

Construction noise and vibration Monthly Report – January 2021

London Borough of Camden

Non-Technical Summary	1
Abbreviations and Descriptions	3
1 Introduction	4
1.2 Measurement Locations	7
2 Summary of Results	9
2.1 Summary of Measured Noise and Vibration Levels	9
2.2 Exceedances of the SOAEL	14
2.3 Exceedances of Trigger Level	18
2.4 Complaints	18
Appendix A Site Locations	21
Appendix B Monitoring Locations	26
Appendix C Data	33

List of tables

Table 1: Table of Abbreviations	3
Table 2: Monitoring Locations	7
Table 3: Summary of Measured dB L _{Aeq} Data over the Monitoring Period	10
Table 4: Summary of Measured PPV Data over the Monitoring Period	14
Table 5: Summary of Exceedances of SOAEL	15
Table 6: Summary of Total Exceedances of SOAEL	17
Table 7: Summary of Exceedances of Trigger Levels	18
Table 8: Summary of Complaints	18

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 during the month of January 2021.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of The Adelaide Road Ventilation Shaft (ref.: ARVS), where relocation of materials, installation of a temporary gate, Heras fencing installation, floodlight installation, vegetation clearance, working platform construction and testing, earthworks, utility works and general site maintenance were underway.
- Noise monitoring was undertaken in the vicinity of Euston Throat Retained Cut worksite (ref.: ETRC) where guide wall construction, silo installation, excavations and piling were underway.
- Noise monitoring was undertaken in the vicinity of Euston Scissor Cut worksite (ref.: ESC) where pile installation, groundworks, installation of pile mat and guide walls, access ramp installation, surveys and haul road maintenance were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Hampstead Road Bridge worksite (ref.: HRB), where hoarding works, roadworks, removal of street assets and installation of traffic management systems were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Euston Cavern worksite (ref.: ECAV), where testing of ground anchors, bridge investigations and hoarding works were underway.
- Noise monitoring was undertaken in the vicinity of On-Network worksites (ref.: B, C, D, E, F, G and H), where overhead line equipment adjustments (worksites C–G), signalling and cabling works (worksites C–G), resurfacing works (worksites G and H only), removal of signals and cabling works (worksite C only), signal head installation (worksite G only), cable management system installation (worksite H only) and demolition works (worksite H only) were underway.
- Noise monitoring was undertaken in the vicinity of the 140 Hampstead Road and Power Signal Box worksite (ref.: S001-WS02), where groundworks, pile cap removal and minor demolitions were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite (ref.: S003-WS03) where excavation of utility trenches and groundworks were underway.

- Noise monitoring was undertaken in the vicinity of the Former National Temperance Hospital, 110 Hampstead Road worksite (ref.: S003-WS06), where deliveries were underway.
- Noise monitoring was undertaken in the vicinity of the Former National Temperance Hospital - Euston North worksite (ref.: NTH-EN), where piling, removal of pile rig, installation / loading of props and reinstatement of footpaths and walkways were underway.
- Noise monitoring was undertaken in the vicinity of the Vehicle Holding Area worksite (ref.: VHA), where concrete slab construction and site setup were underway.
- Vibration monitoring was undertaken in the vicinity of the Royal College of General Practitioners (RCGP) worksite (ref.: S003-WS08). Whilst works were not undertaken on worksite ref.: S003-WS08, vibration levels at the associated monitors may be influenced by work undertaken on nearby worksite ref.: S003-WS03.

Further works were also undertaken on Stephenson Way, Melton Street, North Gower Street, Ragnart Buildings and Harrington Street, where utilities works were underway; and Interim Taxi Rank worksite where erection of fencing and tree felling were underway.

There were ten (10) exceedances of the HS2 threshold levels for significant noise effects during the reporting period at four (4) monitoring positions.

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

Fifteen (15) complaints were received during the monitoring period. A description of complaints, the results of investigations and any actions taken are detailed in Table 8 of this report.

Abbreviations and Descriptions

The abbreviations, descriptions and project terminology used within this report can be found in Table 1.

Table 1: Table of Abbreviations

Acronym/Term	Definition
$L_{Aeq,T}$	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.
LOAEL	Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
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.
SOAEL	Significant Observed Adverse Effect Level - the level above which significant adverse effects on health and quality of life occur.
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 HS2 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 31st January 2021.

1.1.2 Active construction sites in the local authority area where monitoring was undertaken during this period include:

- The Adelaide Road ventilation shaft, (see plan 2 in Appendix A), where work activities included:
 - relocation of materials within the site;
 - relocation of surplus materials to another HS2 worksite;
 - installation of temporary gate within site hoarding;
 - Heras fencing installation;
 - floodlight installation;
 - vegetation clearance;
 - concrete coring (drilling);
 - trenching excavations;
 - installation of ducts;
 - groundworks (backfilling);
 - installation of utility chamber;
 - works to manholes including brickworks;

- fuel tank repairs;
- relocation of site generators; and
- working platform construction.
- Euston Throat Retained Cut worksite ref.: ETRC (see plan 2 in Appendix A), where work activities included:
 - guide wall construction;
 - silo installation;
 - excavations; and
 - continuous flight auger (CFA) piling.
- Euston Scissor Cut worksite ref.: ESC (see plan 2 in Appendix A), where work activities included:
 - sheet piling;
 - pile installation;
 - groundworks;
 - installation of pile mat and guide walls;
 - installation of ramp access into the site;
 - surveys along Park Village East at track and street level; and
 - haul road maintenance.
- Hampstead Road Bridge worksite ref.: HRB (see plan 3 in Appendix A), where work activities included:
 - installation / removal of hoarding;
 - roadworks;
 - removal of public street assets; and
 - installation of traffic management systems.
- Euston Cavern worksite ref.: ESC (see plan 3 in Appendix A), where work activities included:
 - testing of ground anchors;
 - bridge investigations; and
 - hoarding works.
- On-Network worksites ref.: B, C, D, E, F, G and H (see plan 3 in Appendix A), where work activities included:
 - overhead line equipment adjustments (worksites C, D, E, F and G);
 - signalling and cabling works (worksites C, D, E, F and G);
 - resurfacing works (worksites G and H only);

- removal of points/signals and cabling works (worksite C only);
- signal works (worksite G only);
- cable management system installation (worksite H only); and
- demolition works (worksite H only).
- 140 Hampstead Road and Power Signal Box worksite ref.: S001-WS02 (see plan 2 in Appendix A), where work activities included:
 - groundworks (ground remediation); and
 - pile cap removal enabling works including preparation of pile mats and minor demolition works.
- Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite ref.: S003-WS03 (see plan 3 in Appendix A), where work activities included:
 - excavation of utilities trenches; and
 - groundworks (backfilling and propping).
- Former National Temperance Hospital, 110 Hampstead Road worksite ref.: S003-WS06 (see plan 3 in Appendix A), where work activities included:
 - deliveries.
- Former National Temperance Hospital - Euston North worksite ref.: NTH-EN (see plan 1 in Appendix A), where work activities included:
 - piling;
 - removal of pile rig and associated plant;
 - installation of loading of props; and
 - reinstatement of footpaths and walkways.
- Vehicle Holding Area worksite ref.: VHA (see plan 1 in Appendix A), where work activities included:
 - steel fixing of concrete slabs;
 - concrete pouring; and
 - site setup.

1.1.3 Vibration monitoring was also undertaken in the vicinity of the Royal College of General Practitioners (RCGP) worksite (ref.: S003-WS08). Whilst works were not undertaken on worksite ref.: S003-WS08, vibration levels at the associated monitors may be influenced by work undertaken on nearby worksite ref.: S003-WS03.

- 1.1.4 Further works, where monitoring did not take place, were also undertaken at the following locations:
- Stephenson Way, Melton Street, North Gower Street, Ragnart Buildings and Harrington Street, where utilities works were undertaken.
 - Interim Taxi Rank worksite where work activities included erection of site fencing and tree felling.

1.1.5 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.

1.2 Measurement Locations

1.2.1 Thirty-two (32) noise and seven (7) vibration monitoring installations were active across twelve (12) worksites in January in the LBC area. Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in January 2021.

1.2.2 Maps showing the position of noise and vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
ARVS	N051	Outside 70 Adelaide Road
	N052	Adelaide Road-Beaumont Walk
B	JC	Juniper Crescent
ESC	N024	External to Park Village Studios, Park Village East
	N047	Park Village East/Mornington Street bridge, lamppost #13
ESC, C	N022	External to 34 Mornington Terrace
	N046	Lamppost opposite to 49 Mornington Terrace
ETRC	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)
	N005	5A Granby Terrace
	N023	Lamppost #21 on Hampstead Road
ETRC, D	N004	Mornington Terrace, lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row)
HRB	N020	Mackworth Street, lamppost #1

Worksite Reference	Measurement Reference	Address
	N021	Stanhope Street, lamppost #2
	N044	Regents Park Estate west, near Langdale
	N045	Regents Park Estate south, external to Coniston
	V039 (old)	Coniston, Regents Park Estate
	V039	Coniston, Regents Park Estate
	V043	Cubitt Court, Park Village East
G	HH	Euston Station Parcel Deck, Barnby Street
	BS	Roof of Stockbeck House, Barnby Street
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)
	V002	Royal College of General Practitioners basement boiler room by Stephenson Way
	V037	Magic Circle, basement
	V038	Wesley Hotel, basement lightwell, Euston Street
S003-WS07	N012	Drummond Street, lamppost #14 (opposite to 92-94 Drummond Street)
S003-WS08	N007	Royal College of General Practitioners, Melton Street
	V003	Royal College of General Practitioners basement vaults under Melton St
Vehicle Holding Area (VHA)	N025	External to 3 Prince Albert Road
	N026	Vehicle Holding Area
NTH-EN	N014	Starcross Street lamppost (external to Exmouth Arms)
	N016	Margaret Centre roof
	N017	Hampstead Road, lamppost #48
	V021	42-44 Cobourg Street

2 Summary of Results

2.1 Summary of Measured Noise and Vibration Levels

2.1.1 Table 3 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.

Table 3: 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
ARVS	N051	Outside 70 Adelaide Road	Free-field	68.1 (70.7)	68.8 (71.3)	68.3 (71.0)	67.8 (71.4)	64.6 (73.1)	65.0 (65.7)	69.0 (71.3)	72.2 (73.8)	69.3 (74.6)	64.0 (69.1)	68.2 (75.1)	64.6 (67.7)
	N052	Adelaide Road-Beaumont Walk	Free-field	66.6 (69.2)	67.1 (70.3)	66.4 (69.7)	65.6 (68.7)	62.7 (67.5)	63.1 (63.9)	66.6 (69.1)	70.7 (72.5)	66.7 (72.7)	61.8 (66.2)	65.5 (69.7)	63.0 (66.8)
B	JC	Juniper Crescent	Free-field	56.8 (59.7)	57.8 (60.3)	55.8 (58.9)	57.4 (61.2)	54.2 (59.1)	55.3 (56.6)	55.7 (56.3)	54.9 (55.9)	55.0 (56.5)	53.6 (67.8)	55.5 (58.9)	54.1 (58.4)
ESC	N024	External to Park Village Studios, Park Village East	Free-field	59.7 (64.2)	61.4 (66.3)	60.3 (75.7)	58.0 (60.9)	53.4 (63.1)	56.0 (57.9)	57.5 (59.1)	58.1 (59.2)	58.1 (60.4)	52.5 (57.0)	57.0 (60.5)	53.1 (56.7)
	N047	Park Village East/Mornington Street bridge, lamppost #13	Free-field	59.4 (64.7)	61.3 (64.0)	60.8 (72.9)	58.4 (64.6)	53.3 (62.7)	55.2 (56.1)	58.3 (59.9)	60.9 (65.8)	59.1 (61.5)	53.3 (59.0)	57.8 (61.5)	53.5 (60.4)
ESC, C	N022	External to 34 Mornington Terrace	Free-field	59.8 (61.3)	60.6 (65.6)	59.4 (60.5)	58.6 (63.3)	54.2 (61.7)	57.7 (59.0)	58.9 (59.7)	60.5 (65.7)	58.9 (65.1)	54.8 (62.7)	58.3 (64.2)	54.0 (58.8)
	N046	Mornington Terrace near The Edinboro Castle pub, lamppost #18	Free-field	62.9 (64.7)	63.6 (83.8)	61.7 (63.4)	61.2 (63.5)	57.1 (65.5)	61.3 (62.4)	61.9 (62.2)	61.9 (62.3)	61.7 (67.7)	58.1 (66.9)	61.3 (68.4)	56.9 (63.7)
ETRC	N001	External to Cubitt Court, 100 Park Village East	Free-field	59.2 (64.7)	67.3 (69.7)	60.0 (73.8)	57.6 (60.4)	53.0 (62.2)	53.9 (54.8)	65.0 (72.6)	60.7 (68.3)	58.2 (60.5)	53.1 (57.6)	57.2 (61.4)	53.6 (61.1)
	N002	Richmond Court, Park Village East	Free-field	58.5 (62.3)	62.2 (64.9)	60.7 (71.7)	58.3 (61.3)	52.4 (58.9)	53.8 (55.1)	59.0 (60.4)	59.6 (60.8)	59.4 (61.7)	52.8 (57.8)	57.8 (61.9)	52.7 (56.2)

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
	N003	Silsoe House, Park Village East	Façade	59.4 (63.8)	62.0 (65.9)	61.4 (75.2)	58.9 (62.9)	53.2 (60.4)	54.0 (55.2)	58.9 (60.7)	59.9 (62.0)	60.0 (62.7)	53.1 (58.7)	58.4 (62.5)	53.1 (56.6)
	N005	5A Granby Terrace	Free-field	65.1 (66.4)	67.9 (69.4)	64.6 (65.8)	63.9 (68.4)	62.2 (64.7)	62.4 (63.9)	65.2 (66.8)	64.1 (64.8)	64.0 (65.5)	62.3 (66.2)	64.1 (69.7)	62.5 (64.6)
	N023	Amphill Estate, Hampstead Road	Free-field	69.4 (71.4)	71.2 (73.3)	69.5 (72.1)	68.4 (76.0)	65.6 (70.5)	66.8 (67.0)	69.2 (70.9)	68.6 (69.0)	69.0 (72.2)	64.7 (70.6)	68.0 (72.0)	66.0 (72.3)
ETRC, D	N004	Mornington Terrace, lamppost #7	Free-field	63.7 (64.9)	65.3 (70.0)	62.9 (65.7)	62.4 (65.7)	57.8 (63.1)	62.6 (63.3)	63.6 (64.1)	63.1 (64.3)	62.8 (67.0)	58.6 (66.5)	62.8 (69.3)	58.3 (66.6)
HRB	N020	Mackworth Street	Free-field	54.2 (58.0)	61.3 (67.1)	53.4 (57.9)	51.8 (57.1)	49.3 (60.1)	51.2 (54.8)	56.8 (57.5)	53.1 (55.1)	52.7 (56.4)	48.1 (54.2)	52.7 (56.8)	48.6 (54.7)
	N021	Stanhope Street, lamppost #2	Free-field	58.4 (63.3)	65.2 (72.2)	59.8 (74.4)	57.2 (61.5)	52.7 (65.5)	52.4 (52.9)	60.3 (64.3)	59.3 (64.5)	57.6 (60.3)	51.9 (56.7)	56.5 (61.3)	52.5 (59.8)
	N044	Regents Park Estate west	Free-field	54.5 (58.6)	67.7 (73.6)	56.6 (71.6)	55.1 (72.0)	51.4 (55.4)	52.5 (52.9)	58.5 (61.9)	52.4 (53.0)	53.3 (56.1)	51.5 (56.3)	53.9 (59.6)	50.8 (51.6)
	N045	Regents Park Estate south, external to Coniston	Free-field	58.1 (63.1)	66.7 (72.7)	55.9 (59.0)	54.8 (59.3)	52.5 (62.9)	55.2 (57.0)	64.1 (67.3)	56.0 (58.5)	56.2 (60.5)	51.6 (58.2)	55.8 (58.7)	51.5 (57.7)
G	HH	Euston Station Parcel Deck, Barnby Street	Free-field	61.9 (67.8)	63.0 (64.5)	63.3 (67.9)	61.6 (70.2)	58.6 (65.8)	58.2 (59.0)	61.6 (63.6)	61.0 (63.3)	62.0 (67.8)	57.1 (61.3)	61.2 (66.4)	58.9 (66.9)
	BS	Roof of Stockbeck House, Barnby Street	Free-field	60.0 (62.0)	61.2 (62.9)	59.2 (61.3)	58.4 (60.8)	55.1 (62.1)	58.5 (59.3)	59.7 (62.0)	58.9 (59.7)	58.5 (60.7)	55.6 (61.7)	58.3 (62.7)	56.0 (61.8)

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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
S001-WS02	N018	Outside replacement housing, Hampstead Road	Free-field	69.7 (72.0)	72.1 (77.7)	70.7 (74.6)	70.2 (76.8)	67.0 (71.4)	67.6 (68.6)	71.1 (72.6)	69.2 (71.1)	69.9 (72.2)	65.9 (73.5)	69.0 (73.2)	66.7 (70.4)
	N019	Outside Cartmel, Hampstead Road	Free-field	58.8 (61.6)	63.3 (67.3)	59.0 (62.7)	58.1 (65.2)	55.5 (60.8)	57.5 (58.9)	61.7 (63.5)	58.2 (59.8)	59.0 (61.8)	56.3 (59.9)	58.3 (62.0)	55.7 (61.1)
S003-WS03	N006	RCGP Roof level	Free-field	55.5 (59.5)	63.9 (67.7)	53.2 (55.2)	52.9 (55.7)	53.5 (63.8)	53.6 (54.7)	57.6 (62.3)	53.9 (54.7)	53.4 (57.6)	53.1 (54.5)	52.9 (55.5)	53.0 (54.3)
	N008	RCGP Stephenson Way	Façade	56.8 (65.6)	67.8 (76.6)	53.8 (54.7)	53.3 (55.0)	52.7 (57.3)	56.5 (58.2)	64.1 (75.2)	54.5 (56.0)	53.8 (58.5)	52.4 (54.2)	53.5 (55.6)	52.3 (54.1)
	N010	Wesley Hotel	Façade	55.5 (58.1)	63.6 (68.6)	52.6 (64.6)	51.8 (65.7)	51.0 (63.2)	54.7 (58.3)	62.6 (73.2)	57.8 (73.5)	57.4 (74.5)	50.4 (54.1)	51.9 (54.7)	51.2 (54.4)
	N011	Outside 82 Euston Street	Free-field	56.1 (62.9)	58.8 (61.3)	54.3 (57.0)	54.2 (57.8)	51.8 (62.7)	54.1 (58.0)	55.6 (57.3)	54.0 (55.2)	53.6 (57.2)	49.6 (53.4)	54.3 (67.0)	52.0 (58.7)
S003-WS07	N012	Opposite 92-94 Drummond Street	Free-field	55.9 (60.7)	62.0 (68.4)	56.9 (59.0)	55.4 (59.3)	54.5 (67.9)	53.8 (56.2)	58.5 (62.9)	56.3 (57.5)	55.8 (59.4)	52.6 (55.5)	55.3 (59.8)	52.9 (58.6)
S003-WS08	N007	RCGP, Melton Street	Free-field	64.2 (67.1)	68.4 (78.1)	64.3 (67.4)	63.4 (66.8)	62.0 (74.0)	63.1 (64.0)	66.1 (73.7)	63.2 (64.2)	63.5 (66.0)	60.7 (64.5)	63.3 (67.6)	61.7 (65.9)
VHA	N025	External to 3 Prince Albert Road	Free-field	67.9 (80.1)	69.7 (75.4)	66.7 (74.0)	66.6 (76.9)	62.4 (68.5)	64.4 (65.0)	66.7 (68.2)	67.0 (68.5)	66.7 (71.0)	61.4 (65.5)	65.5 (69.6)	63.7 (69.6)
	N026	Thames Water Compound	Free-field	58.5 (60.1)	61.6 (63.5)	56.8 (59.0)	55.8 (61.8)	51.4 (58.1)	55.6 (57.1)	56.5 (58.0)	56.0 (57.5)	56.0 (58.1)	51.1 (57.6)	55.1 (59.0)	51.8 (57.7)

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
NTH-EN	N014	Starcross Street lamppost (external to Exmouth Arms)	Free-field	54.3 (58.4)	61.0 (67.9)	53.9 (60.1)	52.3 (55.8)	50.4 (61.3)	51.6 (54.4)	56.3 (61.4)	54.7 (56.0)	54.2 (60.8)	48.9 (53.6)	54.3 (67.0)	50.4 (55.5)
	N016	Margaret Centre roof	Free-field	54.8 (57.7)	63.9 (71.9)	54.8 (61.0)	53.7 (58.7)	51.8 (67.4)	52.8 (53.0)	58.1 (65.1)	55.5 (58.9)	55.0 (62.9)	51.2 (58.8)	54.3 (68.3)	51.5 (57.0)
	N017	42-44 Cobourg Street	Free-field	69.9 (72.7)	72.9 (75.6)	70.8 (76.5)	70.2 (77.1)	67.1 (76.7)	67.6 (68.3)	70.8 (73.1)	68.8 (70.2)	70.1 (73.0)	65.9 (73.2)	69.1 (73.5)	67.2 (73.6)

2.1.2 Table 4 presents a summary of the measured vibration levels at each monitoring location over the reporting period. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 4: Summary of Measured PPV Data over the Monitoring Period

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
HRB	V039	Coniston, Regents Park Estate	12.50 (X-Axis)*
	V043	Cubitt Court, Park Village East	2.53 (Y-Axis)
S003-WS03	V002	RCGP. basement boiler room. 305 Euston Road	3.87 (Z-axis)
	V037	Magic Circle, basement	2.45 (Z-axis)
	V038	Wesley Hotel, basement lightwell, Euston Street	1.47 (Z-axis)
S003-WS09	V003	RCGP. basement vaults, 305 Euston Road	0.59 (Z-axis)
NTH-EN	V021	42-44 Cobourg Street (floor)	0.77 (Z-axis)

* High vibration levels were caused by works in close proximity to the monitor. The highest vibration level measured at a distance representative of the receptor was 7.74mm/s (Y-Axis).

2.1.3 Appendix C presents graphs of the noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consists 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>.

2.2 Exceedances of the SOAEL

2.2.1 The significant observed adverse effect level (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."

2.2.2 HS2 Phase One Information Paper E23: Control of Construction Noise and Vibration sets out the SOAELs for construction noise.

2.2.3 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.

2.2.4 Table 5 presents a summary of recorded exceedances of the SOAEL at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 5: Summary of Exceedances of SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
ARVS	N051	Outside 70 Adelaide Road	All days	All periods	No exceedance
	N052	Adelaide Road-Beaumont Walk	All days	All periods	No exceedance
B	JC	Juniper Crescent	All days	All periods	No exceedance
ESC	N024	External to Park Village Studios, Park Village East	All days	All periods	No exceedance
	N047	Park Village East/Mornington Street bridge, lamppost #13	All days	All periods	No exceedance
ESC - C	N022	External to 34 Mornington Terrace	All days	All periods	No exceedance
	N046	Lamppost opposite to 49 Mornington Terrace	Night	22:00-07:00	12
			Sunday	07:00-22:00	10
ETRC	N001	Park Village East Lamppost #1	Night	All periods	No exceedance
	N002	Park Village East Lamppost #2	All days	All periods	No exceedance
	N003	Park Village East Lamppost #9	All days	All periods	No exceedance
	N005	5A Granby Terrace	All days	All periods	No exceedance
	N023	Amphill Estate, lamppost #21, Hampstead Road	Weekday	19:00-22:00	1
ETRC - D	N004	Mornington Terrace, lamppost #7	All days	All periods	No exceedance
HRB	N020	Mackworth Street, lamppost #1	All days	All periods	No exceedance
	N021	Stanhope Street, lamppost #2	All days	All periods	No exceedance
	N044		Weekday	08:00-18:00	1

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
		Regents Park Estate West, near Langdale	Weekday	18:00-19:00	2
			Weekday	19:00-22:00	3
	N045	Regents Park Estate south, external to Coniston	All days	All periods	No exceedance
G	HH	Euston Station Parcel Deck, Barnby Street	All days	All periods	No exceedance
	BS	Barnby Street	Night	22:00-07:00	17
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	Not applicable*
	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-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
VHA	N025	External to 3 Prince Albert Road	All days	All periods	No exceedance
	N026	Thames Water Compound	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
NTH-EN	N014	Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street	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

* The defined SOAEL criteria are not applicable to non-residential properties

2.2.5 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 6 and may be lower than the total sum of individual exceedances reported in Table 5 for each location.

Table 6: Summary of Total Exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
ESC - C	N046	Lamppost opposite to 49 Mornington Terrace	2
G	BS	Barnby Street	3
ETRC	N023	Amphill Estate, lamppost #21, Hampstead Road	1
HRB	N044	Regents Park Estate West, near Langdale	4

2.2.6 10 exceedances of the SOAEL were recorded due to HS2 construction works during January 2021. The exceedances occurred at:

- Monitoring location N046 during weekend possession works (points removal);
- Monitoring location BS during the night-time due to platform resurfacing works;
- Monitoring location N023 during a weekday evening due to installation of rails;
- Monitoring location N044 during weekday daytime due to pile mat installation, steel fixing of upstand polymer slabs and cementation drilling; and during weekday evenings due to piling and use of a vacuum excavator;

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 noise 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
-	-	-	-	-	-

2.4 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.

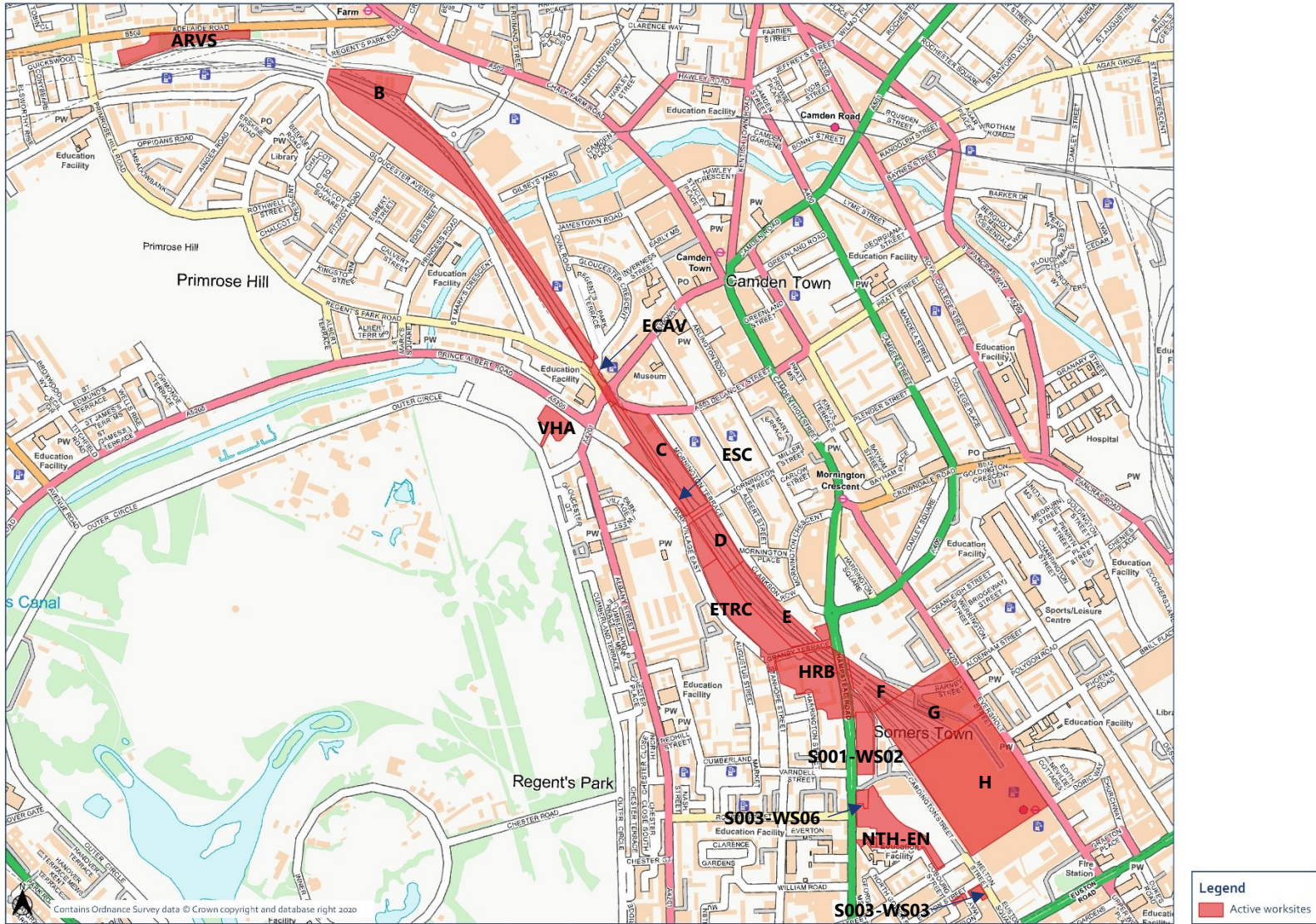
Table 8: Summary of Complaints

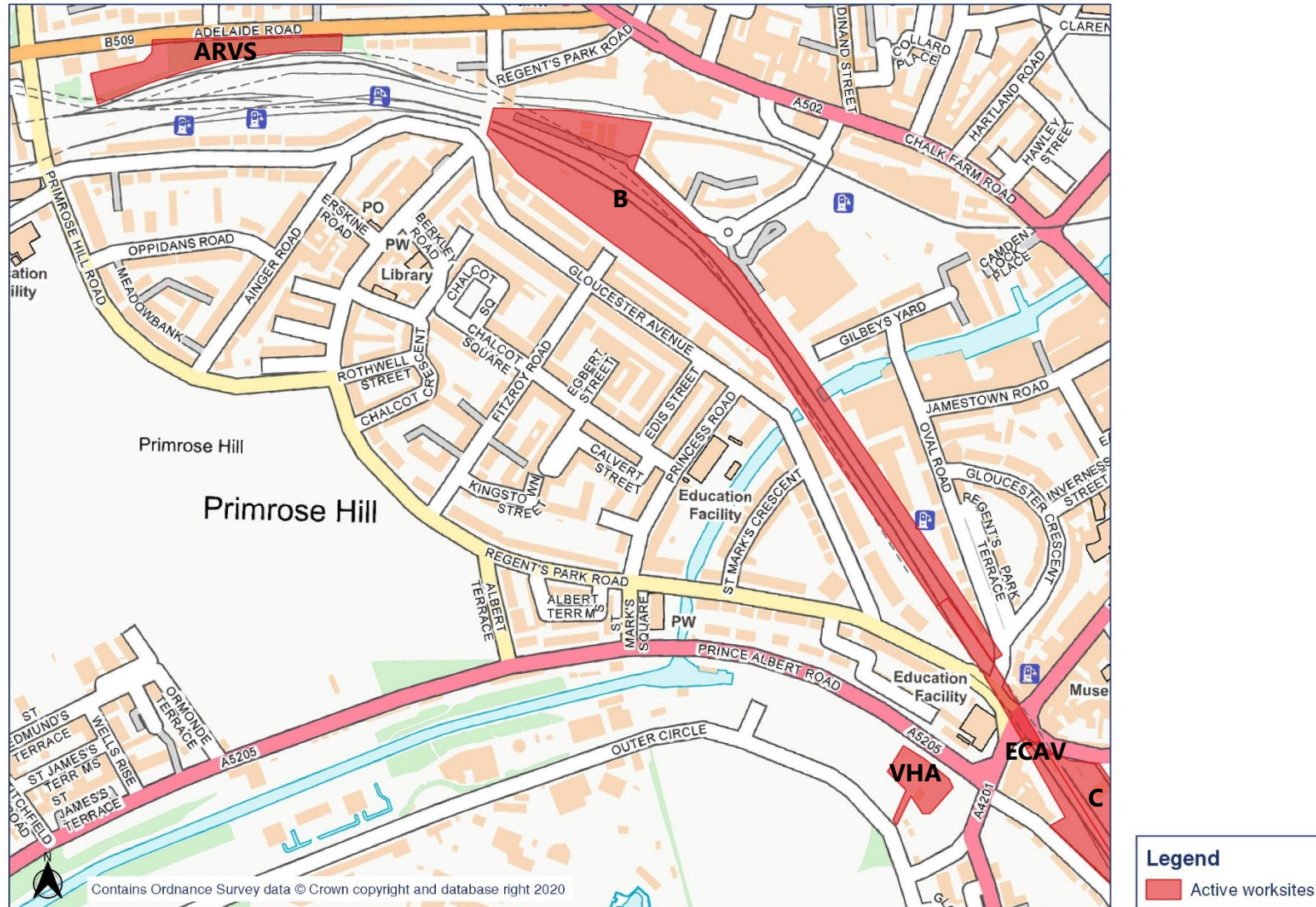
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-41167-C	NTH-EN / S003-WS03	Complaint regarding construction noise during the daytime.	The associated works were due to two-way ducts being installed. Works are continuing until mid-February. At point of response 60-70% of works were completed.	The stakeholder was informed that best practical means of work are in place. An offer was made for stakeholder to discuss further on site with the site manager, whilst maintaining social distancing.
HS2-21-41173-C	NTH-EN / S003-WS03	Complaint regarding construction noise during the daytime.	On-going.	On-going.
HS2-21-41180-C	HRB / S001-WS02	Complaint regarding construction noise and vibration during the daytime.	On-going.	On-going.
HS2-21-41182-C HS2-21-52683-E	HRB / S001-WS02	Complaint due to noise from a generator near Varndell Street.	On-going.	On-going.

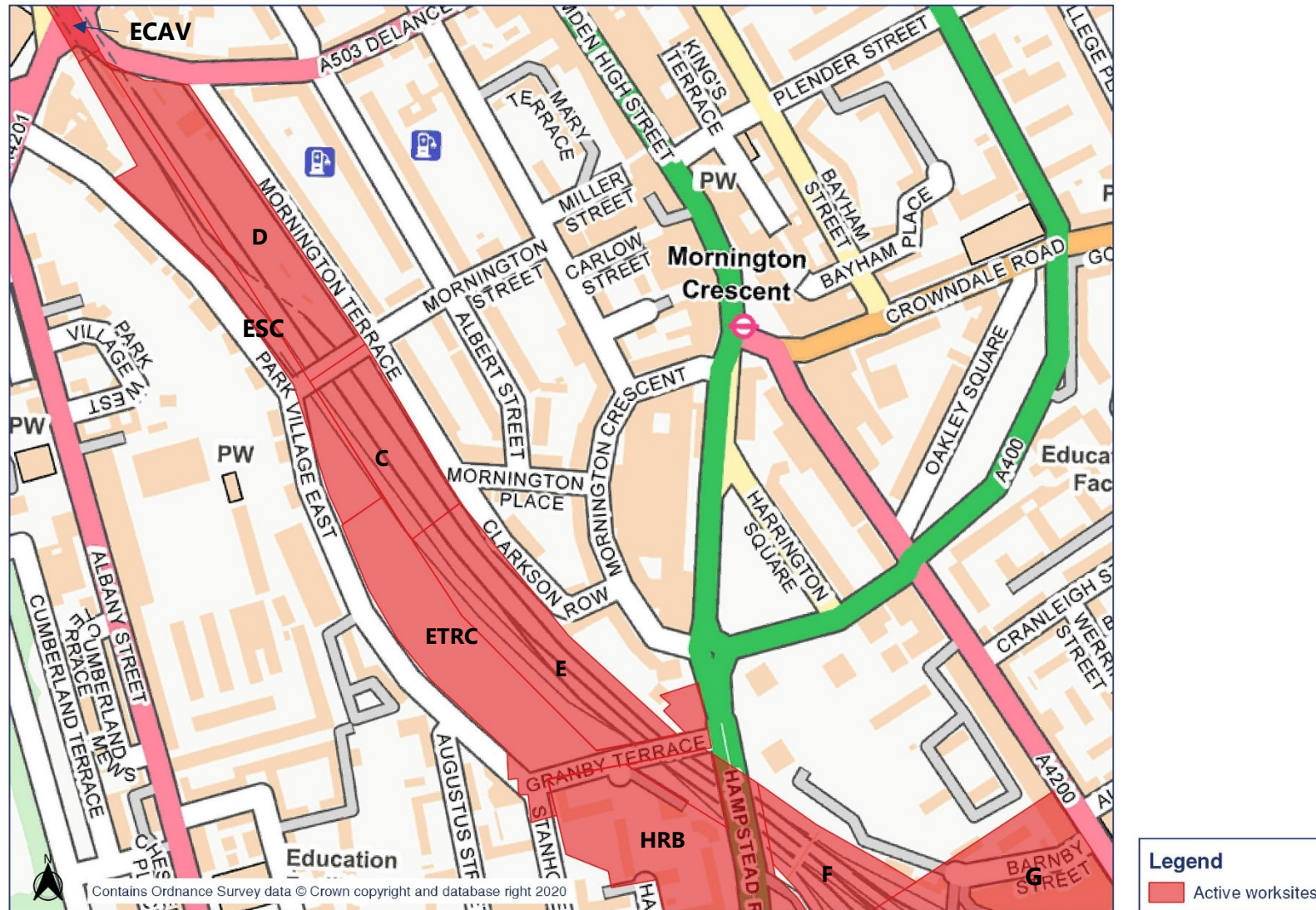
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-41183-C	ESC / C	Complaint regarding construction noise during the night-time causing sleep disturbance.	On-going.	On-going.
HS2-21-41192-C	ESC / C	Complaint regarding construction noise and vibration during the night-time.	Works were undertaken during core-hours for the period of time raised by the stakeholder. Increased levels of noise were caused by concrete breaking.	Information was provided to the stakeholder confirming that monitoring data demonstrates compliance with Section 61 consent and best practical methods of work were implemented. It was also confirmed that details regarding the work are available on HS2 Commonplace.
HS2-21-41200-C	HRB / S001-WS02	Complaint regarding droning noise during the daytime.	On-going.	On-going.
HS2-21-41214-C	H	Complaint regarding drilling noise during the night-time (23:00).	The drilling noise reported was not associated with any HS2 construction works.	Information was provided to the stakeholder detailing the outcome of the investigation.
HS2-21-41216-C	ECAV	Complaint regarding construction noise and vibration during the daytime.	On-going.	On-going.
HS2-21-41229-C	HRB / S001-WS02	Complaint regarding drilling noise during the night-time.	The noise was caused by hoarding works. A letterbox and email notification of the works was made in advance.	The stakeholder was advised that prior notification had been given and that the details of the works can be found on HS2 Commonplace.
HS2-21-52750-E	C	Complaint regarding construction noise across various days.	Preliminary investigations indicate that it is likely that HS2 construction works caused noise on some of the days raised by the stakeholder. Investigation is on-going.	An update was provided indicating when other HS2 works would be occurring in the area.

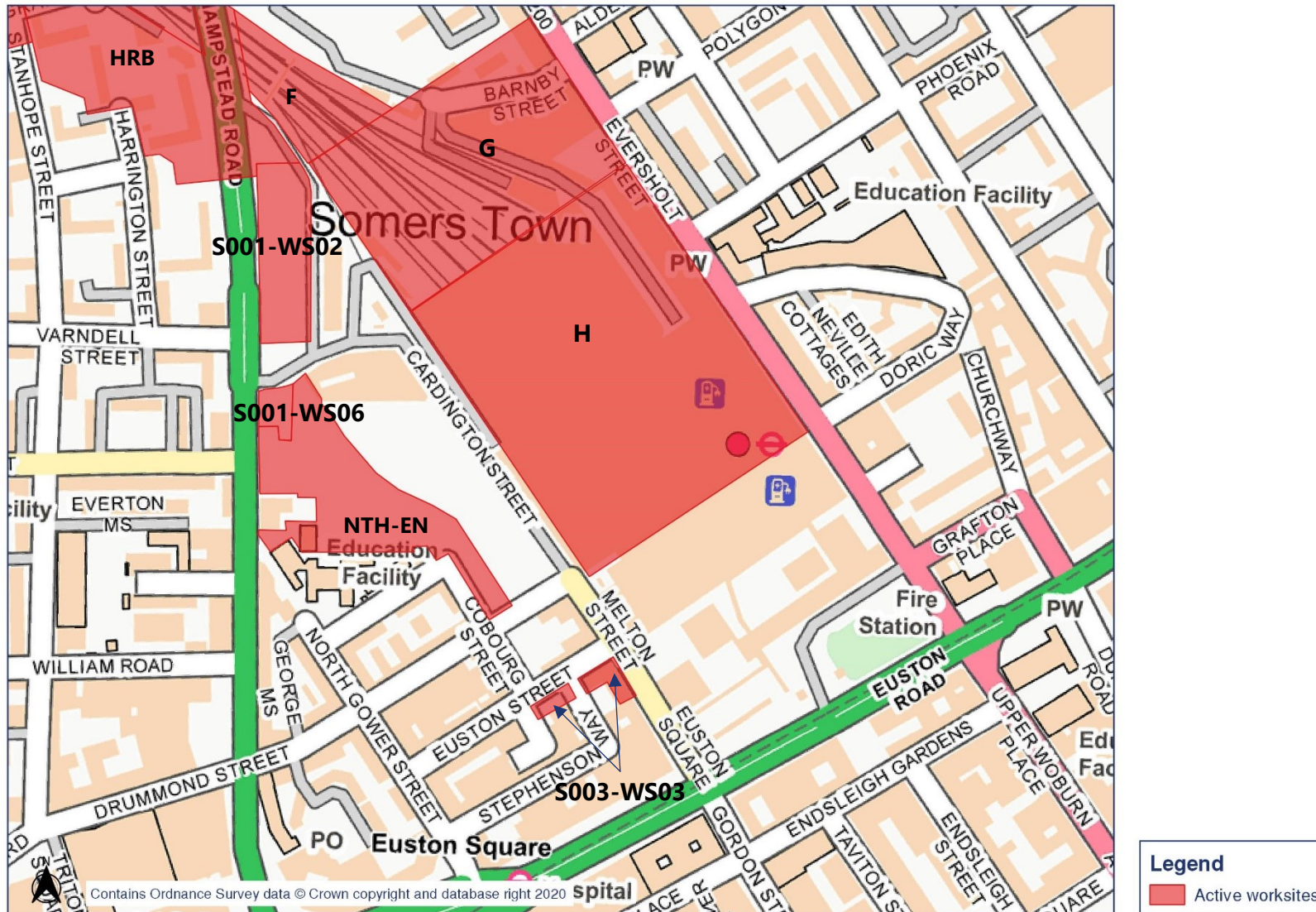
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-20-51579-E HS2-21-52536-E	ARVS	Complaint regarding construction noise during the night-time.	Source of noise unclear however hybrid generators that normally operate on battery power overnight may need to run for short periods on diesel power if battery power becomes low.	Information was provided to the stakeholder confirming that monitoring data demonstrates compliance with Section 61 consent and best practical methods of work were implemented.
HS2-21-53240-E	ARVS	Complaint regarding construction noise during the night-time.	Site generator became active during the night-time. Hybrid generators that normally operate on battery power overnight may need to run for short periods on diesel power if battery power becomes low.	Helpdesk called the stakeholder and advised that the team will attend site and turn the generator off, and that the team would be escalating this further including with the generator supplier to avoid this happening again.

Appendix A Site Locations

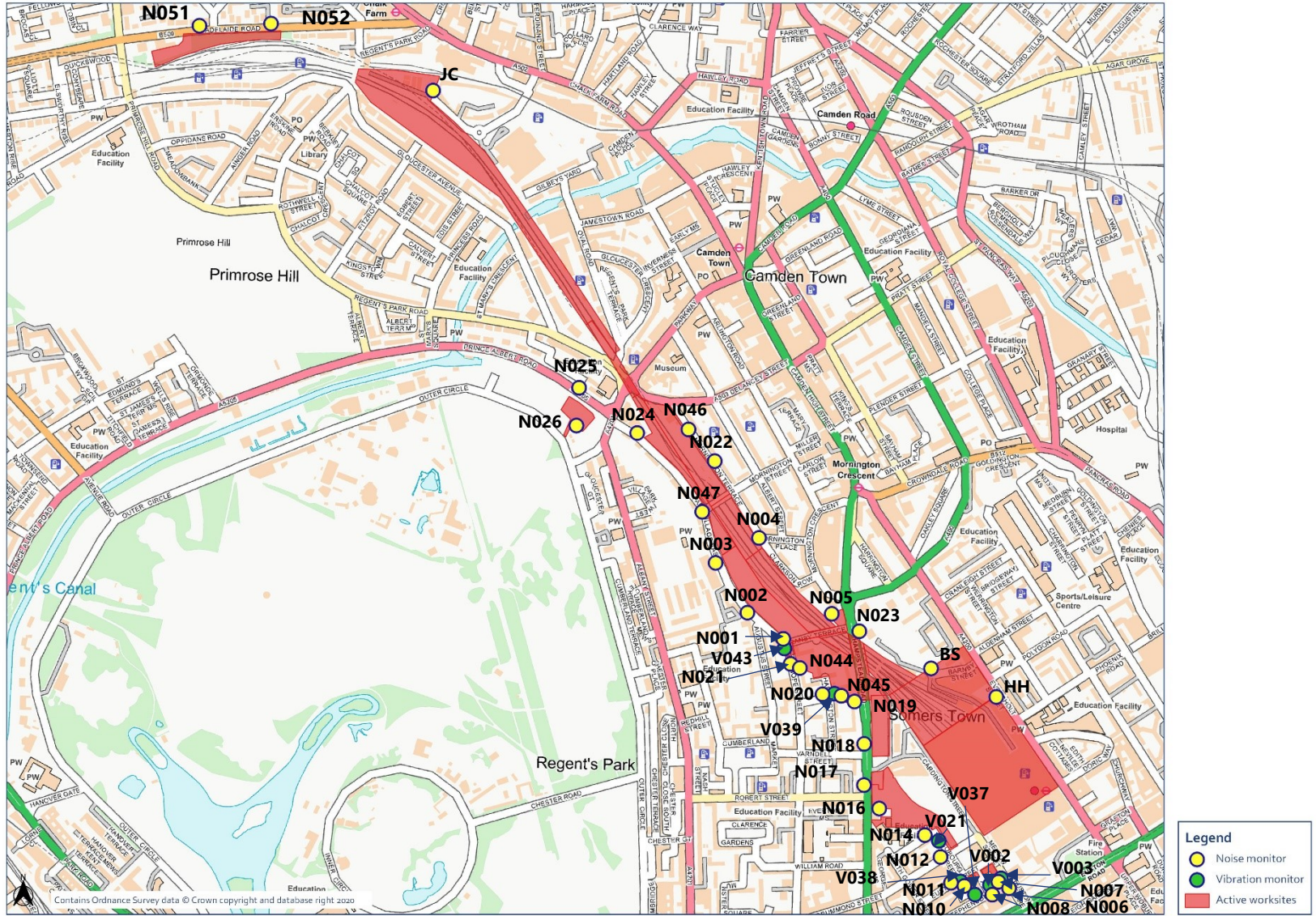


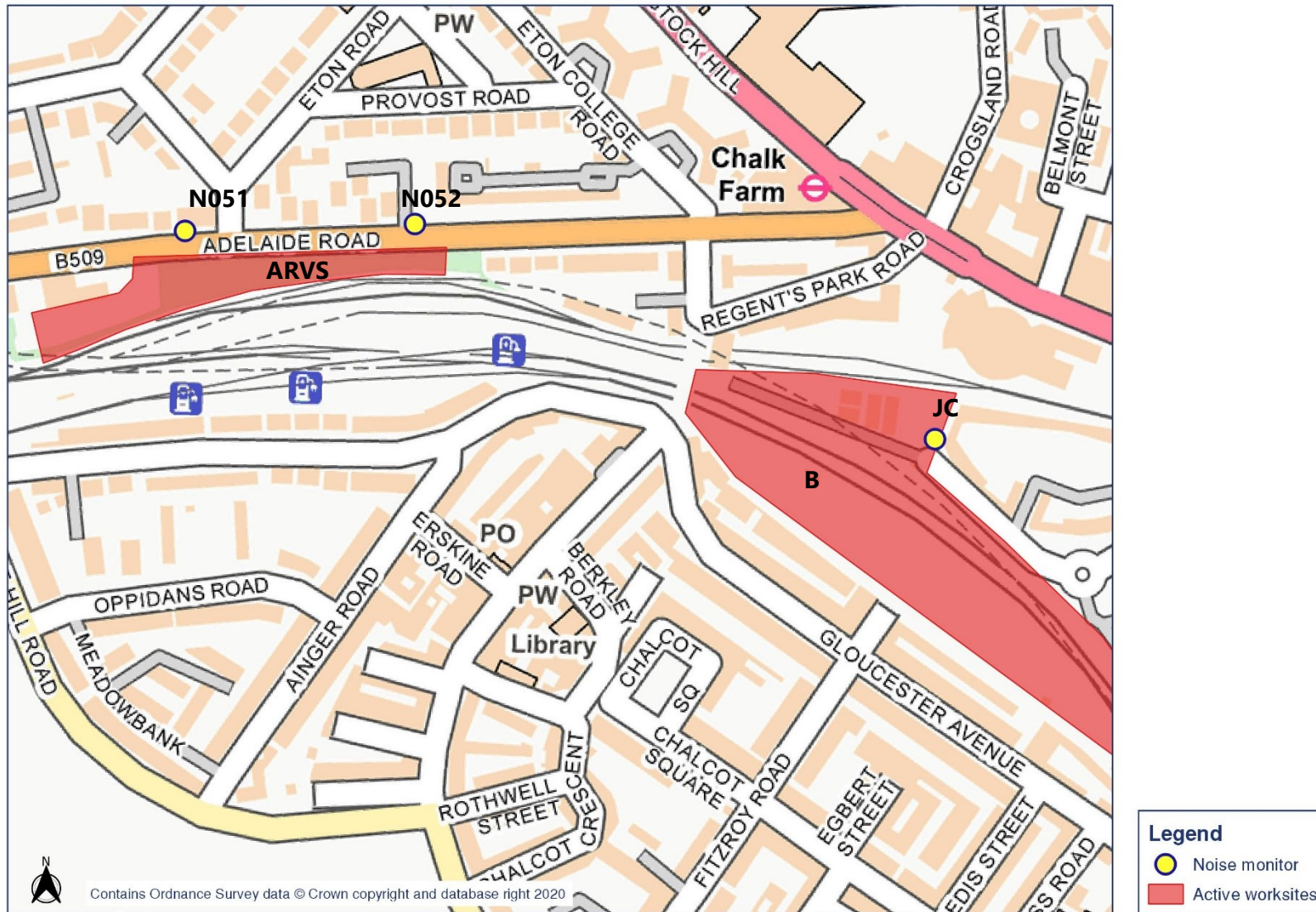


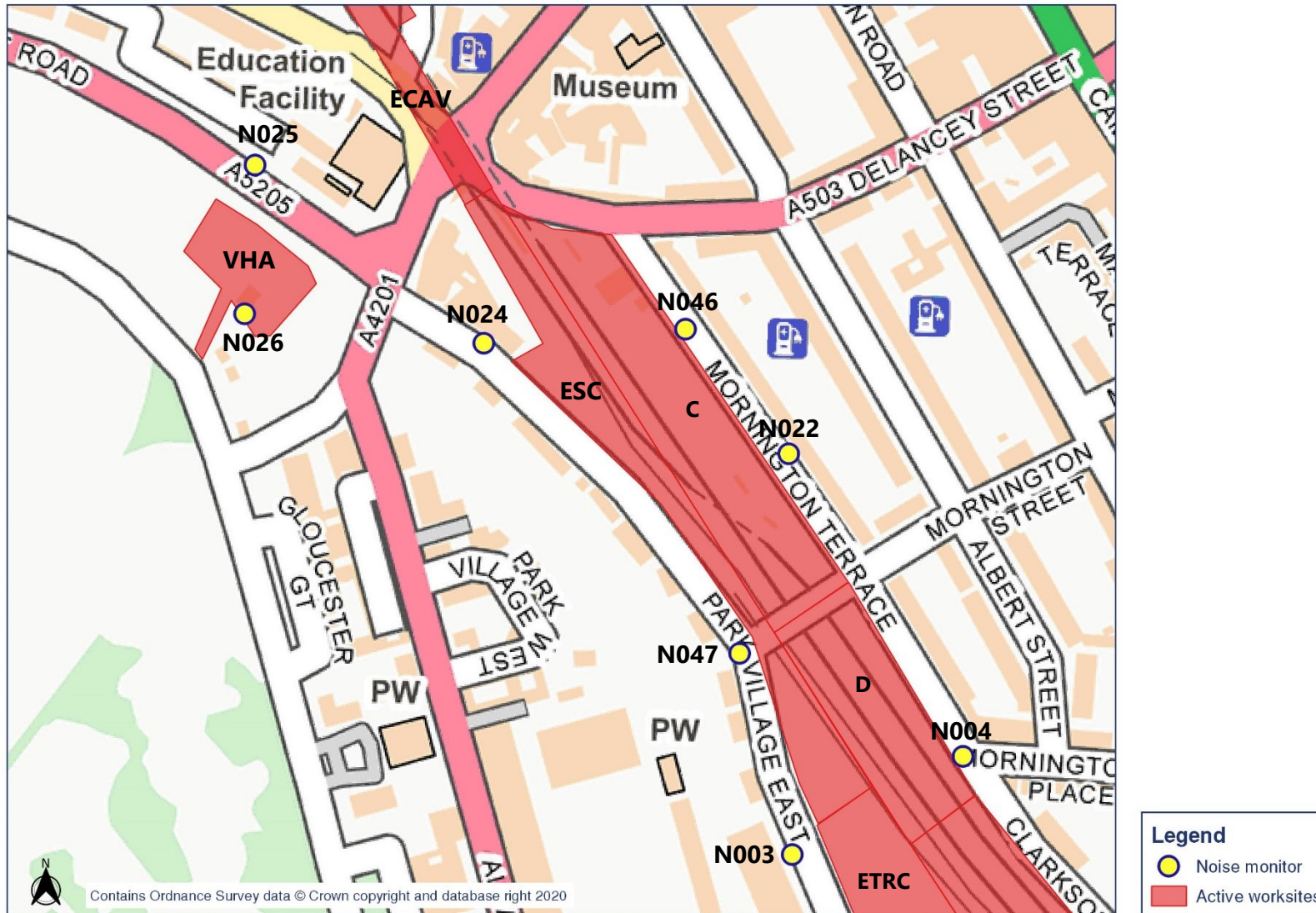


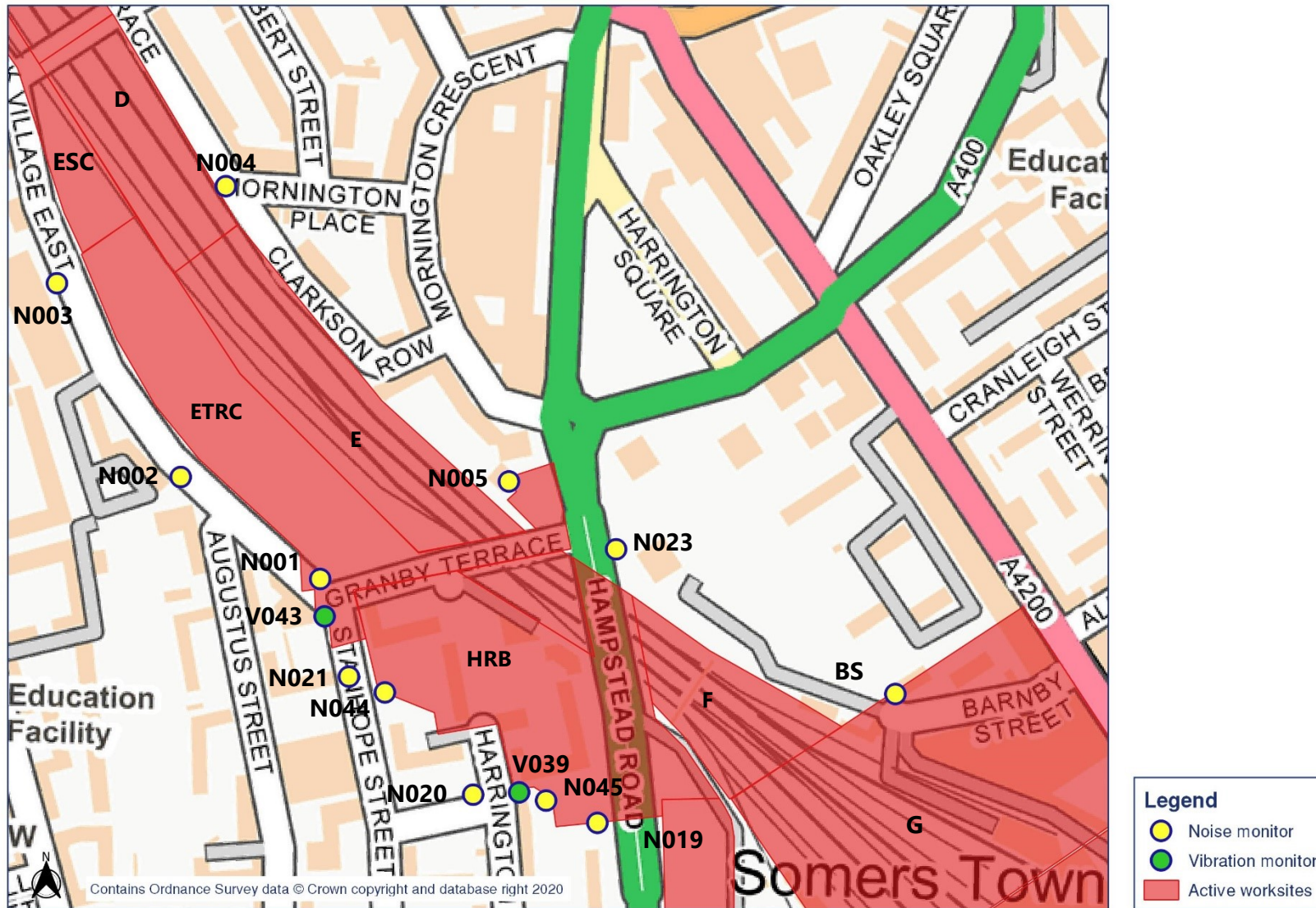


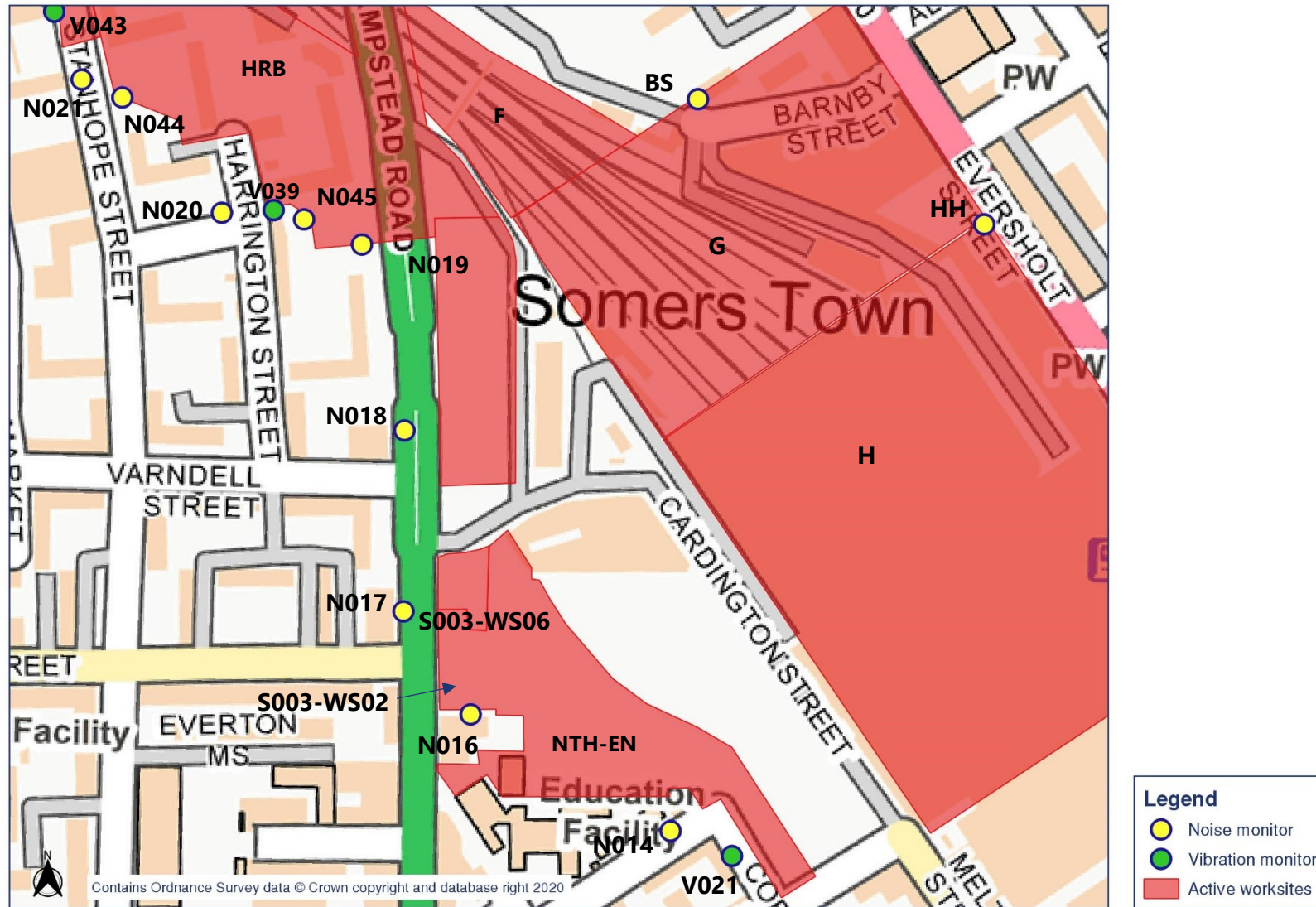
Appendix B Monitoring Locations

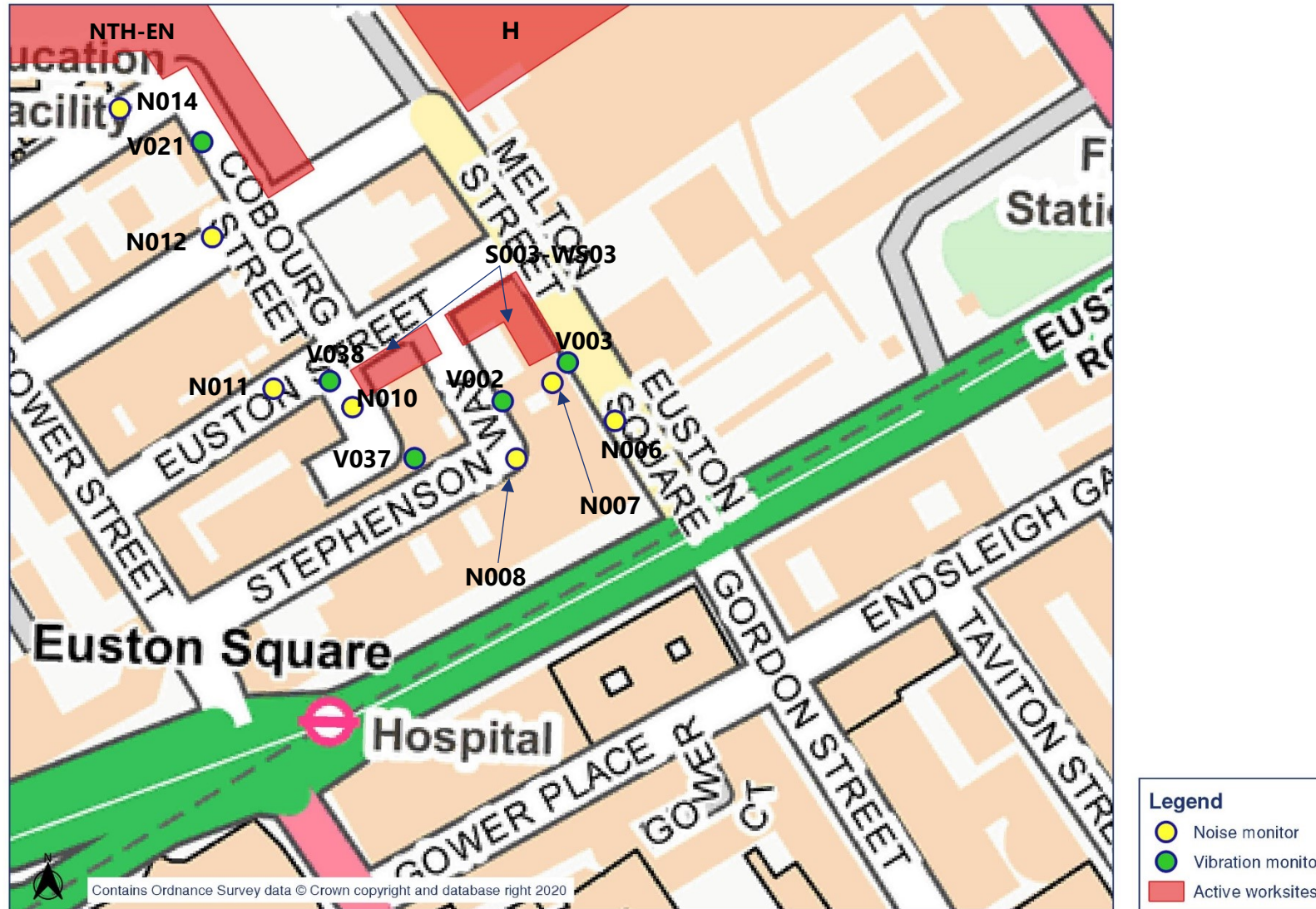










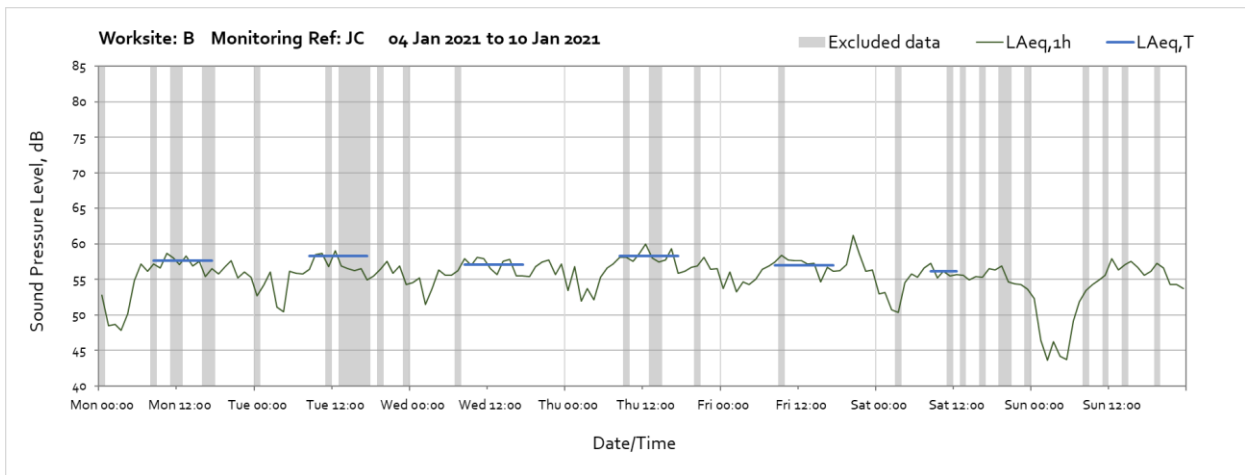
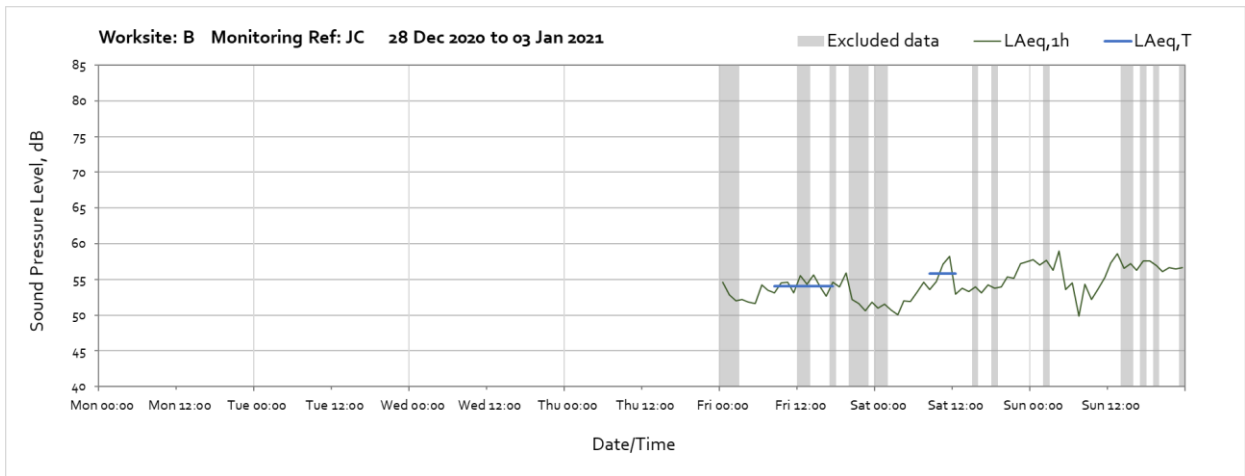


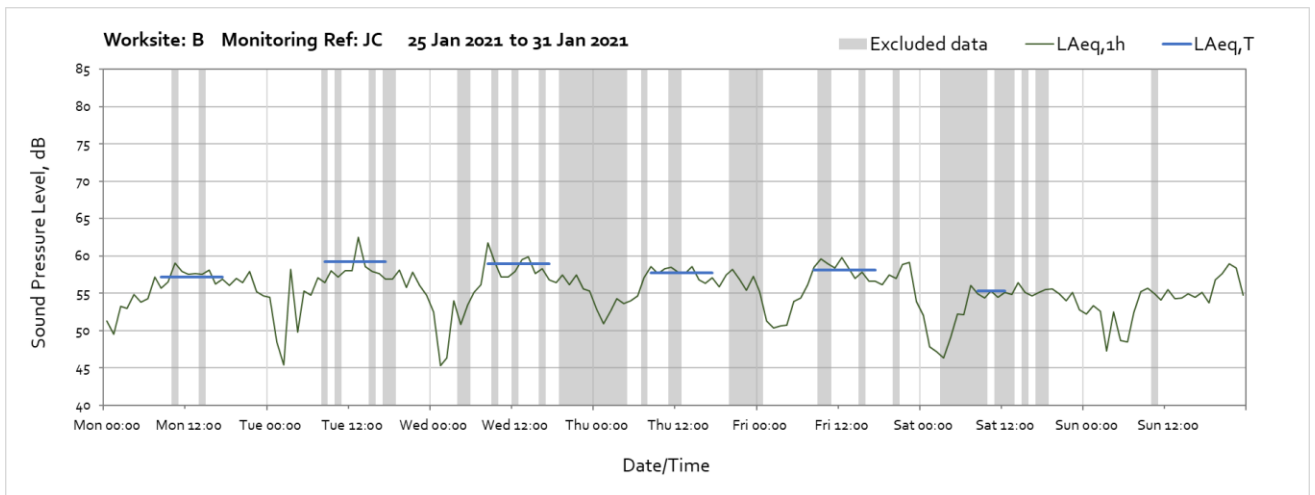
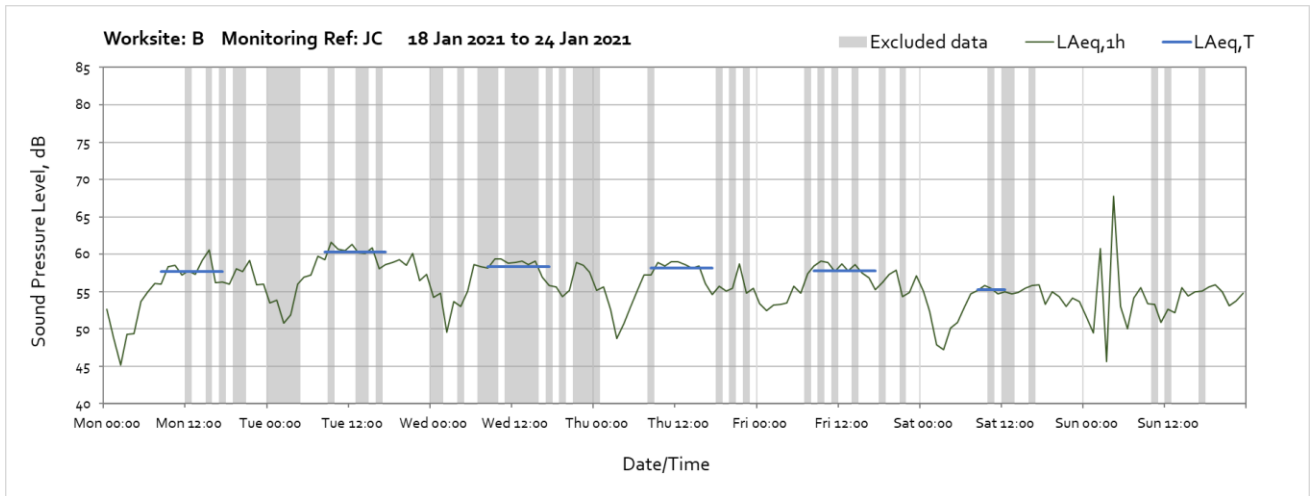
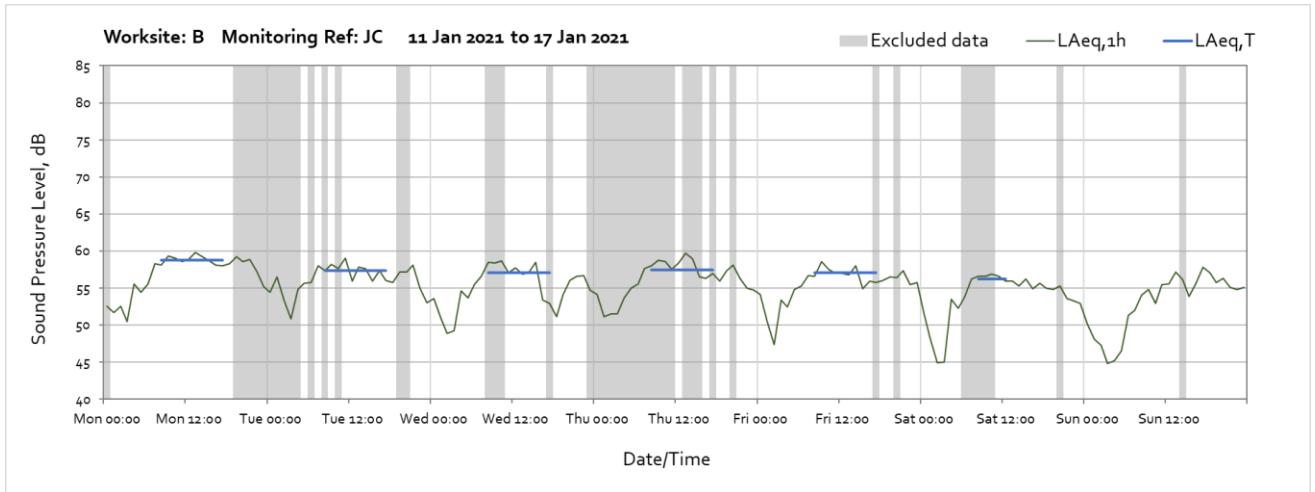
Appendix C Data

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 in Table 3 of the main report.

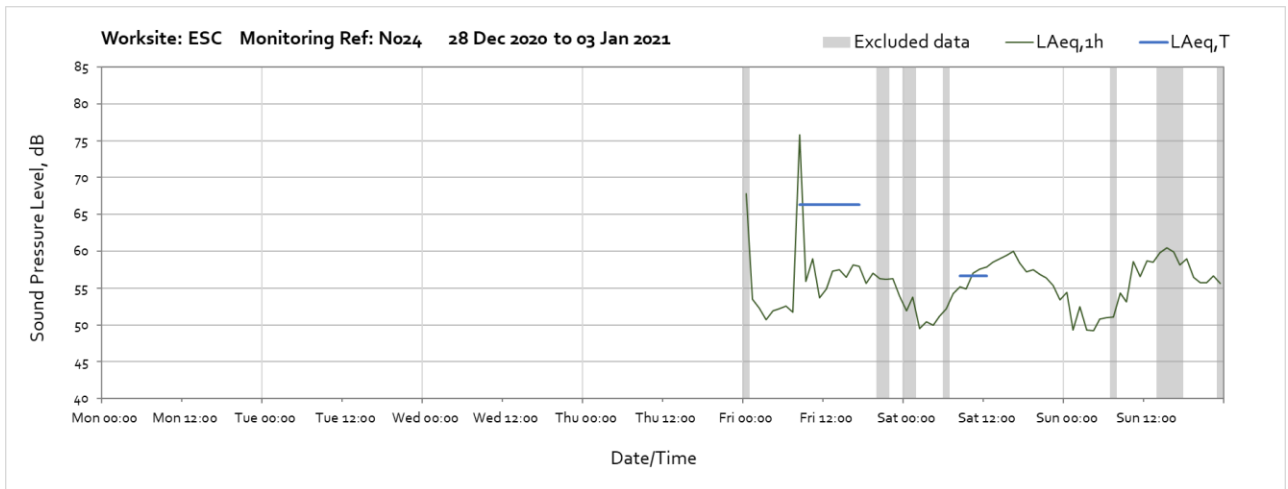
Noise

Worksite: B – Monitoring Ref: JC

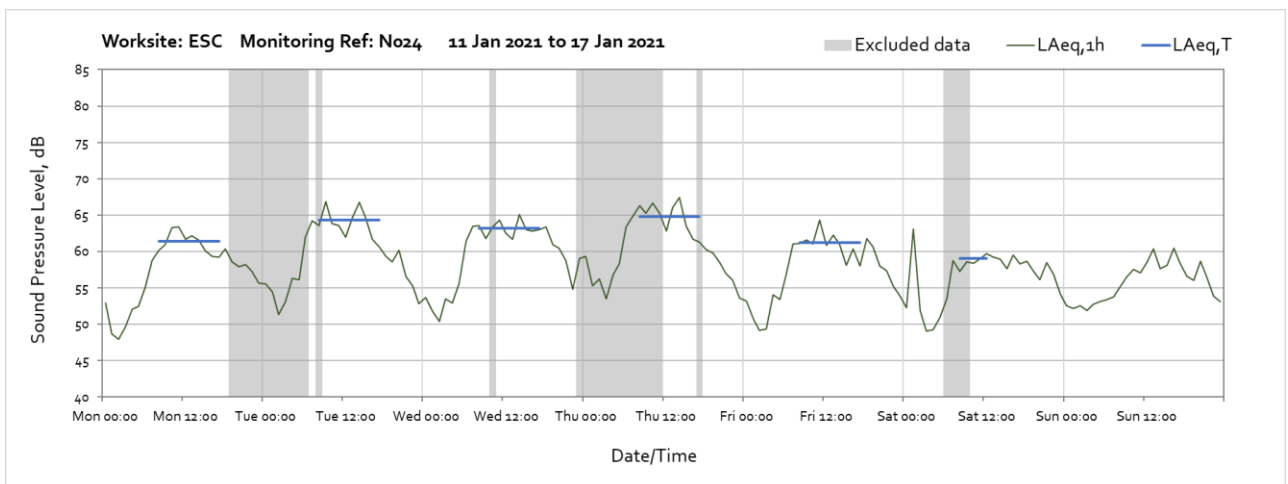
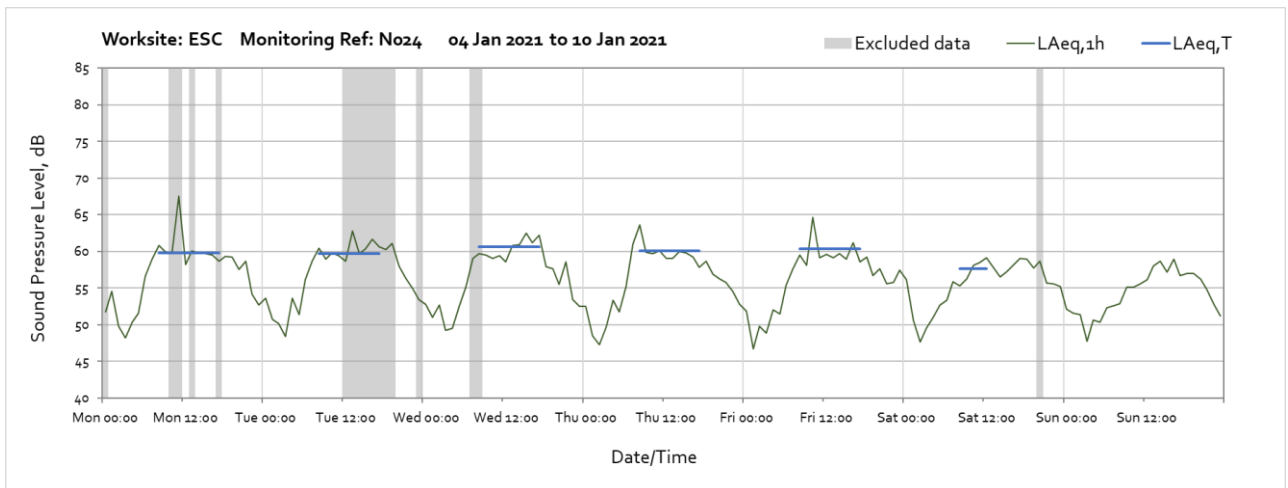


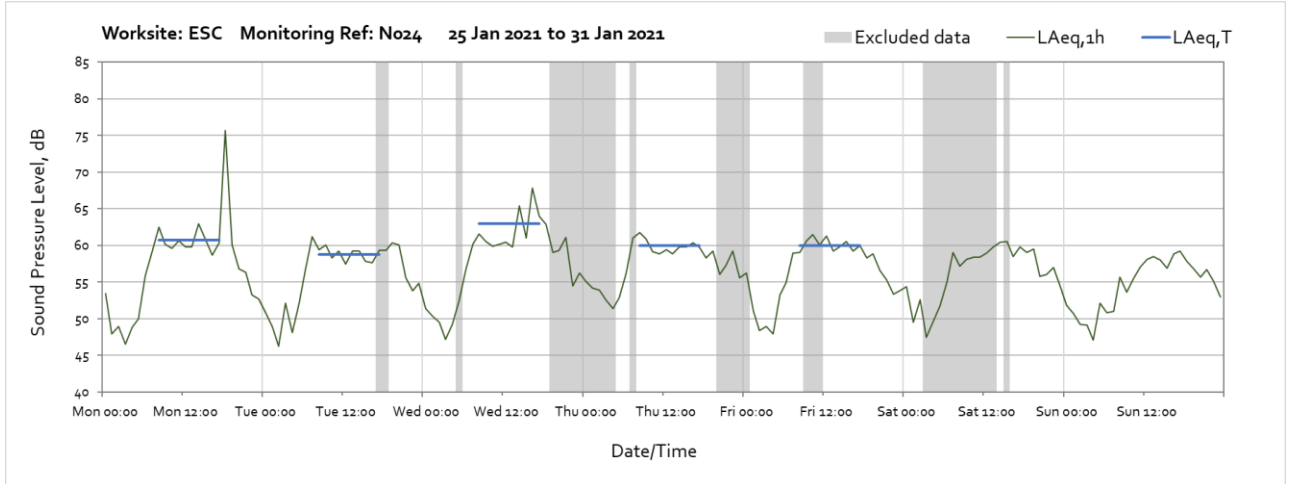
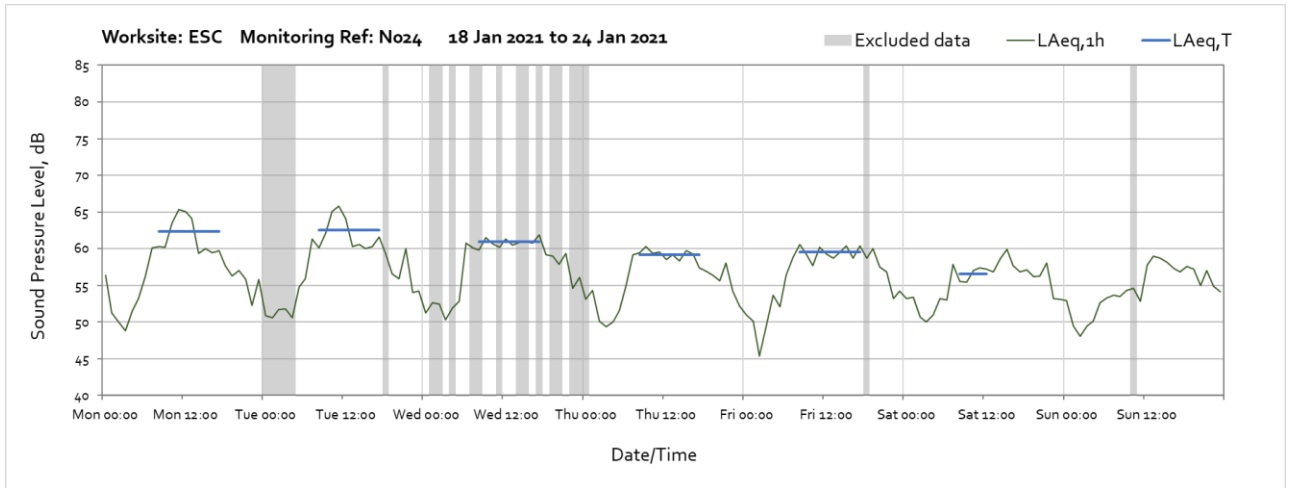


Worksite: ESC – Monitoring Ref: N024

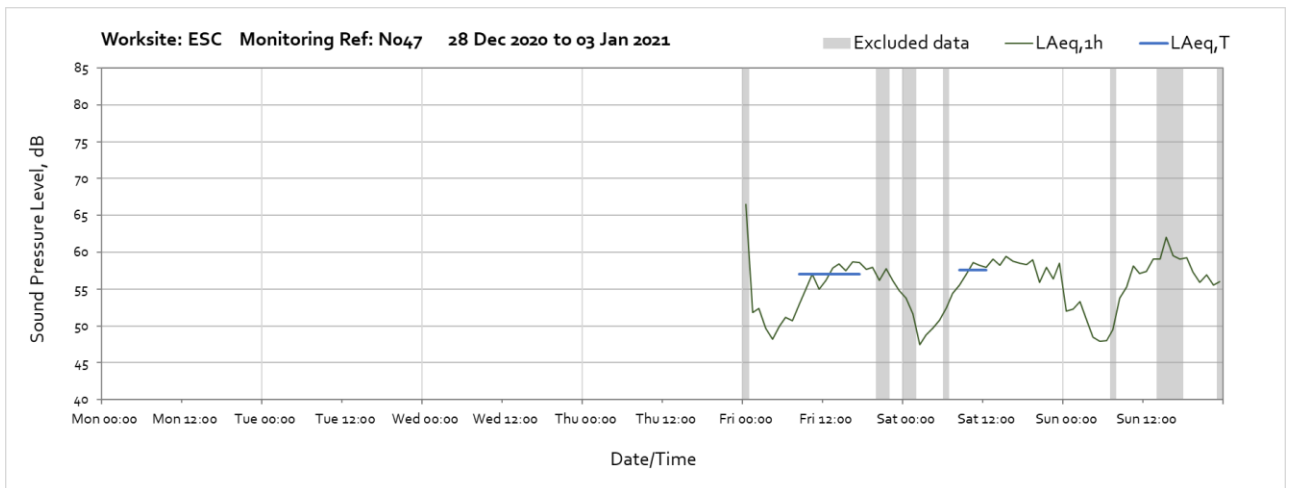


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

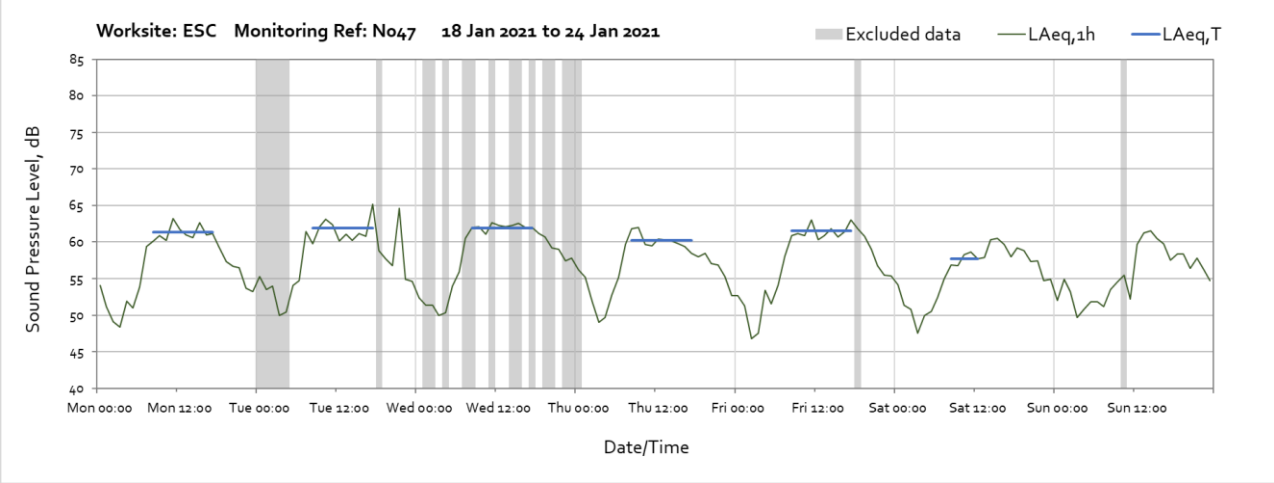
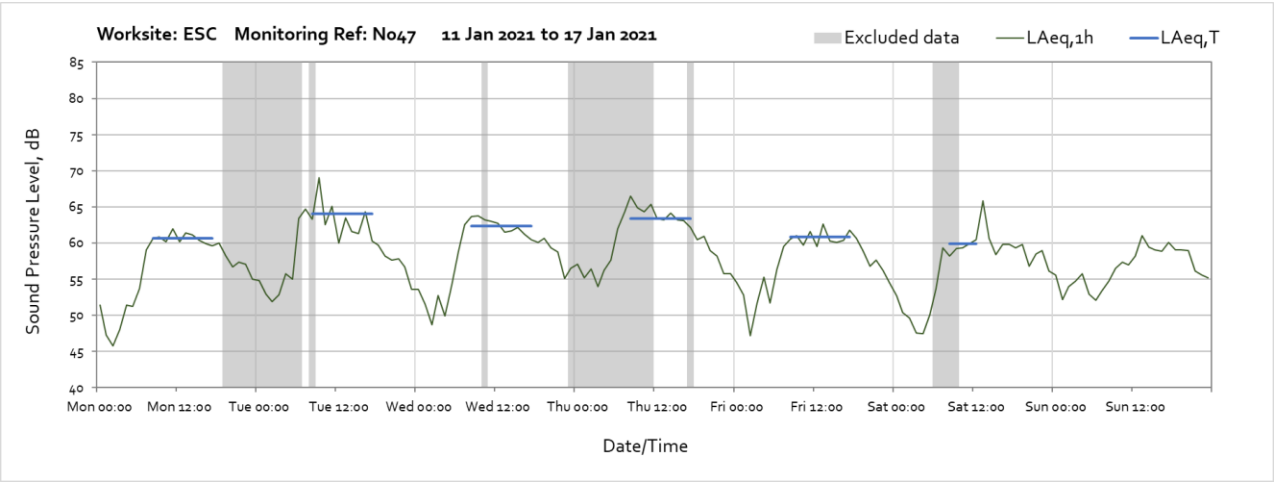
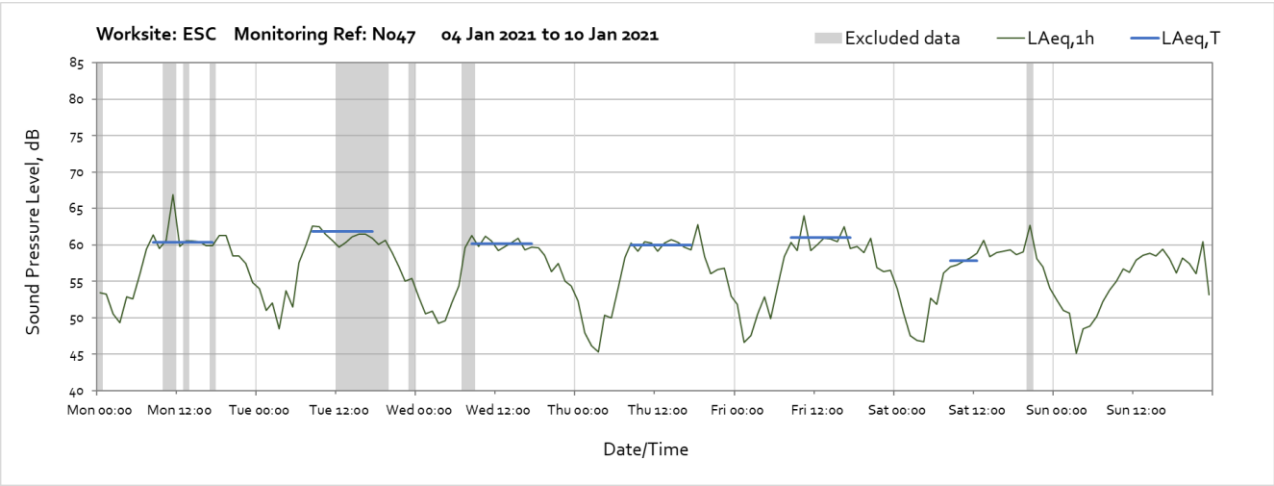


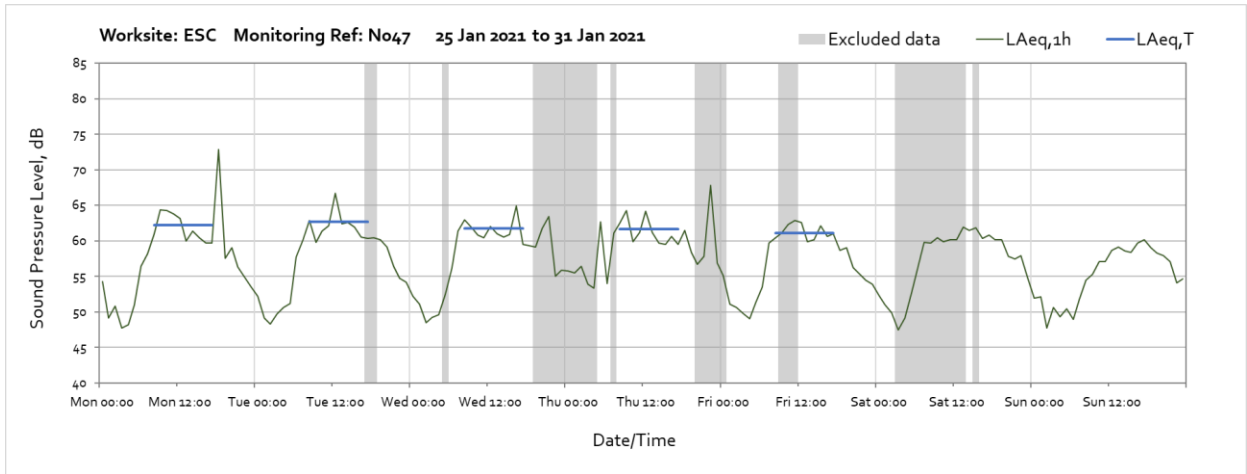


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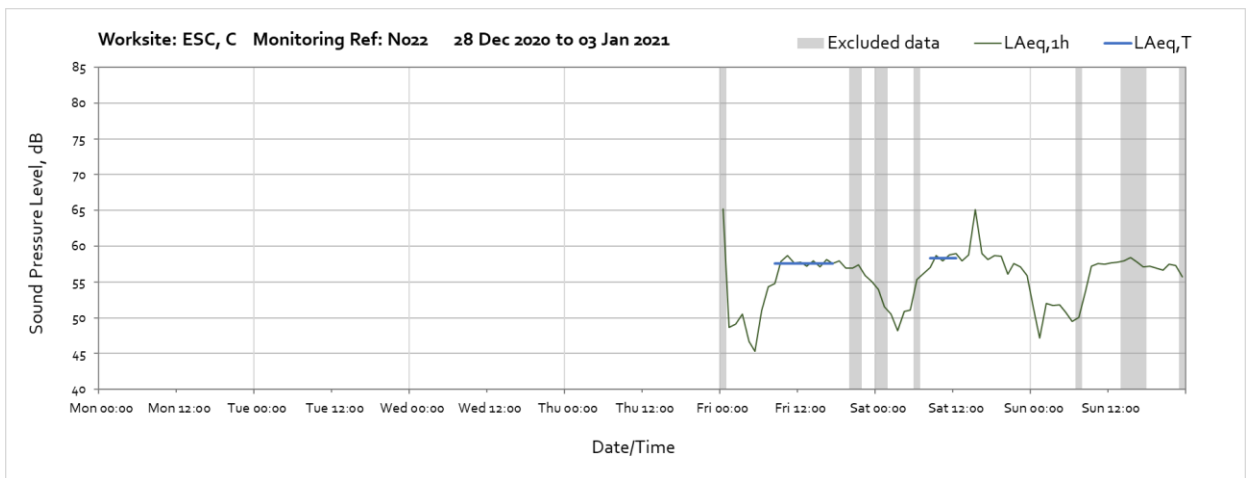


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

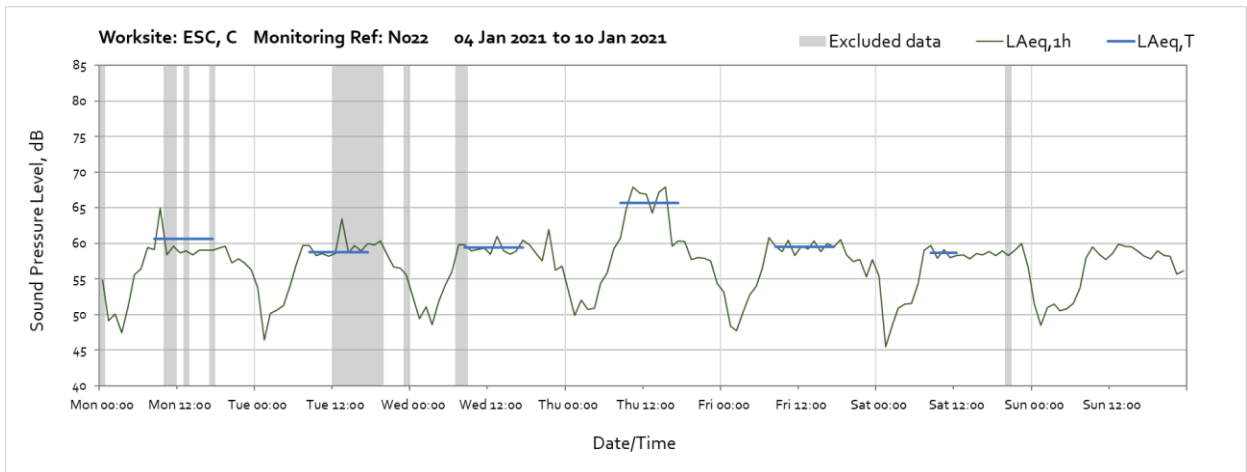


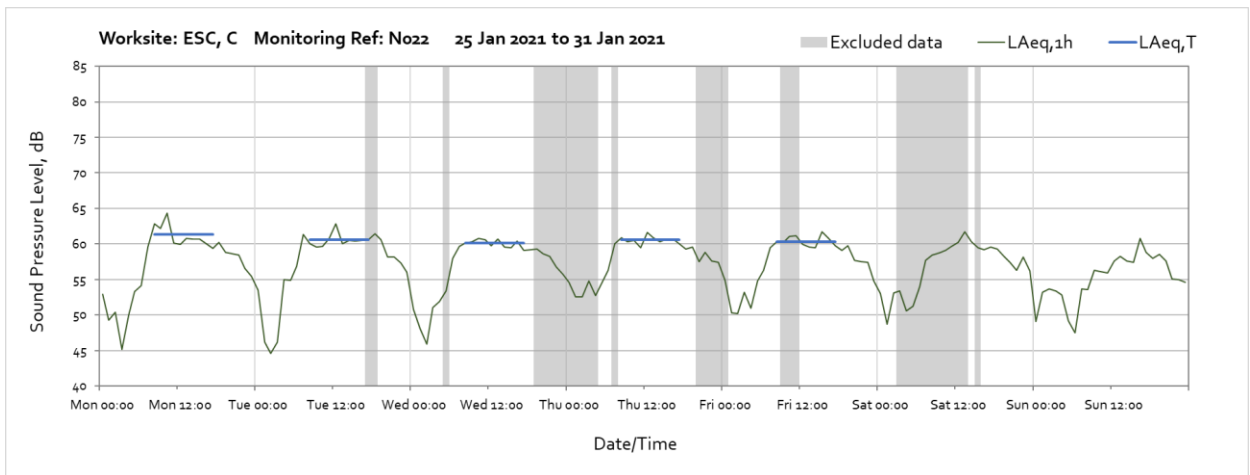
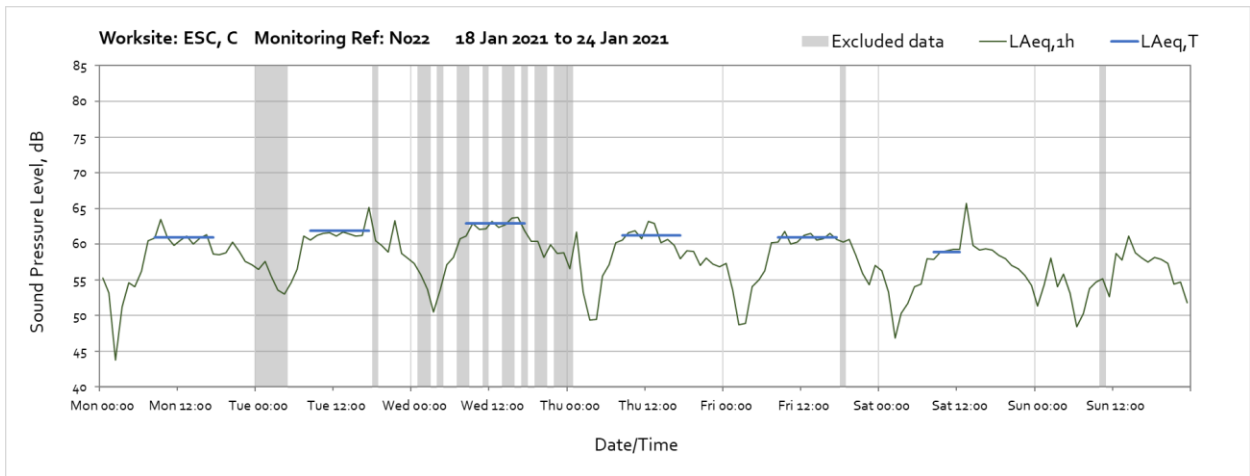
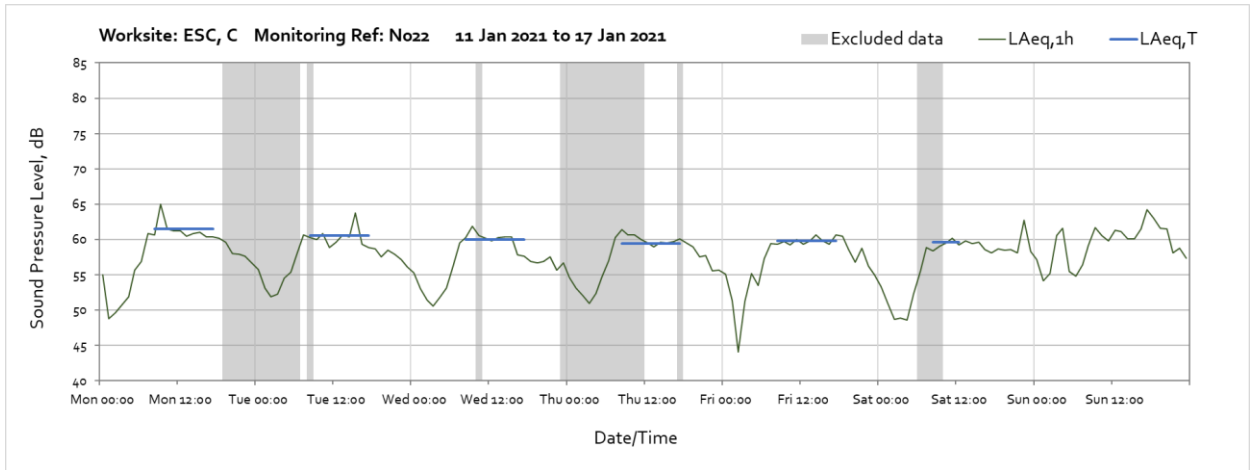


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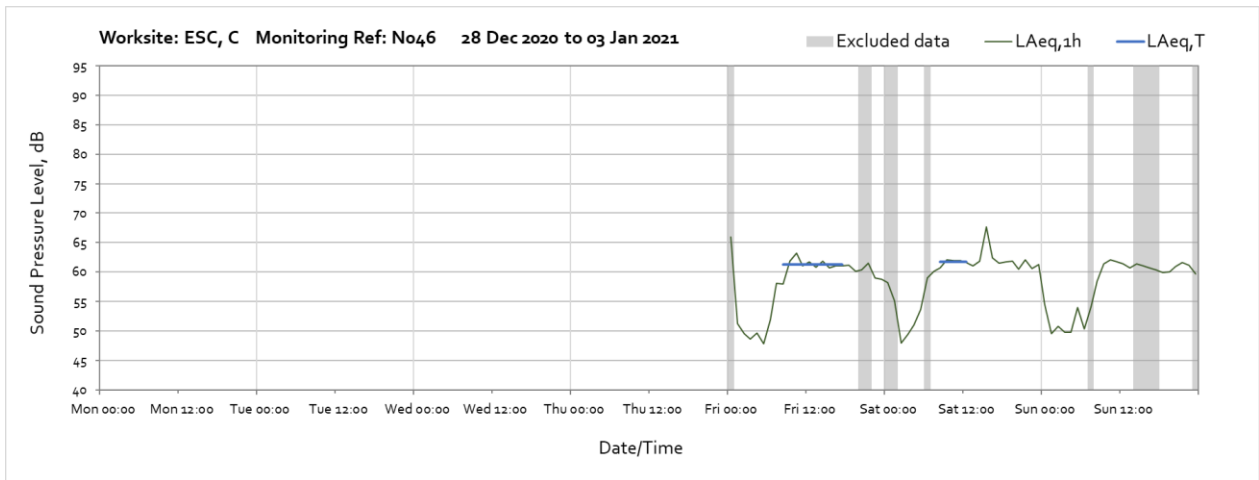


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

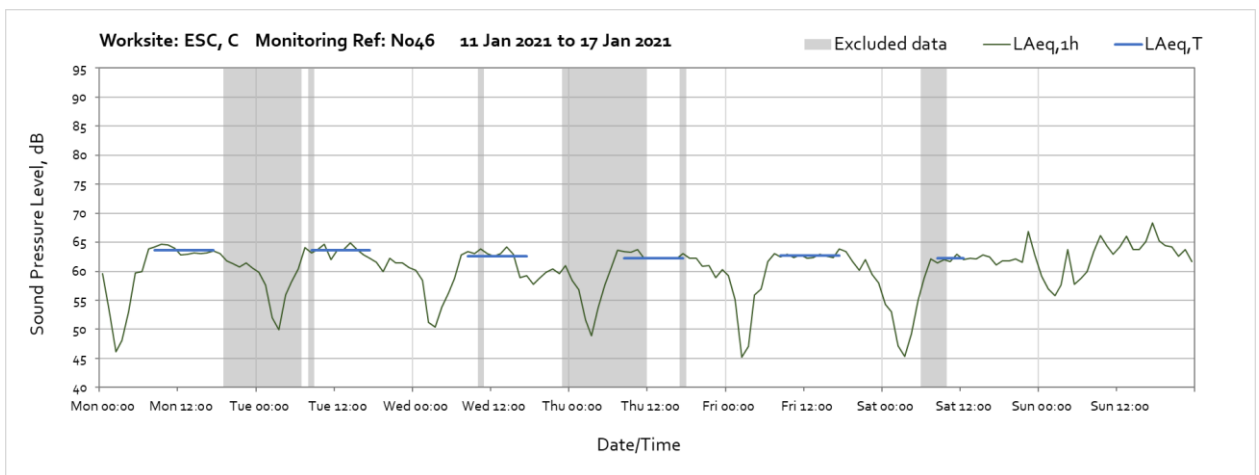
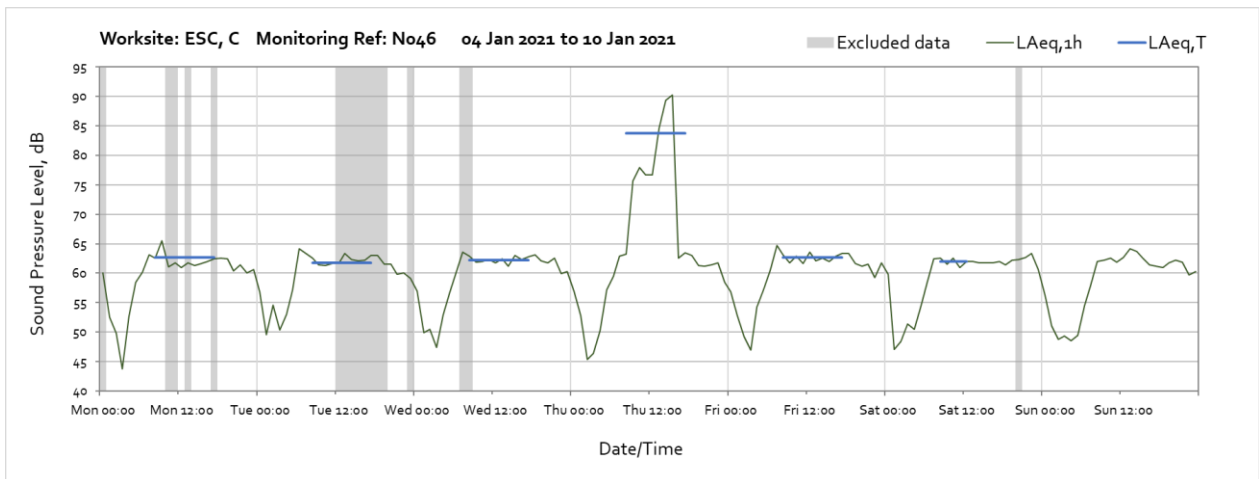


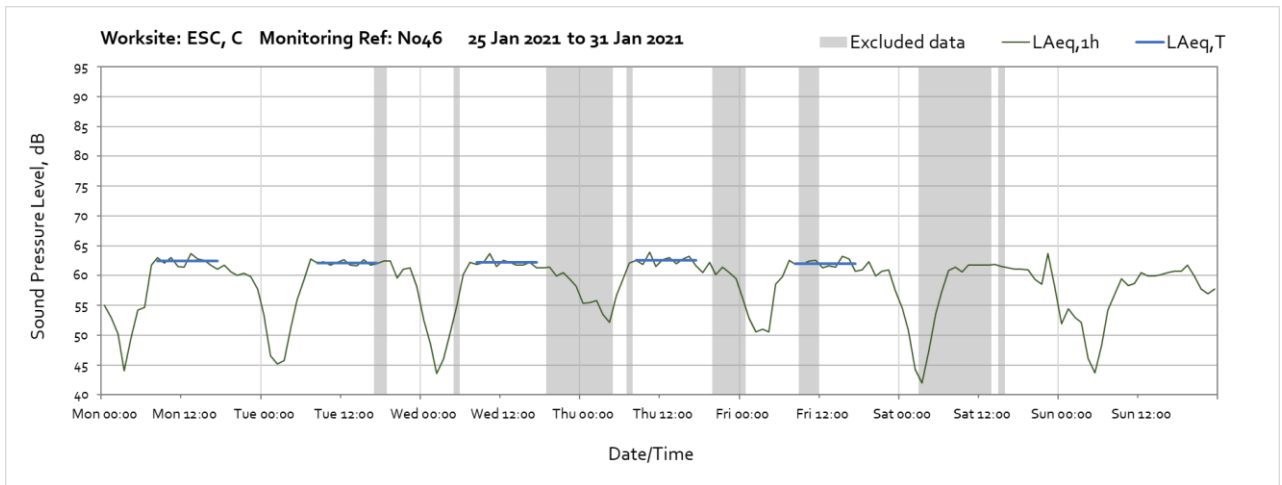
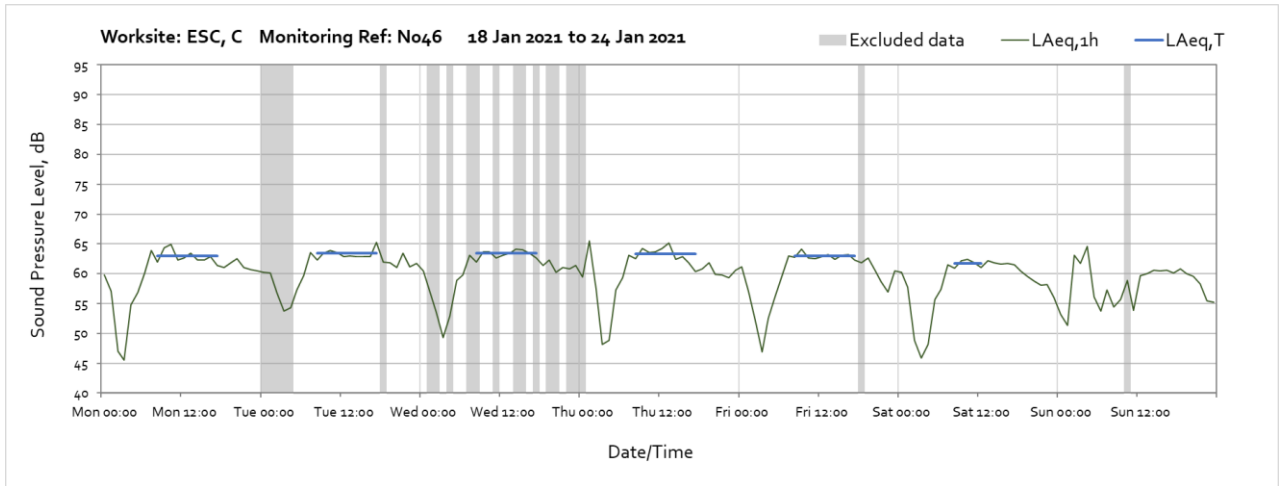


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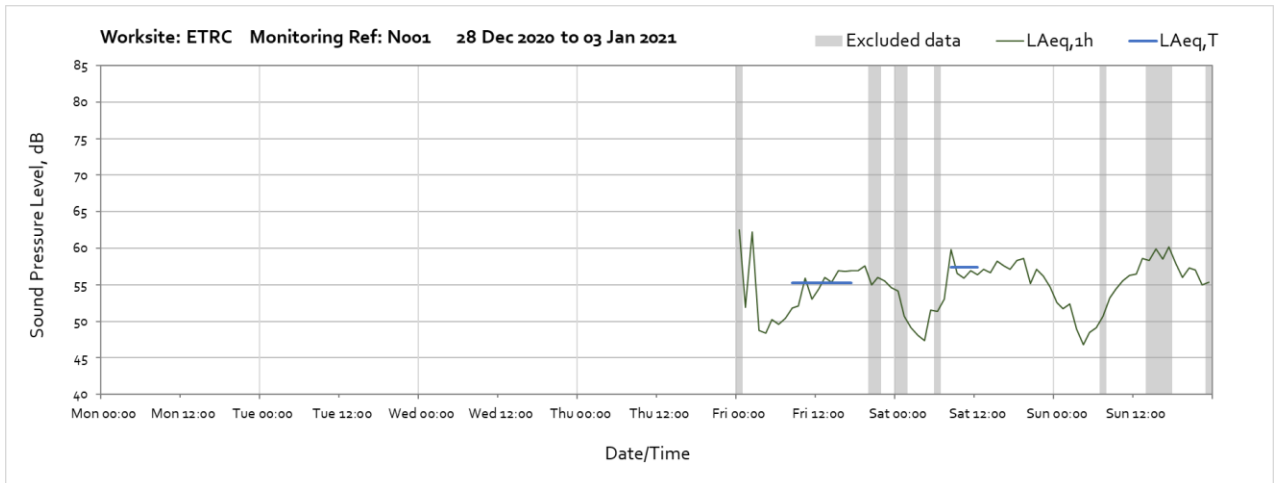


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

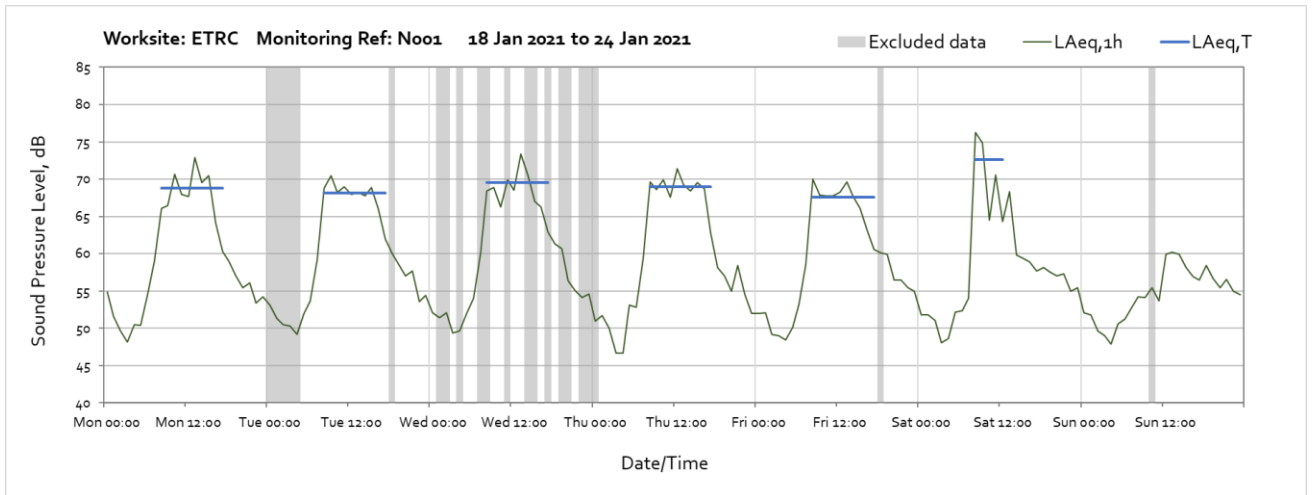
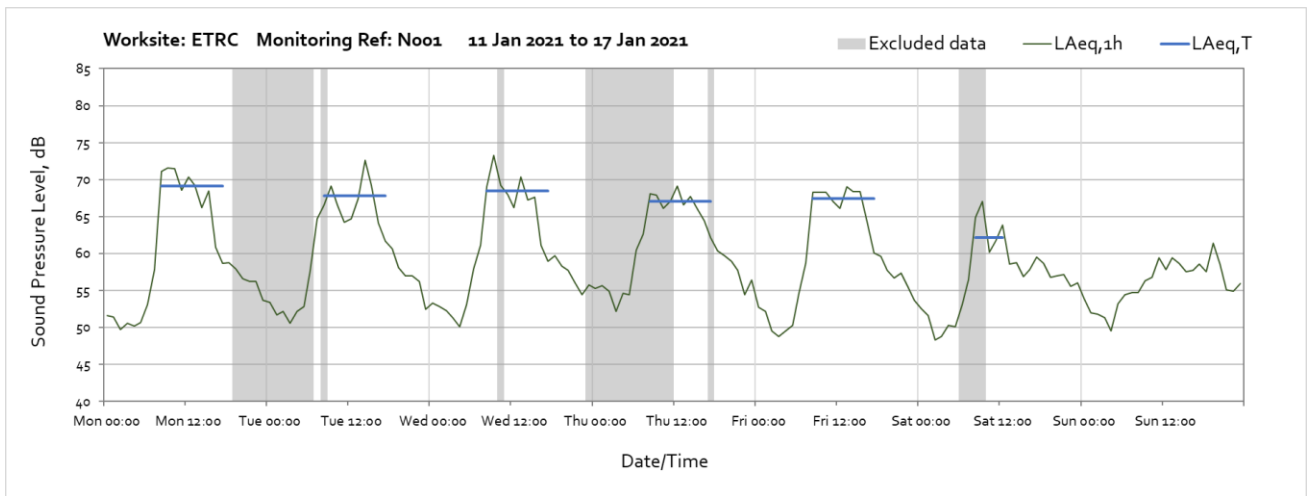
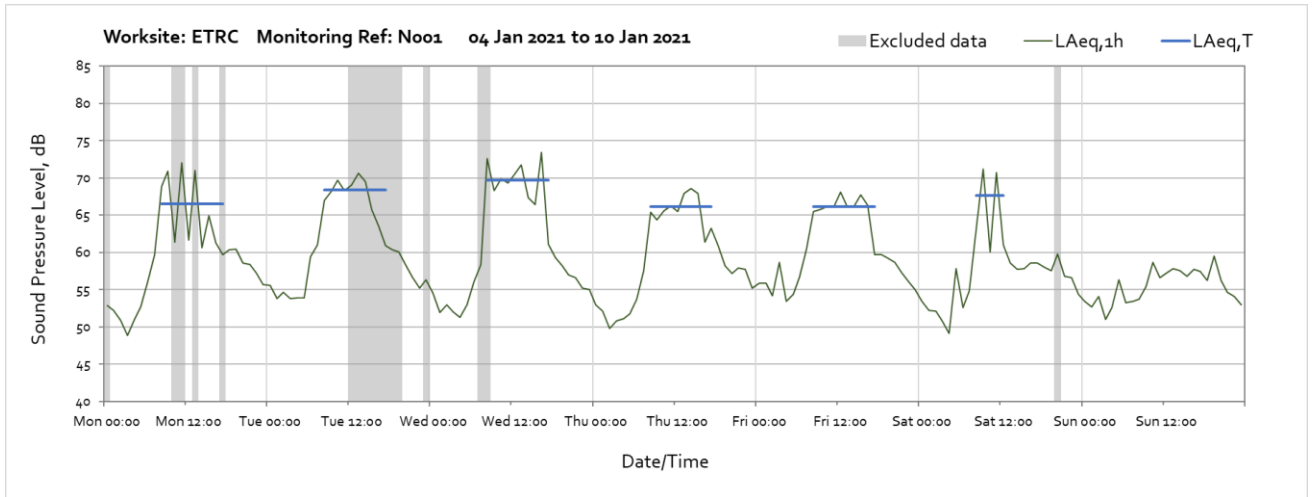


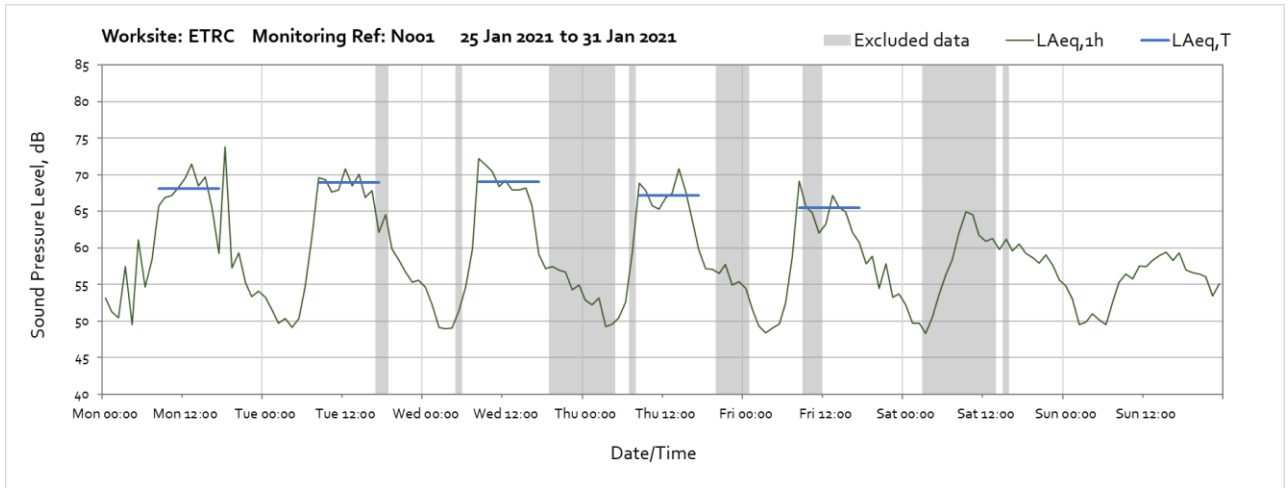


Worksite: ETRC – Monitoring Ref: N001

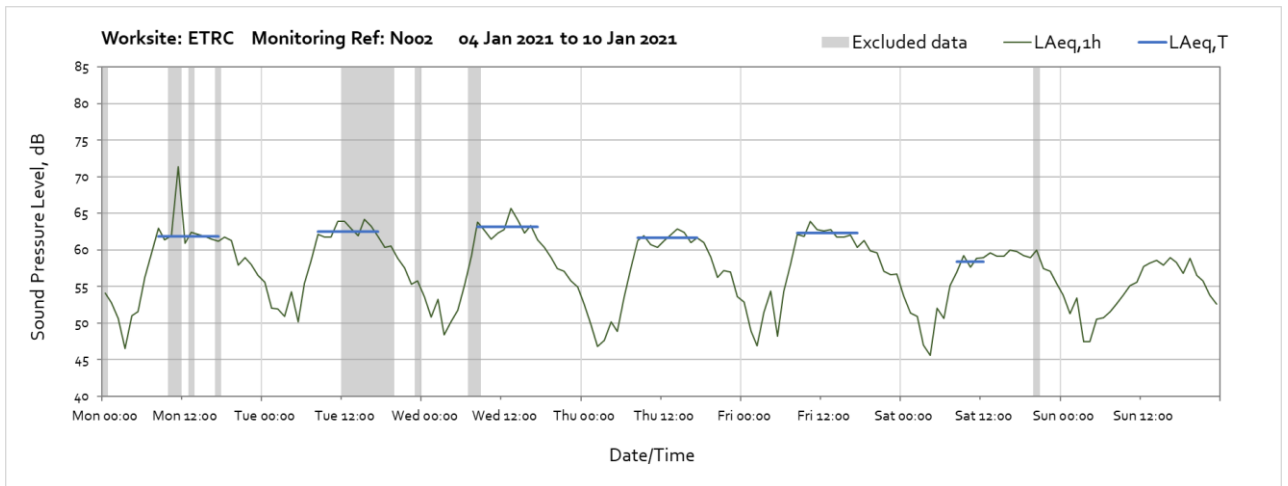
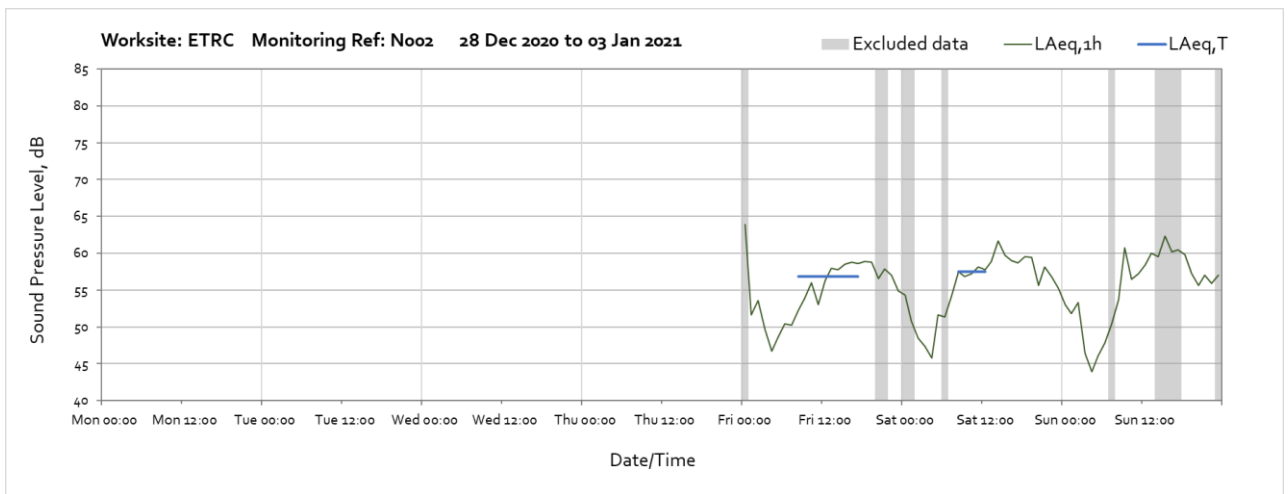


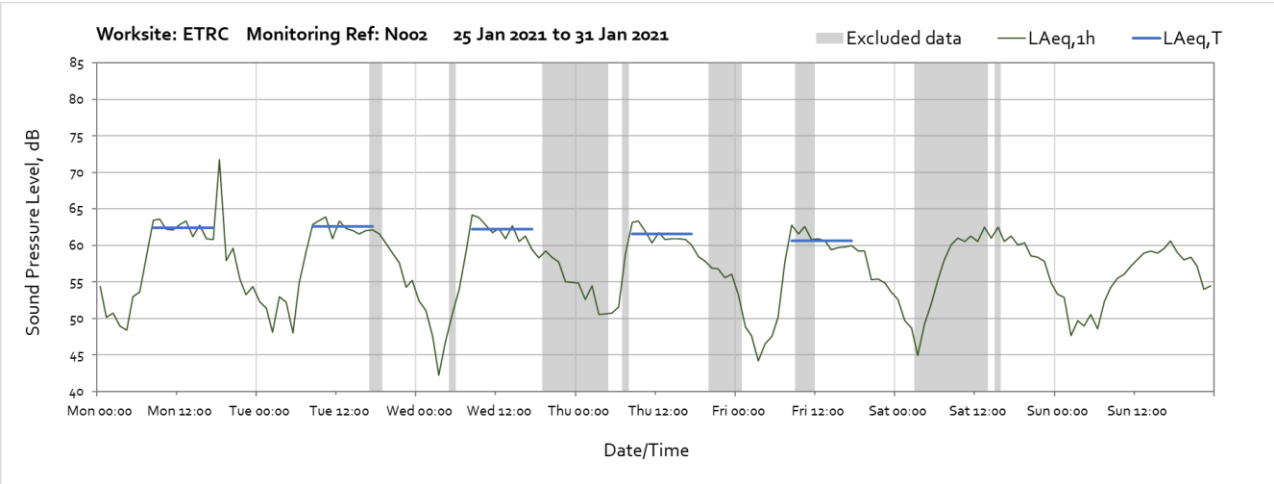
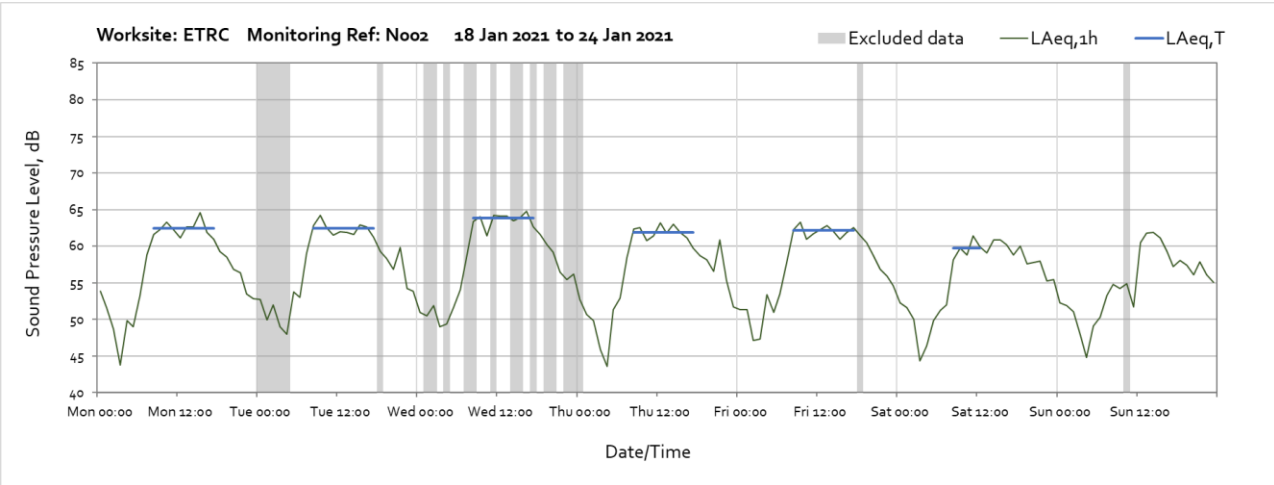
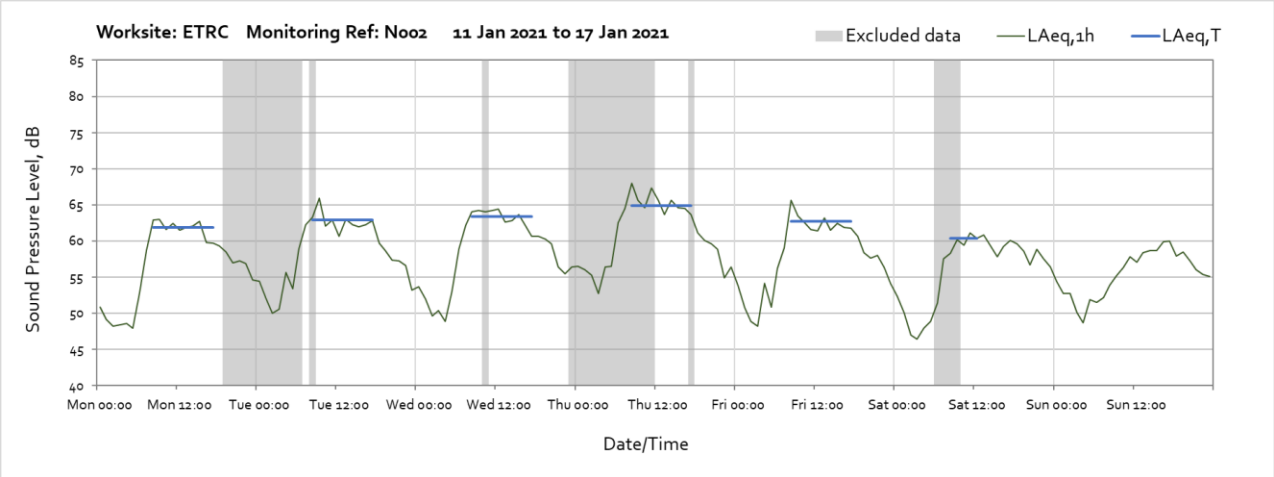
Note: High noise levels on the early hours of the 1st January were due to New Year’s Eve celebrations and have been excluded to calculate values in Table 3.



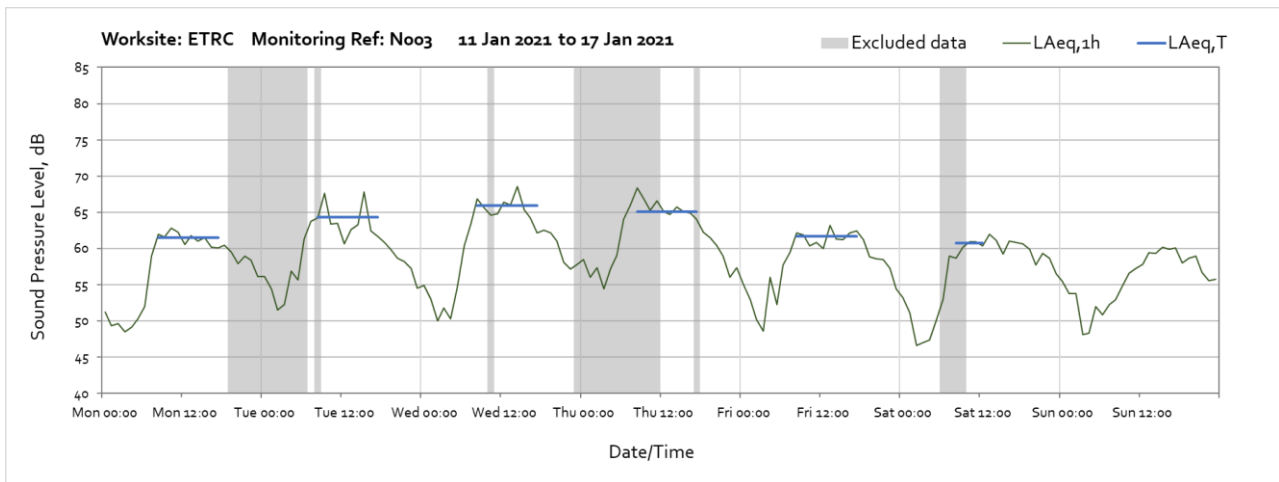
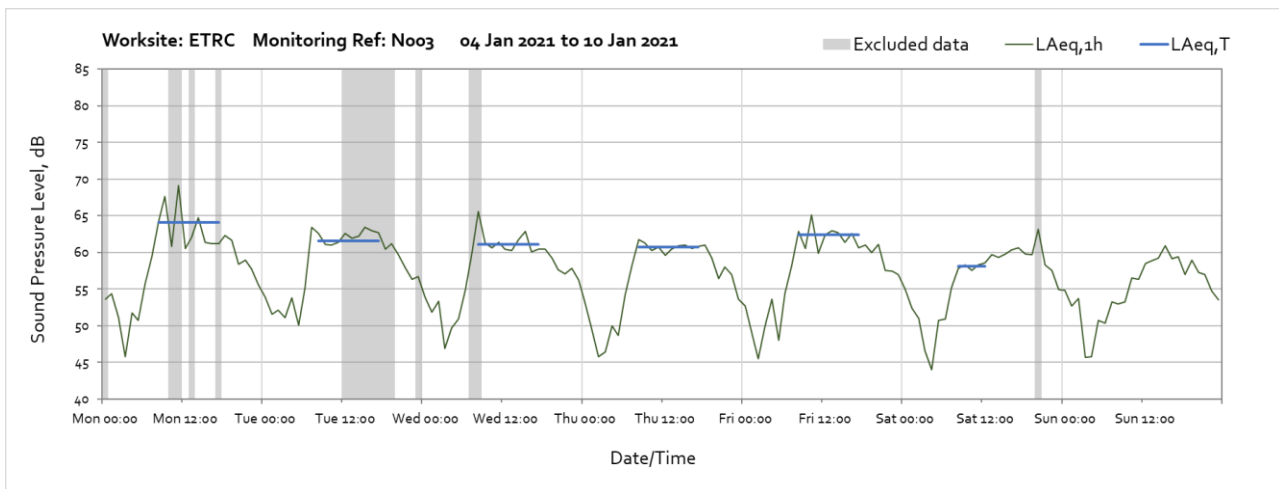
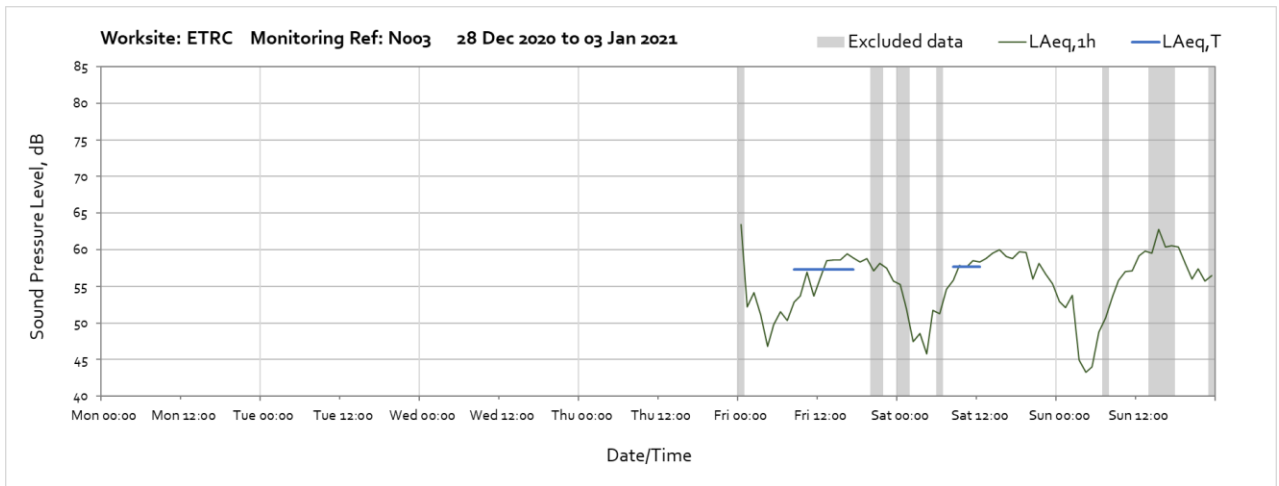


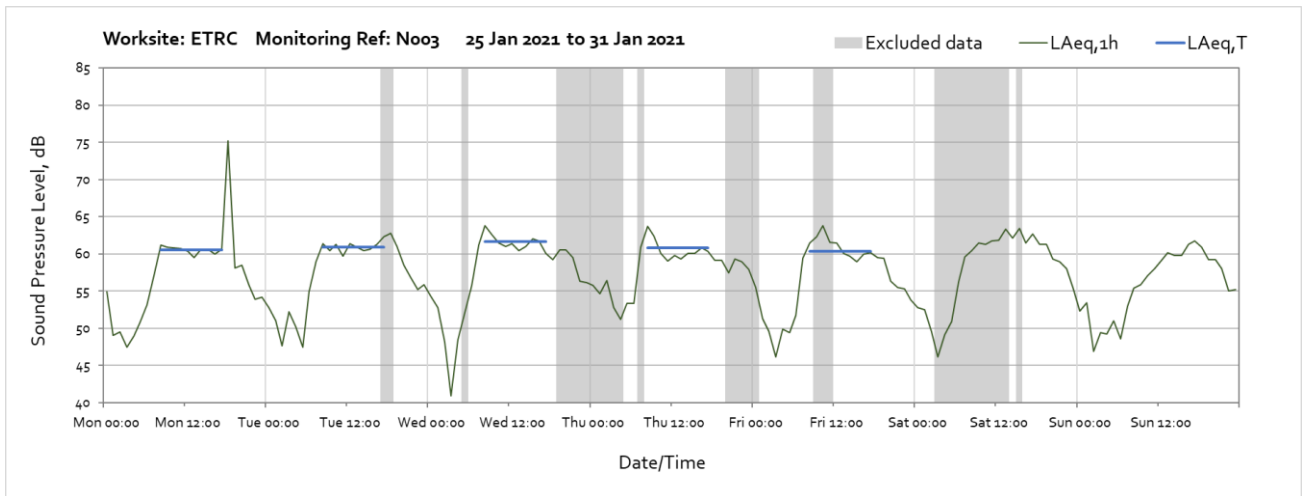
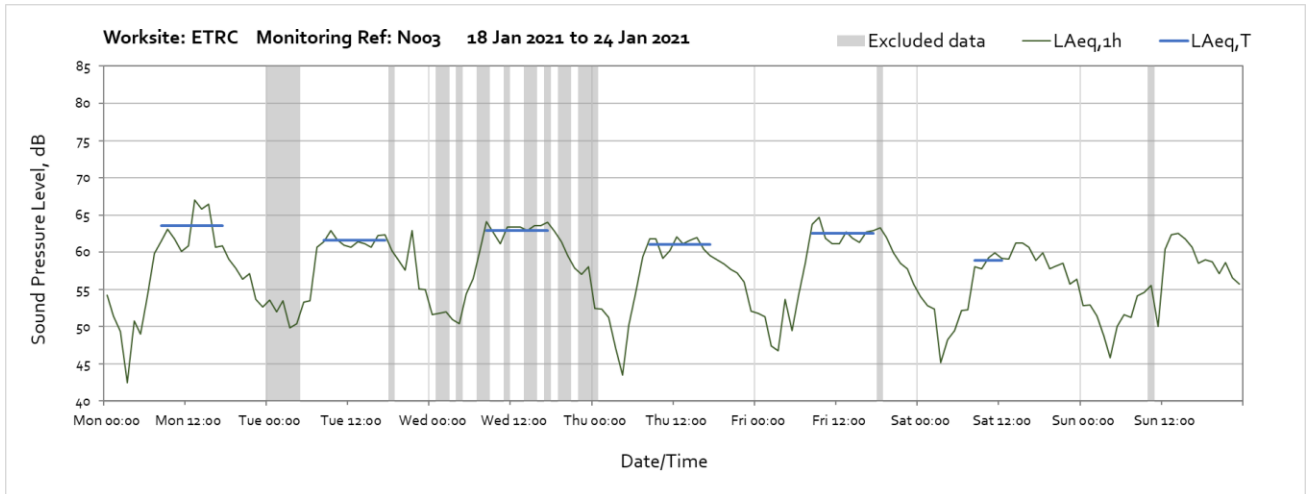
Worksite: ETRC – Monitoring Ref: N002



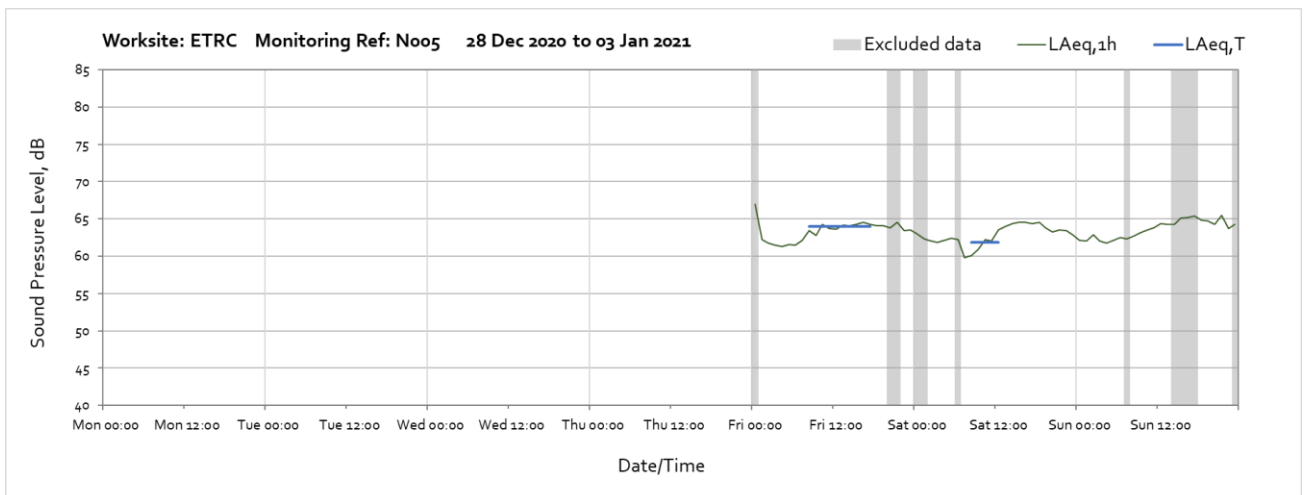


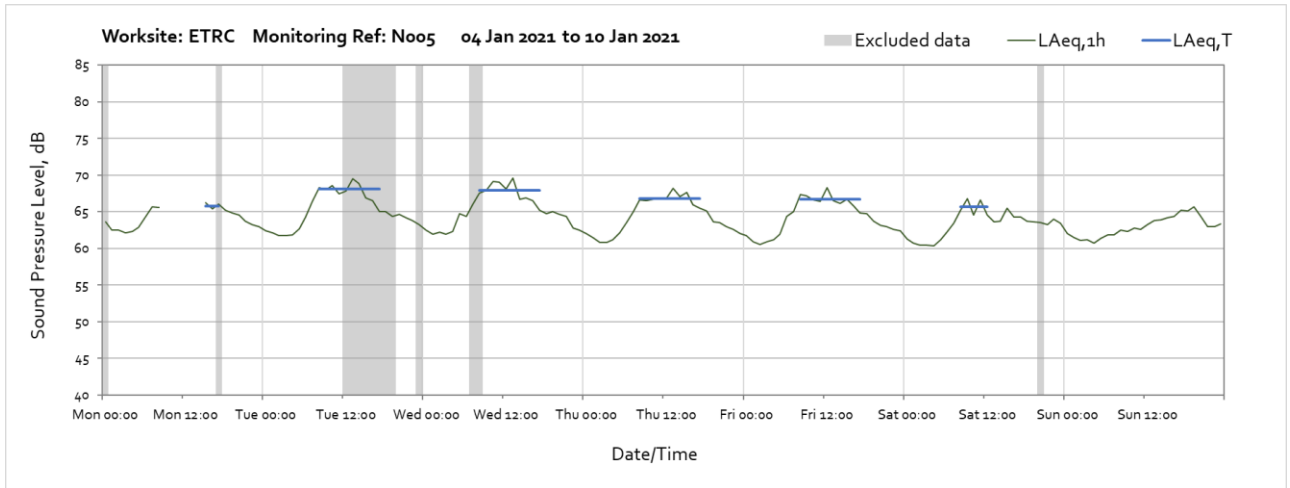
Worksite: ETRC – Monitoring Ref: N003



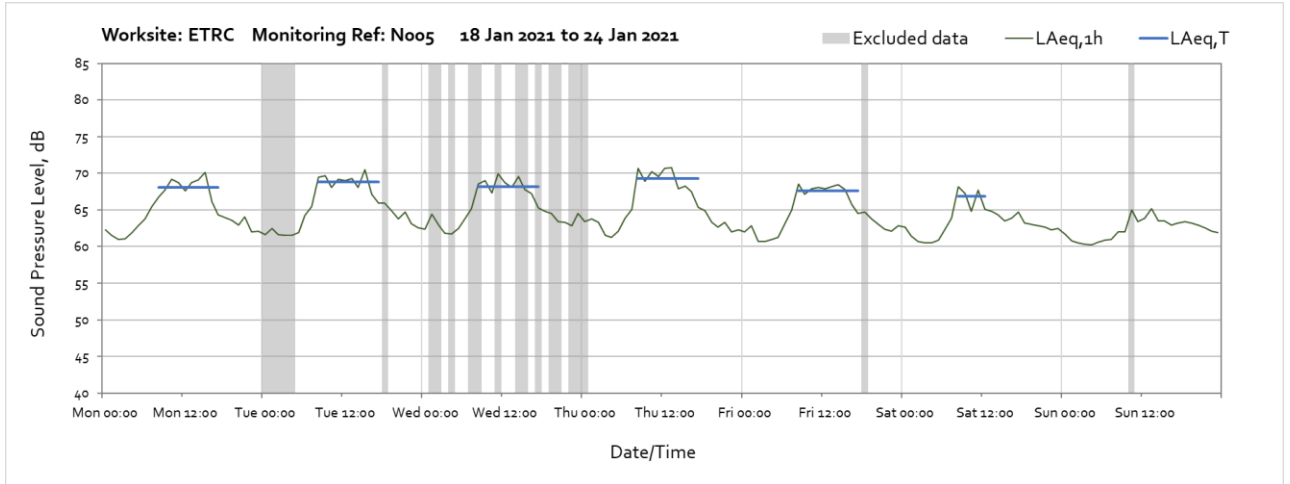
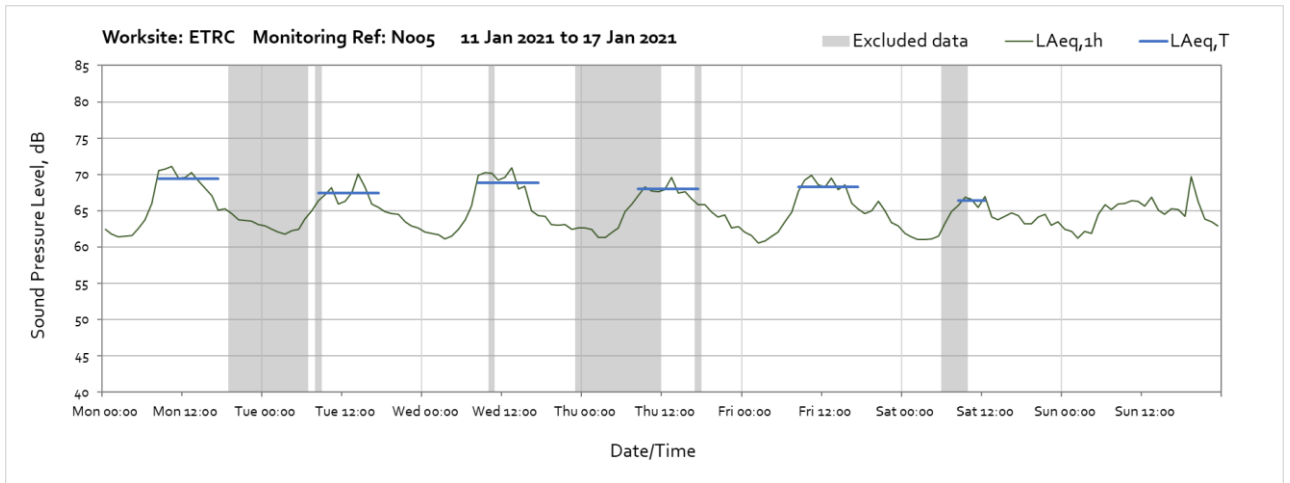


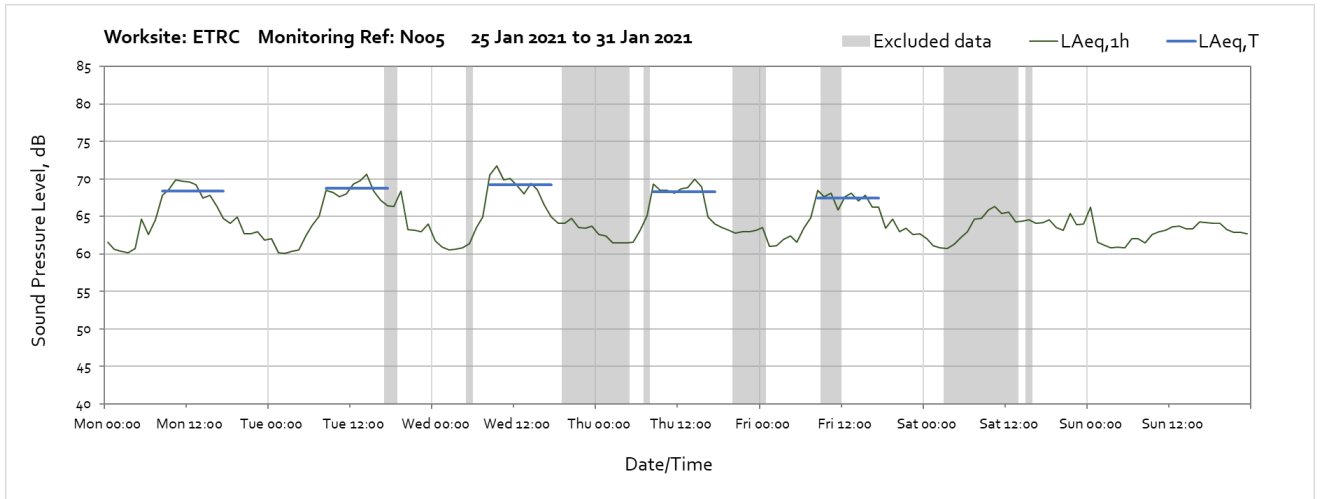
Worksite: ETRC – Monitoring Ref: N005



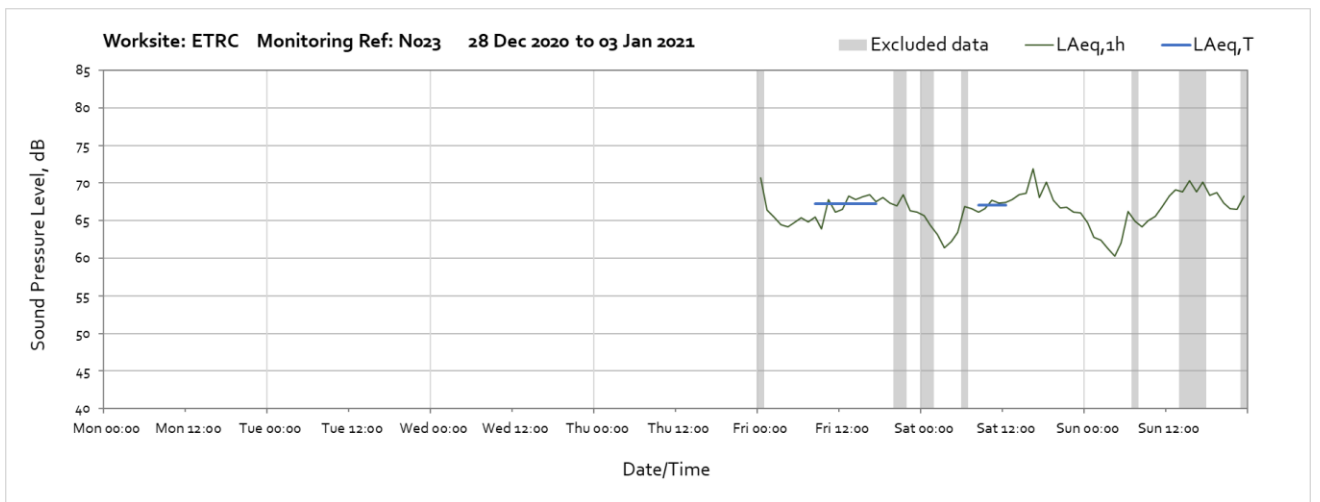


Note: Missing data from 09:00 until 15:00 on Monday 4th January was due to loss of power at the monitoring station caused by a loss of site power and depleted monitoring station battery. The battery depleted as access to the site and monitor was limited of the Christmas period. The site team were requested to check the remaining battery power at the start of each shift.

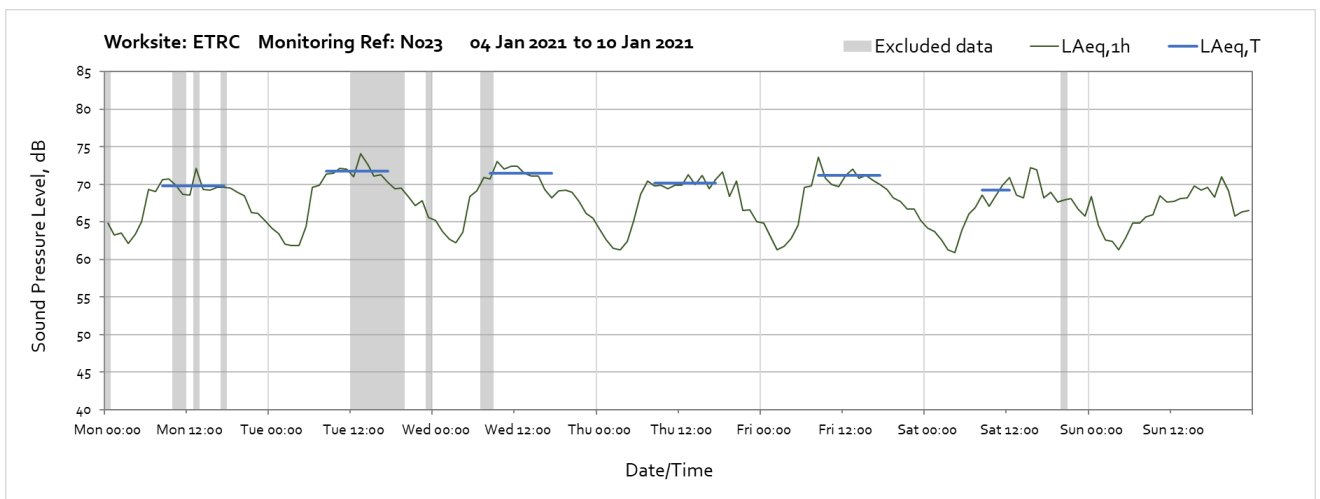


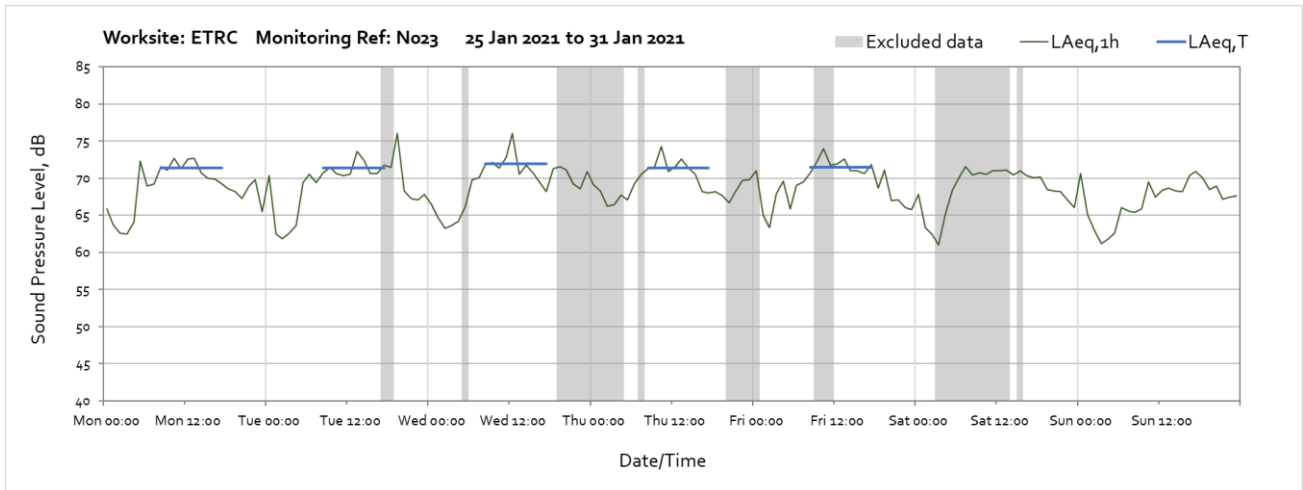
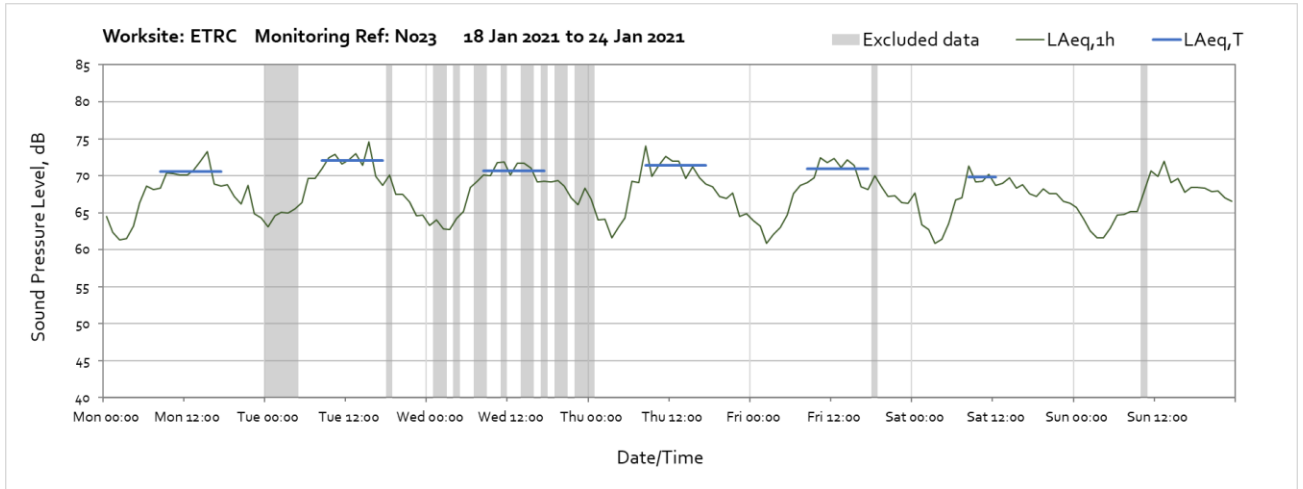
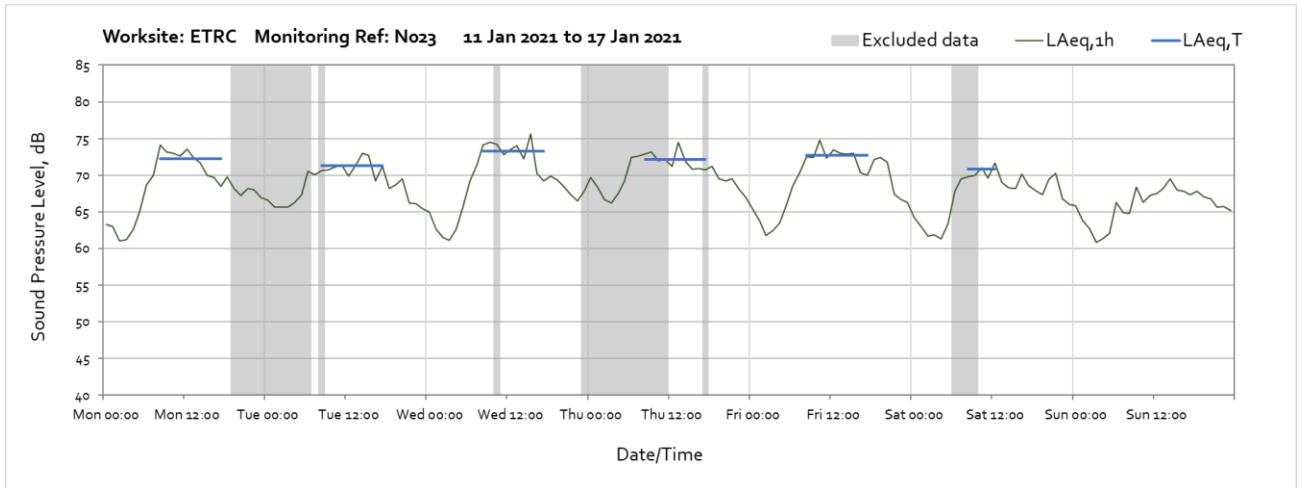


Worksite: ETRC – Monitoring Ref: N023

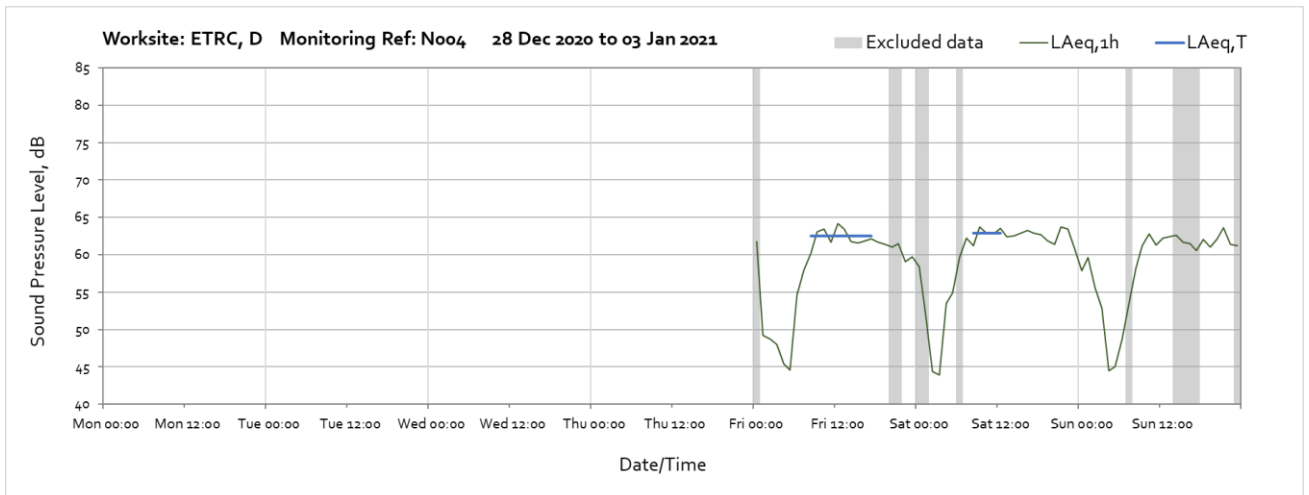


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

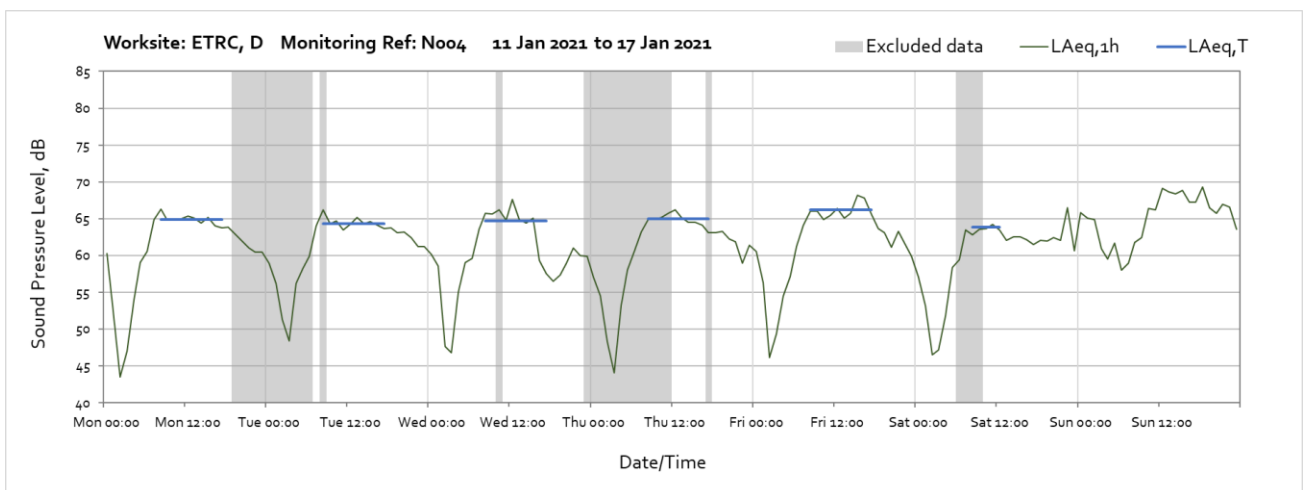
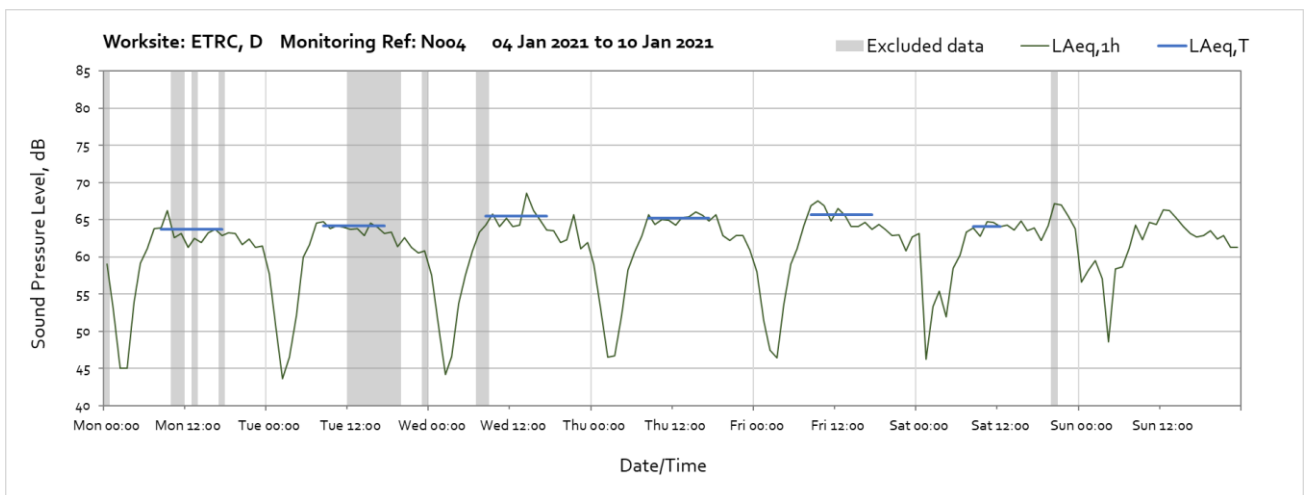


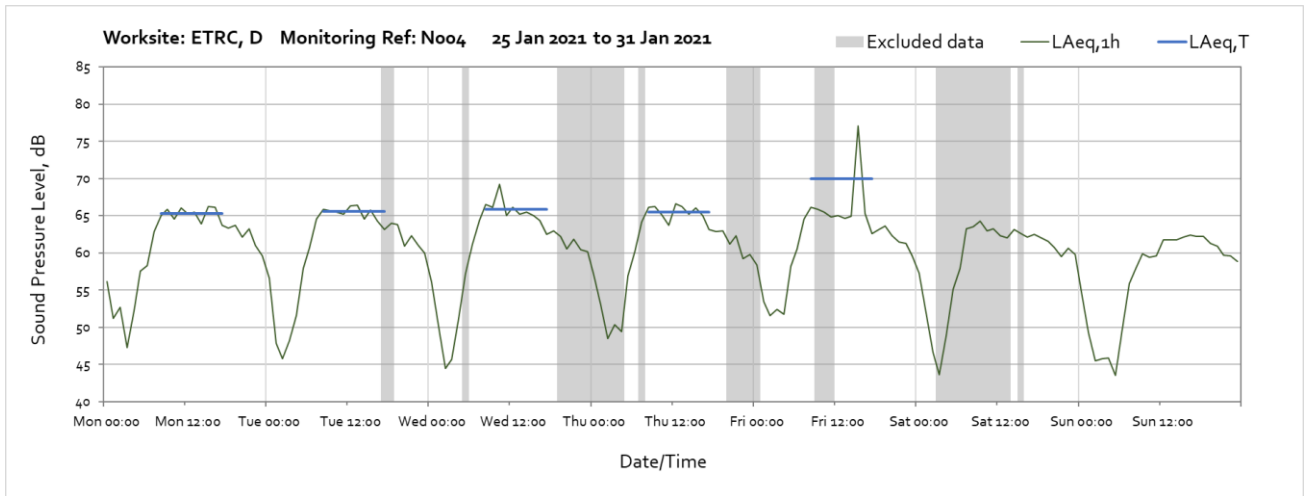
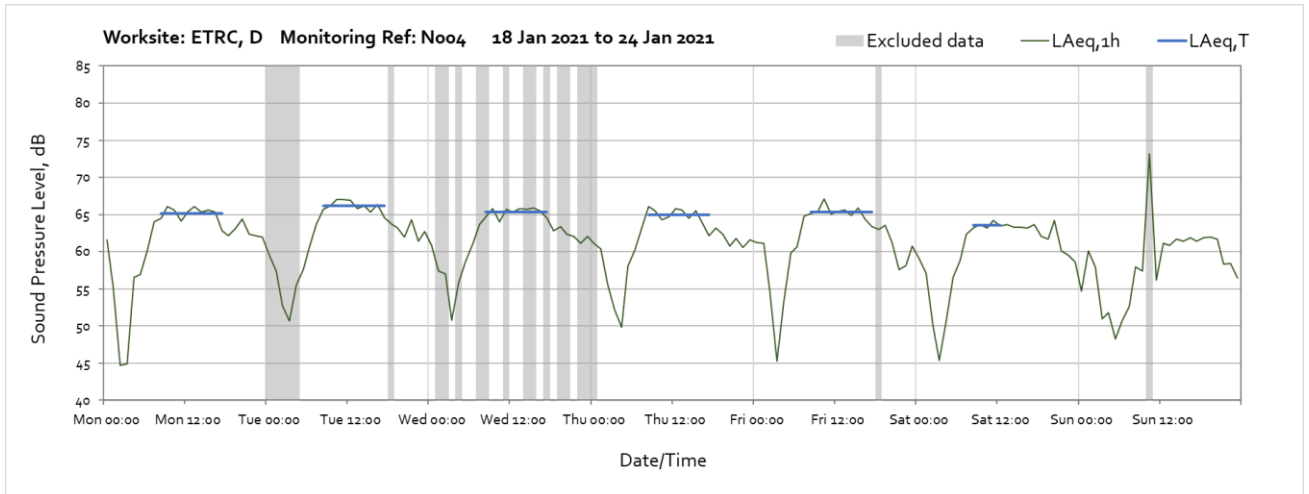


Worksite: ETRC-D – Monitoring Ref: N004

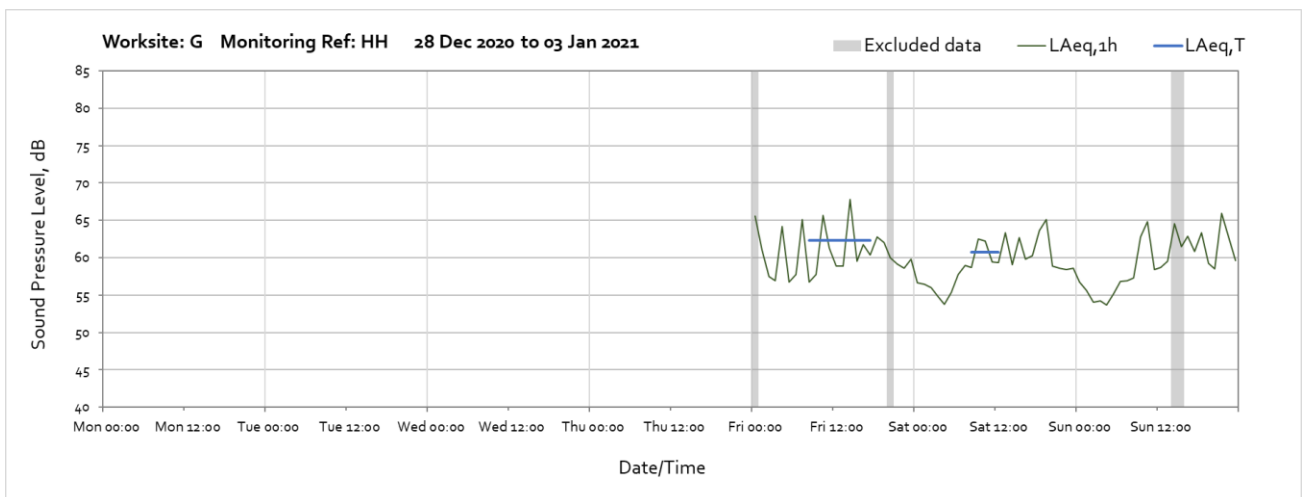


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

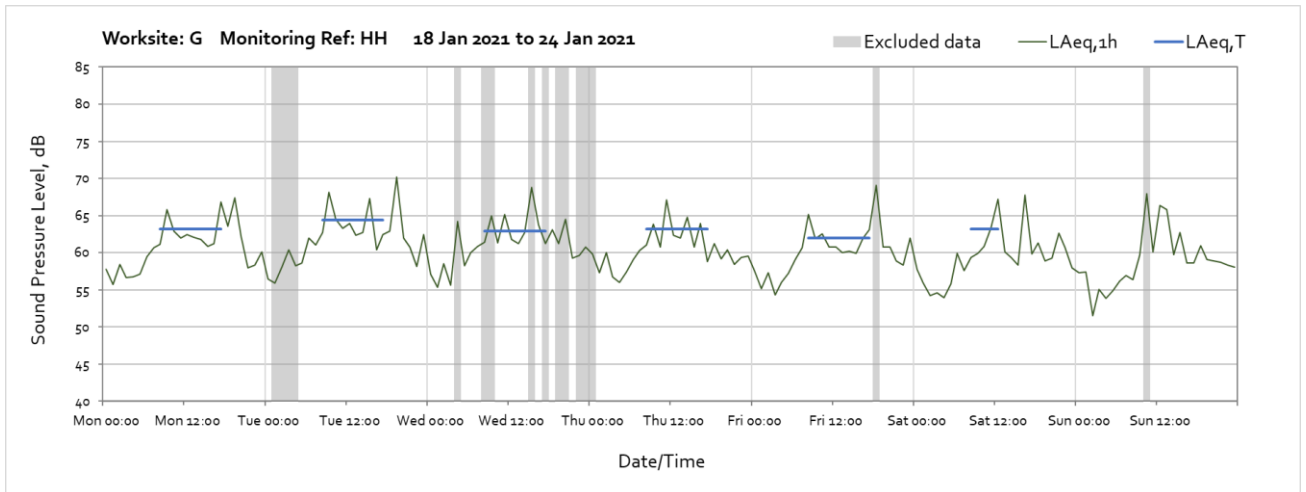
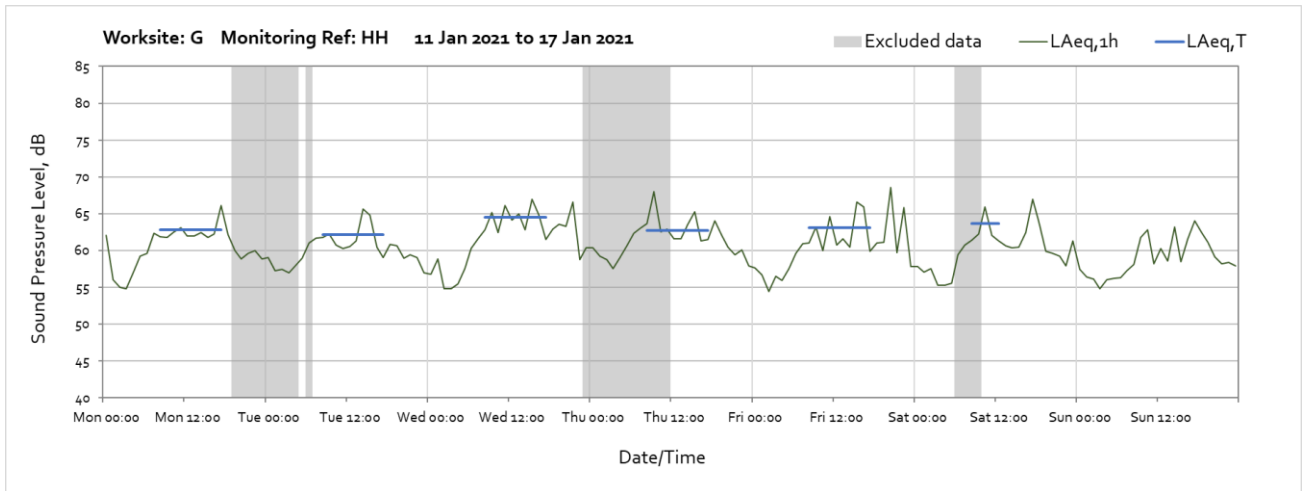
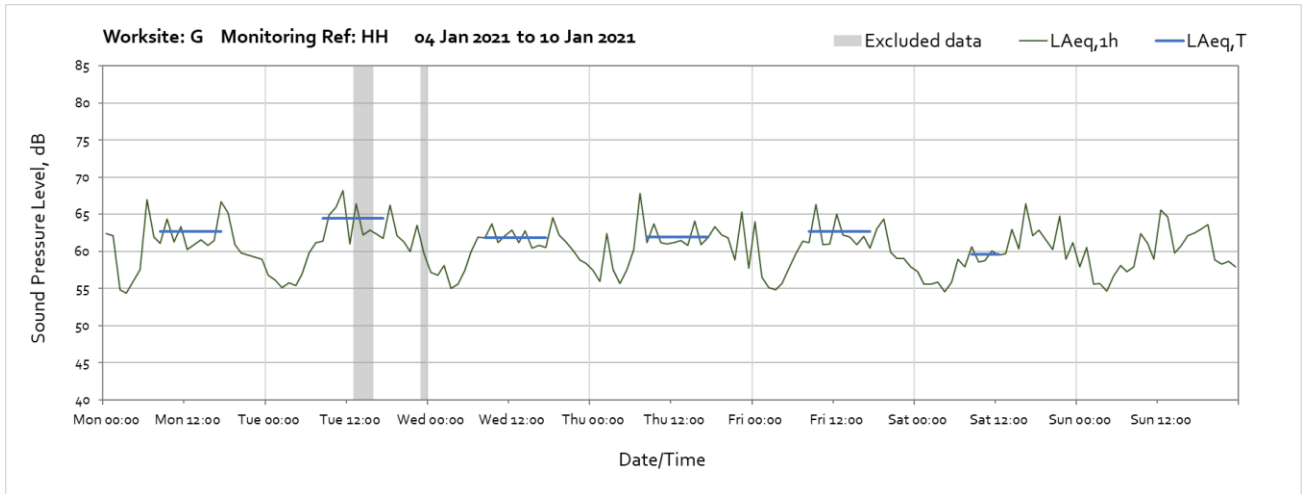


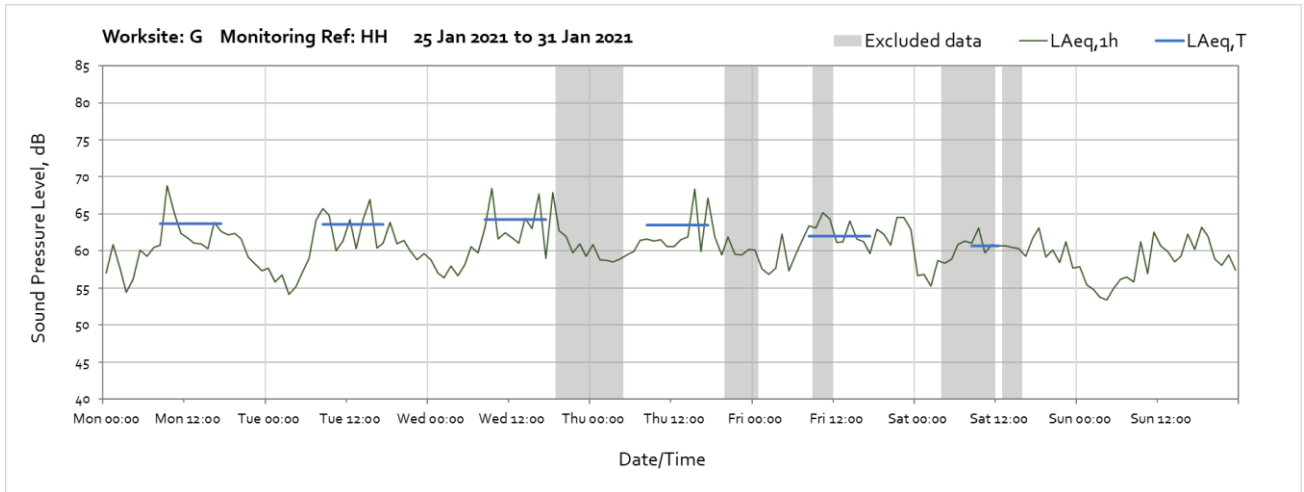


Worksite: G – Monitoring Ref: HH

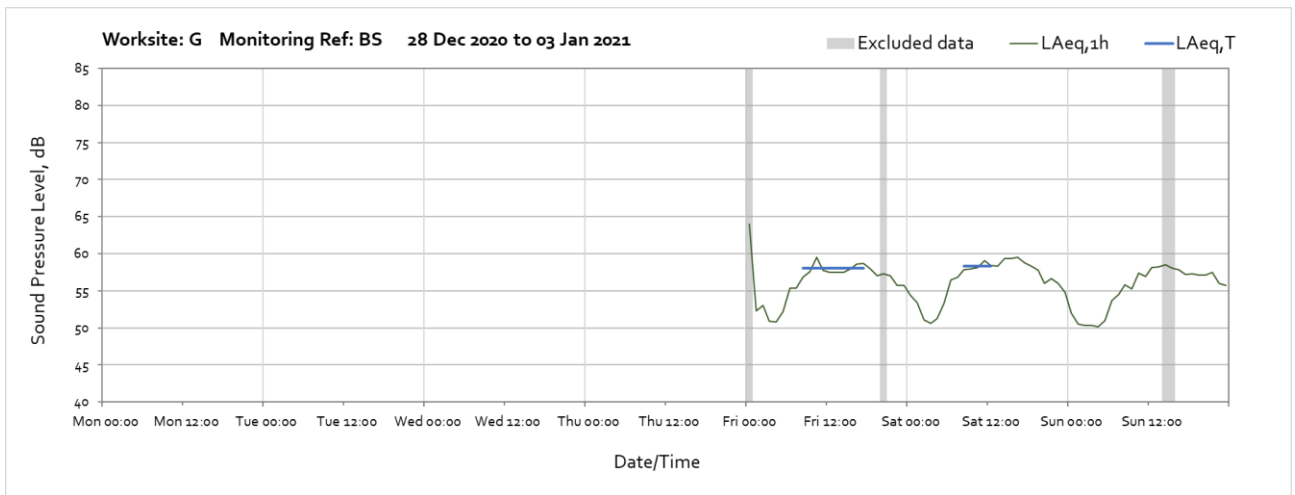


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

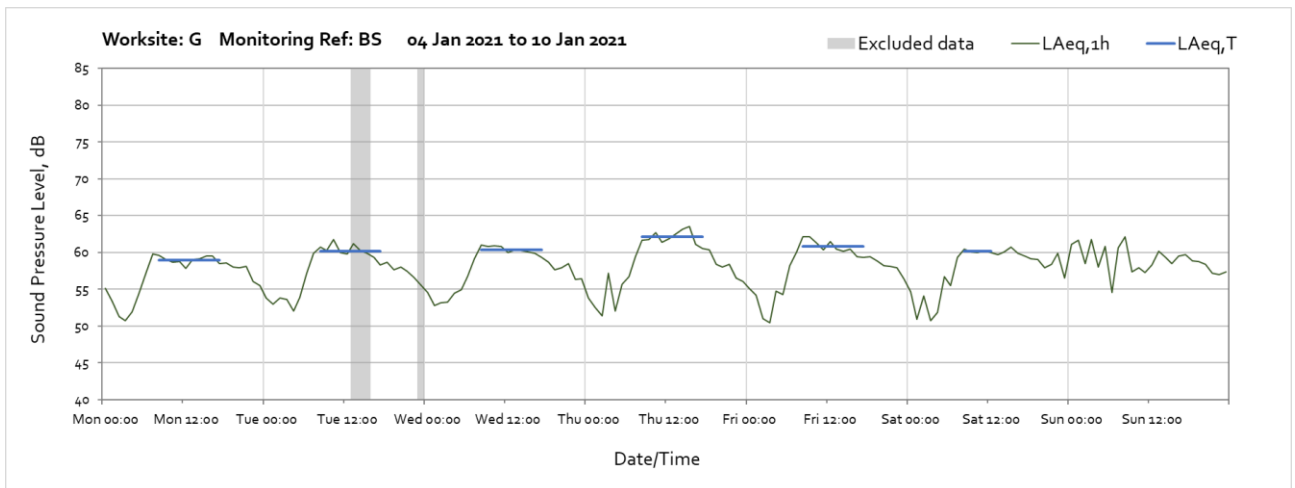


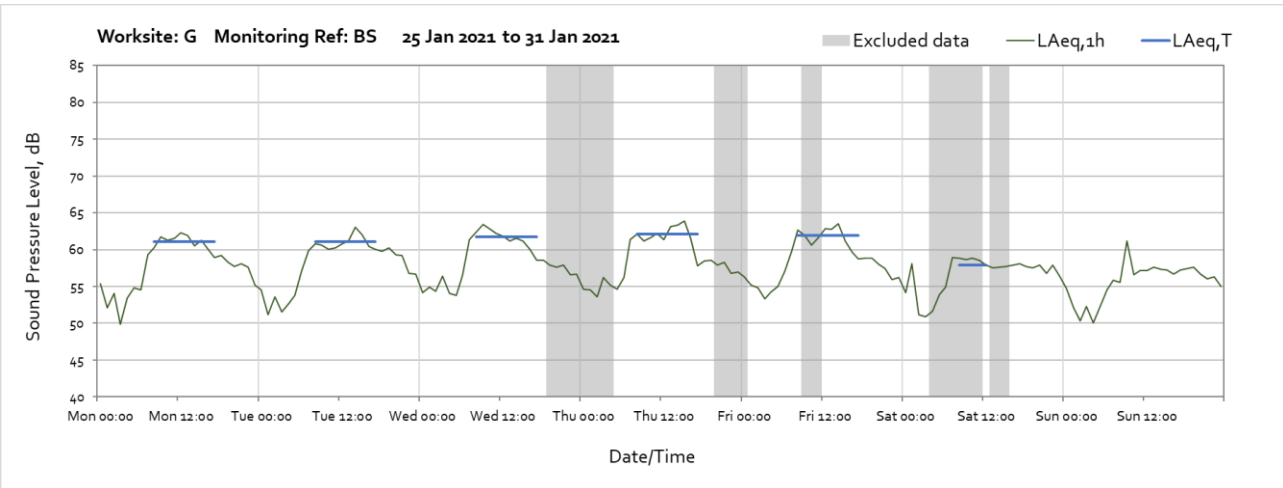
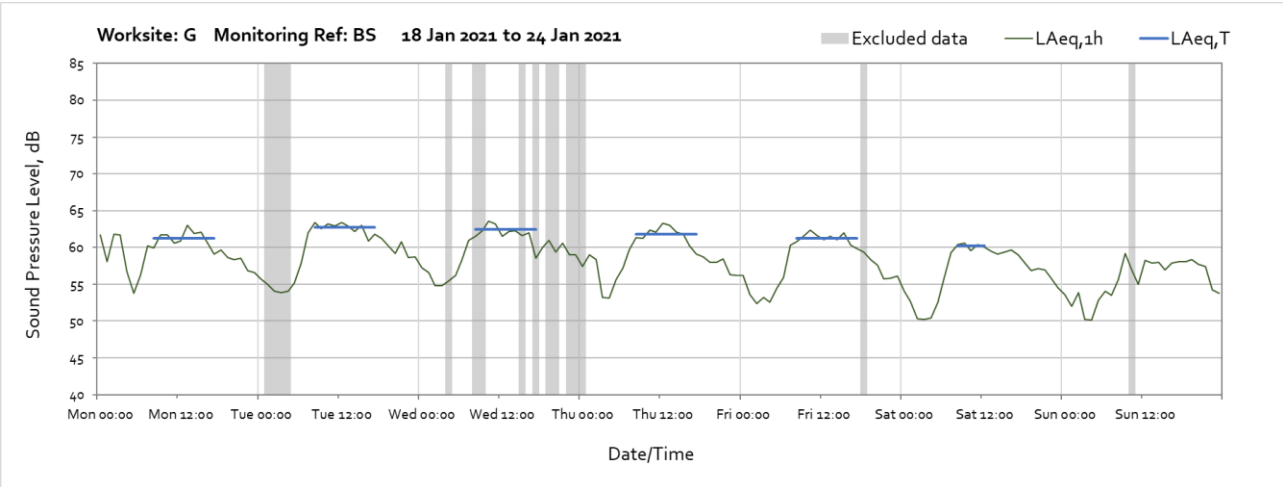
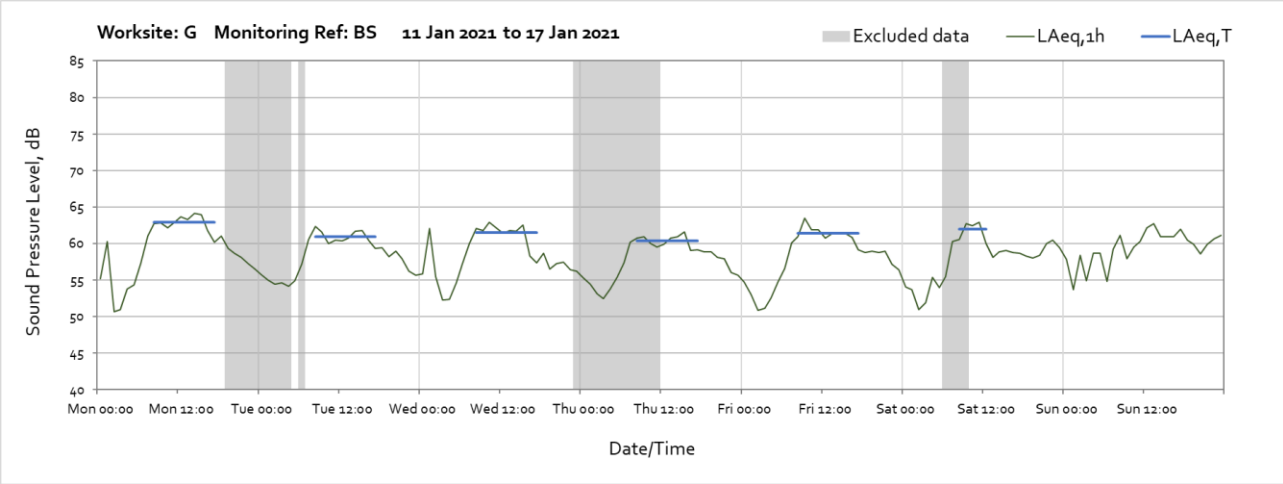


Worksite: G – Monitoring Ref: BS

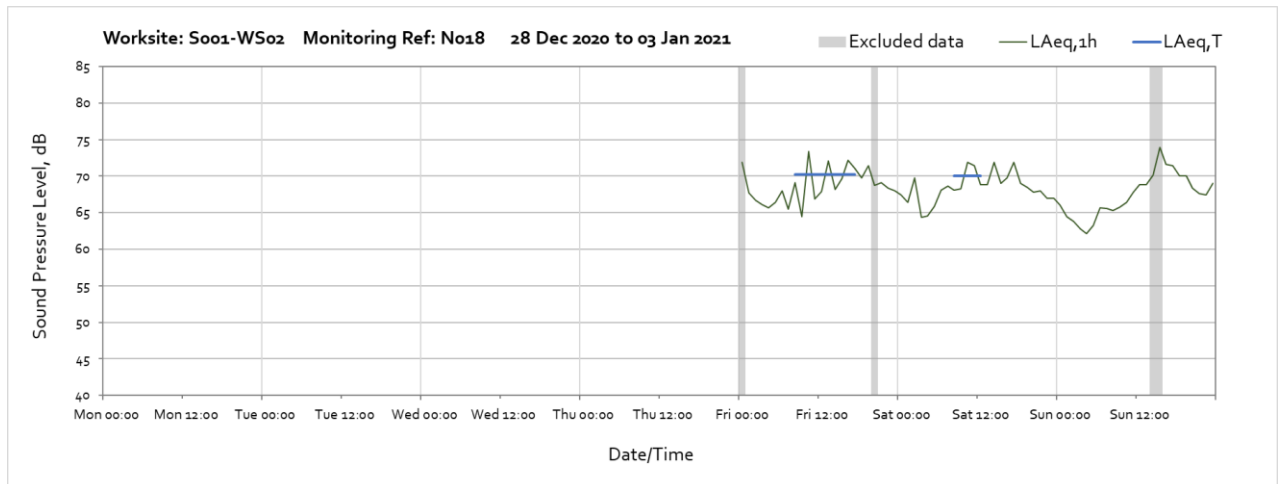


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

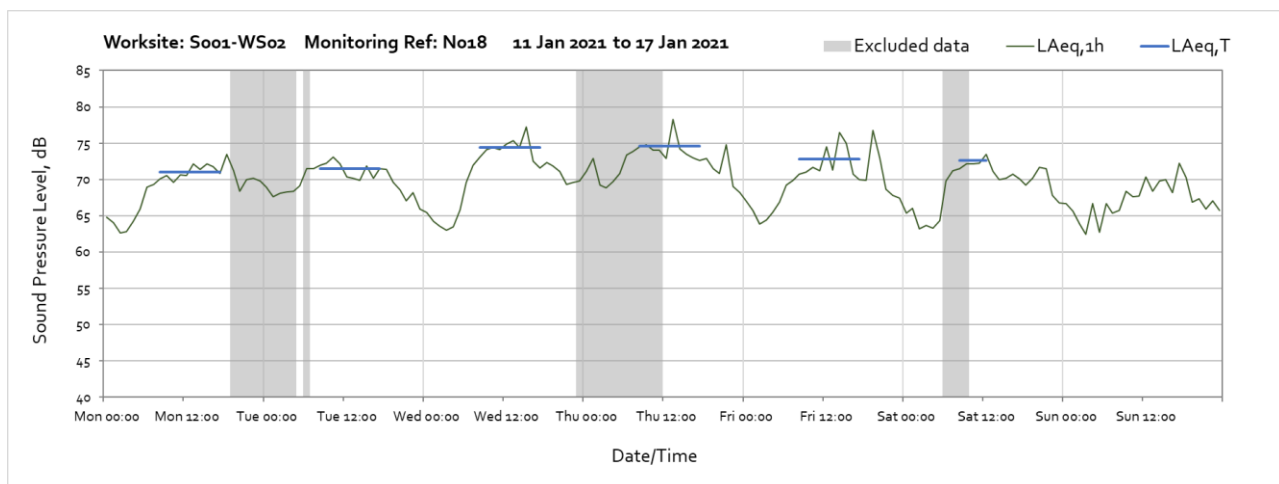
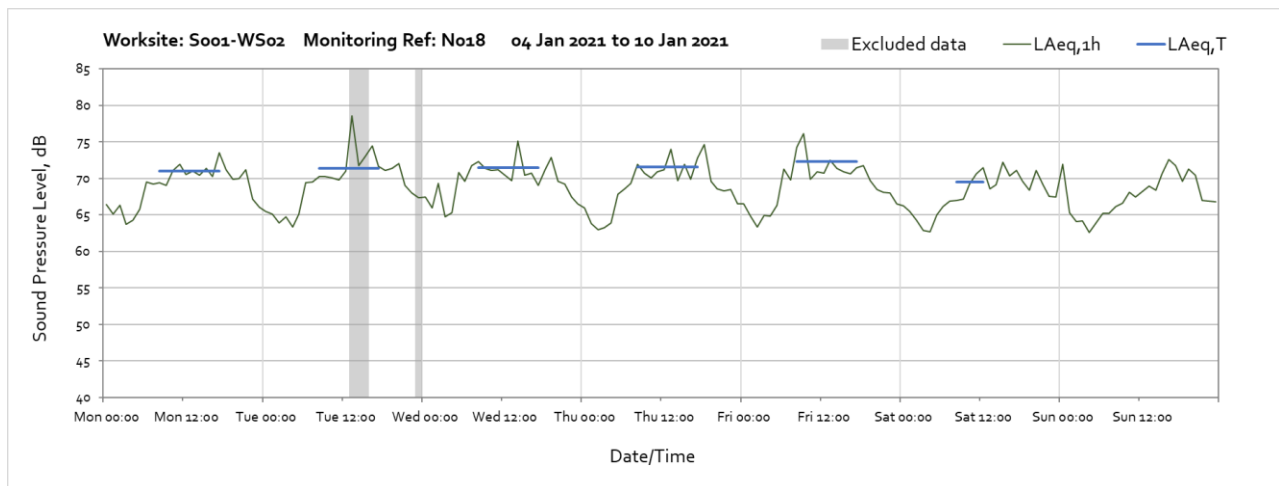


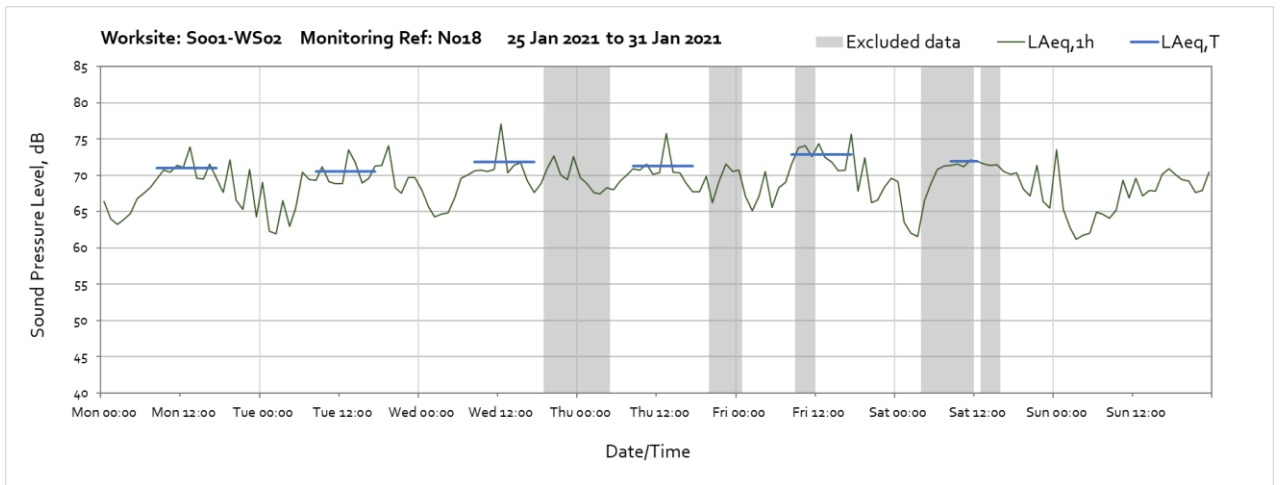
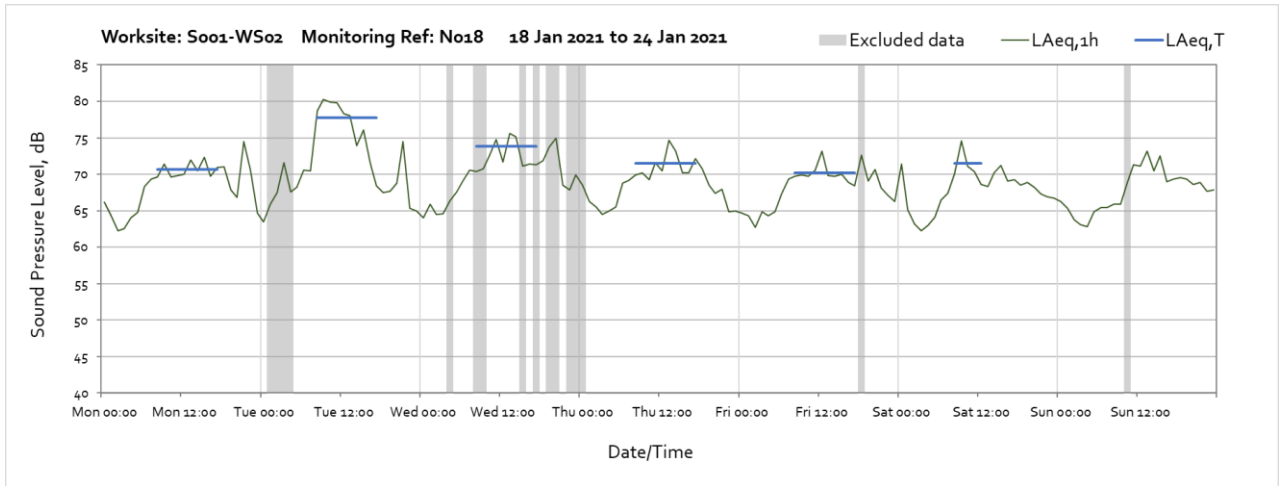


Worksite: S001-WS02 – Monitoring Ref: N018

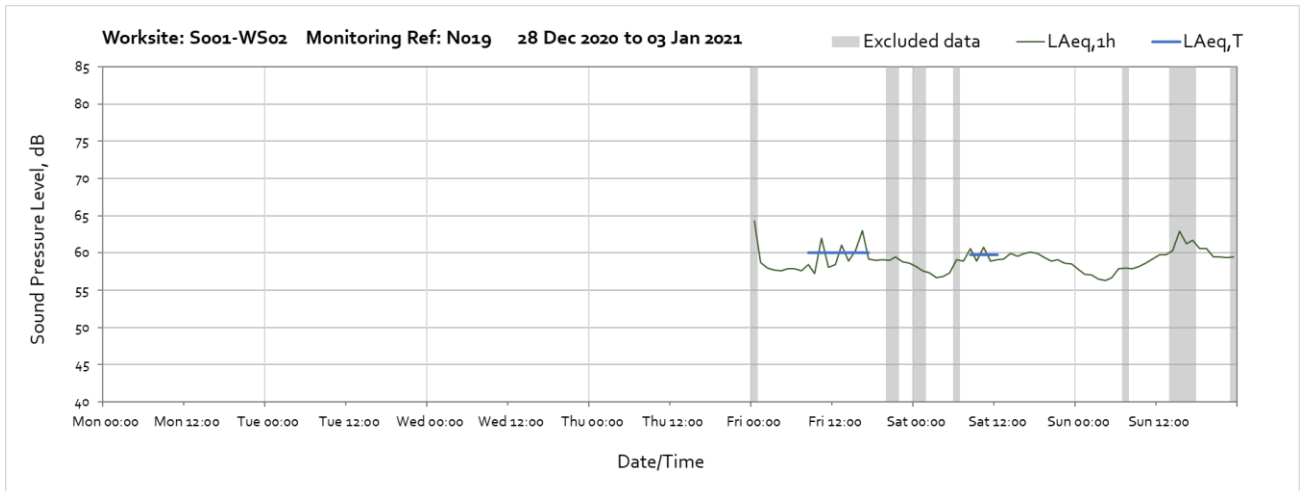


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

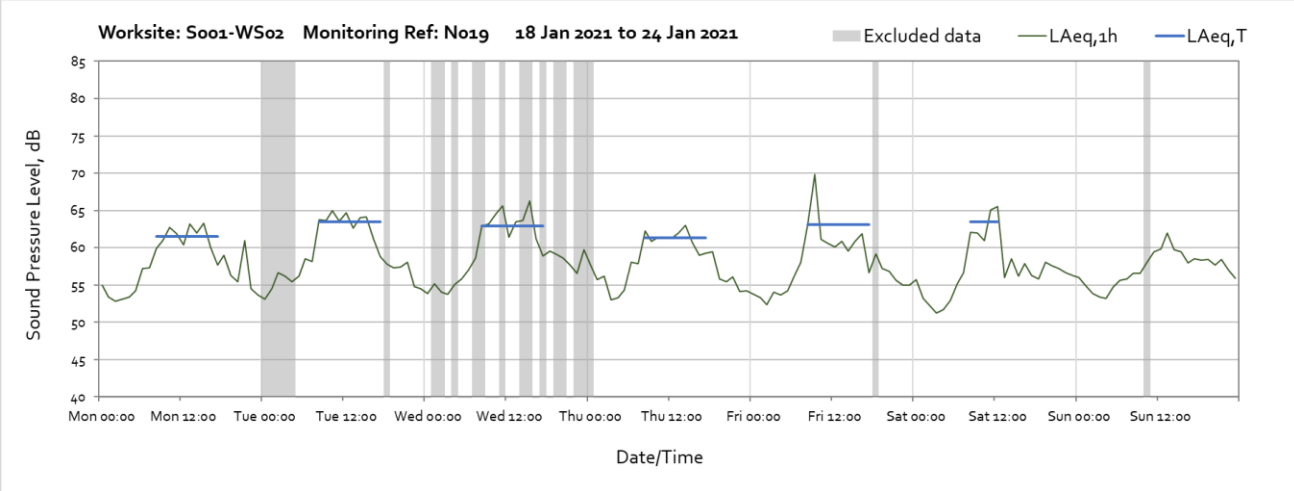
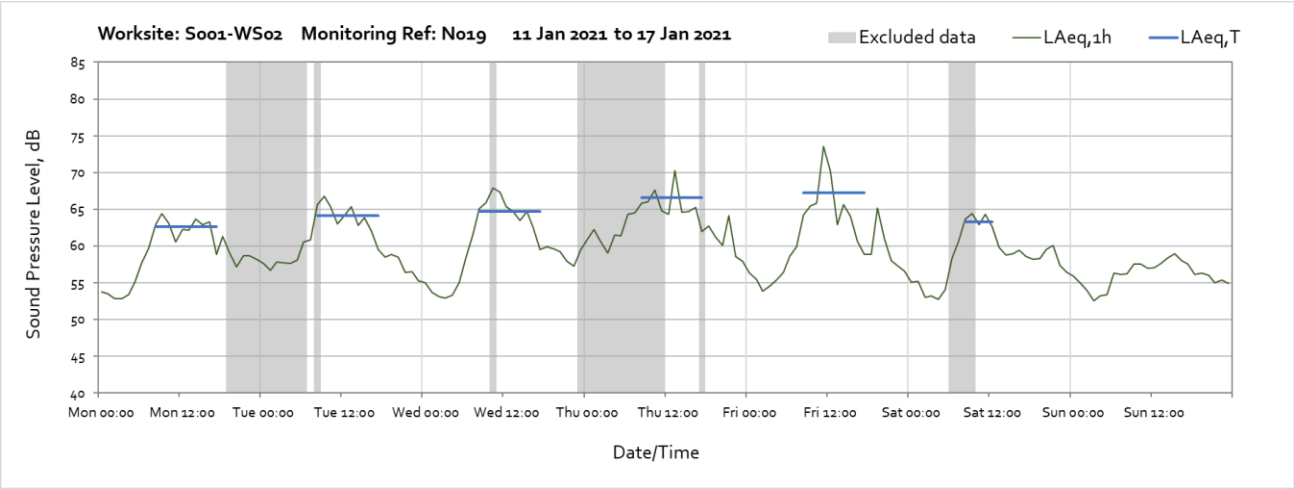
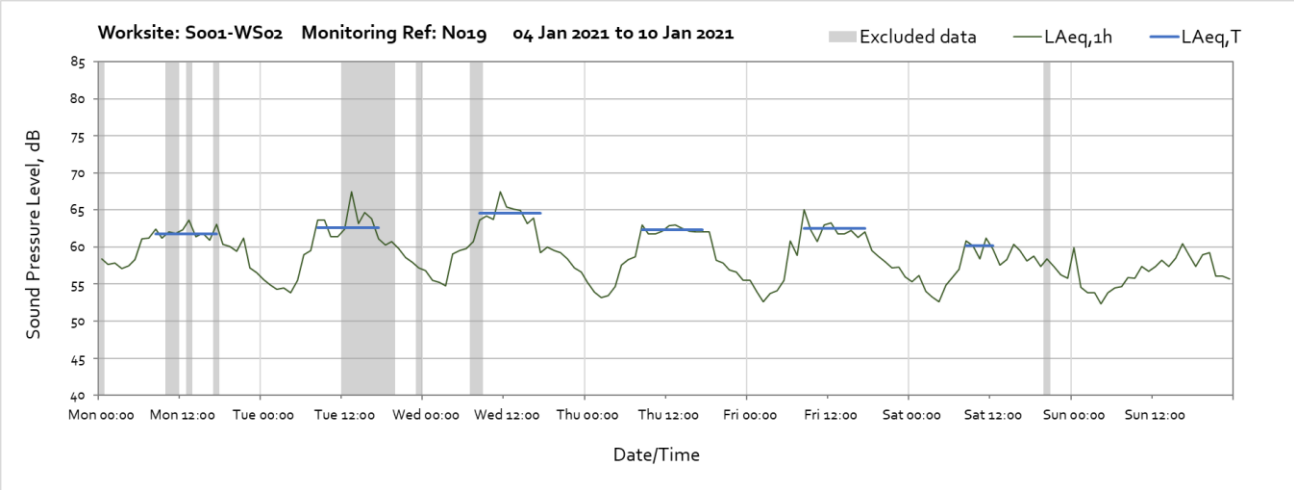


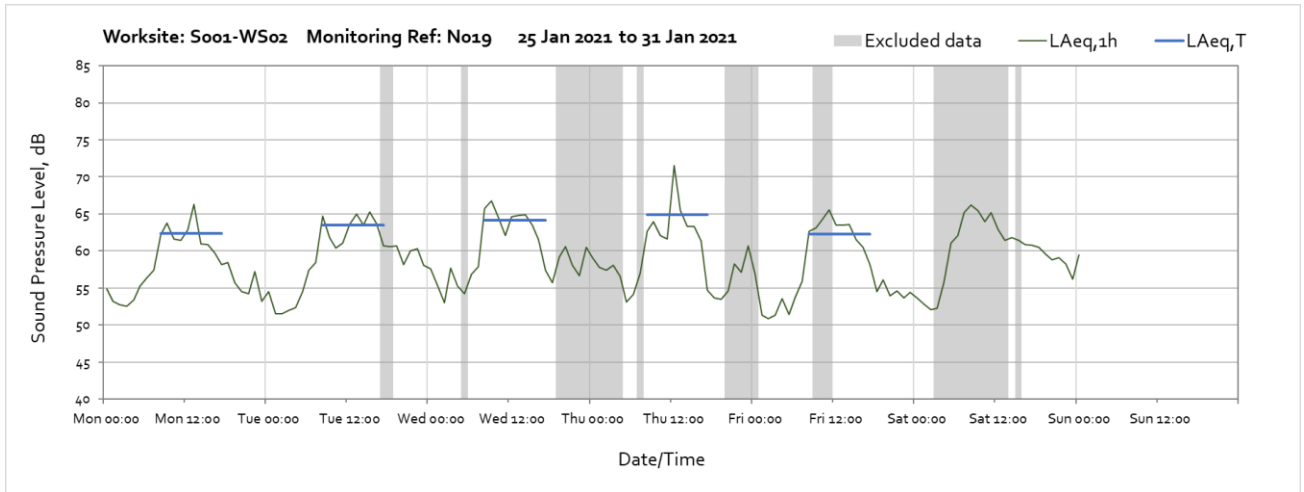


Worksite: S001-WS02 – Monitoring Ref: N019



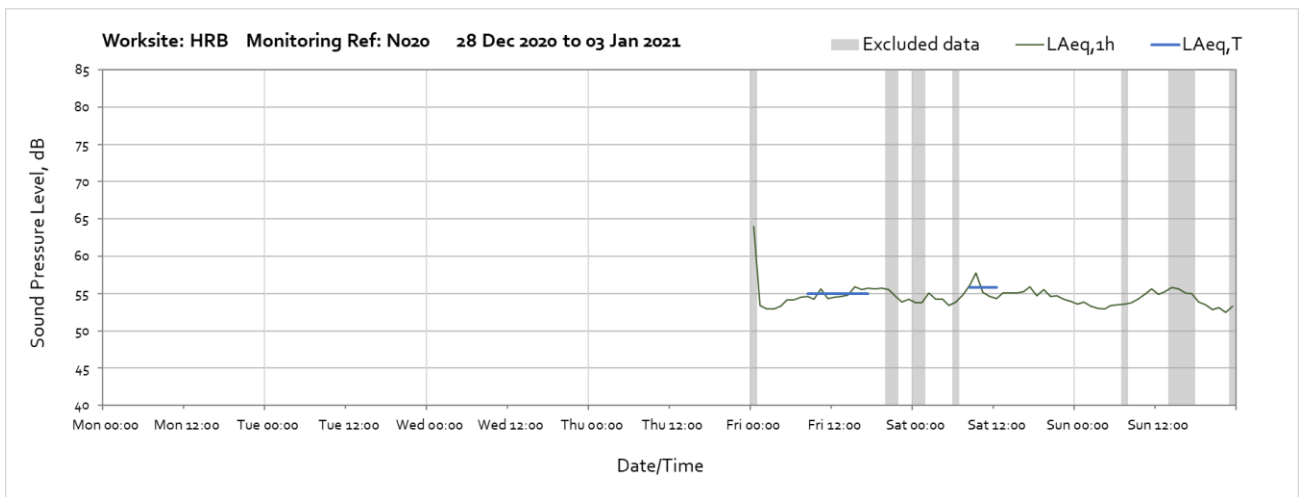
Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.



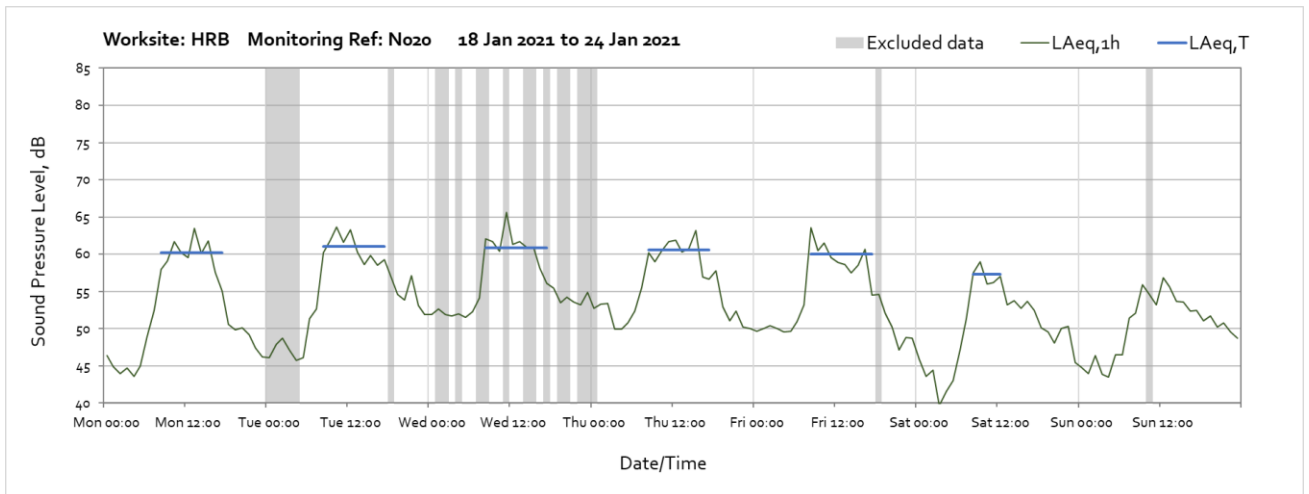
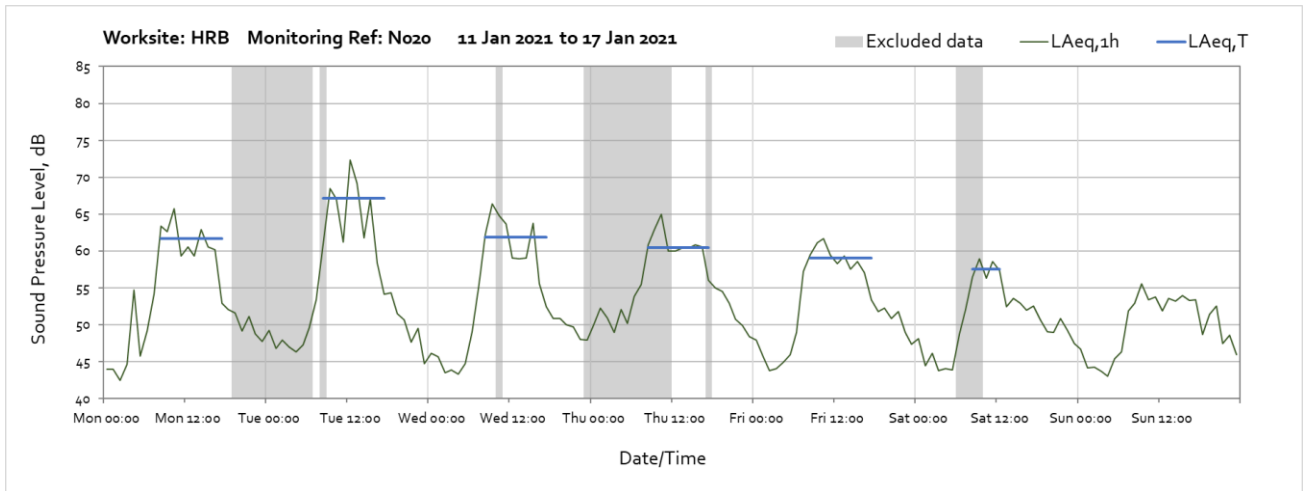
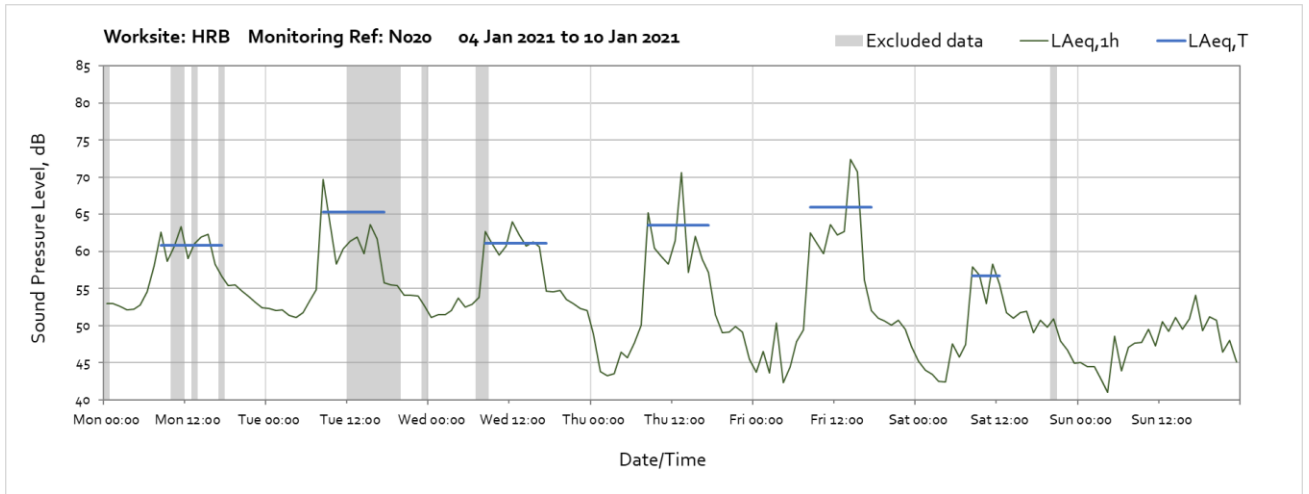


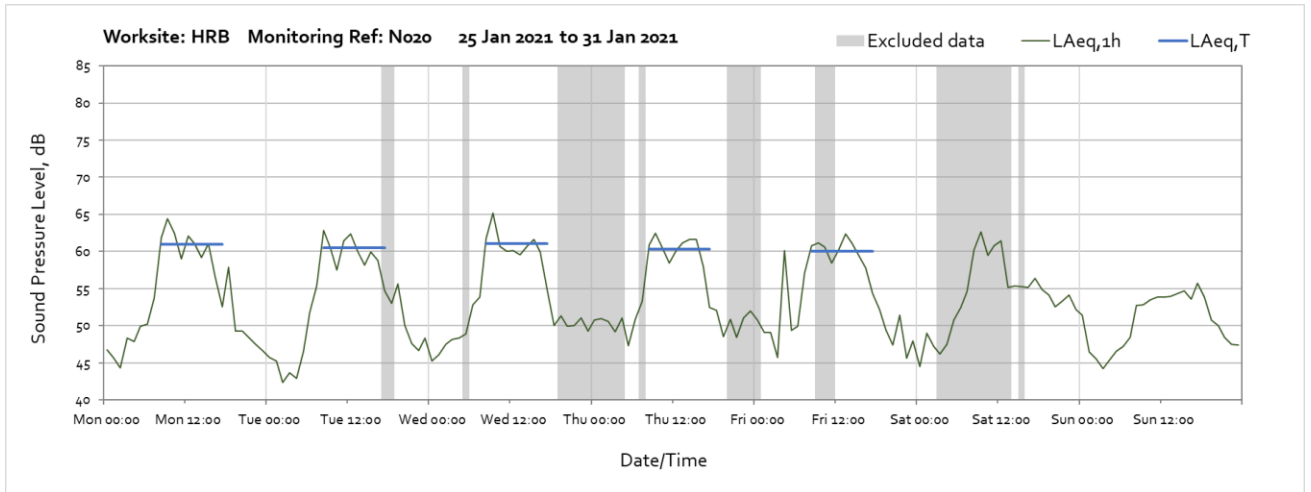
Note: Missing data from 00:00 on Sunday 31st January until the end of the month was due to loss of power to the lighting column which powers the monitoring station. The lighting column provider was contacted on the 29th January when the monitoring station battery charge was noted as reducing. The provider was asked to give notification to any potential interruptions in good time.

Worksite: HRB – Monitoring Ref: N020

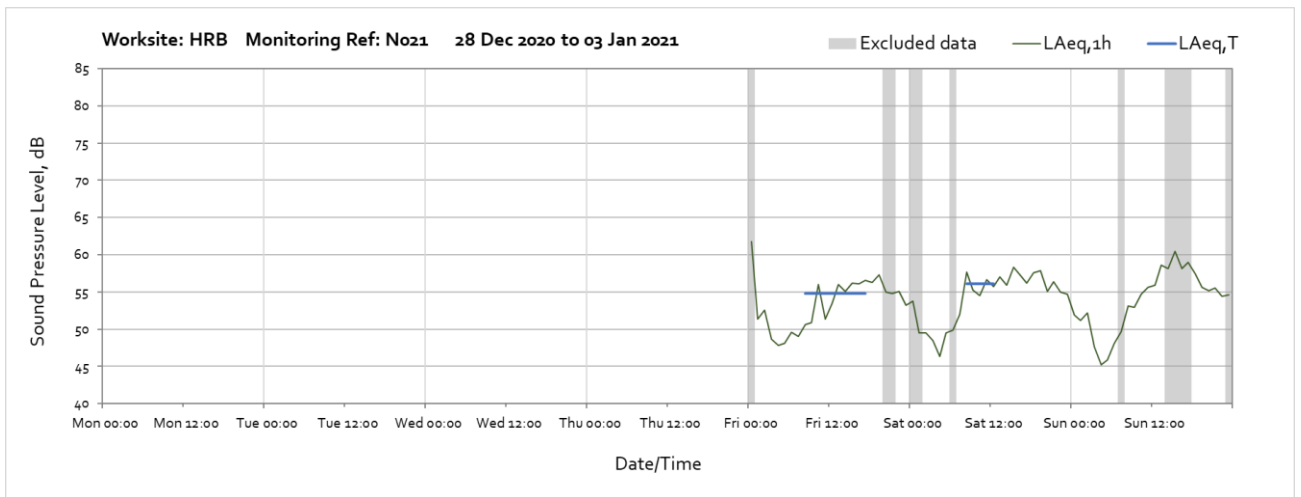


Note: High noise levels on the early hours of the 1st January were due to New Year’s Eve celebrations and have been excluded to calculate values in Table 3.

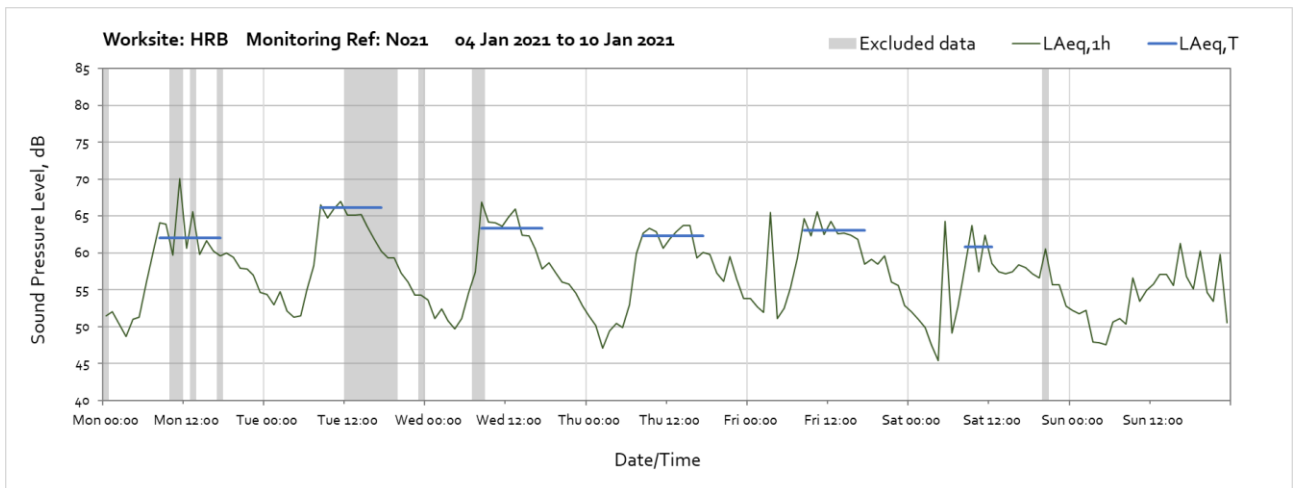


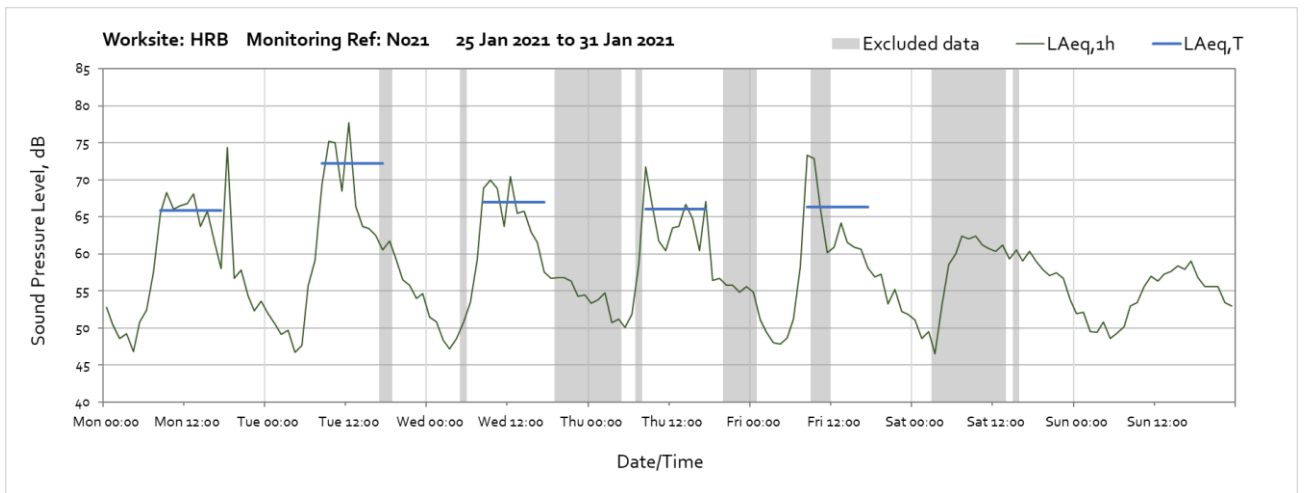
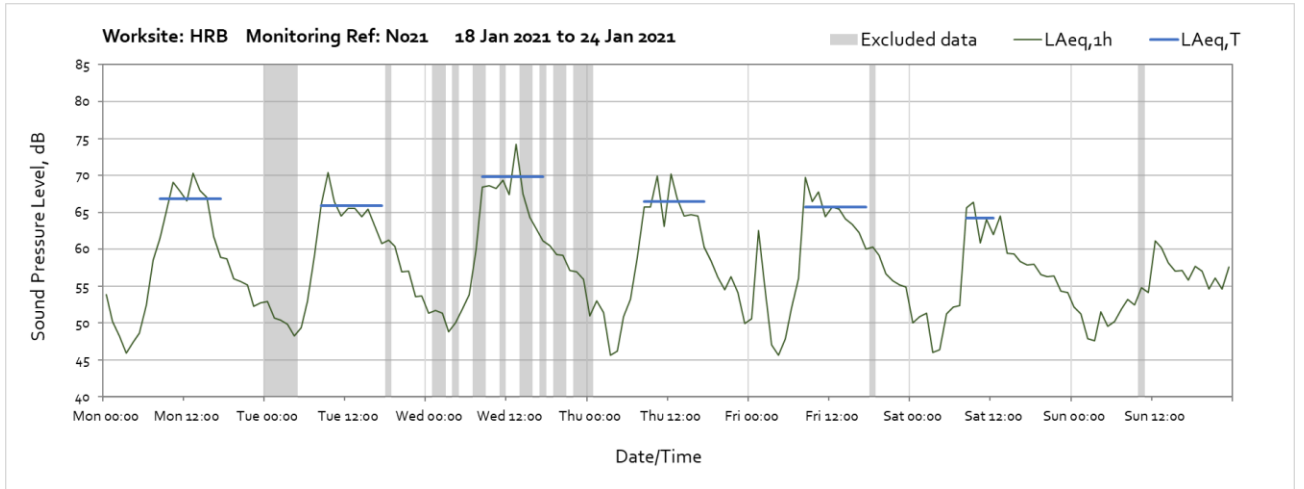
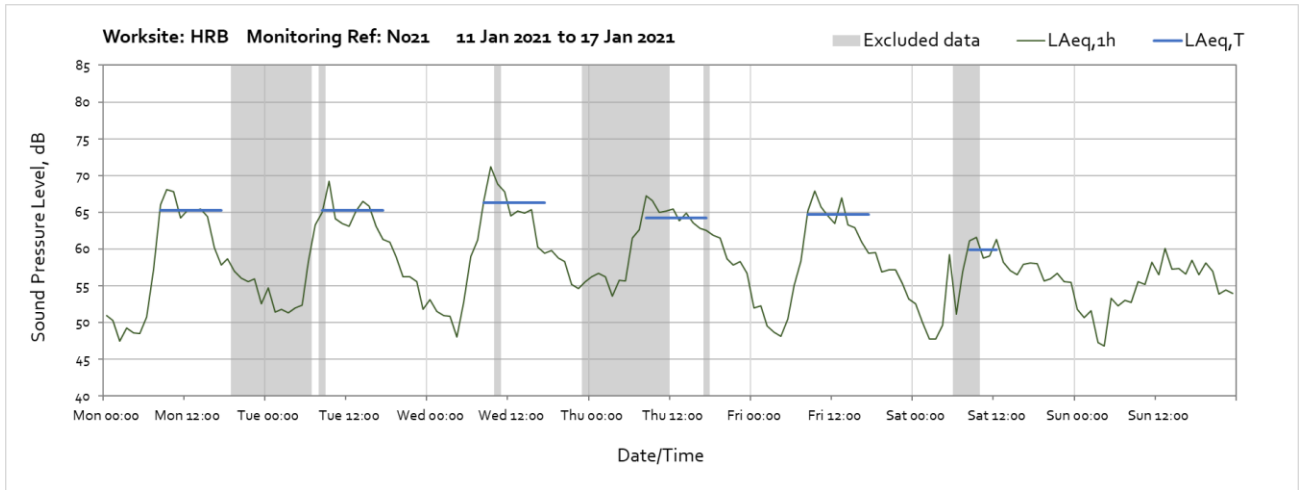


Worksite: HRB – Monitoring Ref: N021

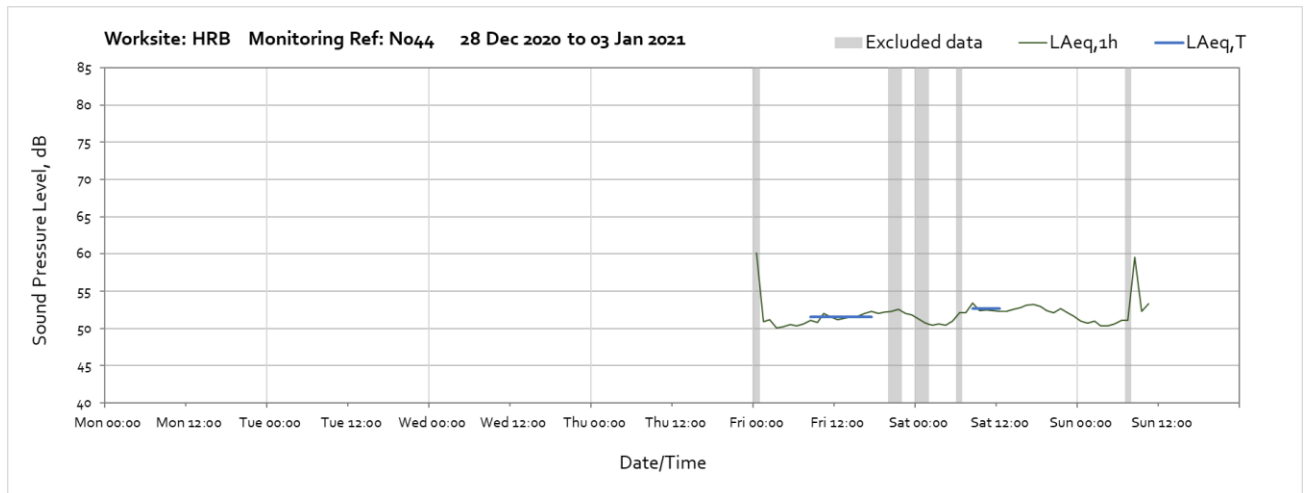


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

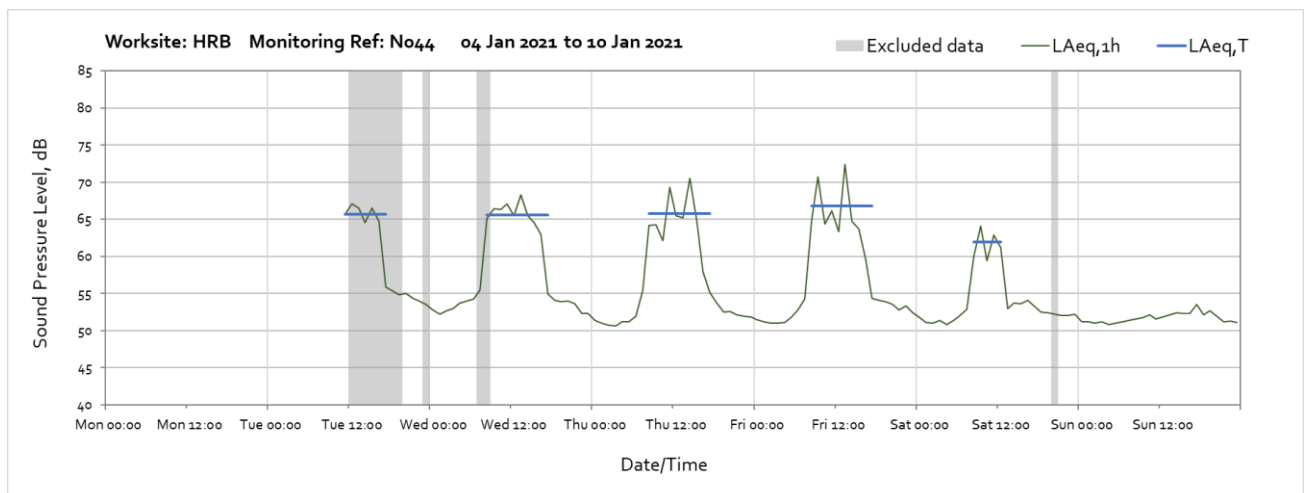




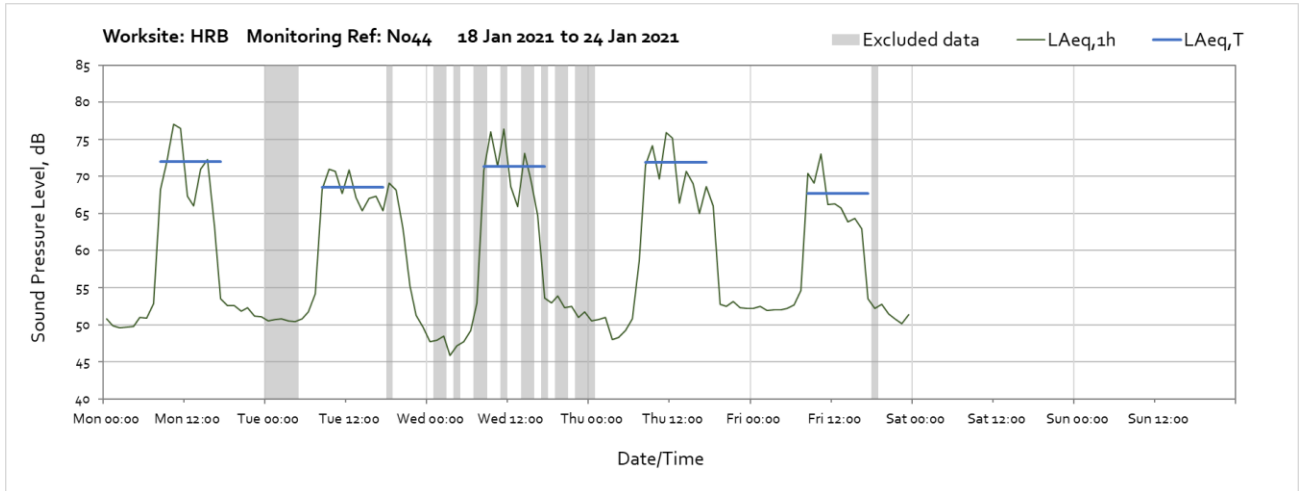
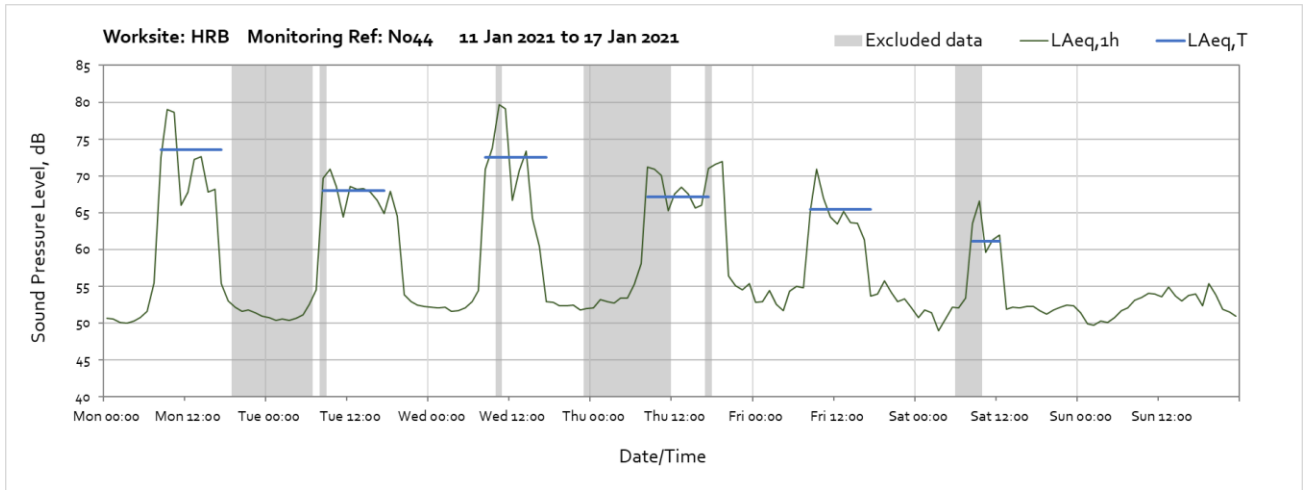
Worksite: HRB – Monitoring Ref: N044



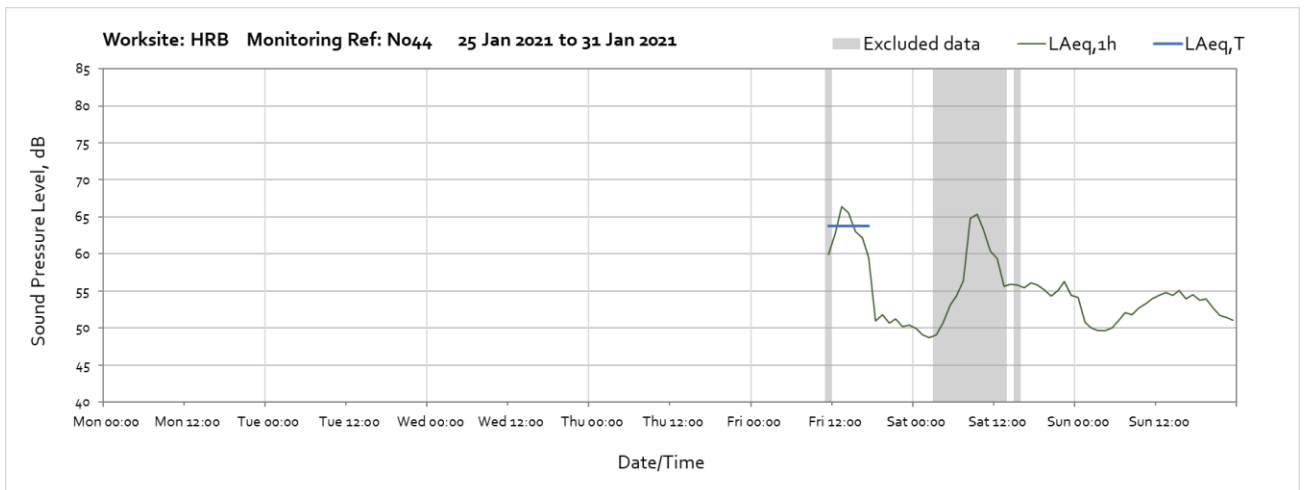
Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3. Missing data between 11:00 on Sunday 3rd until 10:00 on Tuesday 5th January was due to loss of power at the monitoring station caused by a loss of site power and depleted monitoring station battery. The battery depleted as access to the site and monitor was limited of the Christmas period. The site team were requested to check the remaining battery power at the start of each shift.



Note: Missing data between 11:00 on Sunday 3rd until 10:00 on Tuesday 5th January was due to loss of power at the monitoring station caused by a loss of site power and depleted monitoring station battery. The battery depleted as access to the site and monitor was limited of the Christmas period. The site team were requested to check the remaining battery power at the start of each shift.



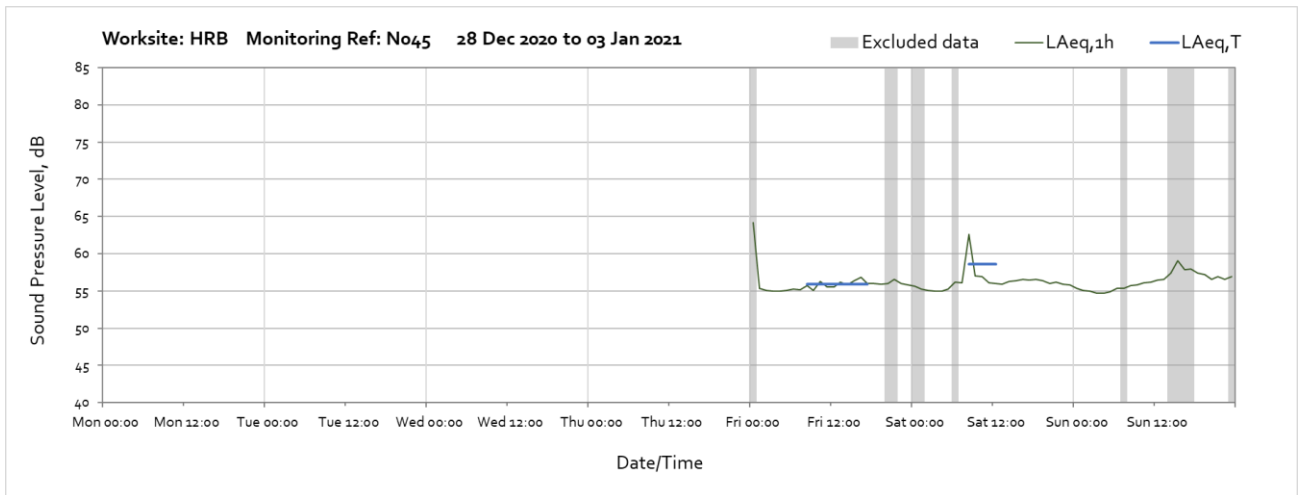
Note: Missing data from 00:00 on Saturday 23rd January until 11:00 on Friday 29th January was due to a system fault with the monitoring station. The monitoring station was replaced.



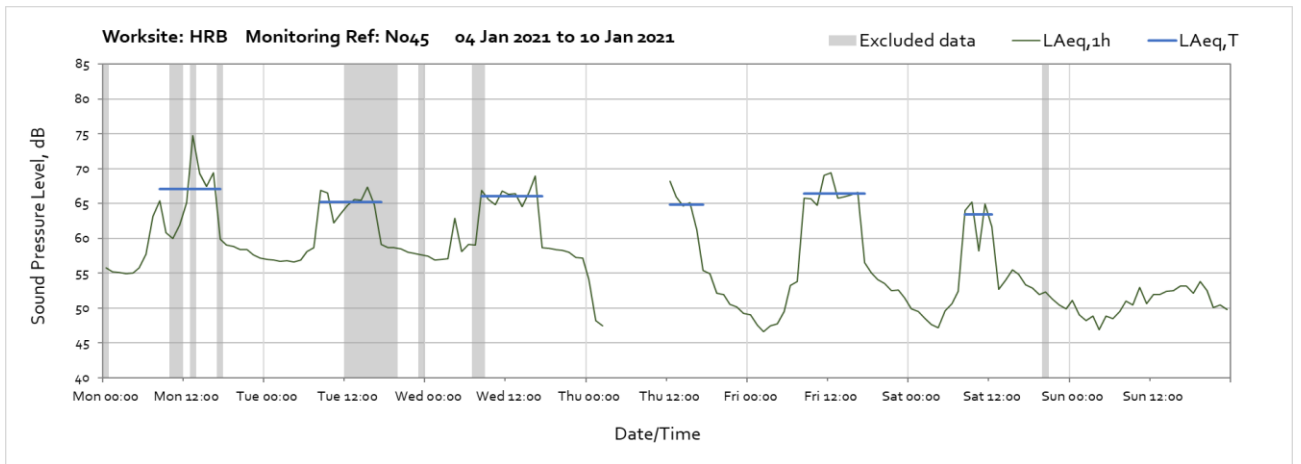
Note: Missing data from 00:00 on Saturday 23rd January until 11:00 on Friday 29th January was due to a system fault with the monitoring station. The monitoring station was replaced.

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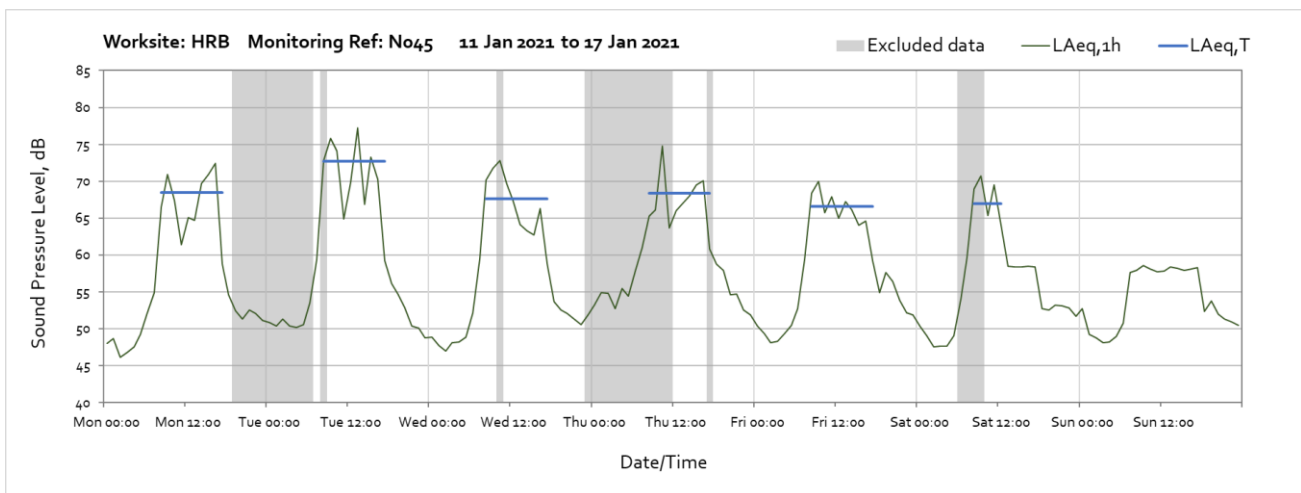
Worksite: HRB – Monitoring Ref: N045

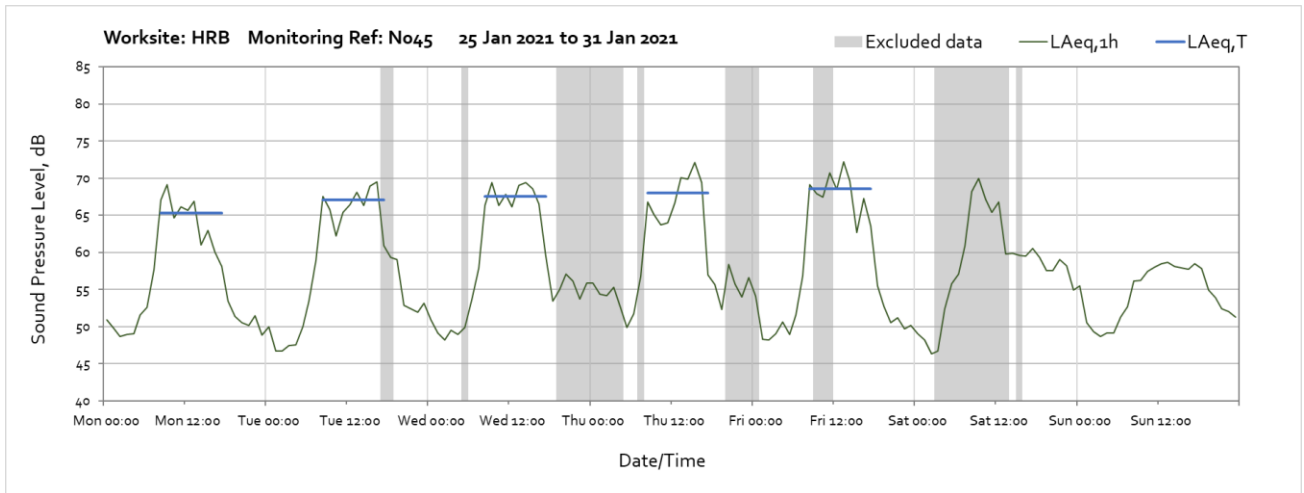
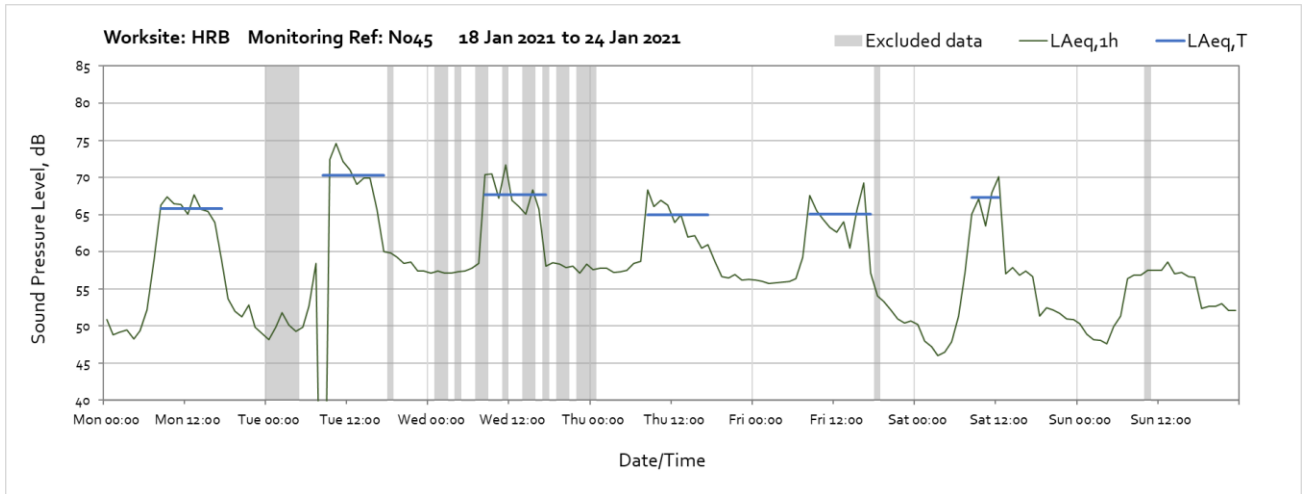


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

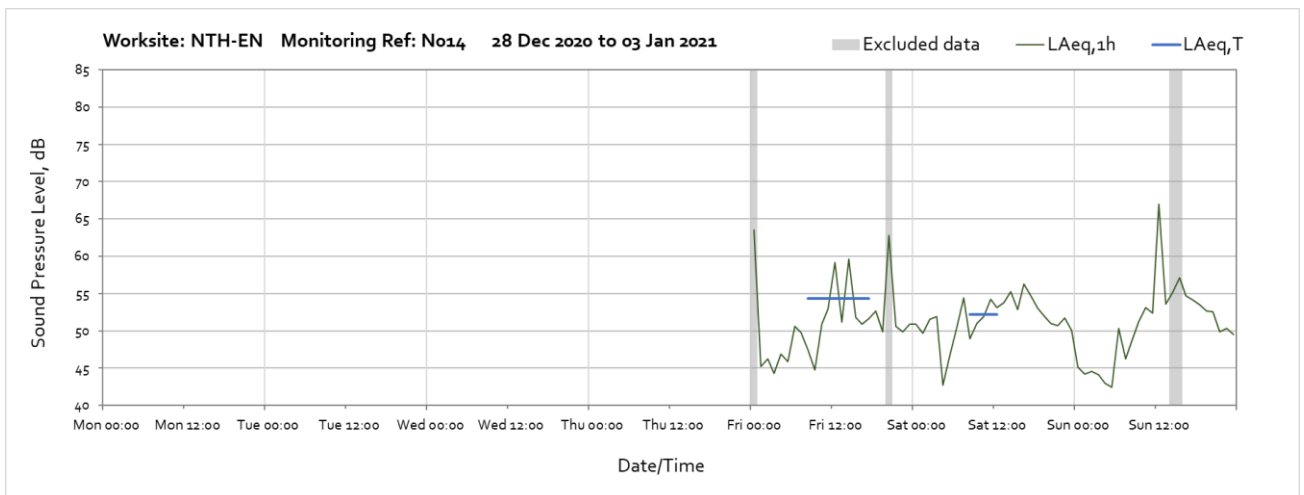


Note: Missing data between 03:00 until 12:00 on Thursday 7th January was due to loss of power at the monitoring station whilst the site generator hydrogen cylinder was replaced.

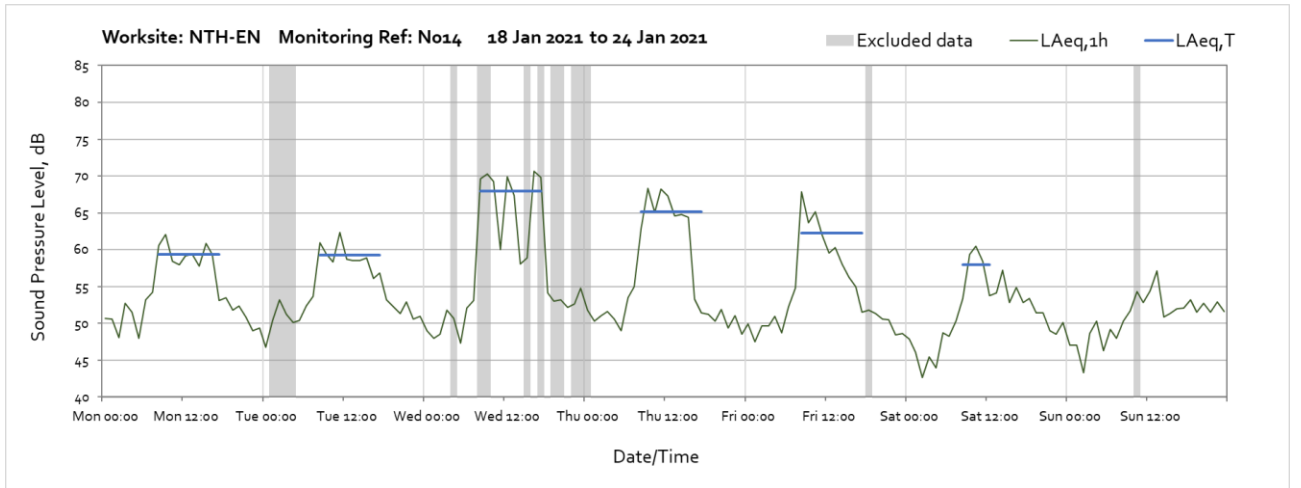
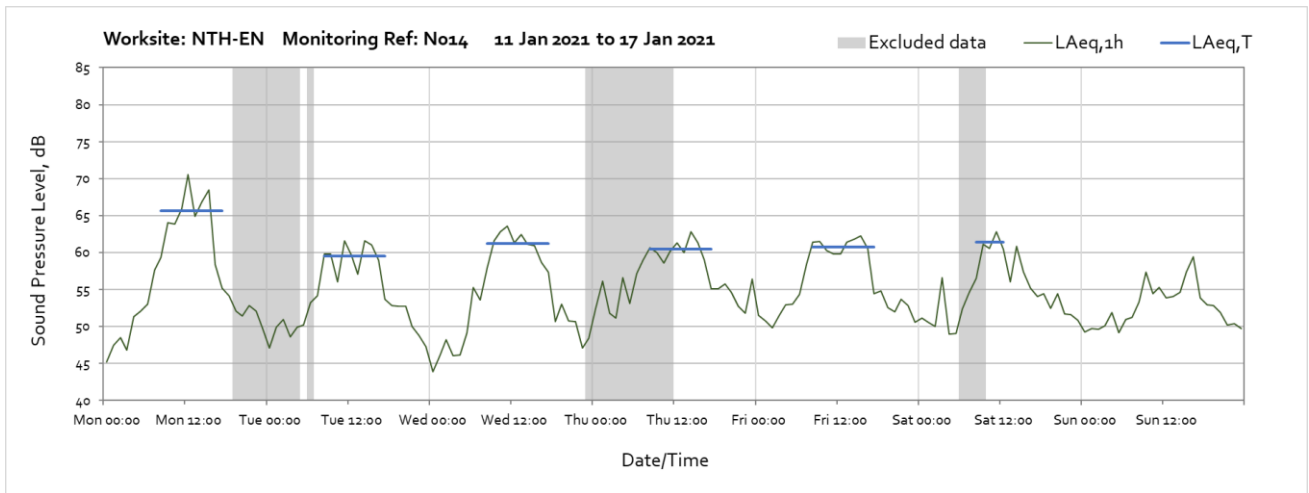
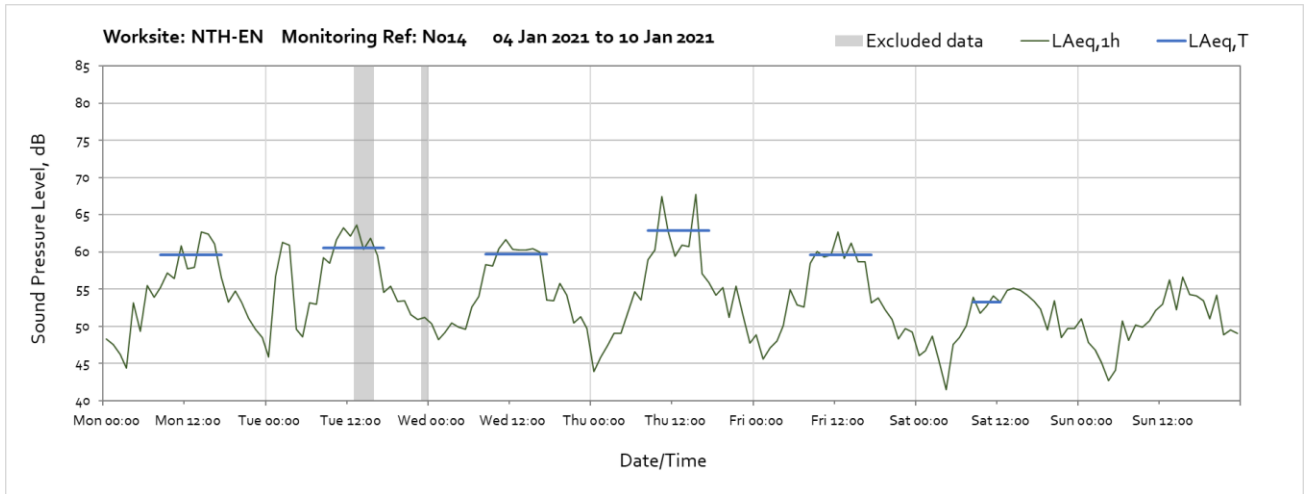


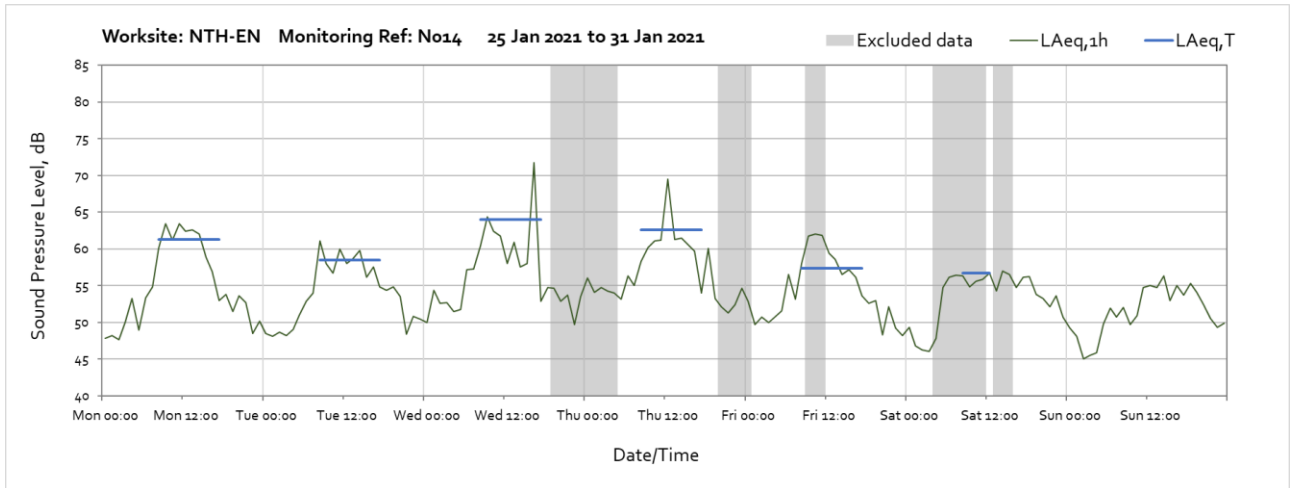


Worksite: NTH-EN – Monitoring Ref: N014

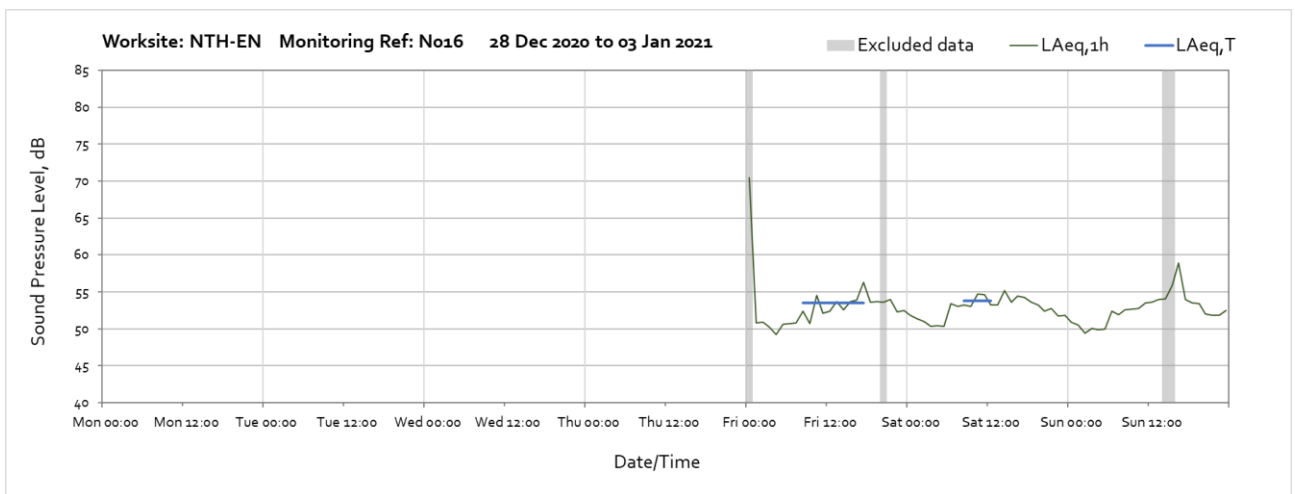


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

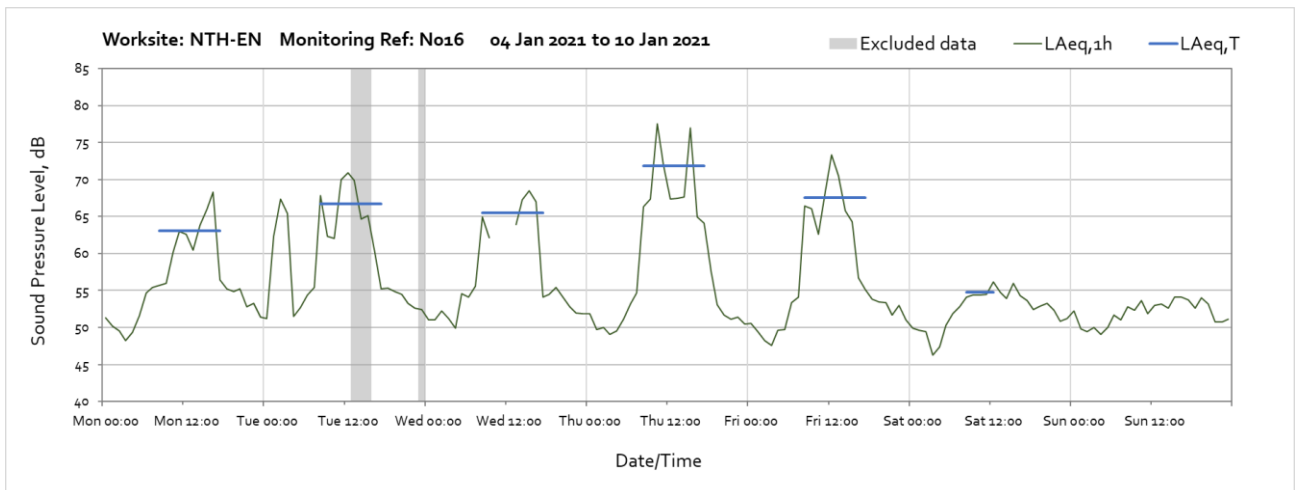




Worksite: NTH-EN – Monitoring Ref: N016

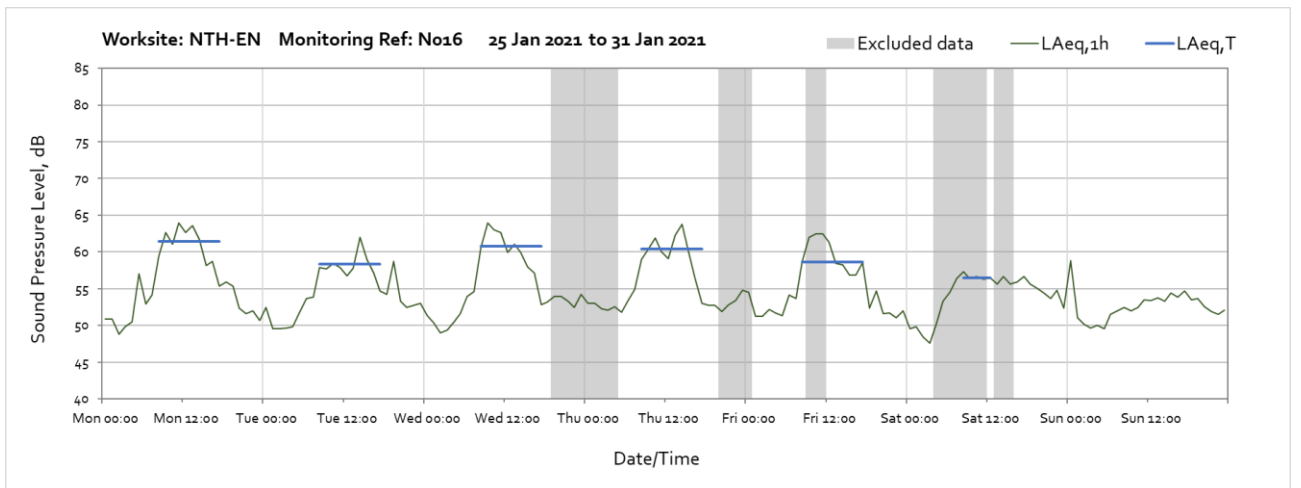
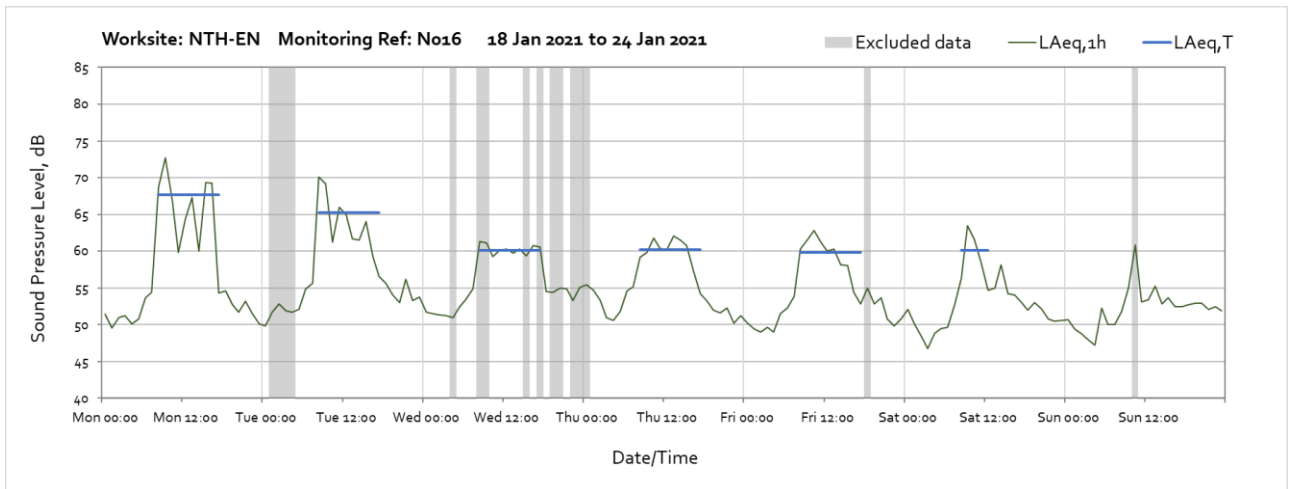
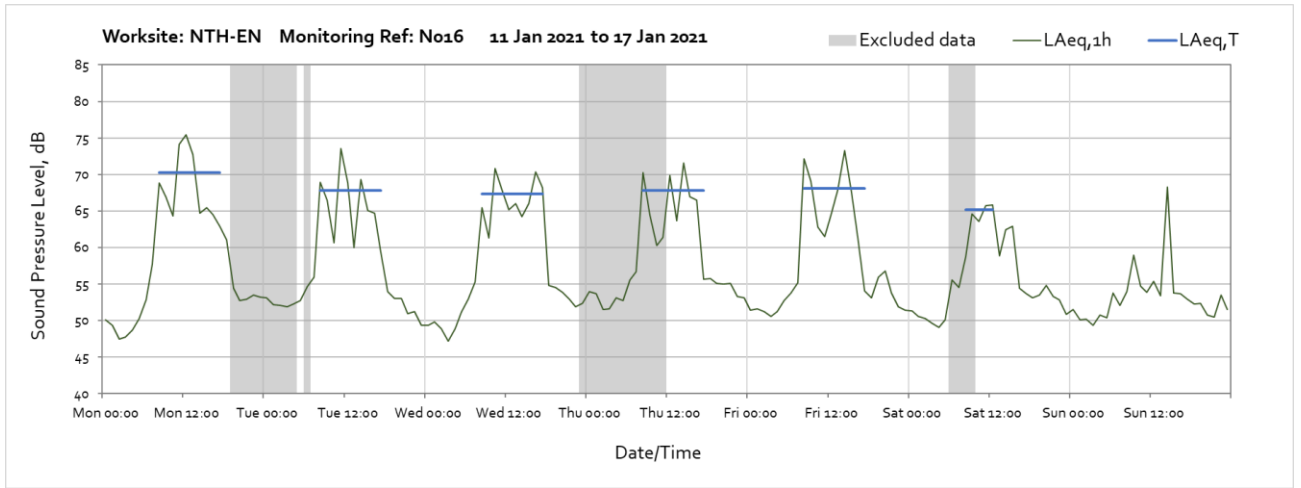


Note: High noise levels on the early hours of the 1st January were due to New Year’s Eve celebrations and have been excluded to calculate values in Table 3.

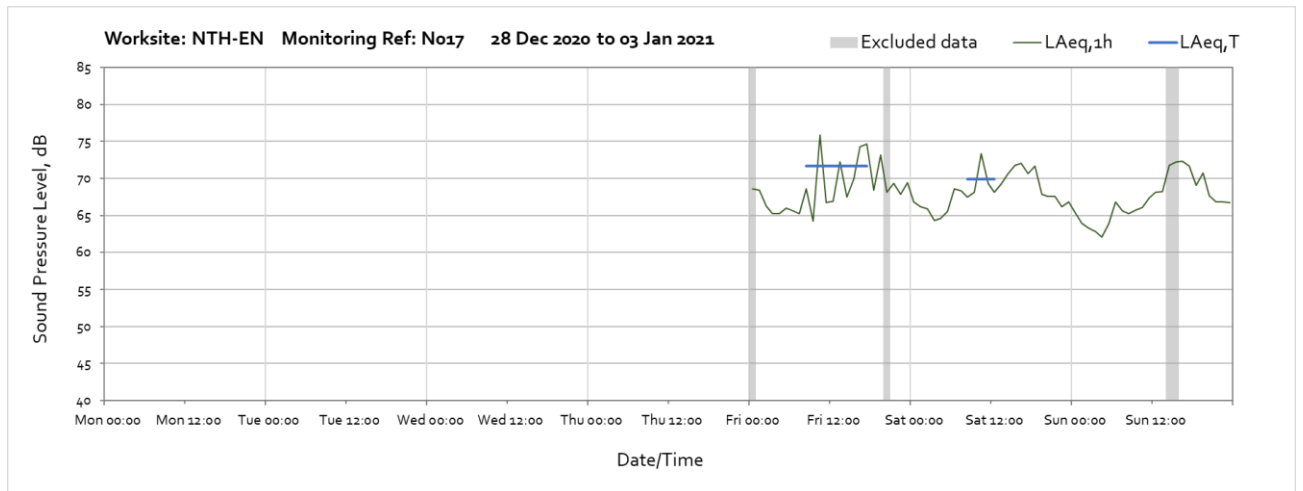


Note: Missing data from 10:00 until 13:00 on Wednesday 6th January was due to a software error within the monitoring station.

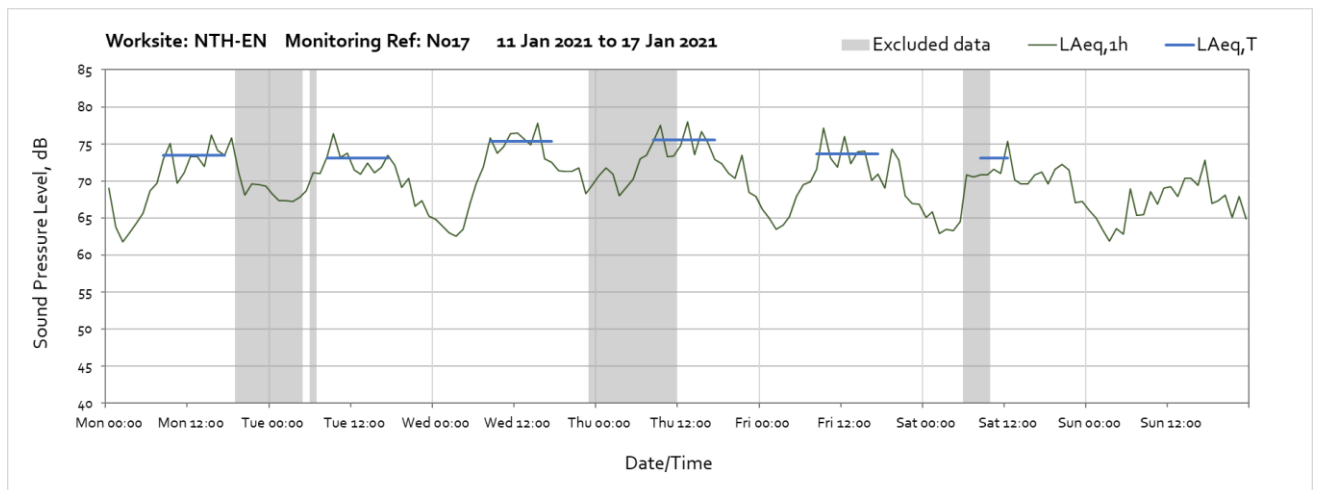
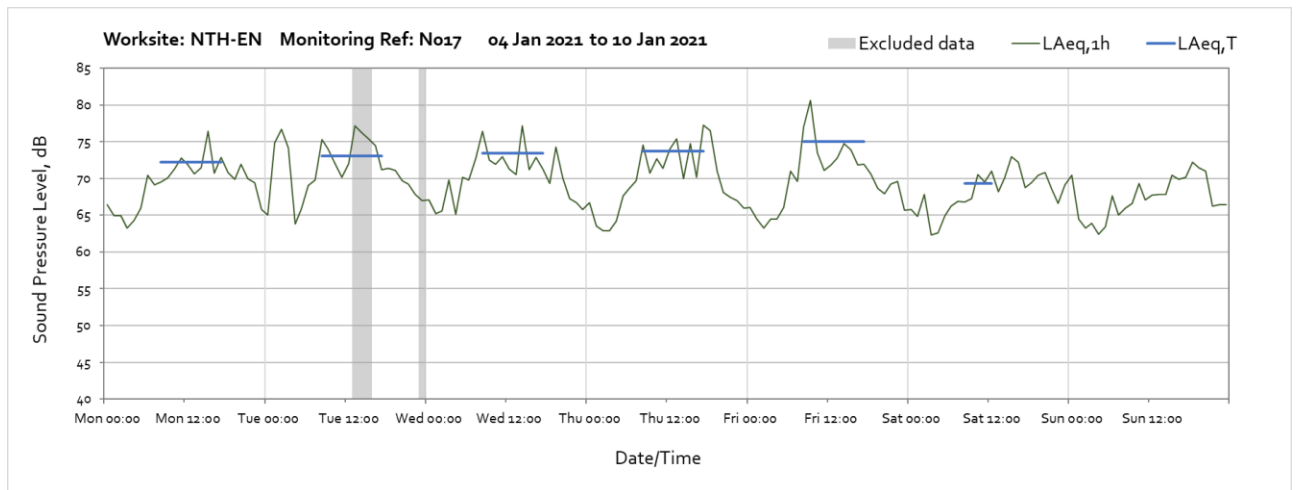
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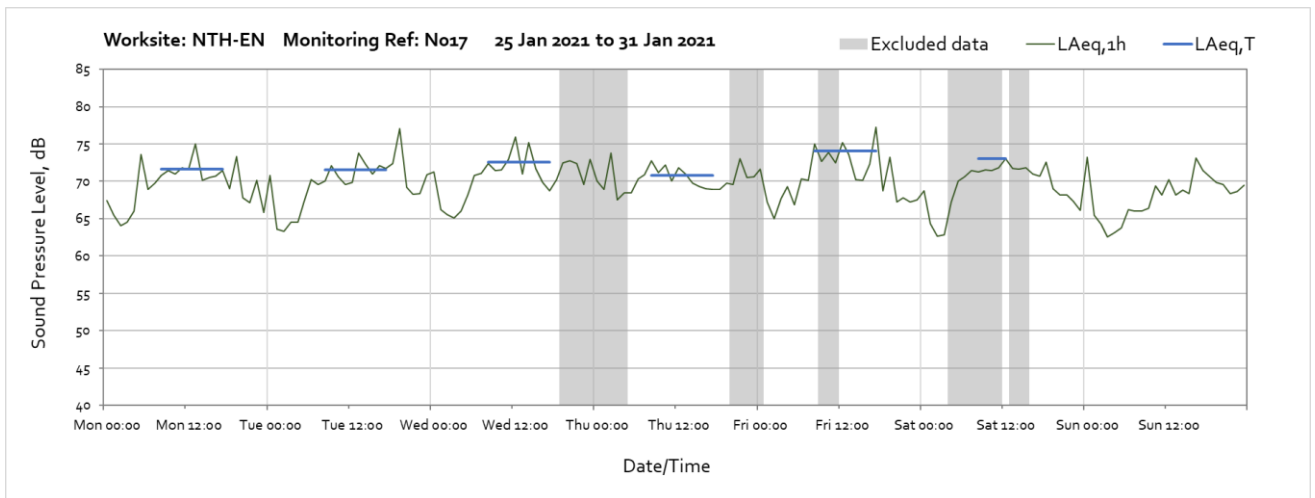
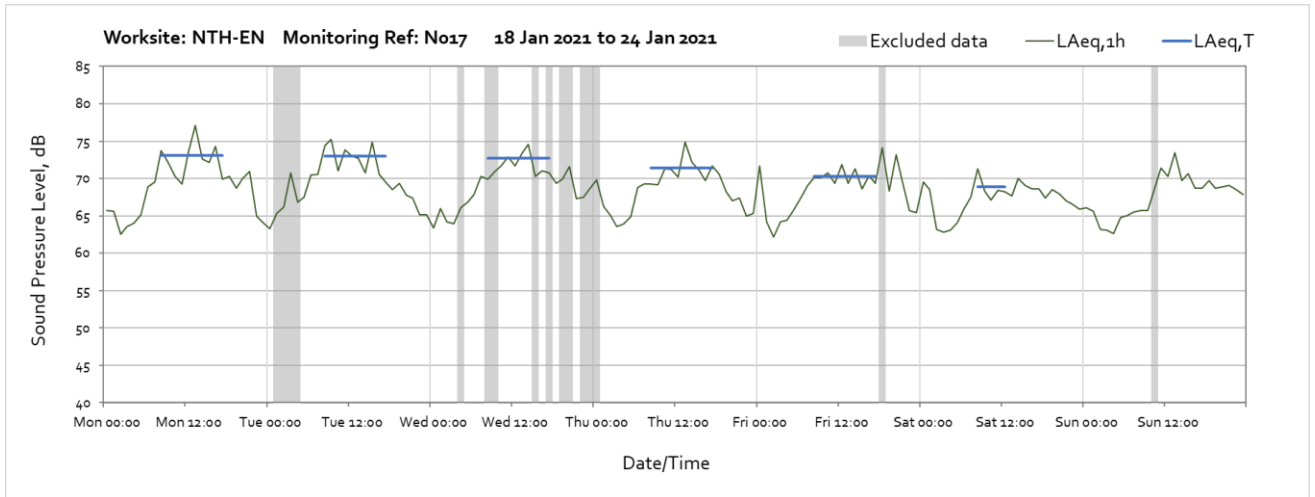


Worksite: NTH-EN – Monitoring Ref: N017

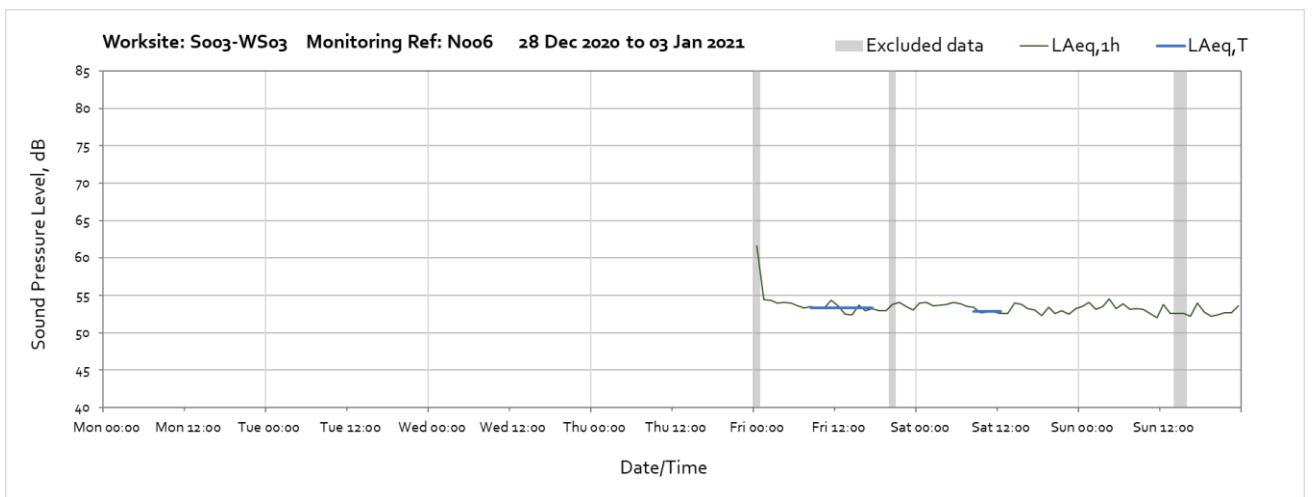


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

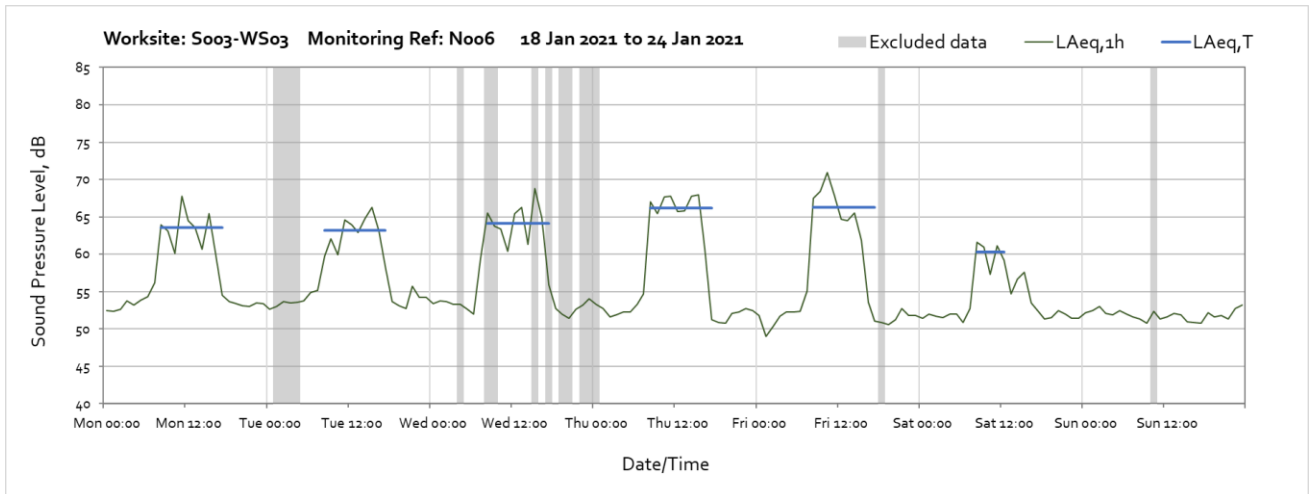
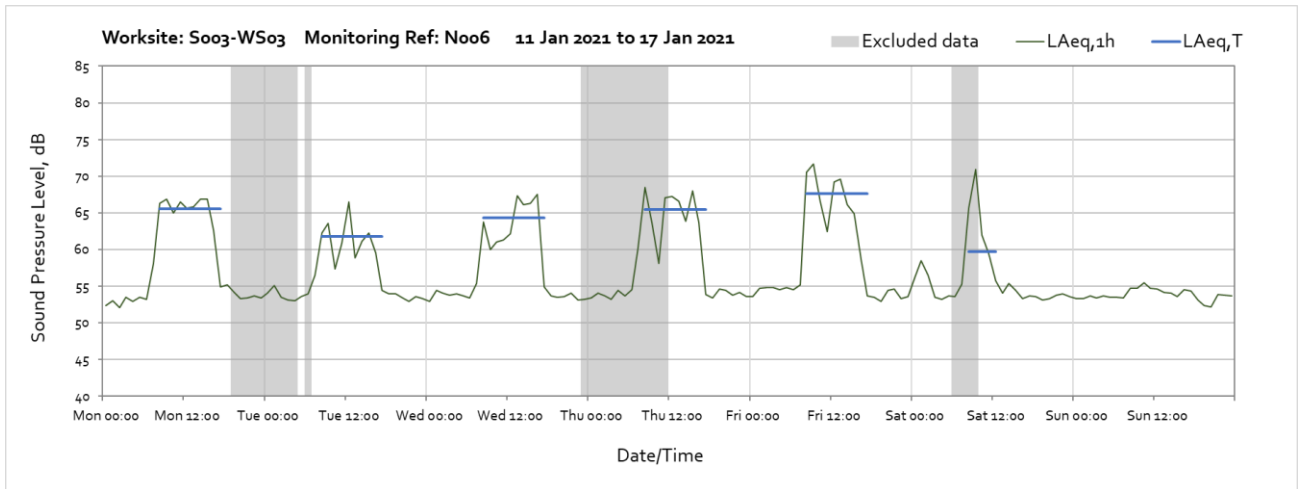
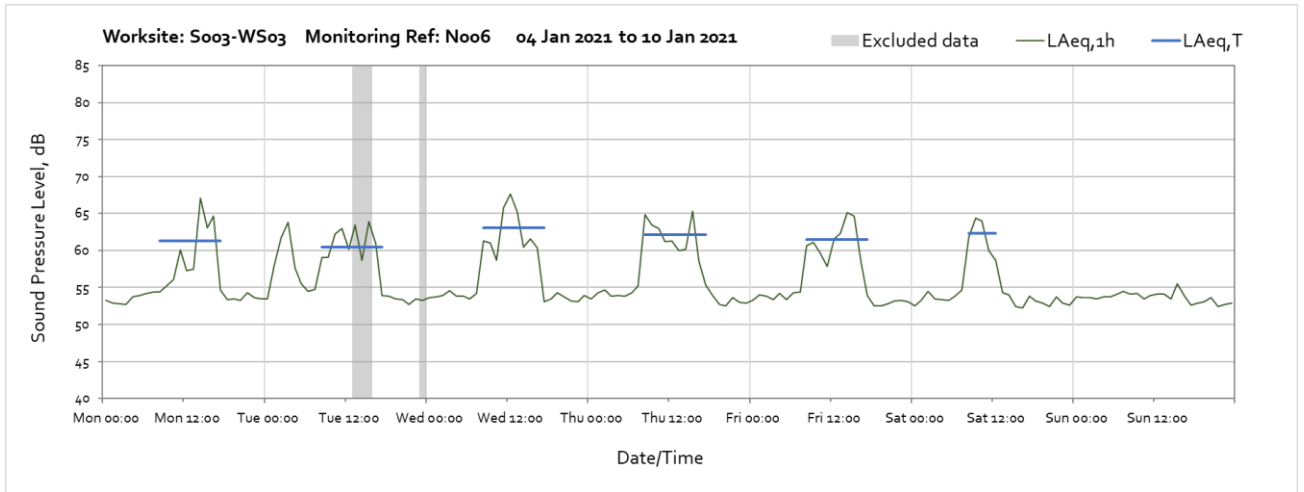


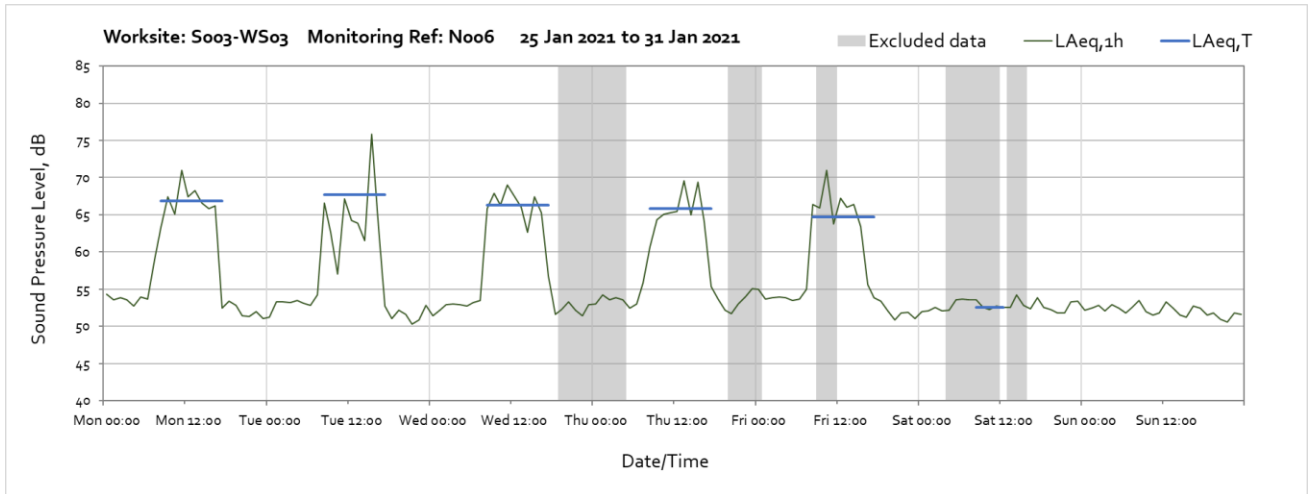


Worksite: S003-WS03 – Monitoring Ref: N006

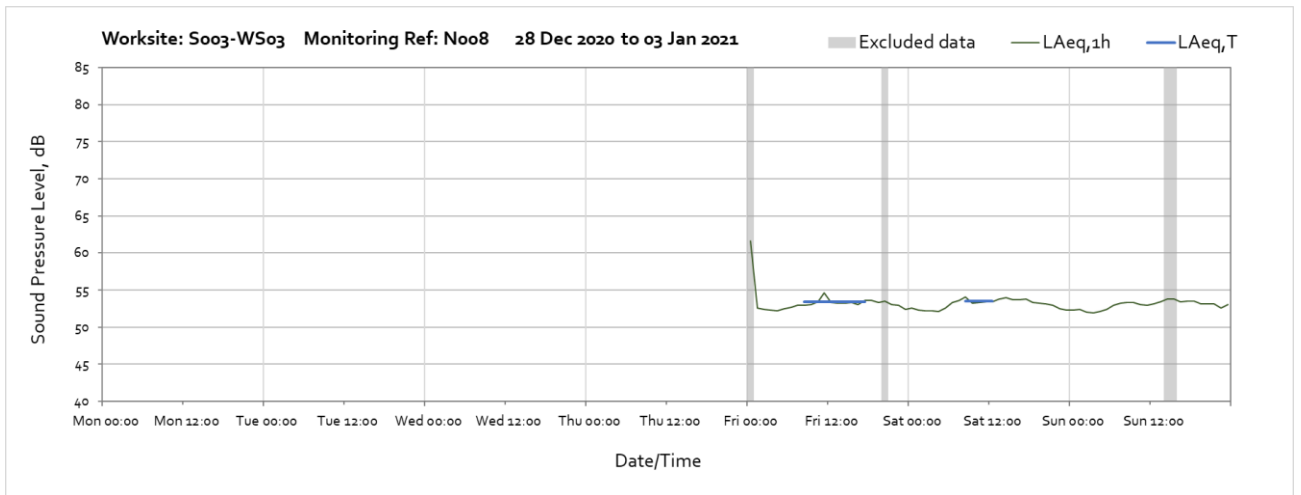


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

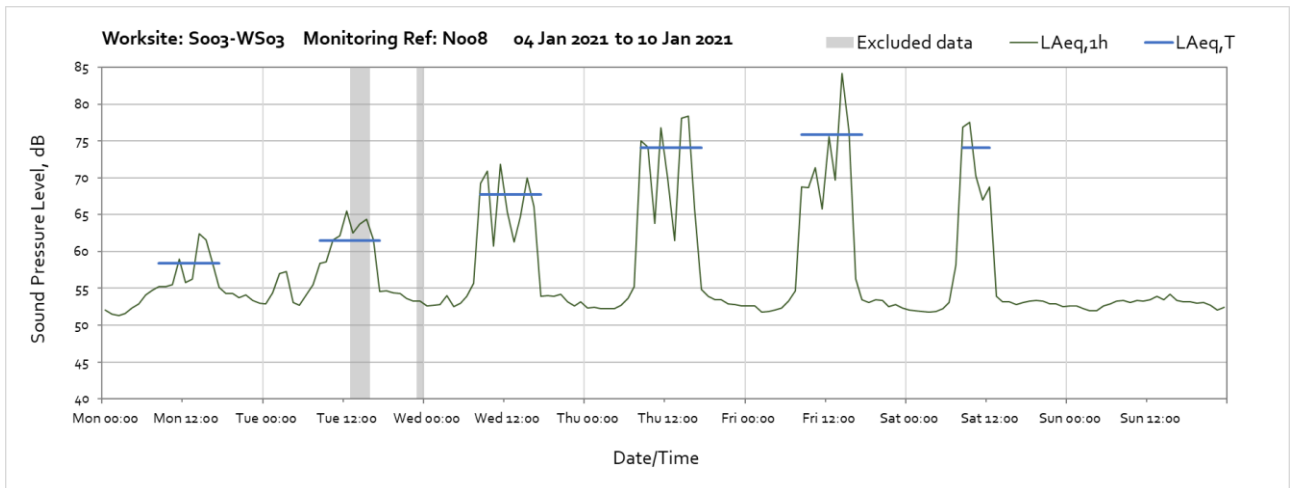


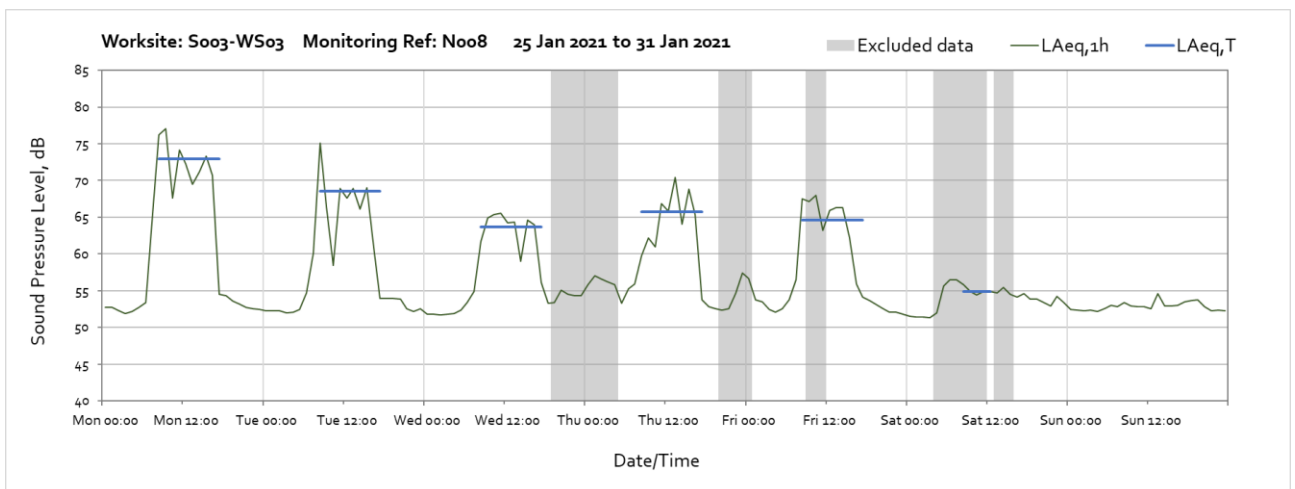
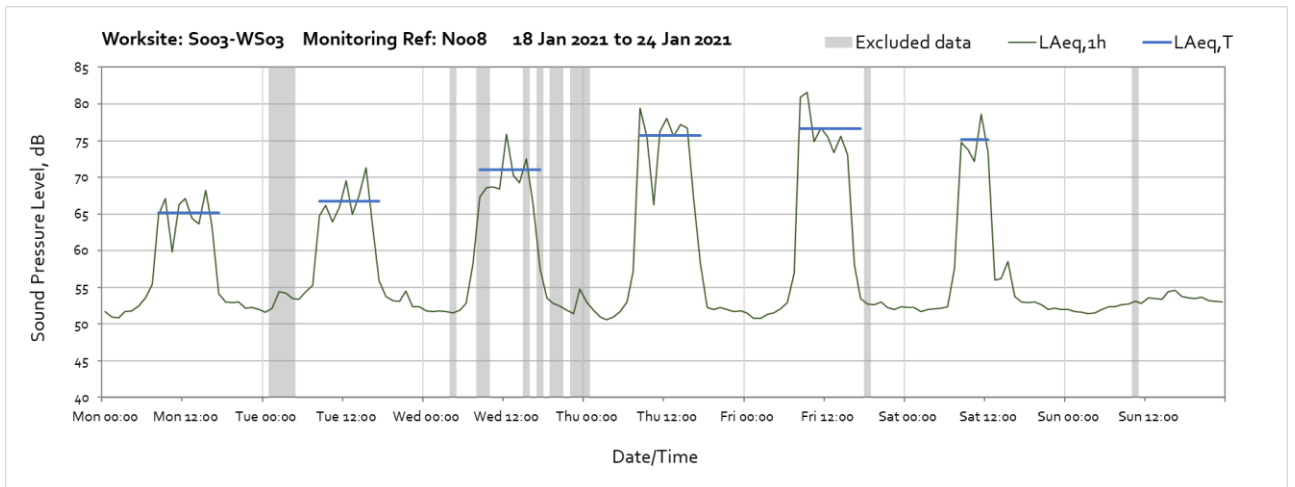
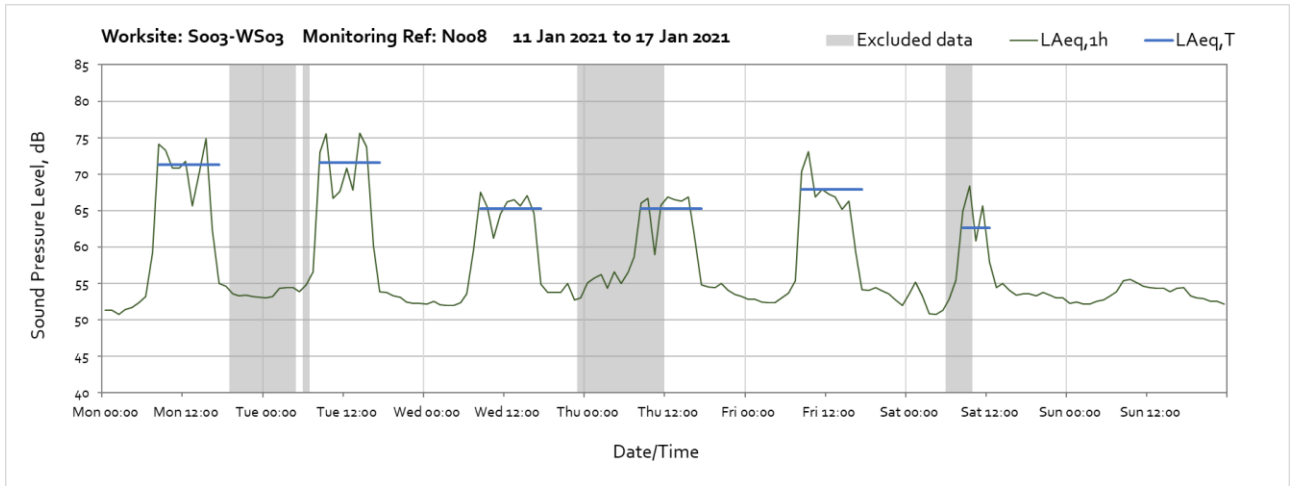


Worksite: S003-WS03 – Monitoring Ref: N008

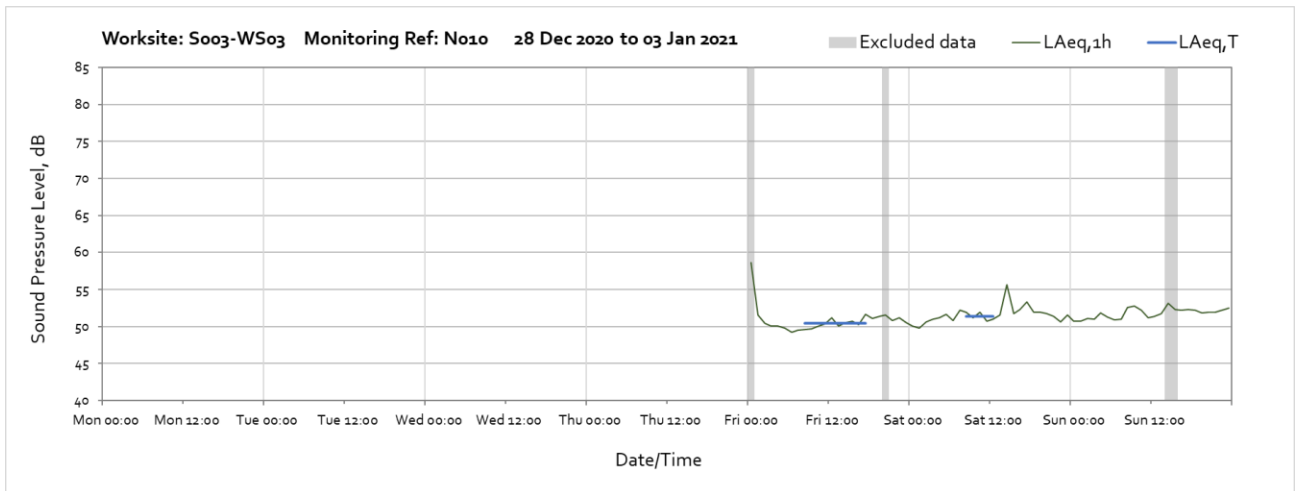


Note: High noise levels on the early hours of the 1st January were due to New Year’s Eve celebrations and have been excluded to calculate values in Table 3.

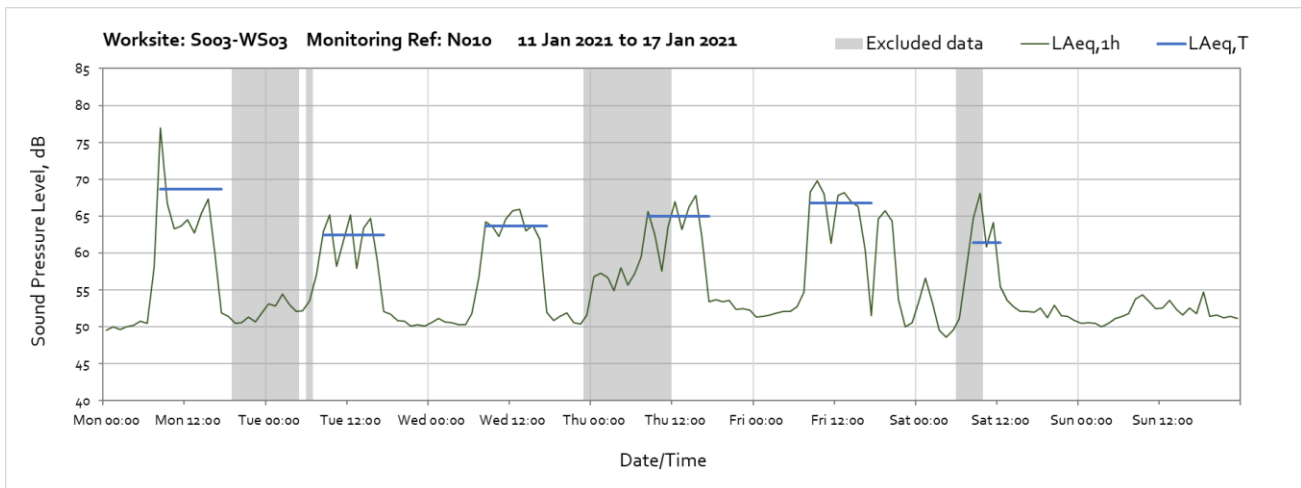
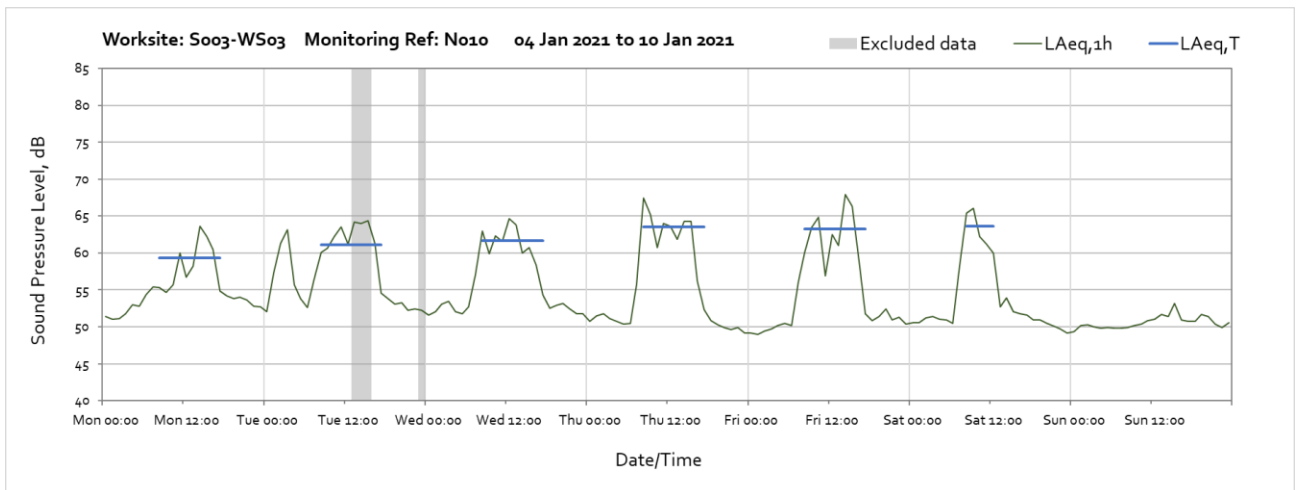


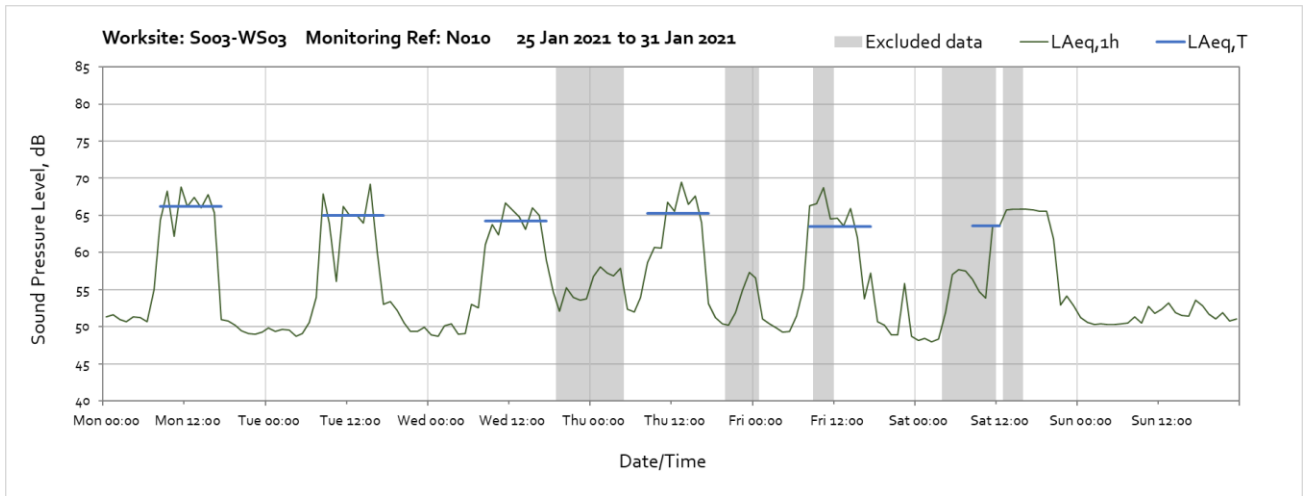
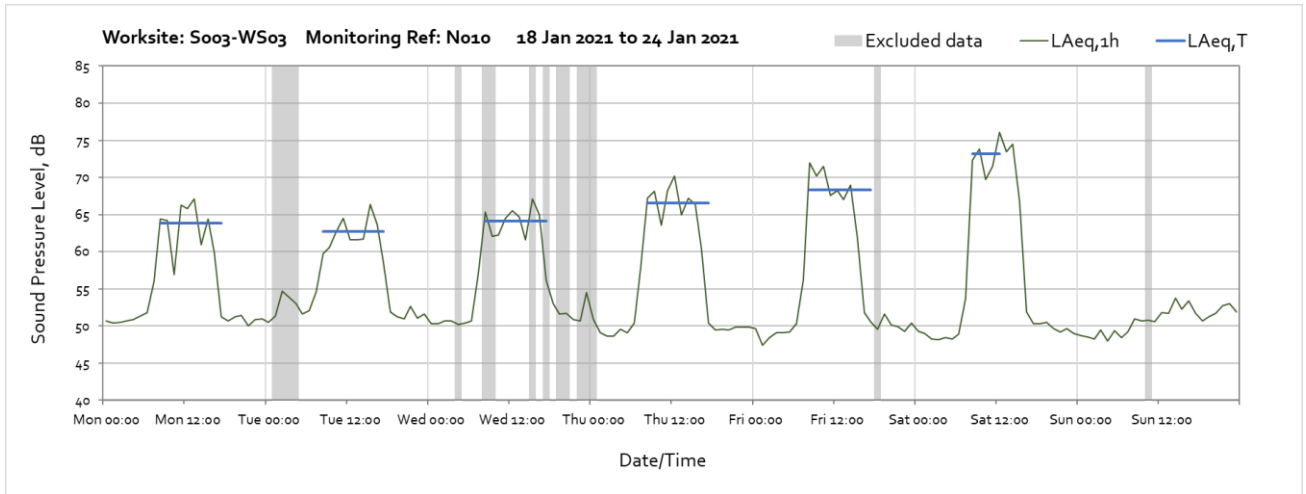


Worksite: S003-WS03 – Monitoring Ref: N010

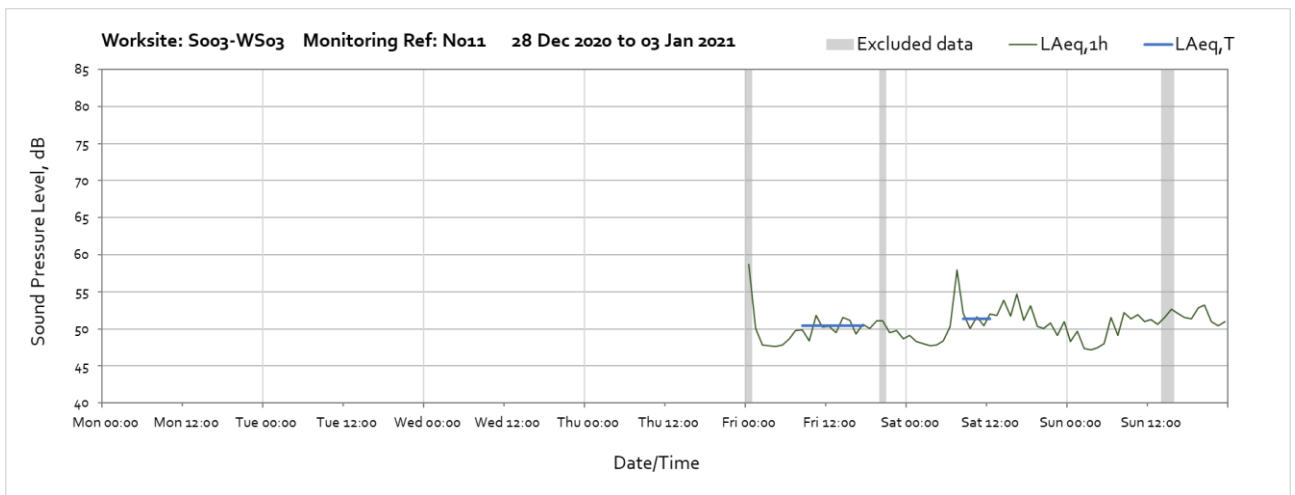


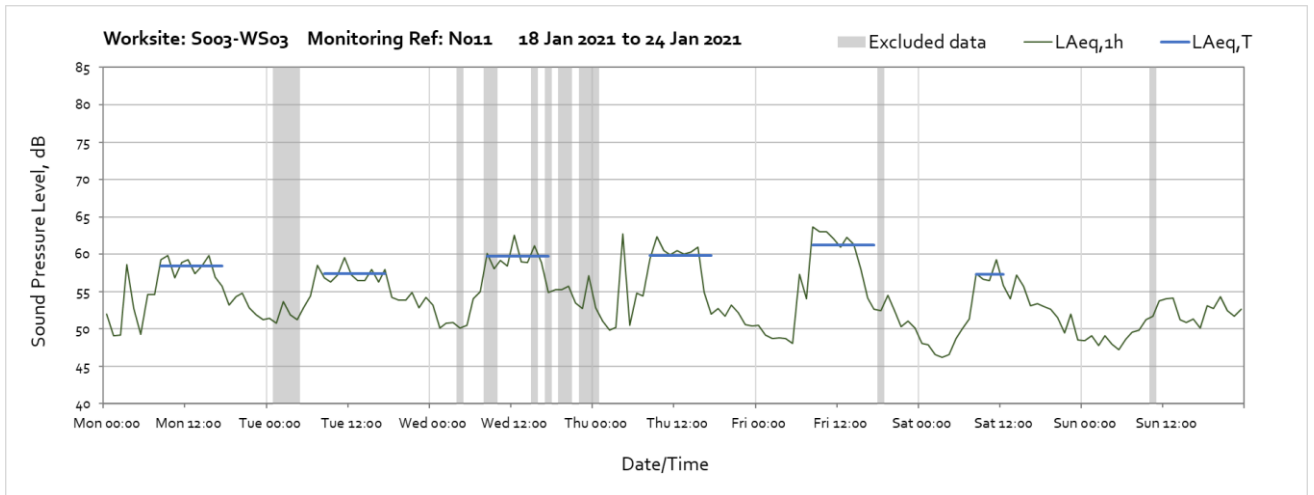
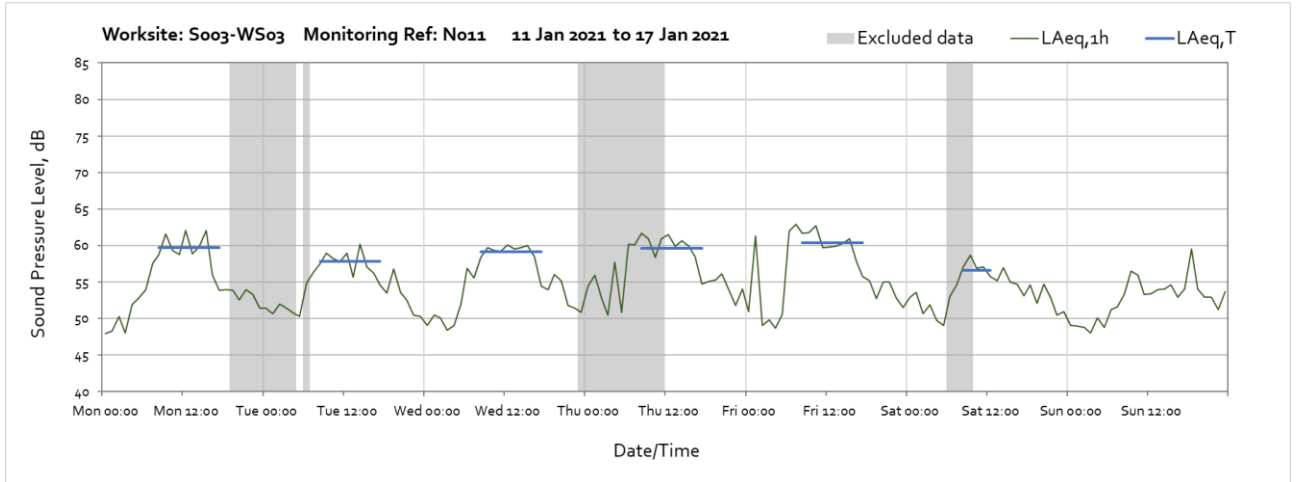
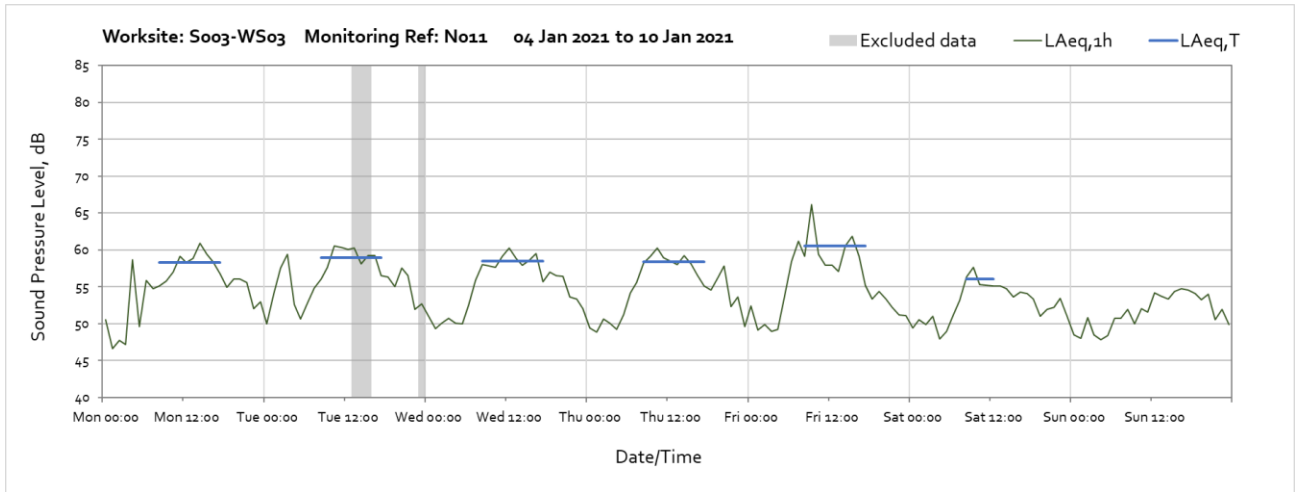
Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

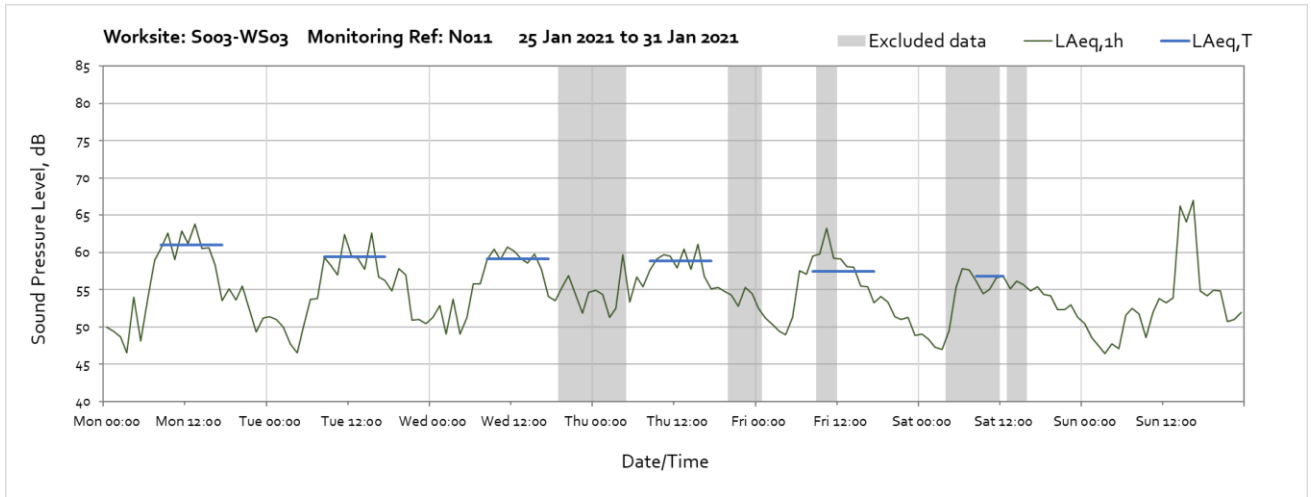




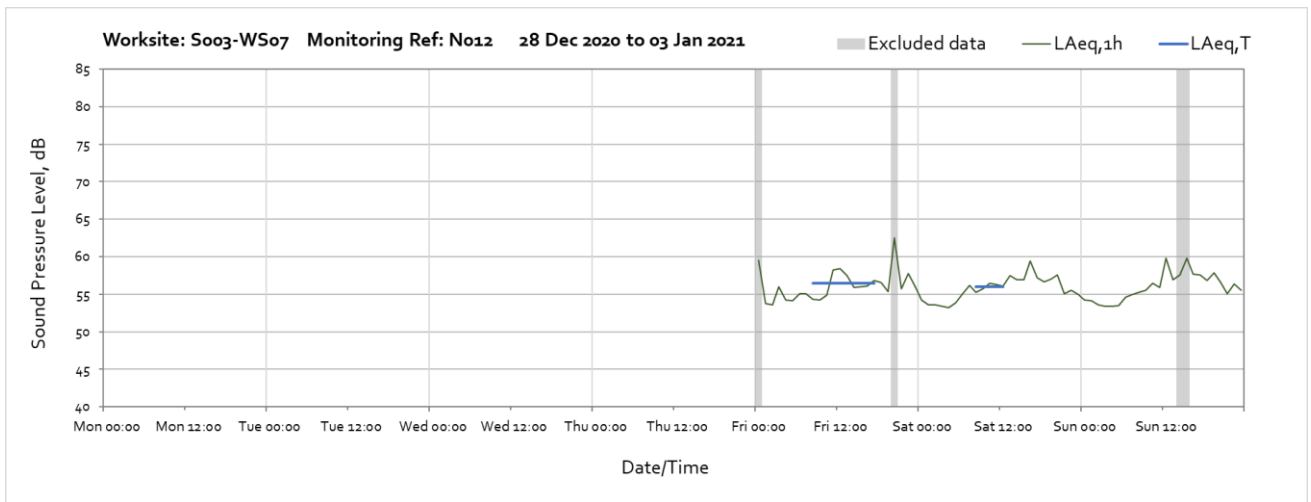
Worksite: S003-WS03 – Monitoring Ref: N011



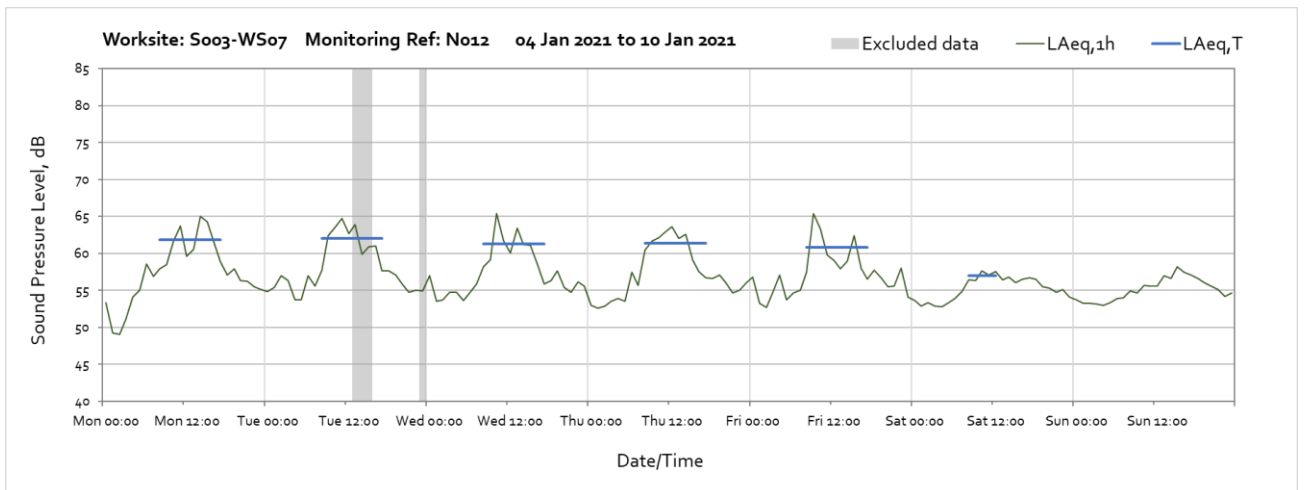


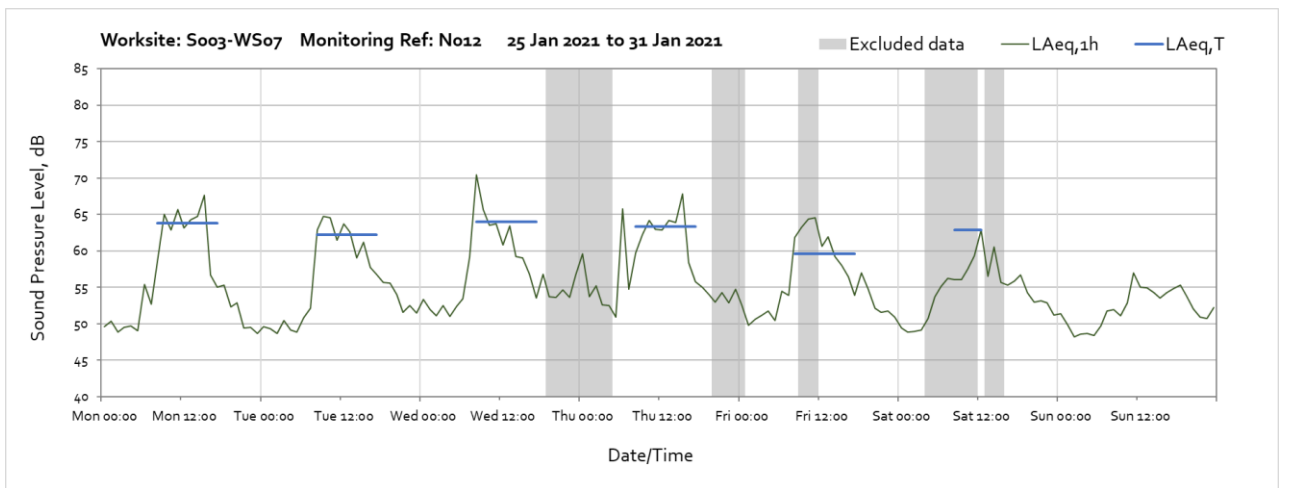
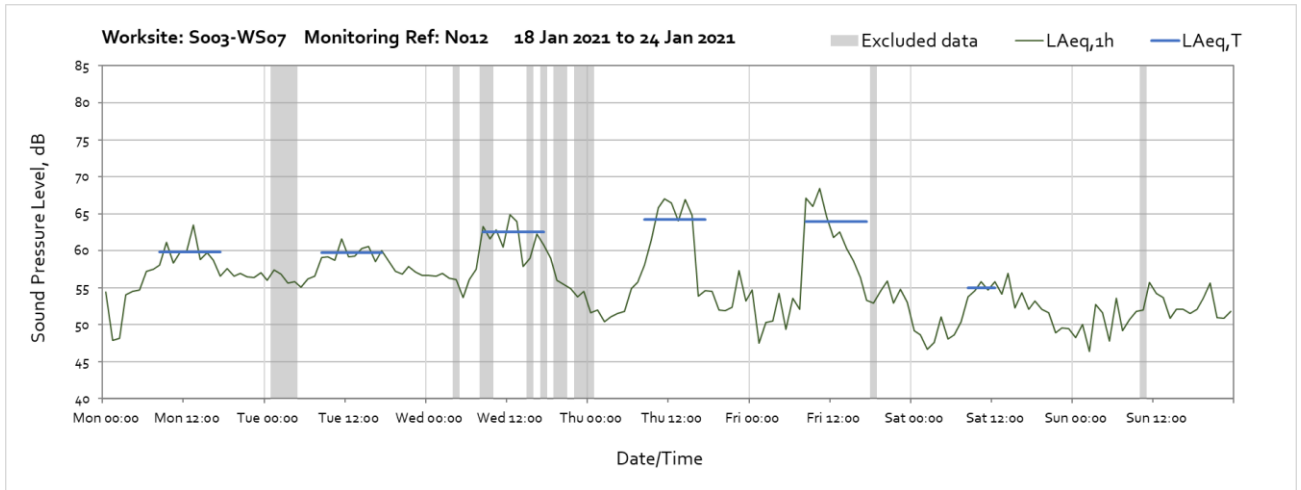
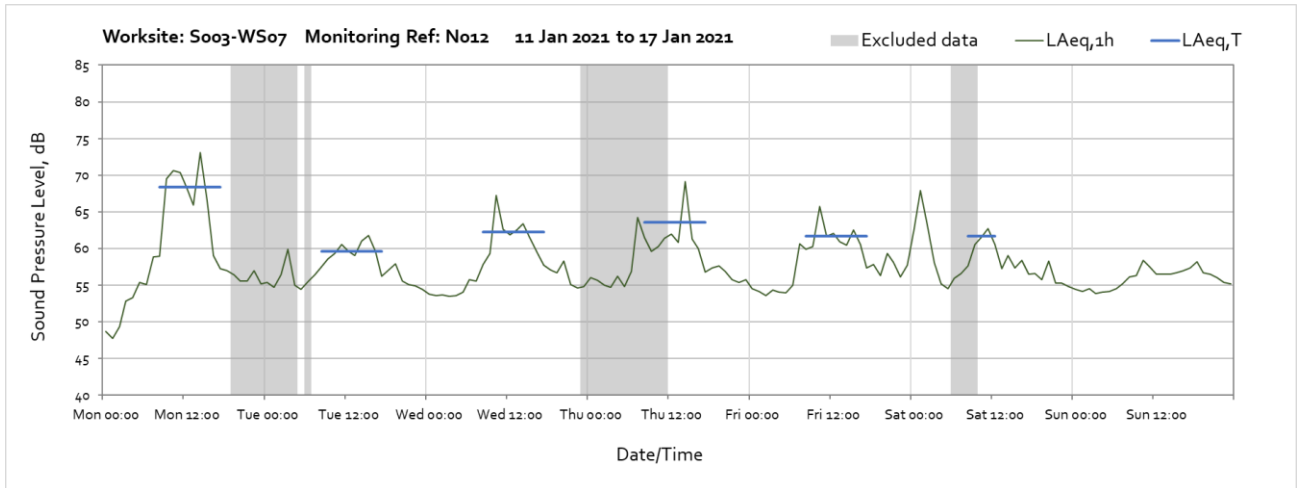


Worksite: S003-WS07 – Monitoring Ref: N012

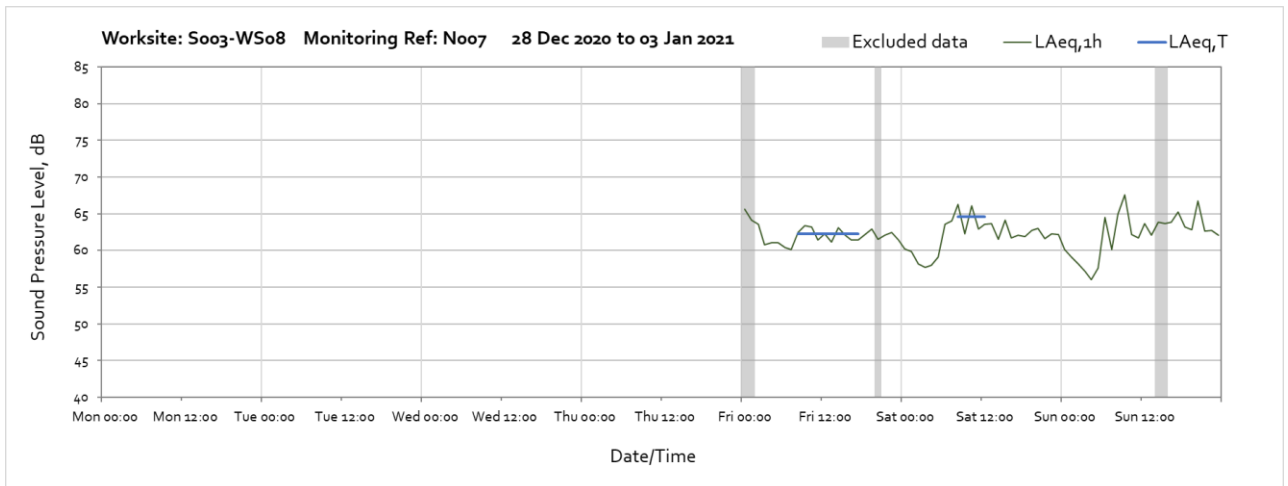


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

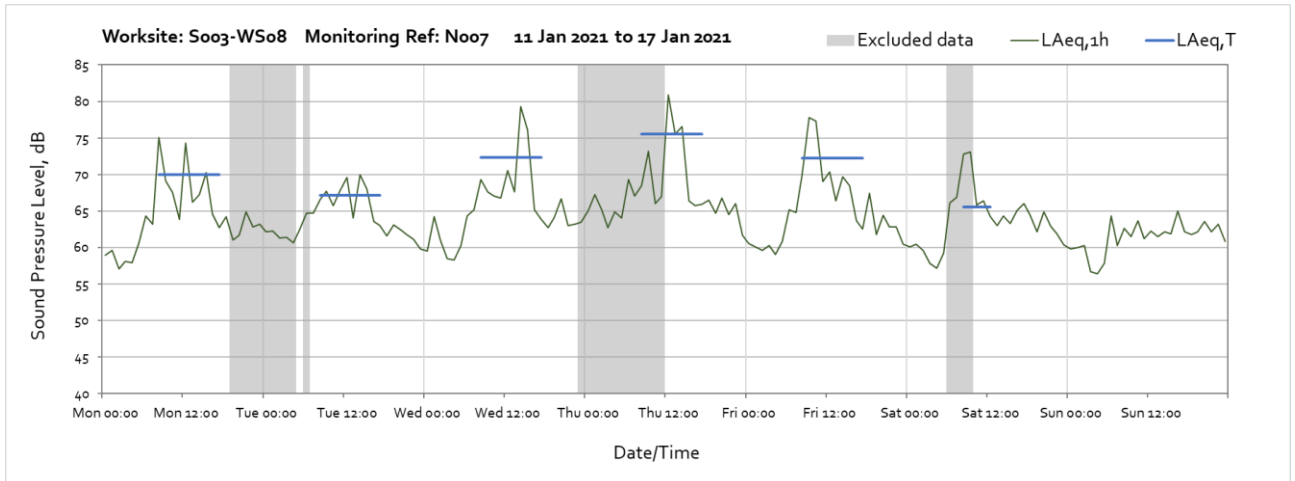
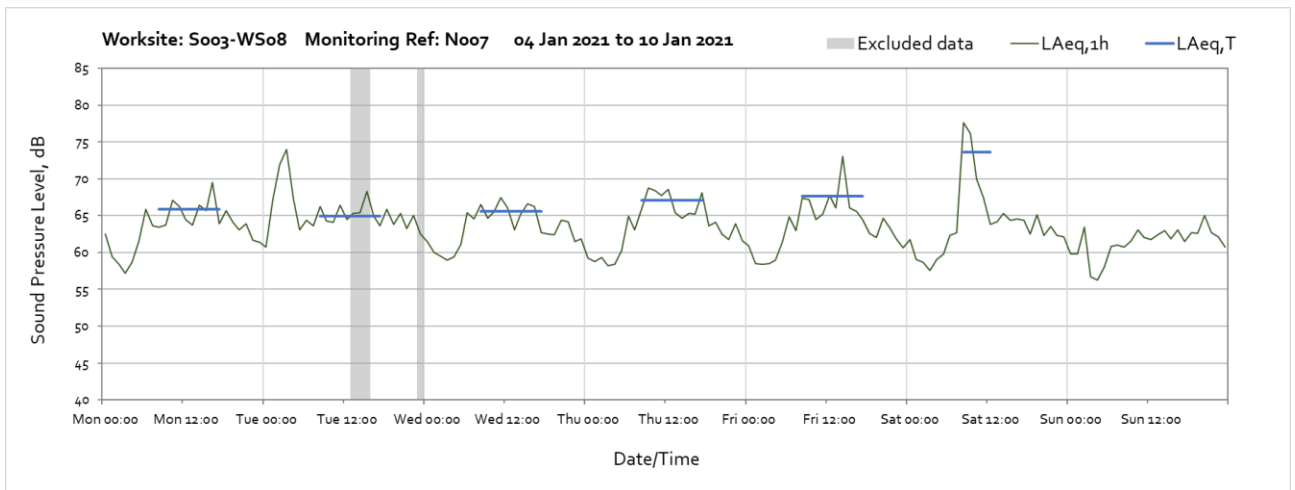


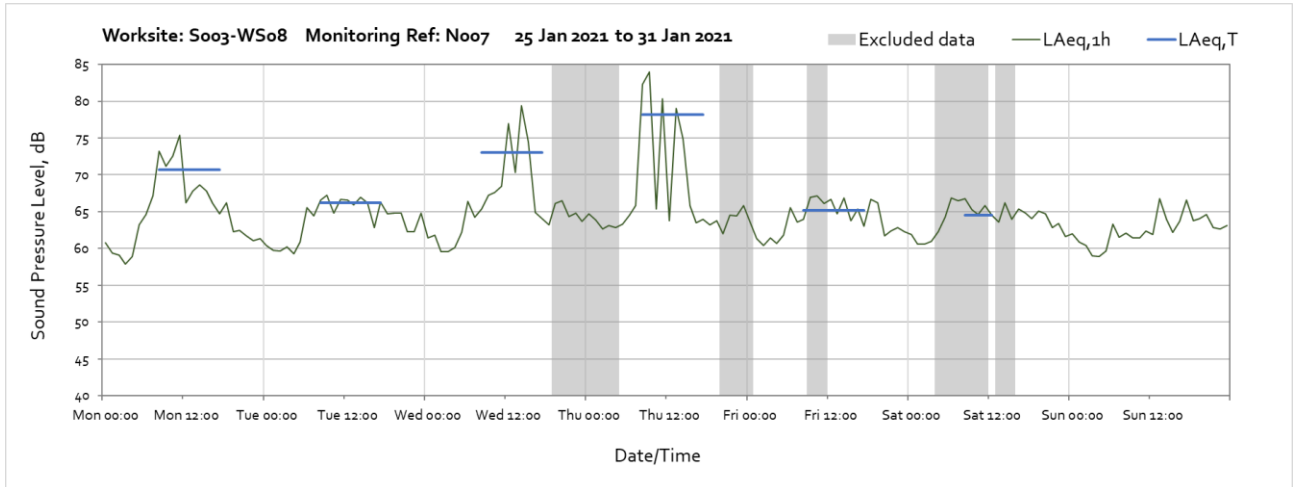
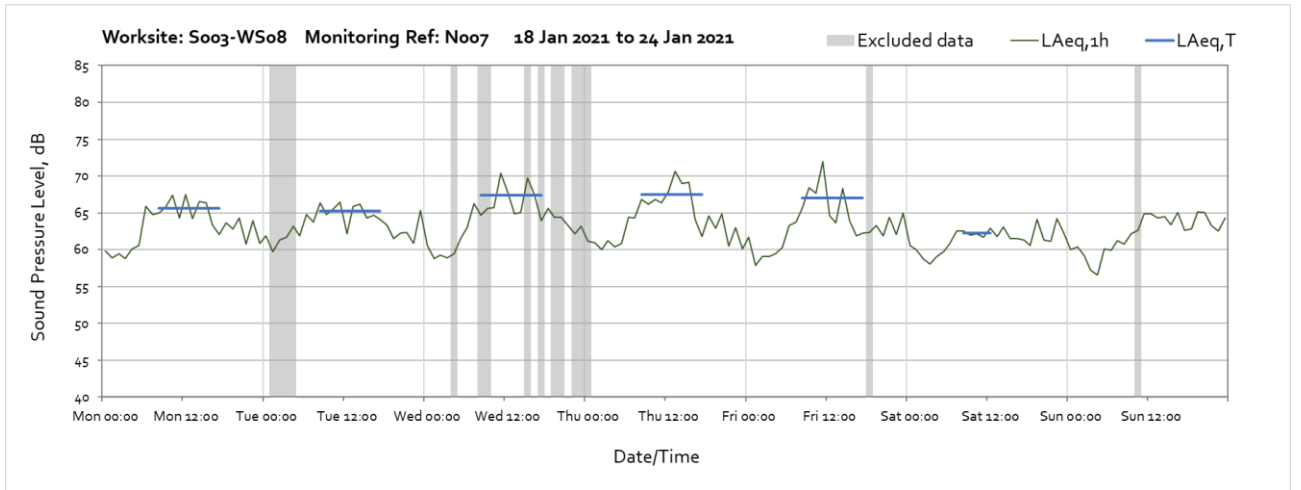


Worksite: S003-WS08 – Monitoring Ref: N007

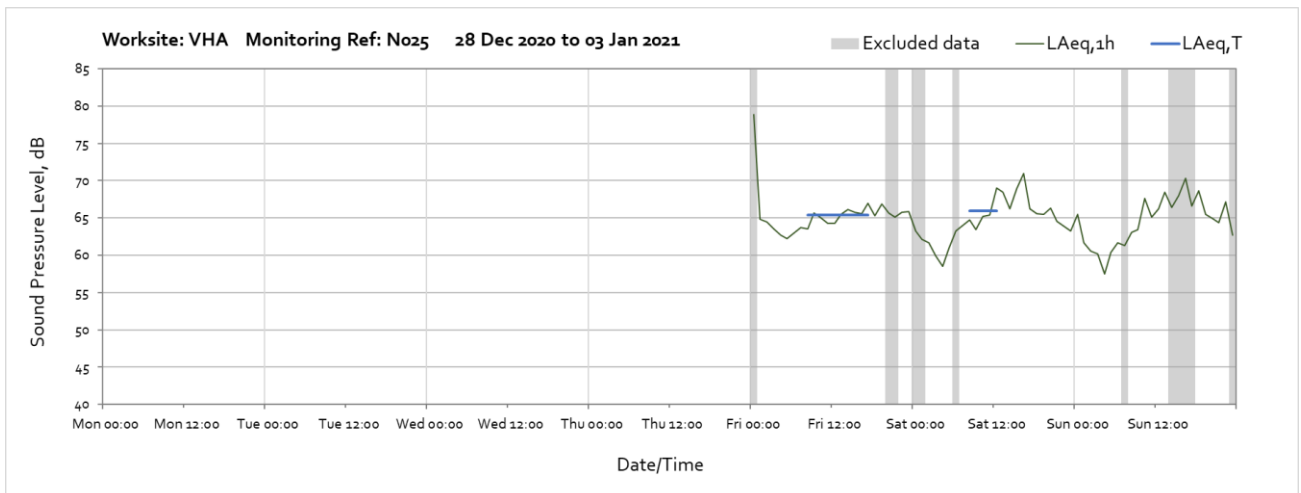


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

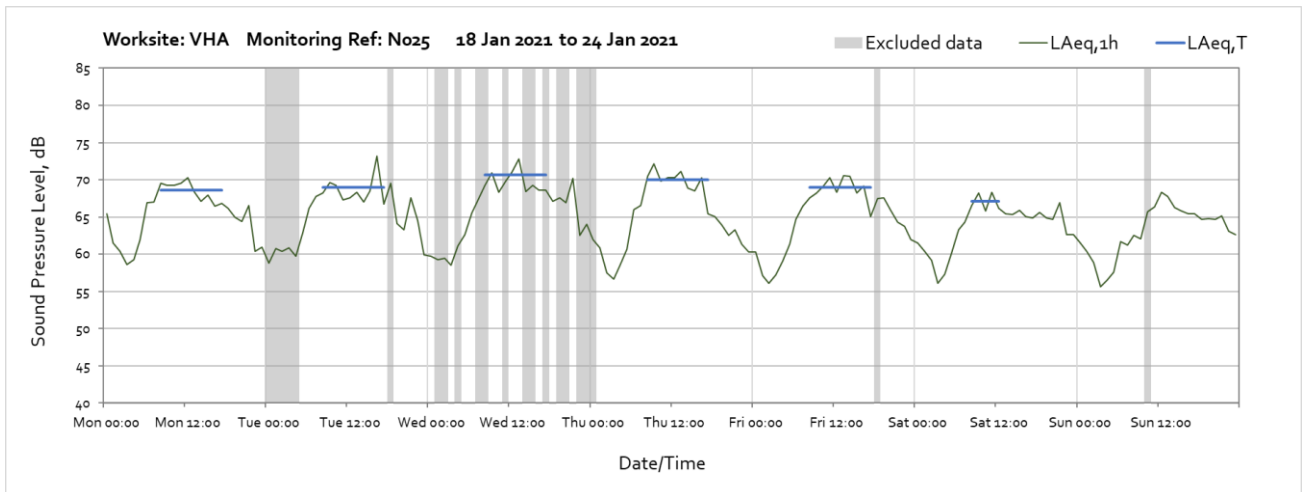
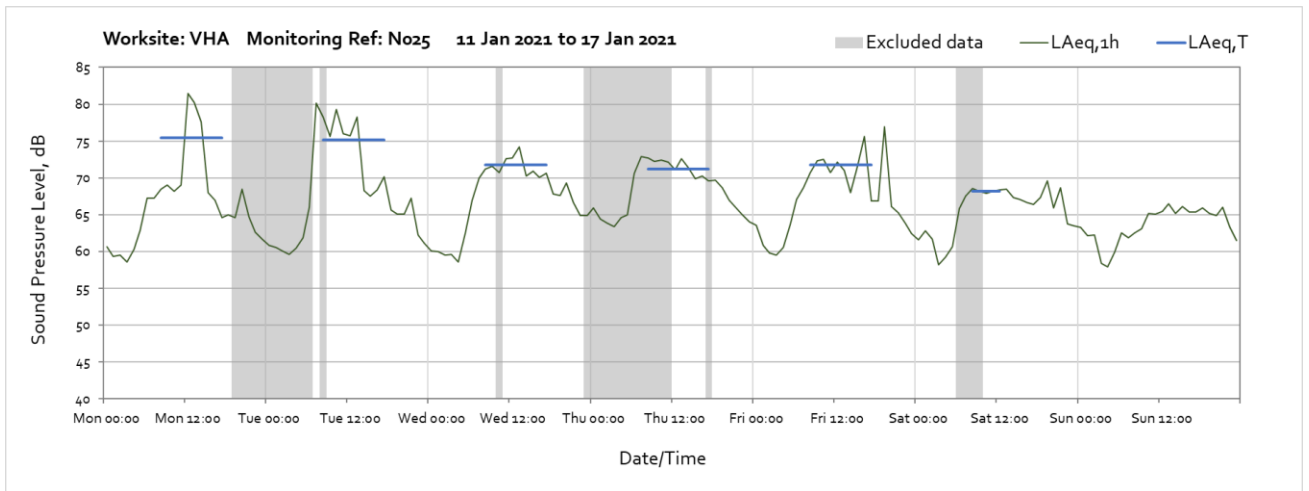
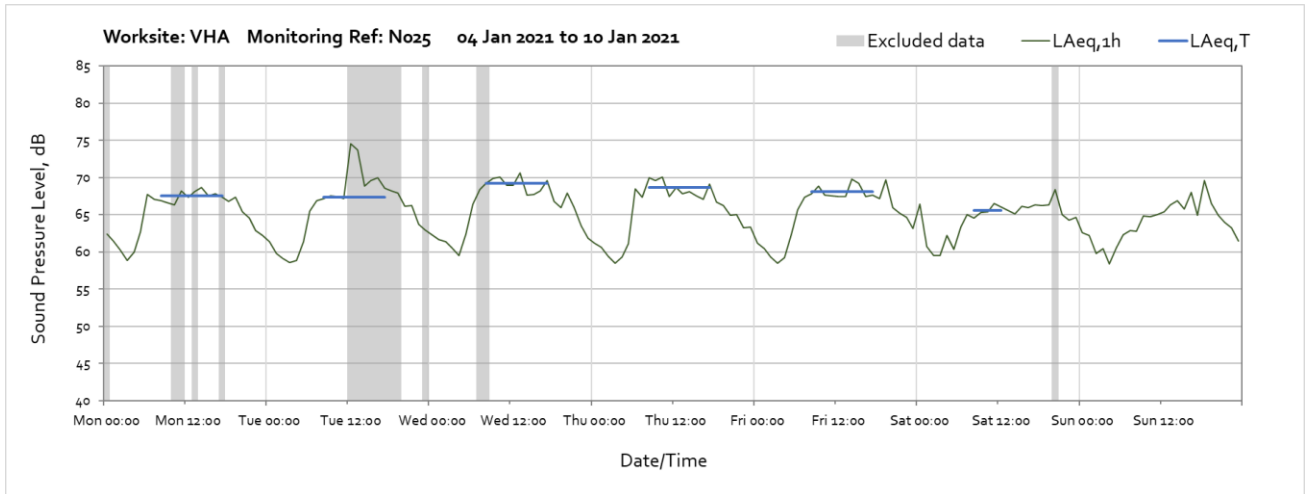


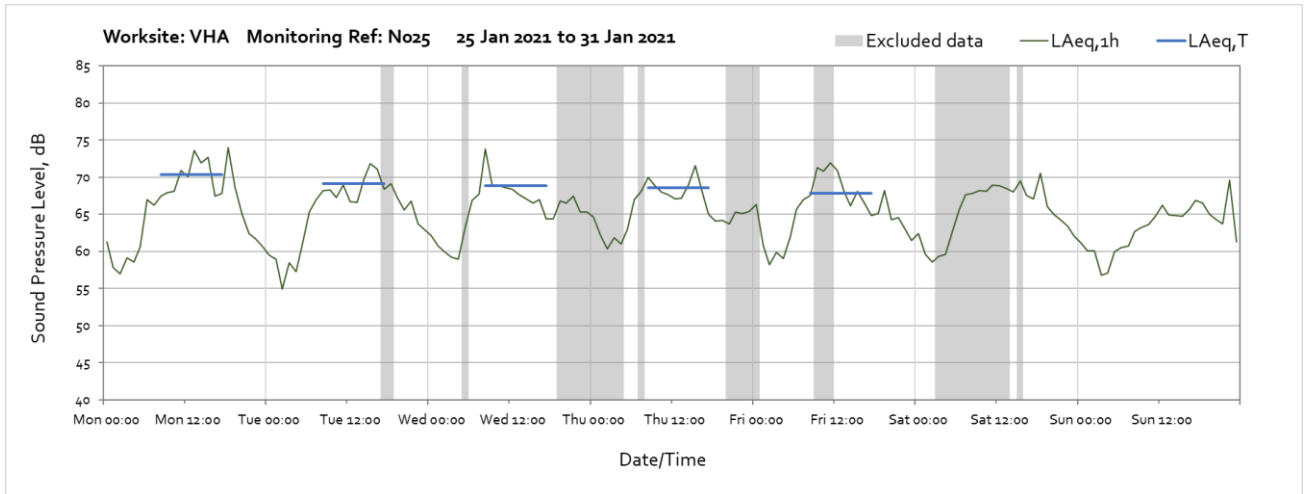


Vehicle Holding Area (VHA) – Monitoring Ref: N025

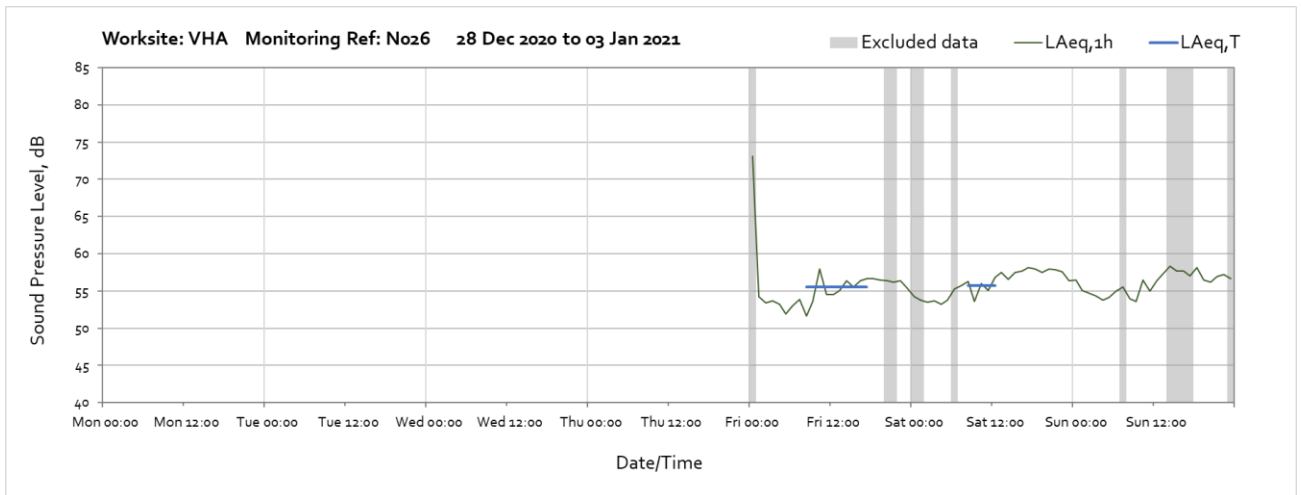


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

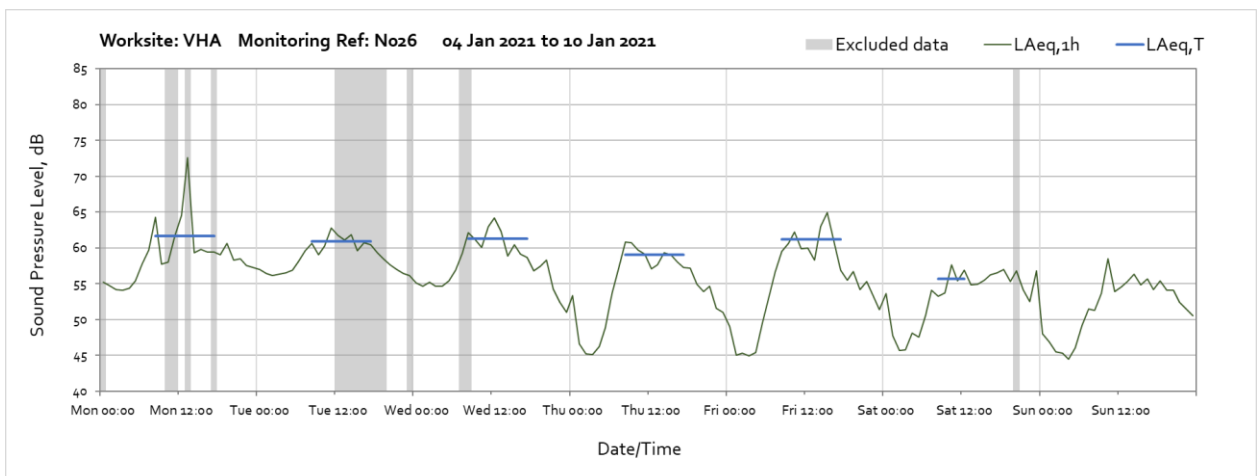


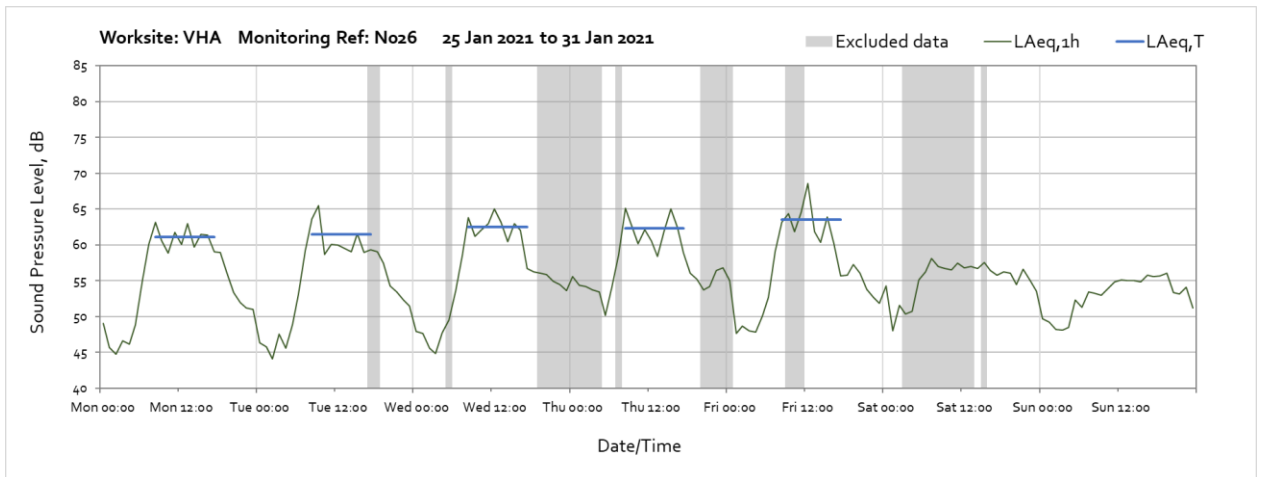
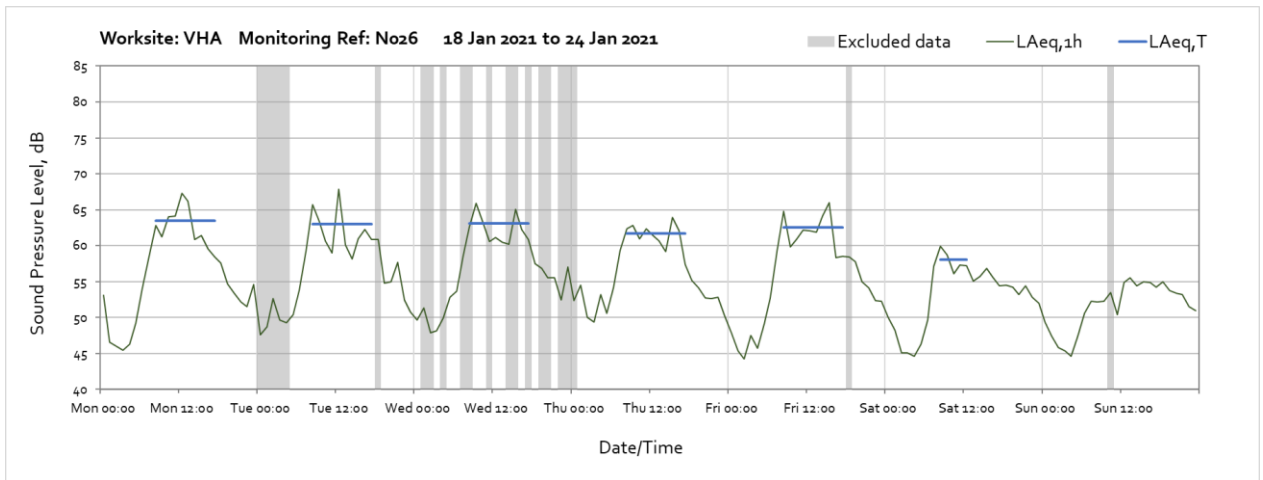
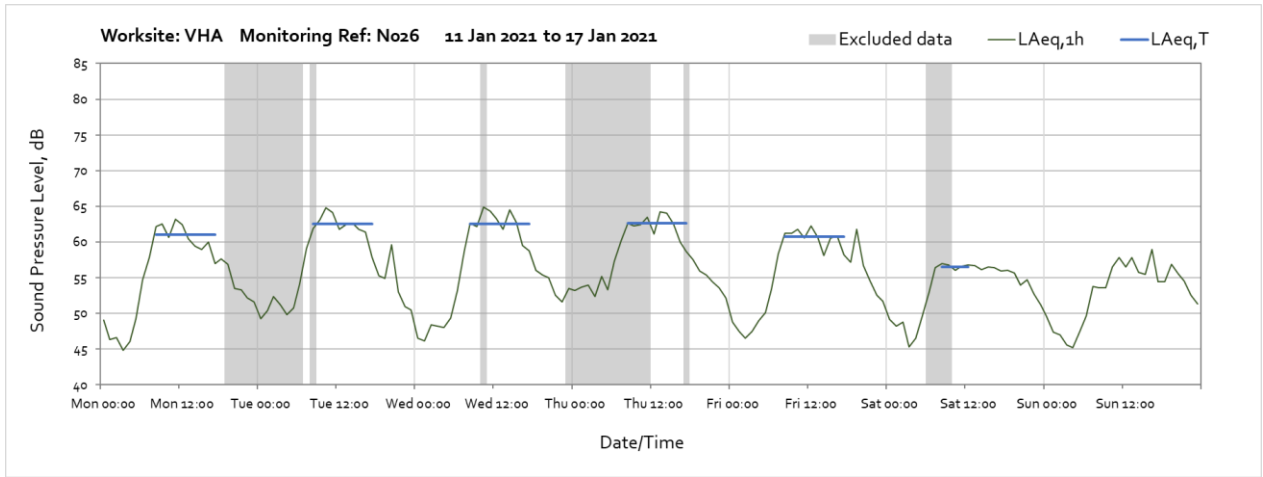


Vehicle Holding Area (VHA) – Monitoring Ref: N026

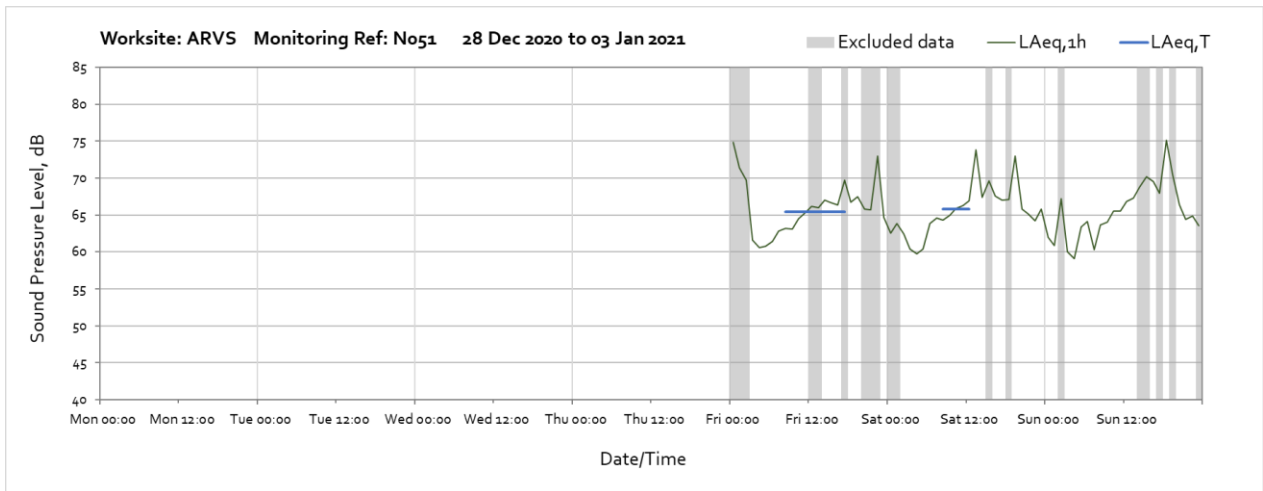


Note: High noise levels on the early hours of the 1st January were due to New Year’s Eve celebrations and have been excluded to calculate values in Table 3.

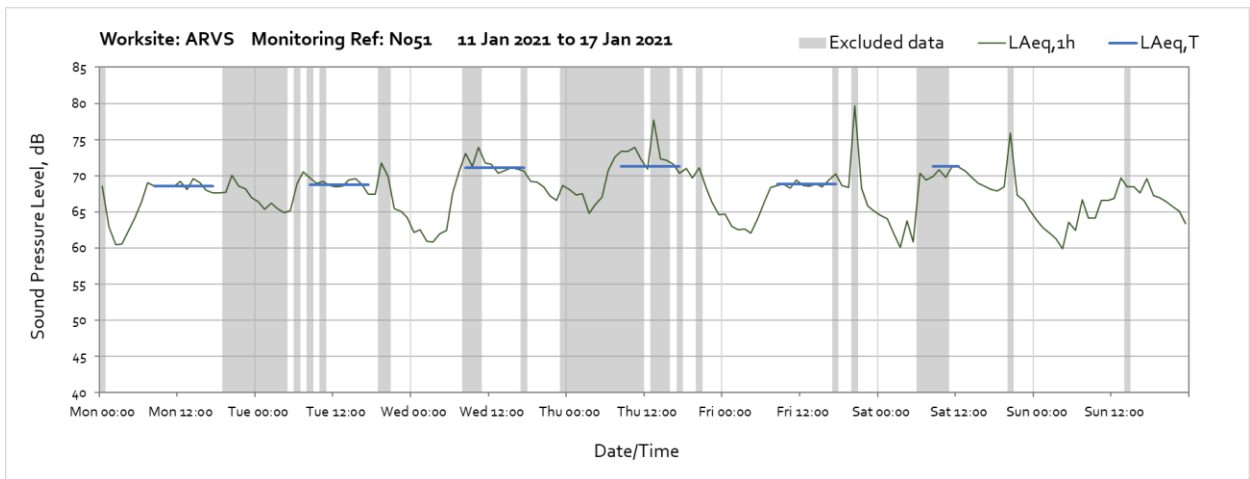
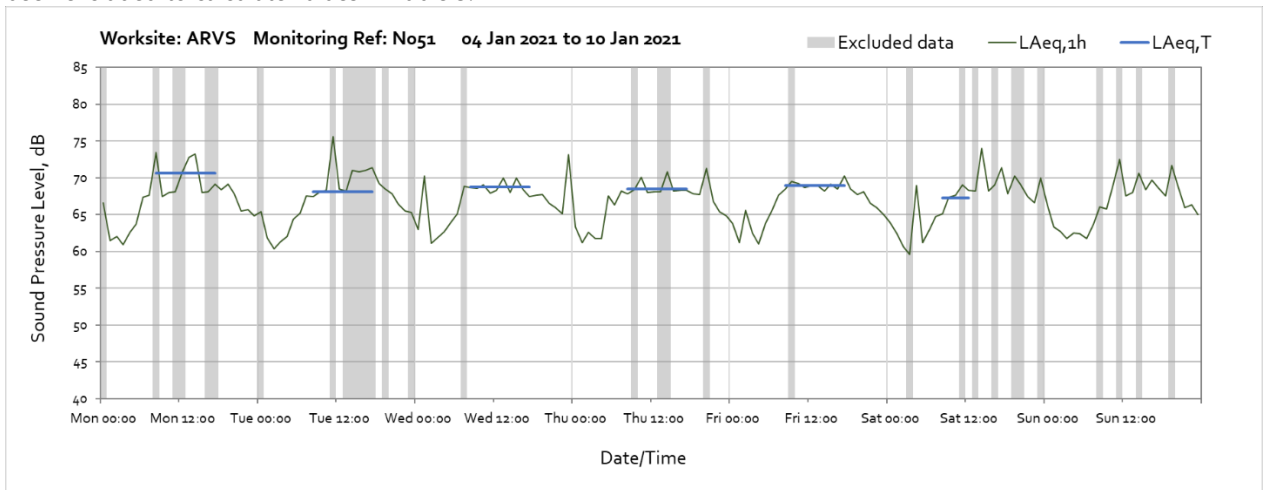


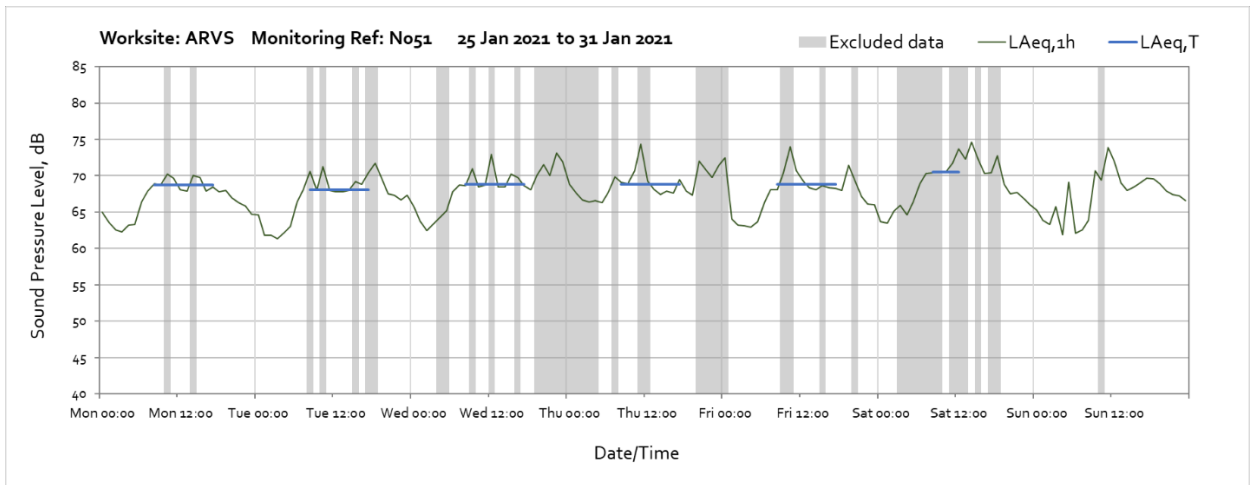
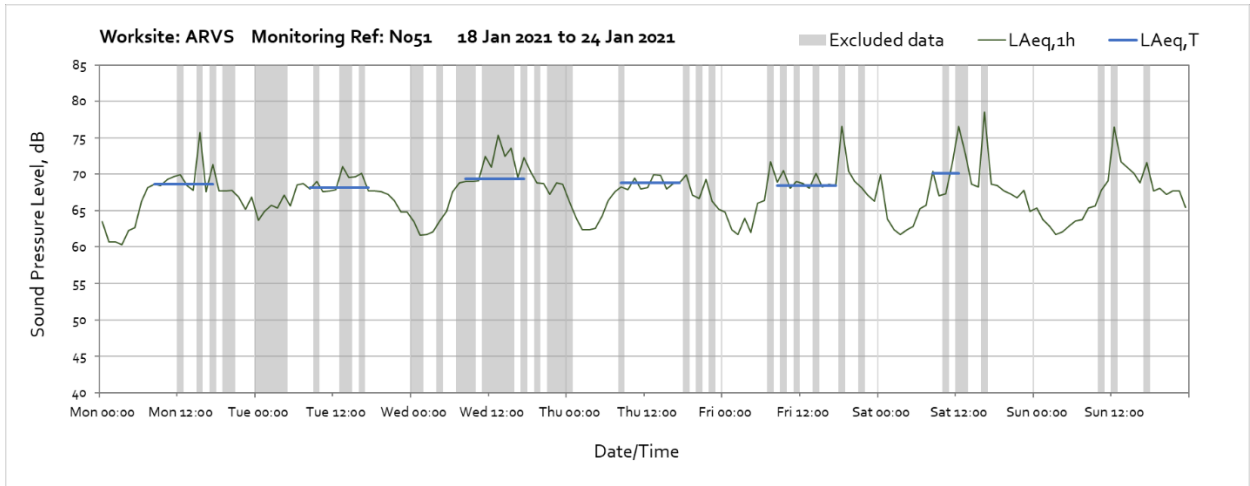


Adelaide Road Ventilation Shaft (ARVS) – Monitoring Ref: N051

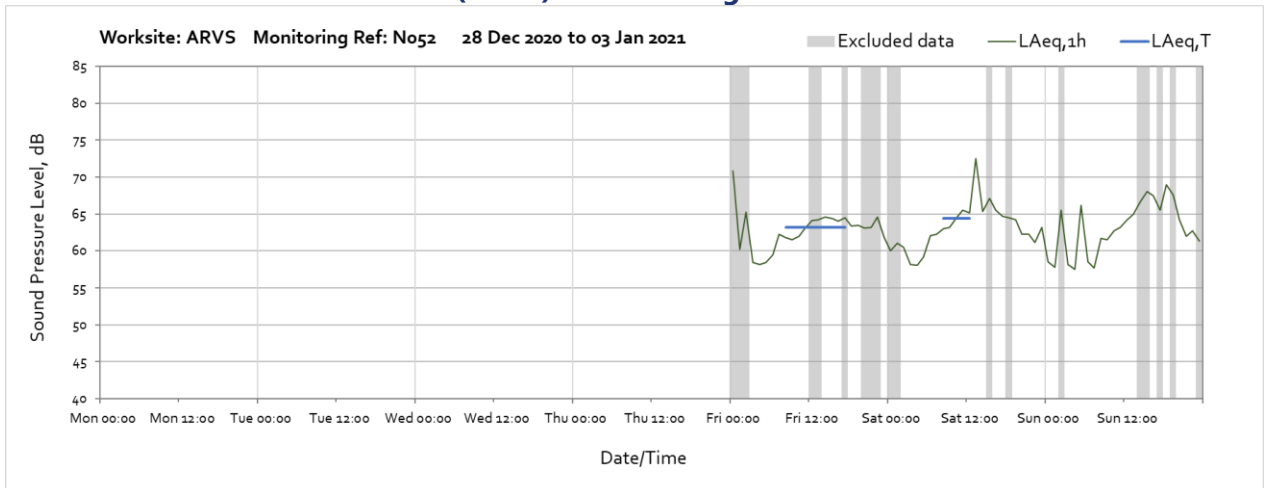


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

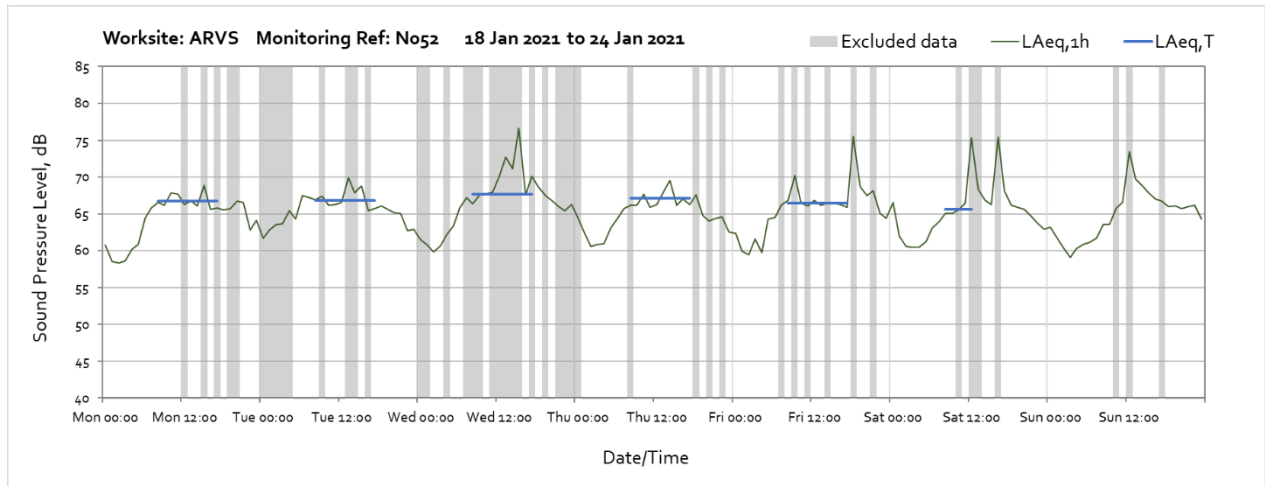
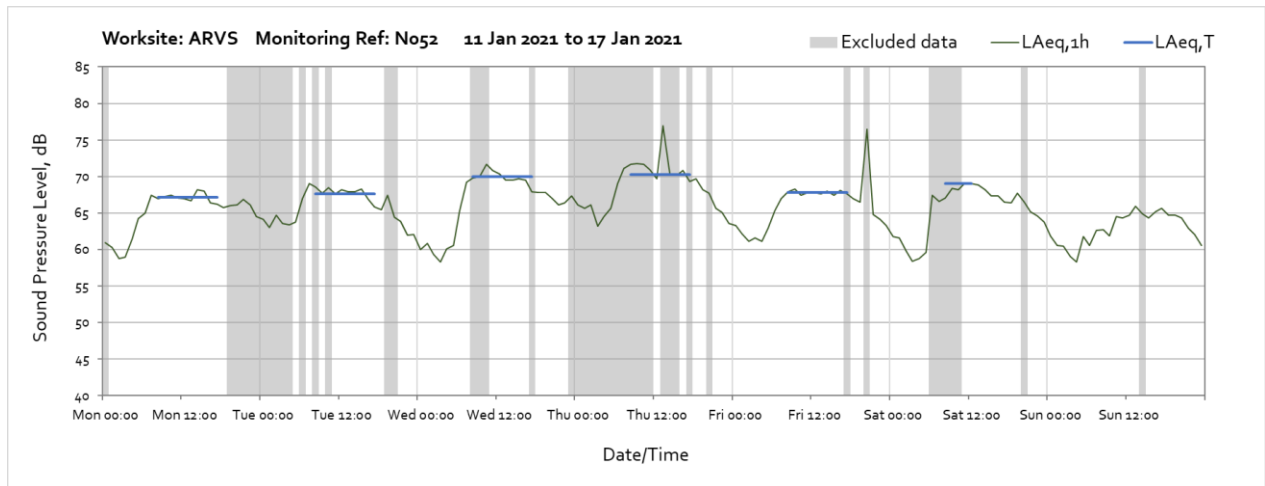
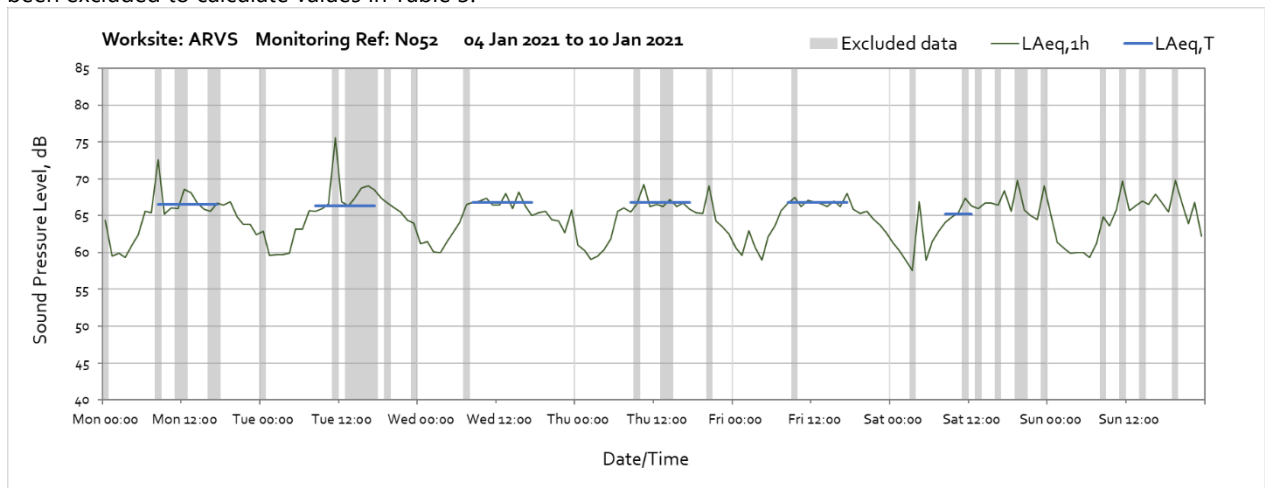


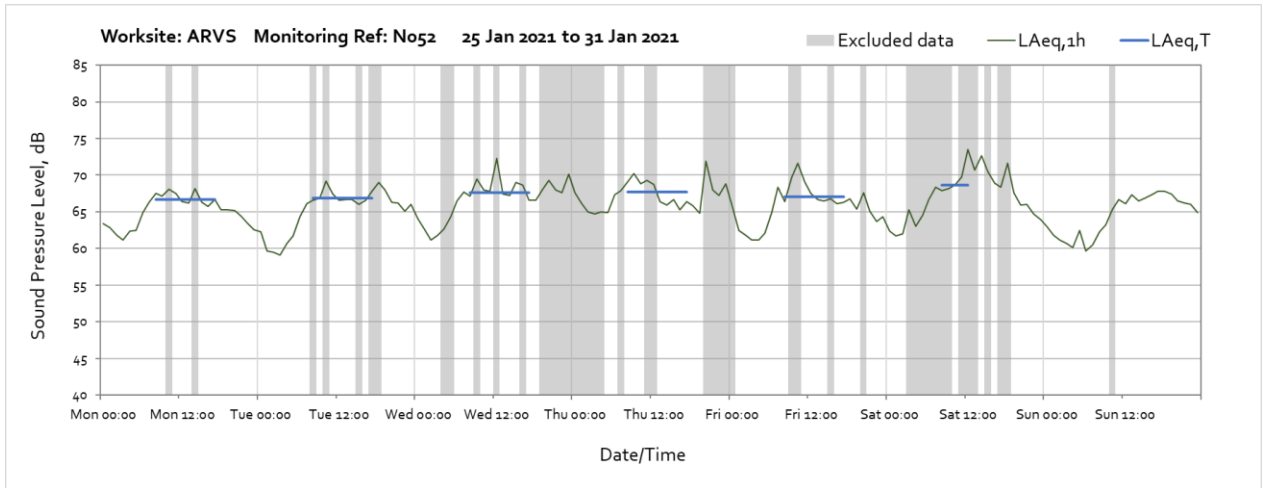


Adelaide Road Ventilation Shaft (ARVS) – Monitoring Ref: N052



Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 3.

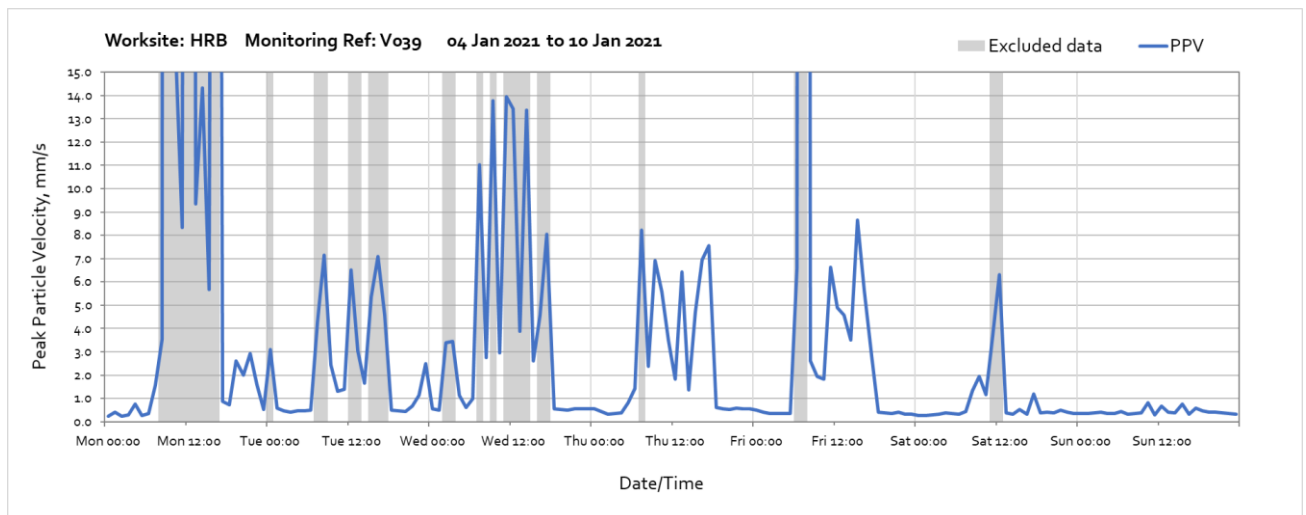
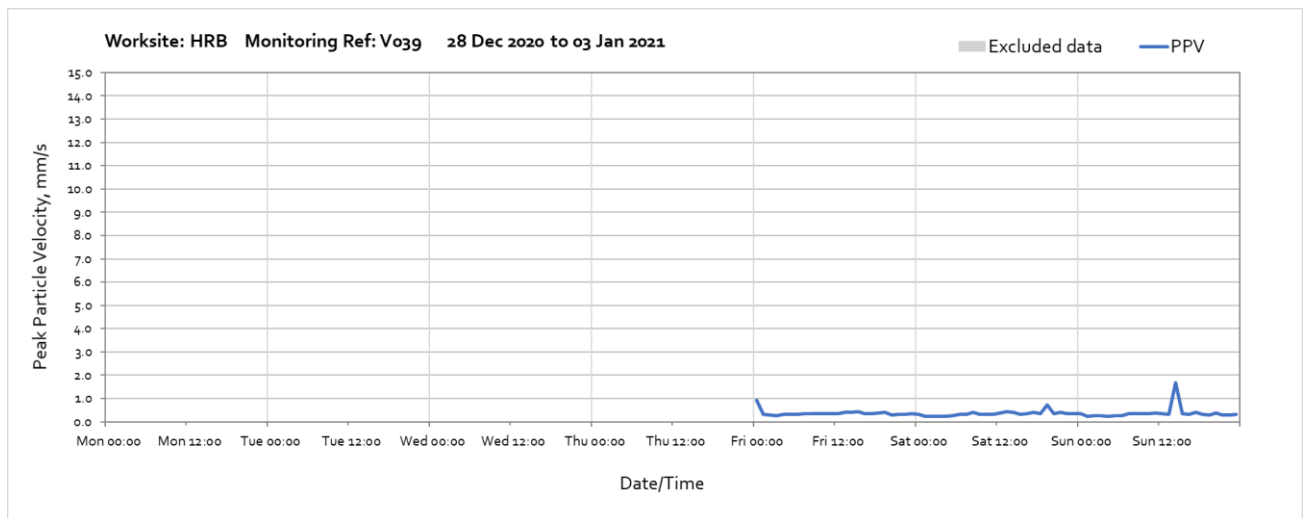




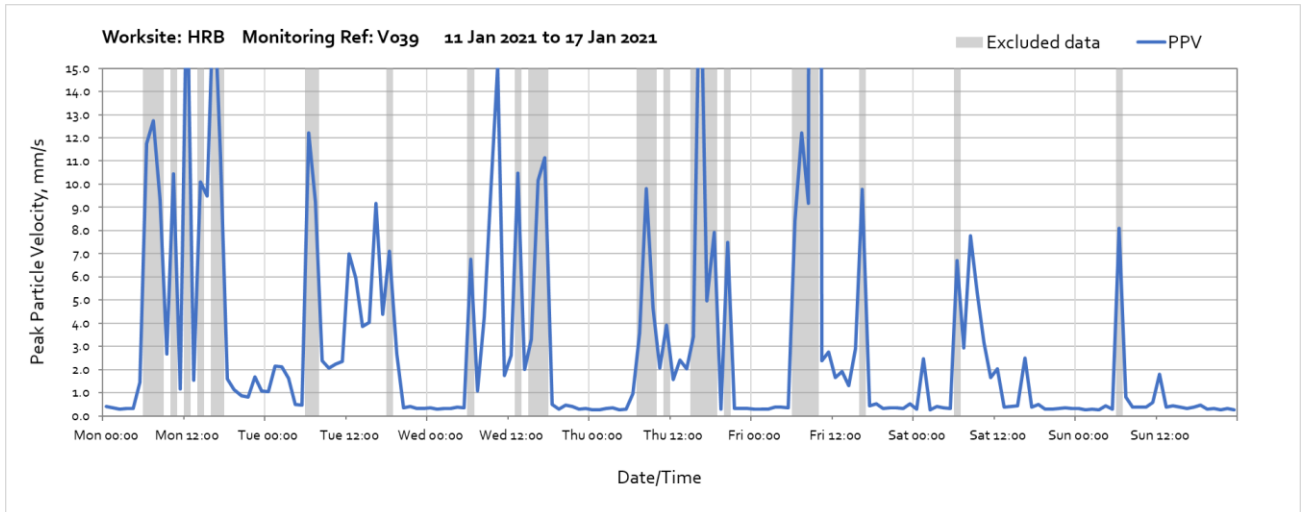
Vibration

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. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative of HS2 construction works, these values have been greyed out in the following charts and have been excluded to calculate values in Table 4 of the main report.

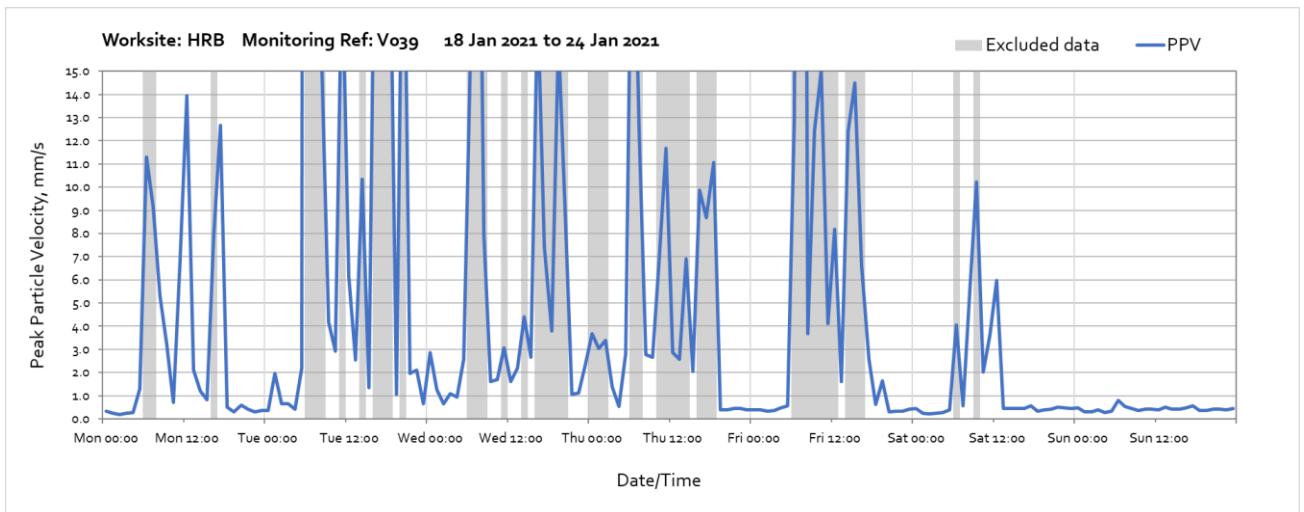
Worksite: HRB – Monitoring Ref: V039



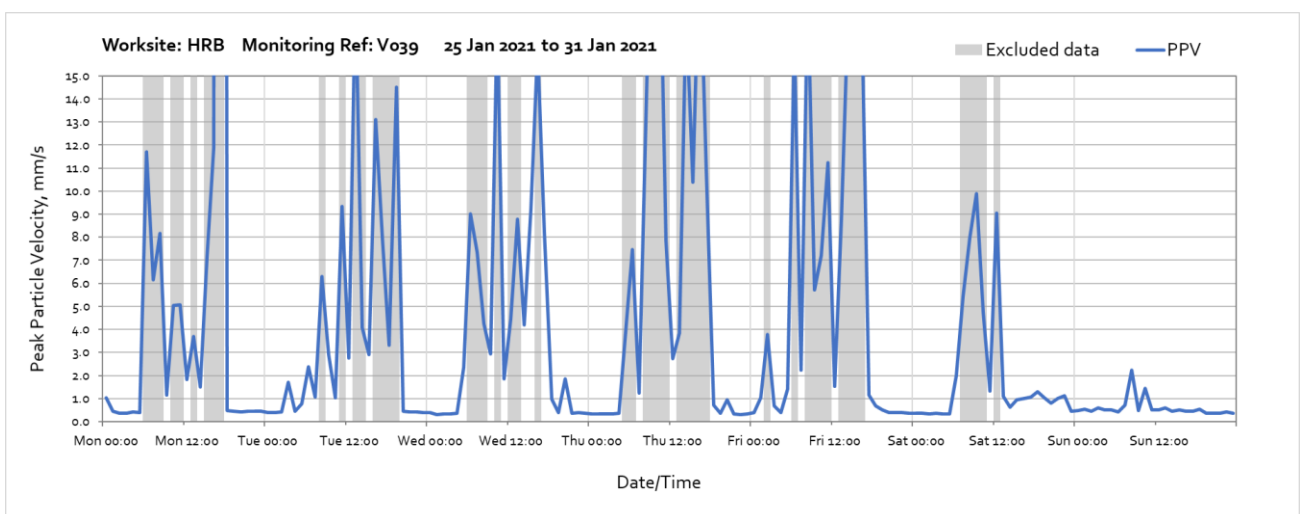
Note: High vibration levels measured throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels at the nearest receptor.



Note: High vibration levels measured throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels at the nearest receptor.



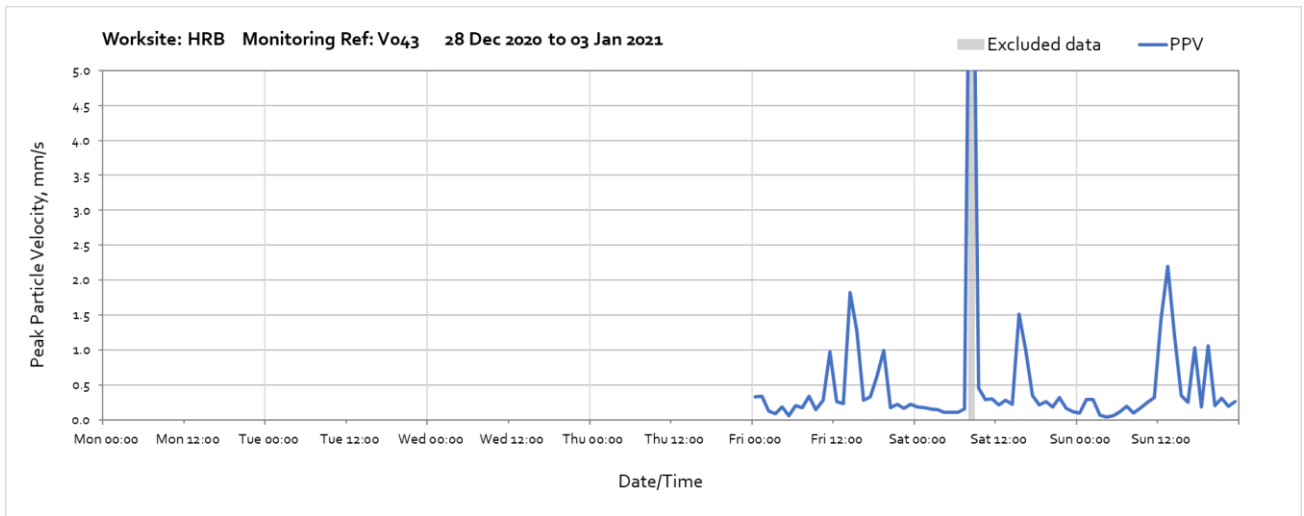
Note: High vibration levels measured throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels at the nearest receptor.



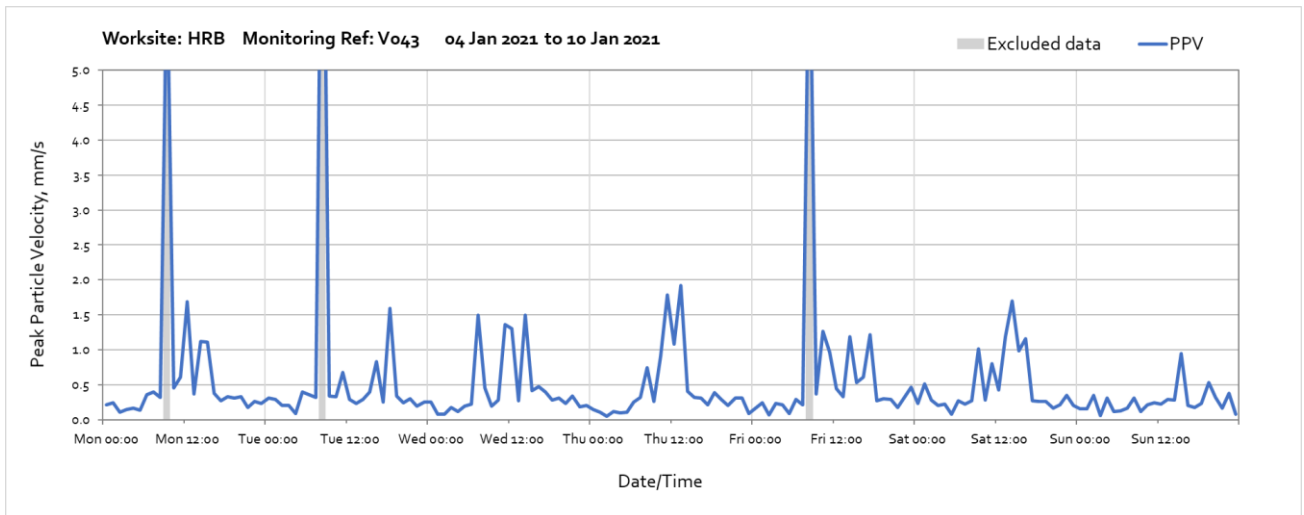
Note: High vibration levels measured throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels at the nearest receptor.

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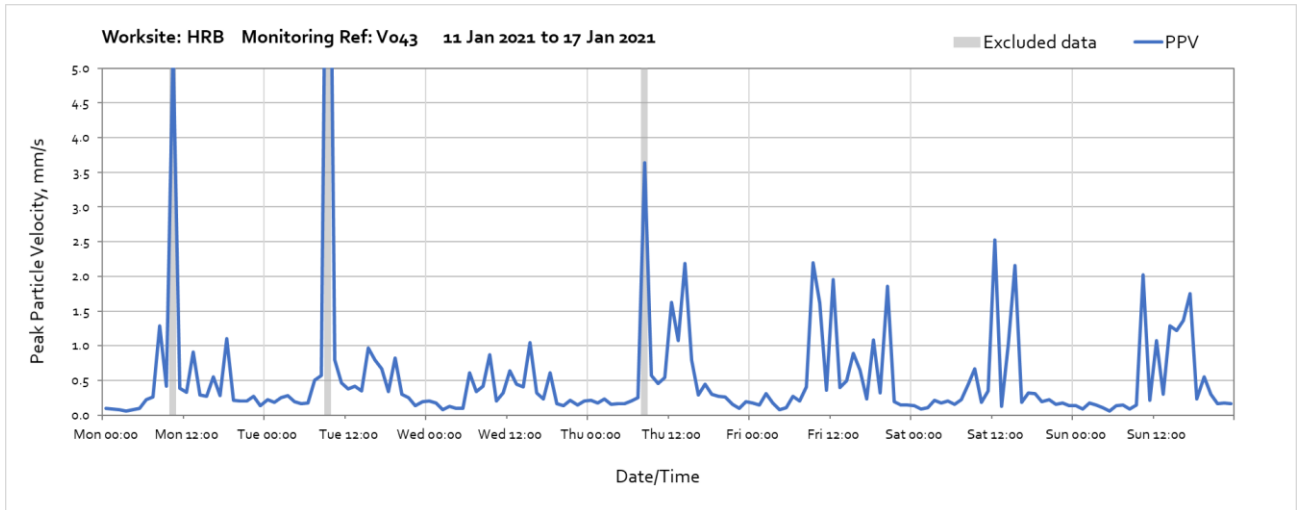
Worksite: HRB – Monitoring Ref: V043



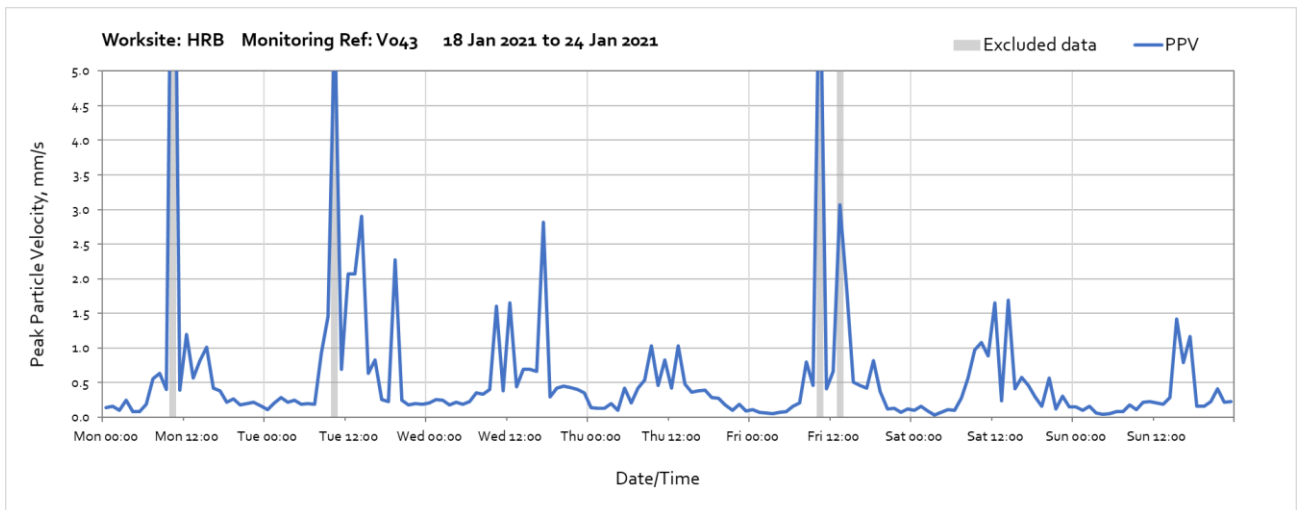
Note: High vibration levels measured at 08:00 on Saturday 2nd January were due to use of the nearby residential bin store and are not representative of HS2 vibration levels.



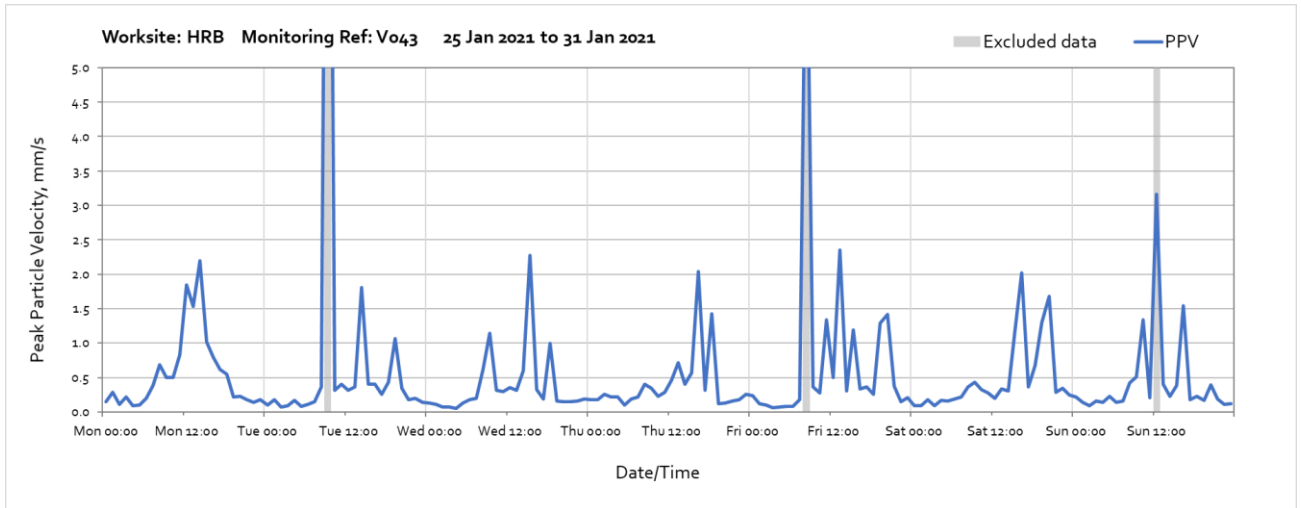
Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and are not representative of HS2 vibration levels.



Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels.

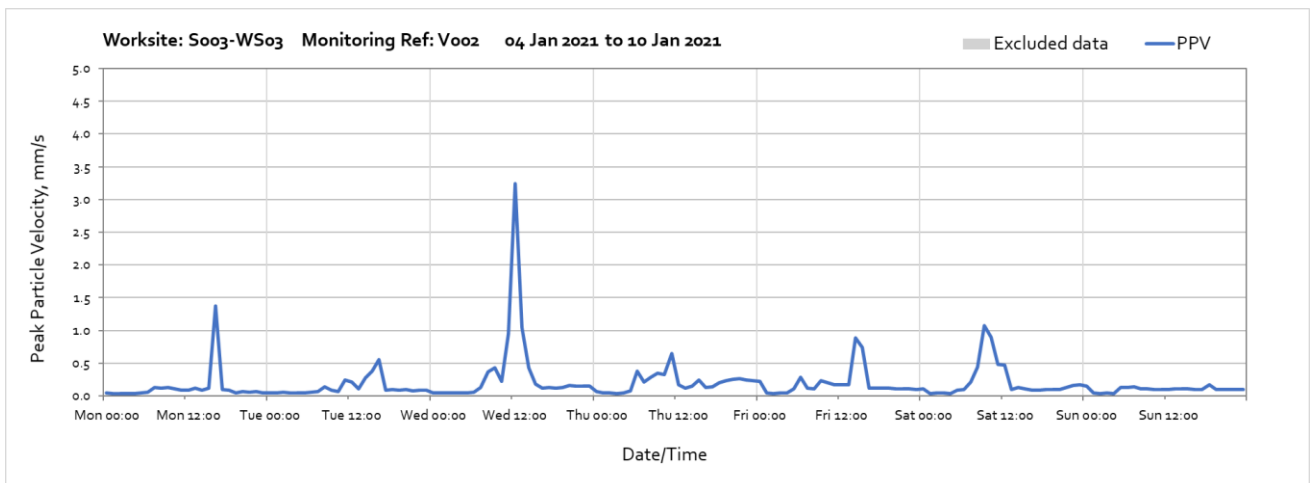
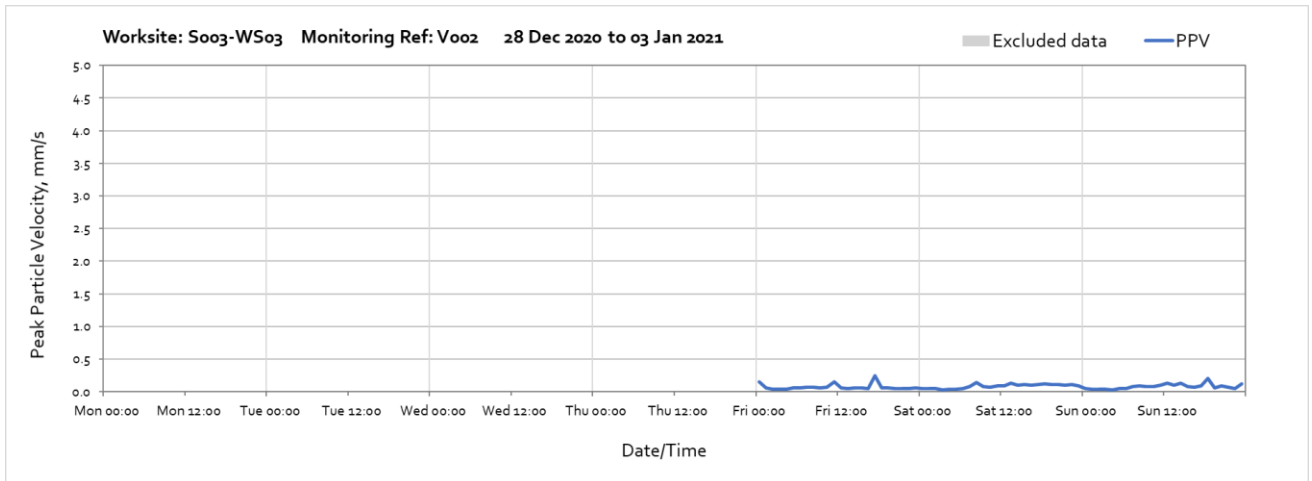


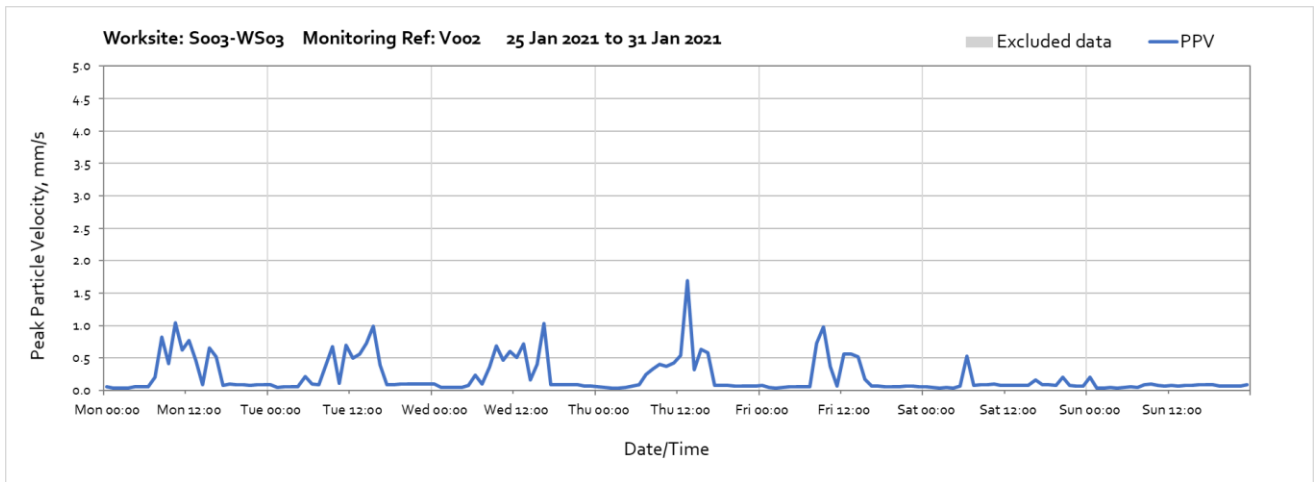
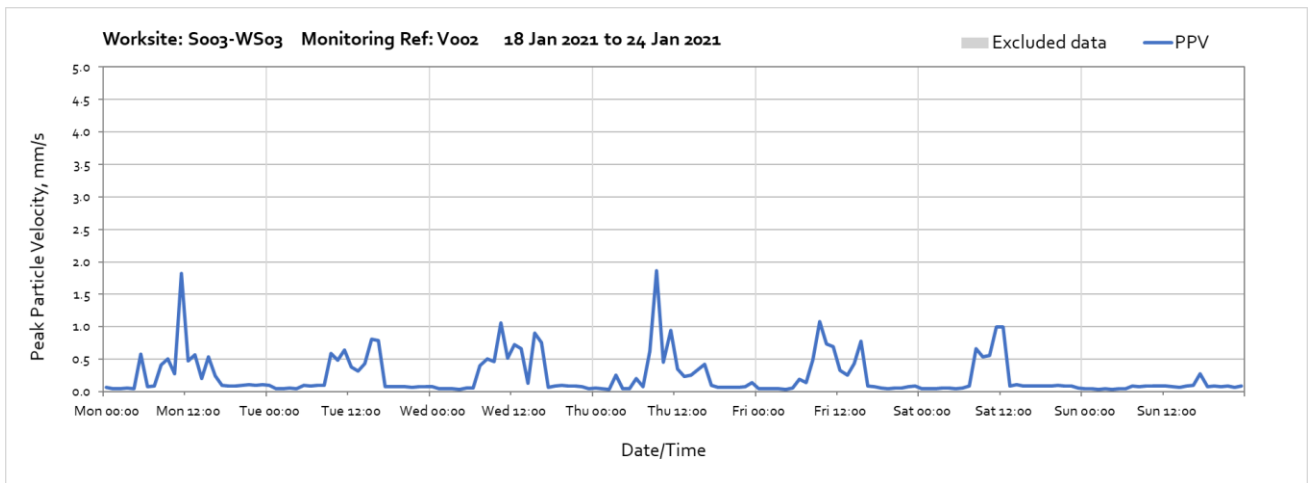
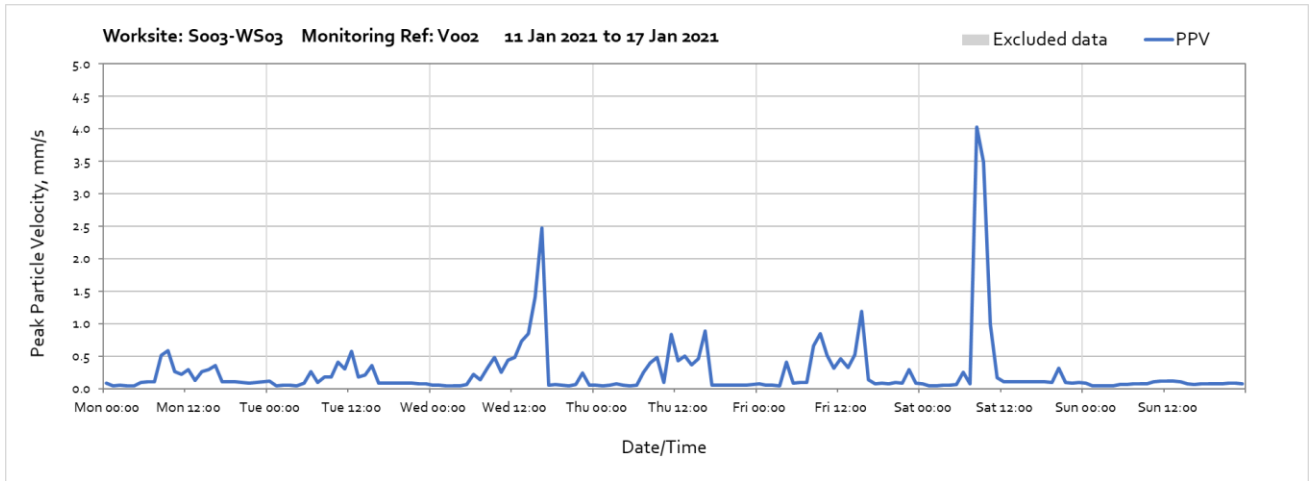
Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels.



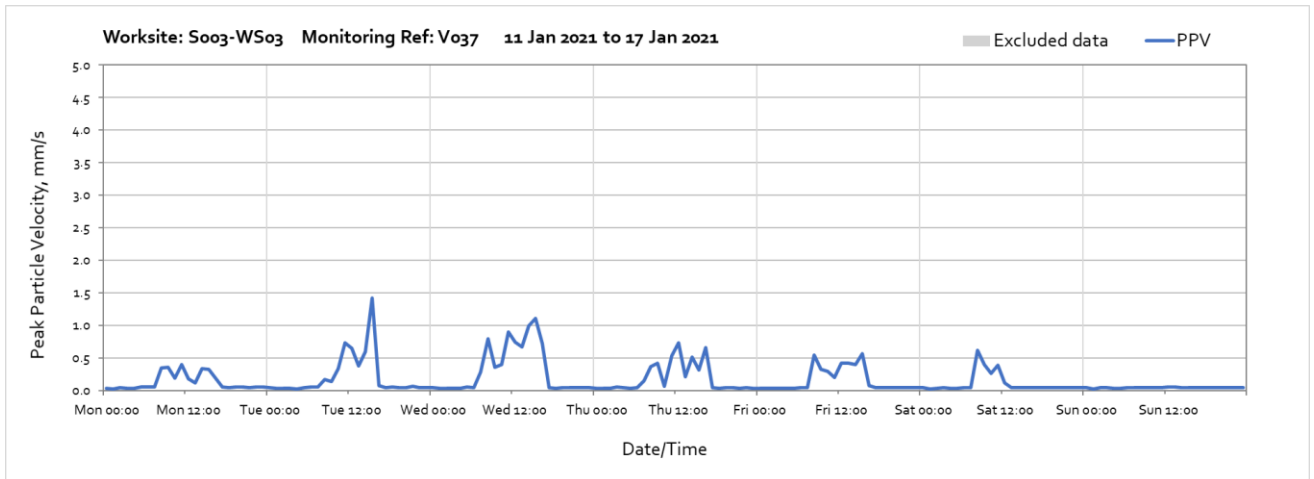
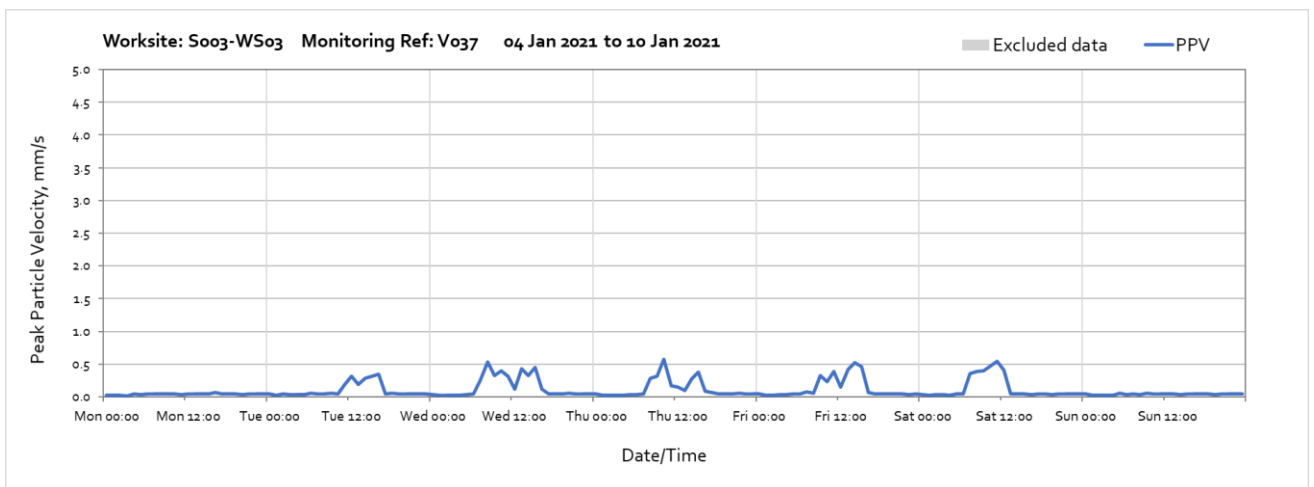
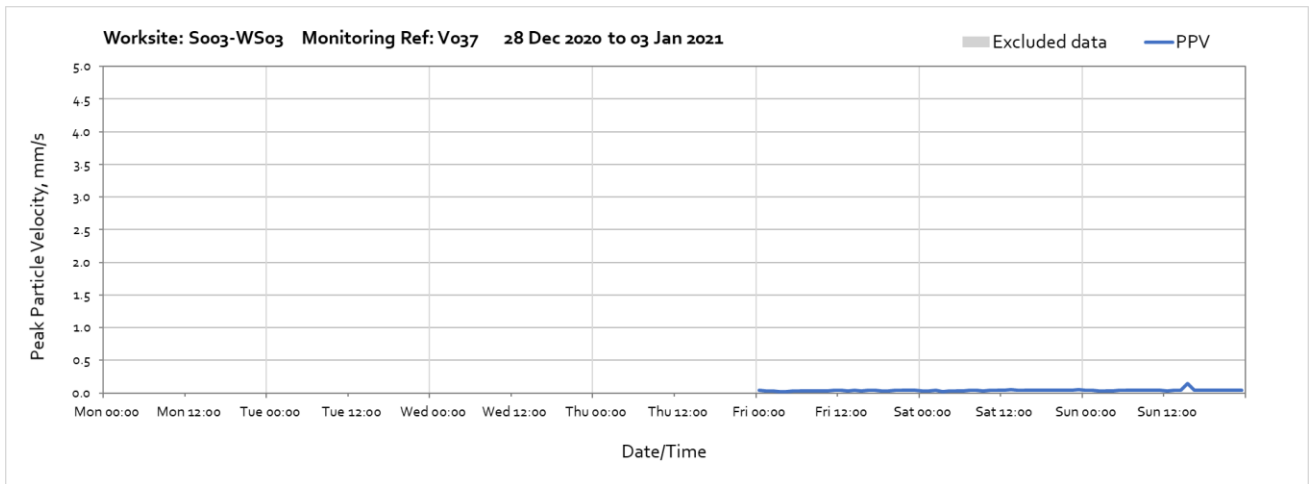
Note: High vibration levels measured throughout the week were due to the use of the nearby residential bin store and local interference of the monitor and are not representative of HS2 vibration levels.

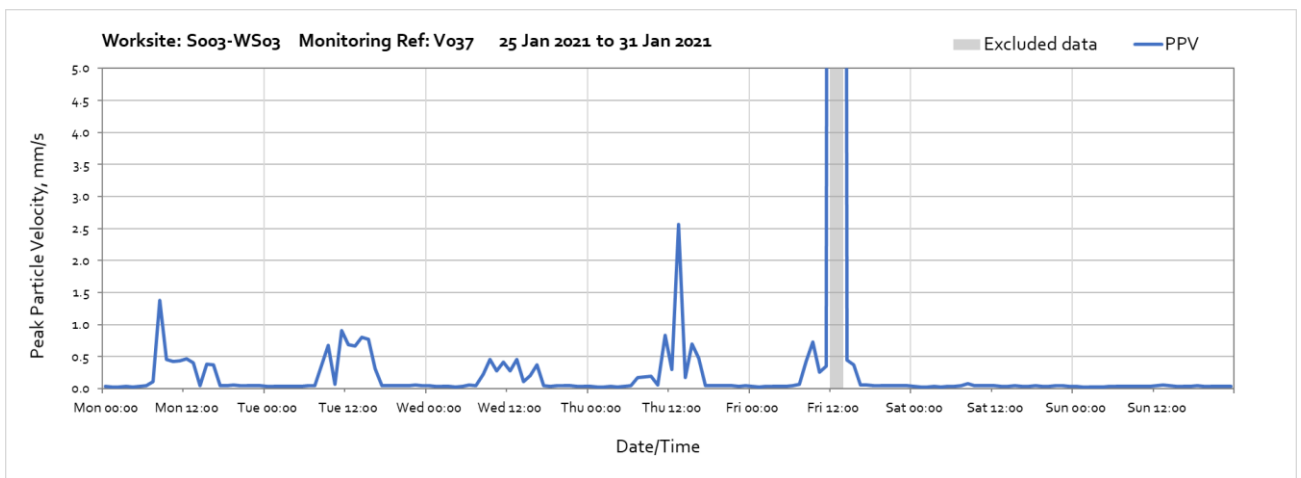
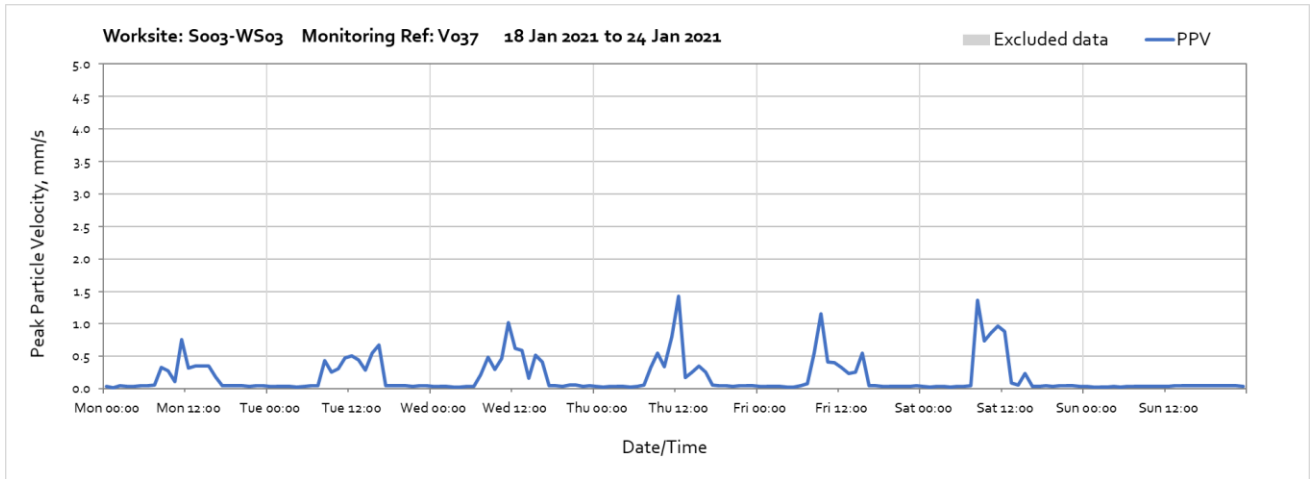
Worksite: S003-WS03 – Monitoring Ref: V002





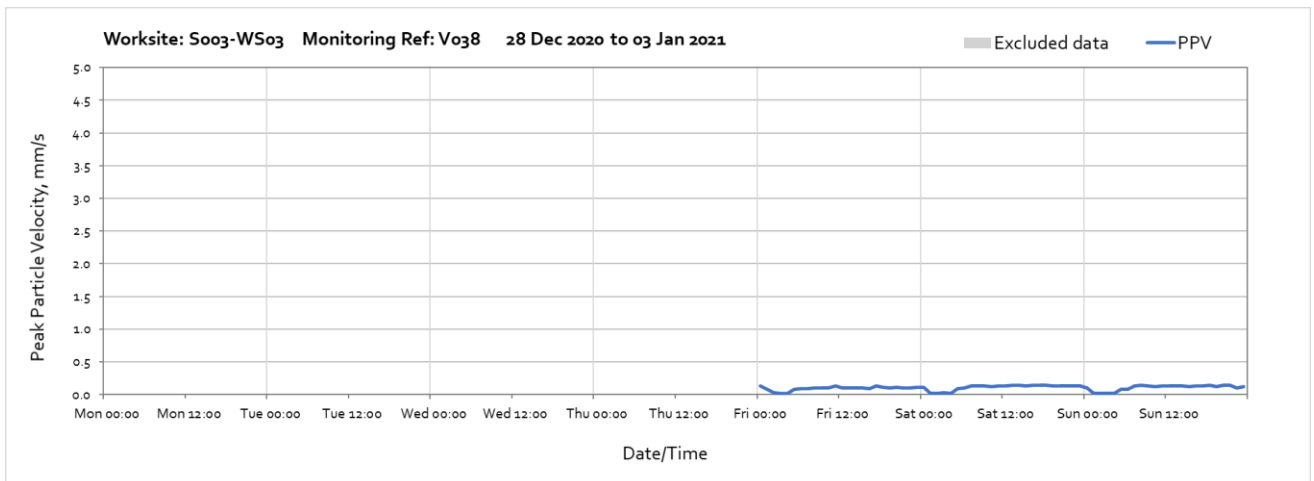
Worksite: S003-WS03 – Monitoring Ref: V037

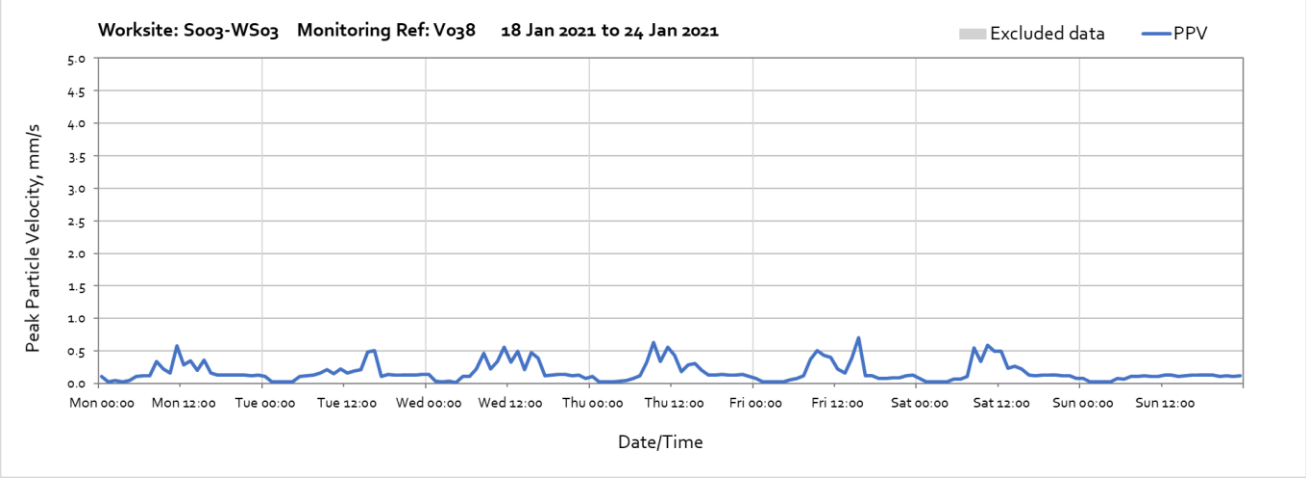
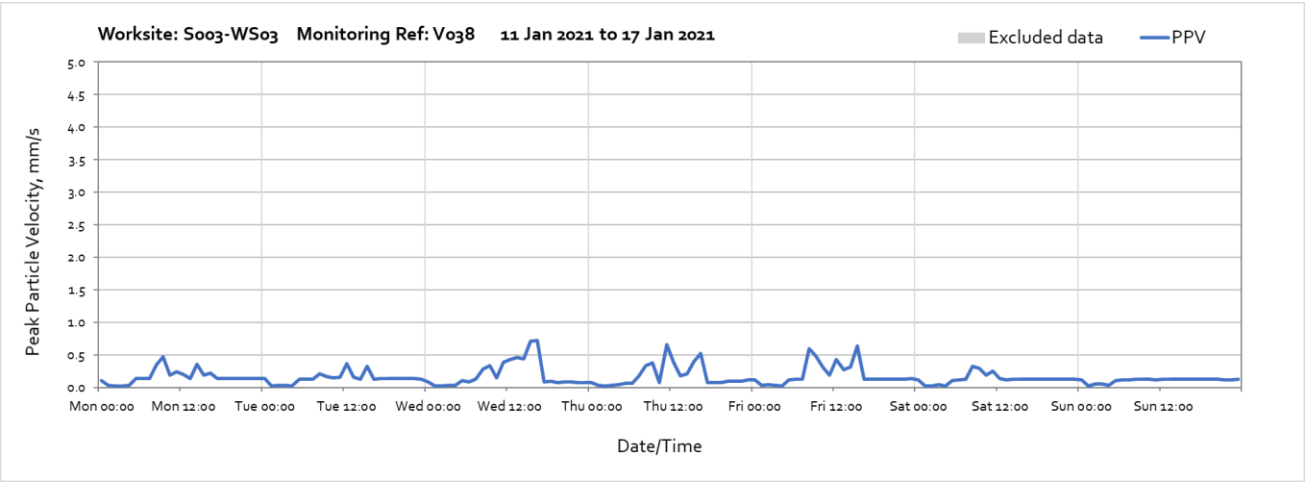
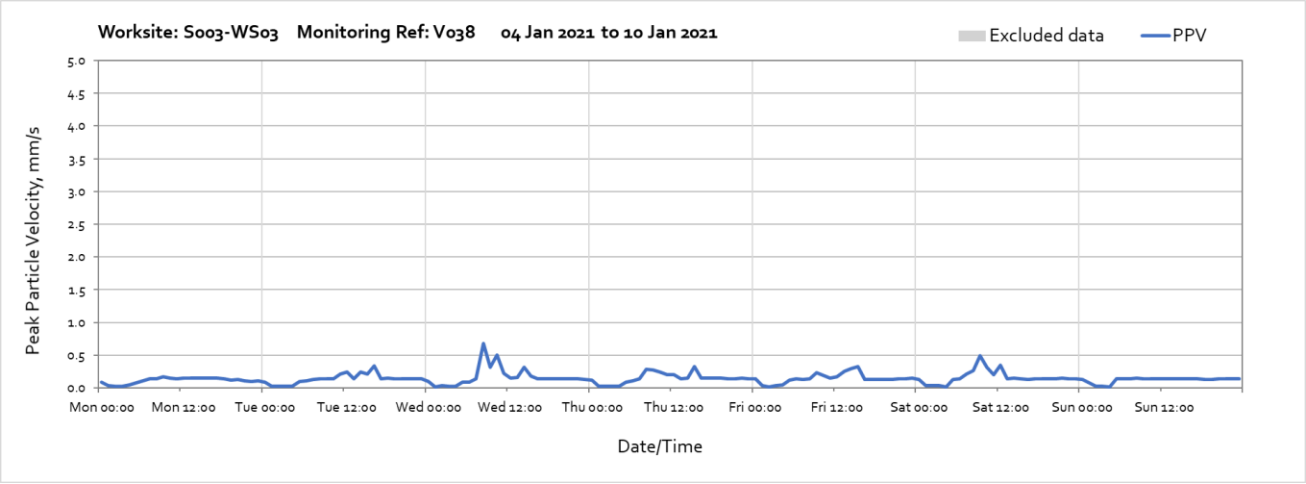


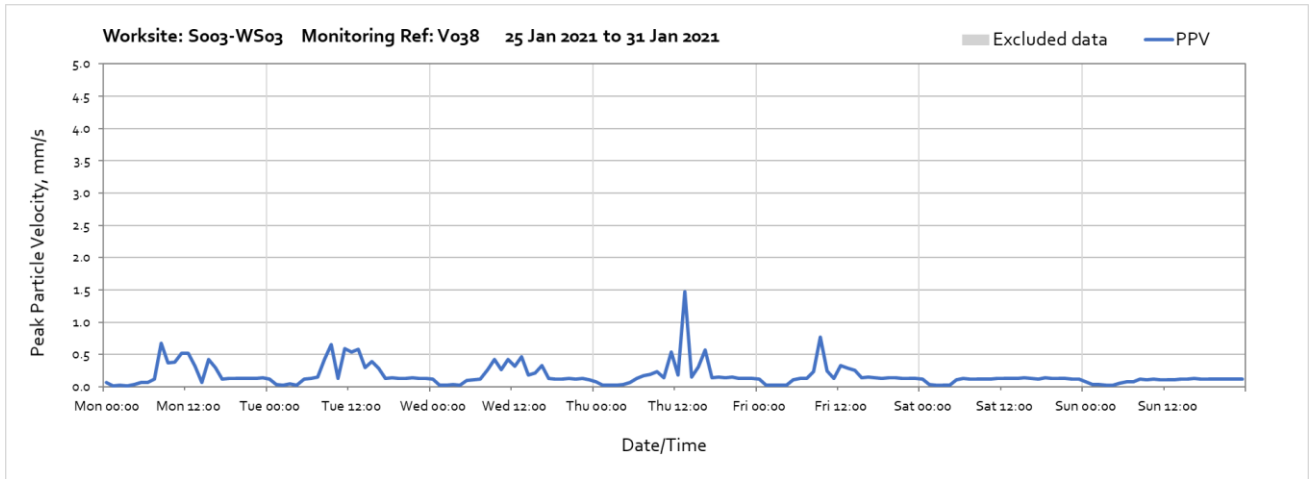


Note: High vibraton levels measured between 12:00 and 13:00 on Friday 29th January were due to local disturbance of the monitor during maintenance of the monitoring station and are not representative of HS2 vibraton levels.

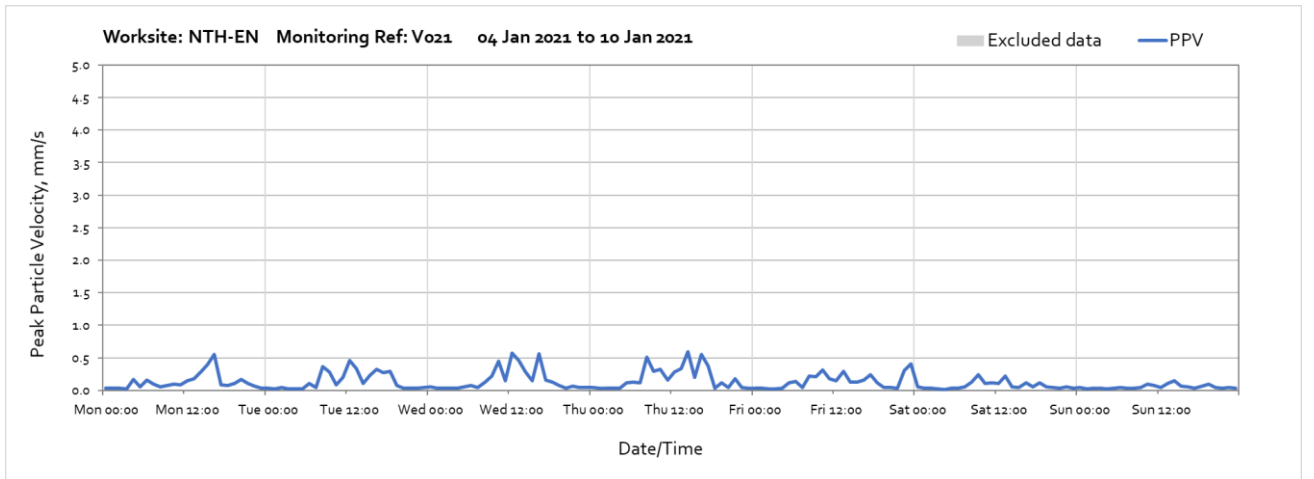
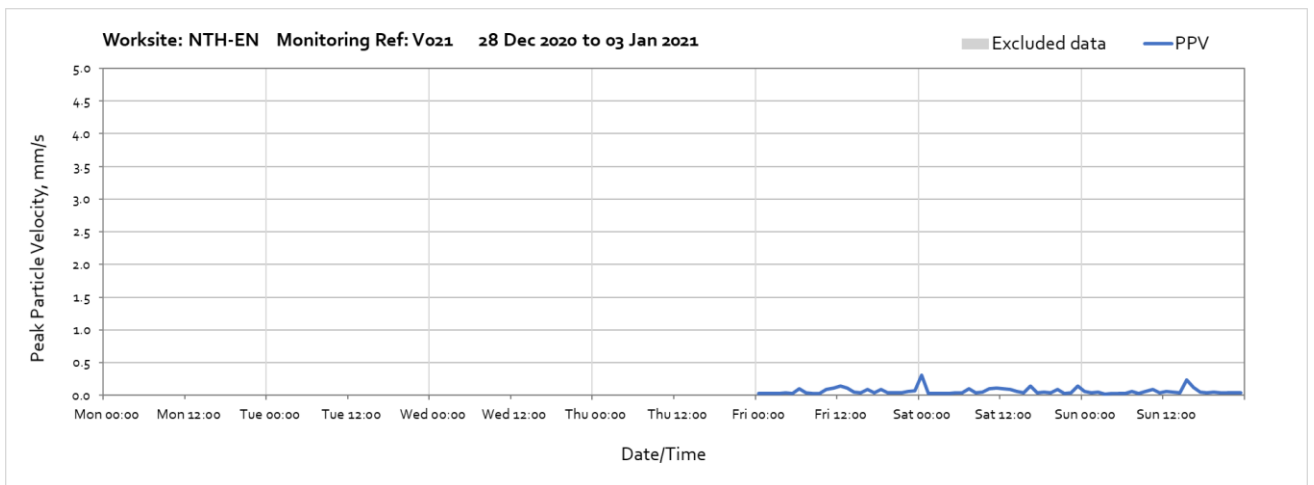
Worksite: S003-WS03 – Monitoring Ref: V038

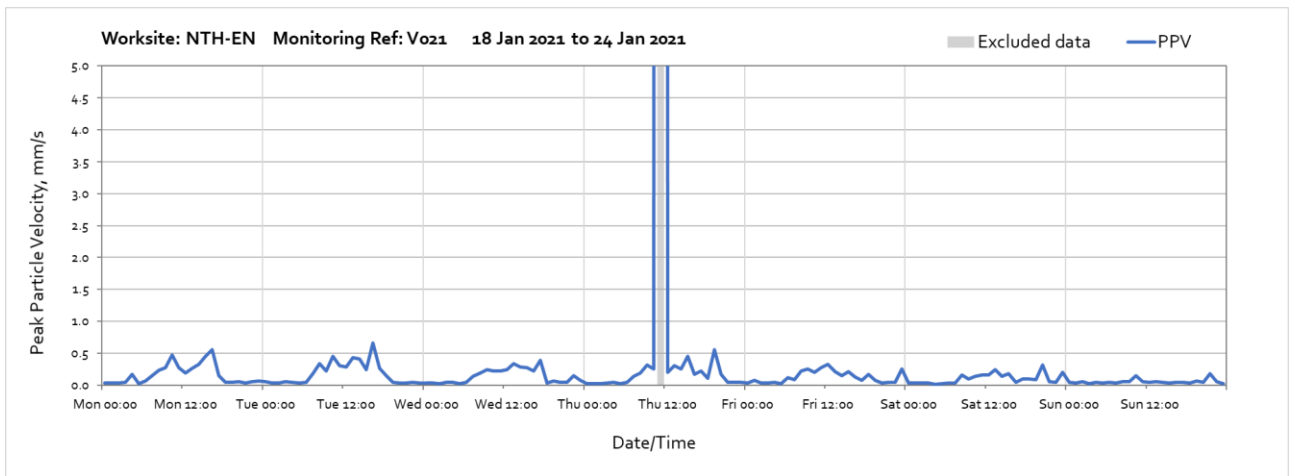
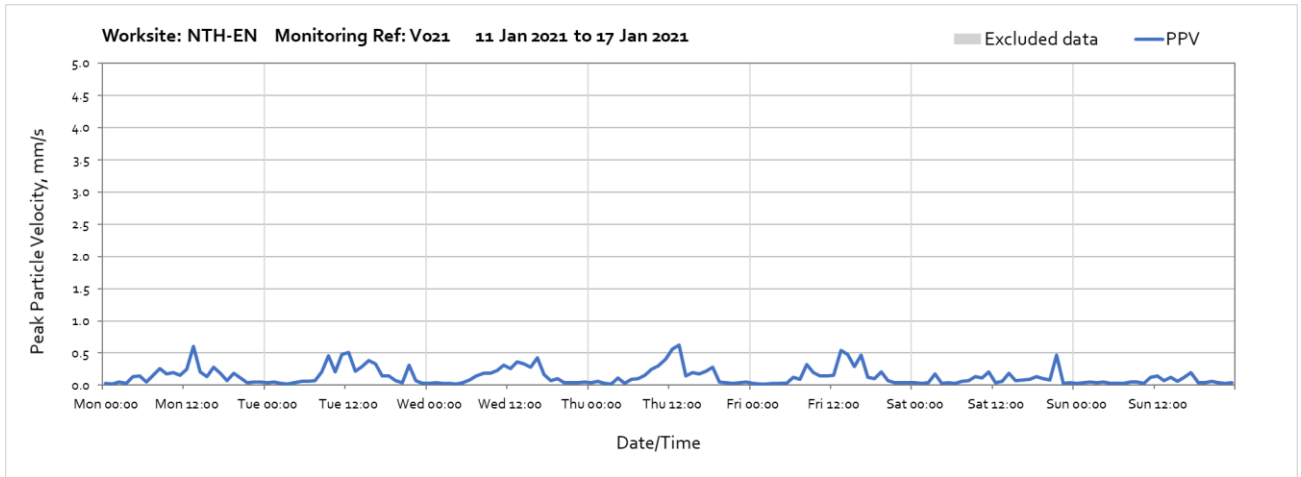




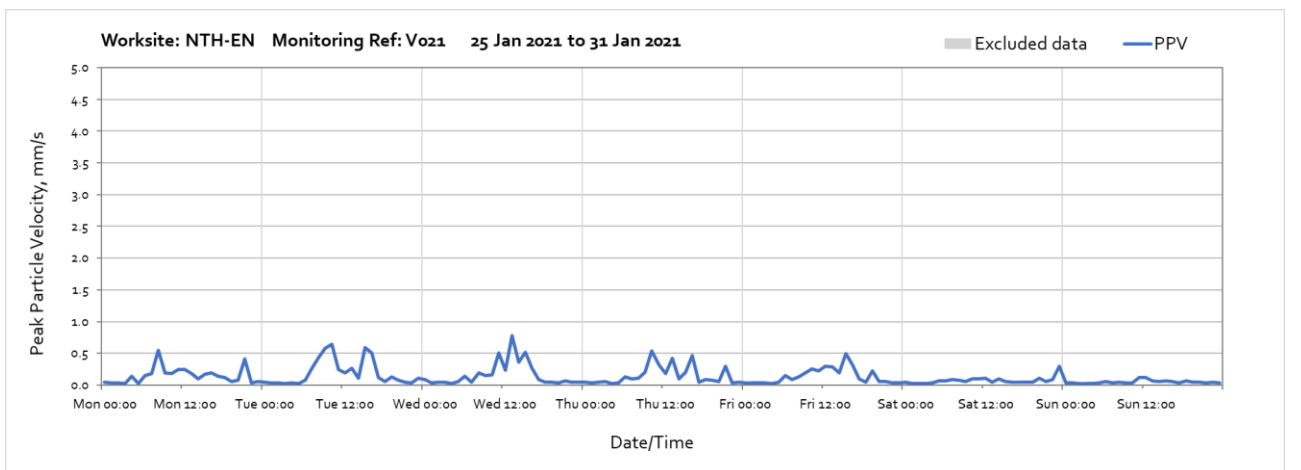


Worksite: NTH-EN – Monitoring Ref: V021





Note: High vibrator levels measured between 11:00 and 12:00 on Thursday 21st January were due to local disturbance of the monitor during maintenance of the monitoring station and are not representative of HS2 vibrator levels.



Worksite: S003-WS09 – Monitoring Ref: V003

