

Construction Noise and Vibration Monthly Report – April 2022

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	8
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 April 2022.

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 roads, construction of ramps, construction of platform, installation of staircase, conveyor works, installation of reinforcement steel and framework erection and slab pouring were underway.
- Noise and vibration monitoring were undertaken in the vicinity of the Willesden EuroTerminal worksite (ref. WET), where deliveries and removal of waste, joint sealing works, manholes and asphaltting, hoarding works, gas testing and pipe removal works, conveyor works, haul road repair works, vegetation clearance, utility installations and gantry foundation works were underway.
- Noise monitoring was undertaken in the vicinity of the Victoria Road Crossover Box worksite (worksite ref. VRCB), where:
 - construction of diaphragm wall works, crane assembly and preparation of buttress cages installations were underway.
 - At the Victoria Road Ancillary Shaft, shaft installation works, waterproofing, concrete drilling works erection of scaffolding and installation of reinforcement material in tunnelling opening were underway.
- Noise monitoring was undertaken in the vicinity of the Flat Iron compound (worksite ref. FIC), where installation diaphragm walls, set up od power supply, earthing and welding tents, buttress bed enabling works, brickwork repairs, concrete pouring and excavation works were underway.
- Noise and vibration monitoring were undertaken in proximity of the Old Oak Common depot worksite (ref. OOC), where excavations, concrete works, haul road construction, drainage installations, wall stabilisation works, piling works, concrete breaking out, conveyor erection works, and construction of slab foundations were underway.
- Noise monitoring was undertaken in proximity of the Mandeville Road Ventilation Shaft worksite (ref.: MRVS), where piling works and excavations works were underway.
- Noise and vibration monitoring were undertaken in proximity of the Green Park Way Ventilation Shaft worksite (ref. GPWVS), where concrete works, clamps installation, road sweeper works, grouting and drilling works, chalk wells and piezometer installations, delivery of pre-cast concrete storage bin units, installation

of retaining walls and waterproofing works, removal of well casing, vegetation clearance, surveys, concrete works, installation of fencing track lifting and packing were underway.

- Noise monitoring was undertaken in proximity of the Westgate Ventilation Shaft (ref. WVS), where installation of concrete lines and power cable, tunnelling and ventilation works, installation wastewater pipe and site set up works for hydro-demolition were undertaken.

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

- Atlas Road Sub-Station where power utility works were underway; and
- Wormwood Scrubs where concrete pours, pipe laying and segment installation 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 five (5) 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.

Nine (9) 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 +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 April 2022.

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 laying reinforcement and concrete pours;
 - Construction works of launch ramp, including pile trimming, steel fixing, shuttering, concreting works, excavations, drainage and manholes installation and installation of beams and props;
 - Construction of granular working platform and walkway;
 - Installation of staircase;
 - Conveyor works, including snagging works, installation of bridges and framework, excavation and plate bearing tests;
 - Installation of reinforcement steel and formwork erection; and

- Slab pouring.
- Willesden EuroTerminal worksite, ref. WET (see plan 5 in Appendix A), where work activities included:
 - Deliveries and removal of waste;
 - Joint sealing works to the segment storage area;
 - Manholes and asphaltting works;
 - Hoarding works;
 - Gas testing works, including pipe removal;
 - Conveyor works, including shuttering works, steel works, reinforcement cage, installation of edge protection and bridge segments;
 - Works to the gantry foundations, including asphalt breaking out and concrete works and repairs to the site haul road;
 - Haul Road repair works, including installation of kerbs, concrete breaking, and laying reinforcement to re-concrete;
 - Vegetation clearance;
 - Gantry foundation works including excavation and backfilling works; and
 - Utility installations.
- Victoria Road Crossover Box worksite, ref. VRCB (see plan 6 in Appendix A), where work activities included:
 - Construction of diaphragm wall, including excavation works, installation of cages and concrete works;
 - Preparation works for buttress cages installation, including crane assembly and buttress lifting support; and
 - Victoria Road Ancillary Shaft works comprising bar fixing, secondary lining works, welding and lifting shutter pipe legs, waterproofing works, installation of formworks, concrete drilling, scaffolding works and installation of reinforcement material.
- Flat Iron compound, worksite ref. FIC (see plan 6 in Appendix A), where work activities included:
 - Fabrication area works, including diaphragm walls installation and set up of power supply, earthing and welding tents;
 - Buttress bed enabling works;
 - Excavation works;

- Concrete pouring; and
- Brickwork repairs.
- 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:
 - Excavation and concrete works;
 - Concrete breaking;
 - Haul road construction;
 - Drainage installation;
 - Wall stabilisation works
 - Conveyor erection works;
 - Piling works; and
 - Construction of slab foundations including pipe laying.
- Mandeville Road Ventilation Shaft worksite, reference MRVS (see plan 1 in Appendix A), where work activities included:
 - Installation of steel sheet piles; and
 - Excavation works.
- Green Park Way Ventilation Shaft worksite, reference GPWVS (see plan 2 in Appendix A), where work activities included:
 - Concrete works;
 - Clamps installations;
 - Road sweeper works;
 - Chalk wells and piezometer installations;
 - Grouting works including pre-drilling and drilling works;
 - Removal works;
 - Concrete pouring works;
 - Delivery of pre-cast concrete storage bin units;
 - Installation of retaining walls and waterproofing works;
 - Removal of wall casing;
 - Vegetation clearance;

- Installation of fencing;
- Surveys; and
- Track lifting and packing.
- Westgate Ventilation Shaft worksite, reference WVS (see plan 3 in Appendix A), where work activities included:
 - Installation of wastewater pipe;
 - Hydro-demolition site set up;
 - Installation of concrete lines and power cable; and
 - Tunnelling and ventilation works.

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

- Atlas Road Sub-Station where power utility works were underway; and
- Wormwood Scrubs where concrete pours, pipe laying and segment installation 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 eight (8) vibration monitoring installations were active in April in the LBE area. Table 2 summarises the position of noise and vibration monitoring installations within the LBE area in April 2022.

1.2.2 The vibration monitor at measurement location ref.: V052, worksite ref.: WET was relocated on the 20th April to a more representative location at 63 Stephenson Street as agreed with LBE.

1.2.3 On Tuesday 15th March 2022, the vibration monitor ref.: OOC-V01, worksite ref.: OOC-V01, has been removed as the number of localised events outweighed any activity caused by construction. A more suitable location representative of properties on Wells House Road is being planned.

1.2.4 The noise monitor ref.: N050_temp was temporarily installed at Victoria Crossover Box, worksite.: VRCB, on the 1st April whilst the noise monitor ref.: N050, was offline

due to power supply issues. The power supply has been re-established on the 20th April.

1.2.5 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
	V057	37, Stephenson Street
	V052	63, Stephenson Street
VRCB	N031	School Road, outside Acton Business Centre
	N050	Acton Square, outside North Acton Station
	N050_temp	Victoria Crossover Box
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-V02	Kildun Court, Old Oak Common Lane
	OOC-V03	Wells House Road Alleyway
MRVS	N040	Badminton Close
	N058	Mandeville Road
	N063	Mandeville Road
	V055	Mandeville Road
	V056	Mandeville Road
GPWVS	N059	Green Park Way Ventilation Shaft
	N064	Green Park Way Ventilation Shaft
	V053	Green Park Way, Greenford
	V054	Green Park Way Ventilation Shaft
WVS	N062	Westgate Ventilation Shaft

2 Summary of Results

2.1 Summary of Measured Noise and Vibration Levels

2.1.1 Table 3 presents a summary of the measured noise levels at each monitoring location over the reporting period. The $L_{Aeq,T}$ is presented for each of the relevant time periods averaged over the calendar month, along with the highest single period $L_{Aeq,T}$ that was found to occur within the month.

Table 3: Summary of Measured dB LAeq Data over the Monitoring Period

Worksite Reference	Measurement Reference	Site Address	Free-field or Façade measurement	Weekday Average LAeq,T (highest day LAeq,T)					Saturday Average LAeq,T (highest day LAeq,T)					Sunday / Public Holiday Average LAeq,T (highest day LAeq,T)	
				0700 - 0800	0800 - 1800	1800 - 1900	1900 - 2200	2200 - 0700	0700 - 0800	0800 - 1300	1300 - 1400	1400 - 2200	2200 - 0700	0700 - 2200	2200 - 0700
AR	N032	Shaftesbury Gardens	Free-field	62.8 (65.6)	63.7 (64.9)	62.6 (64.7)	61.7 (65.6)	58.4 (63.3)	61.2 (63.5)	62.4 (63.4)	62.3 (63.2)	62.1 (63.7)	58.2 (62.1)	61.1 (65.9)	57.6 (61.6)
	N033	Outside The Collective, Atlas Road/Victoria Road	Free-field	66.1 (70.5)	68.3 (74.6)	65.1 (70.6)	64.0 (71.9)	60.4 (66.2)	63.4 (64.5)	69.1 (72.1)	63.6 (64.6)	63.5 (68.0)	59.7 (63.0)	63.0 (69.9)	59.4 (64.2)
	N060	Atlas Road next to Bashey Road	Free-field	55.6 (62.2)	65.3 (71.6)	52.5 (60.5)	56.6 (70.3)	54.3 (65.9)	54.8 (61.1)	57.6 (62.2)	53.4 (60.3)	54.5 (66.7)	48.6 (57.4)	50.8 (56.1)	51.6 (60.6)
WET	N034	Stephenson Street (north)	Free-field	53.3 (56.8)	57.0 (63.4)	55.2 (61.2)	53.6 (61.2)	48.0 (58.9)	51.5 (54.2)	54.6 (55.9)	53.2 (56.4)	53.4 (57.5)	45.1 (54.6)	52.6 (59.2)	45.7 (52.1)
	N035	Stephenson Street (south)	Free-field	53.8 (57.8)	56.4 (61.5)	51.7 (57.7)	50.5 (55.0)	47.9 (55.3)	53.0 (54.9)	53.7 (55.8)	50.4 (55.1)	51.1 (55.5)	45.9 (54.1)	49.6 (55.2)	46.0 (52.9)
	N041	Junction of Stephenson Street/Goodhall Street	Free-field	54.6 (57.3)	60.5 (69.9)	56.0 (62.4)	54.7 (59.9)	49.9 (57.3)	53.5 (55.3)	56.8 (61.4)	55.8 (60.7)	55.3 (62.8)	49.2 (54.9)	57.0 (74.4)	49.4 (56.4)

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	59.5 (63.7)	62.2 (69.5)	60.5 (66.2)	58.5 (69.0)	54.3 (72.8)	55.7 (59.0)	58.6 (60.5)	59.5 (61.3)	59.1 (61.5)	52.9 (59.4)	56.7 (59.9)	52.3 (57.9)
	N050	Acton Square, outside North Acton Station	Free-field	65.0 (67.4)	67.1 (78.6)	62.9 (64.6)	62.6 (64.5)	59.0 (66.7)	63.7 (63.8)	63.9 (64.8)	62.8 (63.3)	62.4 (63.2)	60.3 (61.9)	62.8 (69.0)	58.4 (63.1)
	N050_temp	Victoria Crossover Box	Free-field	57.9 (64.4)	64.3 (70.8)	58.9 (74.9)	55.7 (68.0)	54.5 (63.1)	56.2 (58.5)	63.5 (69.6)	54.6 (57.0)	54.5 (56.9)	53.9 (57.5)	54.2 (56.7)	53.6 (56.7)
FIC	N029	Braitrim House, Victoria Road	Free-field	51.8 (59.6)	59.8 (66.2)	52.2 (58.0)	55.6 (65.4)	53.5 (67.1)	52.8 (59.3)	54.7 (57.4)	52.8 (60.0)	52.2 (62.1)	49.8 (61.6)	48.4 (53.1)	50.0 (62.2)
	N042	Bodens car park	Free-field	57.3 (61.0)	61.2 (66.5)	57.1 (66.6)	55.5 (65.6)	53.7 (59.3)	55.9 (57.7)	60.8 (65.4)	56.6 (63.2)	55.8 (61.7)	54.3 (61.8)	54.2 (59.0)	53.0 (56.9)
	N049	Flat Iron compound	Free-field	57.7 (63.2)	63.2 (73.5)	55.9 (62.5)	57.5 (68.8)	59.3 (74.7)	56.8 (61.5)	58.7 (61.0)	54.2 (57.0)	54.0 (60.2)	53.6 (65.5)	53.0 (60.1)	54.0 (61.1)
OOC	OOC-N01	Old Oak Common Lane	Free-field	64.6 (66.7)	70.9 (73.8)	64.0 (68.1)	62.1 (68.7)	58.5 (68.8)	62.3 (65.0)	67.8 (72.7)	62.7 (65.6)	62.7 (71.7)	59.5 (65.3)	61.6 (67.3)	58.2 (63.9)
	OOC-N02	Old Oak Common Lane, Hilltop Works	Free-field	67.2 (70.0)	71.3 (76.4)	67.6 (70.5)	66.1 (69.8)	62.4 (69.4)	64.6 (65.5)	67.7 (70.1)	66.5 (68.0)	66.5 (73.4)	62.2 (68.1)	64.7 (68.9)	61.2 (64.8)
MRVS	N040	Badminton Close	Free-field	53.4 (57.6)	55.5 (60.2)	53.2 (56.9)	53.0 (56.8)	51.2 (66.1)	52.4 (54.1)	52.9 (55.2)	52.7 (59.8)	52.2 (54.2)	50.5 (53.9)	53.8 (69.7)	50.2 (54.5)

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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
	N058	Mandeville Road	Free-field	54.0 (59.5)	66.9 (76.3)	55.3 (70.7)	53.8 (68.7)	50.2 (59.4)	52.0 (54.6)	56.4 (63.8)	53.8 (62.7)	53.2 (65.2)	49.3 (53.8)	52.7 (56.8)	49.5 (55.1)
	N063	Mandeville Road	Free-field	58.4 (66.4)	66.5 (72.5)	57.0 (59.8)	57.3 (60.8)	54.4 (60.3)	57.2 (59.9)	62.7 (70.8)	55.2 (55.9)	56.7 (60.1)	54.0 (58.3)	56.1 (58.4)	53.9 (58.2)
GPWVS	N059	Green Park Way Ventilation Shaft	Free-field	57.2 (63.6)	62.3 (71.1)	55.0 (65.6)	57.8 (67.2)	54.0 (66.7)	51.3 (54.4)	53.6 (59.8)	52.4 (58.0)	52.6 (64.5)	47.2 (51.8)	50.8 (55.1)	48.5 (52.2)
	N064	Green Park Way Ventilation Shaft	Façade	55.8 (59.4)	60.4 (66.5)	55.9 (62.8)	56.5 (62.3)	53.1 (62.6)	52.6 (54.1)	54.0 (61.5)	52.4 (55.5)	52.3 (57.1)	50.2 (59.3)	54.1 (61.3)	49.5 (55.4)
WVS	N062	Westgate Ventilation Shaft	Free-field	62.5 (70.7)	65.6 (71.3)	59.1 (67.9)	62.5 (69.6)	59.1 (71.4)	56.4 (62.2)	60.1 (63.3)	56.7 (60.8)	55.4 (57.3)	53.9 (58.5)	56.4 (61.1)	54.4 (57.9)

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	63, Stephenson Street	3.96 (Y-axis)
WET	V057	37, Stephenson Street	2.57 (X-axis)
OOC	OOC-V02	Kildun Court, Old Oak Common Lane	1.00 (Z-axis)
	OOC-V03	Wells House Road Alleyway	0.88 (Y-axis)
GPWVS	V053	Green Park Way, Greenford	0.87 (Z-axis)
	V054	Green Park Way Ventilation Shaft	2.34 (Z-axis)
MRVS	V055	Mandeville Road	3.55 (Z-axis)
	V056	Mandeville Road	1.47 (Z-axis)

2.1.3 Appendix C presents graphs of the noise and vibration monitoring data over the month for each of the measurement locations. Noise data presented consists of the hourly L_{Aeq} values and, where relevant, the $L_{Aeq,T}$ values (where the time period T has been taken to be the averaging period as specified in Table 1 of HS2 Information Paper E23). Vibration data presented consist of hourly PPV values. The full data set for the monitoring equipment can be found at the following location:

<https://data.gov.uk/dataset/24542ae7-dd44-444f-b259-871c4cc43b5e/environmental-monitoring-data>.

2.2 Exceedances of the SOAEL

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

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

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

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

Table 5: Summary of Exceedances of SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
AR	N032	Shaftesbury Gardens	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	All days	All periods	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
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
	N050_temp	Victoria Crossover Box	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	Weekdays	0800-1800	1
OOC	OOC-N01	Old Oak Common Lane	All days	All periods	No exceedance
	OOC-N02	Old Oak Common Lane, Hilltop Works	Weekdays	0800-1800	1
MRVS	N040	Badminton Close	All days	All periods	No exceedance

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of SOAEL
	N058	Mandeville Road	Weekdays	0800-1800 1800-1900 1900-2200	2 1 1
	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
FIC	N049	Flat Iron compound	1
OOC	OOC-N02	Old Oak Common Lane, Hilltop Works	1
MRVS	N058	Mandeville Road	3

2.2.6 Five (5) exceedances of the SOAEL were recorded due to HS2 construction works during April 2022. Exceedances occurred at the noise monitor N049 and OOC-N02 during one weekday daytime periods and at N058 during normal core hours and one evening period.

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

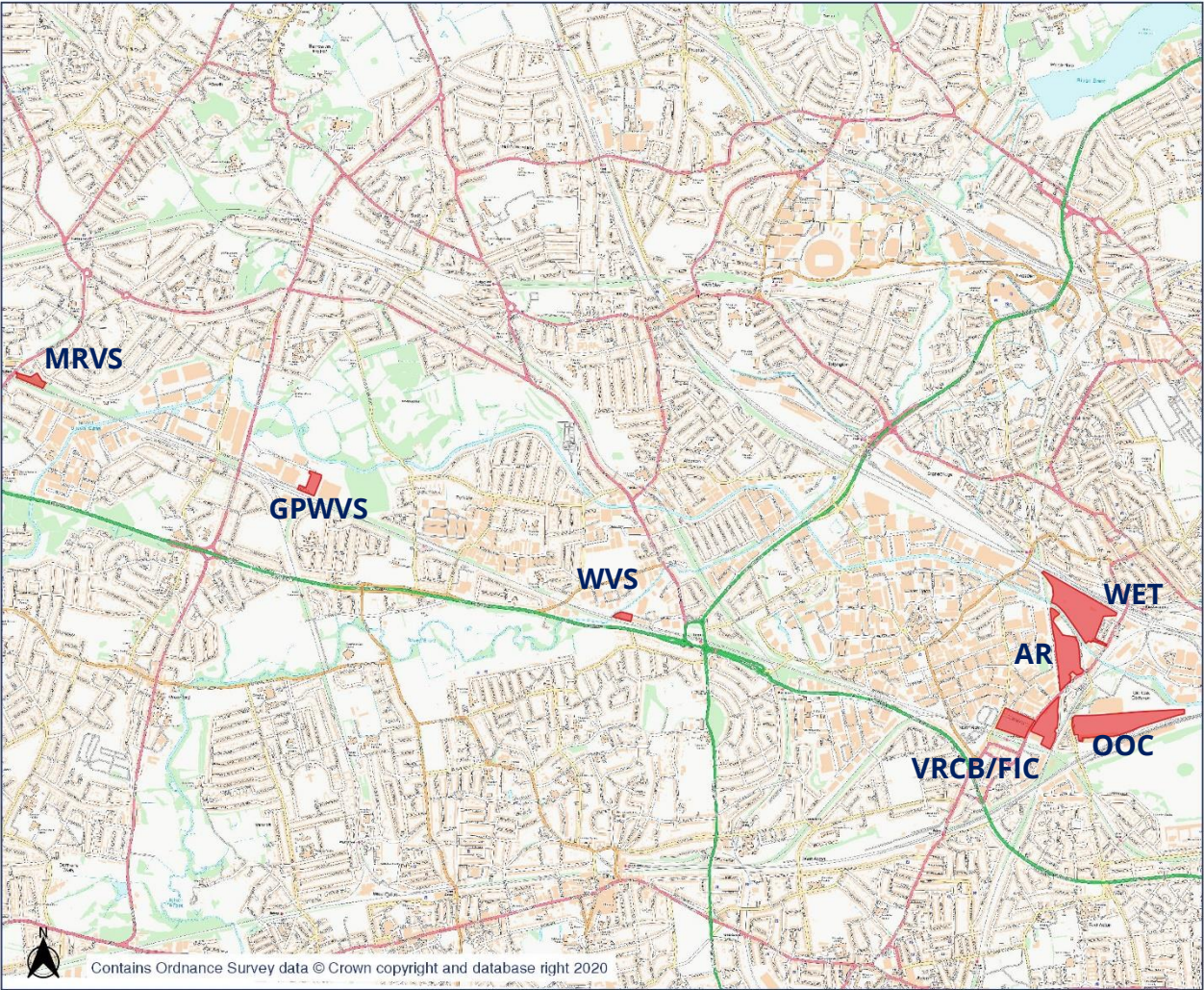
2.4.1 Table 8 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 8: Summary of Complaints

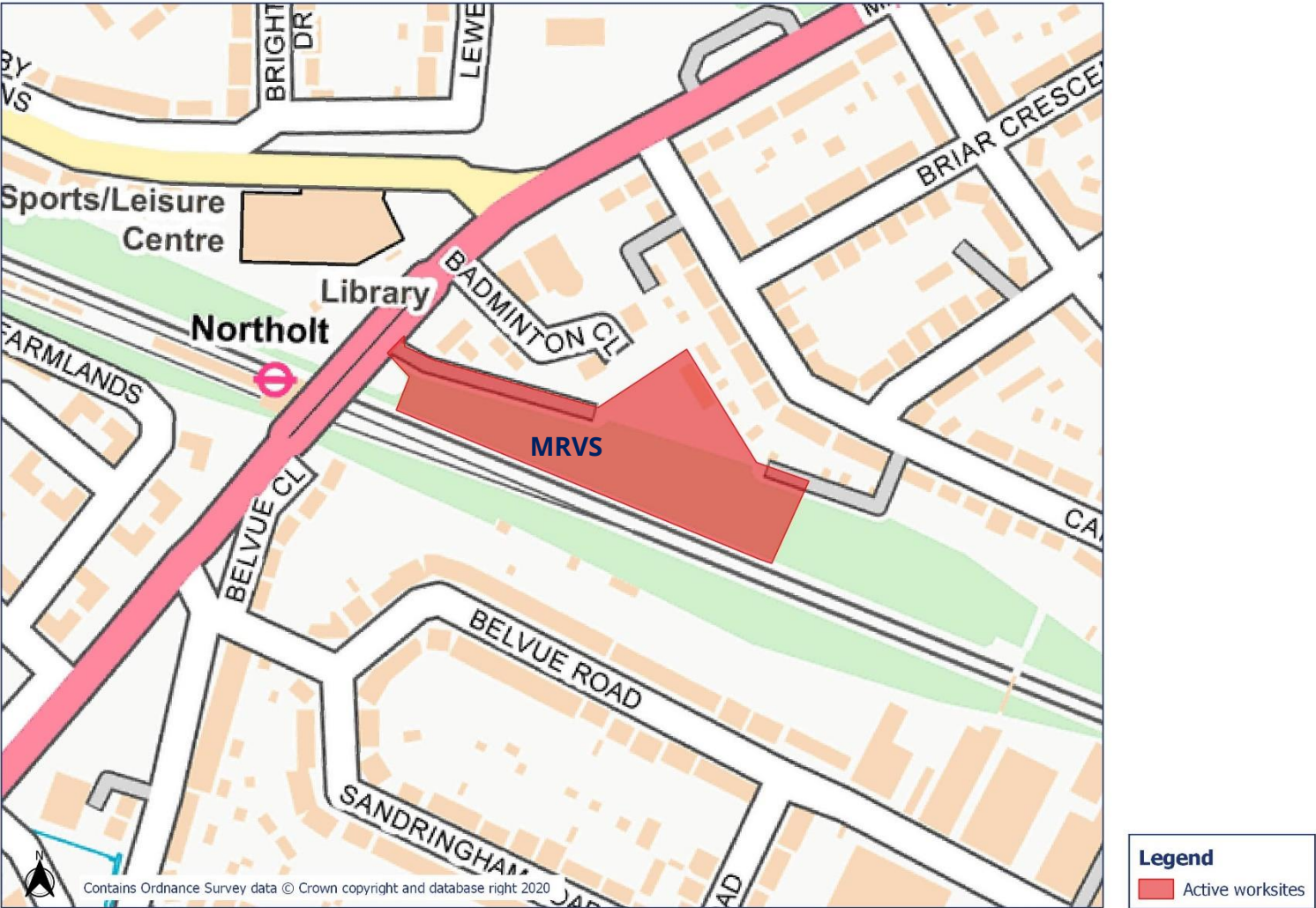
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-22-43506-C	OOO	Complaint due to disturbance from loud music being played by site workers at 7:30pm.	Investigation by site security established that music was from a house near the corner of Wells House Road & Old Oak Common Lane.	No actions taken as it was not site or works related.
HS2-22-43538-C	OOO	Complaint due to noise disturbance from works at site directly opposite property.	The investigation showed that road surface replacement works to reduce dust/noise from vehicles on site were underway. Additional acoustic barriers were used around works to reduce noise impact.	The complainant was informed about works undertaken and mitigation measures.
HS2-22-43565-C	OOO	Complaint about shouting on site just after midnight.	The team from the CCTV footage is currently being identified.	Response is being drafted.
HS2-22-43566-C	OOO	Complaint due to loud angle grinding noise disturbance from site, early on Saturday morning.	The investigation showed that the works taking place were to the pavement slabs by the boundary wall, which is directly behind the resident's property. Acoustic blankets were in place.	The result of the investigation was confirmed to the stakeholder. Following the complaint, a noise enclosure was added.

Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-22-76832-E	WET	The stakeholder enquired that noise and vibration levels at the property should be investigated by HS2.	No works have been taking place at the WET site which would have caused vibration perceptible at the house in question. Works at the WET are taking place in line with S61 and there have been no trigger alerts for noise monitors in Stephenson Street.	Contact made with resident to provide response to enquiry.
HS2-22-75703-E	WET	Complaint due to squealing noise from train movements near Stephenson Street.	Investigation was undertaken and the issue was found to be a fault with wheel flange lubrication equipment (greasing guns) which was rectified.	Site logistics team to carry out an inspection of the railway tracks at the throat to the WET sidings to see if any track defects are causing squeal. Response made to resident to clarify results of investigation.
HS2-22-76701-E HS2-22-76762-E	OOO	Complaint about vibration and loud noise coming from the worksite. The complainant asked about a monitor being placed at the property.	Investigations shown that the high vibration levels were caused by concrete breaking works outside the worksite office.	Response is being drafted. Noise monitoring is being proposed.
HS2-22-76817-E-C	OOO	Complaint about noise from whistles and car horns coming from the site.	Investigations showed that the whistle noise came from the box when materials were being lowered or lifted.	The resident was informed of the results of the investigation. The site teams have been briefed about using the horn on their vehicles for emergency use only.

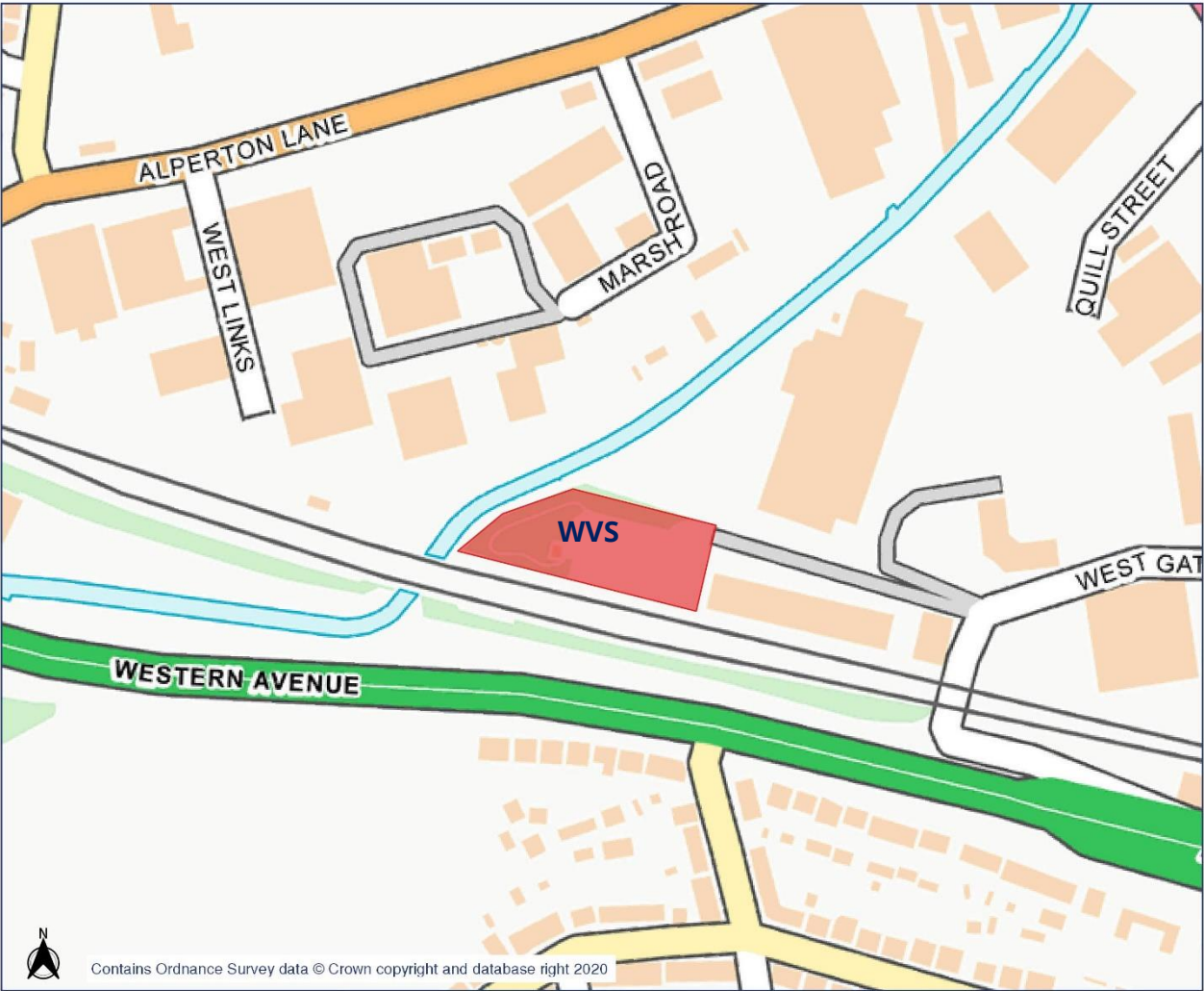
Appendix A Site Locations

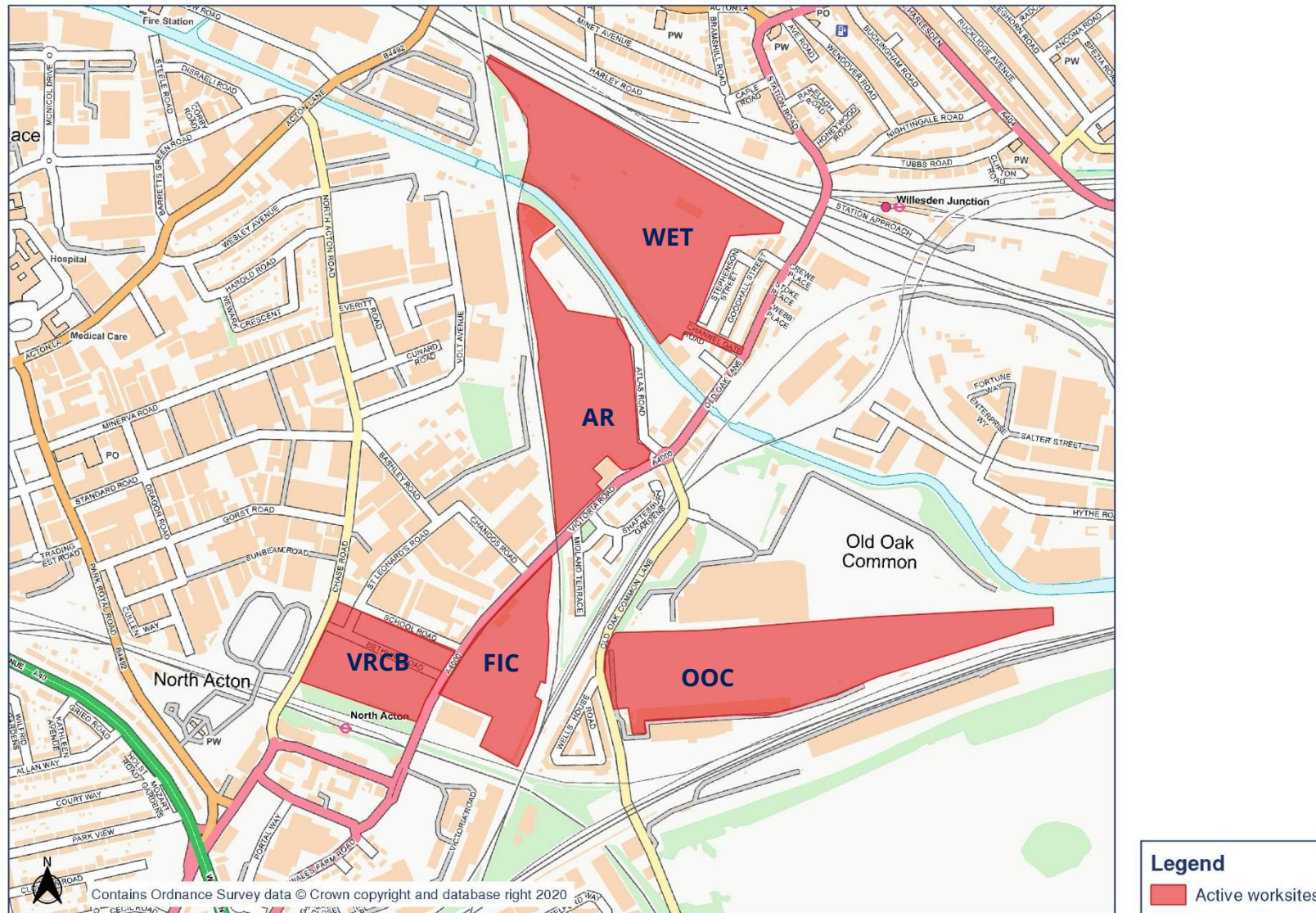


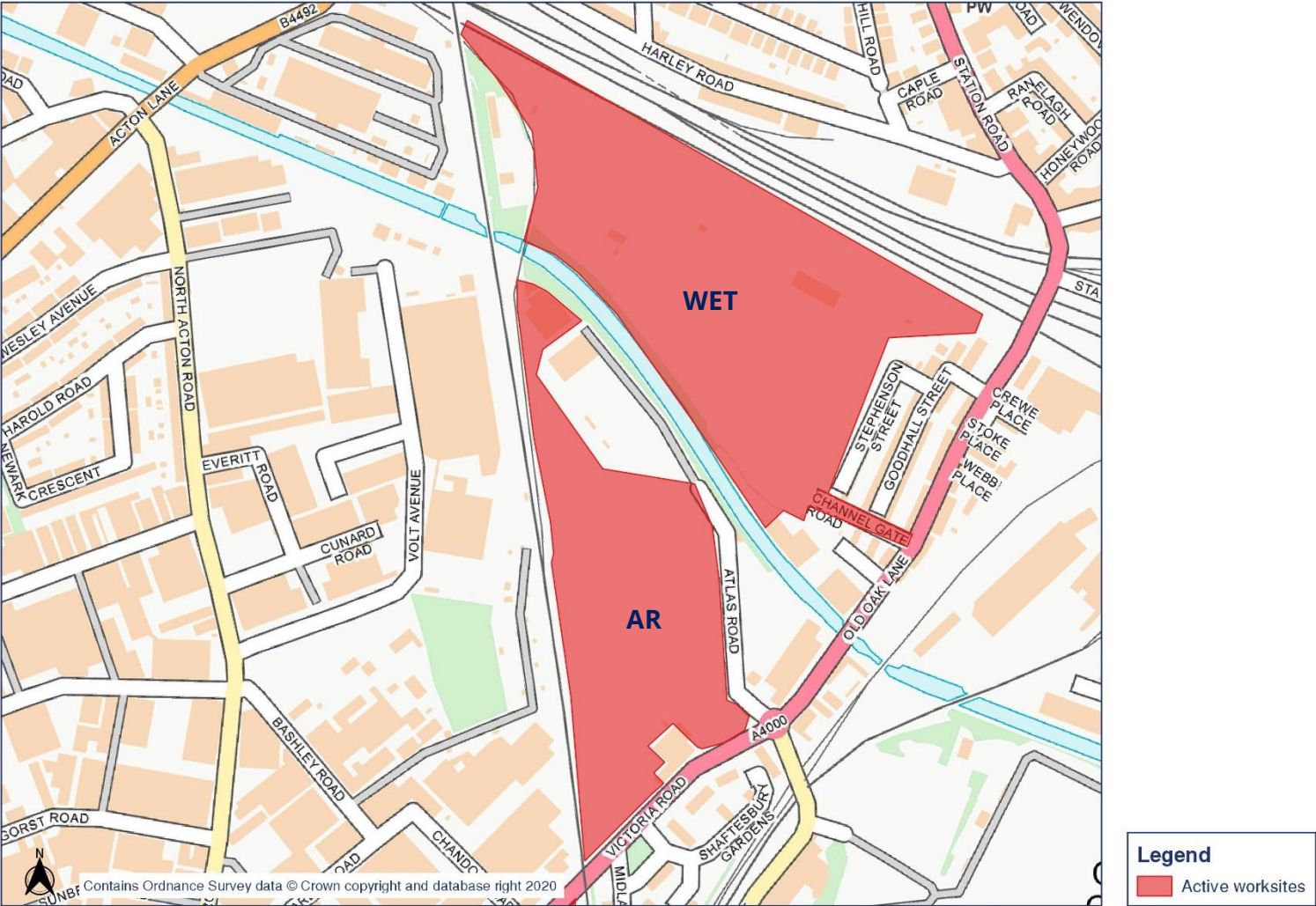
Legend
Active worksites

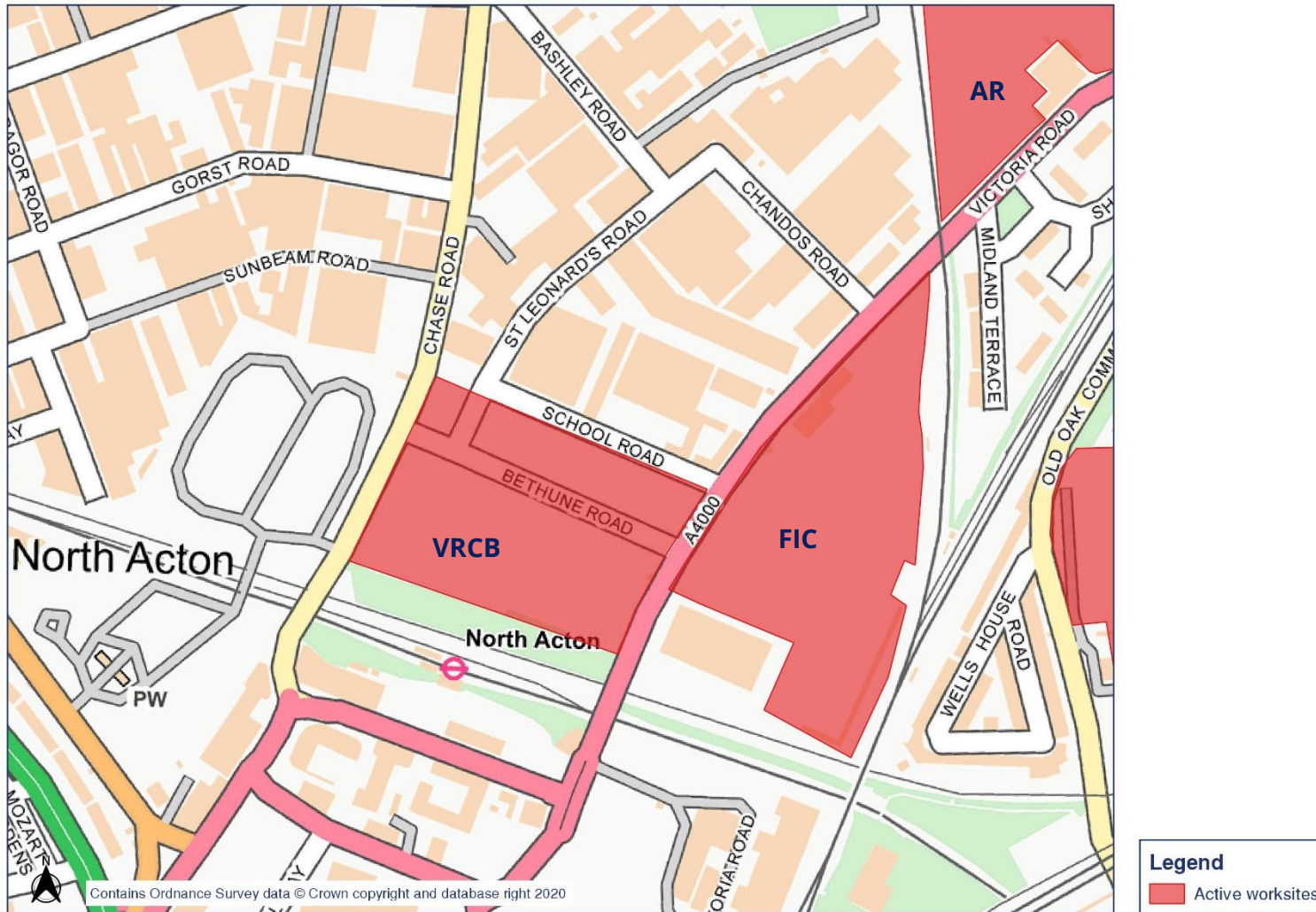


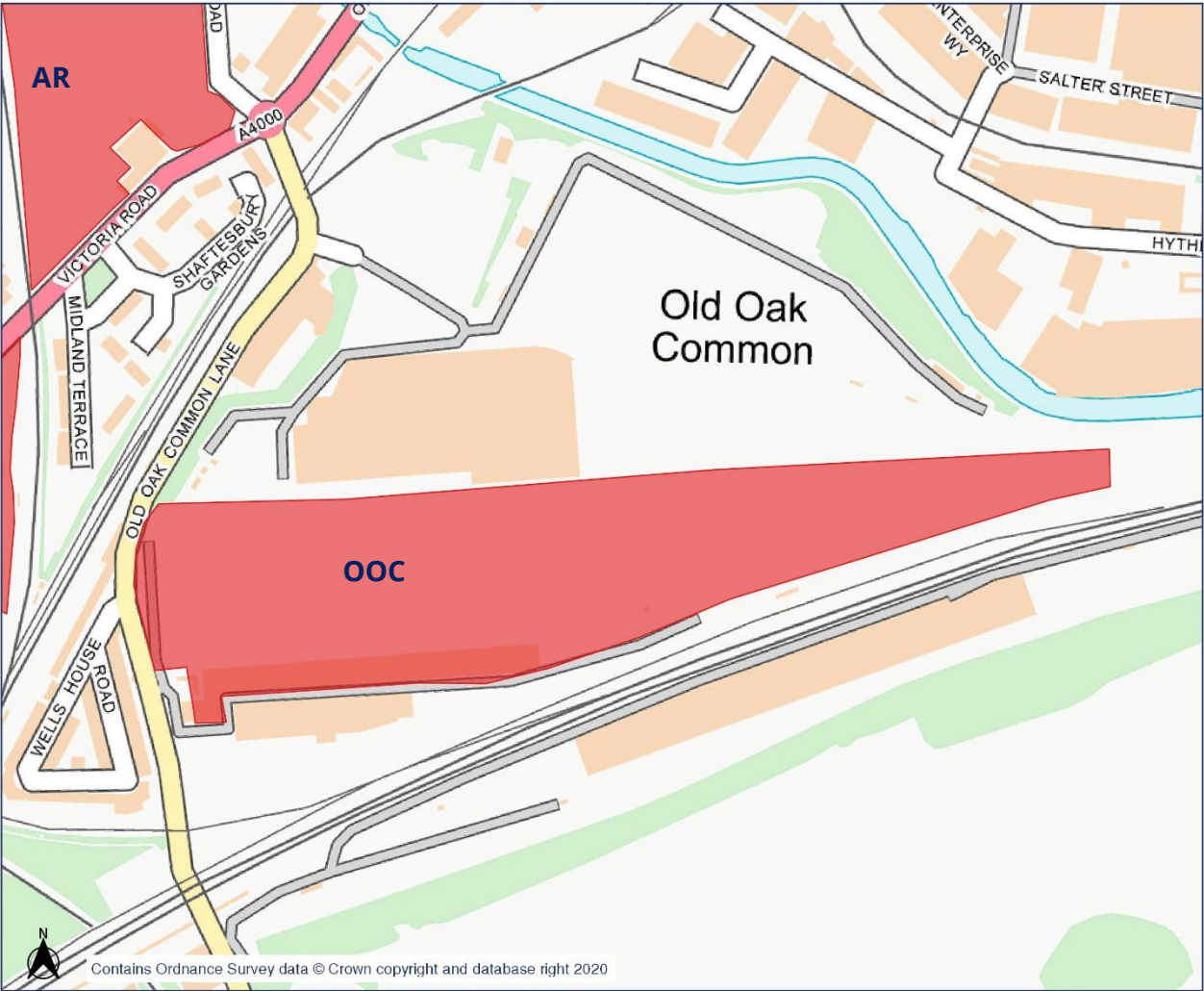






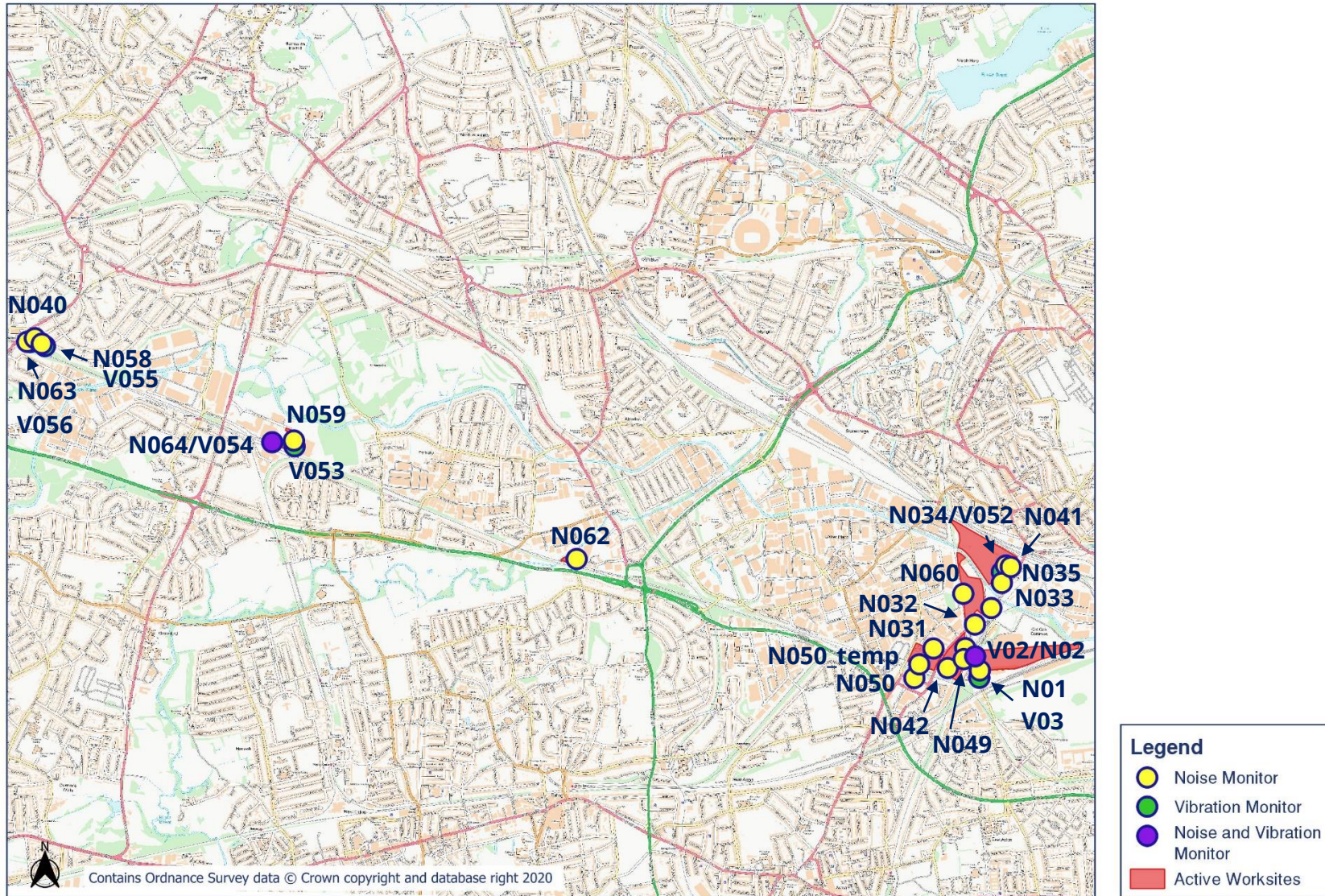


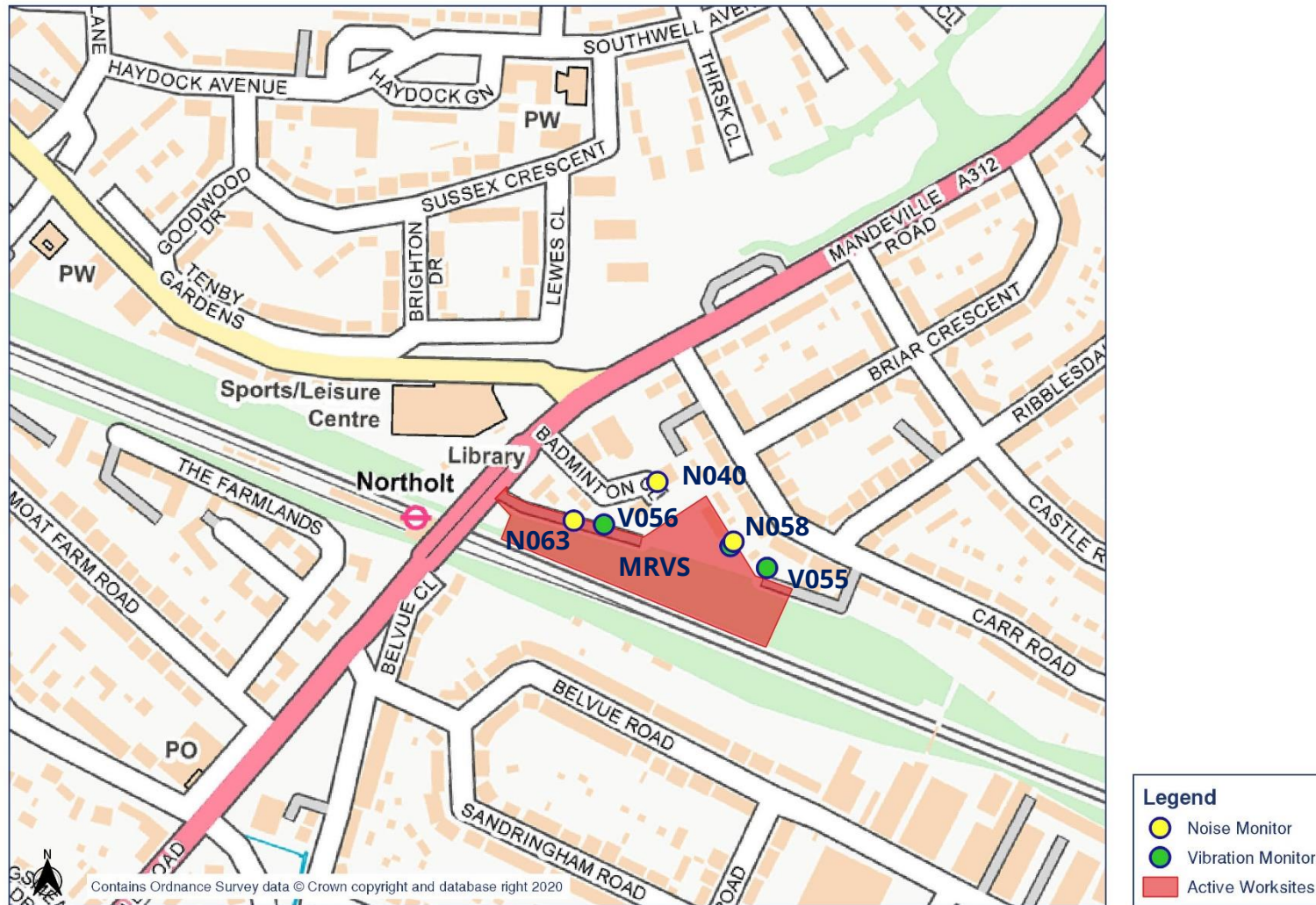


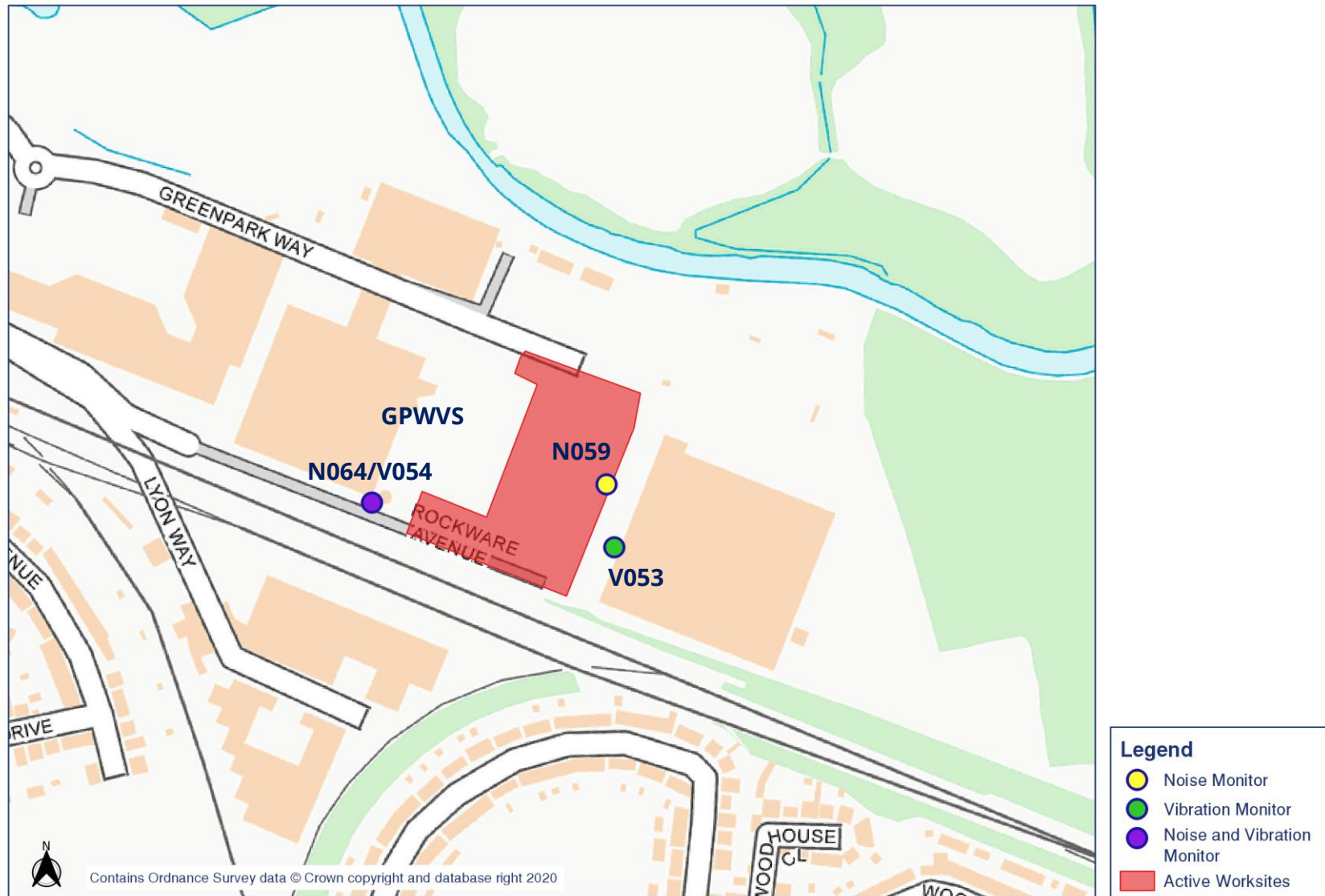


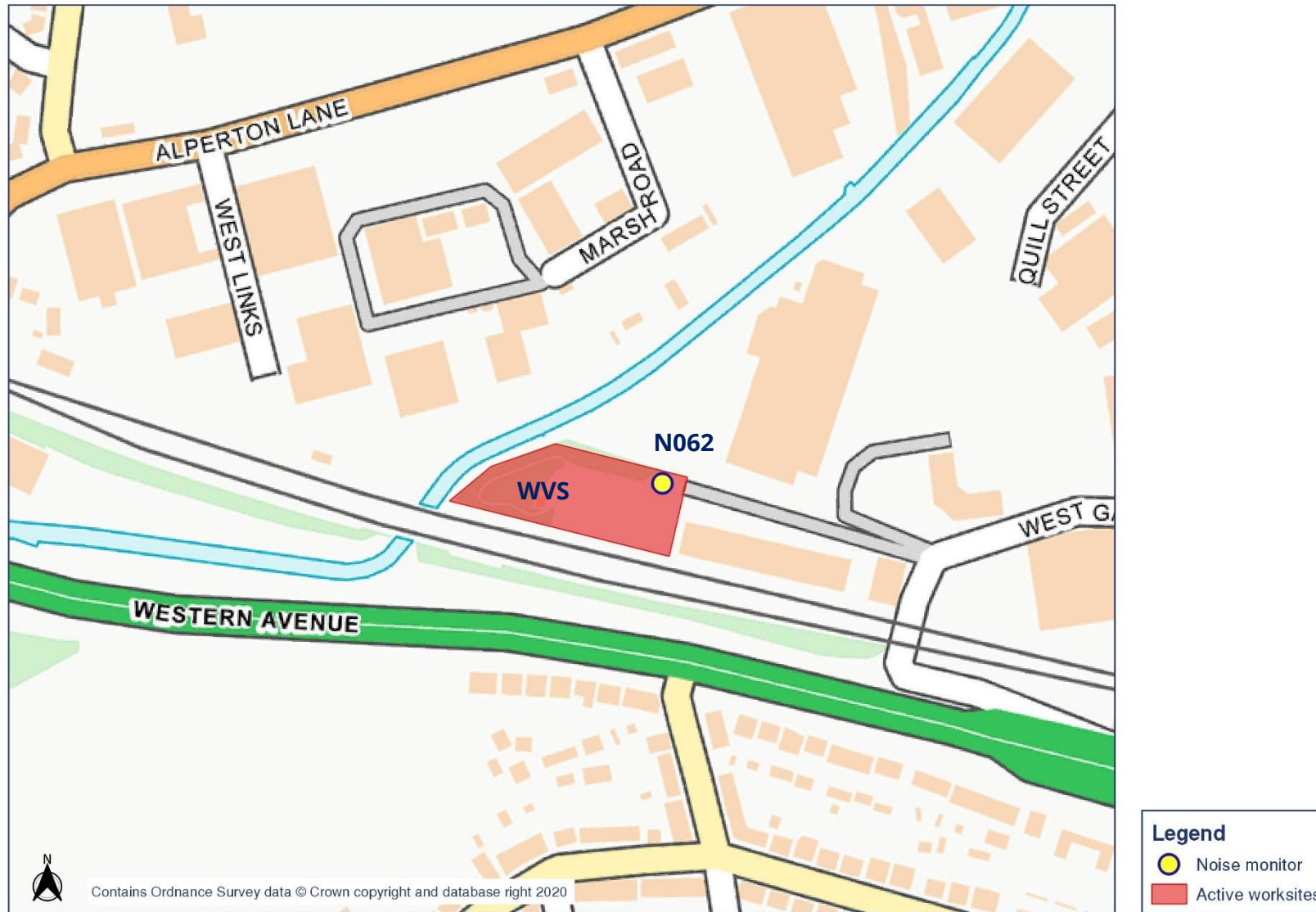
Appendix B Monitoring Locations

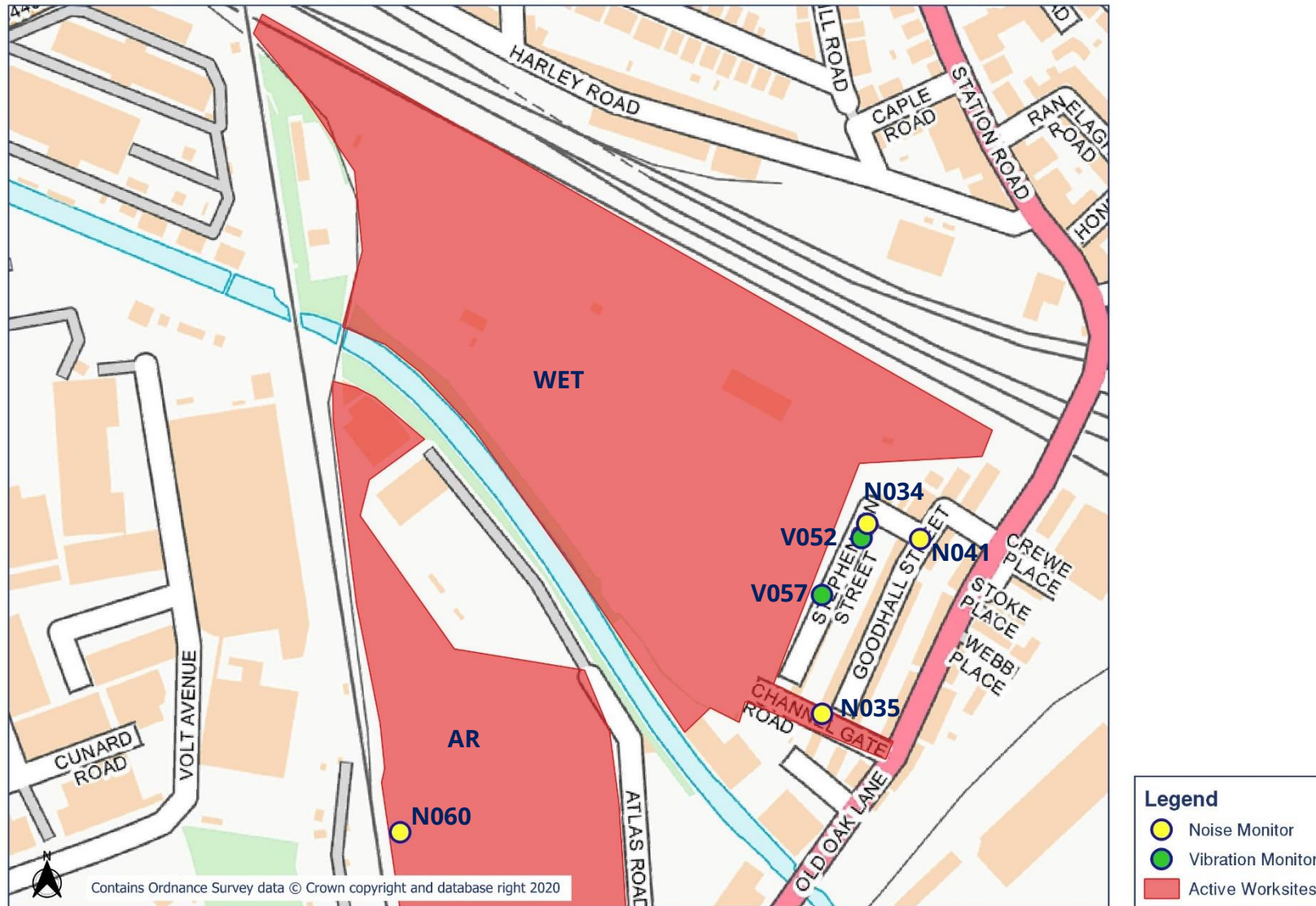
HS2 Noise and vibration monitoring plan - Overview

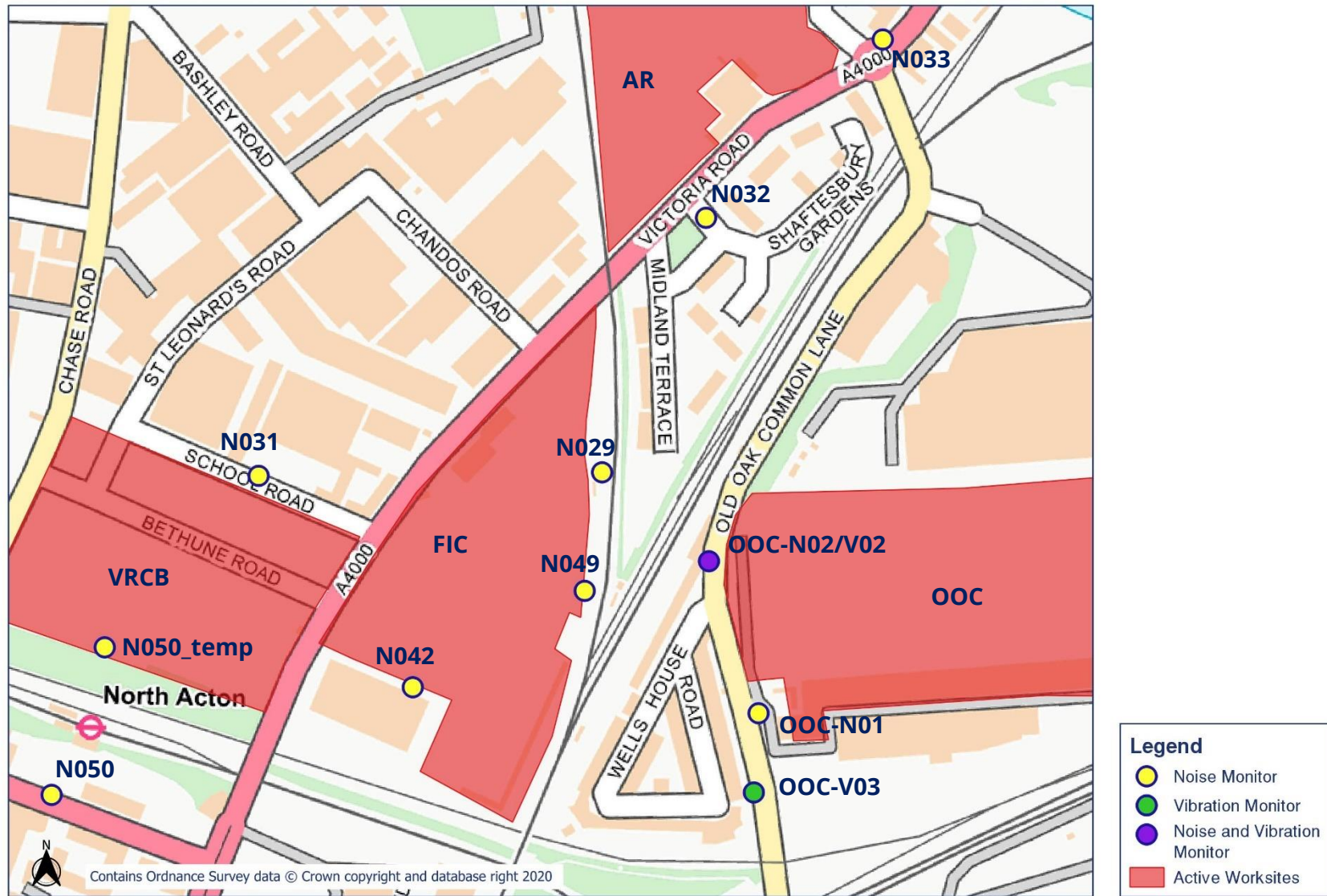










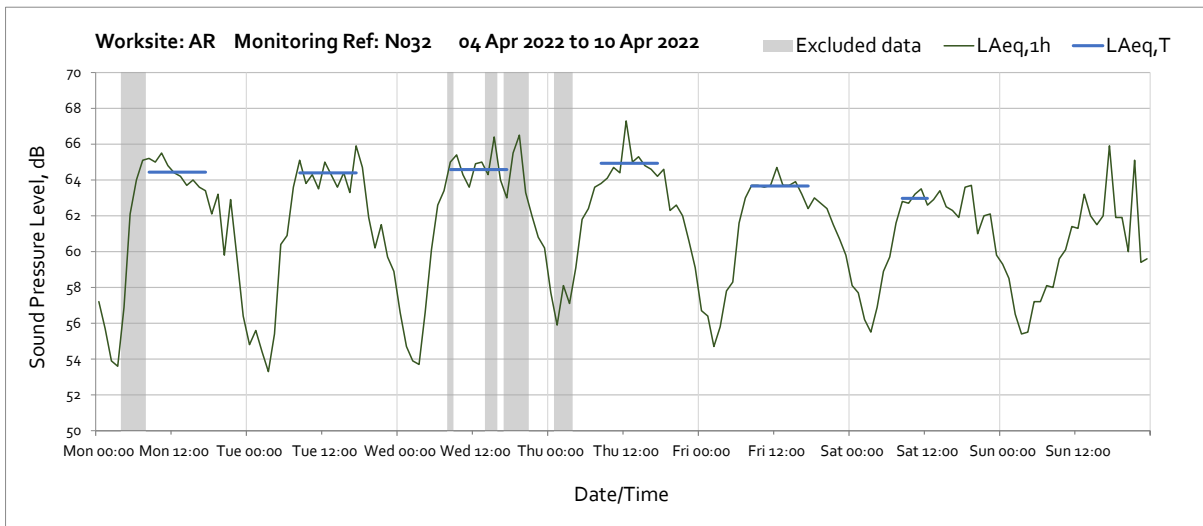
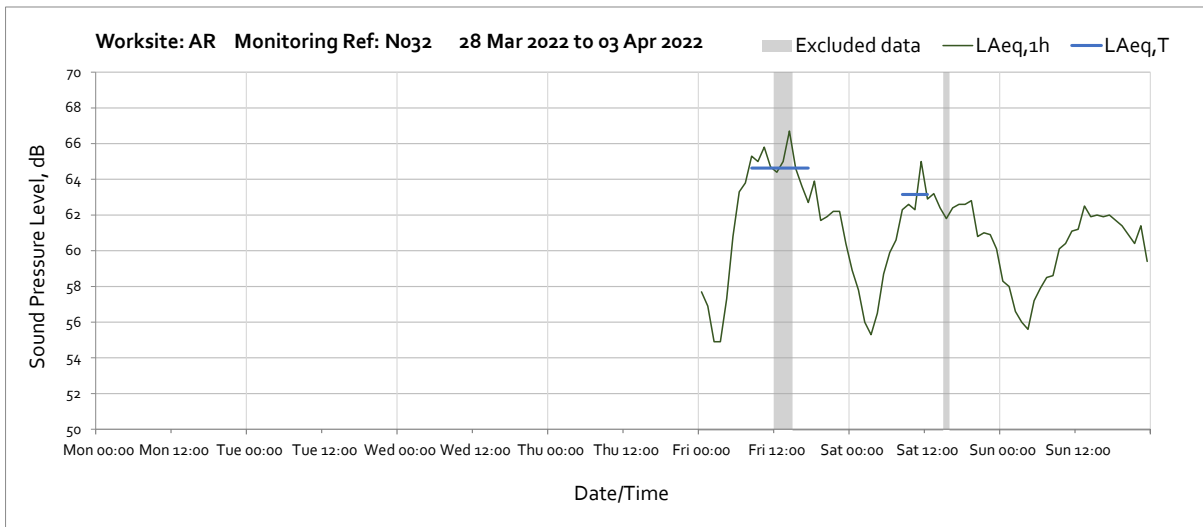


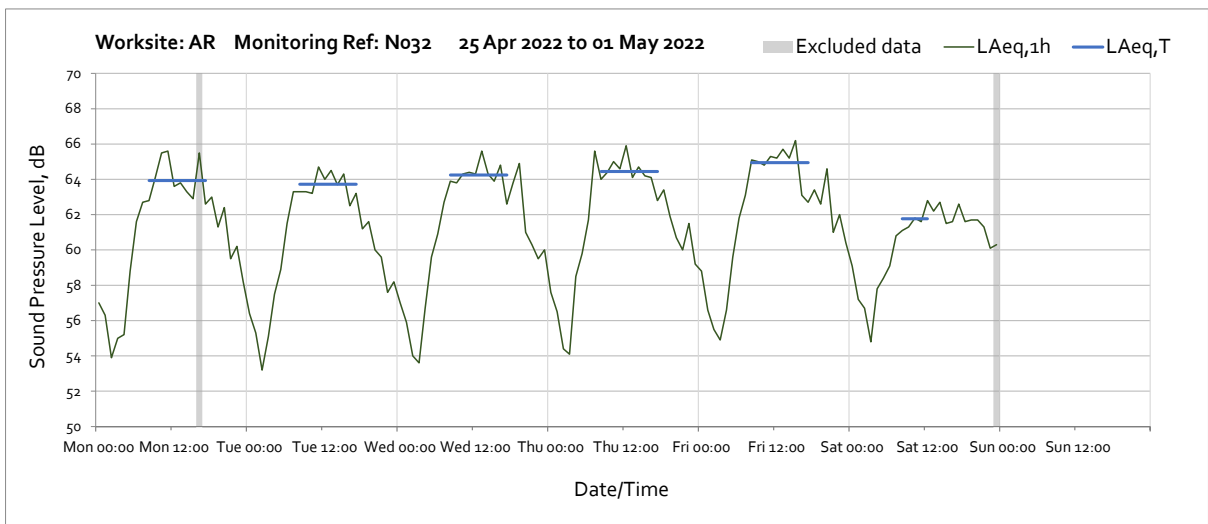
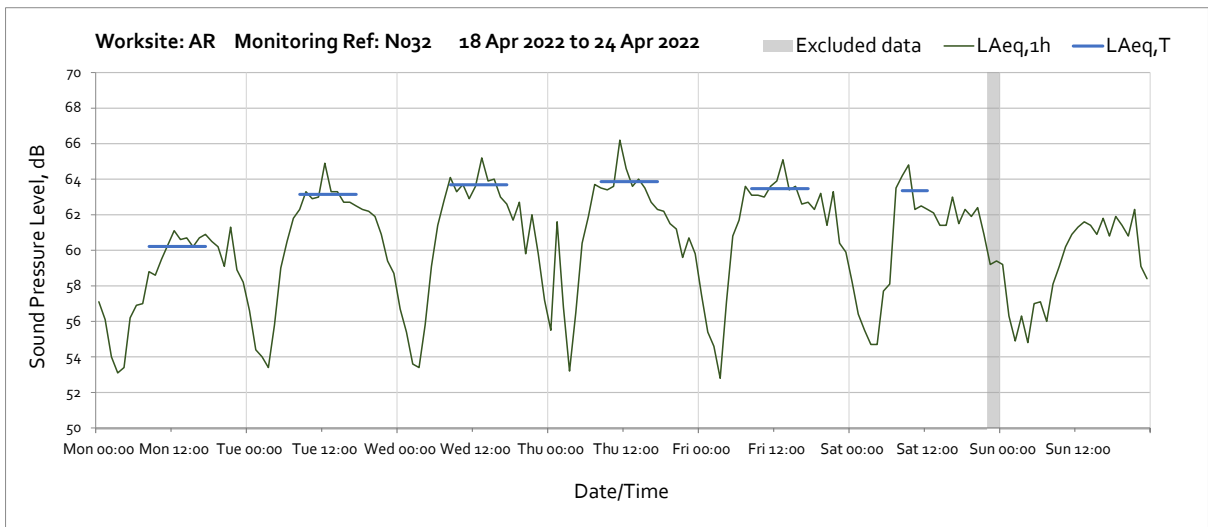
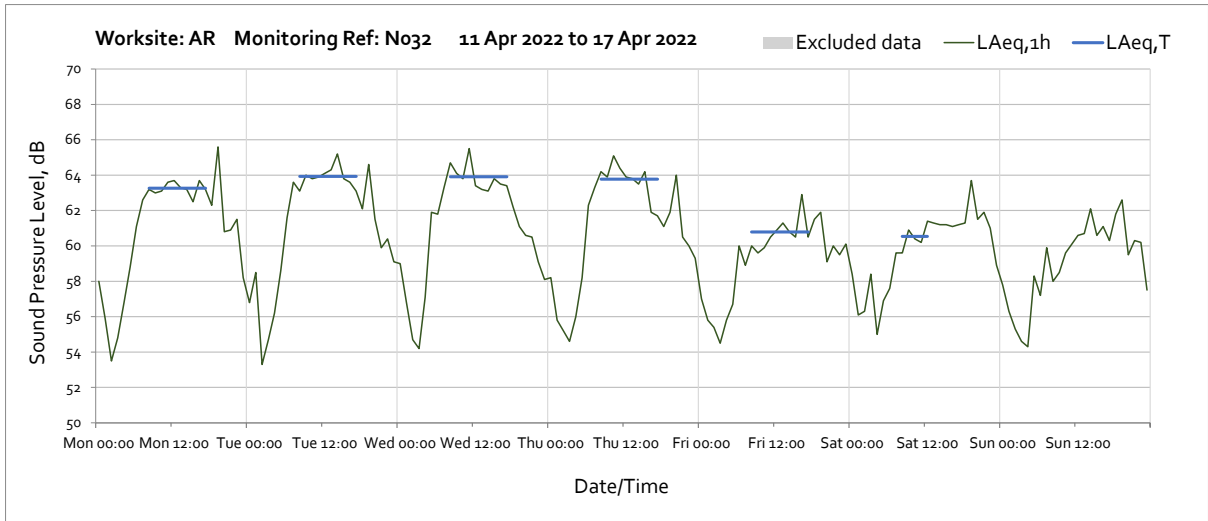
Appendix C Data

Noise

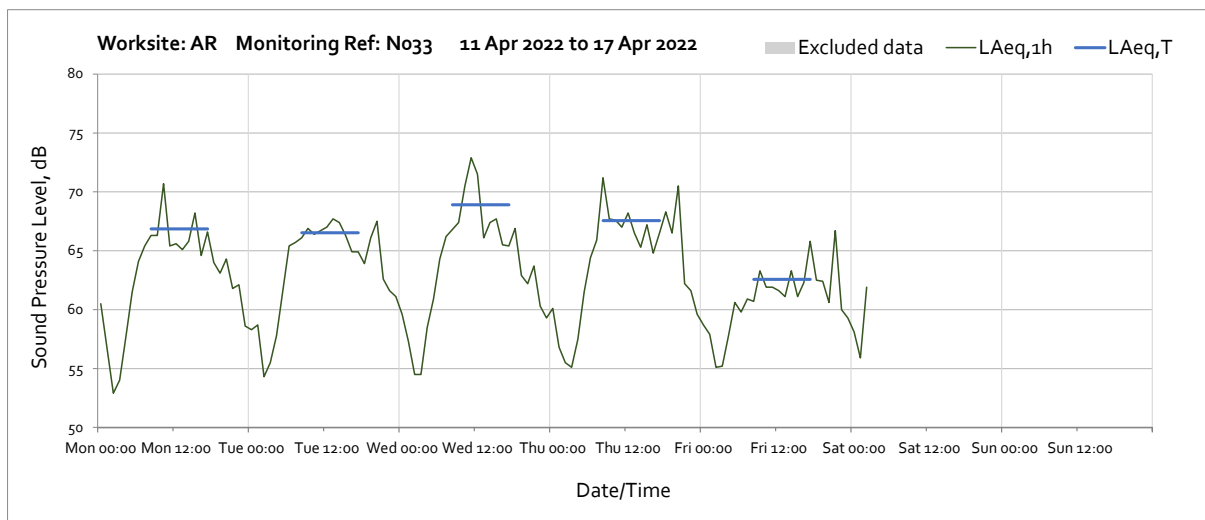
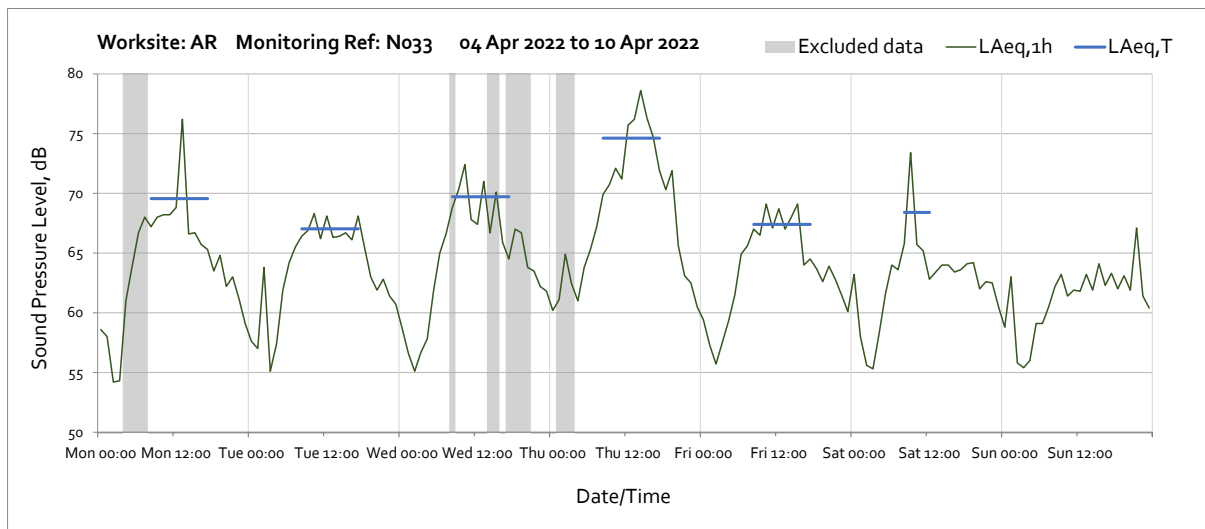
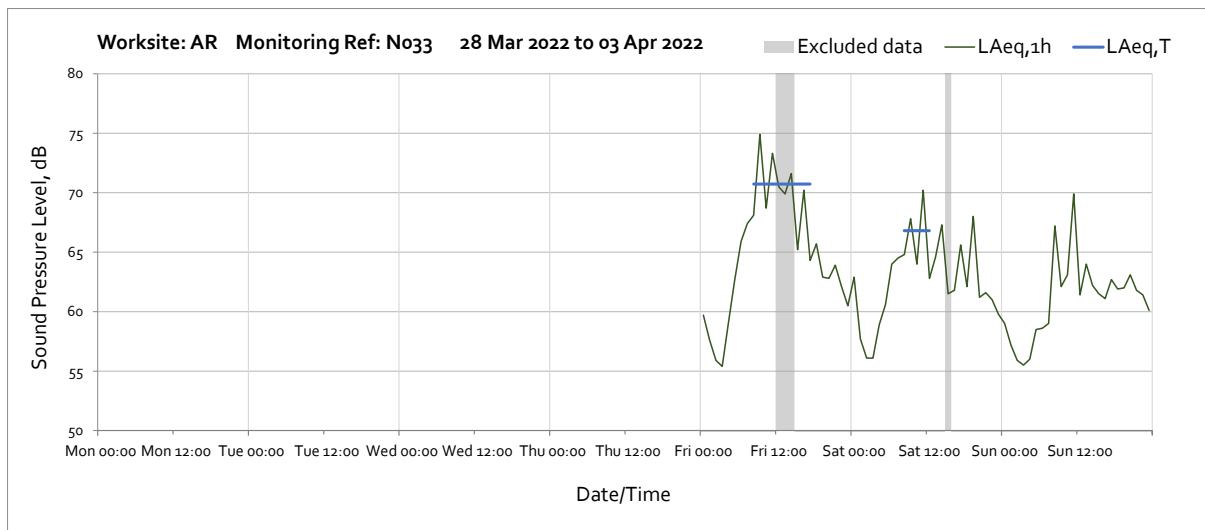
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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



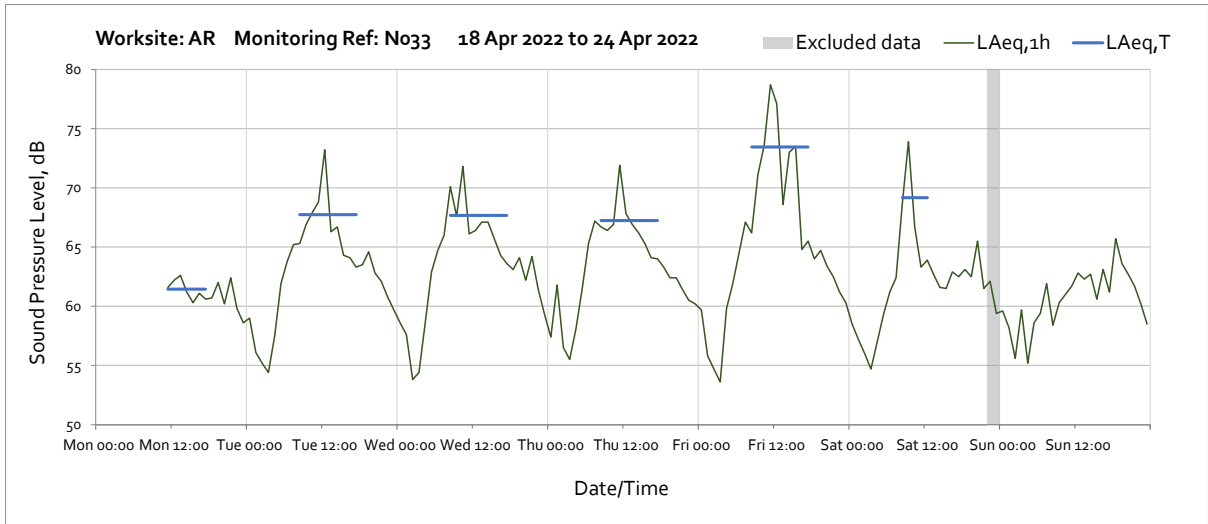


Worksite: Atlas Road worksite (AR) – Monitoring Ref: N033

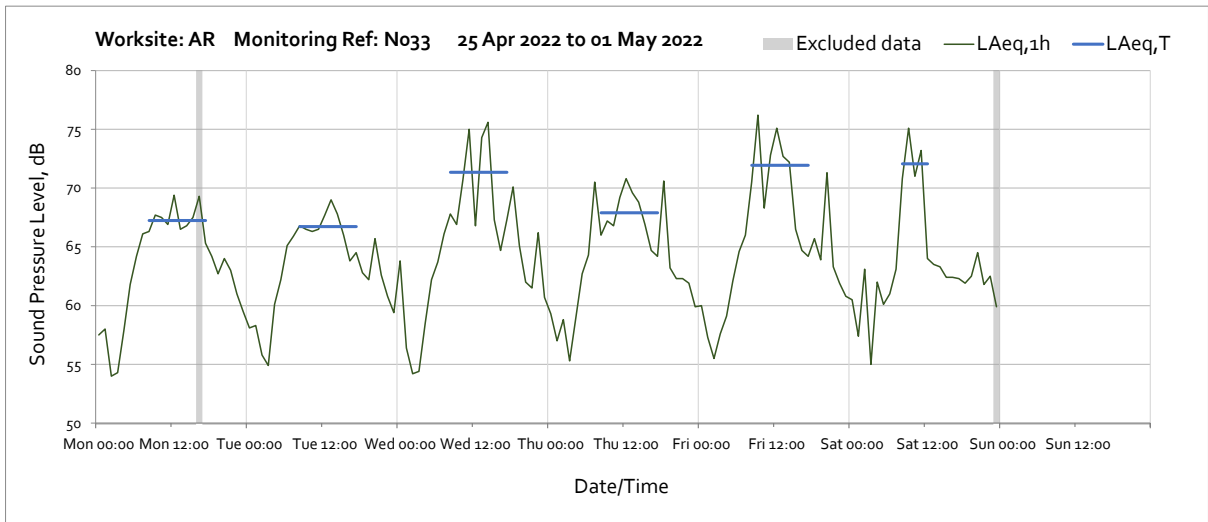


Note: Missing data between 03:00 on Saturday 16th April and 11:00 on Monday 18th April was due to loss of power at the monitoring station.

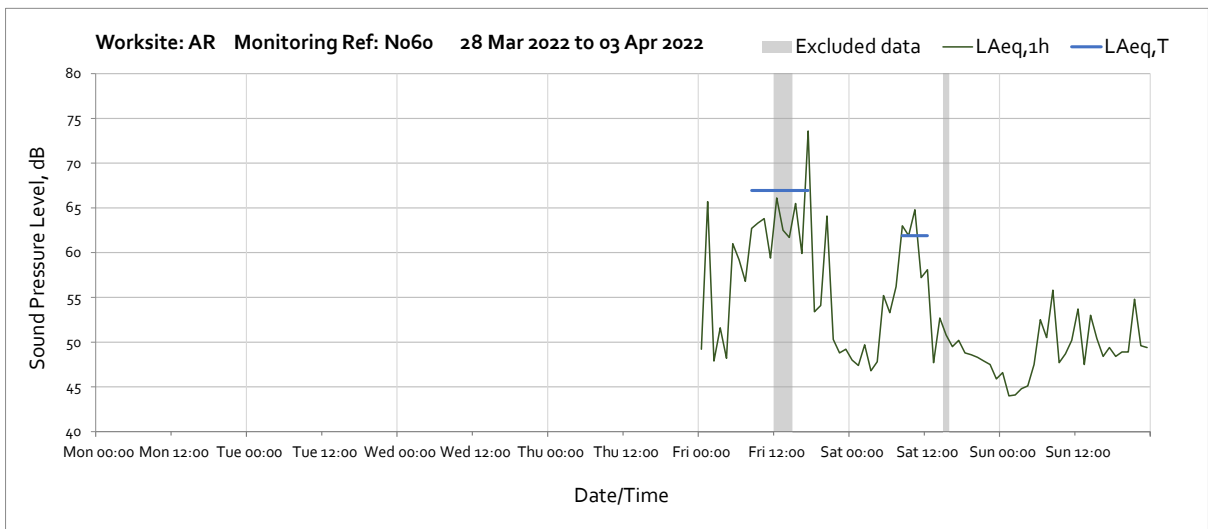
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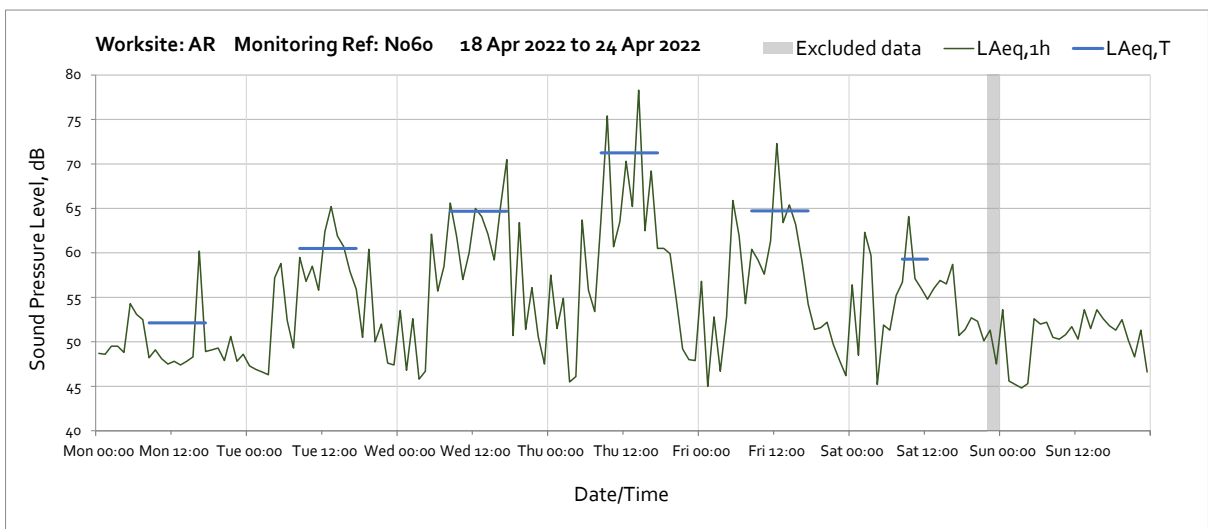
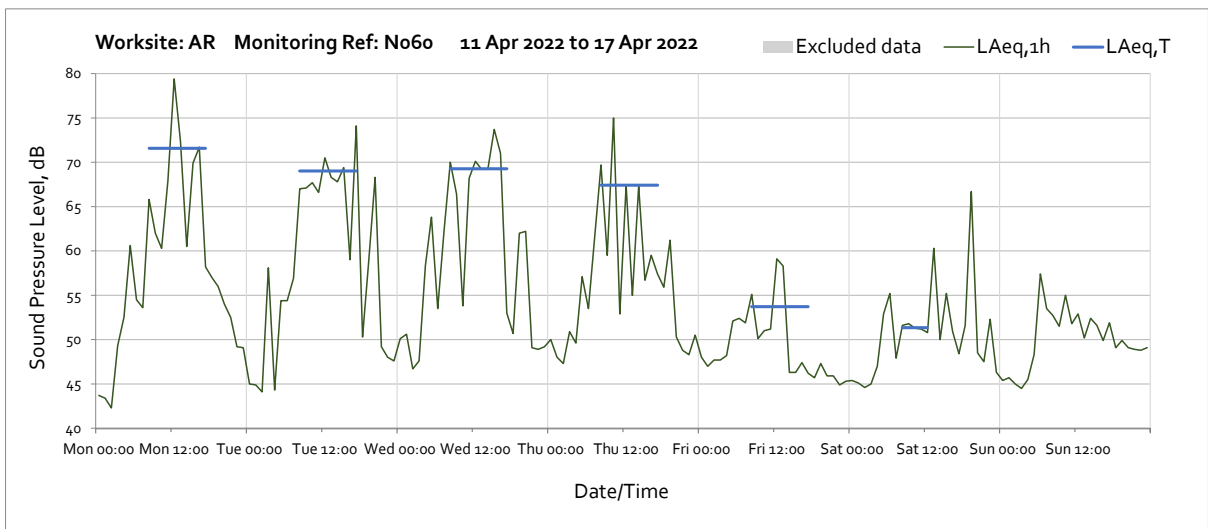
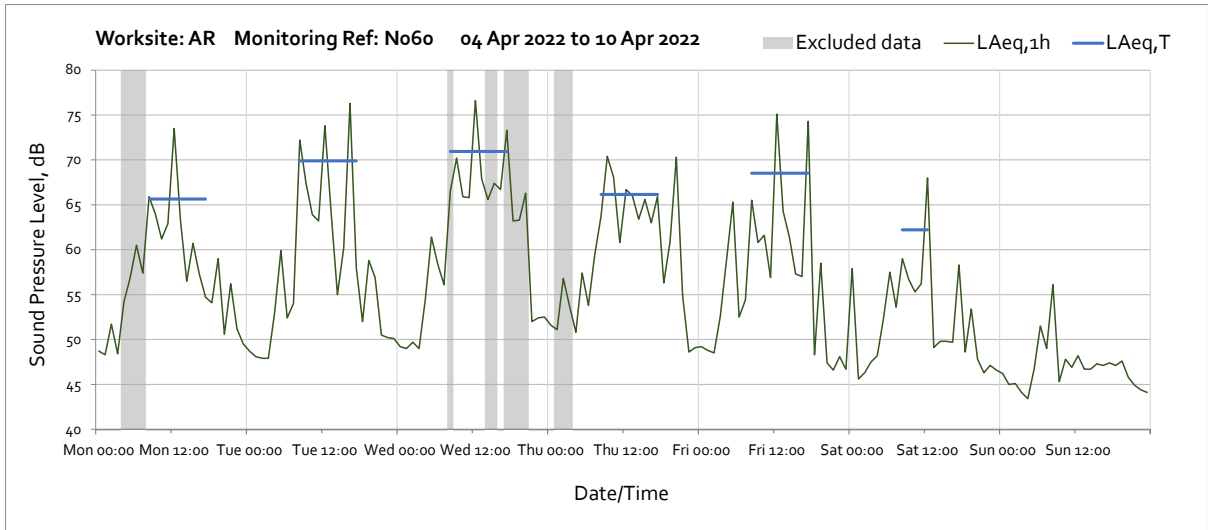


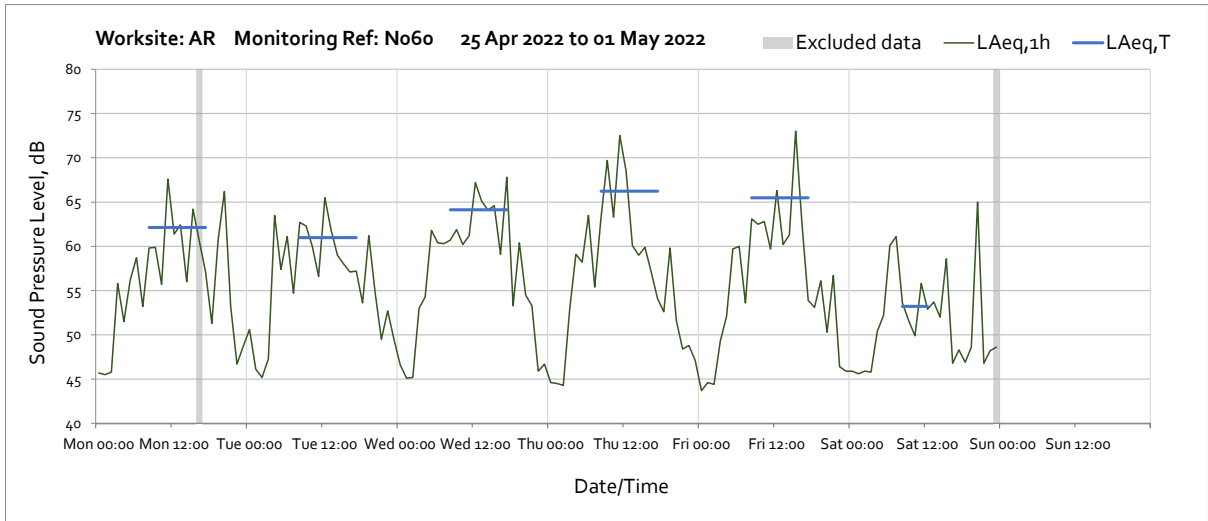
Note: Missing data between 03:00 on Saturday 16th April and 11:00 on Monday 18th April was due to loss of power at the monitoring station.



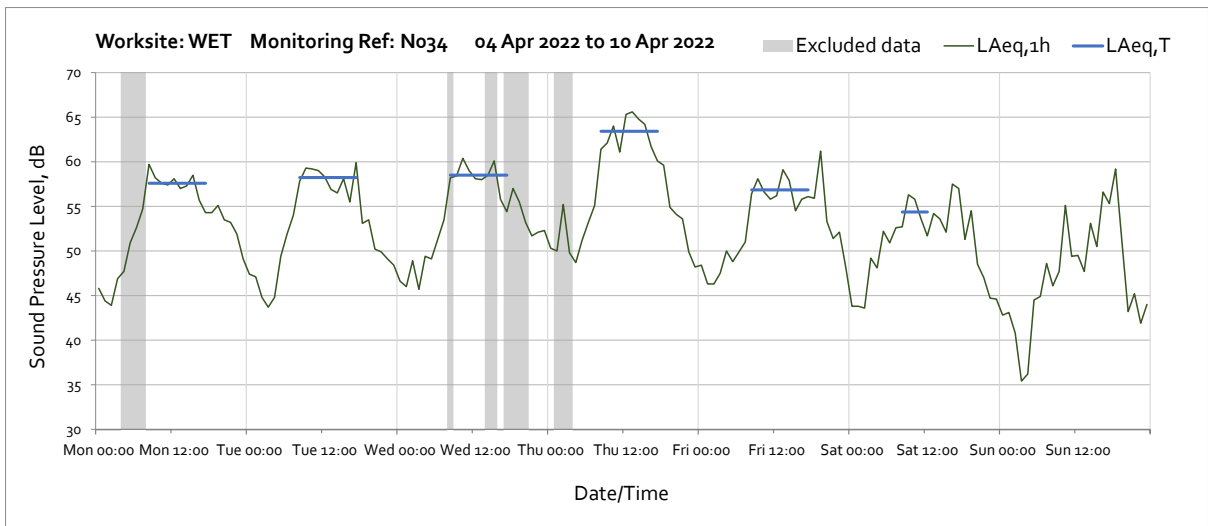
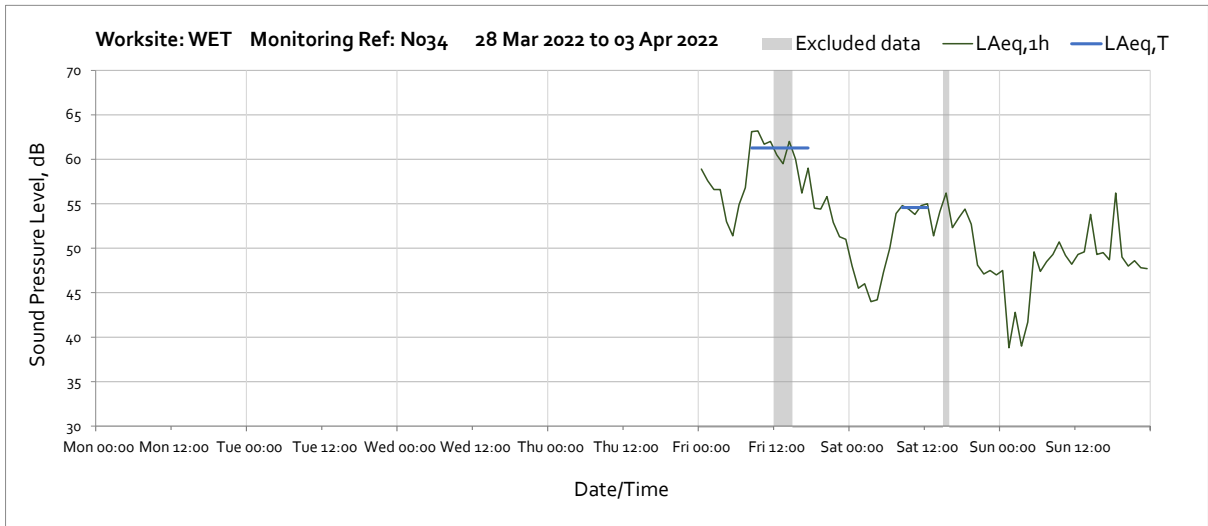
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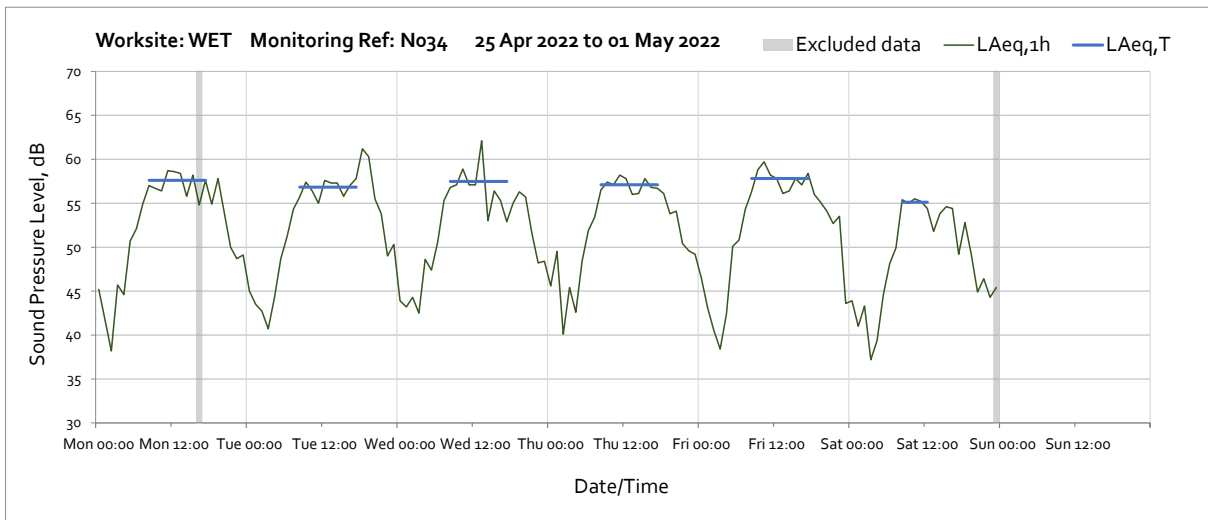
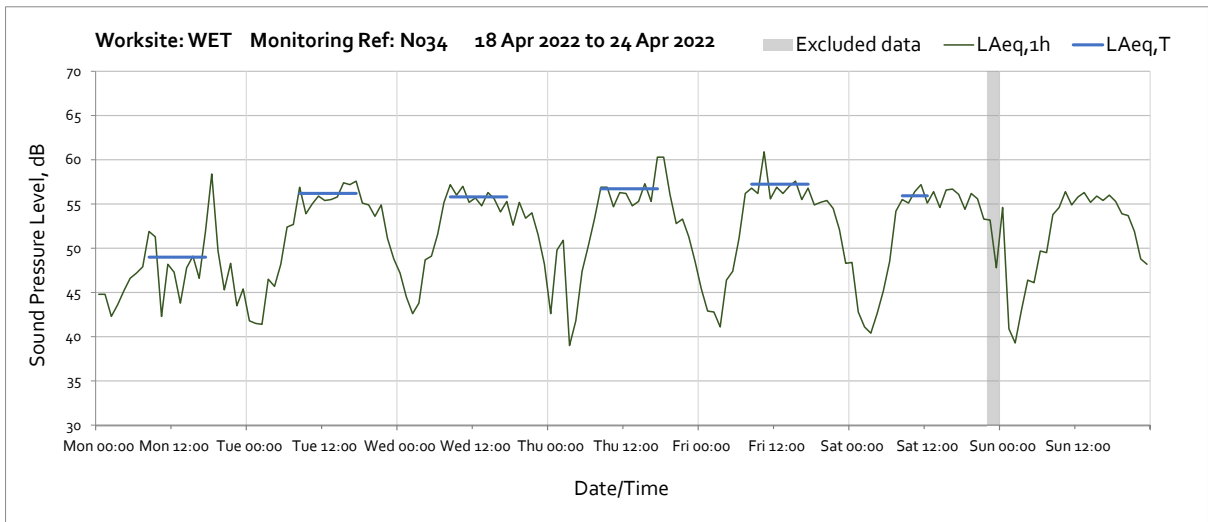
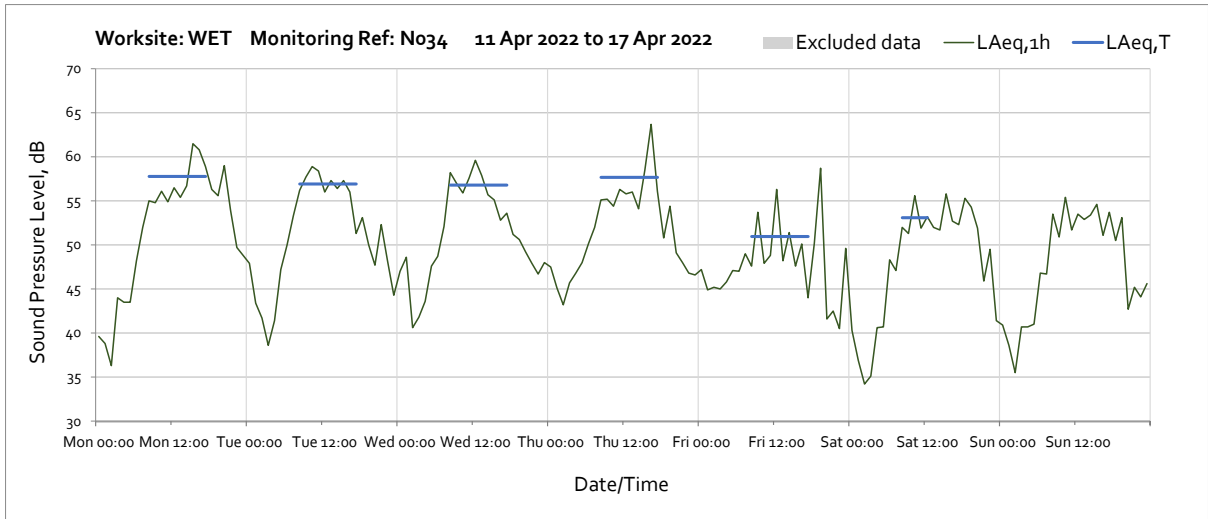




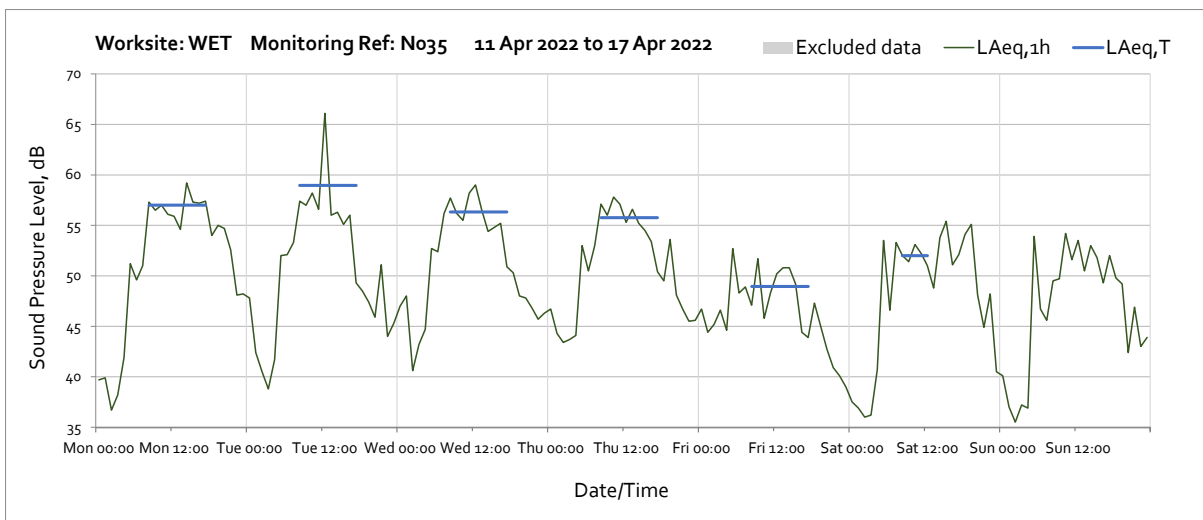
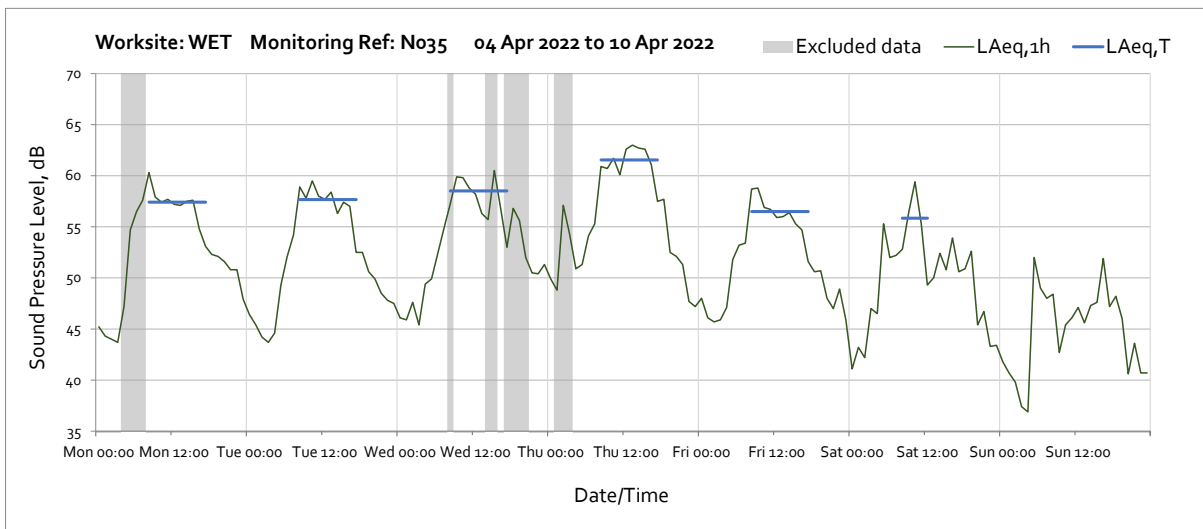
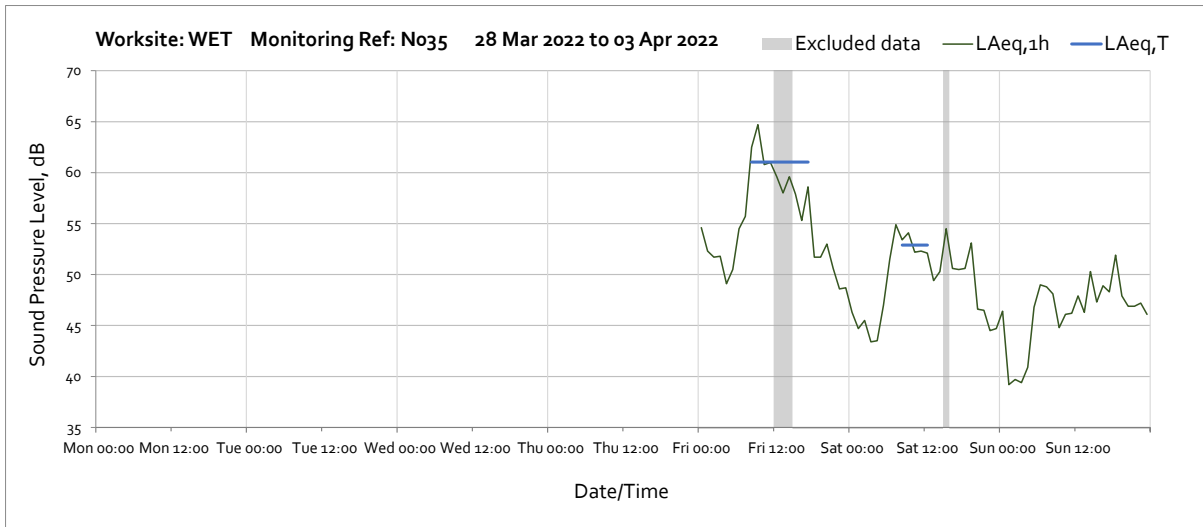


Worksite: Willesden Euro Terminal (WET) - Monitoring Ref: N034

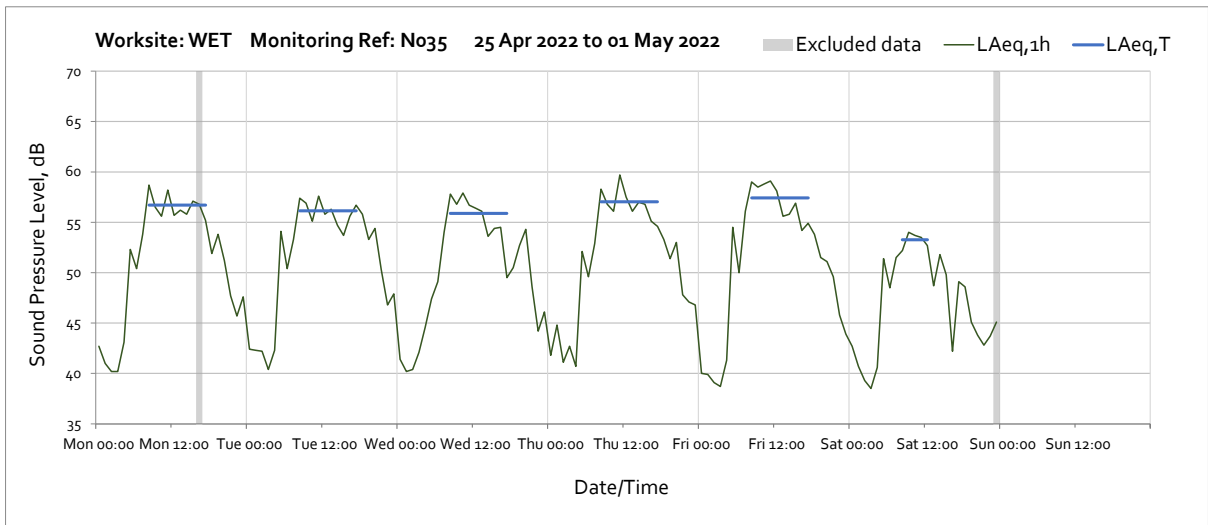
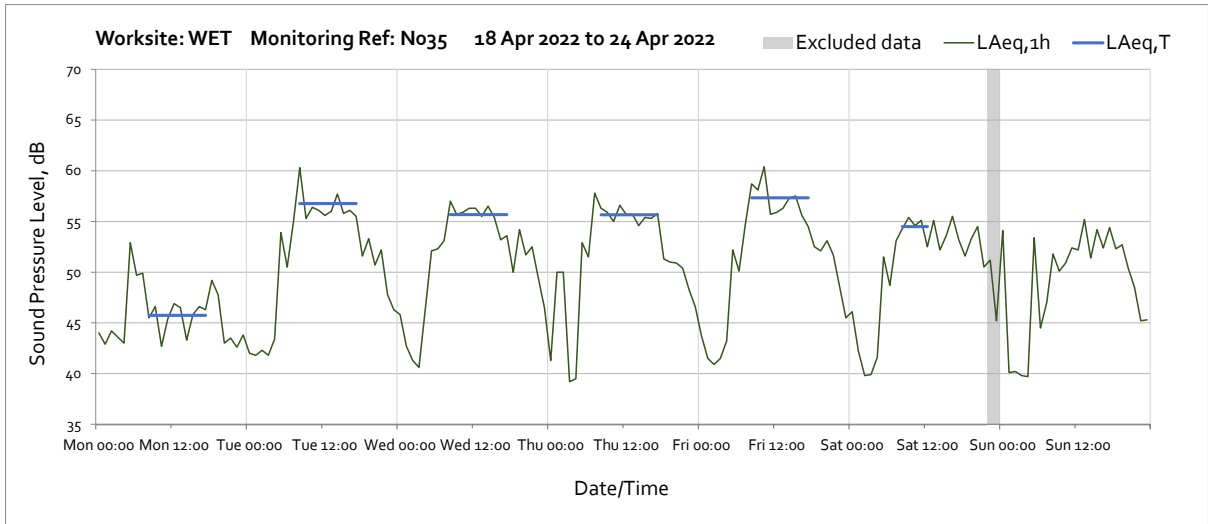




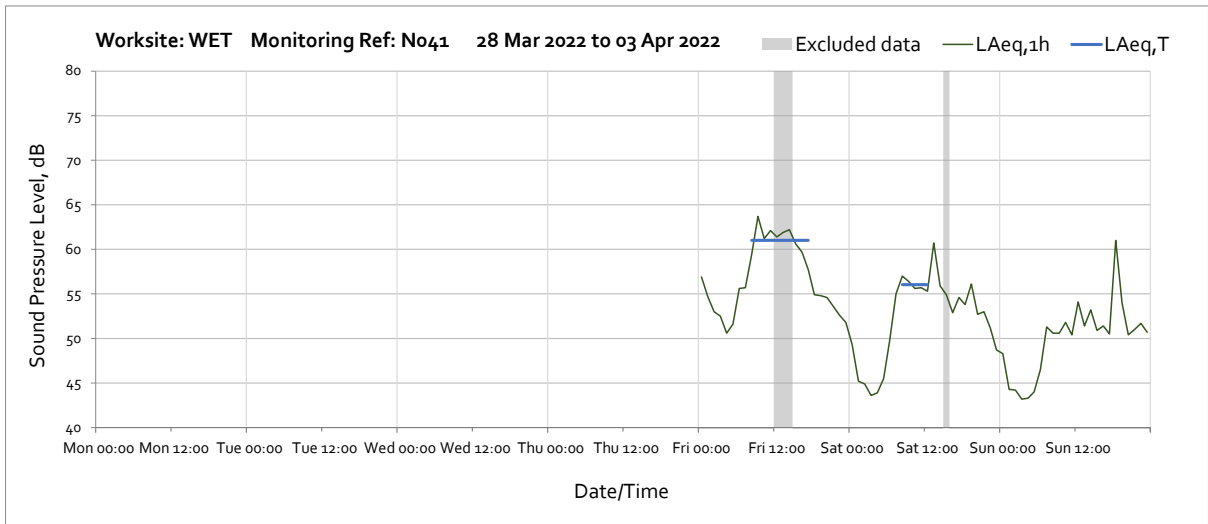
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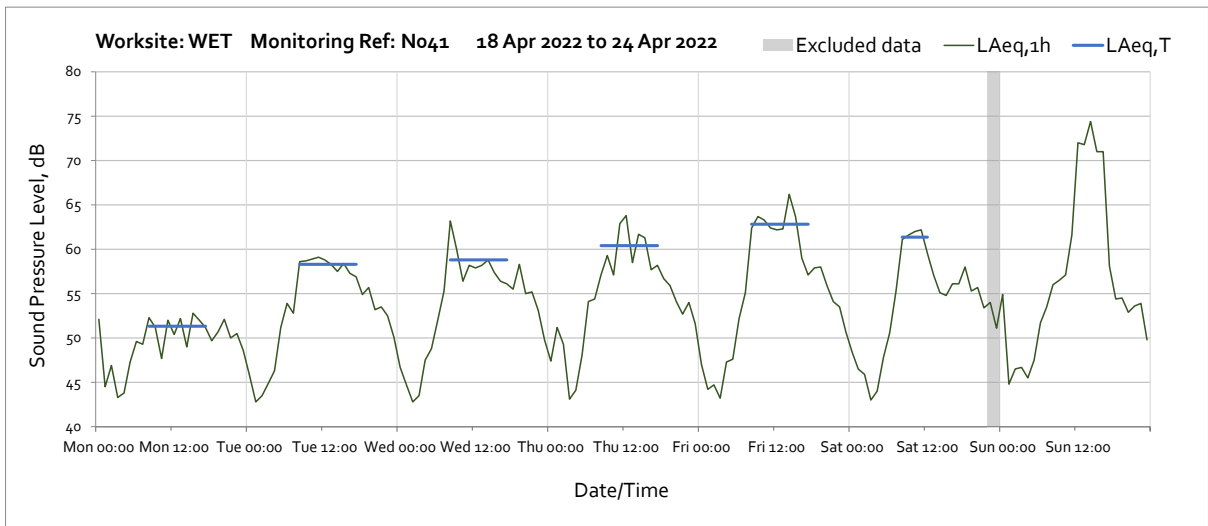
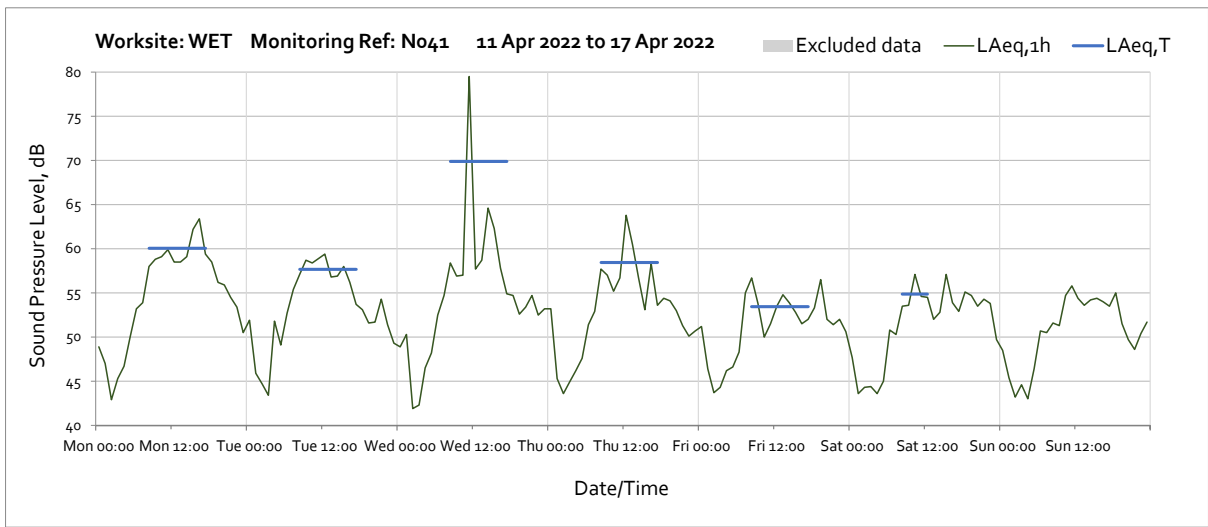
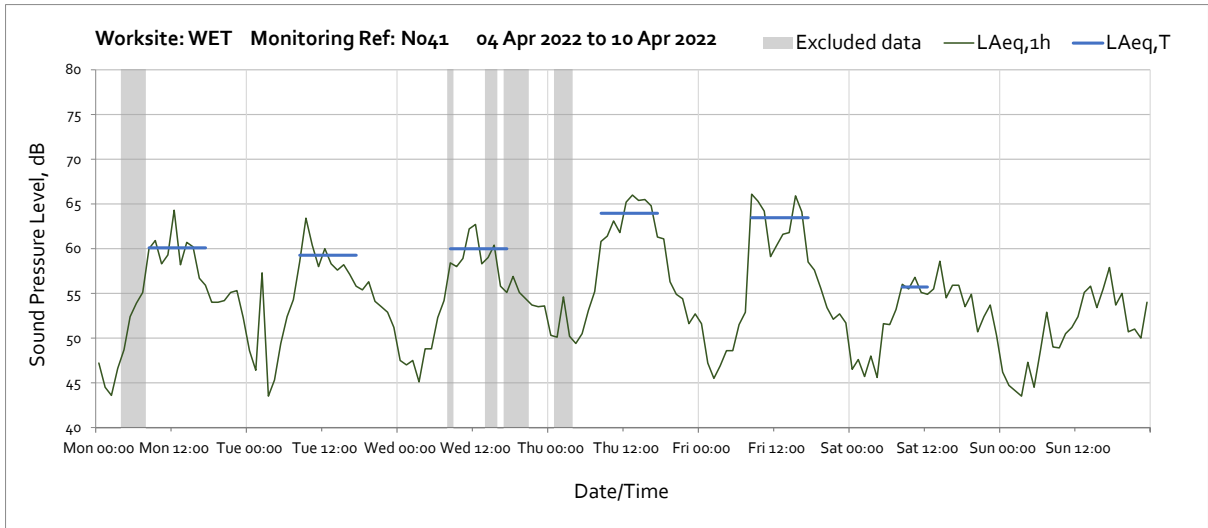


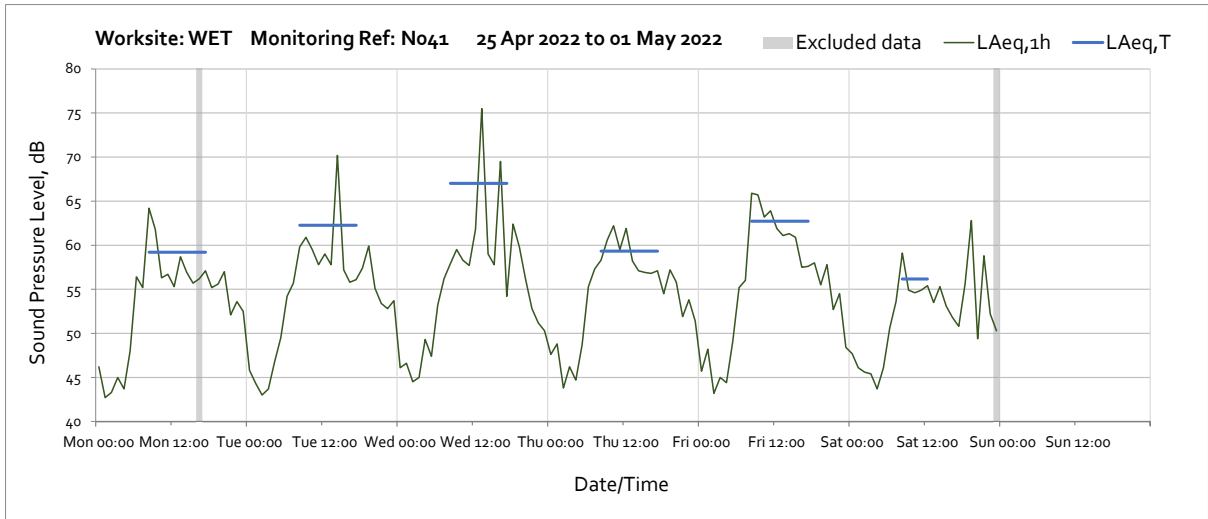
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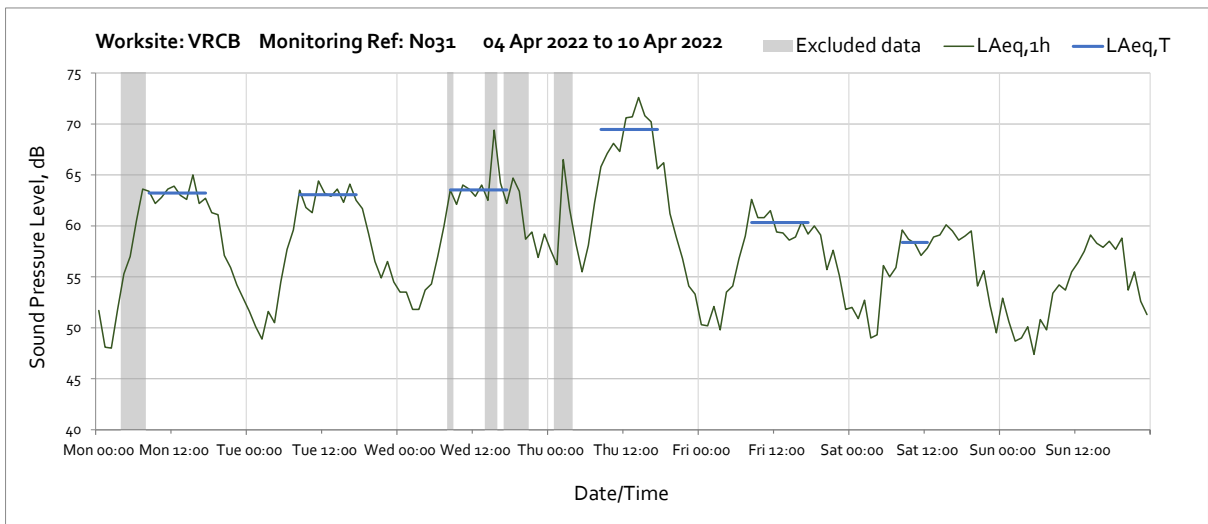
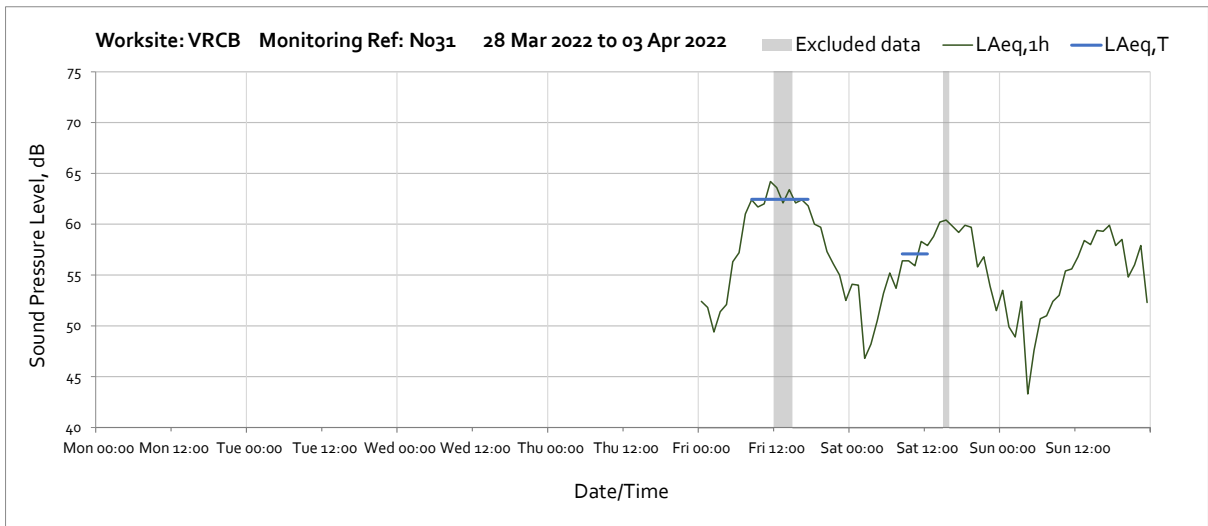
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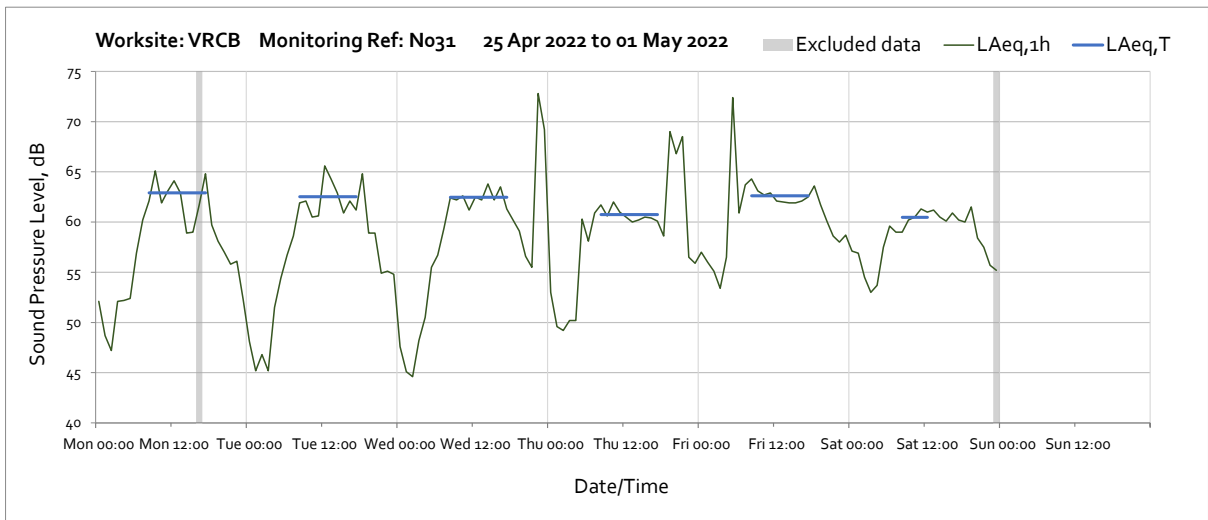
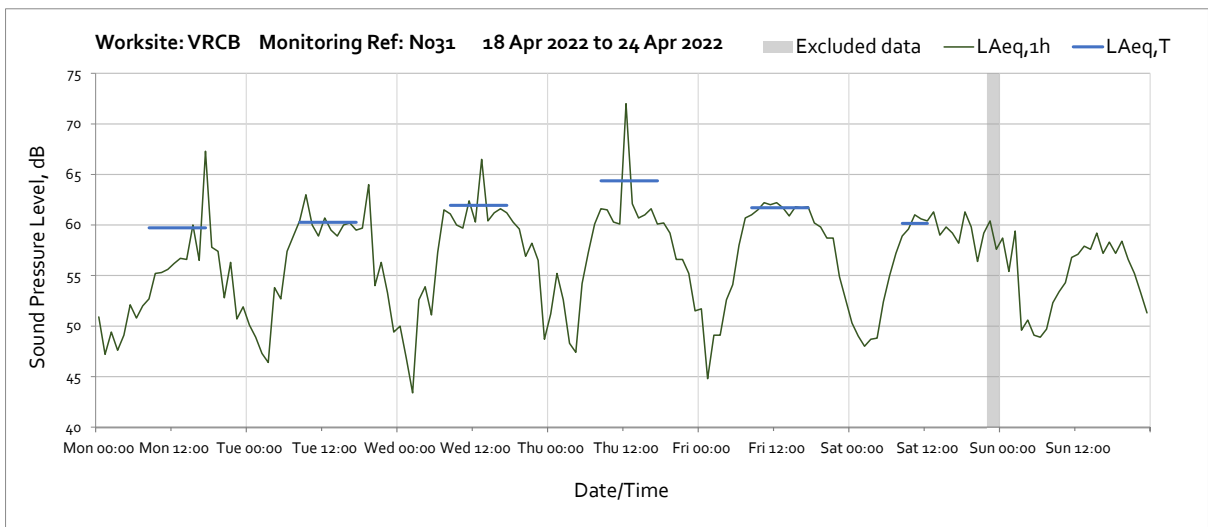
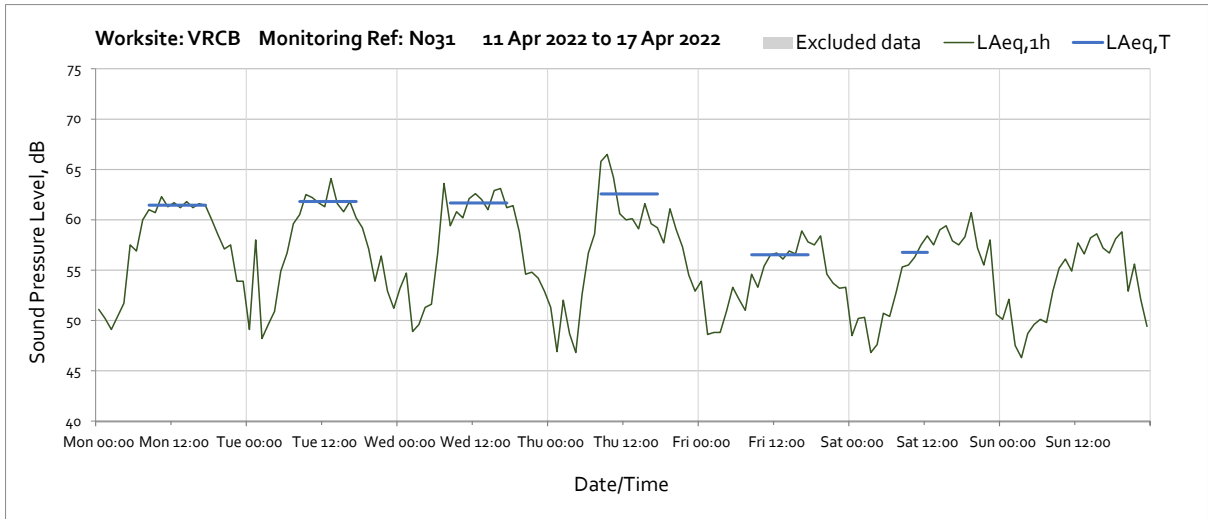




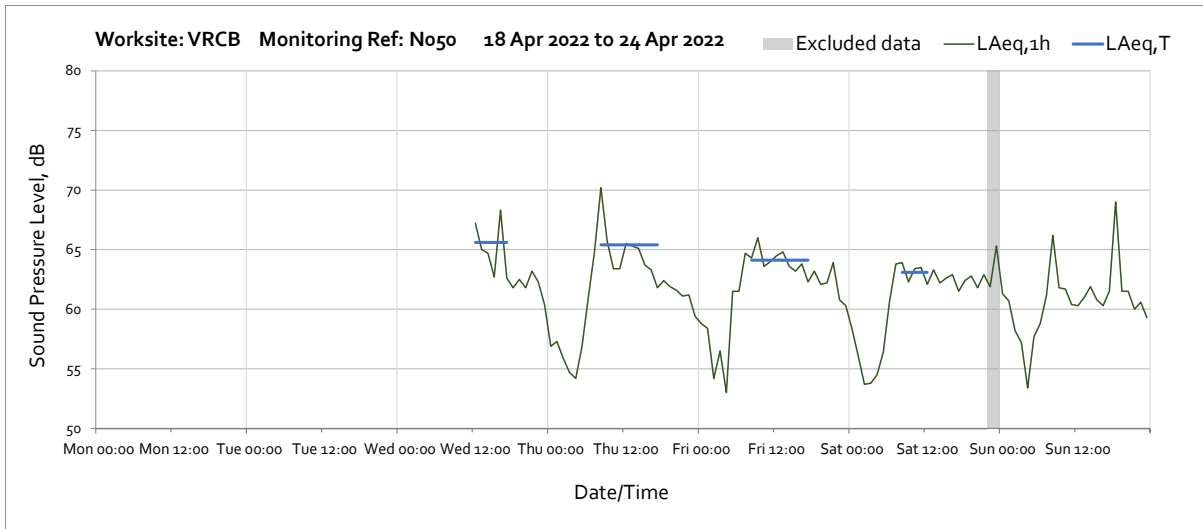


Worksite: Victoria Road Crossover Box (VRCB) – Monitoring Ref: N031

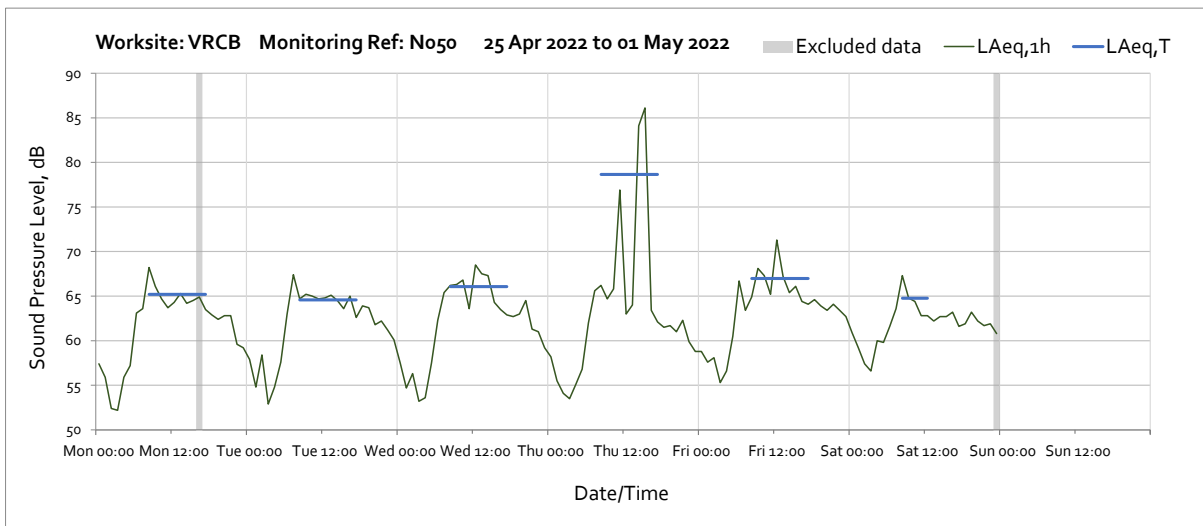




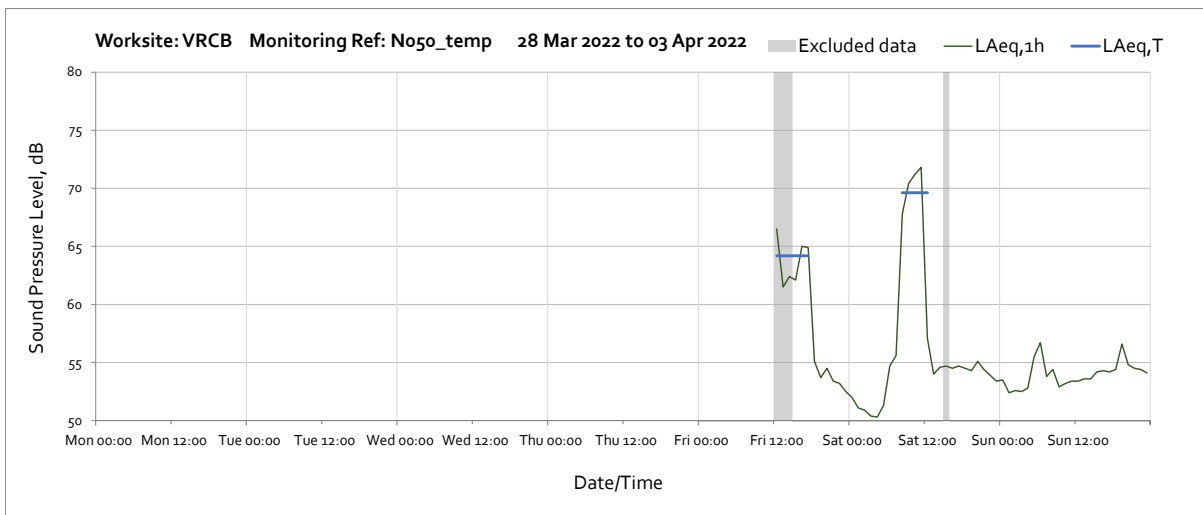
Worksite: Victoria Road Crossover Box (VRCB) – Monitoring Ref: N050



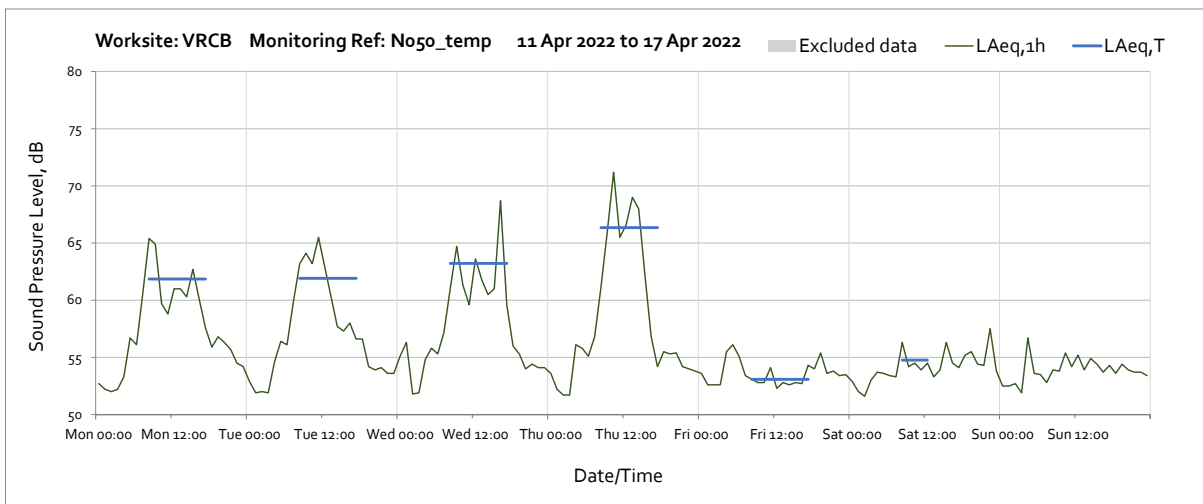
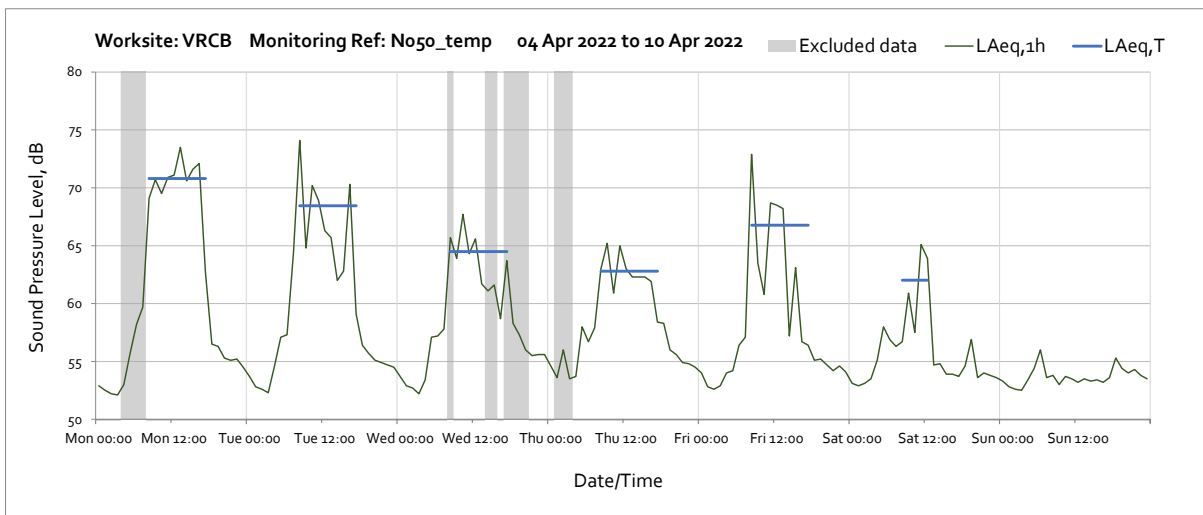
Note: Missing data from beginning of April 2022 was due to loss of power at the monitoring station. The power connection was restored at 12:00 on Wednesday 20th April.



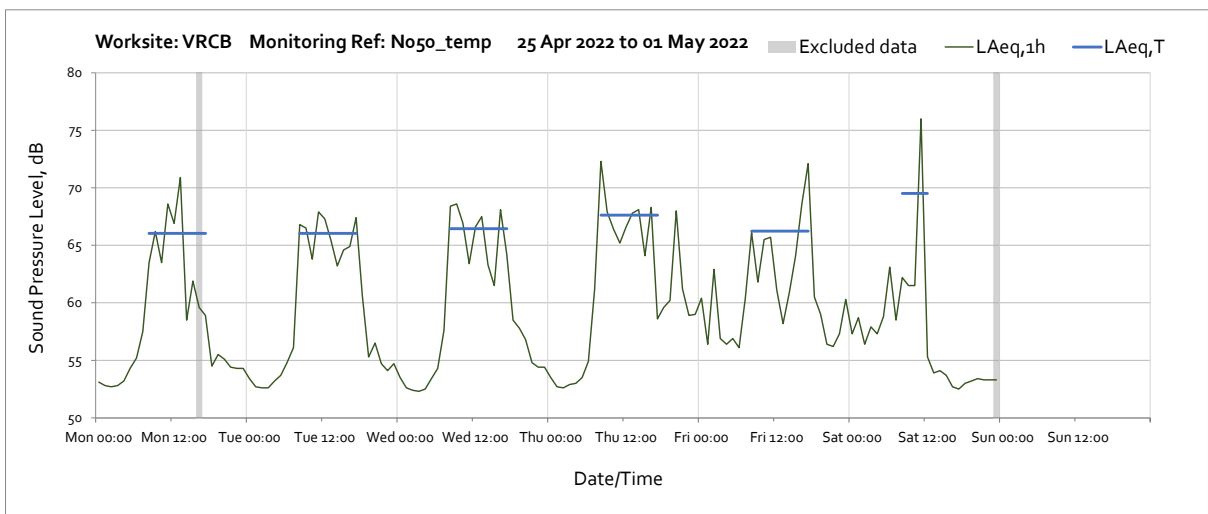
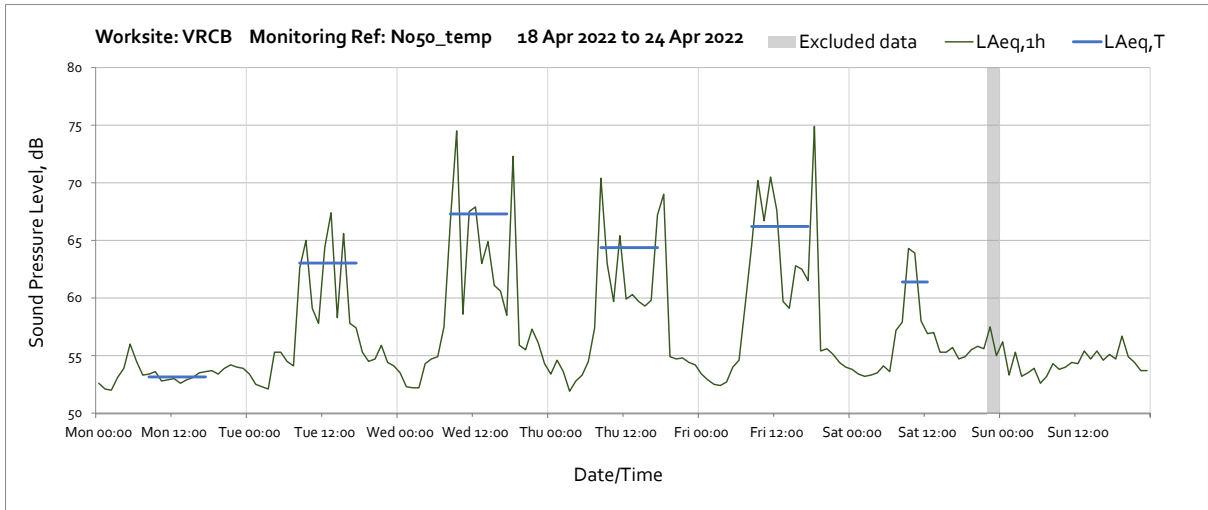
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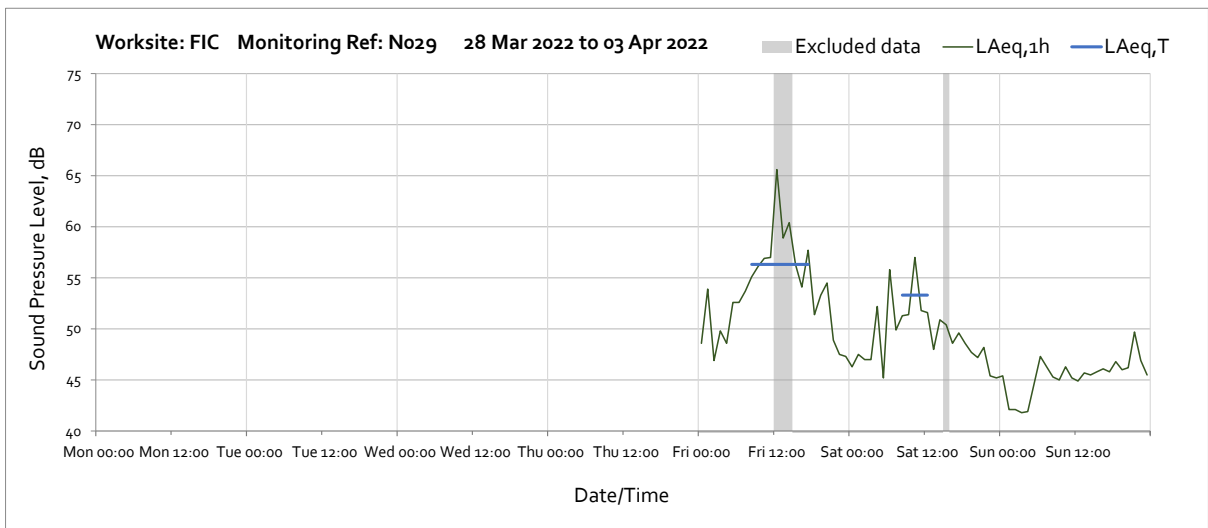
Note: The noise monitor was temporarily installed at 12:00 on Friday 1st April 2022.

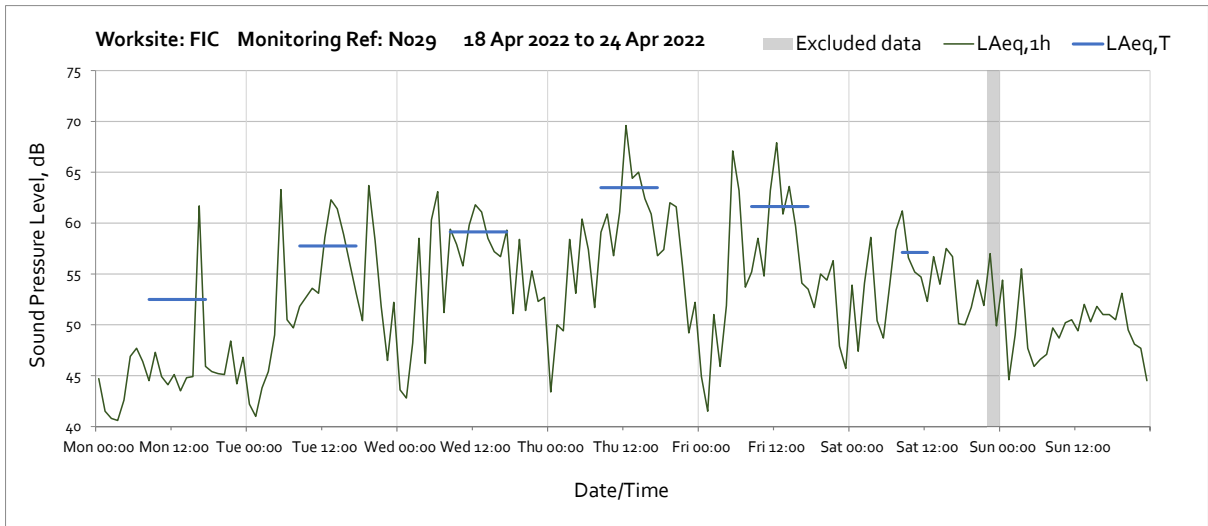
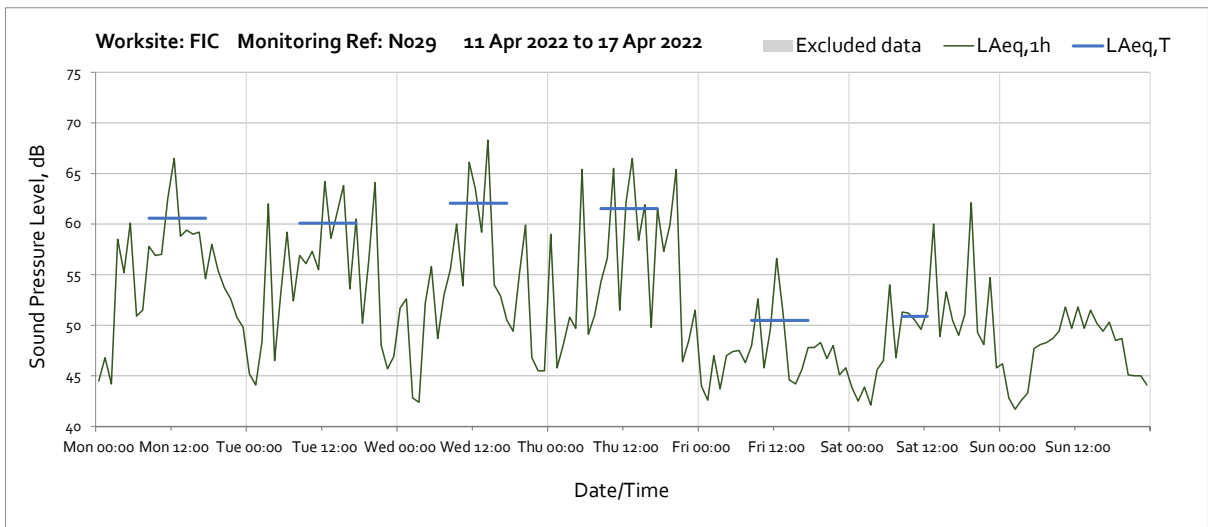
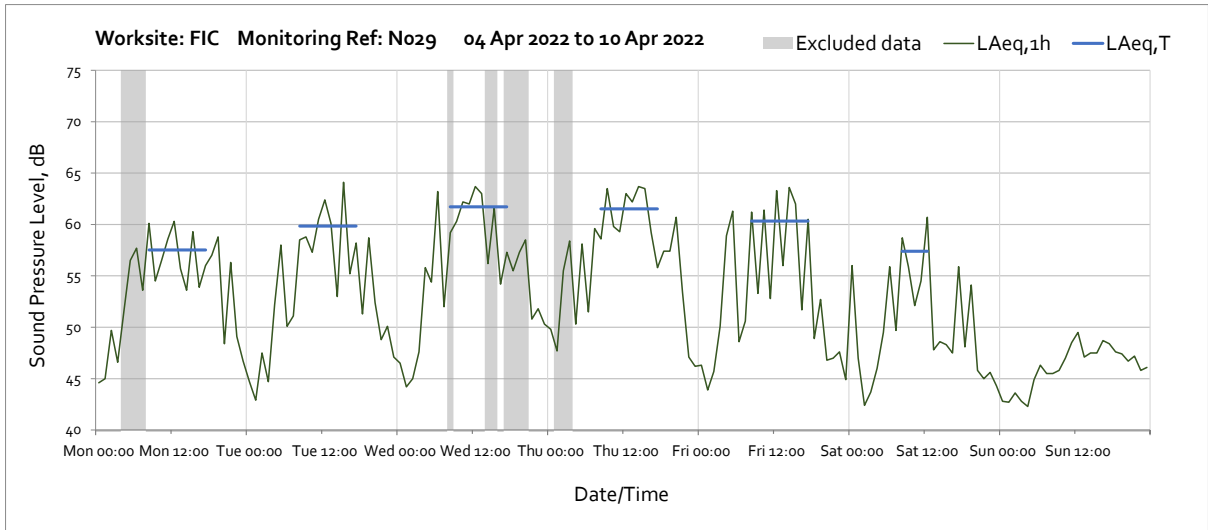


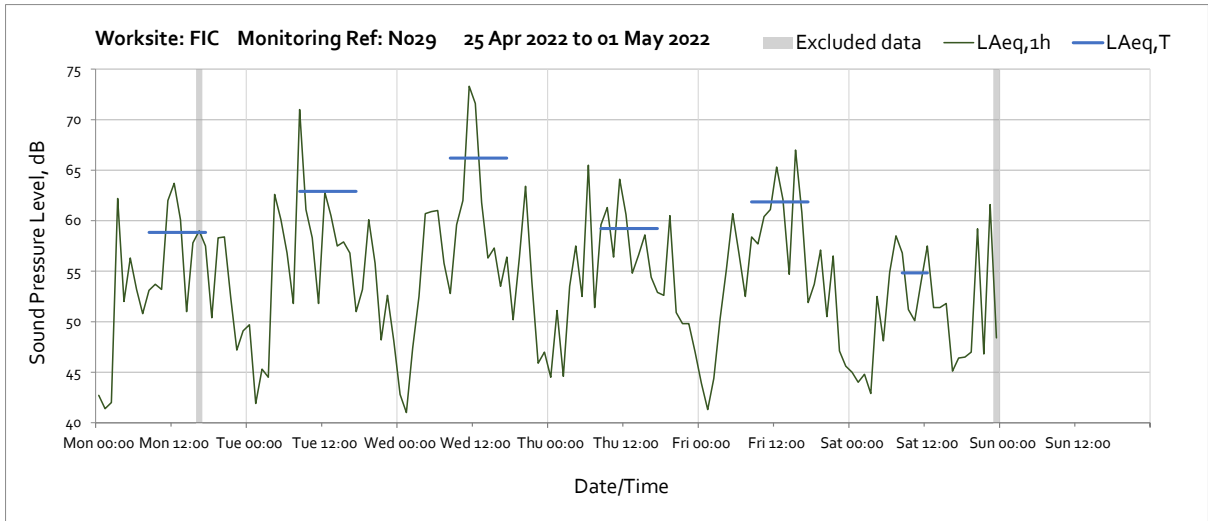
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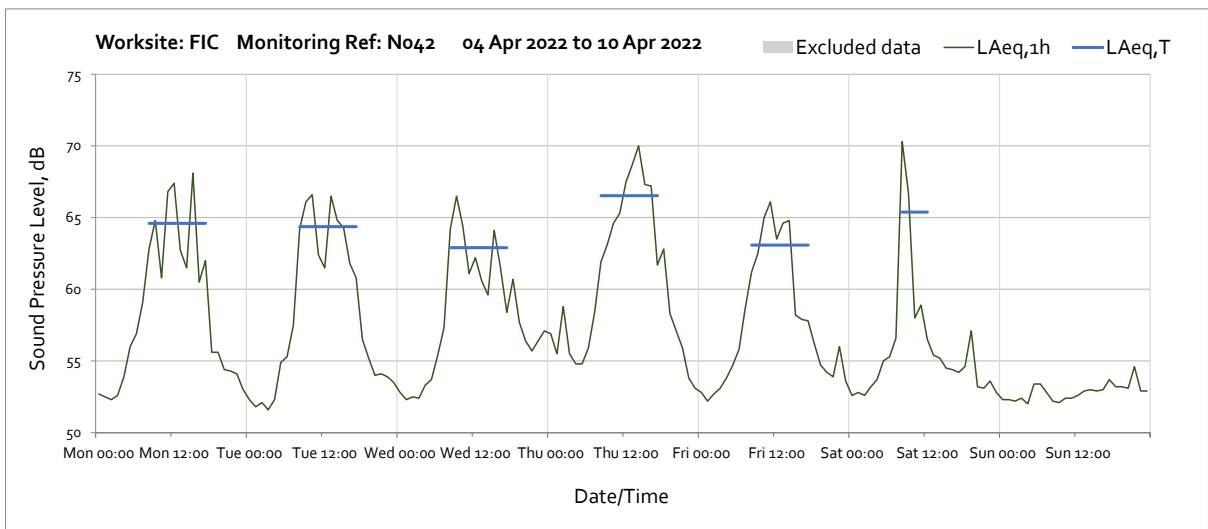
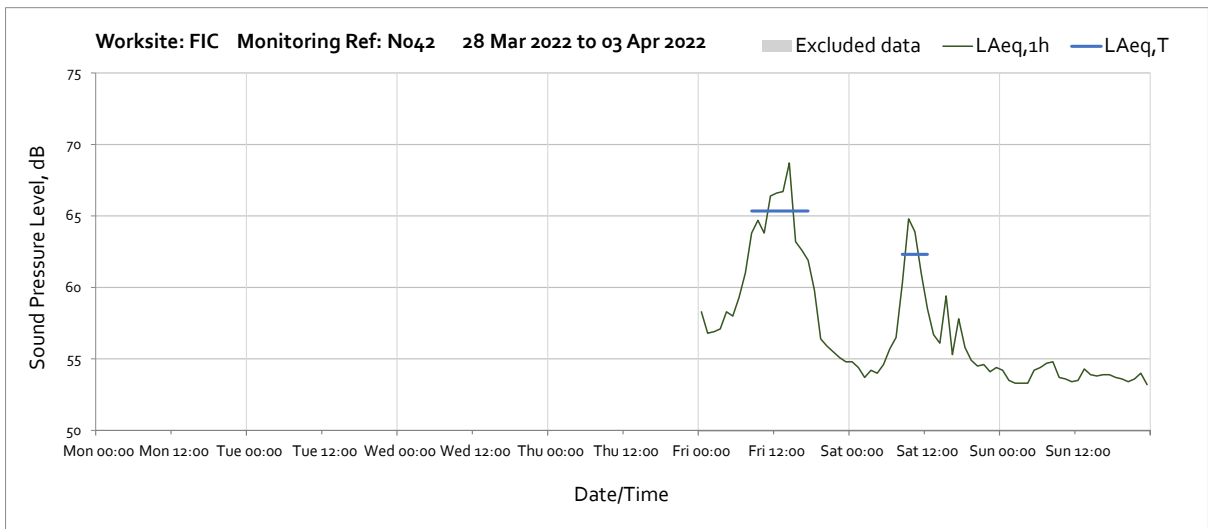
Worksite: Flat Iron Compound (FIC) – Monitoring Ref: N029

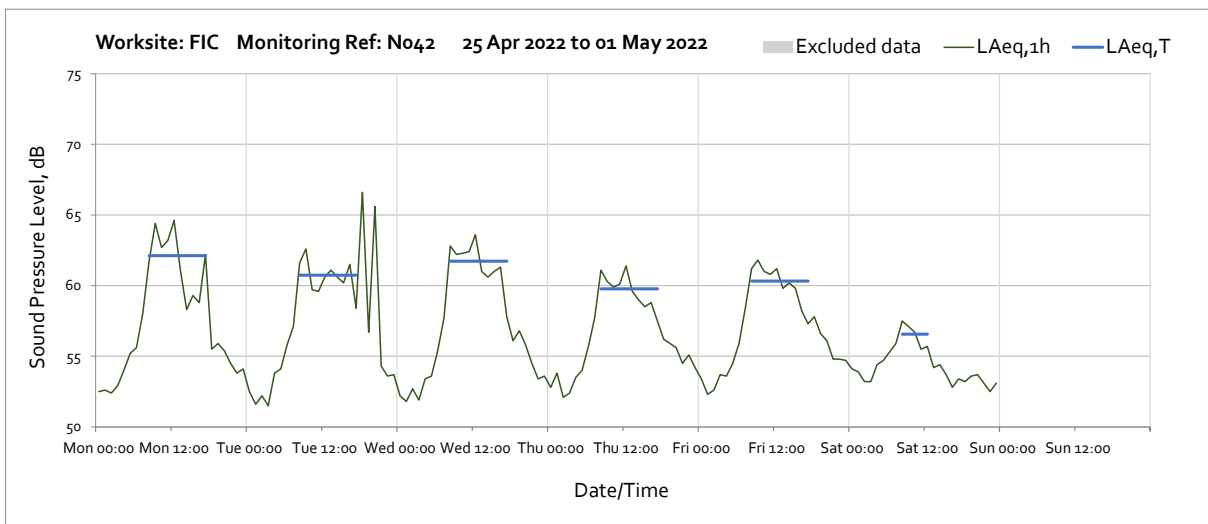
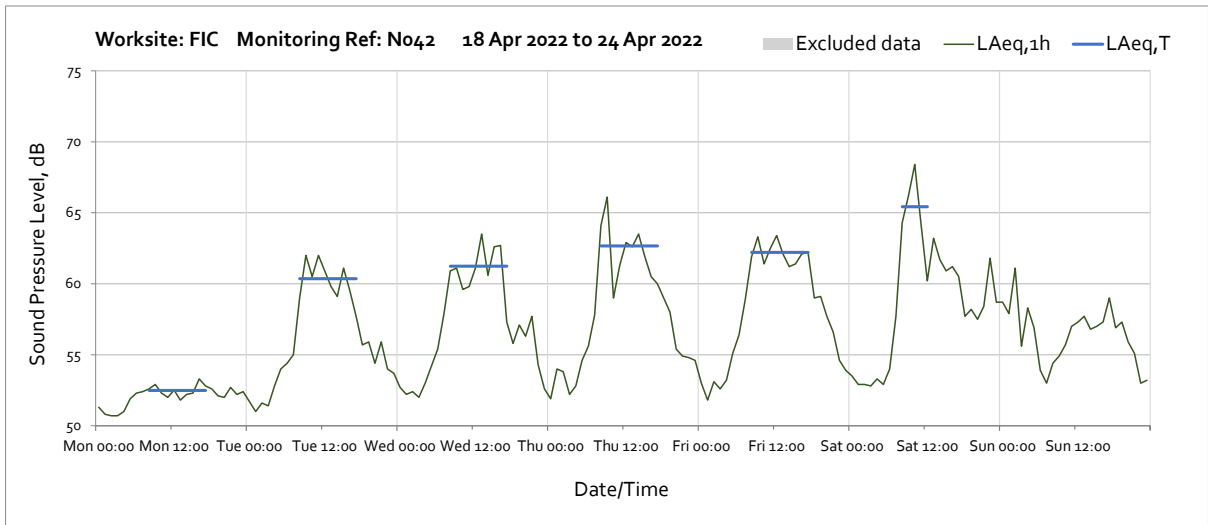
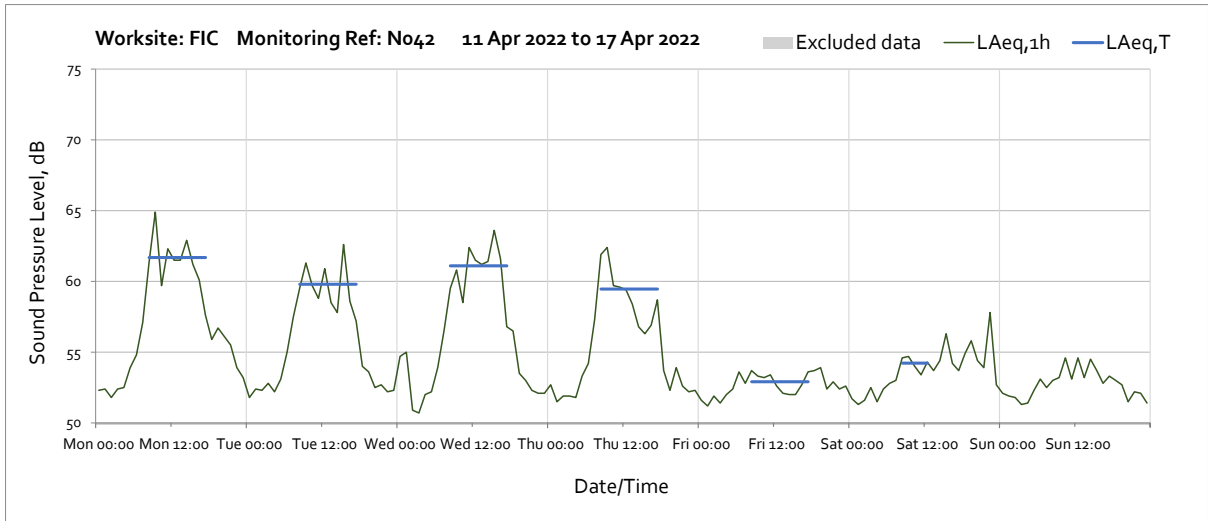




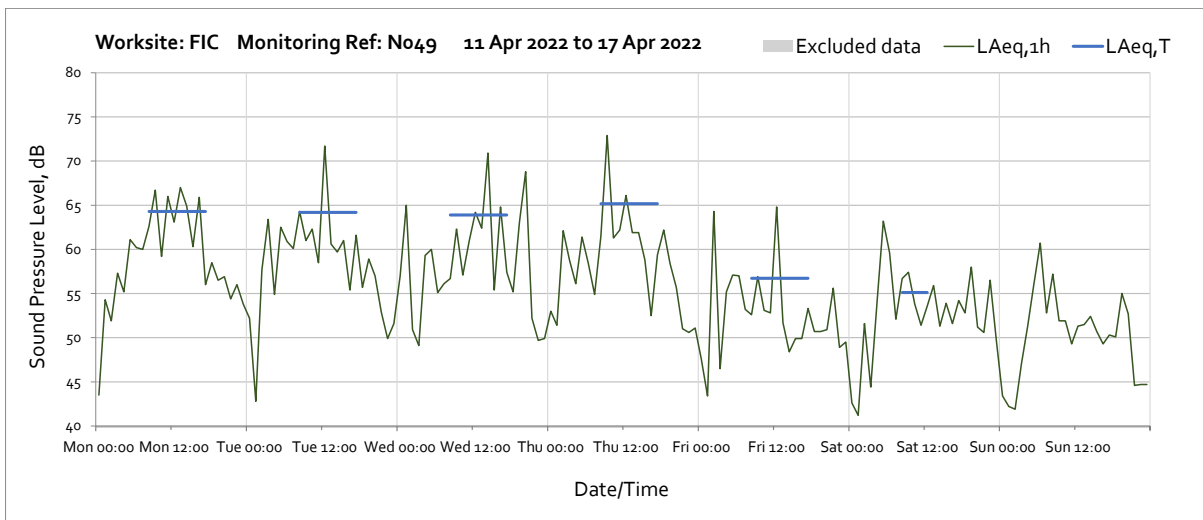
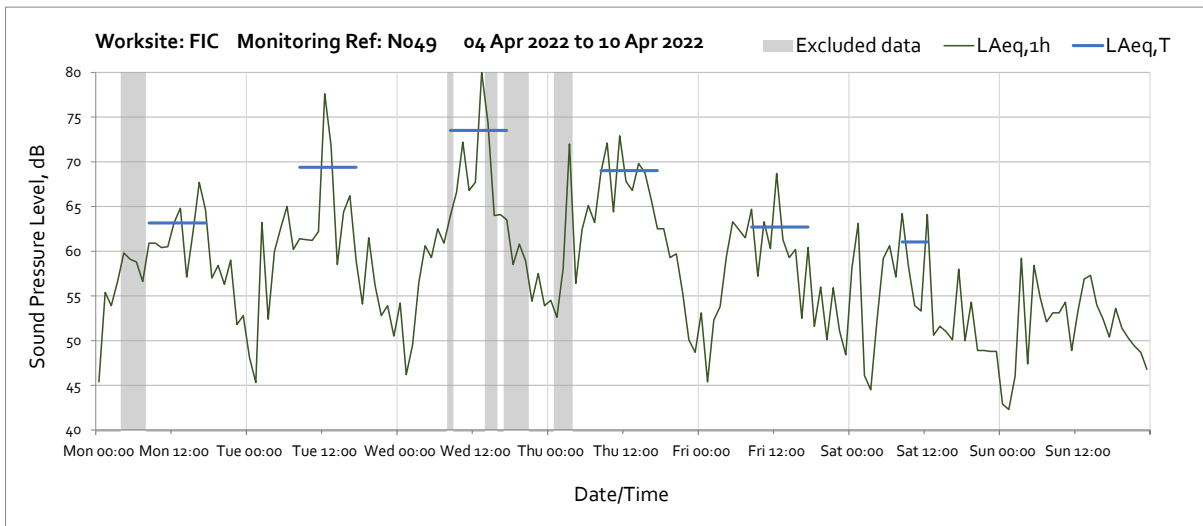
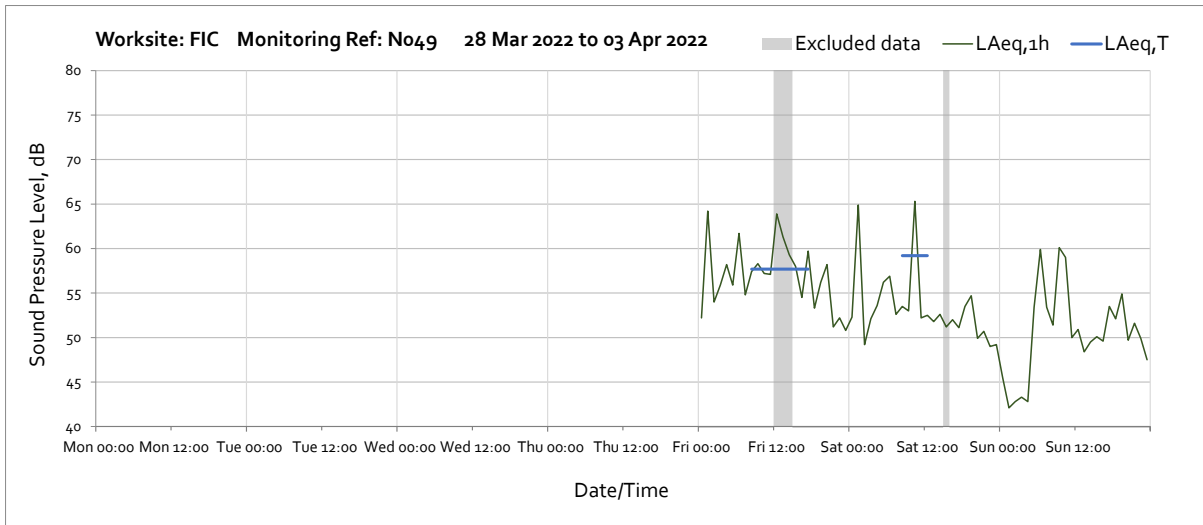


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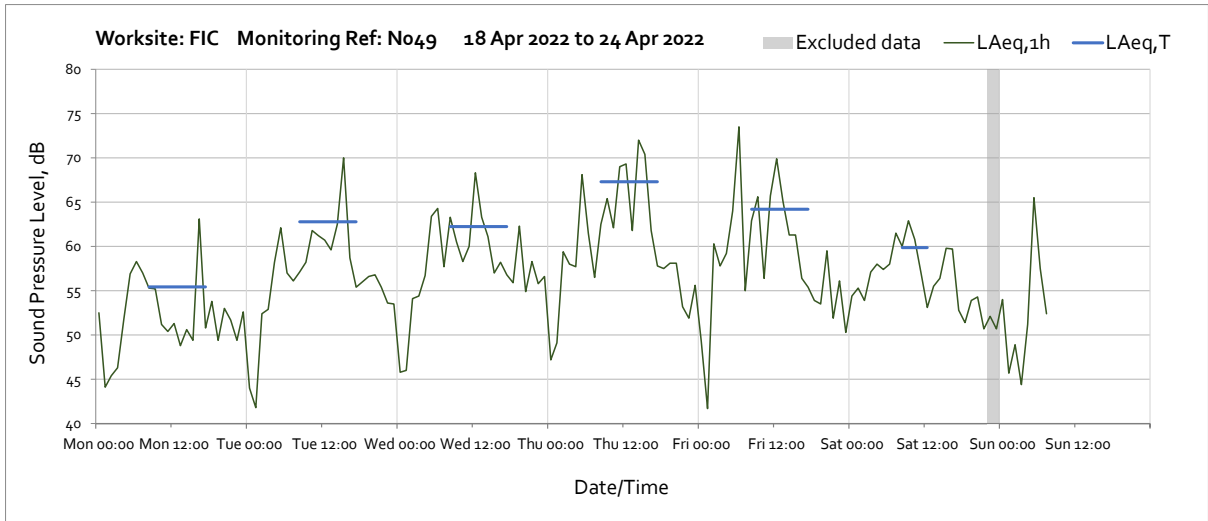




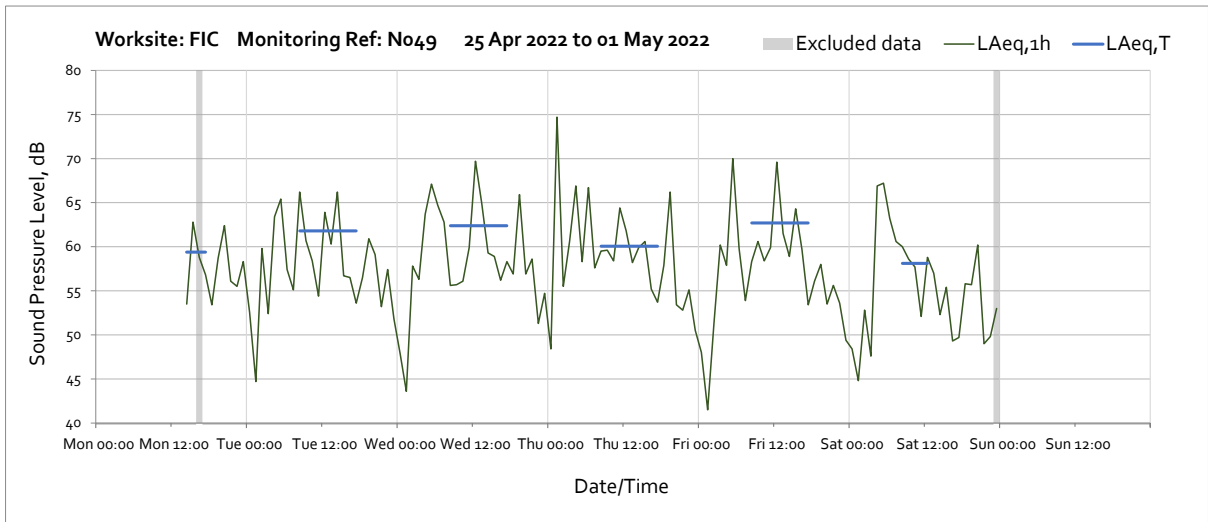
Worksite: Flat Iron Compound (FIC) – Monitoring Ref: N049



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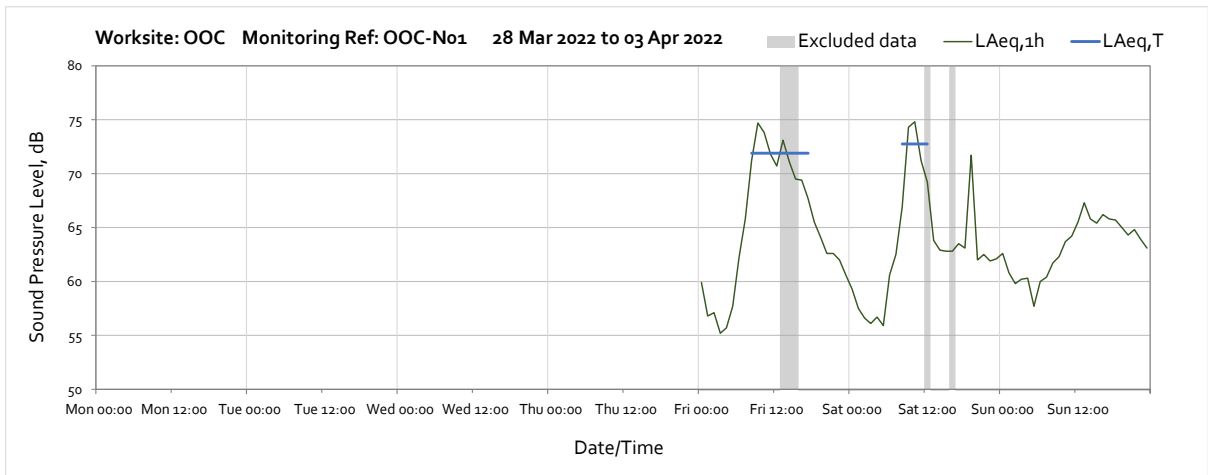


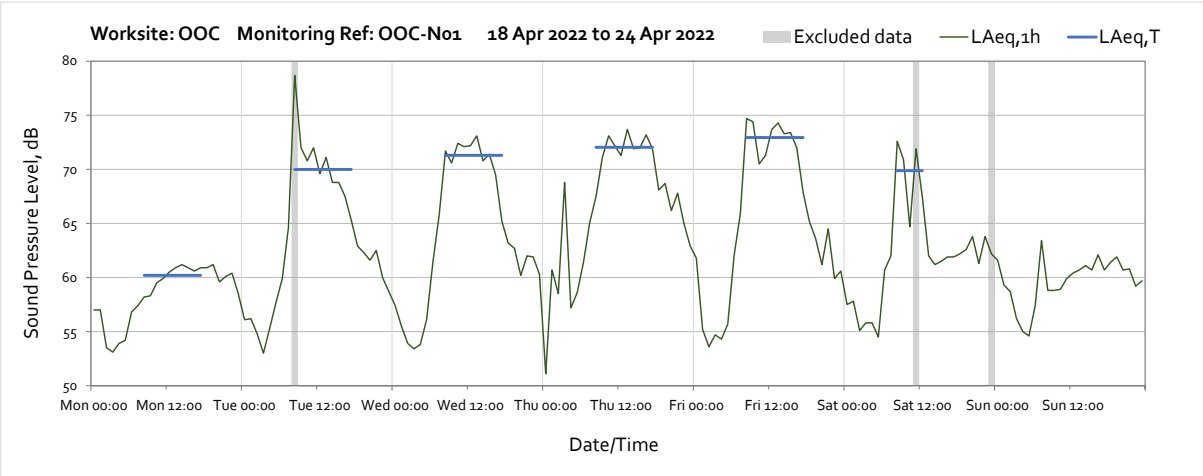
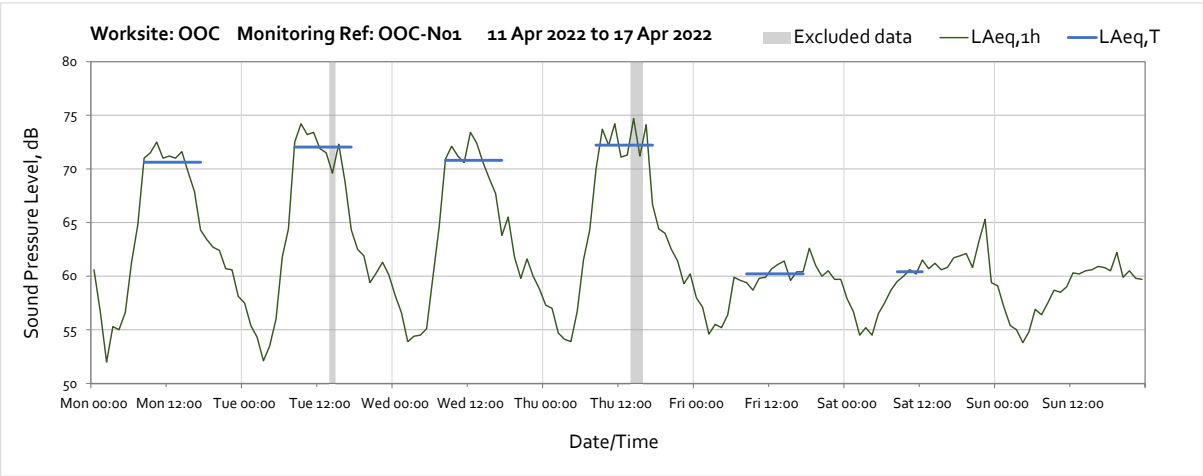
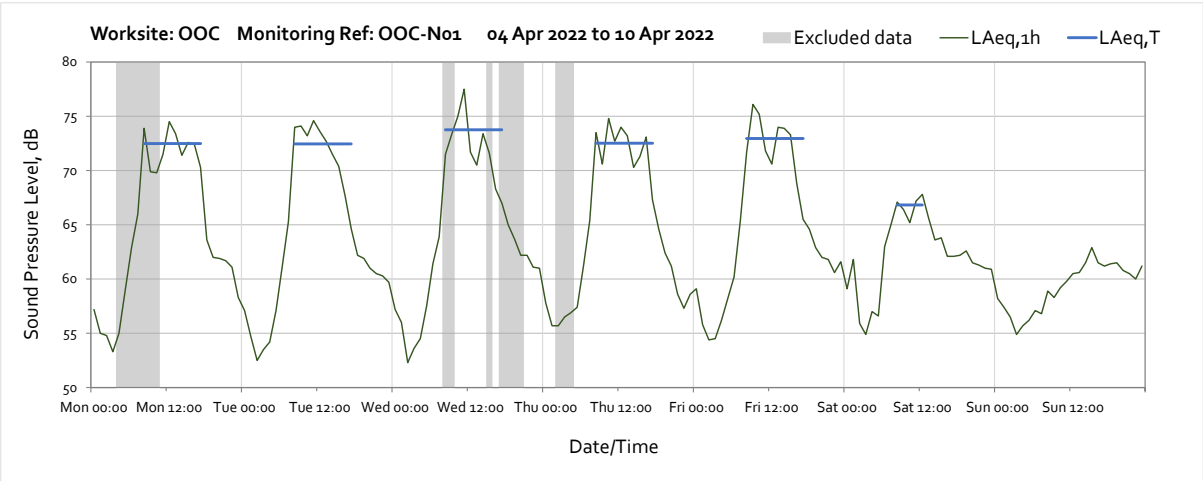
Note: Missing data between 08:00 on Sunday 24th April and 13:00 on Monday 25th April was due to loss of power at the monitoring station.

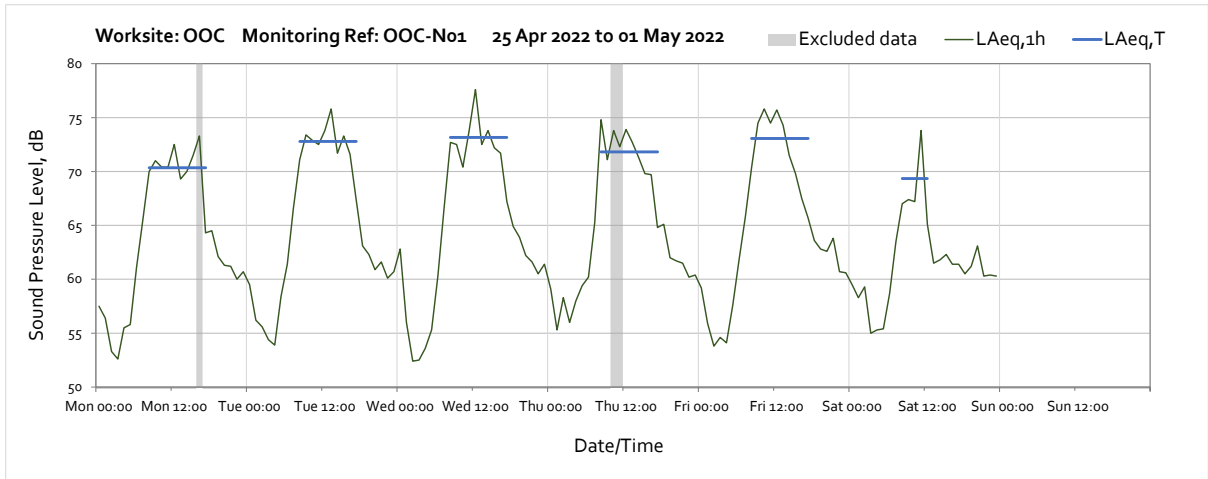


Note: Missing data between 08:00 on Sunday 24th April and 13:00 on Monday 25th April was due to loss of power at the monitoring station.

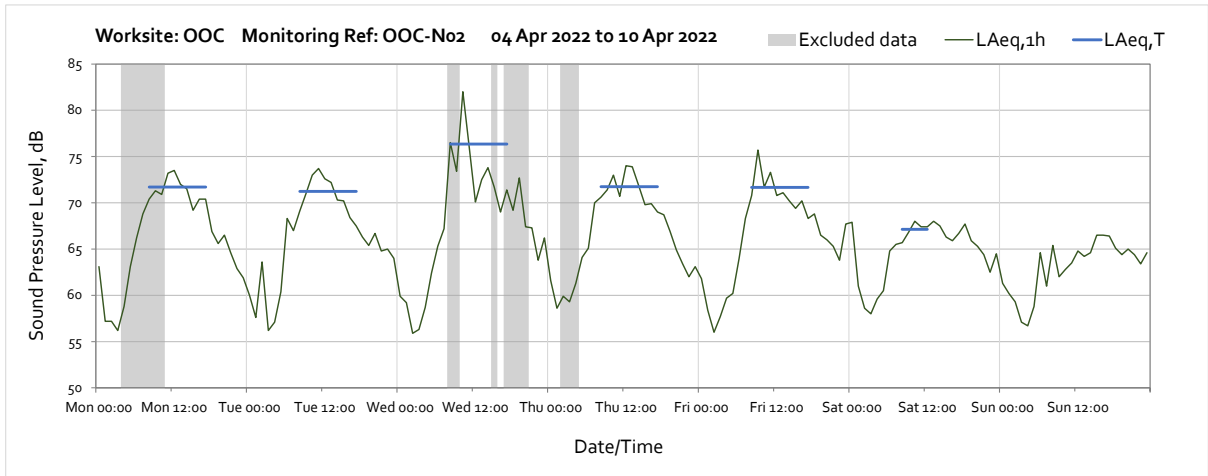
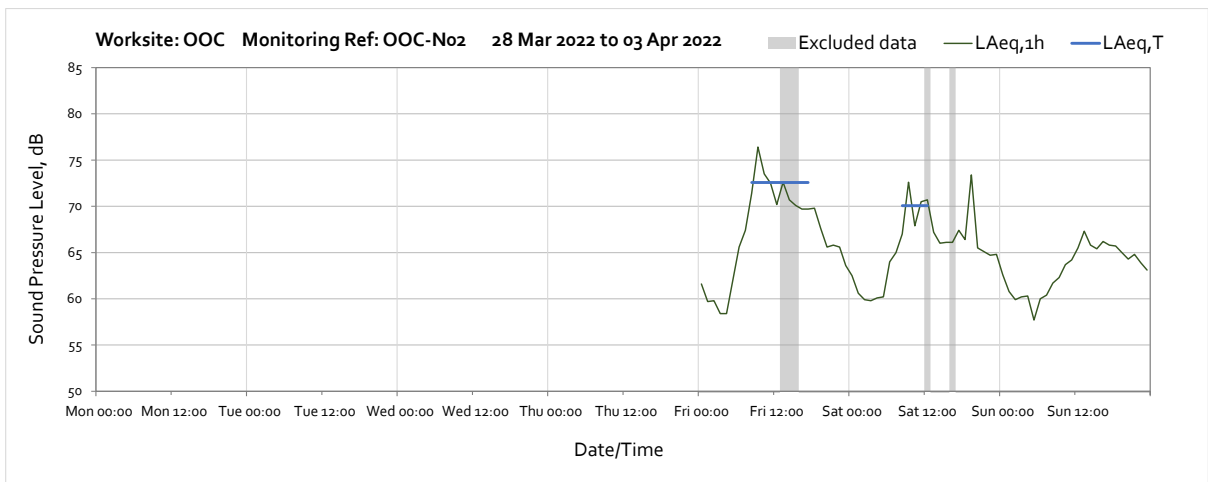
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N01

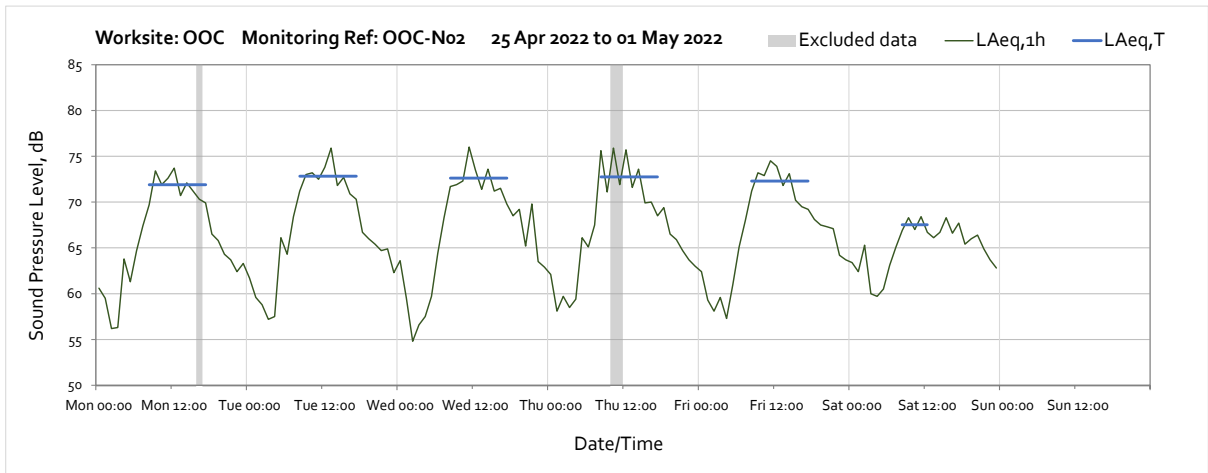
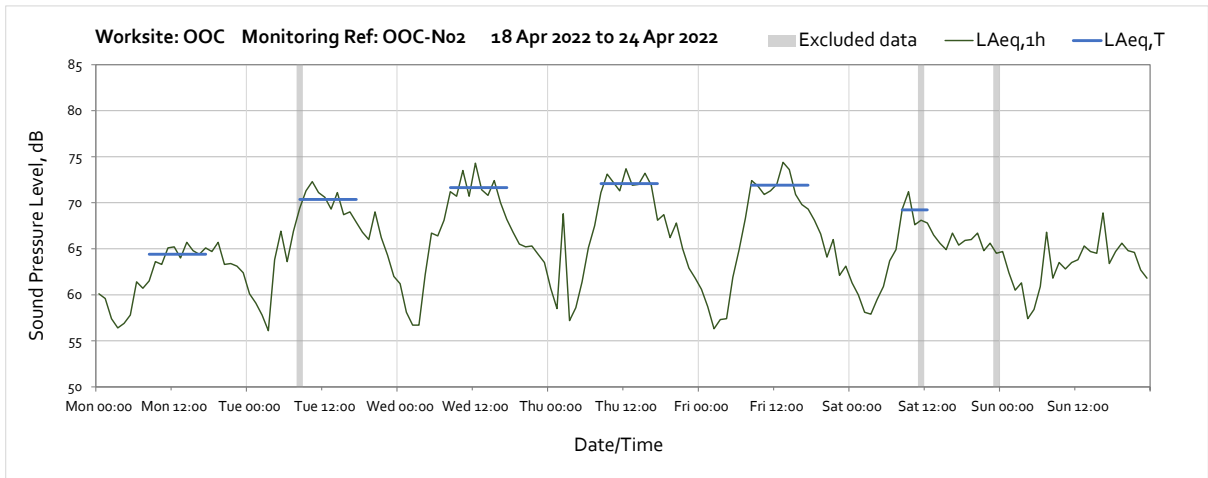
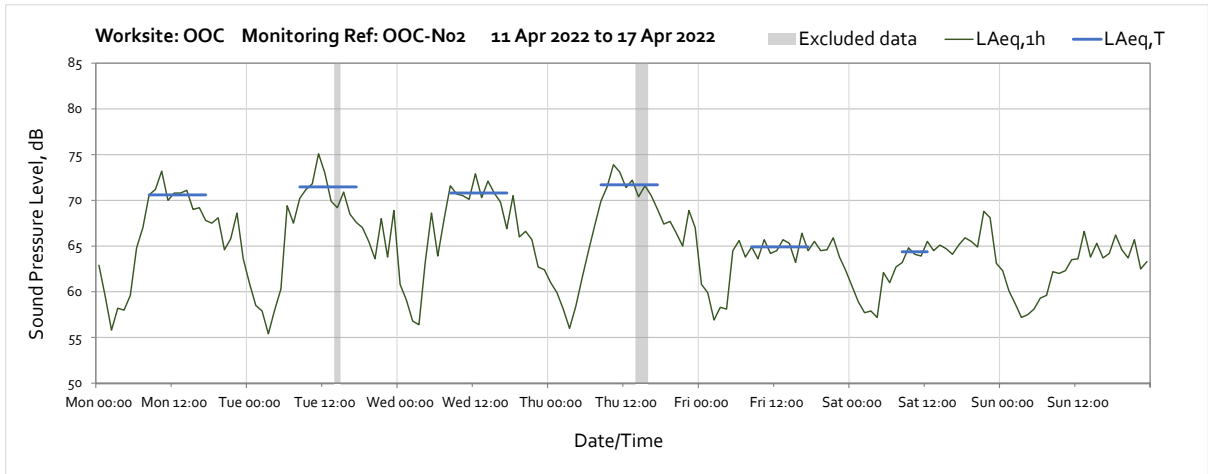




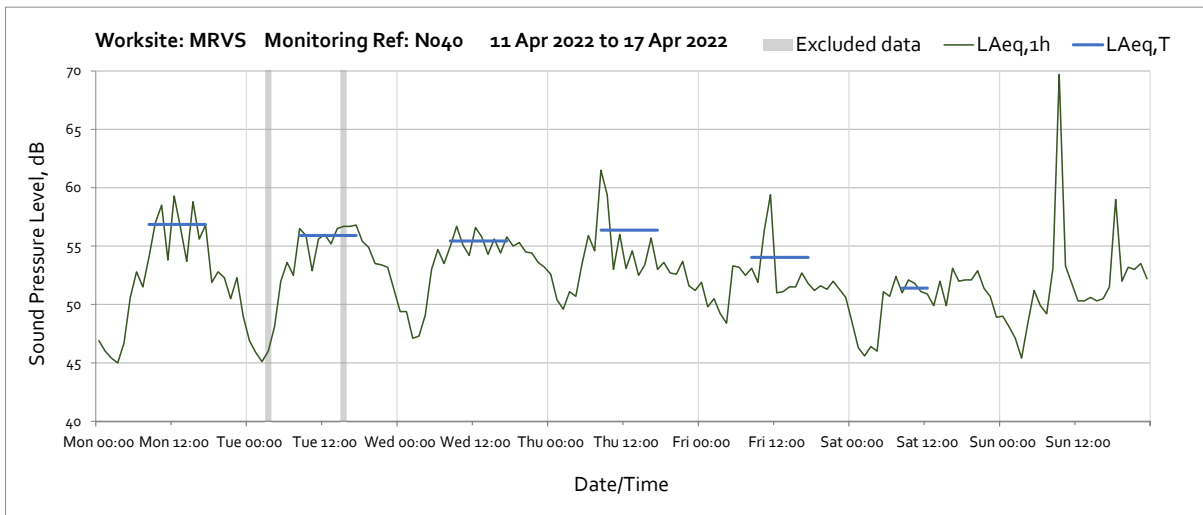
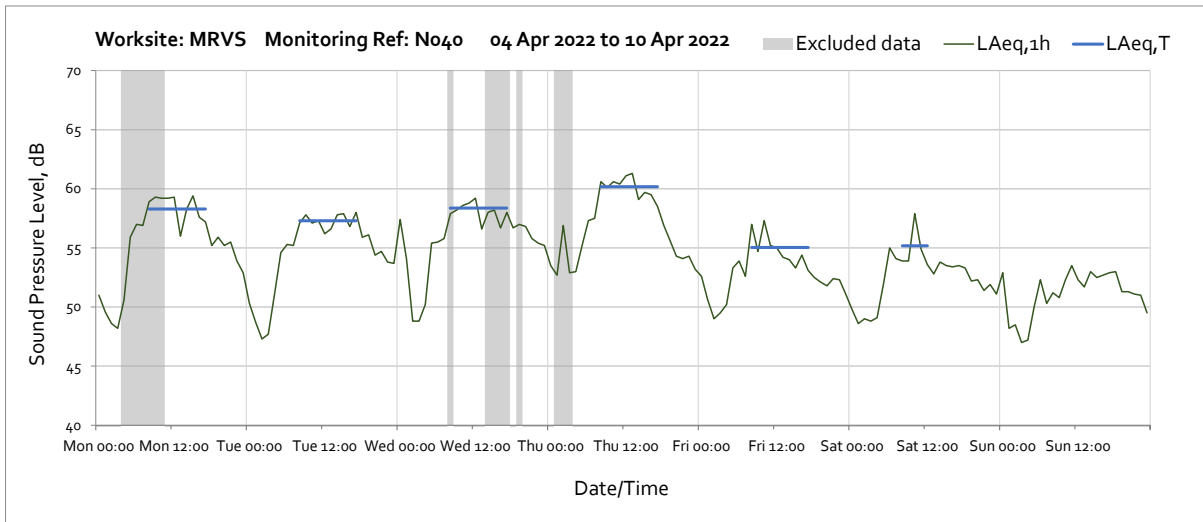
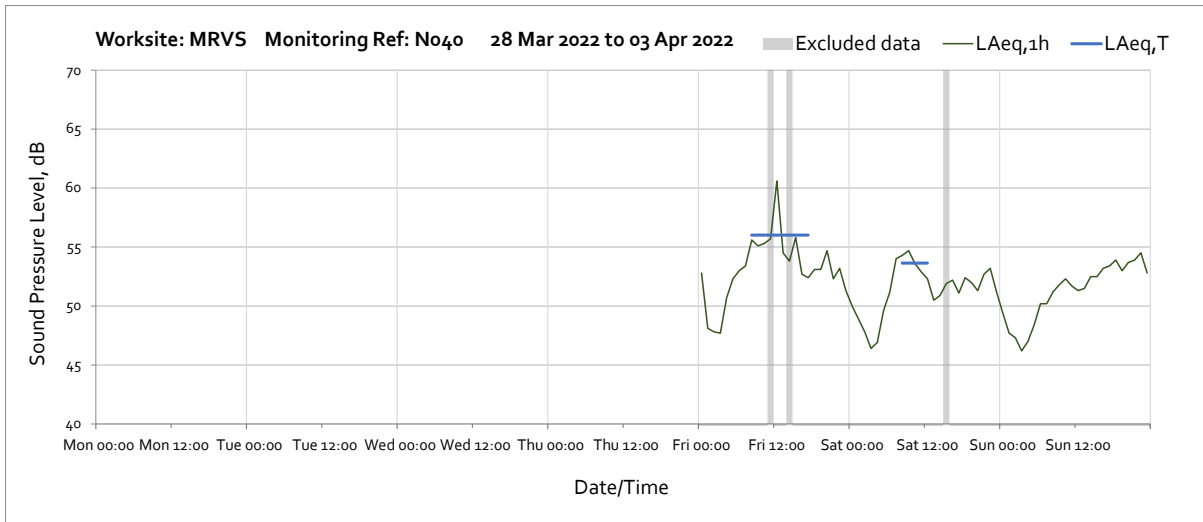


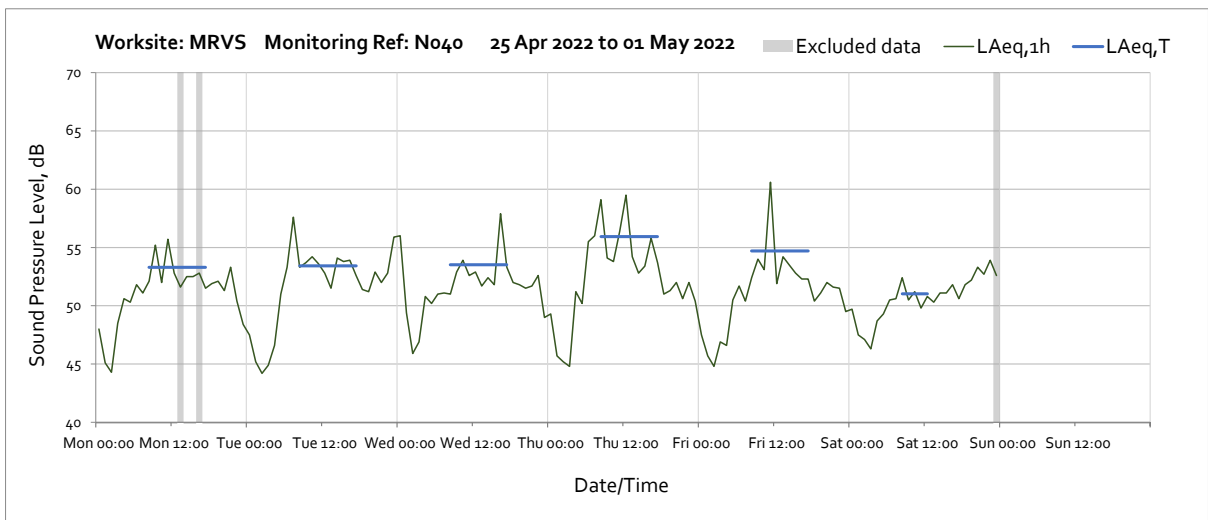
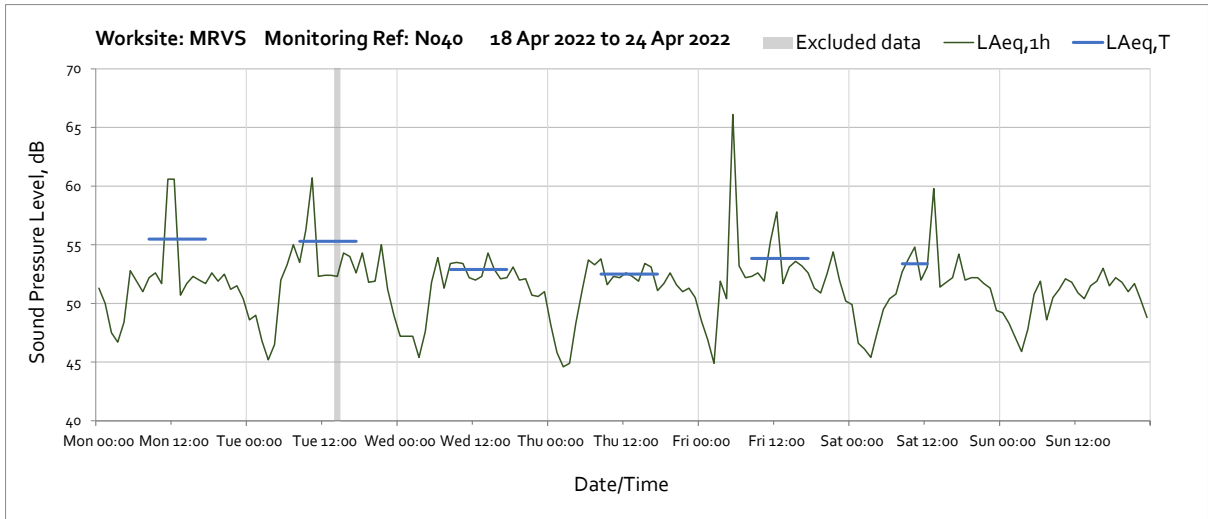
Worksite: Oal Oak Common (OOC) – Monitoring Ref: OOC-N02



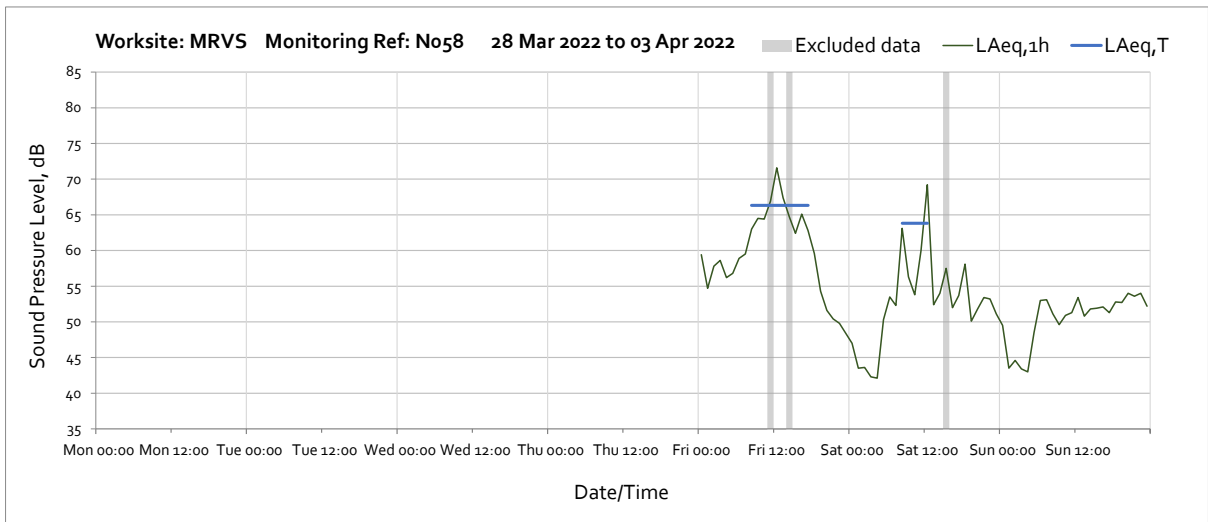


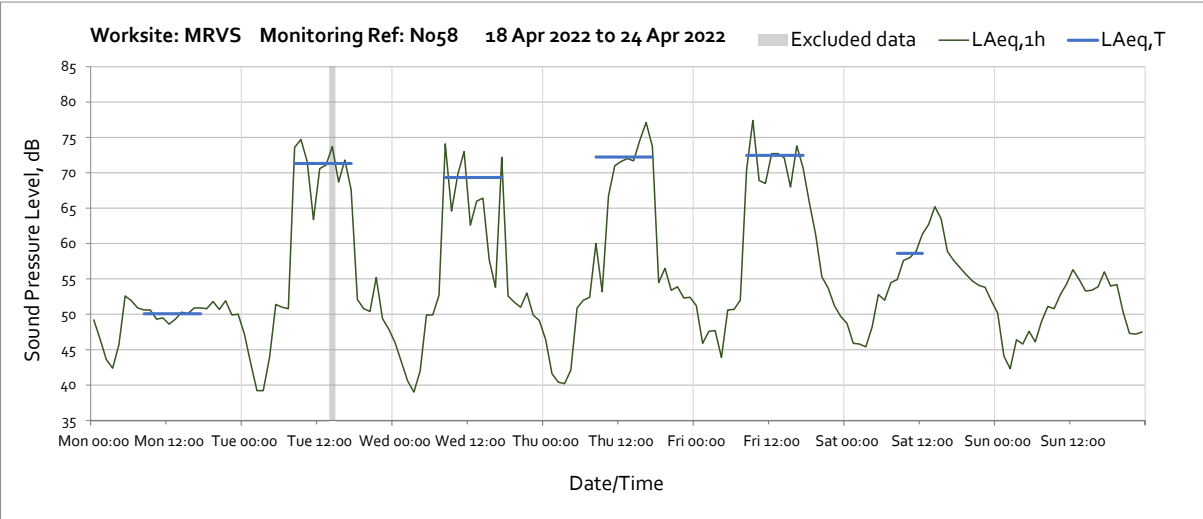
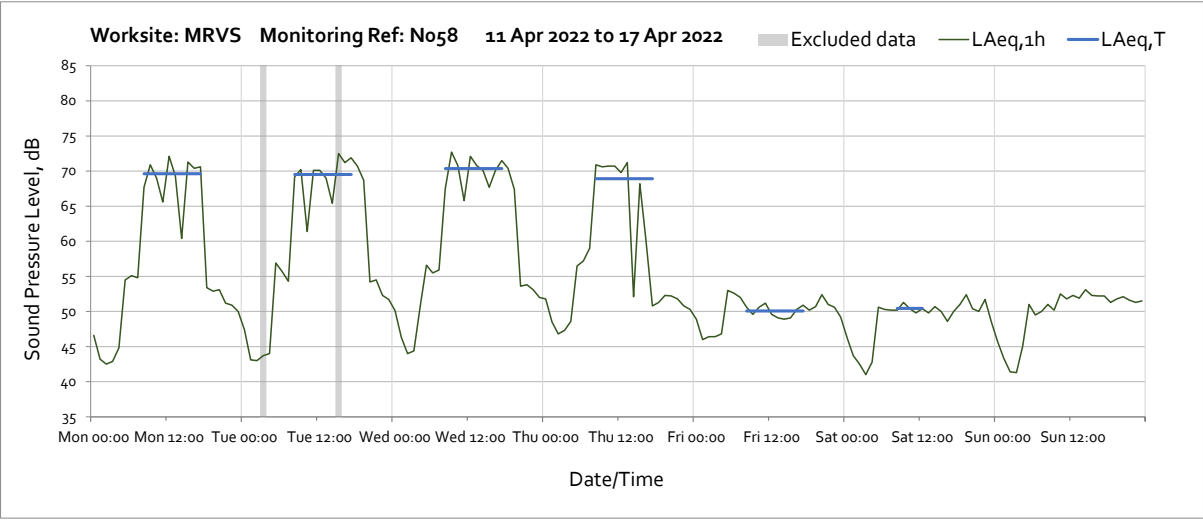
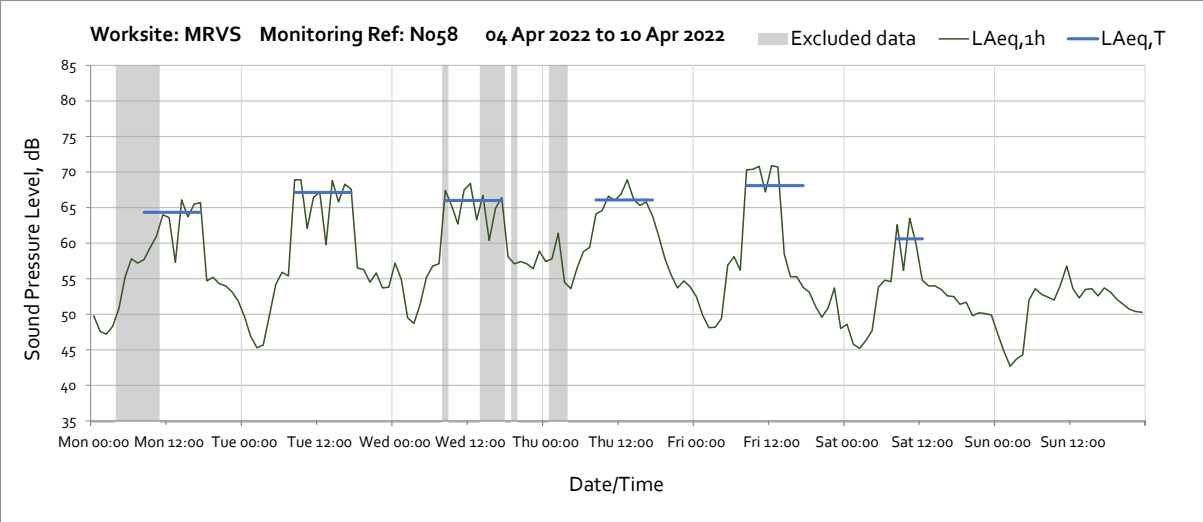
Worksite: Mandeville Road Ventilation Shaft (MRVS) – Monitoring Ref: N040

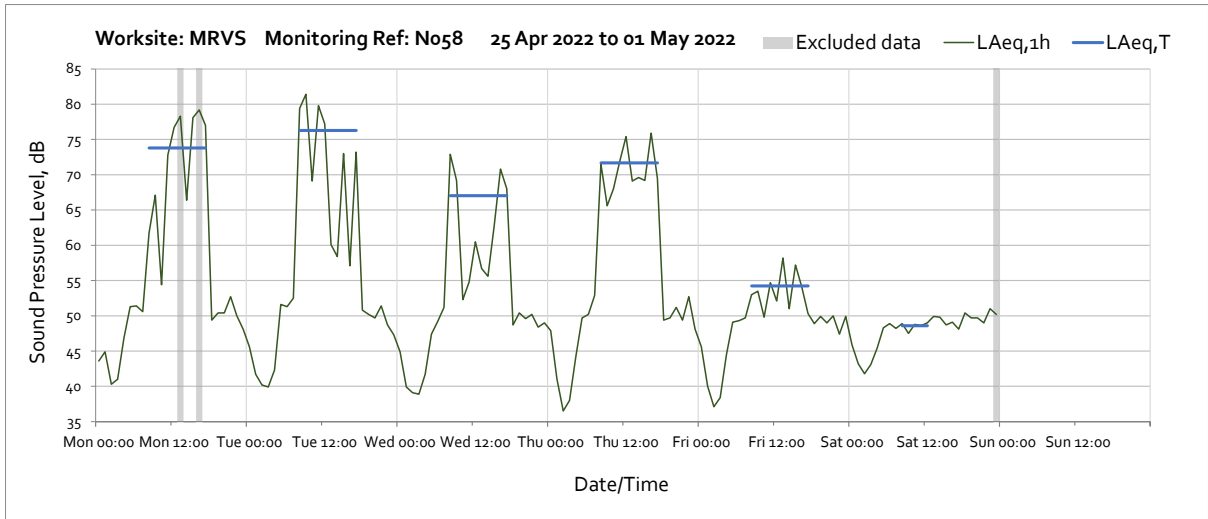




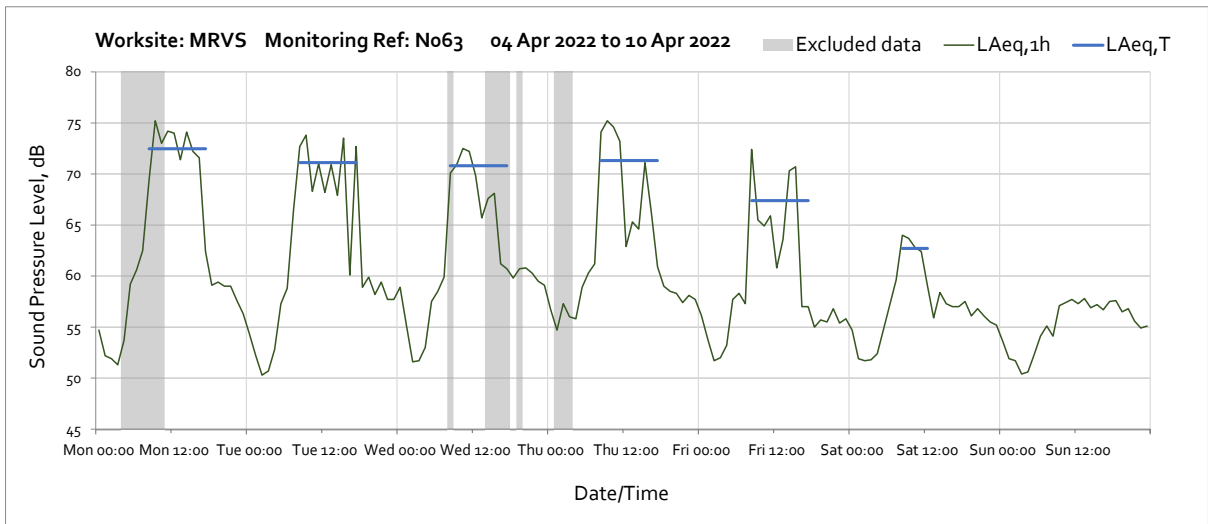
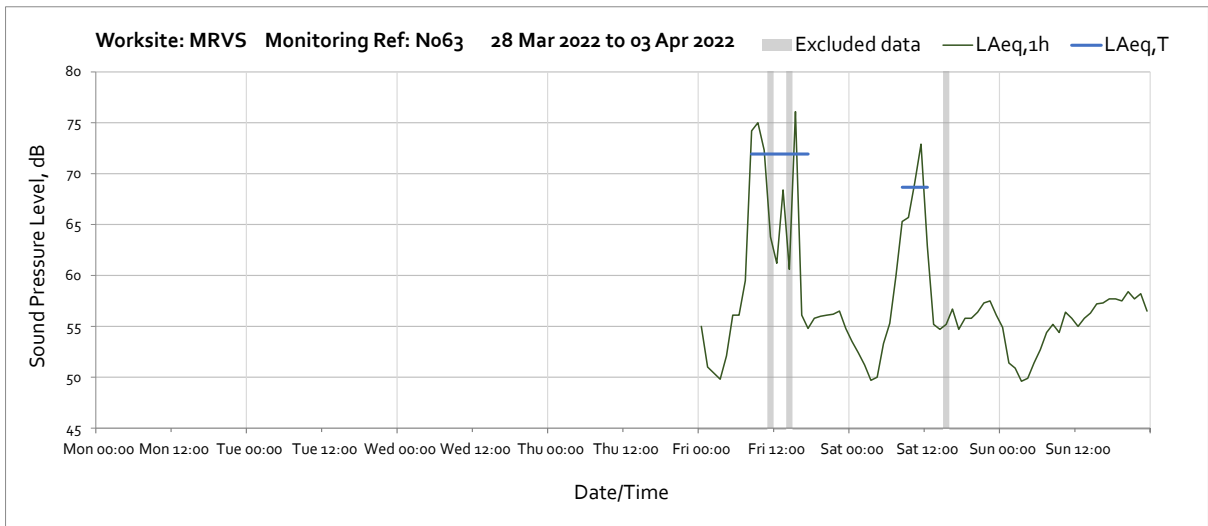
Worksite: Mandeville Road Ventilation Shaft (MRVS) - Monitoring Ref: N058

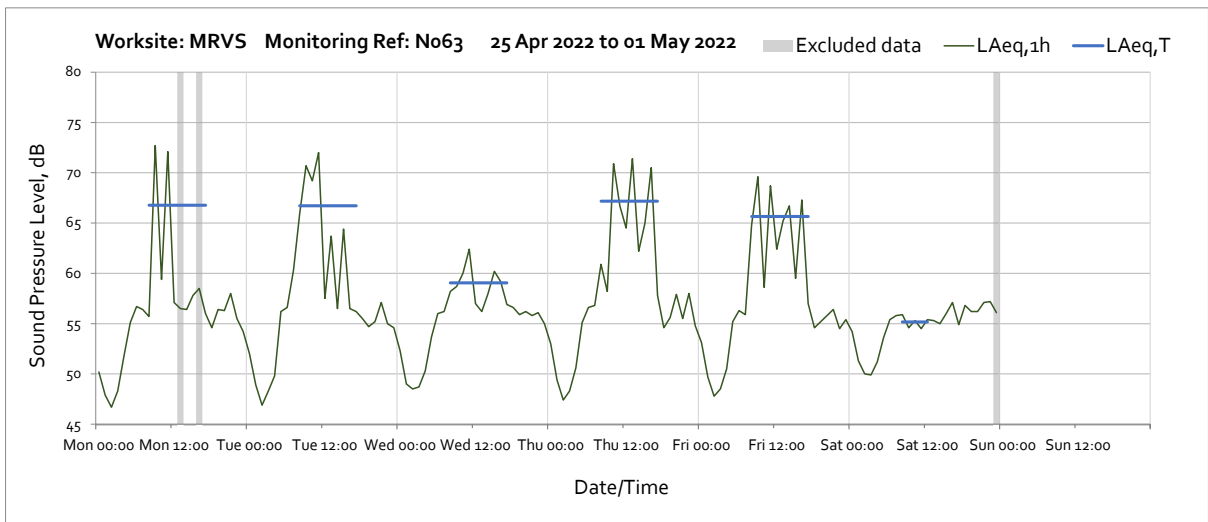
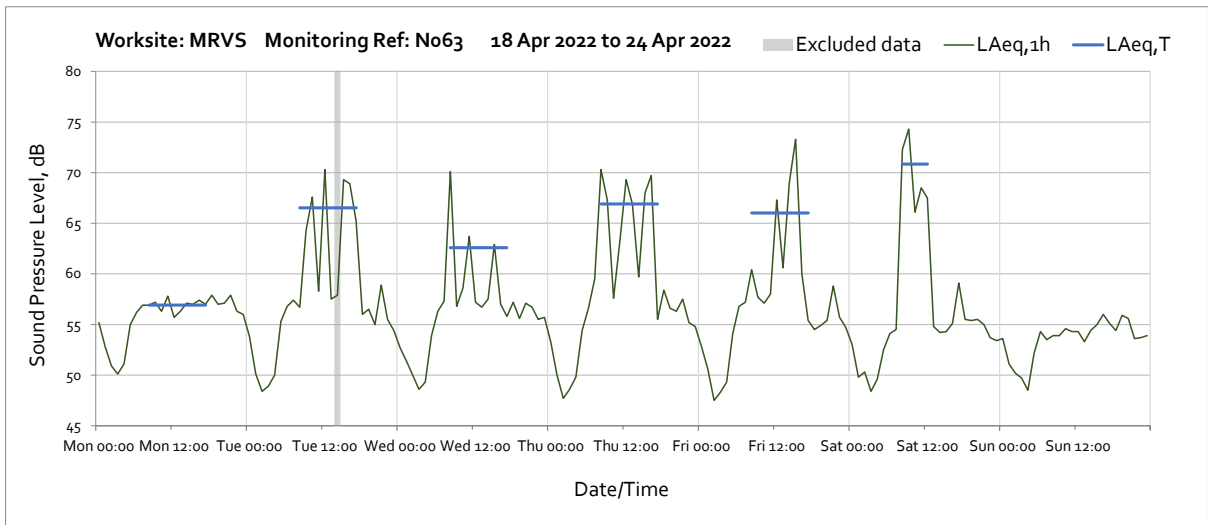
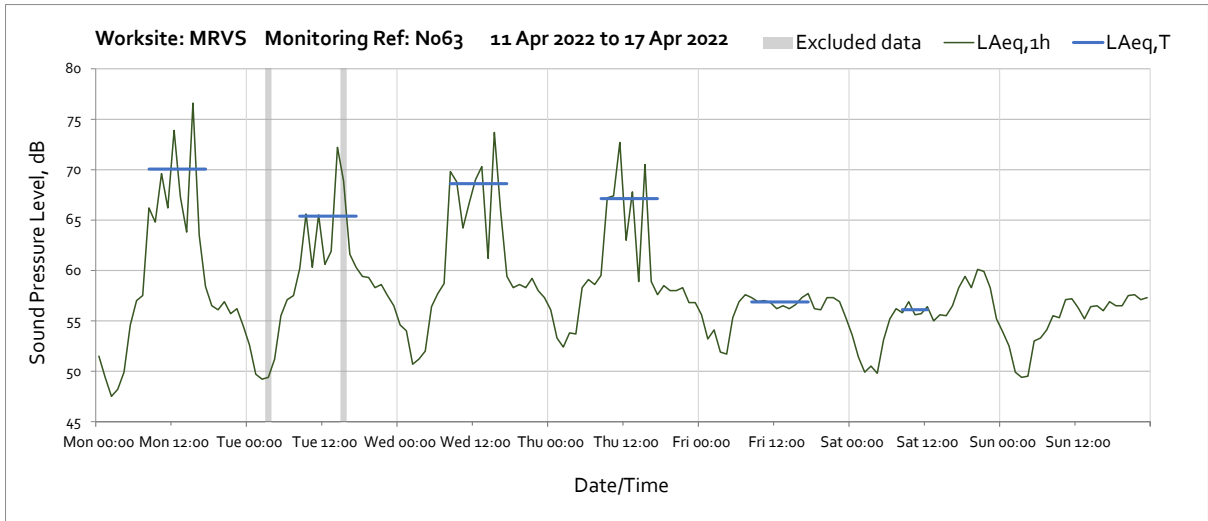




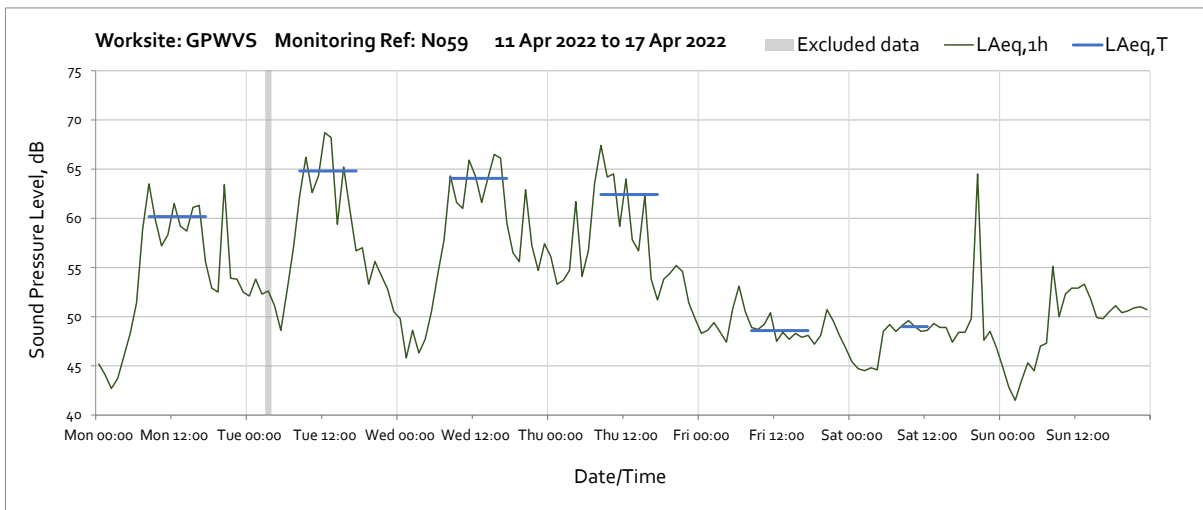
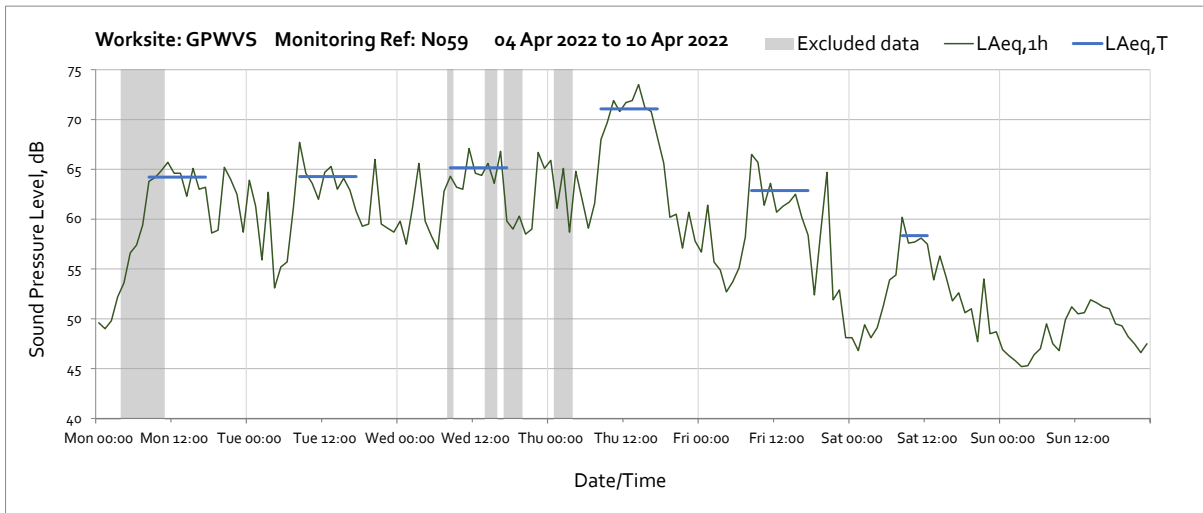
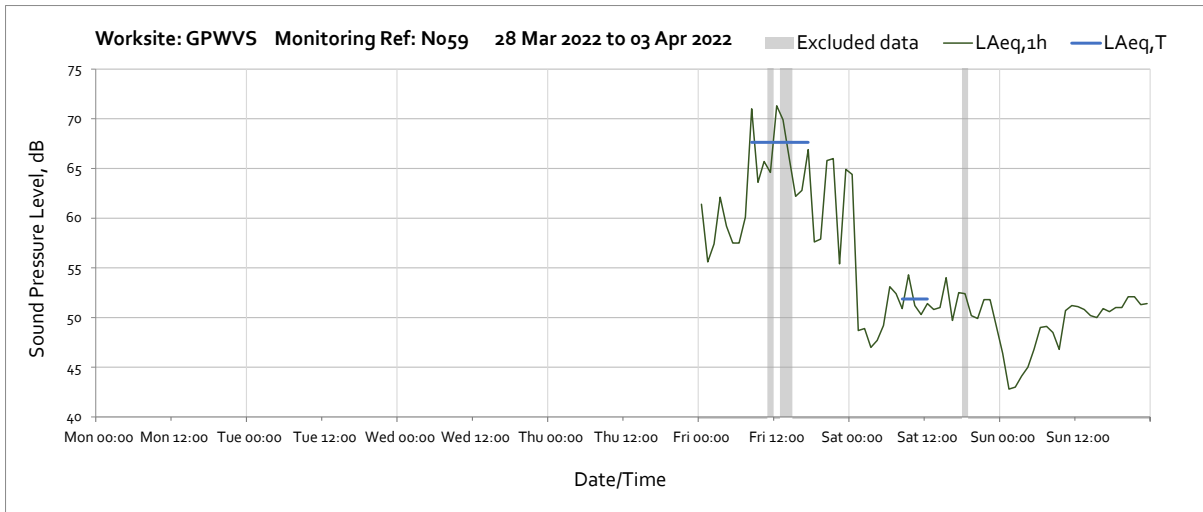


Worksite: Mandeville Road Ventilation Shaft (MRVS) - Monitoring Ref: N063

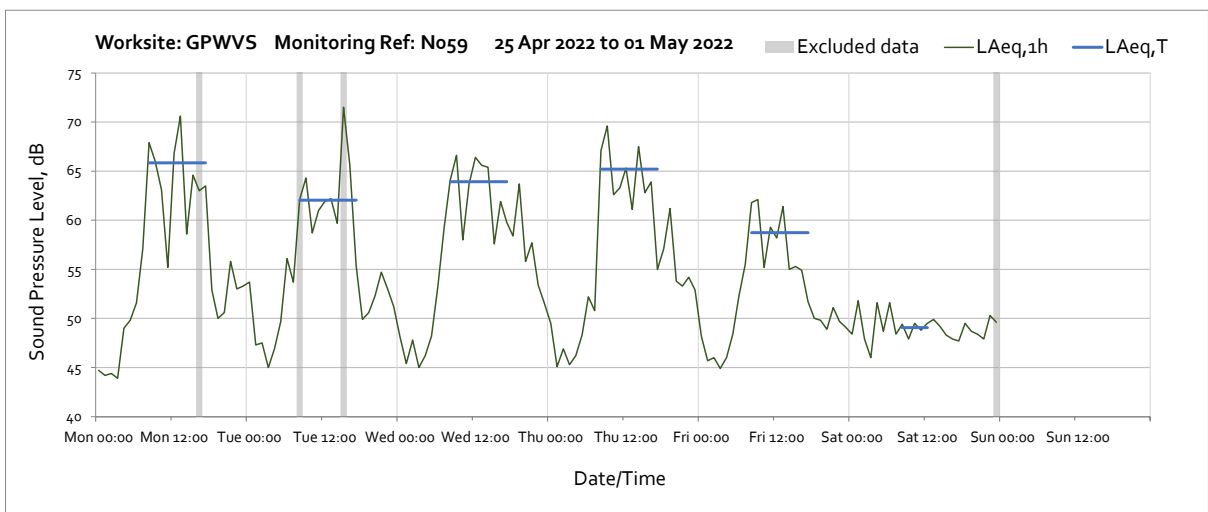
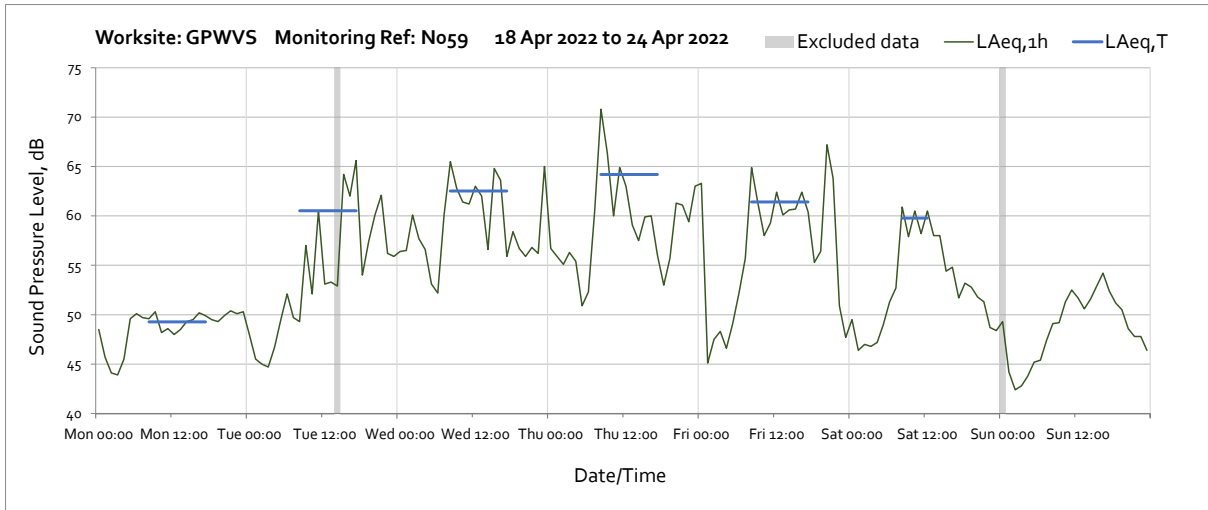




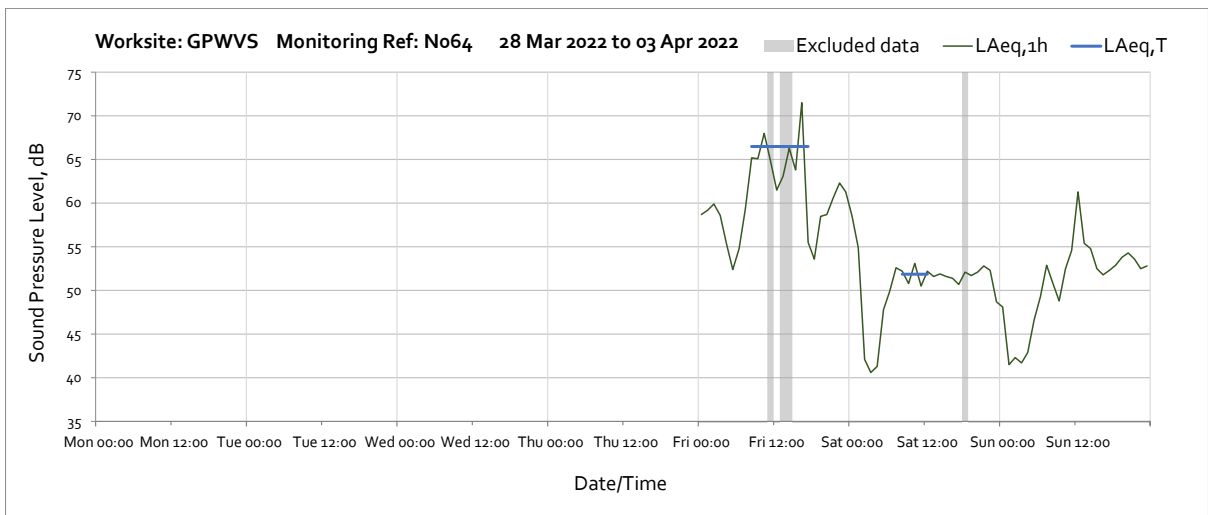
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N059

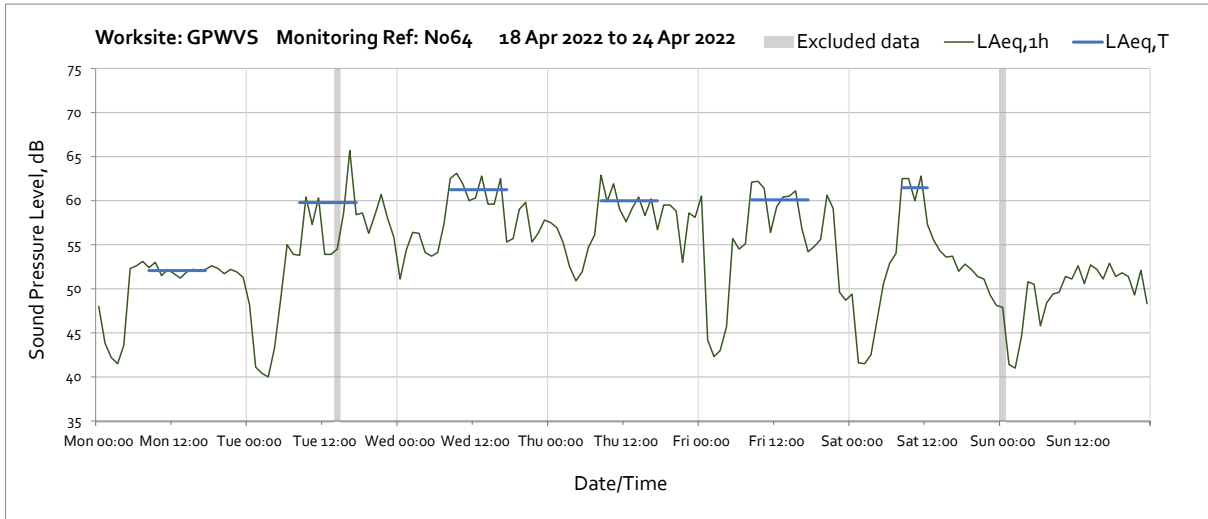
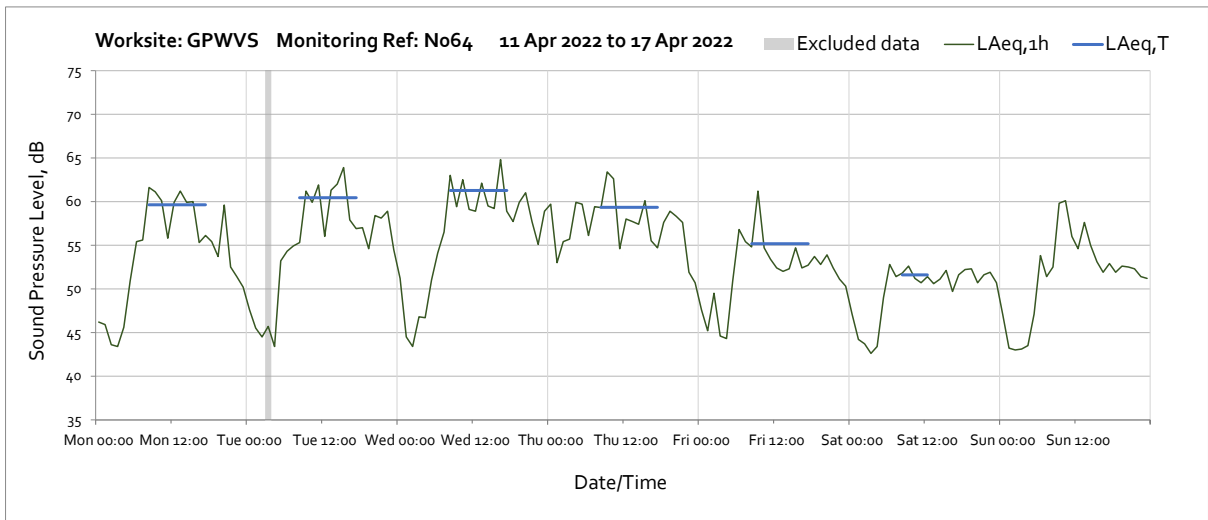
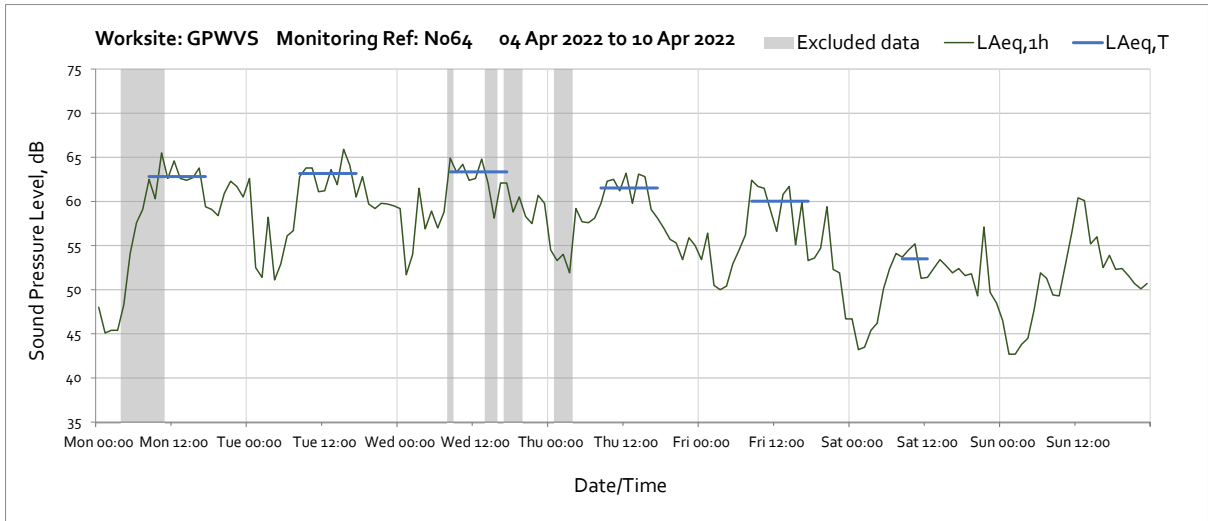


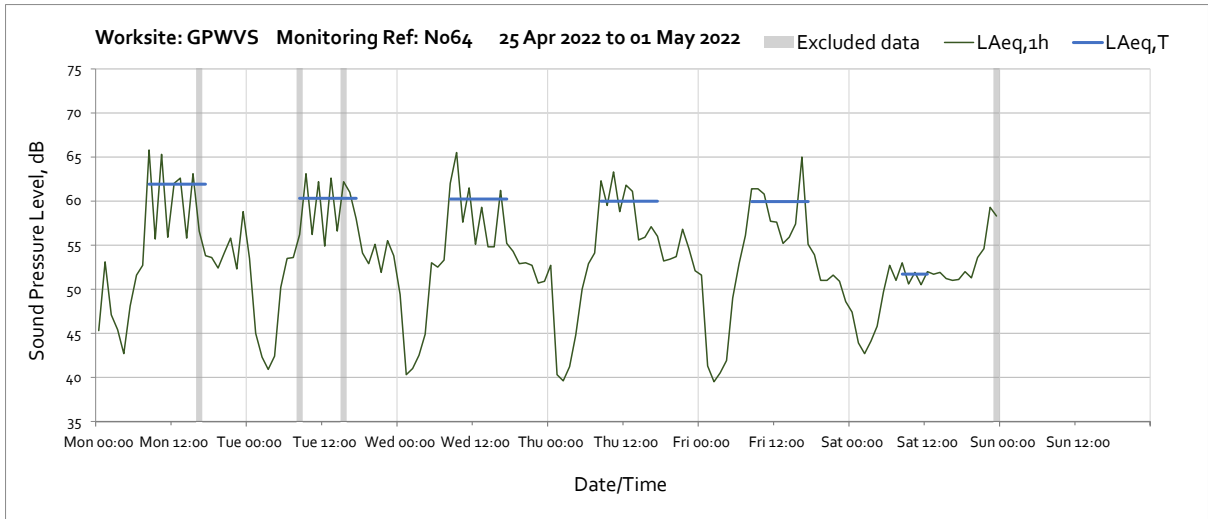
OFFICIAL



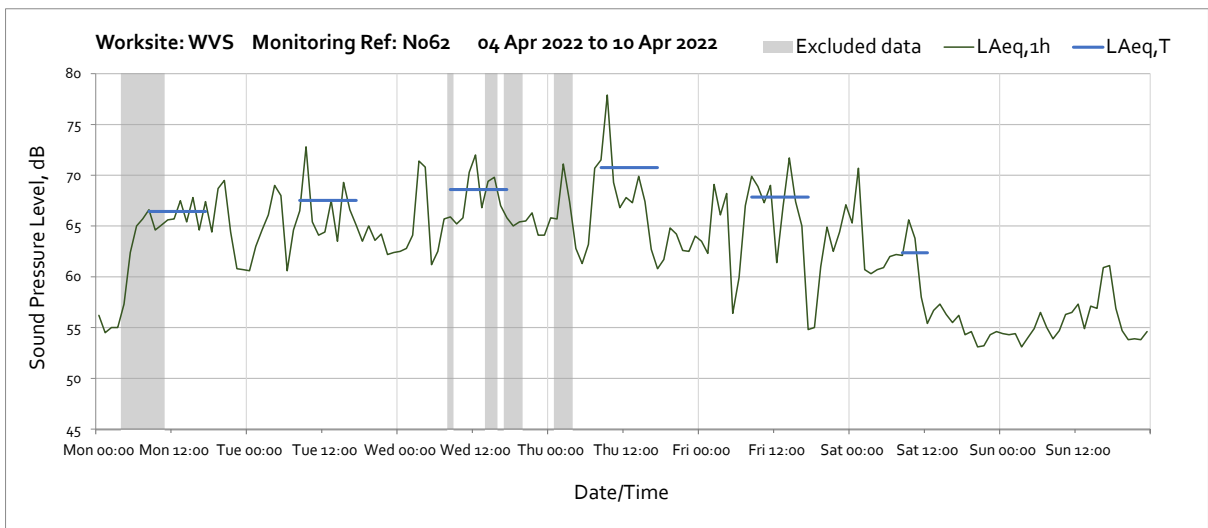
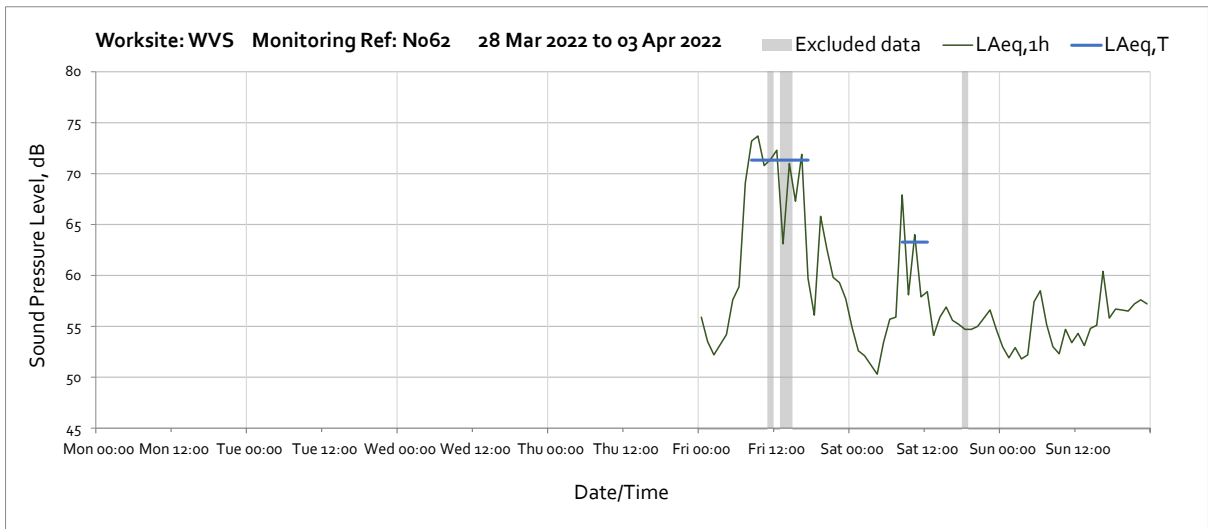
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: N064

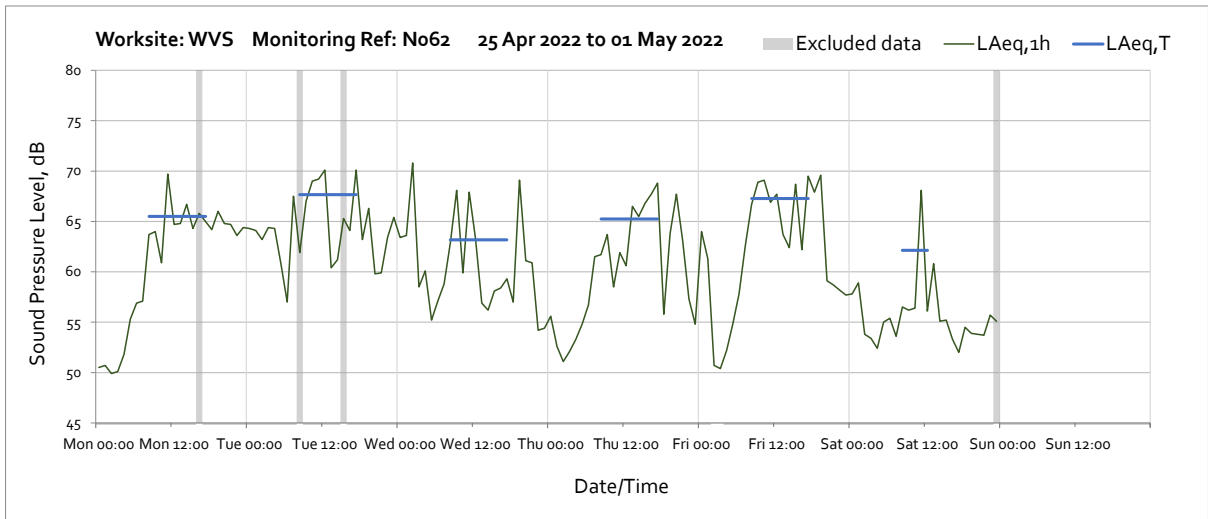
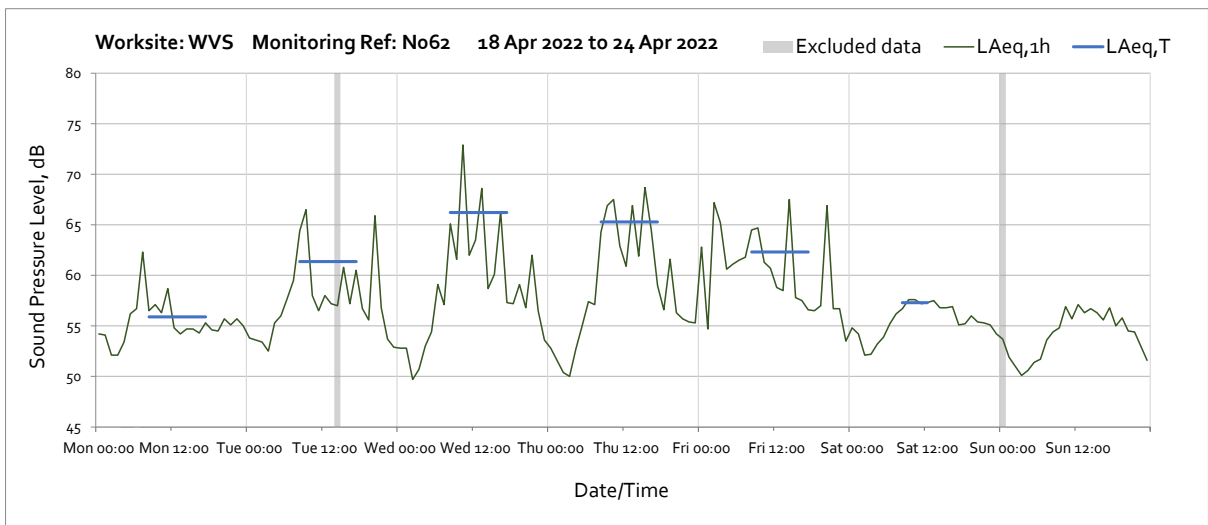
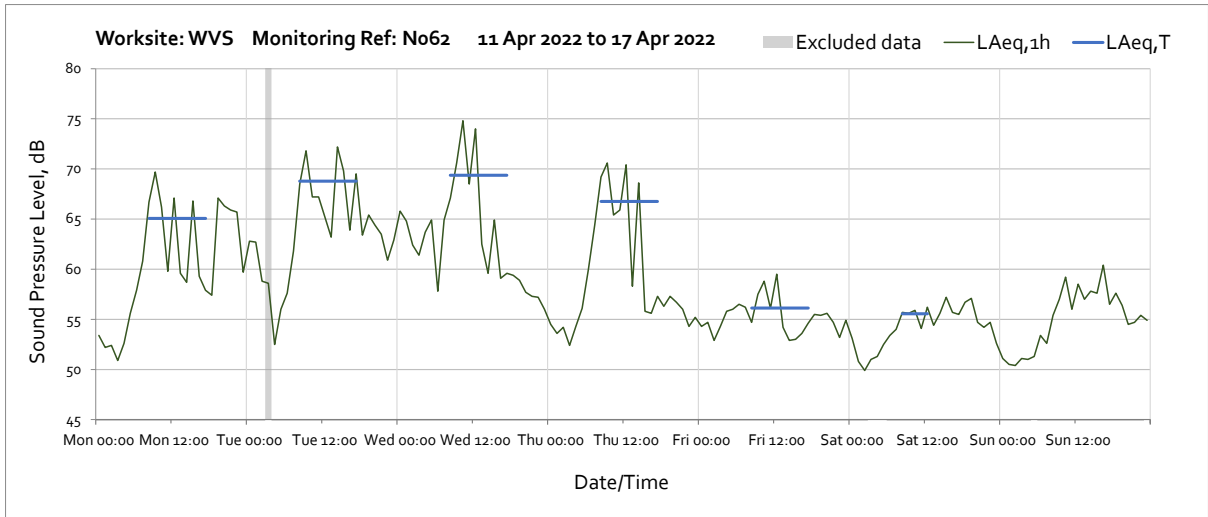






Worksite: Westgate Ventilation Shaft (WVS) – Monitoring Ref: N062

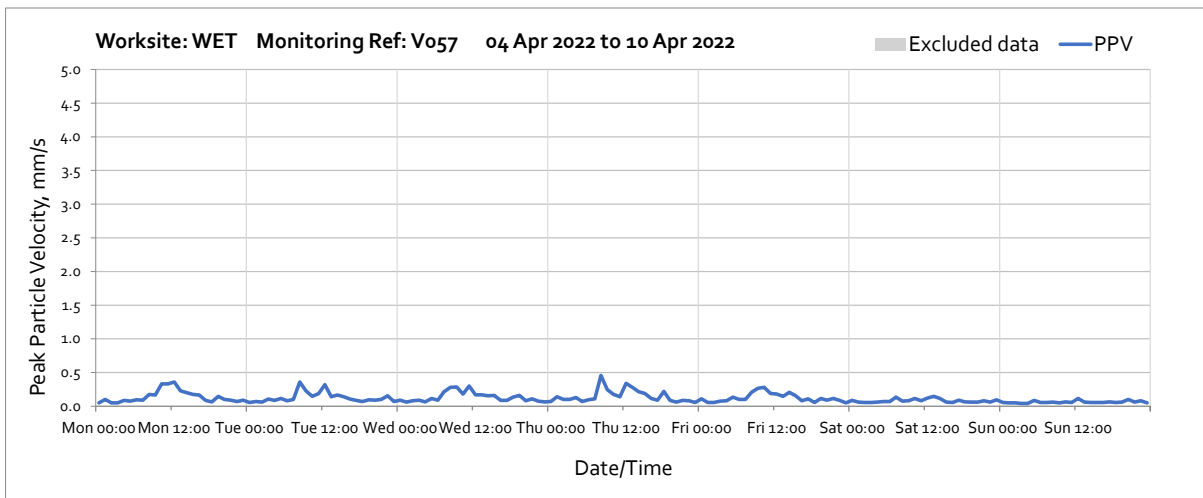
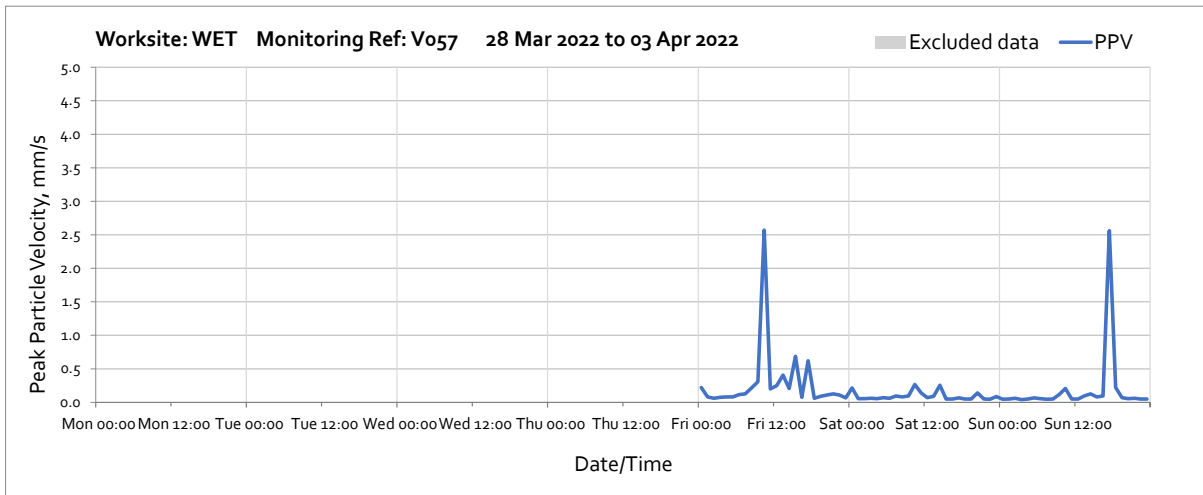


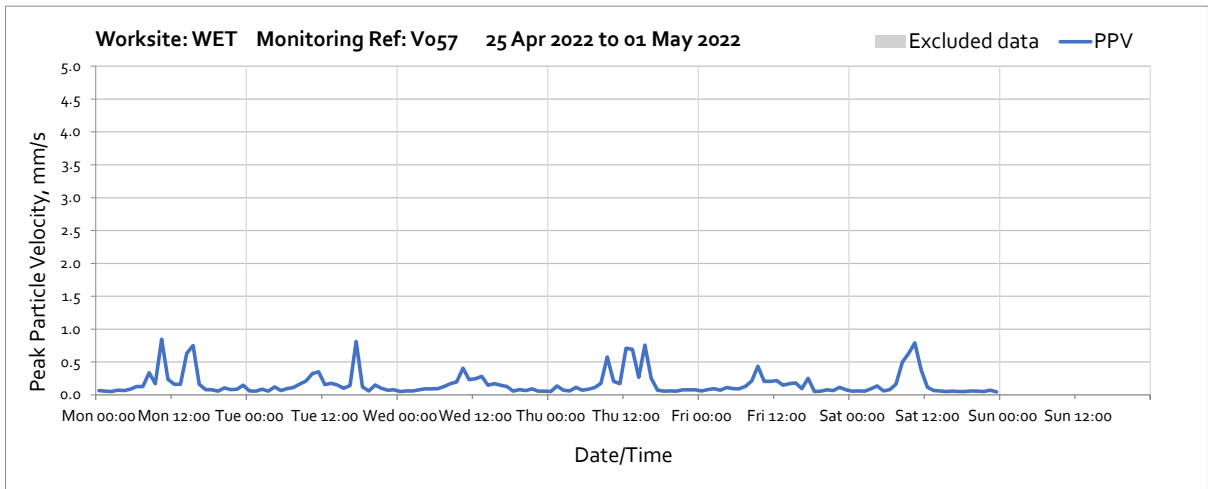
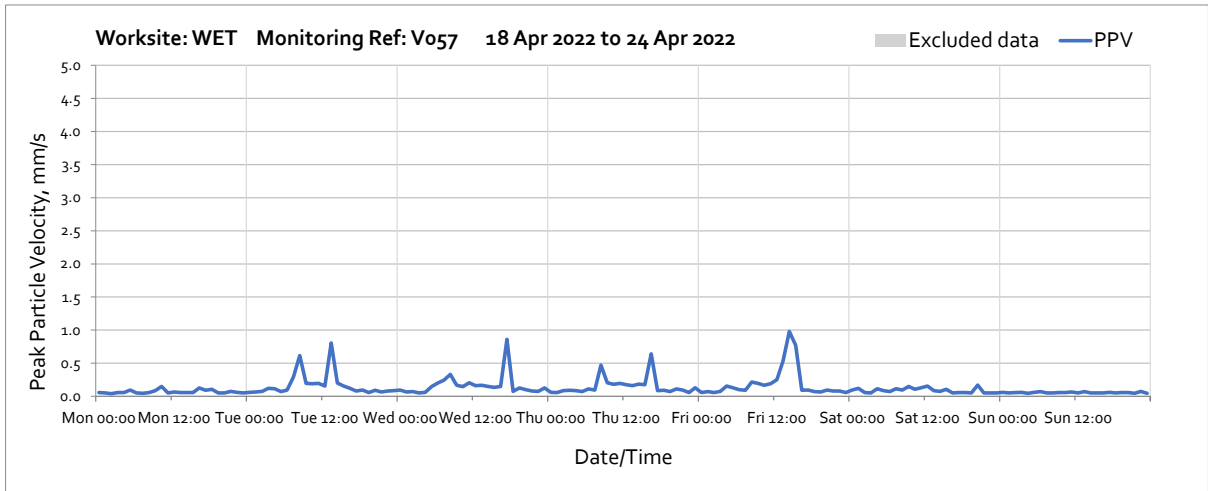
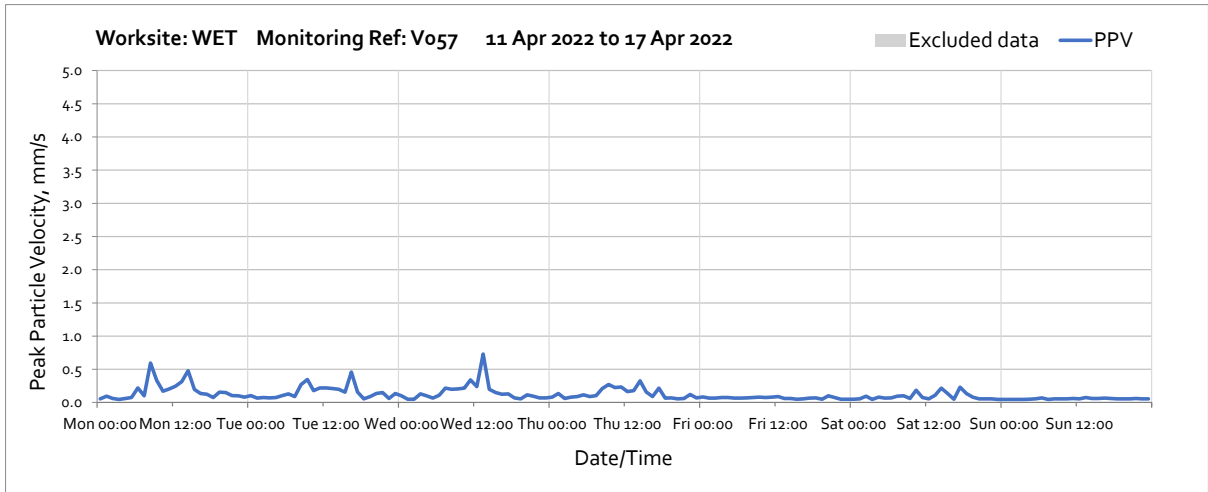


Vibration

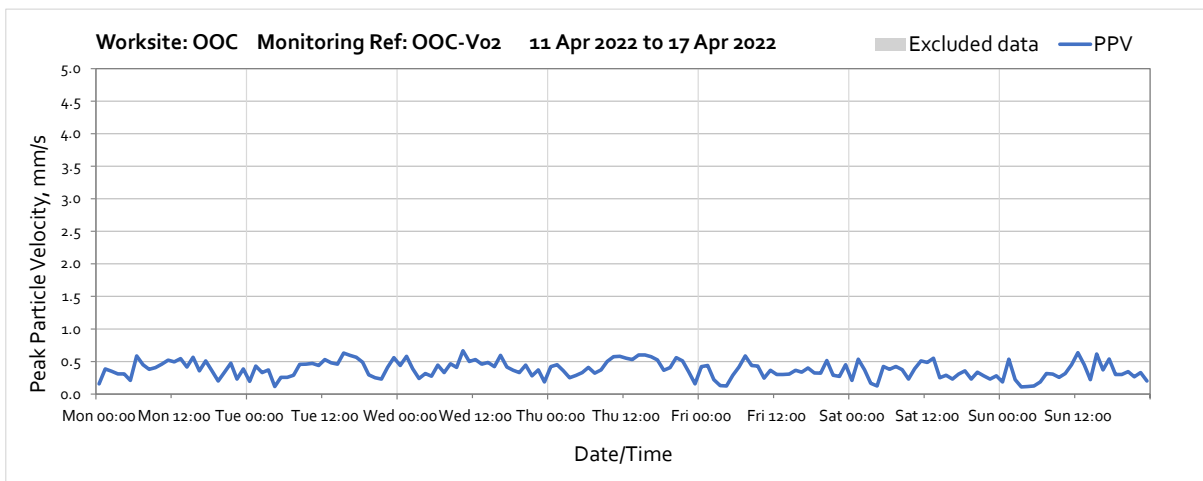
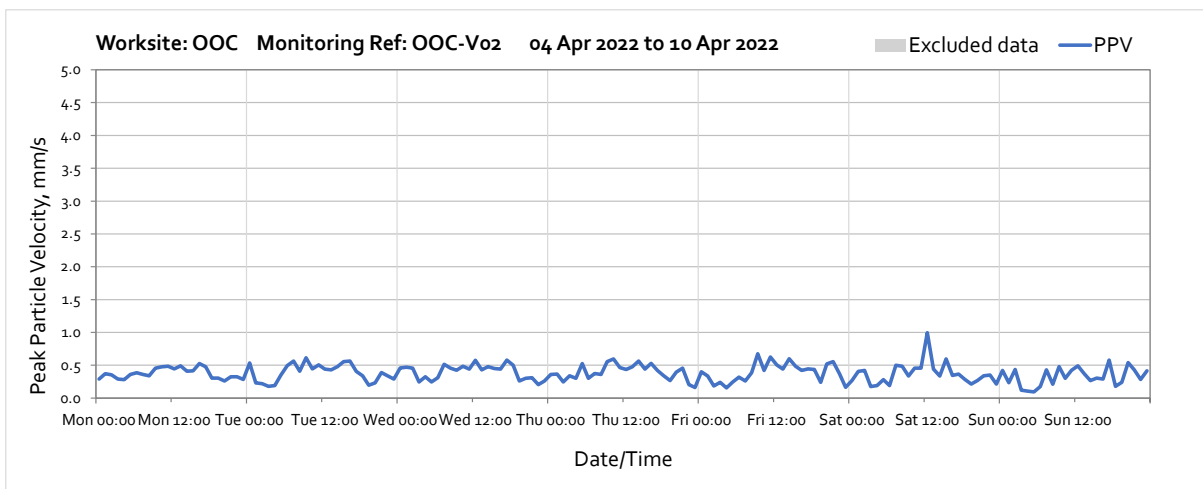
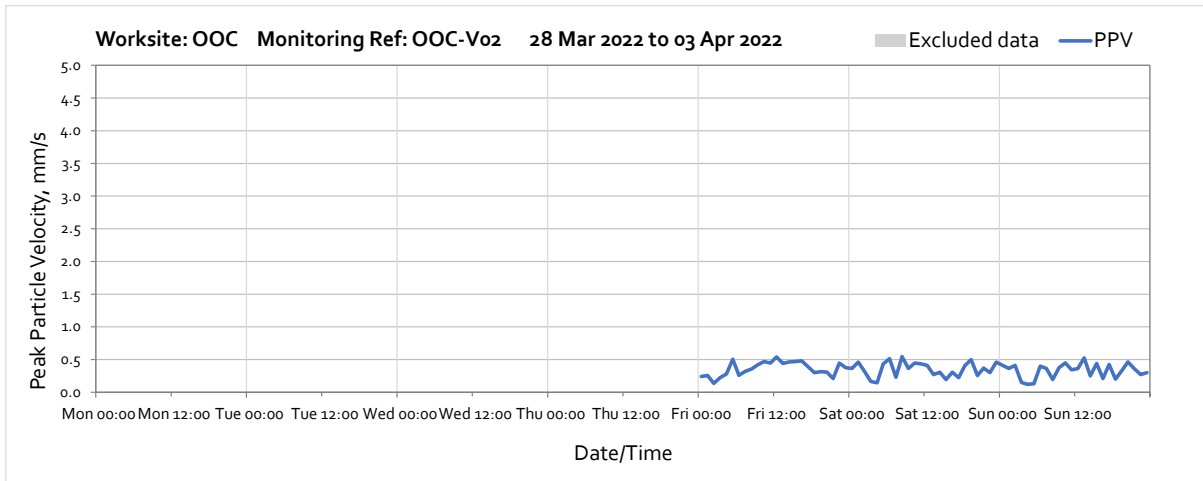
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the highest PPV of the three orthogonal axis x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which are not representative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

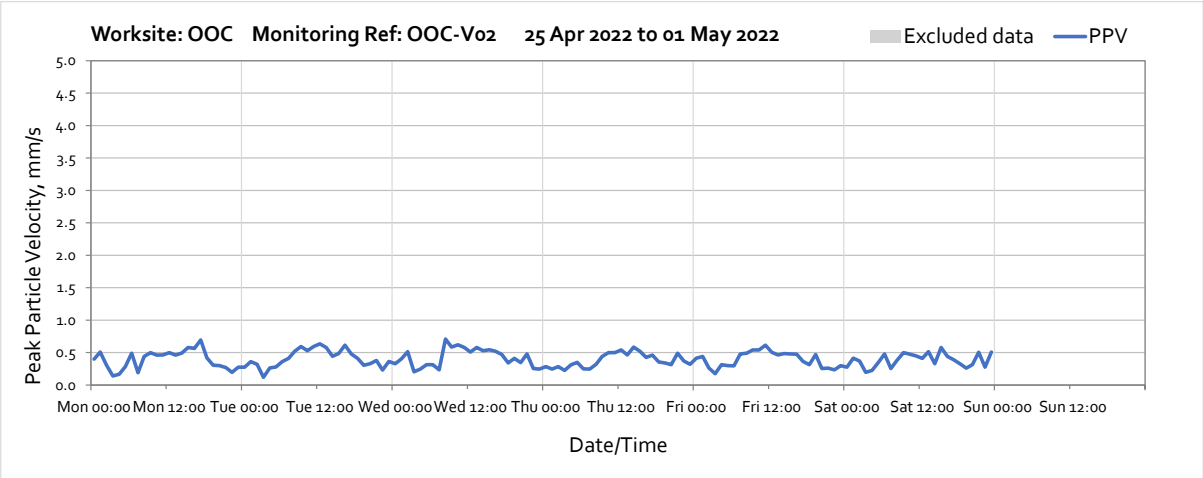
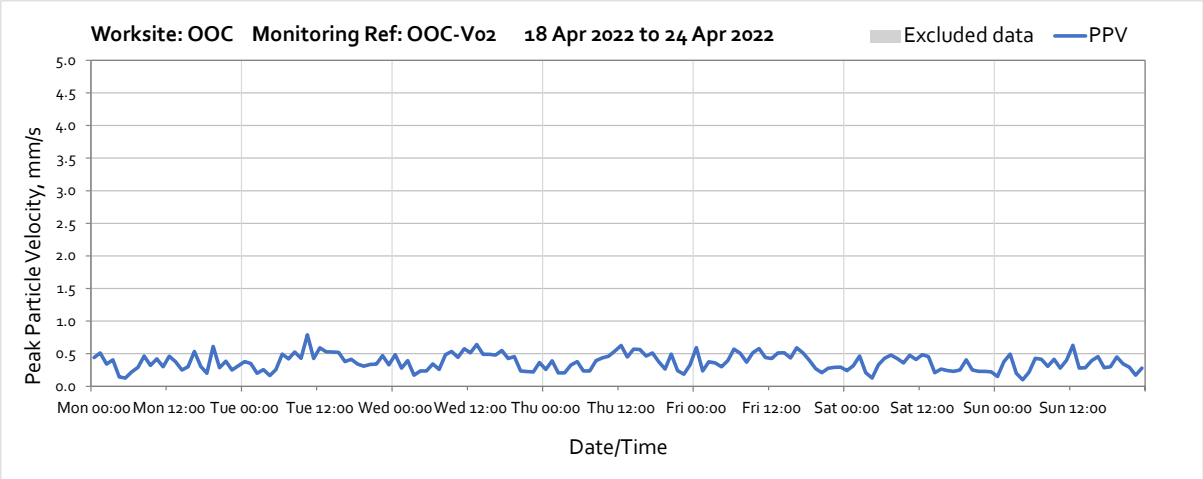
Worksite: Willesden Euro Terminal (WET) – Monitoring Ref: V057



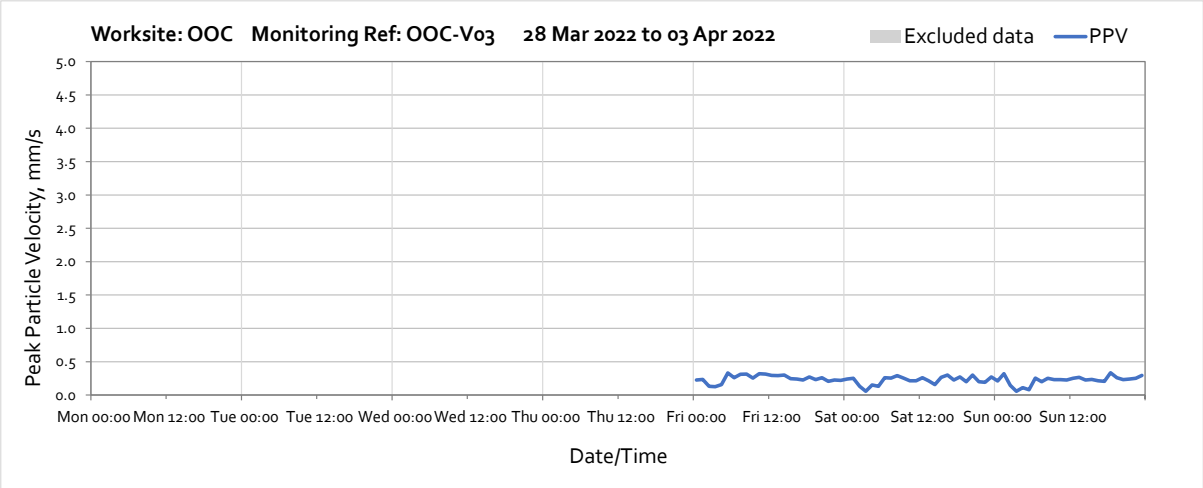


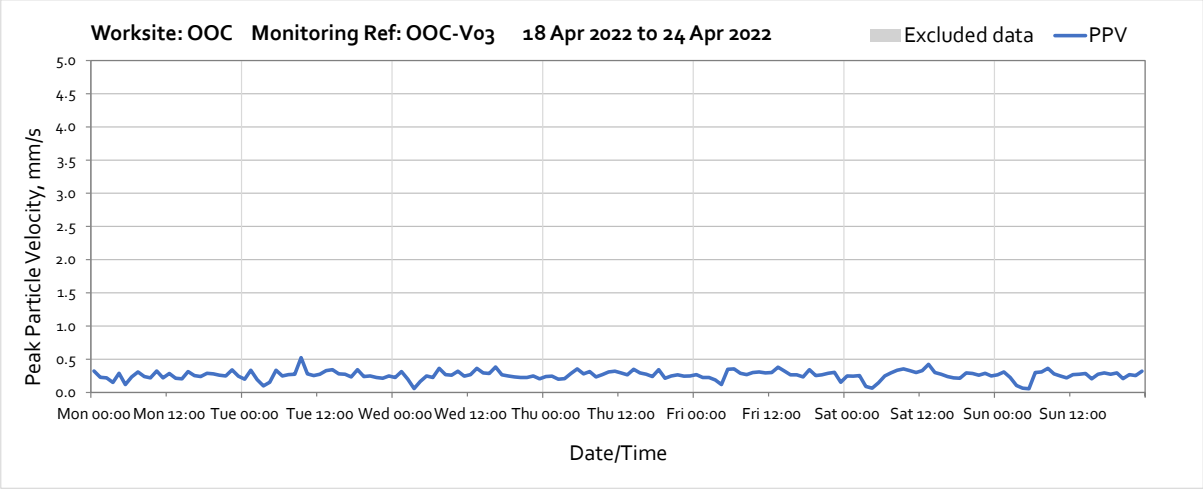
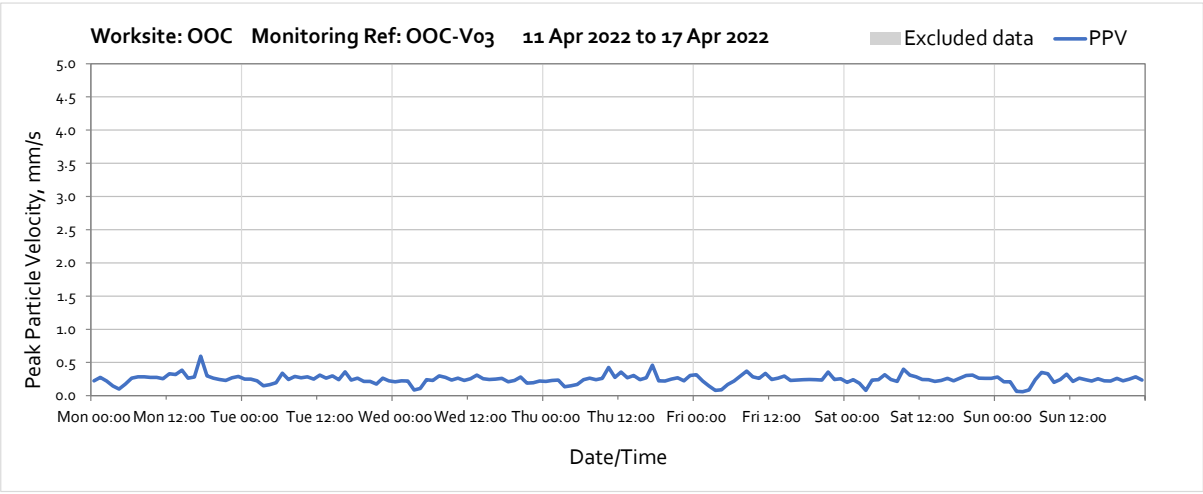
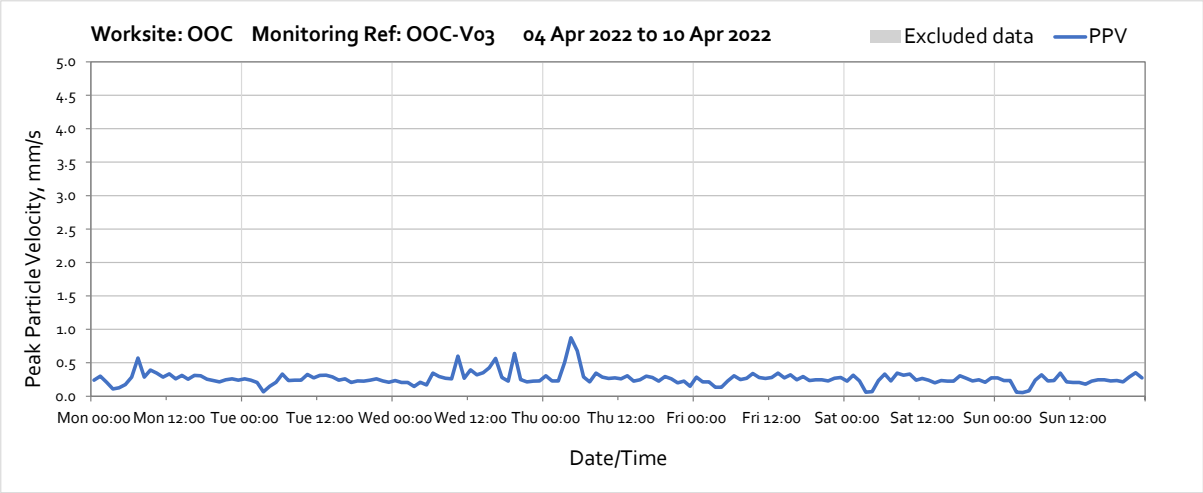
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V02

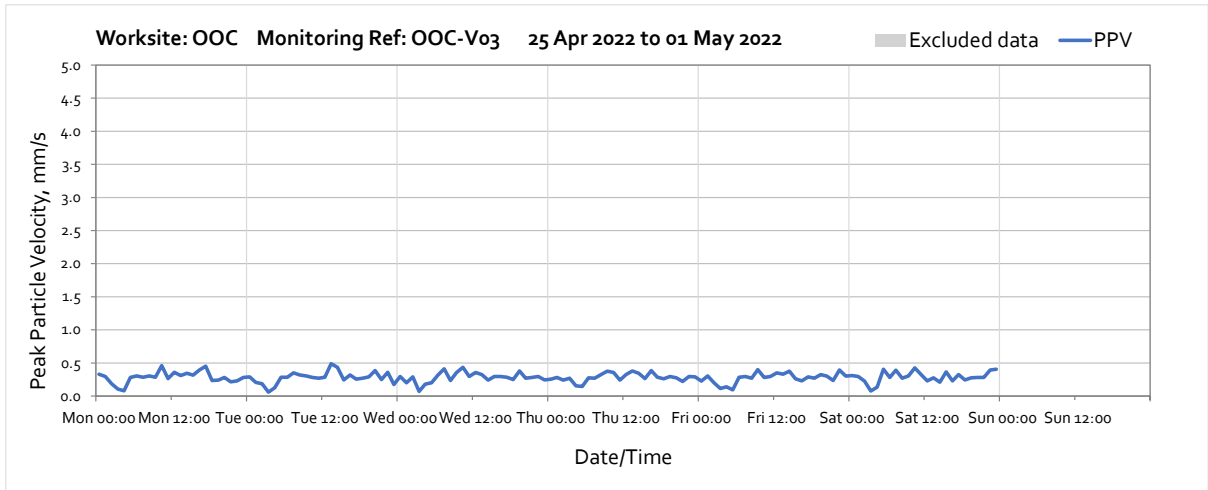




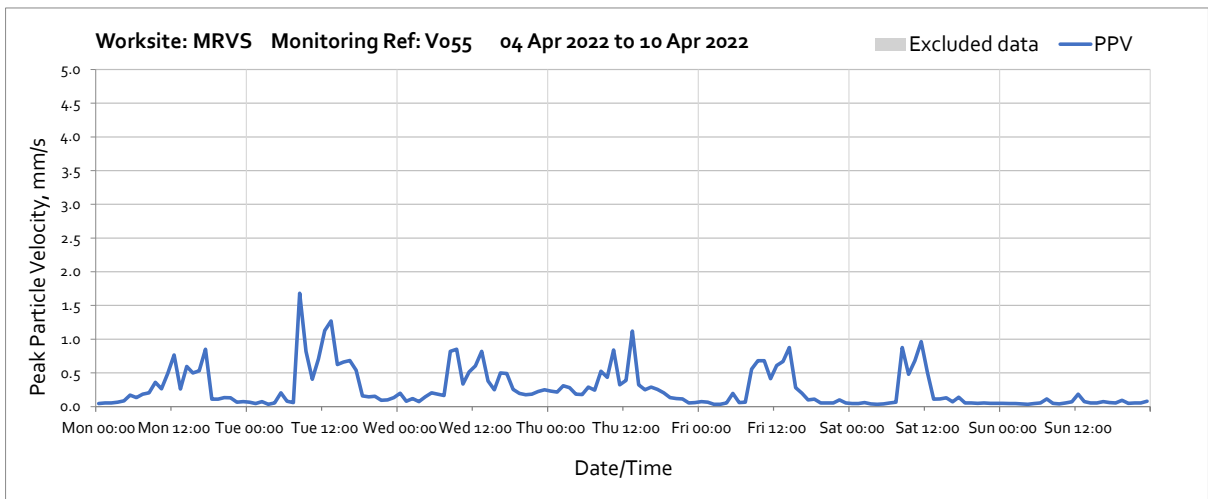
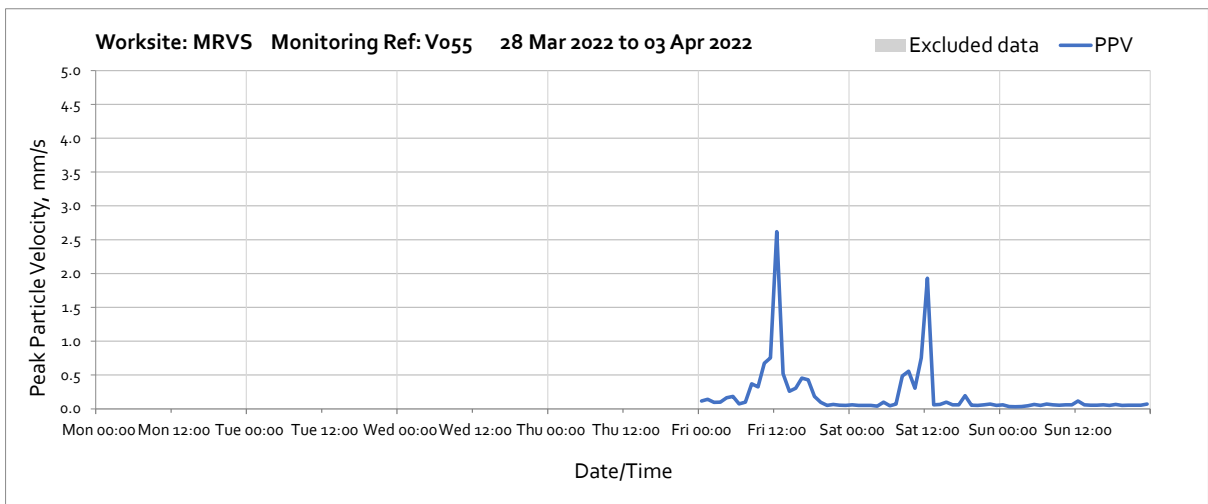
Worksite: Old Oak Common (OOC) – Monitoring Ref: OOC-V03

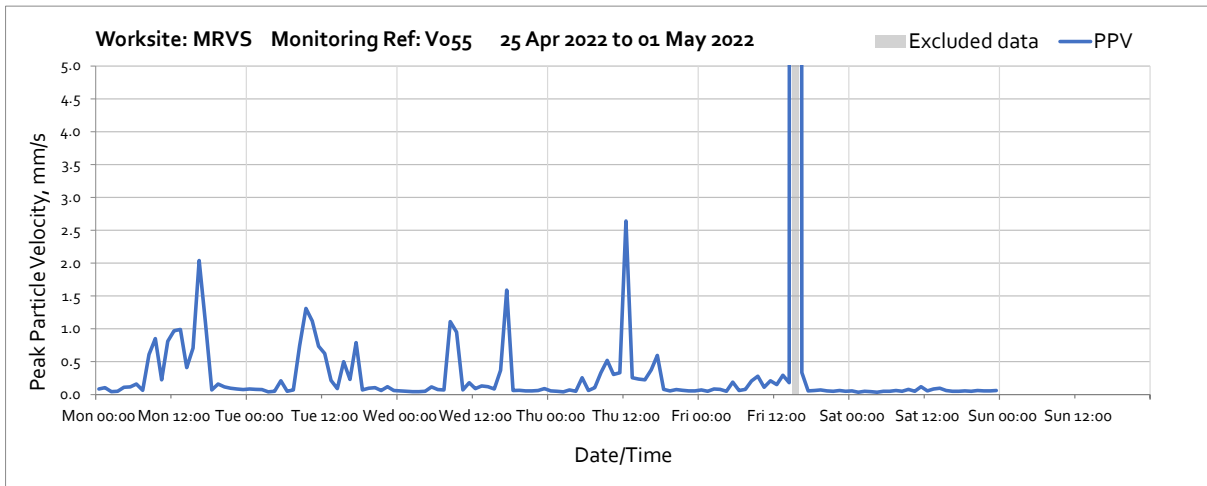
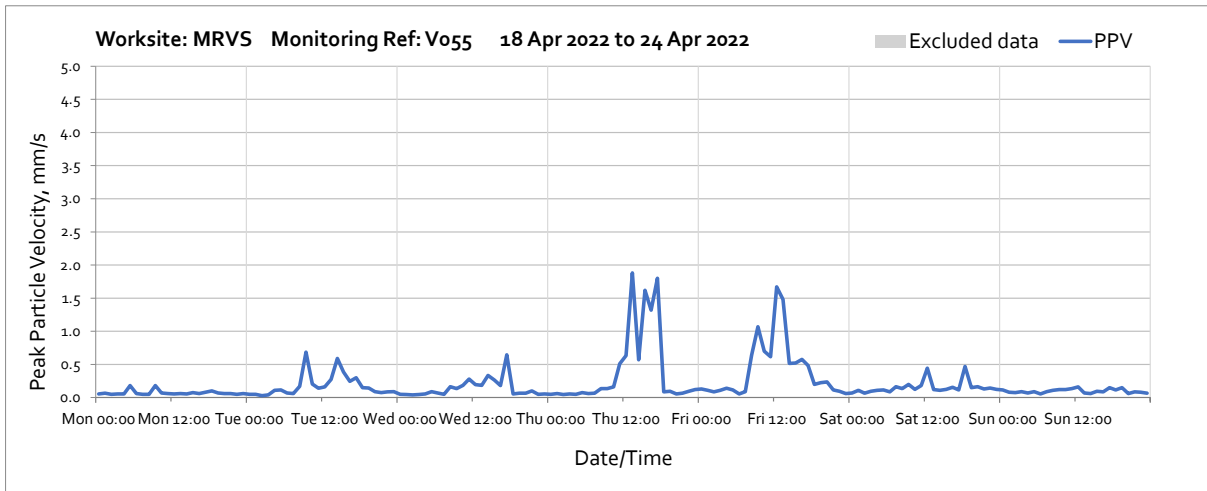
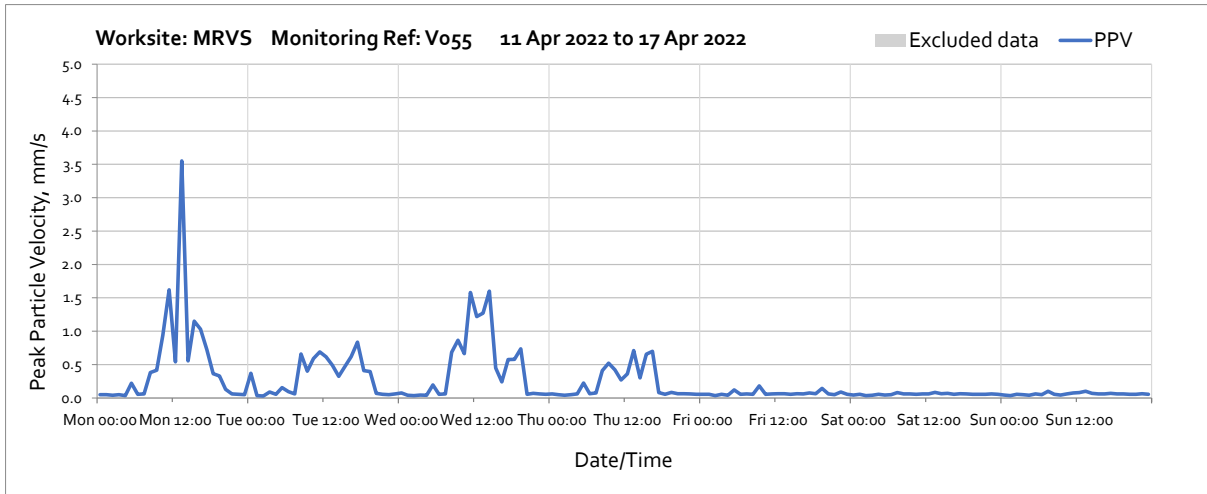






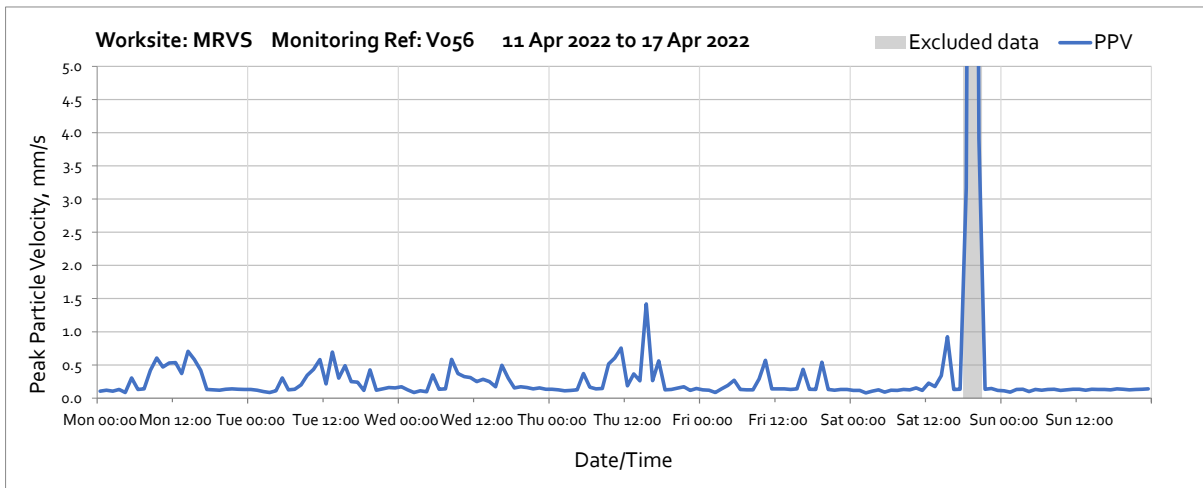
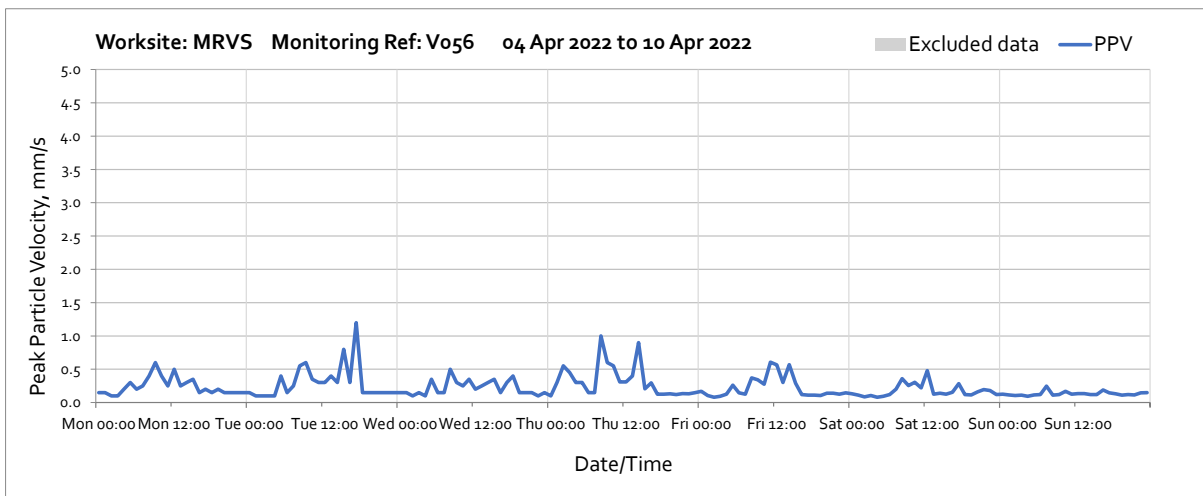
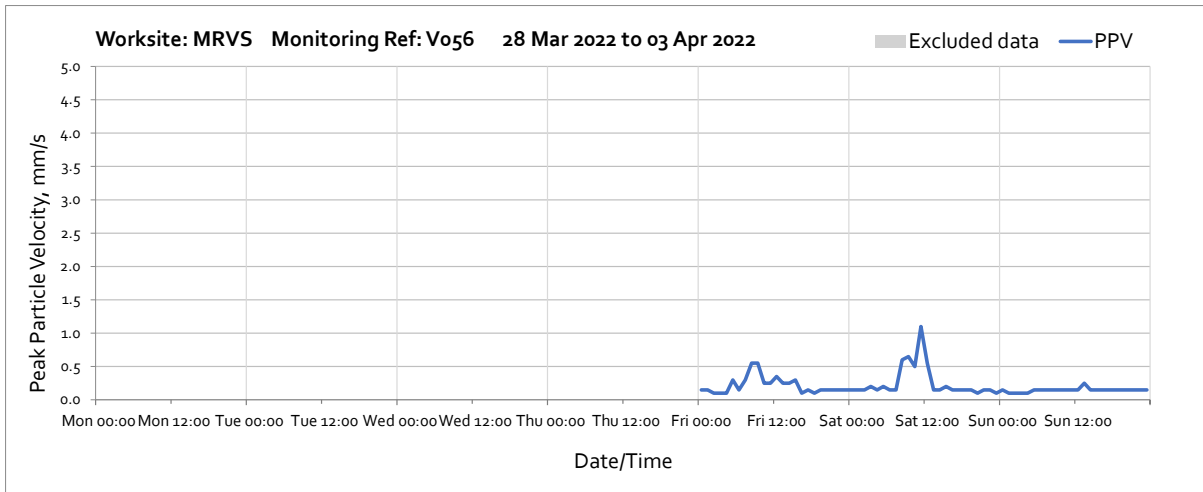
Worksite: Mandeville Road Vent Shaft (MRVS) – Monitoring Ref: V055



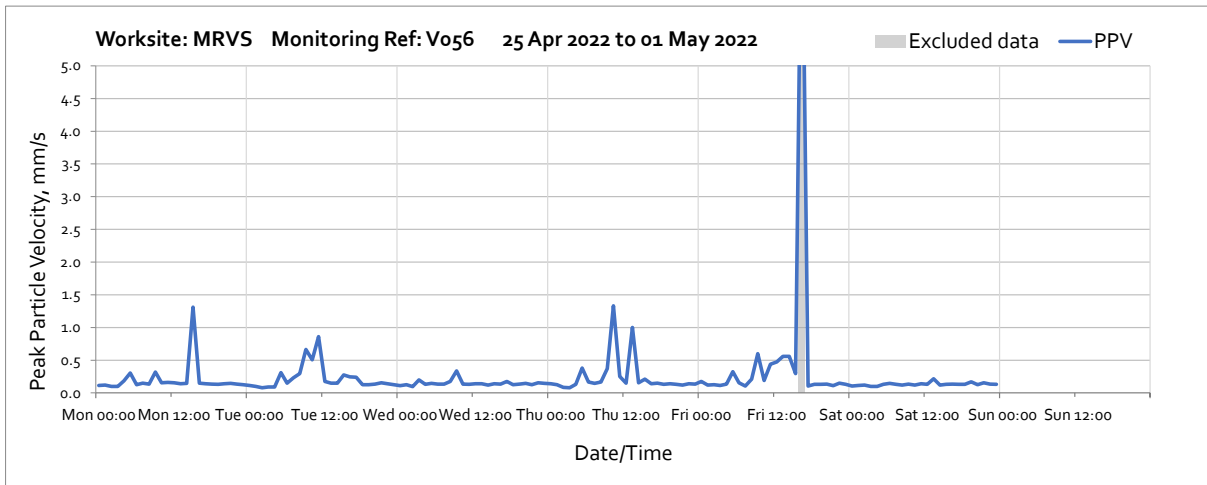
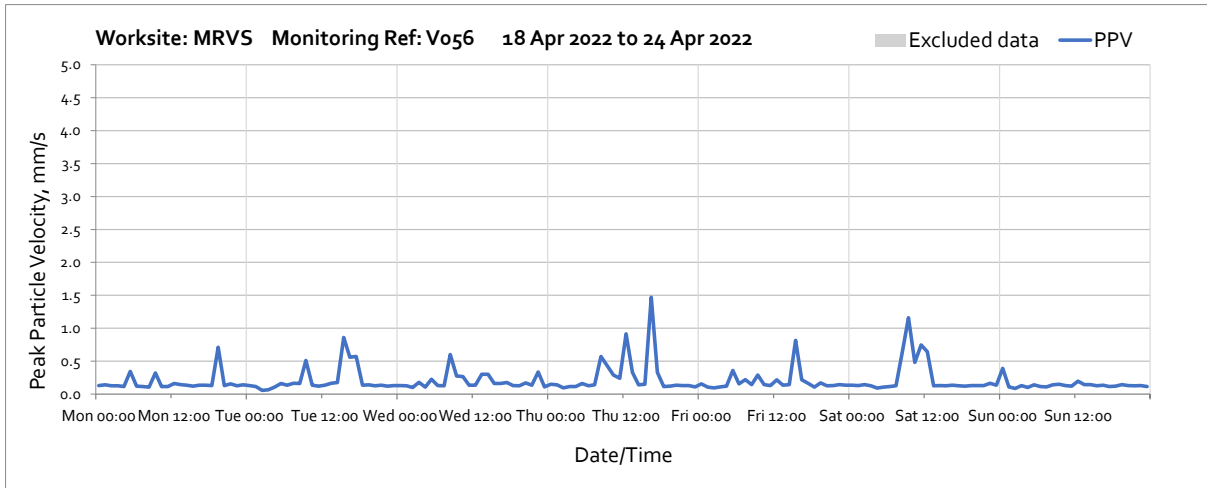


Note: High vibration levels measured at 15:00 on Friday 29th April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.

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

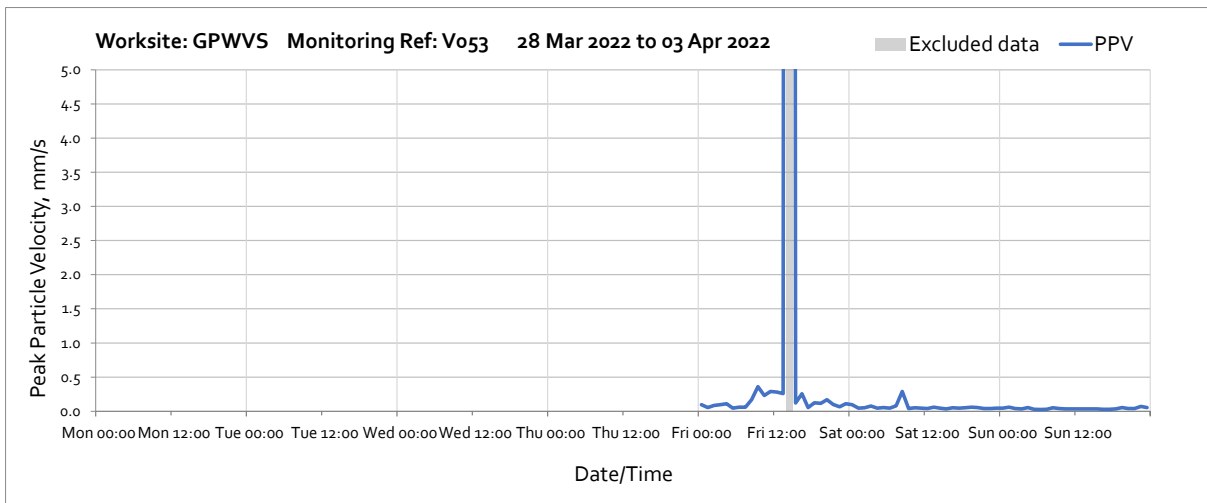


Note: High vibration levels measured between 18:00 and 20:00 on Saturday 16th April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.

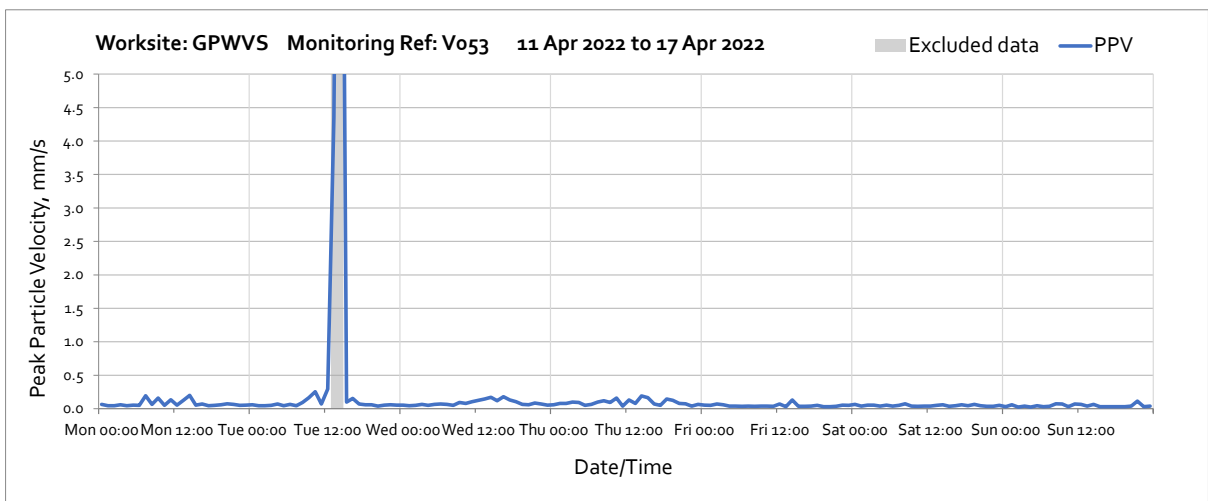
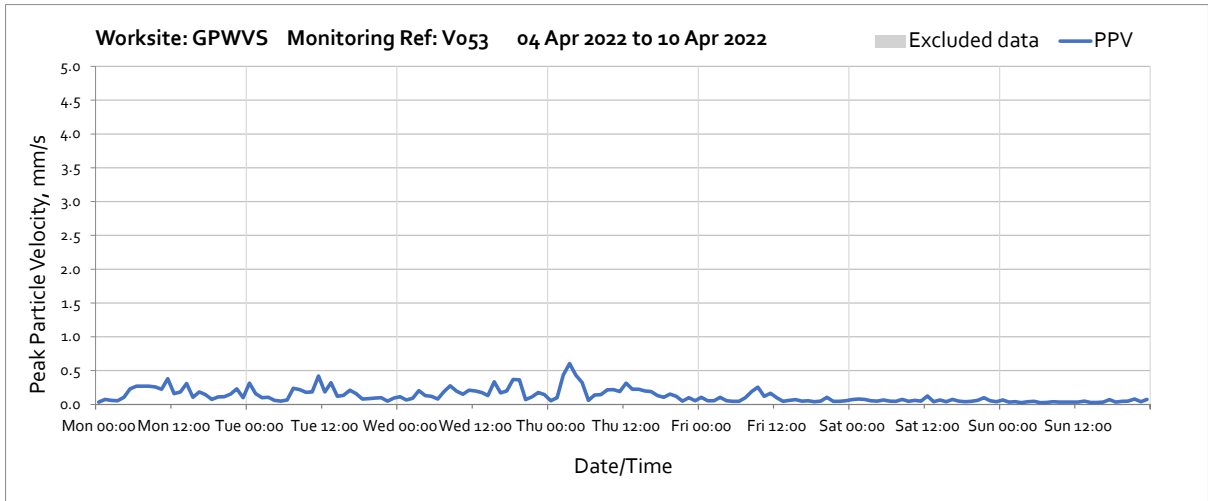


Note: High vibration levels measured at 16:00 on Friday 29th April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.

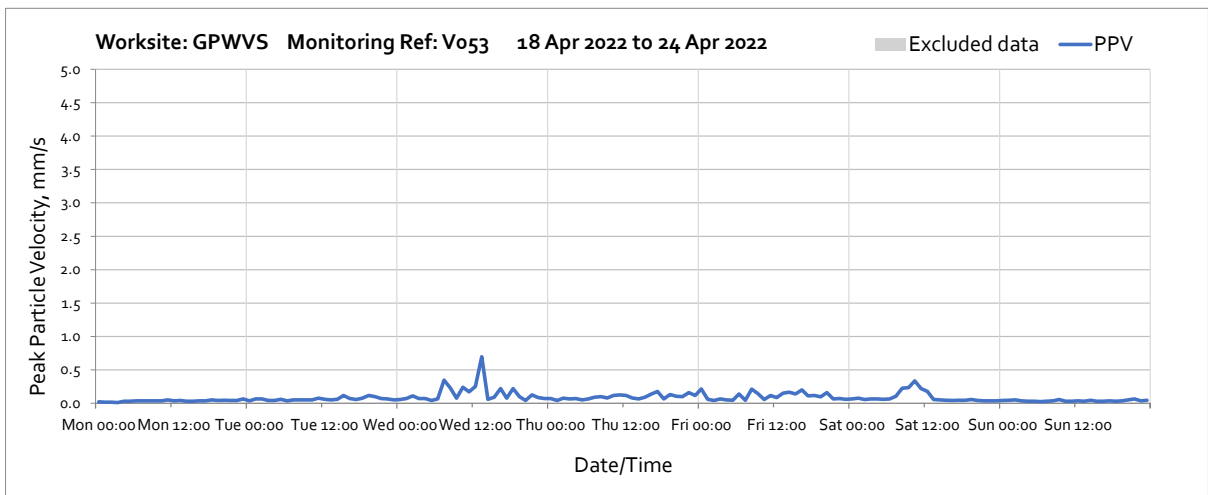
Worksite: Green Park Way Vent Shaft (GPWVS) – Monitoring Ref: V053

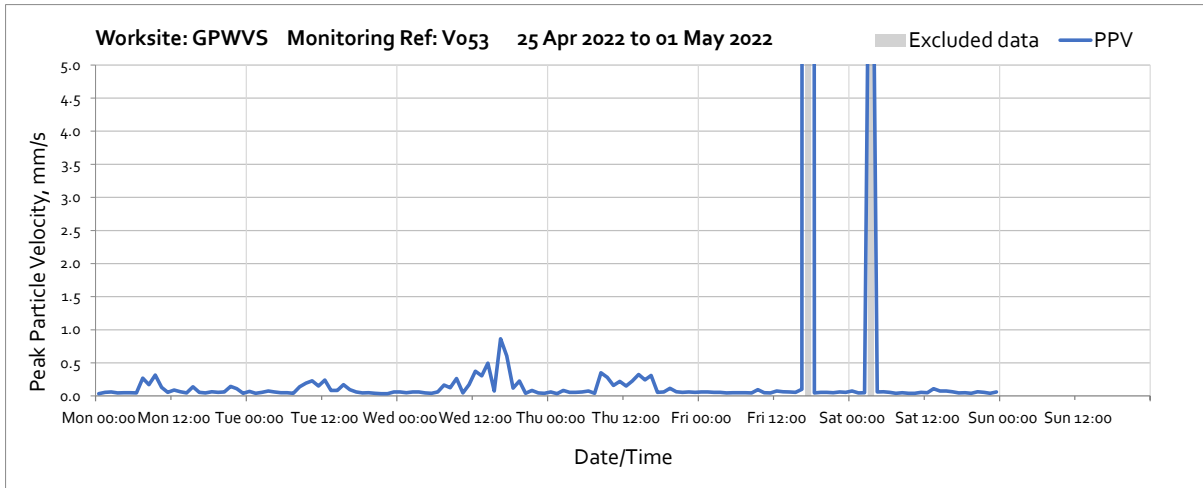


Note: High vibration levels measured at 14:00 on Friday 1st April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.



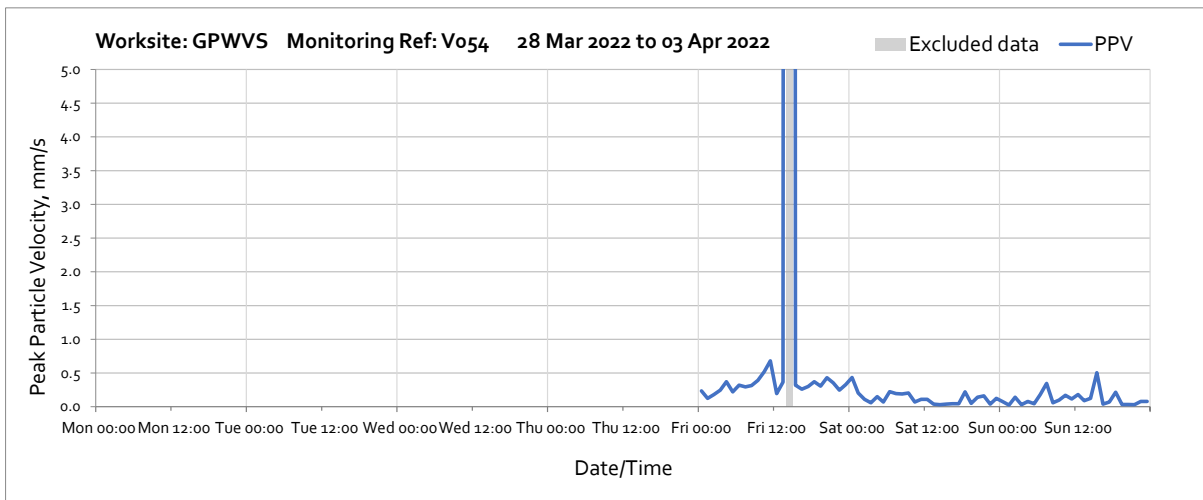
Note: High vibration levels measured between 12:00 and 13:00 on Tuesday 12th April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.





Note: High vibration levels measured at 17:00 on Friday 29th April 2022 and 02:00 on Saturday 30th April were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.

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



Note: High vibration levels measured at 14:00 on Friday 1st April 2022 were due to local disturbance at the monitoring location and not representative of HS2 vibration levels at the receptor.

