

Construction noise and vibration Monthly Report – September 2020

London Borough of Camden

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Camden during the month of September 2020.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of Euston Cavern worksite (ref.: ECAV), where vegetation removal, surveying and site setup activities were underway.
- Noise monitoring was undertaken in the vicinity of Euston Scissor Box worksite (ref.: ESC), where site setup, surveys, vegetation clearance, groundworks, concrete breaking, extension and widening of access ramp and removal of redundant track were underway.
- Noise monitoring was undertaken in the vicinity of Euston Throat Retained Cut worksite (ref.: ETRC) where site setup and test piling were underway.
- Noise monitoring was undertaken in the vicinity of On-Network worksites (ref.: E), where removal of redundant track was underway.
- Noise monitoring was undertaken in the vicinity of On-Network worksites (ref.: G and ref.: H), where column removal, cabling works, wall repairs, inspections and surveys were underway.
- Noise monitoring was undertaken in the vicinity of the 132 and 140 Hampstead Road and Petrol Station worksite (ref.: S001-WS02), where material storage and laydown activities were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Regent's Park Estate worksite (ref.: S001-WS07), where demolition, groundworks and materials processing activities were underway.
- Noise monitoring was undertaken in the vicinity of the St James's Gardens worksite (ref.: S003-WS01), where piling platform construction and site setup were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite (ref.: S003-WS03), where demolition and groundworks were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Ibis Hotel, 3 Cardington Street worksite (ref.: S003-WS05), where surveys 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 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street and 69 Cobourg Street worksite (ref.: S003-WS07), where erection of steelwork was 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 other nearby worksites ref.: S003-WS03 and ref.: S003-WS09.
- Noise monitoring was undertaken in the vicinity of the One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street worksite (ref.: S003-WS09), where scaffolding works was underway.
- Noise monitoring was undertaken in the vicinity of the Vehicle Holding Area worksite (ref.: VHA), where surveys, vegetation clearance and site setup were underway.

There were no exceedances of the HS2 threshold levels for significant noise effects during the reporting period at any monitoring position.

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

Fourteen (14) complaints were received during the monitoring period. A description of complaints, the results of investigations and any actions taken are detailed in Table 7 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 30th September 2020.

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

- Euston Cavern worksite ref.: ECAV (see plan 2 in Appendix A), where work activities included:
 - Vegetation removal;
 - Surveys;
 - Site setup.
- Euston Scissor Box worksite ref.: ESC (see plan 2 in Appendix A), where work activities included:
 - Installation of site services, working platforms and scaffolding;
 - Surveying and monitoring of assets and surrounding structures;
 - Site clearance including vegetation clearance;
 - Installation, adaption and removal of hoarding;
 - Construction of drilling fluid slabs;

- Preparation activities for the main piling works, including removal of cargo shed foundations and slab construction;
- Removal of redundant track on the west side of the cutting.
- Euston Throat Retained Cut worksite ref.: ETRC (see plan 2 in Appendix A), where work activities included:
 - Setup of site offices;
 - Preparations for and undertaking of test piling including pile mat installation, plate bearing tests, test piling rig mobilisation, anchor pile installation and test pile installation;
 - Hoarding relocations.
- On-Network worksite ref.: E (see plan 3 in Appendix A), where work activities included:
 - Removal of redundant track on the west side of the cutting.
- On-Network worksite ref.: G and ref.: H (see plan 3 in Appendix A), where work activities included:
 - Column removal;
 - Cable management system installation
 - Wall repair works on Gloucester Avenue;
 - Signal head installation and inspection;
 - Surveys.
- 132 and 140 Hampstead Road and Petrol Station worksite ref.: S001-WS02 (see plan 2 in Appendix A), where work activities included:
 - Material storage and laydown.
- Regent's Park Estate worksite ref.: S001-WS07 (see plan 3 in Appendix A), where work activities included:
 - Substructure demolition;
 - Groundworks (backfilling);
 - Materials processing.
- St James' Gardens, worksite ref. S003-WS01 (see plan 2 in Appendix A), where works activities included:
 - Piling platform construction;
 - Site setup;

- Wolfson House, Walkden House, 67-75 & 77-79 Euston Road worksite ref.: S003-WS03 (see plan 3 in Appendix A), where work activities included:
 - Demolition;
 - Groundworks (backfilling).
- Ibis Hotel, 3 Cardington Street worksite ref.: S003-WS05 (see plan 3 in Appendix A), where work activities included:
 - Surveys.
- Former National Temperance Hospital, 110 Hampstead Road worksite ref.: S003-WS06 (see plan 3 in Appendix A), where work activities included:
 - Deliveries.
- 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street and 69 Cobourg Street worksite ref.: S003-WS07 (see plan 3 in Appendix A), where work activities included:
 - Erection of steelwork.
- One Euston Square, 40 Melton Street, Grant Thornton House, 22 Melton Street worksite ref.: S003-WS09 (see plan 3 in Appendix A), where work activities included:
 - Scaffolding.
- Vehicle Holding Area worksite ref.: VHA (see plan 1 in Appendix A), where work activities included:
 - Surveying and monitoring of assets and surrounding structures;
 - Site clearance including vegetation clearance;
 - Installation, adaption and removal of hoarding;
 - Installation of lighting systems.

1.1.3 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 other nearby worksites ref.: S003-WS03 and ref.: S003-WS09.

1.1.4 Further works, where monitoring did not take place, were also undertaken at the following locations:

- The Adelaide Road ventilation shaft, where work activities included:
 - Continuation of roadworks;

- Relocation of welfare units and site generator;
 - Continuation of vegetation clearance at the north of the site;
 - Demolition of boundary wall between the site and Adelaide Road;
 - Excavation of trial holes to look for services / obstructions;
 - Construction of concrete platform and erection of hoarding along Adelaide Road boundary;
 - Groundworks (stripping of topsoil);
 - Removal of tree stumps.
- Stephenson Way, North Gower Street, Euston Street and Harrington Street, where utilities works were undertaken.

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 (30) noise and seven (7) vibration monitoring installations were active across thirteen (13) worksites in September in the LBC area. Table 2 summarises the position of noise and vibration monitoring installations within the LBC area in September 2020.

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 |
|--------------------|-----------------------|--|
| B | JC | Juniper Crescent |
| ESC | N022 | External to 34 Mornington Terrace |
| | N024 | External to Park Village Studios, Park Village East |
| | N046 | Lamppost opposite to 49 Mornington Terrace |
| | N047 | Park Village East/Mornington Street bridge, lamppost #13 |
| 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) |

| Worksite Reference | Measurement Reference | Address |
|----------------------------|-----------------------|---|
| | N004 | Mornington Terrace, lamppost #7 (junction of Mornington Terrace, Mornington Place and Clarkson Row) |
| | N005 | 5A Granby Terrace |
| | N023 | Lamppost #21 on Hampstead Road |
| 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 |
| S001-WS07 | N020 | Mackworth Street, lamppost #1 |
| | N021 | Stanhope Street, lamppost #2 |
| | N044 | Regents Park Estate west, near Langdale (temporarily removed from site on 31 st August) |
| | N045 | Regents Park Estate south, external to Coniston |
| | V039 | Coniston, Regents Park Estate |
| | V043 | Cubitt Court, Park Village East |
| S003-WS01 | N016 | Margaret Centre roof |
| 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-WS05 | N014 | Starcross Street lamppost (external to Exmouth Arms) |
| | V021 | 42-44 Cobourg Street |
| S003-WS06 | N017 | Hampstead Road, lamppost #48 |
| S003-WS07 | N012 | Drummond Street, lamppost #14 (opposite to 92-94 Drummond Street) |
| S003-WS08 | N007 | Royal College of General Practitioners, Melton Street |
| | V003 | Royal College of General Practitioners basement vaults under Melton St |
| Vehicle Holding Area (VHA) | N025 | External to 3 Prince Albert Road |
| | N026 | Thames Water Compound (temporarily removed from site on 21 st June) |

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 |
| B | JC | Juniper Crescent | Free-field | 58.1 (59.9) | 59.2 (63.2) | 59.1 (60.8) | 58.9 (60.8) | 55.2 (59.9) | 59.3 (59.8) | 58.1 (58.8) | 57.8 (58.3) | 58.0 (61.5) | 52.9 (58.0) | 56.5 (59.9) | 54.7 (58.7) |
| ESC | N047 | Park Village East/Mornington Street bridge, lamppost #13 | Free-field | 59.4 (60.5) | 61.8 (63.8) | 61.2 (64.1) | 59.2 (63.3) | 53.4 (61.1) | 57.0 (58.6) | 59.6 (62.0) | 60.0 (60.7) | 62.0 (76.3) | 54.9 (60.3) | 58.7 (64.3) | 53.1 (59.0) |
| | N046 | Mornington Terrace near The Edinboro Castle pub, lamppost #18 | Free-field | 62.9 (64.4) | 63.1 (65.6) | 62.9 (65.2) | 62.4 (64.0) | 57.3 (63.1) | 62.7 (63.0) | 62.1 (63.1) | 61.3 (62.1) | 62.0 (63.9) | 59.0 (65.0) | 61.1 (65.0) | 58.0 (62.9) |
| | N022 | External to 34 Mornington Terrace | Free-field | 60.2 (63.4) | 60.8 (63.3) | 60.4 (63.6) | 59.7 (63.5) | 54.3 (60.3) | 59.8 (60.2) | 59.5 (60.7) | 58.7 (59.5) | 59.1 (60.4) | 56.7 (62.6) | 58.4 (63.6) | 54.7 (58.9) |
| | N024 | External to Park Village Studios, Park Village East | Free-field | 60.2 (62.5) | 62.5 (66.6) | 62.3 (68.7) | 59.1 (63.5) | 54.0 (60.0) | 55.7 (56.8) | 59.6 (63.3) | 60.7 (61.6) | 60.1 (62.2) | 54.6 (60.7) | 58.5 (66.4) | 53.4 (58.9) |

| 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 |
| ETRC-HRB-GTB | N005 | 5A Granby Terrace | Free-field | 65.7 (66.9) | 66.5 (68.5) | 65.6 (66.9) | 64.8 (66.5) | 62.5 (66.4) | 64.7 (65.8) | 69.9 (80.4) | 64.5 (65.7) | 64.3 (66.3) | 62.2 (66.0) | 64.0 (67.0) | 62.8 (65.9) |
| | N023 | Amphill Estate, Hampstead Road | Free-field | 70.4 (72.1) | 69.8 (70.9) | 69.1 (70.6) | 68.5 (72.5) | 66.0 (71.3) | 67.9 (68.1) | 69.1 (69.9) | 69.6 (71.4) | 69.2 (74.2) | 66.7 (72.8) | 68.2 (70.8) | 66.1 (71.9) |
| | N001 | External to Cubitt Court, 100 Park Village East | Façade | 58.3 (60.9) | 64.8 (67.5) | 59.9 (62.8) | 58.5 (61.0) | 52.7 (58.8) | 59.2 (62.6) | 58.3 (58.7) | 57.9 (58.7) | 58.5 (60.9) | 53.7 (58.6) | 57.2 (60.4) | 51.5 (55.5) |
| | N002 | Richmond Court, Park Village East | Free-field | 58.6 (60.7) | 62.5 (65.3) | 61.0 (64.0) | 59.1 (61.2) | 53.2 (60.3) | 56.9 (59.3) | 58.7 (59.4) | 58.8 (60.2) | 61.3 (75.2) | 54.6 (60.9) | 58.3 (62.9) | 52.9 (56.9) |
| | N003 | Silsoe House, Park Village East | Free-field | 58.7 (60.4) | 61.9 (65.5) | 60.8 (63.8) | 58.8 (62.1) | 53.2 (58.6) | 56.6 (59.0) | 58.6 (60.9) | 59.0 (59.9) | 61.2 (73.8) | 54.6 (61.0) | 58.0 (63.0) | 53.0 (56.9) |
| | N004 | Mornington Terrace, lamppost #7 | Free-field | 64.0 (66.1) | 65.4 (67.1) | 64.7 (67.0) | 64.4 (67.9) | 58.9 (67.8) | 63.5 (63.6) | 63.8 (65.4) | 62.8 (64.6) | 64.3 (71.0) | 61.2 (71.8) | 64.9 (72.6) | 62.4 (67.6) |
| G | HH | Euston Station Parcel Deck, Barnby Street | Free-field | 63.7 (66.1) | 64.2 (66.4) | 63.2 (67.5) | 62.9 (73.0) | 59.0 (69.6) | 63.9 (66.9) | 63.1 (64.0) | 62.6 (66.4) | 63.2 (67.5) | 60.4 (67.2) | 61.6 (68.6) | 57.9 (64.7) |
| | BS | Roof of Stockbeck House, Barnby Street | Free-field | 61.6 (63.6) | 62.0 (63.2) | 61.5 (63.3) | 61.6 (64.3) | 57.1 (64.5) | 60.3 (60.8) | 61.3 (62.8) | 60.5 (62.4) | 60.8 (62.4) | 56.7 (62.9) | 60.2 (62.9) | 58.1 (63.1) |
| S001-WS02 | N018 | Outside replacement housing, Hampstead Road | Free-field | 70.3 (73.3) | 71.0 (72.7) | 70.5 (72.0) | 70.2 (76.0) | 67.2 (72.4) | 68.5 (69.1) | 70.3 (71.4) | 70.7 (71.5) | 70.9 (75.2) | 68.5 (74.1) | 70.3 (74.8) | 67.3 (72.0) |
| | N019 | Outside Cartmel, Hampstead Road | Free-field | 69.3 (70.8) | 70.0 (71.5) | 69.7 (71.9) | 69.2 (76.5) | 66.7 (73.3) | 67.9 (68.6) | 69.8 (71.4) | 69.5 (70.6) | 70.3 (76.8) | 67.6 (71.7) | 69.2 (72.2) | 66.5 (72.2) |

| 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 |
| S001-WS07 | N020 | Mackworth Street | Free-field | 52.0 (54.3) | 64.4 (69.5) | 51.9 (57.8) | 50.6 (53.5) | 47.1 (52.7) | 51.7 (55.6) | 64.0 (78.5) | 51.0 (53.5) | 52.4 (56.4) | 48.2 (51.4) | 51.4 (58.5) | 47.2 (51.5) |
| | N021 | Stanhope Street, lamppost #2 | Free-field | 56.7 (60.0) | 63.3 (68.7) | 58.1 (60.6) | 56.4 (59.6) | 51.3 (63.0) | 55.1 (57.7) | 56.0 (56.3) | 56.7 (56.8) | 58.3 (62.9) | 53.3 (62.1) | 55.3 (58.4) | 50.9 (58.5) |
| | N044 | Regents Park Estate west | Free-field | 52.8 (55.2) | 65.3 (69.5) | 52.6 (57.2) | 52.2 (55.9) | 48.5 (54.0) | 53.9 (59.9) | 53.9 (55.7) | 52.5 (54.7) | 52.7 (57.4) | 49.7 (60.5) | 51.5 (55.8) | 48.3 (52.7) |
| | N045 | Regents Park Estate south, external to Coniston | Free-field | 57.6 (69.6) | 65.4 (70.8) | 55.7 (56.8) | 55.9 (58.1) | 53.3 (57.8) | 55.0 (55.3) | 58.9 (62.5) | 54.7 (55.1) | 55.5 (56.6) | 54.1 (58.0) | 55.8 (62.7) | 53.6 (57.1) |
| S003-WS03 | N006 | RCGP Roof level | Free-field | 58.5 (62.6) | 64.6 (68.3) | 55.3 (57.7) | 55.2 (58.9) | 54.4 (58.9) | 55.8 (57.7) | 61.0 (64.0) | 62.0 (67.4) | 57.0 (66.3) | 54.4 (56.6) | 57.7 (68.7) | 53.5 (55.3) |
| | N008 | RCGP Stephenson Way | Façade | 60.1 (64.3) | 70.3 (74.3) | 54.2 (56.5) | 54.0 (58.8) | 53.7 (60.8) | 57.6 (62.8) | 60.3 (68.0) | 54.0 (54.2) | 54.8 (60.3) | 53.7 (55.0) | 54.2 (56.4) | 53.2 (55.1) |
| | N010 | Wesley Hotel | Façade | 67.4 (69.3) | 71.0 (75.1) | 57.4 (67.1) | 55.3 (67.2) | 54.9 (67.4) | 63.7 (67.9) | 64.5 (69.9) | 62.4 (67.0) | 63.9 (67.1) | 53.9 (64.1) | 65.1 (67.5) | 52.0 (58.5) |
| | N011 | Outside 82 Euston Street | Free-field | 54.3 (61.4) | 64.1 (71.1) | 53.4 (73.5) | 51.8 (59.2) | 50.2 (63.0) | 52.5 (53.6) | 57.6 (60.5) | 55.5 (57.2) | 52.7 (58.0) | 49.6 (52.2) | 51.4 (54.3) | 49.3 (51.9) |
| S003-WS05 | N014 | Starcross Street | Free-field | 54.0 (58.1) | 58.5 (61.6) | 57.5 (61.8) | 57.4 (65.1) | 51.4 (66.0) | 54.8 (58.7) | 53.9 (55.6) | 56.7 (59.7) | 55.1 (58.2) | 49.7 (56.2) | 54.3 (63.1) | 49.8 (53.1) |
| S003-WS01 | N016 | Margaret Centre roof | Free-field | 55.0 (55.9) | 59.5 (62.5) | 54.3 (57.0) | 54.4 (61.3) | 51.7 (60.9) | 53.8 (54.4) | 55.4 (56.2) | 54.2 (56.4) | 55.0 (58.5) | 51.9 (56.9) | 53.7 (56.2) | 51.1 (54.8) |

| Worksite Reference | Measurement Reference | Site Address | Free-field or Façade Measurement | Weekly Average $L_{Aeq,T}$ (Highest Day $L_{Aeq,T}$) | | | | | Saturday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$) | | | | | Sunday / Public Holiday Average $L_{Aeq,T}$ (highest day $L_{Aeq,T}$) | |
|--------------------|-----------------------|----------------------------------|----------------------------------|---|----------------|----------------|----------------|----------------|---|----------------|----------------|----------------|----------------|--|----------------|
| | | | | 0700 - 0800 | 0800 - 1800 | 1800 - 1900 | 1900 - 2200 | 2200 - 0700 | 0700 - 0800 | 0800 - 1300 | 1300 - 1400 | 1400 - 2200 | 2200 - 0700 | 0700 - 2200 | 2200 - 0700 |
| S003-WS06 | N017 | Hampstead Road, lamppost #48 | Free-field | 69.9 (73.0) | 70.8 (72.1) | 69.8 (72.3) | 69.3 (75.5) | 66.8 (72.2) | 67.7 (68.3) | 69.1 (70.1) | 70.3 (72.5) | 70.3 (74.6) | 67.5 (74.9) | 69.9 (78.2) | 66.6 (71.2) |
| S003-WS07 | N012 | Opposite 92-94 Drummond Street | Free-field | 57.6 (63.4) | 61.1 (63.1) | 58.1 (59.1) | 58.7 (63.0) | 55.9 (62.4) | 56.2 (57.2) | 57.9 (58.9) | 58.8 (59.7) | 58.5 (61.4) | 55.5 (58.0) | 58.5 (68.2) | 55.4 (58.1) |
| S003-WS08 | N007 | RCGP, Melton Street | Free-field | 63.8 (67.1) | 65.5 (69.1) | 62.7 (67.8) | 62.7 (66.4) | 61.5 (66.8) | 62.5 (65.4) | 62.5 (63.6) | 61.9 (62.5) | 62.6 (66.3) | 60.5 (64.6) | 61.5 (68.1) | 60.5 (65.3) |
| VHA | N025 | External to 3 Prince Albert Road | Free-field | 67.8 (70.7) | 69.5 (76.8) | 67.6 (75.4) | 66.5 (72.2) | 63.4 (71.4) | 65.8 (66.8) | 67.2 (68.1) | 66.5 (66.9) | 66.4 (69.0) | 64.3 (71.9) | 65.5 (69.1) | 62.9 (69.4) |
| | N026 | Thames Water Compound | Free-field | 62.5 (76.6) | 69.6 (75.2) | 58.4 (63.1) | 57.9 (65.5) | 55.3 (71.8) | 57.1 (58.5) | 58.7 (60.4) | 57.7 (58.2) | 58.0 (60.3) | 56.2 (62.0) | 57.0 (60.4) | 57.5 (71.9) |

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 |
|--------------------|-----------------------|---|--|
| S001-WS07 | V039 | Coniston, Regents Park Estate | 4.83* (Y-axis) |
| | V043 | Cubitt Court, Park Village East | 3.26** (Y-axis) |
| S003-WS03 | V002 | RCGP. basement boiler room. 305 Euston Road | 2.61 (Z-axis) |
| | V037 | Magic Circle, basement | 4.43 (Z-axis) |
| | V038 | Wesley Hotel, basement lightwell, Euston Street | 3.15 (Z-axis) |
| S003-WS05 | V021 | 42-44 Cobourg Street (floor) | 0.76 (Z-axis) |
| S003-WS09 | V003 | RCGP. basement vaults, 305 Euston Road | 0.85 (X-axis) |

* It is considered that the high vibration levels were caused by activities occurring in close proximity to the monitor. Vibration levels at the receptor would be lower.

** It is considered that the high vibration levels were caused by use of the nearby residential bin store.

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 |
|--------------------|-----------------------|--|--|-------------|--------------------------------|
| B | JC | Juniper Crescent | All days | All periods | No exceedance |
| ESC | N022 | External to 34 Mornington Terrace | All days | All periods | No exceedance |
| | N024 | External to Park Village Studios, Park Village East | All days | All periods | No exceedance |
| | N046 | Lamppost opposite to 49 Mornington Terrace | All days | All periods | No exceedance |
| | N047 | Park Village East/Mornington Street bridge, lamppost #13 | All days | All periods | No exceedance |
| ETRC-HRB-GTB | N001 | Park Village East Lamppost #1 | All days | 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 |
| | N004 | Mornington Terrace, lamppost #7 | All days | All periods | No exceedance |
| | N005 | 5A Granby Terrace | All days | All periods | No exceedance |
| | N023 | Ampthill Estate, lamppost #21, Hampstead Road | All days | All periods | No exceedance |
| G | HH | Euston Station Parcel Deck, Barnby Street | All days | All periods | No exceedance |
| | BS | Barnby Street | All days | All periods | No exceedance |
| S001-WS02 | N018 | 132 and 140 Hampstead Road and Petrol Station | All days | All periods | No exceedance |
| | N019 | 132 and 140 Hampstead Road and Petrol Station | All days | All periods | No exceedance |
| S001-WS07 | N020 | Mackworth Street, lamppost #1 | All days | All periods | No exceedance |
| | N021 | Stanhope Street, lamppost #2 | All days | All periods | No exceedance |

| Worksite Reference | Measurement Reference | Site Address | Day (Weekday, Saturday, Sunday, Night) | Time period | Number of exceedances of SOAEL |
|--------------------|-----------------------|---|--|-------------|--------------------------------|
| | N044 | Regents Park Estate West, near Langdale | All days | All periods | No exceedance |
| | N045 | Regents Park Estate south, external to Coniston | All days | All periods | No exceedance |
| S003-WS01 | N016 | Margarete Centre roof | All days | All periods | No exceedance |
| S003-WS03 | N006 | Royal College of General Practitioners Roof level | All days | All periods | No exceedance |
| | N008 | Walkden House, 67-75 & 77-79 Euston Rd | All days | All periods | No exceedance |
| | N010 | Wesley Hotel | All days | All periods | No exceedance |
| | N011 | Walkden House, 67-75 & 77-79 Euston Rd | All days | All periods | No exceedance |
| S003-WS05 | N014 | Ibis Hotel, 3 Cardington Street & 1-3 Cobourg Street | All days | All periods | No exceedance |
| S003-WS06 | N017 | Hampstead Road, lamppost #48 | All days | All periods | No exceedance |
| S003-WS07 | N012 | 93-103 Drummond Street, 11-15 Melton Street, 54-64 Euston Street, 69 Cobourg Street | All days | All periods | No exceedance |
| S003-WS08 | N007 | Euston Square Gardens (west) | All days | All periods | No exceedance |
| VHA | N025 | External to 3 Prince Albert Road | Weekday | 0800-1800 | 1* |
| | N026 | Thames Water Compound | Weekday | 0800-1800 | 5* |

* Exceedances of the SOAEL are due to utilities works not associated with HS2 and are not considered as representative of HS2 works undertaken in the same period.

2.2.5 No exceedances of the SOAEL were recorded due to HS2 construction works during September 2020.

2.3 Exceedances of Trigger Level

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2.3.1 Table 6 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 6: Summary of Exceedances of Trigger Levels

| Complaint Reference Number (if applicable) | Worksite Reference | Date and Time Period | Identified Source | Results of Investigation (including noise monitoring results) | Actions Taken |
|--|--------------------|----------------------|-------------------|---|---------------|
| - | - | - | - | - | - |

2.4 Complaints

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

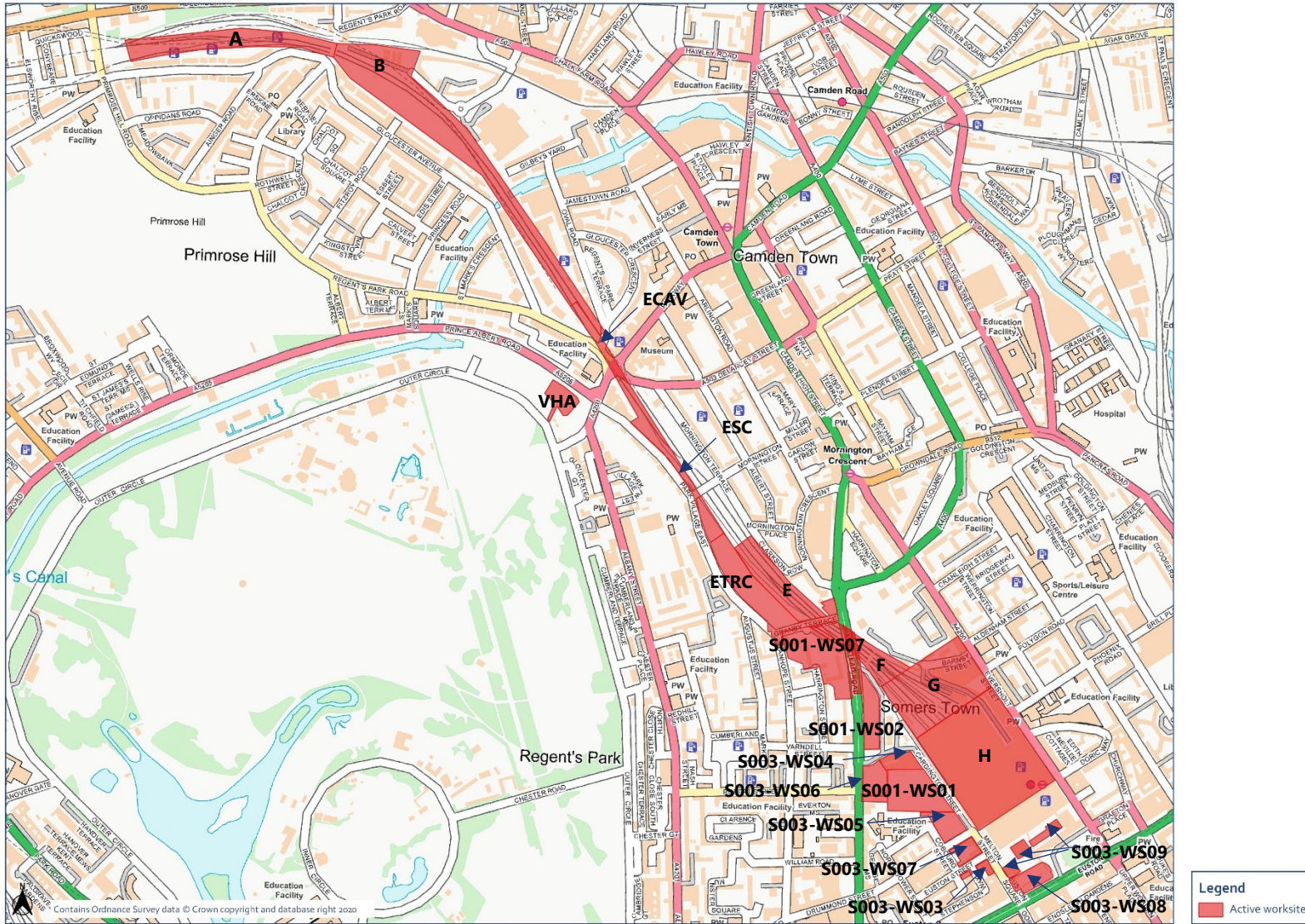
Table 7: Summary of Complaints

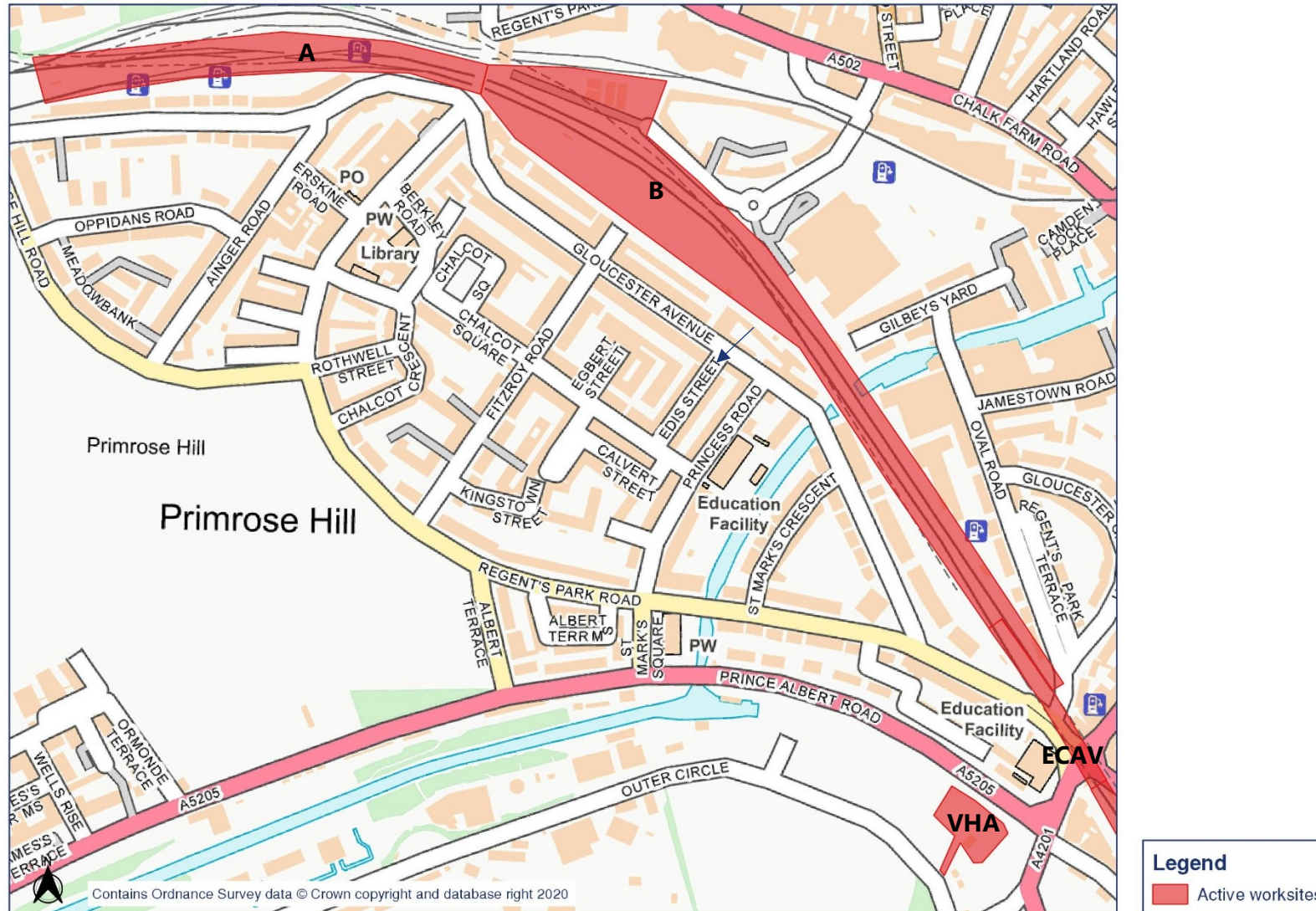
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|----------------------------|-------------------------|---|--|---|
| HS2-20-40491-C | S001-WS07 | Complaint due to audible construction noise from 08:00. | Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | The complainant was informed that the associated works were permitted from 08:00. |
| HS2-20-40513-C | S003-WS01/ S003-WS05 | Complaint due to audible construction noise at 22:00. | Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Prior notification was given to nearby residents about the planned works. Information provided to the complainant. |
| HS2-20-40516-C | S003-WS03 | Complaint due to noise caused by demolition works. | Noise was caused by Euston Station demolition works associated with HS2. Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | The complainant was informed that work had to be carried out at night due to safety reasons. These particular works have progressed and demolition is currently undertaken in daytime periods, with future activities mainly consisting of quieter works. However, for safety reasons some works can only be carried out at night when the railway is not fully operational, and there may be occasions in the future when works at night may be noisier. |

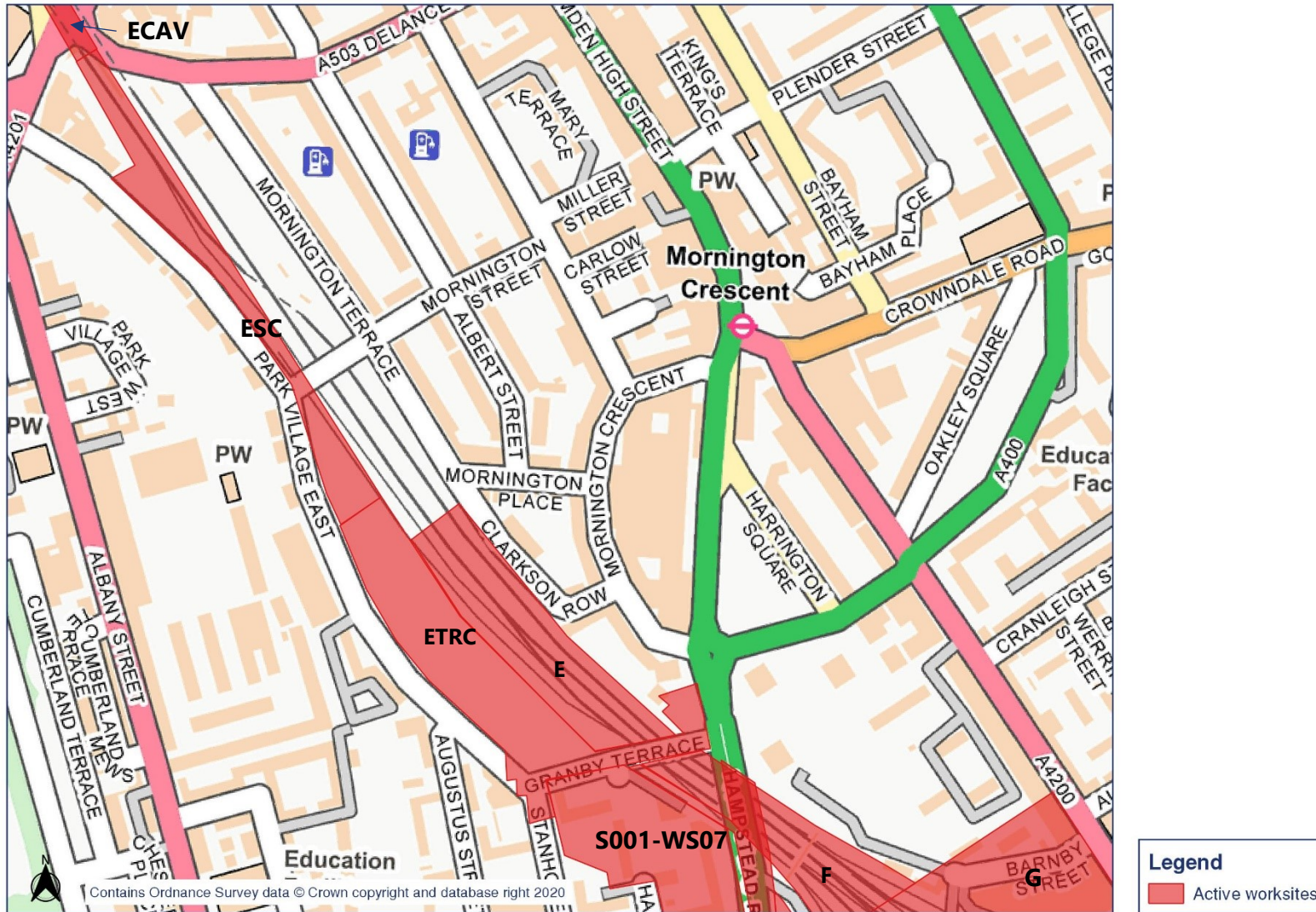
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|----------------------------|--------------------|---|--|---|
| HS2-20-40523-C | B | Complaint due to audible construction noise across three consecutive nights. | The works were not associated with HS2. | Information provided to the complainant. |
| HS2-20-40524-C | S001-WS07 | Complaint due to audible construction noise during the daytime causing a distraction from study. | Hoarding installation work associated with HS2 was being undertaken. Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Information was provided to the complainant that contractors had been installing hoardings. Additional information provided on how they can ask for assistance via special case/vulnerable people panel. |
| HS2-20-40525-C | S001-WS07 | Complaint due to audible construction noise during the daytime causing disruption of sleep following late-night working. | Hoarding installation work associated with HS2 was being undertaken. Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Information was provided to the complainant that contractors had been installing hoardings. Additional information provided on how they can ask for assistance via special case/vulnerable people panel. |
| HS2-20-40537-C | S001-WS07 | Complaint due to audible construction noise during the daytime. | Concrete breaking associated with HS2 was being undertaken. Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Information provided to the complainant. |
| HS2-20-40539-C | A | Complaint due to noise and vibration emitted from a site generator. | A generator was in use on the worksite. | The complainant was informed that the generator is currently screened by acoustic barriers and that in following the erection of the 2.4m site hoarding, the generator will be located behind the hoarding with view of reducing the generator noise emissions further. |
| HS2-20-40552-C | S001-WS07 | Complaint submitted via Camden Council regarding an incident of noise pollution across a 2.5yr period at a residential address. | Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Information provided to the complainant. |

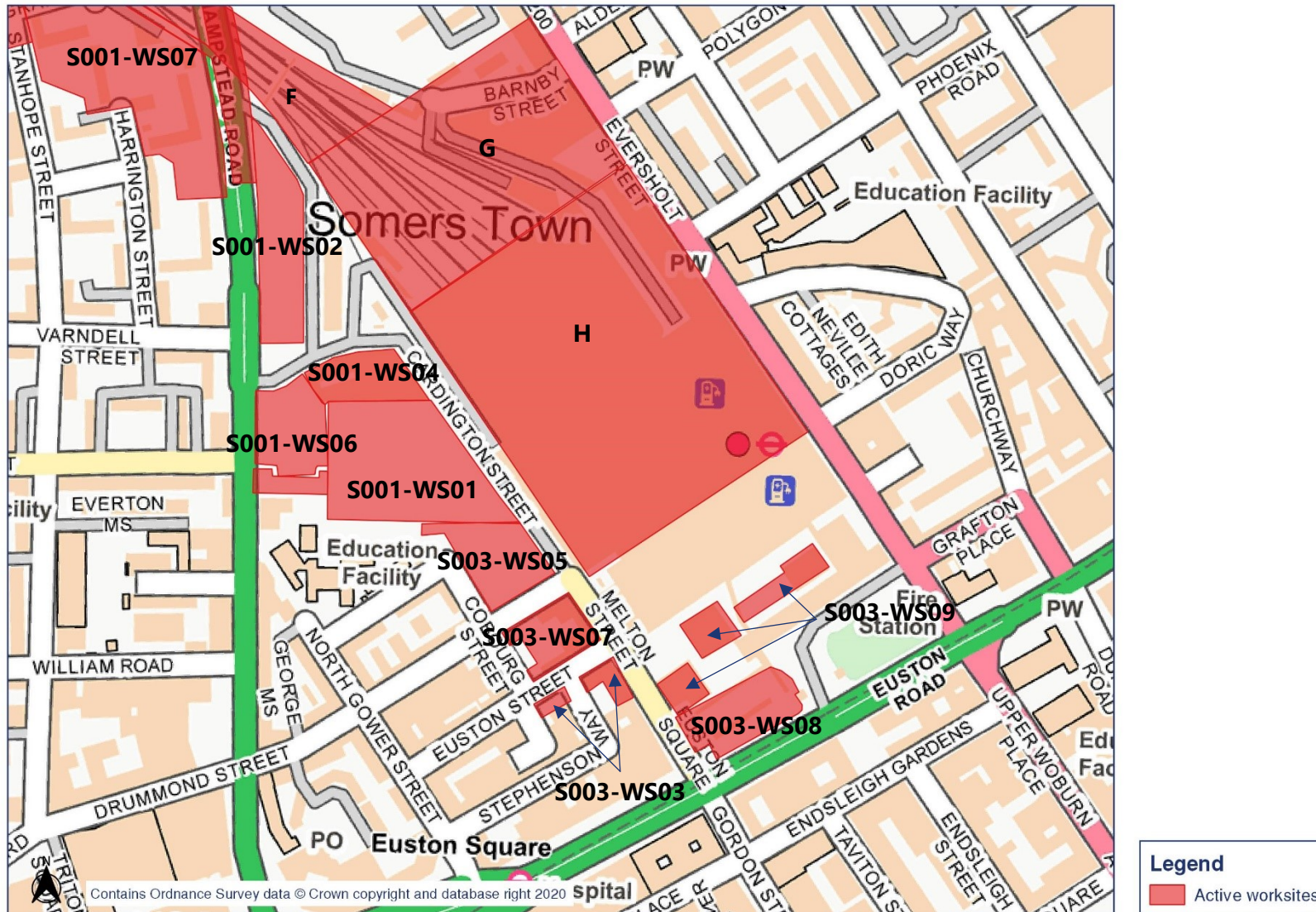
| Complaint Reference Number | Worksite Reference | Description of Complaint | Results of Investigation | Actions Taken |
|----------------------------|---------------------------------|--|---|--|
| HS2-20-40569-C | A | Complaint due to noise and vibration emitted from four site generators. | A generator was in use on the worksite. | The complainant was informed that the generators are currently screened by acoustic barriers and that in following the erection of the 2.4m site hoarding, the generator will be located behind the hoarding with view of reducing the generator noise emissions further. |
| HS2-20-40570-C | ETRC | Complaint due to audible construction noise during the night-time resulting in disturbance of sleep. | Investigation is on-going. | Investigation is on-going. |
| HS2-20-40600-C | S003-WS03 | Complaint due to construction noise affecting meetings within an office building. | The complainant's location is likely to have been more affected by noise from other, closer construction sites. Monitoring data demonstrates compliance with Section 61 and works were in line with best practical means. | Information provided along with a programme of local works. |
| HS2-20-45691 | S003-WS01 | Complaint due to vibration experienced within a commercial workplace. | A sub-contractor working on behalf of HS2 deviated from the agreed works method statement due to works being undertaken within a tight working area resulting in increased vibration. | Work was immediately stopped. The subcontractor team were re-briefed on the method statement following the incident and a toolbox talk on noise and vibration was carried out. The message was clearly relayed that if anyone is in any doubt, they should stop work and refer to the engineer, and must stick to the safe system of work and works information requirements. Information provided to the complainant. |
| HS2-20-45321-E | N/A (Adelaide Road Vent. Shaft) | Complaint due to works taking place without the use of an acoustic barrier. | The acoustic barrier was briefly moved to allow the relocation of a site security cabin. The acoustic barrier was reinstated in a timely manner on the completion of the cabin relocation works. | Information provided to the complainant. |

Appendix A Site Locations

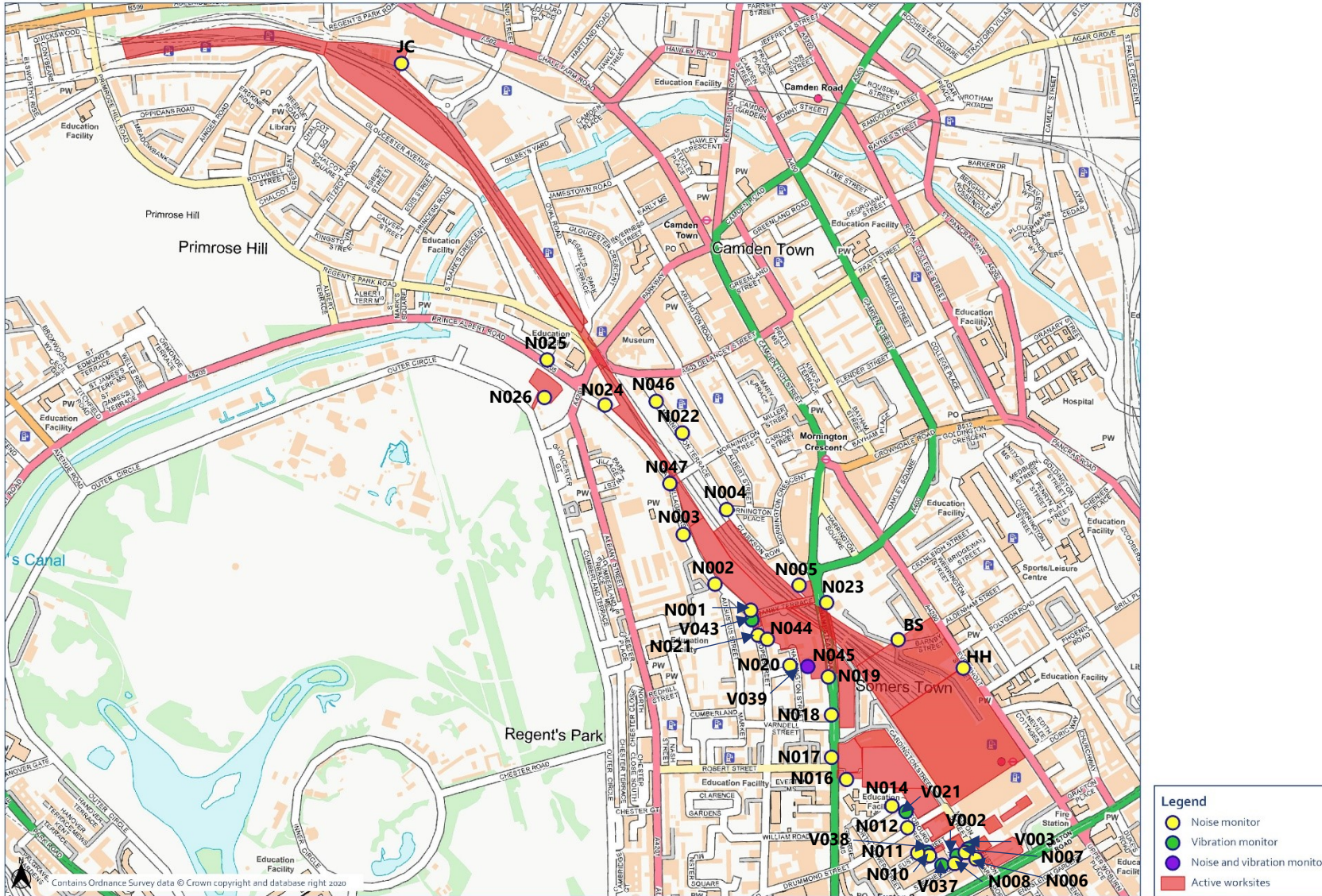


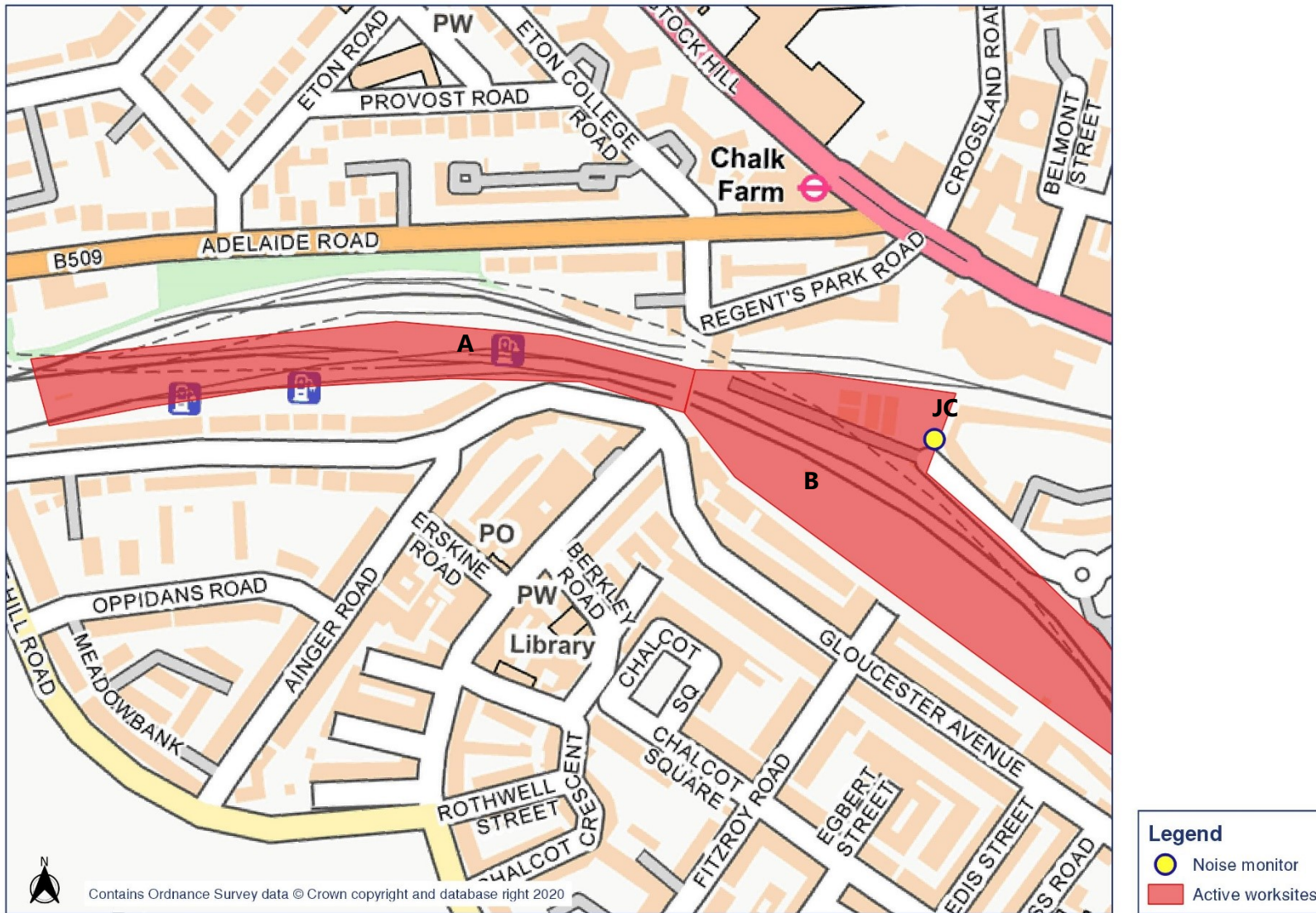


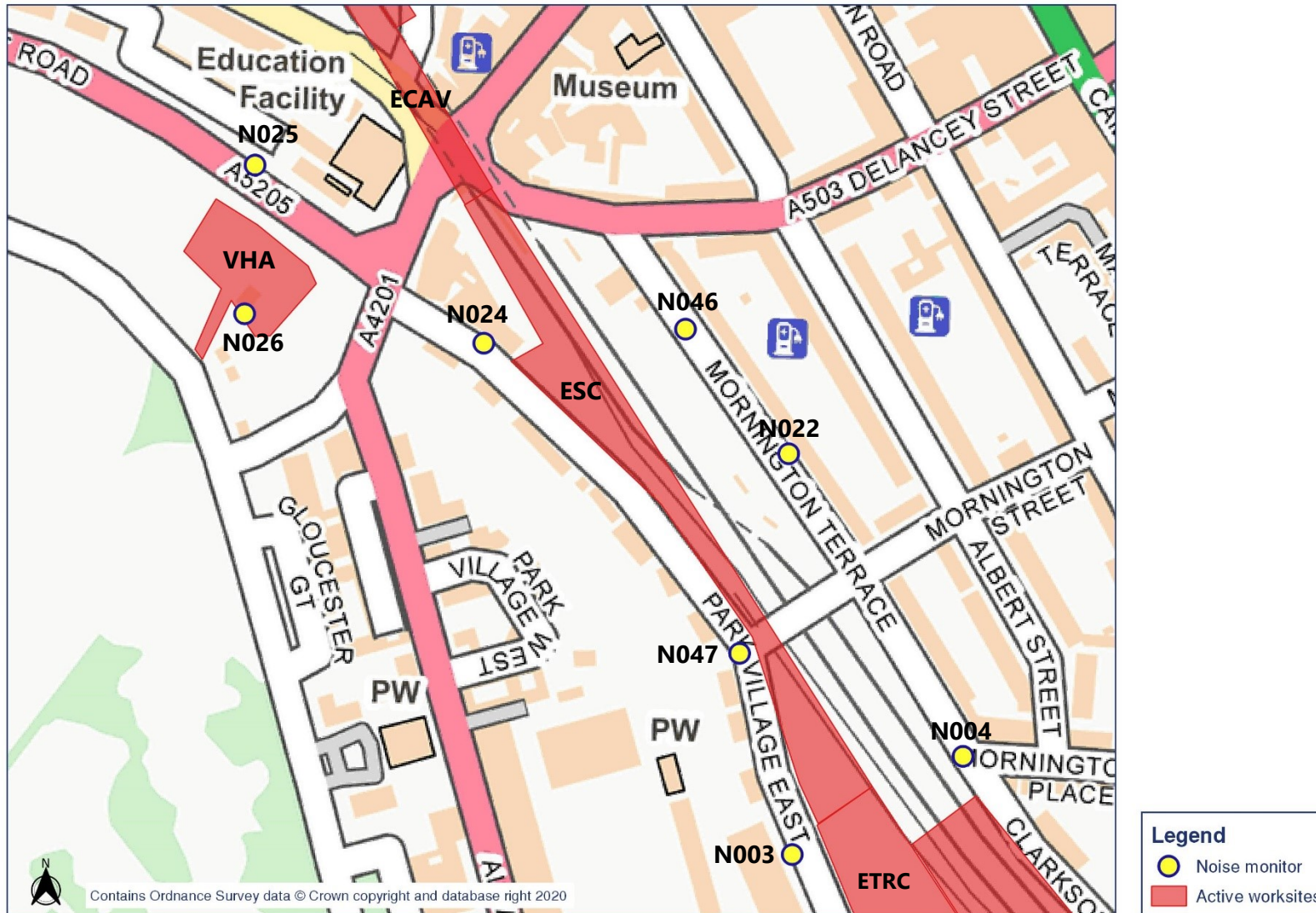


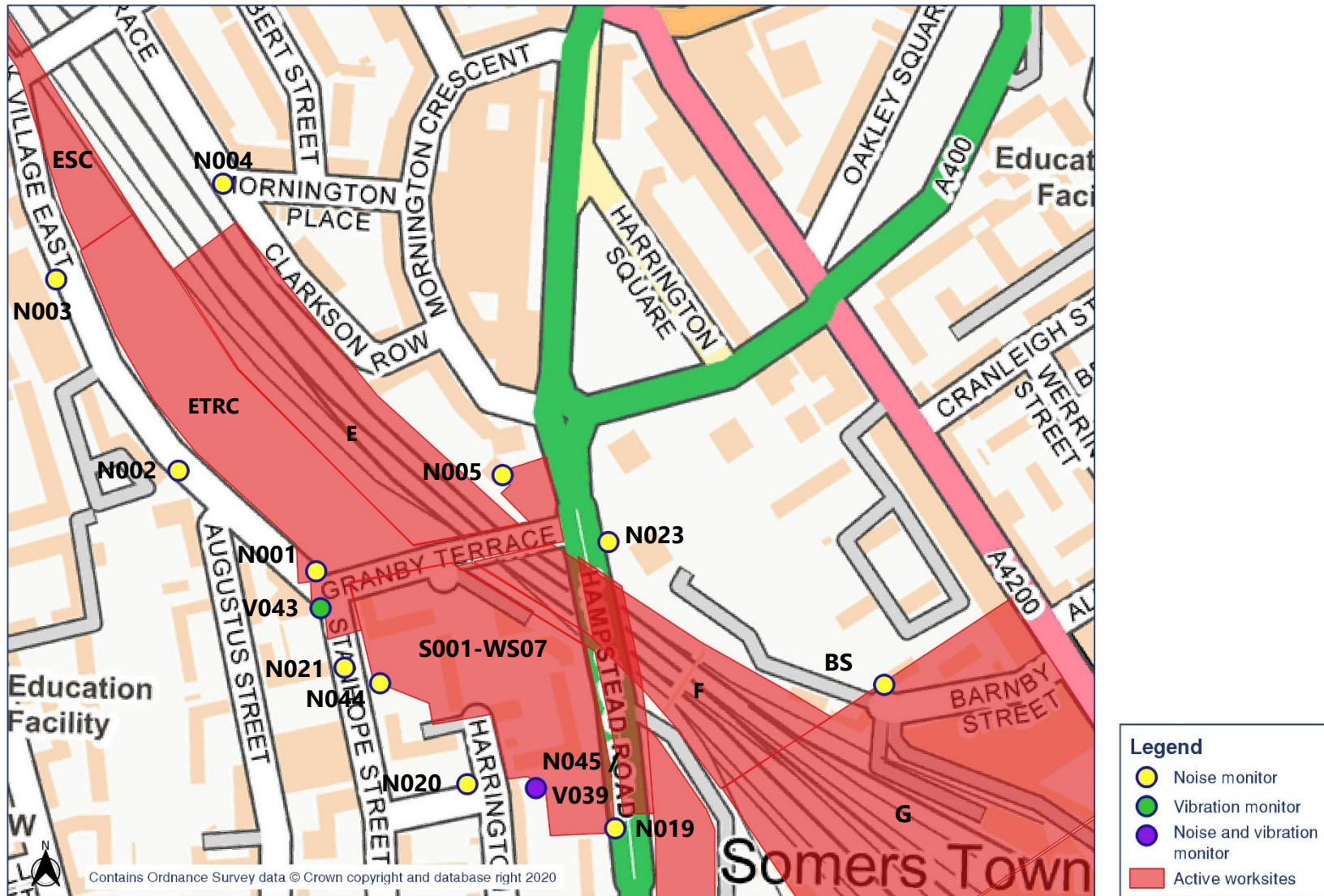


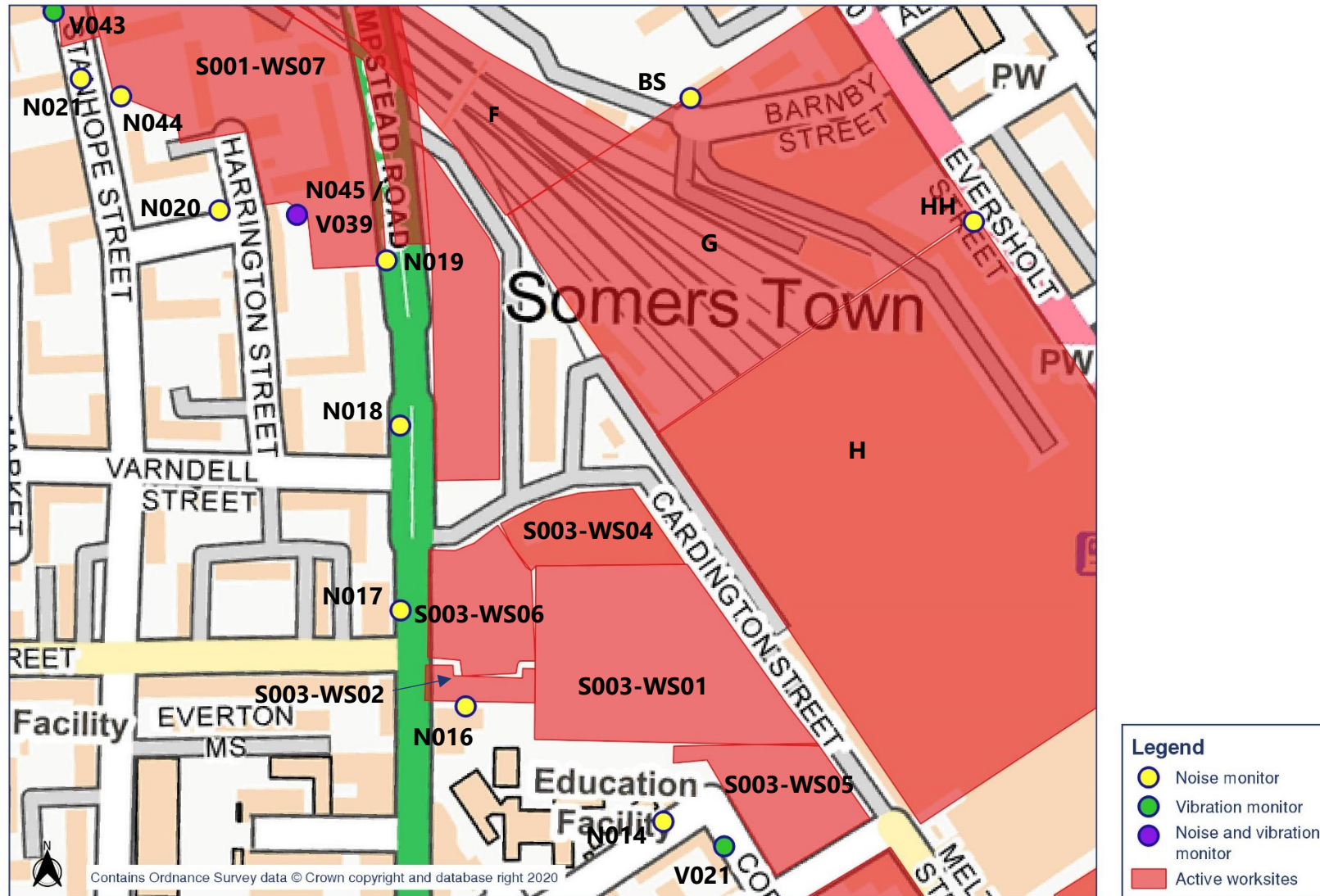
Appendix B Monitoring Locations

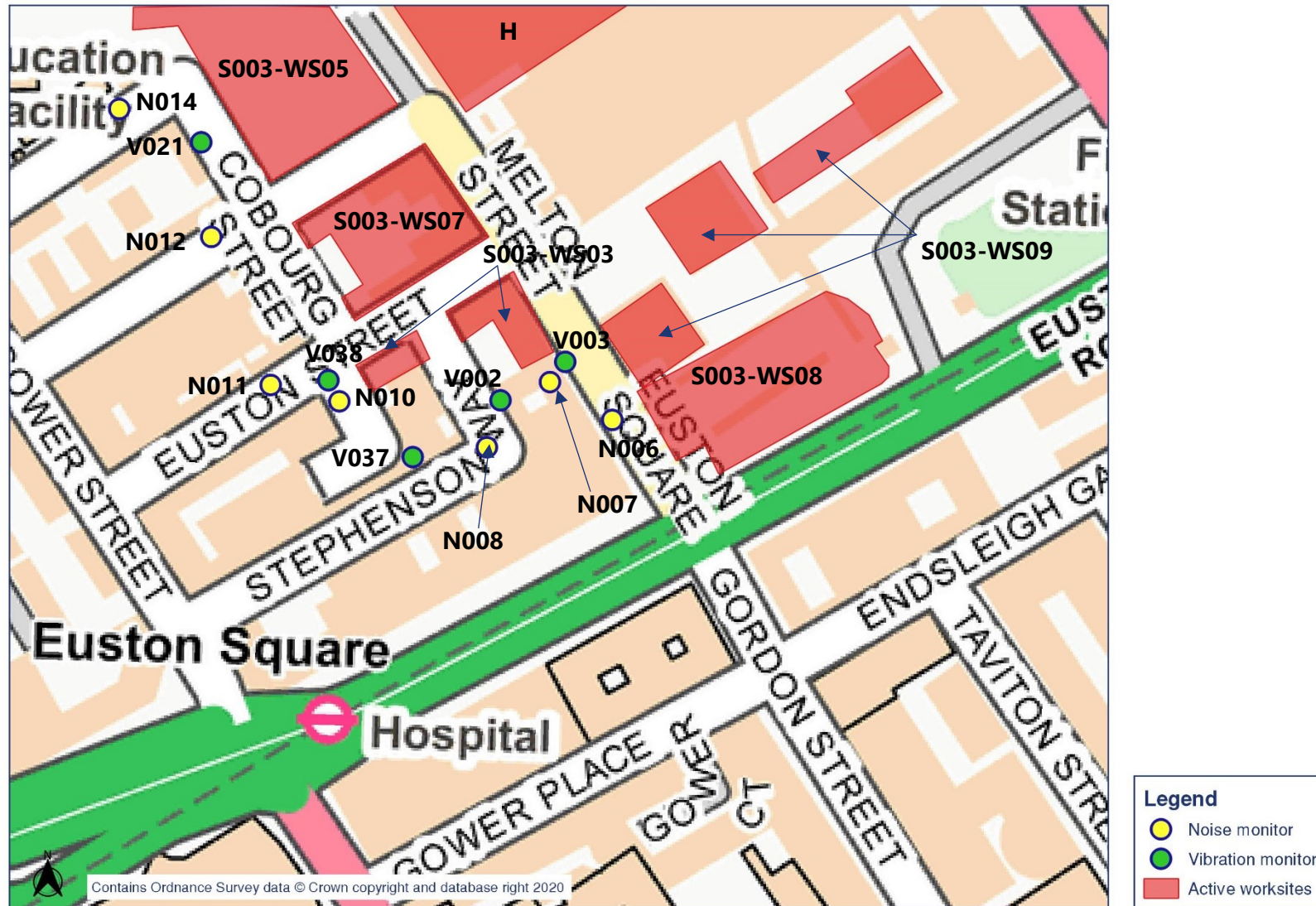










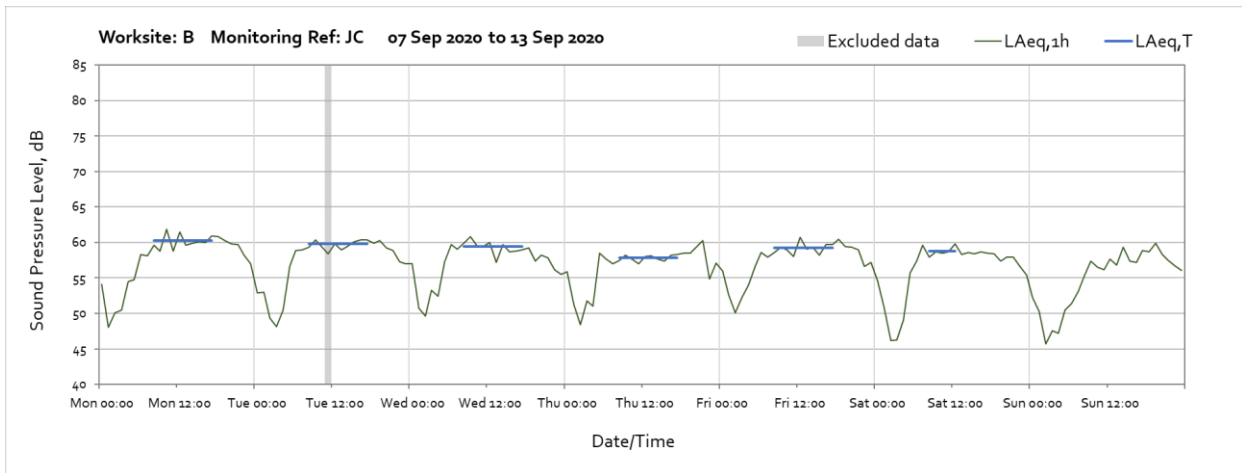
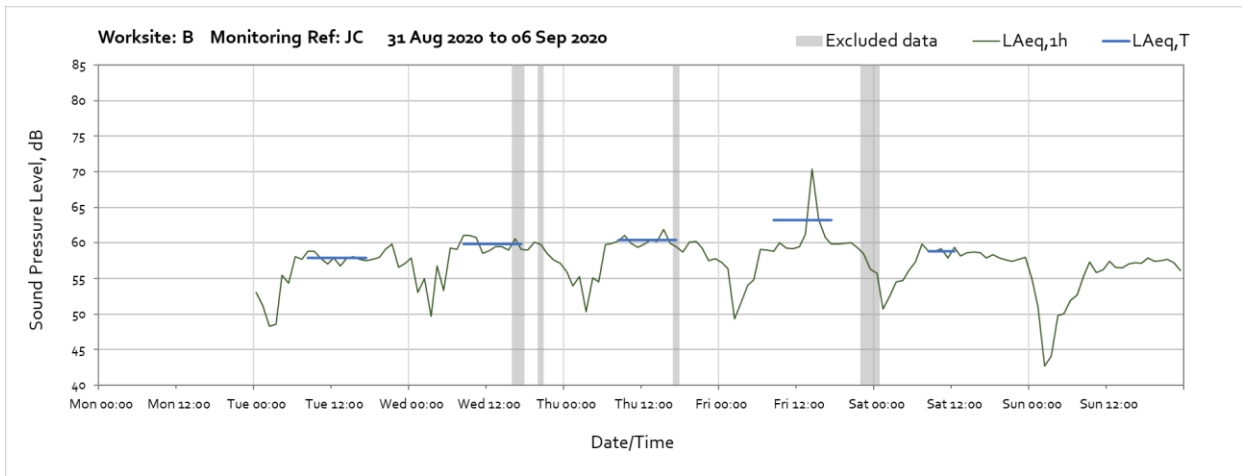


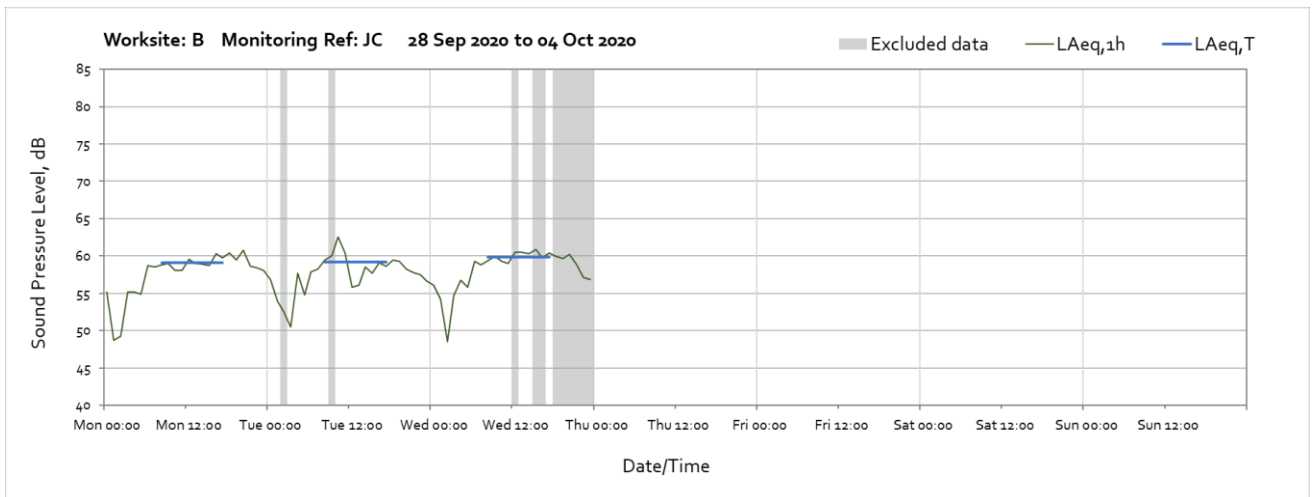
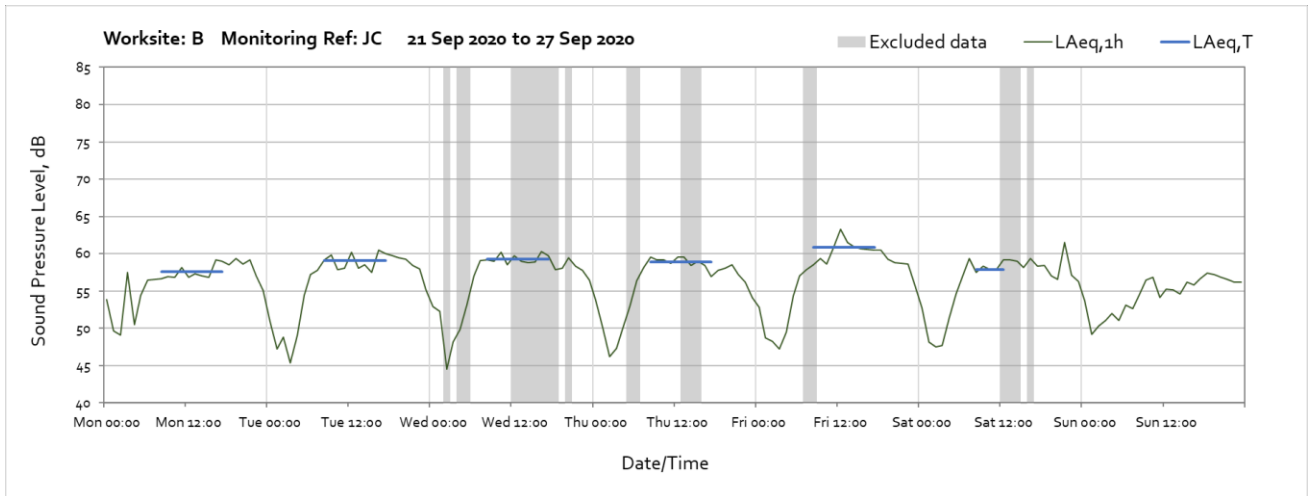
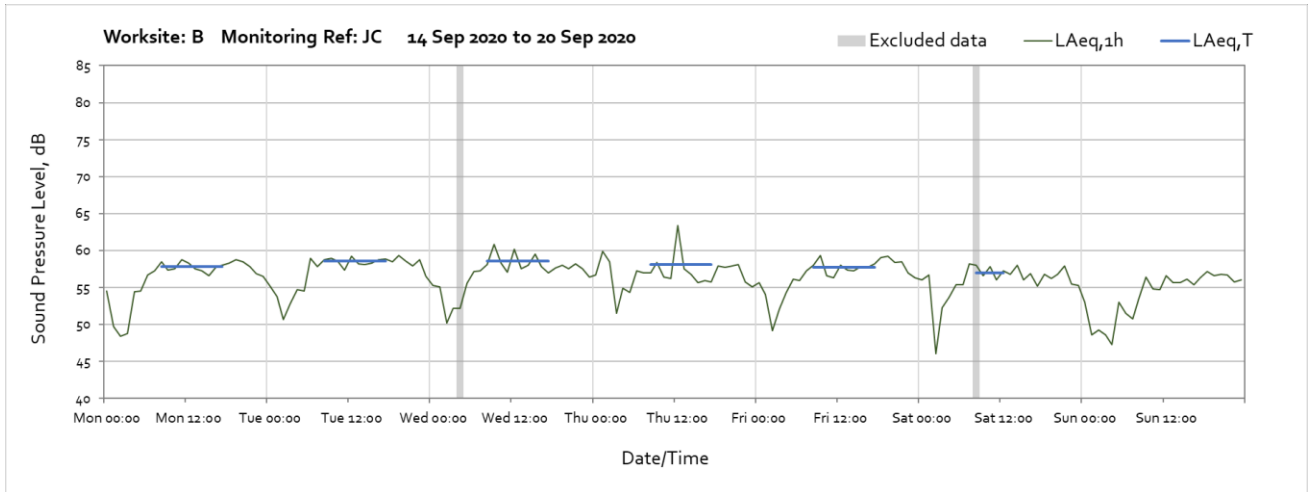
Appendix C Data

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.

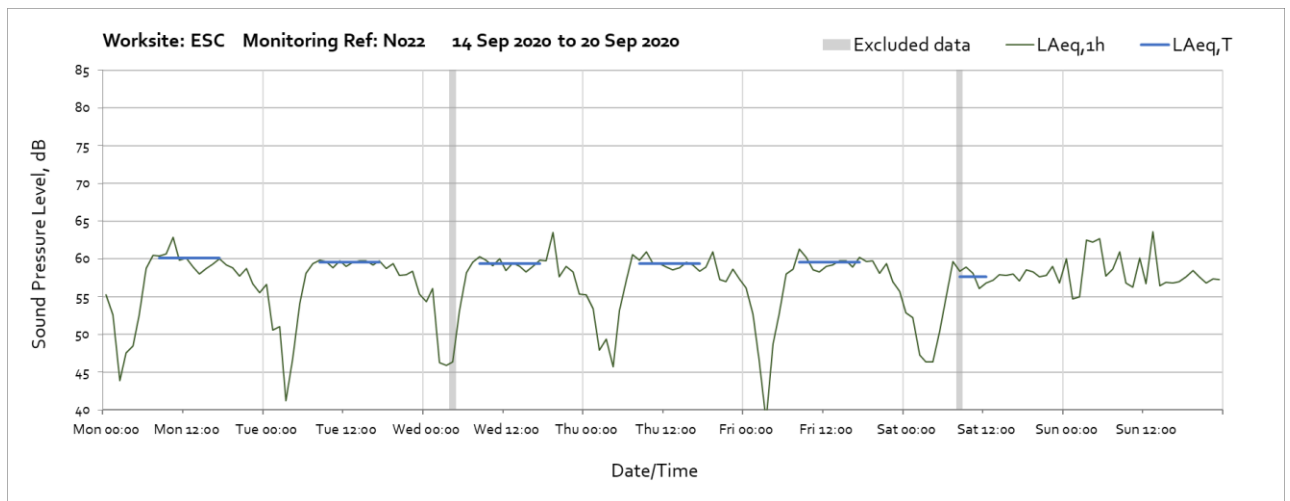
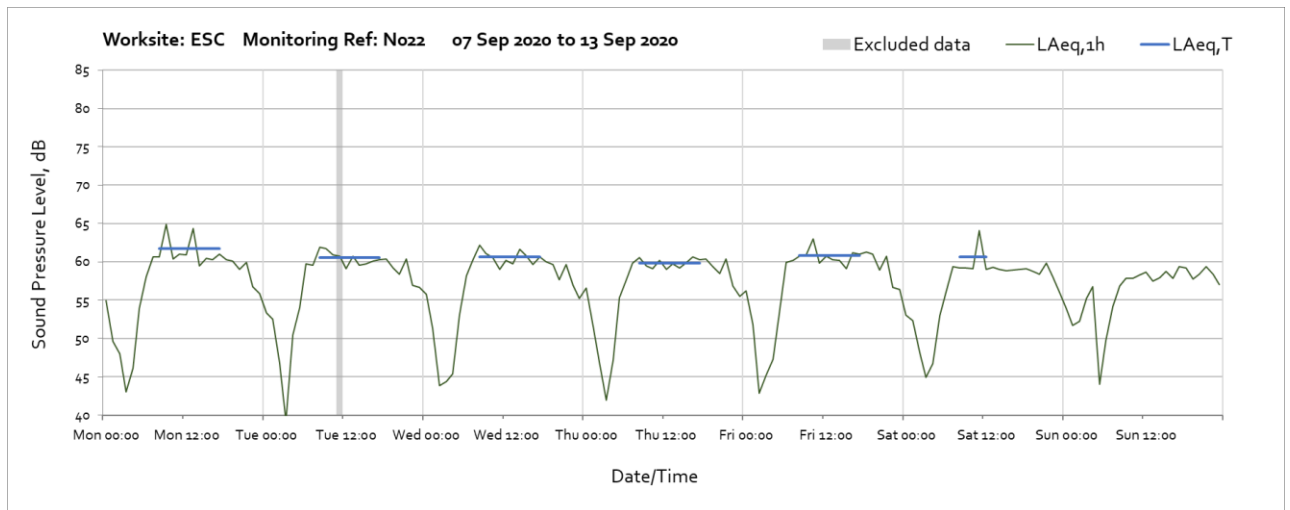
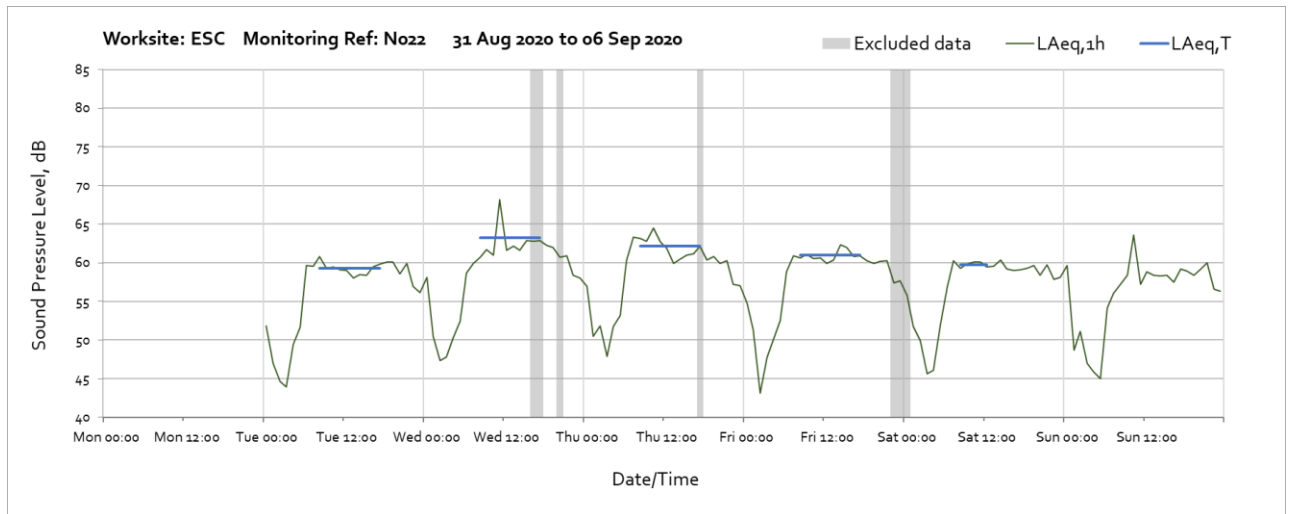
Noise

Worksite: B – Monitoring Ref: JC

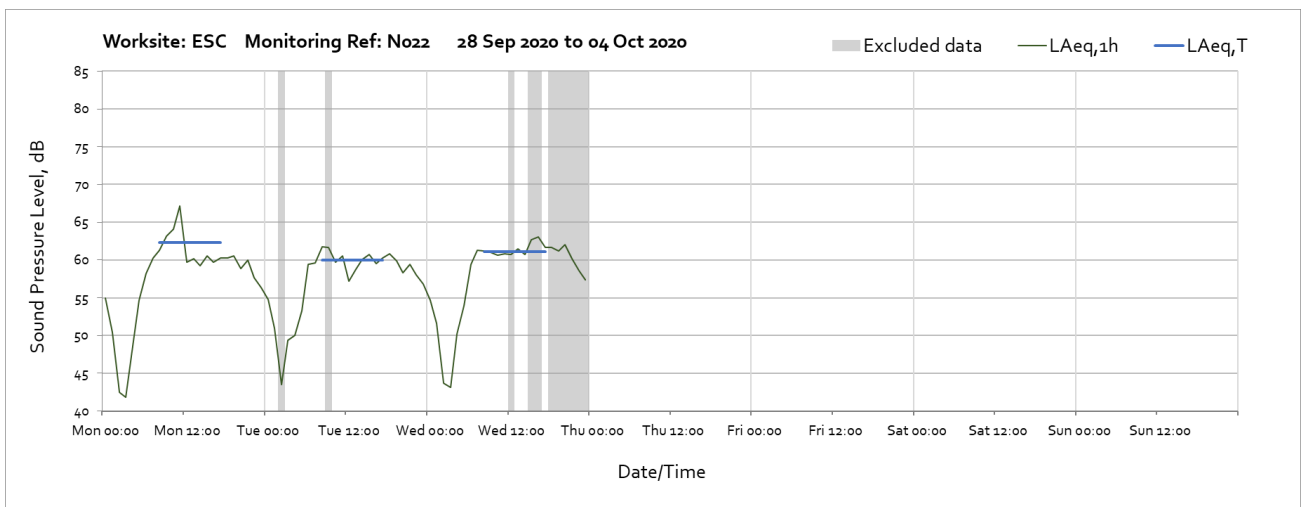
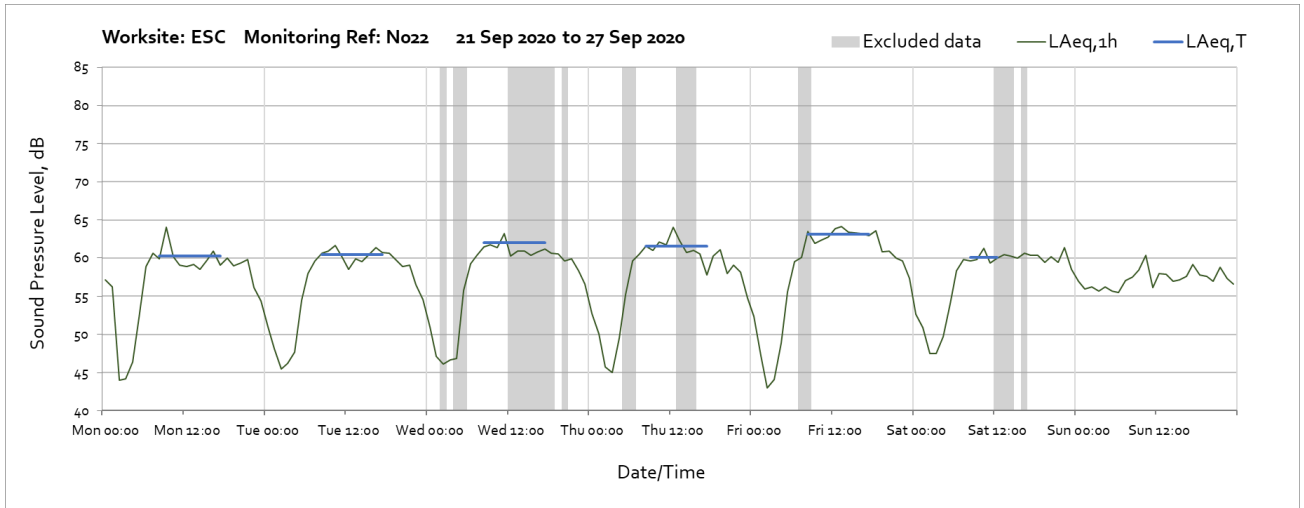




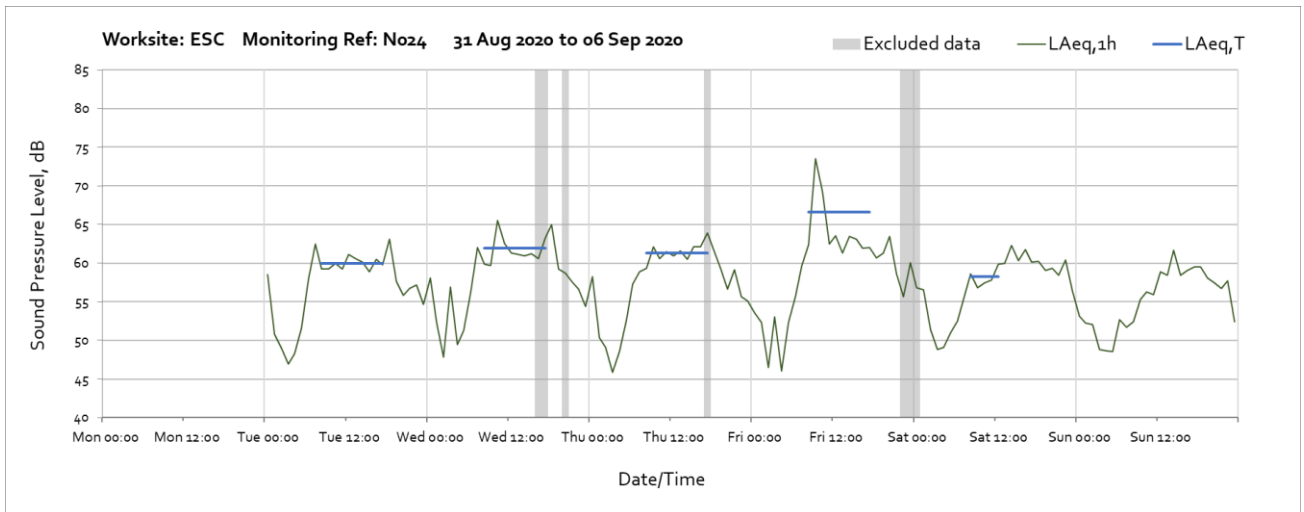
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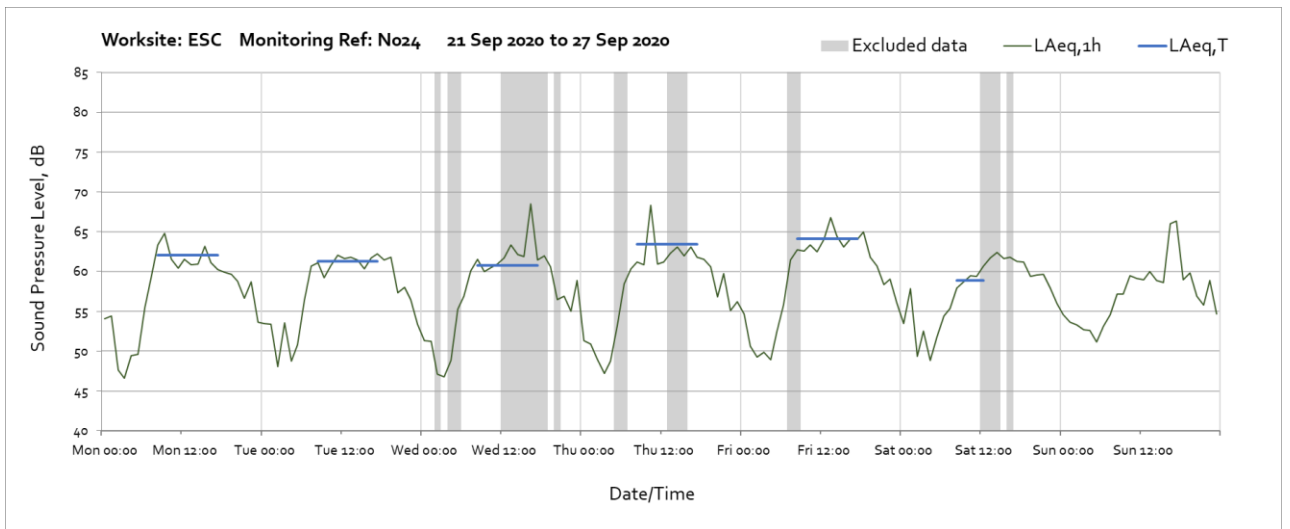
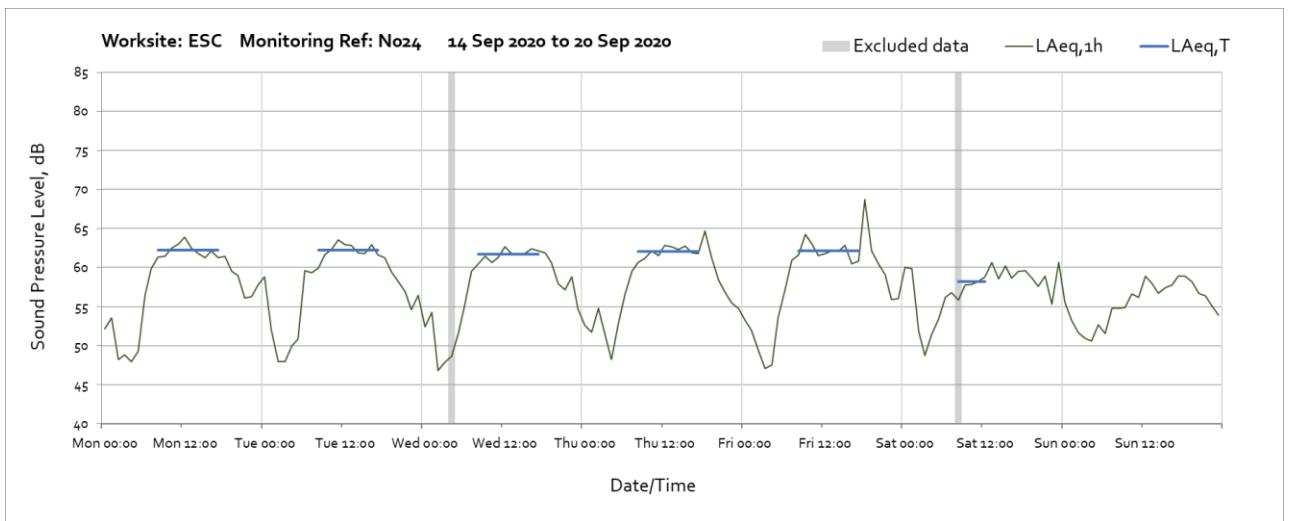
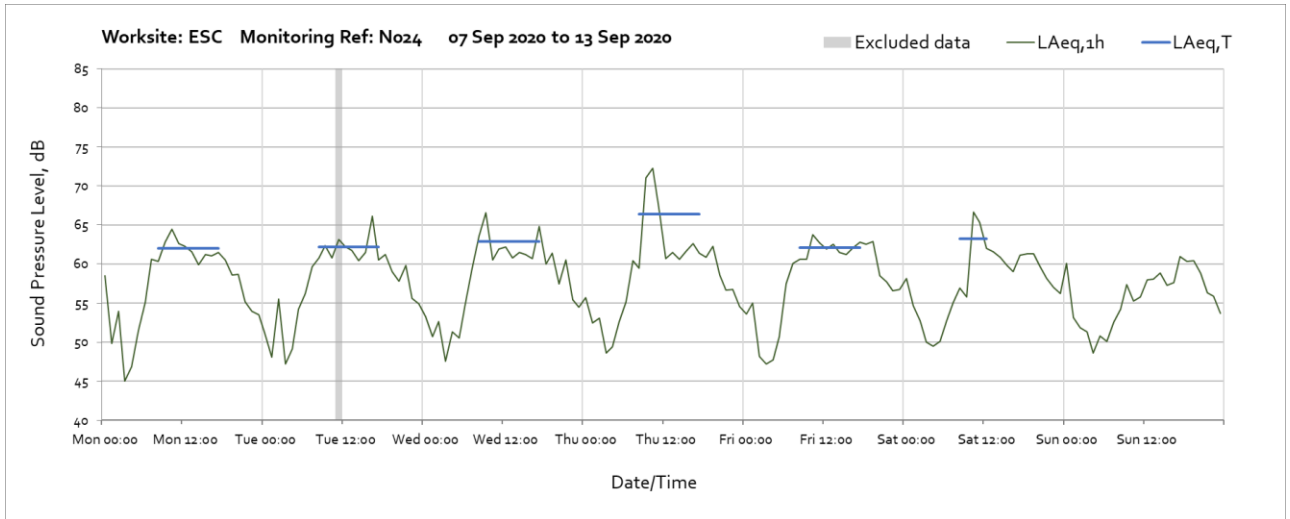


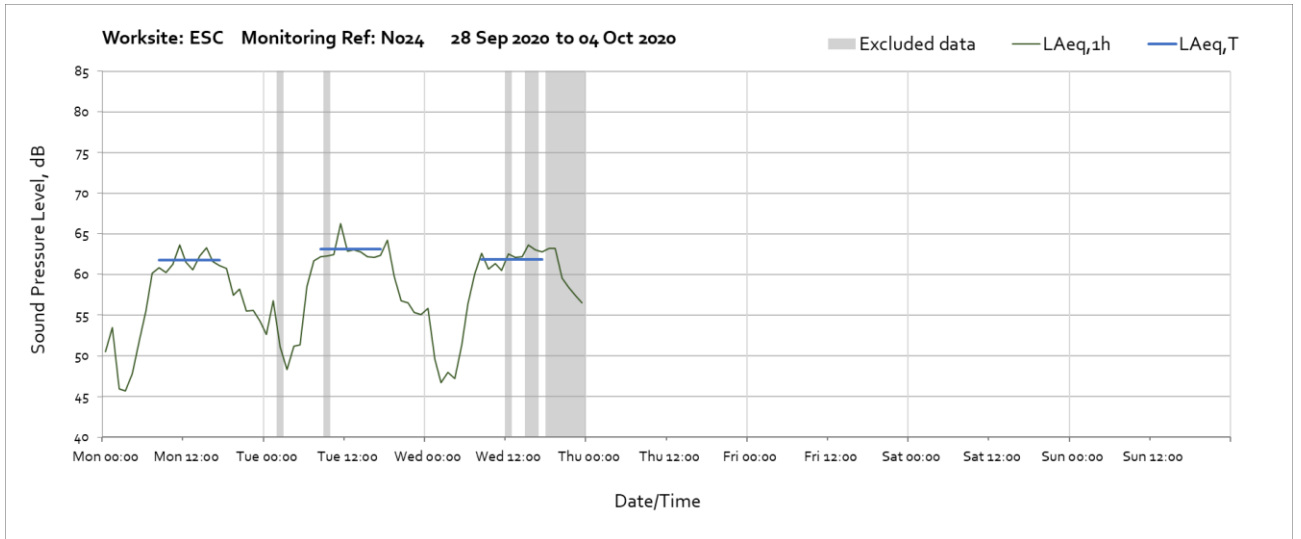
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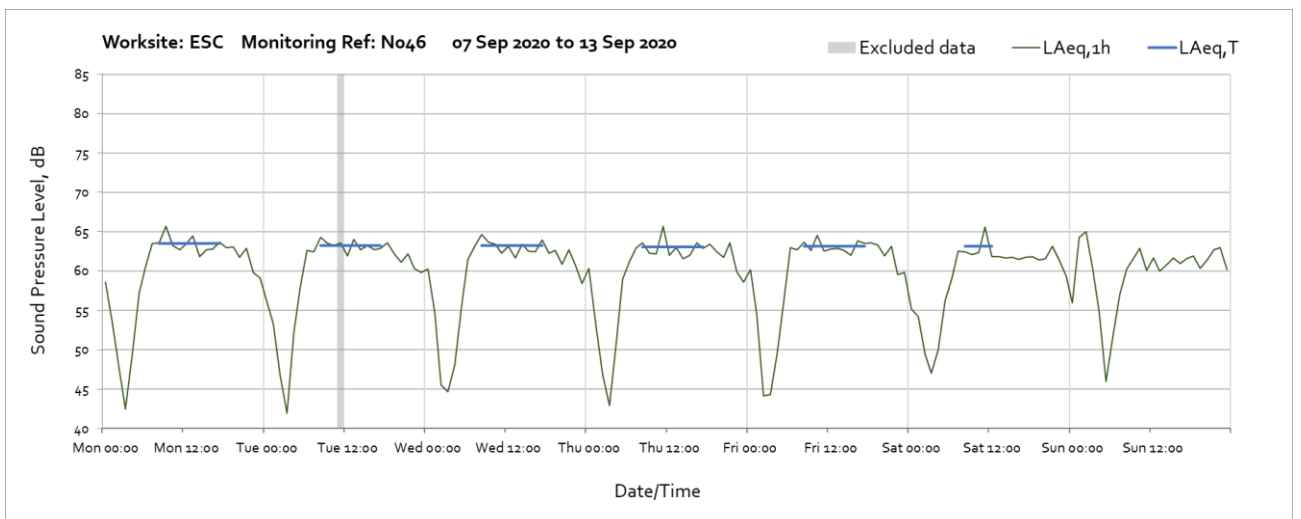
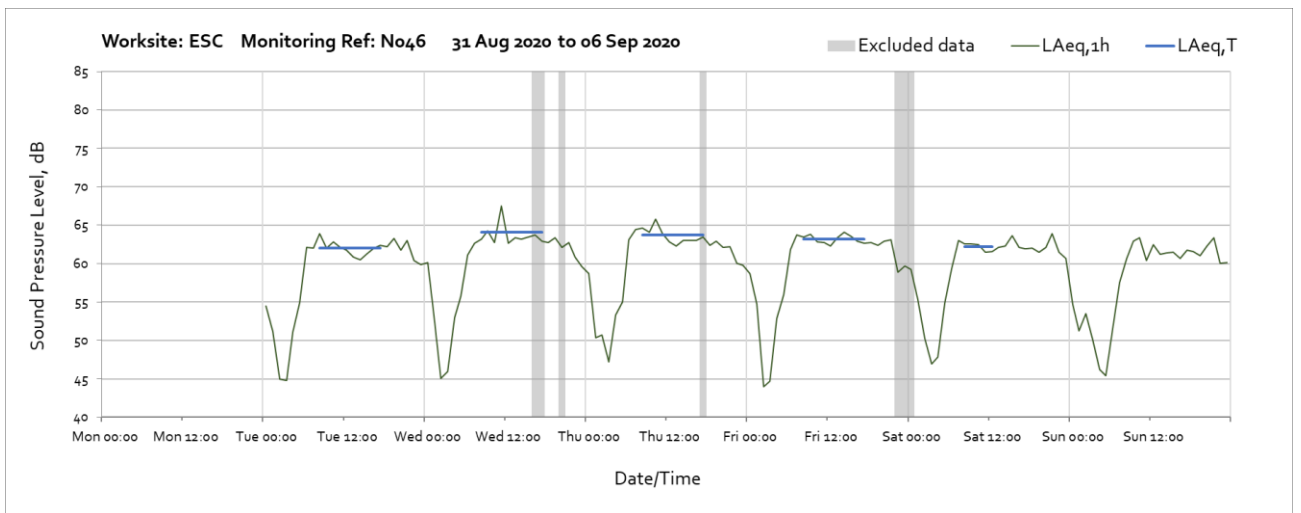
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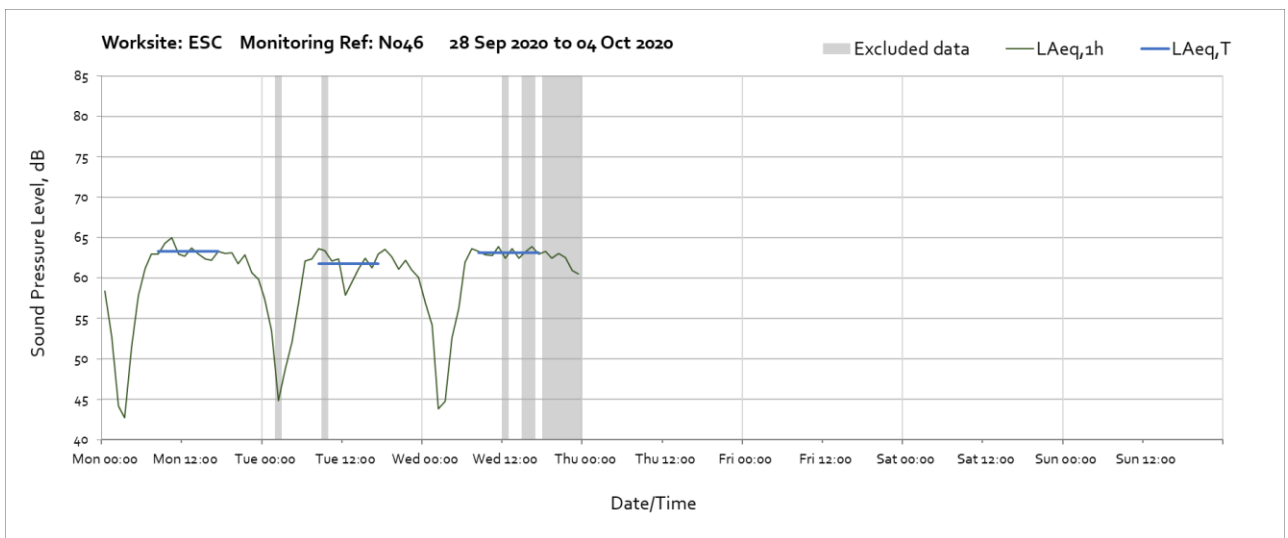
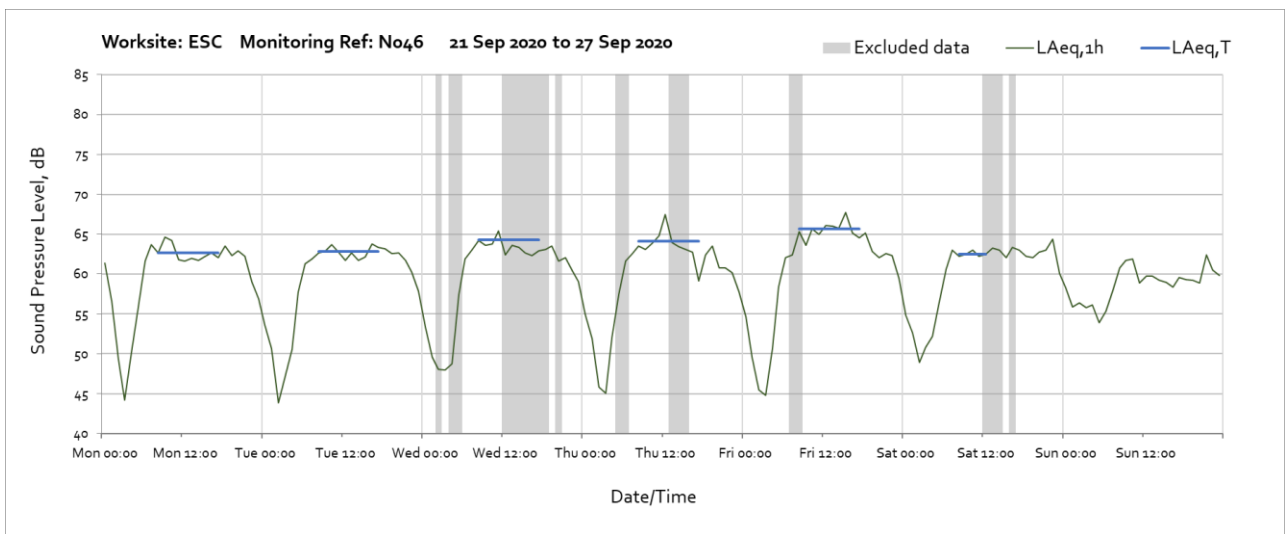
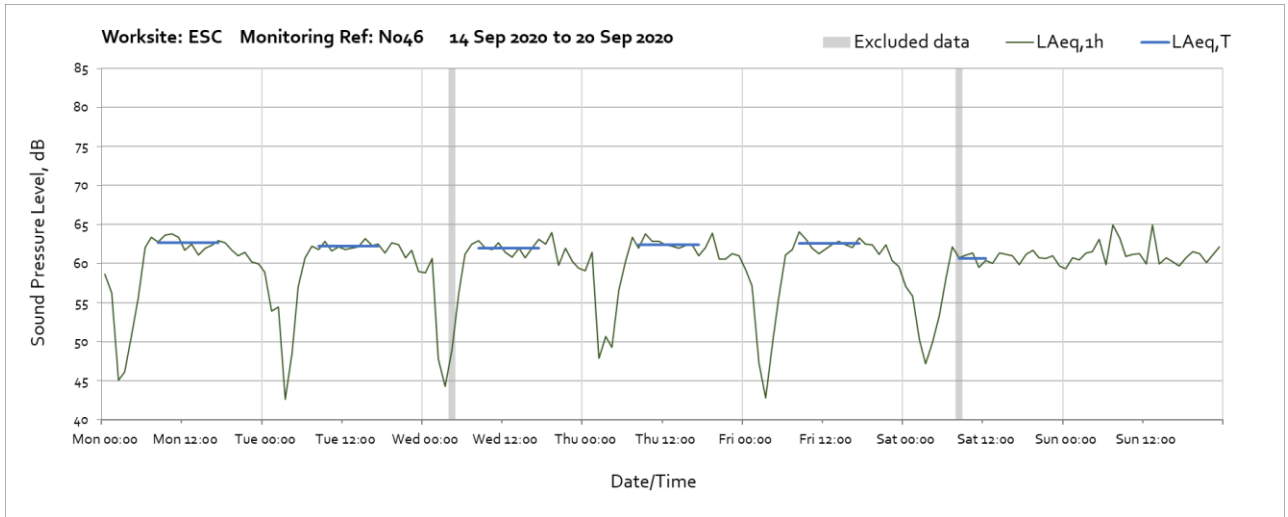




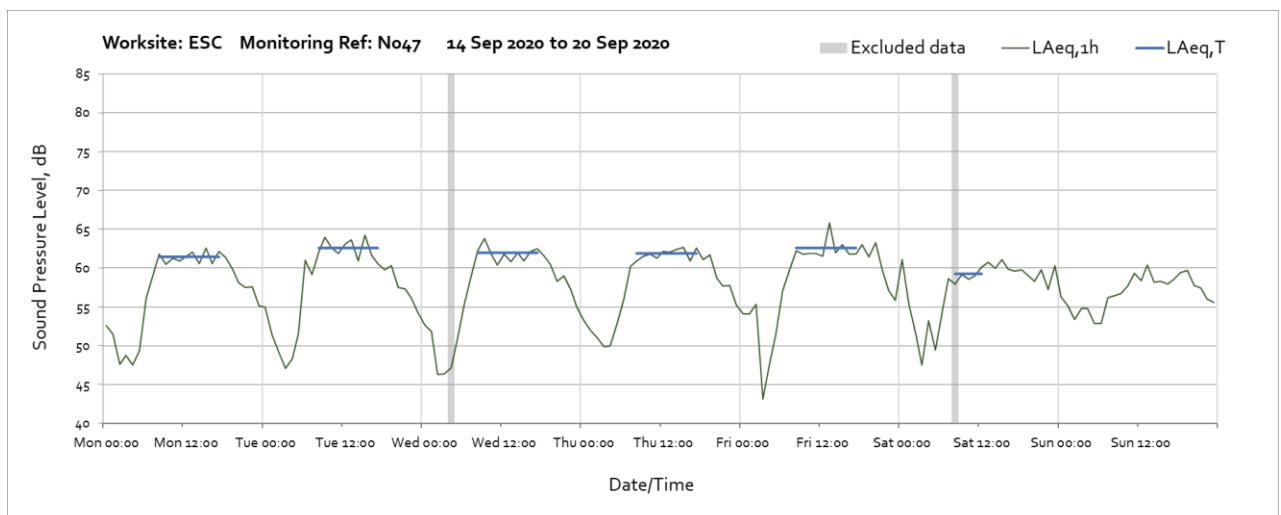
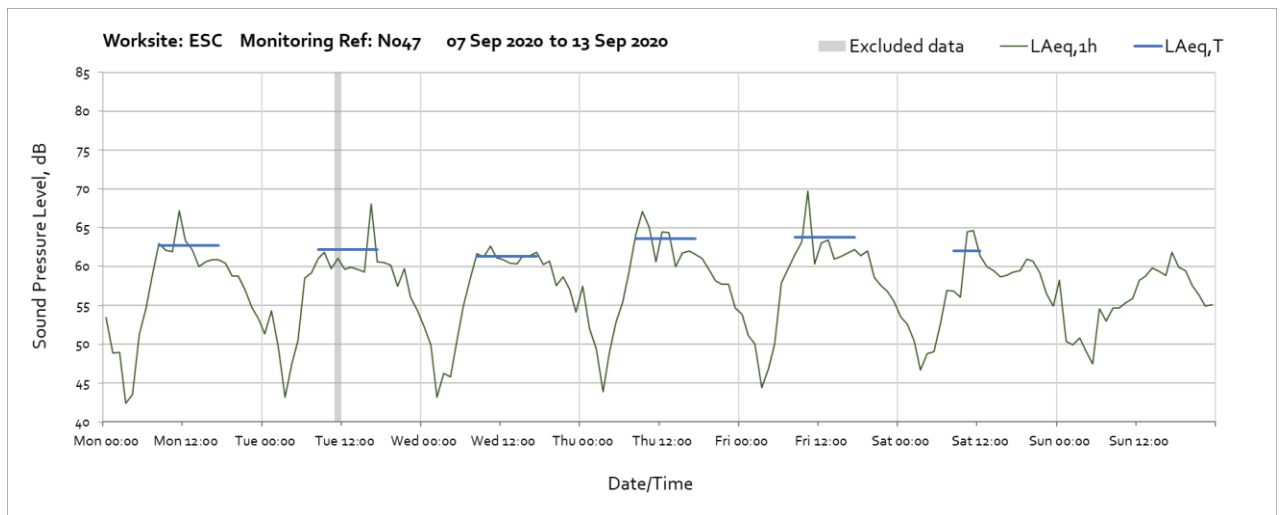
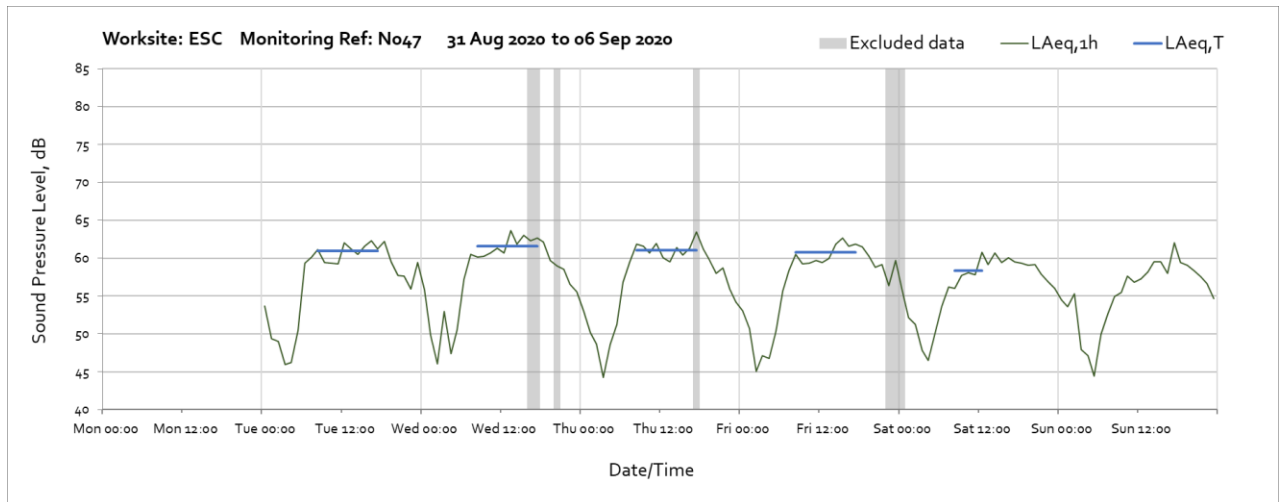


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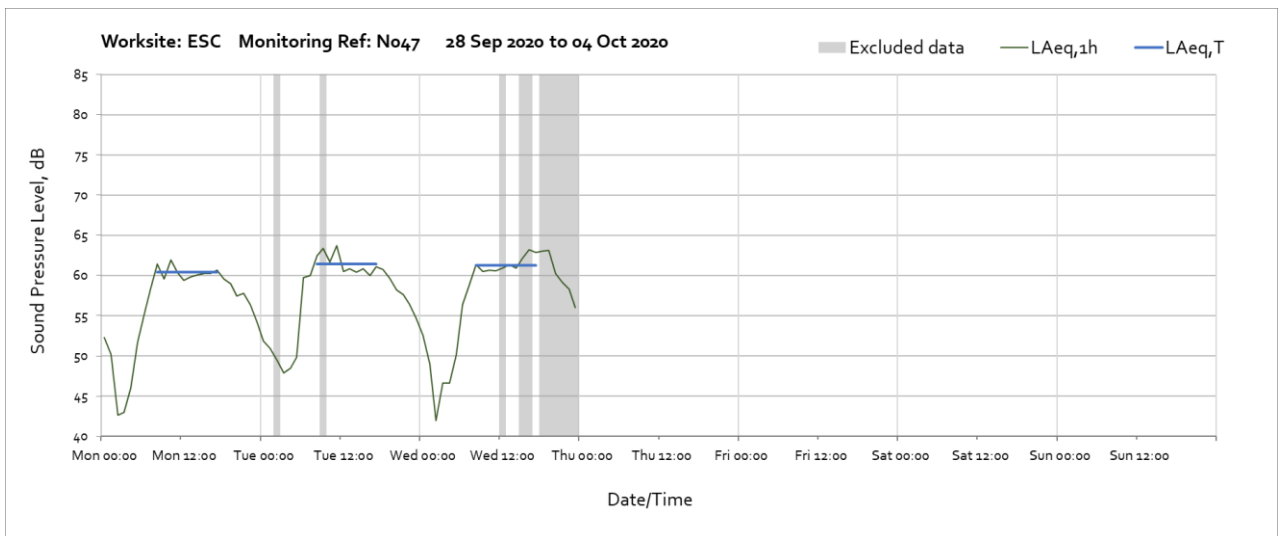
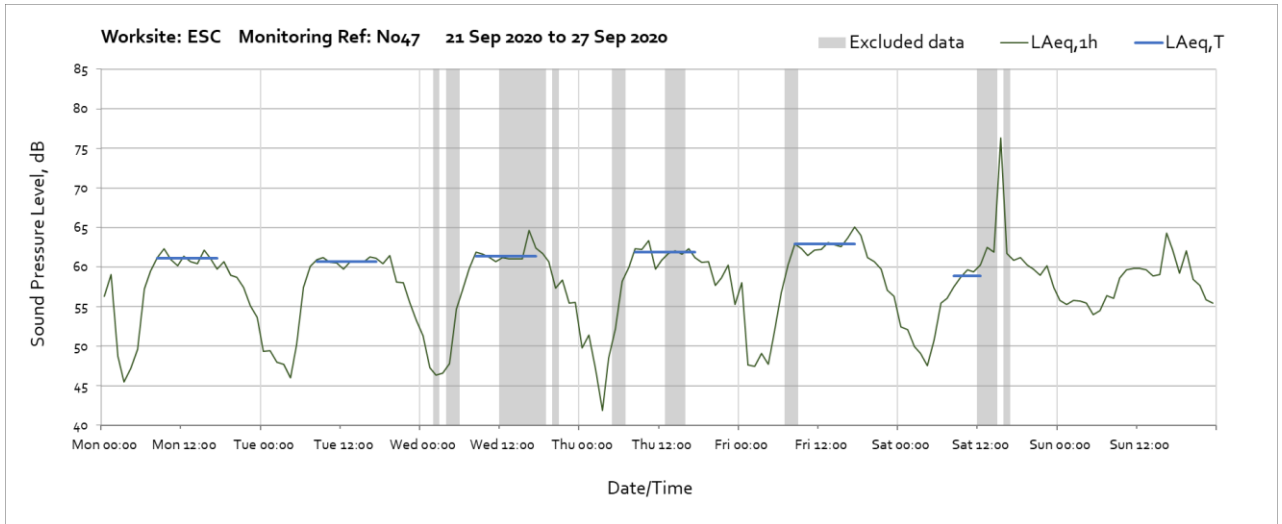




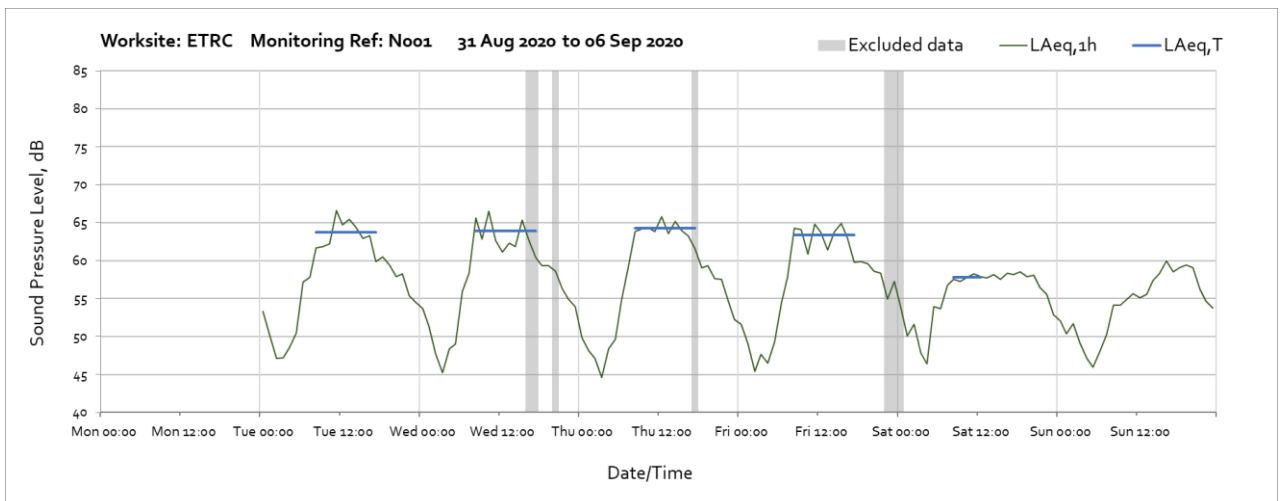
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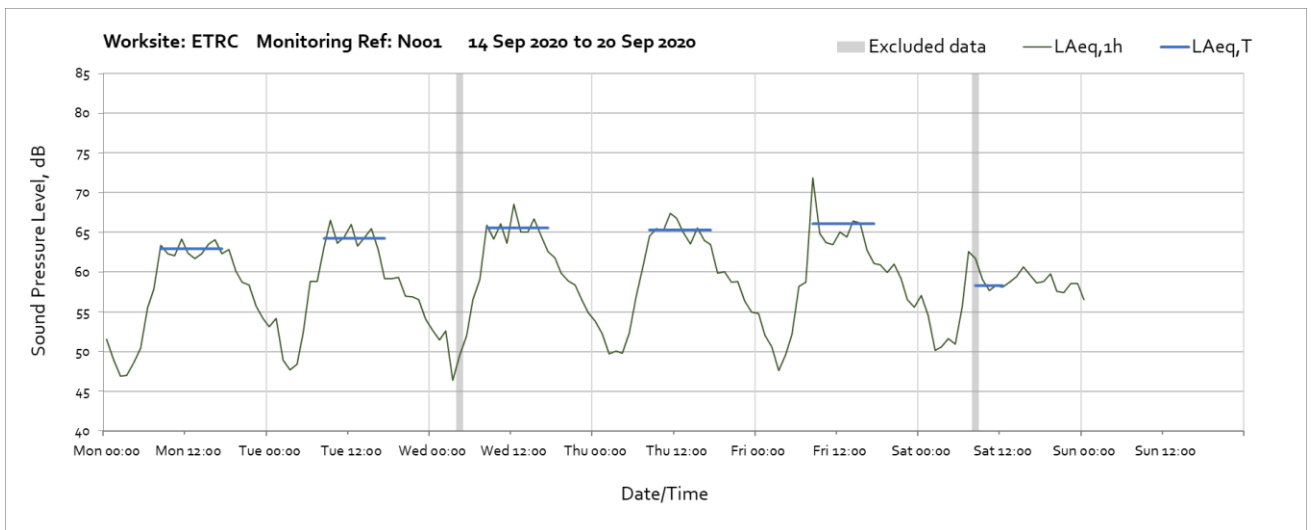
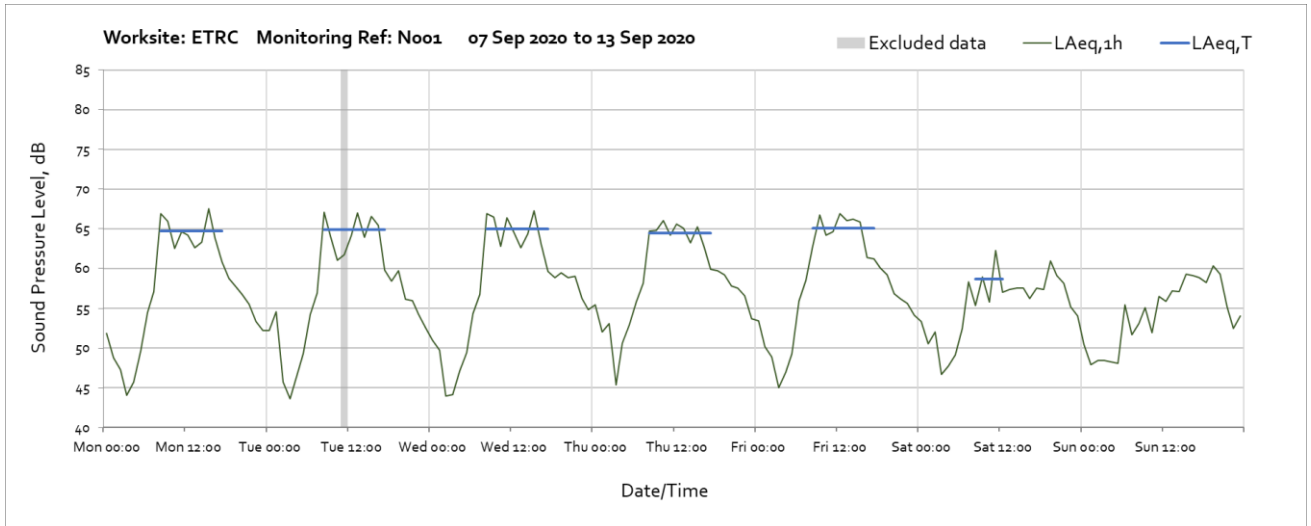


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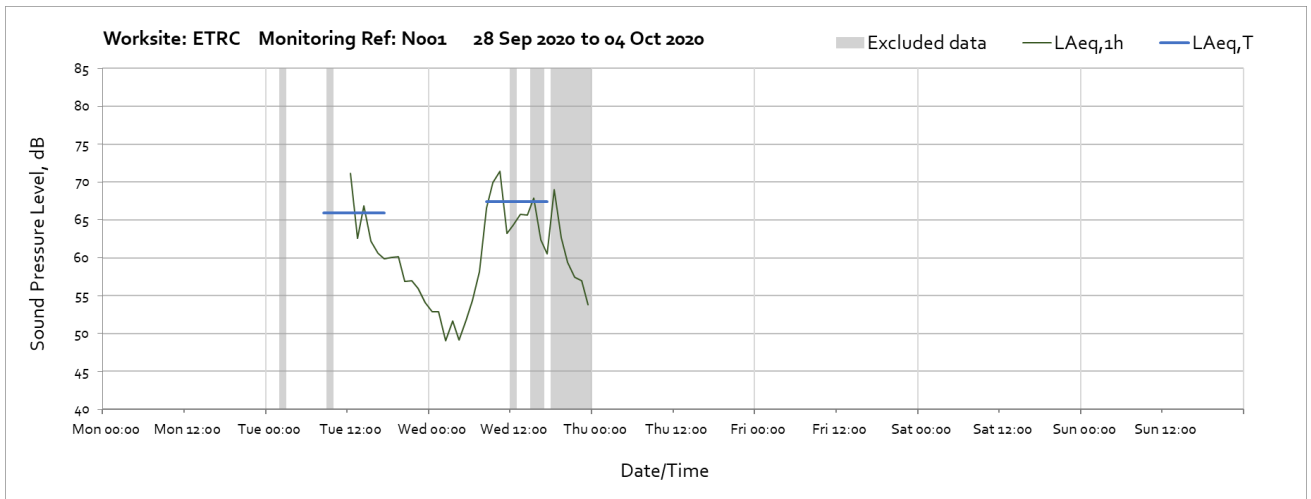


Worksite: ETRC – Monitoring Ref: N001



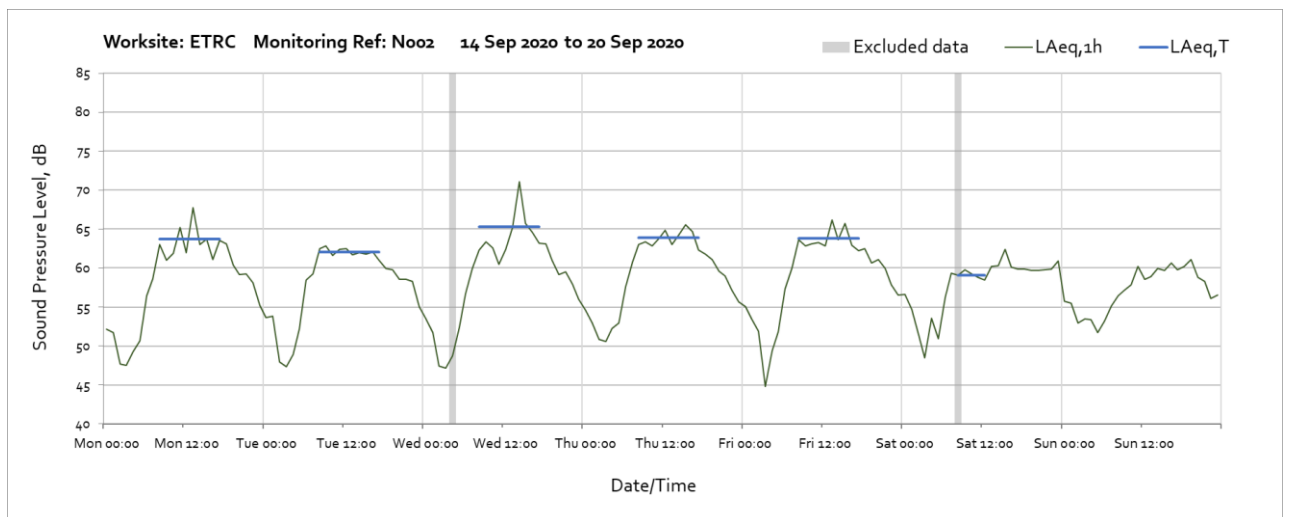
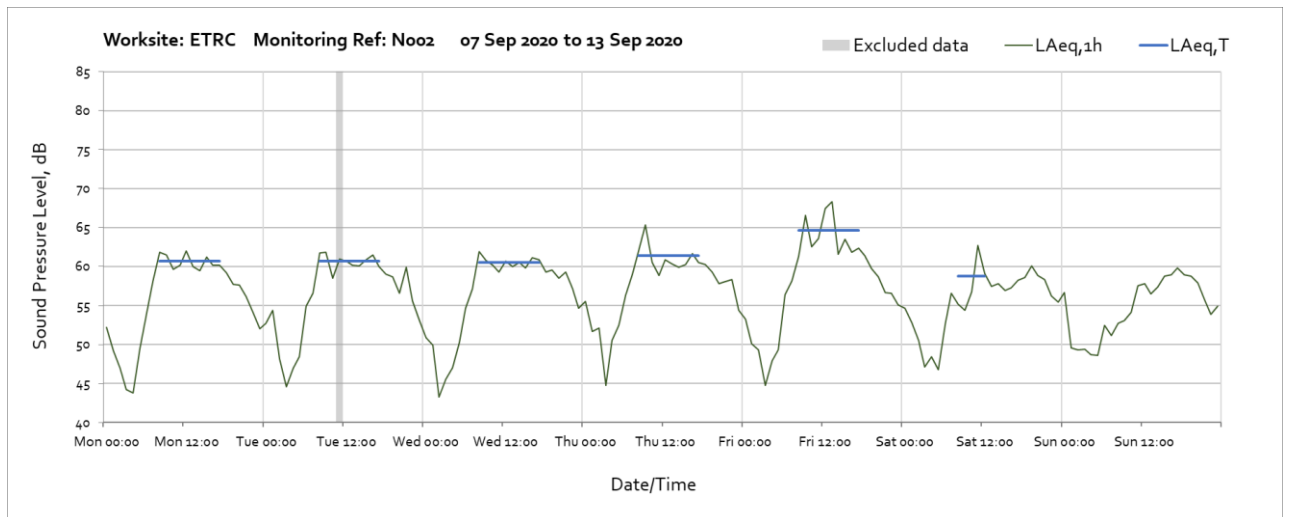
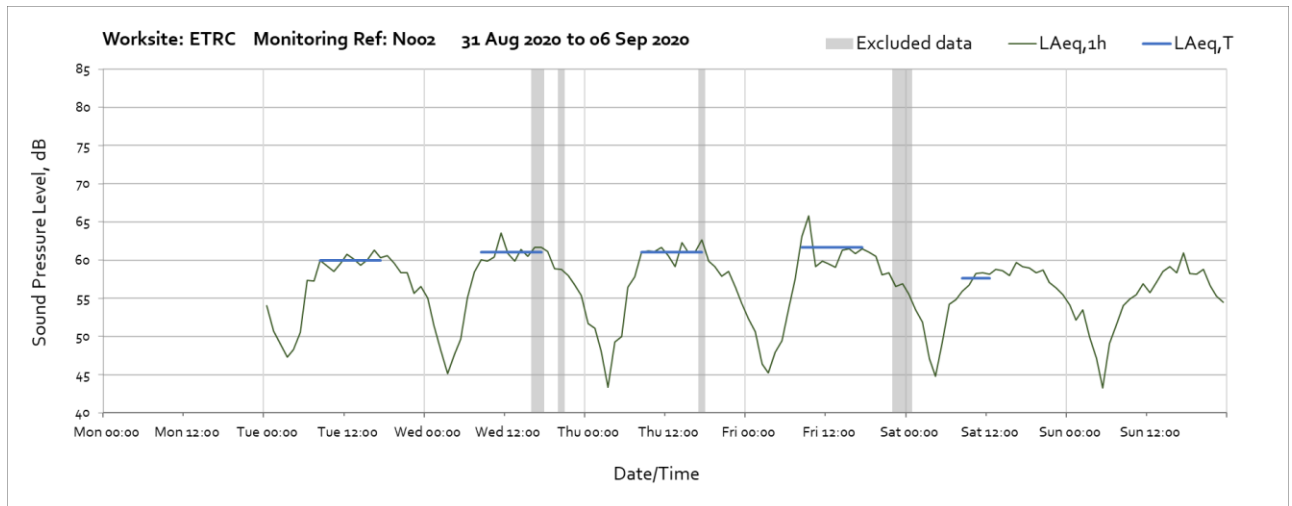


Note: Missing data from 01:00 on Sunday 20th September until 00:00 on Monday 15th September was due to failure of the monitoring station memory card.

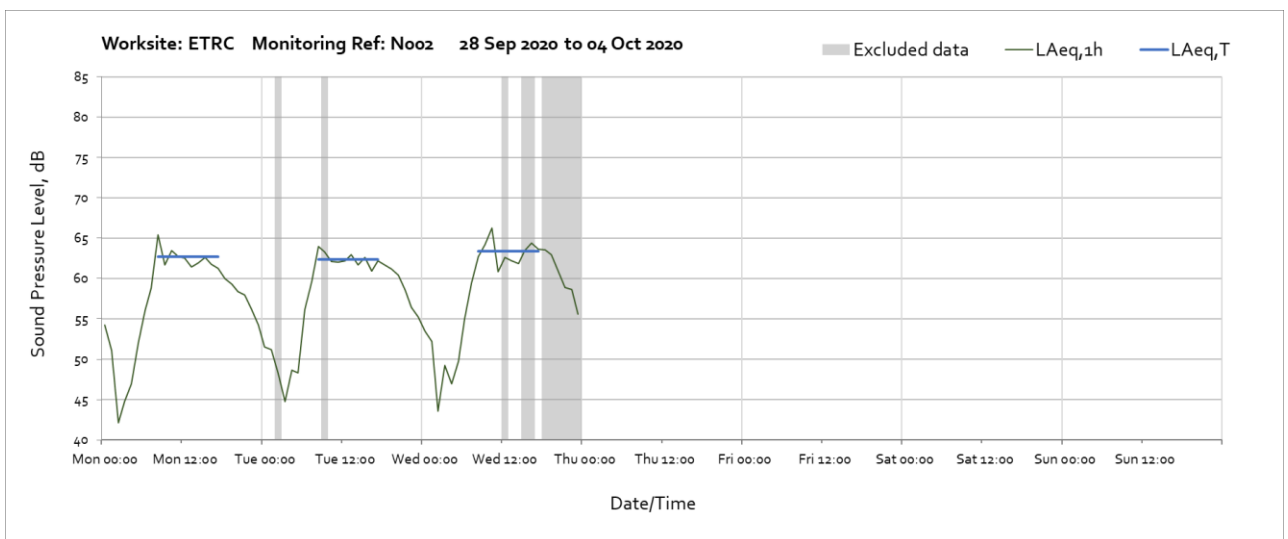
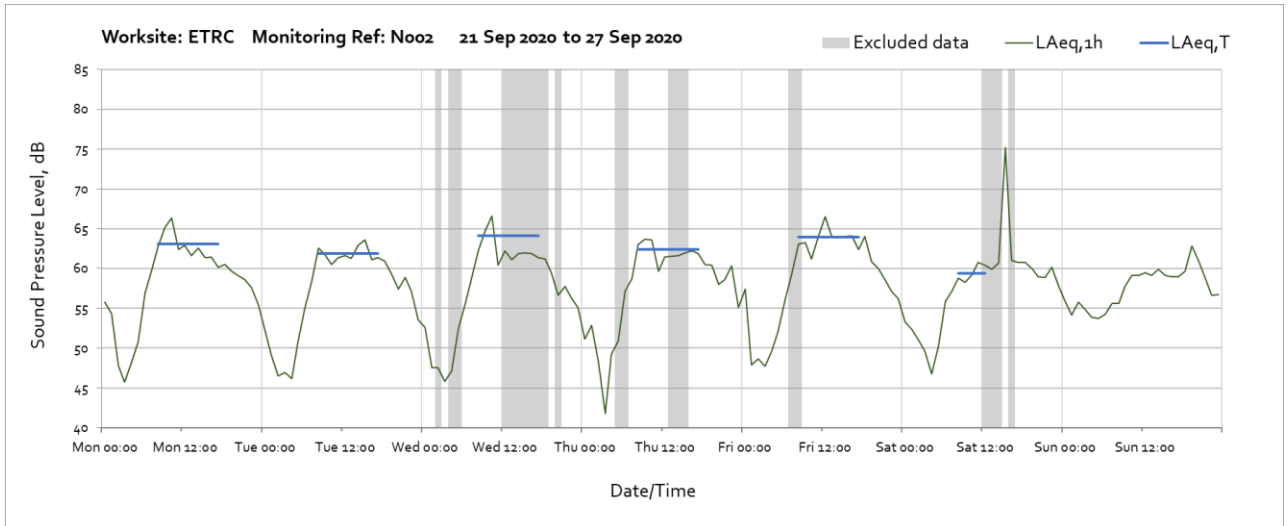


Note: Missing data from 00:00 on Monday 28th September until 12:00 on Tuesday 29th September was due to failure of the monitoring station memory card.

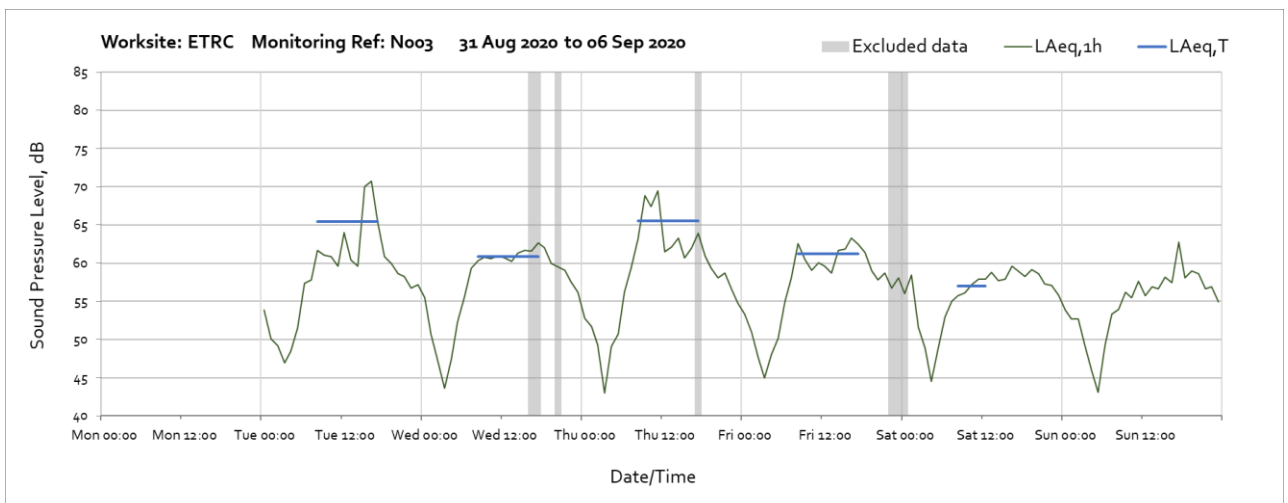
Worksite: ETRC – Monitoring Ref: N002

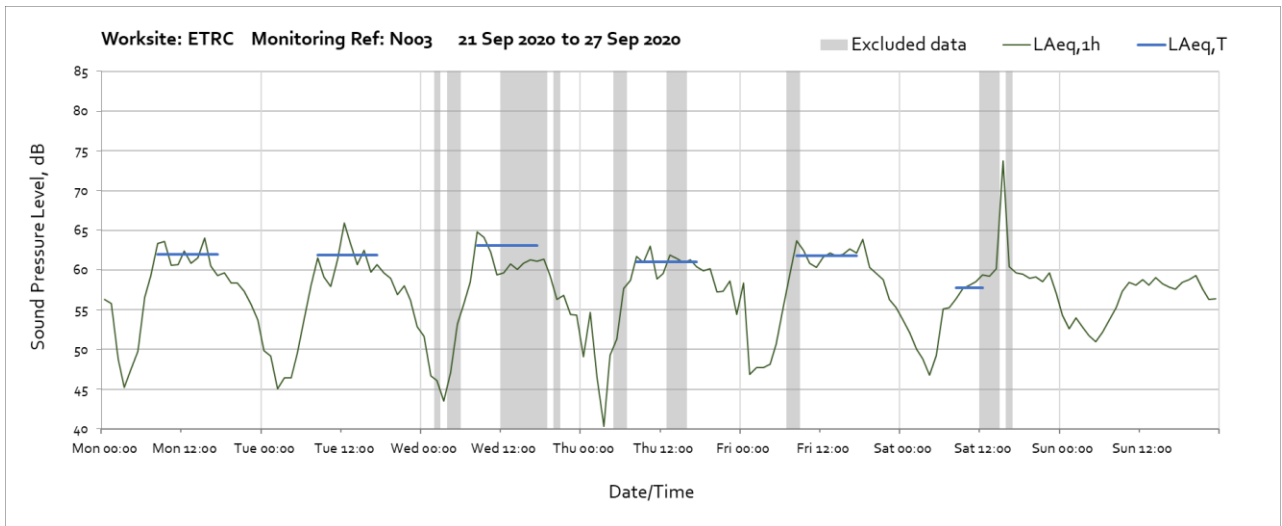
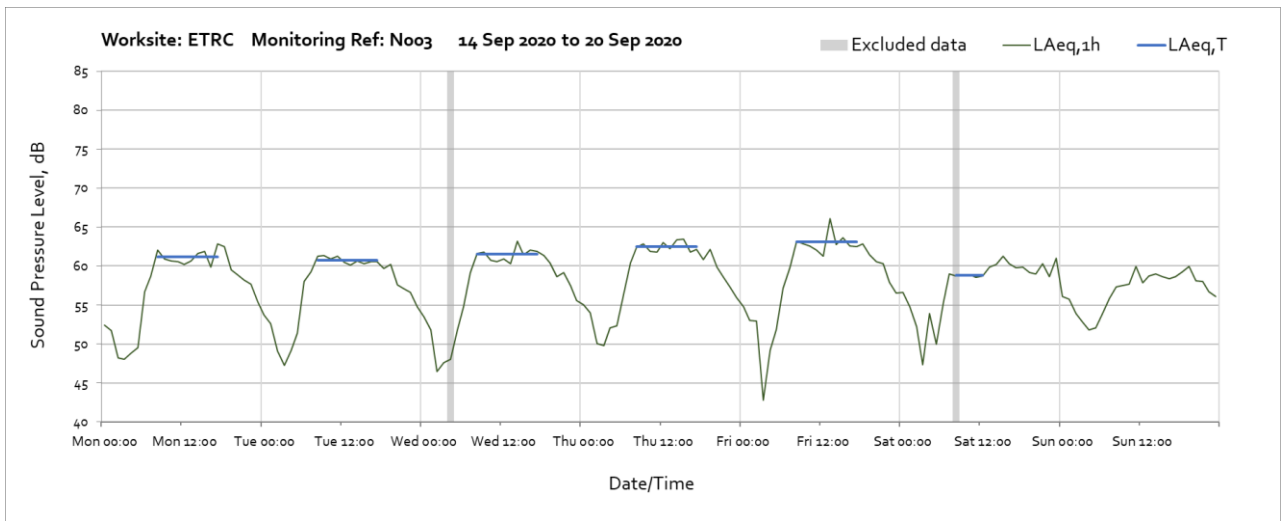
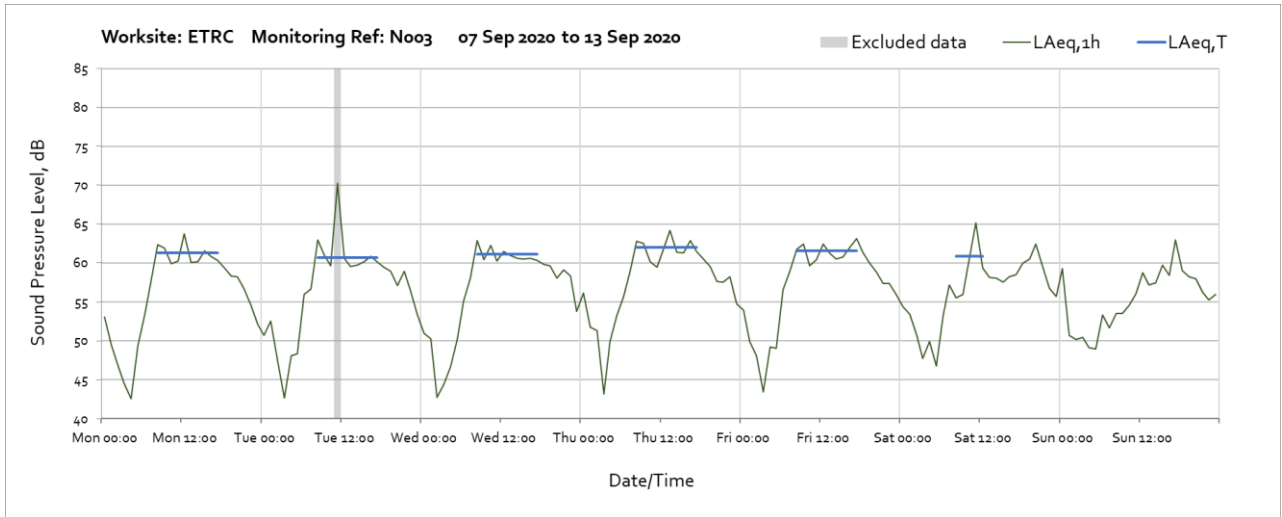


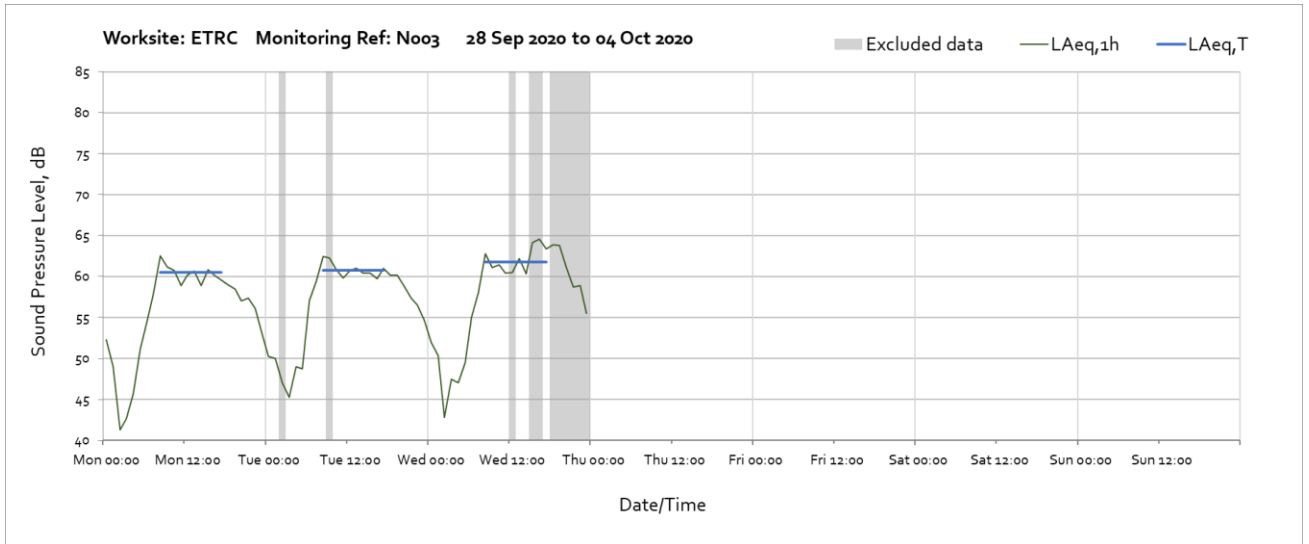
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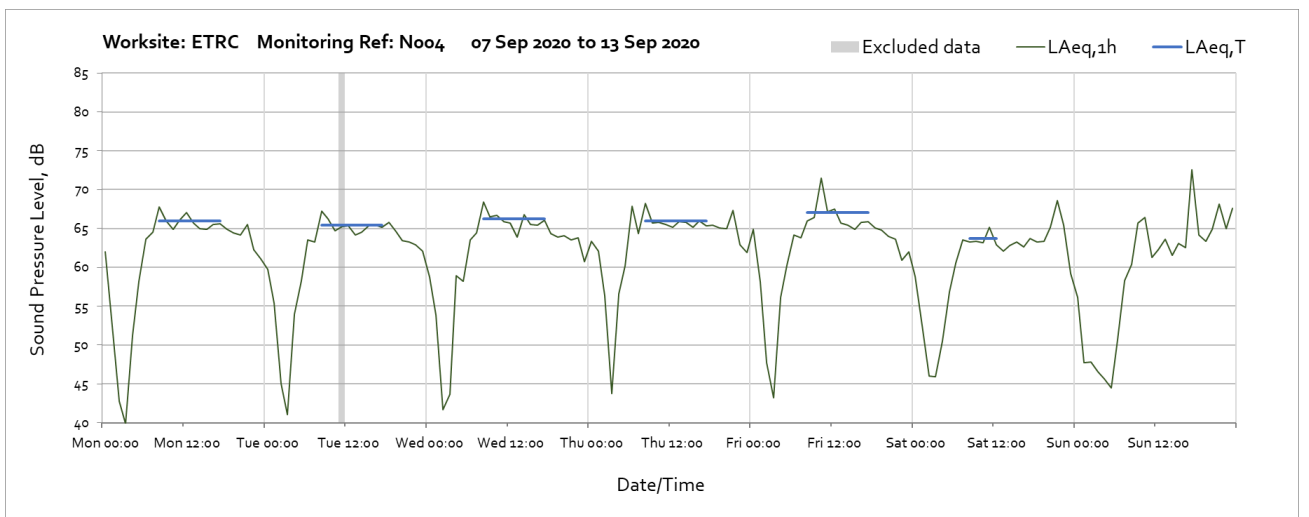
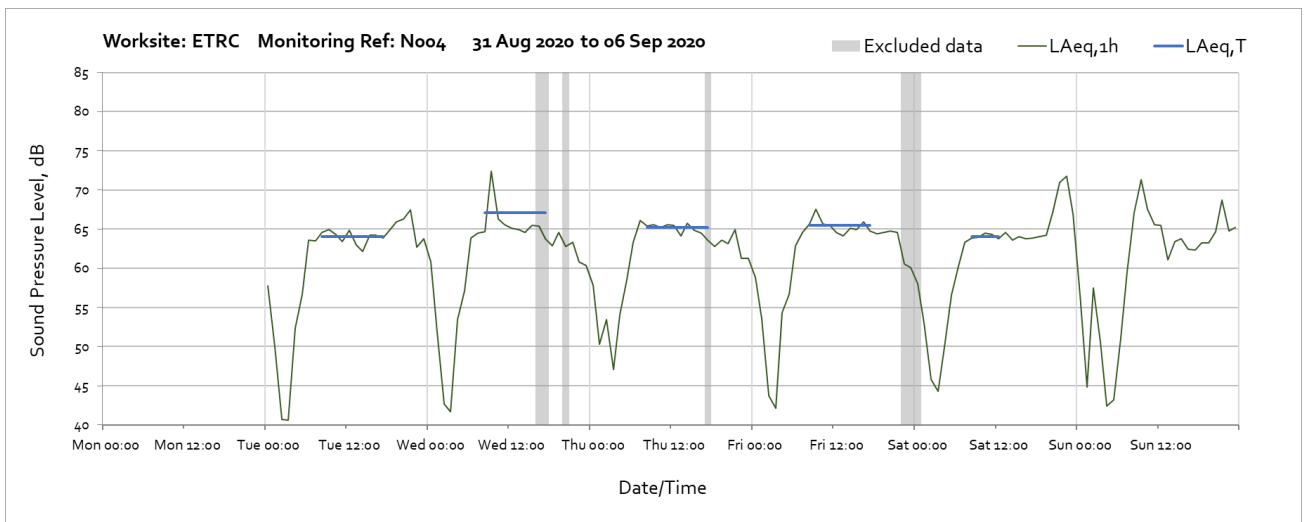
Worksite: ETRC – Monitoring Ref: N003

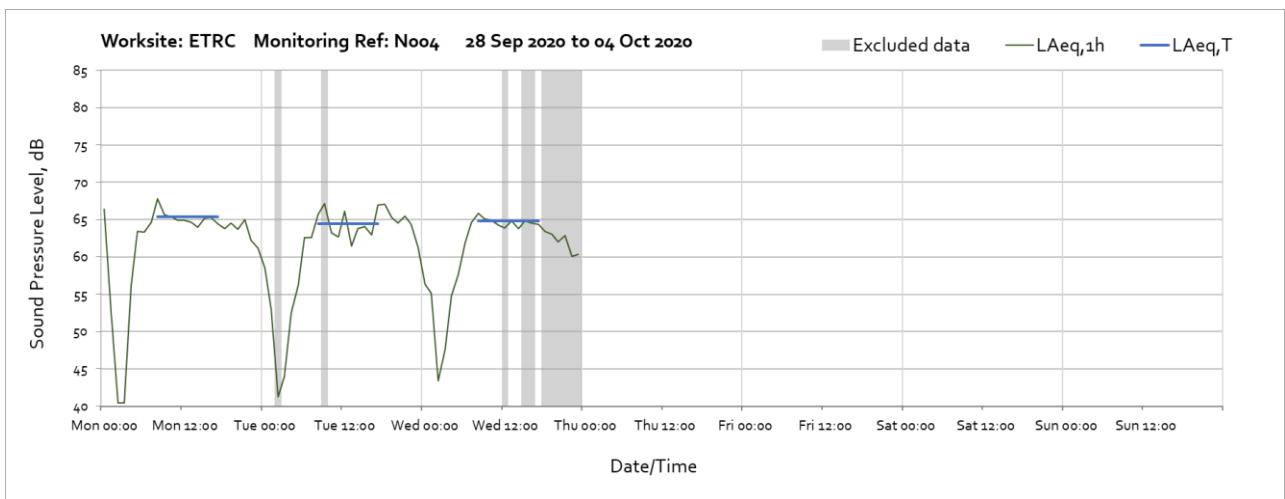
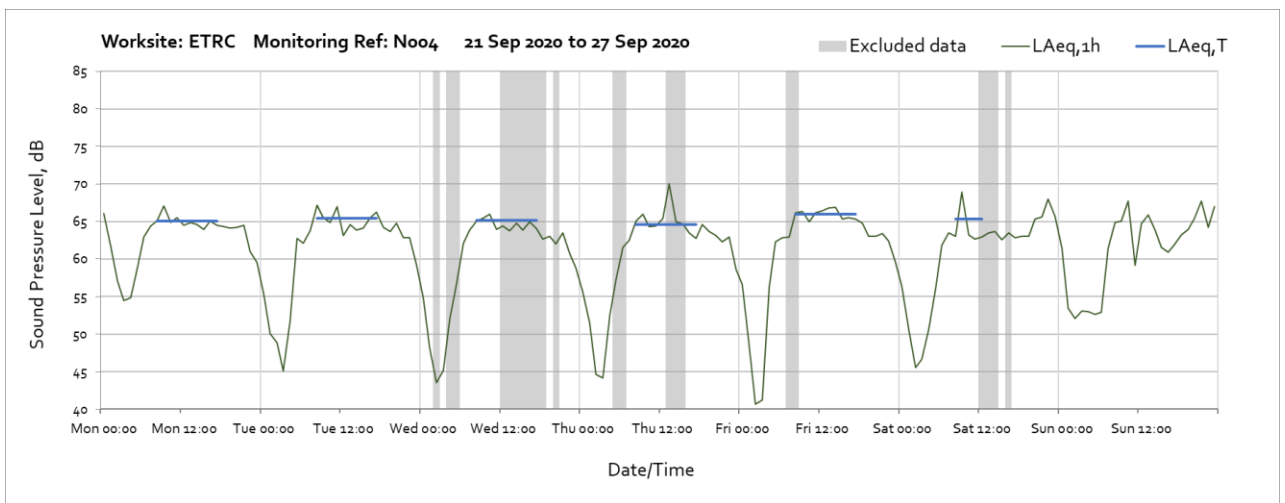
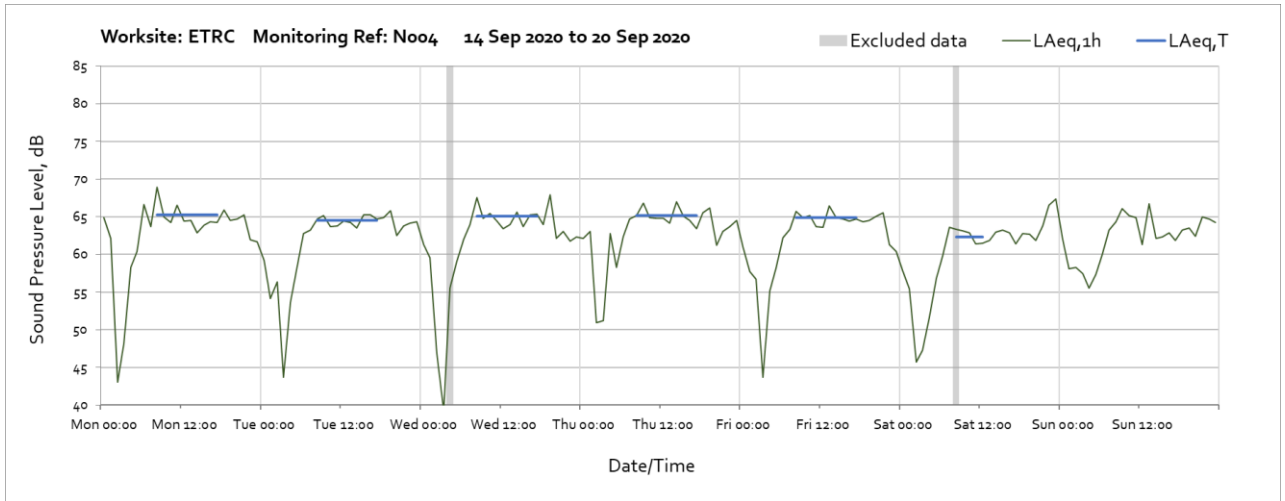




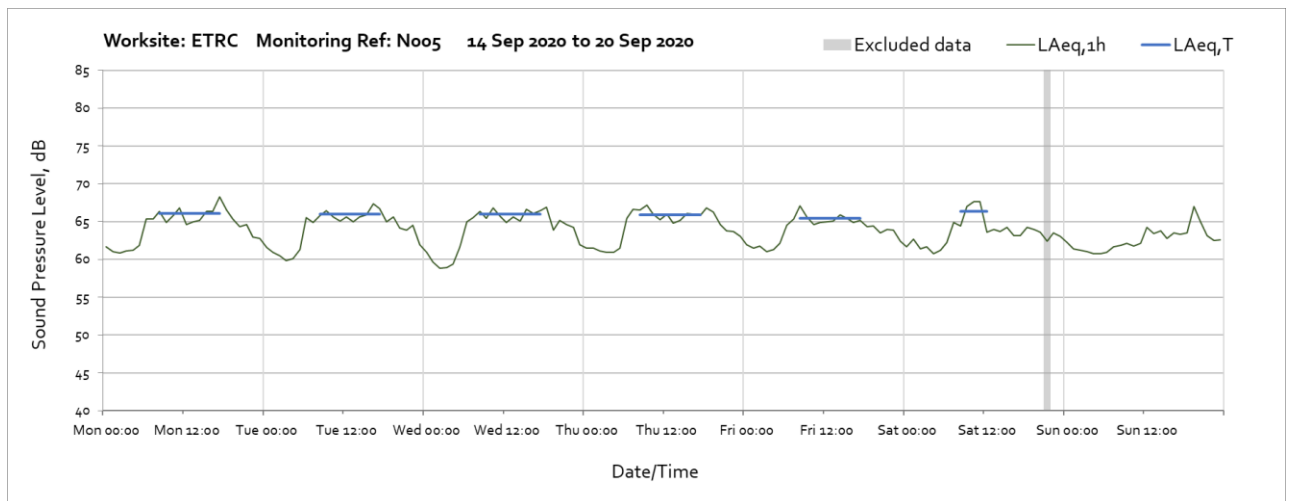
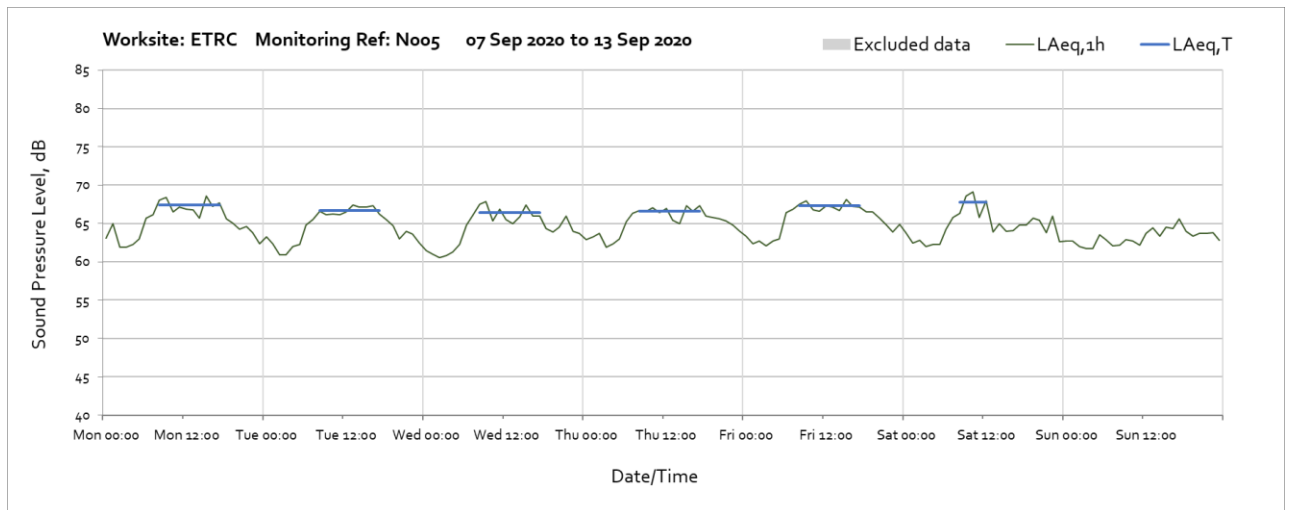
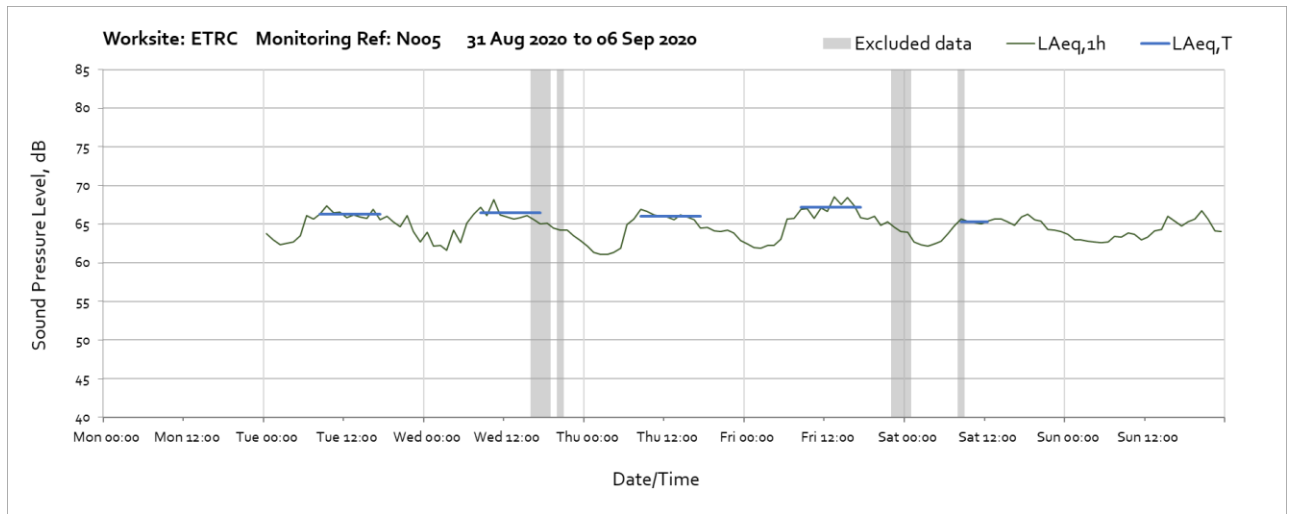


Worksite: ETRC – Monitoring Ref: N004

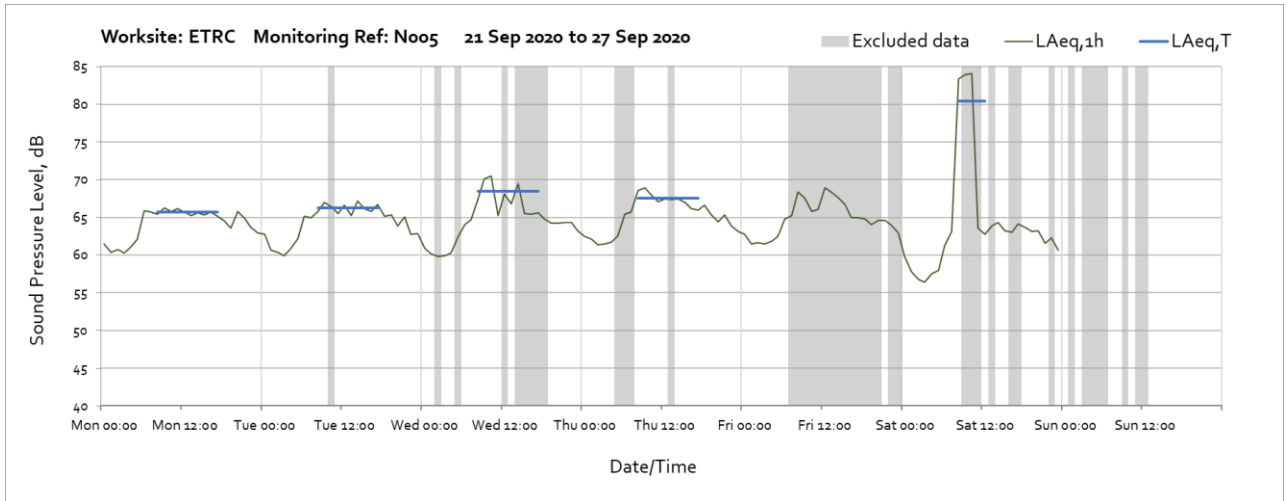




Worksite: ETRC – Monitoring Ref: N005

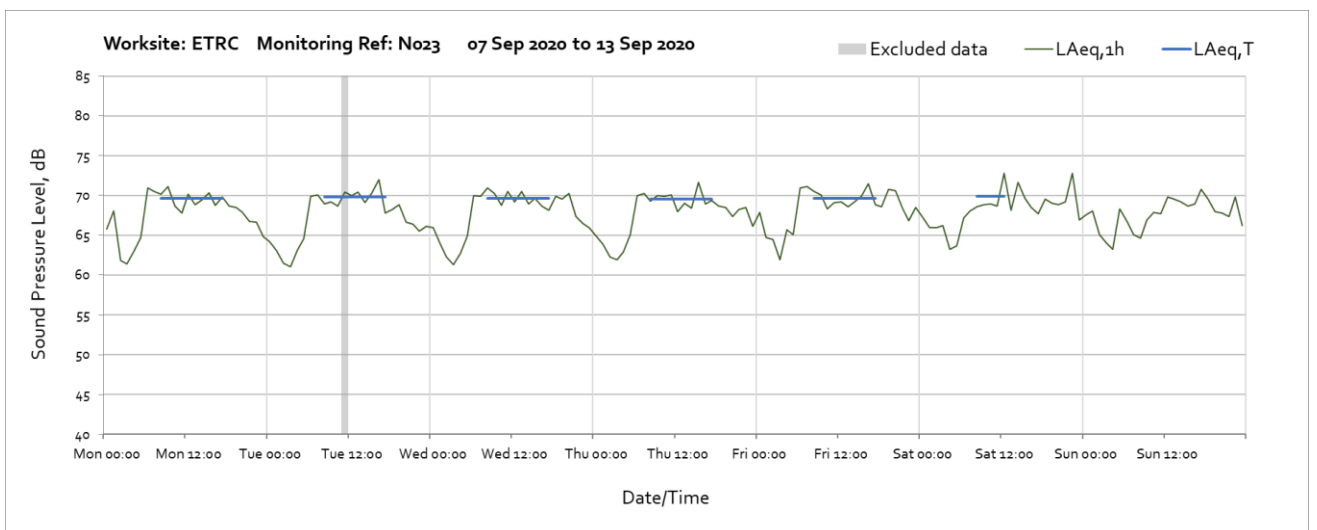
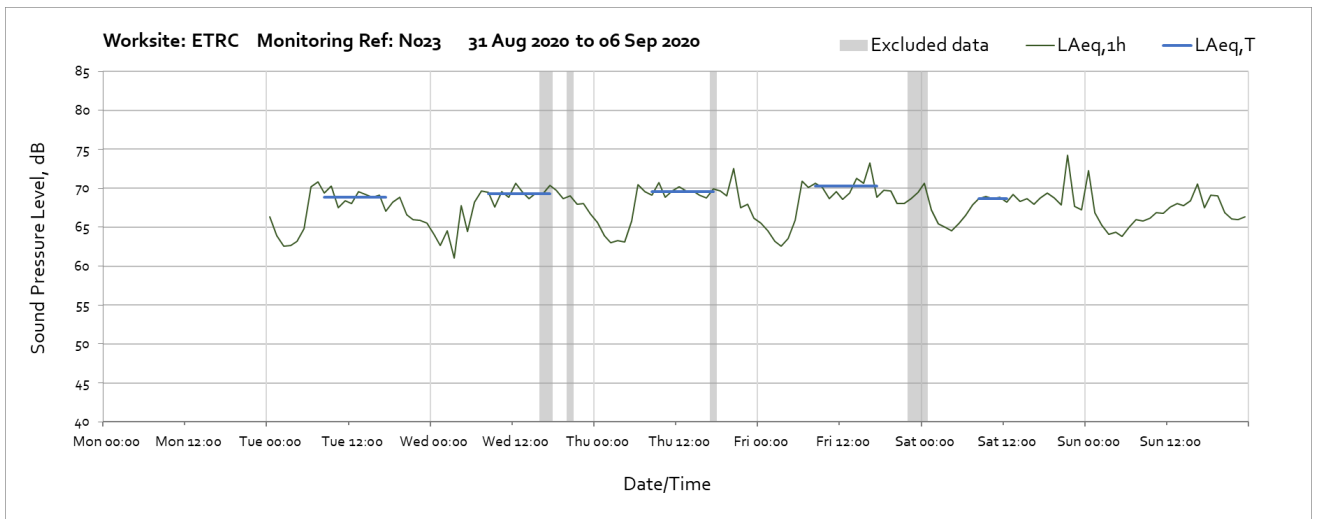


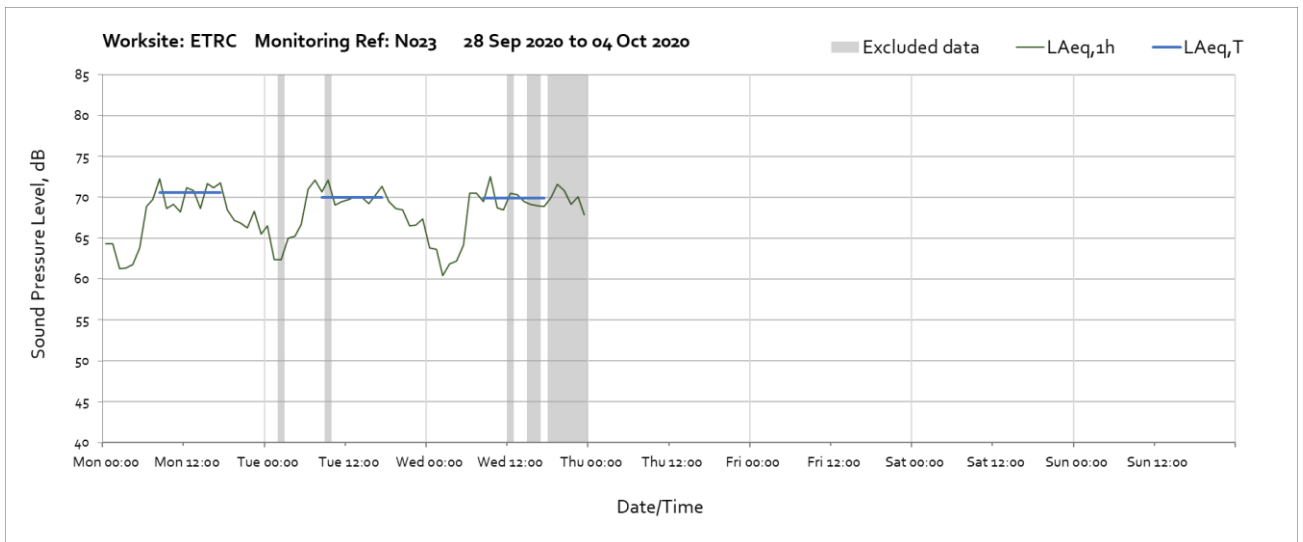
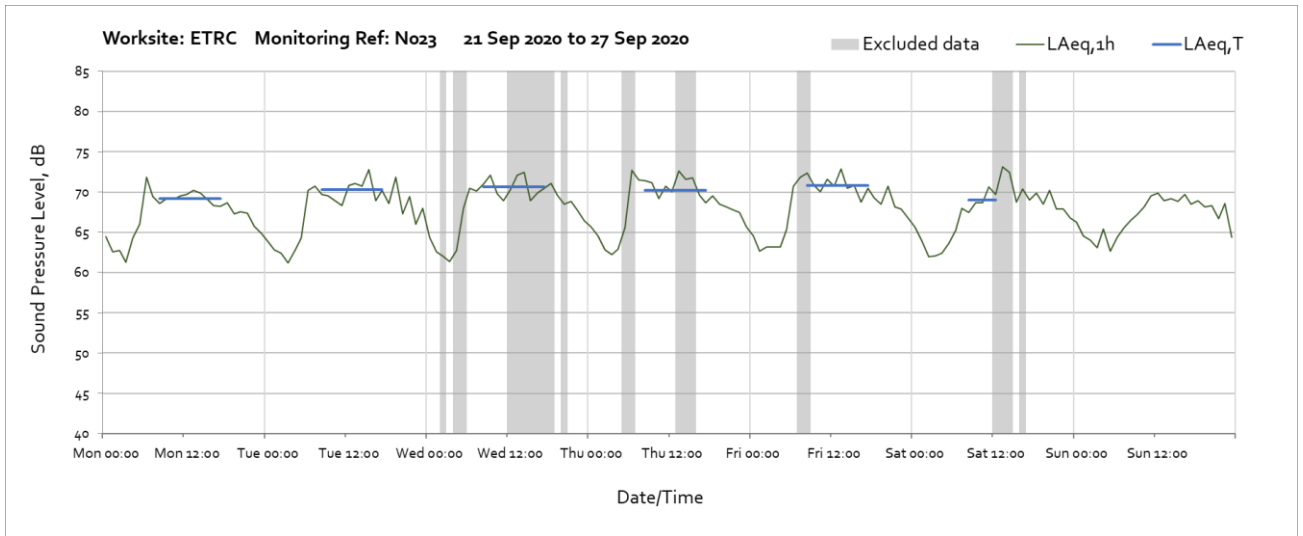
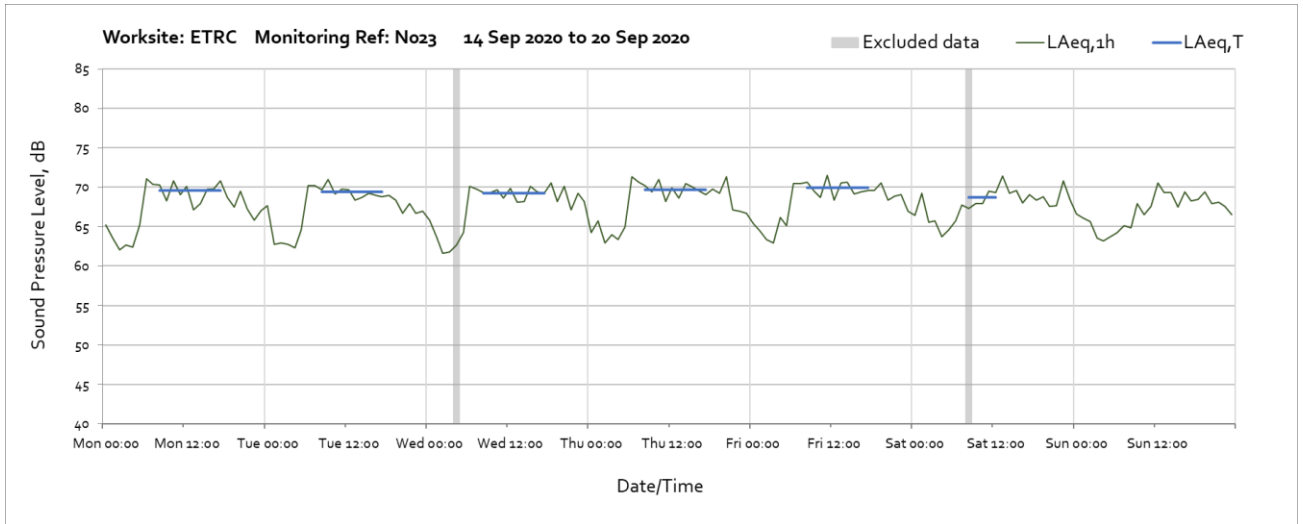
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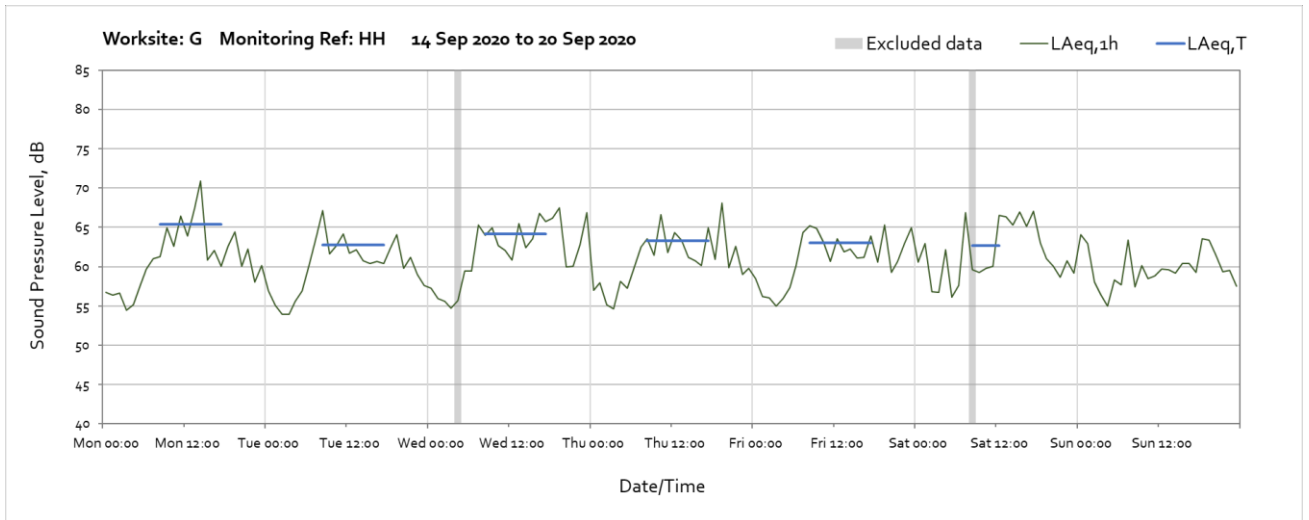
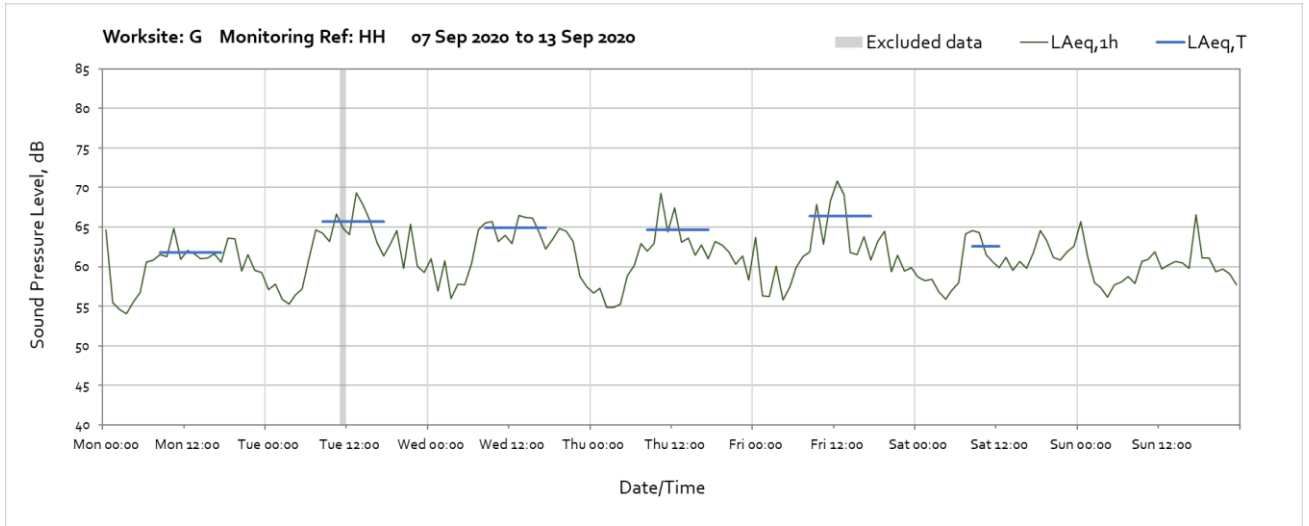
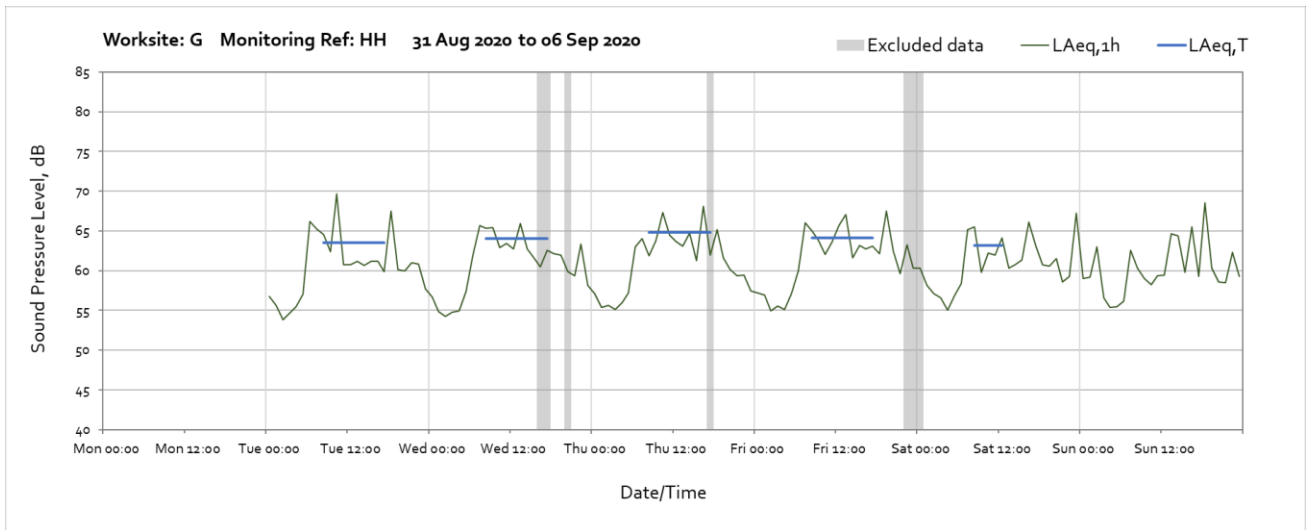
Note: Missing data from 00:00 on Sunday 27th September until 00:00 on Thursday 1st October was due to loss of site power.

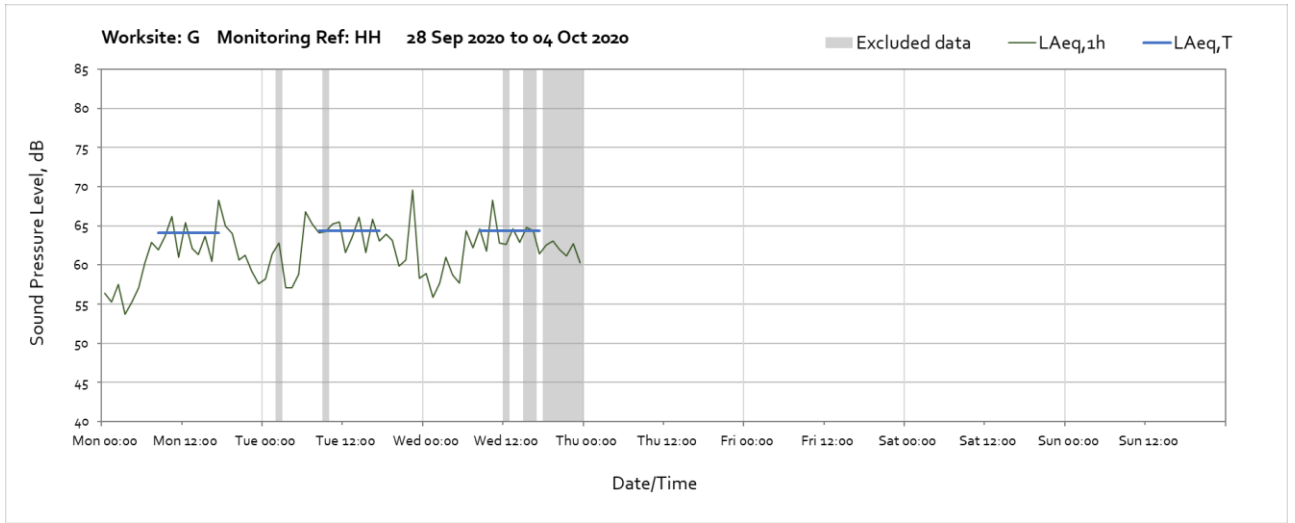
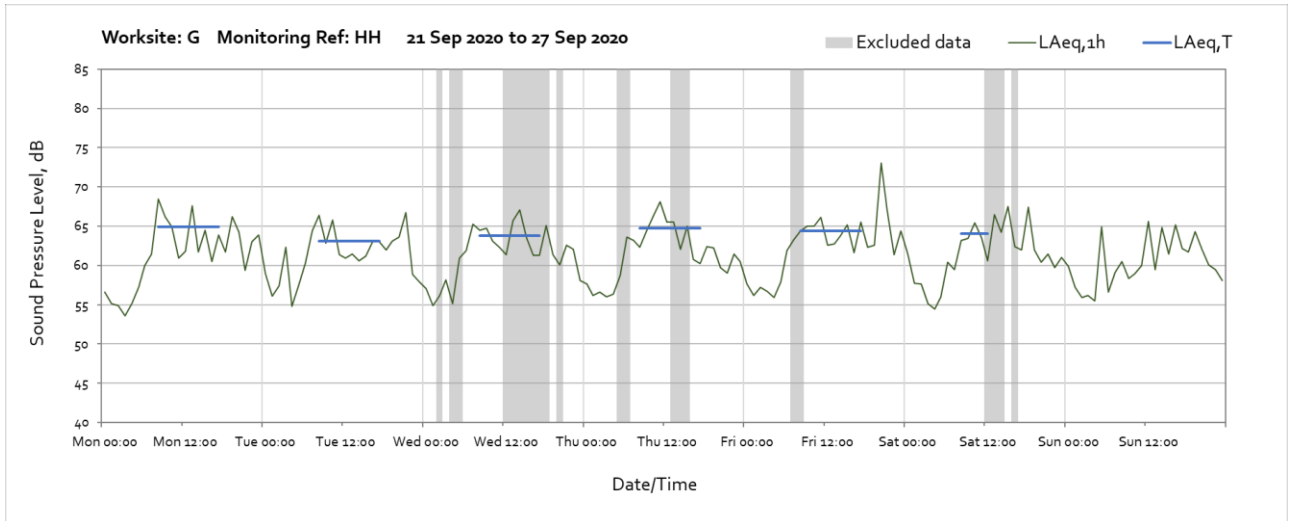
Worksite: ETRC – Monitoring Ref: N023



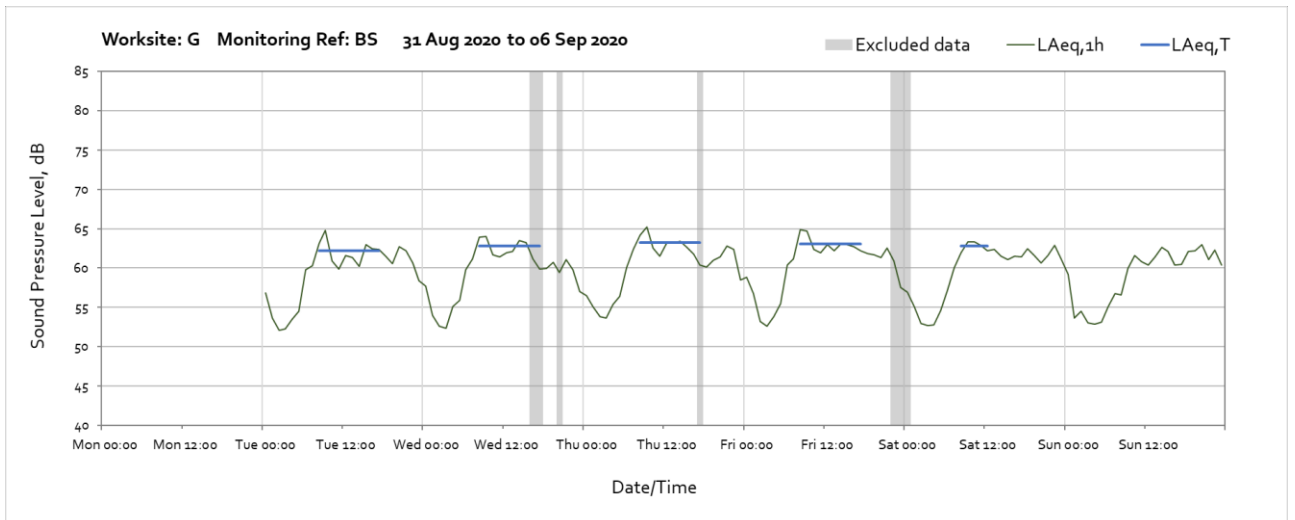


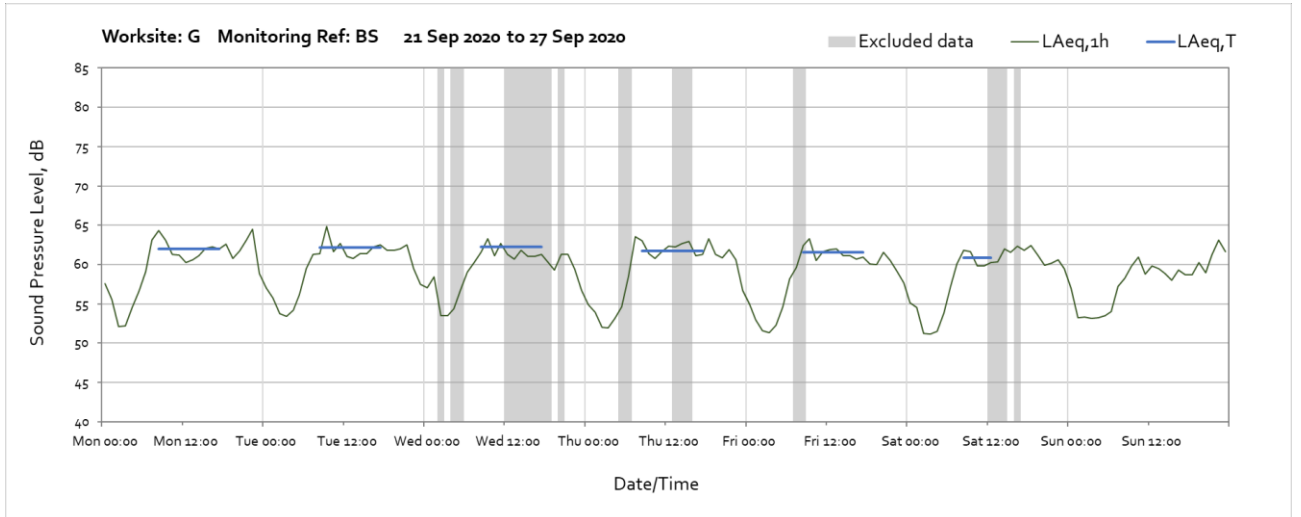
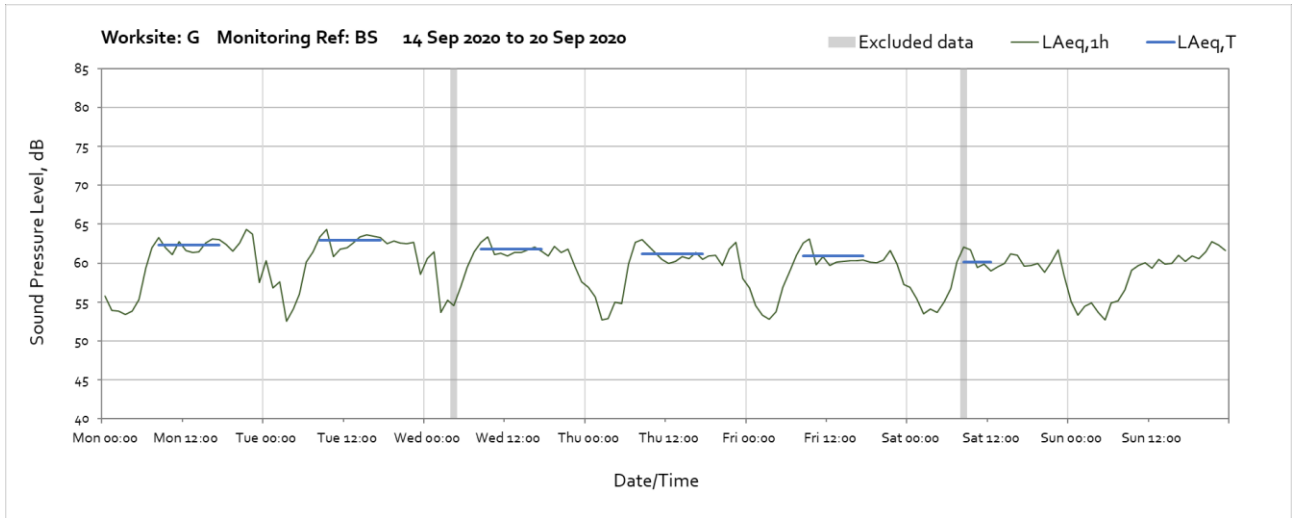
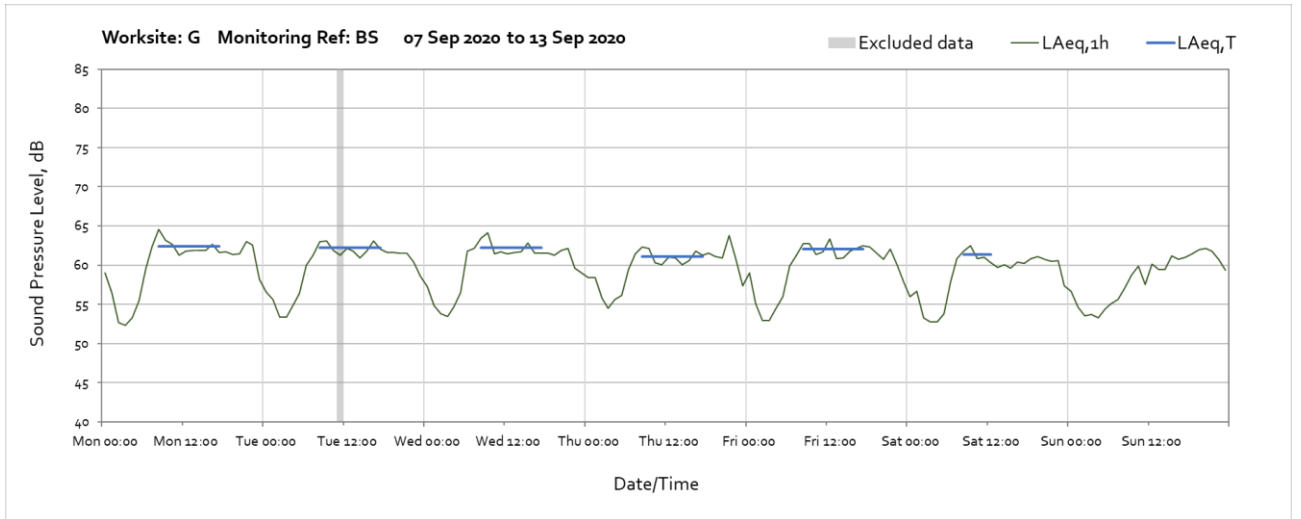
Worksite: G – Monitoring Ref: HH

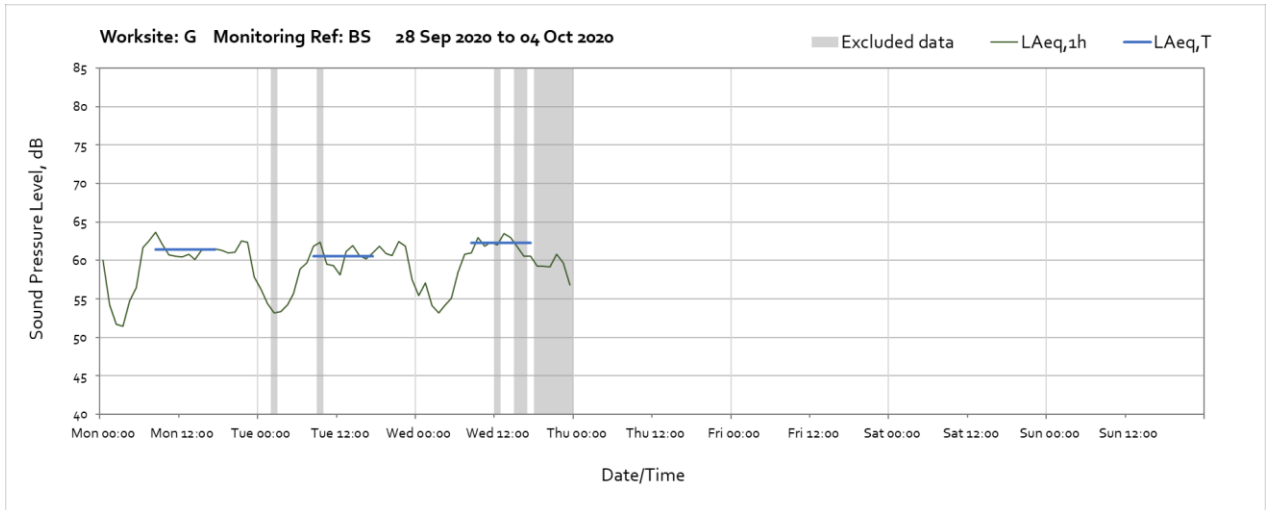




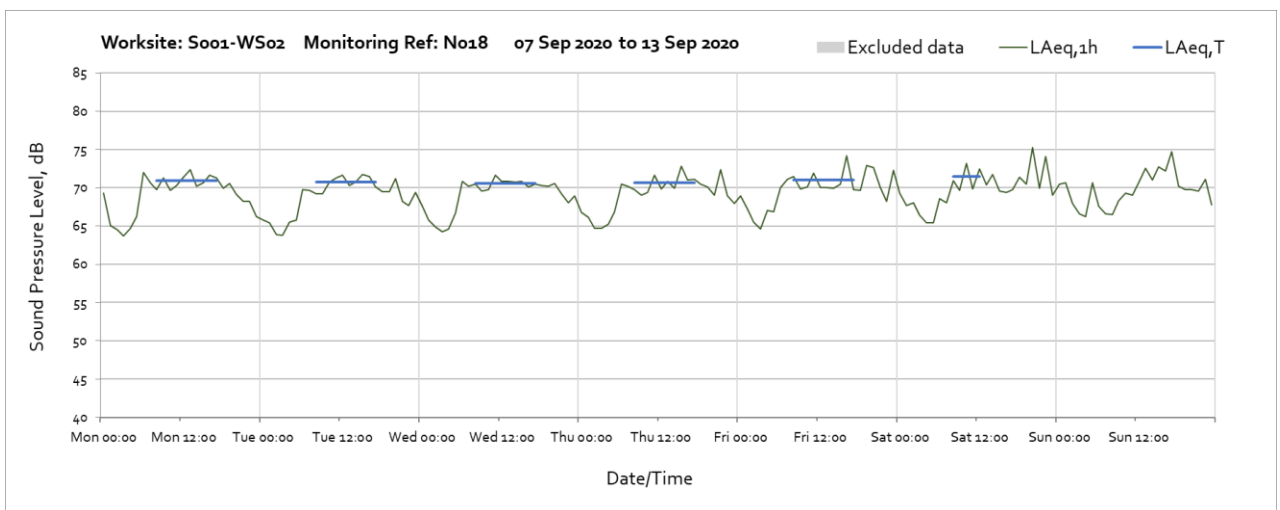
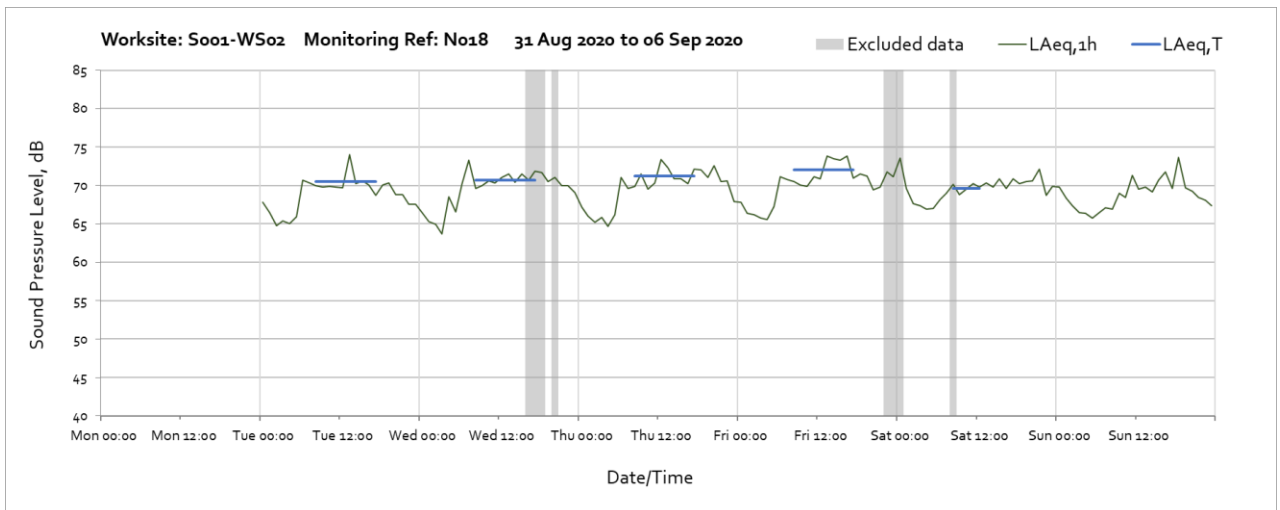
Worksite: G – Monitoring Ref: BS

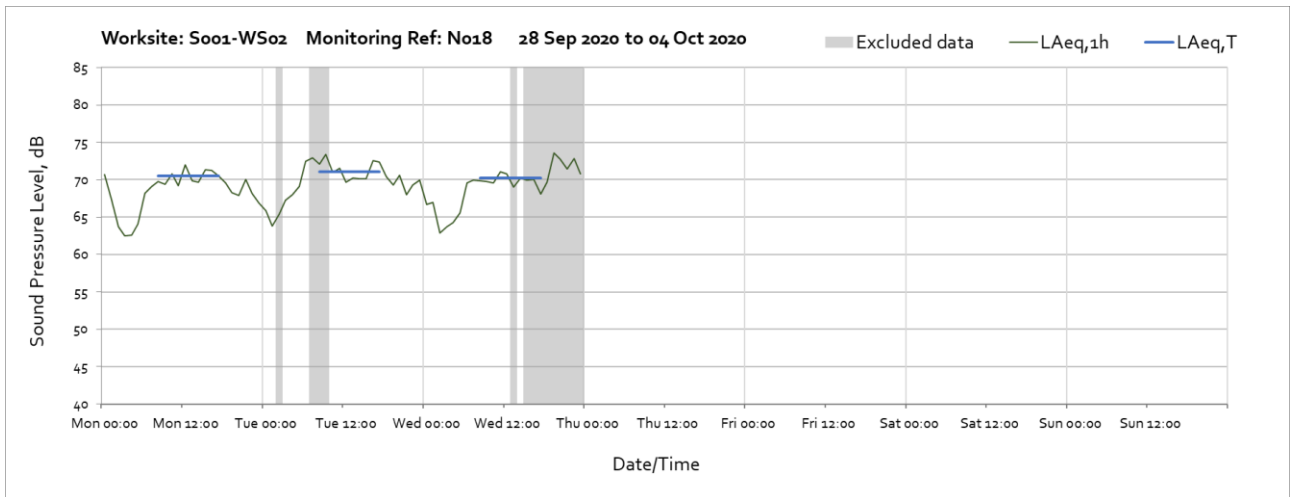
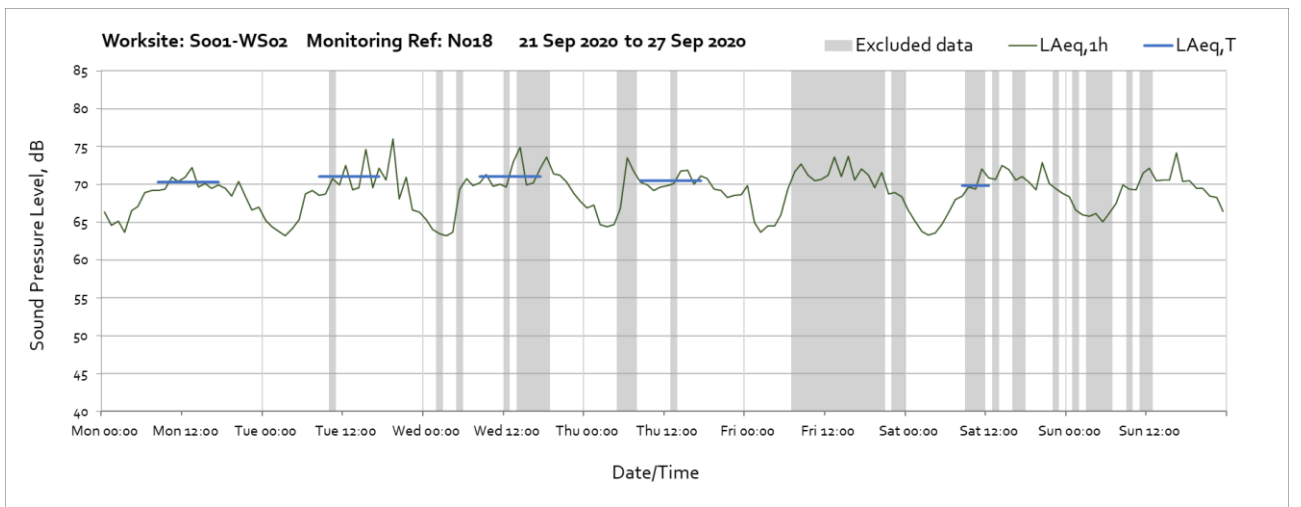
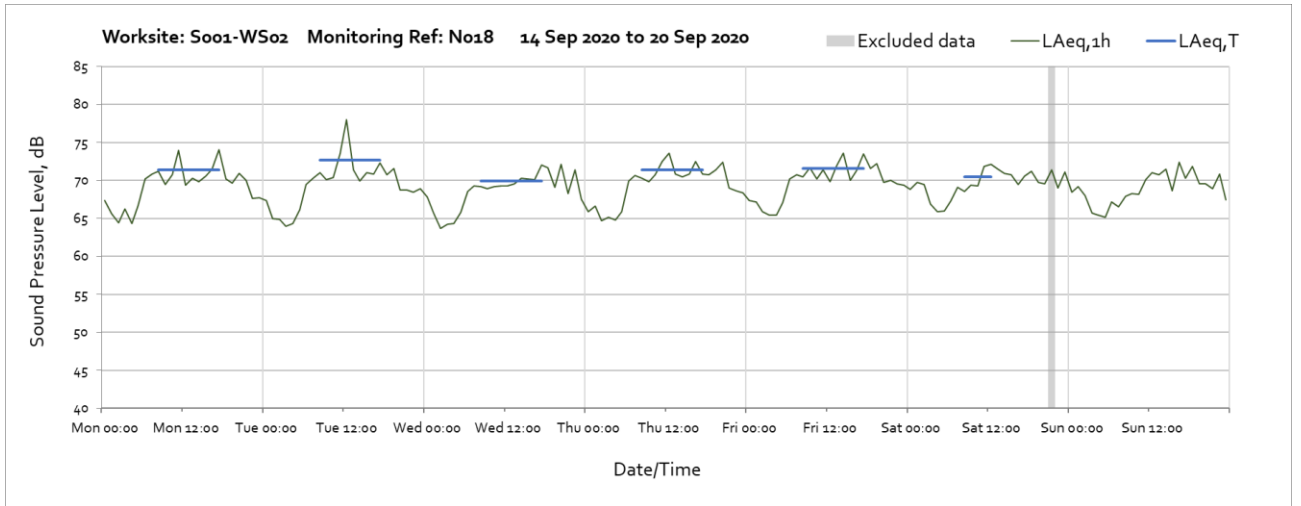




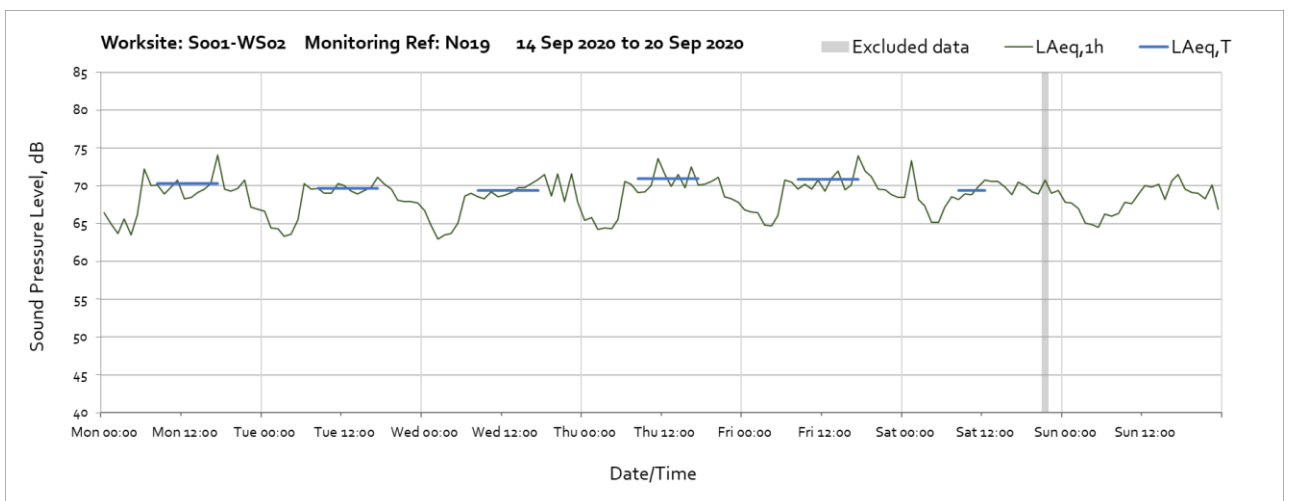
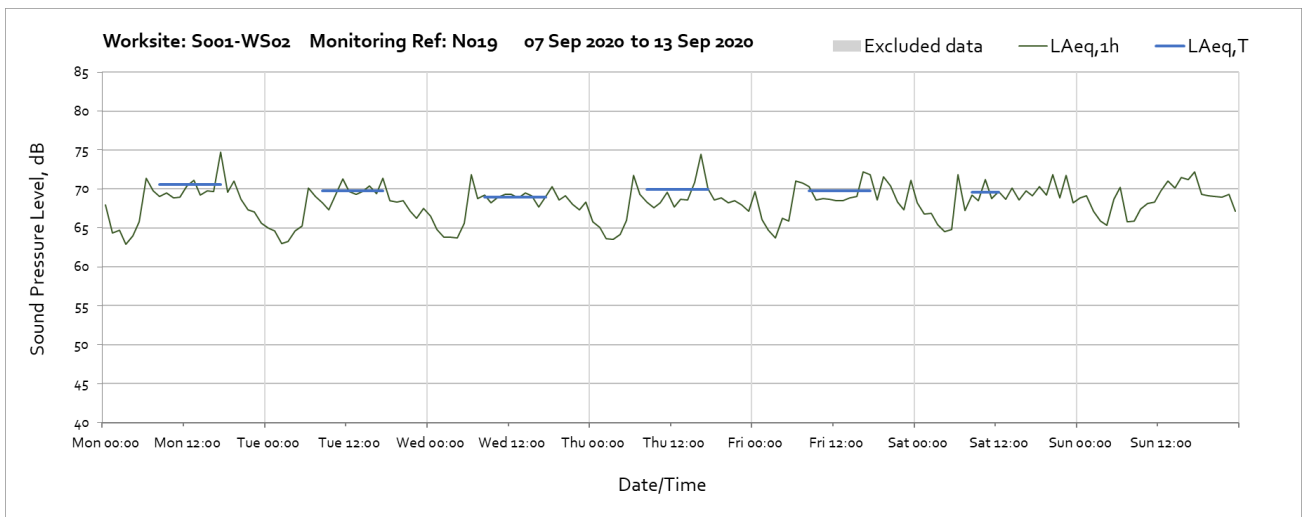
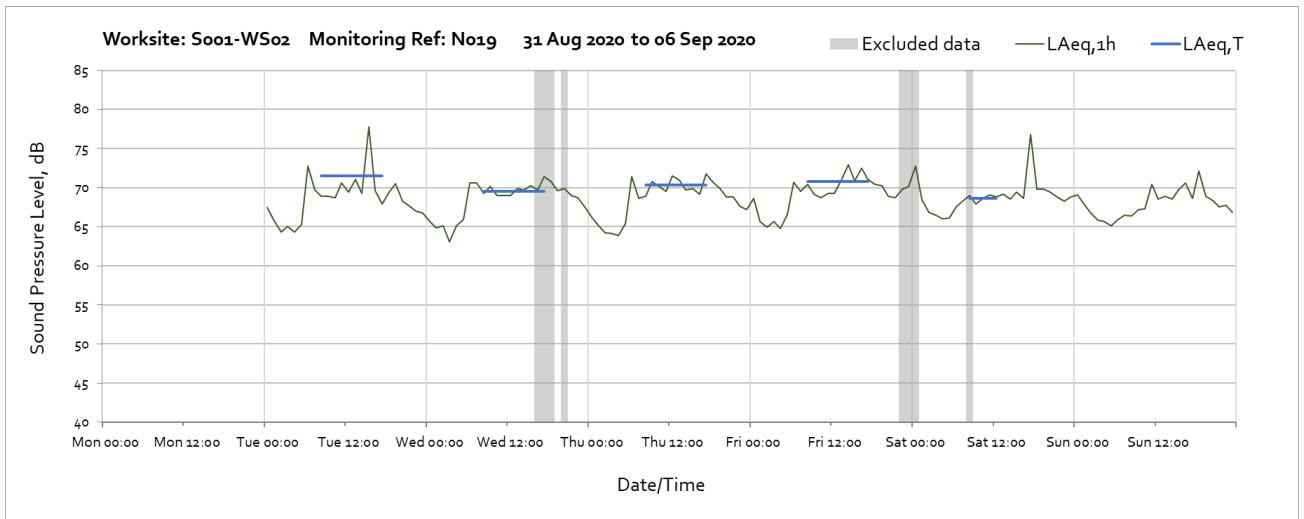


Worksite: S001-WS02 – Monitoring Ref: N018

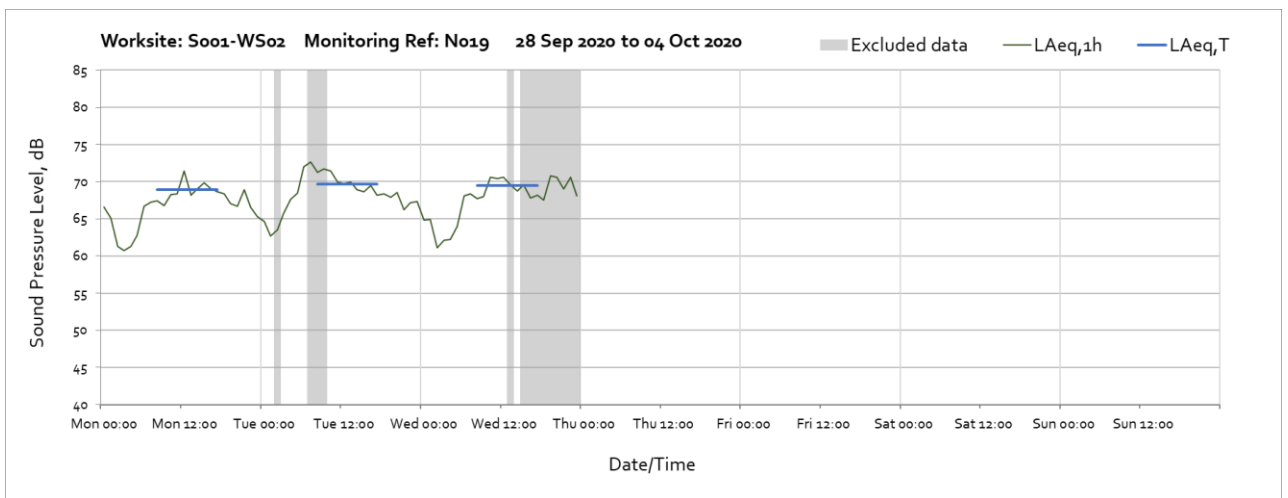
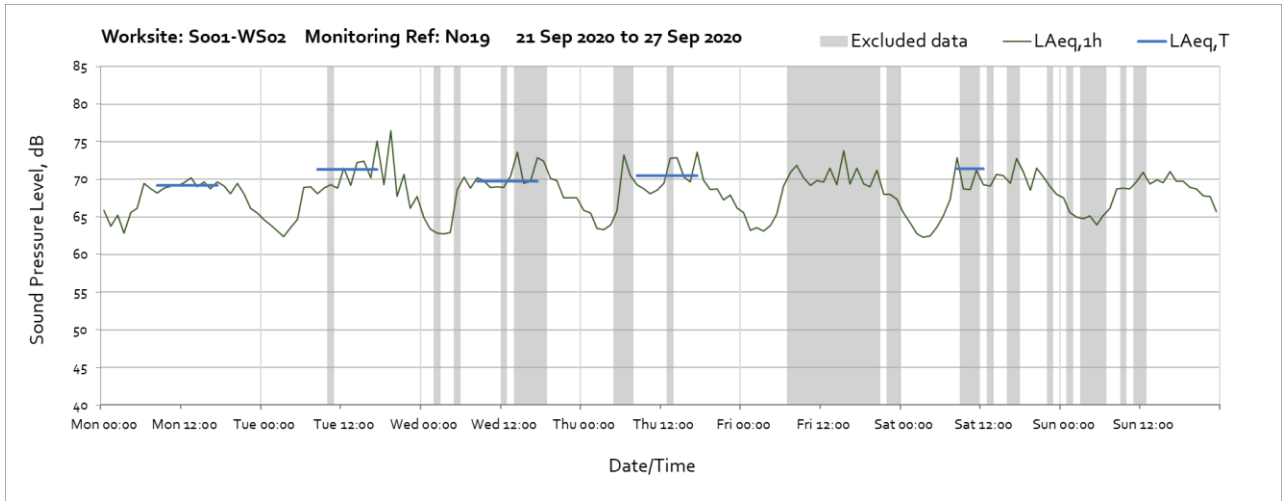




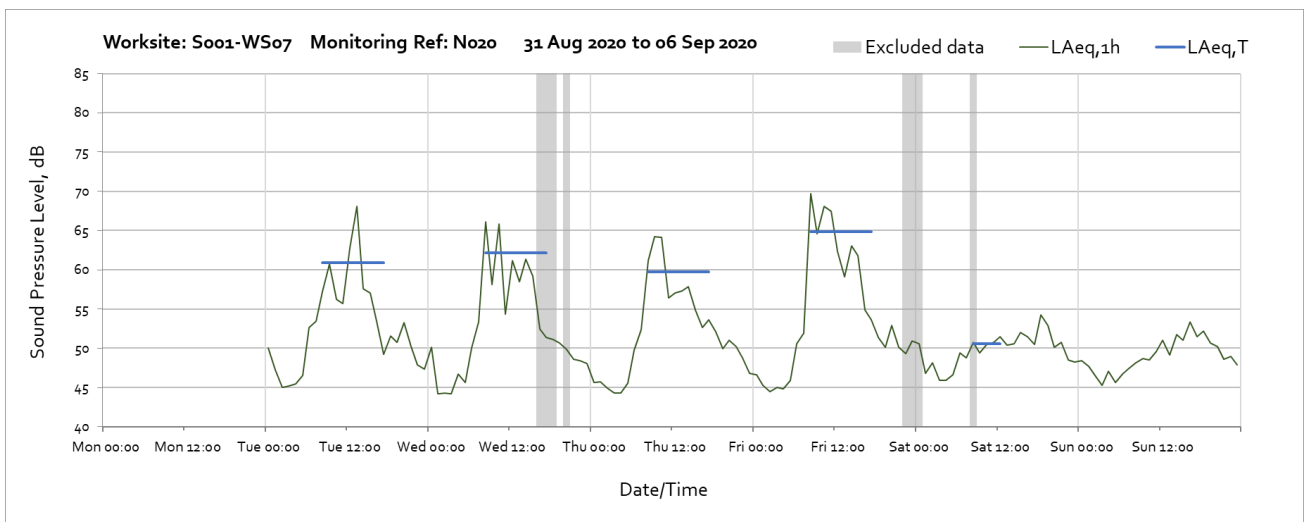
Worksite: S001-WS02 – Monitoring Ref: N019

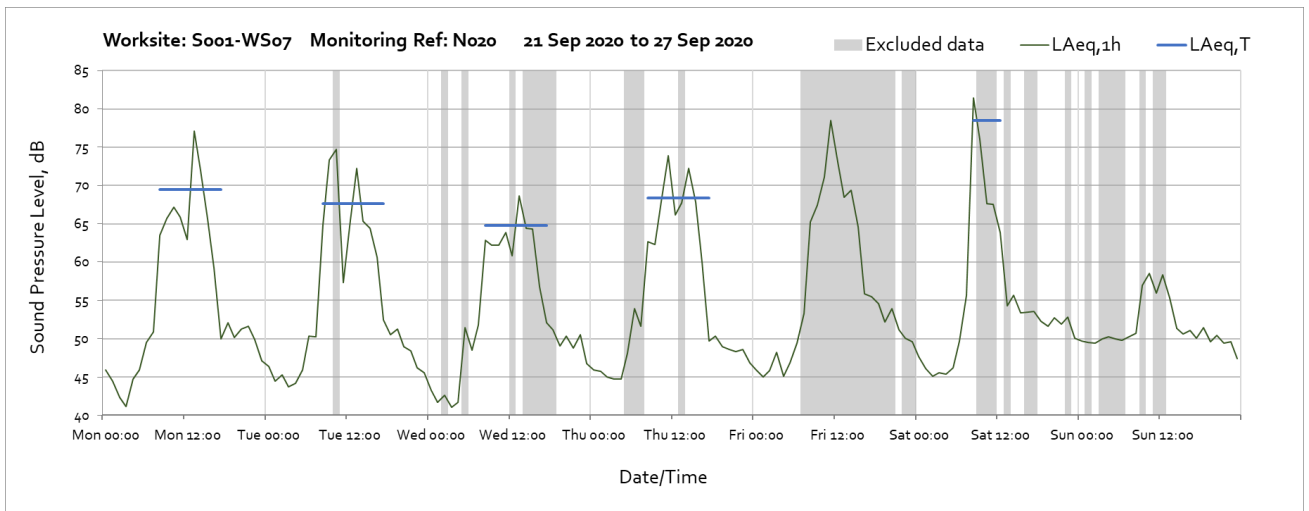
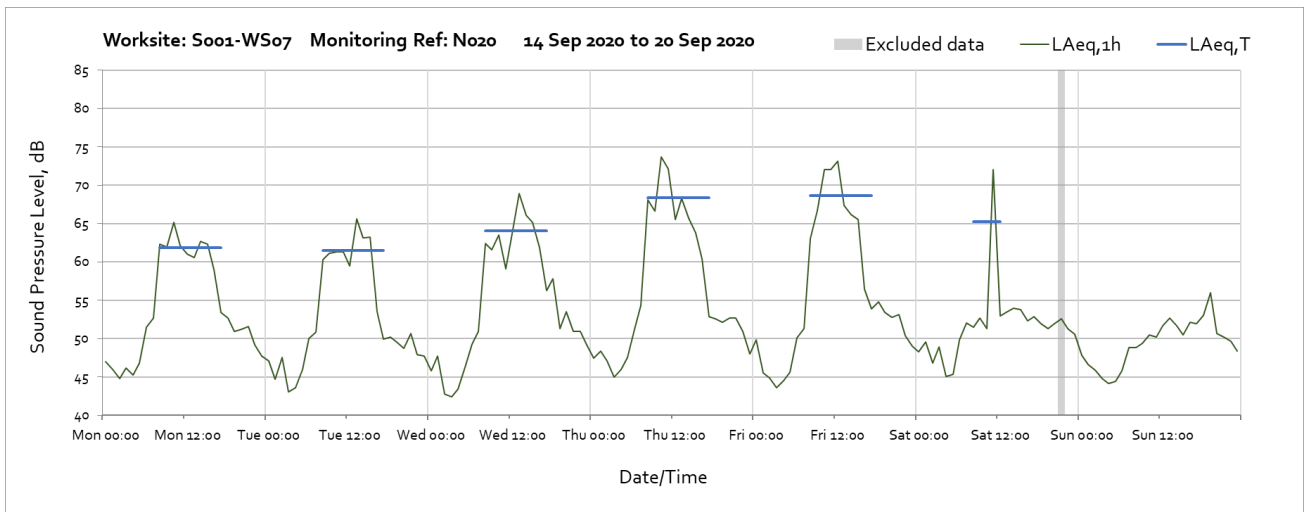
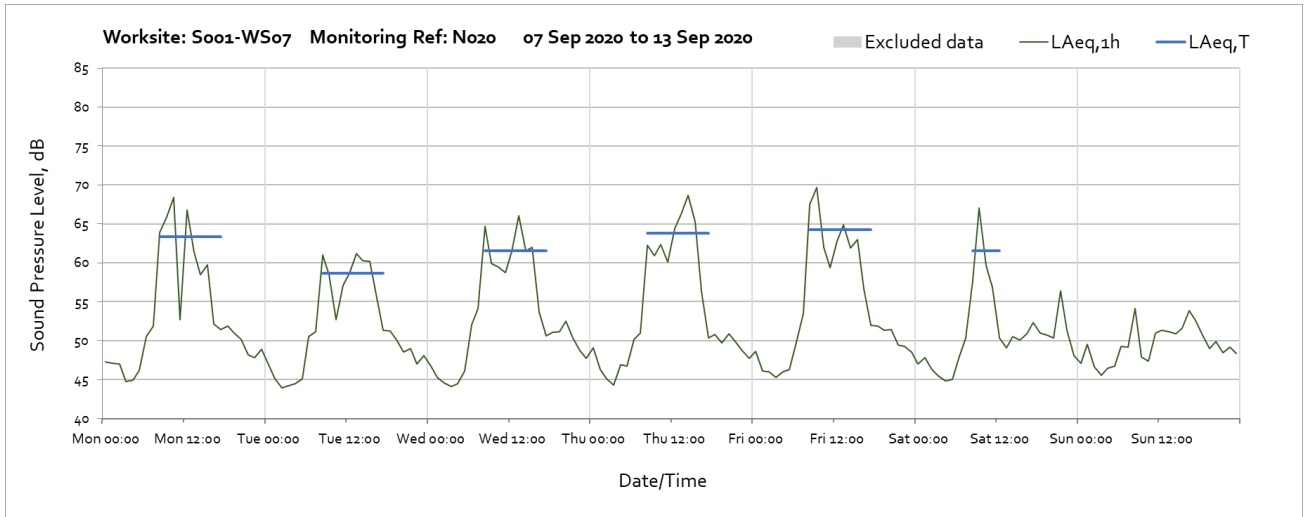


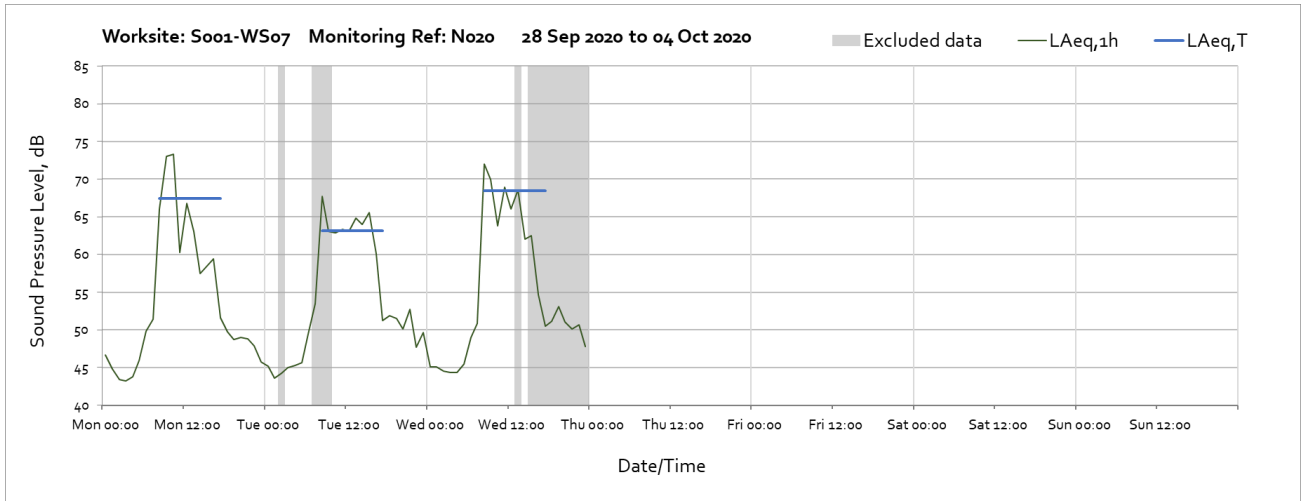
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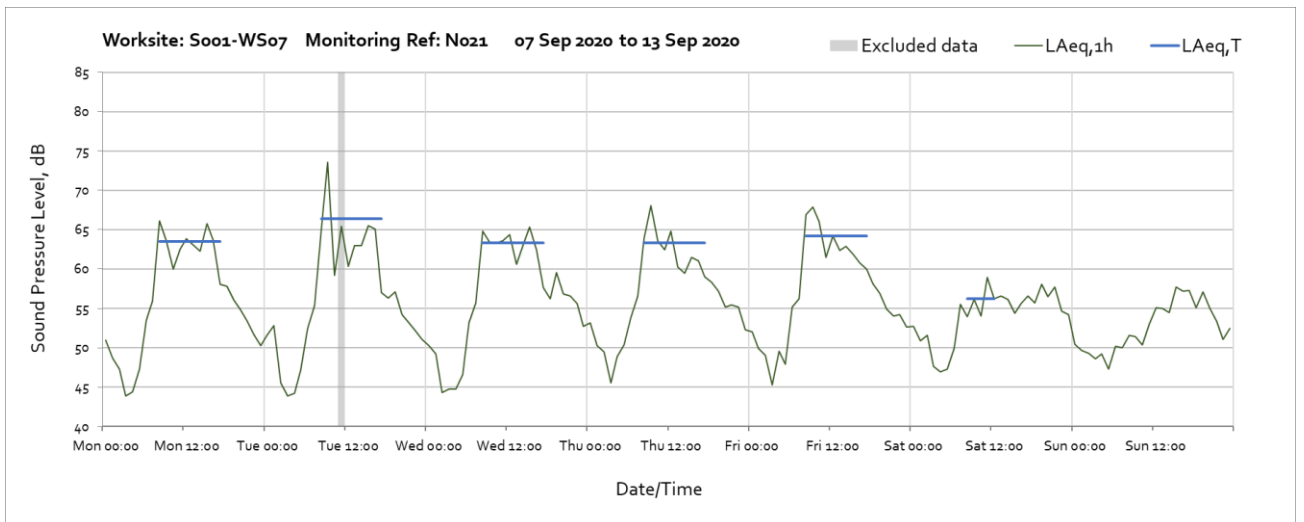
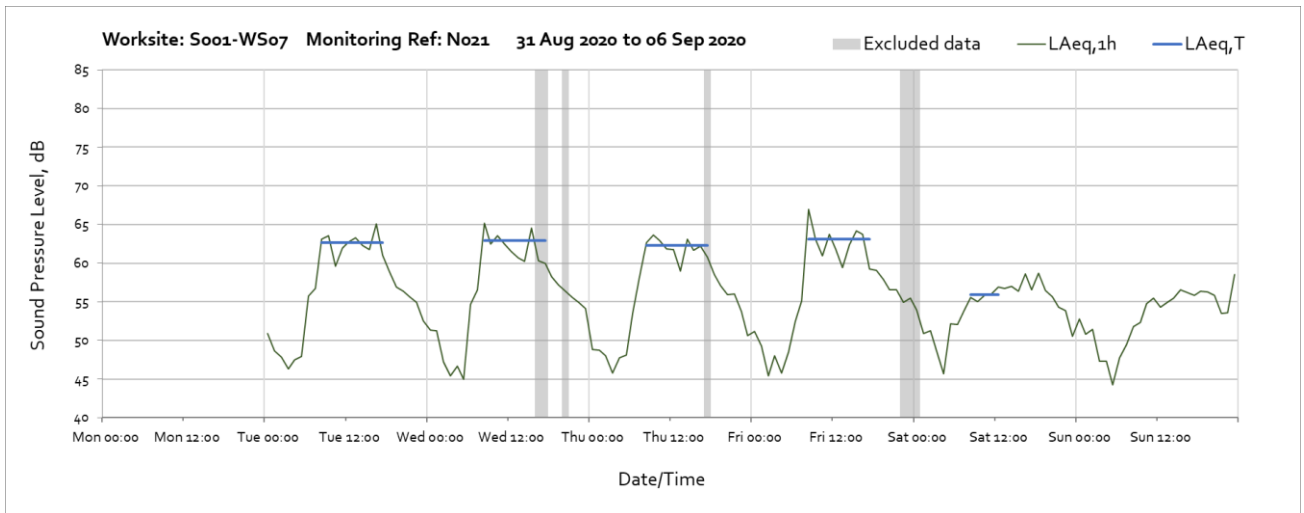
Worksite: S001-WS07 – Monitoring Ref: N020

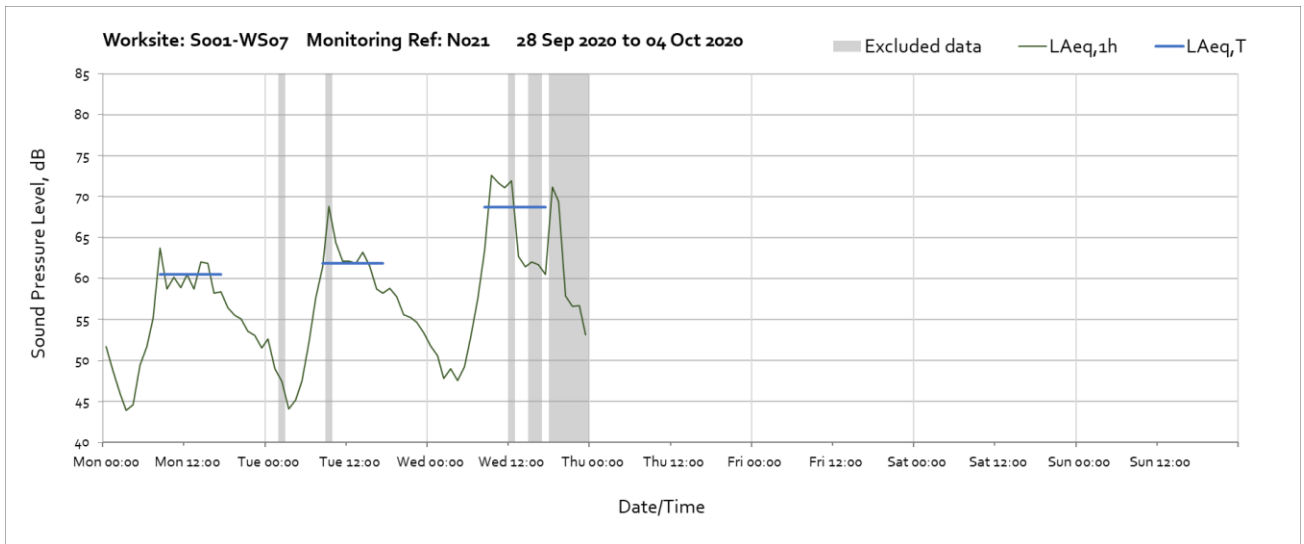
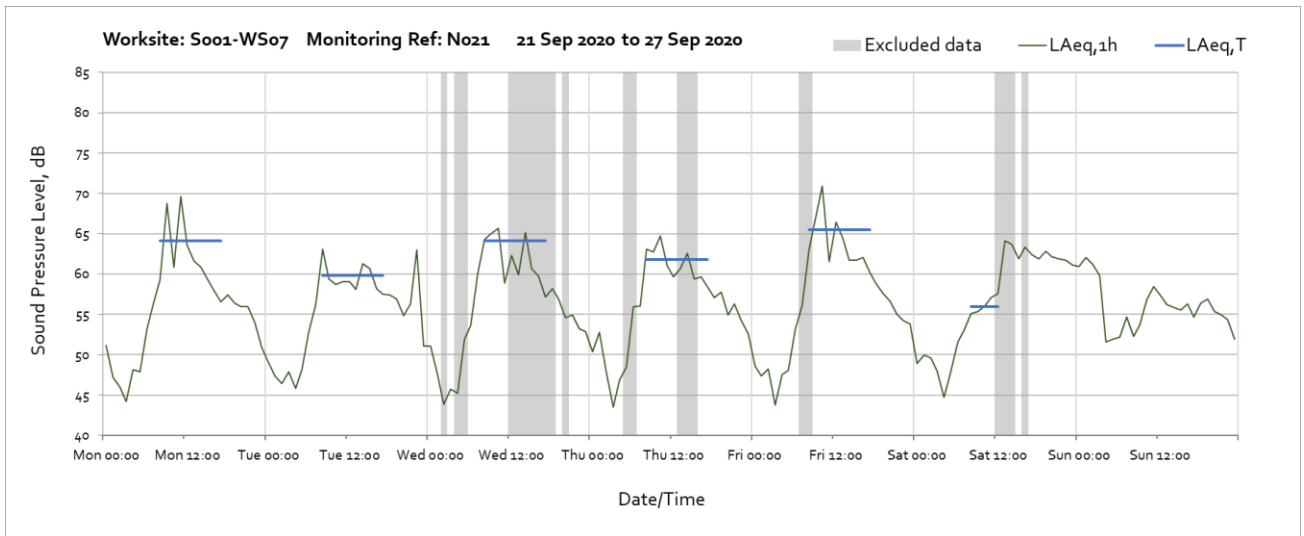
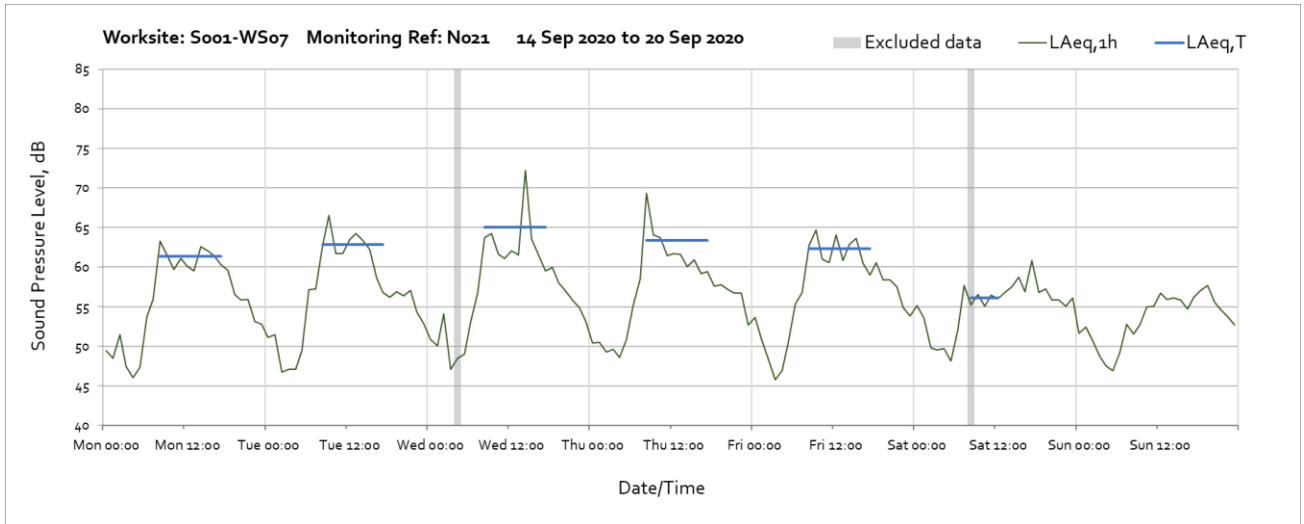




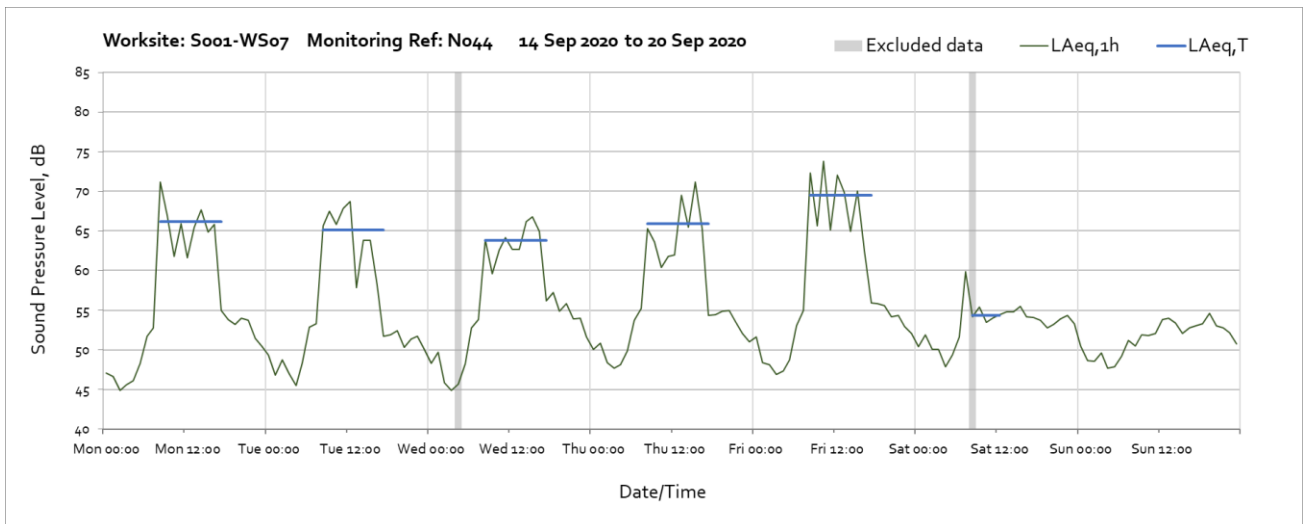
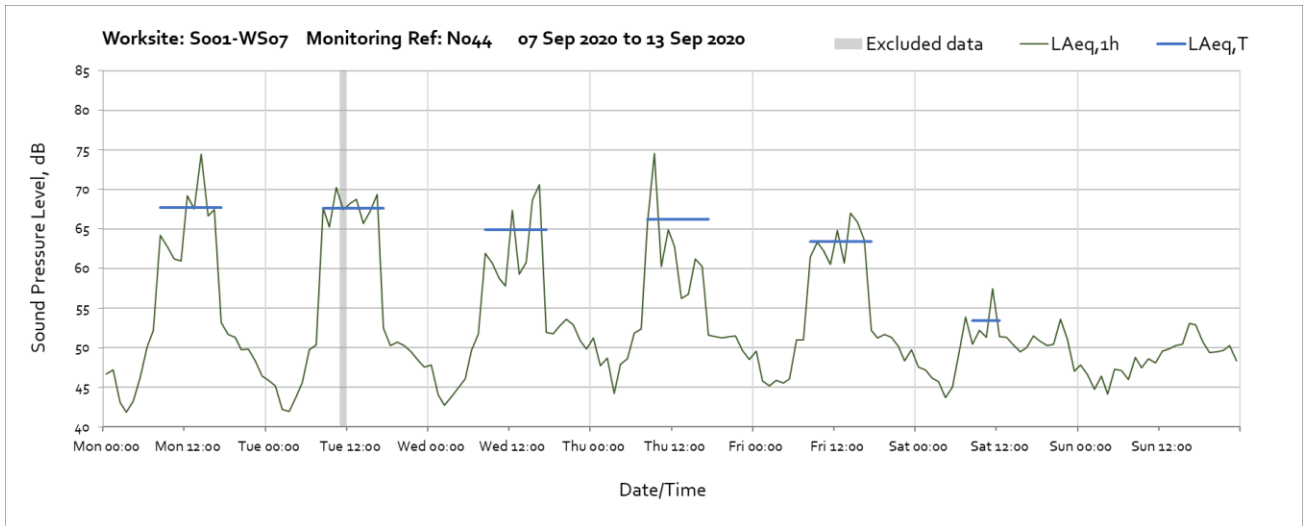
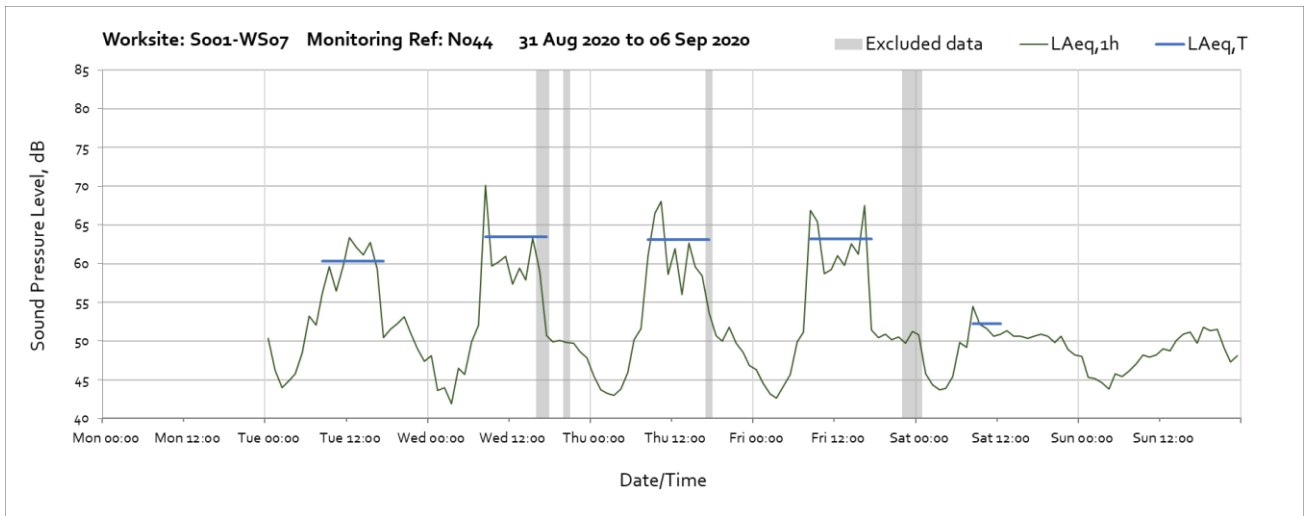


Worksite: S001-WS07 – Monitoring Ref: N021

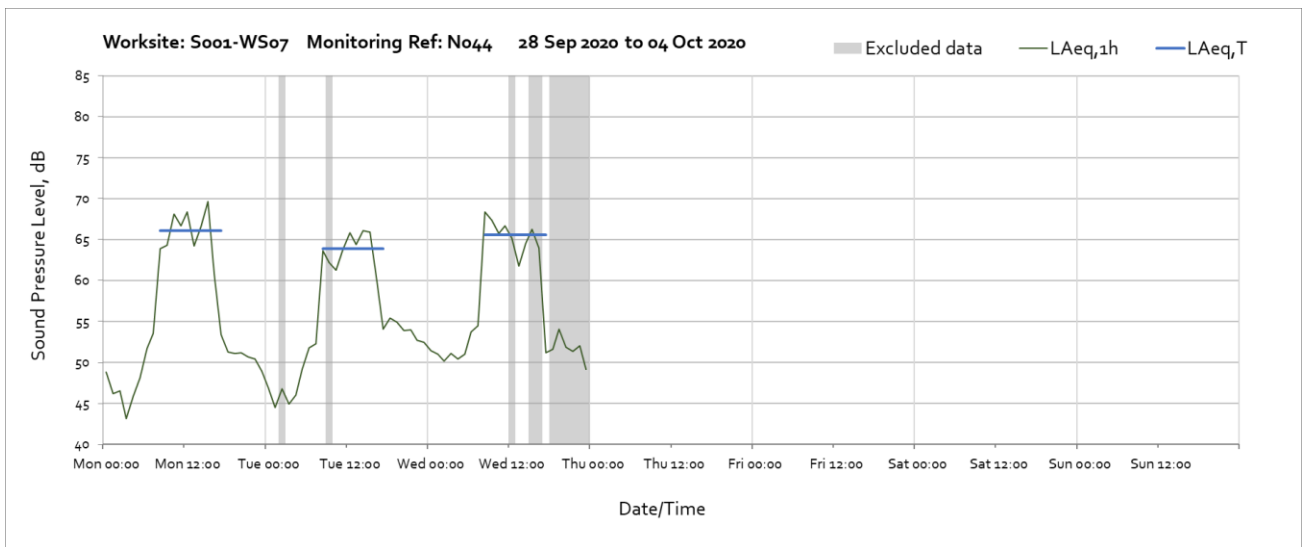
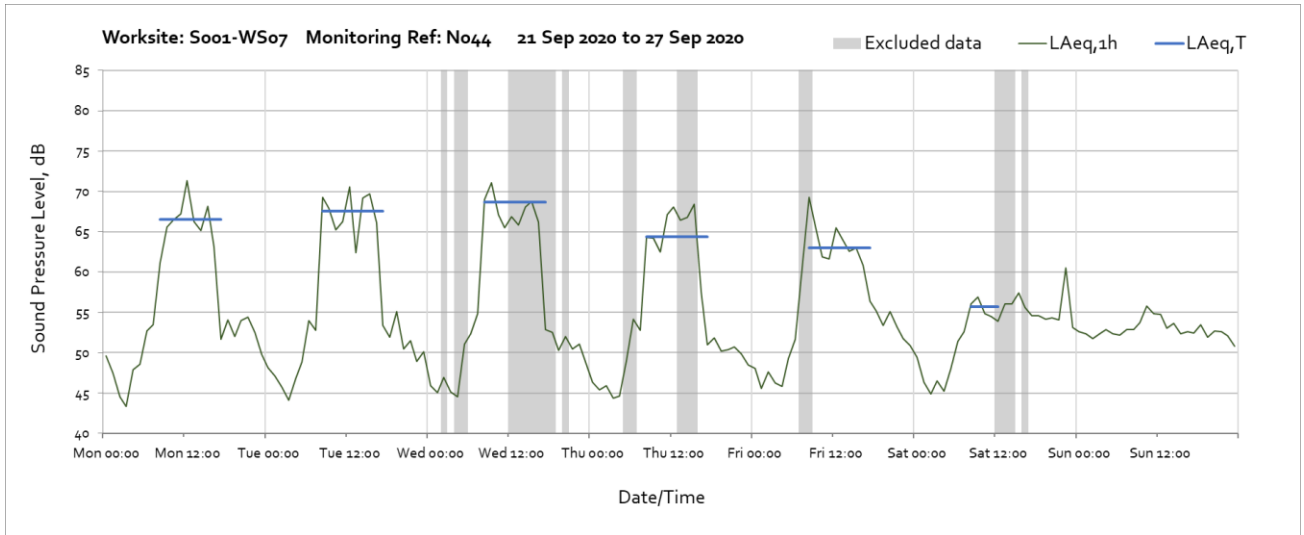




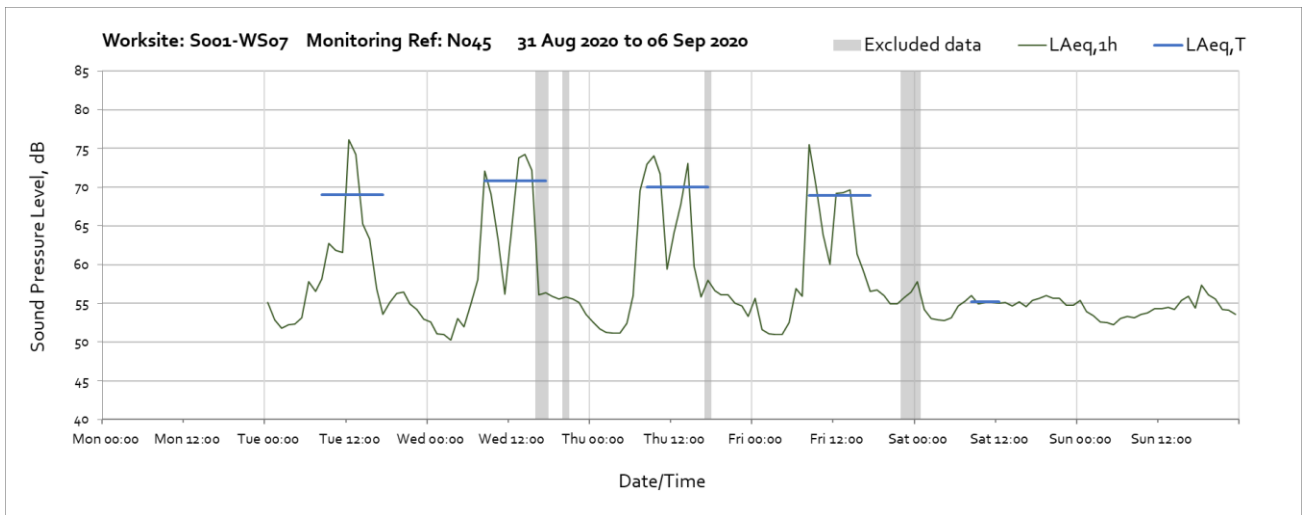
Worksite: S001-WS07 – Monitoring Ref: N044

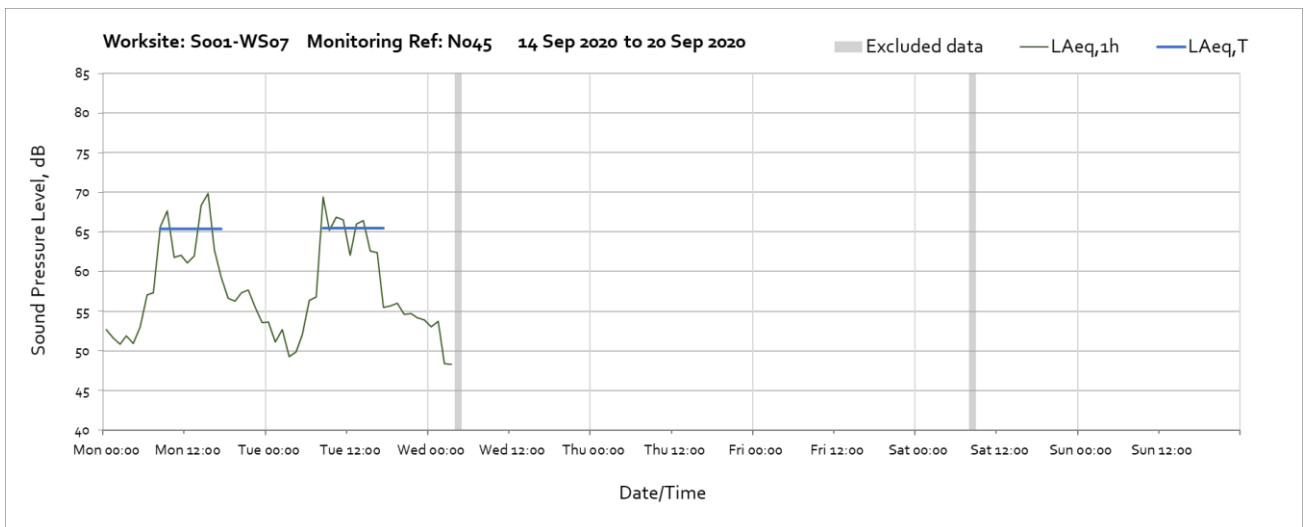
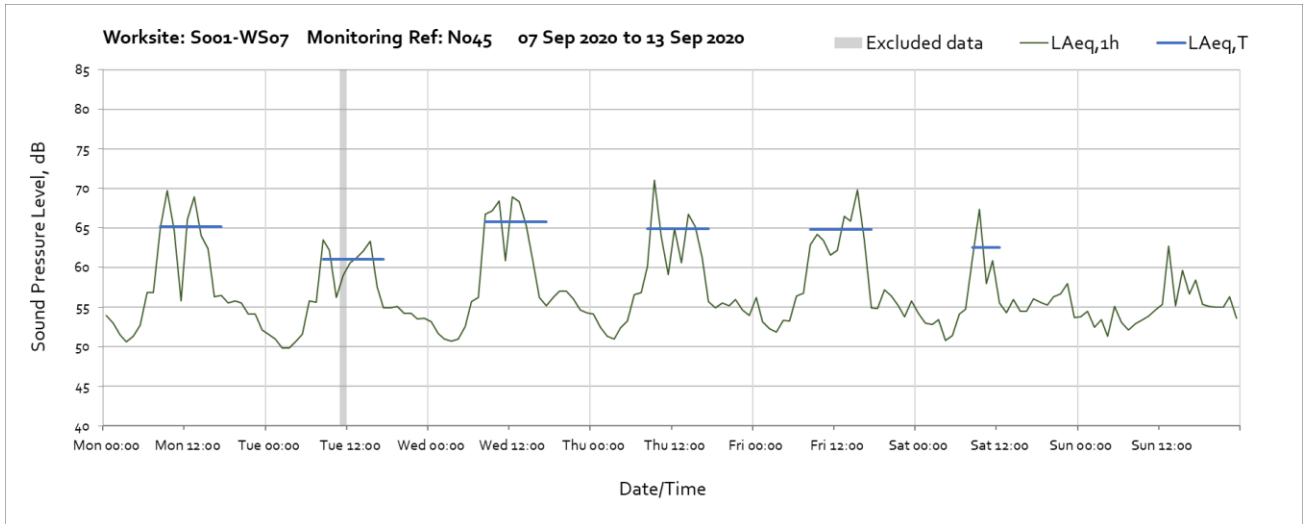


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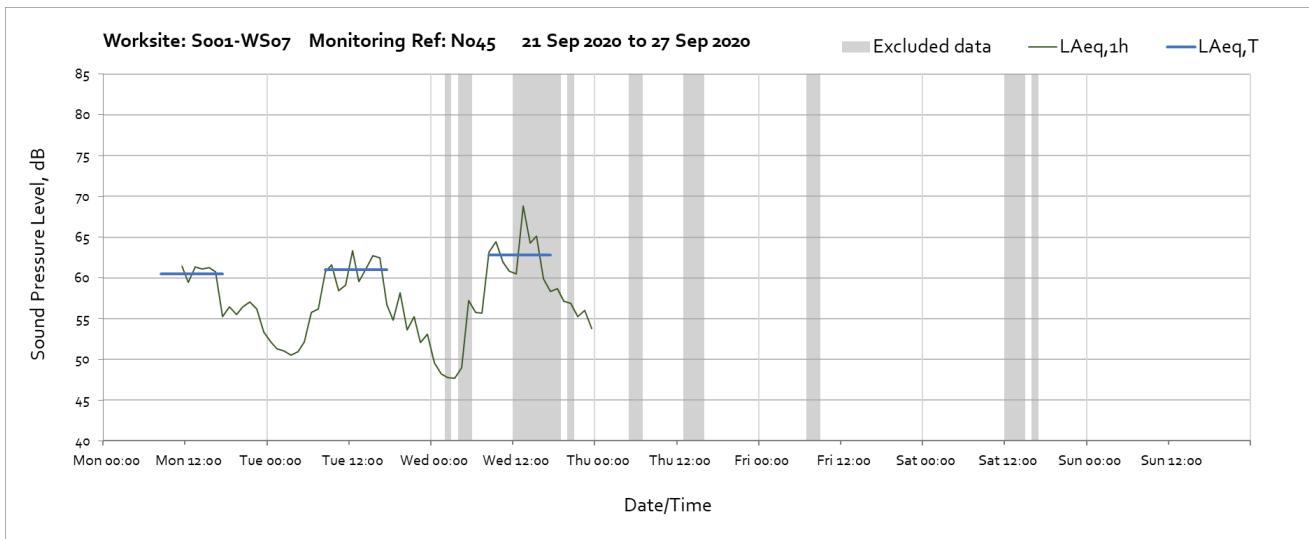


Worksite: S001-WS07 – Monitoring Ref: N045





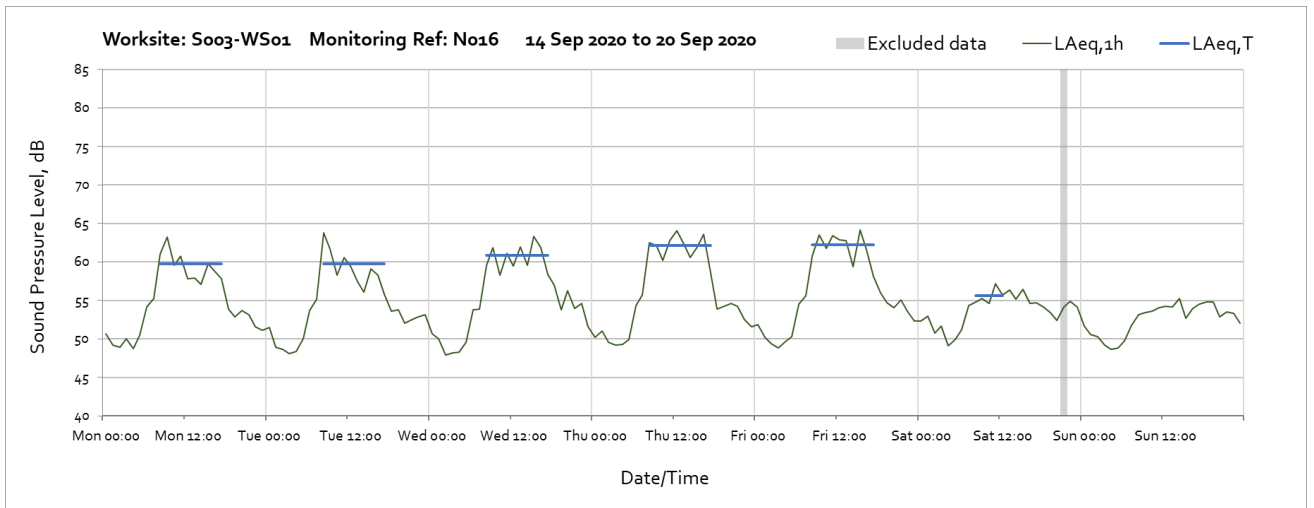
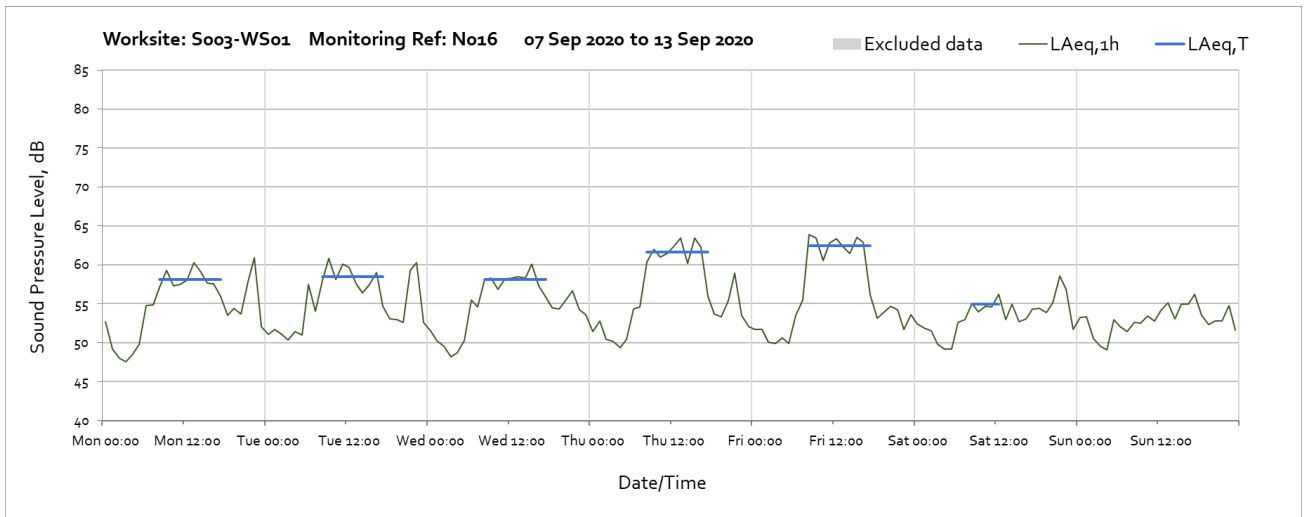
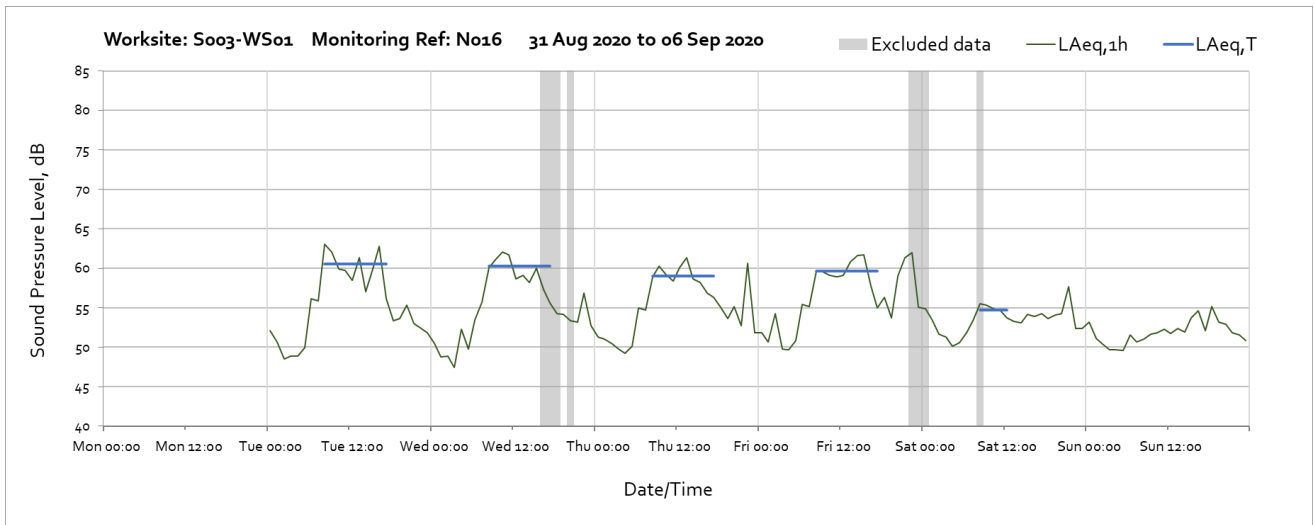
Note: Missing data from 04:00 on Wednesday 16th September until 00:00 on Monday 21st September was due to loss of site power.



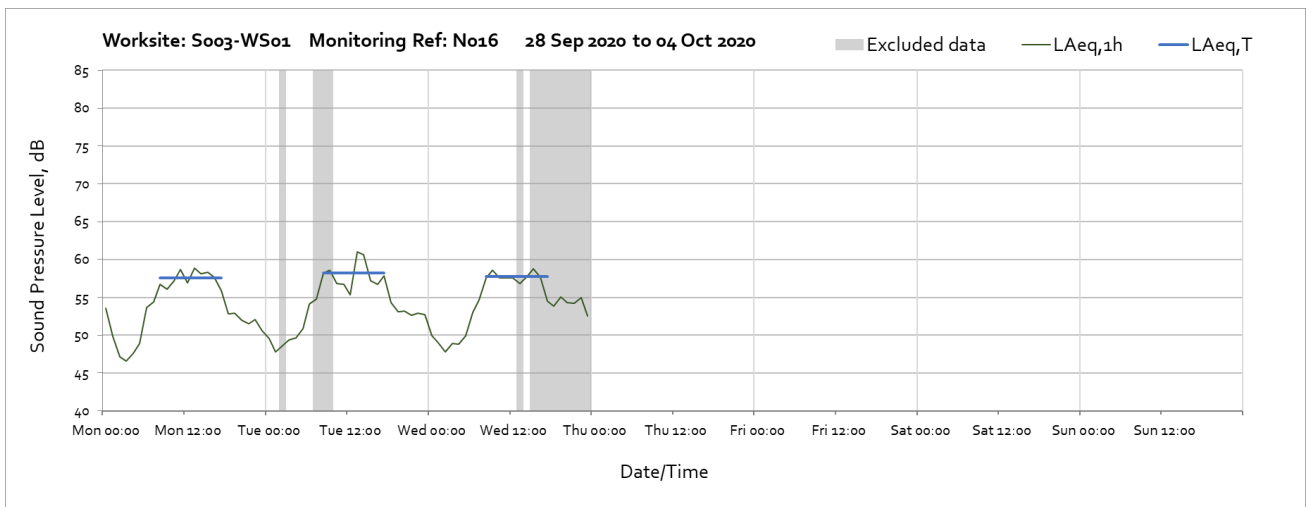
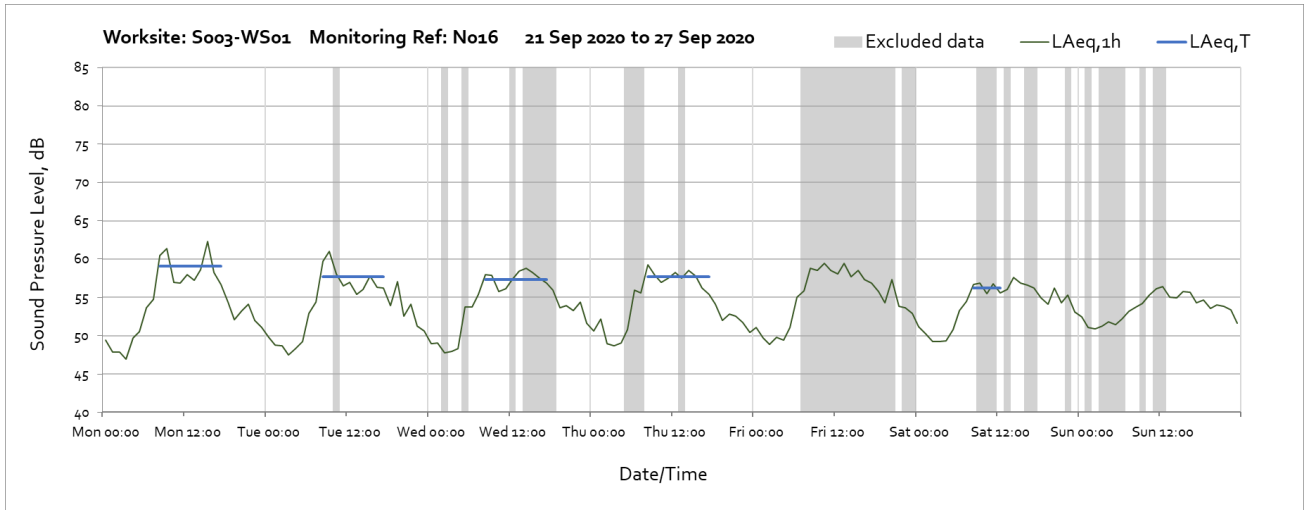
Note: Missing data from 00:00 until 11:00 on Monday 21st September and from 00:00 on Thursday 24th September until the end of the month was due to loss of site power.

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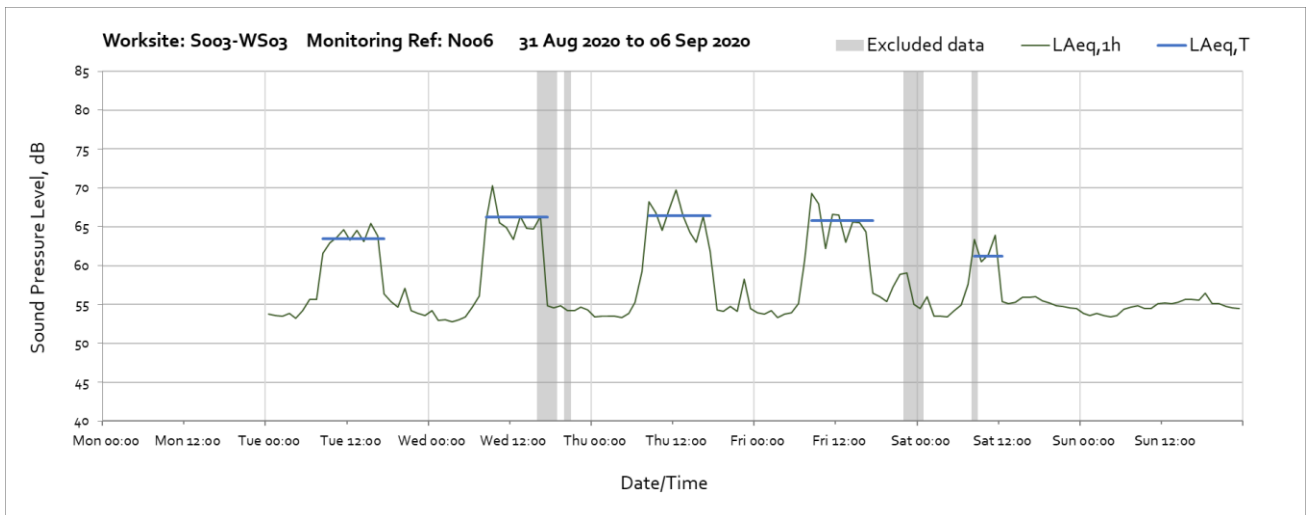
Worksite: S003-WS01 – Monitoring Ref: N016

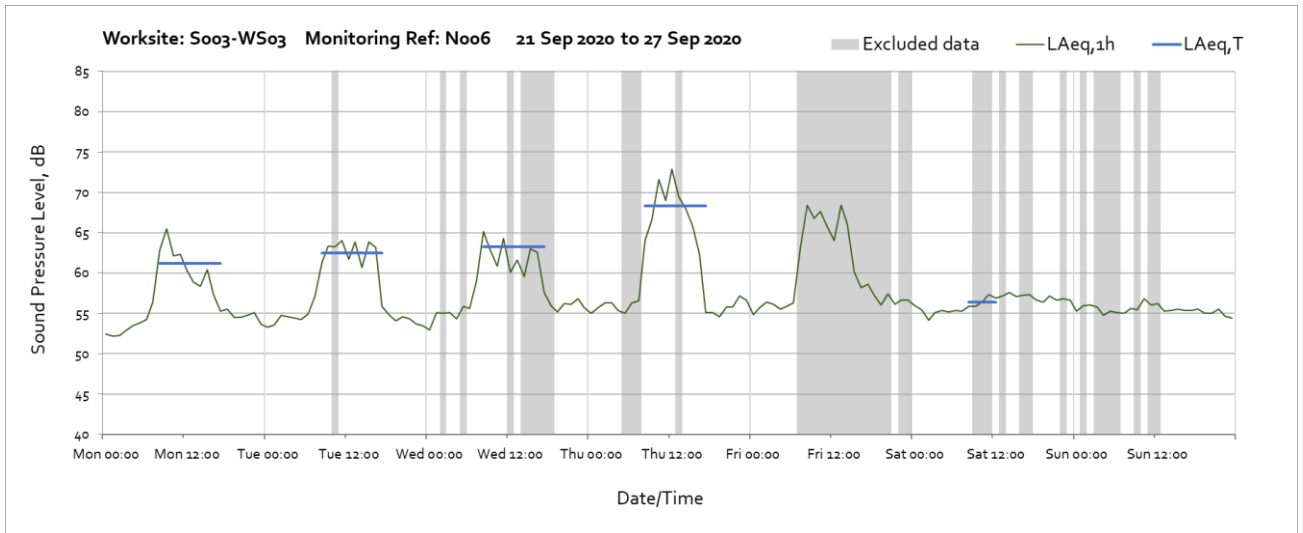
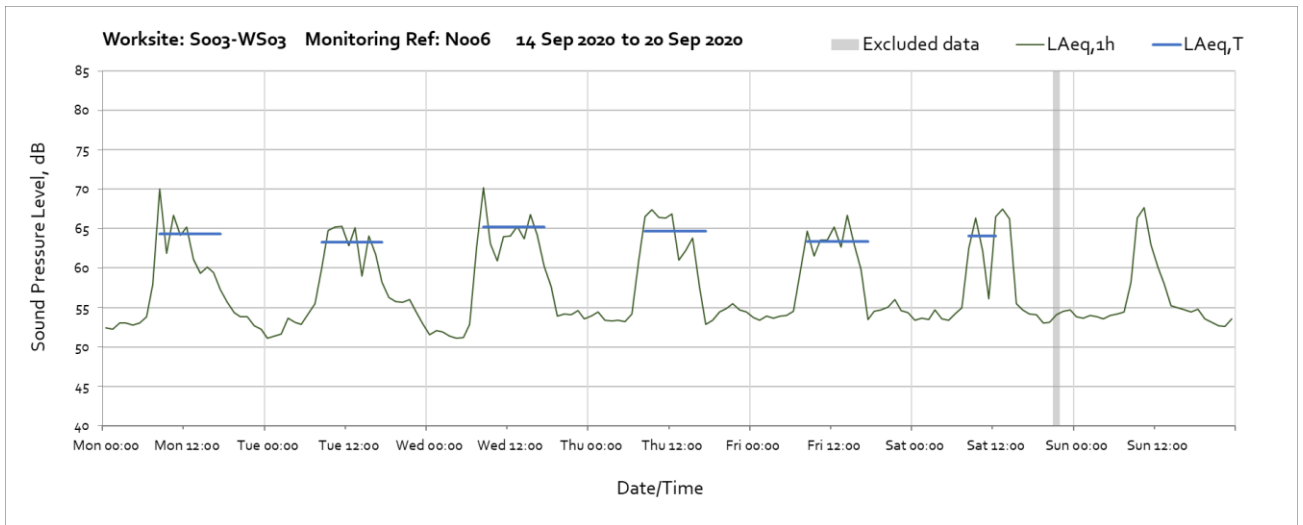
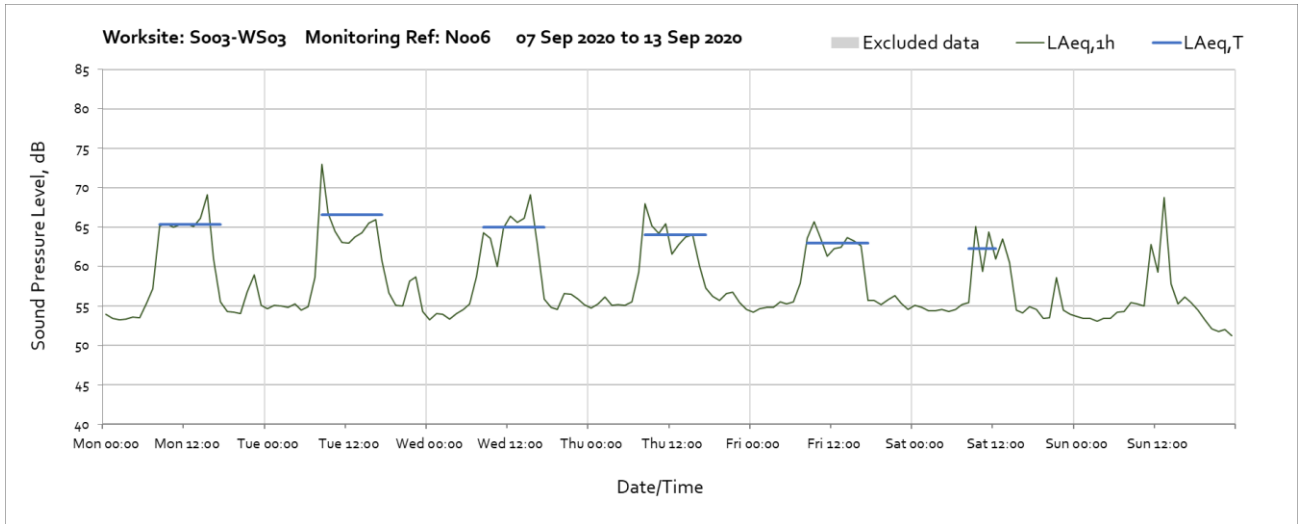


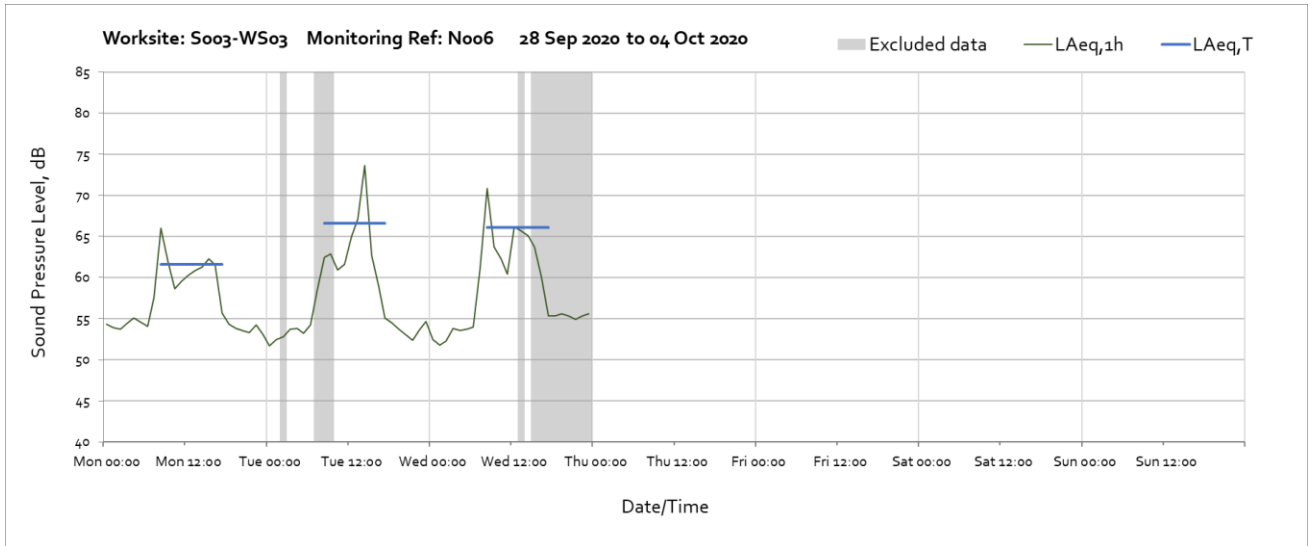
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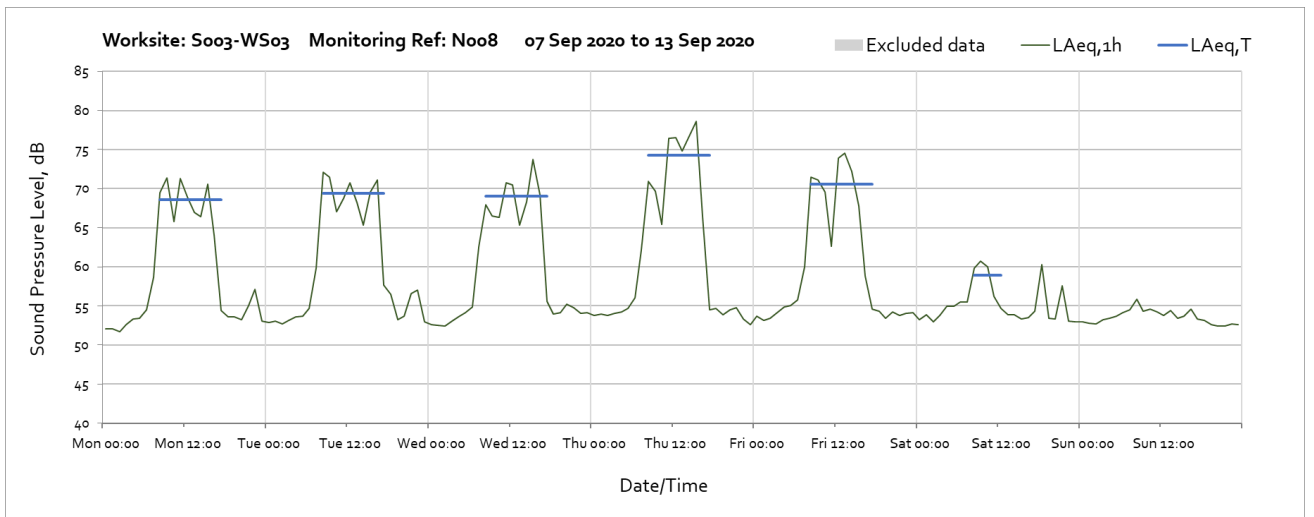
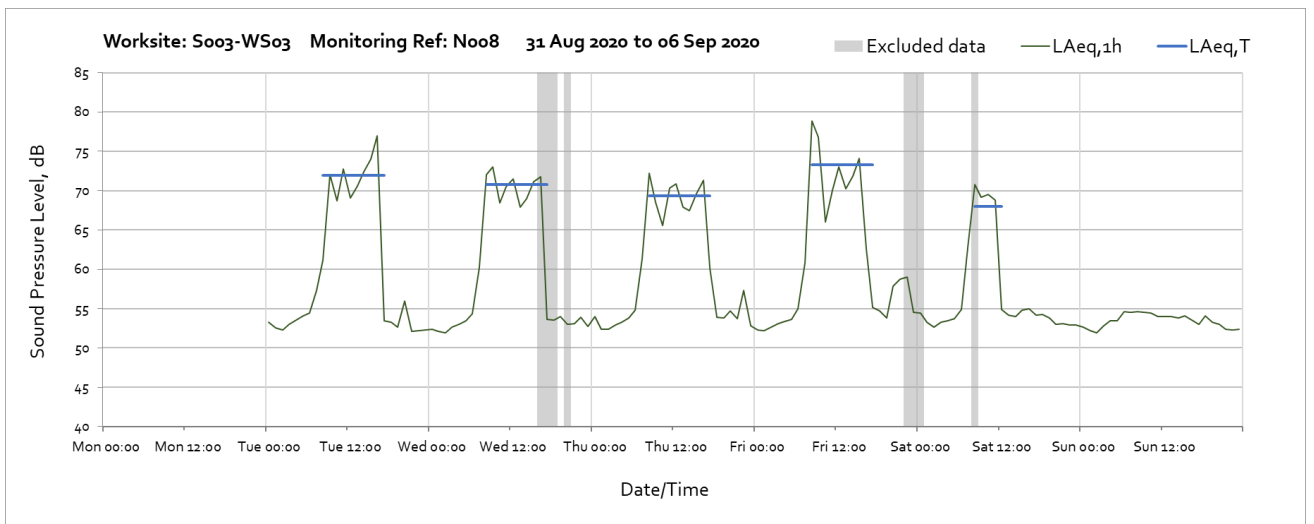
Worksite: S003-WS03 – Monitoring Ref: N006

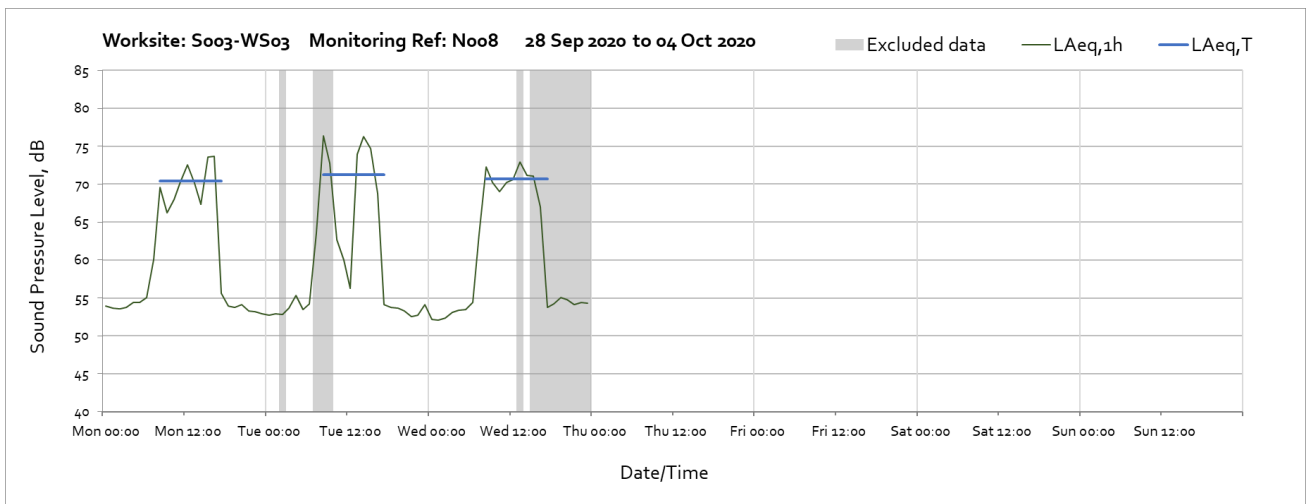
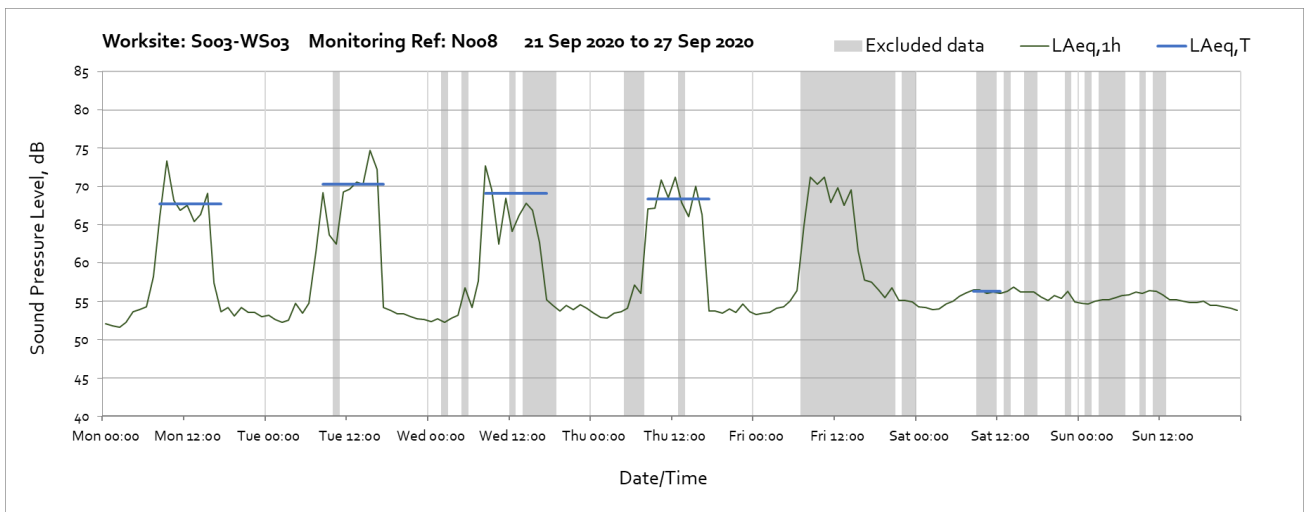
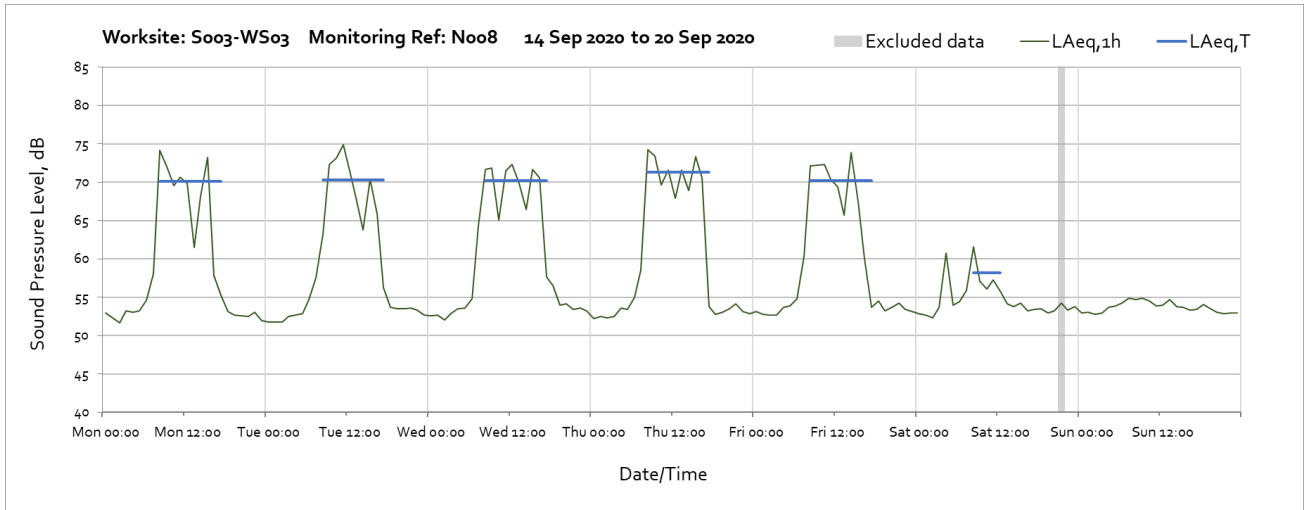




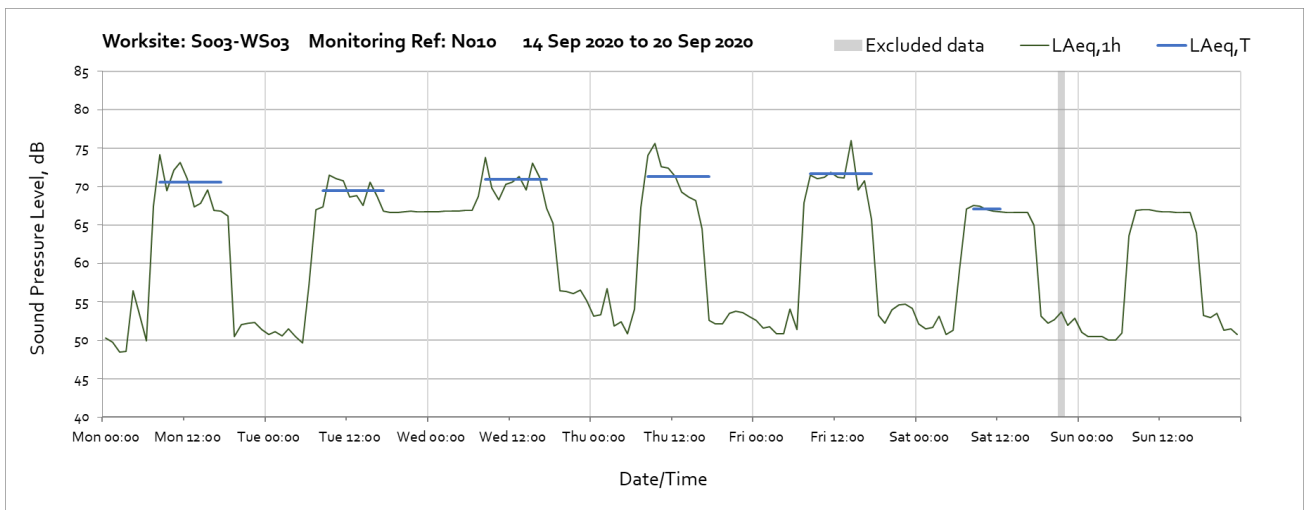
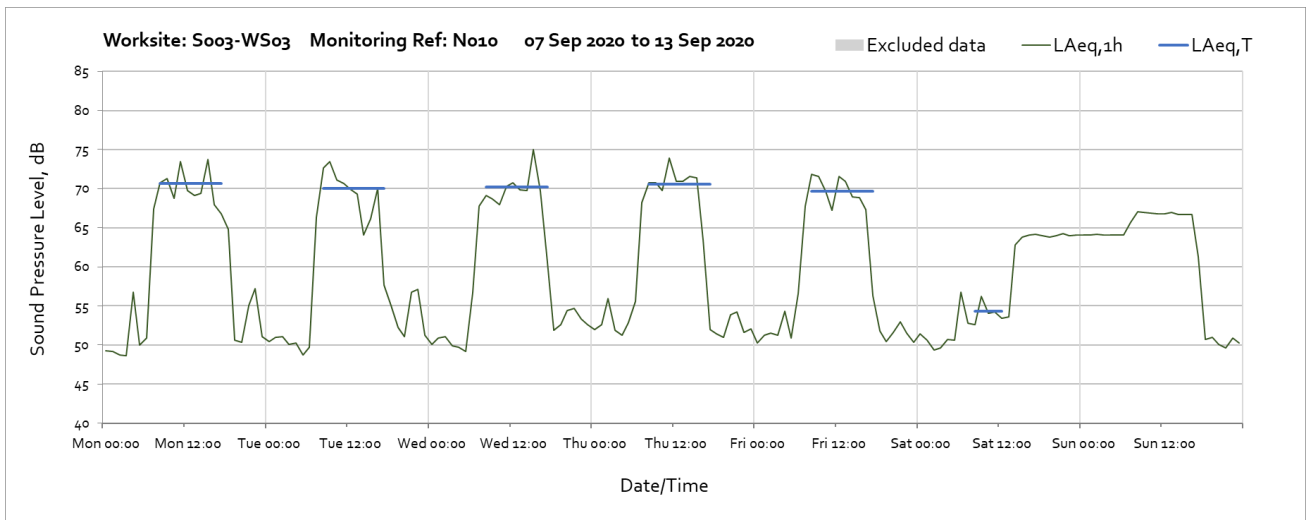
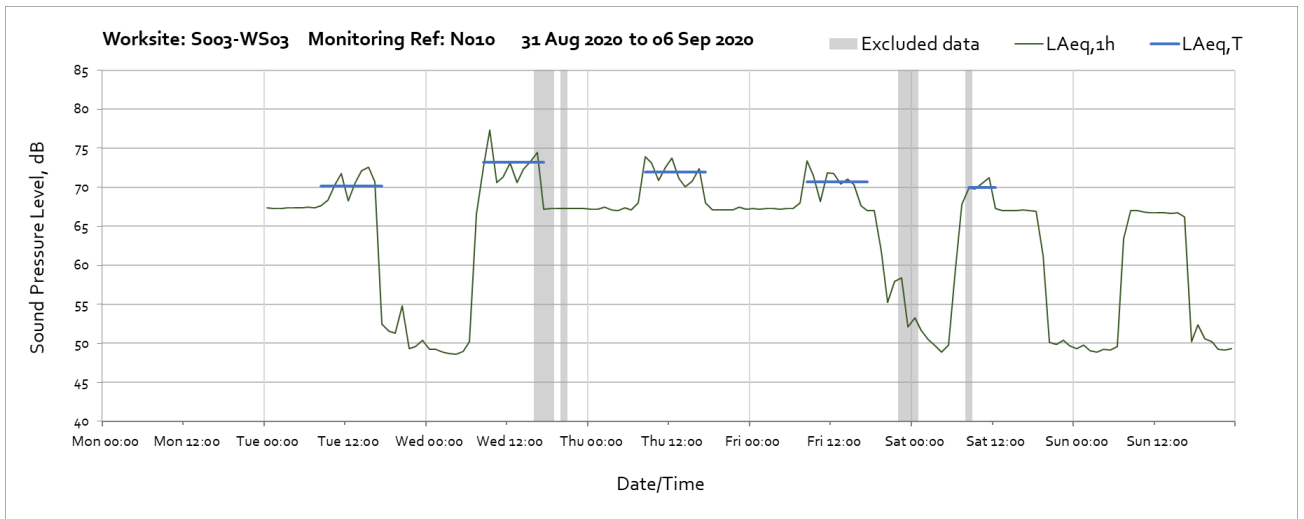


Worksite: S003-WS03 – Monitoring Ref: N008

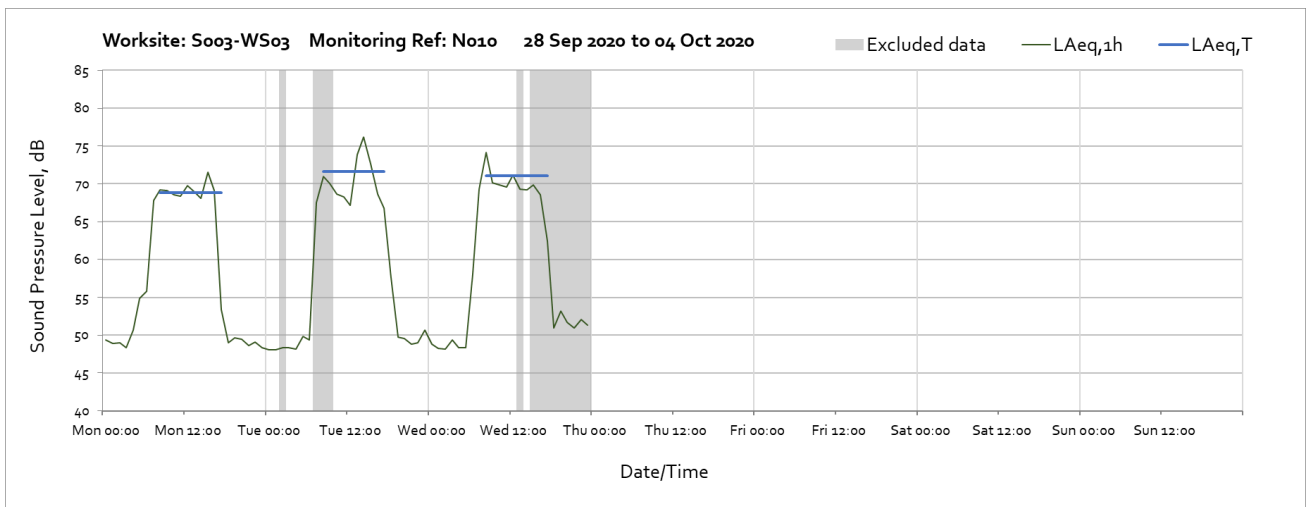
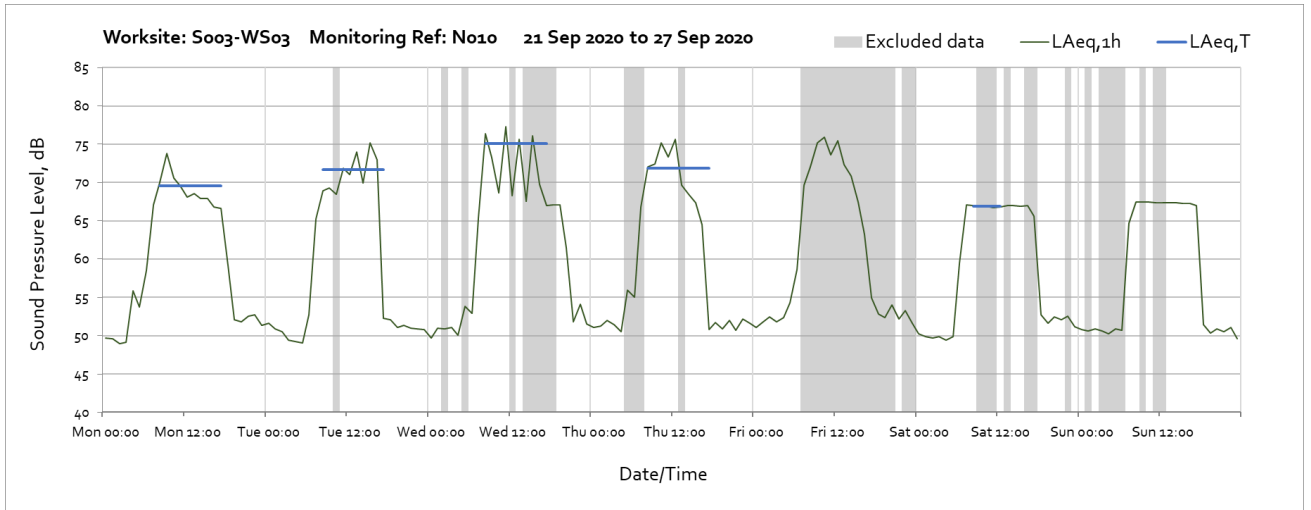




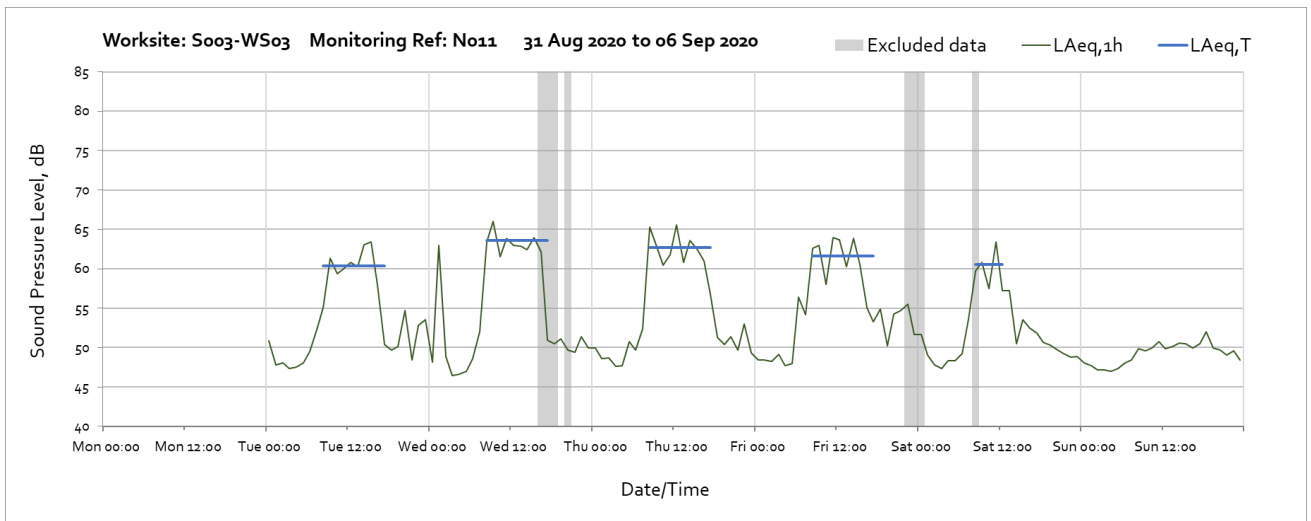
Worksite: S003-WS03 – Monitoring Ref: N010

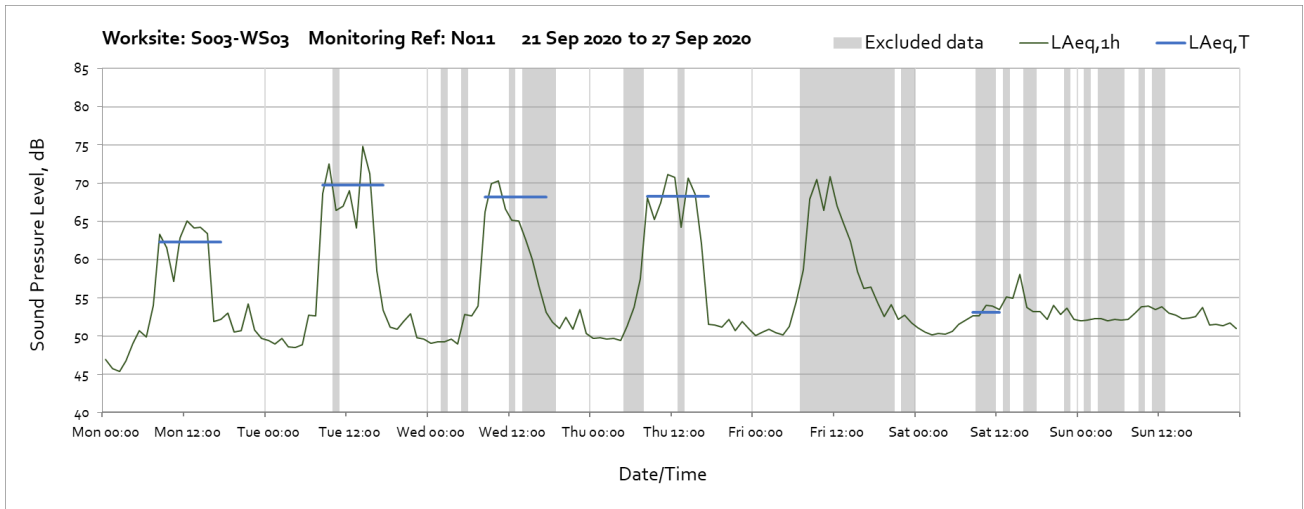
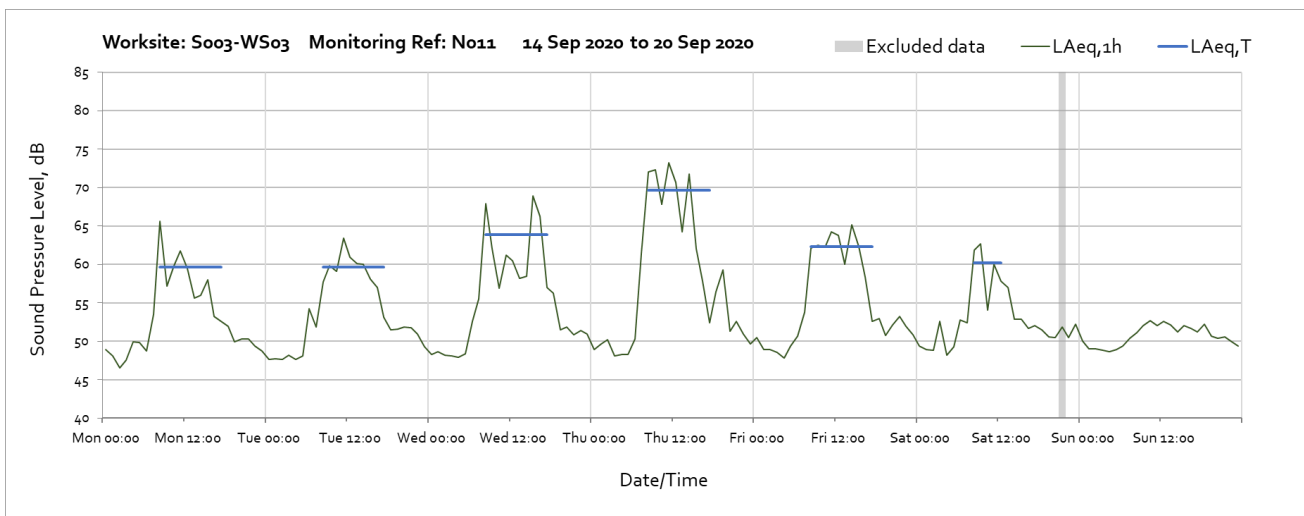
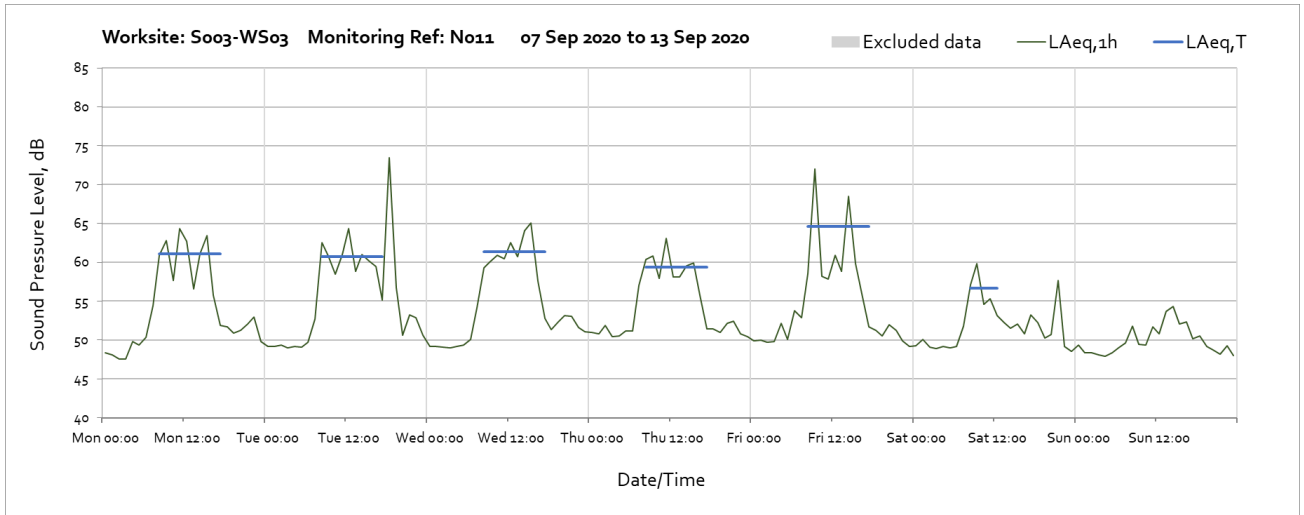


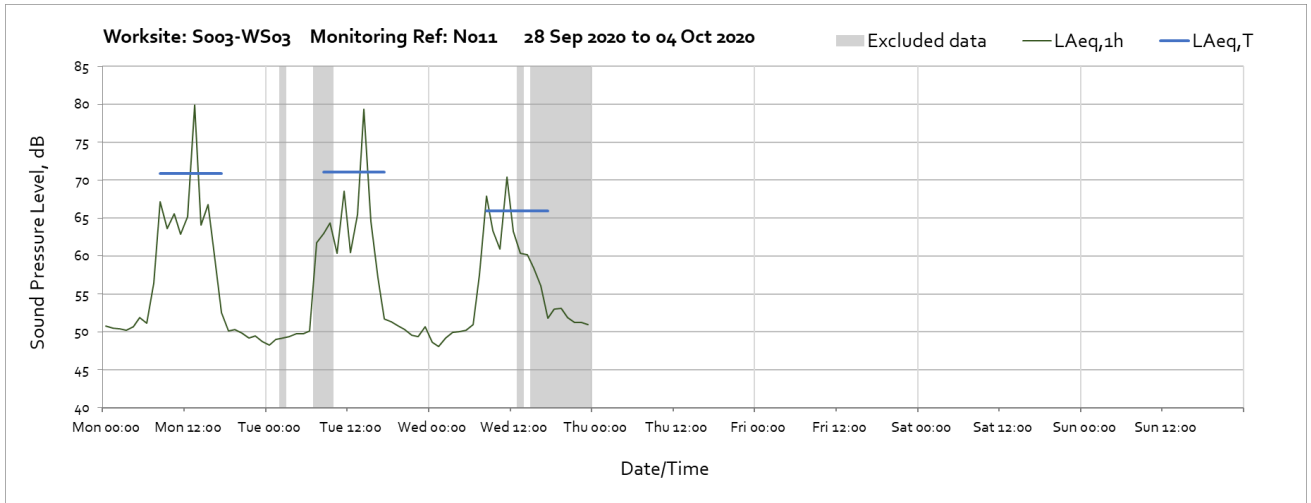
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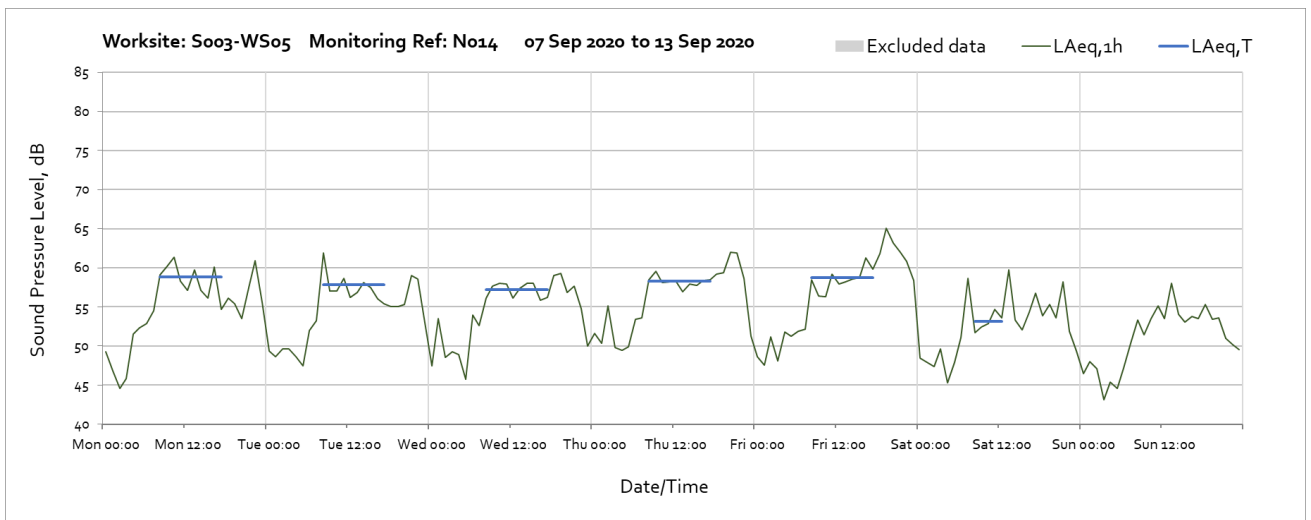
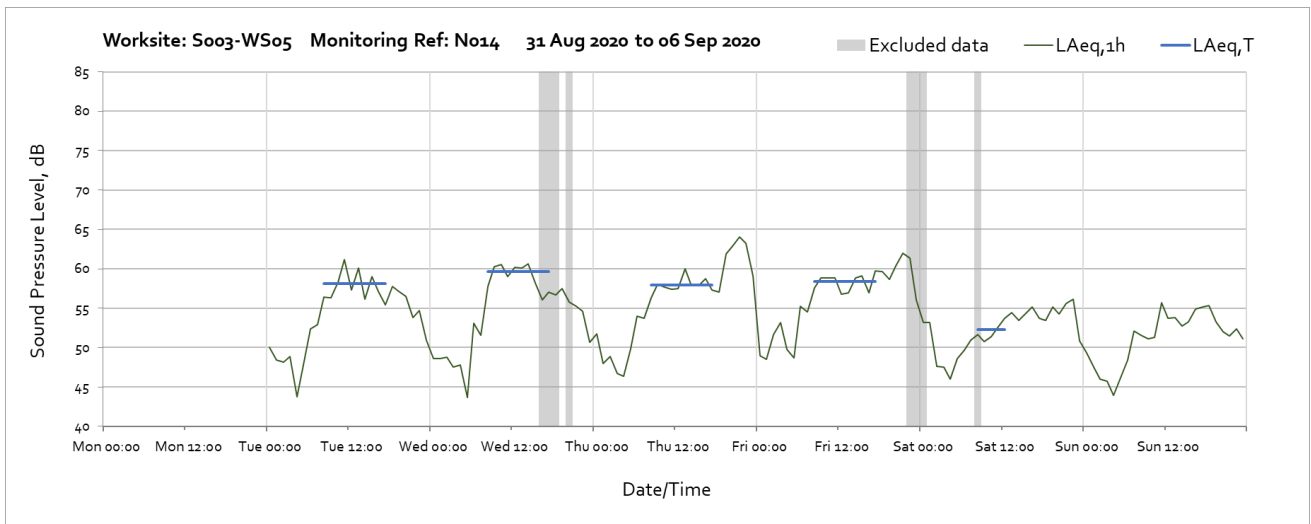
Worksite: S003-WS03 – Monitoring Ref: N011

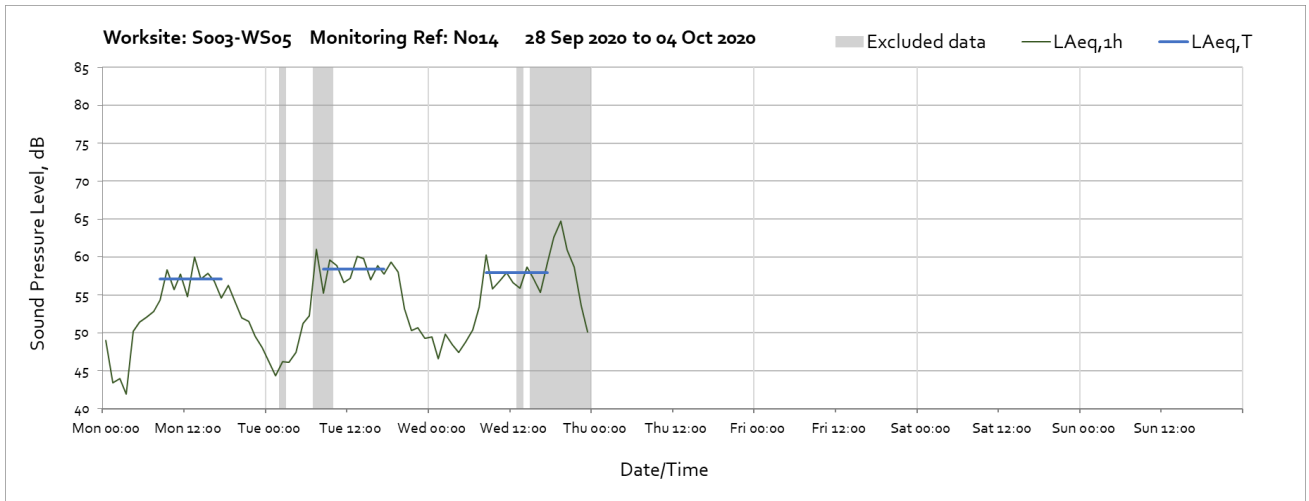
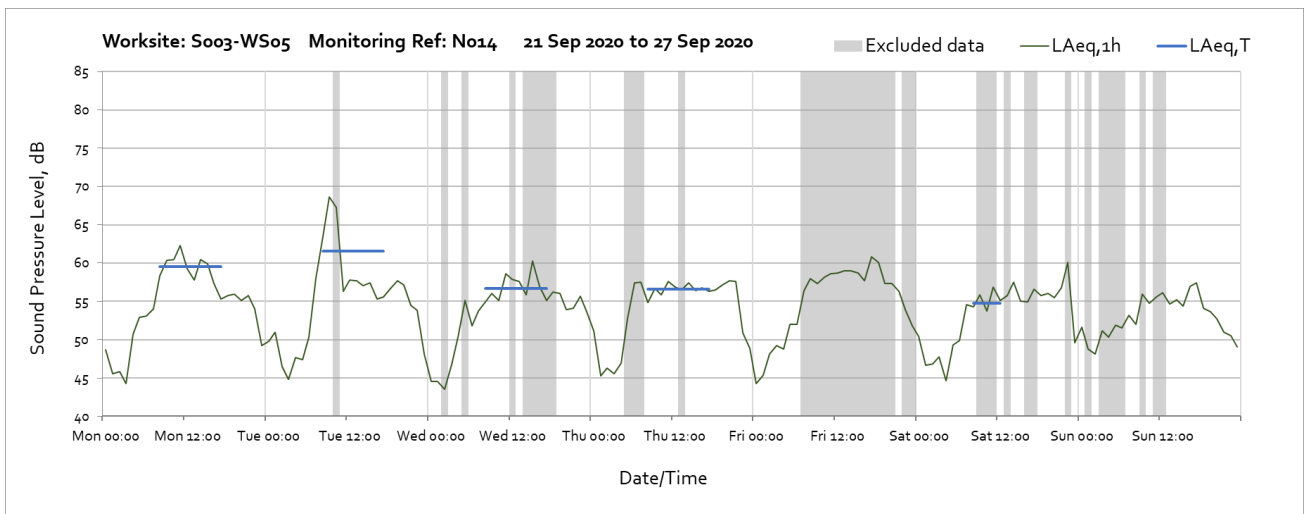
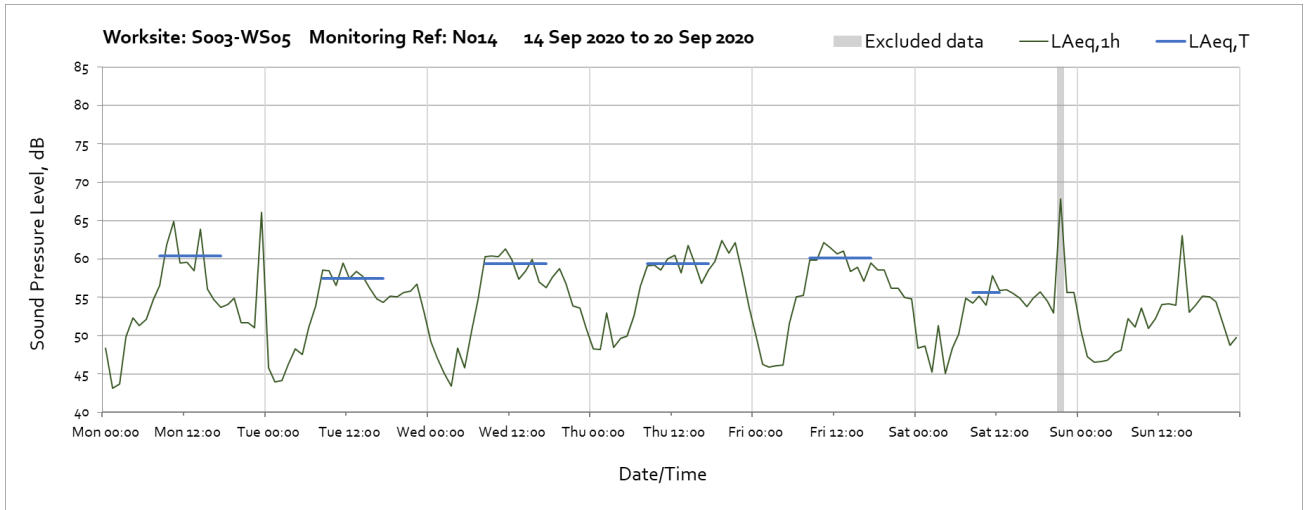




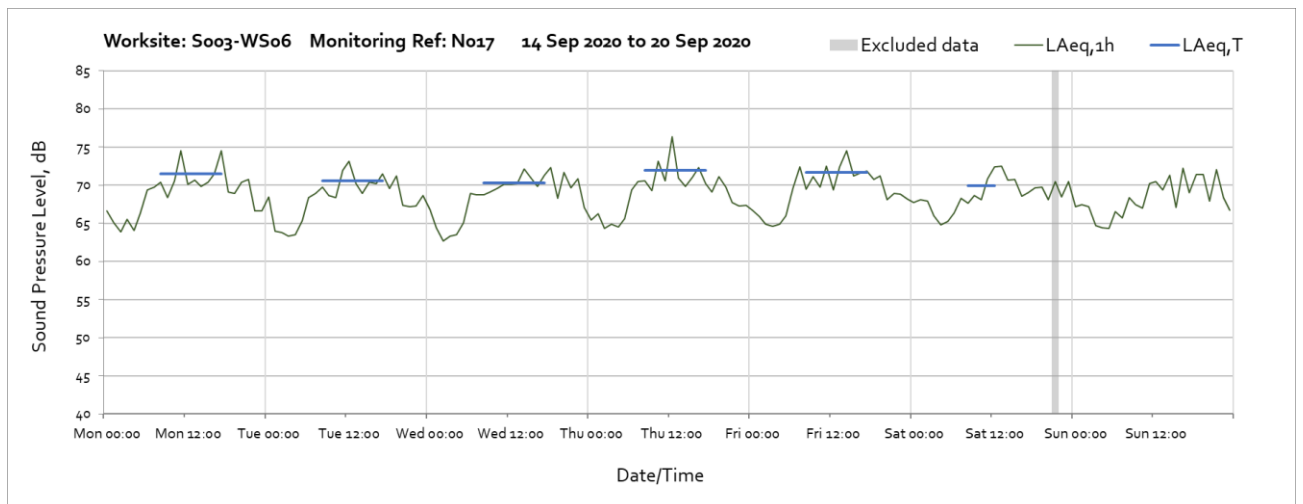
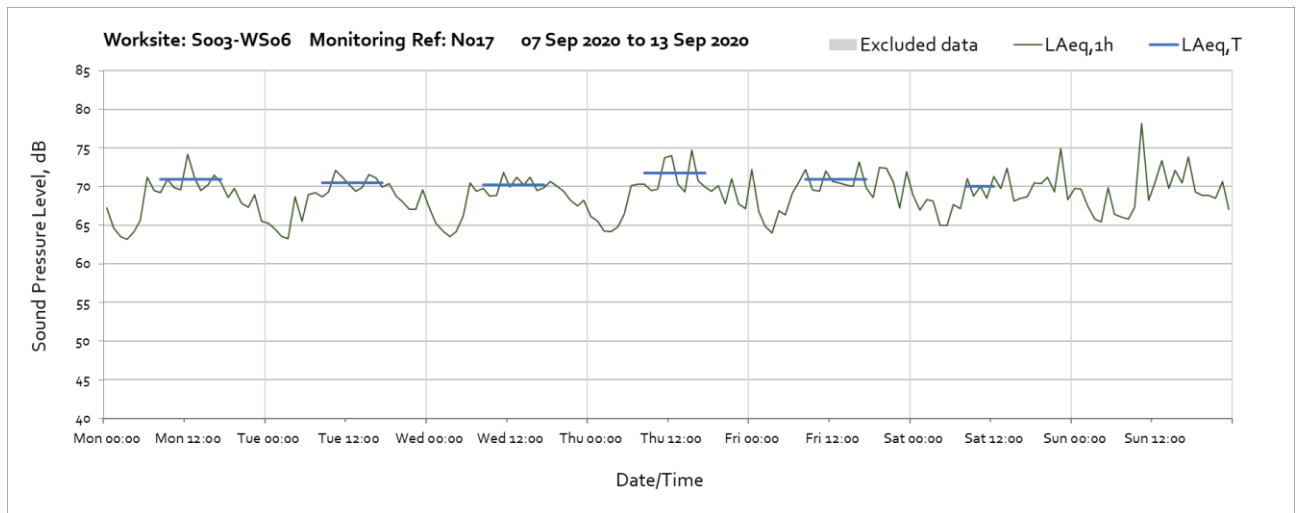
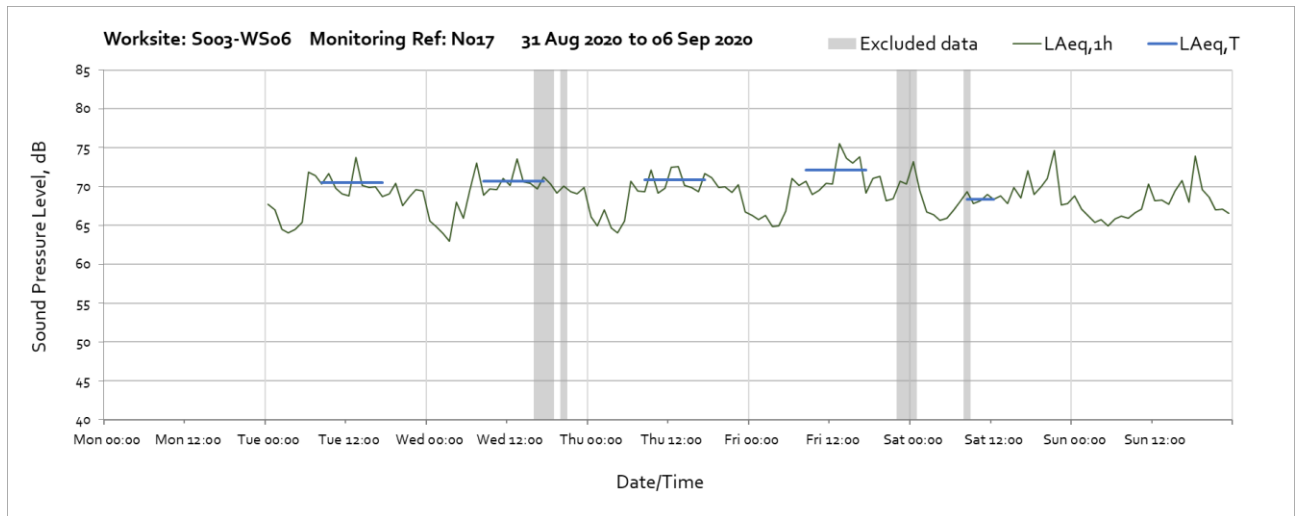


Worksite: S003-WS05 – Monitoring Ref: N014

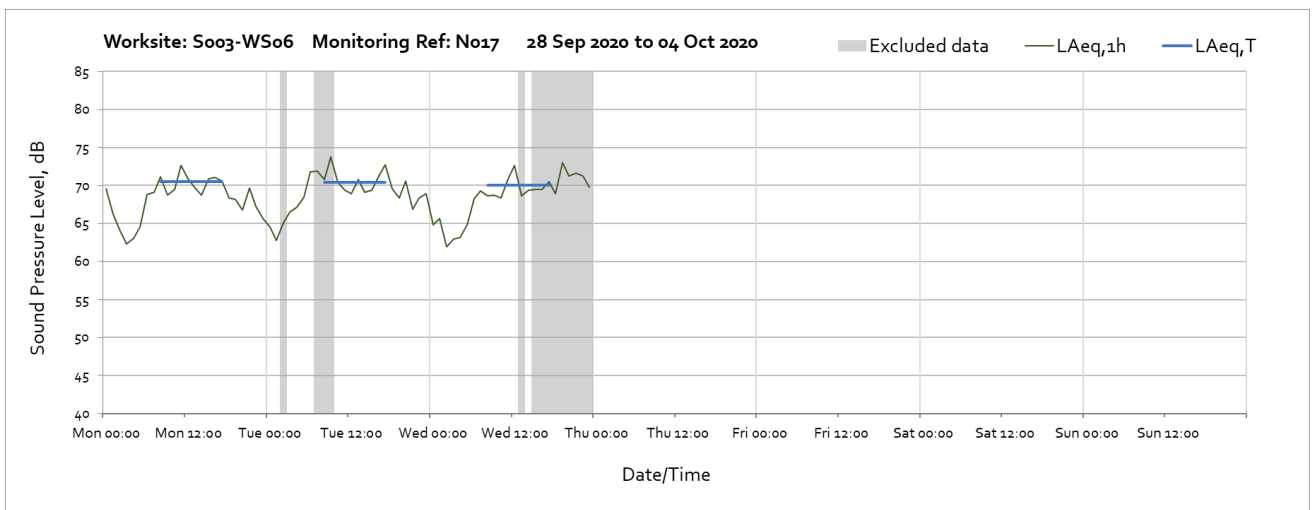
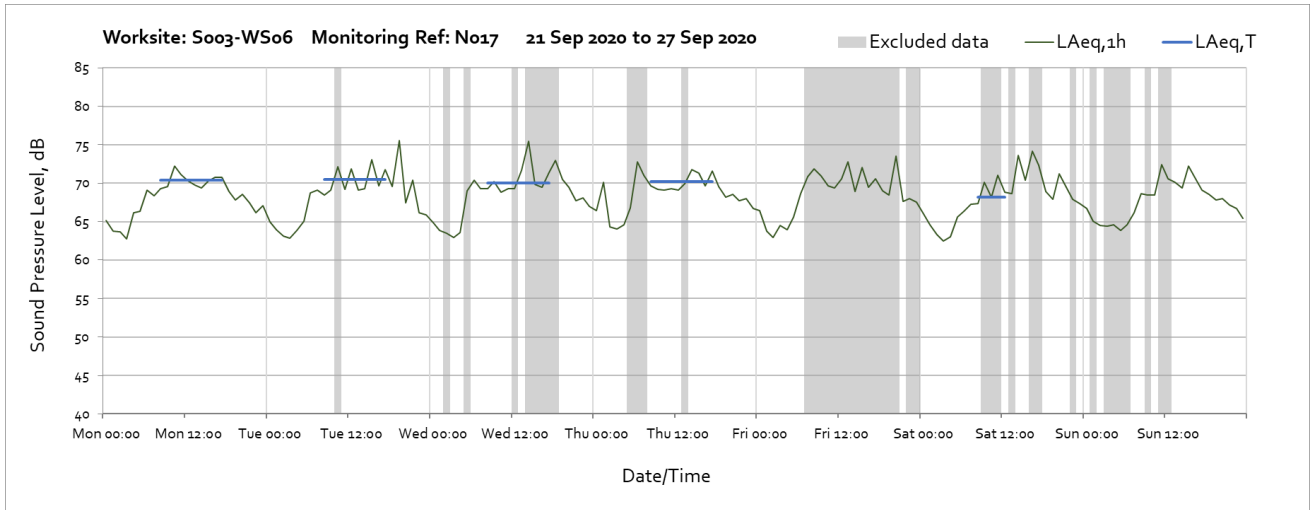




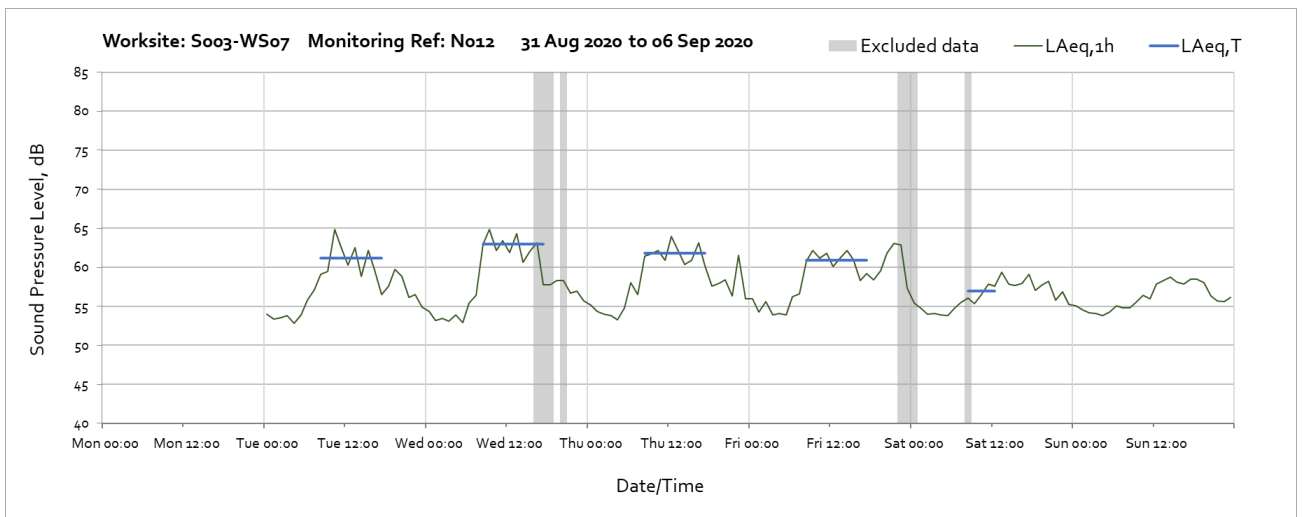
Worksite: S003-WS06 – Monitoring Ref: N017

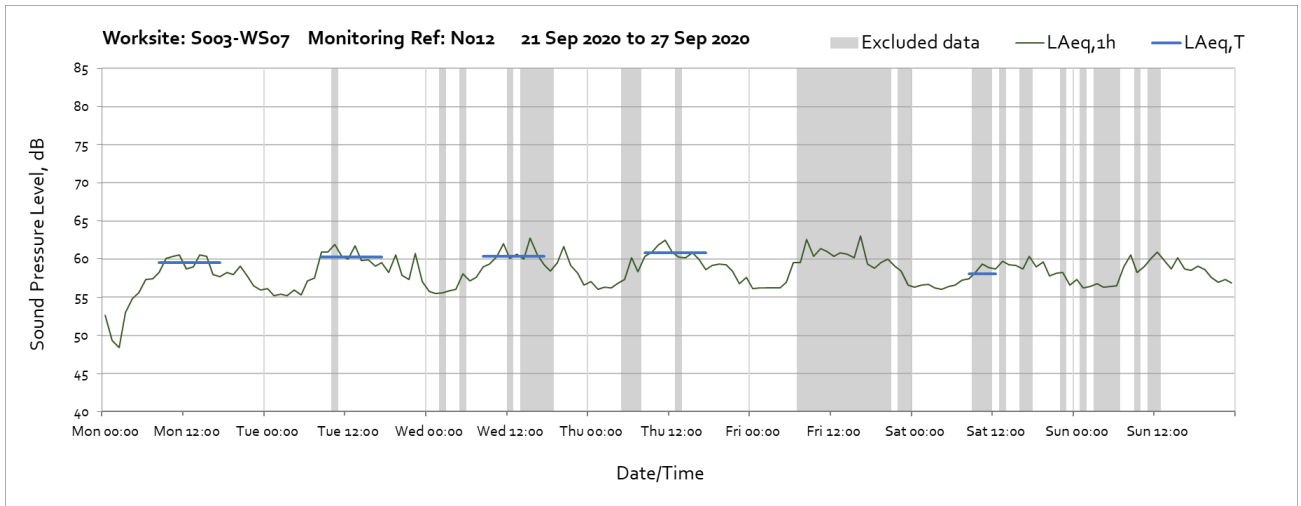
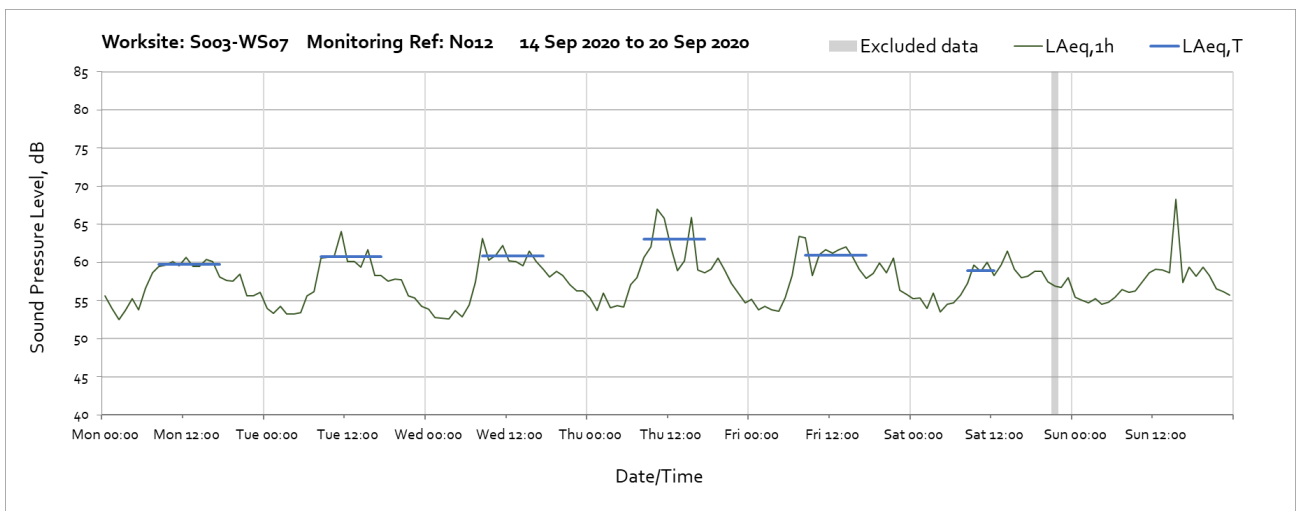
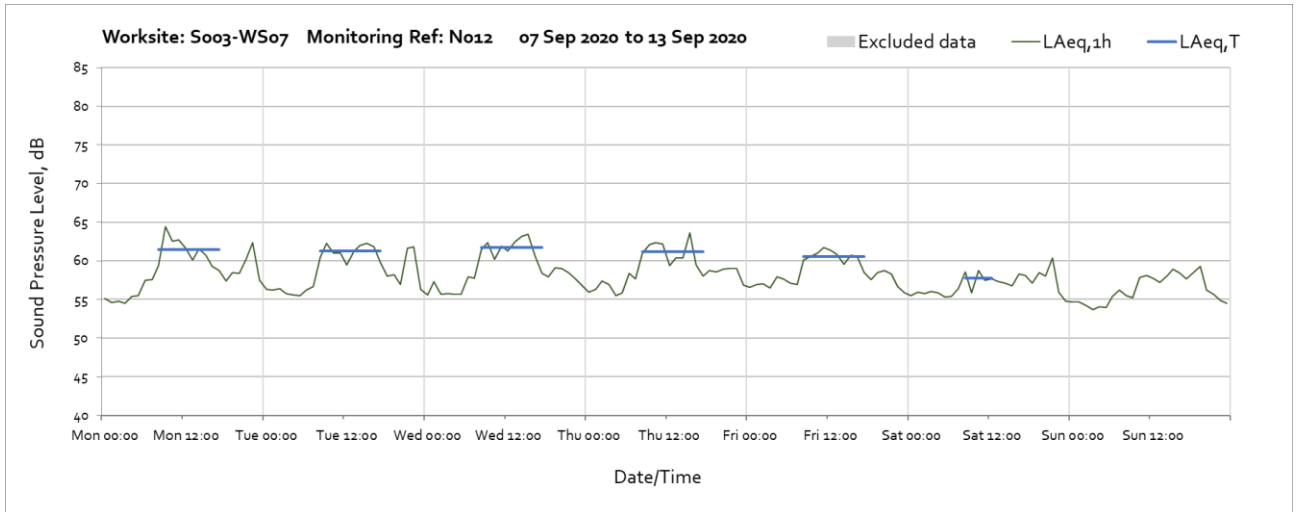


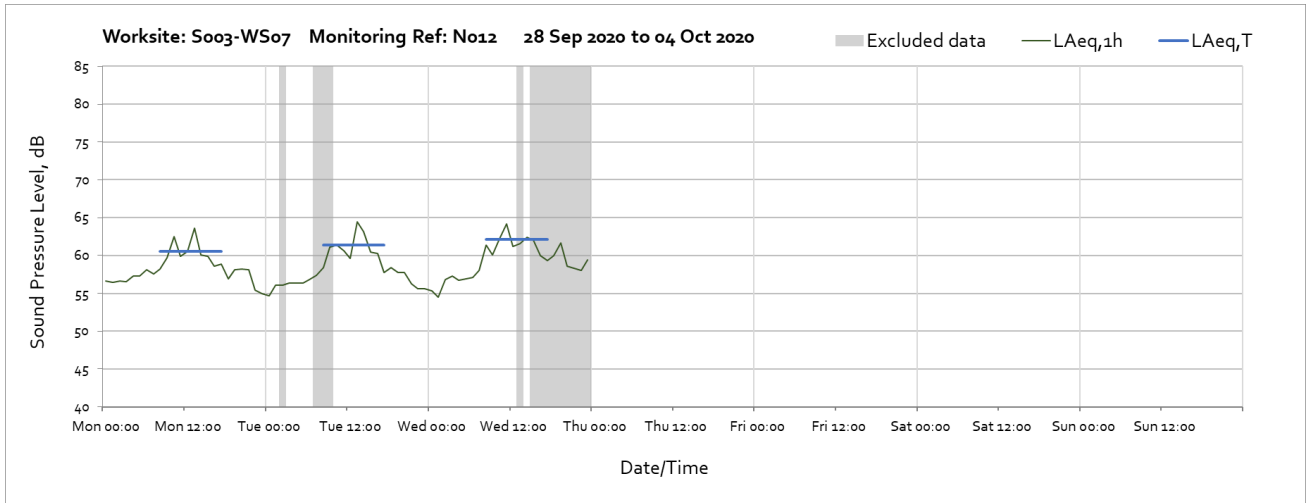
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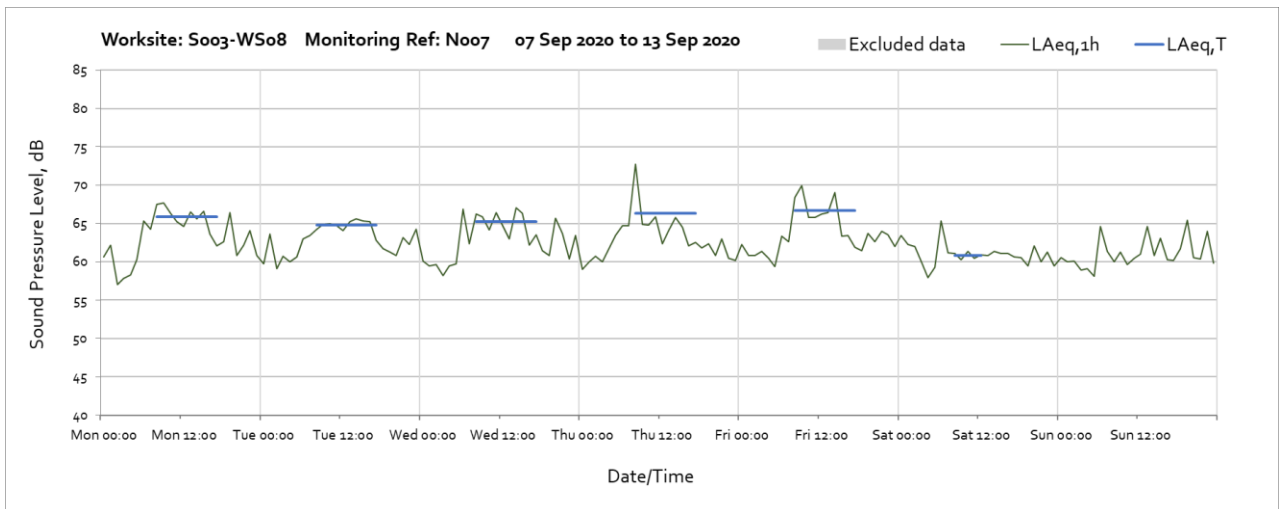
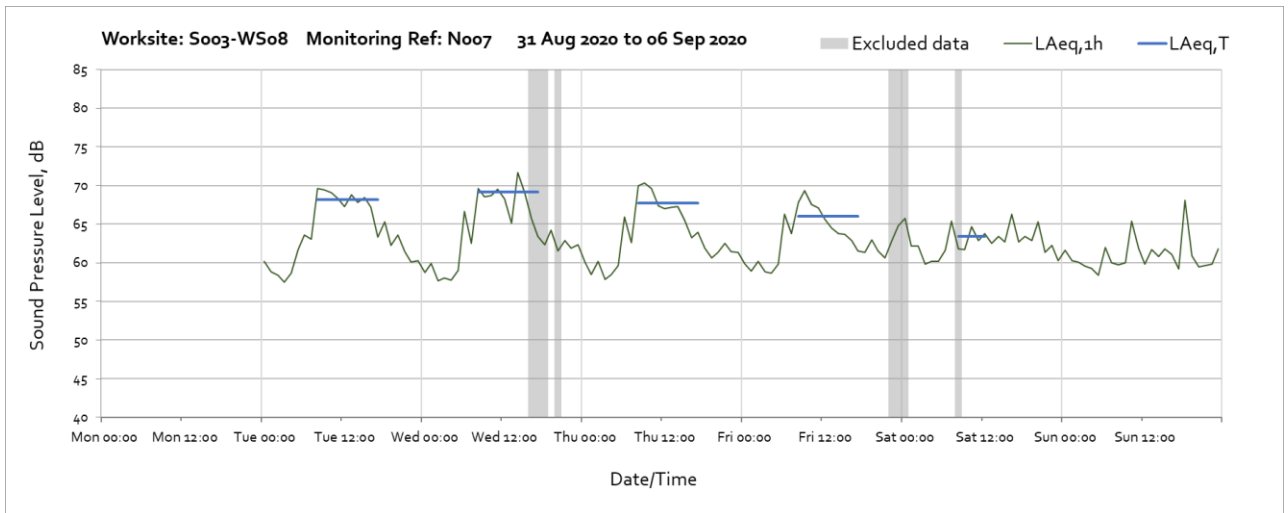
Worksite: S003-WS07 – Monitoring Ref: N012

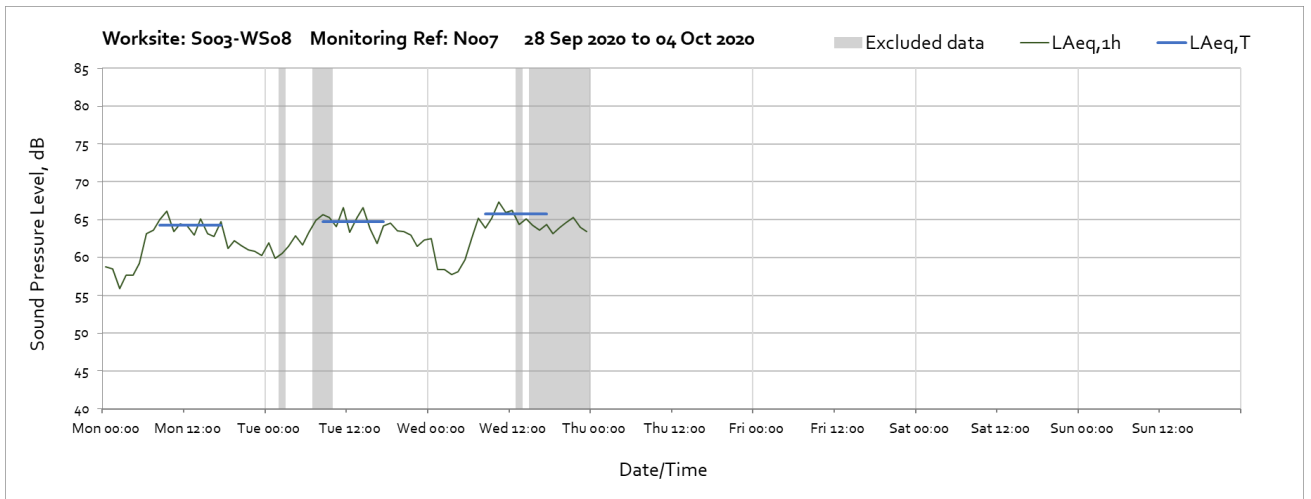
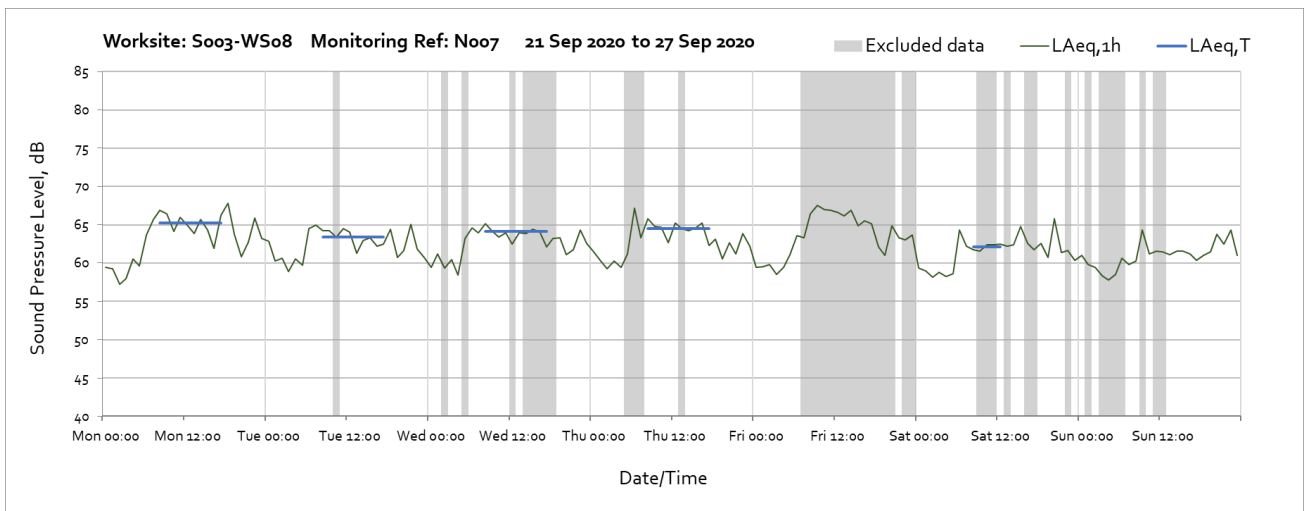
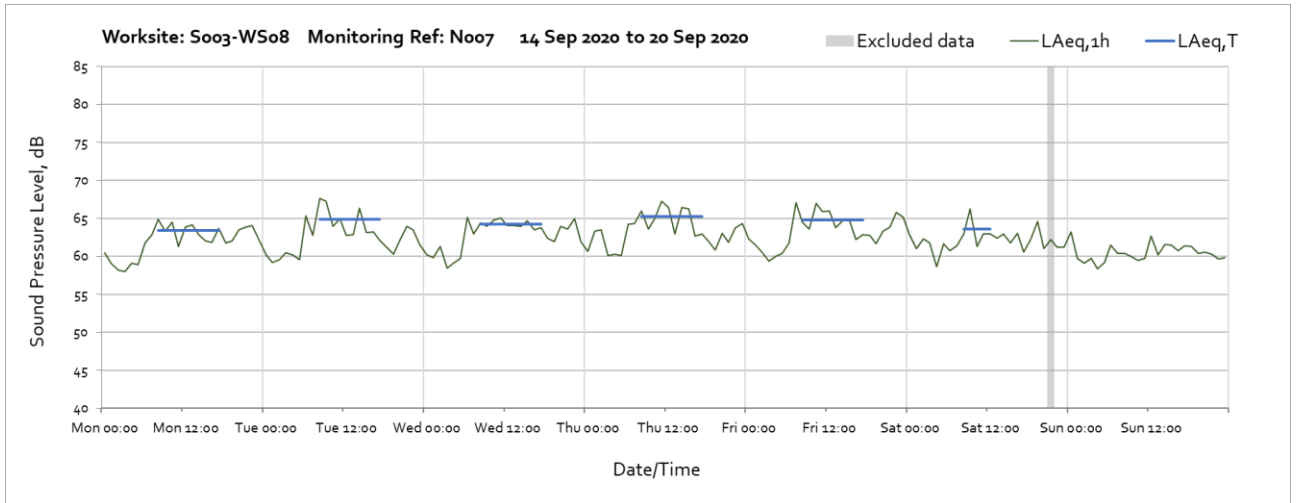




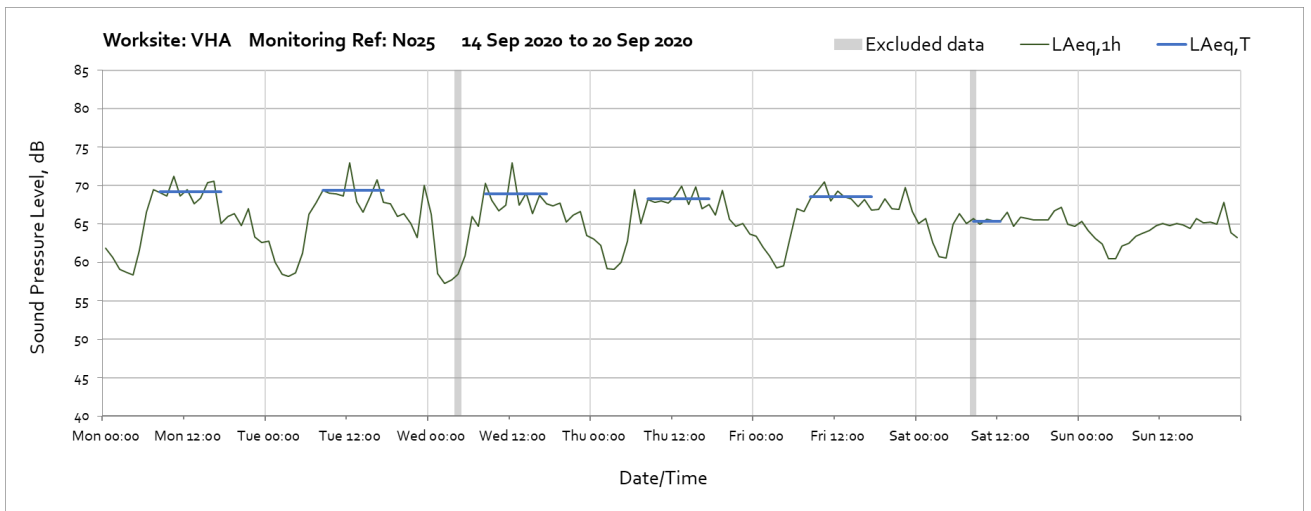
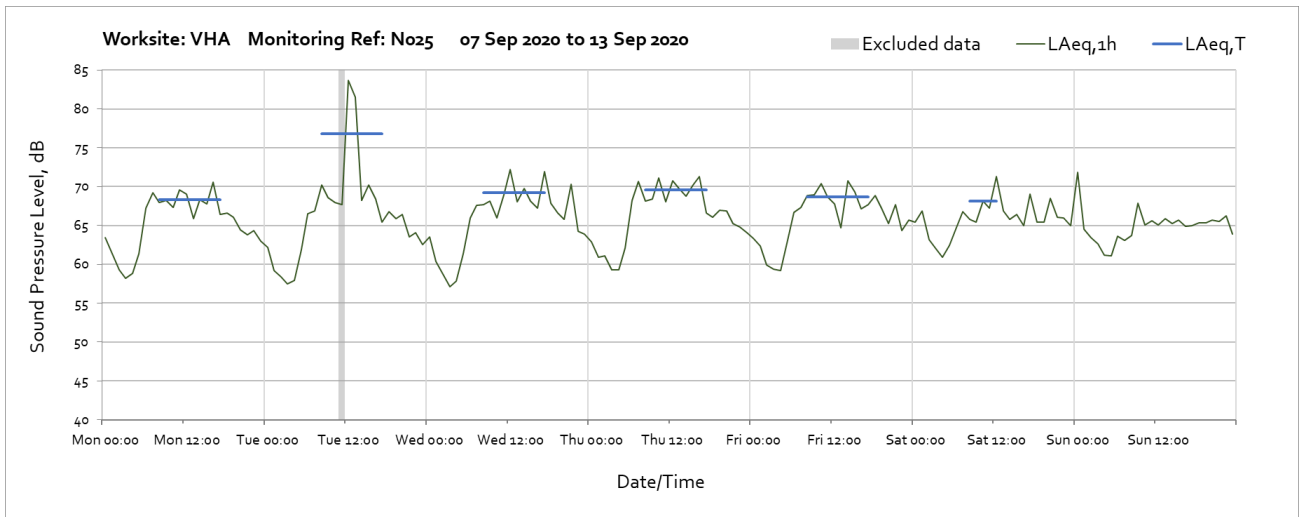
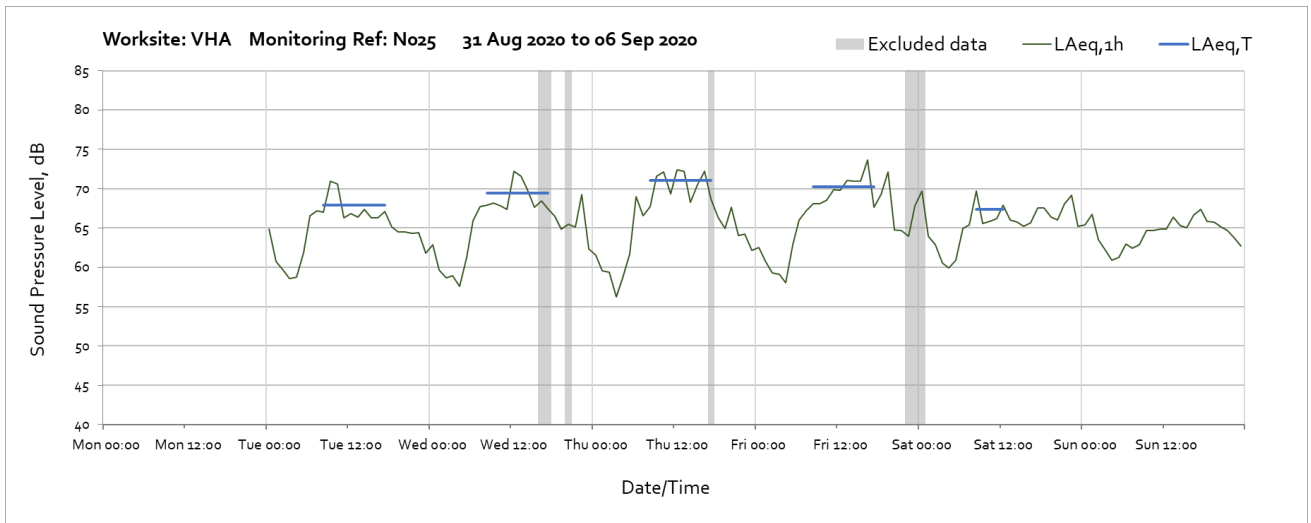


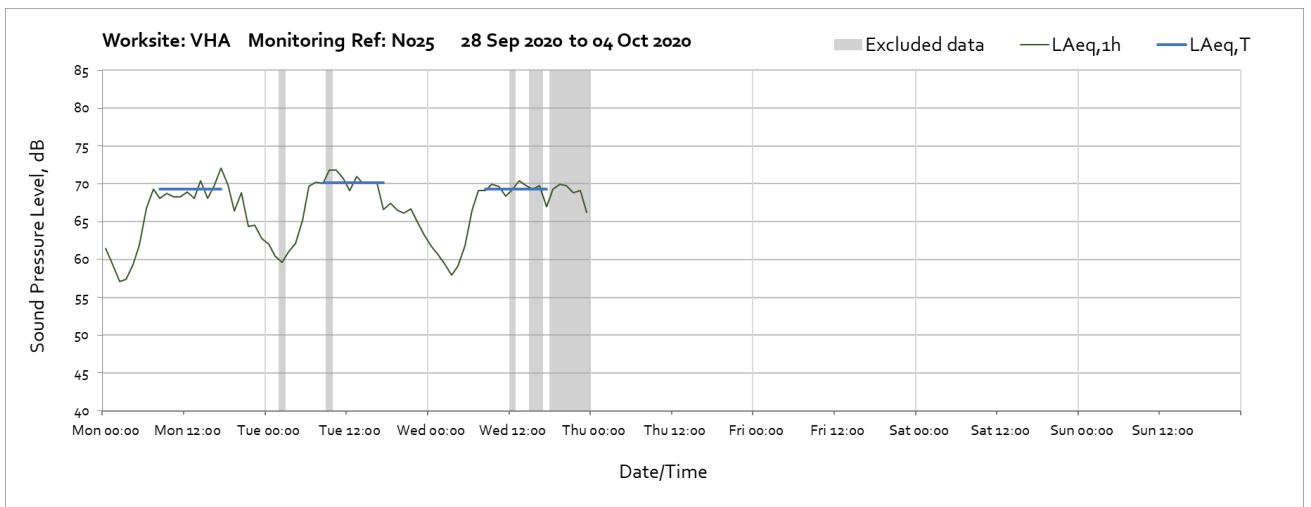
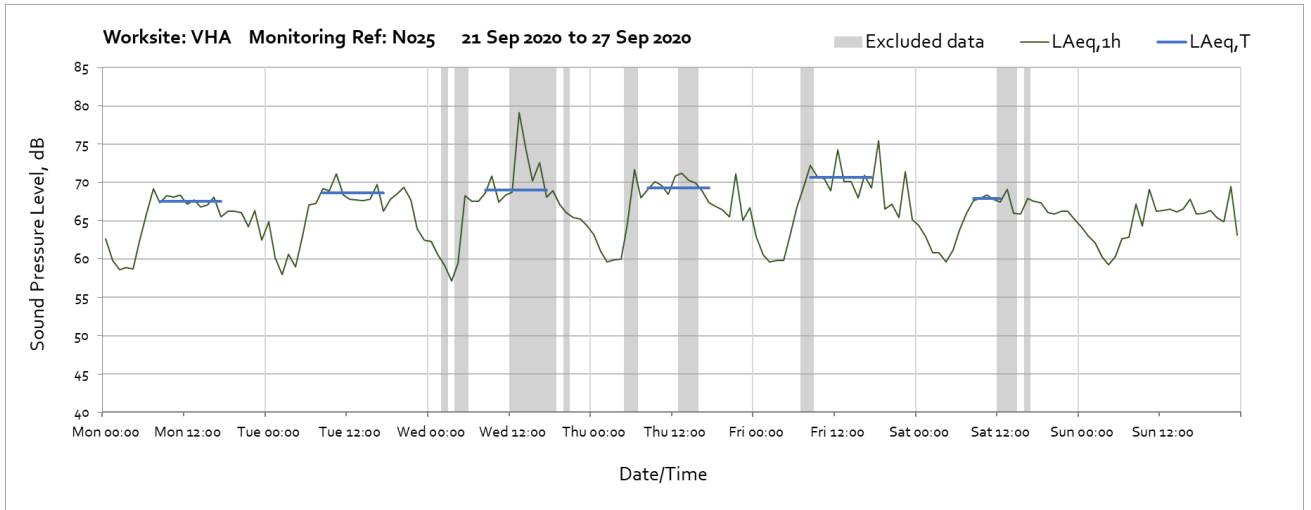
Worksite: S003-WS08 – Monitoring Ref: N007



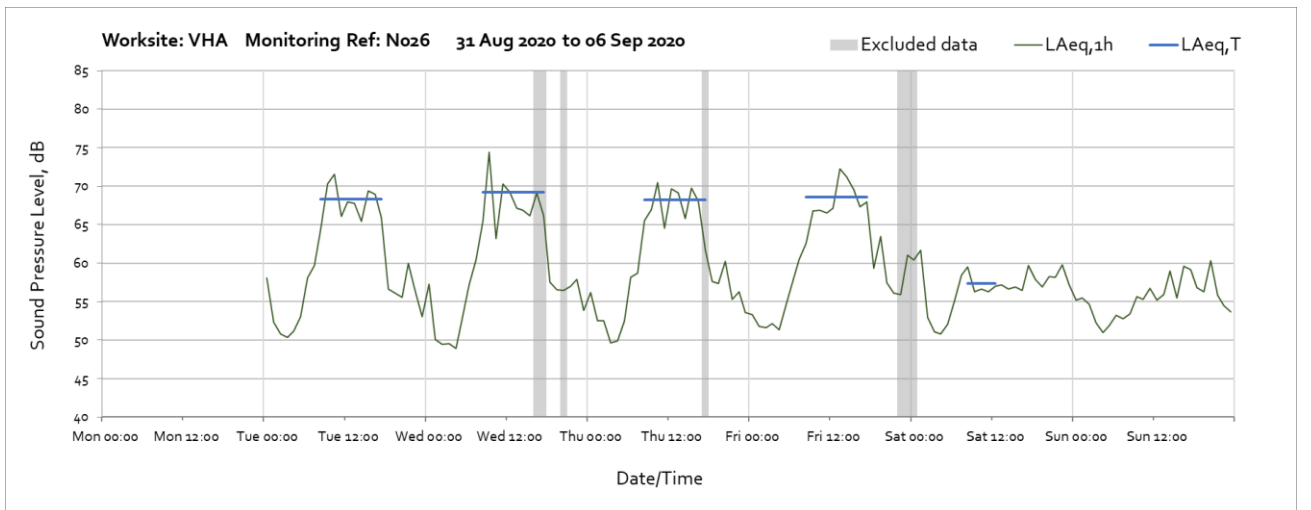


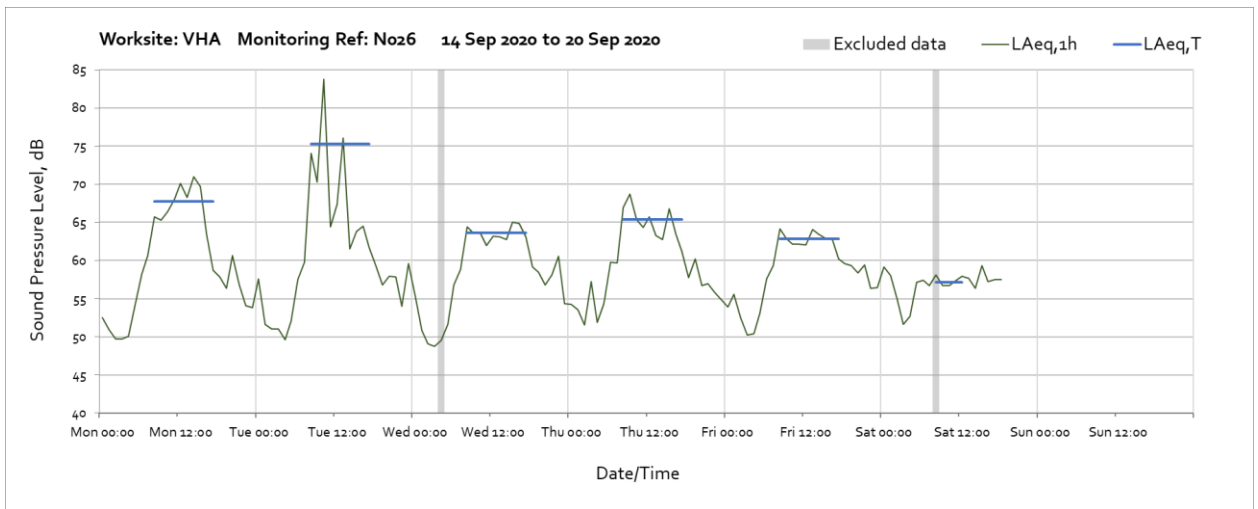
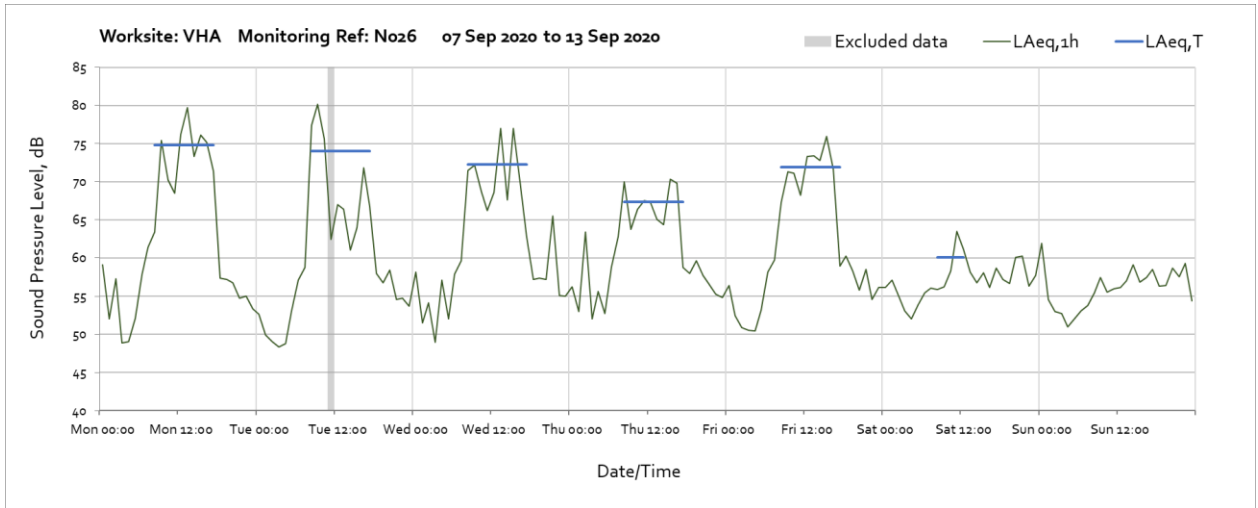
Vehicle Holding Area (VHA) – Monitoring Ref: N025



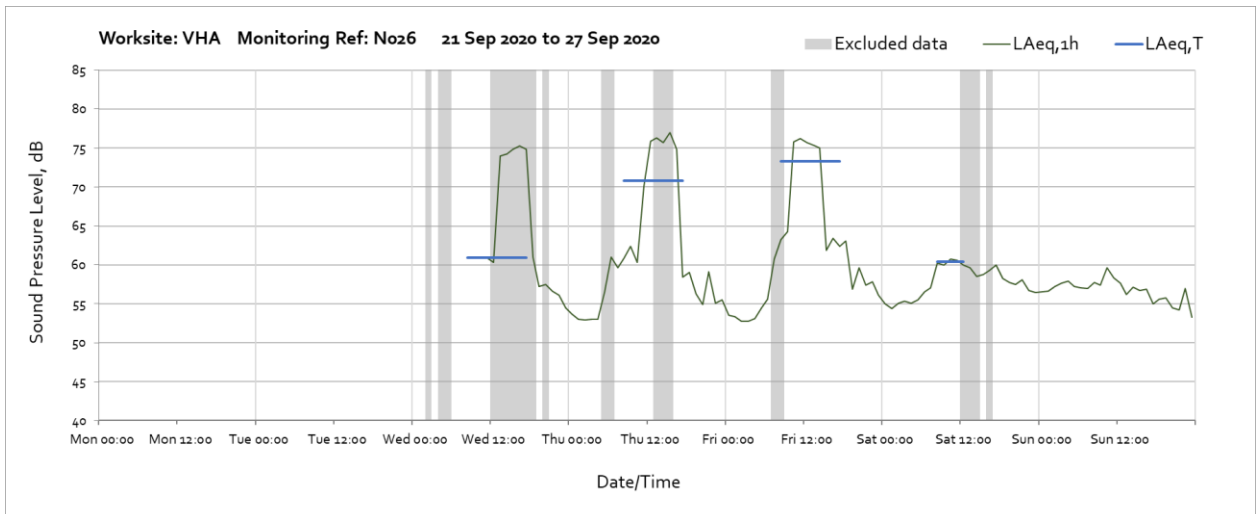


Vehicle Holding Area (VHA) – Monitoring Ref: N026



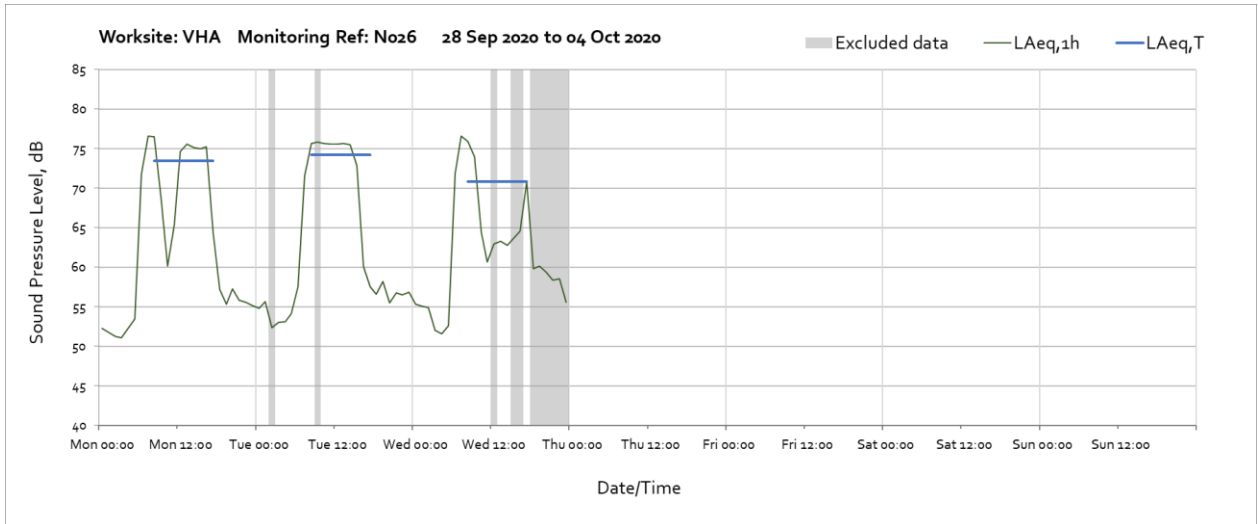


Note: Missing data from 19:00 on Saturday 19th September until 00:00 on Monday 21st September was due to loss of site power.



Note: Missing data from 00:00 on Monday 21st September until 11:00 on Wednesday 23rd was due to loss of site power.

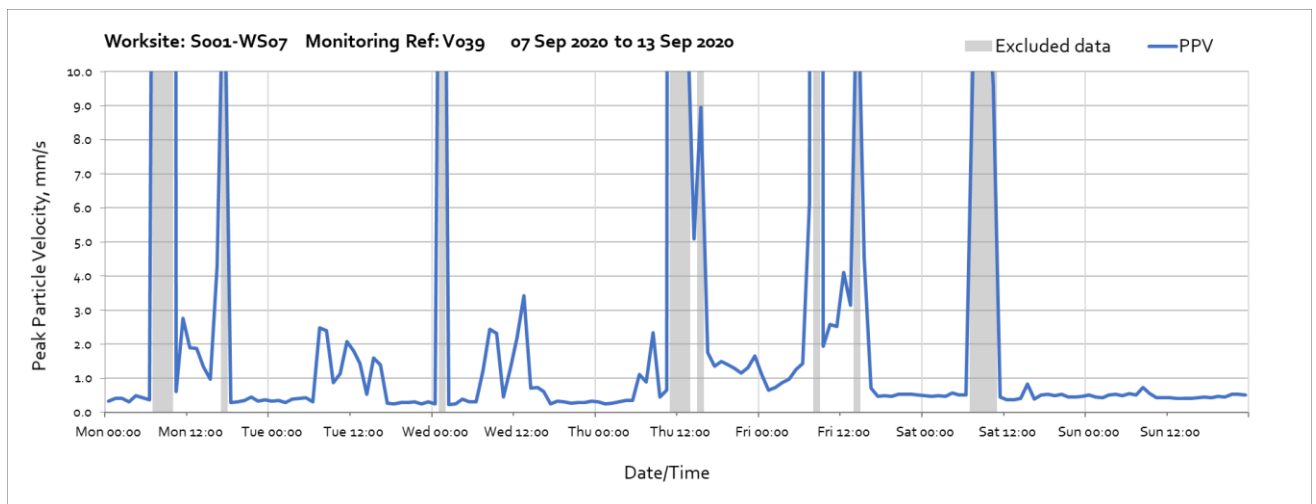
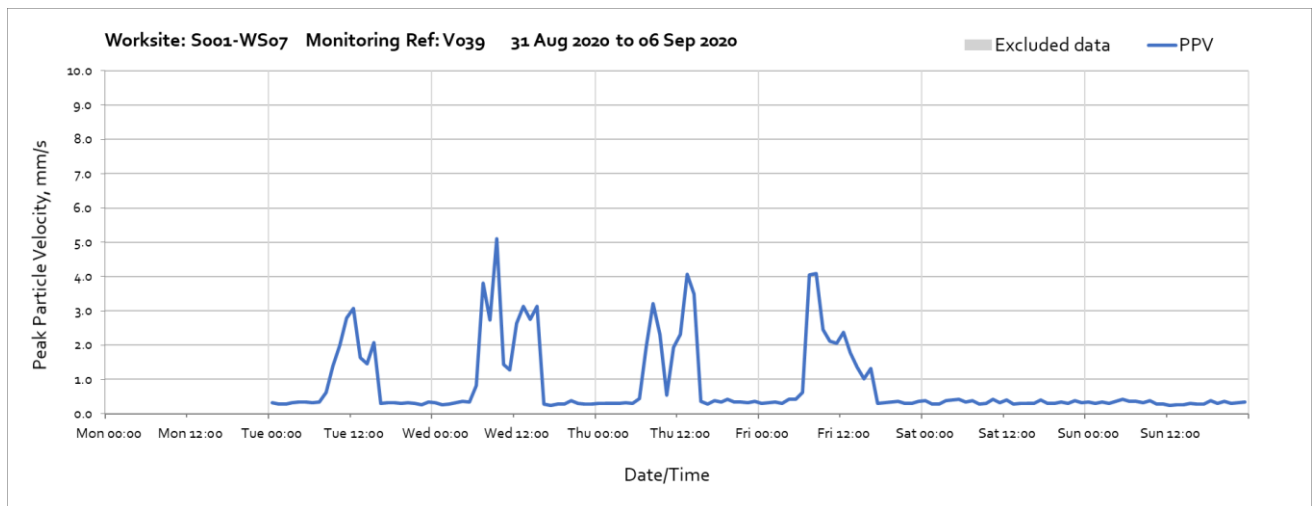
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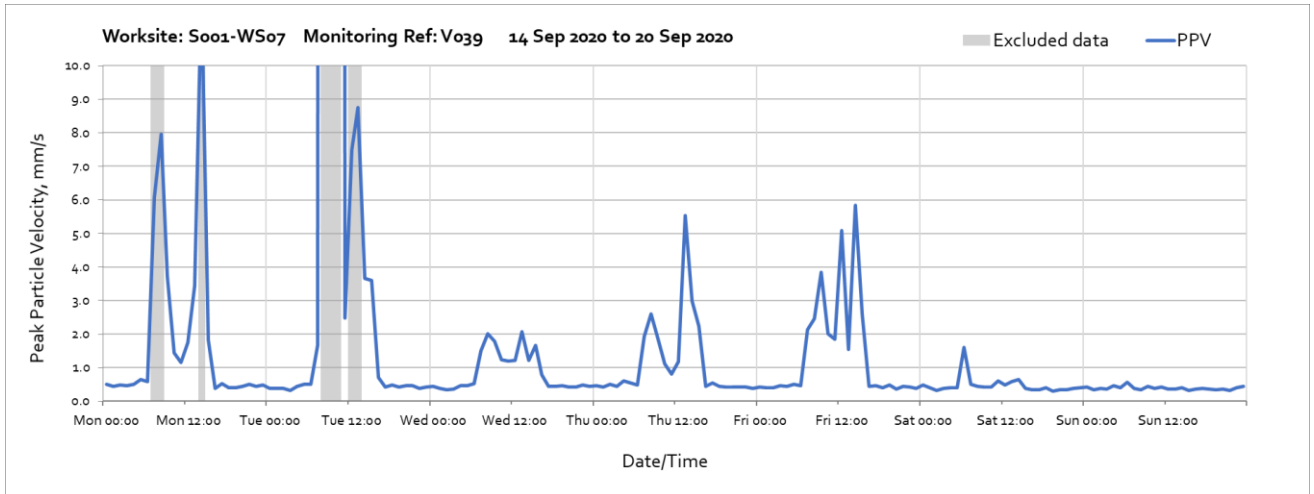
Vibration

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.

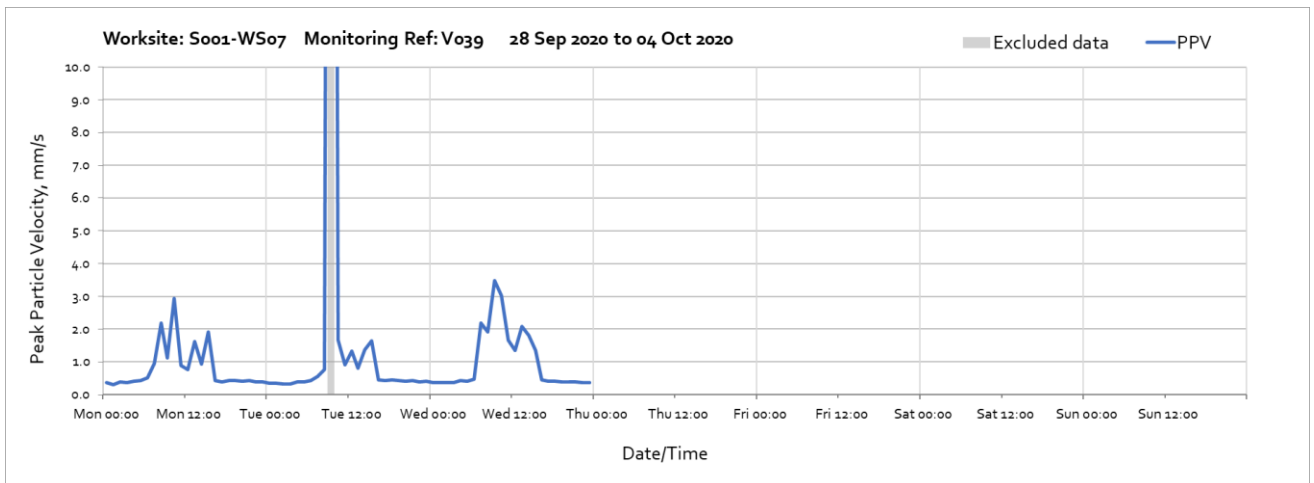
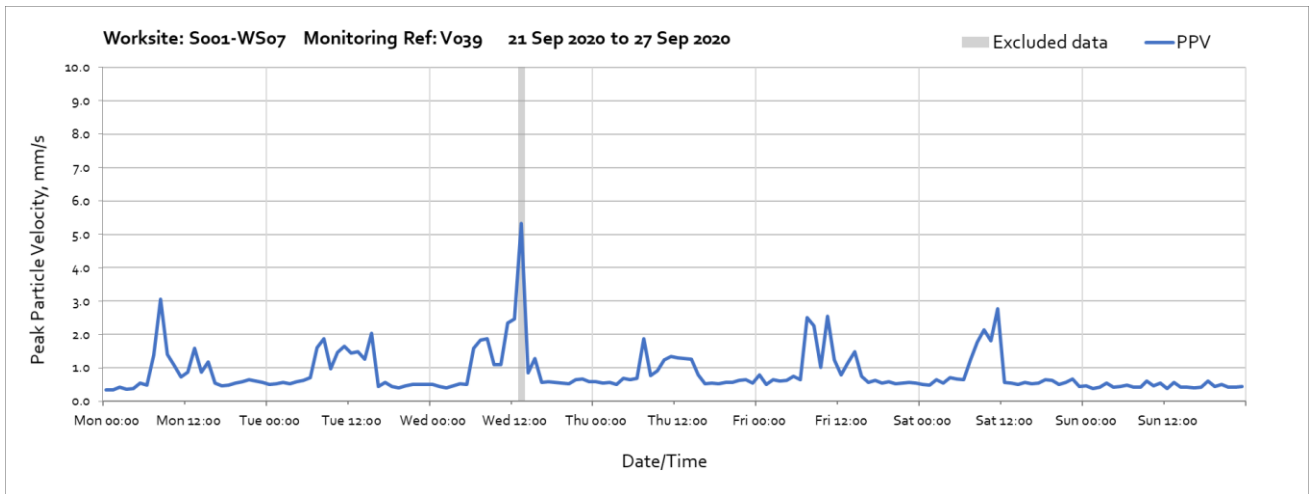
Worksite: S001-WS07 – Monitoring Ref: V039



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.

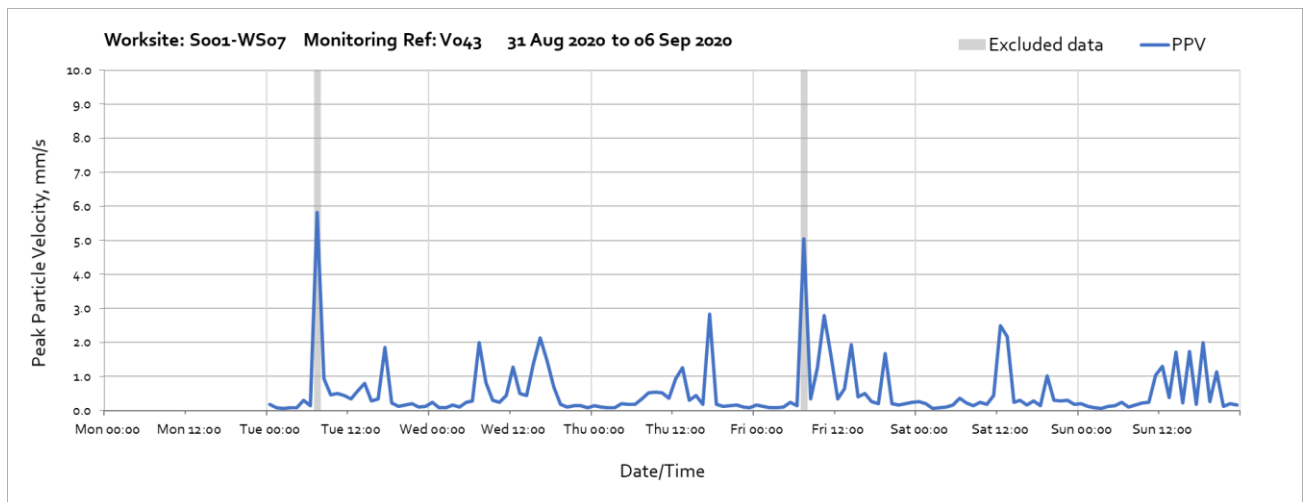


Note: High vibration levels measured throughout the week were due to local disturbance of the vibration monitor and are not representative of HS2 vibration levels.

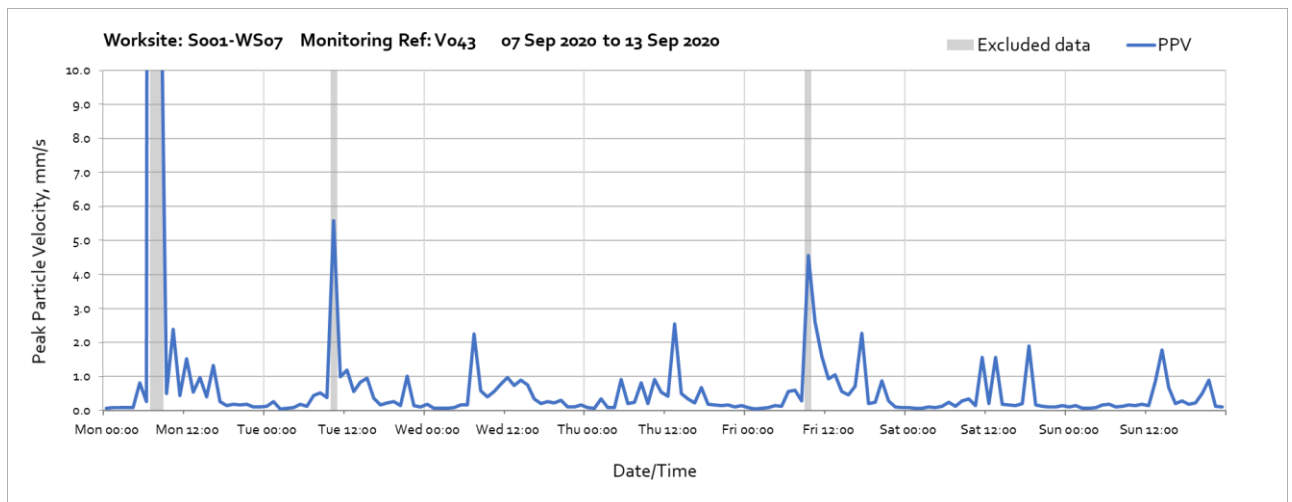


Note: High vibration levels measured between 09:00 and 10:00 on Tuesday 29th of August were due to local disturbance of the monitor and are not representative of HS2 vibration levels.

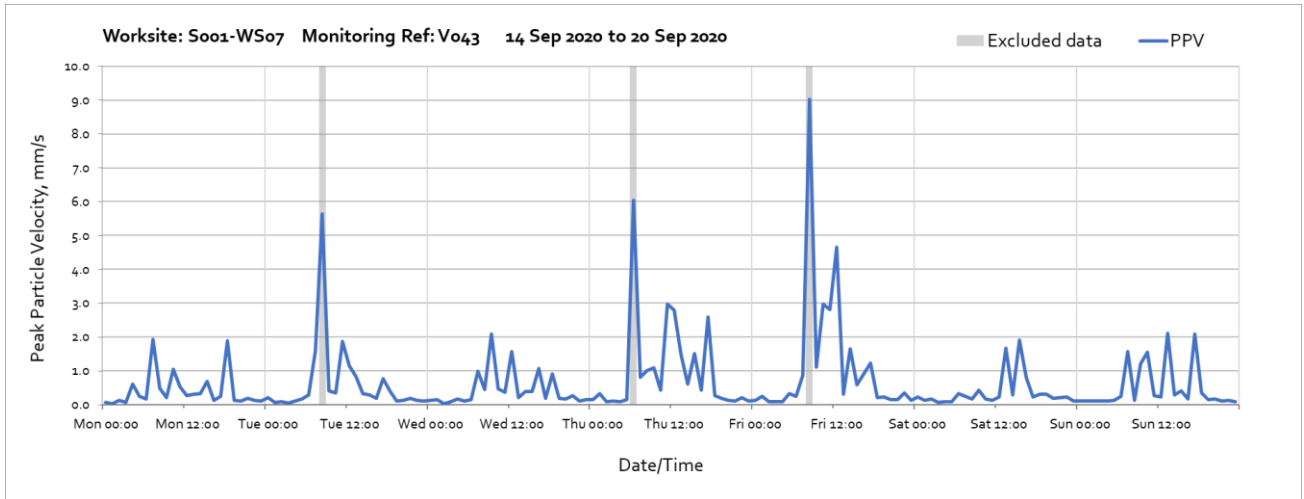
Worksite: S001-WS07 – Monitoring Ref: V043



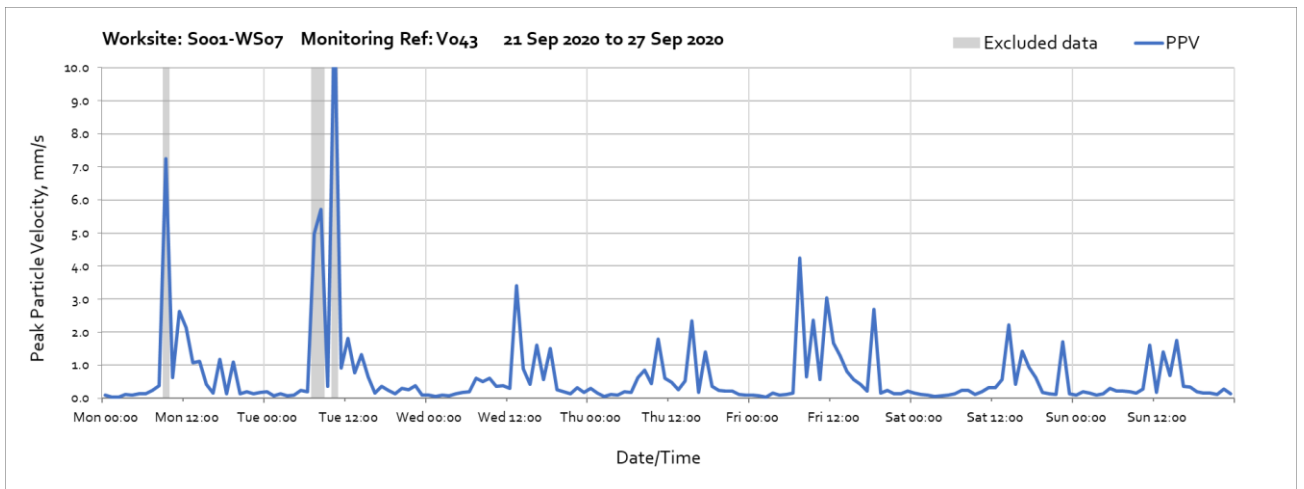
Note: High vibration levels measured between 07:00 and 08:00 on Tuesday 1st of September and Friday 4th of September were due to local disturbance of the monitor and are not representative of HS2 vibration levels.



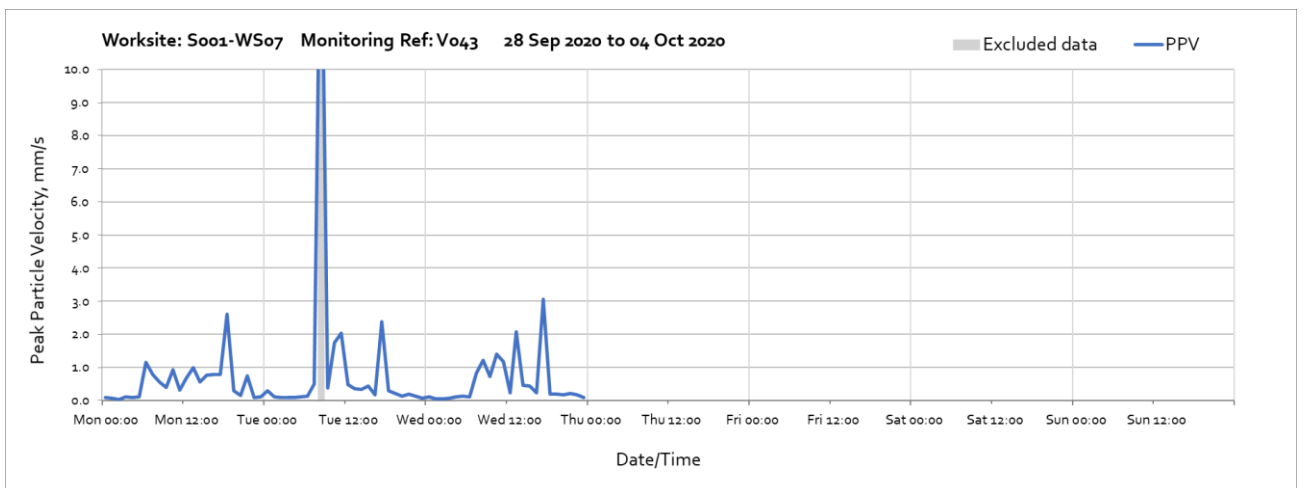
Note: High vibration levels measured between 07:00 and 09:00 on Monday 7th of September were due to local disturbance of the monitor and are not representative of HS2 vibration levels.



Note: High vibration levels measured between 06:00 and 07:00 on Thursday 17th of September and between 08:00 and 09:00 on Friday 18th of September were due to local disturbance of the monitor and are not representative of HS2 vibration levels.

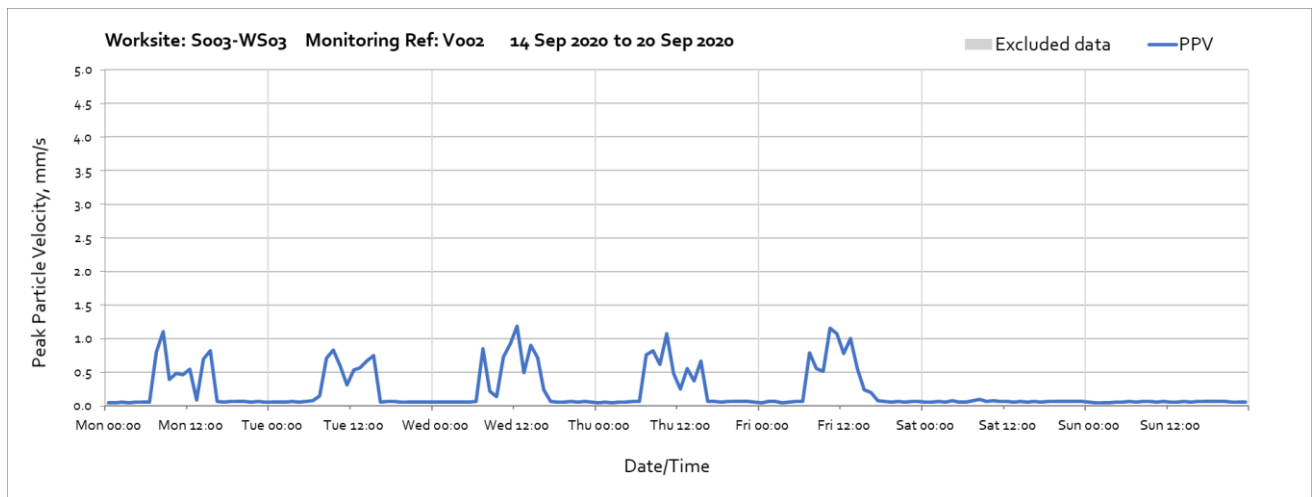
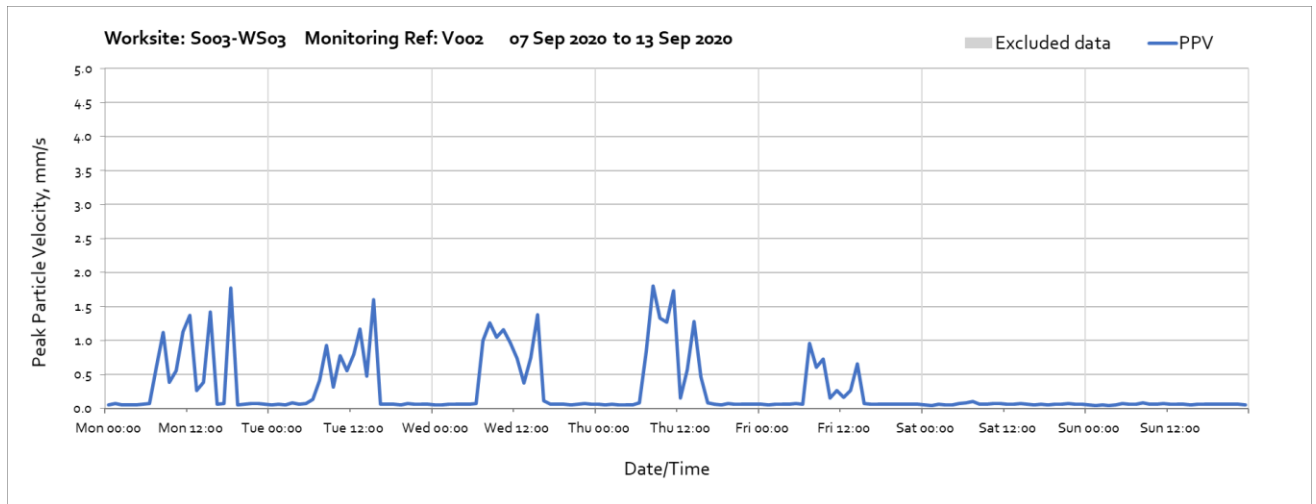
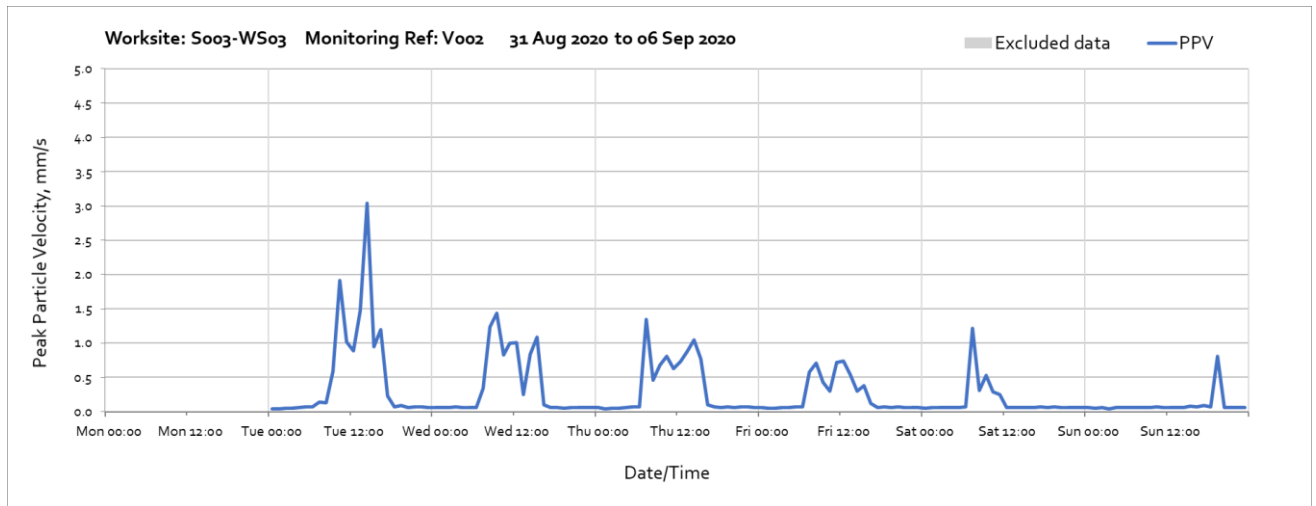


Note: High vibration levels measured between 10:00 and 11:00 on Tuesday 22nd of September were due to local disturbance of the monitor and are not representative of HS2 vibration levels.

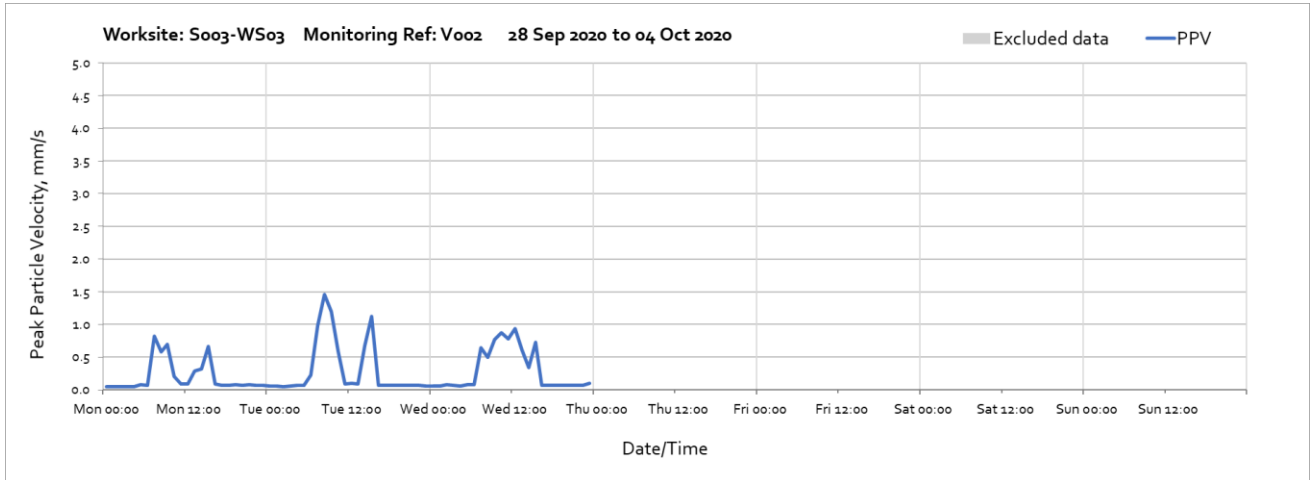
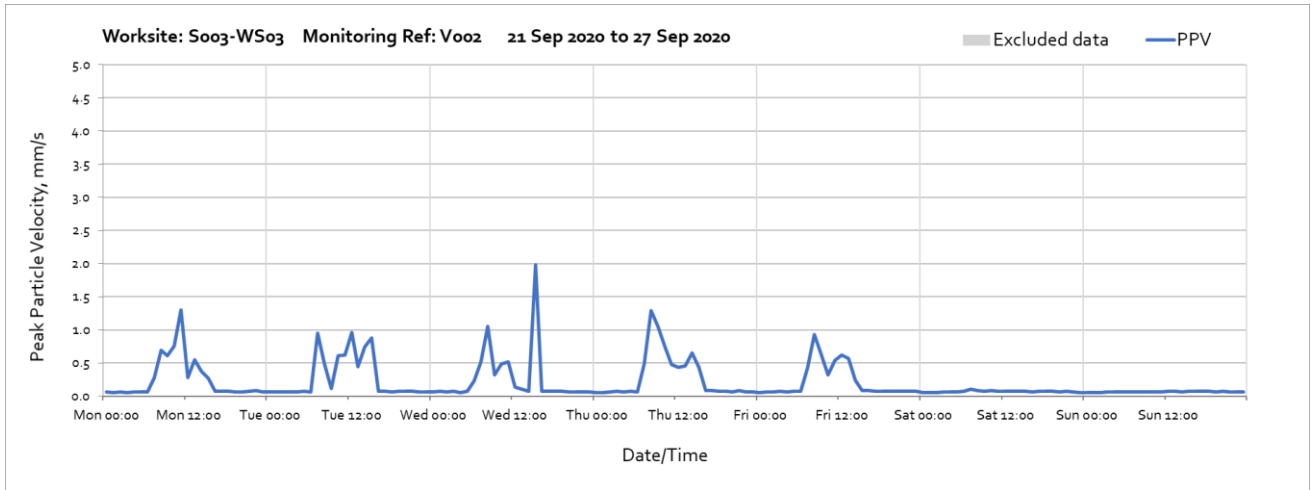


Note: High vibration levels measured between 08:00 and 09:00 on Tuesday 27th of September were due to local disturbance of the monitor and are not representative of HS2 vibration levels.

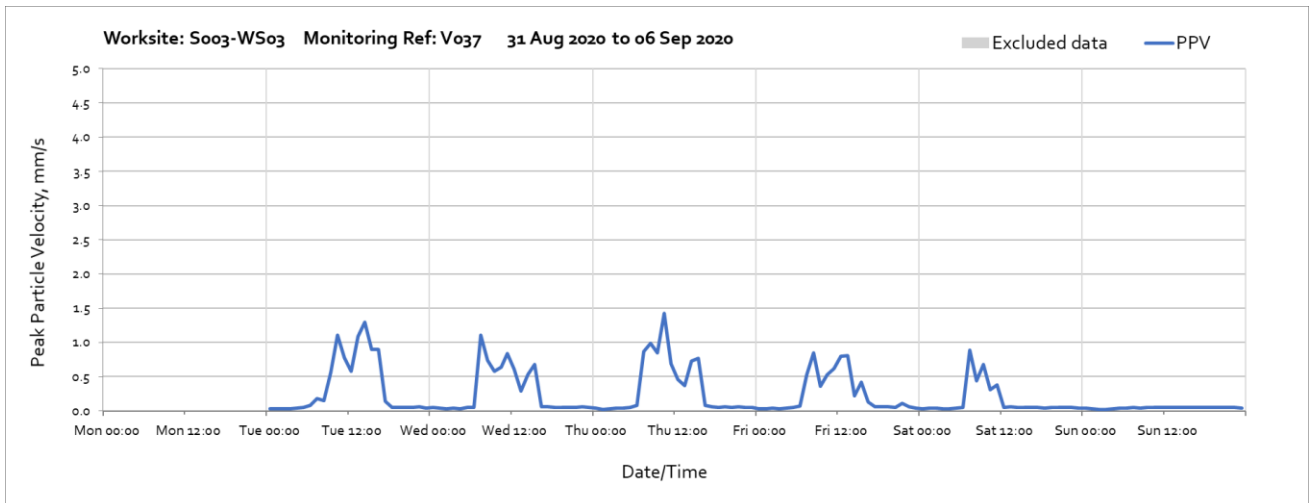
Worksite: S003-WS03 – Monitoring Ref: V002

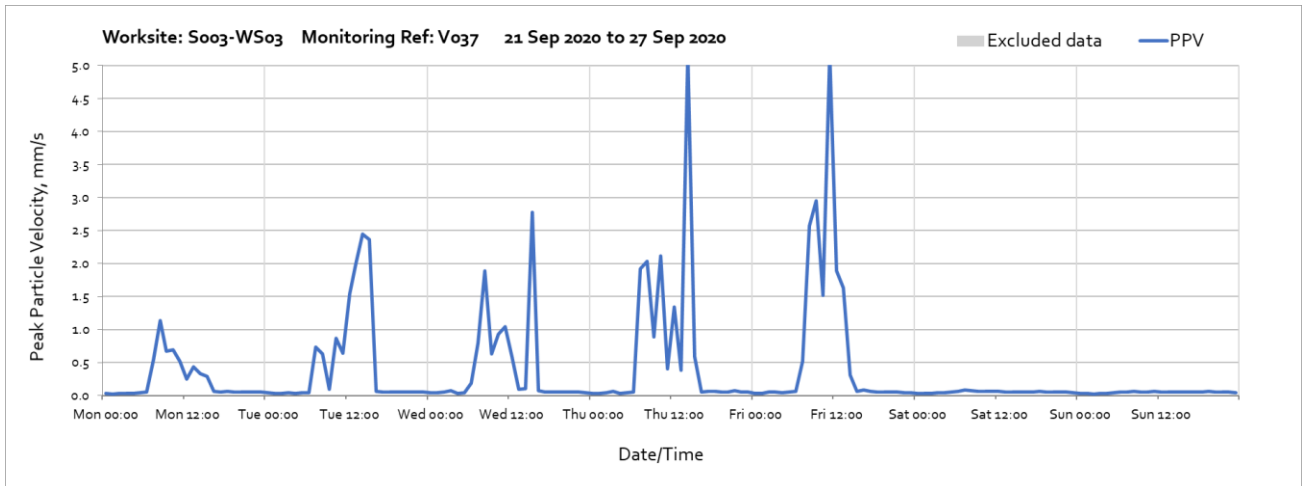
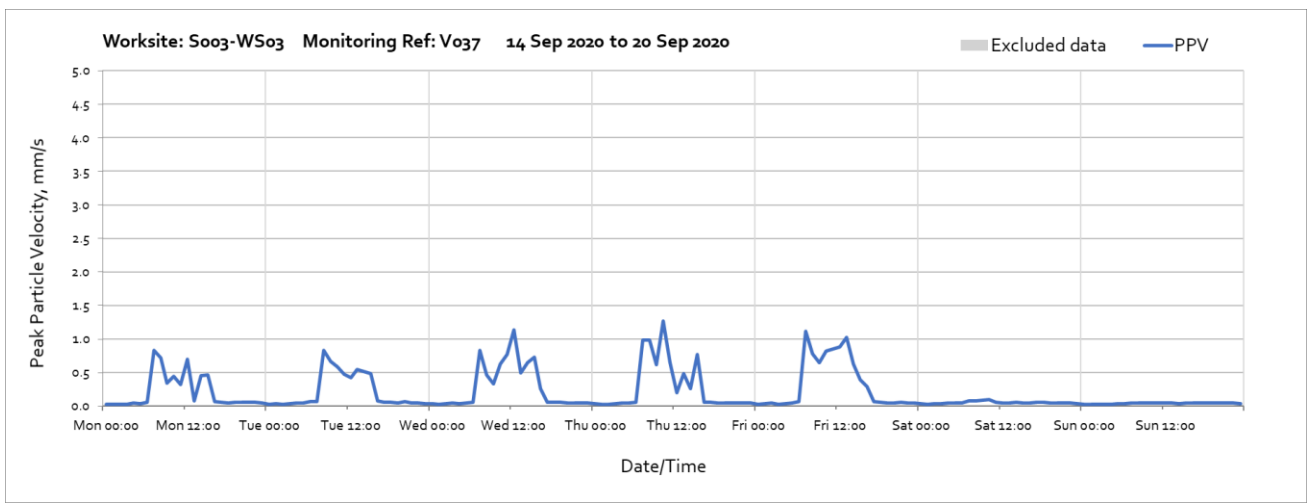
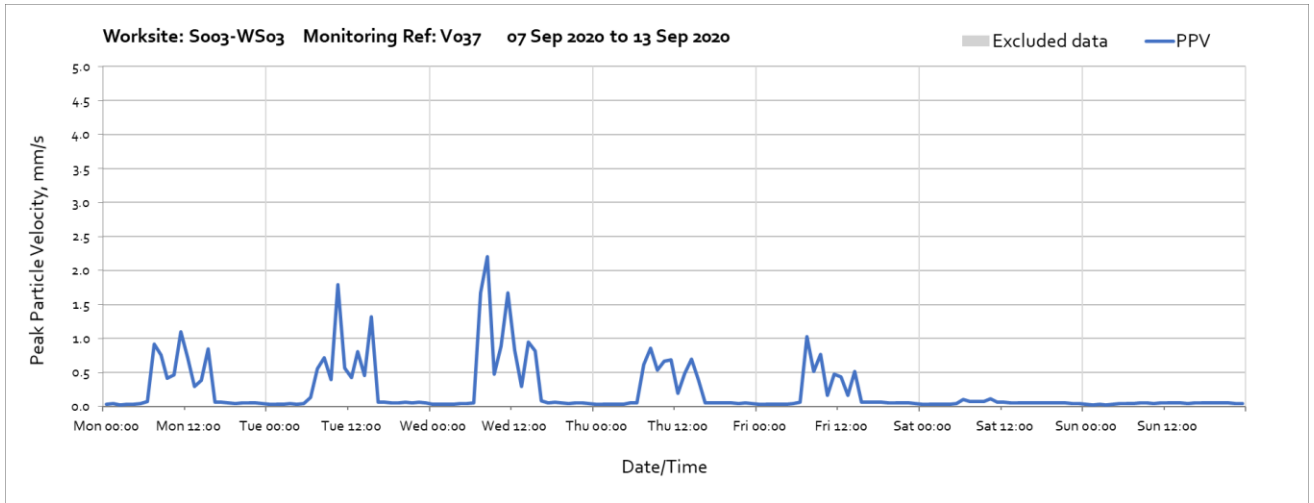


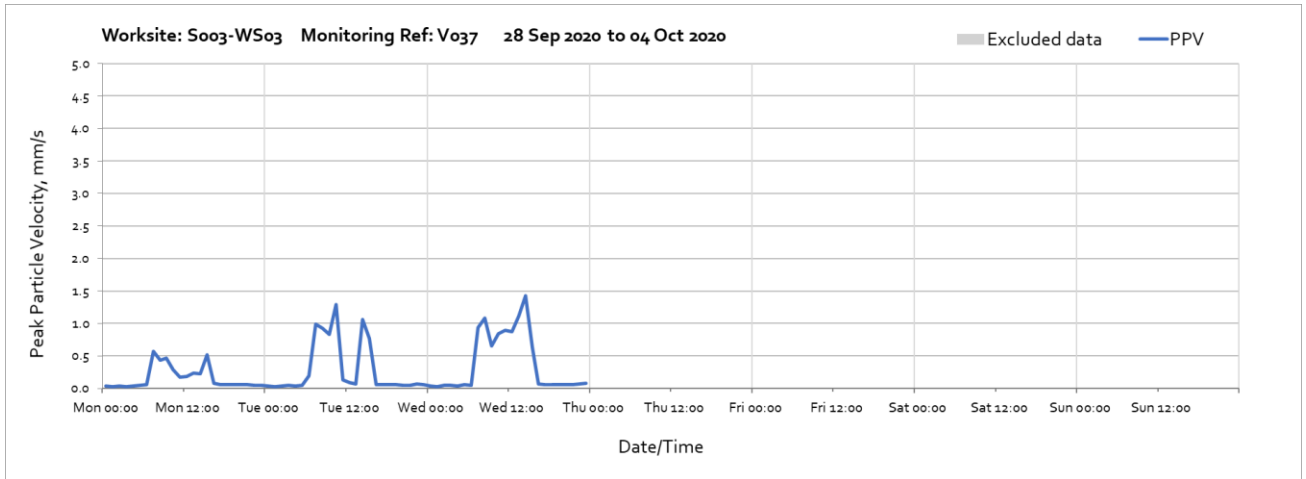
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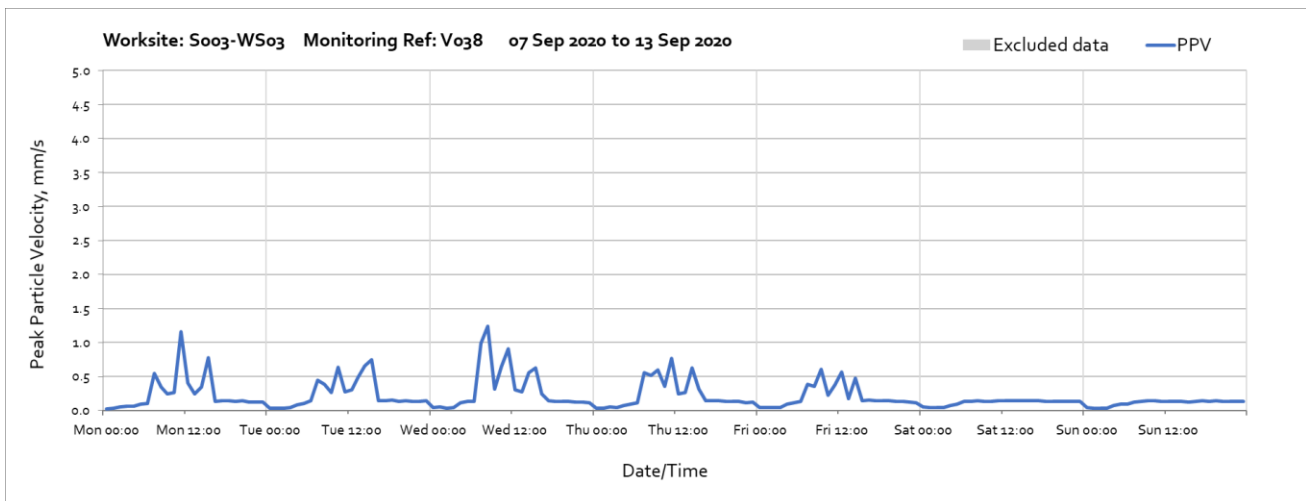
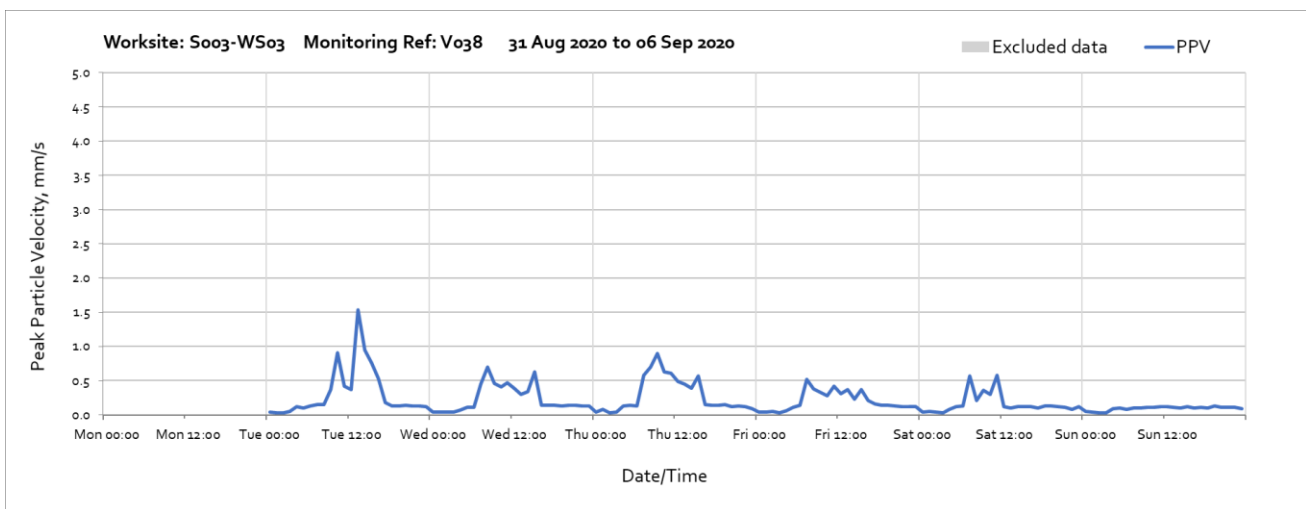
Worksite: S003-WS03 – Monitoring Ref: V037

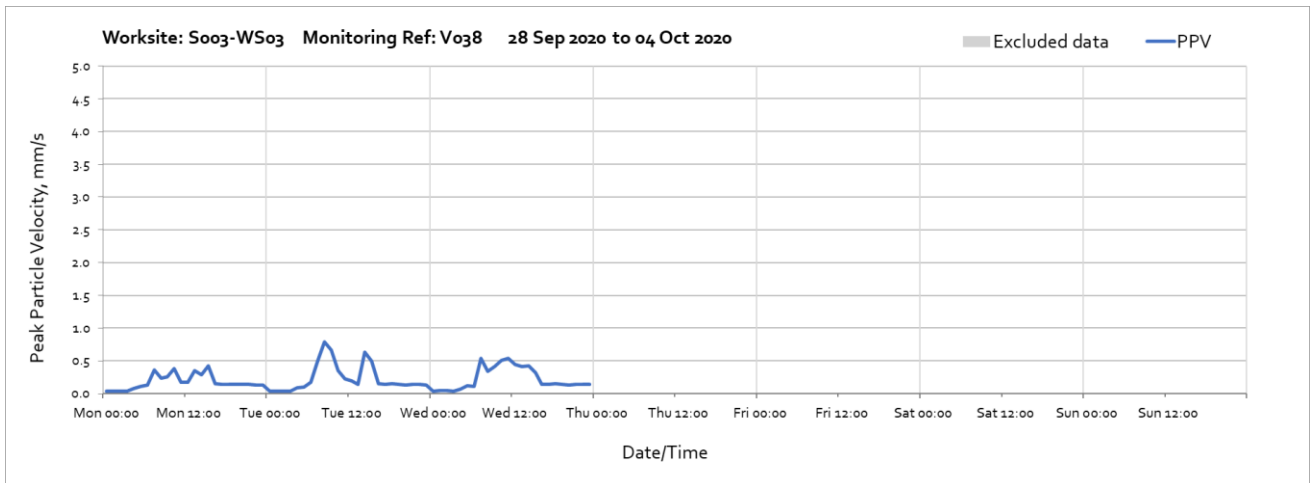
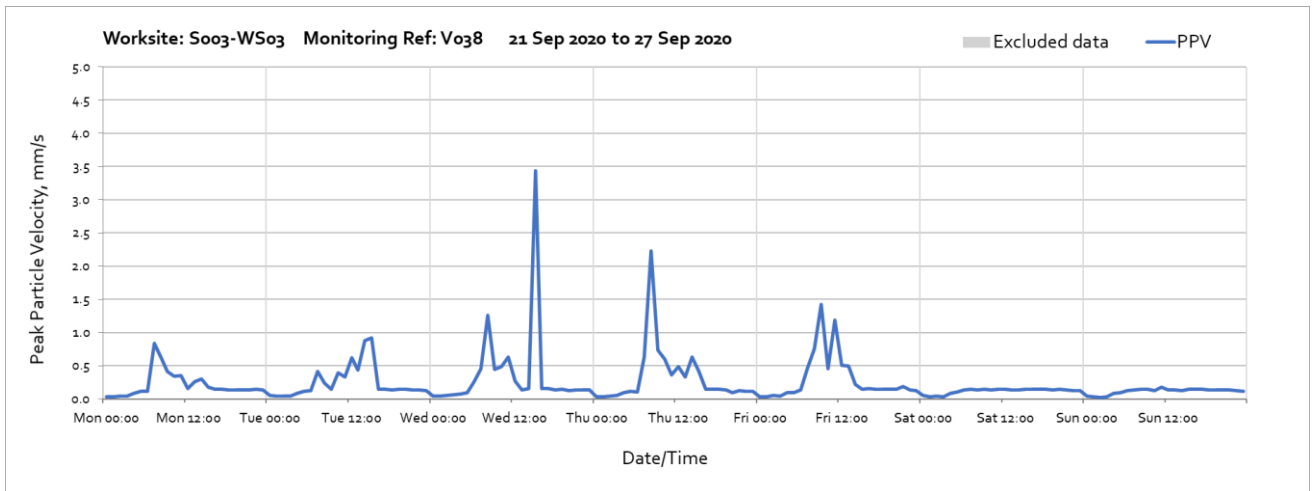
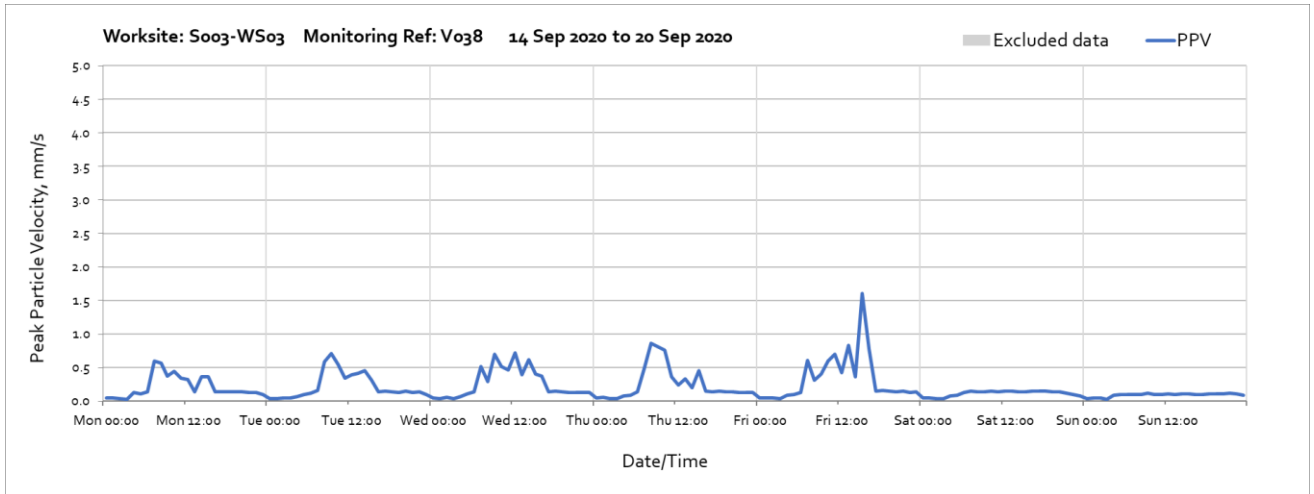




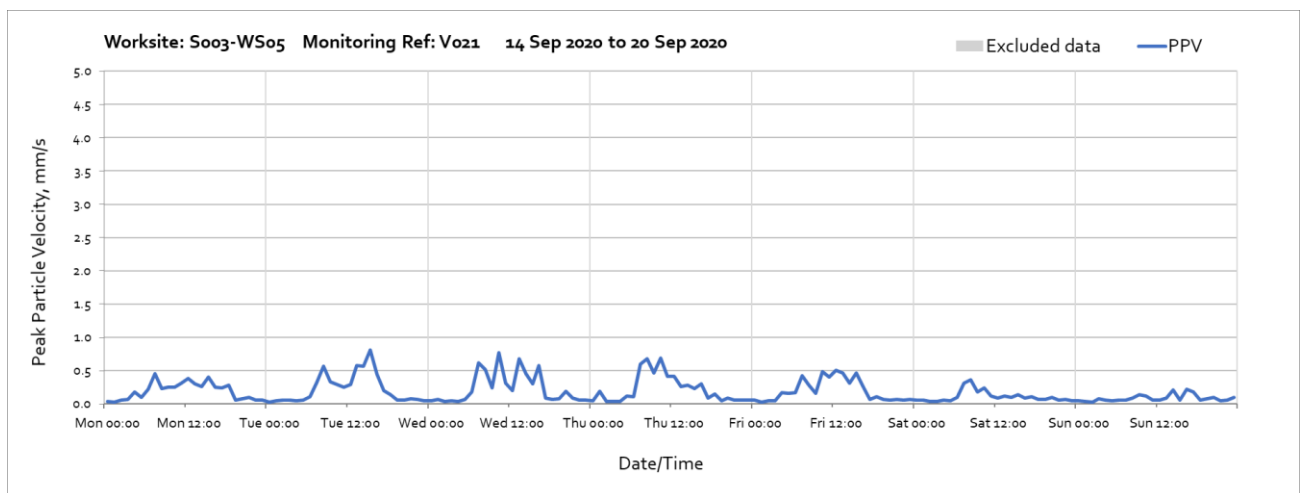
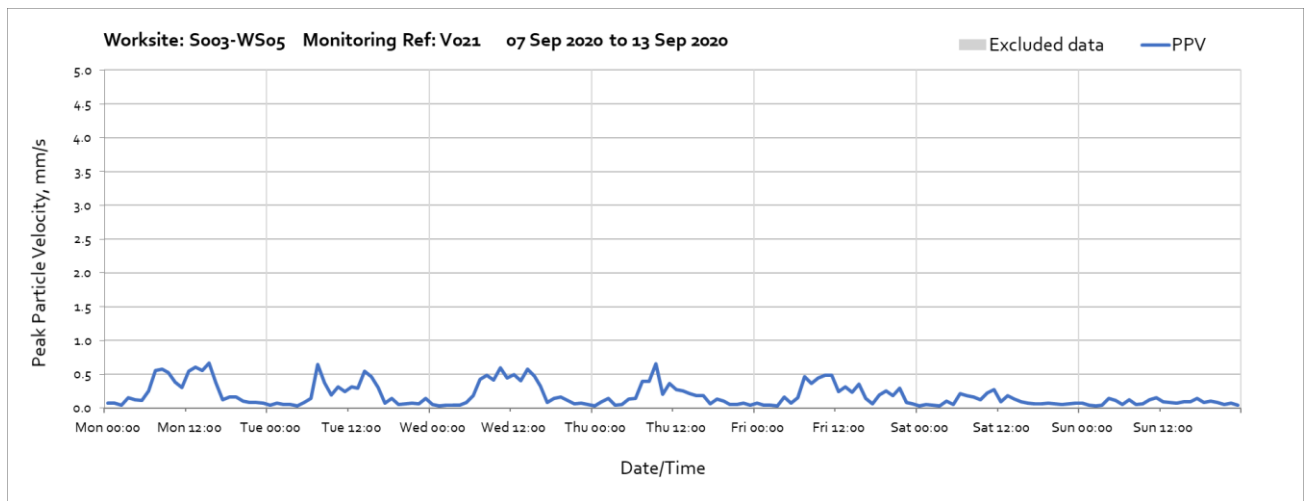
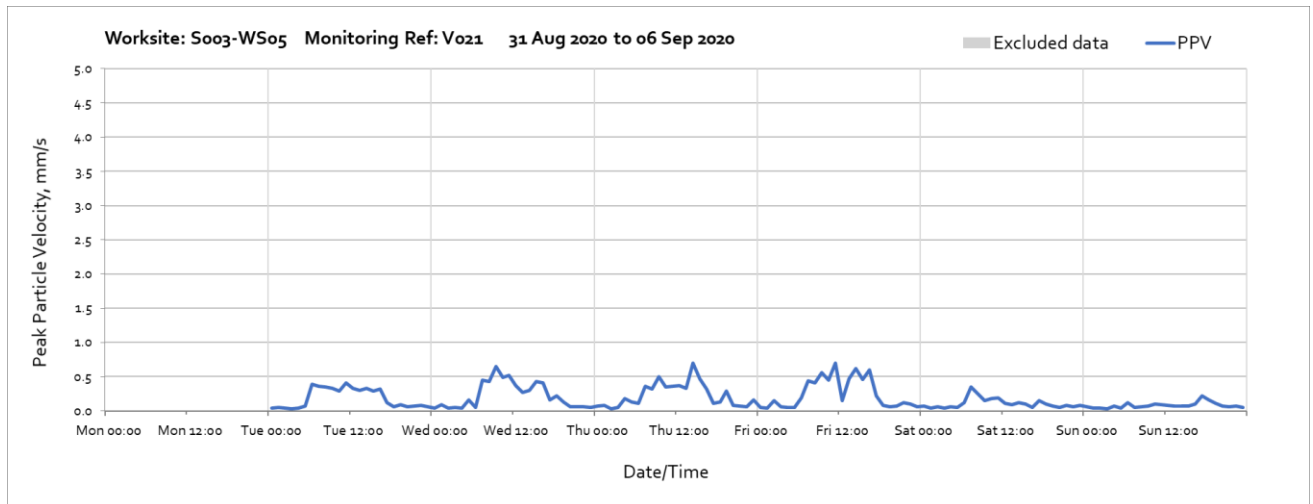


Worksite: S003-WS03 – Monitoring Ref: V038

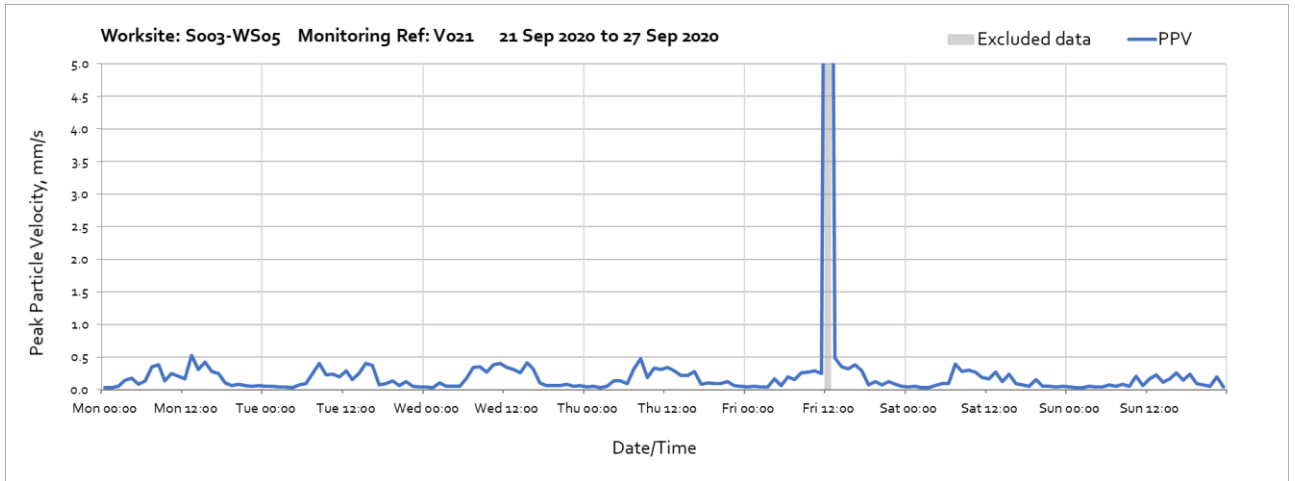




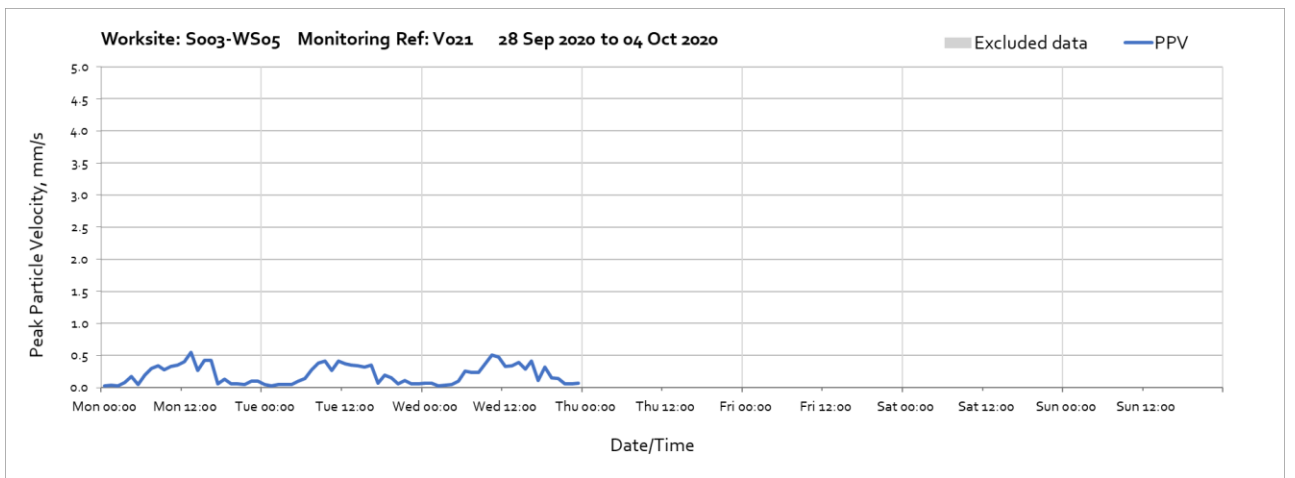
Worksite: S003-WS05 – Monitoring Ref: V021



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Note: High vibration levels measured between 12:00 and 13:00 on Friday 25th September were due to disturbance of the monitor during the charging of monitor batteries.



Worksite: S003-WS09 – Monitoring Ref: V003

