

# HS2

August 2022

## **Construction Noise and Vibration Monthly Report – June 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 June 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 embankment preparation, moving materials; excavation; concrete pouring; erecting structures; road sweeping; and cabin installation.
- Noise monitoring was undertaken at the Kingsbury Main Compound worksite (ref.: KMC), where work activities included fence installation, road marking, services installations, road sweeping, installation of fuel pipes, material moving, earthworks, top soil stripping, excavations, pipe works, installation of trench box, deliveries, and concrete works.
- Noise monitoring was undertaken at the Faraday Avenue Embankment and Underbridge worksite (ref.: FAEU), where work activities included finishing stockpile area, stockpiling, stone deliveries, and plant removal.
- Noise monitoring was undertaken at the Birmingham & Fazeley Canal Viaduct worksite (ref.: BFCV), where work was not carried out at this location during the reporting period.
- Noise monitoring was not undertaken at the Water Orton South Compound worksite (ref.: WOSC), where work activities included building lighting tower foundations, steel works and deliveries.
- Noise monitoring was undertaken at the Attleboro Lane Overbridge worksite (ref.: ALO), where work activities included removal of stockpiles, stabilisation, laying of stone, and insulation of welfare facilities.
- Noise monitoring was undertaken at the Birmingham Road site worksite (ref.: BRD), where work activities included de-vegetation, mobilisation to site, demolition, soil movements.
- Noise monitoring was undertaken at the Packington Embankment worksite (ref.: PE), where work activities included embankment filling and compaction, concrete and asphalt removal, concrete pouring, stockpiling, and haul road construction.

- Noise monitoring was undertaken at the Bickenhill Cutting worksite (ref.:BIC), where work activities included excavation, geotextile laying, removal of material, and topsoil stockpile maintenance.

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.

Two (2) complaints were received within the North Warwickshire area during the monitoring 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:

- 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 30<sup>th</sup> June 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 2 in Appendix A), where work activities included:
  - Embankment preparation,
  - Moving materials;
  - Excavation;
  - Concrete pouring;
  - Erecting structures;
  - Road sweeping; and
  - Cabin installation.
- Kingsbury Main Compound worksite, ref.: KMC (see Plan 1 in Appendix A), where work activities included:
  - Fencing Installation;

- Road markings;
  - Excavation;
  - Installation of utilities;
  - Road sweeping
  - Moving of materials;
  - Earthworks;
  - Installation of fuel pipes;
  - Top soil stripping;
  - Trench back filling;
  - Delivery of stone; and
  - Concrete works.
- Faraday Avenue Embankment and Underbridge worksite, ref.: FAEU (see Plan 2 in Appendix A), work activities included:
    - Stockpiling;
    - Construction piling platform;
    - Vegetation clearance; and
    - Deliveries.
  - Birmingham & Fazeley Canal Viaduct worksite, ref.: BFCV (see Plan 1 in Appendix A), where no works were undertaken during the reporting period.
  - Water Orton South Compound worksite, ref.: WOSC (see Plan 3 in Appendix A), work activities included:
    - Concrete works;
    - Assembling steel cages; and
    - Material deliveries;
  - Attleboro Lane Overbridge worksite, ref.: ALO (see Plan 3 in Appendix A), work activities included:
    - Removal of stockpiles;
    - Stone laying and rolling; and
    - Install of welfare units.

- Birmingham Road worksite, ref.: BRD (see Plan 4 in Appendix A), work activities included:
  - De-vegetation;
  - Demolition;
  - Mobilisation; and
  - Soil Movements.
- Packington Embankment worksite, ref.: PE (see Plan 5 in Appendix A), works activities included:
  - Embankment works;
  - Concrete and asphalt removal;
  - Concrete coring;
  - Stockpiling; and
  - Road construction.
- Bickenhill Cutting worksite.: BIC (see Plan 6 in Appendix A), works activities included:
  - Excavation;
  - Laying geotextile;
  - Material removal; and
  - Site maintenance;

1.1.4 Further works were also undertaken at Gilson Road as part of sewer diversion 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 Ten (10) noise monitoring installations and four (4) vibration monitoring installations were active in June in the NWBC area. Table 2 summarises the position of noise and vibration monitoring installations within the NWBC area in June 2022.
- 1.2.2 An additional noise monitor, ref.: PE-N1, was installed at Packington Embankment, Common Farm, Chester Road, Colehill, Birmingham, worksite ref.: PE on 16<sup>th</sup> June 2022.
- 1.2.3 An additional noise monitor, ref.; BIC-N1, was installed at Bickenhill Cutting, Park Farm Barns, Chester Road, Marston Green, Coventry, worksite ref.; BIC on 16<sup>th</sup> June 2022.
- 1.2.4 Maps showing the position of noise and vibration monitoring installations are presented in Appendix B.

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
Kingsbury Main Compound (KMC)	KMC-N1	Kingsbury Road, Curdworth CP, Marston, Warwick, West Midland
	KMC-N2	Kingsbury Road, Curdworth CP, Marston, Warwick, West Midland
Birmingham Fazeley Canal Viaduct (BFCV)	BFCV-N1	Lock Cottage, Marston Lane, Curdworth CP, North Warwickshire,
	BFCV-V1	Lock Cottage, Marston Lane, Curdworth CP, North Warwickshire,
Marston Box (MB)	MB-N1	Kingsbury Road, Curdworth, Sutton Coldfield, West Midland
	MB-V1	Kingsbury Road, Curdworth, Sutton Coldfield, West Midland
Faraday Avenue Embankment and Underbridge (FAEU)	FAEU-N1	Orchard Cottage, Newlands Lane, Curdworth, Warwickshire
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
Birmingham Road (BRD)	BRD-N2	New Cottages, Birmingham Road, Coleshill, Birmingham
	BRD-V1	New Cottages, Birmingham Road, Coleshill, Birmingham
Pakington Embankment (PE)	PE-N1	Common Farm, Chester Road, Coleshill, Birmingham
Bickenhill Cutting (BIC)	BIC-N1	Park Farm Barns, Chester Rd, Marston Green, Coventry

## 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
KMC	KMC-N1	Kingsbury Road, Curdworth CP, Marston	Free-field	56.6 (60.1)	56.8 (60.0)	54.8 (59.3)	54.0 (58.5)	53.1 (59.6)	54.5 (55.8)	54.9 (56.3)	54.3 (55.8)	54.7 (58.3)	51.8 (54.9)	55.0 (58.6)	53.9 (59.3)
	KMC-N2	Kingsbury Road, Curdworth CP, Marston	Free-field	53.7 (56.3)	58.8 (62.7)	53.2 (56.4)	51.8 (55.3)	51.1 (56.2)	52.2 (54.4)	53.4 (55.1)	53.5 (55.1)	53.3 (56.2)	50.3 (54.7)	53.0 (56.4)	50.5 (54.8)
BFCV	BFCV-N1	Lock Cottage, Marston Lane, Curdworth CP	Free-field	64.3 (66.5)	63.7 (66.6)	63.2 (67.1)	62.9 (65.2)	63.7 (68.7)	62.8 (63.3)	65.0 (65.9)	65.1 (65.6)	65.5 (68.7)	61.3 (66.3)	63.7 (68.3)	62.5 (66.6)
MB	MB-N1	Kingsbury Road, Curdworth, Sutton Coldfield	Free-field	56.8 (61.6)	55.5 (59.8)	55.6 (63.4)	56.0 (60.8)	52.8 (58.9)	56.3 (58.4)	56.9 (59.0)	55.7 (59.3)	56.8 (61.9)	52.5 (58.9)	57.3 (64.2)	52.3 (57.4)
FAEU	FAEU-N1	Orchard Cottage, Newlands Lane, Curdworth	Free-field	56.8 (60.7)	62.6 (71.0)	56.2 (63.3)	55.4 (60.8)	54.3 (61.7)	56.3 (58.9)	57.7 (60.9)	57.1 (61.0)	57.5 (63.1)	52.4 (57.3)	56.8 (65.8)	53.1 (58.8)
WOSC	WOSC-N1	53 Watton Lane, Water Orton CP	Free-field	64.3 (66.3)	64.2 (65.6)	63.6 (66.5)	62.3 (66.5)	59.5 (65.0)	62.4 (64.1)	65.3 (67.6)	66.0 (67.7)	64.4 (68.0)	58.1 (62.9)	63.9 (67.5)	59.9 (65.4)

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
ALO	ALO-N1	47 Attleboro Lane, Water Orton	Free-field	54.0 (59.3)	57.9 (71.7)	54.2 (58.8)	53.6 (63.6)	52.4 (59.3)	53.0 (57.4)	57.3 (59.9)	54.7 (59.7)	55.1 (62.9)	50.6 (55.6)	53.7 (60.7)	51.2 (57.0)
BRD	BRD-N1	New Cottages, Birmingham Road, Coleshill	Free-field	61.3 (63.4)	61.0 (62.9)	60.8 (63.5)	59.7 (62.9)	57.9 (63.7)	59.5 (60.0)	61.8 (63.2)	62.4 (63.4)	61.6 (64.0)	56.5 (59.3)	61.0 (64.2)	57.4 (62.4)
PE	PE-N1	Common Farm, Chester Road, Coleshill	Free-field	56.4 (62.5)	58.2 (63.3)	54.4 (57.9)	53.8 (58.2)	52.9 (59.0)	56.7 (57.6)	56.9 (58.4)	56.6 (59.4)	55.6 (57.4)	53.0 (58.2)	55.3 (58.4)	52.4 (57.3)
BIC	BIC-N1	Park Farm Barns, Chester Rd, Marston Green	Free-field	56.0 (57.7)	55.6 (62.7)	53.4 (57.0)	52.5 (55.4)	52.9 (60.3)	52.1 (53.9)	52.9 (54.7)	53.0 (54.6)	53.6 (56.0)	52.1 (60.0)	52.5 (55.8)	50.8 (57.0)

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
BFC - Birmingham Fazeley Canal	SL7-BFCV-V1	Lock Cottage, Marston Lane, Curdworth CP, North Warwickshire, B76 0DG	1.83 (Y-axis)
MB - Marston Box	SL7-MB-V1	Kingsbury Road, Curdworth, Sutton Coldfield, West Midland, B76 0DF	0.93 (X-axis)
ALO - Attleboro Lane Overbridge	SLD6NC-ALO-V1	47 Attleboro Lane, Water Orton, Birmingham, B46 1SB	1.48 (X-axis)
BRD- Birmingham Road	SL6BS-BRD-V1	1, New Cottages, Birmingham Road, Coleshill, Birmingham B46 1DP	1.40 (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
KMC	KMC-N1*	Wheatley House, Kingsbury Road, Sutton Coldfield	All days	All periods	No Exceedances	No Exceedances
	KMC-N2	Wheatley House, Kingsbury Road, Sutton Coldfield	All days	All periods	No Exceedances	No Exceedances
BFCV	BFCV-N1	Lock Cottage, Marston Lane, Curdworth	All days	All periods	No Exceedances	No Exceedances
MB	MB-N1*	Kingsbury Road, Curdworth	All days	All periods	No Exceedances	No Exceedances
FAEU	FAEU-N1	Orchard Cottage, Newlands Lane, Curdworth	Weekdays	08:00-18:00	9	No Exceedances
WOSC	WOSC-N1	53 Watton Lane, Water Orton CP, Warwickshire	All days	All periods	No Exceedances	No Exceedances
ALO	ALO-N1	47 Attleboro Lane, Water Orton, Birmingham	Weekdays	08:00-18:00	3	No Exceedances

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
BRD	BRD-N2	New Cottages, Birmingham Road, Coleshill, Birmingham B46 1DP	All days	All Periods	No Exceedances	No Exceedances
PE	PE-N1	Common Farm, Chester Road, Coleshill	All days	All periods	No Exceedances	No Exceedances
BIC	BIC-N1	Park Farm Barns, Chester Rd, Marston Green	All days	All periods	No Exceedances	No Exceedances

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

2.2.6 Twelve (12) exceedances of the LOAEL were recorded at FAEU and ALO worksites during core working hours. No exceedances of SOAEL were recorded due to HS2 construction works during June 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
-	-	-	-	-	-

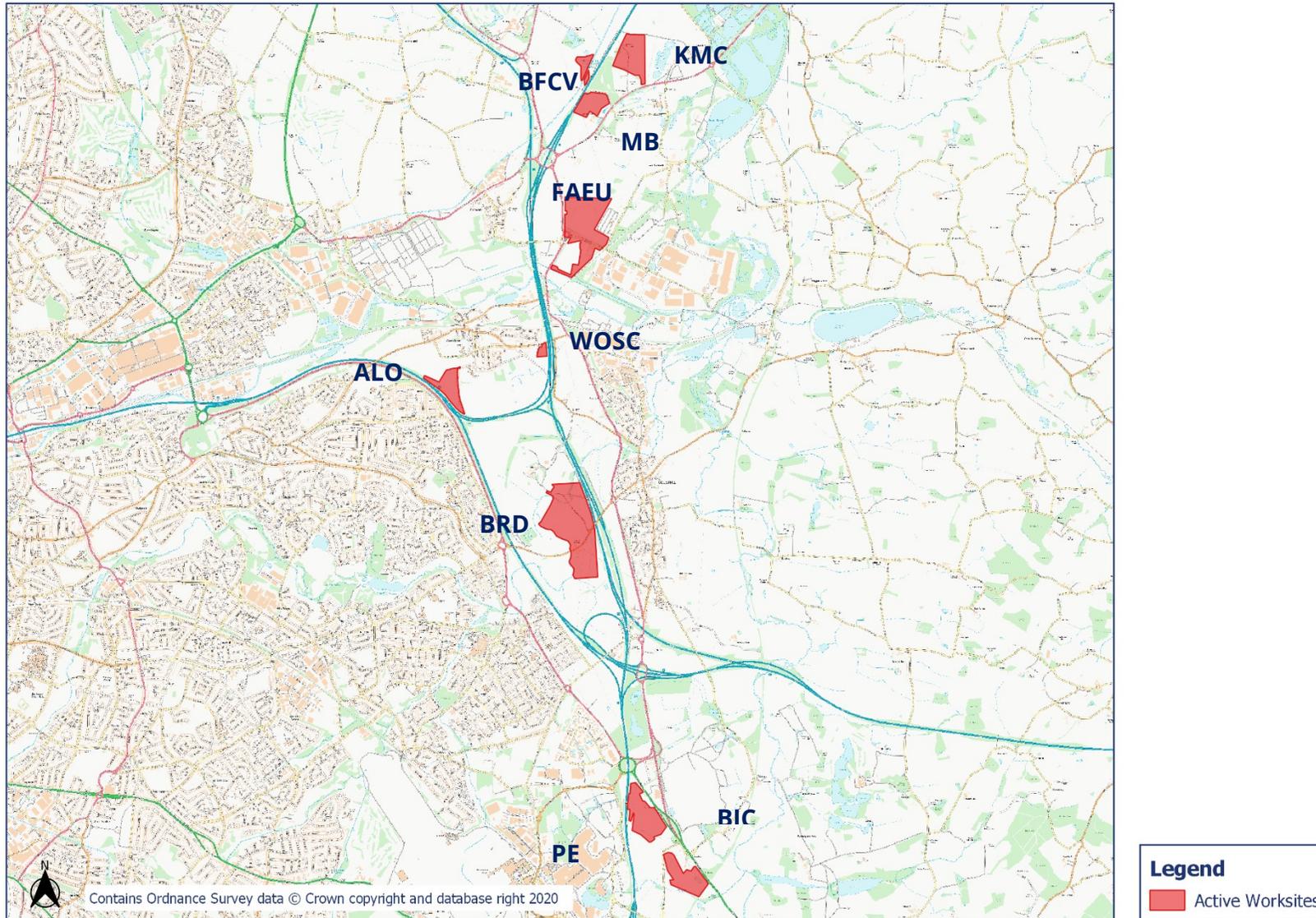
## 2.4 Complaints

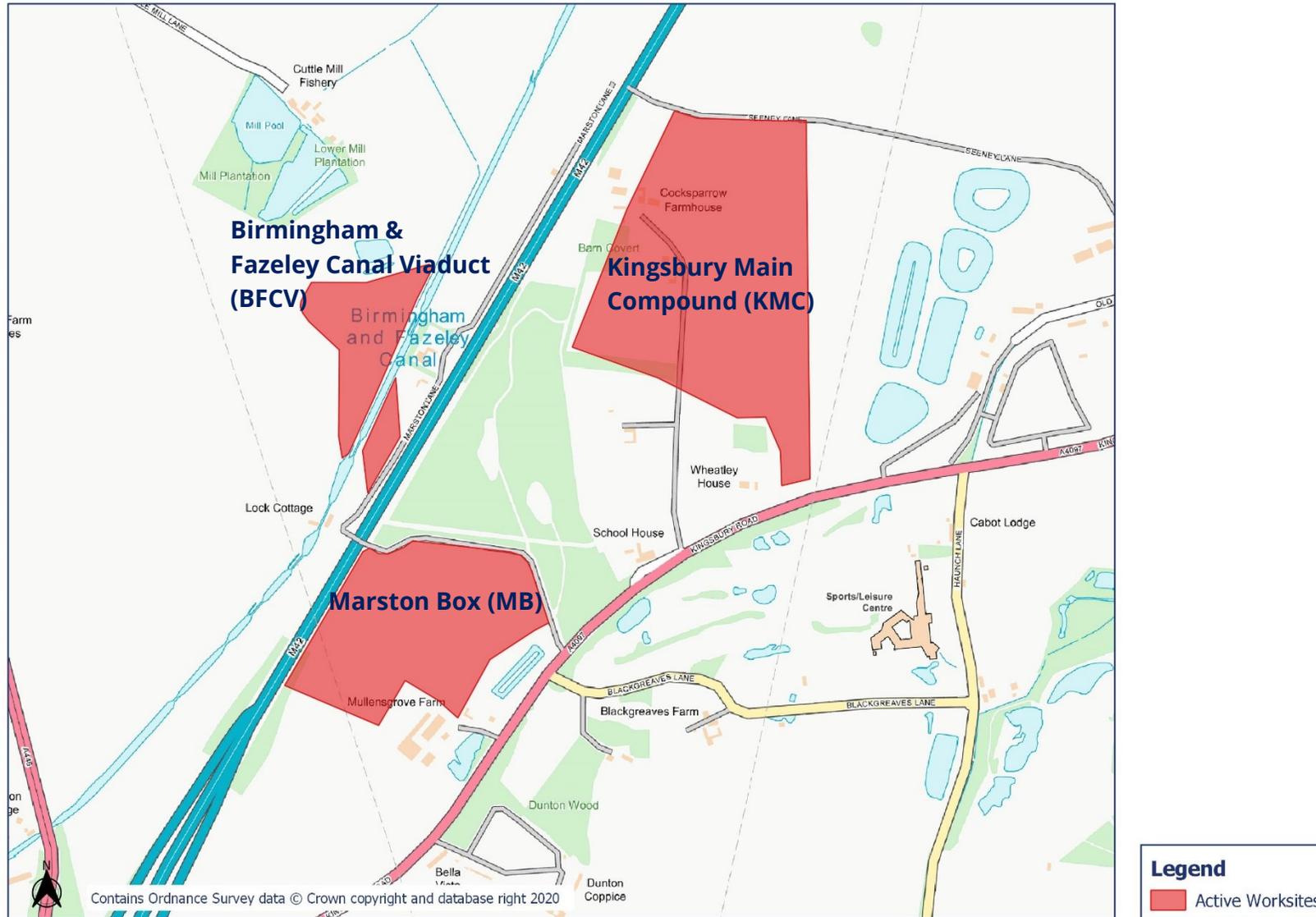
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

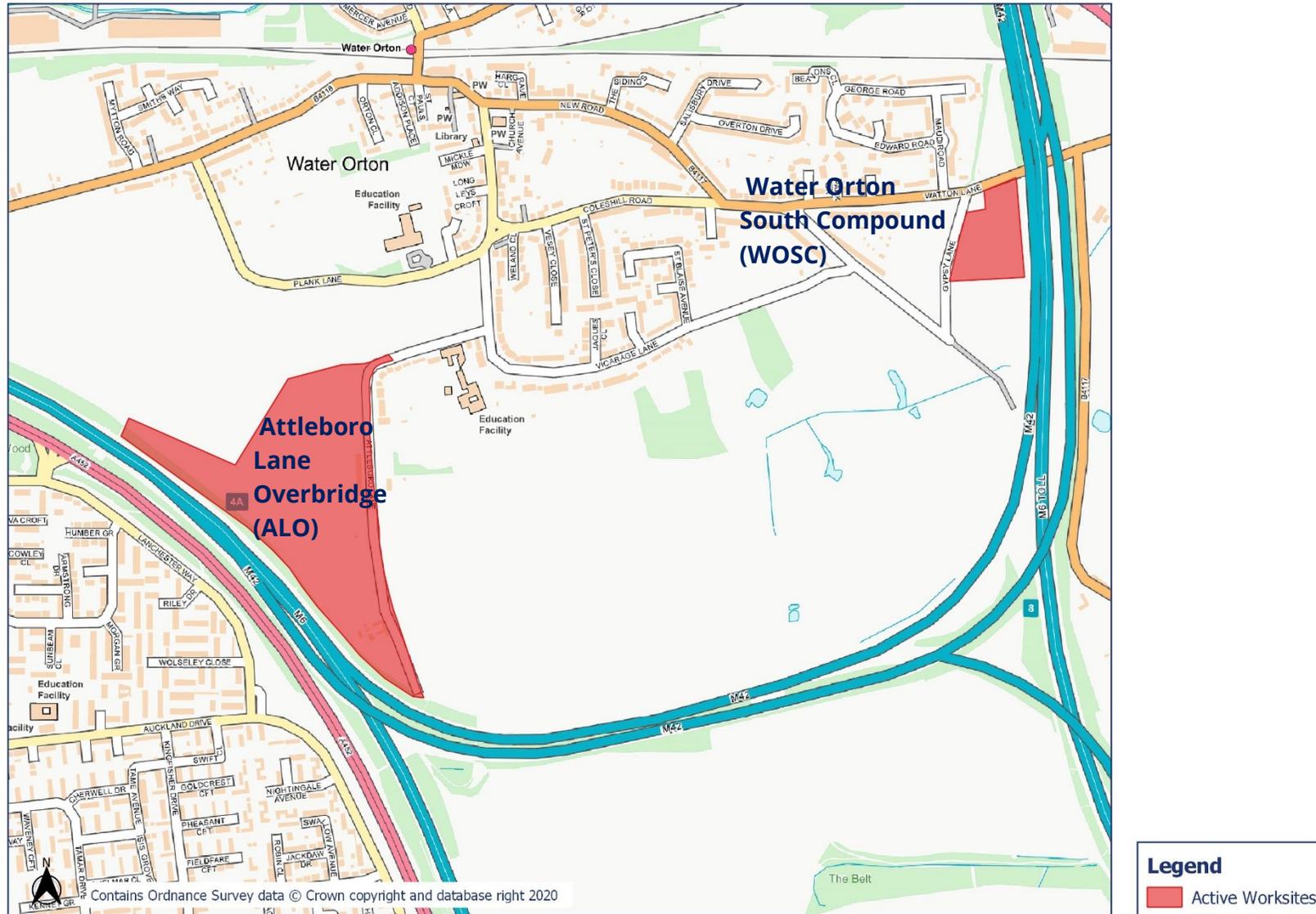
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-22-43723-C	BRD- Birmingham Road	Ground vibration from on heavy plant on site. House vibrating and rattling.	Vibratory rollers used in construction of access road. Works closest to residential properties to be completed outside of early and late hours to minimise disruption. Vibration monitor to be installed.	Vibration monitor installed
HS2-22-43751-C	ALO - Attleboro Lane Overbridge	Work commencing prior to 8am, causing a noise disturbance.	Ongoing works in area, however no evidence found that works are commencing earlier than they should be. WPD works also ongoing in area.	Confirmed outcome of investigation to complainant.

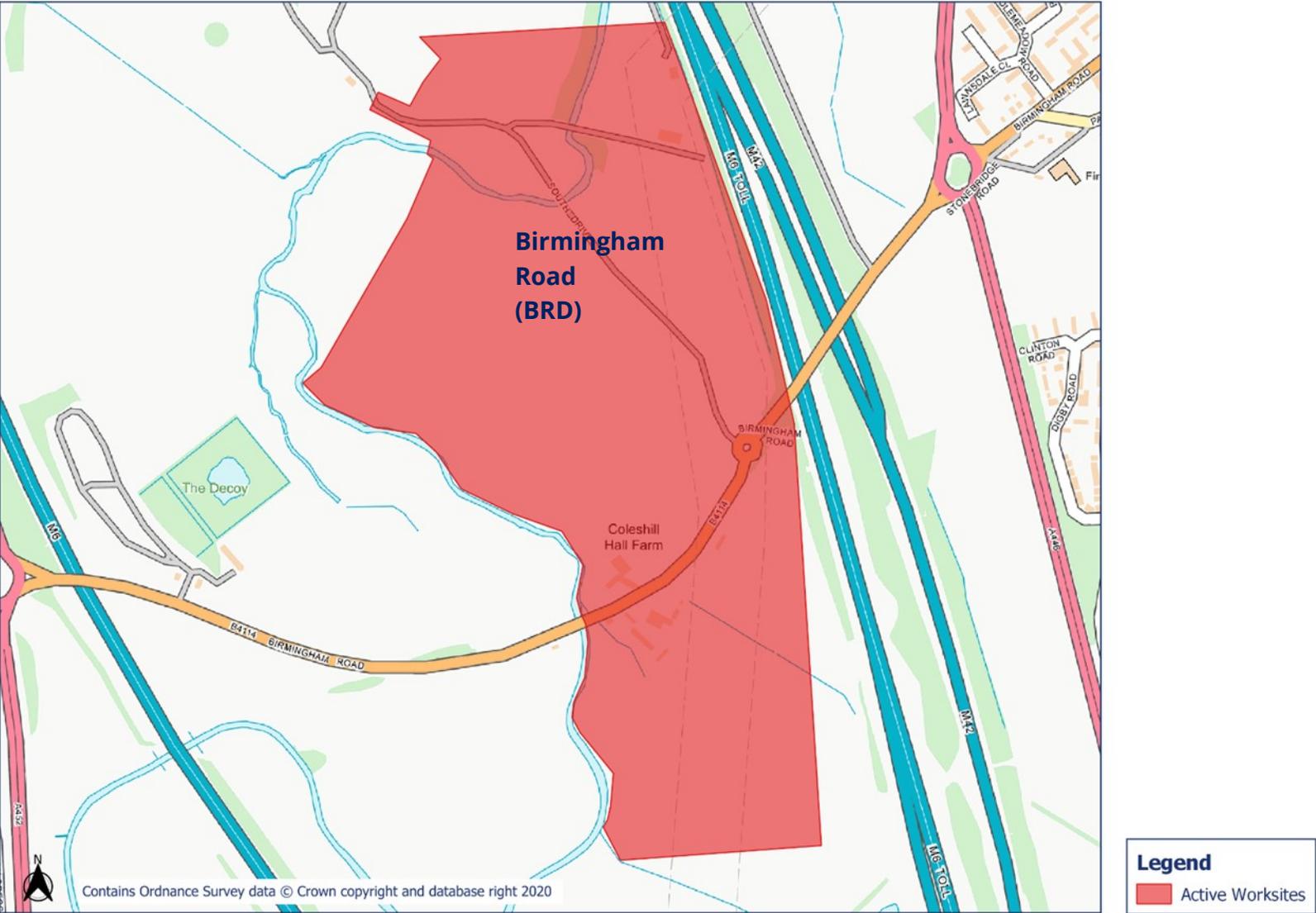
# Appendix A Site Locations







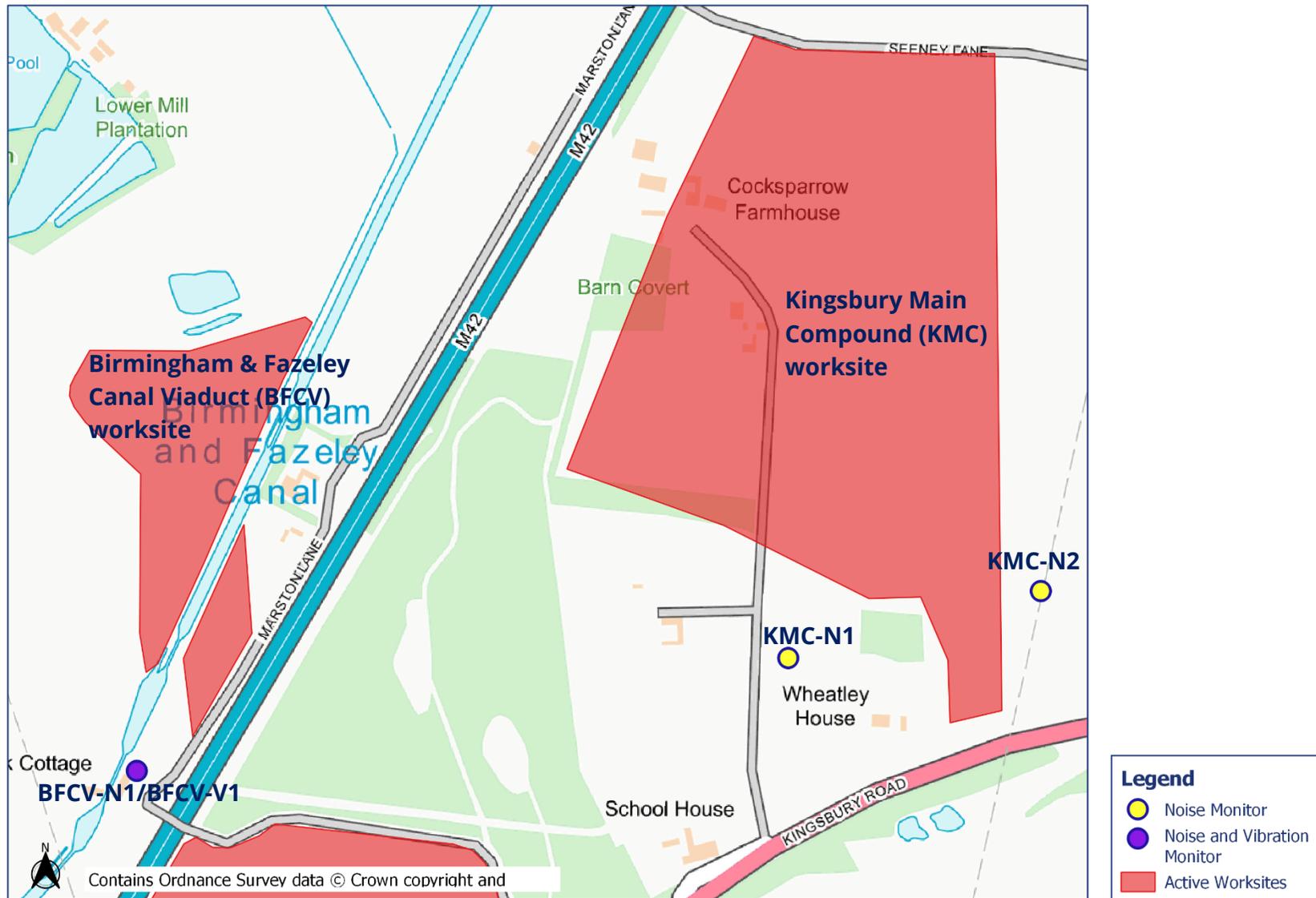


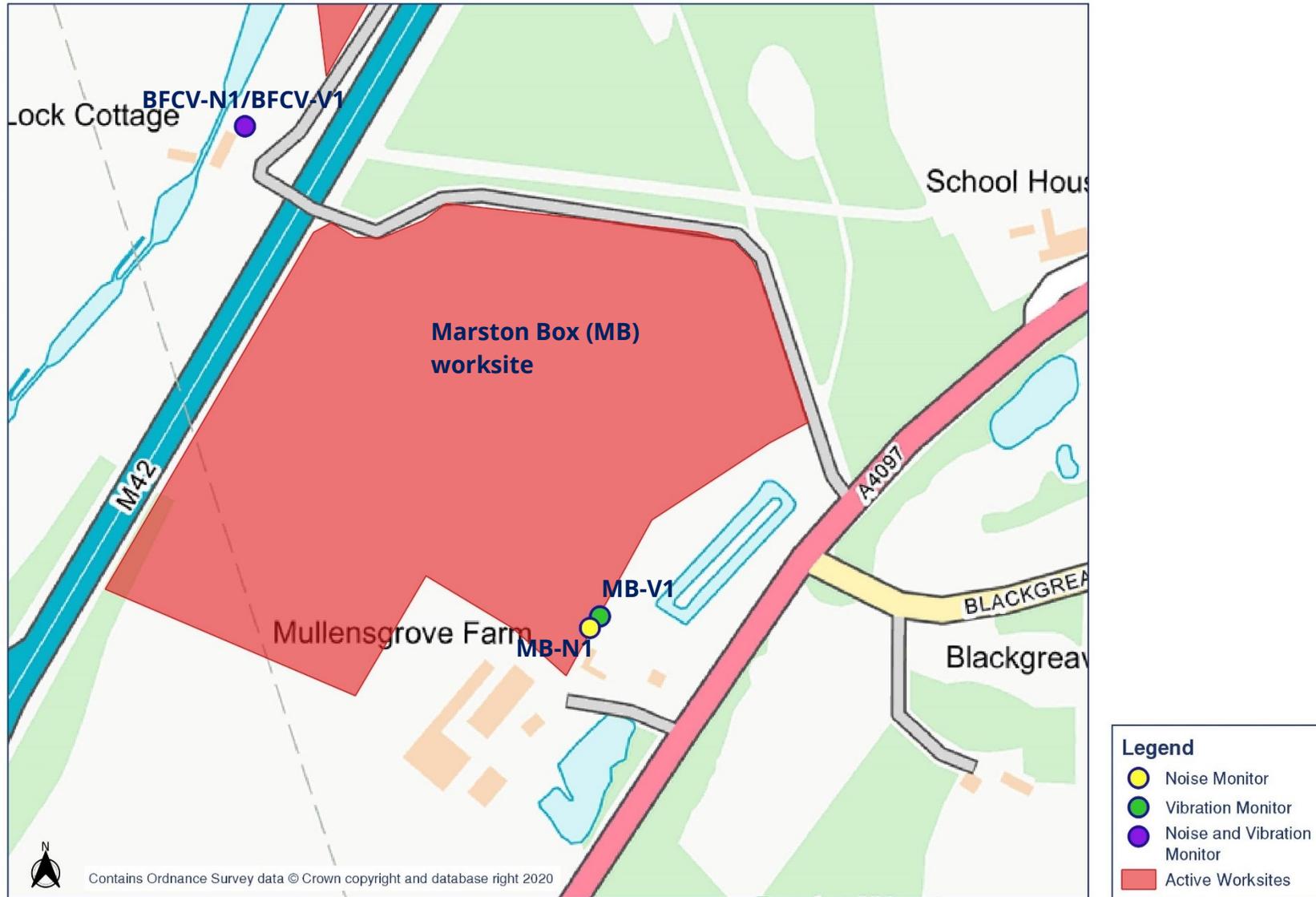


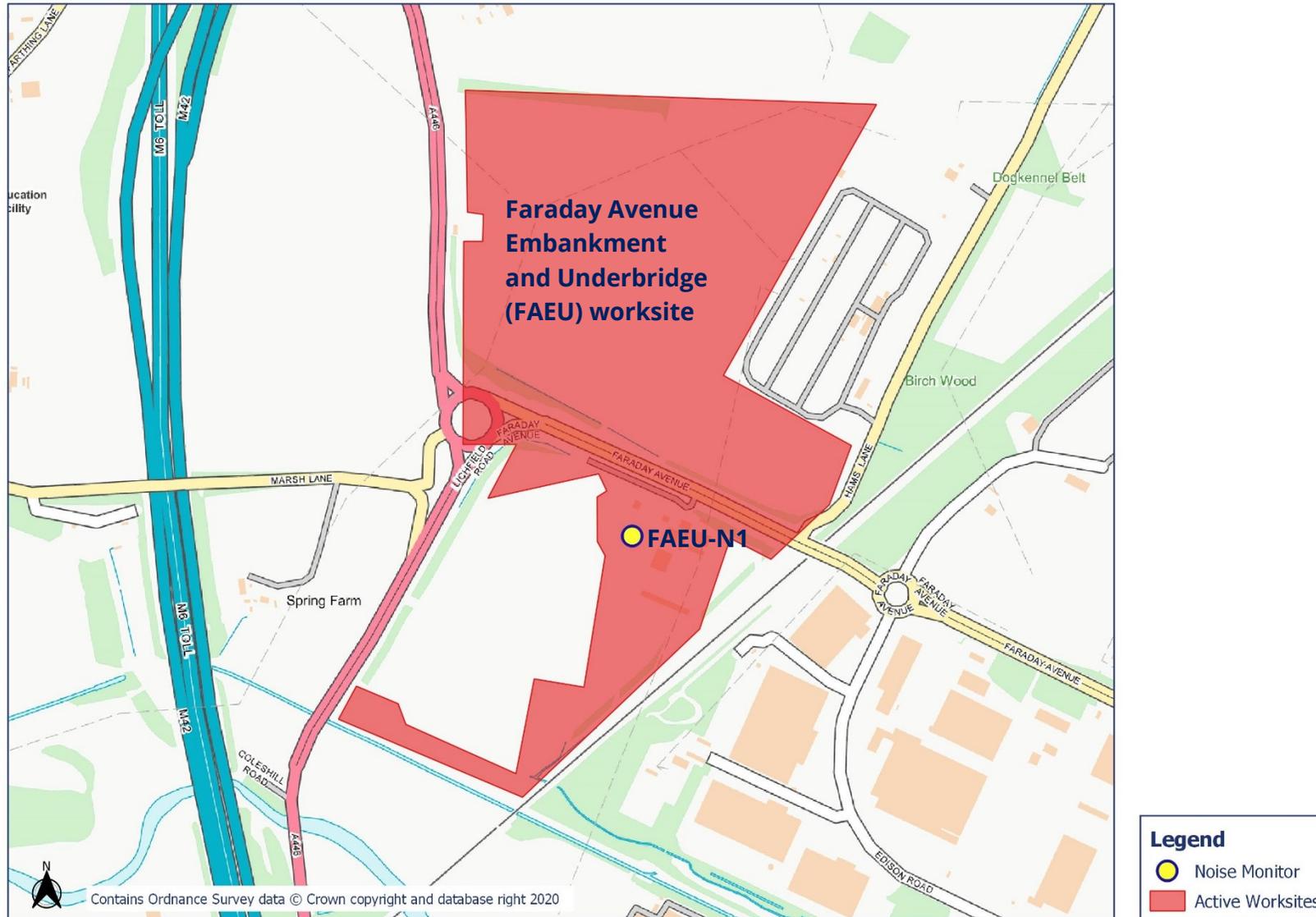


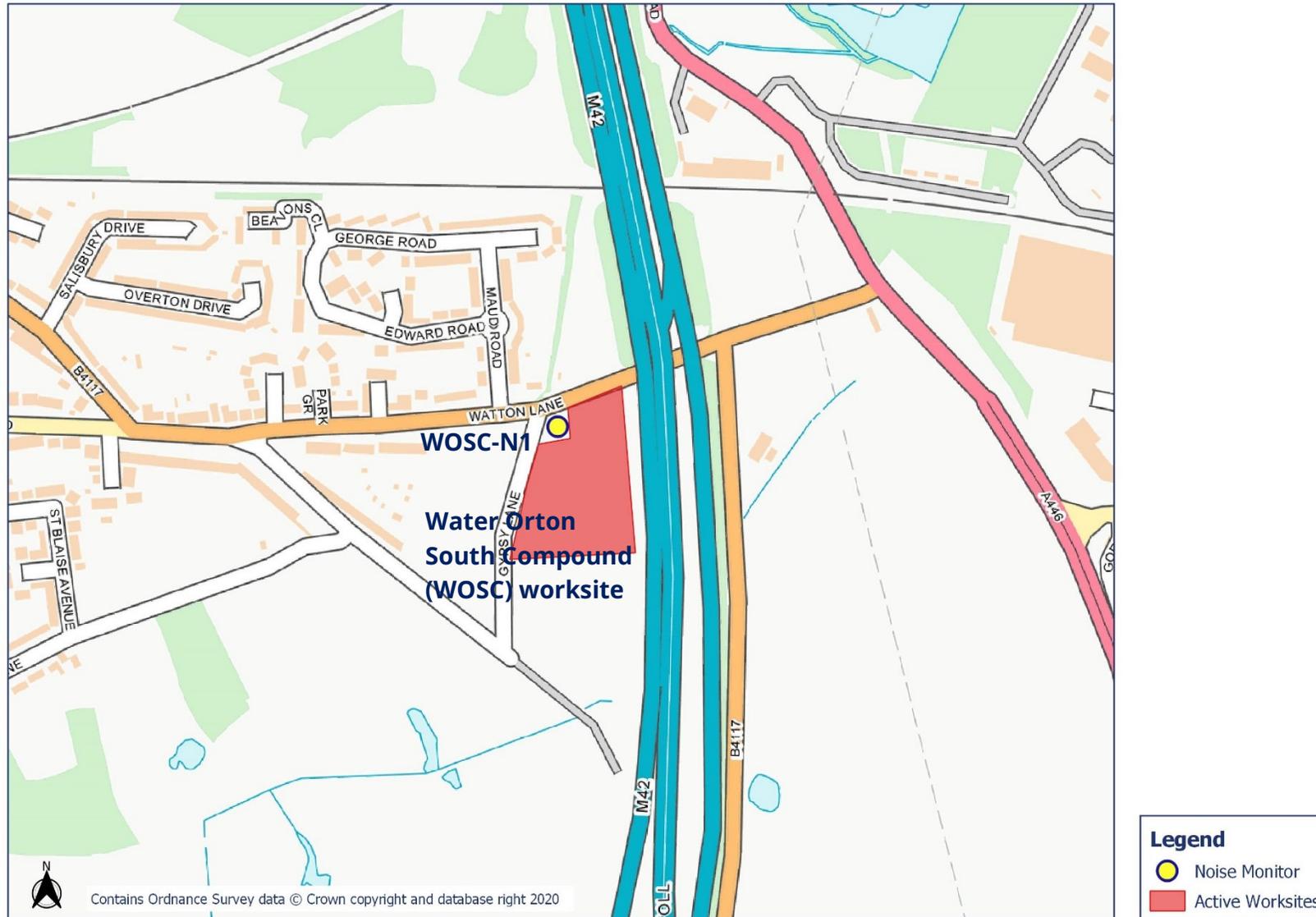


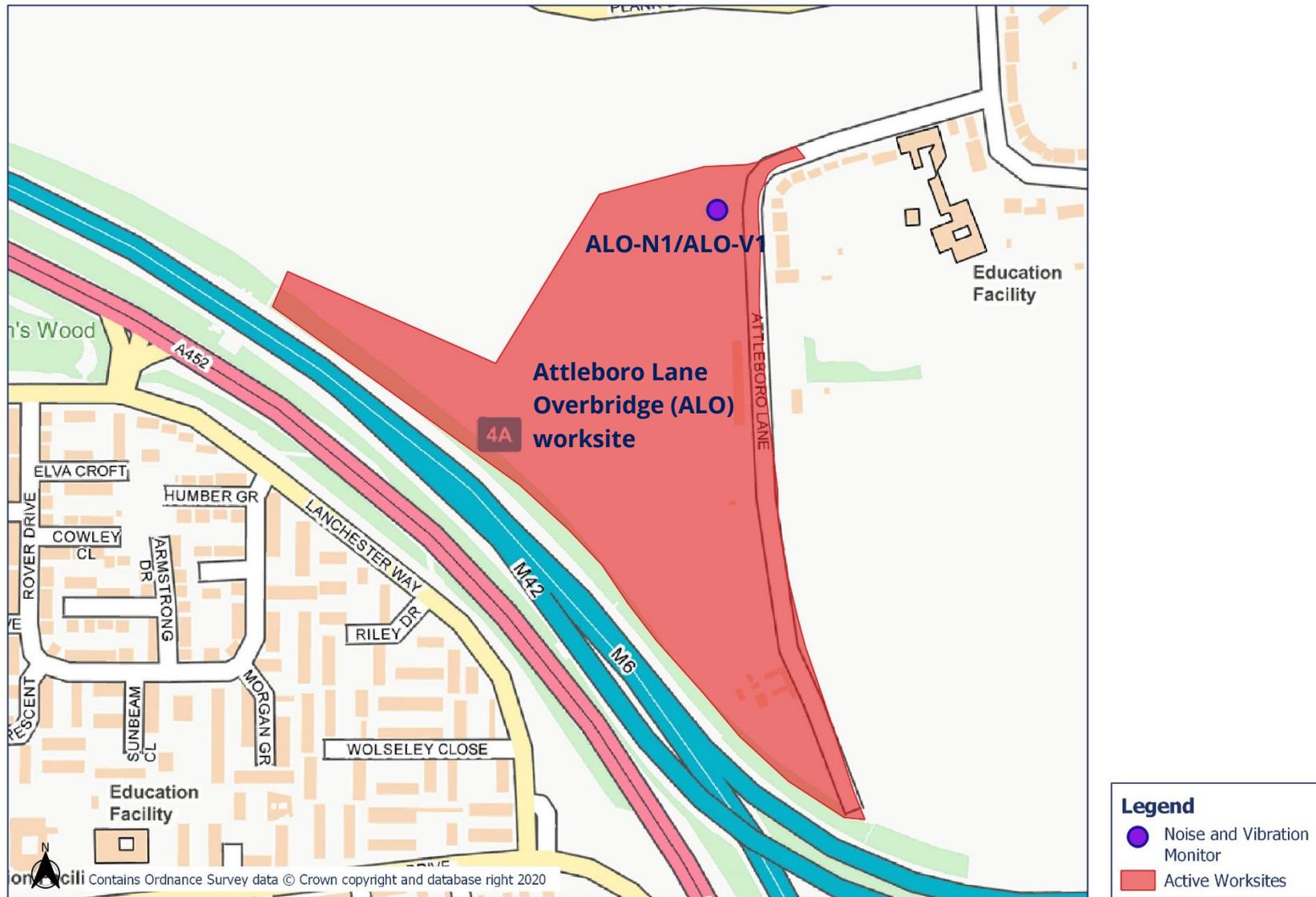
# Appendix B Monitoring Locations

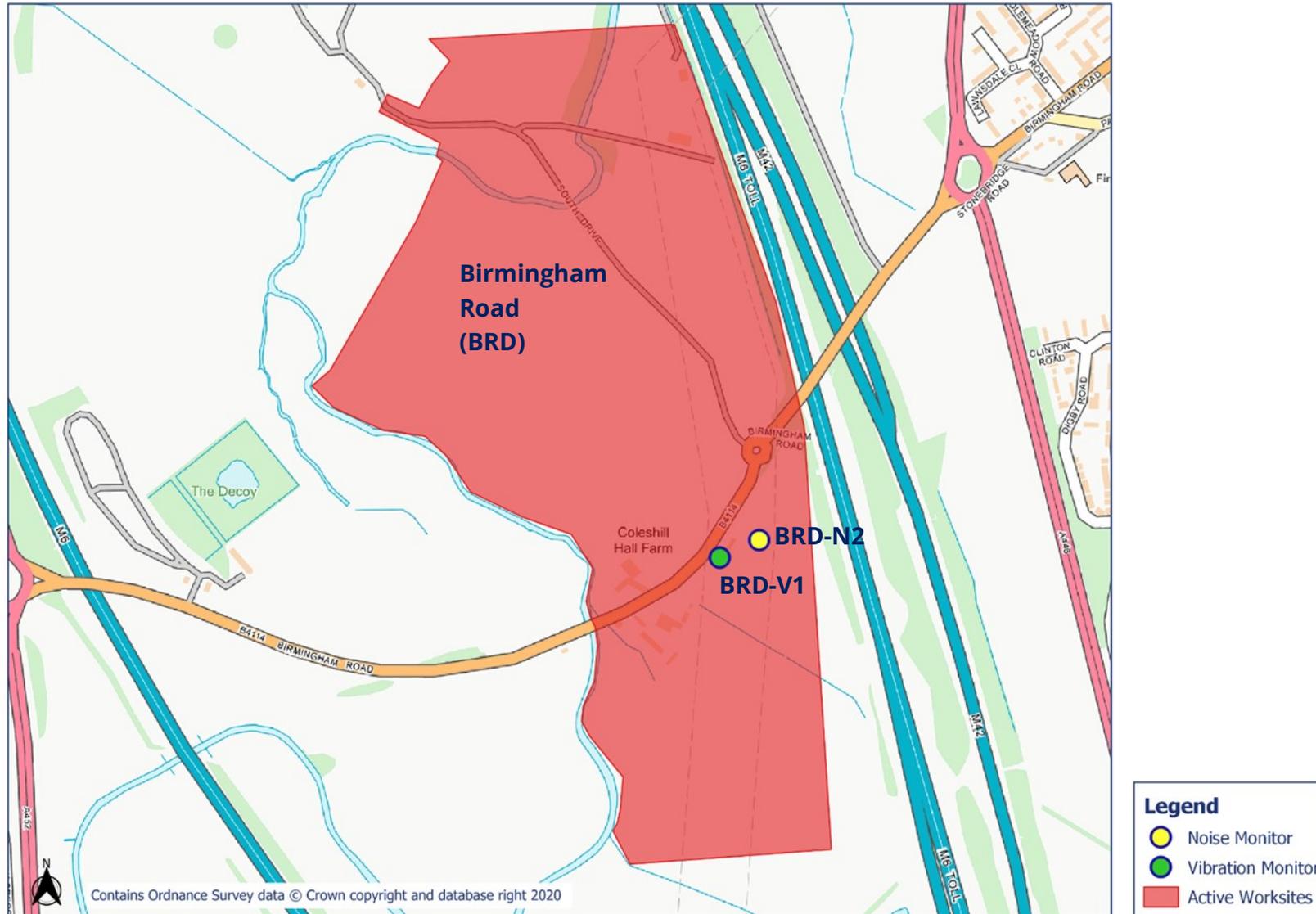


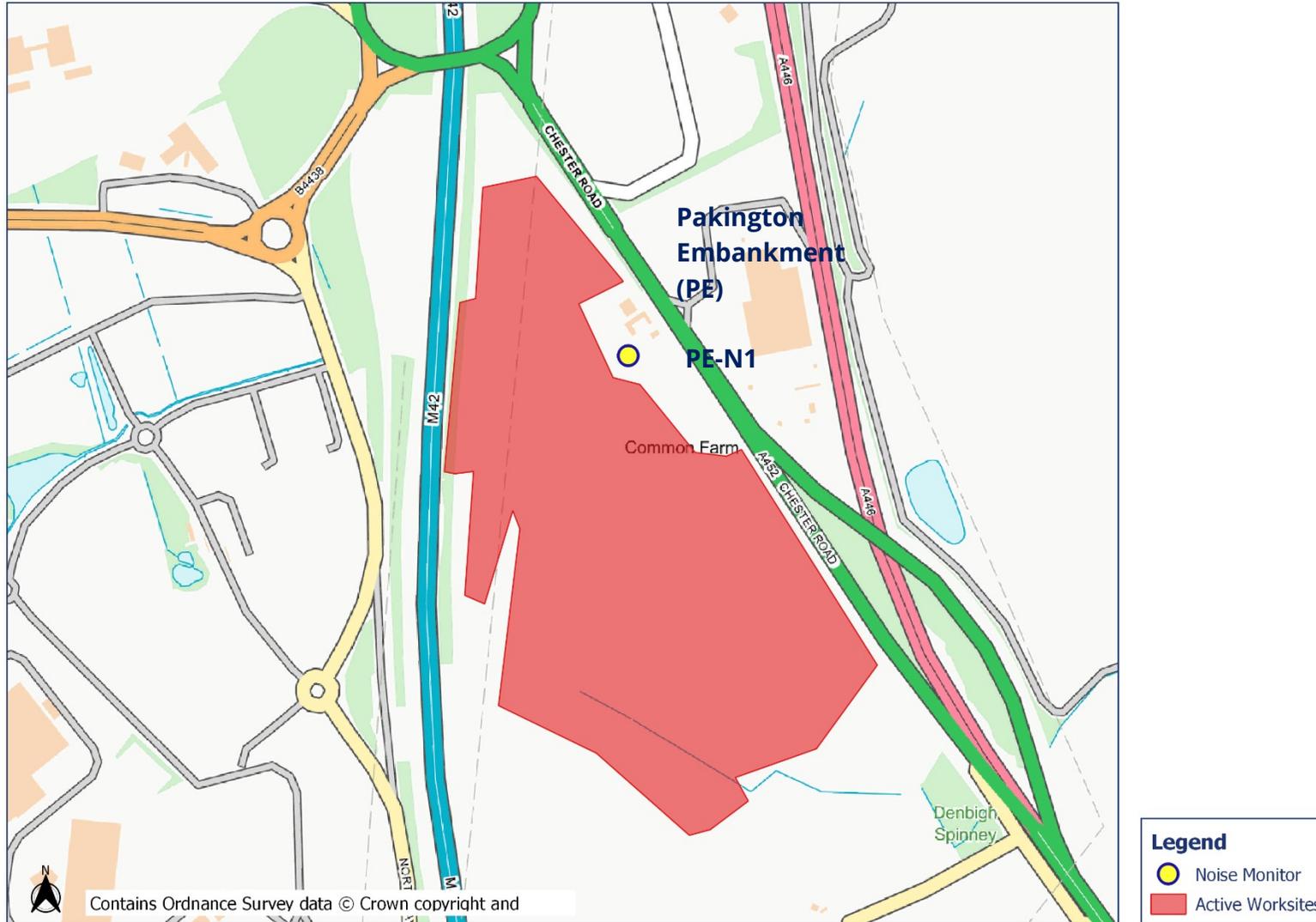


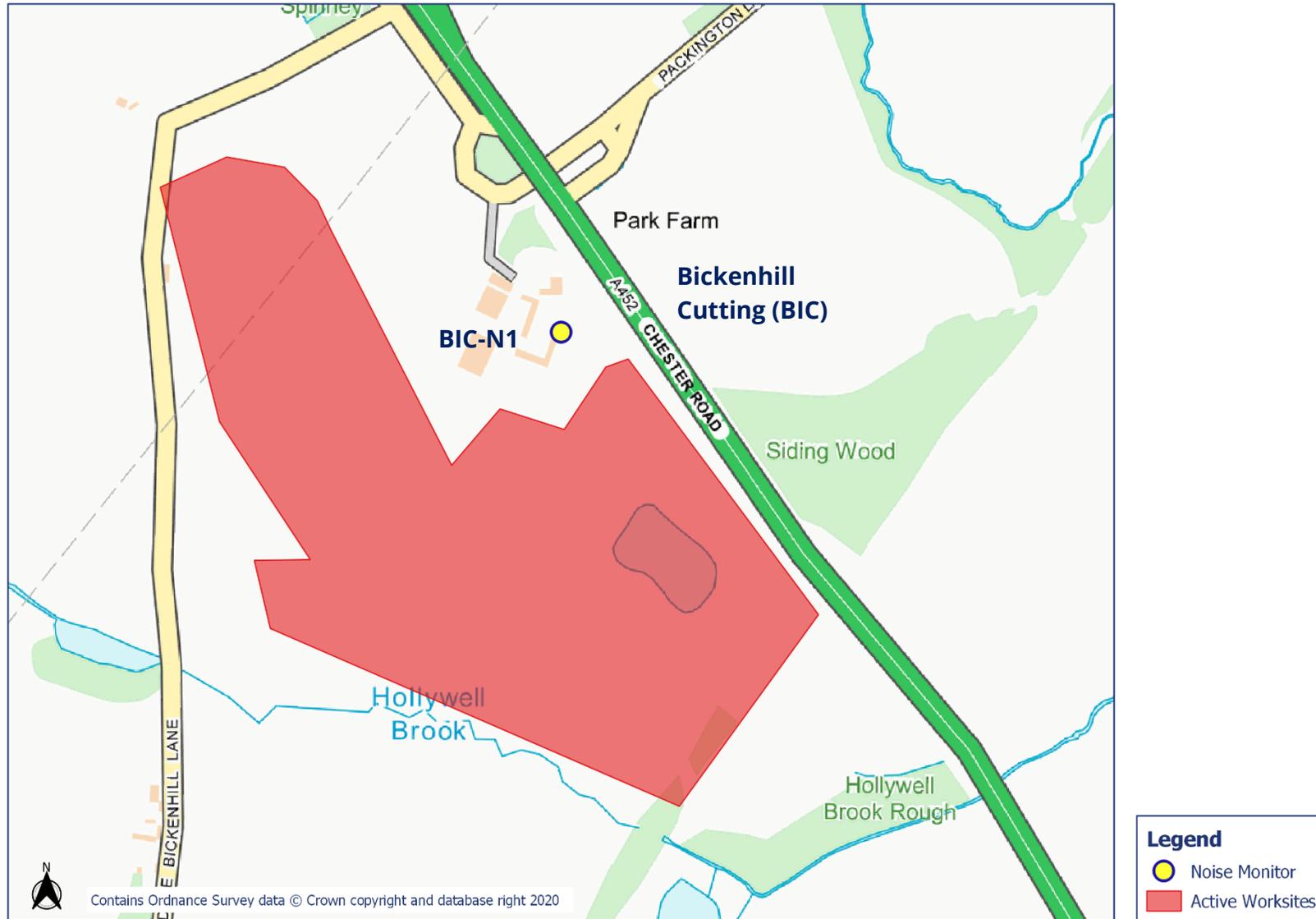










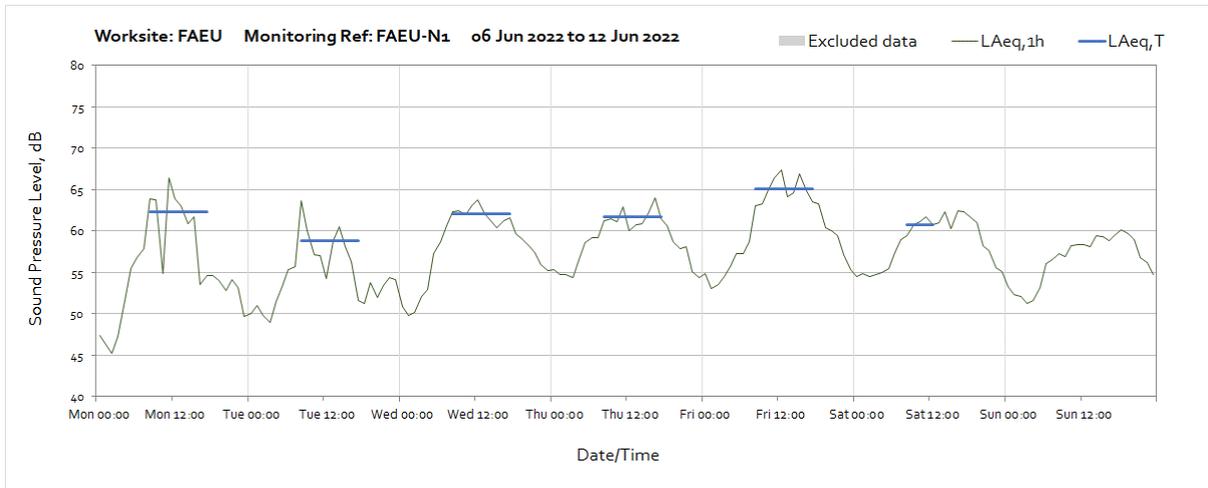
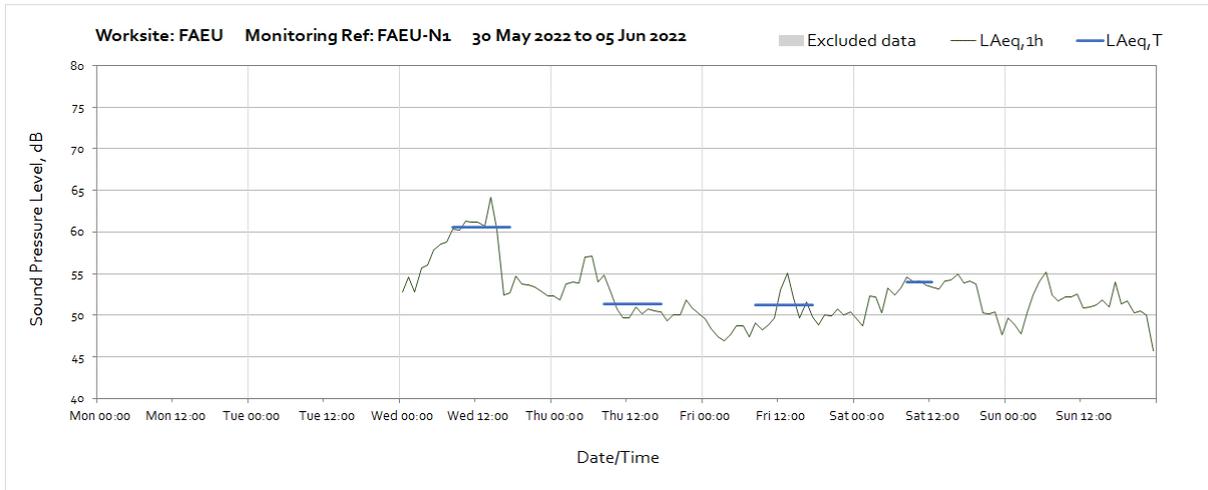


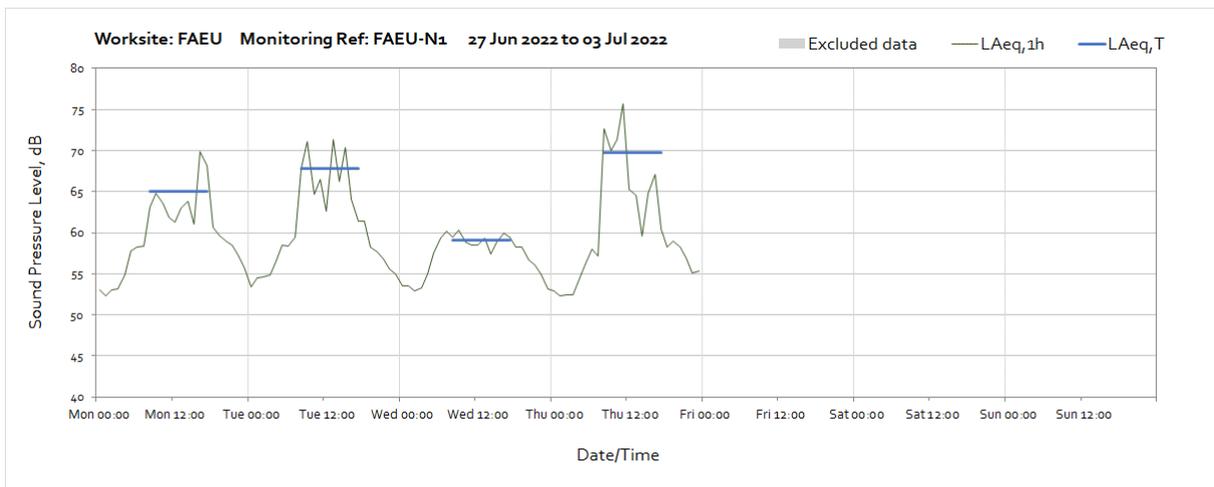
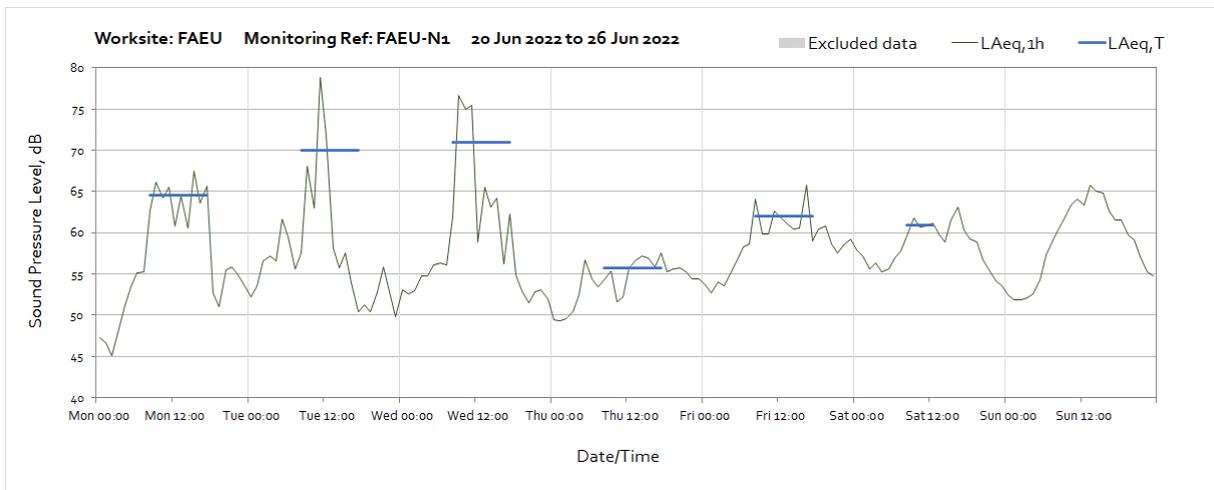
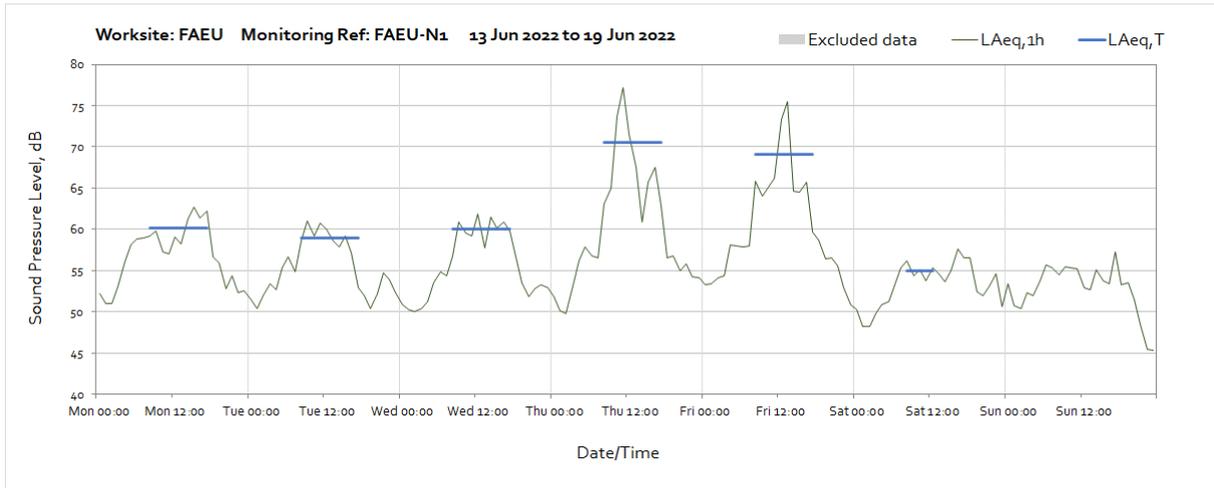
# Appendix C Data

## Noise

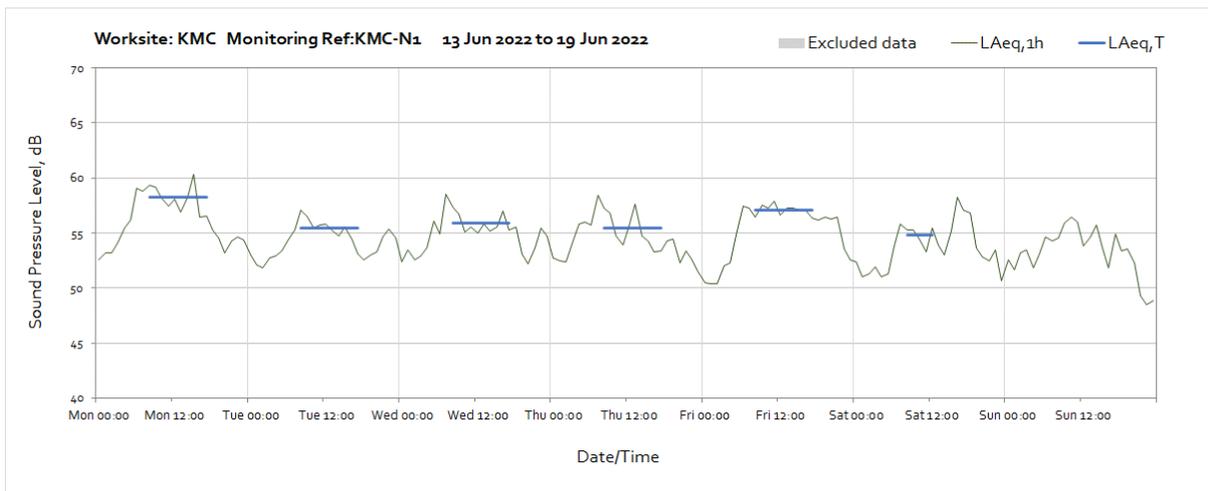
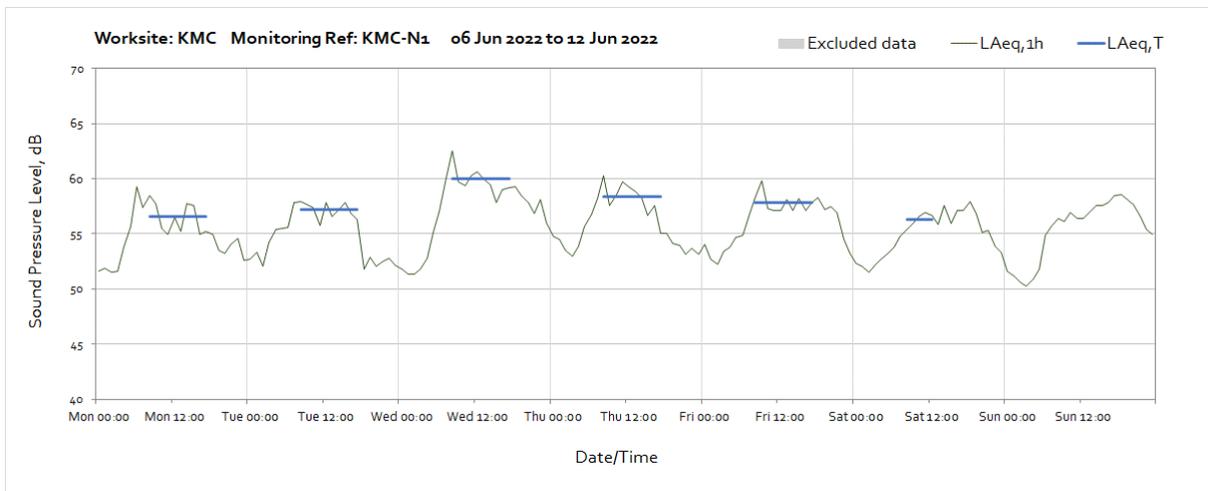
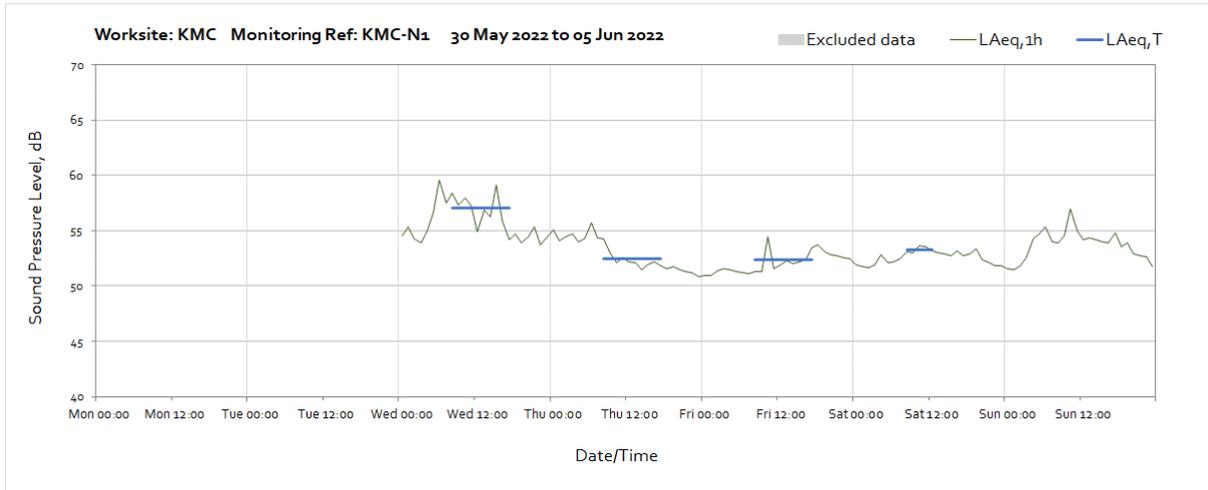
The following graphs show the hourly measured ambient noise level  $L_{Aeq,1h}$  and, where relevant, the averaged noise level  $L_{Aeq,T}$  values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and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

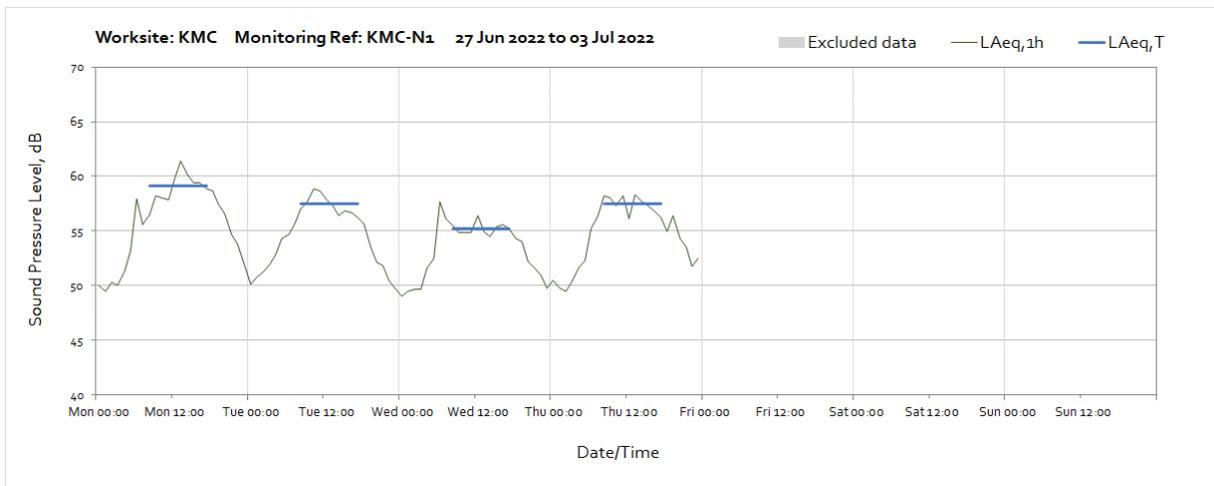
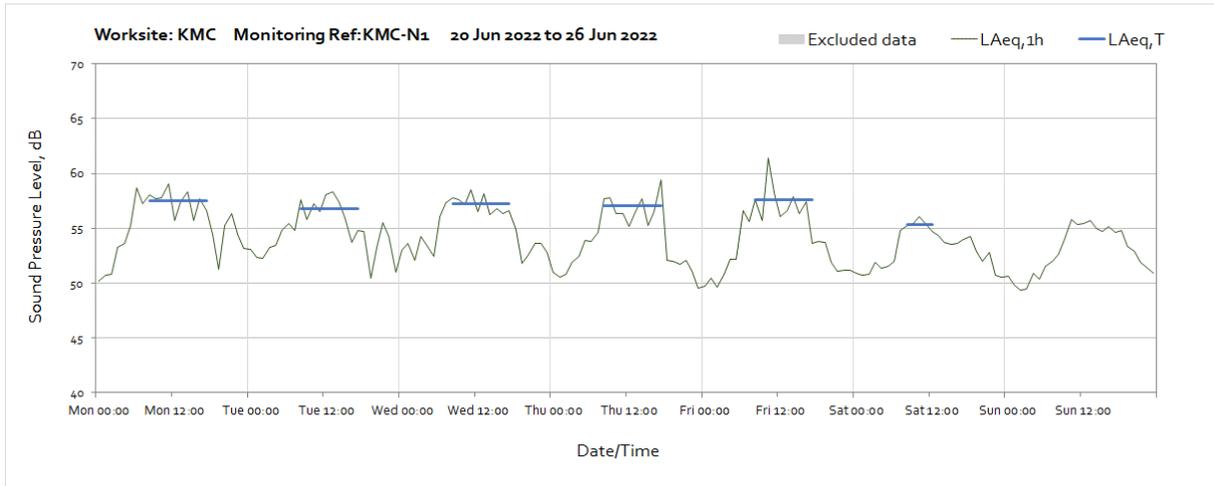
### Worksite: FAEU – Monitoring Ref: FAEU-N1



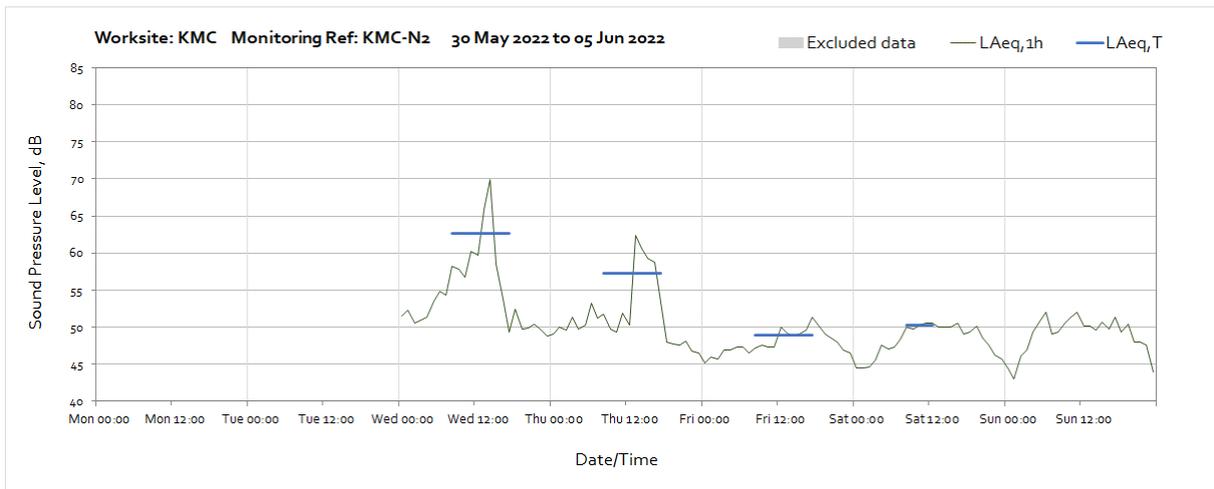


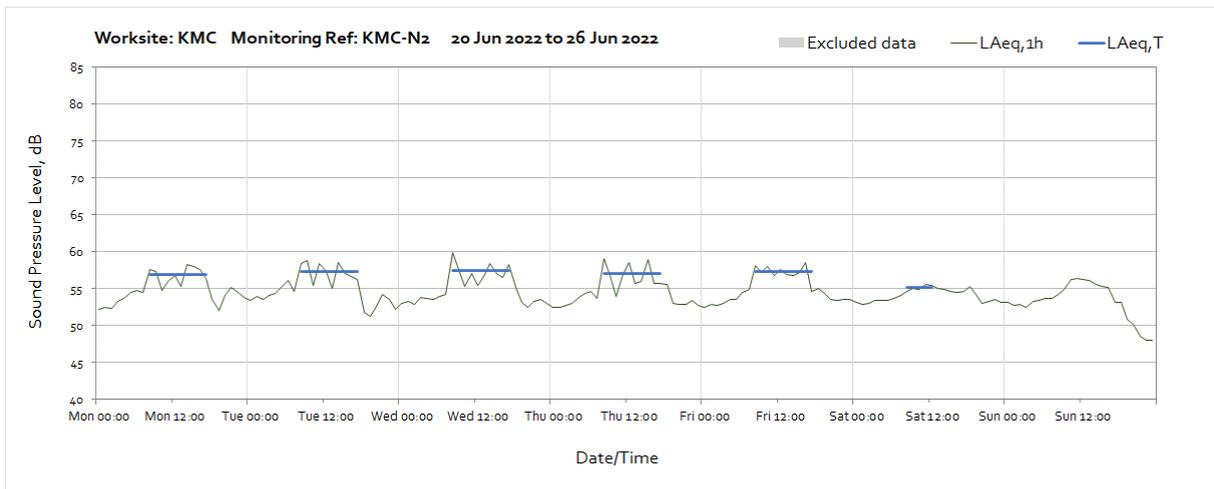
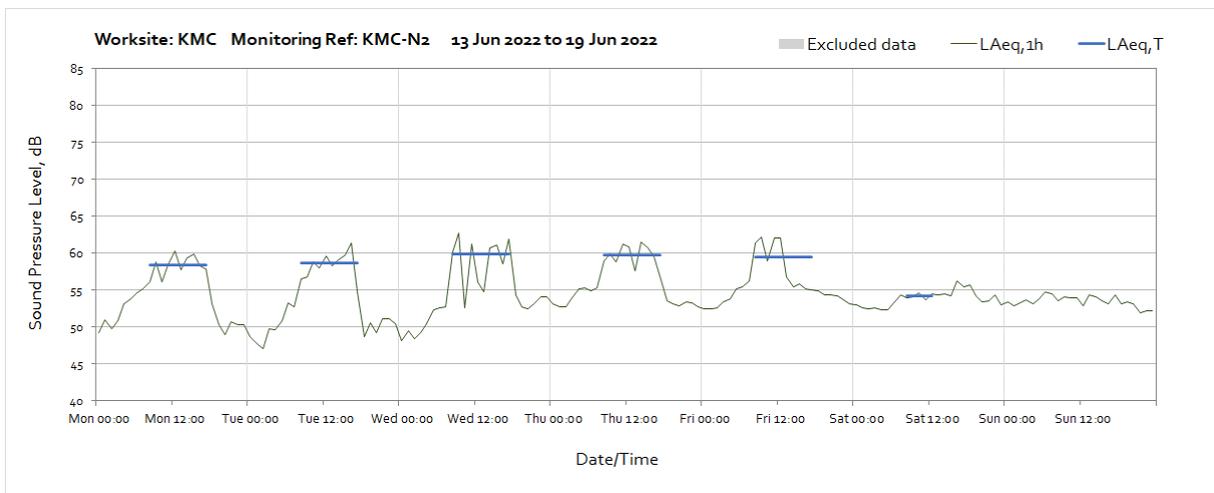
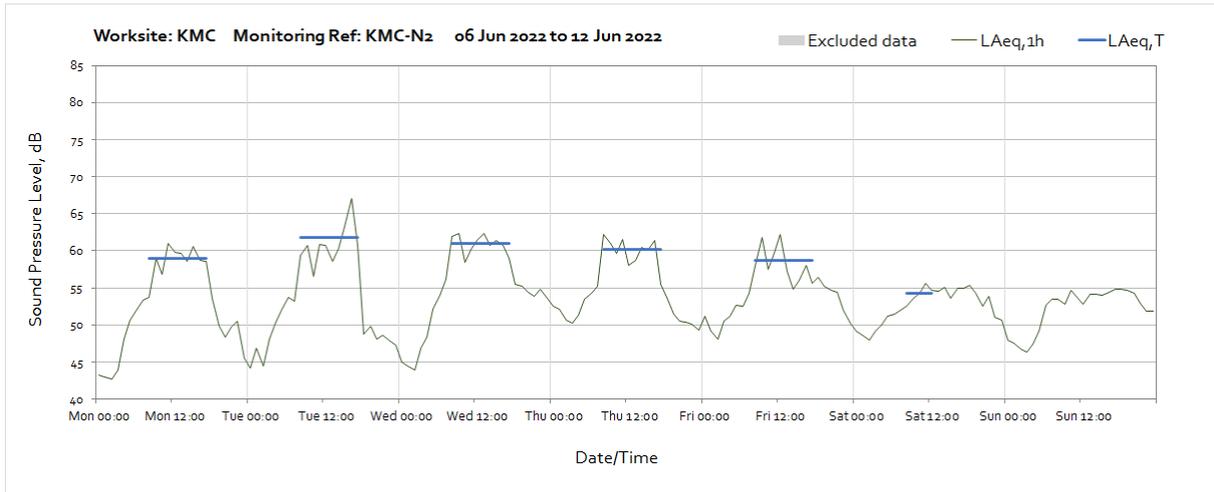
# Worksite: KMC – Monitoring Ref: KMC-N1

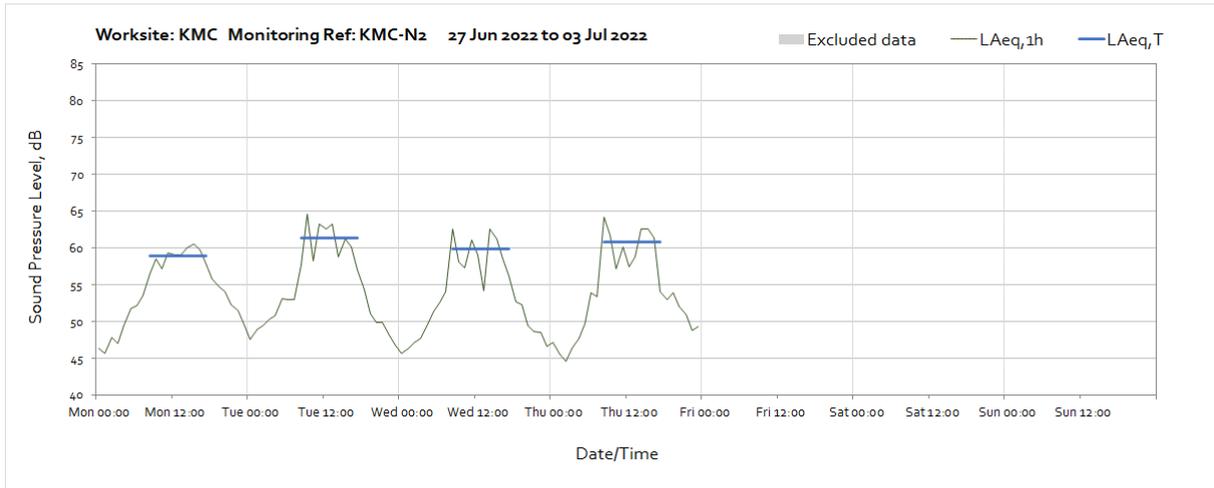




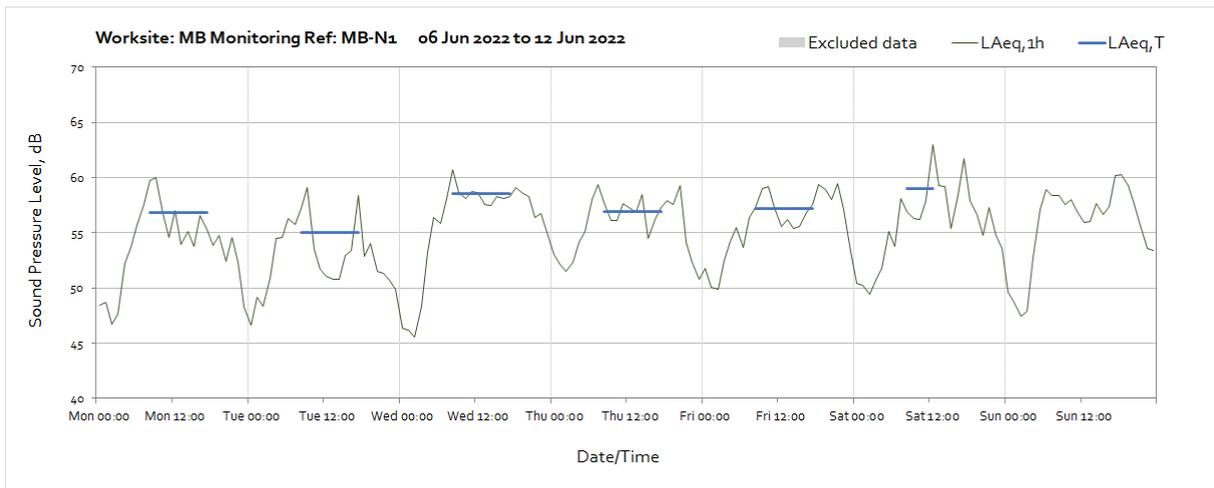
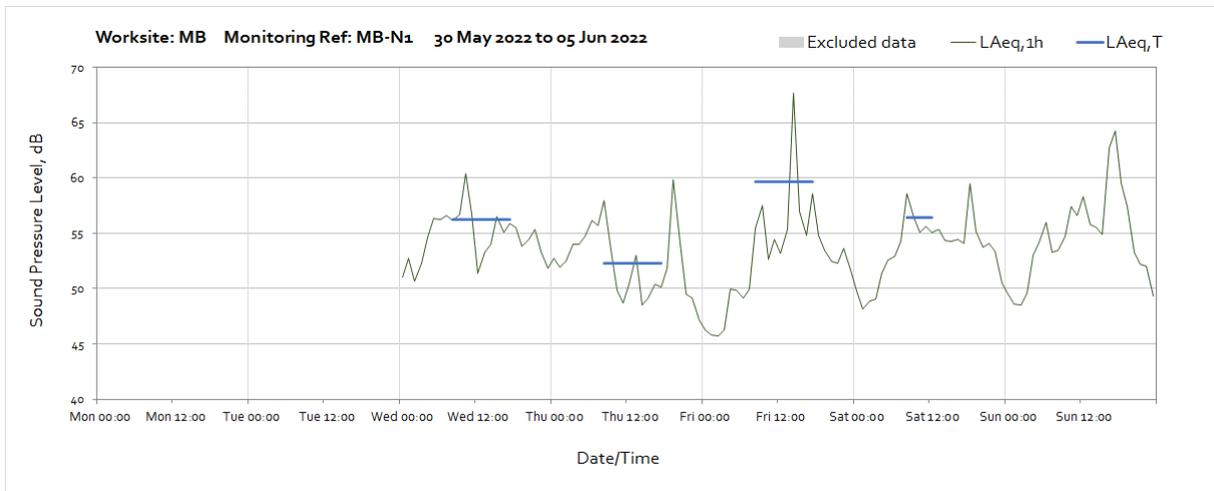
## Worksite: KMC - Monitoring Ref: KMC-N2

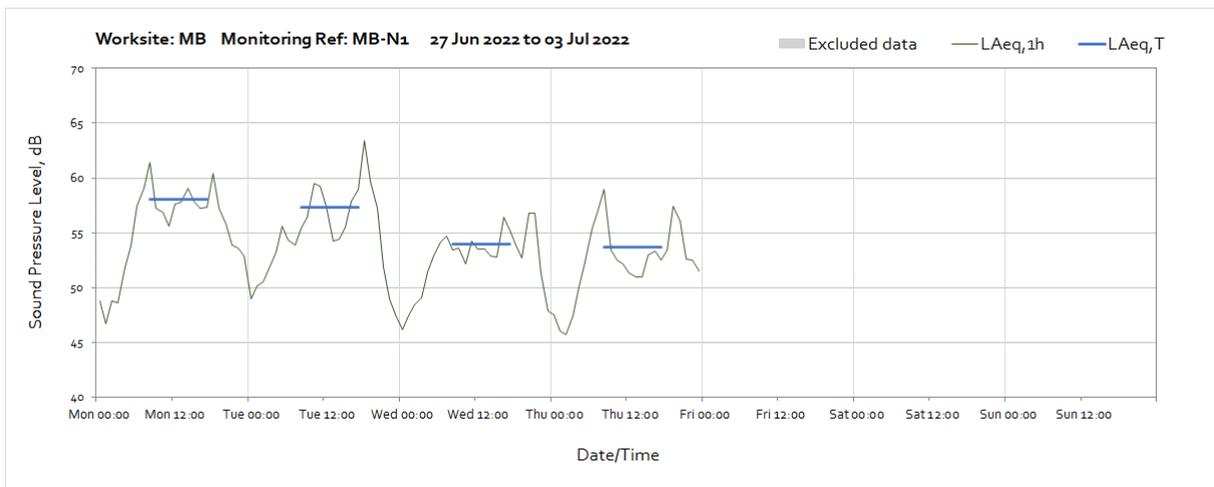
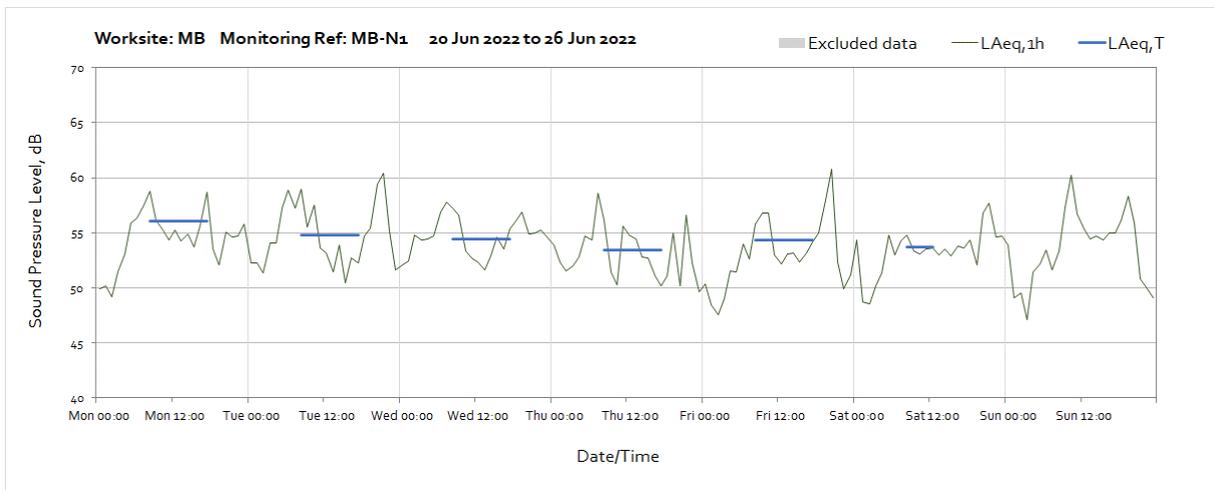
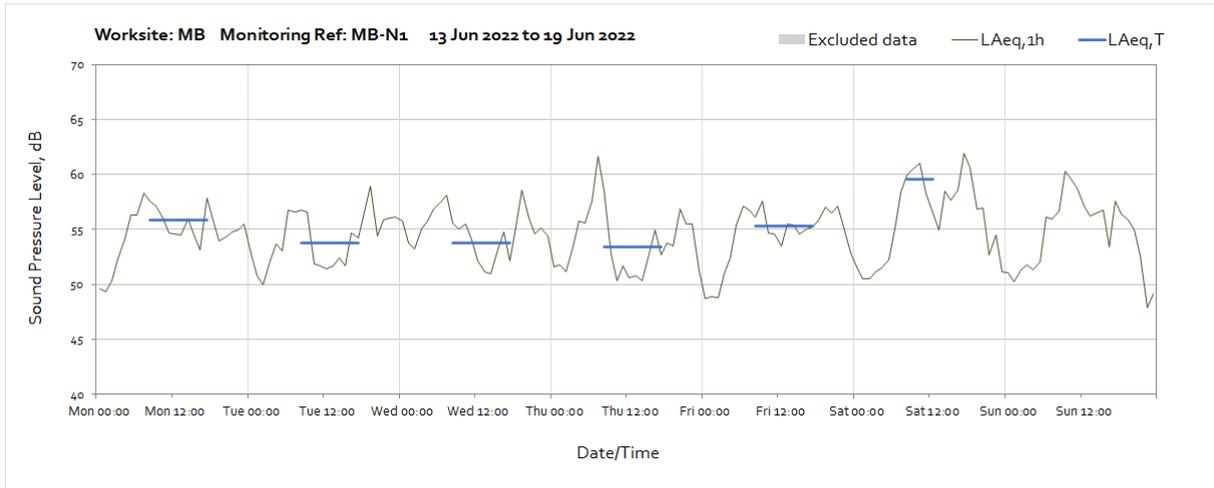




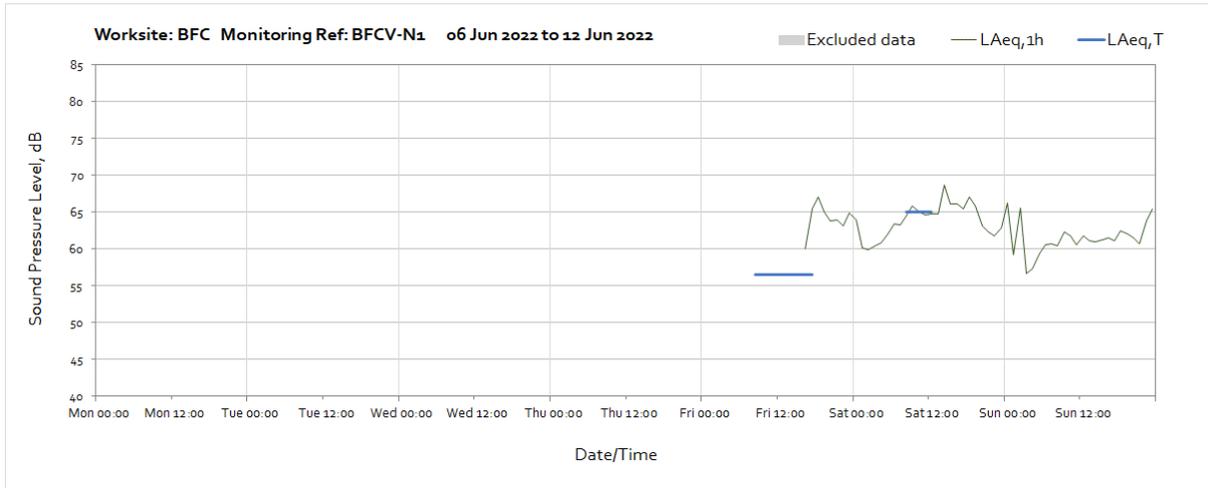


**Worksite: MB – Monitoring Ref: MB-N1**

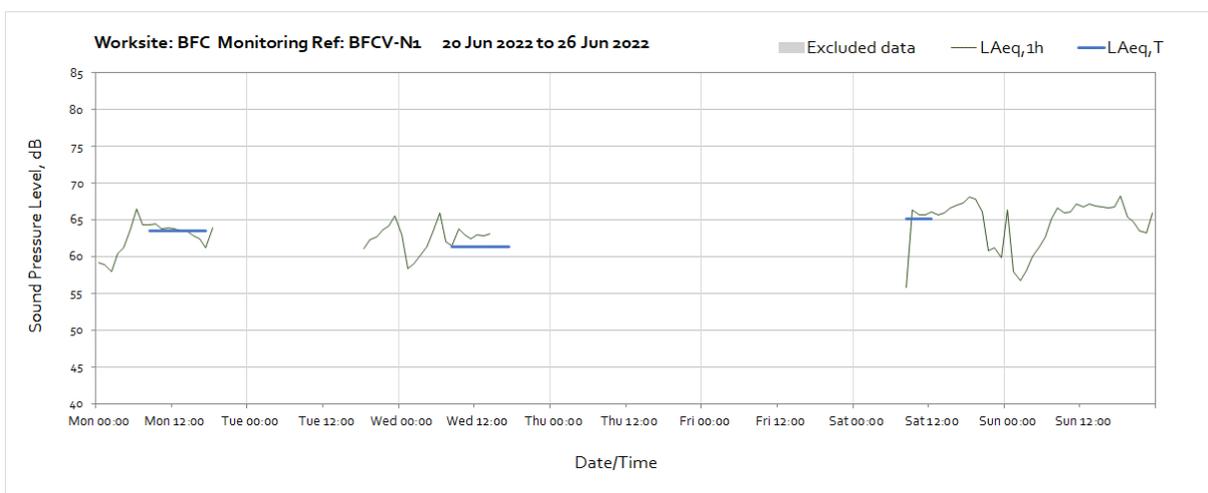
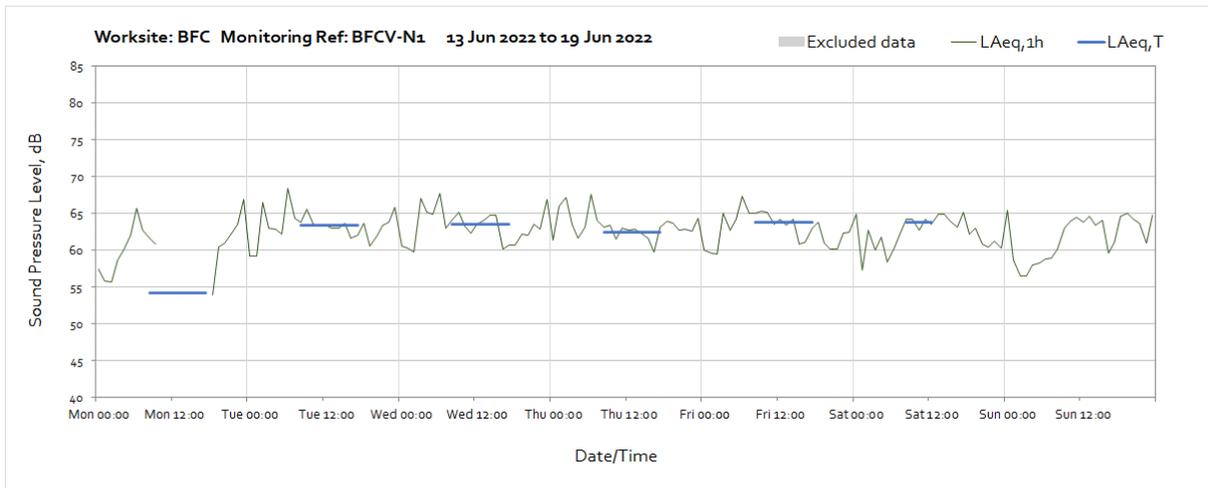




## Worksite: BFCV – Monitoring Ref: BFCV-N1

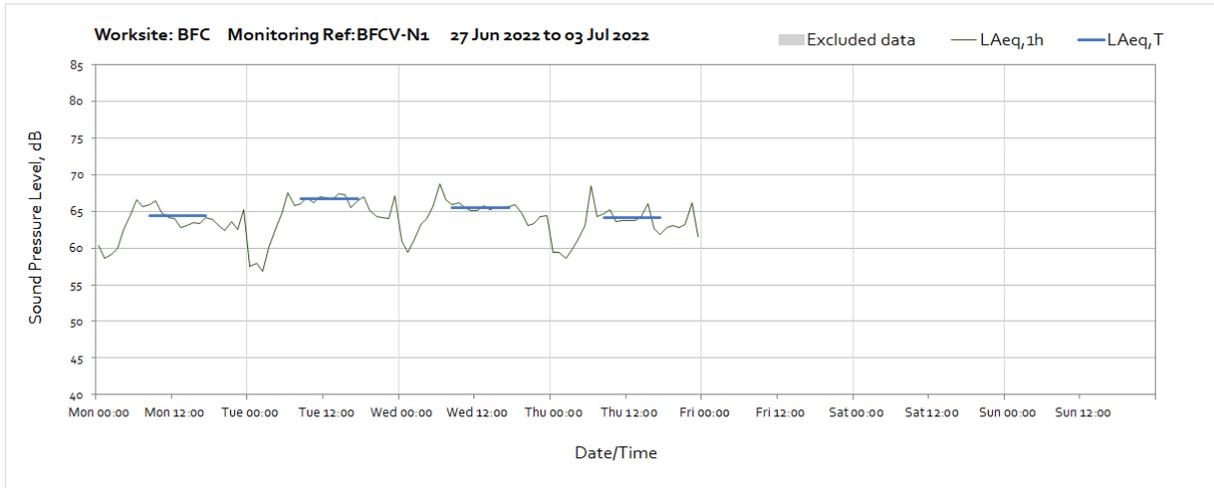


Note: Missing data 1<sup>st</sup> – 10<sup>th</sup> June was due to a power disconnection

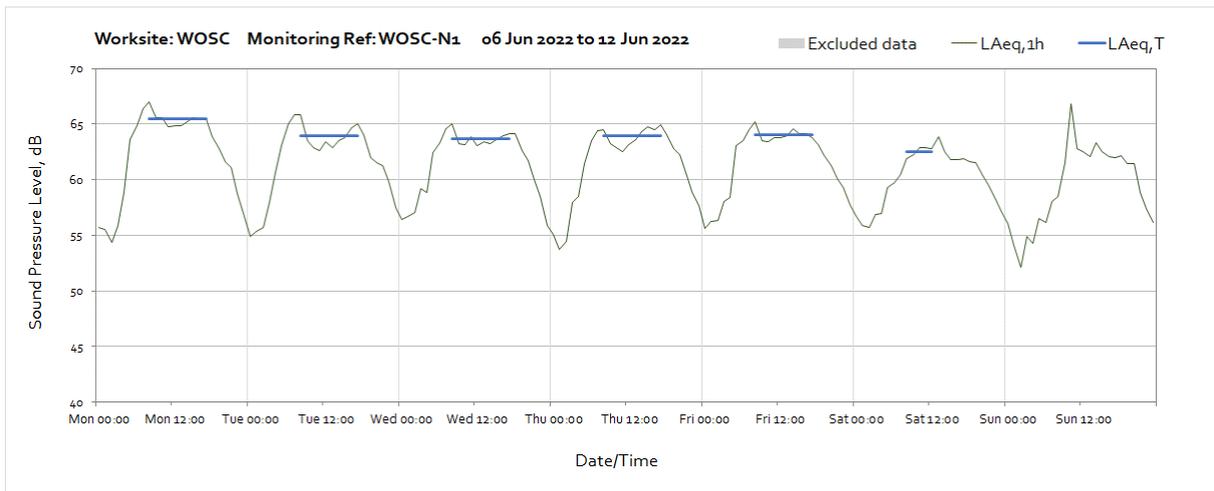
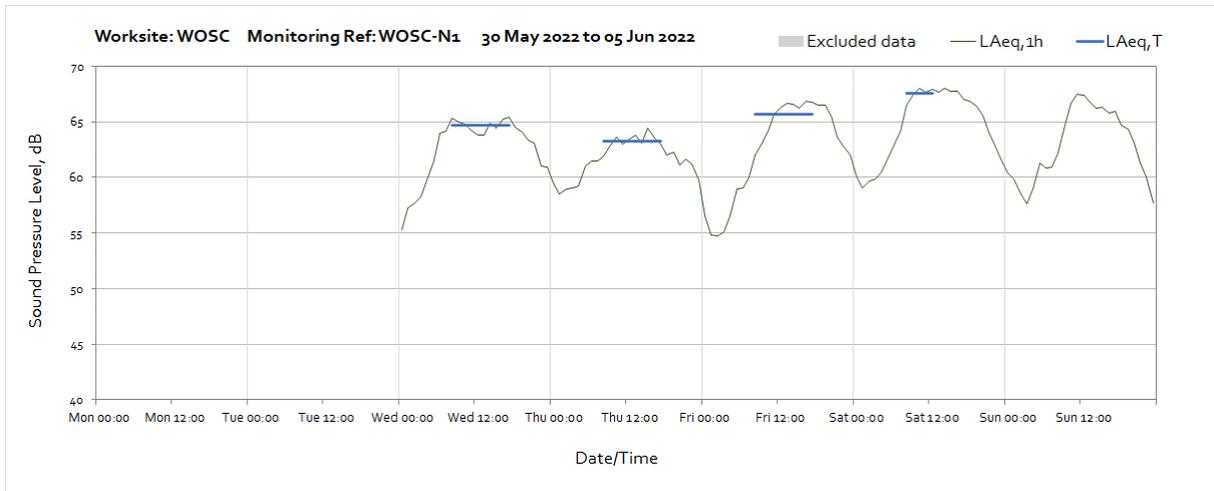


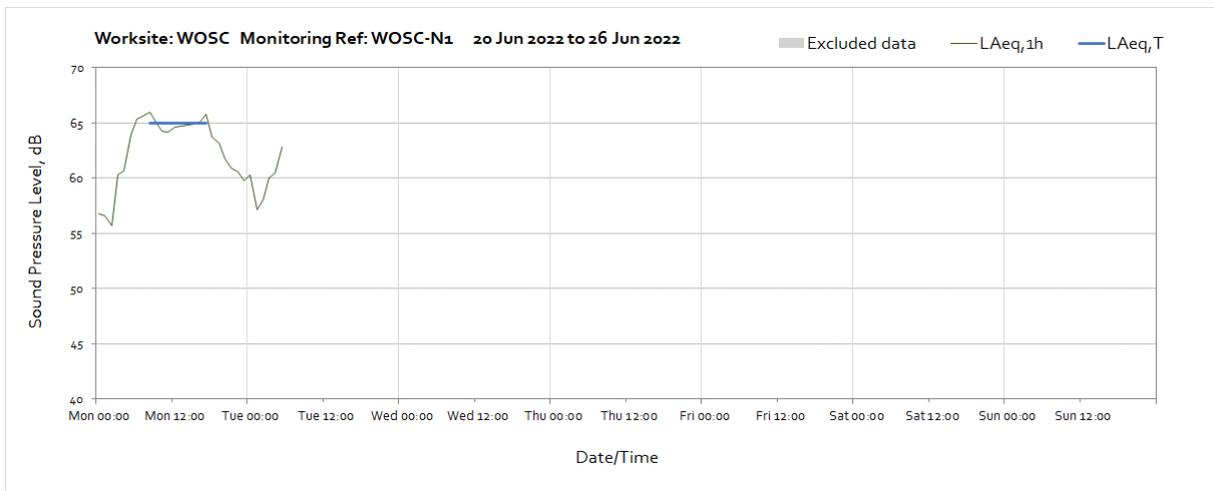
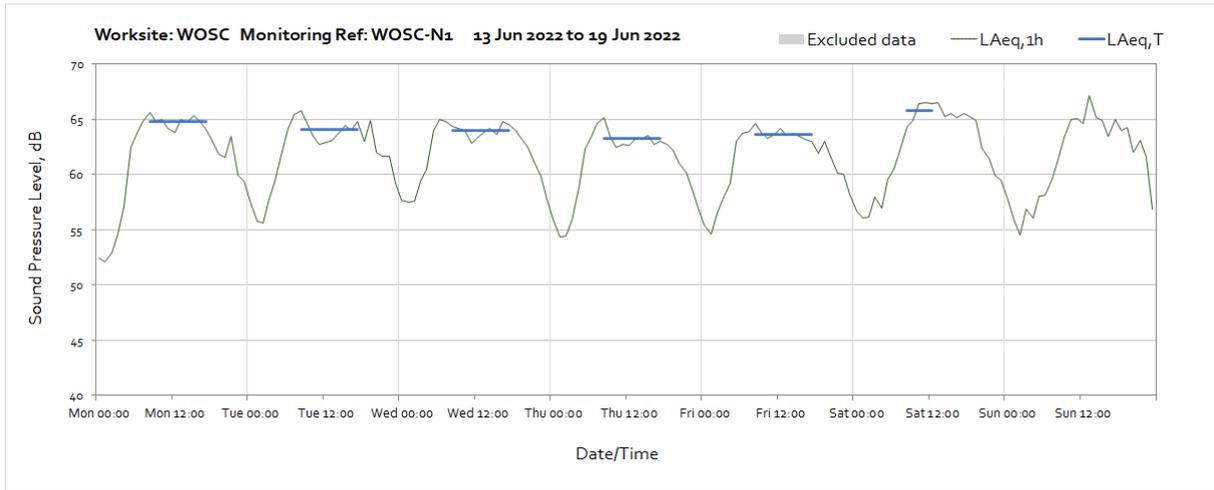
Note: Missing data 20<sup>th</sup>, 21<sup>st</sup>, 22<sup>nd</sup>- 25<sup>th</sup> June is due to power disconnection.

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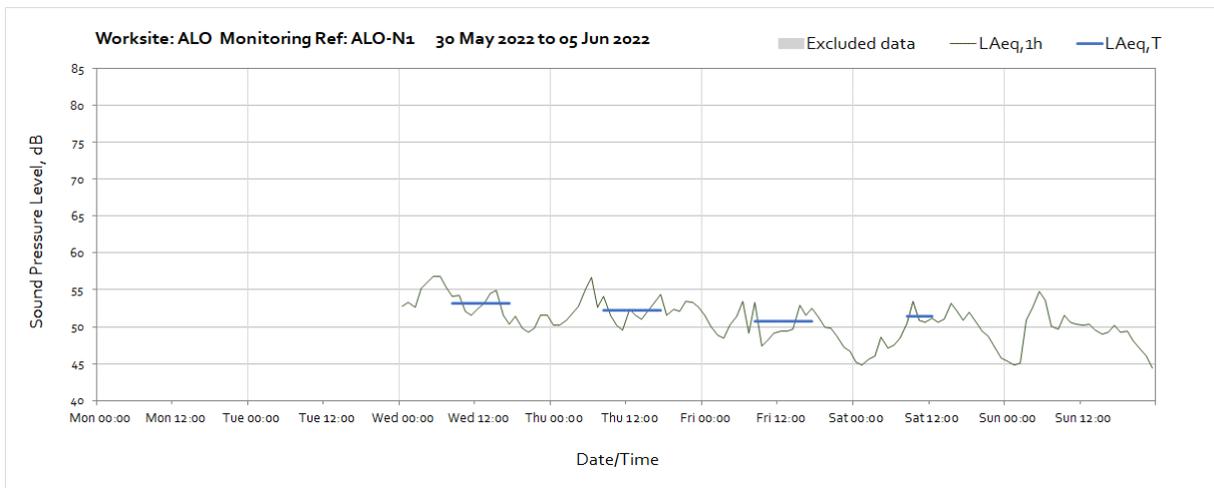
**Worksite: WOSC – Monitoring Ref: WOSC-N1**

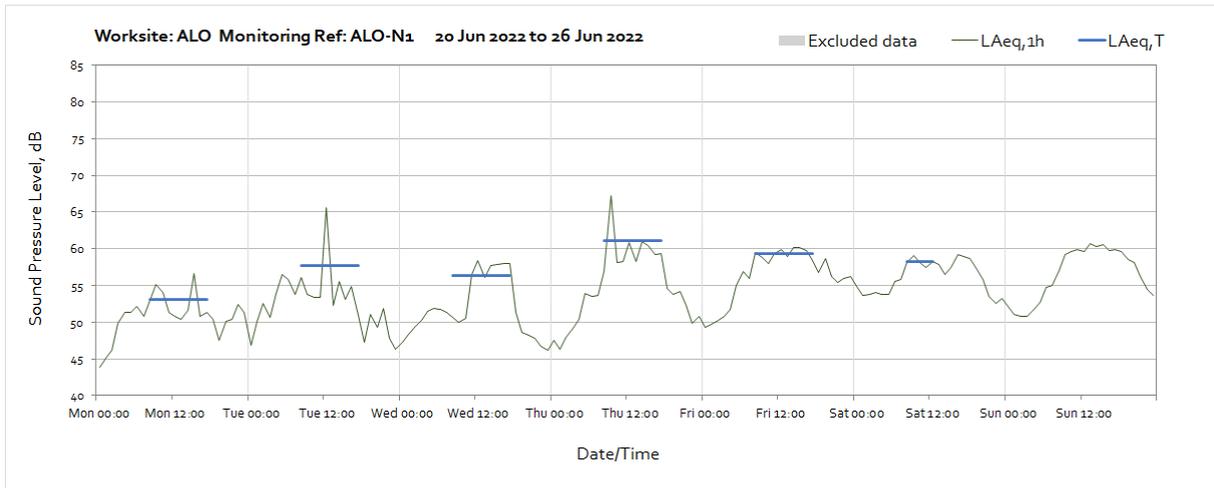
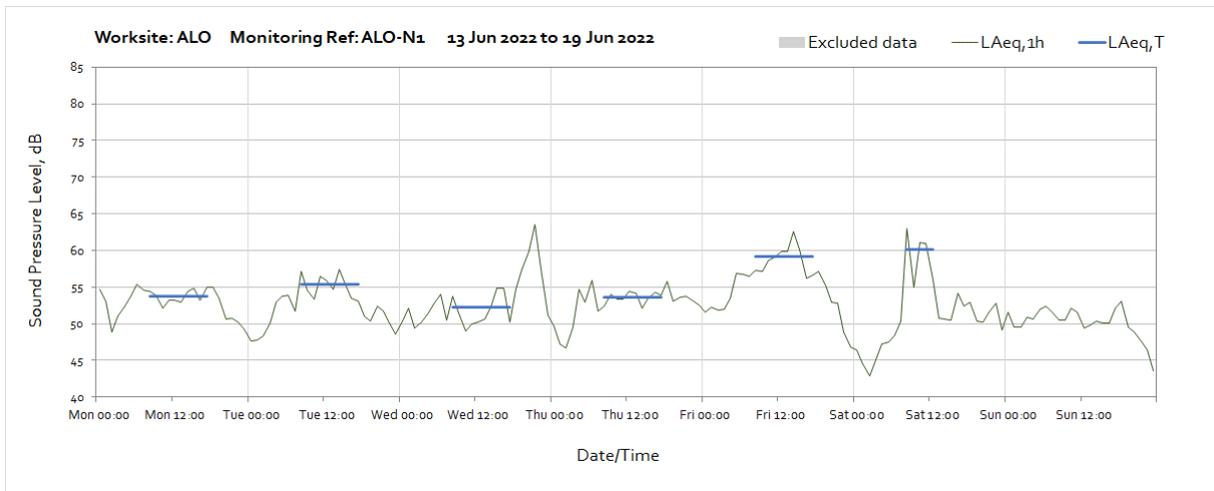
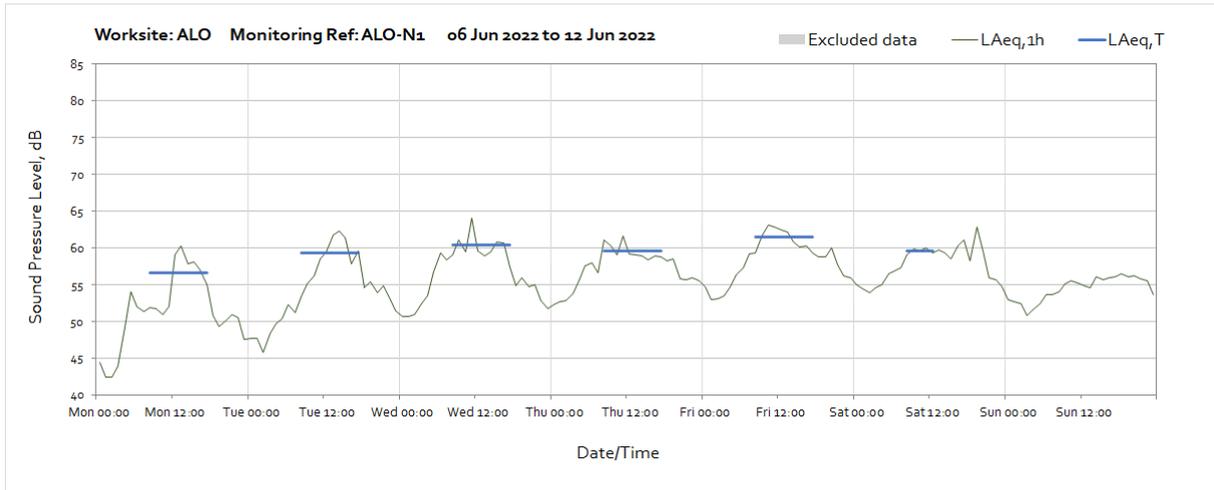


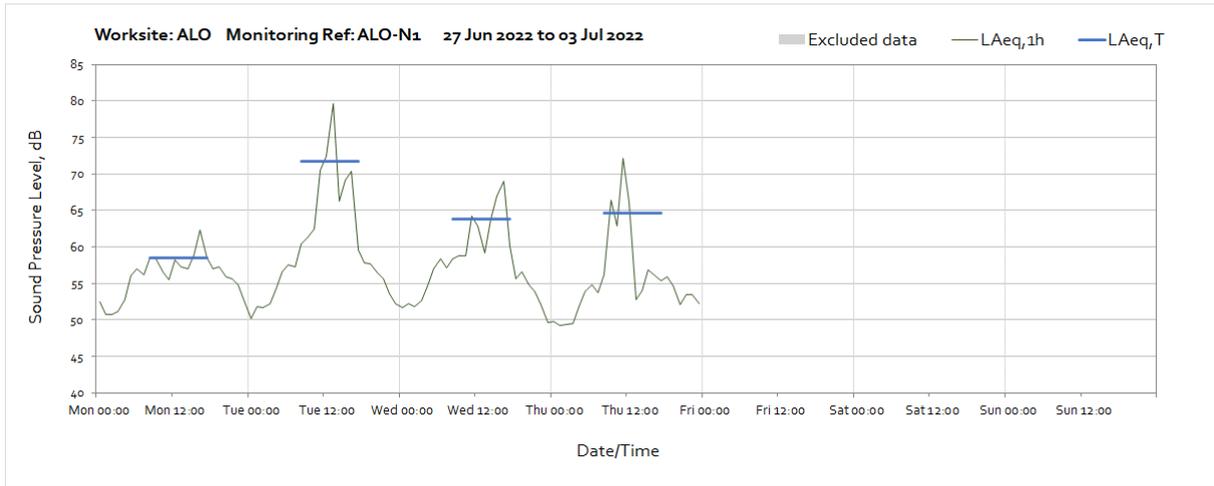


Note: Missing data 26<sup>th</sup>-30<sup>th</sup> June was due to grass growing in front of solar panel leading to intermittent power from solar.

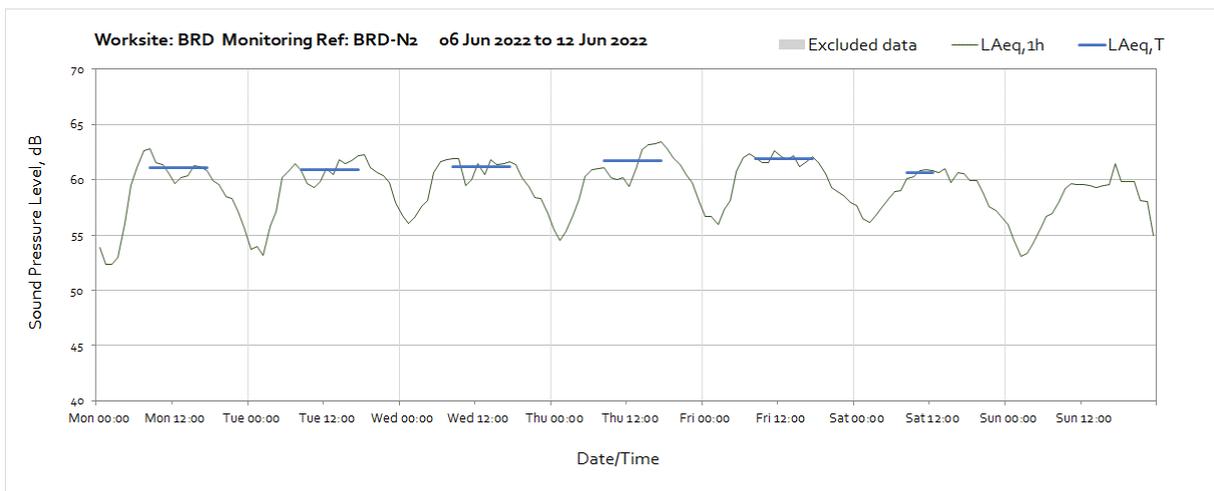
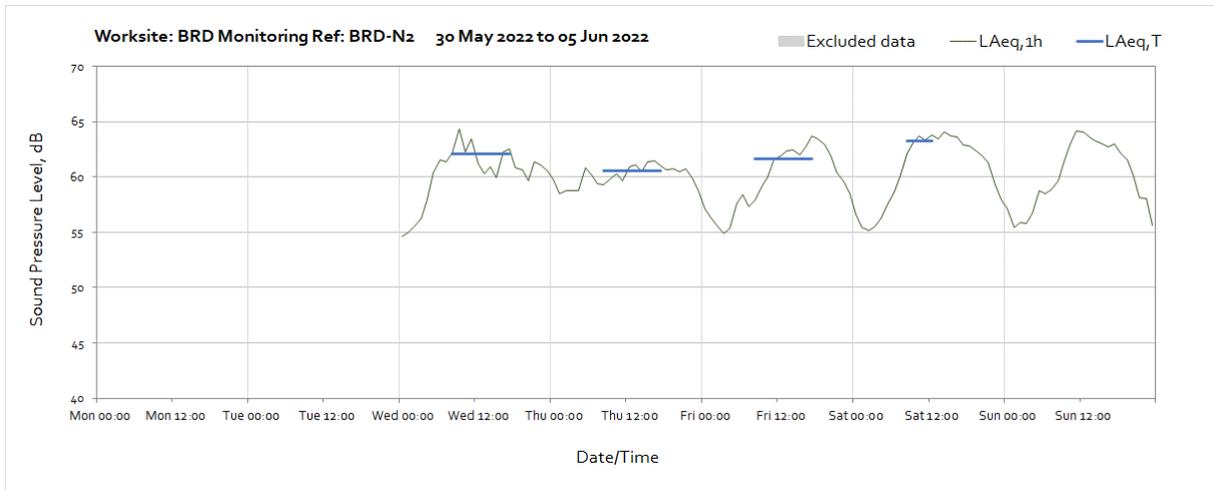
## Worksite: ALO - Monitoring Ref: ALO-N1

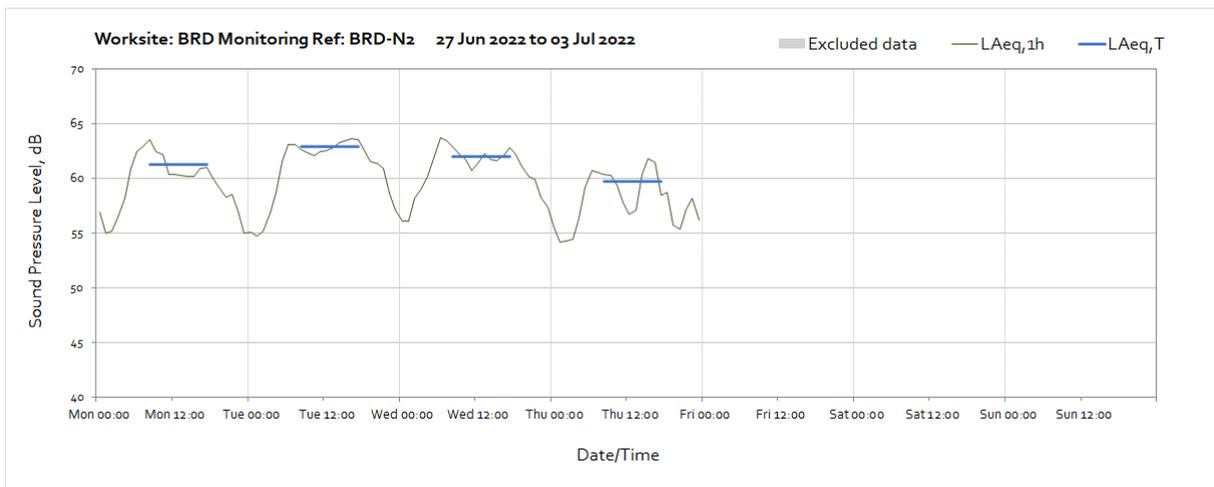
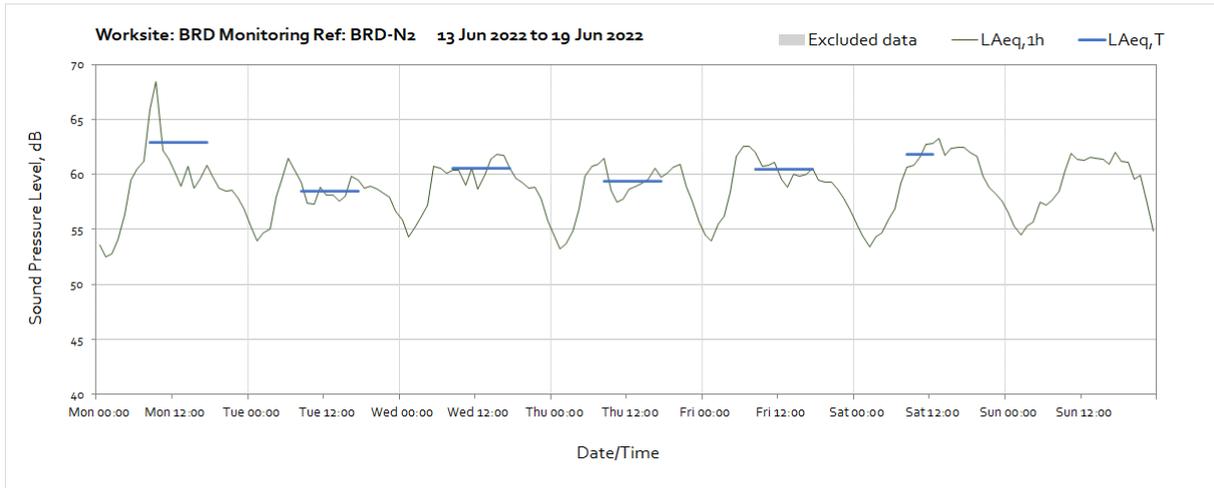






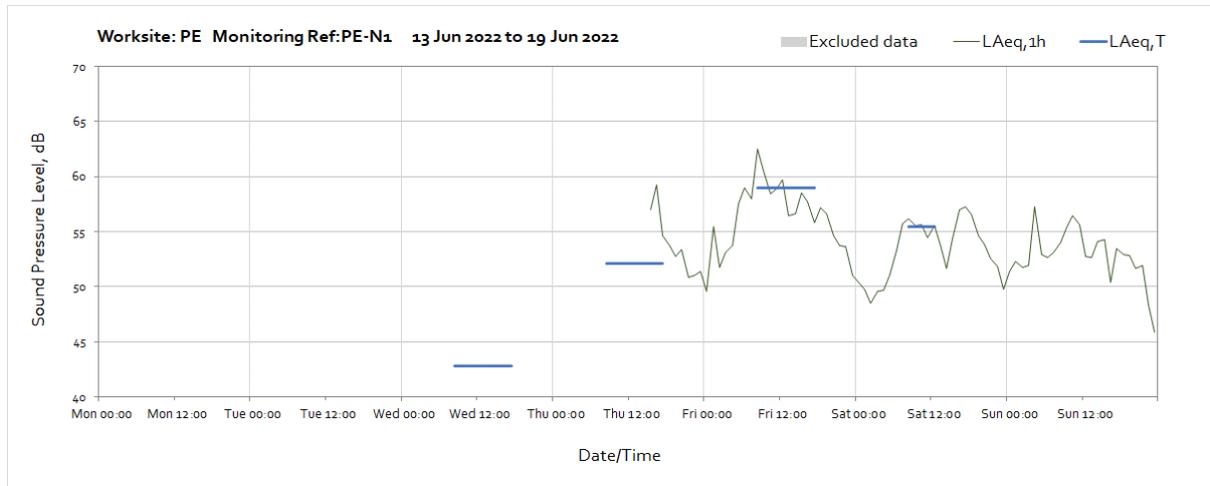
**Worksite: BRD - Monitoring Ref: BRD-N2**



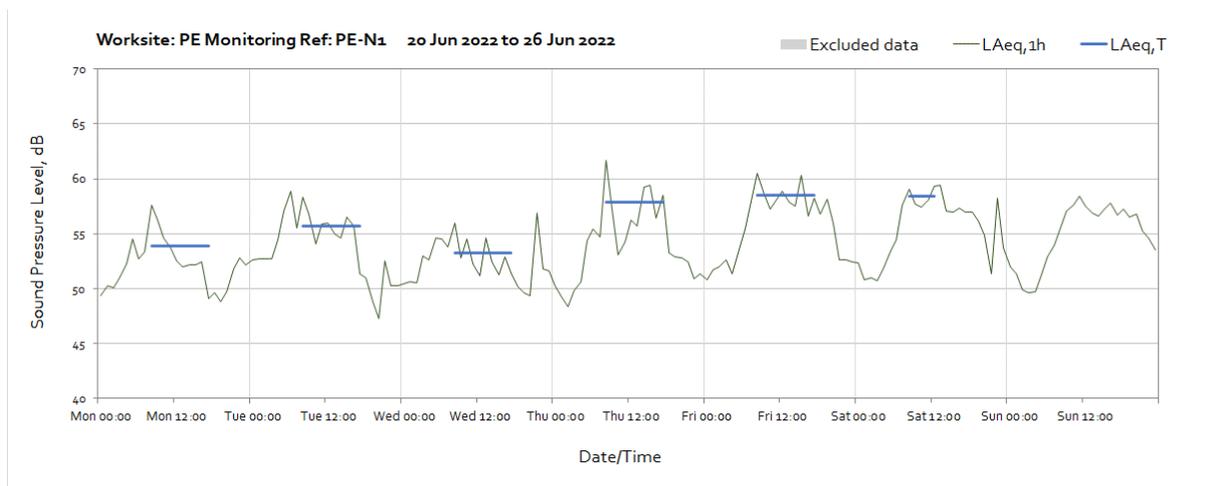


## Worksite: PE - Monitoring Ref: PE-N1

Note: Missing data is due to the monitor being installed after 16<sup>th</sup> June.

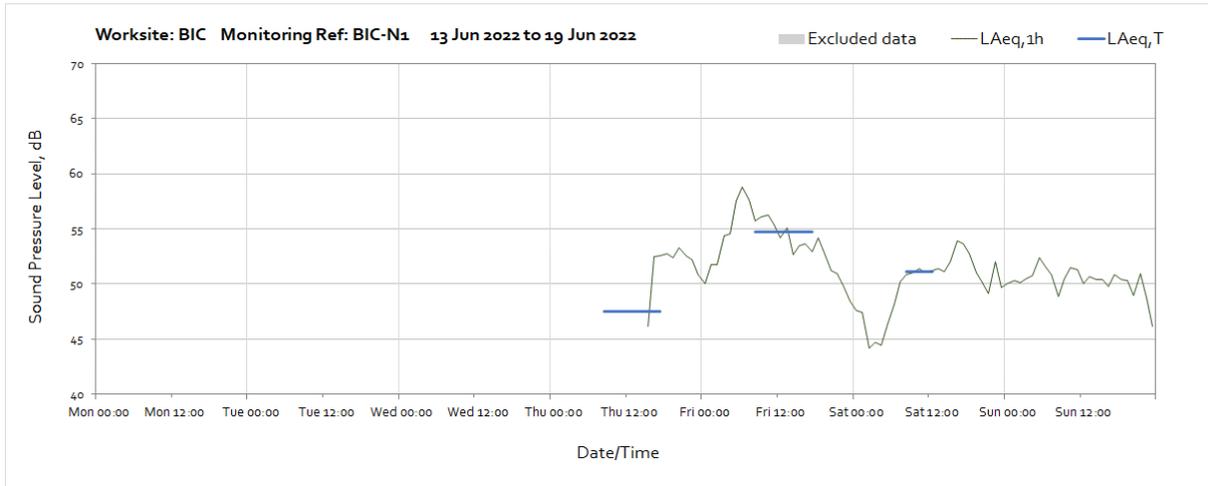


Note: Missing data is due to the monitor being installed after 16<sup>th</sup> June.

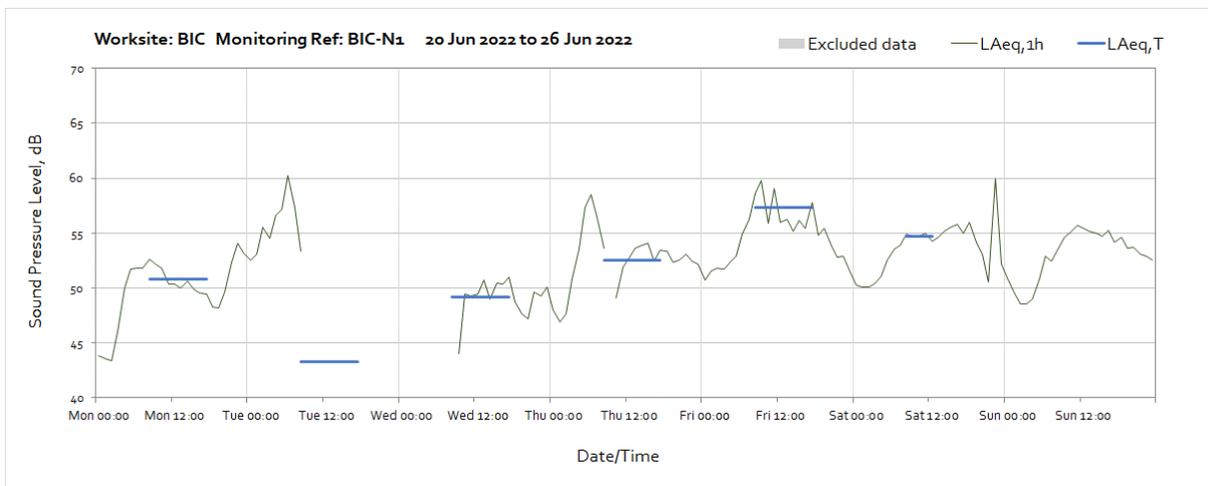


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## Worksite: BIC - Monitoring Ref: BIC-N1



Note: Missing data is due to the monitor being installed after 16<sup>th</sup> June.



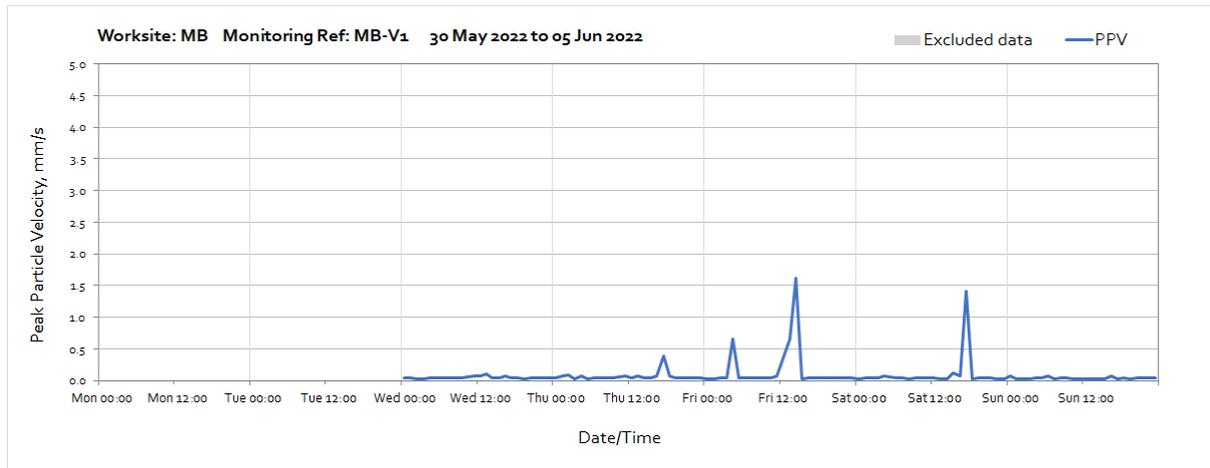
Note: Missing data 21<sup>st</sup> - 22<sup>nd</sup> June is due to a glitch between clocks



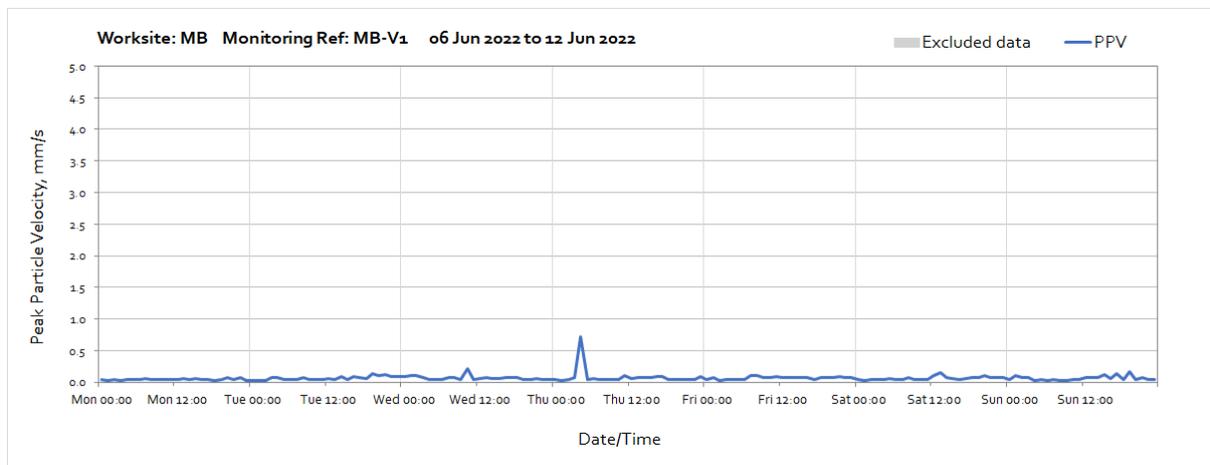
## Vibration

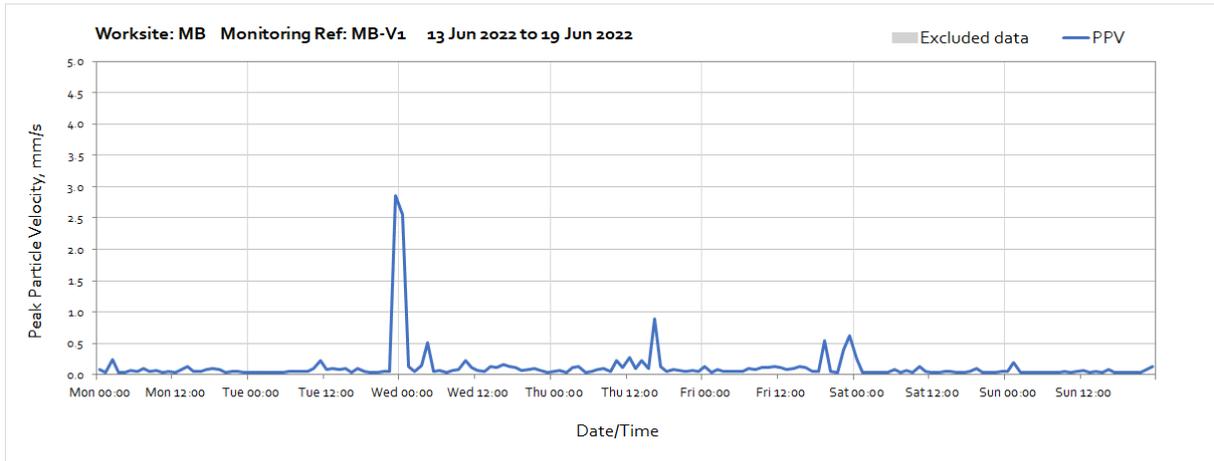
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axes x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative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

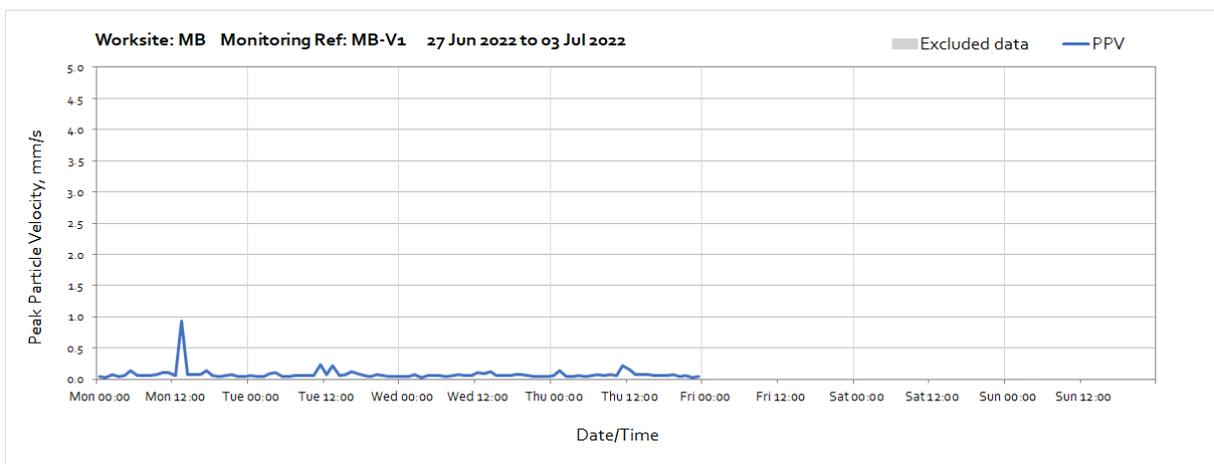
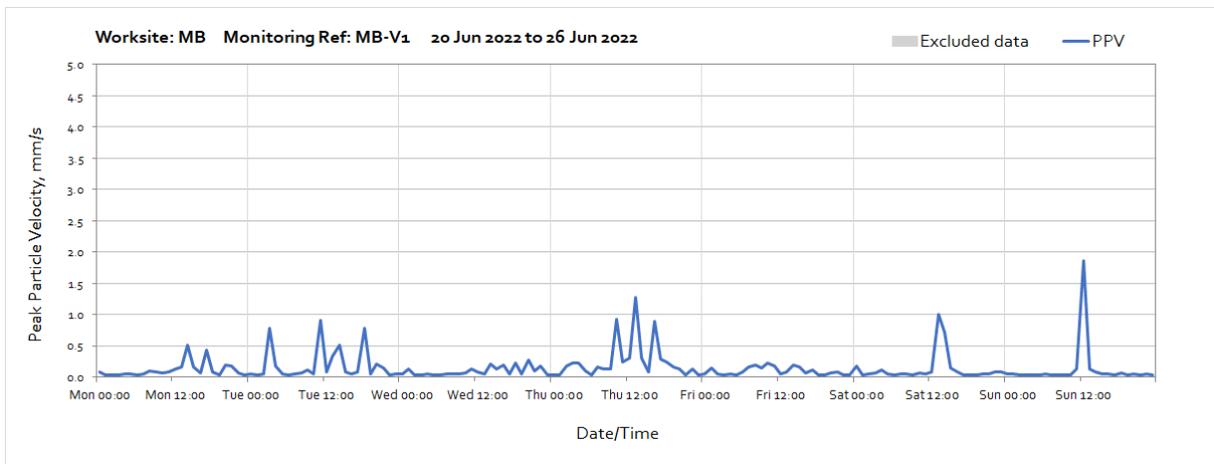


Note: High vibration levels were due to local disturbance.

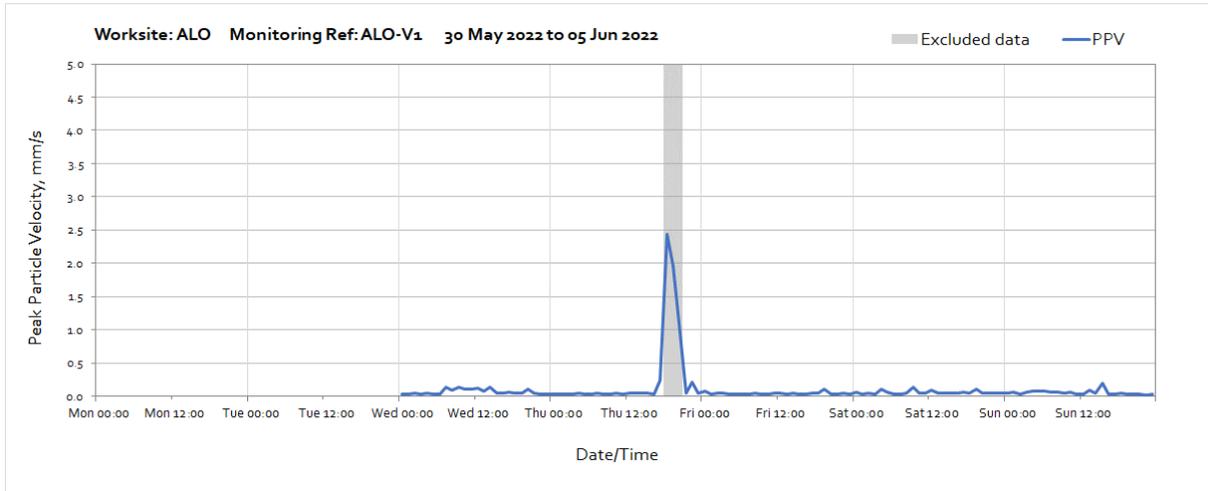




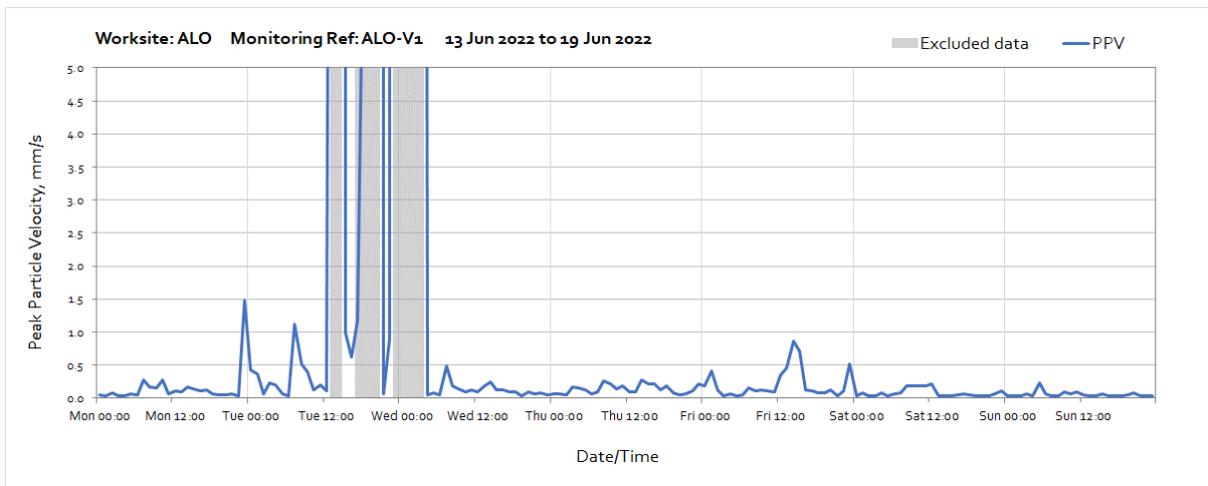
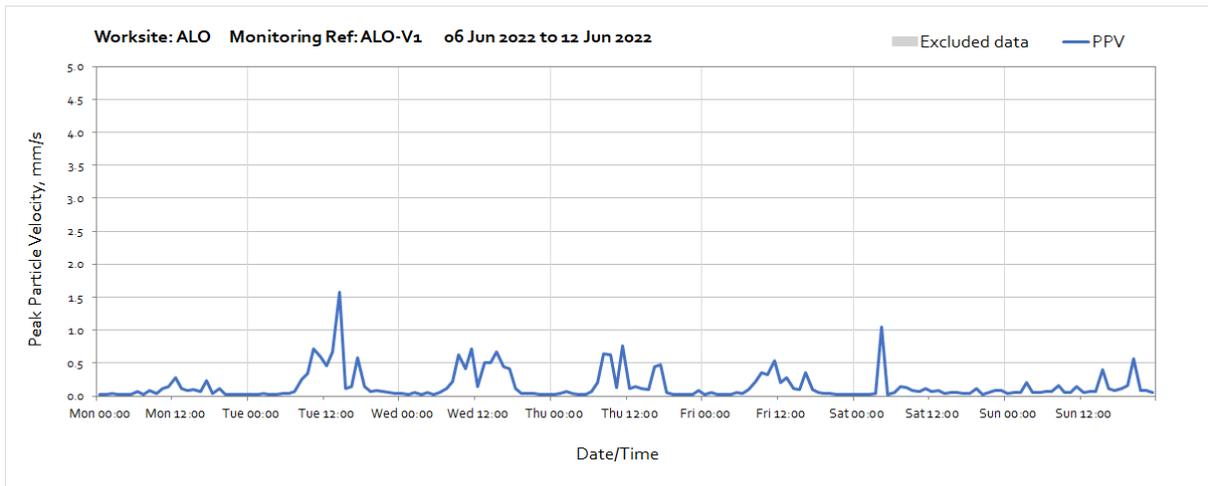
Note: High vibration levels on 14<sup>th</sup>-15<sup>th</sup> June was due to local disturbance and occurred outside of core working hours.



## Worksite: ALO – Monitoring Ref: ALO-V1

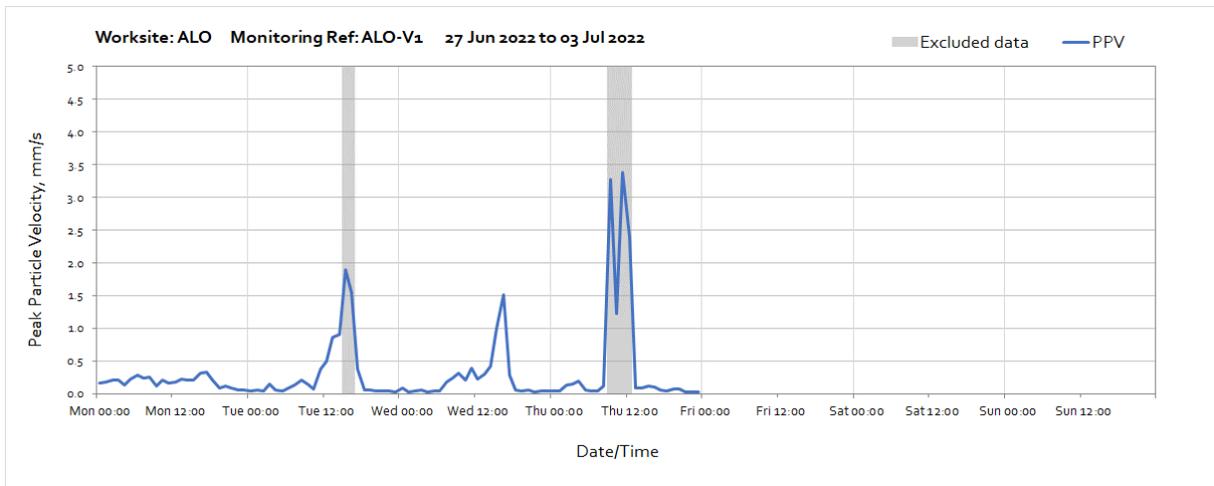
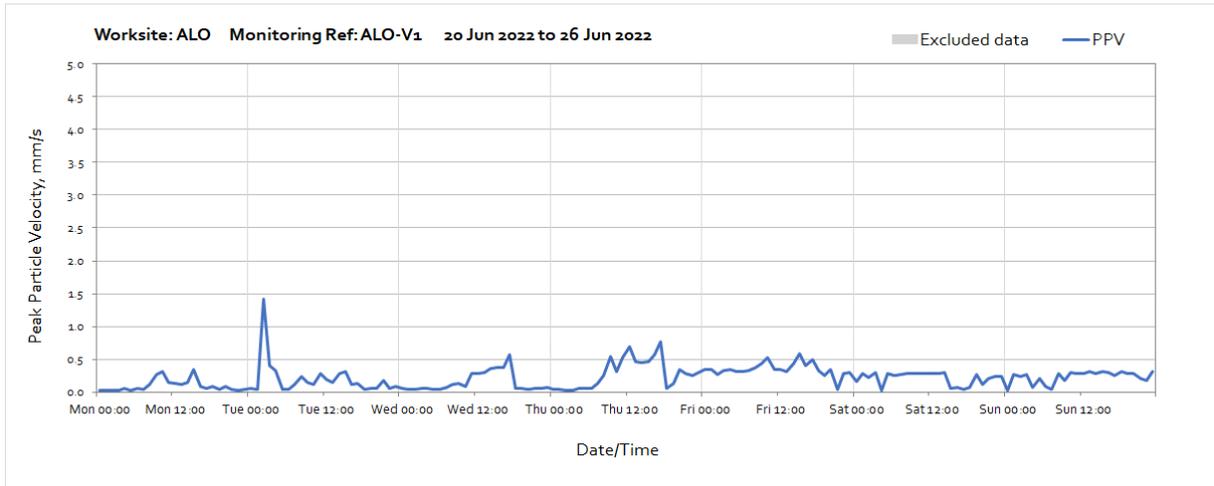


Note: High vibration levels on 2<sup>nd</sup> June was due to local disturbance and occurred outside of core working hours.



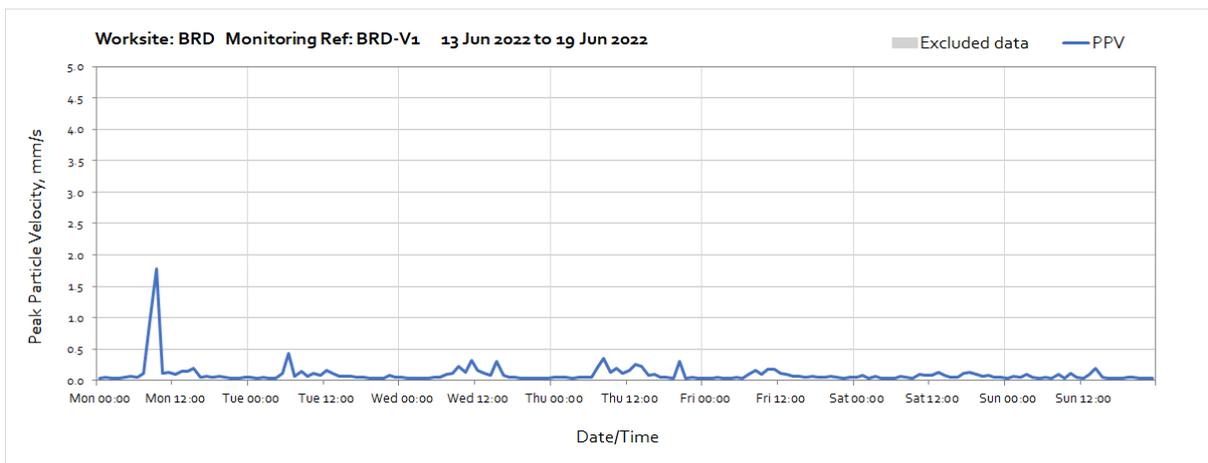
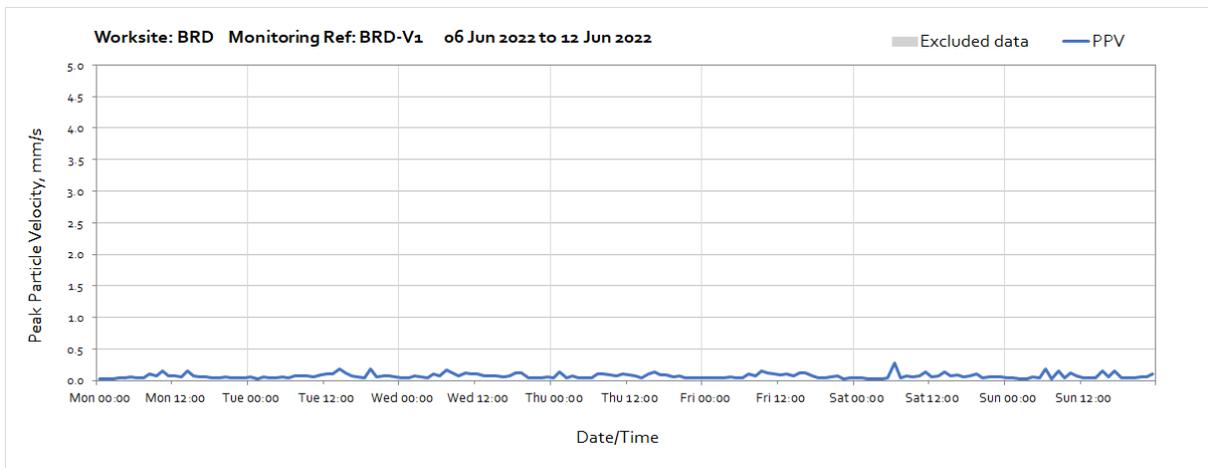
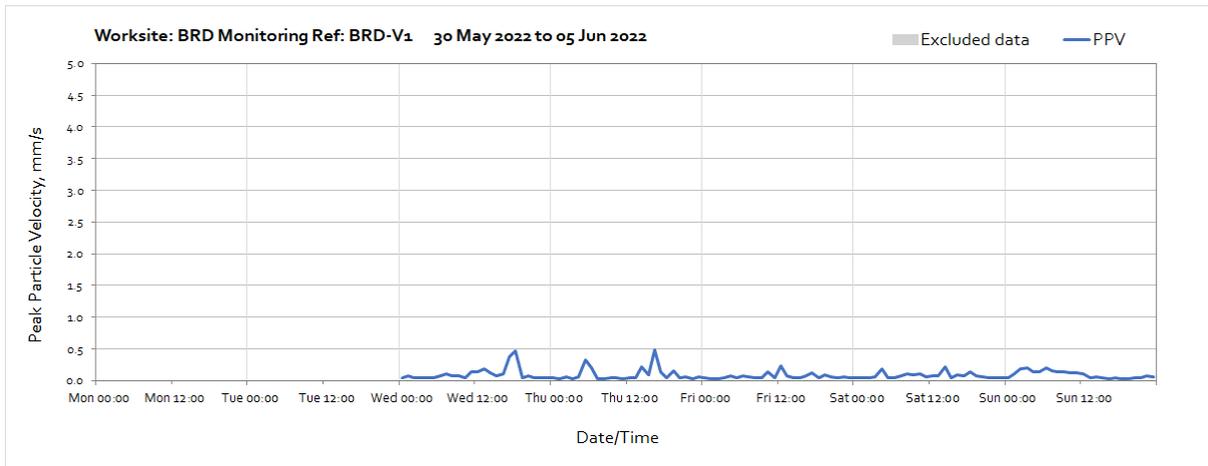
Note: High vibration levels on 14<sup>th</sup> June was due to local disturbance and occurred outside of core working hours.

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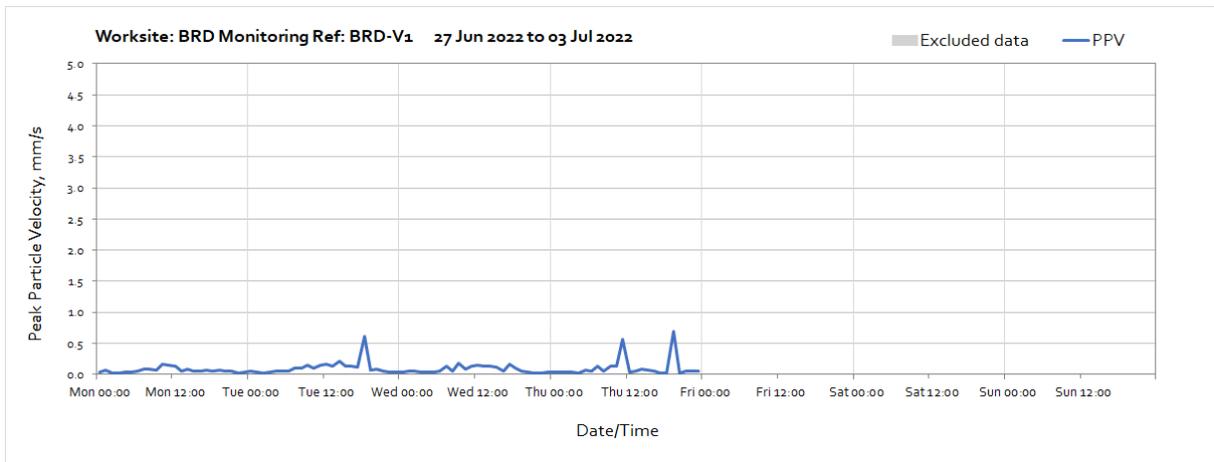
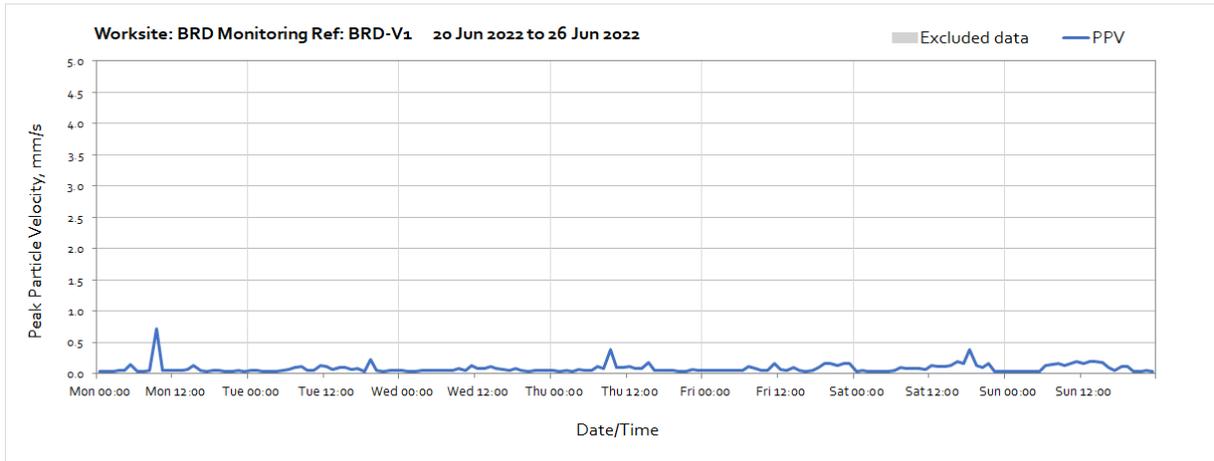


Note: High vibration levels on 28<sup>th</sup> – 29<sup>th</sup> and 30<sup>th</sup> June was due to physical disturbance of the monitor from de-vegetation works and are not representative of the ground vibration levels.

## Worksite: BRD - Monitoring Ref: BRD-V1



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

