

HS2

May 2022

Construction Noise and Vibration Monthly Report – March 2022

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 March 2022.

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 tower crane foundation including pile caps, excavation, laying concrete, construction of road sweeper pit and maintenance of haul roads with a grater.
- Noise monitoring was undertaken at the Kingsbury Main Compound worksite (ref.: KMC), where work activities included moving stockpiles, fencing installation, surfacing, service installation, moving material, earthworks, fuel pipe works, stone delivery, and concrete works.
- Noise monitoring was undertaken at the Faraday Avenue Embankment and Underbridge worksite (ref.: FAEU), where work activities included site and office maintenance, site security, road sweeper, top soil stripping, vegetation clearance, plant and welfare unit deliveries.
- Noise monitoring was undertaken at the Birmingham & Fazeley Canal Viaduct worksite (ref.: BFCV), where work activities included general site and office maintenance, road sweeping, stripping of top soil, piling and platform test.
- Noise monitoring was undertaken at the Water Orton South Compound worksite (ref.: WOSC), where work activities included excavations, shuttering and pouring of concrete for footpaths, installation of bollards for the car parking area, landscaping of top soil, concrete drilling and installation of handrails, welding and cutting of steel doors and work benches for shipping containers.
- Noise monitoring was undertaken at the Attleboro Lane Overbridge worksite (ref.: ALO), where work activities included construction of the compound and haul road, lime stabilisation and stockpiling.

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 exceeded on thirty-five (34) occasions of LOAEL due to HS2 works during the reporting period.

There were no exceedances of trigger levels, as defined in Section 61 consents during the reporting period.

Two (2) complaints were received within the North Warwickshire area during the monitoring period. A description of complaints, the results of investigations and any action 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 +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.

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 1st to 31th March 2022.

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:
 - Tower crane foundations with drilling;
 - De-mobilising;
 - Constructing road sweeper pit;
 - Maintenance.
- Kingsbury Main Compound worksite, ref.: KMC (see Plan 1 in Appendix A), where work activities included:
 - Stockpiling moving works and clean up the area;
 - Fencing installation;
 - Road surfacing works;

- Power connection installation;
 - Road sweeping works;
 - Moving material;
 - Earthworks, including top soil strip and bulk excavation;
 - Fuel pipe works, including excavation of trenches, installation of trench box and backfilling ;
 - Delivery of stone;
 - Concrete works.
- Faraday Avenue Embankment and Underbridge worksite, ref.: FAEU (see Plan 2 in Appendix A), work activities included:
 - Top soil stripping;
 - Vegetation clearance;
 - Deliveries;
 - Site set up.
 - Birmingham & Fazeley Canal Viaduct worksite, ref.: BFCV (see Plan 1 in Appendix A), work activities included:
 - Stripping of topsoil for working platform;
 - Piling platform test.
 - Water Orton South Compound worksite, ref.: WOSC (see Plan 2 in Appendix A), work activities included:
 - Excavation and installation of foundations;
 - Shuttering and concrete laying;
 - Topsoil stripping;
 - Drilling;
 - Welding.
 - Attleboro Lane Overbridge worksite, ref.: ALO (see Plan 1 in Appendix A), work activities included:
 - Compound construction.

1.1.4 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 monitoring installations and three (3) vibration monitoring installations were active in March in the NWBC area. Table 2 summarises the position of noise and vibration monitoring installations within the NWBC area in March 2022.
- 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
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	Orchard Cottage, Newlands Lane, Curdworth,
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-N1	Lock Cottage, Marston Lane, Curdworth
	BFCV-V1	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	47 Attleboro Lane, Water Orton, Birmingham
	ALO-V1	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 LAeq Data over the Monitoring Period

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade Measurement	Weekday Average LAeq,T (highest day LAeq,T)					Saturday Average LAeq,T (highest day LAeq,T)					Sunday / Public Holiday Average LAeq,T (highest day LAeq,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
WOSC - Water Orton South Compound	SLD6NC-WOSC-N1	53 Watton Lane, Water Orton CP, Warwickshire, B46 1PB	Free field	67.4 (69.4)	66.7 (69.7)	66.0 (68.3)	64.1 (67.4)	62.6 (68.8)	64.1 (64.8)	66.5 (67.3)	66.6 (66.9)	65.8 (68.3)	59.8 (63.4)	65.1 (68.2)	61.0 (66.4)
ALO - Attleboro Lane Overbridge	SLD6NC-ALO-N1	47 Attleboro Lane, Water Orton, Birmingham, B46 1SB	Free field	57.4 (63.2)	61.0 (64.9)	55.2 (61.0)	55.3 (60.6)	54.3 (63.0)	55.7 (59.6)	57.5 (61.5)	54.3 (60.3)	53.4 (61.5)	50.1 (58.1)	53.1 (61.8)	53.7 (62.8)
KMC - Kingsbury Main Compound	SL7-KMC-N1	Kingsbury Road, Curdworth CP, Marston, Warwick, West Midland B76 0DH	Free field	58.0 (61.9)	58.3 (62.3)	55.8 (61.0)	54.3 (60.4)	54.7 (62.2)	55.1 (57.9)	55.0 (58.0)	53.7 (57.5)	53.5 (58.0)	51.8 (55.3)	52.7 (57.5)	54.5 (61.4)
BFC - Birmingham Fazeley Canal	SL7-BFCV-N1	Lock Cottage, Marston Lane, Curdworth CP, North Warwickshire, B76 0DG	Free field	67.0 (69.1)	66.6 (68.8)	66.9 (68.2)	65.3 (68.4)	64.5 (70.8)	64.6 (66.4)	67.0 (68.0)	67.9 (69.4)	66.7 (68.8)	62.2 (65.6)	66.8 (74.3)	63.6 (69.9)
MB - Marston Box	SL7-MB-N1	Kingsbury Road, Curdworth, Sutton Coldfield, West Midland, B76 0DF	Free field	57.6 (61.4)	56.9 (60.8)	57.7 (62.5)	55.9 (62.6)	54.6 (61.8)	56.1 (58.8)	58.4 (61.3)	54.9 (55.9)	56.6 (65.1)	51.6 (56.4)	55.5 (63.5)	53.4 (61.6)
FAEU - Faraday Avenue Embankment and Underbridge	SL7-FAEU-N1	Orchard Cottage, Newlands Lane, Curdworth, Warwickshire, B76 0BE	Free field	57.3 (61.5)	56.2 (65.3)	54.7 (59.6)	53.9 (59.3)	54.4 (63.2)	54.6 (56.5)	53.9 (57.6)	54.7 (56.8)	51.6 (56.8)	50.0 (55.8)	51.7 (57.8)	54.2 (61.5)

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	0.37 (X-axis)
Attleboro Lane Overbridge (ALO)	ALO-V1	47 Attleboro Lane, Water Orton, Birmingham	1.39 (X-axis)
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-V1	Lock Cottage, Marston Lane, Curdworth	6.67 (Z-axis)*

* High vibration levels at this receptor were due to HS2 related works undertaken at close proximity to the monitor. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower.

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	Orchard Cottage, Newlands Lane, Curdworth	Weekdays	0800-1800	1	No exceedance
Birmingham & Fazeley Canal Viaduct worksite (BFCV)	BFCV-N1	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	Weekdays Saturdays	08:00-18:00 08:00-13:00	23 4	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
Attleboro Lane Overbridge (ALO)	ALO-N1	47 Attleboro Lane, Water Orton, Birmingham	Weekdays	0800-1800	6	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 March 2022. LOAEL exceedances were recorded at noise monitoring locations FAEU-N1 , WOSC-N1 and ALO-N1 during core working 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

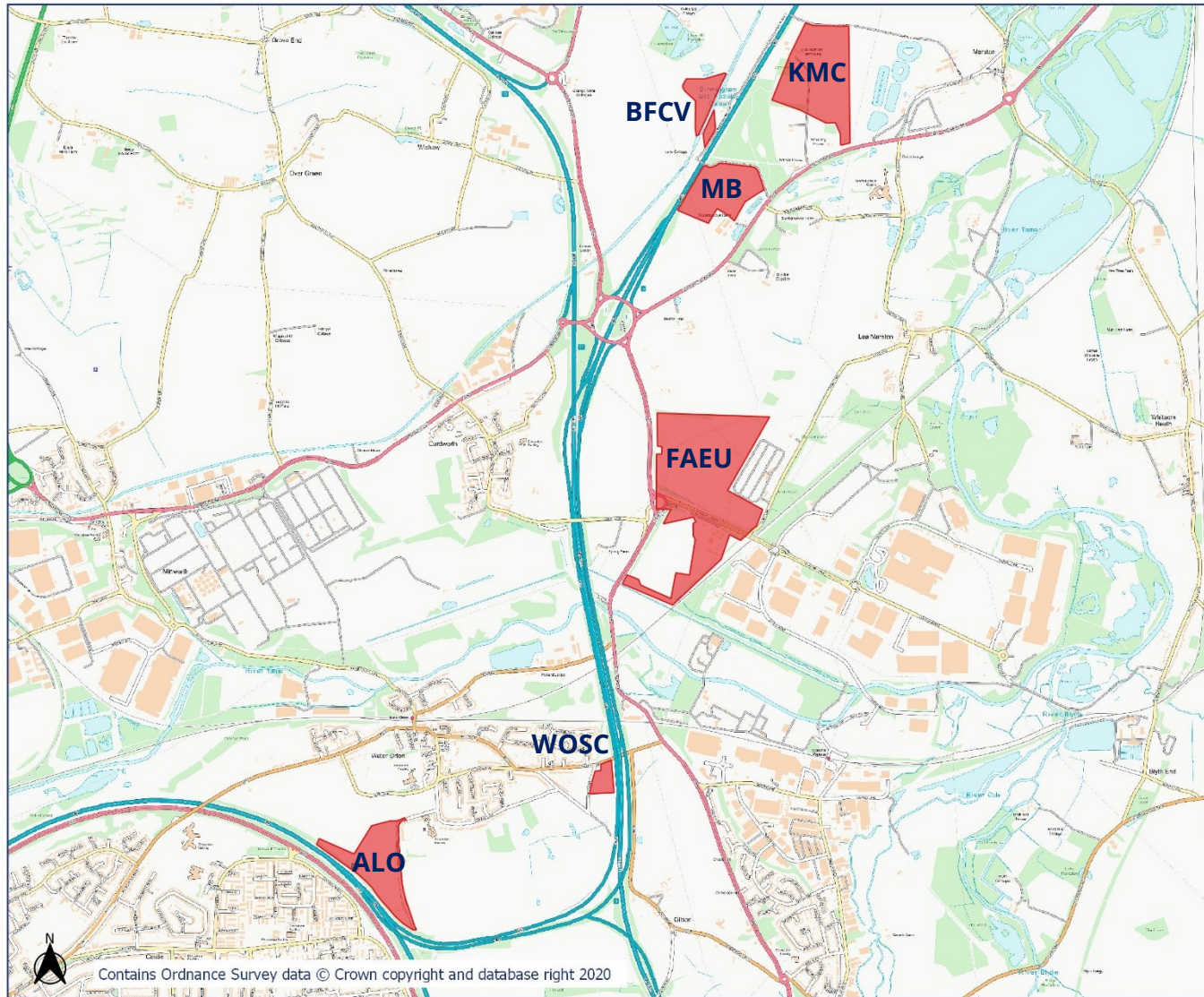
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

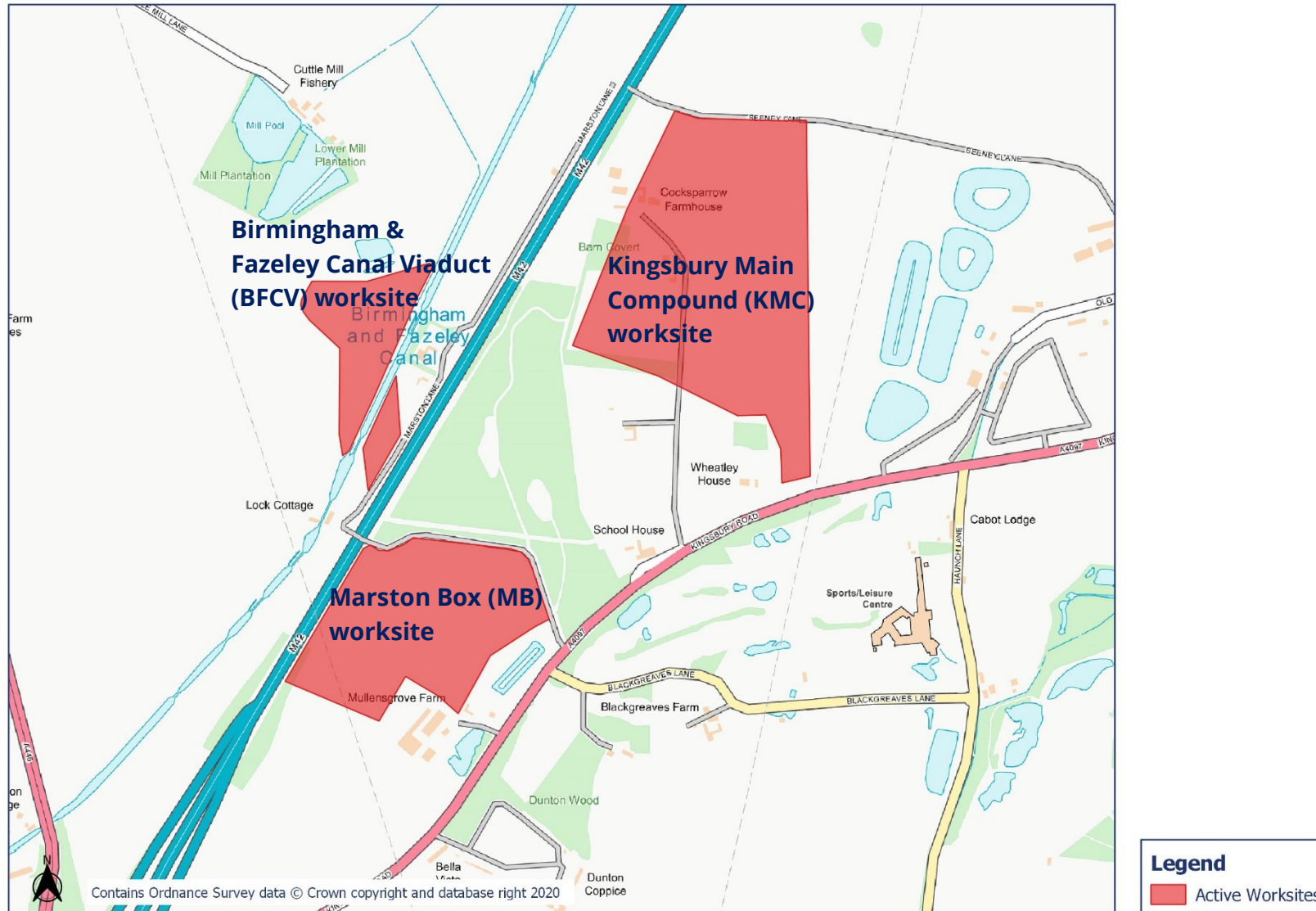
Table 7: Summary of Complaints

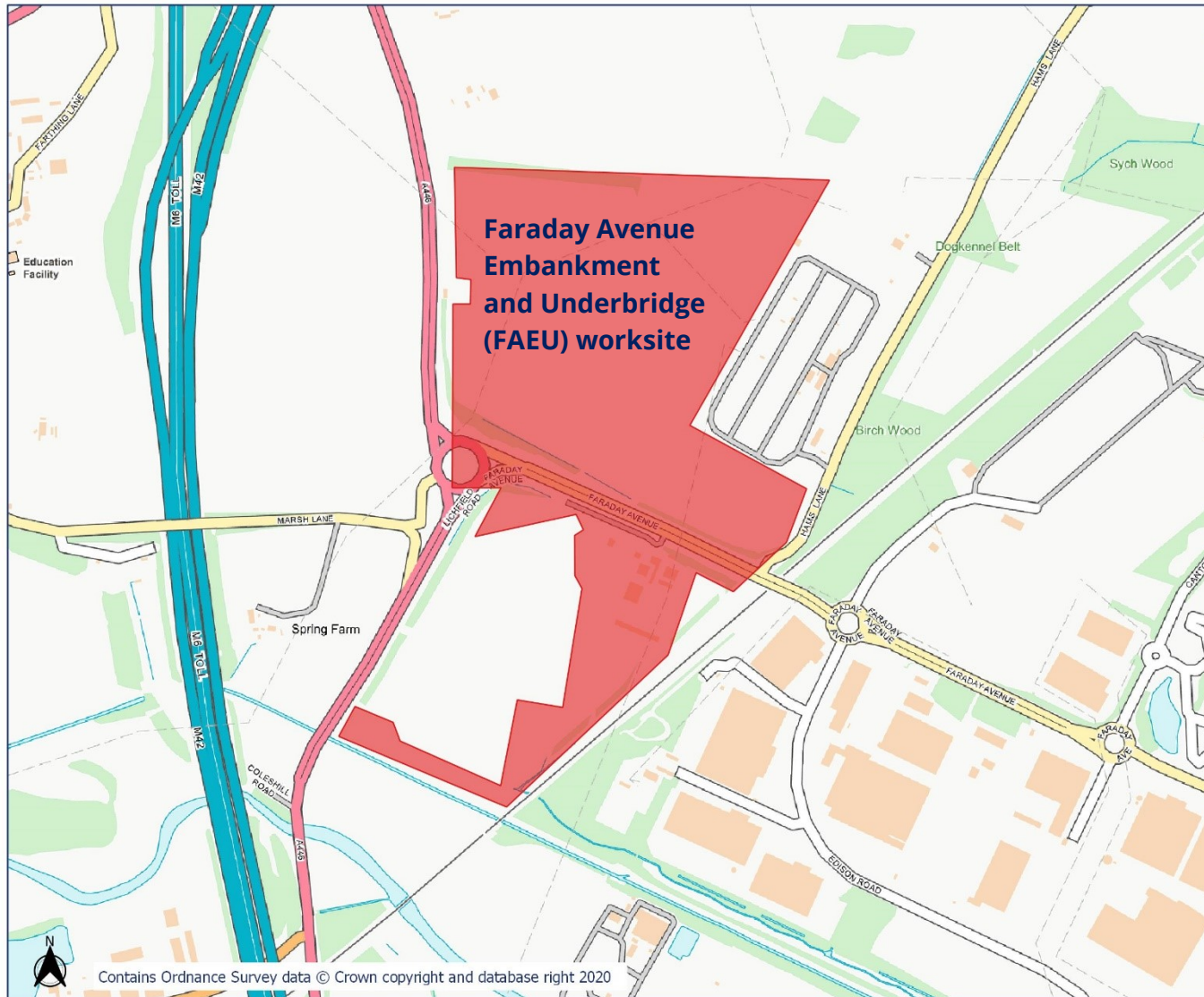
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-22-43407-C	Marston Box (MB)	Noise disturbance experienced by residents at 3AM. Described as loud vacuum/thumping sound for 3 hours.	Not BBV/HS2 related works. Contractor advises National Highways was carrying out work at the time and was the most likely source of noise.	Outcome of investigation confirmed to the stakeholder.

HS2-22-43463-C	Marston Box (MB)	Noise disturbance from loud construction works taking place during the night.	No HS2 related works being undertaken in the area at night that could have been the source of the reported noise disturbance.	Outcome of investigation confirmed to the stakeholder.
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Appendix A Site Locations

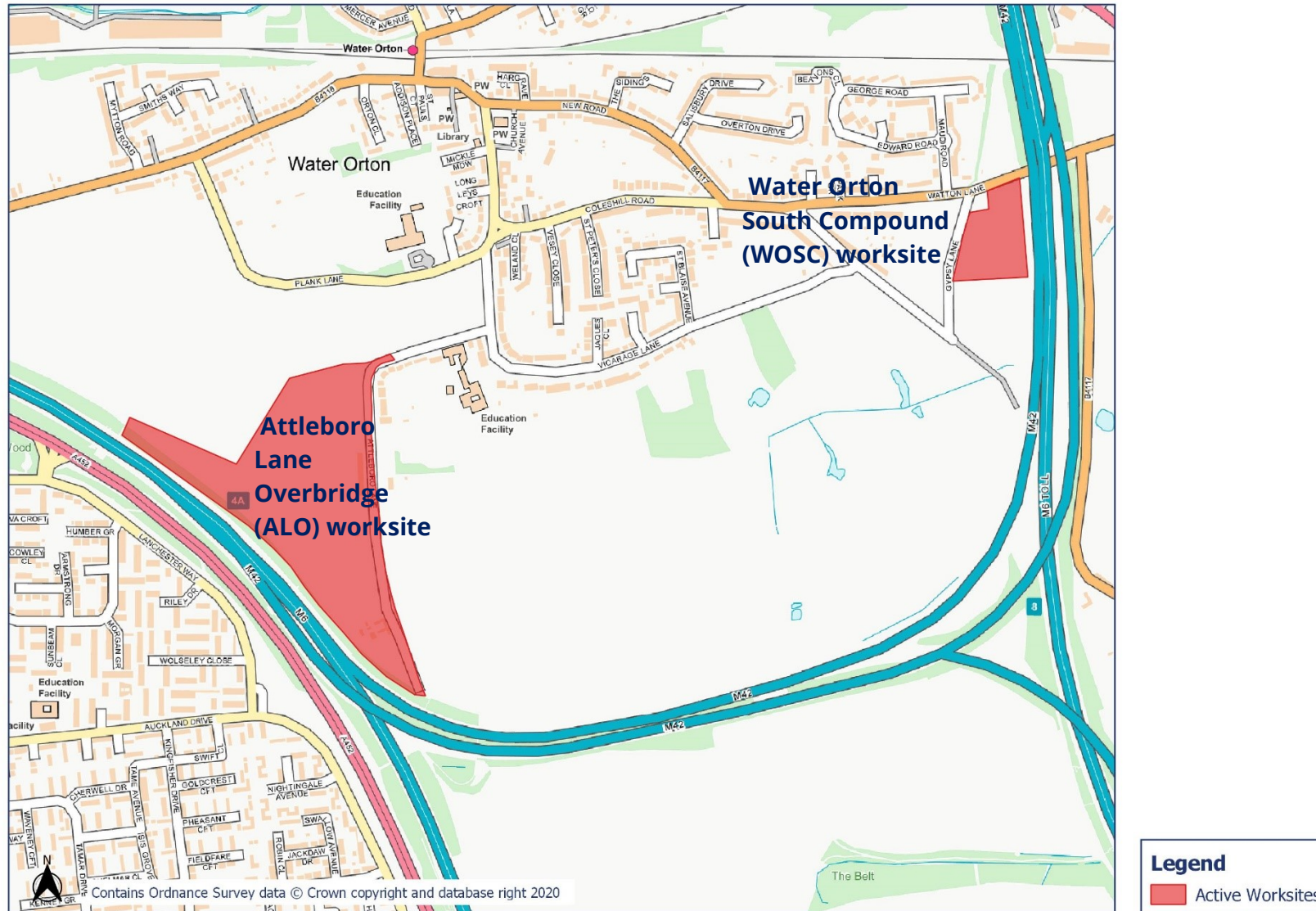




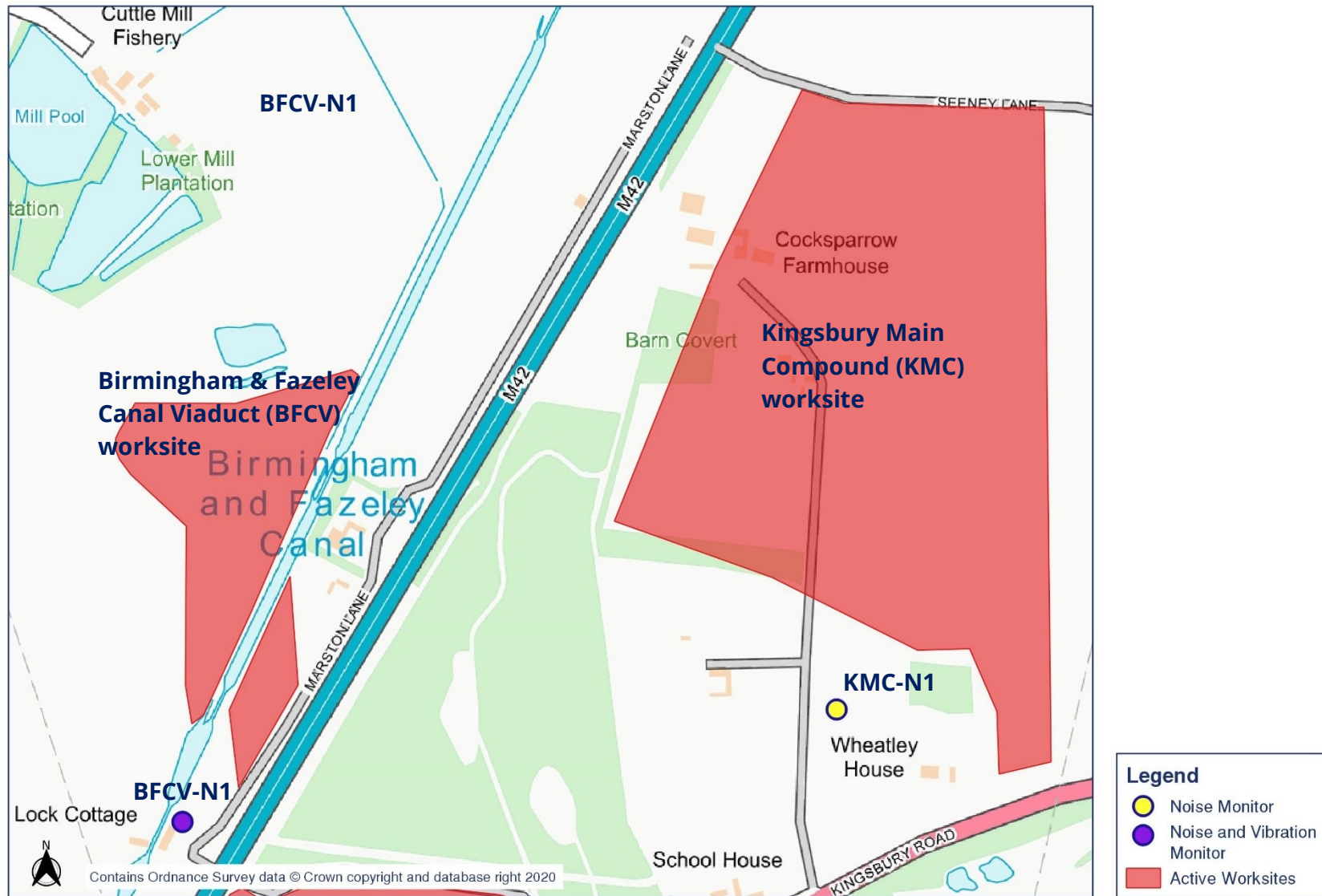


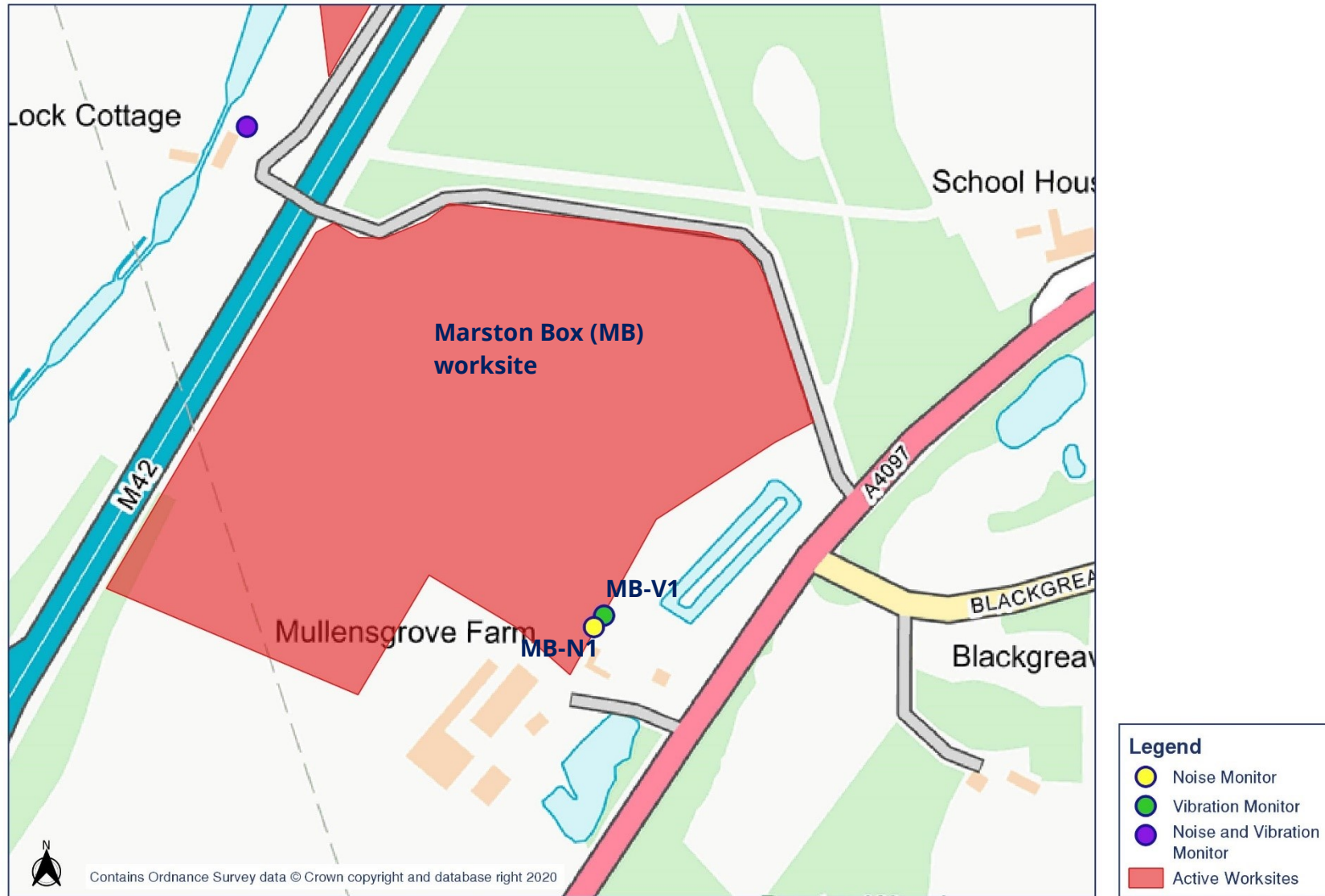
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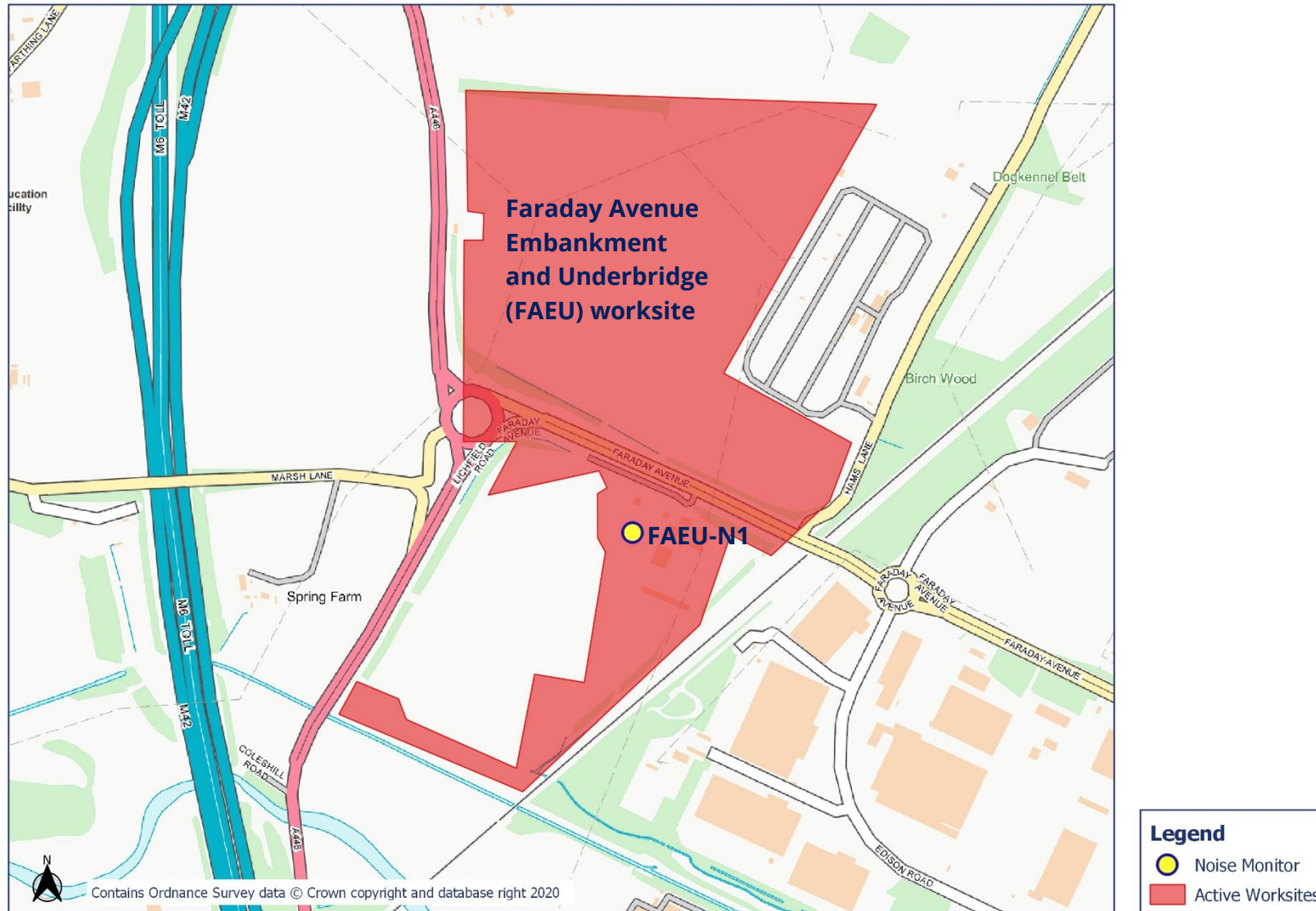
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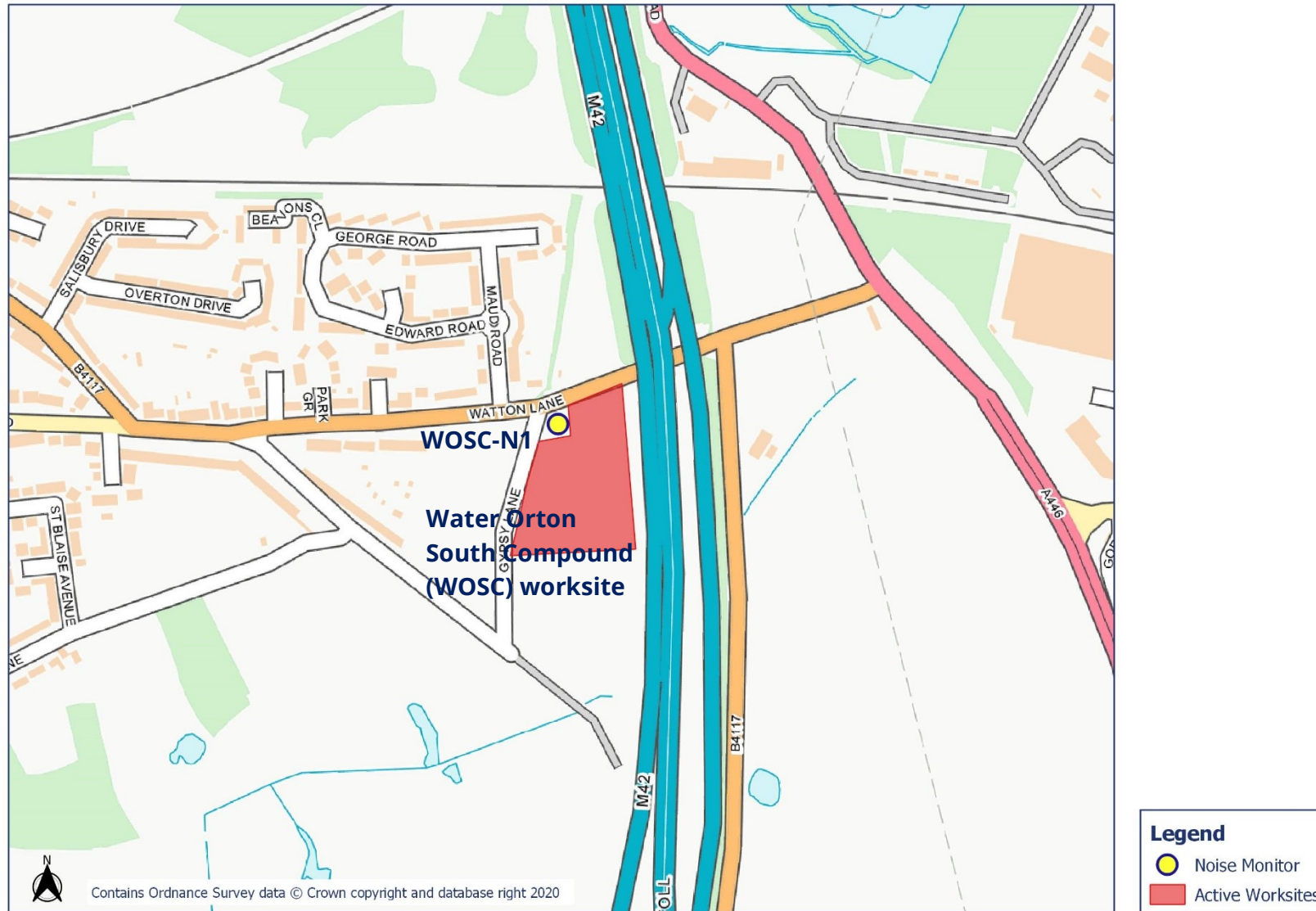


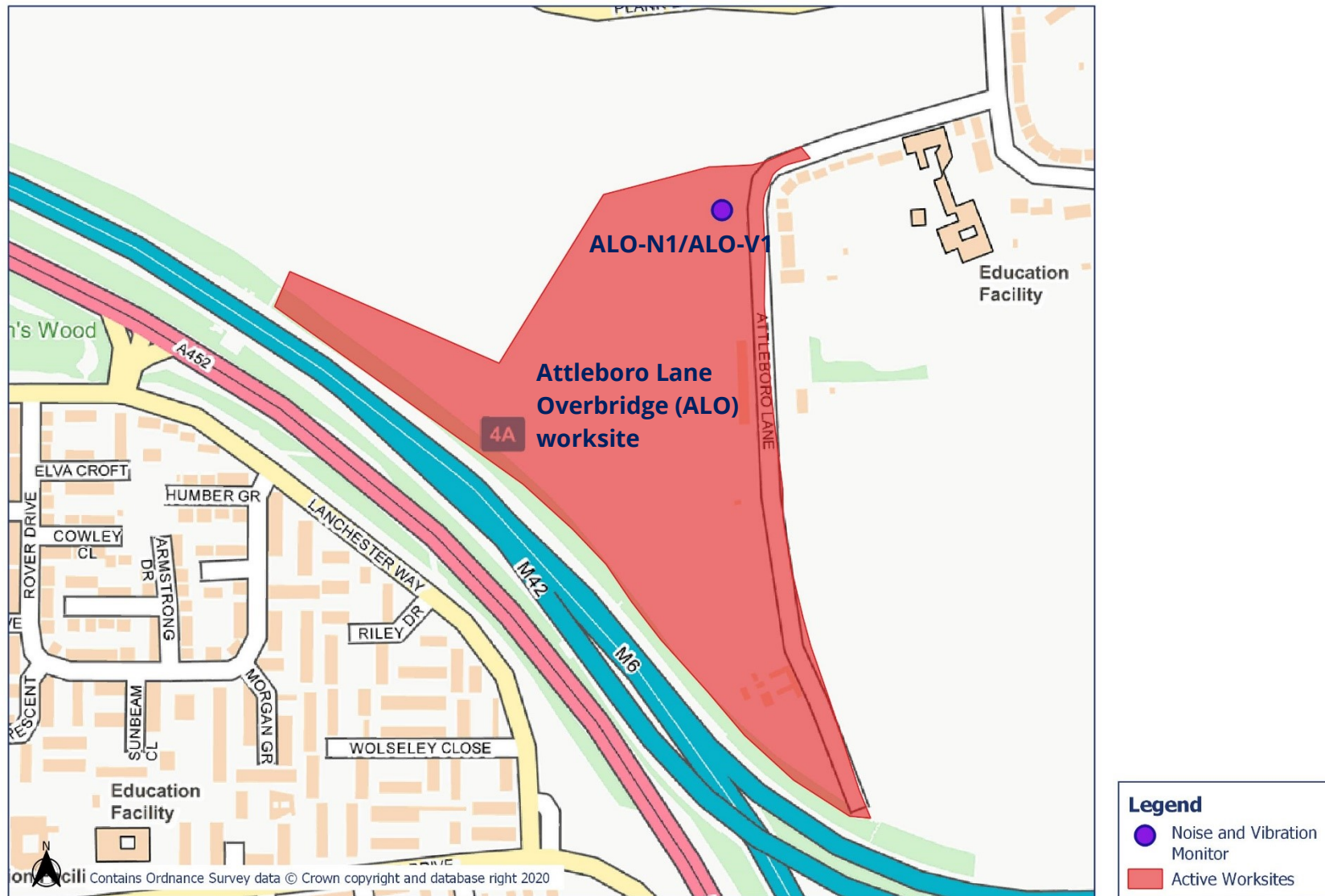
Appendix B Monitoring Locations









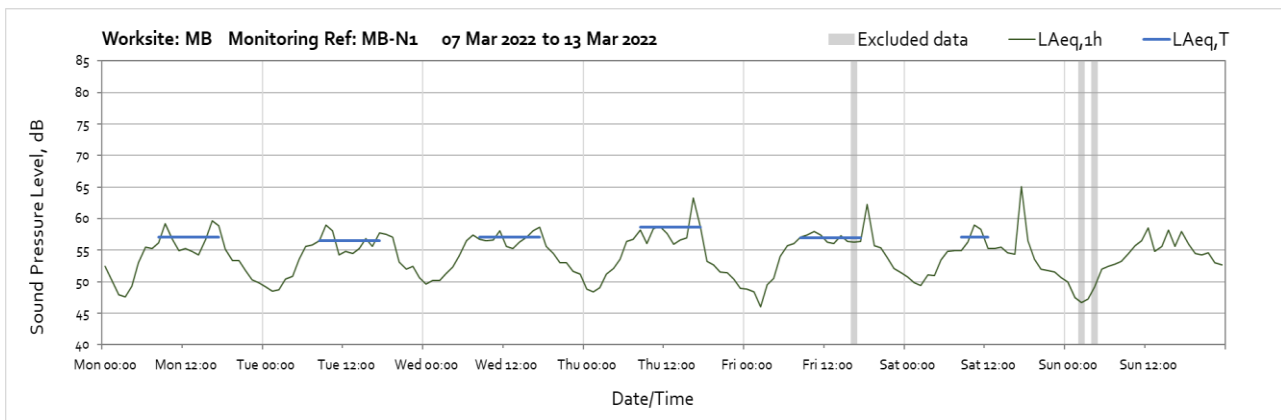
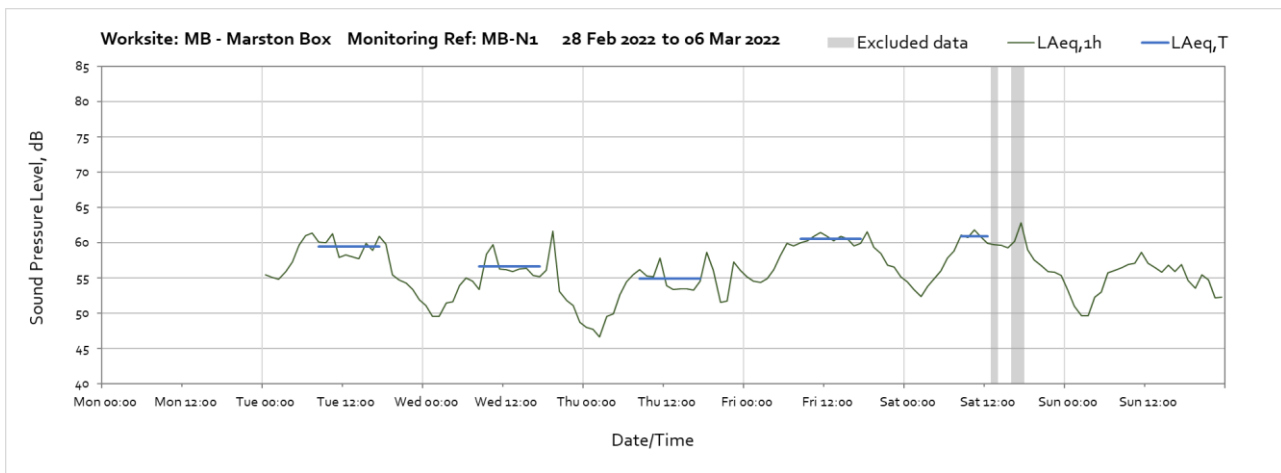


Appendix C Data

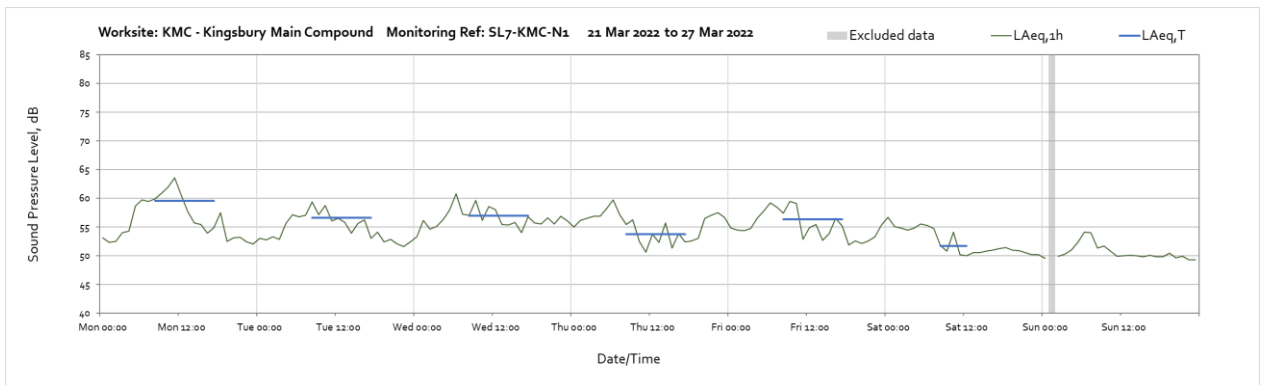
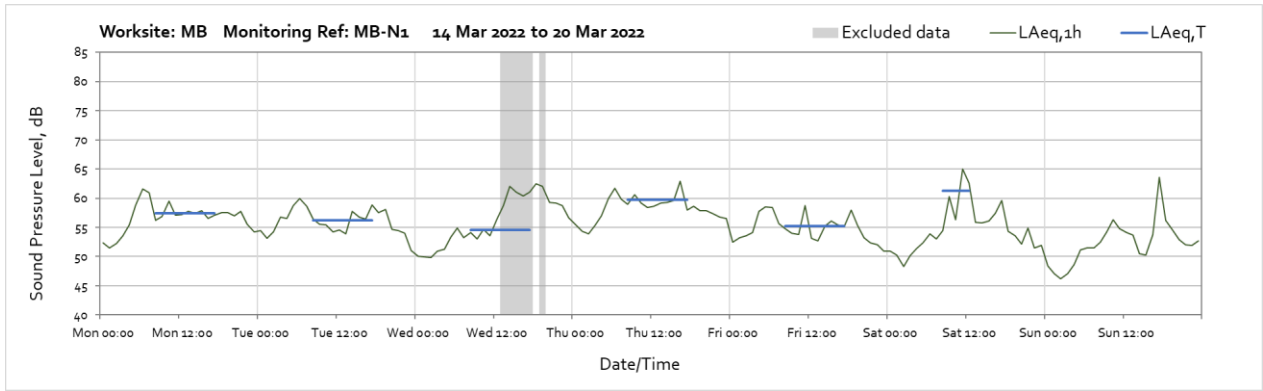
Noise

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.

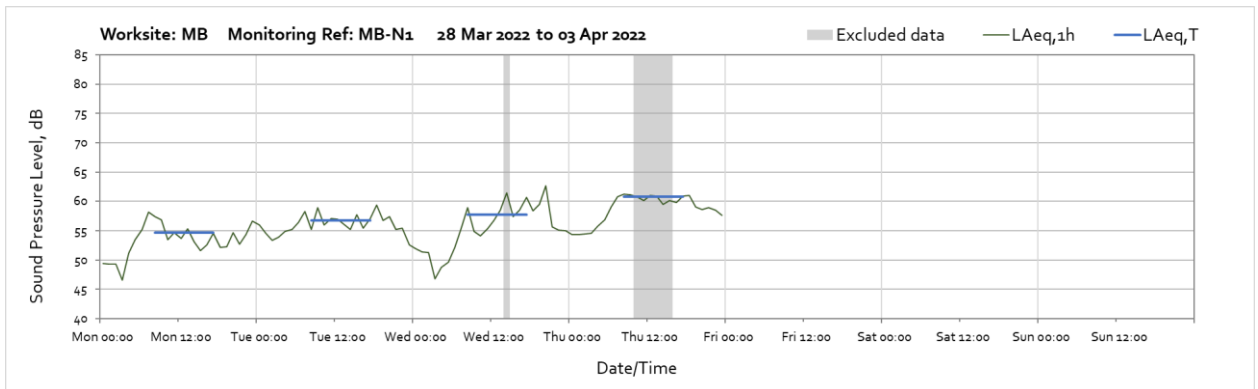
Worksite: MB – Monitoring Ref: MB-N1



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

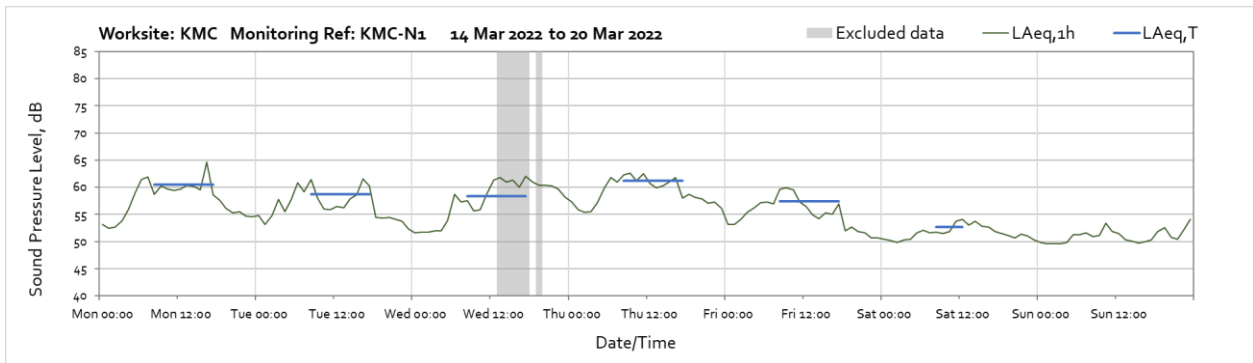
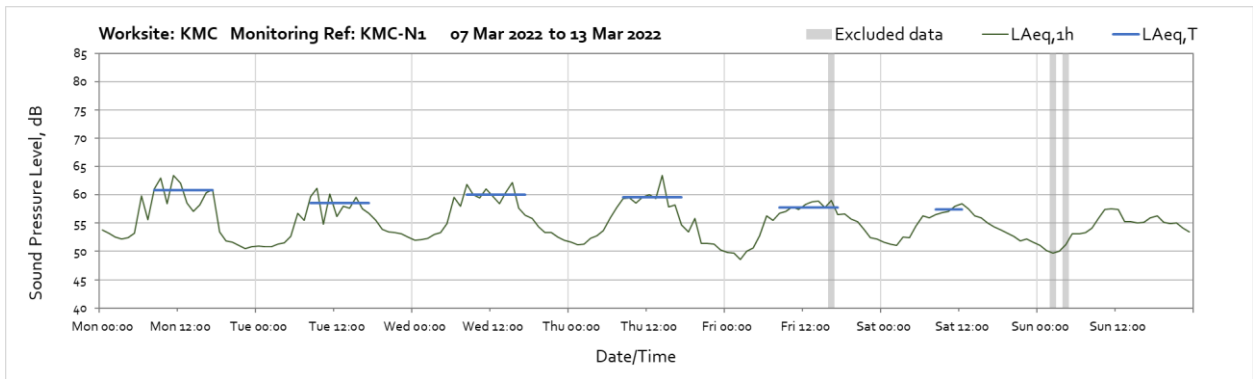
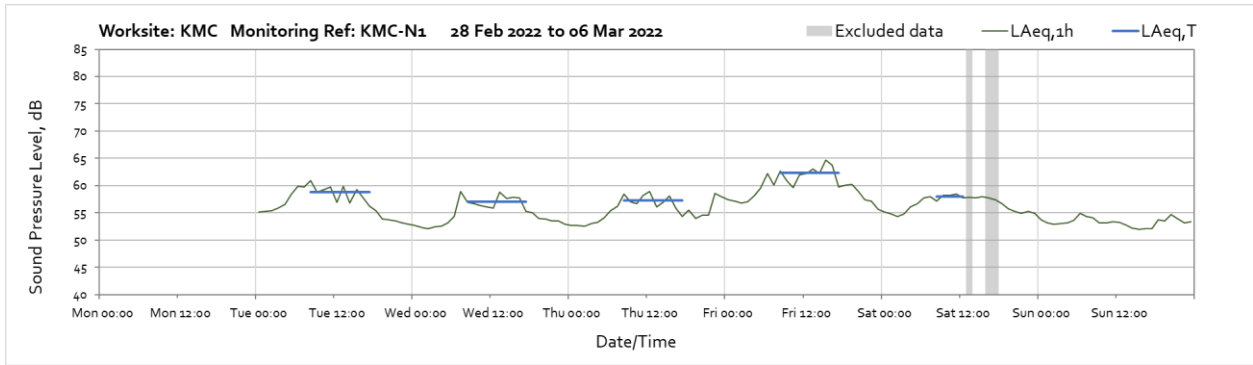


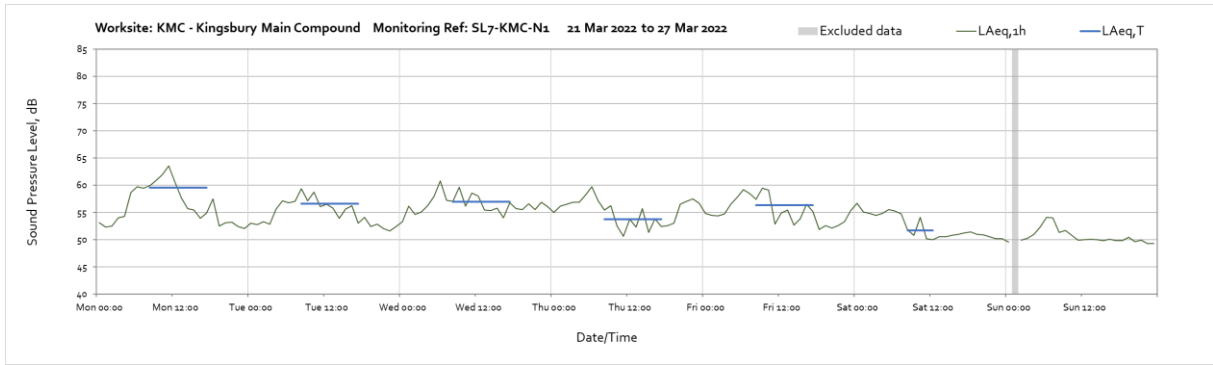
Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.



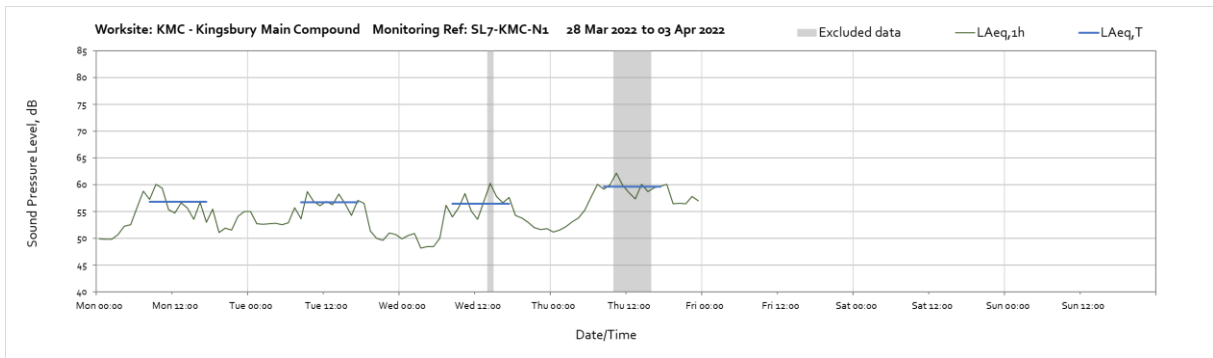
Worksite: KMC - Monitoring Ref: KMC-N1

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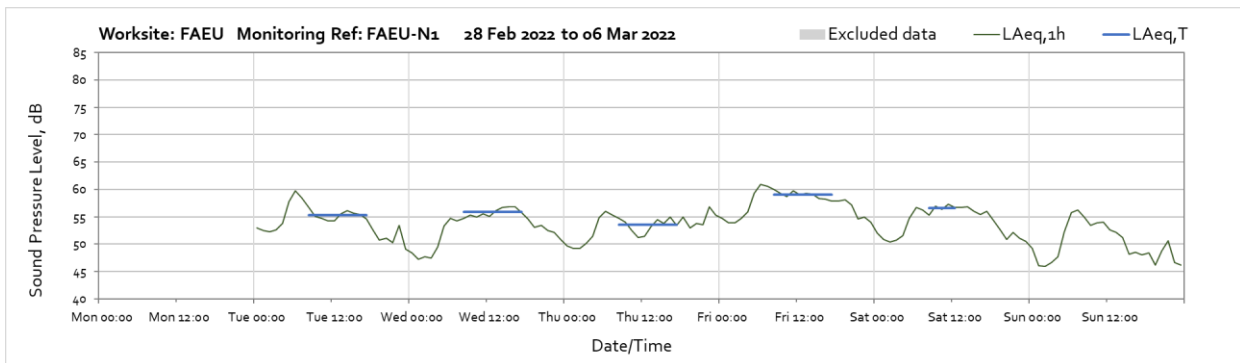


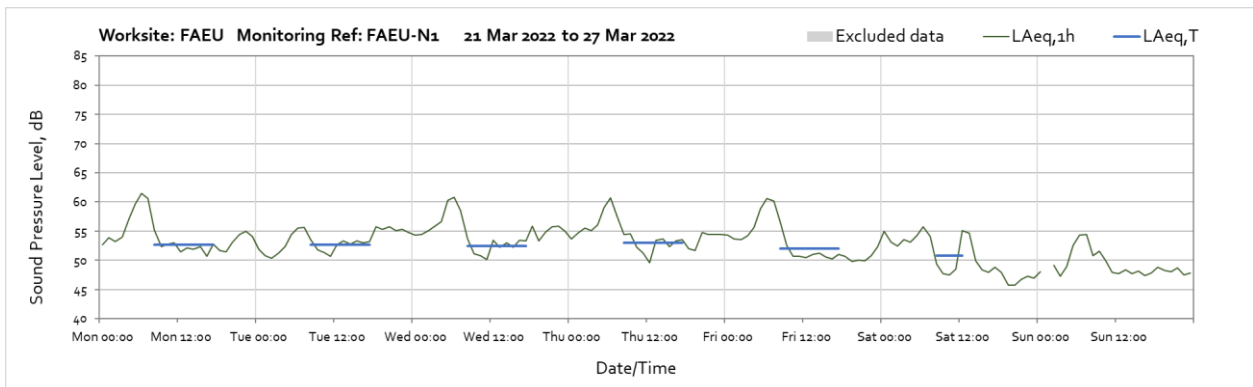
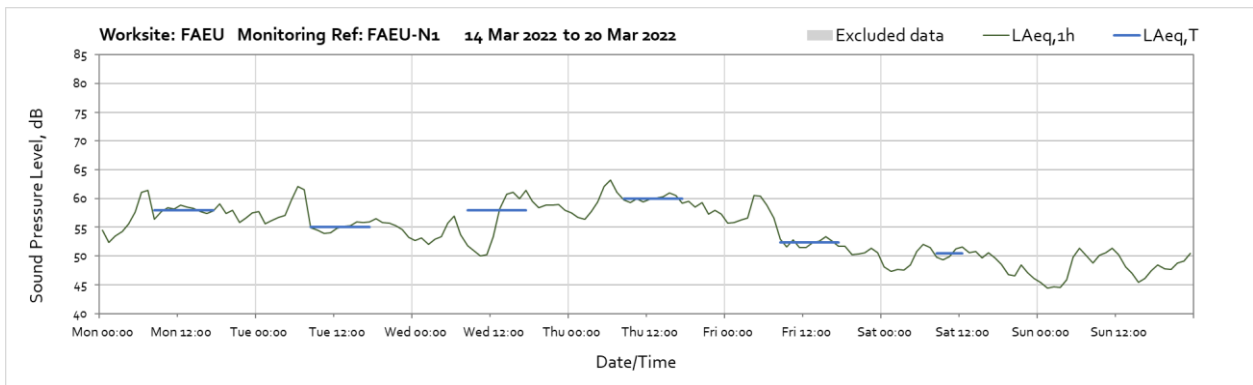
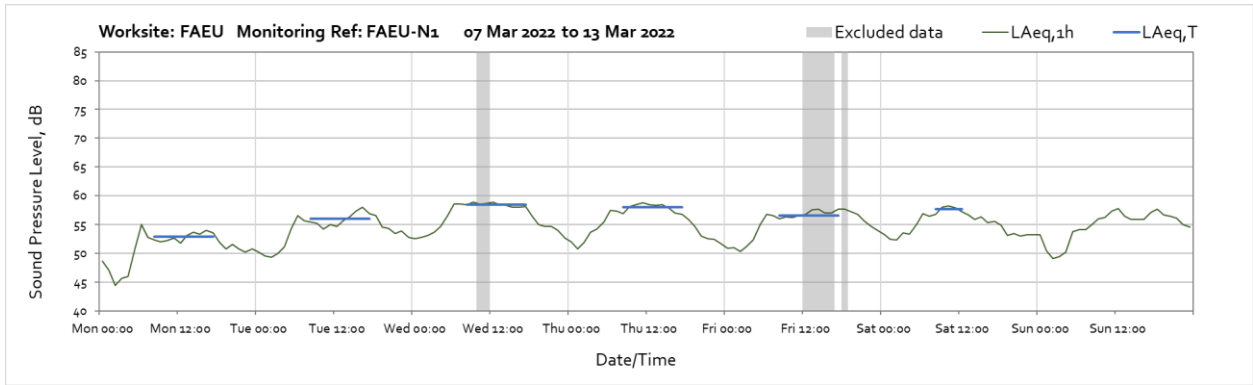


Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.

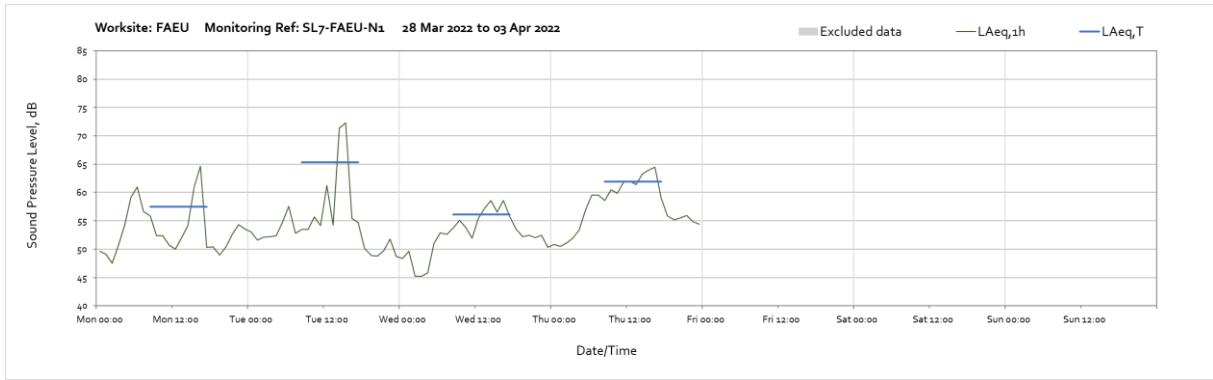


Worksite: FAEU – Monitoring Ref: FAEU-N1

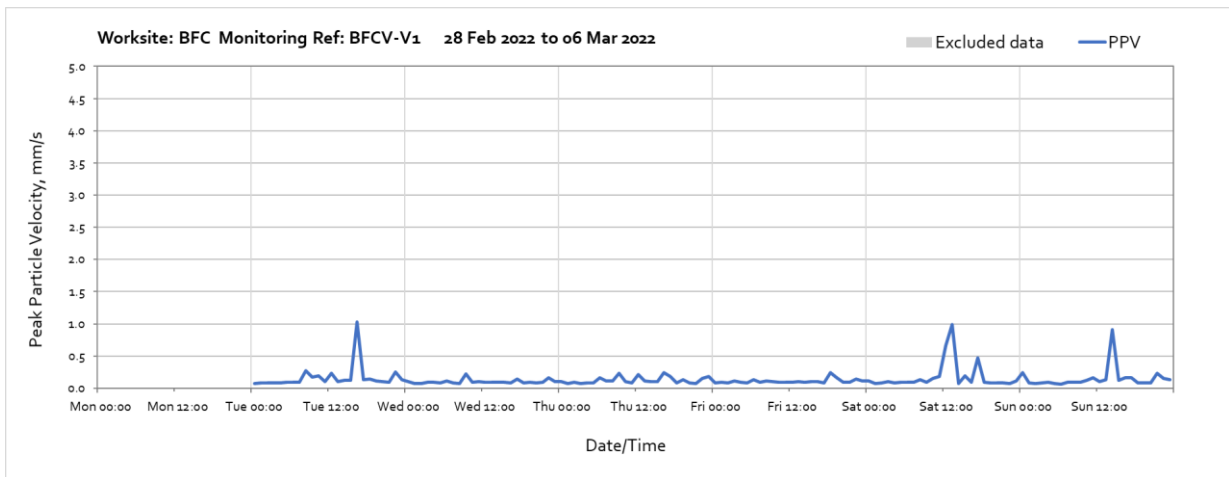


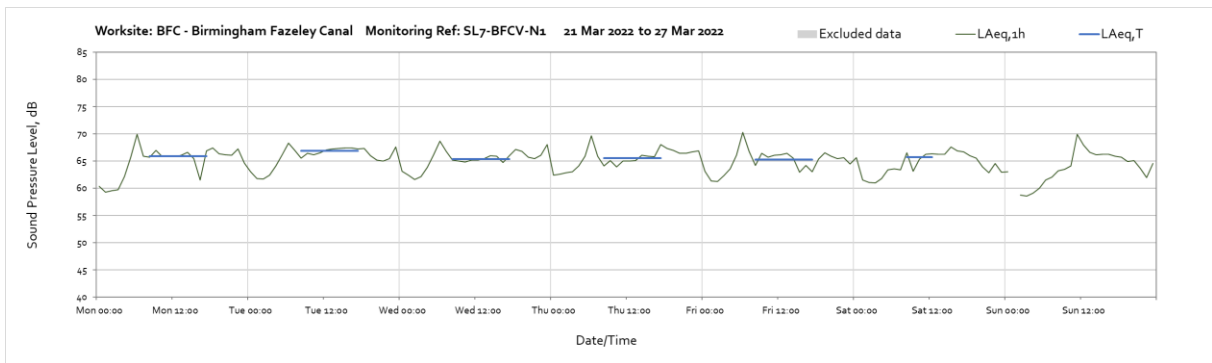
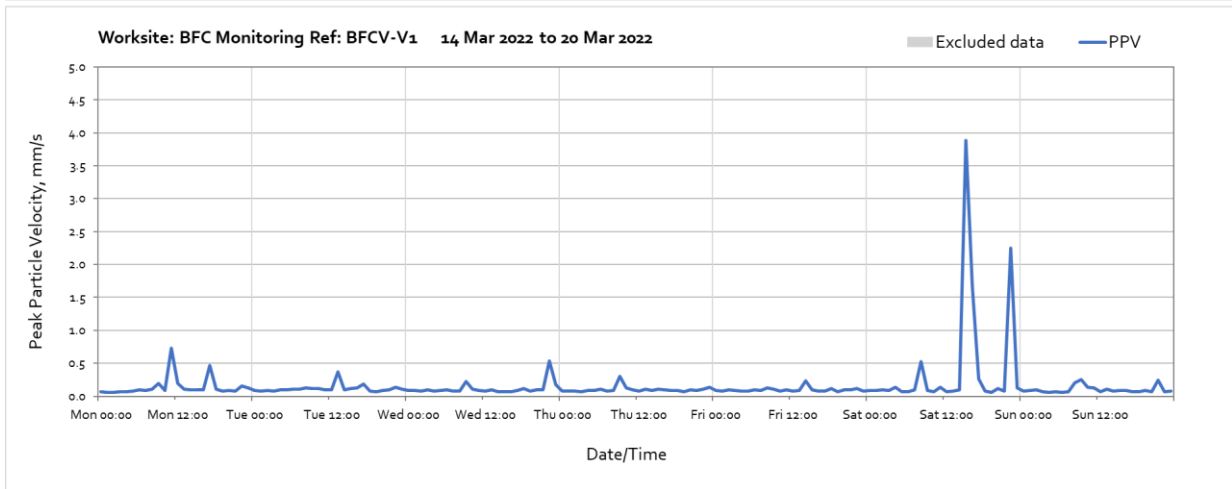
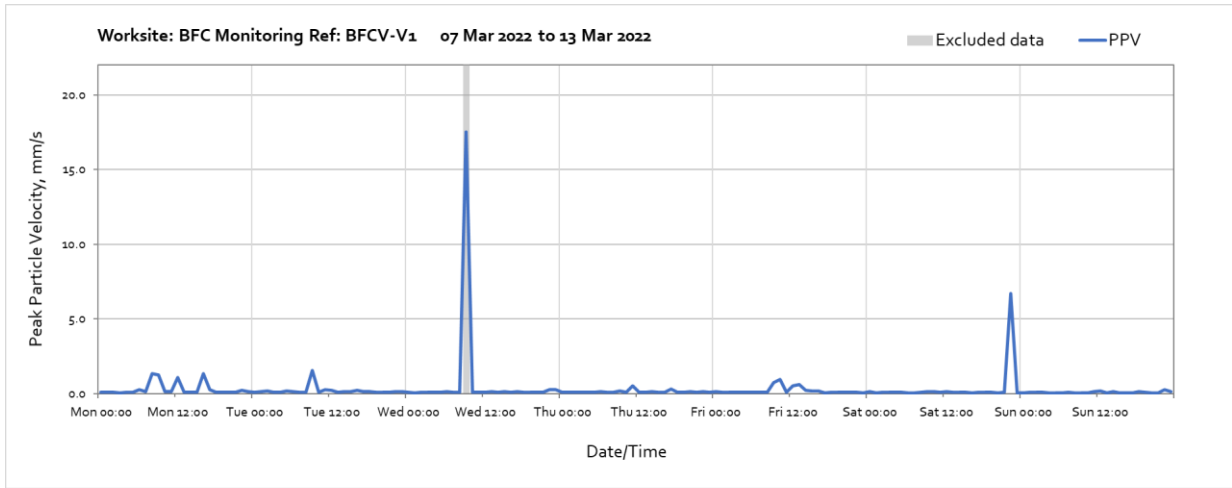


Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.

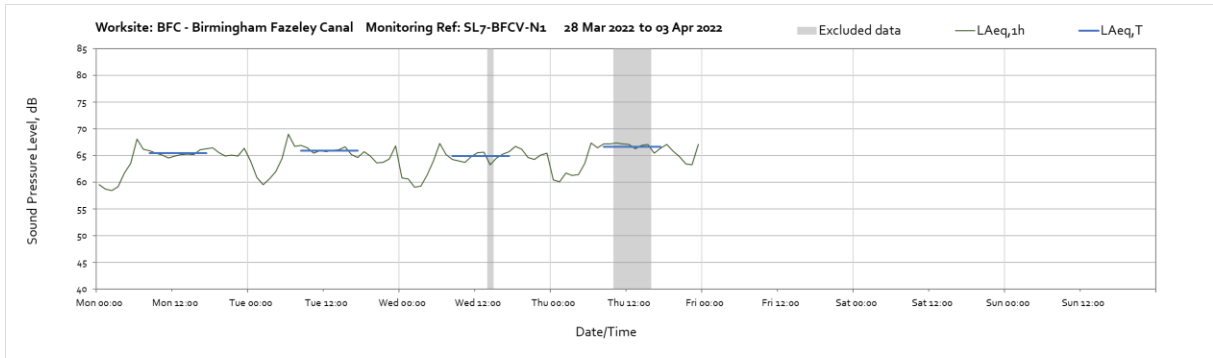


Worksite: BFCV – Monitoring Ref: BFCV-N1

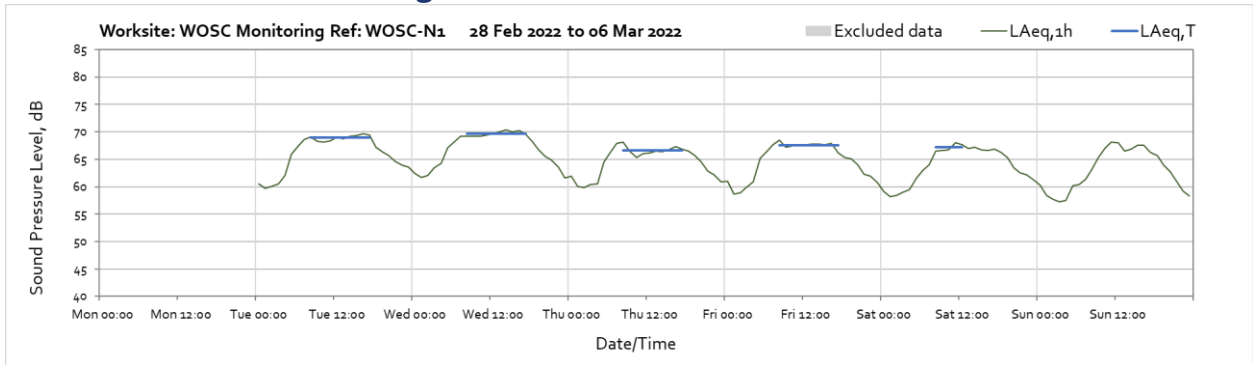


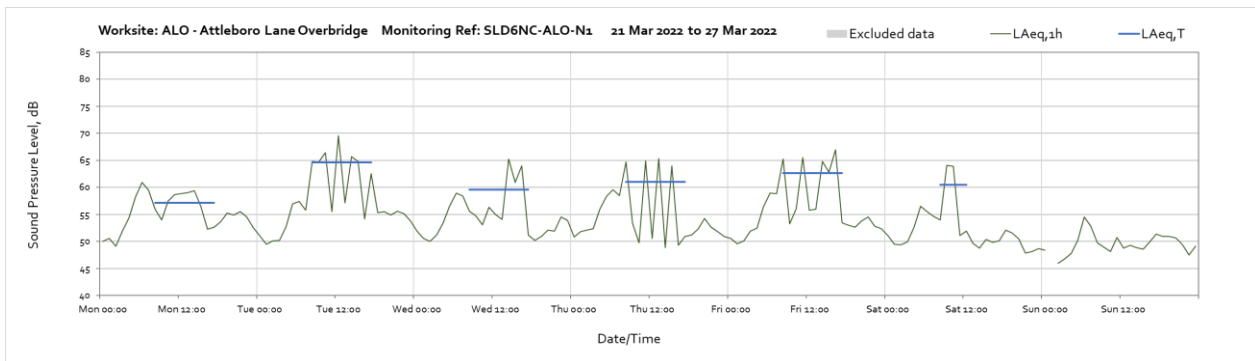
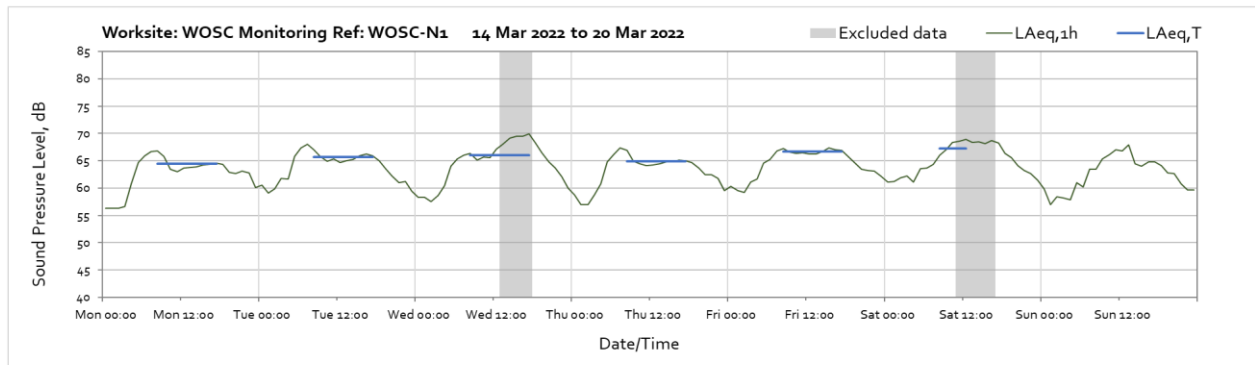
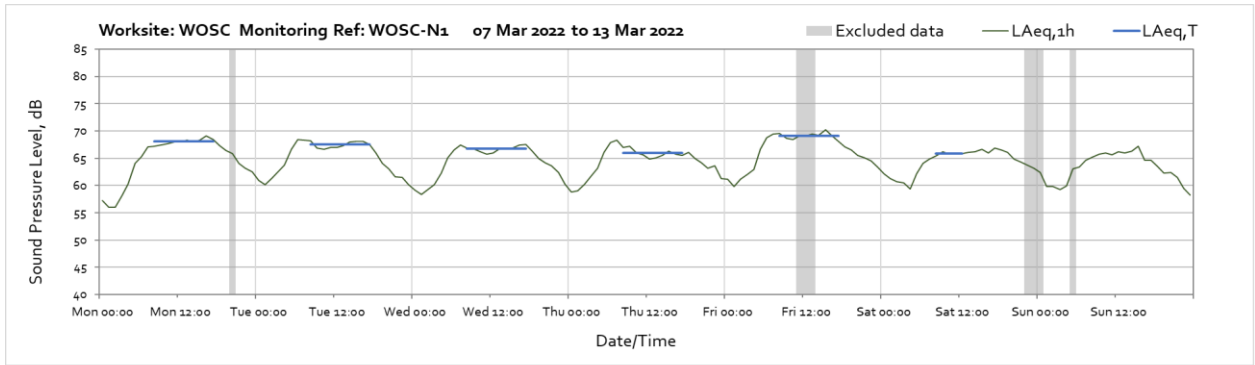


Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.

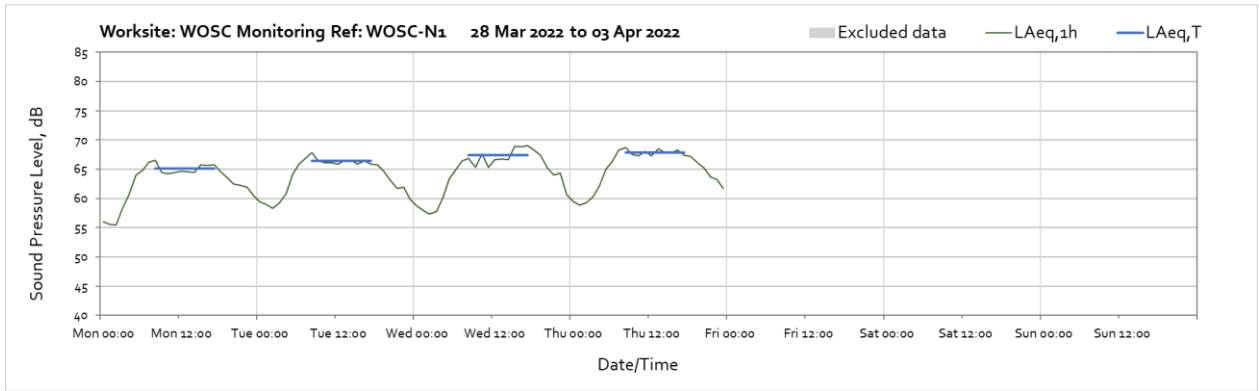


Worksite: WOSC - Monitoring Ref: WOSC-N1

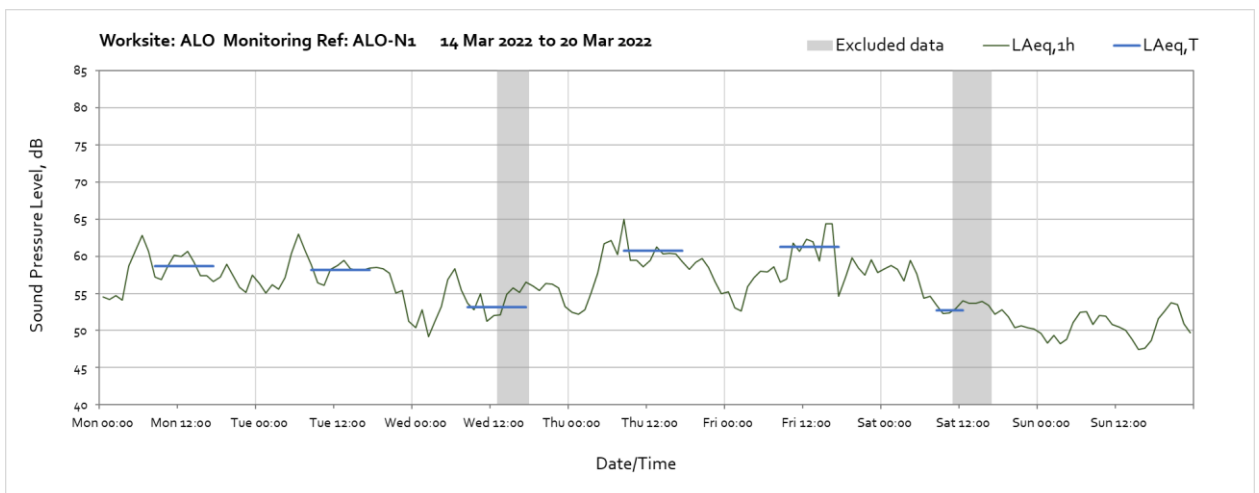
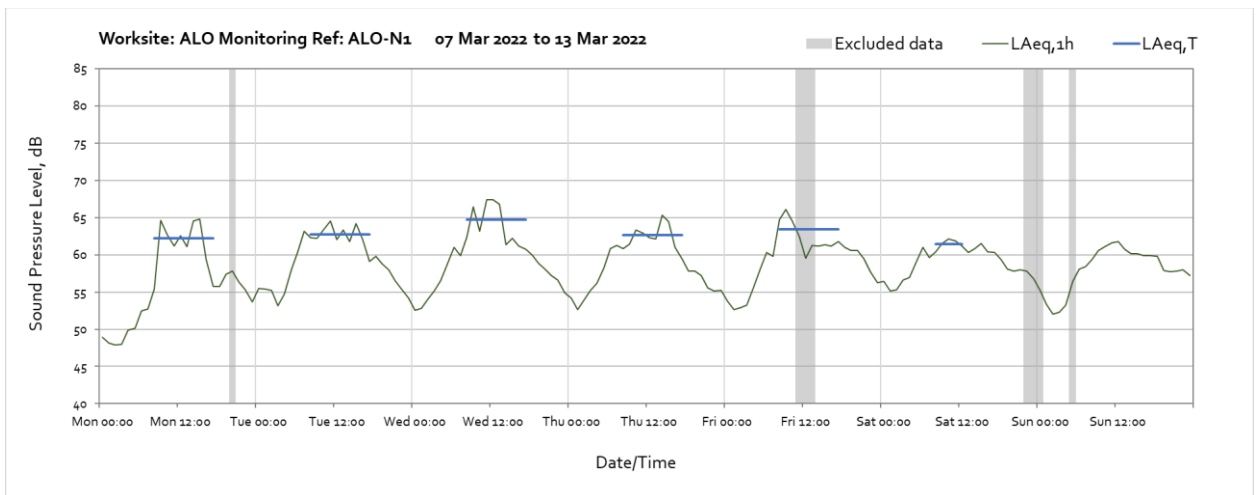




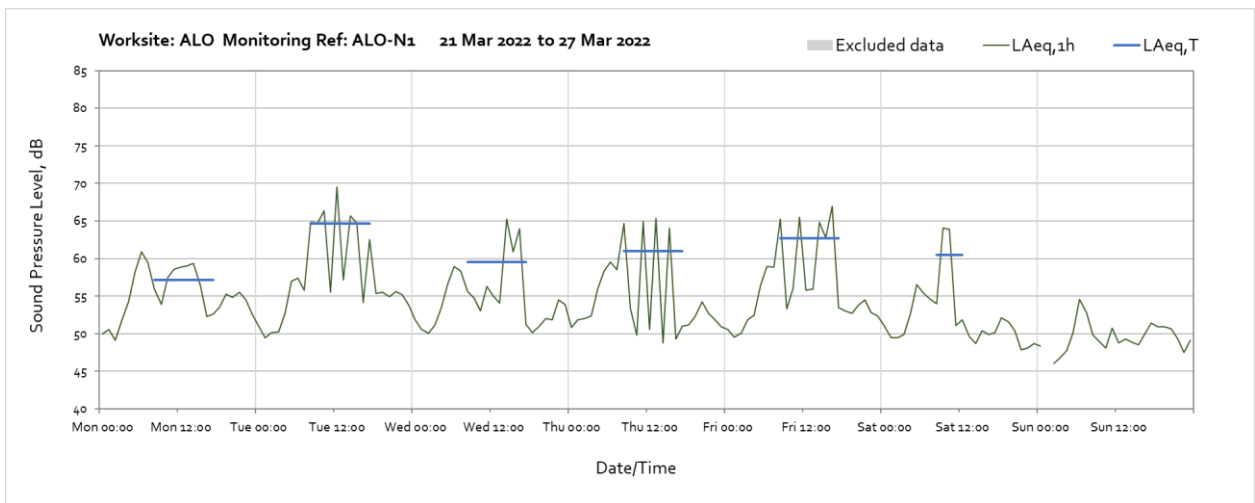
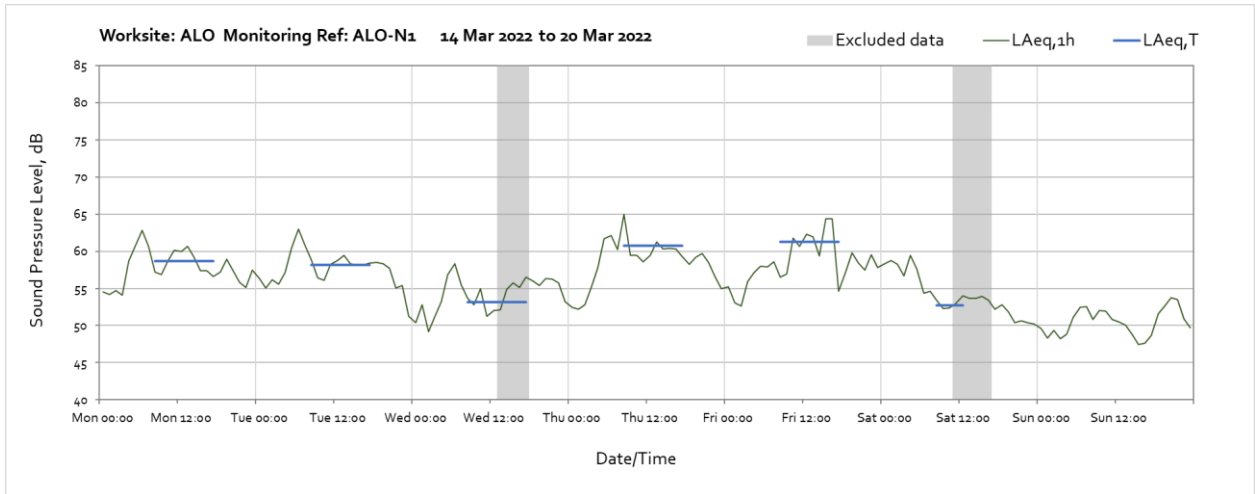
Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.



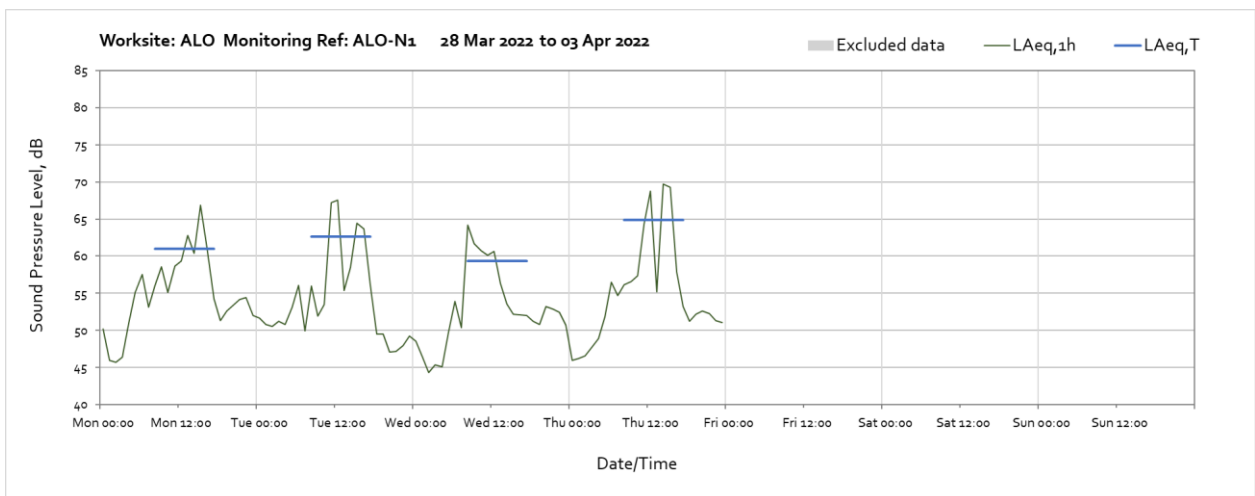
Worksite: ALO - Monitoring Ref: ALO-N1



OFFICIAL



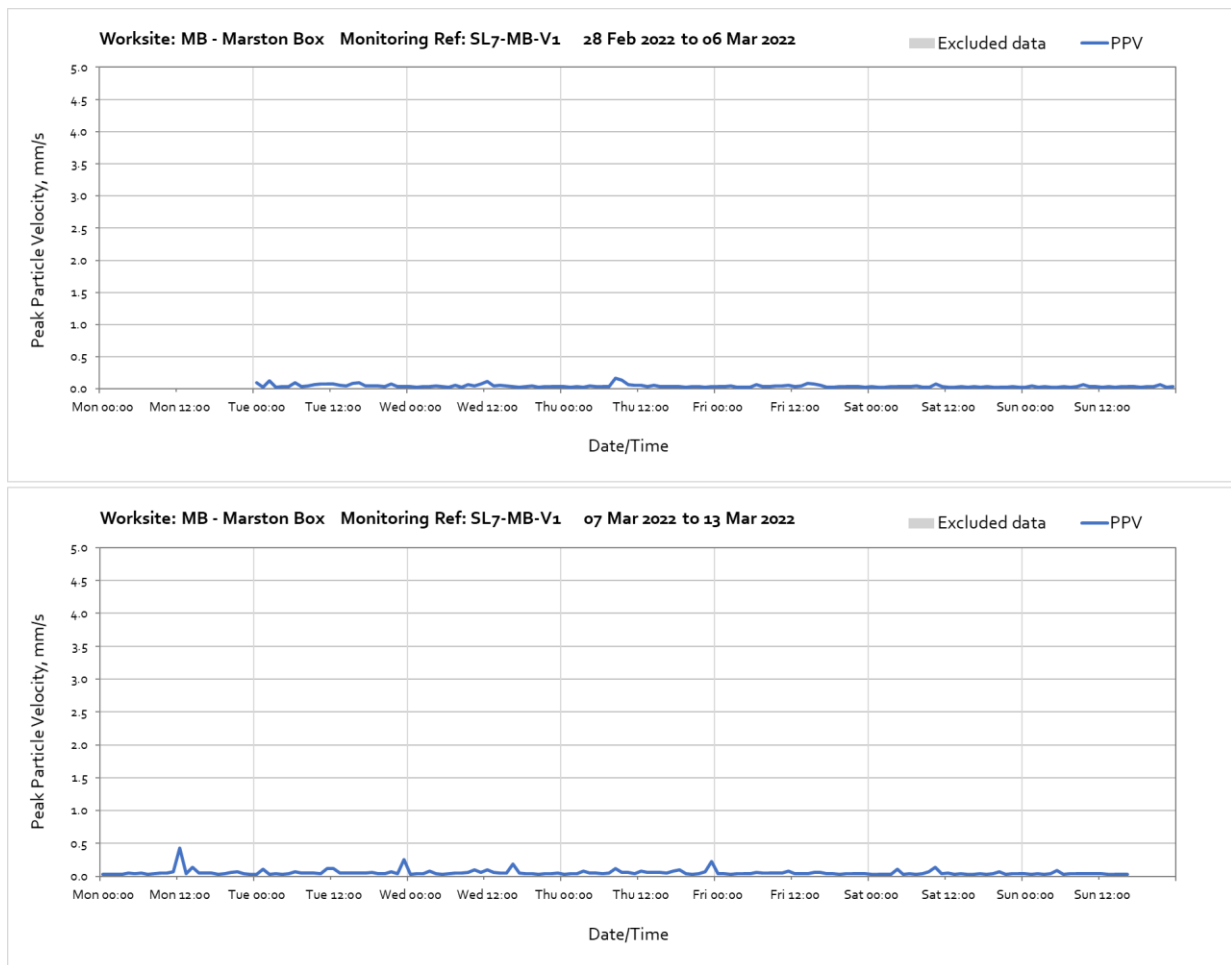
Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.



Vibration

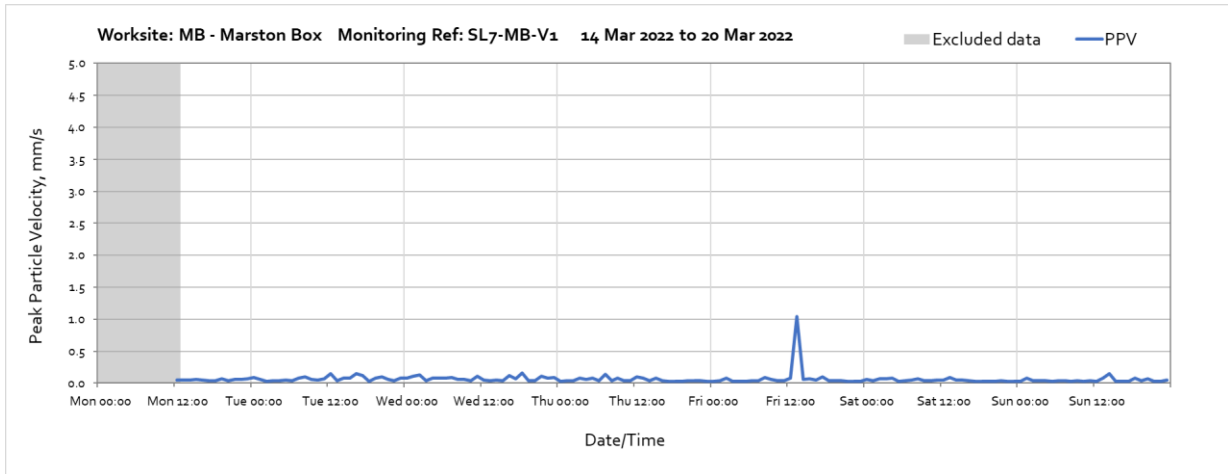
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axes x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative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

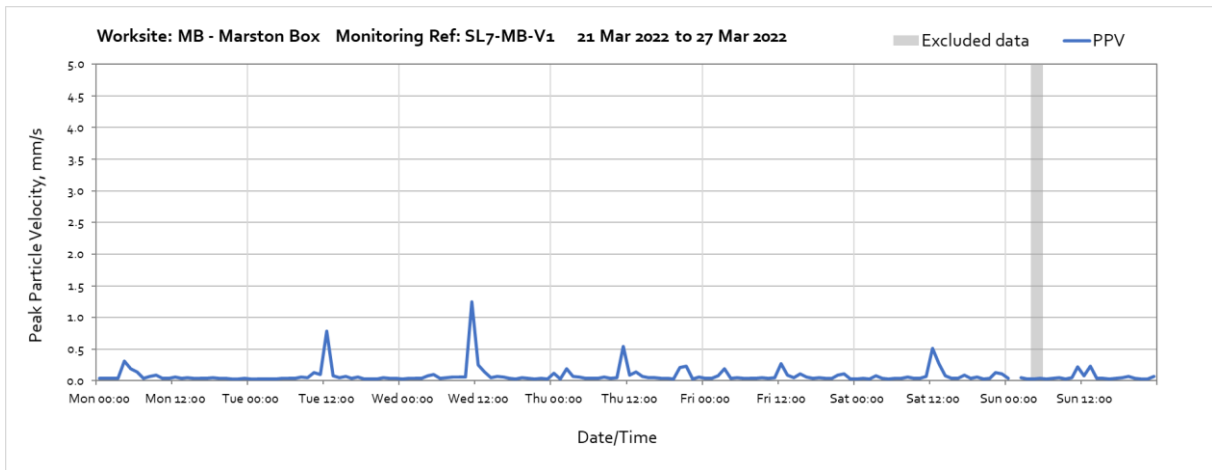


Note: Missing data measured from Sunday 13th March 17:00 until 11:00 on Monday 16th March due to a system glitch whereby the system was reset.

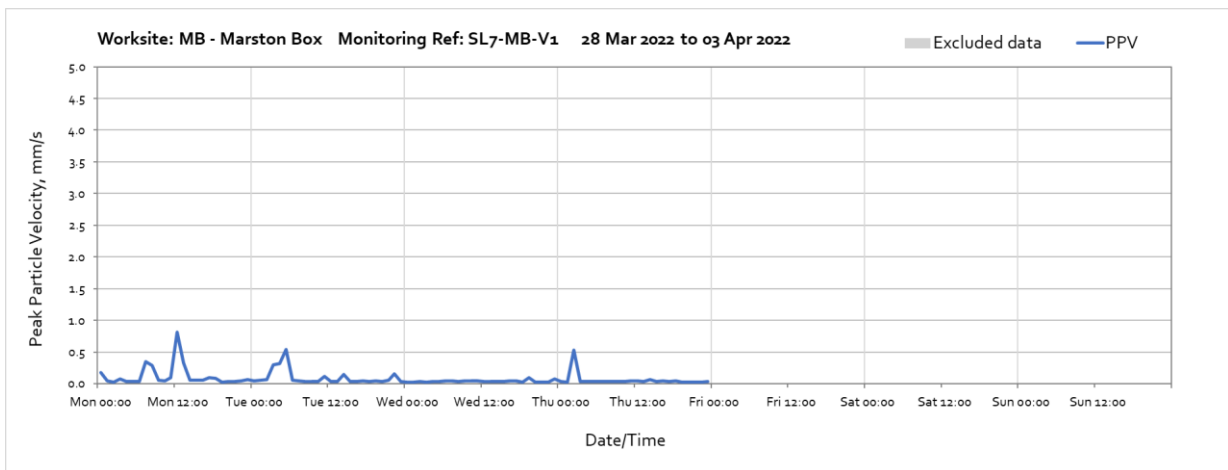
OFFICIAL



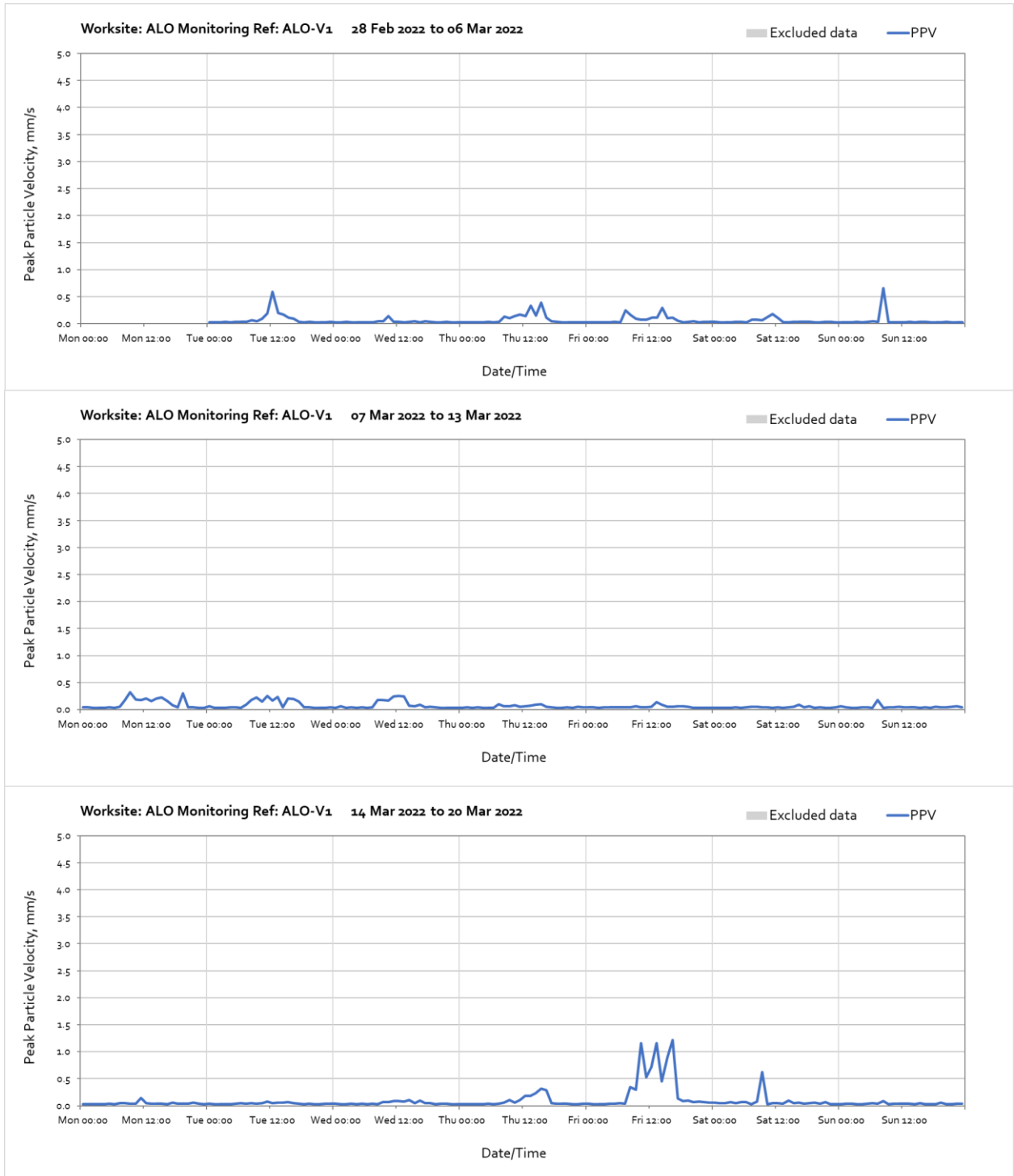
Note: Missing data measured from Sunday 13th March 17:00 until 11:00 on Monday 16th March due to a system glitch whereby the system was reset.



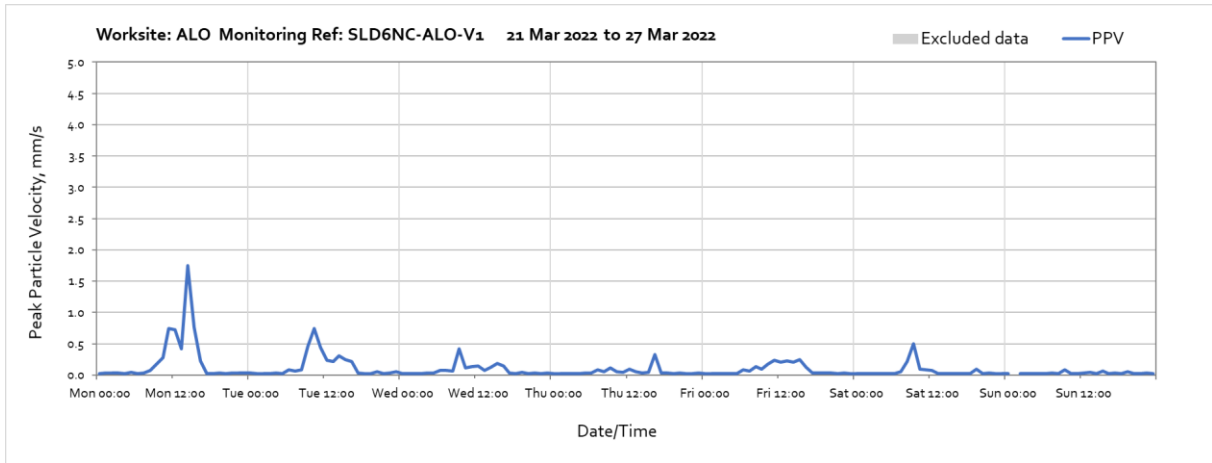
Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time.



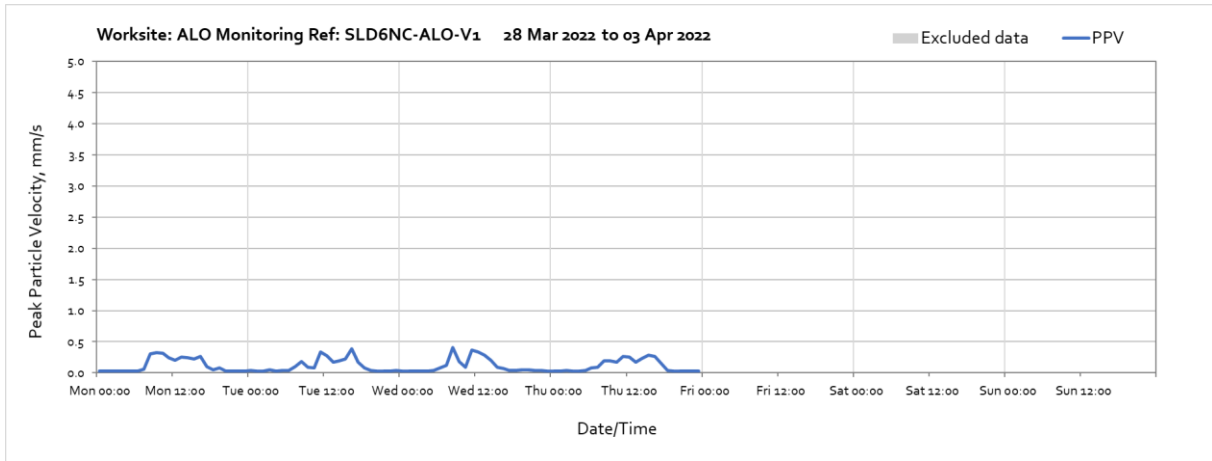
Worksite: ALO – Monitoring Ref: ALO-V1



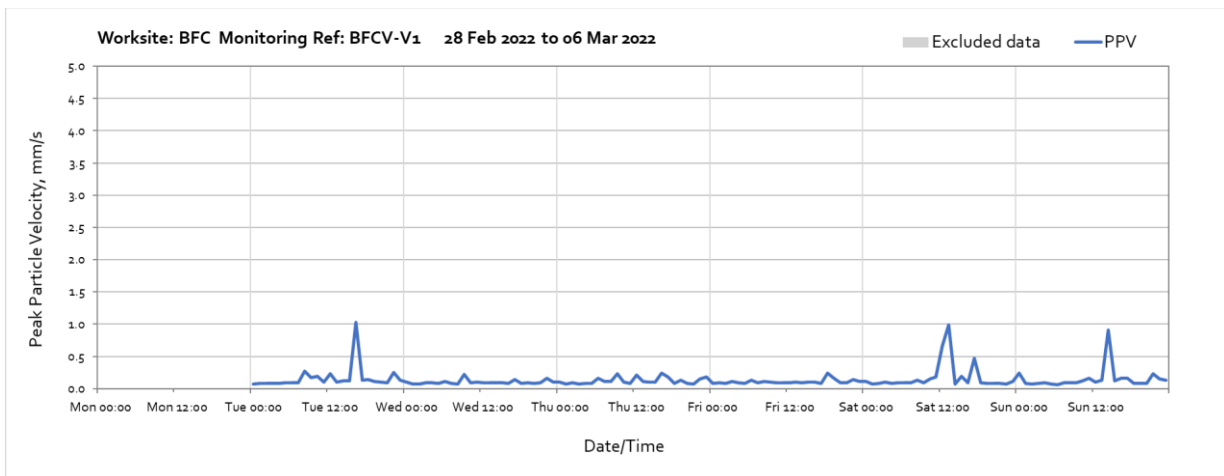
OFFICIAL

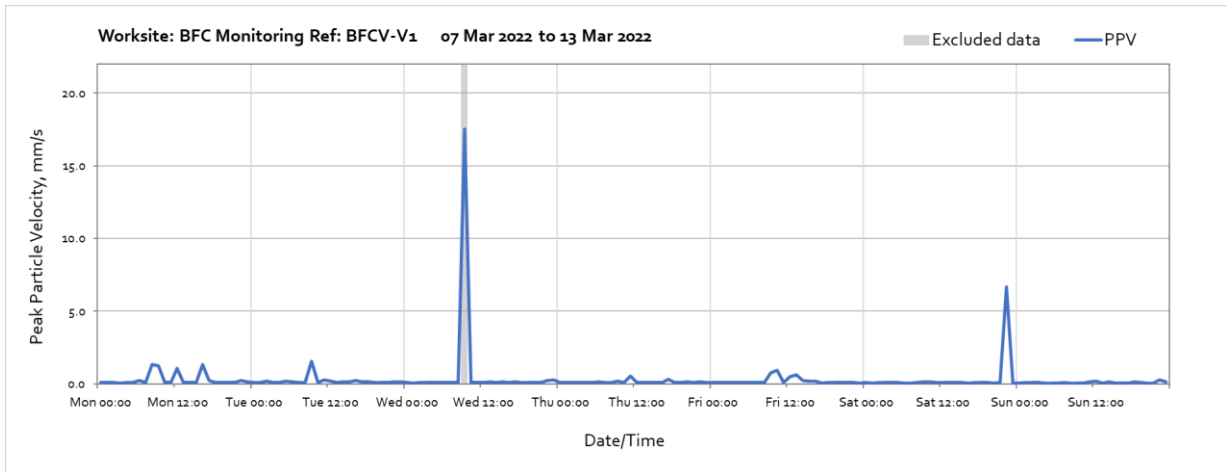


Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time

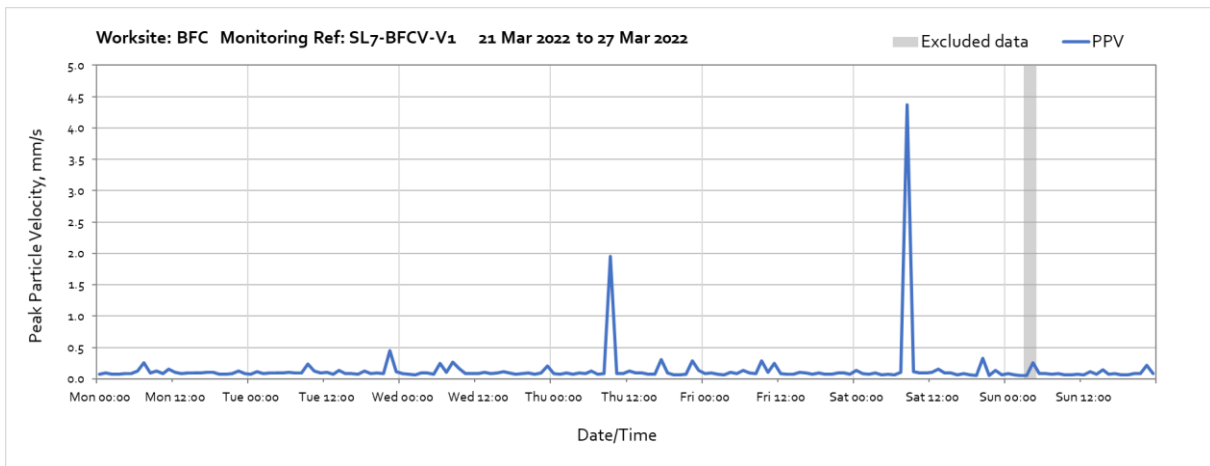
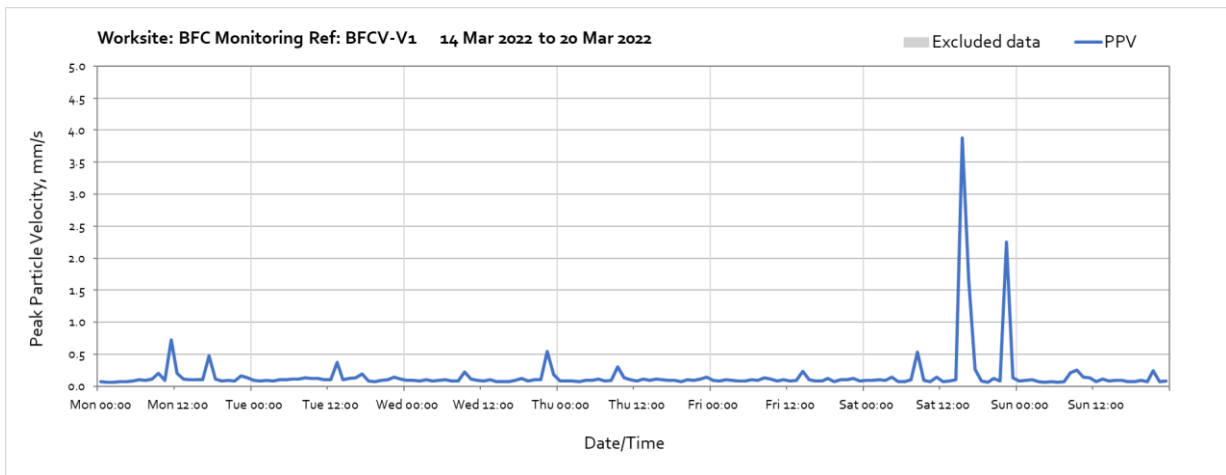


Worksite: BFCV – Monitoring Ref: BFCV-V1





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



Note: Missing data at 01:00 on Sunday 27th March 2021 was due to the clocks going forward at the start of British Summer Time

