

Construction noise and vibration Monthly Report – November 2021

London Borough of Ealing

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise and vibration monitoring carried out within the London Borough of Ealing (LBE) (including one monitoring location on the boundary with the London Borough of Hammersmith and Fulham) during the month of November 2021.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of the Atlas Road worksite (ref. AR) where construction of the site haul road, concreting works, slab extension, hoarding works, shutter installation, segment storage area works, drainage and excavation works, capping beam works, conveyor works, site widening works, lightening installation and main power connection works were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. WET), where inspection and concreting works, installation of channel drain, conveyor works, utilities works including backfilling and concreting, and drainage works including attenuation tank works were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road Crossover Box worksite (worksite ref. VRCB), where:
 - diaphragm wall works, excavation and concrete works, shuttering works, steel fixing works, excavation works, concrete pouring, works to welfare facilities, concreting of the footpath and installation of permanent barriers were underway.
 - At the Victoria Road Ancillary Shaft, preparation work on the base slab of the shaft including tower lighting for lifting and stores areas, and installation of reinforcement layer at the bottom of the shaft were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (worksite ref. FIC), where steel fixing, shuttering and concrete pours, installation of cones, installation of bolts and plates for aggregates, gate works, installation of windows to welfare and conveyor base installation were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. OOC), where fit-out works for the permanent accommodation building, vegetation clearance, demolition works, panel and steel frame removal works, construction of site haul road, drainage works, piling and diaphragm wall works, breaking down works, conveyor foundation construction works and conveyor steel erection works were underway.
- Noise monitoring was undertaken in proximity of the Mandeville Road Ventilation Shaft worksite (ref.: MRVS), where installation of steel sheet piles; excavation works and hoarding works were underway.

- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. GPWVS), where drainage works, backfilling, walkways works, kerbs installation, grouting works including pre-drilling, drilling and jet grouting works, vegetation clearance, trial holes installation, excavation and backfilling works were underway.
- Noise monitoring was undertaken in proximity of the Westgate Ventilation Shaft (ref. WVS), where installation of shaft lighting, storage containers rearrangement, installation of shaft ventilation brackets, service brackets and concrete line brackets, shaft excavation, flow test and early strength Sprayed Concrete Lining mix testing, vegetation clearance and soil testing, drum cutting works and reparation of the kerbs and blockwork were underway.

Further works, where monitoring was not undertaken, were also underway at:

- School Road, Bethune Road, Chase Road, Victoria Road and Atlas Road as part of utility diversion works; and
- Wormwood Scrubs where crane mat construction was underway.

The HS2 threshold levels for significant noise impacts, which are defined in Information Paper E23 (<https://www.gov.uk/government/publications/hs2-information-papers-environment>), were exceeded on eighteen (18) occasions 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 at any monitoring position.

Four (4) complaints were received during the monitoring period. A description of complaints, the results of investigation and any actions taken are detailed in Table 8 of this report.

Abbreviations and Descriptions

The abbreviations, descriptions and project terminology used within this report can be found in Table 1.

Table 1: Table of Abbreviations

Acronym/Term	Definition
$L_{Aeq,T}$	See equivalent continuous sound pressure level
Ambient sound	A description of the all-encompassing sound at a given location and time which will include sound from many sources near and far. Ambient sound can be quantified in terms of the equivalent continuous sound pressure level, $L_{pAeq,T}$
Decibel(s), or dB	Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal (Pa)). Because of this wide range, a level scale called the decibel (dB) scale, based on a logarithmic ratio, is used in sound measurement. Audibility of sound covers a range of approximately 0-140dB.
Decibel(s) A-weighted, or dB(A)	The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure sound is weighted to represent the performance of the ear. This is known as the 'A weighting' and is written as 'dB(A)'.
Equivalent continuous sound pressure level, or $L_{Aeq,T}$	An index used internationally for the assessment of environmental sound impacts. It is defined as the notional unchanging level that would, over a given period of time (T), deliver the same sound energy as the actual time-varying sound over the same period. Hence fluctuating sound levels can be described in terms of an equivalent single figure value, typically expressed as a decibel level.
Exclusion of data	Measurement of noise levels can be affected by weather conditions such as prolonged periods of rain, winds speeds higher than 5m/s and snow/ice ground cover. Noise levels measured during these periods are considered not representative of normal noise conditions at the site and, for the purposes of this report, are excluded from the assessment of exceedances and calculation of typical noise levels and are also greyed out in charts. Identifiable incongruous noise and vibration events not attributable to HS2 construction noise are also excluded.
Façade	A facade noise level is the noise level 1m in front of a large reflecting surface. The effect of reflection, is to produce a slightly higher (typically +2.5 to +3 dB) sound level than it would be if the reflecting surface was not there.
Free-field	A free-field noise level is the noise level measured at a location where no reflective surfaces, other than the ground, lies within 3.5 metres of the microphone position.
LOAEL	Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
Peak particle velocity, or PPV	Instantaneous maximum velocity reached by a vibrating element as it oscillates about its rest position. The PPV is a simple indicator of perceptibility and risk of damage to structures due to vibration. It is usually measured in mm/s.
SOAEL	Significant Observed Adverse Effect Level - the level above which significant adverse effects on health and quality of life occur.
Sound pressure level	The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Vibration dose value, or VDV	An index used to evaluate human exposure to vibration in buildings. While the PPV provides information regarding the magnitude of single vibration events, the VDV provides a measure of the total vibration experienced over a specified period of time (typically 16h daytime and 8h night-time). It takes into account the magnitude, the number and the duration of vibration events and can be used to quantify exposure to continuous, impulsive, occasional and intermittent vibration. The vibration dose value is measured in $m/s^{1.75}$.

1 Introduction

1.1.1 HS2 is required to undertake noise (and vibration) monitoring as necessary to comply with the requirements of the High Speed Rail (London-West Midlands) Environmental Minimum Requirements, including specifically Annex 1: Code of Construction Practice, in addition to any monitoring requirements arising from conditions imposed through consents under Section 61 of the Control of Pollution Act, 1974 or through Undertakings & Assurances given to third parties. Such monitoring may be undertaken for the following purposes:

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

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 London Borough of Ealing (LBE) (including one monitoring location on the boundary with the London Borough of Hammersmith and Fulham) during the month for the period 1st to 30th November 2021.

1.1.3 Active construction sites in the local authority area, where noise and vibration monitoring were conducted during this period, include:

- Atlas Road worksite, ref. AR (see plan 5 in Appendix A), where work activities included:
 - Construction of the site haul road, including concreting works, preparation works to hoarding and installation of shutters for drainage channels;
 - Segment storage area works included prepping, concrete pours and striking of shutters, installed mastic to joints and levelling of stone on north segment storage area;
 - Drainage works to haul road and chamber installed, installation of surcharge filter, excavate and installation of channels;
 - Work to capping beam for the Logistics Tunnel Launch ramp included pouring blinding between secant piles, continuing with dig and final trim, excavation and installing sump and cut veins for pump, lifting down steel to ring beam area and installation and drilling piles to expose reinforcement steel for tying in;

- Conveyor works included base construction works and installation of gantry towers and spans;
- Site wide works included installation of earthing trenches, pouring slab extension and store shelves installed;
- Installation of the lightening around site; and
- Main power connection works.
- Willesden EuroTerminal worksite, ref. WET (see plan 5 in Appendix A), where work activities included:
 - Inspection works;
 - Concreting works;
 - Installation of channel drain;
 - Ongoing works to the conveyor;
 - Utilities works includes backfilling and concreting; and
 - Site drainage works including works to the attenuation tank.
- Victoria Road Crossover Box worksite, ref. VRCB (see plan 6 in Appendix A), where work activities included:
 - Diaphragm wall works;
 - Excavation and concrete works;
 - Shuttering works;
 - Steel fixing works;
 - Works to welfare facilities;
 - Concreting of the footpath; and
 - Installation of permanent barriers.
 - At the Victoria Road Ancillary Shaft preparation work on the base slab of the shaft including tower lighting for lifting and stores areas, and installation of reinforcement layer at the bottom of the shaft were underway.
- Flat Iron compound, worksite ref. FIC (see plan 6 in Appendix A), where work activities included:
 - Steel fixing;
 - Shuttering and concrete pours;
 - Installation of cones;

- Installation of bolts and plates for aggregates;
- Gate works;
- Installation of windows to welfare; and
- Conveyor base installation.
- Old Oak Common depot worksite, located in the London Borough of Hammersmith and Fulham (LBHF), ref. OOC (see plan 7 in Appendix A), where work activities included:
 - Fit out works for the permanent accommodation building;
 - Vegetation clearance;
 - Demolition works;
 - Panel and steel frame removal works;
 - Construction of site haul roads;
 - Drainage works;
 - Piling and diaphragm wall works;
 - Breaking down works;
 - Conveyor foundation construction works;
 - Conveyor steel erection works; and
- Mandeville Road Ventilation Shaft worksite, reference MRVS (see plan 1 in Appendix A), where work activities included:
 - Installation of steel sheet piles;
 - Excavation works; and
 - Hoarding works.
- Green Park Way Ventilation Shaft worksite, reference GPWVS (see plan 2 in Appendix A), where work activities included:
 - Drainage works including backfilling;
 - Walkways works;
 - Kerbs installation;
 - Grouting works including pre-drilling, drilling and jet grouting works;
 - Vegetation clearance;
 - Trial holes installation; and

- Excavation and backfilling works.
- Westgate Ventilation Shaft worksite, reference WVS (see plan 3 in Appendix A), where work activities included:
 - Installation of shaft lighting;
 - Storage containers rearrangement;
 - Installation of shaft ventilation brackets, service brackets and concrete line brackets;
 - Shaft excavation;
 - Flow test and early strength Sprayed Concrete Lining mix testing;
 - Vegetation clearance and soil testing;
 - Drum cutting works; and
 - Reparation of the kerbs and blockwork.

1.1.4 Further works, where monitoring did not take place, were undertaken at:

- School Road, Bethune Road, Chase Road, Victoria Road and Atlas Road as part of utility diversion works; and
- Wormwood Scrubs where crane mat construction was underway.

1.1.5 The applicable standards, guidance, and monitoring methodology are 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 Nineteen (19) noise and nine (9) vibration monitoring installations were active in November 2021 in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in November 2021.

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
AR	N032	Shaftesbury Gardens
	N033	Outside The Collective, Atlas Road / Victoria Road
	N060	Atlas Road next to Bashey Road
WET	N034	Stephenson Street (north)
	N035	Stephenson Street (south)
	N041	Junction of Stephenson Street / Goodhall Street
	V052	Stephenson Street (north)
	V057	37, Stephenson Street
VRCB	N031	School Road, outside Acton Business Centre
	N050	Acton Square, outside North Acton Station
FIC	N029	Braitrim House, Victoria Road
	N042	Boden House Car Park
	N049	Flat Iron compound railway fence, Victoria Rd North Acton
OOC	OOC-N01	Old Oak Common Lane
	OOC-N02	Old Oak Common Lane, Hilltop Works
	OOC-V01	25 Wells House Road
	OOC-V02	Kildun Court, Old Oak Common Lane
	OOC-V03	Wells House Road Alleyway
MRVS	N040	Badminton Close
	N058	Mandeville Road
	N063	Mandeville Road
	V055	Mandeville Road
	V056	Mandeville Road
GPWVS	N059	Green Park Way Ventilation Shaft
	N064	Green Park Way Ventilation Shaft
	V053	Green Park Way, Greenford
	V054	Green Park Way Ventilation Shaft
WVS	N062	Westgate Ventilation Shaft

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
AR	N032	Shaftesbury Gardens	Free-field	62.3 (64.9)	64.2 (65.3)	62.5 (72.6)	60.6 (65.2)	57.5 (65.3)	63.7 (77.4)	62.2 (64.1)	62.2 (64.3)	61.7 (66.0)	57.8 (65.2)	60.1 (63.2)	57.0 (60.6)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	66.9 (68.9)	68.7 (70.5)	65.8 (69.8)	64.1 (67.9)	61.2 (67.9)	63.9 (66.9)	67.4 (71.9)	64.7 (66.3)	64.8 (67.4)	60.2 (66.3)	63.5 (67.9)	61.1 (68.5)
	N060	Atlas Road next to Bashey Road	Façade	54.0 (57.4)	64.2 (74.3)	53.7 (71.9)	56.0 (72.5)	54.5 (66.5)	54.0 (56.5)	56.4 (58.6)	55.1 (58.5)	54.4 (62.6)	53.4 (70.8)	55.9 (68.3)	54.1 (62.3)
WET	N034	Stephenson Street (north)	Free-field	53.3 (55.5)	57.6 (65.9)	55.0 (61.5)	53.6 (64.0)	49.2 (58.7)	52.2 (54.2)	54.4 (57.2)	54.0 (57.2)	57.6 (76.7)	48.7 (57.0)	54.0 (59.4)	49.6 (53.8)
	N035	Stephenson Street (south)	Free-field	54.5 (56.1)	58.0 (60.9)	52.4 (61.5)	51.2 (62.2)	48.5 (57.5)	52.0 (52.8)	54.5 (57.9)	52.3 (55.7)	54.5 (65.5)	49.1 (62.9)	52.3 (56.2)	48.0 (53.5)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	54.7 (60.8)	58.9 (65.6)	55.8 (60.4)	54.7 (59.7)	50.4 (57.8)	55.2 (64.4)	59.2 (66.6)	57.8 (63.0)	60.3 (76.9)	50.8 (62.2)	55.2 (63.1)	49.2 (52.8)

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
VRCB	N031	School Road, outside Acton Business Centre	Free-field	61.3 (65.1)	63.3 (66.2)	62.1 (74.7)	58.7 (63.0)	55.5 (63.2)	56.6 (61.3)	63.6 (69.4)	60.8 (63.0)	59.0 (64.1)	51.5 (58.9)	57.9 (66.8)	52.9 (58.4)
	N050	Acton Square, outside North Acton Station	Free-field	64.4 (66.4)	64.9 (65.9)	63.4 (66.4)	62.6 (72.1)	58.9 (68.4)	63.5 (64.2)	64.5 (69.1)	63.4 (65.1)	63.1 (66.6)	58.9 (66.2)	62.3 (66.6)	58.1 (62.7)
FIC	N029	Braitrim House, Victoria Road	Free-field	56.6 (61.8)	62.8 (77.5)	53.7 (72.7)	55.5 (65.4)	53.9 (69.3)	54.3 (58.7)	60.1 (63.4)	56.9 (59.8)	54.4 (61.5)	47.1 (56.5)	54.6 (60.5)	52.0 (61.5)
	N042	Bodens car park	Free-field	58.1 (64.5)	62.2 (73.6)	56.9 (69.8)	55.7 (60.8)	54.0 (59.5)	54.9 (56.0)	59.1 (60.1)	57.0 (59.6)	56.2 (63.0)	53.3 (61.3)	55.0 (58.8)	53.6 (55.9)
	N049	Flat Iron compound	Free-field	54.6 (60.2)	66.1 (78.0)	56.1 (69.2)	55.6 (60.0)	55.4 (61.9)	54.5 (58.4)	59.1 (65.6)	56.5 (59.6)	54.5 (60.5)	50.2 (58.6)	52.7 (59.6)	53.6 (60.3)
OOC	OOC-N01	Old Oak Common Lane	Free-field	64.3 (66.3)	70.4 (74.1)	61.7 (64.0)	59.4 (62.9)	56.7 (63.4)	60.1 (61.1)	63.9 (68.1)	62.0 (63.7)	60.8 (64.0)	58.1 (61.9)	60.2 (65.1)	56.9 (61.0)
	OOC-N02	Old Oak Common Lane, Hilltop Works	Free-field	68.3 (72.4)	71.7 (76.7)	68.3 (72.8)	66.3 (69.1)	62.4 (68.0)	65.2 (66.0)	69.4 (71.6)	67.9 (69.2)	67.6 (71.9)	62.0 (65.9)	66.1 (68.6)	62.0 (66.0)
MRVS	N040	Badminton Close	Free-field	54.3 (58.1)	57.4 (62.2)	54.3 (59.2)	55.3 (66.0)	52.0 (60.5)	56.6 (60.4)	55.4 (56.6)	56.3 (61.1)	56.8 (62.8)	51.8 (57.8)	54.8 (67.0)	50.6 (59.7)
	N058	Mandeville Road	Free-field	54.0 (56.8)	61.2 (67.7)	53.6 (60.4)	54.4 (67.3)	51.3 (67.9)	52.7 (55.3)	58.6 (65.4)	53.9 (55.8)	55.5 (66.3)	51.3 (59.7)	53.7 (64.5)	48.5 (58.3)

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
	N063	Mandeville Road	Free-field	58.6 (62.7)	68.0 (74.3)	58.1 (60.7)	59.0 (65.2)	55.9 (63.4)	58.2 (59.9)	64.4 (68.7)	58.0 (59.4)	59.0 (63.0)	55.5 (61.5)	57.7 (68.0)	54.1 (59.9)
GPWVS	N059	Green Park Way Ventilation Shaft	Free-field	59.4 (66.0)	65.0 (69.2)	54.8 (59.7)	55.3 (64.1)	54.0 (74.2)	57.6 (64.8)	62.6 (68.9)	61.6 (72.9)	60.4 (76.6)	53.3 (68.9)	57.3 (66.4)	51.4 (58.5)
	N064	Green Park Way Ventilation Shaft	Façade	58.3 (60.6)	65.1 (69.1)	57.8 (61.8)	58.2 (63.0)	55.2 (61.5)	56.5 (57.4)	57.8 (58.3)	58.3 (59.0)	57.4 (62.6)	49.9 (56.5)	54.5 (59.2)	50.6 (58.6)
WVS	N062	Westgate Ventilation Shaft	Free-field	63.7 (73.4)	65.6 (72.0)	59.5 (65.3)	61.6 (70.3)	59.7 (70.8)	58.9 (59.7)	65.4 (68.2)	60.2 (64.0)	59.0 (69.9)	55.3 (63.2)	57.9 (70.9)	55.2 (61.6)

2.1.2 Table 4 presents a summary of the measured vibration levels at each monitoring location over the reporting period. The highest PPV measured during the monitoring along any axis is presented in the table.

Table 4: Summary of Measured PPV Data over the Monitoring Period

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
WET	V052	Stephenson Street (north)	4.70 (Z-axis)
	V057	37, Stephenson Street	0.63 (Z-axis)
OOC	OOC-V01	25 Wells House Road	2.53 (X-axis)
	OOC-V02	Kildun Court, Old Oak Common Lane	0.83 (Y-axis)
	OOC-V03	Wells House Road Alleyway	0.95 (Z-axis)
GPWVS	V053	Green Park Way, Greenford	0.96 (Z-axis)
	V054	Green Park Way Ventilation Shaft	1.18 (Z-axis)
MRVS	V055	Mandeville Road	2.98 (Z-axis)
	V056	Mandeville Road	4.72 (Z-axis)

2.1.3 Appendix C presents graphs of the noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consists of the hourly L_{Aeq} values and, where relevant, the $L_{Aeq,T}$ values (where the time period T has been taken to be the averaging period as specified in Table 1 of HS2 Information Paper E23). Vibration data presented consist of hourly PPV values. The full data set for the monitoring equipment can be found at the following location: <https://data.gov.uk/dataset/24542ae7-dd44-444f-b259-871c4cc43b5e/environmental-monitoring-data>.

2.2 Exceedances of the SOAEL

2.2.1 The significant observed adverse effect level (SOAEL) is defined in the 'Planning Practice Guidance – Noise' as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

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

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

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

Table 5: Summary of Exceedances of SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
AR	N032	Shaftesbury Gardens	Saturday Night	1400-2200 2200-0700	4 9
	N033	Outside The Collective, Atlas Road / Victoria Road	All days	All periods	No exceedance
	N060	Atlas Road next to Bashey Road	Sunday Night	0700-2200 2200-0700	2 10
WET	N034	Stephenson Street (north)	All days	All periods	No exceedance
	N035	Stephenson Street (south)	All days	All periods	No exceedance
	N041	Junction of Stephenson Street / Goodhall Street	All days	All periods	No exceedance
VRCB	N031	School Road, outside Acton Business Centre	All days	All periods	Not applicable*
	N050	Acton Square, outside North Acton Station	Weekday Night	1900-2200 2200-0700	2 6
FIC	N029	Braitrim House, Victoria Road	Weekday	0800 -1800	1
	N042	Bodens Car Park	All days	All periods	No exceedance
	N049	Flat Iron compound	Weekday	0800 -1800	4
OOC	OOC-N01	Old Oak Common Lane	All days	All periods	No exceedance
	OOC-N02	Old Oak Common Lane, Hilltop Works	Weekday	0800 -1800	5
MRVS	N040	Badminton Close	All days	All periods	No exceedance
	N058	Mandeville Road	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
	N063	Mandeville Road	All days	All periods	No exceedance
GPWVS	N059	Green Park Way Ventilation Shaft	All days	All periods	Not applicable*
	N064	Green Park Way Ventilation Shaft	All days	All periods	Not applicable*
WVS	N062	Westgate Ventilation Shaft	All days	All periods	Not applicable*

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

2.2.5 For the purpose of assessing eligibility for noise insulation or temporary rehousing, multiple exceedances of the SOAEL in a 24-hour period would be counted as a single exceedance during that day. Over the reporting period, the overall number of SOAEL exceedances at each measurement location is shown in Table 6 and may be lower than the total sum of individual exceedances reported in Table 5 for each location.

Table 6: Summary of Total Exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
AR	N032	Shaftesbury Gardens	2
	N060	Atlas Road next to Bashey Road	3
VRCB	N050	Acton Square, outside North Acton Station	5
FIC	N029	Braitrim House, Victoria Road	1
	N049	Flat Iron compound	4
OOC	OOC-N02	Old Oak Common Lane, Hilltop Works	3

2.2.6 18x no. exceedances of the SOAEL were recorded due to HS2 construction works during November 2021. The exceedance occurred at:

- Monitoring locations N032 during one weekend periods and two night-time periods and N060 during two night-time periods due to installation of steel elements from WET worksite;
- Monitoring location N050 during two evening time periods and four during night-time periods due to diaphragm wall works;

- Monitoring locations N029 during one daytime period and N049 during four daytime periods due to conveyor works;
- Monitoring location OOC-N02 during three daytime periods due to street cleaning along Old Oak Common Lane.

2.3 Exceedances of Trigger Level

2.3.1 Table 7 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 7: 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

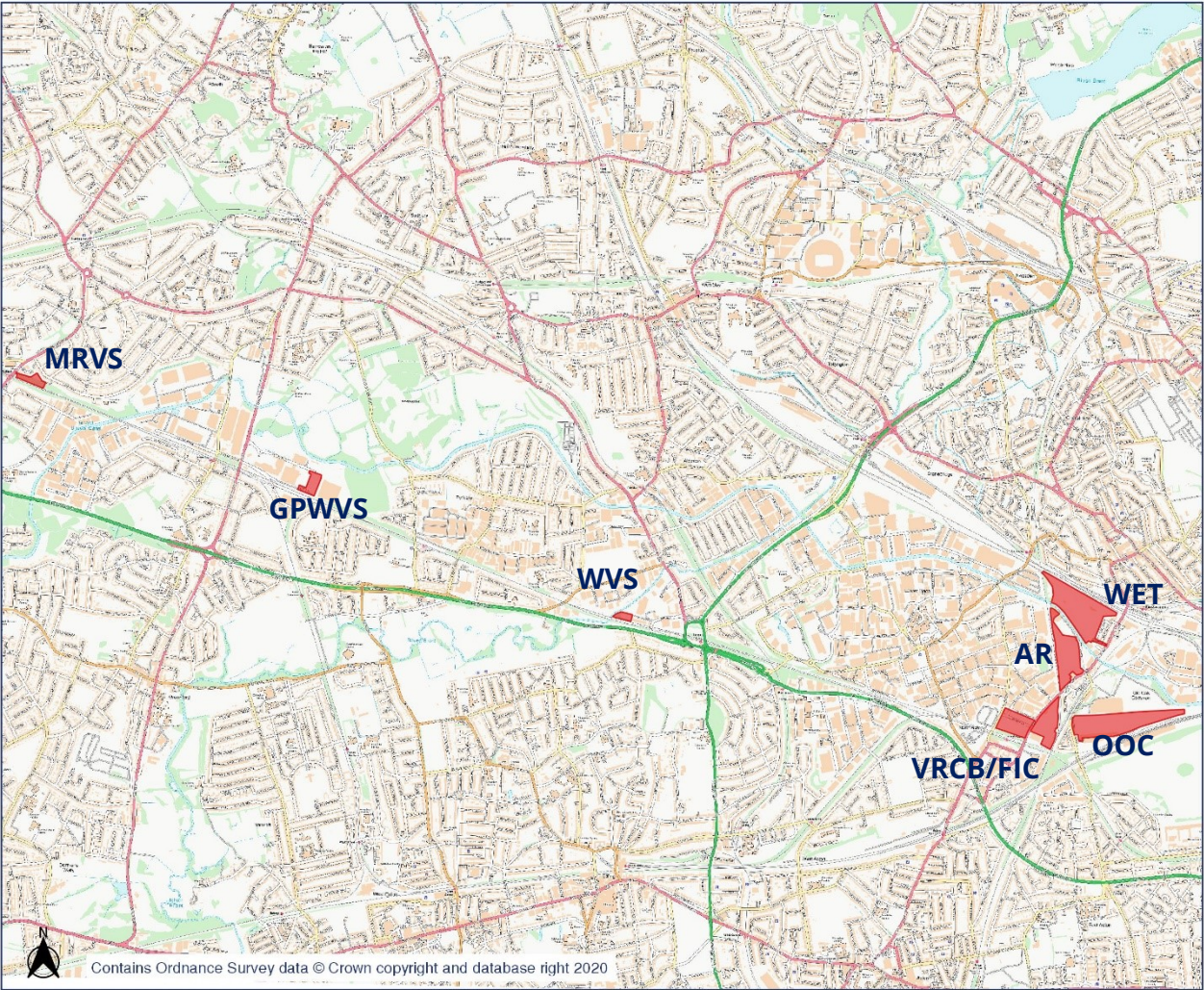
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 8: Summary of Complaints

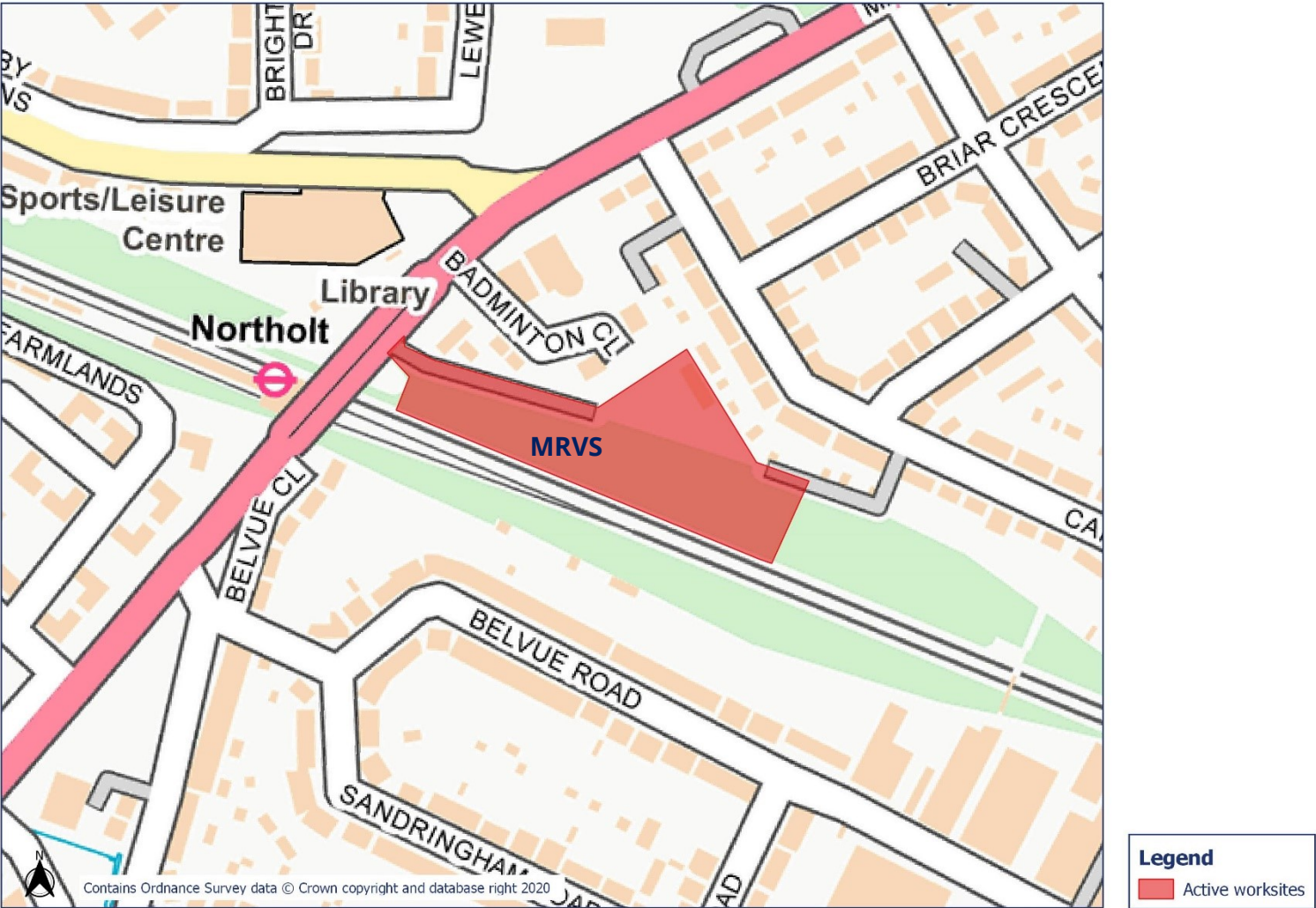
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42956-C	VRCB	Complaint due to noise disturbance and light on site during night-time.	Nothing specific has been raised about the noise element of the complaint. However, Best Practicable Means were in place and works have been completed in line with S61.	Site Team asked to look at getting the lighting adjusted. Contact has been made with complainant and information provided.
HS2-21-42726-C	OOO	Complaint due to noise disturbance from shouting on site prior to 7am and during the day due to HGV vehicles using their horns.	Investigation shown that on that morning a large delivery took place for an emergency contingency machine. This, however, was for	A reminder has been sent to all the contractors for disciplinary action to be taken against the driver for the horn disturbance. The complainant has been contacted and information provided.

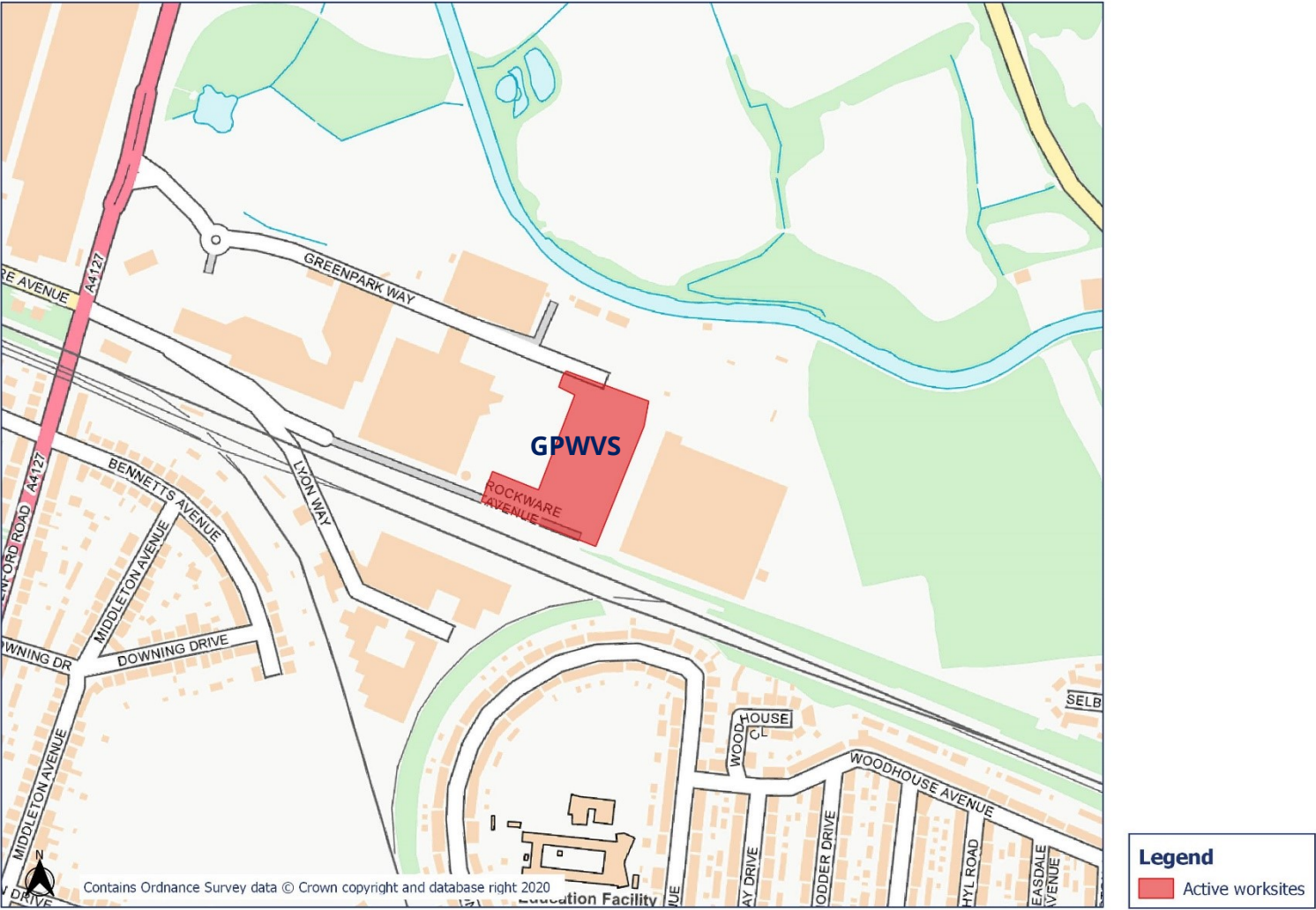
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
			National Rail work, not HS2 related.	
HS2-21-42936-C	OOC	Complaint due to shouting and noise from the site at 6:40am.	Under investigation.	Under investigation.
HS2-21-42965-C	OOC	General noise levels from Old Oak Common site.	Investigation shown that noise was caused by breaking out the suspended slab within remain section of demolition of Heathrow Express Depot building. Work to continue this until early December with use of the breaker minimised as much as possible.	Noise and vibration monitors are being checked on an ongoing basis.

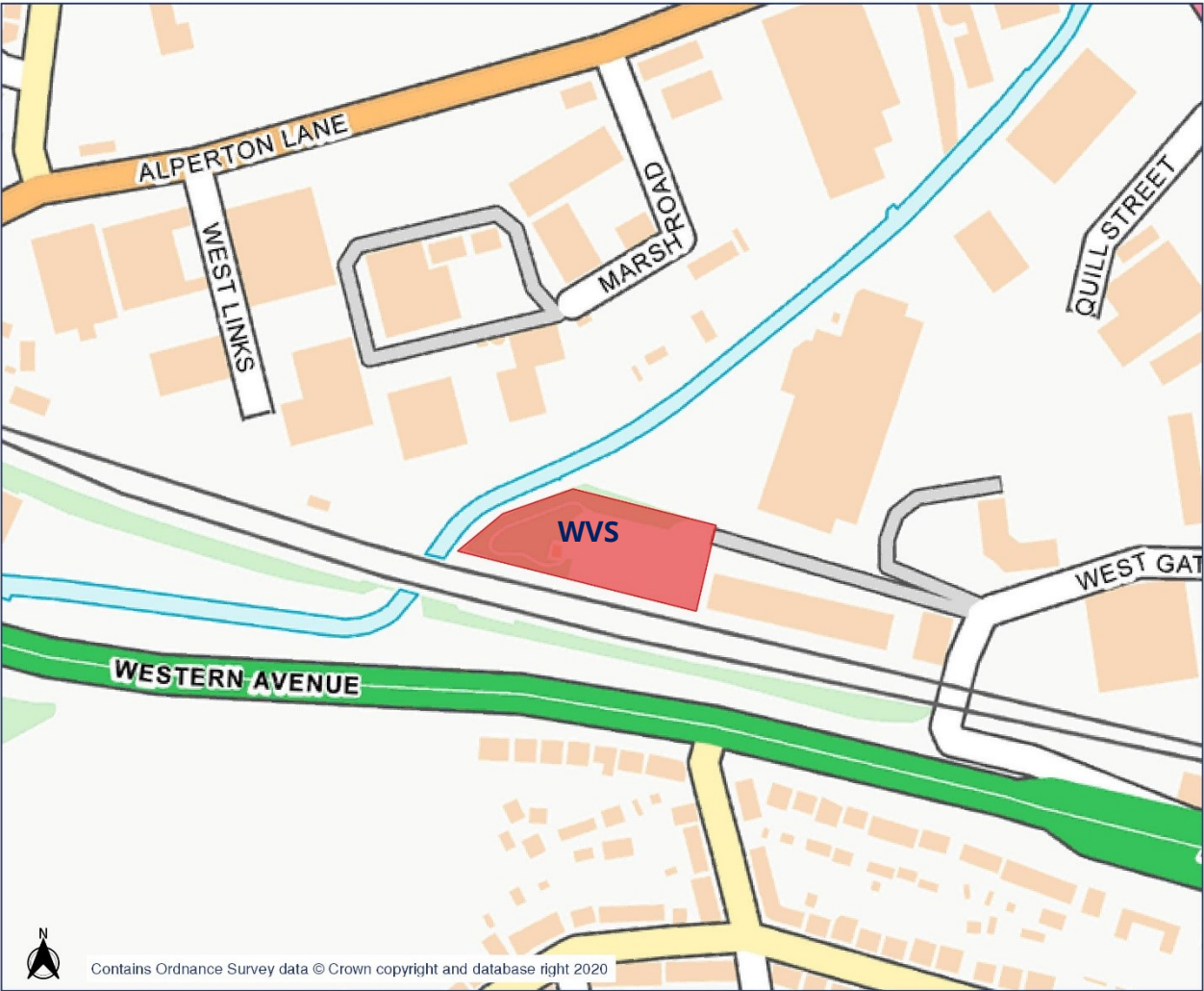
Appendix A Site Locations

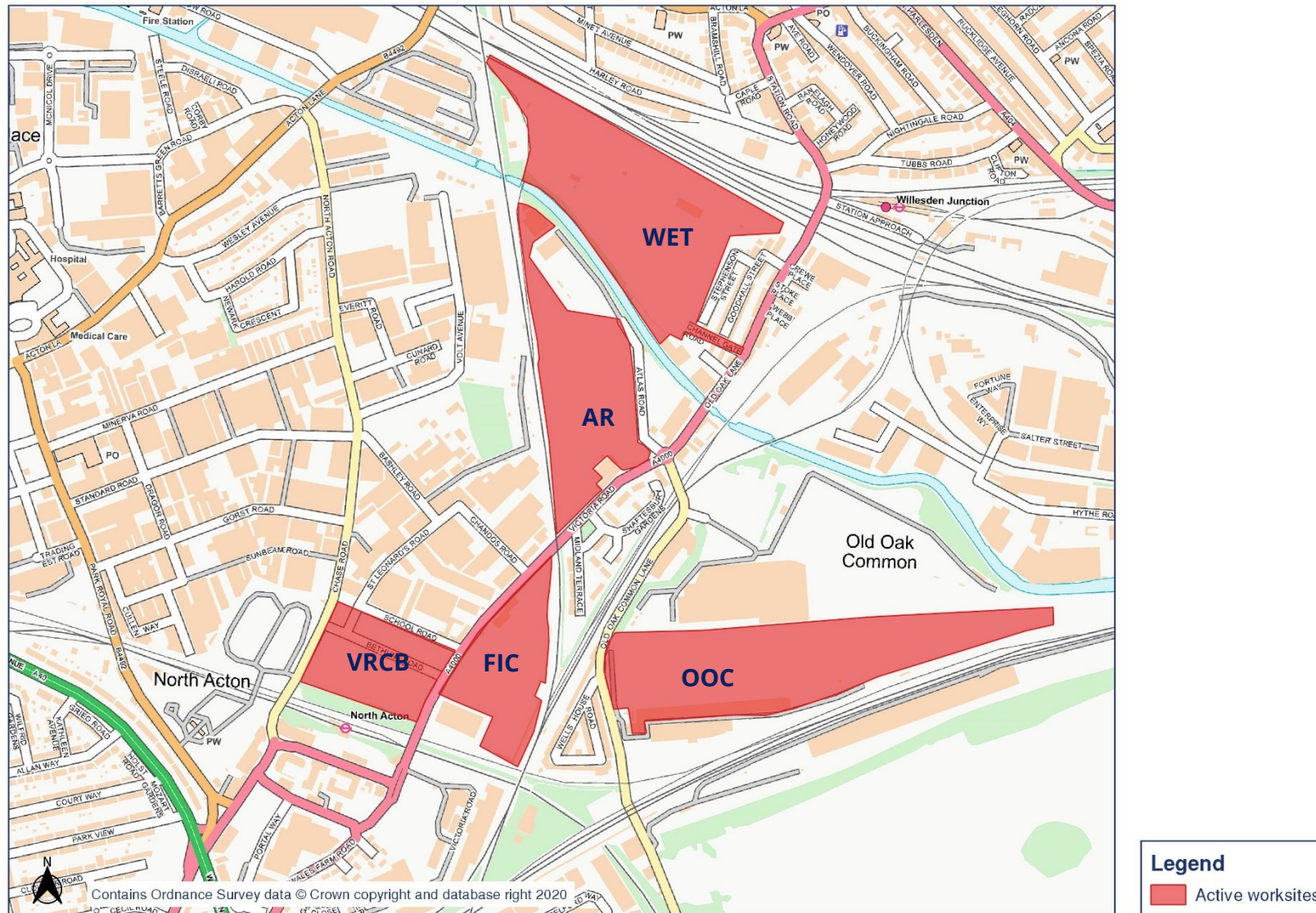


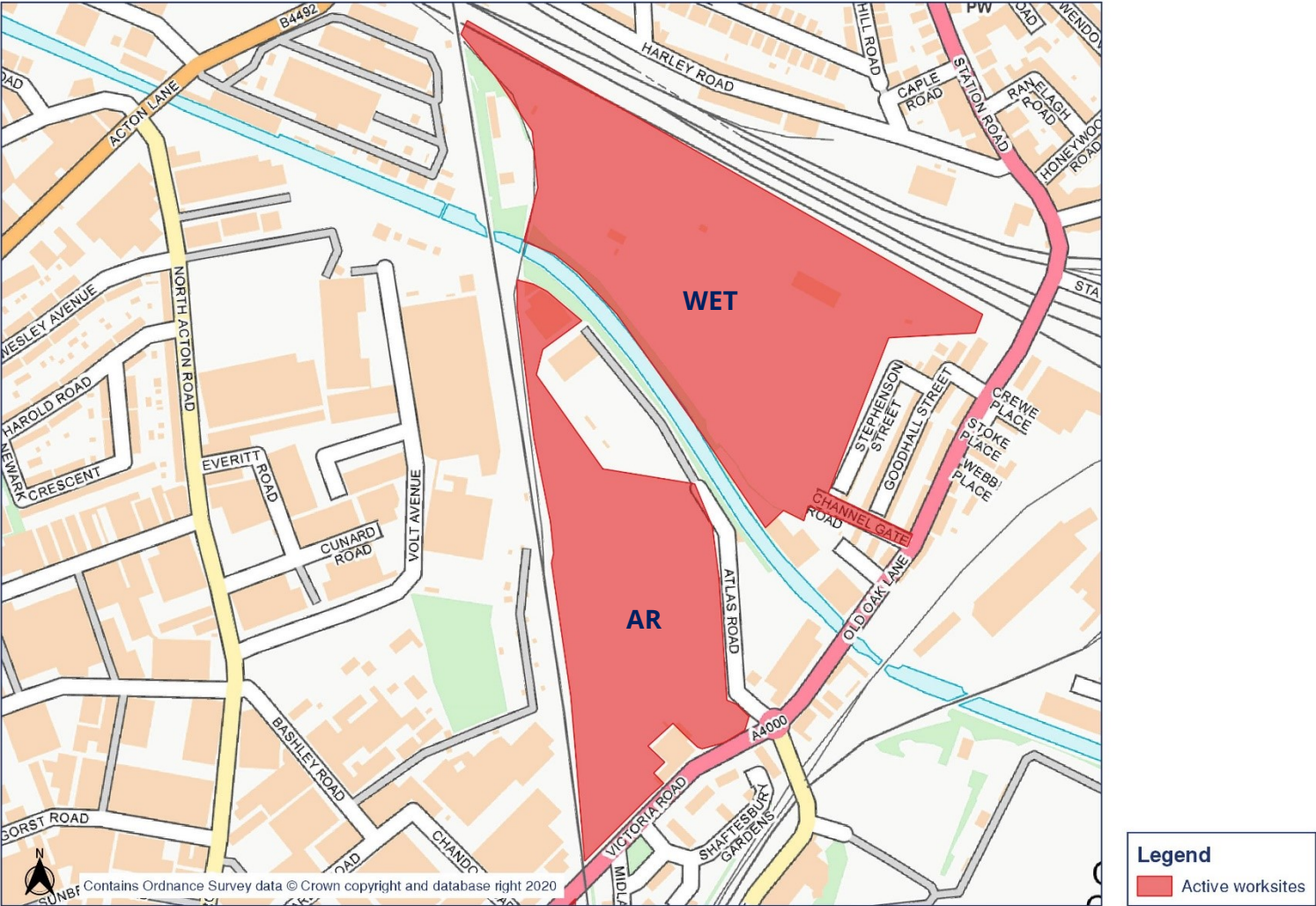
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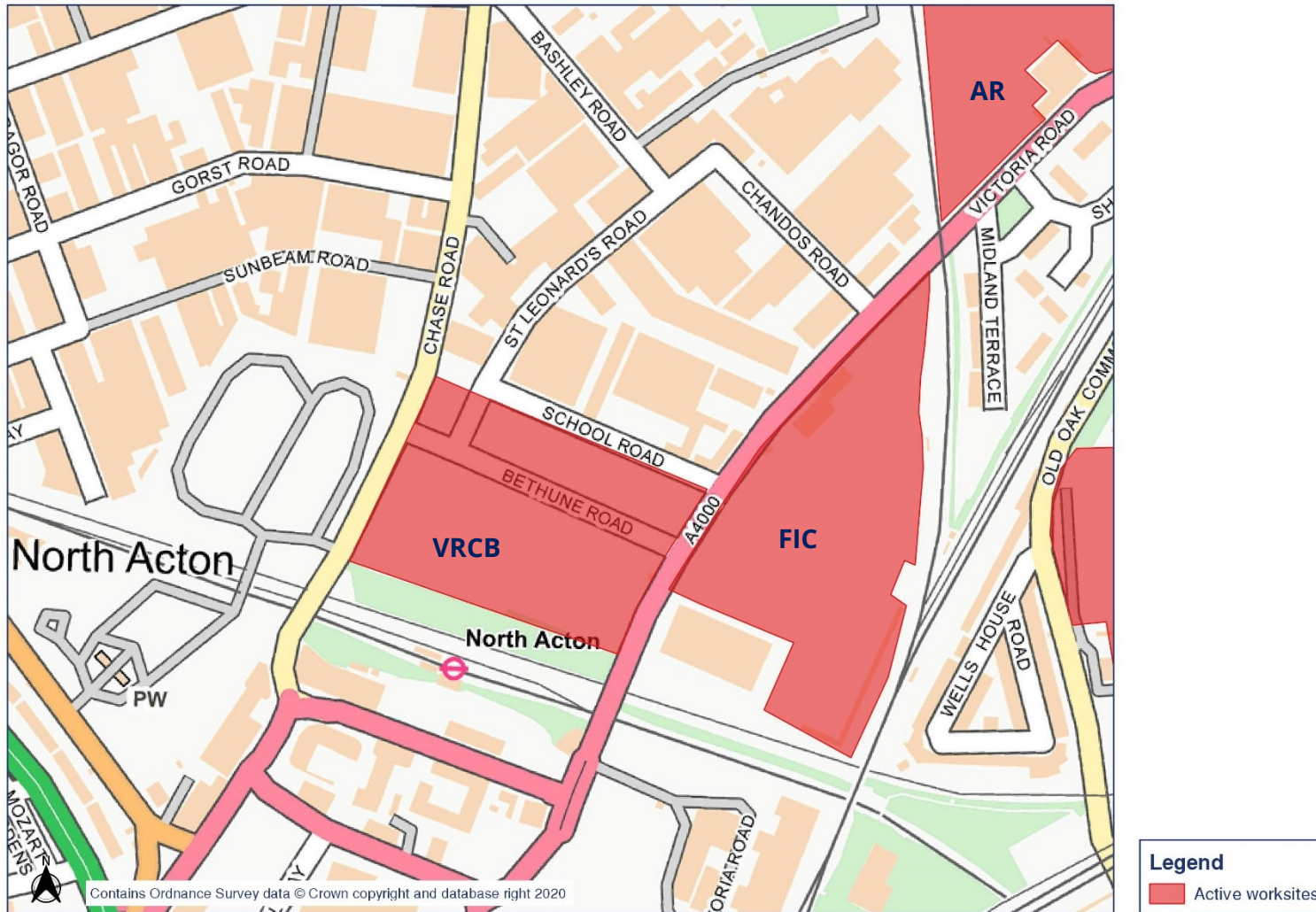


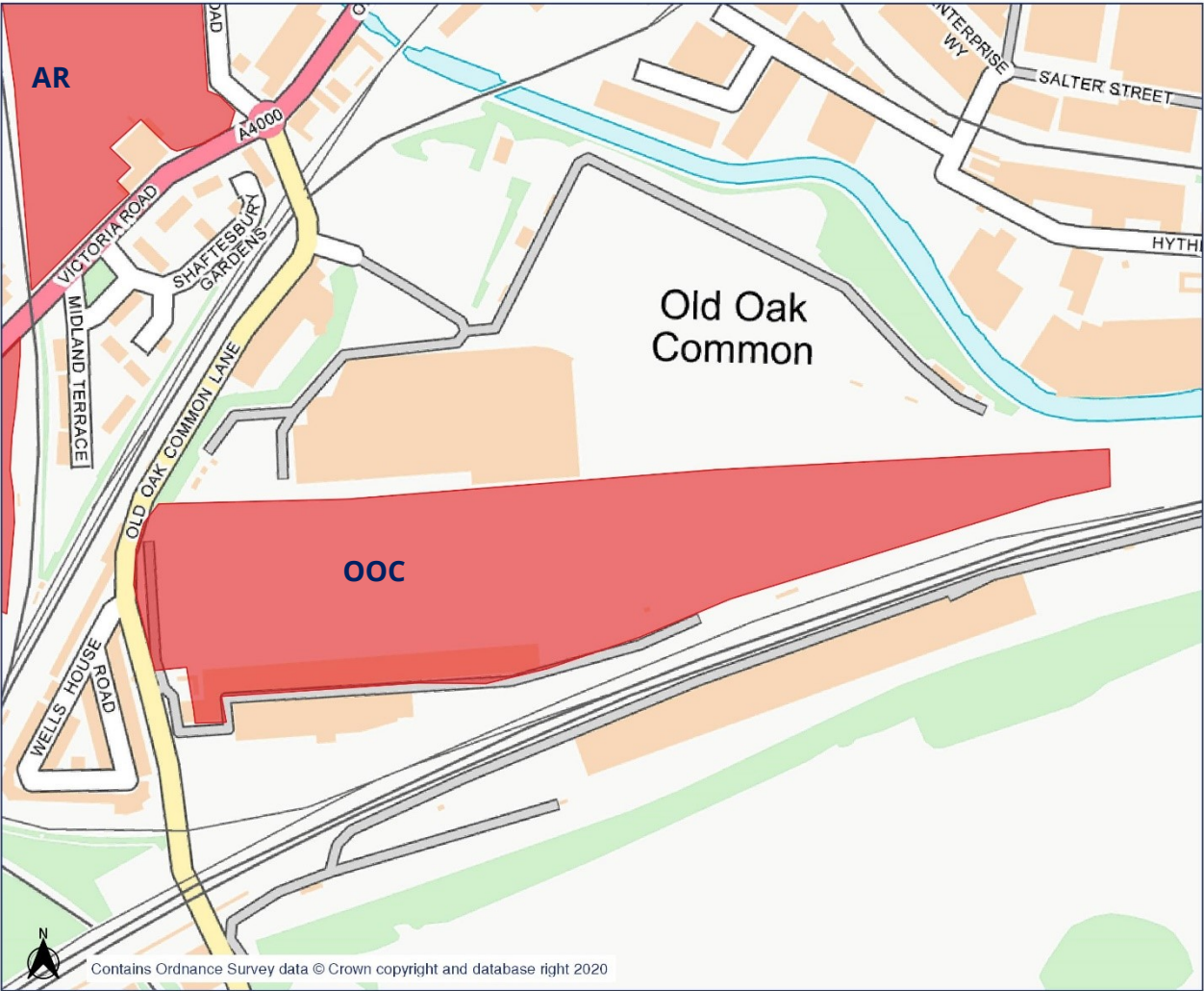








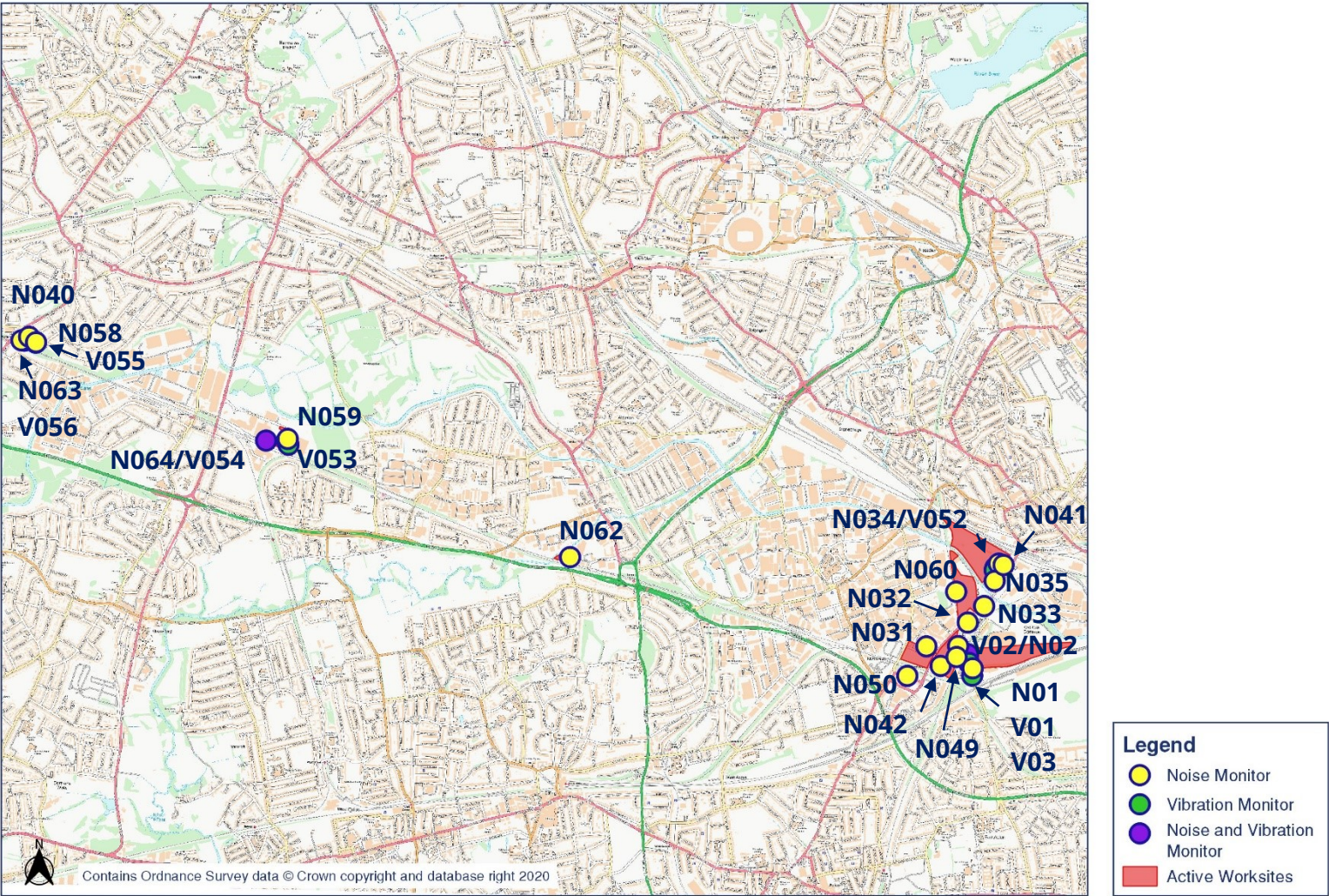


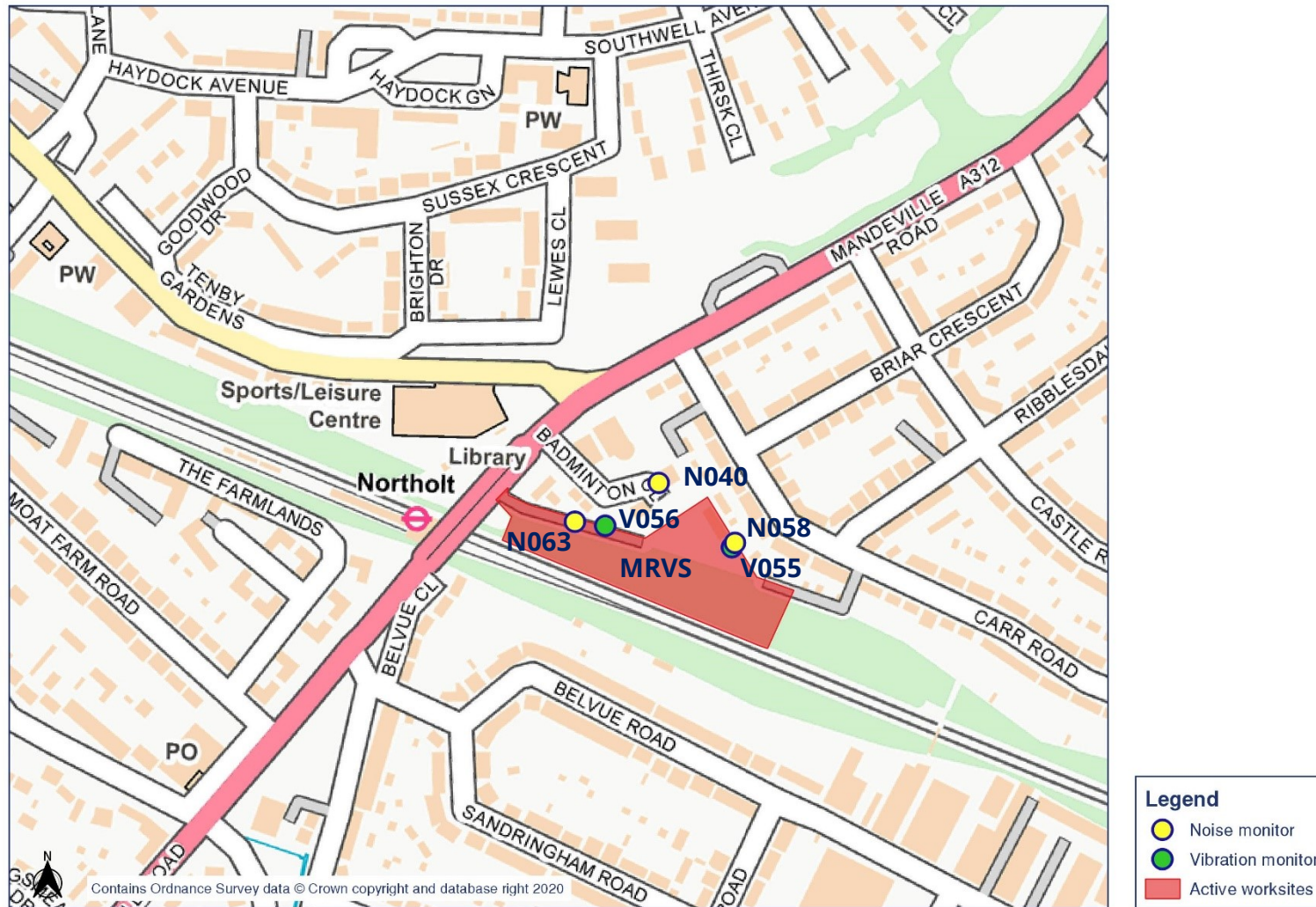


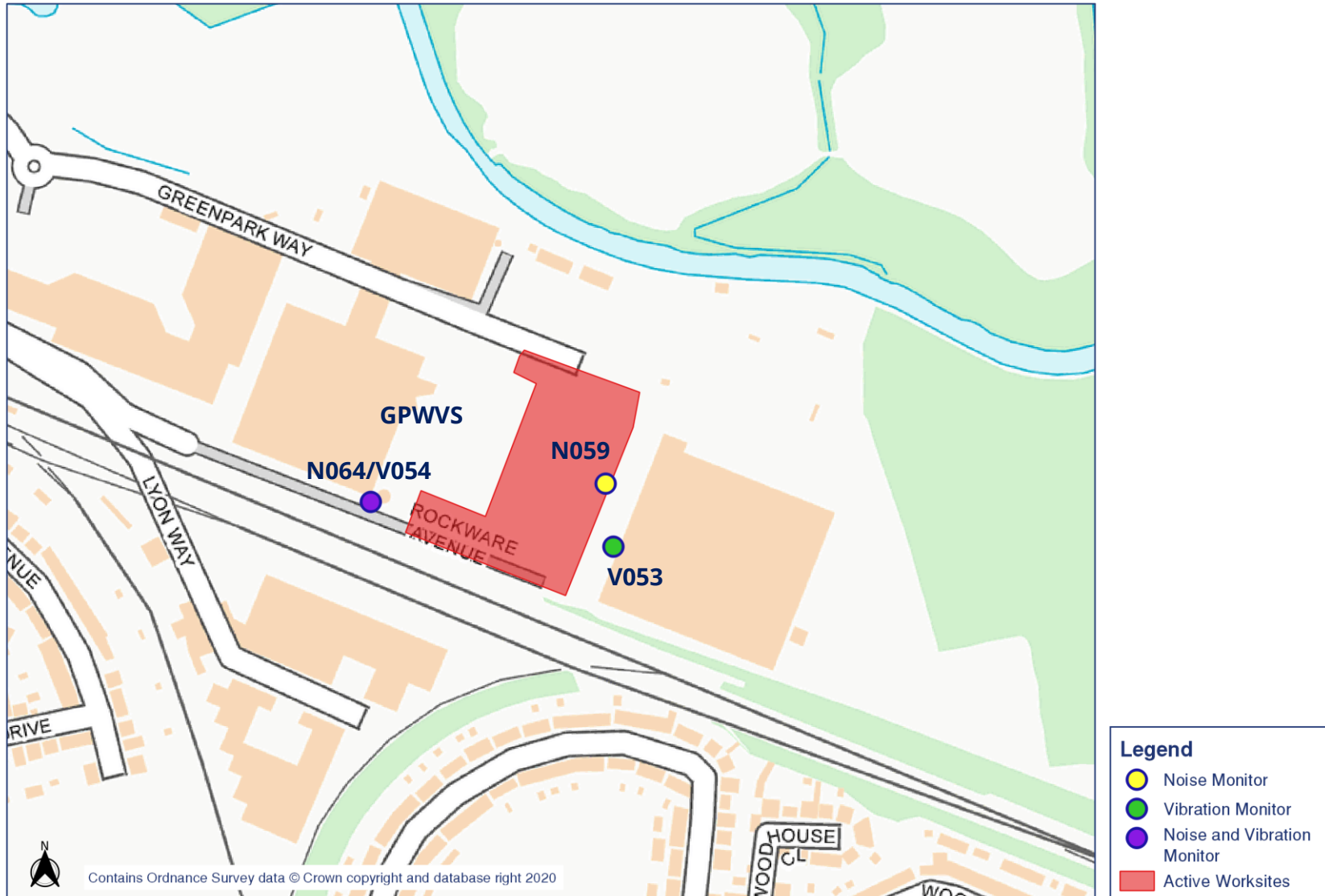
Legend
Active worksites

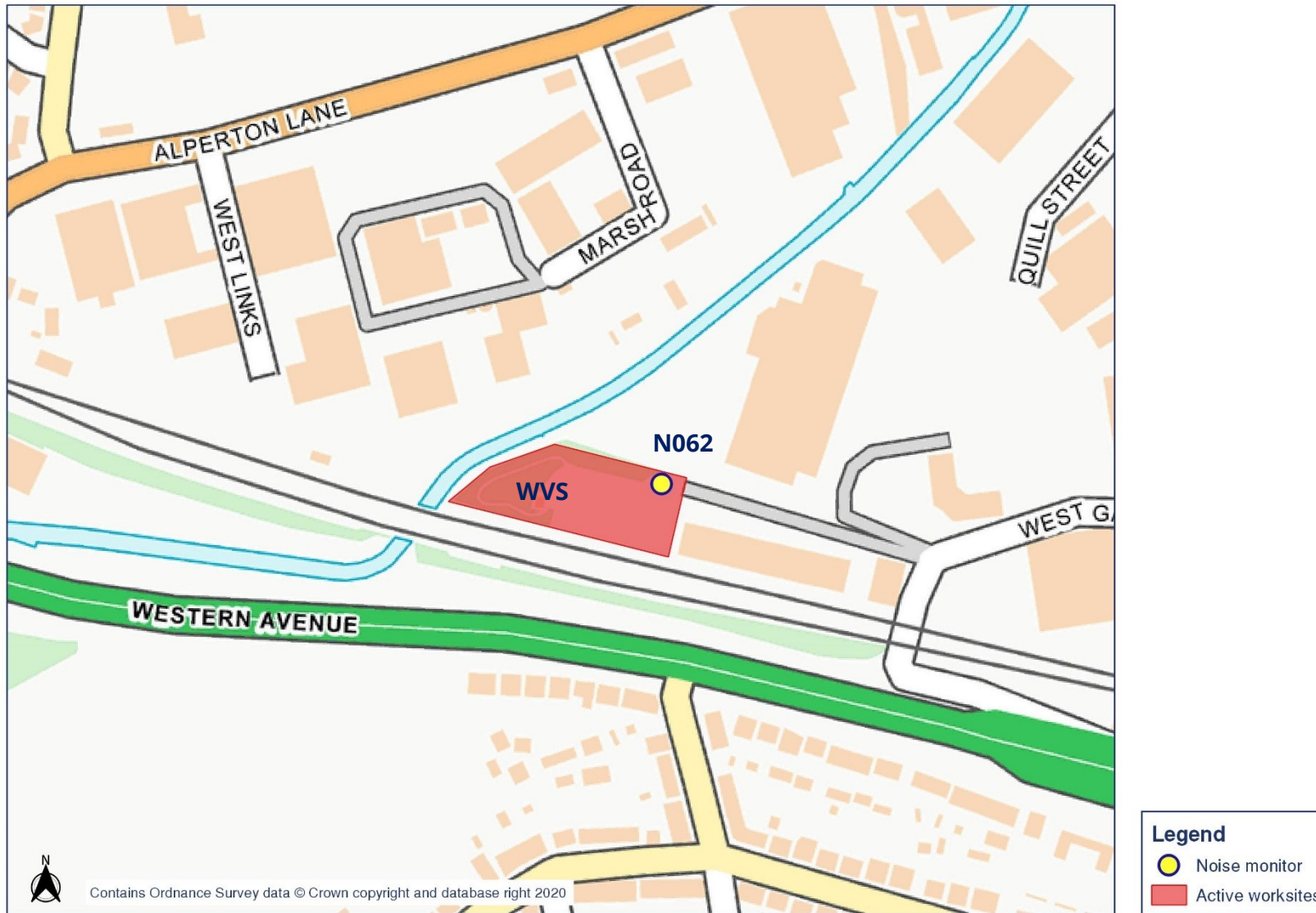
Appendix B Monitoring Locations

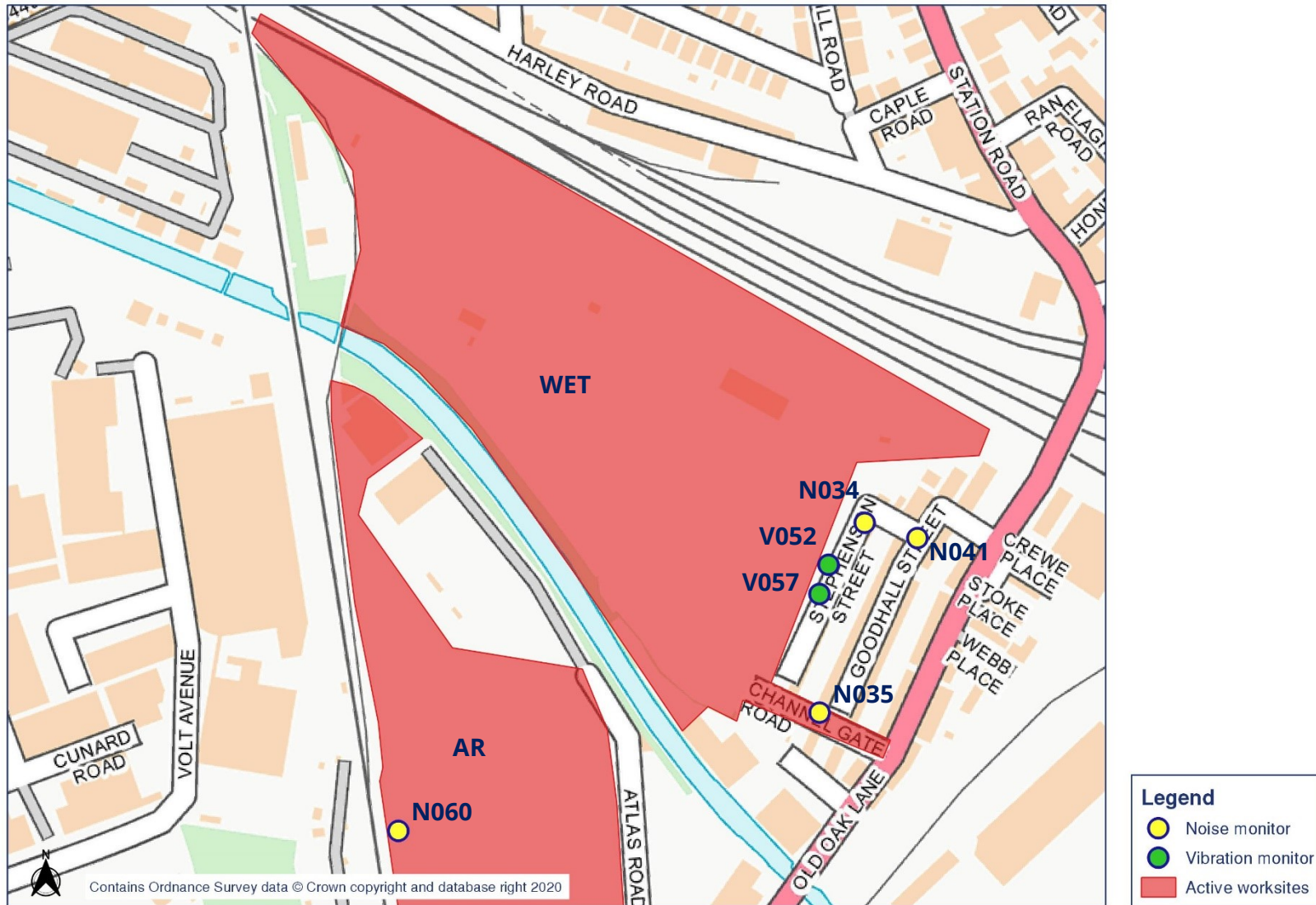
HS2 Noise and vibration monitoring plan - Overview

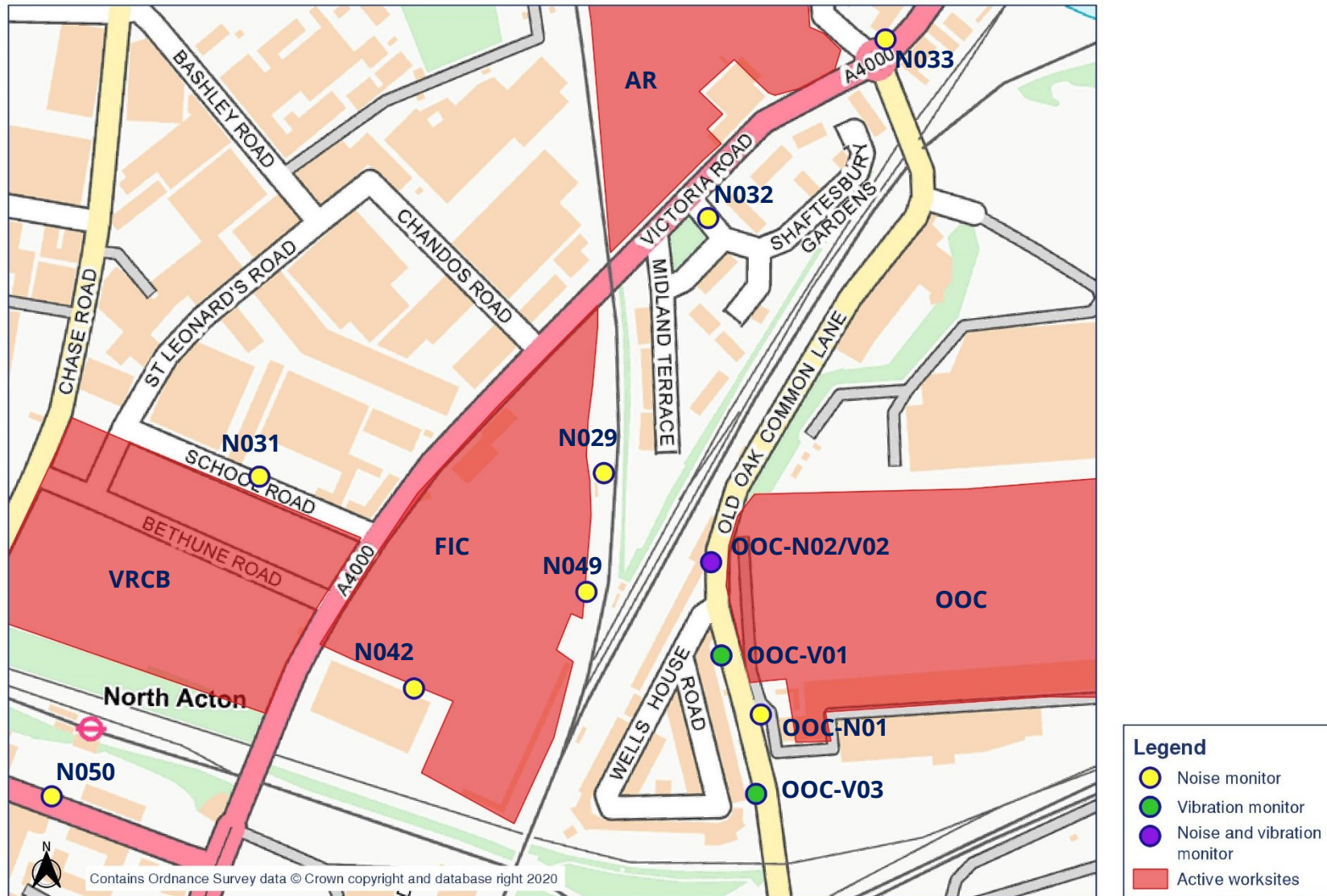










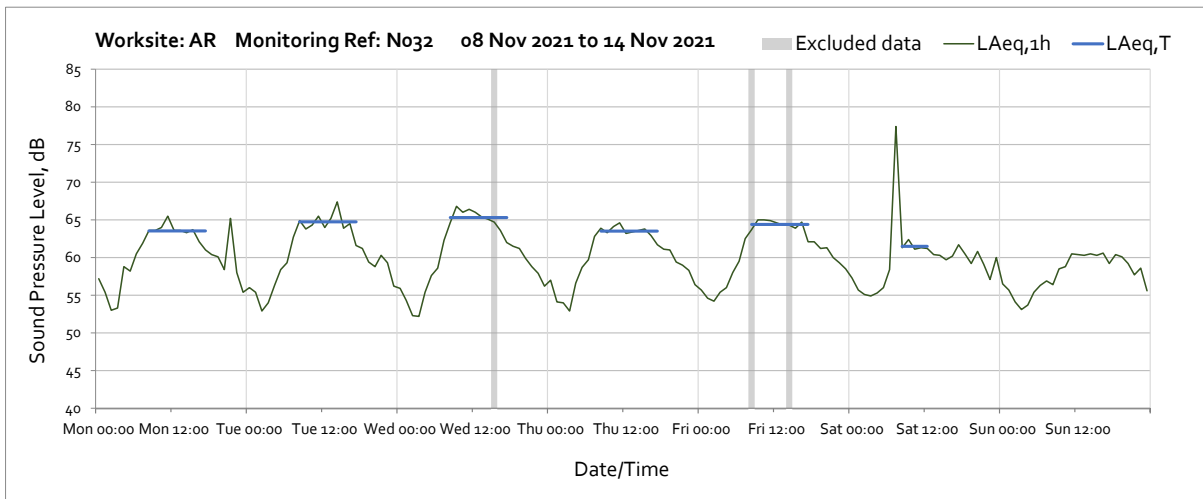
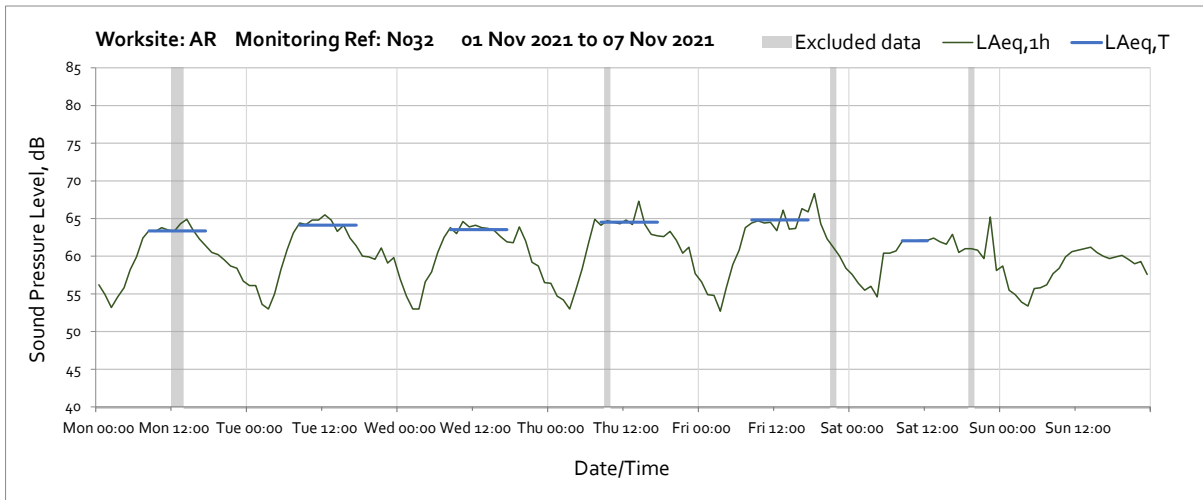


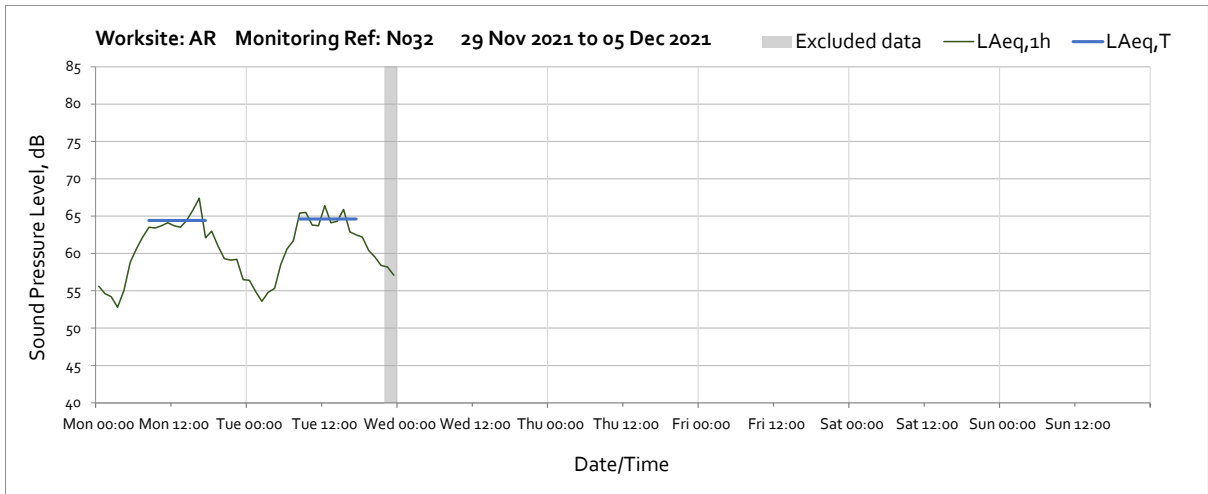
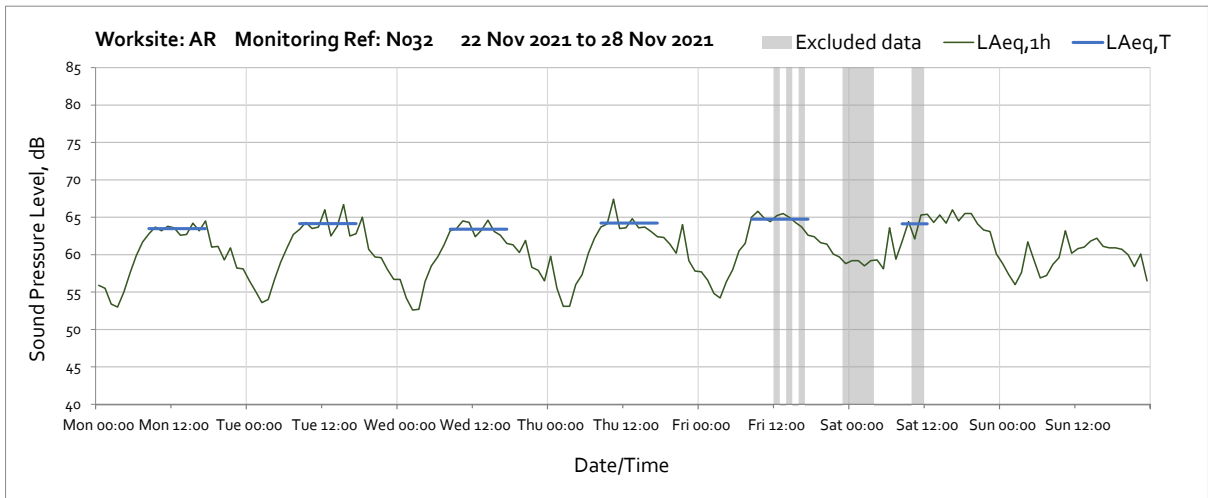
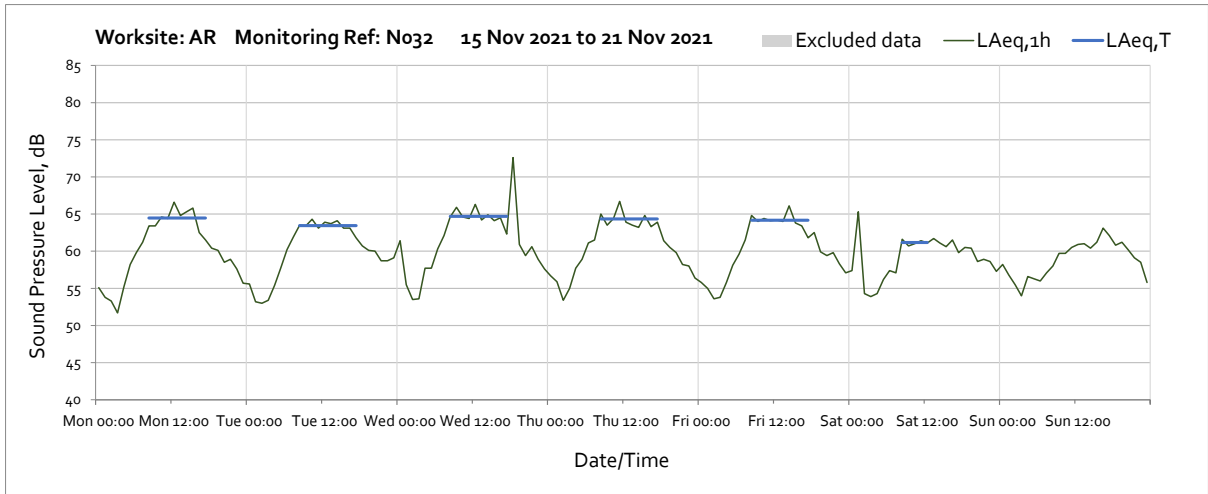
Appendix C Data

Noise

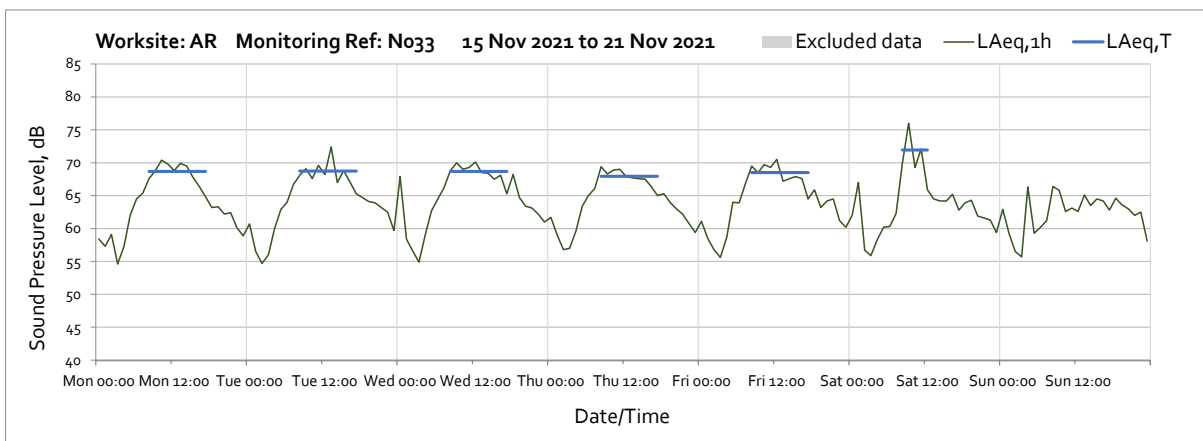
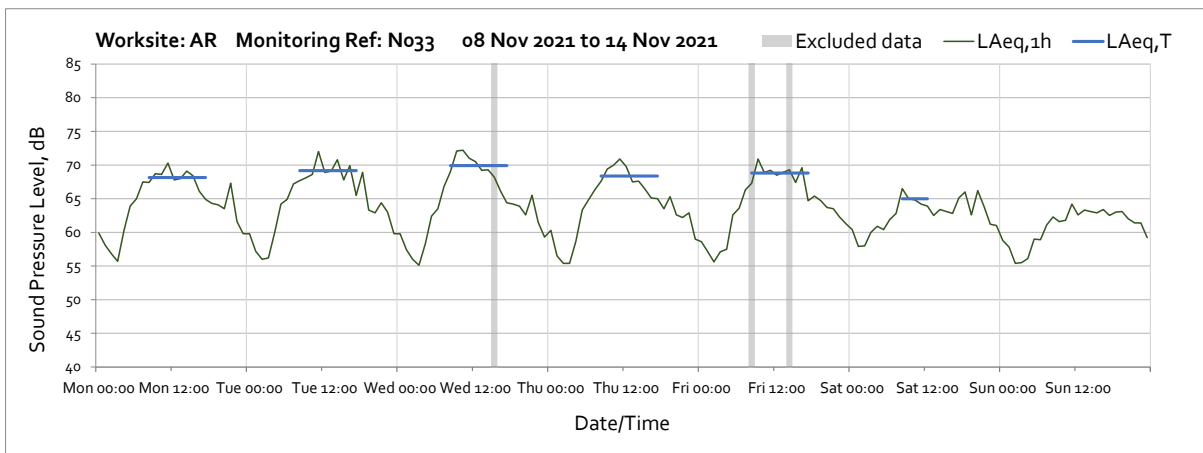
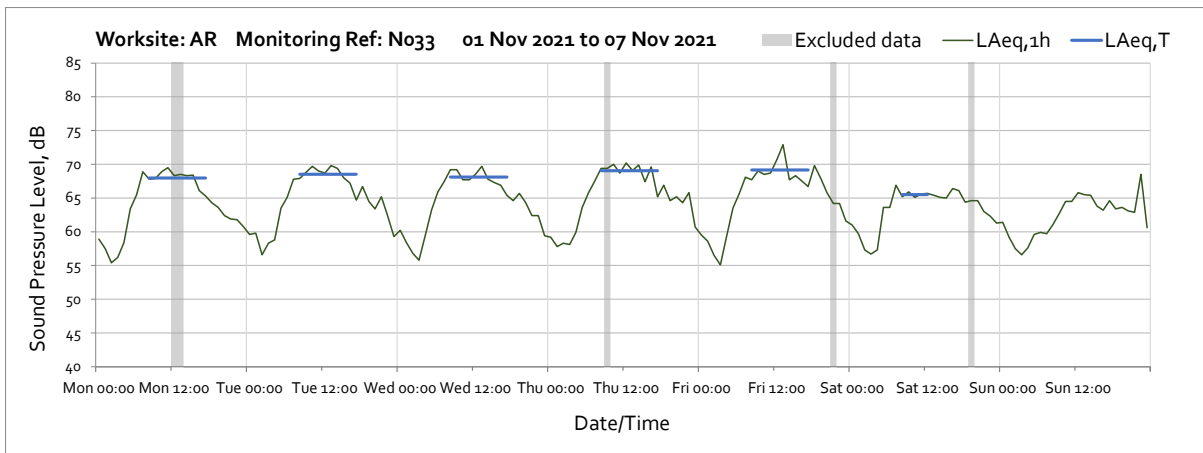
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

Worksite: Atlas Road worksite (AR) – Monitoring Ref: N032

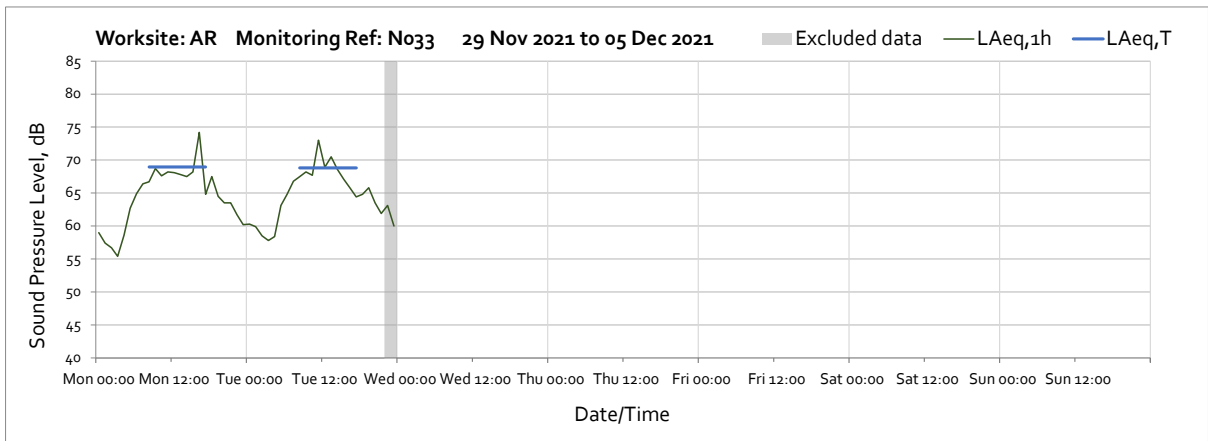
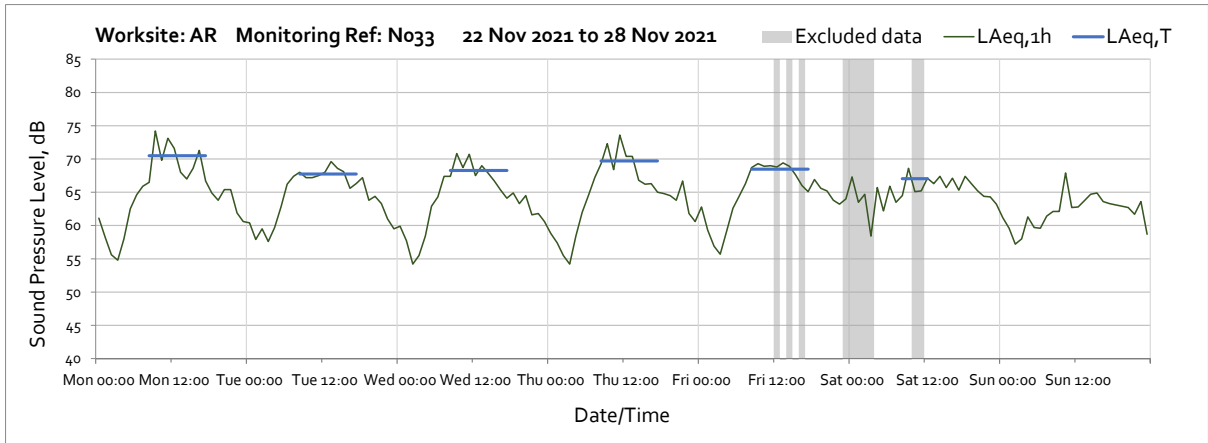




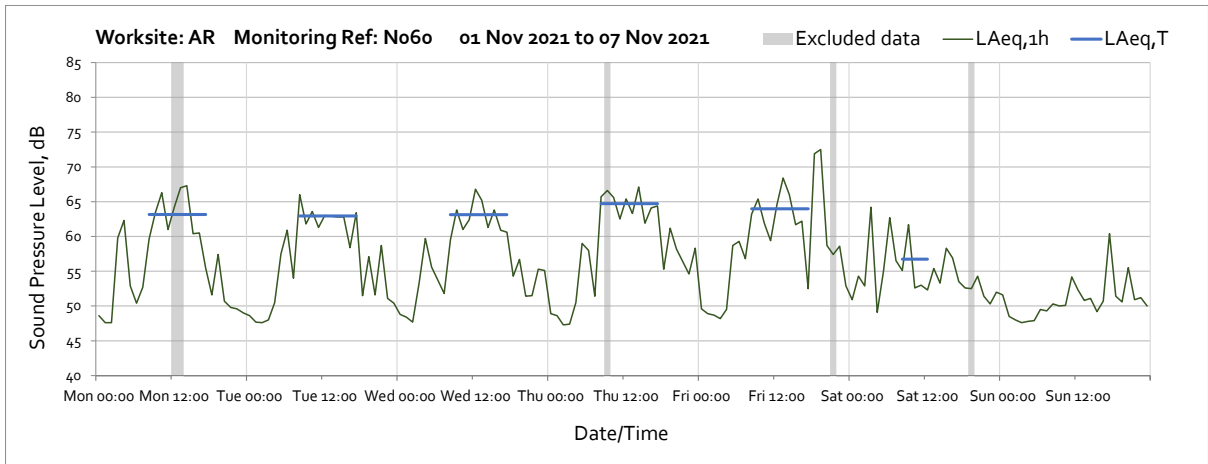
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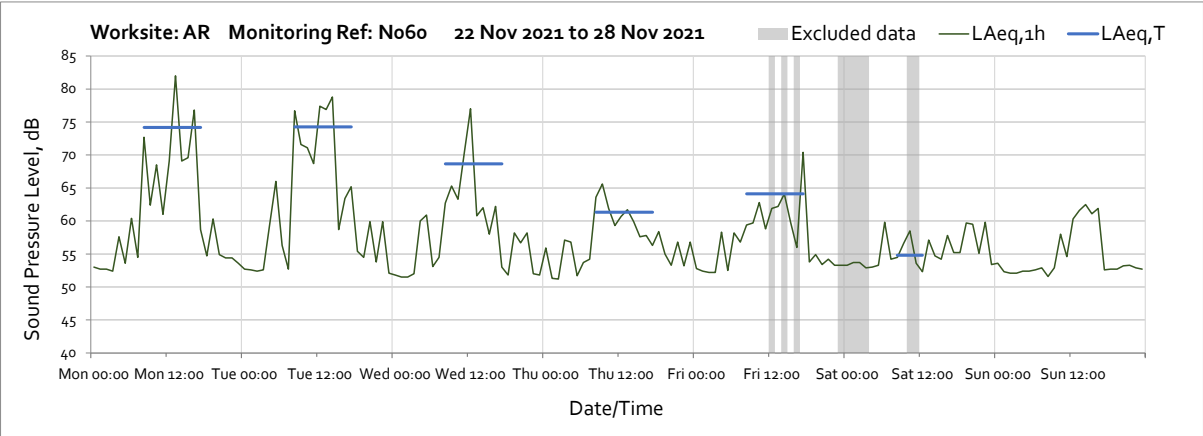
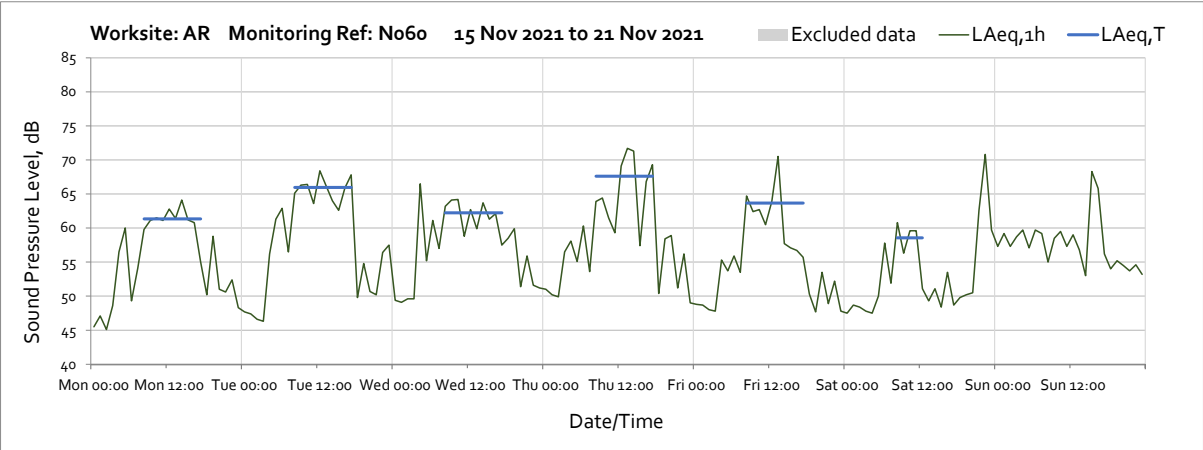
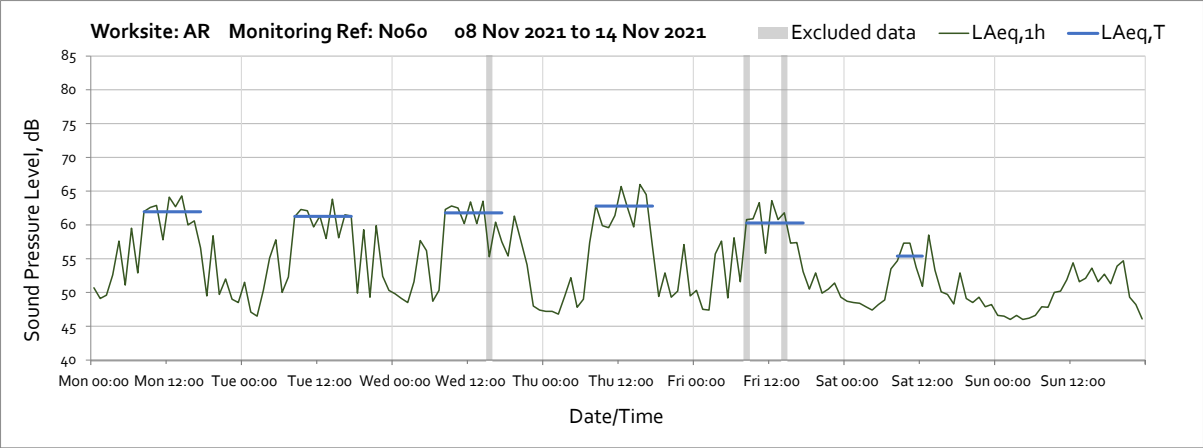


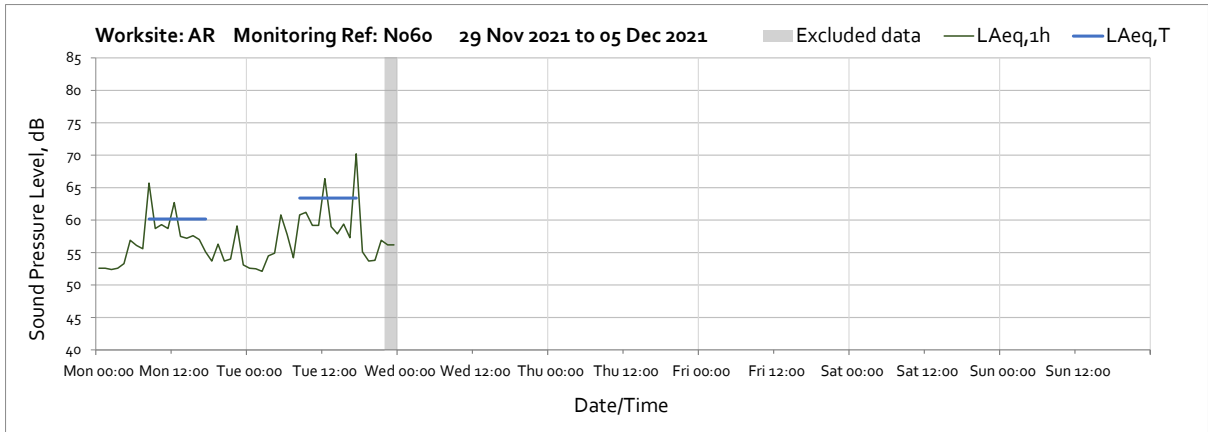
OFFICIAL



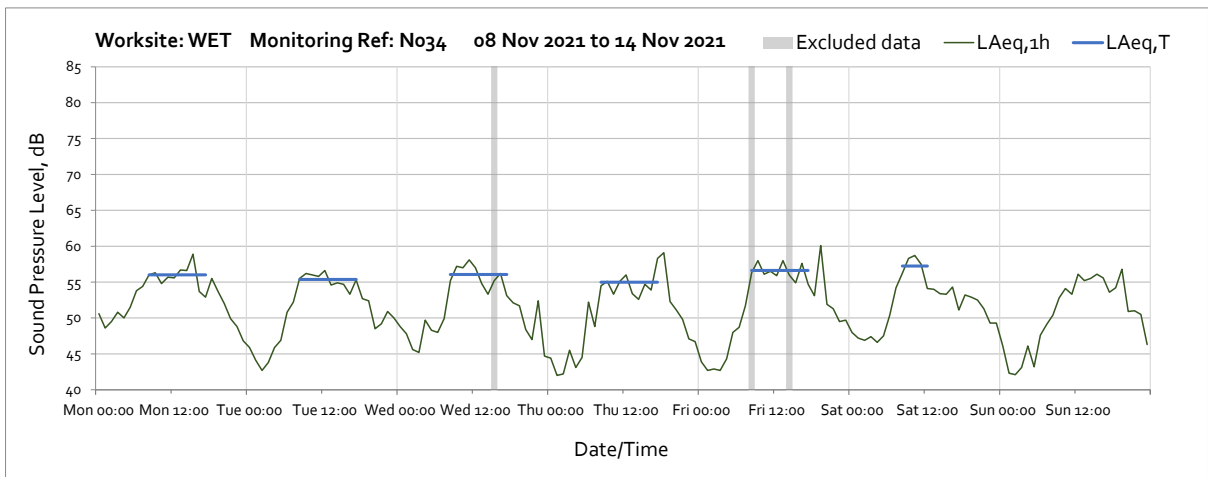
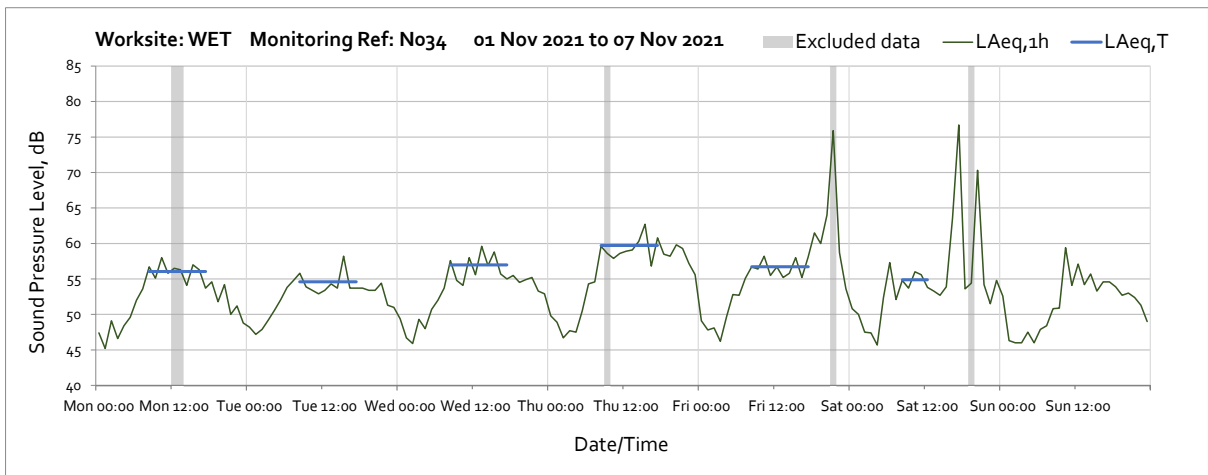
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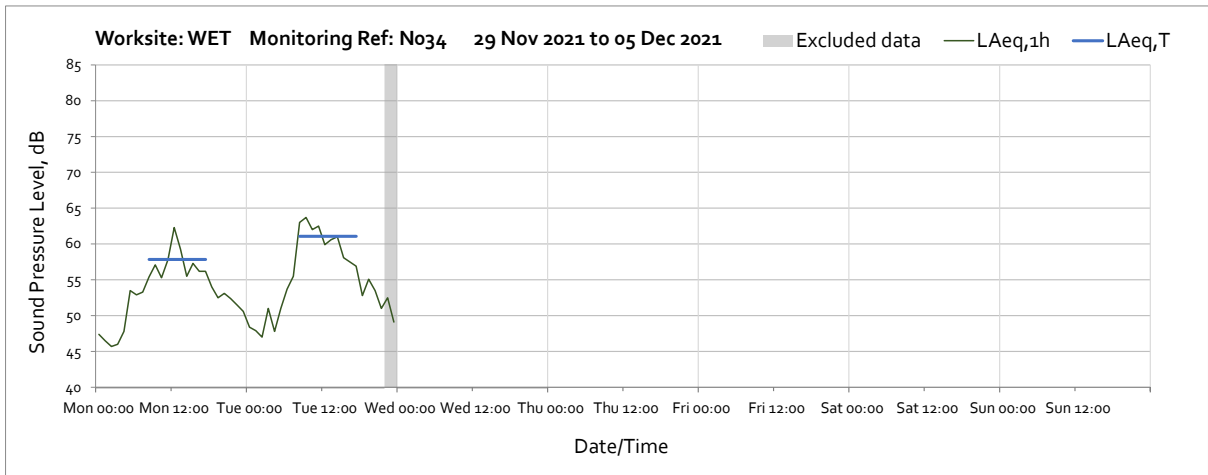
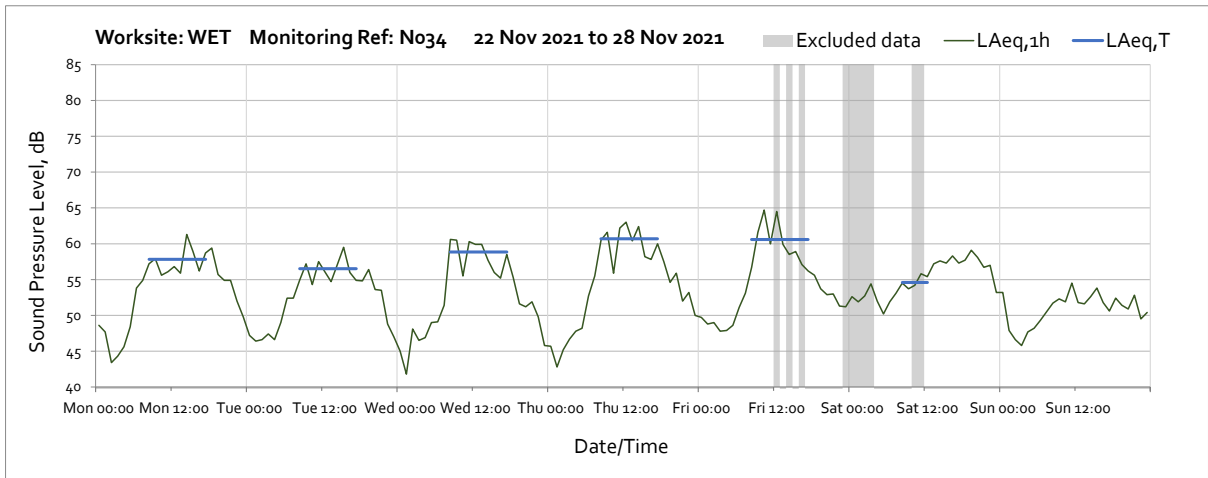
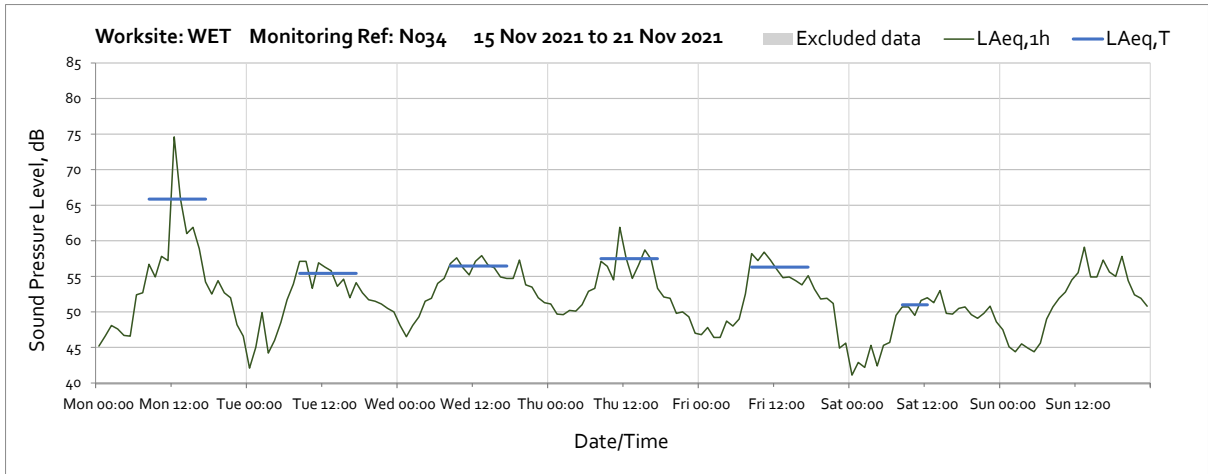




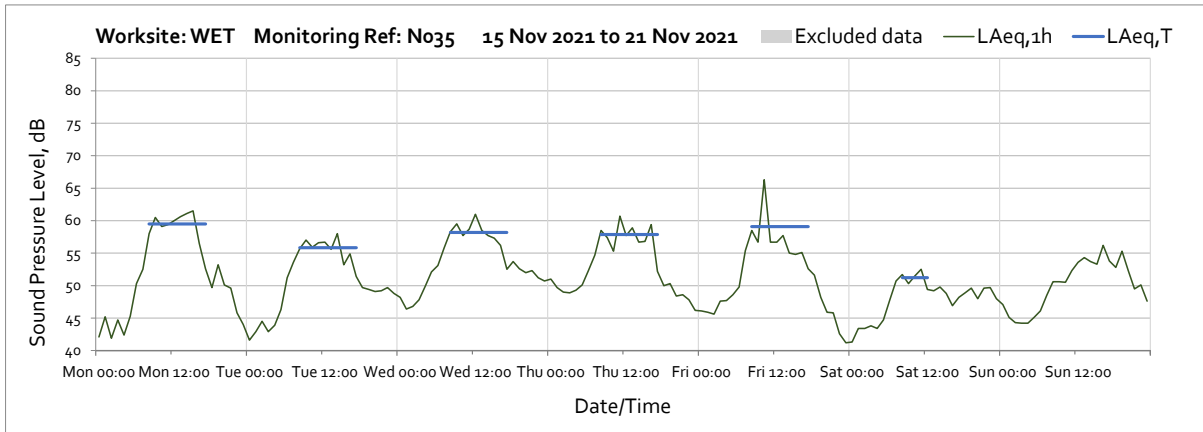
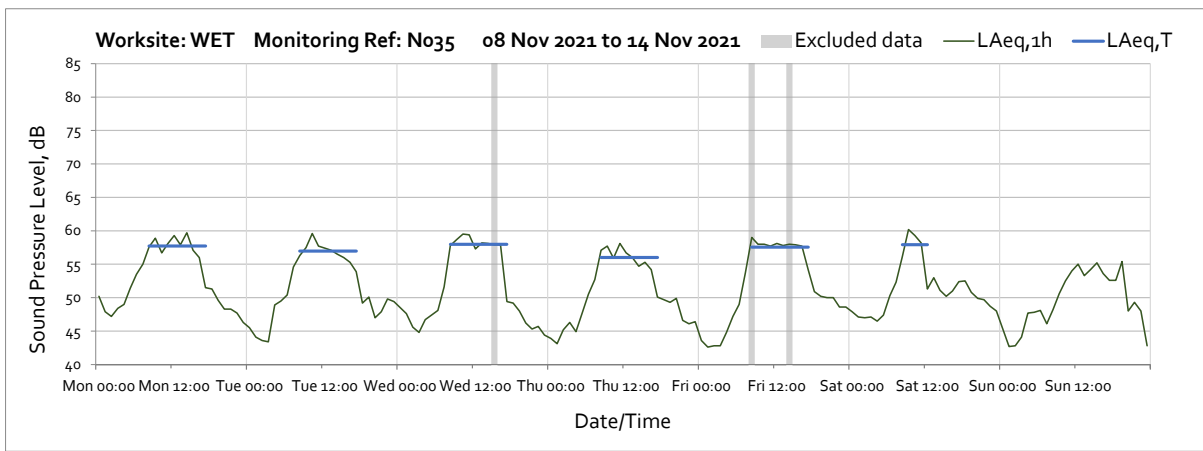
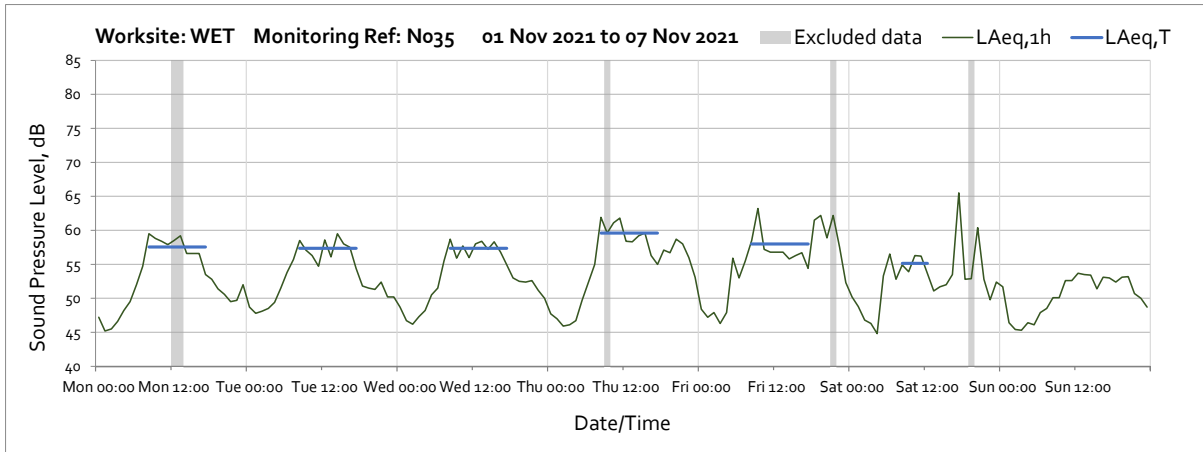


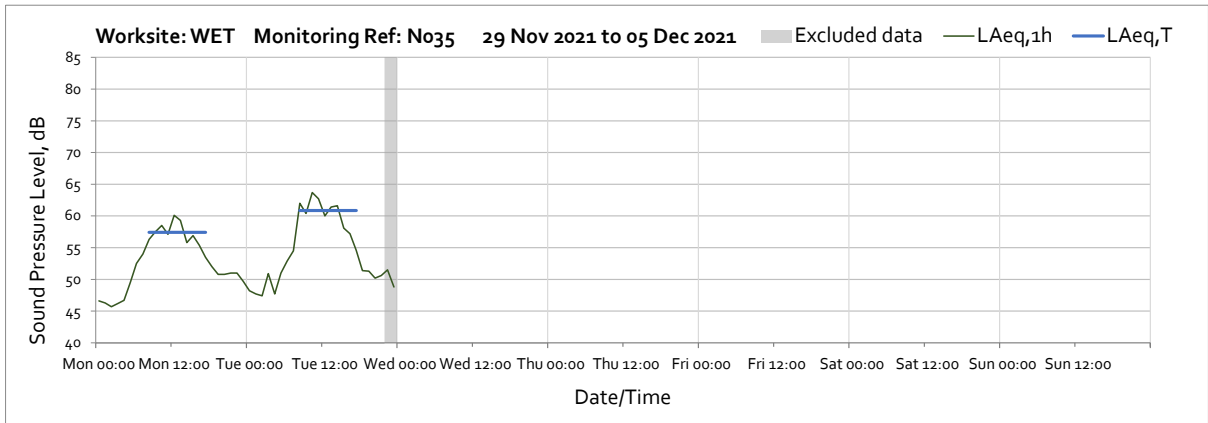
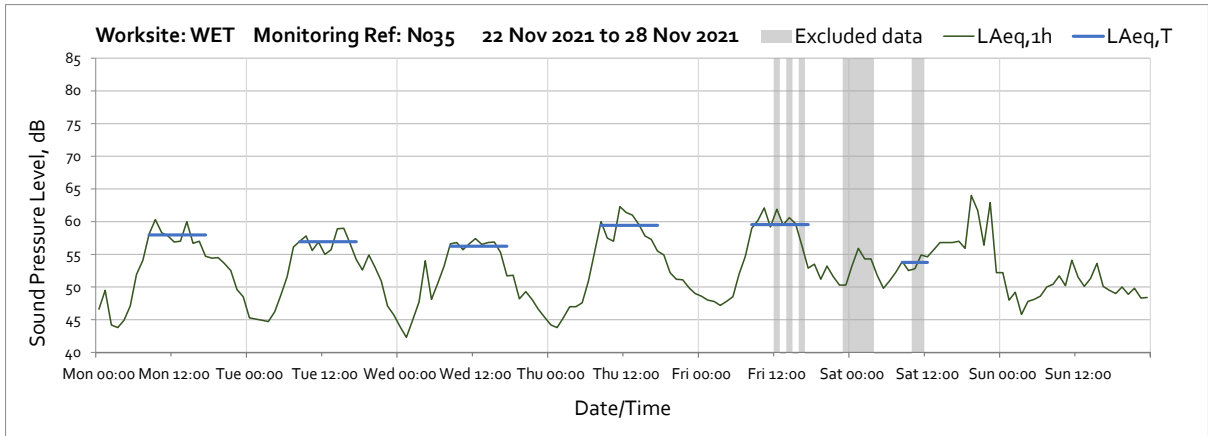
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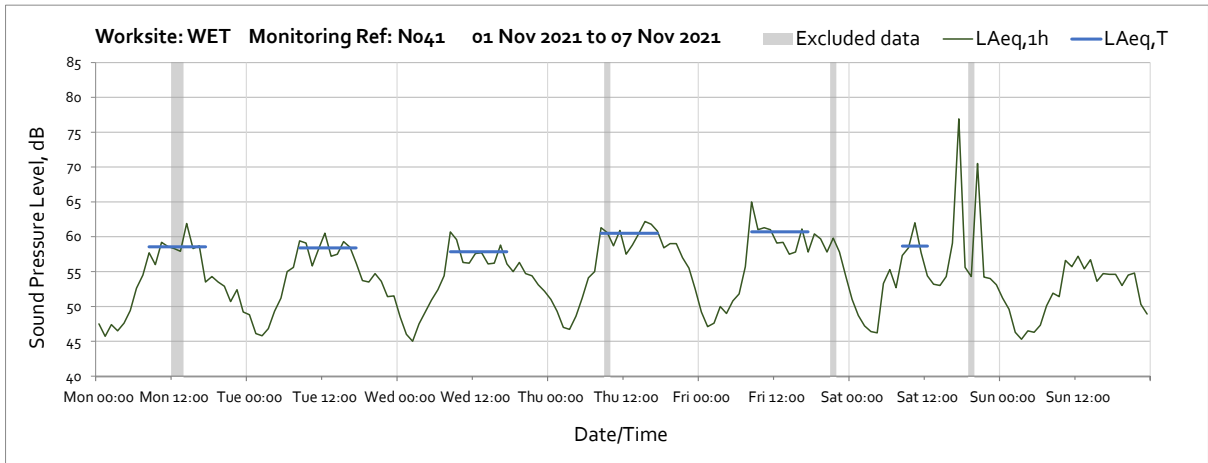


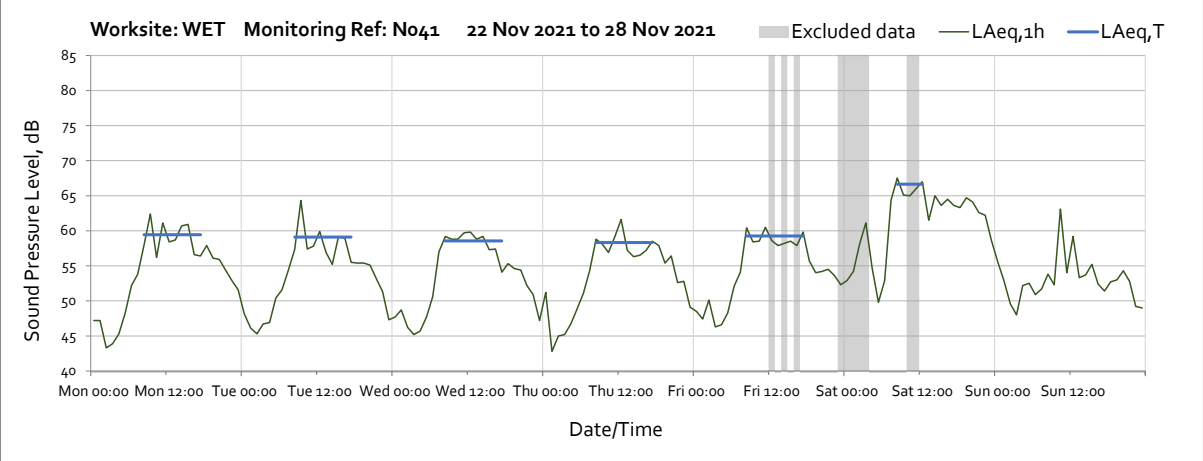
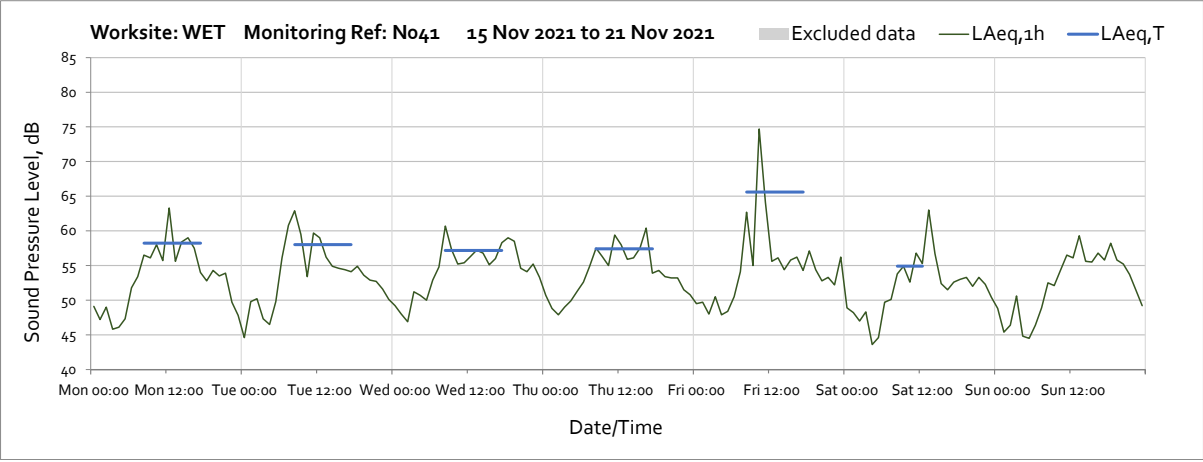
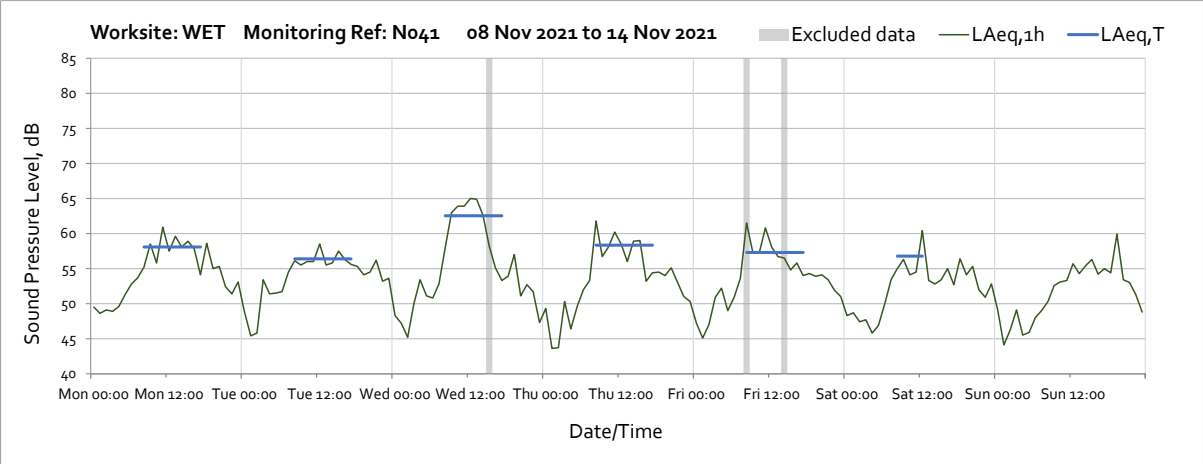
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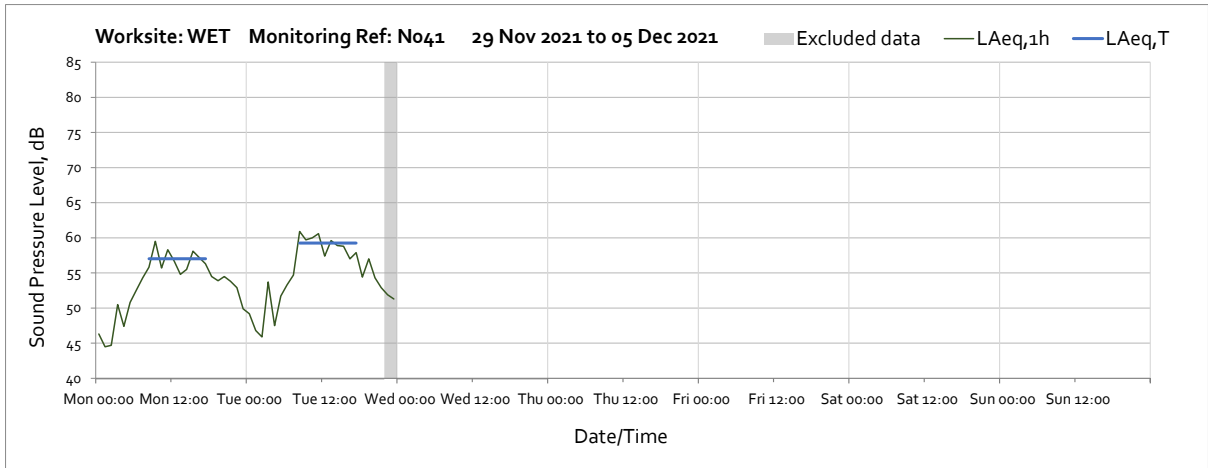




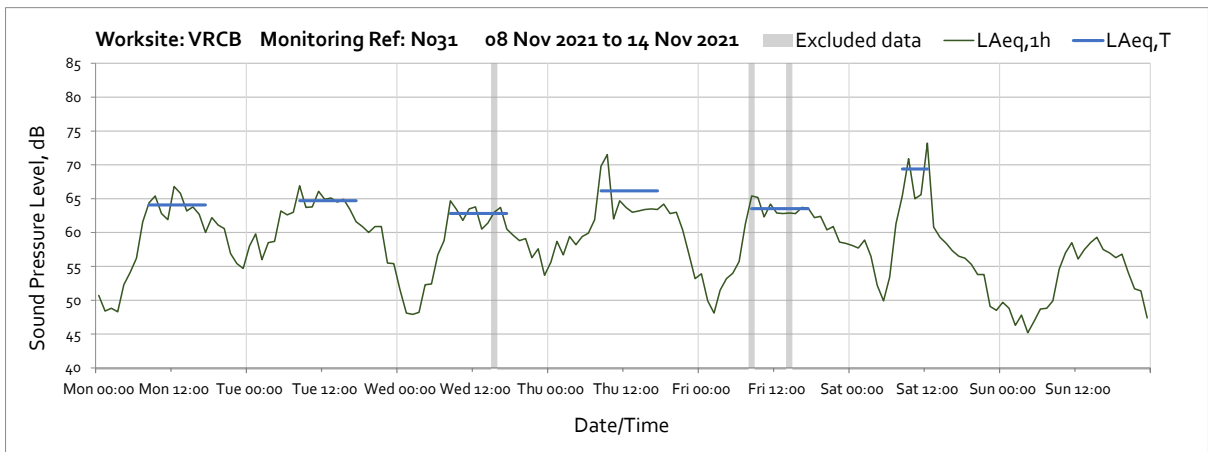
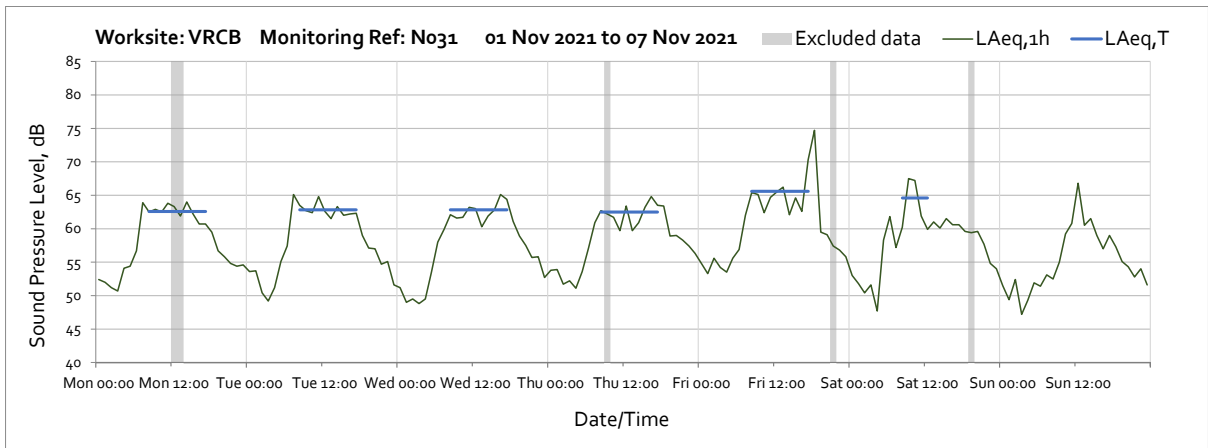
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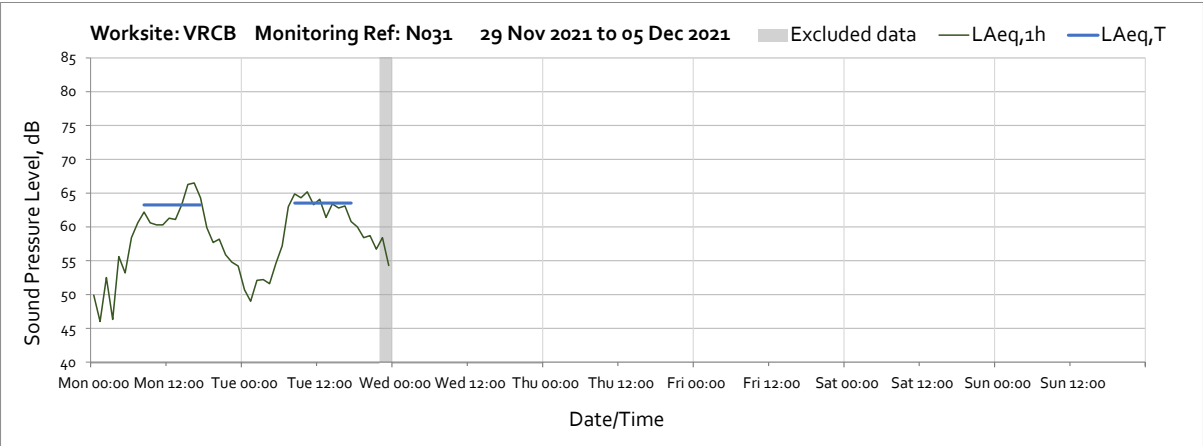
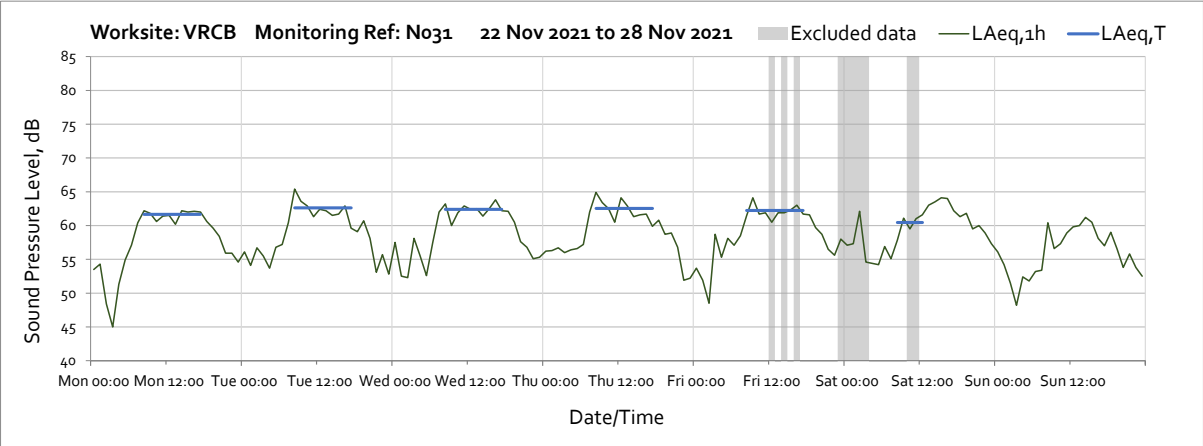
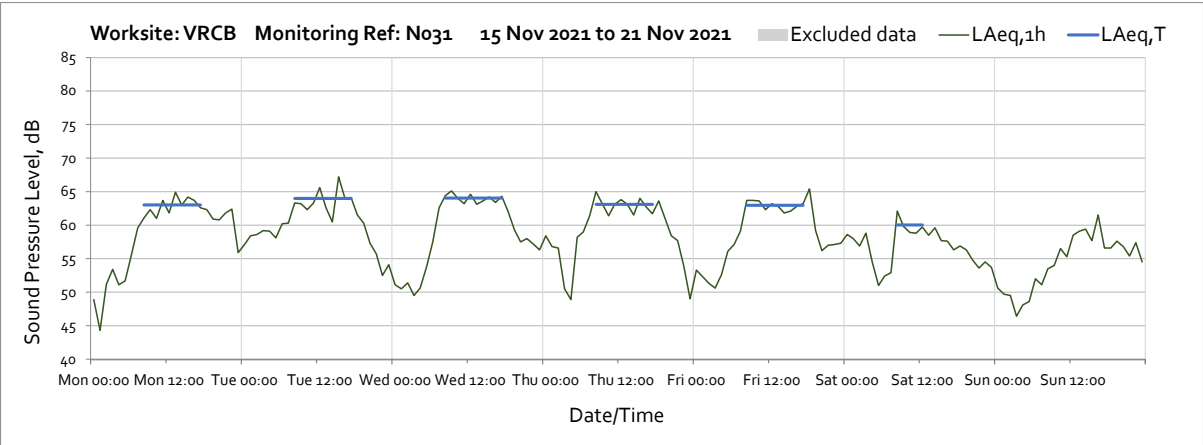




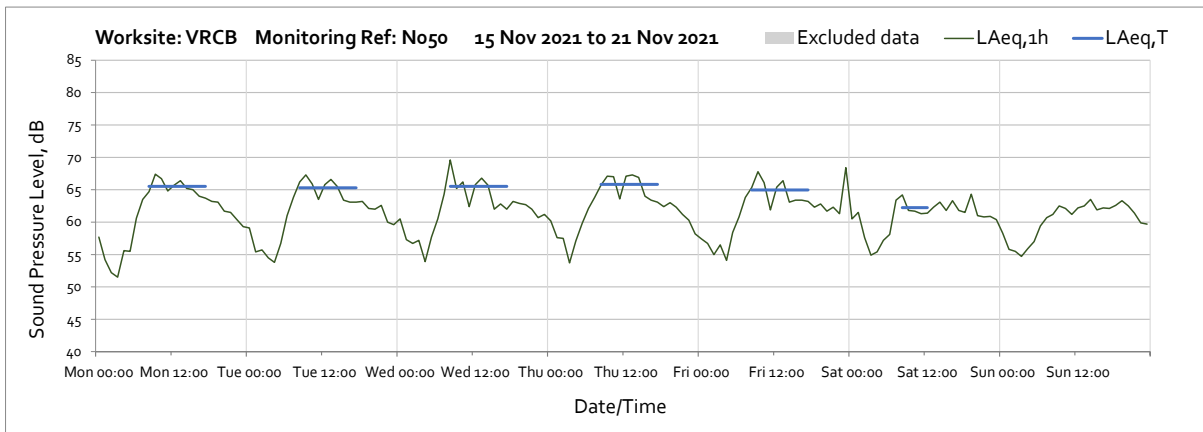
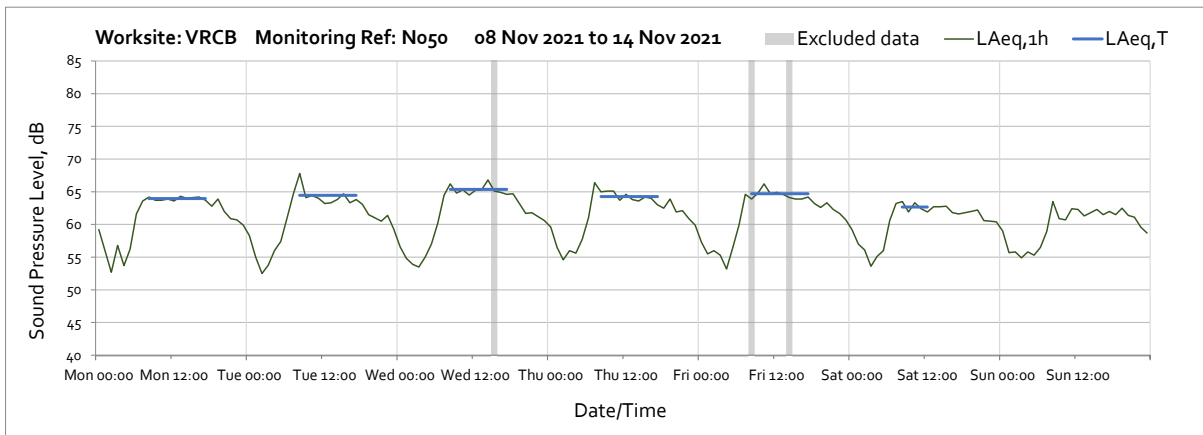
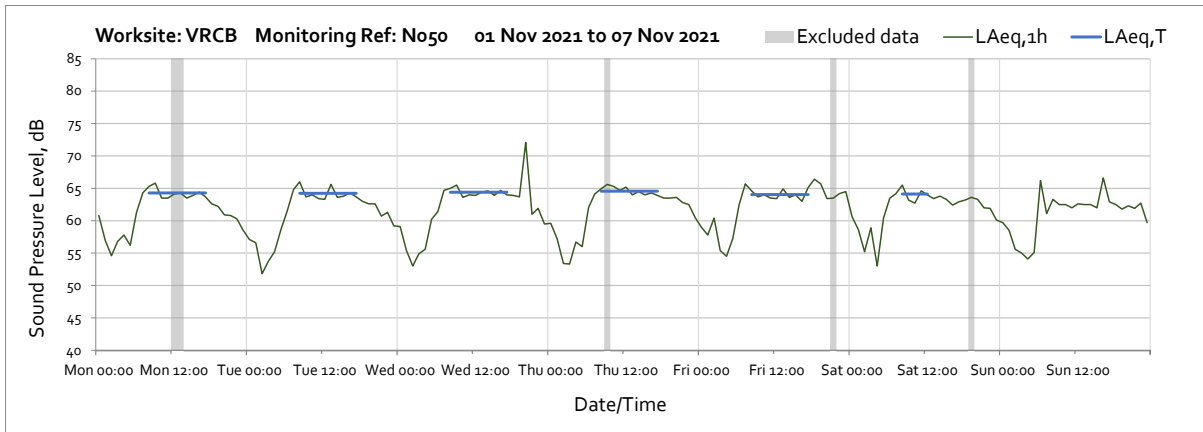


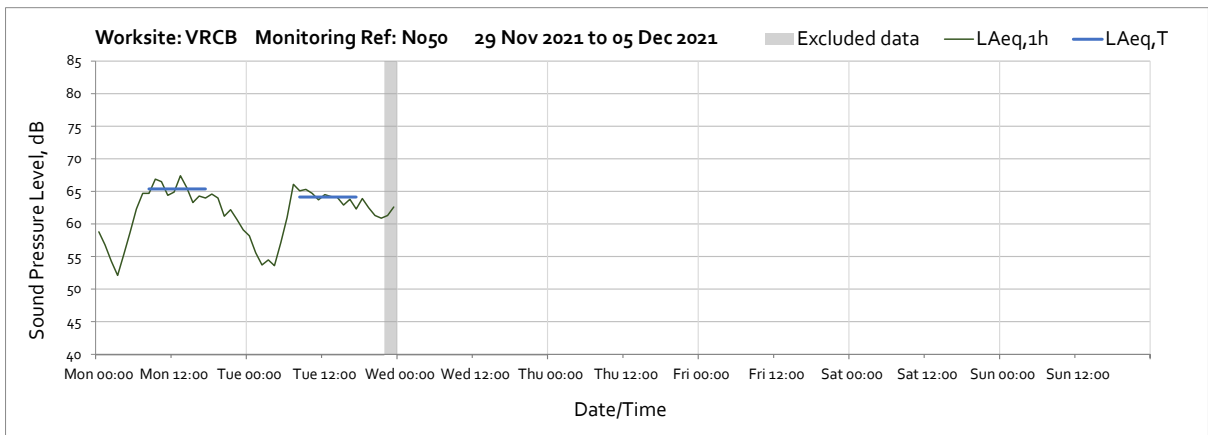
Worksite: Victoria Road Crossover Box (VRCB) – Monitoring Ref: N031



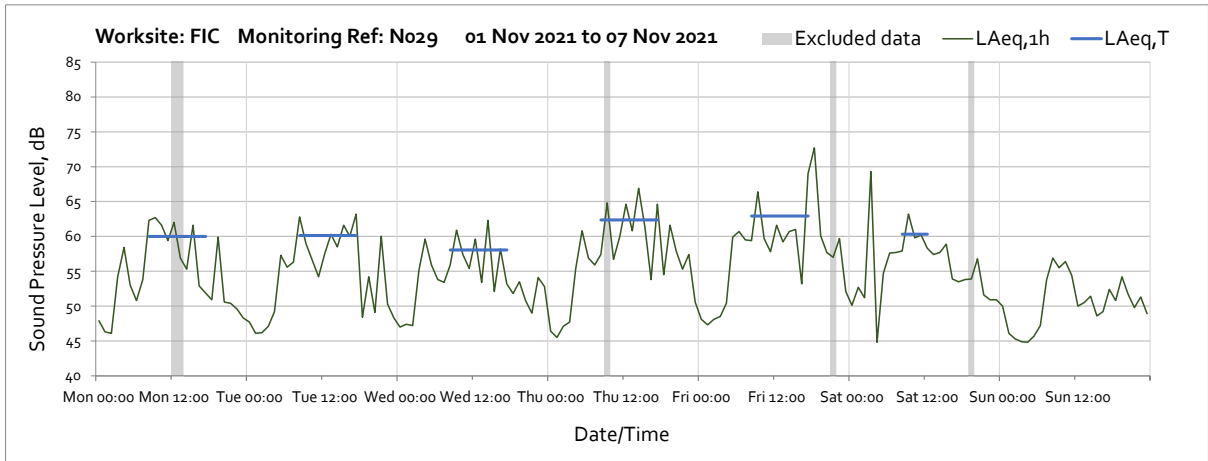


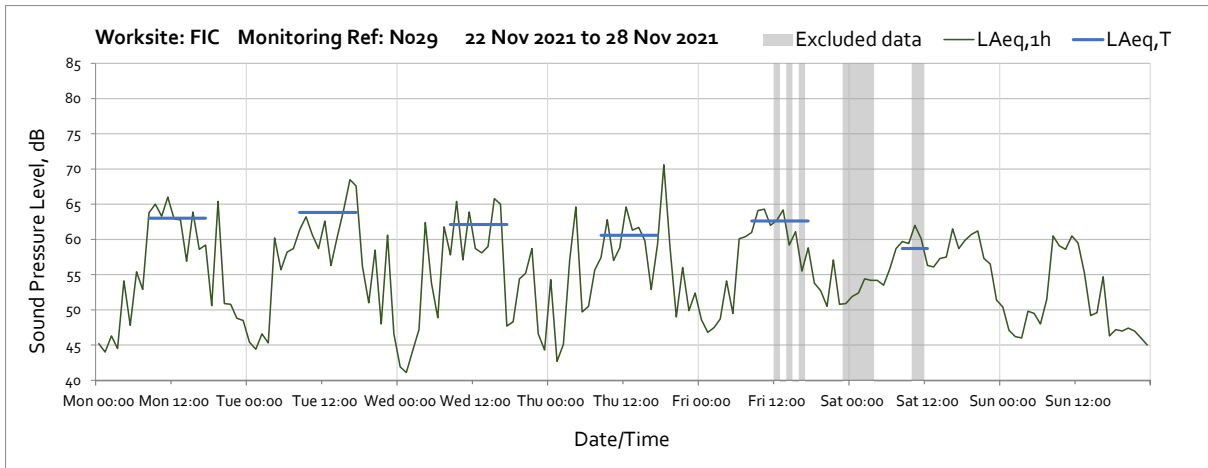
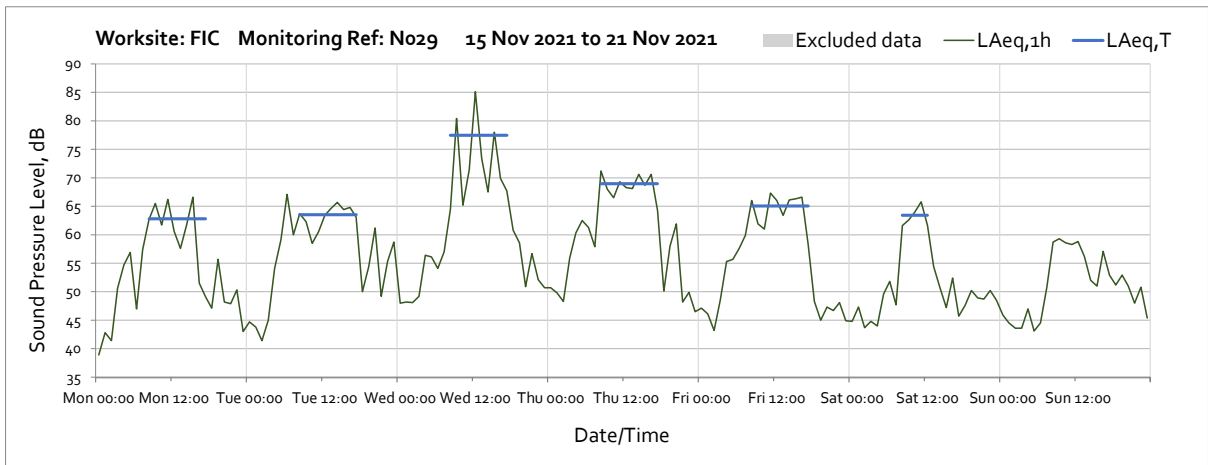
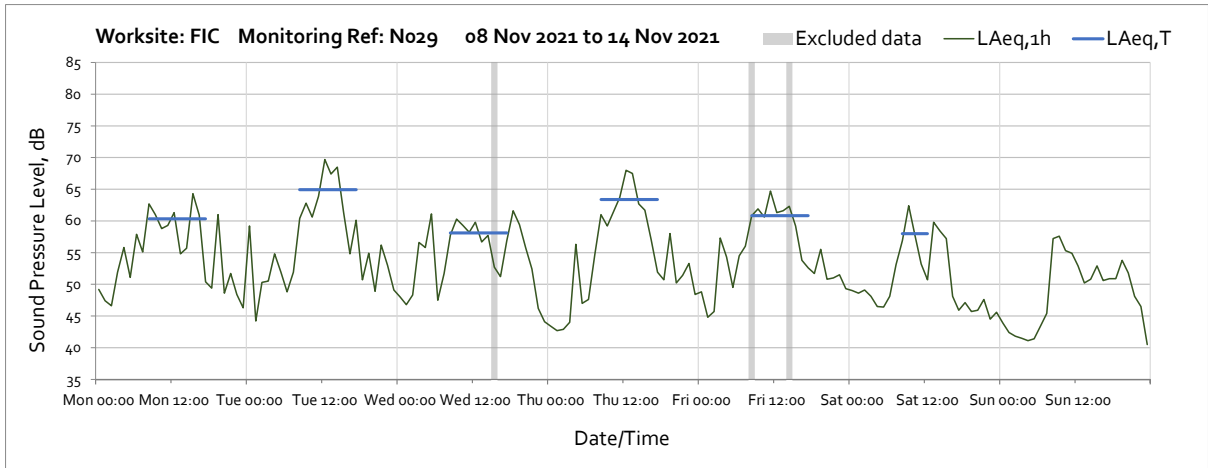
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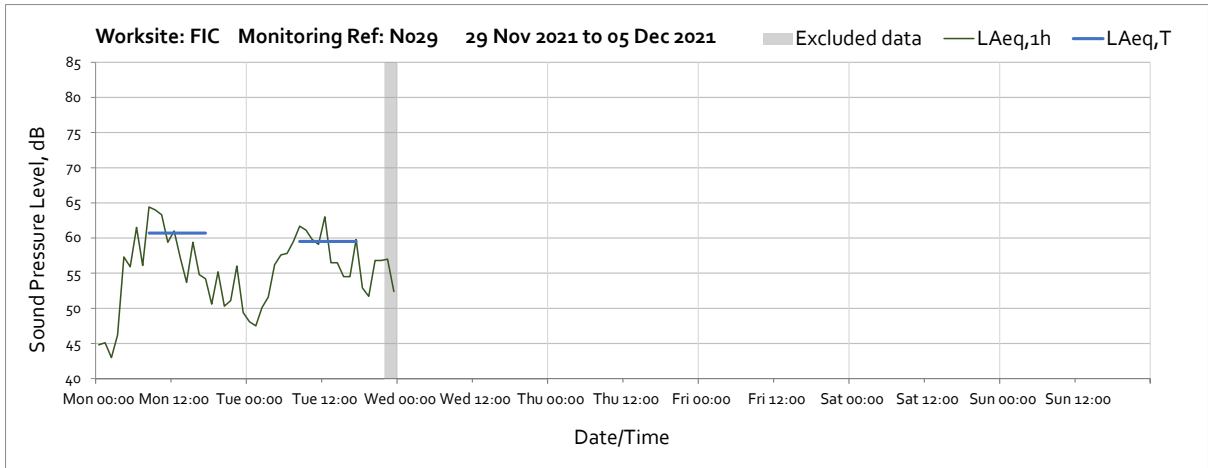




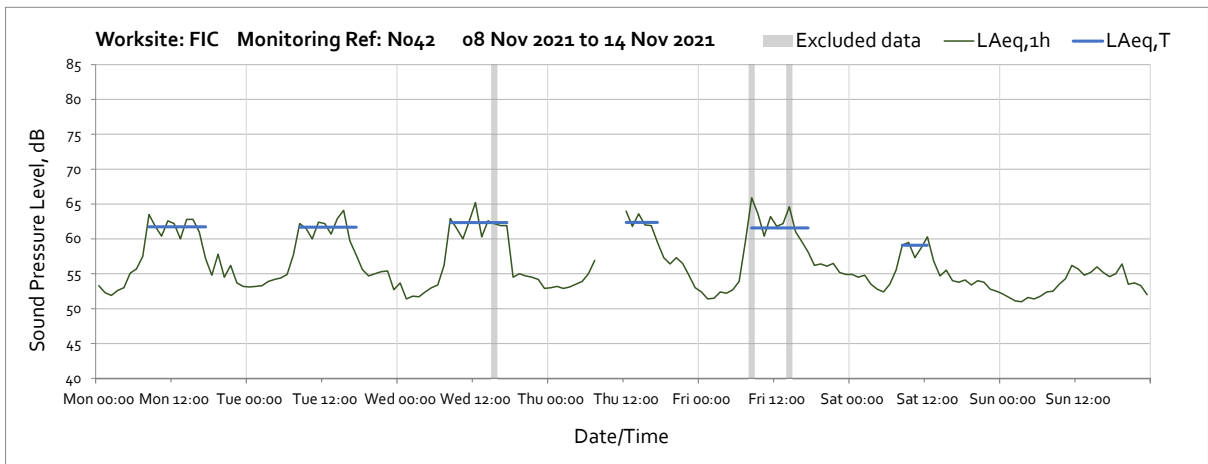
Worksite: Flat Iron Compound (FIC) – Monitoring Ref: N029



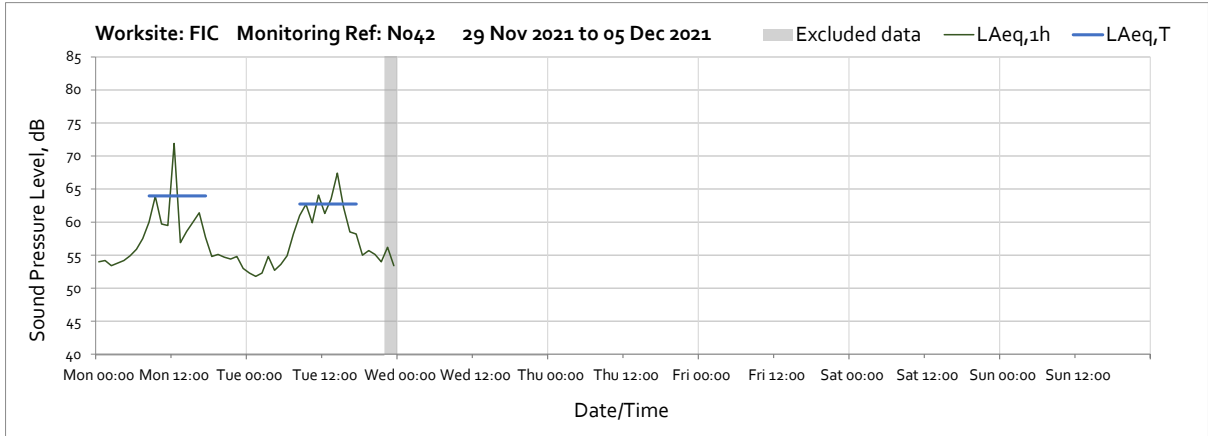
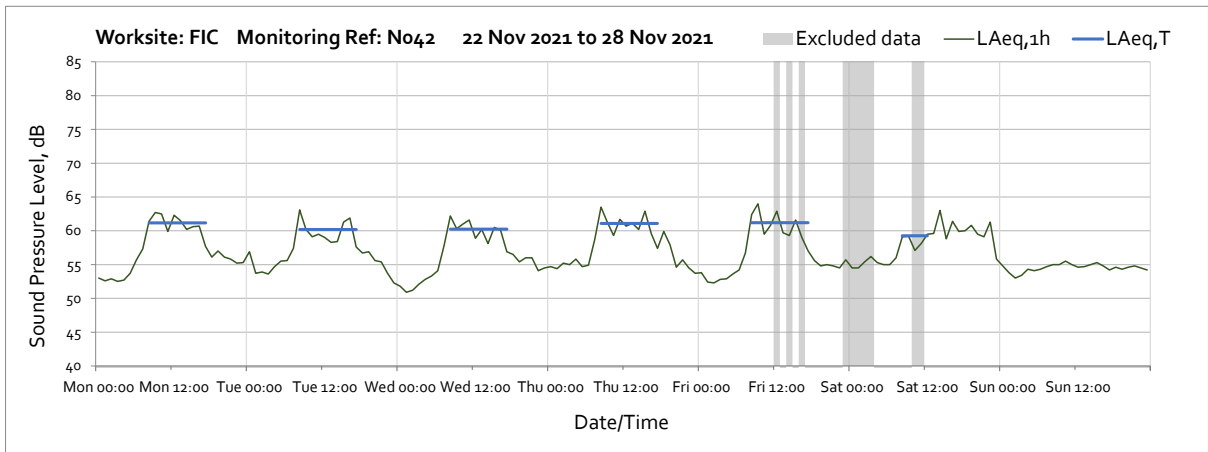
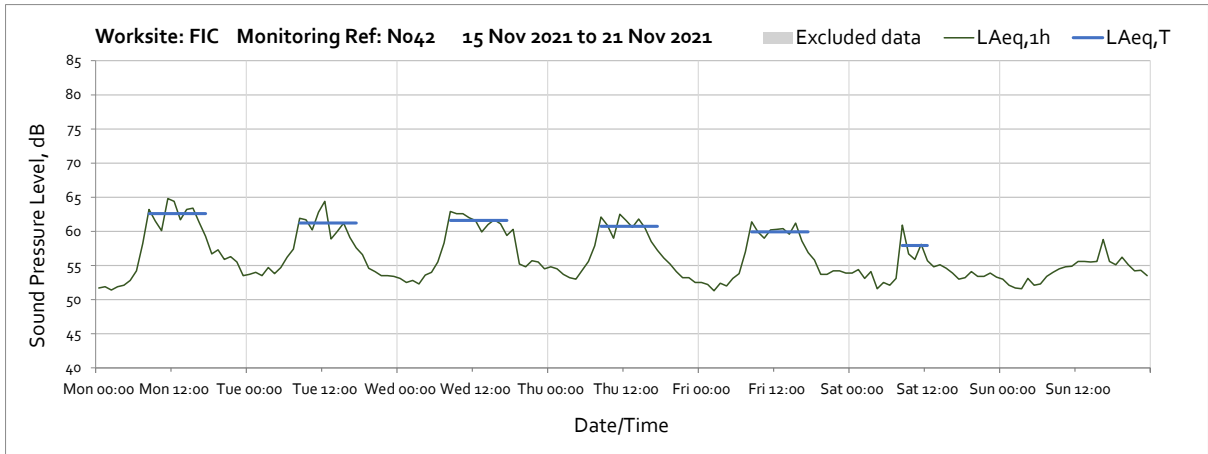




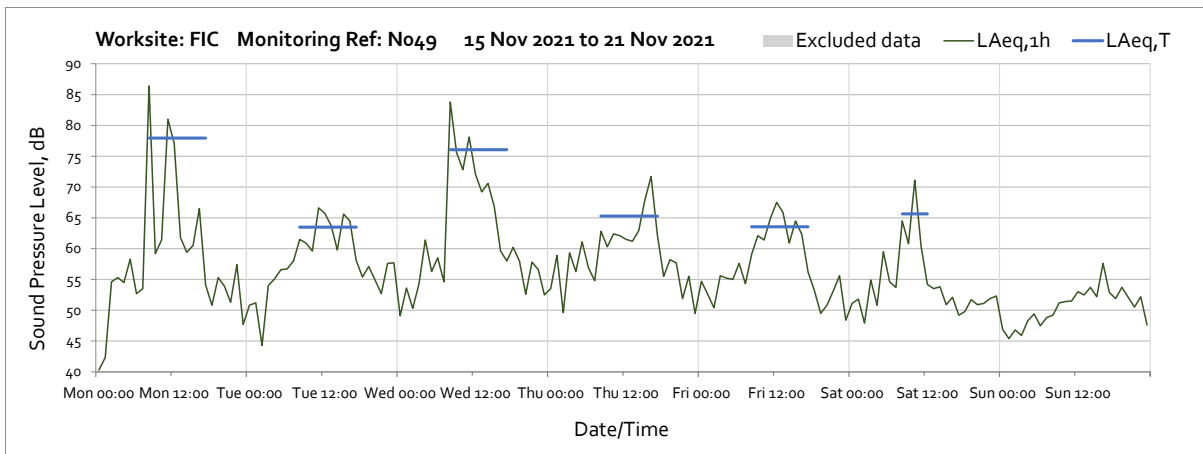
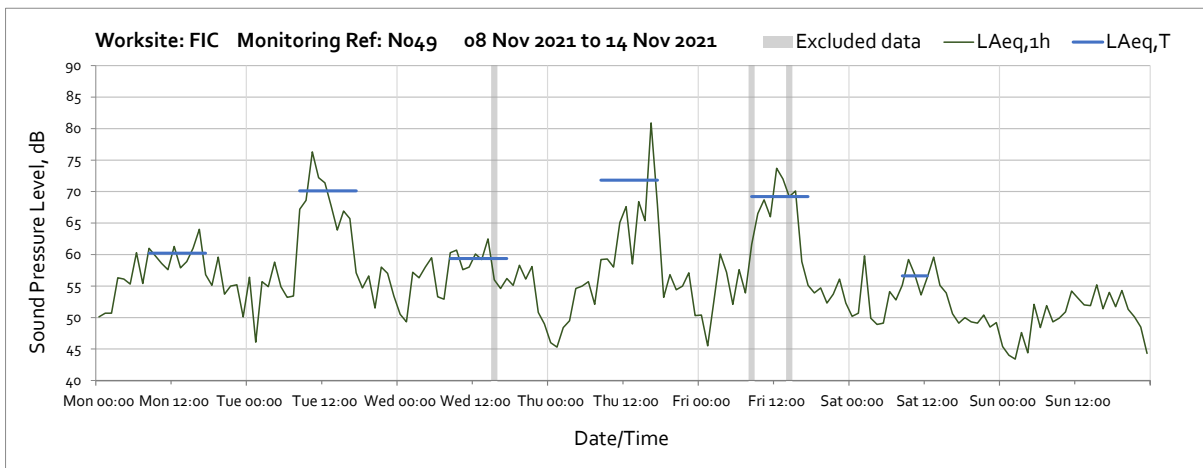
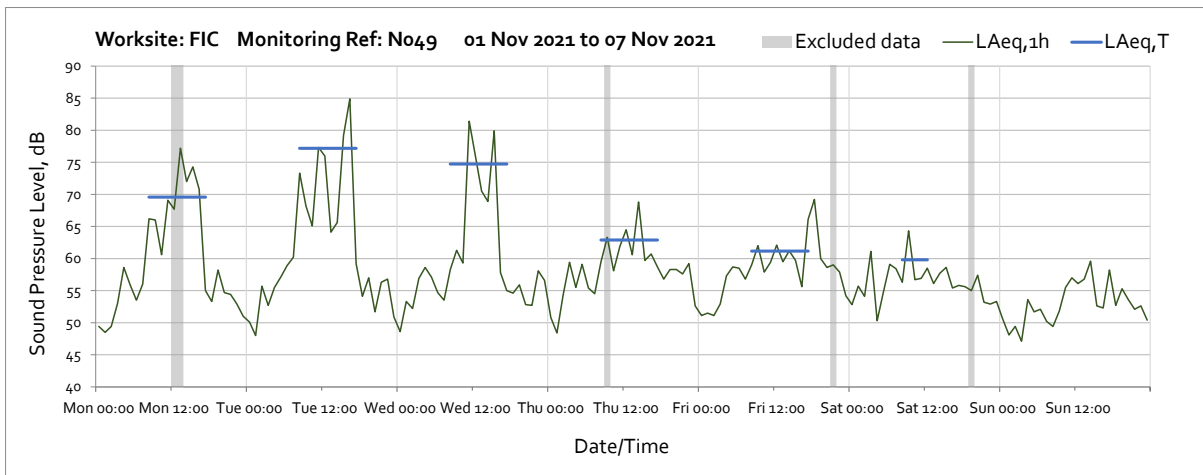
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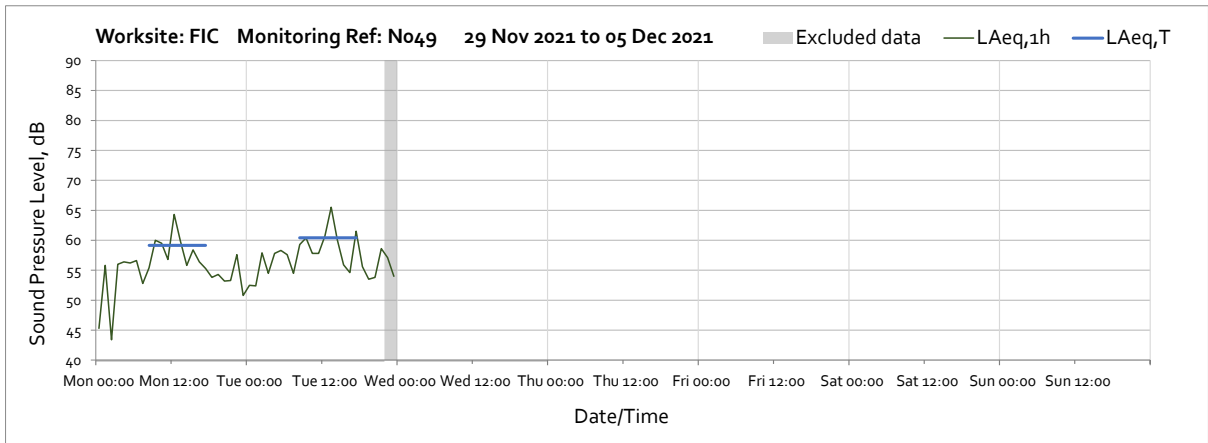
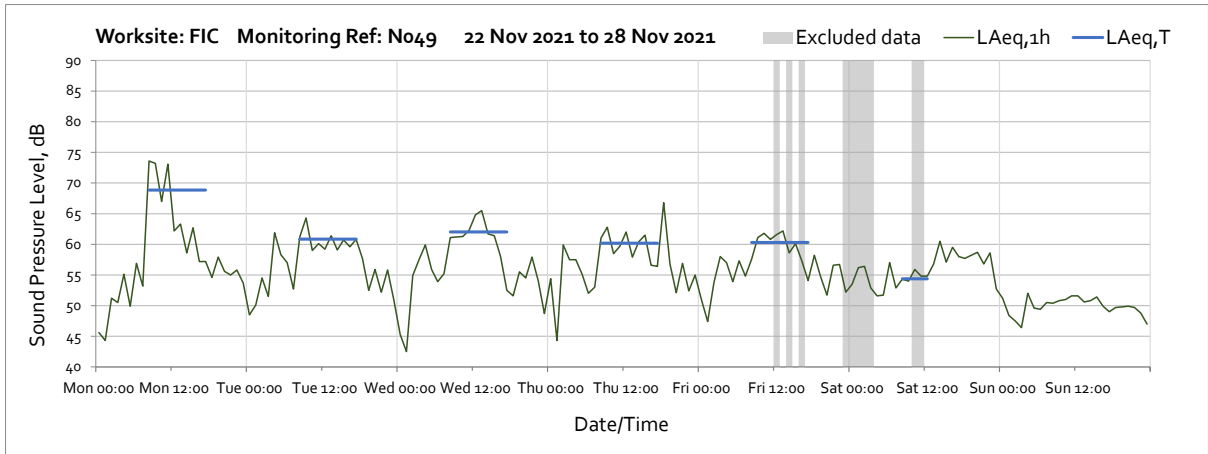


Note: Missing data between 08:00 and 11:00 on Thursday 11th November was due to a memory card error.

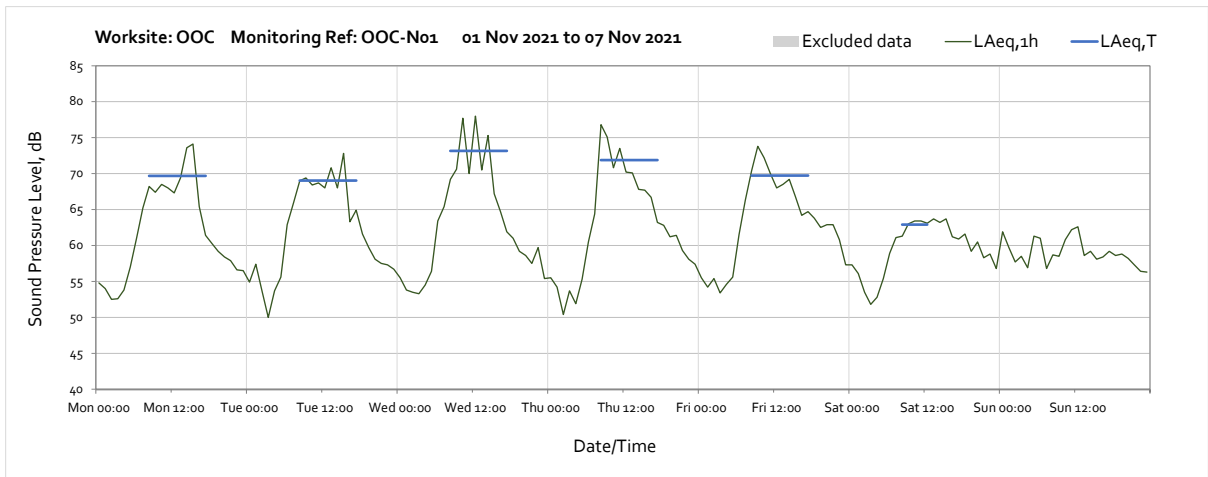


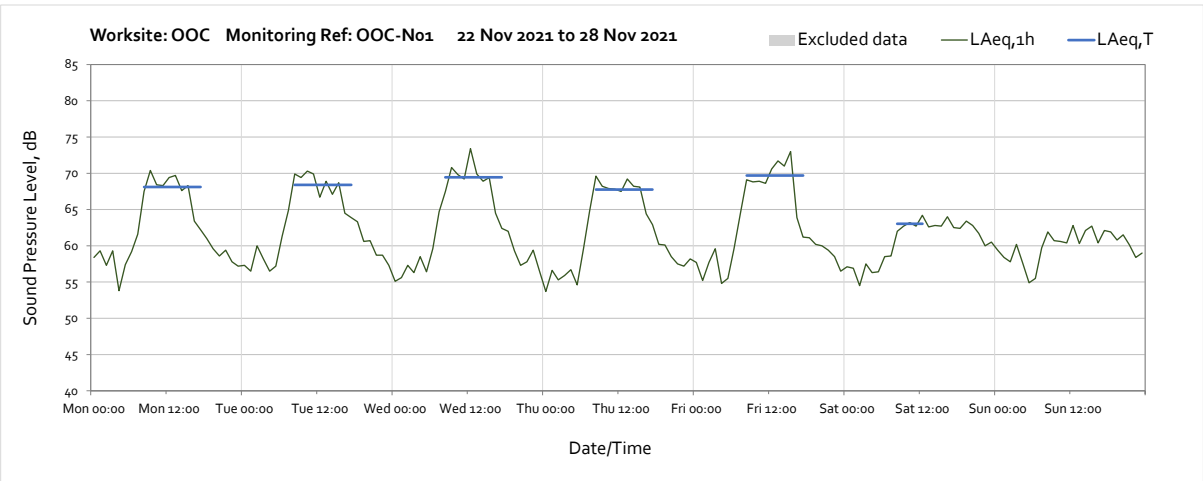
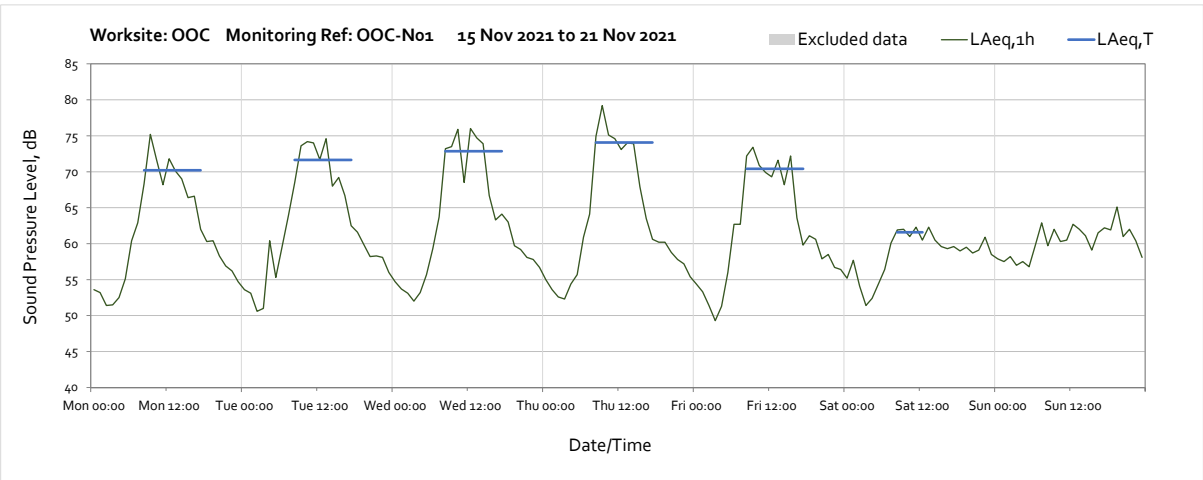
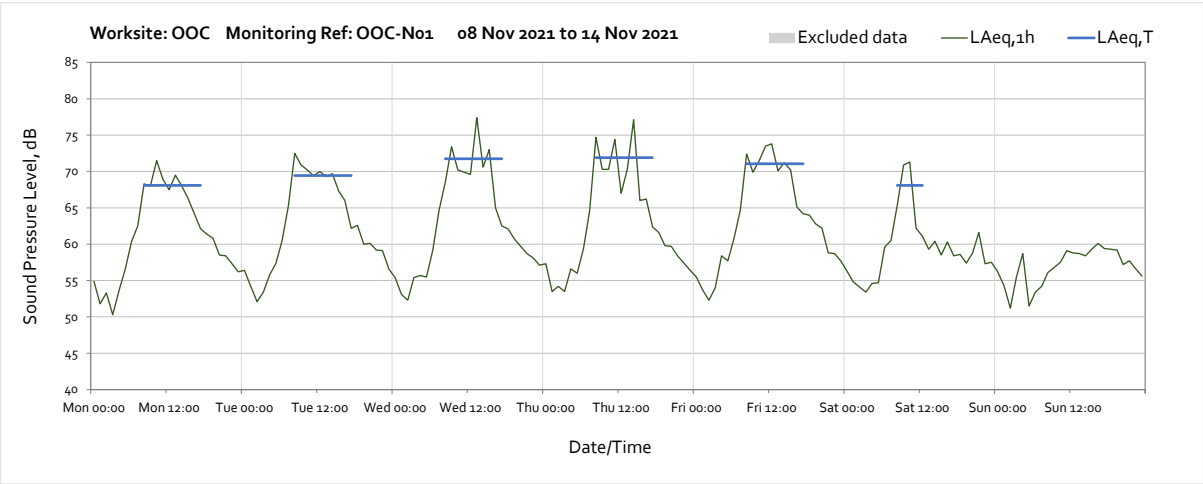
Worksite: Flat Iron Compound (FIC) – Monitoring Ref: N049

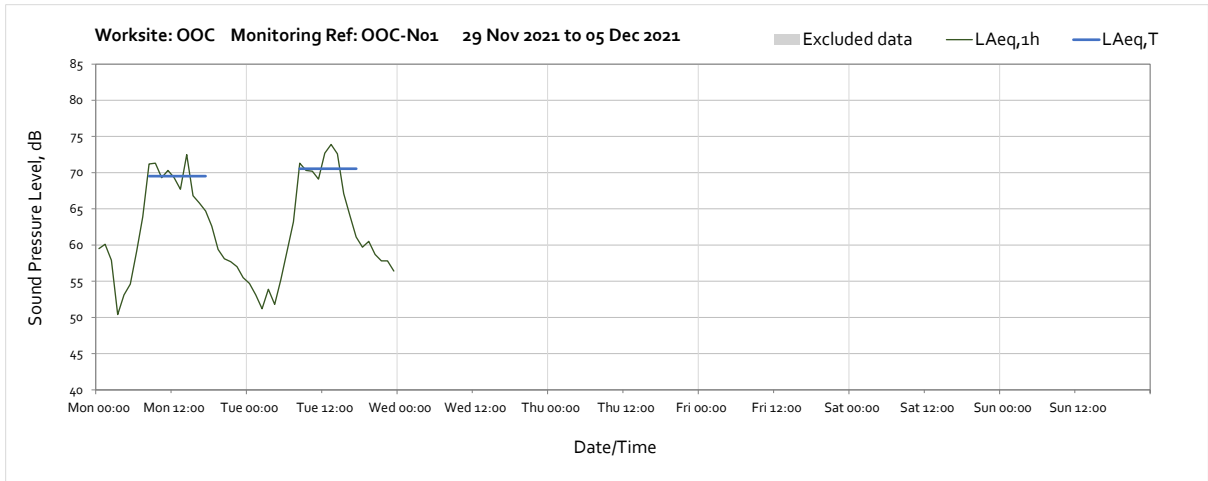




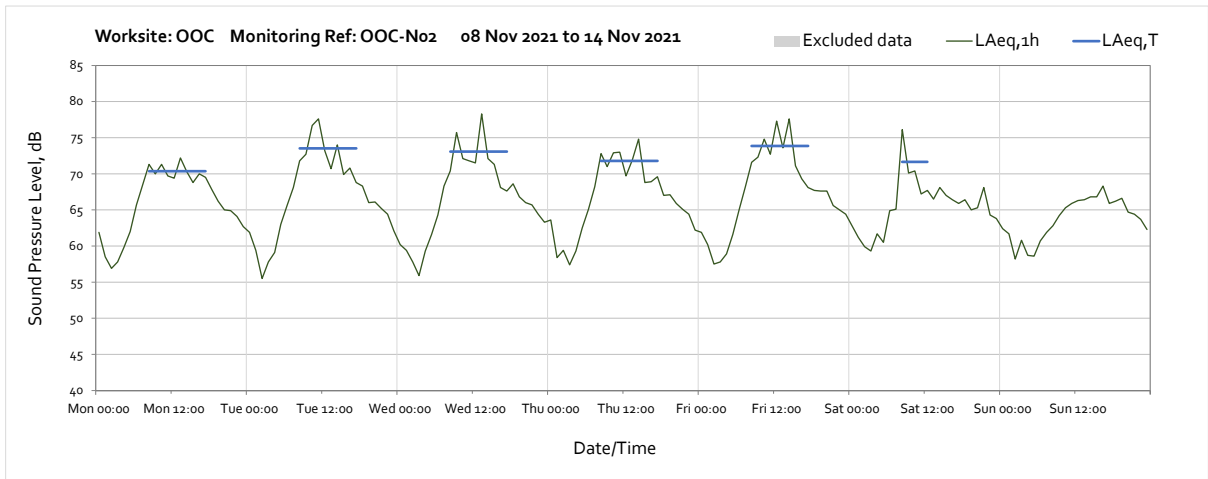
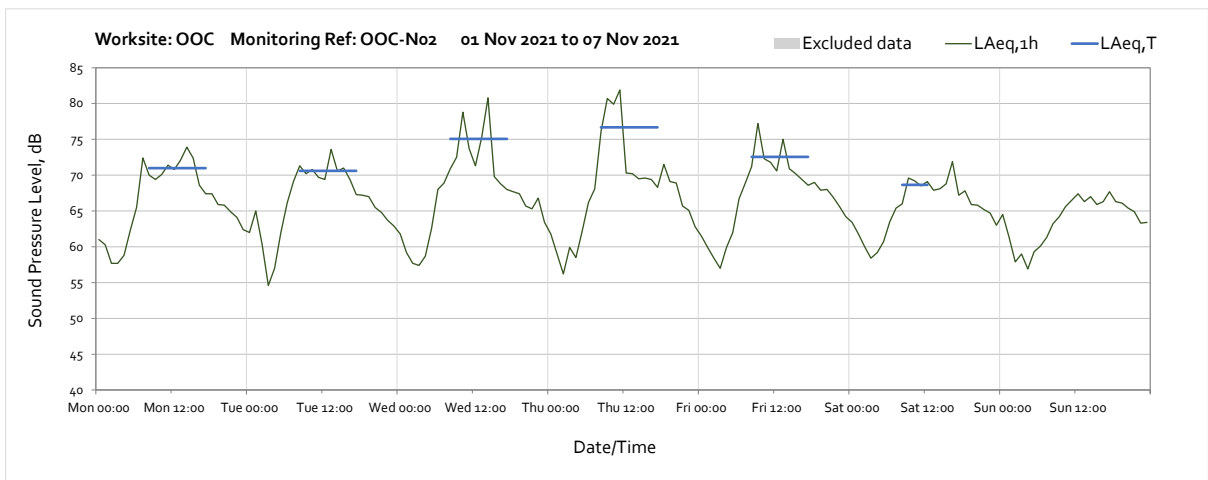
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N01

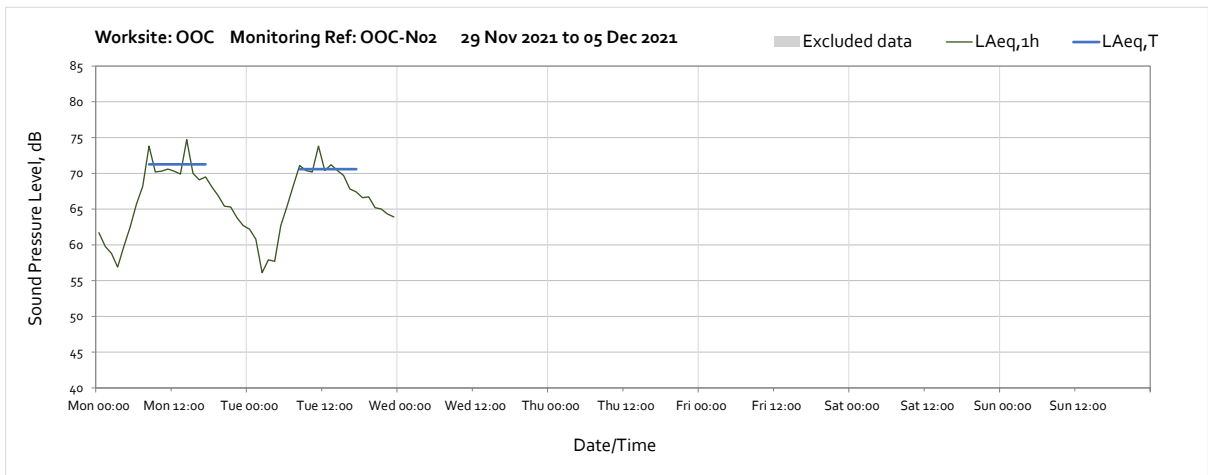
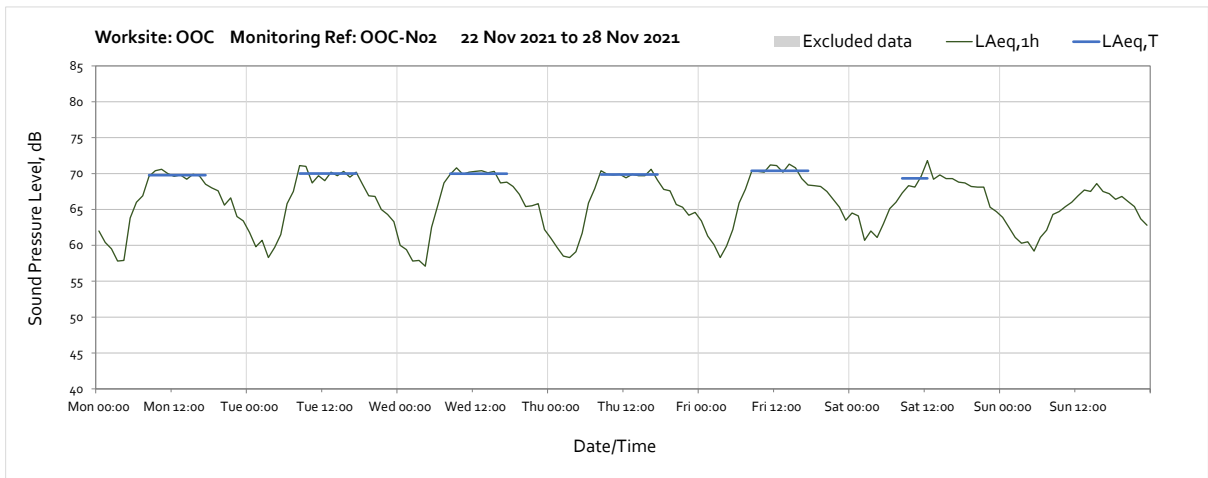
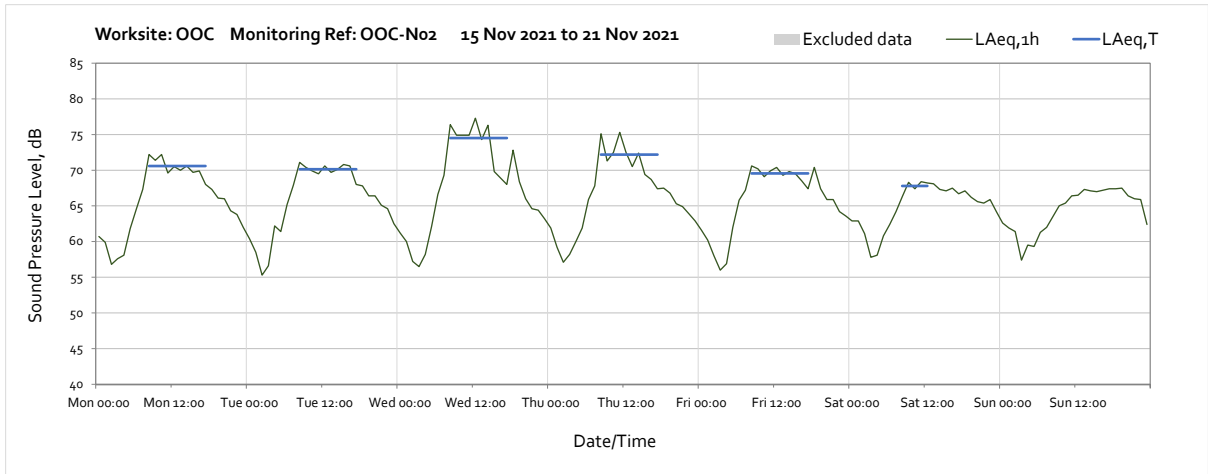




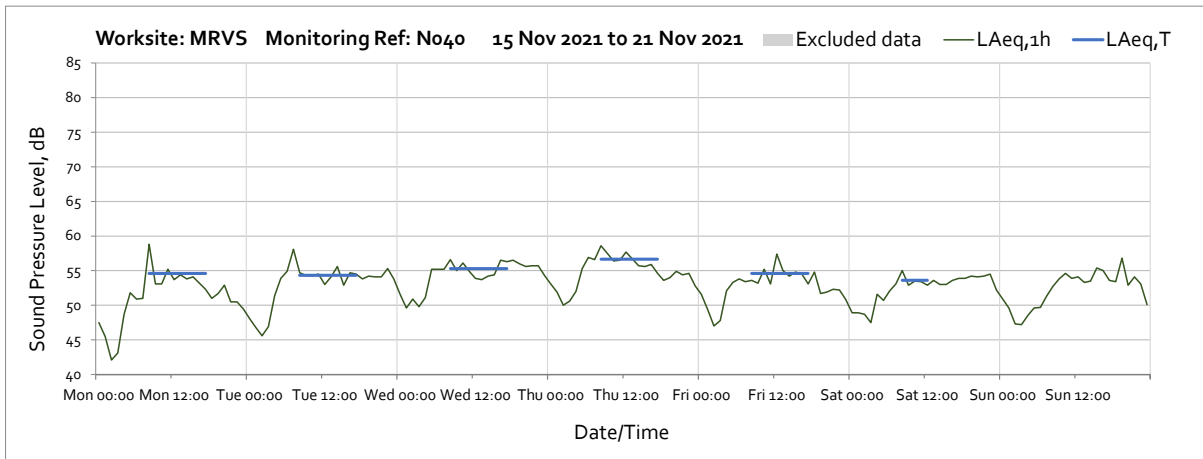
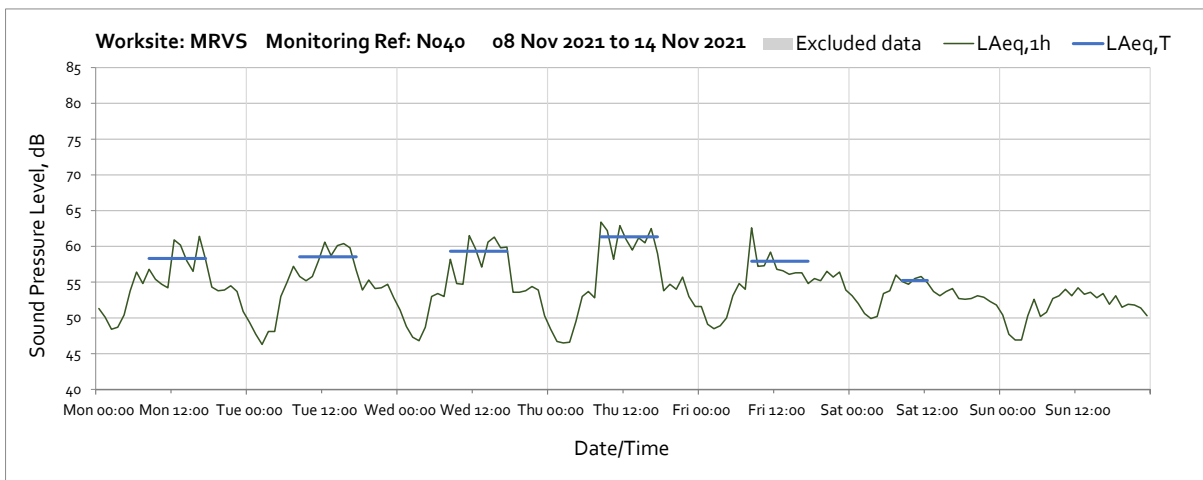
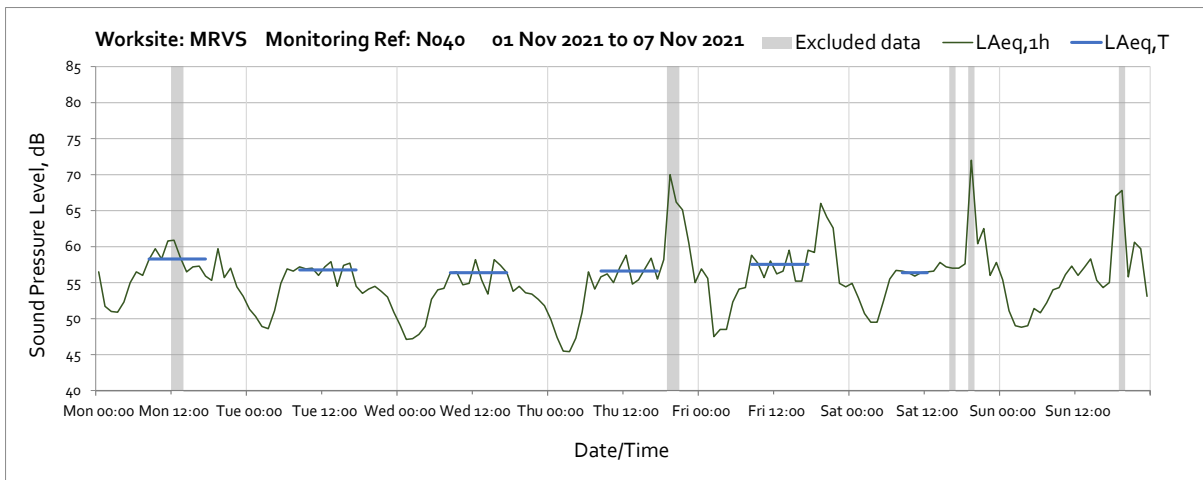


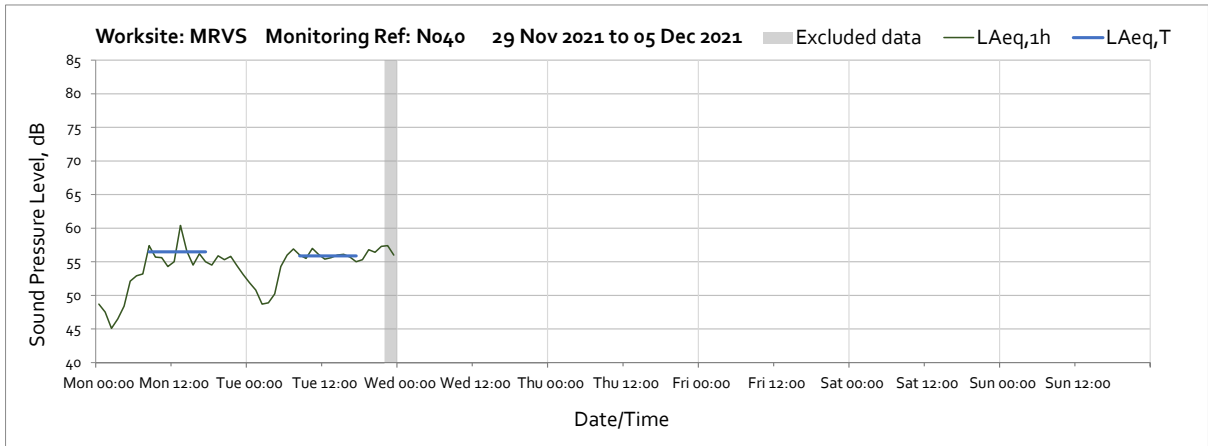
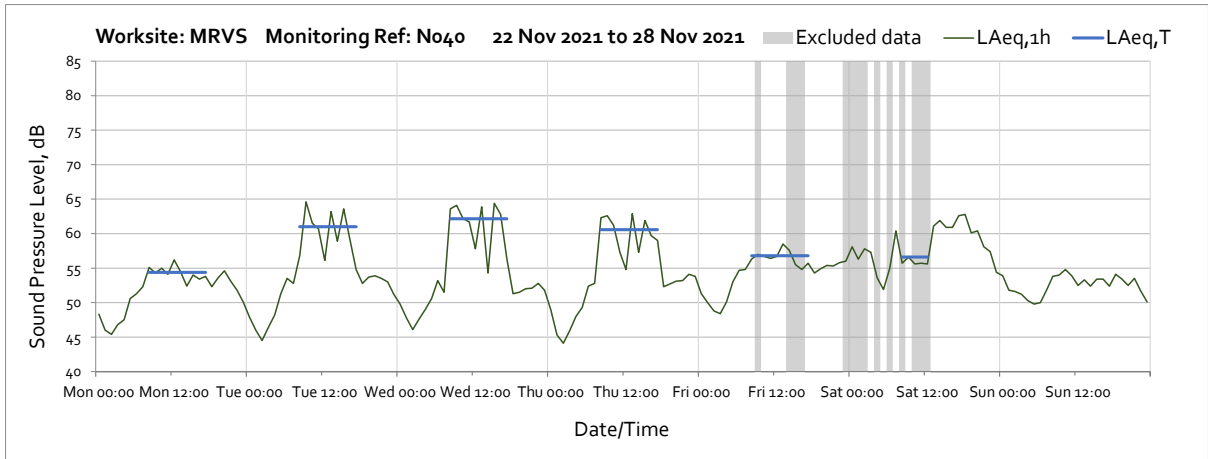
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N02



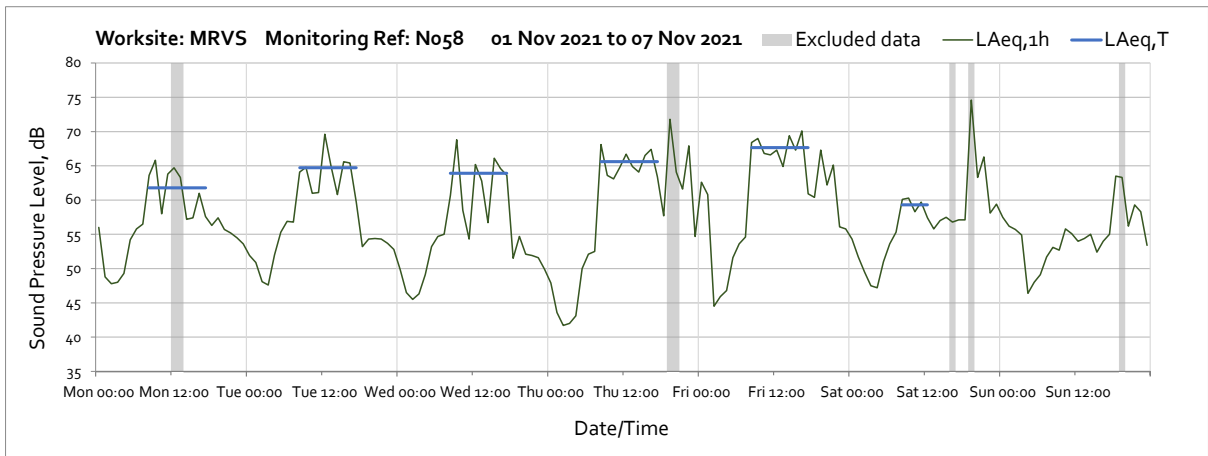


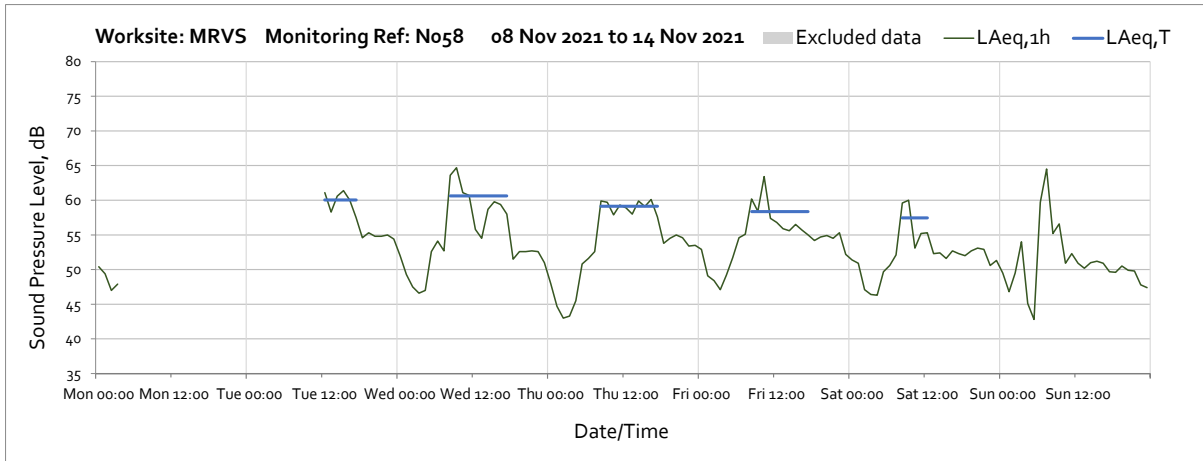
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N040



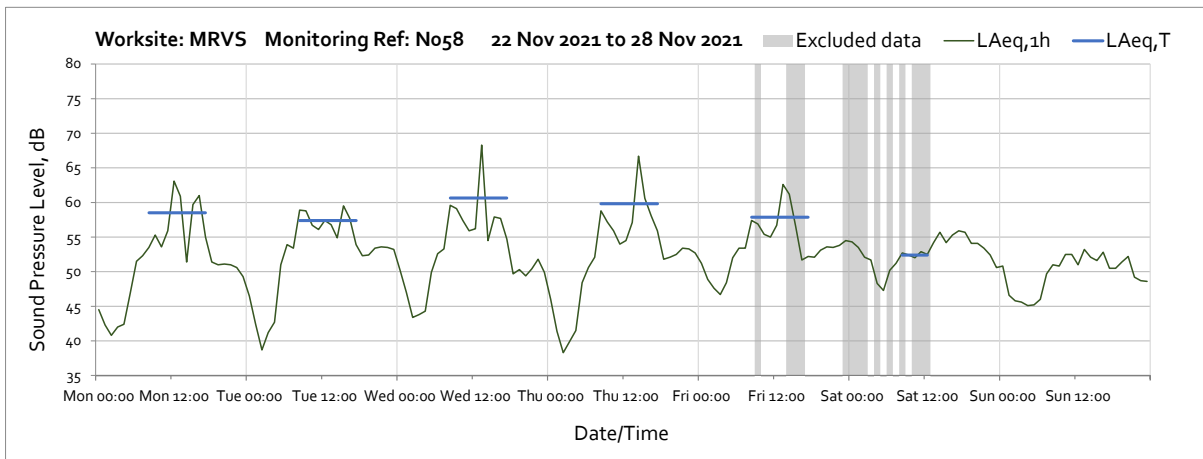
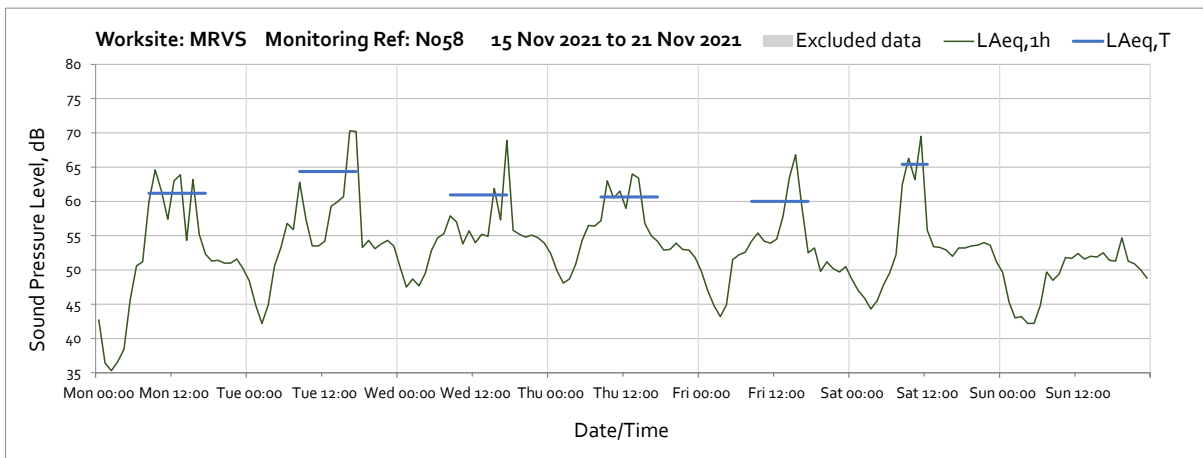


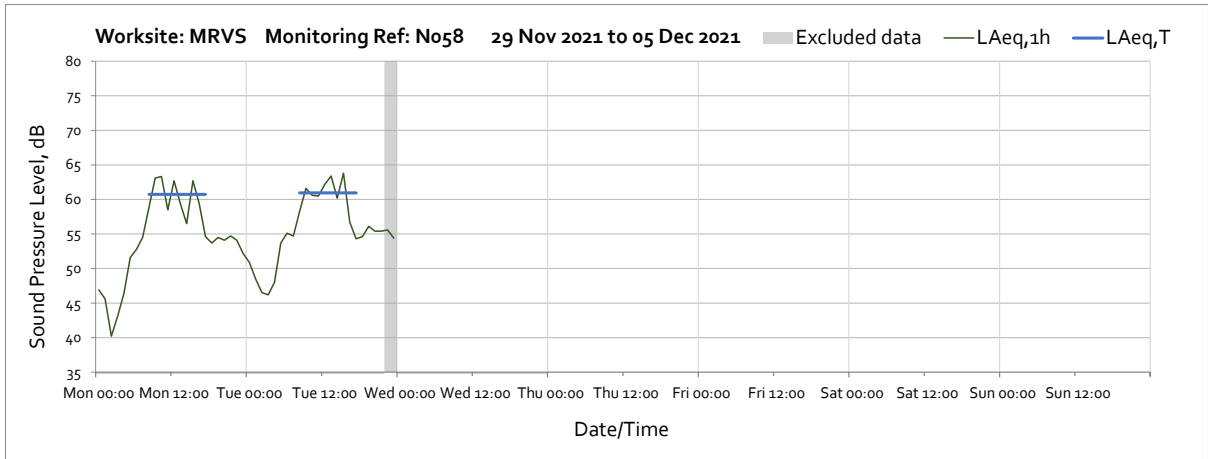
Worksite: Mandeville Road Ventilation Shaft (MRVS) - Monitoring Ref: N058



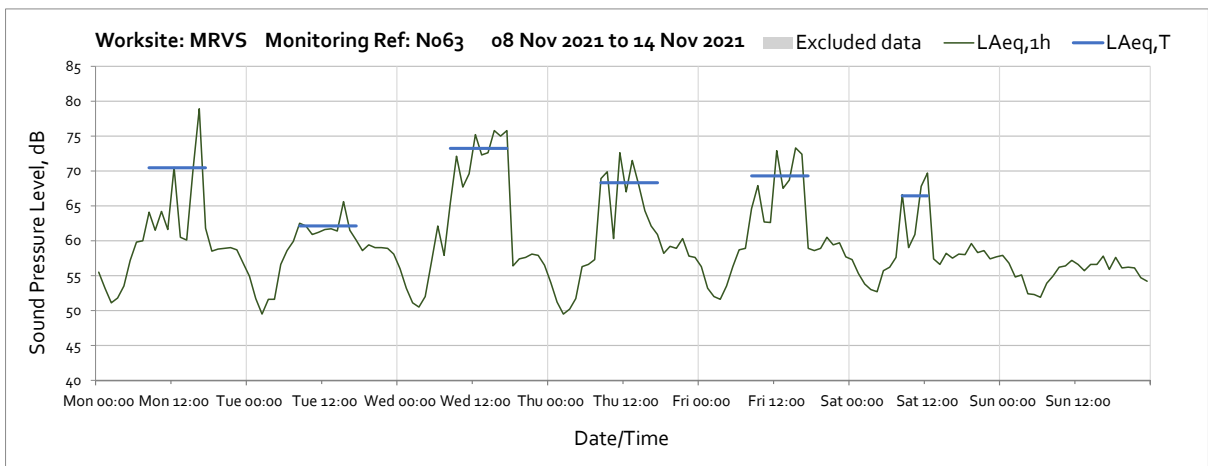
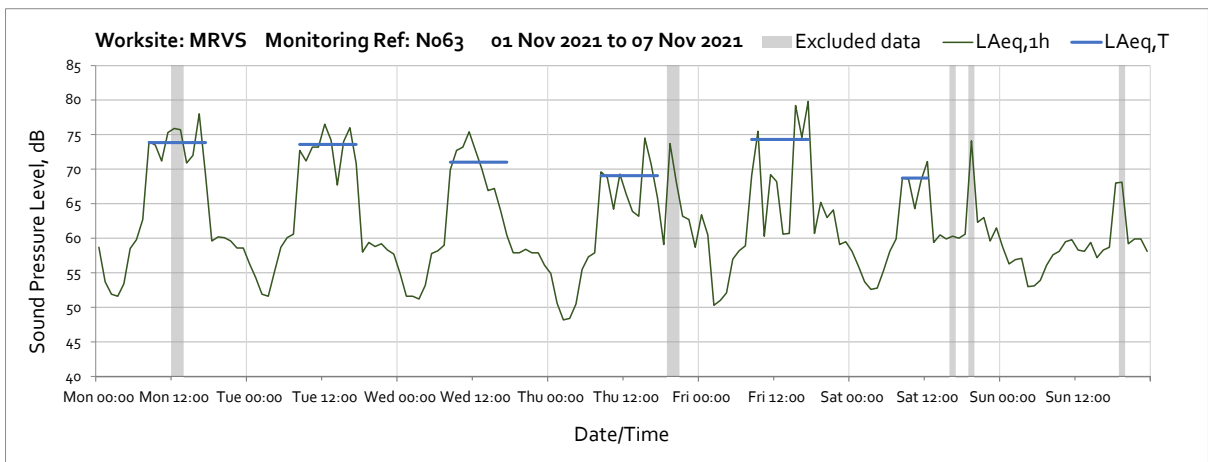


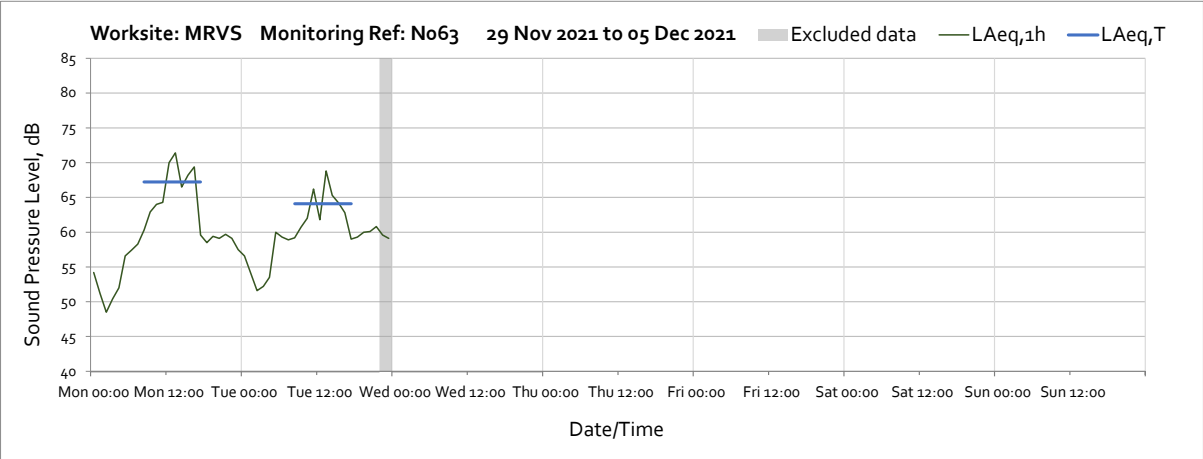
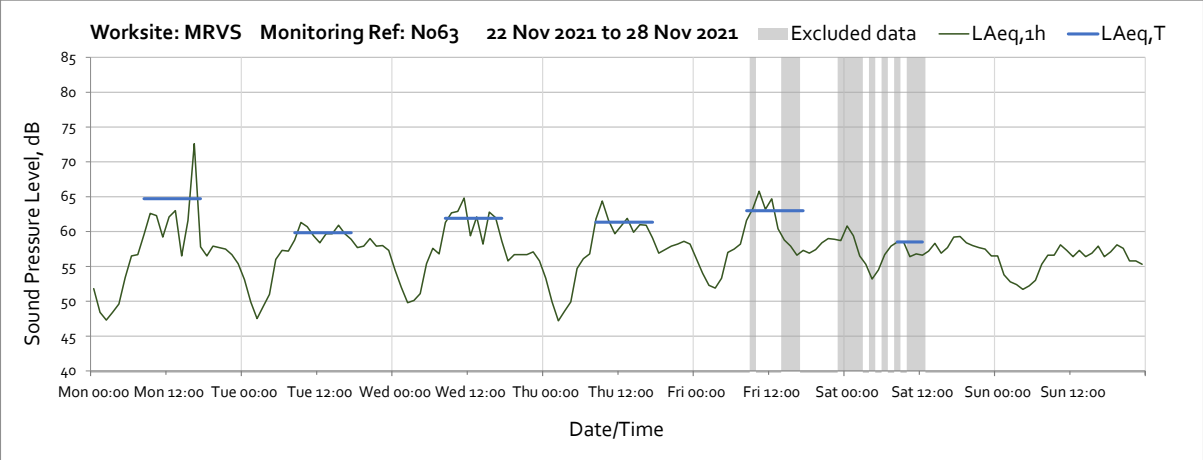
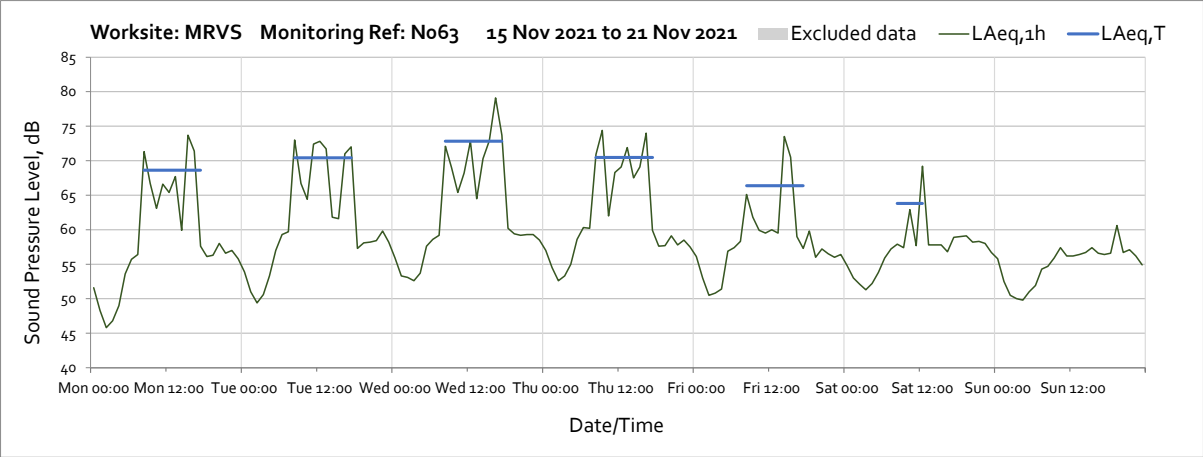
Note: Missing data between 04:00 on Monday 8th November and 11:00 on Tuesday 9th November was due to loss of continuous power at the monitoring station.



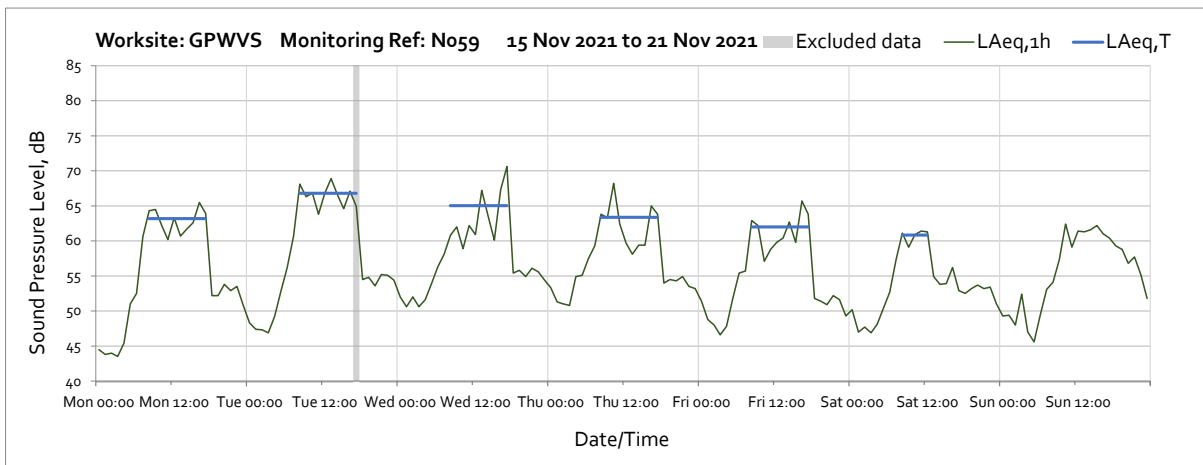
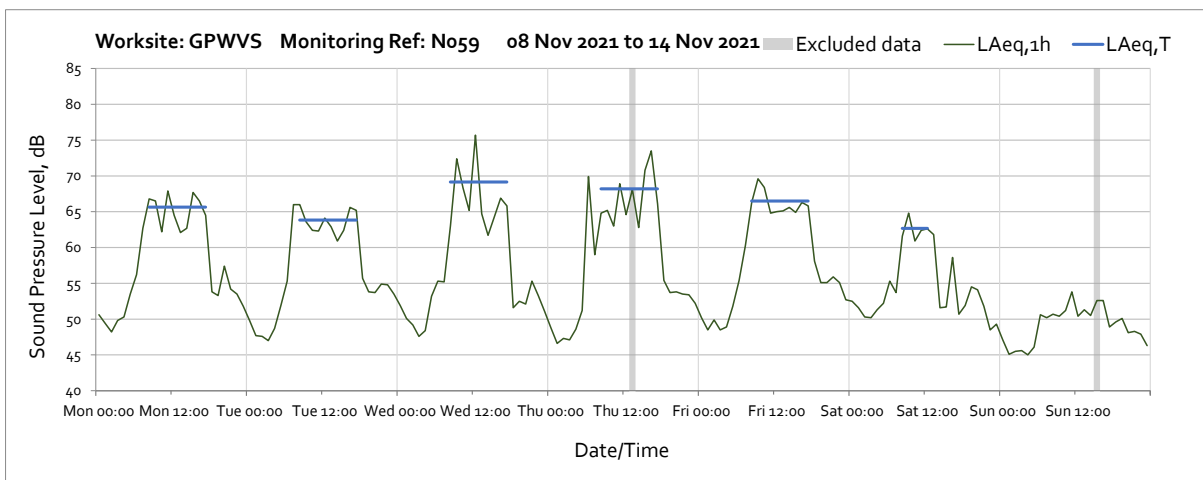
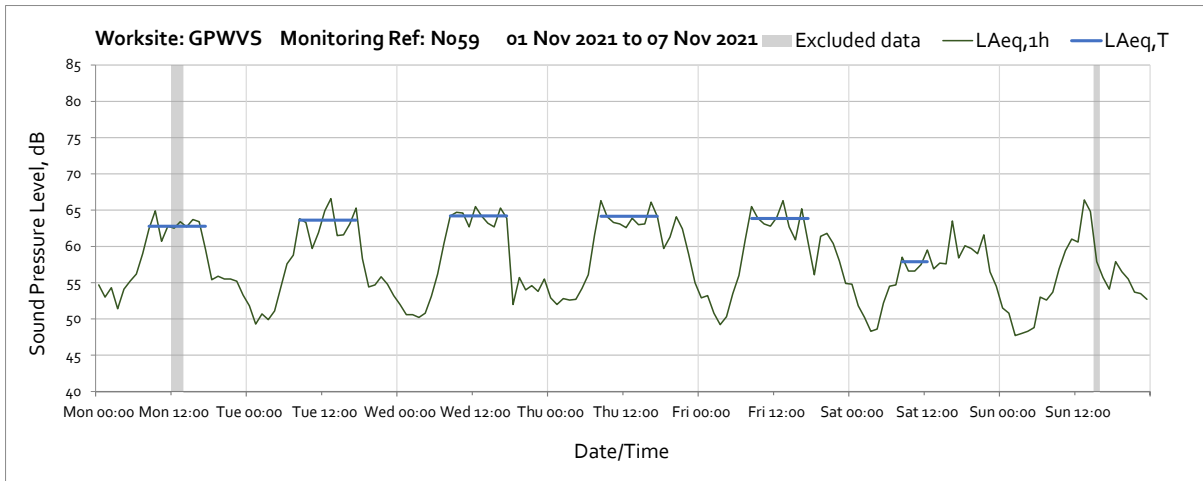


Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N063

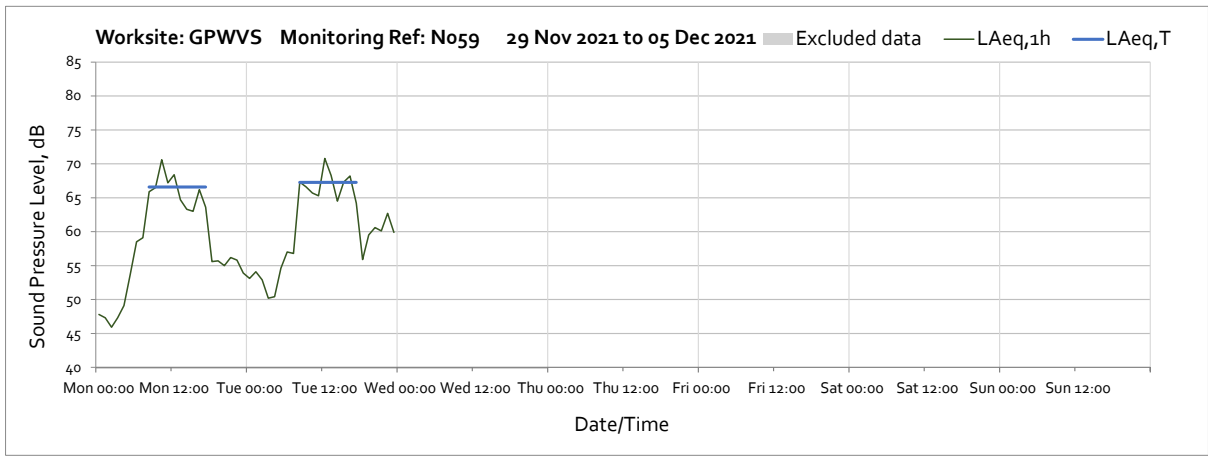
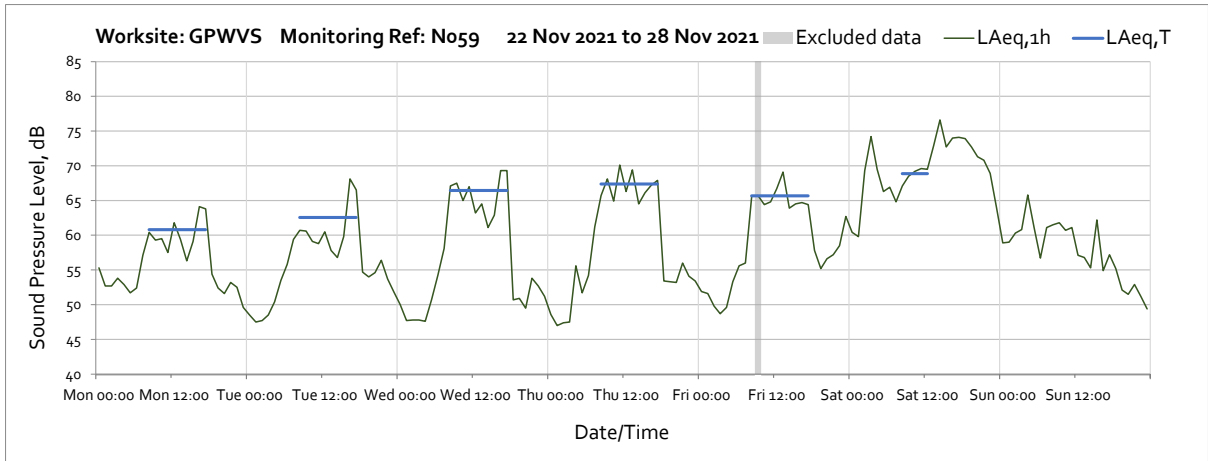




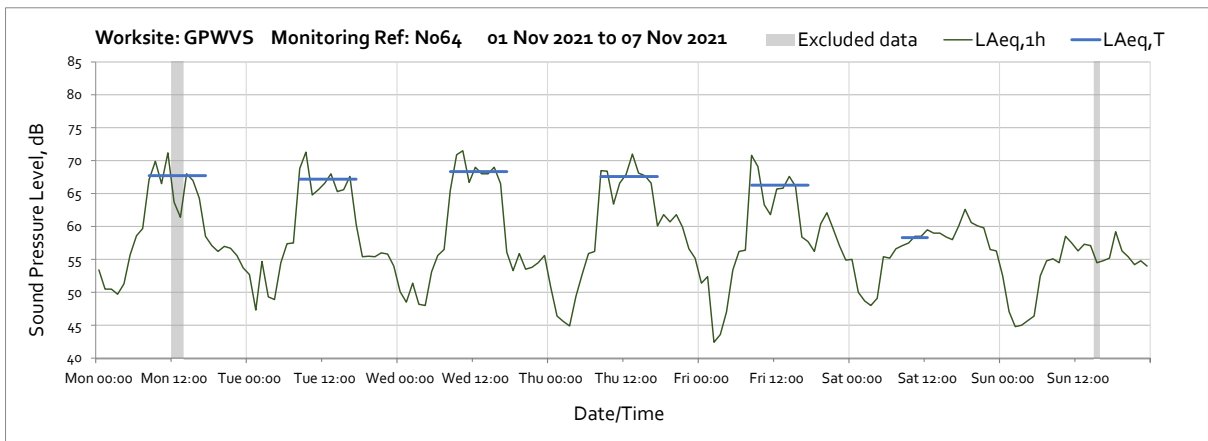
Worksite: Green Park Way Vent Shaft (GPWVS) - Monitoring Ref: N059

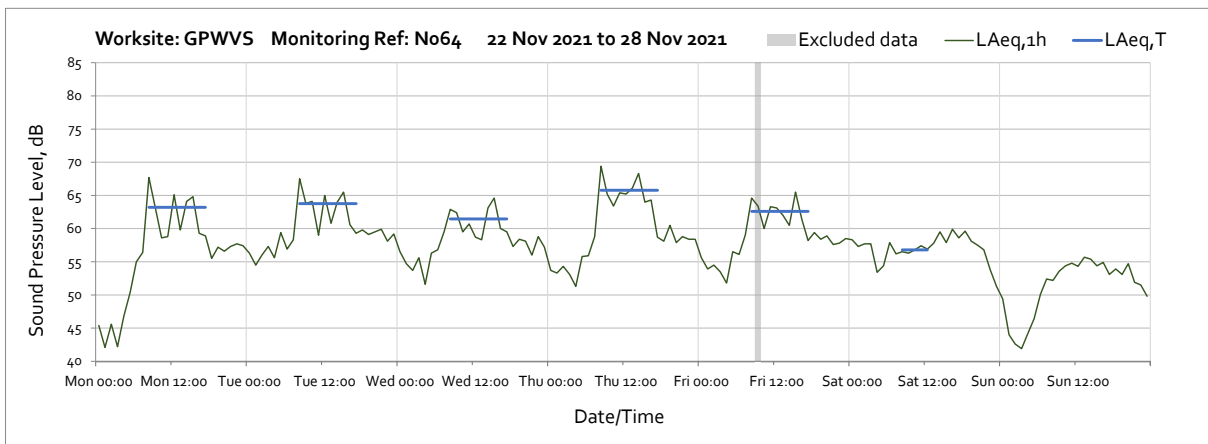
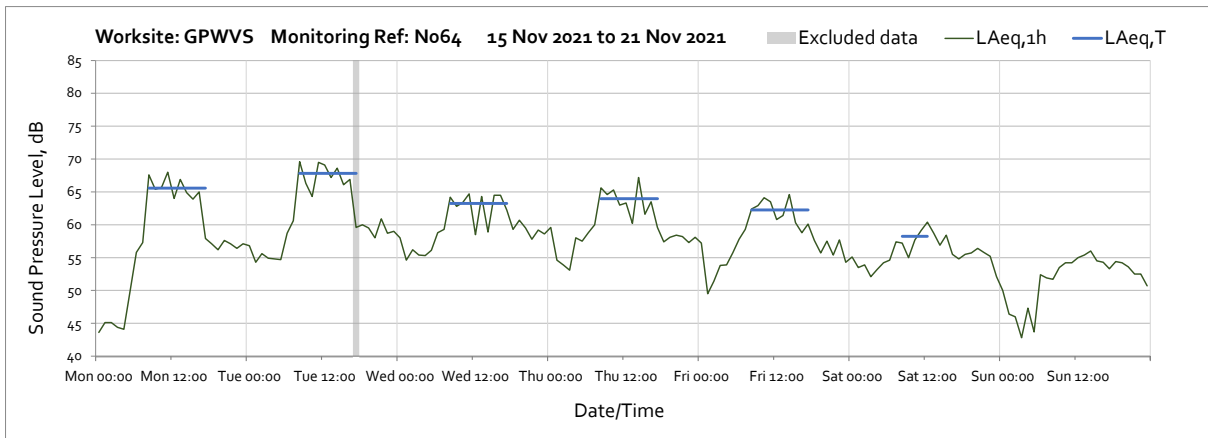
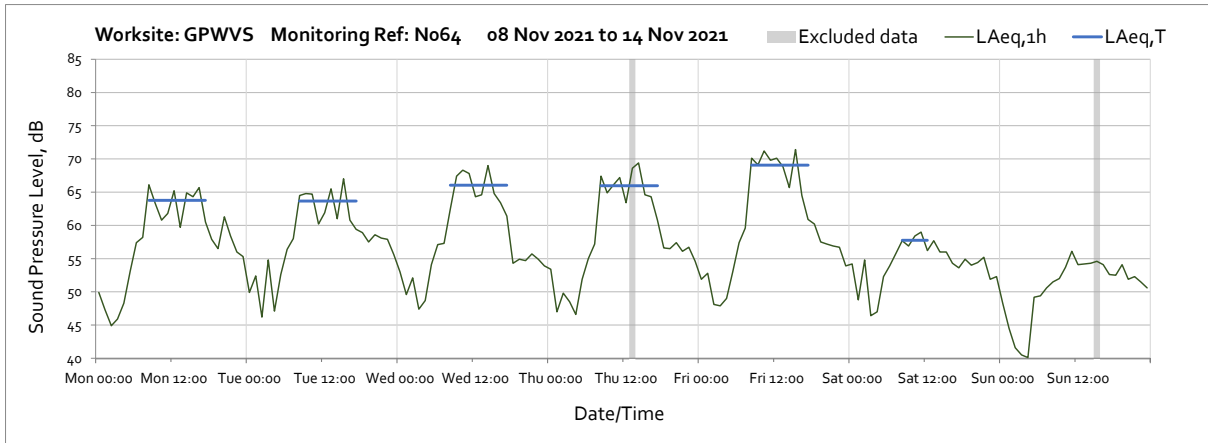


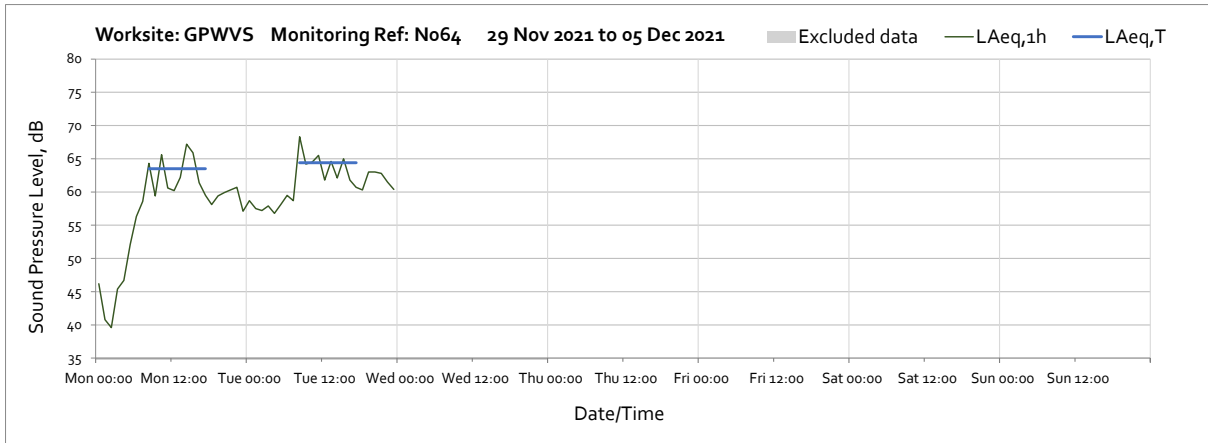
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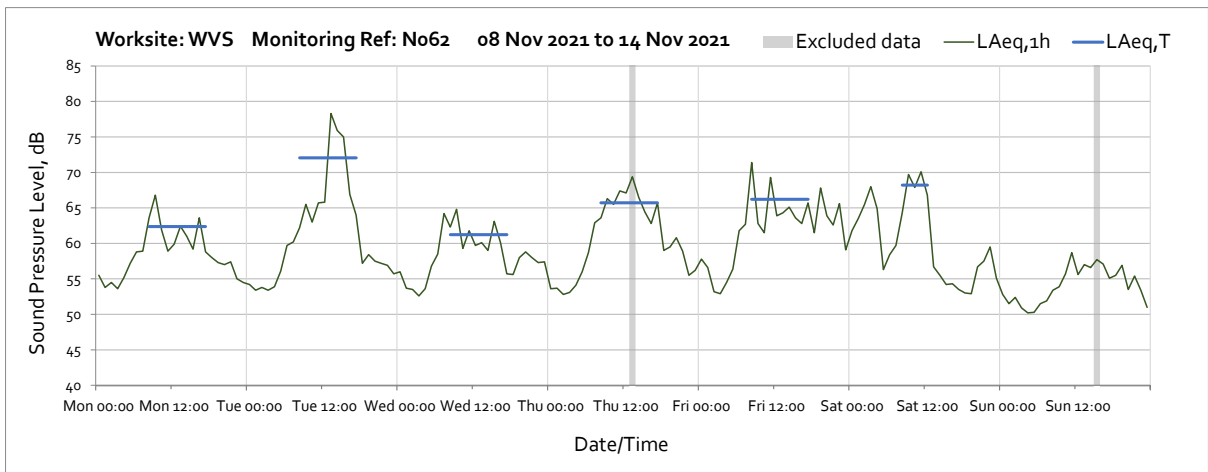
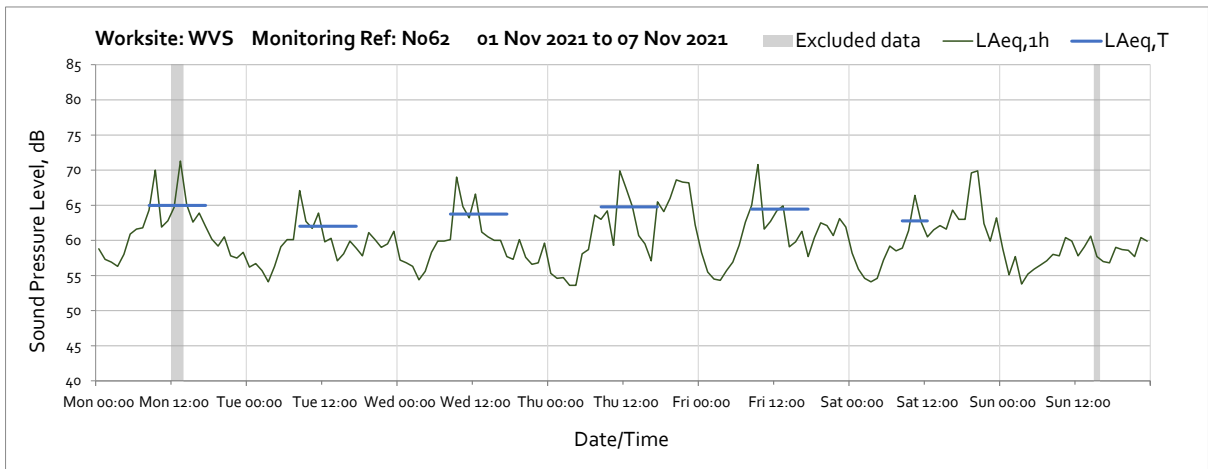
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N064

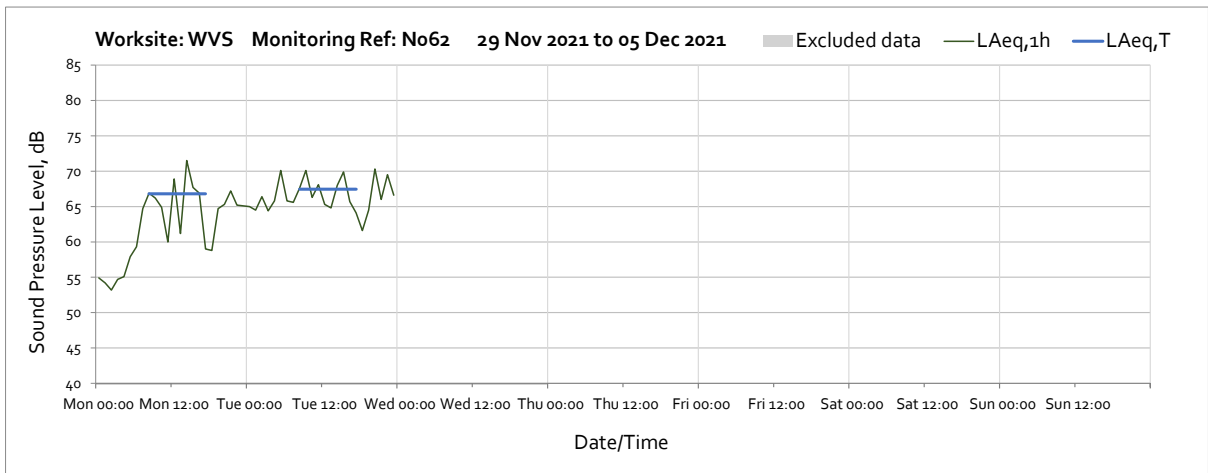
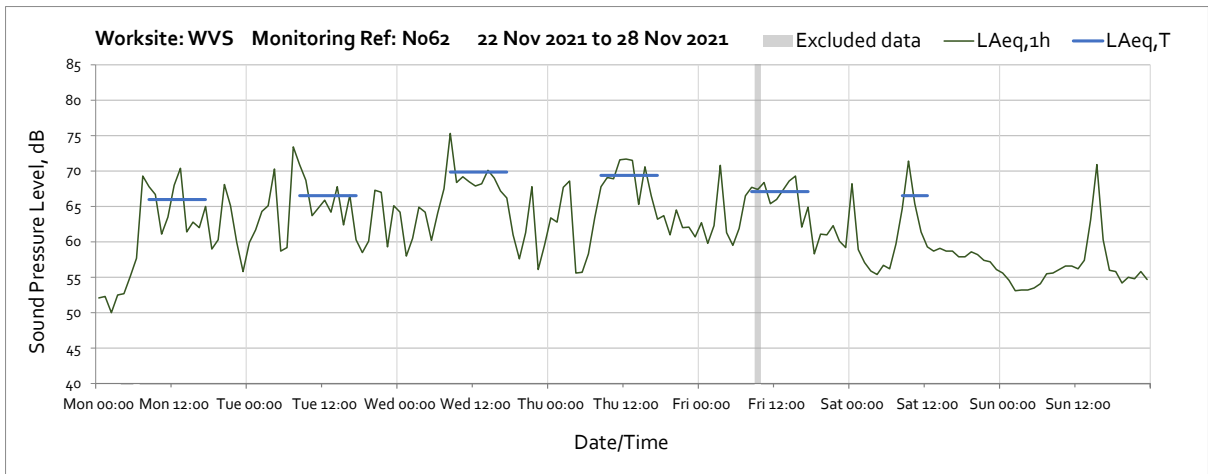
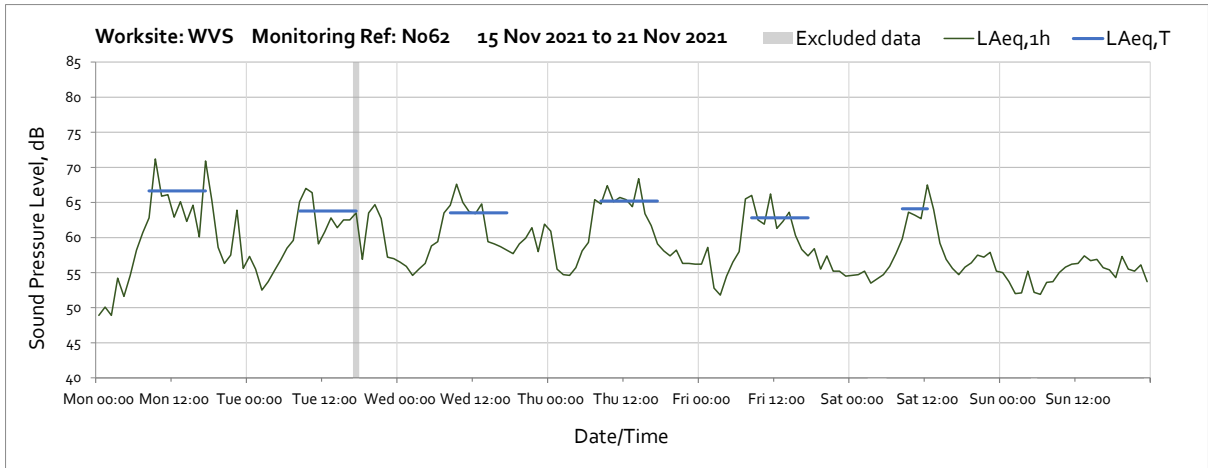






Worksite: Westgate Ventilation Shaft (WVS) – Monitoring Ref: N062

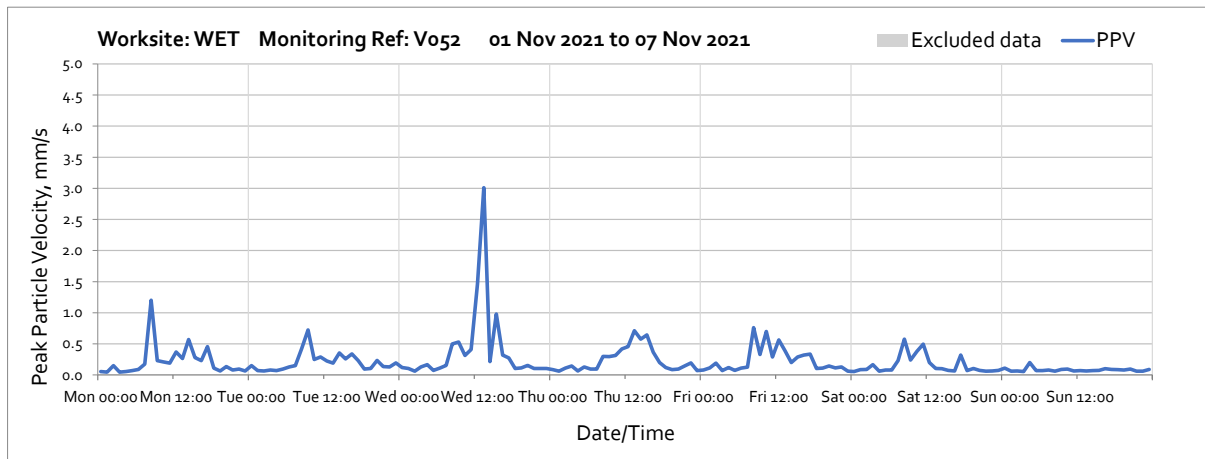




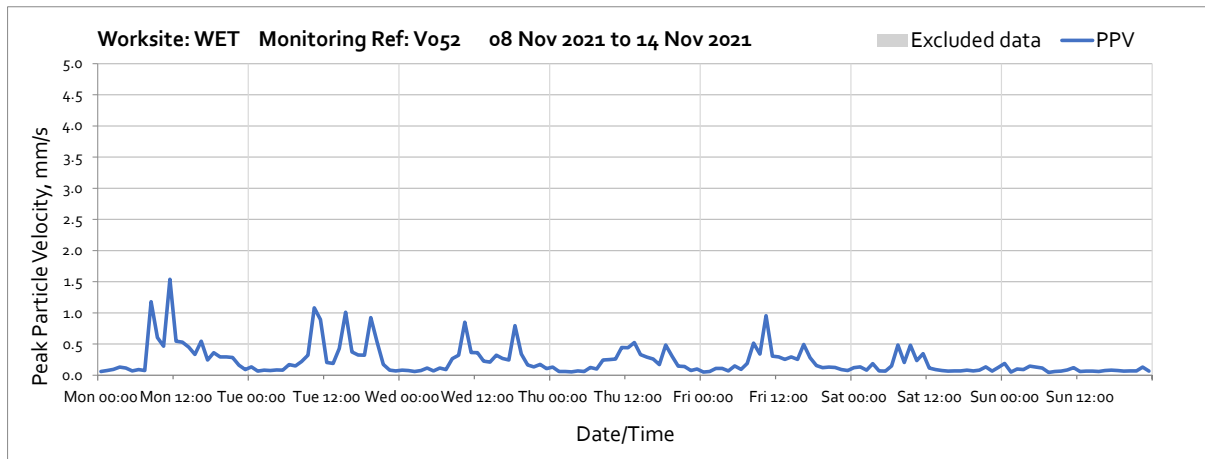
Vibration

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 axis x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative of HS2 construction works, these values have been greyed out in the following charts and have been excluded to calculate values in Table 4 of the main report.

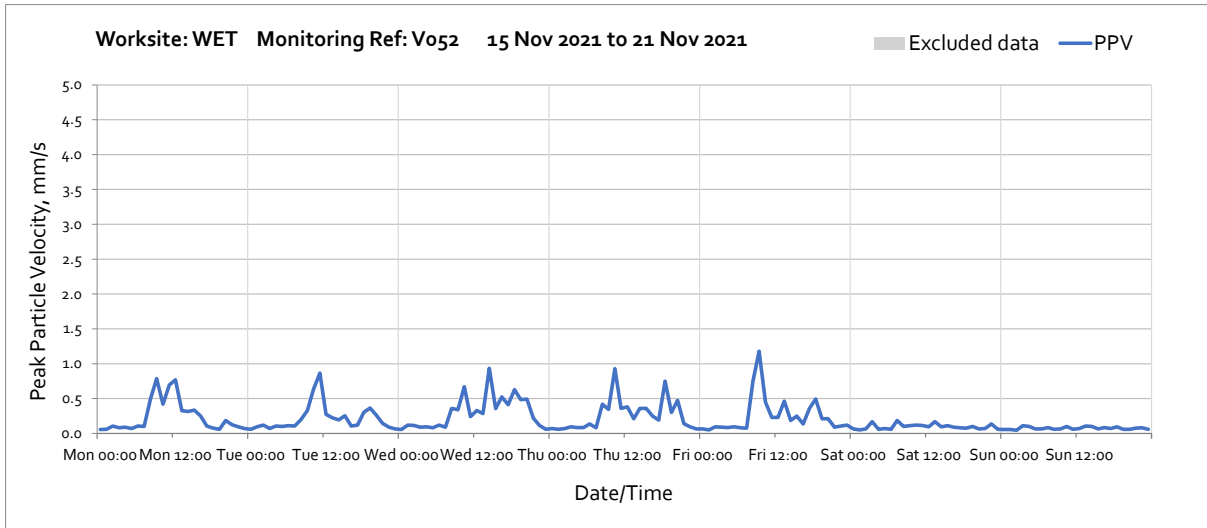
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V052



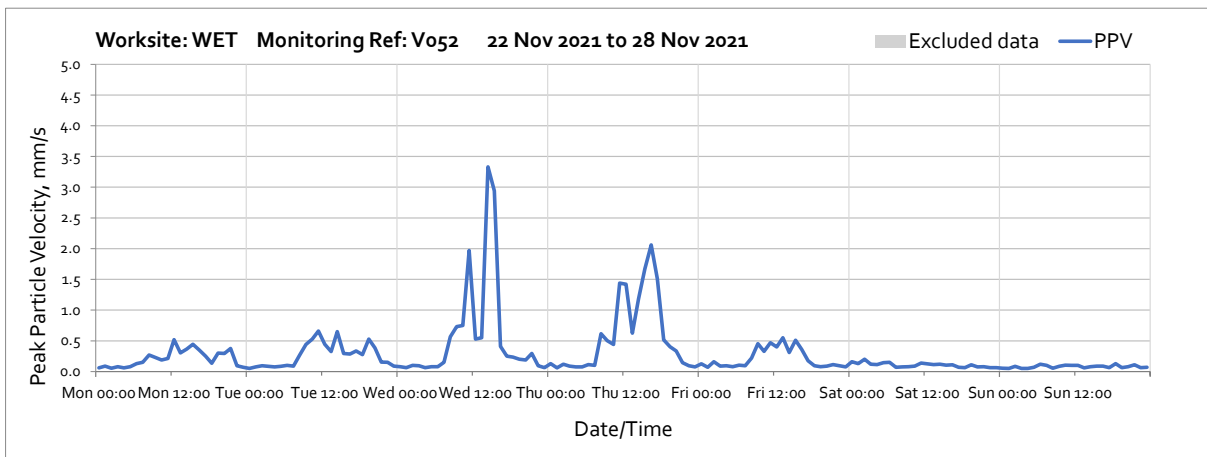
Note: High vibration levels measured at 08:00 on Monday 1st November and 13:00 on Wednesday 3rd November were due to concrete cutting using a floor saw.



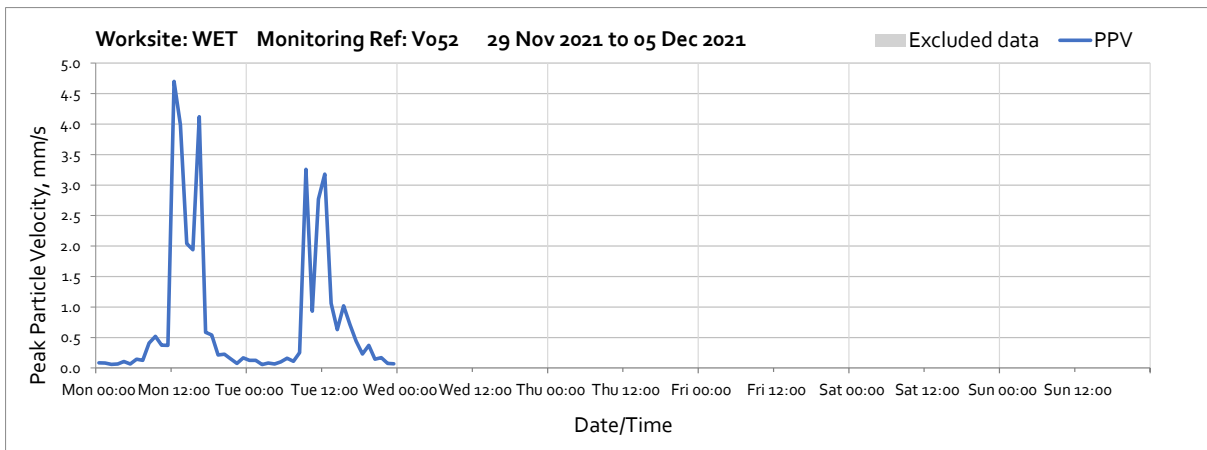
Note: High vibration levels measured at 08:00 and 11:00 on Monday 8th November and 10:00 on Tuesday 9th November were due to concrete cutting using a floor saw.



Note: High vibration levels measured at 09:00 on Friday 19th November were due to concrete cutting using a floor saw.

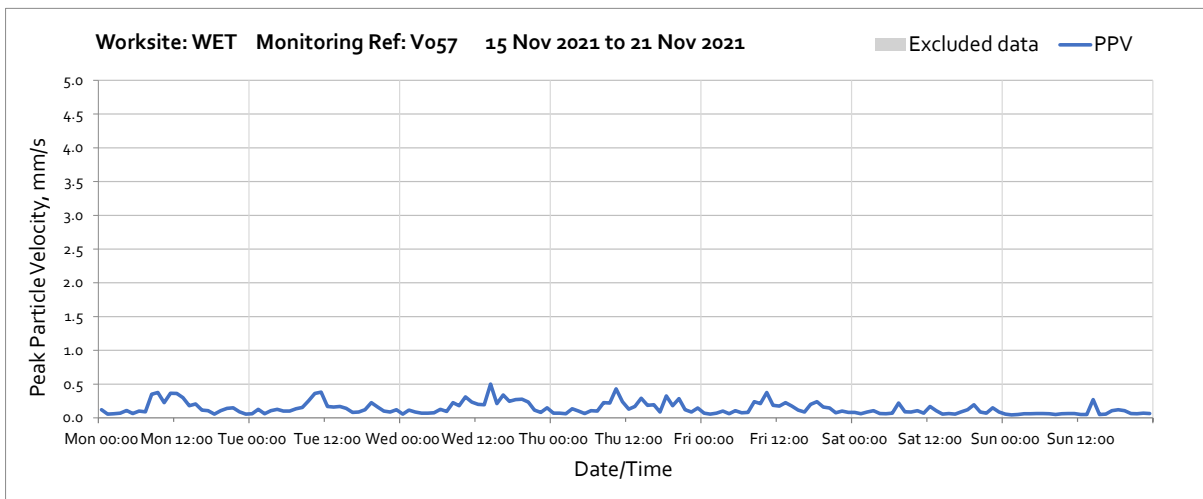
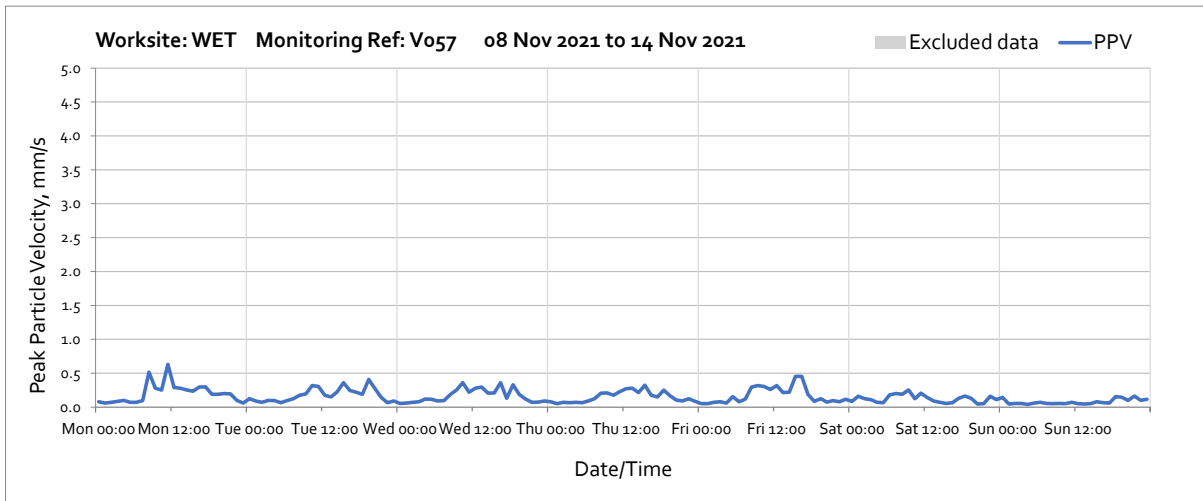
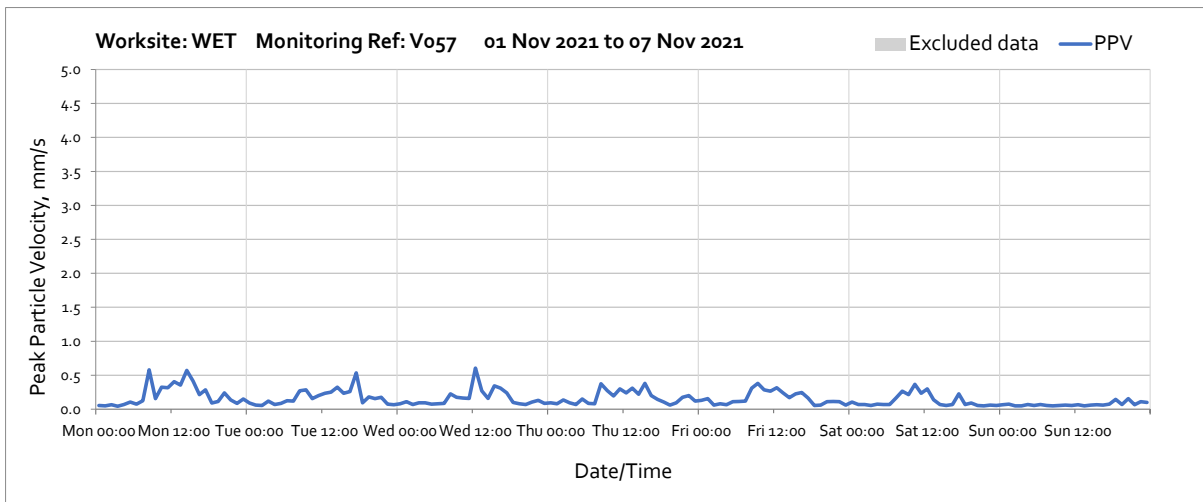


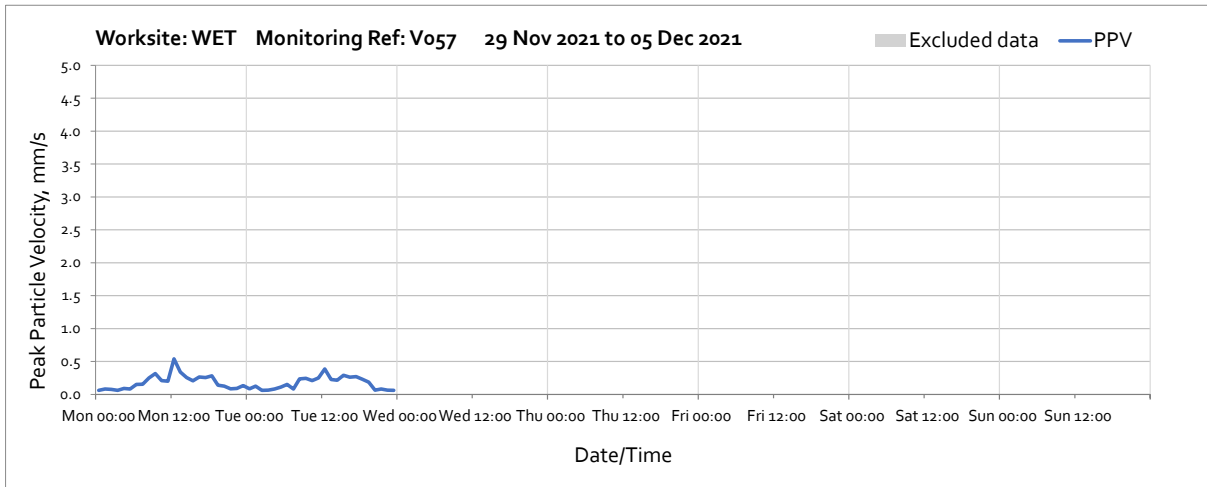
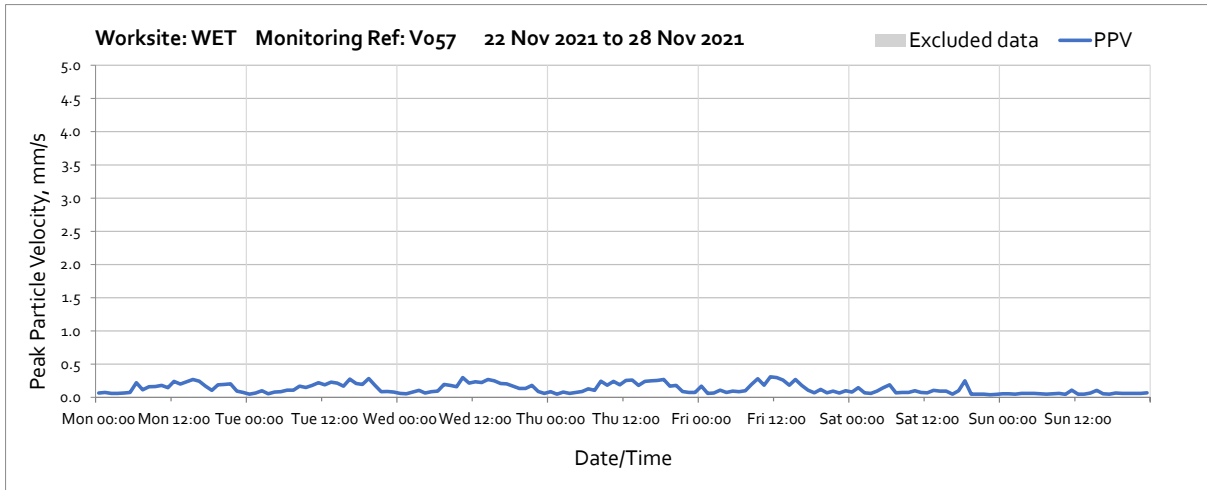
Note: High vibration levels measured from 11:00 until 15:00 on Wednesday 24th November and from 11:00 until 17:00 on Thursday 25th November were due to concrete cutting using a floor saw.



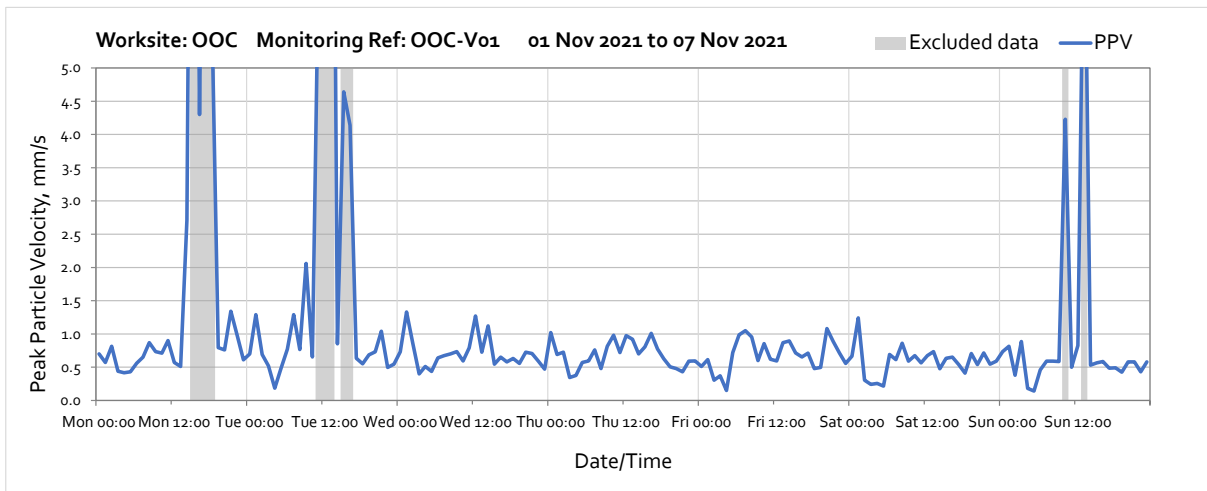
Note: High vibration levels measured from 12:00 until 16:00 on Monday 29th November and from 09:00 until 15:00 on Tuesday 30th November were due to concrete cutting using a floor saw.

Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V057

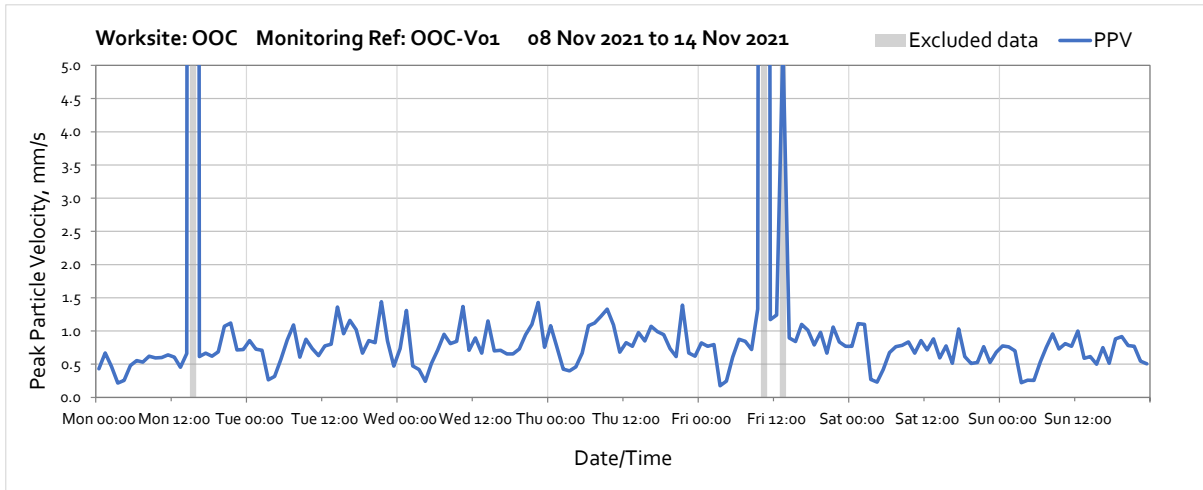




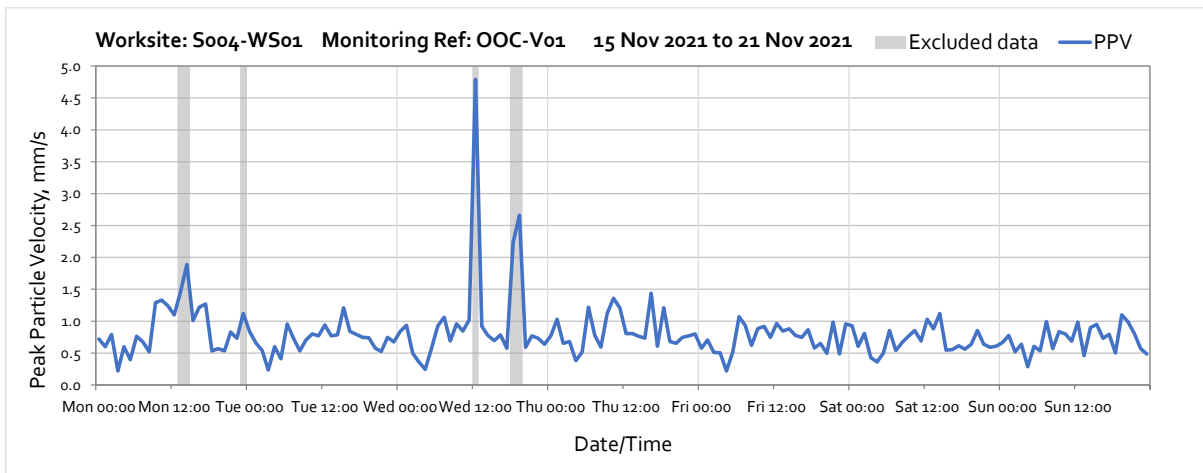
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V01



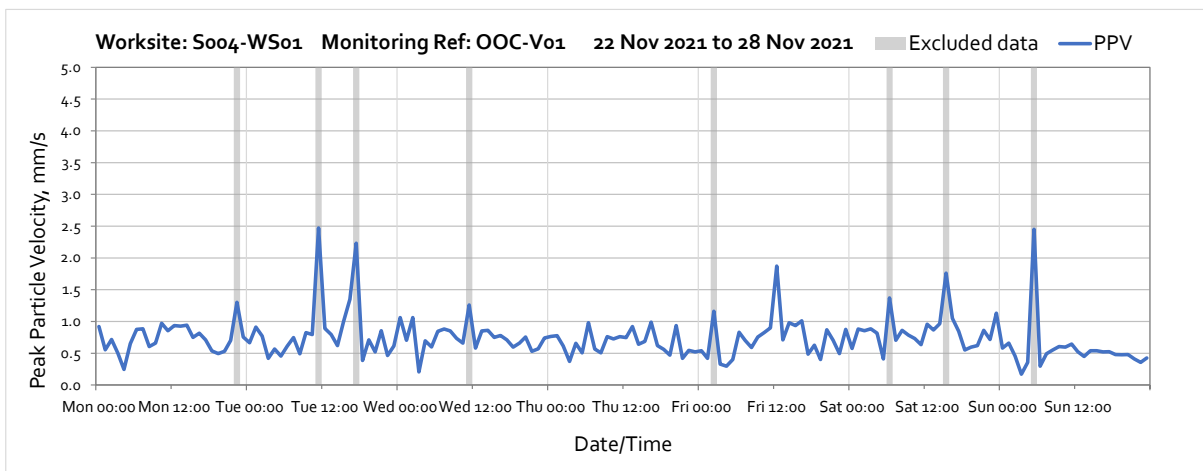
Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



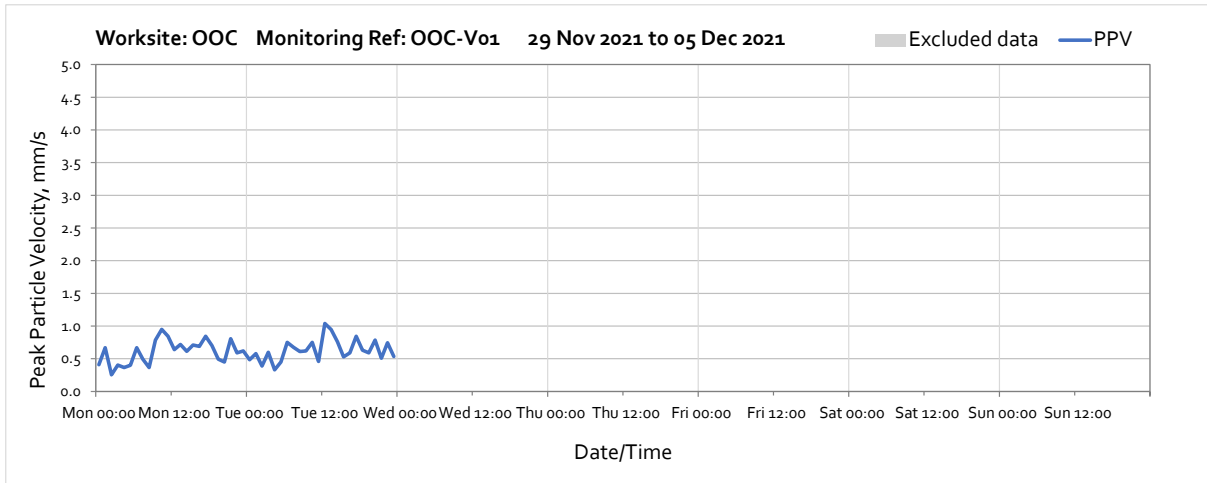
Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



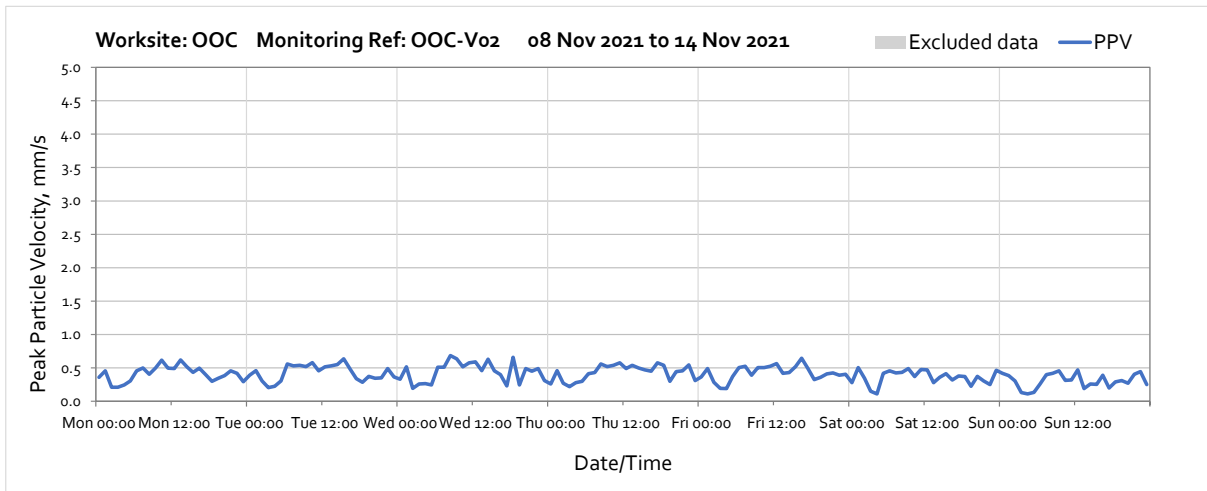
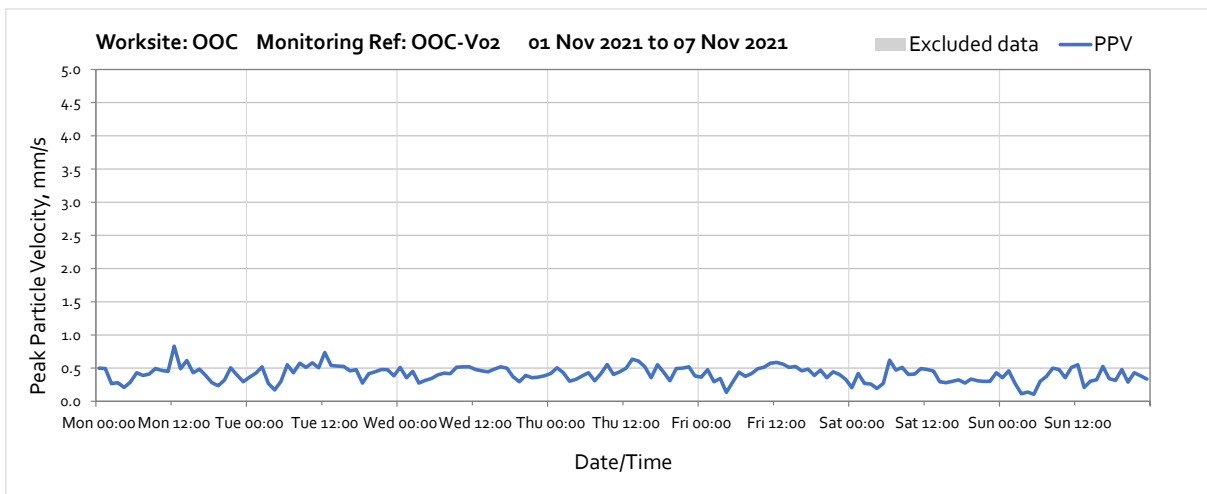
Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.

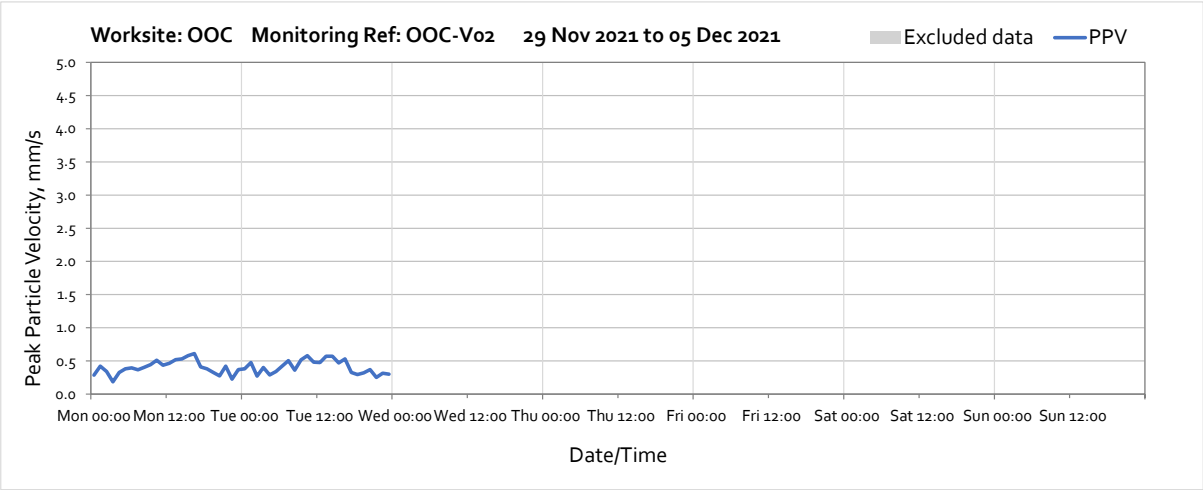
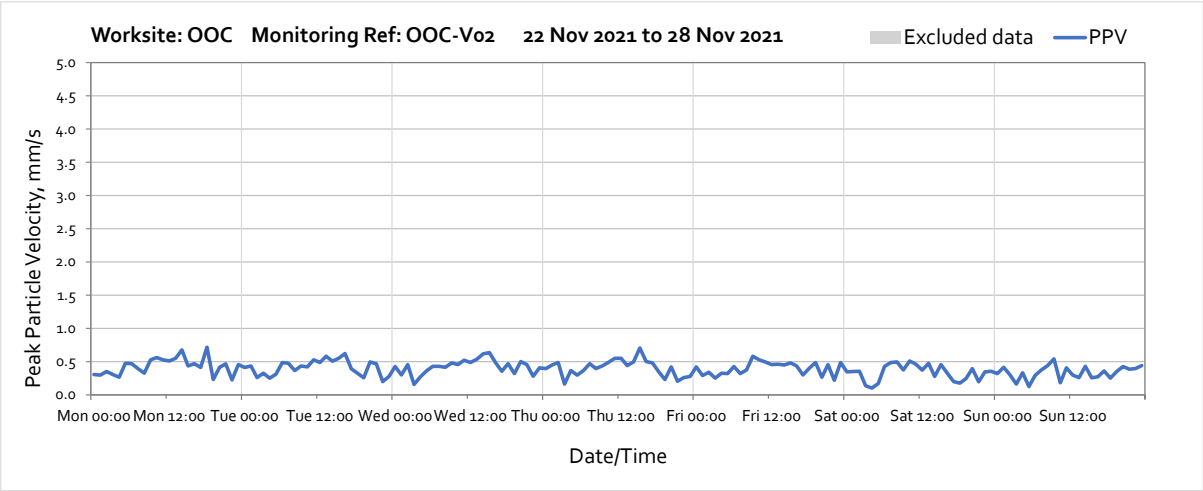
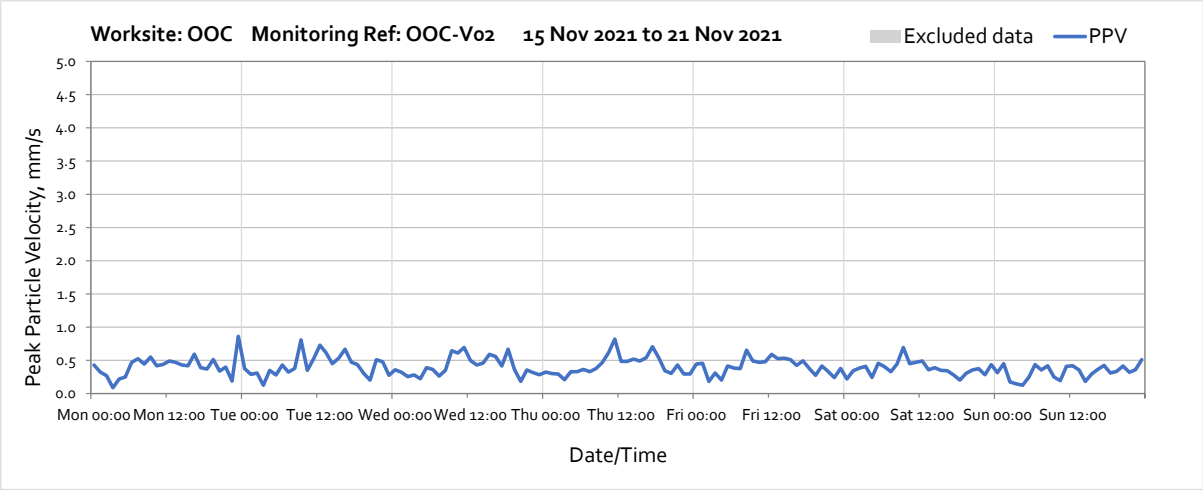


Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.

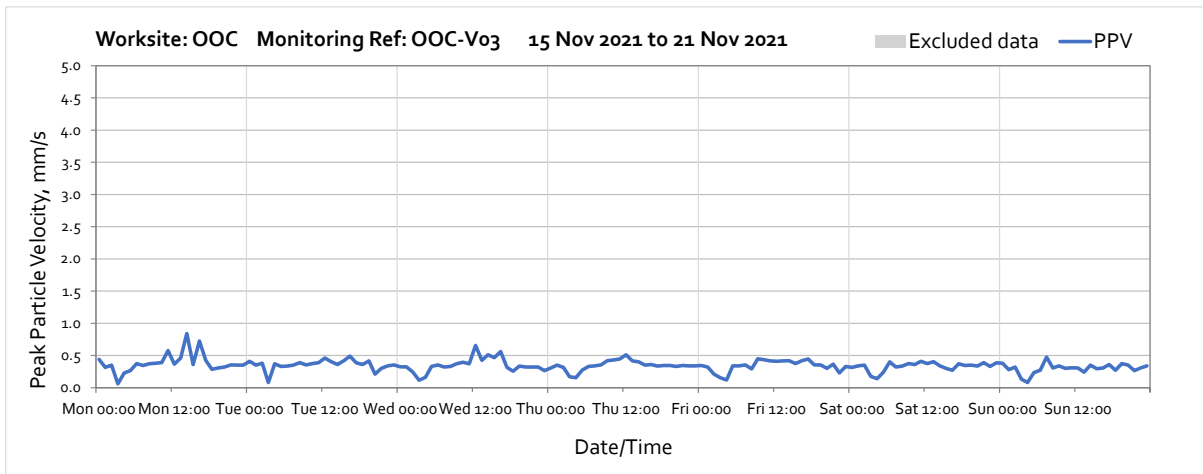
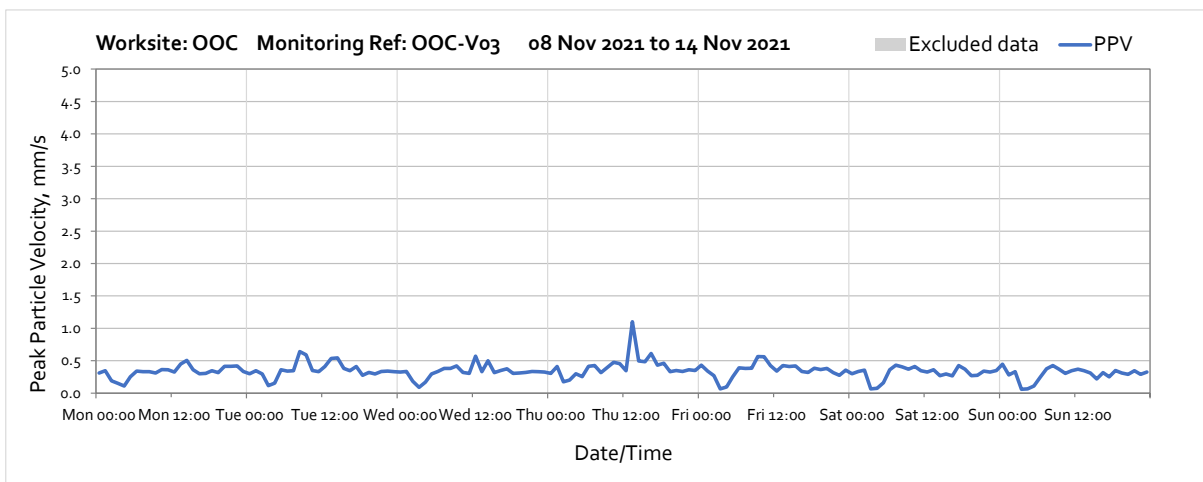
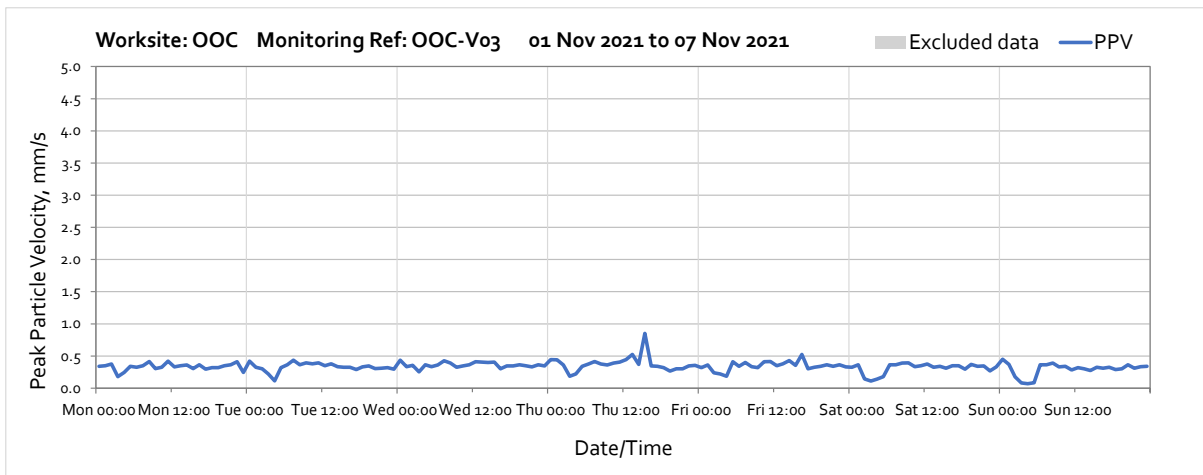


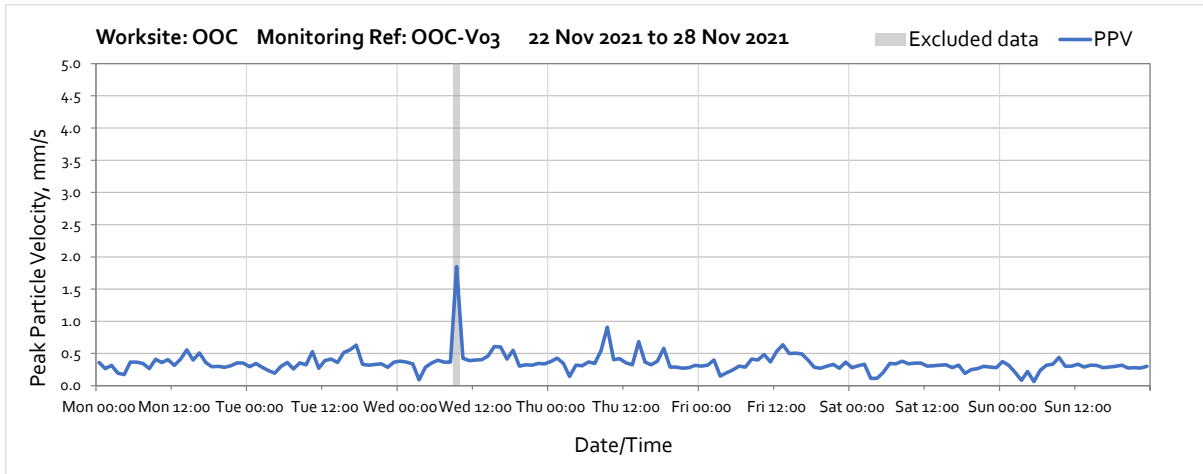
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V02



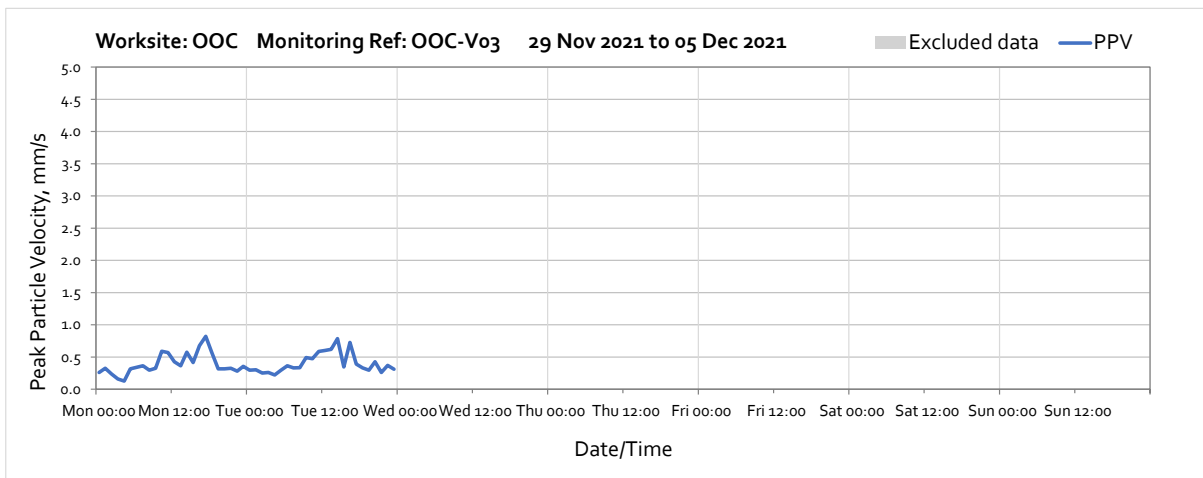


Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V03

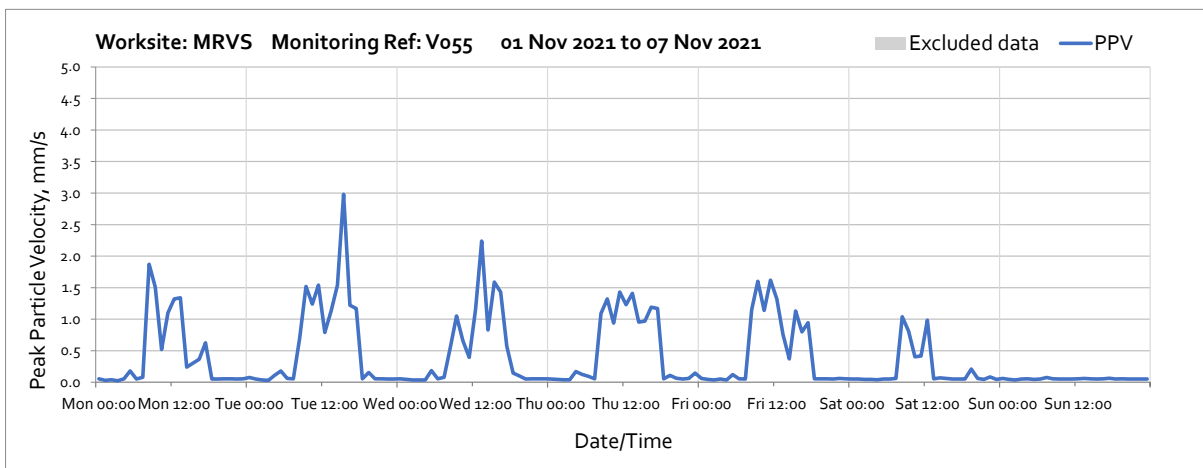




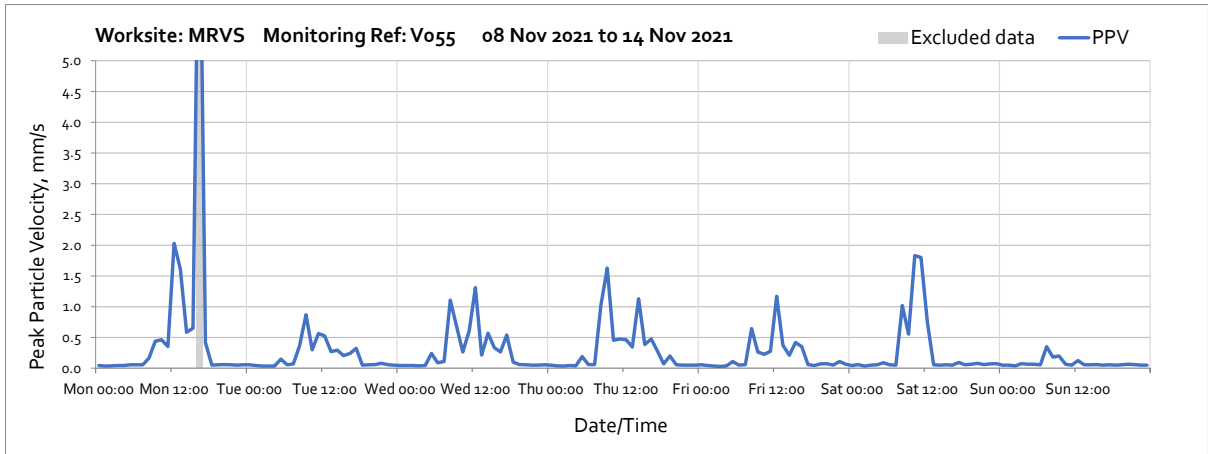
Note: High vibration levels measured at 09:00 on Wednesday 24th November were due local disturbance and not representative of HS2 vibration levels.



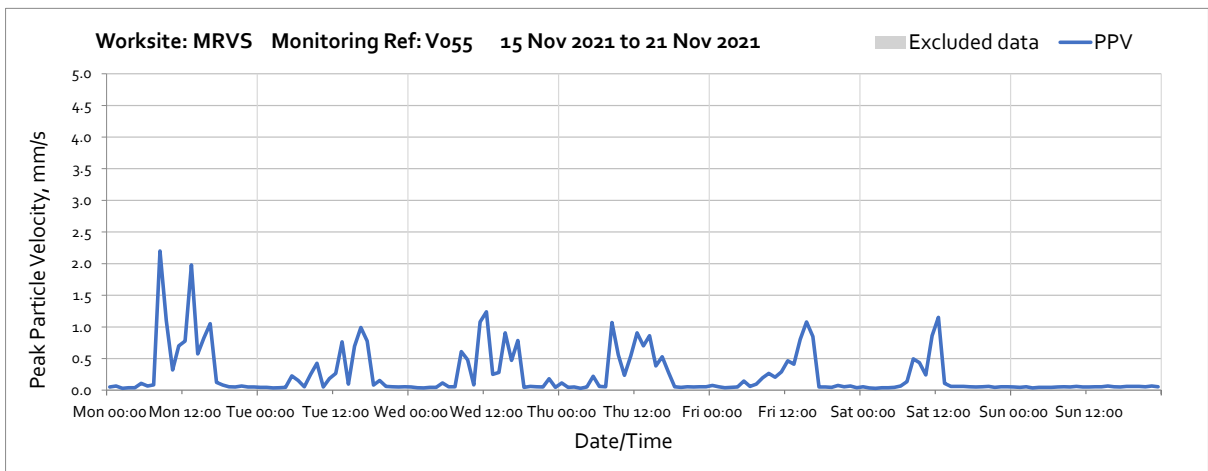
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V055



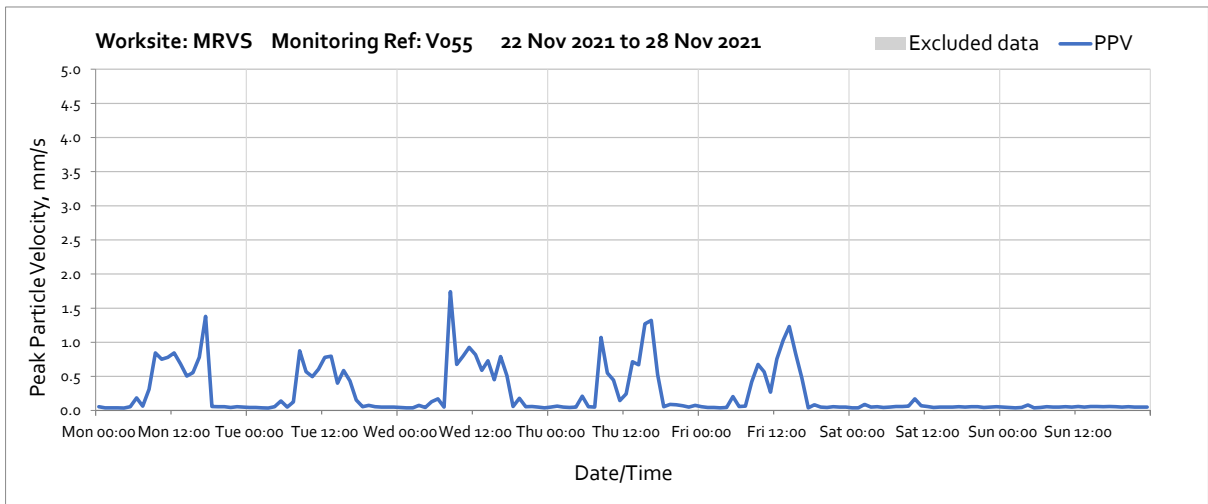
Note: High vibration levels measured across the week were caused by the access road maintenance works undertaken in proximity of the vibration monitor location.



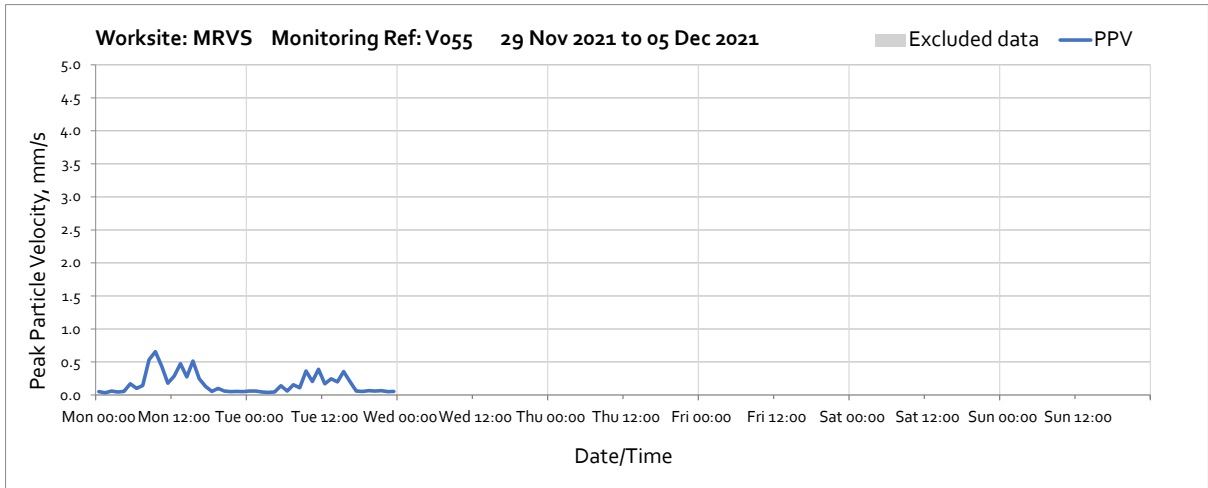
Note: High vibration levels measured across the week were caused by the access road maintenance works undertaken in proximity of the vibration monitor location.



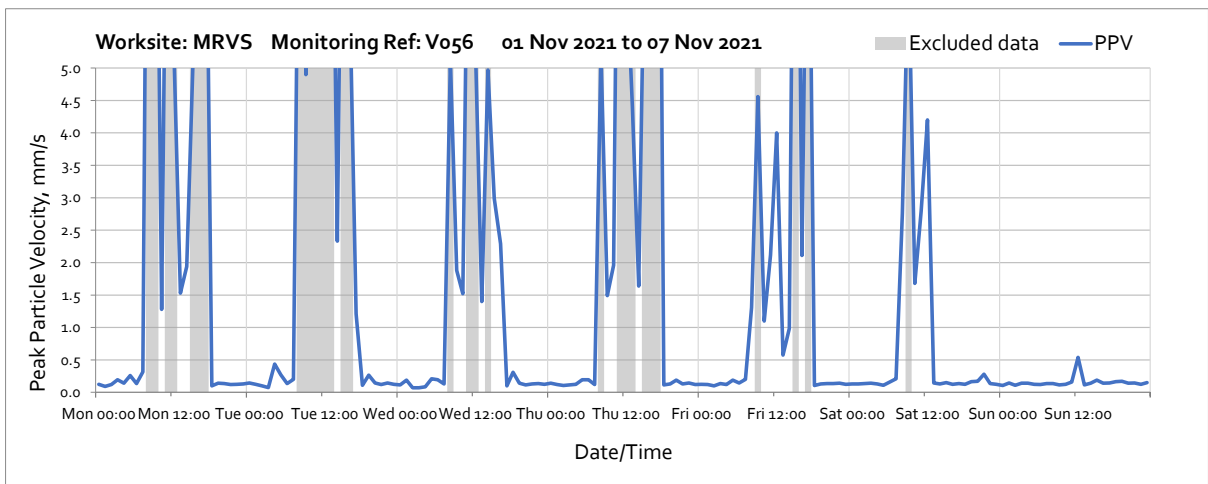
Note: High vibration levels measured across the week were caused by the access road maintenance works undertaken in proximity of the vibration monitor location.



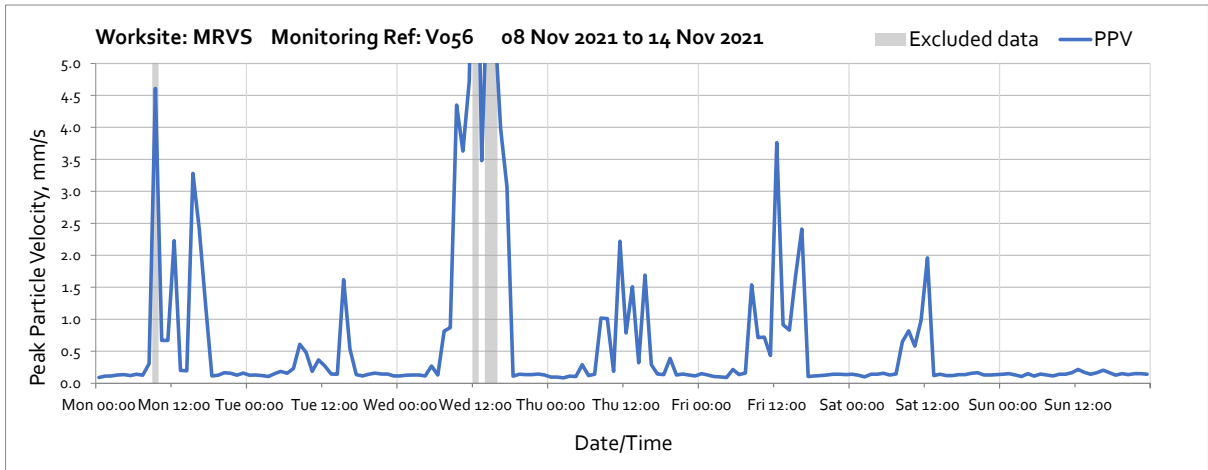
Note: High vibration levels measured across the week were caused by the access road maintenance works undertaken in proximity of the vibration monitor location.



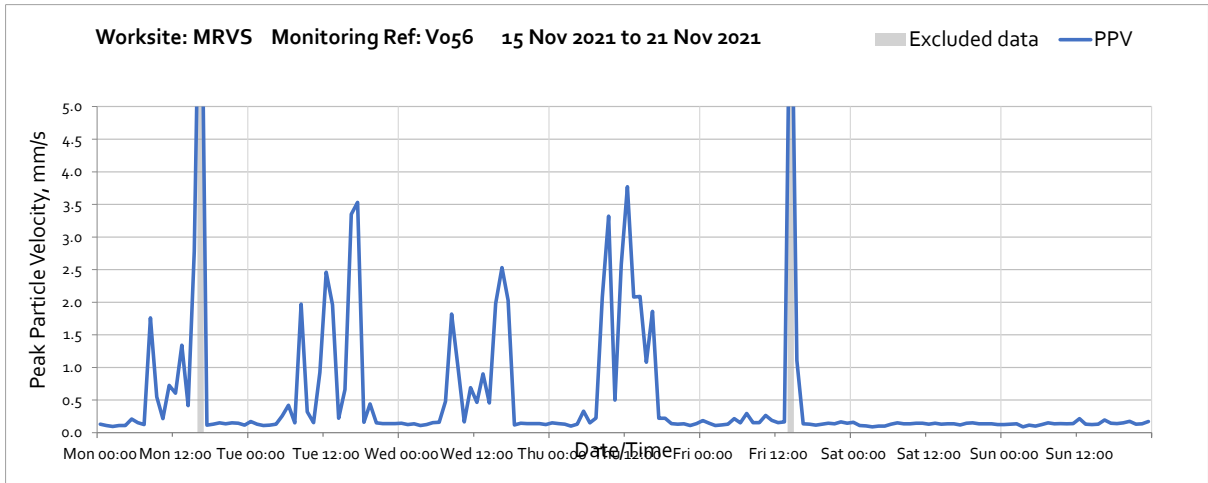
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V056



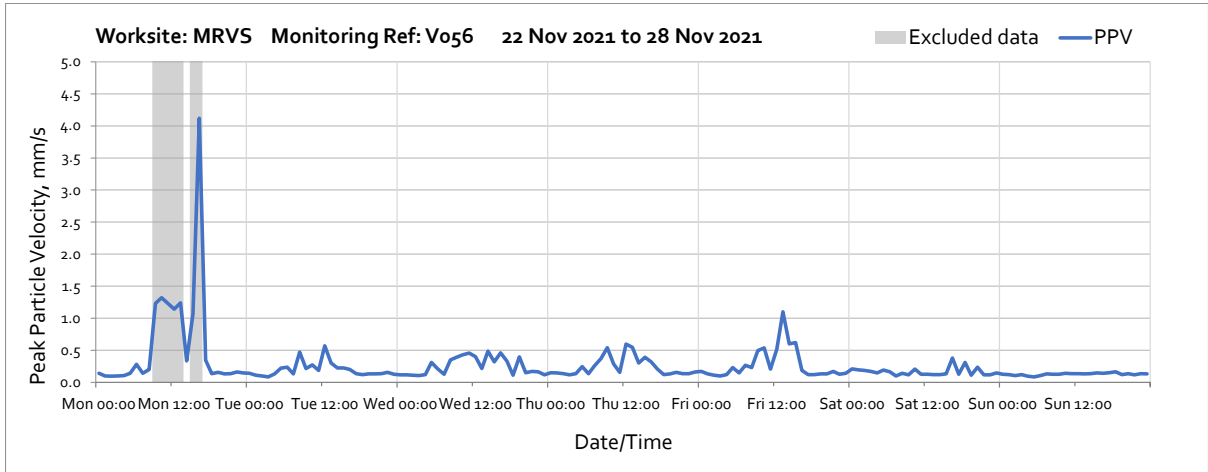
Note: High vibration levels measured across the week were caused by the access road maintenance works, the vibration roller compacting the ground very close to monitor and not representative of HS2 vibration levels.



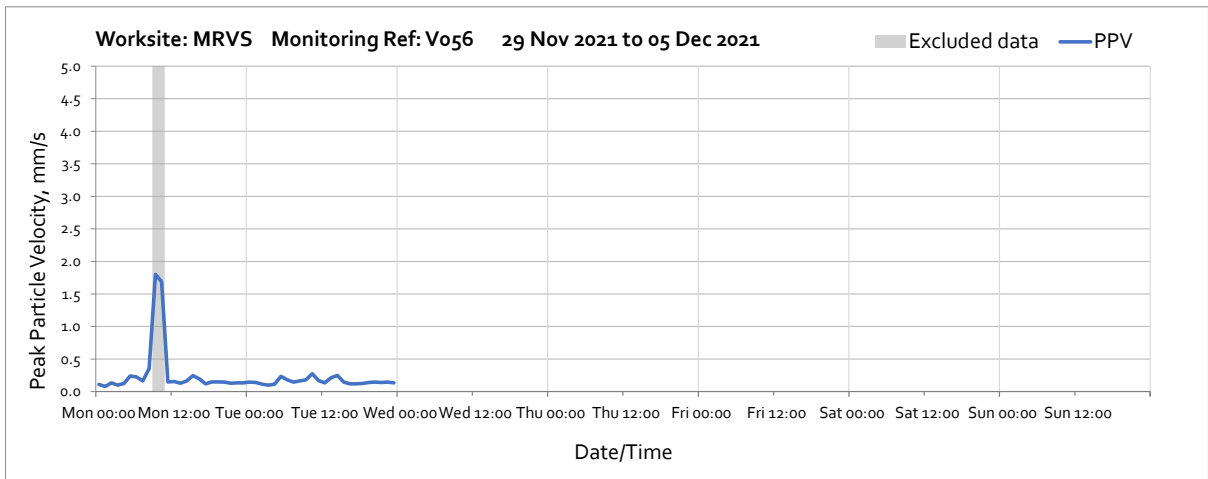
Note: High vibration levels measured across the week were caused by the access road maintenance works, the vibration roller compacting the ground very close to monitor and not representative of HS2 vibration levels.



Note: High vibration levels measured across the week were caused by the access road maintenance works, the vibration roller compacting the ground very close to monitor and not representative of HS2 vibration levels.

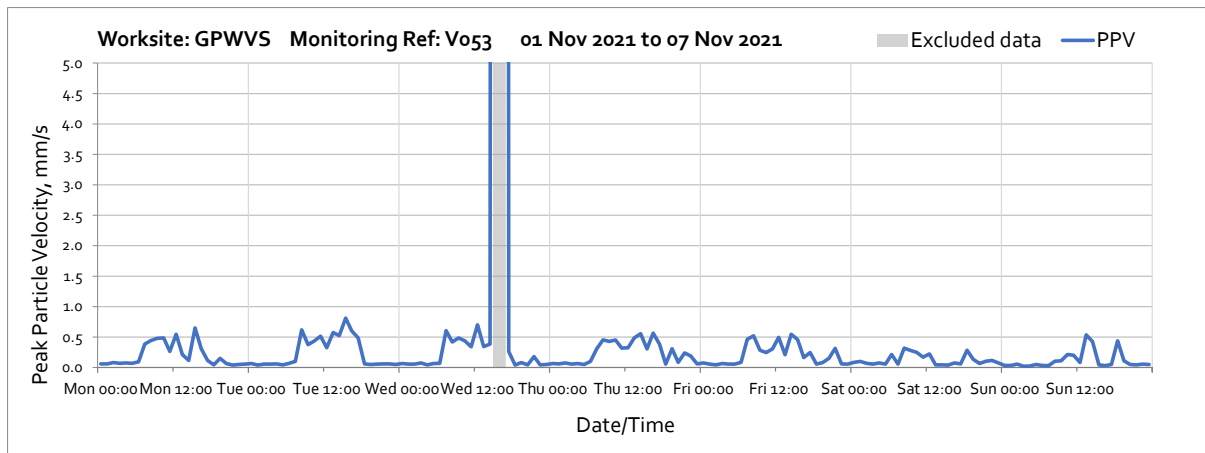


Note: High vibration levels measured across the week were caused by the access road maintenance works, the vibration roller compacting the ground very close to monitor and not representative of HS2 vibration levels.

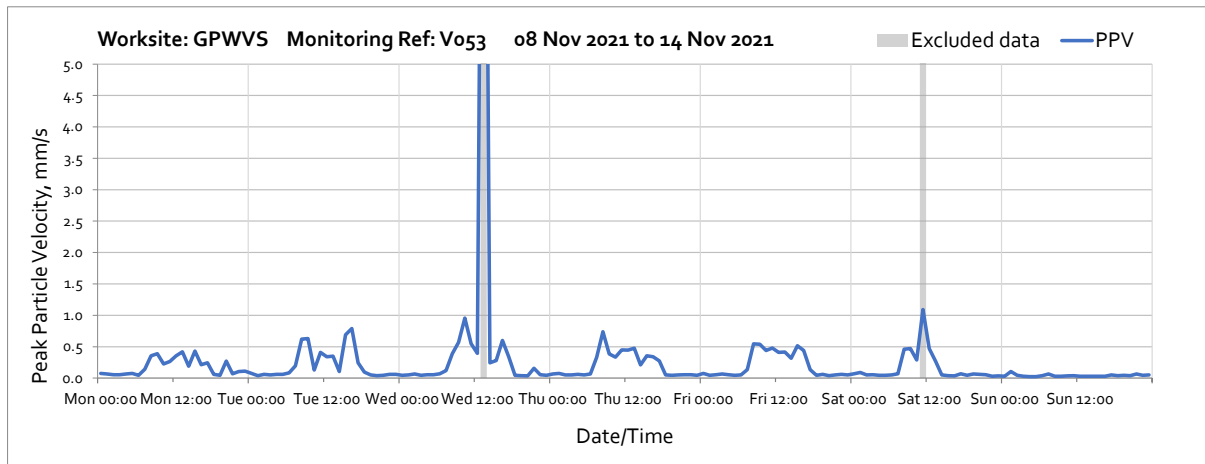


Note: High vibration levels measured across the week were caused by the access road maintenance works, the vibration roller compacting the ground very close to monitor and not representative of HS2 vibration levels.

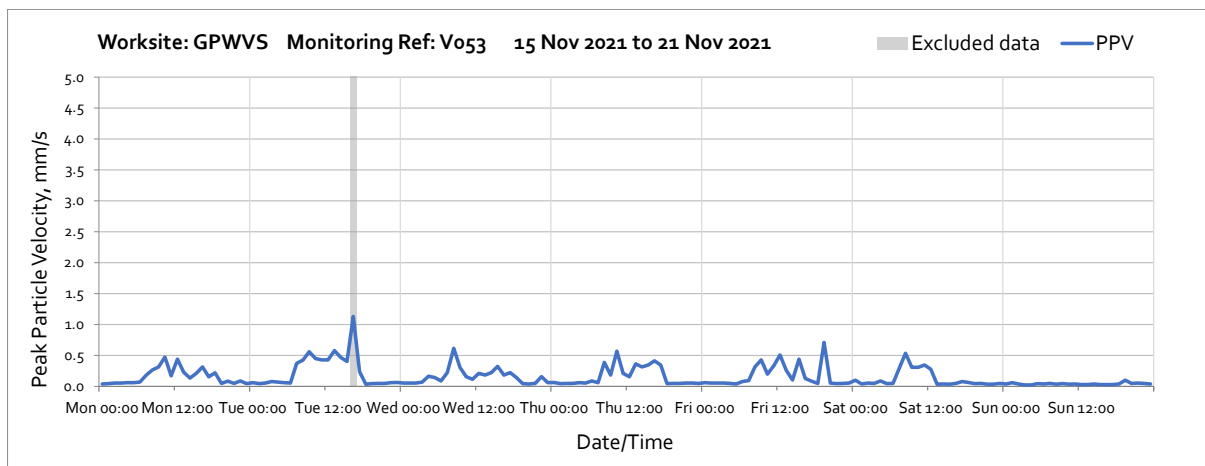
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: V053



Note: High vibration levels measured in between 15:00 and 16:00 on Wednesday 3rd November 2021 were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.

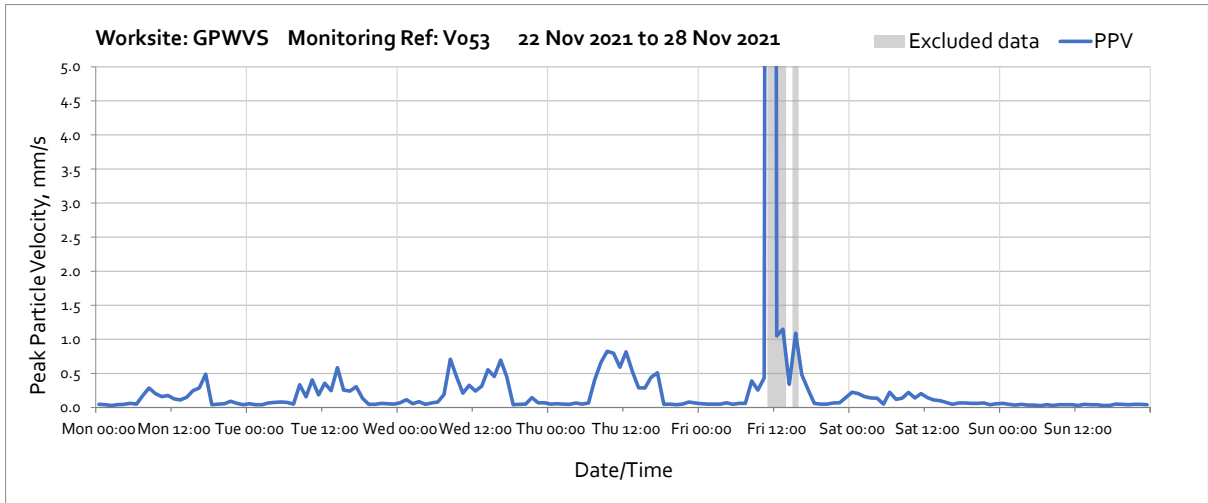


Note: High vibration levels measured 13:00 on Wednesday 3rd November 2021 were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.

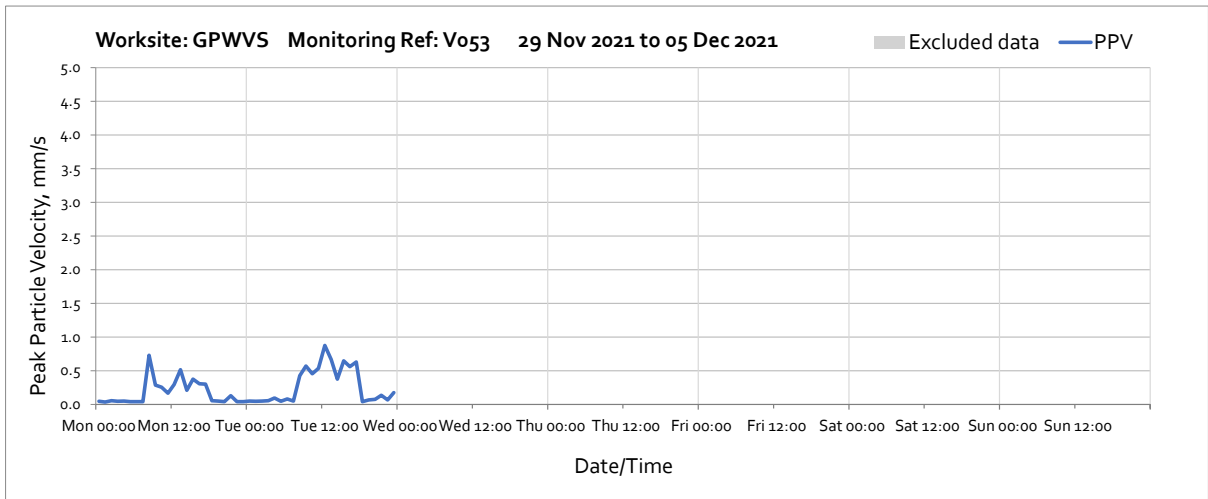


Note: High vibration levels measured 16:00 on Tuesday 16th November 2021 were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.

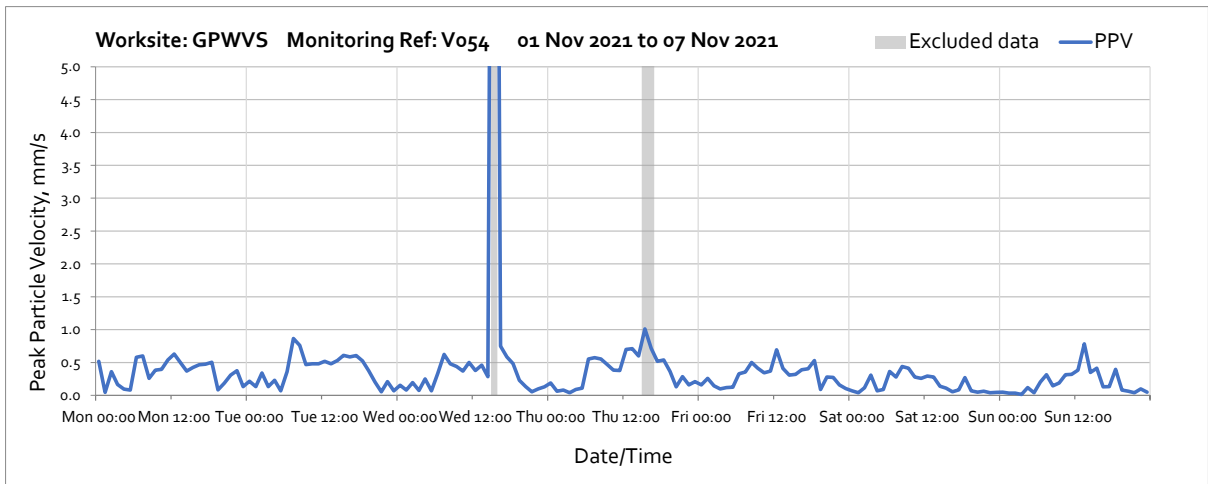
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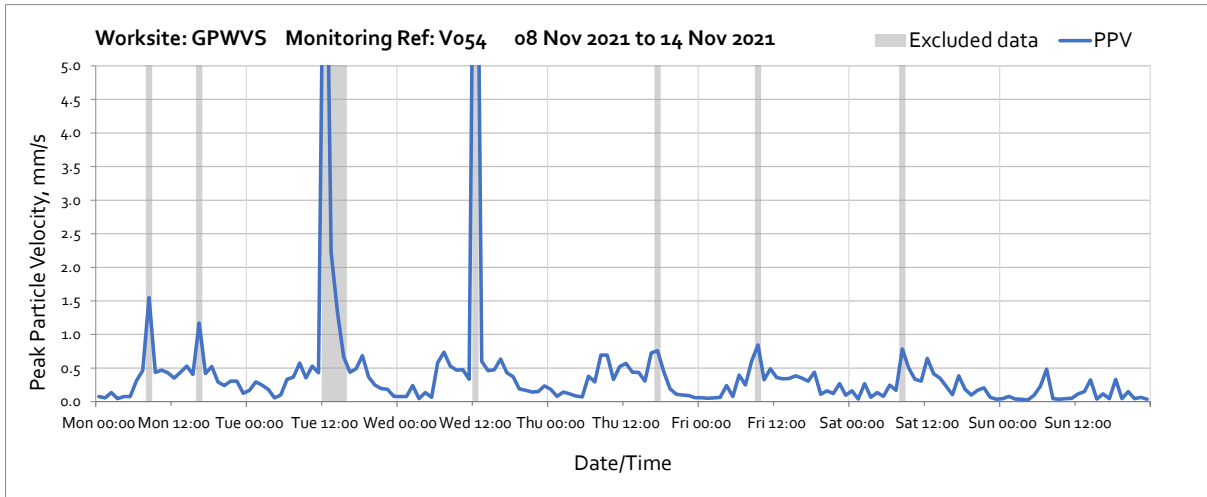
Note: High vibration levels measured in between 11:00 and 15:00 on Friday 26th November 2021 were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



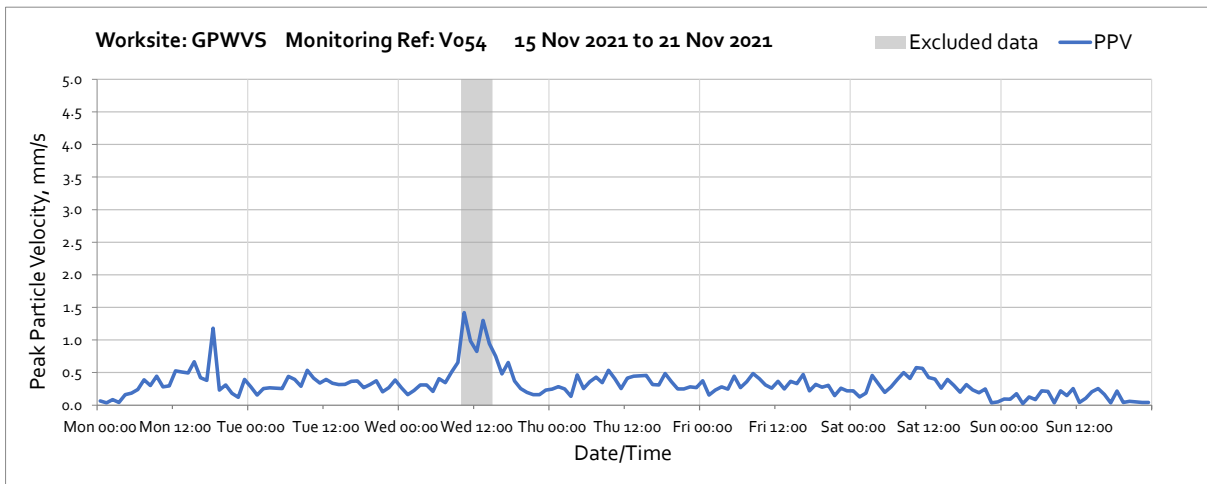
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: V054



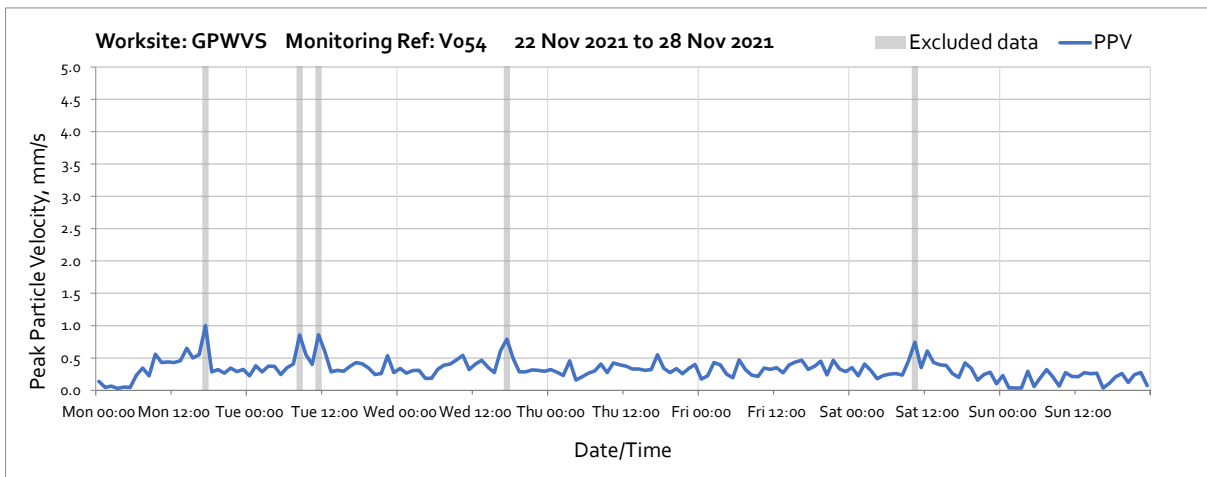
Note: High vibration levels measured at 15:00 on Wednesday 3rd November 2021 and from 15:00 until 16:00 on Thursday 4th November were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



Note: High vibration levels measured across the week were due to residents activity close to the vibration monitor and not representative of HS2 vibration levels.



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