

## **Construction noise and vibration Monthly Report – November 2018**

**London Borough of Camden**

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# Non-technical summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Camden (LBC) during the month of November 2018.

Modifications to track, overhead line equipment and other railway assets, supported by plant and material deliveries and collections to and from site were underway at Network Rail worksite B, C, D and E. Construction of electrical substation was underway at Network Rail worksite F. Demolition of bungalow was underway at Network Rail worksite G. Ancillary activities were undertaken at the DB Cargo and former Addison Lee worksite (ref. S001-WS01). Scaffolding and demolition were underway at 132 and 140 Hampstead Road and Petrol Station, worksite (ref. S001-WS02). Archaeological excavations and construction of screening structures were underway at St James's Gardens worksite (ref. S003-WS01). Demolition was underway at the former National Temperance Hospital, 110 Insull Wing worksite (ref. S003-WS02) and at the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05). Removal of fixtures and fittings of buildings and utilities disconnections were carried out at Walkden House, 67-75 & 77-79 Euston Rd worksite (ref. S003-WS03), at Drummond Street / Euston Street worksites (ref.: S003-WS07) and at One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street (ref.: S003-WS09). Removal of fixtures and fittings of buildings and removal of asbestos were carried out at the Thistle Hotel worksite (ref. S003-WS04). Taxi ranks construction were undertaken at Euston Square Gardens (west) worksite (ref. S003-WS08). Further non-intrusive activities were underway at other worksites around Euston Station (worksites ref. S003-WS06). Utility diversion works were also undertaken at the north end of Park Village East. Details of works undertaken at each worksite is presented in the report.

Noise monitoring was undertaken in the vicinity of Network Rail worksites B, C, D, E and F, the DB Cargo worksite (ref.: S001-WS01), 132 and 140 Hampstead Road and Petrol Station worksite (ref.: S001-WS02), St James's Gardens worksite (ref.: S003-WS01), Walkden House, 67-75 & 77-79 Euston Rd worksite (ref.: S003-WS03), the Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street worksite (ref. S003-WS05), former National Temperance Hospital, 110-122 Hampstead Road worksite (ref. S003-WS06), Drummond Street / Euston Street worksites (ref.: S003-WS07), Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08) and the Thistle Hotel (ref. S003-WS04). Further noise monitoring was also undertaken at Regents Park Estate, in the vicinity of Regents Park Lorry Holding Area and on Eversholt Street. Vibration monitoring was undertaken in the vicinity of the Walkden House, 67-75 & 77-79 Euston Rd worksite (ref. S003-WS03) and of the Ibis Hotel, Euston Square Gardens (west) worksite (ref. S003-WS08). Additional noise monitoring at Granby Terrace (N005) was commenced on the 23<sup>rd</sup> of November with the purpose of replacing noise monitor GT.

Exceedances of the SOAELs were measured at some monitoring positions surrounding worksites B, D, E, F and S001-WS01, which were caused by activities at on-network HS2 construction sites outside core working hours. No exceedance of S61 trigger levels was measured during the monitoring period. Seven complaints were received during the monitoring period. Description of the complaints, results of investigations and any actions taken are detailed in the report.

# Abbreviations and descriptions

The abbreviations, descriptions and project terminology used within this report can be found in the Project Dictionary (HS2-HS2-PM-GDE-000-000002).

Table 1: Table of abbreviations

Acronym	Meaning
$L_{Aeq,T}$	See equivalent continuous sound pressure level
Ambient sound	A description of the all-encompassing sound at a given location and time which will include sound from many sources near and far. Ambient sound can be quantified in terms of the equivalent continuous sound pressure level, $L_{pAeq,T}$
decibel(s), or dB	Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal (Pa)). Because of this wide range, a level scale called the decibel (dB) scale, based on a logarithmic ratio, is used in sound measurement. Audibility of sound covers a range of approximately 0-140dB.
decibel(s) A-weighted, or dB(A)	The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure sound is weighted to represent the performance of the ear. This is known as the 'A weighting' and is written as 'dB(A)'.
Equivalent continuous sound pressure level, or $L_{Aeq,T}$	An index used internationally for the assessment of environmental sound impacts. It is defined as the notional unchanging level that would, over a given period of time (T), deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating sound levels can be described in terms of an equivalent single figure value, typically expressed as a decibel level.
Exclusion of data	Measurement of noise levels can be affected by weather conditions such as prolonged periods of rain, winds speeds higher than 5m/s and snow/ice ground cover. Noise levels measured during these periods are considered not representative of normal noise conditions at the site and, for the purposes of this report, are excluded from the assessment of exceedances and calculation of typical noise levels and are also greyed out in charts. Identifiable incongruous noise and vibration events not attributable to HS2 construction noise are also excluded.
Façade	A facade noise level is the noise level 1m in front of a large reflecting surface. The effect of reflection, is to produce a slightly higher (typically +2.5 to +3 dB) sound level than it would be if the reflecting surface was not there.
Free-field	A free-field noise level is the noise level measured at a location where no reflective surfaces, other than the ground, lies within 3.5 metres of the microphone position.
Equivalent continuous sound pressure level, or $L_{pAeq,T}$	An index used internationally for the assessment of environmental sound impacts. It is defined as the notional unchanging level that would, over a given period of time (T), deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating sound levels can be described in terms of an equivalent single figure value, typically expressed as a decibel level.
Peak particle velocity, or PPV	Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position. The PPV is a simple indicator of perceptibility and risk of damage to structures due to vibration. It is usually measured in mm/s.
Sound pressure level	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Vibration dose value, or VDV	An index used to evaluate human exposure to vibration in buildings. While the PPV provides information regarding the magnitude of single vibration events, the VDV provides a measure of the total vibration experienced over a specified period of time (typically 16h daytime and 8h night-time). It takes into account the magnitude, the number and the duration of vibration events and can be used to quantify exposure to continuous, impulsive, occasional and intermittent vibration. The vibration dose value is measured in $m/s^{1.75}$ .

# 1 Introduction

1.1.1 The nominated undertaker is required to undertake noise (and vibration) monitoring as necessary to comply with the requirements of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements, including specifically Annex 1: Code of Construction Practice, in addition to any monitoring requirements arising from conditions imposed through consents under section 61 of the Control of Pollution Act, 1974 or through Undertakings & Assurances given to third parties. Such monitoring may be undertaken for the following purposes:

- monitoring the impact of construction works;
- to investigate complaints, incidents and exceedance of trigger levels; or
- monitoring the effectiveness of noise and vibration control measures.

Monitoring data and interpretive reports are to be provided to each relevant local authority on a monthly basis and shall include a summary of the construction activities occurring, the data recorded over the monitoring period, any complaints received, any periods in exceedance of agreed trigger levels, the results of any investigations and any actions taken or mitigation measures implemented. This report provides noise data, and interpretation thereof, for monitoring carried out by HS2 within the London Borough of Camden (LBC) for the period 1<sup>st</sup> to 30<sup>th</sup> November 2018.

1.1.2 Active construction sites in the local authority area during this period include:

- Network Rail on-networks HS2 preparatory works: worksite ref. B (see plan 1 in Appendix A)
  - Works activities include movement of materials, lighting works, renewing of sidings, construction of walkway and installation of cable management system.
- Network Rail on-networks HS2 preparatory works: worksite ref. C, D and E (see plan 2 in Appendix A)
  - Works activities include deliveries, movement of plant, equipment, materials and waste, ground investigation works, digging of trial holes, repositioning of rails, excavations, breaking out of concrete foundations, surveys of overhead line equipment (OLE) and cable inspections, construction of concrete foundation for OLE, installation of switch gear and cables and installation, connection and commission of point heating control cubicles.
- Network Rail on-networks HS2 preparatory works: worksite ref. F (see plan 2 in Appendix A)
  - Works activities include installation of architectural brick finishes, UKPN high voltage equipment and commencement of internal mechanical and electrical containment.

- Network Rail on-networks HS2 preparatory works: worksite ref. G (see plan 2 in Appendix A)
  - Works activities include deconstruction/demolition of bungalow structure and removal of debris.
- DB Cargo shed and adjacent land on Granby Terrace, worksite ref. S001-WS01 (see plan 2 in Appendix A)
  - Works activities include ancillary activities at the former Addison Lee site.
- 132 and 140 Hampstead Road and Petrol Station, worksite ref. S001-WS02 (see plan 3 in Appendix A)
  - Works activities include scaffolding and demolition.
- St James’s Gardens, worksite ref. S003-WS01 (see plan 3 in Appendix A)
  - Works activities include archaeological excavations and construction of screening structures.
- Former National Temperance Hospital, Insull Wing, worksite ref. S003-WS02 (see 3 in Appendix A)
  - Works activities include demolition.
- Walkden House, 67-75 & 77-79 Euston Rd, worksite ref. S003-WS03 (see plan 3 in Appendix A)
  - Works activities include removal of fixtures and fittings and utilities disconnections.
- Thistle Hotel, Cardington Street, worksite ref. S003-WS04 (see plan 3 in Appendix A)
  - Works activities include removal of fixtures and fittings and asbestos removal.
- Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street, worksite ref. S003-WS05 (see plan 3 in Appendix A)
  - Works activities include demolition.
- Former National Temperance Hospital, 110-122 Hampstead Road, worksite ref. S003-WS06 (see plan 3 in Appendix A)
  - Site activities include deliveries.
- 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street, worksite ref. S003-WS07 (see plan 3 in Appendix A)
  - Works activities include removal of fixtures and fittings and utilities disconnections.

- Euston Square Gardens (west), worksite ref. S003-WS08 (see plan 3 in Appendix A)
  - Works activities include taxi rank construction.
- One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street, worksite ref. S003-WS09 (see plan 3 in Appendix A)
  - Works activities include removal of fixtures and fittings.
- Further works were also carried out at the north end of Park Village East to divert utilities (including gas, fibre optics and sewers in the area) in preparation for the main works, planned to start in March 2019. These included breaking out of the road surface and excavations, followed by utility installations and surface reinstatement. The site was demobilised on the 23<sup>rd</sup> of November.

The applicable standards, guidance, and monitoring methodology is outlined in the construction noise and vibration monitoring methodology report which can be found at the following location <https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2>. Noise and vibration monitoring reports for previous months can also be found at this location. Noise and vibration reports prior to 2018 can be found at the following location [www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route](http://www.gov.uk/government/publications/monitoring-noise-and-vibration-on-the-hs2-phase-one-route).

## 1.2 Measurement locations

- 1.2.1 The following table summarises the position of noise and vibration monitoring installations within the LBC area in November 2018.
- 1.2.2 A new noise monitor (N005) was installed at Granby Terrace on the 23<sup>rd</sup> of November. This monitor was installed as a replacement for monitor GT, which has lately been affected by noise from a power generator recently installed in close proximity to this noise monitor.
- 1.2.3 Maps showing the position of noise monitoring installations are presented in Appendix B.

Table 2: Monitoring locations.

Worksite Reference	Measurement Reference	Address
B	CC	Whittlebury Mews West, Camden Town, London, NW1 8JB
	JC	Juniper Crescent, London, NW1 8HA
C	EC	The Edinboro Castle, 57 Mornington Terrace, London, NW1 7RU
	N022	External to #34 Mornington Terrace
	N024	External to Park Village Studios, Park Village East
D	MT	13 Mornington Terrace, Kings Cross, London, NW1 7RR

Worksite Reference	Measurement Reference	Address
	N004	Mornington Terrace lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row)
E	GT	5A Granby Terrace, Kings Cross, London, NW1 3SA
	N005	5A Granby Terrace, Kings Cross, London, NW1 3SA
F	BS	Roof of Stockbeck House, Barnby Street, Kings Cross, London, NW1 2RS
	N023	Lighting column #21 on Hampstead Road
G	HH	Euston Station Parcel Deck, Barnby Street, Euston, London, NW1 2RS
S001-WS01	N001	Park Village East lamppost #1 (external to Cubitt Court, 100 Park Village East)
	N002	Park Village East lamppost #2 (external to Richmond Court)
	N003	Park Village East lamppost #9 (external to Silsoe House)
	N021	Stanhope Street, Lamppost #2
S001-WS02	N018	Outside replacement housing, Hampstead Road
	N019	Outside Cartmel, Hampstead Road
S003-WS03	N006	Royal College of General Practitioners Roof level
	N008	Stephenson's Way lamppost (external to RCGP)
	N010	Wesley Hotel
	N011	Euston Street lamppost #4 (external to 82 Euston Street)
	V01	Royal College of General Practitioners basement boiler room by Stephenson Way
	V02	Royal College of General Practitioners basement vaults under Melton St
S003-WS05	N014	Starcross Street lamppost (external to Exmouth Arms)
S003-WS06	N015	Maria Fidelis School
	N016	Margarete Centre roof
	N017	Hampstead Road, Lamppost #48
S003-WS07	N012	Drummond Street lamppost #14 (opposite to 92-94 Drummond Street)
S003-WS08	N007	Royal College of General Practitioners, Melton Street
Not near worksite	N020	Mackworth Street lamppost #1
Not near worksite	N025	External to #3 Prince Albert Road
Not near worksite	N026	Thames Water Compound

## 2 Summary of results

### 2.1 Exceedances of SOAEL

- 2.1.1 The significant observed adverse effect levels (SOAEL) is defined in the Planning Practice Guidance – Noise as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."
- 2.1.2 Where construction noise levels exceed the SOAEL, relevant periods will be identified and summary statistics provided in order to evaluate ongoing qualification for noise insulation and temporary rehousing.
- 2.1.3 Table 3 presents a summary of recorded exceedances of the SOAEL due to HS2 related construction noise at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 3: Summary of exceedances of LOAEL and SOAEL.

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL <sup>(1)</sup>
B	CC	Whittlebury Mews West, Camden Town, London, NW1 8JB	Sunday	0700-2200	2
			Night	2200-0700	4
	JC <sup>(1)</sup>	Juniper Crescent	Saturday	1400-2200	2
			Sunday	0700-2200	1
			Night	2200-0700	11
C	EC	The Edinboro Castle, 57 Mornington Terrace, London, NW1 7RU	All days	All periods	No exceedance
	N022	External to #34 Mornington Terrace	Night	All periods	No exceedance
	N024	External to Park Village Studios, Park Village East	All days	All periods	No exceedance
D	MT	Mornington Terrace	Night	2200-0700	1
	N004	Mornington Terrace lamppost #7	Sunday	0700-2200	1
Night			2200-0700	3	
E	GT	Granby Terrace	Sunday	0700-2200	1
			Night	2200-0700	1

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL <sup>(1)</sup>
	N005	5A Granby Terrace, Kings Cross, London, NW1 3SA	All days	All periods	No exceedance
F	BS	Barnby Street	All days	All periods	No exceedance
	N023	Amphill Estate lighting column #21, Hampstead Road	Sunday Night	0700-2200 2200-0700	1 1
G	HH	Euston Station Parcel Deck, Barnby Street, Euston, London, NW1 2RS	All days	All periods	No exceedance
S001-WS01	GT <sup>(2)</sup>	Granby Terrace	Night	2200-0700	20
	N001	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
	N002	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
	N003	DB Cargo shed and adjacent land on Granby Terrace	All days	All periods	No exceedance
	N021	Stanhope Street, Lamppost #2	All days	All periods	No exceedance
S001-WS02	N018	132 and 140 Hampstead Road and Petrol Station	All days	All periods	No exceedance
	N019	132 and 140 Hampstead Road and Petrol Station	All days	All periods	No exceedance
S003-WS03	N006	Royal College of General Practitioners Roof level	All days	All periods	No exceedance
	N008	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
	N010	Wesley Hotel	All days	All periods	No exceedance
	N011	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
S003-WS05	N014	Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street	All days	All periods	No exceedance
S003-WS06	N015	Maria Fidelis School	All days	All periods	No exceedance
	N016	Margarete Centre roof	All days	All periods	No exceedance
	N017	Hampstead Road, Lamppost #48	All days	All periods	No exceedance
S003-WS07	N012	93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street	All days	All periods	No exceedance
S003-WS08	N007	Euston Square Gardens (west)	All days	All periods	No exceedance
Not near worksite	N020	Mackworth Street lamppost #1	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL <sup>(1)</sup>
Not near worksite	N025	External to #3 Prince Albert Road	All days	All periods	No exceedance
Not near worksite	N026	Thames Water Compound	All days	All periods	No exceedance

<sup>(1)</sup> This monitor is located within the worksite and the measured noise levels and exceedances of the SOAEL are not representative of noise at the surrounding residential properties. This monitor is being relocated to a more representative location on site in closer proximity to nearby residential properties.

<sup>(2)</sup> Due to the recent installation of a power generator in close proximity to the noise monitor, the measured noise levels and exceedances of the SOAEL due to activities at worksite S001-WS01 are not representative of noise at surrounding areas. Noise monitor N005 has been installed on site at a location more representative of nearby residential properties.

2.1.4 Over the reporting period the SOAEL was exceeded at a number of measurement locations in the vicinity of worksites B, D, E, F and S001-WS01. These were caused by activities at Network Rail on-network HS2 construction sites mainly during night-time periods and during weekend days. Outside of these times any exceedances of the SOAEL were caused by the underlying ambient noise levels or other construction activities not related to HS2, rather than being attributable to HS2 construction noise. Exceedances of the SOAEL measured at monitor GT during night-time periods were in large part due to noise from a power generator at worksite S001-WS01 in close proximity to the monitor, and are not representative of noise at surrounding areas. However, some exceedances (well above the noise from generator) were still measured at this location due to works at worksite E.

2.1.5 For the purpose of assessing eligibility for noise insulation or temporary rehousing, multiple exceedances of the SOAEL in a 24-hour period would be counted as a single exceedance during that day. Over the reporting period, the overall number of SOAEL exceedances at each measurement location is shown in Table 4 and may be lower than the total sum of individual exceedances reported in Table 3 for each location.

Table 4: Summary of total exceedances of SOAEL.

Worksite Reference	Measurement Reference	Site Address	Total of SOAEL exceedances in the month
B	CC	Whittlebury Mews West, Camden Town, London, NW1 8JB	5
	JC <sup>(1)</sup>	Juniper Crescent	11
D	MT	Mornington Terrace	1
	N004	DB Cargo shed and adjacent land on Granby Terrace	3
E	GT	Granby Terrace	2

Worksite Reference	Measurement Reference	Site Address	Total of SOAEL exceedances in the month
F	N023	Amphill Estate lighting column #21, Hampstead Road	2
S001-WS01	GT <sup>(2)</sup>	Granby Terrace	18

<sup>(1)</sup> This monitor is located within the worksite and the measured noise levels and exceedances of the SOAEL are not representative of noise at the surrounding residential properties.

<sup>(2)</sup> Due to the recent installation of a power generator in close proximity to the noise monitor, the measured noise levels and exceedances of the SOAEL due to activities at worksite S001-WS01 are not representative of noise at surrounding areas.

2.1.6 Monitoring of vibration peak particle velocity (PPV) was undertaken with the purpose of ensuring that construction generated vibration are not of such a magnitude to damage adjacent buildings, in accordance with Annex 1: Code of Construction Practice of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements. There are no LOAEL and SOAEL criteria based on PPV applicable to HS2 construction vibration.

## 2.2 Summary of measured noise and vibration levels

2.2.1 Table 5 presents a summary of the measured noise levels at each monitoring location over the reporting period. The  $L_{Aeq,T}$  is presented for each of the relevant time periods averaged over the calendar month, along with the highest single period  $L_{Aeq,T}$  that was found to occur within the month.

2.2.2 Noise monitoring in the vicinity of worksites B, D, E, F, S001-WS02, S003-WS01, S003-WS02, S003-WS05 and S003-WS08 is considered representative of HS2 Area South works during periods of construction works. Other worksites were not considered to be giving rise to substantial levels of HS2 related construction noise, with the measured noise levels largely dominated by the underlying ambient noise, acknowledging that intermittent HS2 works may on occasion be taking place within the area.

Table 5: Summary of measured dB L<sub>Aeq</sub> data over the monitoring period.

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade measurement	Weekly Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )*					Saturday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )*					Sunday / Public Holiday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )*	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
B	CC	Whittlebury Mews West, Camden Tow	Free-field	63.0 (66.3)	60.0 (64.2)	62.8 (65.7)	61.8 (68.3)	56.3 (62.1)	61.8 (63.7)	62.0 (63.5)	57.8 (58.5)	60.9 (63.2)	60.4 (74.2)	62.0 (66.1)	56.6 (61.5)
	JC	Juniper Crescent, London, NW1 8HA	Free-field	67.4 (70.7)	68.6 (70.0)	68.7 (70.7)	67.3 (69.7)	62.8 (68.9)	67.1 (68.9)	68.3 (70.0)	68.4 (70.8)	67.6 (69.7)	65.9 (75.2)	67.1 (70.3)	62.9 (66.9)
C	EC	The Edinboro Castle, 57 Mornington Terrace	Free field	66.4 (67.6)	66.0 (68.3)	66.9 (67.6)	65.6 (66.8)	61.9 (68.0)	65.4 (65.7)	65.2 (65.4)	65.1 (65.5)	65.6 (67.7)	60.2 (67.5)	64.8 (66.7)	61.9 (65.8)
	N022	External to #34 Mornington Terrace	Free-field	59.5 (61.7)	60.5 (62.1)	60.7 (64.3)	59.0 (61.7)	55.3 (79.3)	58.2 (59.8)	59.2 (60.3)	59.1 (61.0)	58.9 (62.0)	55.0 (59.8)	57.6 (59.6)	53.9 (57.8)
	N024	External to Park Village Studios, Park Village East	Free-field	58.3 (72.6)	62.0 (71.8)	59.3 (65.5)	58.7 (69.3)	54.0 (70.2)	55.3 (57.8)	56.4 (58.7)	55.6 (57.6)	57.2 (61.2)	52.6 (57.8)	54.9 (60.2)	52.1 (59.0)
D	MT	13 Mornington Terrace, Kings Cross, London, NW1 7RR	Free-field	52.5 (57.2)	55.5 (59.6)	58.3 (66.5)	56.3 (60.9)	52.4 (84.1)	41.3 (55.3)	42.4 (56.8)	42.7 (57.5)	37.7 (58.7)	40.5 (57.7)	41.7 (57.8)	42.1 (75.7)
	N004	Mornington Terrace lamppost #7	Free-field	64.1 (71.5)	65.1 (66.6)	64.9 (72.2)	63.2 (65.5)	59.6 (77.2)	62.5 (63.3)	63.4 (63.8)	63.1 (63.7)	65.2 (70.3)	61.9 (68.0)	64.6 (71.3)	60.8 (66.3)
E	GT <sup>(2)</sup>	5A Granby Terrace, Kings Cross, London, NW1 3SA	Free-field	64.0 (68.6)	65.4 (69.5)	68.7 (70.7)	67.1 (70.7)	63.8 (70.5)	49.8 (67.2)	50.7 (68.0)	50.8 (68.8)	45.0 (69.9)	47.0 (64.9)	50.1 (69.3)	47.6 (66.6)
	N005	5A Granby Terrace, Kings Cross, London, NW1 3SA	Free-field	66.4 (66.5)	67.1 (67.7)	67.4 (68.7)	66.3 (68.4)	64.2 (66.0)	65.3 (65.3)	66.8 (66.8)	66.4 (66.4)	65.9 (66.7)	64.0 (65.4)	65.7 (67.2)	63.4 (65.5)

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade measurement	Weekly Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
F	BS	Roof of Stockbeck House, Barnby Street	Free-field	60.1 (61.2)	63.1 (64.6)	61.6 (65.1)	60.4 (66.1)	56.9 (78.9)	59.7 (60.2)	61.6 (62.9)	61.6 (62.7)	60.6 (63.7)	56.2 (61.7)	59.8 (62.2)	56.3 (60.3)
	N023	Ampthill Estate, Hampstead Road	Free-field	71.7 (73.6)	71.0 (72.3)	71.0 (73.3)	70.1 (72.8)	68.1 (73.6)	68.5 (70.2)	69.6 (71.1)	70.0 (70.9)	70.1 (72.8)	68.6 (72.2)	69.9 (73.8)	68.0 (72.4)
G	HH	Euston Station Parcel Deck, Barnby Street	Free-field	61.0 (69.0)	63.1 (72.3)	57.8 (69.7)	59.0 (71.0)	56.4 (72.1)	63.5 (67.1)	63.2 (63.8)	62.8 (65.5)	66.0 (71.8)	63.0 (66.5)	64.9 (72.6)	61.1 (66.6)
S001-WS01	N001	External to Cubitt Court, 100 Park Village East	Façade	58.3 (67.8)	58.7 (63.8)	59.8 (69.7)	58.9 (68.7)	53.8 (67.3)	58.6 (63.9)	60.1 (66.4)	58.5 (60.5)	59.9 (66.1)	54.4 (60.8)	57.6 (64.0)	53.9 (59.0)
	N002	Richmond Court, Park Village East	Free-field	60.4 (68.1)	61.9 (63.2)	62.4 (70.4)	60.1 (65.1)	56.0 (73.2)	57.0 (59.7)	60.0 (61.3)	60.4 (62.1)	61.4 (64.5)	56.1 (60.3)	60.1 (67.1)	55.2 (59.0)
	N003	Silsoe House, Park Village East	Free-field	60.0 (66.1)	62.1 (64.2)	62.0 (67.8)	60.2 (64.9)	55.9 (75.3)	57.0 (59.6)	59.8 (61.6)	59.9 (61.9)	61.1 (63.0)	56.6 (64.3)	59.4 (62.4)	55.1 (59.6)
	N021	Stanhope Street, Lampost #2	Free-field	55.3 (61.6)	60.4 (66.1)	57.5 (70.5)	56.6 (77.8)	52.5 (71.6)	53.3 (56.2)	56.8 (58.5)	59.7 (61.8)	56.8 (61.3)	52.0 (58.3)	55.2 (59.7)	50.6 (55.5)
S001-WS02	N018	Outside replacement housing, Hampstead Road	Free-field	72.8 (74.3)	74.0 (75.4)	74.3 (77.8)	73.4 (77.8)	71.5 (75.4)	70.3 (71.7)	72.4 (74.7)	72.4 (74.3)	72.3 (75.0)	71.4 (74.8)	72.5 (76.6)	71.1 (73.2)
	N019	Outside Cartmel, Hampstead Road	Free-field	71.4 (72.2)	72.5 (73.7)	68.9 (75.5)	68.3 (77.2)	70.3 (78.9)	69.3 (70.7)	70.9 (72.7)	70.8 (72.5)	72.0 (77.0)	70.3 (73.1)	71.1 (74.0)	70.2 (73.7)

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade measurement	Weekly Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
S003-WS03	N006	RCGP Roof level	Free-field	53.4 (56.0)	61.7 (72.0)	51.1 (57.7)	50.7 (60.0)	49.7 (54.4)	51.2 (52.2)	55.4 (57.5)	53.1 (55.0)	51.5 (54.4)	50.3 (56.2)	51.5 (57.1)	50.4 (54.0)
	N008	RCGP Stephenson Way	Façade	64.8 (72.5)	65.1 (70.2)	54.9 (66.0)	53.4 (66.1)	55.3 (70.5)	61.1 (64.3)	59.9 (61.2)	60.7 (69.5)	60.5 (69.0)	55.3 (65.9)	57.1 (66.4)	62.5 (74.3)
	N010	Wesley Hotel	Façade	64.3 (67.2)	65.3 (68.7)	62.3 (66.8)	61.9 (64.0)	59.0 (66.0)	62.1 (64.5)	61.7 (63.7)	61.2 (63.0)	63.1 (64.2)	58.5 (63.7)	62.2 (66.0)	58.9 (63.2)
	N011	Outside #82 Euston Street	Free-field	61.2 (66.2)	63.2 (67.6)	61.1 (63.9)	58.9 (64.4)	55.7 (62.5)	58.3 (61.7)	61.4 (63.1)	60.6 (67.7)	60.3 (65.8)	53.9 (58.4)	59.7 (72.5)	55.1 (60.0)
S003-WS05	N014	Starcross Street	Free-field	55.3 (59.9)	63.7 (71.6)	59.3 (67.1)	58.5 (68.9)	52.1 (62.3)	58.0 (61.0)	60.8 (62.8)	57.1 (59.5)	56.1 (65.2)	52.5 (59.1)	54.1 (65.4)	49.8 (57.3)
S003-WS06	N015	Maria Fidelis School	Free-field	57.2 (59.2)	69.6 (71.6)	56.4 (60.5)	56.2 (62.6)	54.4 (65.2)	59.5 (63.0)	69.0 (69.8)	66.4 (67.7)	60.9 (69.5)	54.5 (60.1)	58.7 (68.9)	53.9 (56.1)
	N016	Margarete Centre roof	Free-field	54.7 (56.5)	67.4 (75.3)	55.2 (58.6)	54.9 (63.7)	52.8 (57.4)	56.1 (59.5)	69.6 (75.1)	61.4 (63.4)	56.4 (61.6)	52.8 (57.5)	55.5 (61.5)	52.2 (54.3)
	N017	Hampstead Road, Lampost #48	Free-field	71.9 (74.0)	73.5 (75.0)	68.6 (75.8)	68.3 (77.5)	67.2 (74.7)	69.7 (71.2)	72.7 (74.8)	71.5 (73.8)	71.3 (78.0)	69.9 (74.4)	70.9 (75.8)	70.1 (72.5)
S003-WS07	N012	Opposite #92-94 Drummond Street	Free-field	58.2 (61.1)	65.7 (75.0)	60.2 (69.6)	58.8 (65.3)	55.1 (61.1)	56.3 (58.8)	63.9 (66.9)	60.3 (70.7)	58.8 (66.0)	54.3 (59.1)	57.0 (61.4)	53.5 (57.5)
S003-WS08	N007	RCGP, Melton Street	Free-field	68.3 (71.0)	71.5 (73.3)	68.8 (76.0)	68.9 (75.6)	66.3 (76.3)	68.2 (70.5)	72.2 (73.3)	69.4 (71.5)	67.7 (70.2)	65.4 (67.9)	68.7 (73.1)	64.2 (67.8)
Not near worksite	N020	Mackworth Street	Free-field	53.8 (55.8)	60.0 (65.7)	55.0 (72.2)	53.4 (73.4)	51.1 (70.5)	52.2 (55.2)	54.7 (56.1)	54.2 (56.2)	53.2 (56.4)	51.6 (59.3)	52.5 (58.7)	50.3 (57.2)

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade measurement	Weekly Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *					Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$ ) *	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
Not near worksite	N025	External to #3 Prince Albert Road	Free-field	68.8 (71.9)	69.0 (70.0)	68.4 (73.0)	67.6 (71.4)	66.2 (70.4)	67.3 (67.6)	68.1 (69.2)	67.4 (68.1)	68.1 (73.2)	66.7 (71.0)	67.1 (71.1)	65.2 (69.1)
Not near worksite	N026	Thames Water Compound	Free-field	58.8 (60.4)	60.1 (65.7)	58.1 (59.8)	57.6 (60.8)	54.7 (62.5)	56.5 (57.3)	57.9 (58.2)	57.9 (58.5)	58.4 (62.4)	54.7 (58.4)	57.3 (63.2)	53.6 (57.0)

- (1) This monitor is located within the worksite and the measured noise levels and exceedances of the SOAEL are not representative of noise at the surrounding residential properties.
- (2) Due to the recent installation of a power generator in close proximity to the noise monitor, the measured noise levels are not representative of noise at surrounding residential properties.

2.2.3 Table 6 presents a summary of the measured vibration levels at monitoring locations V01 and V02 over the reporting period. The highest PPV measured during the monitoring along any axis is presented in the table. High values of PPV were measured at monitor V02 in the afternoon of Wednesday 21<sup>st</sup> of November. These elevated vibration levels were due to local interference in close proximity to the vibration monitor. This data was not considered representative of HS2 construction vibration levels and has been excluded from the table below.

Table 6: Summary of measured PPV data over the monitoring period.

Worksite Reference	Measurement Reference	Site Address	Highest PPV measured in any axis, mm/s
S003-WS03	V01	Royal College of General Practitioners basement boiler room by Stephenson Way	1.60 (X axis)
	V02	Royal College of General Practitioners basement vaults under Melton St	0.31 (Z axis)

2.2.4 Appendix C presents graphs of noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consist of the hourly  $L_{Aeq}$  values and, where relevant, the  $L_{Aeq,T}$  values (where the time period T has been taken to be the averaging period as specified in Table 1 of HS2 Information Paper E23). Vibration data presented consist of hourly PPV values. The full data set for the monitoring equipment can be found at the following location: <https://data.gov.uk/dataset/24542ae7-dd44-444f-b259-871c4cc43b5e/environmental-monitoring-data>.

## 2.3 Exceedances of trigger level

2.3.1 Table 7 provides a summary of exceedances of the S61 trigger noise levels determined to be due to HS2 related construction measured during the reporting period, along with the findings of any investigation.

Table 7: Summary of exceedances of trigger levels.

Complaint reference number (if applicable)	Worksite reference	Date and time period	Identified Source	Results of investigation (including noise monitoring results)	Actions taken
-	-	-	-	-	-

2.3.2 There were no exceedances of trigger levels as defined in section 61 consents during the reporting period at any monitoring position.

## 2.4 Complaints

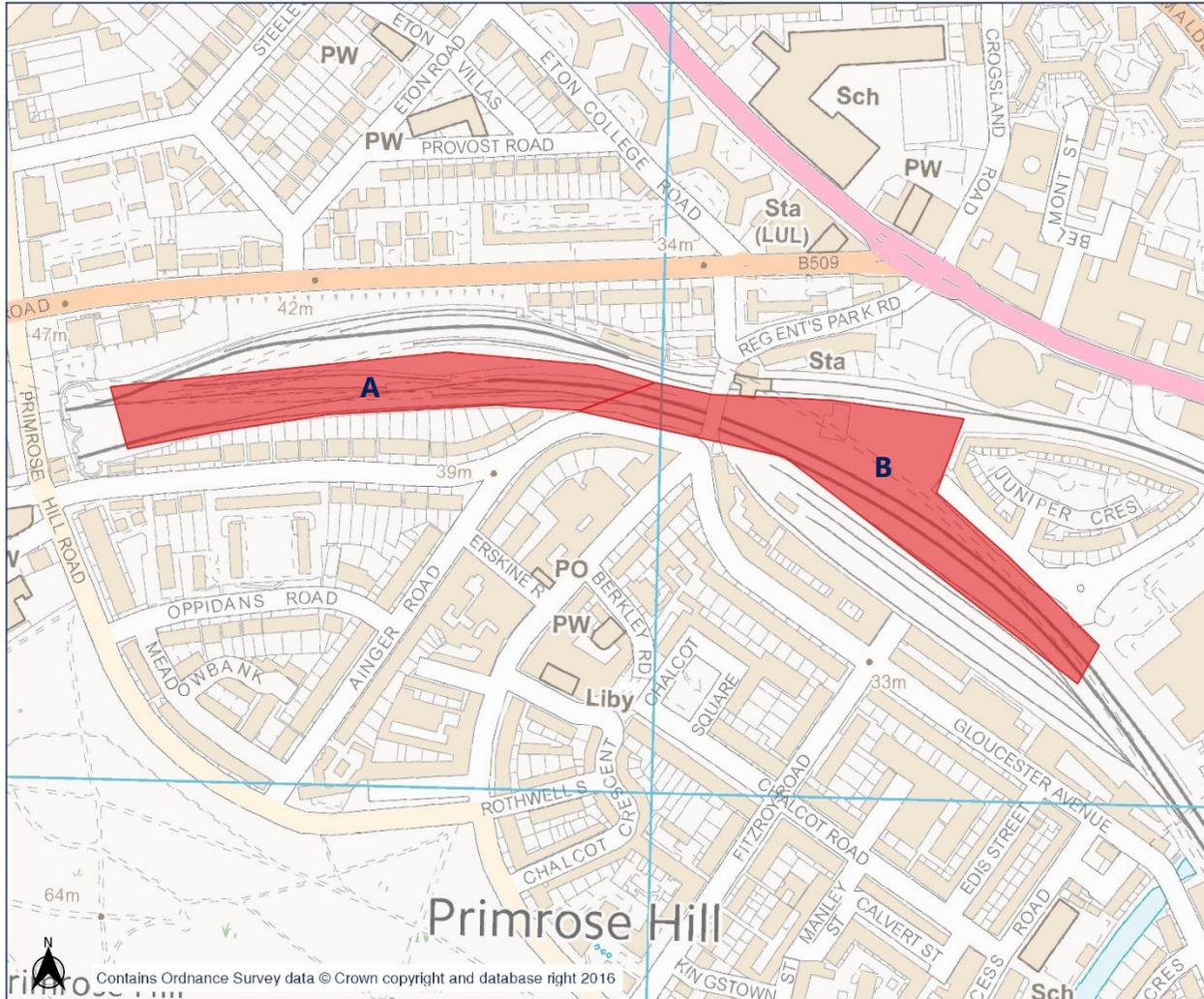
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

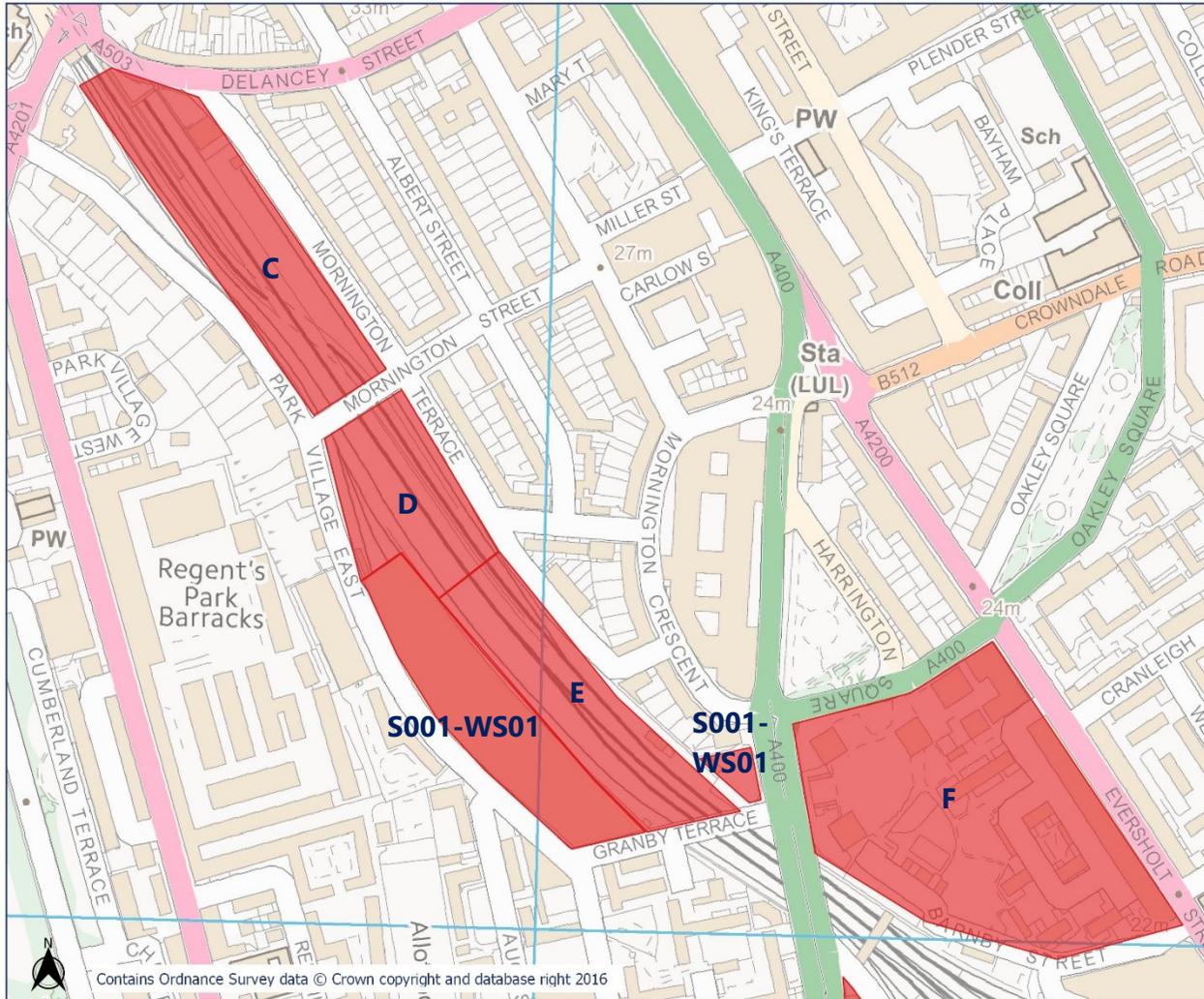
Table 8: Summary of complaints.

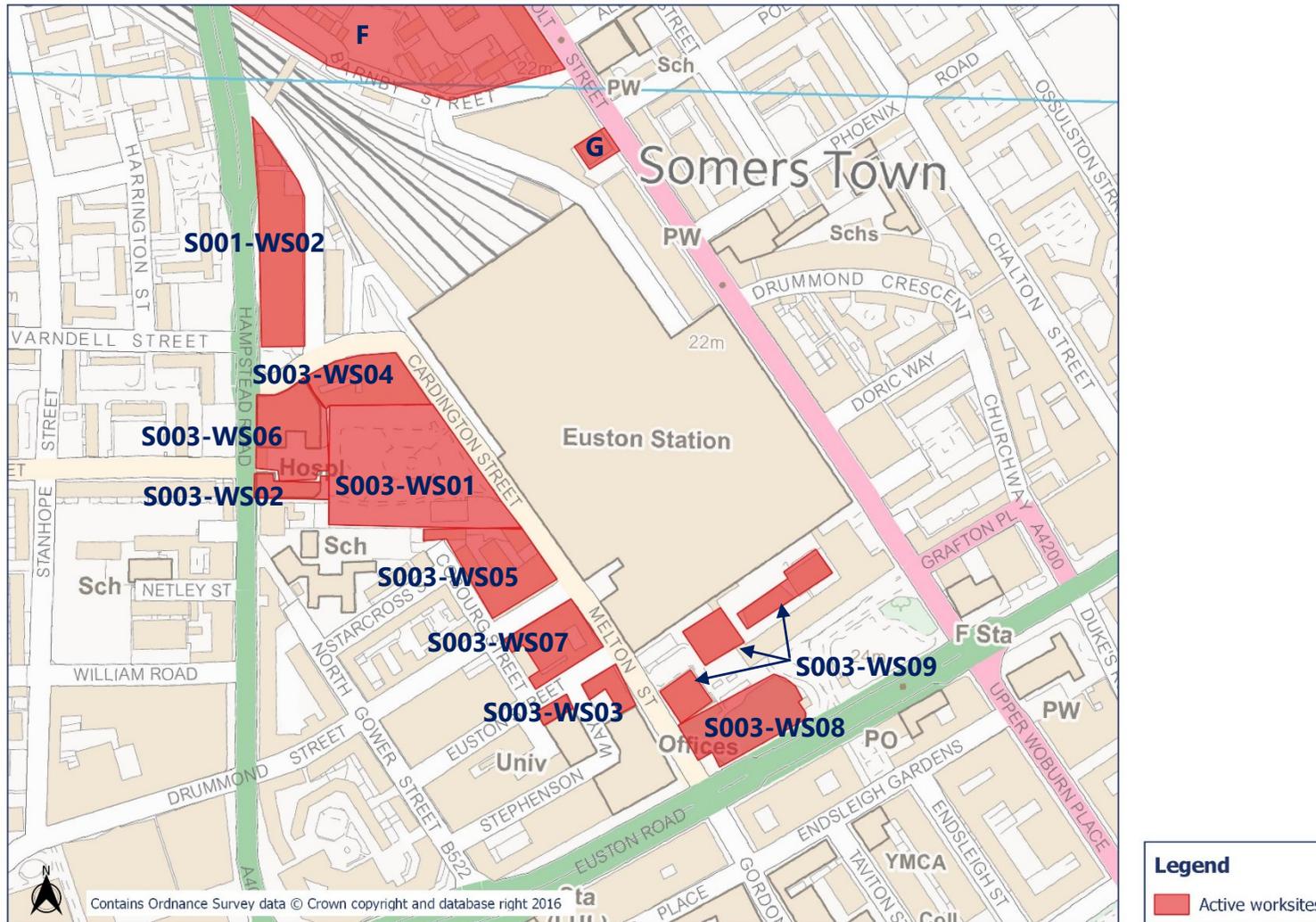
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
-	B	Complaint from a resident on Gloucester avenue about construction vibration allegedly causing a crack in a property.	The complaint is under investigation.	-
CPA-000525	Not applicable	Complaint about perceptible building vibration at properties and enquiry regarding construction activities being undertaken.	The complaint was investigated, vibration was due to Thames Water works to repair a burst water main. Works were not related to HS2 construction works.	-
CPA-000536	C	Enquiry from a resident on Mornington Crescent requesting seismic and geological data for the area and asking to investigate potential signs of structural damage at his property due to vibration.	The complaint is under investigation.	-
CPA-000592	S003-WS08	Complaint from non-residential premises regarding saw-cutting associated with taxi rank construction without full acoustic screening.	Saw cutting of road surface at the tie-in with Melton Street being carried out. Acoustic barriers of limited height being used instead of full height acoustic barriers due to temporary work requirements	Works ceased and full height barriers installed prior to continuation of saw cutting activities.
CPA-000596	S003-WS01	Complaint from resident to the west of Euston Station regarding night-time works activities.	Archaeological trial holes being excavated on Cardington Street outside of core working	Further review of site control measures to ensure all reasonably practicable

Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
			hours. Works being undertaken under S61 consent. Works methodology and noise monitoring levels in line with terms of S61 consent.	means of noise control are implemented.
CPA-000604	Not applicable	Complaint about alarm ringing from a construction site for a prolonged period.	Identified as a malfunctioning property alarm that had been removed from a property being refurbished.	Alarm located and disabled.
CPA-000605	S001-WS02	Comment from a resident on Harrington Street about construction noise and rehousing.	Attempts made to contact individual.	-

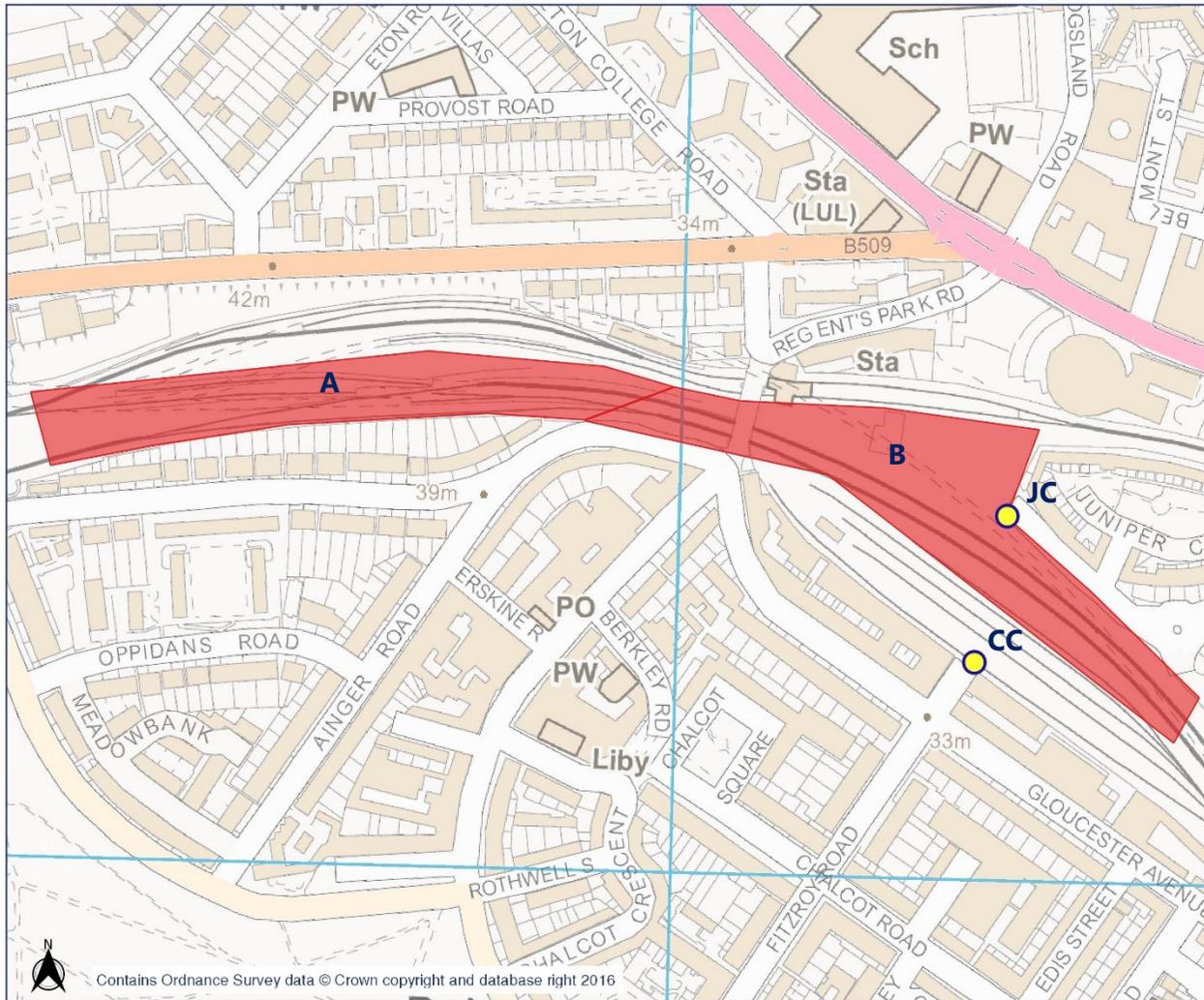
# Appendix A Site Locations





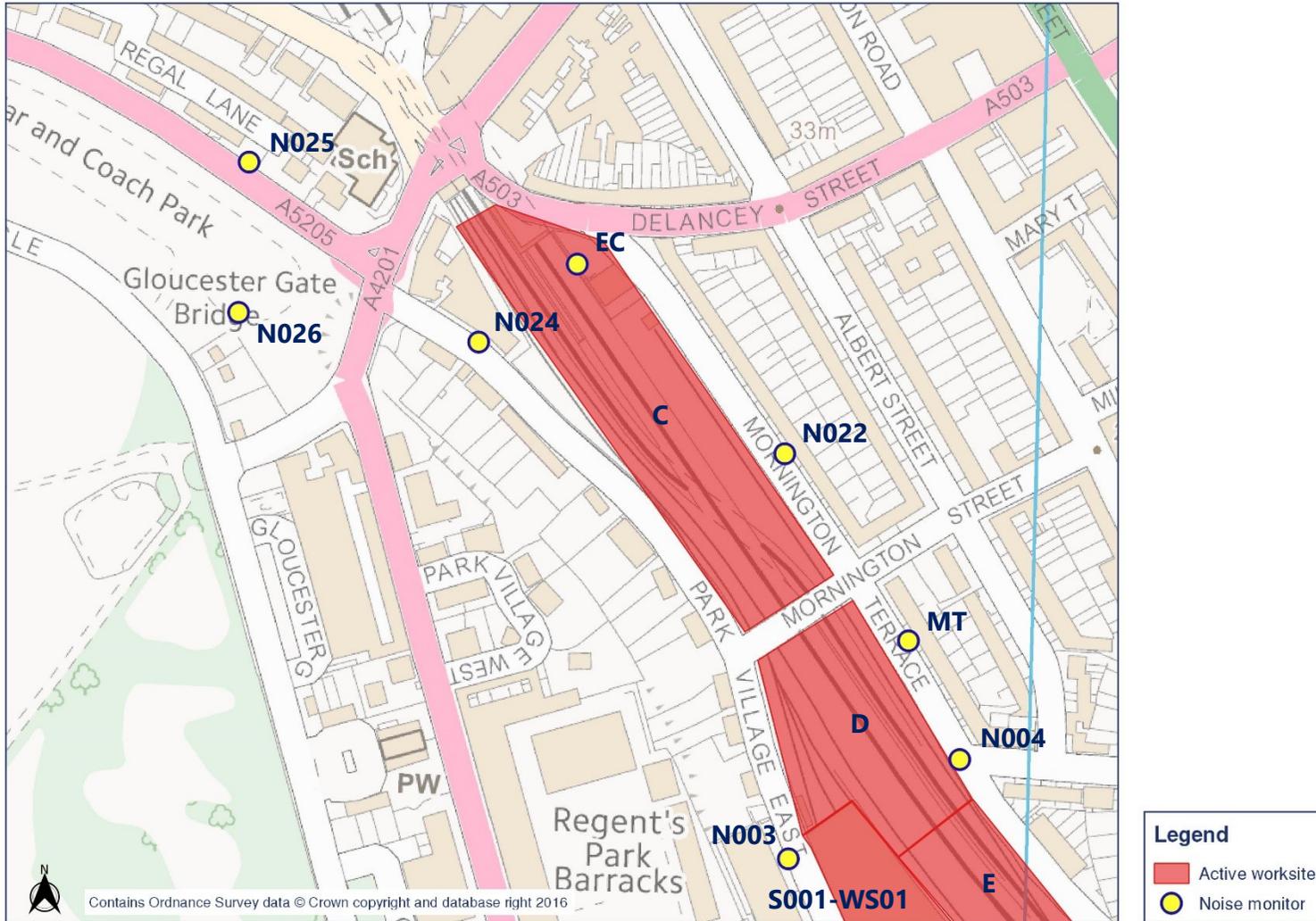


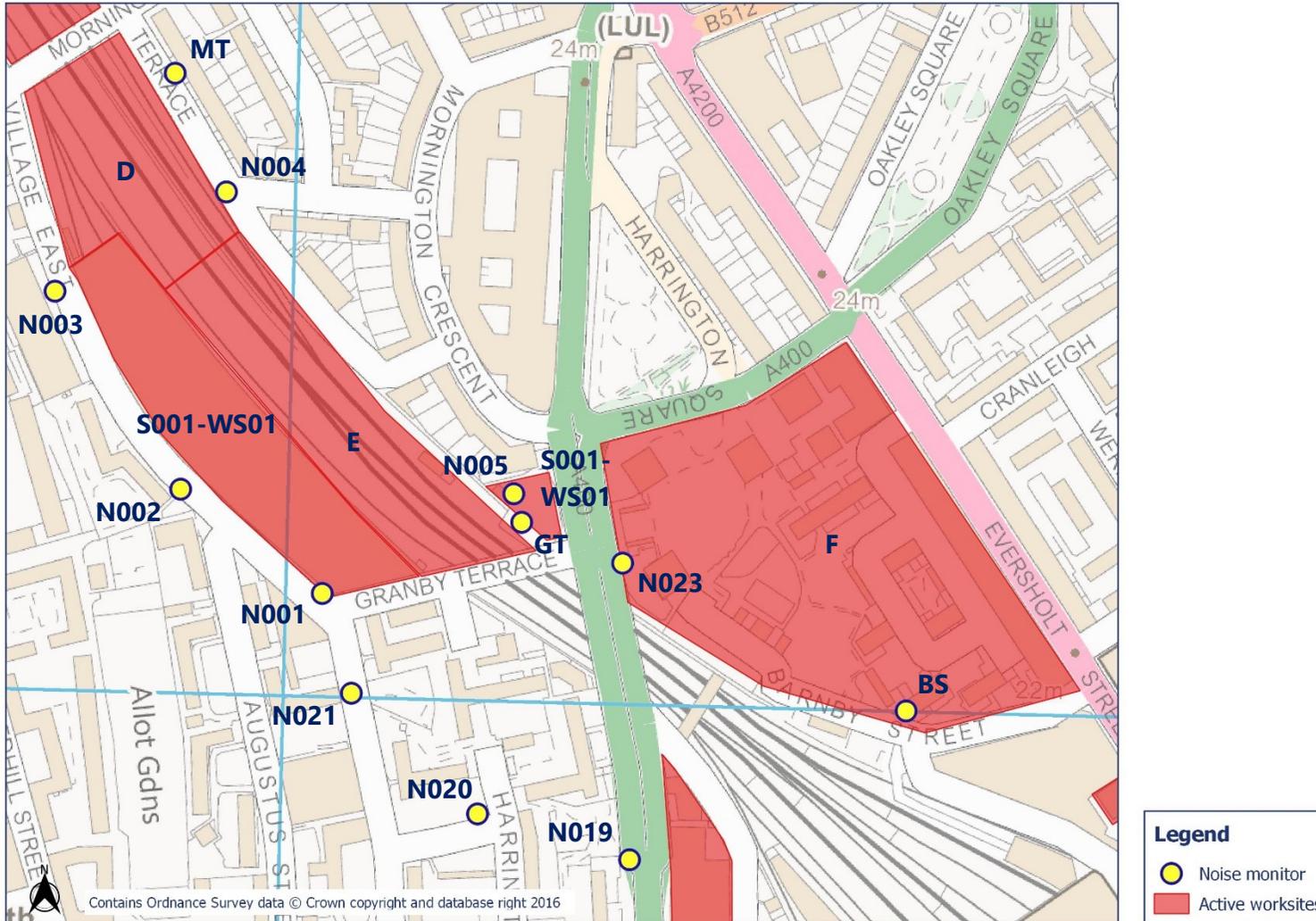
# Appendix B Monitoring Locations

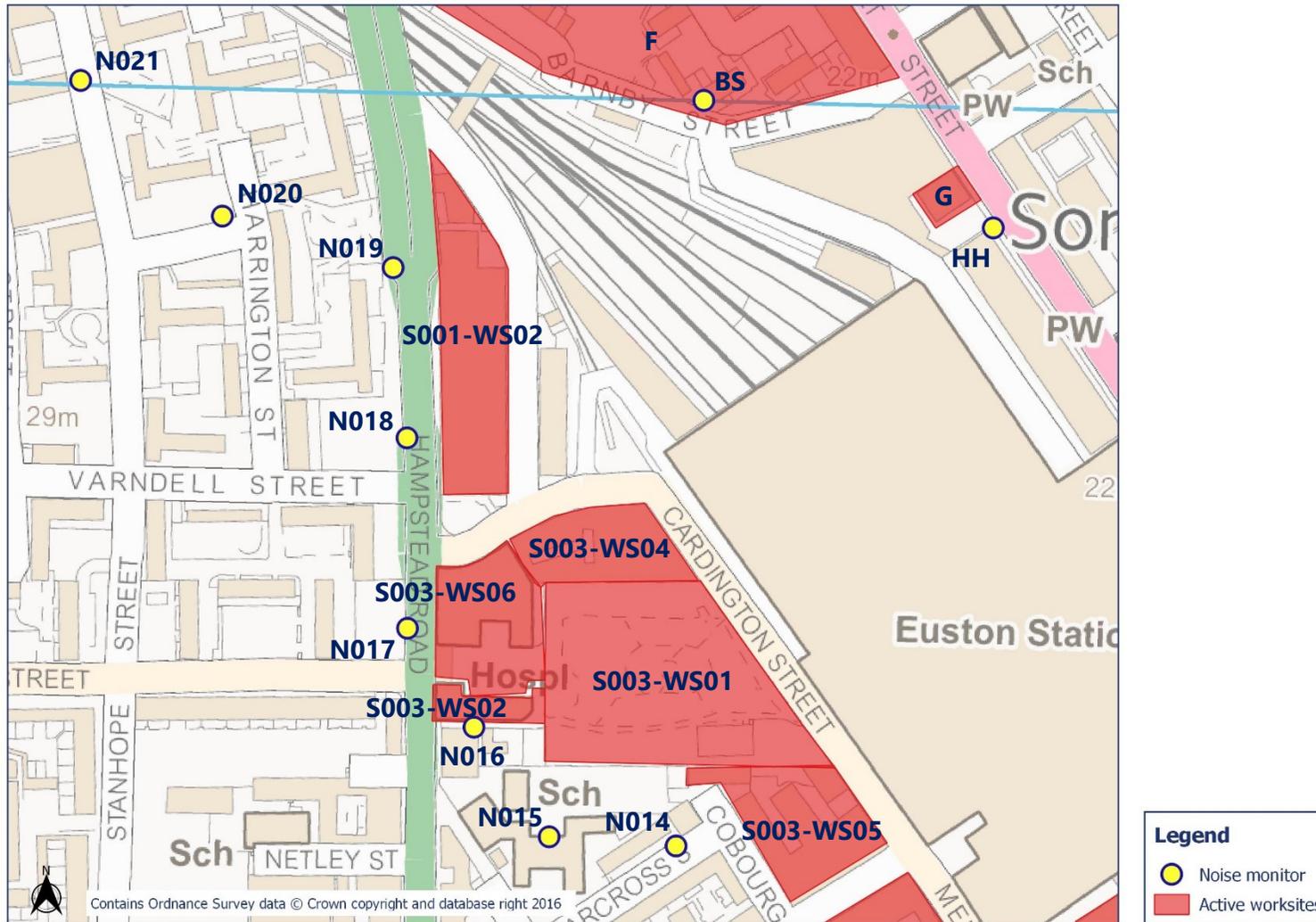


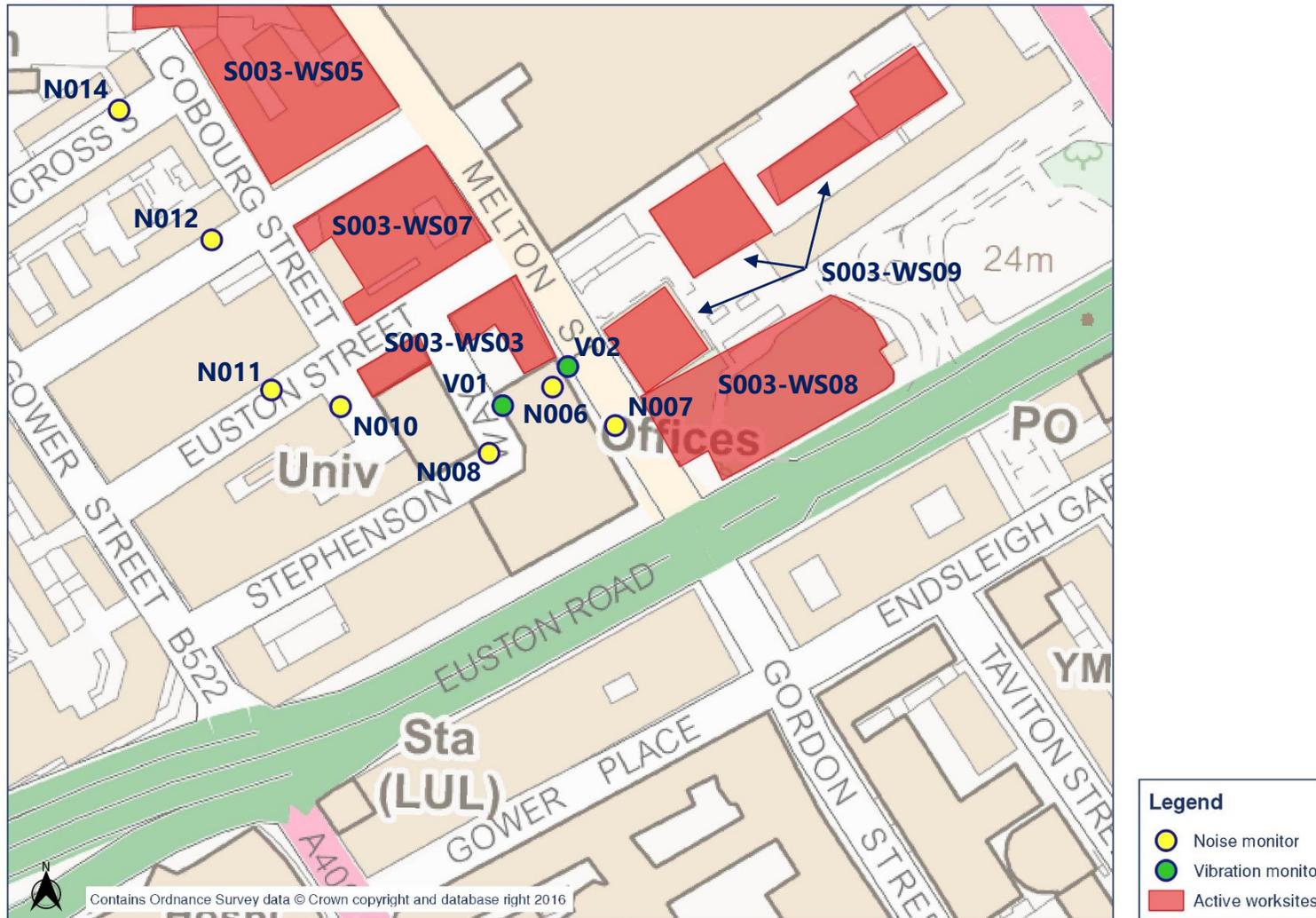
**Legend**

- Active worksites
- Noise monitor







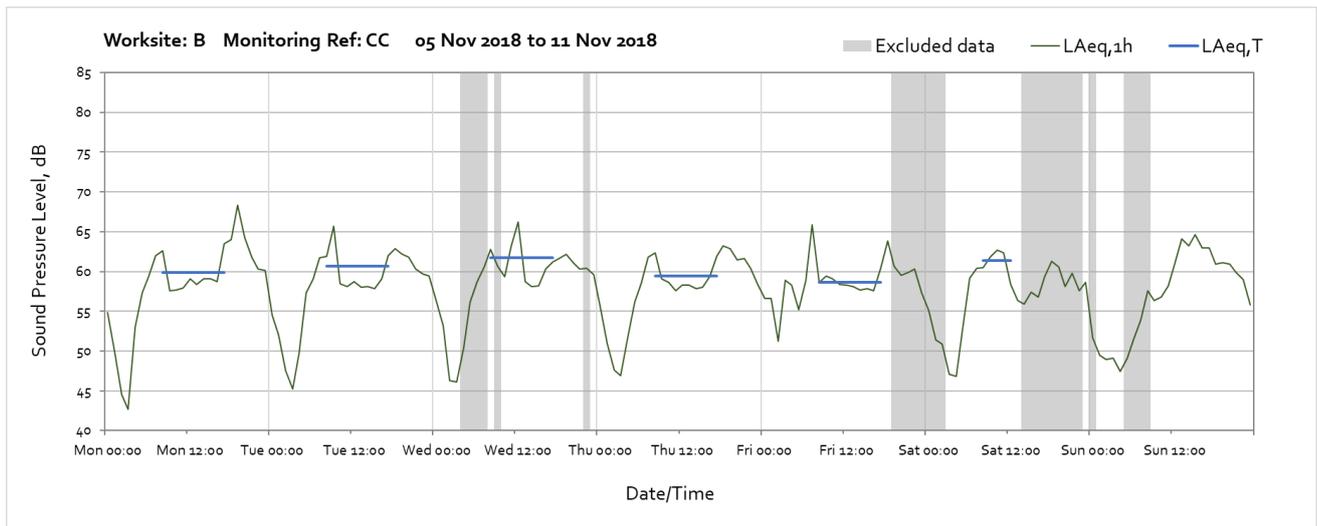
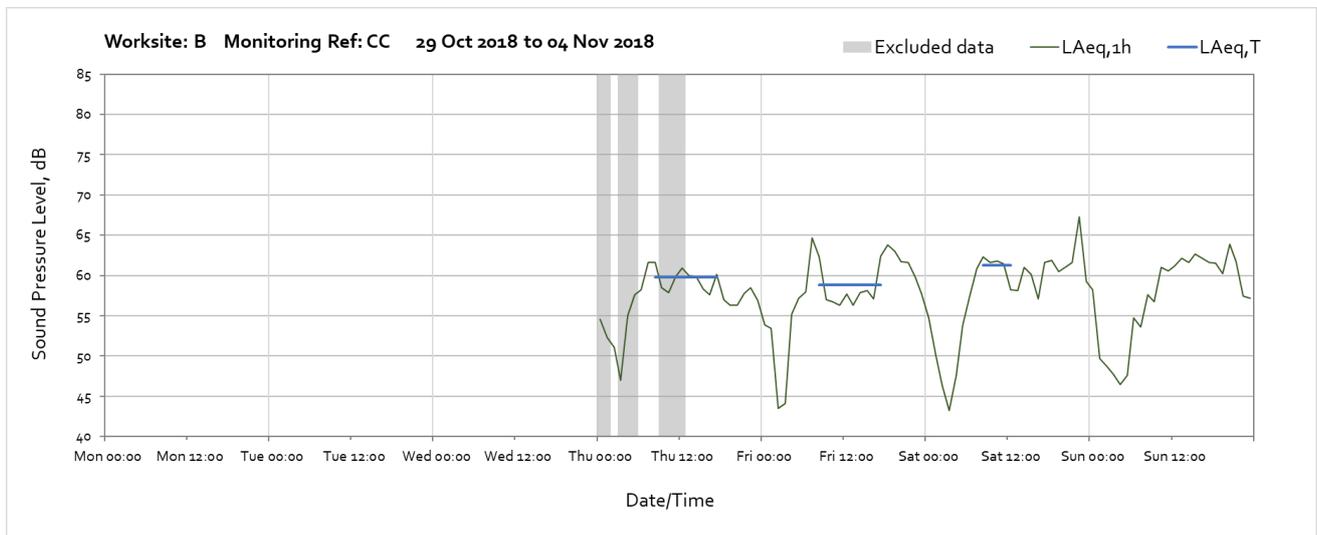


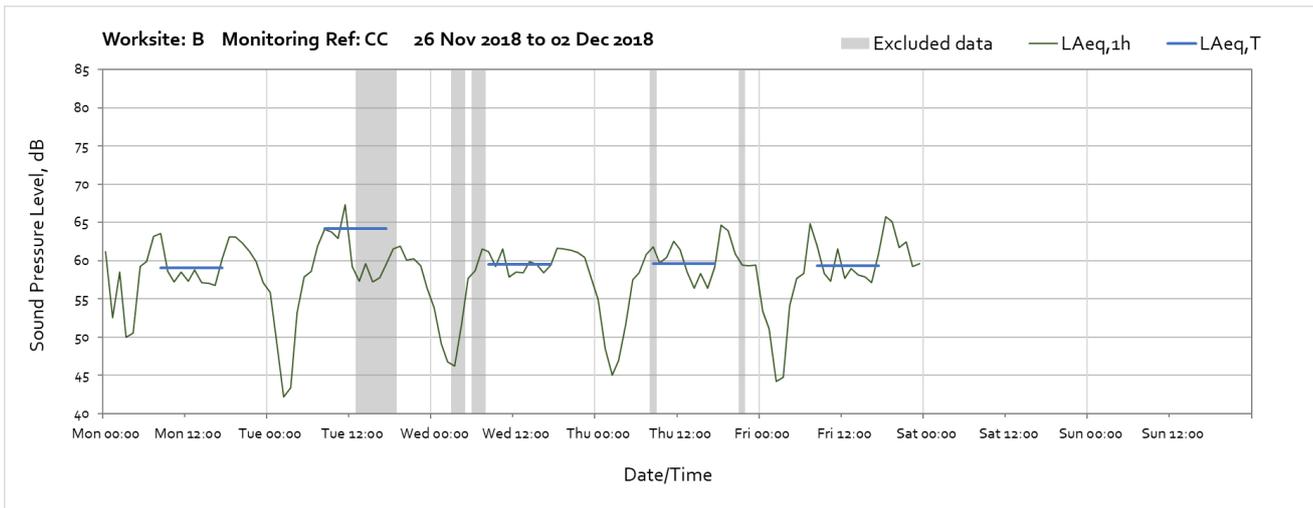
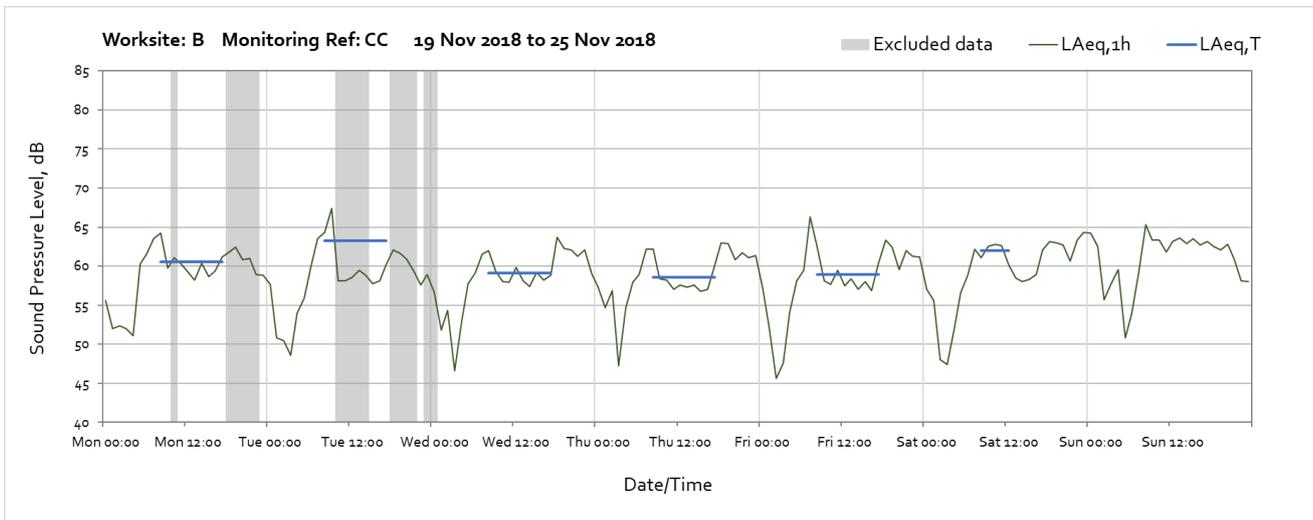
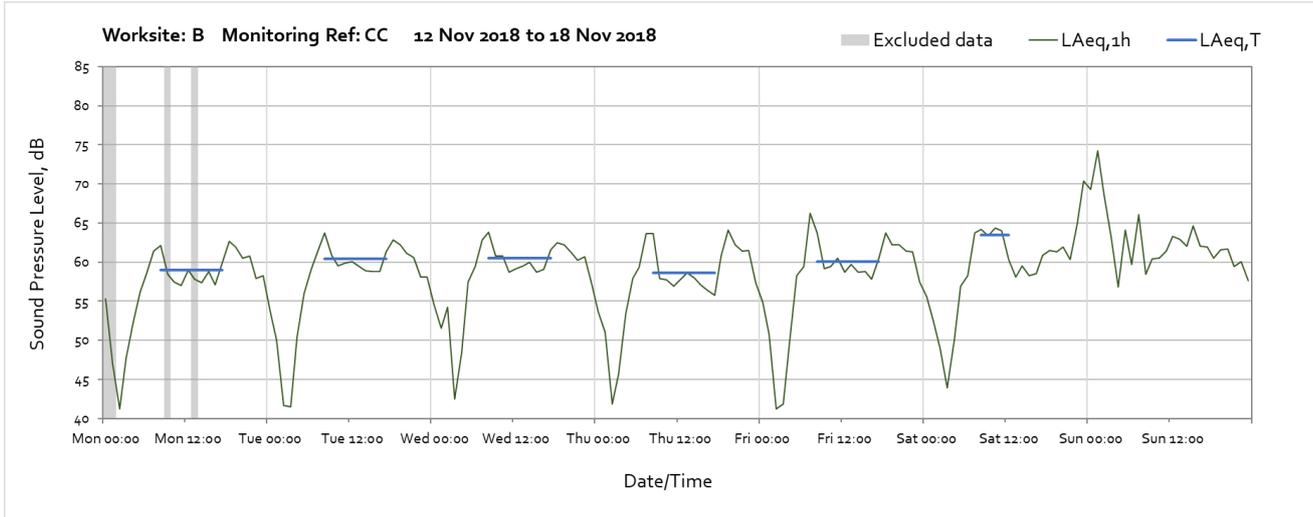
# Appendix C Data

## Noise

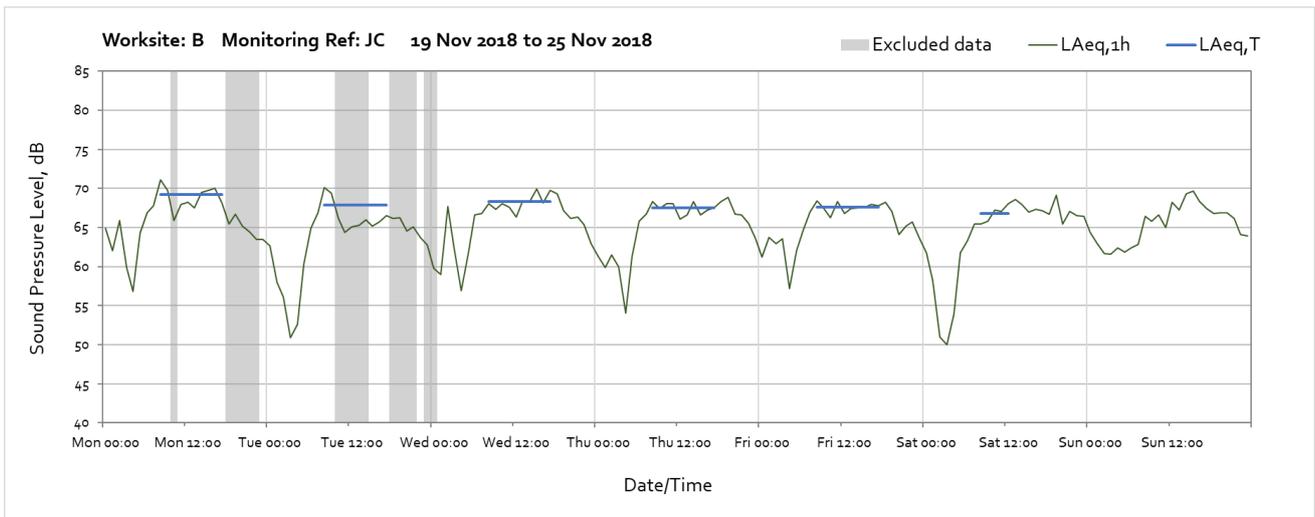
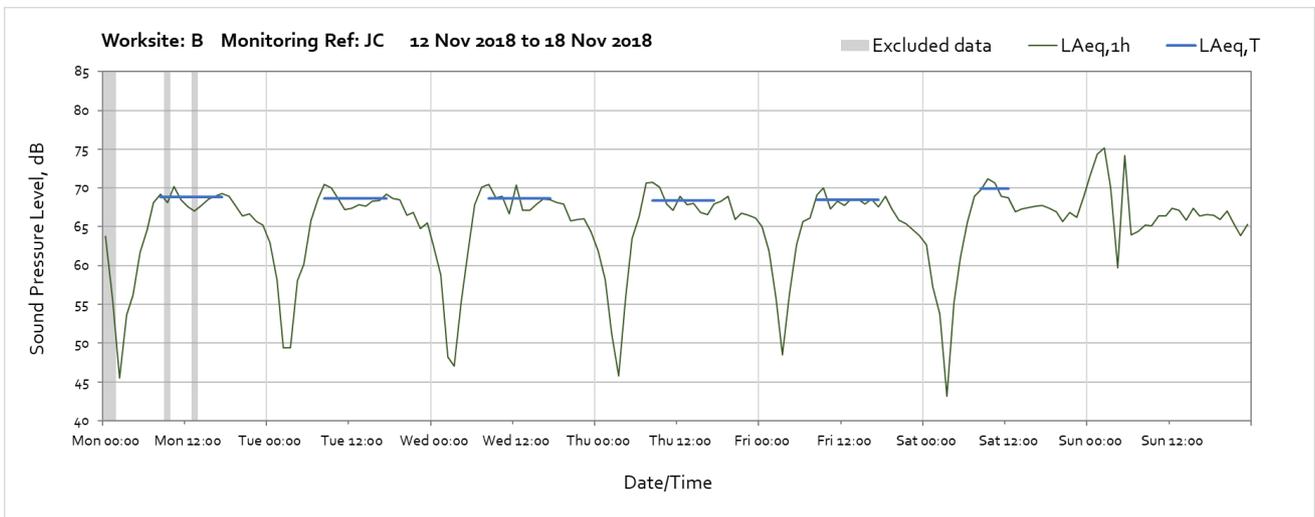
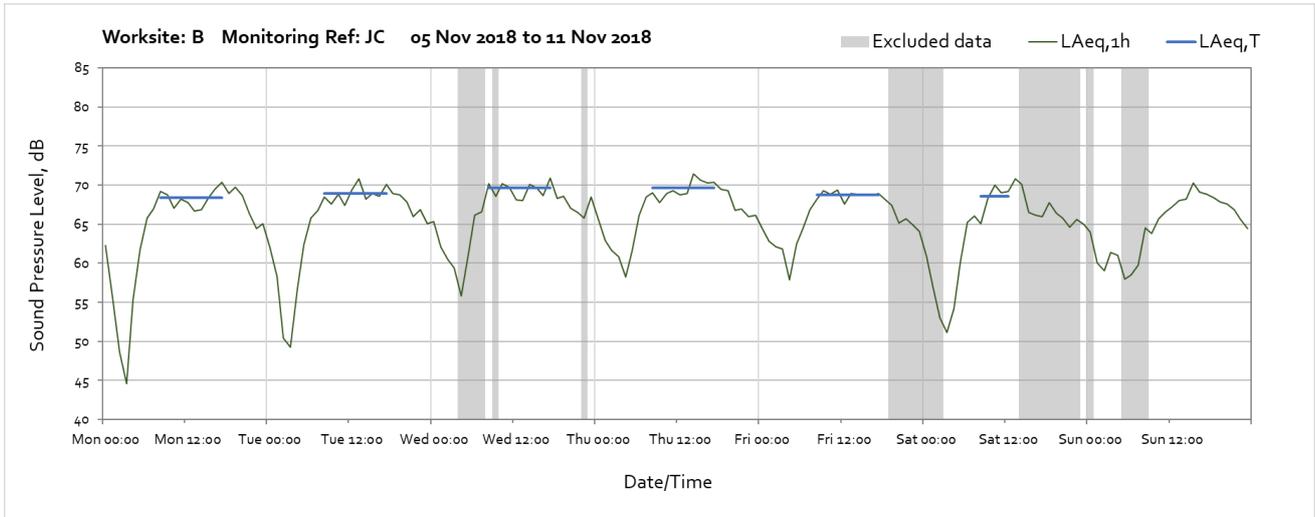
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been excluded from the calculation of the  $L_{Aeq,T}$  values.

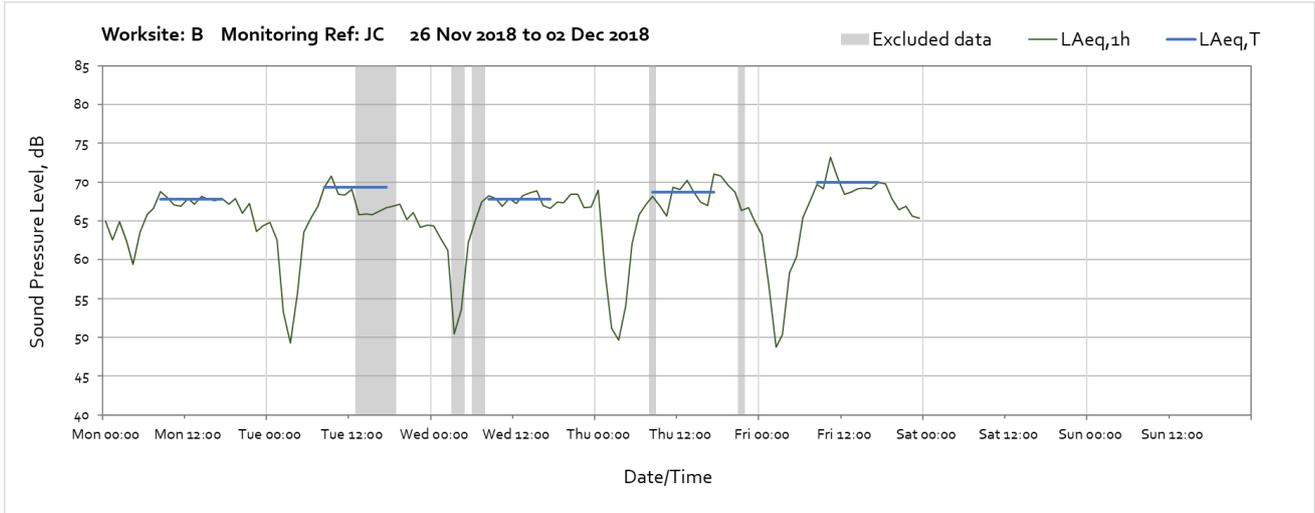
### Worksite: B – Monitoring Ref: CC



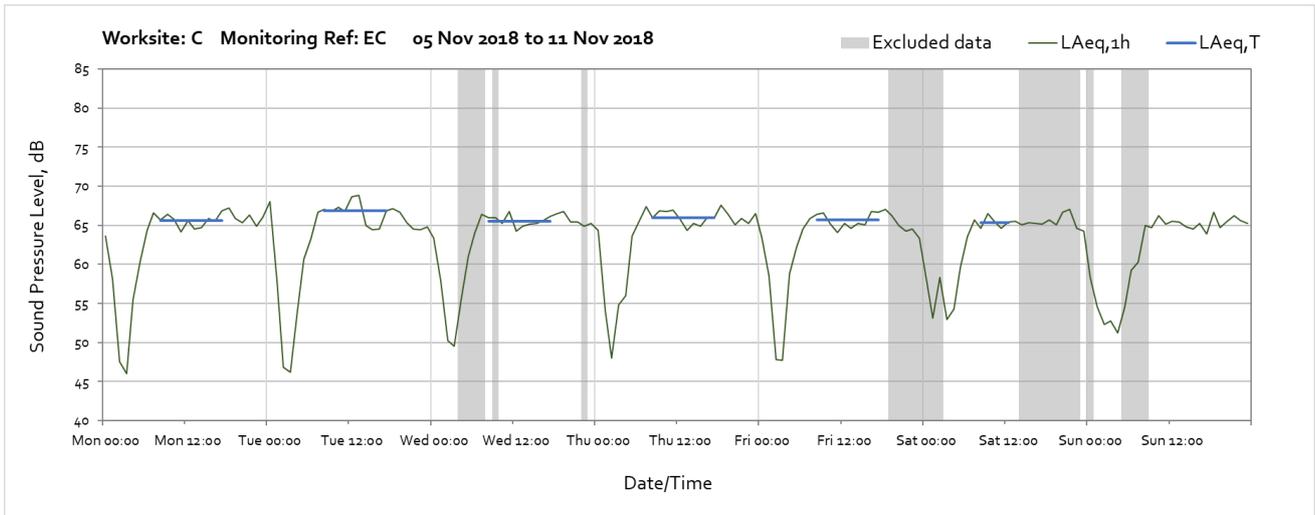
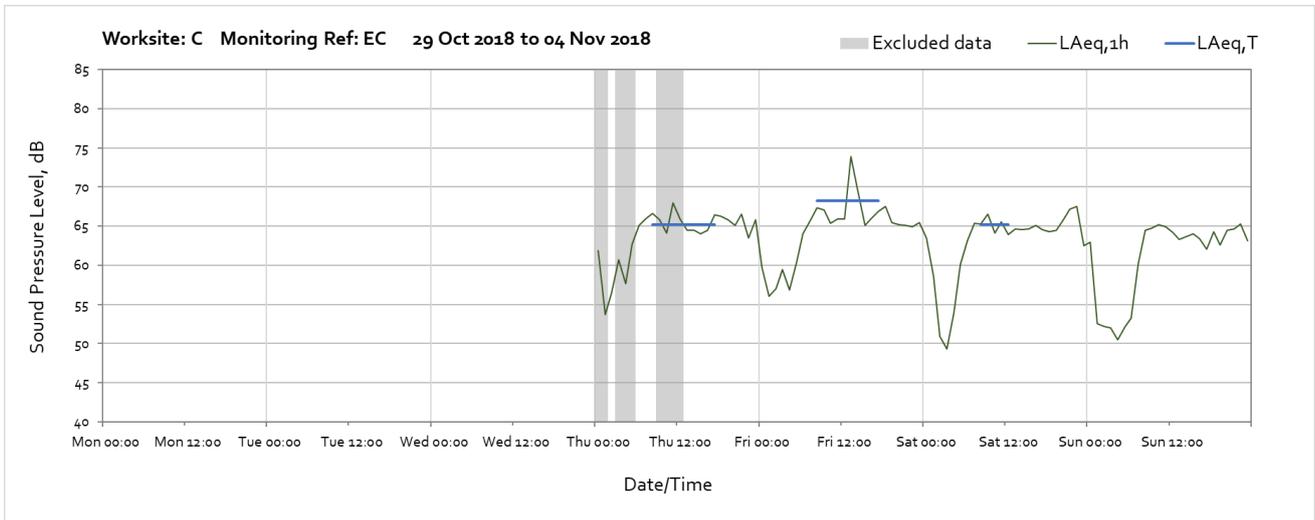


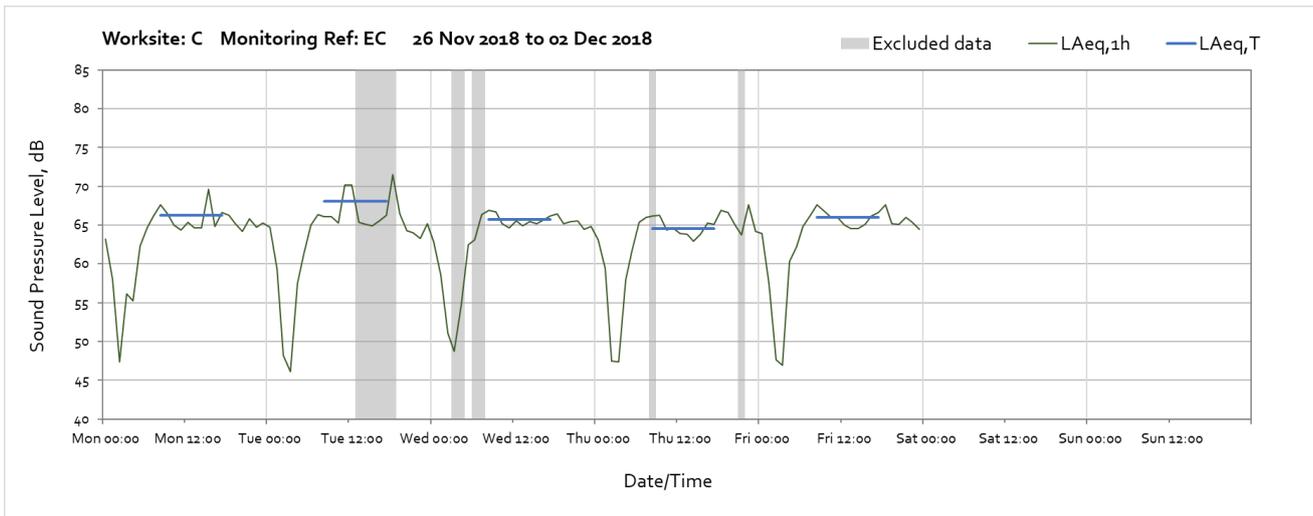
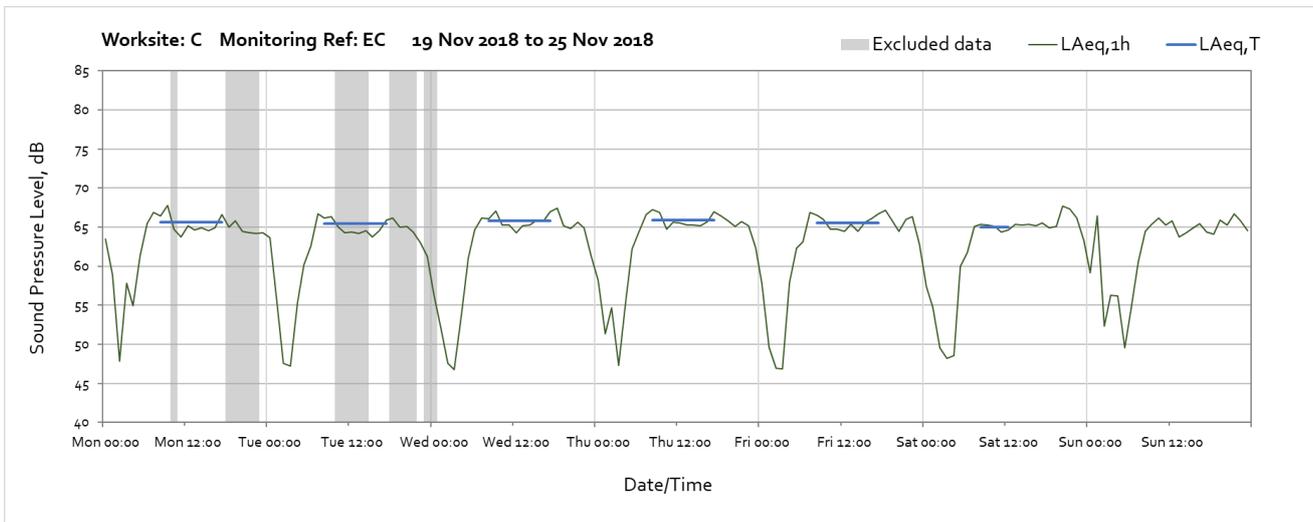
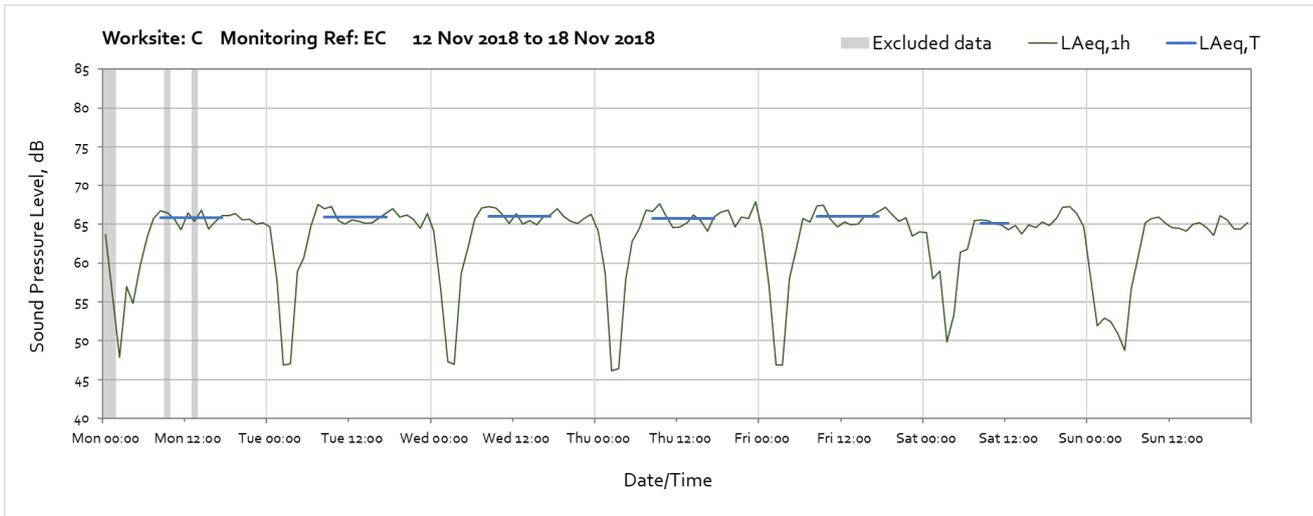
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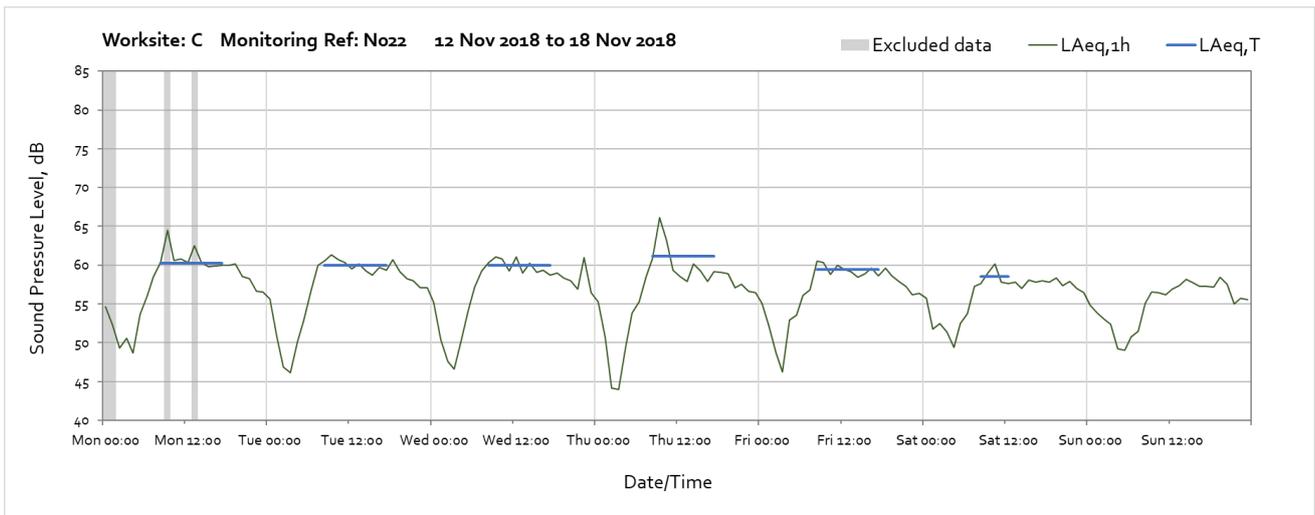
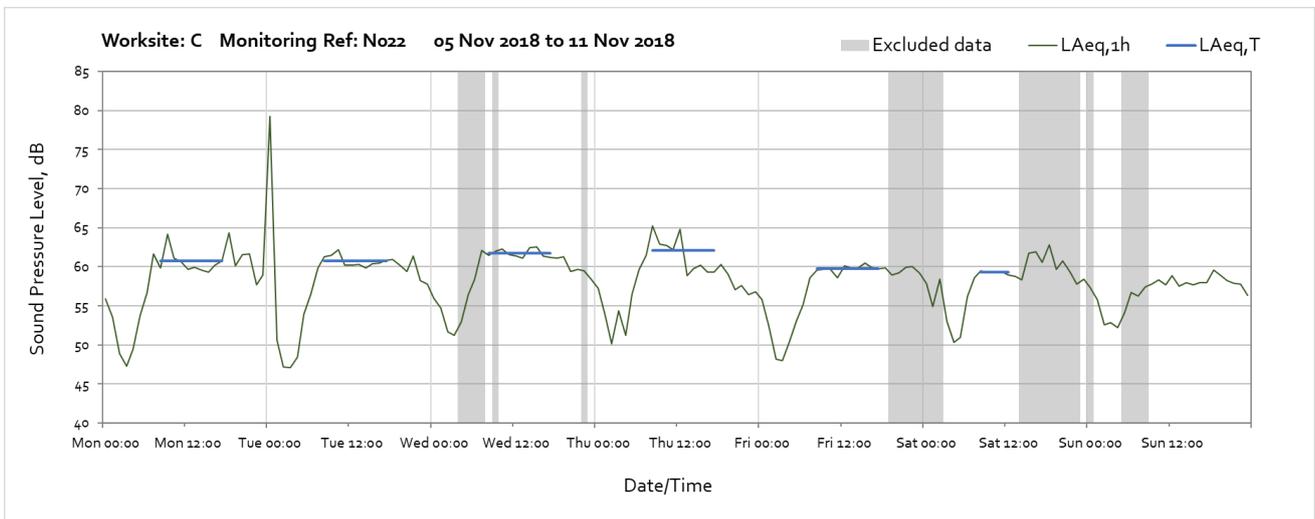
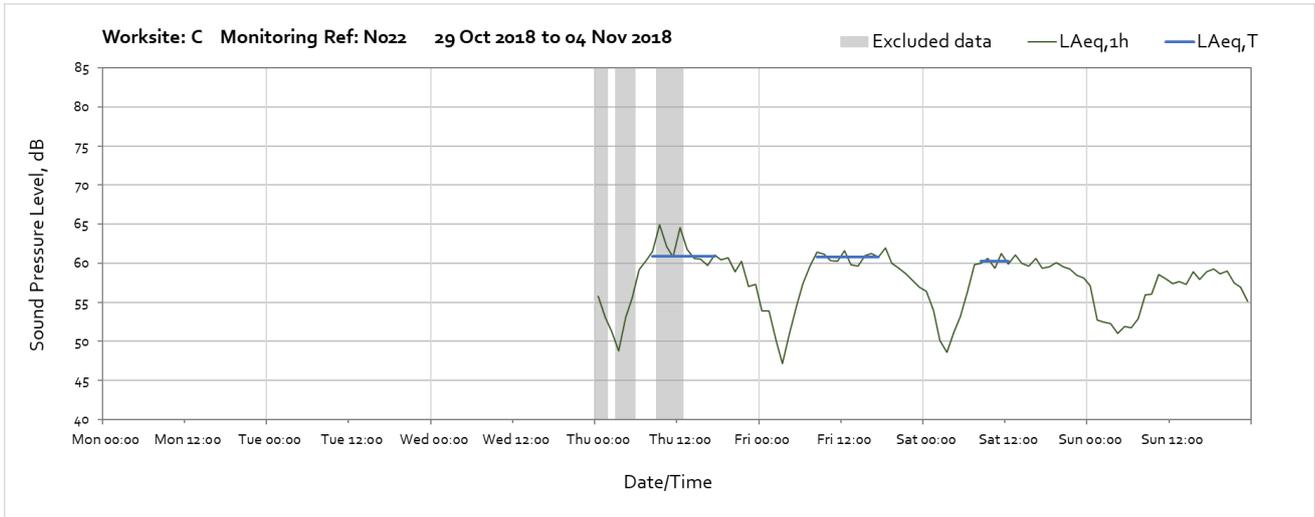


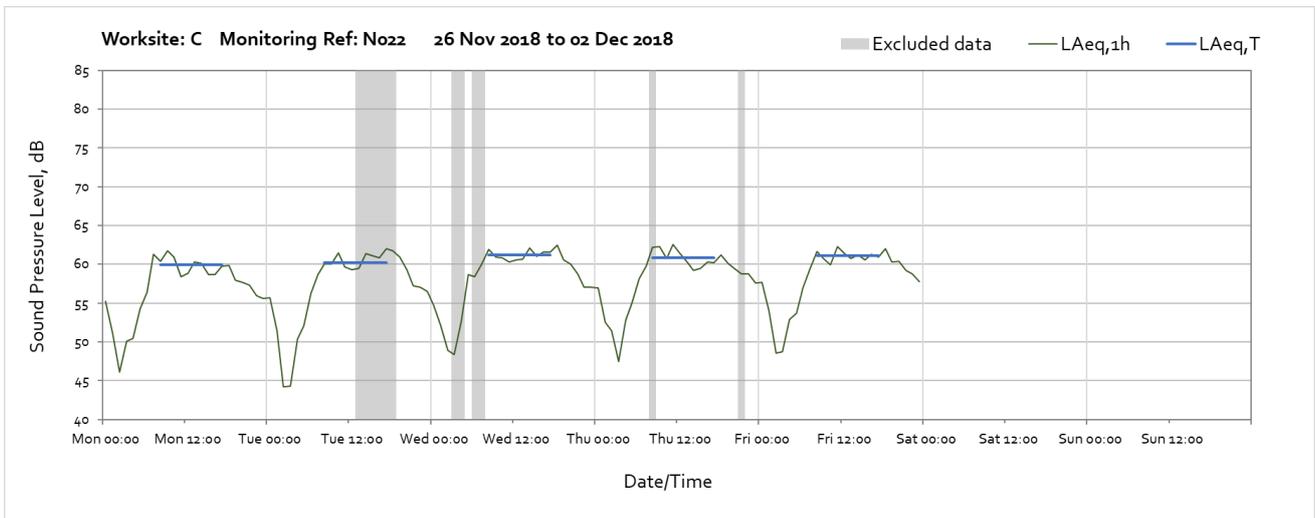
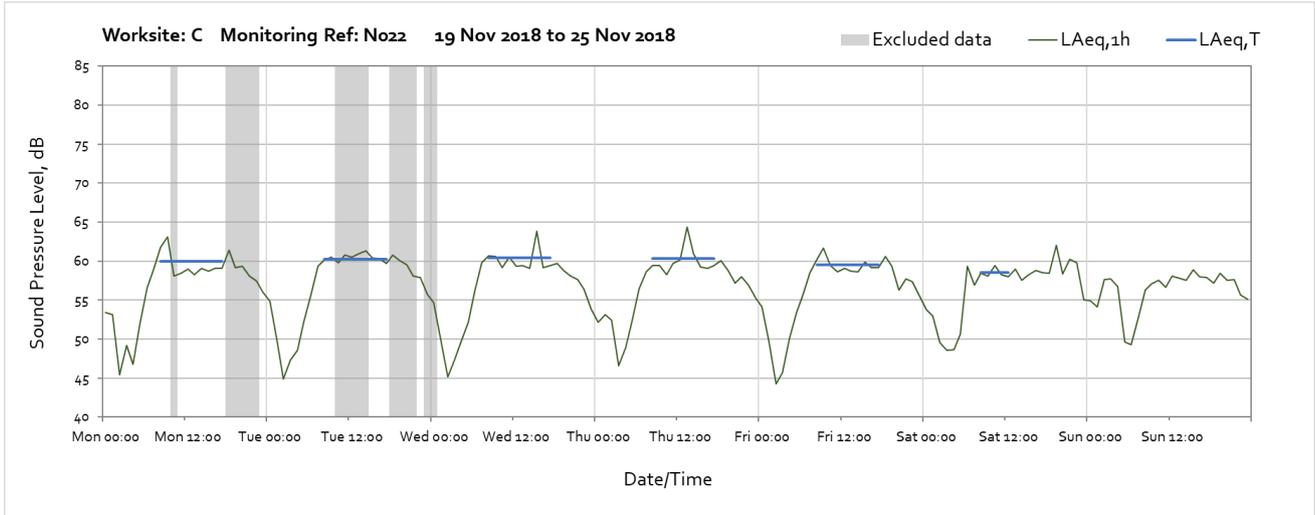
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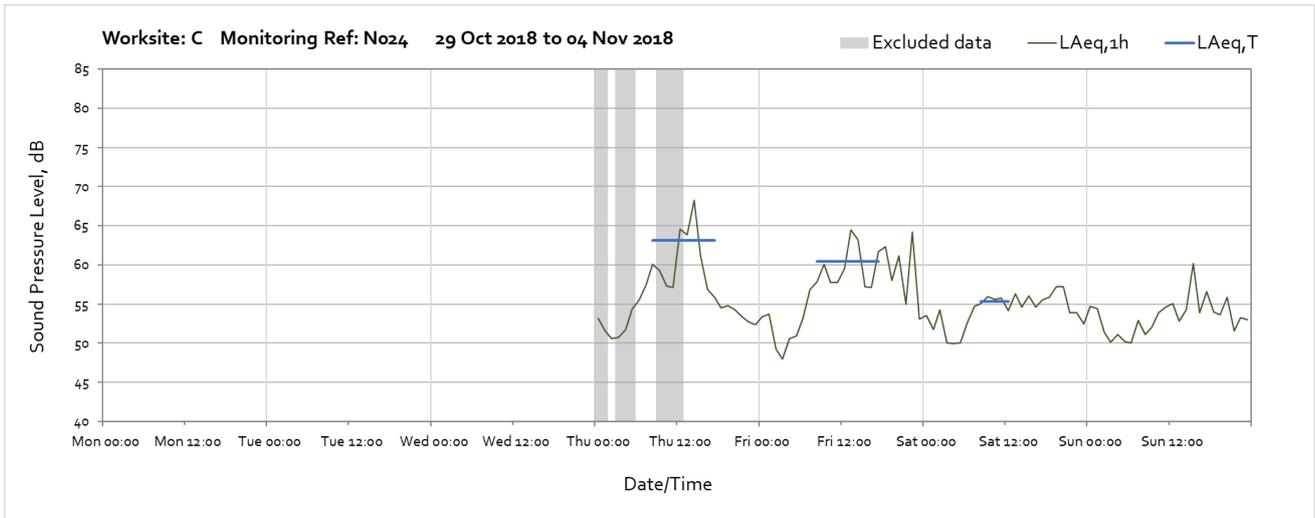


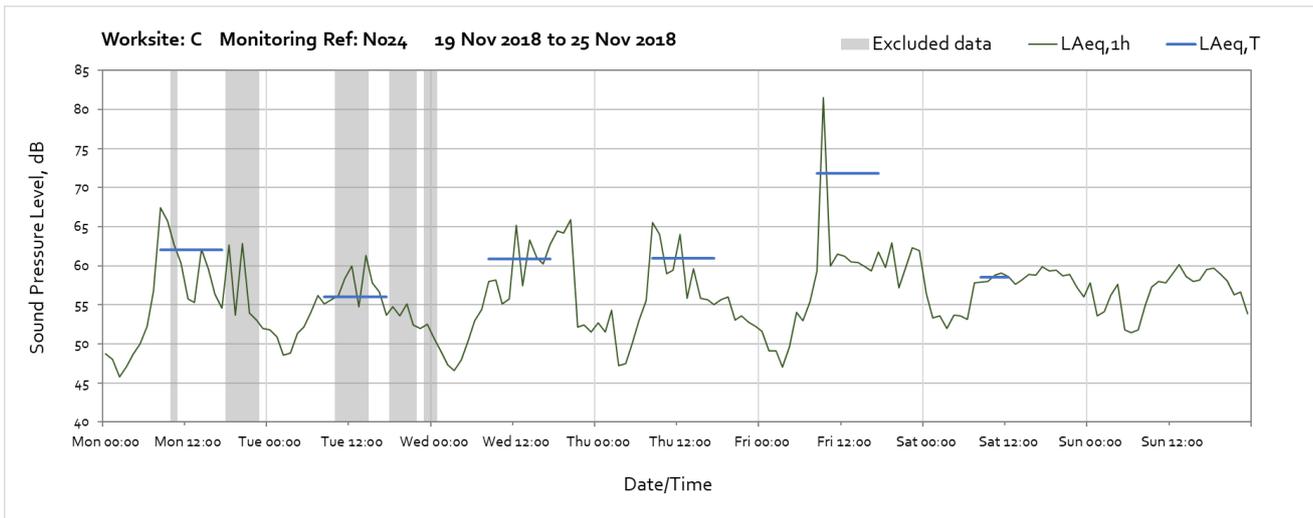
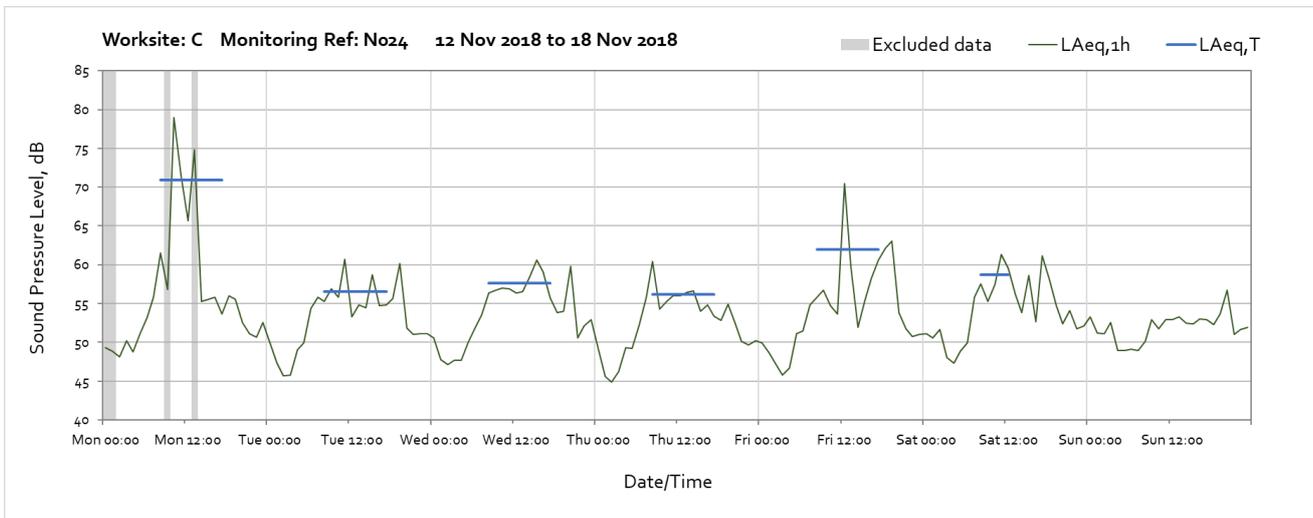
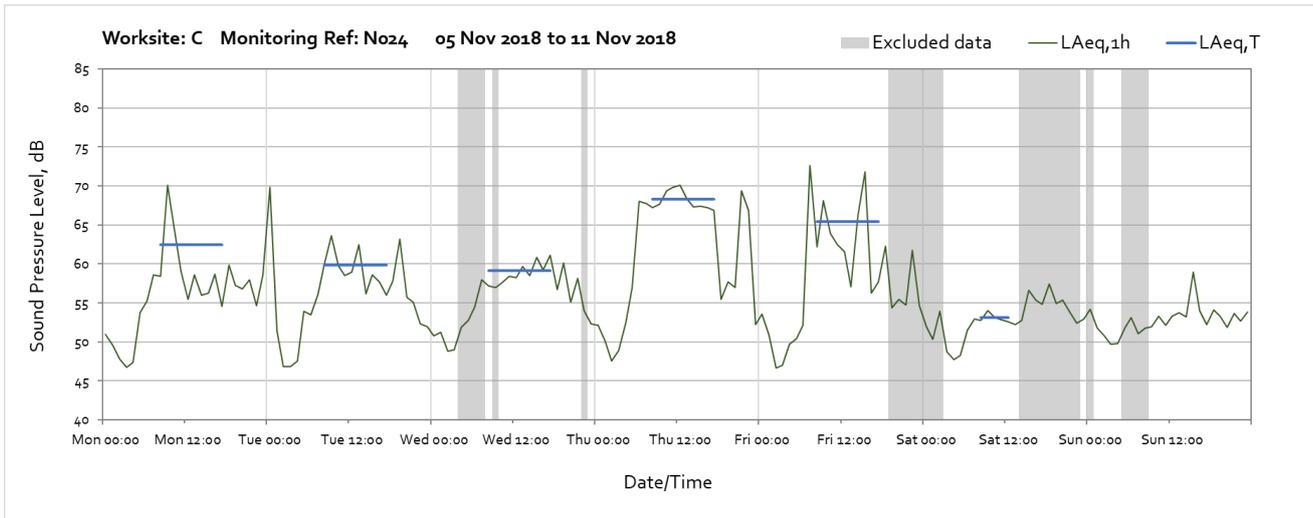
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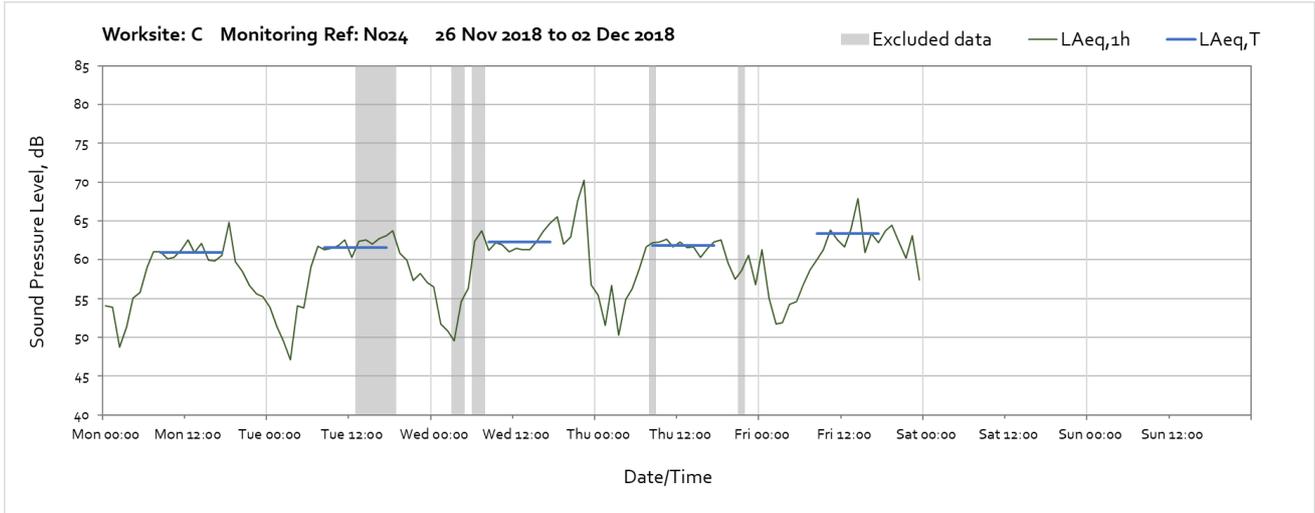




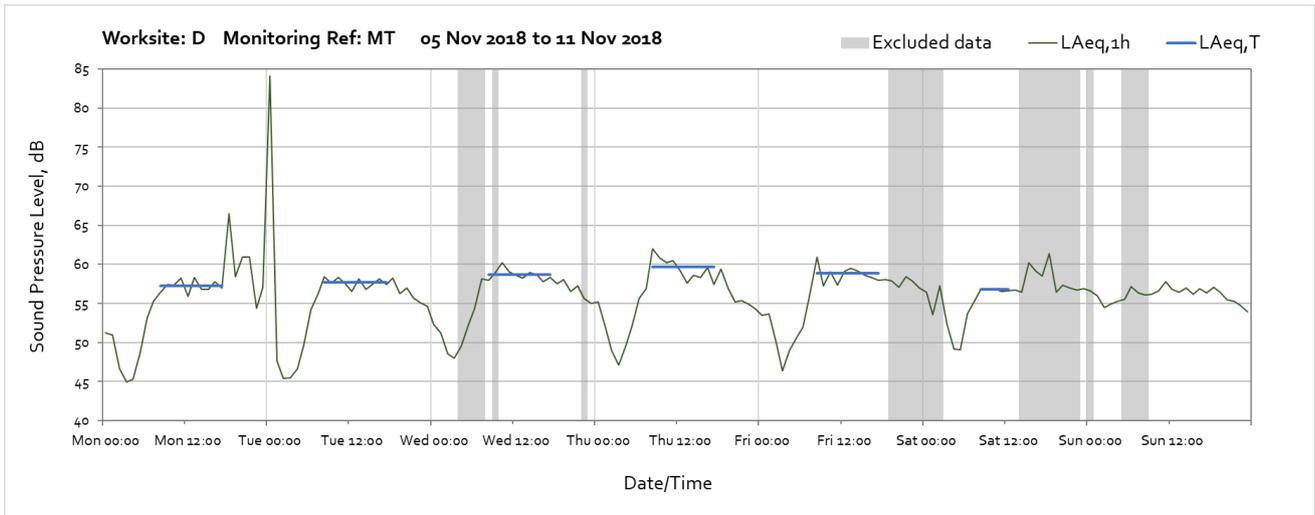
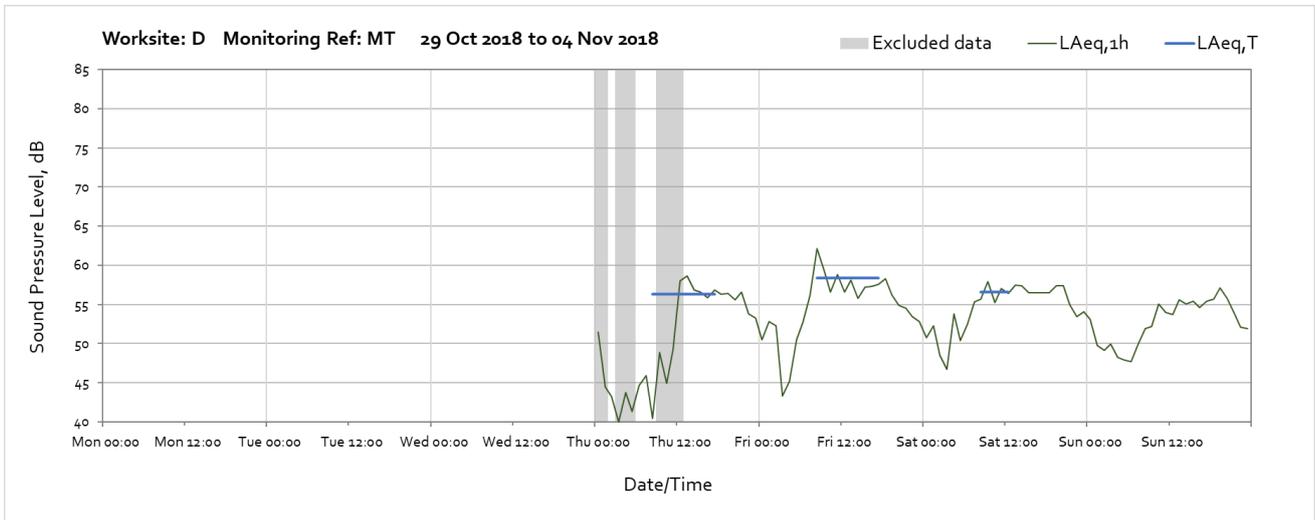
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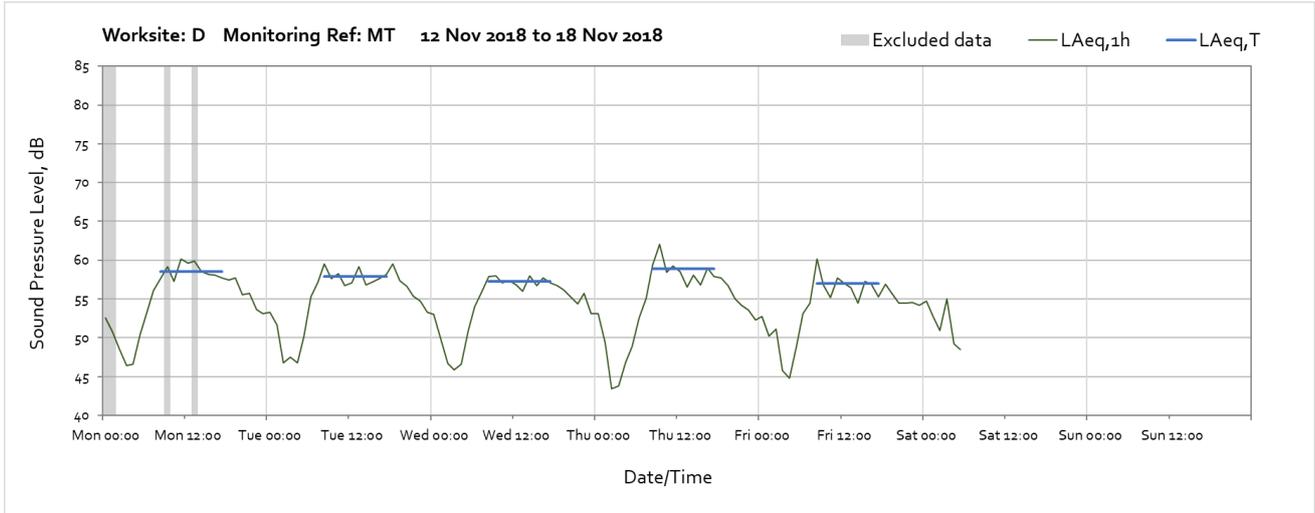




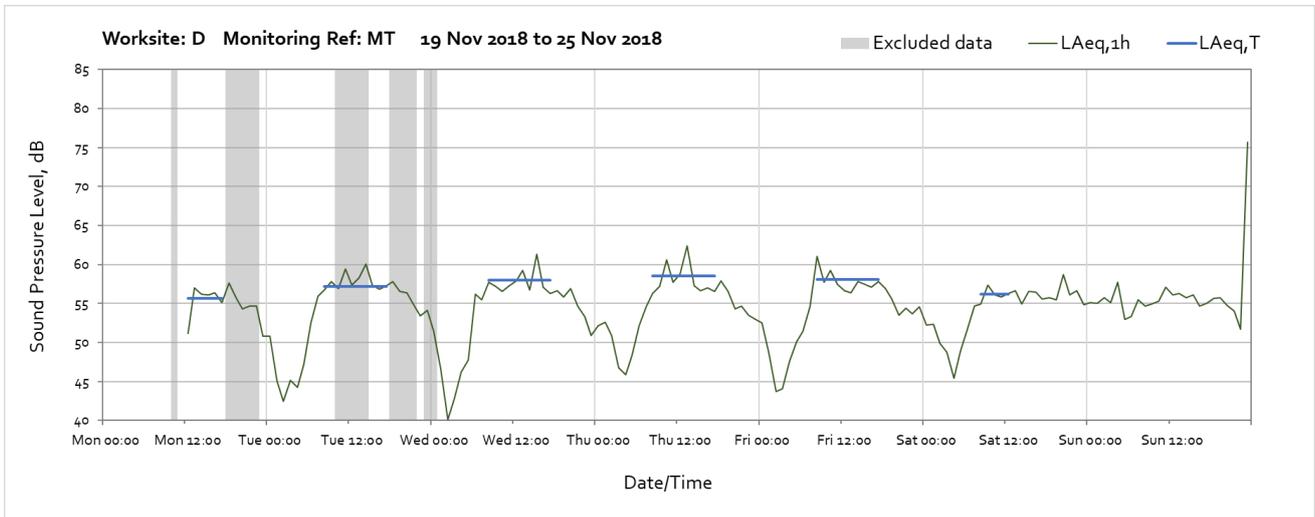


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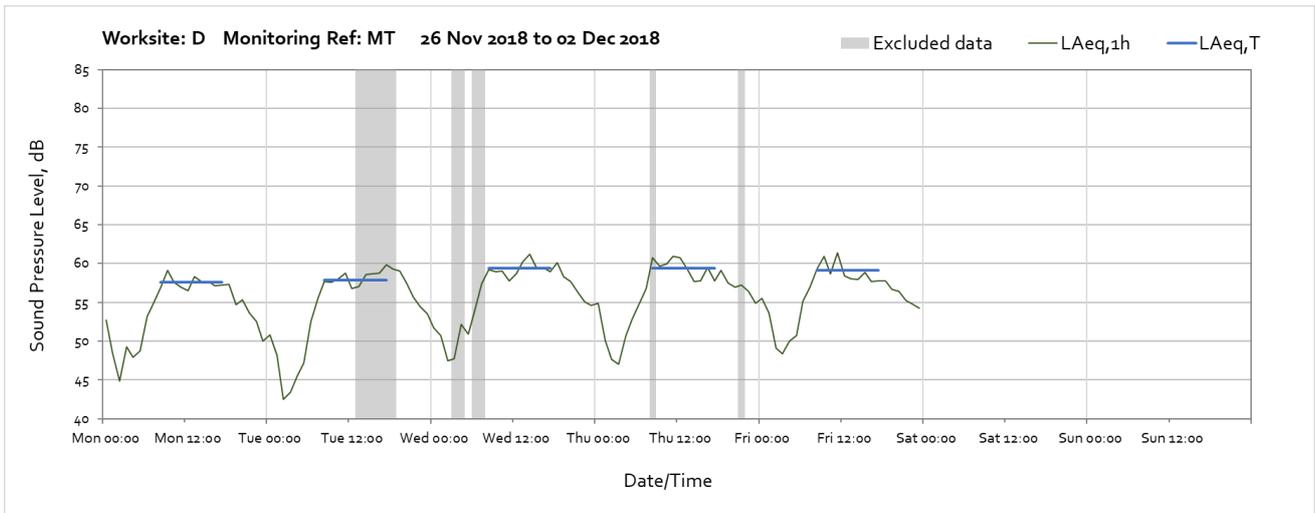




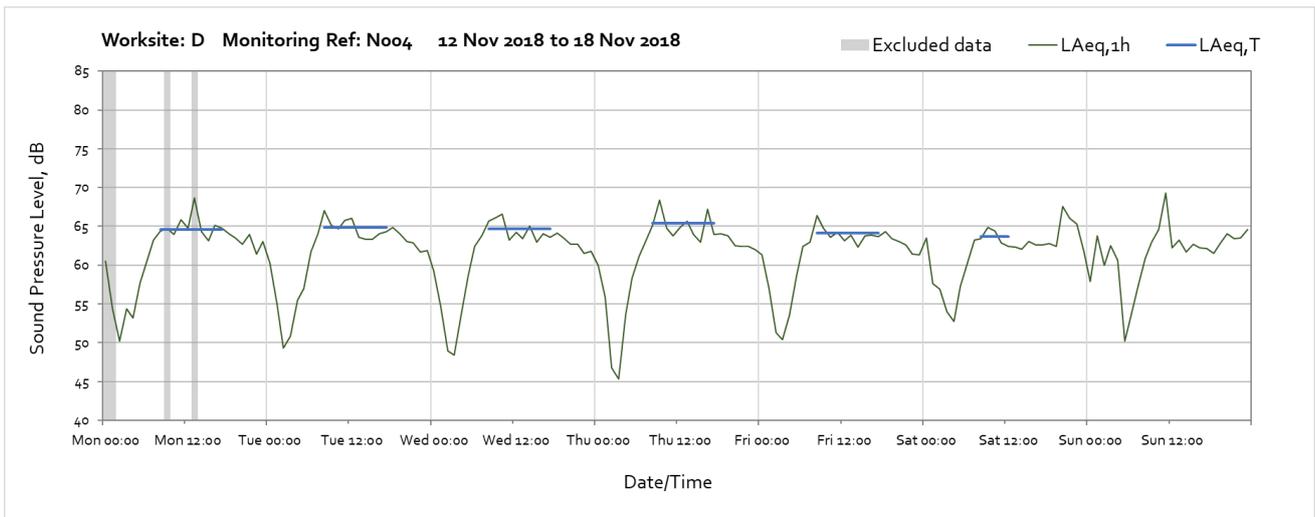
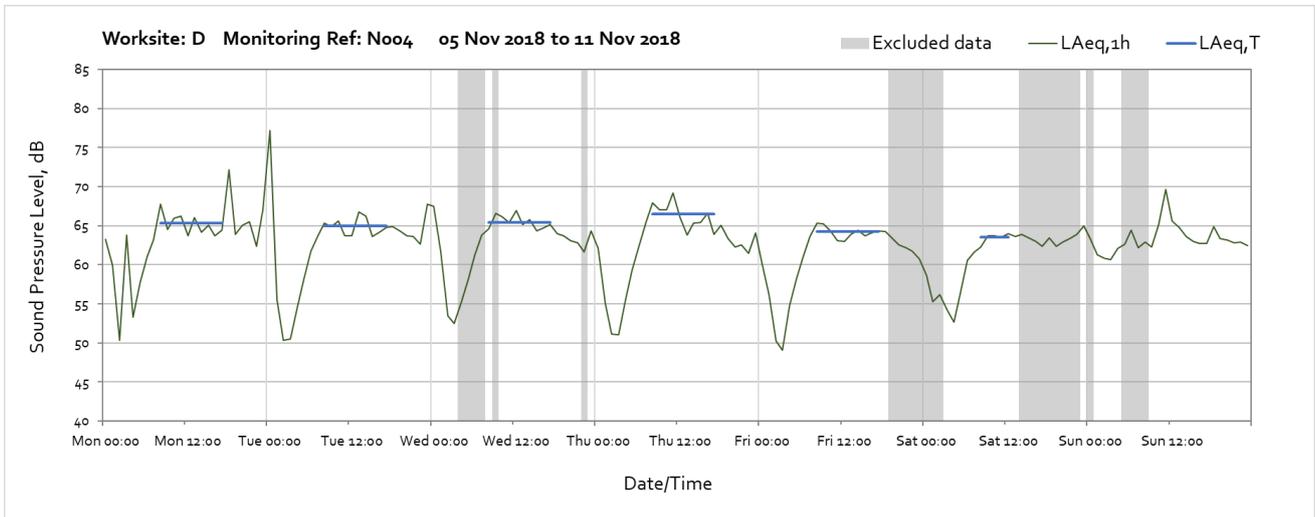
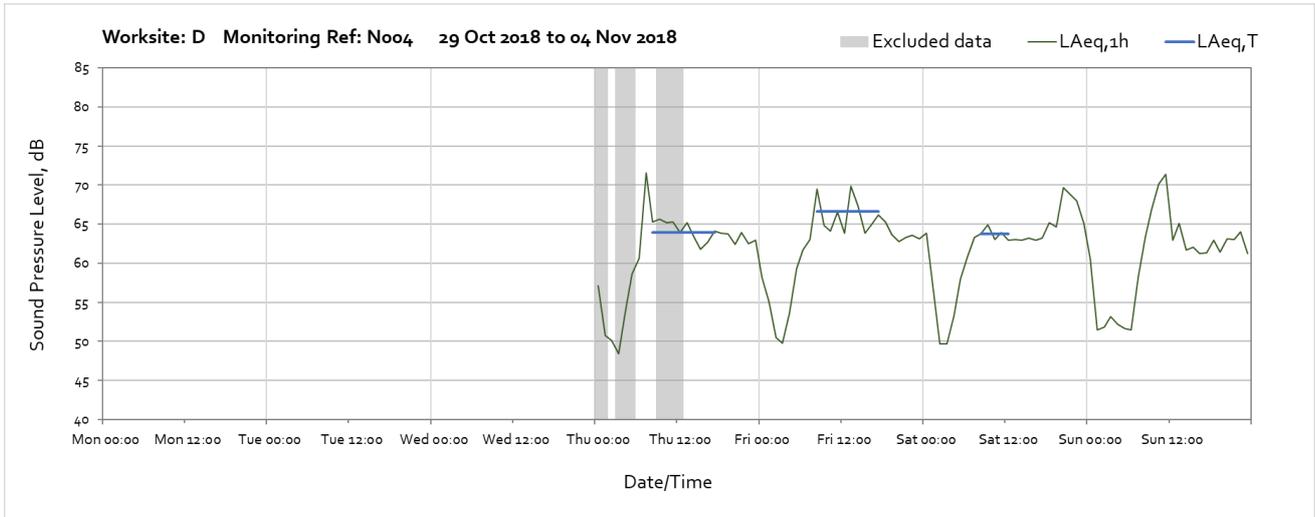
Note – Missing data between 06:00 on Saturday 17<sup>th</sup> and 12:00 on Monday 19<sup>th</sup> due to a loss of power at the noise monitor.

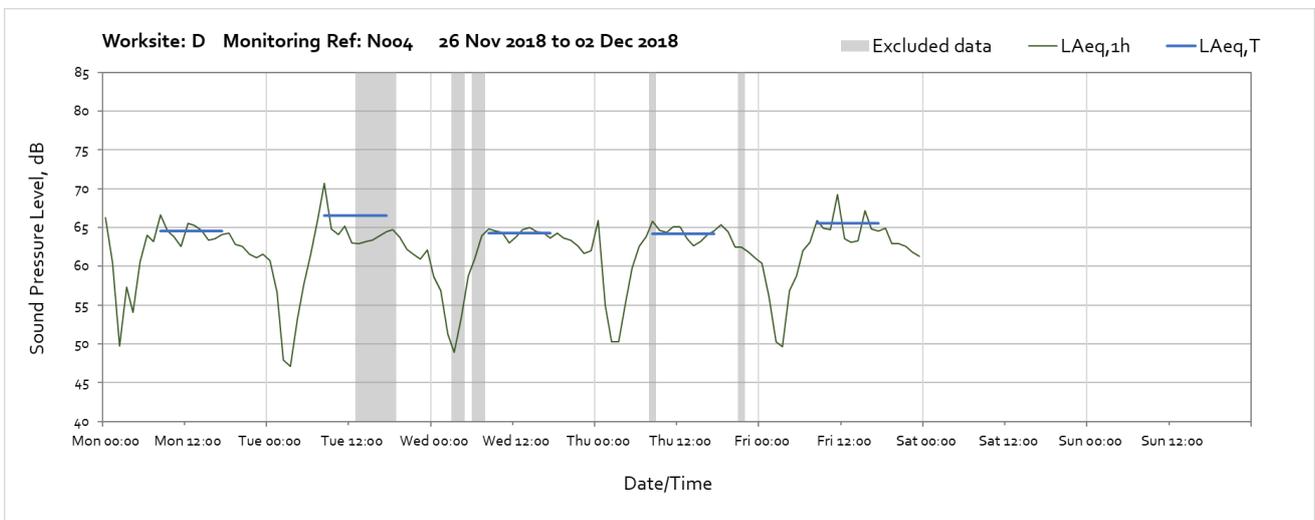
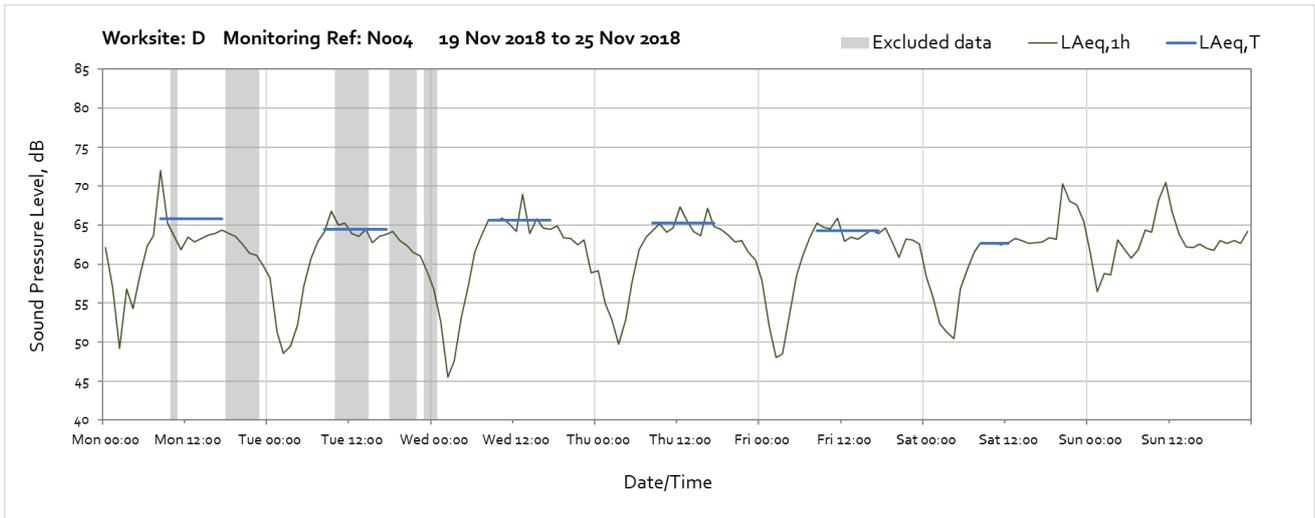


Note – Missing data between 06:00 on Saturday 17<sup>th</sup> and 12:00 on Monday 19<sup>th</sup> due to a loss of power at the noise monitor.



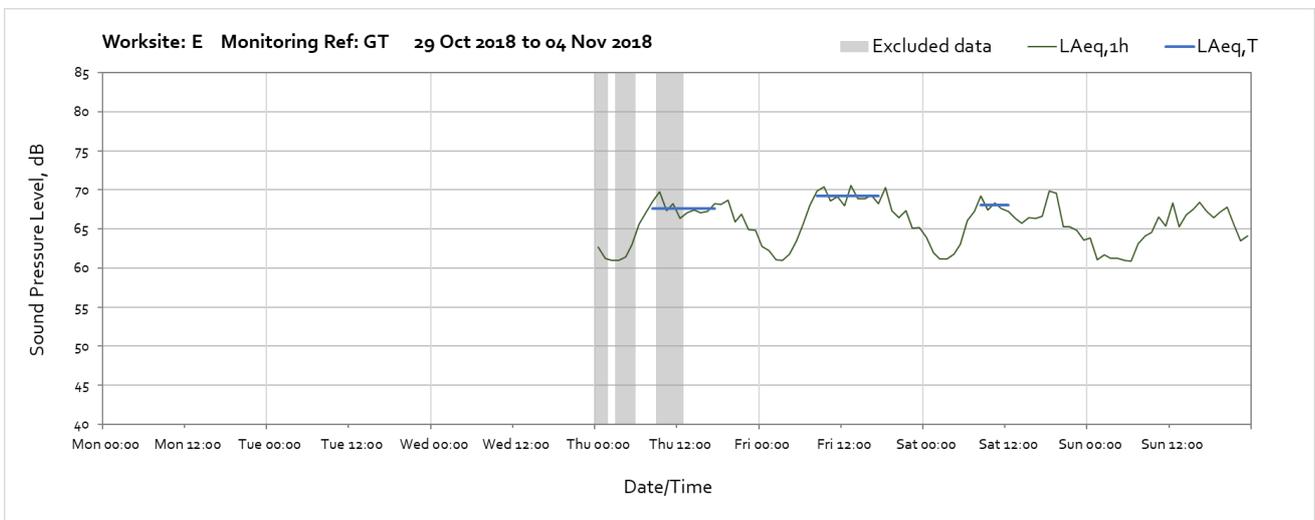
# Worksite: D – Monitoring Ref: N004

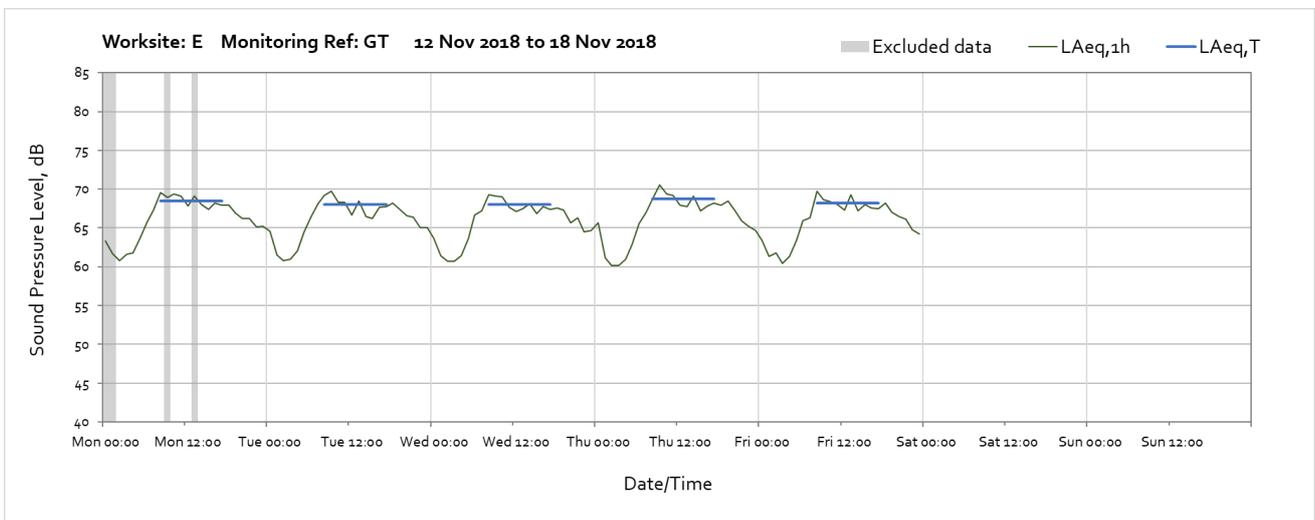
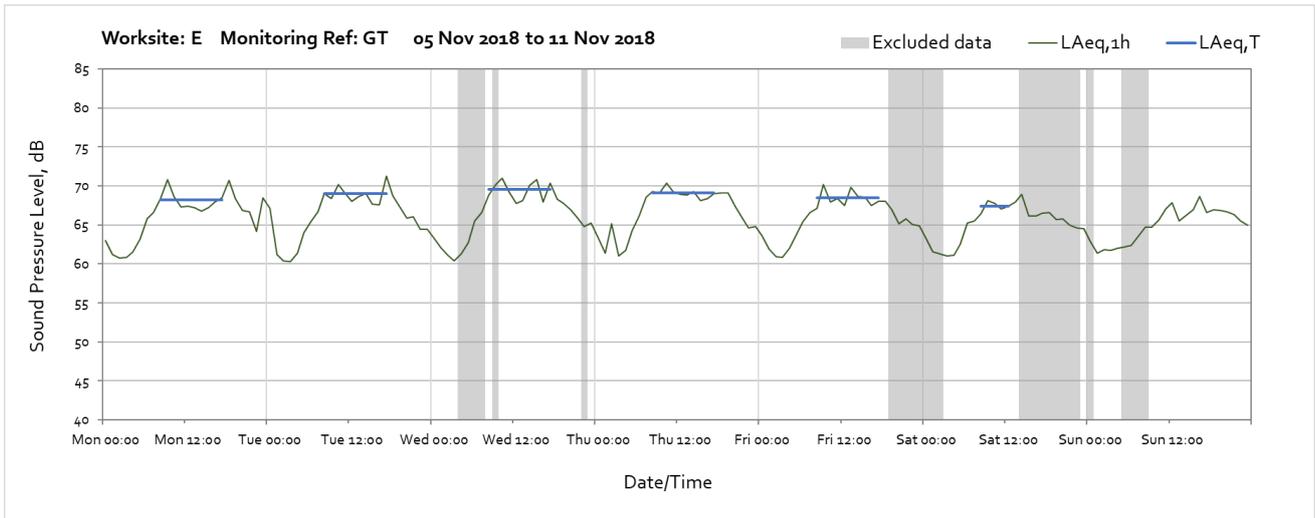




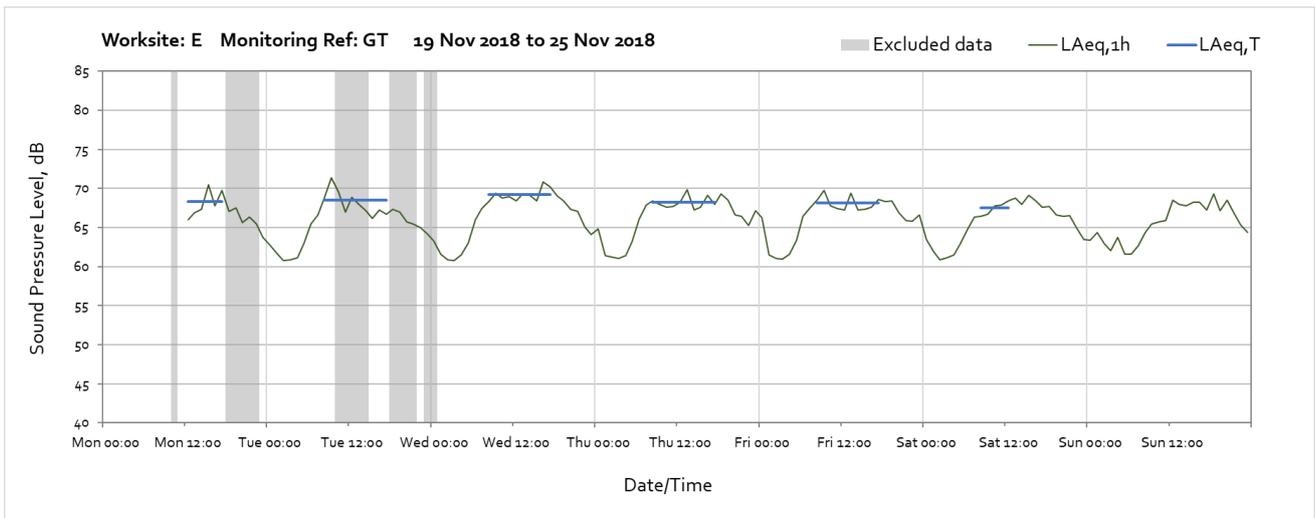
## Worksite: E – Monitoring Ref: GT

NOTE – Due to the recent installation of a power generator in close proximity to the noise monitor, the measured noise levels are not representative of noise at surrounding areas. Noise monitor N005 has been installed on site at a location more representative of nearby residential properties.

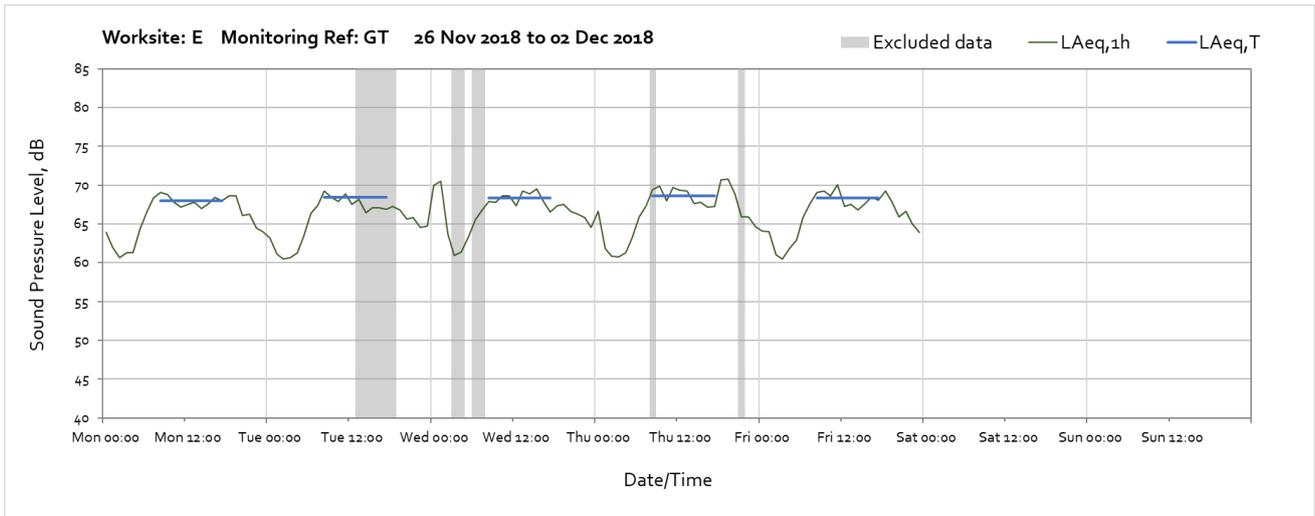




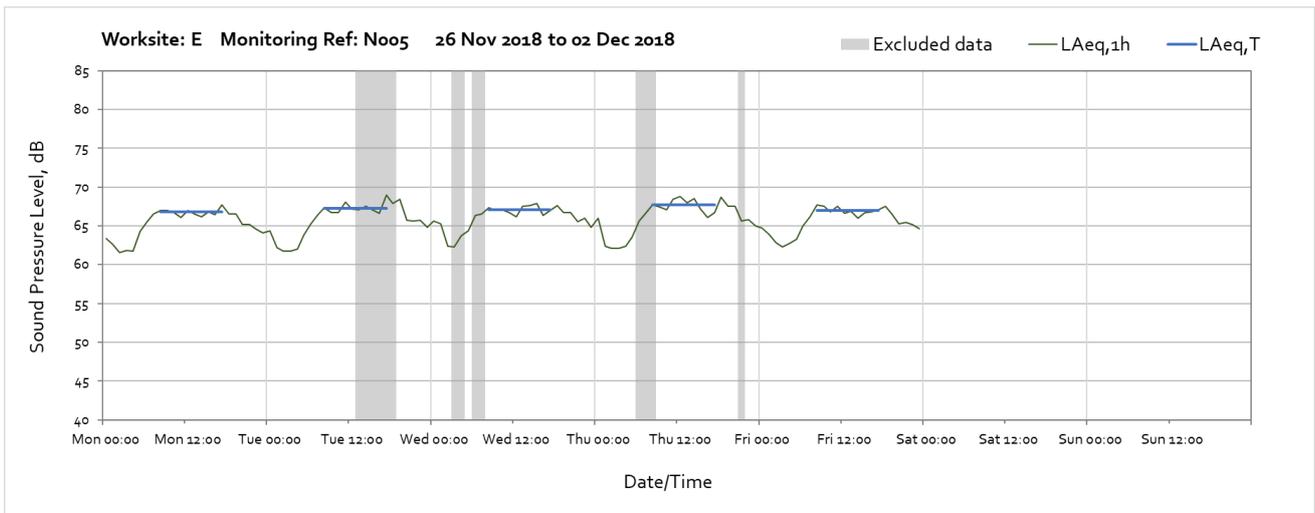
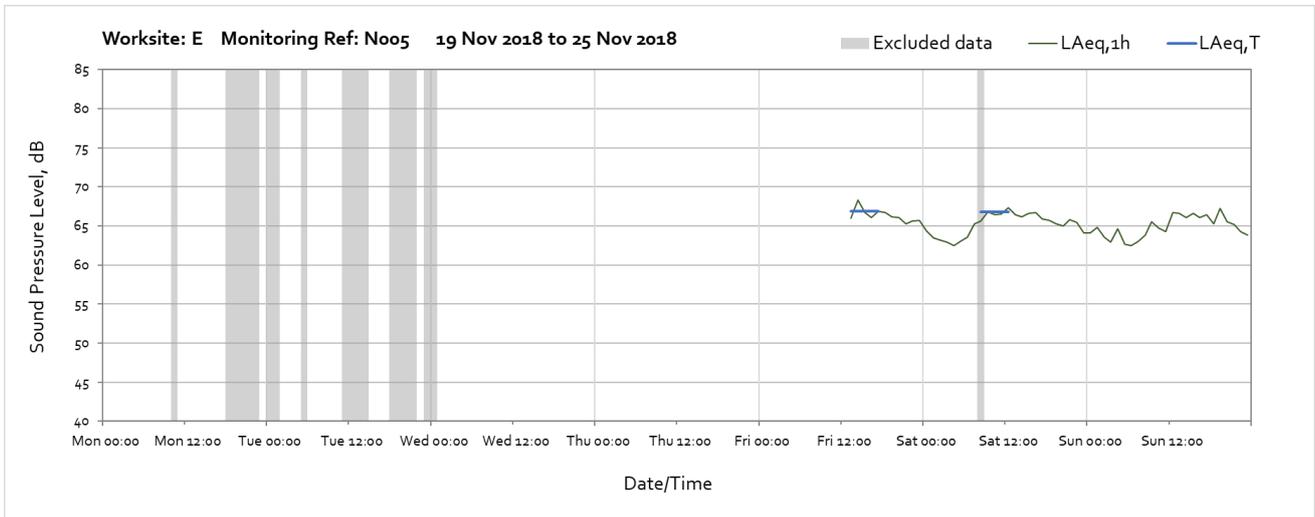
Note – Missing data between 00:00 on Saturday 17<sup>th</sup> and 12:00 on Monday 19<sup>th</sup> due to a loss of power at the noise monitor.



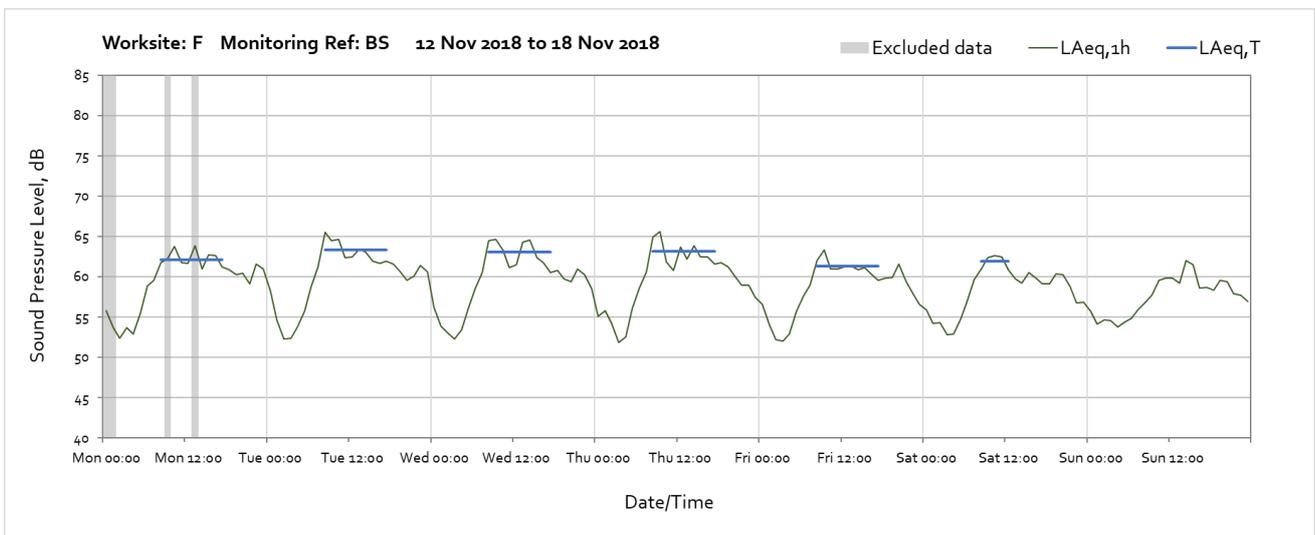
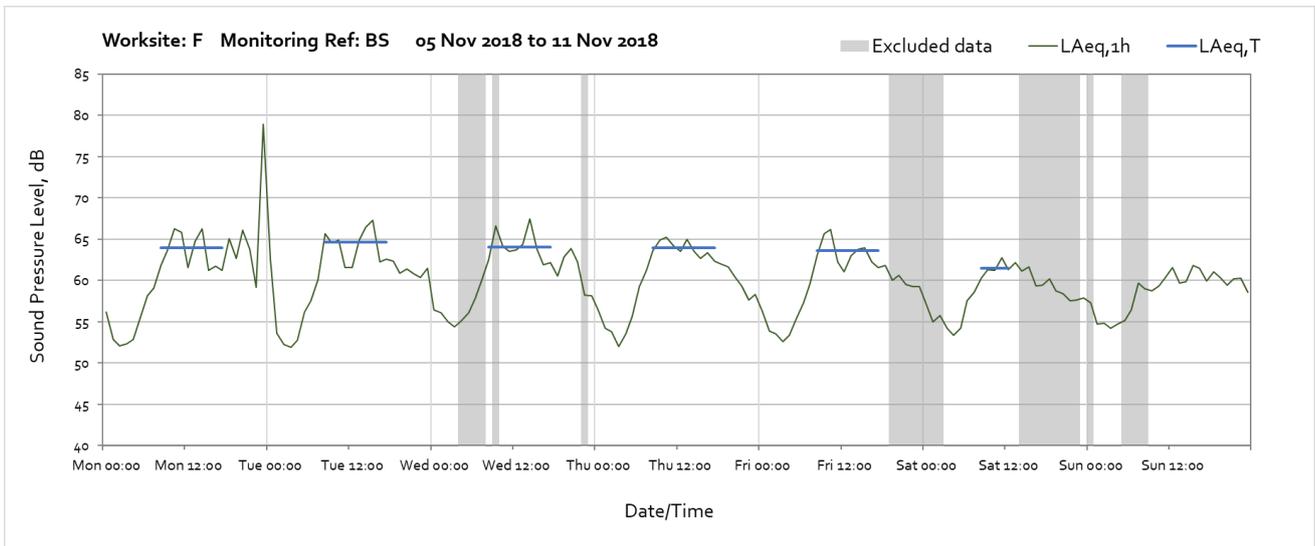
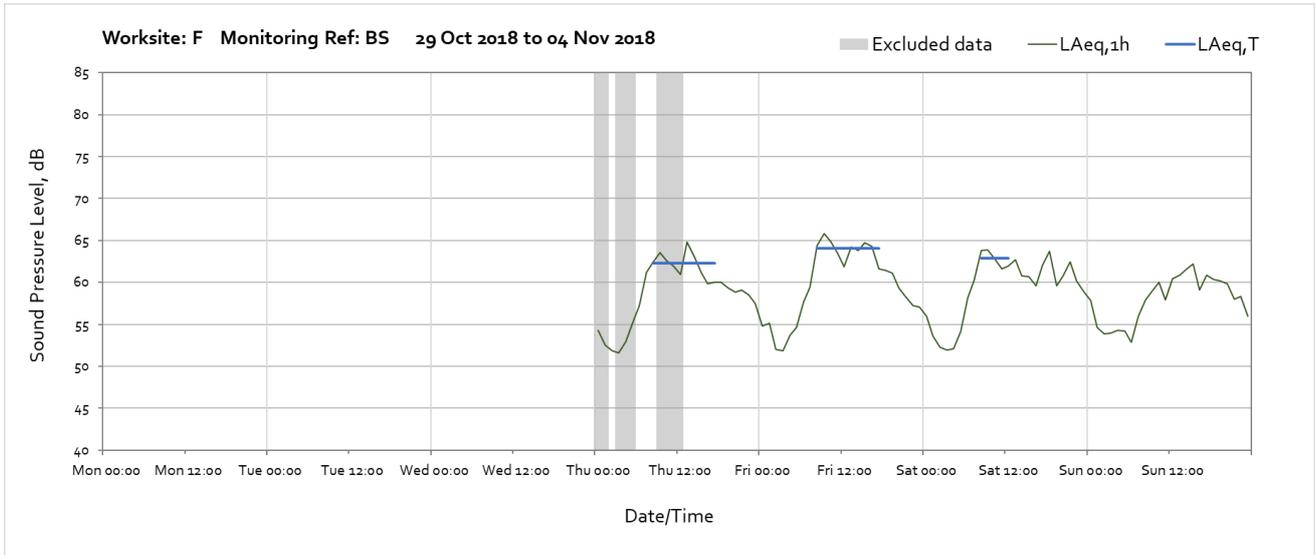
Note – Missing data between 00:00 on Saturday 17<sup>th</sup> and 12:00 on Monday 19<sup>th</sup> due to a loss of power at the noise monitor.

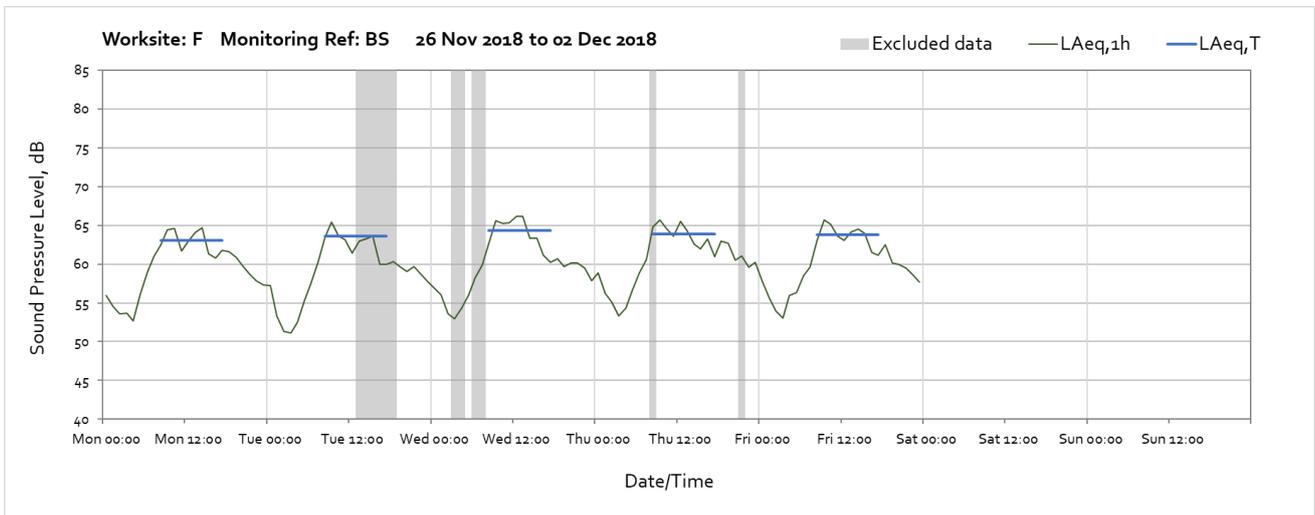
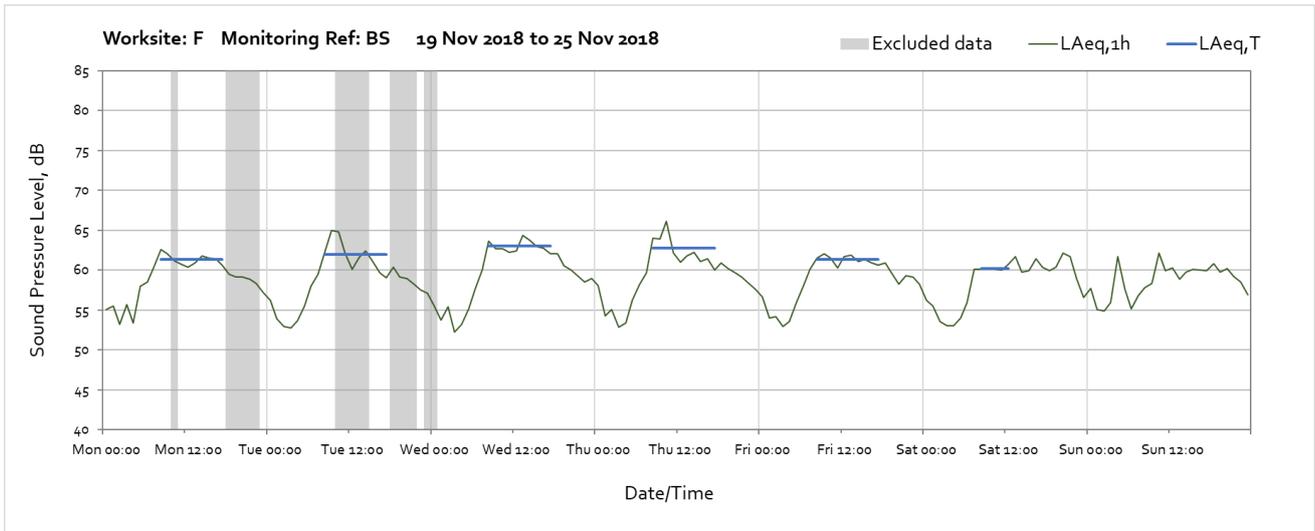


## Worksite: E – Monitoring Ref: N005

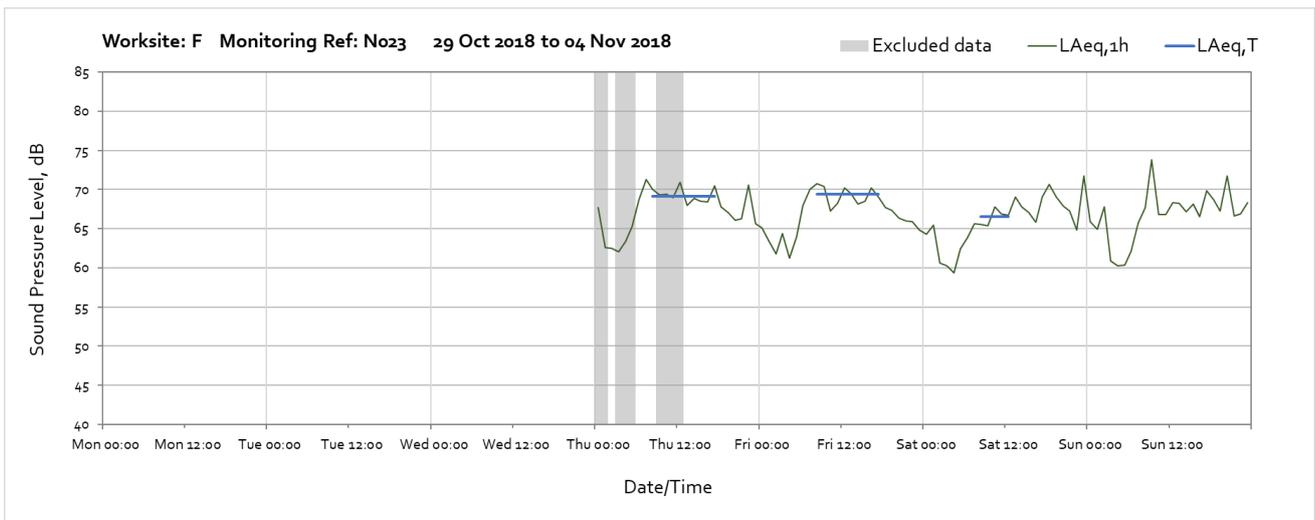


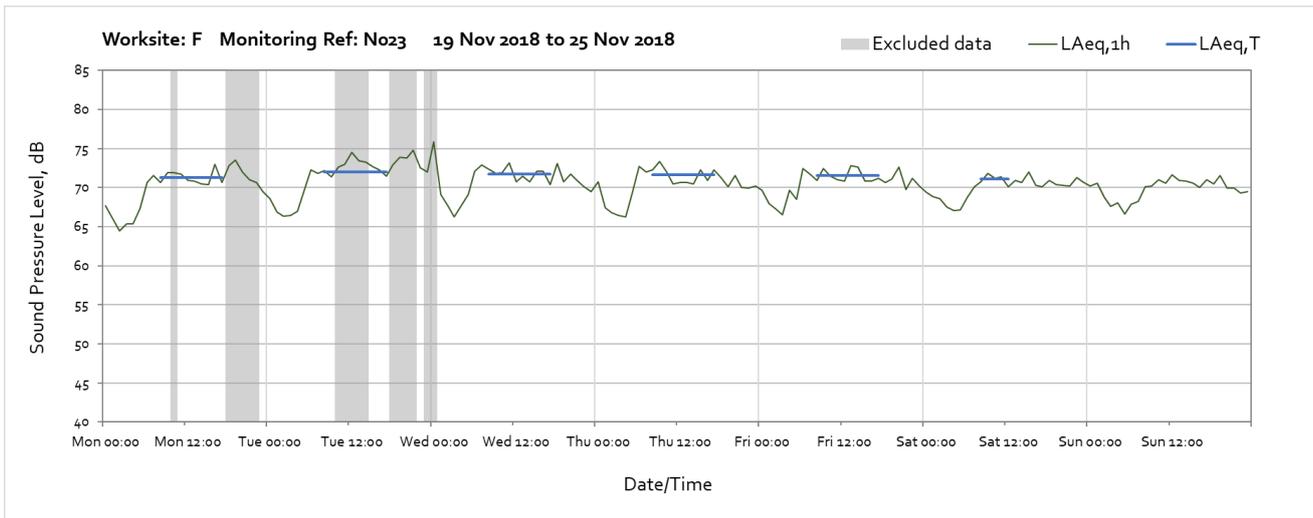
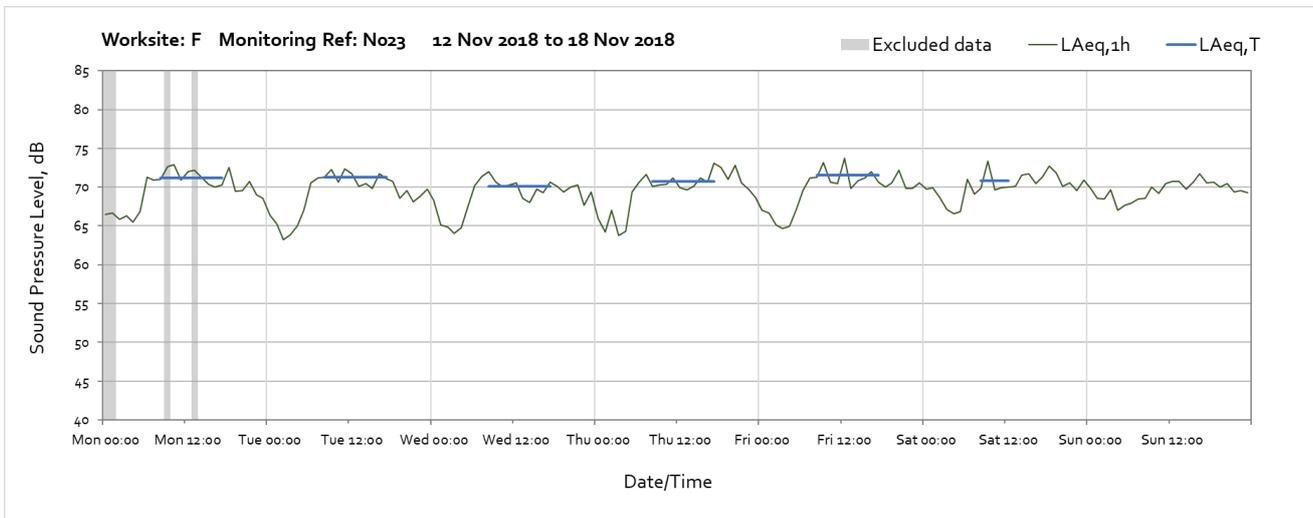
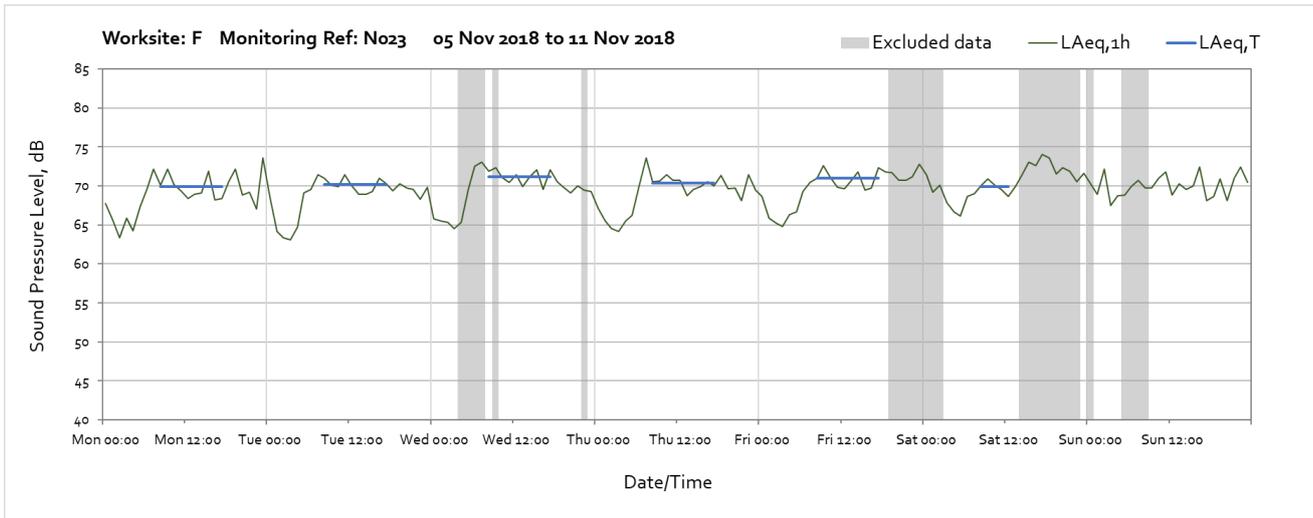
# Worksite: F – Monitoring Ref: BS

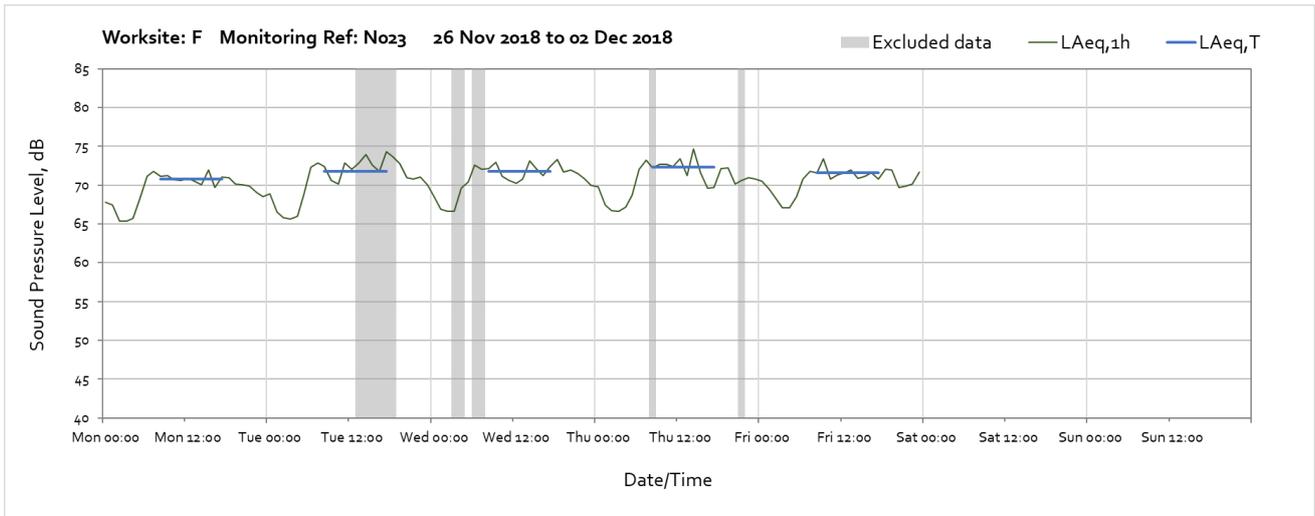




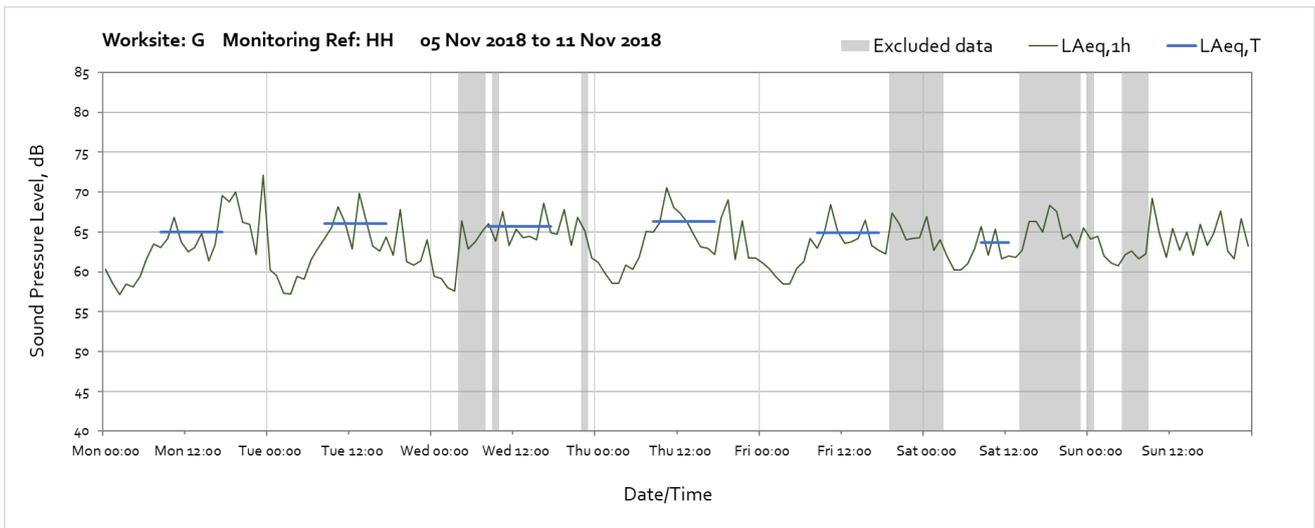
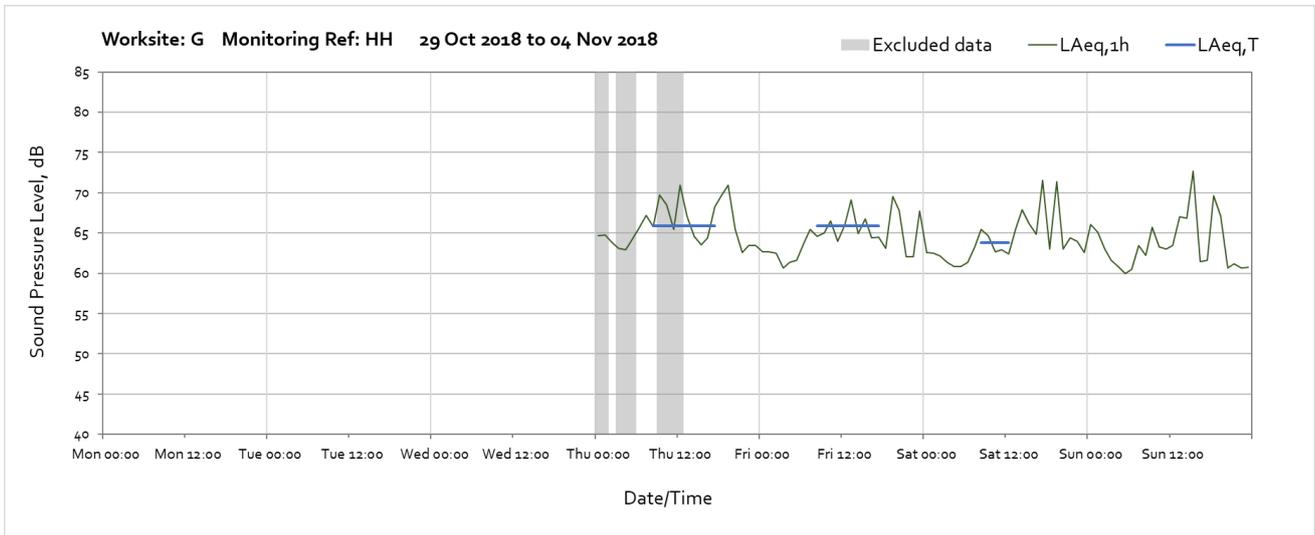
## Worksite: F – Monitoring Ref: N023

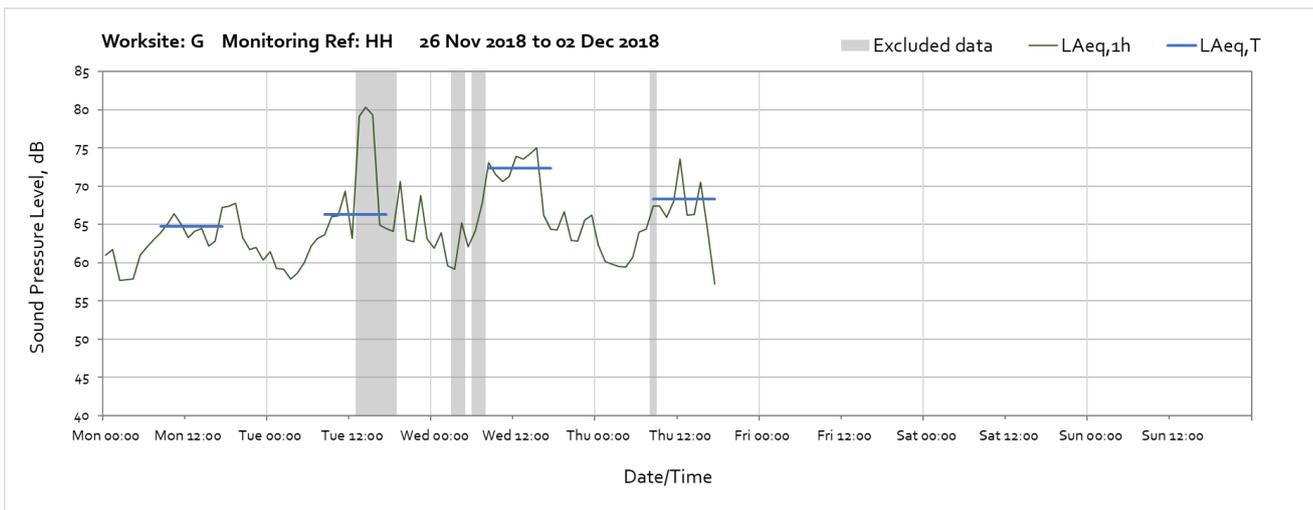
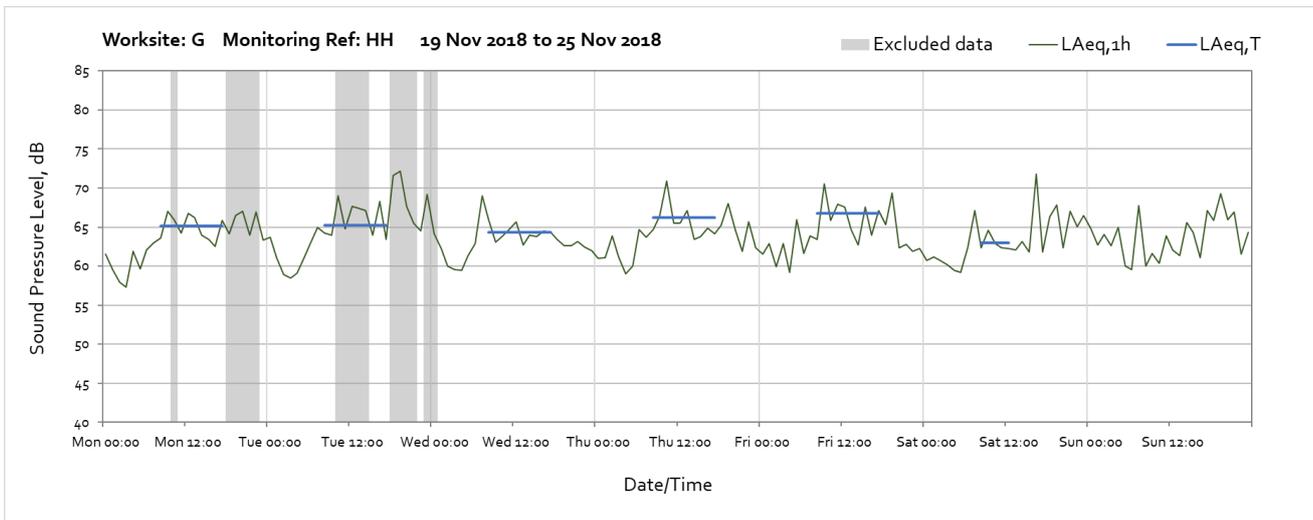
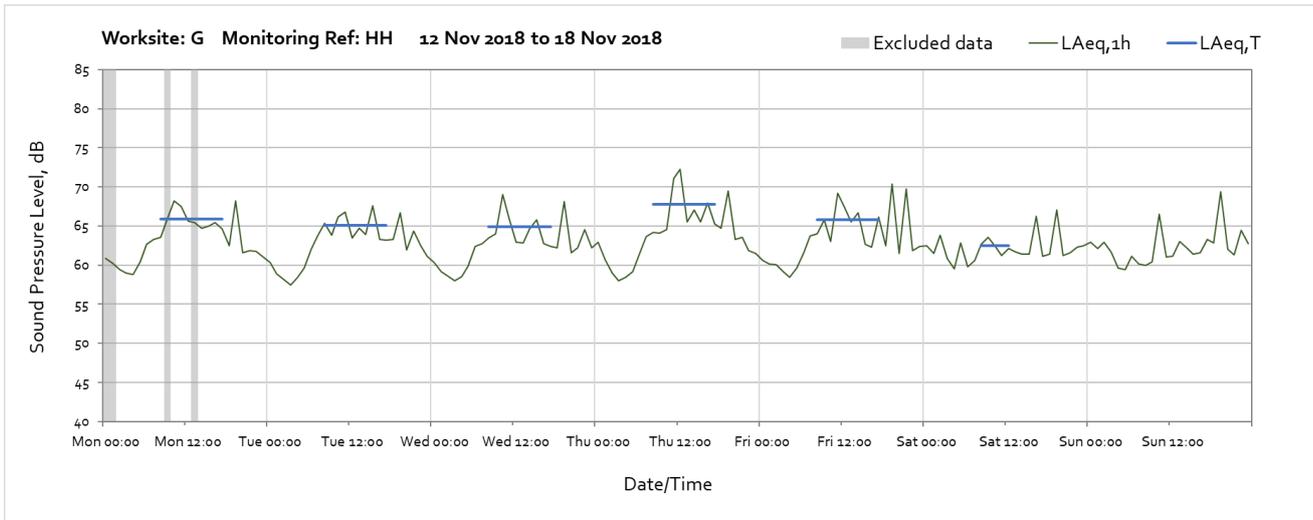






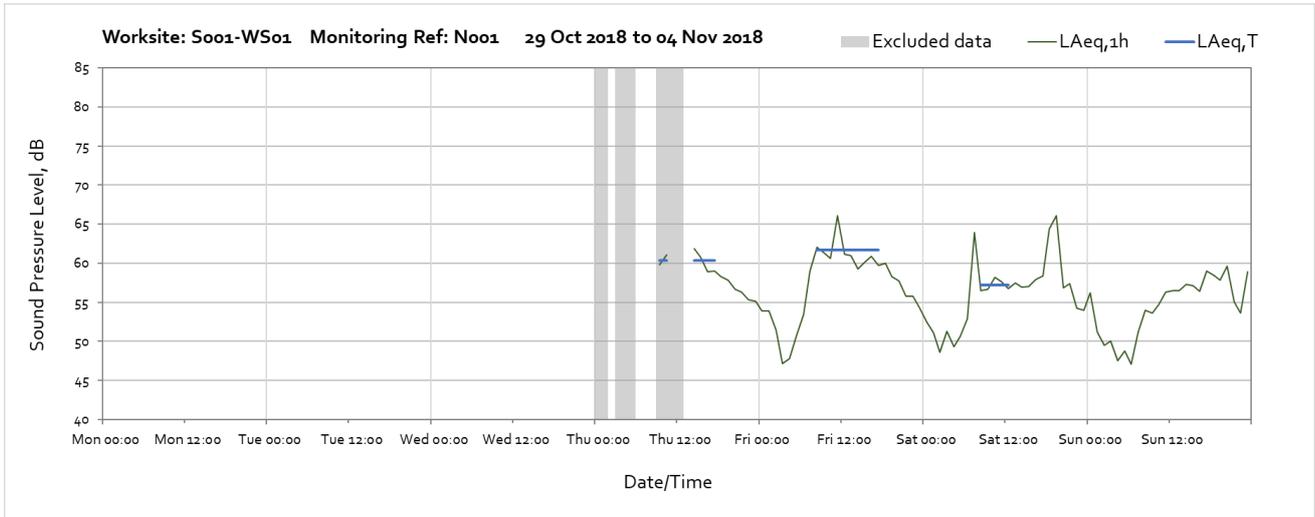
## Worksite: G – Monitoring Ref: HH



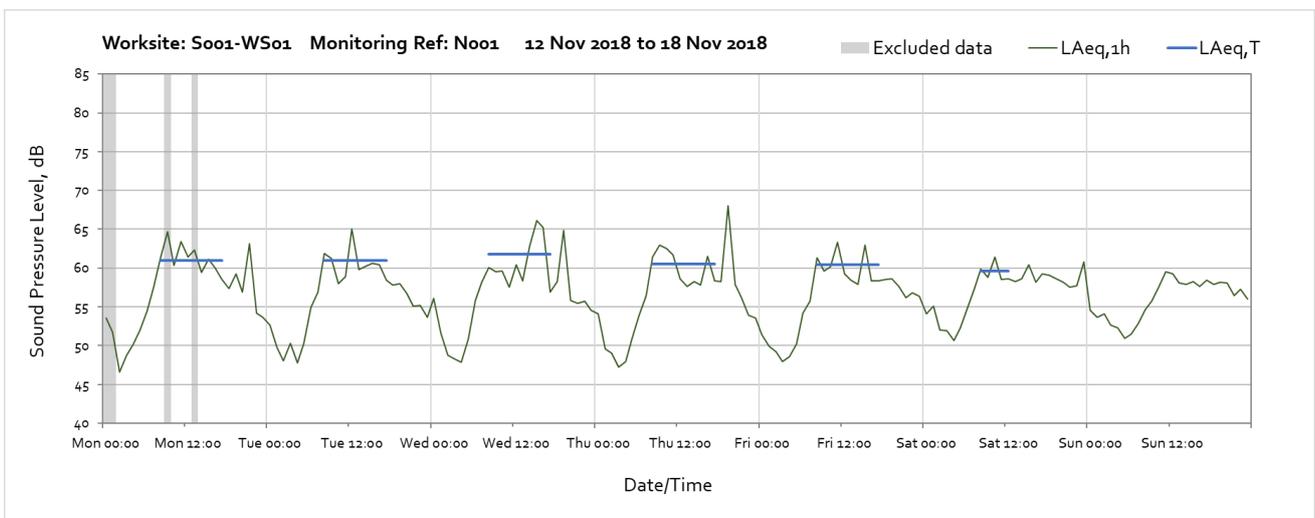
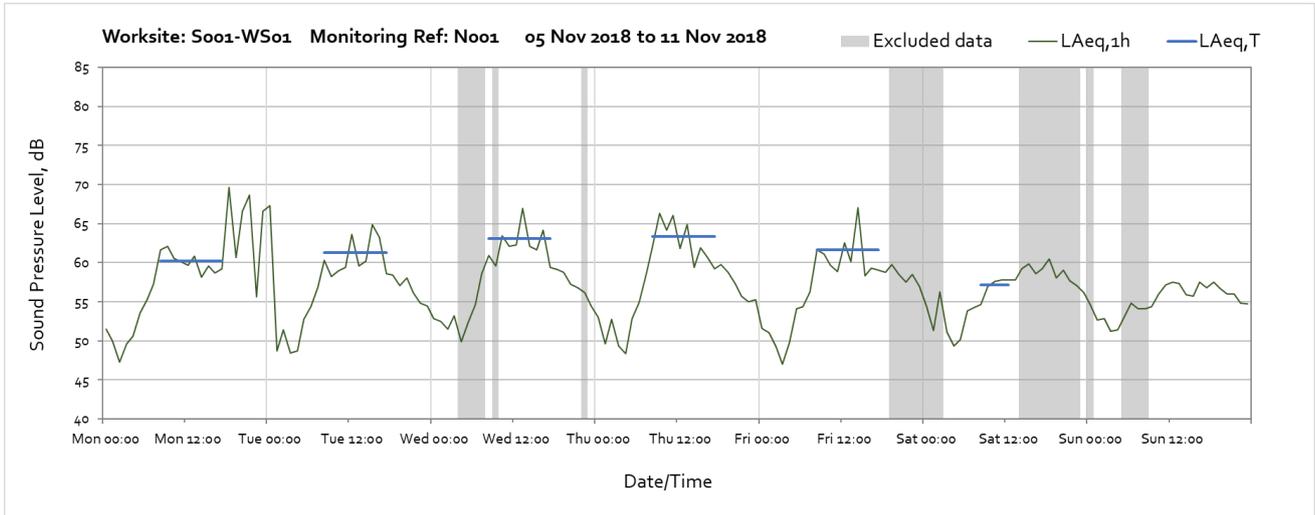


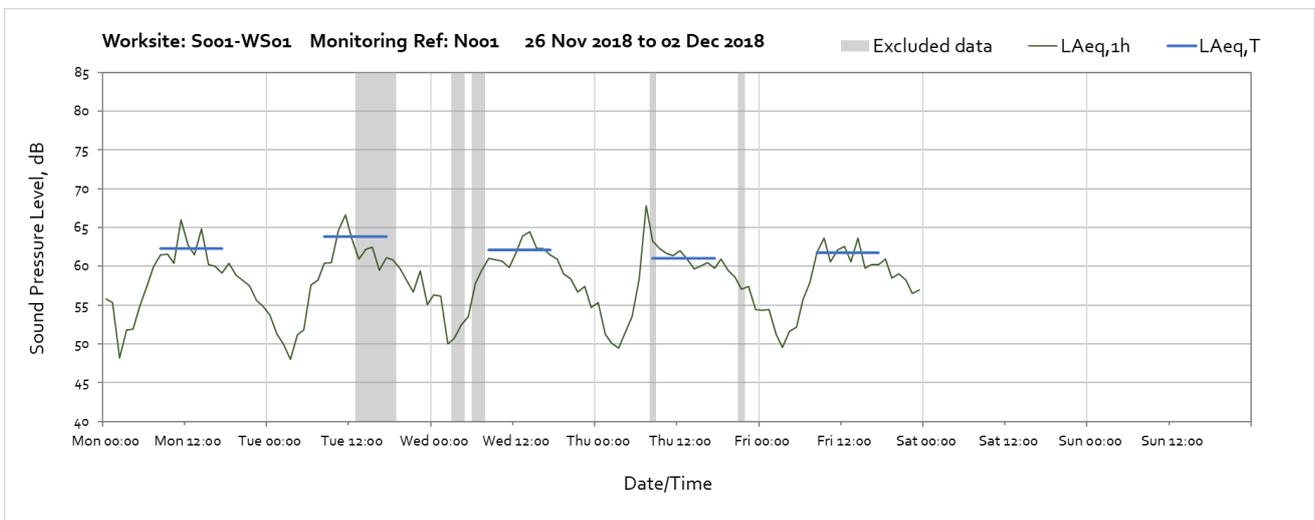
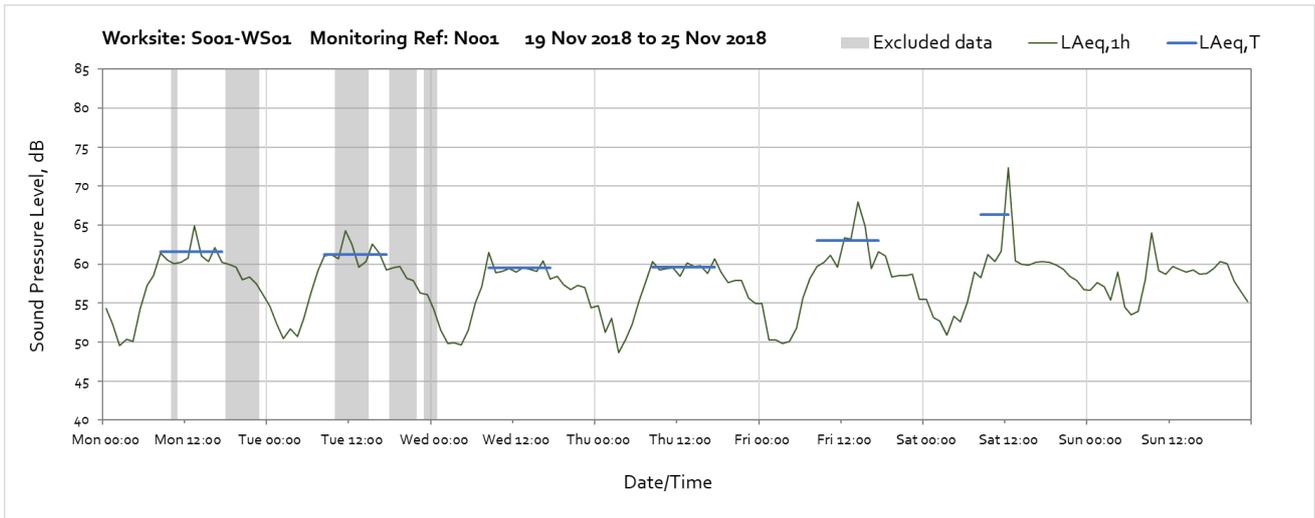
Note – Missing data from 18:00 on Thursday 29<sup>th</sup> until end of month due to a loss of power at the noise monitor.

# Worksite: S001-WS01 – Monitoring Ref: N001

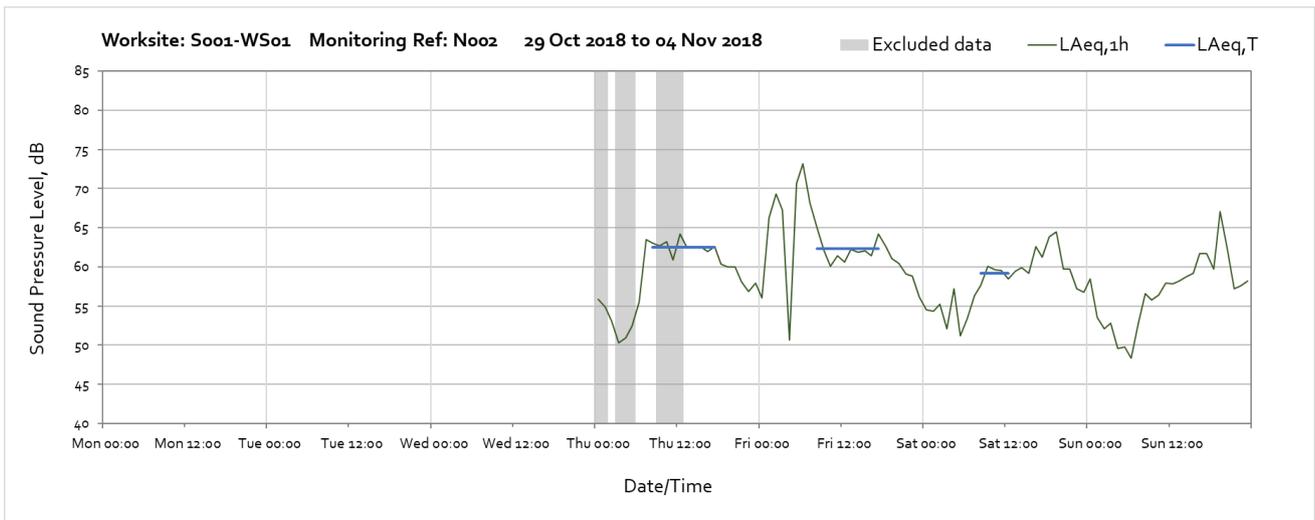


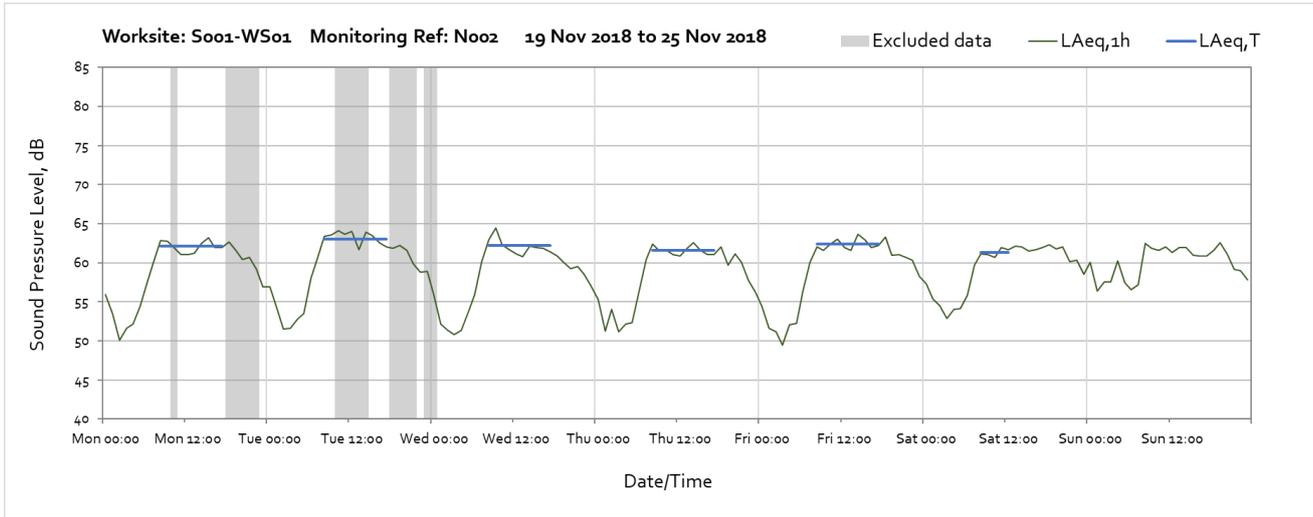
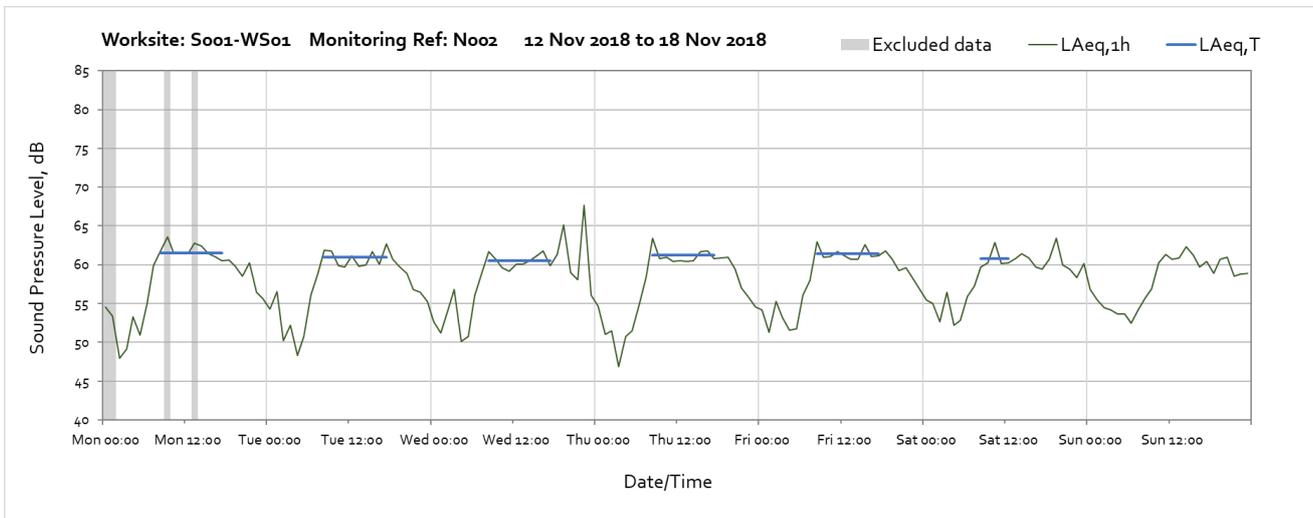
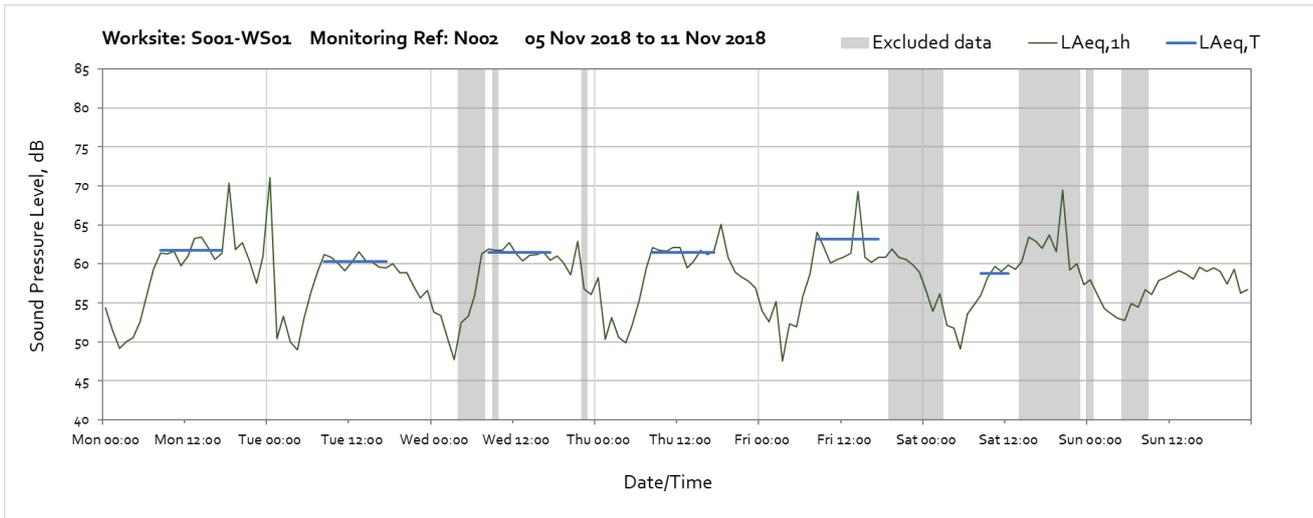
Note – Missing data between 11:00 and 14:00 on Thursday 1<sup>st</sup> due to a temporary loss of power at the noise monitor.

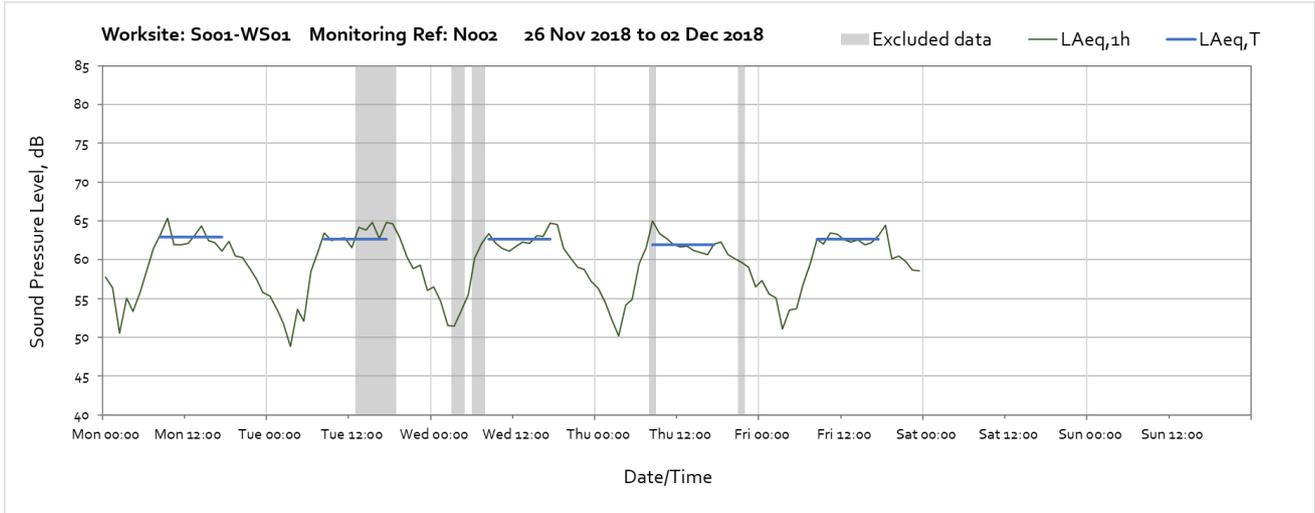




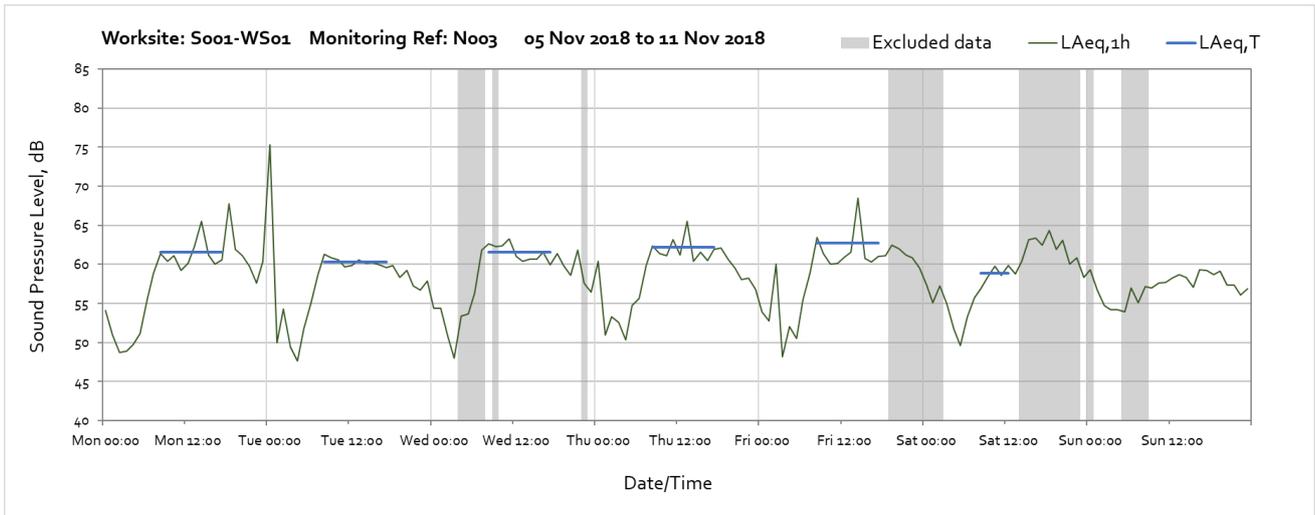
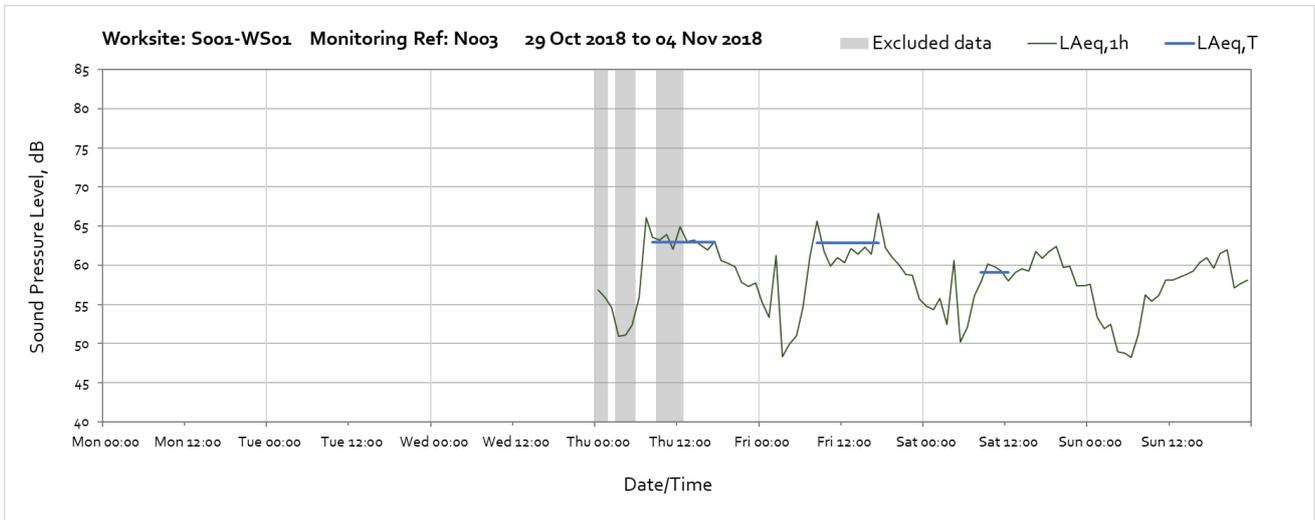
## Worksite: S001-WS01 – Monitoring Ref: N002

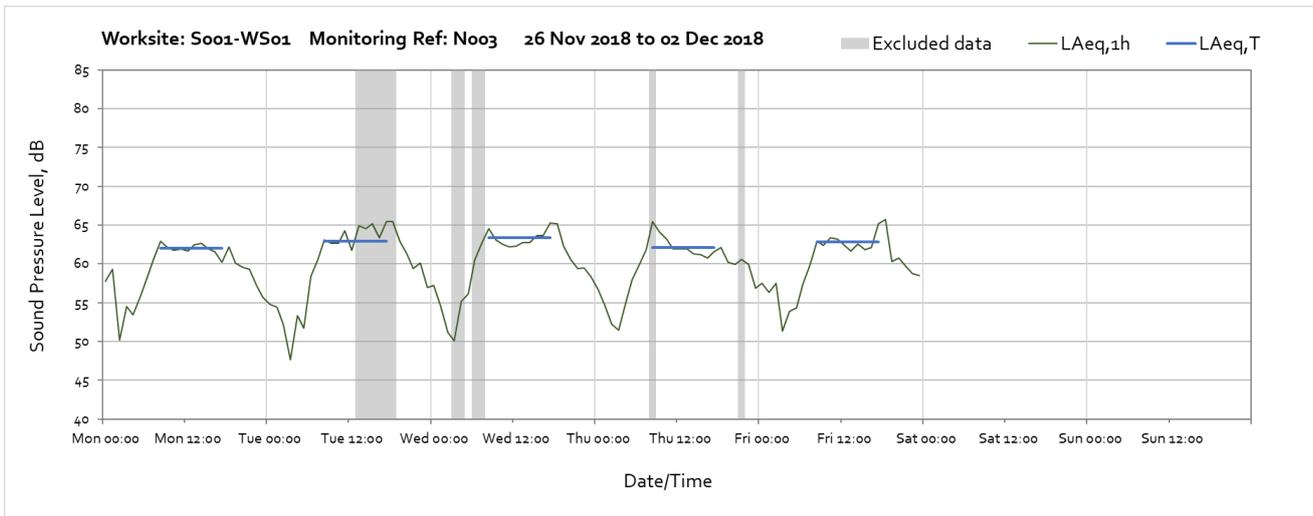
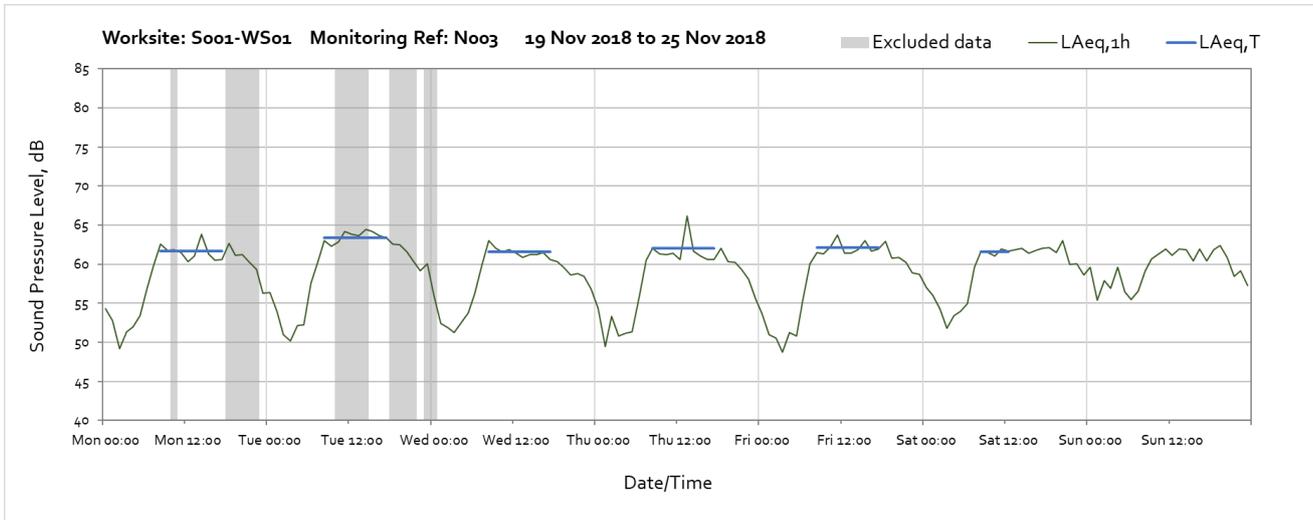
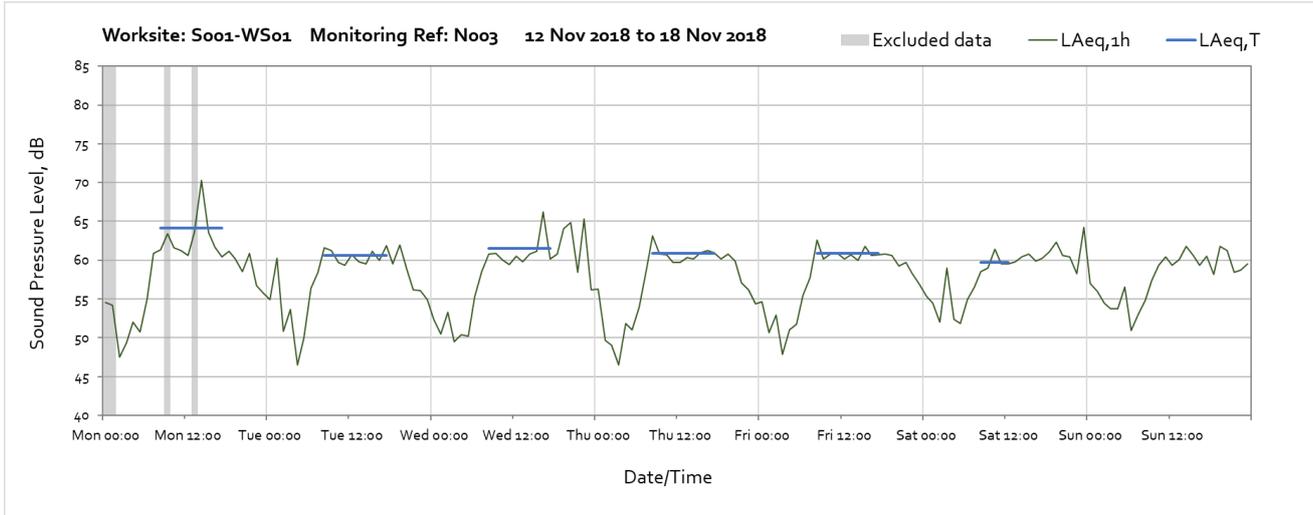




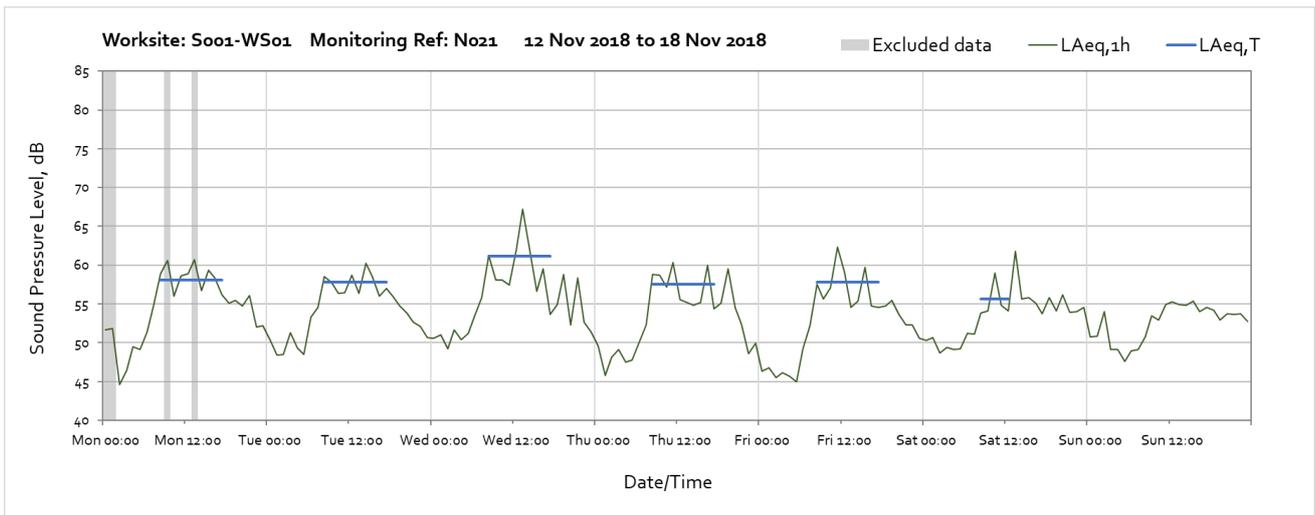
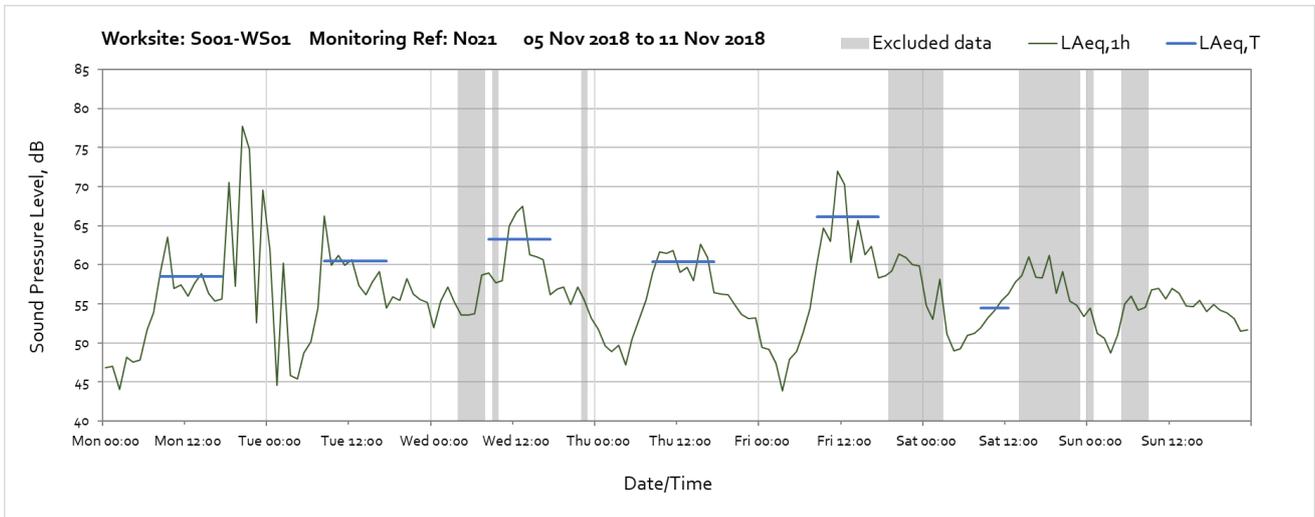
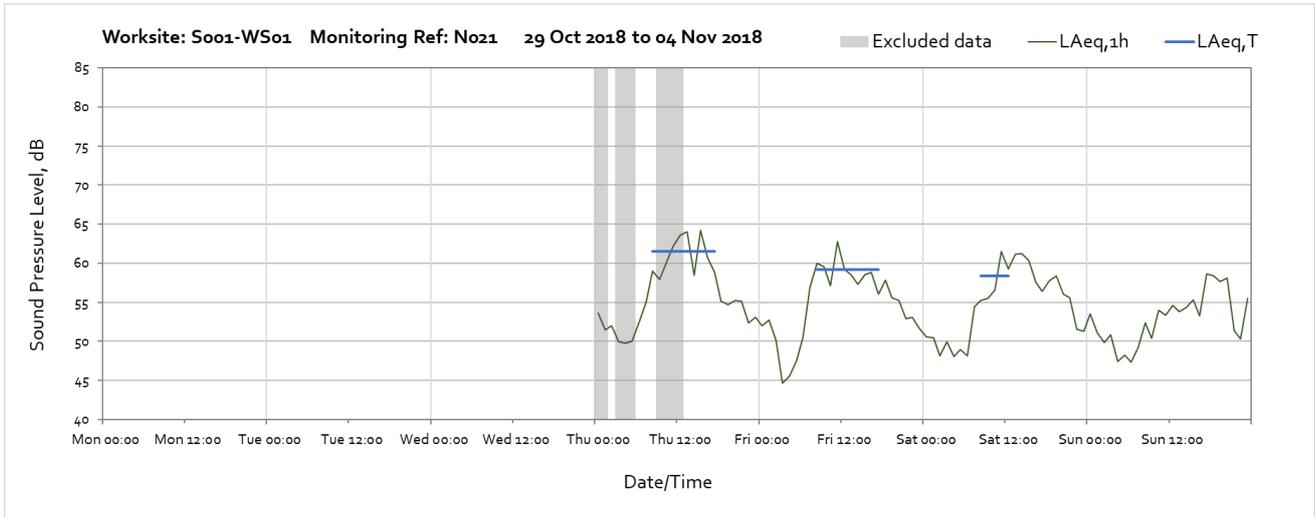


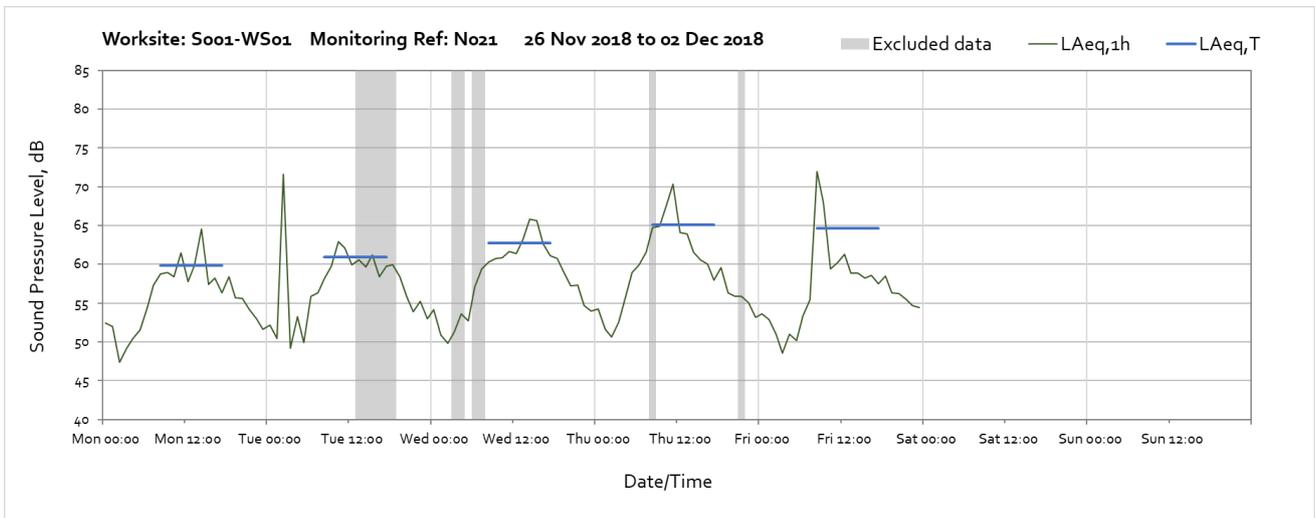
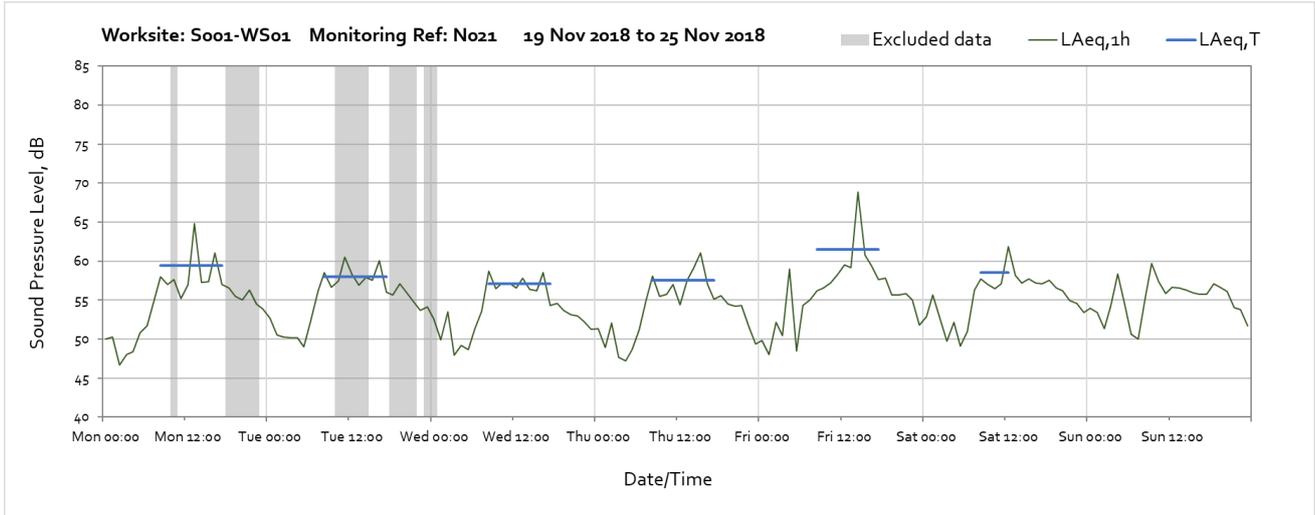
## Worksite: S001-WS01 – Monitoring Ref: N003



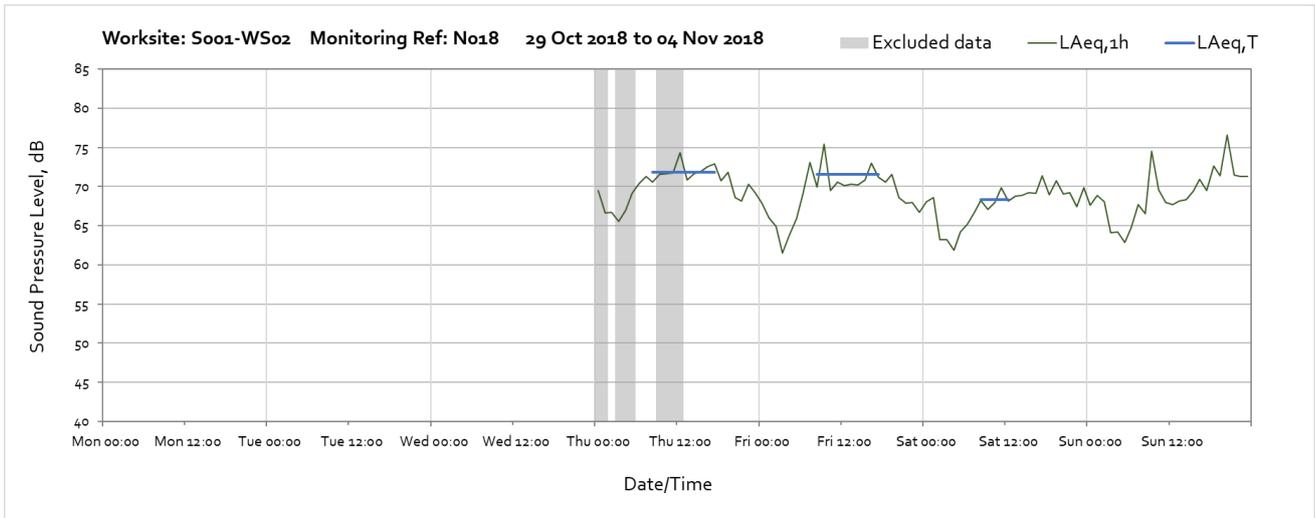


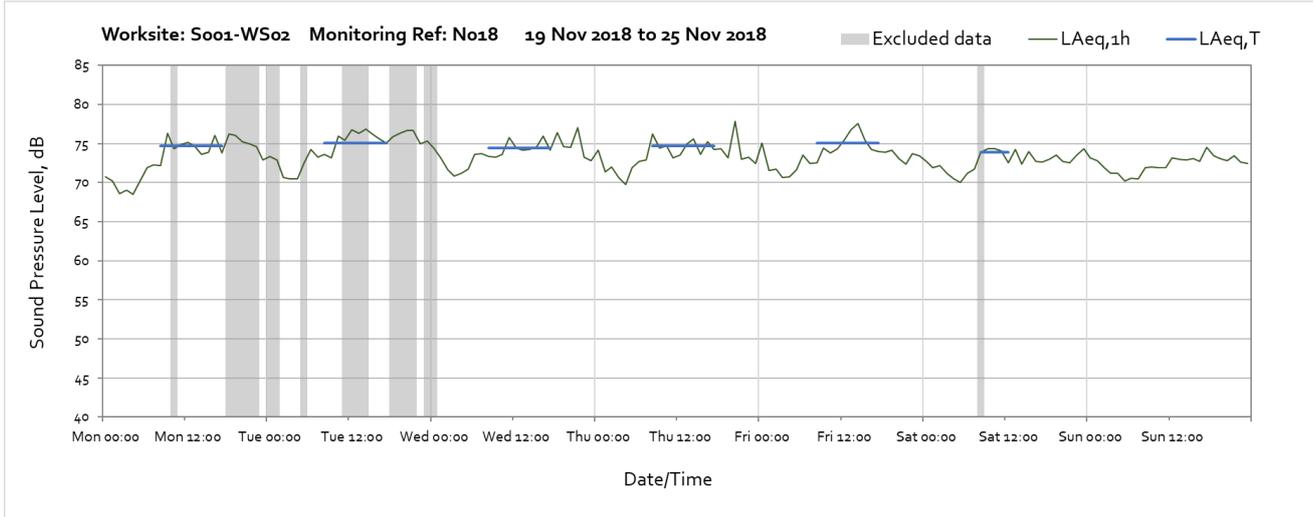
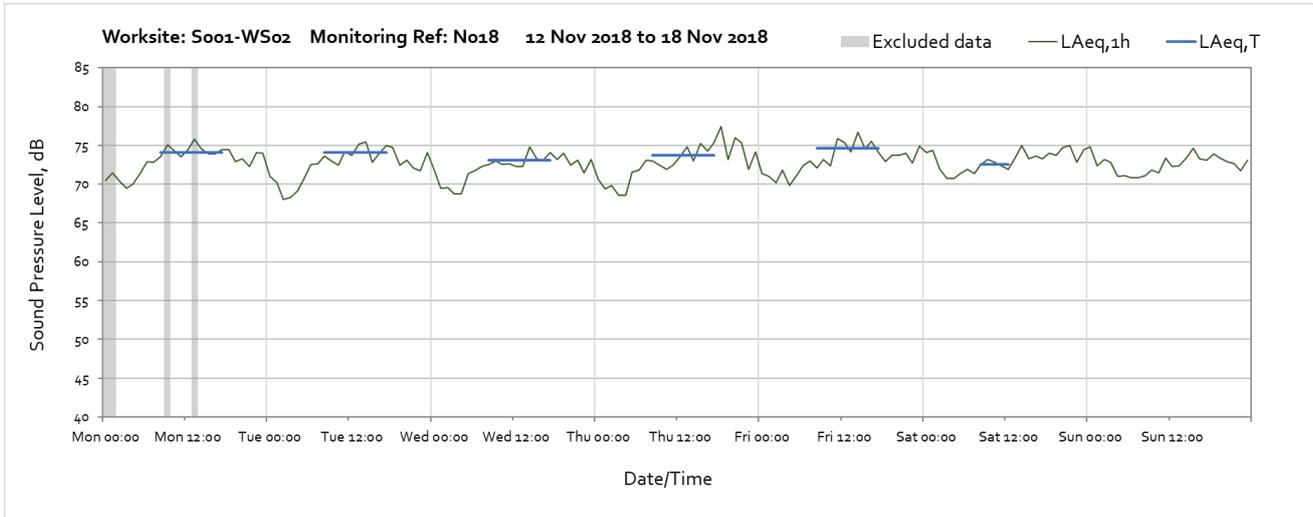
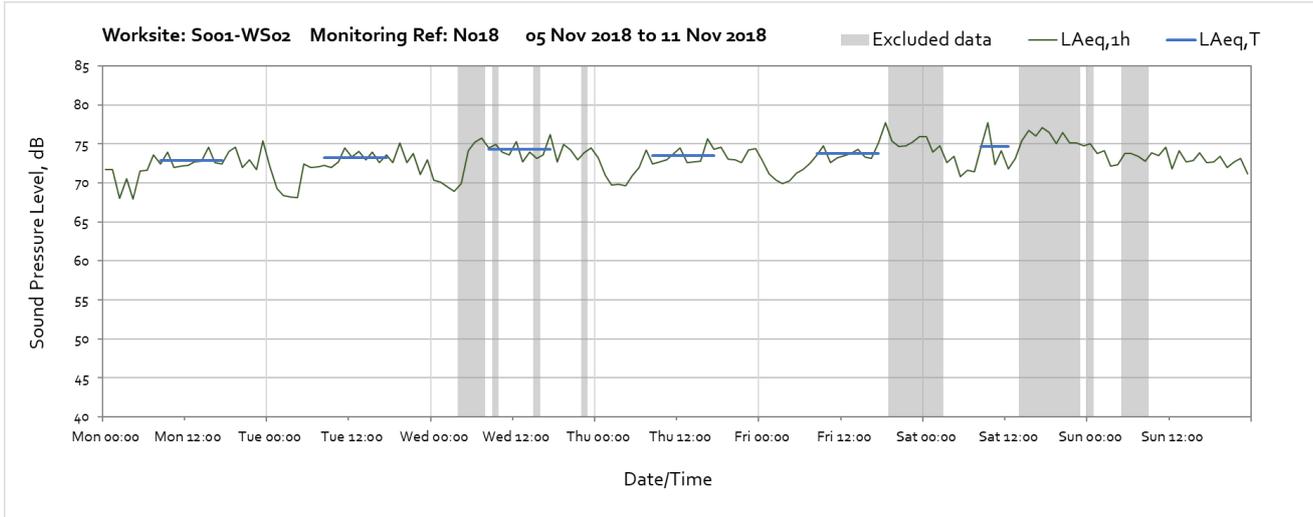
# Worksite: S001-WS01 – Monitoring Ref: N021

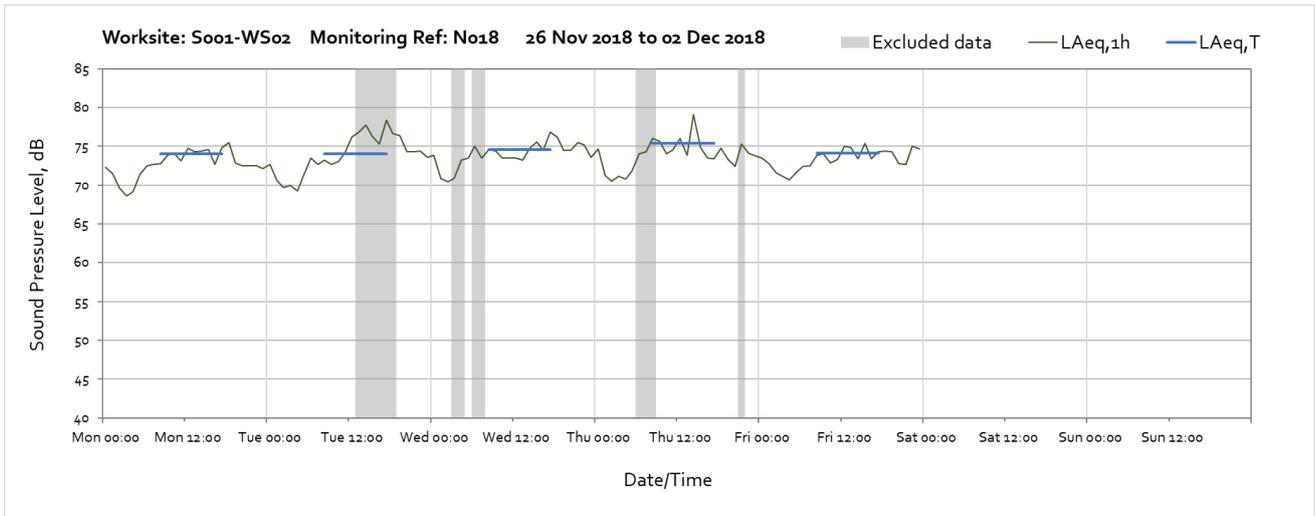




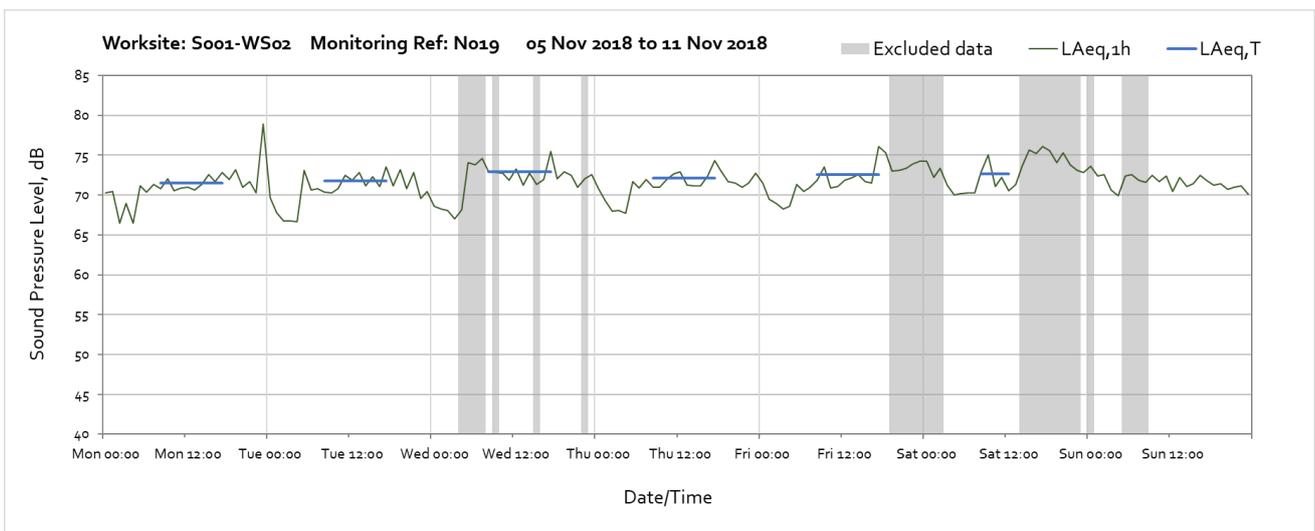
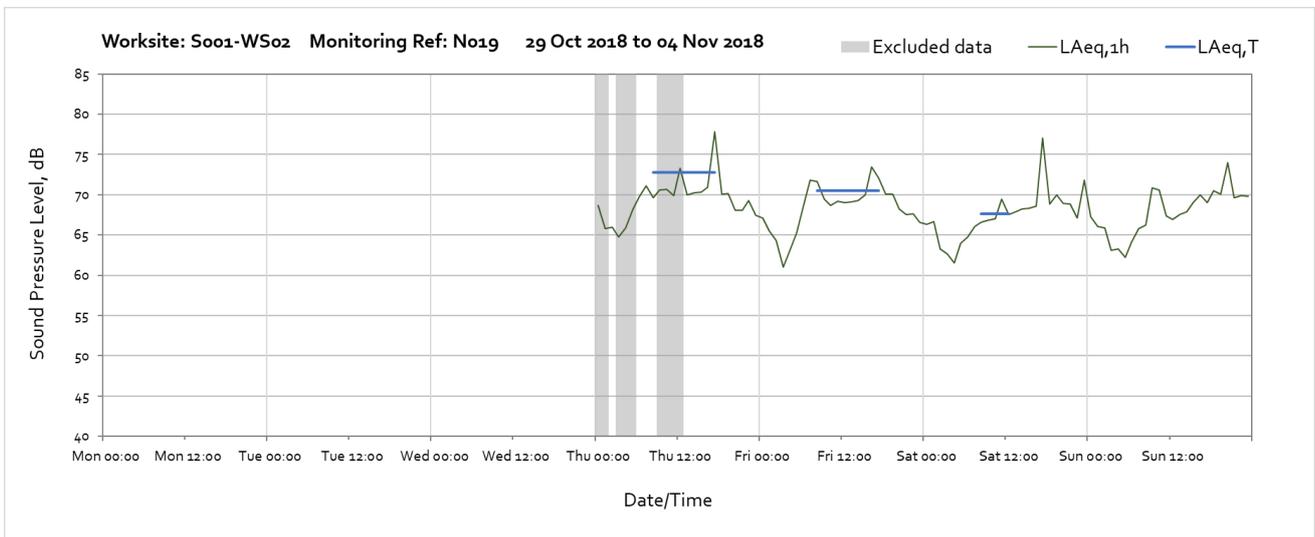
## Worksite: S001-WS02 – Monitoring Ref: N018

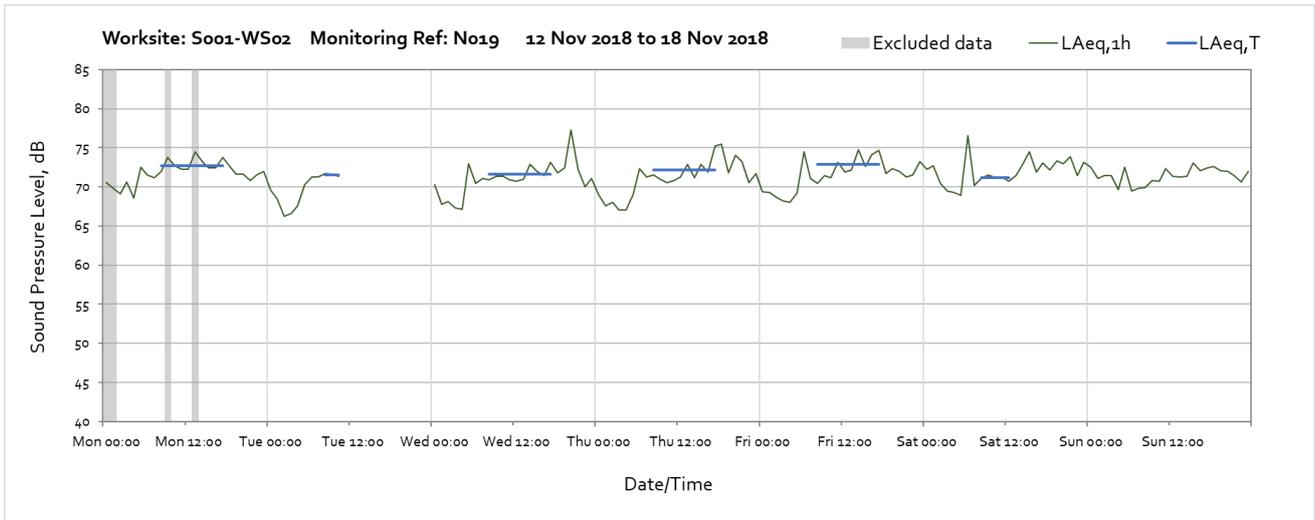




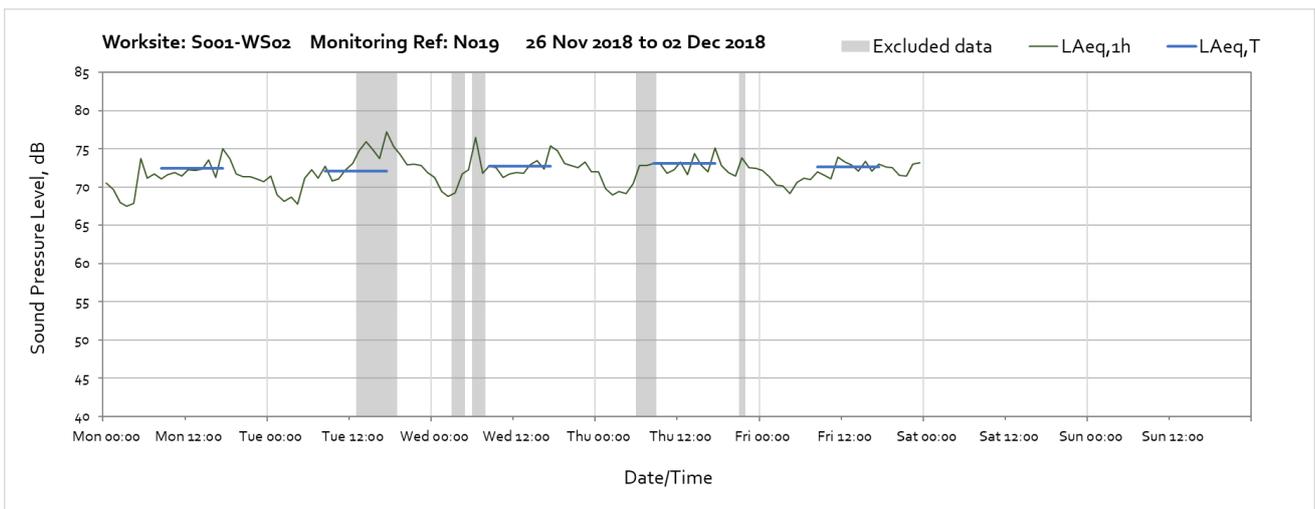
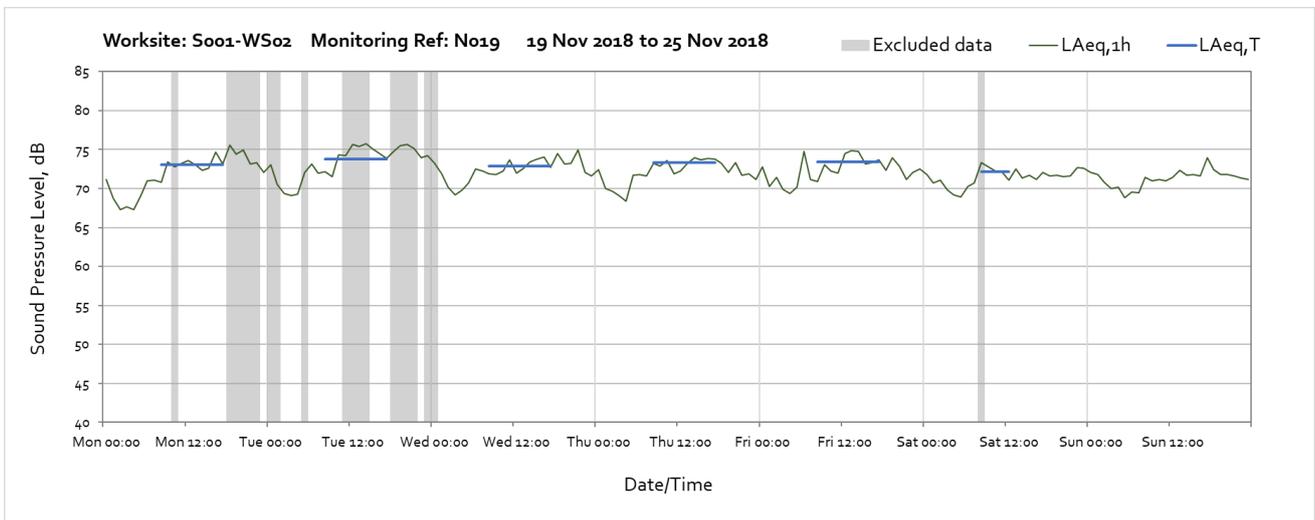


## Worksite: S001-WS02 – Monitoring Ref: N019

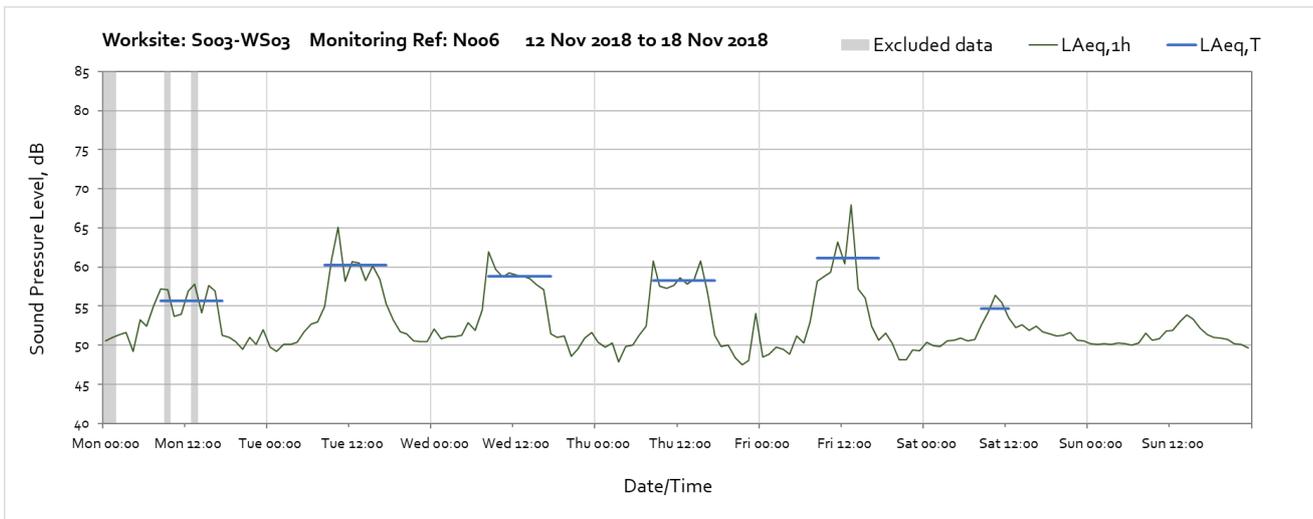
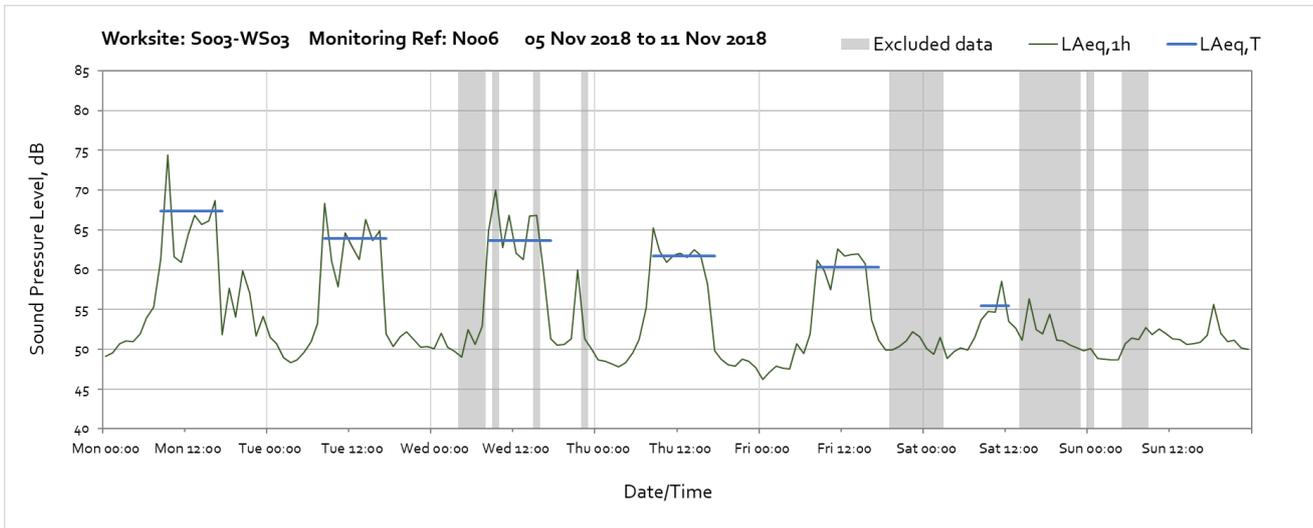
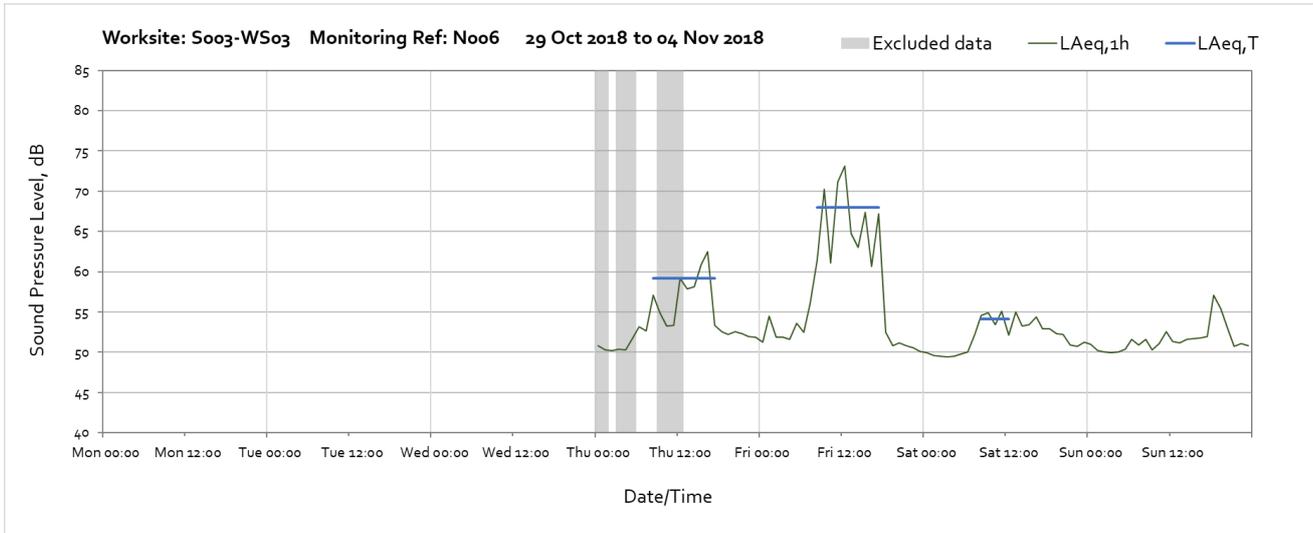


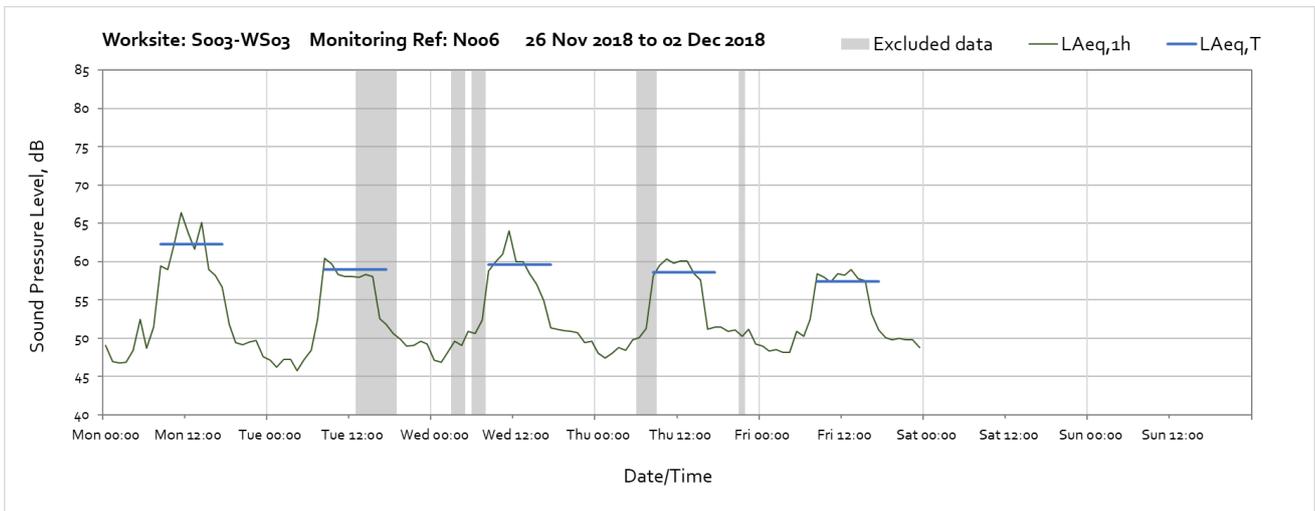
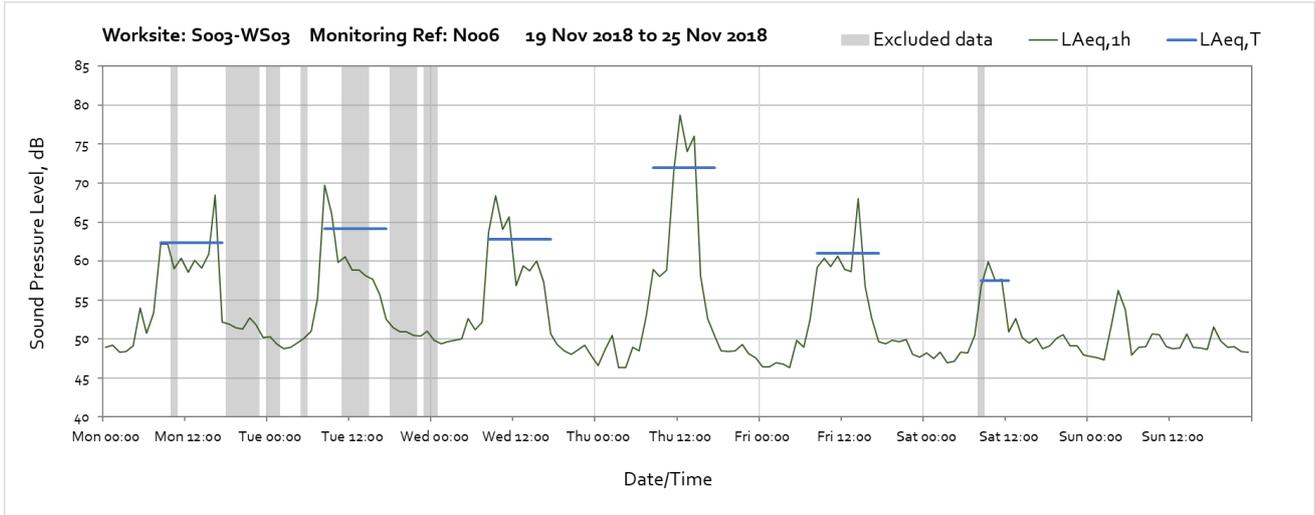


Note – Missing data between 11:00 on Tuesday 13<sup>th</sup> and 00:00 on Wednesday 14<sup>th</sup> due to a loss of power at the noise monitor.

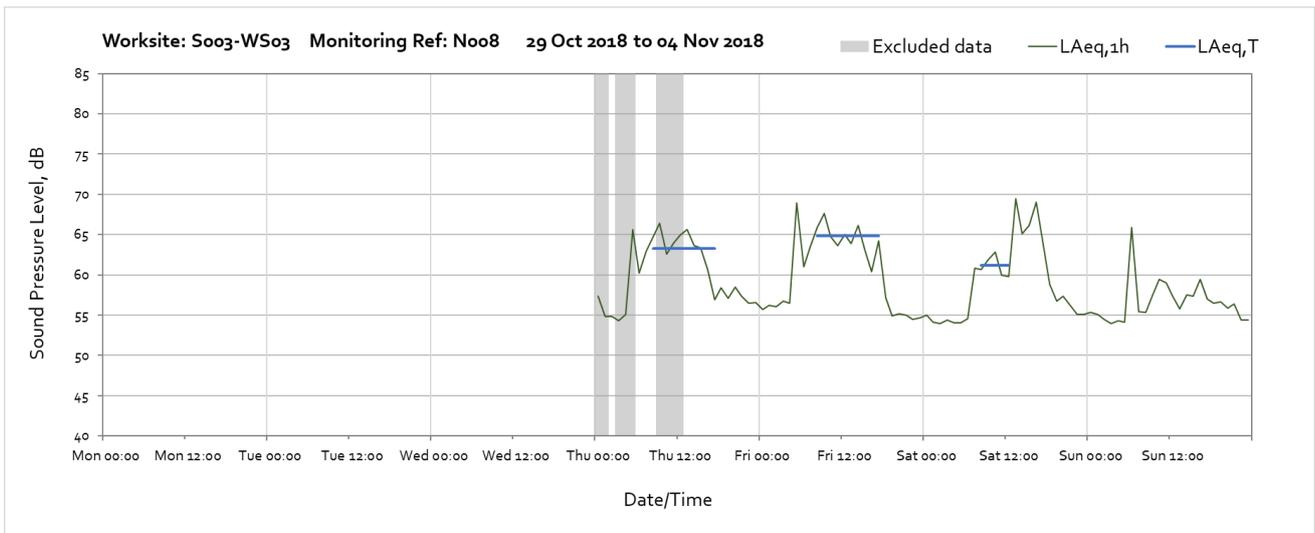


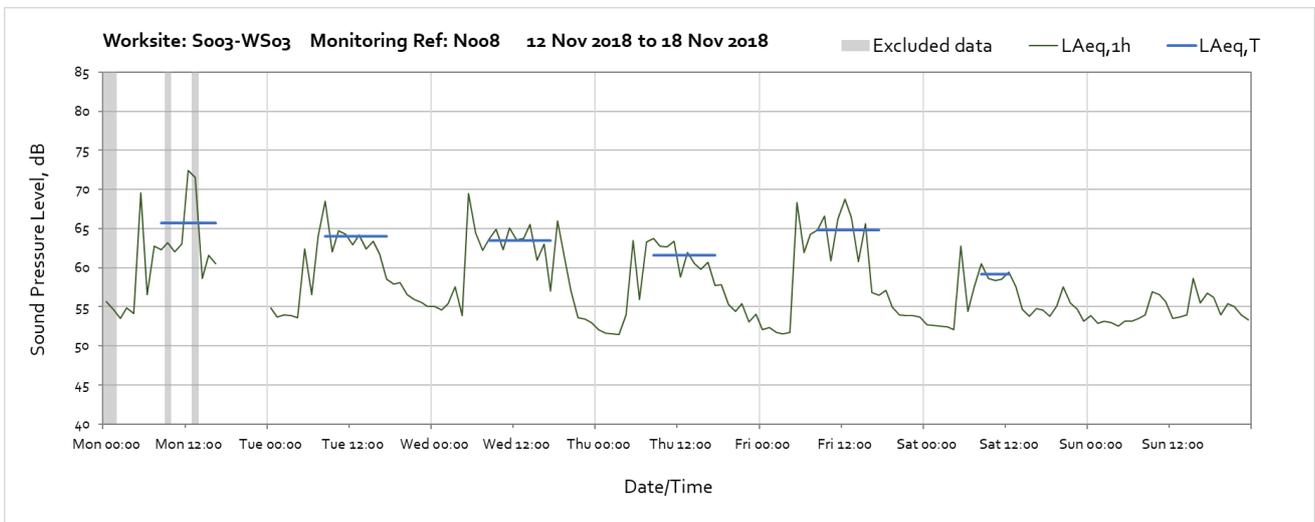
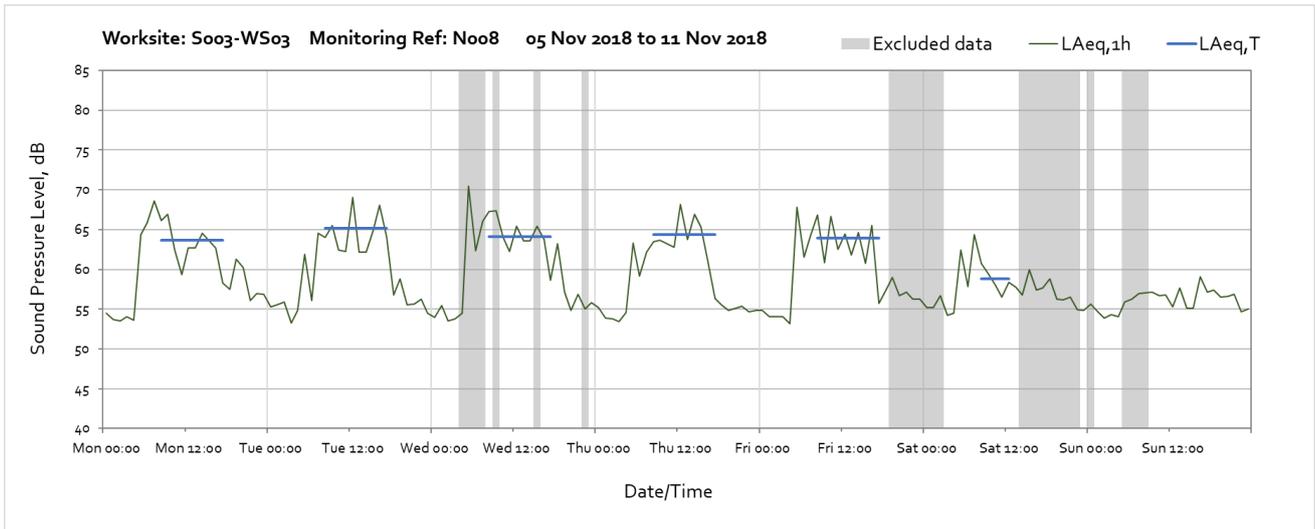
# Worksite: S003-WS03 – Monitoring Ref: N006



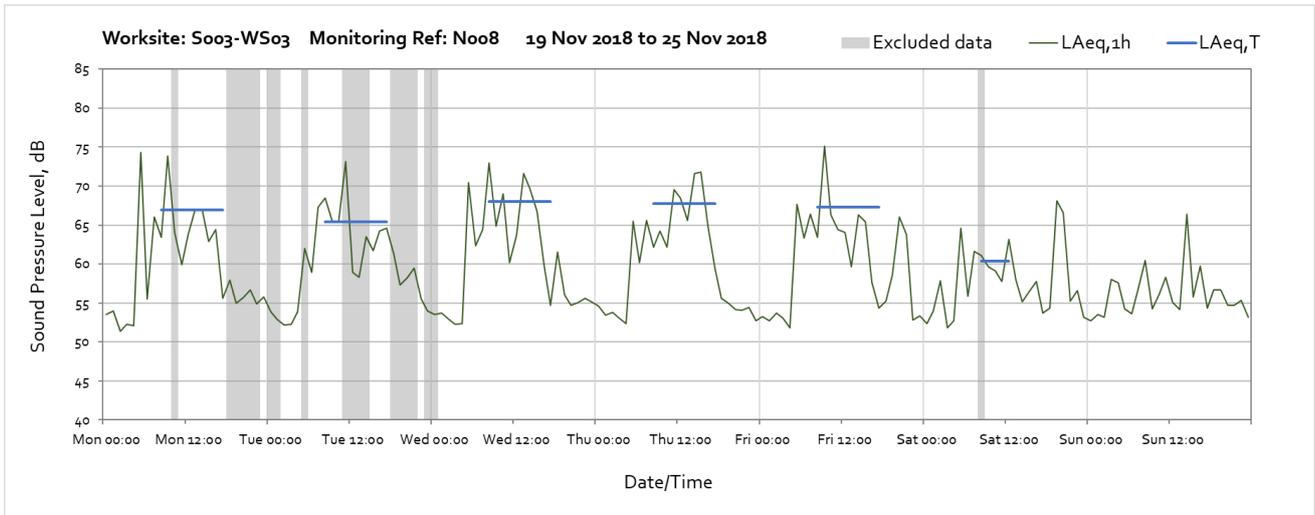


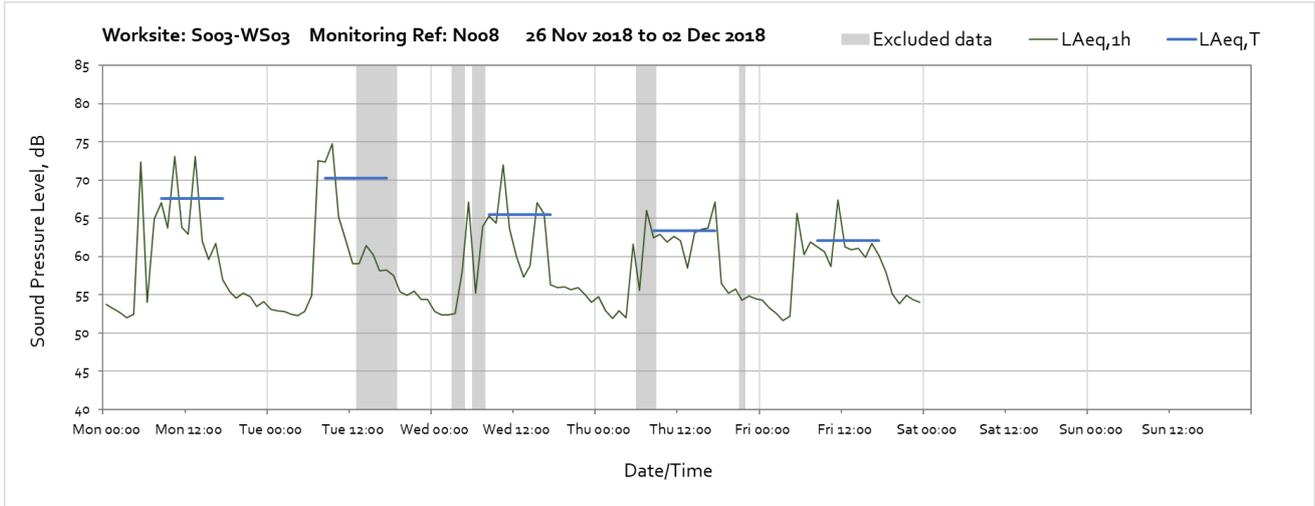
## Worksite: S003-WS03 – Monitoring Ref: N008



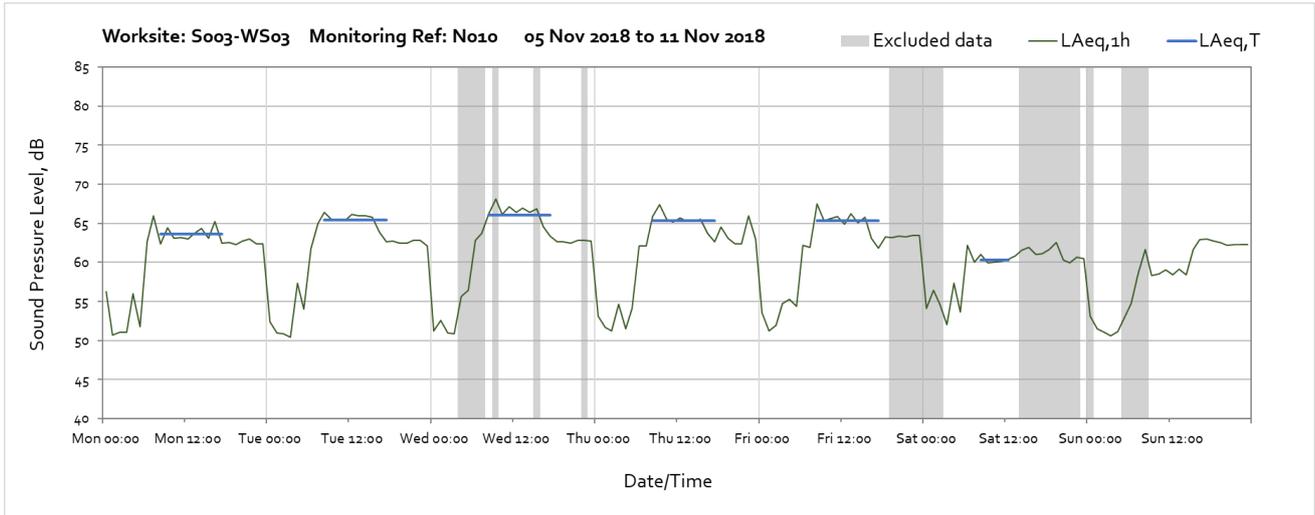
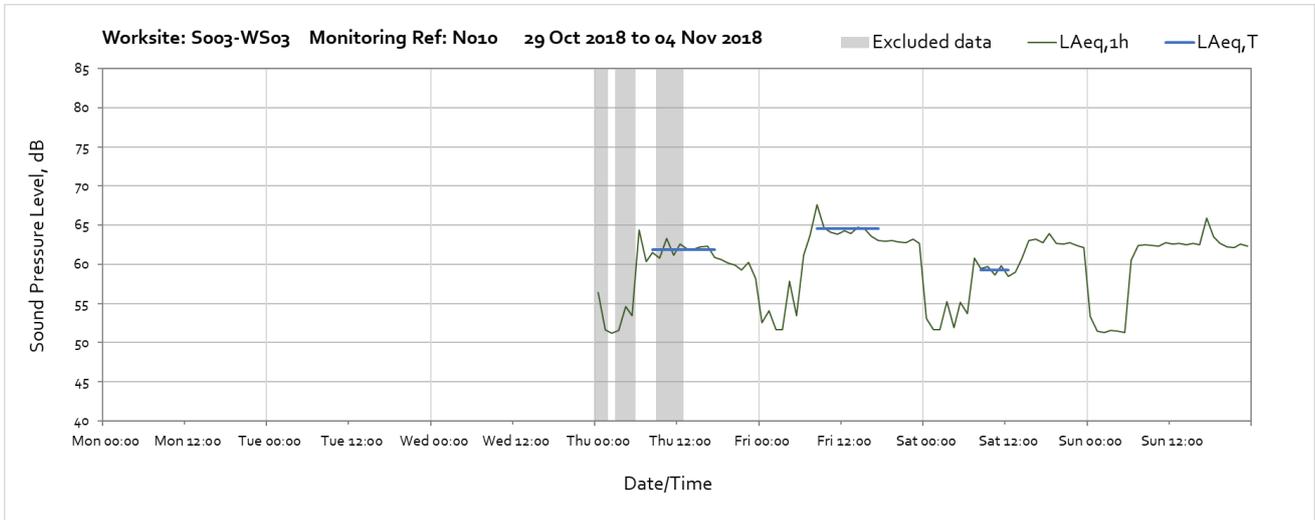


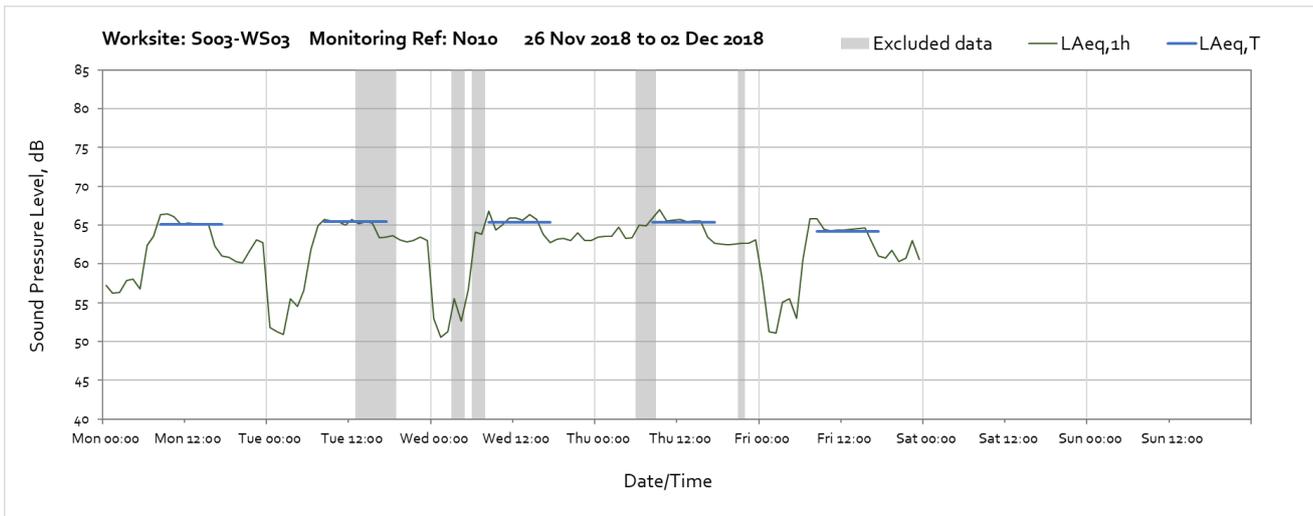
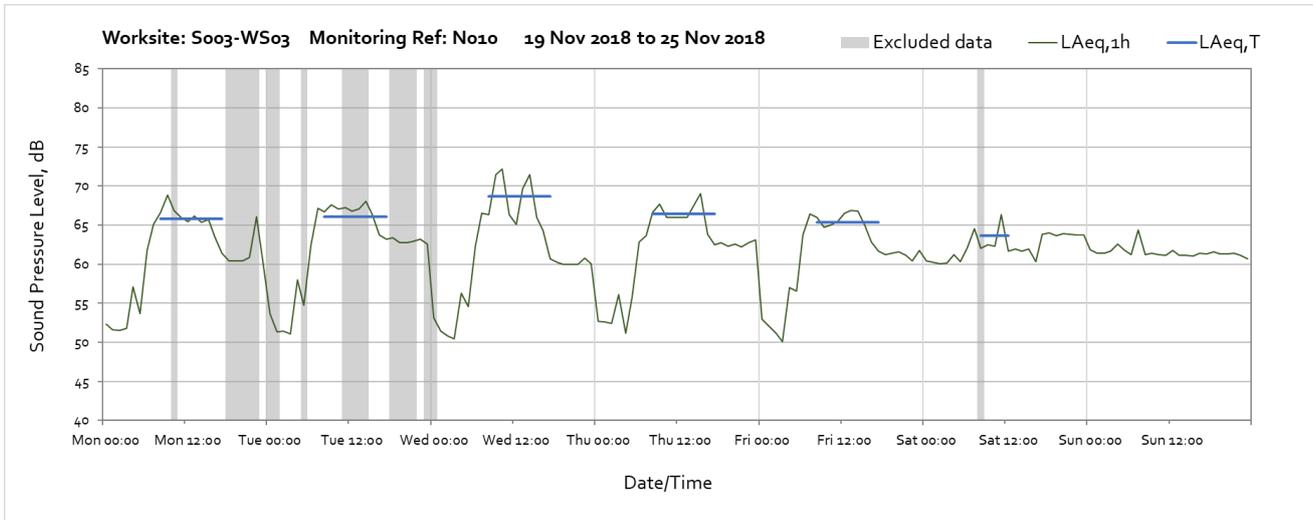
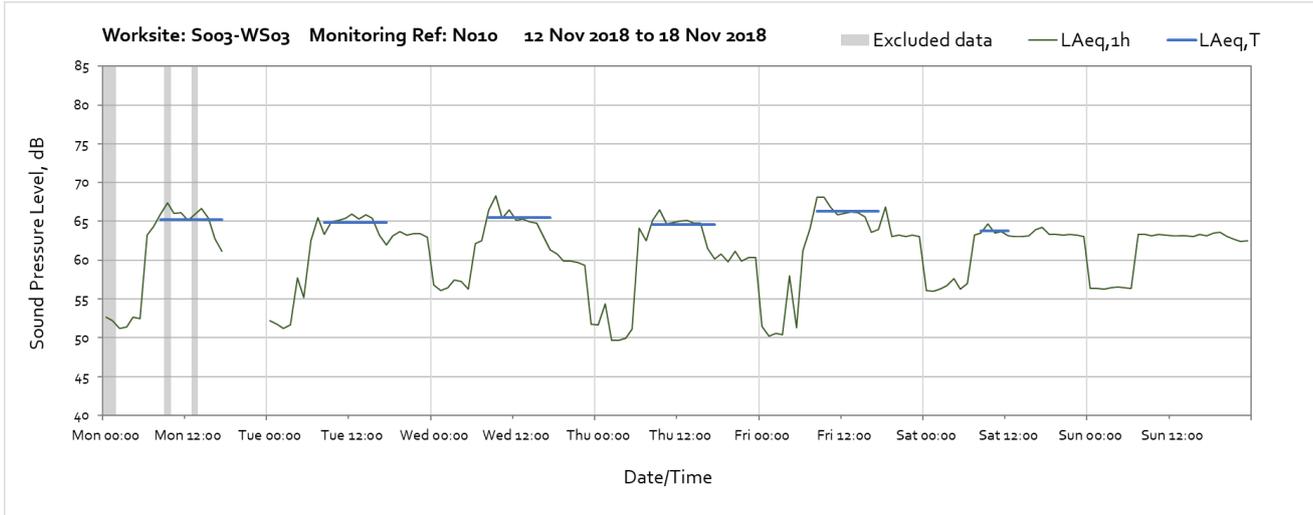
Note – Missing data between 17:00 on Monday 12<sup>th</sup> and 00:00 on Wednesday 13<sup>th</sup> due to a loss of power at the noise monitor.



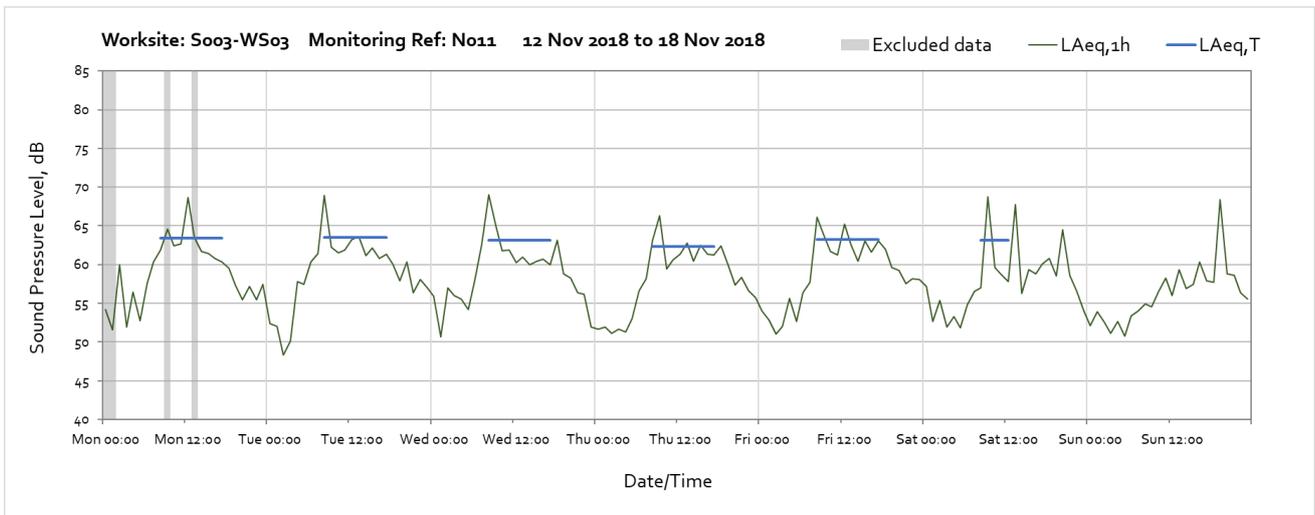
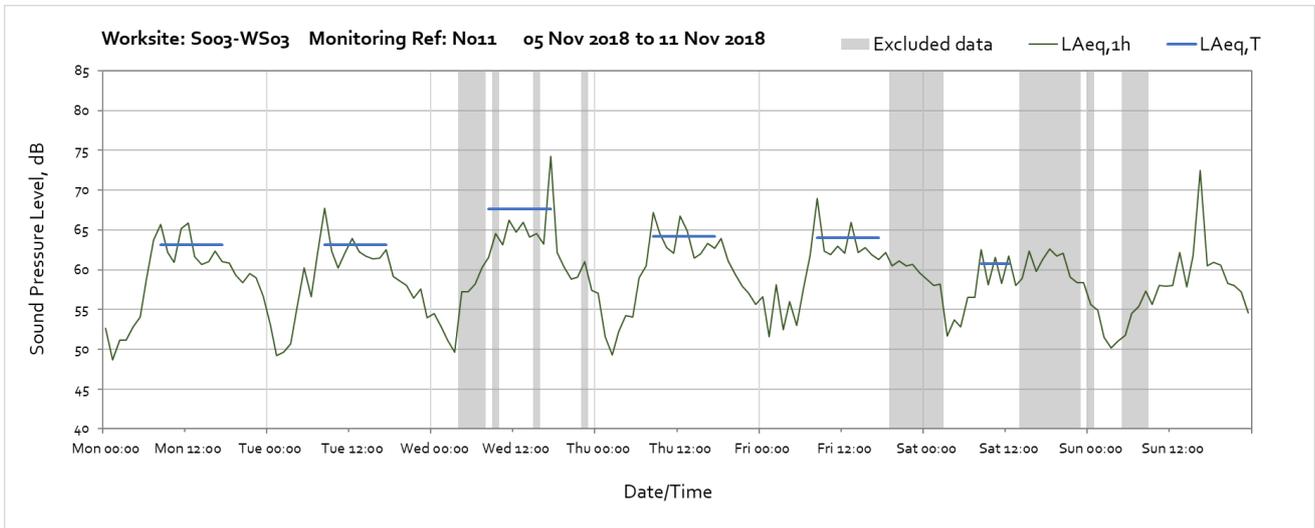
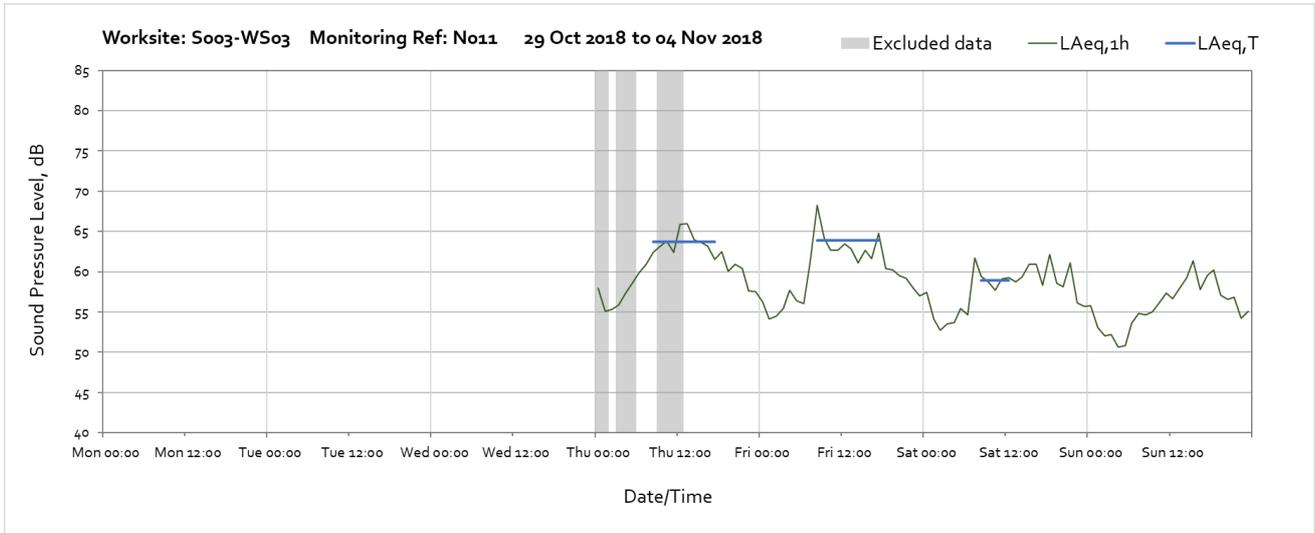


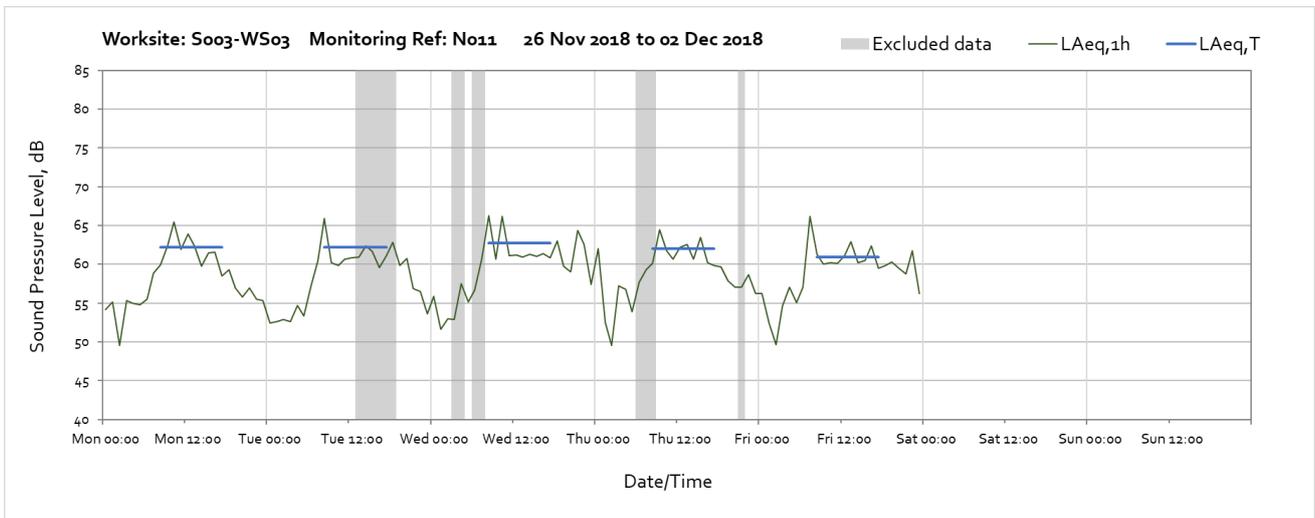
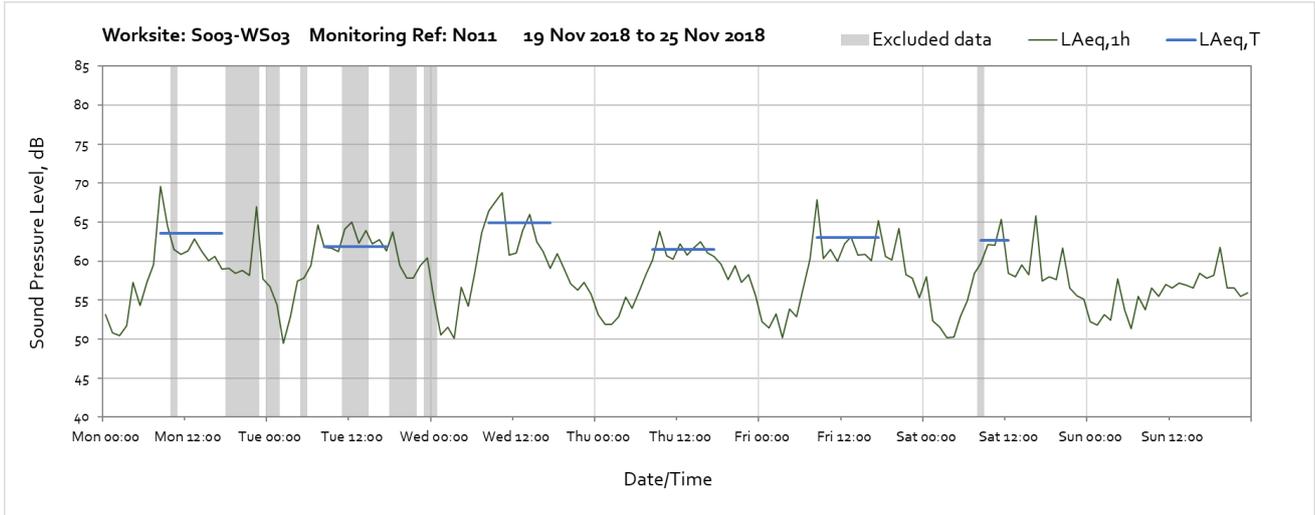
## Worksite: S003-WS03 – Monitoring Ref: N010



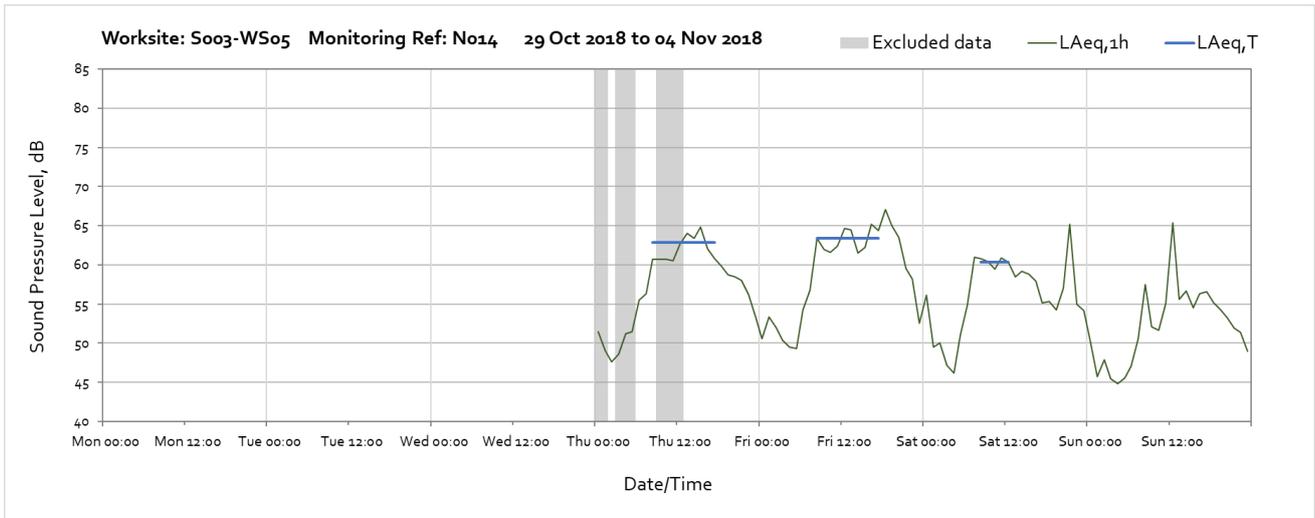


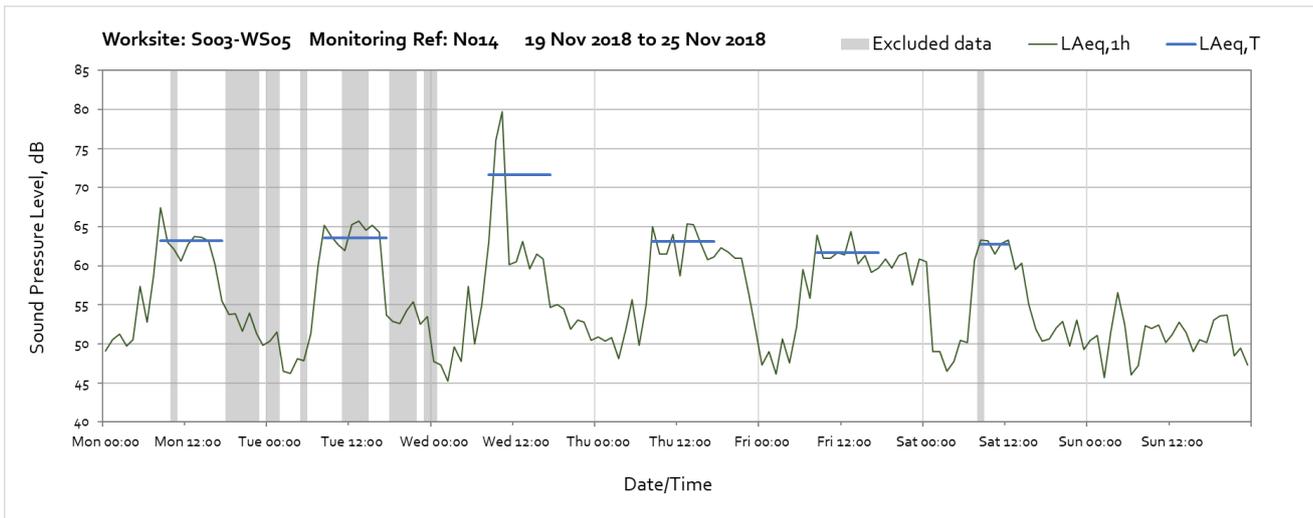
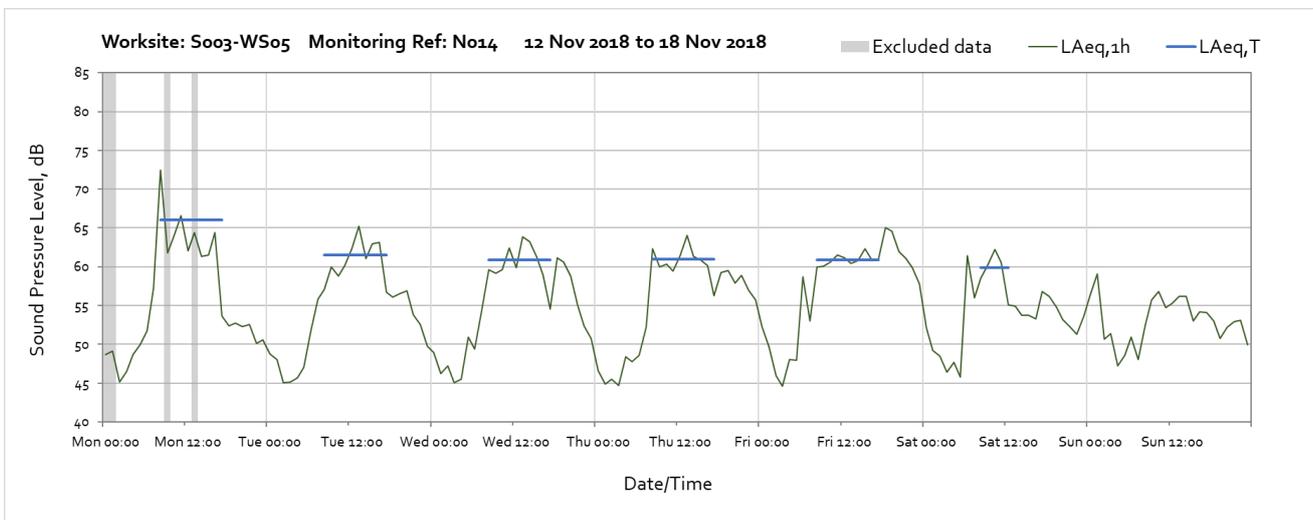
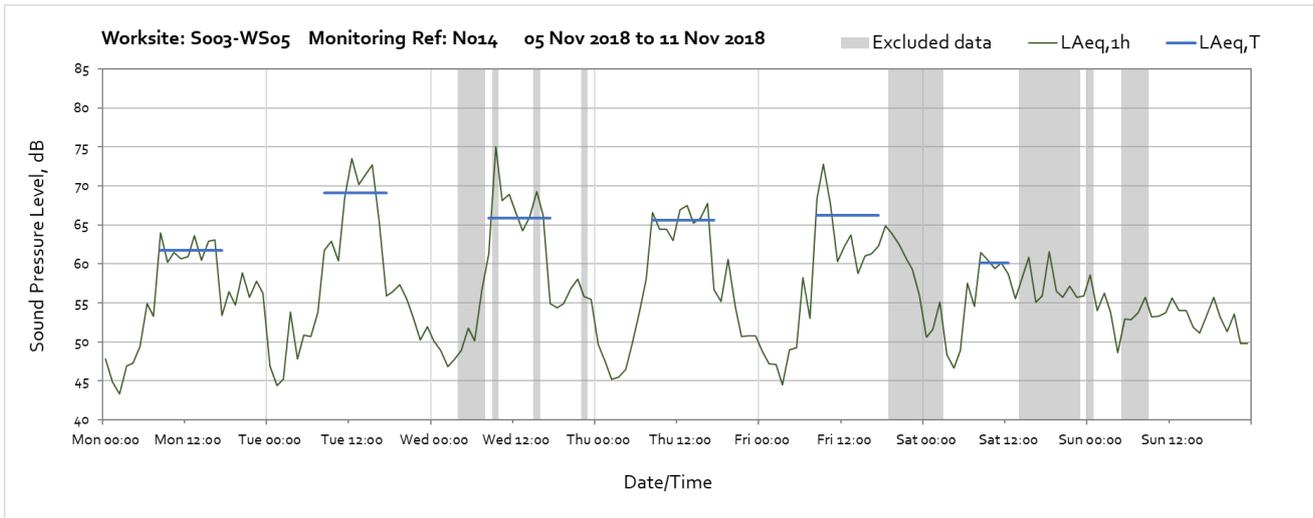
# Worksite: S003-WS03 – Monitoring Ref: N011

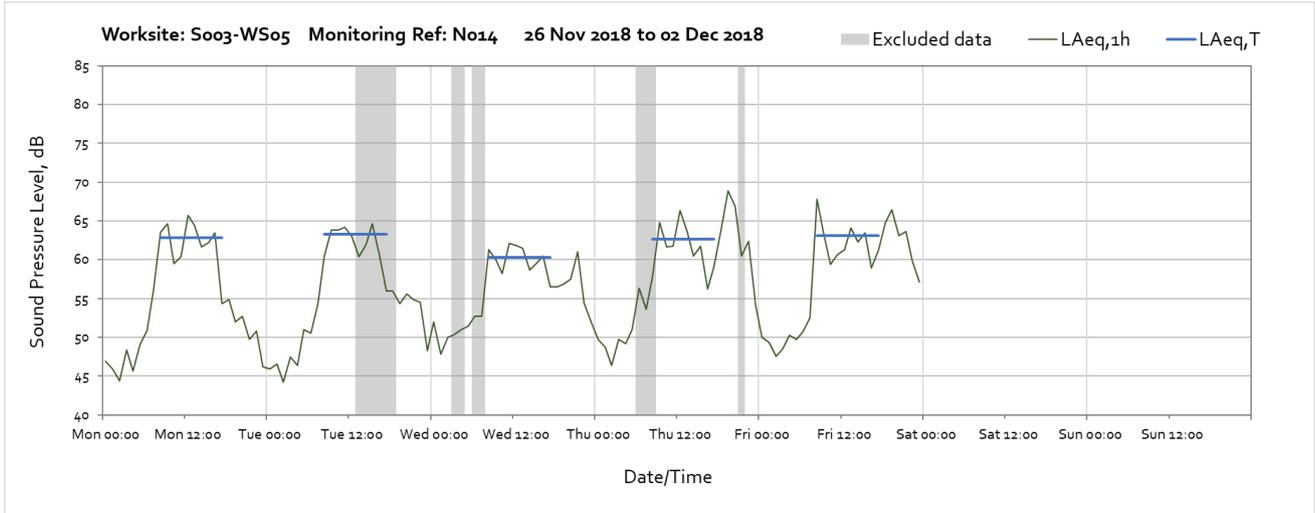




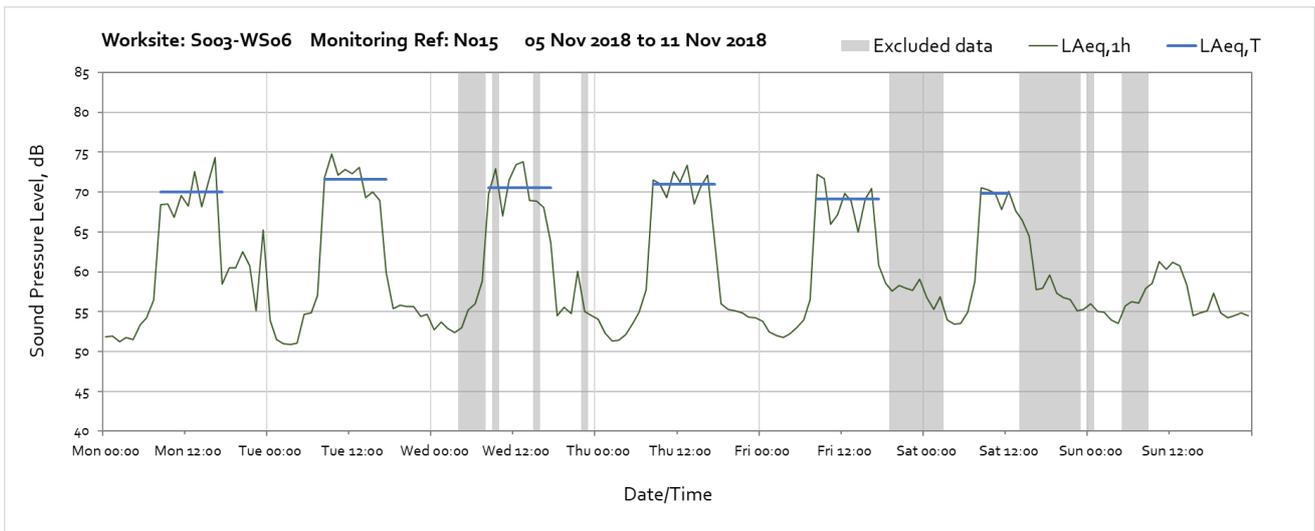
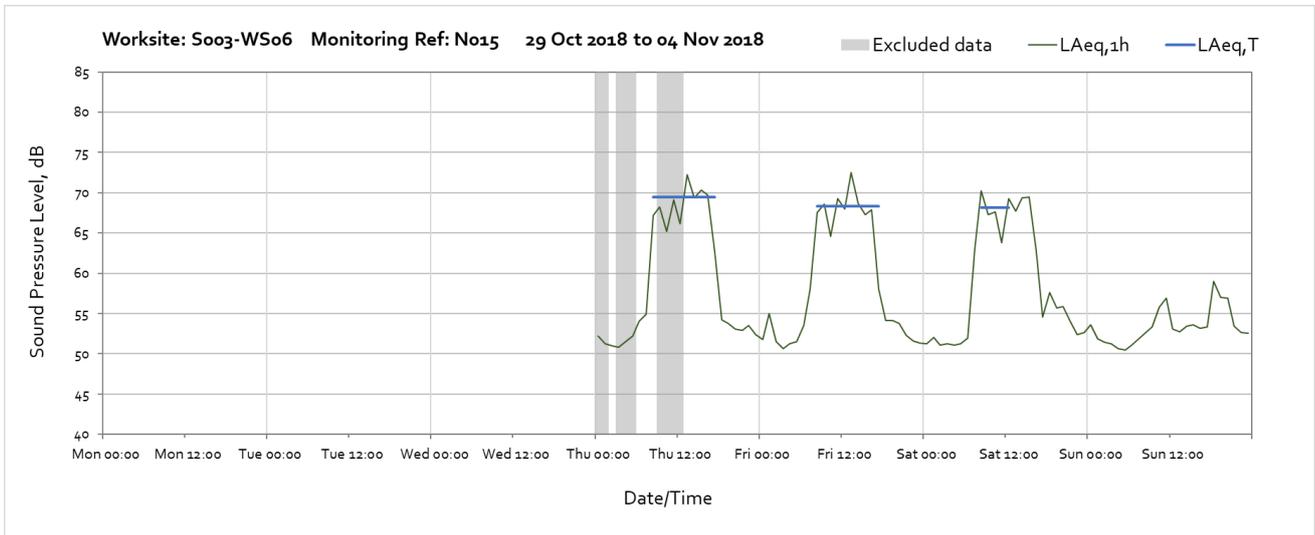
## Worksite: S003-WS05 – Monitoring Ref: N014

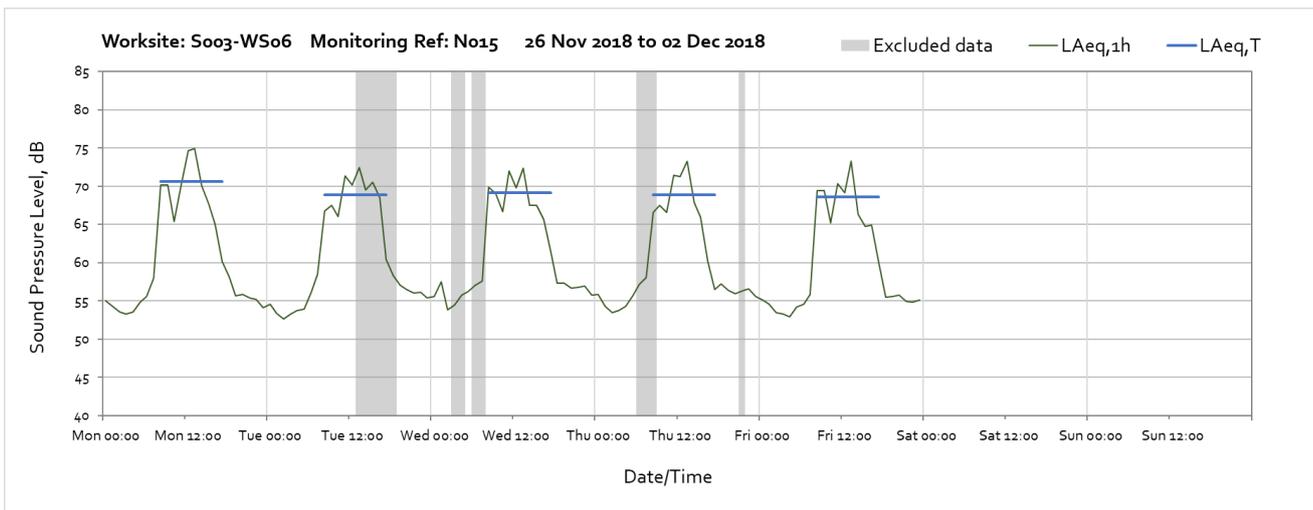
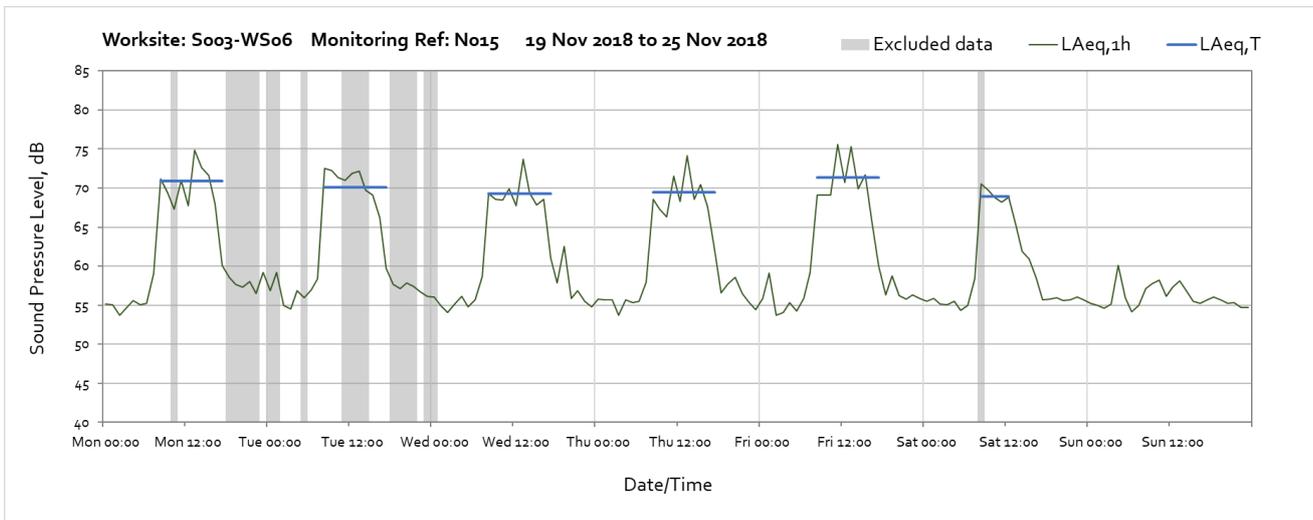
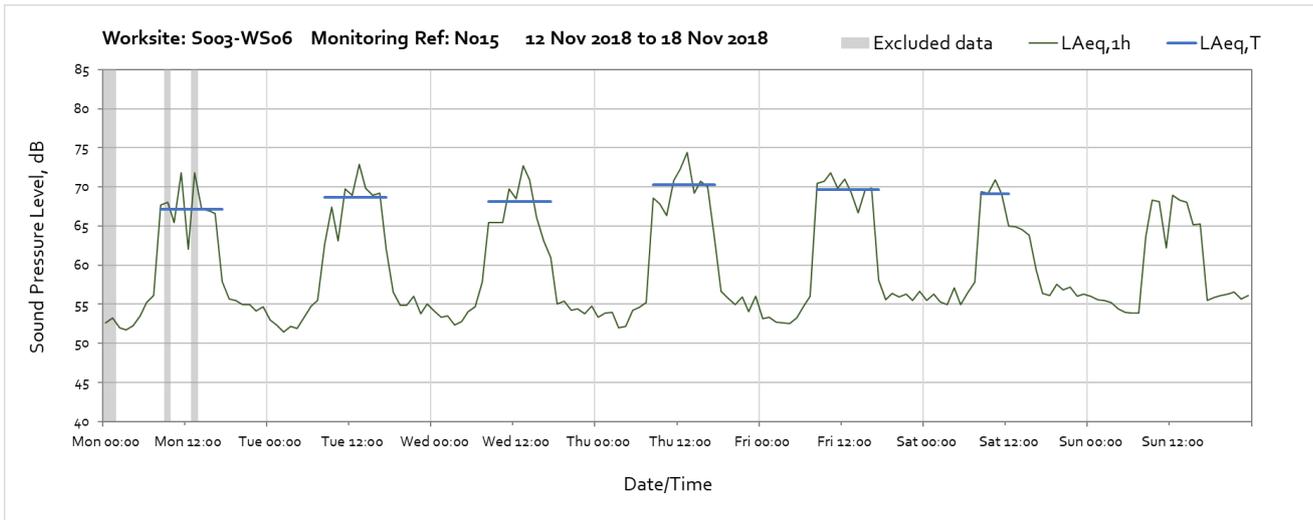




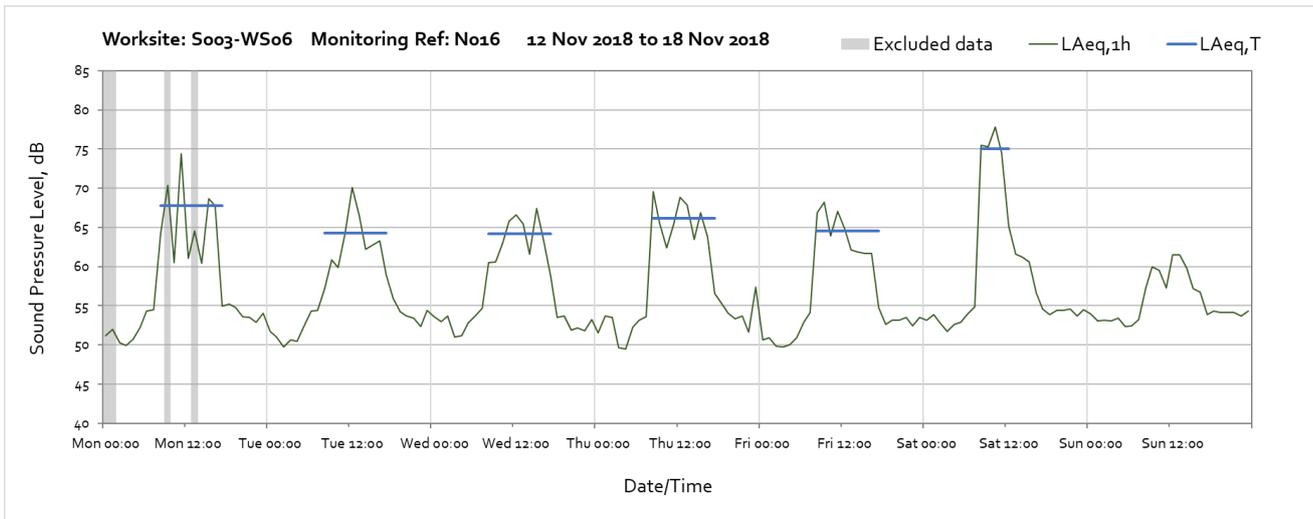
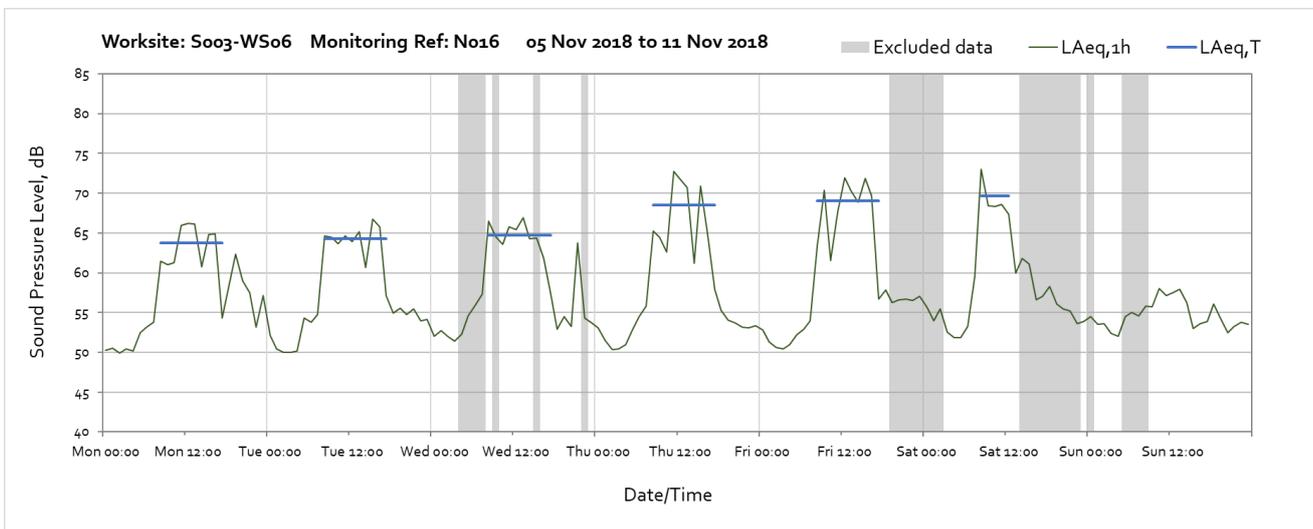
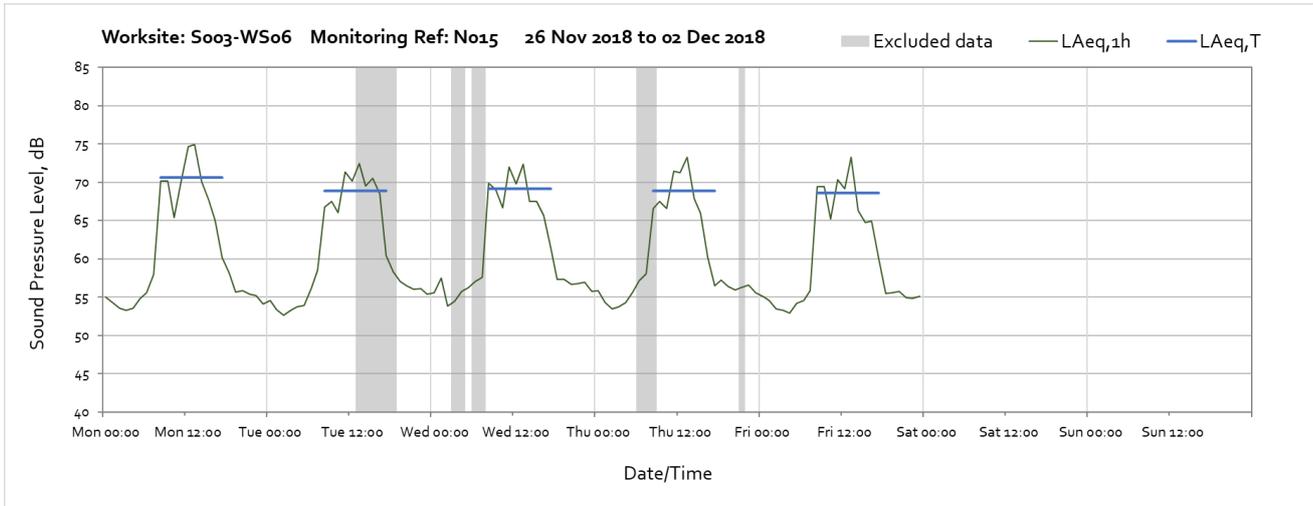


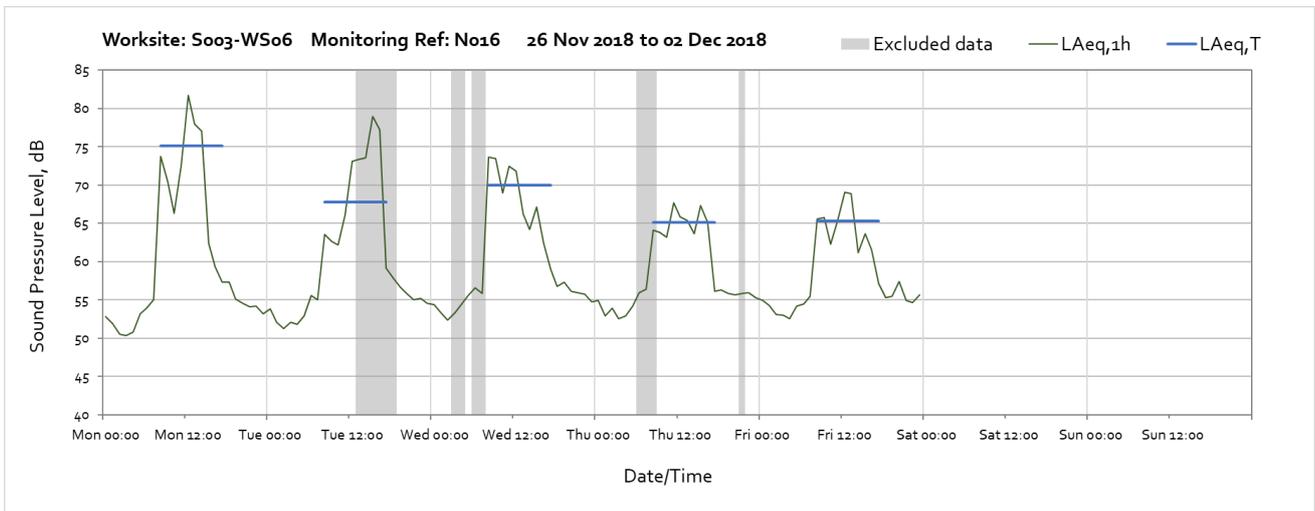
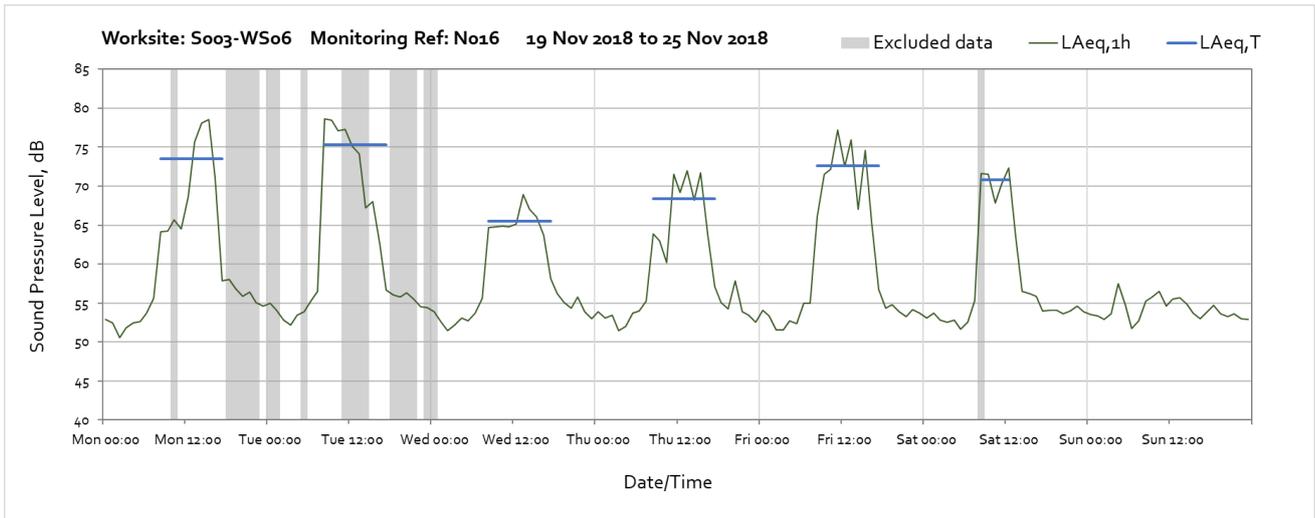
## Worksite: S003-WS06 – Monitoring Ref: N015



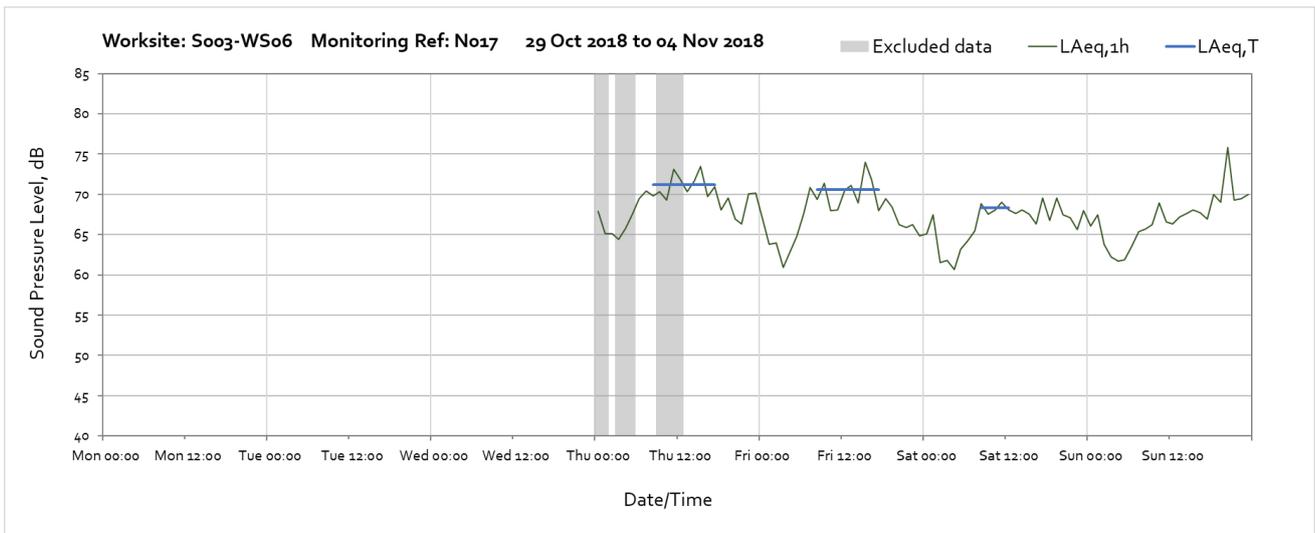


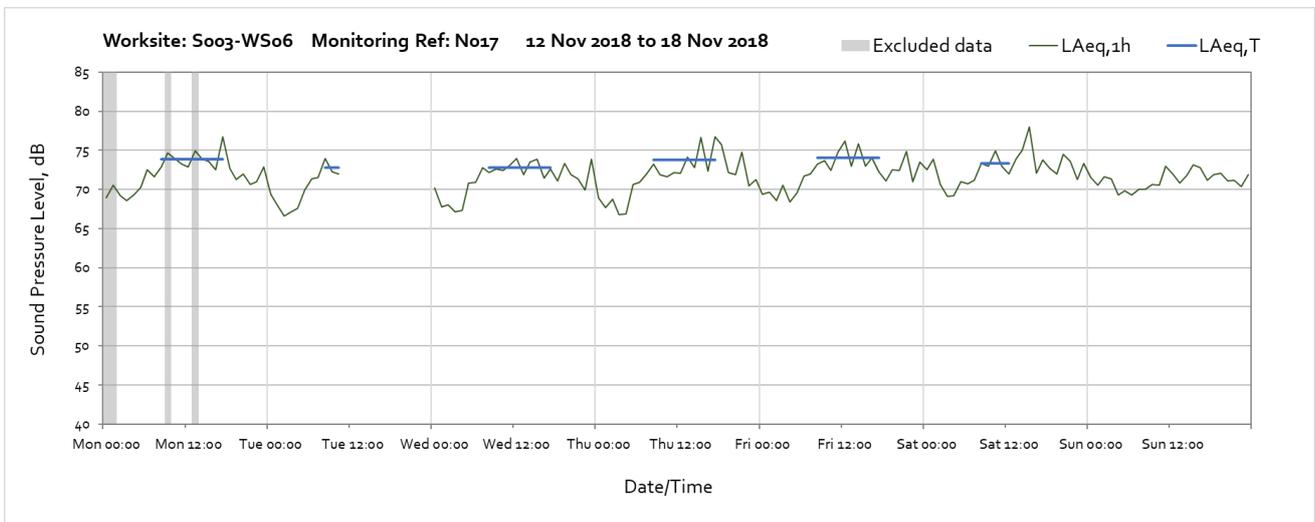
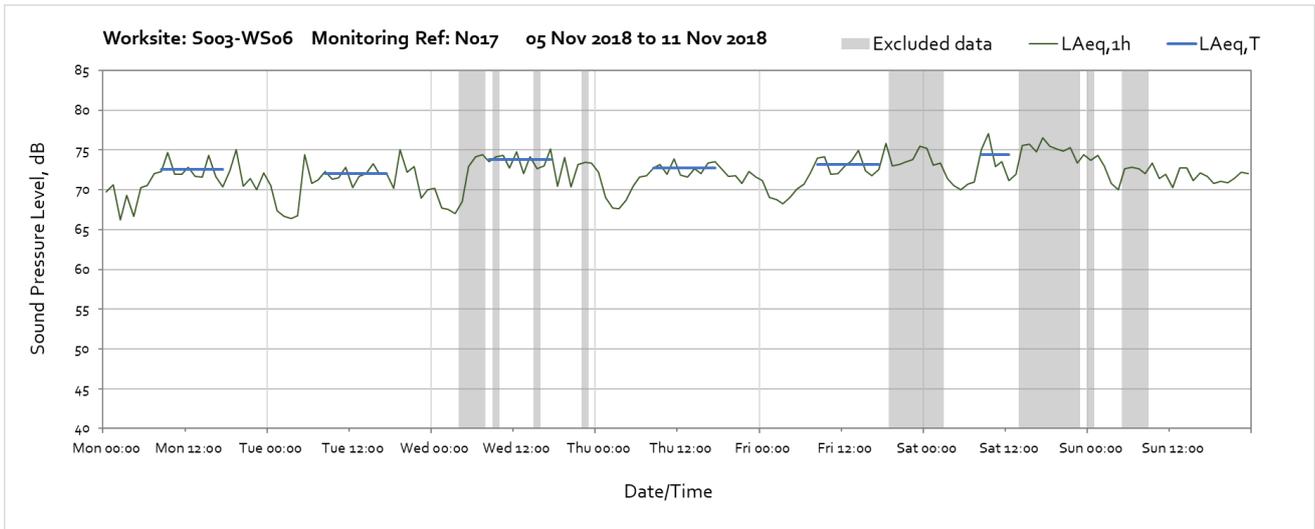
# Worksite: S003-WS06 – Monitoring Ref: N016



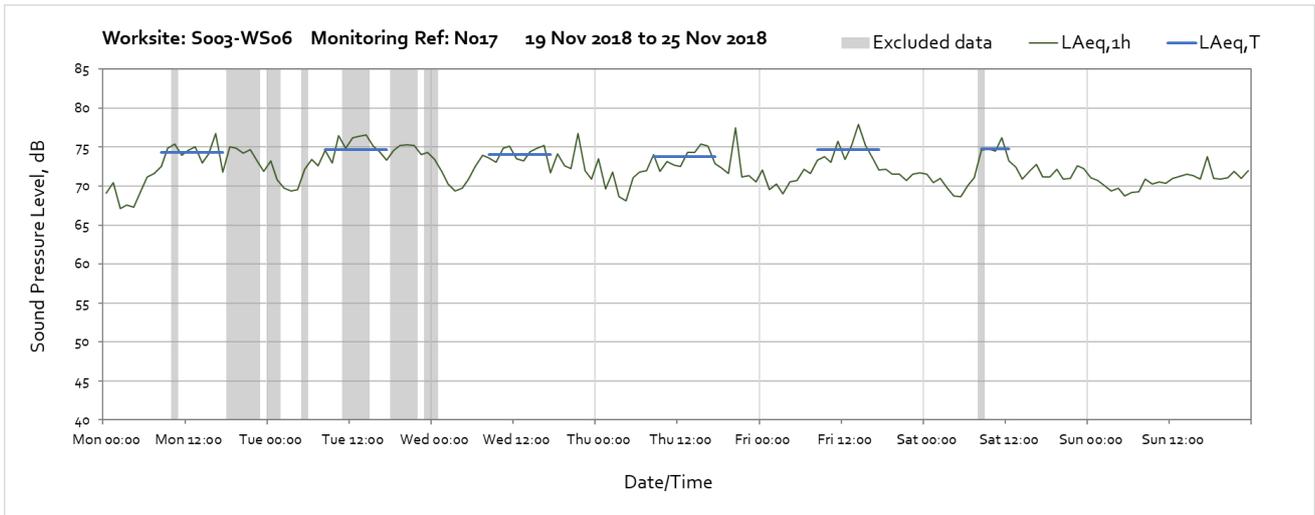


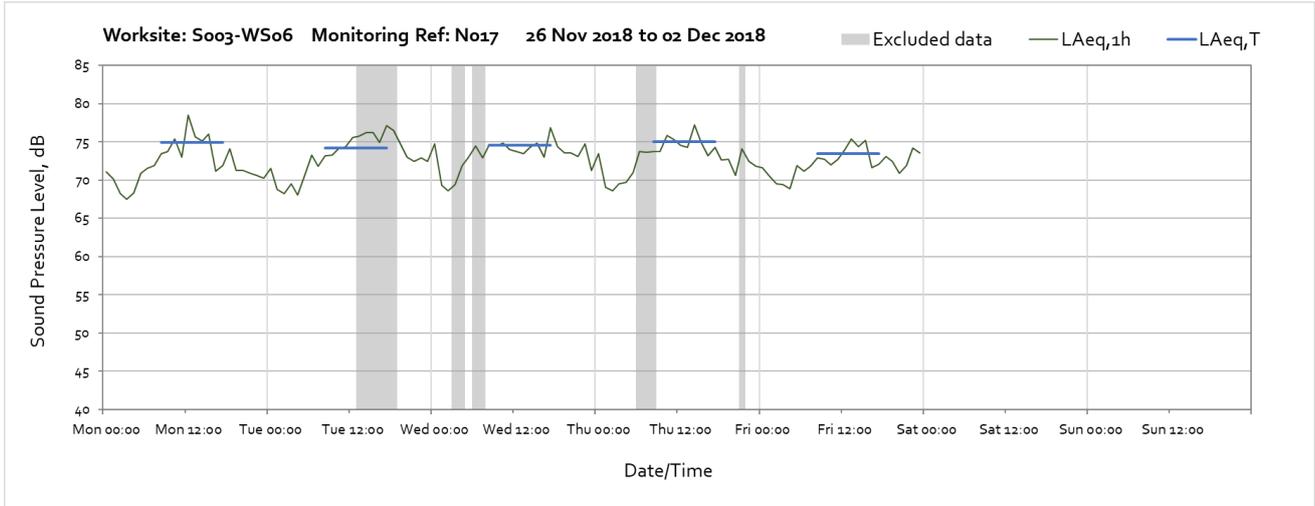
## Worksite: S003-WS06 – Monitoring Ref: N017



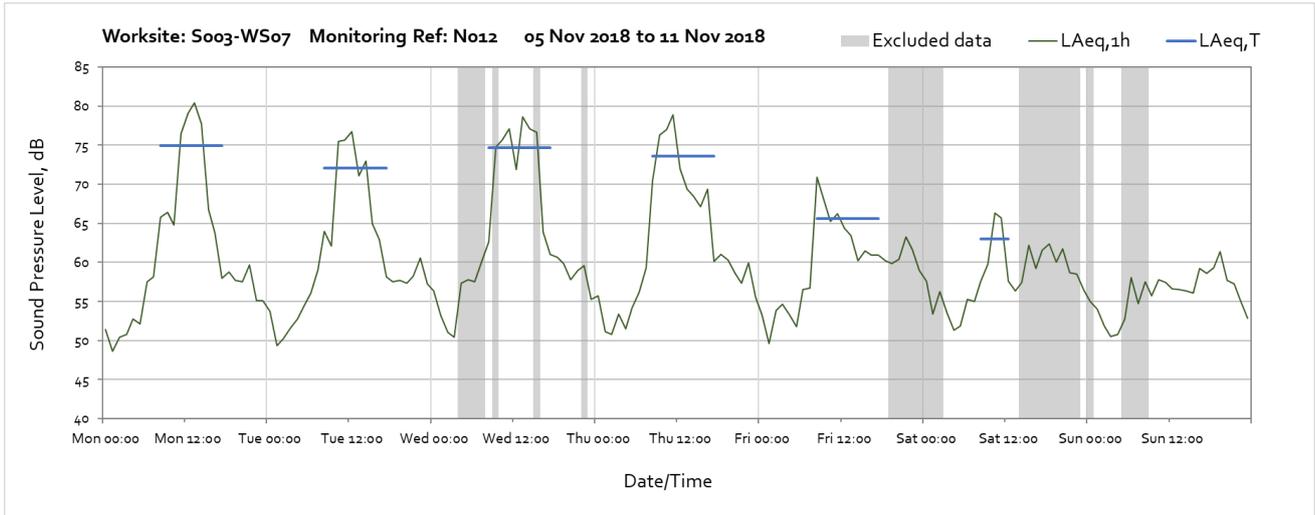
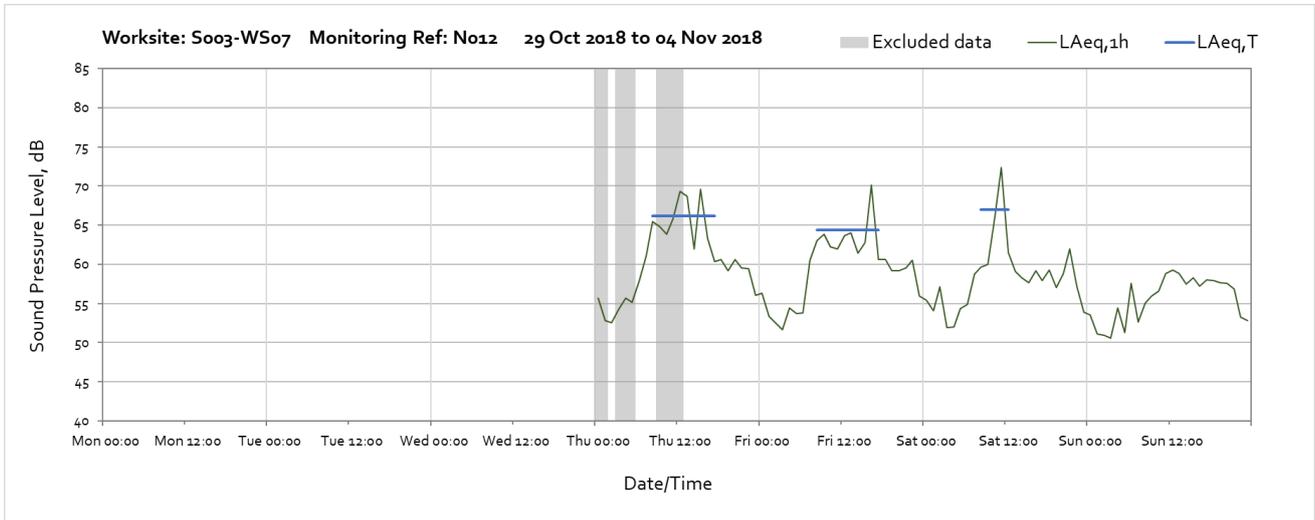


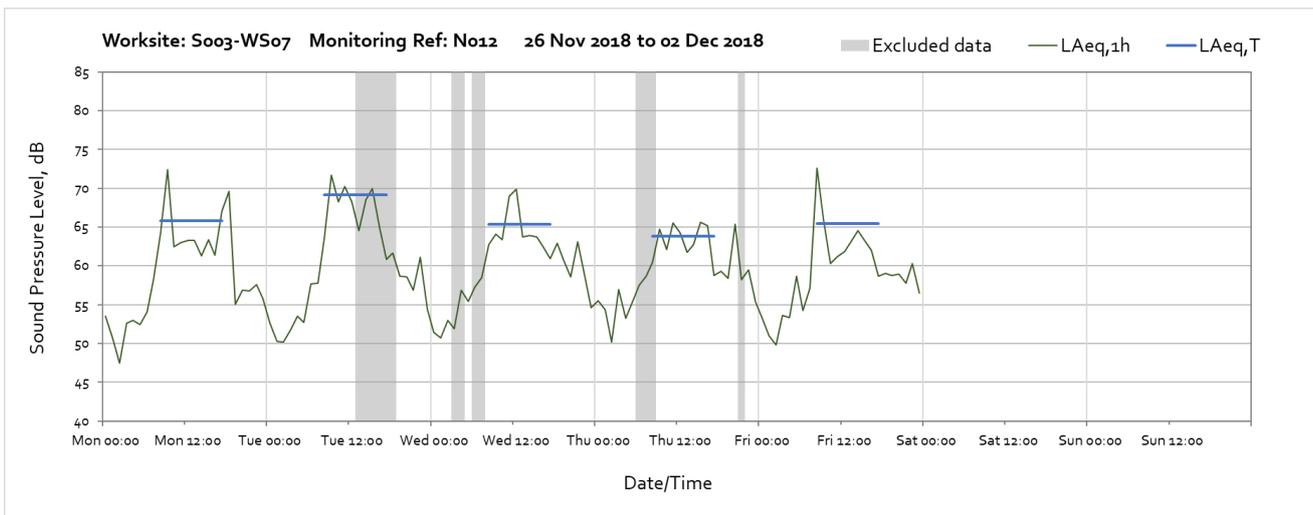
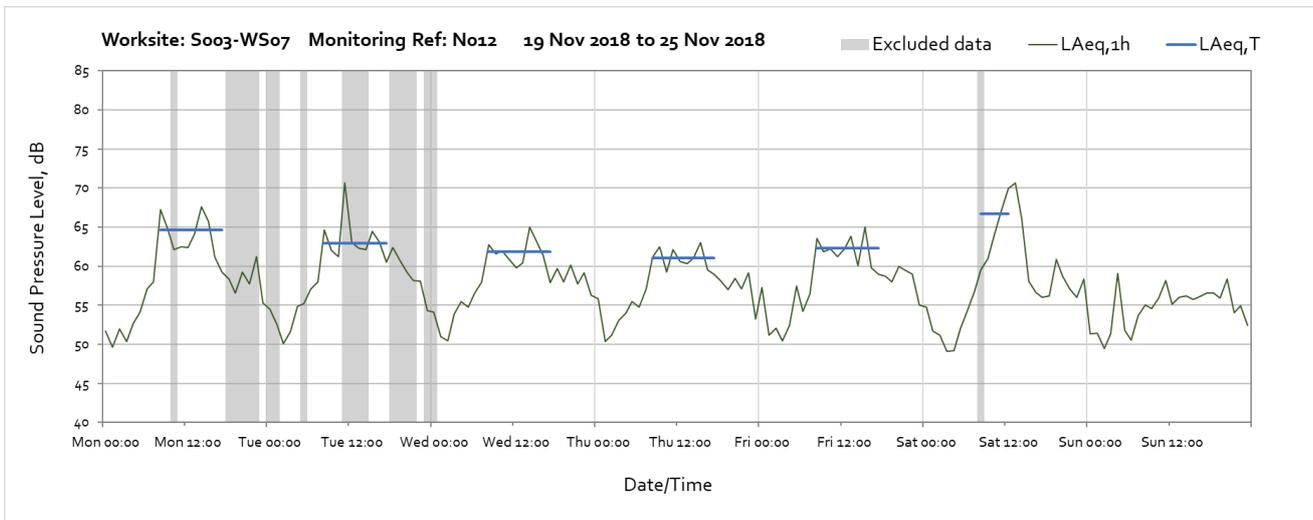
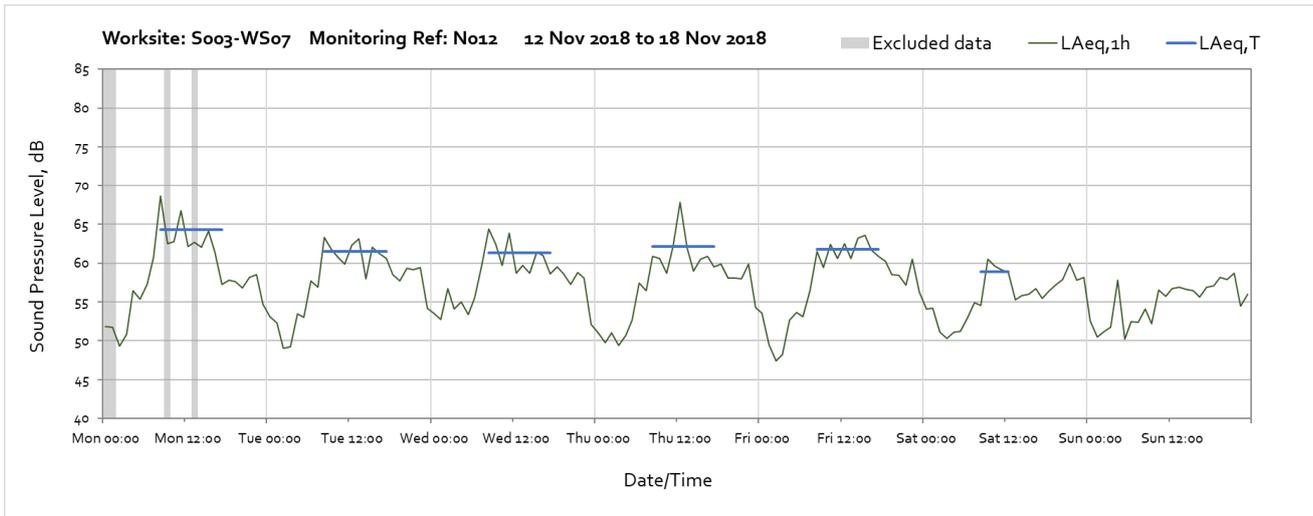
Note – Missing data between 11:00 on Tuesday 13<sup>th</sup> and 00:00 on Wednesday 14<sup>th</sup> due to a loss of power at the noise monitor.



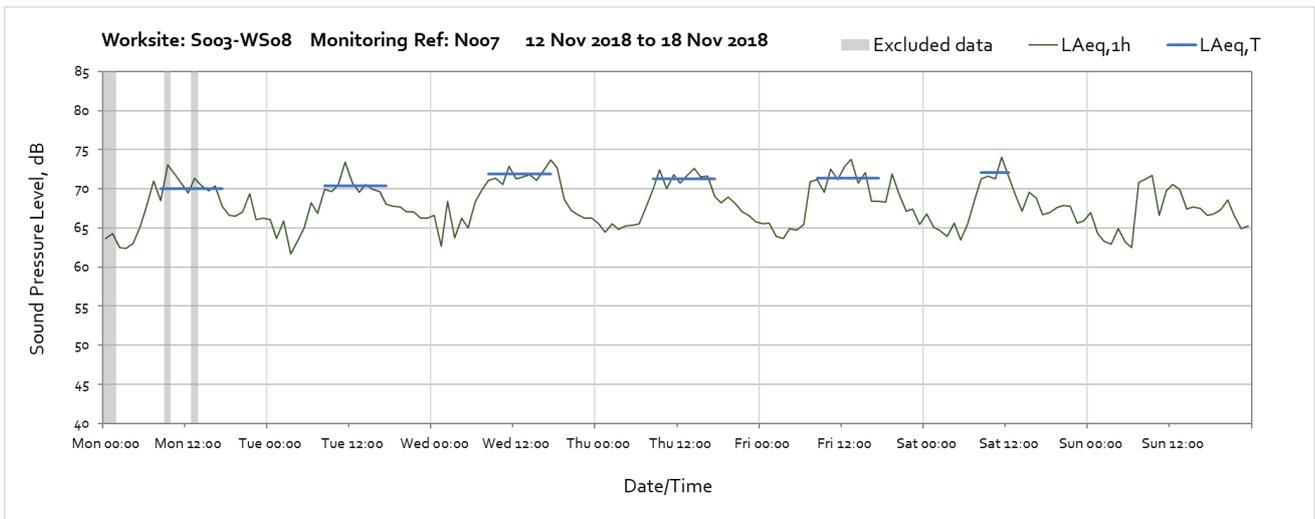
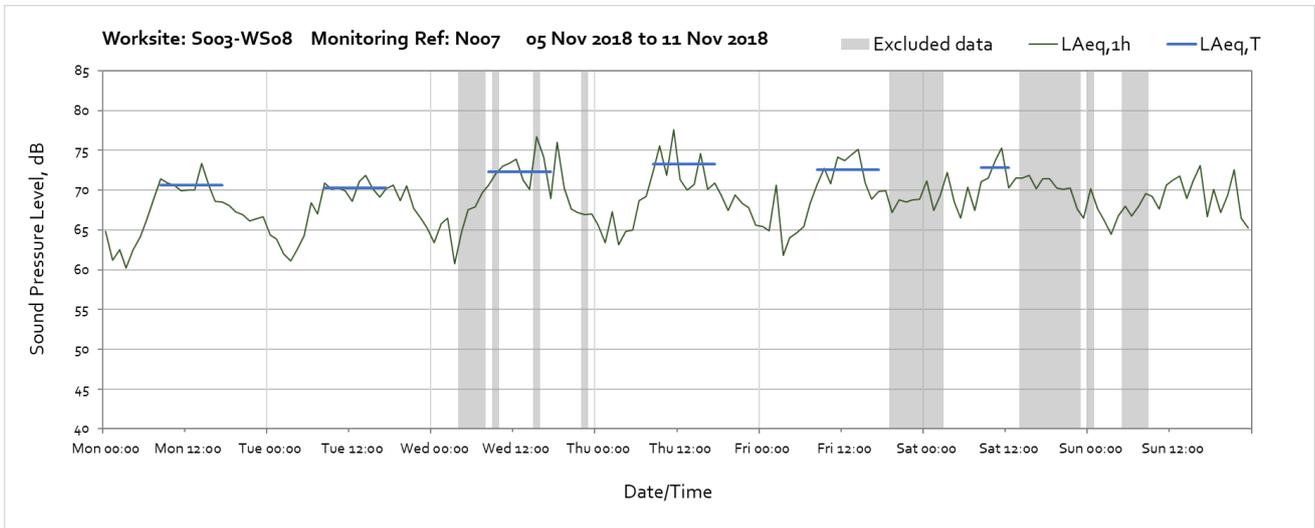
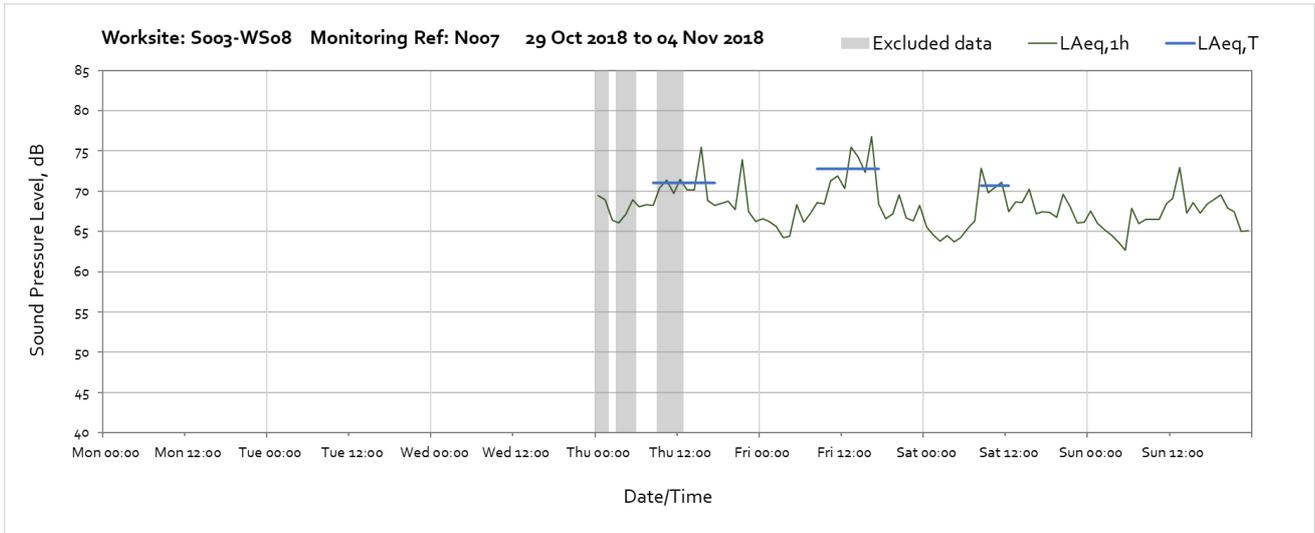


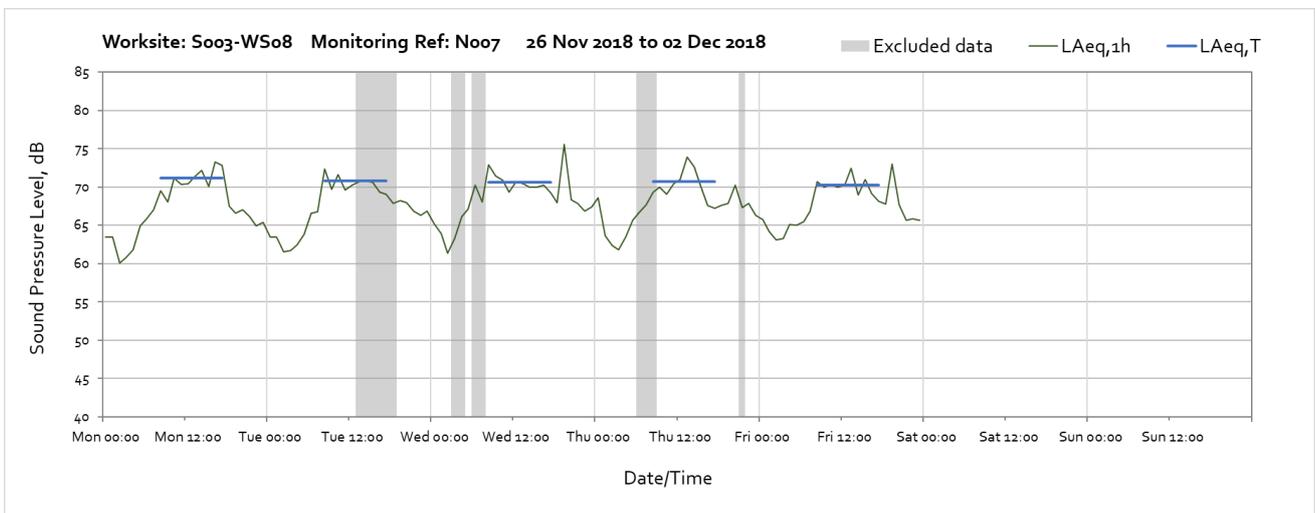
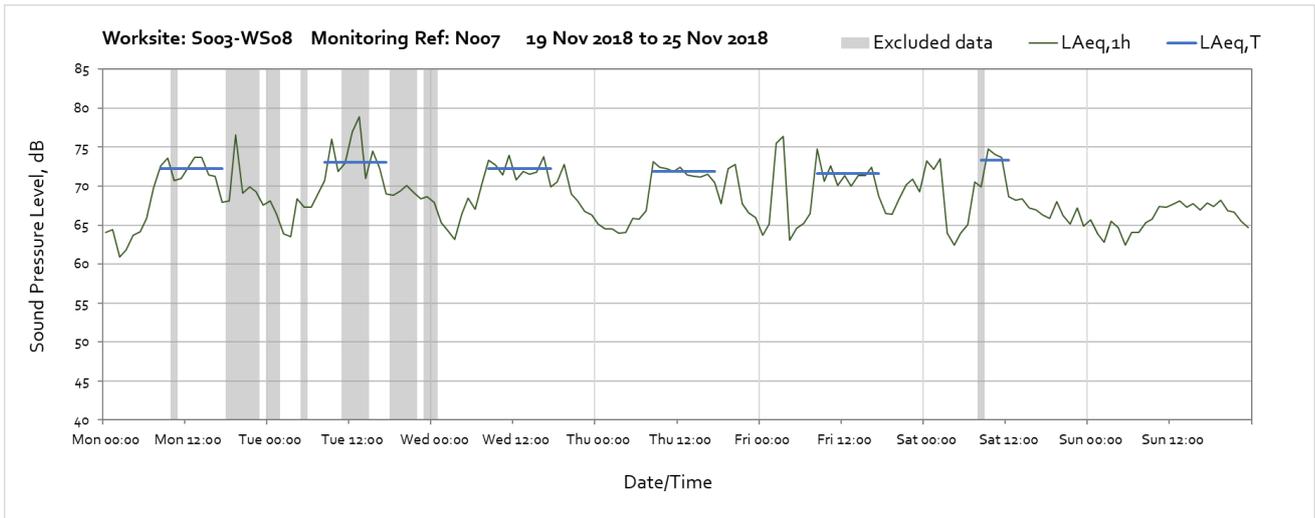
## Worksit: S003-WS07 – Monitoring Ref: N012



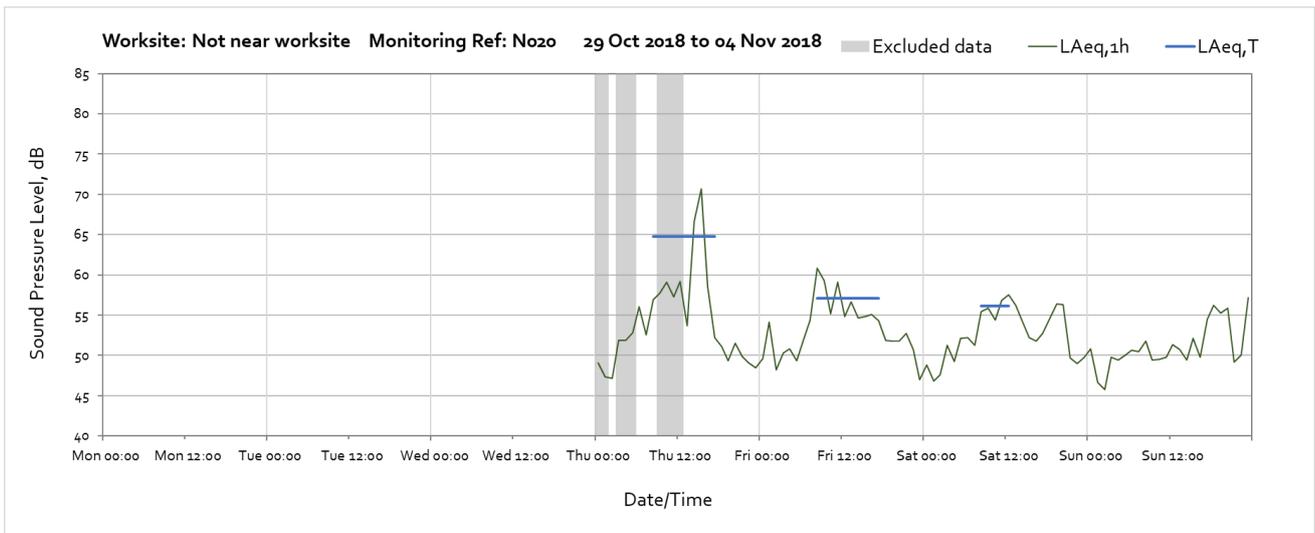


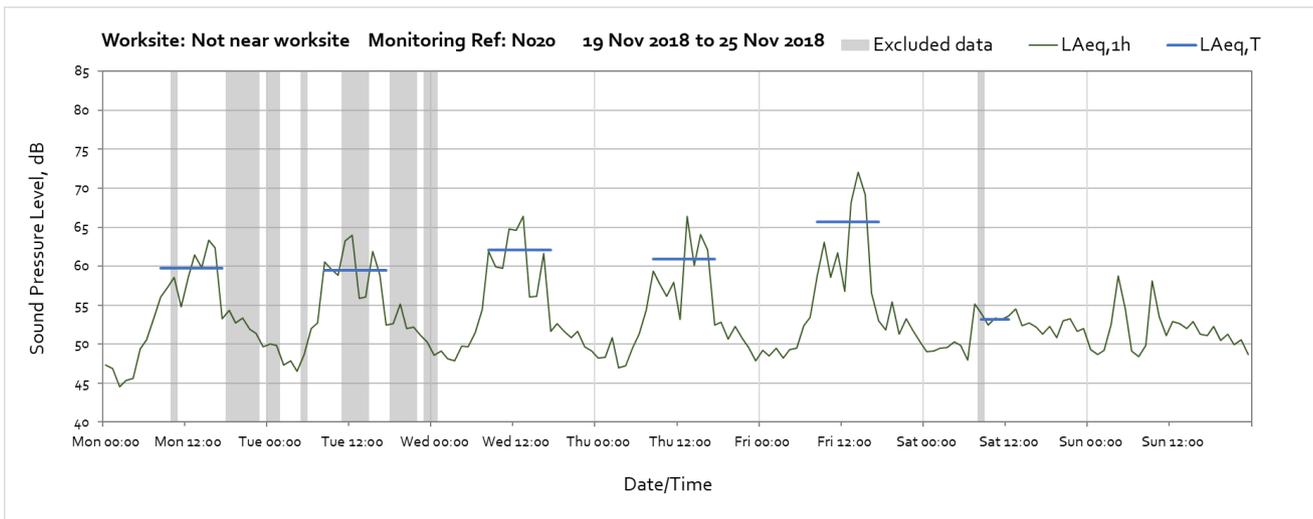
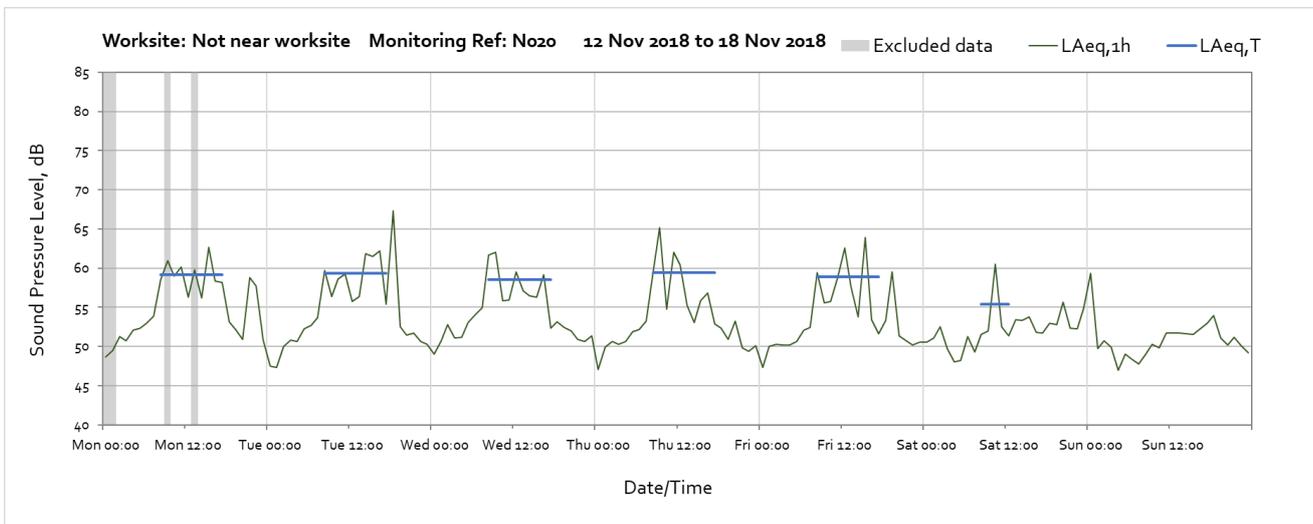
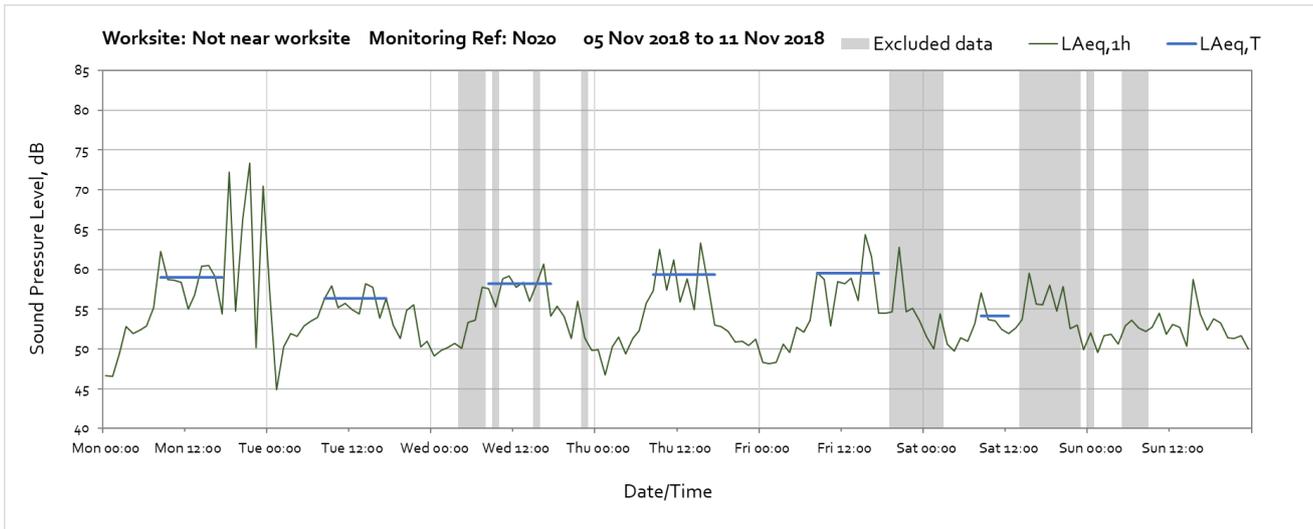
# Worksite: S003-WS08 – Monitoring Ref: N007

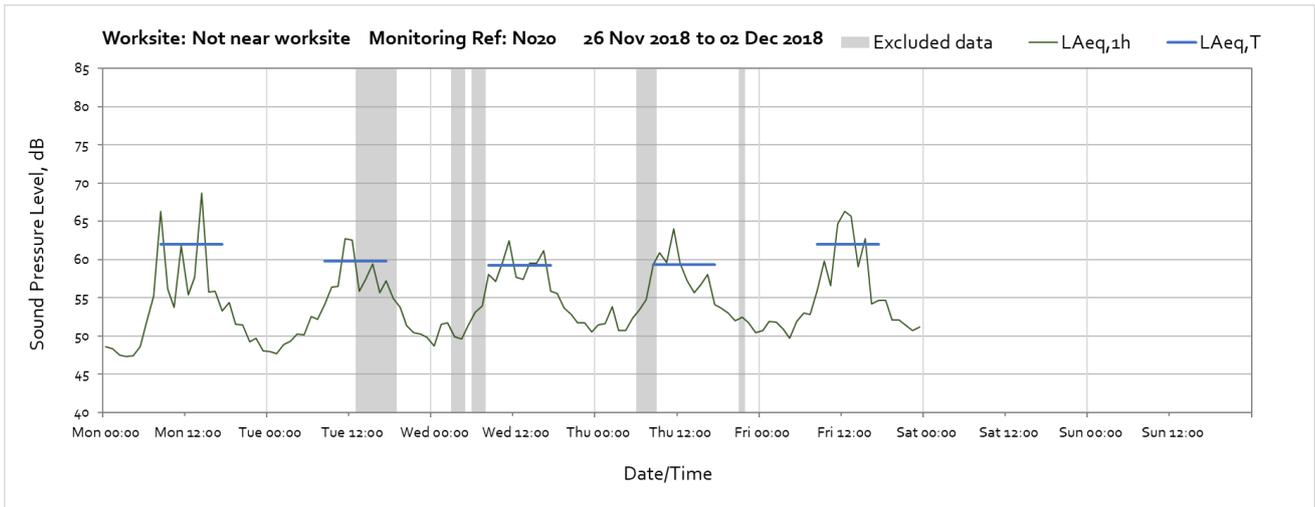




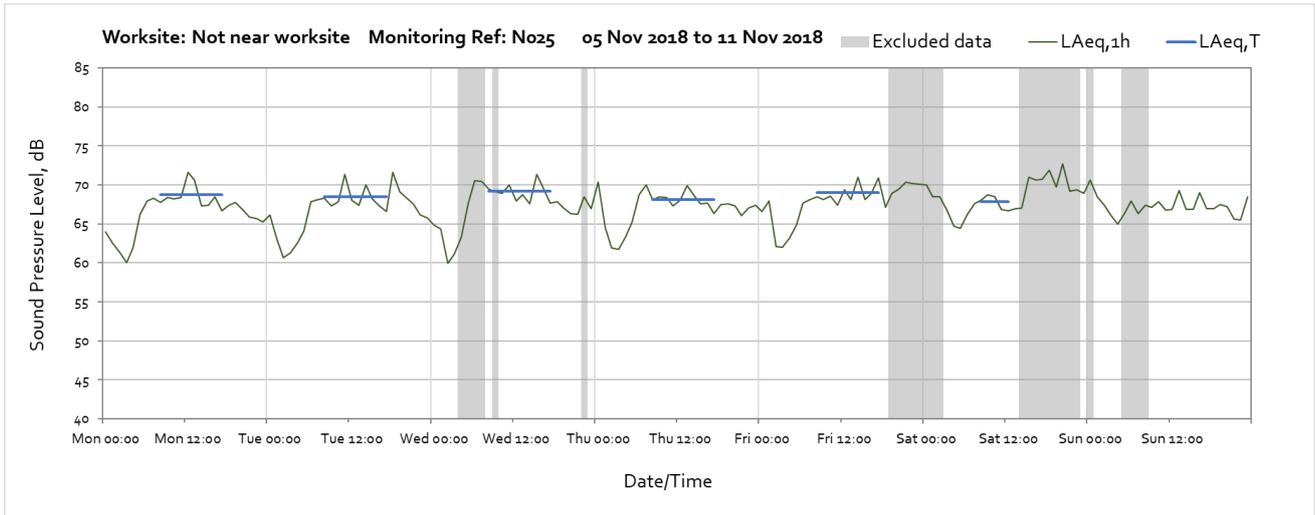
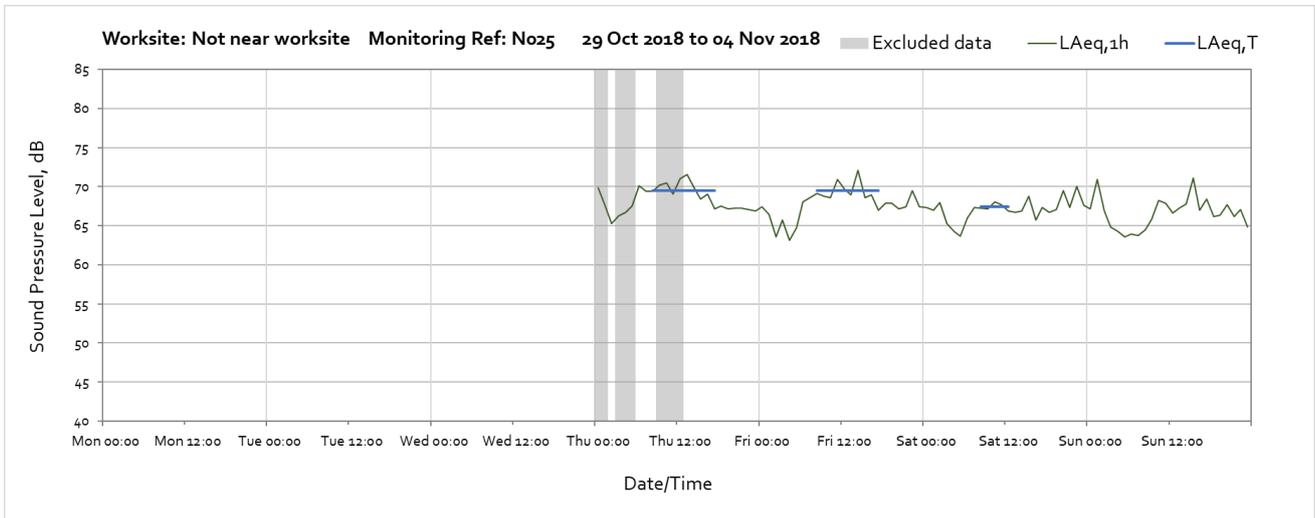
## Monitoring Ref: N020

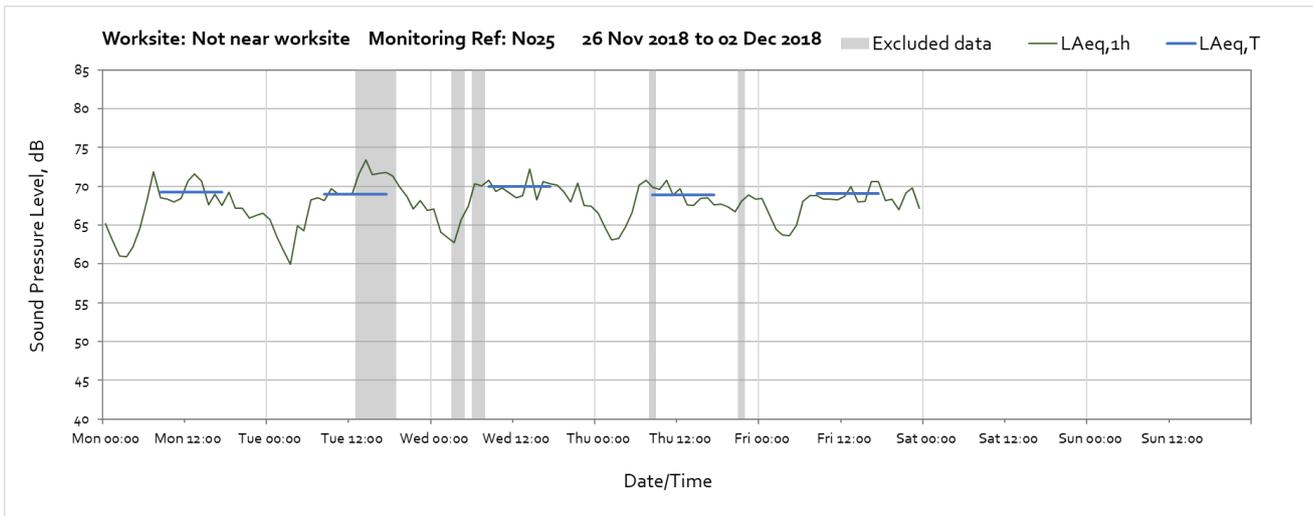
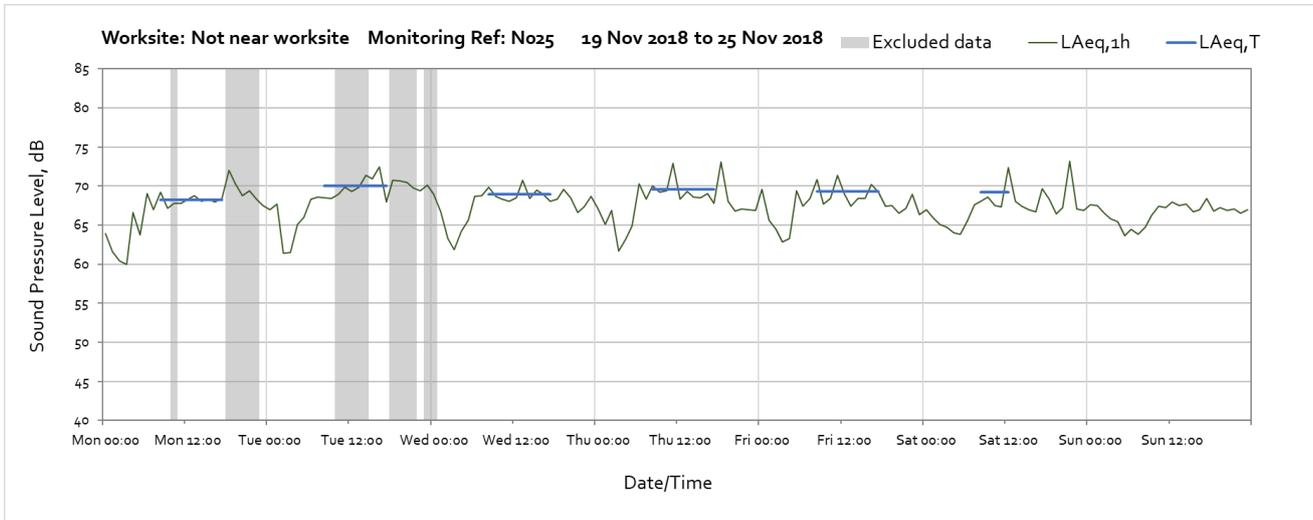
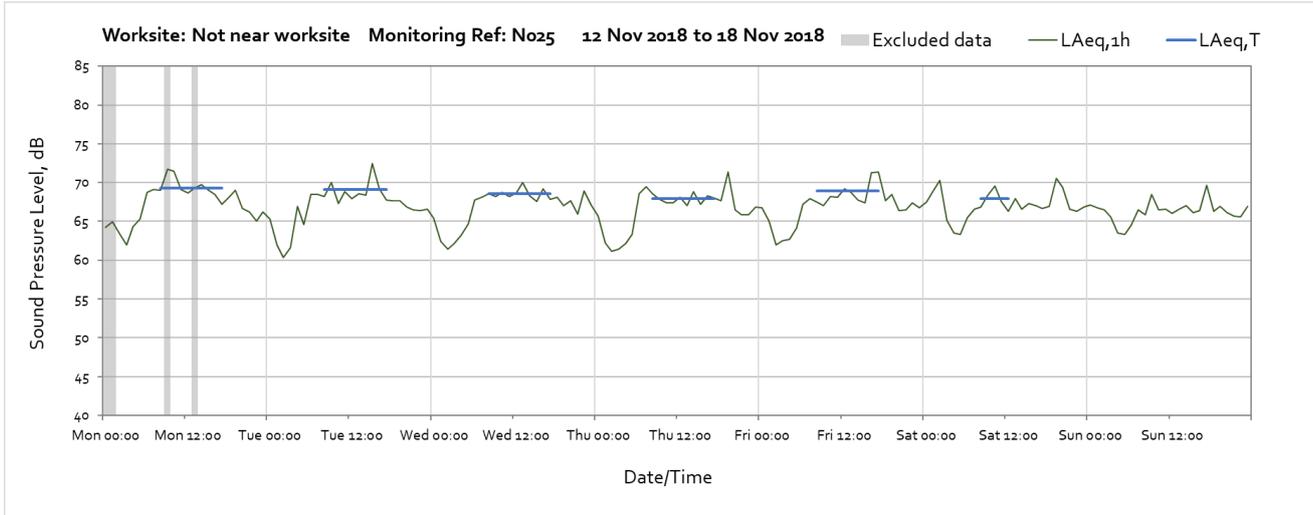




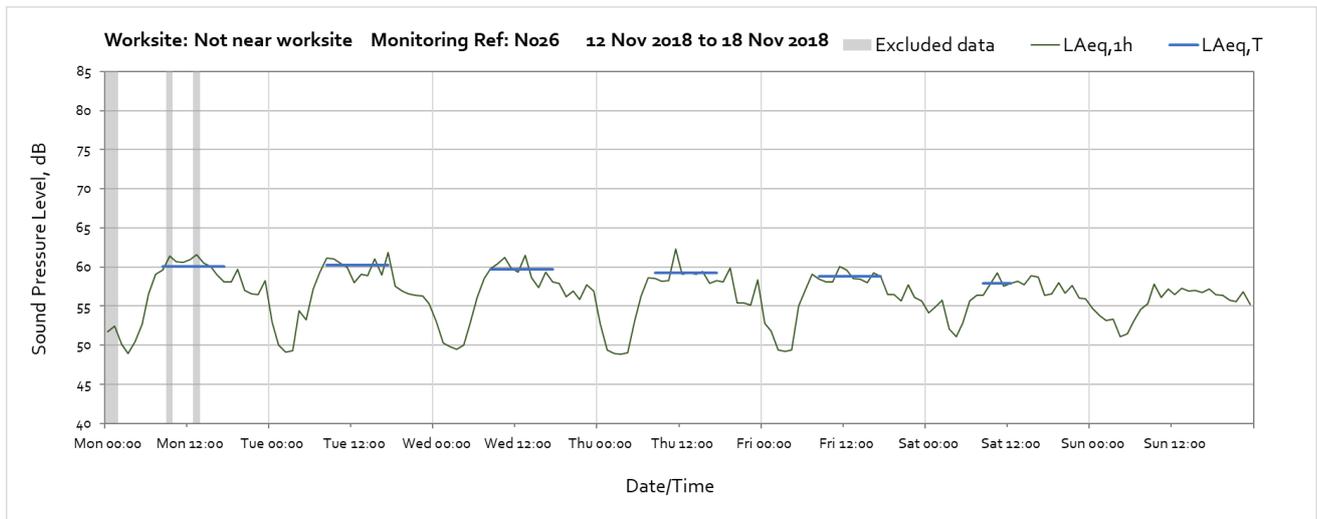
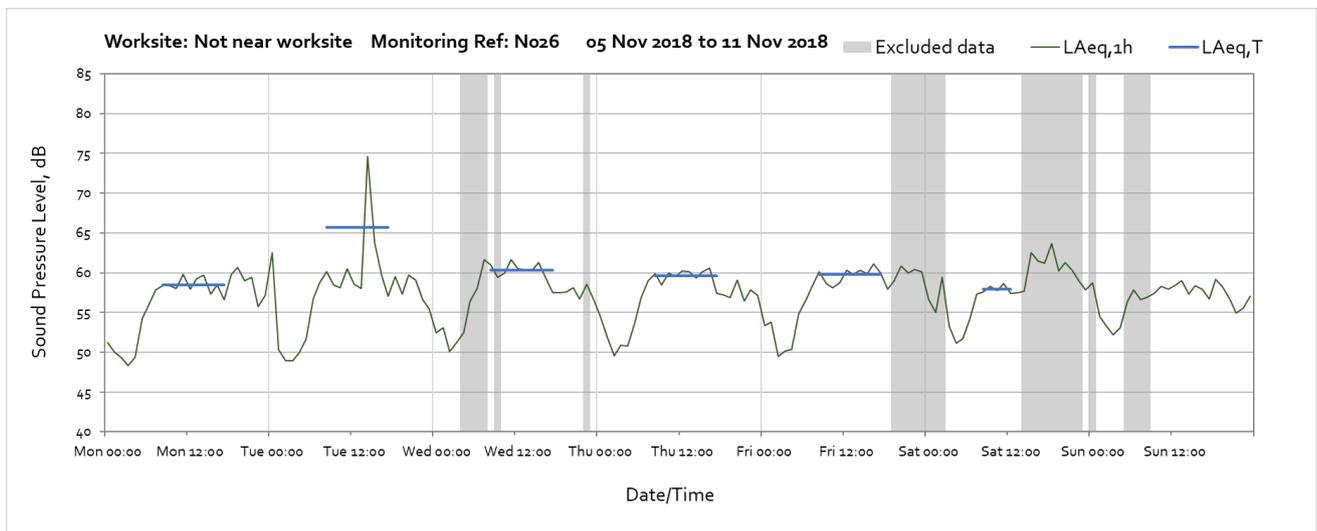
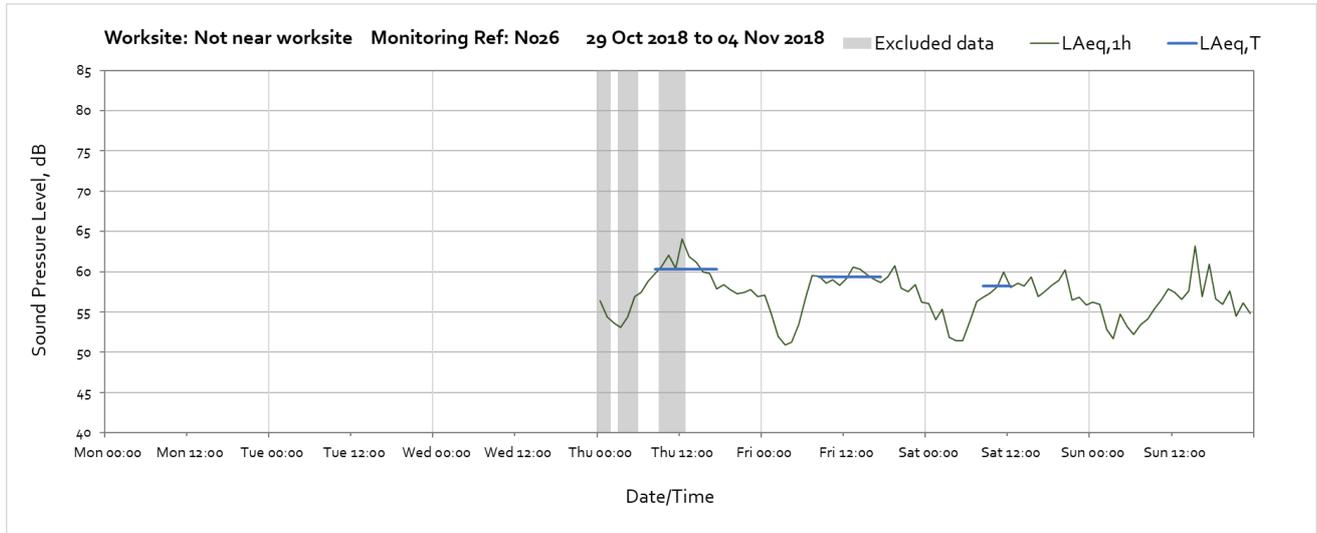


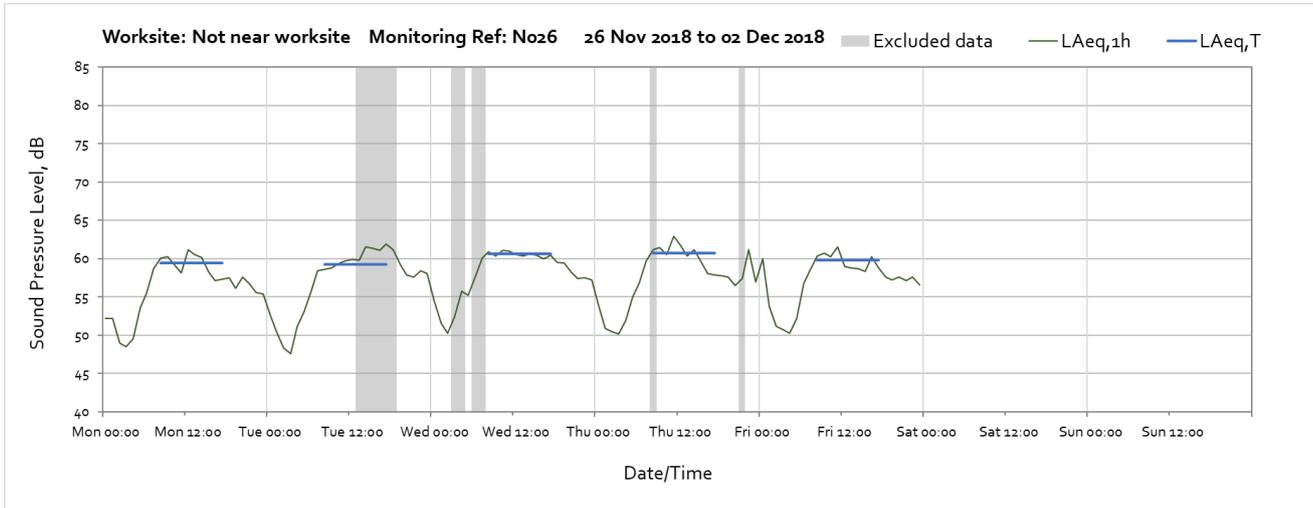
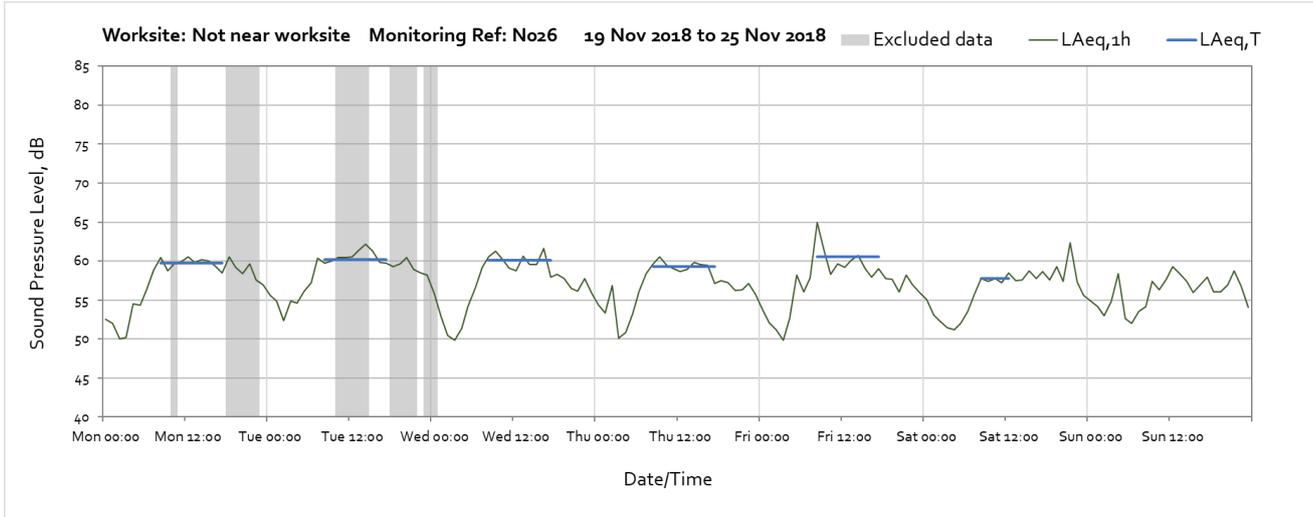
## Monitoring Ref: N025





# Monitoring Ref: N026

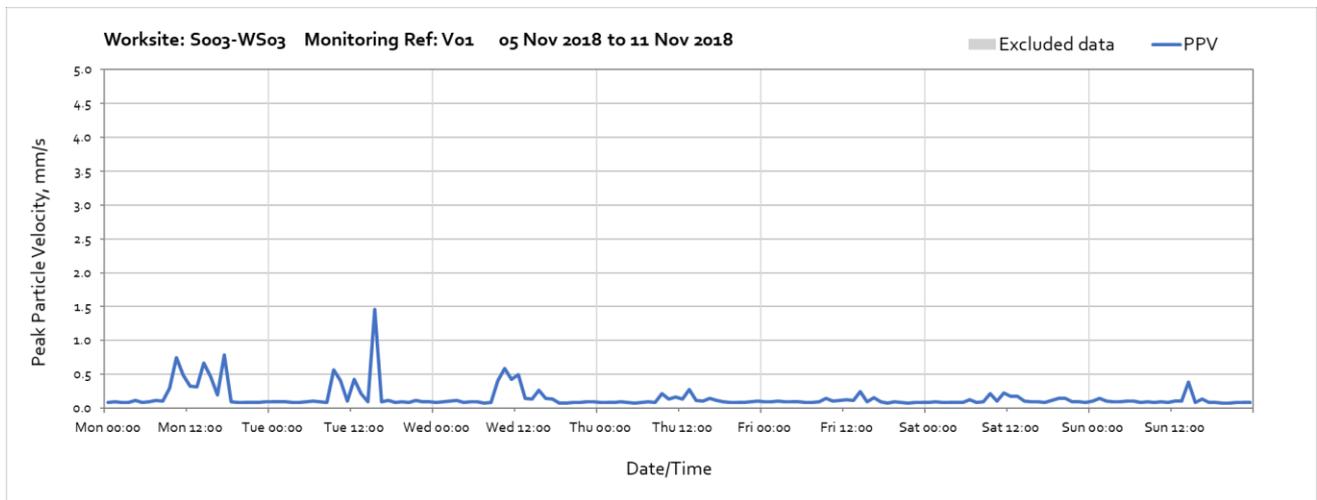
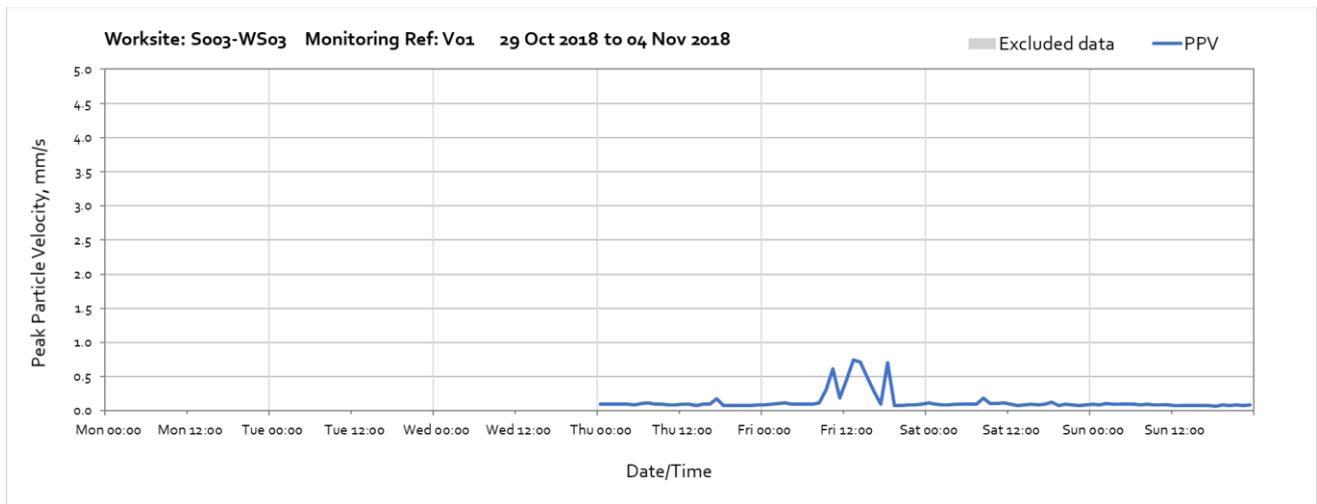


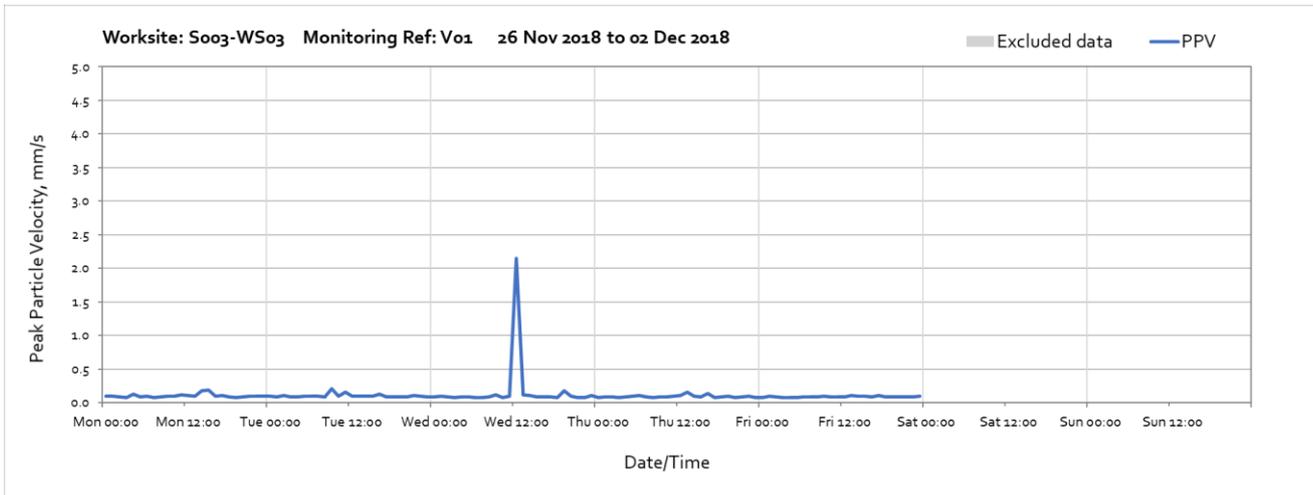
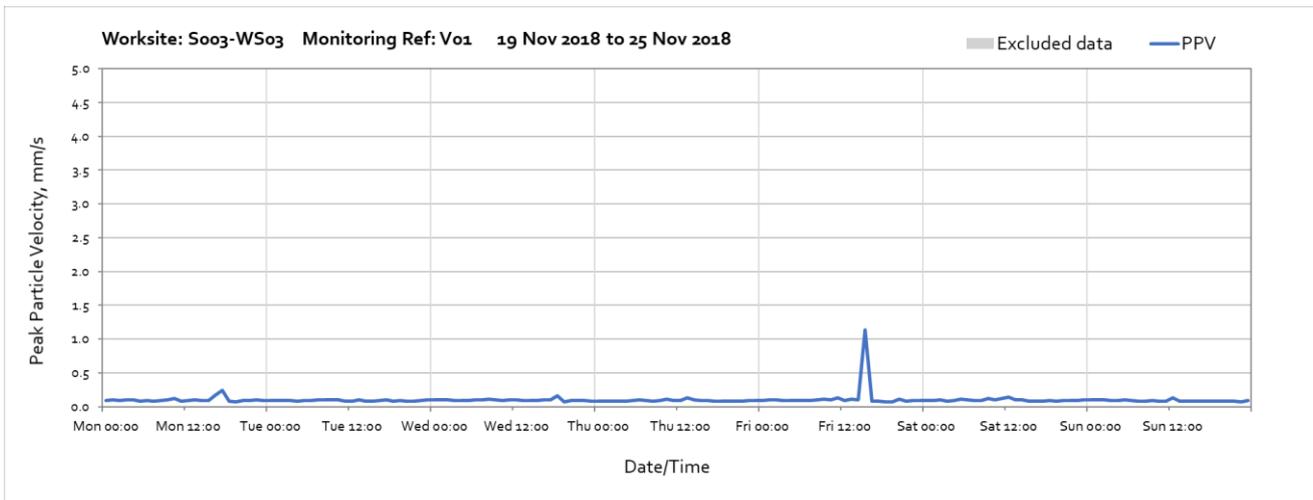
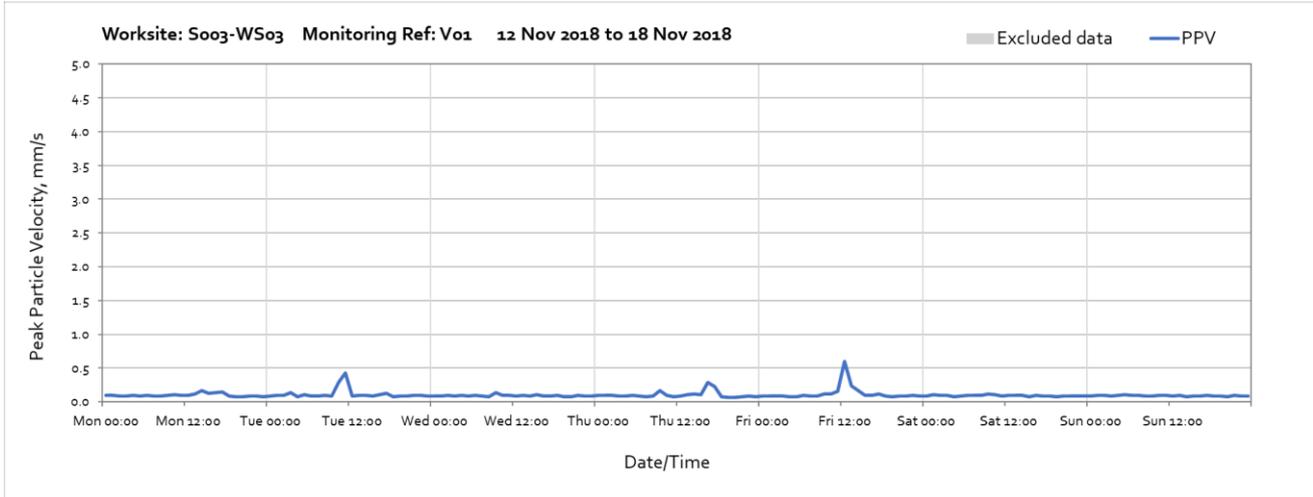


## Vibration

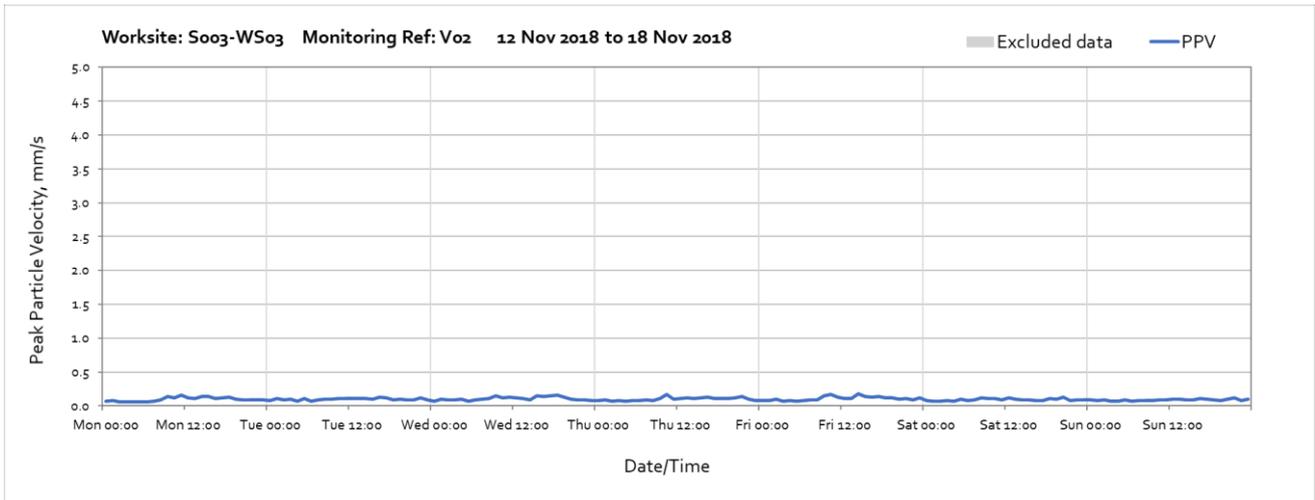
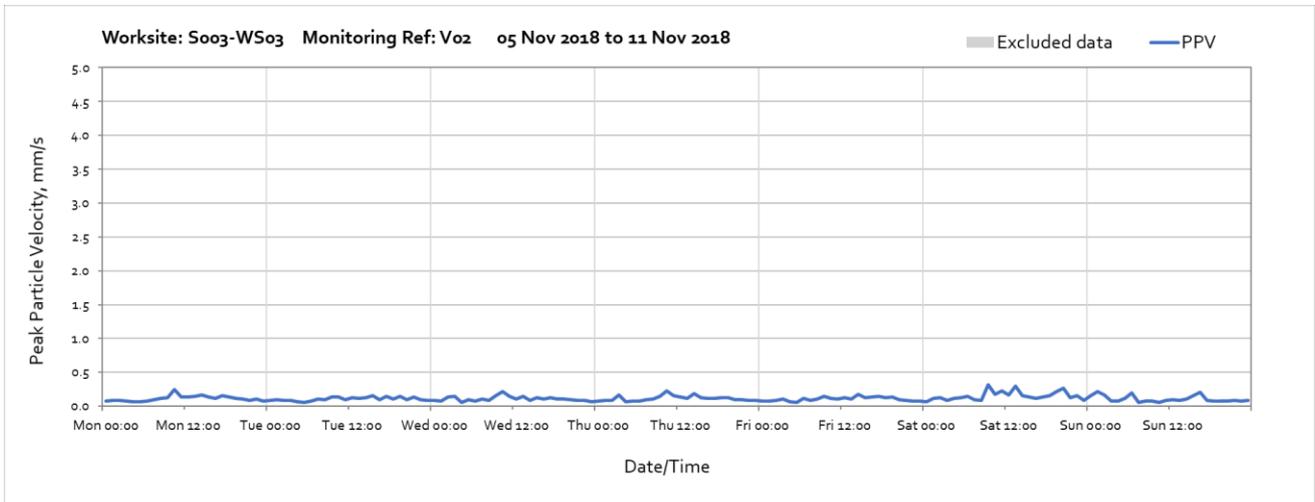
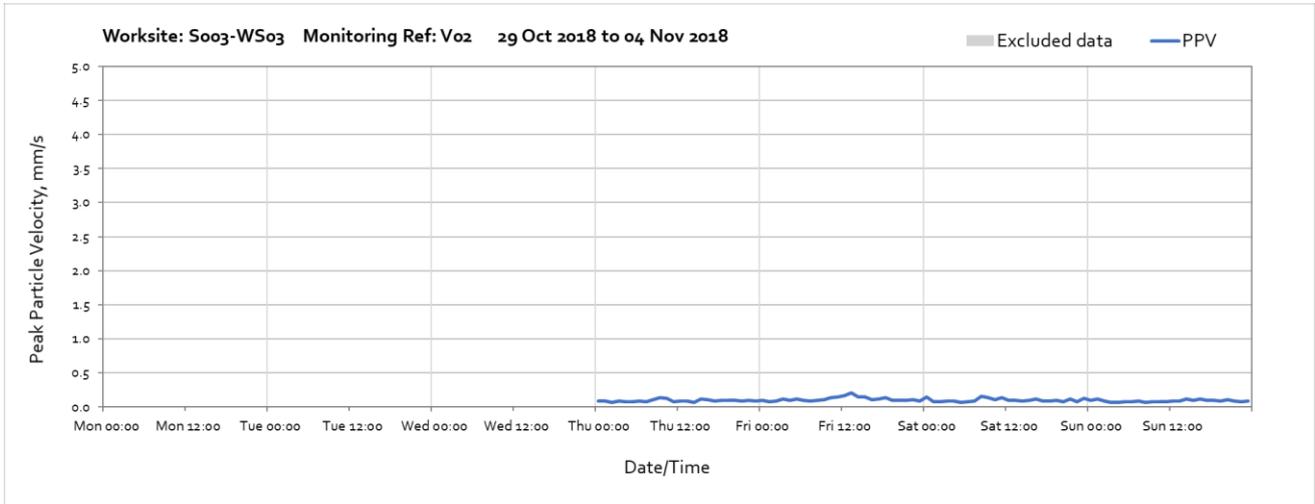
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axis x, y and z. Exceptionally high values of PPV were measured at vibration monitor V02 in the afternoon of Wednesday 21<sup>st</sup> of November. These elevated vibration levels were due to local interference in close proximity to the vibration monitor. These data entries have been excluded to calculate values in Table 6.

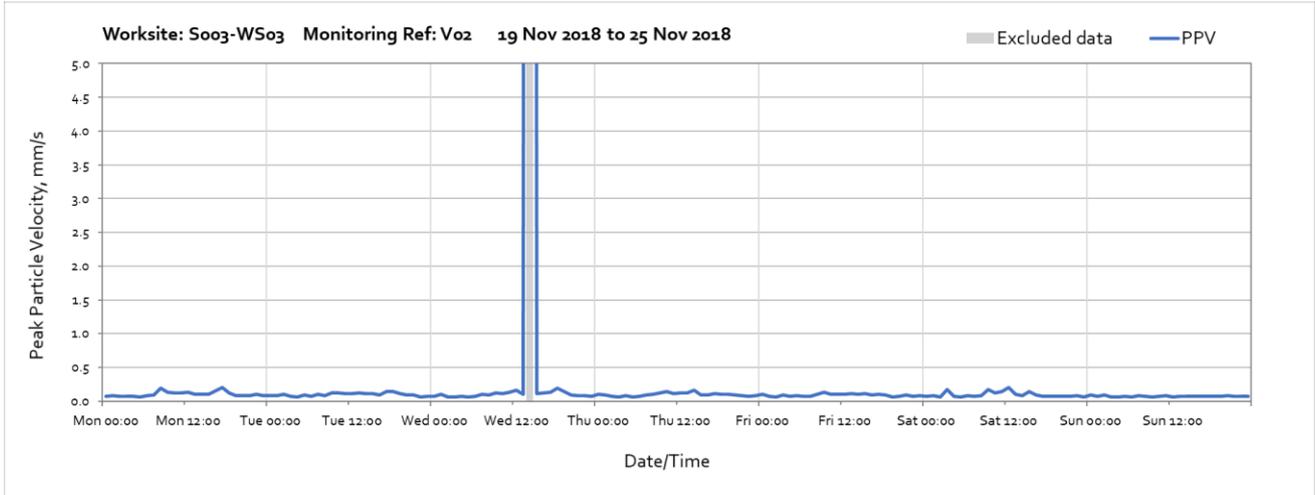
### Worksite: S003-WS03 – Monitoring Ref: V01





# Worksite: S003-WS03 – Monitoring Ref: V02





Note – High vibration event at 14:00 on Wednesday 21<sup>st</sup> was due to local interference and was not related to HS2 works.

