

Construction Noise and Vibration Monthly Report – December 2022

Stratford-on-Avon District Council

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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 Stratford-on-Avon District Council (SADC) during the month of December 2022.

Within this period noise monitoring was undertaken at the following worksites in the SADC area:

- Long Itchington Wood Tunnel North Portal worksite (ref.: LIWNP), where tunnel boring machine operations, preparation of temporary stockpiles and material storage, earthworks, concrete works, operation of slurry treatment plant and operation of water treatment plant were underway.
- Long Itchington Wood Tunnel South Portal worksite (ref.: LIWSP), where excavation, tunnel boring machine operations, road works and new access road construction were underway.
- Ladbroke Cutting (LC) formerly known as Southam (SHM), where pond maintenance, site drainage works, site access road maintenance, haul road maintenance, topsoil stripping and de-vegetation works, overbridge piling works, road diversion works and bulk earthworks were underway.
- Southam Cutting (SC) formerly known as Kineton Road (KR), where pond maintenance, site drainage works, site access road maintenance, haul road maintenance, topsoil stripping, de-vegetation works and preparation of road diversions were underway.

Further works where monitoring was not undertaken occurred at:

- Mill Pond Embankment where pond maintenance, drainage, site access road maintenance, earthworks, de-vegetation works, instrumentation and monitoring works were underway.
- Southam Embankment where pond maintenance, drainage, site access road and haul road maintenance, topsoil stripping, de-vegetation, piling and piling platform works, and stockpiling were underway.
- Ladbroke Grove Embankment where pond maintenance, drainage, site access and haul road maintenance, de-vegetation, piling and piling platform works and earthworks were underway.
- Ladbroke Grove Cutting where pond maintenance, drainage, site access and haul road maintenance and earthworks were underway.

- Lower Radbourne Embankment where pond maintenance, drainage, site access and haul road maintenance, de-vegetation works, topsoil stripping and track diversion were underway.
- Lower Radbourne North Viaduct where pond maintenance, drainage, site access and haul road maintenance were underway.
- Upper Radbourne Embankment where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping and de-vegetation works were underway.
- Lower Radbourne South Viaduct where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation and culvert works were underway.
- Oxford Canal North Embankment and Viaduct where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation and bridge installation were underway.
- Oxford Canal South Embankment where pond maintenance, drainage, site access and haul road maintenance works were underway.
- Boddington Cutting Group where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping and de-vegetation works were underway.

The HS2 threshold levels for significant noise impacts, which are defined in Information Paper E23 (<https://www.gov.uk/government/publications/hs2-information-papers-environment>) were not exceeded due to HS2 works in the Local Authority Area during the reporting period.

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

No complaints were received during the reporting period.

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 +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:

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

1.1.2 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 Stratford-on-Avon District Council (SADC) for the period 1st to 31st December 2022.

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

- Long Itchington Wood Tunnel North Portal (LIWNP) (see Appendix A), where work activities included:
 - Tunnel boring machine operations.
 - Preparation of temporary stockpiles and material storage.
 - Earthworks.
 - Concrete works.
 - Operation of Slurry Treatment Plant.
 - Operation of Water Treatment Plant.
- Long Itchington Wood Tunnel South Portal (LIWSP) (see Appendix A), where work activities included:
 - Road works, including surfacing and tie in works.
 - Installation of vehicle restraint systems.

- Excavation.
- Tunnel boring machine operations.
- New access road construction.
- Ladbroke Cutting (LC) formerly known as Southam (SHM) (see Appendix A), where work activities included:
 - Pond maintenance.
 - Site drainage works.
 - Site access road maintenance.
 - Haul road maintenance.
 - Topsoil stripping and de-vegetation works.
 - Overbridge piling works.
 - Road diversion works.
 - Bulk earthworks.
- Southam Cutting (SC) formerly known as Kineton Road (KR) (see Appendix A), where work activities included:
 - Pond maintenance.
 - Site drainage works.
 - Site access road maintenance.
 - Haul road maintenance.
 - Topsoil stripping and de-vegetation works.
 - Preparation of road diversion works.

1.1.4 Further works where monitoring was not undertaken occurred at:

- Mill Pond Embankment where pond maintenance, drainage, site access road maintenance, topsoil stripping, de-vegetation works, instrumentation and monitoring works were underway.
- Southam Embankment where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation works, overbridge piling and piling platform works and stockpiling works were underway.
- Ladbroke Grove Embankment where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation, overbridge piling and piling platform works and earthworks were underway.

- Ladbroke Grove Cutting where pond maintenance, drainage, site access and haul road maintenance and earthworks, were underway.
- Lower Radbourne Embankment where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation, earthworks and track diversion works were underway.
- Lower Radbourne North Viaduct where pond maintenance, drainage, site access and haul road maintenance were underway.
- Upper Radbourne Embankment where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping and de-vegetation works were underway.
- Lower Radbourne South Viaduct where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation and culvert works were underway.
- Oxford Canal North Embankment and Viaduct where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping, de-vegetation and bridge installation were underway.
- Oxford Canal South Embankment where pond maintenance, drainage, site access and haul road maintenance works were underway.
- Boddington Cutting Group where pond maintenance, drainage, site access and haul road maintenance, topsoil stripping and de-vegetation works were underway.

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 Six (6) noise and one (1) vibration monitoring installations were active in December in the SADC area.

- 1.2.2 Table 2 summarises the position of noise and vibration monitoring installations within the SADC area in December 2022.
- 1.2.3 Maps showing the position of noise monitoring installations are presented in Appendix B.

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
LIWNP	LIWNP-N1	Woodmeadow Farm, Welsh Road, Bascote, Southam
	LIWNP-N2	Welsh Road Lock Cottage, Welsh Road, Bascote, Southam
LIWSP	LIWSP-N1	Dallas Burston Polo Club, Southam Road, Stoneythorpe, Southam
	LIWSP-N2	Lower Farm, Southam Road, Stoneythorpe, Southam
	LIWSP-V1	Woodside House, Bascote Heath, Southam
LC	HF-N1	Harp Farm, Banbury Road, Southam
SC	KR-N1	Kineton Road, Southam

2 Summary of Results

2.1 Summary of Measured Noise 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	Weekday 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
LIWNP	LIWNP-N1	Welsh Road, Bascote	Free-field	45.7 (50.8)	48.2 (53.3)	44.5 (53.8)	43.4 (52.0)	40.1 (51.8)	43.9 (45.0)	46.9 (49.0)	47.7 (52.8)	43.6 (48.7)	39.9 (51.4)	43.6 (56.2)	42.0 (50.1)
	LIWNP-N2	Welsh Road Lock Cottage, Welsh Road, Bascote, Southam	Free-field	51.0 (56.3)	53.0 (55.5)	52.2 (55.9)	48.6 (52.7)	46.1 (54.3)	49.8 (51.9)	52.3 (55.3)	53.6 (56.1)	50.5 (54.9)	45.7 (50.7)	50.0 (55.9)	46.1 (54.0)
LIWSP	LIWSP-N1	Dallas Burston Polo Club, Southam Road, Stoneythorpe	Free-field	49.9 (54.9)	51.3 (55.4)	49.4 (53.4)	47.2 (52.6)	43.4 (51.3)	48.0 (49.5)	51.7 (53.7)	51.6 (54.5)	49.3 (52.7)	48.3 (66.4)	46.9 (55.4)	41.4 (51.7)
	LIWSP-N2	Lower Farm, Southam Road, Stoneythorpe	Free-field	46.9 (50.9)	48.0 (51.2)	46.0 (50.4)	44.1 (48.8)	41.2 (52.1)	44.8 (45.2)	46.7 (48.5)	47.2 (49.2)	45.8 (49.1)	43.8 (58.5)	45.8 (50.2)	40.3 (46.1)
LC	HF-N1	Harp Farm, Banbury Road, Southam	Free-field	51.6 (57.4)	55.4 (66.3)	52.1 (60.9)	49.7 (63.4)	46.6 (64.1)	49.7 (55.7)	53.7 (55.2)	53.9 (54.6)	51.0 (54.6)	44.6 (50.1)	49.5 (57.2)	45.6 (56.5)
SC	KR-N1	Kinton Road, Southam	Free-field	49.8 (54.6)	51.2 (57.1)	49.3 (52.8)	47.0 (53.3)	44.0 (55.4)	48.1 (55.6)	50.6 (51.4)	50.4 (51.6)	49.1 (51.9)	43.6 (48.2)	48.0 (56.2)	43.3 (51.0)

2.1.2 Table 4 presents a summary of the measured vibration levels at the 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
LIWSP - Long Itchington Wood South Portal	LIWSP-V1	Woodside House, Bascote Heath, Southam	0.72 (Z-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 LOAEL and SOAEL

2.2.1 The lowest observed adverse effect level (LOAEL) is defined in the Planning Practice Guidance – Noise (PPG) as the level above which "noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life".

2.2.2 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."

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

2.2.4 Where construction noise levels exceed the LOAEL and SOAEL, relevant periods will be identified. Summary statistics to evaluate ongoing qualification for noise insulation and temporary rehousing are also presented where relevant.

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

Table 5: Summary of Exceedances of LOAEL and SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
LIWNP	LIWNP-N1	Welsh Road, Bascote	All days	All periods	No exceedance	No exceedance
	LIWNP-N2	Welsh Road Lock Cottage, Welsh Road, Bascote, Southam	All days	All periods	No exceedance	No exceedance
LIWSP	LIWSP-N1	Dallas Burston Polo Club, Southam Road, Stoneythorpe	All days	All periods	Not applicable*	Not applicable*
	LIWSP-N2	Lower Farm, Southam Road, Stoneythorpe	All days	All periods	No exceedance	No exceedance
LC	HF-N1	Harp Farm, Banbury Road, Southam	Weekday	08:00-18:00	3	No exceedance
SC	KR-N1	Kineton Road, Southam	All days	All periods	No exceedance	No exceedance

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

2.2.6 Three (3) exceedance of the LOAEL was recorded during weekday core working hours at the monitoring locations ref.: HF-N1. No exceedances of SOAEL were recorded due to HS2 construction works during December 2022.

2.3 Exceedances of Trigger Level

2.3.1 Table 6 provides a summary of exceedances of the Section 61 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
-	-	-	-	-	-

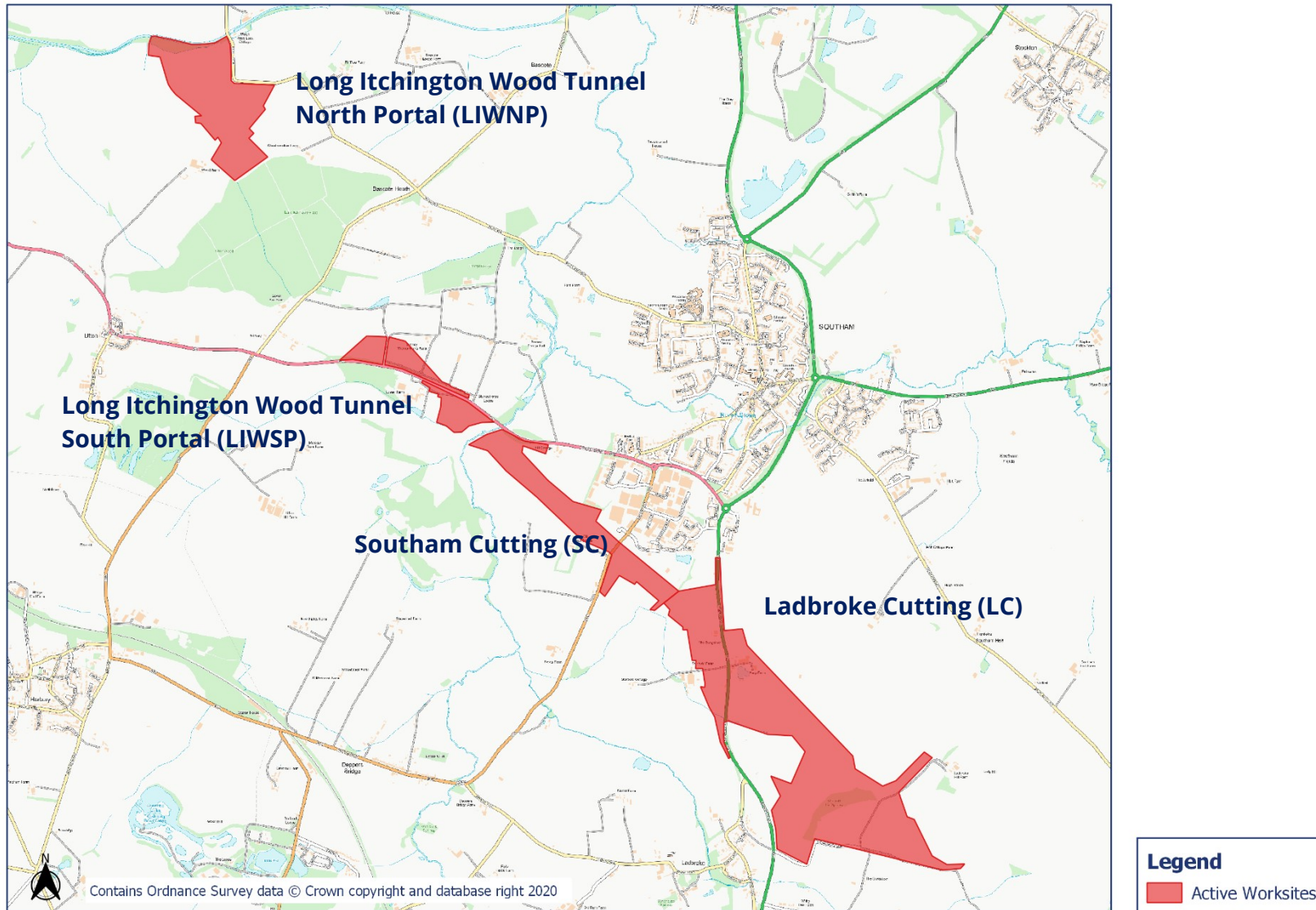
2.4 Complaints

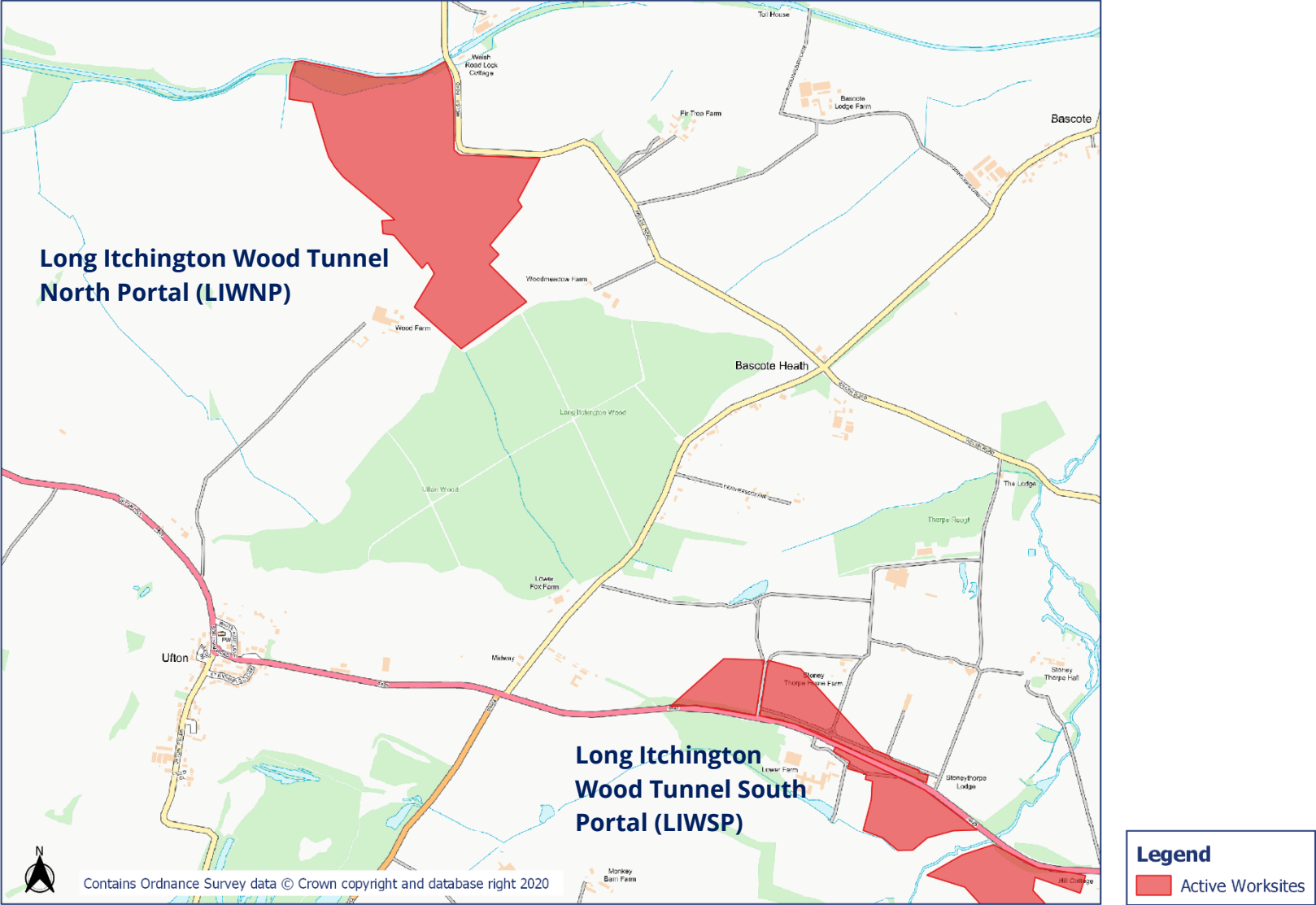
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

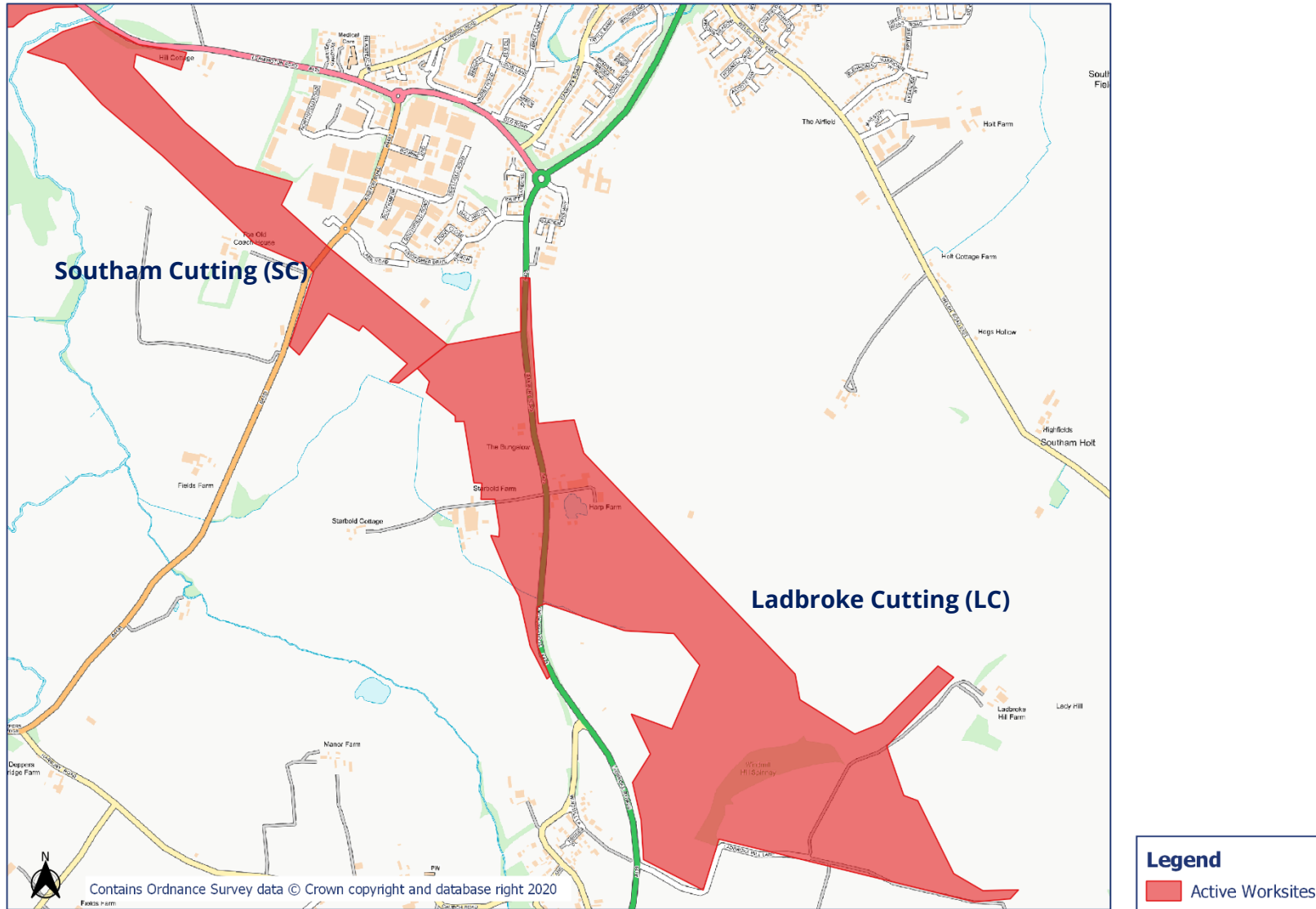
Table 7: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
-	-	-	-	-

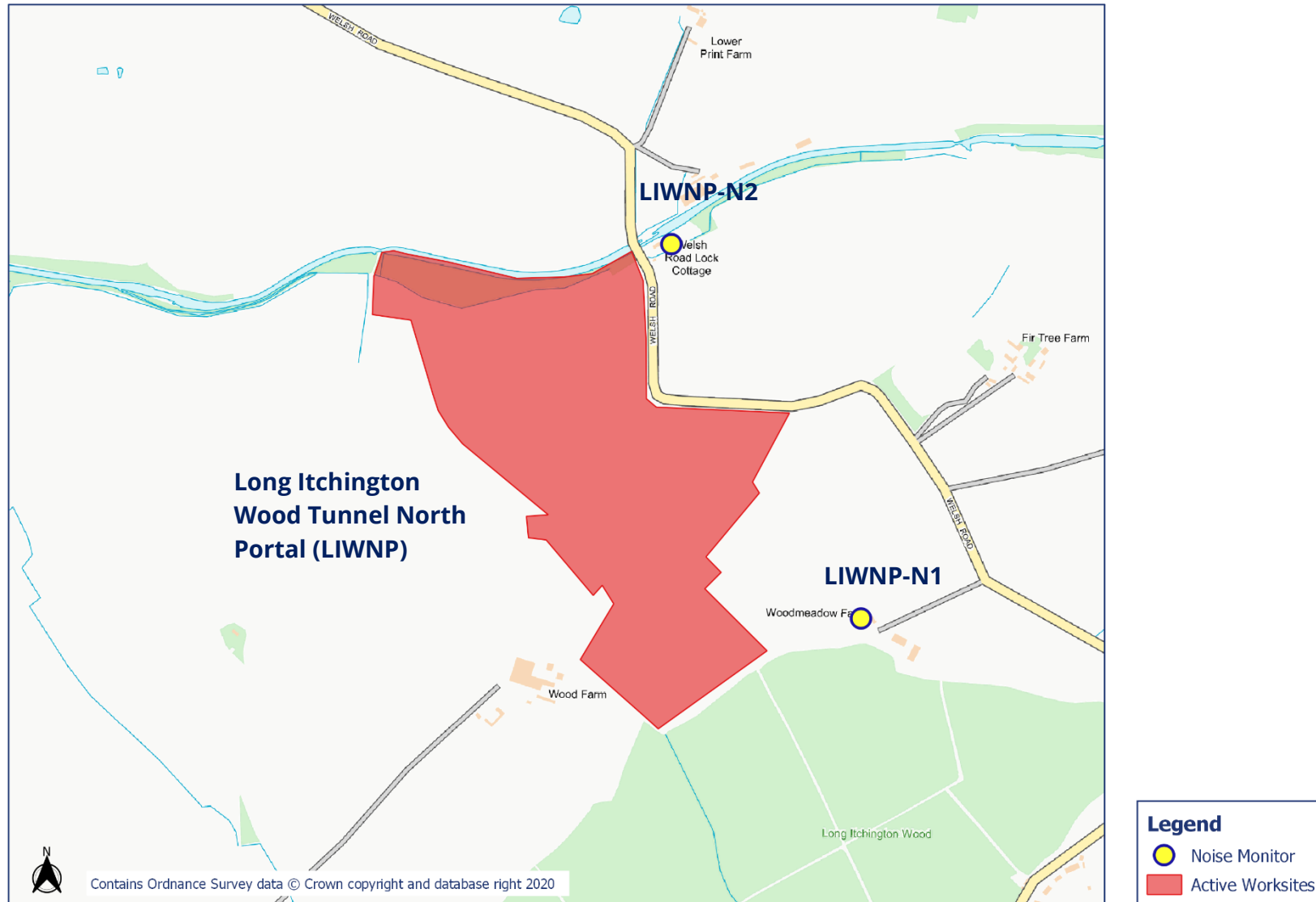
Appendix A Site Locations

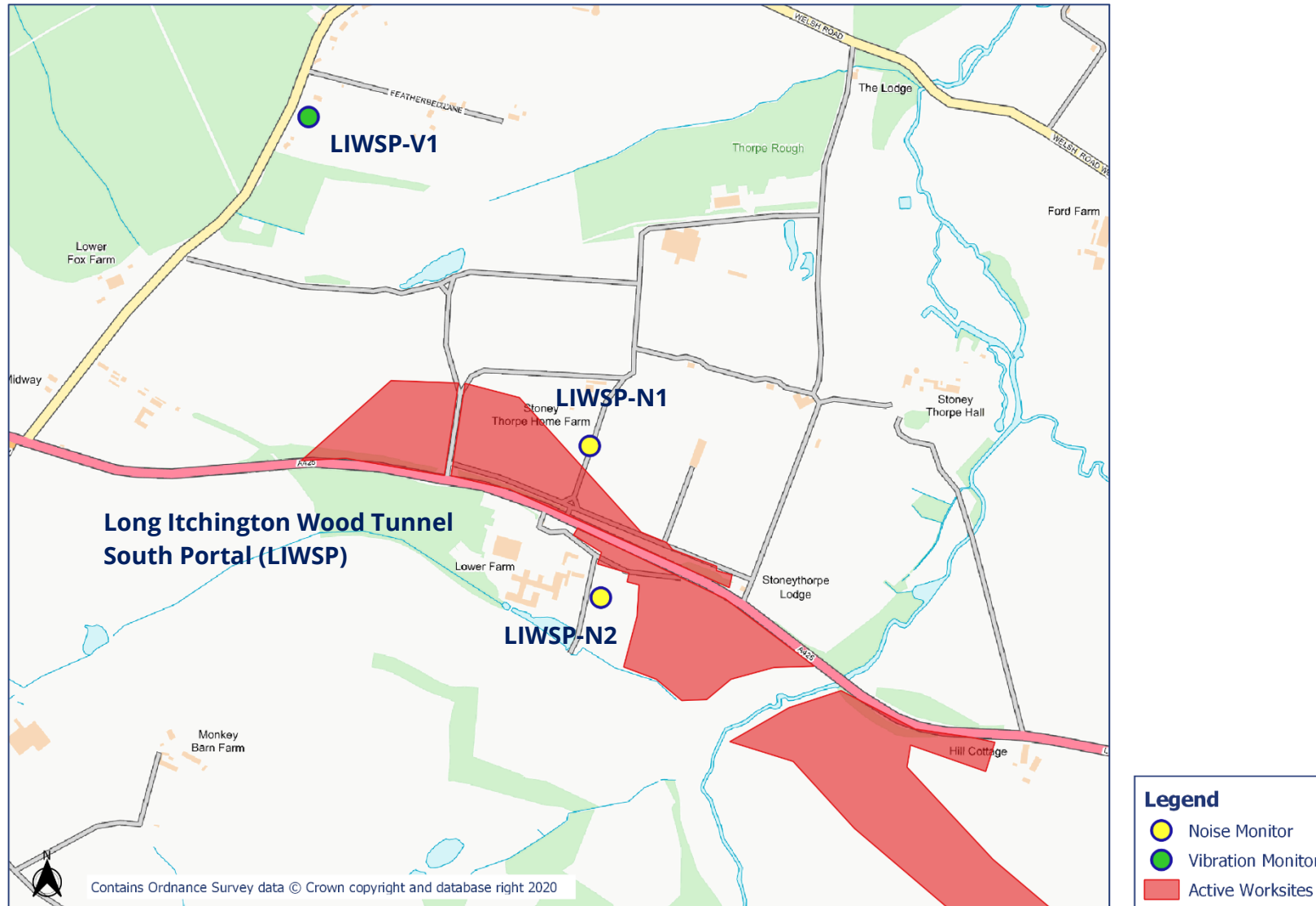


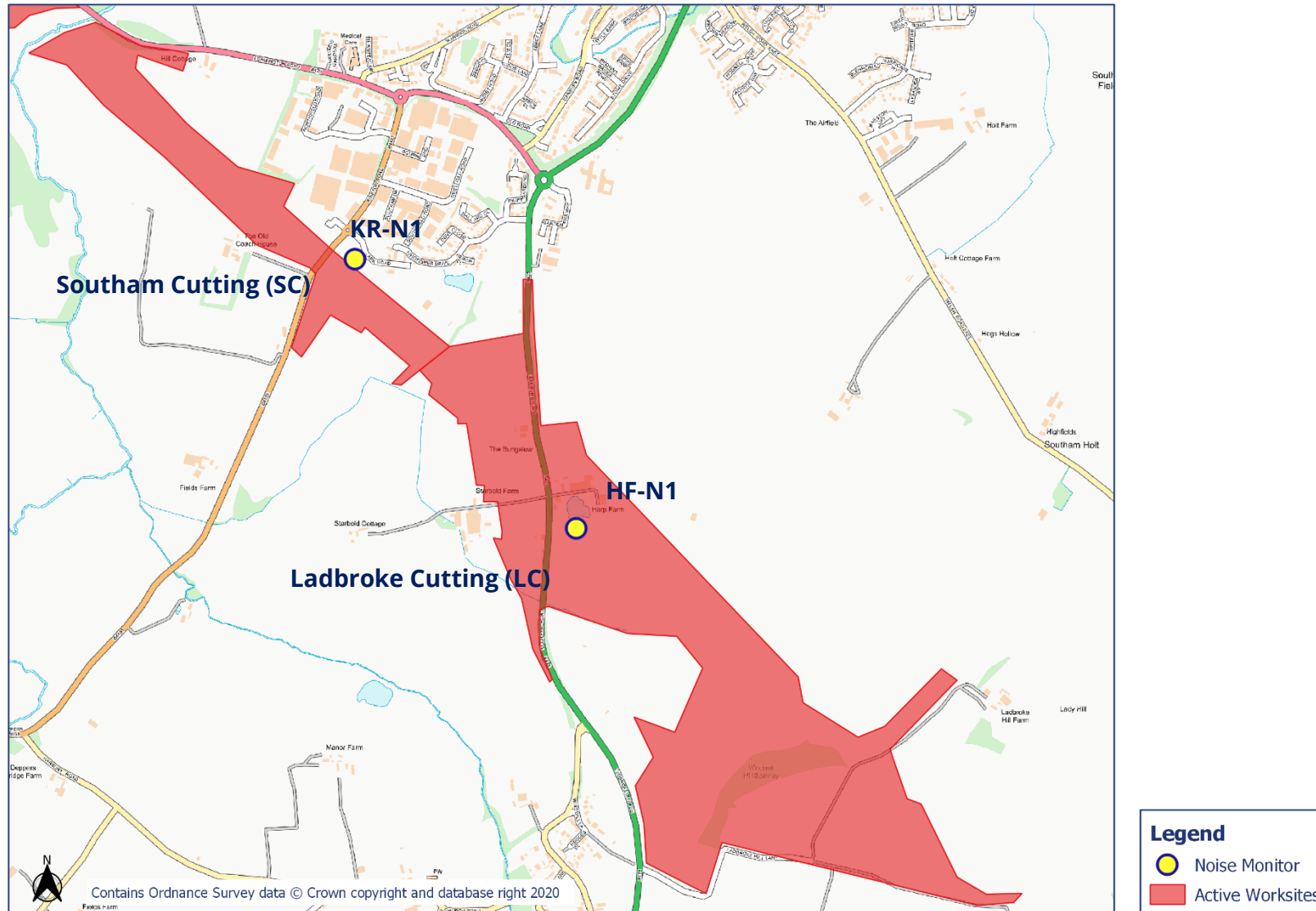




Appendix B Monitoring Locations



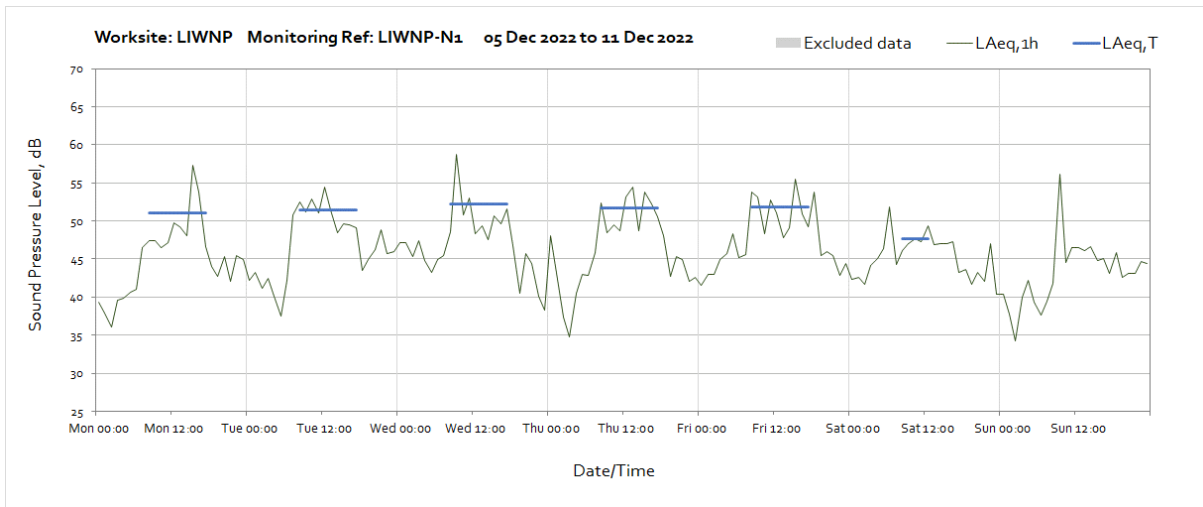


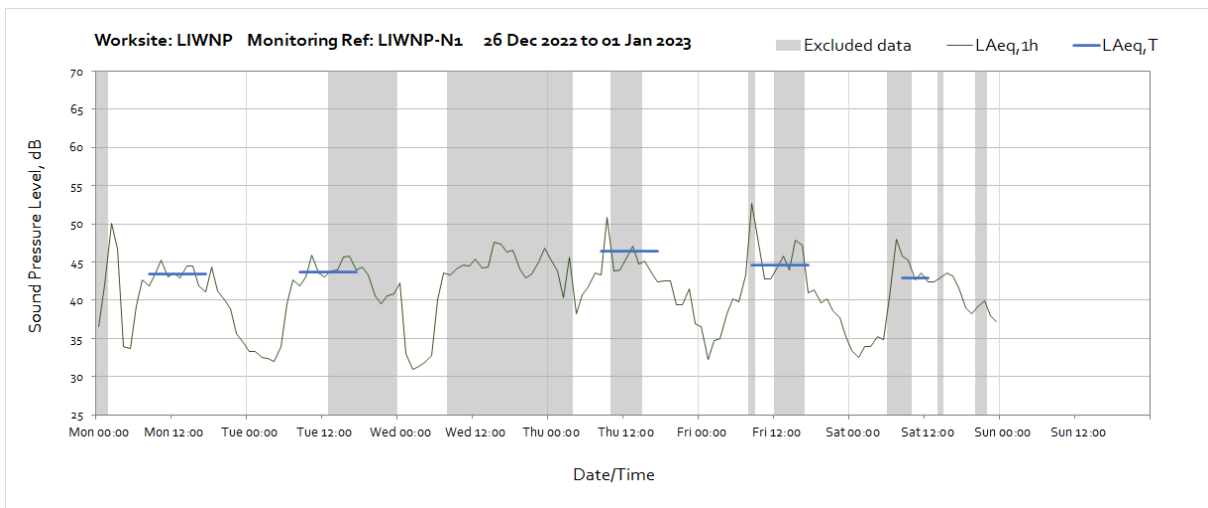
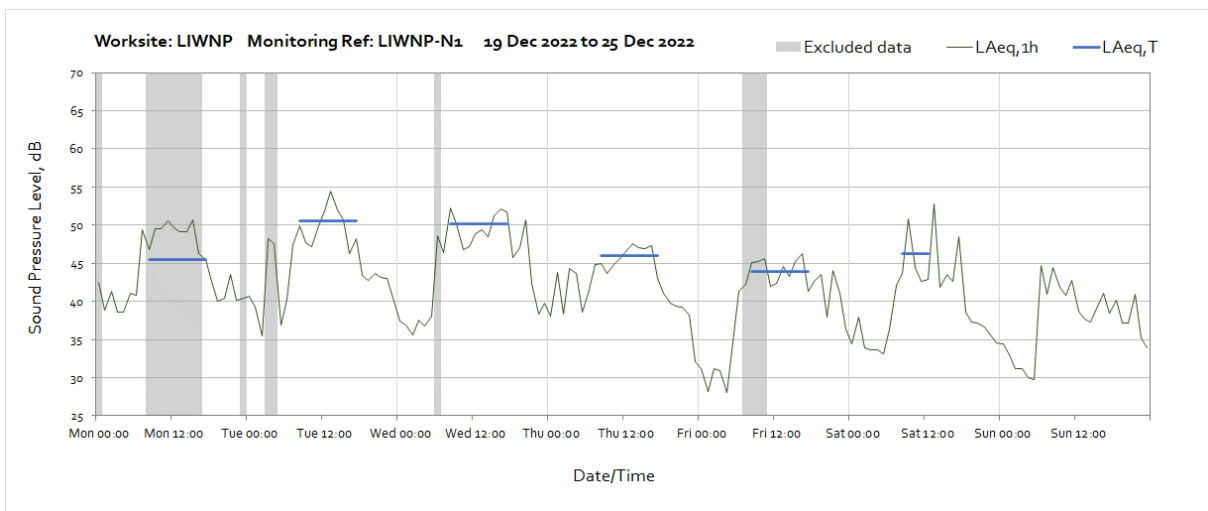
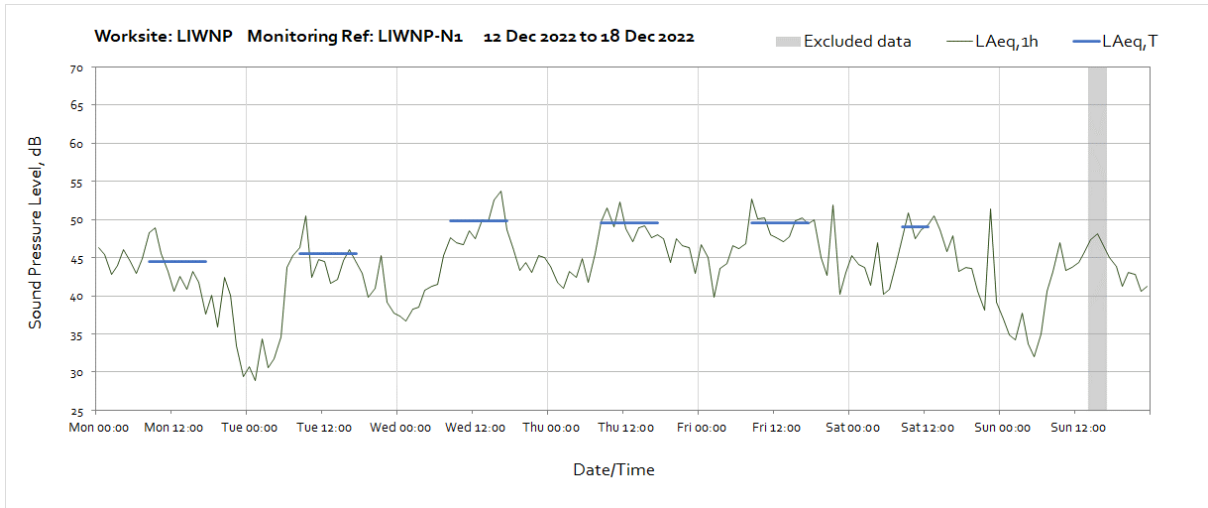


Appendix C Data

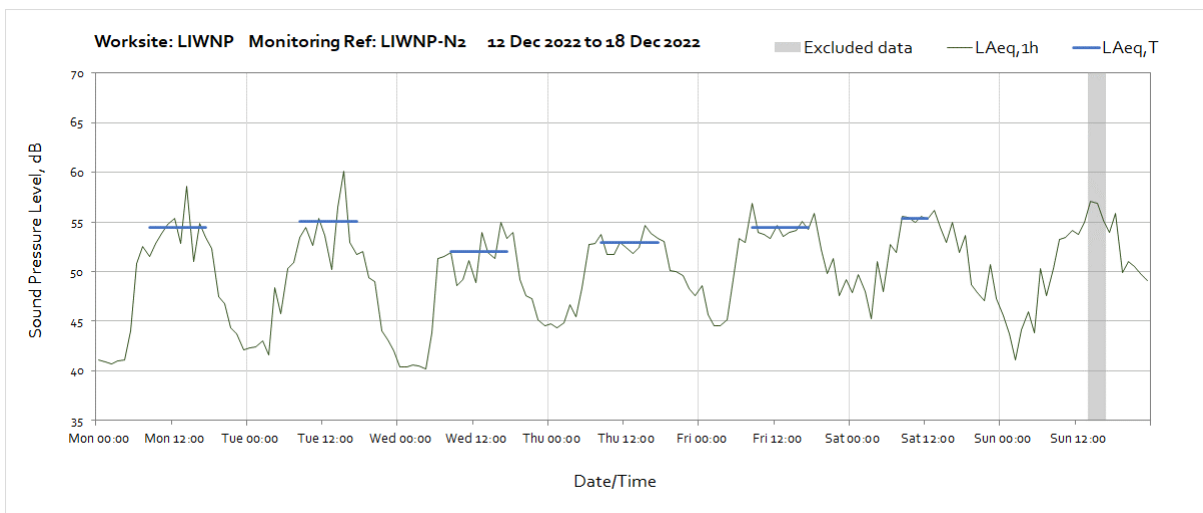
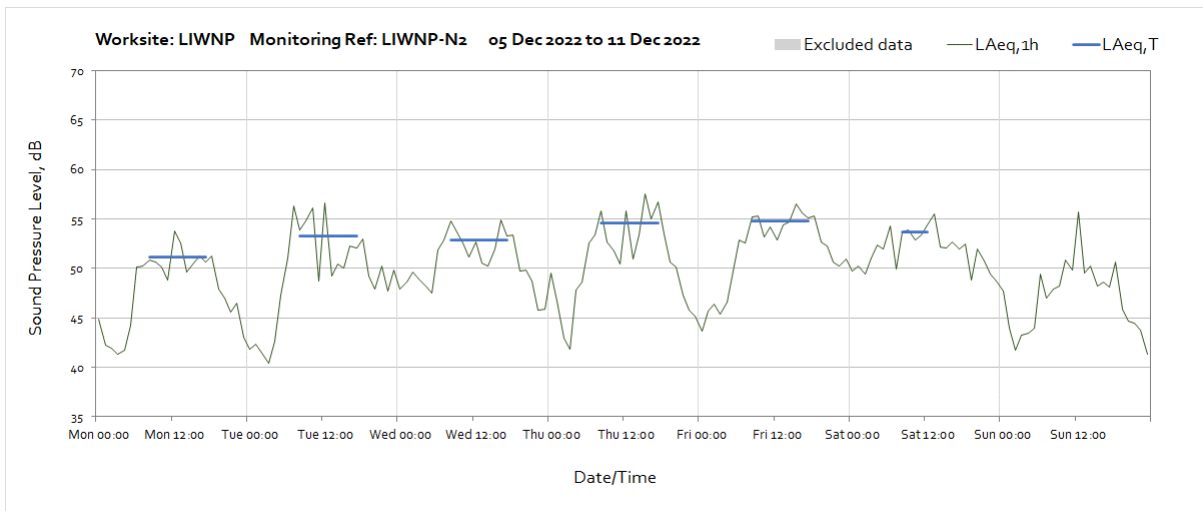
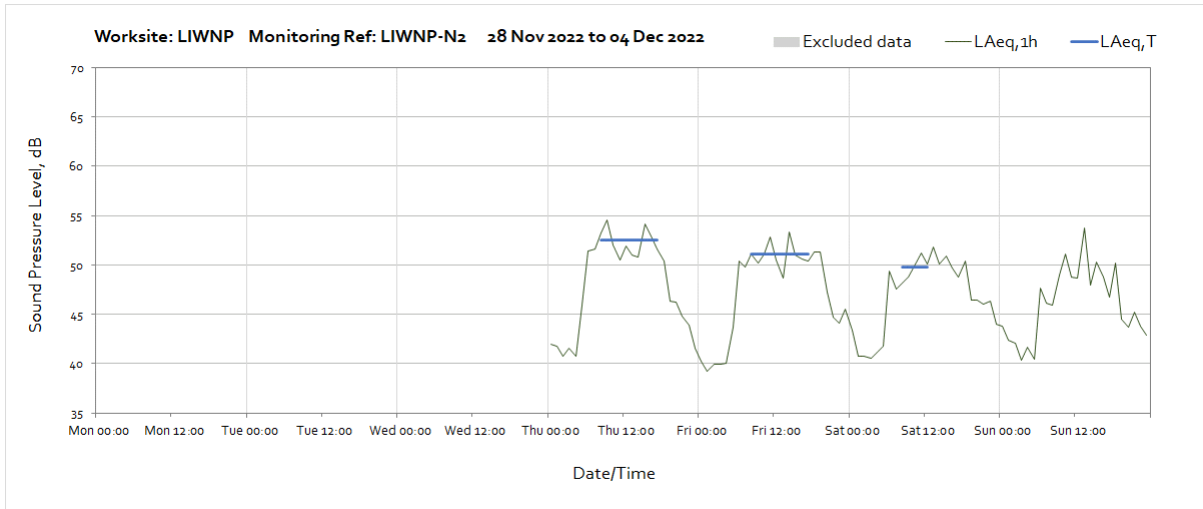
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been excluded from the calculation of the $L_{Aeq,T}$ values in Table 3 of the main report.

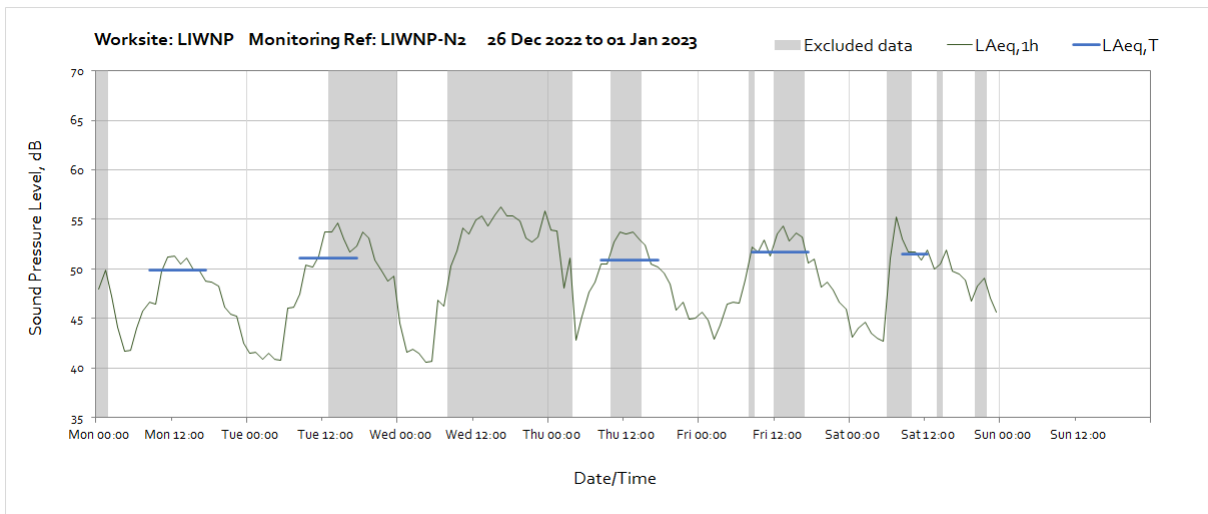
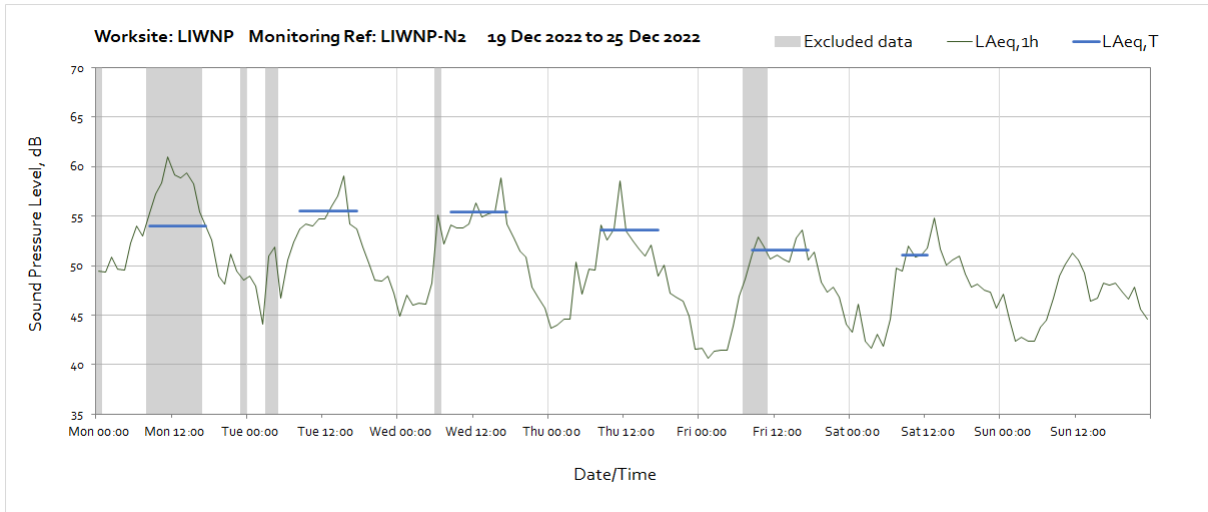
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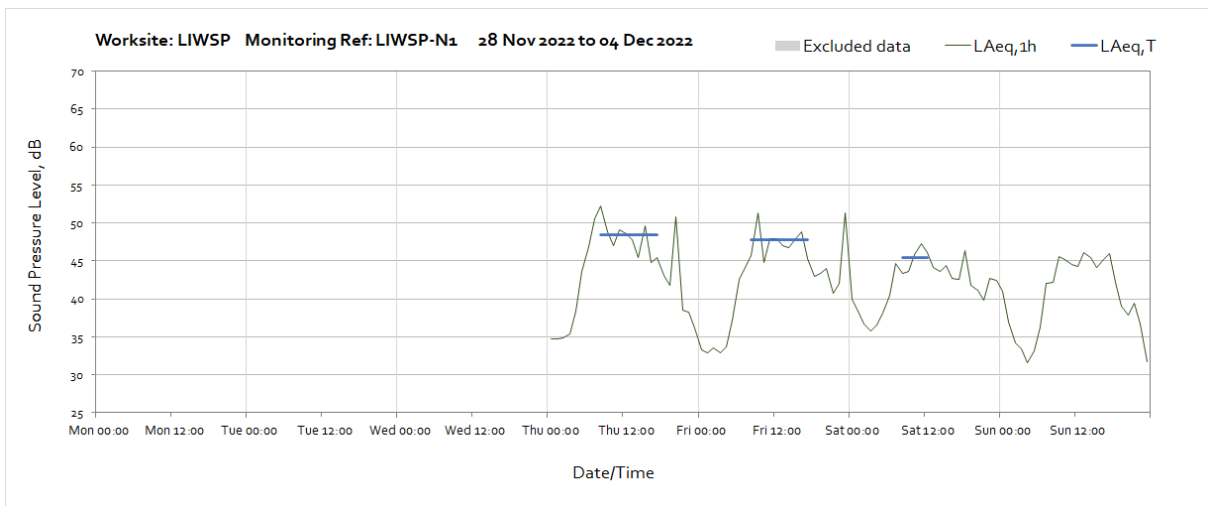


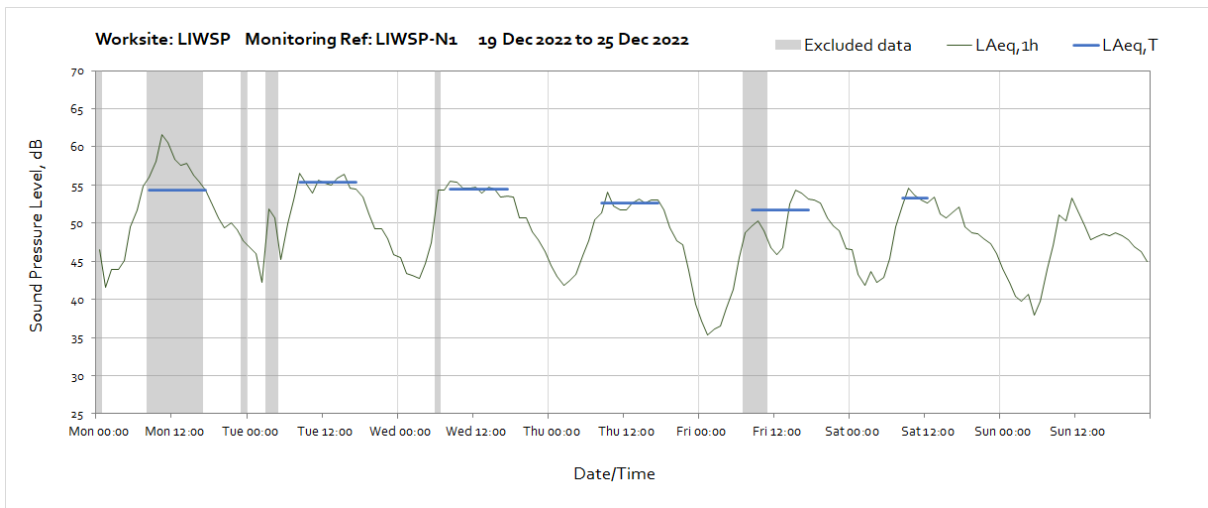
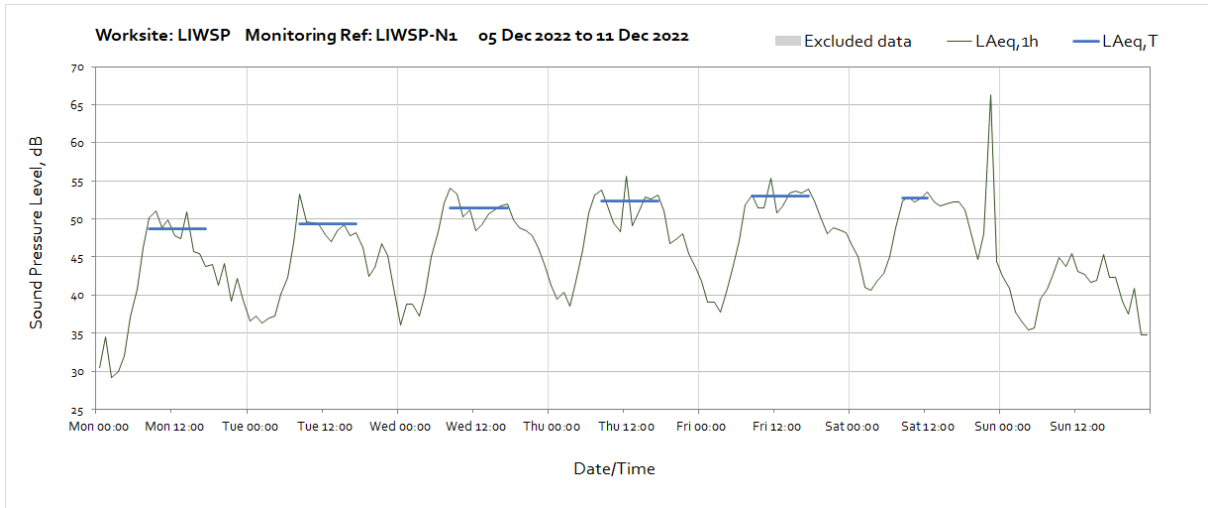
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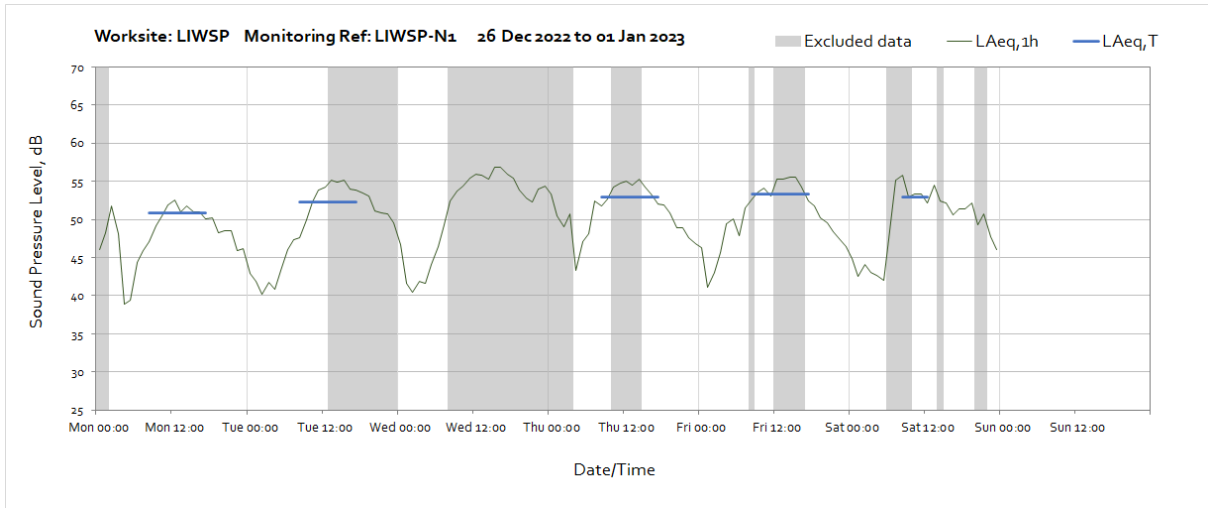




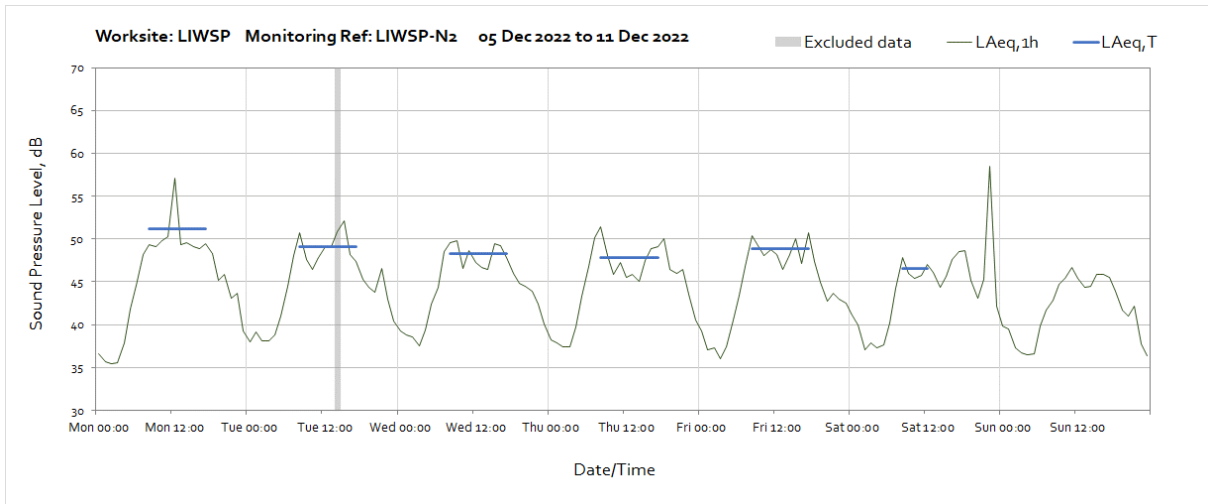
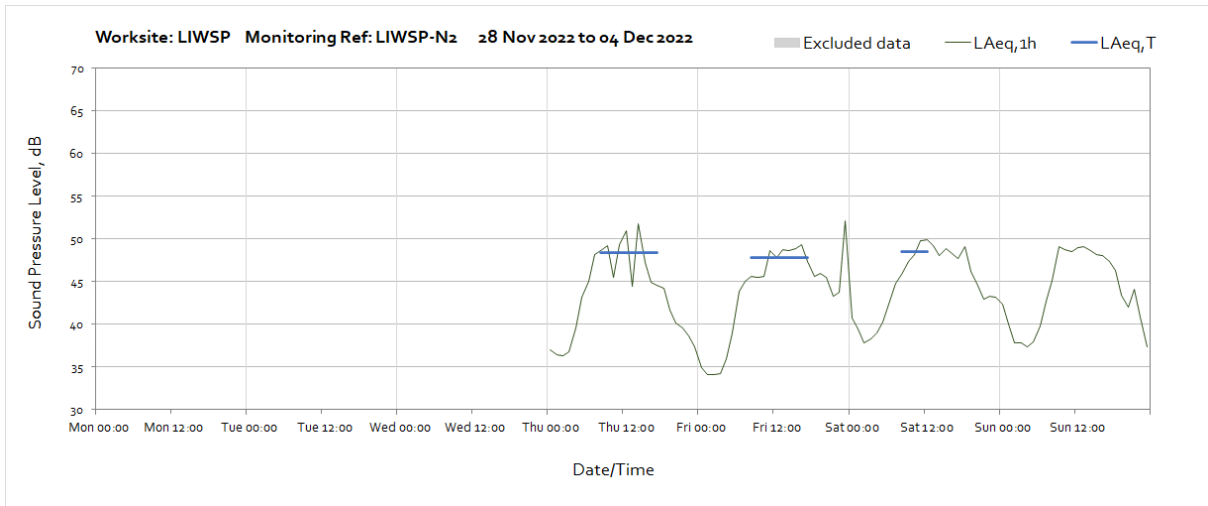
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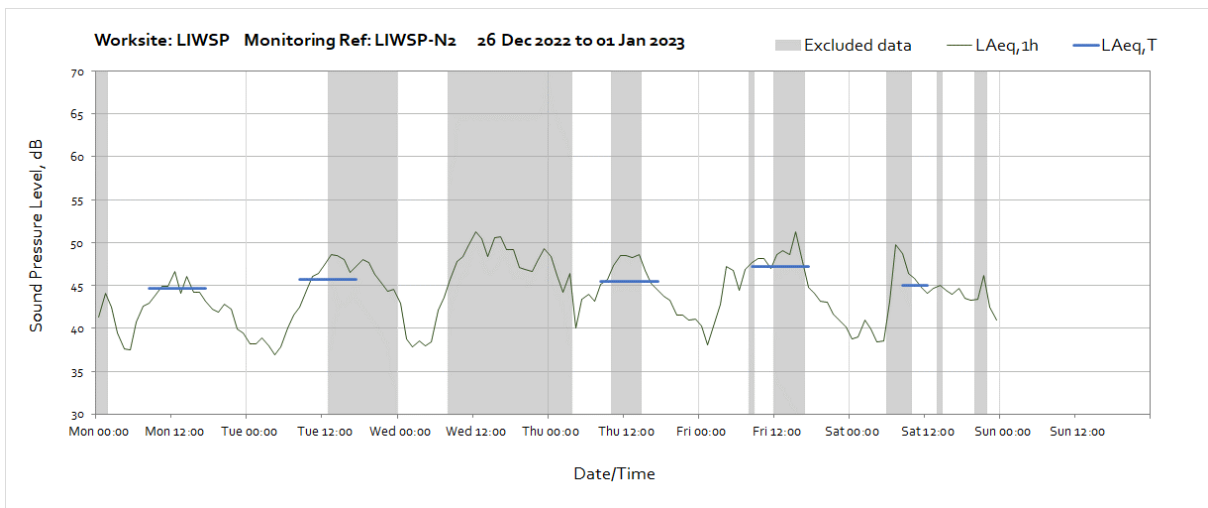
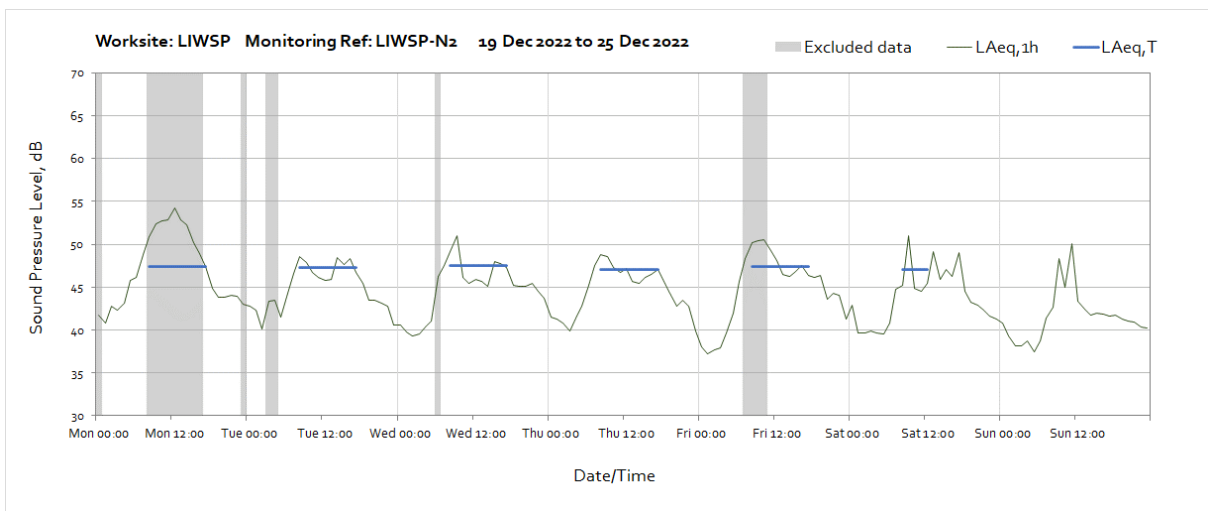
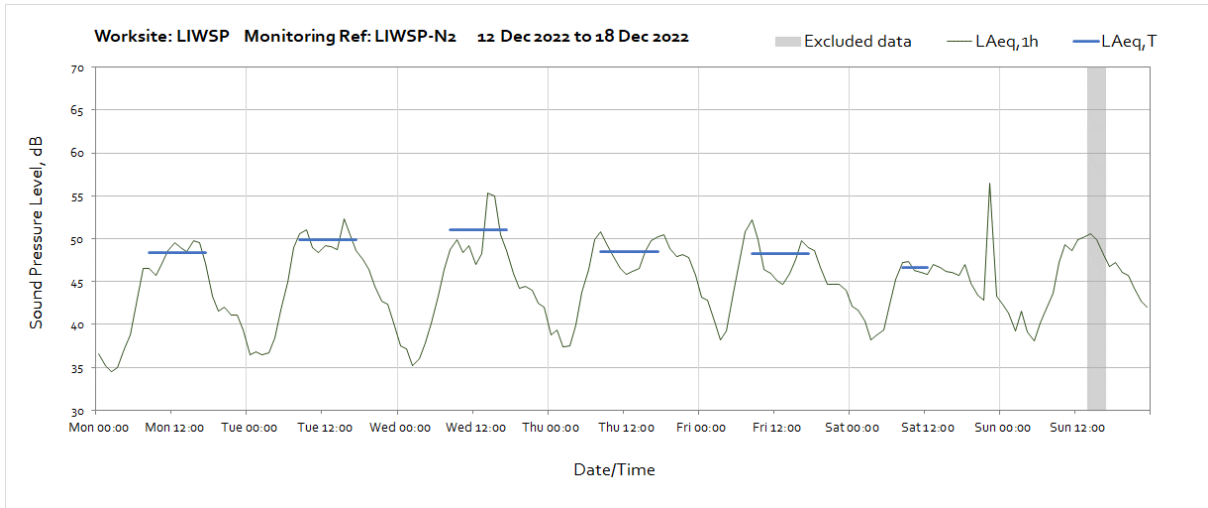




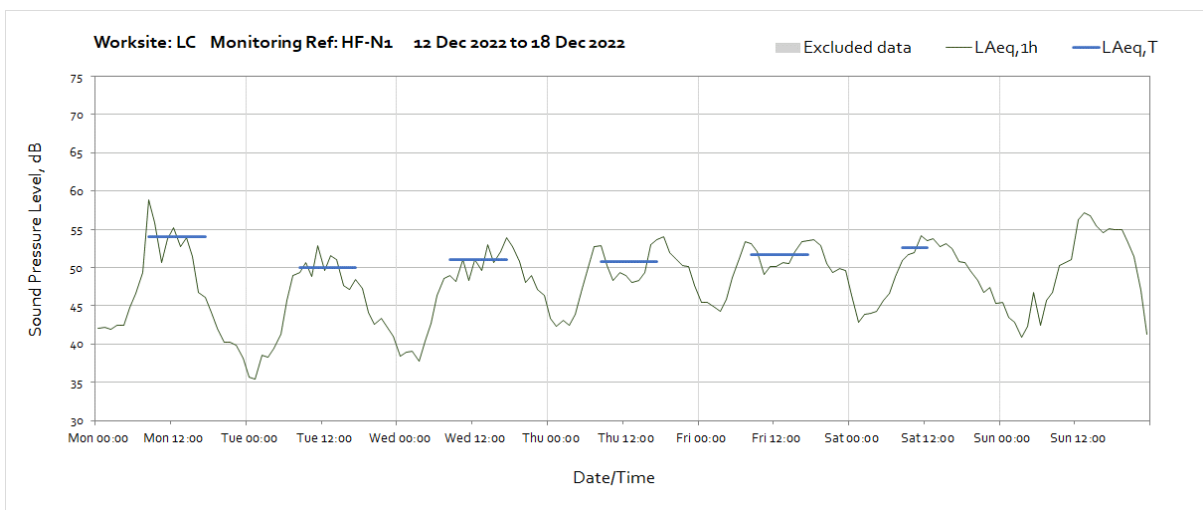
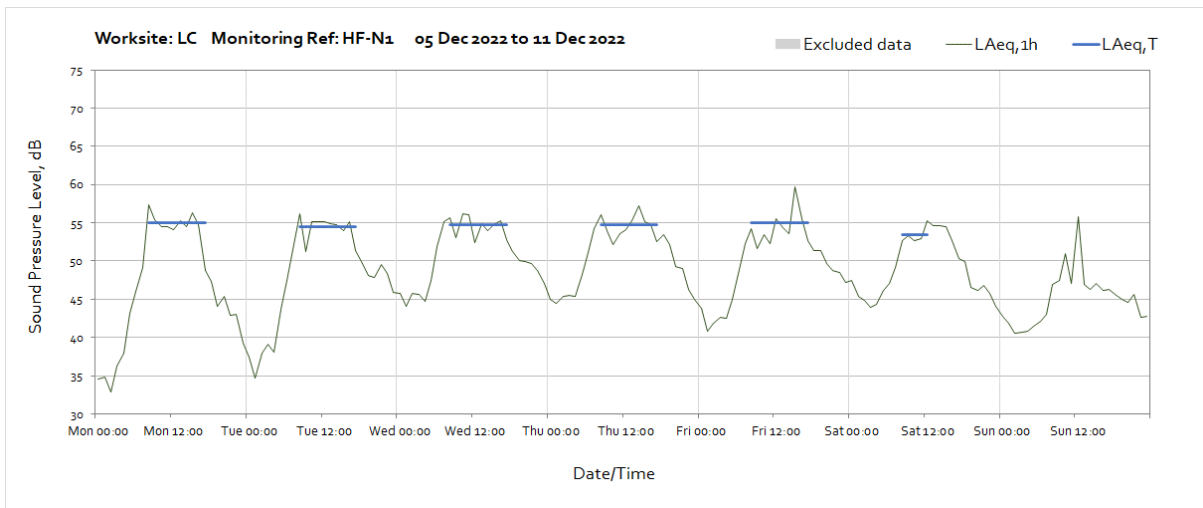
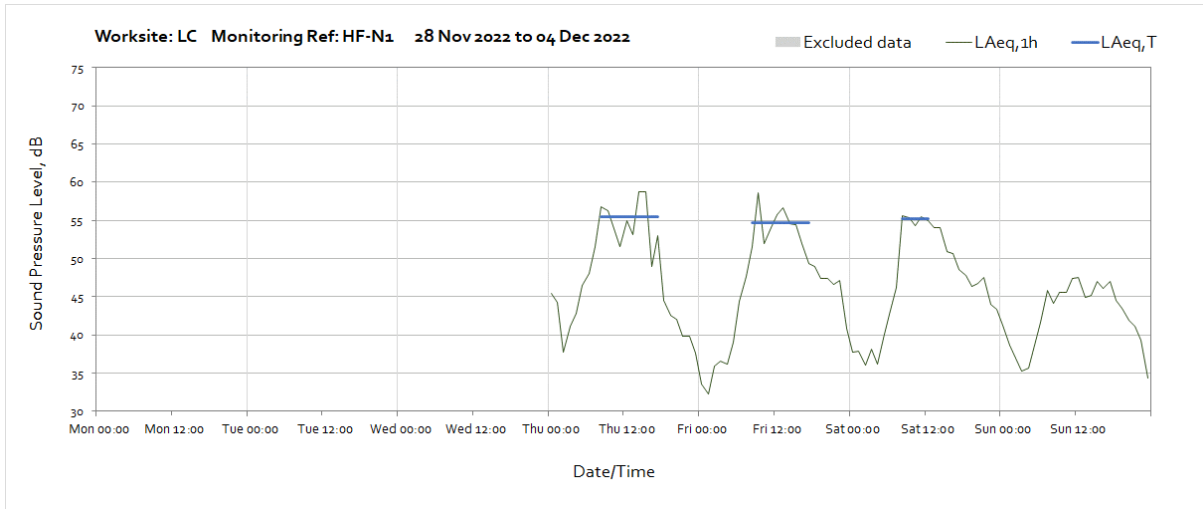


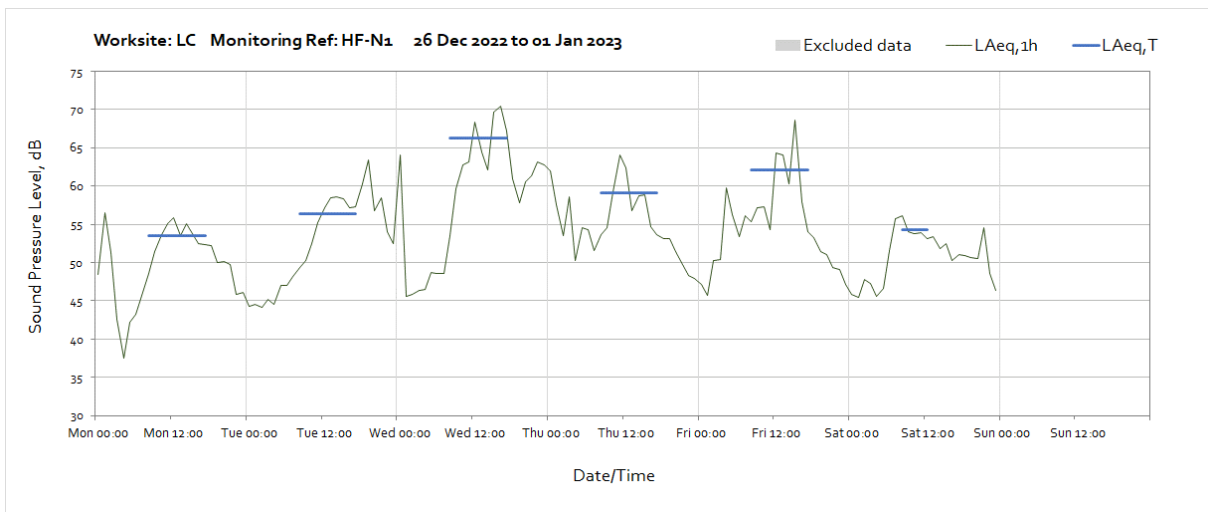
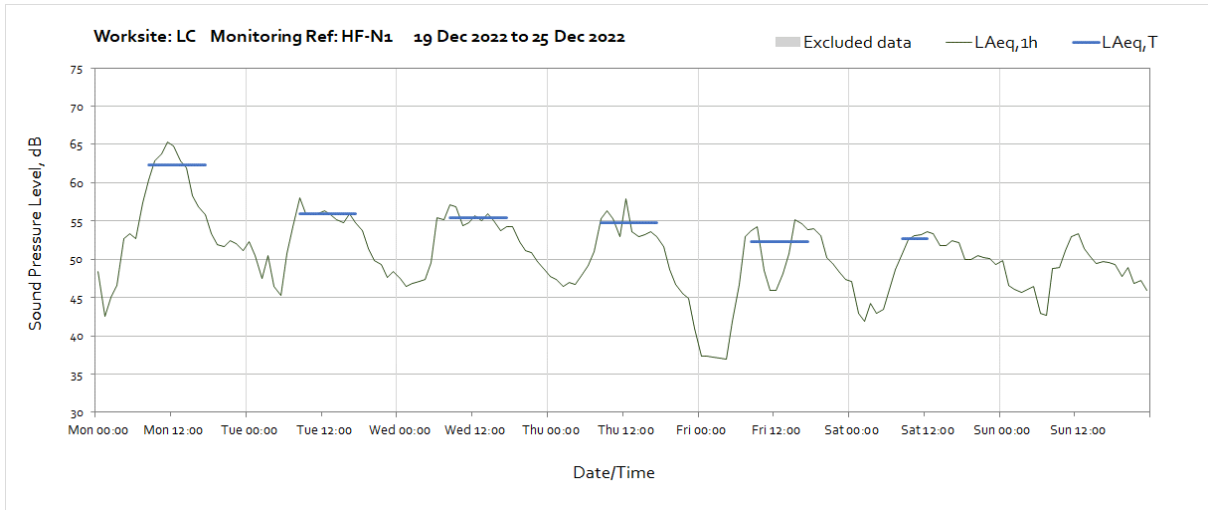
Worksite: LIWSP Monitoring Ref: LIWSP-N2



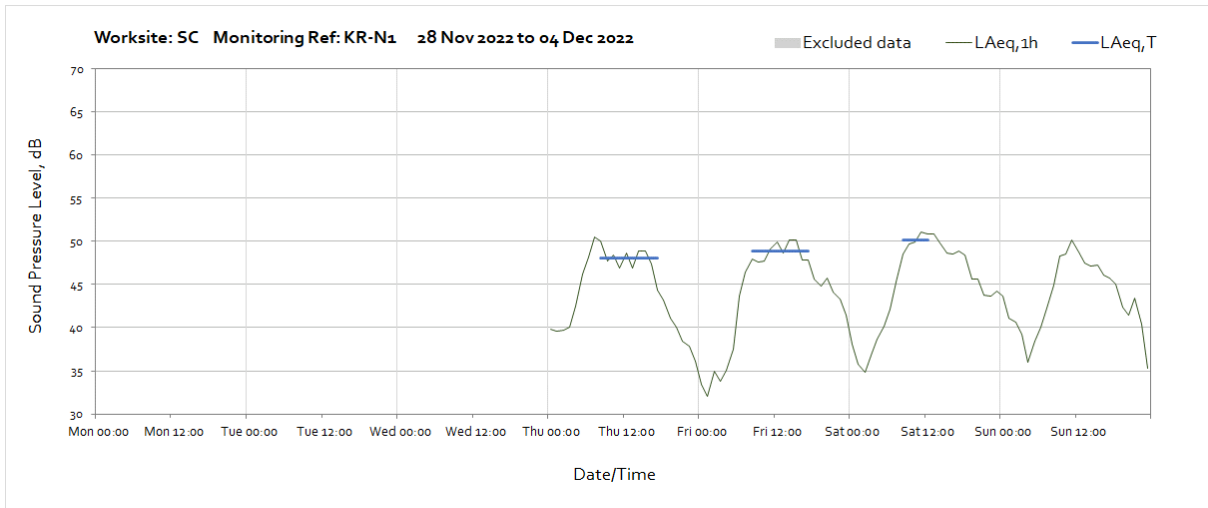


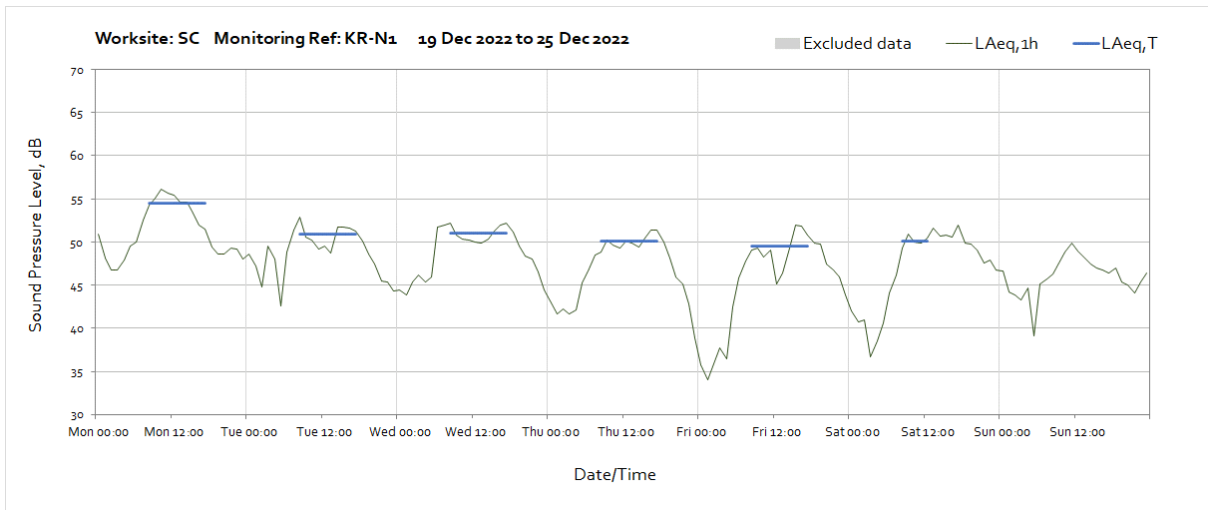
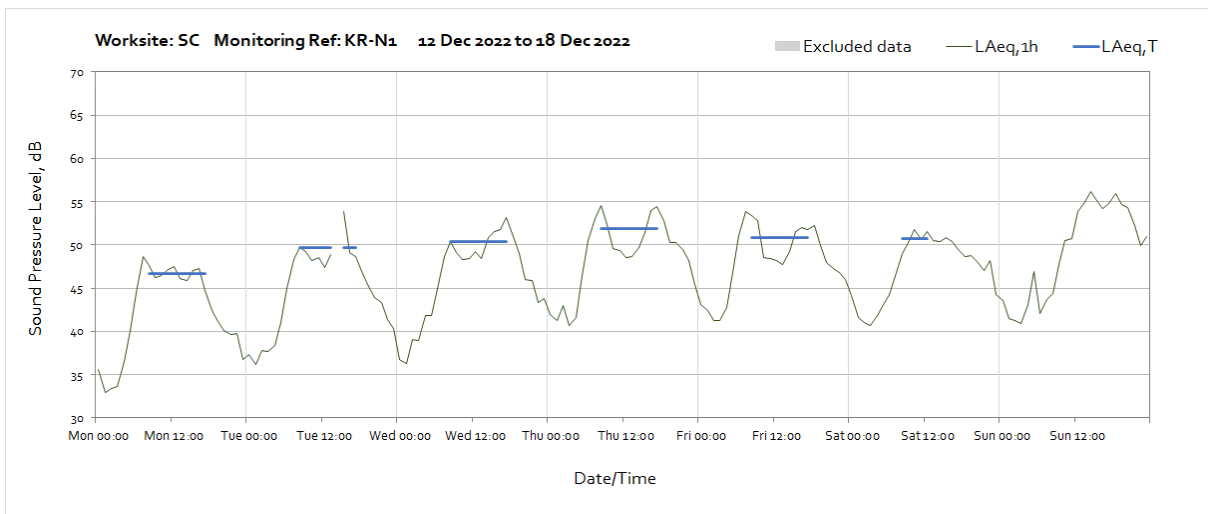
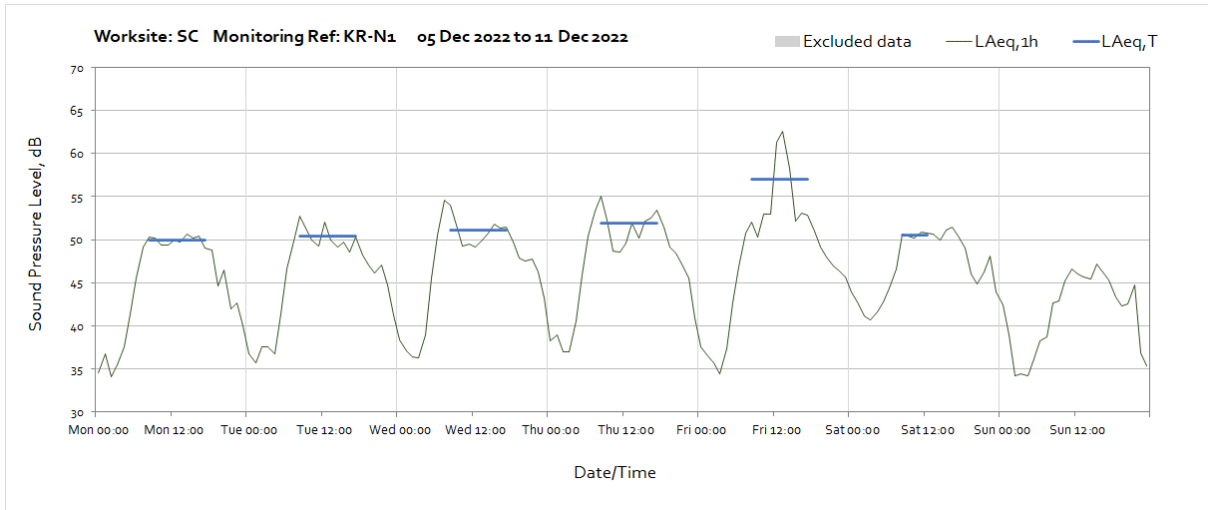
Worksite: SHM Monitoring Ref: HF-N1

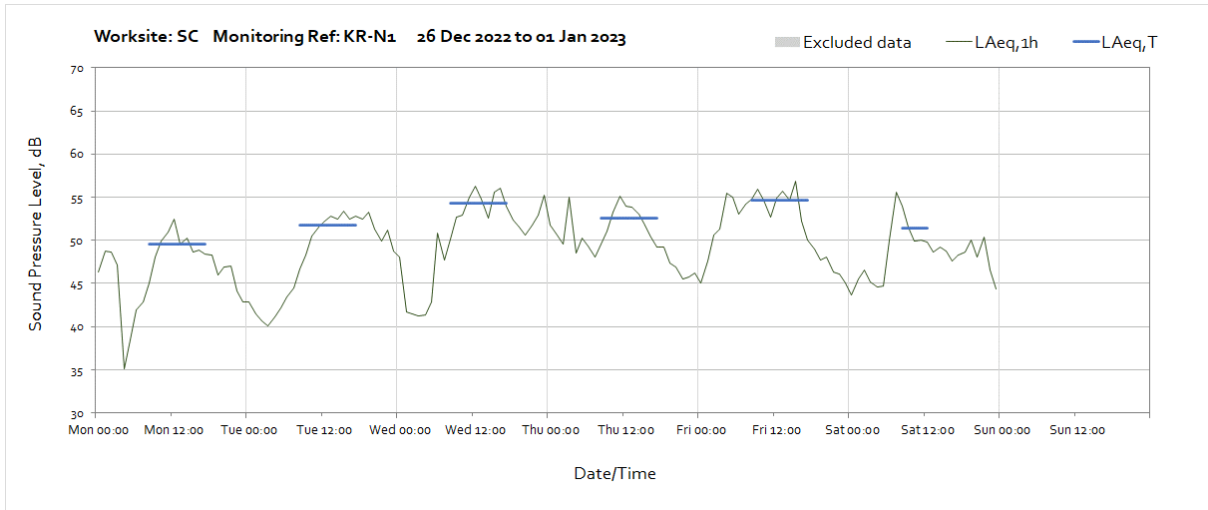




Worksite: SC Monitoring Ref: KR-N1



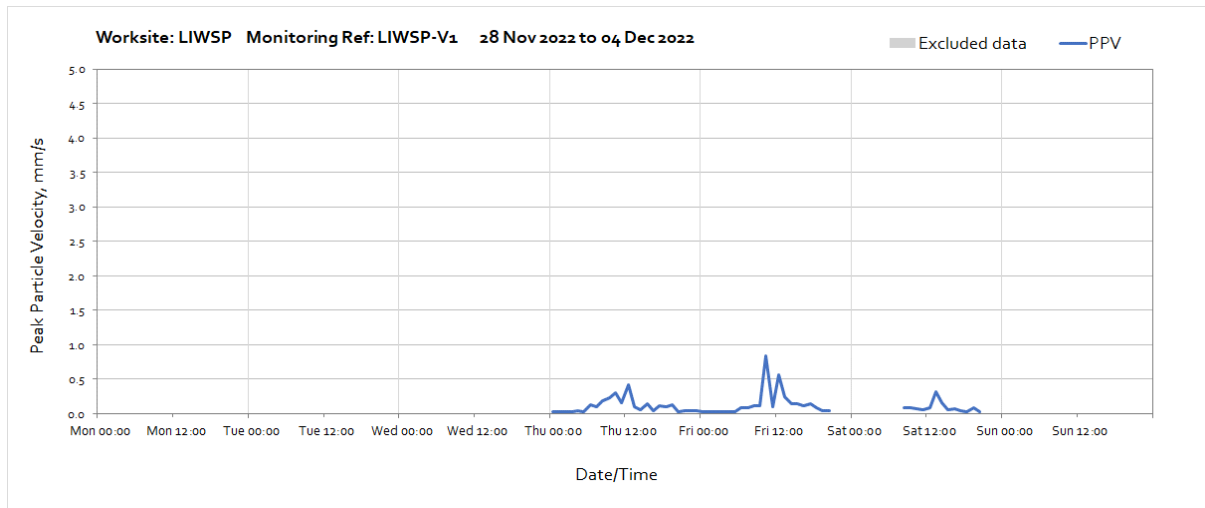




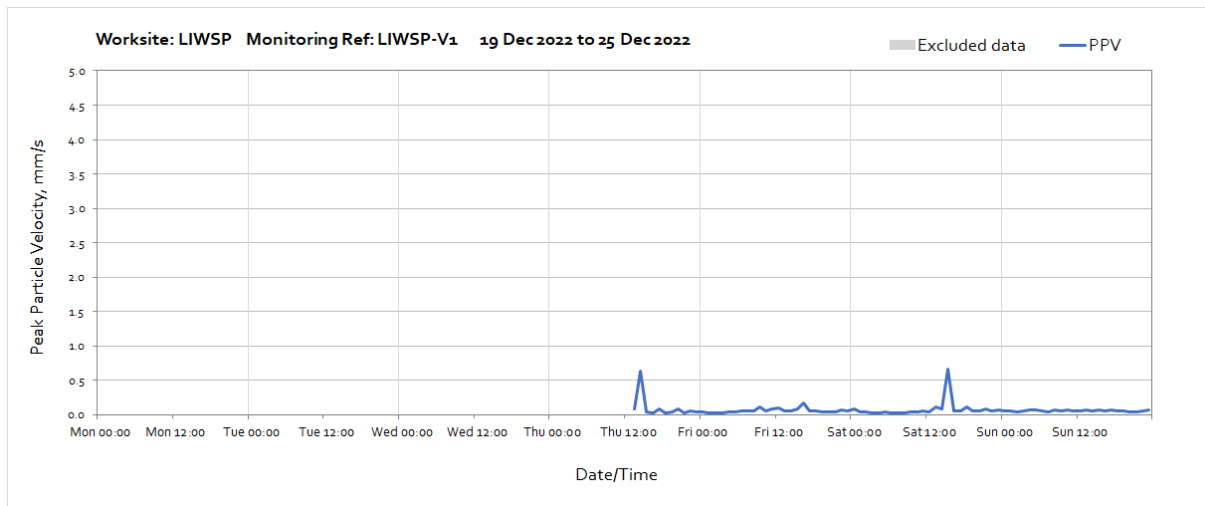
Vibration

The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axes 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: LIWSP Monitoring Ref: LIWSP-V1



Note: Missing data between 21:00 on Friday 2nd December and 08:00 on Saturday 3rd December, then from 21:00 on Saturday 3rd December ongoing till 13:00 on 22nd December was due to loss of power at the monitoring station as the solar battery supply was not able to charge.



Note: Missing data between 00:00 on Monday 19th December and 13:00 on Thursday 22nd December was due to loss of power at the monitoring station as the solar battery supply was not able to charge.

