

Construction noise and vibration Monthly Report – September 2021

London Borough of Ealing

Non-Technical Summary	1
Abbreviations and Descriptions	3
1 Introduction	4
1.2 Measurement Locations	7
2 Summary of Results	9
2.1 Summary of Measured Noise and Vibration Levels	9
2.2 Exceedances of the SOAEL	13
2.3 Exceedances of Trigger Level	15
2.4 Complaints	16
Appendix A Site Locations	18
Appendix B Monitoring Locations	27
Appendix C Data	34

List of tables

Table 1: Table of Abbreviations	3
Table 2: Monitoring Locations	7
Table 3: Summary of Measured dB L_{Aeq} Data over the Monitoring Period	10
Table 4: Summary of Measured PPV Data over the Monitoring Period	13
Table 5: Summary of Exceedances of SOAEL	14
Table 6: Summary of Total Exceedances of SOAEL	15
Table 7: Summary of Exceedances of Trigger Levels	16
Table 8: Summary of Complaints	16

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 September 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, drainage works, piling works, construction of conveyors, excavation works for the Gran Union Canal conveyor bridge and for the access ramp, main power connection works, tarmac stripping works and ground levelling works were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. WET), where fitting out works of Breadbin Building, excavation works, installation of channel drains, excavation works for the foundations of the Gran Union Canal conveyor bridge, concrete pouring of the base for the new welfare area and installation of jack pads were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road Crossover Box worksite (worksite ref. VRCB), where:
 - diaphragm walling works, excavation works, shuttering works, steel fixing works, concrete pouring, groundworks, shutter installations, backfilling, power connection works, construction and maintenance of piling platform and drainage works were underway.
 - At the Victoria Road Ancillary Shaft, segment concrete lining works, drilling works and drainage works, including excavation works and waterproofing works were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (worksite ref. FIC), where groundworks and reinforced concrete works, fit out works of the new laboratory building, vegetation clearance, installation of conveyors, including excavation works, steel fabrication and construction of concrete bases and drainage works were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. OOC), where ground reduction works, construction of permanent accommodation building, vegetation clearance, demolition works, construction of site haul road, drainage works, piling and excavation works, construction of platforms, guide walls and removal of spoil were underway.
- Noise monitoring was undertaken in proximity of the Mandeville Road Ventilation Shaft worksite (ref.: MRVS), where installation of steel sheet piles; power utility works, hoarding works; and installation of rails cable trough were underway.

- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. GPWVS), where site management, including adjustment to site walkway and installation of additional signage, installation of the sliding gate post, excavations and kerb installations, installation of security fencing, grouting works and construction of wells, drainage works, blockage clearing works and construction of site haul road were underway.
- Noise monitoring was undertaken in proximity of the Westgate Ventilation Shaft (ref. WVS), where installation of the shaft collar, vegetation clearance, installation of piling edge protections, construction of scaffold walkway, pre-cast concrete works and installation of concrete rings 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 power utility works;
- Horsenden Lane, Perivale, as part of water utility works.
- Wormwood Scrubs, where topsoil striping works, excavation and backfilling works were underway.

The HS2 threshold levels for significant noise impacts, which are defined in Information Paper E23 (<https://www.gov.uk/government/publications/hs2-information-papers-environment>), were exceeded on one (1) occasion 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.

Five (5) 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 September 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 shutters installation, concrete pouting, excavation works and compaction works for storage area;
 - Drainage works, including excavation works, backfilling of the attenuation tank and sand laying works;
 - Piling works, including pile cropping, steel fixing works and concrete pouring;
 - Construction of the conveyor, including excavations, steel fixing, bolts setting and concrete pouring;
 - Excavation works for the foundations of the Gran Union Canal conveyor bridge;
 - Excavation of the access ramp;

- Main power connection works, including excavation of tranches for earthing and earthing installations; and
- Tarmac stripping works and ground levelling works.
- Willesden EuroTerminal worksite, ref. WET (see plan 5 in Appendix A), where work activities included:
 - Fitting out works of Breadbin Building;
 - Excavation works for the storage slab and installation of channel drains;
 - Works to the conveyor, including excavation works for the foundations of the Gran Union Canal conveyor bridge and steel fixing works; and
 - Concrete pouring works of the base for the new welfare area and installation of jack pads.
- Victoria Road Crossover Box worksite, ref. VRCB (see plan 6 in Appendix A), where work activities included:
 - Diaphragm walling works;
 - works to the welfare facilities, including excavations, shuttering, steel fixing and concrete pouring;
 - Guide wall works, including groundworks, steel fixing, installation of shitters, concrete works, construction of wall bases and wall upstands and backfilling works;
 - Power connection works;
 - Concrete pouring;
 - Excavation and drainage works;
 - Piling platform maintenance works.
 - At the Victoria Road Ancillary Shaft activities included segment concrete lining works, drilling works and drainage works, including bulk excavation, excavation of drainage chamber pit, installation of chamber base and ring, laying of geotextile and filter material and waterproofing works.
- Flat Iron compound, worksite ref. FIC (see plan 6 in Appendix A), where work activities included:
 - Groundworks and reinforced concrete works for conveyors;
 - Fit out works of the new laboratory building;
 - Vegetation clearance;

- Installation of conveyors, including excavation works, steel fabrication and construction of concrete bases; and
- Drainage works.
- 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:
 - Ground reduction works;
 - Construction of permanent accommodation building;
 - Vegetation clearance;
 - Railway siding demolition works;
 - Construction of temporary site haul roads;
 - Drainage installation;
 - Piling and excavation works; and
 - Construction of platforms, guide walls and removal of spoil.
- Mandeville Road Ventilation Shaft worksite, reference MRVS (see plan 1 in Appendix A), where work activities included:
 - Installation of steel sheet piles;
 - Power utility works to connect services into new offices;
 - Hoarding works; and
 - Installation of rails cable trough.
- Green Park Way Ventilation Shaft worksite, reference GPWVS (see plan 2 in Appendix A), where work activities included:
 - Site management, including adjustment to site walkway and installation of additional signage;
 - Installation of the sliding gate post;
 - Excavations and kerb installations;
 - Installation of security fencing;
 - Grouting works and construction of wells, including drilling works;
 - Drainage works, including excavations, installation and backfilling of pipe runs, fitting rings, man holes and attenuation tanks;
 - Blockage clearing works; and

- Construction of site haul road.
- Westgate Ventilation Shaft worksite, reference WVS (see plan 3 in Appendix A), where work activities included:
 - Installation of the shaft collar, including concrete pouring and installation of hydraulic jacks;
 - Vegetation clearance;
 - Installation of piling edge protections along walkway;
 - Construction of scaffold walkway;
 - Pre-cast concrete works; and
 - Installation of concrete rings.

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 power utility works;
- Horsenden Lane, Perivale, as part of water utility works.
- Wormwood Scrubs, where topsoil striping works, excavation and backfilling works were 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 September 2021 in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in September 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

Worksite Reference	Measurement Reference	Address
	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	60.6 (65.0)	62.9 (65.3)	60.1 (61.2)	58.9 (63.0)	55.0 (64.0)	56.7 (57.4)	59.1 (61.6)	58.6 (62.5)	58.5 (62.5)	55.7 (71.3)	58.7 (71.3)	54.0 (58.1)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	66.2 (68.4)	67.9 (70.5)	64.9 (67.5)	63.7 (67.7)	60.0 (66.3)	62.9 (63.9)	64.5 (65.2)	65.1 (69.2)	64.1 (68.4)	59.5 (70.5)	63.4 (74.7)	59.2 (64.9)
	N060	Atlas Road next to Bashey Road	Façade	53.2 (57.9)	65.5 (77.7)	52.5 (58.6)	54.9 (61.0)	53.5 (65.4)	51.8 (53.8)	62.6 (72.2)	51.3 (56.6)	51.0 (57.5)	49.6 (61.9)	50.7 (62.8)	53.0 (61.6)
WET	N034	Stephenson Street (north)	Free-field	52.3 (54.9)	55.8 (59.3)	55.2 (65.2)	54.3 (63.7)	47.4 (55.9)	48.5 (50.1)	53.4 (55.4)	50.2 (53.3)	52.3 (56.3)	45.0 (51.8)	50.3 (57.1)	45.9 (52.5)
	N035	Stephenson Street (south)	Free-field	53.9 (56.9)	57.4 (61.0)	52.4 (55.6)	52.1 (63.5)	46.5 (54.1)	49.4 (51.0)	53.7 (54.3)	48.6 (52.3)	50.7 (54.8)	44.2 (50.7)	49.7 (54.9)	44.8 (50.8)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	54.3 (61.8)	58.2 (63.1)	56.9 (58.9)	56.0 (65.6)	49.0 (55.2)	52.5 (55.8)	54.7 (56.1)	53.9 (55.6)	54.2 (58.1)	49.0 (55.4)	52.7 (58.1)	50.1 (64.4)

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
VRCB	N031	School Road, outside Acton Business Centre	Free-field	57.5 (67.2)	60.9 (62.6)	58.0 (62.0)	55.8 (64.0)	52.0 (60.5)	52.3 (54.6)	58.0 (58.9)	56.7 (60.6)	55.7 (60.5)	50.9 (60.9)	53.3 (60.2)	50.3 (54.9)
	N050	Acton Square, outside North Acton Station	Free-field	63.8 (70.7)	64.6 (68.5)	63.1 (69.6)	62.0 (66.5)	58.7 (71.3)	62.0 (64.3)	63.4 (64.3)	63.5 (65.7)	63.3 (68.7)	57.8 (63.5)	62.3 (71.9)	58.2 (64.5)
FIC	N029	Braitrim House, Victoria Road	Free-field	54.6 (62.5)	63.7 (71.0)	53.1 (61.3)	56.0 (65.0)	54.4 (68.6)	50.2 (54.5)	59.1 (63.7)	51.6 (53.4)	52.1 (59.0)	47.5 (66.3)	48.5 (64.1)	53.4 (63.5)
	N042	Bodens car park	Free-field	56.8 (59.1)	62.1 (68.4)	56.0 (63.7)	55.5 (64.8)	53.7 (59.9)	53.8 (54.2)	59.7 (67.8)	54.6 (55.9)	54.0 (56.0)	53.1 (63.9)	53.8 (63.8)	52.7 (55.3)
	N049	Flat Iron compound	Free-field	54.6 (60.3)	65.1 (69.2)	53.3 (57.6)	55.7 (65.8)	55.9 (64.3)	54.2 (58.0)	60.7 (69.2)	56.6 (65.4)	52.8 (64.3)	51.2 (65.2)	50.6 (64.5)	53.8 (62.8)
OOC	OOC-N01	Old Oak Common Lane	Free-field	62.3 (68.1)	66.6 (71.4)	61.2 (67.3)	59.4 (67.3)	56.0 (64.0)	63.7 (67.8)	67.1 (68.8)	65.9 (67.7)	63.7 (70.7)	55.2 (59.3)	61.5 (67.2)	56.4 (67.5)
	OOC-N02	Old Oak Common Lane, Hilltop Works	Free-field	66.5 (67.2)	69.4 (71.8)	66.6 (68.6)	64.9 (71.6)	60.2 (67.3)	64.3 (66.2)	66.2 (67.6)	65.9 (66.4)	66.0 (71.8)	60.6 (70.0)	63.6 (69.2)	59.5 (63.9)
MRVS	N040	Badminton Close	Free-field	52.9 (55.9)	55.1 (60.5)	52.4 (57.0)	52.1 (57.0)	49.1 (55.7)	50.7 (51.6)	51.7 (52.3)	50.5 (52.1)	51.7 (53.9)	48.9 (53.3)	51.7 (54.8)	47.5 (52.6)
	N058	Mandeville Road	Free-field	54.5 (57.3)	60.1 (65.4)	53.8 (57.2)	54.3 (57.2)	50.8 (59.1)	50.7 (53.9)	53.1 (60.6)	52.4 (54.5)	51.8 (56.1)	48.7 (54.7)	51.3 (55.9)	48.4 (53.2)

OFFICIAL

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	62.3 (63.4)	64.6 (74.7)	61.8 (62.9)	62.1 (63.7)	58.3 (62.7)	58.5 (61.4)	59.0 (62.5)	59.4 (62.2)	60.2 (65.5)	55.9 (61.9)	59.9 (67.8)	54.5 (59.8)
GPWVS	N059	Green Park Way Ventilation Shaft	Façade	55.8 (60.3)	64.4 (69.6)	52.9 (59.6)	52.6 (57.5)	50.3 (63.0)	52.8 (57.5)	55.4 (64.1)	50.3 (52.2)	51.7 (64.1)	46.2 (50.9)	49.8 (54.0)	48.6 (56.0)
	N064	Green Park Way Ventilation Shaft	Façade	57.7 (60.9)	63.8 (69.6)	56.9 (61.1)	55.2 (59.5)	51.8 (61.2)	54.1 (56.1)	54.2 (56.1)	53.3 (56.3)	53.4 (58.8)	49.0 (54.8)	53.3 (65.3)	49.9 (58.2)
WVS	N062	Westgate Ventilation Shaft	Free-field	61.4 (69.2)	64.7 (70.3)	57.9 (67.4)	57.4 (66.9)	55.3 (61.7)	56.1 (58.4)	63.7 (69.2)	57.0 (58.2)	55.6 (57.4)	53.9 (62.2)	56.4 (69.0)	53.8 (58.7)

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)	0.96 (Z-axis)
	V057	37, Stephenson Street	0.87 (Z-axis)
OOC	OOC-V01	25 Wells House Road	1.43 (Y-axis)
	OOC-V02	Kildun Court, Old Oak Common Lane	3.40 (Z-axis)
	OOC-V03	Wells House Road Alleyway	0.96 (Z-axis)
GPWVS	V053	Green Park Way, Greenford	0.97 (Z-axis)
	V054	Green Park Way Ventilation Shaft	0.71 (Z-axis)
MRVS	V055	Mandeville Road	5.59* (Z-axis)
	V056	Mandeville Road	3.69 (Z-axis)

* High vibration levels are due to the proximity of the construction activities to the vibration monitor. The nearest residential receptors are further away from the works and vibration levels at the receptor will therefore be lower.

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

2.2 Exceedances of the 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	All days	All periods	No exceedance
	N033	Outside The Collective, Atlas Road / Victoria Road	All days	All periods	No exceedance
	N060	Atlas Road next to Bashey Road	Weekday	0800-1800	1
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	All days	All periods	No exceedance
FIC	N029	Braitrim House, Victoria Road	All days	All periods	No exceedance
	N042	Bodens Car Park	All days	All periods	No exceedance
	N049	Flat Iron compound	All days	All periods	No exceedance
OOC	OOC-N01	Old Oak Common Lane	All days	All periods	No exceedance
	OOC-N02	Old Oak Common Lane, Hilltop Works	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
MRVS	N040	Badminton Close	All days	All periods	No exceedance
	N058	Mandeville Road	All days	All periods	No exceedance
	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	N060	Atlas Road next to Bashey Road	1

2.2.6 1x no. exceedance of the SOAEL was recorded due to HS2 construction works during September 2021. The exceedance occurred at monitoring location N060 during 1x no. daytime period due to pile trimming works undertaken in line with Section 61 consent.

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

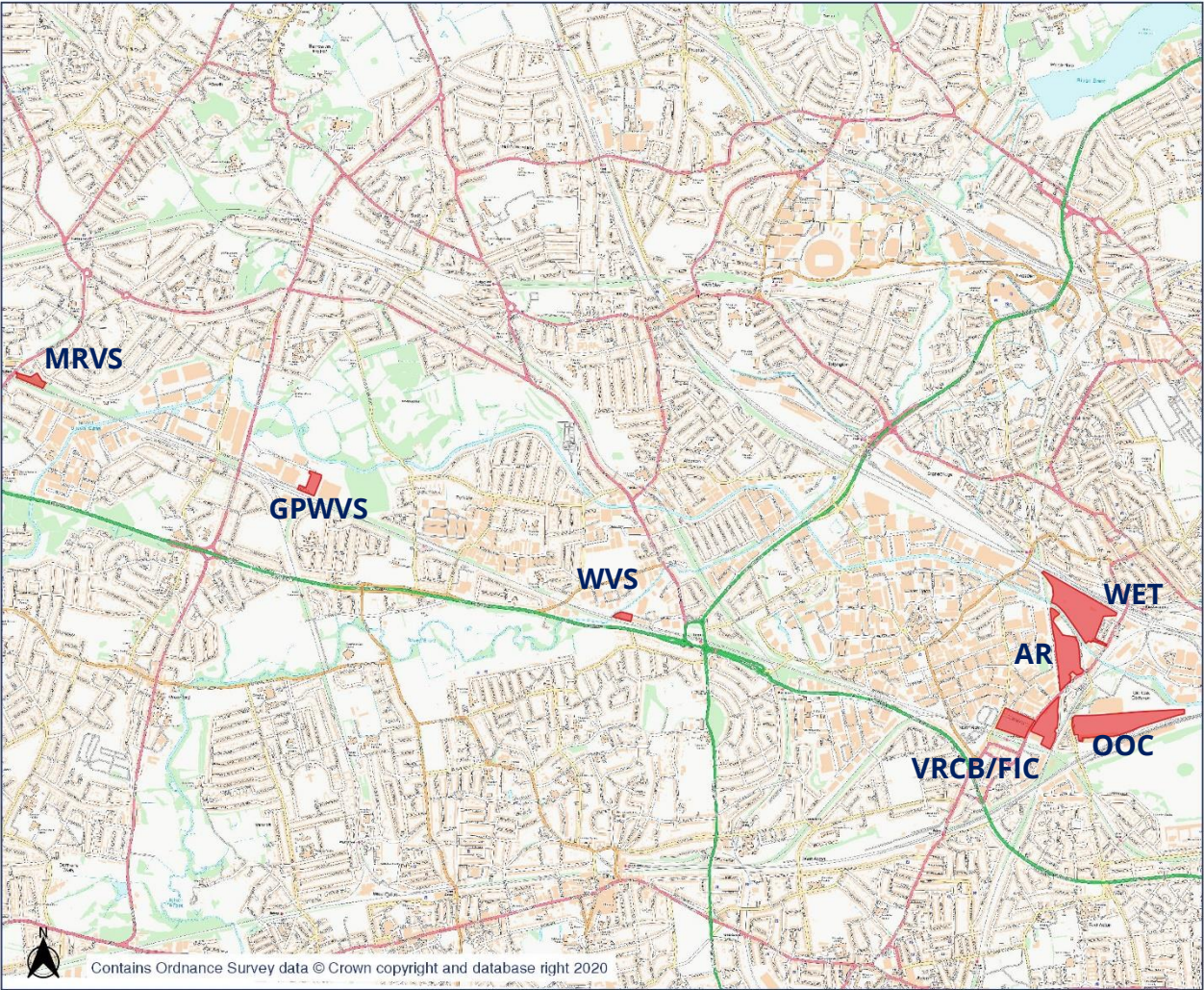
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 8: Summary of Complaints

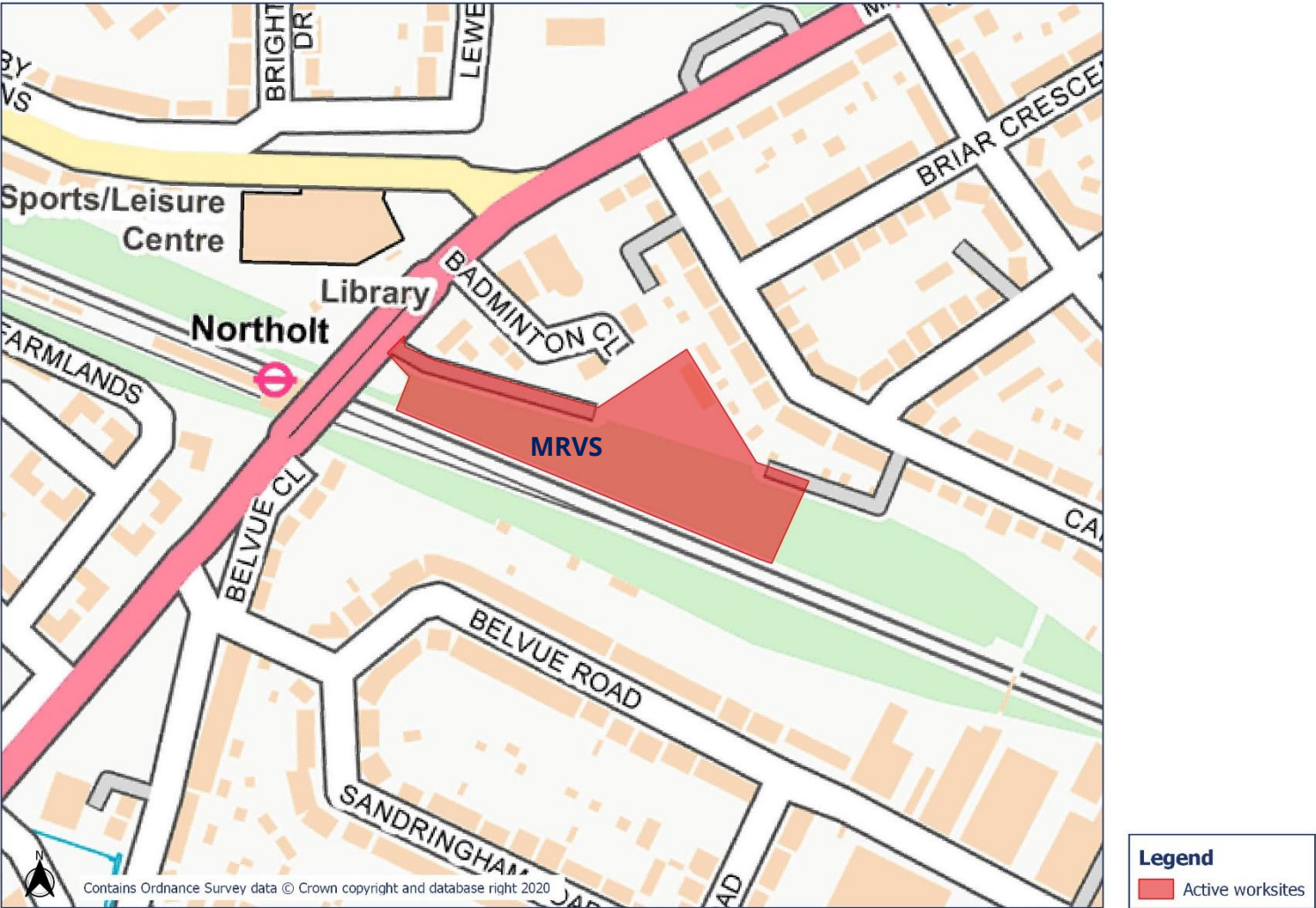
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42528-C	OOO	Complaint due to construction noise and dust from the worksite.	Investigations confirmed that works were carried out in line with Section 61 consent and Best Practicable Means (BPMs) were in place, including the adoption of acoustic blankets.	The complainant has been contacted and information provided. It has also been confirmed that high screen to deflect dust is not feasible due to the foundations/support required.
HS2-21-42606-C	WET	Complaint due to noise disturbance due to heavy machinery and cranes movements during night-time.	Investigations shown that at the time of the complaint night work permissions were until 1am. However, works were completed early, and the heavy machines had egressed back to the depot by 11:30pm. The works were undertaken in compliance with Section 61 and best practicable means (BPM) were used.	The complainant has been contacted and advised that the source of disturbance has not been identified. To identify any future disturbance, the complainant has been asked to provide recordings of the noise.
HS2-21-42556-C HS2-21-42583-C	WET	Complaint due to impulsive noise (loud banging) coming from the construction site at night.	Investigations shown that excavation works were undertaken at the time of the complaint. However, no noise trigger alerts	The complainant has been contacted and information about works undertaken and mitigation in place have been provided. However, Logistics Team

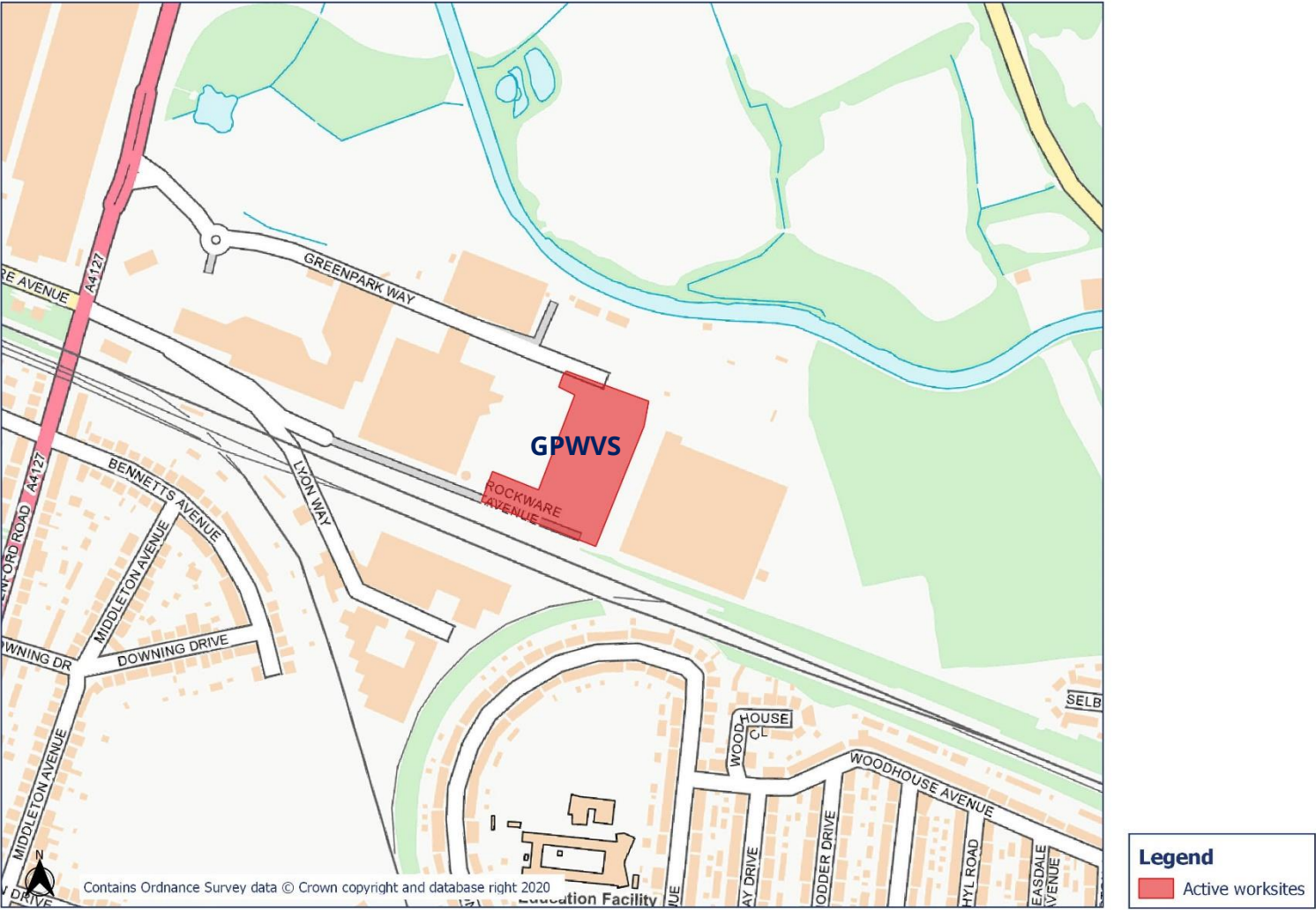
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
			<p>were recorded, and noise levels were within the predicted ones and in line with Section 61 consent.</p>	<p>asked to brief excavator operators to be careful during loading and not to bang buckets into anything. In addition to this, a replacement of conventional excavator to alternatives with clamshell grabs for loading railway wagons has been planned.</p>
HS2-21-42584-C	VRCB	<p>Complaint due to jackhammer noise at night.</p>	<p>Extended night-time works (concrete laying) were undertaken at the time of the complaint. At the time of the complaint, the last concrete delivery was delivered on site for the final pouring and cleaning works were carried out to conclude night works at the site.</p>	<p>The complainant has been contacted and information about necessary extended hour works were provided. The site teams were re-briefed regarding best practicable means to reduce noise levels to a minimum.</p>

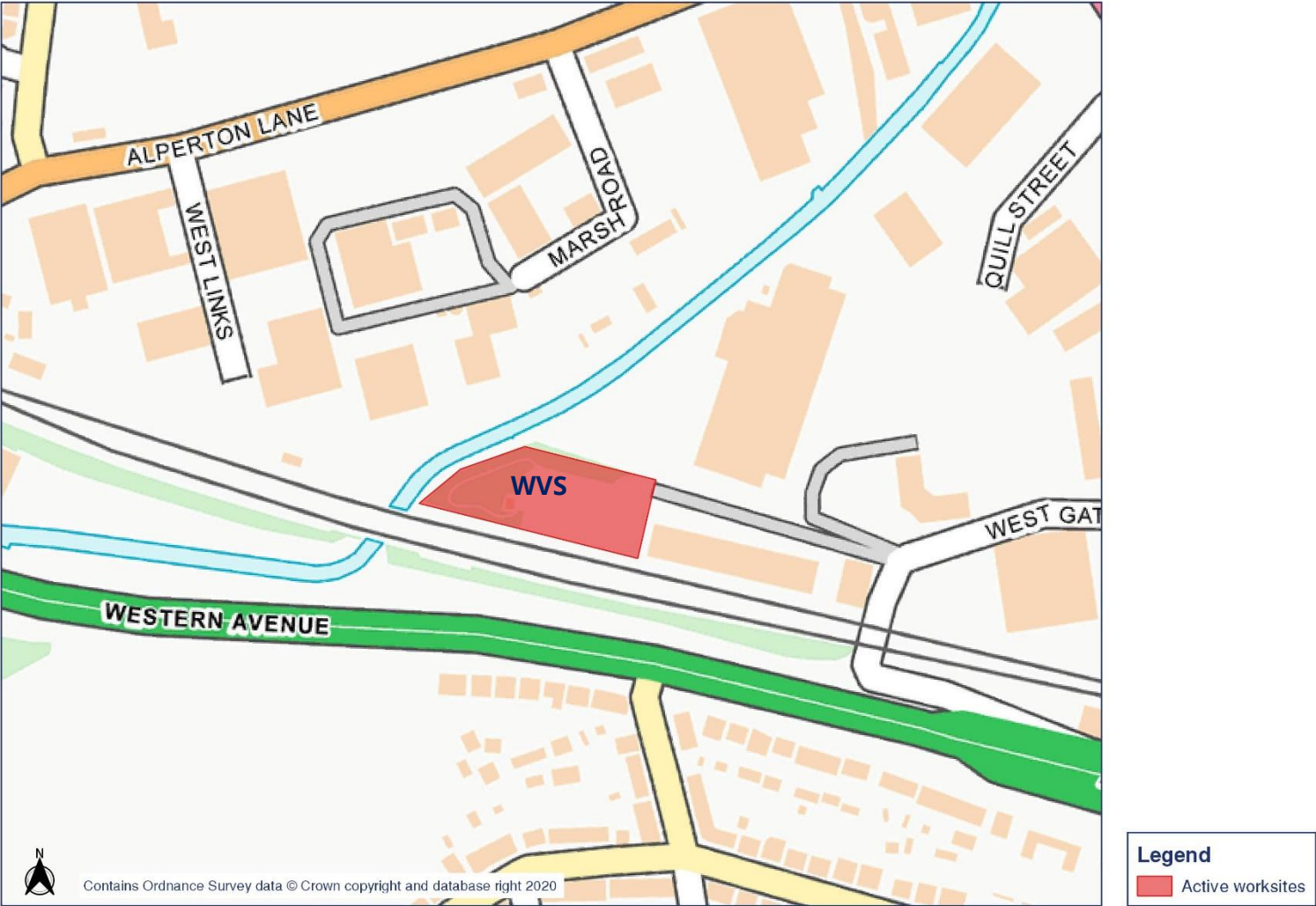
Appendix A Site Locations

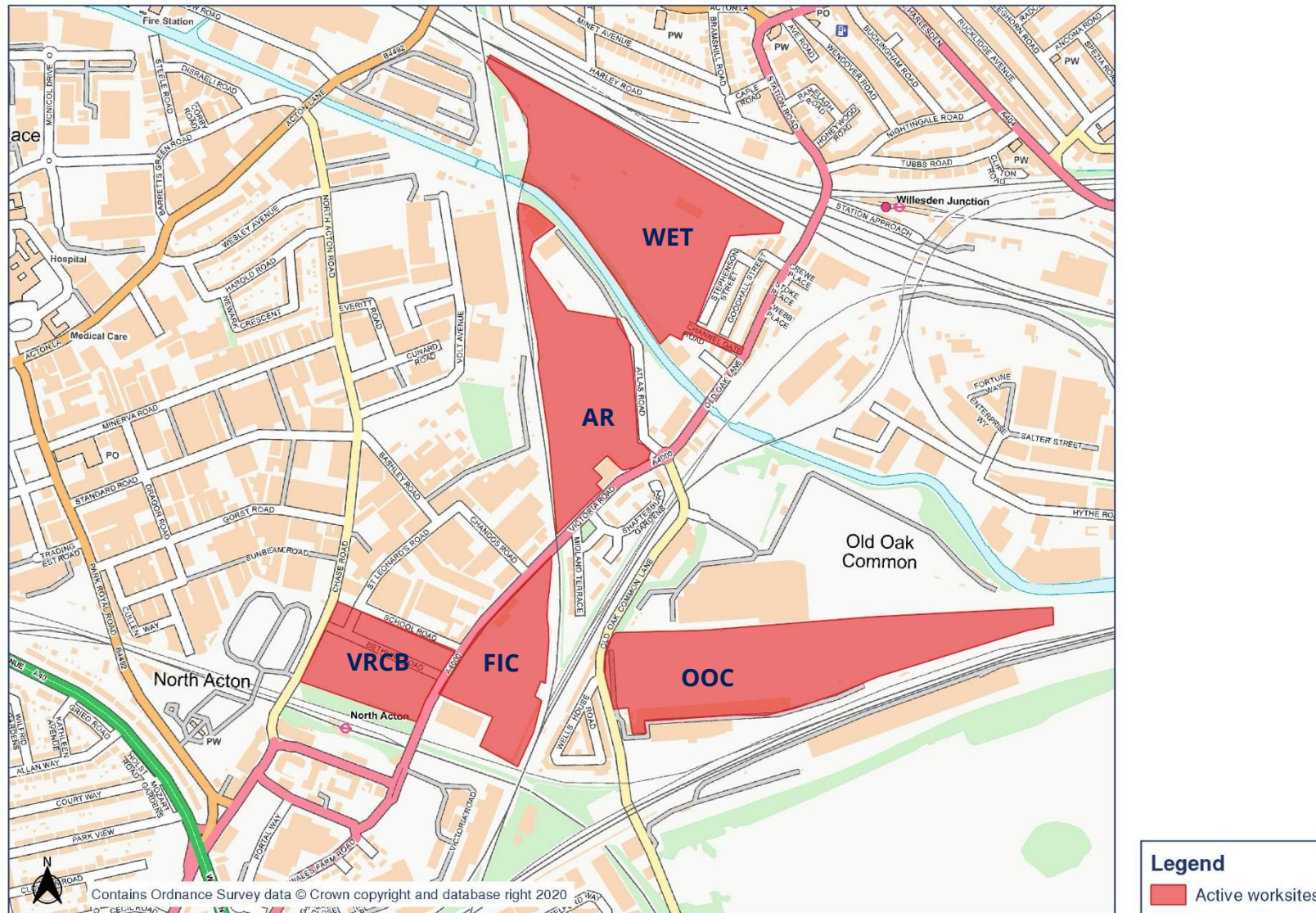


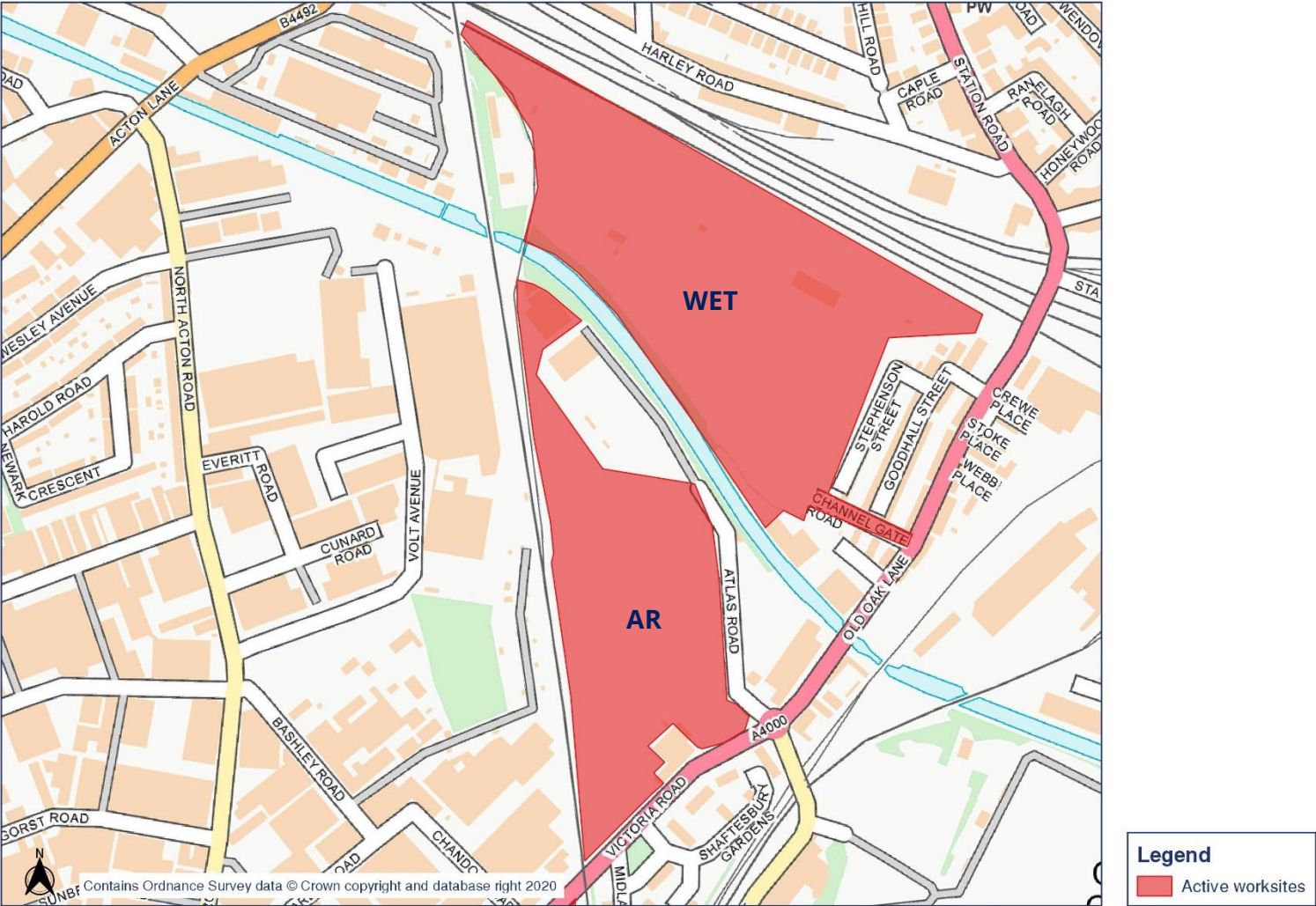
Legend
Active worksites

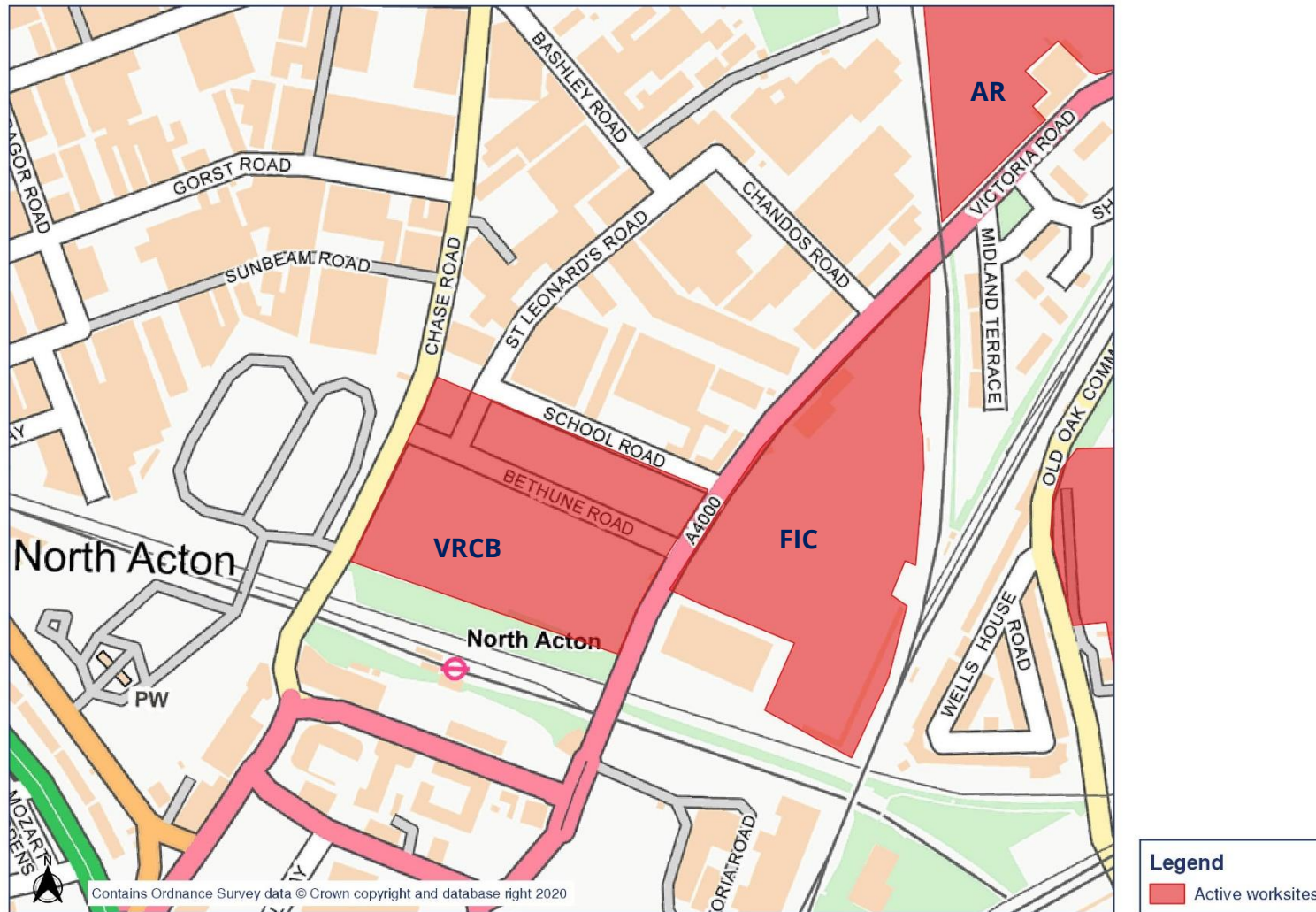








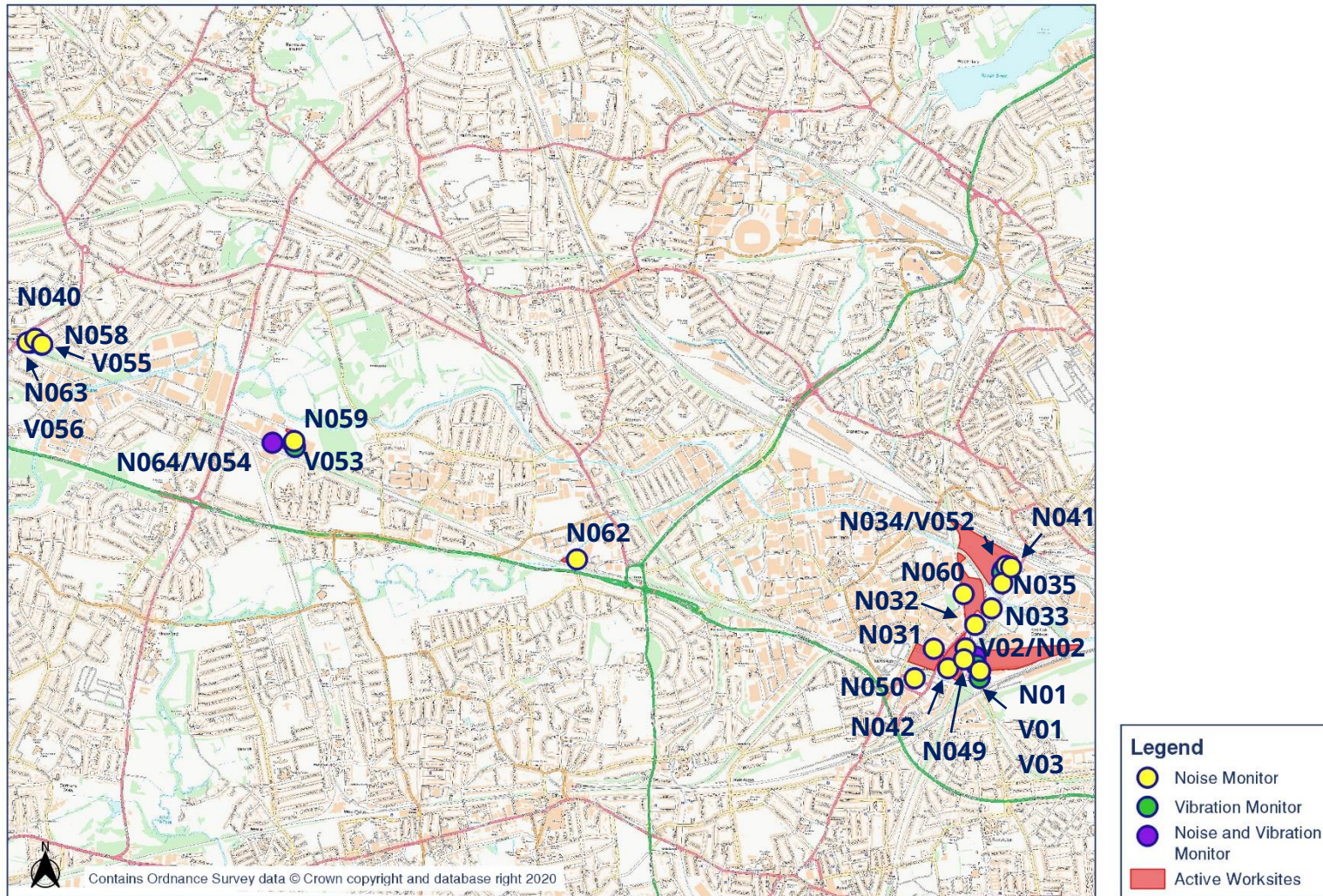


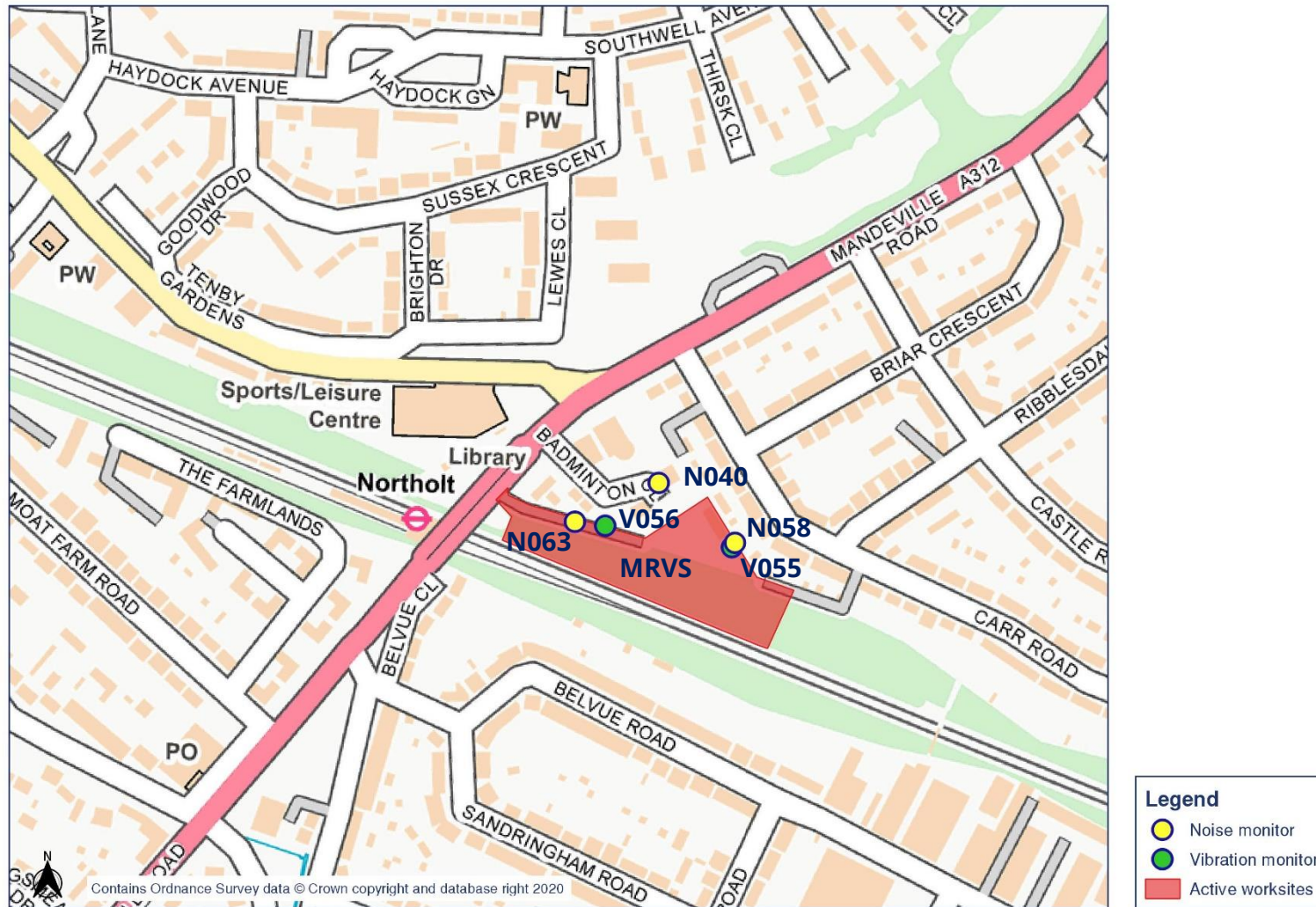


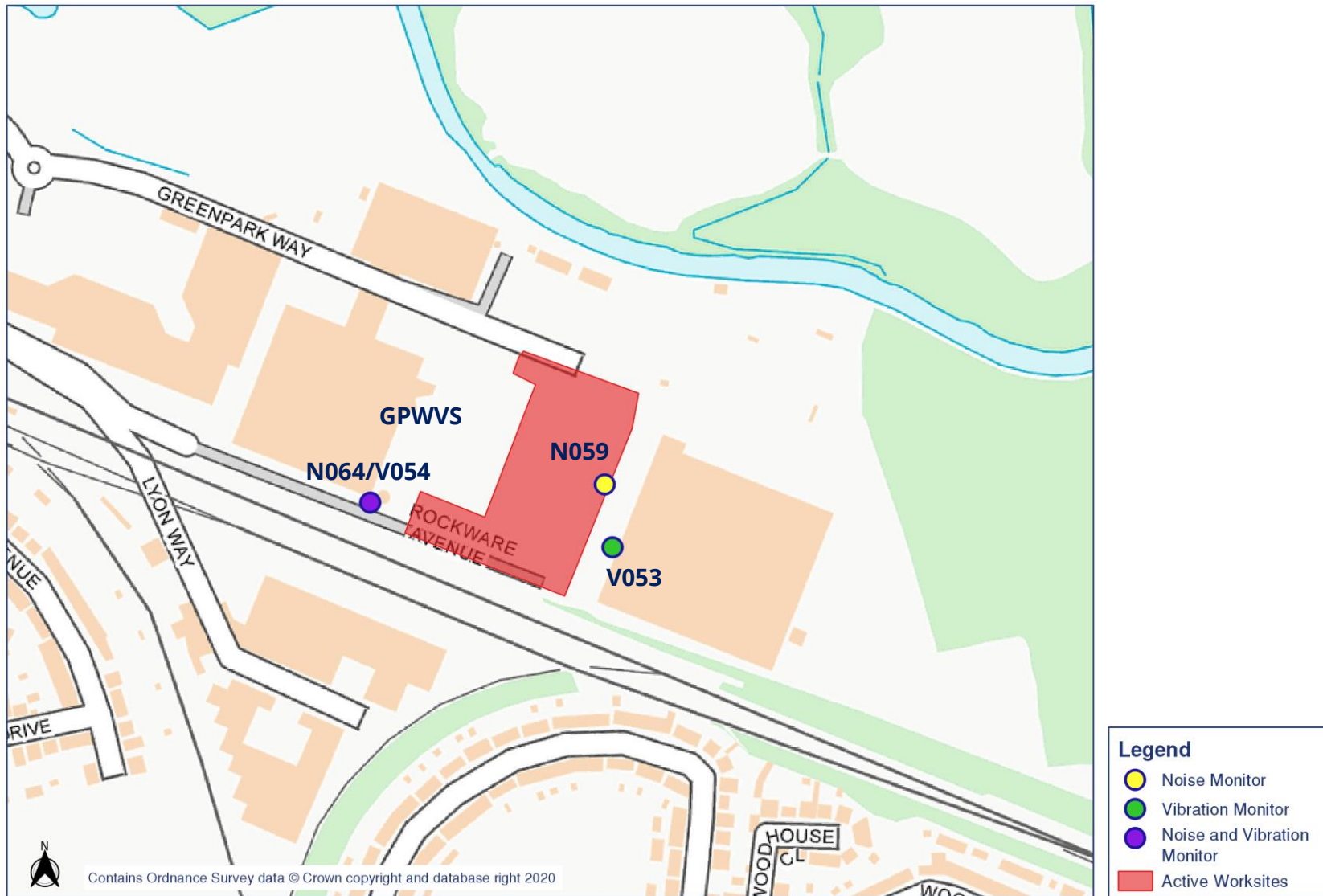


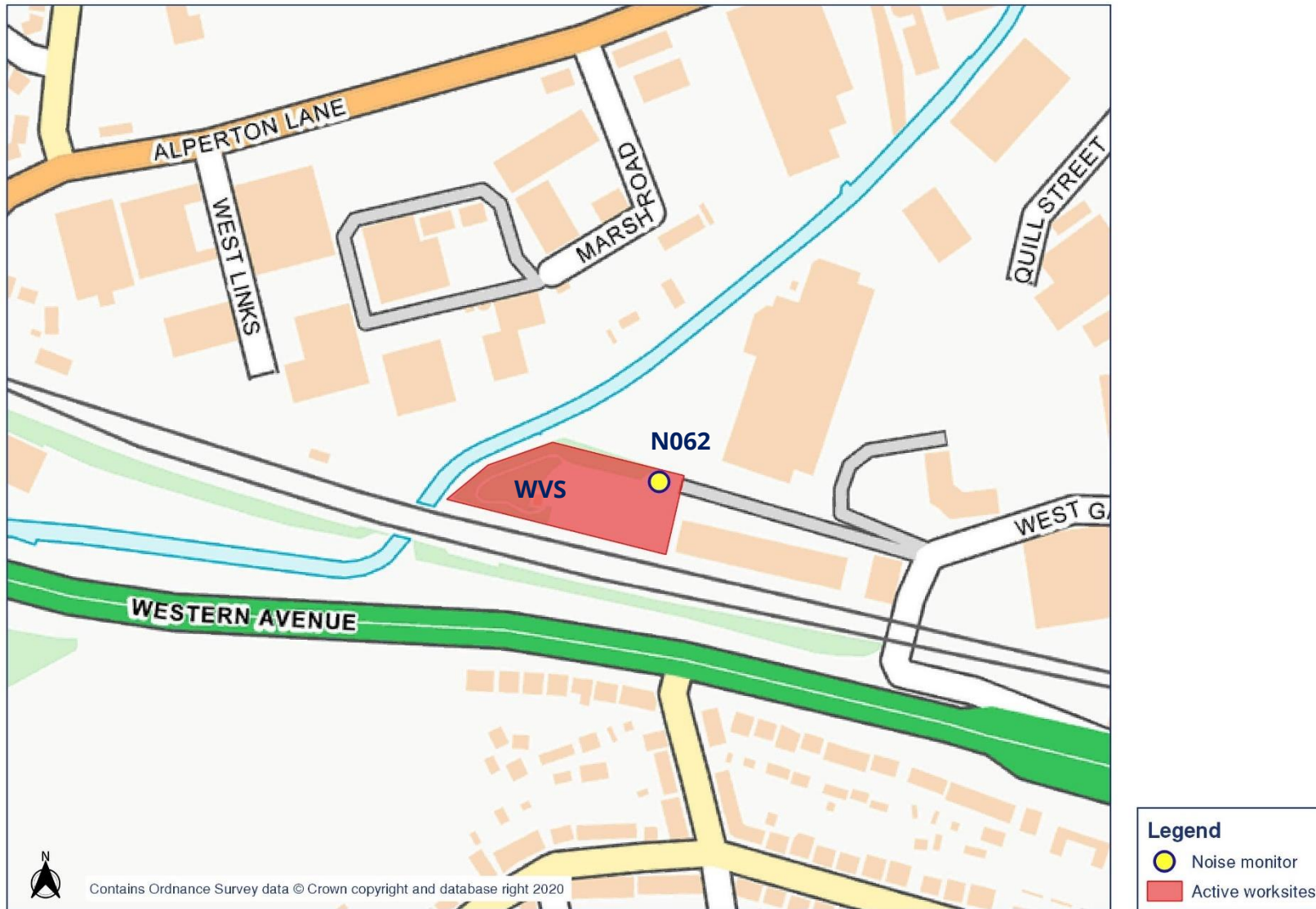
Appendix B Monitoring Locations

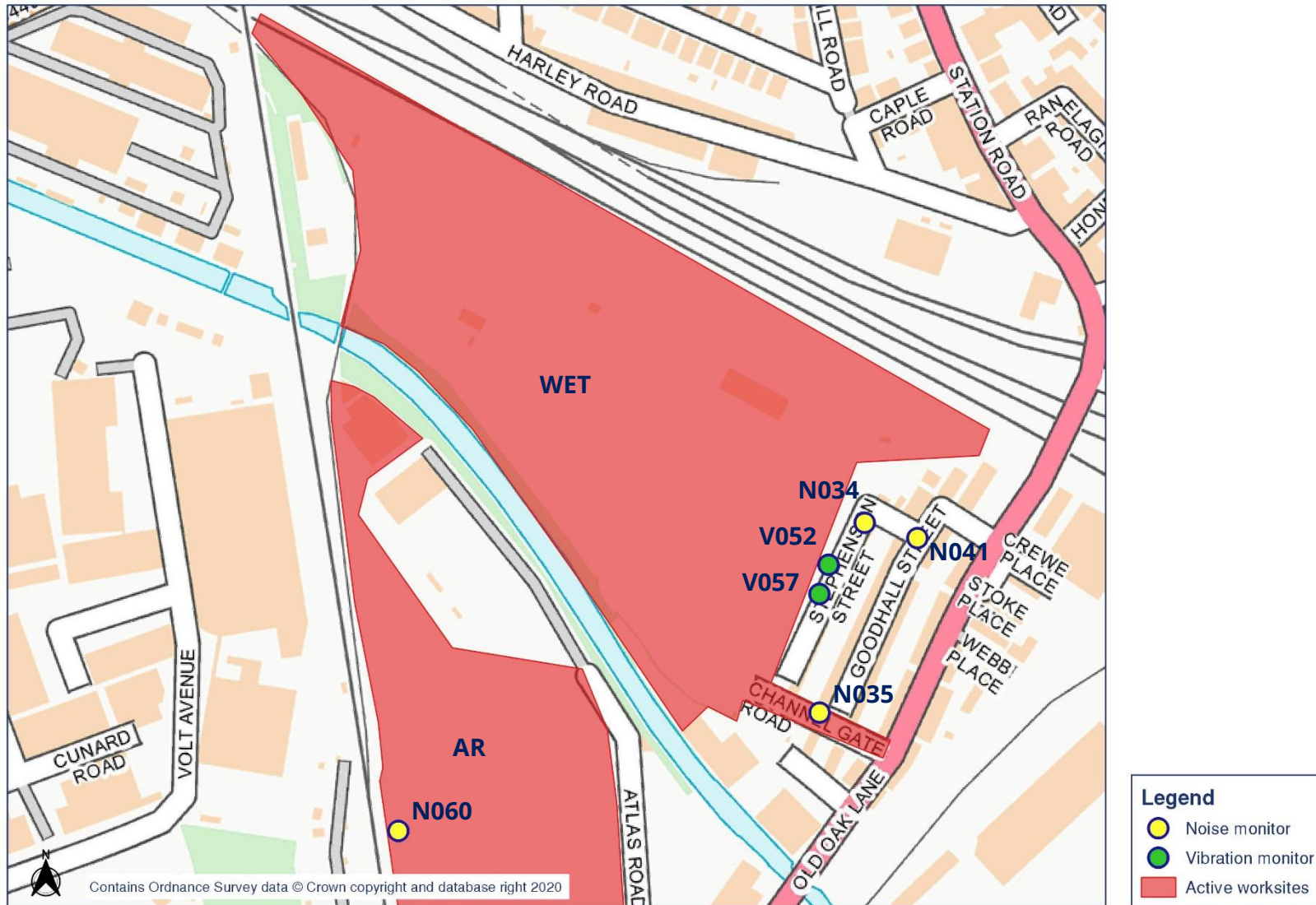
HS2 Noise and vibration monitoring plan - Overview

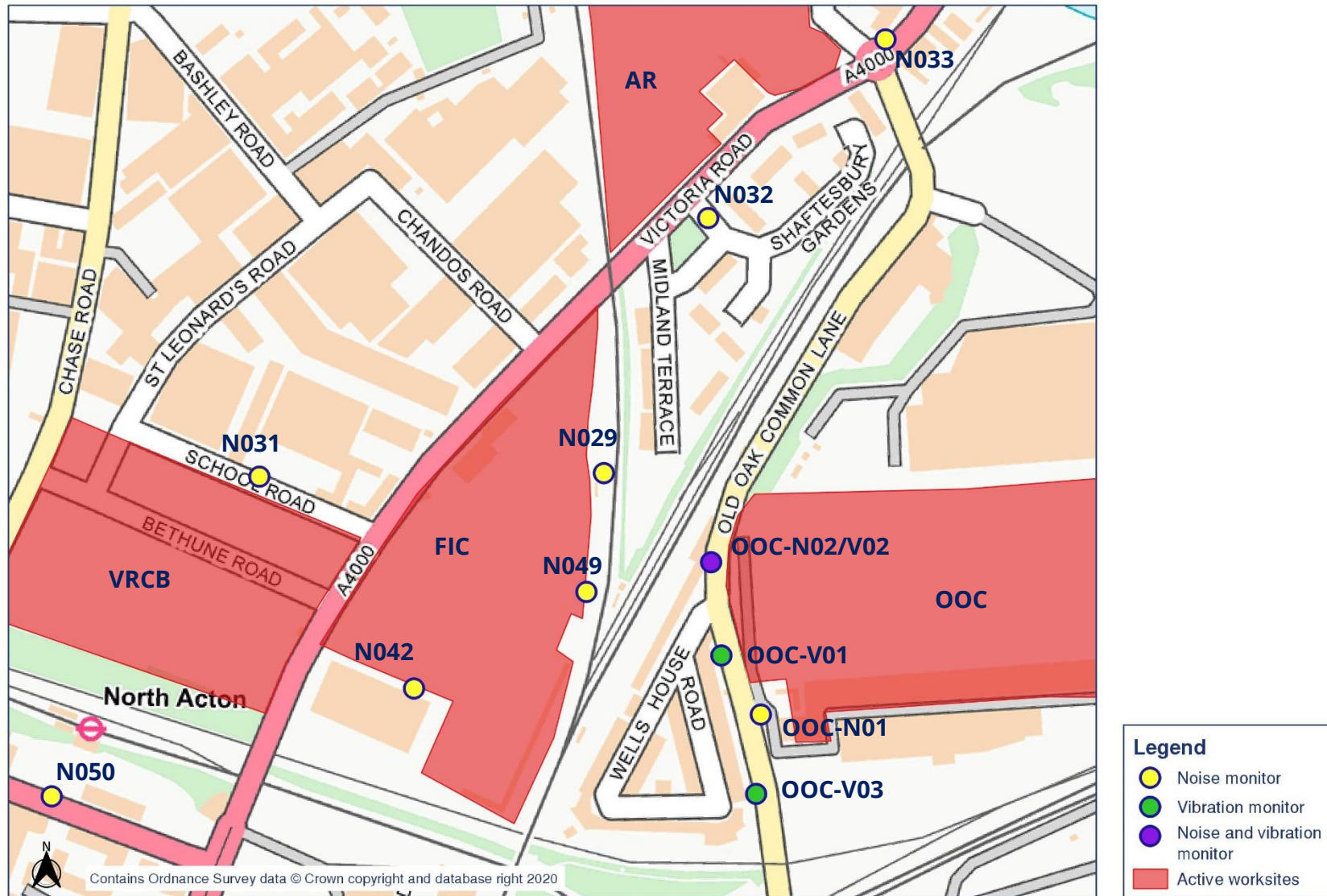










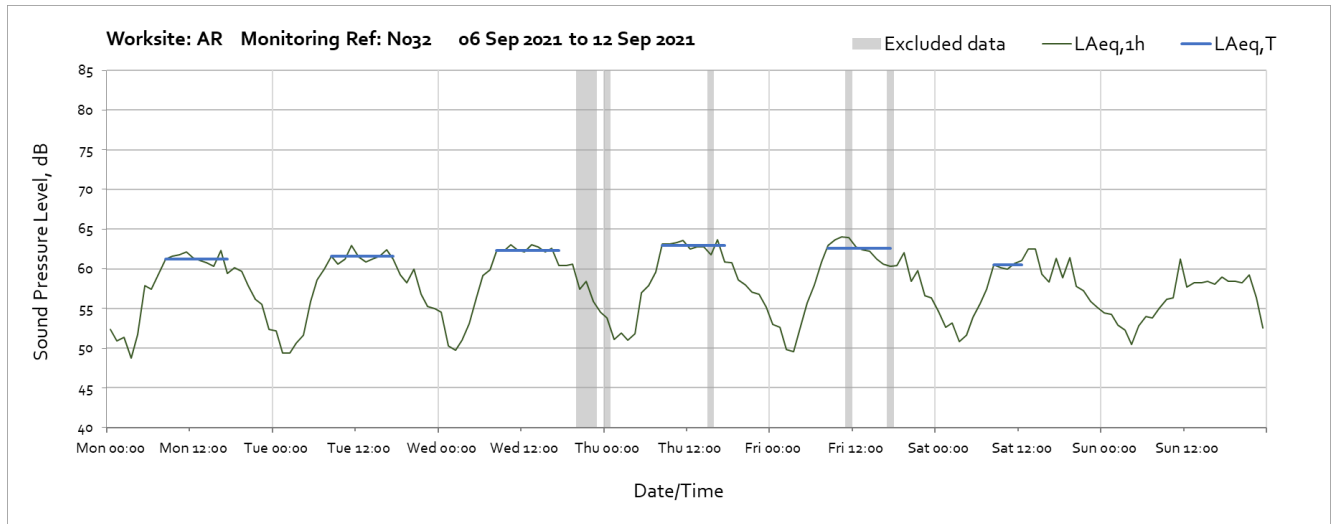
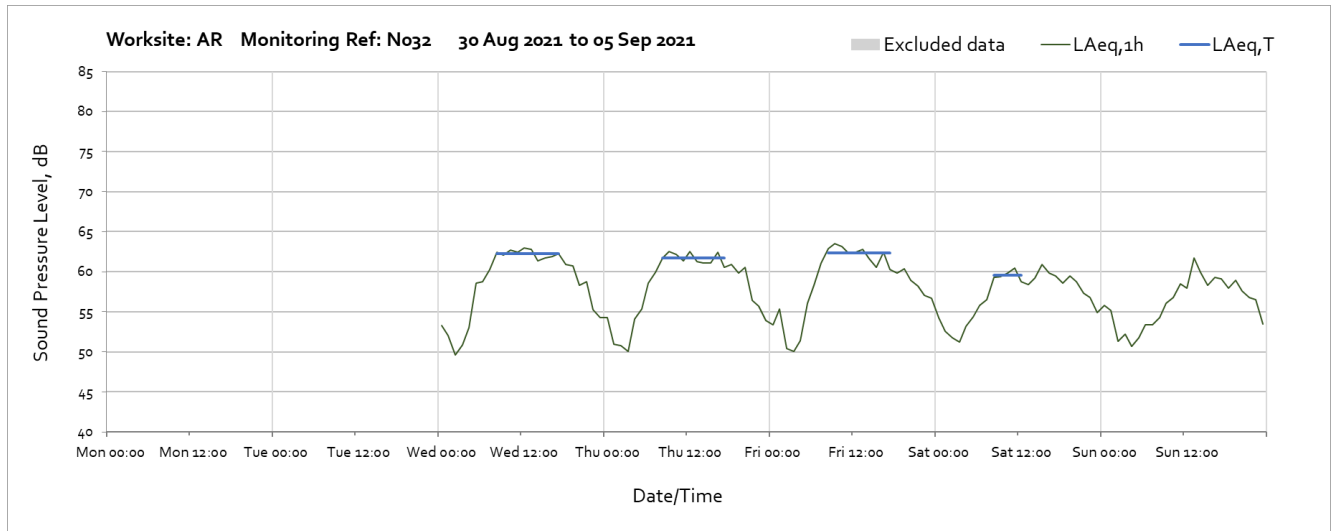


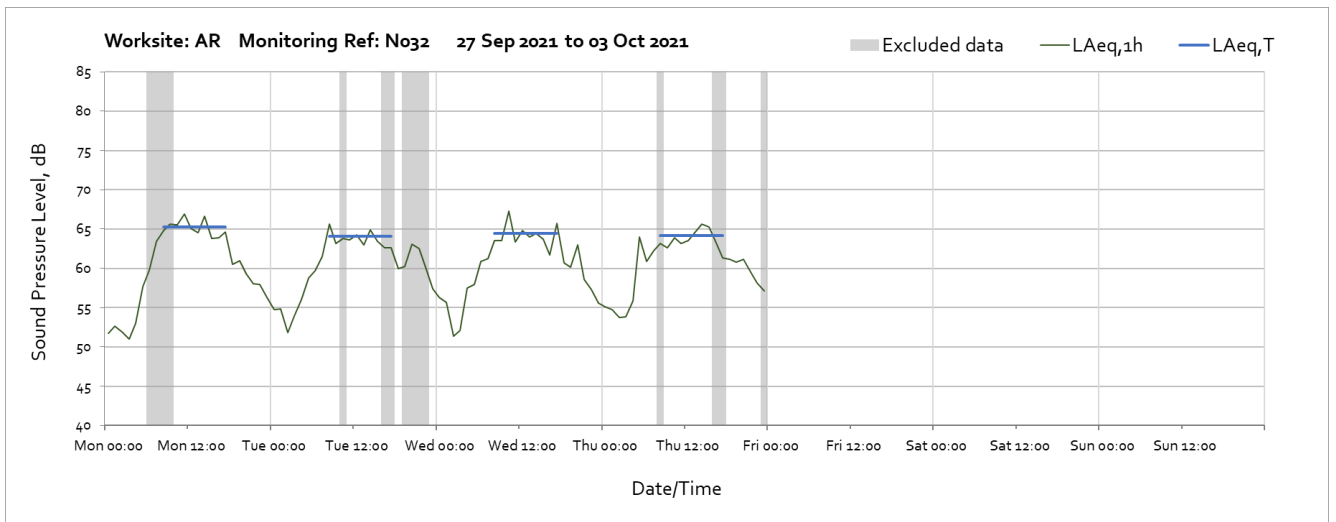
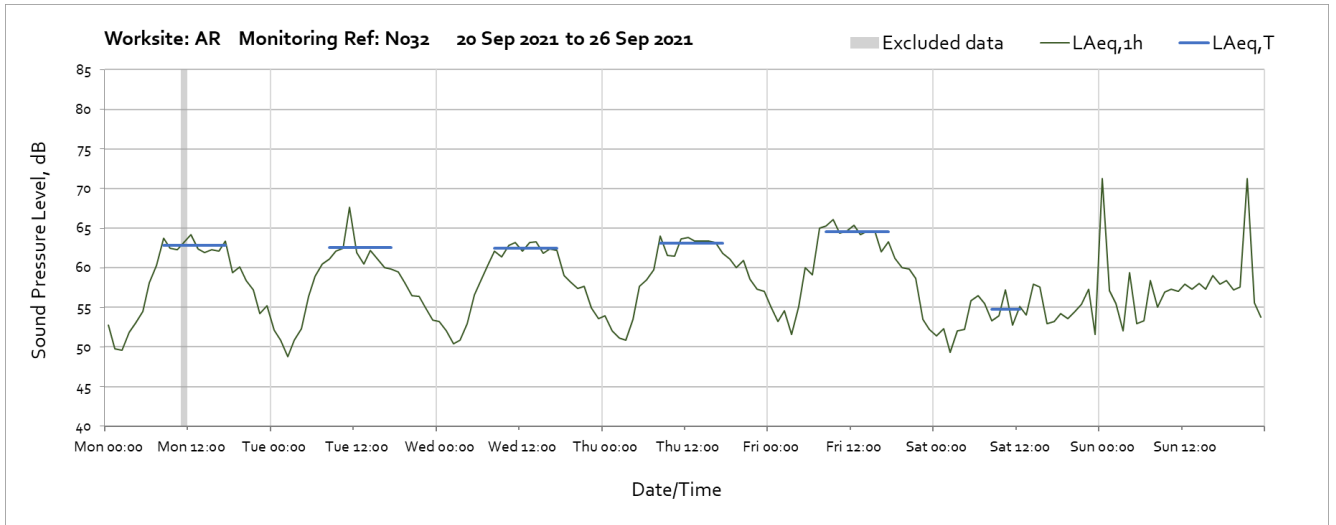
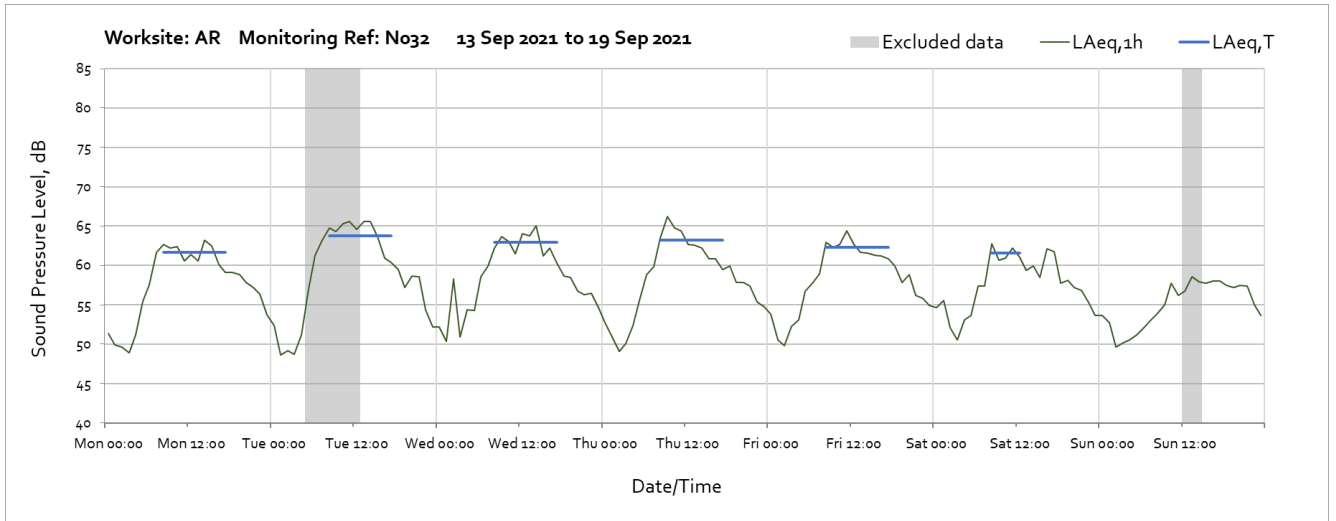
Appendix C Data

Noise

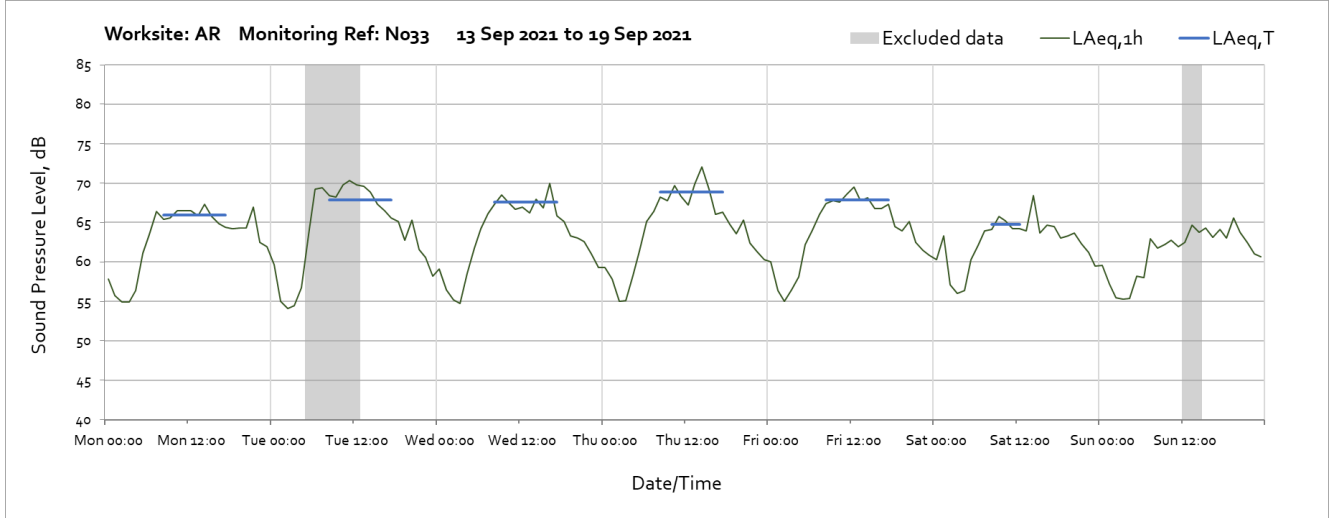
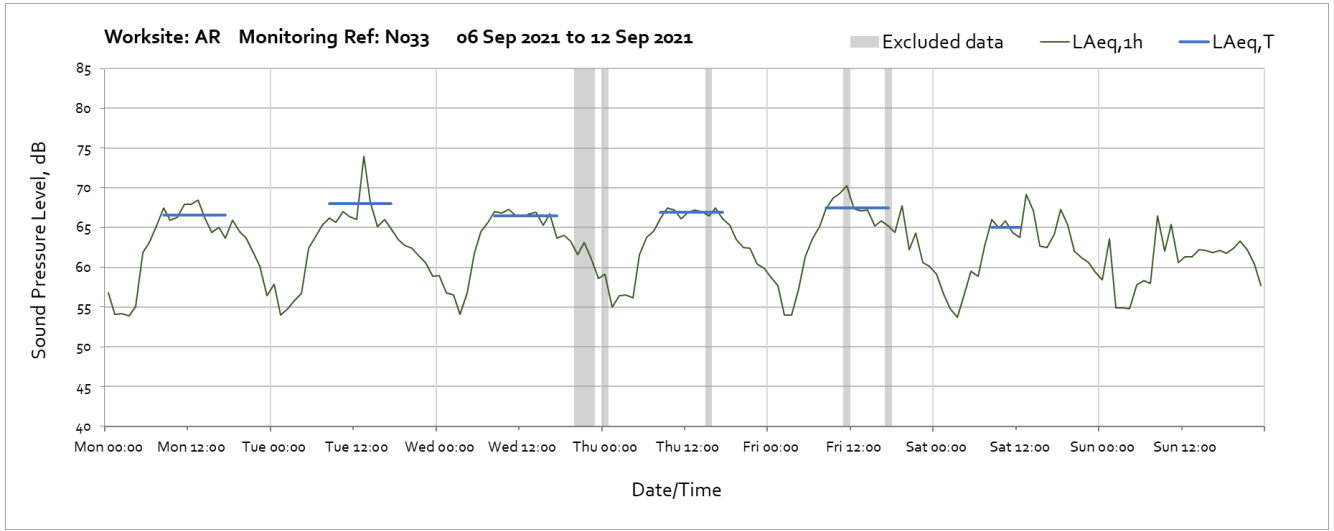
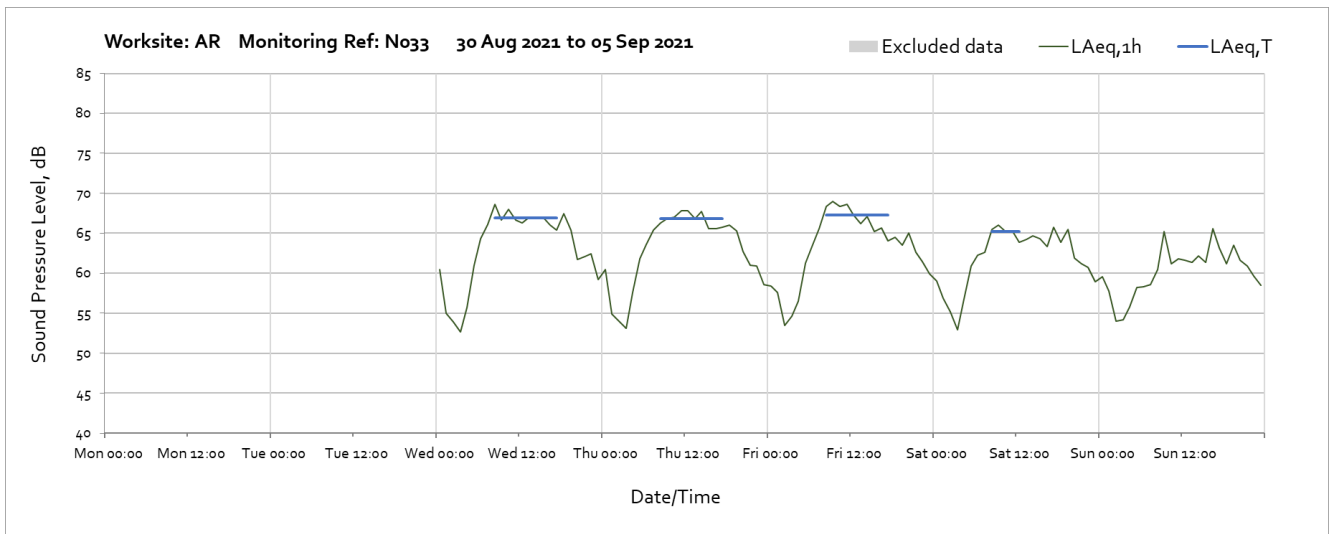
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

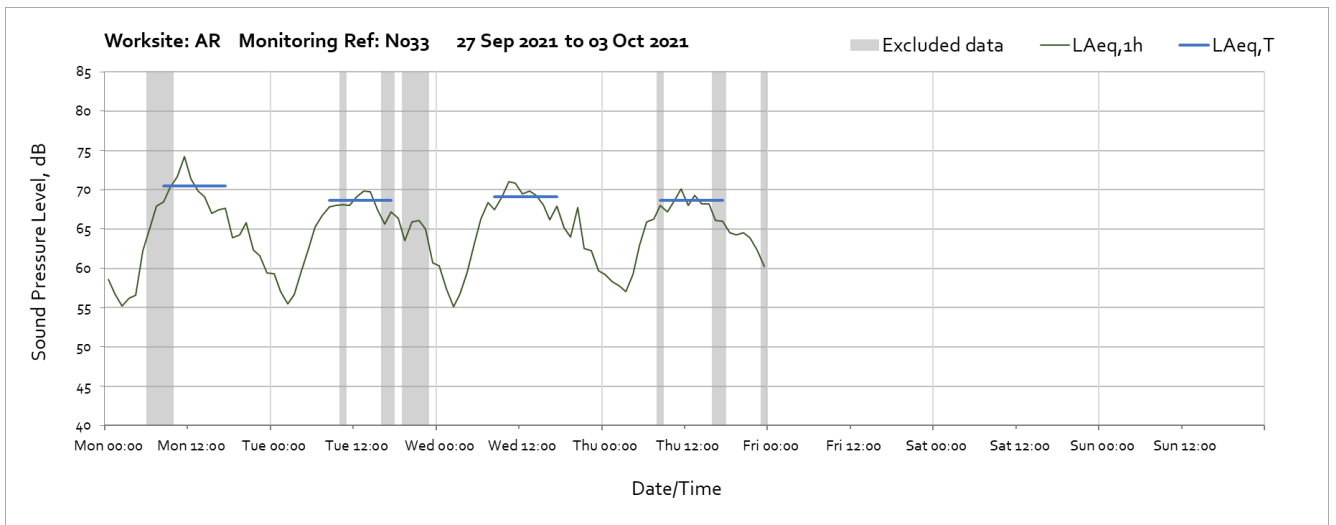
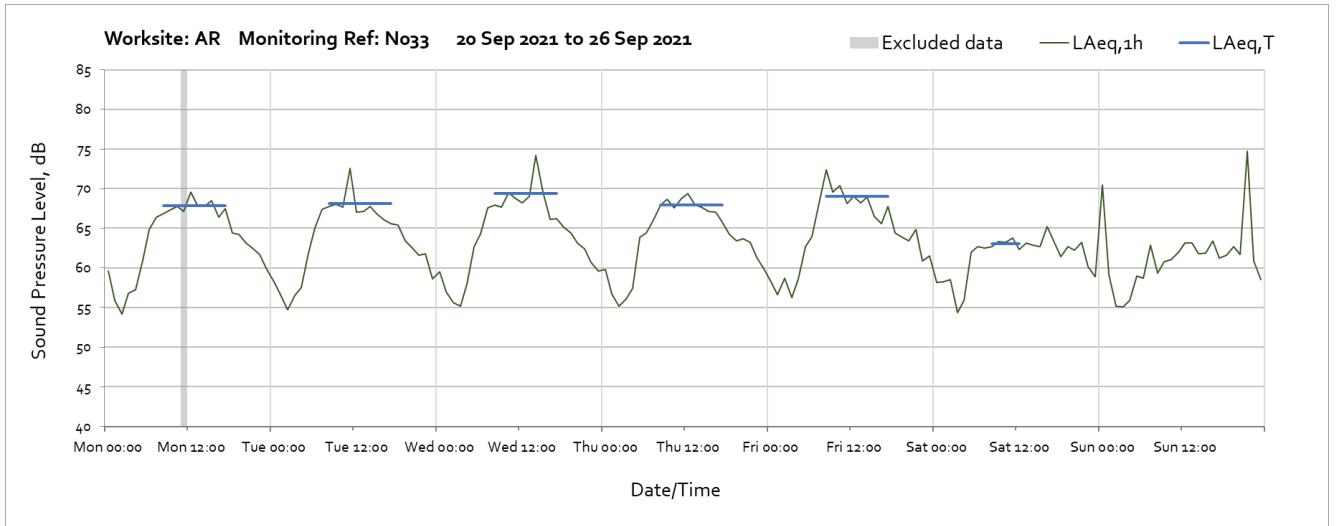
Worksite: Atlas Road worksite (AR) – Monitoring Ref: N032



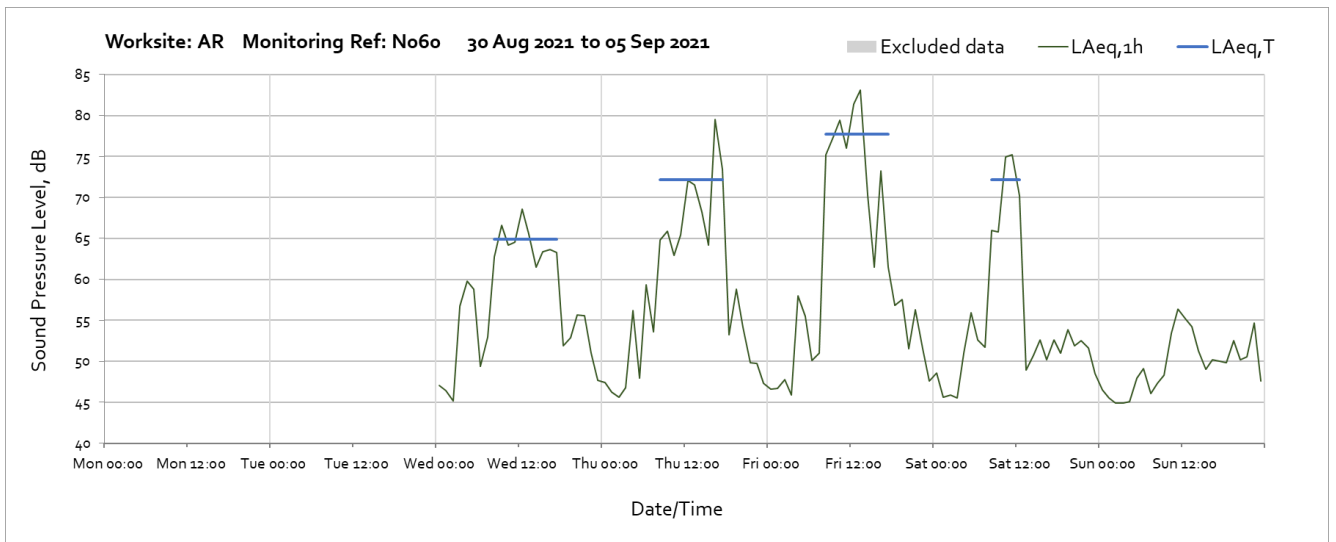


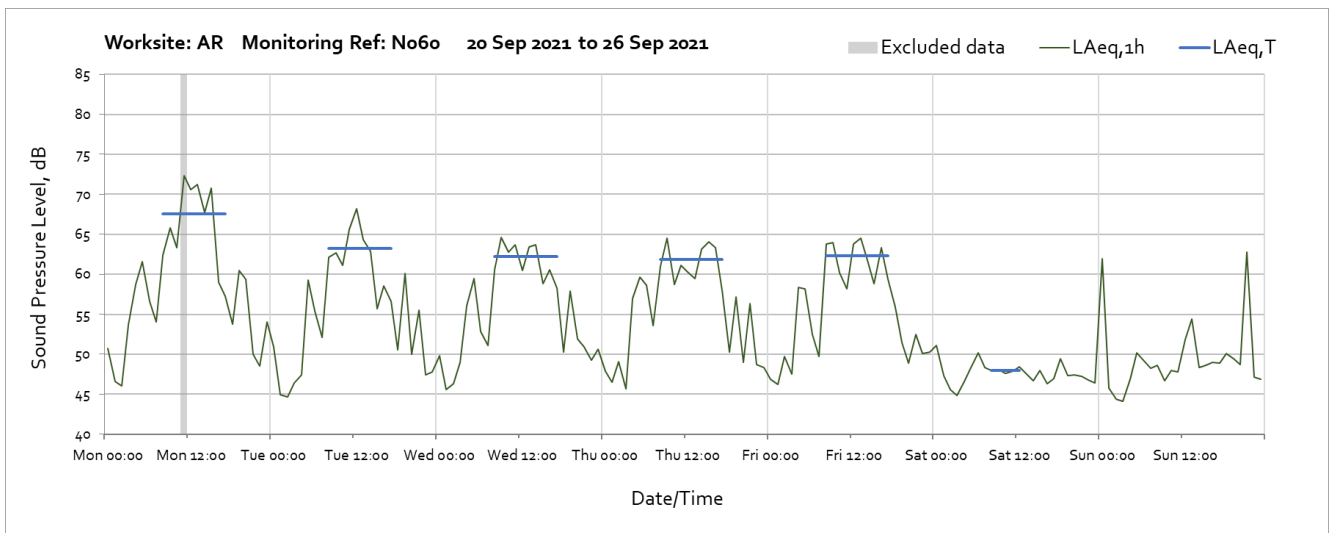
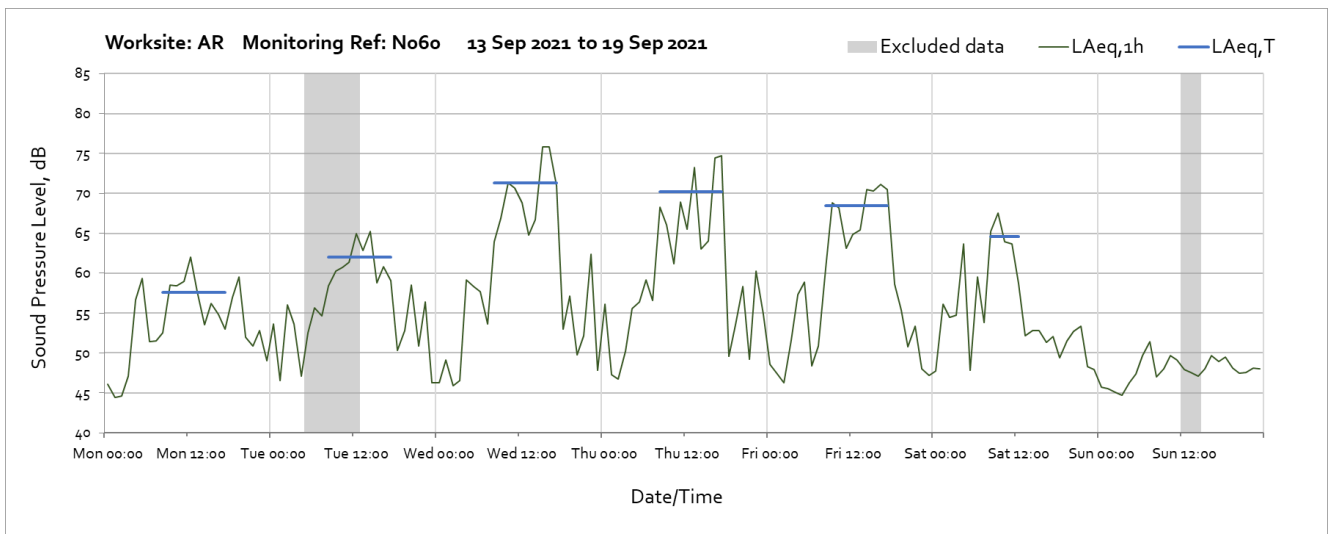
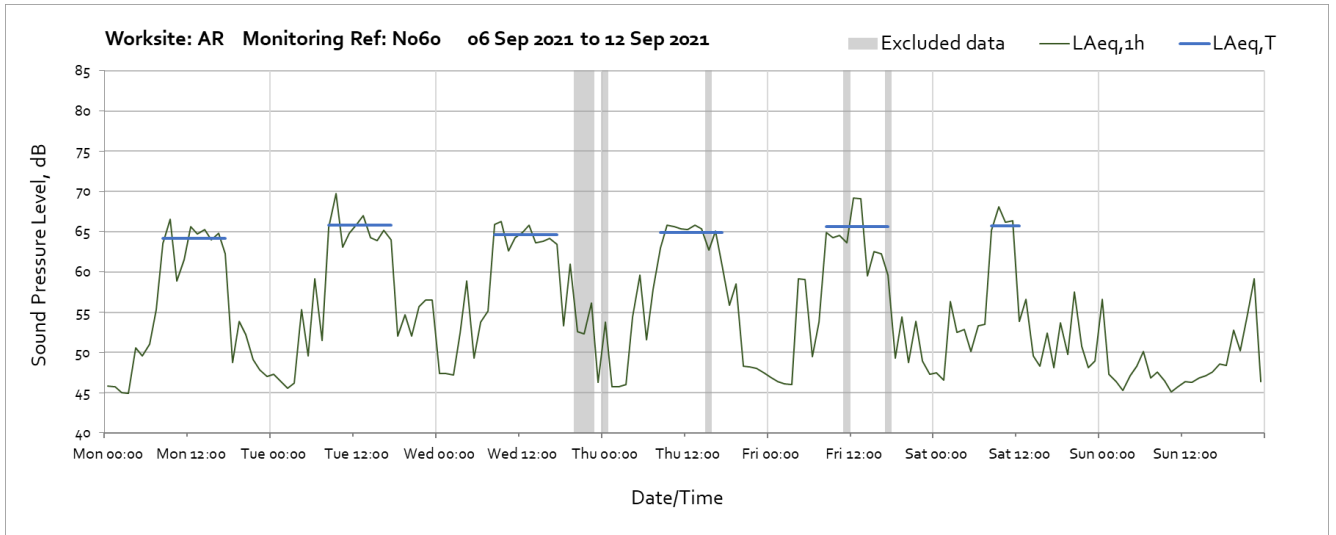
Worksite: Atlas Road worksite (AR) – Monitoring Ref: N033

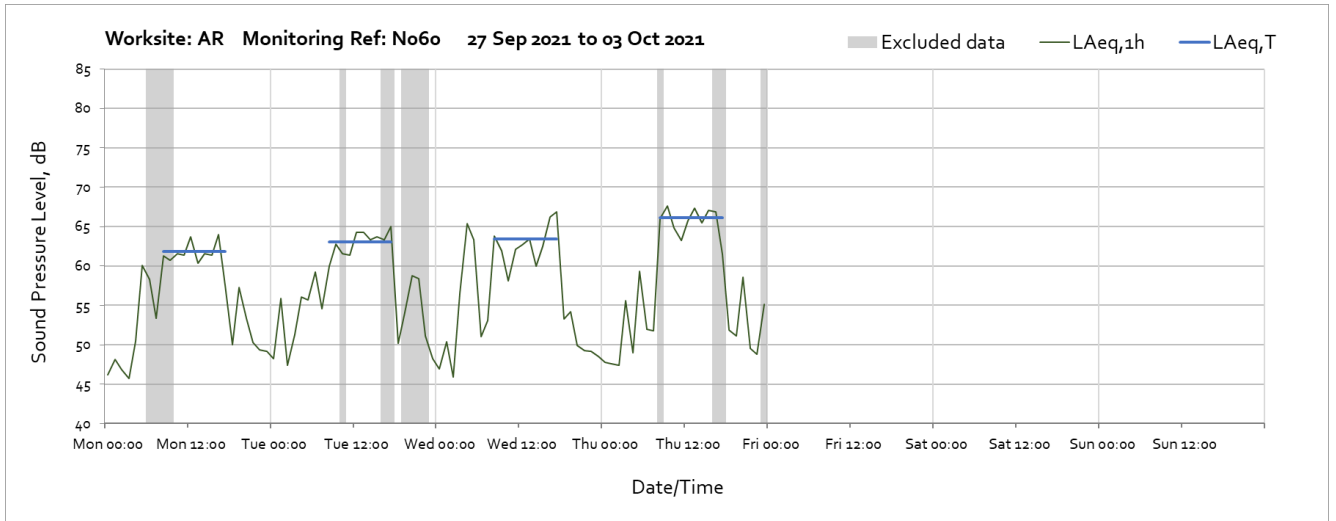




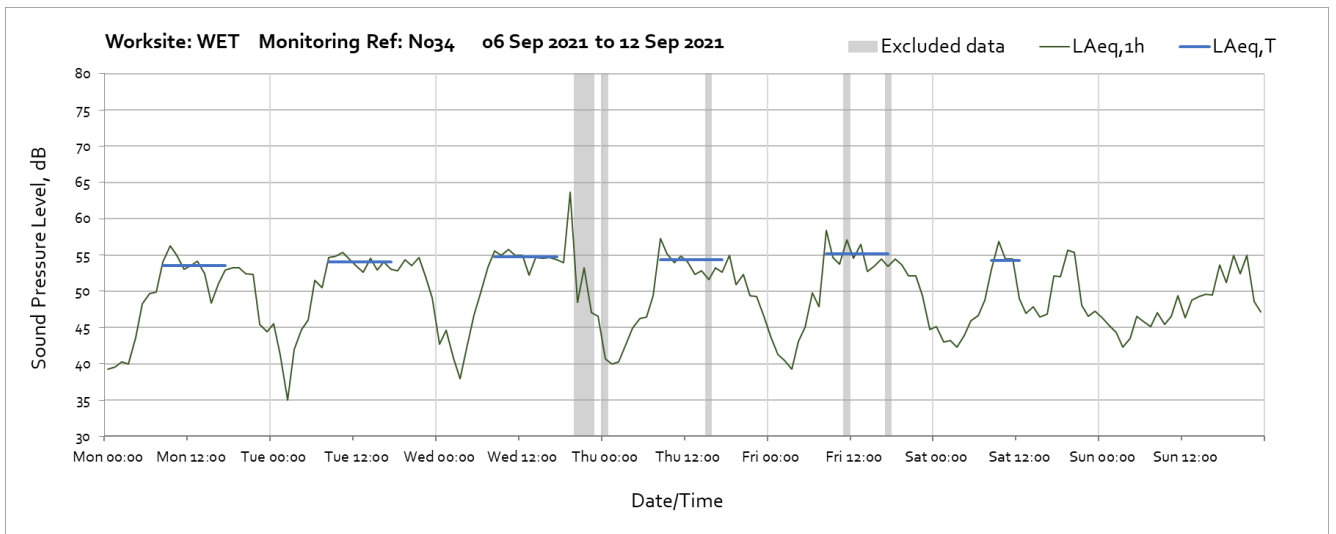
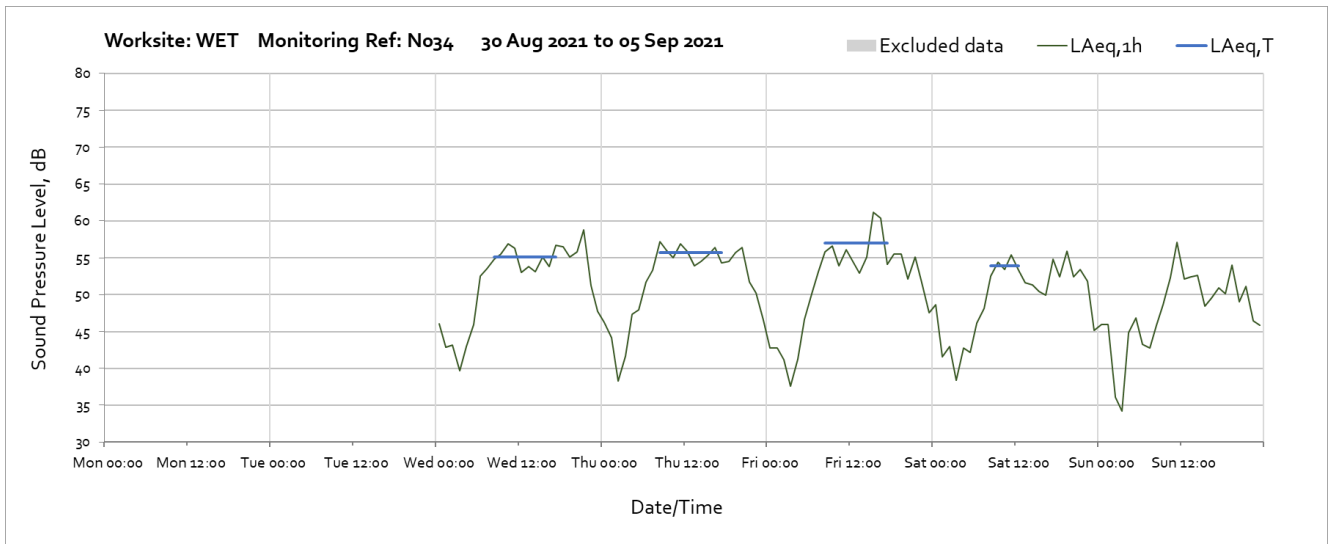
Worksite: Atlas Road worksite (AR) - Monitoring Ref: N060

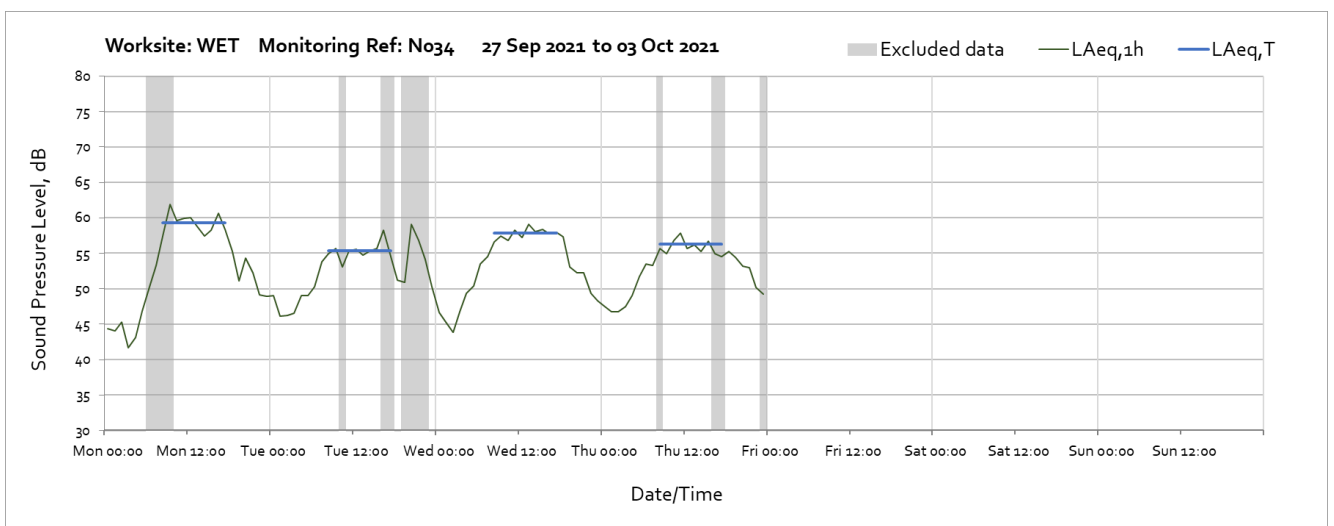
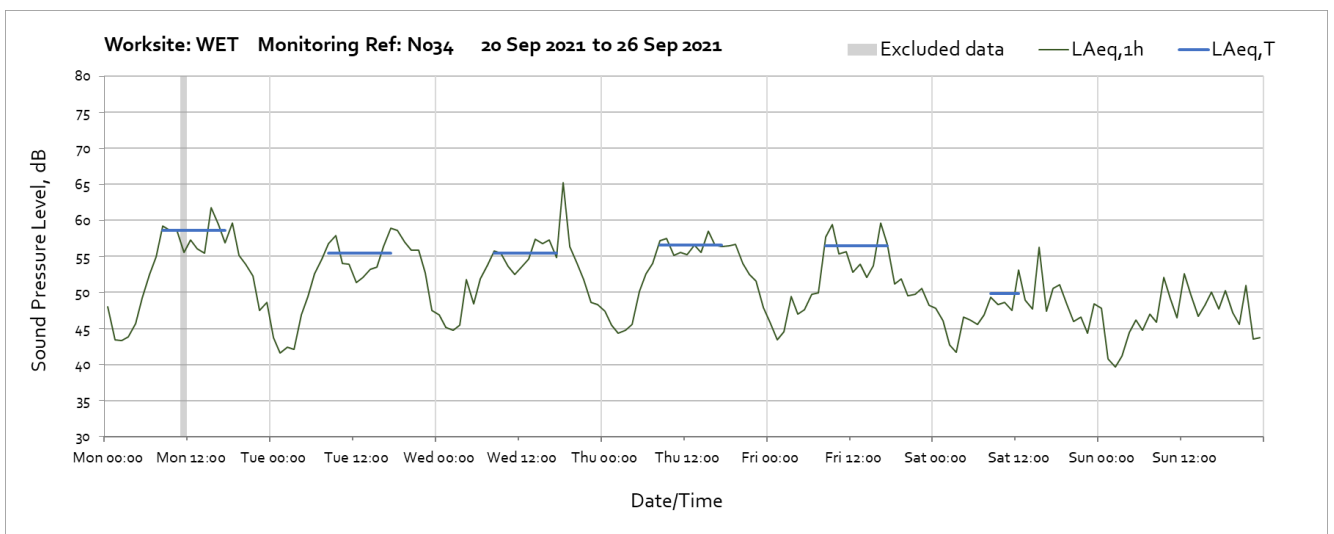
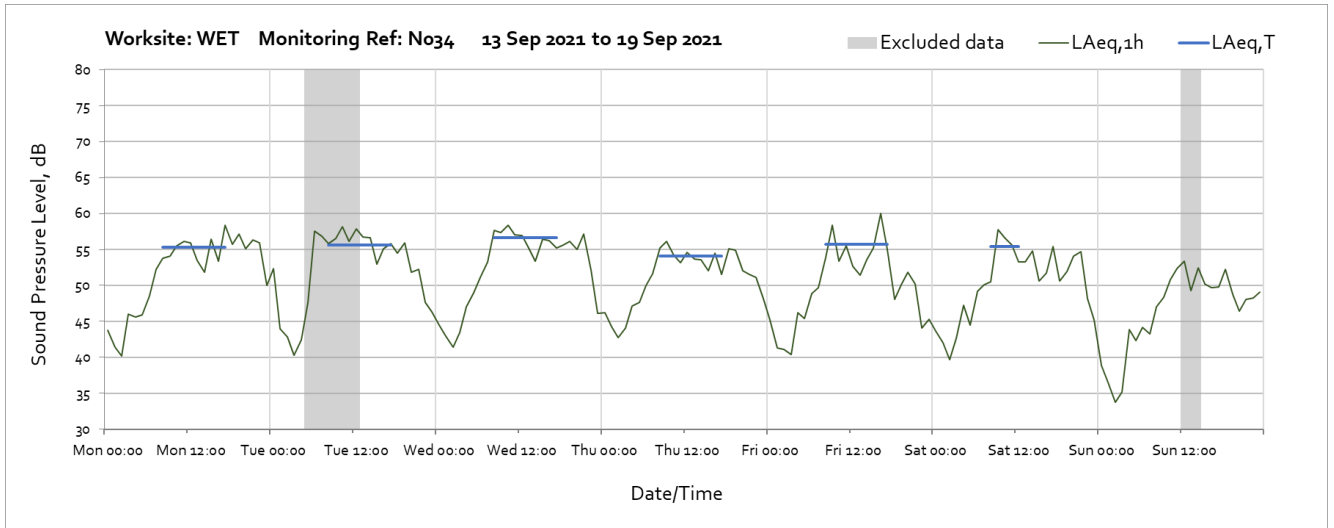




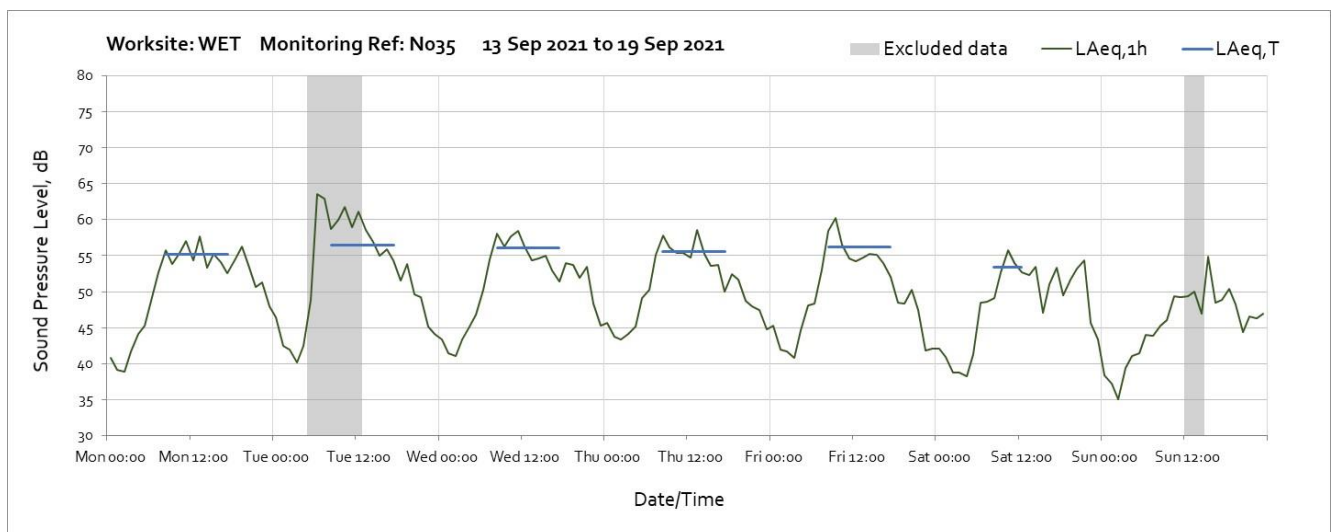
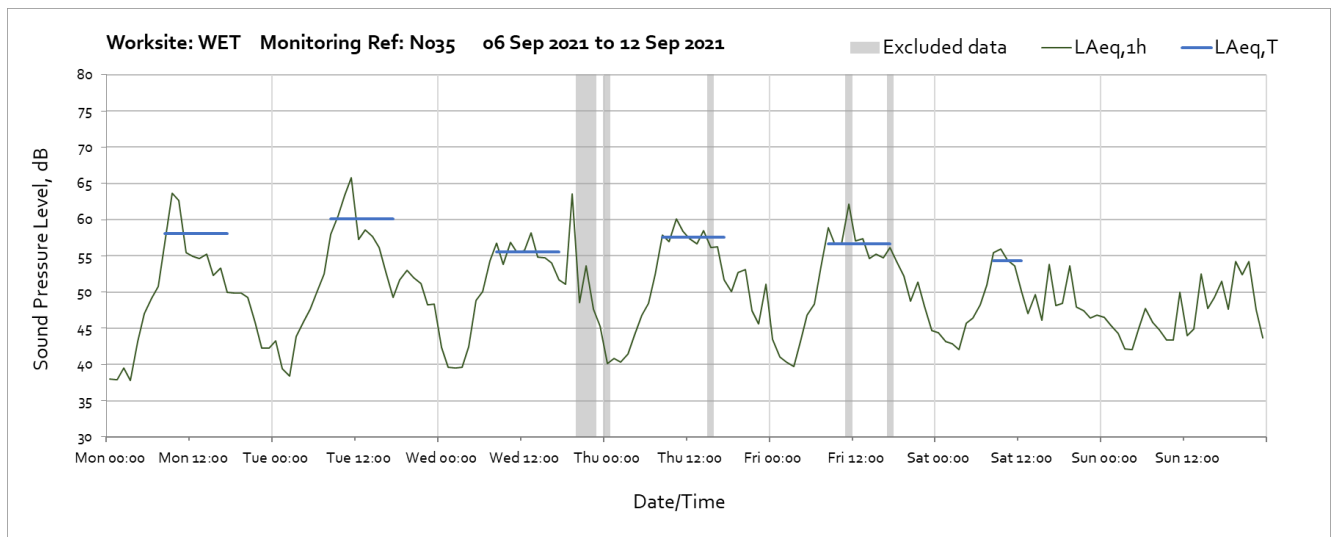


Worksite: Willesden Euro Terminal (WET) - Monitoring Ref: N034

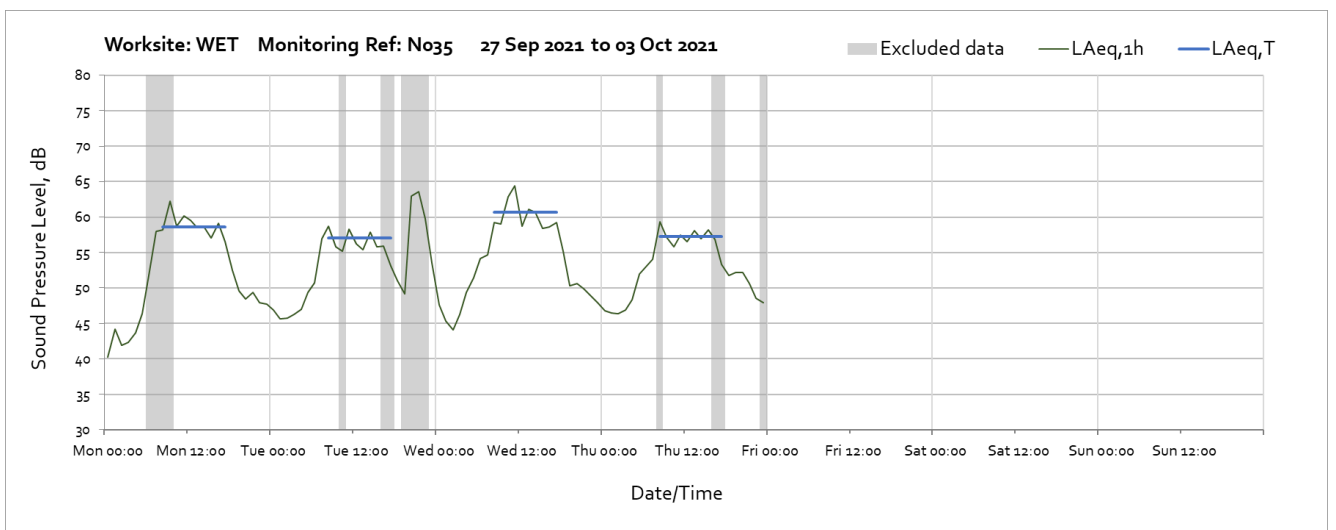
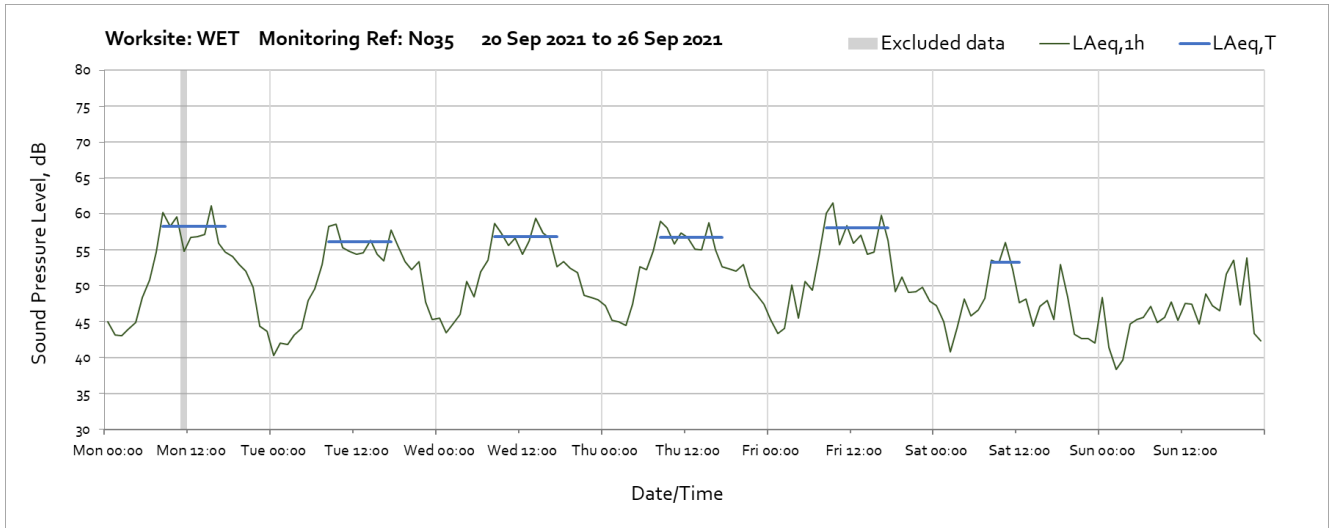




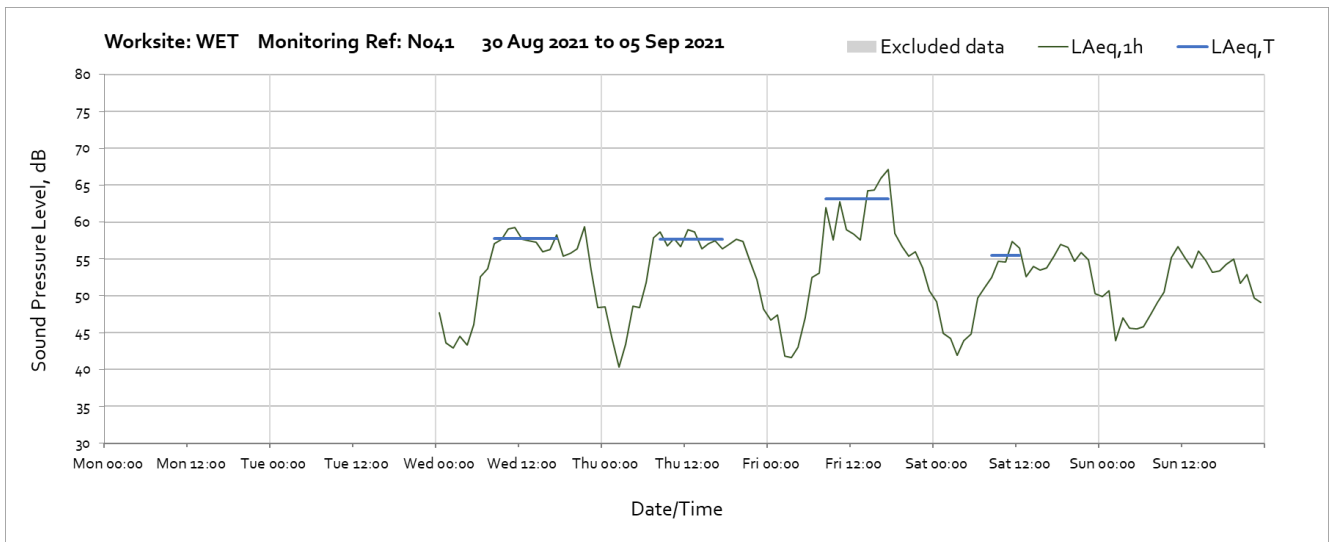
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: N035

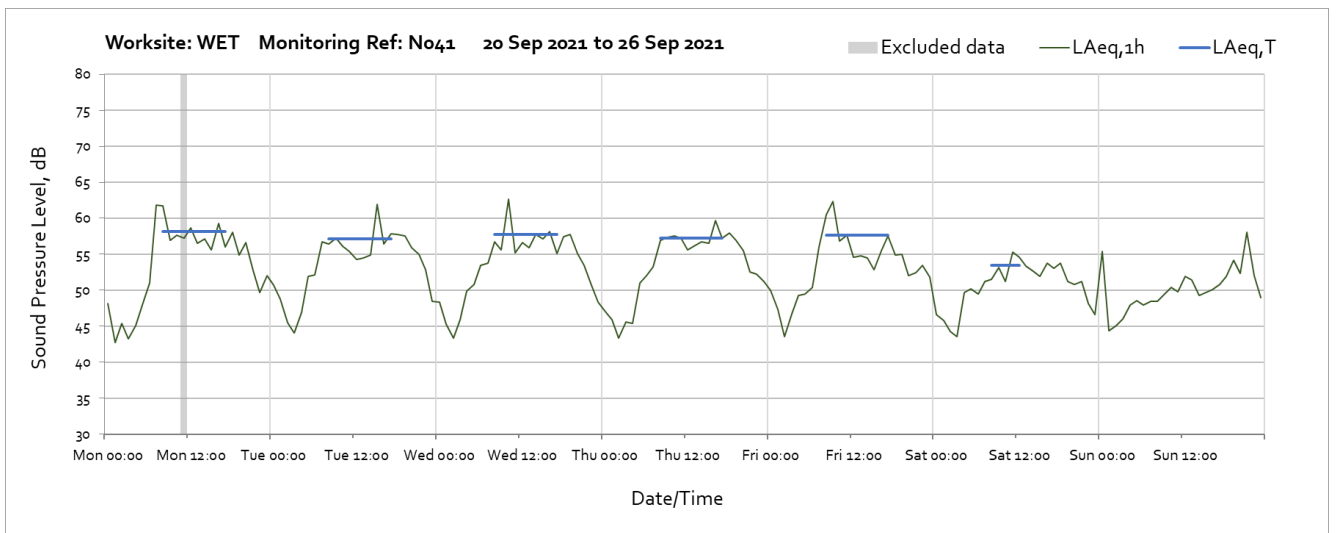
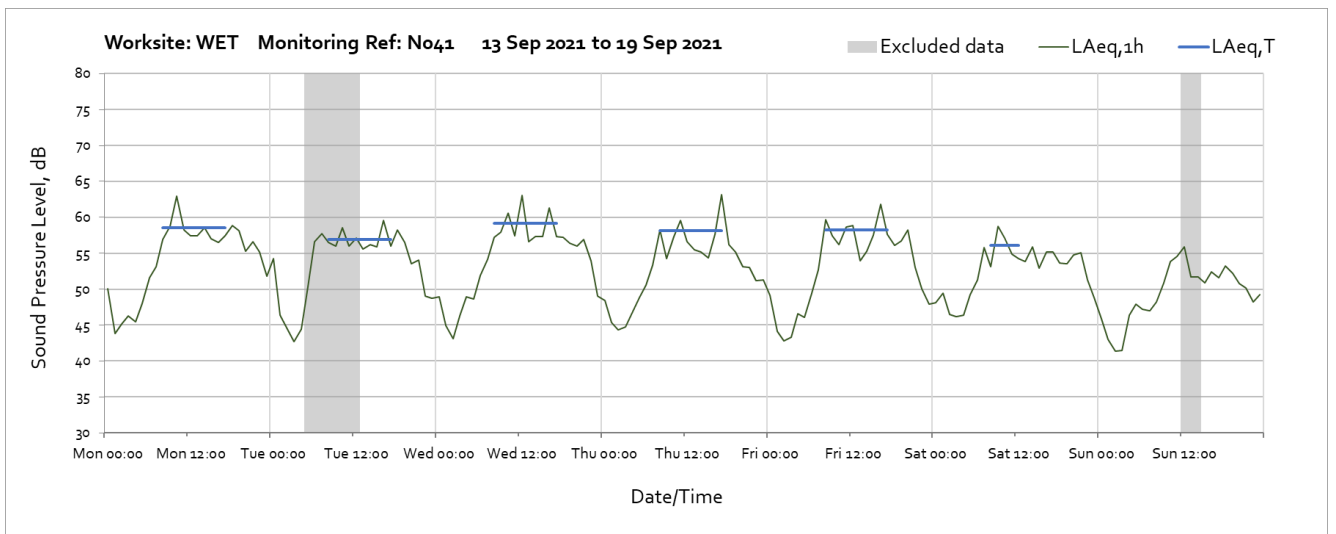
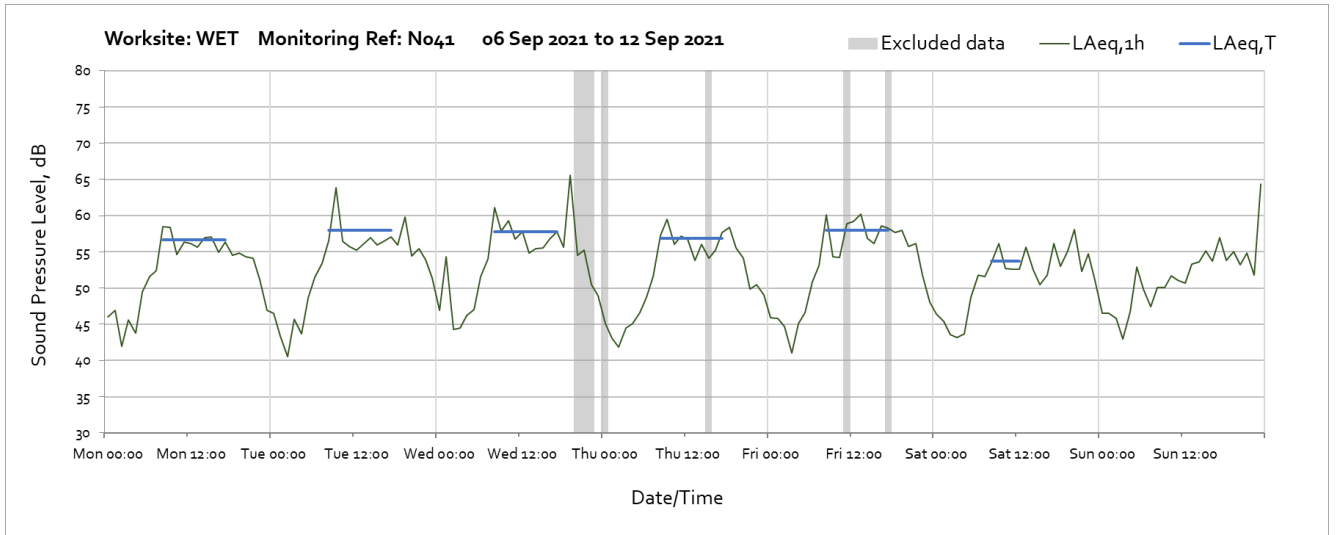


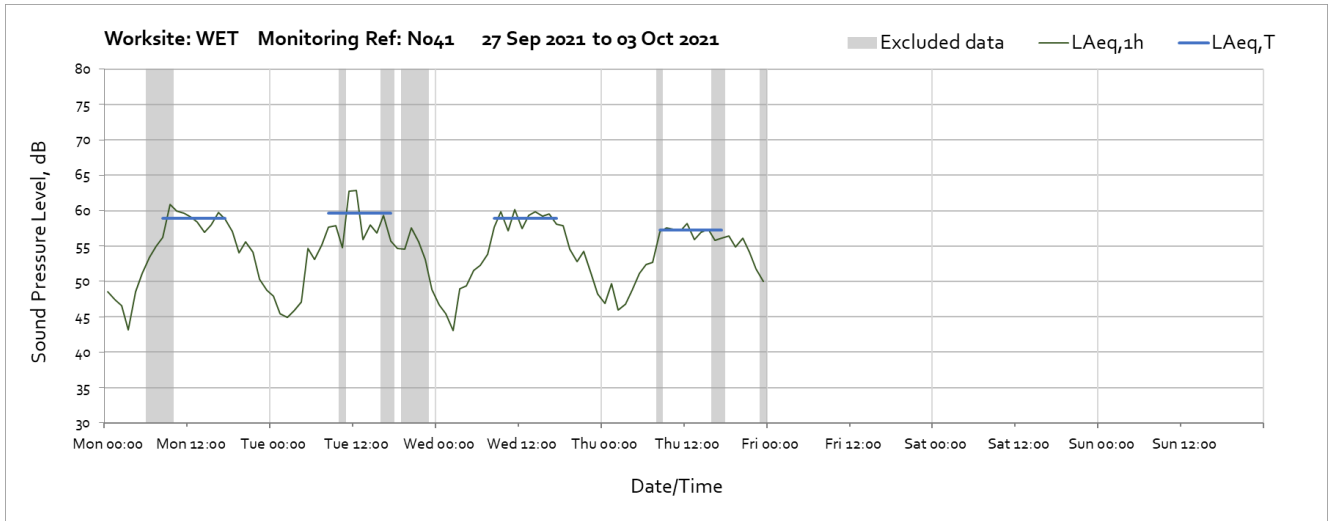
OFFICIAL



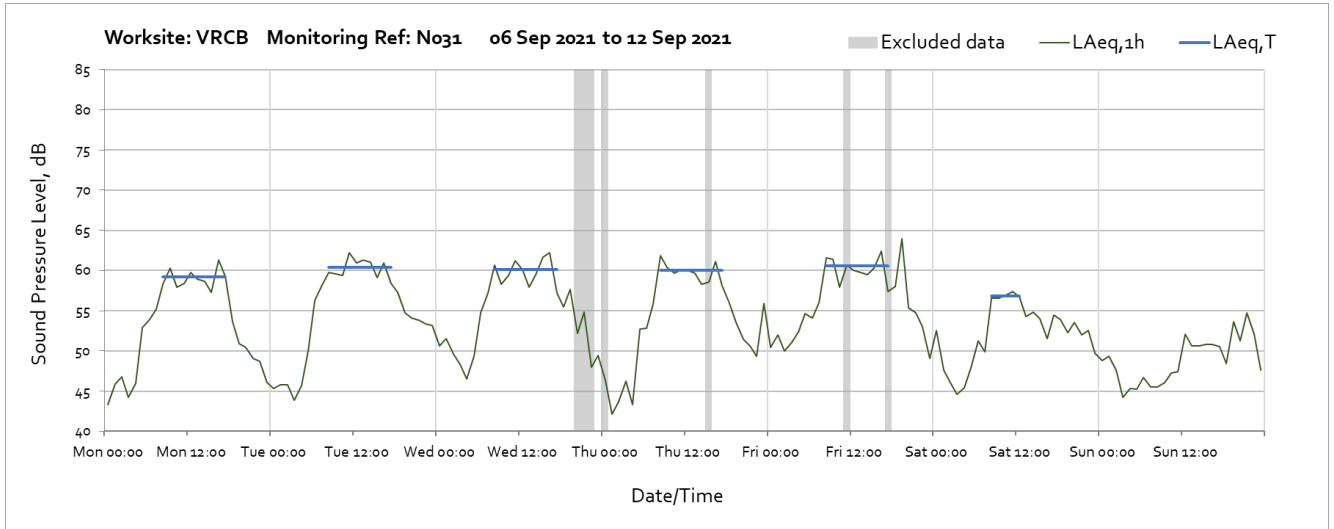
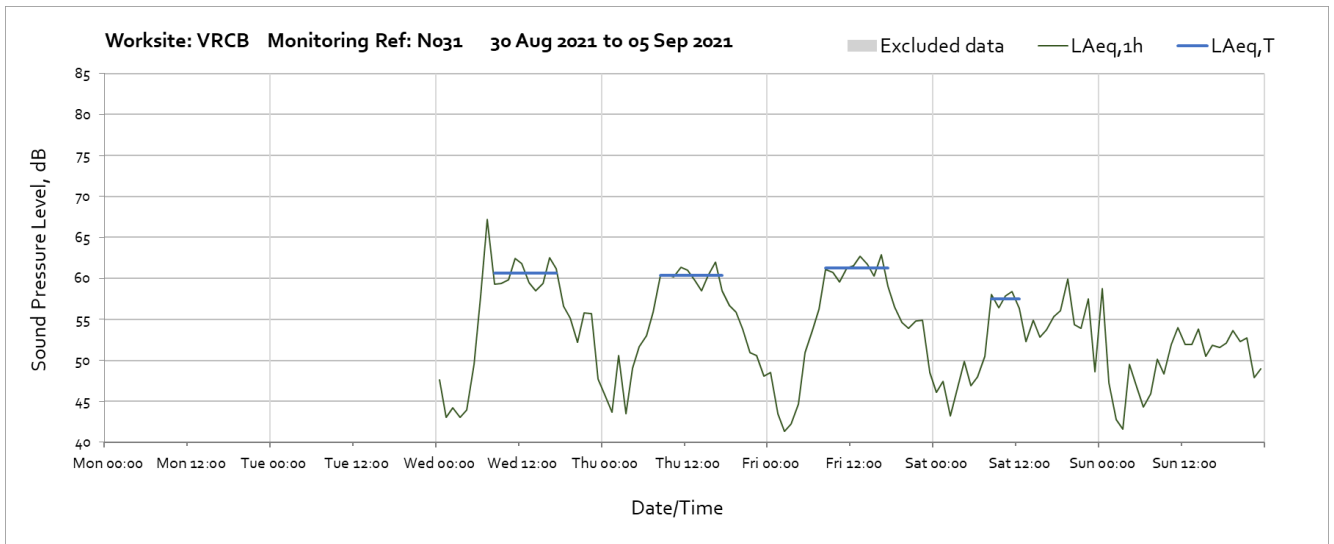
Worksite: Willesden Euro Terminal (WET) - Monitoring Ref: N041

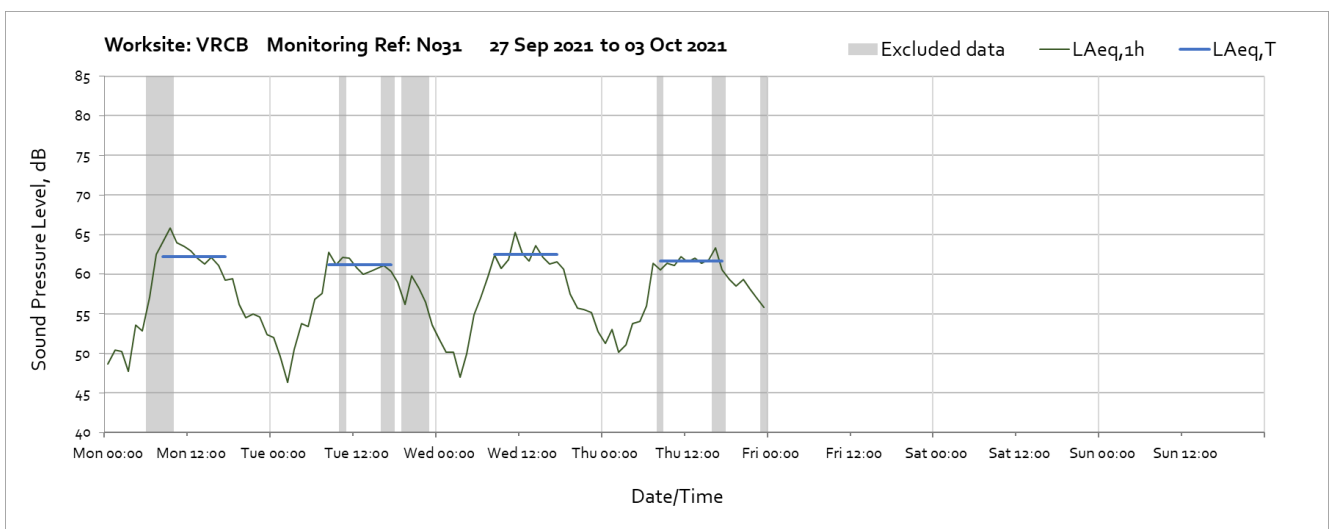
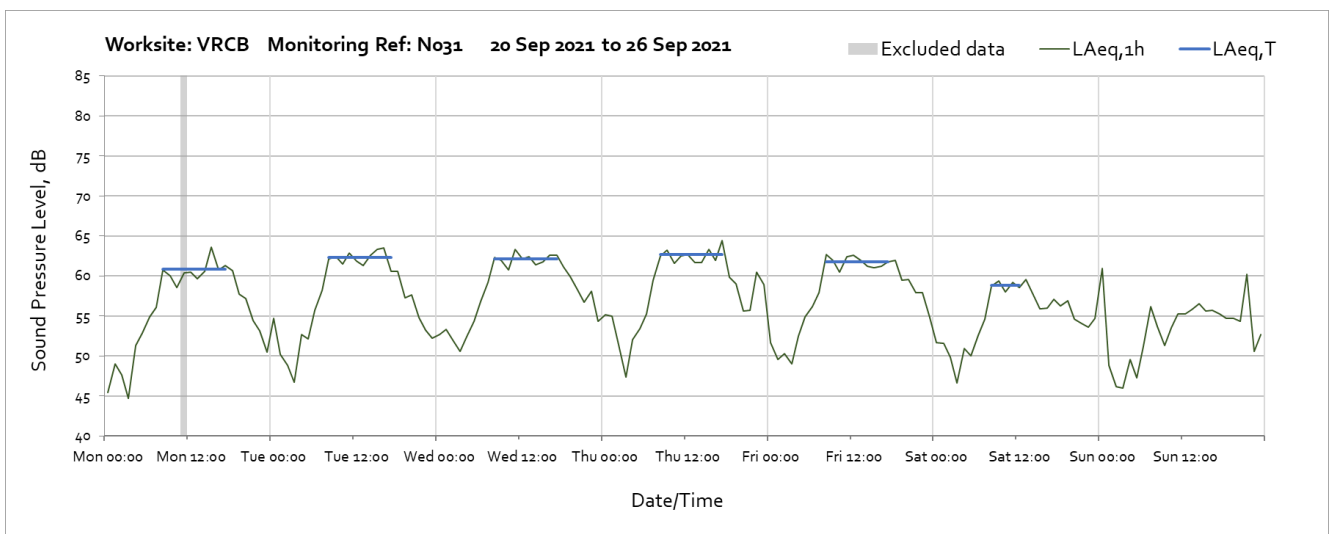
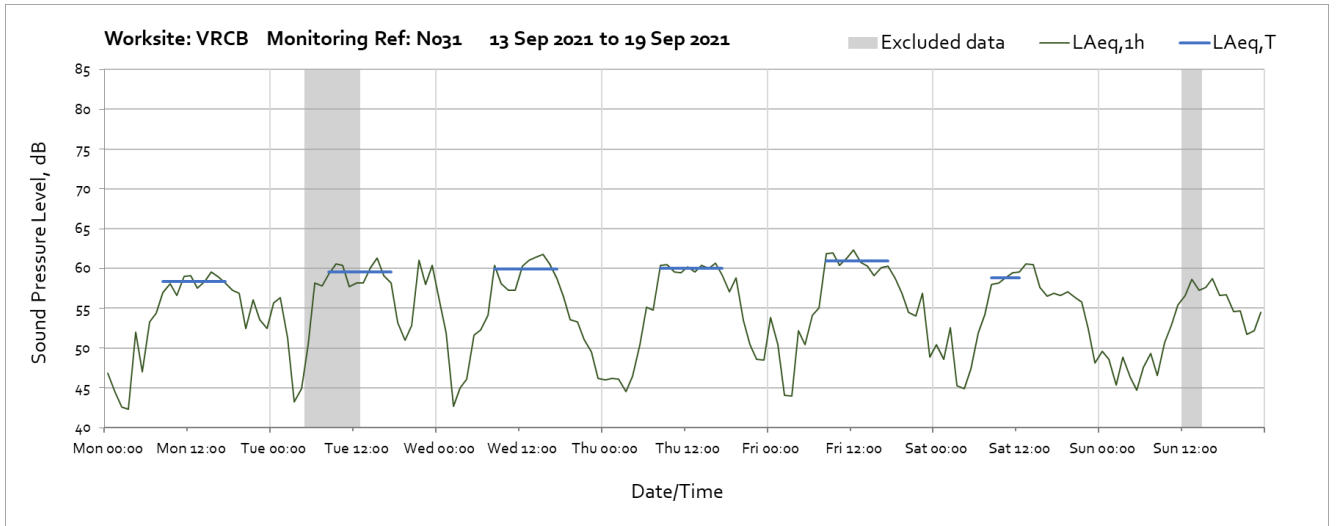




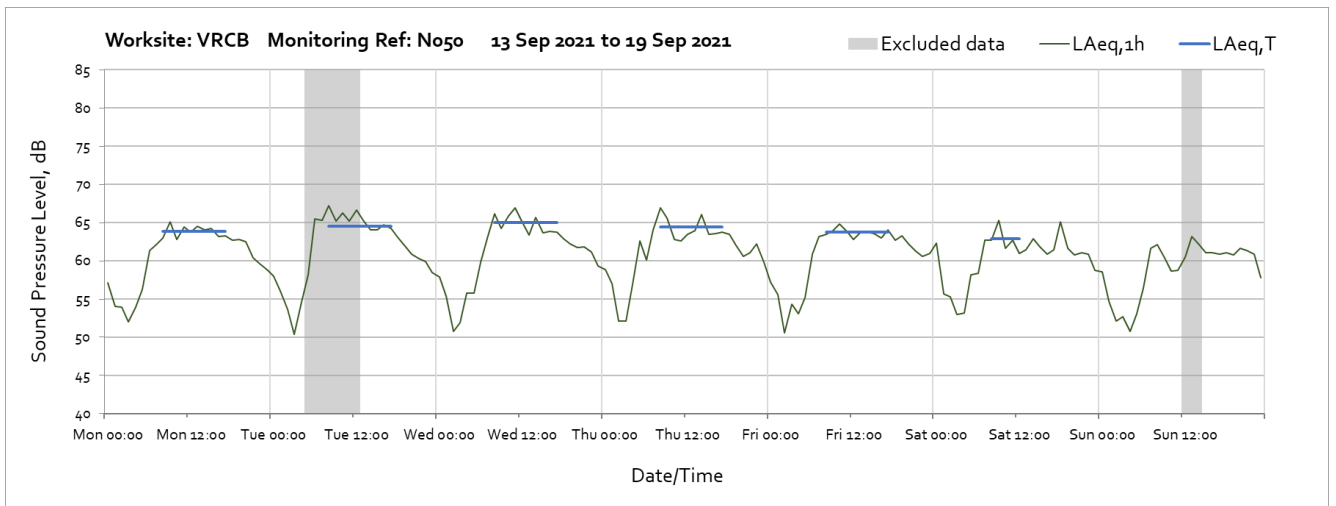
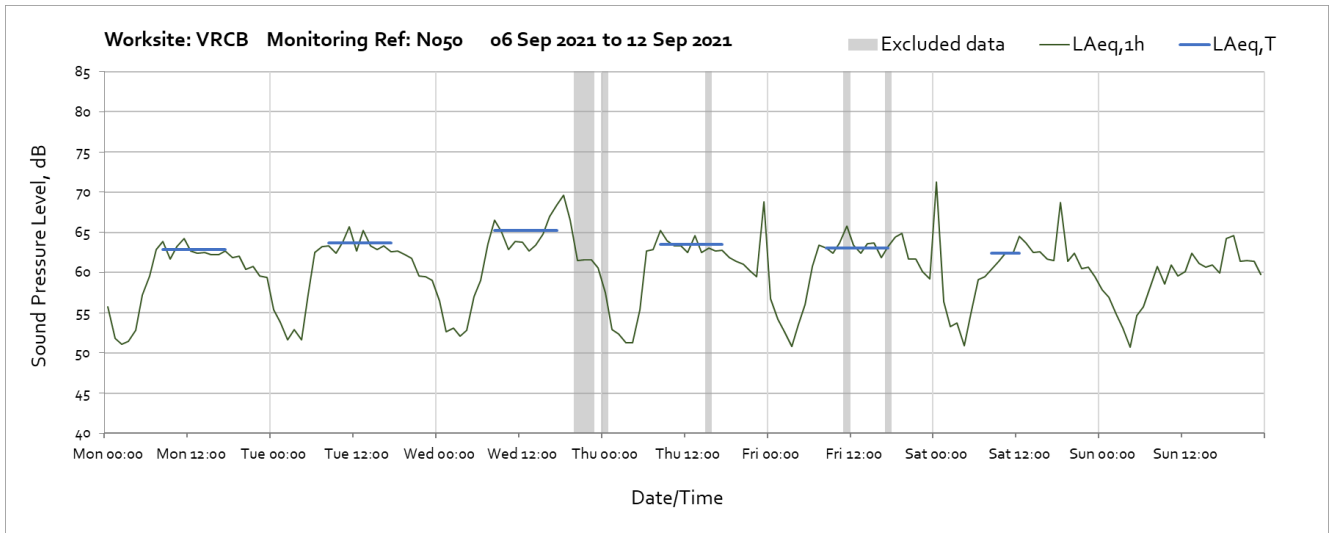
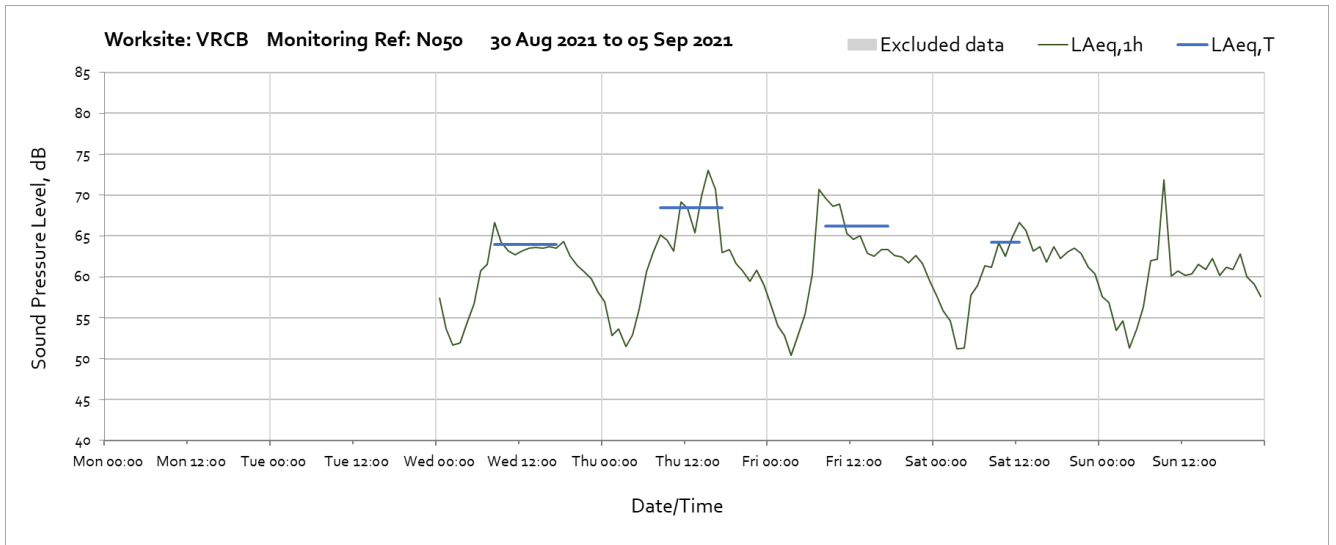


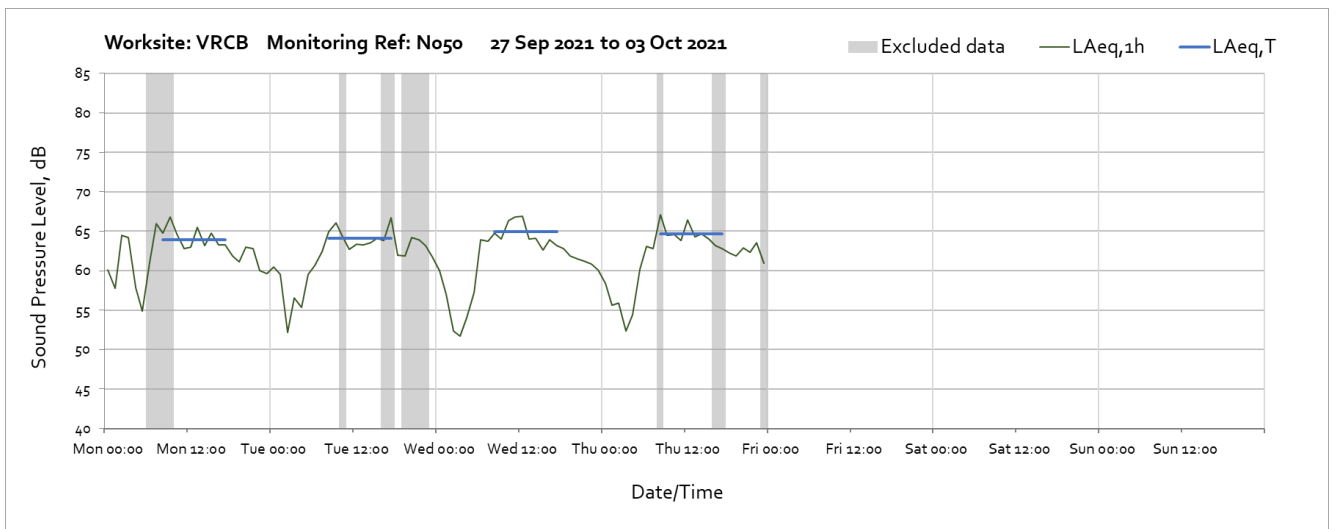
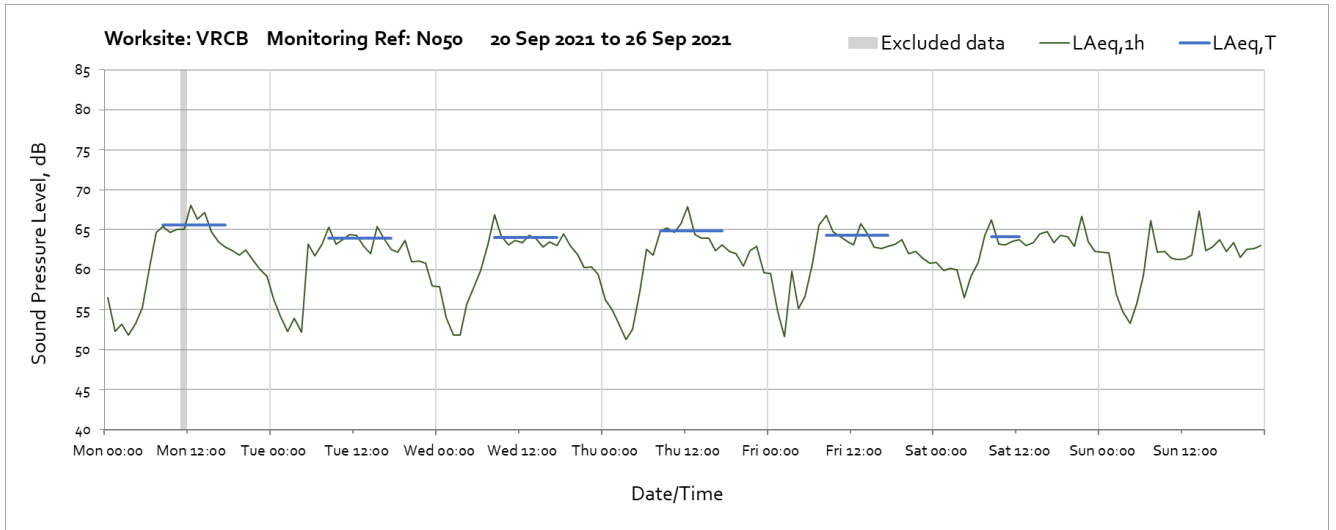
Worksite: Victoria Road Crossover Box (VRCB) – Monitoring Ref: N031



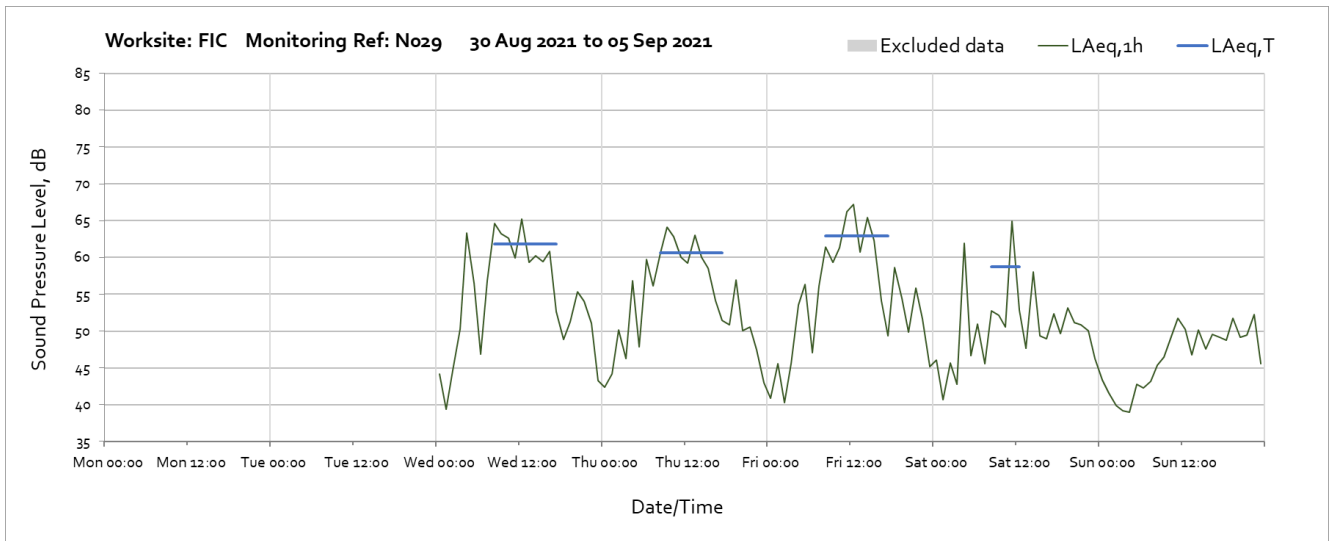


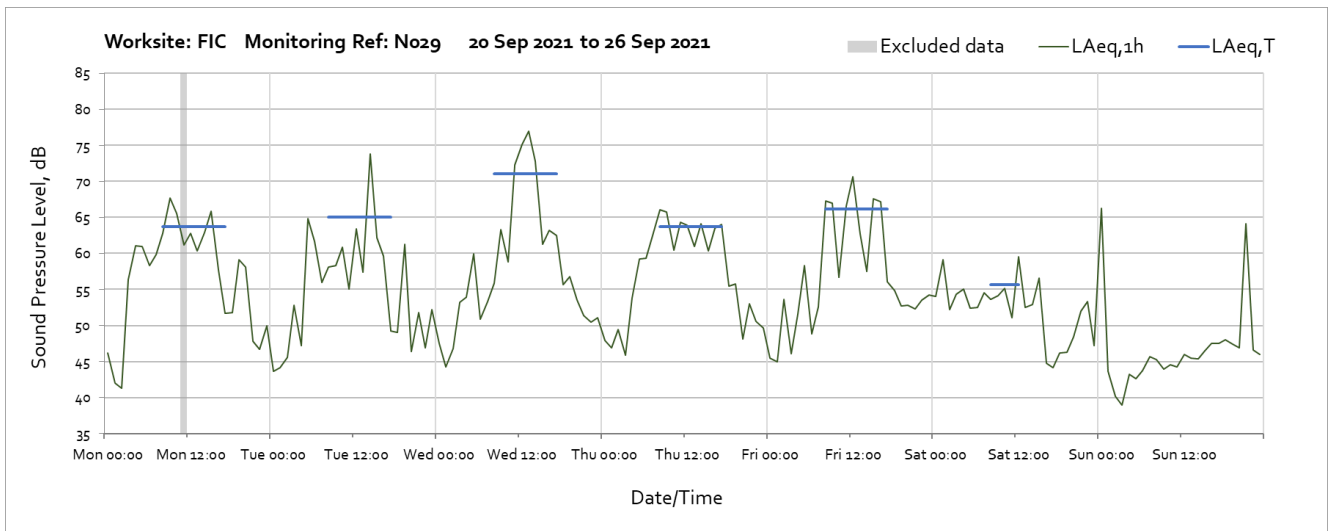
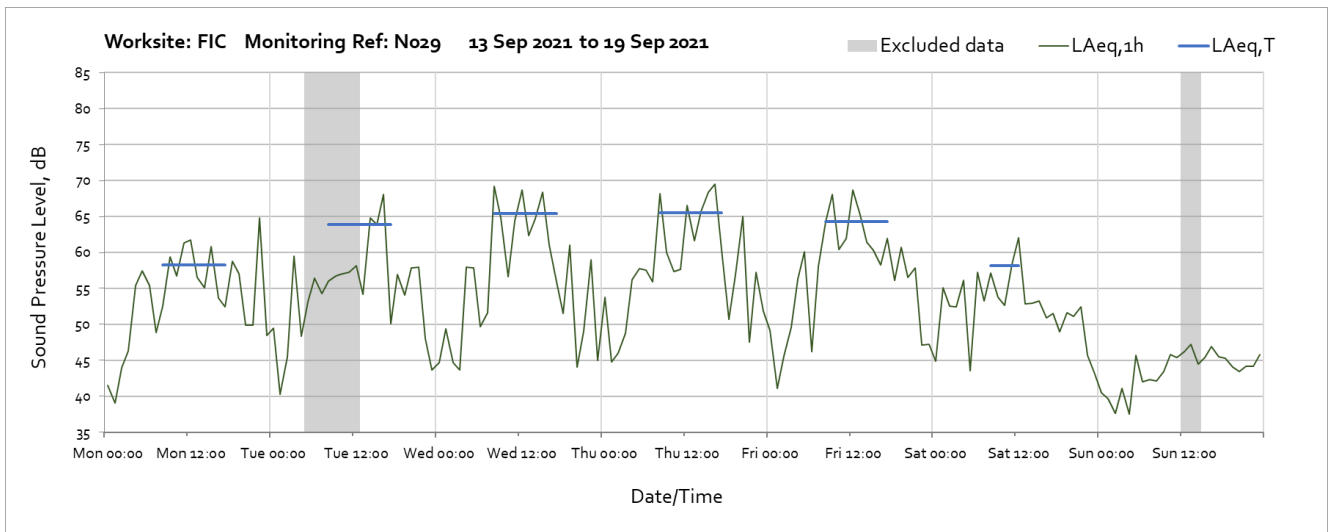
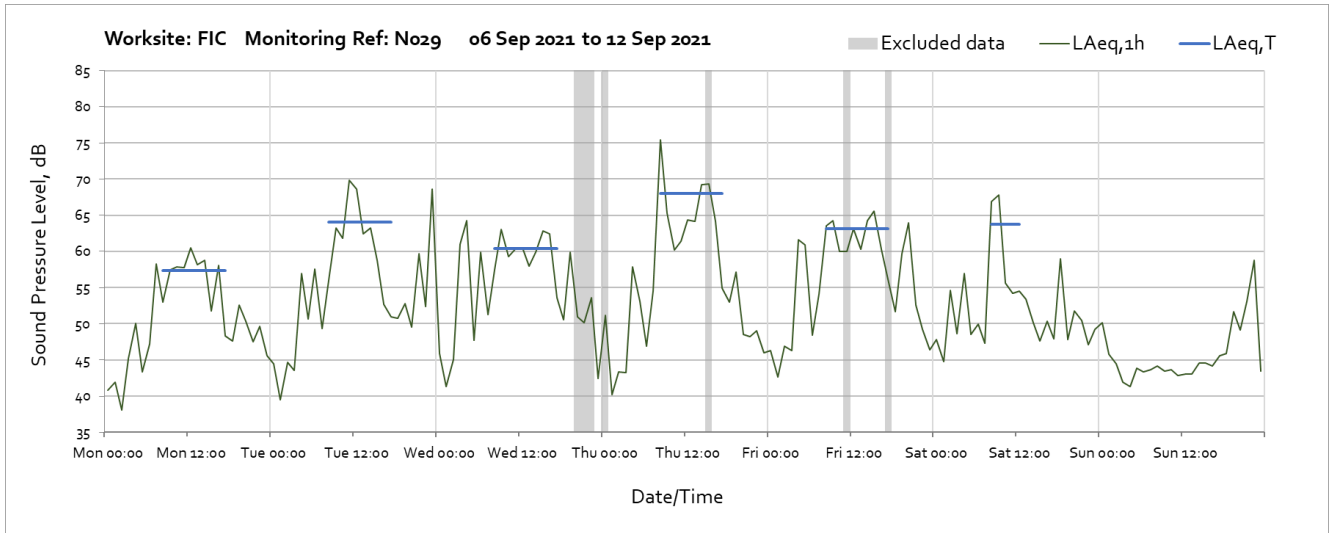
Worksite: Victoria Road Crossover Box (VRCB) – Monitoring Ref: N050

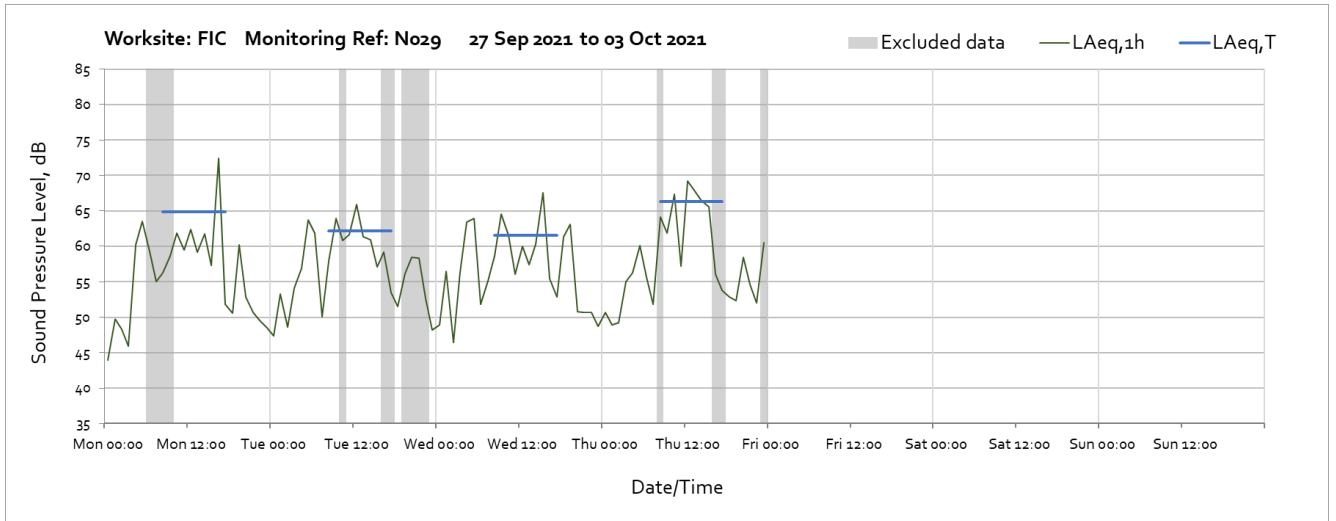




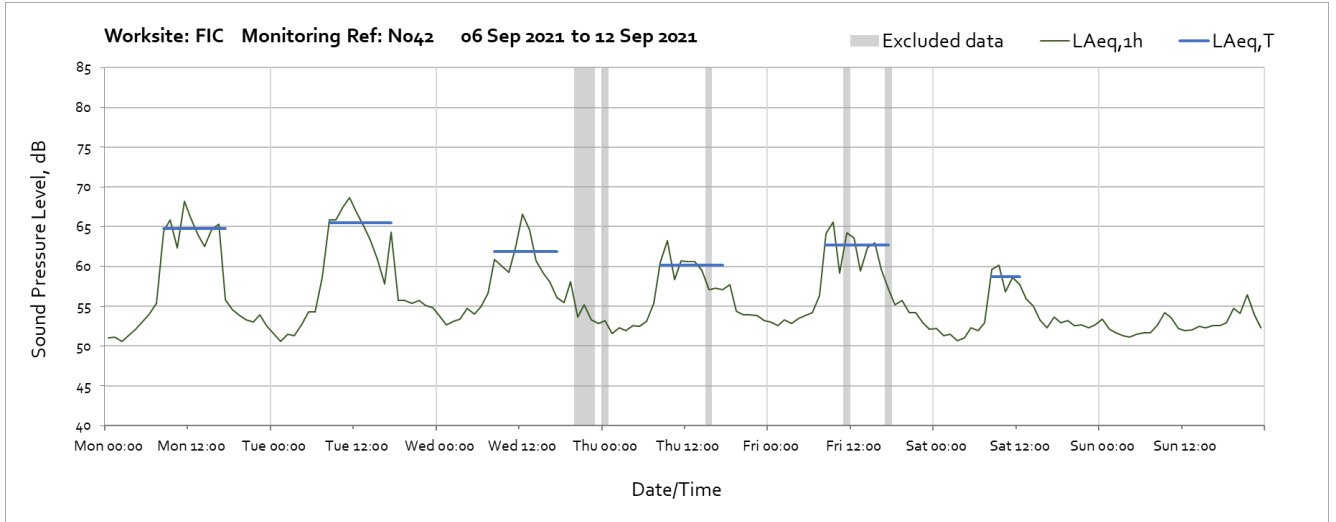
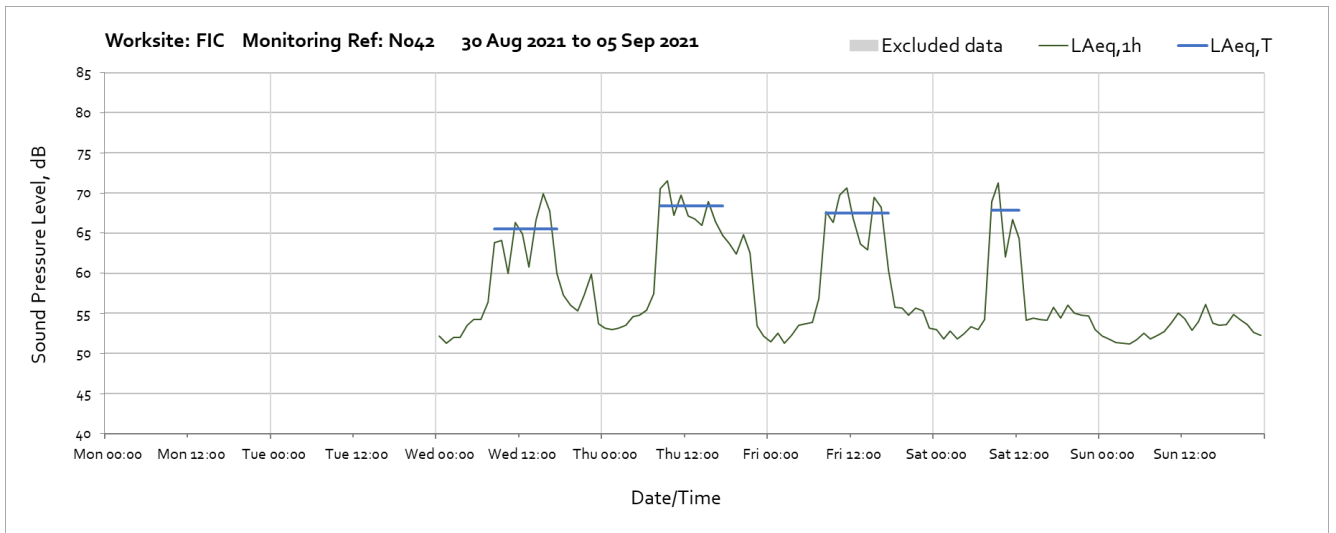
Worksite: Flat Iron Compound (FIC) - Monitoring Ref: N029

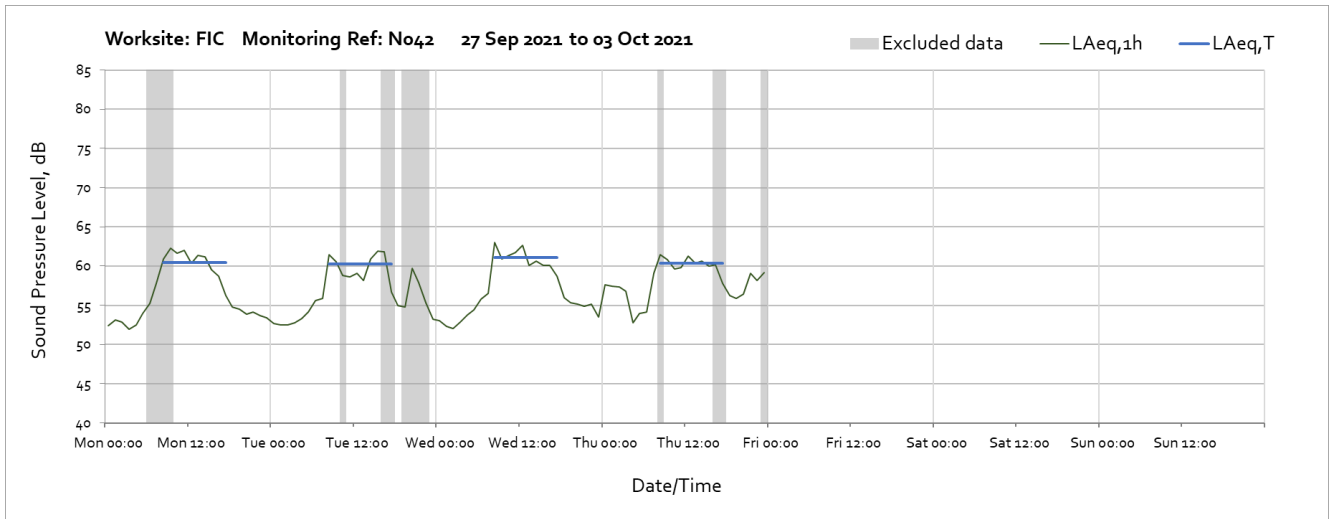
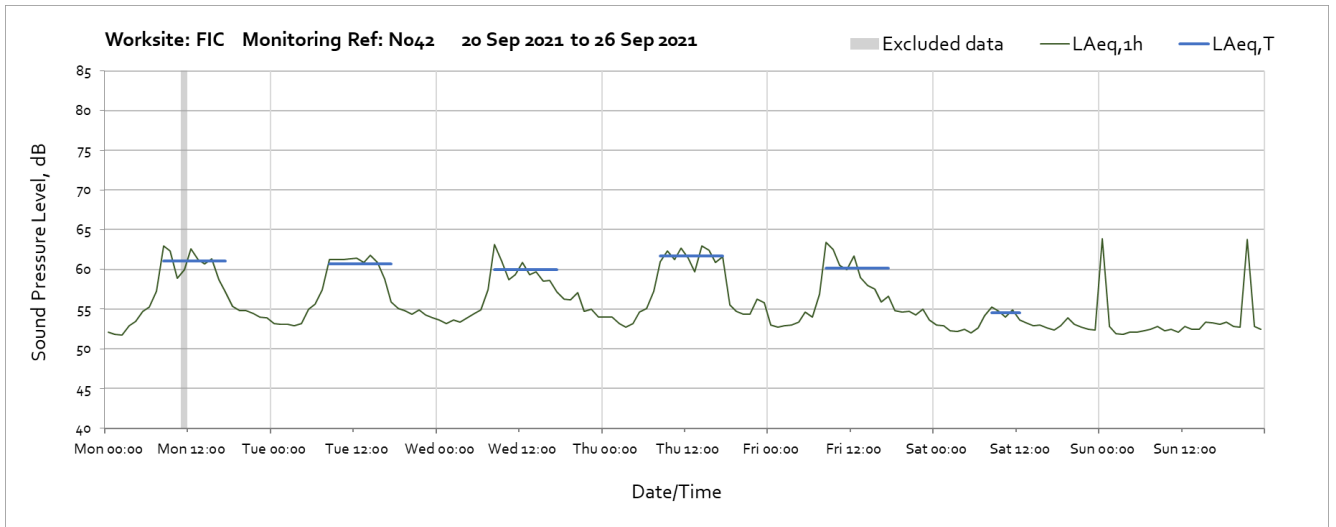
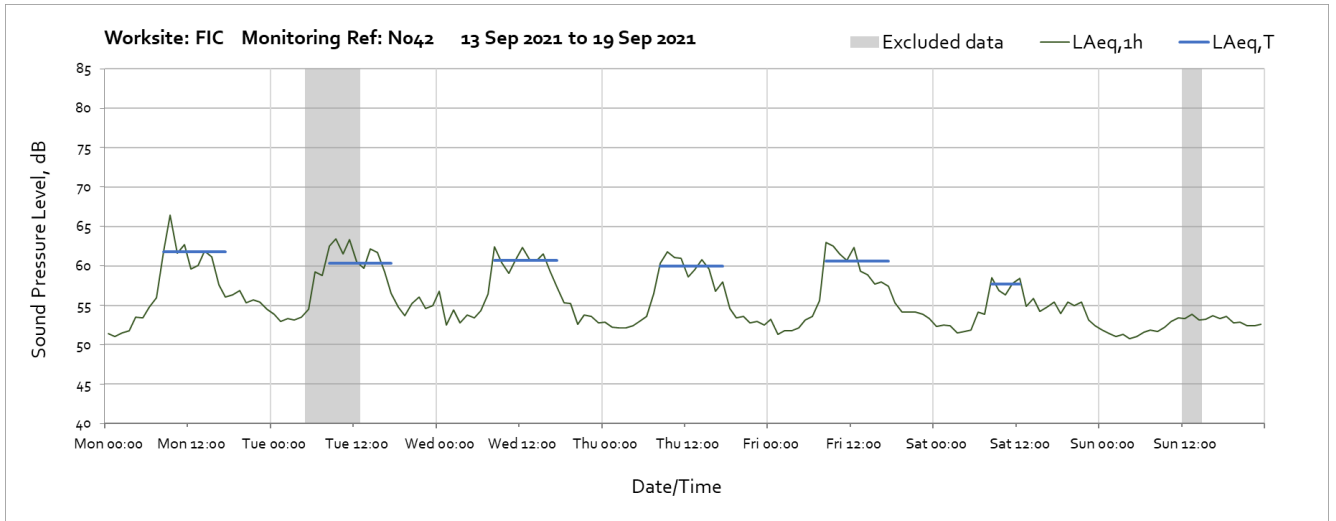




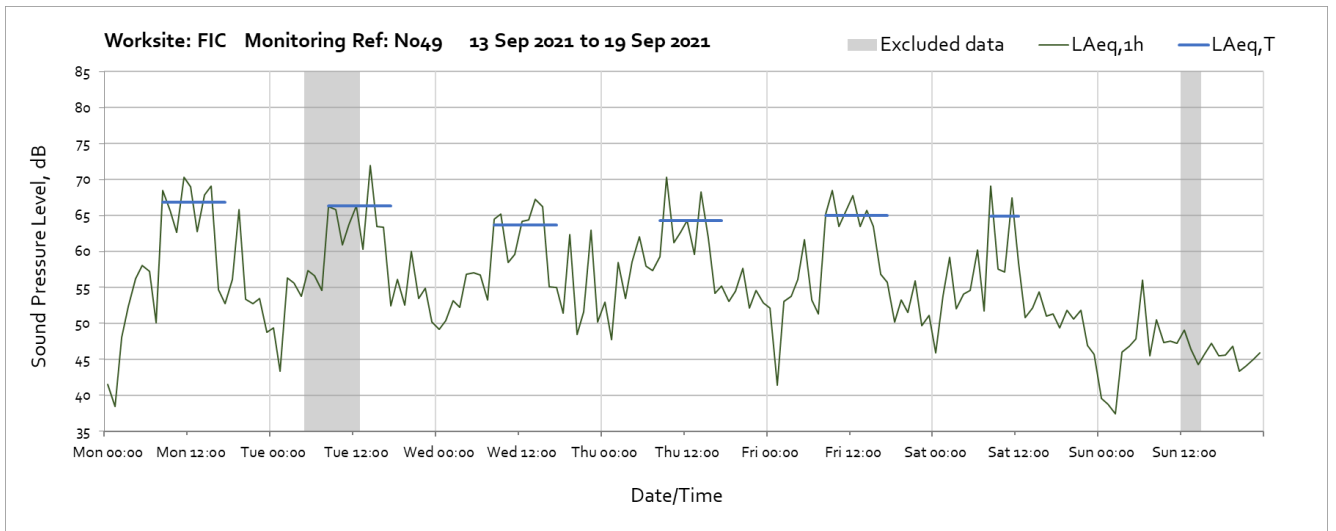
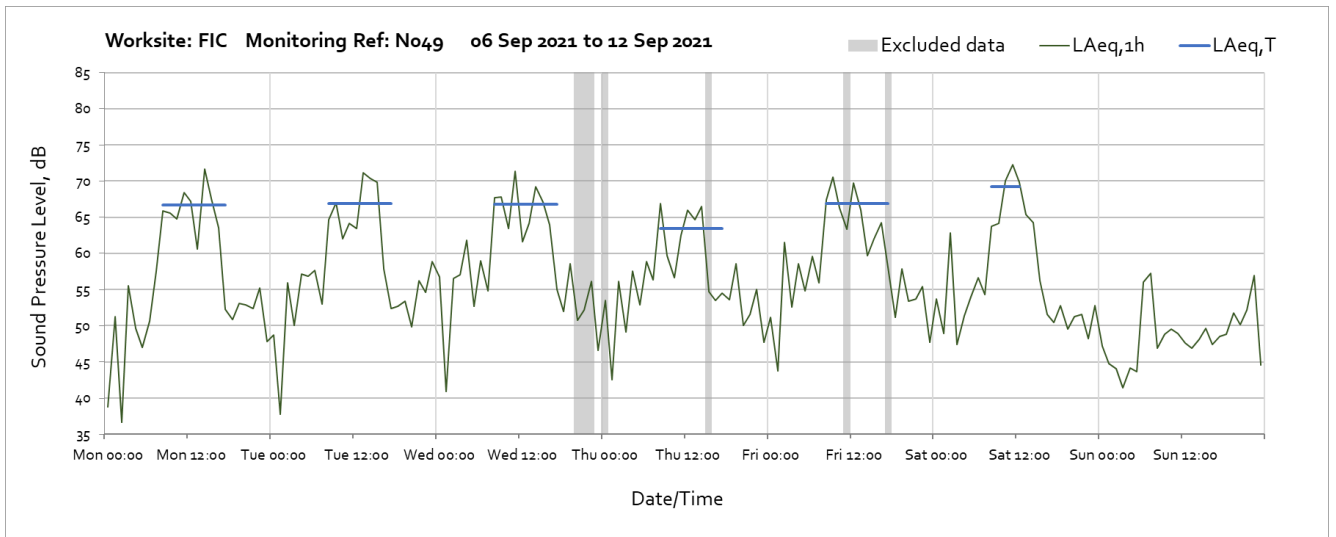
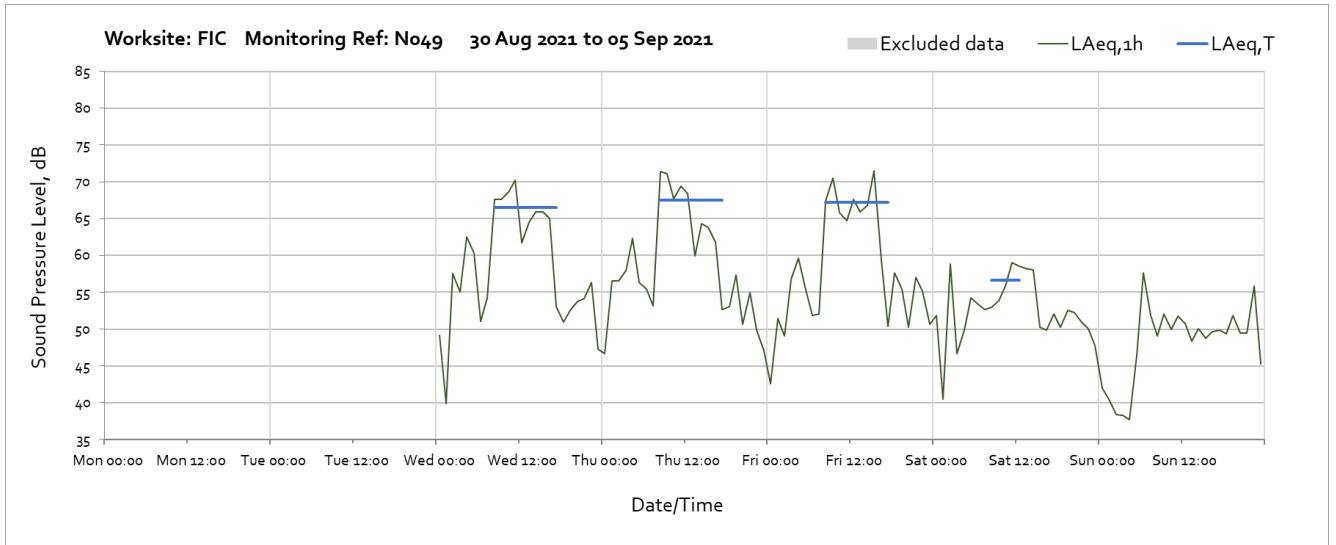


Worksite: Flat Iron Compound (FIC) - Monitoring Ref: N042

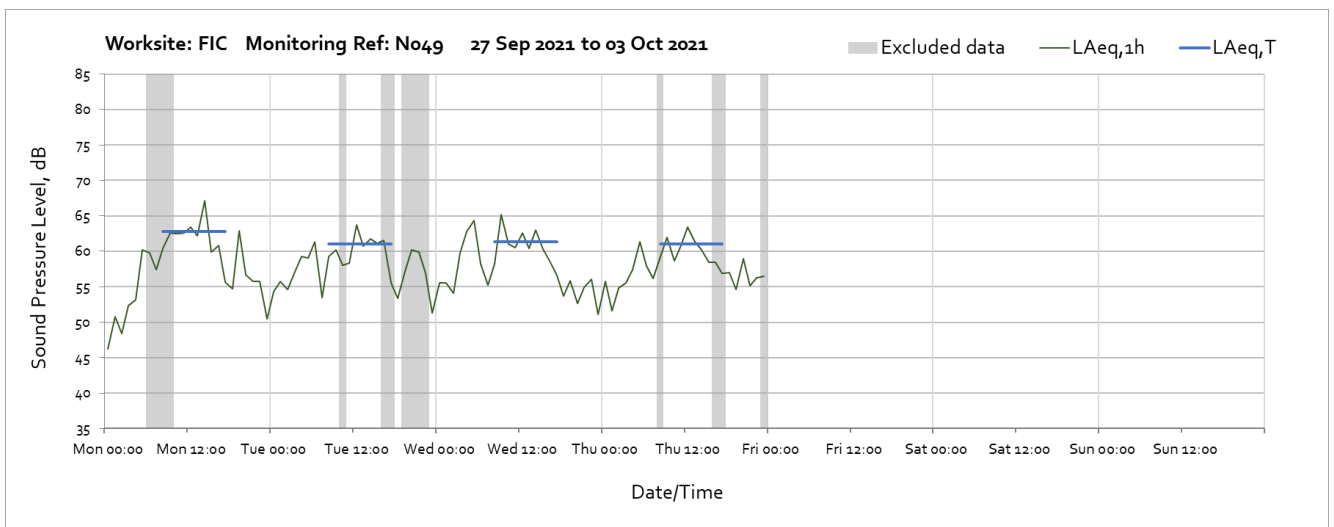
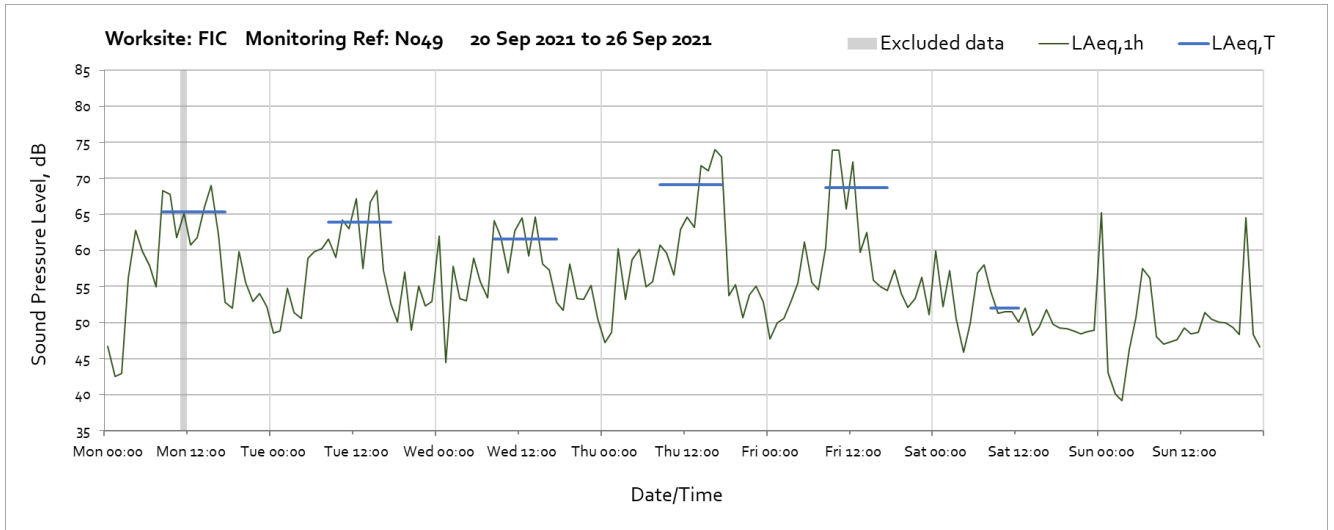




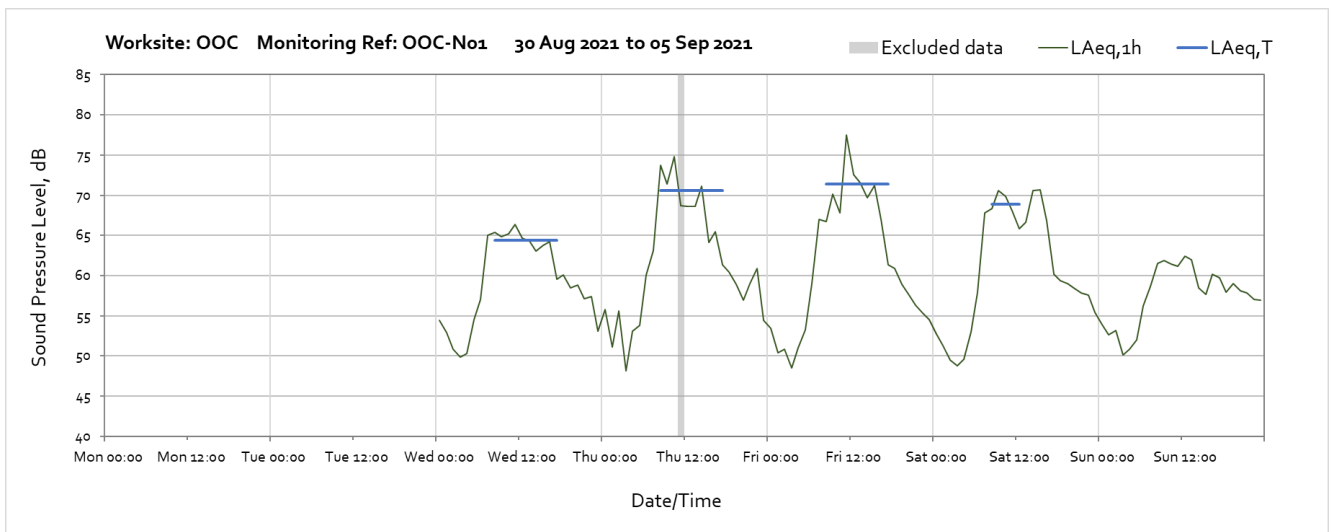
Worksite: Flat Iron Compound (FIC) – Monitoring Ref: N049

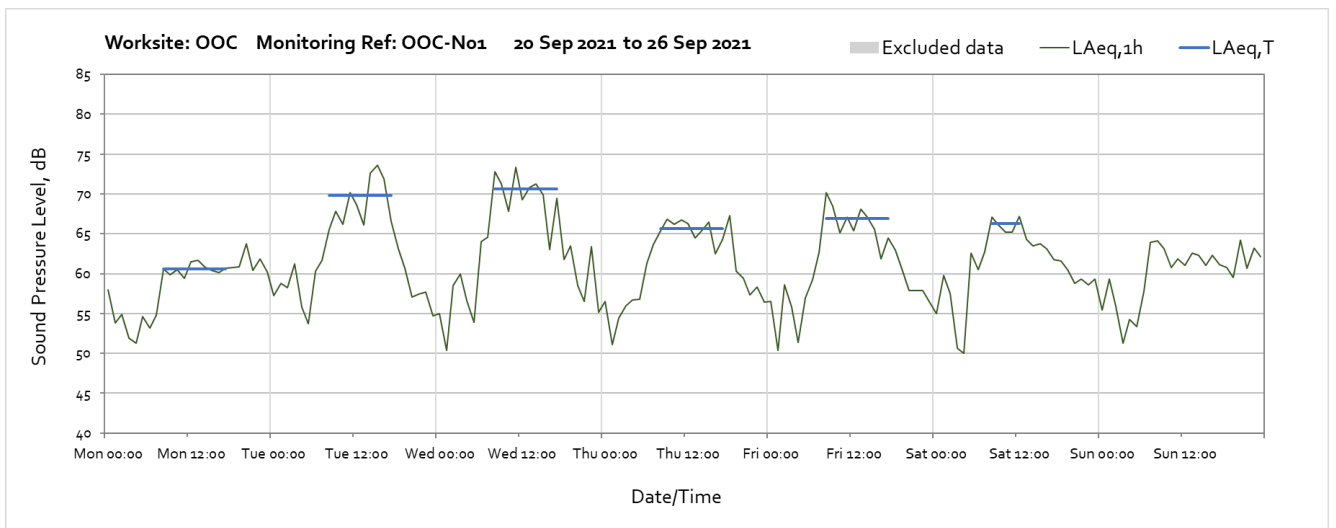
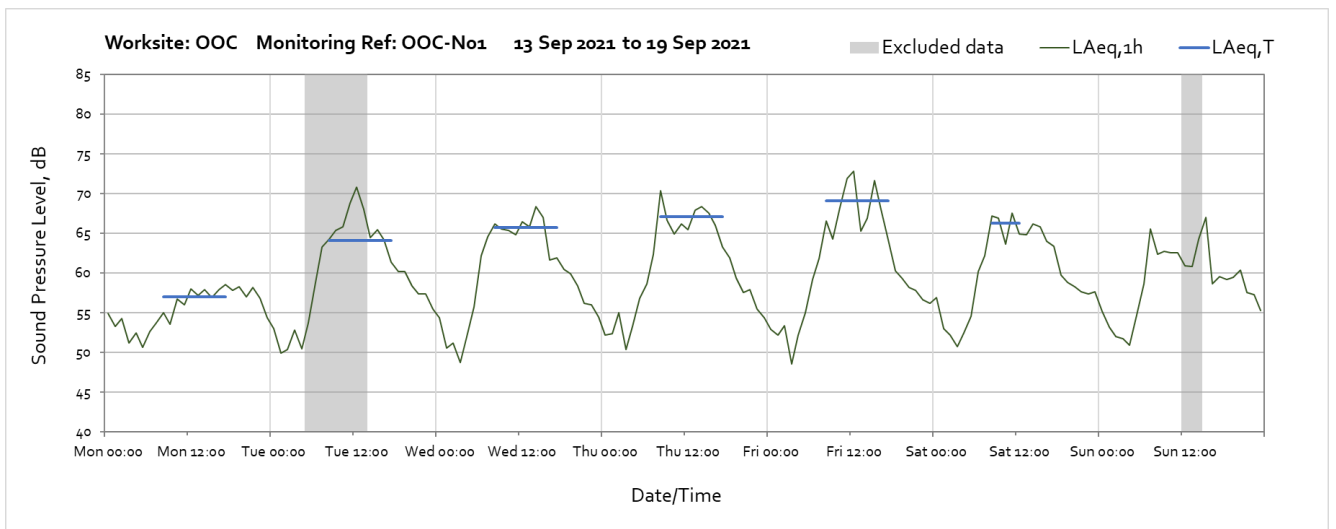
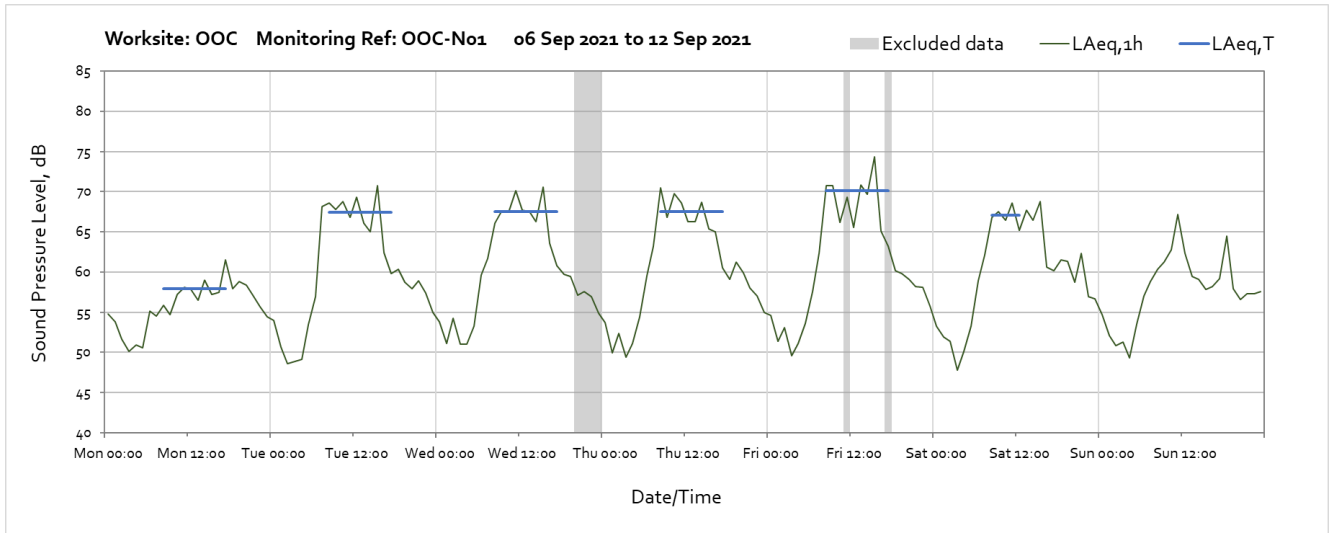


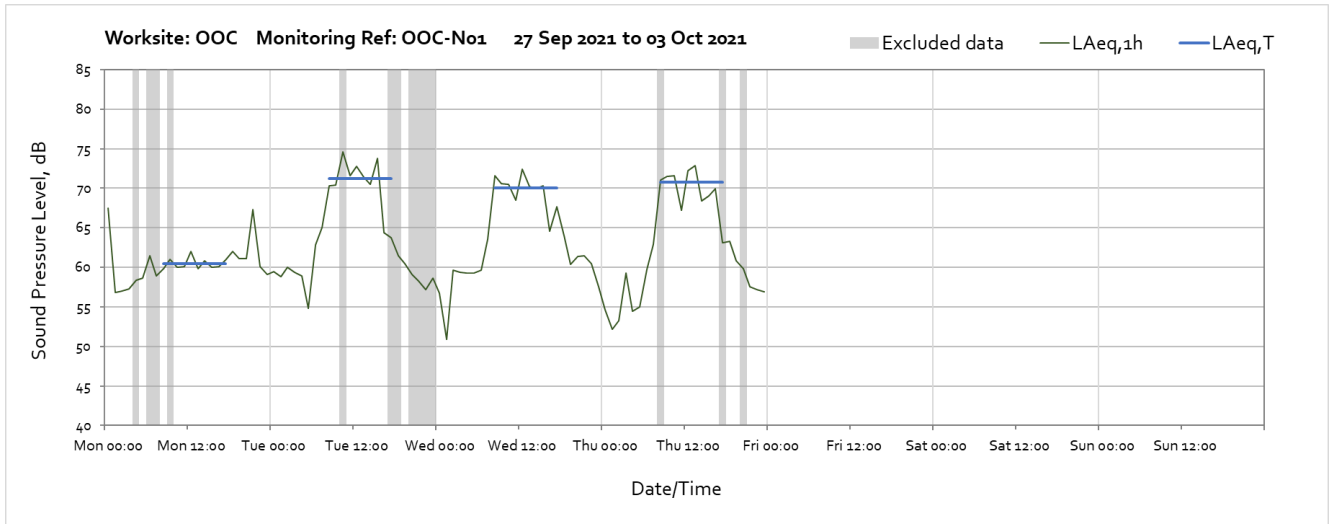
OFFICIAL



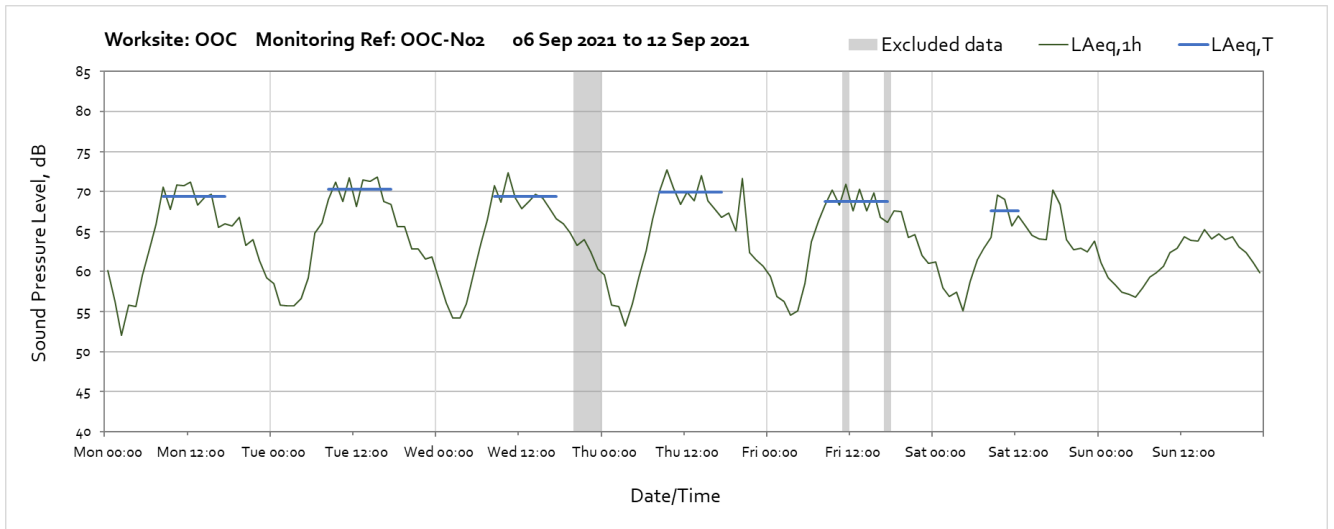
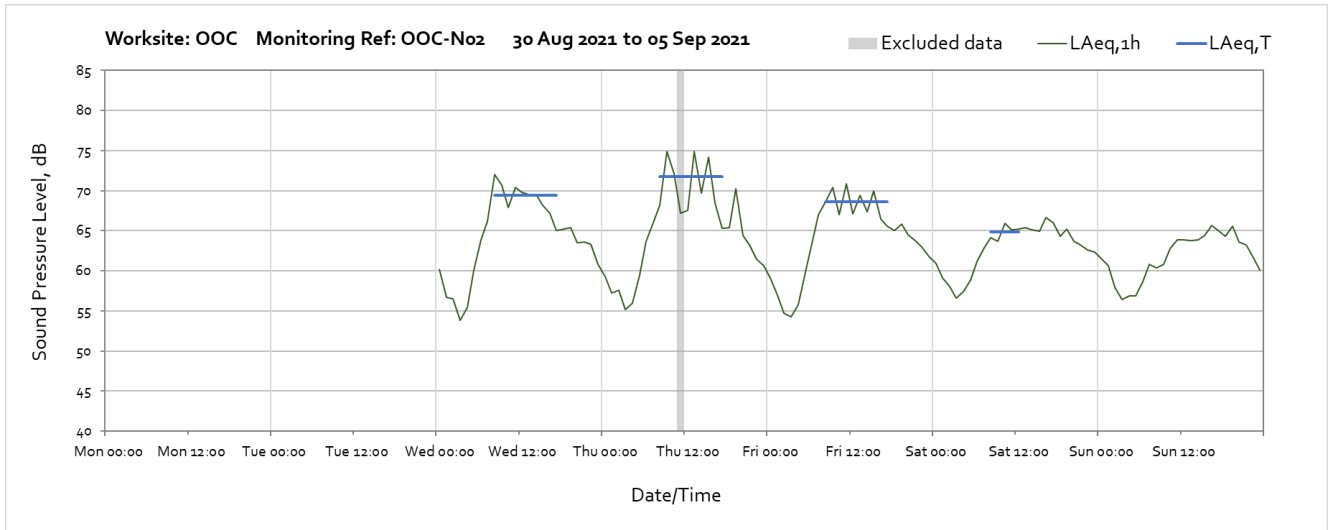
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N01

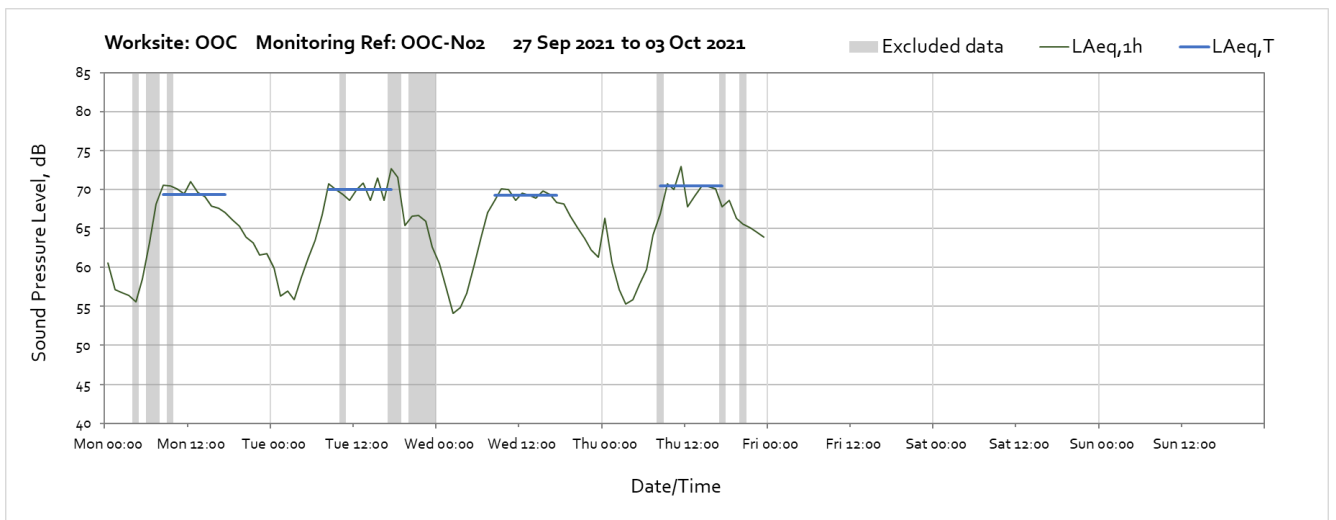
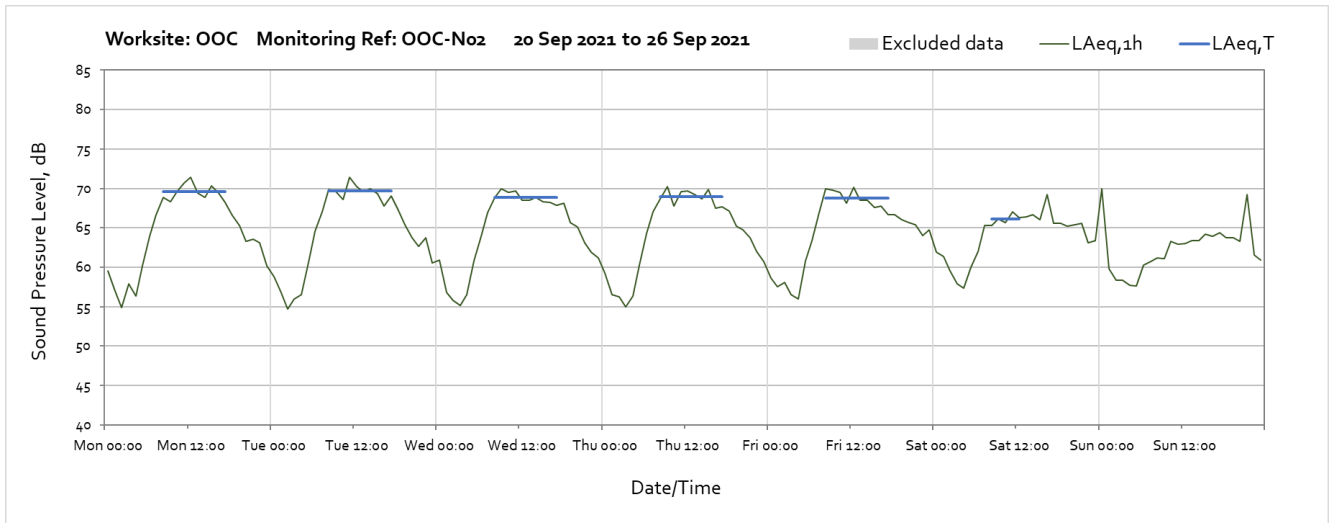
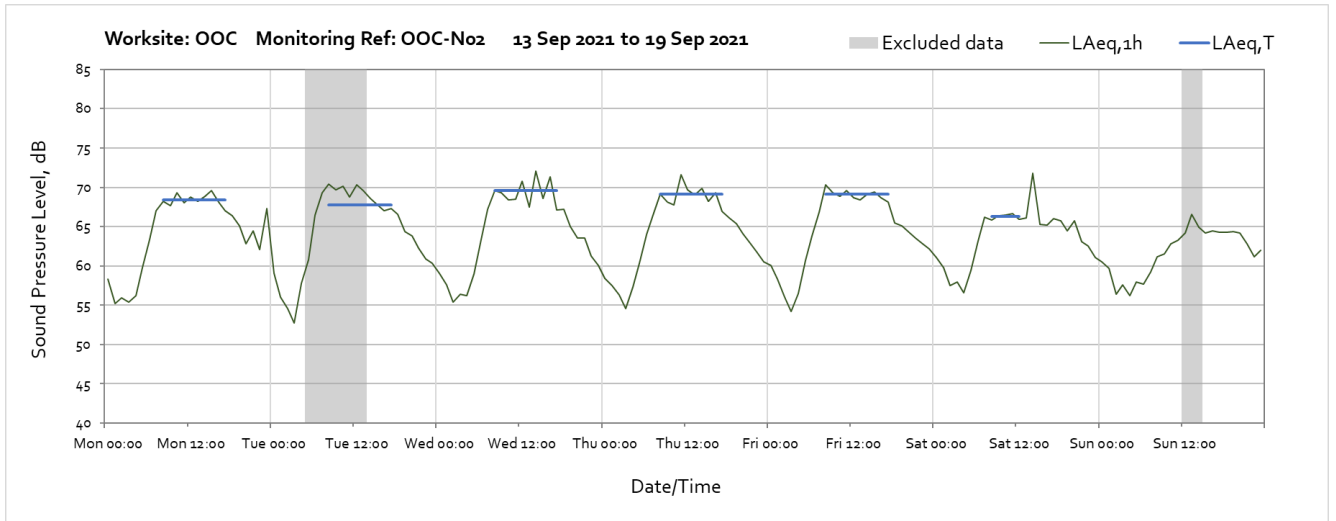




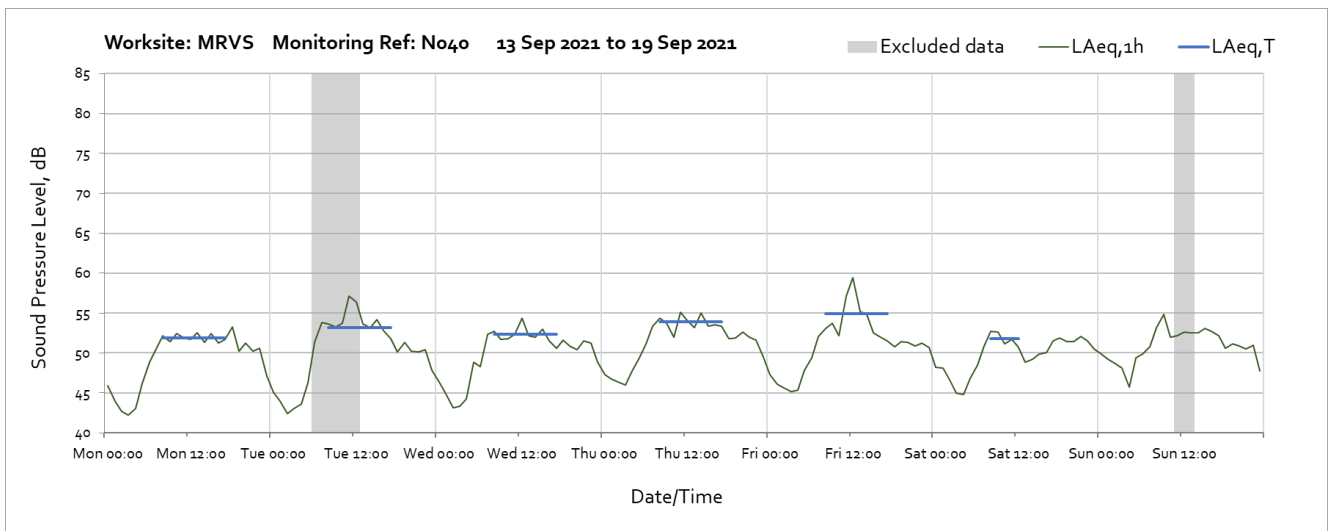
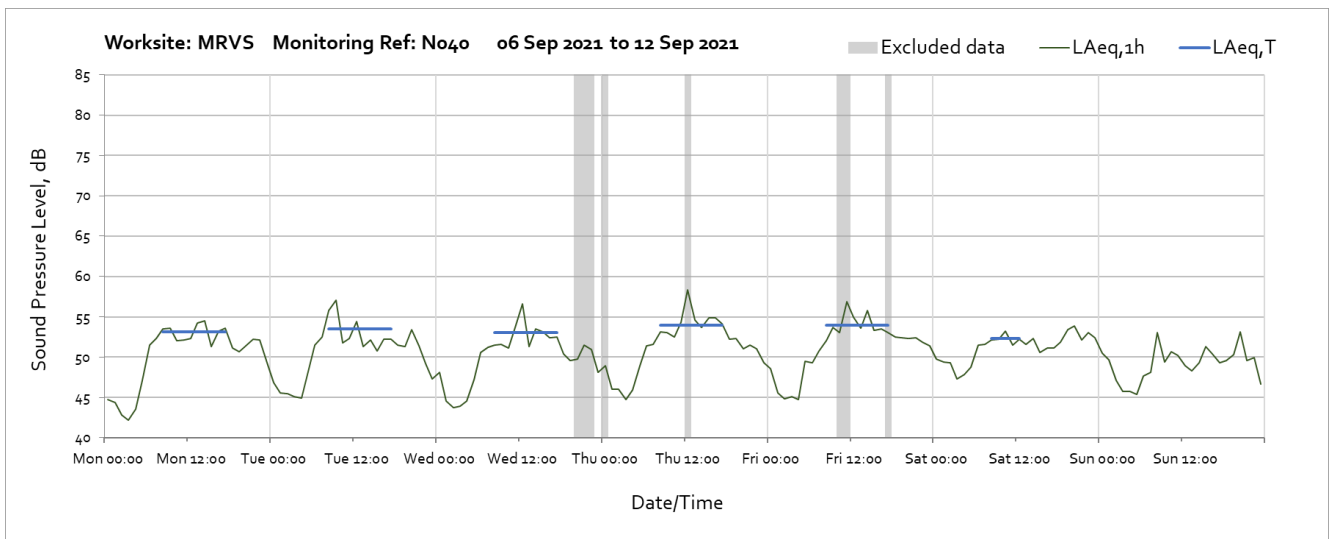
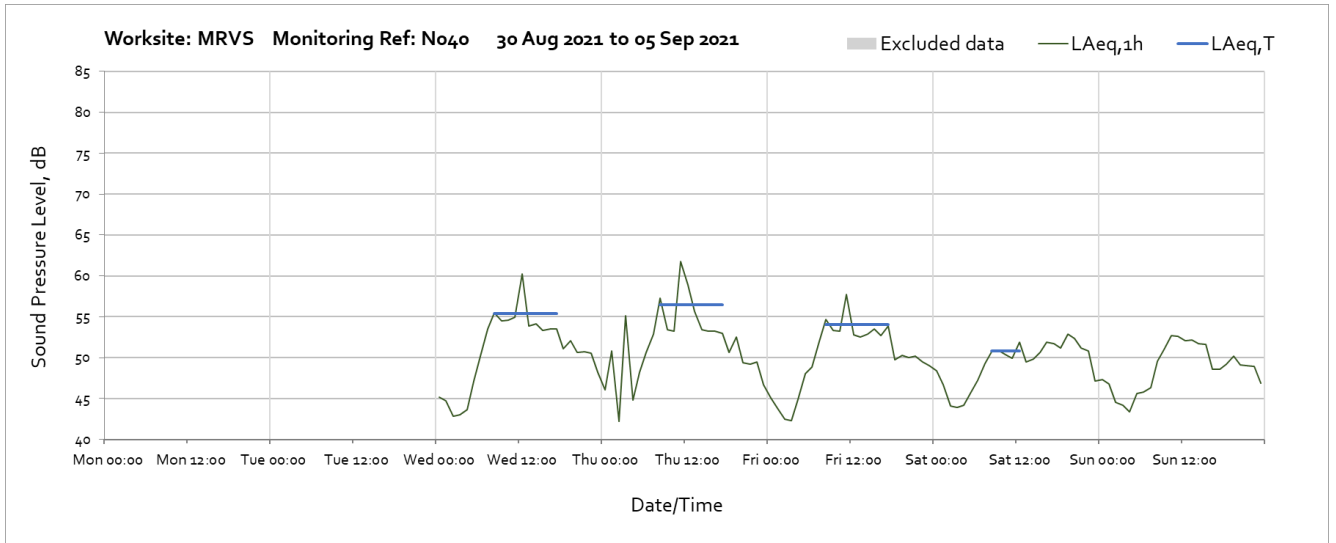


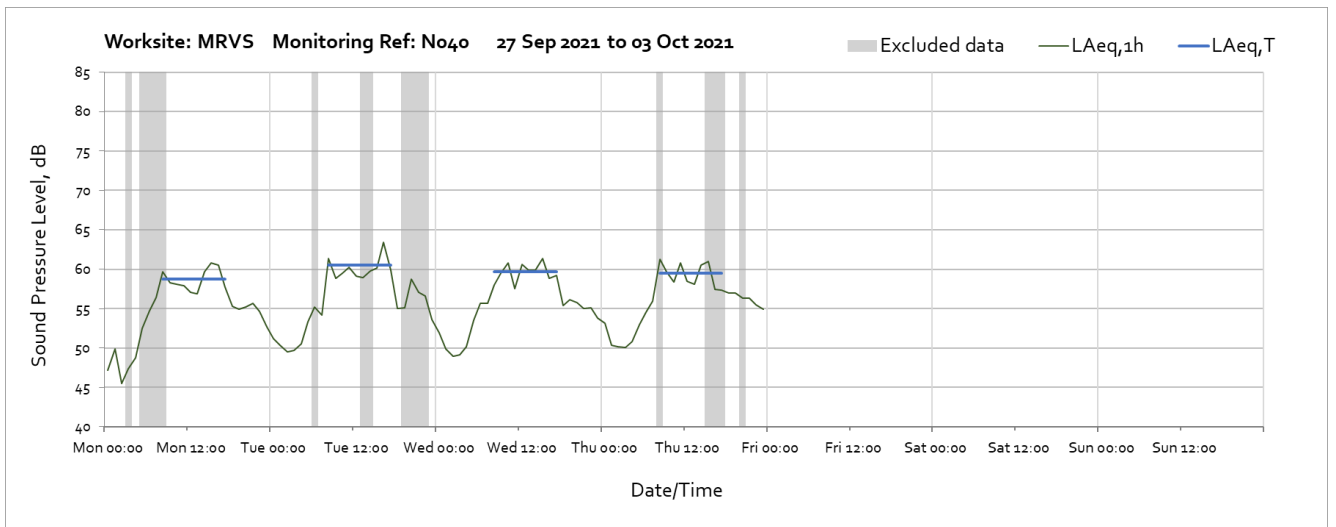
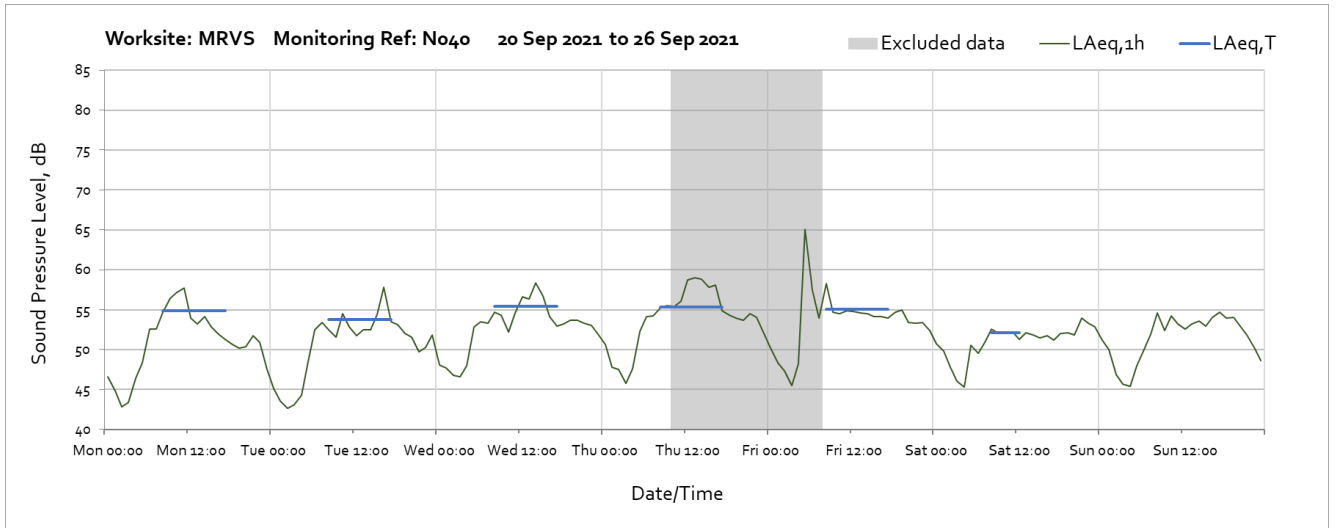
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N02



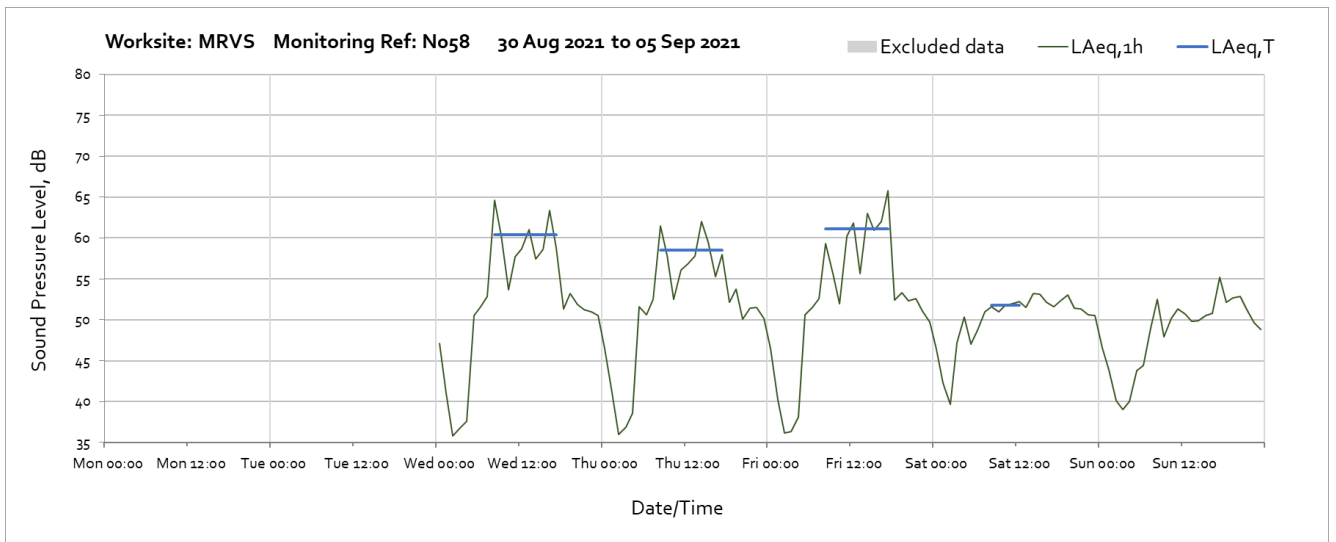


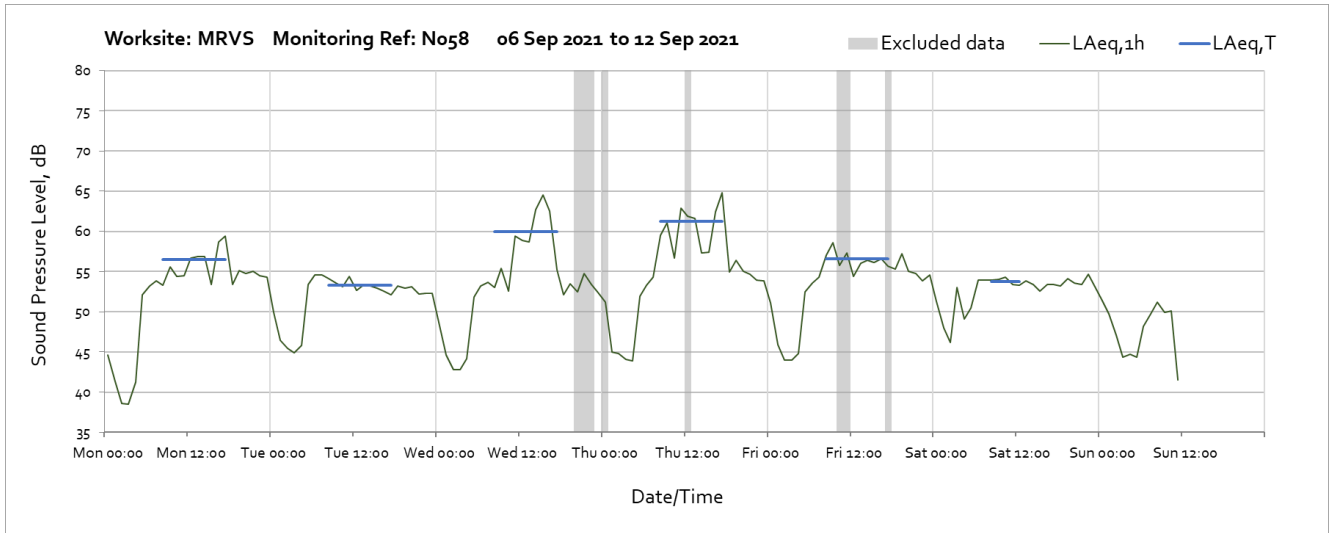
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N040



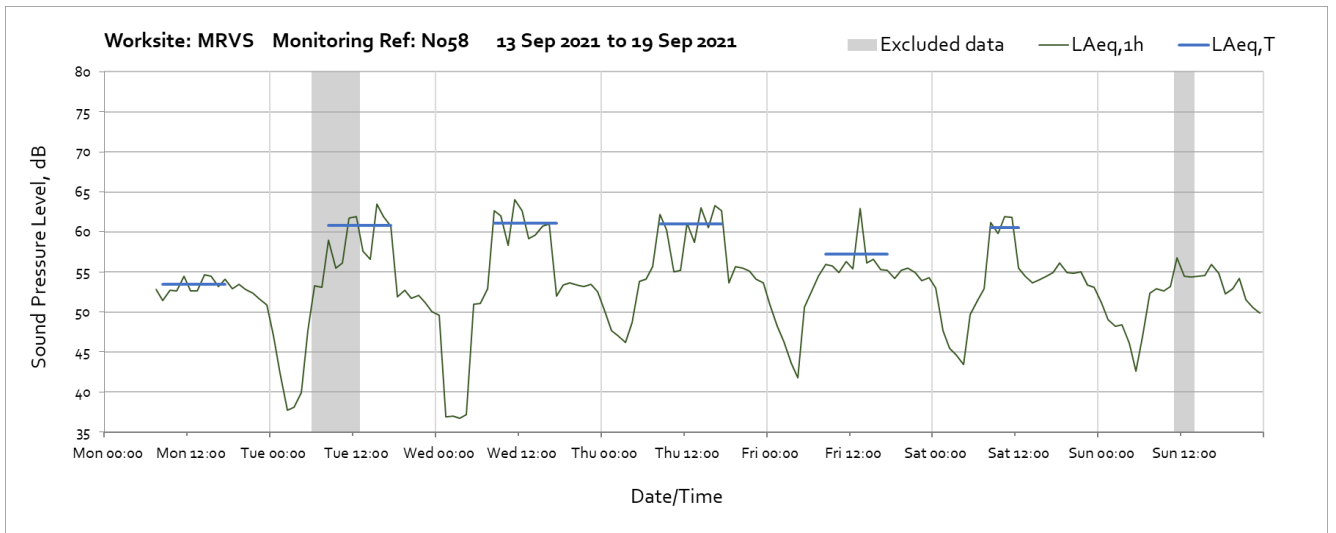


Worksite: Mandeville Road Ventilation Shaft (MRVS) - Monitoring Ref: N058

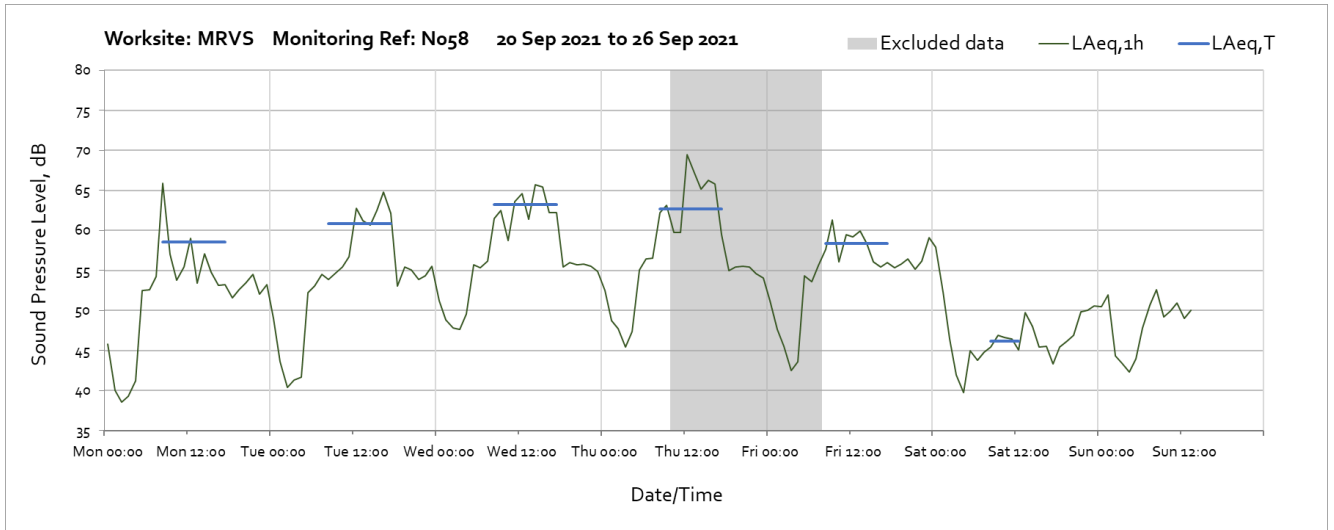




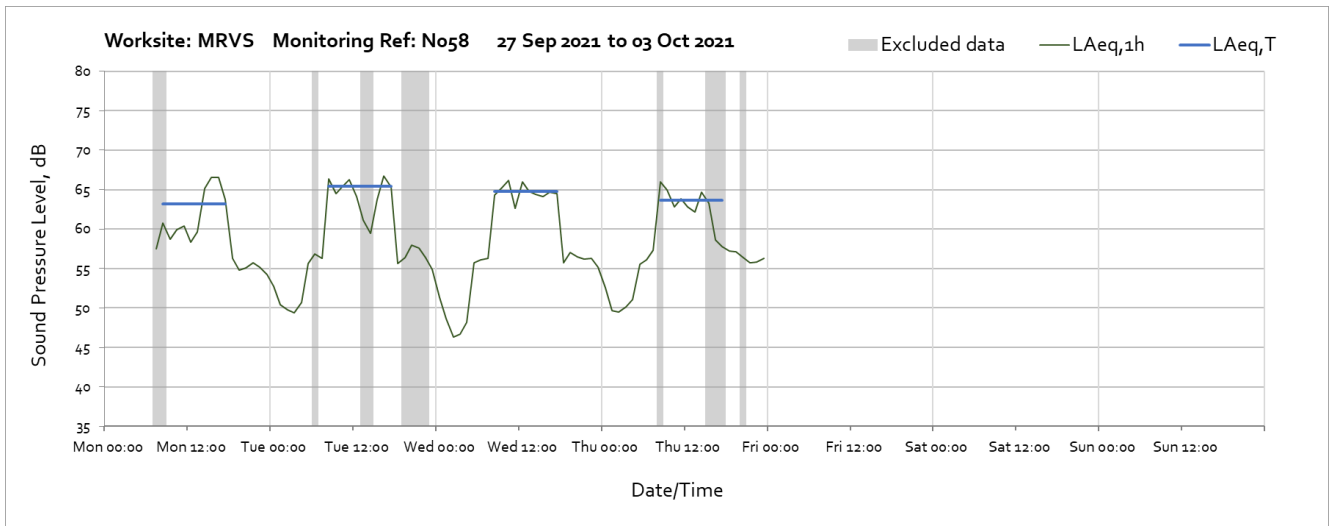
Note: Missing data between 12:00 on Sunday 12th September and 07:00 on Monday 13th September 2021 was due to loss of power at the monitor location.



Note: Missing data between 12:00 on Sunday 12th September and 07:00 on Monday 13th September 2021 was due to loss of power at the monitor location.

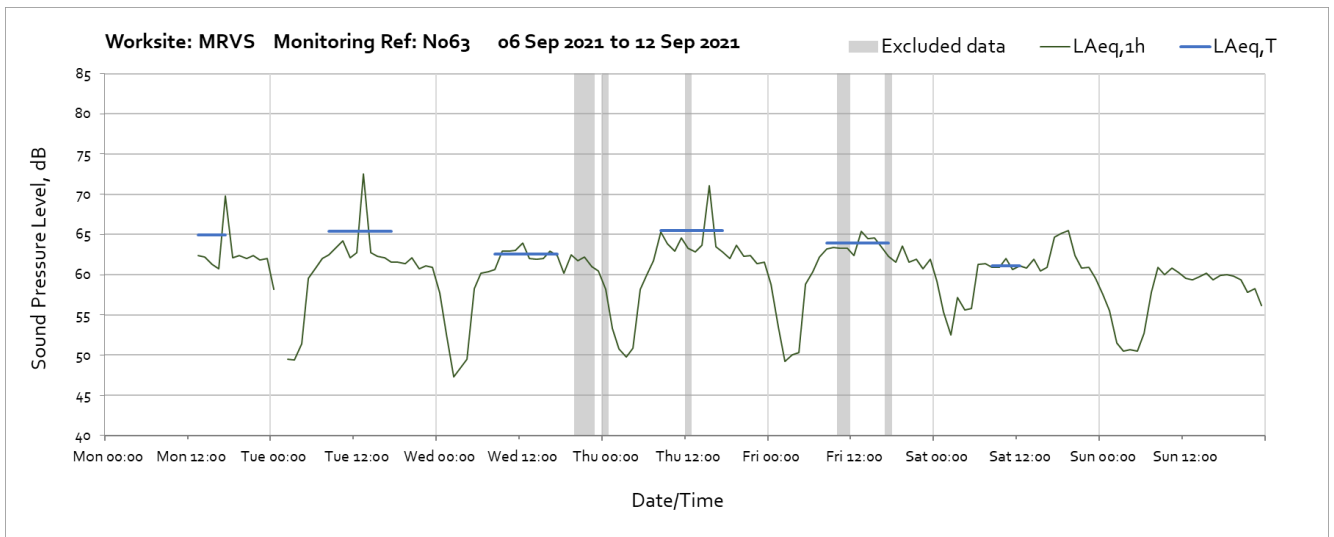


Note: Missing data between 14:00 on Sunday 26th September and 07:00 on Monday 13th September 2021 was due to loss of power at the monitor location.

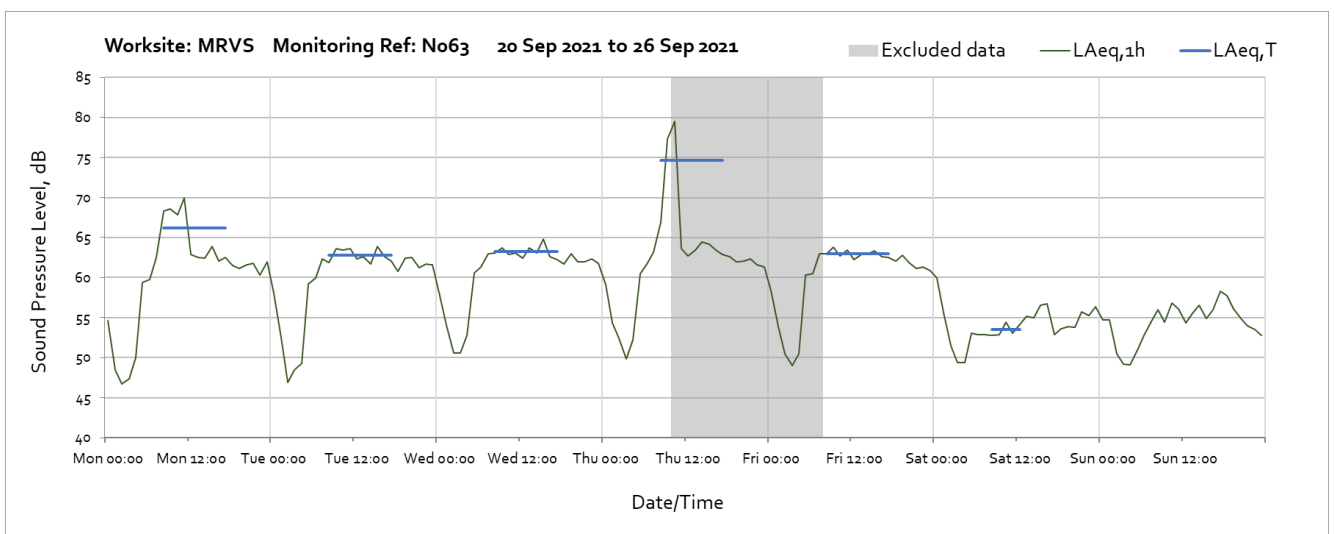
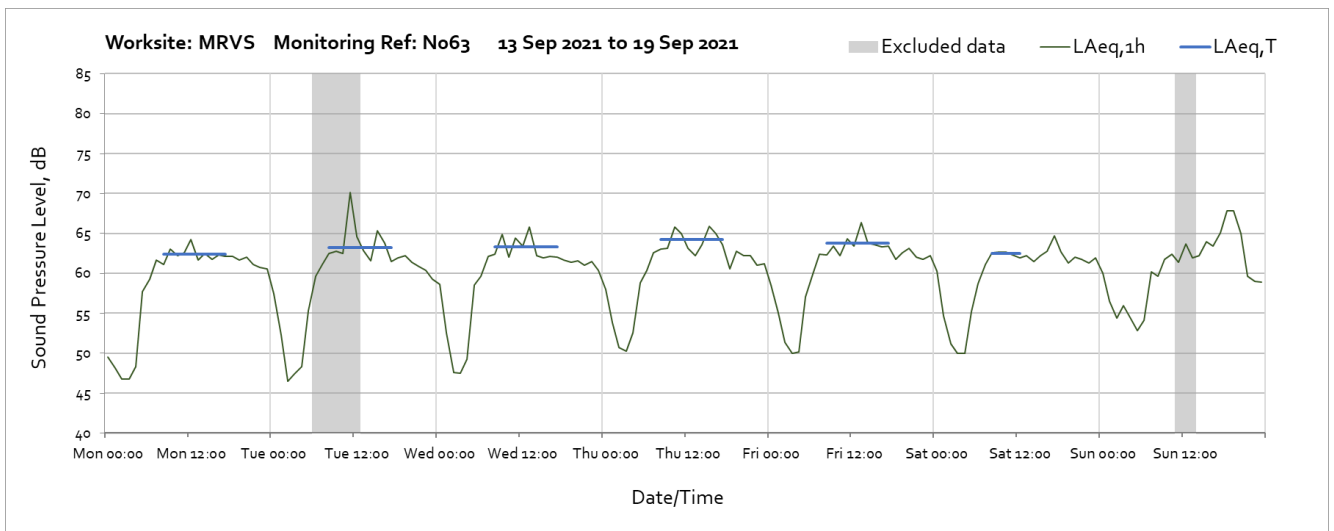


Note: Missing data between 14:00 on Sunday 26th September and 07:00 on Monday 13th September 2021 was due to loss of power at the monitor location.

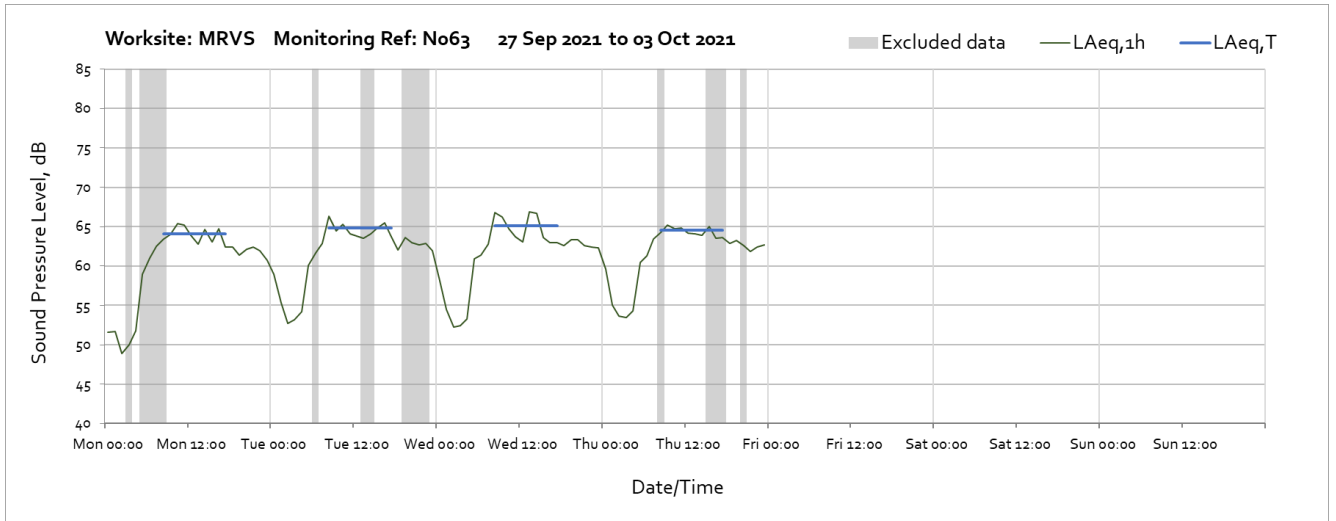
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N063



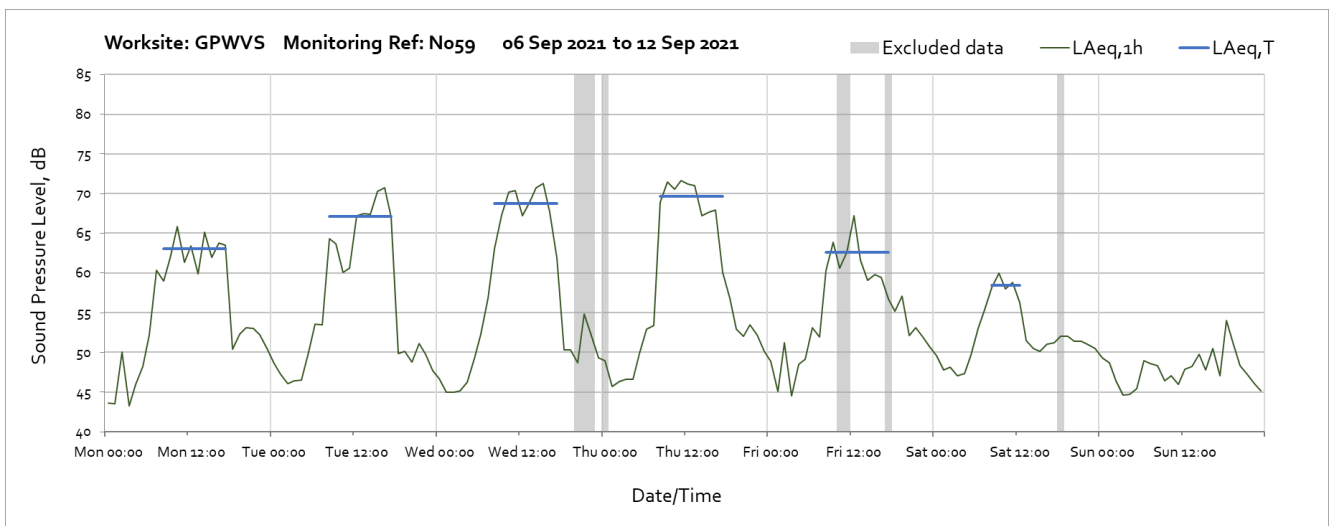
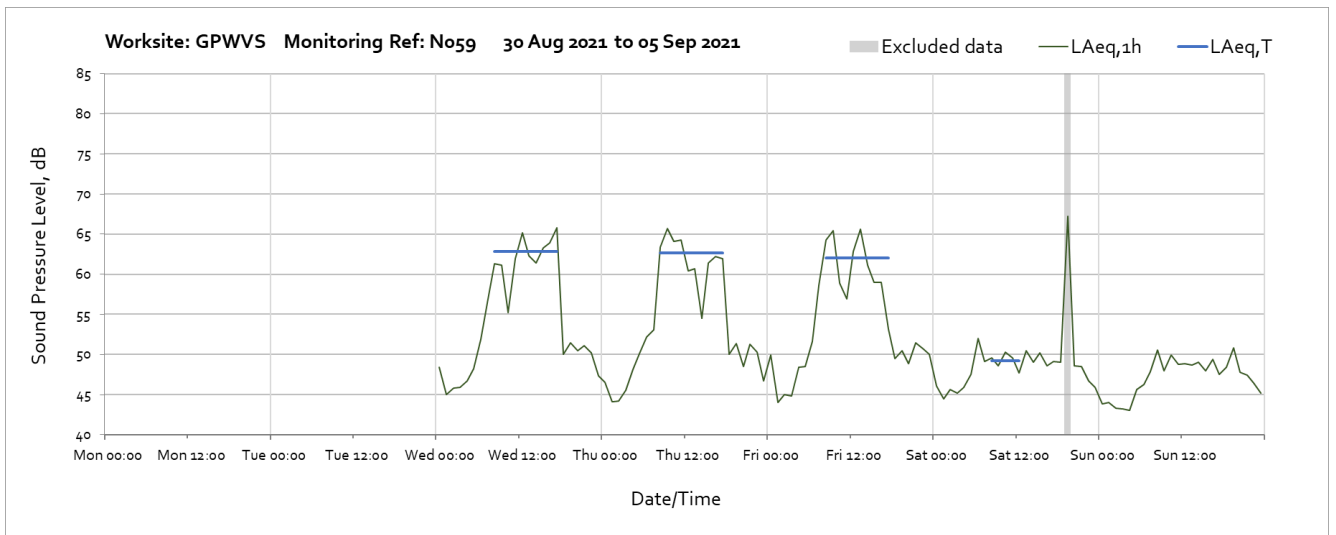
Note: Missing data from the beginning of September to 13:00 on Monday 6th September 2021 was due to loss of power at the monitor location. Missing data at 01:00 on Tuesday 7th September was due system error affecting the monitoring station.

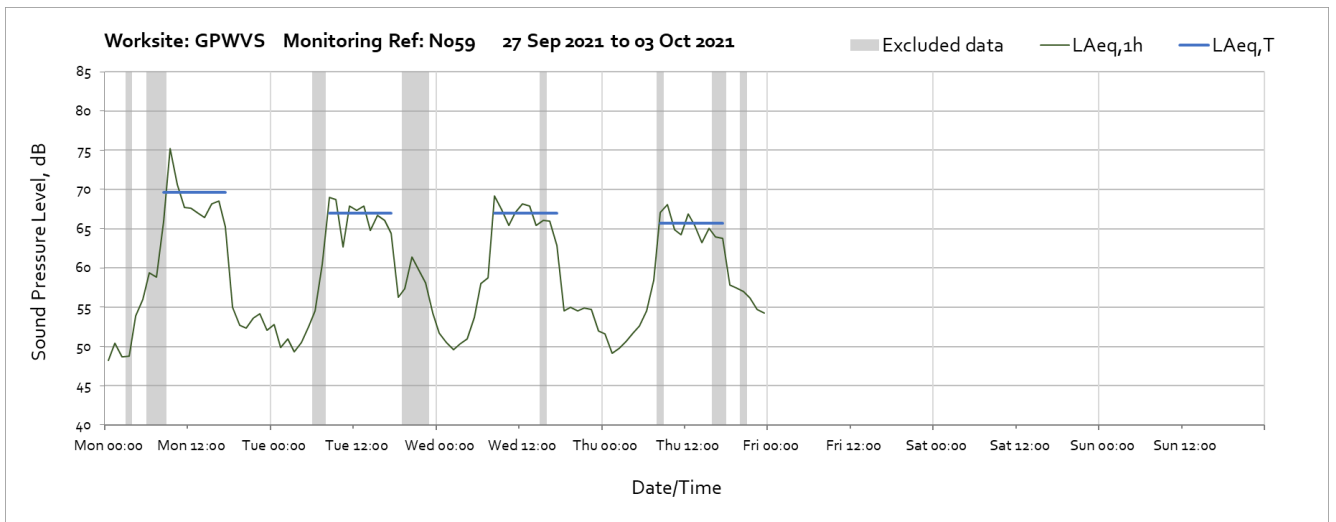
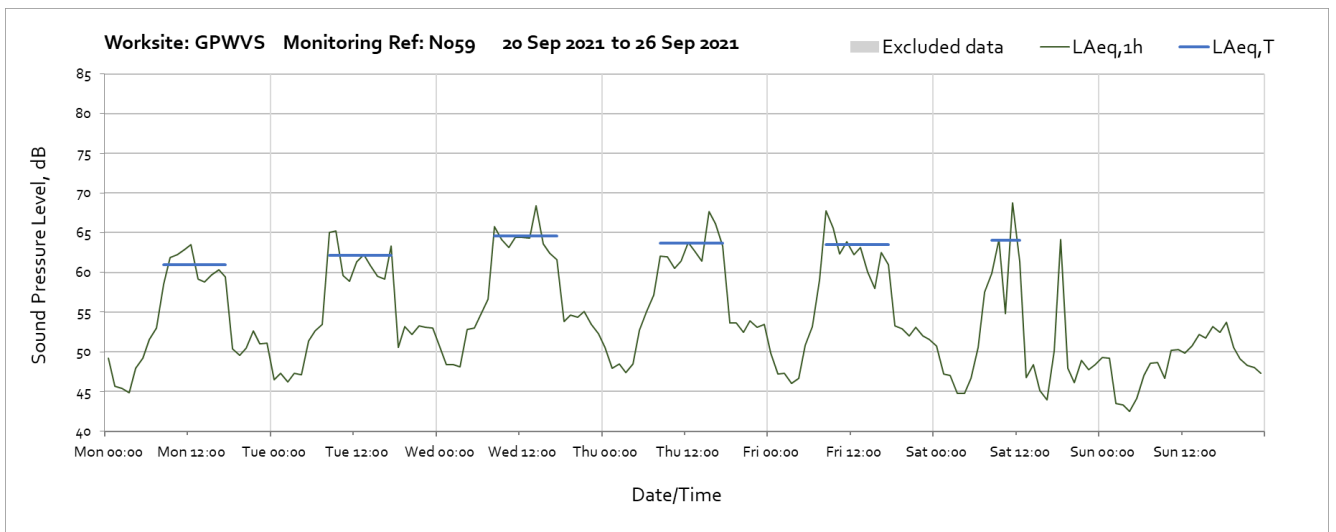
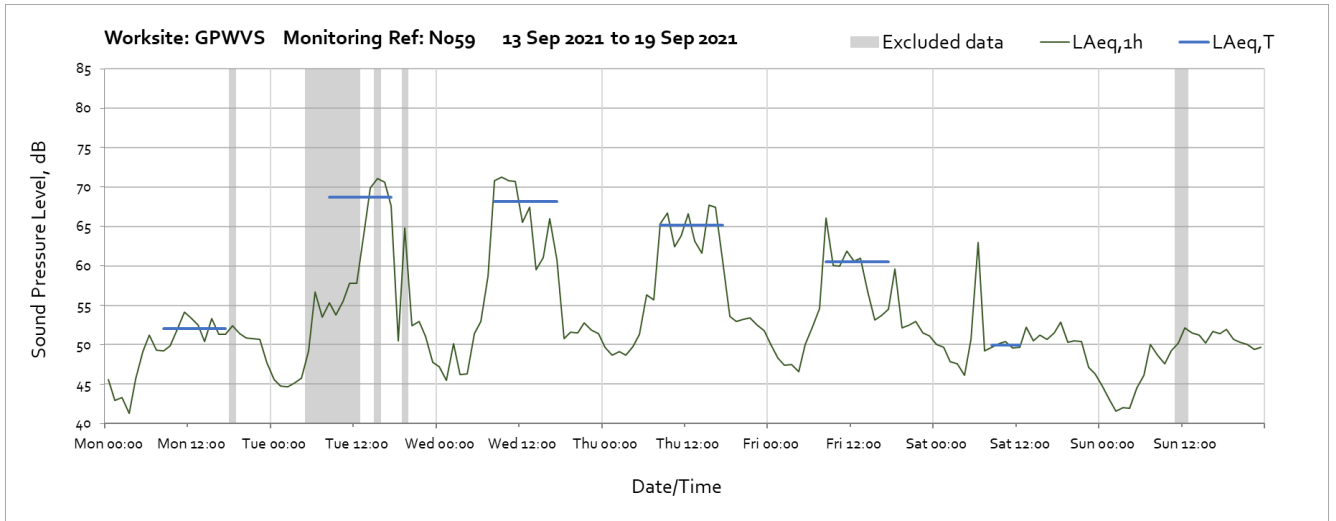


OFFICIAL

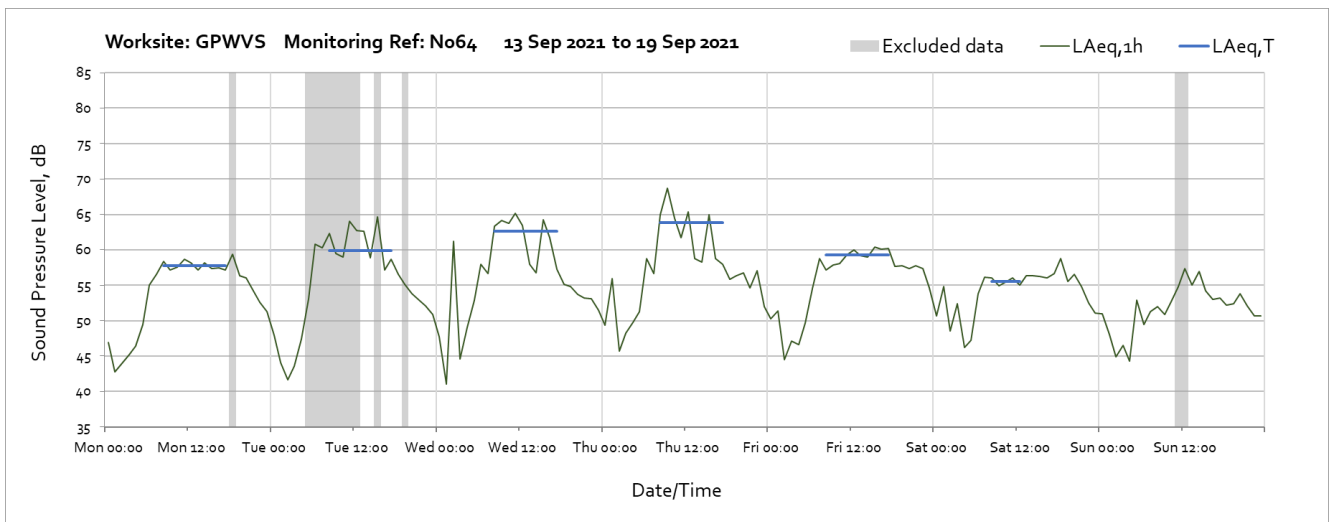
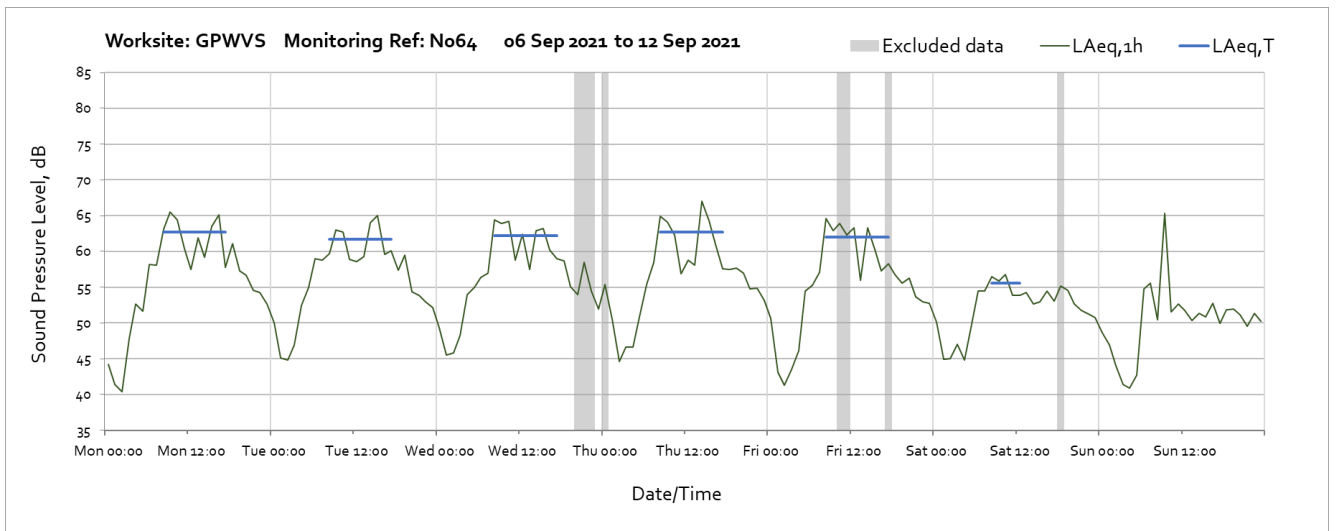
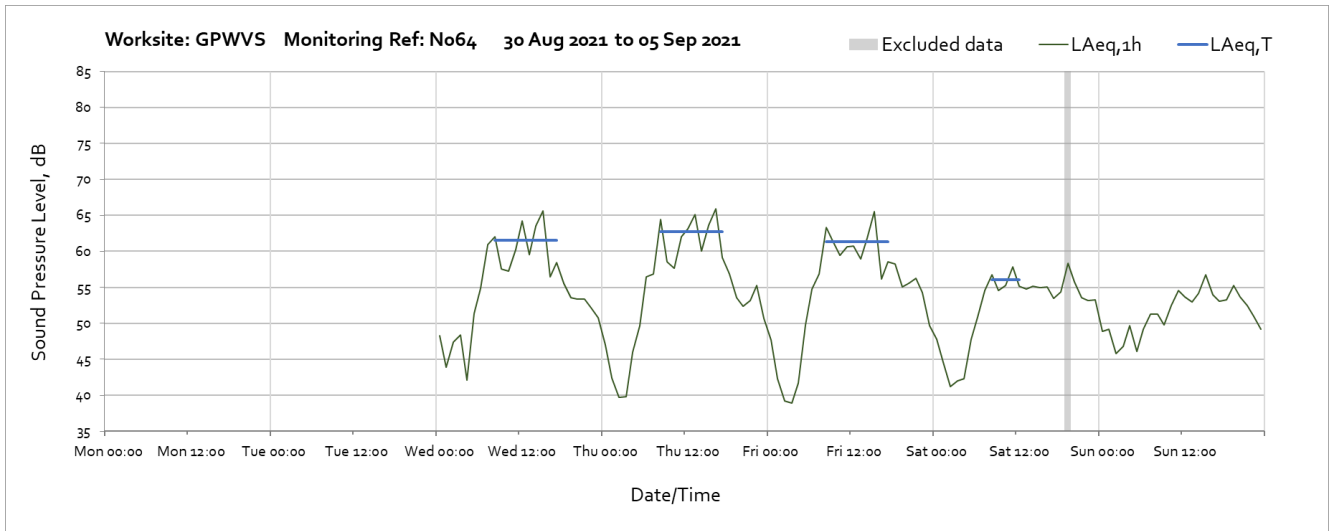


Worksite: Green Park Way Vent Shaft (GPWVS) - Monitoring Ref: N059

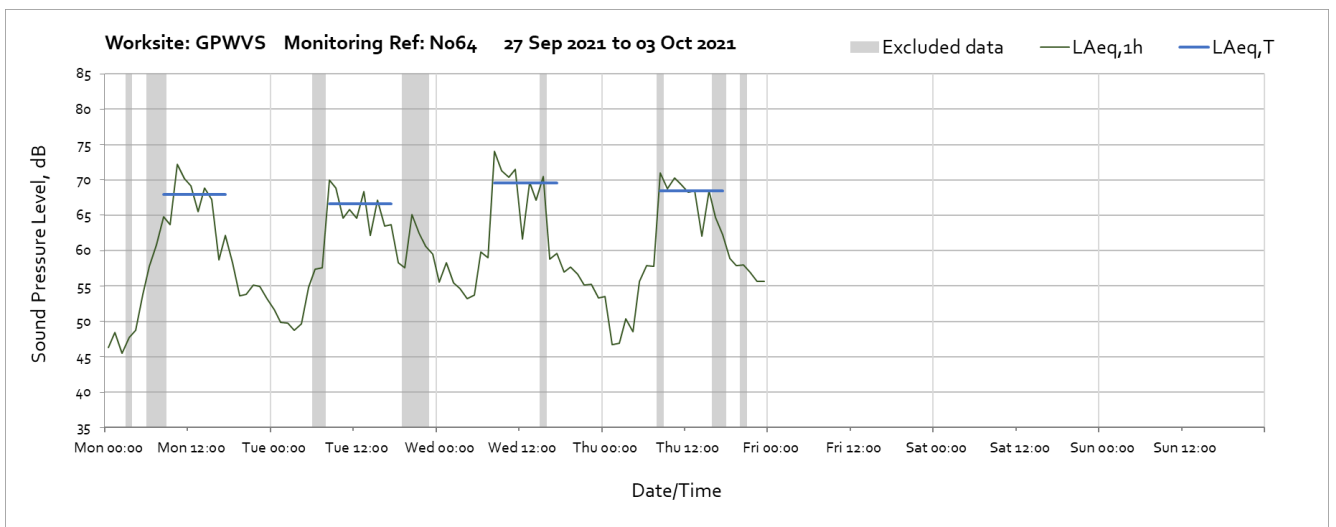
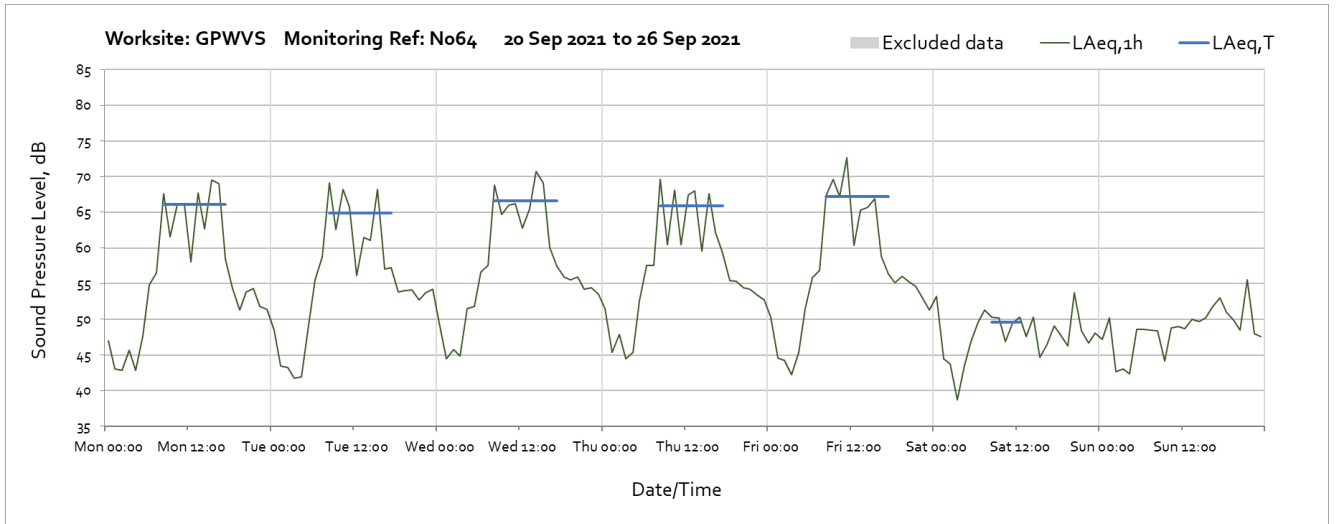




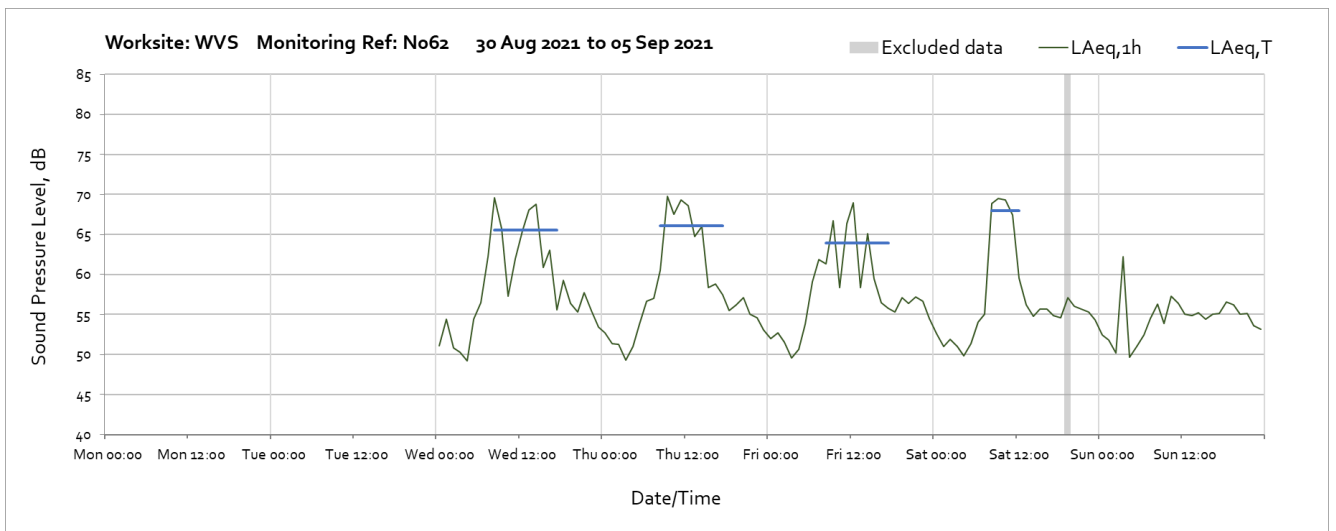
Worksite: Green Park Way Vent Shaft (GPWVS) - Monitoring Ref: N064

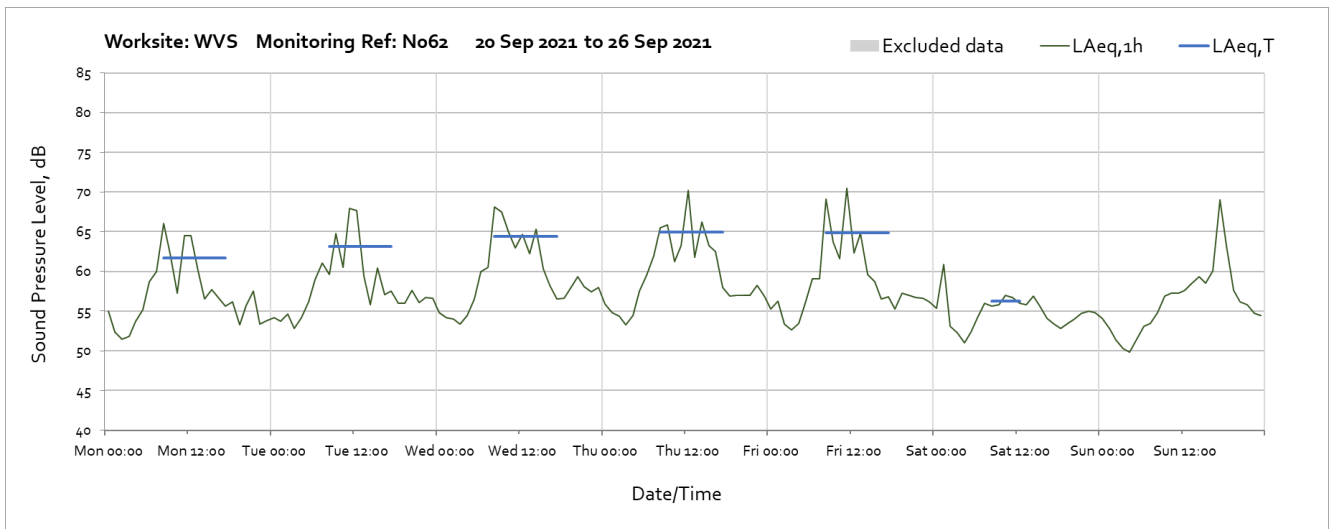
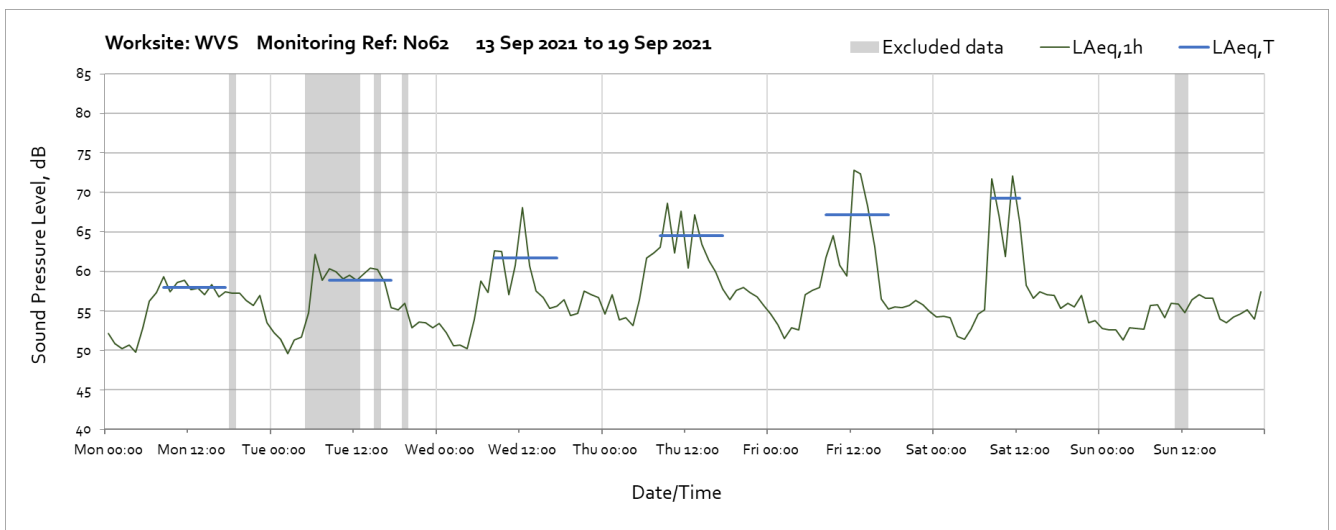
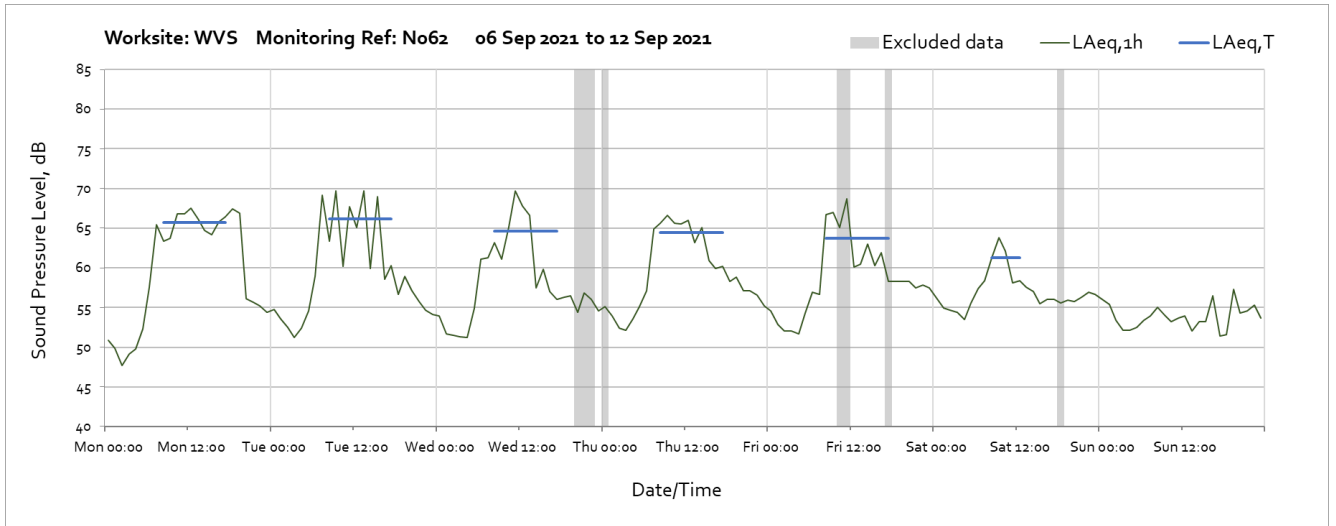


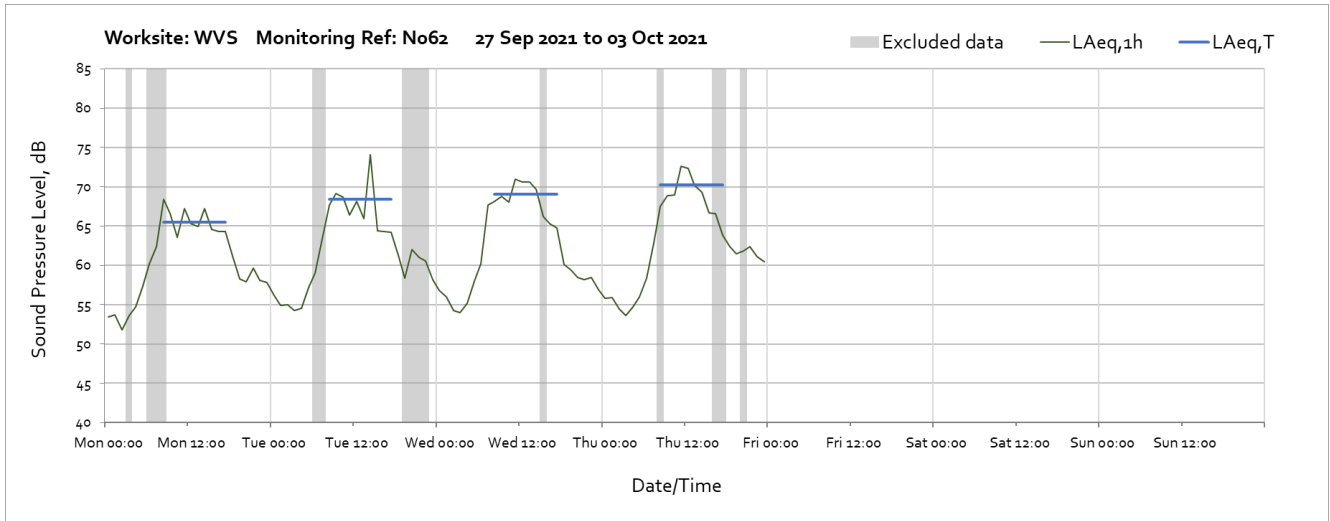
OFFICIAL



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



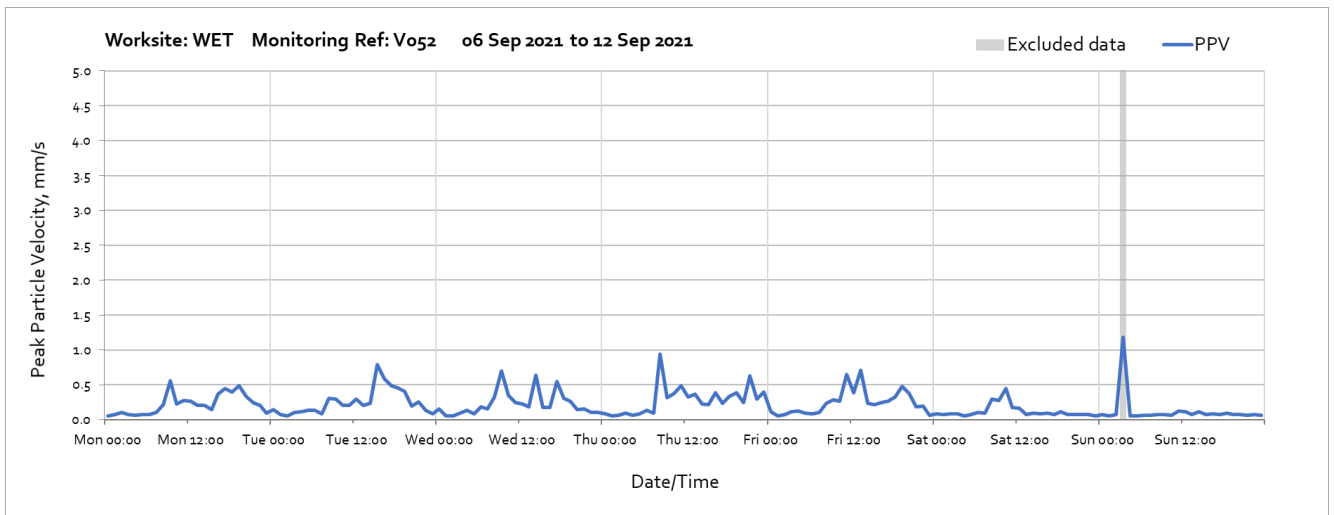
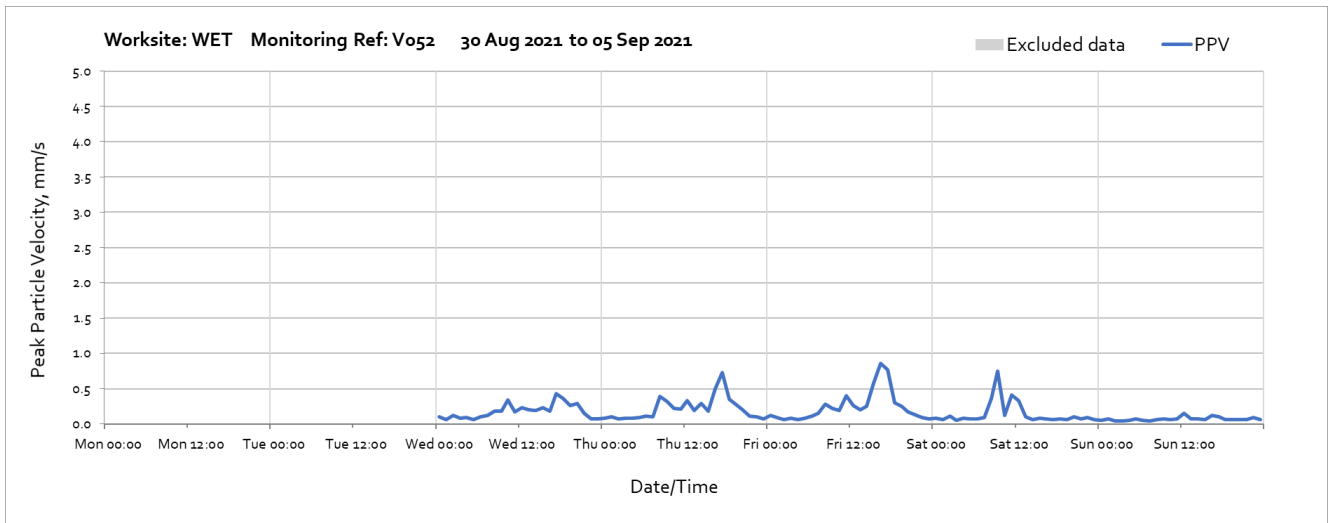




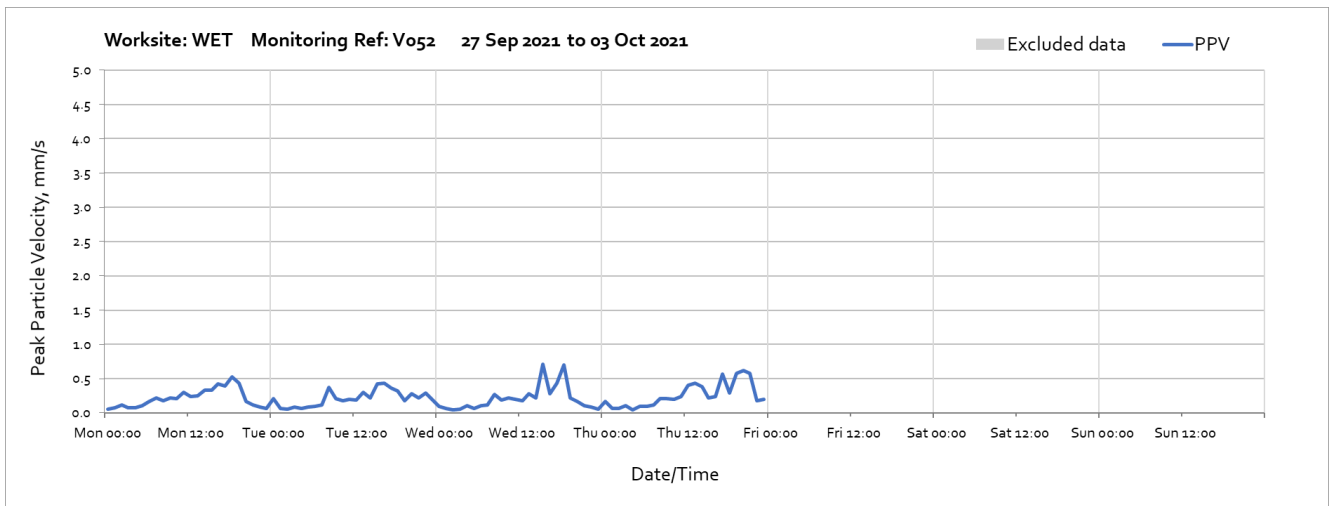
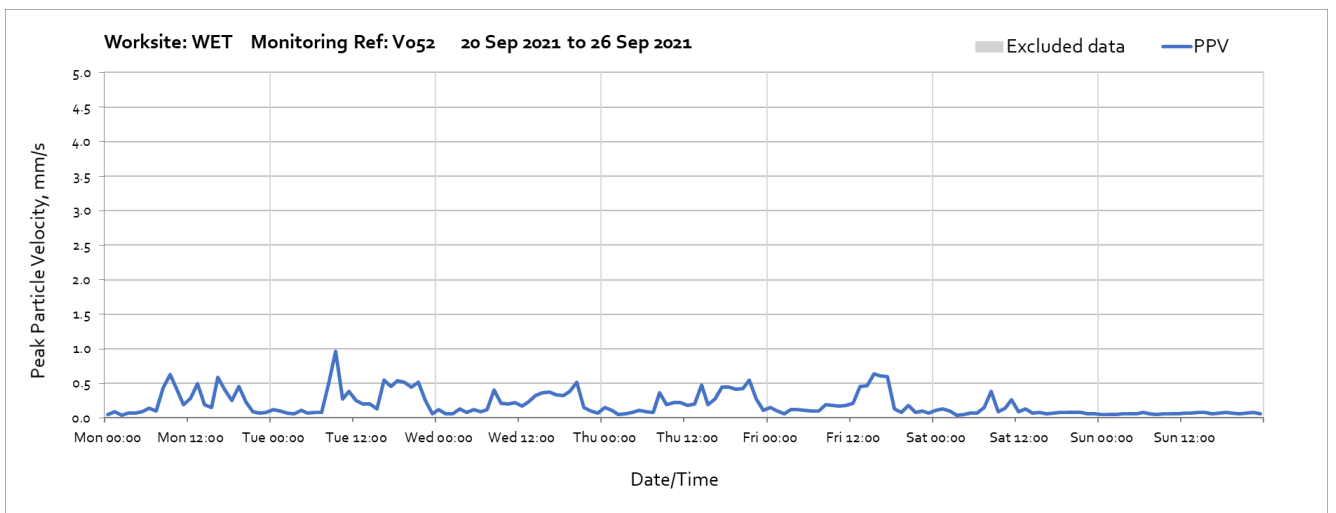
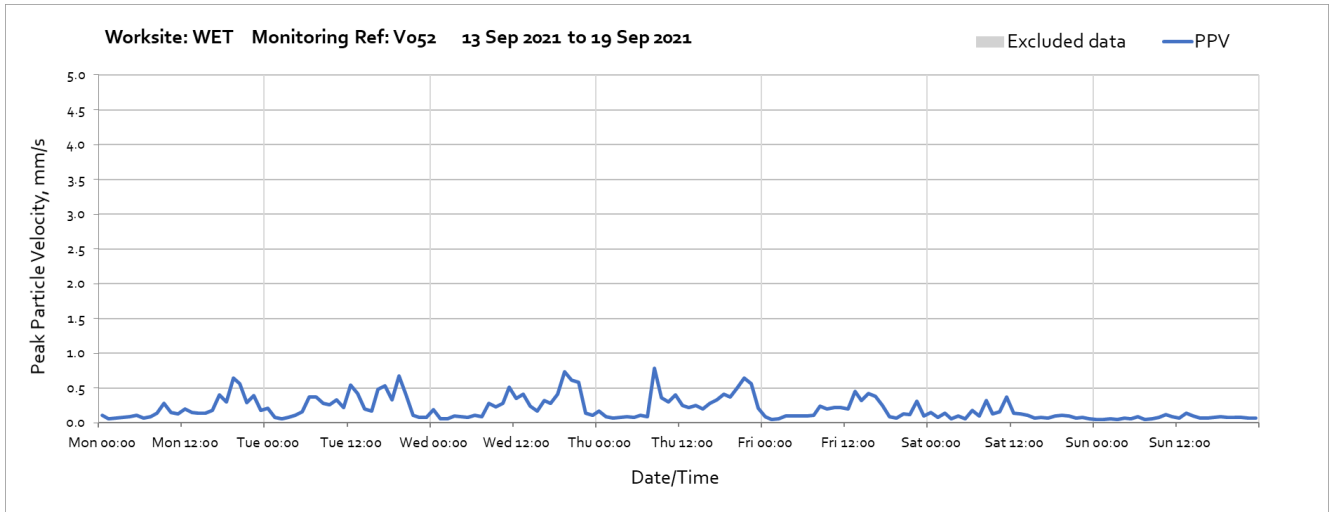
Vibration

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.

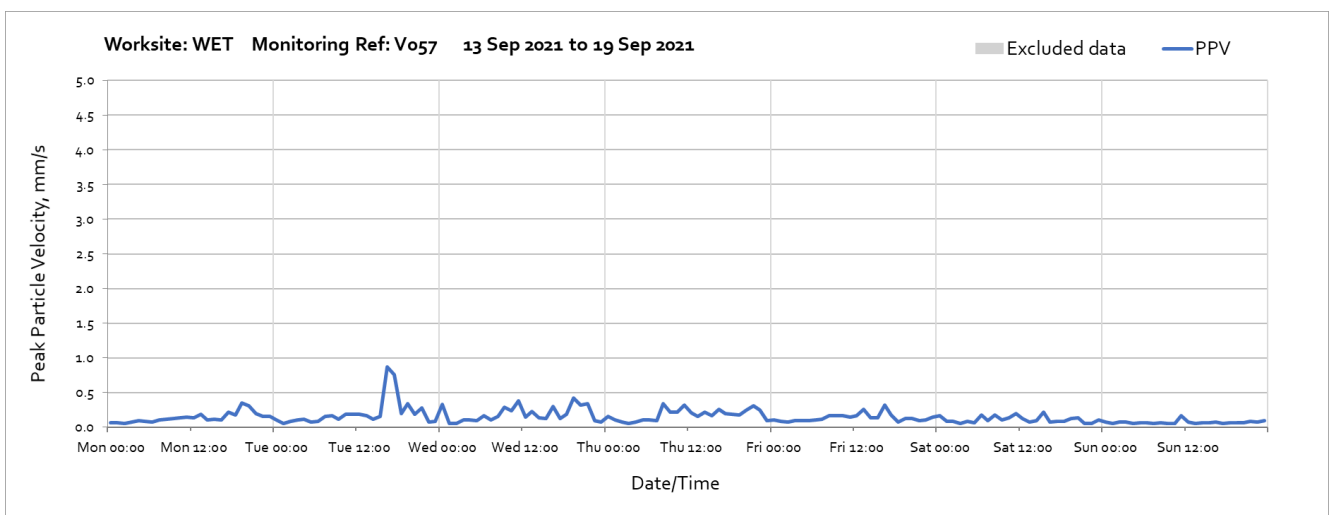
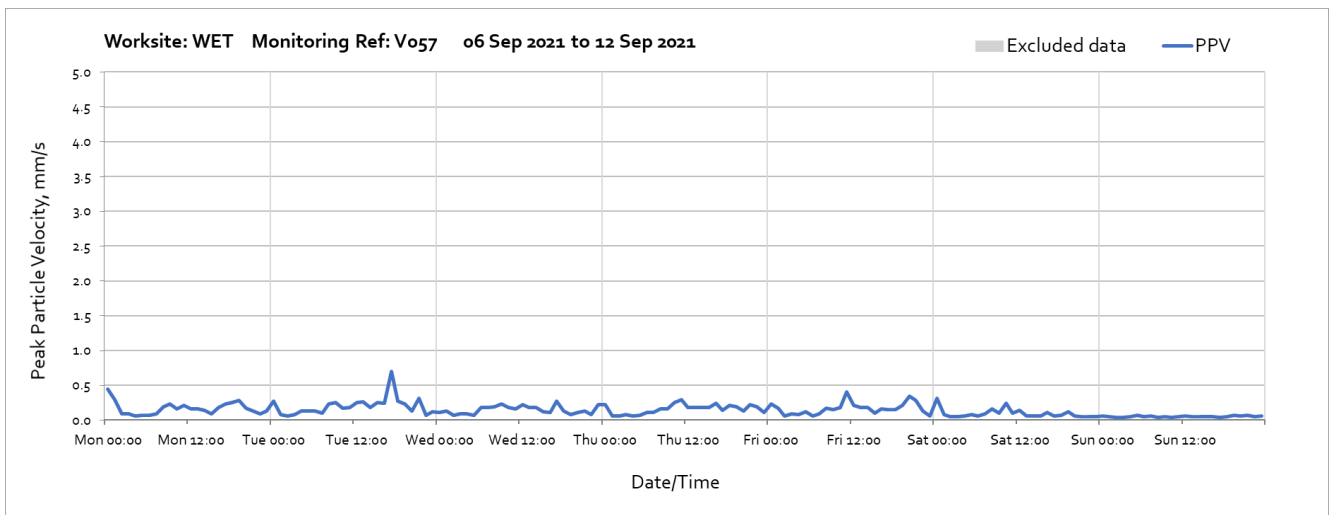
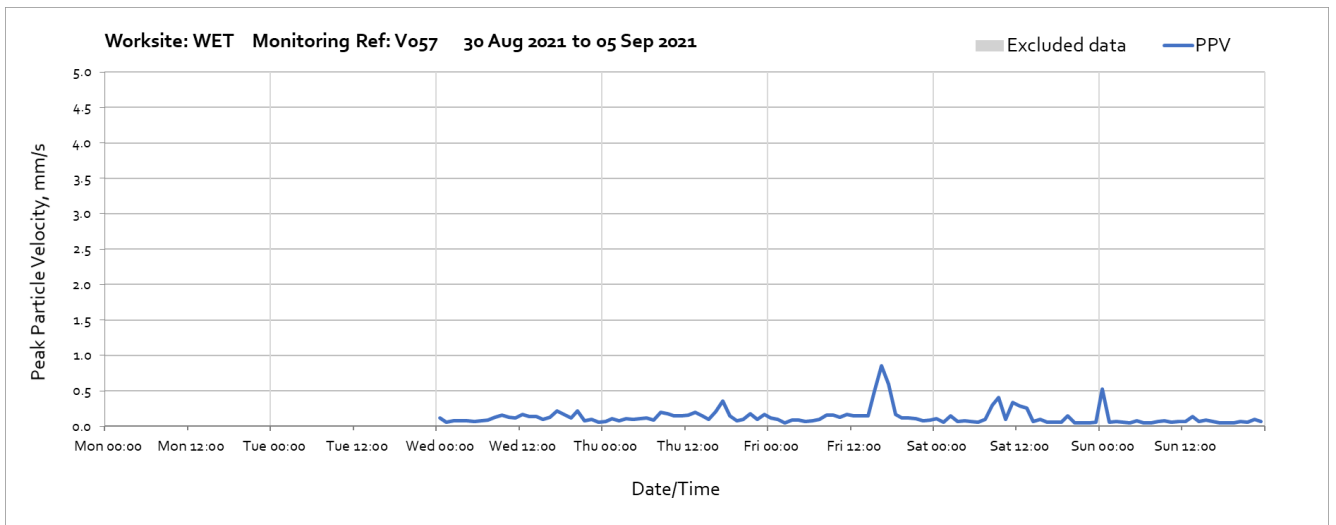
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V052

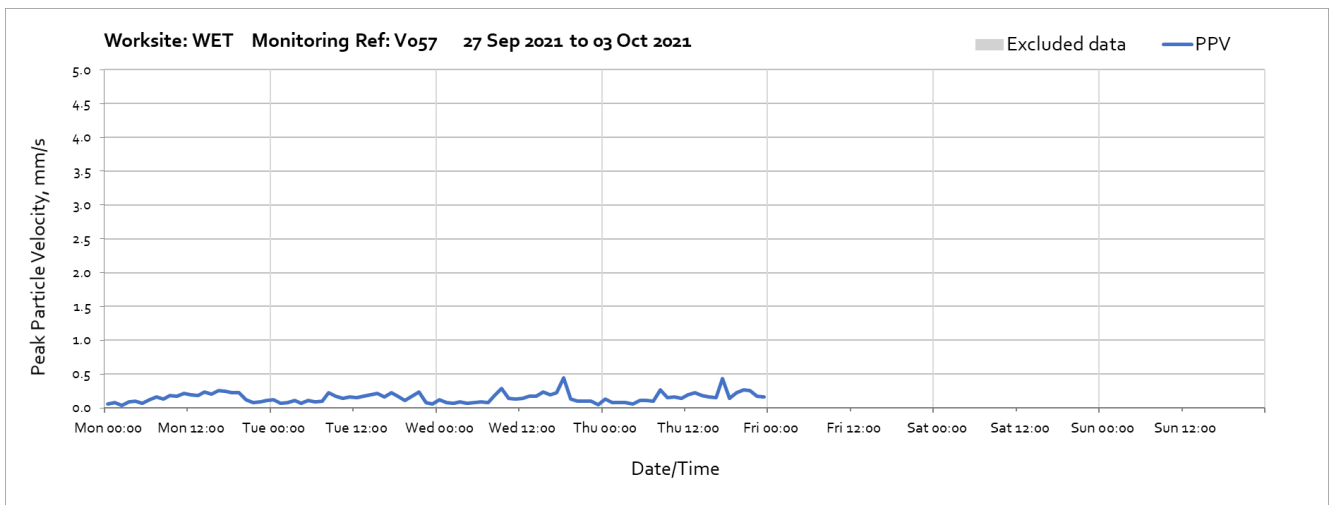
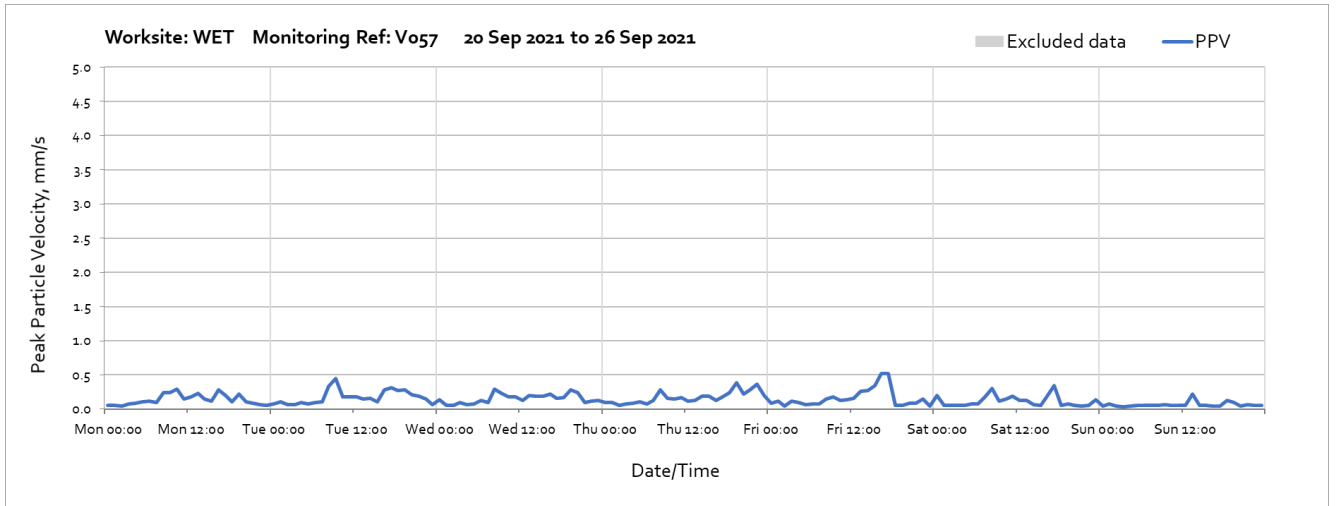


Note: High vibration levels measured at 03:00 on Sunday 12th September 2021 was due to local disturbance at the monitor station and not representative of HS2 vibration levels.

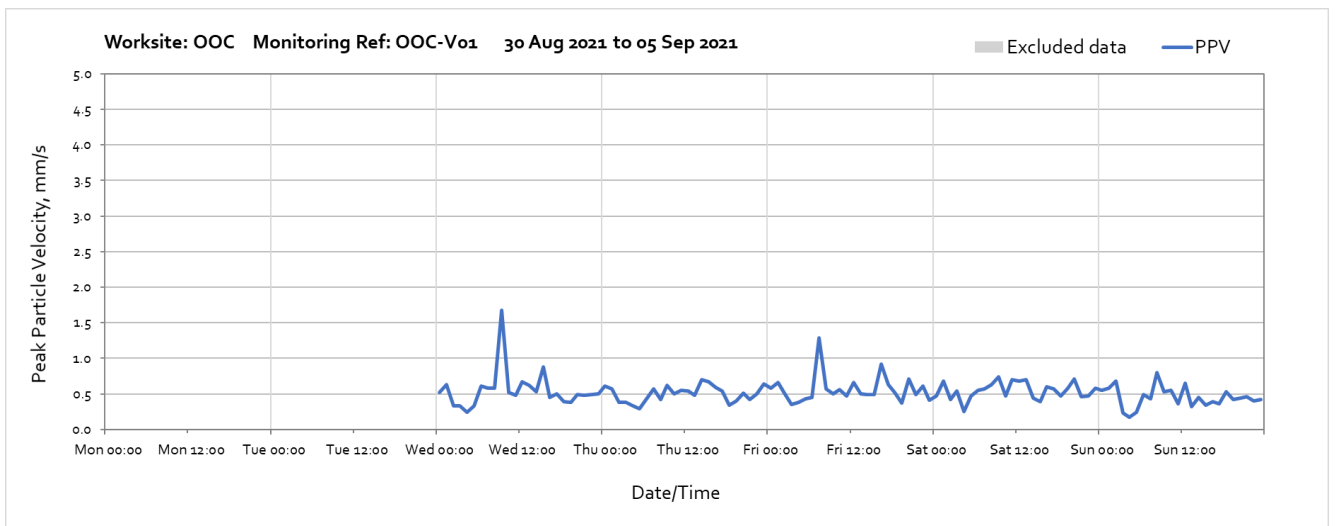


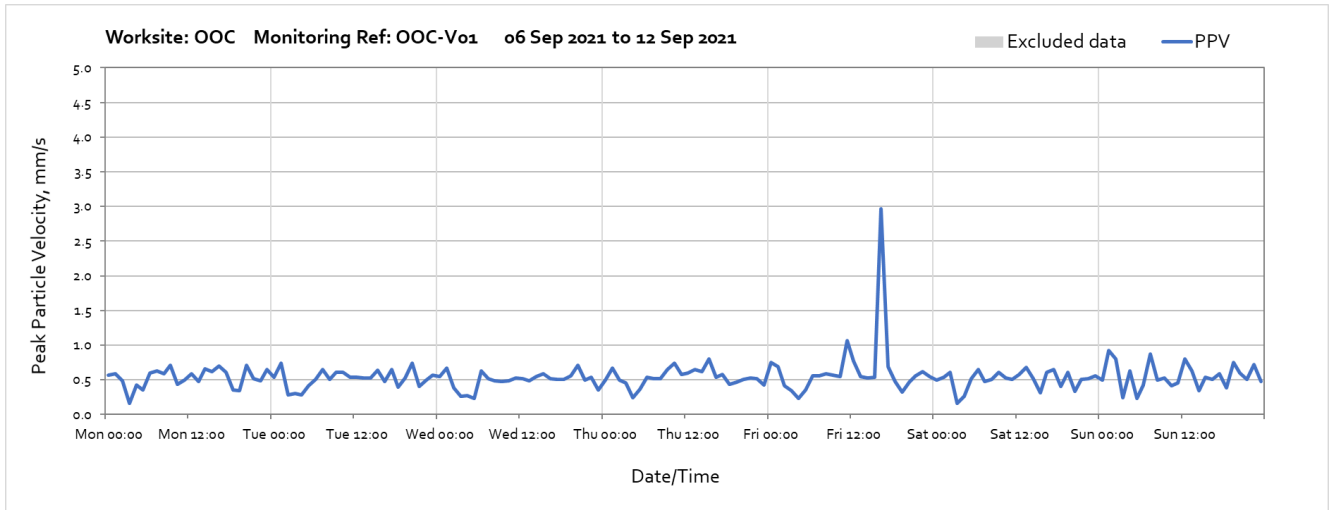
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V057



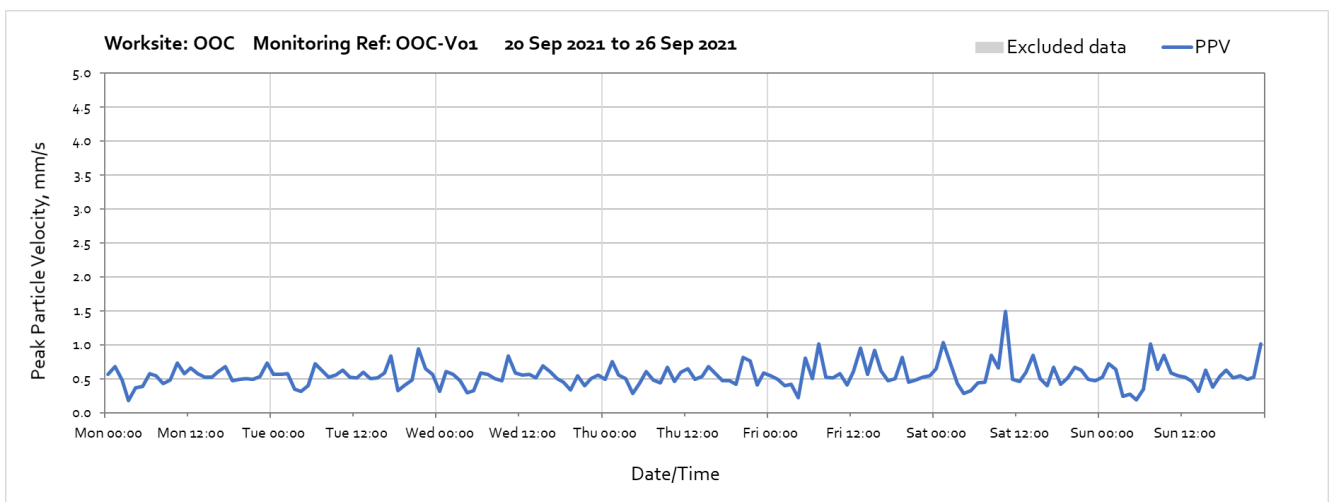
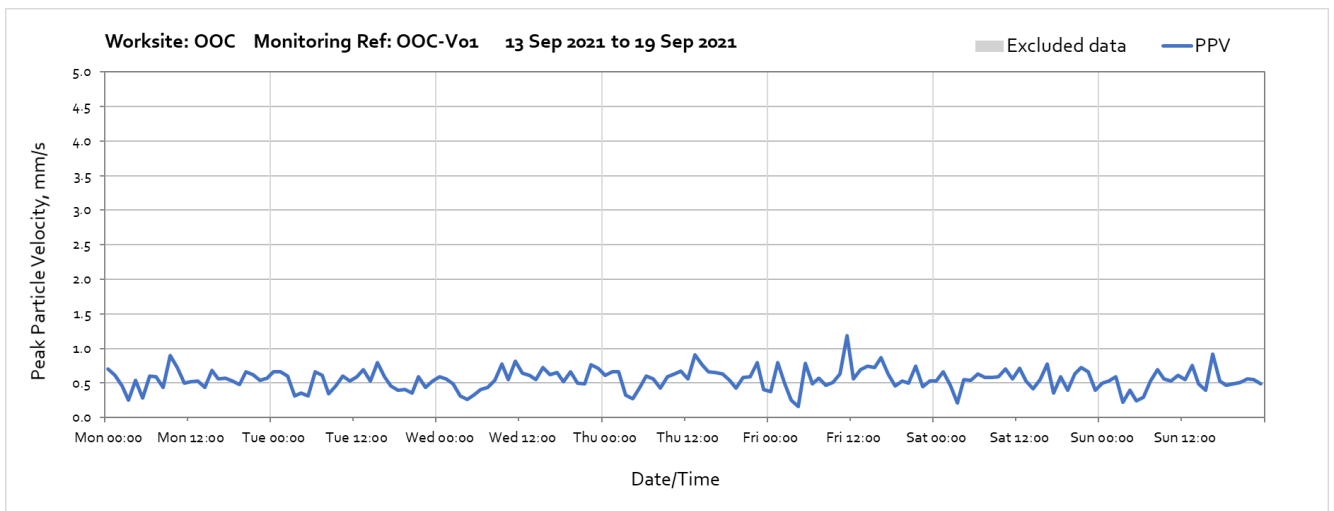


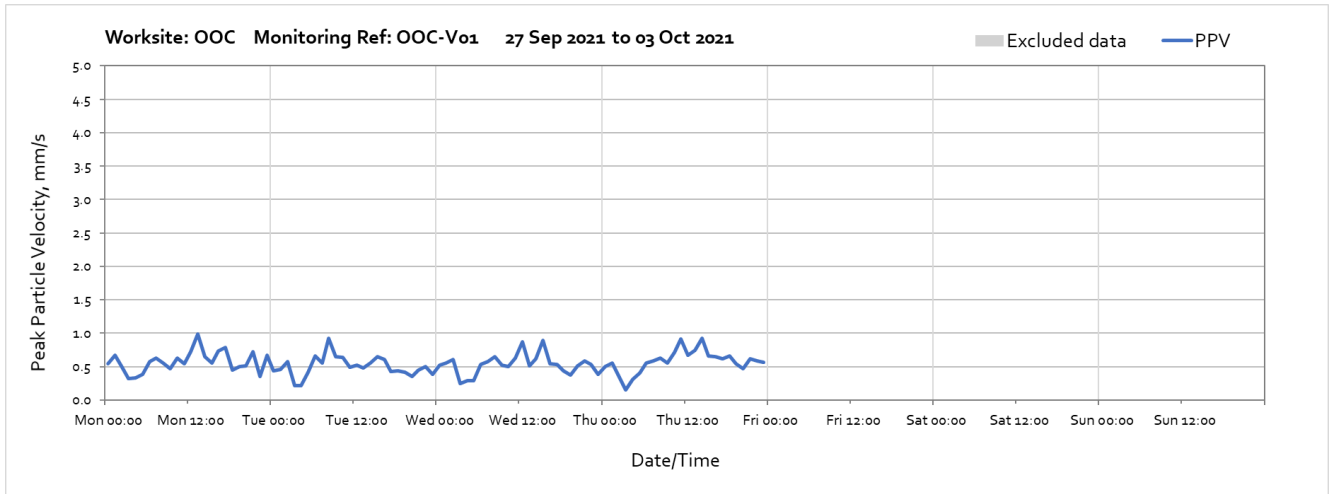
Worksite: Old Oak Common (OOC) - Monitoring Ref: OOC-V01



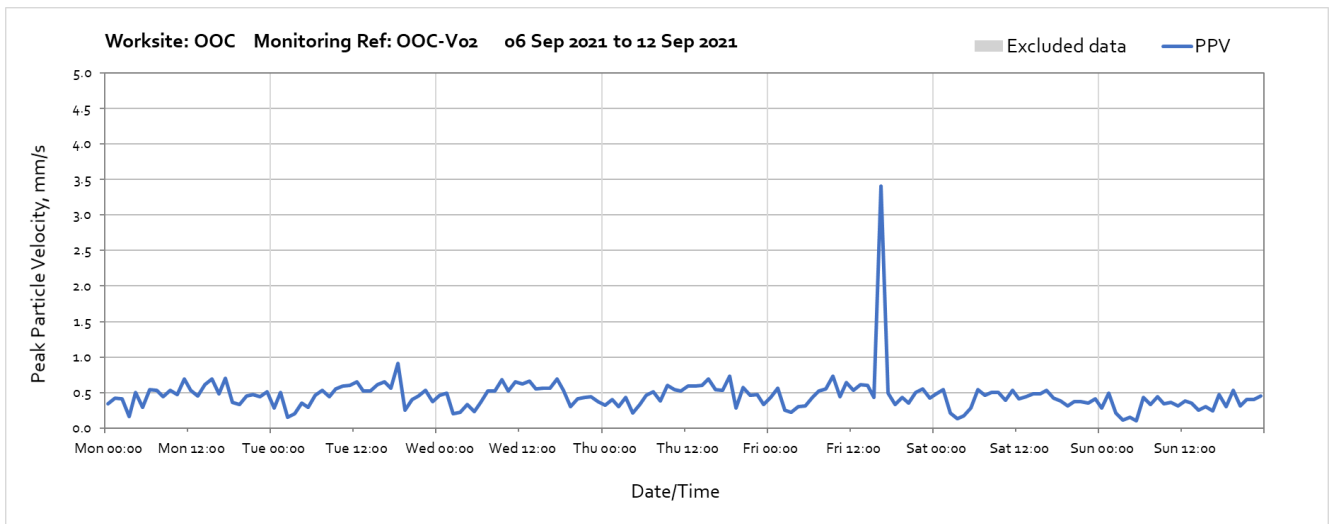
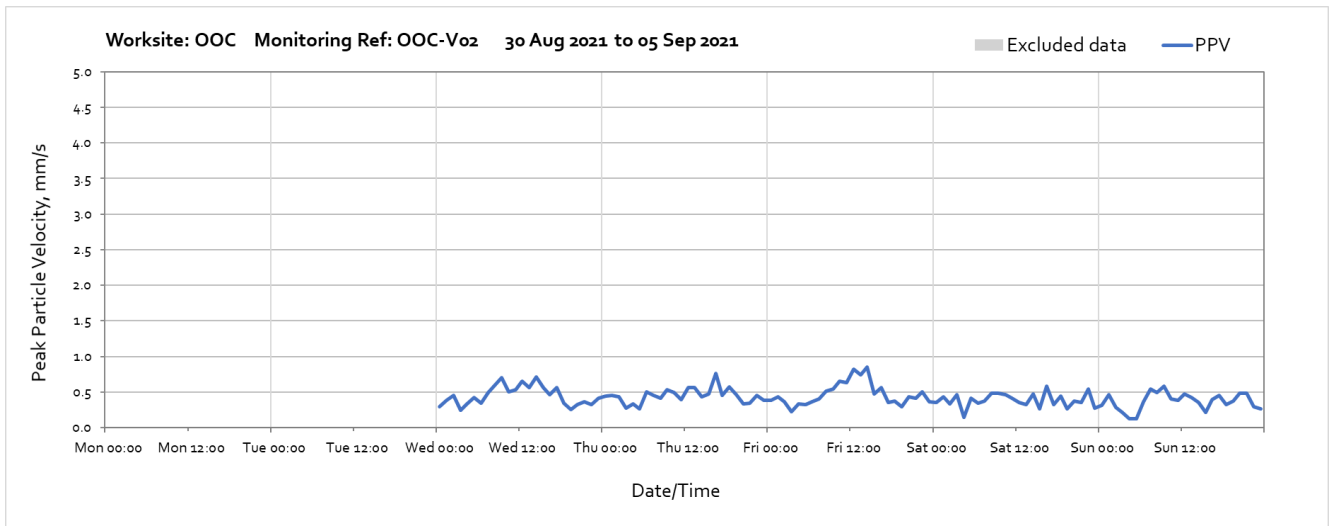


Note: High vibration levels measured at 16:00 on Friday 10th September 2021 was due to digging works and unintentionally release of the grab bucket on the ground. Operators on site was re-briefed on the operation procedures and a safety related close call opened.



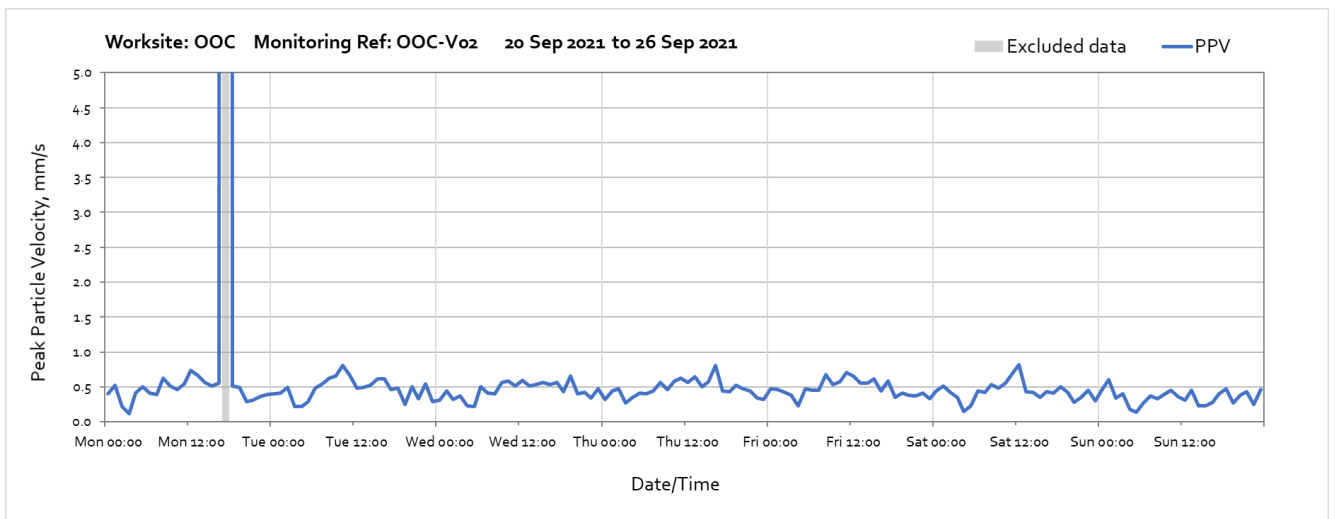
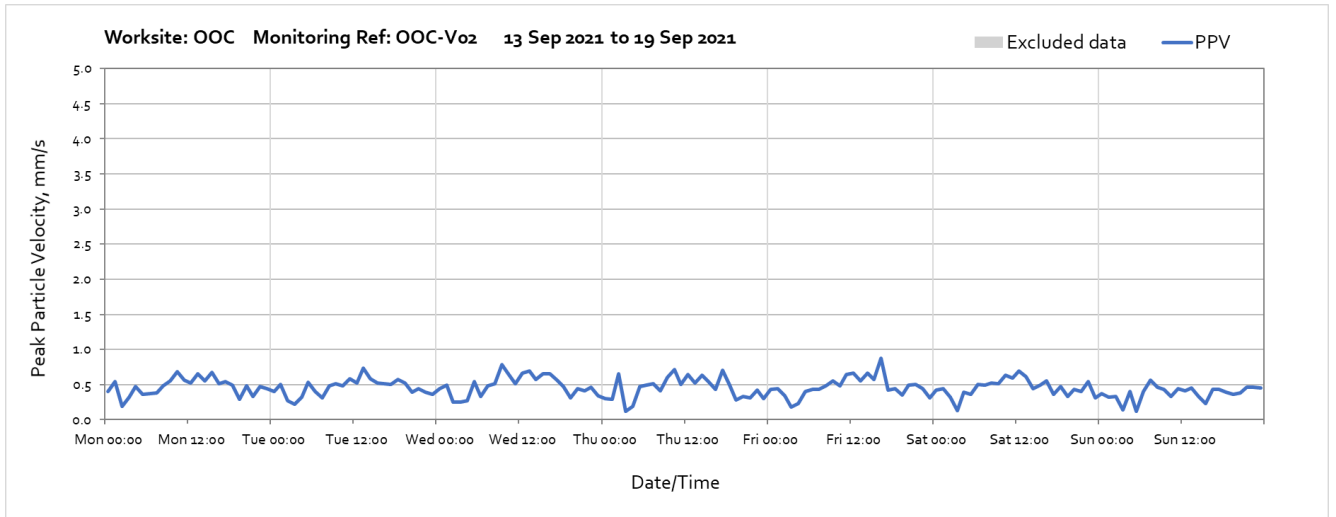


Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V02

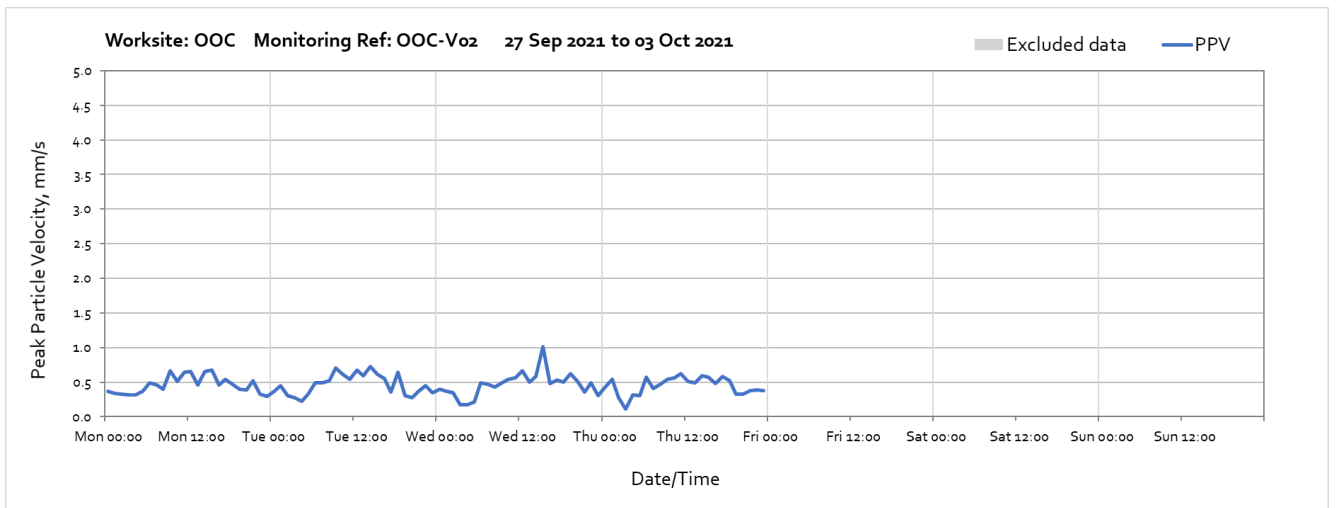


Note: High vibration levels measured at 16:00 on Friday 10th September 2021 was due to digging works and unintentionally release of the grab bucket on the ground. Operators on site was re-briefed on the operation procedures and a safety related close call opened.

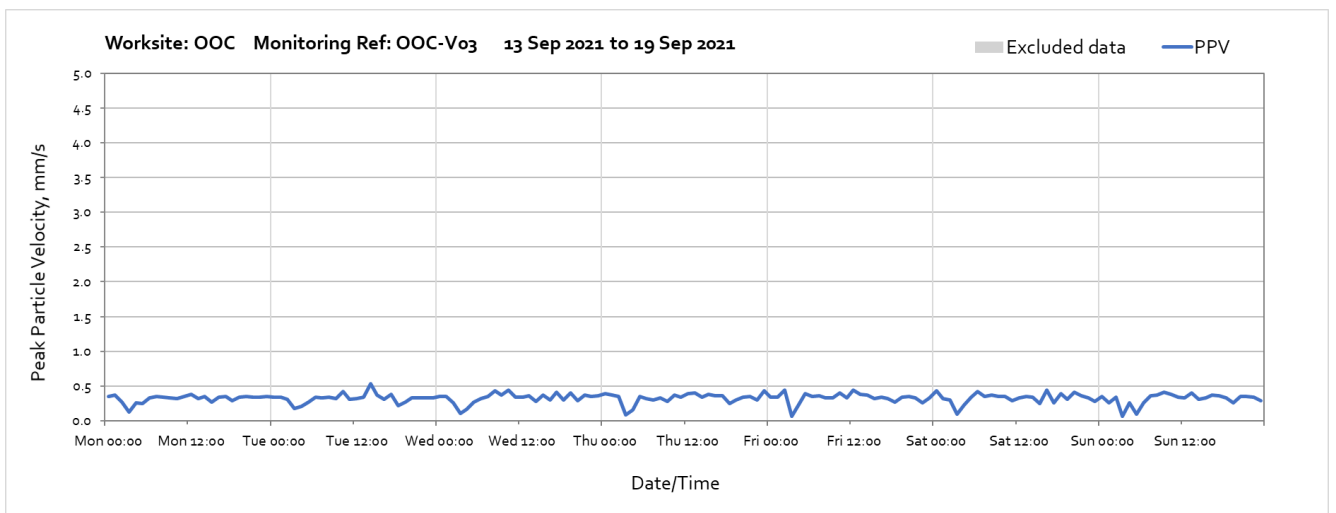
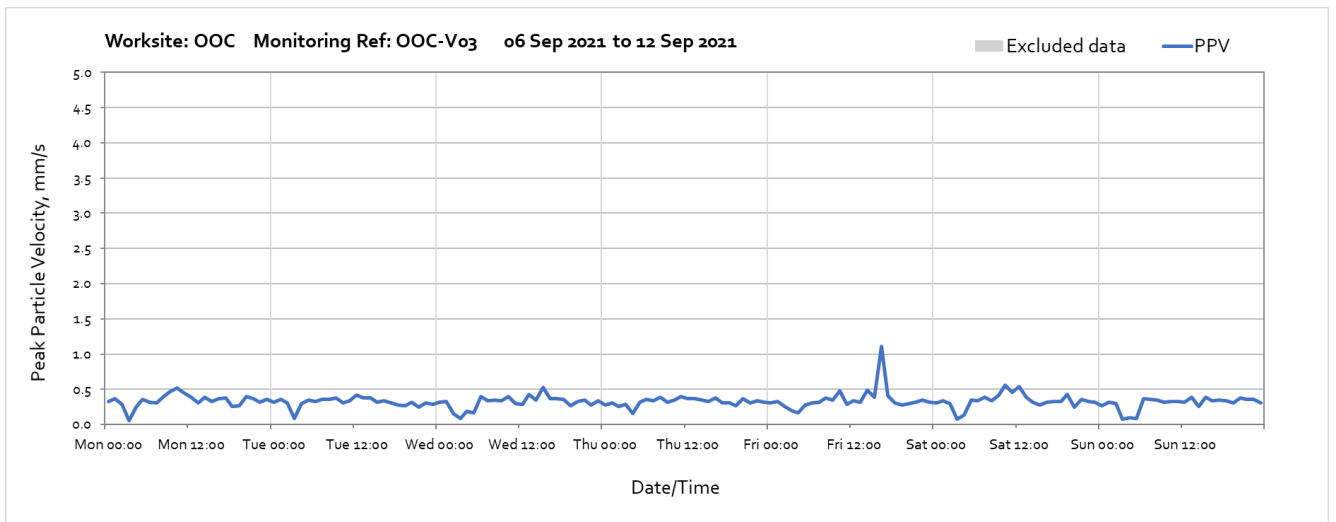
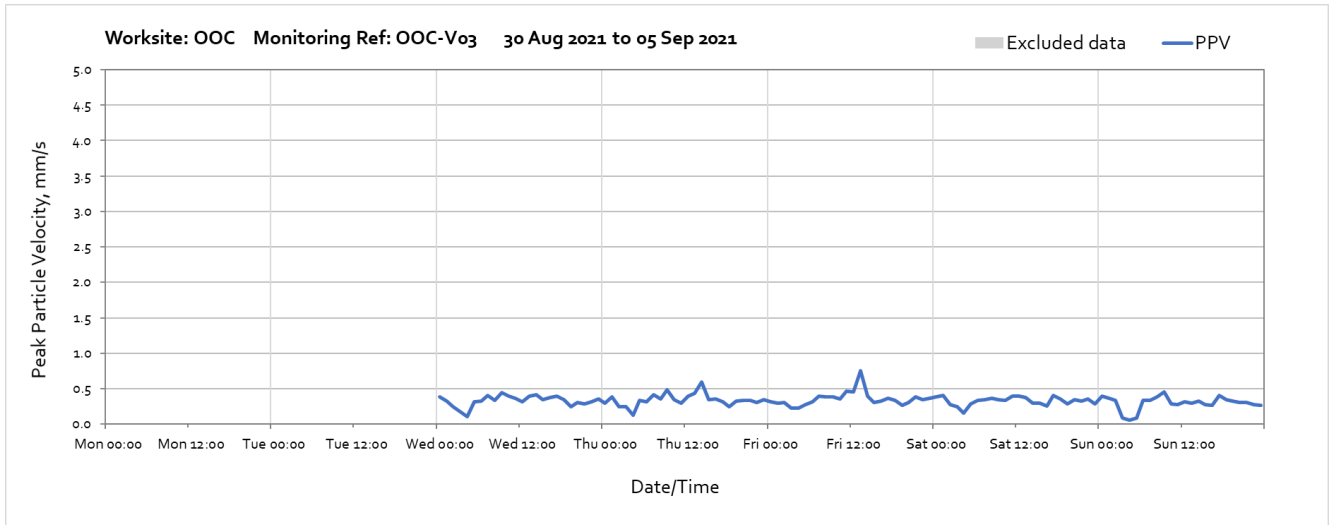
OFFICIAL

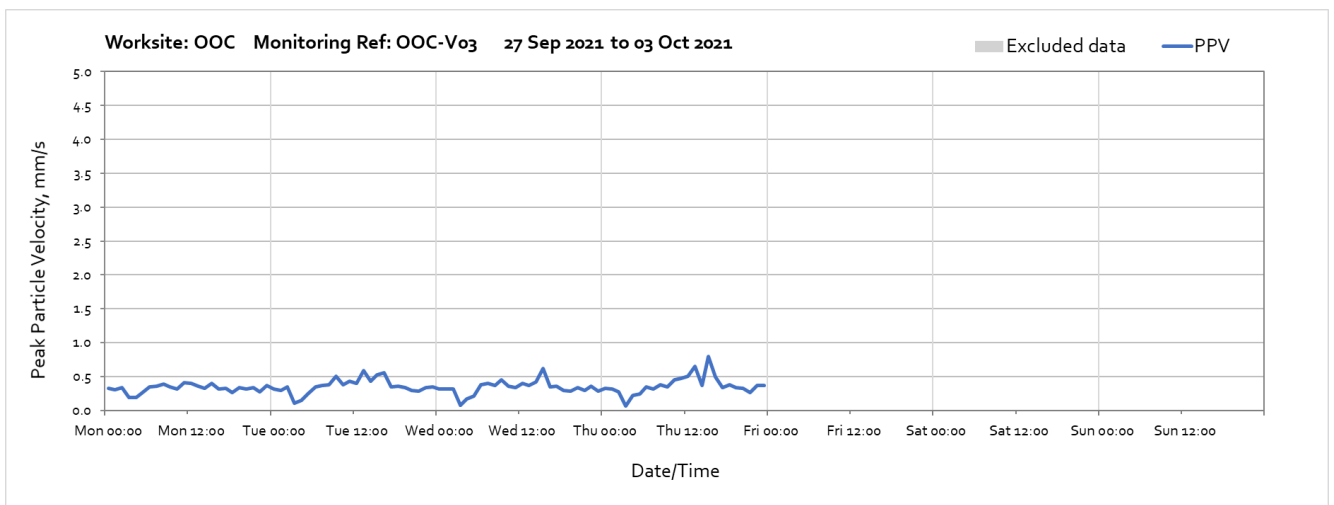
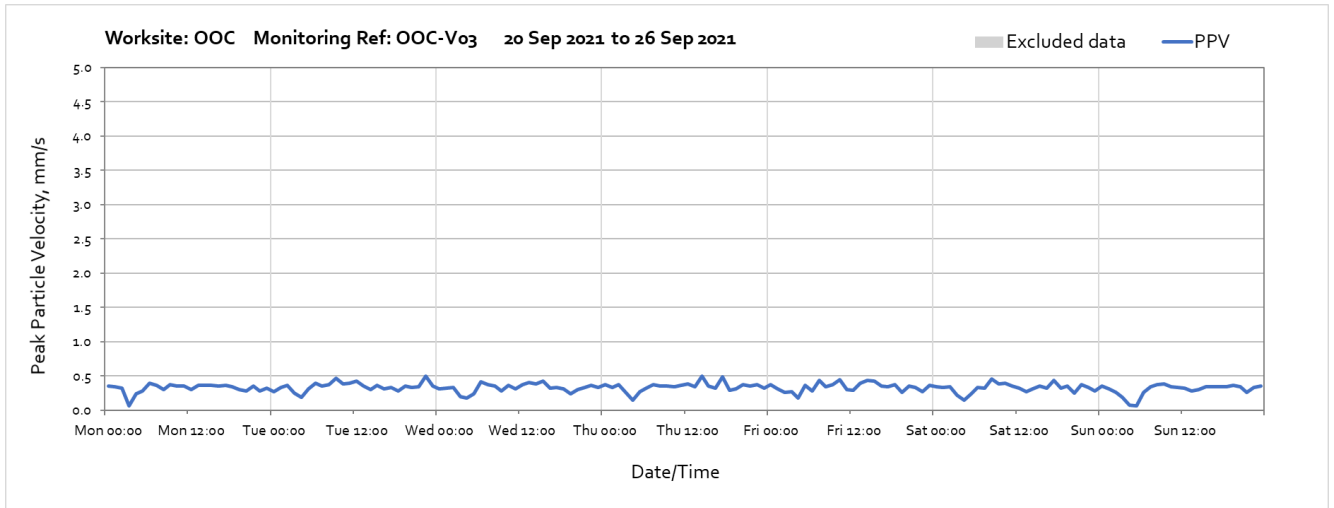


Note: High vibration levels measured at 17:00 on Monday 20th September 2021 was due to local disturbance at the monitor station and not representative of HS2 vibration levels.

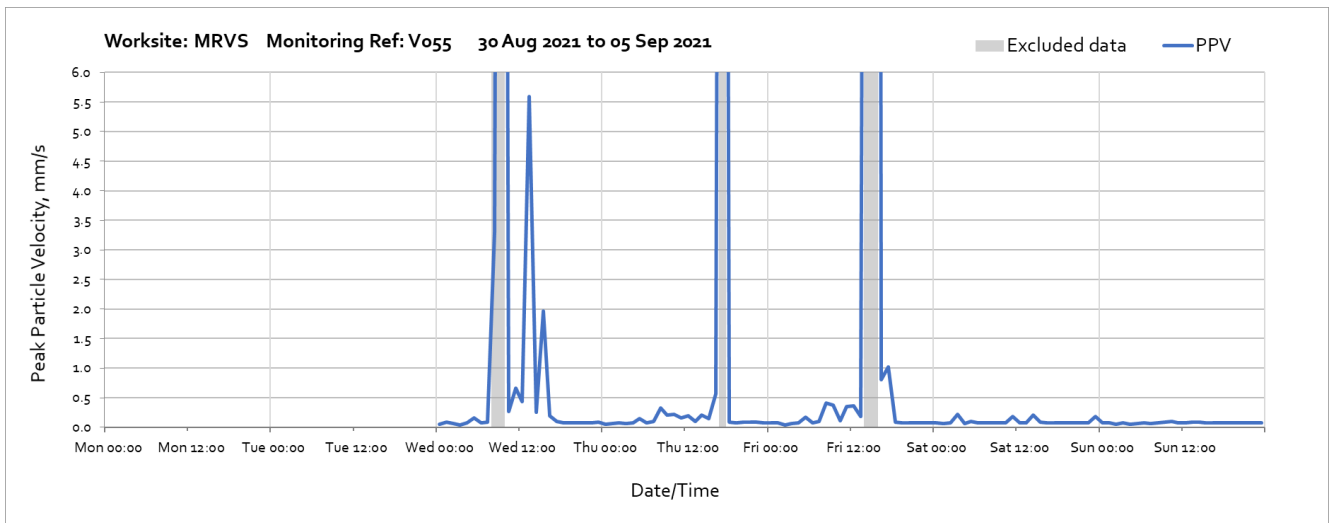


Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V03



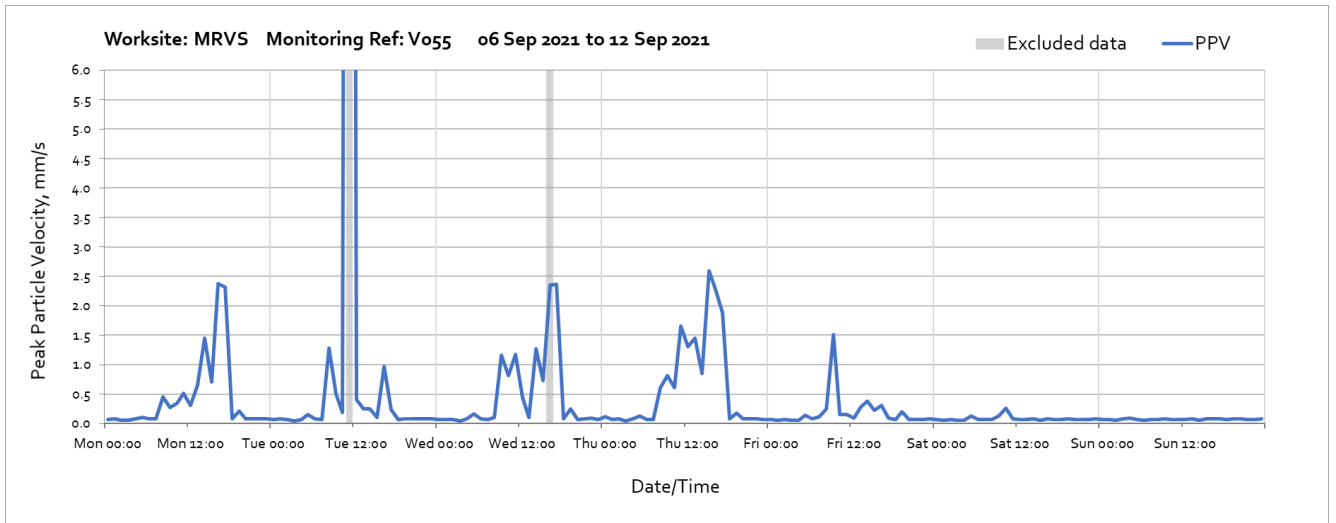


Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V055

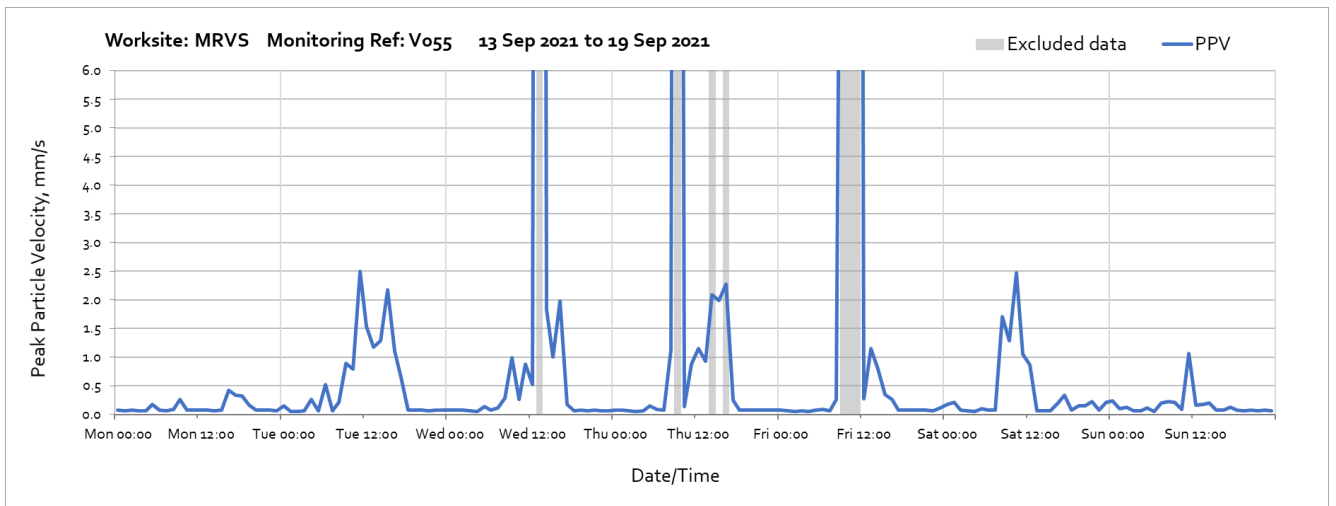


Note: High vibration levels measured at 13:00 on Wednesday 1st September were due to piling works undertaken near to the monitoring location. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower. High vibration levels measured across

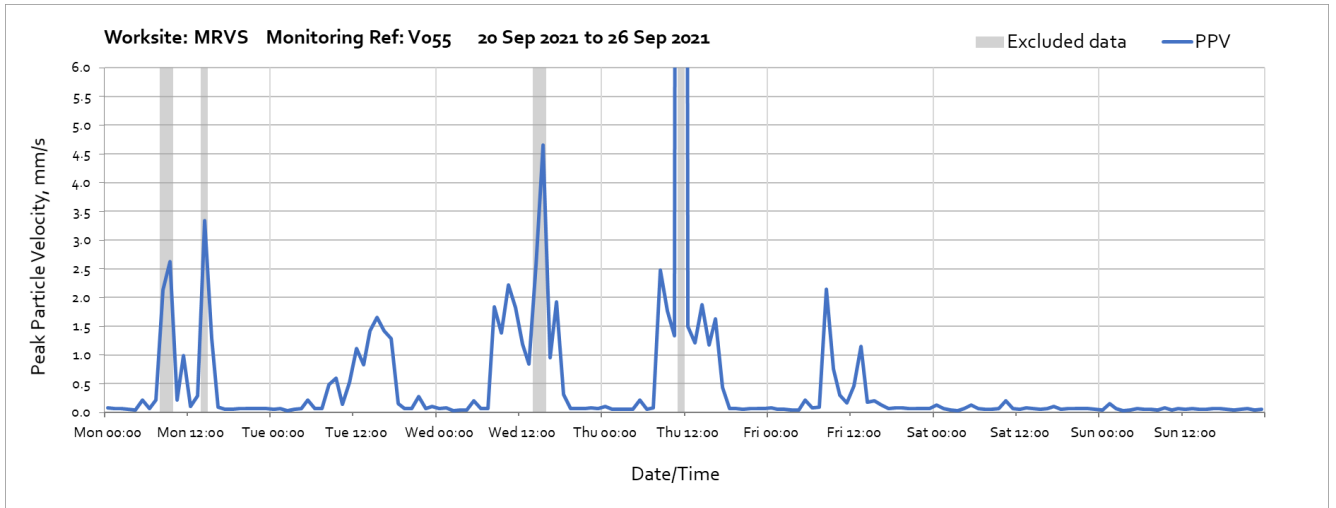
the week were due to local disturbance at the monitor station and are not representative of HS2 vibration levels at the nearest receptor.



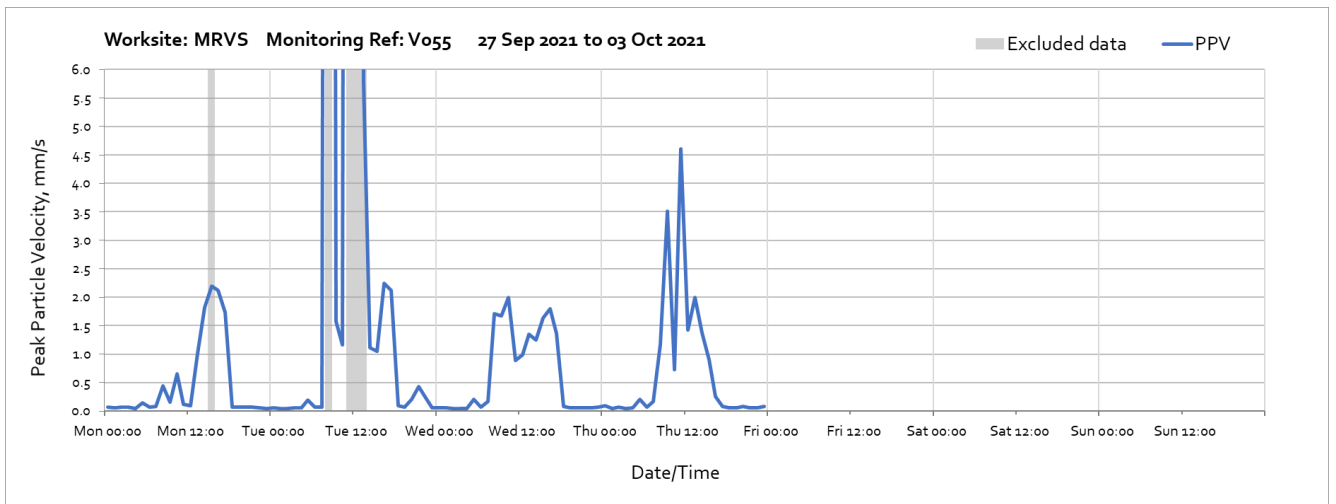
Note: High vibration levels measured at 12:00 on Tuesday 7th September and between at 16:00 on Wednesday 8th September were due to local disturbance at the monitor station and are not representative of HS2 vibration levels at the nearest receptor.



Note: High vibration levels measured across the week were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

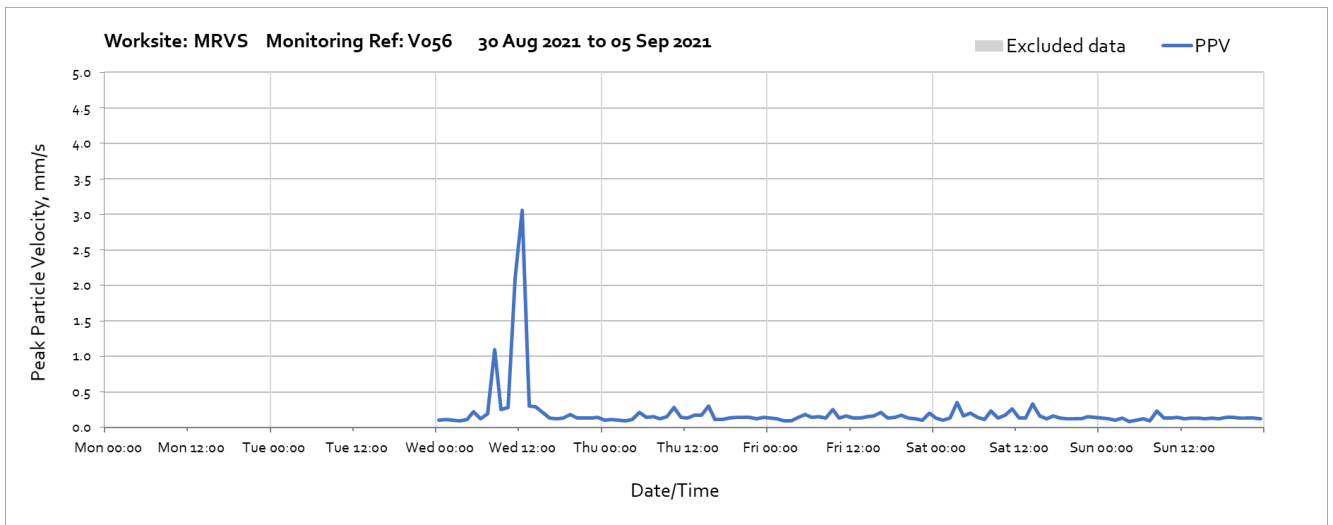


Note: High vibration levels measured across the week were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

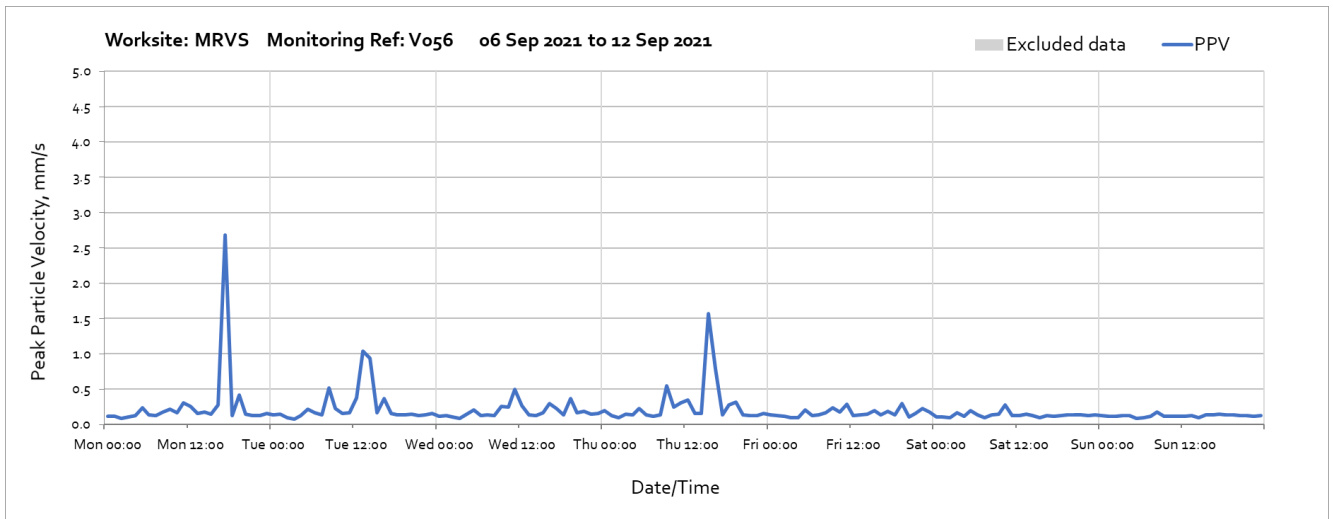


Note: High vibration levels measured across the week were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

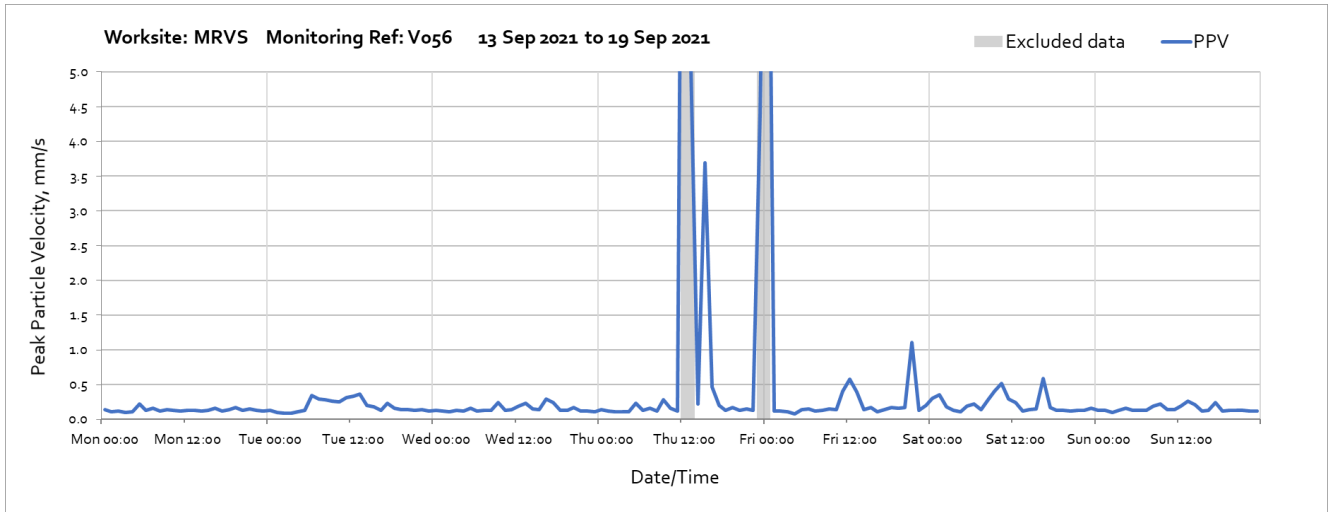
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V056



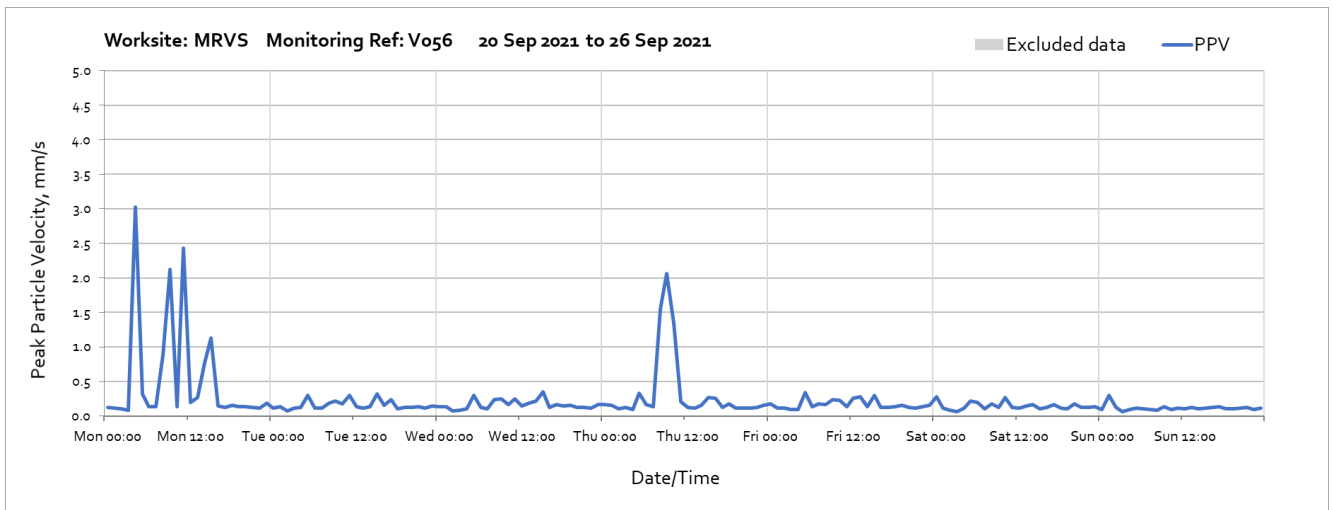
Note: High vibration levels measured between 11:00 and 12:00 on Wednesday 1st September were due to HS2 related works undertaken near to the monitoring location. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower.



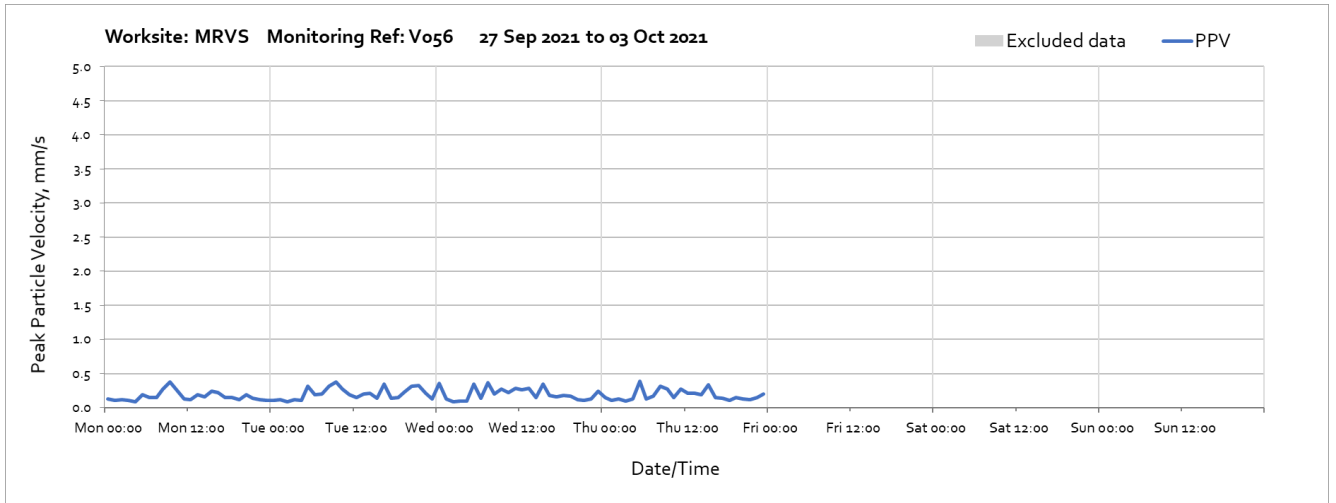
Note: High vibration levels measured at 17:00 on Monday 6th September were due to HS2 related works undertaken near to the monitoring location. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower.



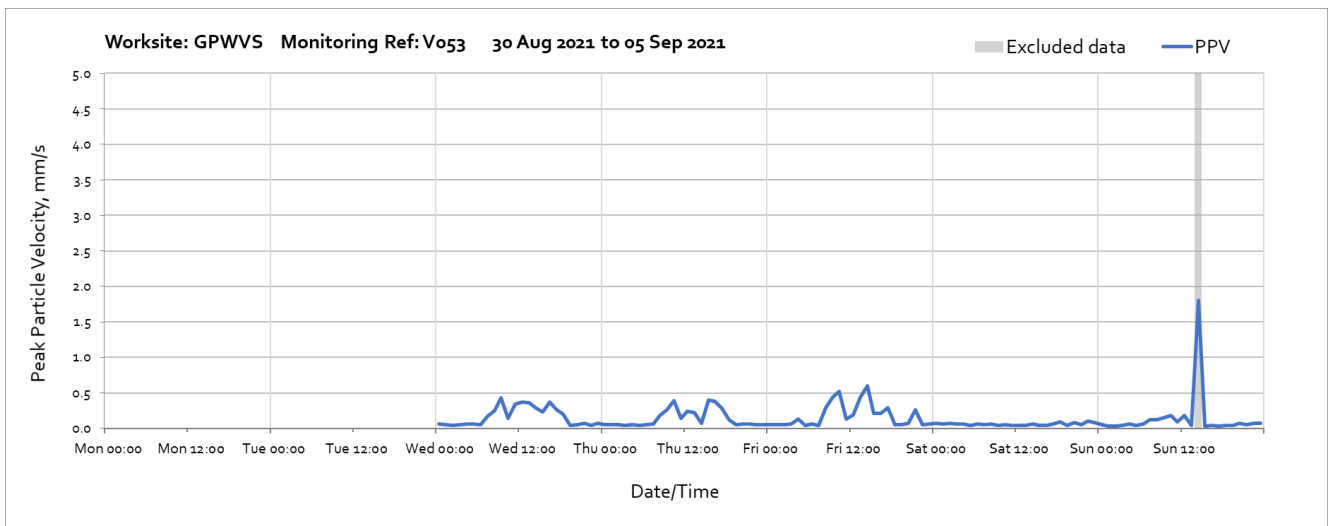
Note: High vibration levels measured at 15:00 on Thursday 16th September were due to HS2 related works undertaken near to the monitoring location. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower. High vibration levels measured between 12:00 and 13:00 and between 23:00 on Thursday 16th September and 00:00 on Friday 17th September were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.



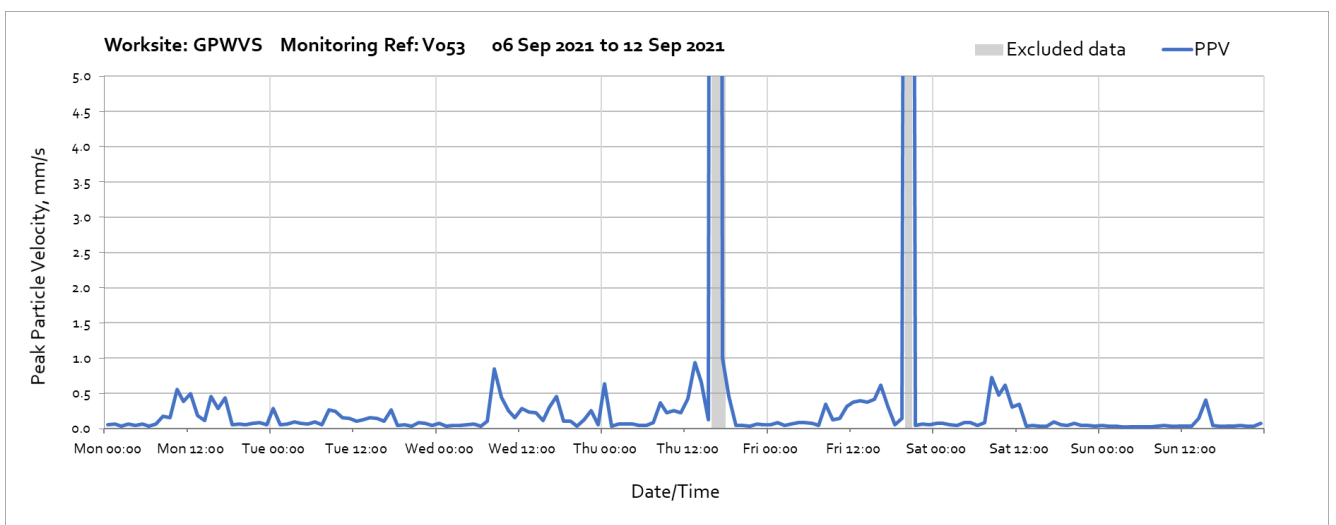
Note: High vibration levels measured between 09:00 and 11:00 on Monday 20th September and at 09:00 on Thursday 23rd September were due to HS2 related works undertaken near to the monitoring location. The nearest residential receptors are further away from the works and vibration levels at the receptors will therefore be lower.



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

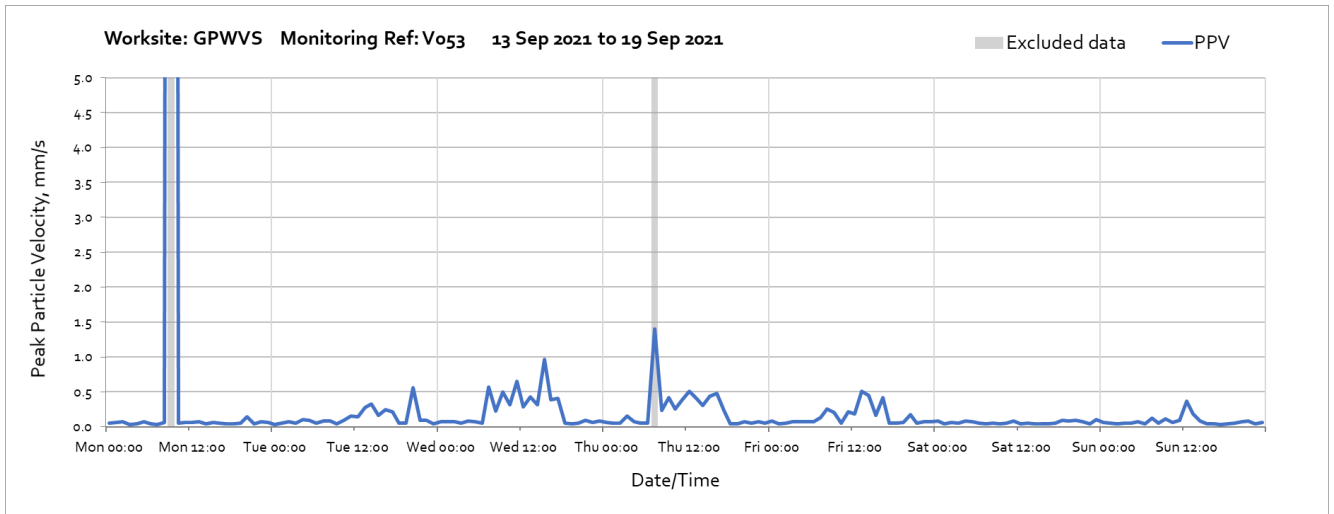


Note: High vibration levels measured at 14:00 on Sunday 5th September 2021 were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

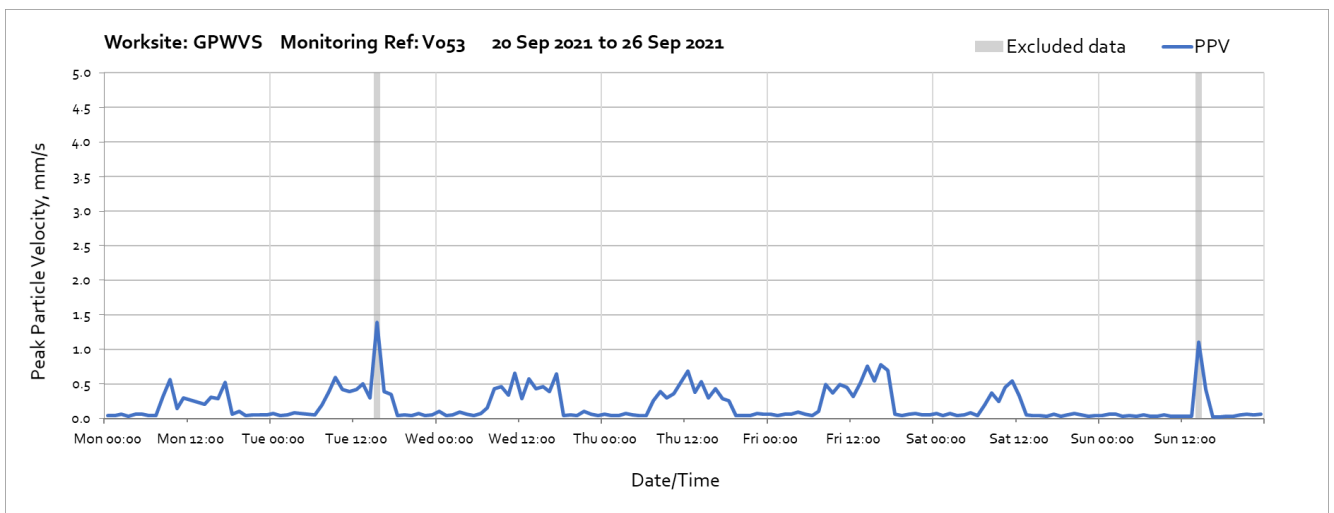


Note: High vibration levels measured between 16:00 and 17:00 on Thursday 9th September and at 20:00 on

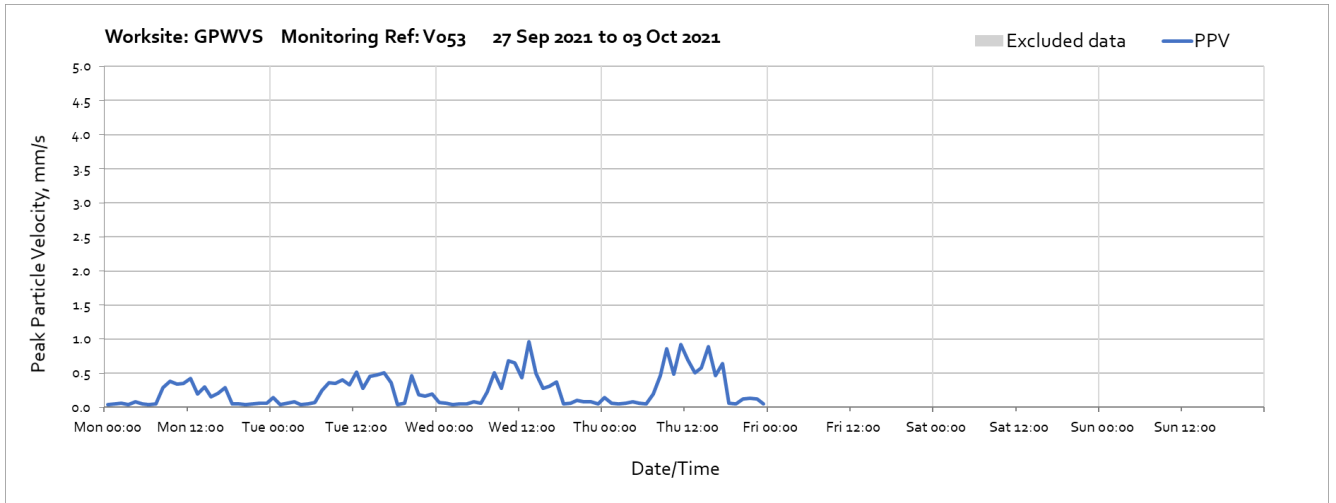
Friday 10th September 2021 were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.



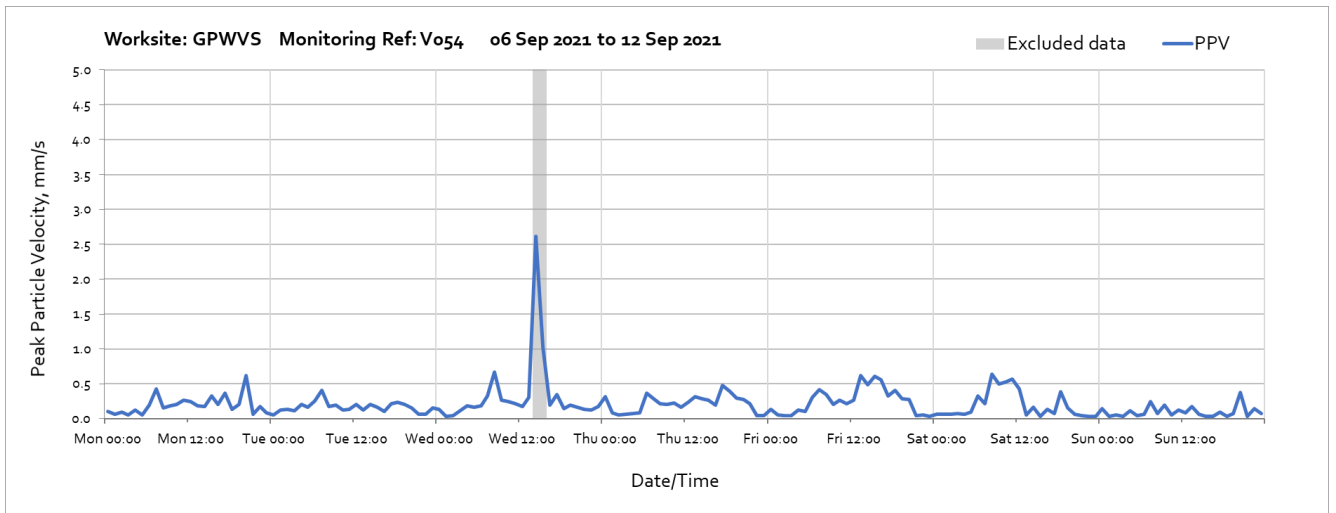
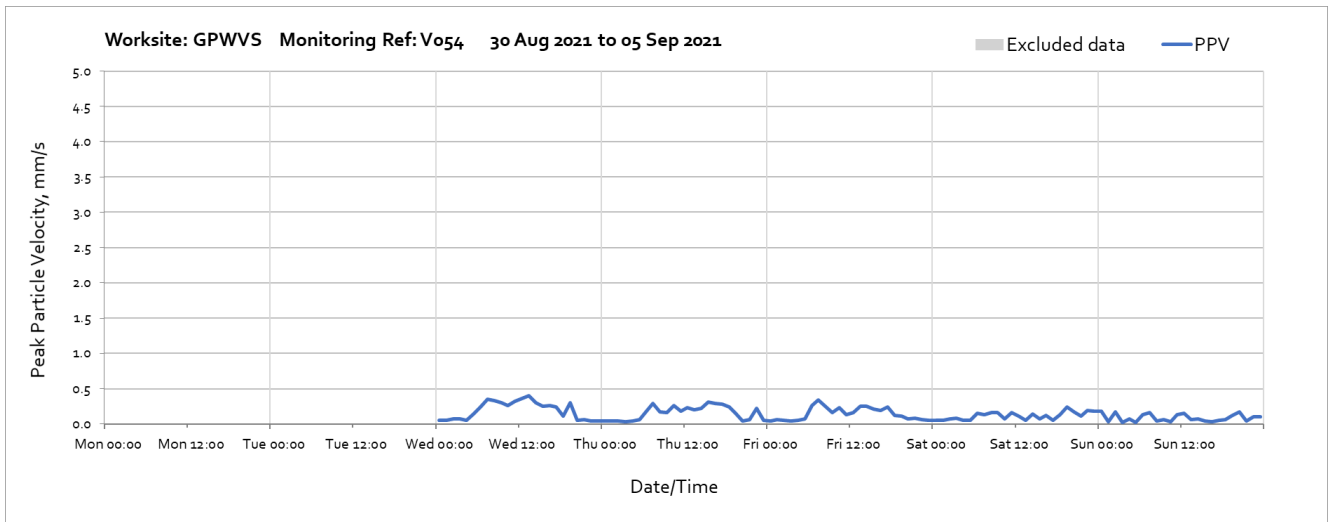
Note: High vibration levels measured at 09:00 on Monday 13th September and at 07:00 on Thursday 16th September 2021 were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.



Note: High vibration levels measured at 15:00 on Tuesday 21st September and at 14:00 on Sunday 26th September 2021 were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

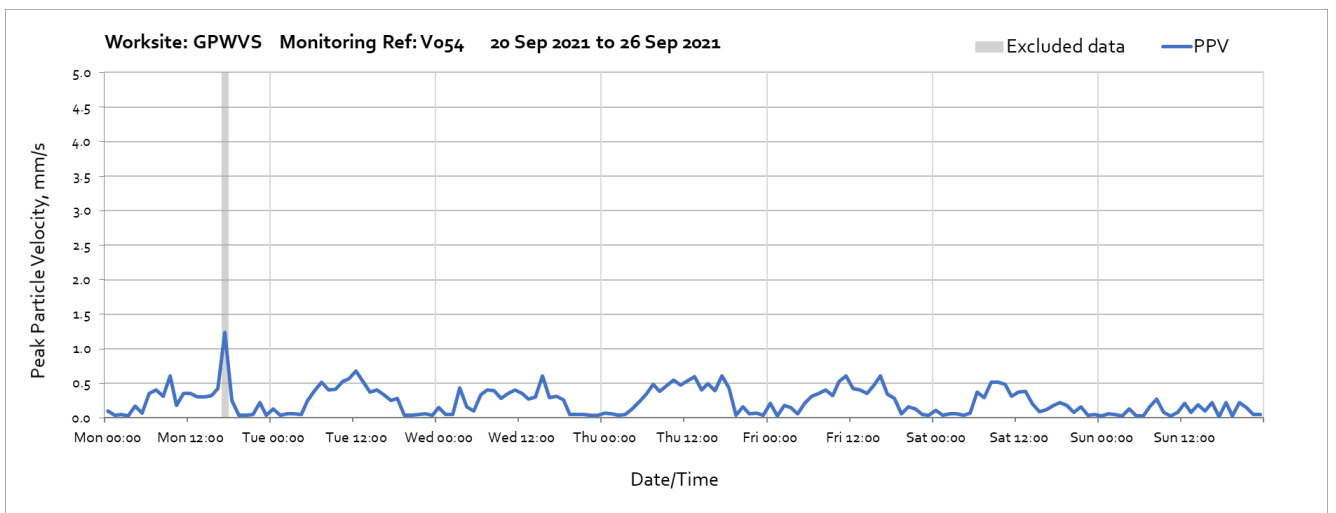
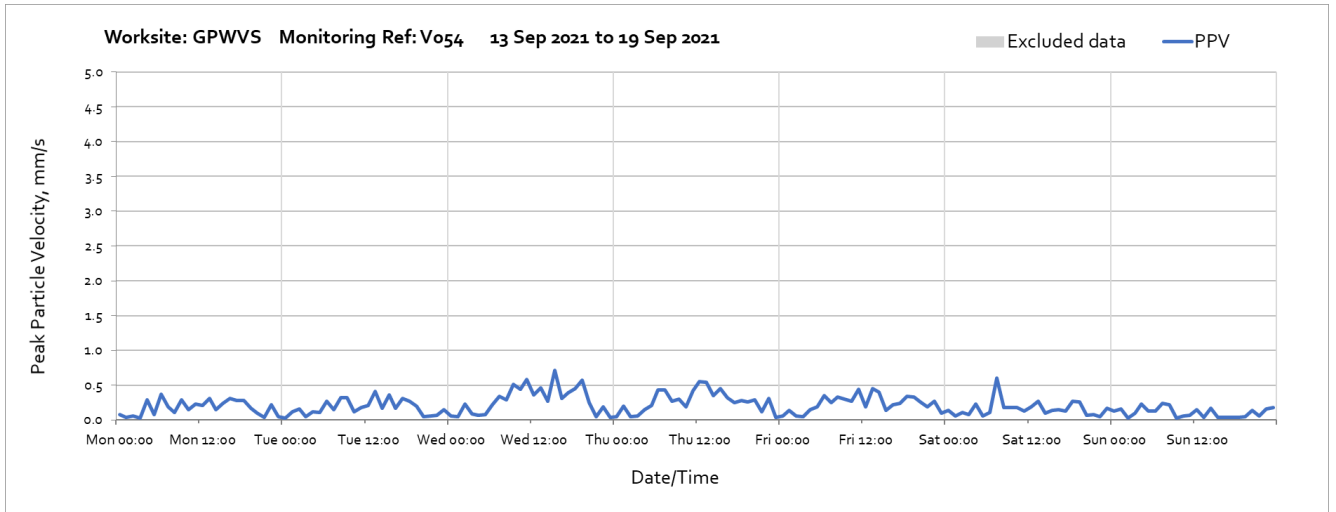


Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: V054



Note: High vibration levels measured between 14:00 and 15:00 on Wednesday 8th September were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

OFFICIAL



Note: High vibration levels measured at 17:00 on Monday 20th September were due to local disturbance at the monitor station and not representative of HS2 vibration levels at the nearest receptor.

