

Construction noise and vibration Monthly Report – May 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 May 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:
 - Removal of spoil, construction of site haul road and working platform, excavation works, construction of concrete slabs and piling platforms, drainage works, installation of barriers and gates, welfare facilities fitting out works, concrete pouring and power utility works; and
 - at the Grand Union Canal Bridge installation of hoardings and steel sheet piling were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. WET), where drainage works, excavation works, concrete works, deliveries, removal of hoarding, installation of ducts, Breadbin Building external façade works, track works, construction of site haul road and power utility works were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road worksite (ref. VRFIC), where:
 - Surfacing works, construction of concrete slab, concrete works, installation of welfare facilities and services, drainage works, concrete pouring, installation of reinforcement cages, excavation and backfilling works, installation of workshops and installation of kerbs; and
 - At the Victoria Road Ancillary Shaft, excavation works and installation of silos were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (within worksite ref. VRFIC), where excavation works, concrete works, installation of gates and hoardings, drainage works, construction of duct runs, were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. OOC), where installation of guide wall and piling platform, test piles, concrete works, construction of concrete plant and set up of the polymer plant, concrete pouring, vegetation clearance, drainage works, piling, asbestos removal works, installation of pile mat, construction of temporary site haul road and permanent roads, installation of services, construction of welfare slab and footpath construction were underway.

- Noise monitoring was undertaken in proximity of the Mandeville Road Ventilation Shaft worksite (ref.: MRVS), where site preparation works, construction of sheet piling platform, installation of hoardings and gates, installation of wheel wash, installation of lighting on access road hoarding and construction of debris fence were underway.
- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. GPWVS), where construction of site haul road, drainage works, construction of slabs, installation of new offices, welfare facilities and staircases, installation of access doors, construction of working platform, installation of new generator, power utility connection works, installation of sliding gate and in-situ plate load testing and shear testing were underway.
- Noise monitoring was undertaken in proximity of the Westgate Ventilation Shaft (ref. WVS), where ground investigation works and in-site testing, water and power connection works, construction of welfare facilities, concrete pouring and sheet piling works were underway.

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

- School Road, Bethune Road, Chase Road, Victoria Road, Atlas Road as part of power utility works;
- The Old Oak Common satellite compound, including vegetation clearance; and
- Horsenden Lane, Perivale, as part of water utility works.

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 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 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 31st May 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:
 - Removal of spoil;
 - Construction of the site haul road and working platforms;
 - Excavation works;
 - Construction of concrete slabs and piling platforms;
 - Drainage works, including installation of ductwork and installation of water pipes for welfare units;
 - Installation of barriers and gates;
 - Welfare facilities fitting out works, including installation of fireproofing, flooring installation, installation of staircases, painting and snagging works and cleaning;

- Concrete pouring;
 - Power utility works; and
 - At the Grand Union Canal Bridge (GUC), installation of hoardings and steel sheet piles.
- Willesden EuroTerminal worksite, ref. WET (see plan 5 in Appendix A), where work activities included:
 - Drainage works, including excavation works and concrete pouring of slab sections;
 - Excavation works and concrete works for the gate foundations;
 - Removal of hoarding;
 - Installation of ducts;
 - Repairs works to the external façade of the Breadbin Building;
 - Track works, including track maintenance;
 - Deliveries;
 - Construction of the site haul roads, including excavation, placement and compaction of the sub-base and surfacing; and
 - Power utility works.
 - Victoria Road worksite, ref. VRFIC (see plan 6 in Appendix A), where work activities included:
 - Surfacing works;
 - Construction of concrete slab;
 - Concrete works, including installation of pre-cast concrete units, installation of silos and concreting of silo bases and construction of bentonite tanks;
 - Installation of welfare facilities/services;
 - Drainage works, including installation of pipelines, drainage runs and manholes;
 - Concrete pouring for piling platform;
 - Installation of reinforcement cages;
 - Excavation and backfilling works;
 - Installation of workshops;
 - Installation of kerbs and excavation of ducts along haul road; and

- At the Victoria Road Ancillary Shaft, excavation works and installation of silos.
- Flat Iron compound, within worksite ref. VRFIC (see plan 6 in Appendix A), where work activities included:
 - Concrete works for foundations;
 - Installation of new gates;
 - Installation of hoarding;
 - Excavations and drainage works;
 - Construction of duct runs; and
 - Shuttering and concrete works for the footpath construction.
- 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:
 - Installation of guide wall and piling platform;
 - Test piles and concrete works;
 - Construction of concrete plant and set up of the polymer plant;
 - Concrete pouring;
 - Vegetation clearance;
 - Drainage works;
 - Sheet piling;
 - Asbestos removal works;
 - Installation of pile mat;
 - Construction of temporary site haul road and permanent roads; and
 - Installation of services, construction of footpaths and construction of permanent welfare slab.
- Mandeville Road Ventilation Shaft worksite, reference MRVS (see plan 1 in Appendix A), where work activities included site preparation works including:
 - Construction of sheet piling platform;
 - Installation of hoarding;
 - Installation of gates;
 - Installation of wheel wash;

- Installation of lighting on access road hoarding; and
- Construction of debris fence.
- Green Park Way Ventilation Shaft worksite, reference GPWVS (see plan 2 in Appendix A), where work activities included:
 - Construction of the site haul road;
 - Installation of site drainage;
 - Construction of slabs;
 - Installation of new offices/welfare building and staircases;
 - Installation of new access doors;
 - Construction of working platforms;
 - Installation of the new generator and power utility connection works.
 - Installation of sliding gate; and
 - In-situ plate load testing and in-situ shear testing.
- Westgate Ventilation Shaft worksite, reference WVS (see plan 3 in Appendix A), where work activities included:
 - Ground investigation works and in-site testing;
 - Water and power connection works;
 - Construction of welfare facilities, including concrete pouring; and
 - Sheet piling.

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

- School Road, Bethune Road, Chase Road, Victoria Road, Atlas Road as part of power utility works;
- The Old Oak Common satellite compound, including vegetation clearance; and
- Horsenden Lane, Perivale, as part of water utility works.

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 noise and nine vibration monitoring installations were active in May 2021 in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in May 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
VRFC	N029	Braitrim House, Victoria Road
	N042	Boden House Car Park
	N031	School Road, outside Acton Business Centre
	N049	Flat Iron compound railway fence, Victoria Rd North Acton
	N050	Acton Square, outside North Acton Station
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

Worksite Reference	Measurement Reference	Address
	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	63.0 (66.0)	65.9 (70.2)	63.1 (65.0)	61.8 (64.0)	59.1 (64.6)	60.5 (61.6)	64.7 (66.7)	62.4 (63.6)	62.9 (66.9)	58.2 (62.4)	61.9 (69.5)	58.4 (63.1)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	66.0 (72.1)	67.2 (72.4)	64.7 (68.0)	63.7 (67.6)	61.1 (67.4)	62.9 (63.0)	64.5 (64.9)	63.5 (64.2)	64.8 (69.8)	60.5 (71.8)	63.5 (71.9)	60.7 (68.9)
	N060	Atlas Road next to Bashey Road	Façade	56.5 (68.1)	62.2 (76.2)	54.6 (67.2)	56.2 (71.5)	53.6 (66.2)	57.9 (60.5)	57.9 (58.9)	50.3 (54.3)	55.2 (69.2)	49.9 (57.2)	50.1 (62.3)	51.2 (60.1)
WET	N034	Stephenson Street (north)	Free-field	53.1 (57.0)	55.5 (60.4)	53.5 (64.2)	51.8 (58.3)	48.9 (59.4)	50.4 (52.2)	53.3 (54.9)	51.0 (53.6)	53.3 (64.8)	47.7 (58.2)	52.0 (64.0)	48.9 (60.2)
	N035	Stephenson Street (south)	Free-field	55.1 (58.4)	58.8 (66.0)	52.1 (61.4)	51.0 (57.9)	48.1 (57.9)	53.2 (55.1)	60.9 (67.8)	49.4 (52.0)	49.4 (56.8)	46.0 (53.1)	49.0 (64.0)	48.6 (54.5)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	55.6 (57.7)	59.0 (64.6)	55.3 (61.9)	54.2 (59.3)	50.5 (61.0)	53.8 (54.9)	56.4 (59.3)	57.8 (71.2)	54.6 (58.1)	49.4 (56.0)	55.8 (71.8)	50.5 (56.2)

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
VRFC	N029	Braitrim House, Victoria Road	Free-field	53.0 (63.9)	57.4 (61.5)	52.5 (62.9)	54.8 (71.6)	51.4 (67.1)	51.5 (57.9)	54.7 (58.8)	49.7 (51.8)	51.3 (61.0)	46.2 (51.7)	50.2 (61.0)	49.9 (66.5)
	N042	Bodens car park	Free-field	55.1 (59.8)	62.1 (65.2)	54.8 (58.9)	53.1 (60.2)	50.8 (61.0)	53.9 (56.9)	56.8 (60.2)	52.9 (55.3)	52.8 (57.0)	49.0 (53.6)	51.5 (56.4)	49.3 (54.8)
	N031	School Road, outside Acton Business Centre	Free-field	57.5 (64.3)	62.4 (66.2)	58.7 (66.2)	56.1 (61.2)	52.8 (64.1)	54.0 (59.5)	57.3 (62.7)	56.9 (60.4)	56.5 (60.5)	50.3 (58.0)	55.8 (60.0)	51.5 (56.7)
	N049	Flat Iron compound	Free-field	55.4 (67.6)	63.3 (72.7)	55.0 (62.2)	55.6 (67.0)	54.6 (67.4)	55.4 (60.8)	55.1 (58.7)	55.1 (62.4)	53.0 (57.9)	50.8 (56.9)	52.4 (62.3)	53.3 (61.7)
	N050	Acton Square, outside North Acton Station	Free-field	64.1 (69.2)	63.6 (65.2)	63.5 (69.1)	62.5 (69.9)	58.8 (67.4)	64.4 (65.0)	62.4 (63.5)	61.8 (62.2)	63.1 (68.9)	58.8 (64.1)	62.2 (66.0)	59.3 (67.0)
OOC	OOC-N01	Old Oak Common Lane	Free-field	64.9 (67.4)	69.5 (71.9)	61.3 (64.9)	59.1 (62.9)	56.7 (62.9)	59.8 (61.3)	61.2 (63.7)	60.4 (61.9)	59.7 (64.2)	60.2 (65.1)	58.8 (64.2)	57.4 (63.4)
	OOC-N02	Old Oak Common Lane, Hilltop Works	Free-field	66.9 (72.0)	68.8 (71.8)	67.6 (71.9)	66.1 (71.1)	61.7 (68.9)	64.3 (64.9)	67.0 (68.0)	66.3 (67.3)	67.3 (72.8)	61.4 (66.2)	64.8 (69.1)	61.6 (65.6)
MRVS	N040	Badminton Close	Free-field	54.3 (57.8)	56.6 (62.7)	54.6 (61.9)	54.1 (58.0)	51.8 (57.2)	53.4 (54.0)	54.3 (56.8)	53.2 (56.3)	55.6 (65.0)	53.4 (68.5)	53.8 (60.3)	51.6 (56.4)
	N058	Mandeville Road	Free-field	57.0 (64.3)	64.4 (71.8)	54.9 (58.5)	55.4 (59.8)	52.5 (60.6)	53.7 (53.7)	62.2 (75.4)	54.1 (57.4)	54.4 (58.6)	50.5 (55.3)	54.2 (56.9)	49.9 (55.2)
				61.9	64.3	58.4	58.7	59.3	59.6	61.3	60.0	60.5	58.5	60.2	56.8

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	(66.9)	(71.7)	(62.9)	(64.6)	(69.4)	(60.0)	(62.4)	(62.5)	(62.8)	(72.6)	(62.7)	(61.9)
GPWVS	N059	Green Park Way Ventilation Shaft	Façade	53.7	62.4	56.3	54.4	53.0	51.5	55.6	56.2	54.1	49.3	55.4	51.0
				(68.6)	(72.9)	(68.3)	(69.6)	(70.0)	(54.8)	(63.0)	(65.9)	(66.2)	(56.5)	(65.9)	(66.9)
	N064	Green Park Way Ventilation Shaft	Façade	56.0	63.5	55.3	54.2	52.1	52.5	53.7	53.7	53.7	49.7	53.9	50.1
				(59.3)	(80.6)	(58.7)	(59.8)	(67.7)	(53.7)	(58.3)	(59.6)	(60.1)	(55.6)	(57.4)	(56.5)
WVS	N062	Westgate Ventilation Shaft	Free-field	59.0	62.9	59.1	59.0	58.4	59.5	60.7	57.0	59.1	57.5	58.6	57.6
				(64.4)	(71.9)	(65.2)	(64.9)	(63.4)	(68.5)	(67.7)	(64.8)	(66.6)	(62.0)	(65.0)	(62.2)

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)	1.40 (Z-axis)
	V057	37, Stephenson Street	0.83 (X-axis)
OOC	OOC-V01	25 Wells House Road	4.06 (Y-axis)
	OOC-V02	Kildun Court, Old Oak Common Lane	1.14 (Z-axis)
	OOC-V03	Wells House Road Alleyway	0.71 (Y-axis)
GPWVS	V053	Green Park Way, Greenford	1.23 (Z-axis)
	V054	Green Park Way Ventilation Shaft	9.27* (Z-axis)
MRVS	V055	Mandeville Road	4.63 (Z-axis)
	V056	Mandeville Road	12.20* (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	Weekdays	08:00-18:00	No exceedance
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
VRFIC	N029	Braitrim House, Victoria Road	All days	All periods	No exceedance
	N042	Bodens Car Park	All days	All periods	No exceedance
	N031	School Road, outside Acton Business Centre	All days	All periods	Not applicable**
	N049	Flat Iron compound	Weekdays	08:00-18:00	1
	N050	Acton Square, outside North Acton Station	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
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
MRVS	N040	Badminton Close	All days	All periods	No exceedance
	N058*	Mandeville Road	Saturdays	08:00-13:00	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**

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

** 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
VRFC	N049	Flat Iron compound	1

2.2.6 No.1 exceedance of the SOAEL was recorded due to HS2 construction works during May 2021. The exceedances occurred at monitoring location N049 during one daytime period due to utility works.

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

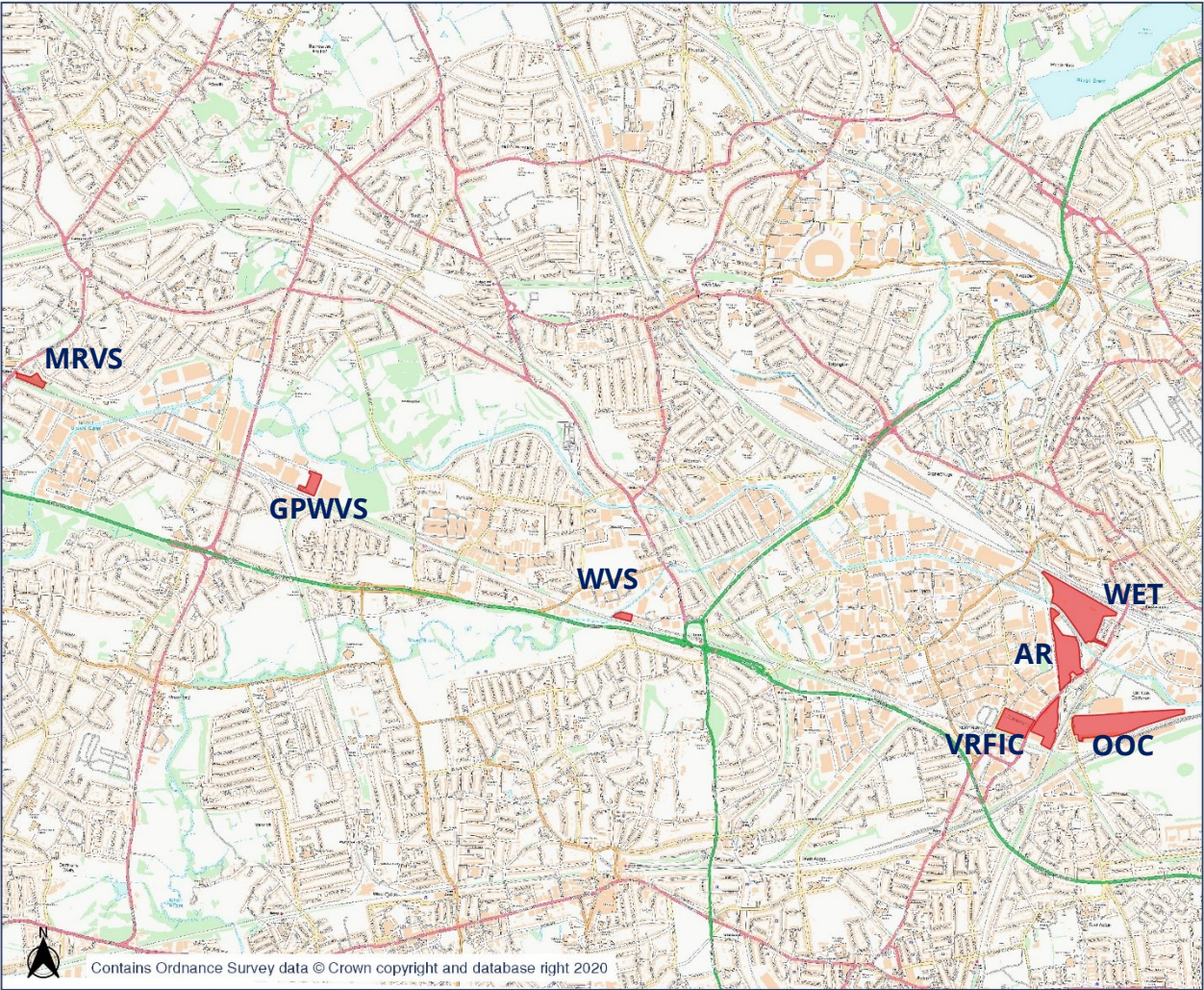
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 8: Summary of Complaints

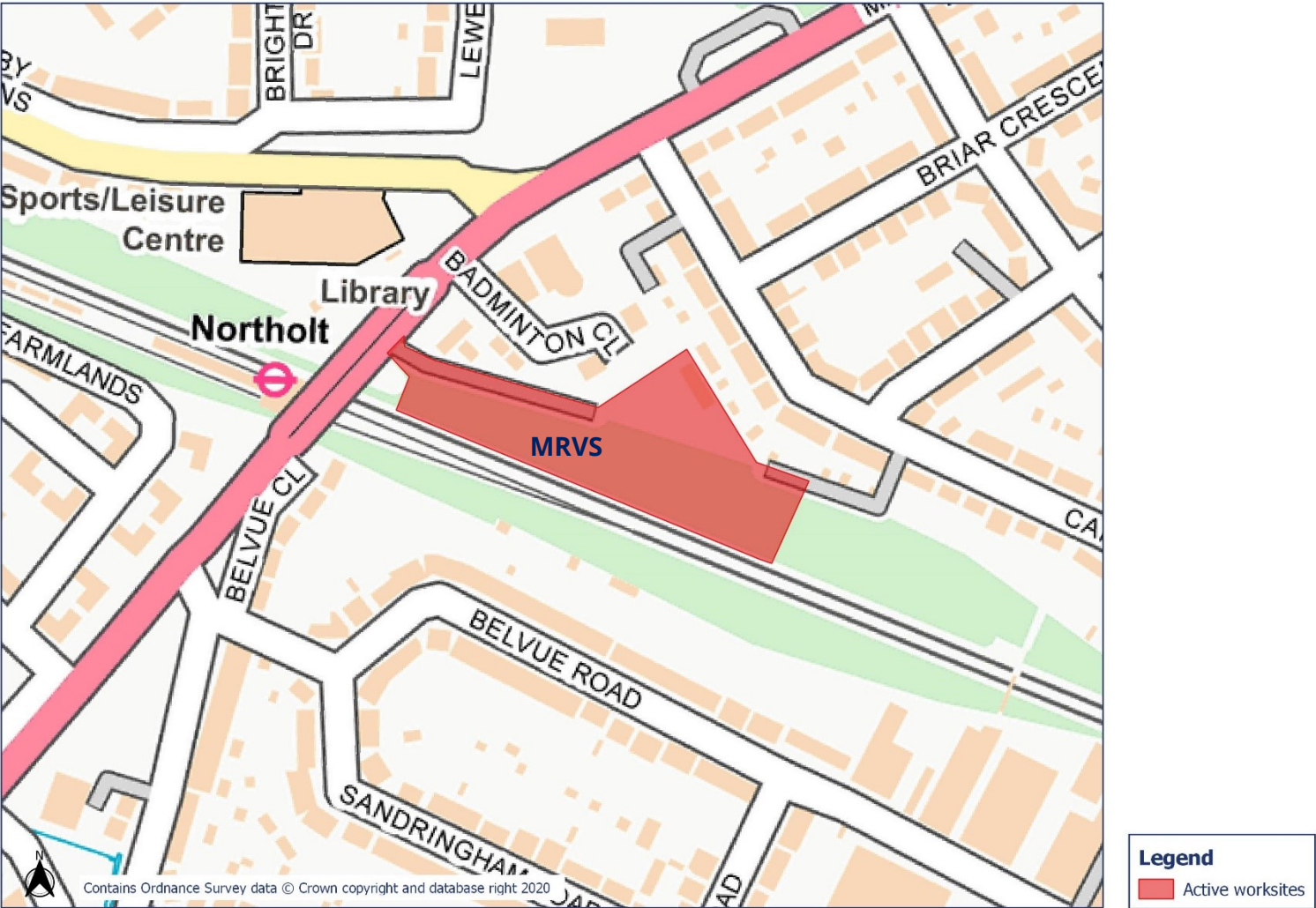
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-41938-C	AR	Complaint due to noise from site during the day.	Investigation confirmed that at the time of the complaint works were undertaken in line with the Section 61 consent and Best Practicable Means (BPM) were applied.	The complainant has been contacted and updated on findings of investigation.
HS2-21-41985-C HS2-21-59831-E	AR	Complaint due to noise from the site during the night.	No night works were undertaken at the time of the complaint.	The complainant has been contacted and updated on findings of investigation.
HS2-21-59839-E	AR	Complaint due to high vibration levels from site.	Investigation confirmed that at the time of the complaint, works were undertaken in line with the Section 61 consent and Best Practicable Means (BPM) were applied.	The complainant has been contacted and updated on findings of investigation.

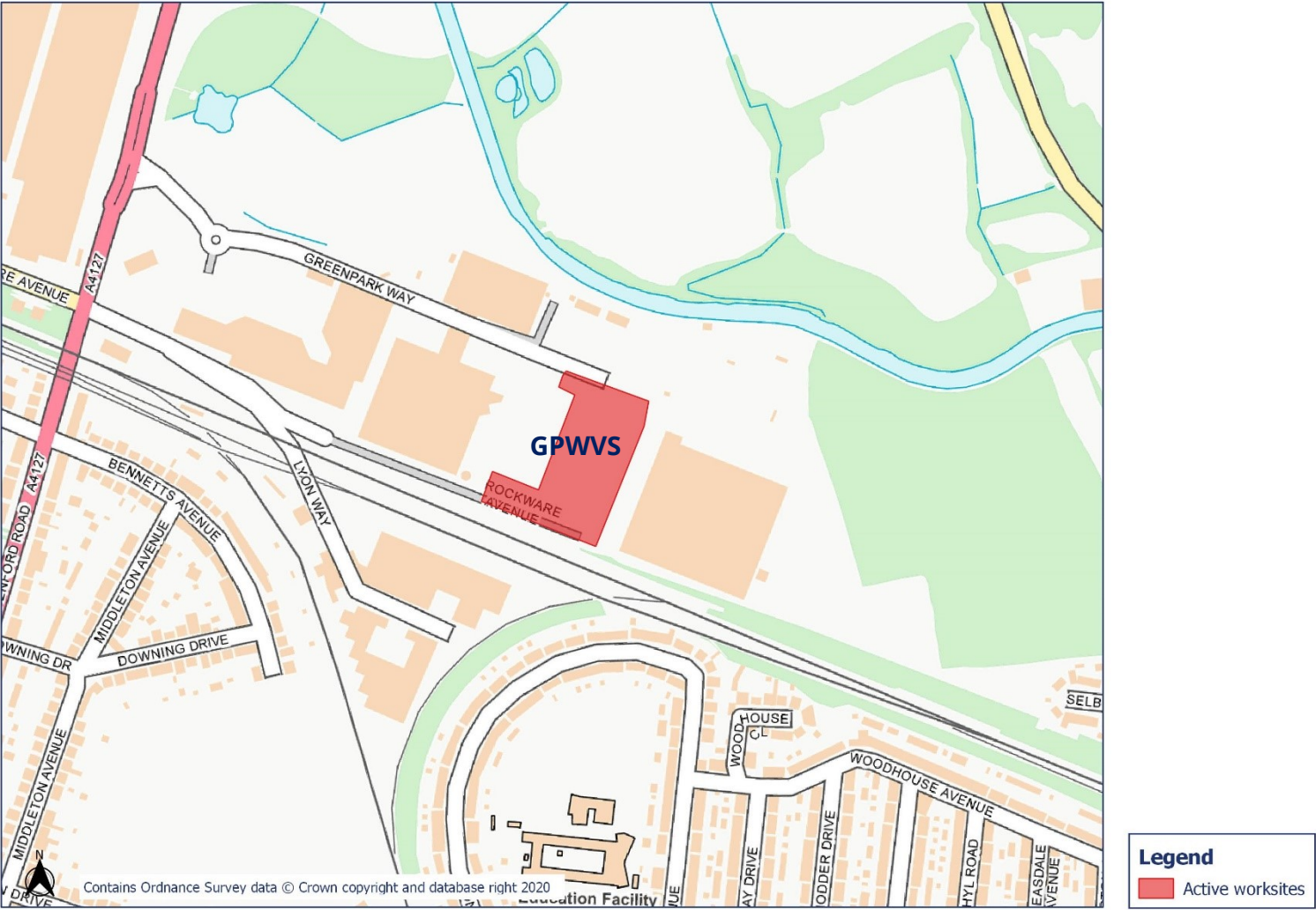
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-21-42037-C	OOC	Complaint due to noise from site during the day and night.	Investigation confirmed that a loud beeping noise during the day was not from the HS2 site and that no works took place during the night.	Noise from non-HS2 site raised with site team for action. The complainant has been contacted and updated on findings of investigation.

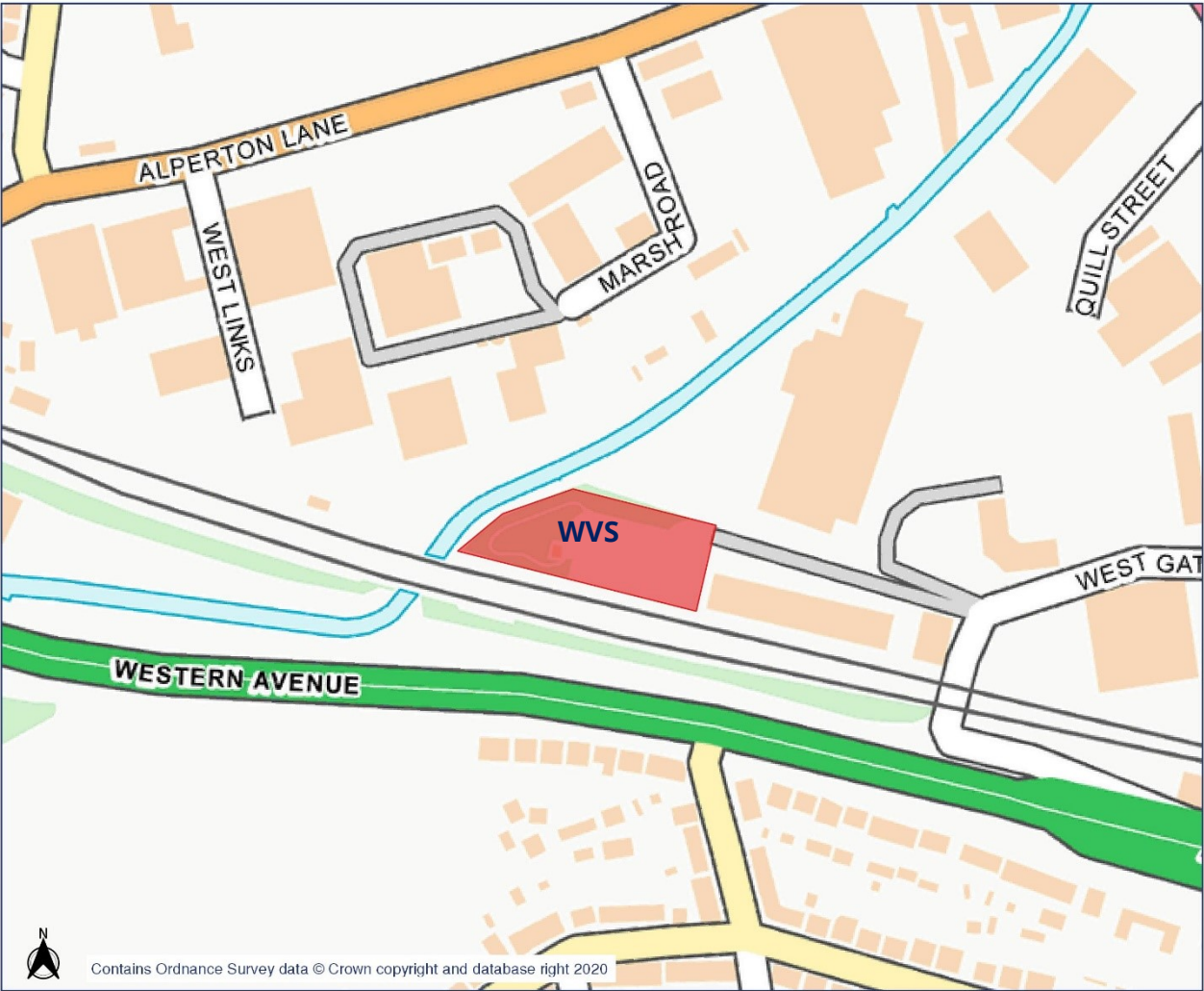
Appendix A Site Locations

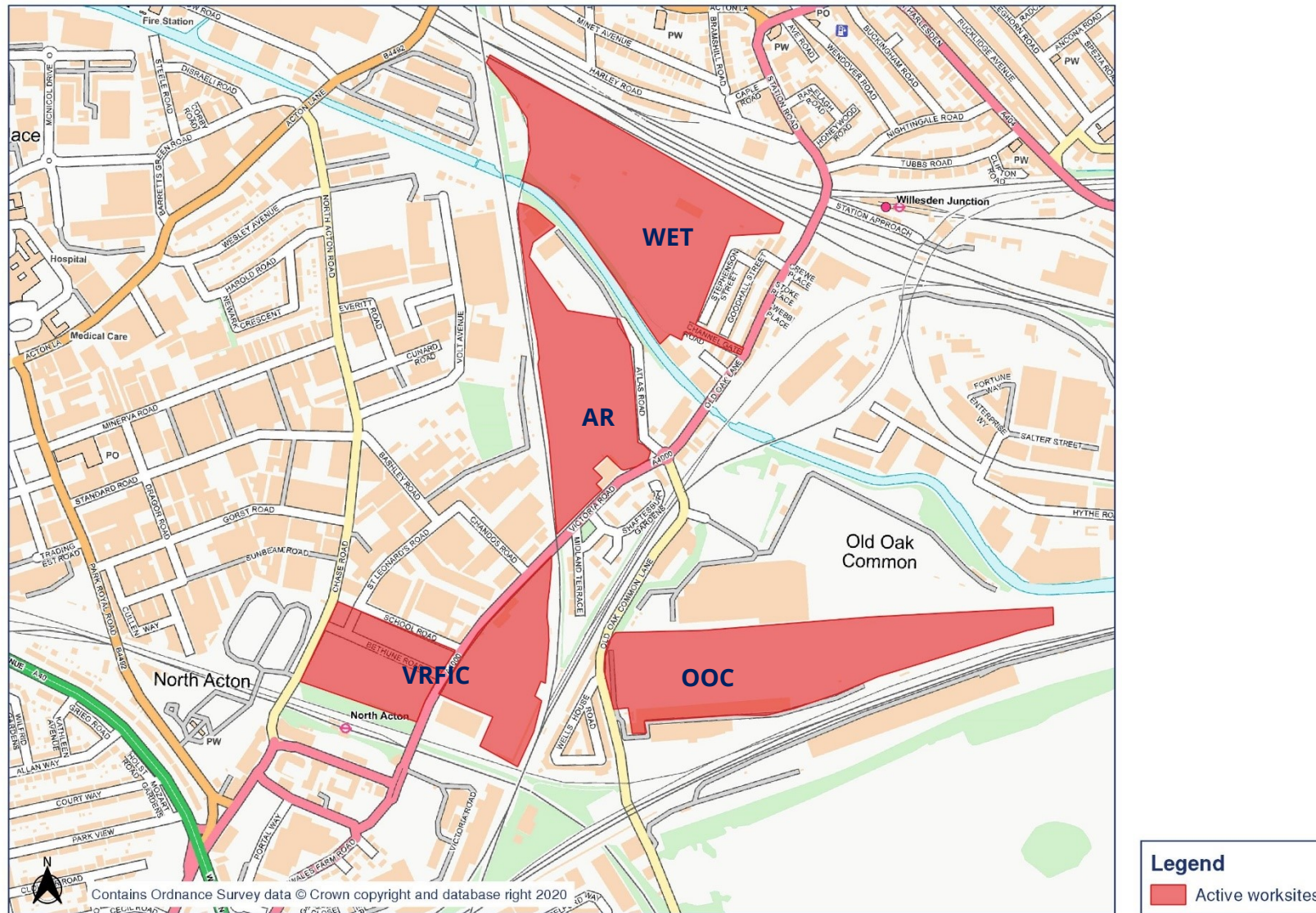


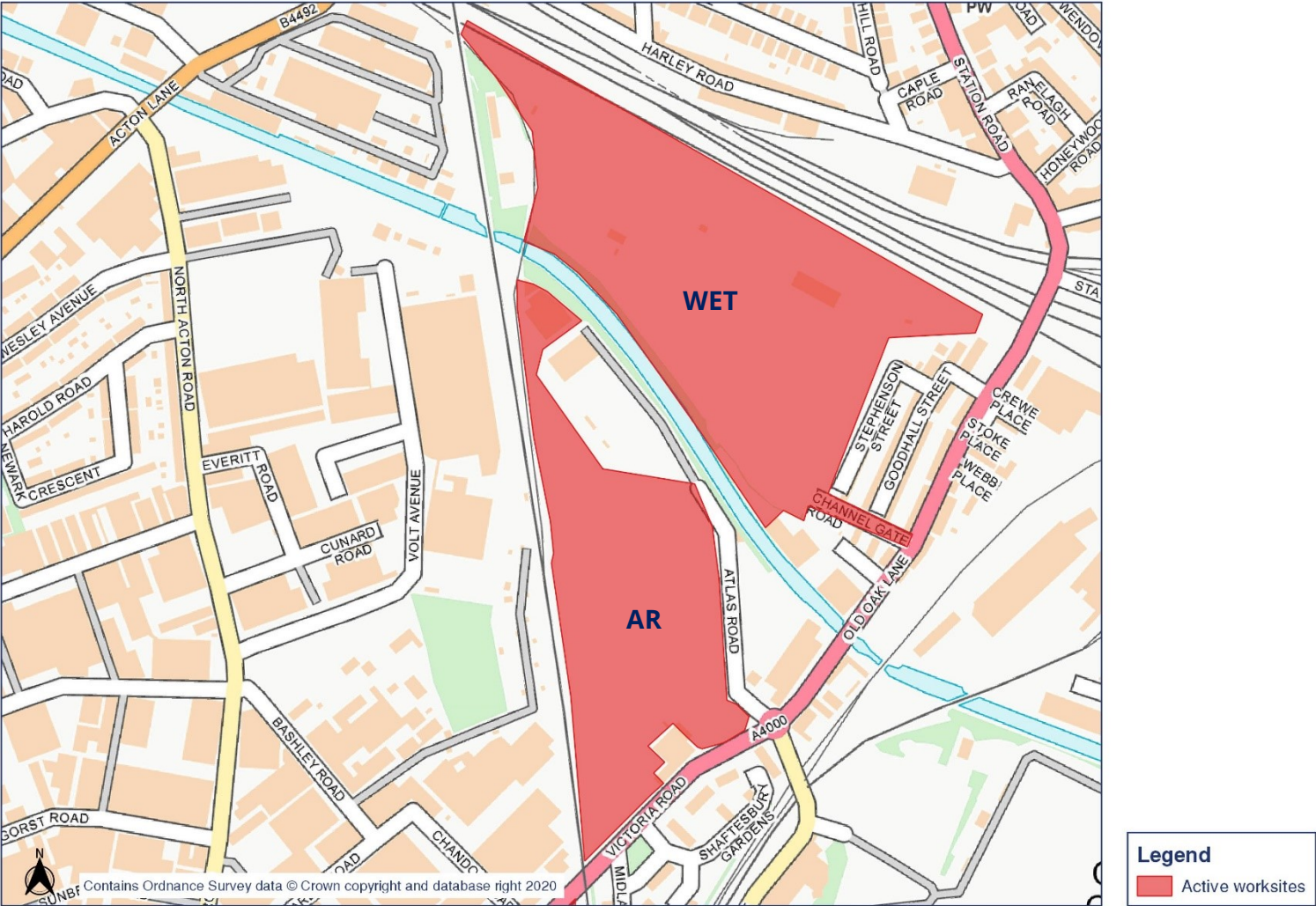
Legend
Active worksites

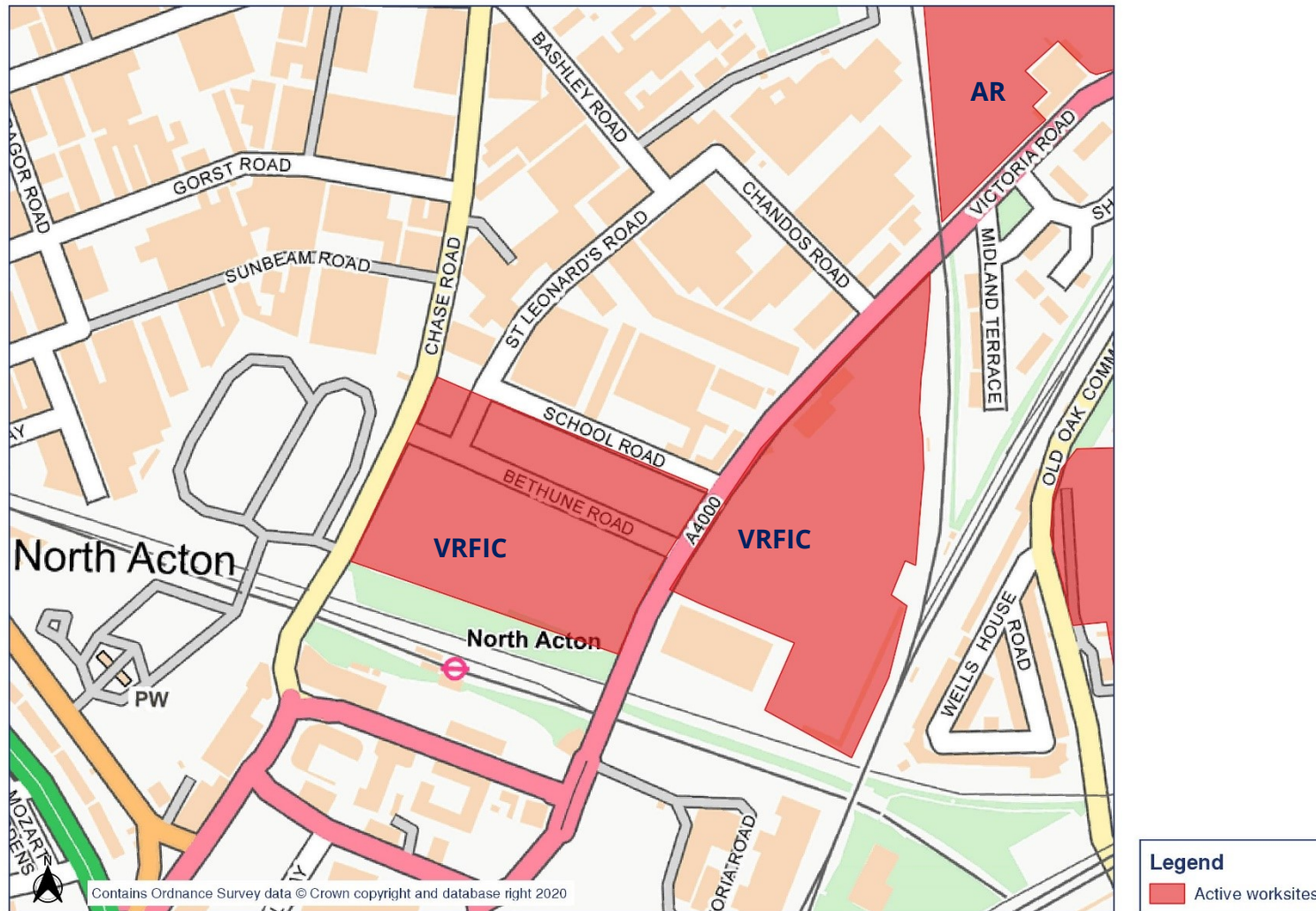








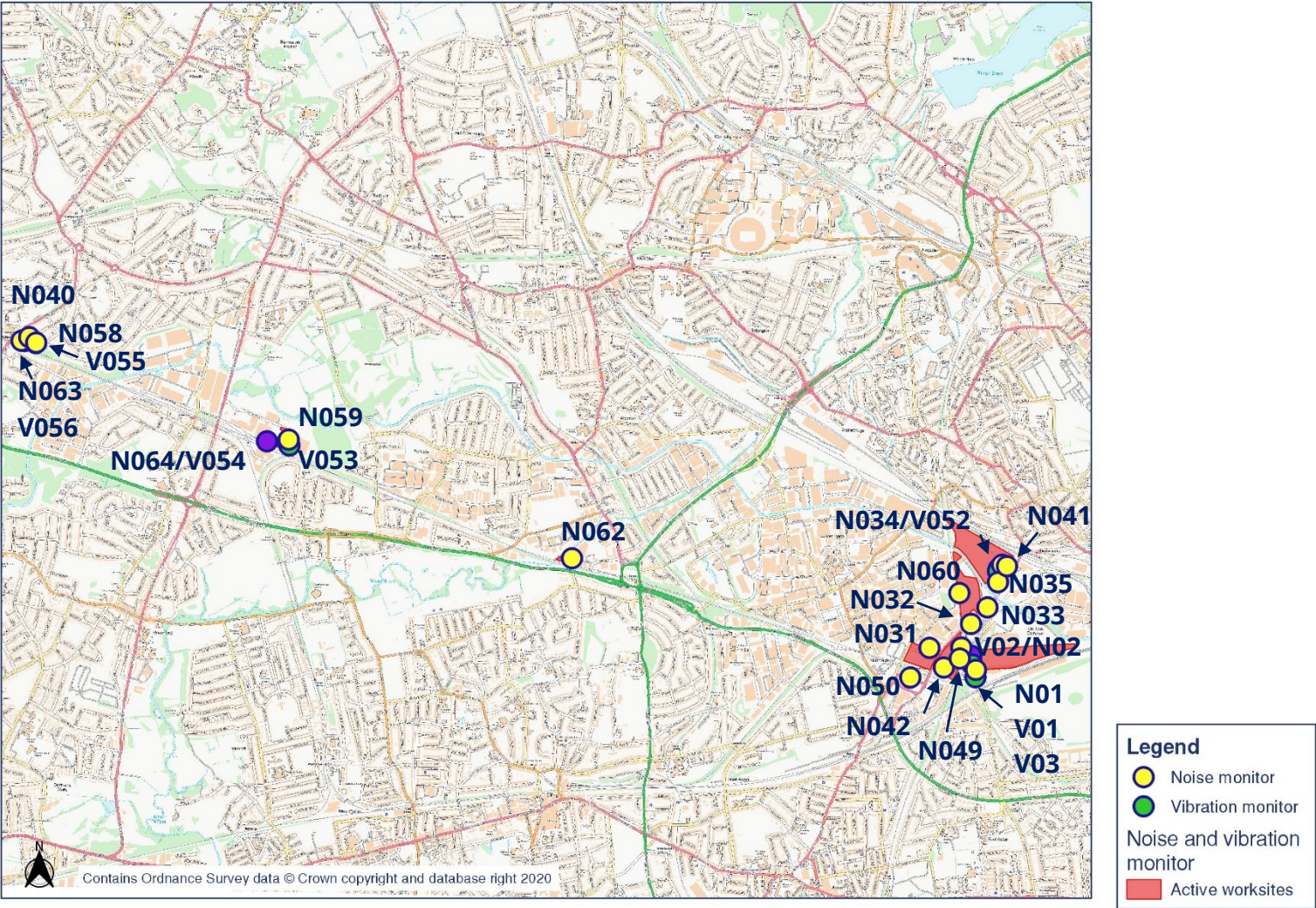


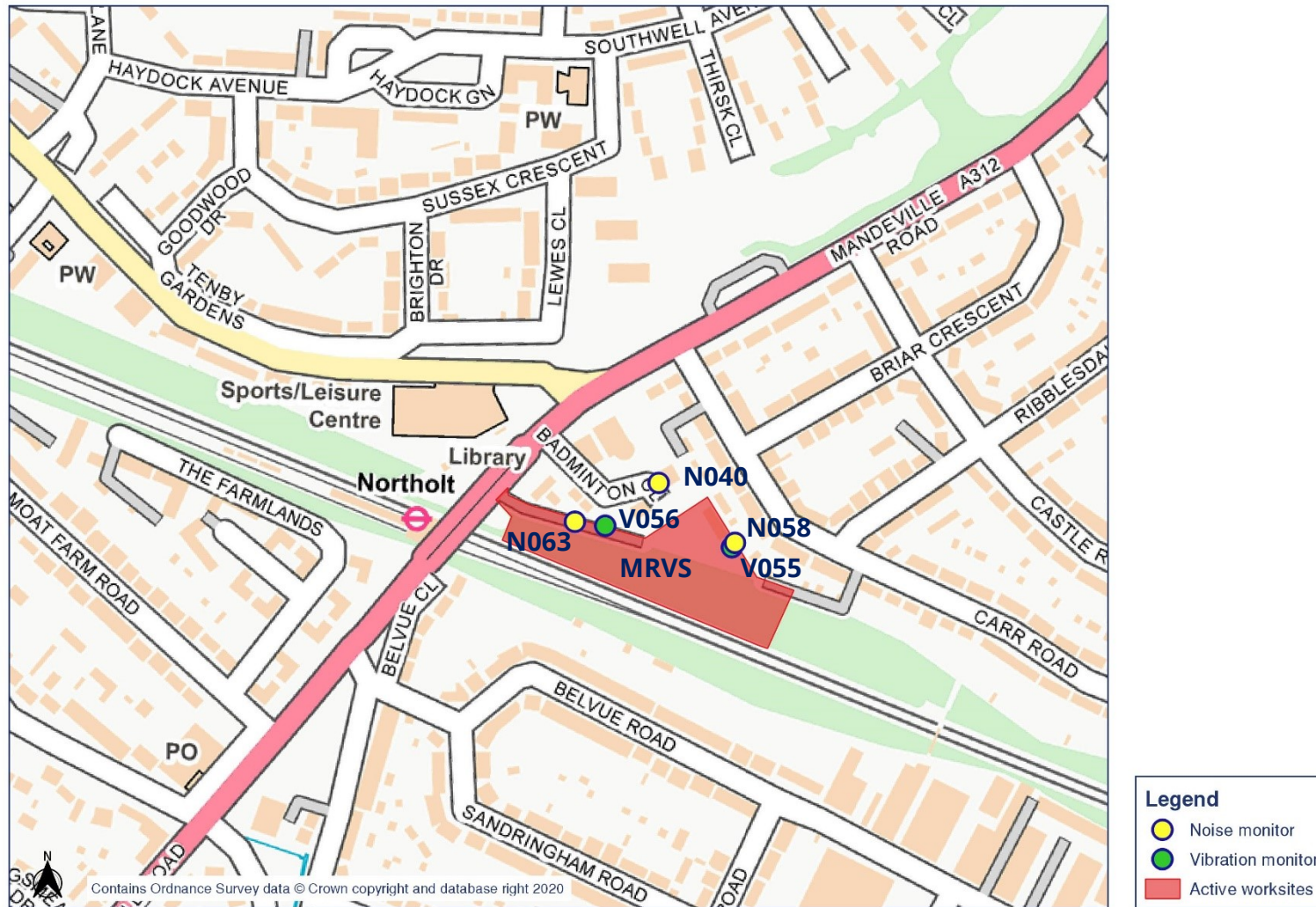


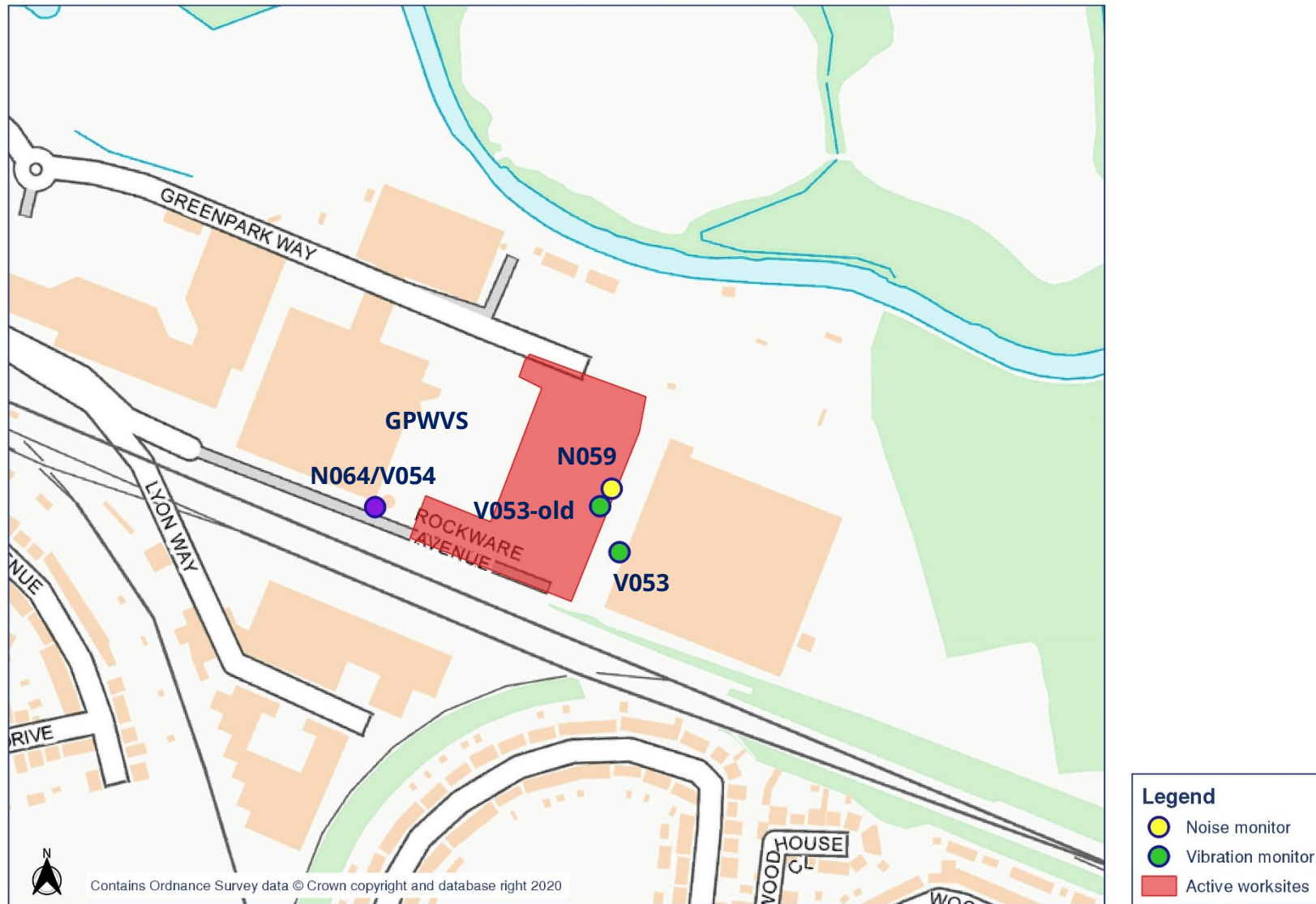


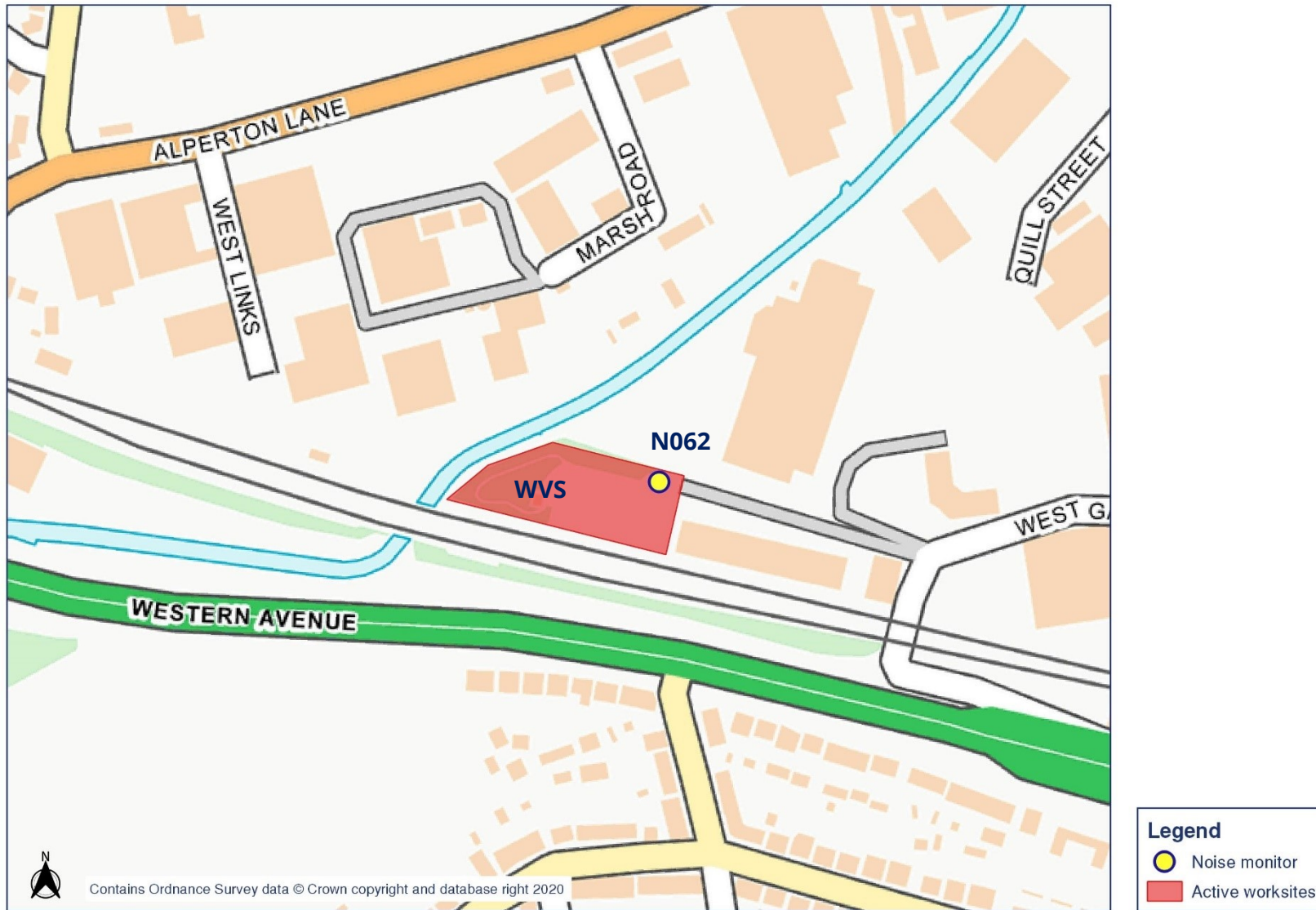
Appendix B Monitoring Locations

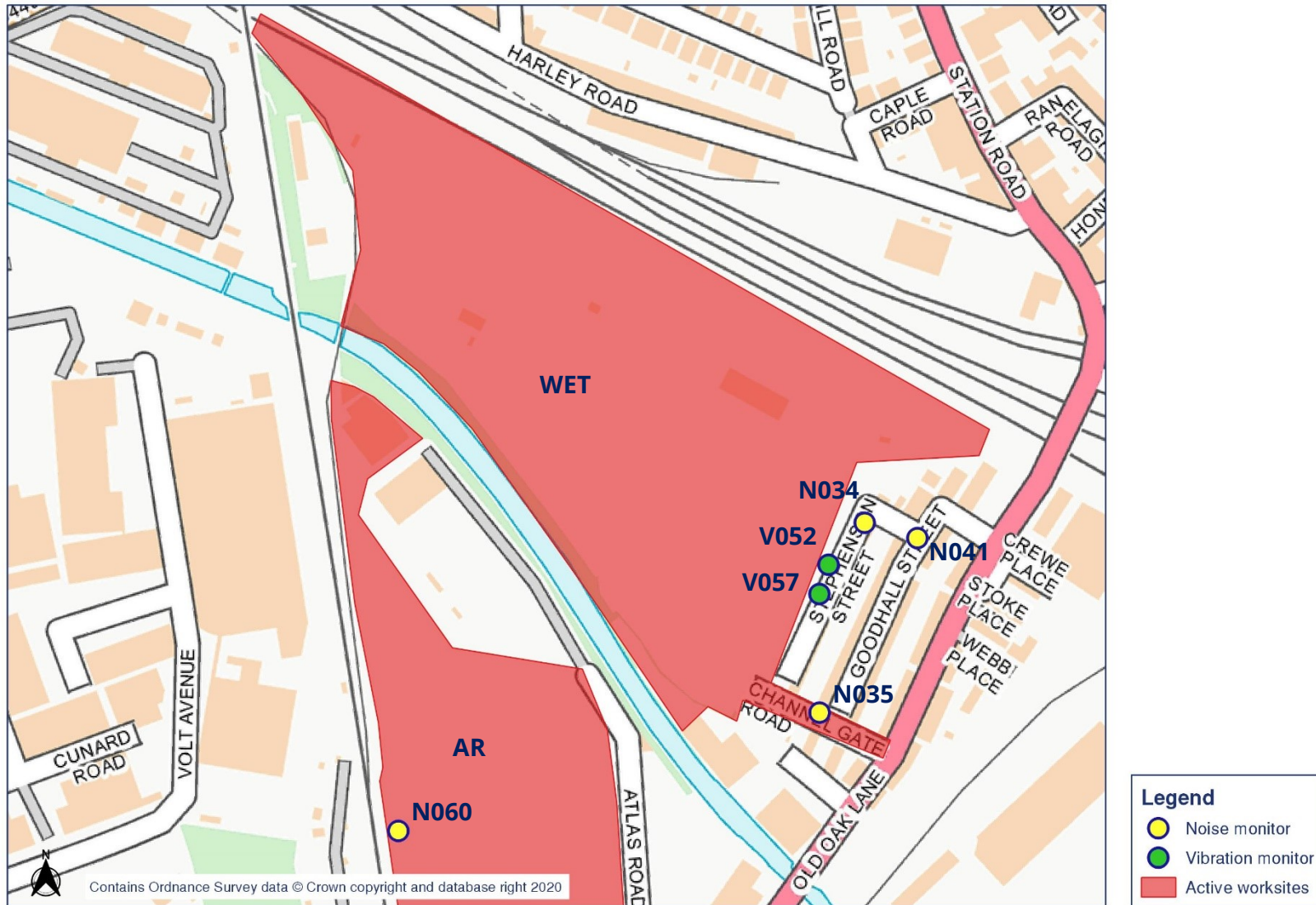
HS2 Noise and vibration monitoring plan - Overview

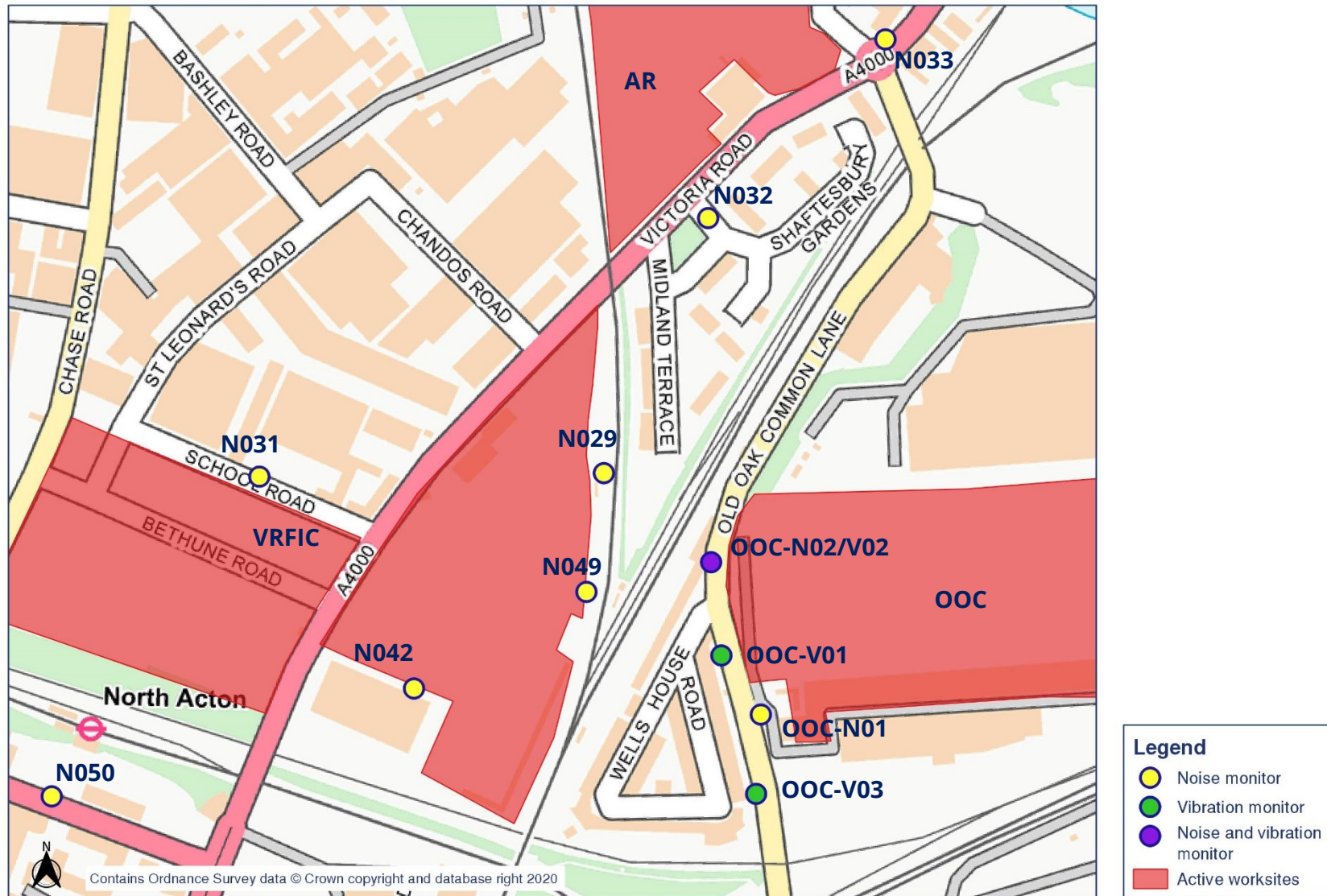










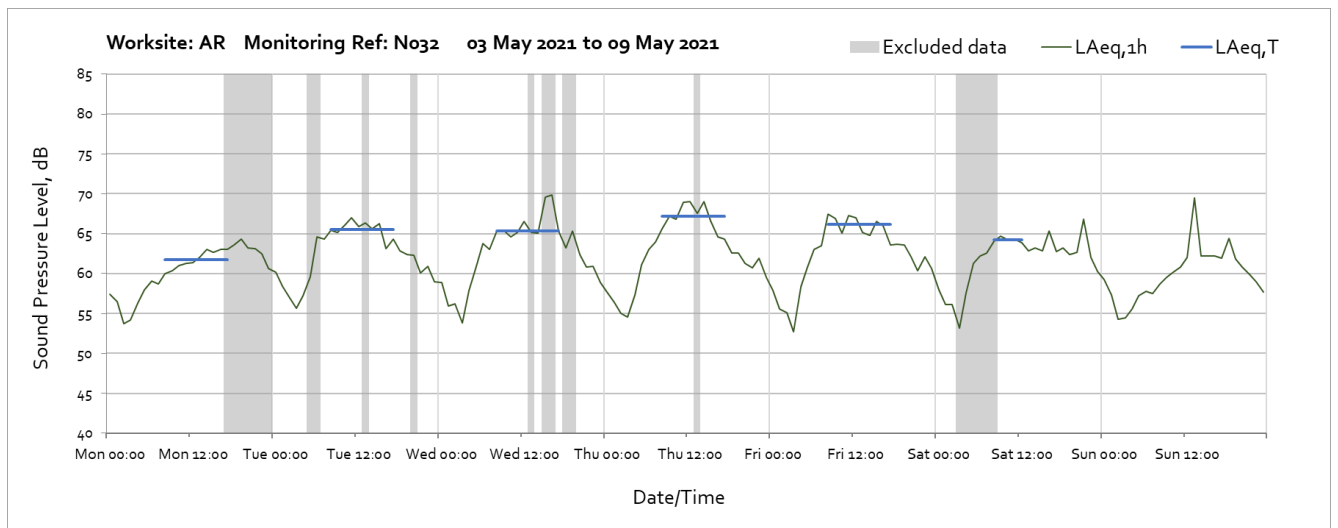
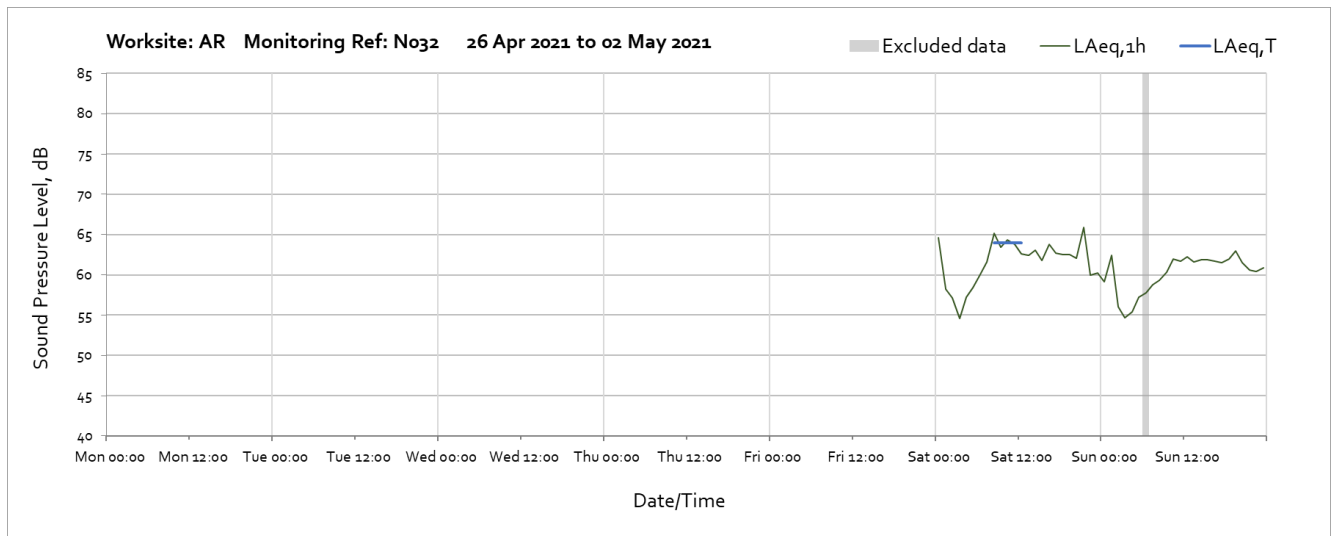


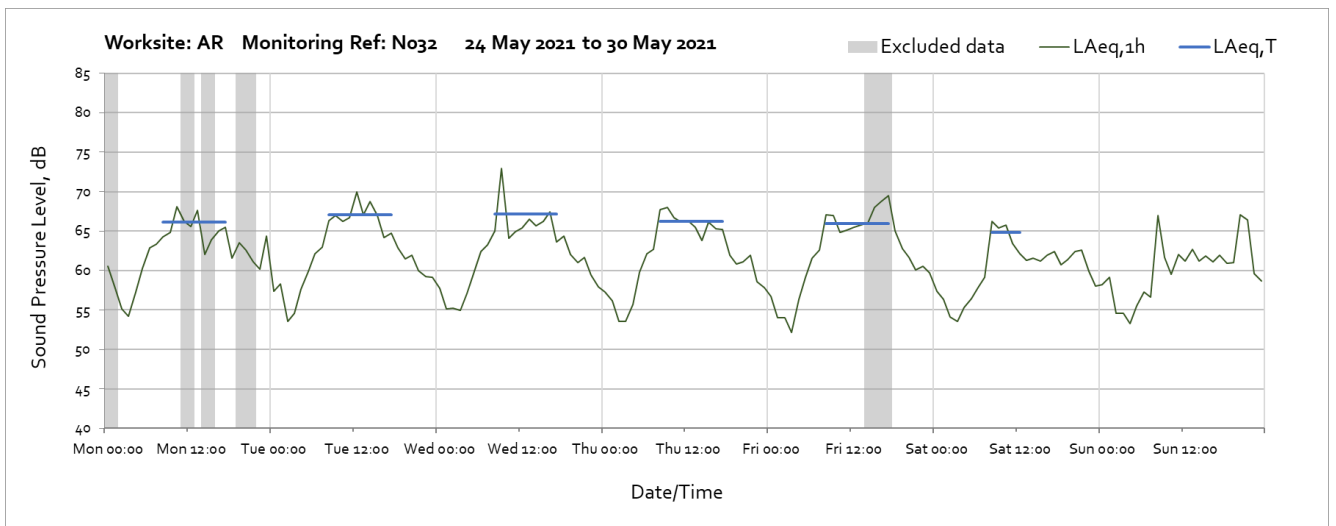
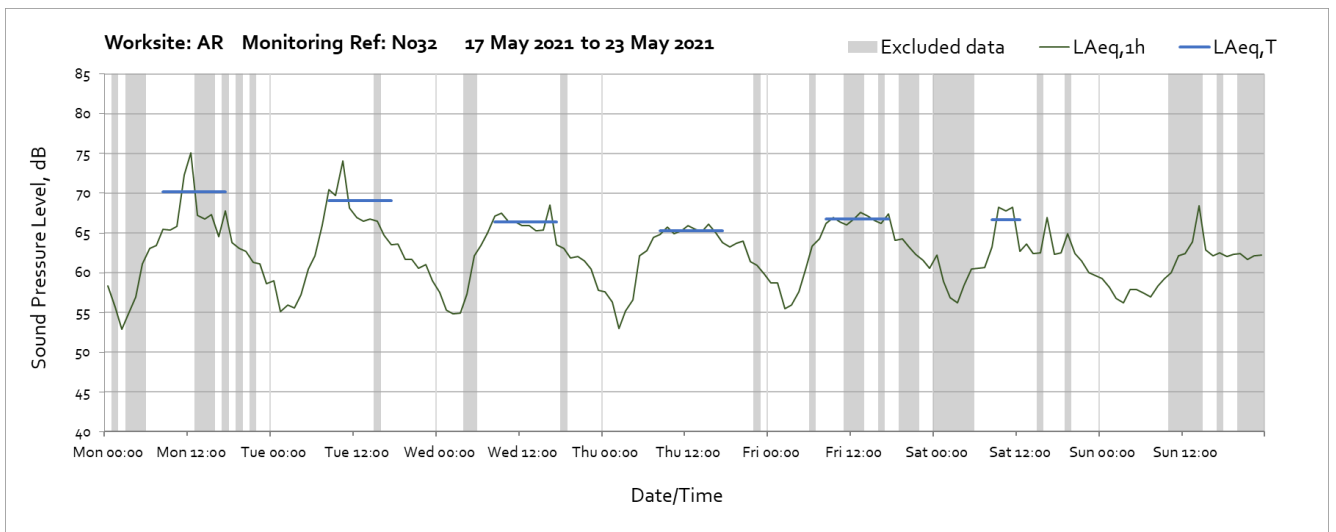
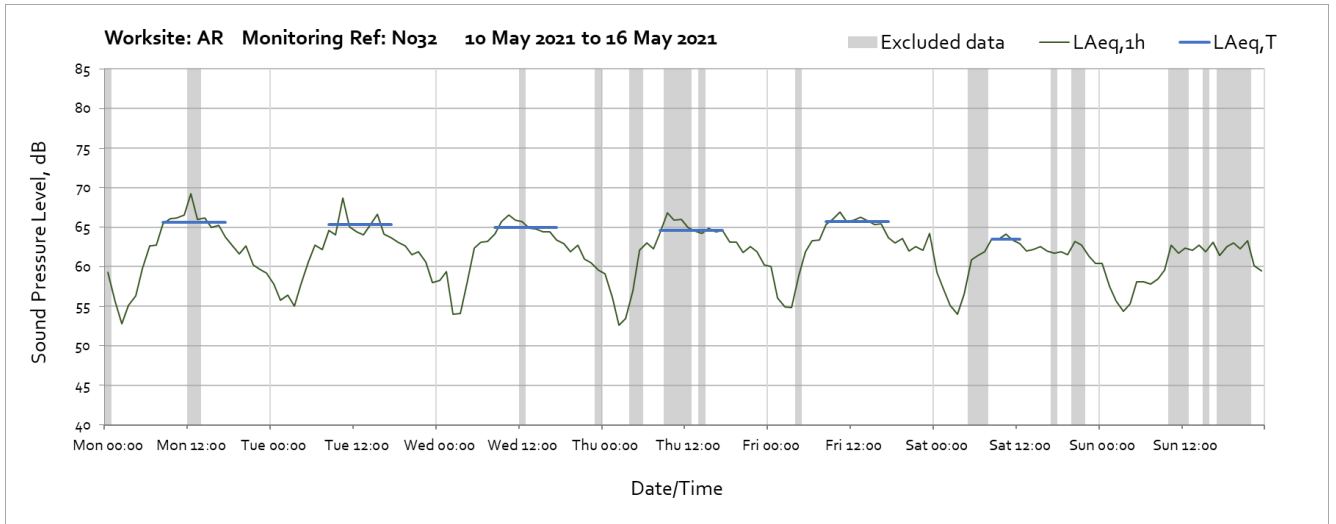
Appendix C Data

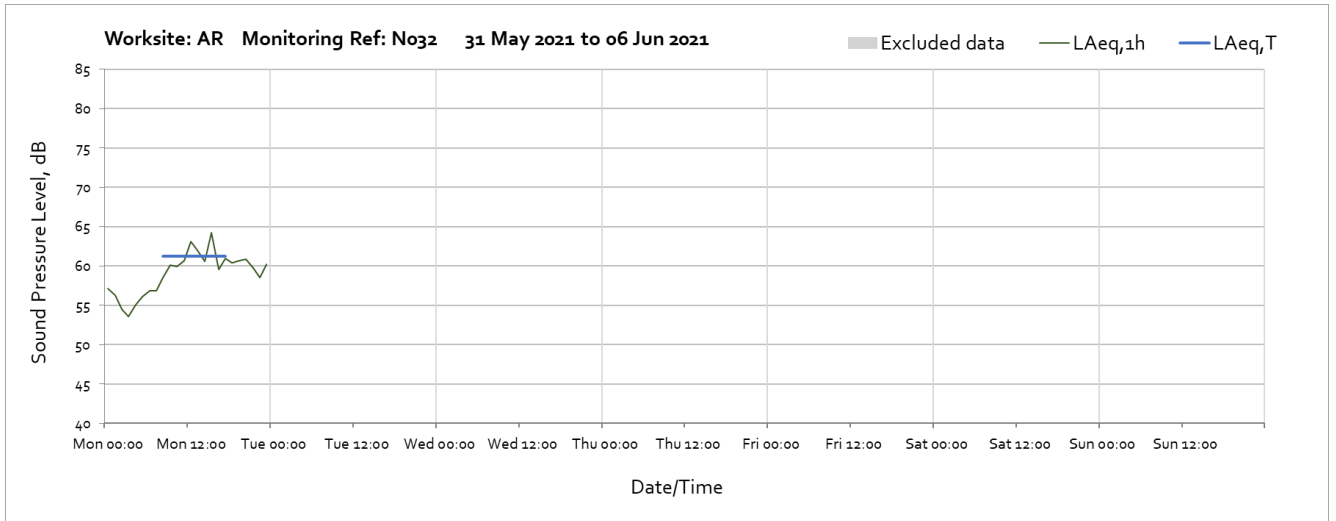
Noise

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.

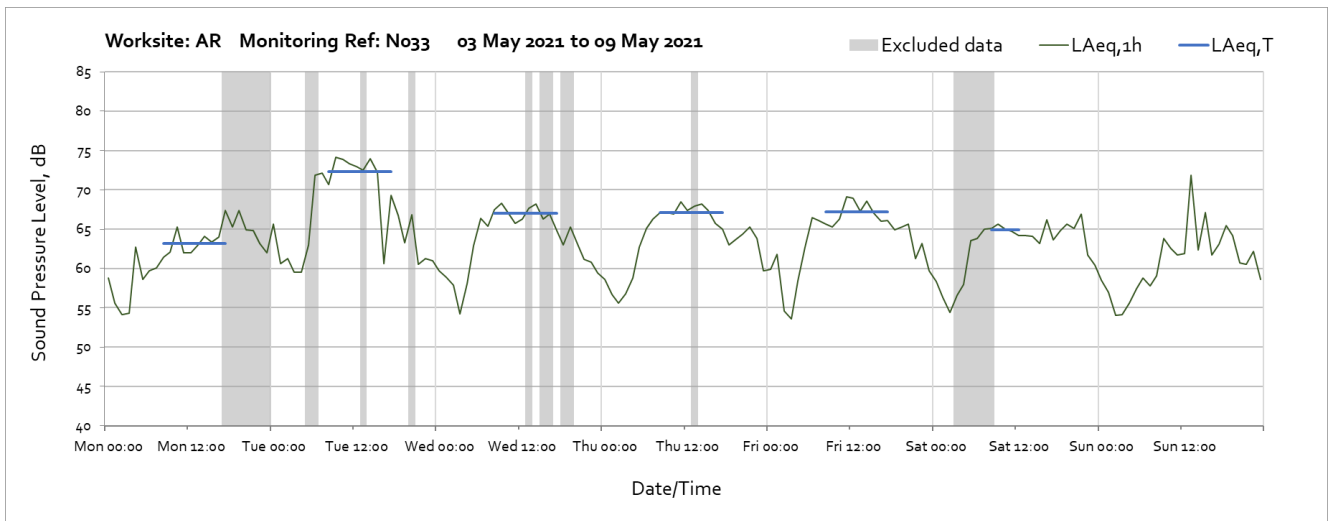
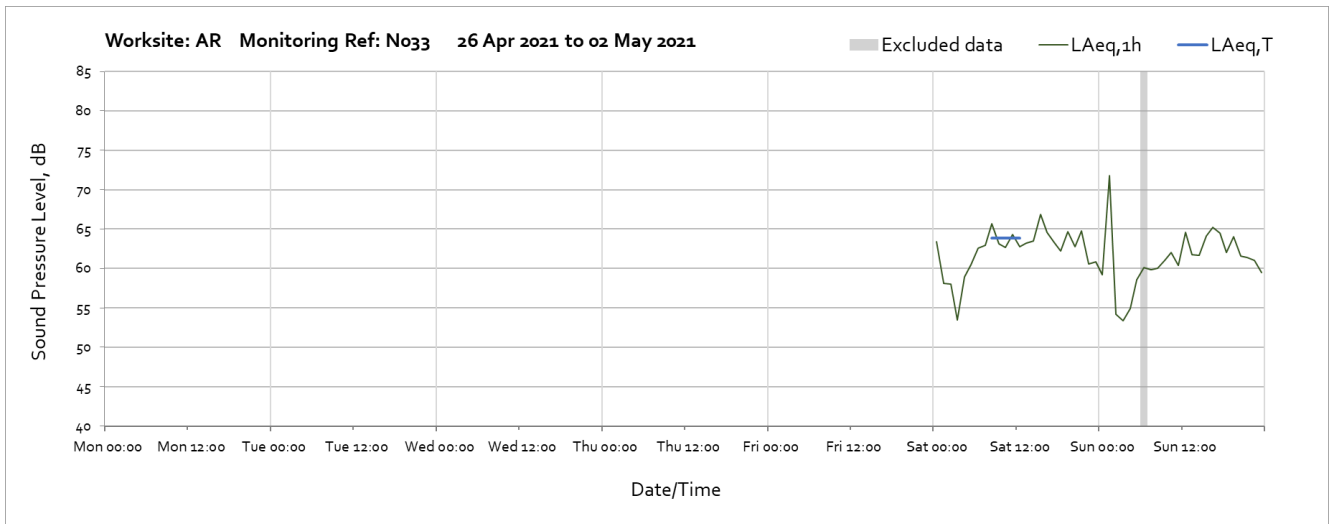
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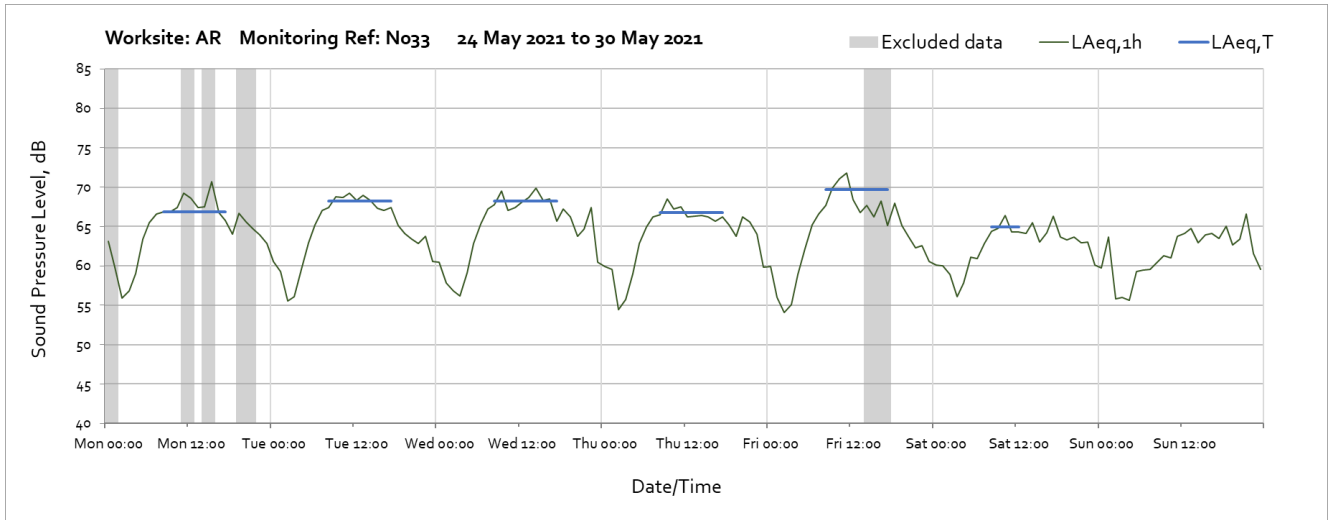
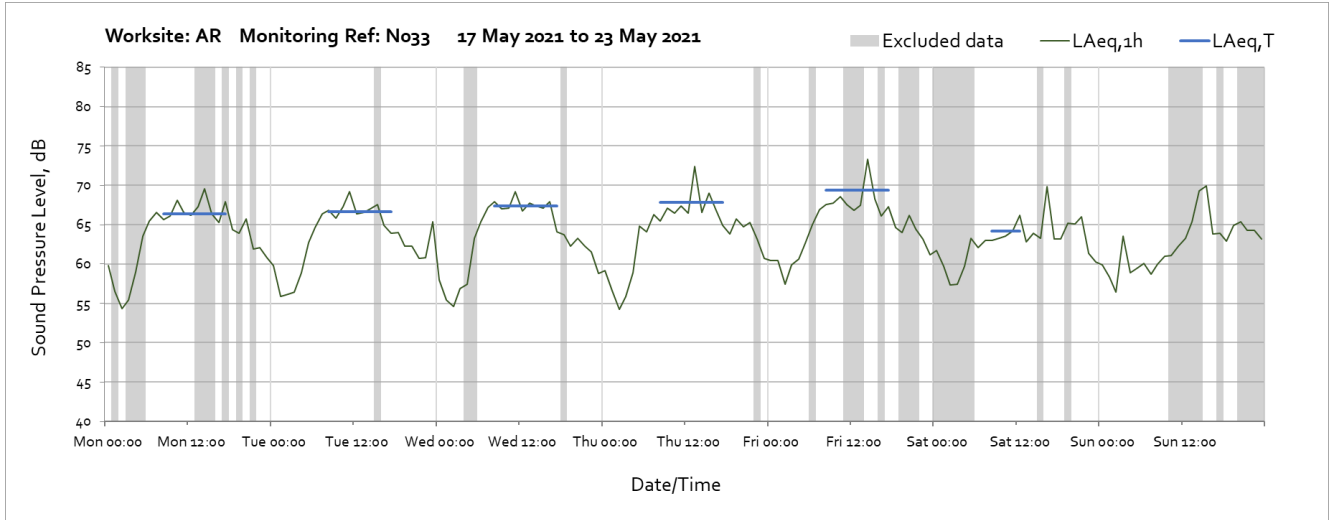
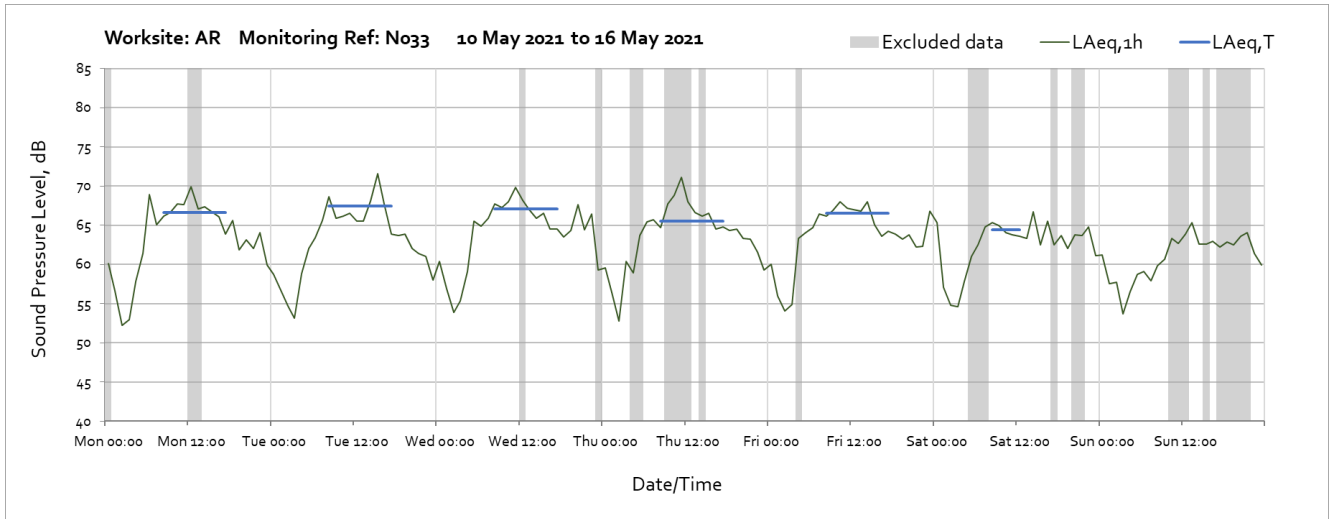


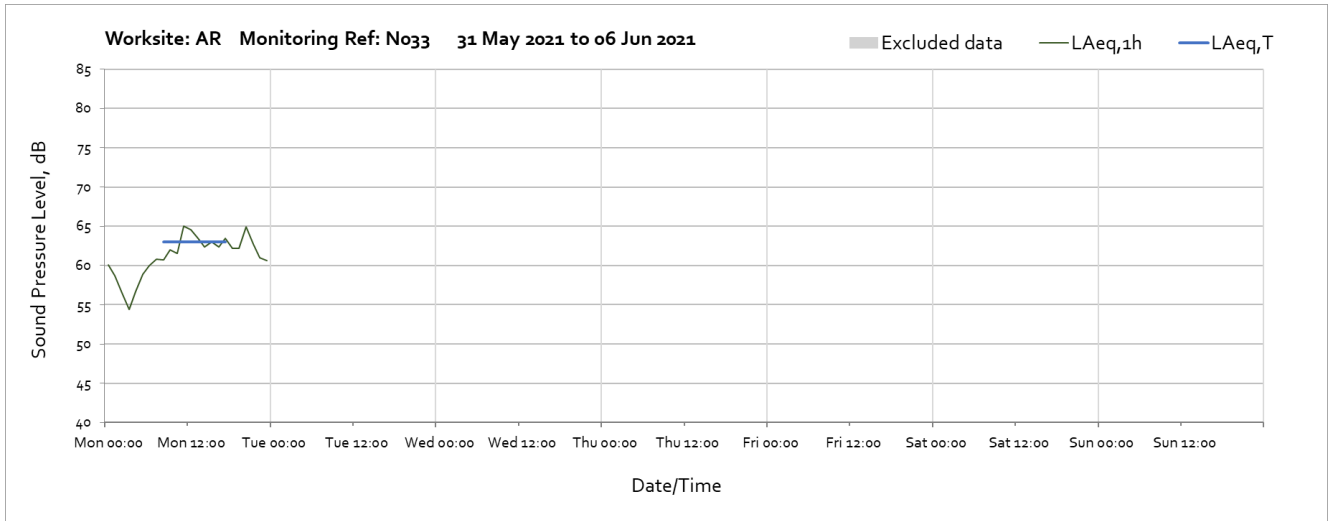




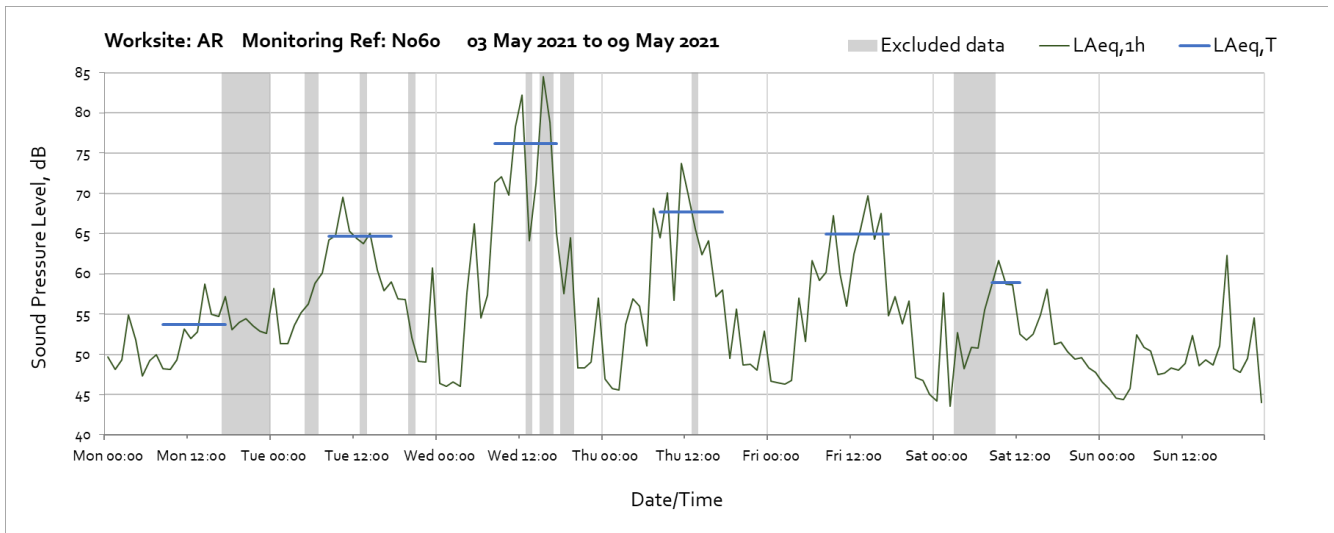
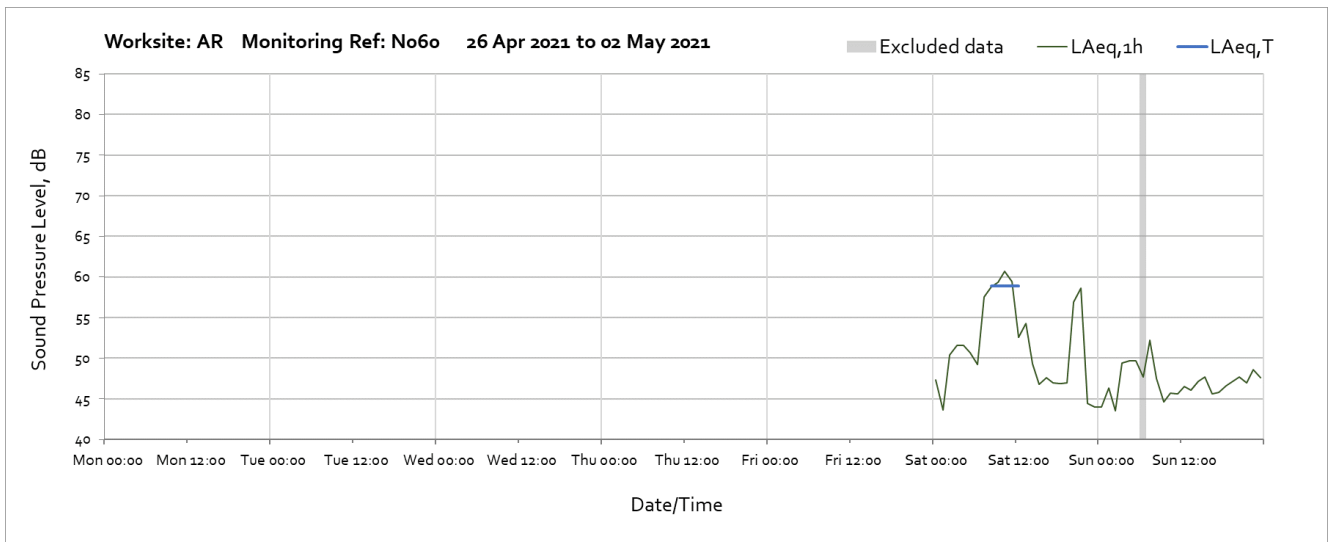
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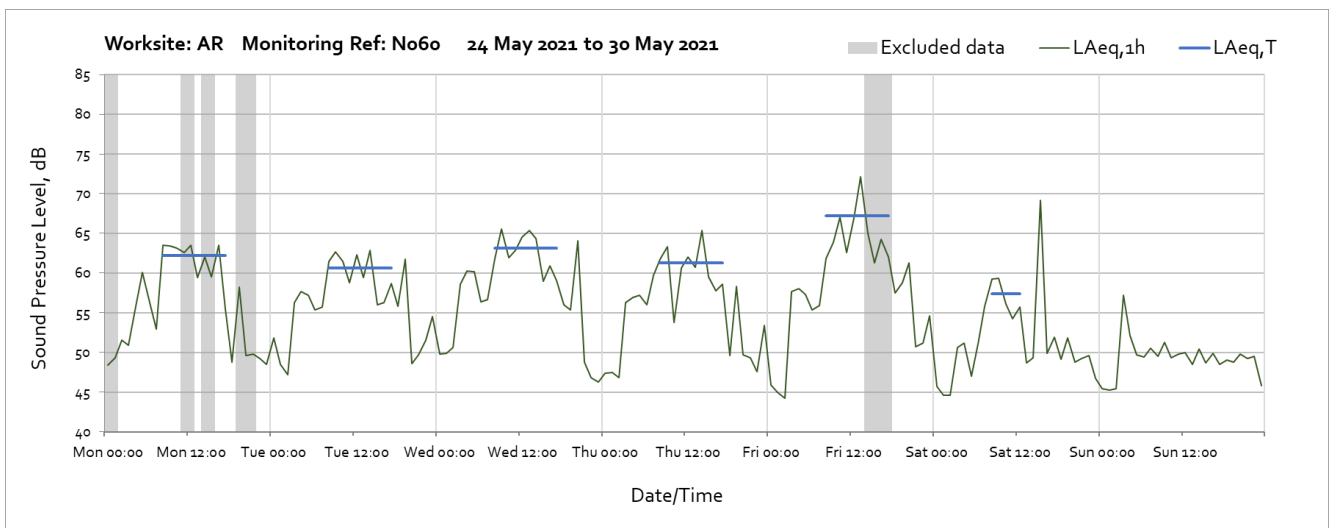
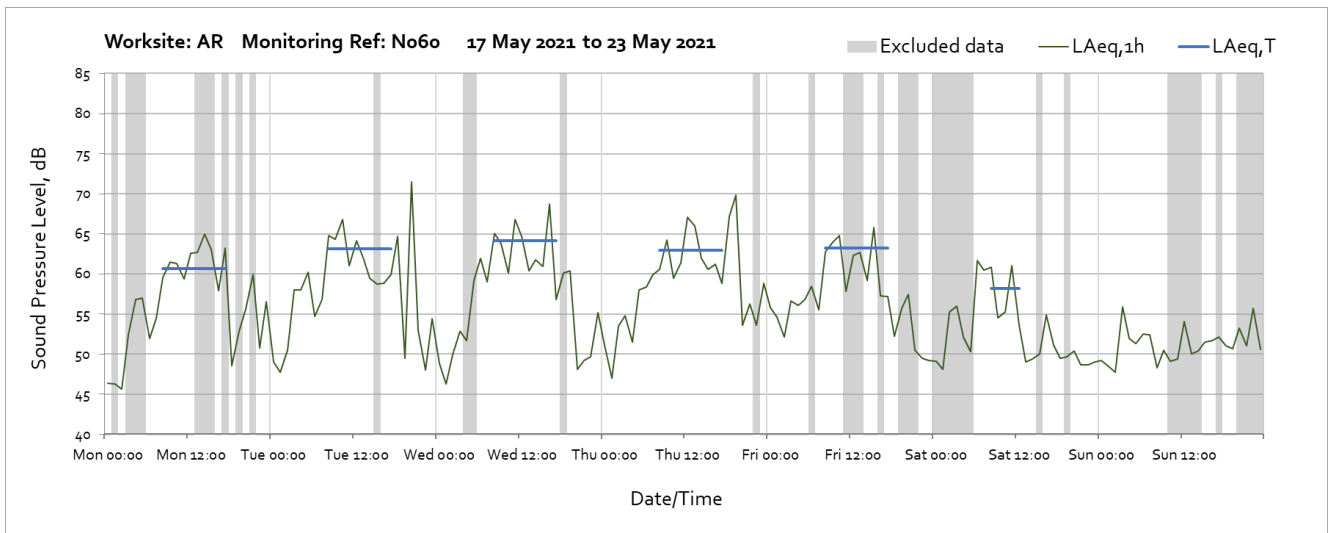
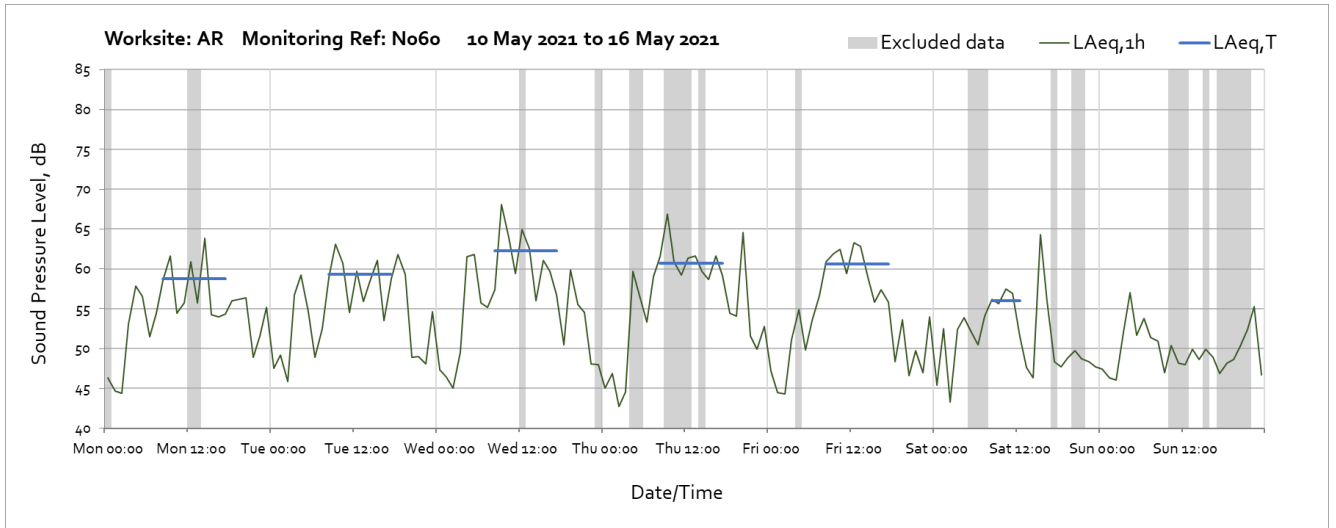


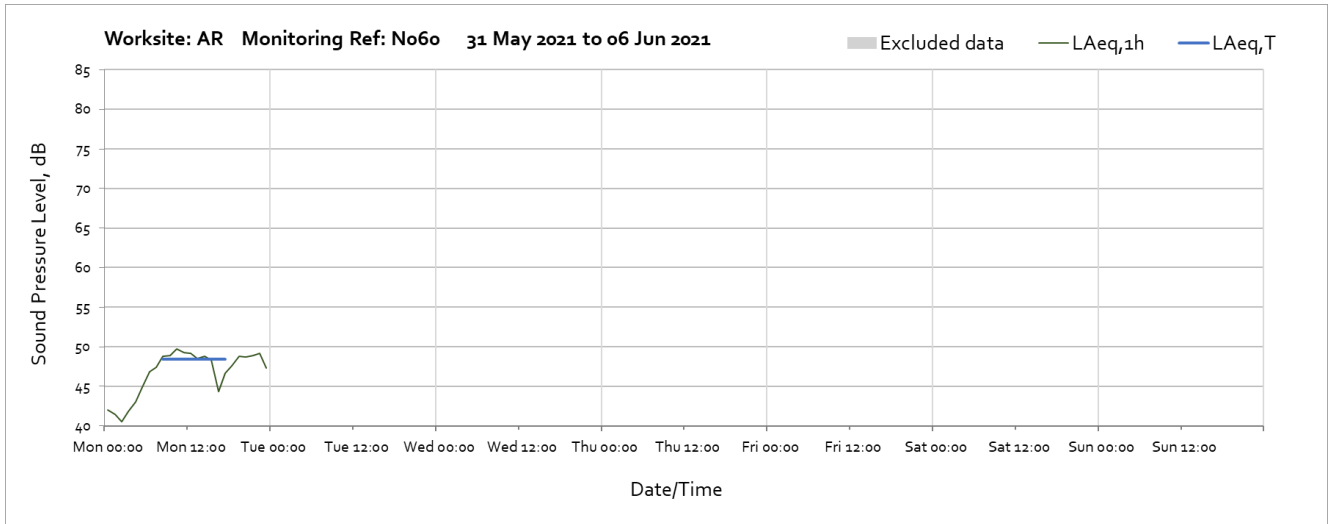




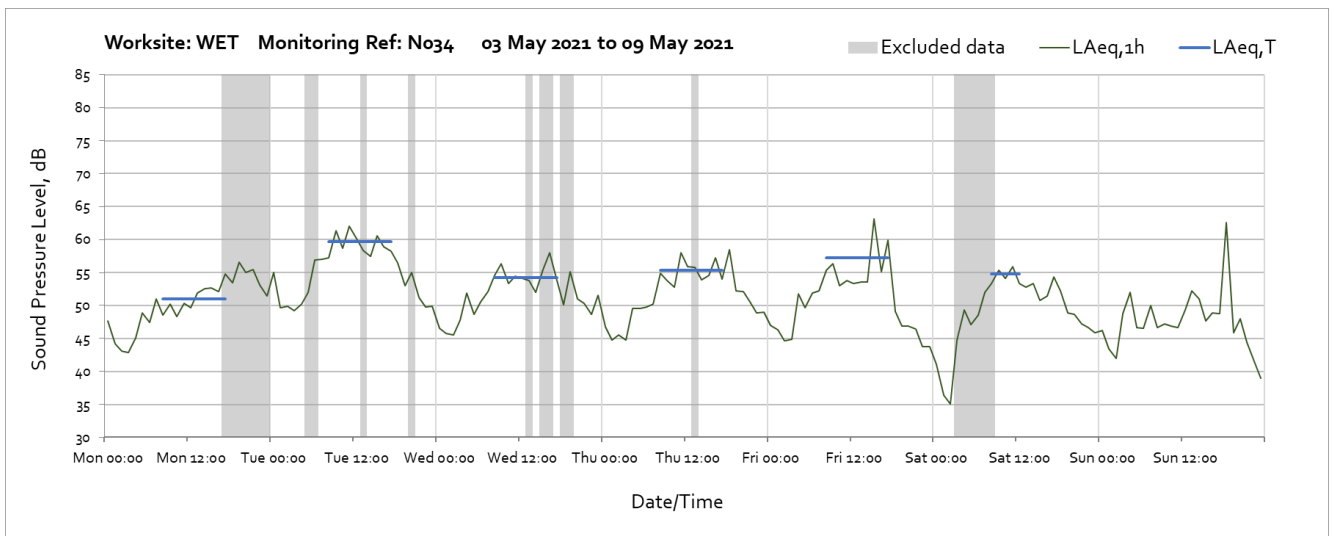
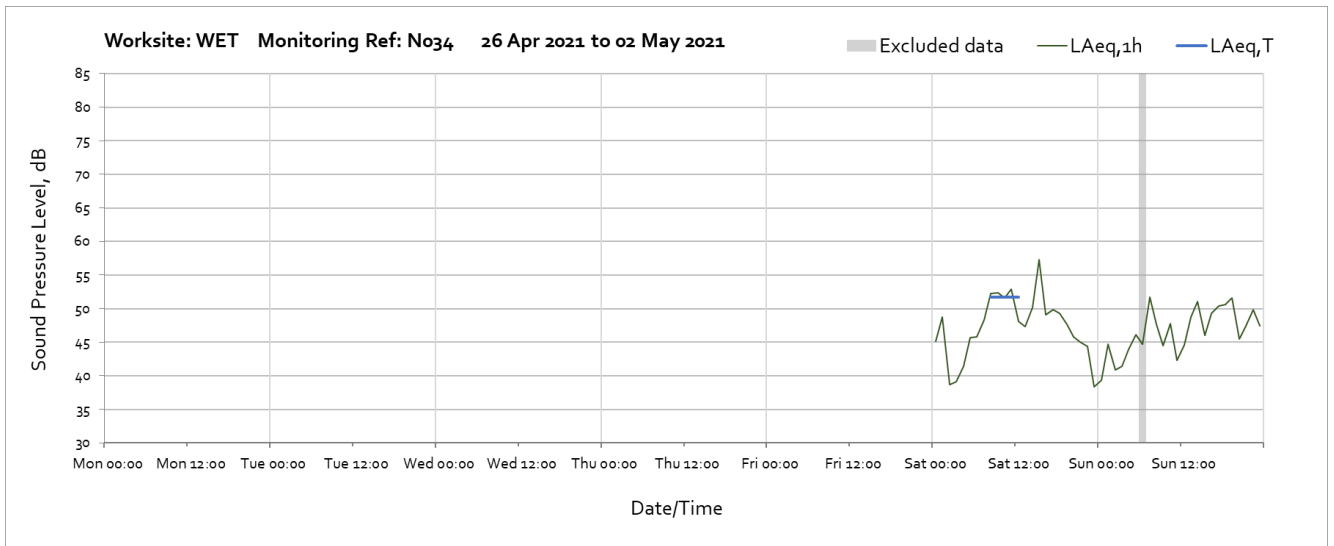
Worksite: Atlas Road worksite (AR) – Monitoring Ref: N060

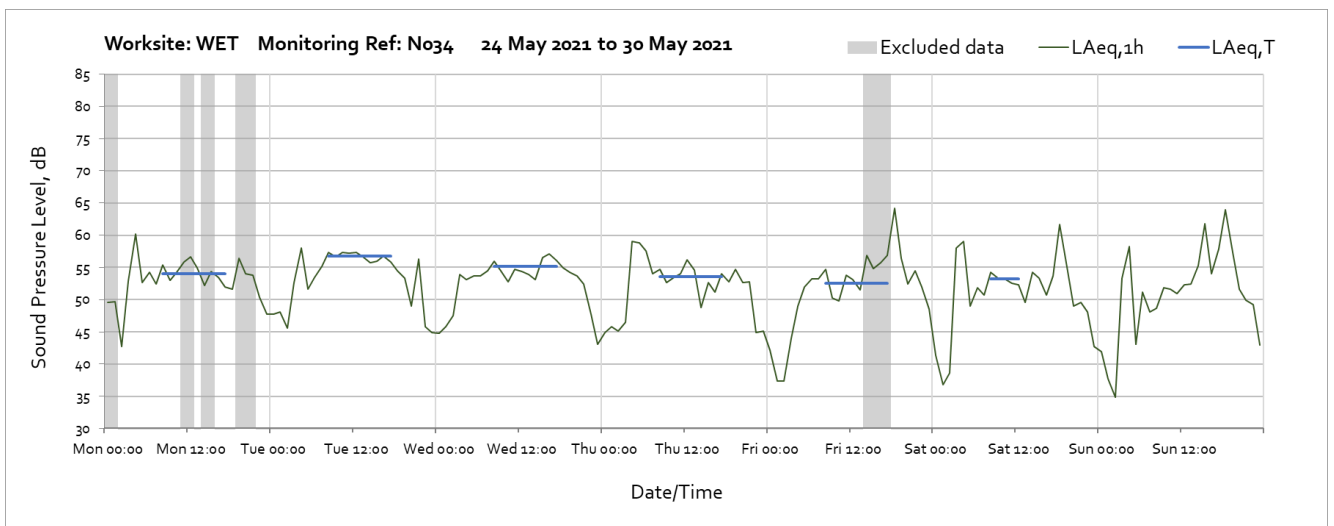
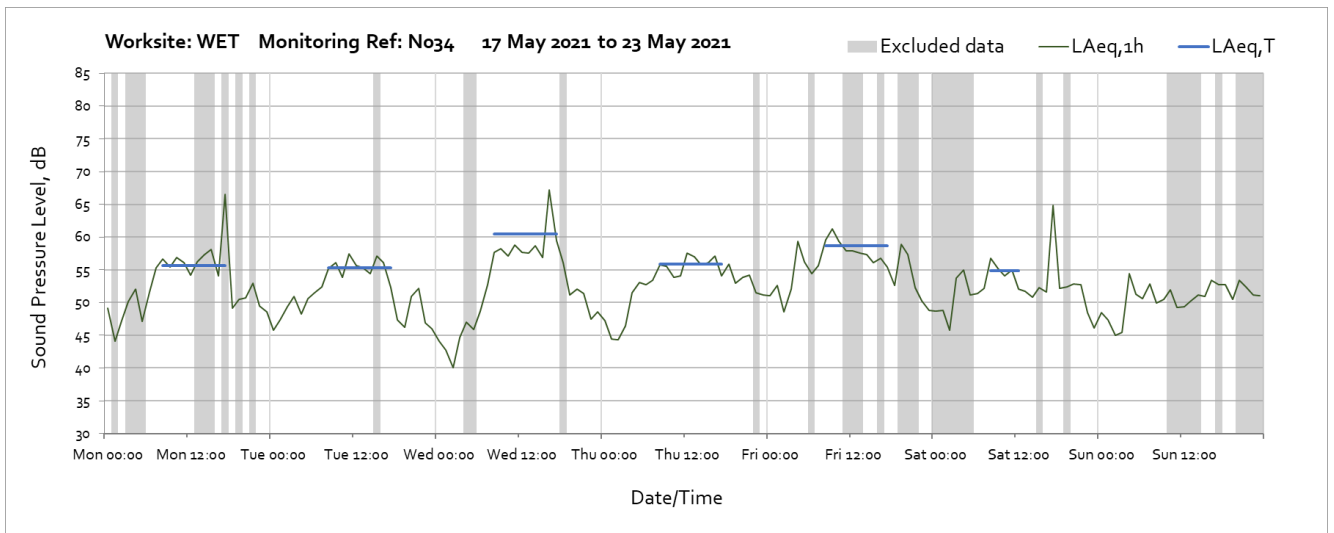
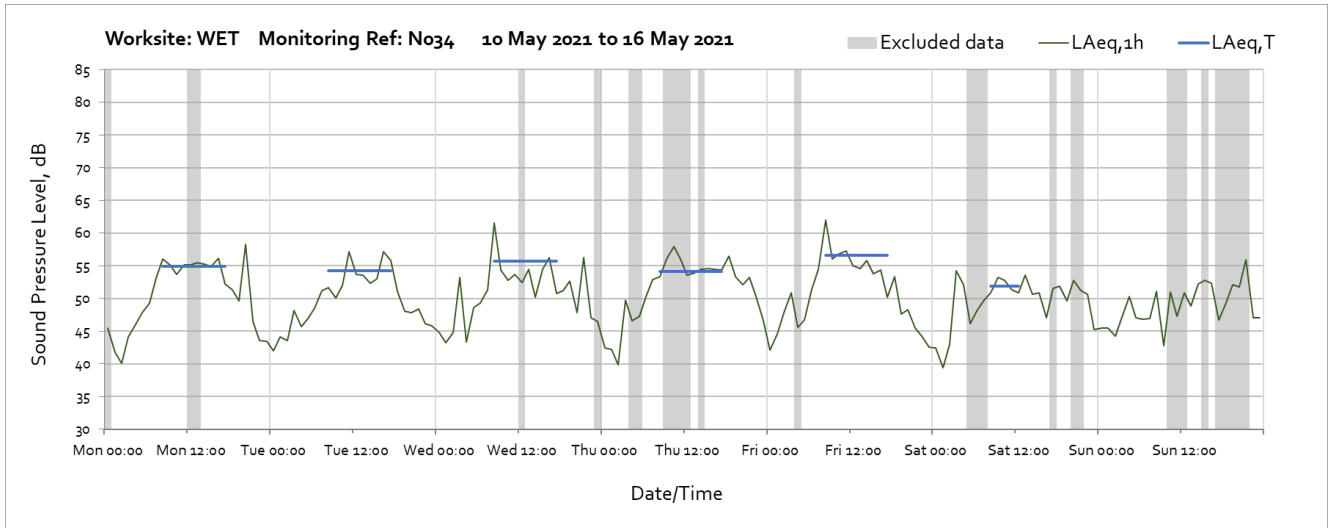


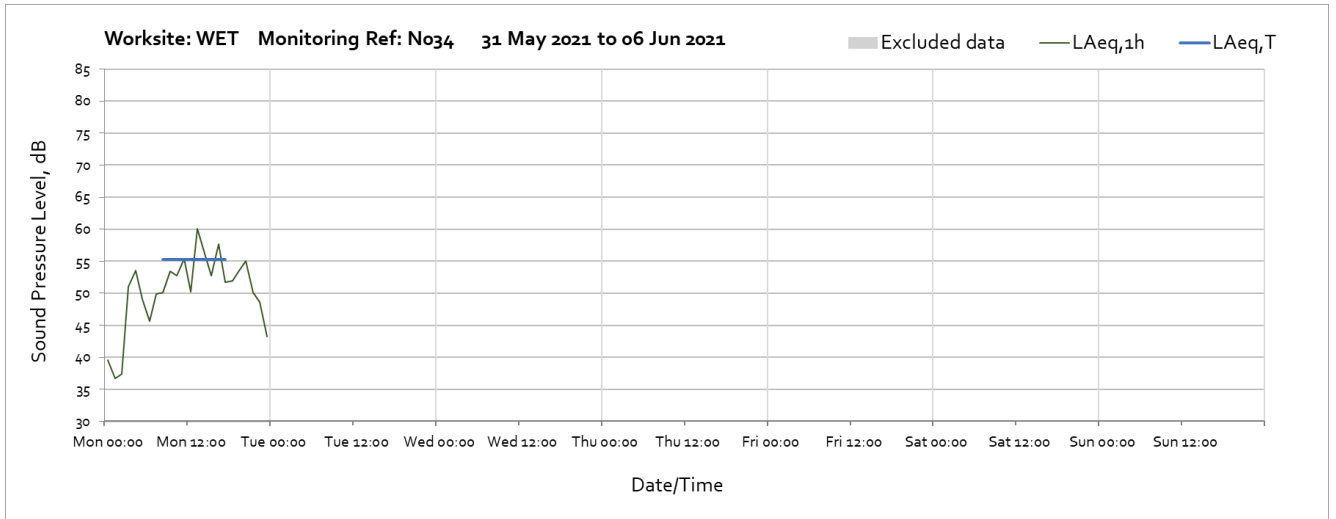




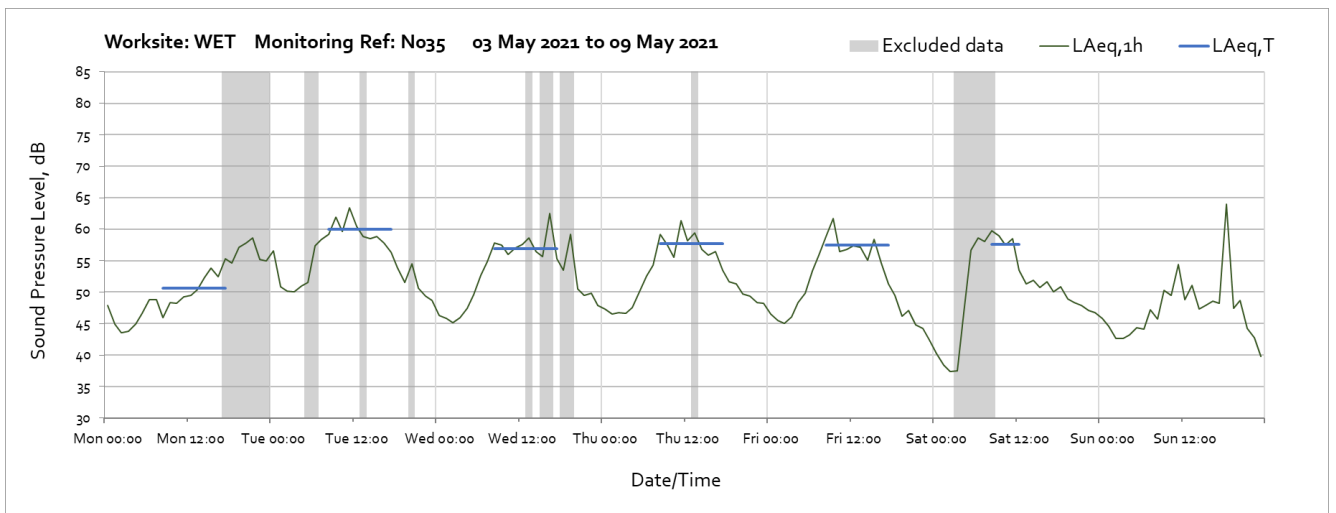
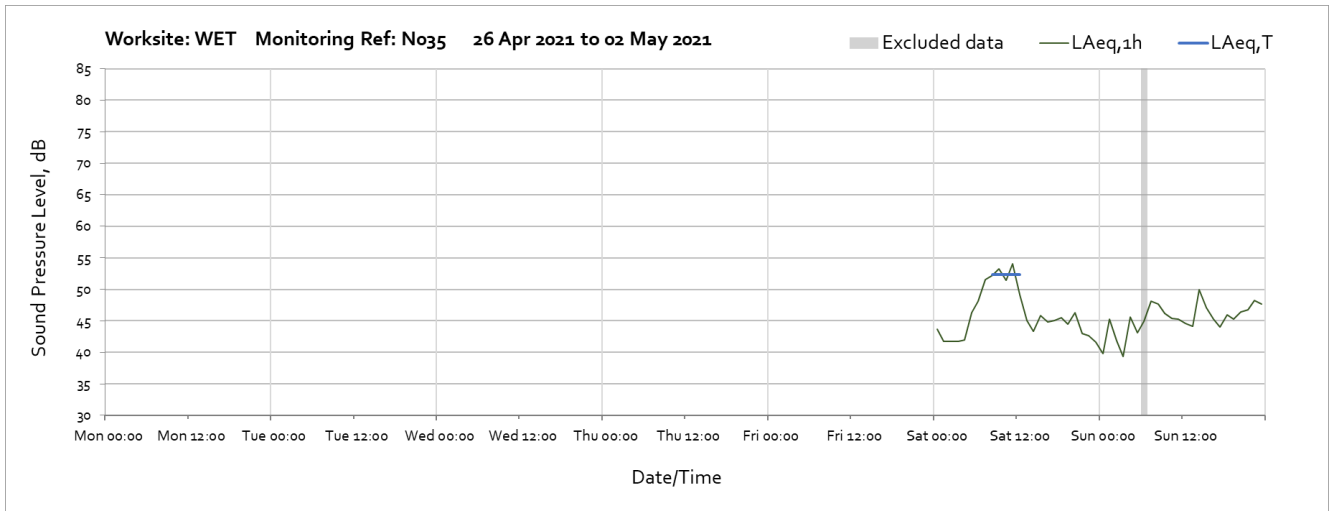
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: N034

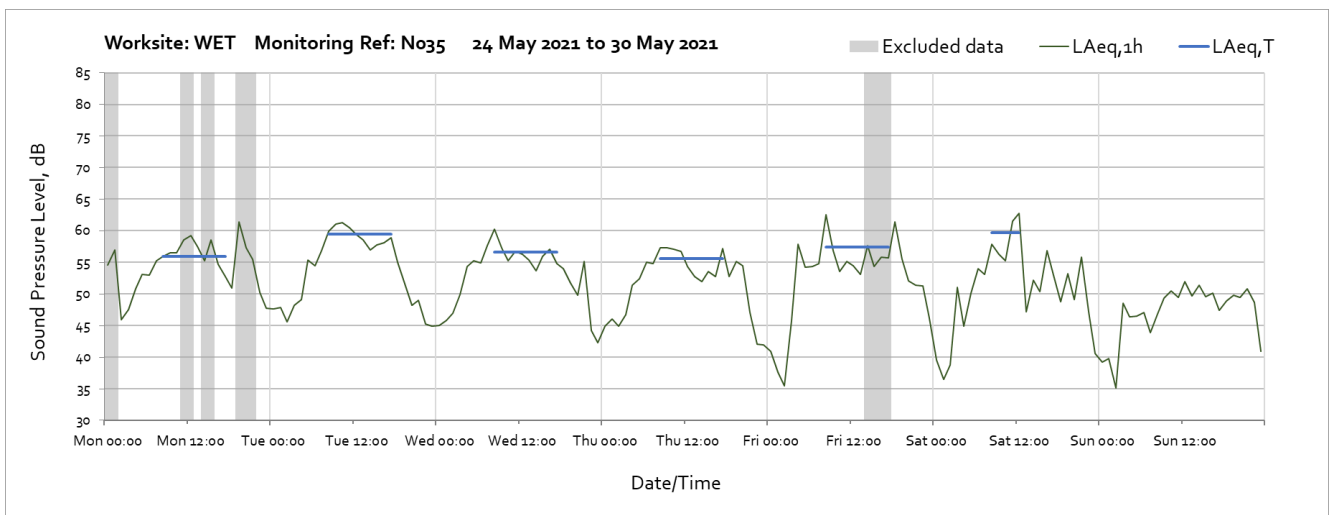
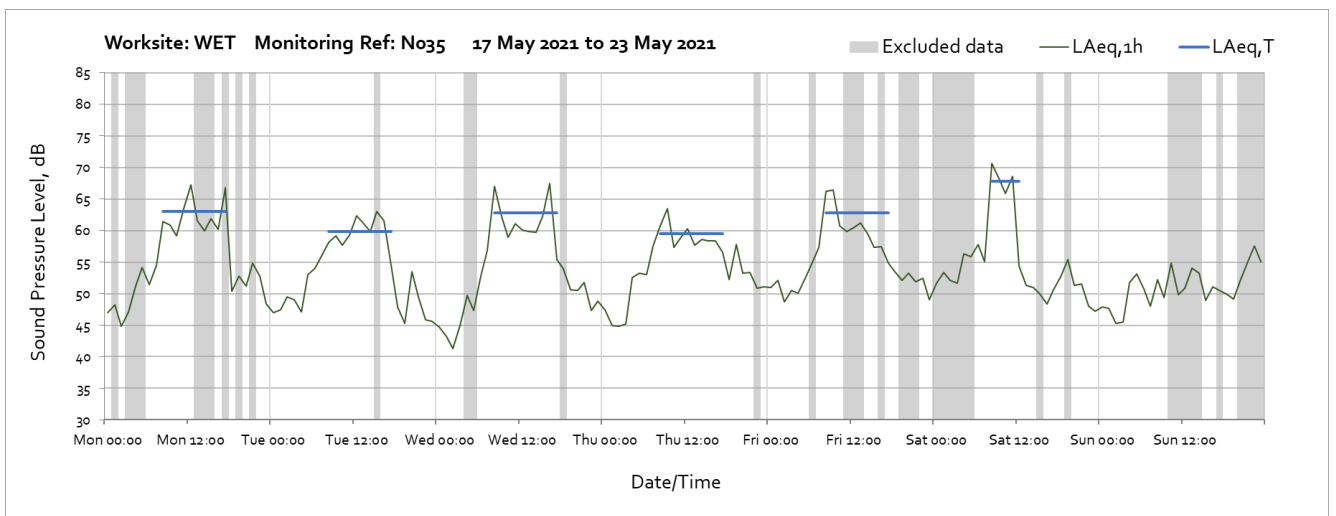
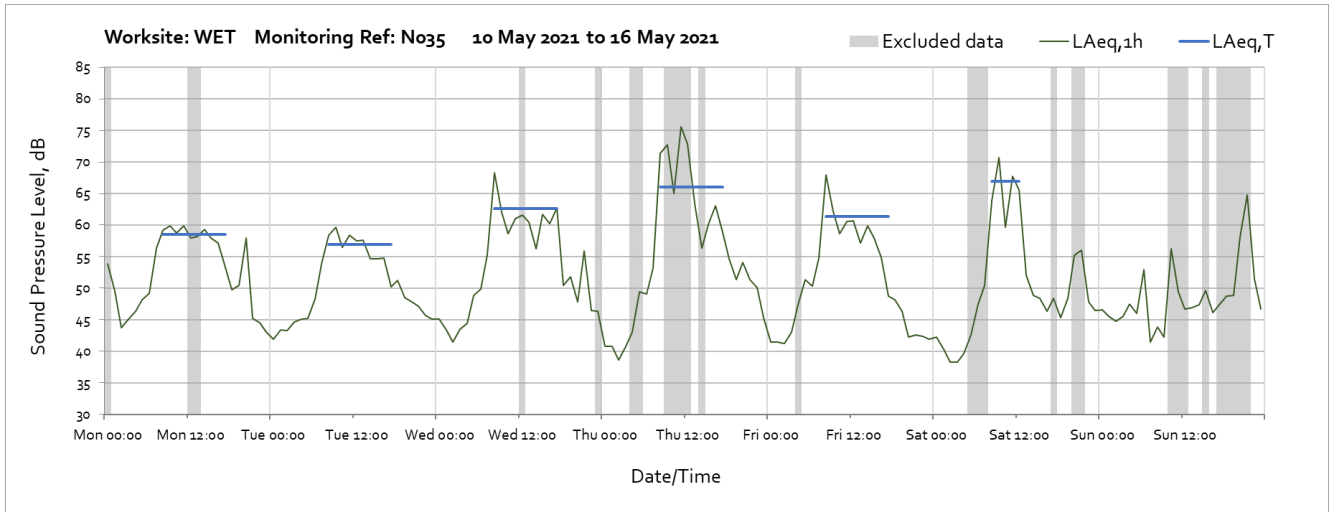


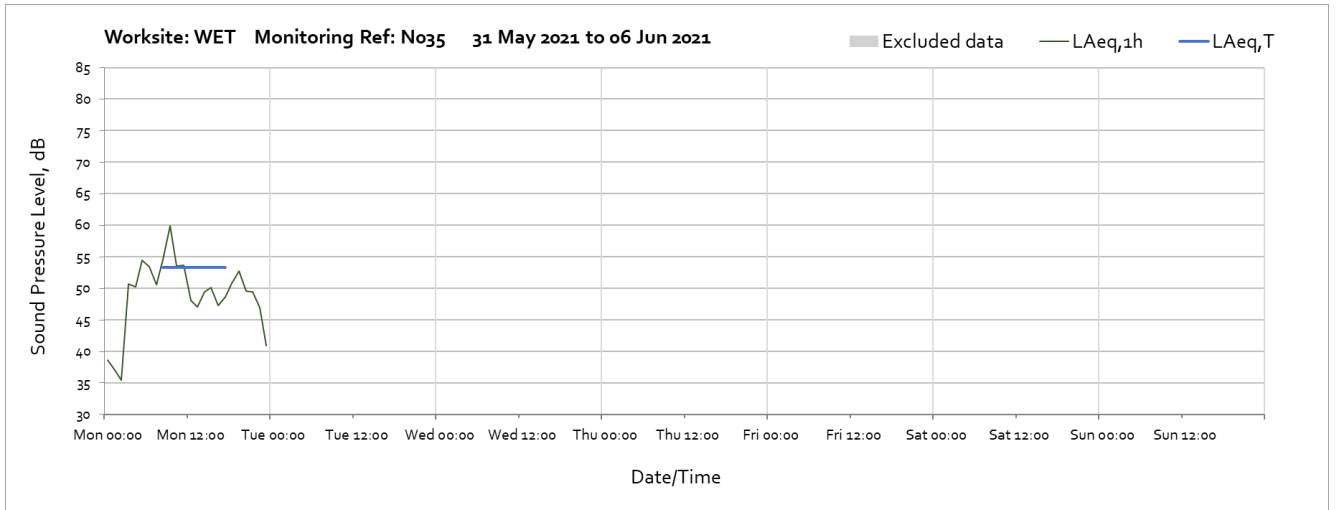




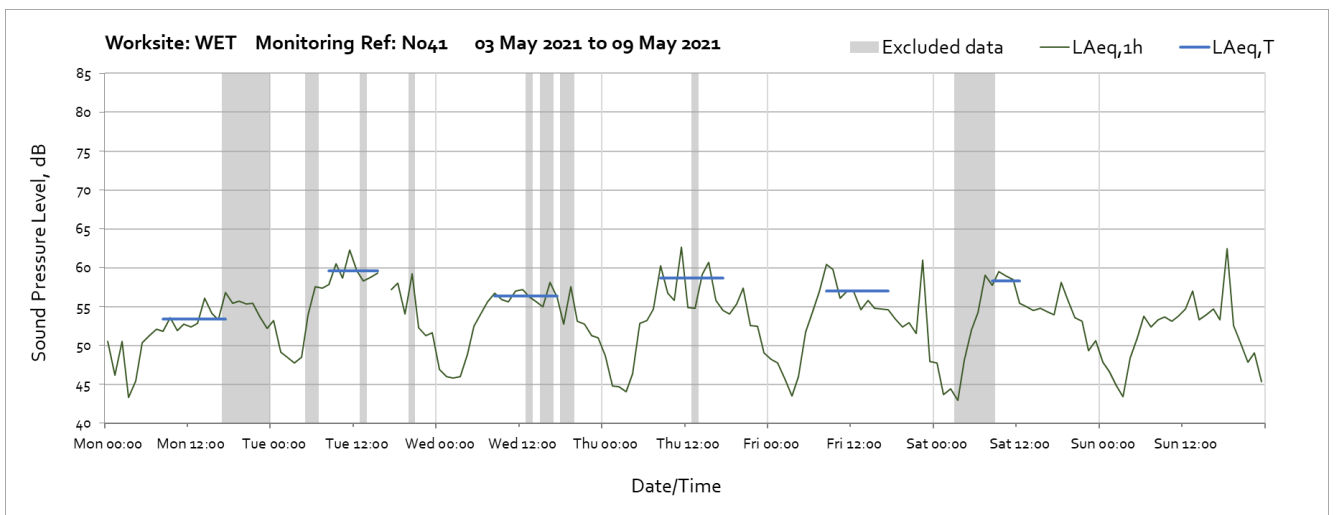
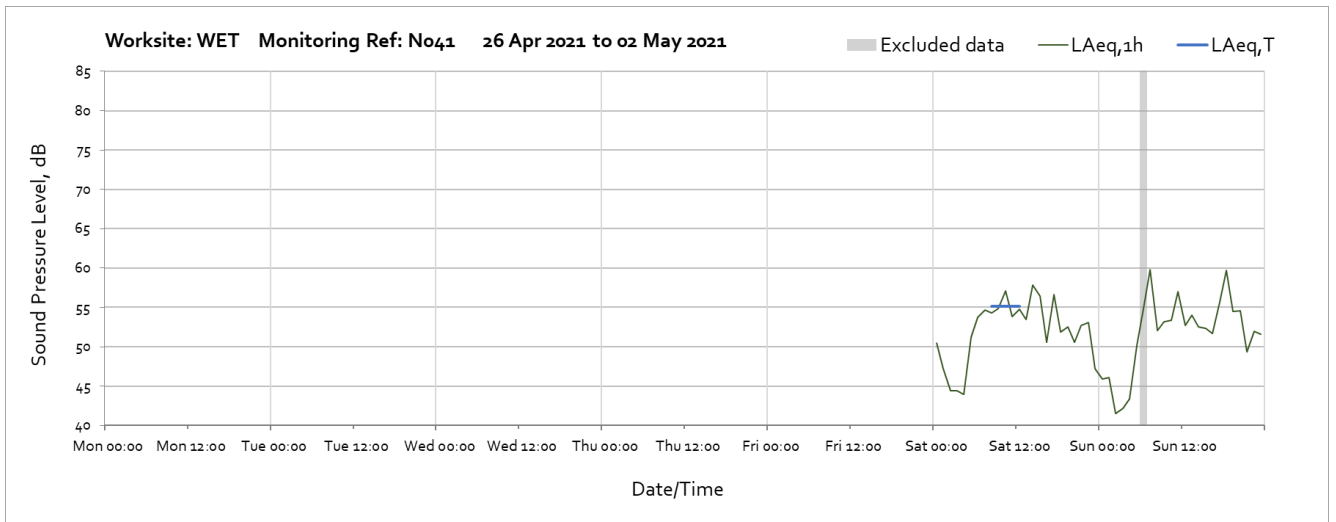
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: N035



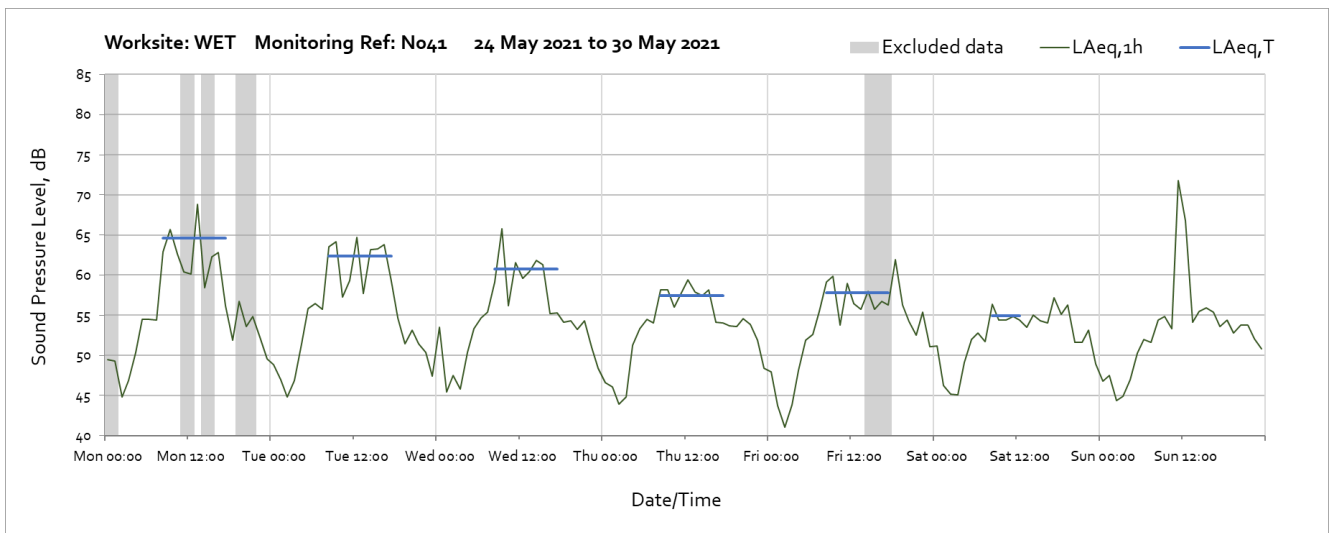
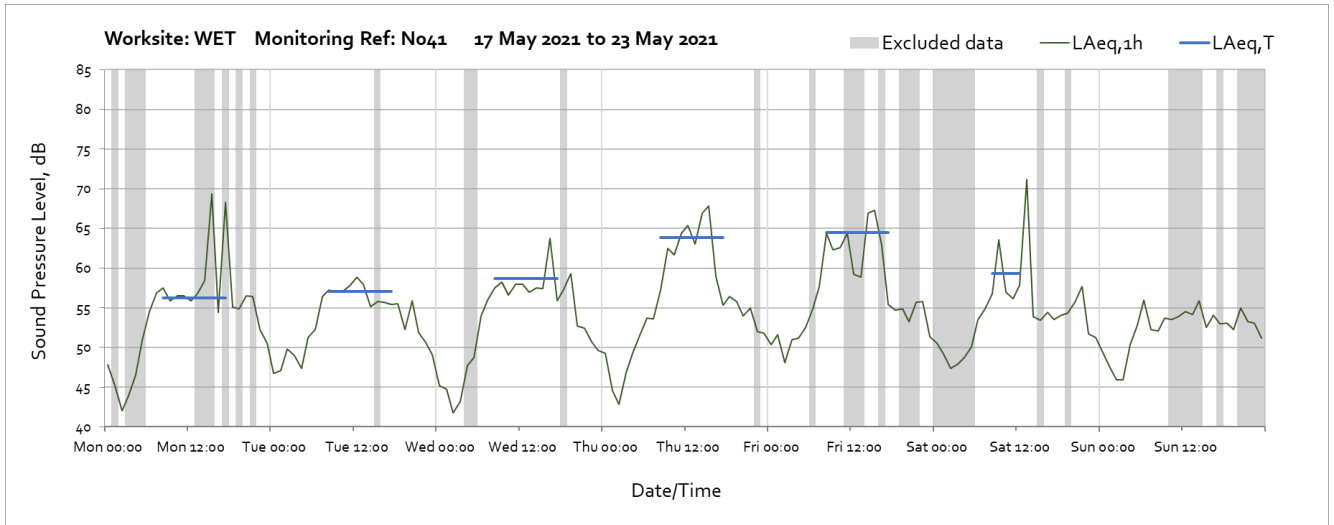
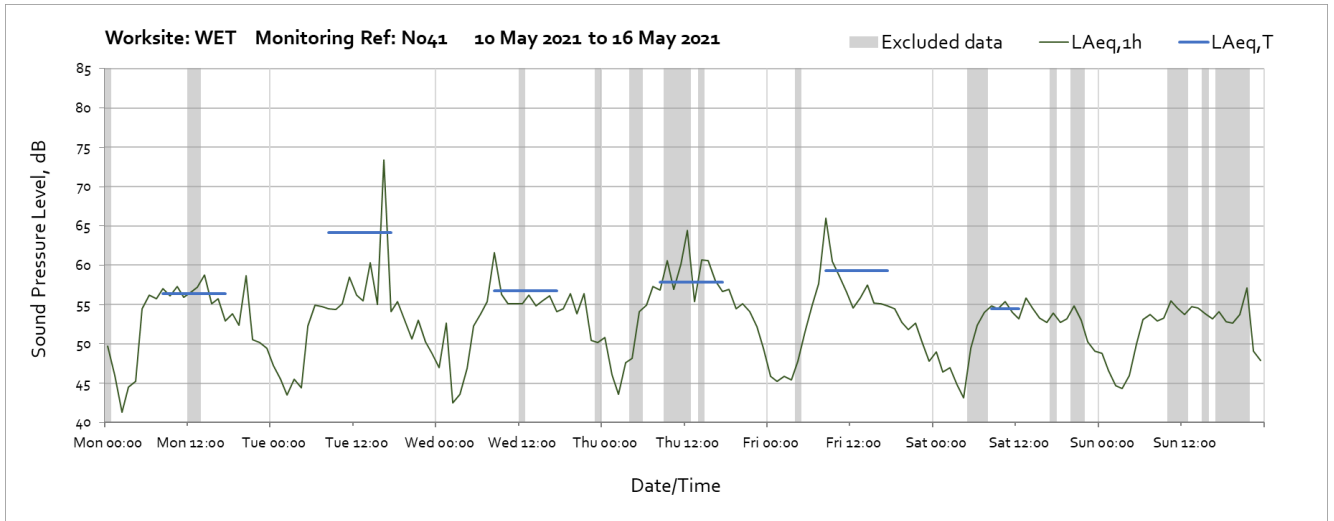


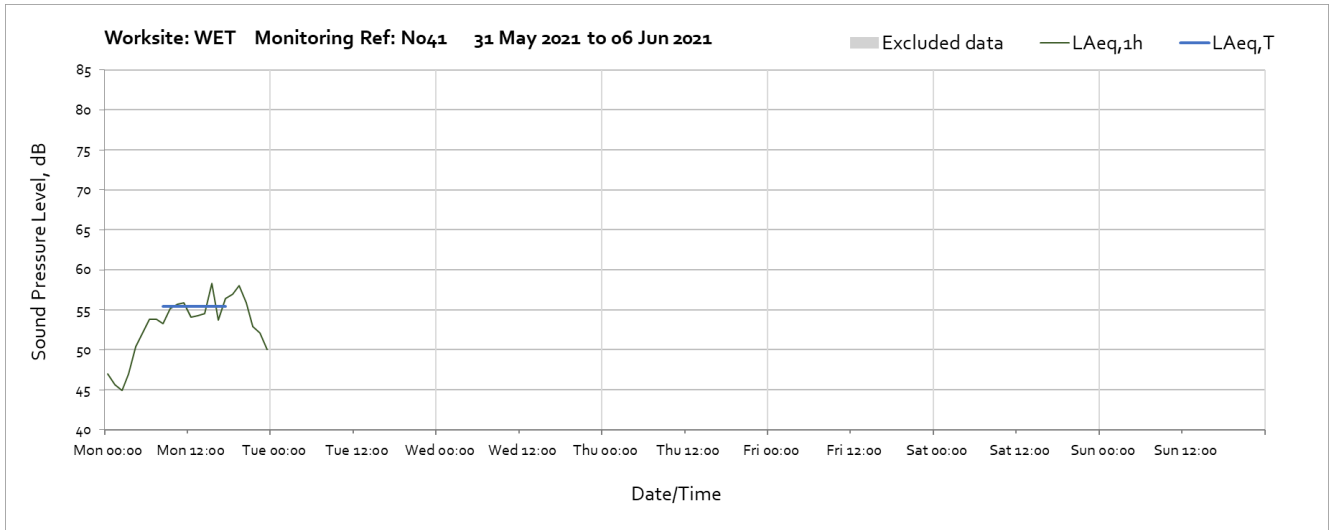


Worksite: Willesden Euro Terminal (WET) - Monitoring Ref: N041

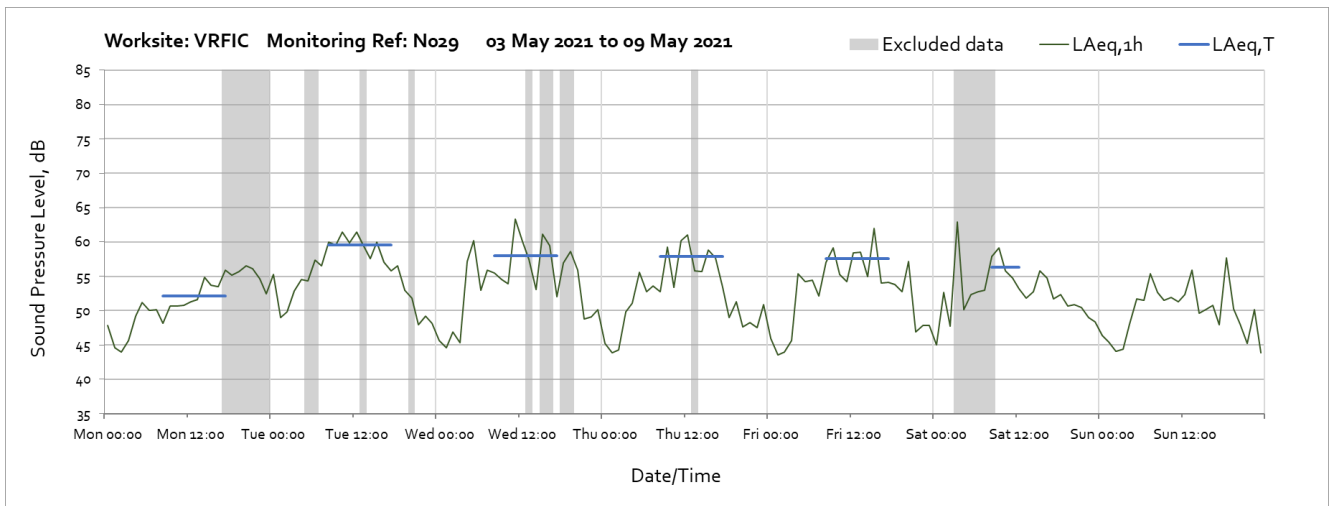
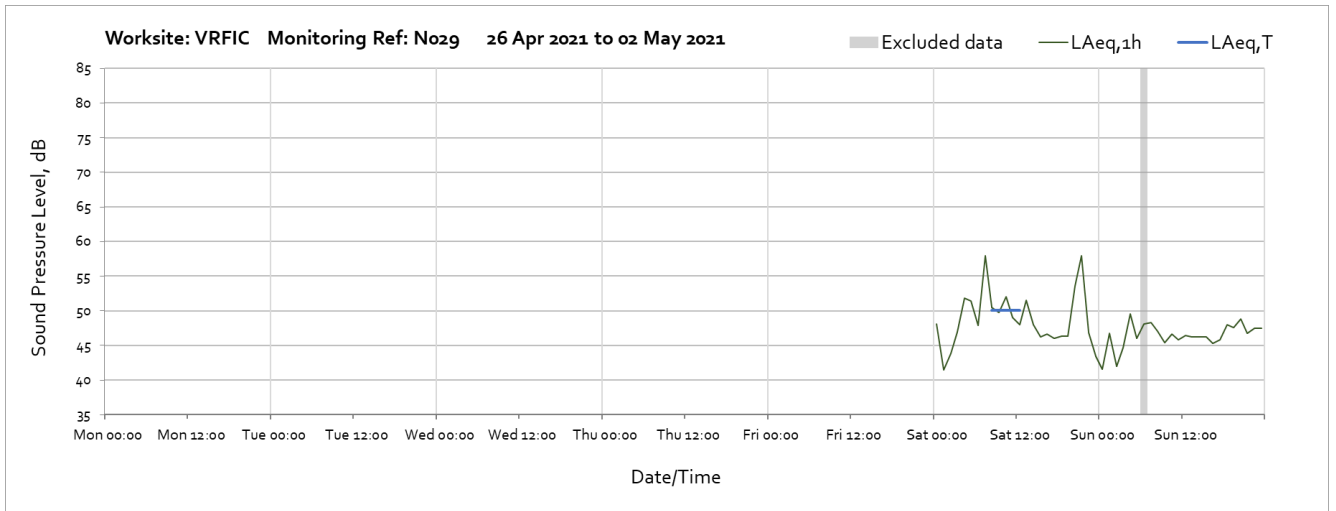


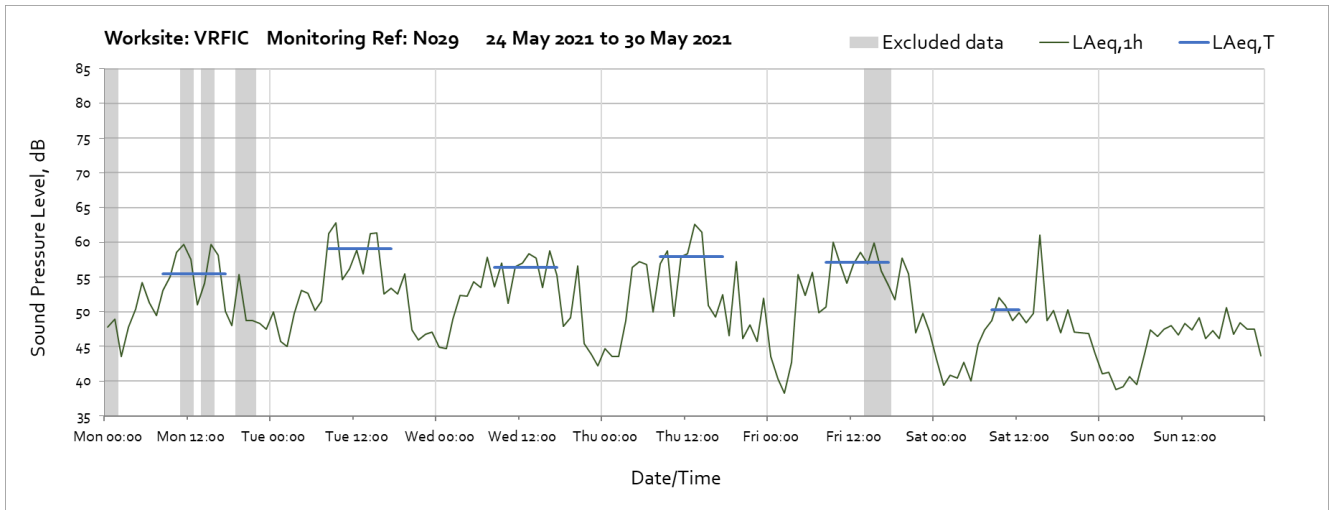
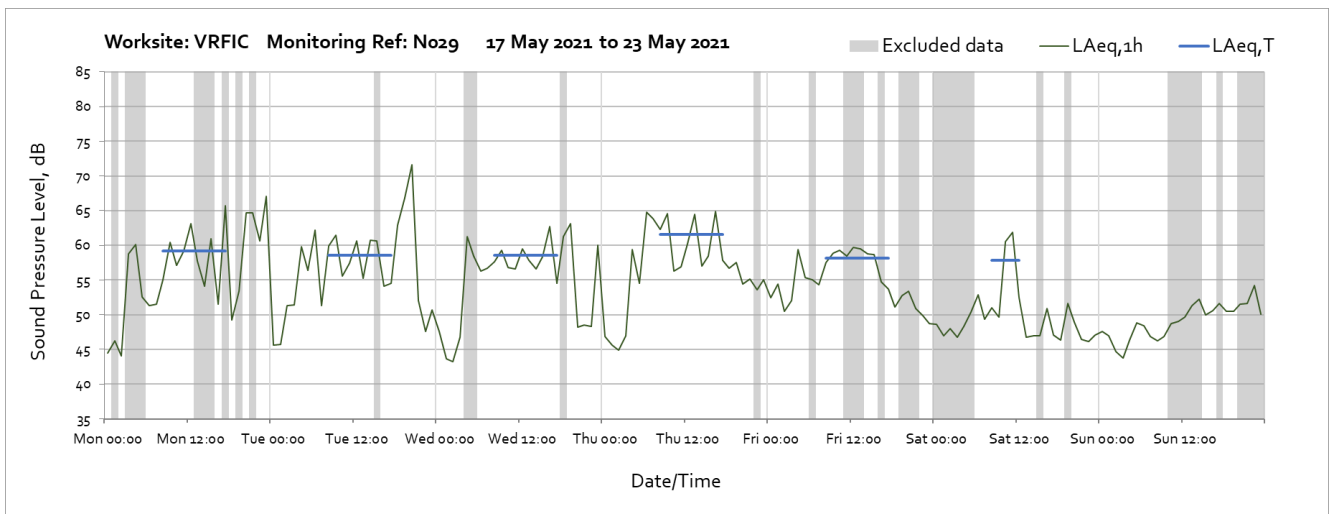
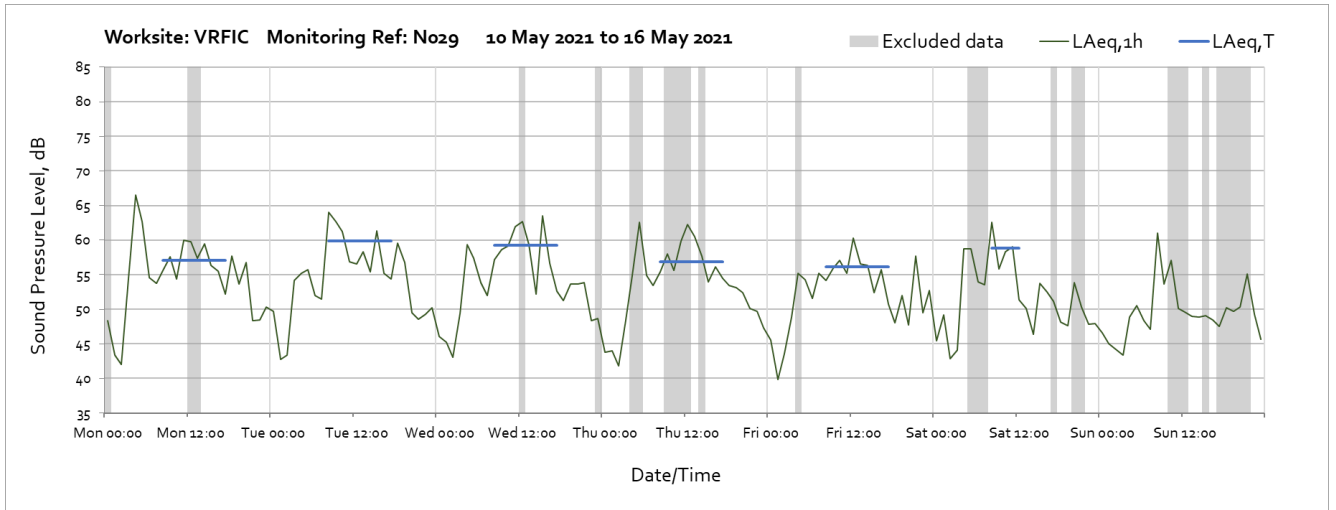
Note: Missing data at 16:00 on Tuesday 4th May 2021 was due to SD card issue of the noise monitor.

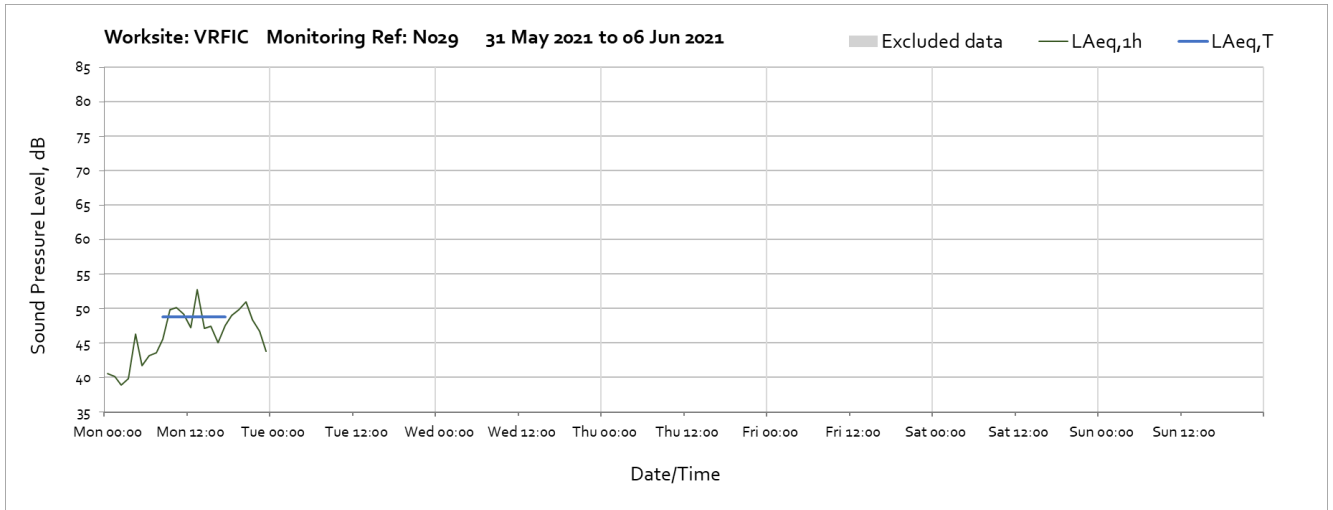




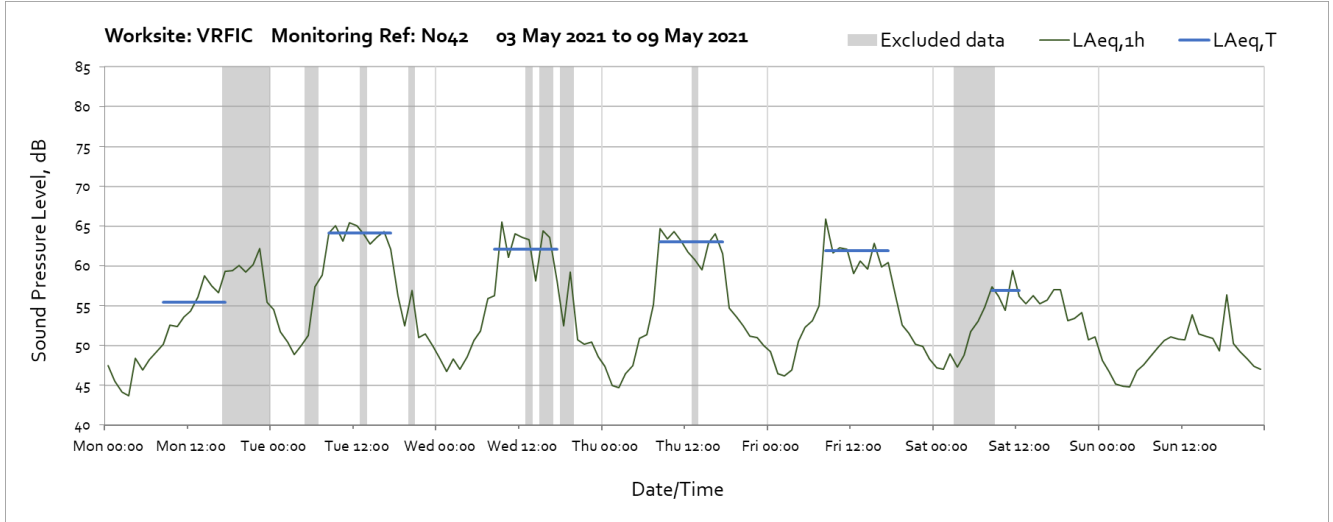
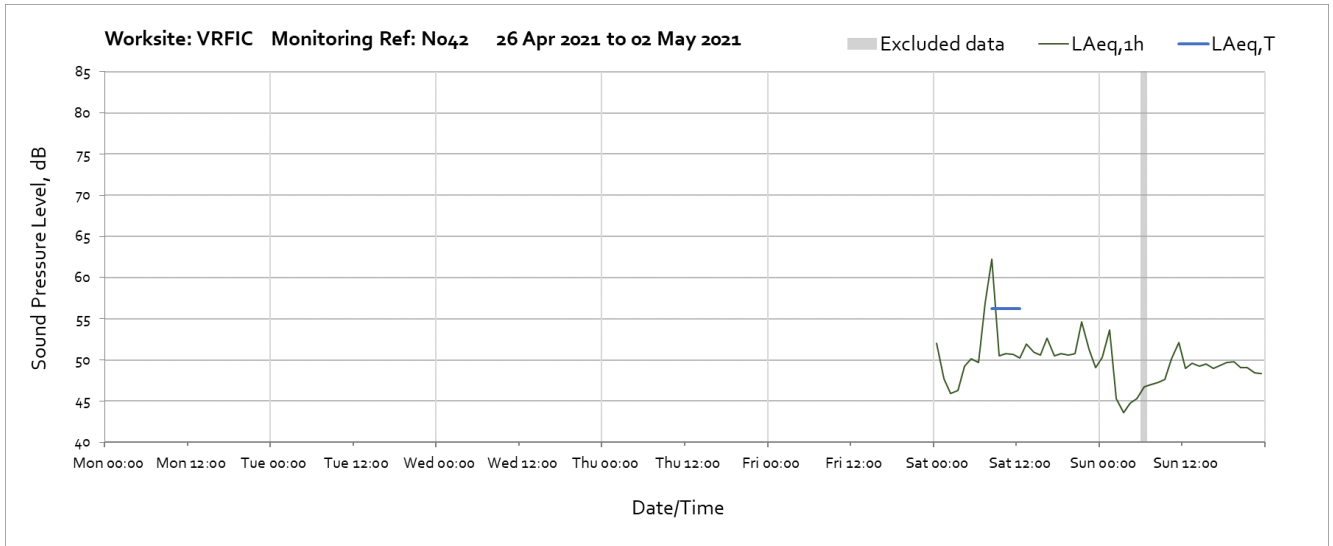
Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N029

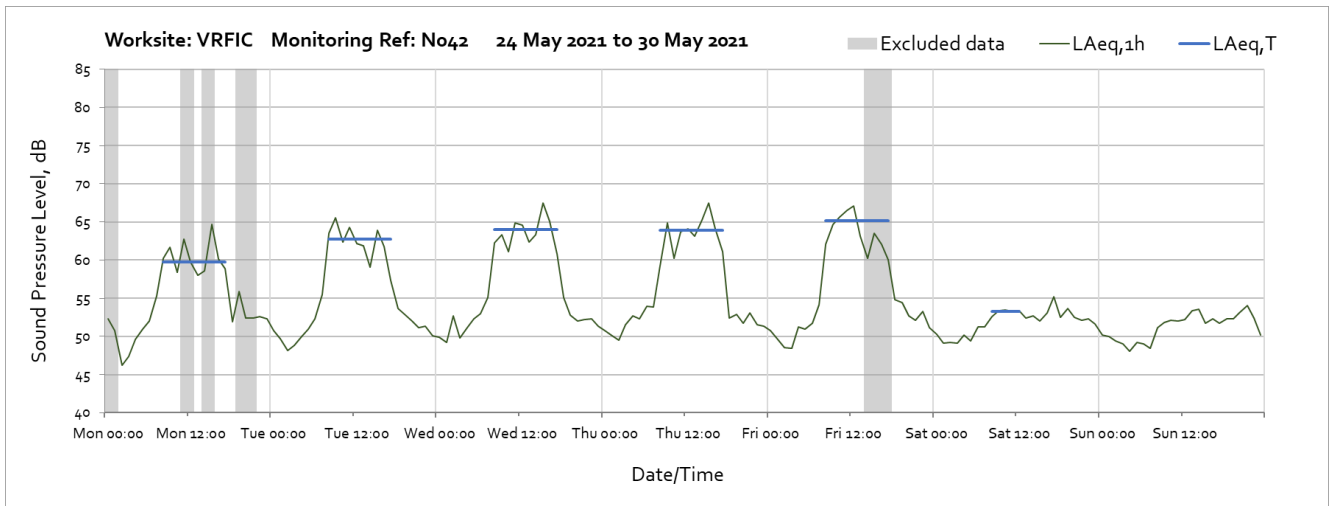
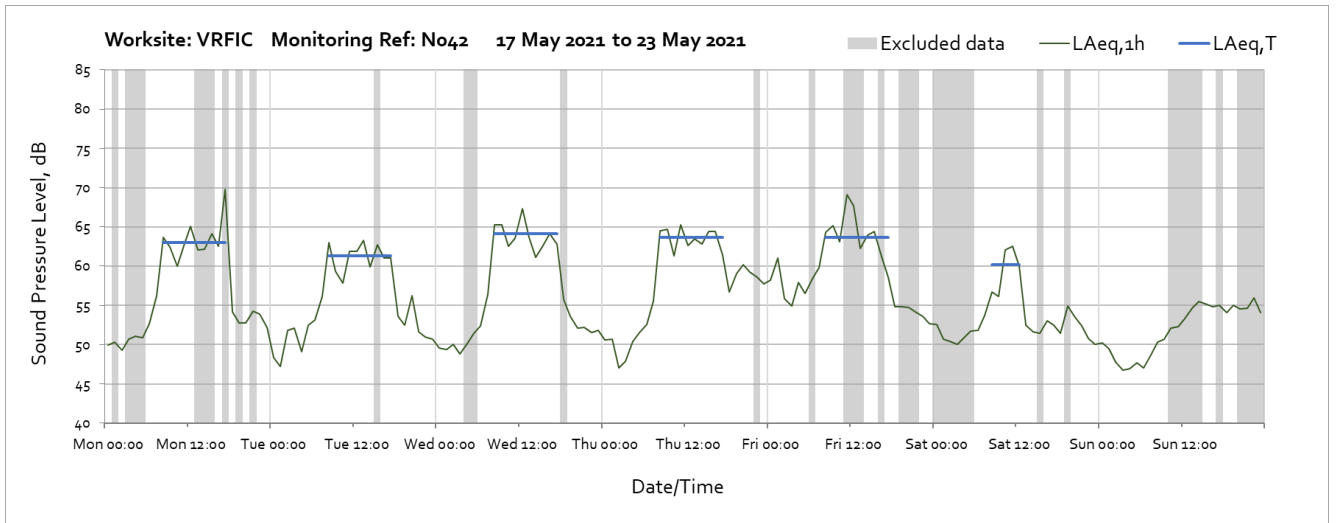
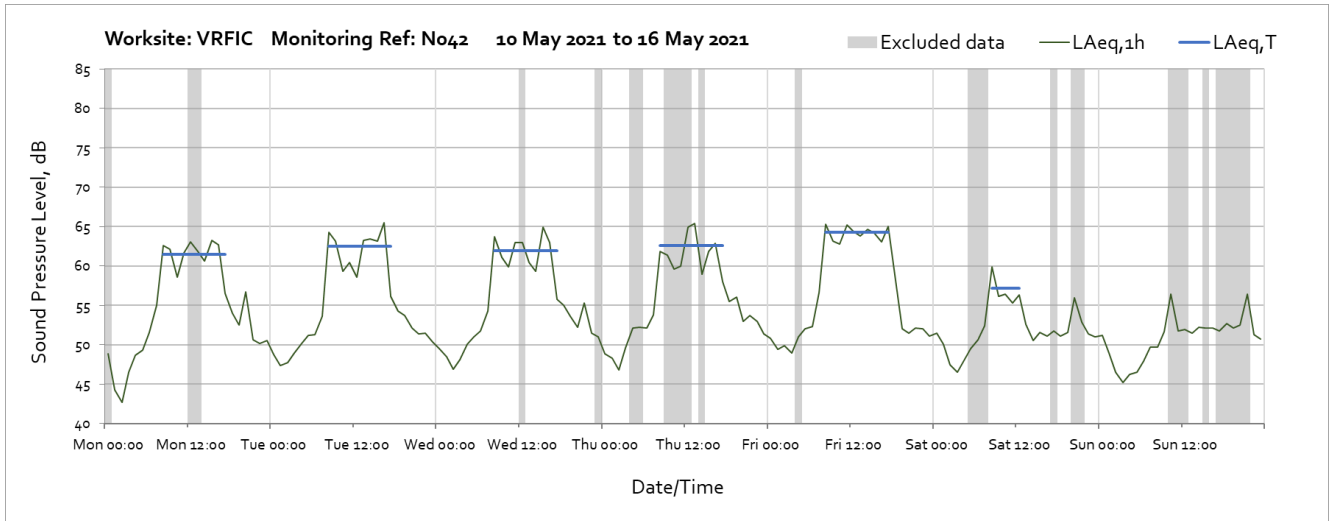


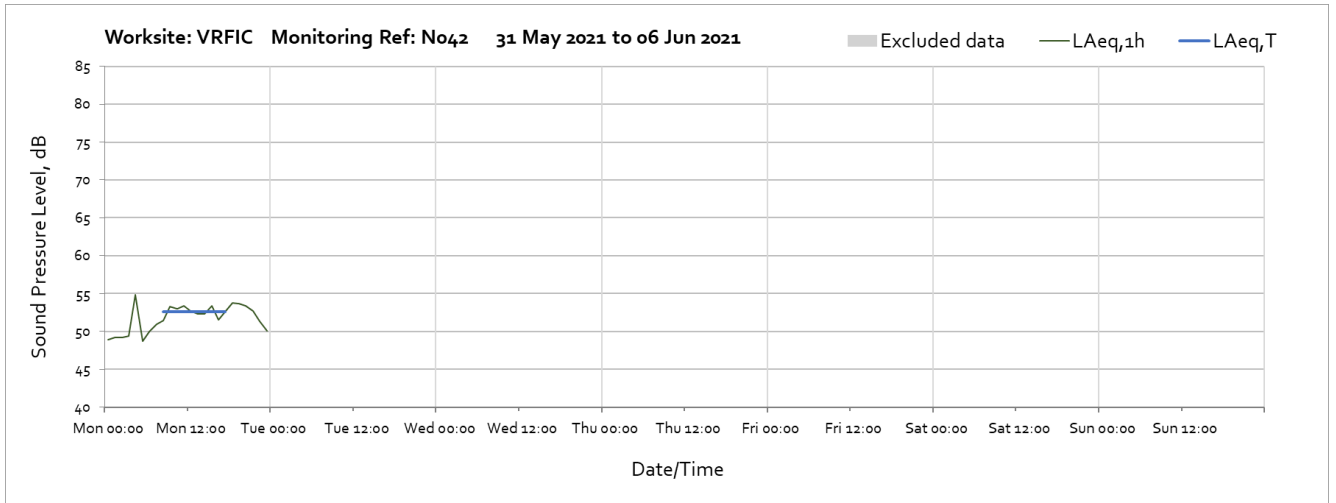




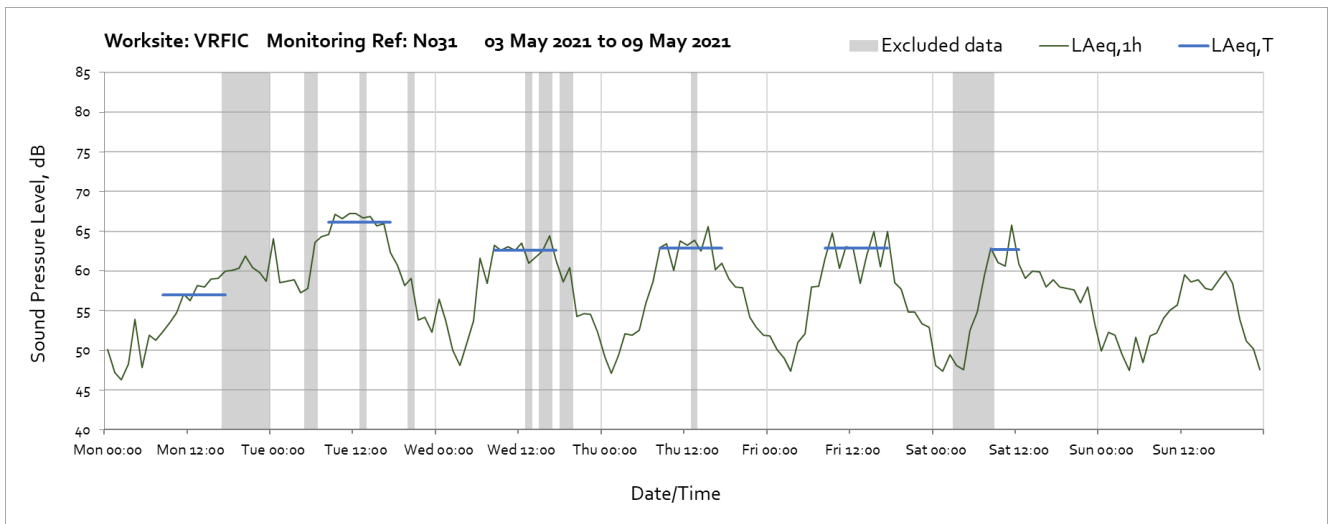
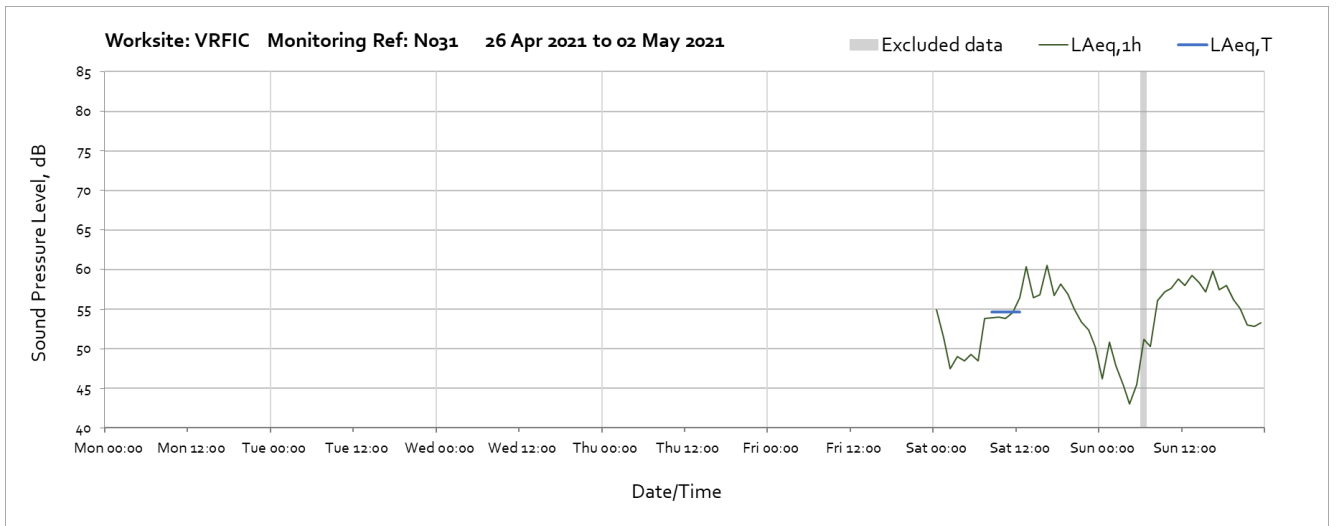
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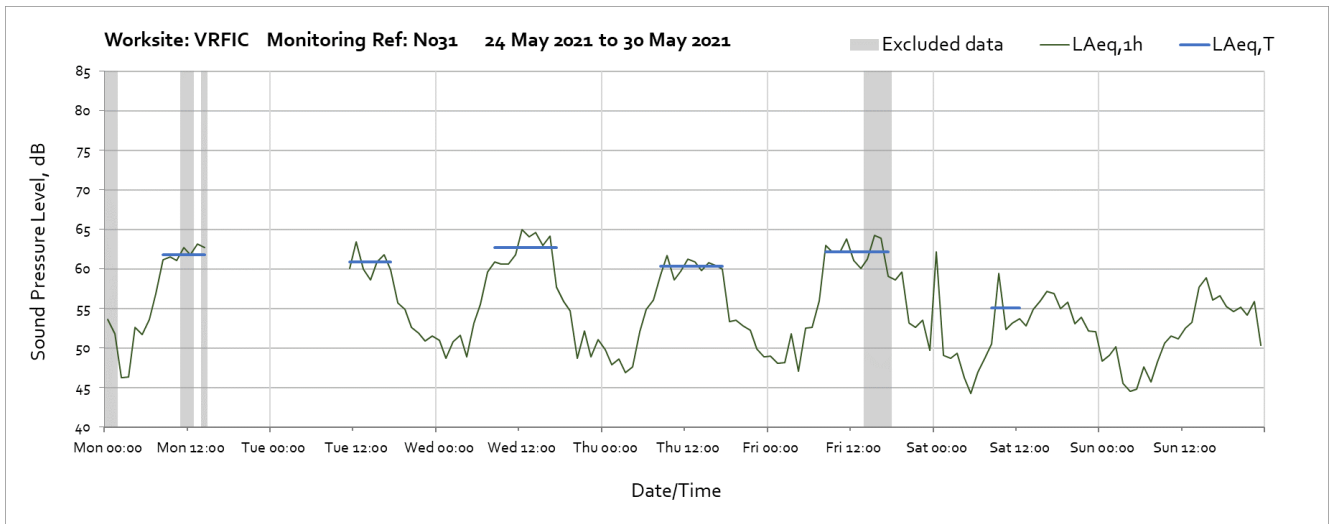
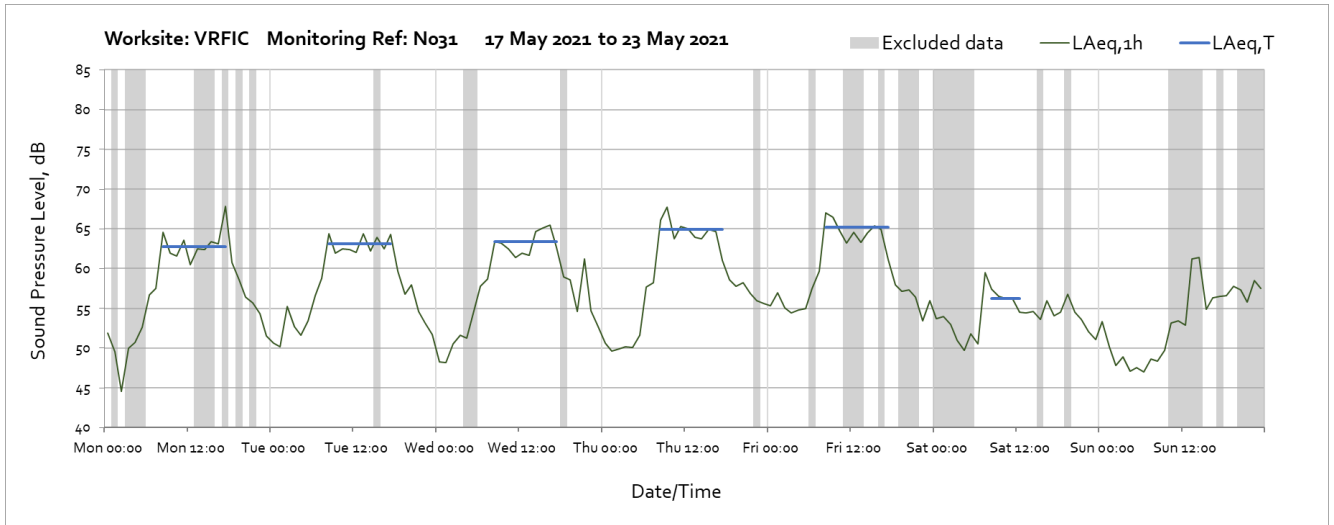
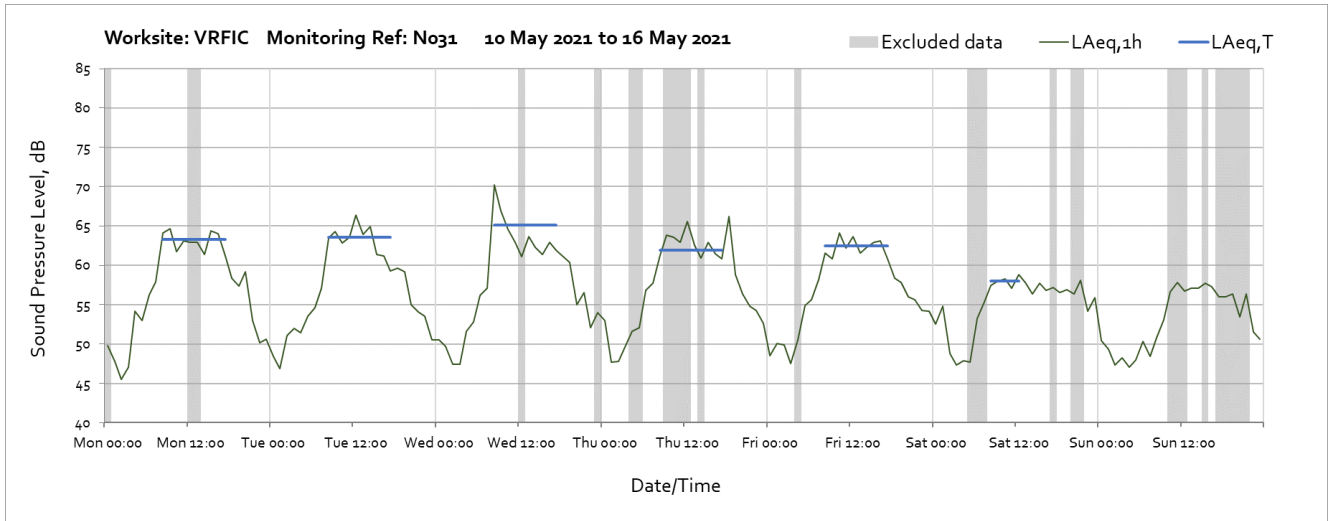




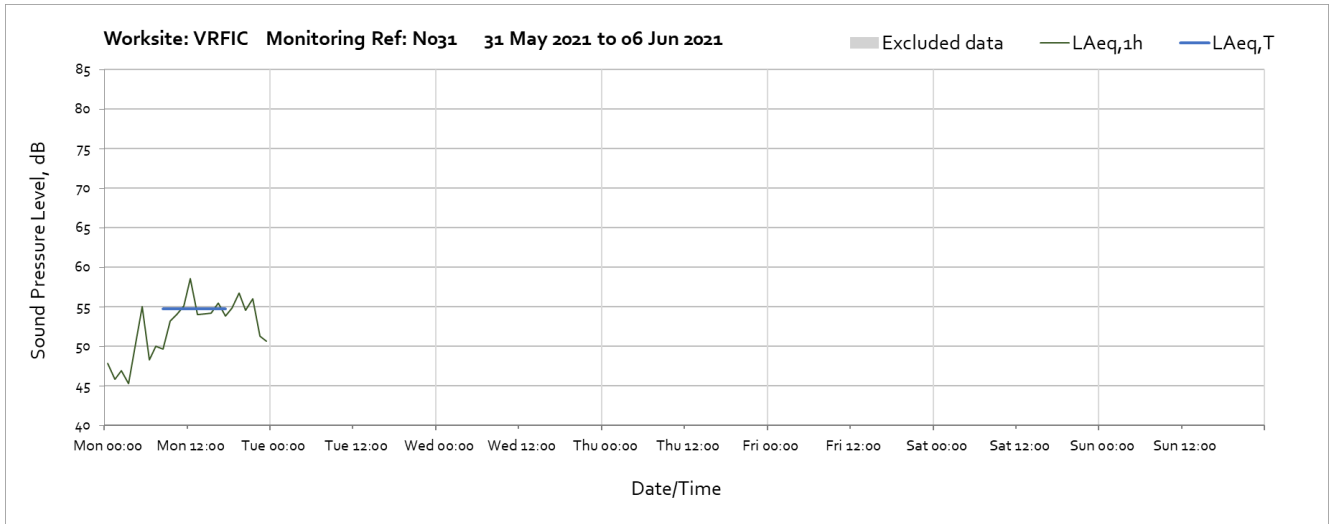


Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N031

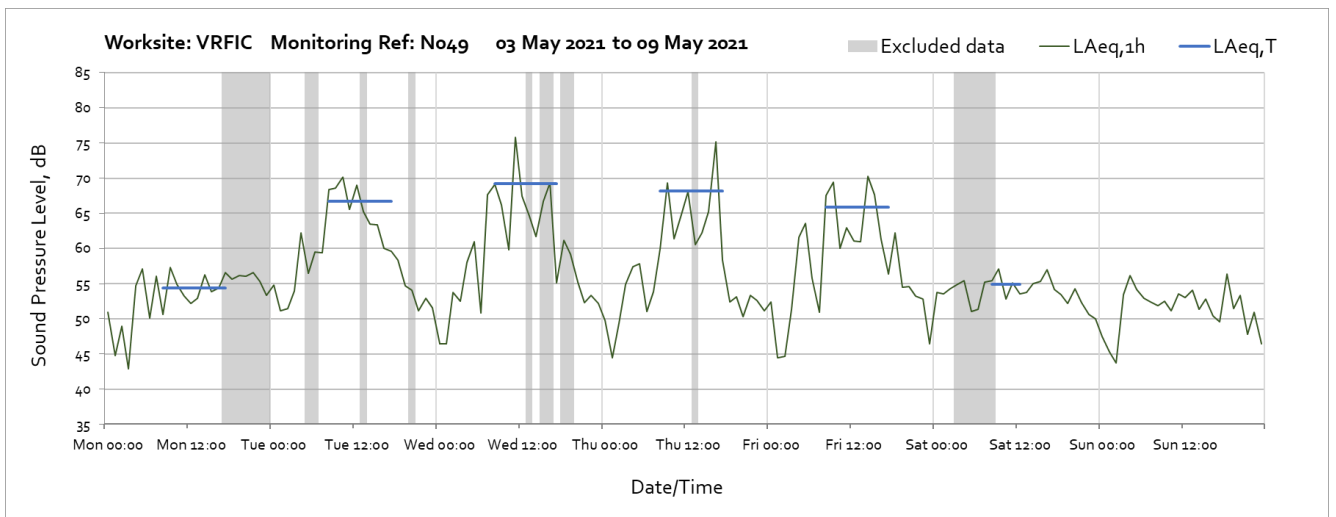
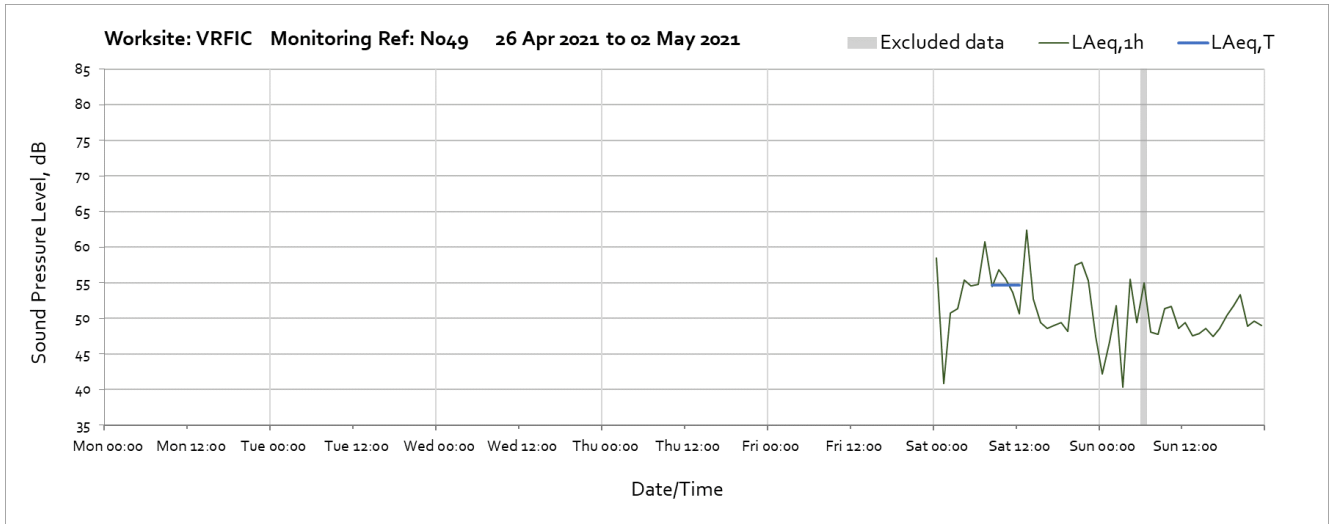


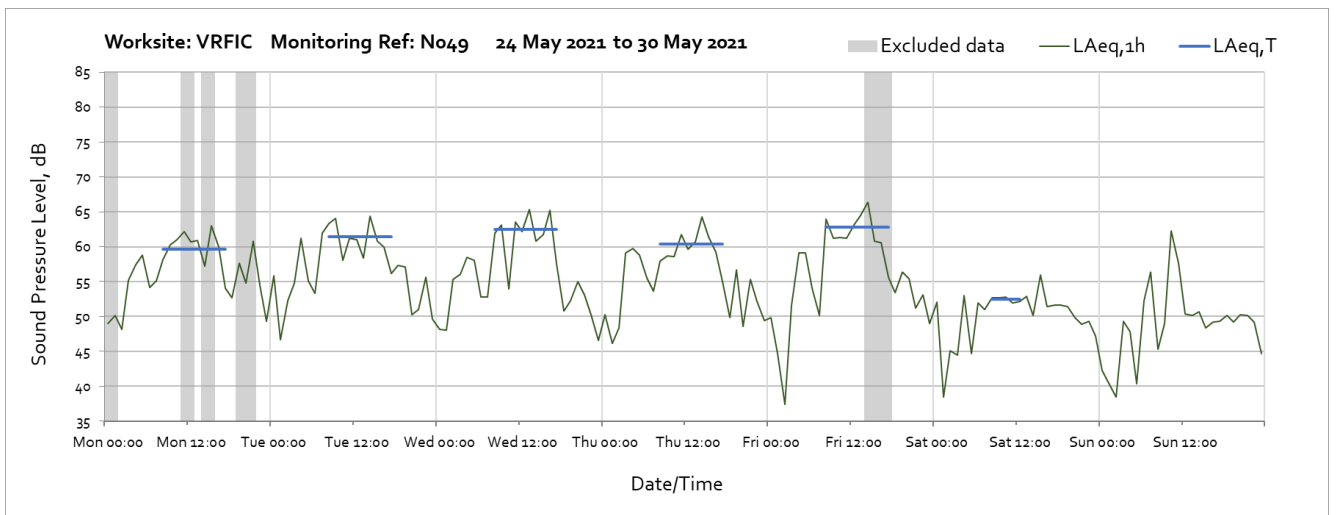
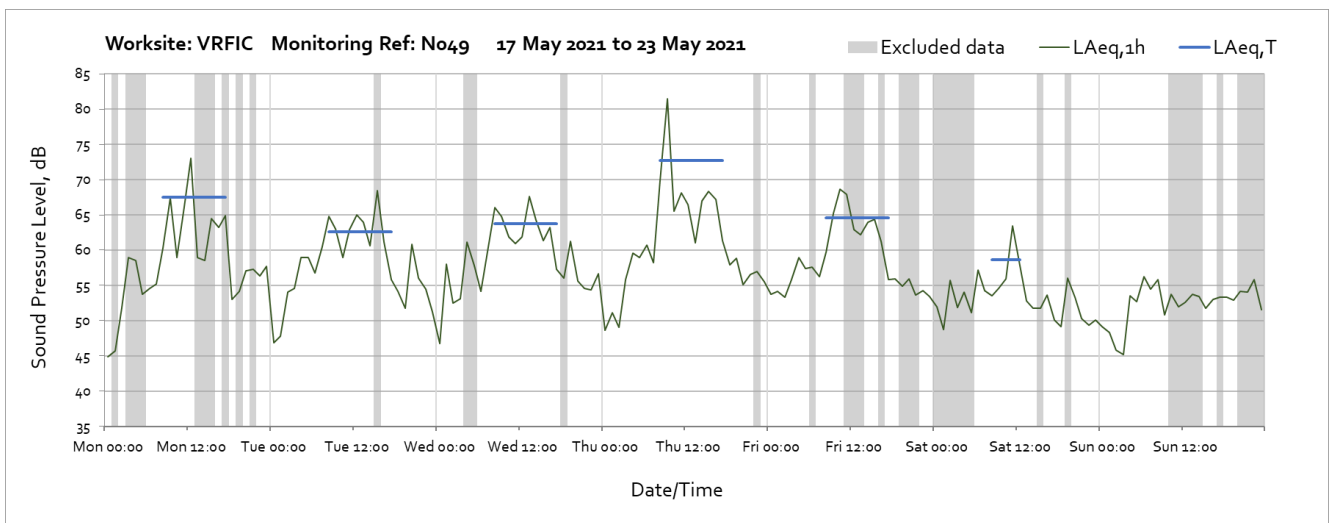
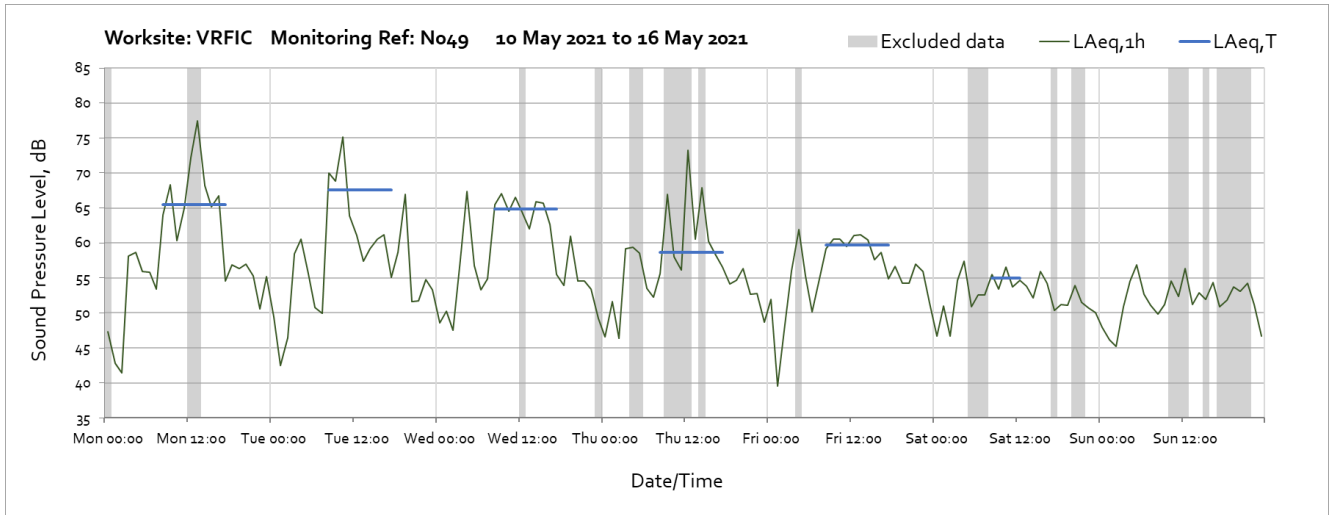


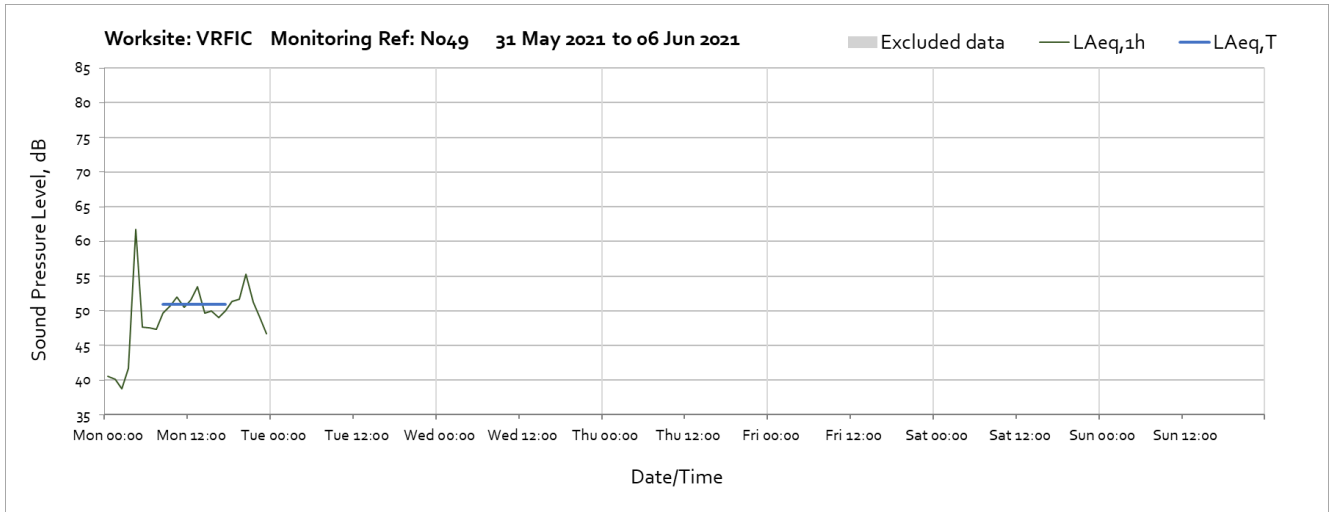
Note: Missing data between 15:00 on Monday 24th May 2021 and 11:00 on Tuesday 25th May 2021 was due to setting error occurred during the monitor swap out.



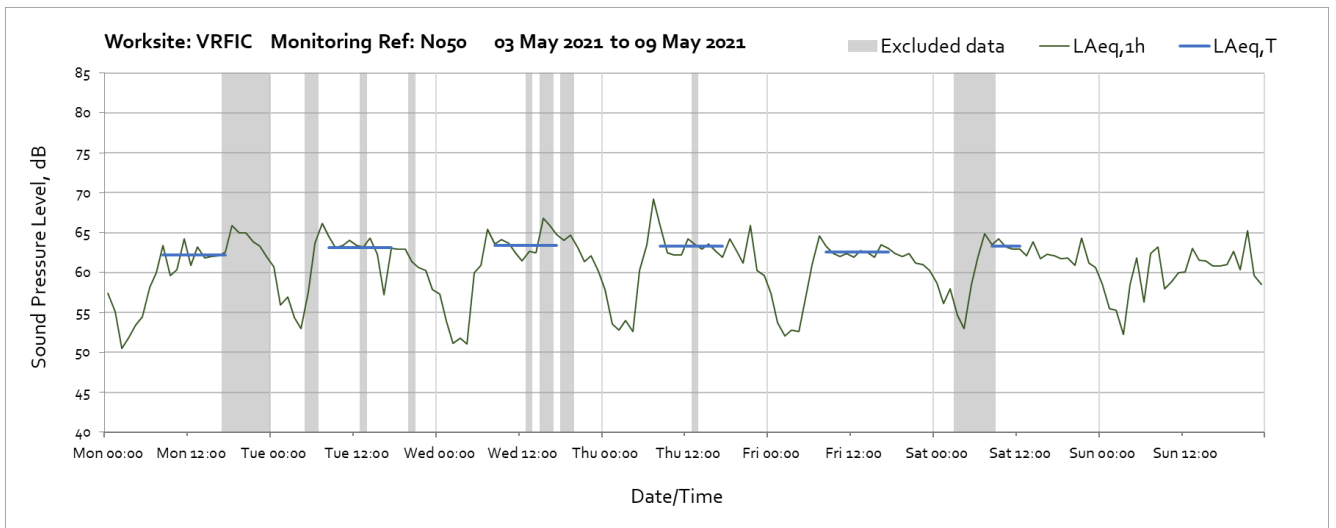
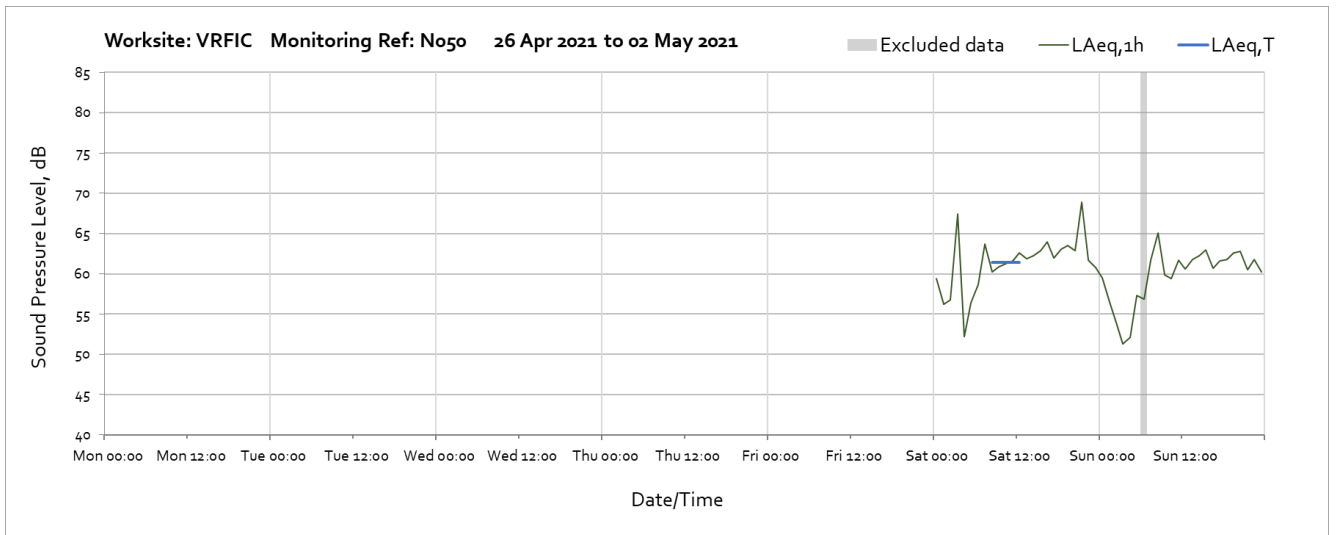
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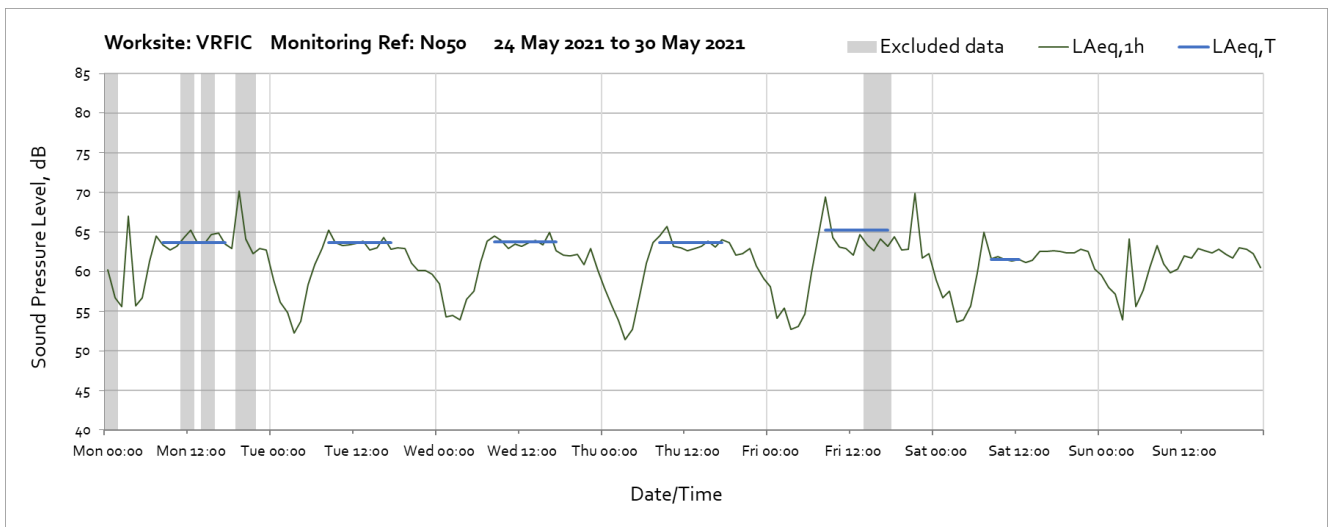
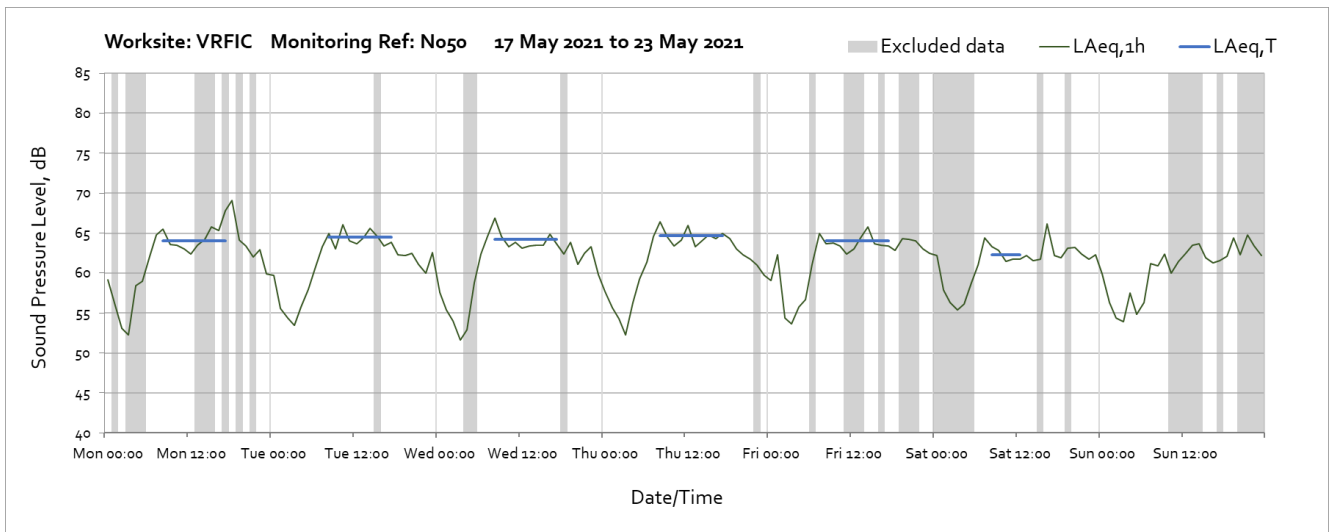
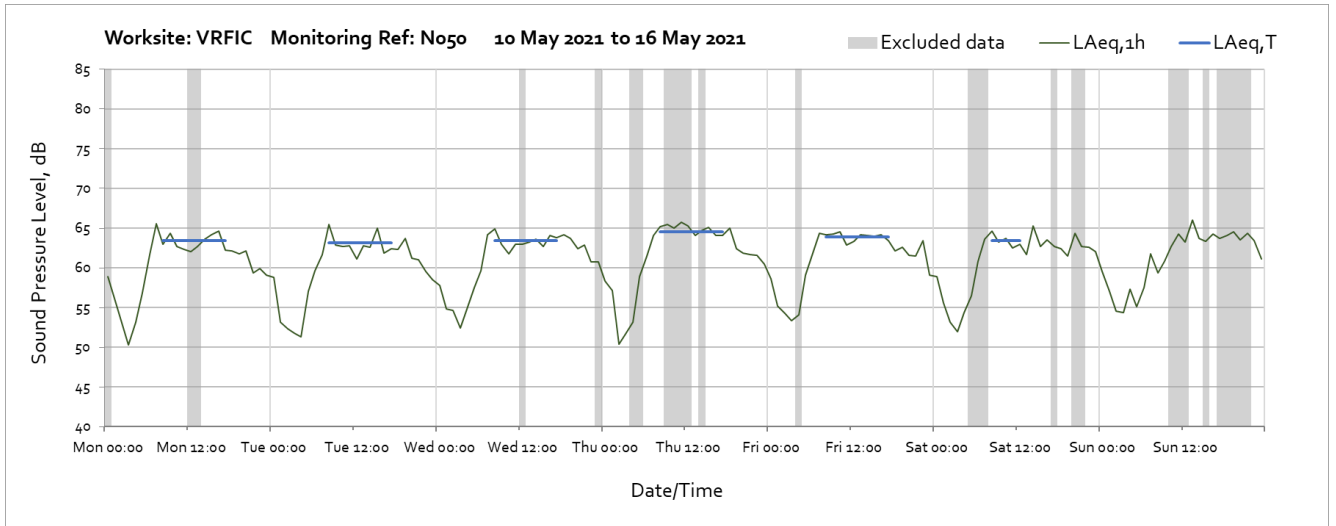


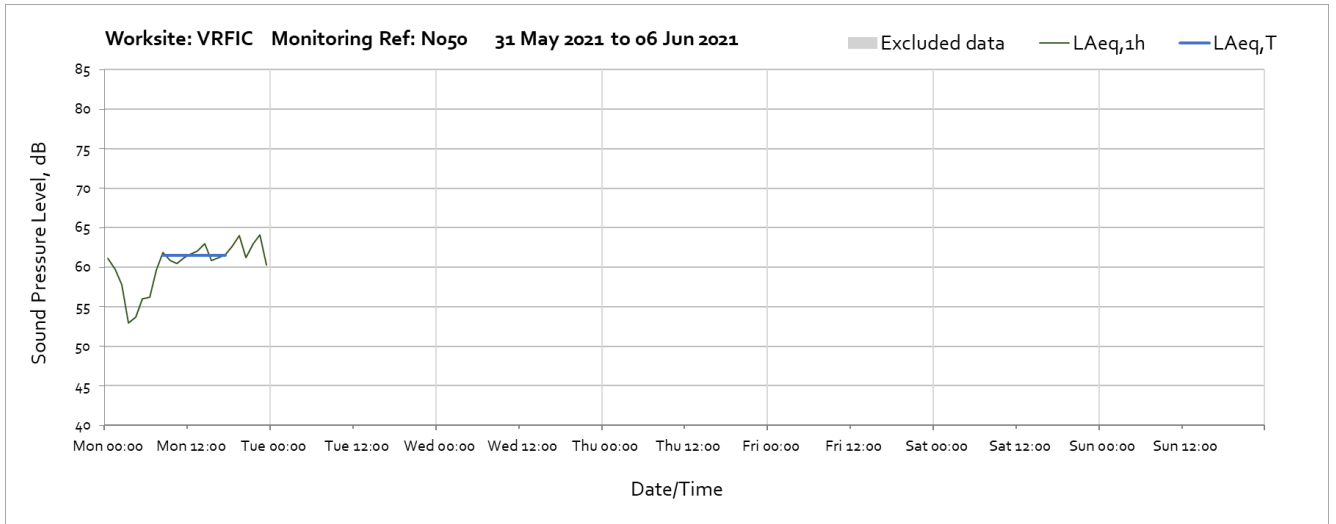




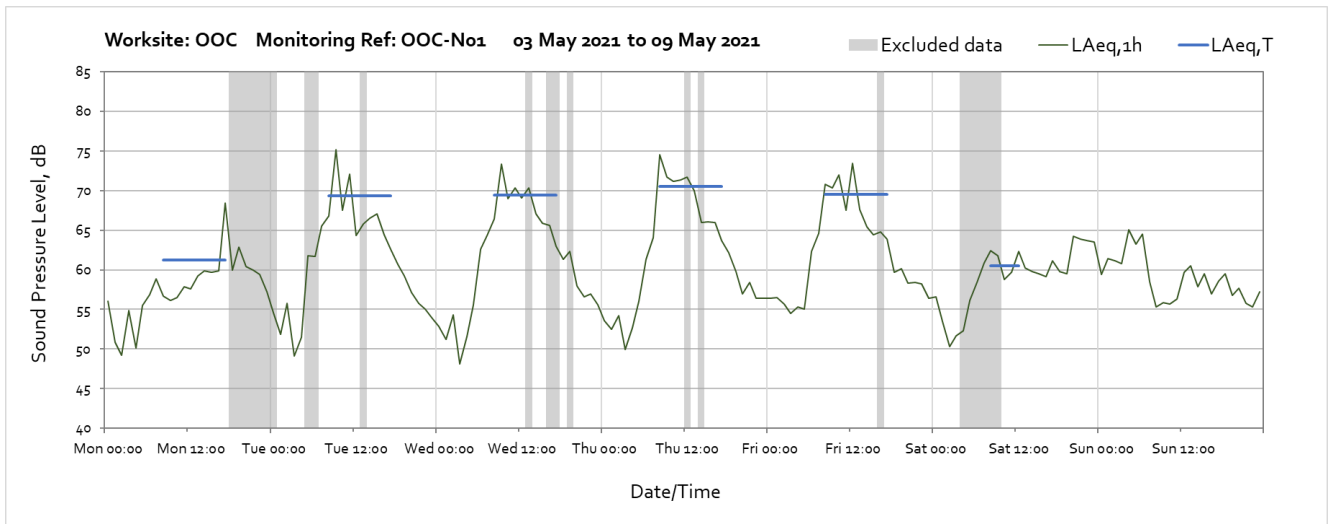
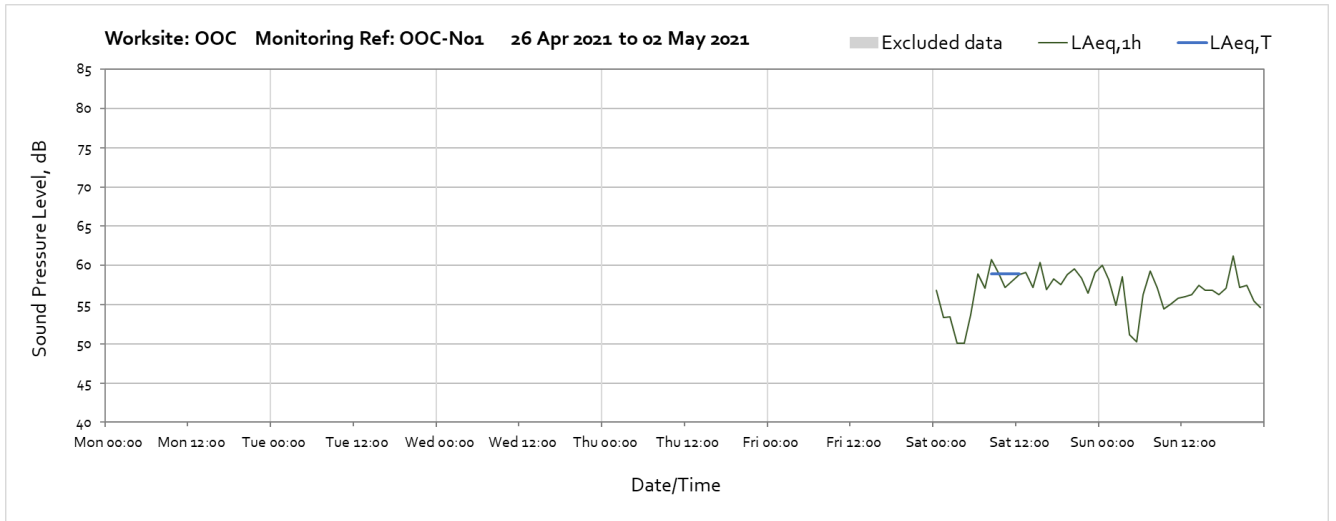
Worksite: Victoria Road and Flat Iron Compound (VRFIC) – Monitoring Ref: N050

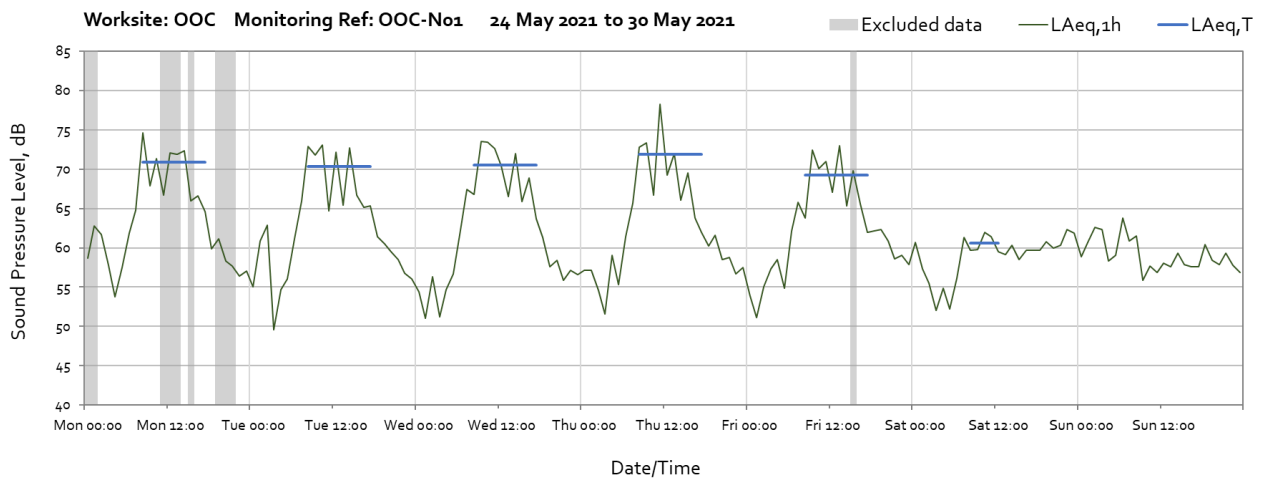
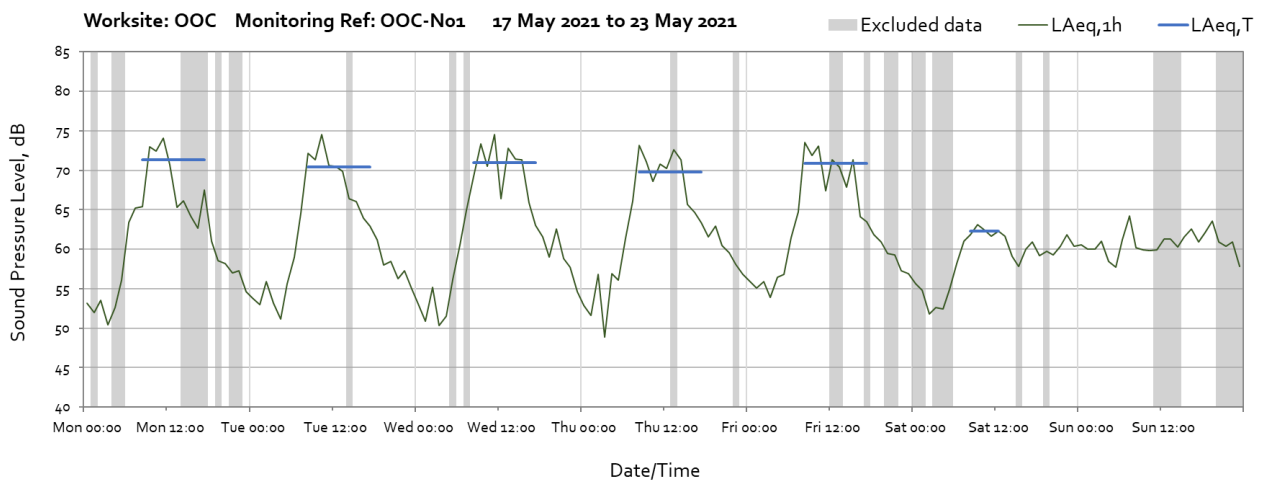
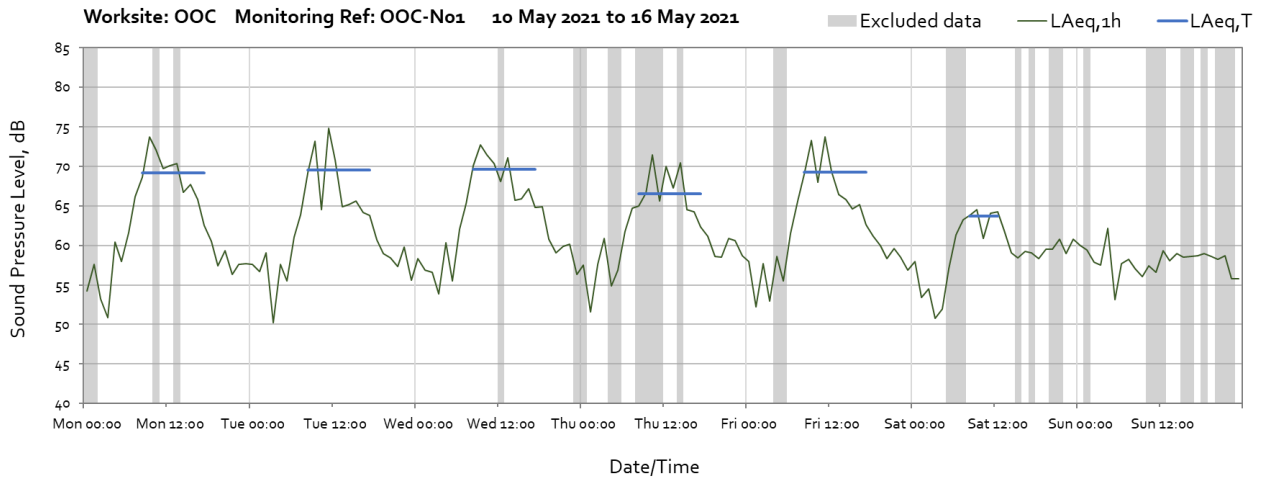


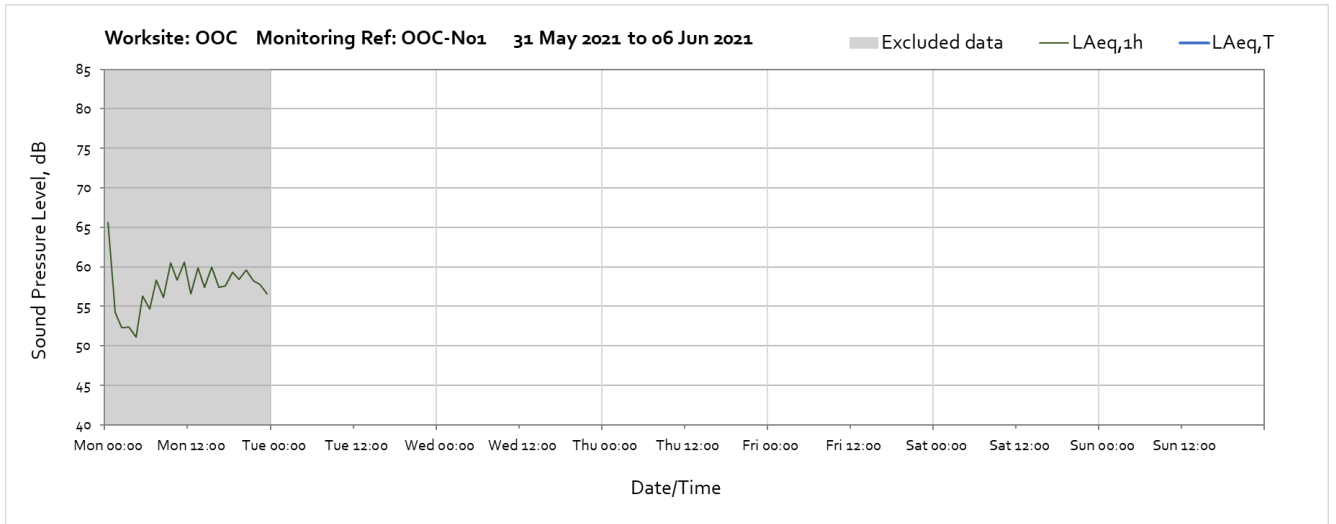




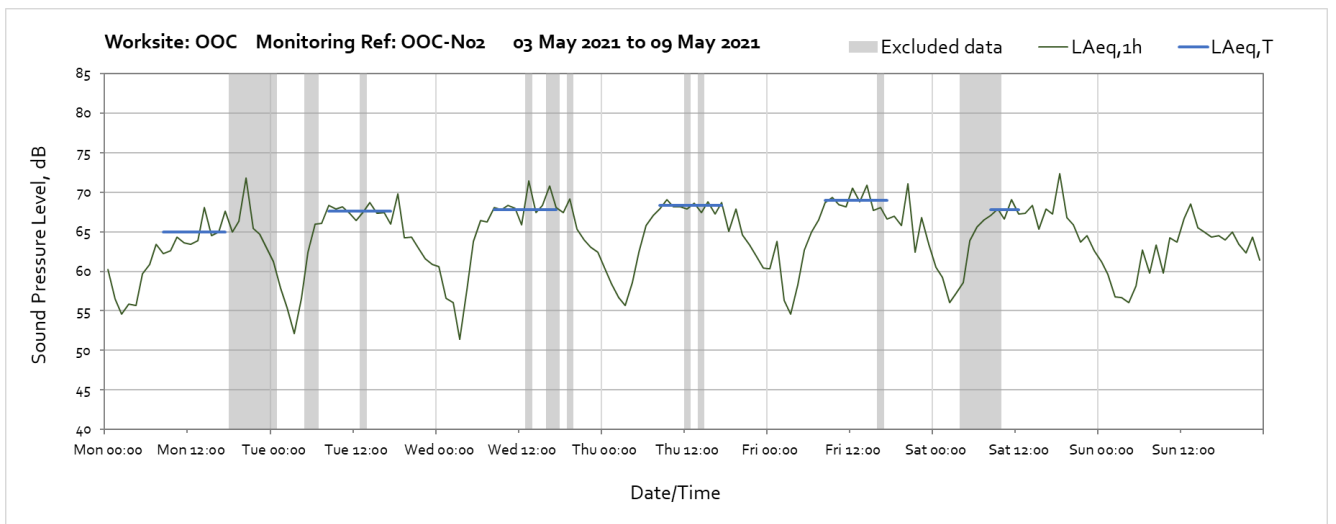
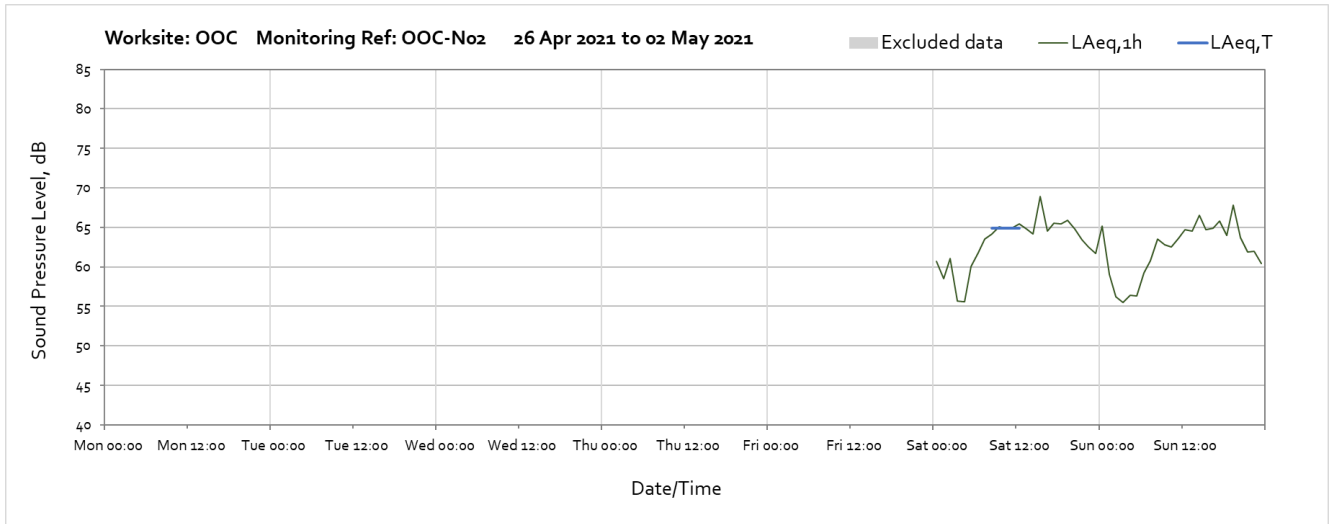
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N01

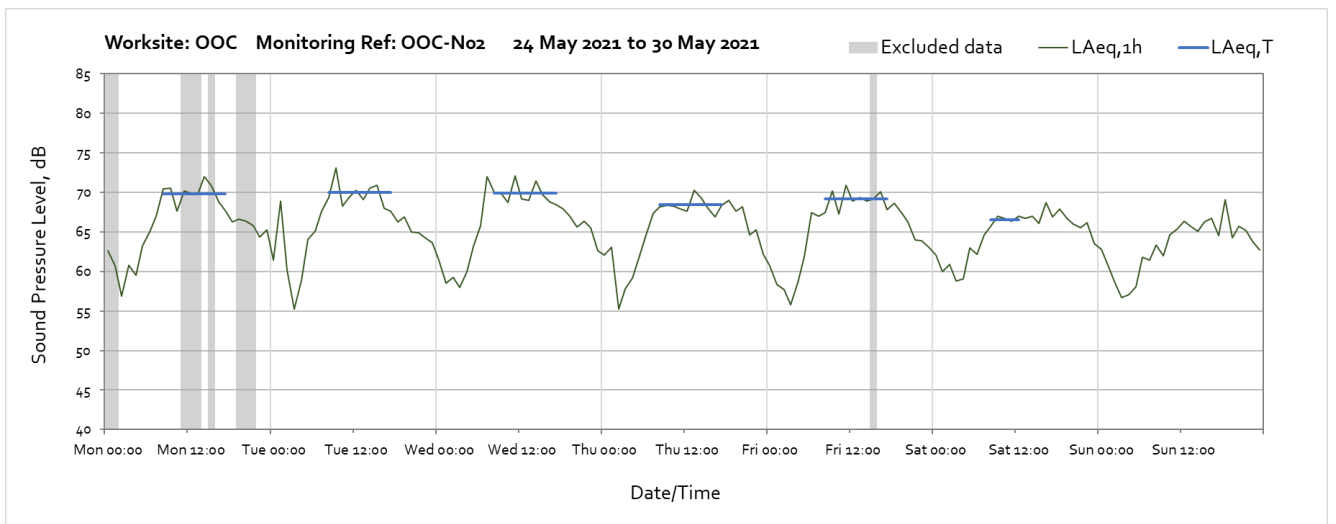
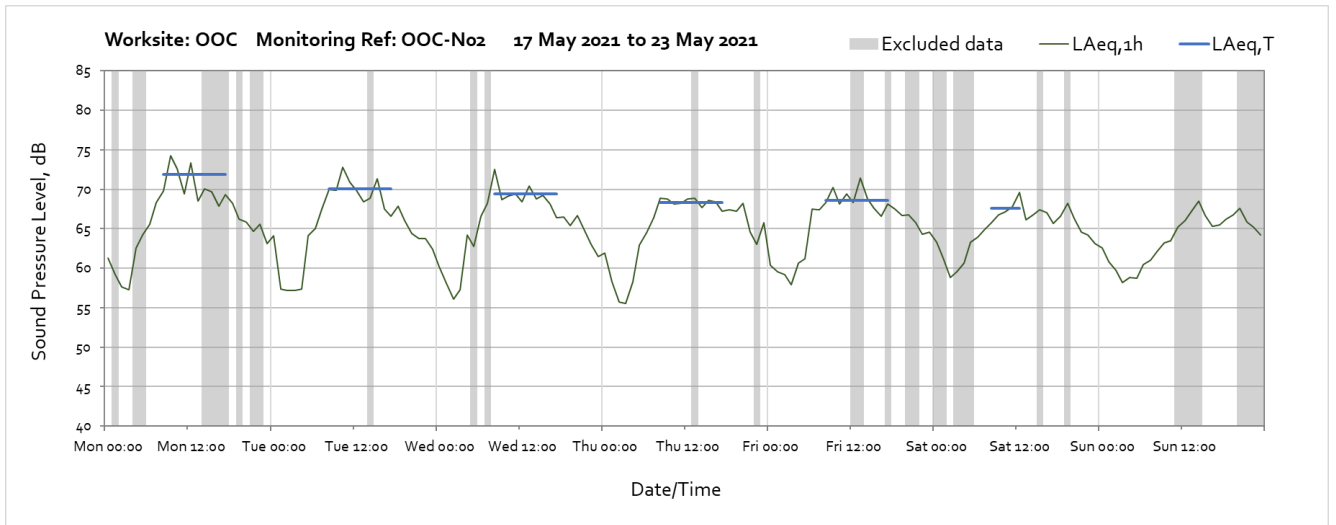
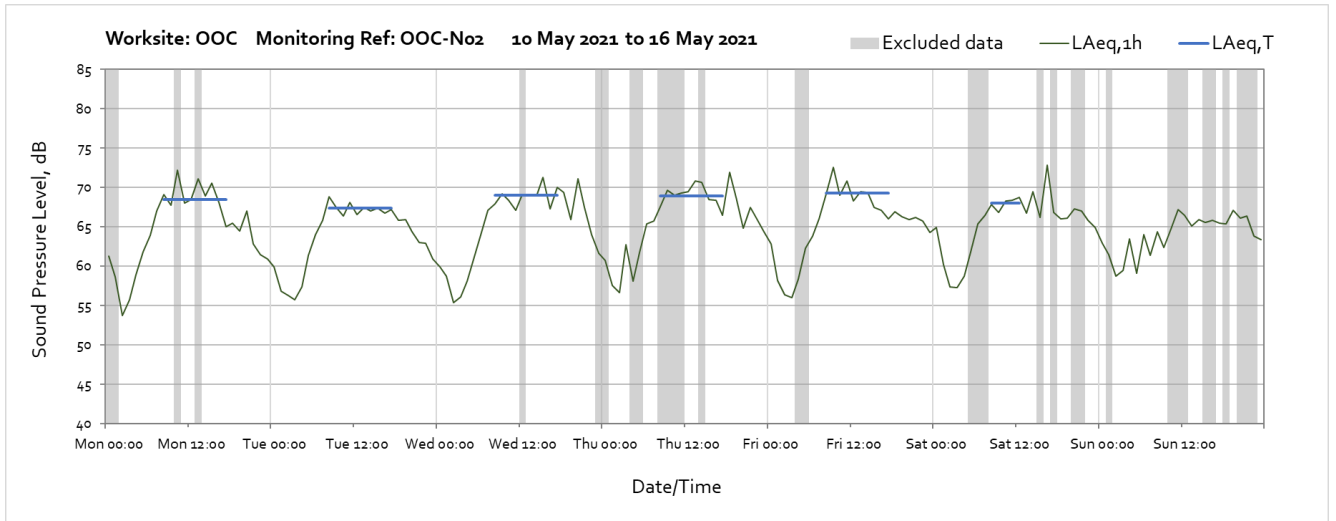


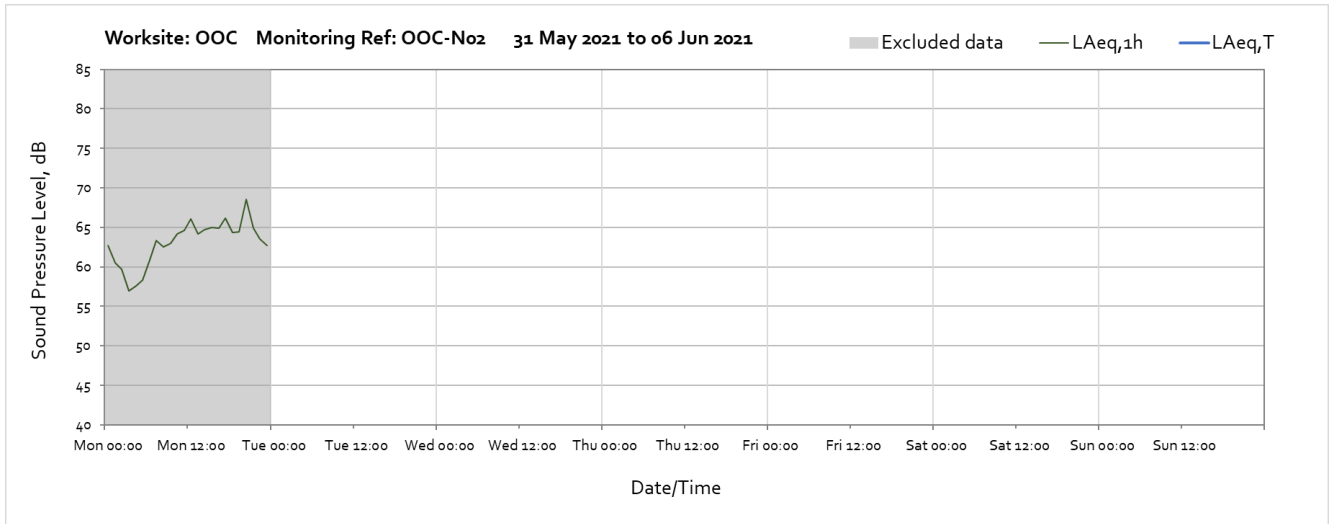




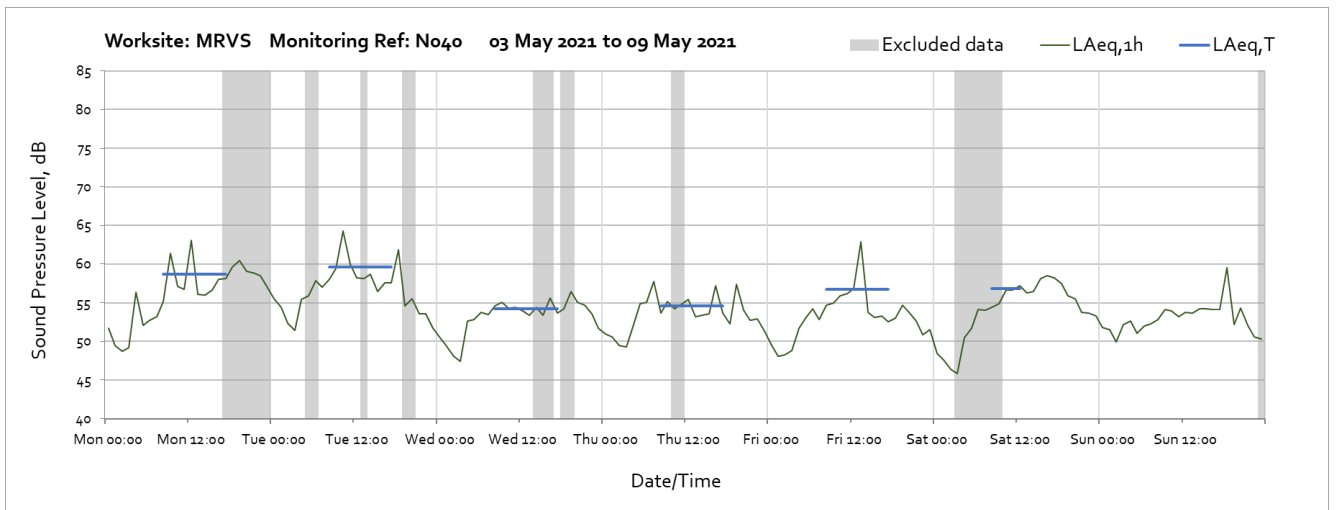
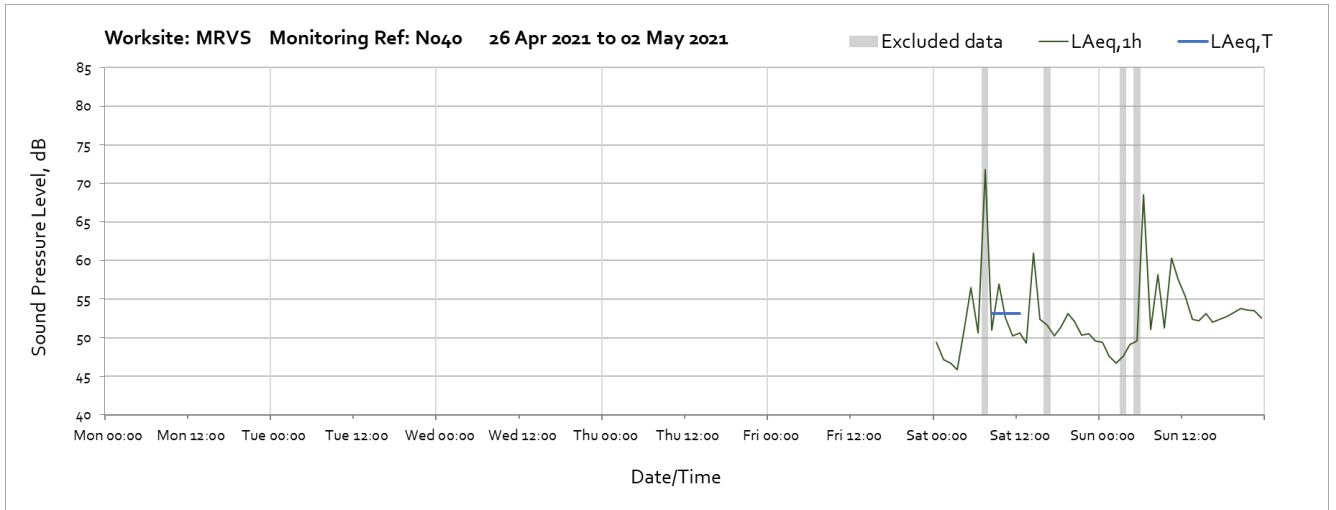
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N02

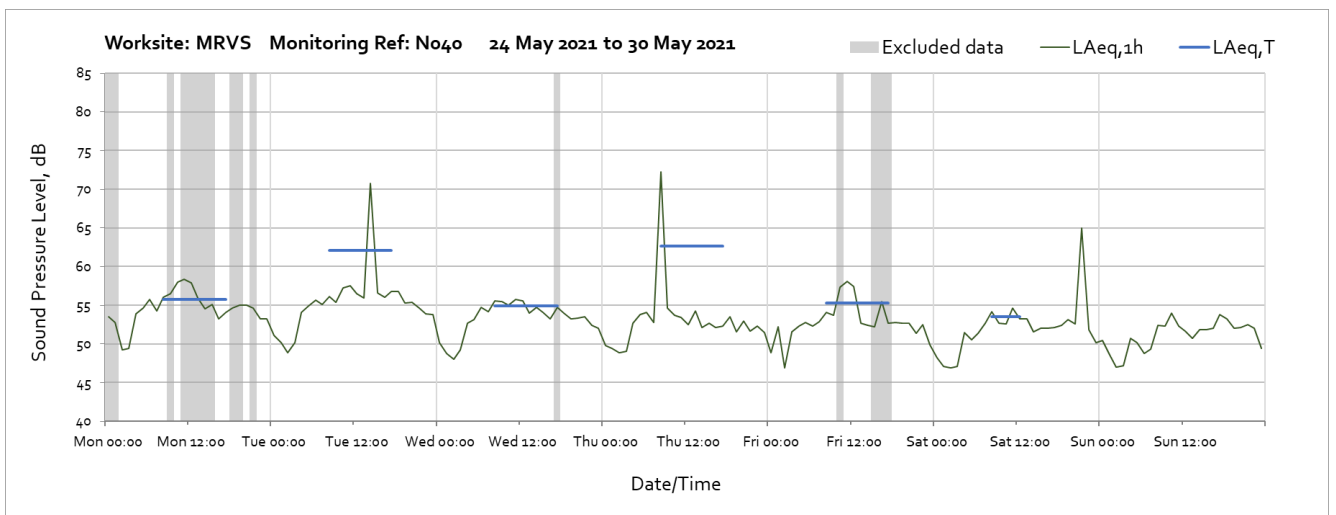
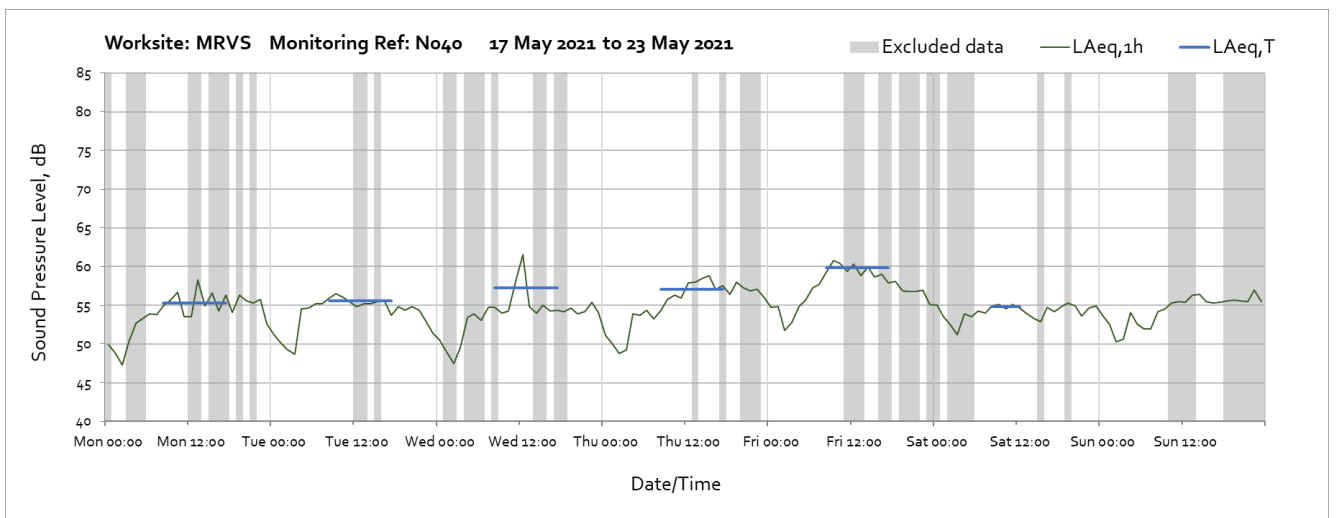
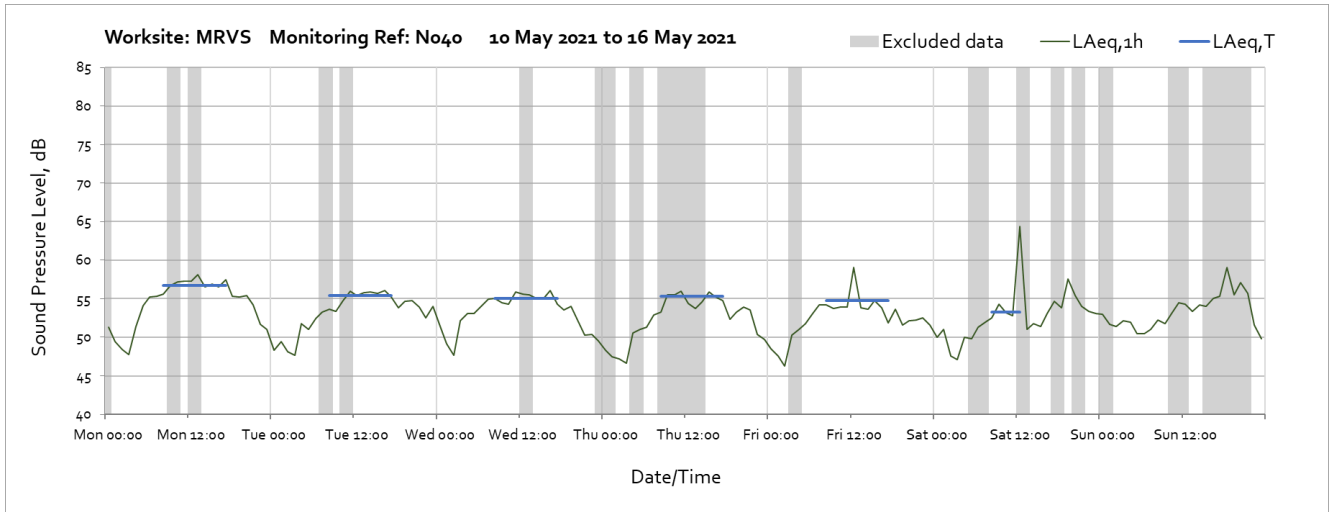


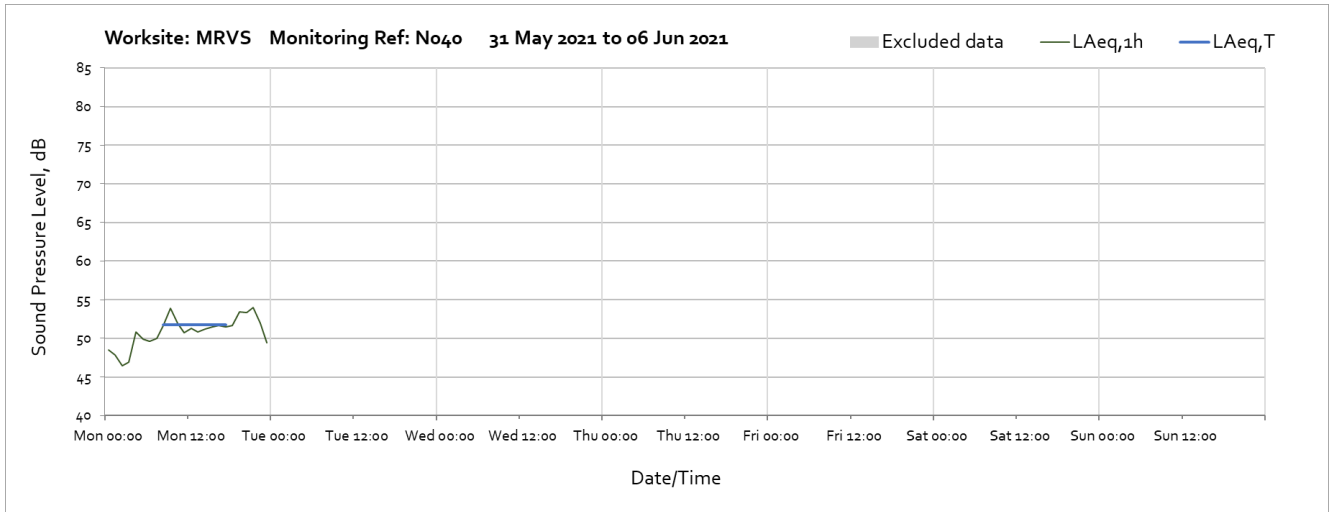




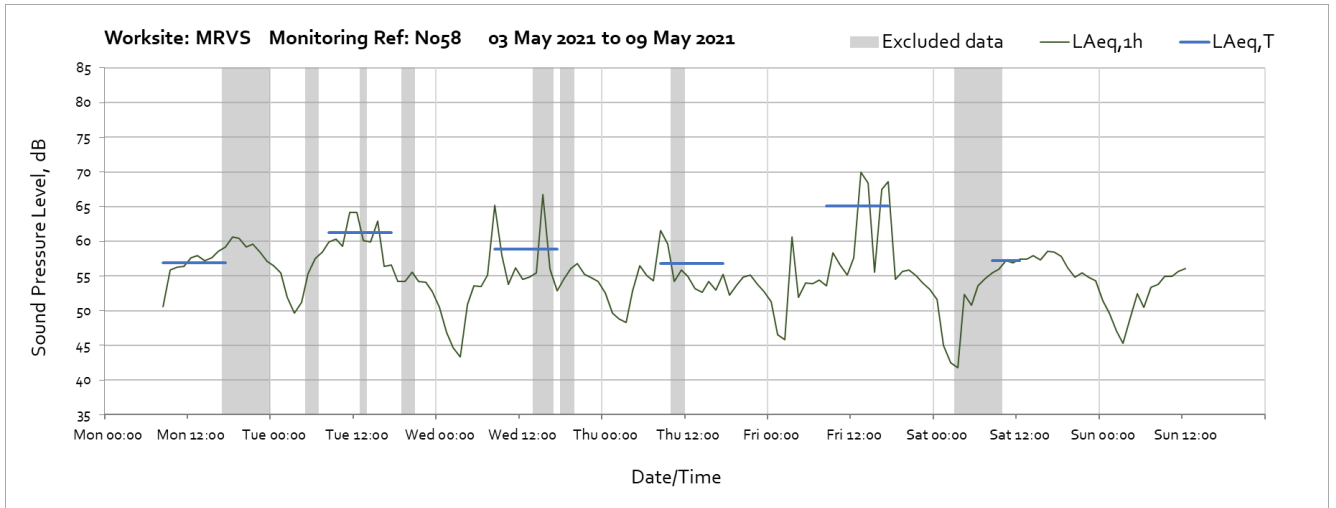
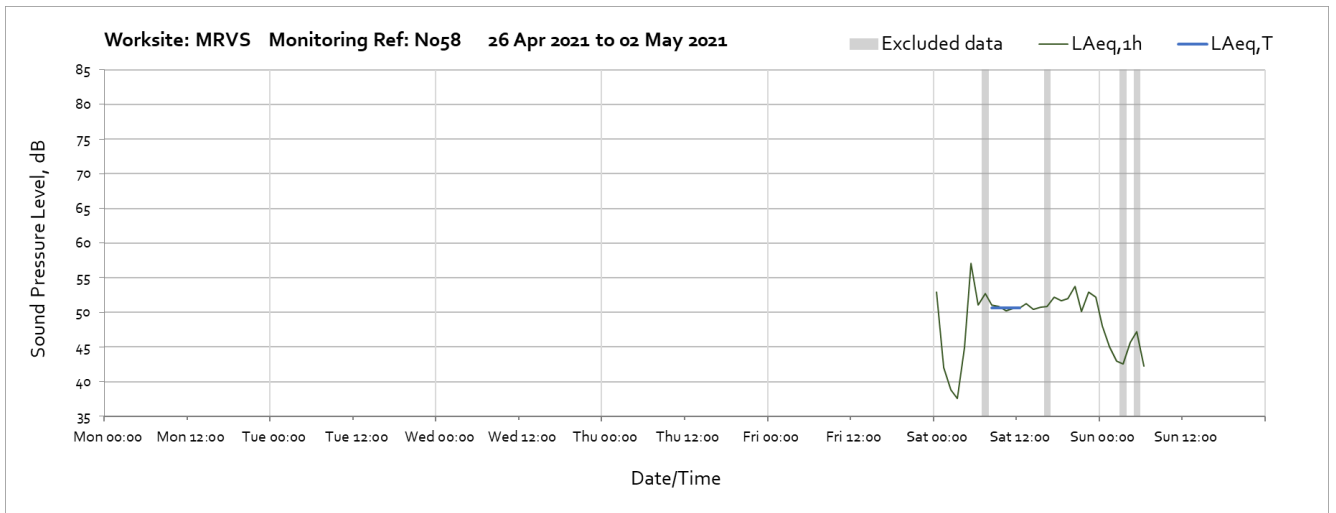
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N040





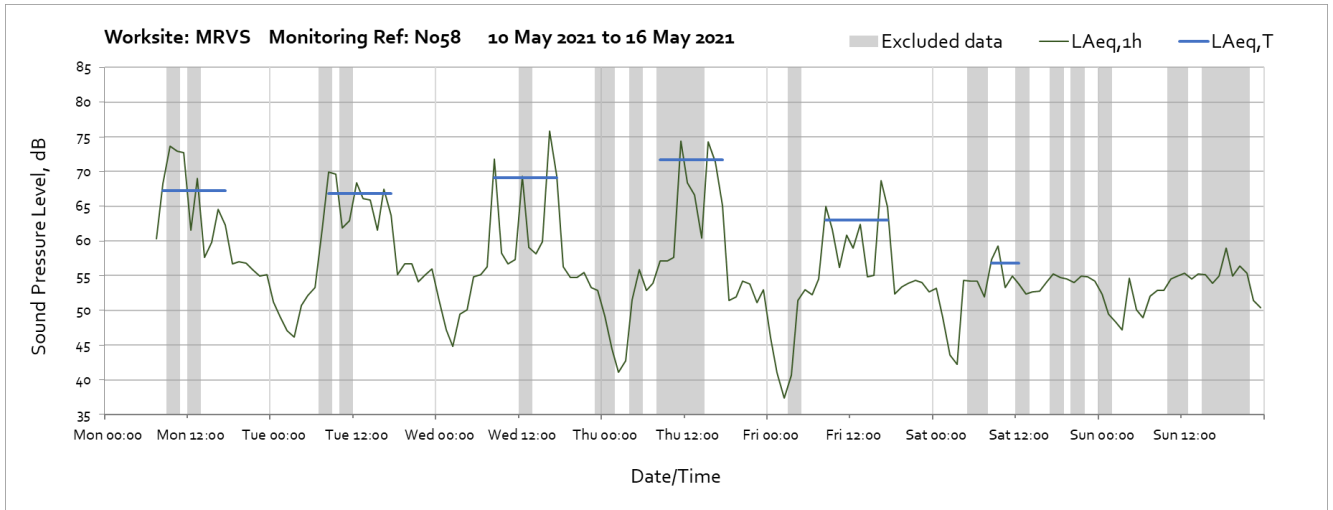


Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N058

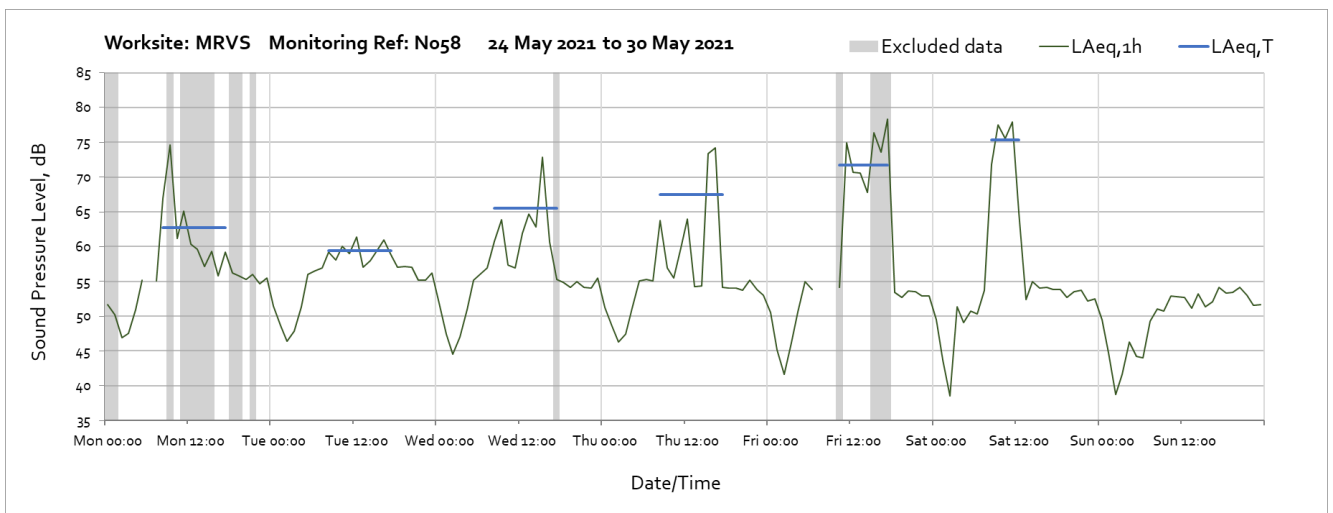
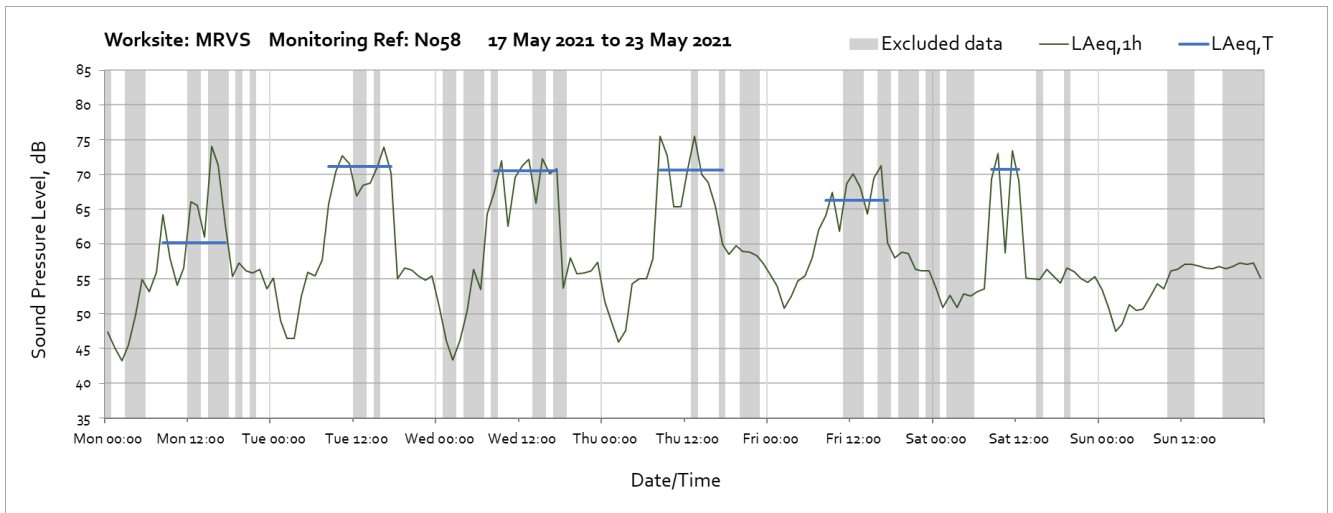


Note: Missing data between 07:00 on Sunday 2nd May 2021 and 07:00 on Monday 3rd May 2021 and between 13:00 on Sunday 9th May 2021 and 06:00 on Monday 10th May 2021 was due to loss of power at the noise monitor.

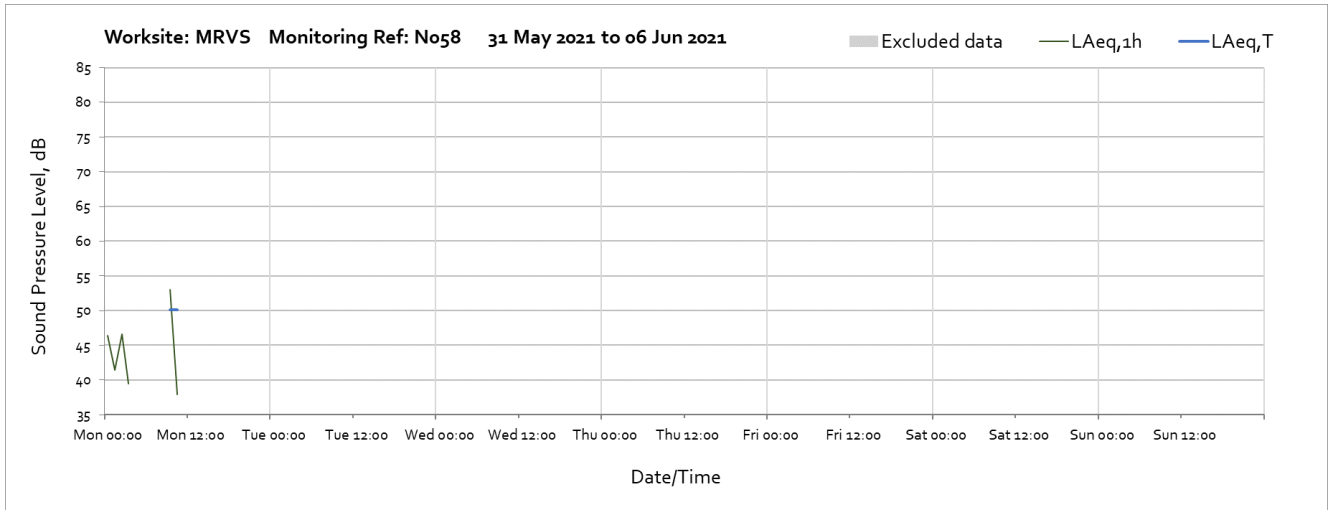
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Note: Missing data between 13:00 on Sunday 9th May 2021 and 06:00 on Monday 10th May 2021 was due to loss of power at the noise monitor.

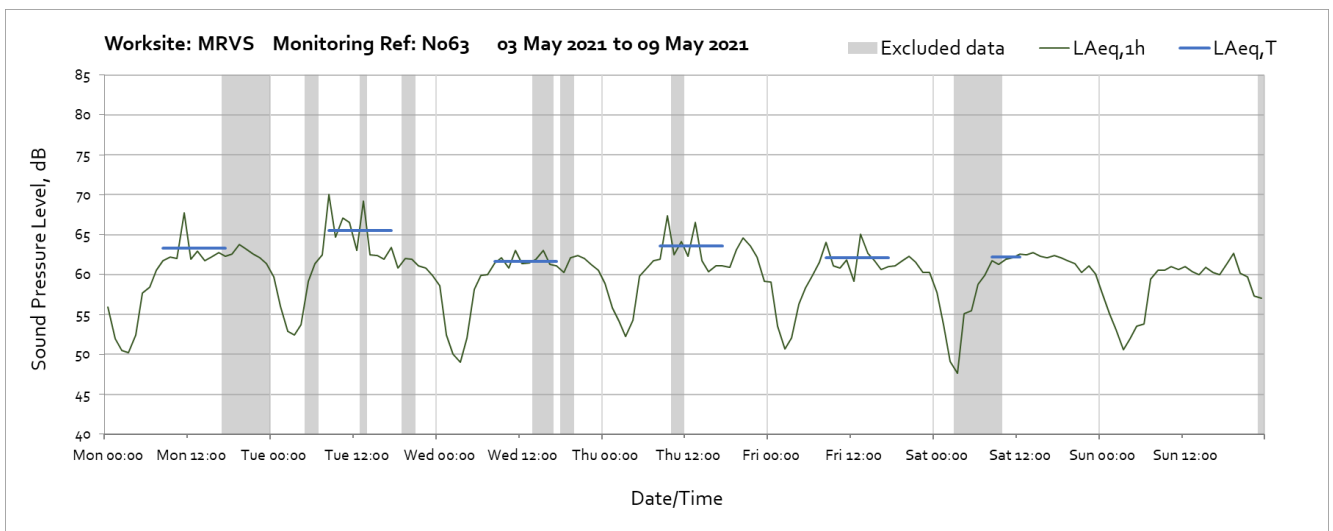
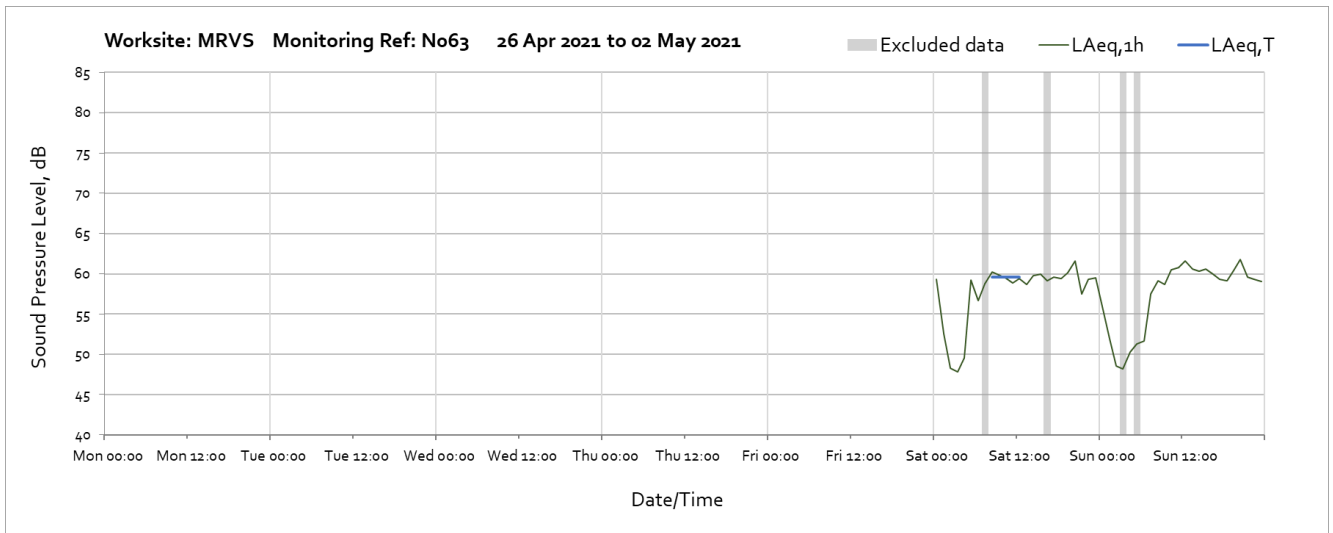


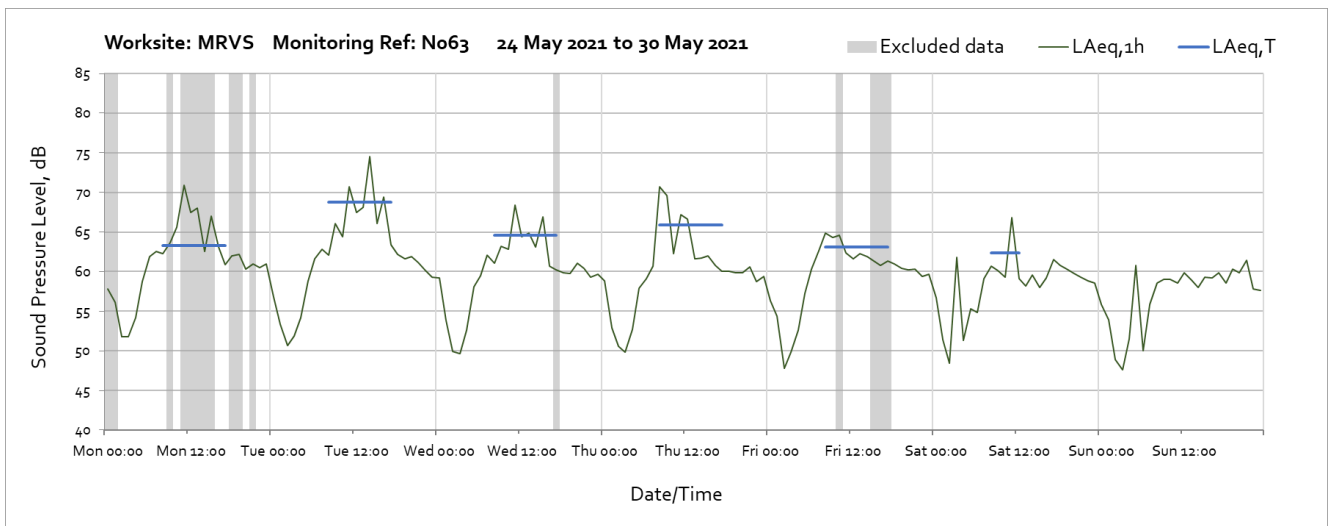
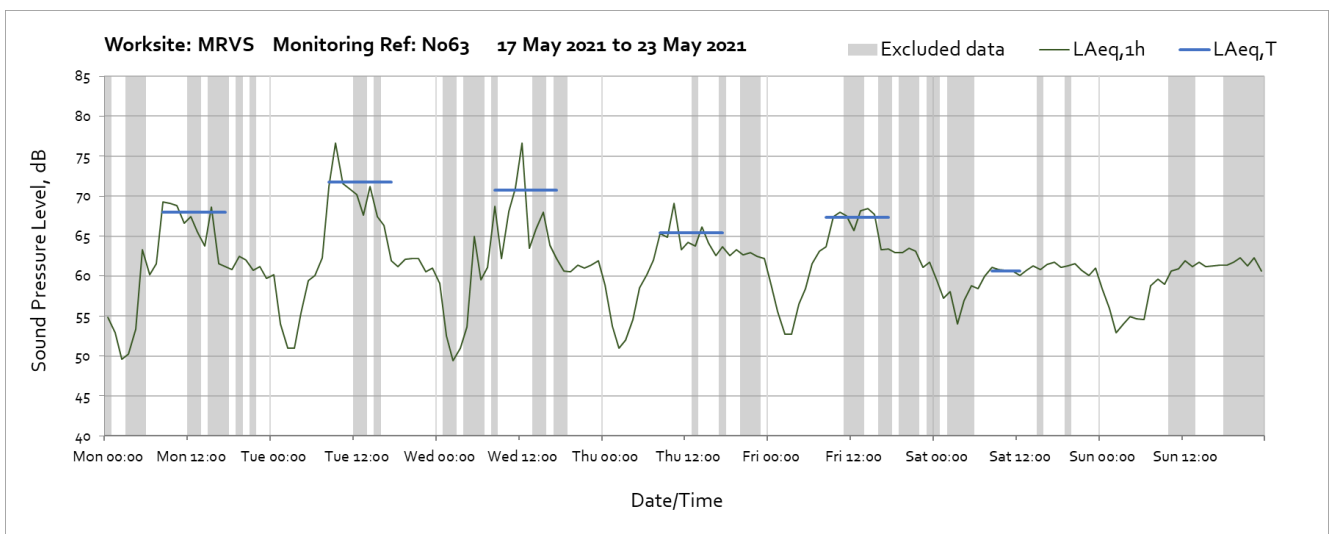
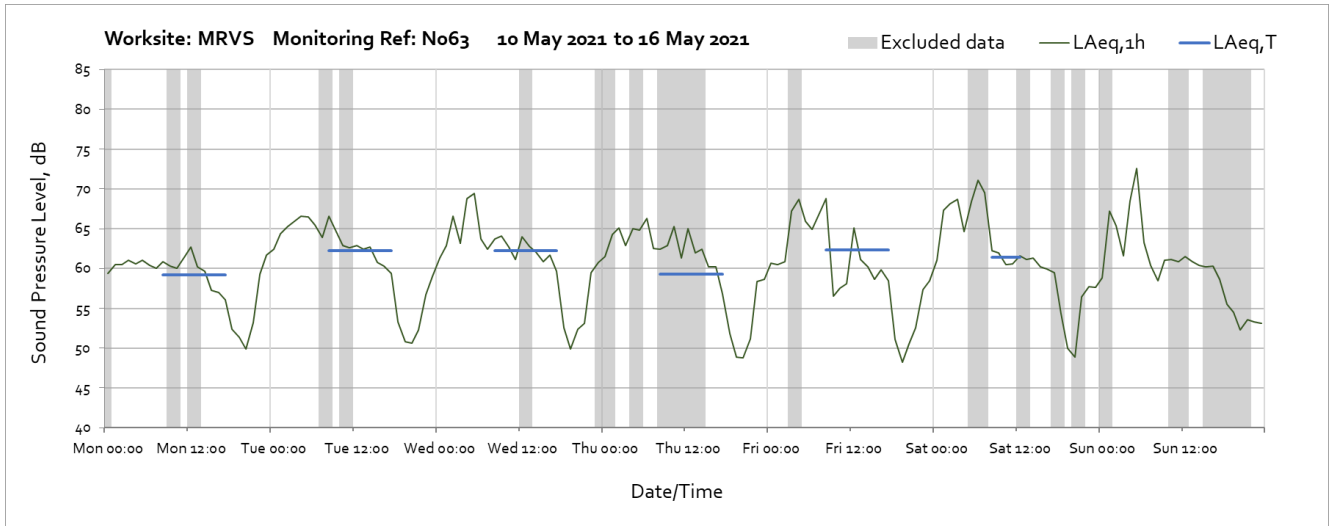
Note: Missing data between 06:00 on Monday 24th May 2021 and between 07:00 and 10:00 on Friday 28th May 2021 was due to loss of power at the noise monitor.

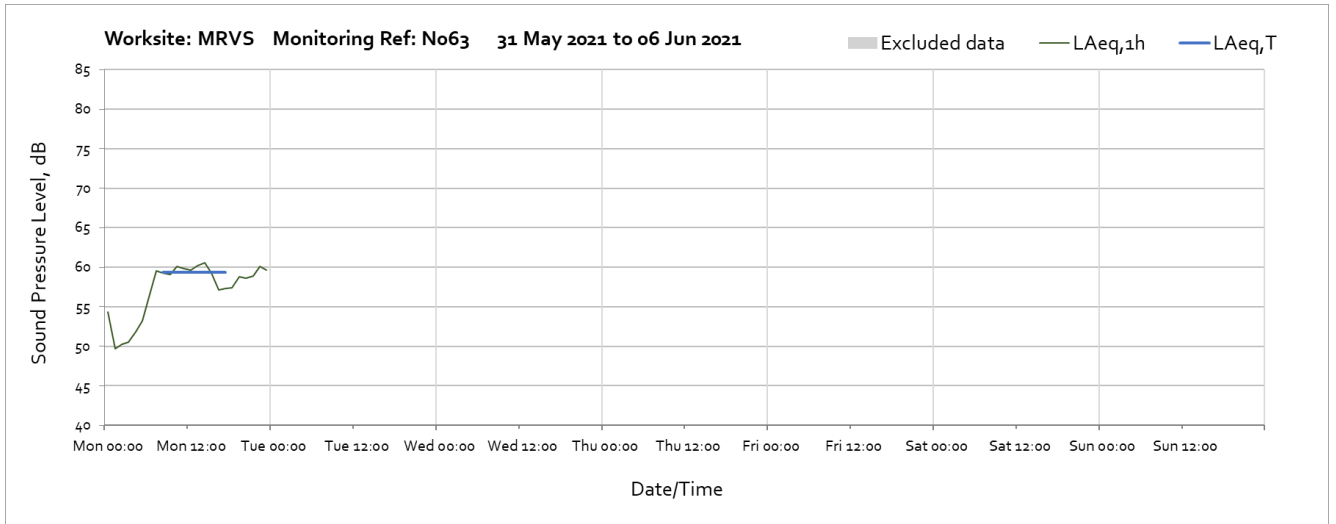


Note: Missing data between 04:00 and 08:00 and between 11:00 and 23:00 on Monday 31st May 2021 was due to loss of power at the noise monitor.

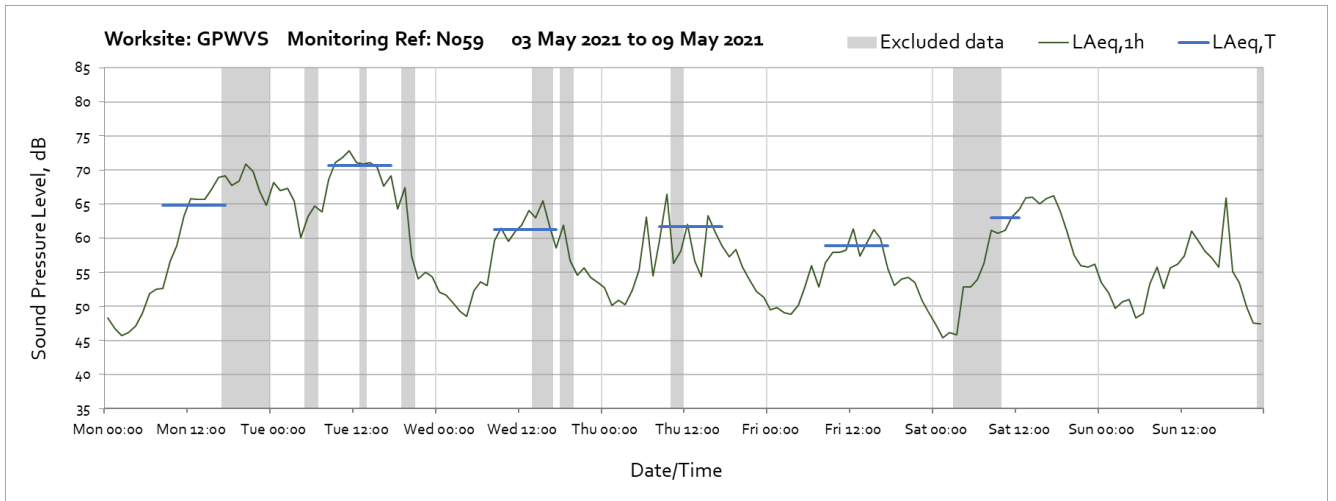
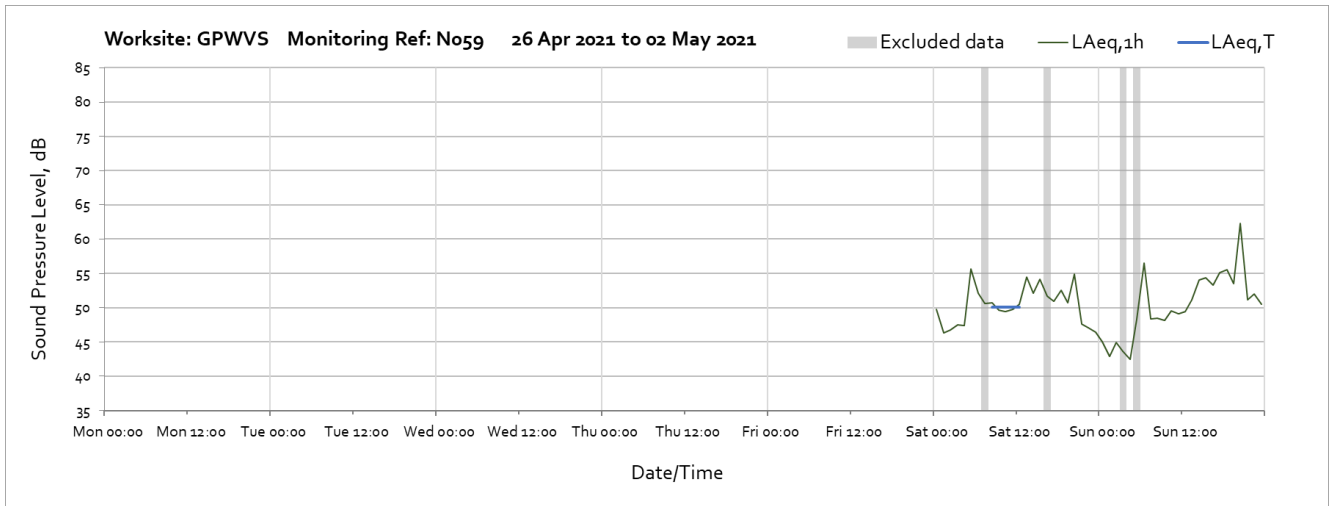
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N063

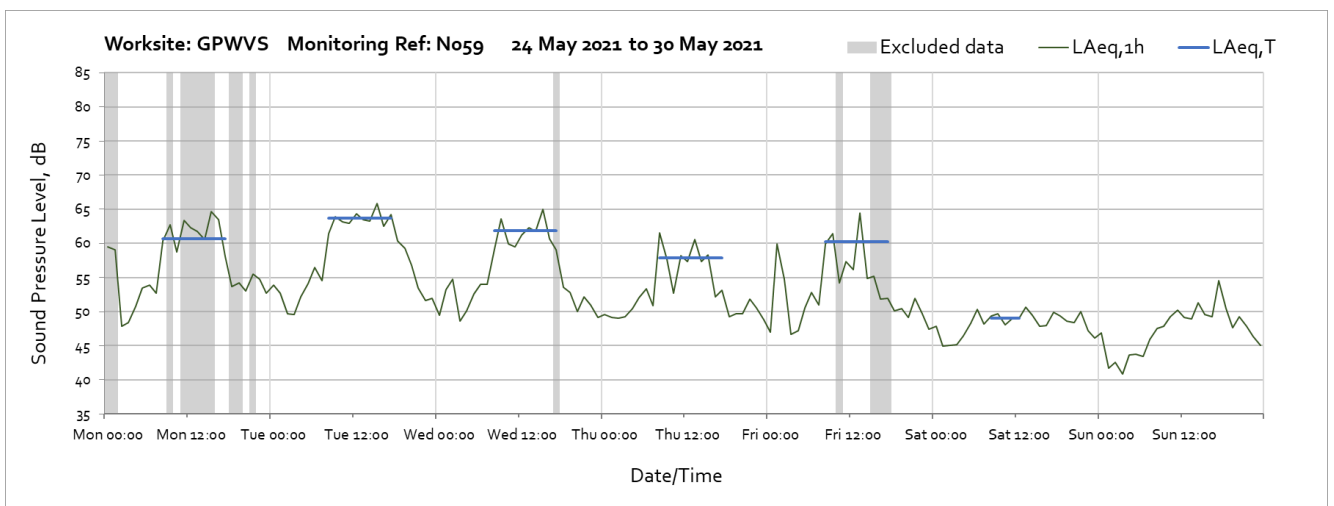
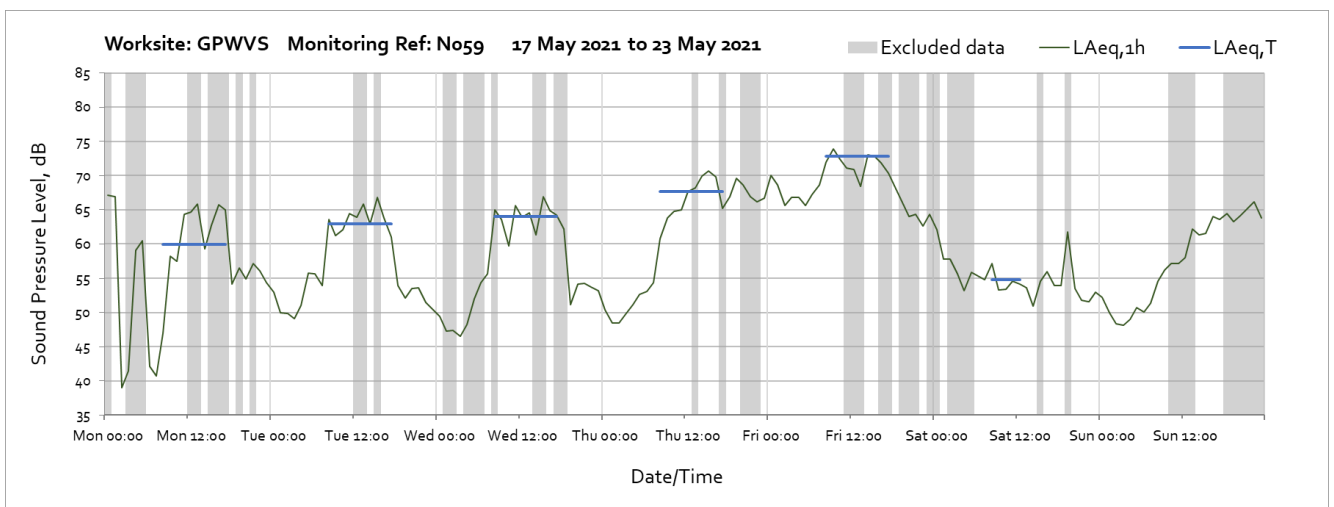
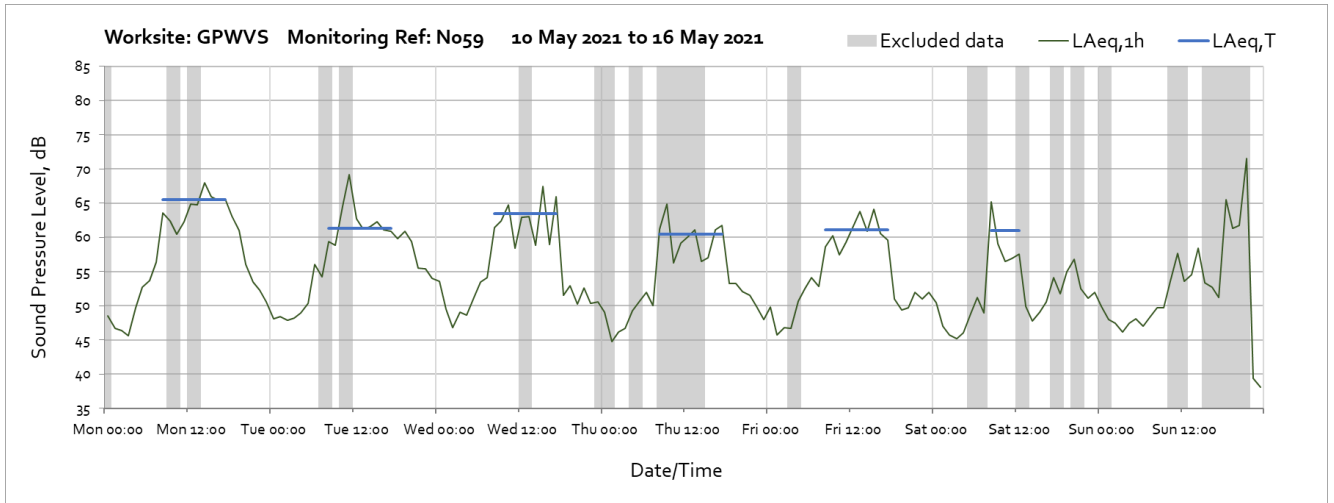


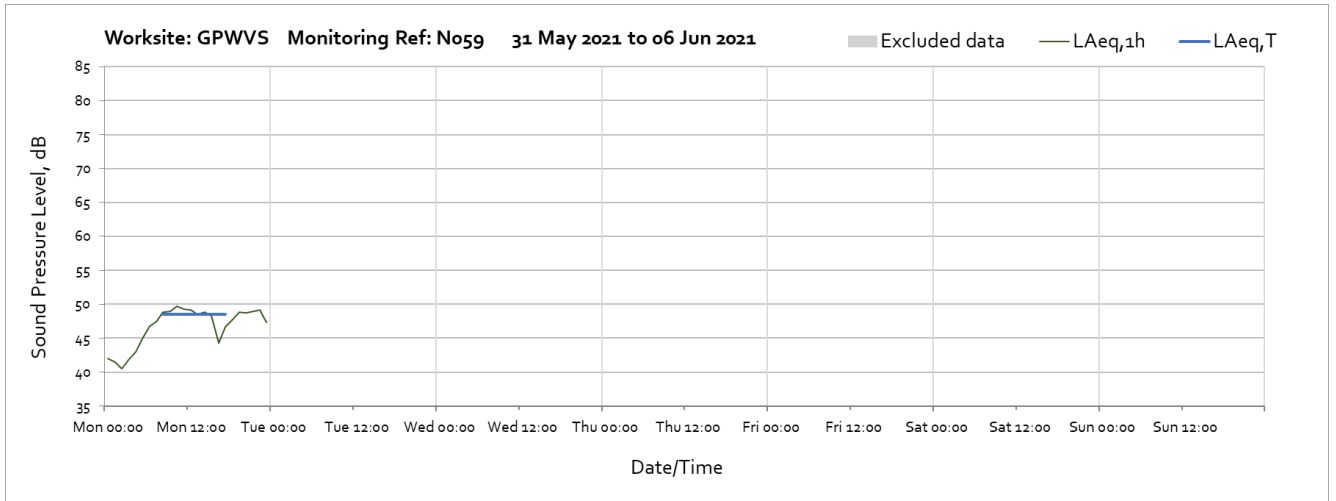




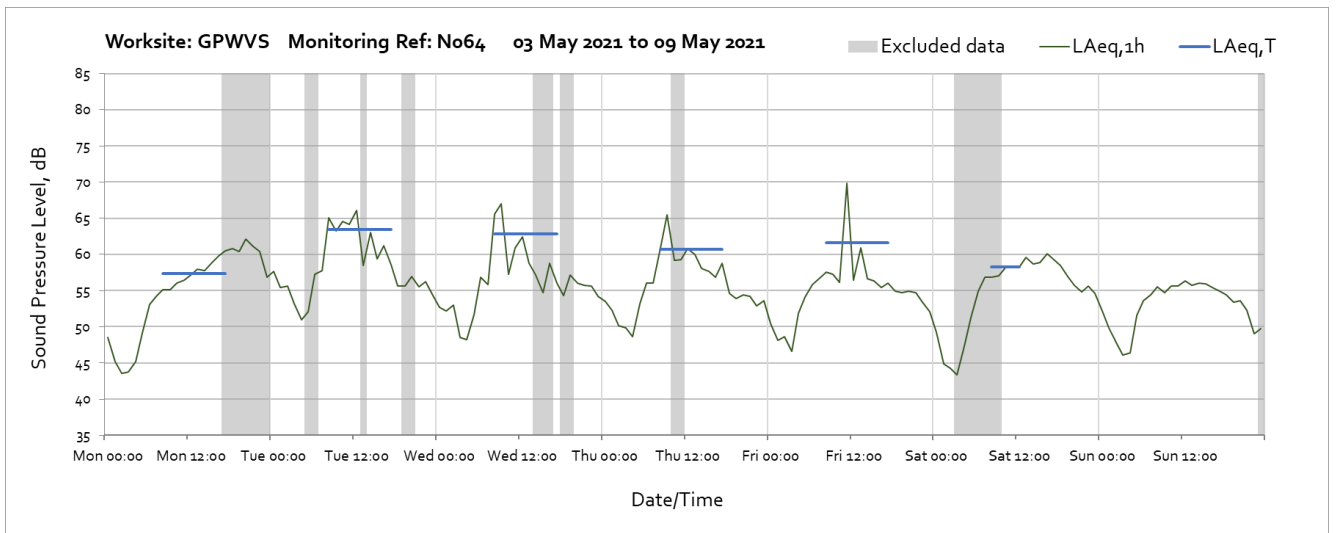
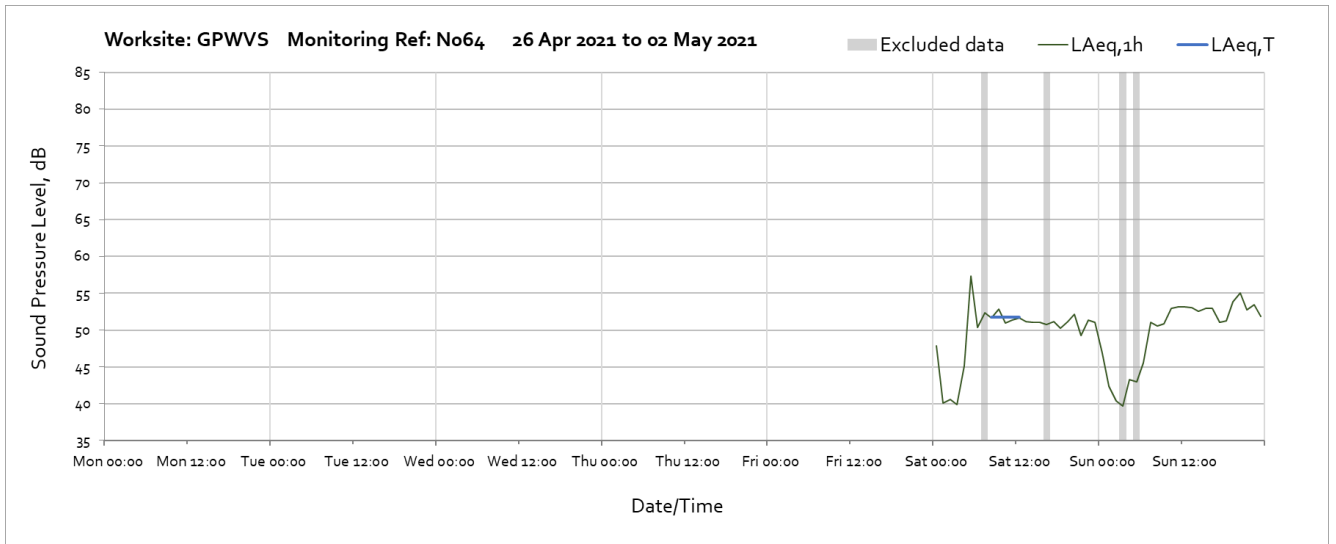
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N059

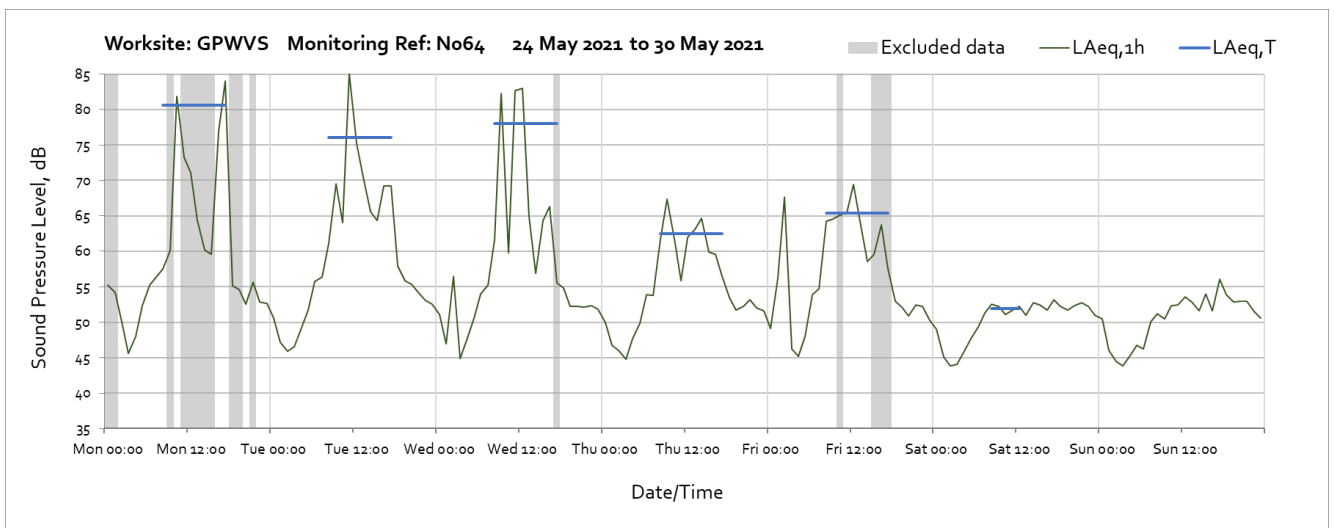
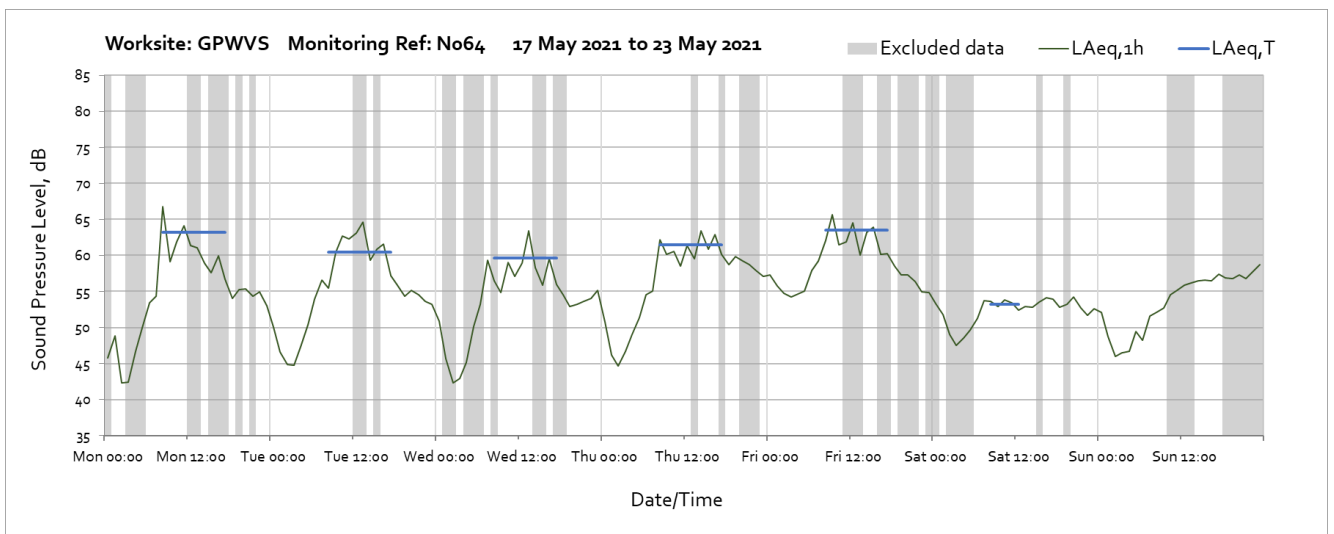
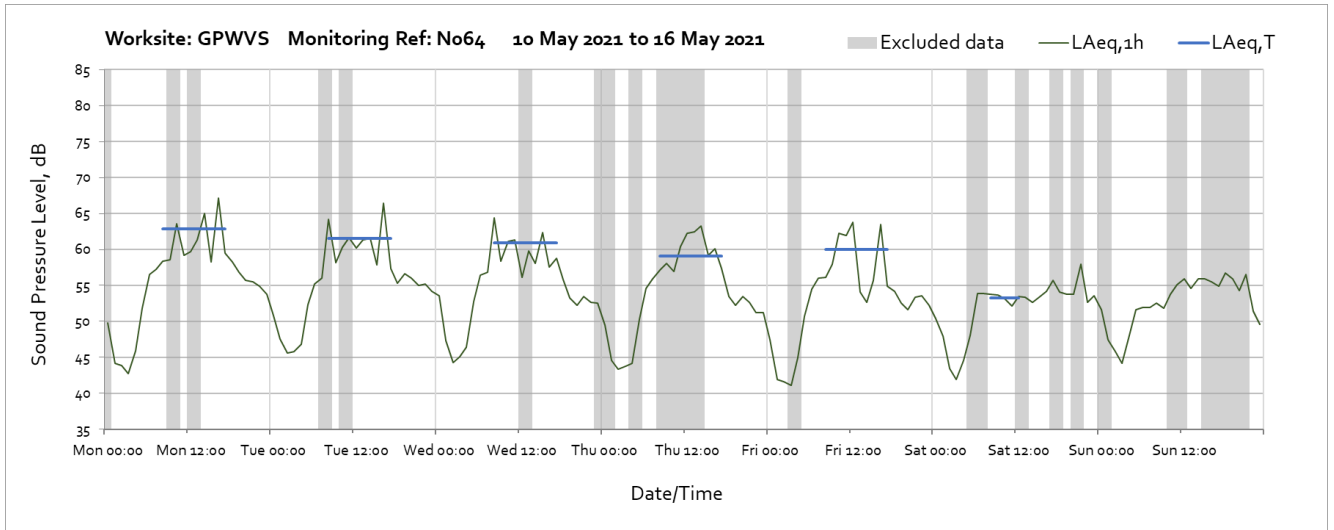


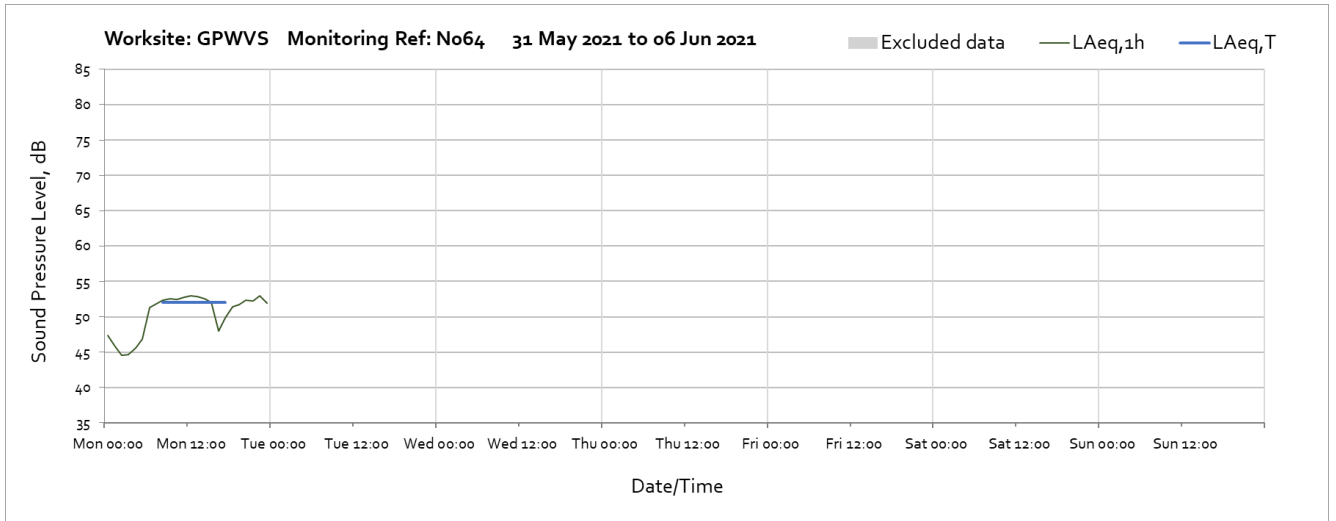




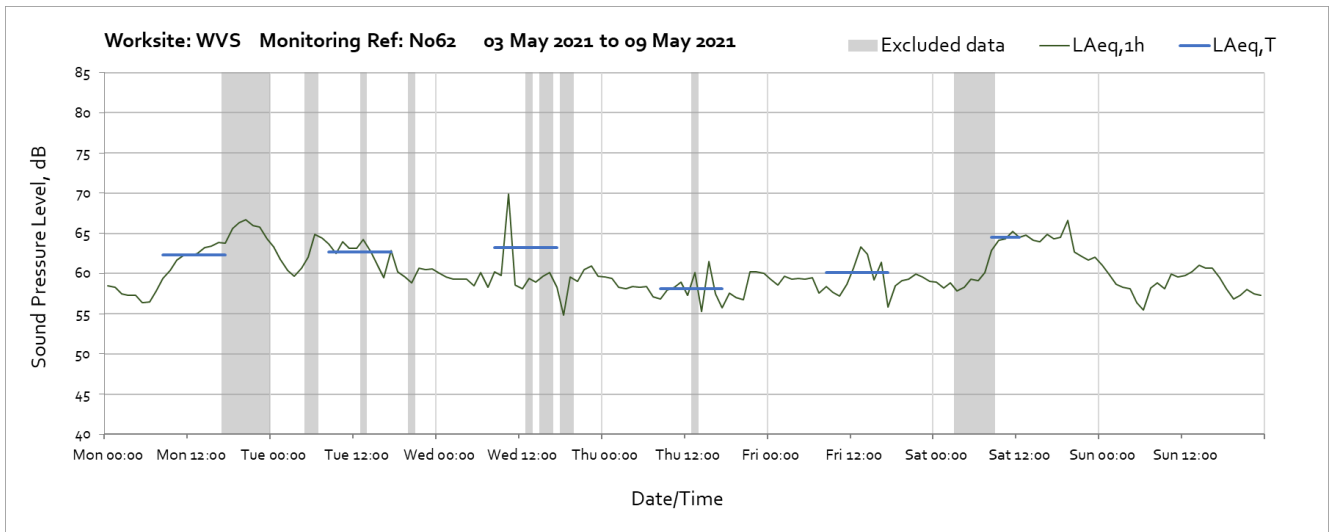
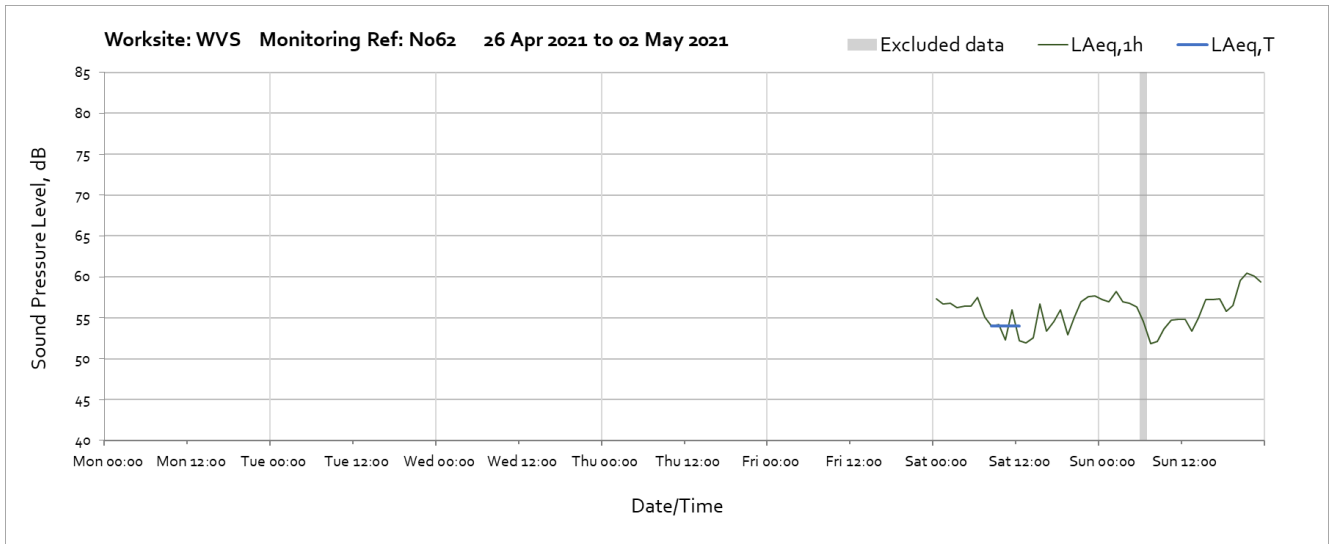
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N064

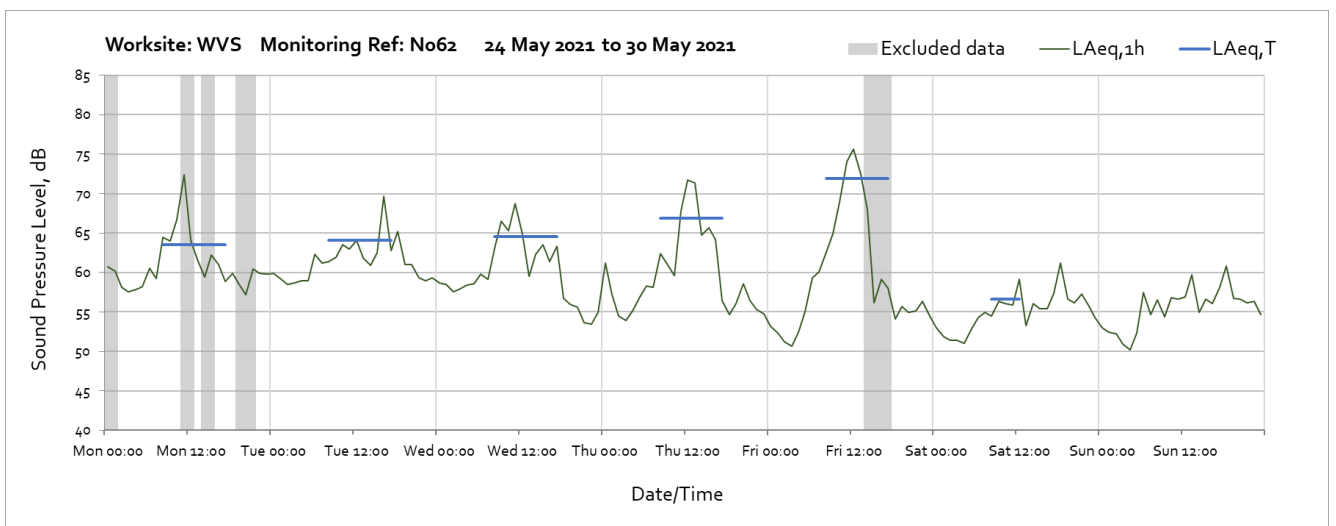
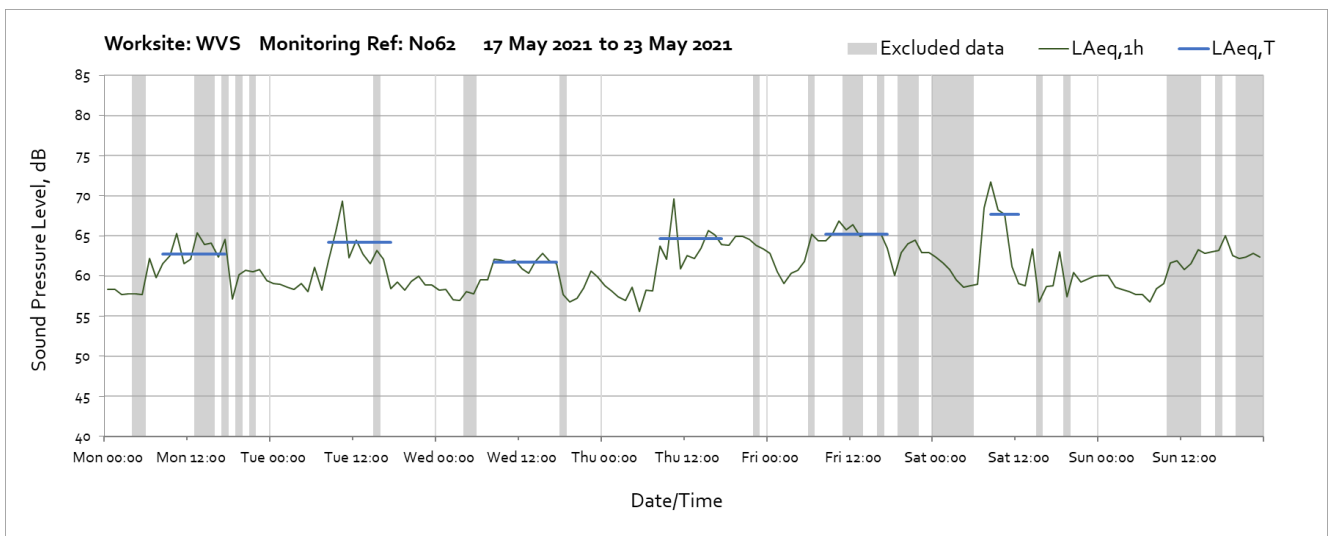
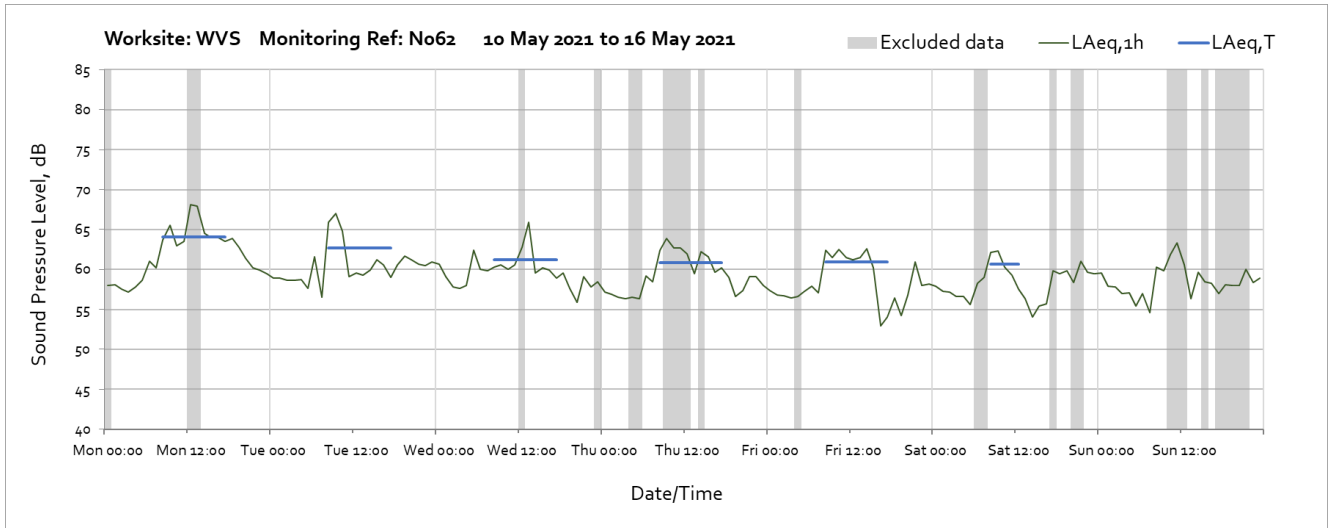


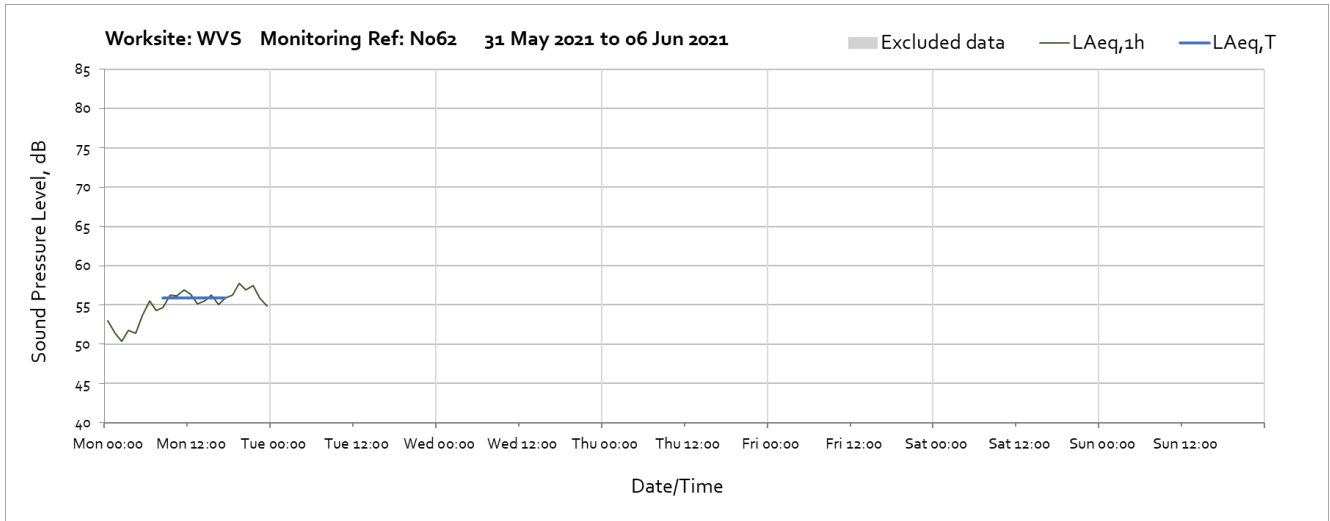




Worksite: Westgate Ventilation Shaft (WVS) – Monitoring Ref: N062



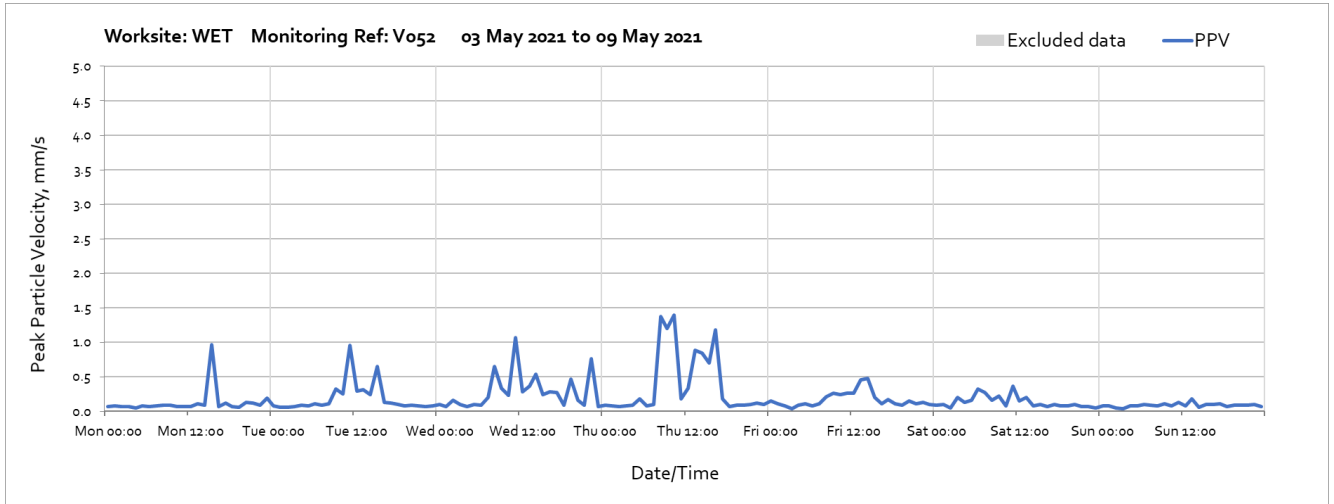
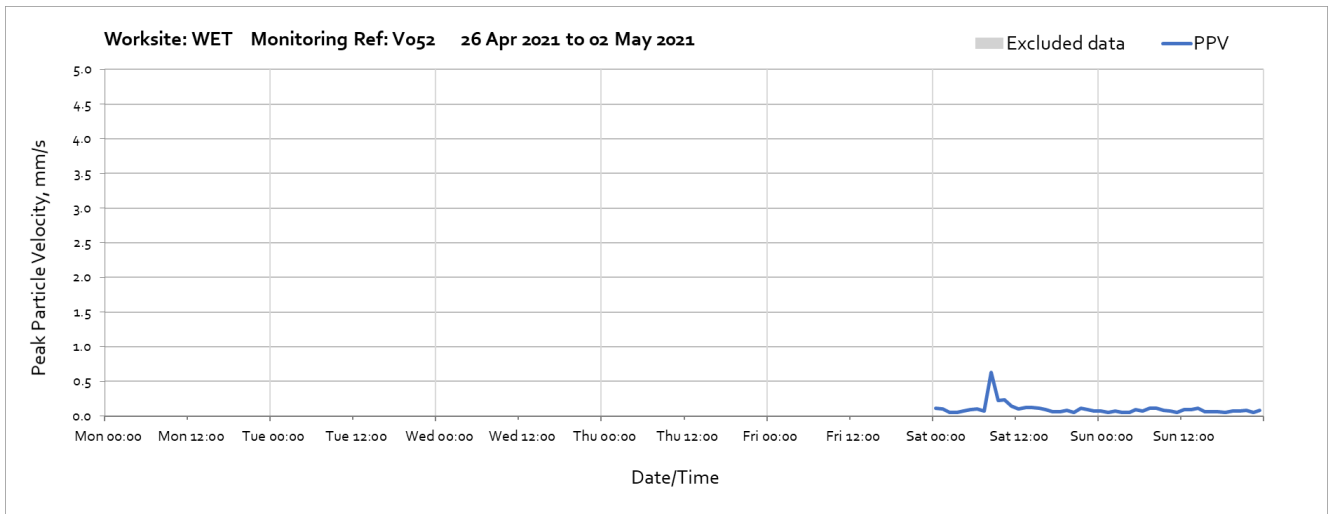


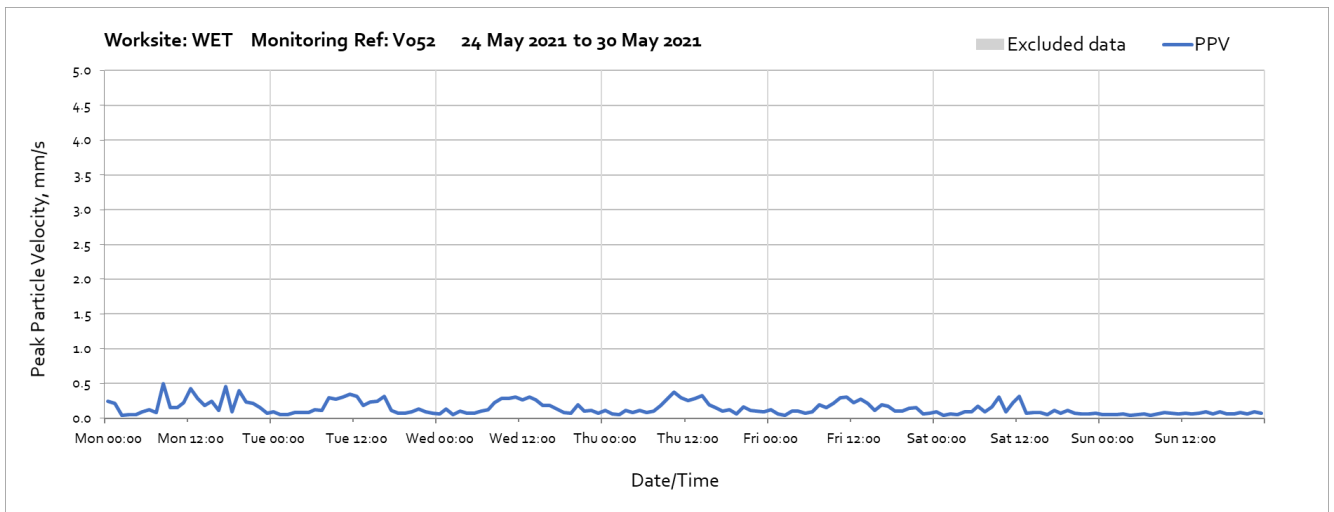
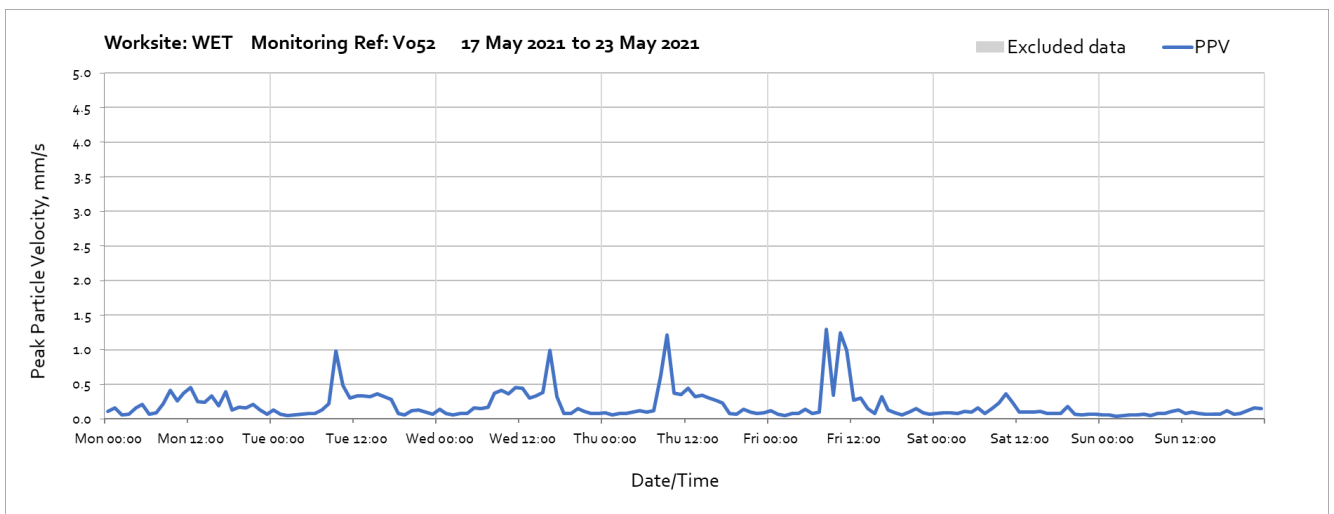
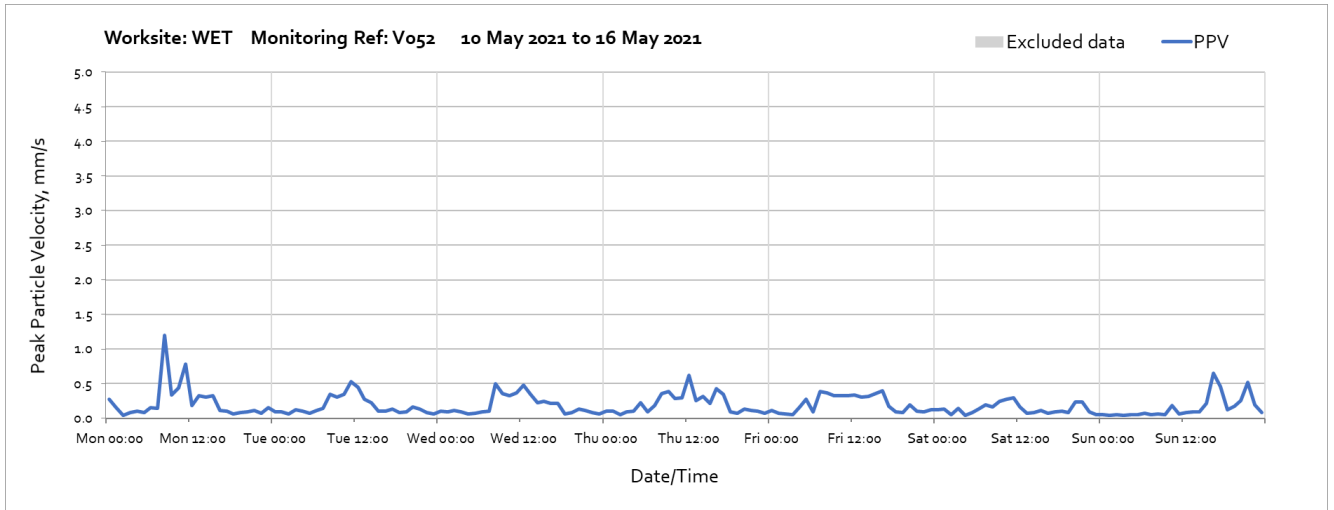


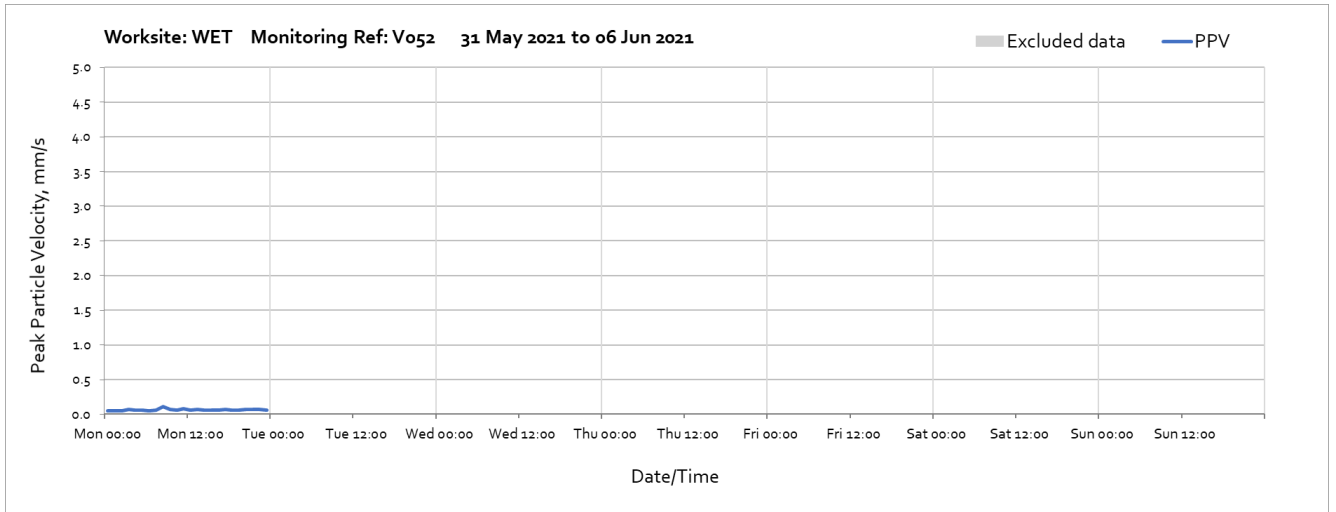
Vibration

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.

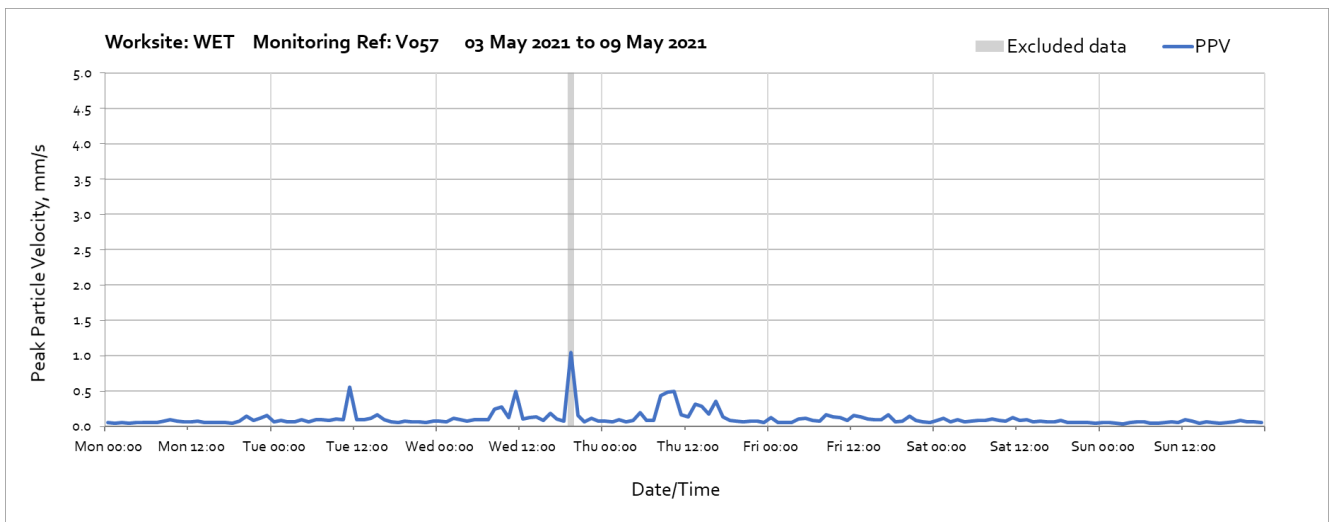
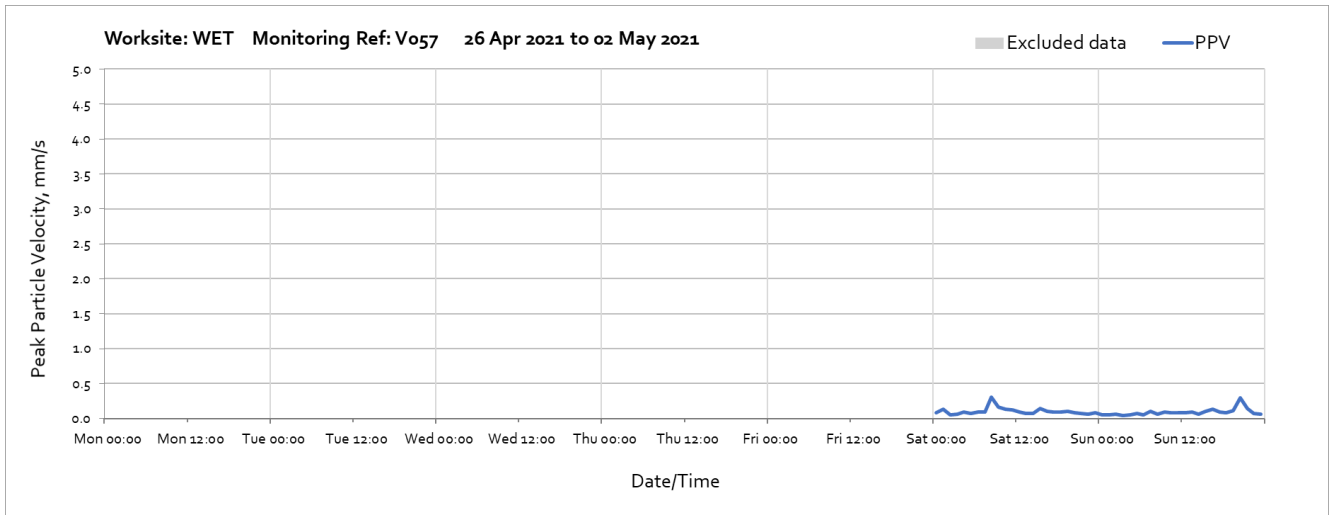
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V052





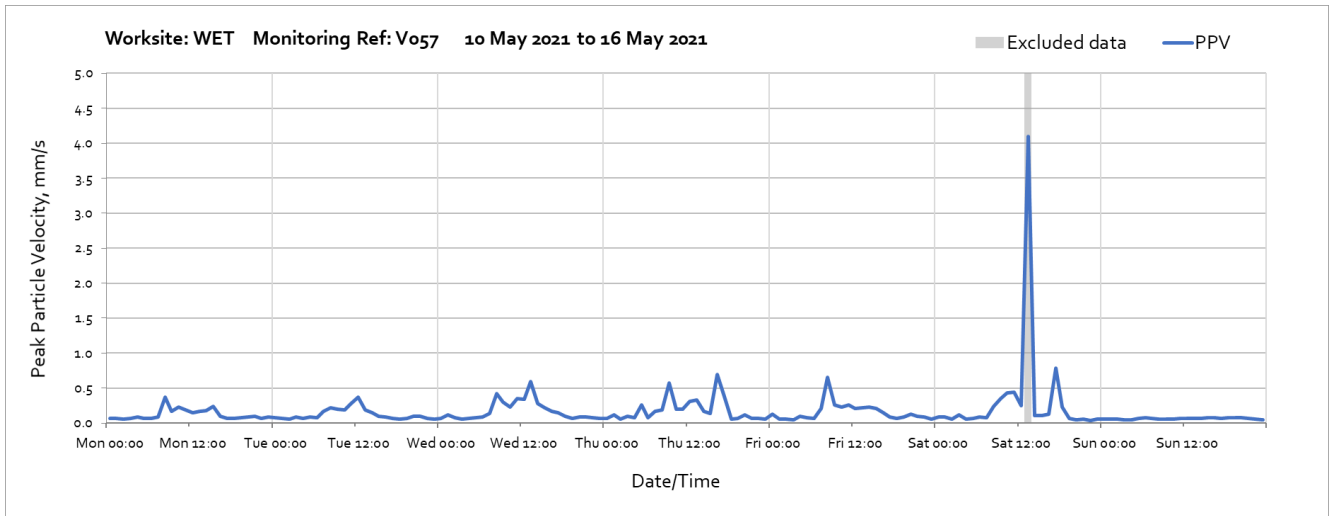


Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V057

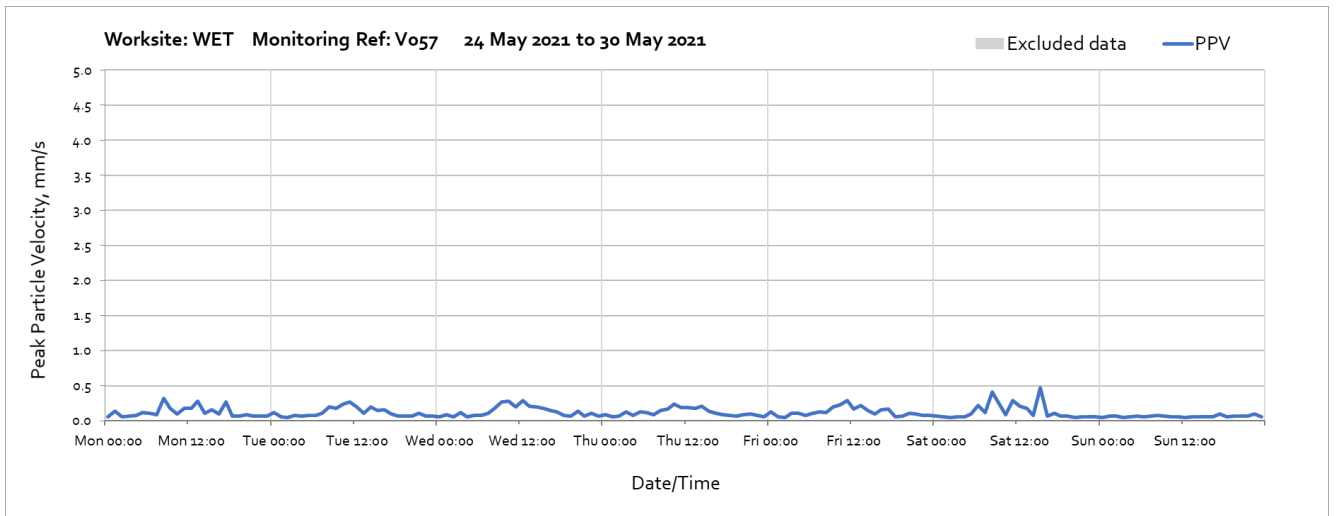
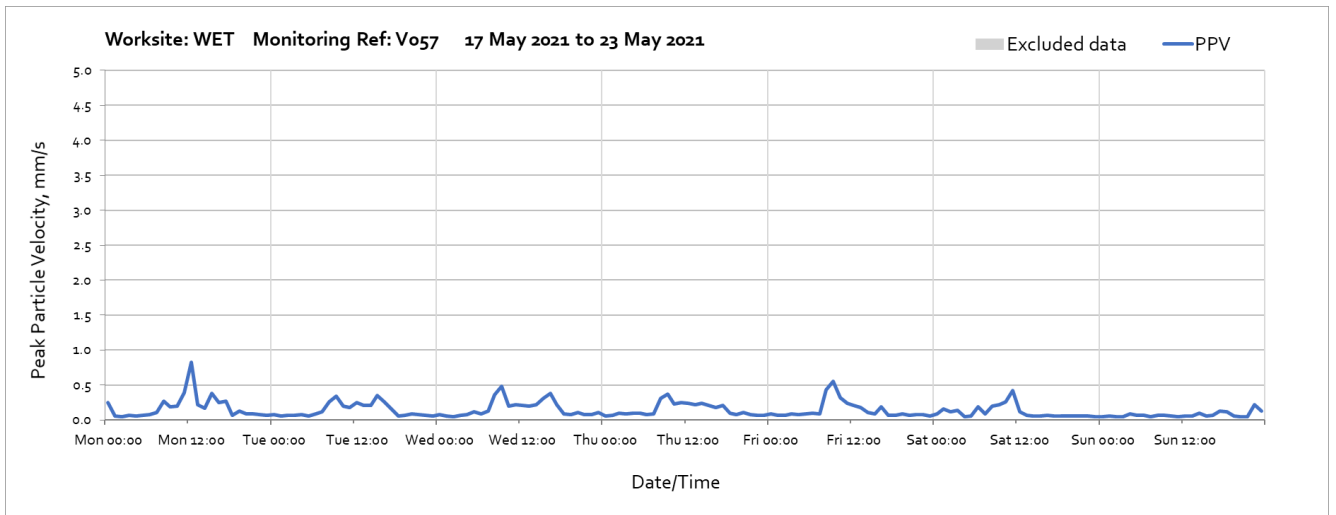


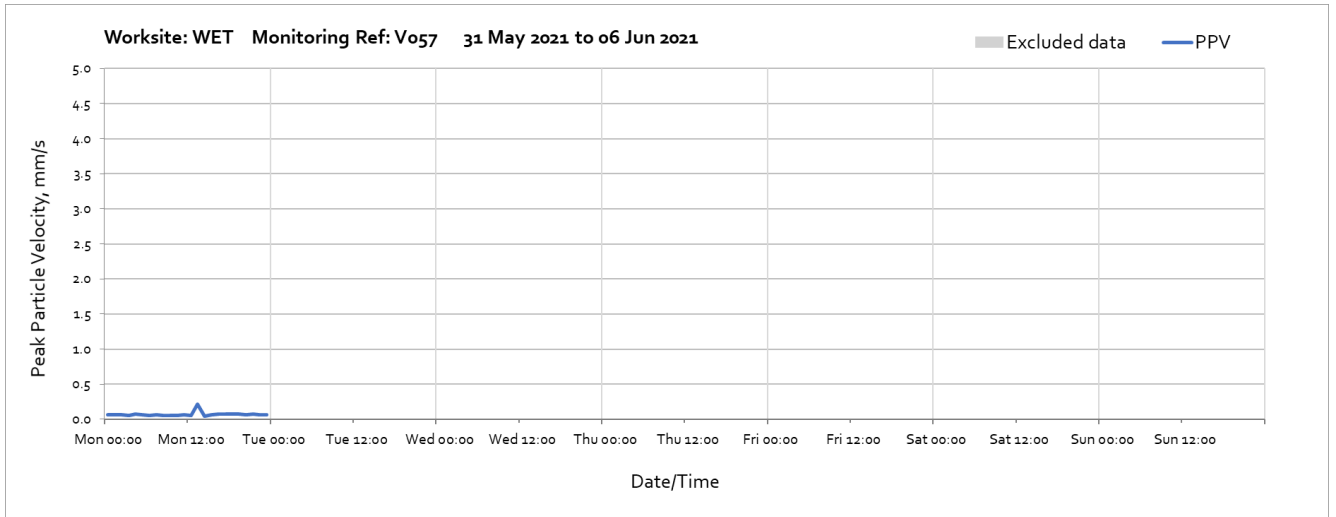
Note: High vibration levels measured at 19:00 on Wednesday 5th May 2021 were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.

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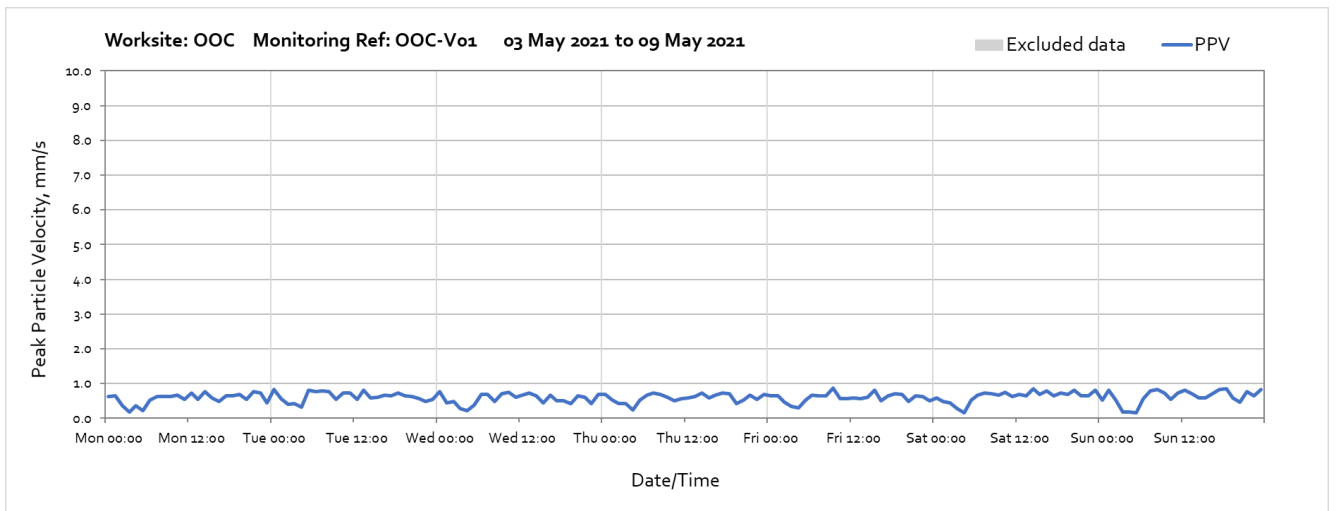
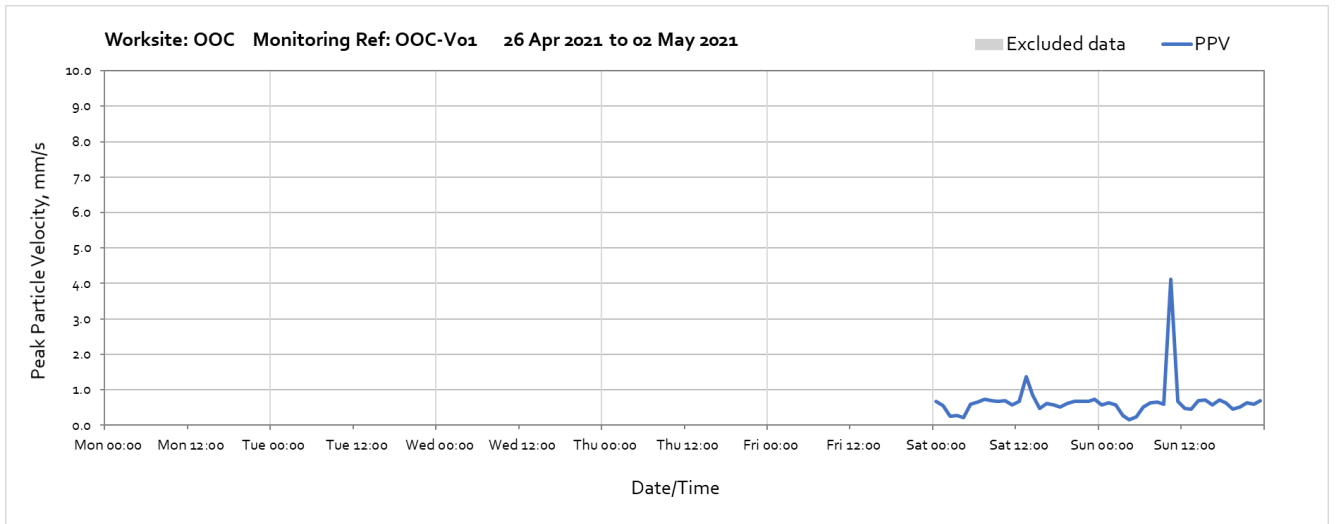


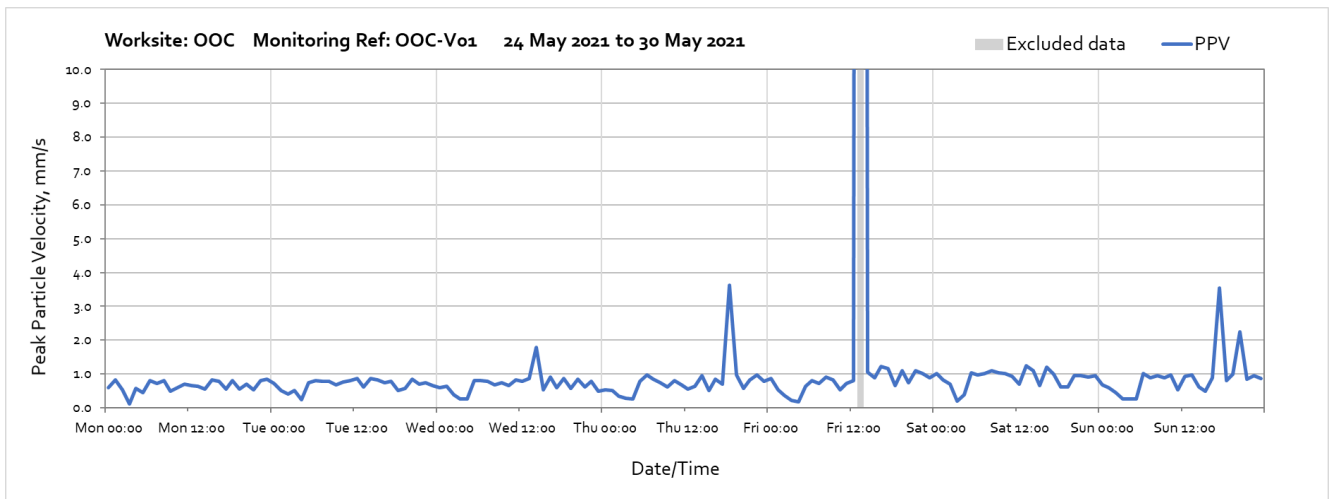
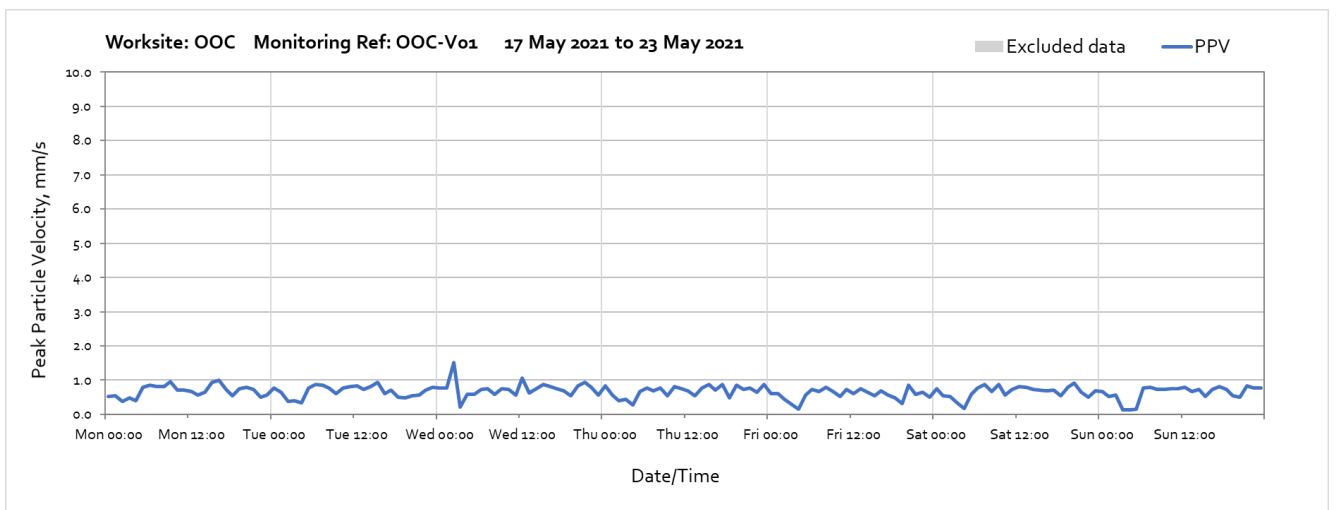
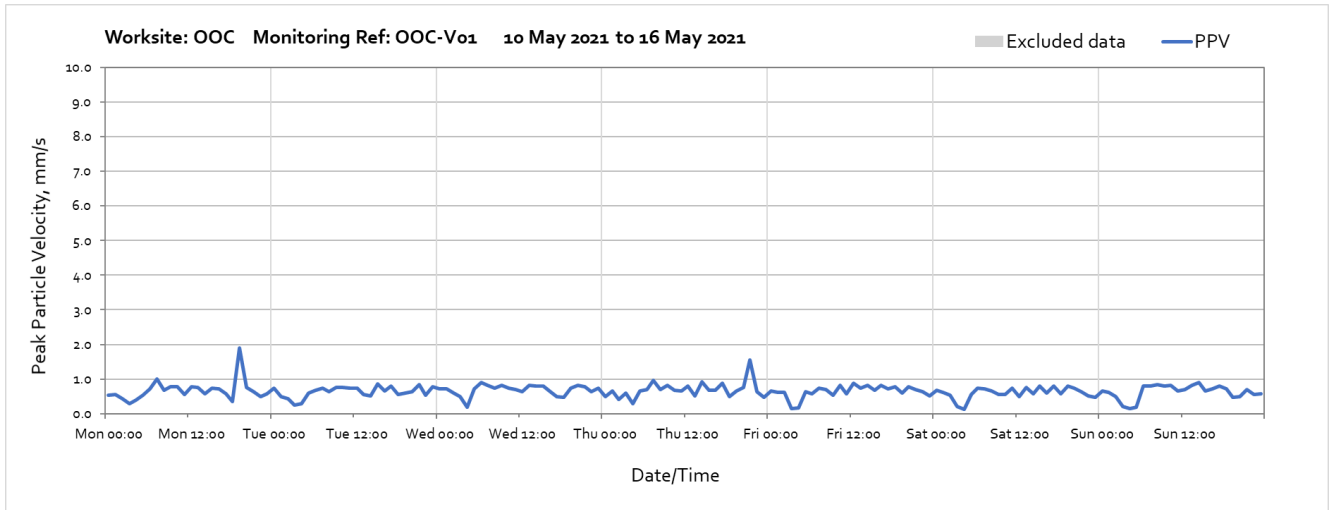
Note: High vibration levels measured at 13:00 on Saturday 15th May 2021 were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.



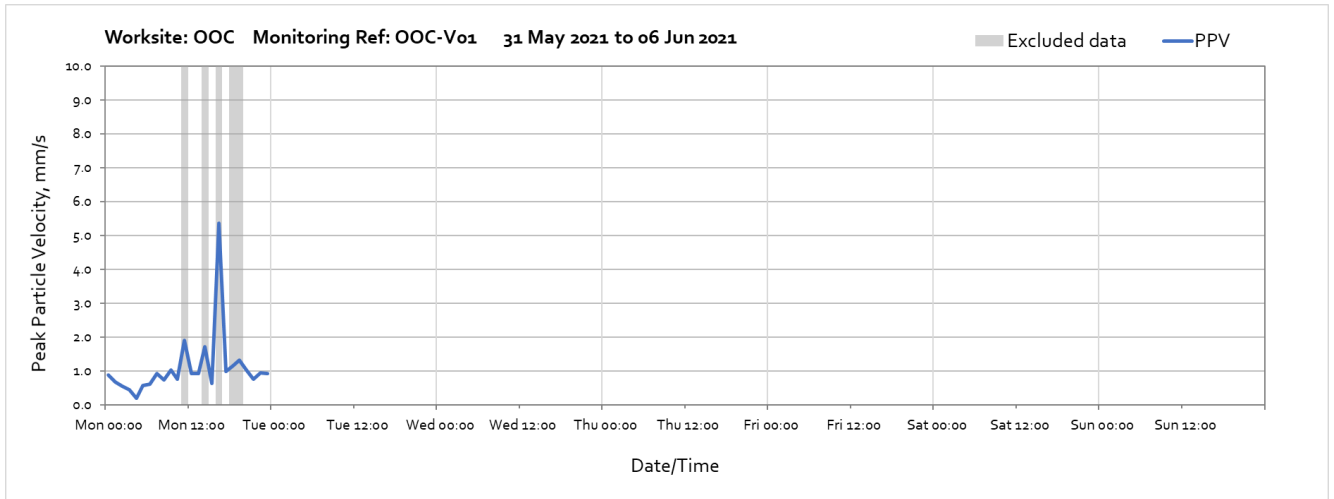


Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V01



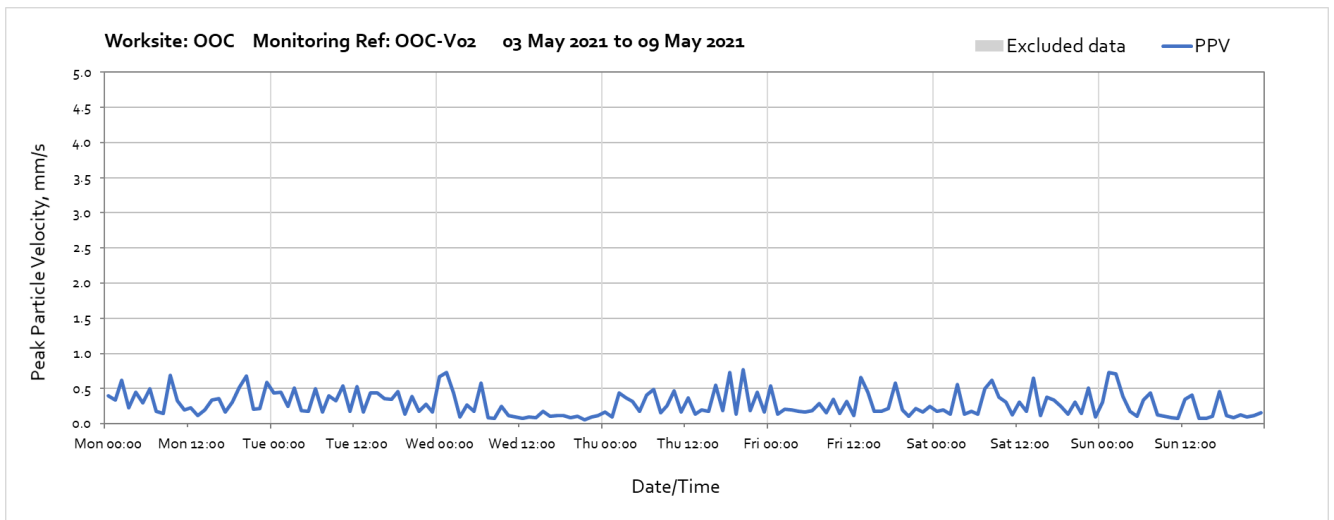
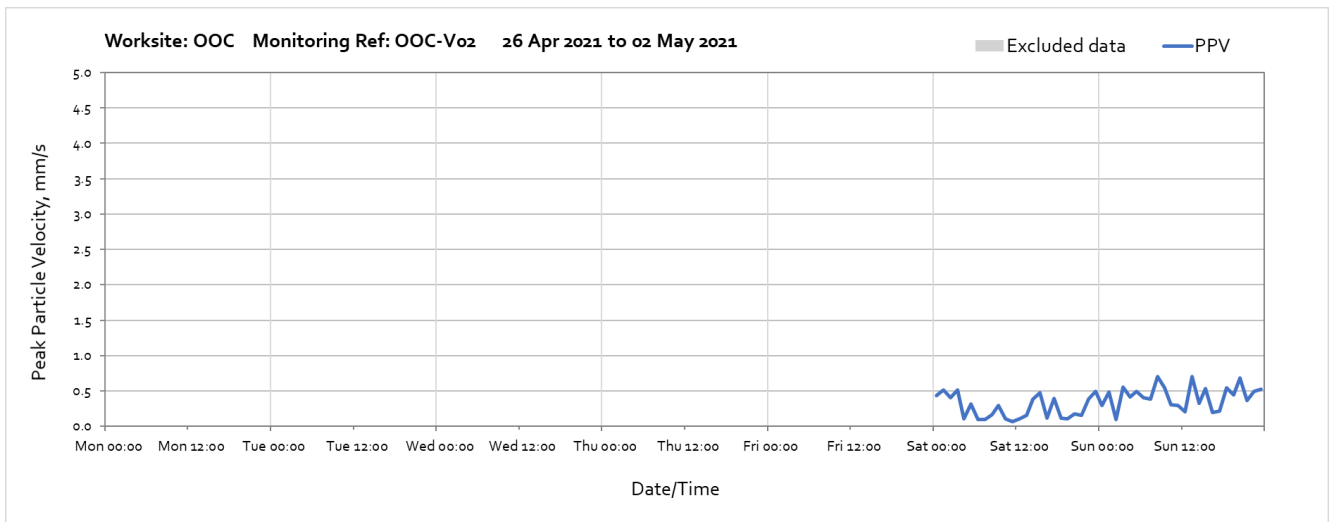


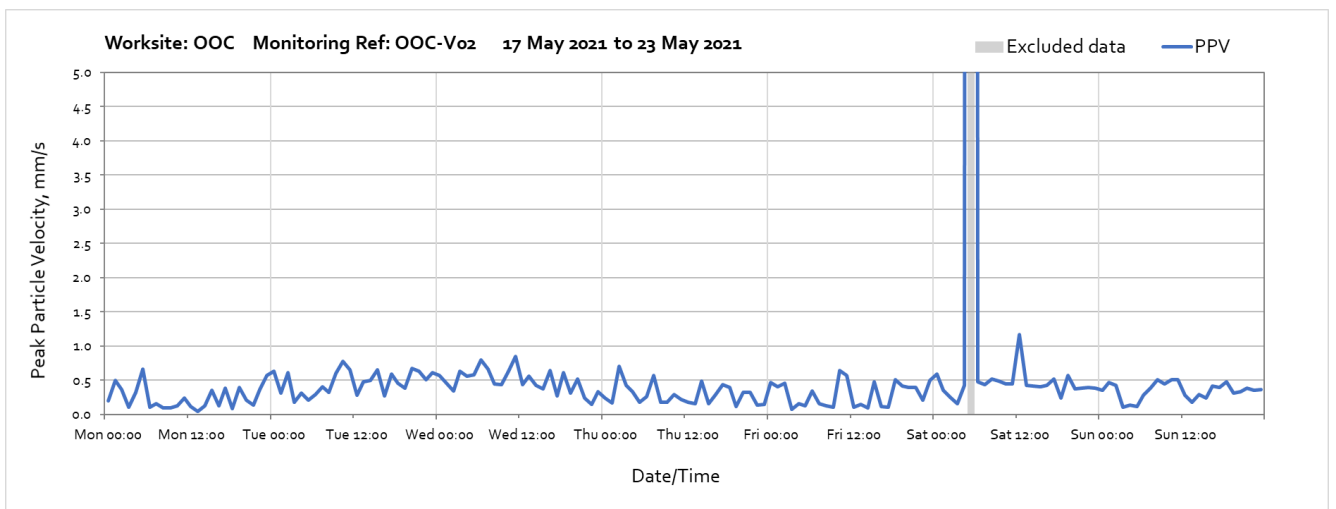
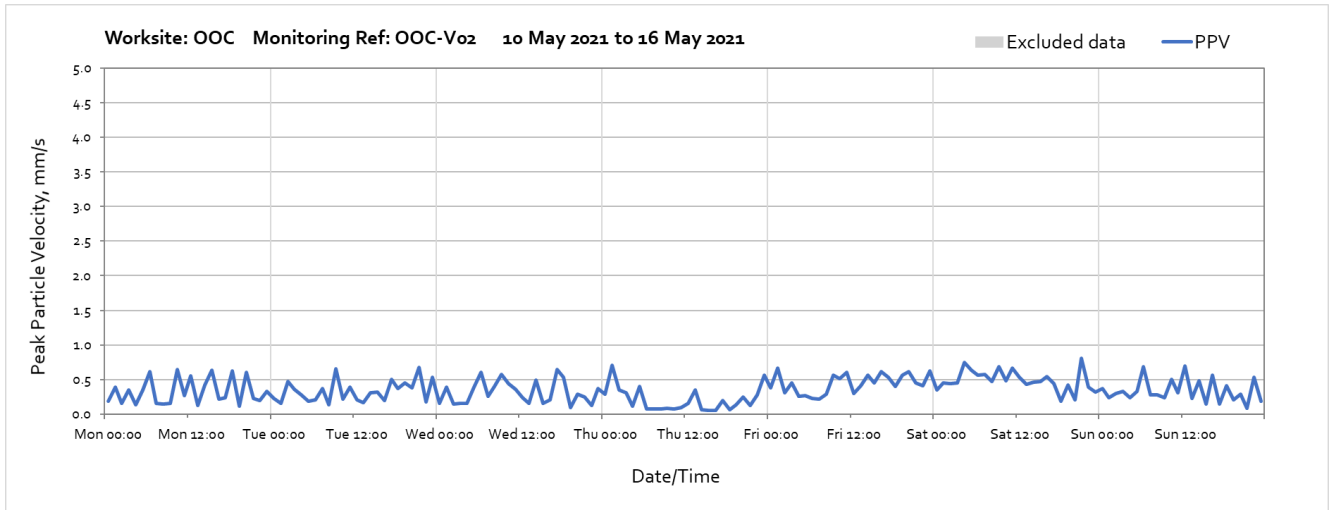
Note: High vibration levels measured at 13:00 on Friday 28th May 2021 were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.



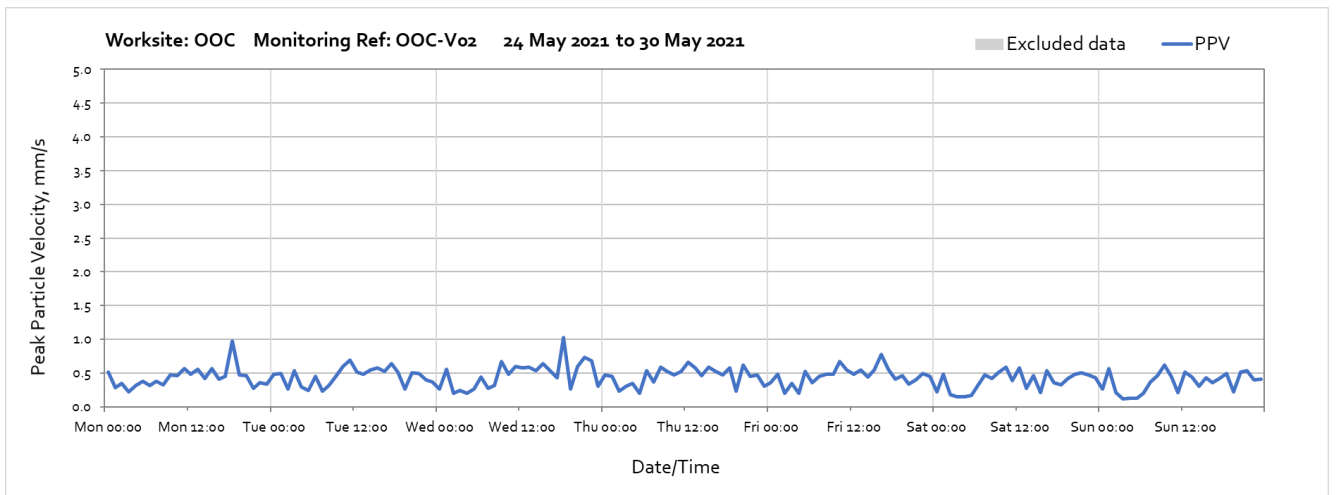
Note: High vibration levels measured on Bank Holiday - Monday 31st May were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.

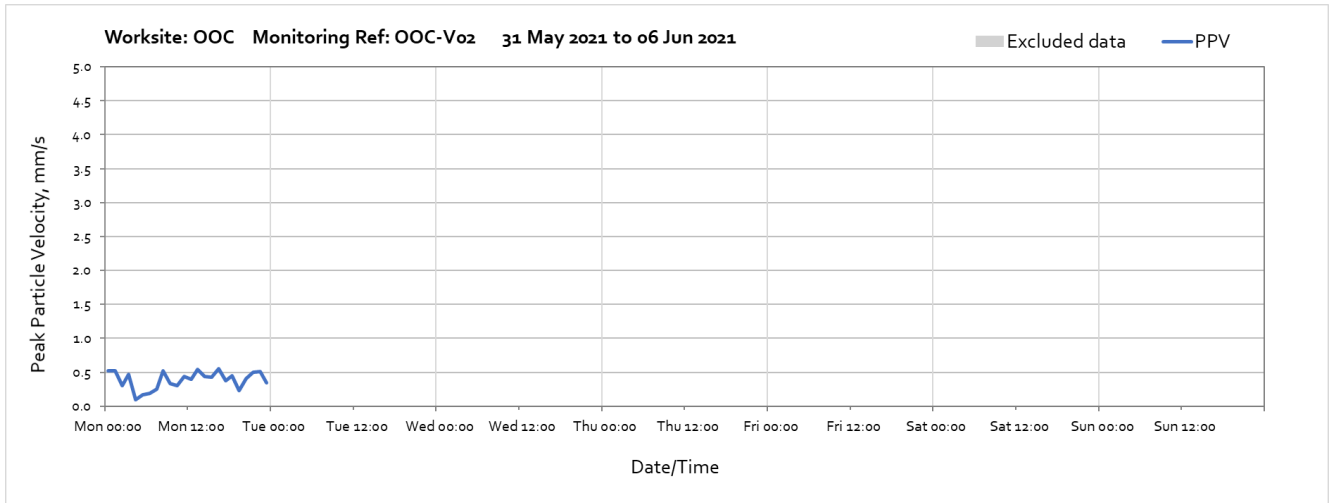
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V02



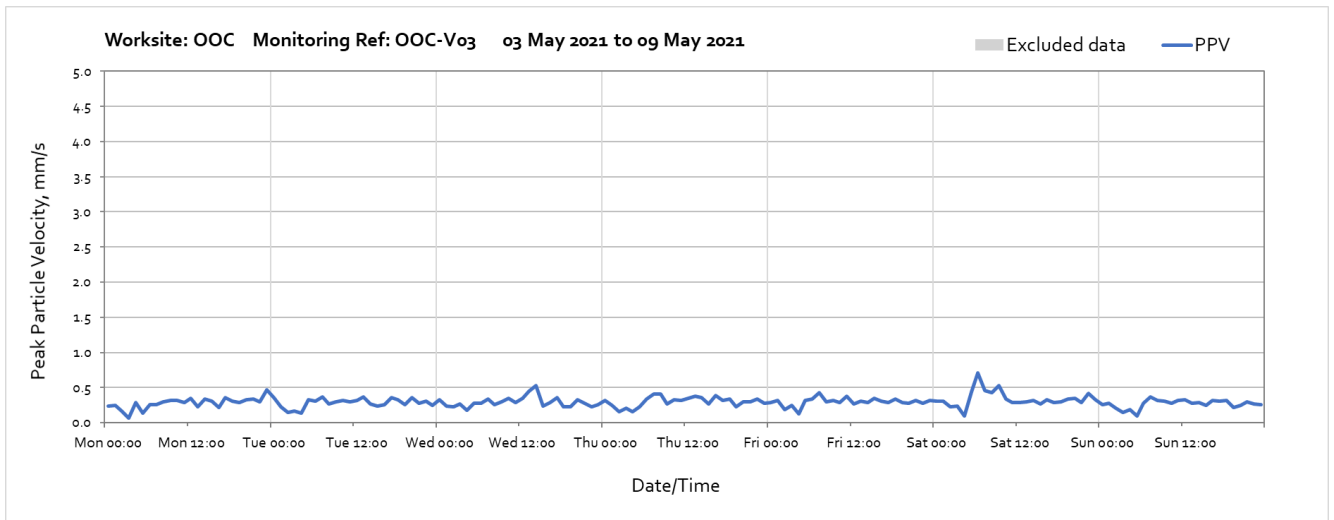
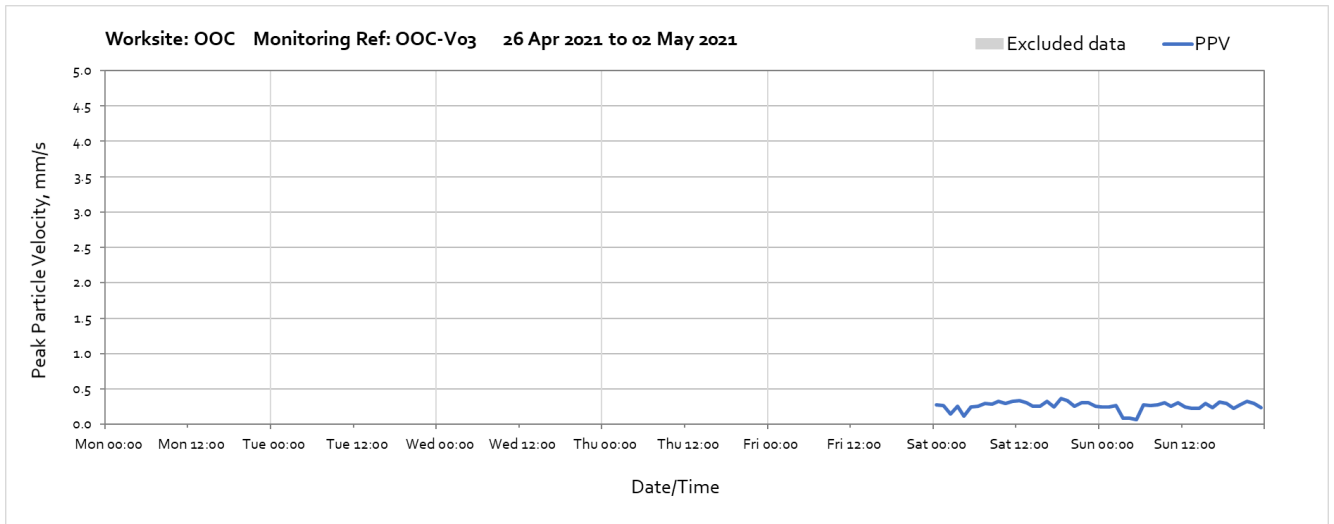


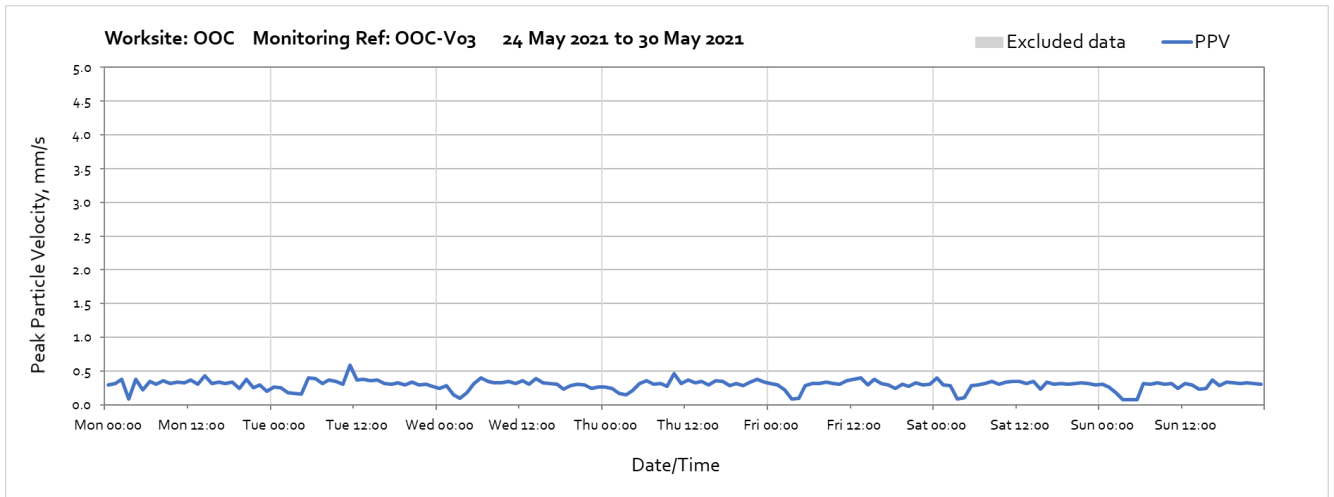
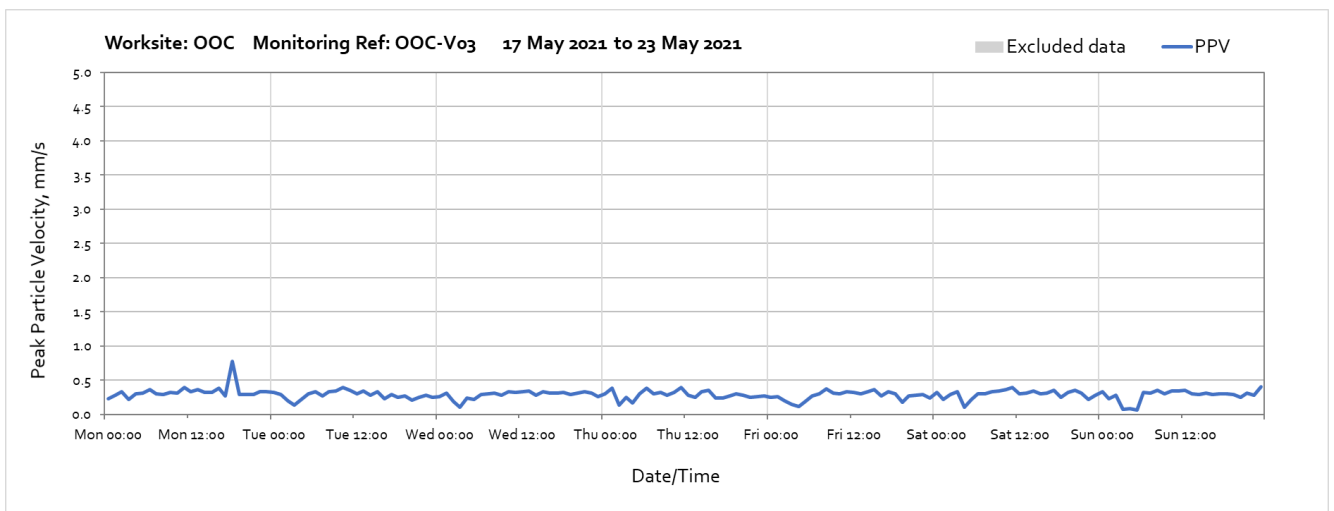
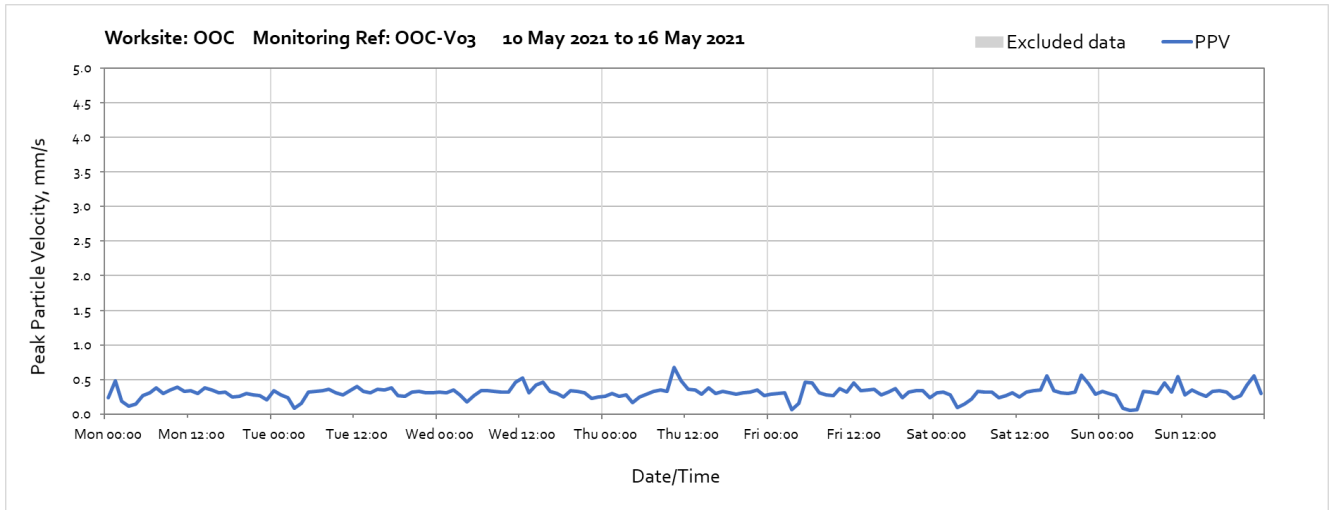
Note: High vibration levels measured at 04:00 on Saturday 22nd May 2021 were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.

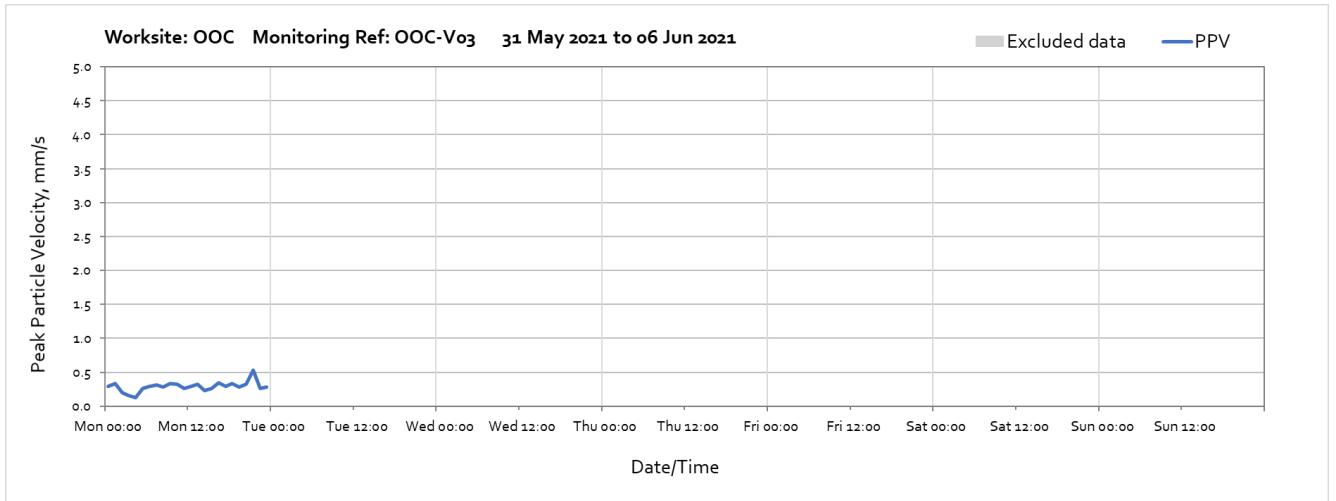




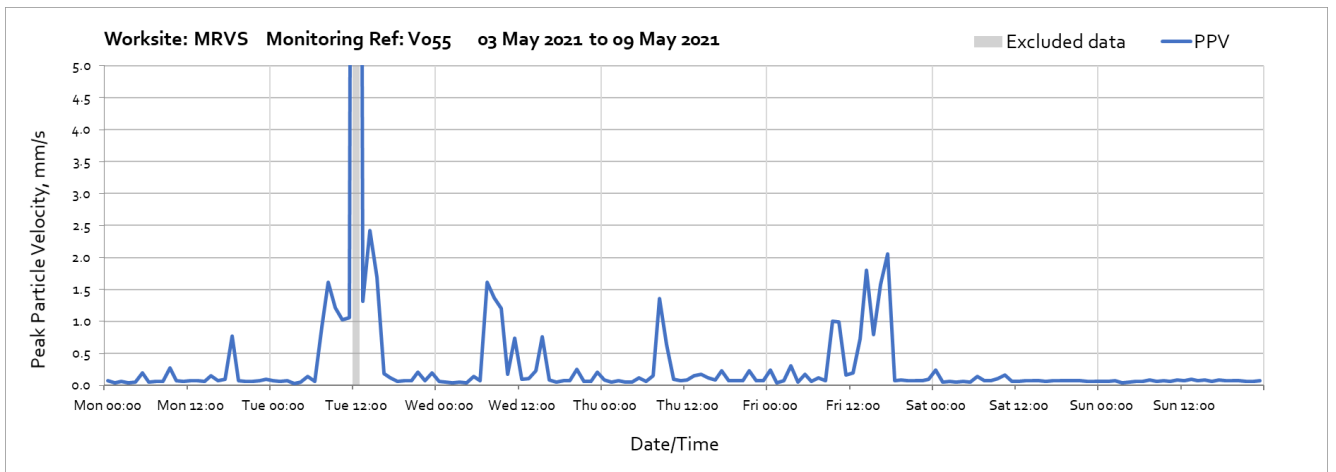
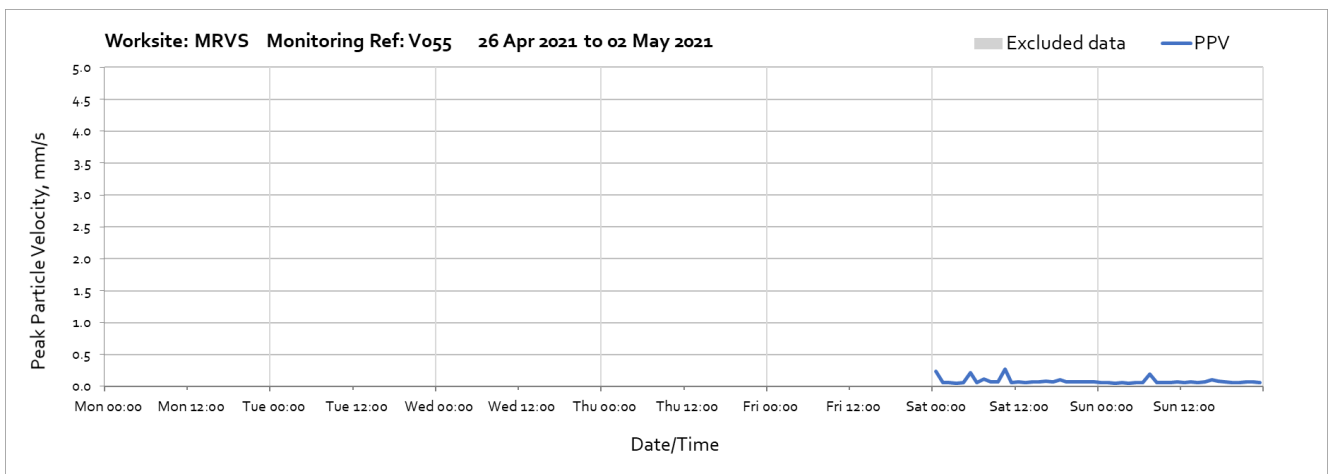
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V03



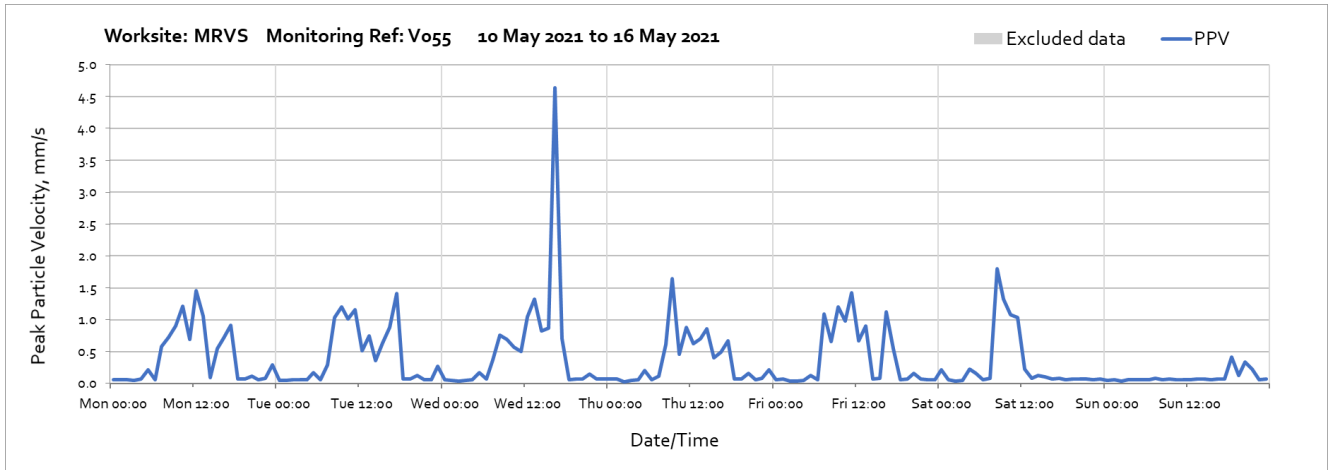




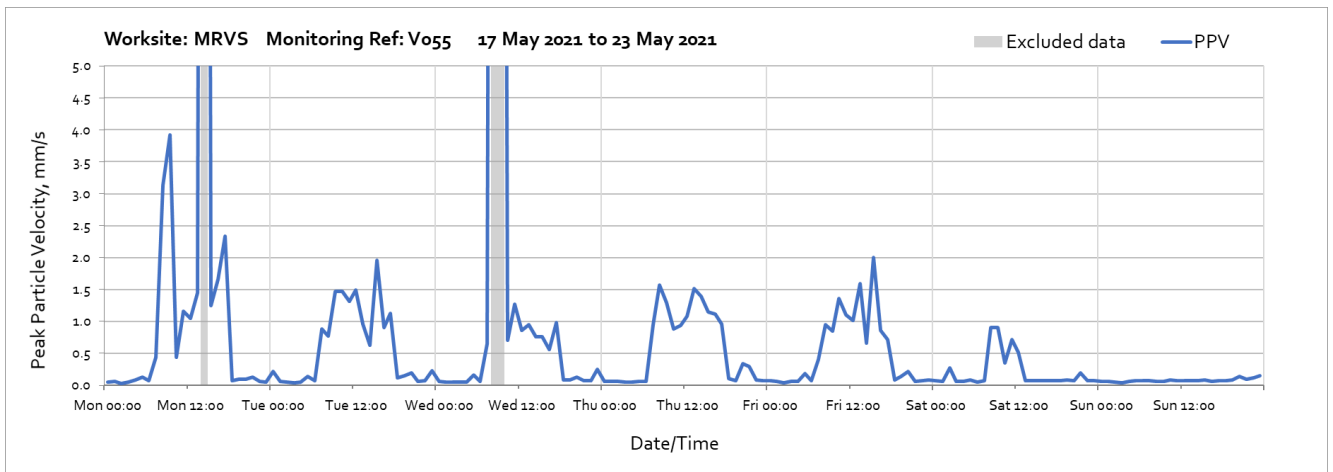
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V055



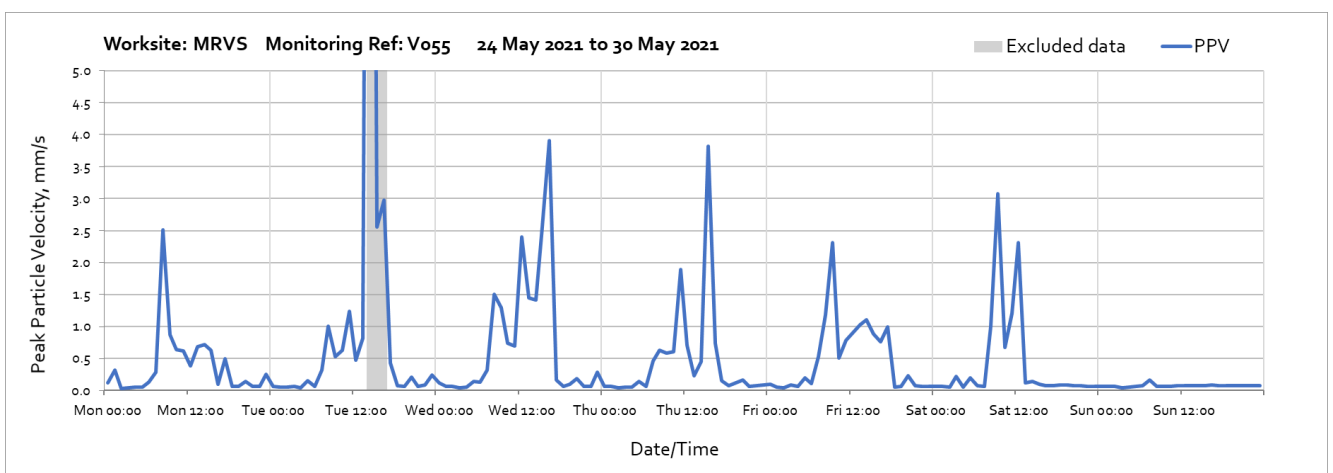
Note: High vibration levels measured at 12:00 on Tuesday 4th May 2021 were due to local disturbance at the monitor location and not representative of HS2 construction vibration levels at the location of nearby receptors.



Note: High vibration levels measured across the week were due to groundworks being undertaken in proximity to the monitor and are not representative of HS2 construction vibration levels at the location of nearby receptors.

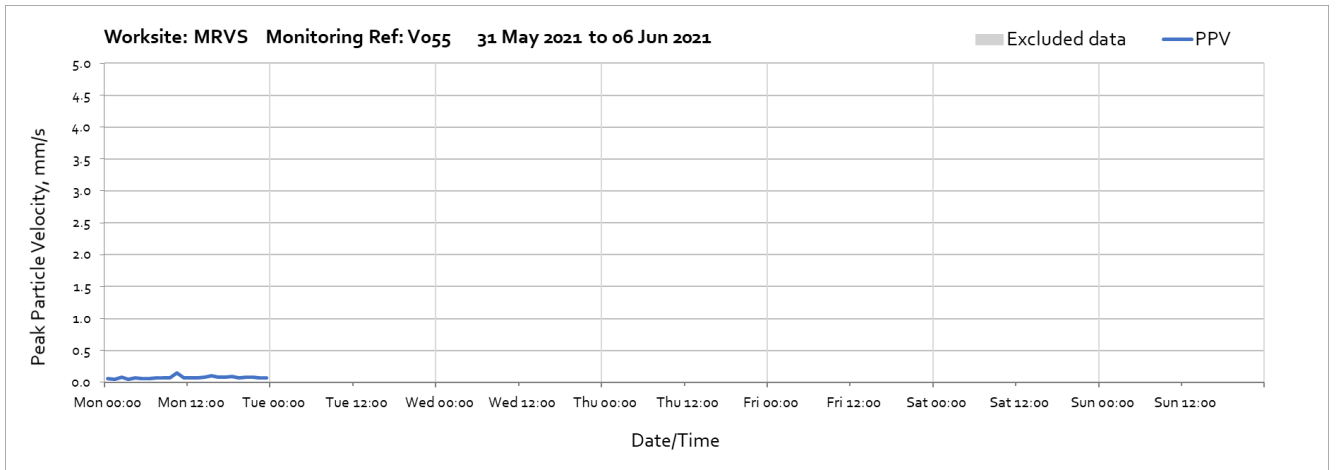


Note: High vibration levels measured at 14:00 on Monday 8th May 2021 and between 08:00 and 09:00 on Wednesday 19th May 2021 were due to local disturbance at the monitor location and high vibration levels measured across the week were due to groundworks being undertaken in proximity to the monitor and are not representative of HS2 construction vibration levels at the location of nearby receptors.

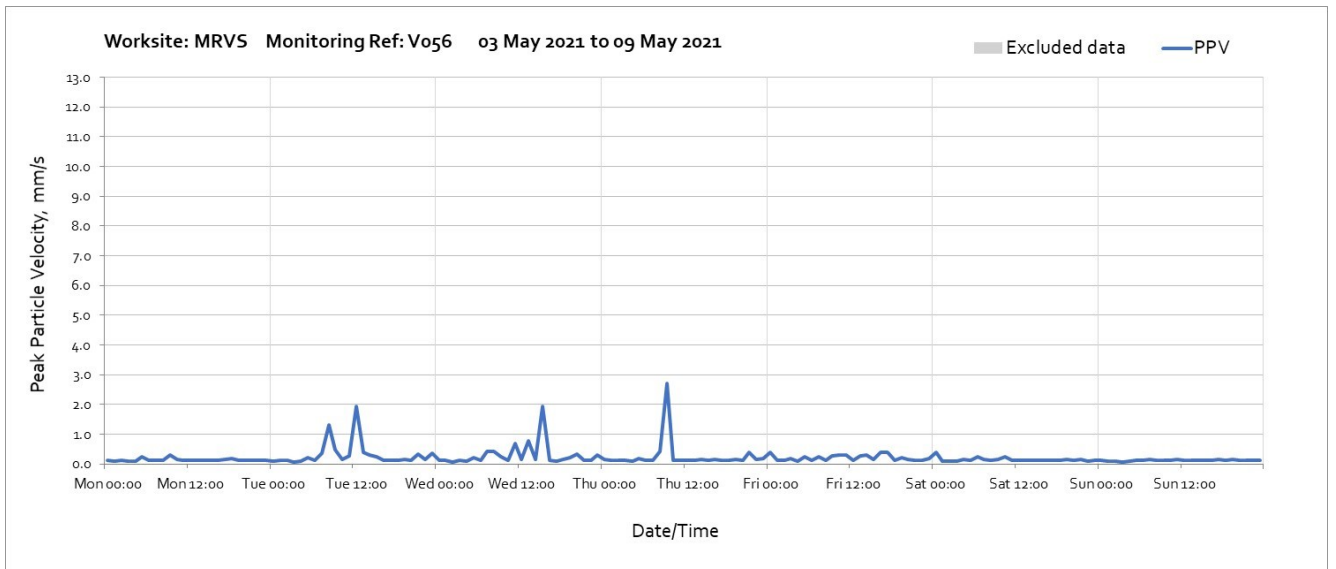
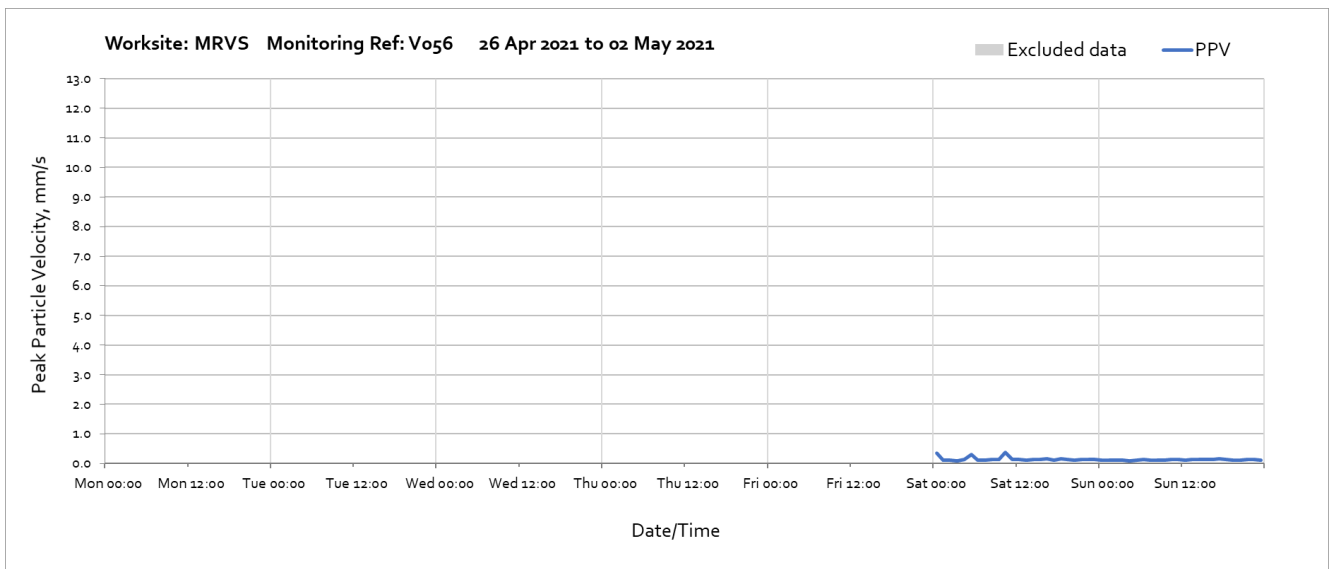


Note: High vibration levels measured between 14:00 and 17:00 on Tuesday 25th May were due to local disturbance at the monitor location and high vibration levels measured across the week were due to

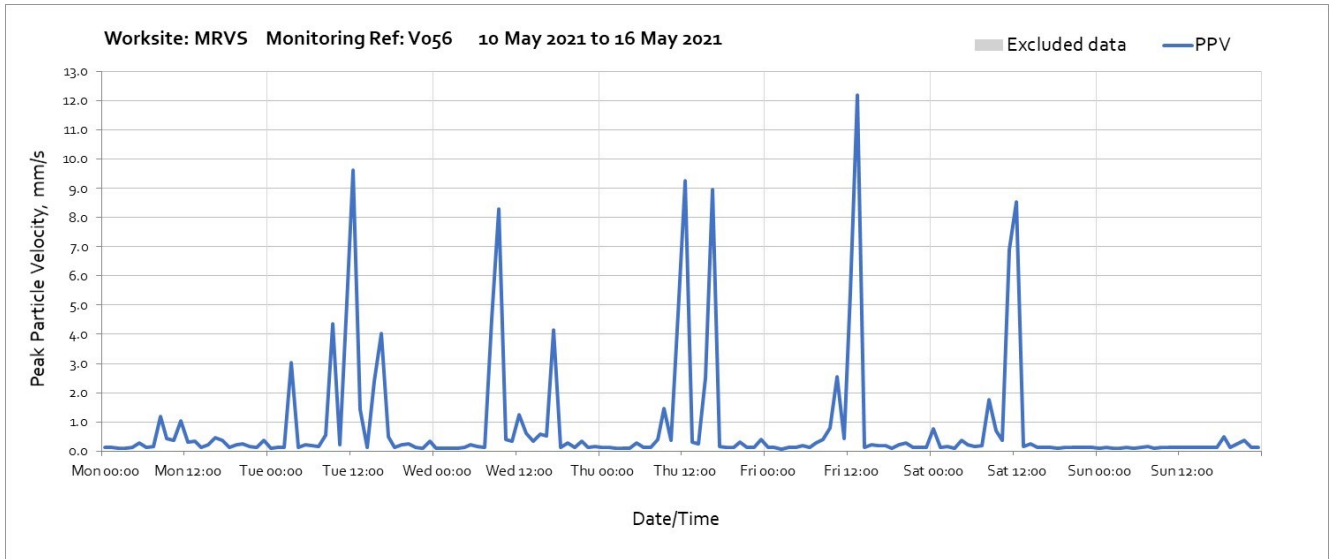
groundworks being undertaken in proximity to the monitor and are not representative of HS2 construction vibration levels at the location of nearby receptors.



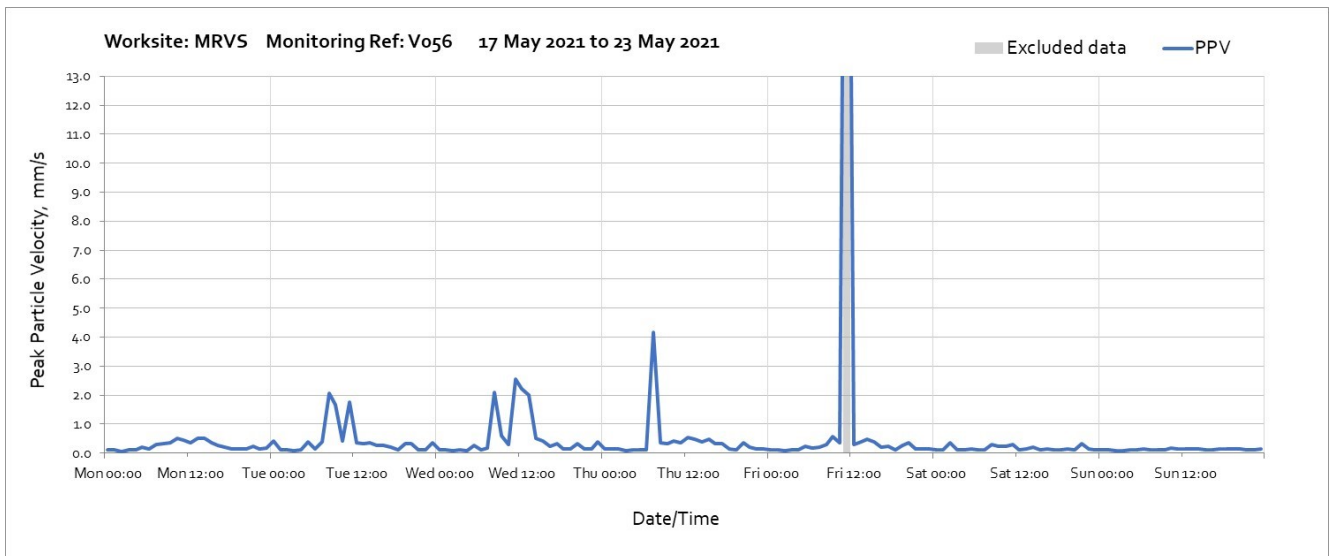
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V056



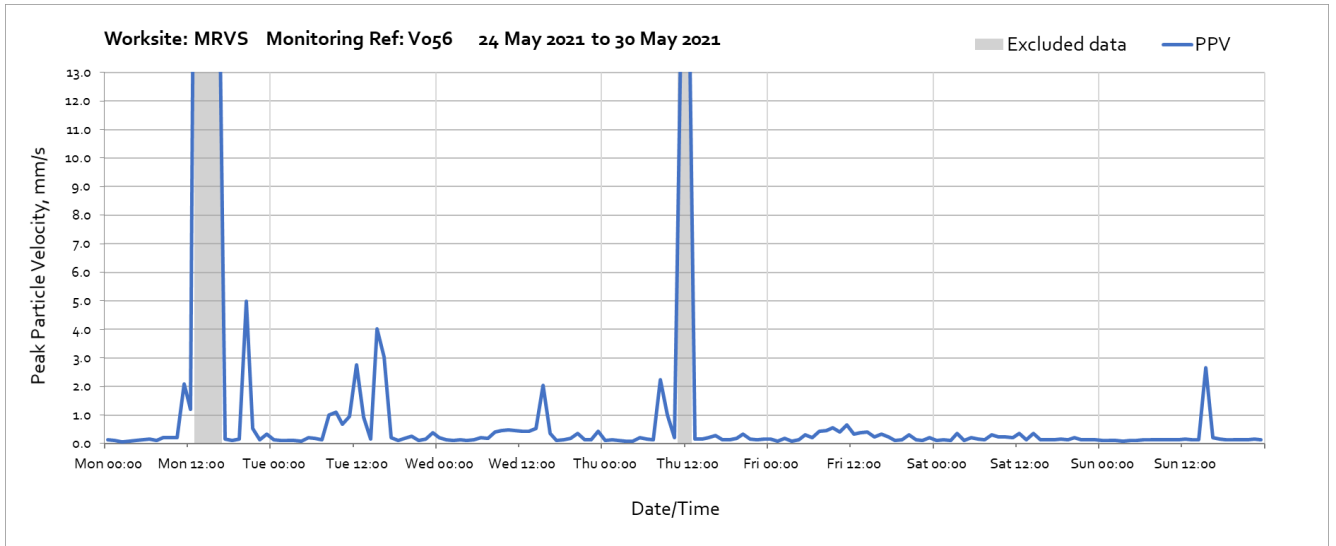
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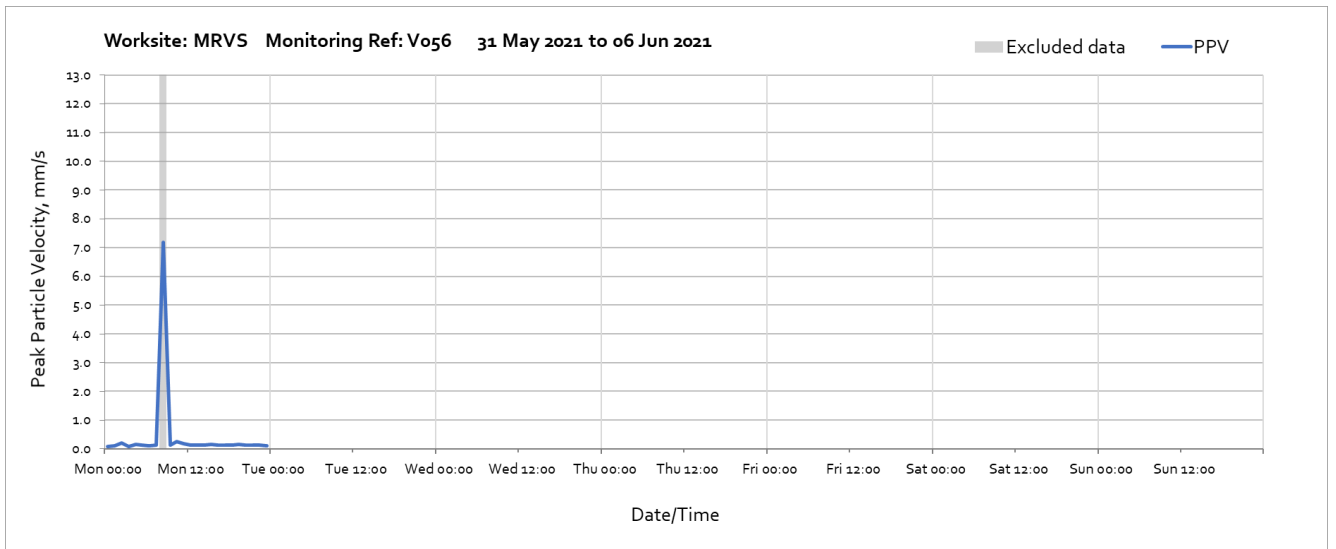
Note: High vibration levels measured across the week were due to excavation works being undertaken in proximity to the monitor and are not representative of HS2 construction vibration levels at the location of nearby receptors.



Note: High vibration levels measured at 11:00 on Friday 21st May 2021 were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.

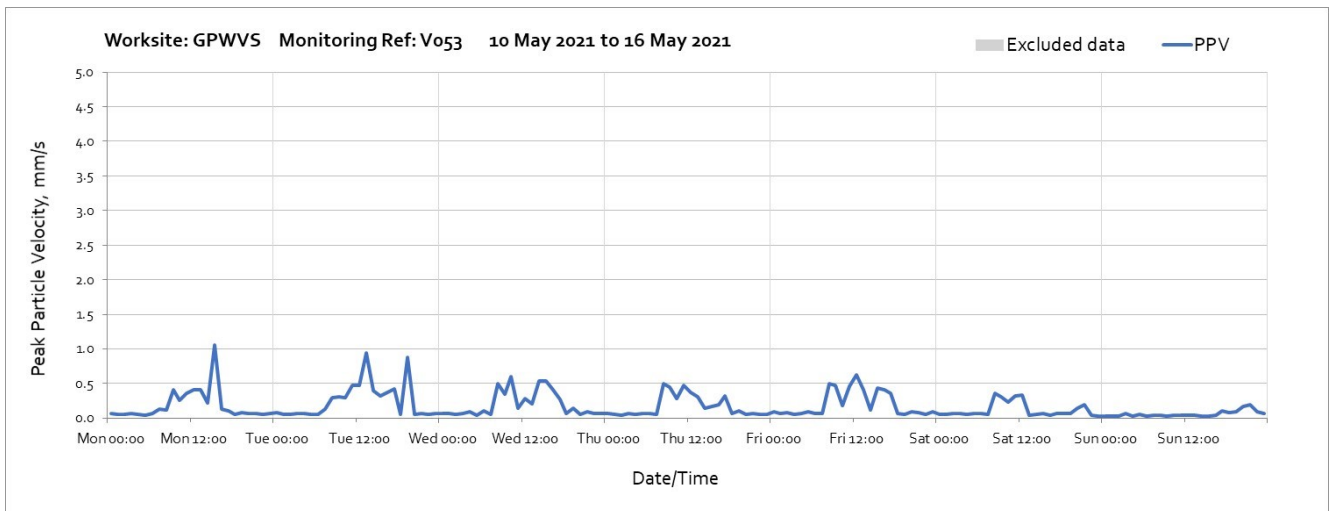
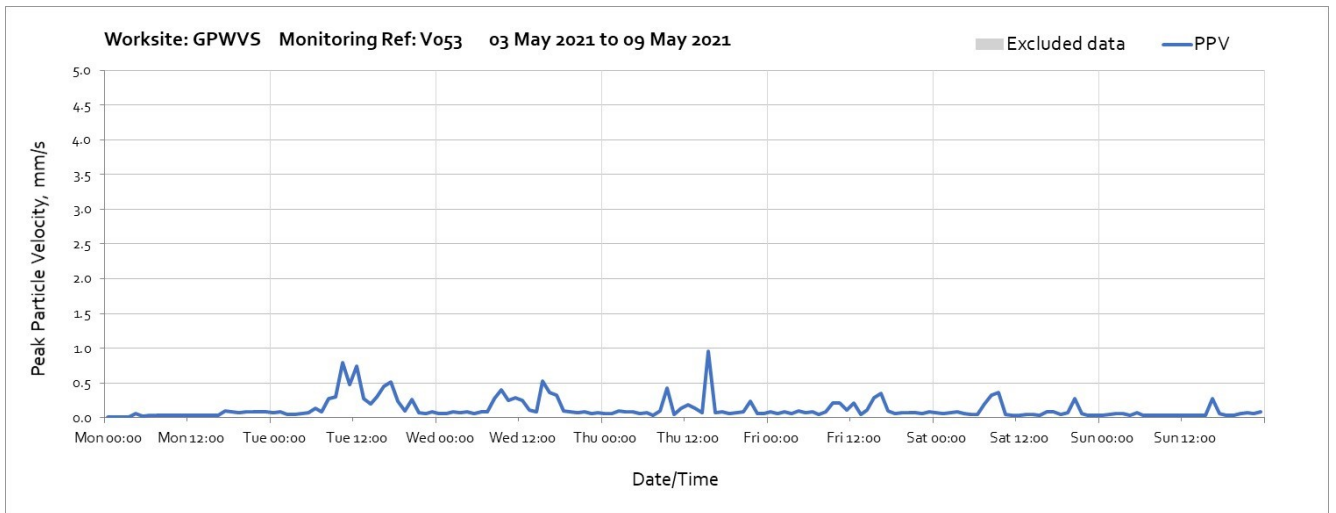
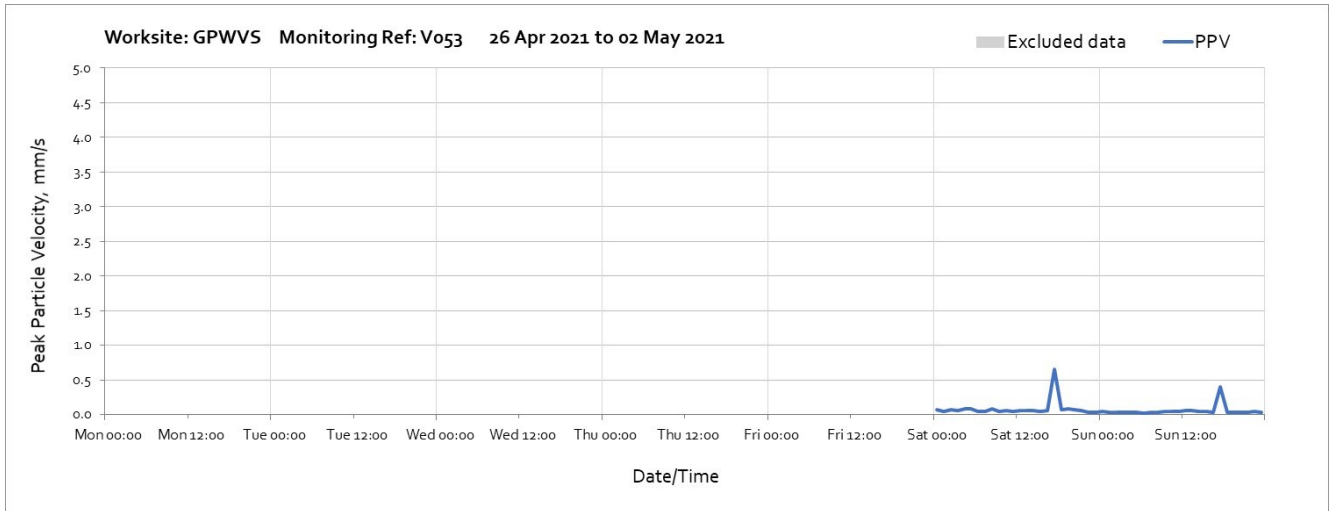


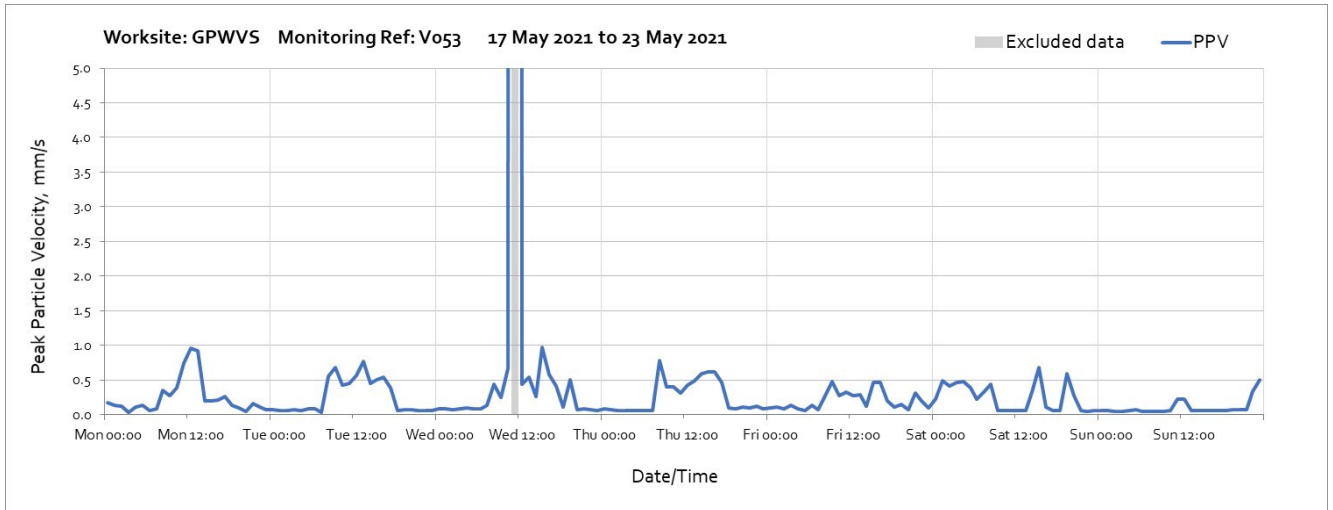
Note: High vibration levels measured between 13:00 and 17:00 on Monday 24th May 2021 and between 11:00 and 13:00 on Thursday 27th May 2021 were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.



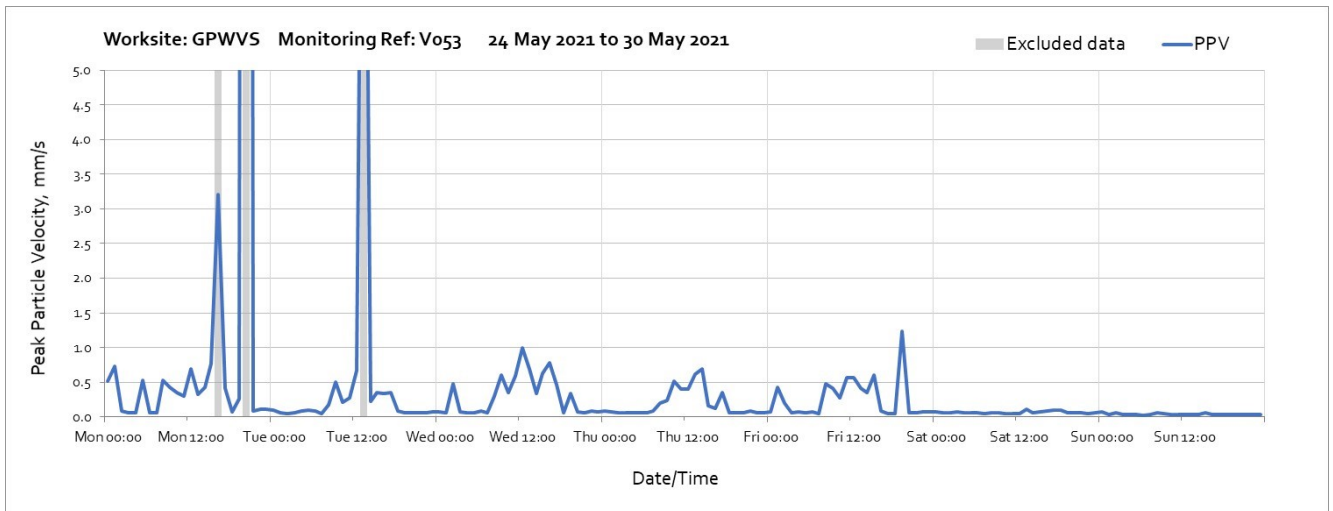
Note: High vibration levels measured at 08:00 on Monday 31st May 2021 were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.

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

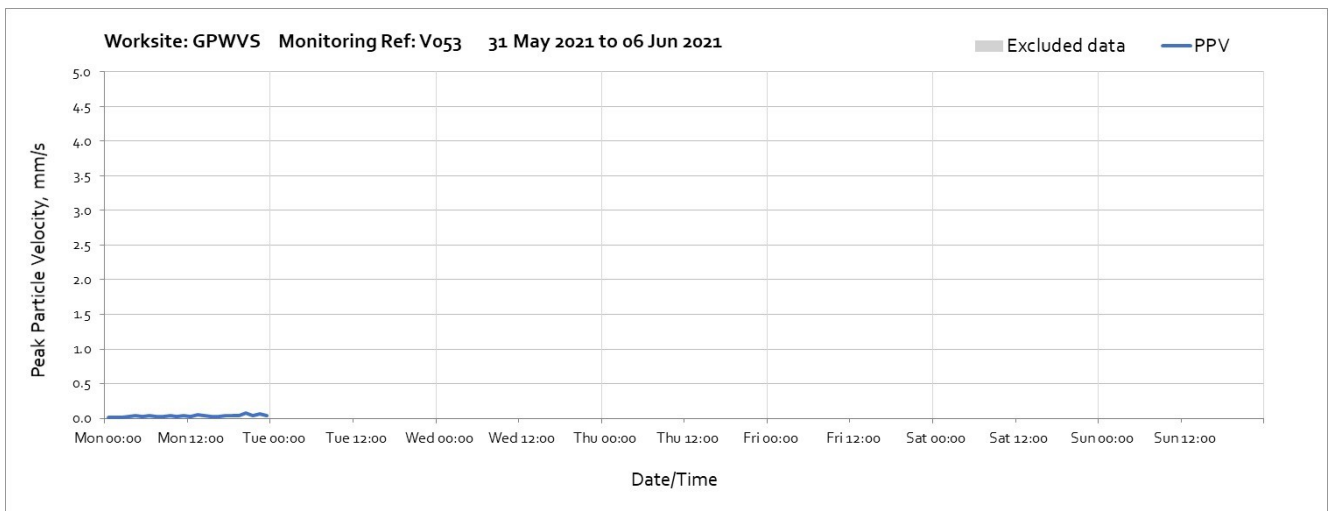




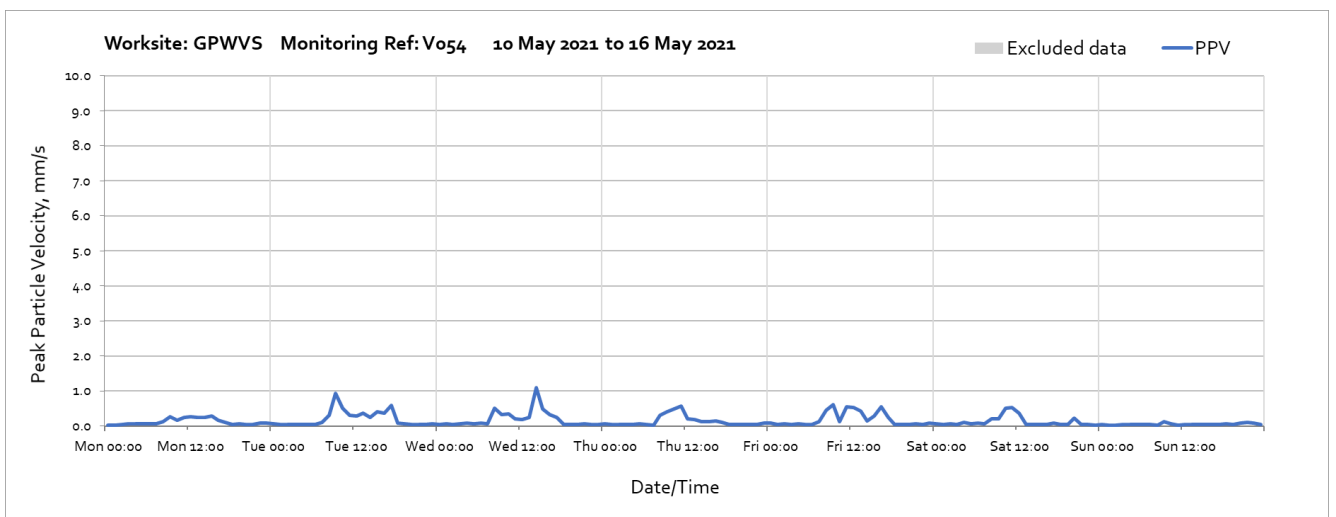
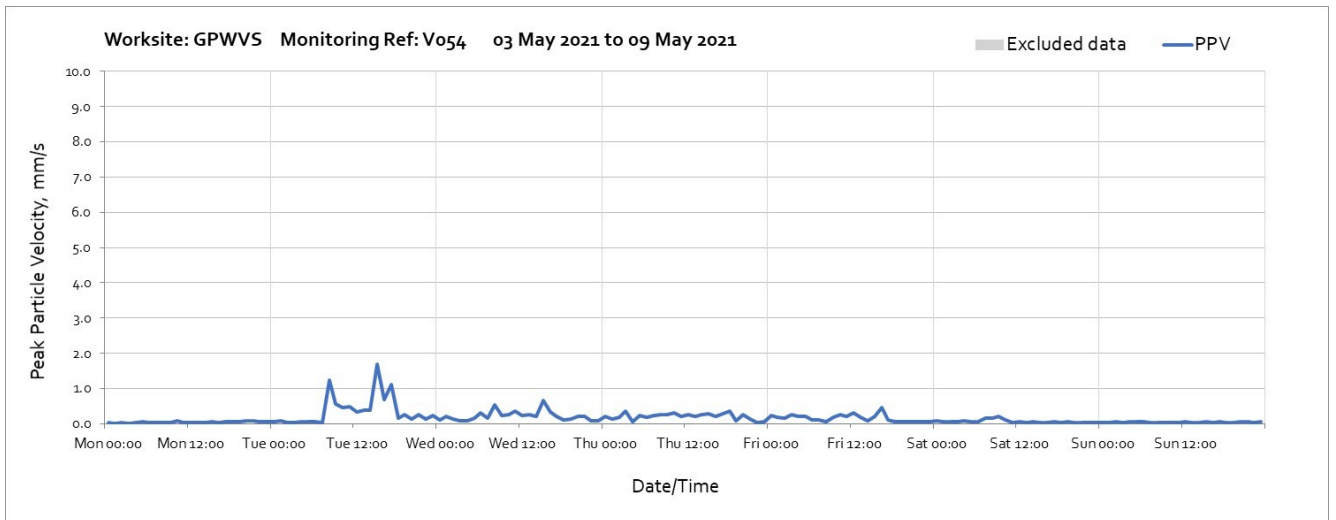
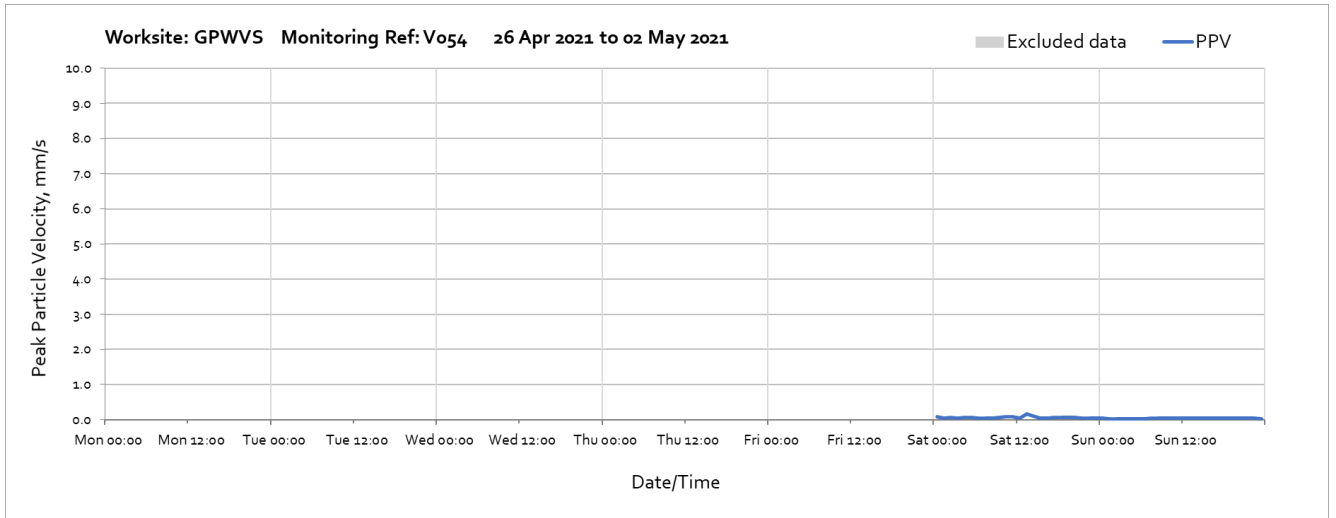
Note: High vibration levels measured at 11:00 on Wednesday 19th May 2021 were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.

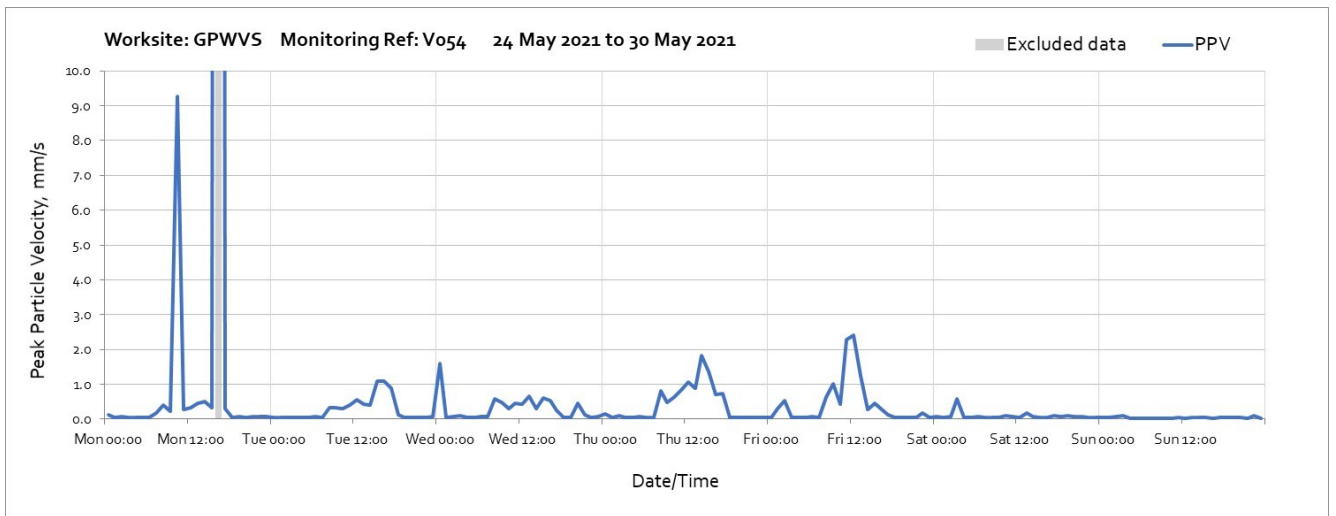
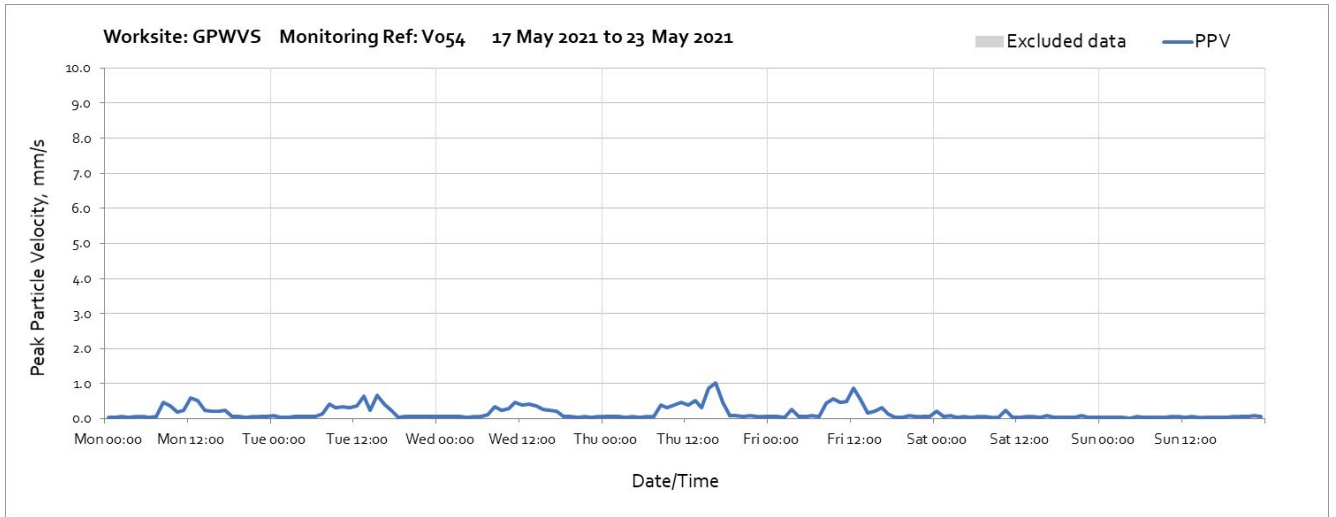


Note: High vibration levels measured at 16:00 and 20:00 on Monday 24th May 2021, at 13:00 on Tuesday 25th May 2021 and at were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.



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





Note: High vibration levels measured at 10:00 on Monday 24th May 2021 were due to works being undertaken in proximity to the monitor location and high vibration levels measured at 16:00 on Monday 24th May 2021 were due to local disturbance at the monitor location and are not representative of HS2 construction vibration levels at the location of nearby receptors.

