

February 2022

# HS2

## **Construction noise and vibration Monthly Report – December 2021**

**North Warwickshire Borough 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 North Warwickshire Borough Council (NWBC) area during the month of December 2021.

Within this period monitoring was undertaken at the following worksites:

- Noise and vibration monitoring were undertaken at the Marston Box/Marston Lane worksite (ref.: MB), where work activities included excavation works, stone laying works and adjustment of the mitigation area and relocation of the trees inside mitigation site.
- Noise monitoring was undertaken at the Kingsbury Main Compound worksite (ref.: KMC), where work activities included stockpile works, pond construction, reshaping ditches and topsoil laying activity, fencing installation, excavation works, concrete delivery, drainage works, foul installation, installation of services, moving material works, batching plant installation works, gantry crane rail construction works, installation of an headwall and Training Centre installation.
- Noise monitoring was undertaken at the Faraday Avenue Embankment and Underbridge worksite (ref.: FAEU), where work activities included fencing installation, removal of old tree stumps and excavation works.
- Noise monitoring was undertaken at the Birmingham & Fazeley Canal Viaduct worksite (ref.: BFCV), where work activities included pile mat works, power utilities works, installation of the Lock Cottage access road and installation of acoustic barrier.
- Noise monitoring was undertaken at the Water Orton South Compound worksite (ref.: WOSC), where work activities included excavation works, and installation of ducts and plant.
- Noise monitoring was undertaken at the Attleboro Lane Overbridge worksite (ref.: ALO), where work activities included stone laying works and soil mixing works.

Further works, where monitoring did not take place, were undertaken at Severn Trent Sewage Works (cabling works).

There were no exceedances of 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>), 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.

Two (2) complaints were received during the monitoring period. A description of complaints, the results of investigation 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 <sub>Aeq,T</sub>	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 <sub>pAeq,T</sub>
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 <sub>Aeq,T</sub>	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 <sup>1.75</sup> .

# 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.

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 North Warwickshire Borough Council (NWBC) area for the period 1<sup>st</sup> to 31<sup>st</sup> December 2021.

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

- Marston Box/Marston Lane worksite, ref.: MB (see Plan 1 in Appendix A), where work activities included:
  - Excavation works;
  - Stone laying works; and
  - Adjustment of the mitigation area and relocation of the trees inside mitigation site.
- Kingsbury Main Compound worksite, ref.: KMC (see Plan 1 in Appendix A), where work activities included:
  - Stockpile works;
  - Pond construction;
  - Reshaping ditches and topsoil laying activity;
  - Fencing installation;

- Excavation works;
  - Concrete delivery;
  - Drainage works;
  - Foul installation;
  - Installation of services;
  - Moving material works;
  - Batching plant installation works;
  - Gantry crane rail construction works;
  - Installation of headwall; and
  - Training Centre installation.
- Faraday Avenue Embankment and Underbridge worksite, ref.: FAEU (see Plan 2 in Appendix A), work activities included:
    - Fencing installation;
    - Removal of old tree stumps; and
    - Excavation works.
  - Birmingham & Fazeley Canal Viaduct worksite, ref.: BFCV (see Plan 1 in Appendix A), work activities included:
    - Pile mat works;
    - Power utilities works;
    - Installation of the Lock Cottage access road; and
    - Installation of acoustic barrier.
  - Water Orton South Compound worksite, ref.: WOSC (see Plan 2 in Appendix A), work activities included:
    - Excavation works; and
    - Installation of ducts and plant.
  - Attleboro Lane Overbridge worksite, ref.: ALO (see Plan 1 in Appendix A), work activities included:

- Stone laying works; and
- Soil mixing works.

1.1.4 Further works, where monitoring did not take place, were undertaken at Severn Trent Sewage Works (cabling works).

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 noise monitoring installations and three vibration monitoring installation were active in December in the NWBC area. Table 2 summarises the position of noise and vibration monitoring installations within the NWBC area in December 2021.

1.2.2 An additional vibration monitor ref: BFCV-V1 was installed at Lock Cottage, Marston Lane, Curdworth, worksite ref: BFCV, on the 9th of December 2021.

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

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
Marston Box (MB)	MB-N1	Kingsbury Road, Curdworth
	MB-V1	Kingsbury Road, Curdworth
Kingsbury Main Compound (KMC)	KMC-N1	Wheatley House, Kingsbury Road, Curdworth
Faraday Avenue Embankment and Underbridge worksite (FAEU)	FAEU-N1	(south of) Orchard Cottage, Newlands Lane, Curdworth,
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-N1	(north of) Lock Cottage, Marston Lane, Curdworth
	BFCV-V1	(north of) Lock Cottage, Marston Lane, Curdworth
Water Orton South Compound (WOSC)	WOSC-N1	53 Watton Lane, Water Orton CP, Warwickshire
Attleboro Lane Overbridge (ALO)	ALO-N1	(west of) 47 Attleboro Lane, Water Orton, Birmingham
	ALO-V1	(west of) 47 Attleboro Lane, Water Orton, Birmingham



## 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<sub>Aeq</sub> Data over the Monitoring Period

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade Measurement	Weekday Average L <sub>Aeq,T</sub> (highest Day L <sub>Aeq,T</sub> )					Saturday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )					Sunday / Public Holiday Average L <sub>Aeq,T</sub> (highest day L <sub>Aeq,T</sub> )	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
MB	MB-N1	Kingsbury Road, Curdworth	Free-field	58.2 (62.8)	59.3 (62.7)	57.8 (62.0)	56.8 (67.6)	54.1 (62.2)	56.5 (61.2)	59.6 (63.1)	58.2 (61.4)	57.5 (62.3)	50.5 (57.9)	57.8 (61.3)	52.4 (58.3)
KMC	KMC-N1	Wheatley House, Kingsbury Road, Sutton Coldfield	Free-field	58.1 (62.2)	60.1 (65.2)	57.1 (60.5)	56.6 (62.3)	55.3 (62.8)	54.9 (58.5)	58.9 (61.3)	58.2 (61.1)	57.7 (61.7)	53.8 (58.9)	57.6 (62.4)	55.9 (62.3)
FAEU	FAEU-N1	(south of) Orchard Cottage, Newlands Lane, Curdworth	Free-field	60.2 (63.6)	60.1 (62.5)	58.0 (62.1)	56.9 (61.6)	56.0 (64.8)	55.5 (59.8)	56.3 (60.9)	56.7 (61.5)	55.4 (61.3)	54.3 (57.1)	57.9 (59.6)	56.1 (60.4)
BFCV	BFCV-N1	(north of) Lock Cottage, Marston Lane, Curdworth	Free-field	62.2 (67.6)	63.0 (68.2)	63.0 (66.9)	61.5 (66.0)	59.4 (66.9)	61.5 (63.3)	63.9 (68.4)	62.1 (65.6)	61.0 (65.5)	55.9 (60.4)	60.5 (65.7)	58.1 (65.0)
WOSC	WOSC-N1	53 Watton Lane, Water Orton CP, Warwickshire	Free-field	66.4 (68.6)	66.5 (69.1)	65.5 (68.2)	63.6 (66.8)	60.7 (66.6)	62.8 (64.4)	66.2 (66.8)	66.6 (66.9)	64.5 (66.5)	58.7 (63.5)	64.6 (68.1)	59.7 (65.4)
ALO	ALO-N1	(west of) 47 Attleboro Lane, Water Orton, Birmingham	Free-field	58.3 (64.9)	59.4 (64.9)	58.5 (64.4)	57.7 (63.9)	55.9 (64.2)	54.8 (60.9)	57.1 (62.4)	54.7 (59.5)	55.9 (62.5)	51.5 (60.3)	54.8 (62.8)	54.0 (62.3)

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
Marston Box (MB)	MB-V1	Kingsbury Road, Curdworth	0.69 (Y-axis)
Attleboro Lane Overbridge (ALO)	ALO-V1	(west of) 47 Attleboro Lane, Water Orton, Birmingham	1.03 (Y-axis)
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-V1	(north of) Lock Cottage, Marston Lane, Curdworth	1.83 (X-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 reported 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
Marston Box (MB)	MB-N1*	Kingsbury Road, Curdworth	All days	All periods	No exceedance	No exceedance
Kingsbury Main Compound (KMC)	KMC-N1*	Wheatley House, Kingsbury Road, Sutton Coldfield	All days	All periods	No exceedance	No exceedance
Faraday Avenue Embankment and Underbridge worksite (FAEU)	FAEU-N1	(south of) Orchard Cottage, Newlands Lane, Curdworth	All days	All periods	No exceedance	No exceedance
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-N1	(north of) Lock Cottage, Marston Lane, Curdworth	All days	All periods	No exceedance	No exceedance
Water Orton South Compound (WOSC)	WOSC-N1	53 Watton Lane, Water Orton CP, Warwickshire	All days	All periods	No exceedance	No exceedance
Attleboro Lane Overbridge (ALO)	ALO-N1	(west of) 47 Attleboro Lane, Water Orton, Birmingham	Weekdays	0800-1800	3	No exceedance

\* A distance correction has been applied when calculating exceedances of the LOAEL and SOAEL.

2.2.6 No exceedances of the SOAEL were recorded due to HS2 construction works during December 2021. Three LOAEL exceedance were recorded at noise monitoring location ref.: ALO-N1 during normal core hours.

## 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
-	-	-	-	-	-

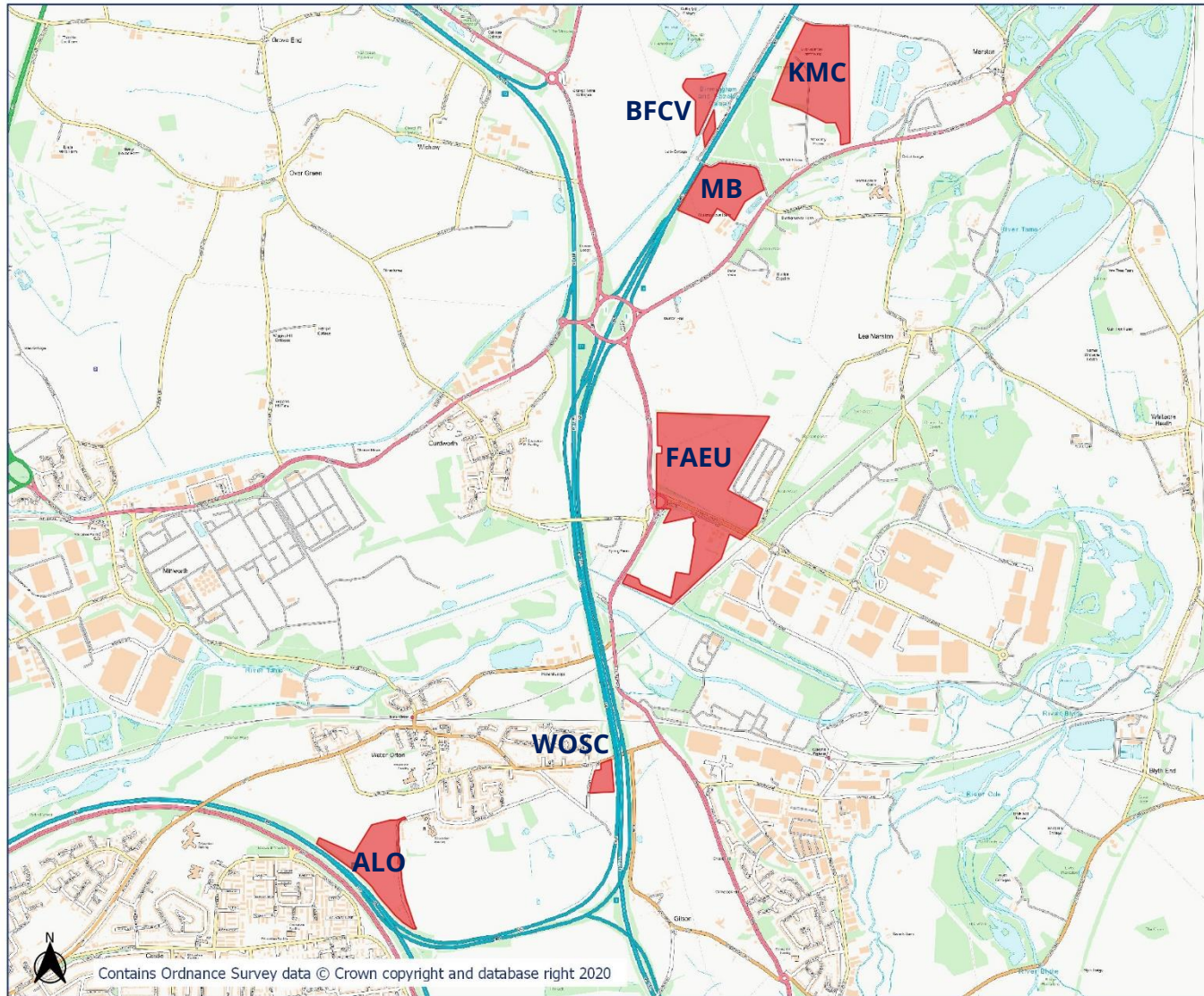
## 2.4 Complaints

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.

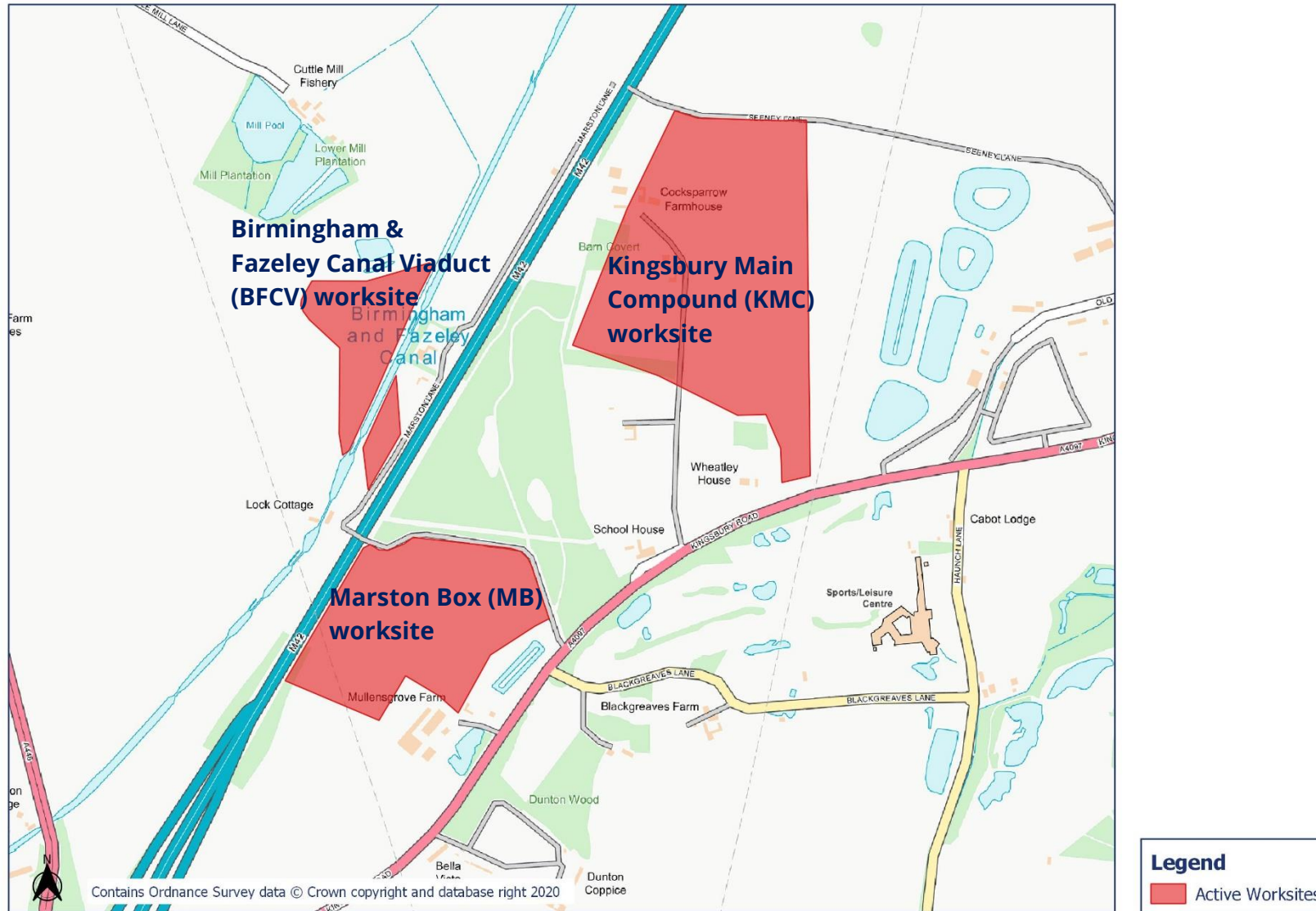
Table 7: Summary of Complaints

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-43071-C	MB	Complaint due to noise disturbance from HS2 works taking place 120m away from property.	Investigations shown that works undertaken were louder than usual.	The contractor has arranged respite over Christmas whilst work's are louder than usual. If the noise remains excessive, the contractor has options for further respite.
HS2-21-43072-C	WOSC	Complaint due to vibration disturbance to property believed to stem from nearby works.	On-going	On-going

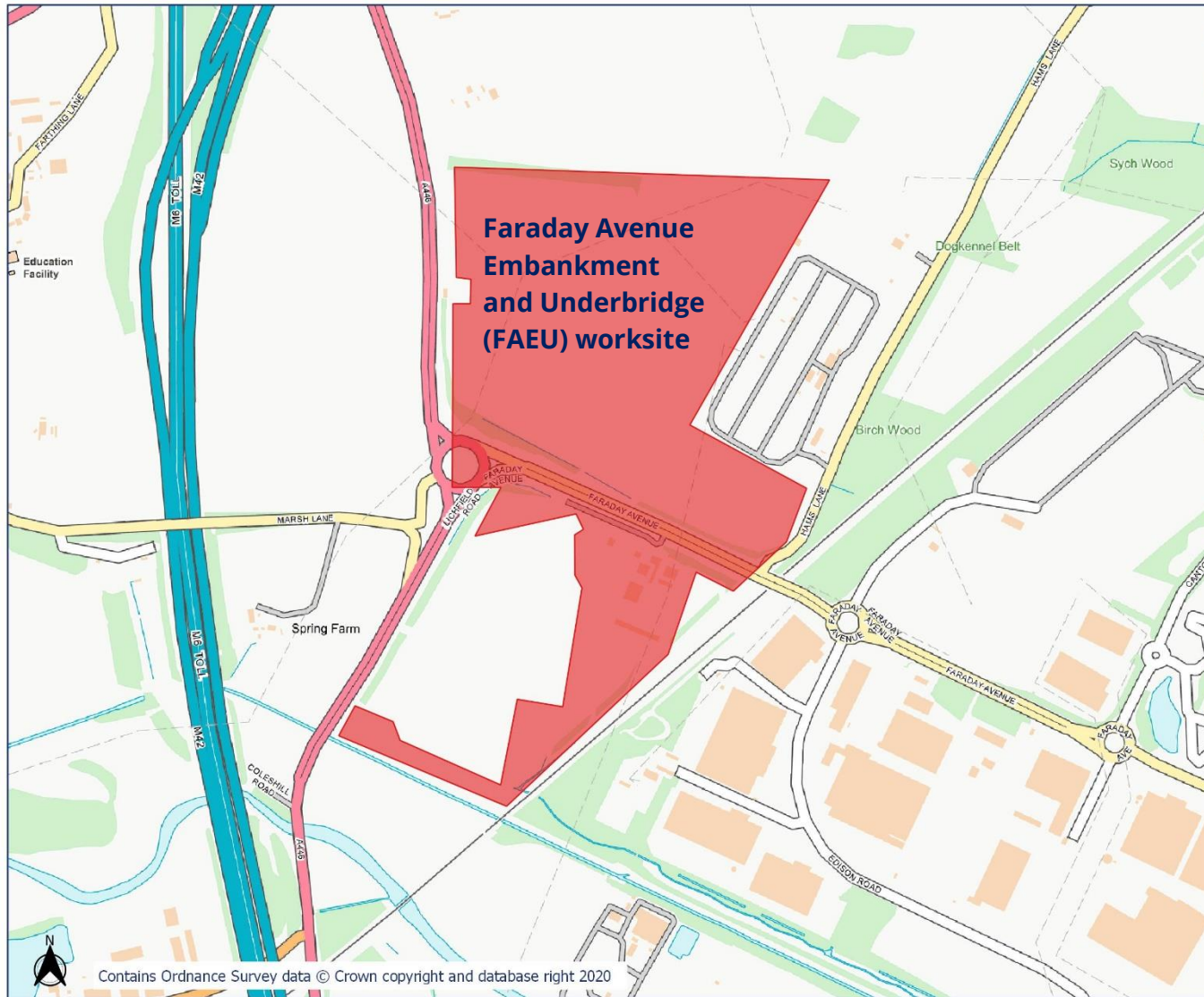
# Appendix A Site Locations

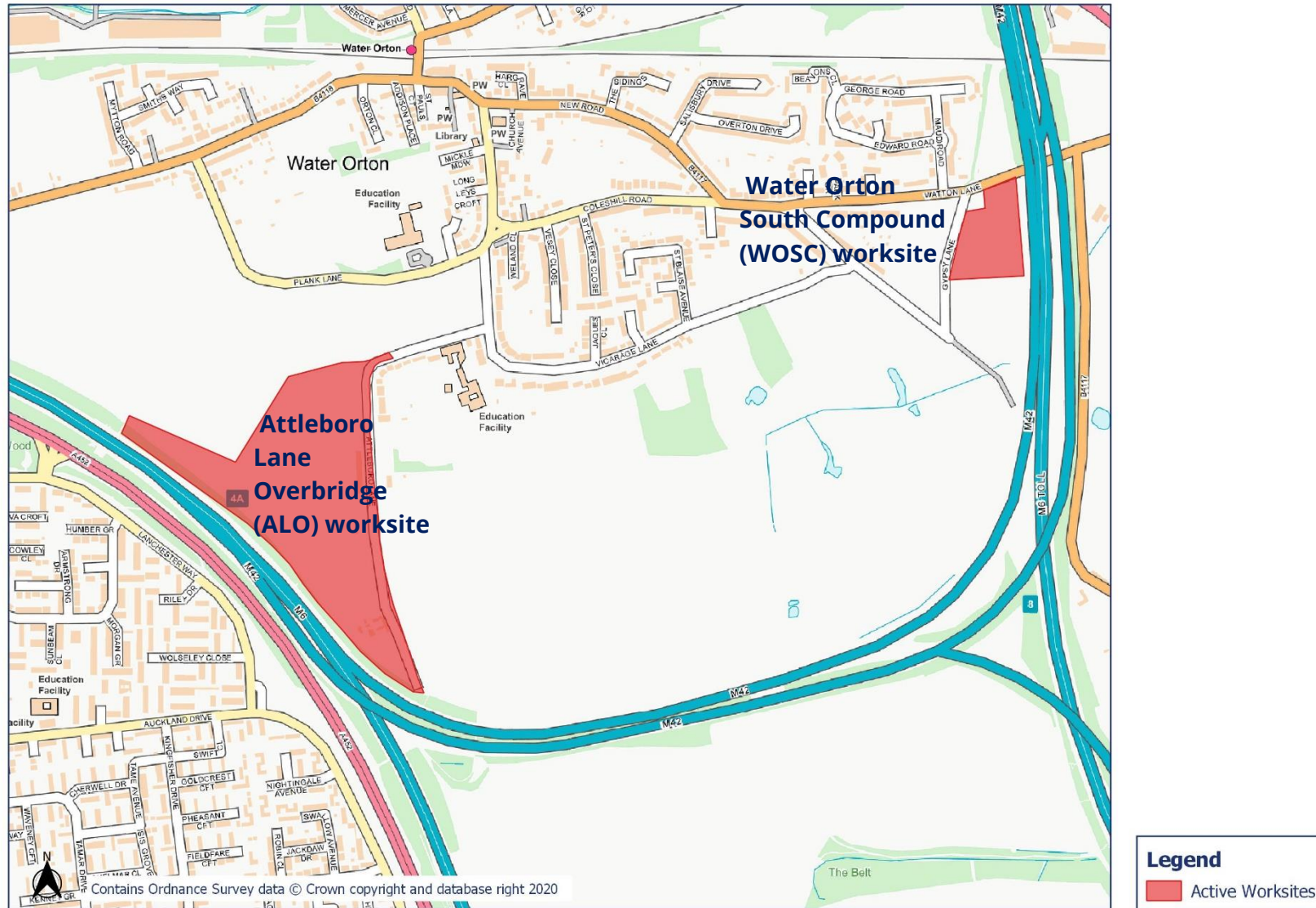




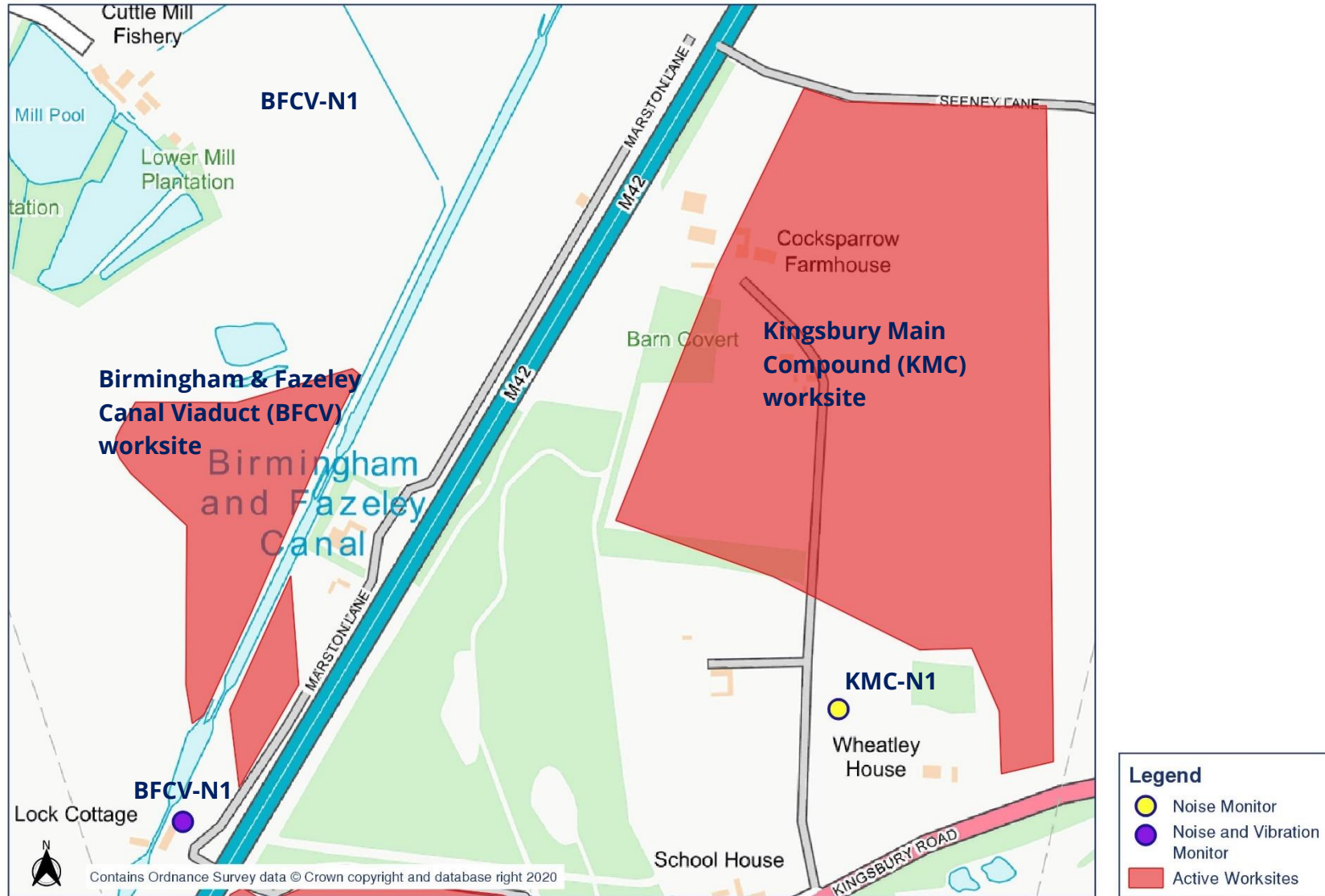




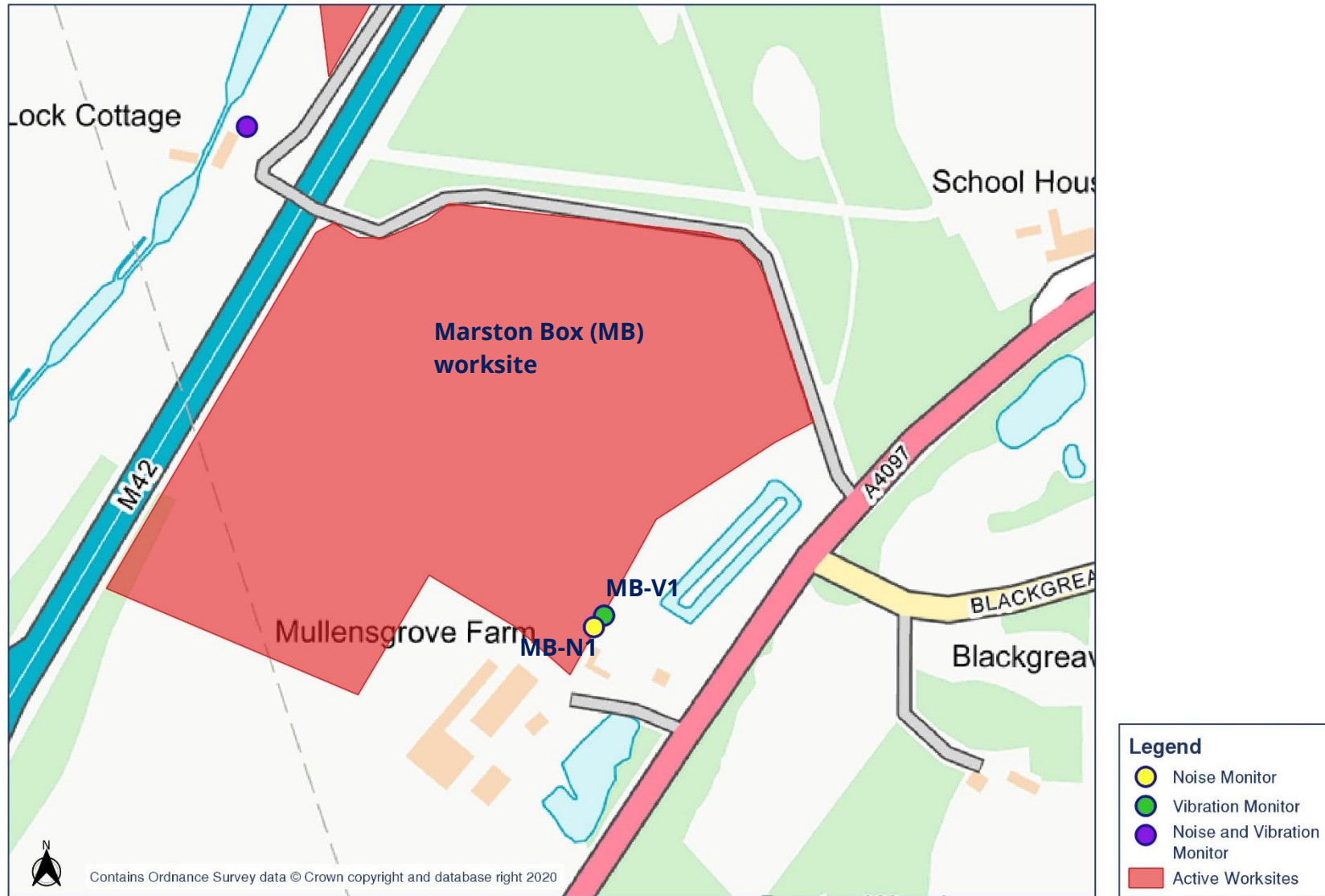


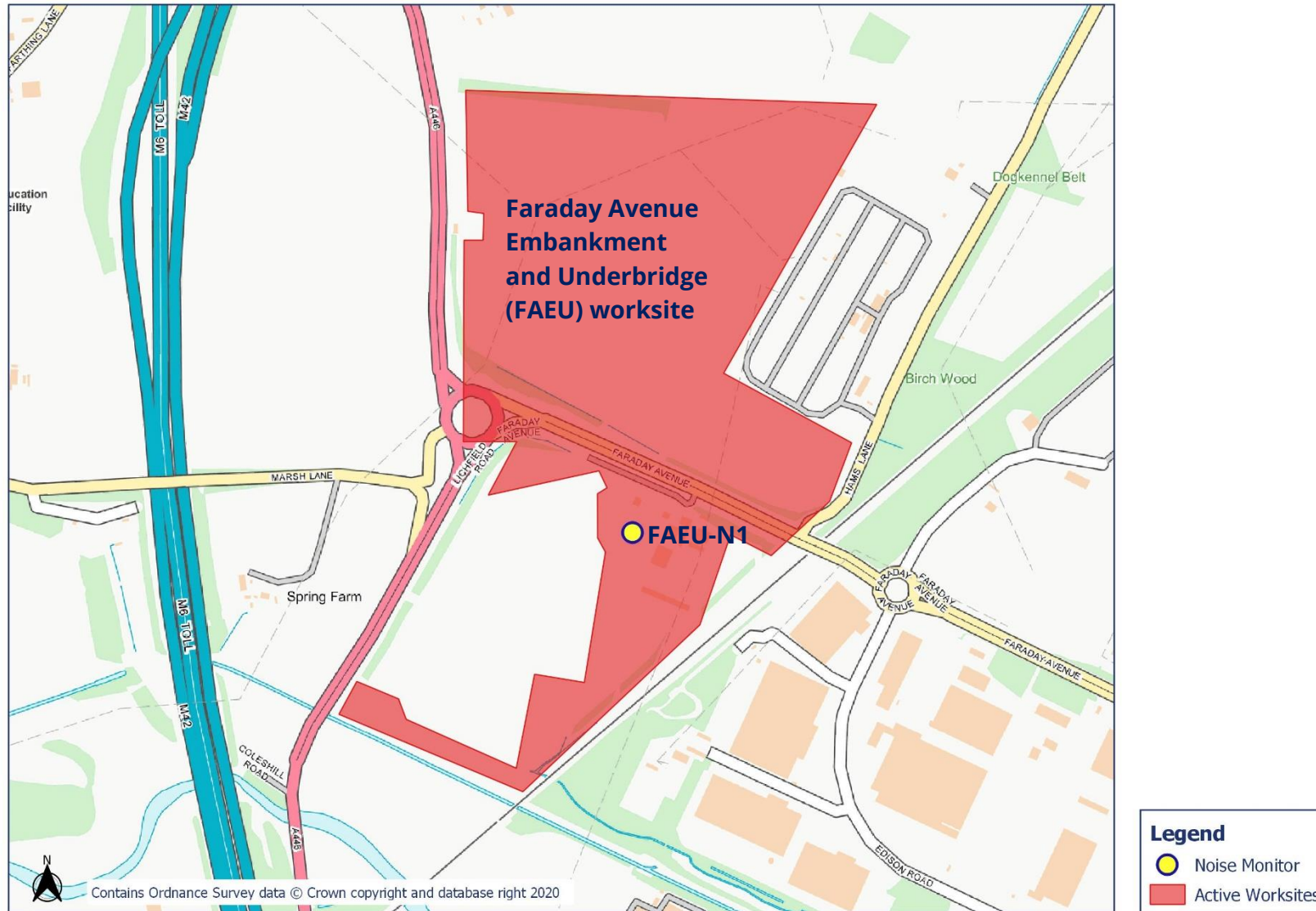


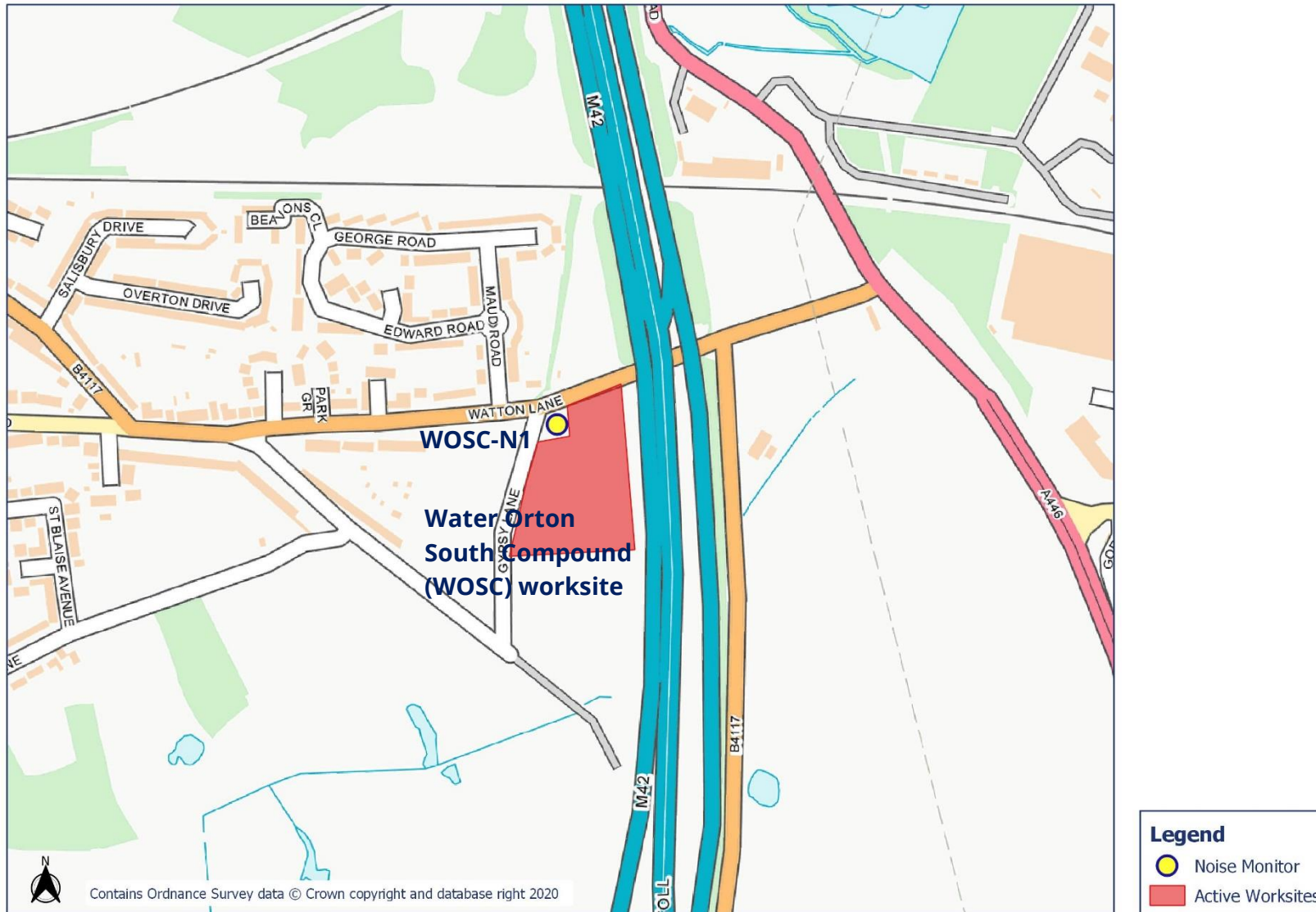
# Appendix B Monitoring Locations



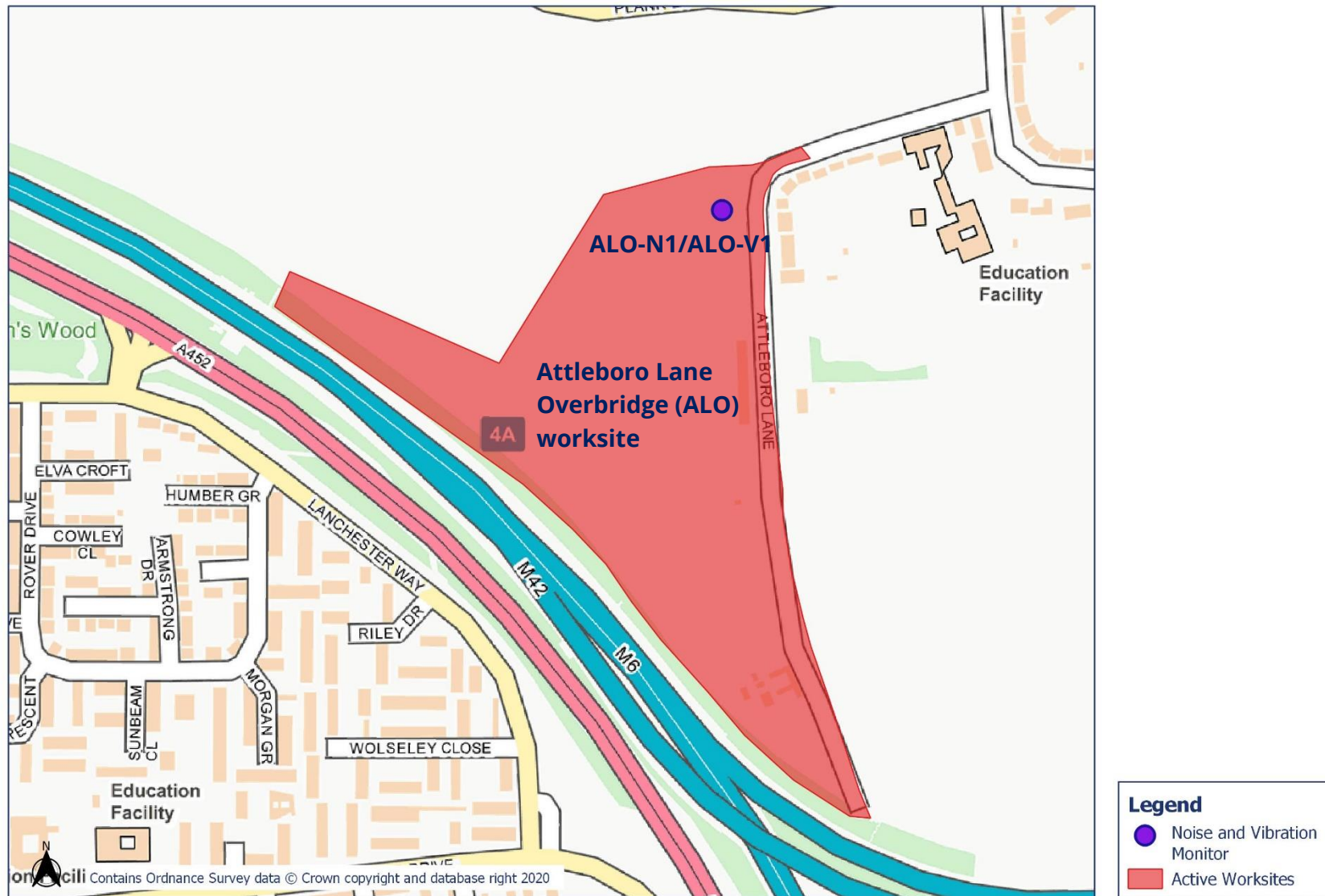












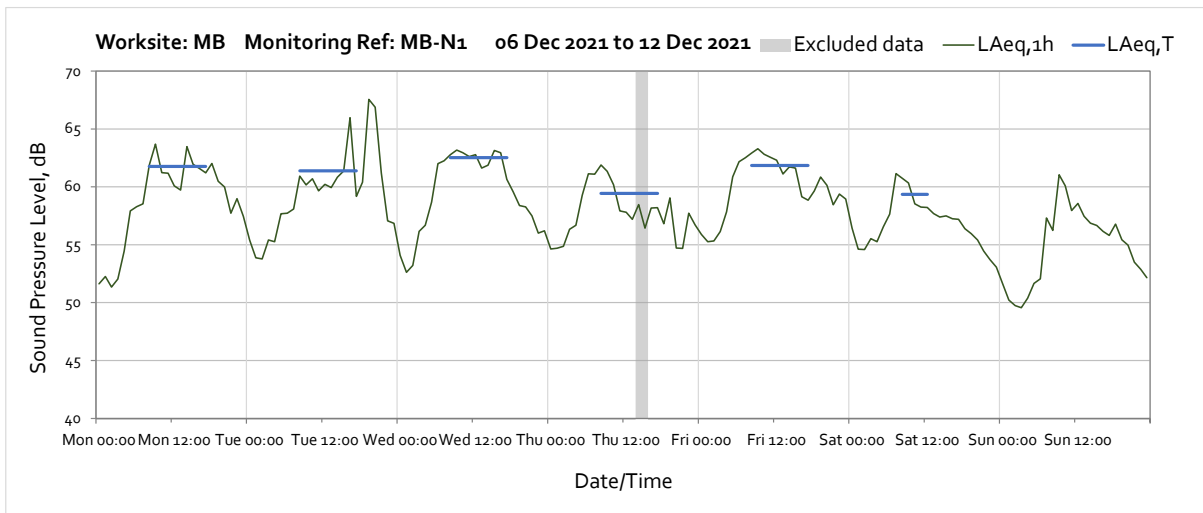
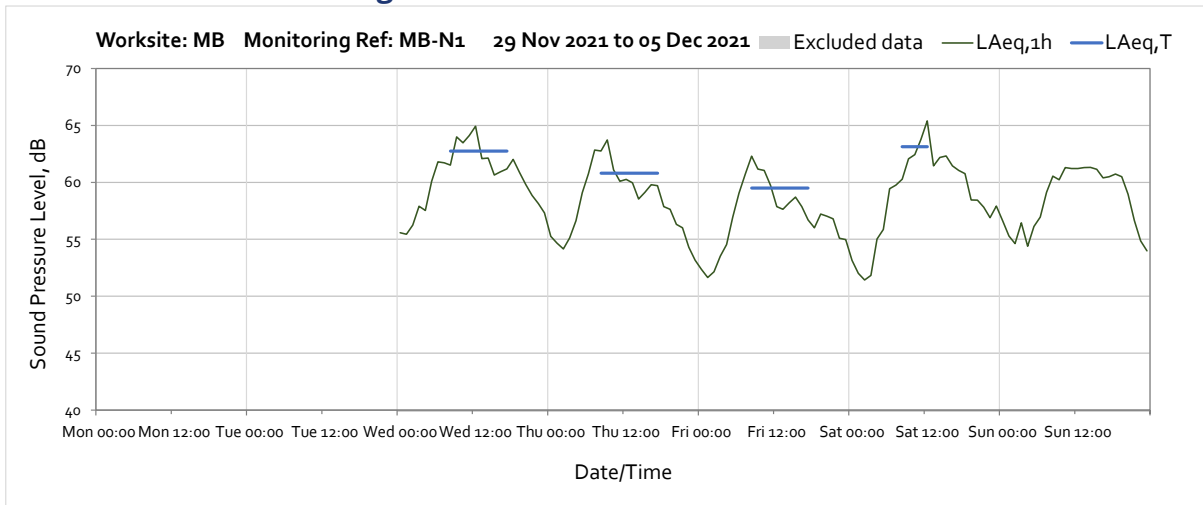


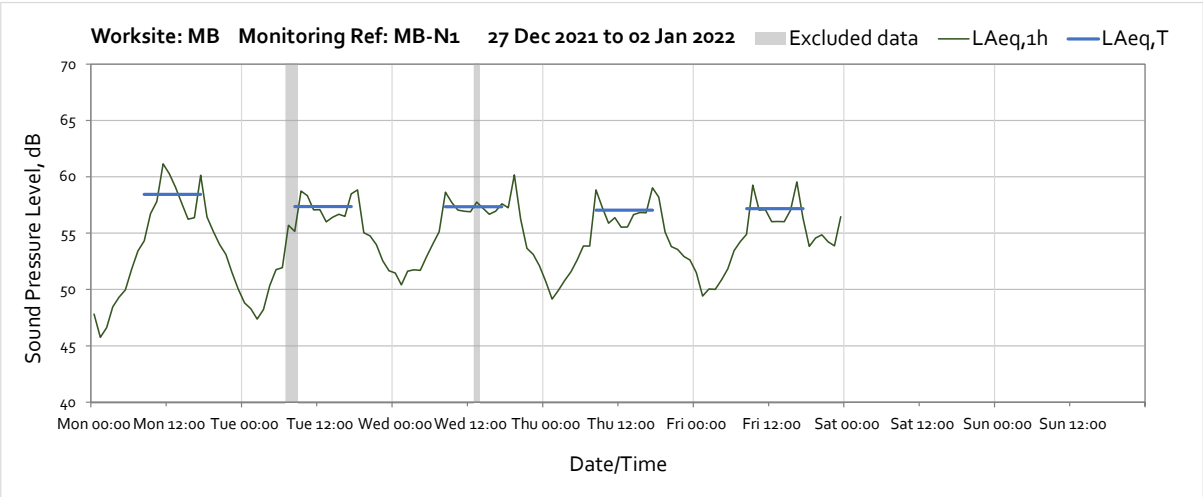
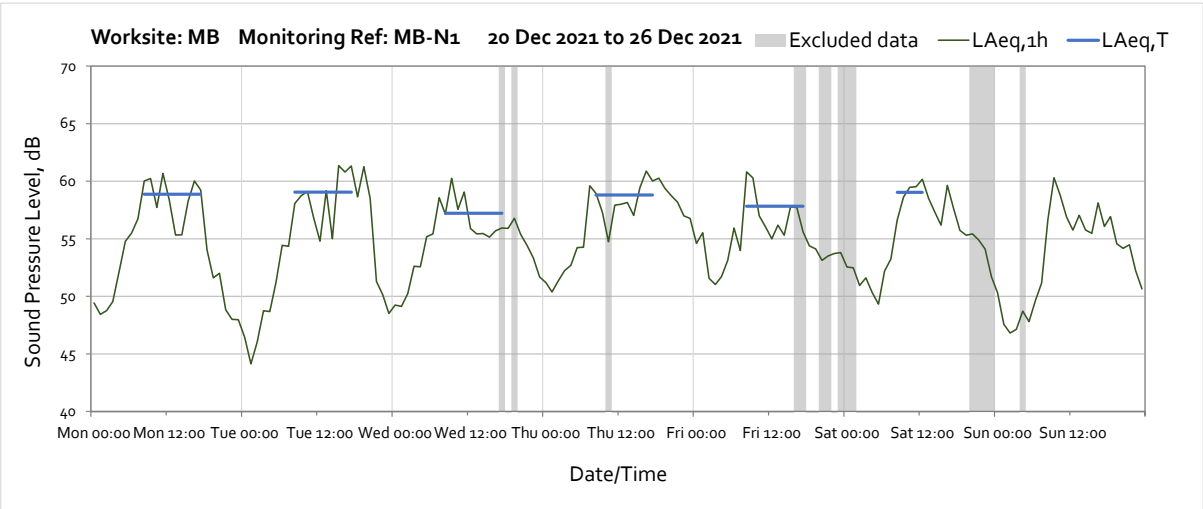
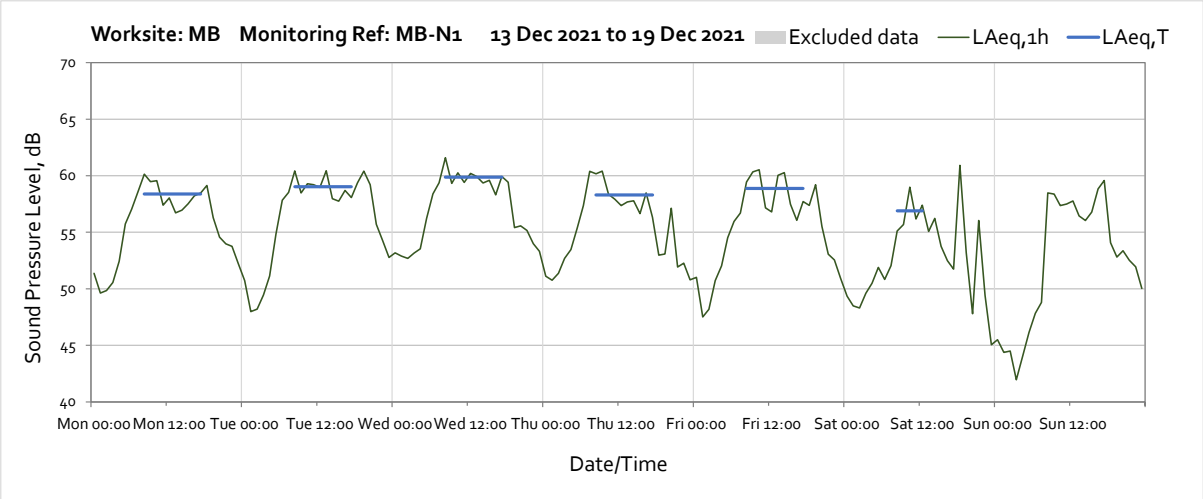
# Appendix C Data

## Noise

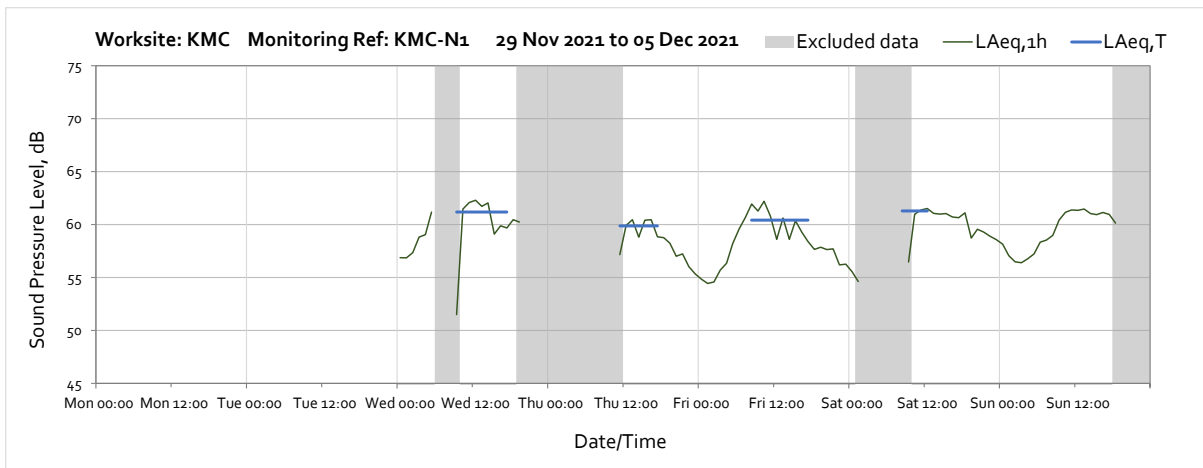
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and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

### Worksite: MB – Monitoring Ref: MB-N1

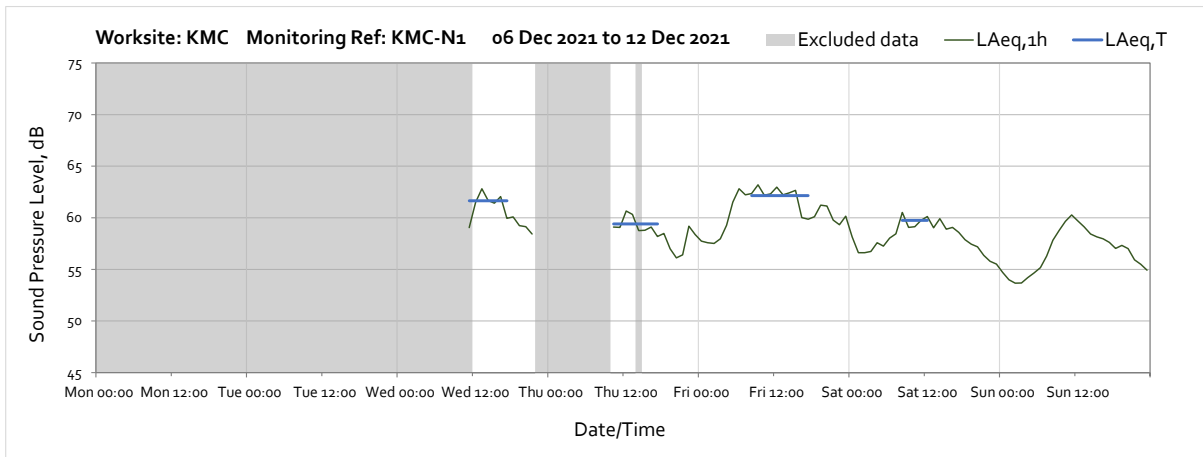




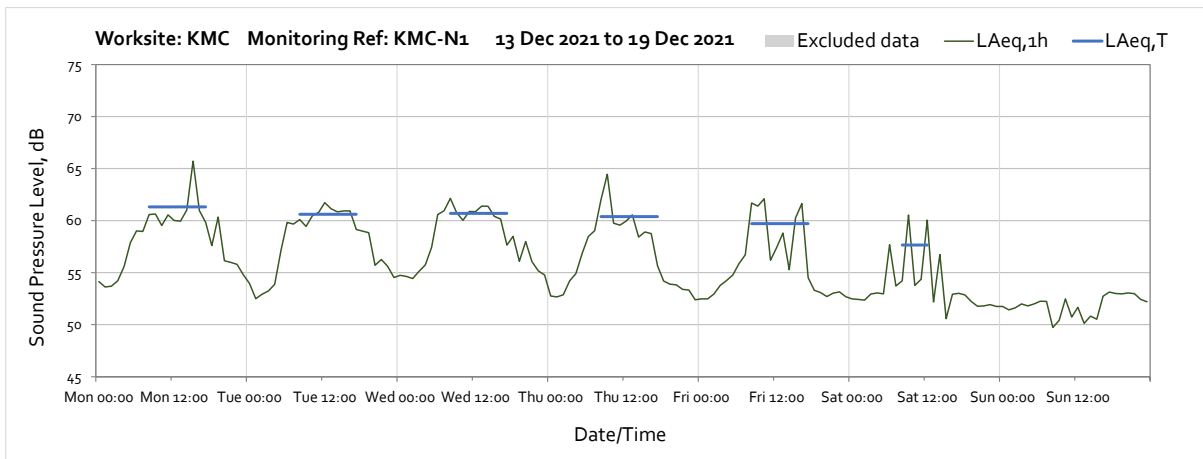
## Worksite: KMC – Monitoring Ref: KMC-N1

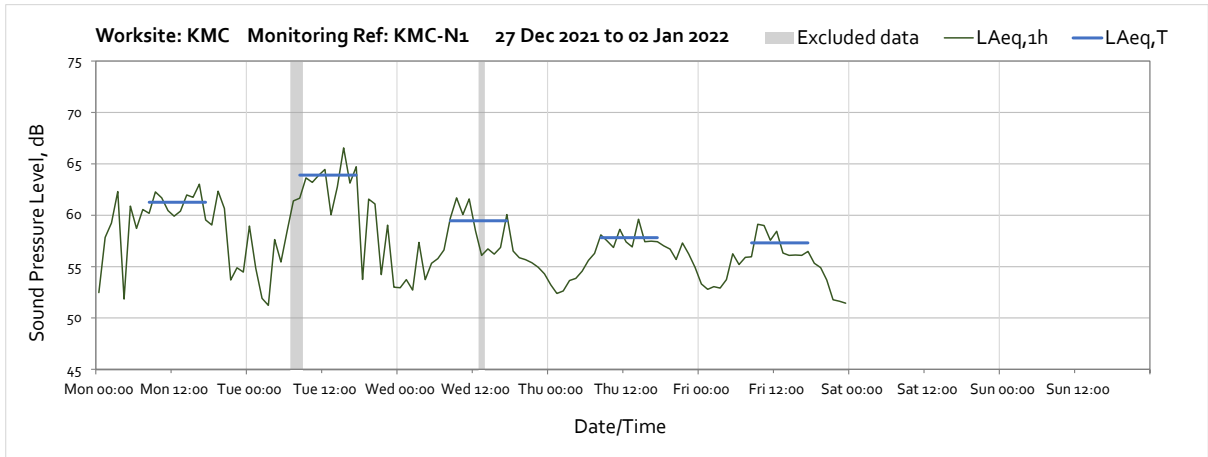
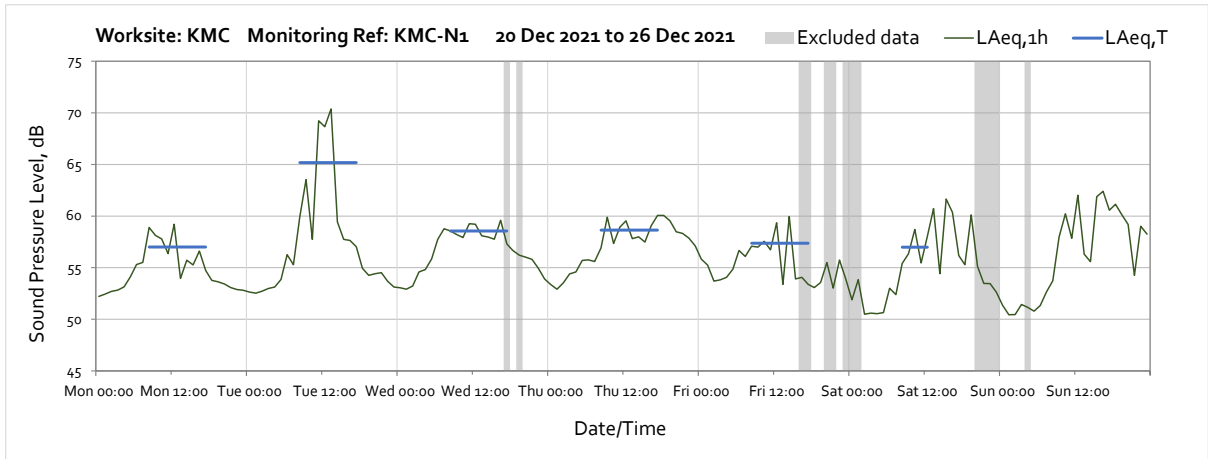


Note: Missing data throughout the week was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight. Batteries were replaced on 9<sup>th</sup> December 2021.

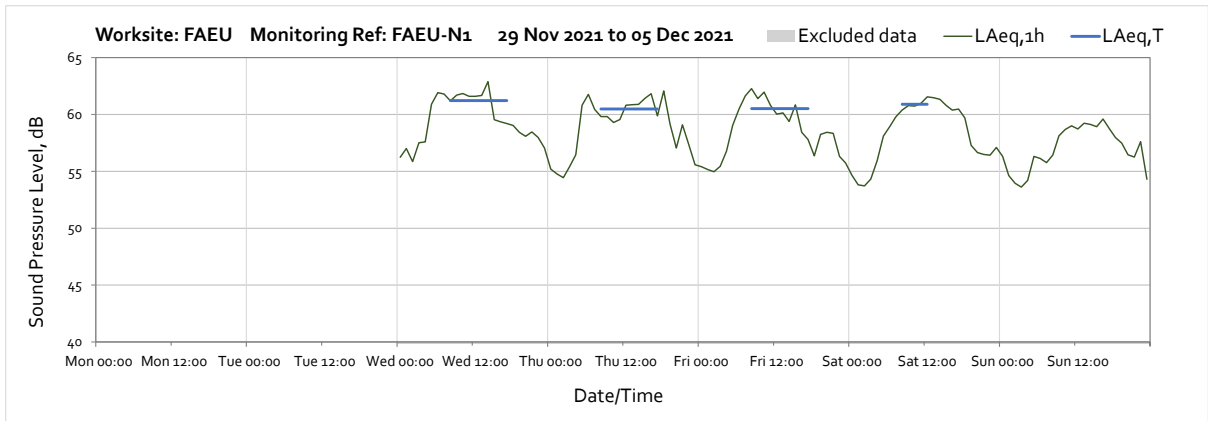


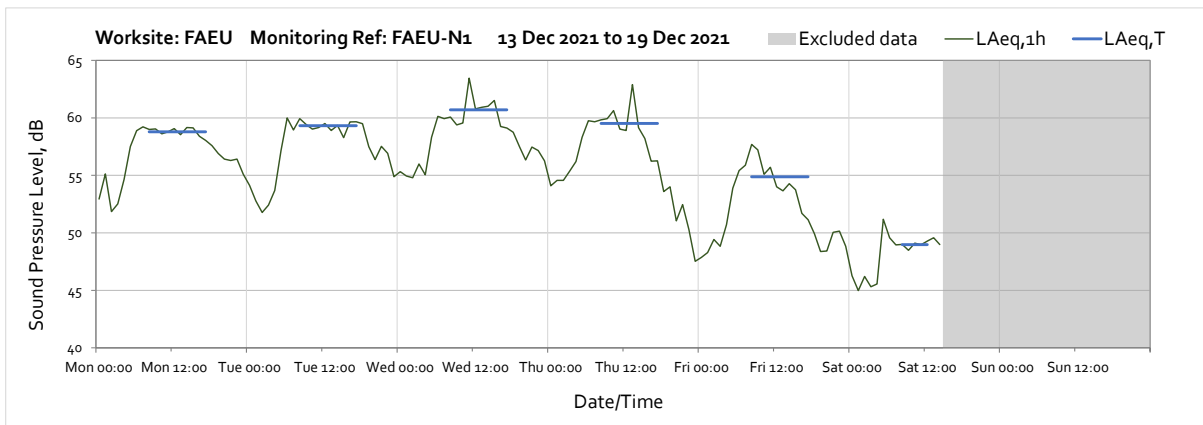
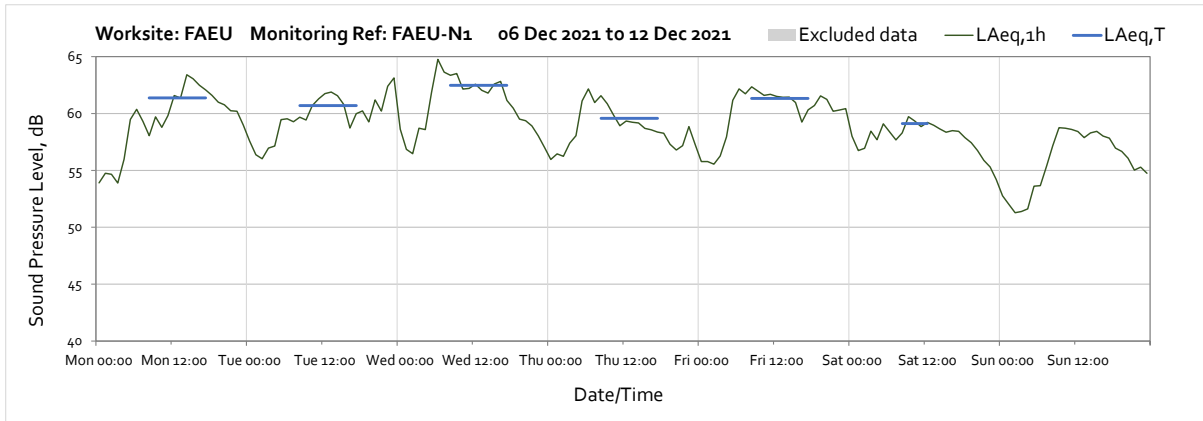
Note: Missing data throughout the week was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight. Batteries were replaced on 9<sup>th</sup> December 2021.



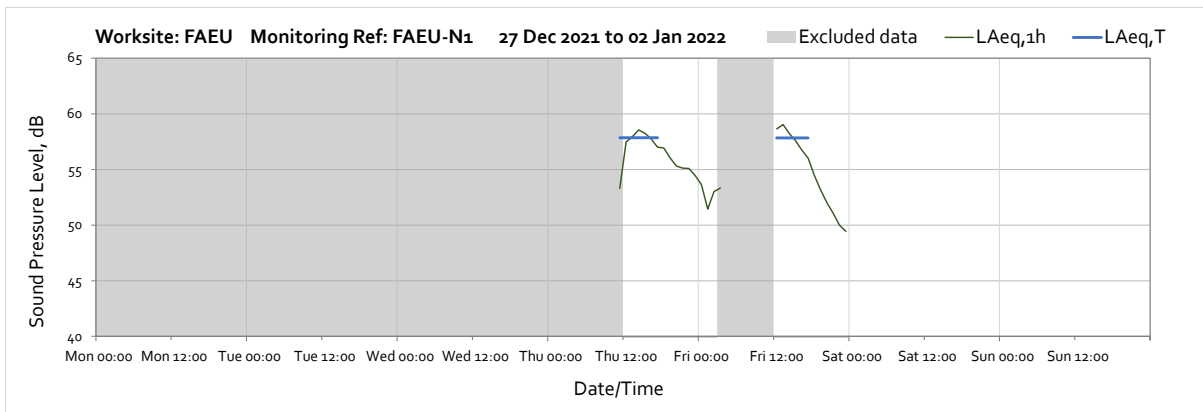


**Worksite: FAEU - Monitoring Ref: FAEU-N1**



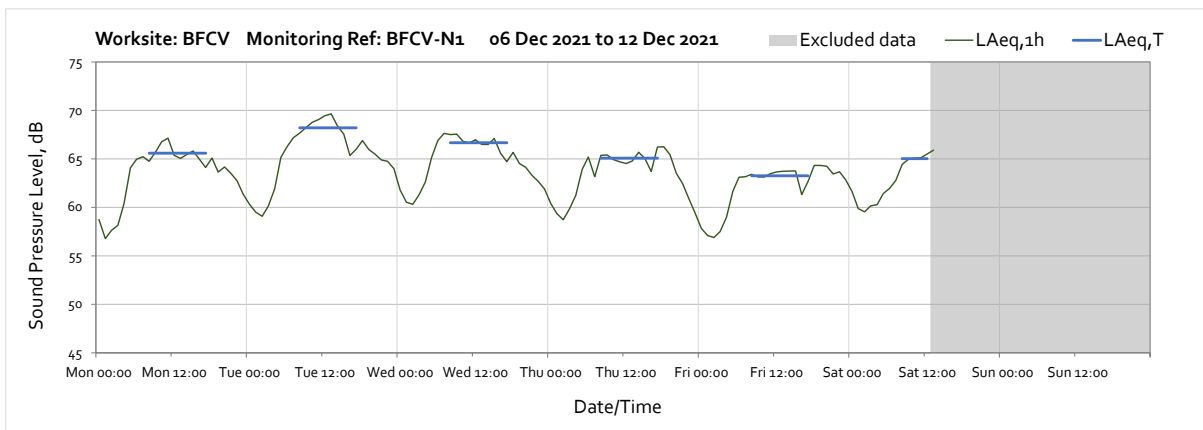
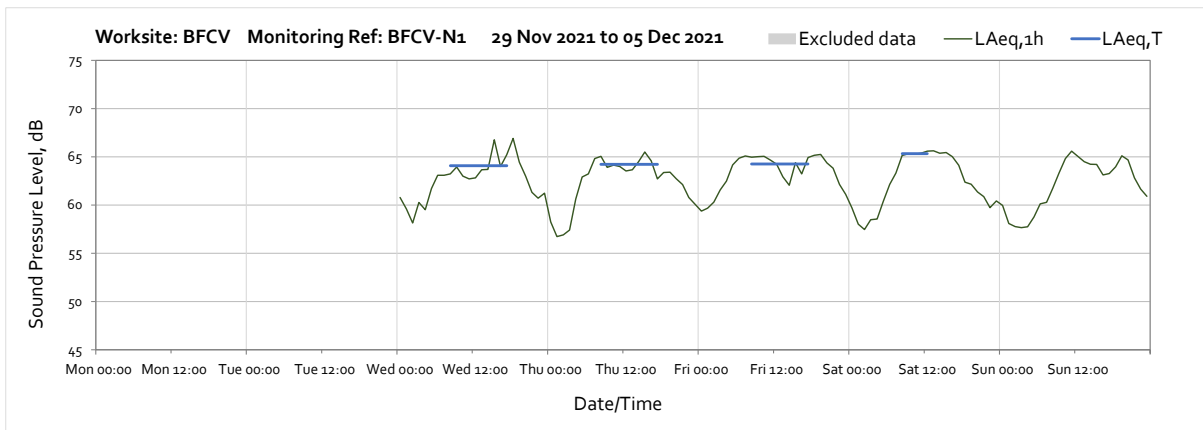


Note: Missing data in between 15:00 on Saturday 18<sup>th</sup> December and 10:00 on Thursday 30<sup>th</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.

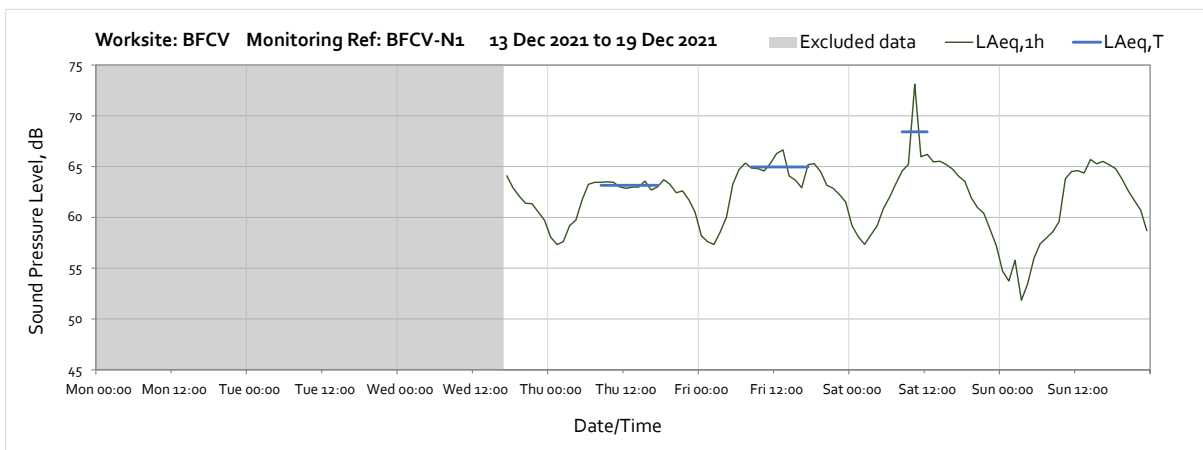


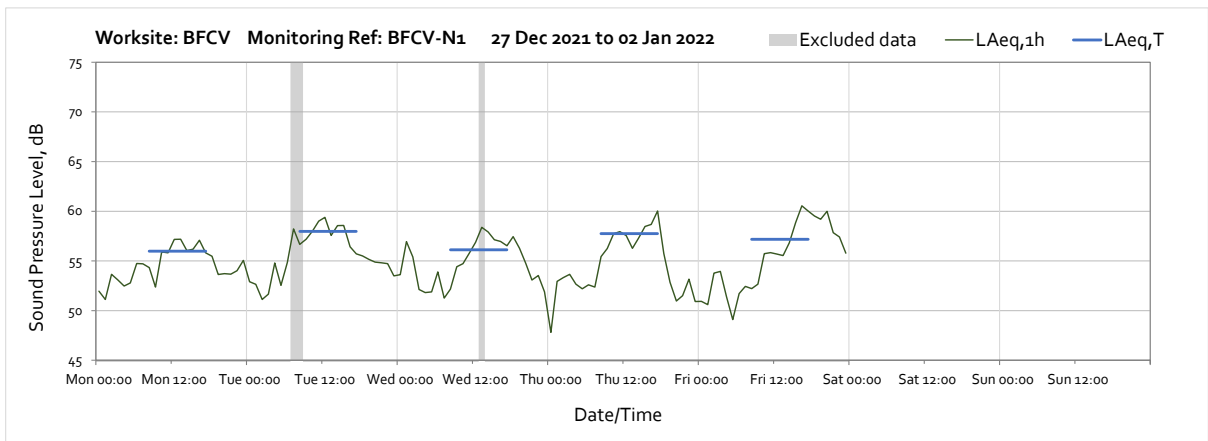
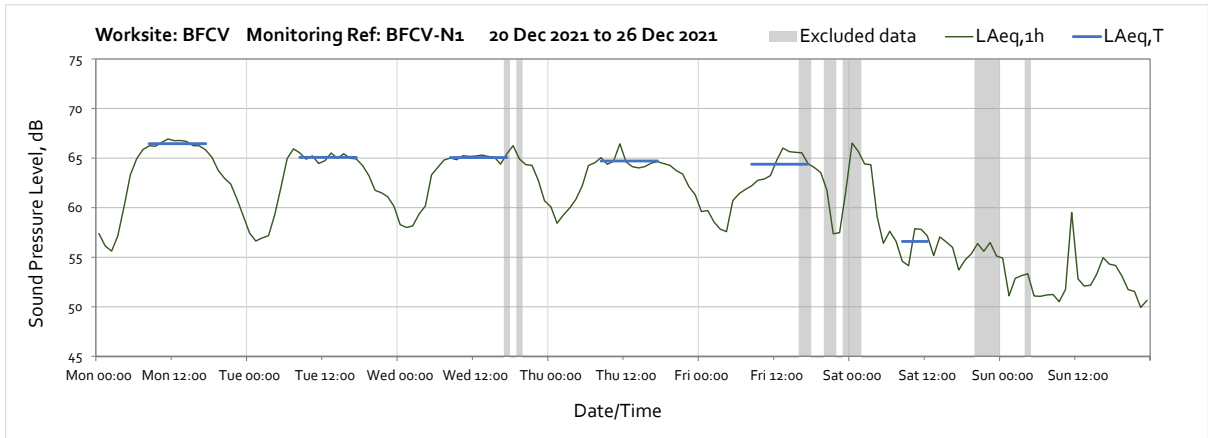
Note: Missing data in between 04:00 and 11:00 on Friday 31<sup>st</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.

## Worksite: BFCV – Monitoring Ref: BFCV-N1

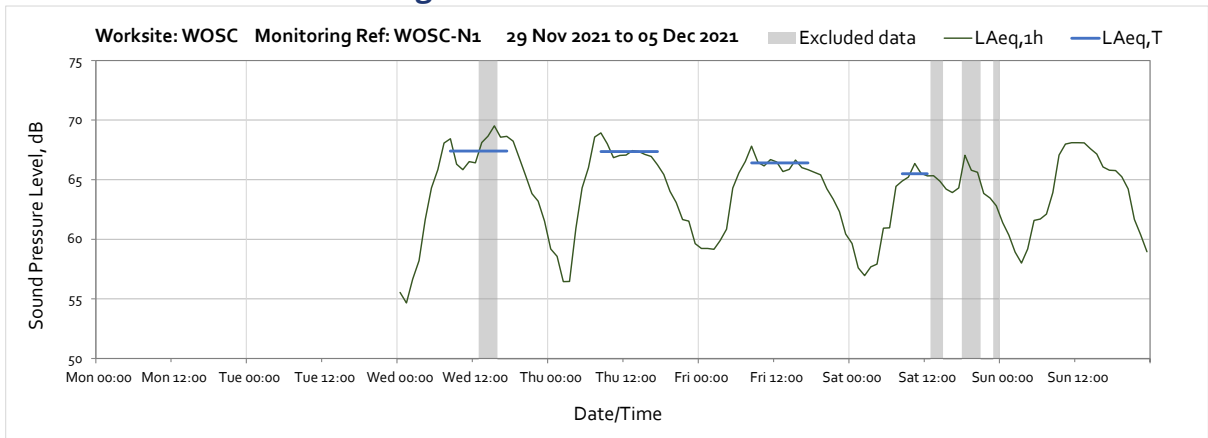


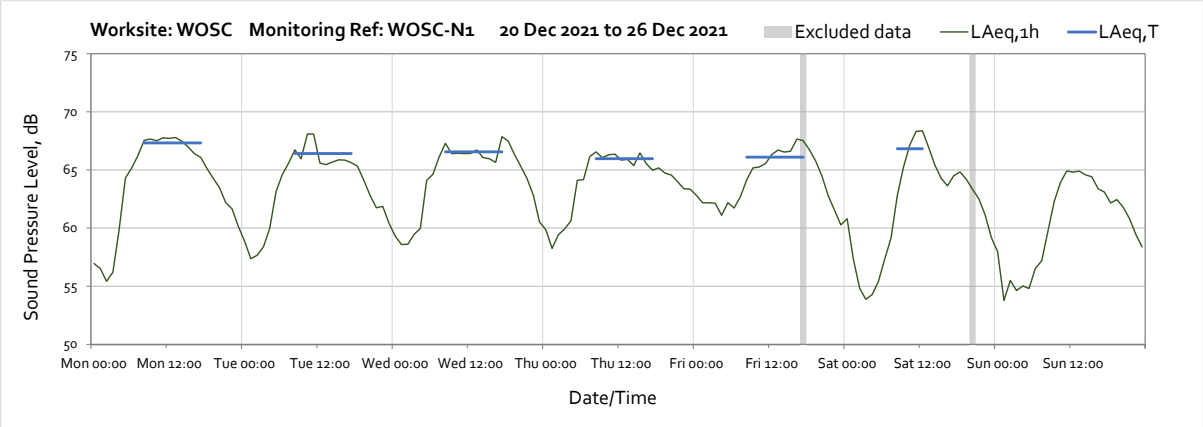
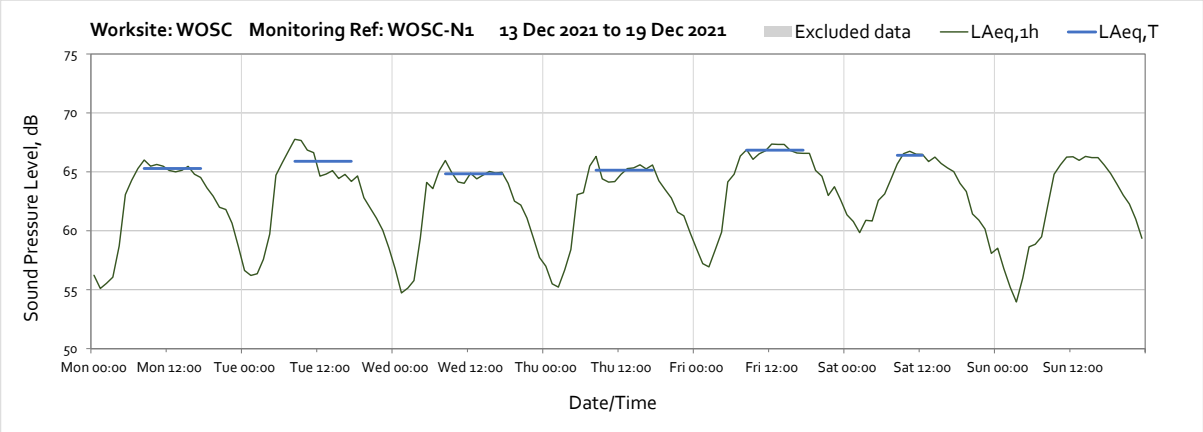
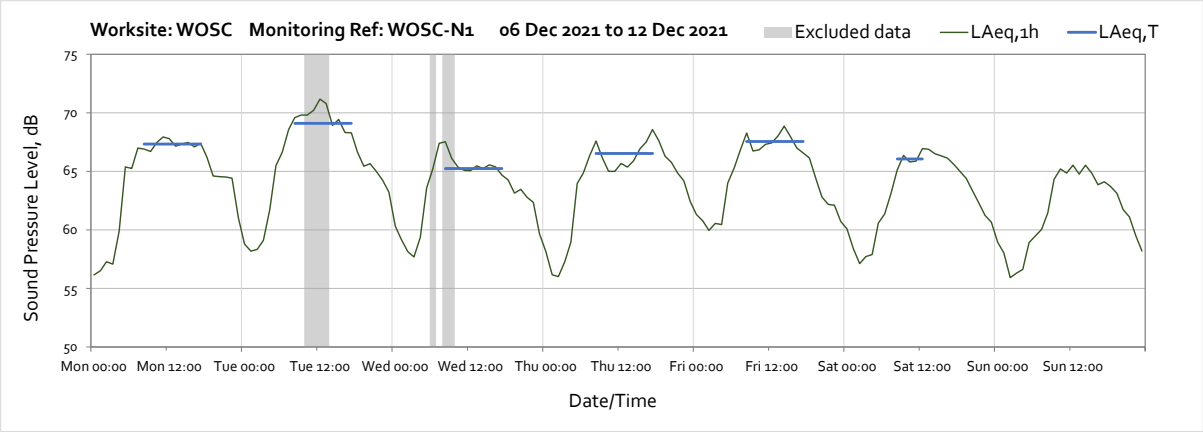
Note: Missing data in between 14:00 on Saturday 11<sup>th</sup> December and 16:00 on Wednesday 15<sup>th</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.



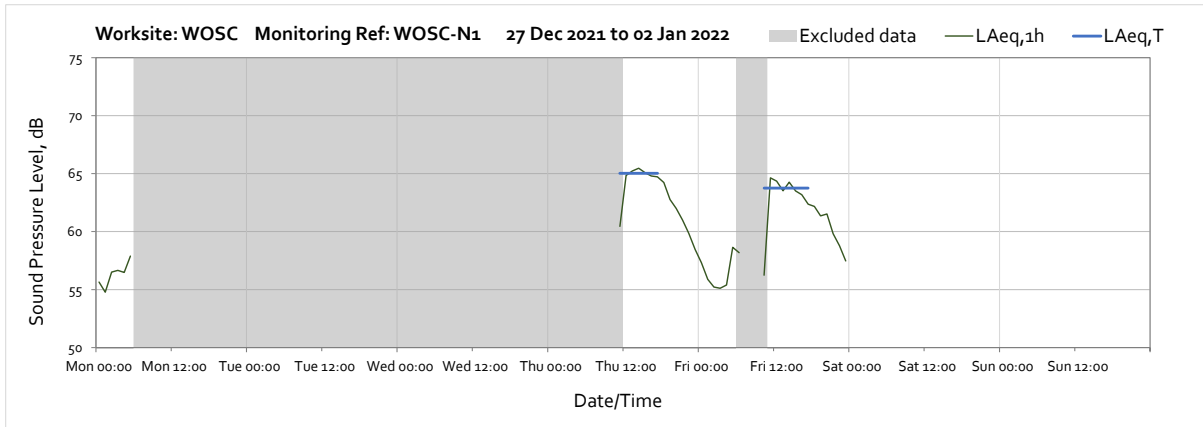


**Worksite: WOSC – Monitoring Ref: WOSC-N1**



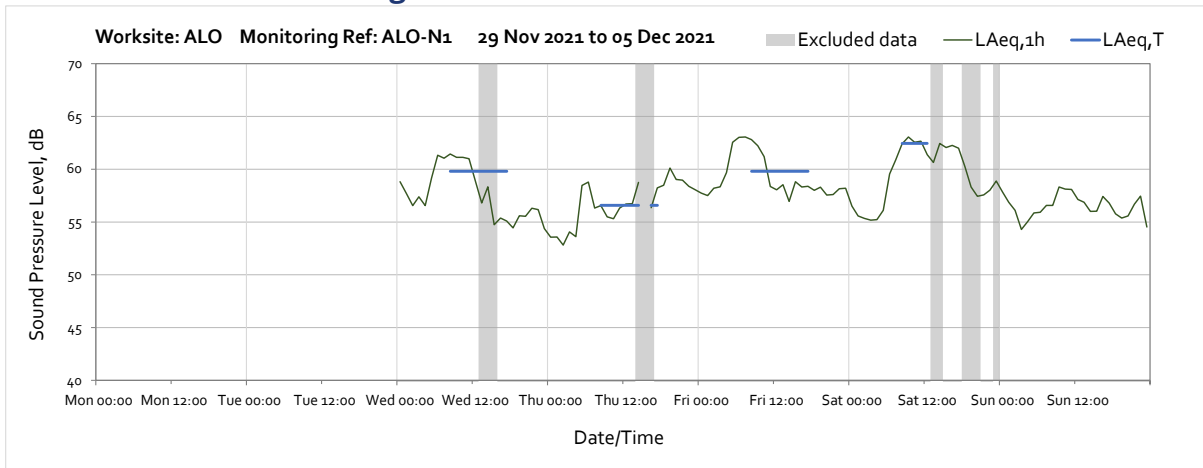




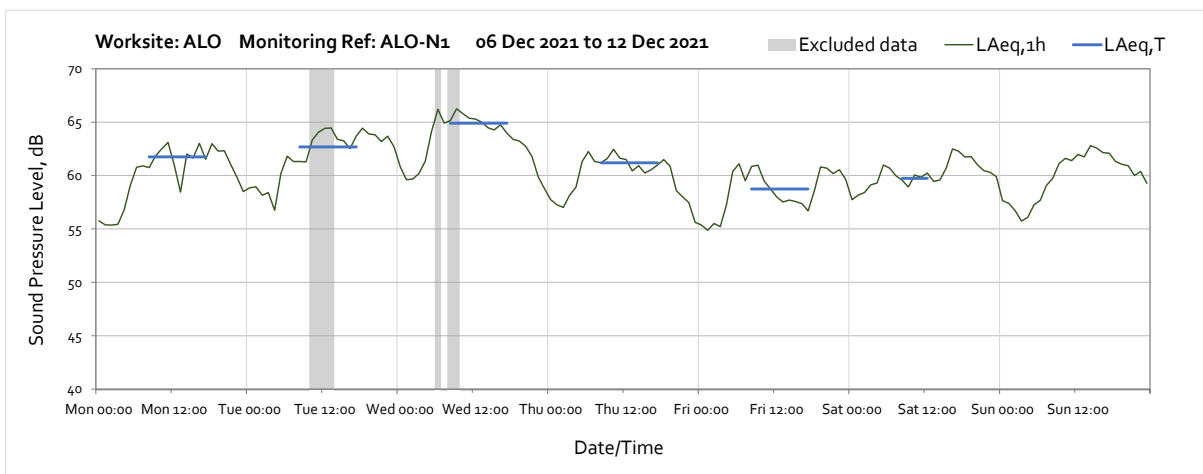


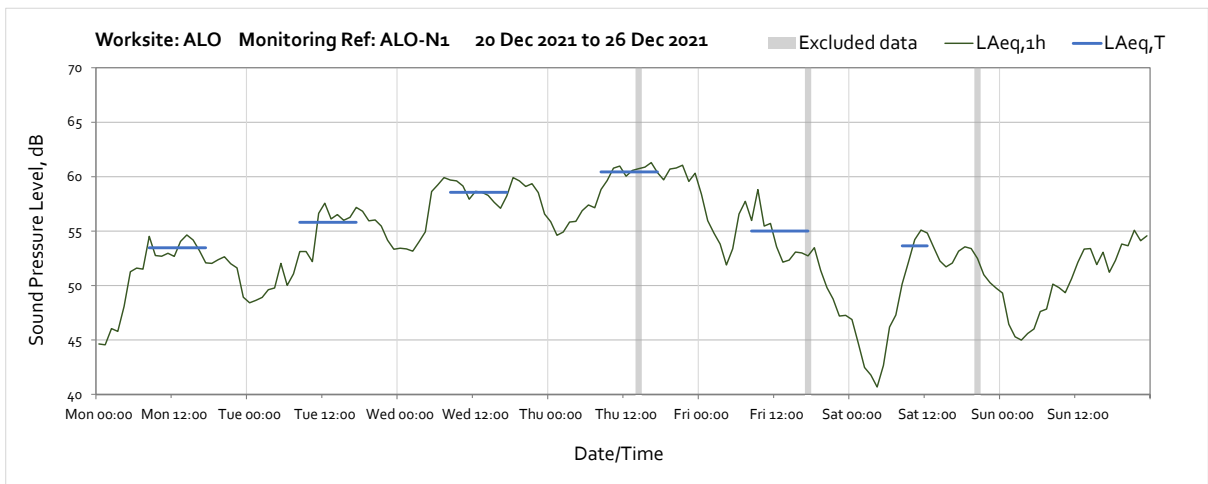
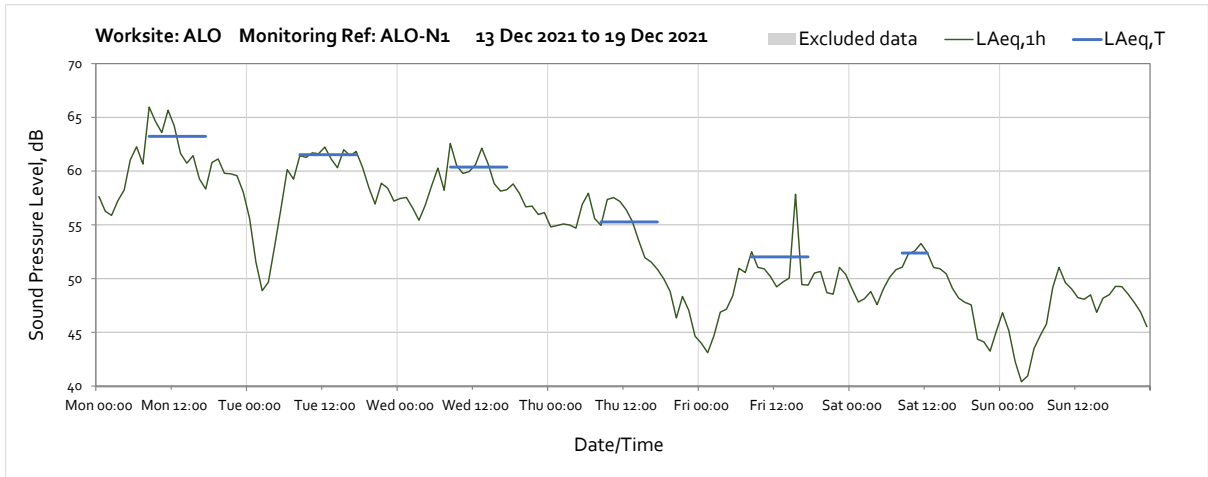
Note: Missing data throughout the week was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.

### Worksite: ALO - Monitoring Ref: ALO-N1



Note: Missing data at 15:00 on Thursday 2<sup>nd</sup> December was due to dust equipment being added to the monitoring station.

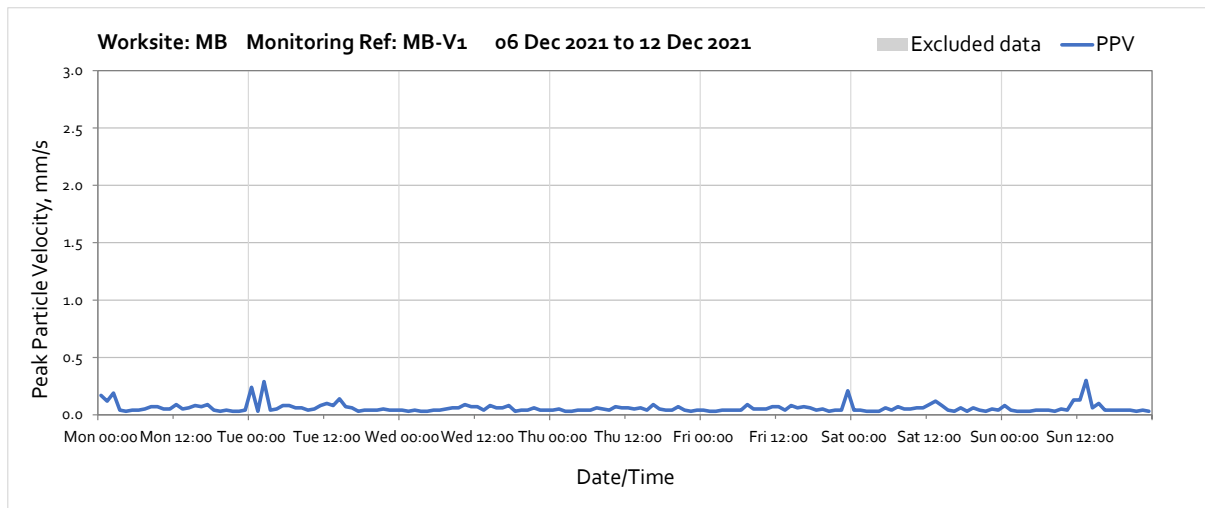
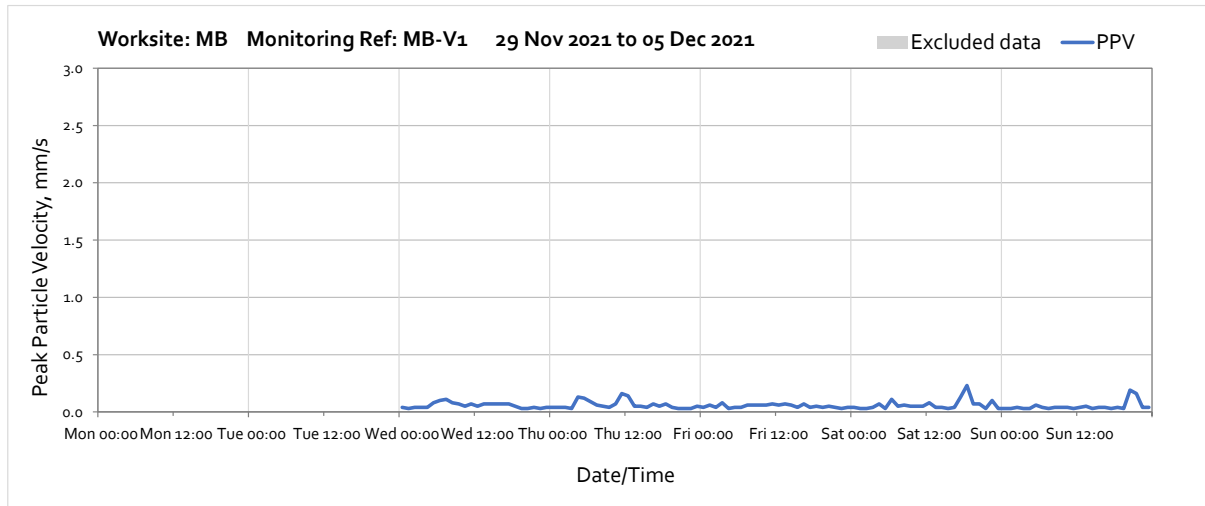


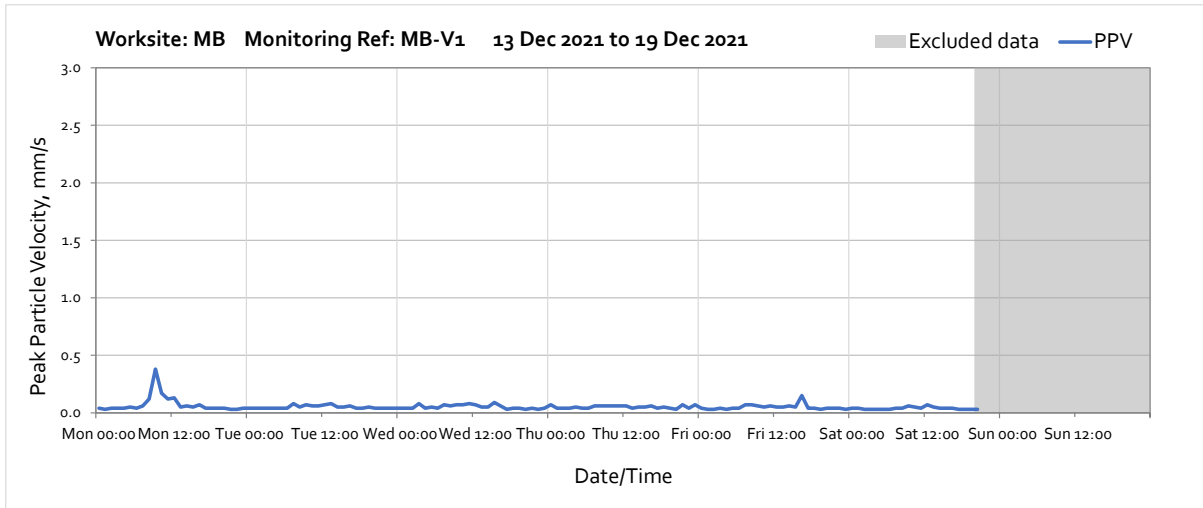


## Vibration

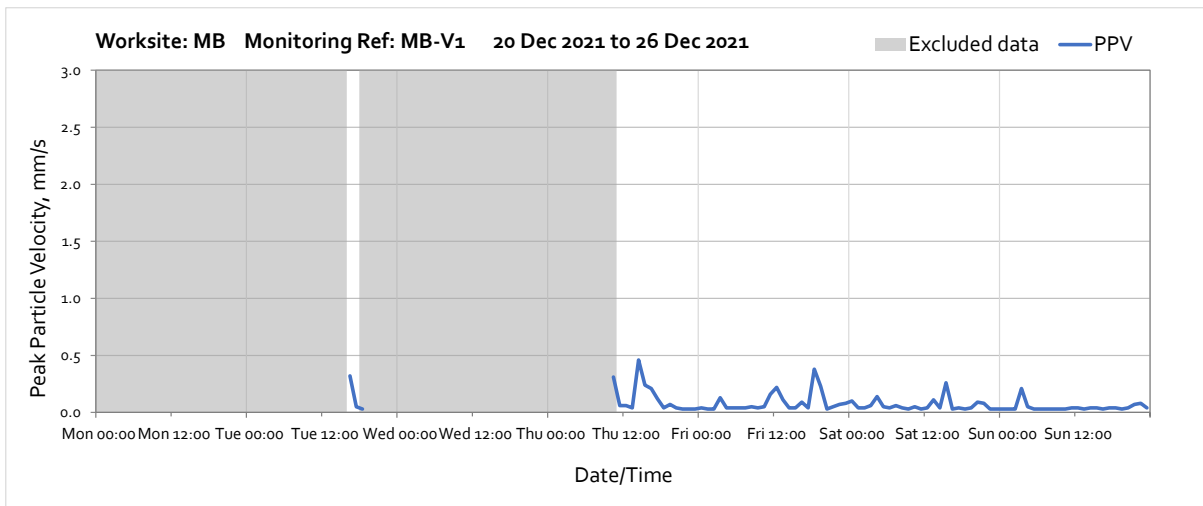
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axes x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative 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: MB – Monitoring Ref: MB-V1

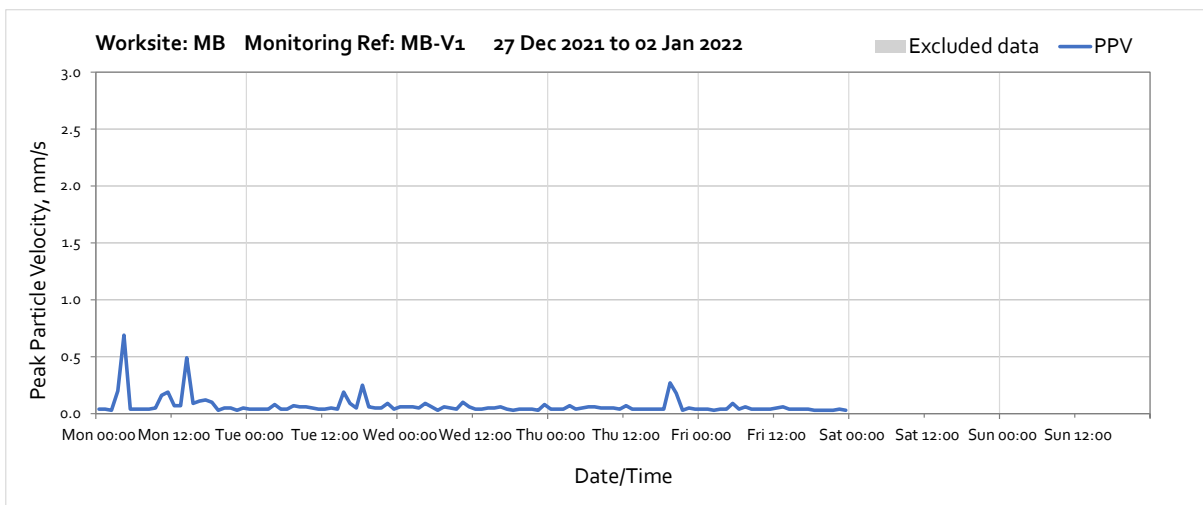


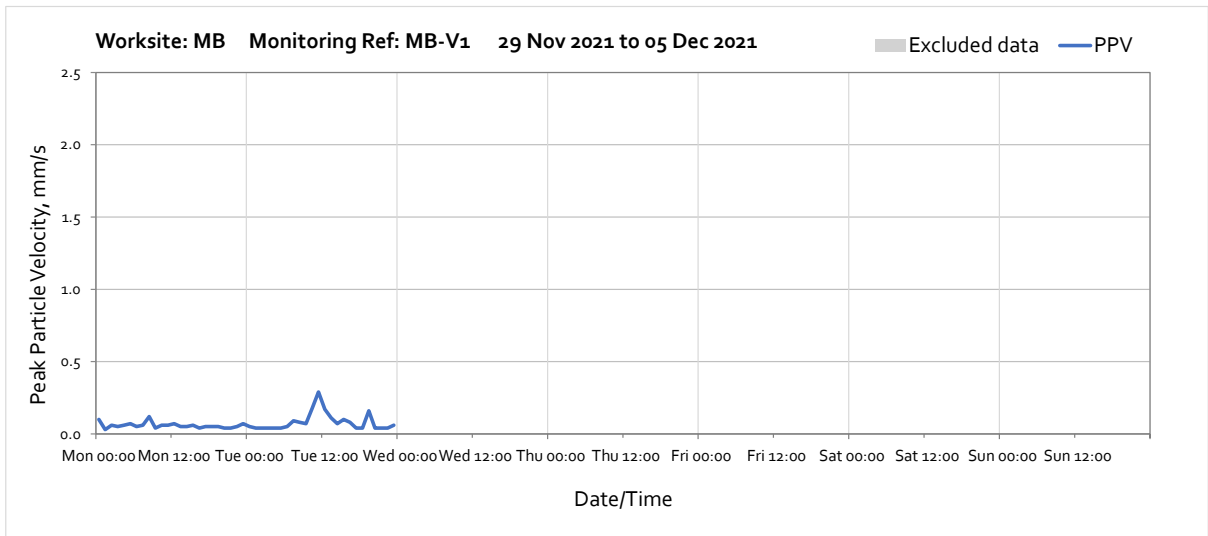


Note: Missing data in between 21:00 on Saturday 18<sup>th</sup> December and 15:00 on Tuesday 21<sup>st</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight. Batteries were replaced on 23<sup>rd</sup> December 2021.

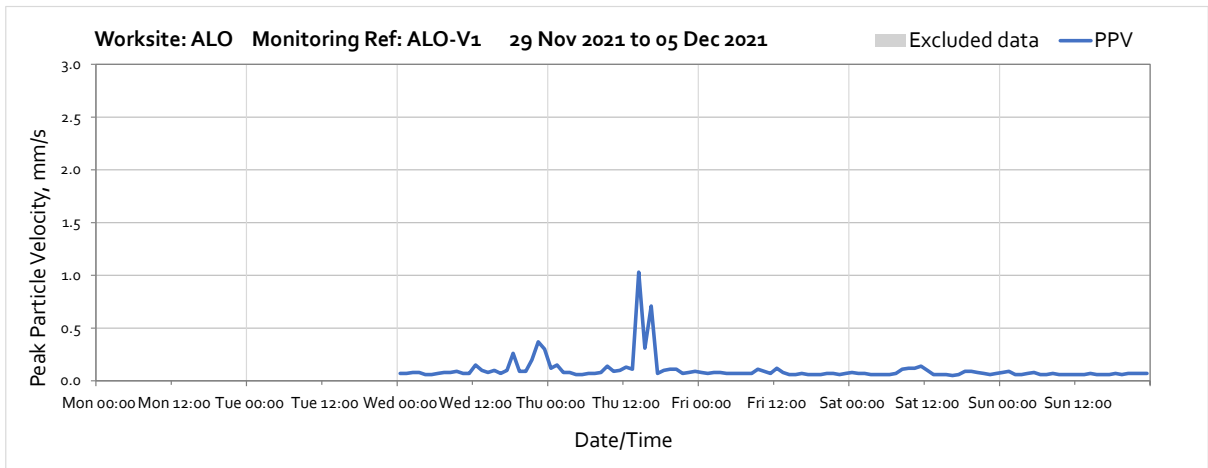


Note: Missing data in between 19:00 on Tuesday 21<sup>st</sup> December and 09:00 on Thursday 23<sup>rd</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight. Batteries were replaced on 23<sup>rd</sup> December 2021.

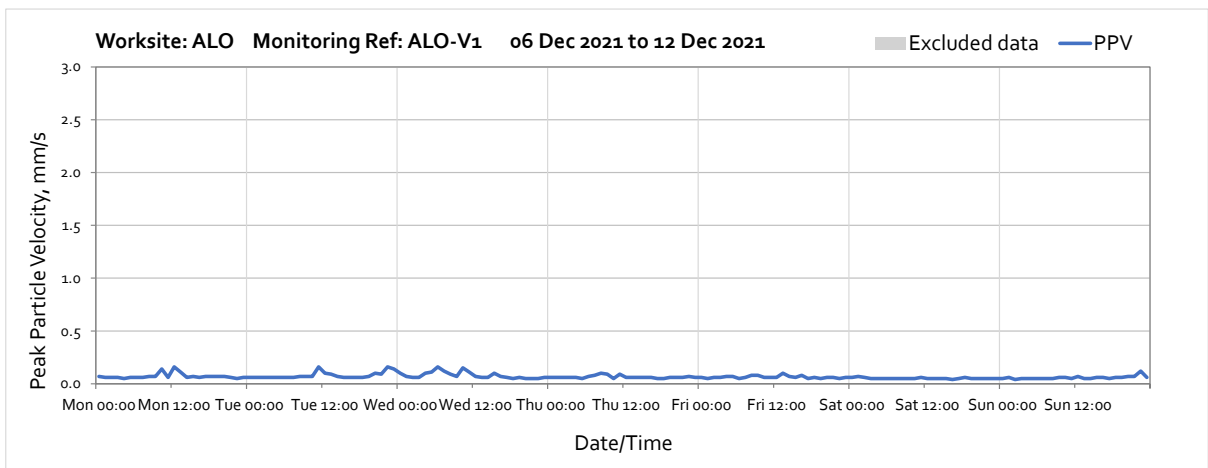


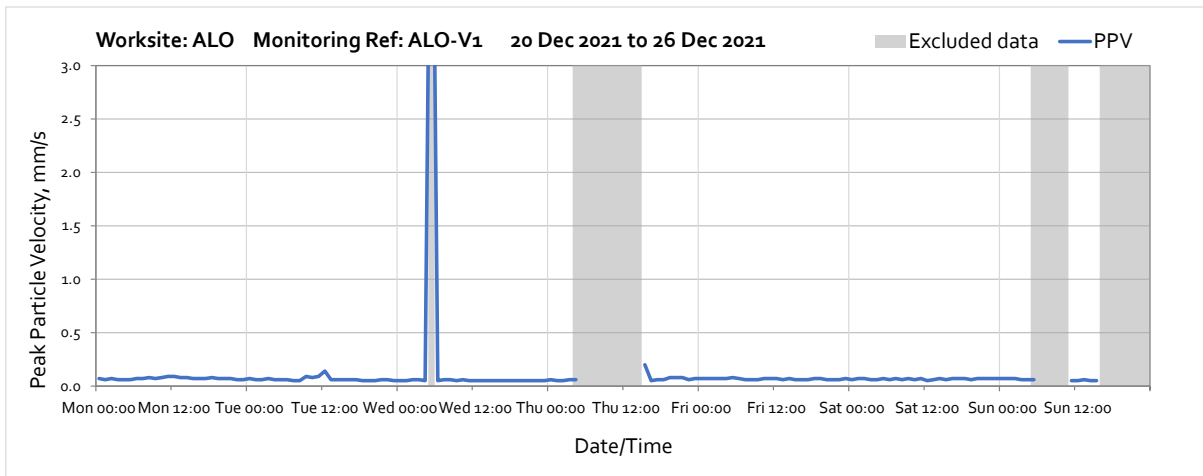
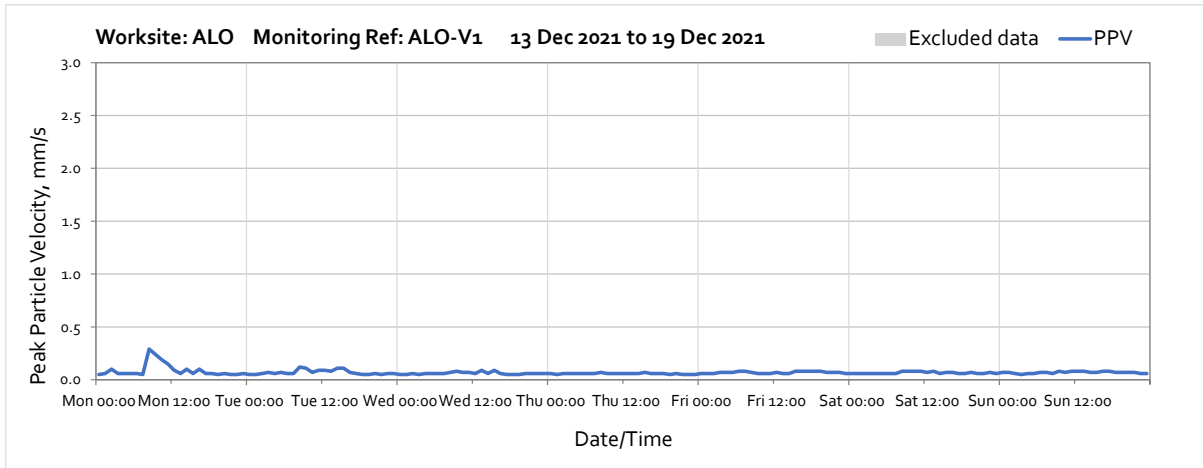


**Worksite: ALO - Monitoring Ref: ALO-V1**



Note: High vibration levels measured at 14:00 on Thursday 2<sup>nd</sup> December were due to stone laying and soil mixing works.

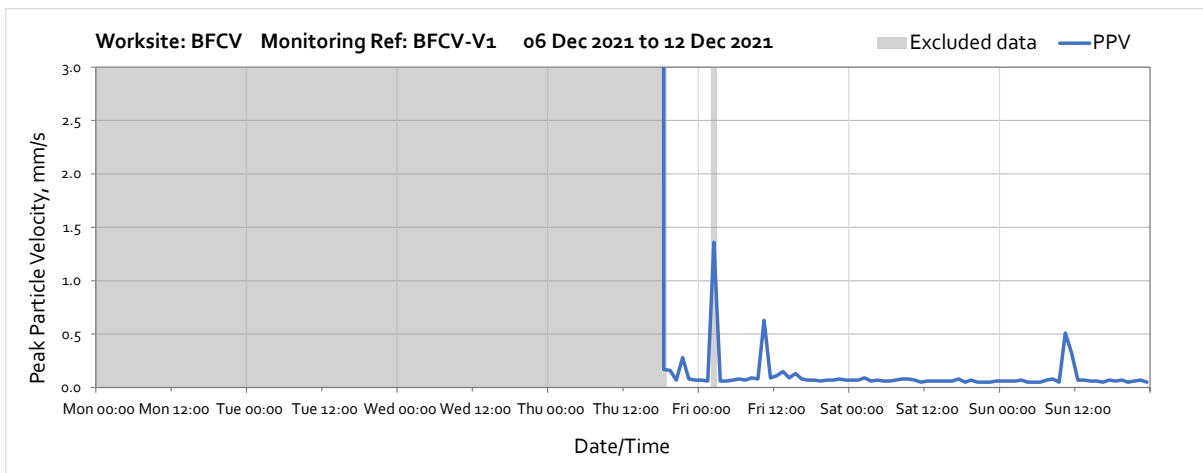




Note: High vibration levels measured at 05:00 on Wednesday 22<sup>nd</sup> December were due to local disturbance, outside of HS2 working hours.

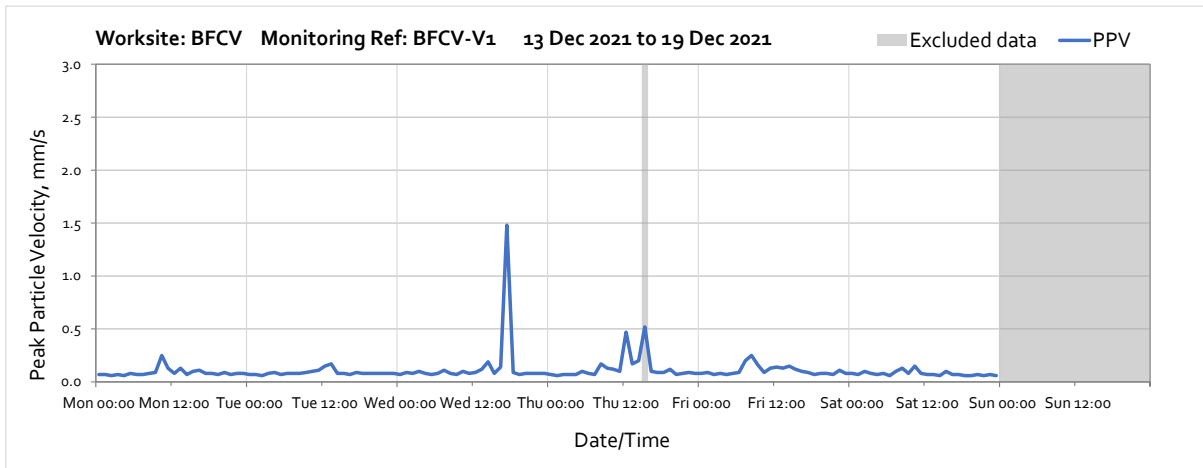
Note: Missing data throughout the week until 23:00 on Friday 31<sup>st</sup> Decemeber was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.

**Worksite: BFCV – Monitoring Ref: BFCV-V1**

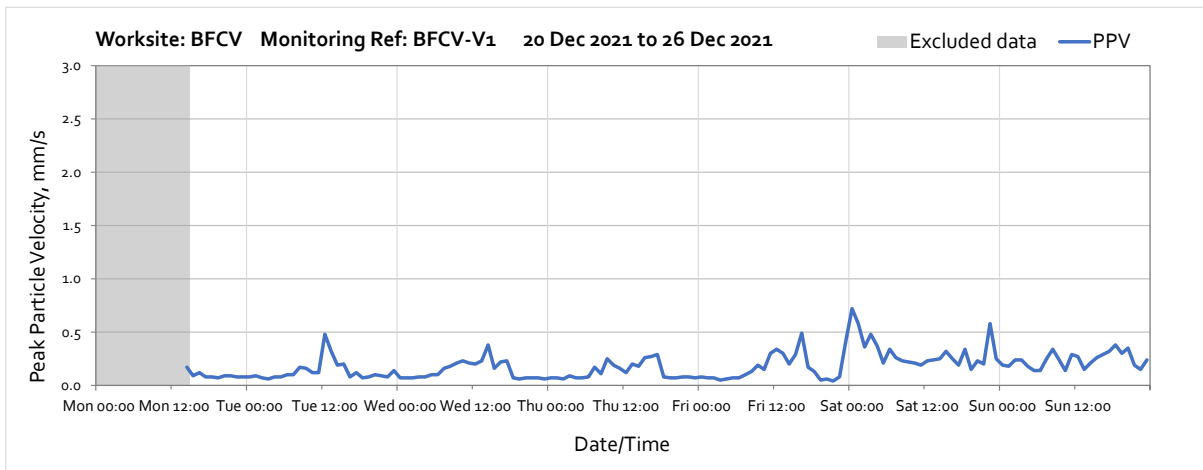


Note: The vibration monitor ref:BFCV-V1 was installed at 17:00 on Thursday 9<sup>th</sup> December 2021.

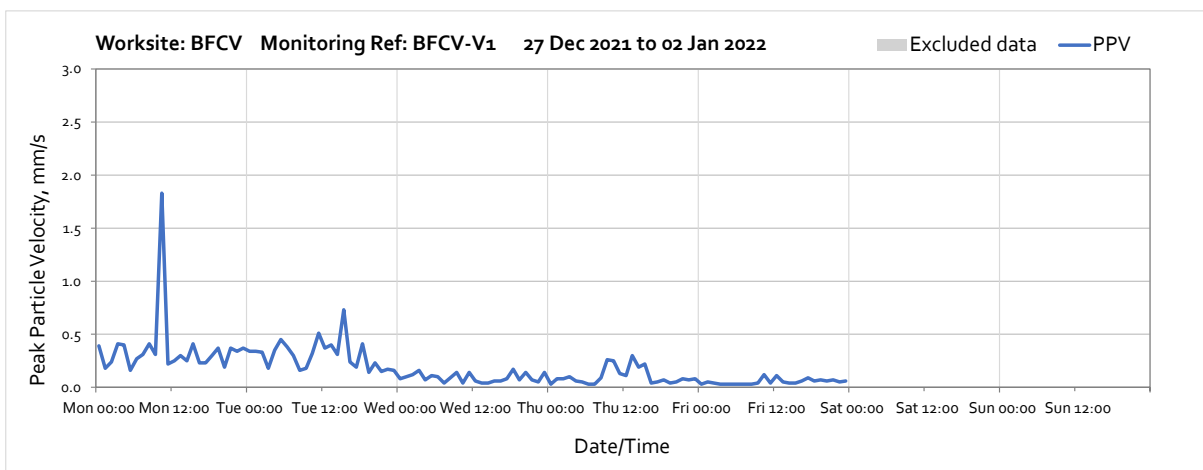
Note: High vibration levels measured at 02:00 on Friday 10<sup>th</sup> December were due to local disturbance, outside of HS2 working hours.



Note: High vibration levels measured at 17:00 on Wednesday 15<sup>th</sup> December were due to construction works undertaken near the monitoring station.



Note: Missing data in between 00:00 on Sunday 19<sup>th</sup> December and 13:00 on Monday 20<sup>th</sup> December was due to battery falling below the required voltage limit caused by prolonged insufficient sunlight.



Note: High vibration levels measured at 10:00 on Monday 27<sup>th</sup> December were due to construction works undertaken near the monitoring station.