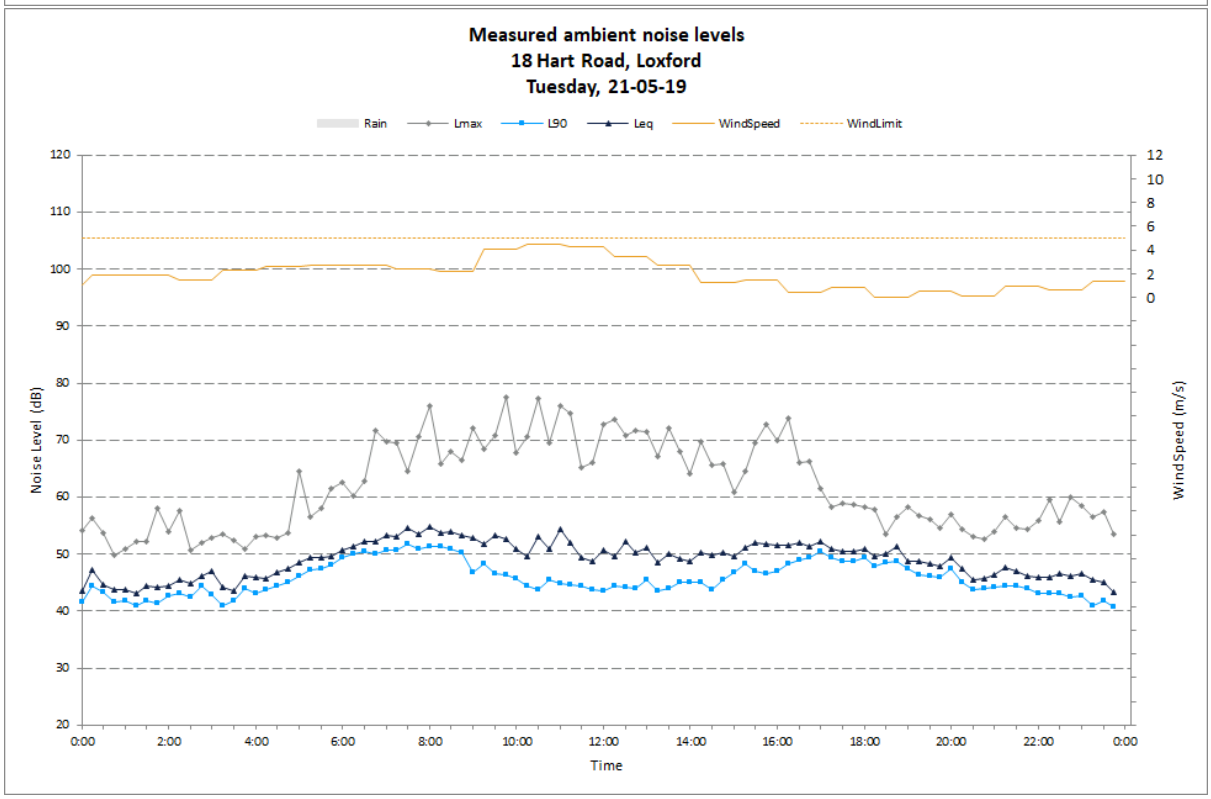

Measured ambient noise levels
18 Hart Road, Loxford
Thursday, 16-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

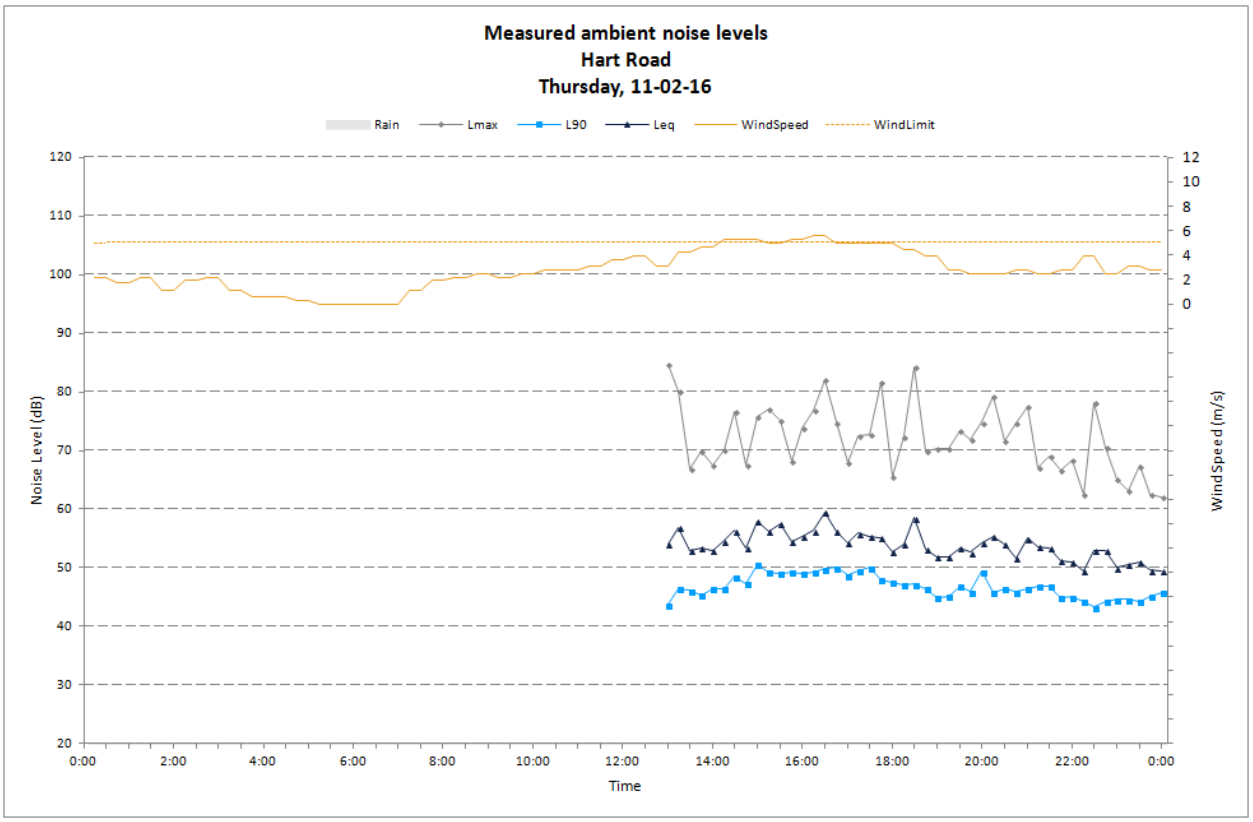

Measured ambient noise levels
18 Hart Road, Loxford
Friday, 17-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

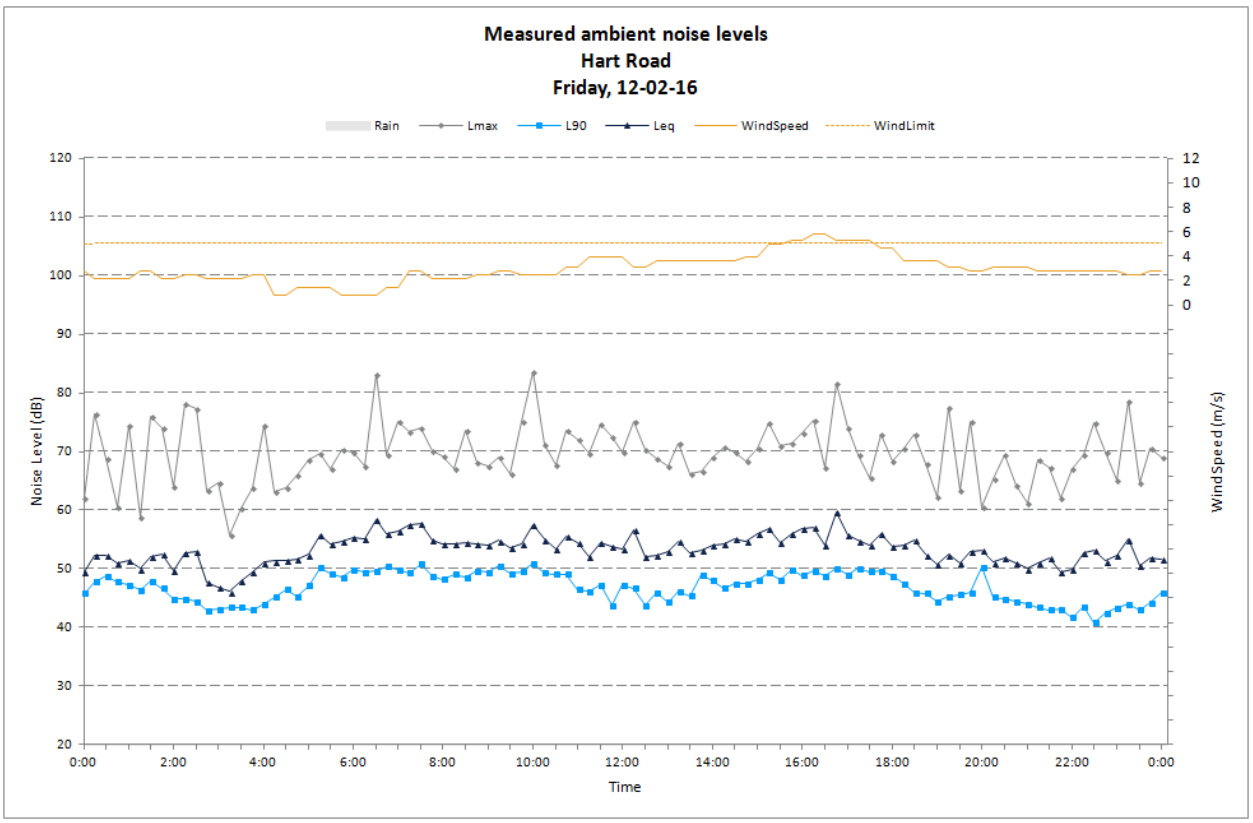

Measured ambient noise levels
18 Hart Road, Loxford
Saturday, 18-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

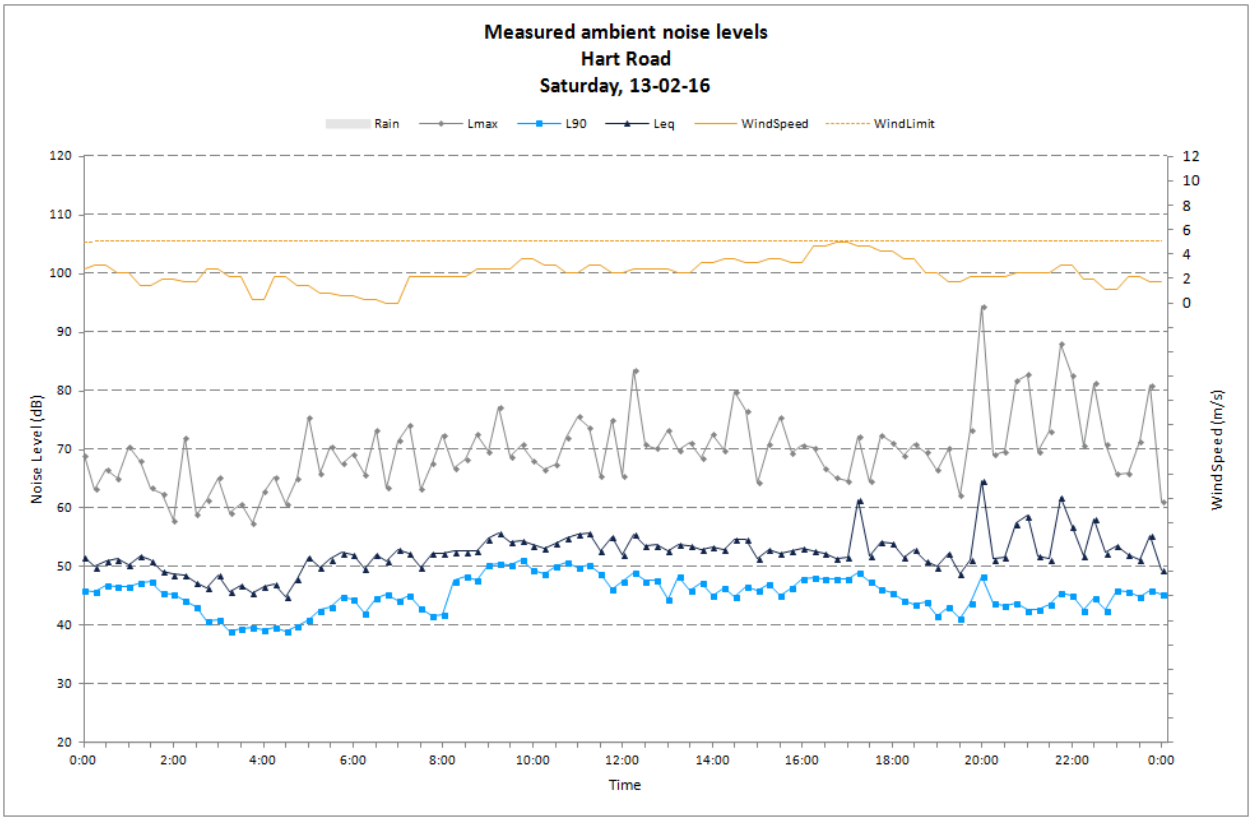

Measured ambient noise levels
18 Hart Road, Loxford
Sunday, 19-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time

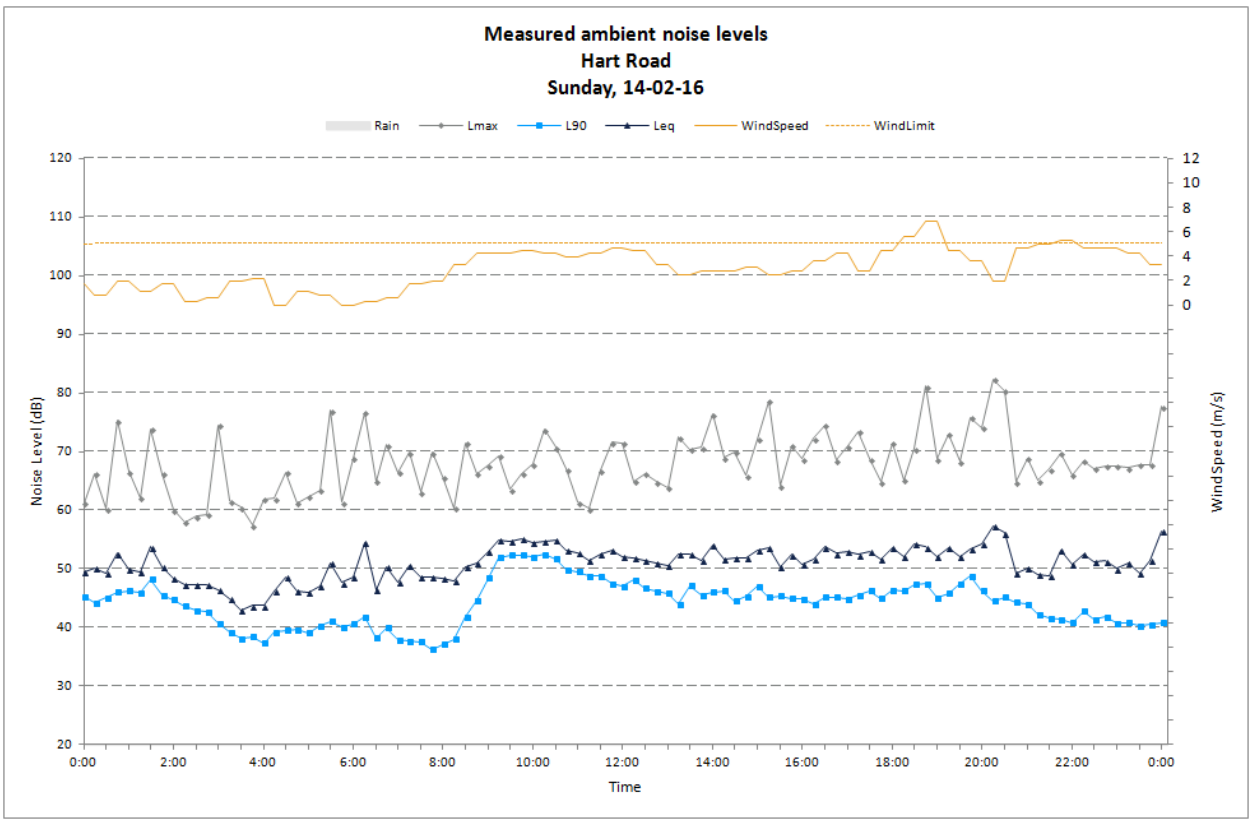

Measured ambient noise levels
18 Hart Road, Loxford
Monday, 20-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

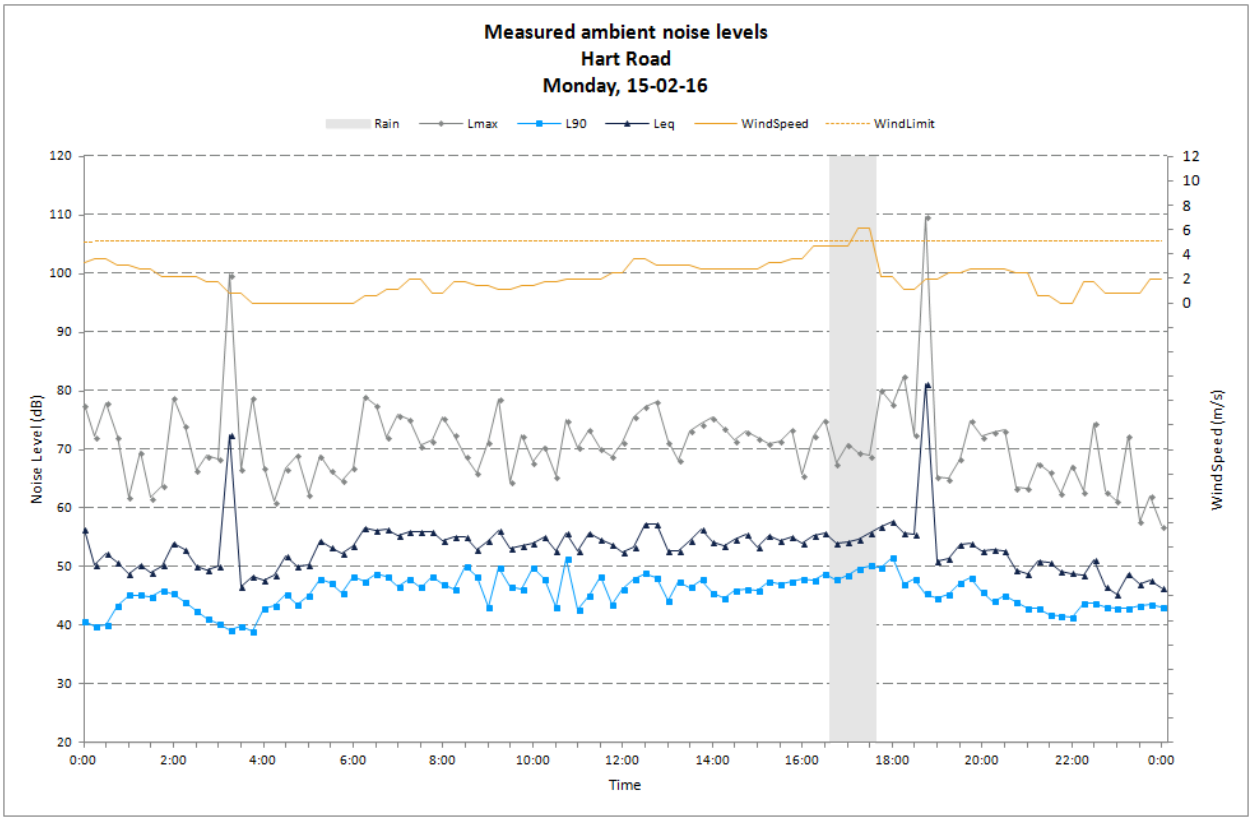

Measured ambient noise levels
18 Hart Road, Loxford
Tuesday, 21-05-19
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

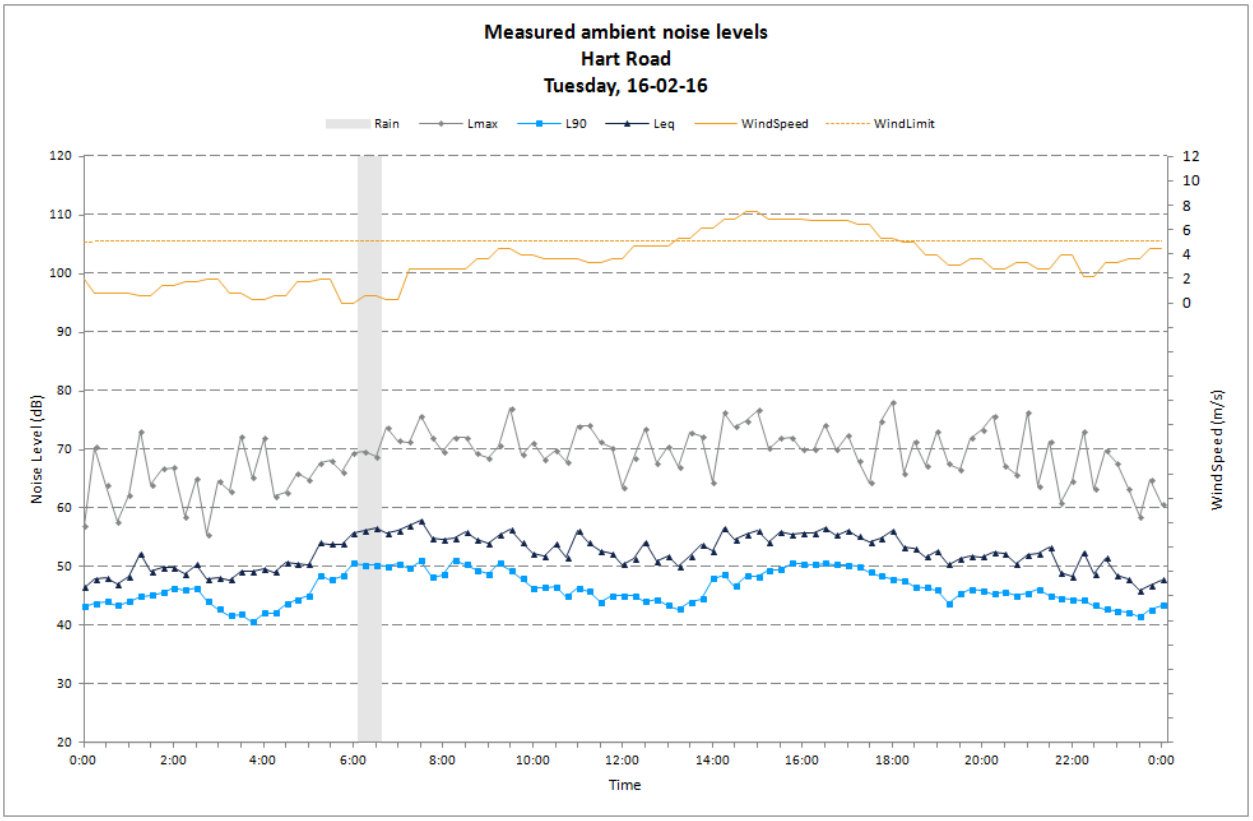

Measured ambient noise levels
Hart Road
Thursday, 11-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00

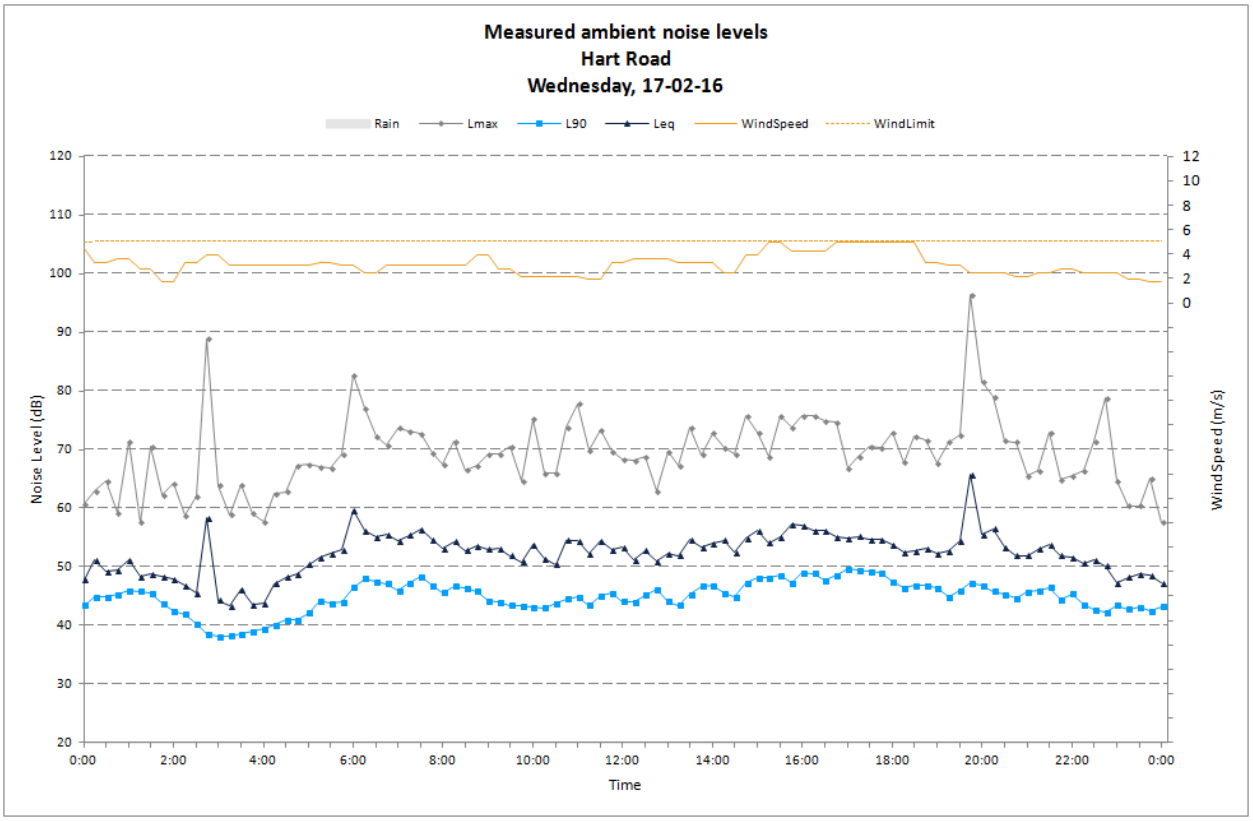

Measured ambient noise levels
Hart Road
Friday, 12-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Saturday, 13-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Sunday, 14-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Monday, 15-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Tuesday, 16-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Wednesday, 17-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
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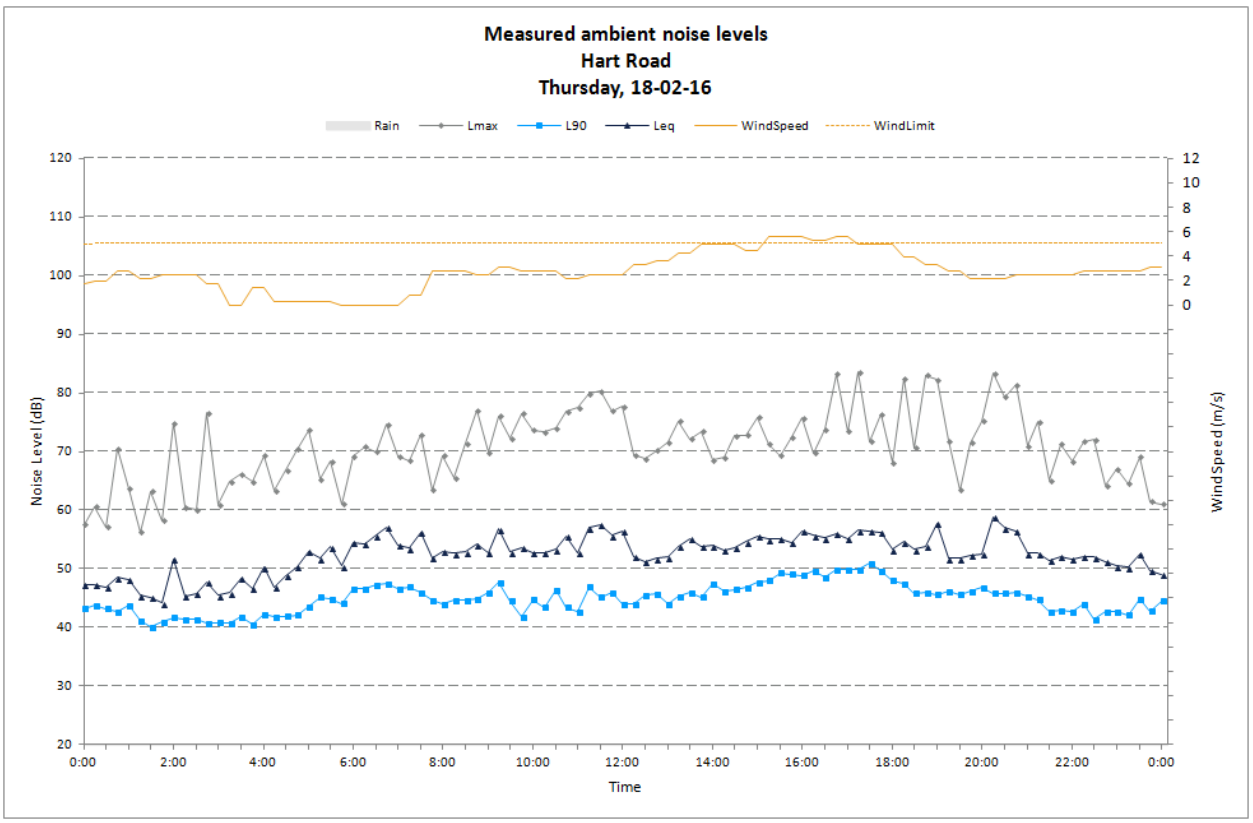
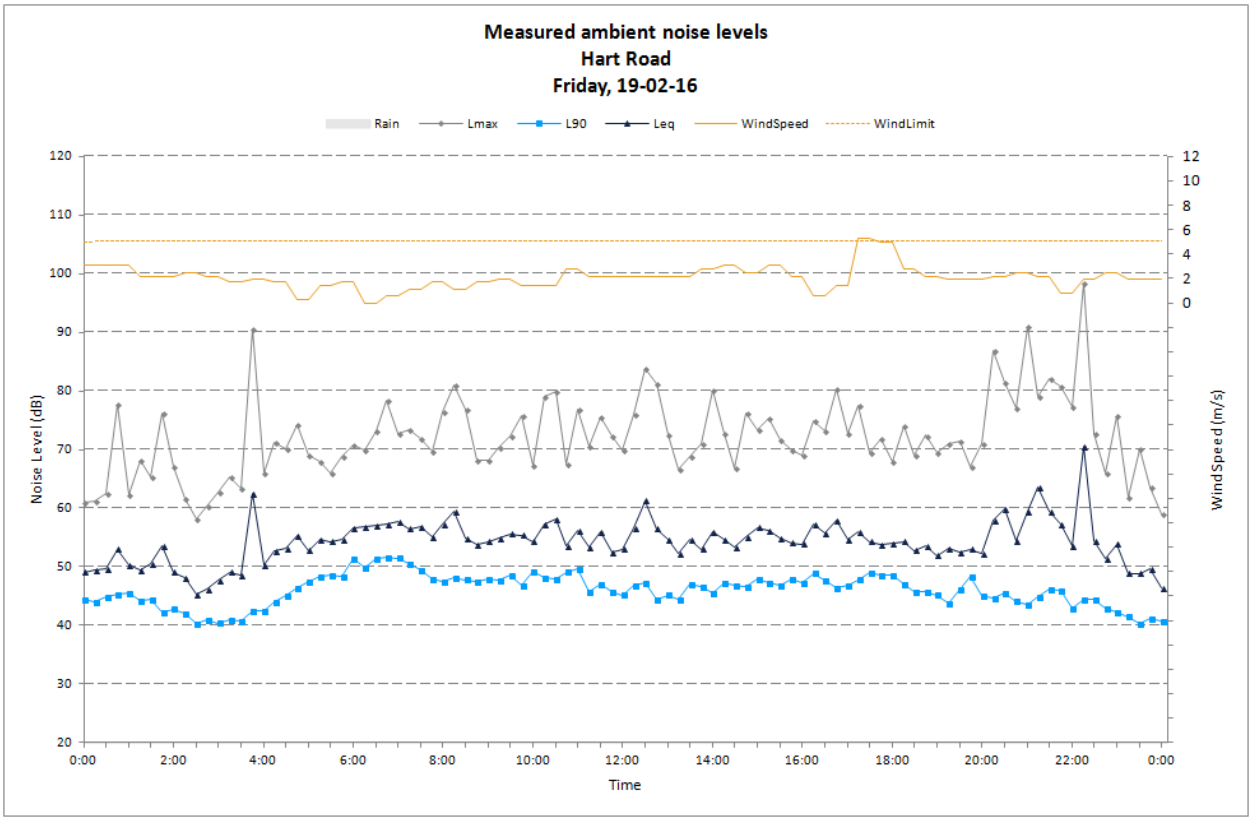
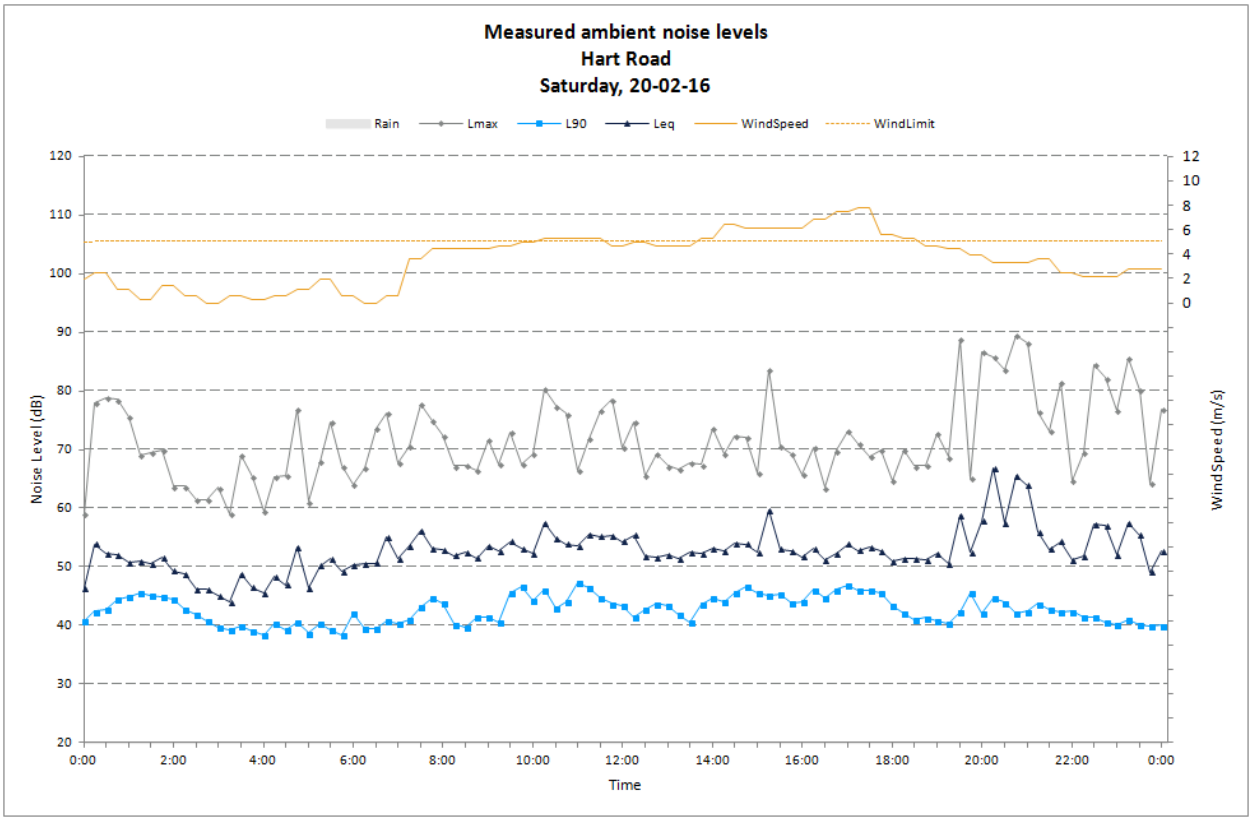
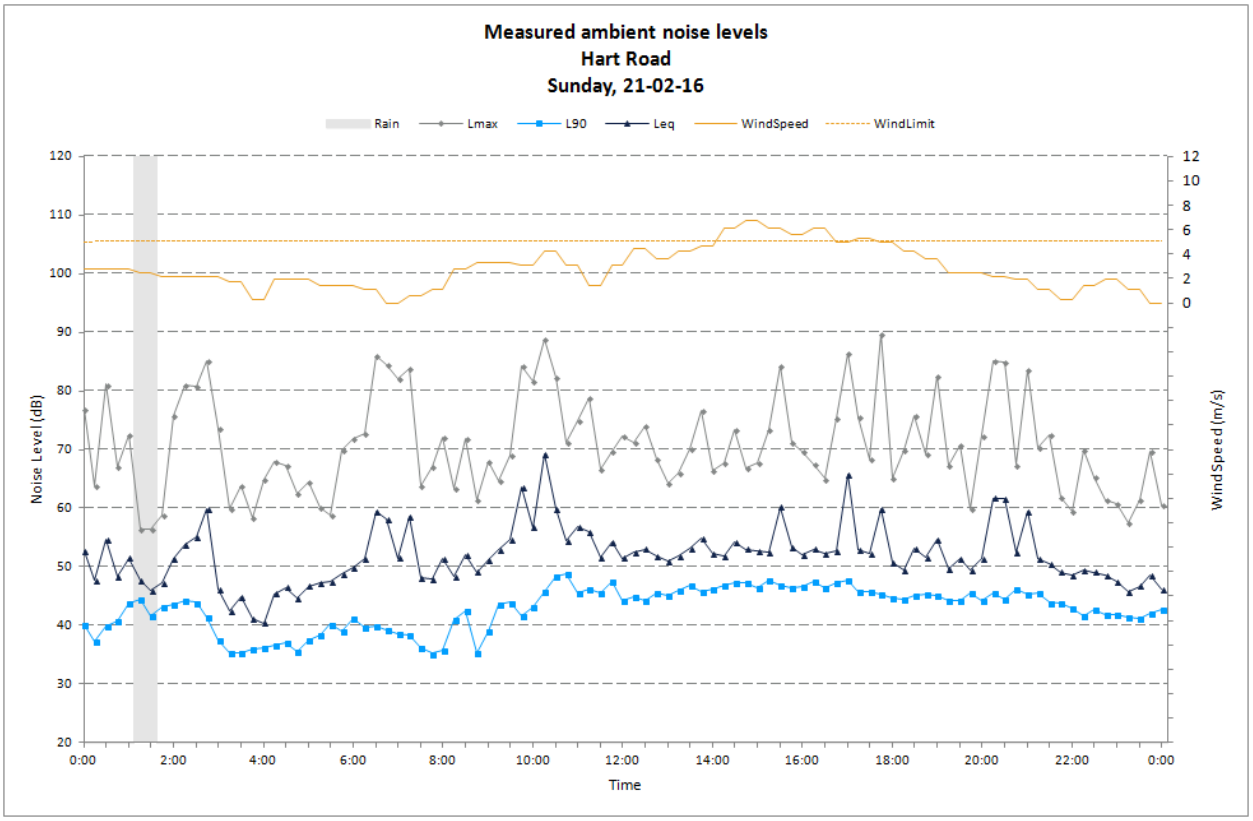
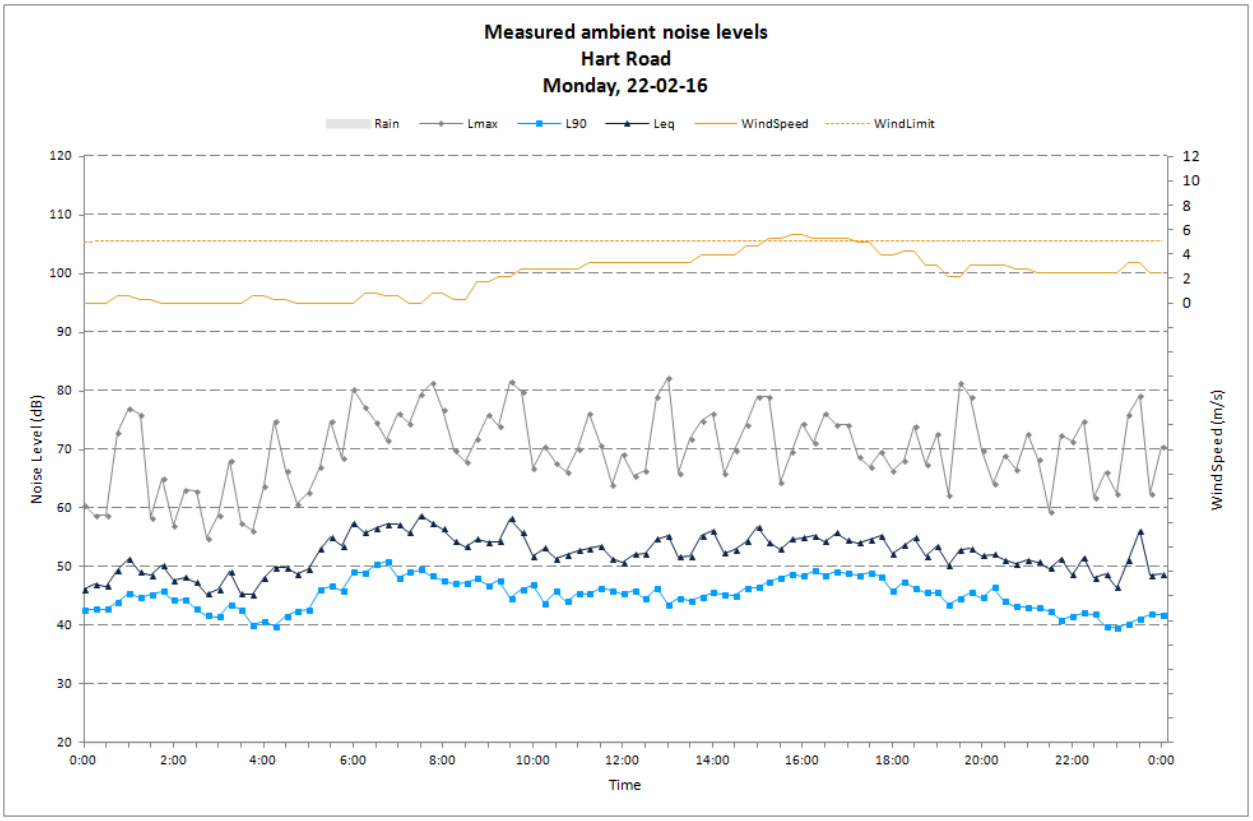
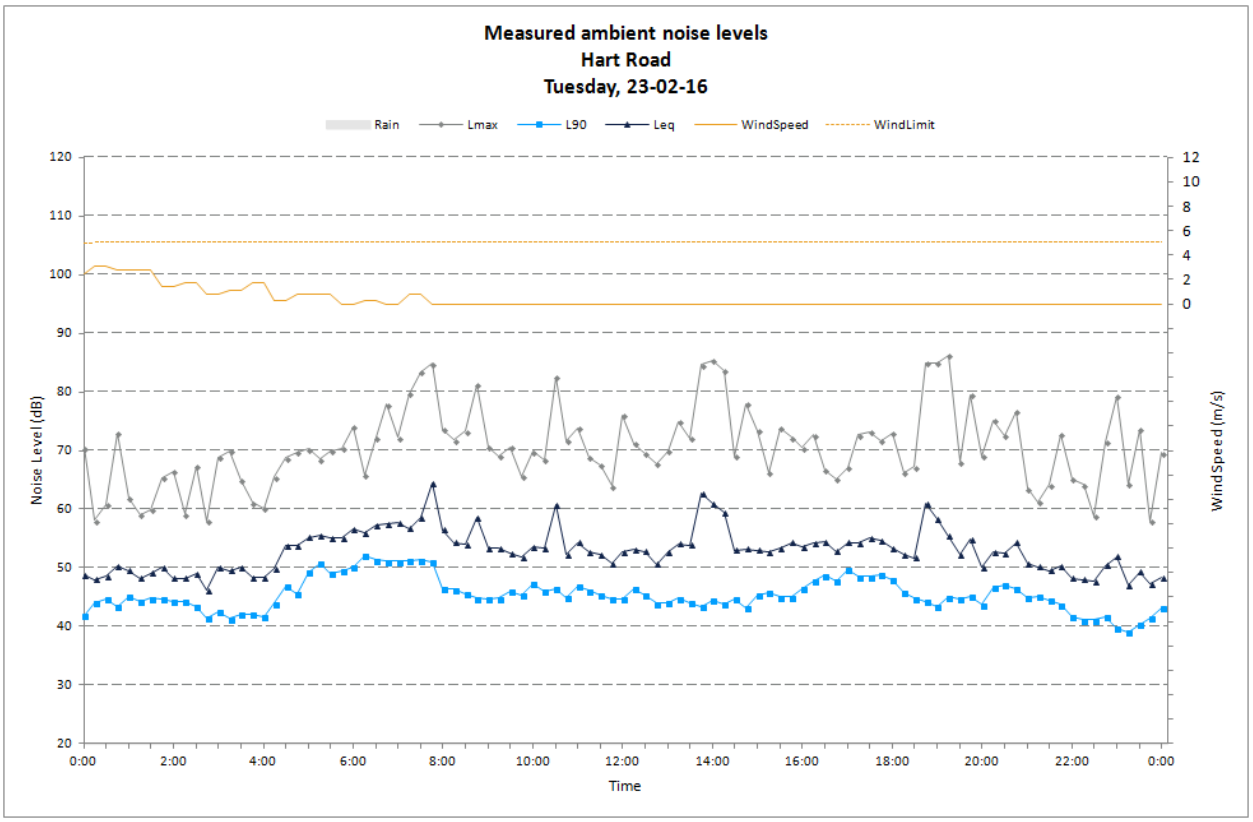

Measured ambient noise levels
Hart Road
Thursday, 18-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Friday, 19-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Saturday, 20-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Sunday, 21-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Monday, 22-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
0:00
2:00
4:00
6:00
8:00
10:00
12:00
14:00
16:00
18:00
20:00
22:00
0:00


Measured ambient noise levels
Hart Road
Tuesday, 23-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
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8:00
10:00
12:00
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16:00
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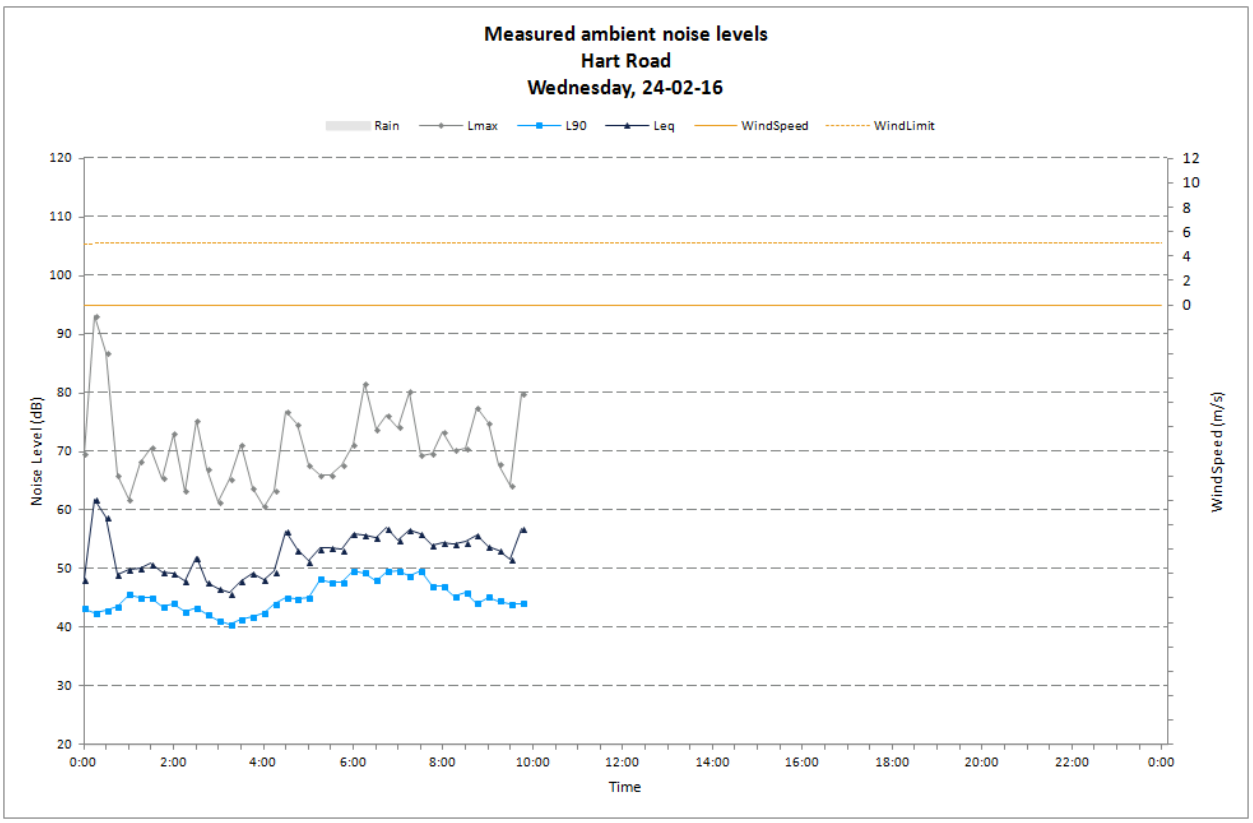
0:00


Measured ambient noise levels
Hart Road
Wednesday, 24-02-16
Rain
Lmax
L90
Leq
WindSpeed
WindLimit
Noise Level (dB)
WindSpeed (m/s)
Time
120
110
100
90
80
70
60
50
40
30
20
12
10
8
6
4
2
0
0:00
2:00
4:00
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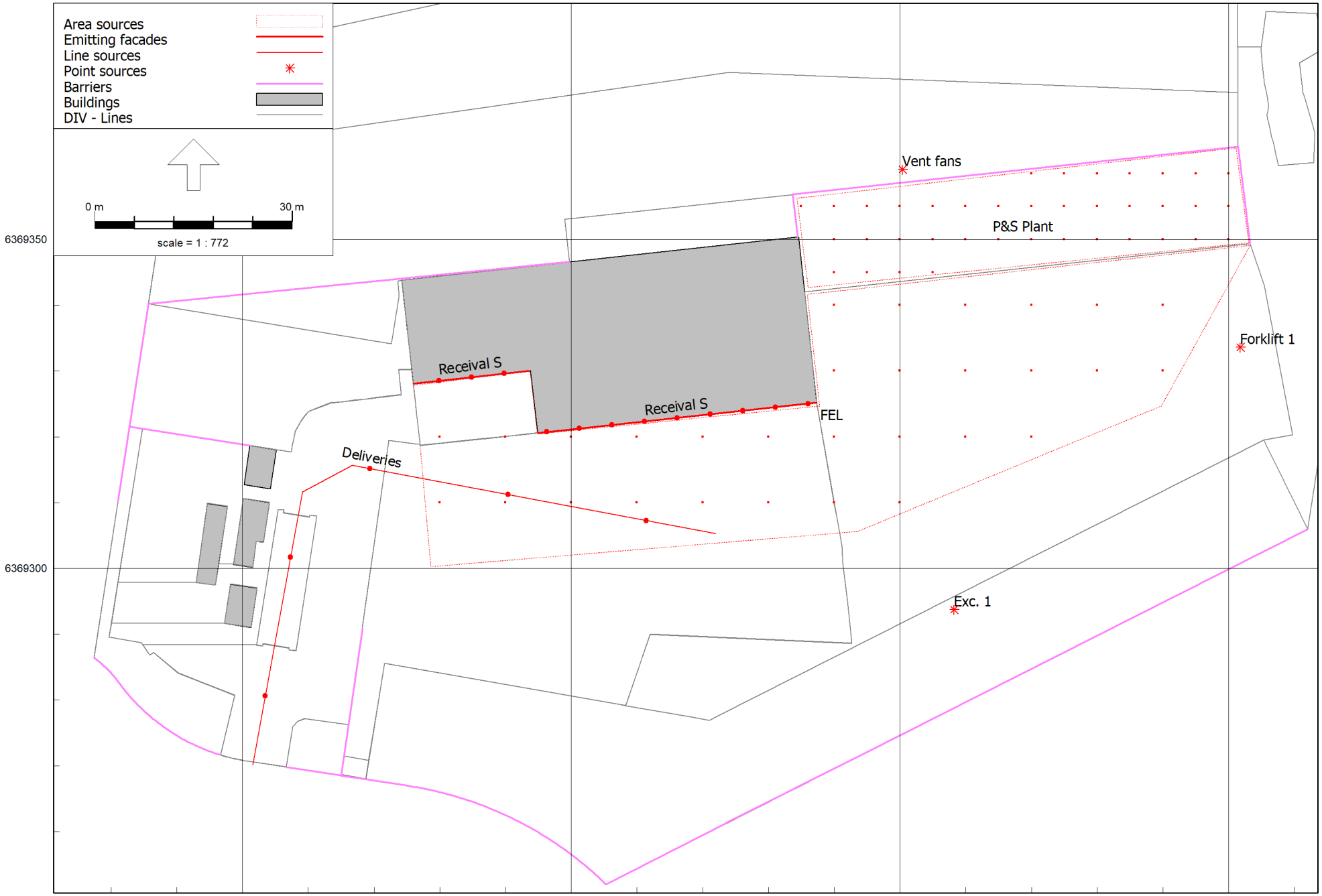
20:00
22:00
0:00

Appendix B

Modelled equipment locations



Copy of E/N - Operations (F+2) - 13.5m wall
2 Mar 2020, 12:36

Baselinenviro Pty Limited - Australia