

Construction noise and vibration Monthly Report – February 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 February 2018.

A number of worksites were active during the reporting month in the LBC area. HS2 preparatory works were undertaken at Network Rail worksites B, C, D, E and F. Erection of demolition scaffold, removal of fixtures and fittings and demolition were underway at the DB Cargo worksite (ref. S001-WS01), along with site establishment works at the former Addison Lee site. Hoarding and pre-demolition surveys were carried out at Walkden House worksite (ref. S003-WS03), and Drummond Street / Euston Street worksites (ref.: S003-WS07). Further non-intrusive activities were underway at other worksites around Euston Station (worksites ref. S001-WS02, S003-WS01, S003-WS02, S003-WS04, S003-WS05, S003-WS06, S003-WS09). Details of works undertaken at each worksite is presented in the report.

Noise monitoring was undertaken in the vicinity of the DB Cargo worksite (ref.: S001-WS01), and Network Rail worksites B, C, E and F. Four new noise monitors were installed in February at locations near Walkden House worksite (ref.: S003-WS03) and along Mackworth Street.

Exceedances of the SOAELs due to HS2 works were measured at some monitoring positions surrounding worksites D, E and F, which were caused by activities at on-network HS2 construction sites. An exceedance of the S61 trigger level was measured at N004 near worksite S001-WS01 on 14 February 2018, which was determined not to be related to HS2 construction works. Three complaints were received regarding noise from construction sites near Euston Square Gardens, Mornington Terrace and Granby Terrace. Description of the complaints, results of investigations and any action taken are detailed in the report.

Further noise monitoring installations are planned within the London Borough of Camden, these are to be put in place in advance of significant demolition and construction activities in other areas, and resulting data incorporated within future monitoring reports.

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 1st to 28th February 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 compound deliveries and works, cone penetration testing, mobilising rotary rig to DB Cargo sidings, material recovery, under track crossing (UTX) monitoring, west side clearance surveys/east side positioning surveys - signalling/telecoms/E&P equipment, de-mobilising cable percussion rig from backing out road 1 Wideway to Juniper Crescent, rotary drilling in DB Cargo sidings, 1 Track UTX installation, topographical surveys and ground investigation, non intrusive surveys.
- Network Rail on-networks HS2 preparatory works: worksite ref. C, D and E (see plan 2 in Appendix A)
 - Works activities include top surveys, ground investigation, crane lift of redundant cable and transformer.
- Network Rail on-networks HS2 preparatory works: worksite ref. F (see plan 2 in Appendix A)
 - Works activities include deep drainage installation, concrete blinding and root barrier, manhole installation and substructure, substructure construction.

- DB Cargo shed and adjacent land on Granby Terrace, worksite ref. S001-WS01 (see plan 2 in Appendix A)
 - Works activities include erection of the demolition scaffold on Park Village East, soft strip of buildings, asbestos removal and initial demolition activities. Works at the former Addison Lee site include surveys and site preparation in advance of installation of accommodation.
- 132 and 140 Hampstead Road and Petrol Station, worksite ref. S001-WS02 (see plan 3 in Appendix A)
 - Works activities include pre-demolition surveys and hoarding.
- St James's Gardens, worksite ref. S003-WS01 (see plan 3 in Appendix A)
 - Works activities include archaeological surveys and tree clearance.
- Former National Temperance Hospital, Insull Wing, worksite ref. S003-WS02 (see 3 in Appendix A)
 - Works activities include pre-demolition surveys.
- Walkden House, 67-75 & 77-79 Euston Rd, worksite ref. S003-WS03 (see plan 3 in Appendix A)
 - Works activities include pre-demolition surveys.
- Thistle Hotel, Cardington Street, worksite ref. S003-WS04 (see plan 3 in Appendix A)
 - Works activities include pre-demolition surveys.
- Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street, worksite ref. S003-WS05 (see plan 3 in Appendix A)
 - Works activities include pre-demolition surveys.
- Former National Temperance Hospital, 110-122 Hampstead Road, worksite ref. S003-WS06 (see plan 3 in Appendix A)
 - Site activities include ground works for staff accommodation and 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 hoarding and pre-demolition surveys.
- Euston Square Gardens (west), worksite ref. S003-WS08 (see plan 3 in Appendix A)
 - Works activities include hoarding and tree clearance (extended working hours due to public and highways interfaces).

- 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 site possession and hoarding.

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>. The noise and vibration monitoring report for January 2018 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.

1.2 Measurement locations

- 1.2.1 Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in February 2018. No vibration monitoring was required during the period of reporting.
- 1.2.2 During February noise monitoring was commenced at three locations near Walkden House worksite (ref.: S003-WS03 – monitors N008 and N011 installed on the 23rd, and monitor N012 installed on the 22nd) and along Mackworth Street (monitor N020 installed on the 26th of February).
- 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	JC	Juniper Crescent, London, NW1 8HA
D	MT	13 Mornington Terrace, Kings Cross, London, NW1 7RR
	N004	Mornington Terrace lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row)
E	GT	5A Granby Terrace, Kings Cross, London, NW1 3SA
F	BS	Roof of Stockbeck House, Barnby Street, Kings Cross, 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)
S003-WS03	N008	Stephenson's Way lamppost (external to RCGP)
	N011	Euston Street lamppost #4 (external to 82 Euston Street)
	N012	Drummond Street lamppost #14 (opposite to 92-94 Drummond Street)

Worksite Reference	Measurement Reference	Address
Not near worksite	N020	Mackworth Street lamppost #1

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
B	JC ⁽¹⁾	Juniper Crescent	All days	All periods	No exceedance
D	MT	Mornington Terrace	Night	2200-0700	1
	N004	Mornington Terrace lamppost #7	Saturday	1400-2200	1
			Sunday	0700-2200	2
Night	2200-0700	3			
E	GT	Granby Terrace	Sunday	0700-2200	3
			Night	2200-0700	2
	N001	DB Cargo shed and adjacent land on Granby Terrace	Night	2200-0700	3
	N002	DB Cargo shed and adjacent land on Granby Terrace	Night	2200-0700	3
N003	DB Cargo shed and adjacent land on Granby Terrace	Night	2200-0700	3	

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
F	BS	Barnby Street	Night	2200-0700	3
S001-WS01	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
S003-WS03	N008	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
	N011	Walkden House, 67-75 & 77-79 Euston Rd	All days	All periods	No exceedance
	N012	93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street	All days	All periods	No exceedance
Not near worksite	N020	Mackworth Street lamppost #1	All days	All periods	No exceedance

⁽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. This monitor is being relocated to a more representative location on site in closer proximity to 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 D, E and F. These were caused by activities at Network Rail on-network HS2 construction sites during night-time periods and 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.

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 day of exceedance. 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
D	MT	Mornington Terrace	1
	N004	DB Cargo shed and adjacent land on Granby Terrace	3

Worksite Reference	Measurement Reference	Site Address	Total of SOAEL exceedances in the month
E	GT	Granby Terrace	3
	N001	DB Cargo shed and adjacent land on Granby Terrace	3
	N002	DB Cargo shed and adjacent land on Granby Terrace	3
	N003	DB Cargo shed and adjacent land on Granby Terrace	3
F	BS	Barnby Street	3

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 Given the limited nature of works currently being undertaken at worksites in LBC the measured noise levels are largely dominated by the underlying ambient noise levels, rather than being attributable to HS2 construction noise, acknowledging that intermittent HS2 works have on occasion been taking place within the area.

Table 5: Summary of measured dB L_{Aeq} data over the monitoring period.

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
B	JC ⁽¹⁾	Juniper Crescent, London, NW1 8HA	Free-field	68.7 (72.8)	69.6 (73.9)	68.6 (72.6)	67.2 (72.6)	63.6 (71.6)	67.6 (71.1)	68.3 (71.3)	66.7 (70.3)	66.9 (71.0)	63.1 (69.3)	67.8 (81.7)	63.1 (69.5)
C	MT	13 Mornington Terrace, Kings Cross, London, NW1 7RR	Free-field	56.3 (59.4)	59.3 (75.0)	58.5 (61.5)	56.4 (60.1)	51.7 (59.2)	56.0 (56.2)	57.1 (57.1)	57.2 (57.4)	57.5 (58.7)	55.1 (58.2)	56.4 (58.1)	56.5 (73.1)
E	GT	5A Granby Terrace, Kings Cross, London, NW1 3SA	Free-field	68.6 (71.0)	69.7 (73.2)	69.3 (75.5)	67.6 (70.7)	63.9 (71.7)	67.7 (68.6)	68.3 (69.5)	67.5 (67.9)	67.0 (70.5)	62.7 (71.1)	67.8 (71.6)	63.1 (70.6)
F	BS	Roof of Stockbeck House, Barnby Street	Free-field	60.6 (62.0)	64.2 (67.0)	62.2 (64.2)	60.9 (63.5)	57.2 (65.3)	60.3 (60.7)	60.8 (61.6)	60.3 (61.4)	60.3 (63.6)	56.3 (60.3)	60.6 (63.9)	57.3 (62.4)
S001-WS01	N001	External to Cubitt Court, 100 Park Village East	Façade	62.1 (64.1)	63.7 (68.5)	62.9 (68.9)	60.2 (62.6)	56.0 (63.9)	58.8 (60.8)	59.8 (60.8)	64.8 (68.2)	62.3 (68.1)	58.1 (61.9)	59.1 (62.7)	56.3 (67.8)
	N002	Richmond Court, Park Village East	Free-field	63.1 (65.1)	64.4 (65.9)	64.4 (68.4)	61.6 (64.1)	57.3 (63.0)	59.8 (61.5)	61.4 (62.6)	64.2 (65.7)	63.6 (69.1)	58.0 (61.9)	60.5 (63.0)	57.8 (66.4)
	N003	Silsoe House, Park Village East	Free-field	63.4 (65.7)	64.5 (65.8)	64.6 (67.8)	62.0 (65.0)	57.5 (63.0)	60.7 (61.4)	61.5 (63.7)	64.4 (66.4)	64.3 (70.1)	57.9 (62.1)	60.7 (63.4)	57.6 (67.1)
	N004	Mornington Terrace lamppost #7	Free-field	64.4 (67.6)	66.3 (73.5)	65.6 (71.2)	63.9 (67.3)	60.4 (69.8)	63.7 (64.7)	64.0 (65.1)	62.7 (63.4)	63.4 (68.6)	57.9 (64.6)	60.9 (67.3)	59.4 (68.3)

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	N008	RCGP Stephenson Way	Façade	63.1 (64.5)	59.7 (61.4)	57.7 (58.0)	60.6 (67.8)	59.7 (70.1)	62.4 (62.4)	58.0 (58.0)	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	57.7 (60.1)	54.2 (54.2)	54.5 (56.1)
	N011	Outside #82 Euston Street	Free-field	59.4 (62.5)	66.9 (67.3)	63.3 (63.9)	61.2 (64.3)	57.8 (64.0)	60.2 (60.2)	59.4 (59.4)	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	55.2 (57.1)	58.2 (58.2)	57.9 (60.6)
	N012	Opposite #92-94 Drummond Street	Free-field	60.6 (63.2)	64.2 (65.0)	62.4 (63.1)	61.3 (62.4)	58.8 (61.4)	60.7 (60.7)	59.1 (59.1)	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	56.4 (57.0)	56.6 (56.6)	58.1 (60.9)
Not near worksite	N020	Mackworth Street	Free-field	50.9 (54.8)	55.0 (56.6)	55.3 (55.6)	52.4 (55.4)	48.6 (54.9)	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾	.. ⁽²⁾ .. ⁽²⁾

- (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) Monitoring was commenced late in the month and insufficient data have been recorded during this time period.

2.2.3 Appendix C presents graphs of noise 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). 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 6 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 6: 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

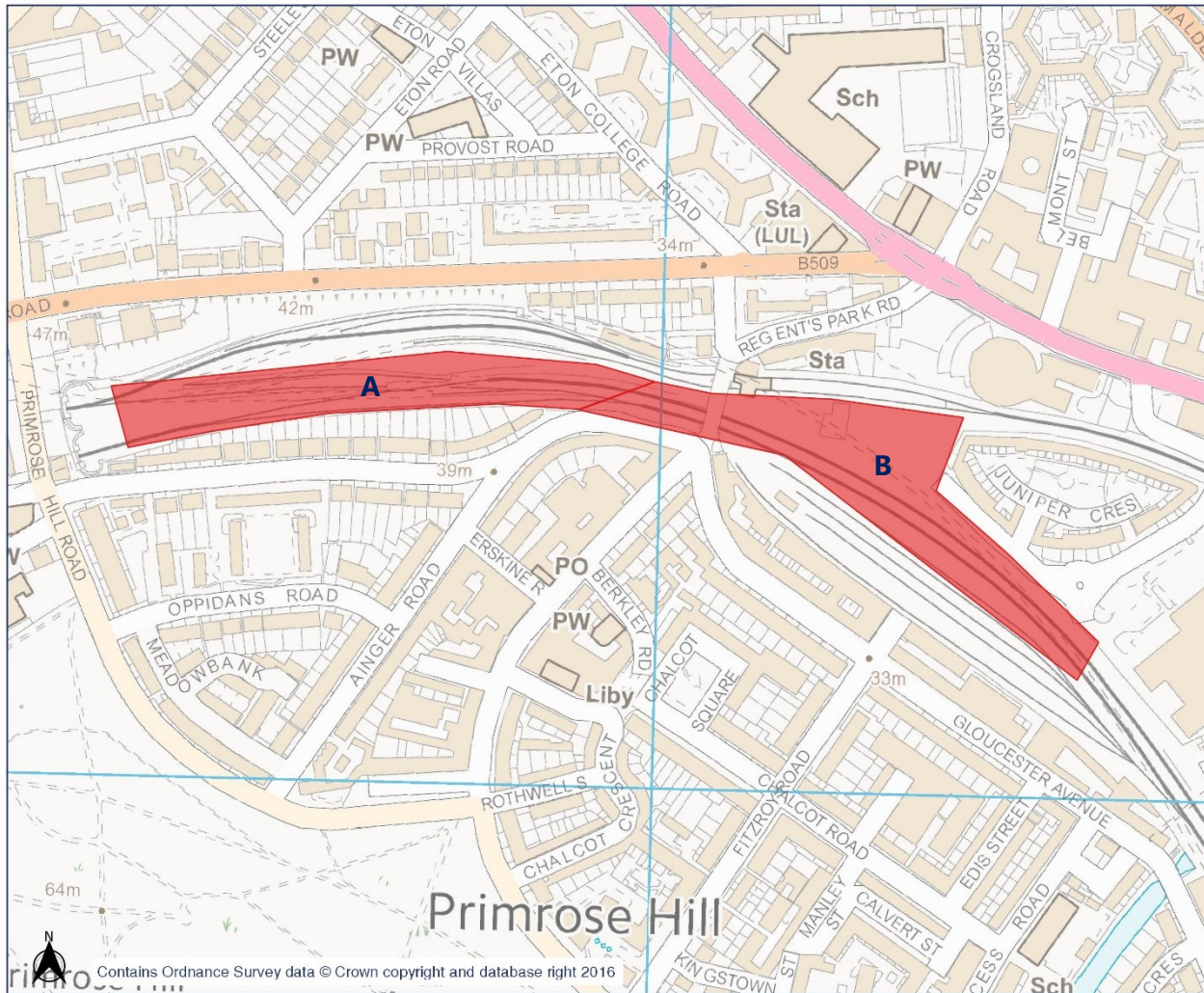
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

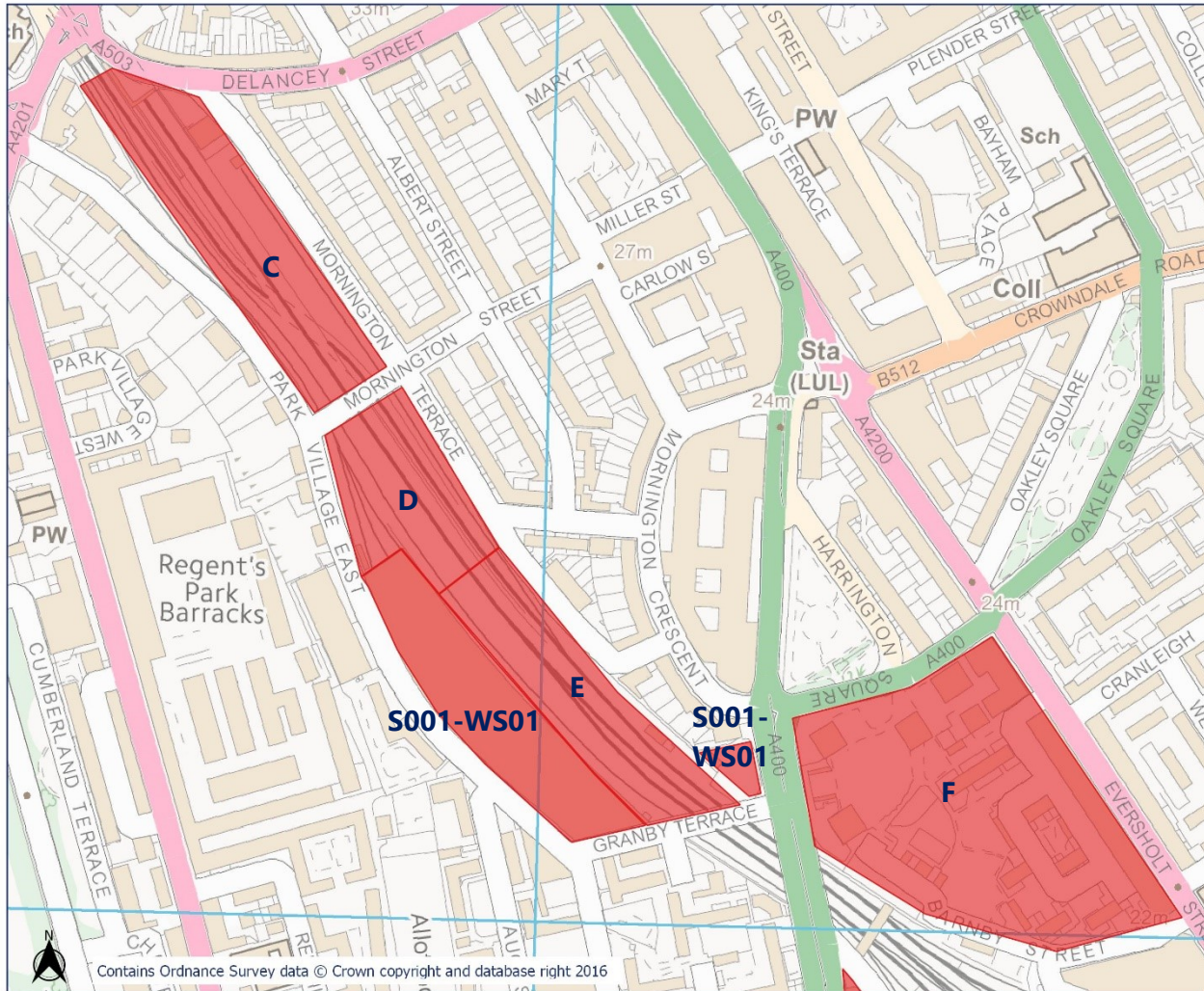
Table 7: Summary of complaints.

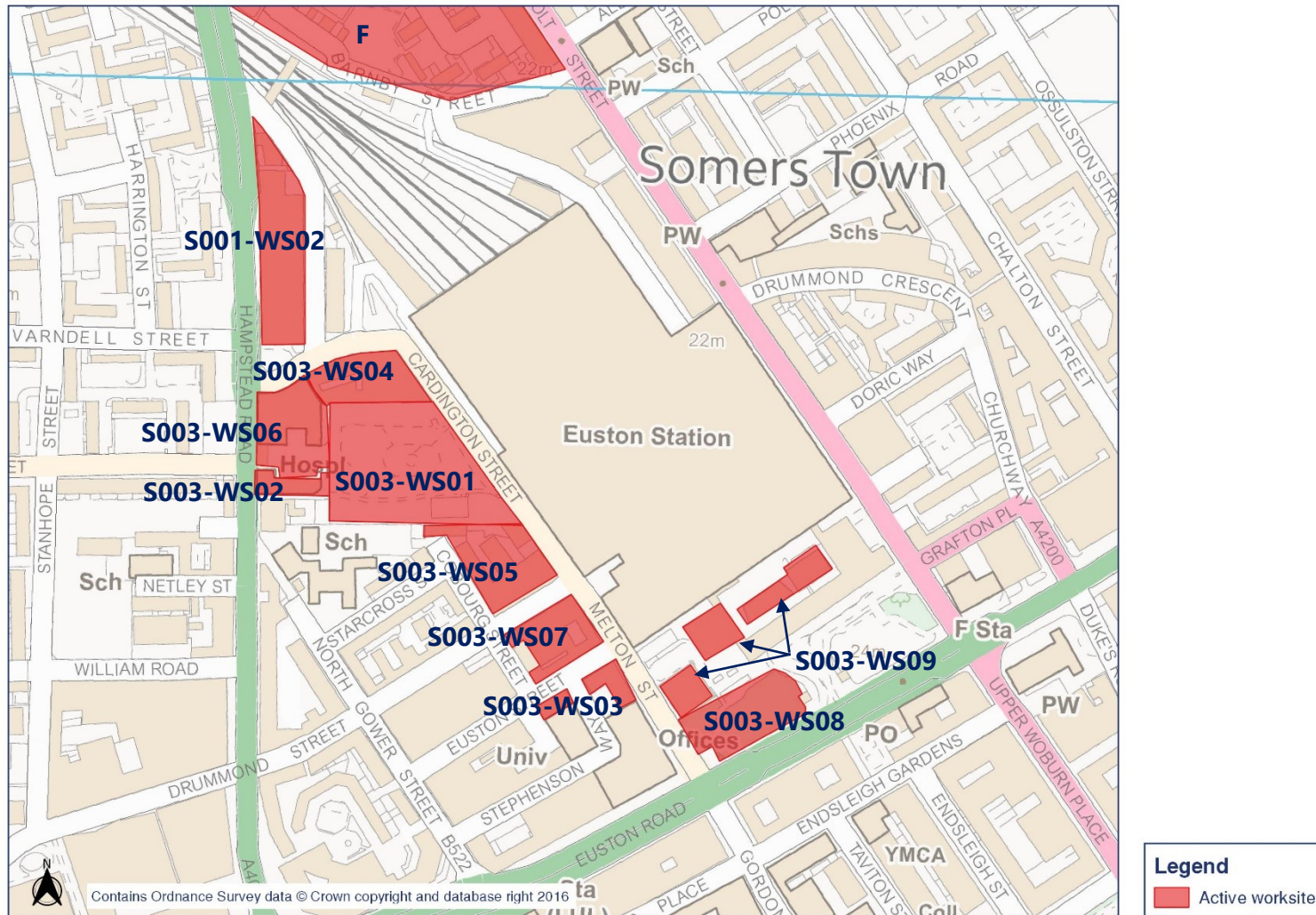
Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
CPO-000222	S003-WS08	Complaint regarding the noise from tree removal activities during the night time period causing vulnerable people without residence in the vicinity to be woken up.	Tree removal and hoarding works within Euston Square Gardens carried out in accordance with S61 consent. Various means of communication for advance notification of the works were provided to stakeholders, with	No action taken.

Complaint reference number	Worksite reference	Description of complaint	Results of investigation	Actions taken
			additional noticeboards to be introduced.	
CPA-000229	C	Complaint from a resident of Mornington Terrace regarding vibration from works	Works were carried out in accordance with S61 consent. Although perceptible vibration was predicted there would only be short lived exposure to local residents. Further mitigation of vibration was not practicable.	Response sent to complainant advising on outcome of investigation.
CPA-000235	D	General complaint from a resident on Granby Terrace regarding construction noise.	Investigation into complaint found that noise was not from HS2 works.	Resident advised noise was not due to HS2 works and that they would receive prior notification of any works likely to disturb them.

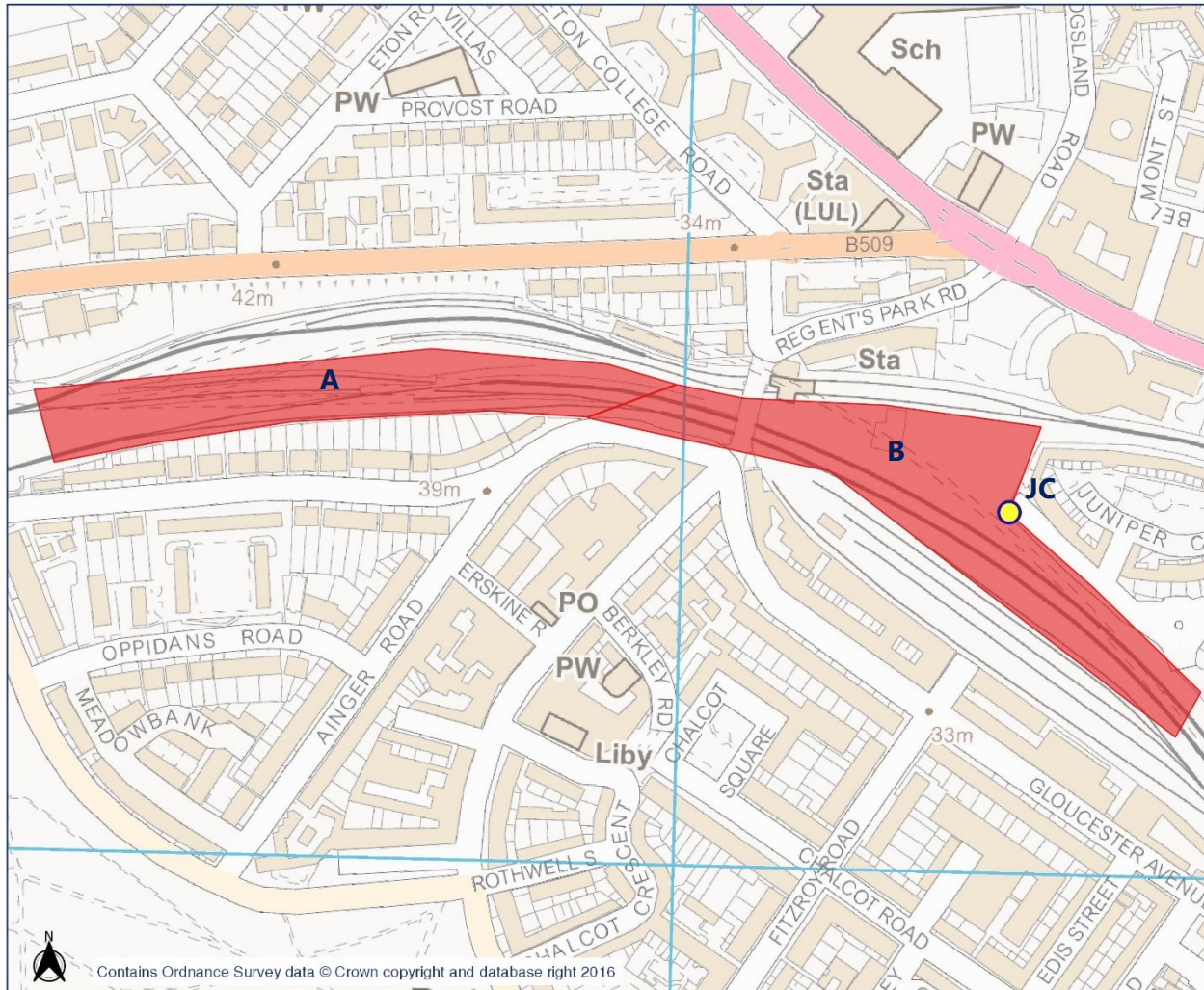
Appendix A Site Locations

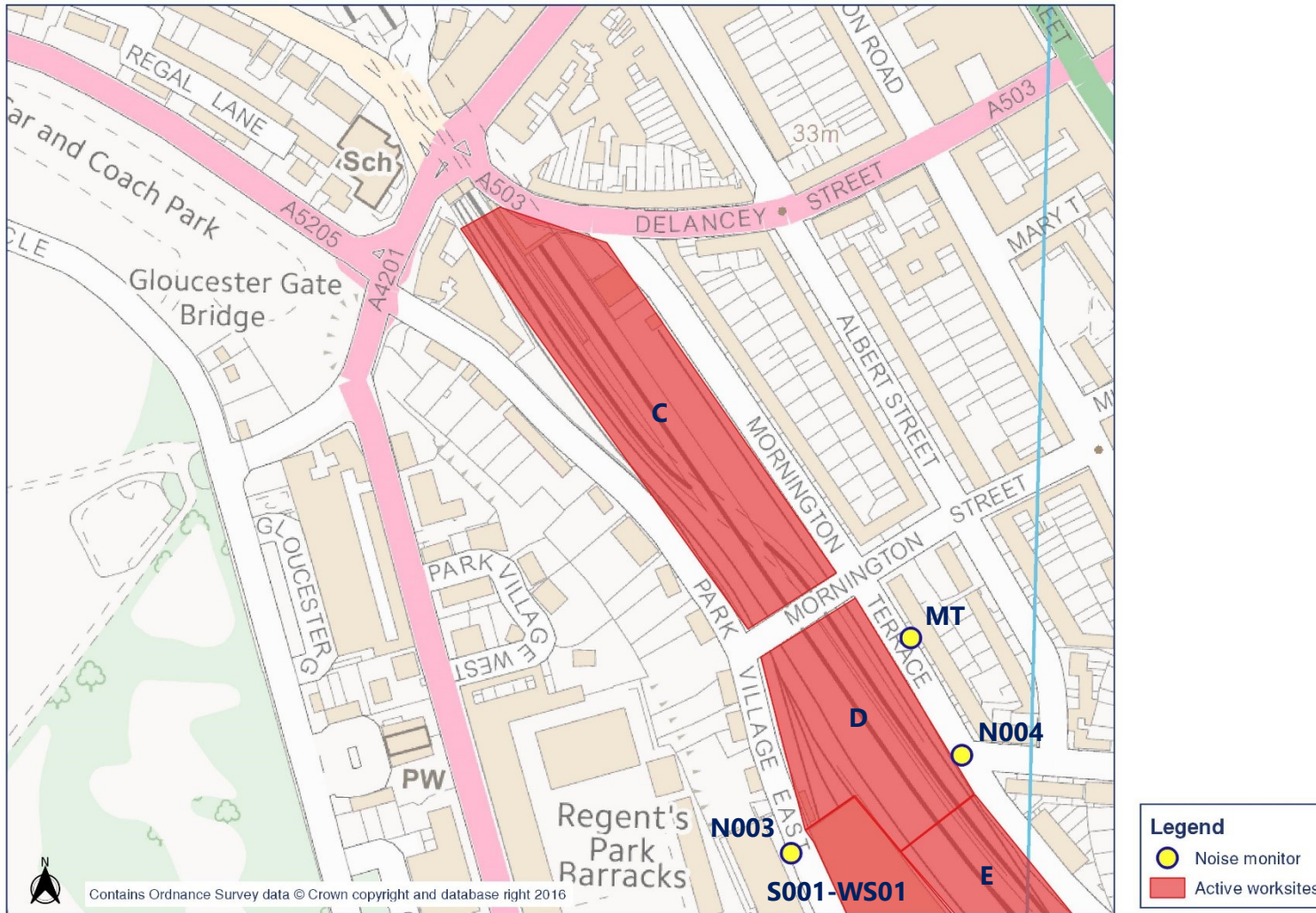


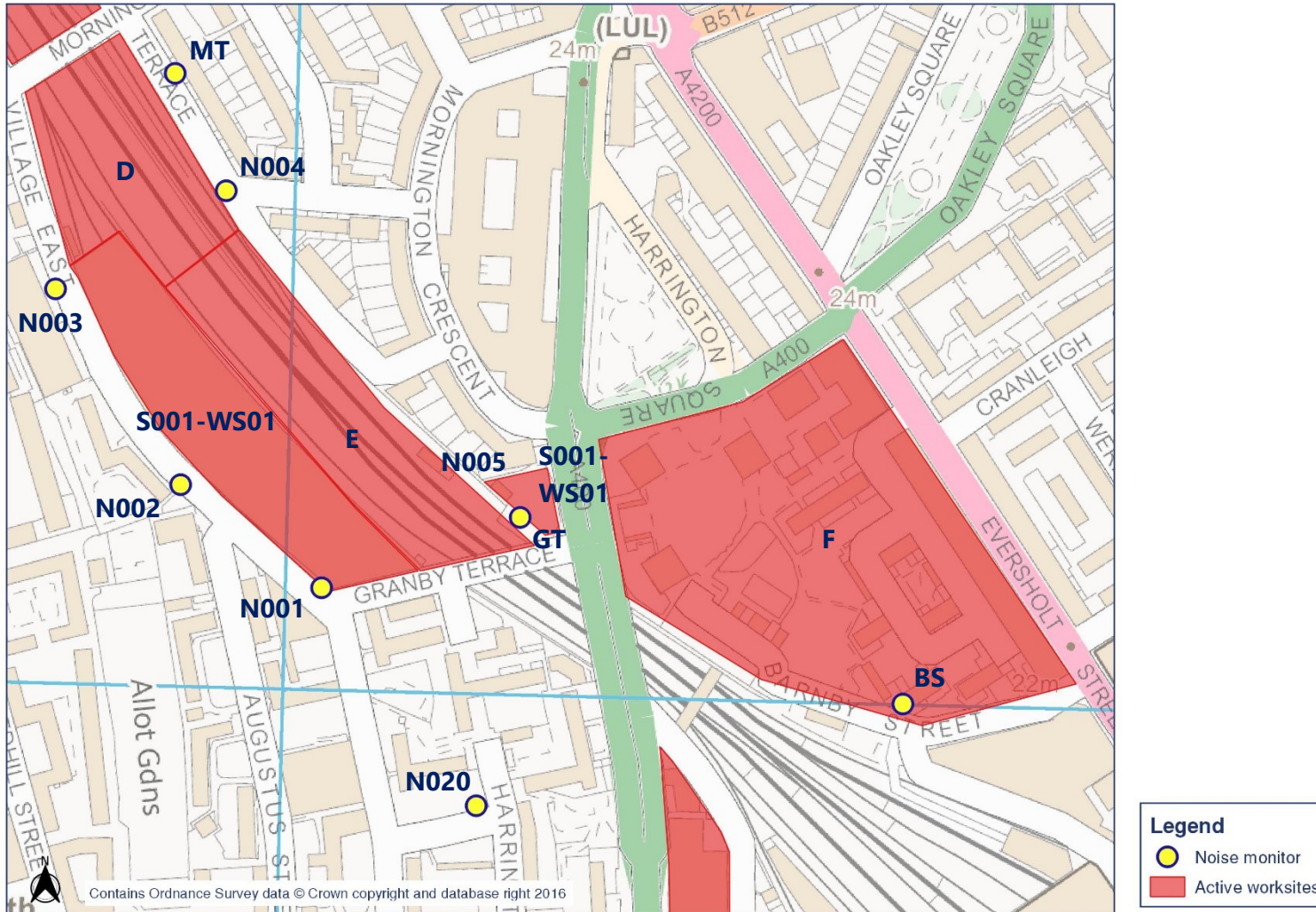


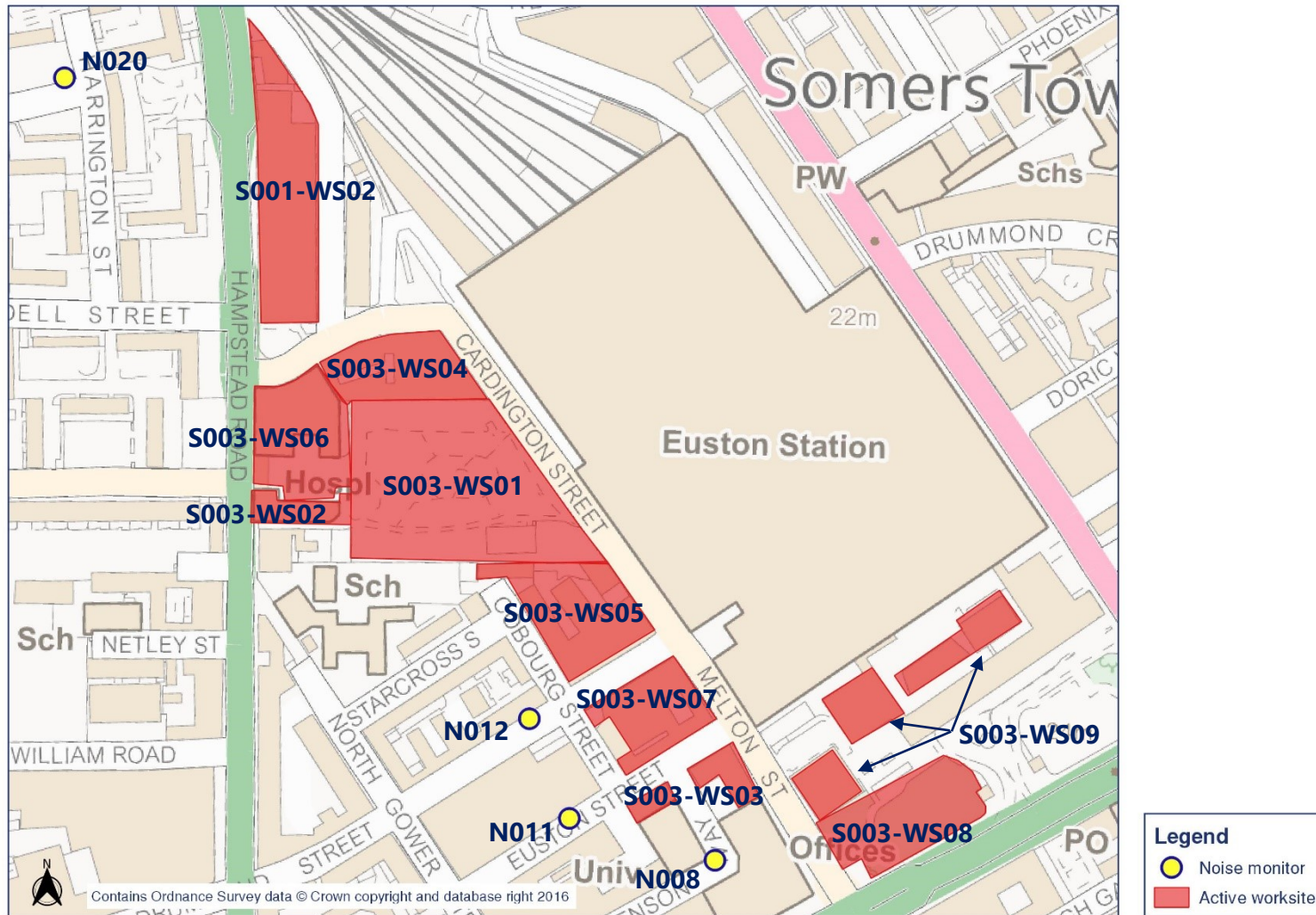


Appendix B Monitoring Locations







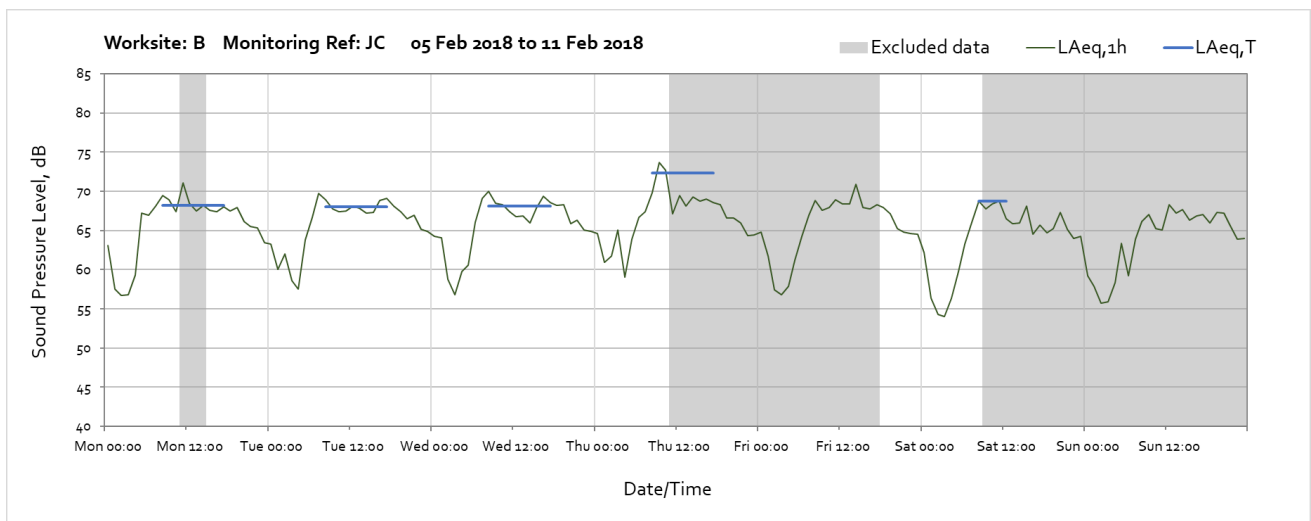
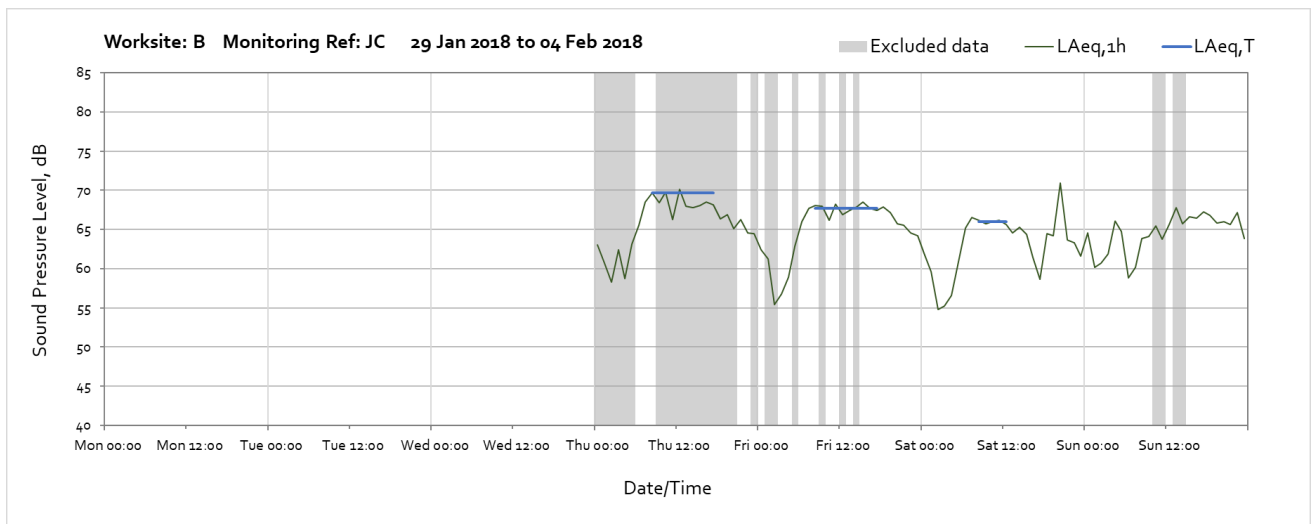


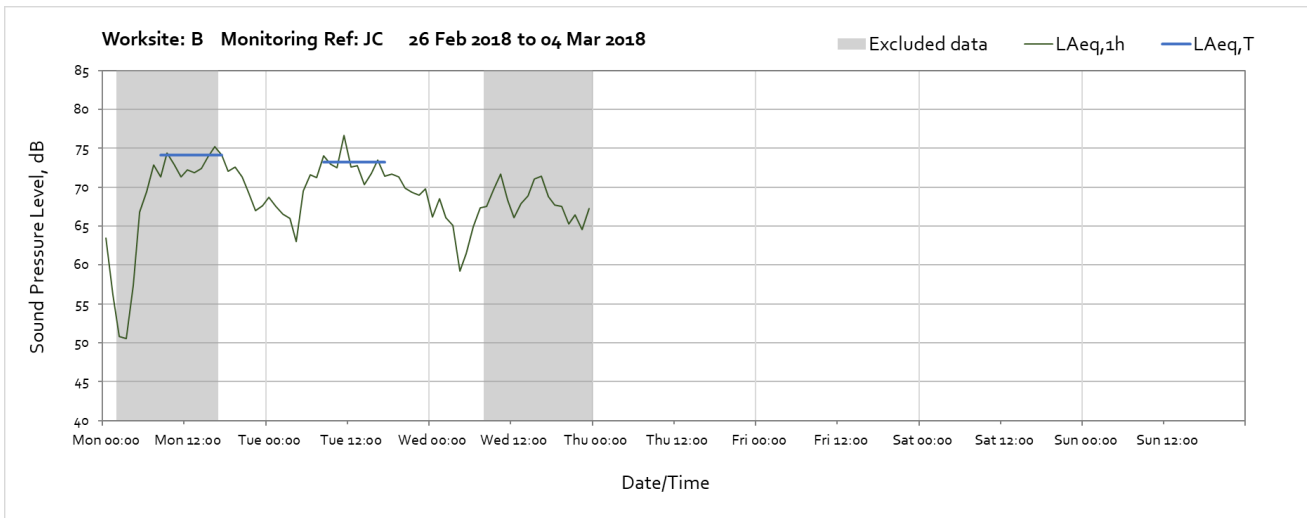
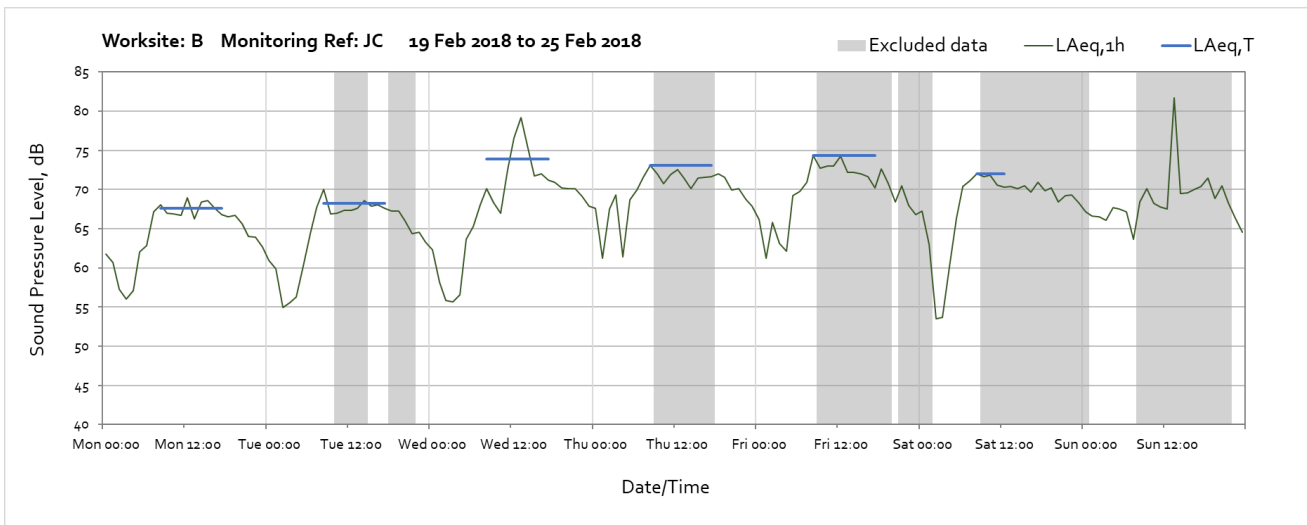
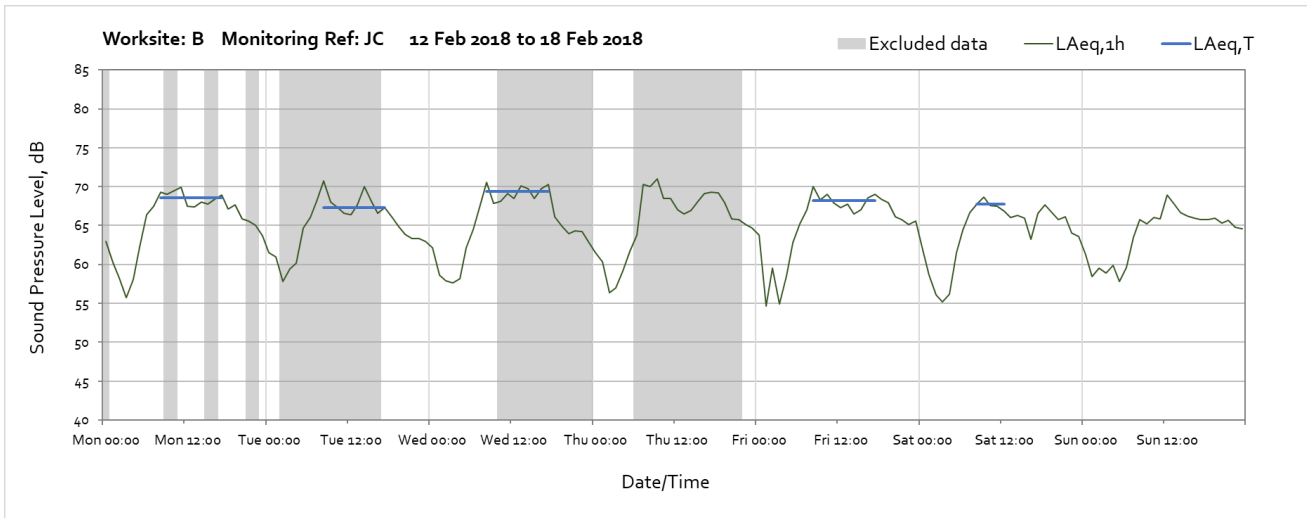
Appendix C Data

Noise

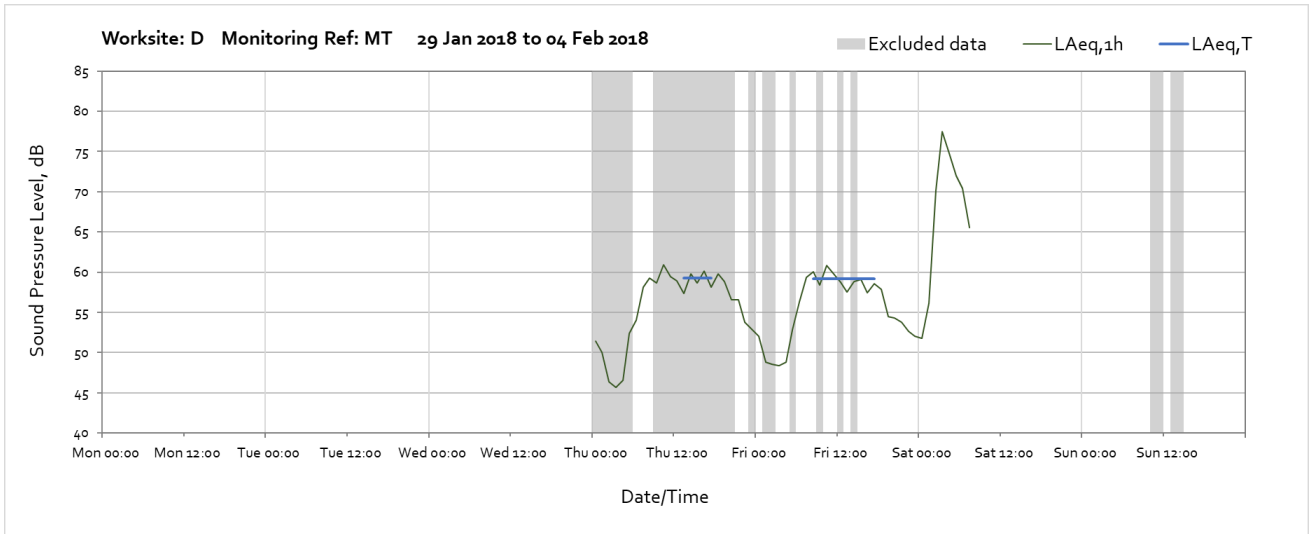
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

Worksite: B – Monitoring Ref: JC

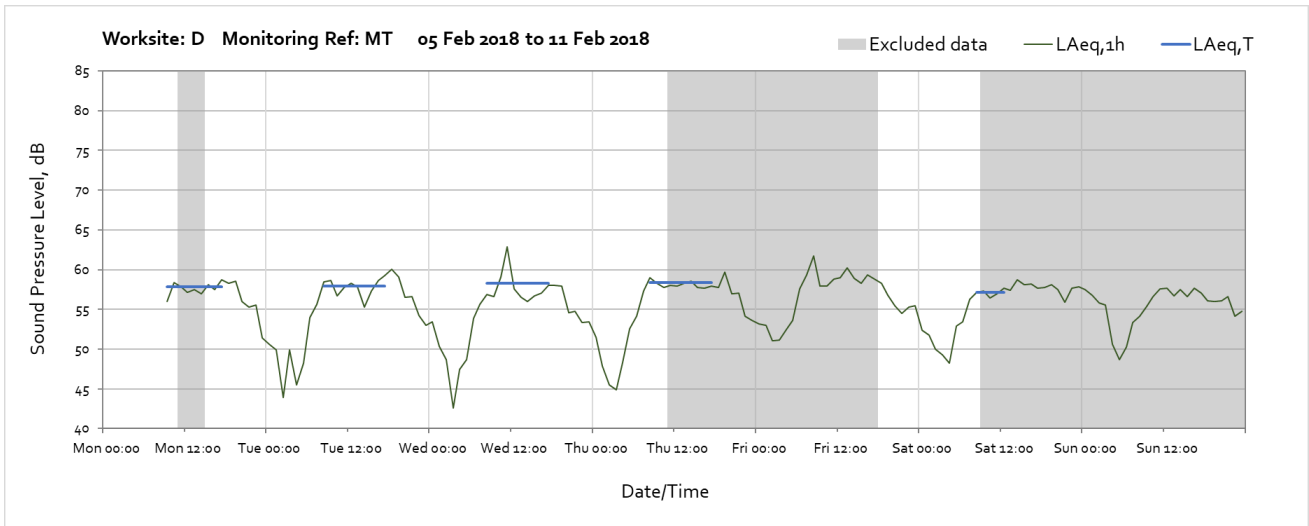




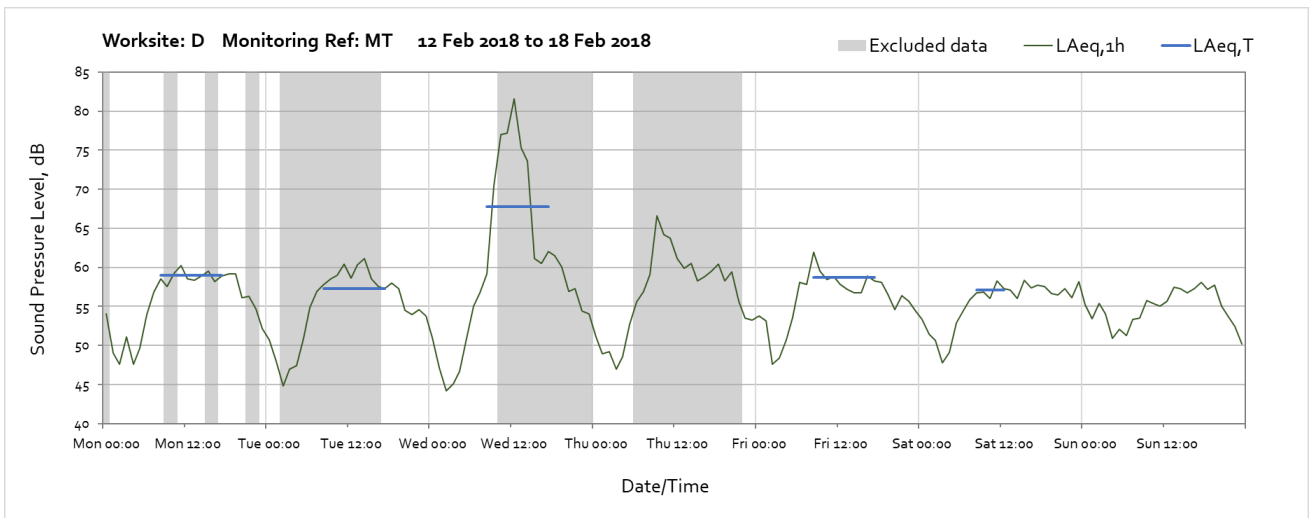
Worksite: D – Monitoring Ref: MT

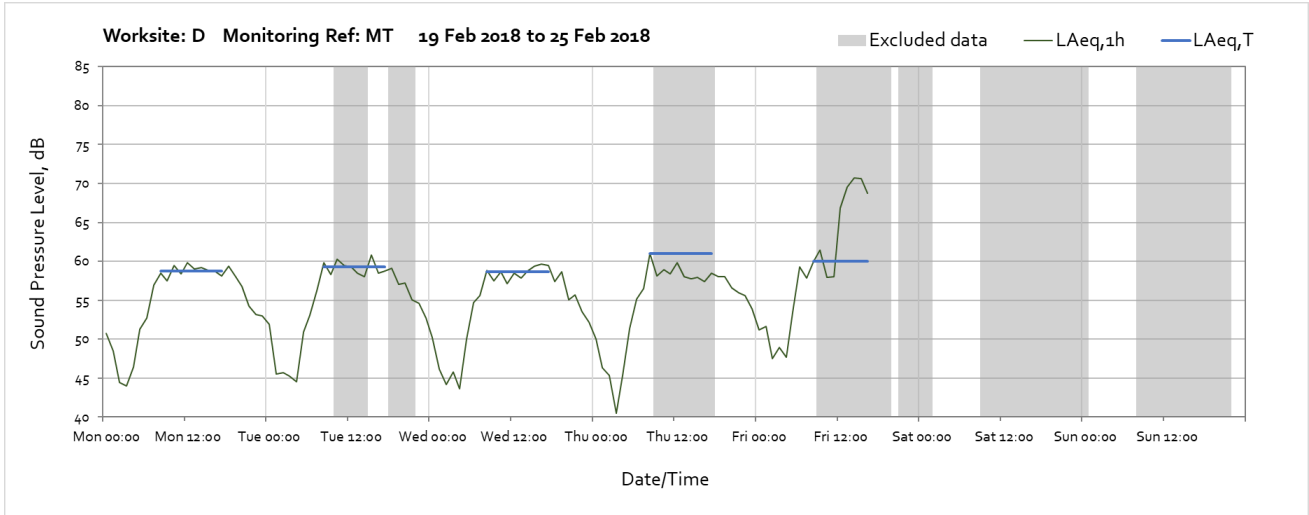


Note – Missing data between 07:00 on Saturday 3rd and 09:00 on Monday 5th due to a power failure.

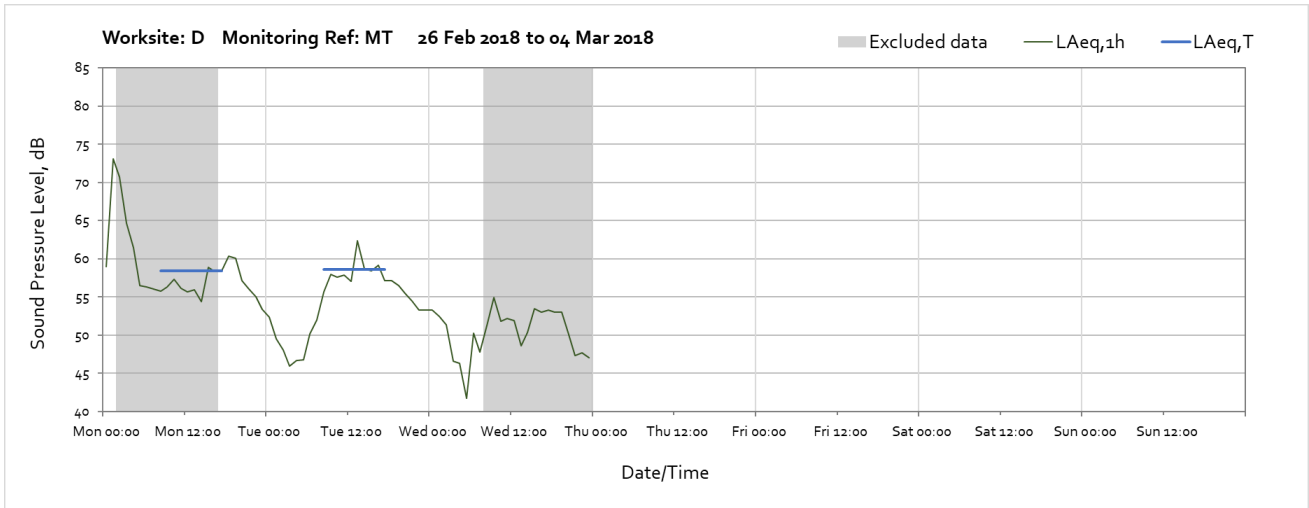


Note – Missing data between 07:00 on Saturday 3rd and 09:00 on Monday 5th due to a power failure.

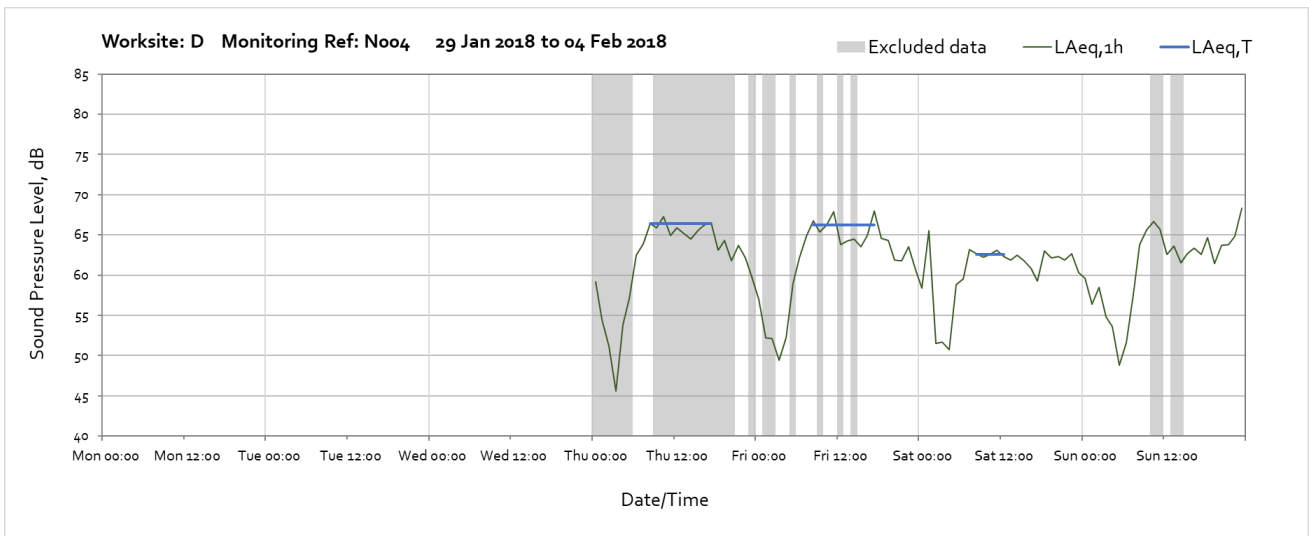


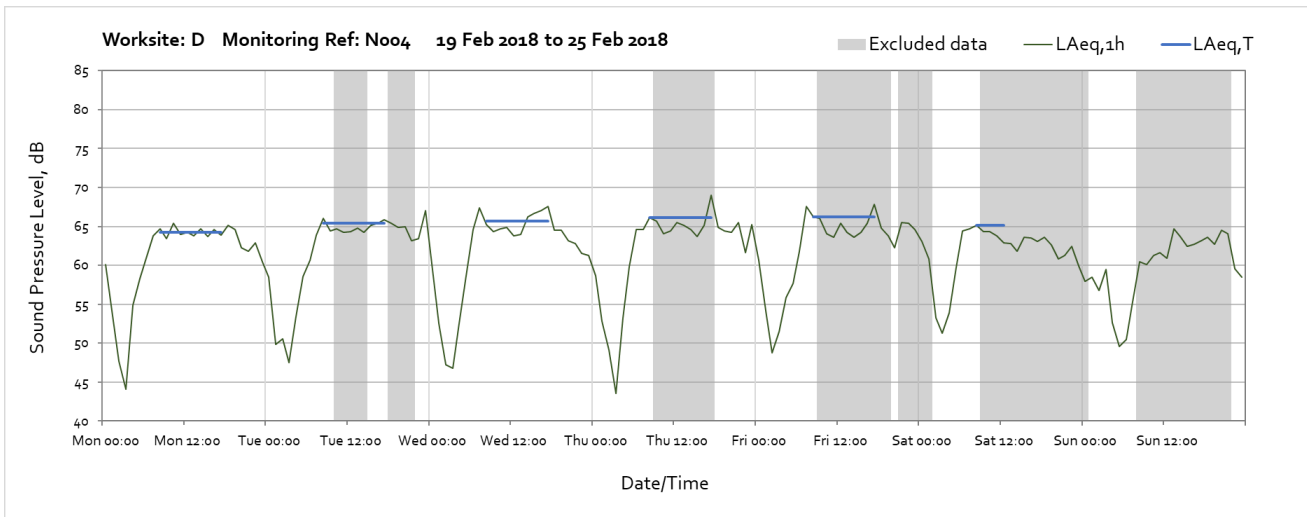
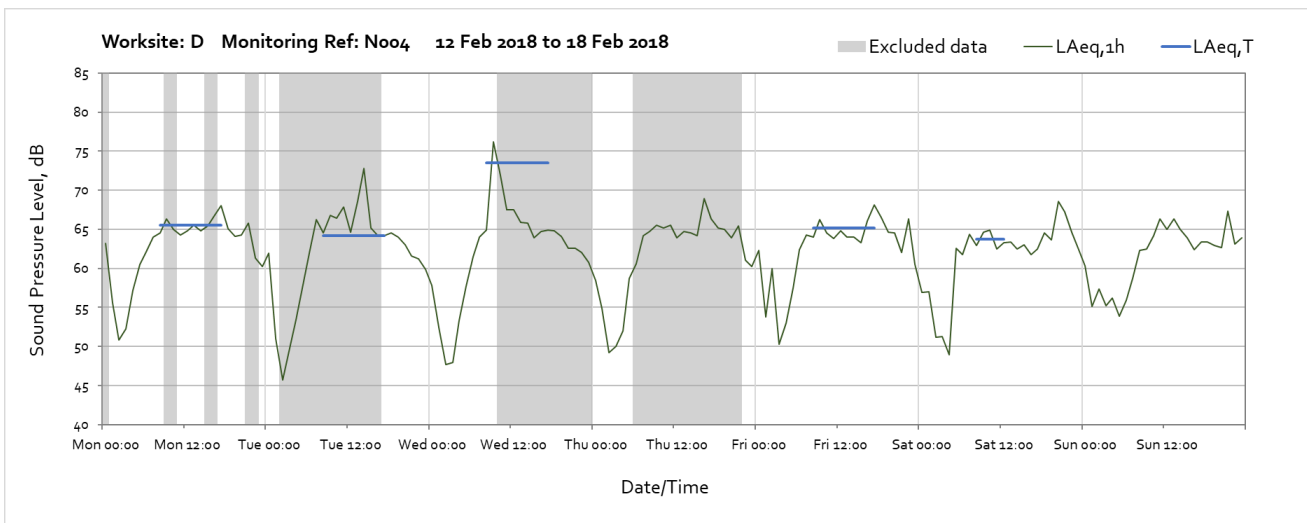
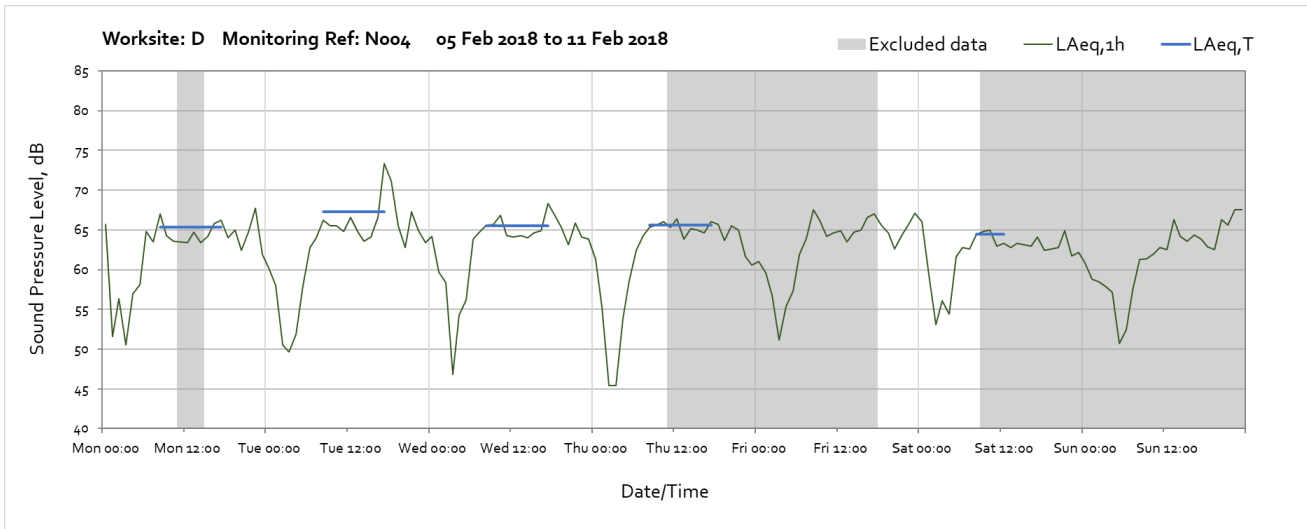


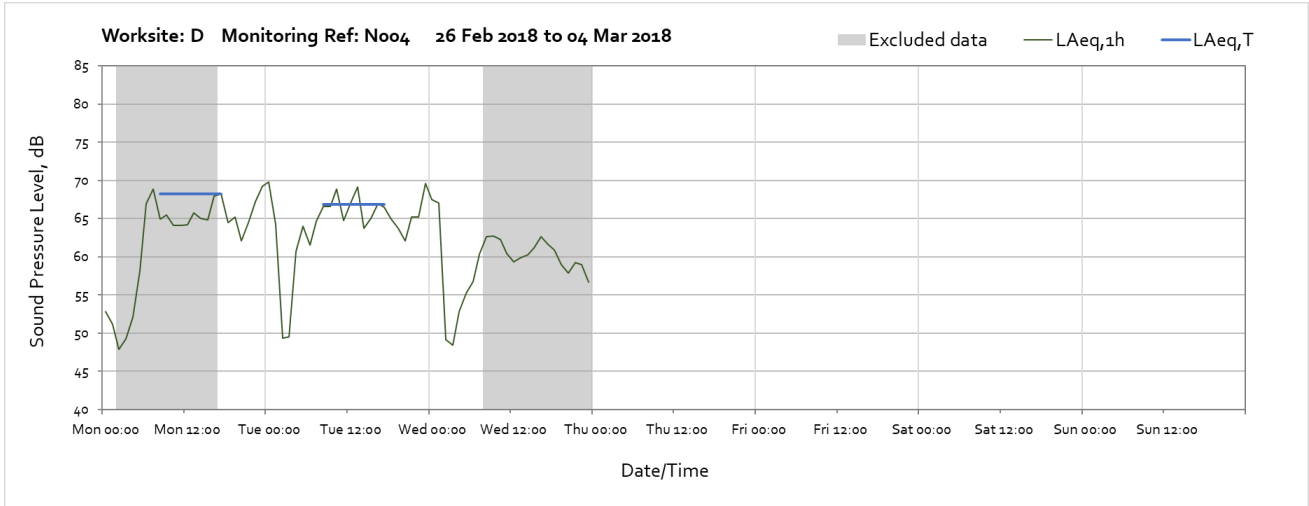
Note – Missing data between 11:00 on Friday 23rd and 00:00 on Monday 26th due to a power failure.



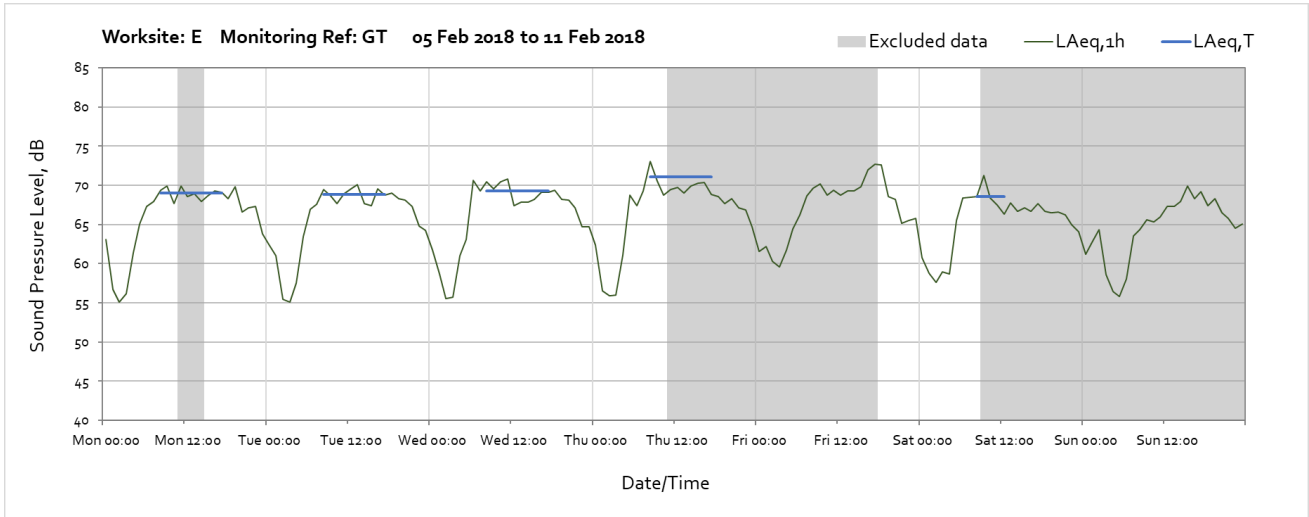
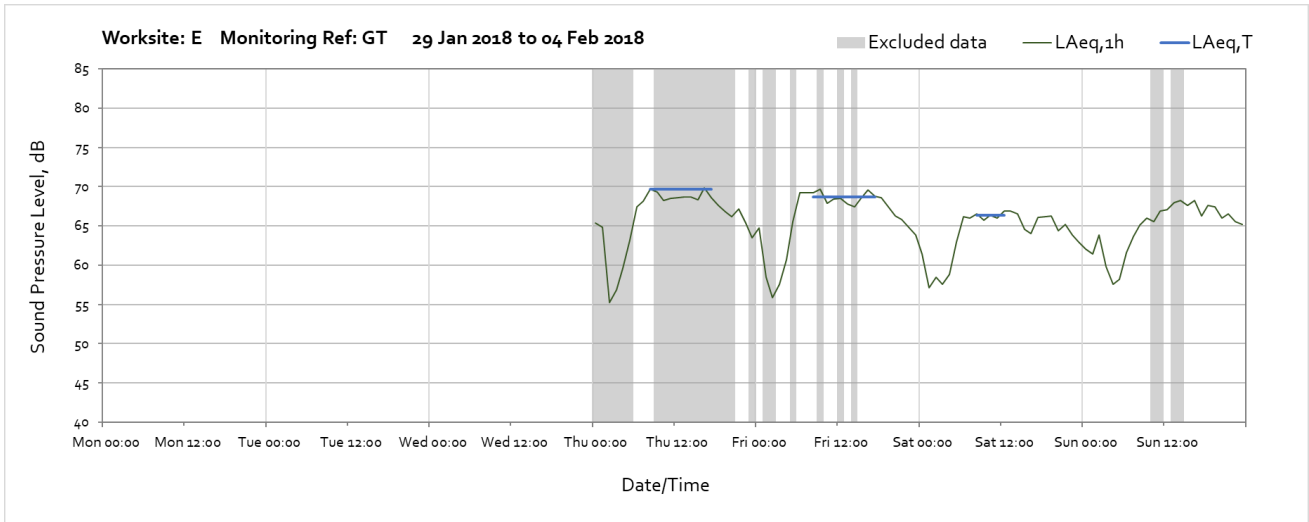
Worksite: D – Monitoring Ref: N004

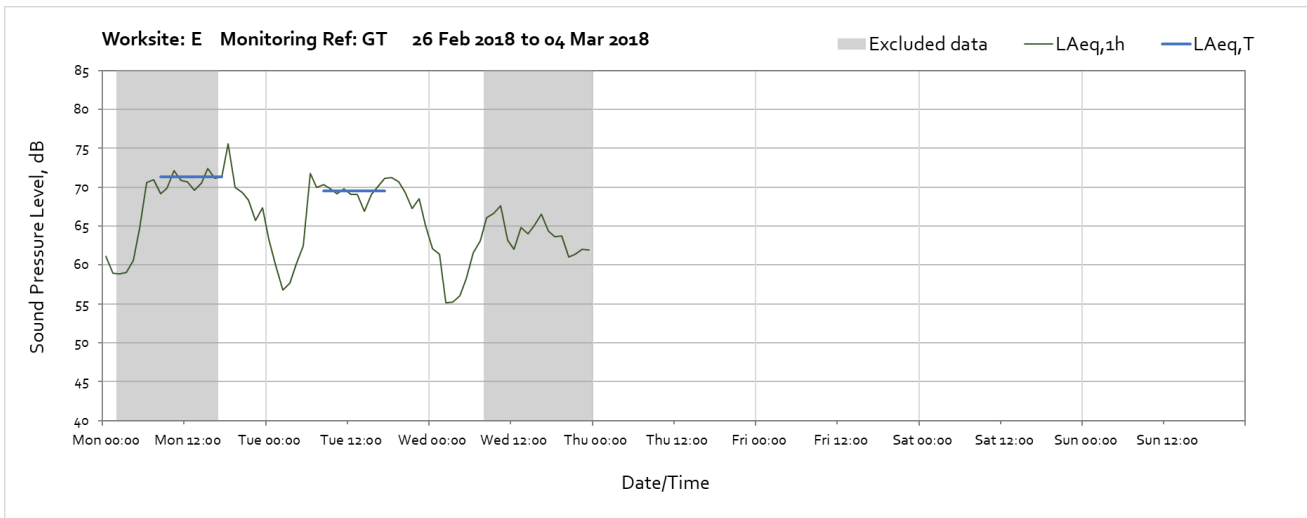
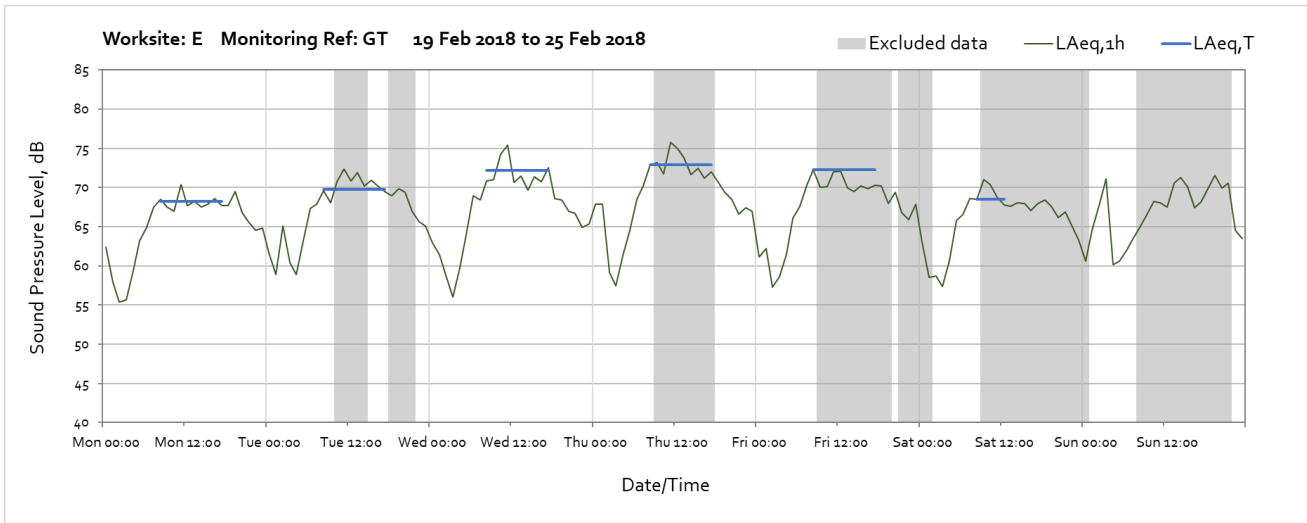
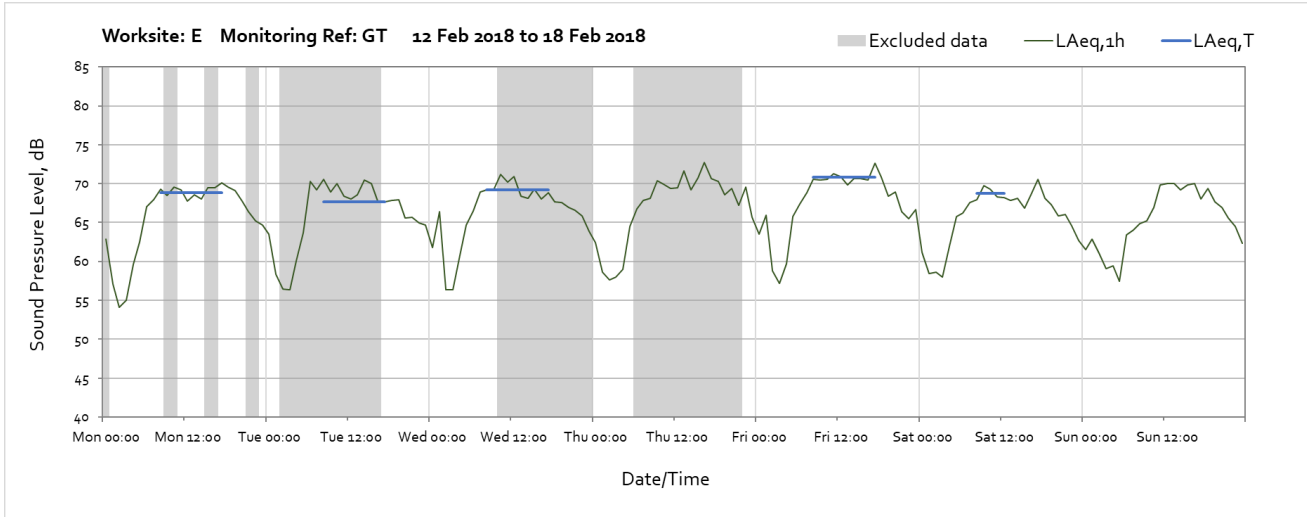




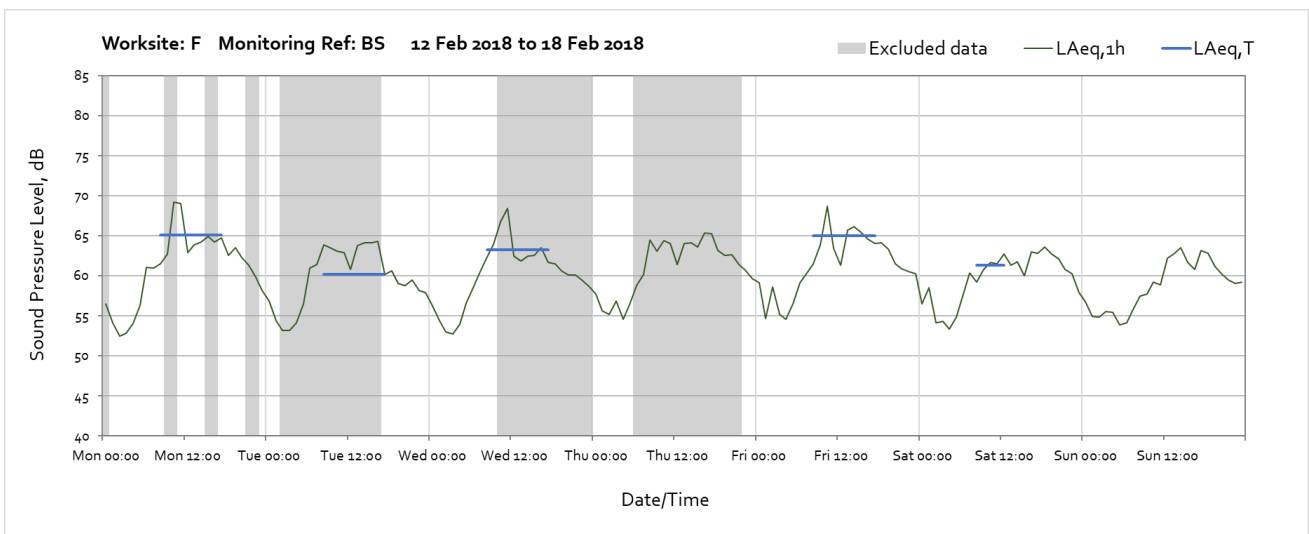
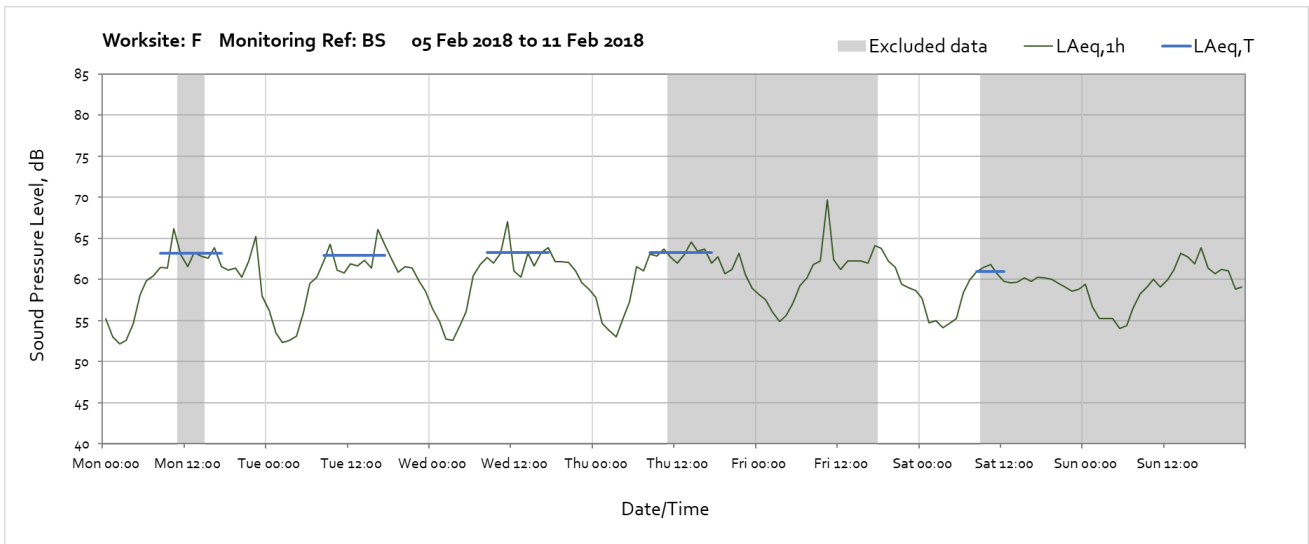
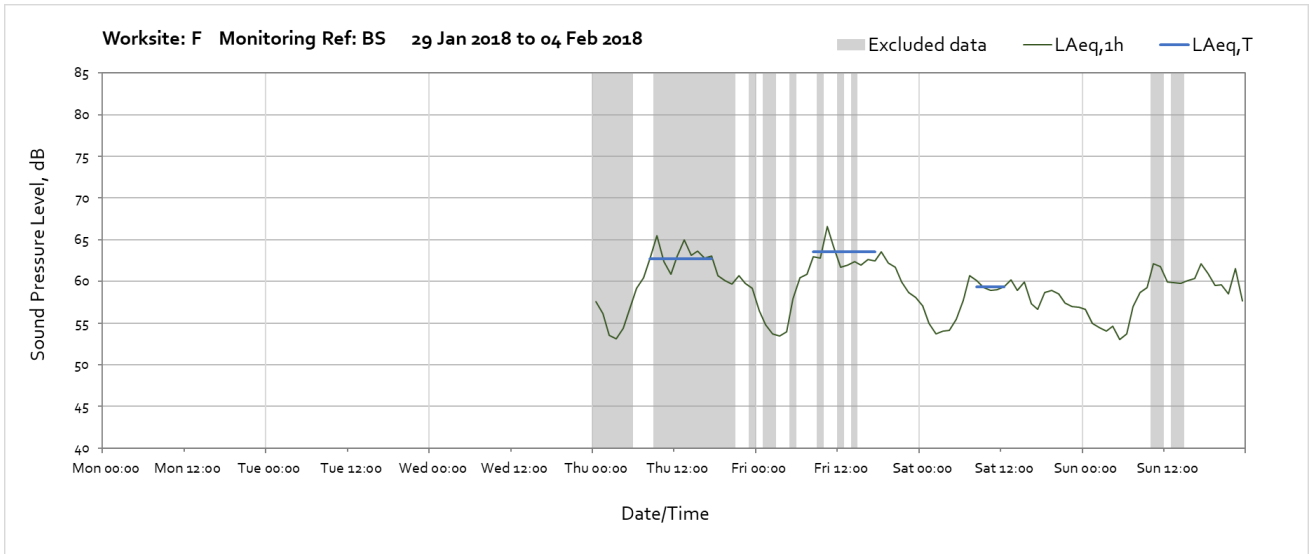


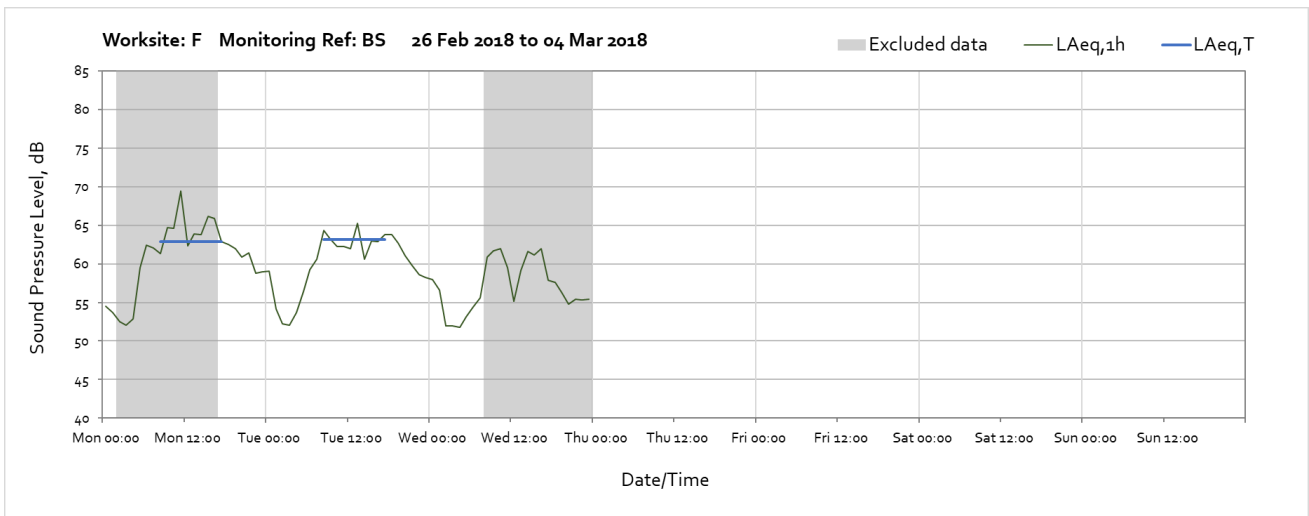
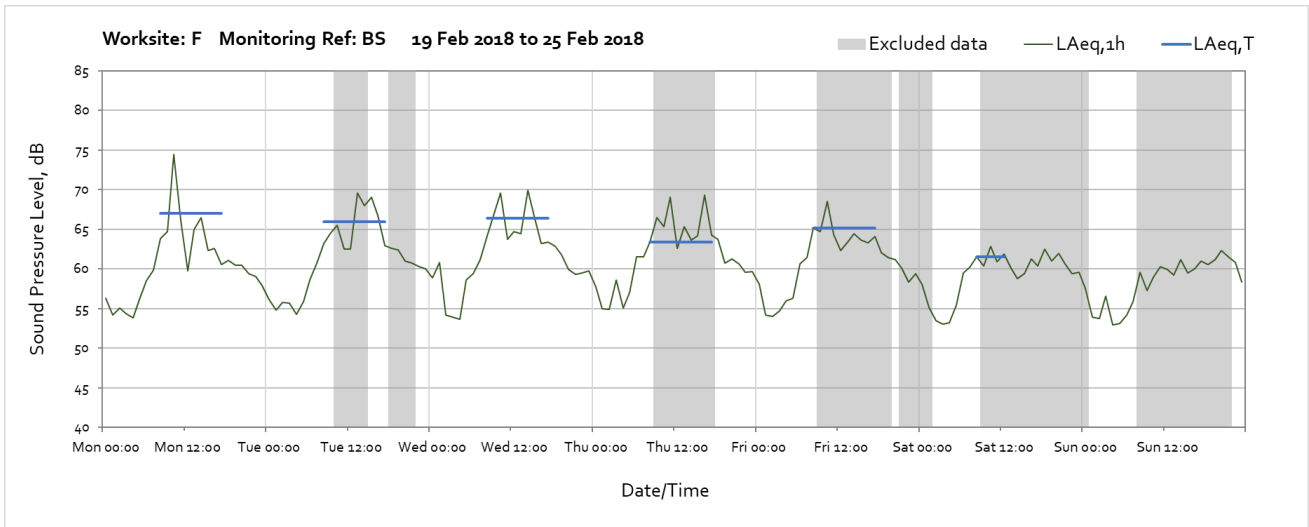
Worksite: E – Monitoring Ref: GT



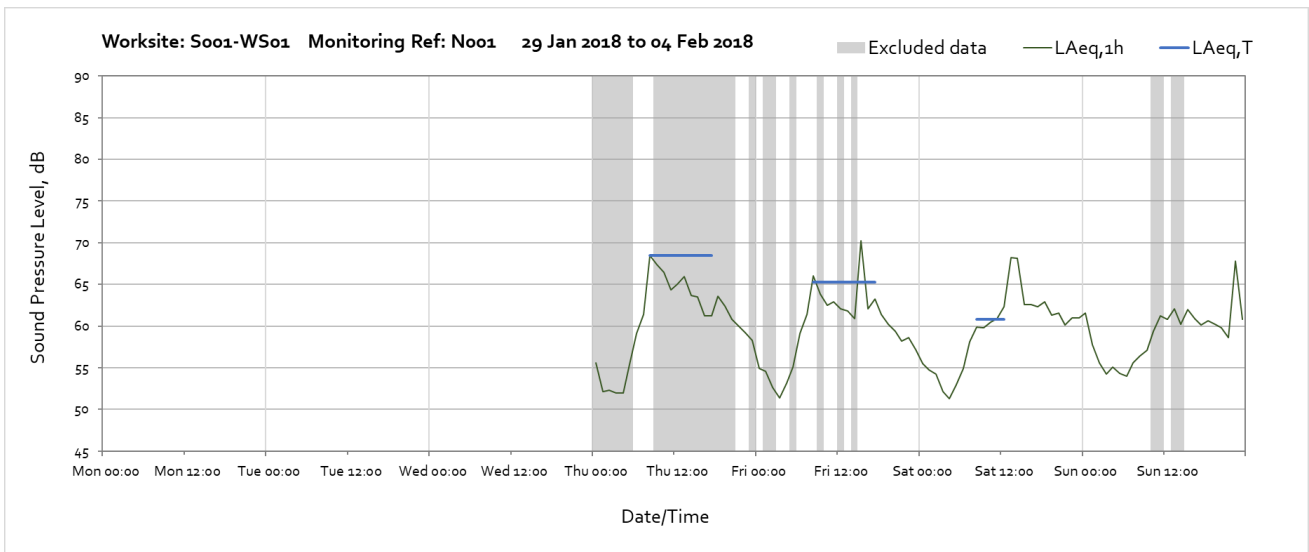


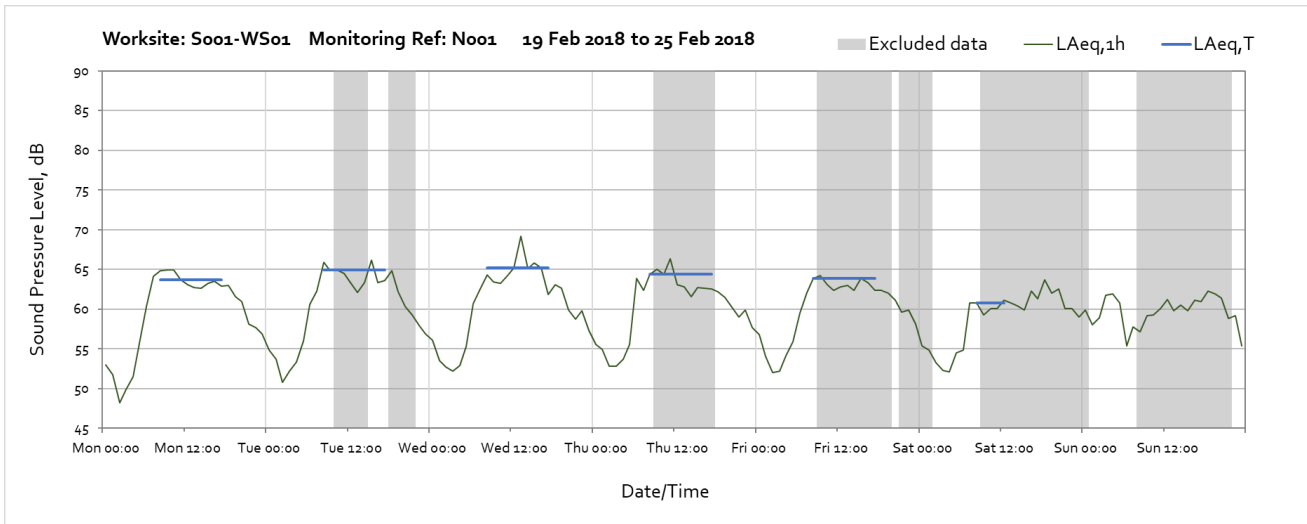
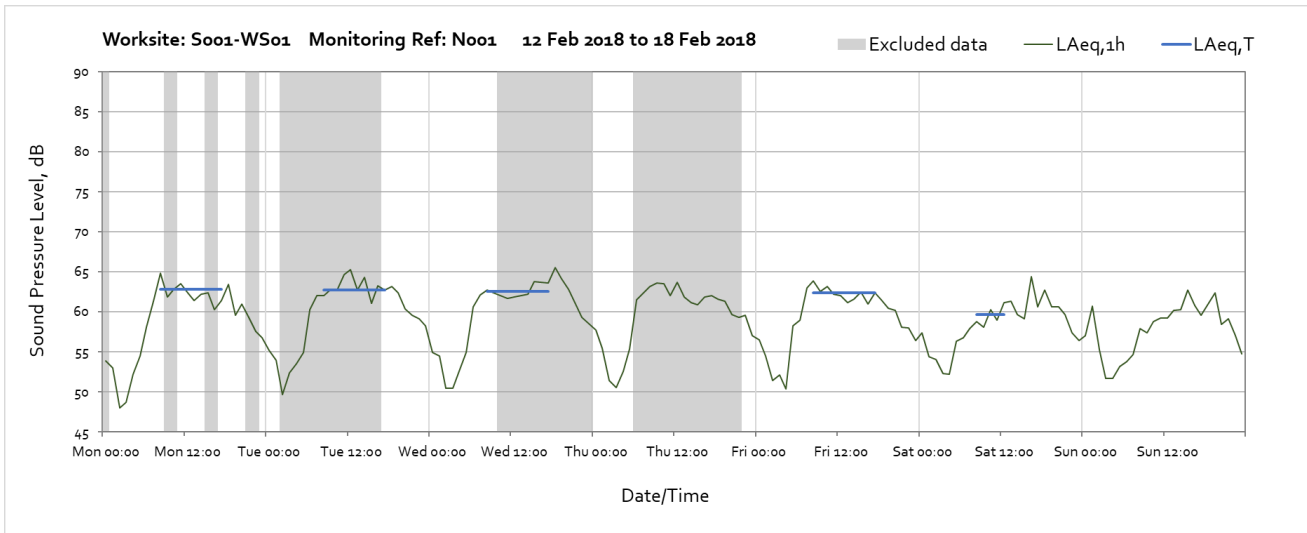
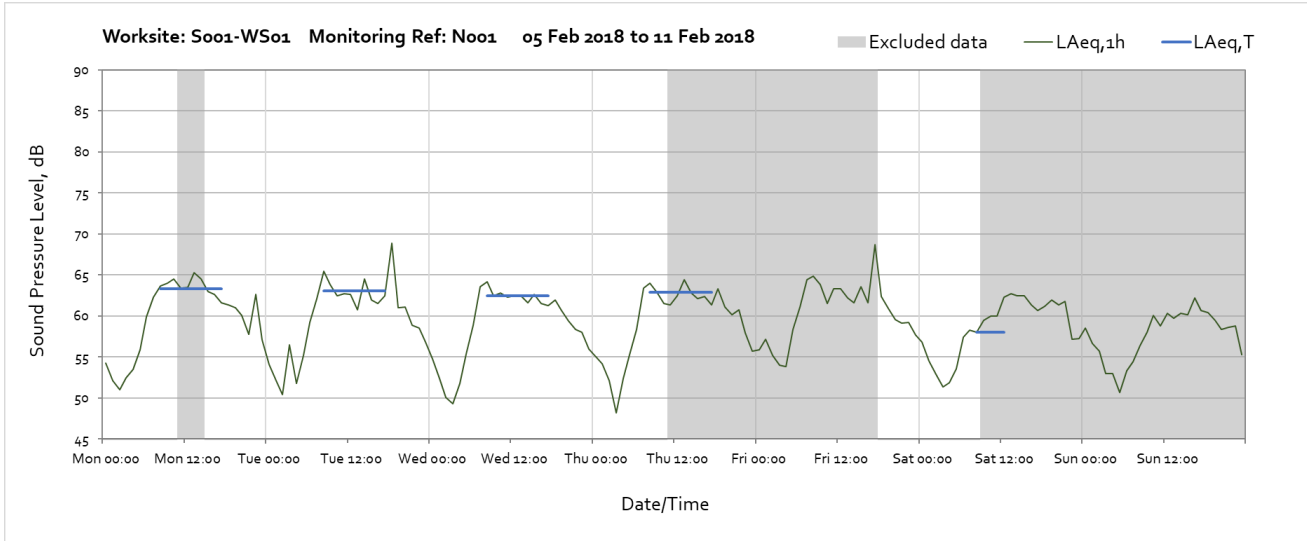
Worksite: F – Monitoring Ref: BS

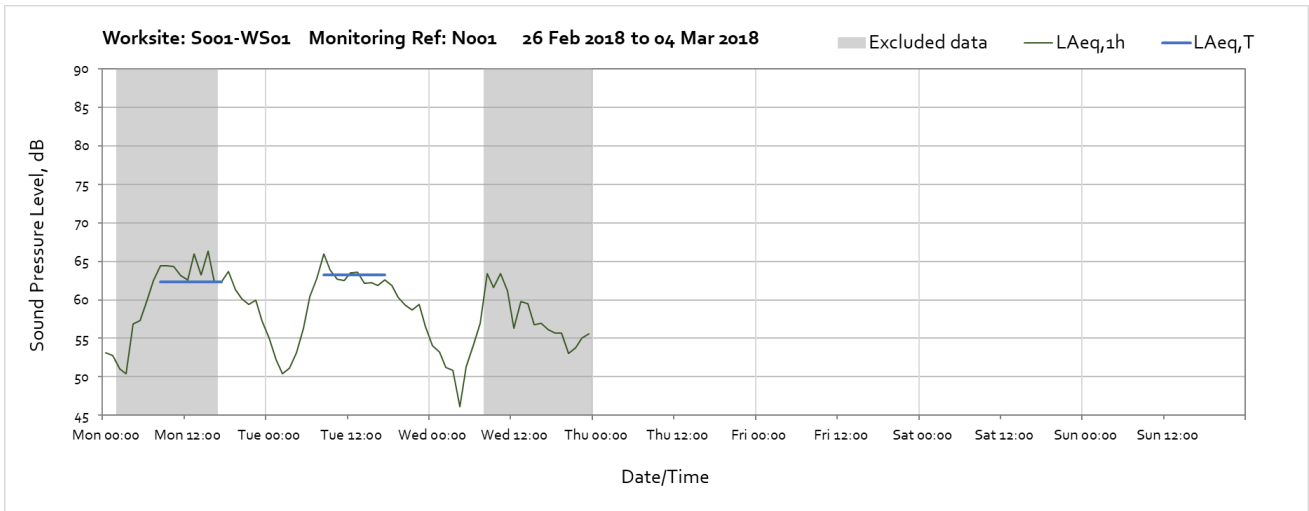




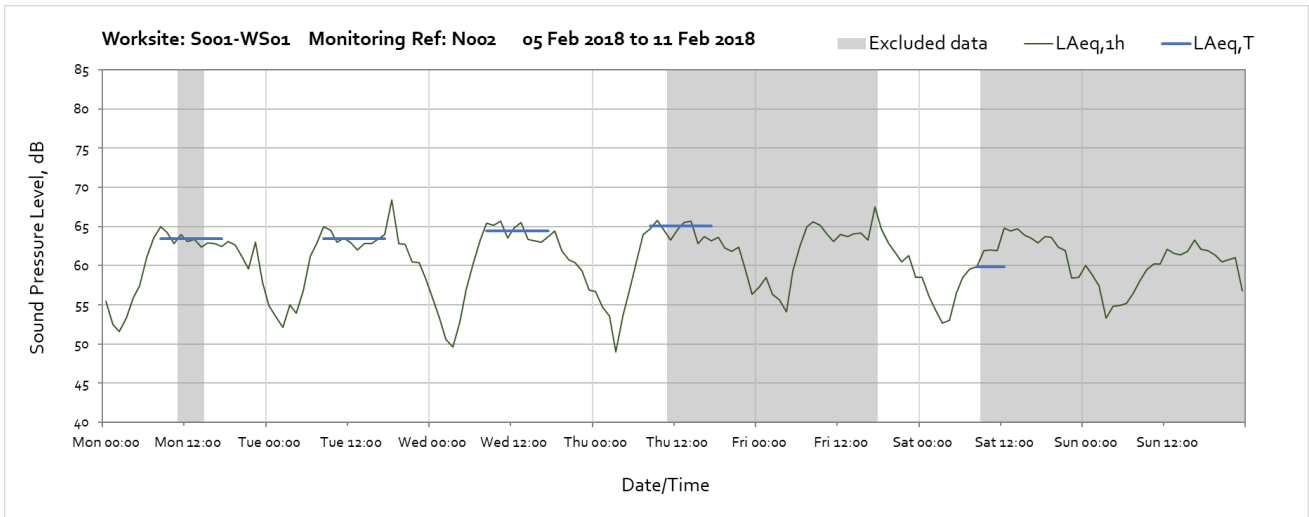
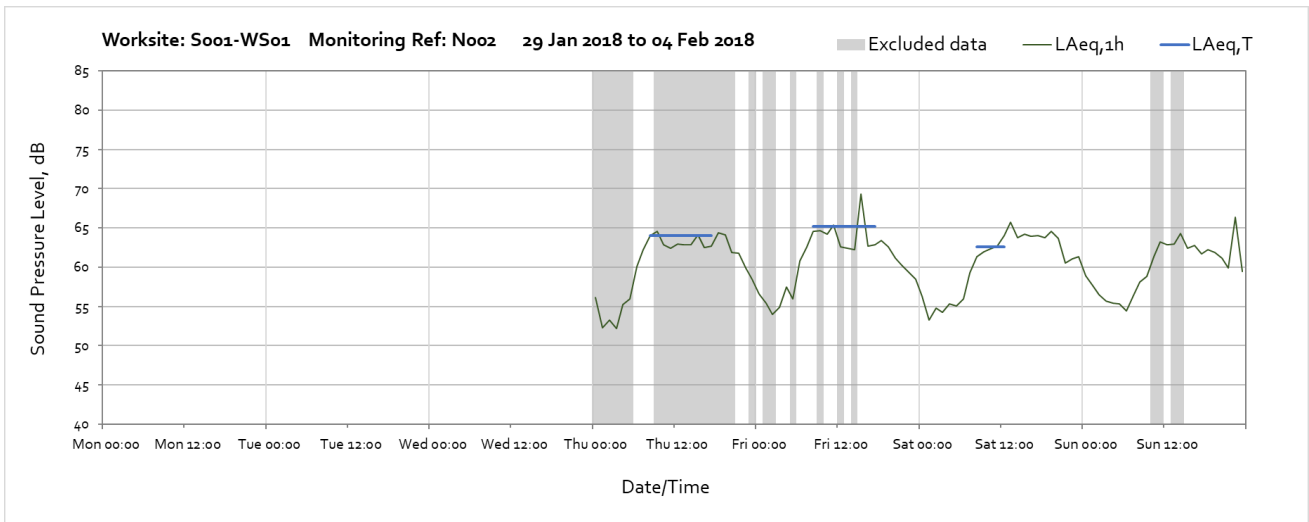
Worksite: S001-WS01 – Monitoring Ref: N001

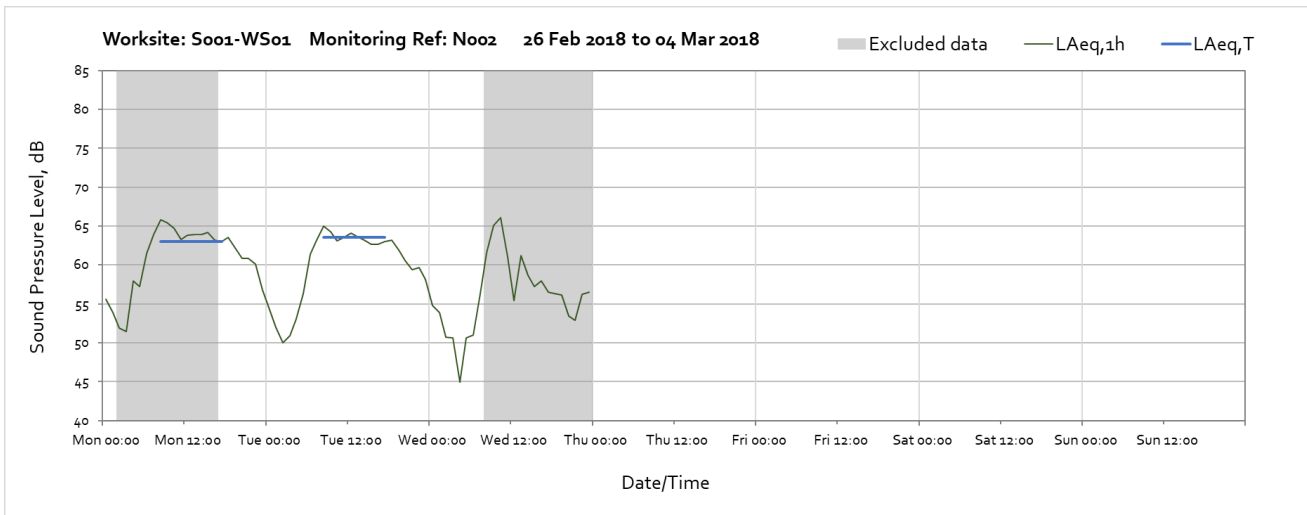
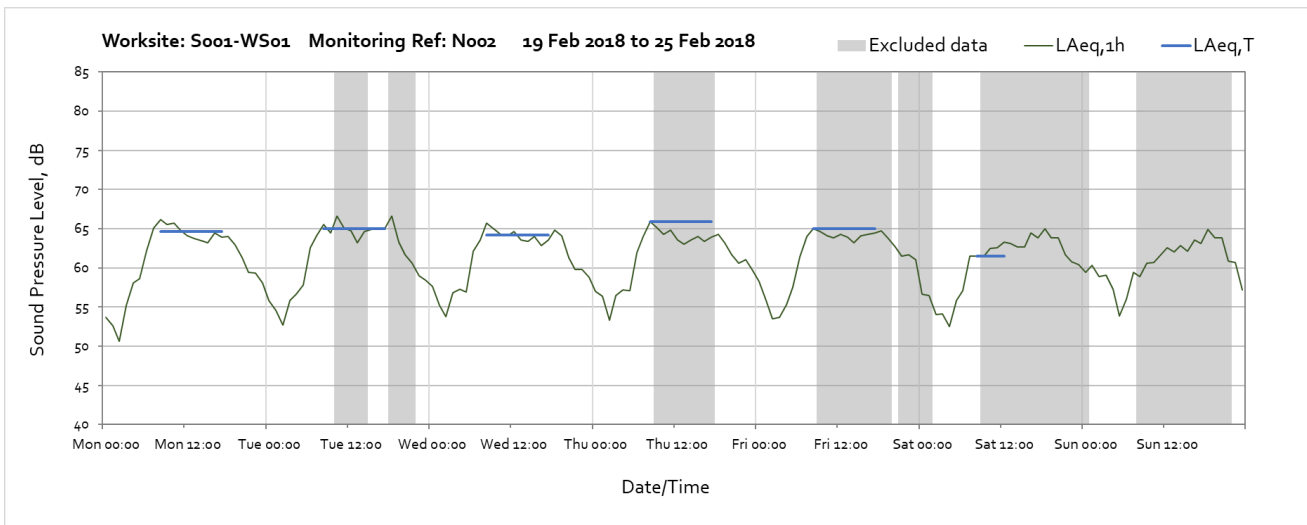
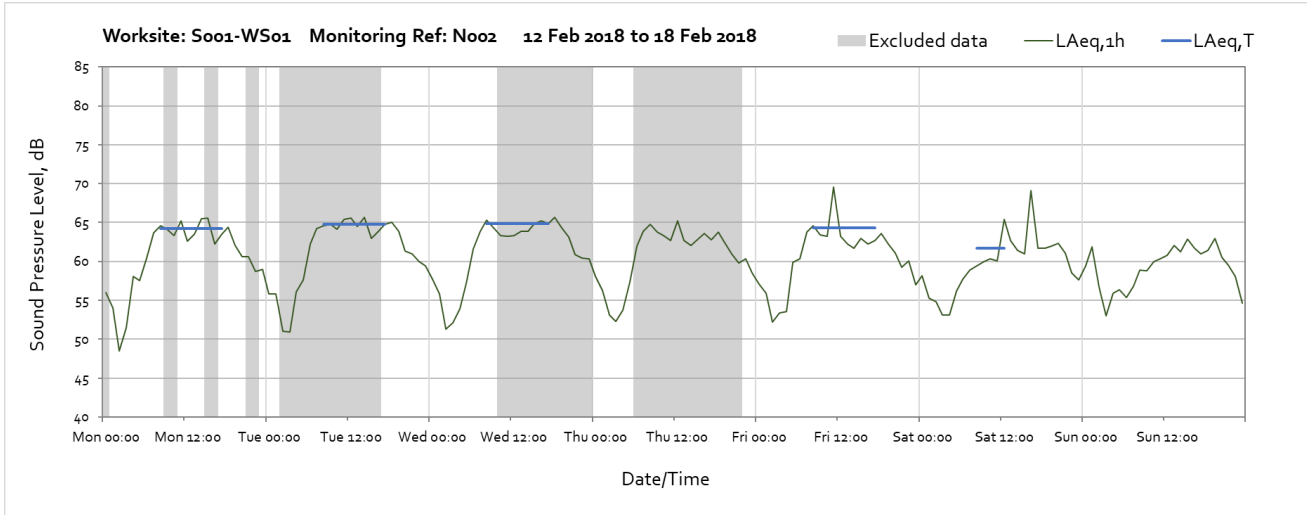




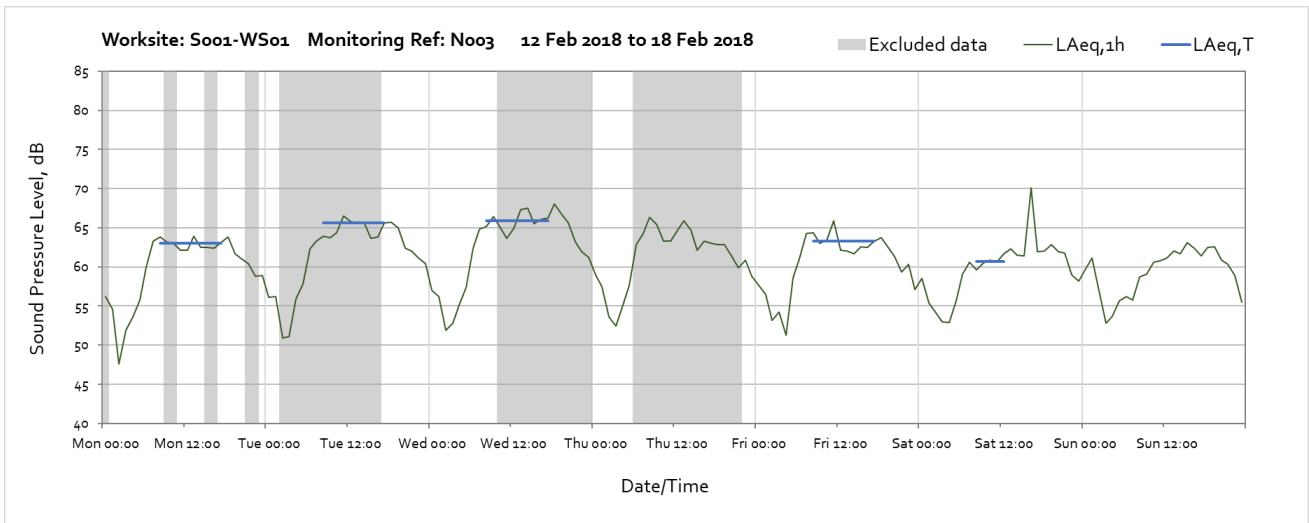
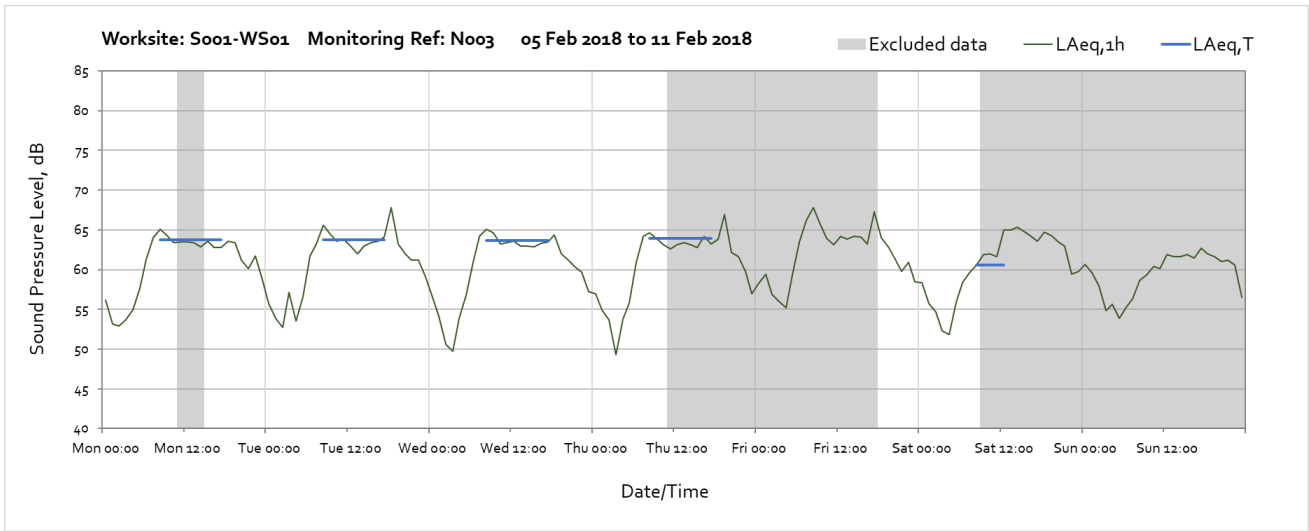
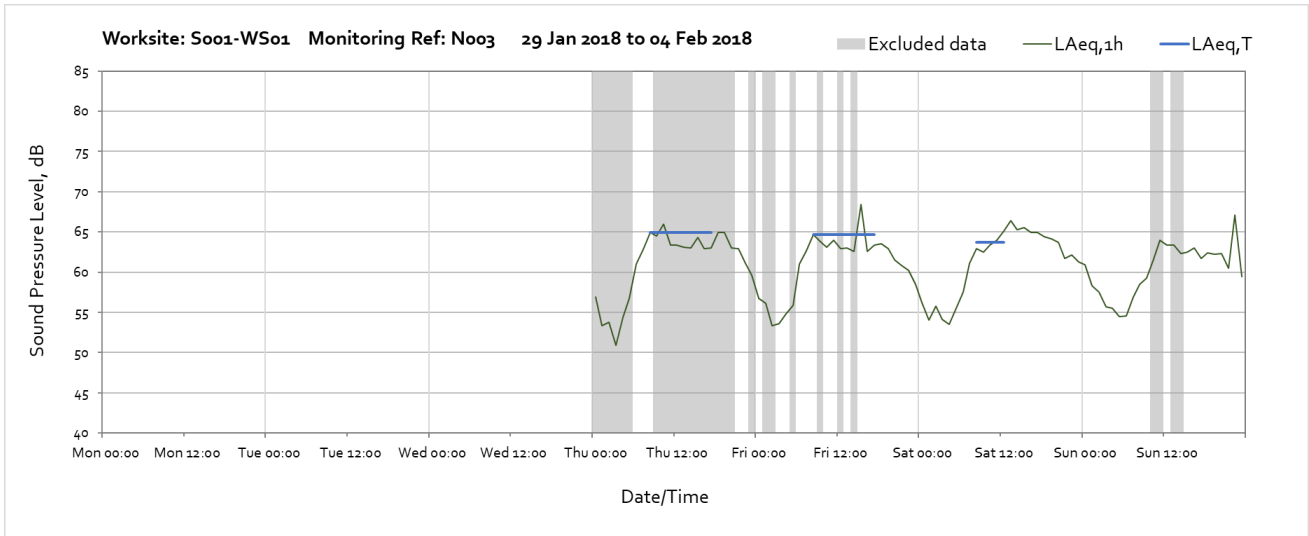


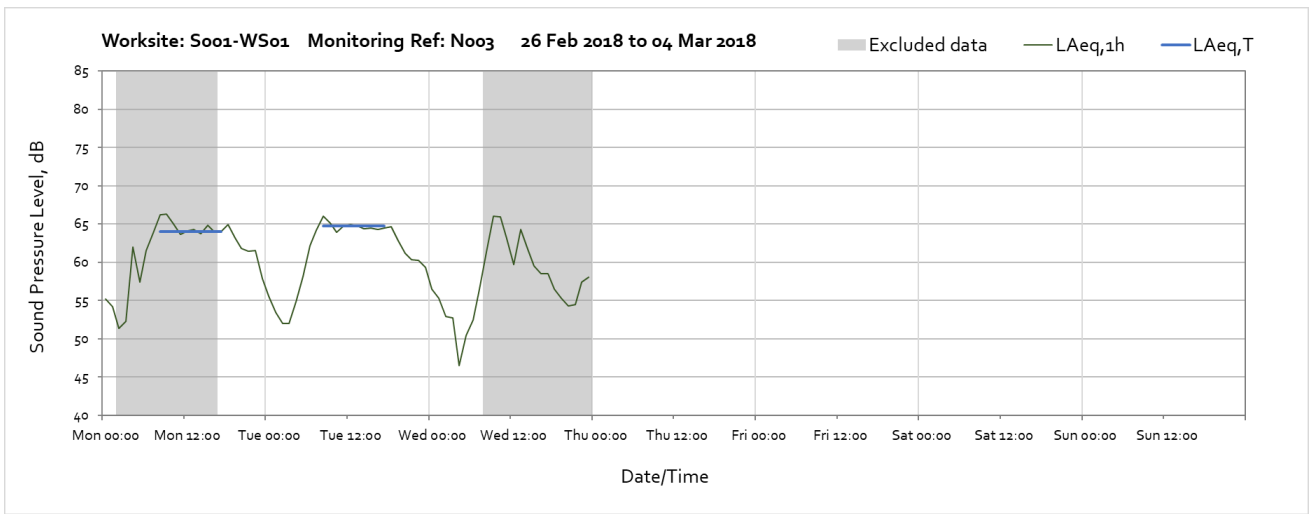
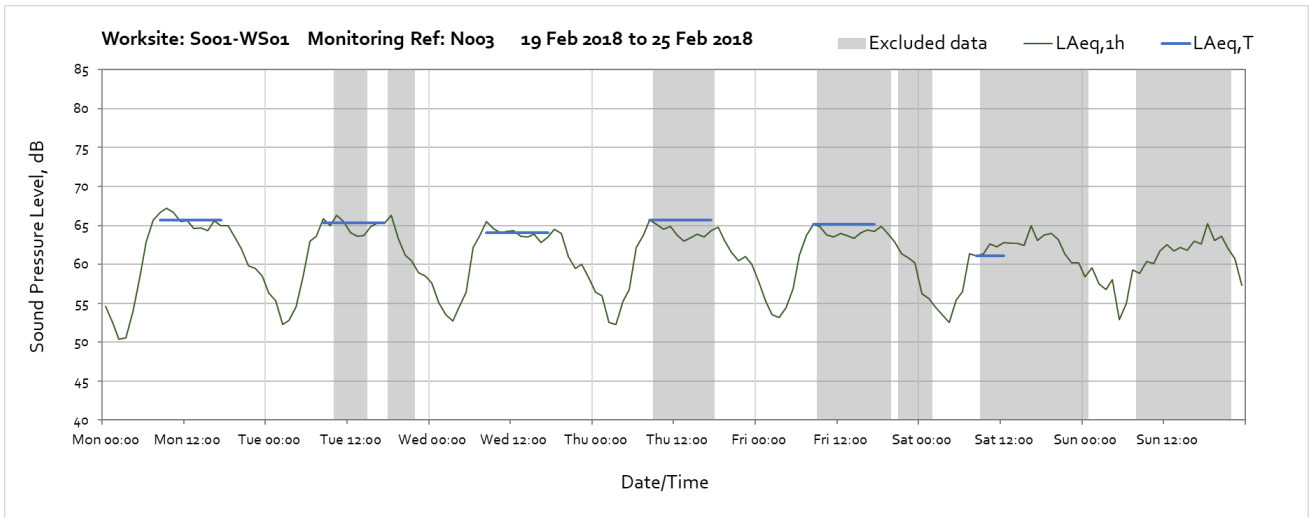
Worksite: S001-WS01 – Monitoring Ref: N002



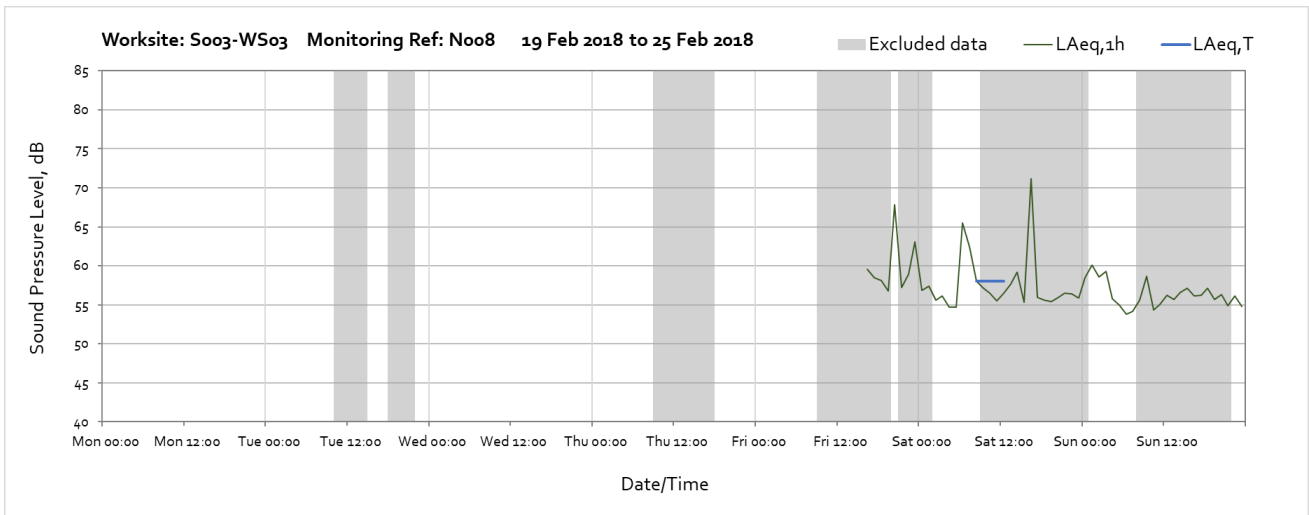


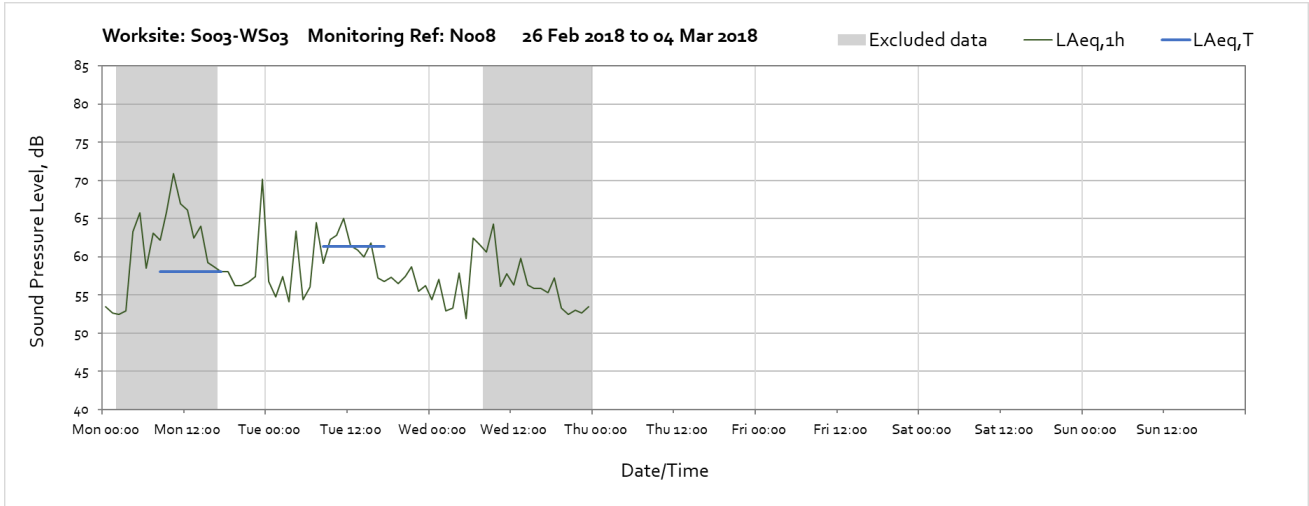
Worksite: S001-WS01 – Monitoring Ref: N003



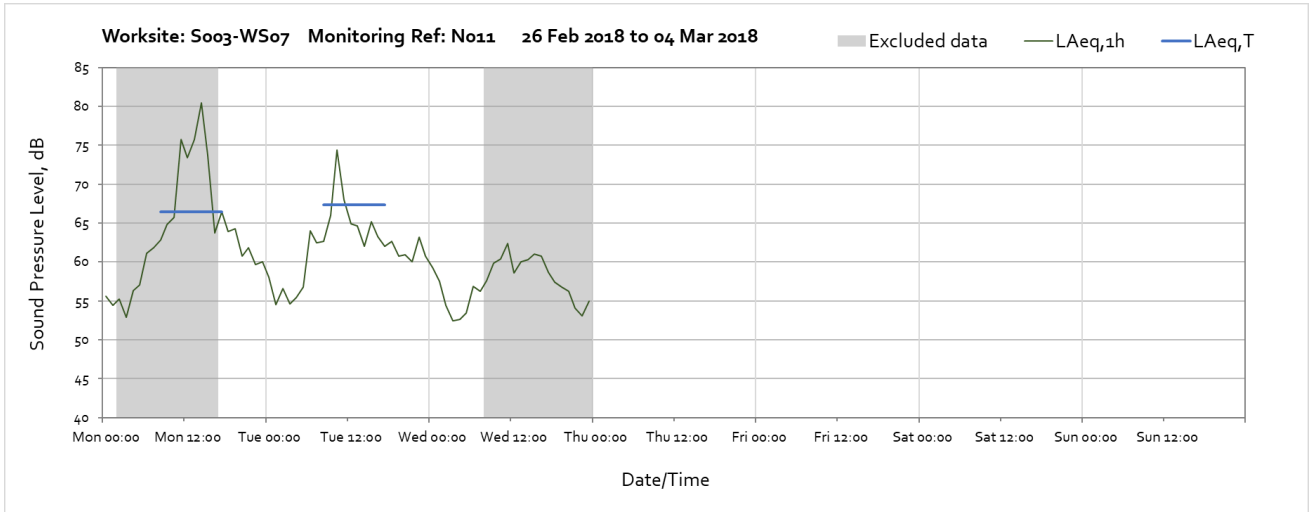
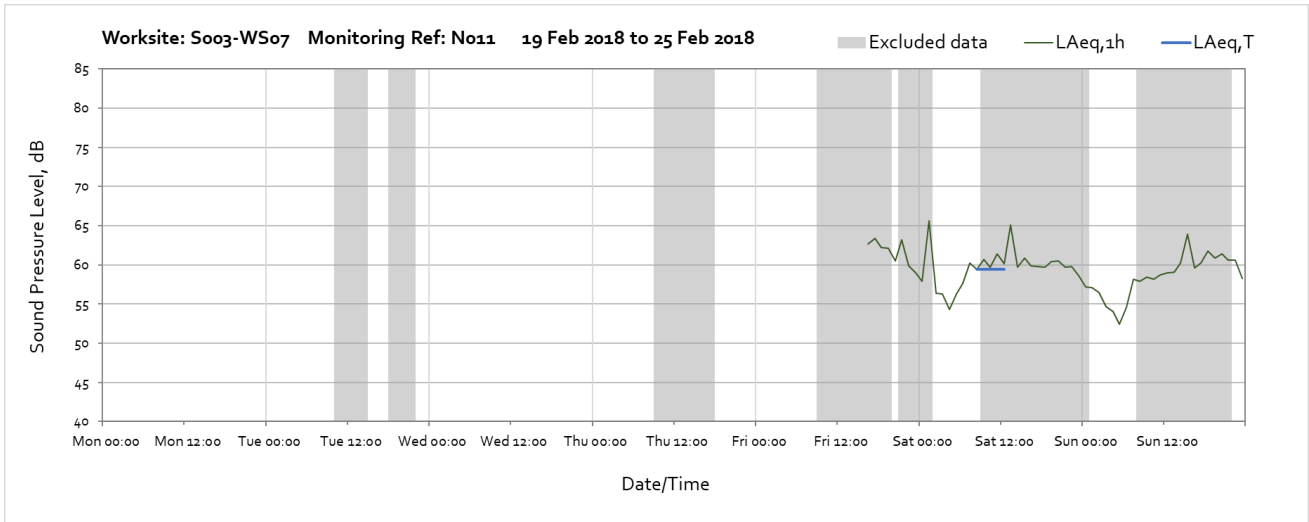


Worksite: S003-WS03 – Monitoring Ref: N008

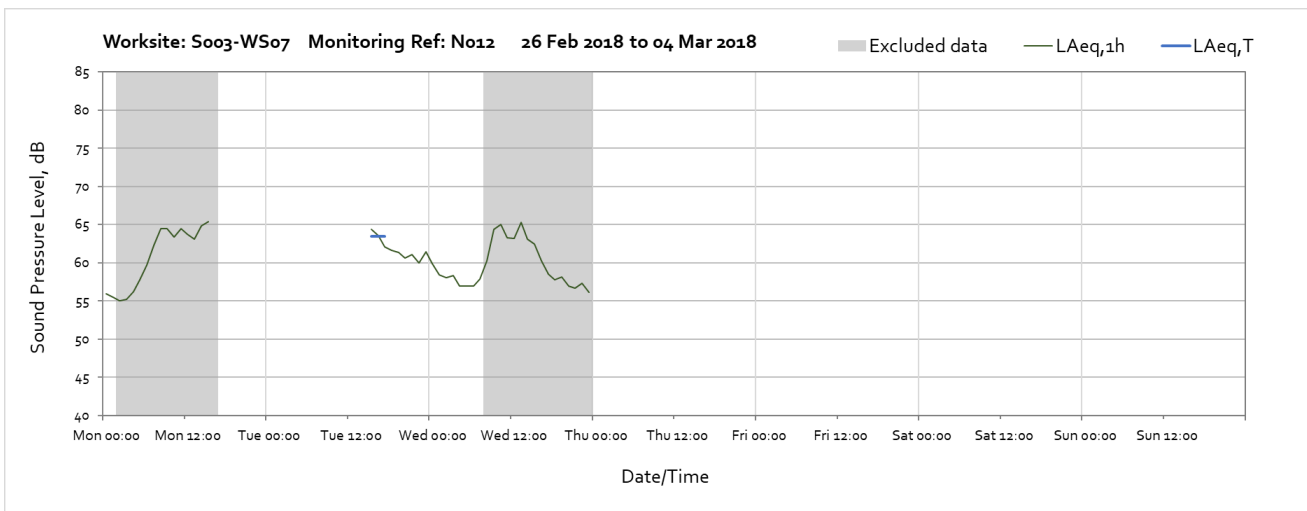
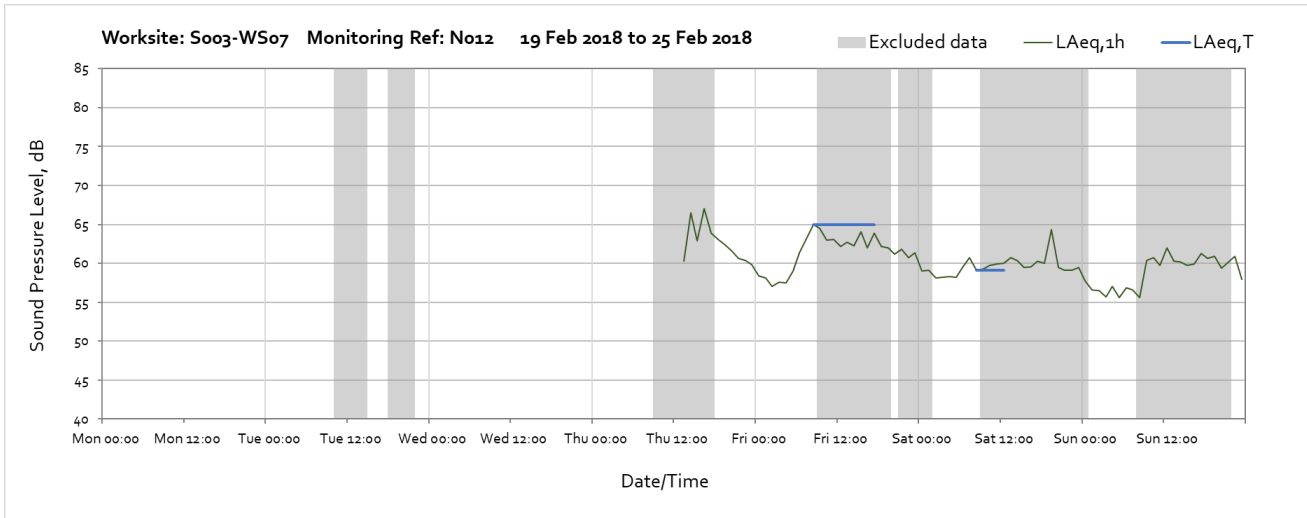




Worksite: S003-WS03 – Monitoring Ref: N011



Worksite: S003-WS07 – Monitoring Ref: N012



Note – Missing data between 16:00 on Monday 26th and 15:00 on Tuesday 27th due to a pause in the measurement to enable changing the measurement configuration.

Monitoring Ref: N020

