HS2

June 2023

Construction Noise and Vibration Monthly Report – April 2023

Birmingham City Council

gov.uk/hs2

List of tables

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 Birmingham City Council during the month of April 2023.

Within this period monitoring was undertaken at the following worksites:

- Noise monitoring was undertaken in the vicinity of the Curzon Street worksite (ref.: CS), where material deliveries, storage and movement, wheel wash operation and maintenance, deck hardstanding construction, pile cap construction works, pier construction works, steel fixing and stockpiling were underway.
- Noise monitoring was undertaken in the vicinity of the Lawley Middleway worksite (ref.: LMW), where pile cap construction works and stockpiling were underway.
- Noise monitoring was undertaken in the vicinity of the Saltley Viaduct Satellite worksite (ref.: SVS), where excavation works, piling platform works, installation of bridge stools, formwork, reinforcement and concrete works, utility verification of trial holes and removal works were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Washwood Heath Depot worksite (ref.: WWHD), where haul road operations, delivery area works, stockpiling management, concrete crushing and batching plant operations were underway.
- Noise and vibration monitoring was undertaken in the vicinity of the Twisted Oak Stables worksite (ref.: TOS), where temporary civils works, tunnel boring machine assembly works, concrete slab works, construction of haul road, muck bin extension works and main haul road operations were underway.

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

- Dorset Road where water and sewage utility works were underway.

The HS2 threshold levels for significant noise impacts, which are defined in Information Paper E23 (https://www.gov.uk/government/publications/hs2-information-papers-environment), were not exceeded 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.

No complaints were received during the monitoring period.

Abbreviations and Descriptions

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

Table 1: Table of Abbreviations

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

1 Introduction

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

- monitoring the impact of construction works;
- investigating 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 vibration data, and interpretation thereof, for monitoring carried out by HS2 within Birmingham City Council for the period 1st to 30th April 2023.

1.1.3 Active construction sites in the local authority area where monitoring was undertaken during this period include:

- Curzon Street worksite ref.: CS (see plan 1 in Appendix A) where work activities included:
    - Material deliveries, storage and movement.
    - Wheel wash operation and maintenance.
    - Deck hardstanding construction, including excavation, compaction and concrete casting.
    - Pile cap construction works, including sheet piling, excavation, pile cropping, concrete casting, pile cap backfill, sheet pile removal and compaction works.
    - Pier construction works, including concrete casting, formwork and scaffolding erection.
    - Steel fixing works.
    - Stockpiling, including removal of arising stockpiles off-site.

- Lawley Middleway worksite, ref.: LMW (see plan 1 in Appendix A) where work activities included:
    - Pile cap construction works, including excavation, pile cropping and concrete casting.
    - Stockpiling, including removal of arising stockpiles off-site.
- Saltley Viaduct Satellite worksite, ref.: SVS (see plan 2 in Appendix A) where work activities included:
    - Excavation works.
    - Piling platform works, including installation of platforms and reduction of platforms.
    - Installation of bridge stools, including restarting works in the cofferdam, delivery and assembly of bridge.
    - Formwork, reinforcement and concrete works.
    - Utility verification of trial holes.
    - Removal works, including asbestos remedial, cables, palisade fencing and street furniture.
- Washwood Heath Depot worksite, ref.: WWHD (see plan 3 in Appendix A) where work activities included:
    - Haul road operations, including maintenance, excavation and compaction works.
    - Delivery area works, including loading and unloading deliveries of plant and materials.
    - Stockpile management, including tipping and loading of wagons.
    - Concrete crushing.
    - Batching plant operations, including delivery of aggregates, operating plant and concrete wagons.
- Twisted Oak Stables worksite, ref.: TOS (see plan 4 in Appendix A) where work activities included:
    - Temporary civils works.
    - Tunnel boring machine assembly works.
    - Concrete slab works, including pouring.
    - Construction of haul road.
    - Muck bin extension works.
    - Main haul road operations, including maintenance, excavation and compaction works.

1.1.4 Further work where monitoring did not take place, was also undertaken at the following locations:

- Dorset Road where water and sewage utility works were underway.

1.1.5 The applicable standards, guidance, and monitoring methodology is outlined in the construction noise and vibration monitoring methodology report which can be found at the following location https://www.gov.uk/government/collections/monitoring-the-environmental-effects-of-hs2. Noise and vibration monitoring reports for previous months can also be found at this location.

1.2 Measurement Locations

1.2.1 Seven (7) noise and four (4) vibration monitoring installations were active in April in the Birmingham City area. Table 2 summarises the position of noise and vibration monitoring installations within the Birmingham City area in April 2023.

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
TOS	TOS-N1	B4118-Birmingham Road, Water Orton, Birmingham
	TOS-V1	B4118-Birmingham Road, Water Orton, Birmingham
WWHD	WWHD-N1	114 Drews Lane, Birmingham
	WWHD-V1	Drews Lane, Birmingham
	WWHD-N2	93 Common Lane, Birmingham
	WWHD-V2	93 Common Lane, Birmingham
	WWHD-N3	154 Warren Road, Washwood Heath, Birmingham
	WWHD-V3	154 Warren Road, Washwood Heath, Birmingham
SVS	SVS-N1	Duddeston Mill Road, Saltley Business Park Area, Birmingham
LMW	LMW-N1	Lawford Close, Digbeth, Birmingham
CS	CS-N1	Curzon Street, Birmingham

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 L_{Aeq} Data over the Monitoring Period

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
TOS	TOS-N1	B4118-Birmingham Road	Free-field	63.4	67.7	61.6	61.1	58.8	59.8	63.8	61.8	58.8	55.6	59.1	57.9
				(65.7)	(70.0)	(64.9)	(67.1)	(65.6)	(61.1)	(68.0)	(67.9)	(63.2)	(59.2)	(62.0)	(62.1)
WWHD	WWHD-N1	114 Drews Lane	Free-field	60.1	62.5	57.8	55.6	54.2	56.0	55.9	52.4	54.3	52.1	54.2	53.0
				(63.0)	(65.8)	(62.1)	(60.4)	(60.4)	(59.1)	(61.3)	(57.6)	(65.2)	(57.7)	(62.1)	(59.2)
	WWHD-N2	93 Common Lane	Free-field	55.8	58.3	55.2	53.9	52.3	54.1	53.4	50.8	54.0	49.7	52.7	51.4
				(65.2)	(66.7)	(60.4)	(58.5)	(61.9)	(58.3)	(58.0)	(58.2)	(70.8)	(56.7)	(60.3)	(59.9)
	WWHD-N3	154 Warren Road	Free-field	58.9	61.3	56.0	52.5	51.7	54.8	55.4	50.1	53.3	50.3	52.5	51.6
				(63.3)	(65.2)	(63.4)	(57.8)	(61.9)	(57.1)	(59.4)	(56.1)	(64.4)	(56.5)	(57.8)	(57.3)
SVS	SVS-N1	Duddeston Mill Road	Free-field	60.0	62.3	60.4	59.1	58.0	55.1	57.9	59.2	59.3	55.6	56.5	55.9
				(63.8)	(65.7)	(64.4)	(63.9)	(67.8)	(57.2)	(60.9)	(60.9)	(64.2)	(64.0)	(60.9)	(61.9)
LMW	LMW-N1	Lawford Close, Digbeth	Free-field	67.9	68.5	65.9	66.2	64.7	65.8	65.7	65.9	66.1	64.4	65.9	65.1
				(69.3)	(74.2)	(68.2)	(70.5)	(67.9)	(67.6)	(67.9)	(67.8)	(68.0)	(67.2)	(68.3)	(68.2)
CS	CS-N1	Curzon Street	Free-field	65.7	67.3	66.3	65.2	63.5	62.8	64.2	64.2	65.2	63.2	63.5	63.6
				(67.8)	(68.7)	(70.1)	(69.7)	(68.4)	(63.6)	(65.3)	(65.7)	(67.8)	(66.8)	(66.7)	(65.6)

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

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

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
TOS	TOS-V1	B4118-Birmingham Road, Water Orton, Birmingham	3.78 (X-axis)*
WWHD	WWHD-V1	Drews Lane, Birmingham	1.64 (X-axis)
	WWHD-V2	93 Common Lane, Birmingham	0.58 (X-axis)
	WWHD-V3	154 Warren Road	0.51 (X-axis)

*High vibration levels measured due to works undertaken close to monitoring station, the nearest residential receptors are further away and therefore HS2 vibration levels are expected to be lower at receptors.

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

2.2 Exceedances of the LOAEL and SOAEL

2.2.1 The lowest observed adverse effect level (LOAEL) is defined in the Planning Practice Guidance – Noise (PPG) as the level above which "noise starts to cause small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life".

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

difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

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

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

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

Table 5: Summary of Exceedances of LOAEL and SOAEL

Worksite Reference	Measurement Reference	Site Address	Day (Weekday, Saturday, Sunday, Night)	Time period	Number of exceedances of LOAEL	Number of exceedances of SOAEL
CS	CS-N1*	Curzon Street, Birmingham	All days	All periods	No exceedance	No exceedance
LMW	LMW-N1*	Lawford Close, Digbeth	Weekdays Saturdays	0800-1800 1400-2200	2 8	No exceedance No exceedance
SVS	SVS-N1*	Duddeston Mill Road, Saltley Business Park Area	All days	All periods	No exceedance	No exceedance
WWHD	WWHD-N1*	114 Drews Lane, Birmingham	All days	All periods	No exceedance	No exceedance
	WWHD-N2*	93 Common Lane, Birmingham	Weekdays Weekdays	0700-0800 0800-1800	1 1	No exceedance No exceedance
	WWHD-N3	154 Warren Road	All days	All periods	No exceedance	No exceedance
TOS	TOS-N1*	B4118-Birmingham Road, Water Orton	All days	All periods	No exceedance	No exceedance

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

2.2.6 Exceedances of the LOAEL were recorded at two (2) noise monitors, LMW-N1 and WWHD-N2. The LOAEL exceedances were recorded during weekdays and Saturday time periods.

2.2.7 No exceedances SOAEL were recorded due to HS2 construction works during the reporting period.

2.3 Exceedances of Trigger Level

2.3.1 Table 6 provides a summary of exceedances of the S61 trigger vibration levels determined to be due to HS2 related construction vibration measured during the reporting period, along with the findings of any investigation.

Table 6: Summary of Exceedances of Trigger Levels

Complaint Reference Number (if applicable)	Worksite Reference	Date and Time Period	Identified Source	Results of Investigation (including noise monitoring results)	Actions Taken
-	-	-	-	-	-

2.4 Complaints

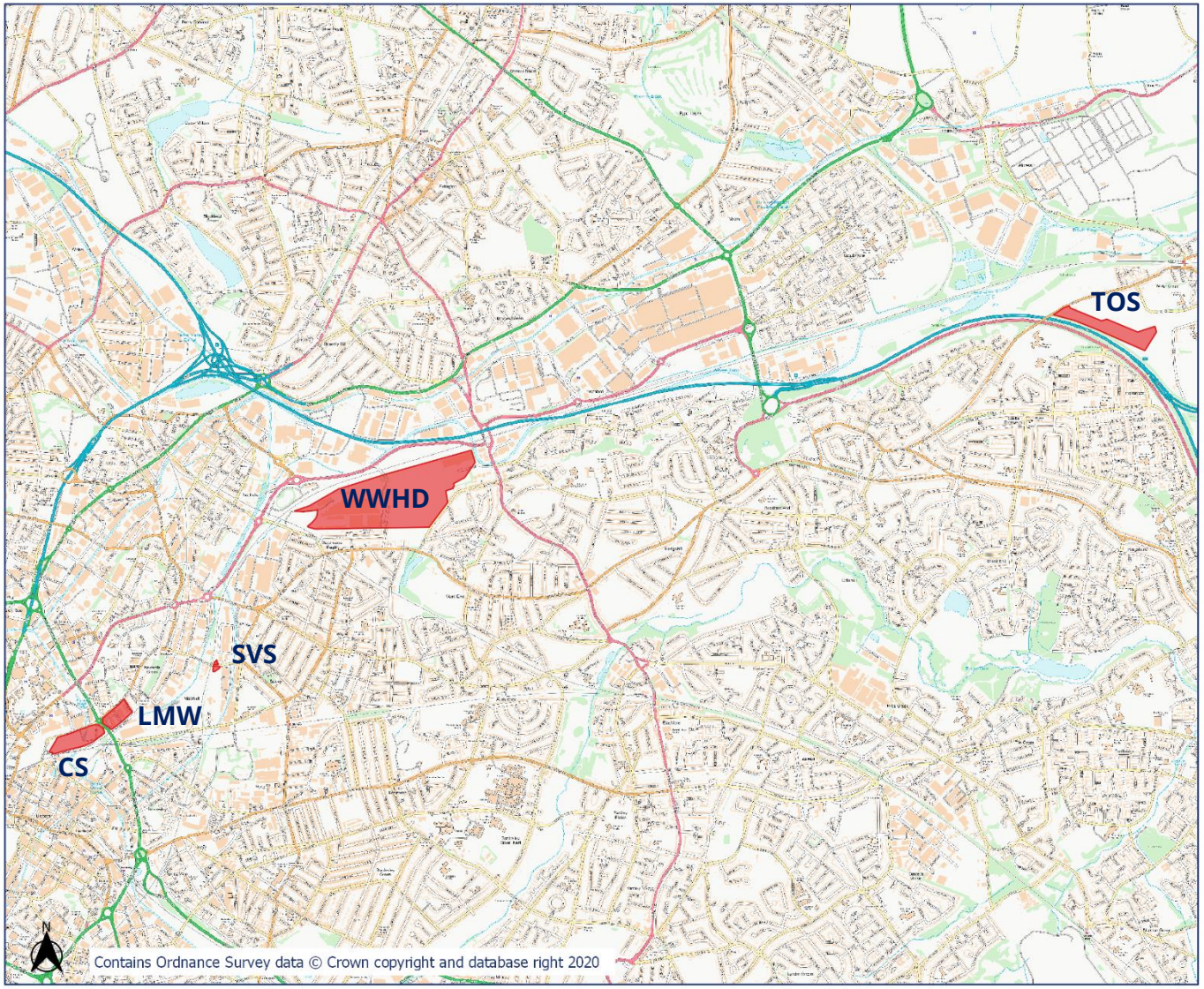
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

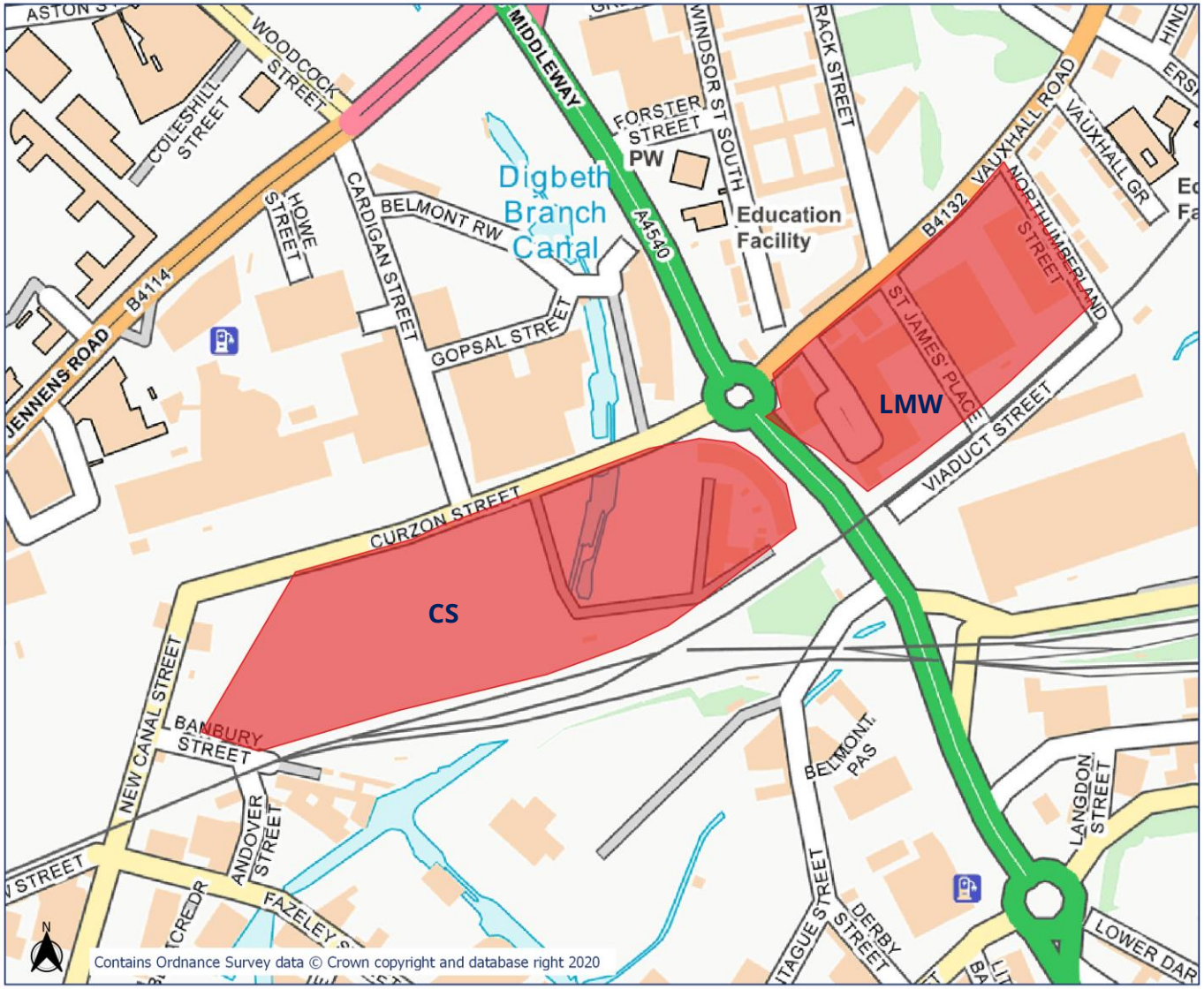
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
-	-	-	-	-

Appendix A Site Locations

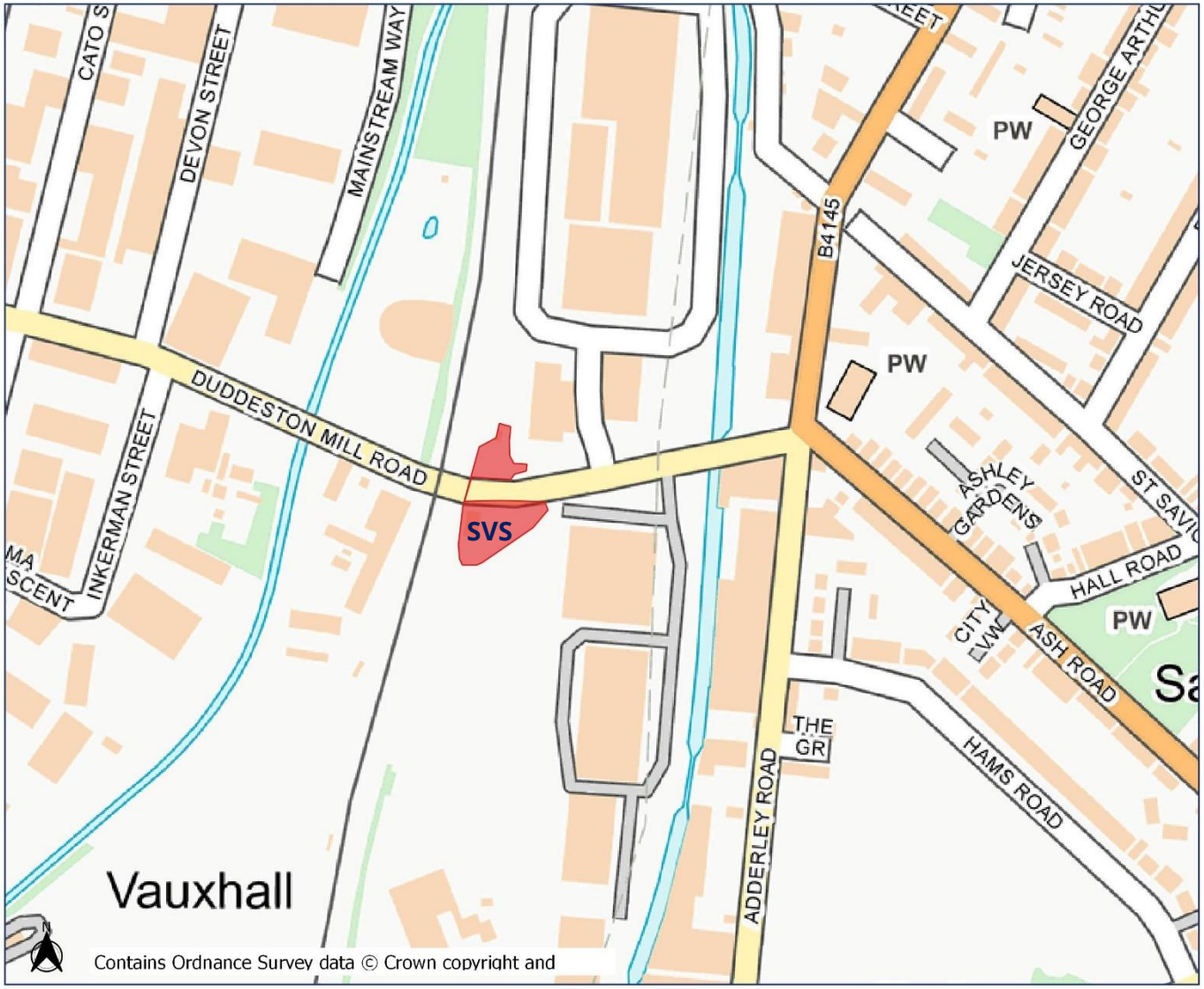
HS2 Worksite Identification Plan - Overview



HS2 Worksite Identification Plan - 1



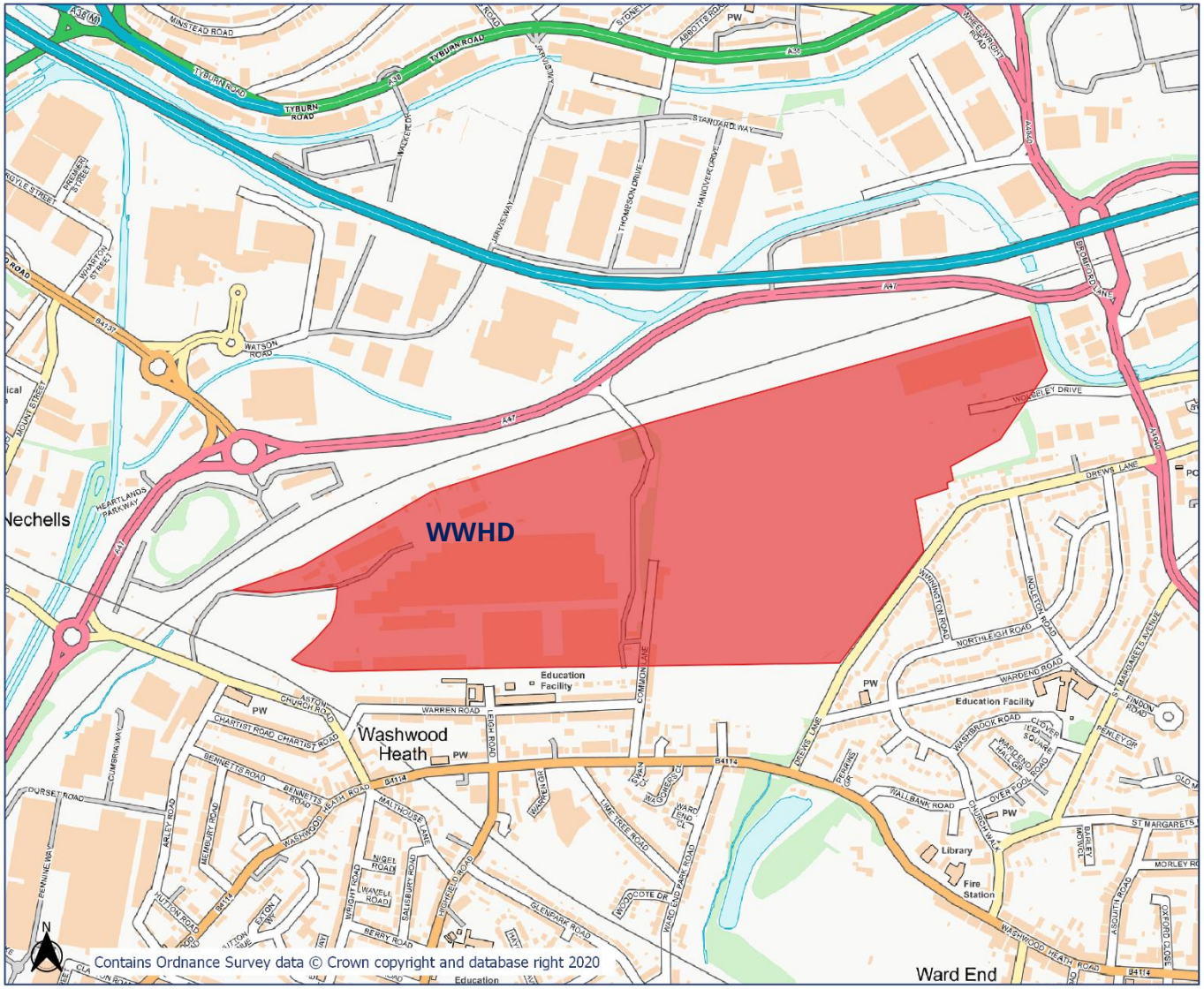
HS2 Worksite Identification Plan - 2



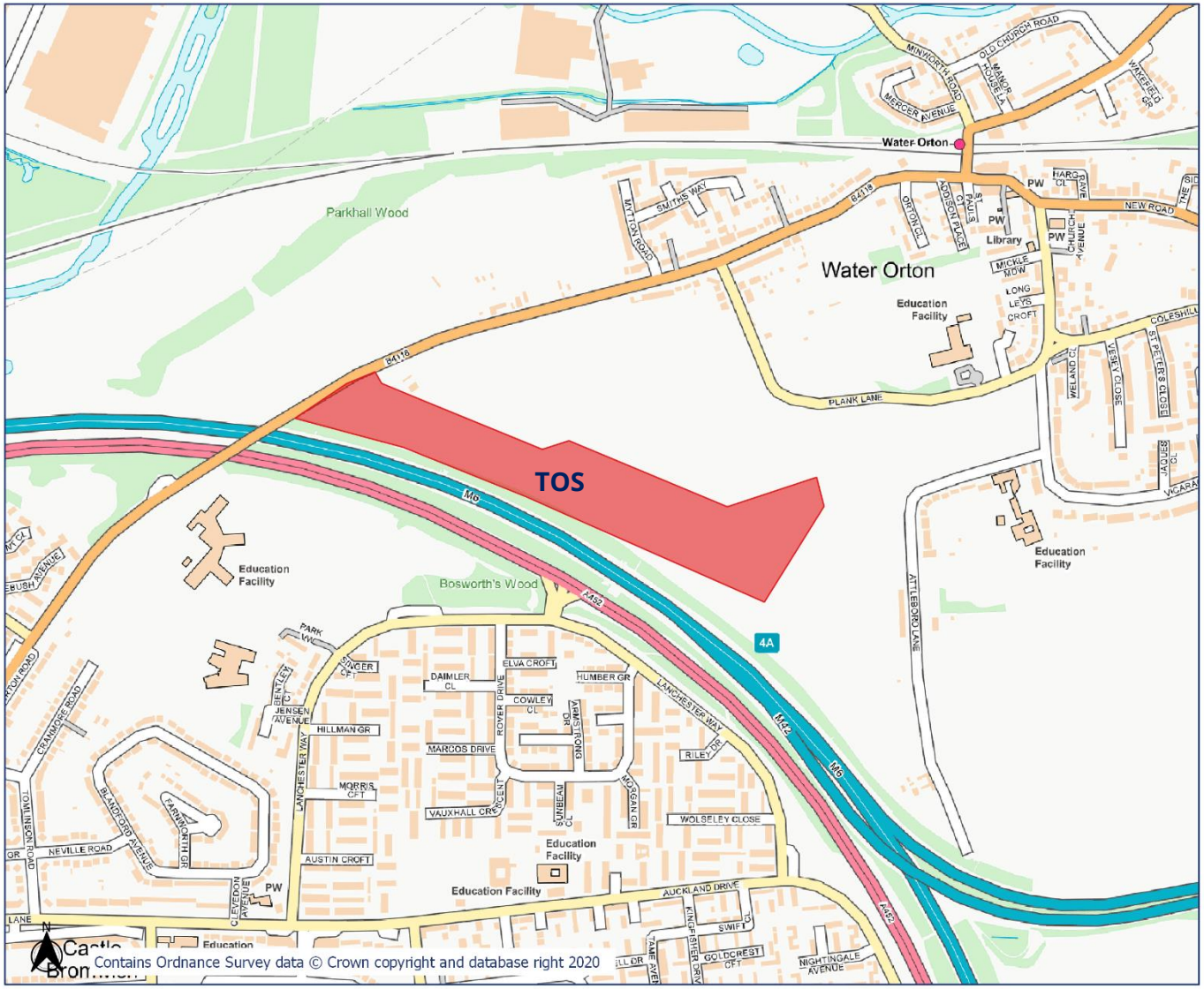
Legend

Active Worksites

Worksite Identification Plan - 3

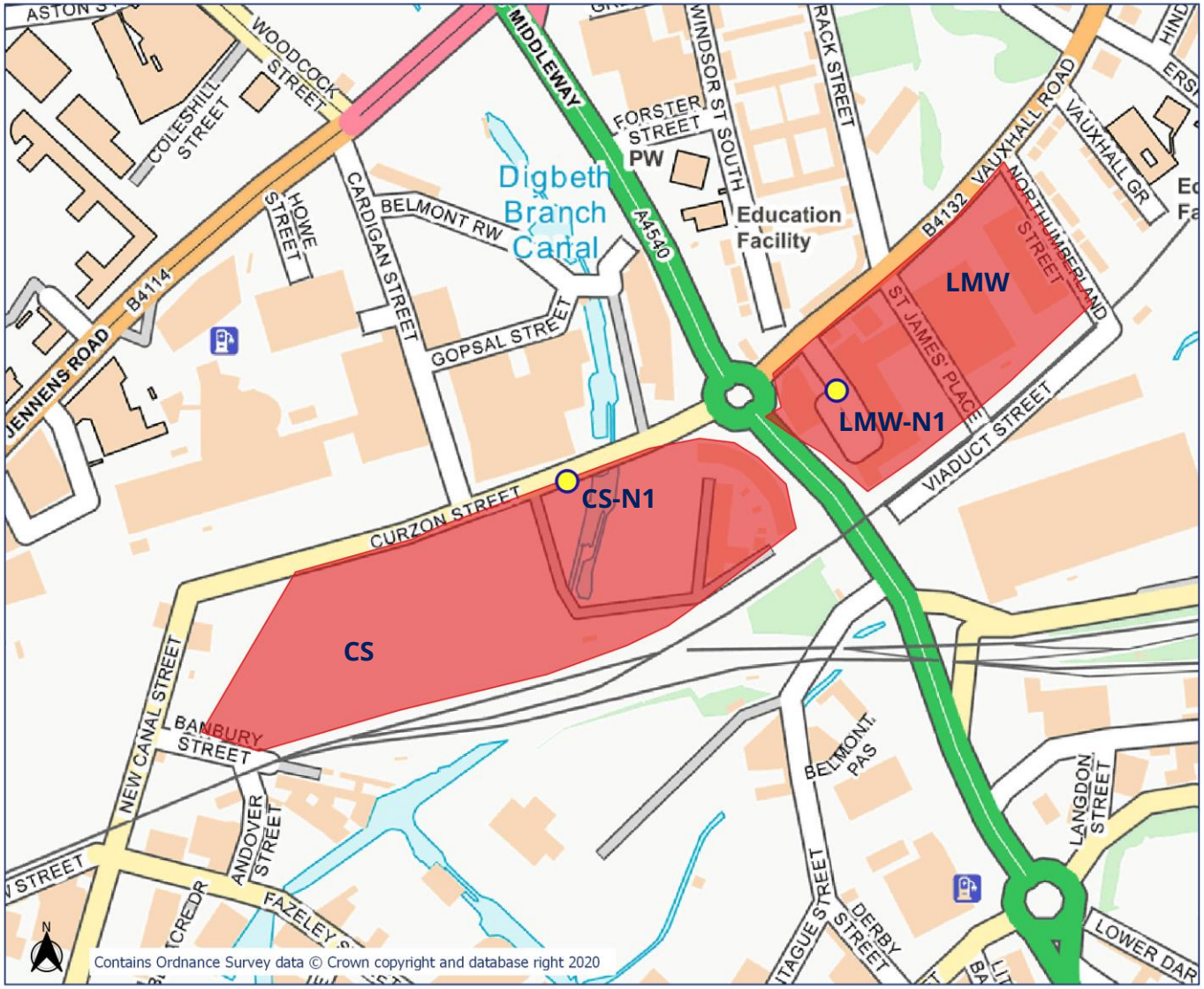


Worksite Identification Plan - 4



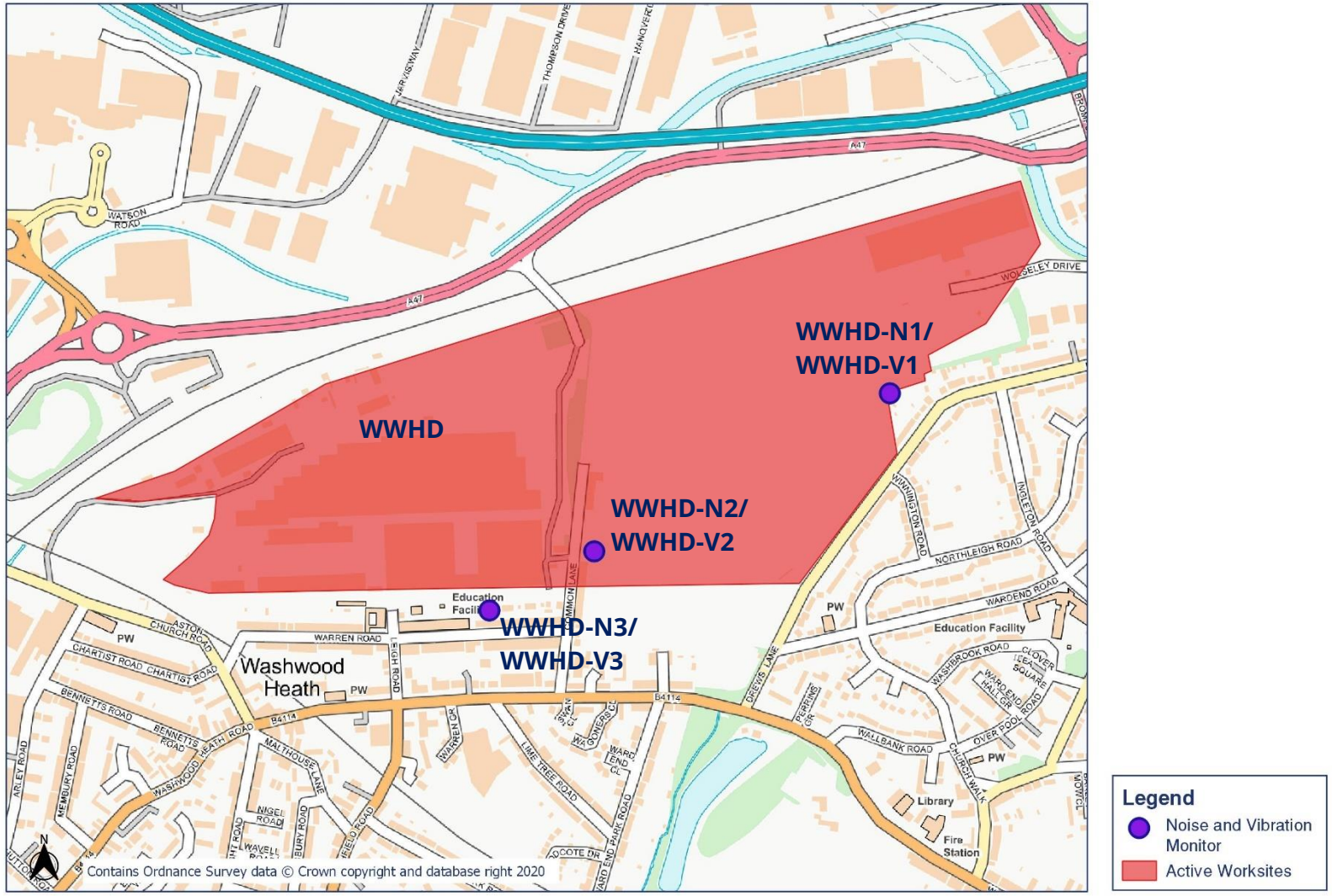
Appendix B Monitoring Locations

HS2 Noise and Vibration Monitoring Plan - 1

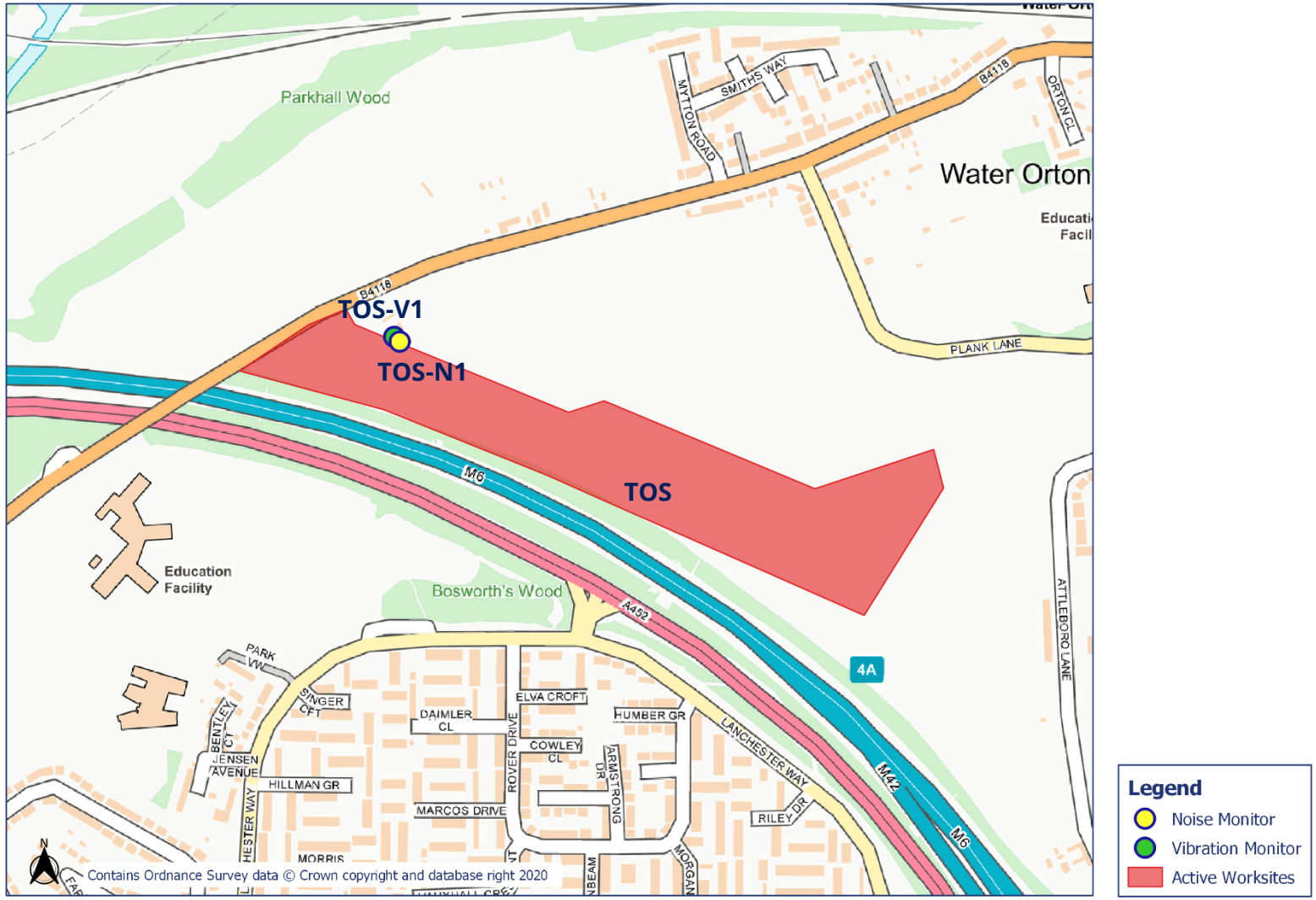


HS2 Noise and Vibration Monitoring Plan - 2

HS2 Noise and Vibration Monitoring Plan - 3



HS2 Noise and Vibration Monitoring Plan - 4

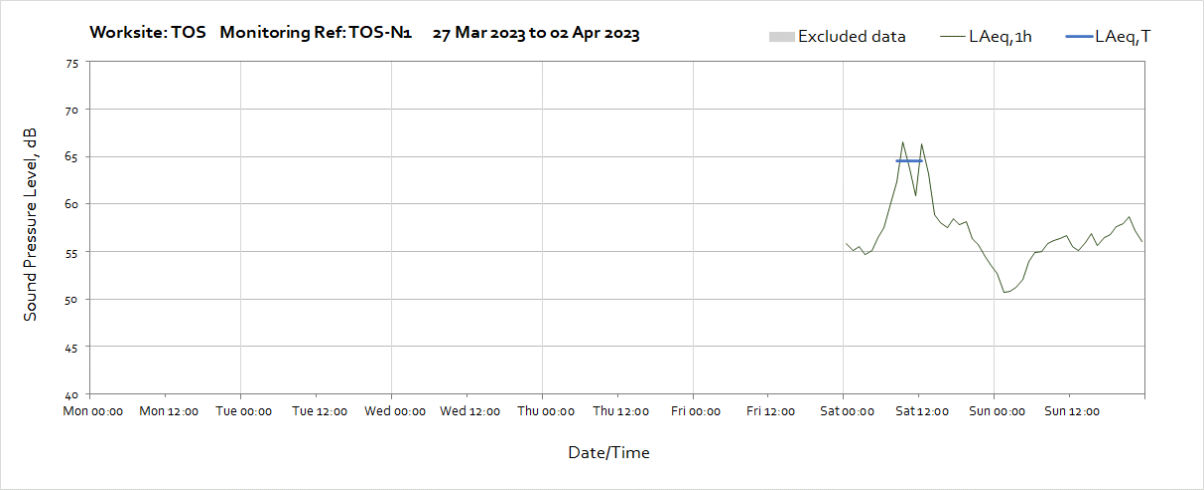


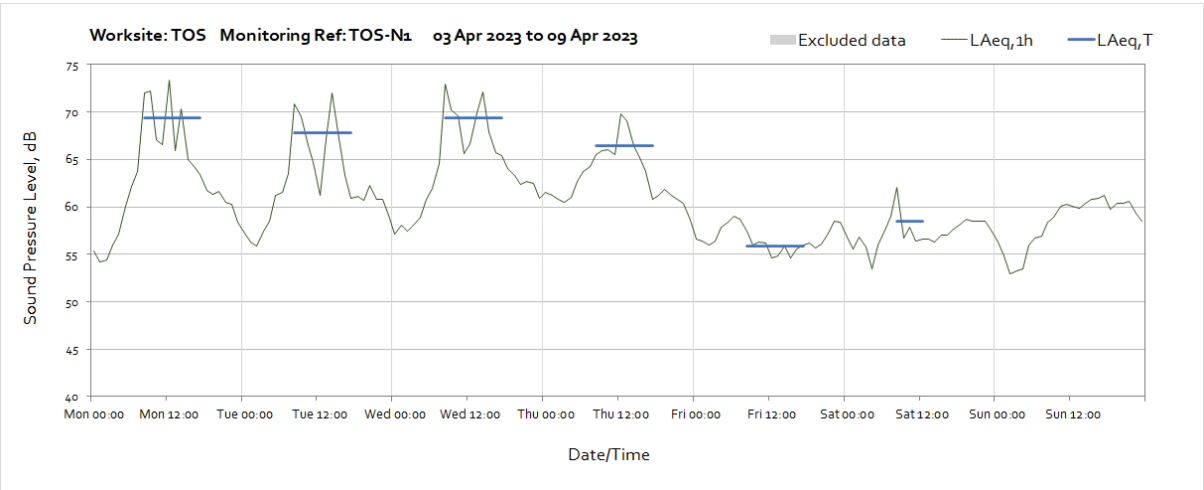
Appendix C Data

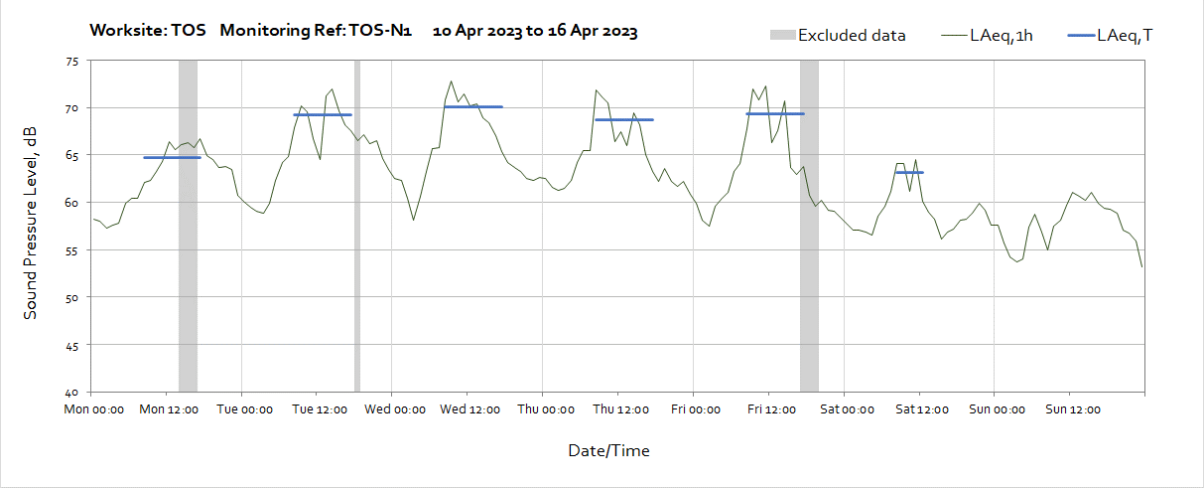
Noise

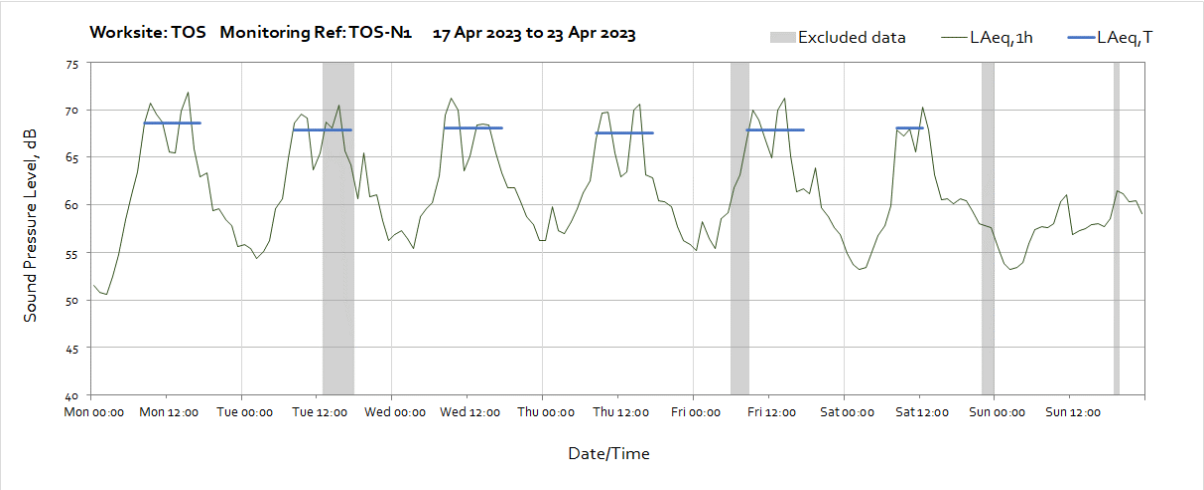
The following graphs show the hourly measured ambient noise level LAeq,1h and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have been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

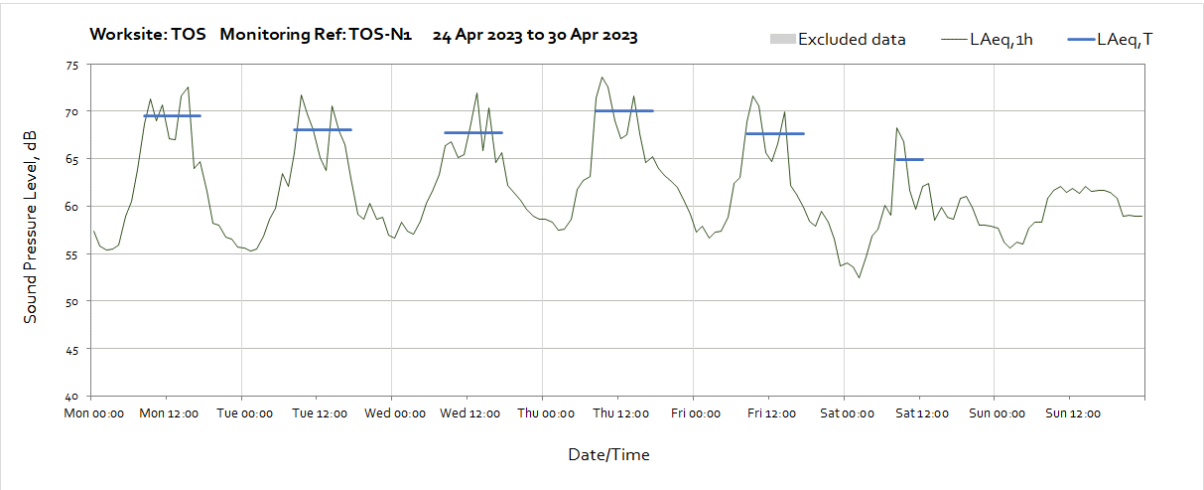
Worksite: TOS – Monitoring Ref: TOS-N1



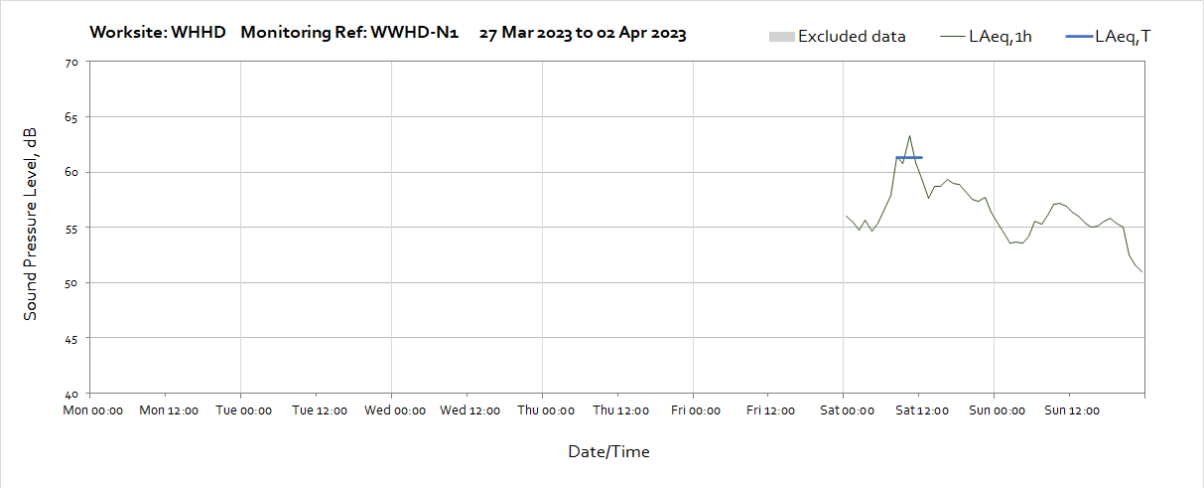


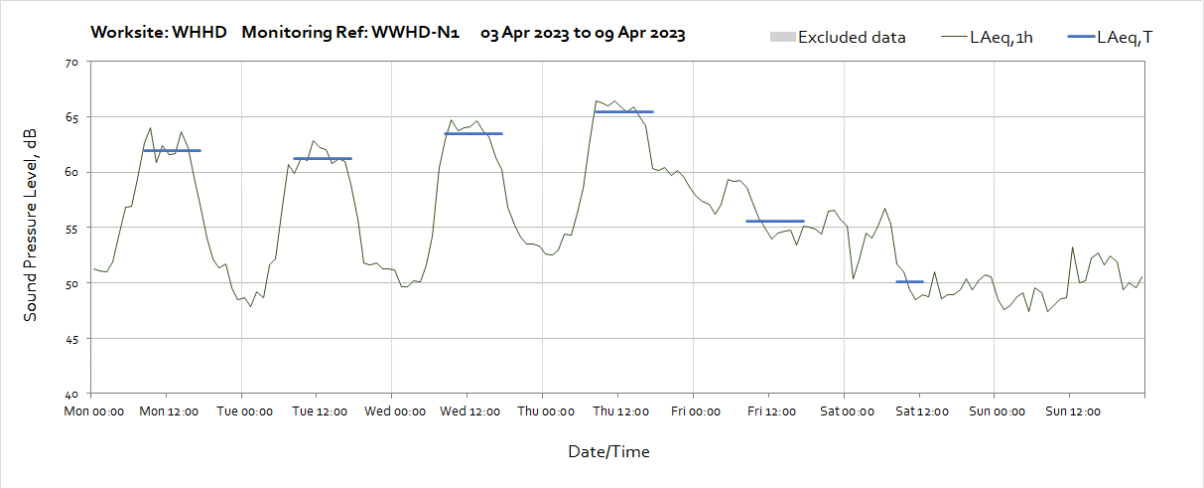

Worksite: TOS Monitoring Ref: TOS-N1 10 Apr 2023 to 16 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

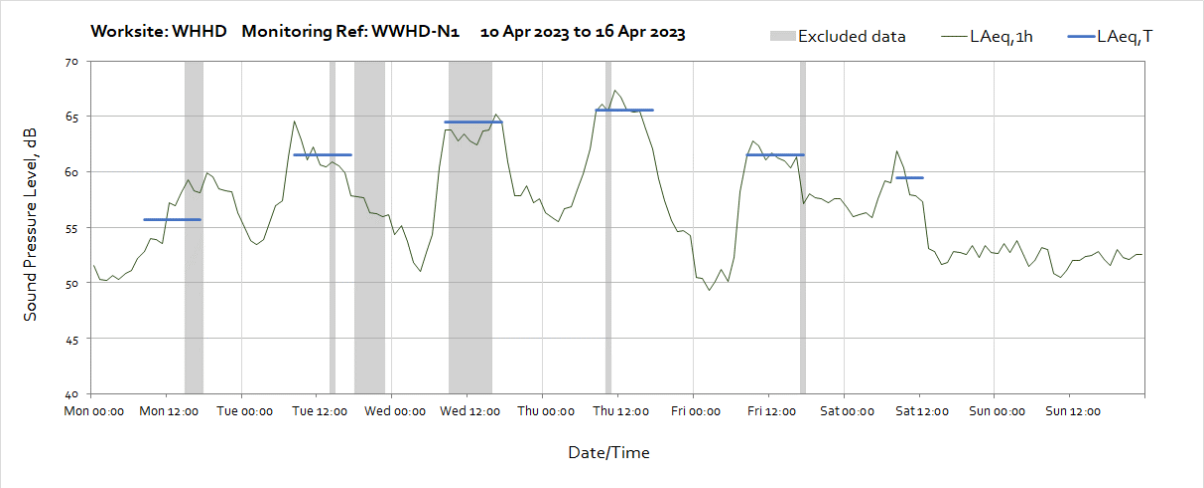

Worksite: TOS Monitoring Ref: TOS-N1 17 Apr 2023 to 23 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

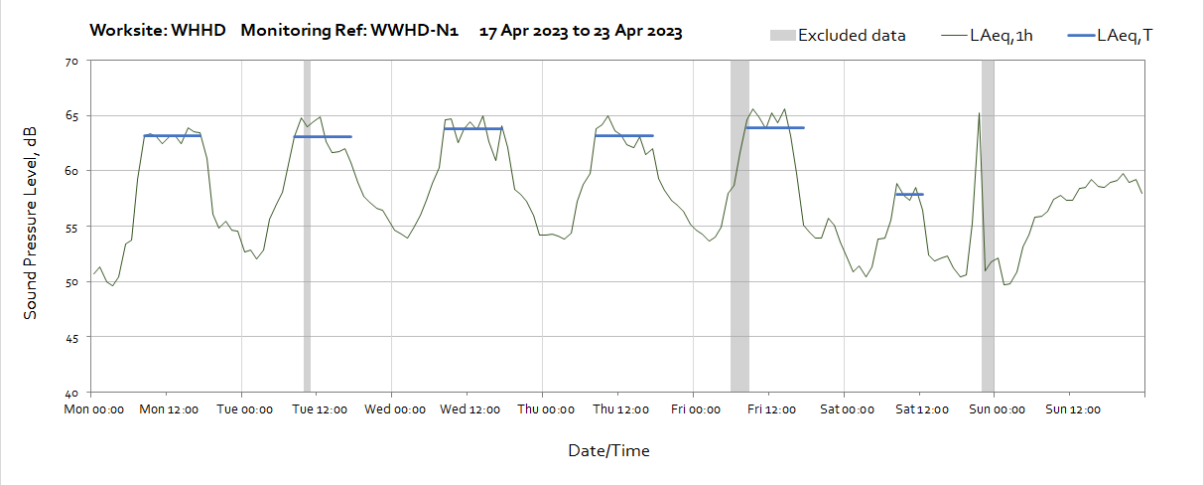

Worksite: TOS Monitoring Ref: TOS-N1 24 Apr 2023 to 30 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

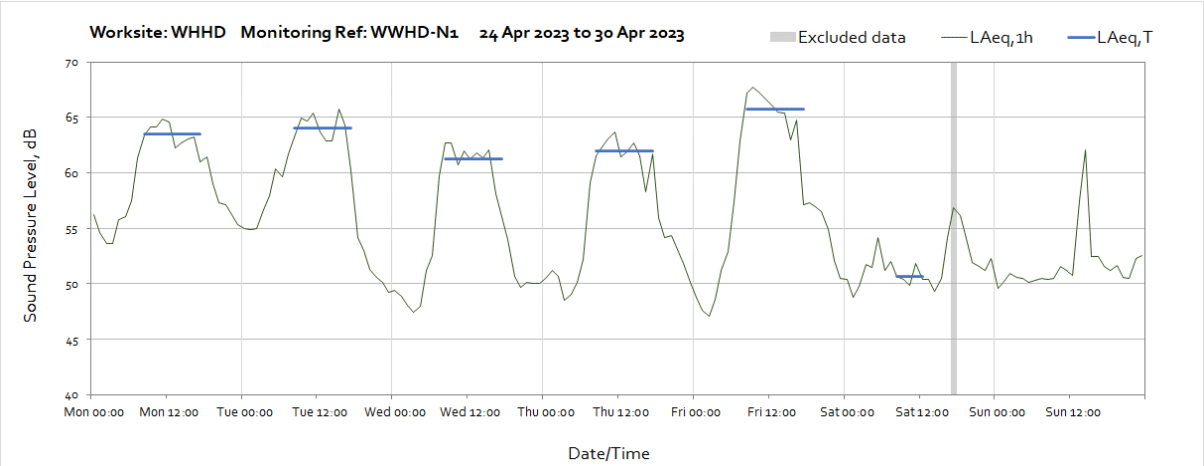
Worksite: WWHD – Monitoring Ref: WWHD-N1



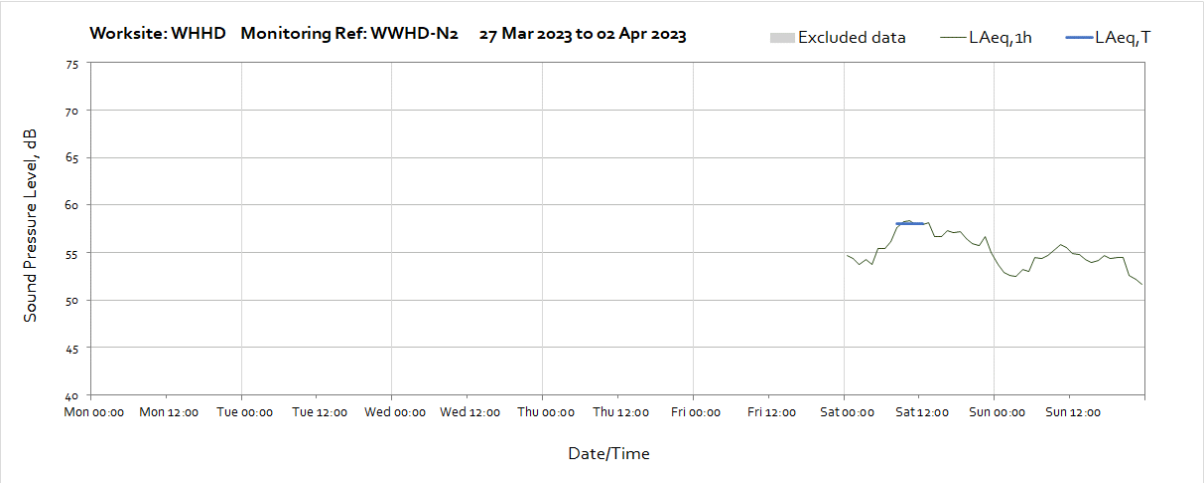


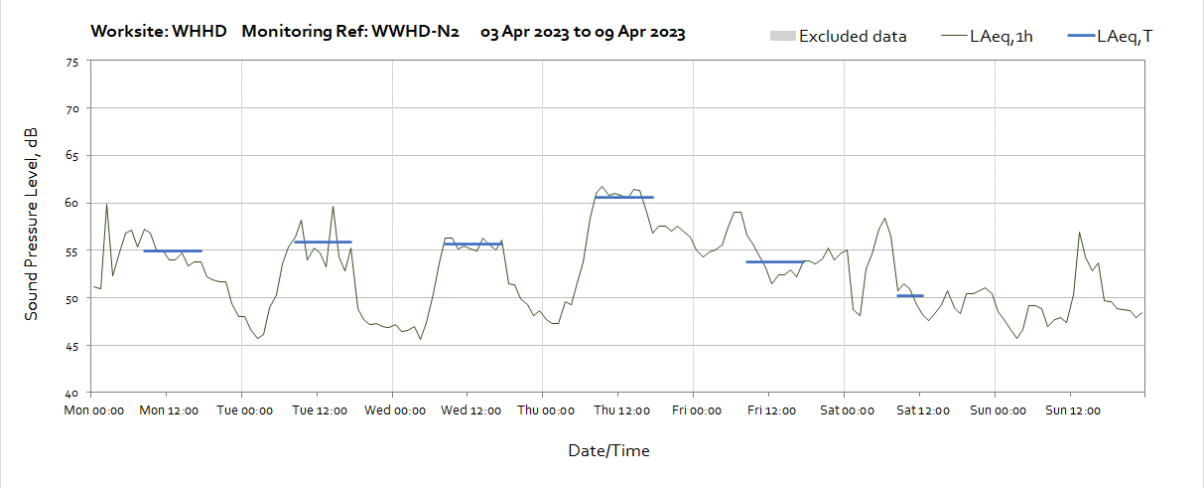


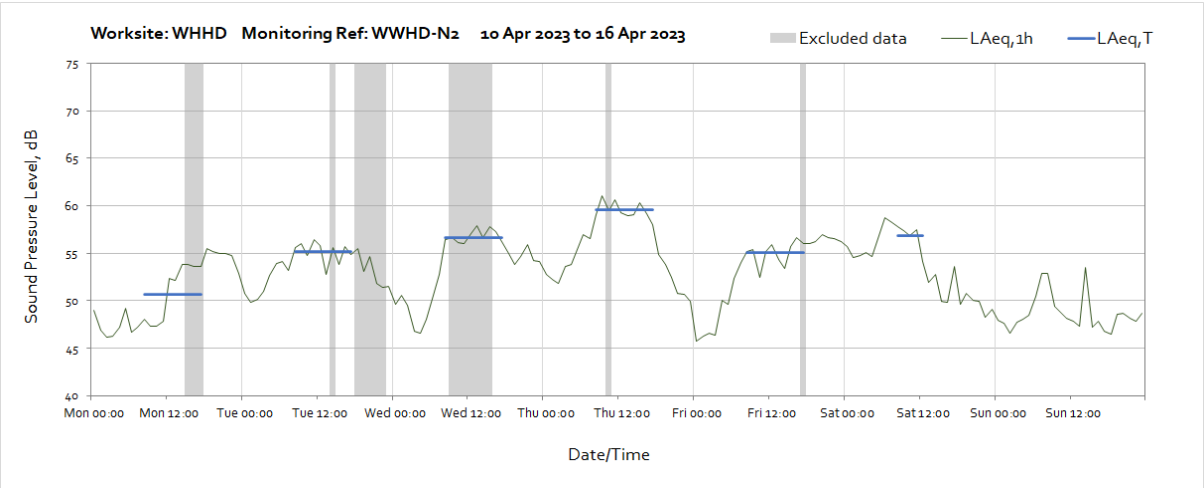


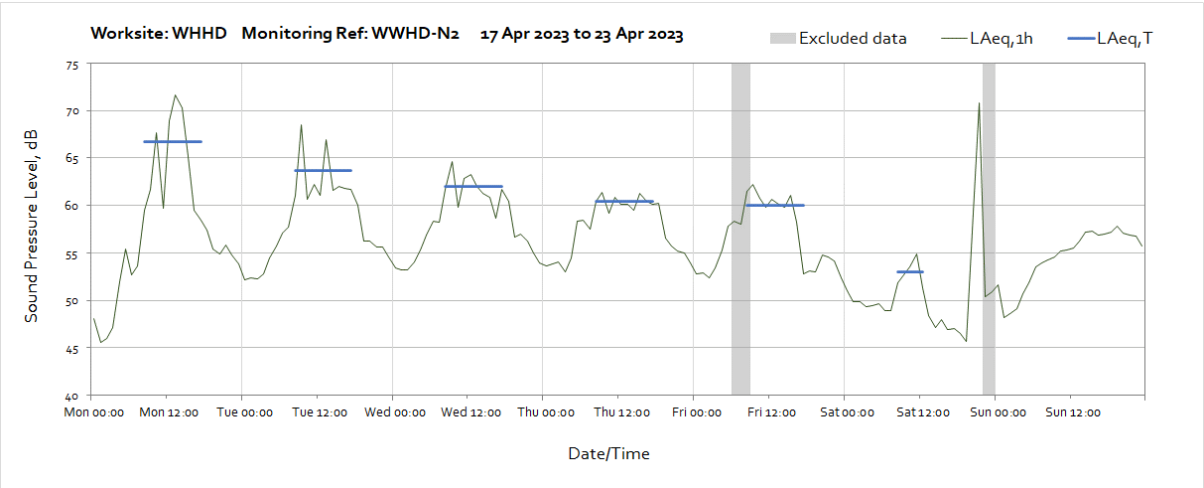


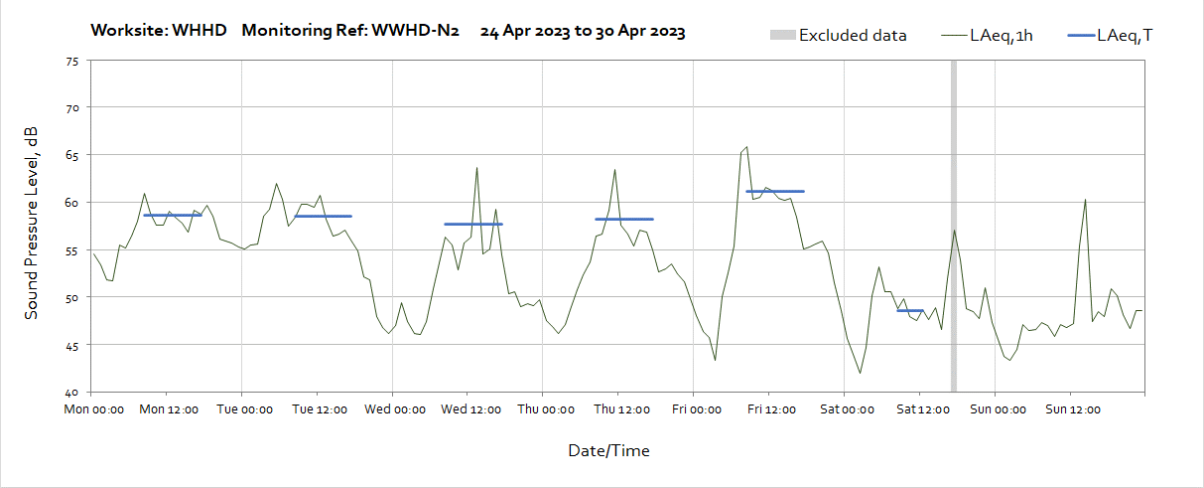
Worksite: WWHD – Monitoring Ref: WWHD-N2



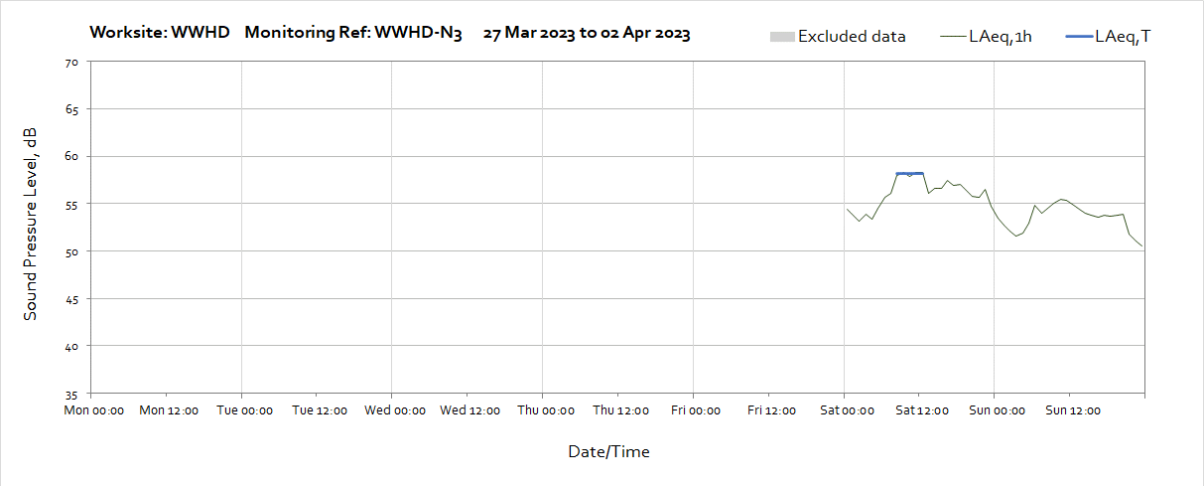

Worksite: WHHD Monitoring Ref: WWHD-N2 03 Apr 2023 to 09 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

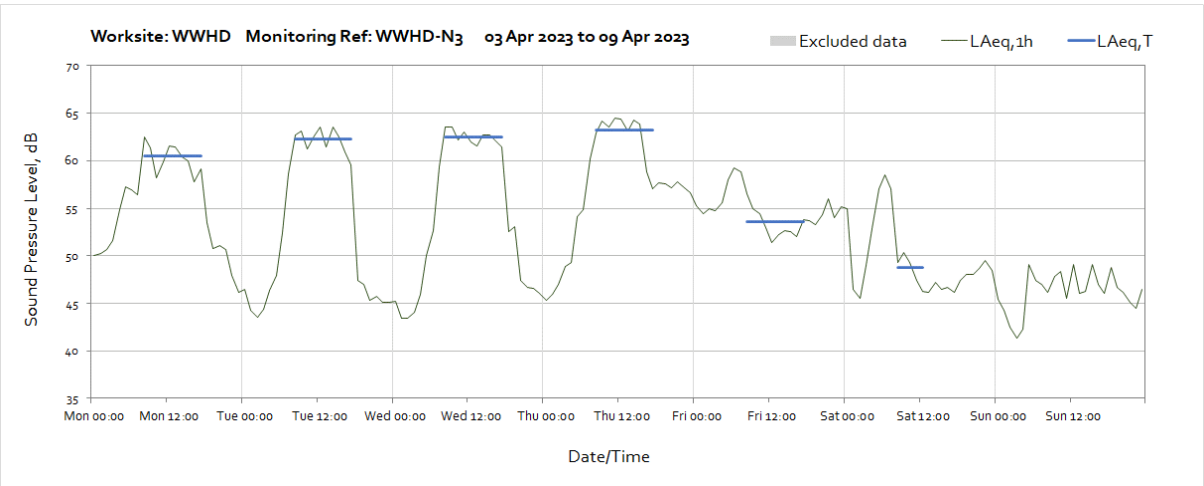

Worksite: WHHD Monitoring Ref: WWHD-N2 10 Apr 2023 to 16 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

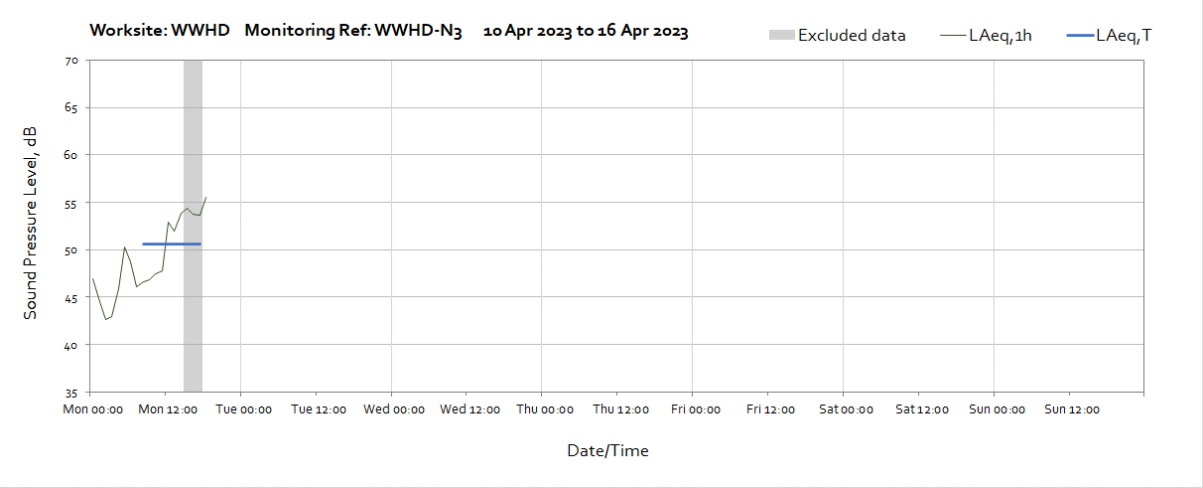

Worksite: WHHD Monitoring Ref: WWHD-N2 17 Apr 2023 to 23 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time



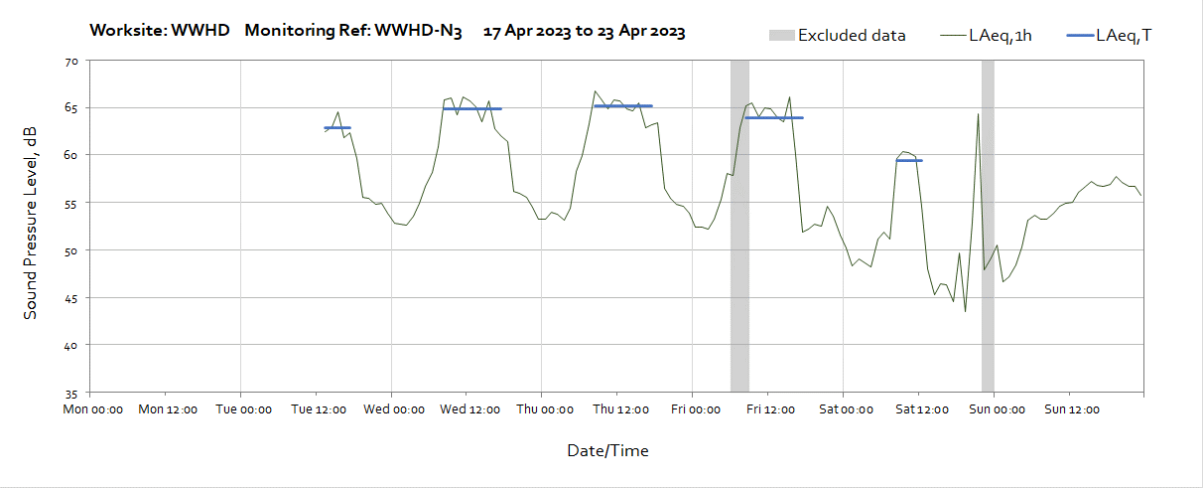
Worksite: WWHD – Monitoring Ref: WWHD-N3



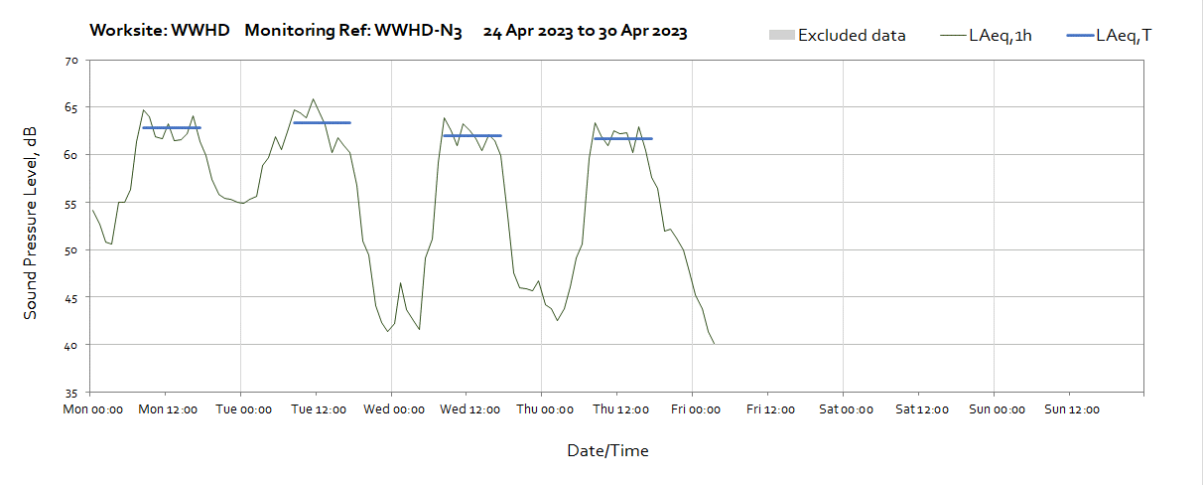




Note: Missing data between 19:00 on Monday 10th April and 13:00 on Tuesday 18th April was due loss of power at the monitoring station.

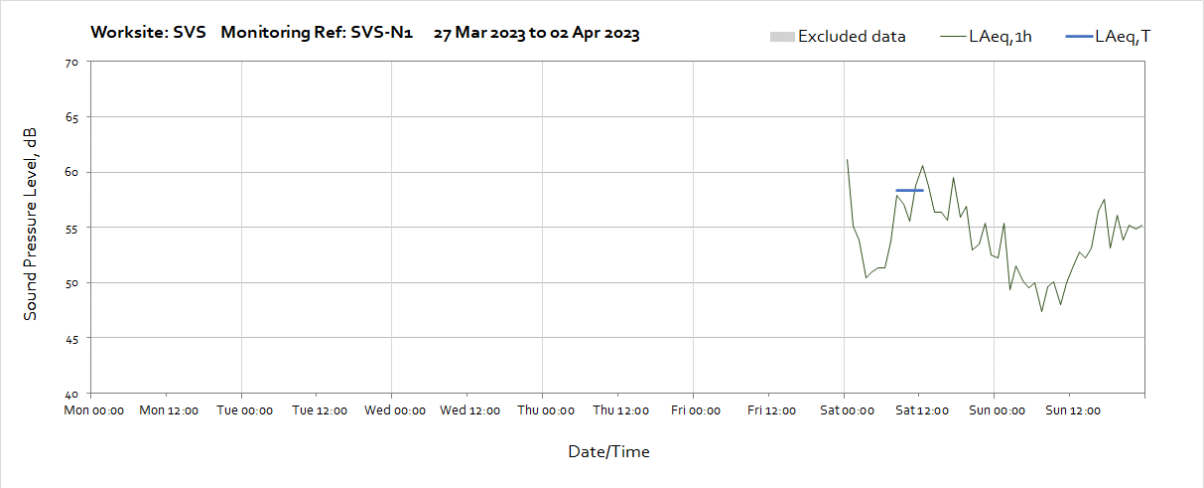


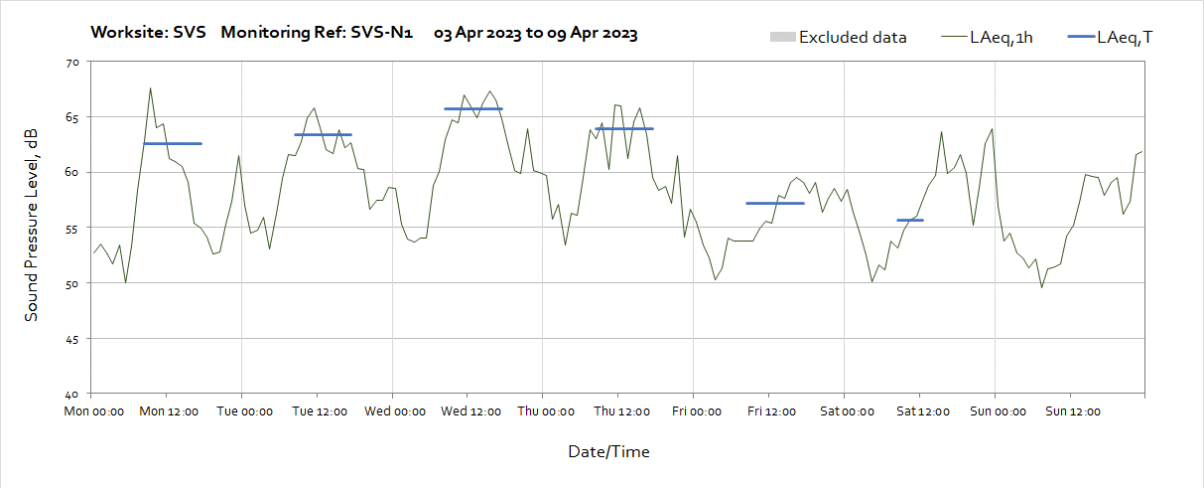
Note: Missing data between 19:00 on Monday 10th April and 13:00 on Tuesday 18th April was due loss of power at the monitoring station.

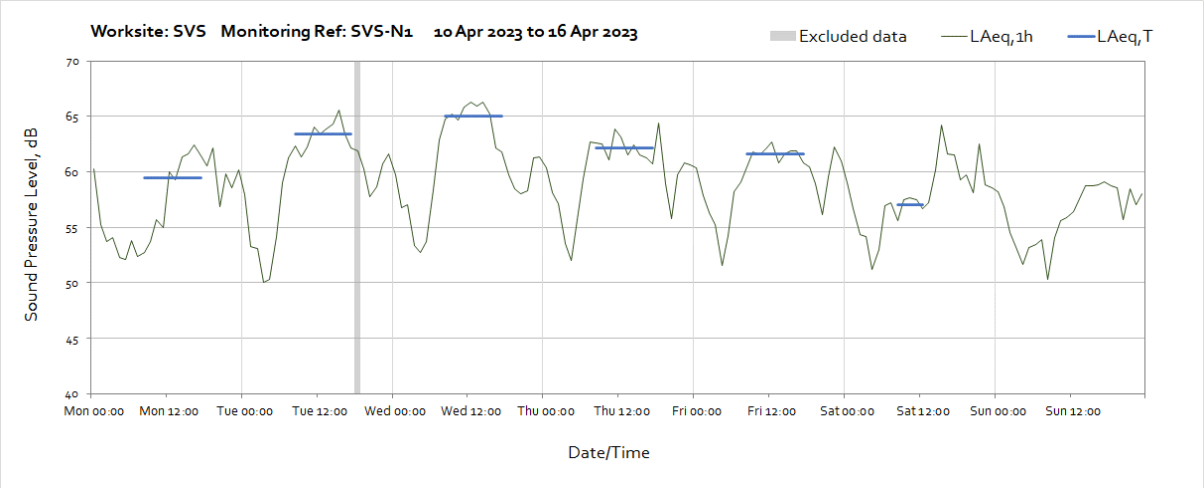


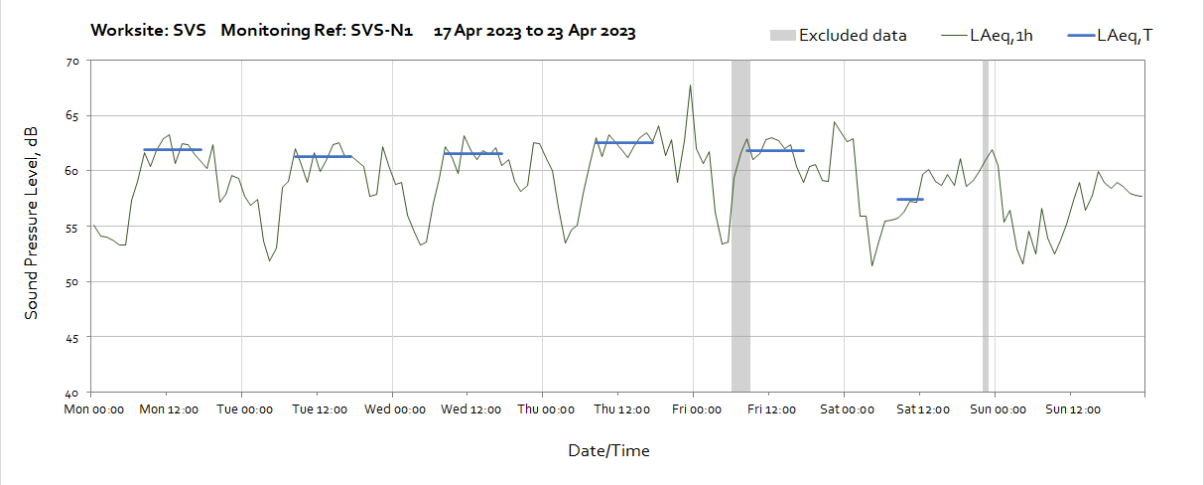
Note: Missing data from 04:00 on Friday 28th April to the end of the month was due to loss of power at the monitoring station.

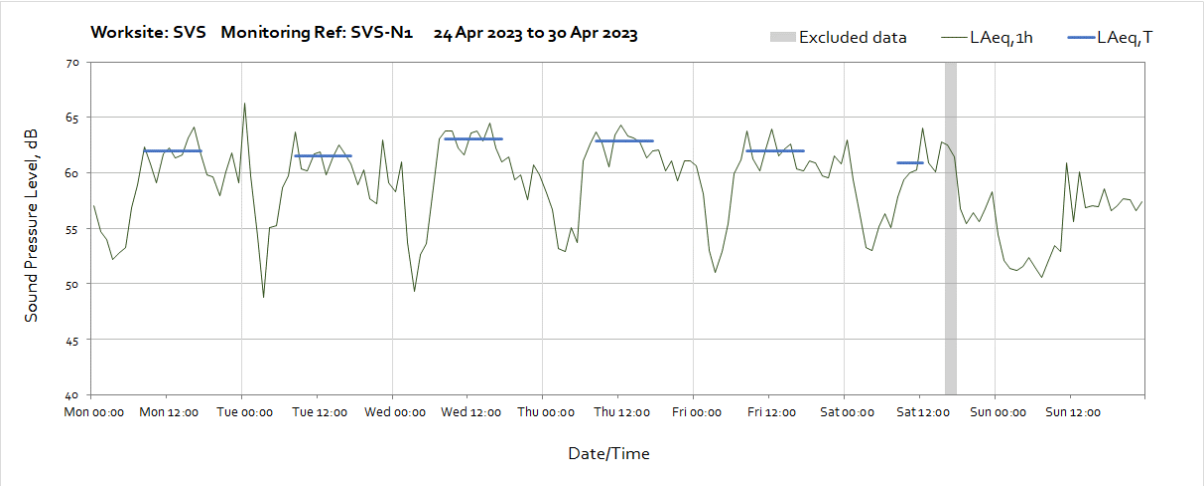
Worksite: SVS – Monitoring Ref: SVS-N1



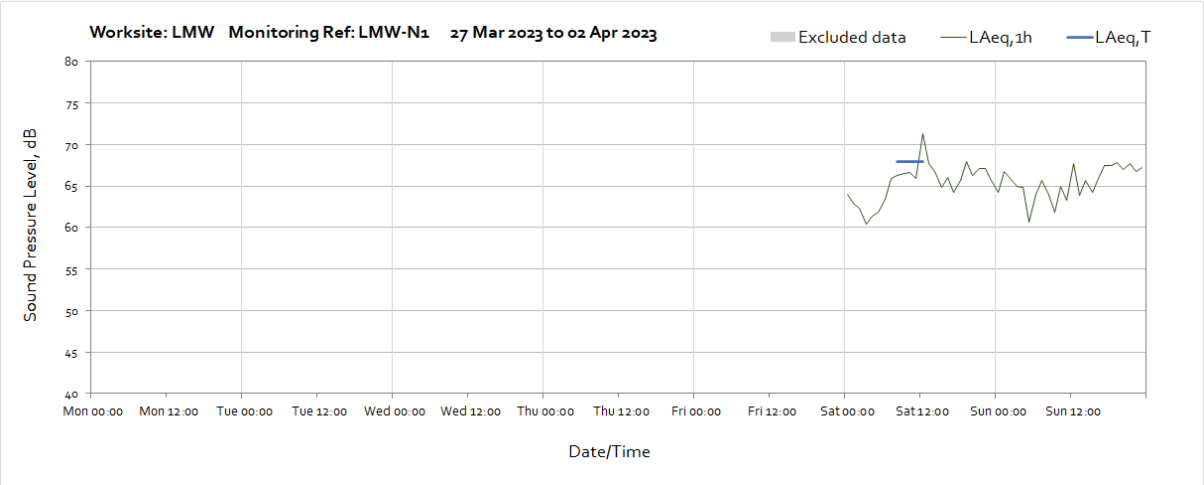


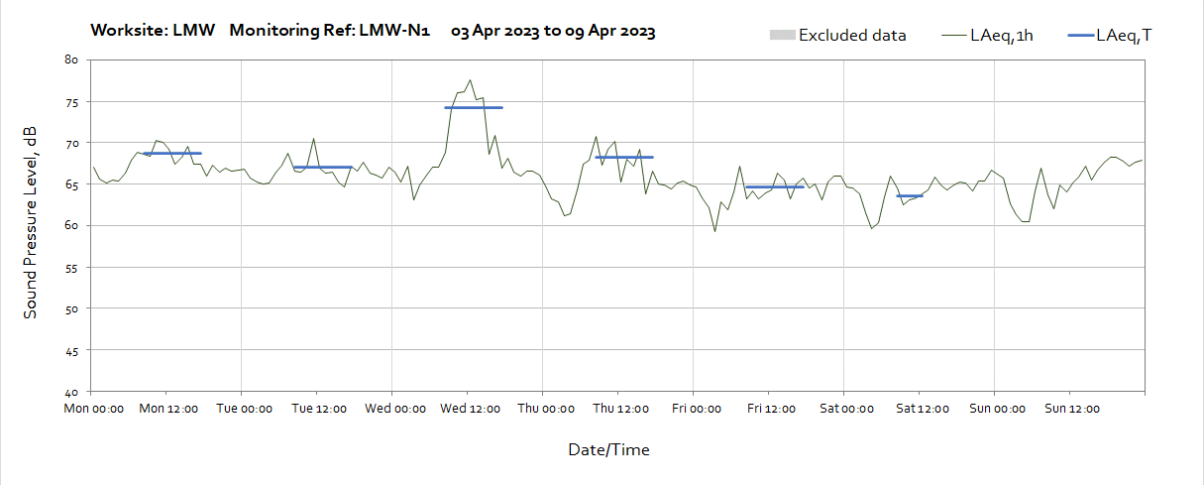


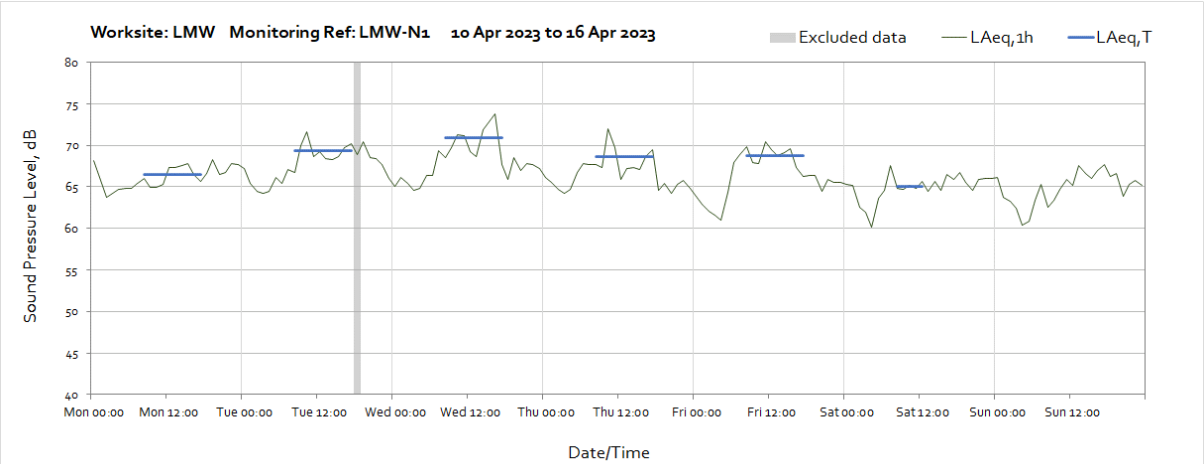


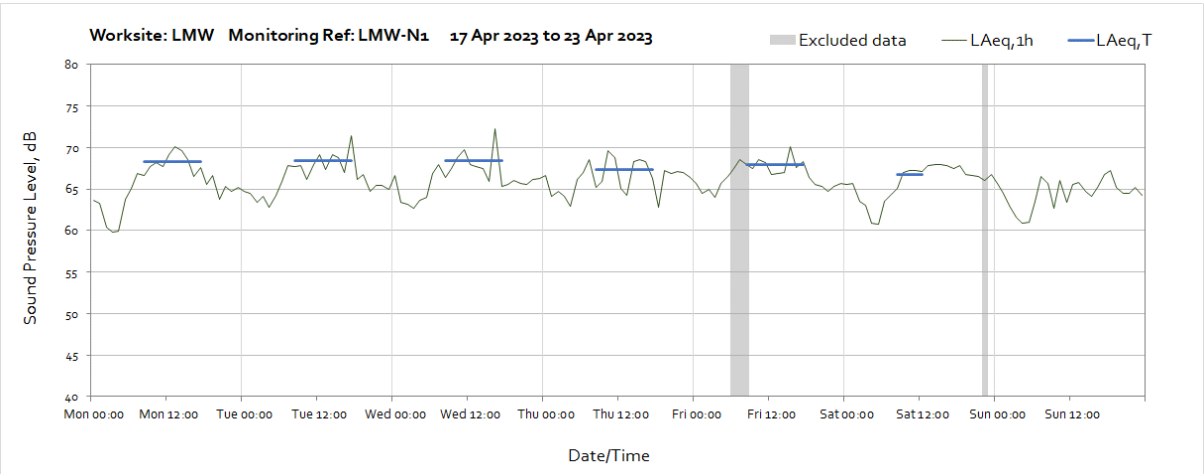


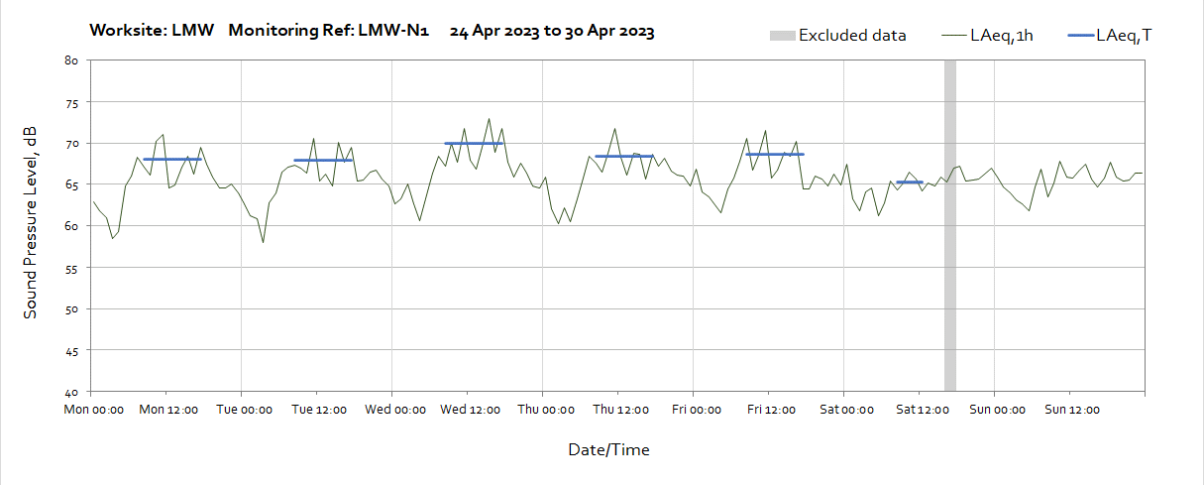
Worksite: LMW – Monitoring Ref: LMW-N1



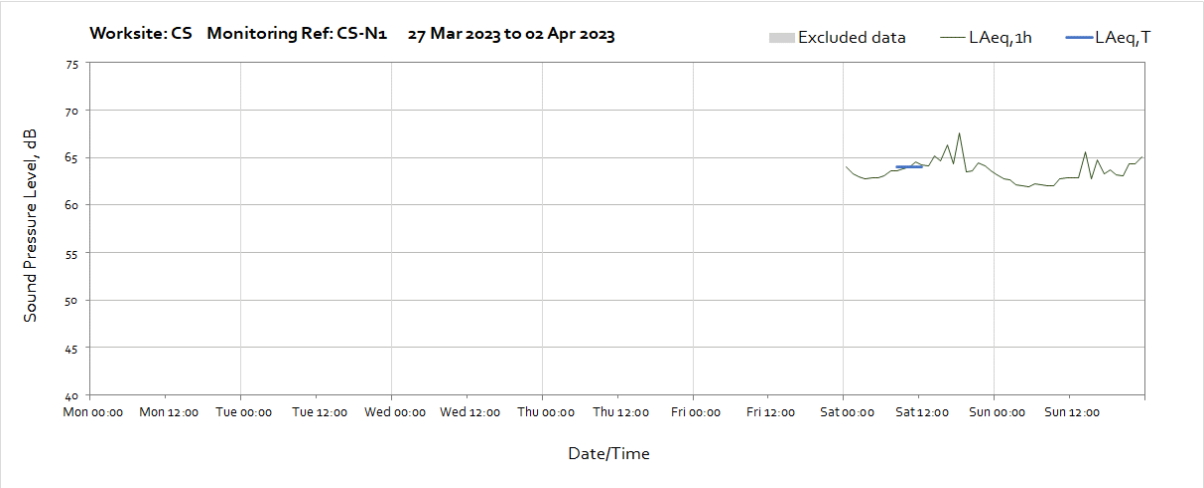

Worksite: LMW Monitoring Ref: LMW-N1 03 Apr 2023 to 09 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

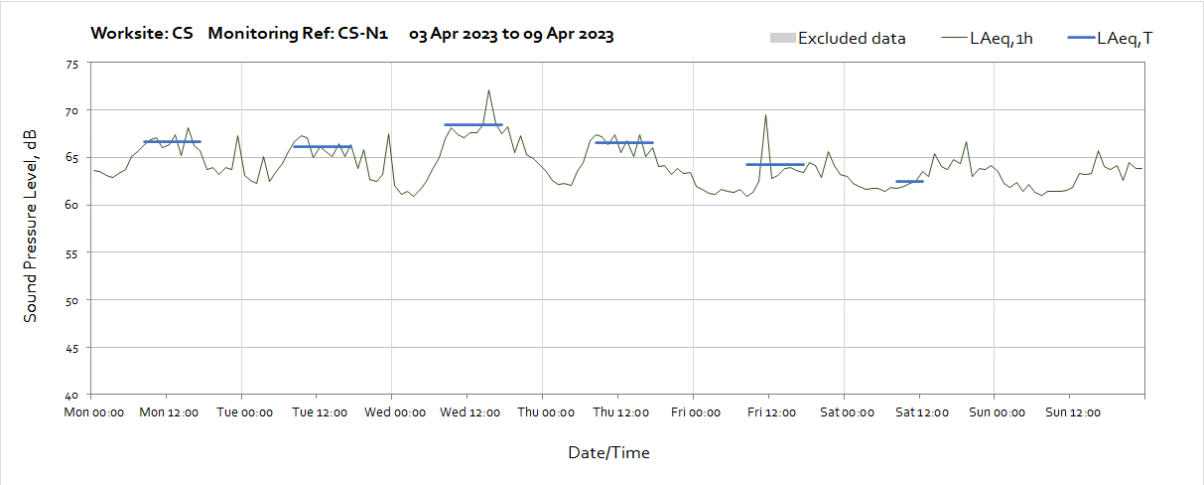

Worksite: LMW Monitoring Ref: LMW-N1 10 Apr 2023 to 16 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

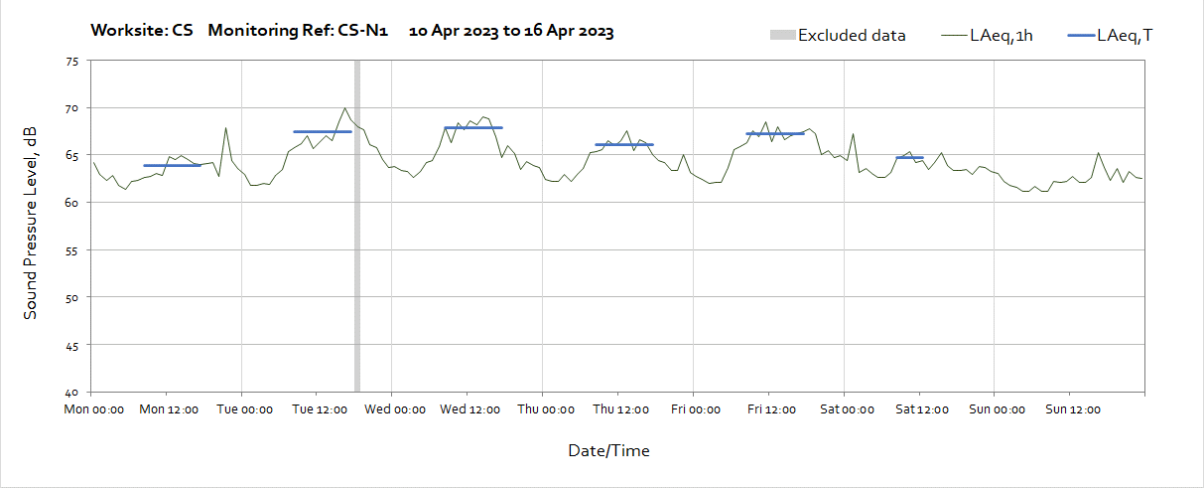

Worksite: LMW Monitoring Ref: LMW-N1 17 Apr 2023 to 23 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
80
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

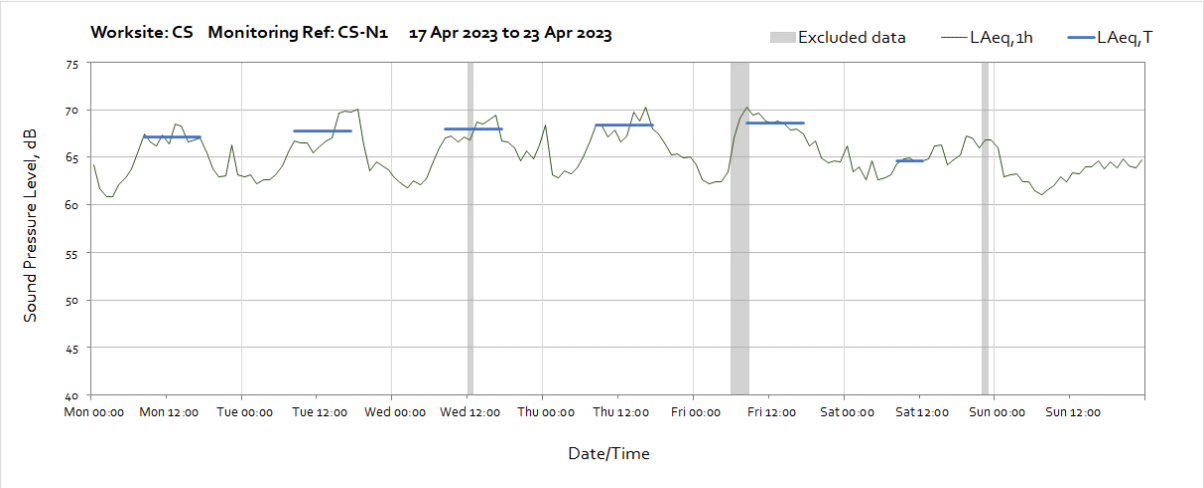


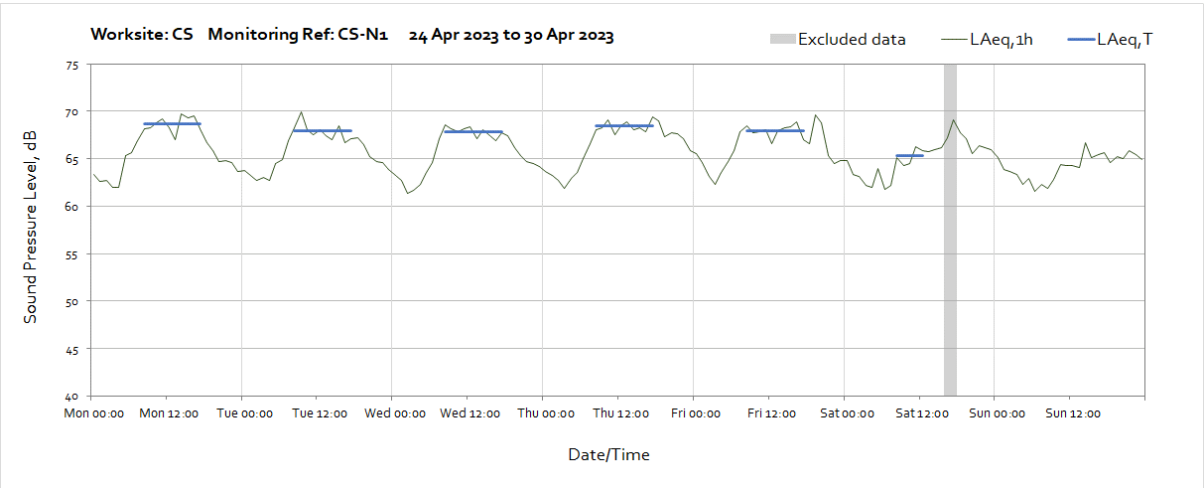
Worksite: CS – Monitoring Ref: CS-N1






Worksite: CS Monitoring Ref: CS-N1 10 Apr 2023 to 16 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

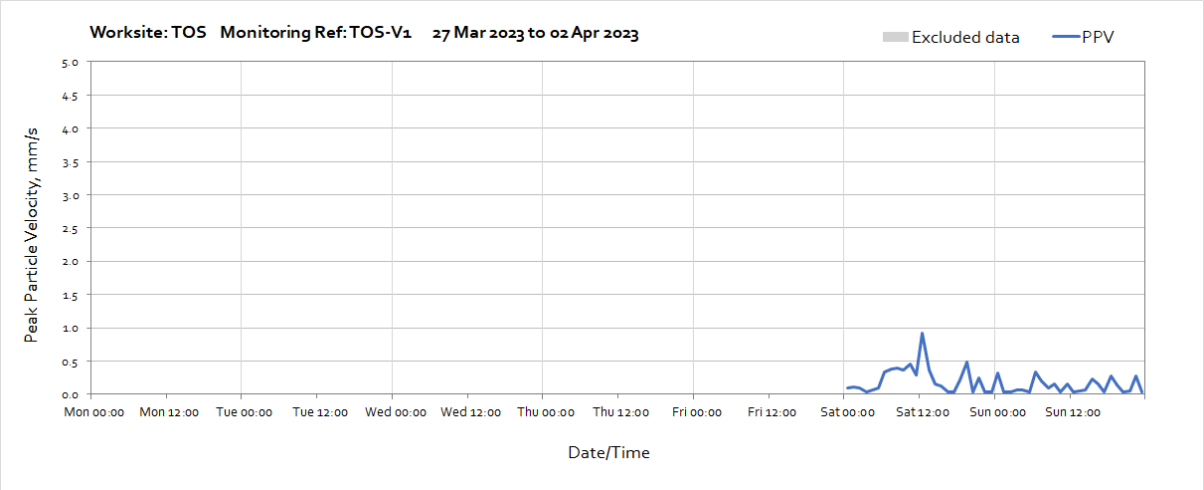

Worksite: CS Monitoring Ref: CS-N1 17 Apr 2023 to 23 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

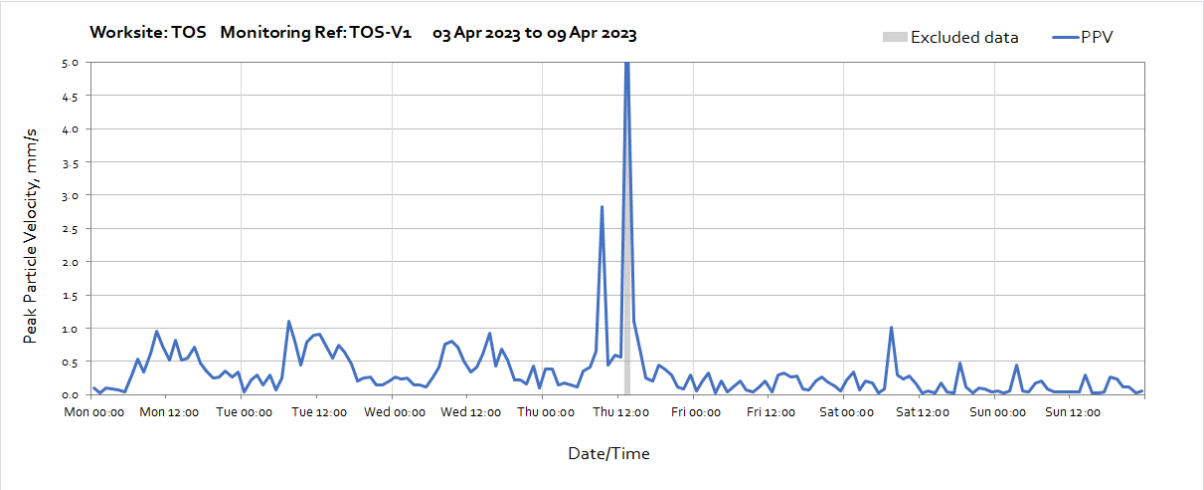

Worksite: CS Monitoring Ref: CS-N1 24 Apr 2023 to 30 Apr 2023
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
75
70
65
60
55
50
45
40
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

Vibration

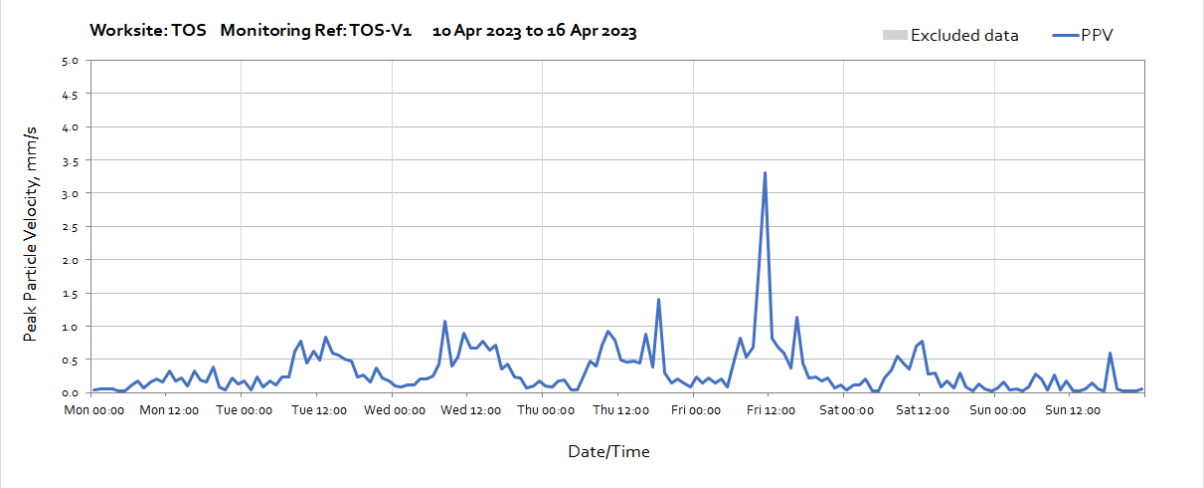
The following graphs show the hourly measured peak particle velocity PPV recorded during the monitoring period. The graphs show the resultant PPV due to vibration components on three orthogonal axis x, y and z. Where high values of PPV were caused by local interference with the vibration monitor, which 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: TOS – Monitoring Ref: TOS-V1

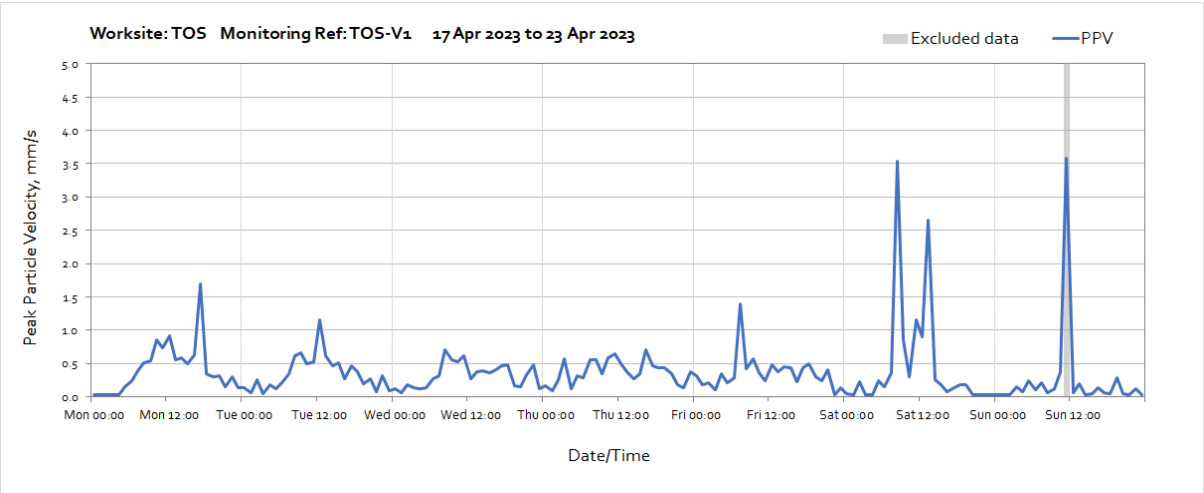




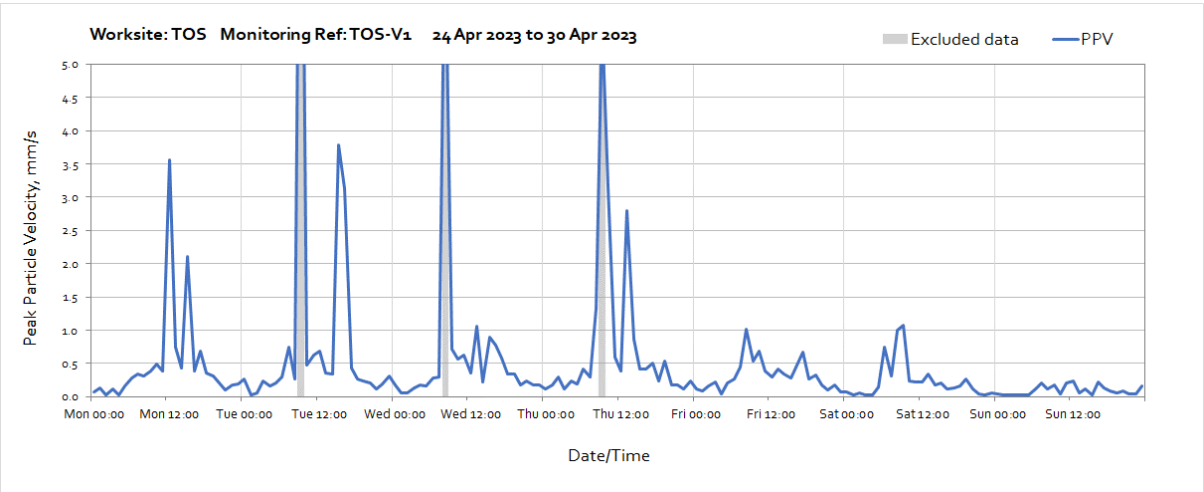
Note: High vibration level measured at 09:00 on Thursday 6th April were due to excavation works taking place close to the monitoring station.



Note: High vibration levels measured between 10:00 and 12:00 on Friday 14th April were due to digging of the new haul road and road extension works taking place close to the monitoring station.

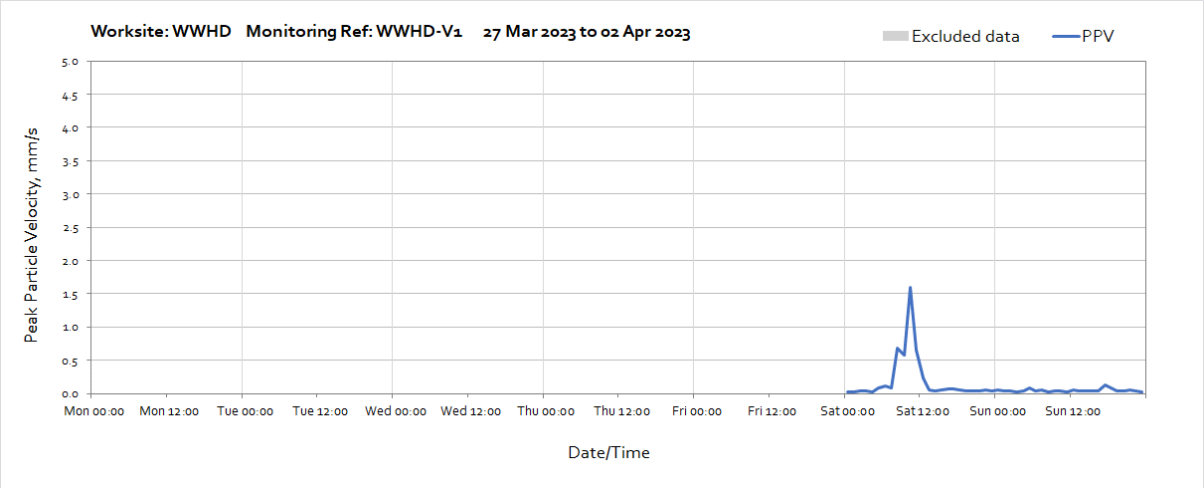


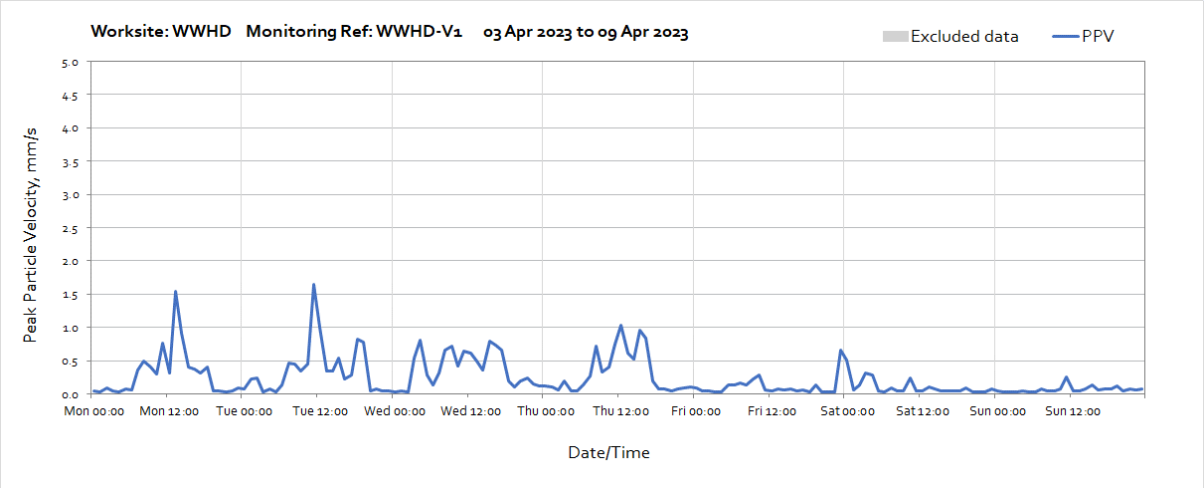
Note: High vibration levels measured at 08:00 and at 13:00 on Saturday 22nd April were due to stone compaction works taking place close to the monitoring station.

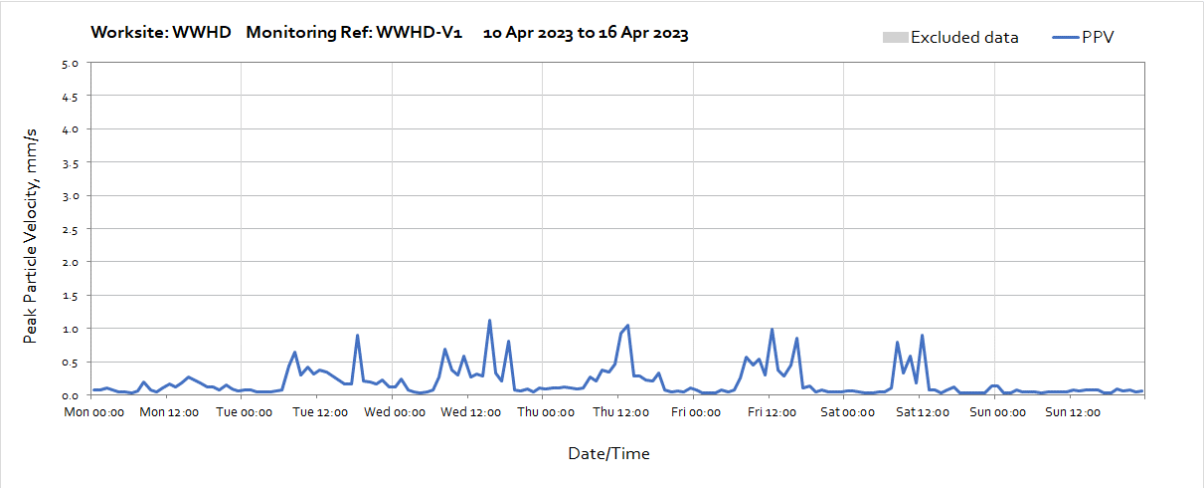


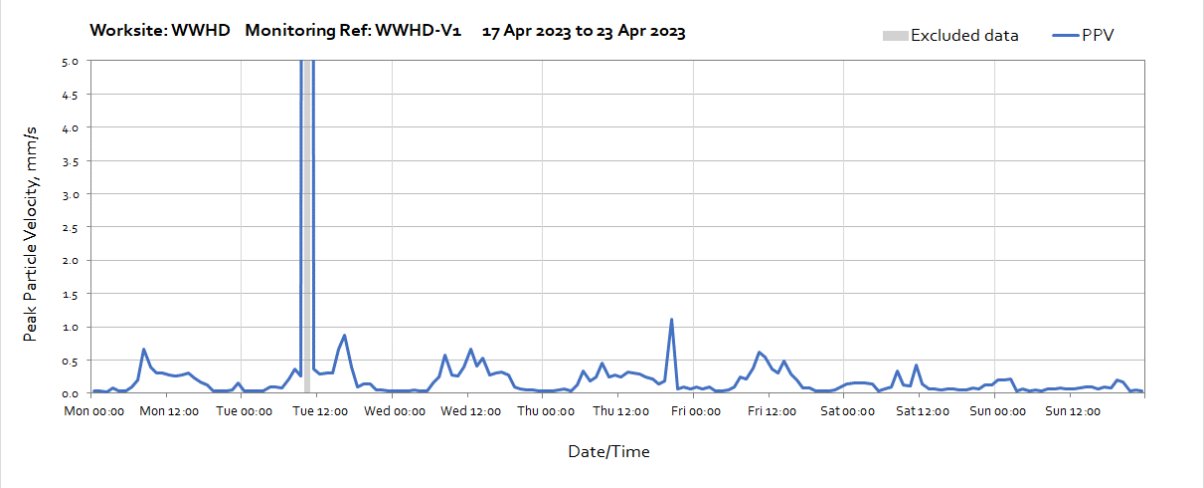
Note: High vibration levels measured across the week were due to excavation, shuttering, concrete pours and stone compaction works taking place close to the monitoring station.

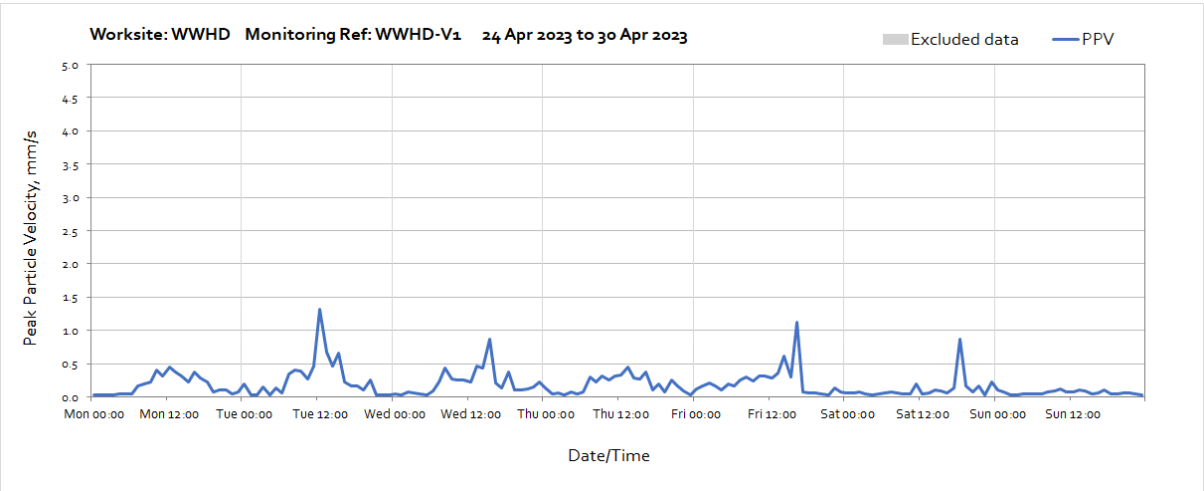
Worksite: WWHD – Monitoring Ref: WWHD-V1



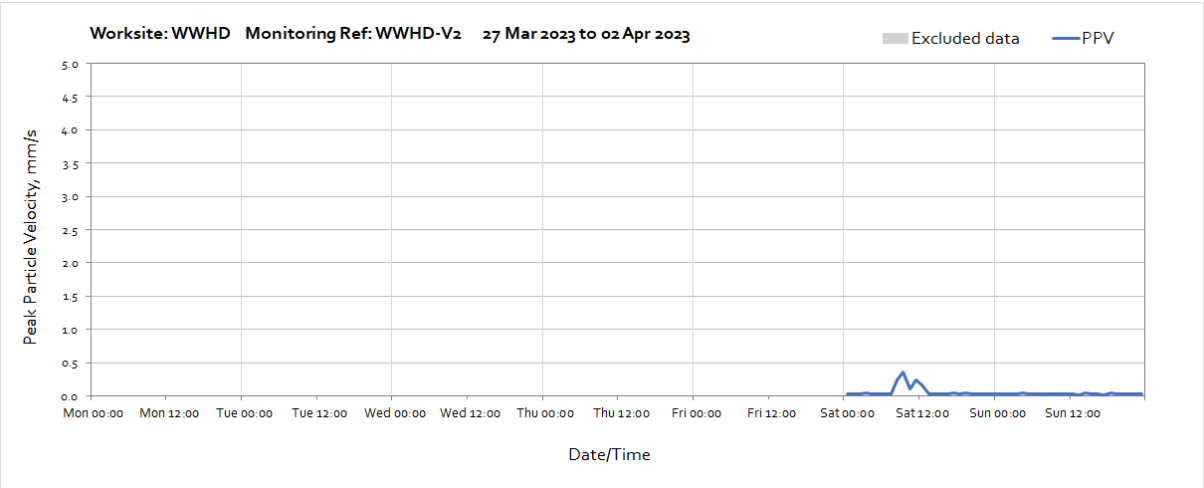


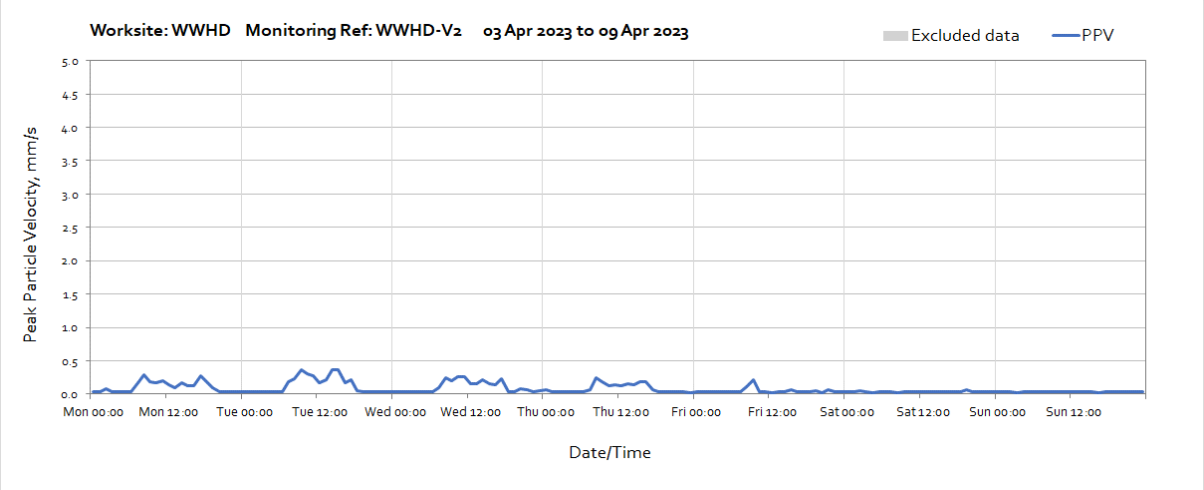


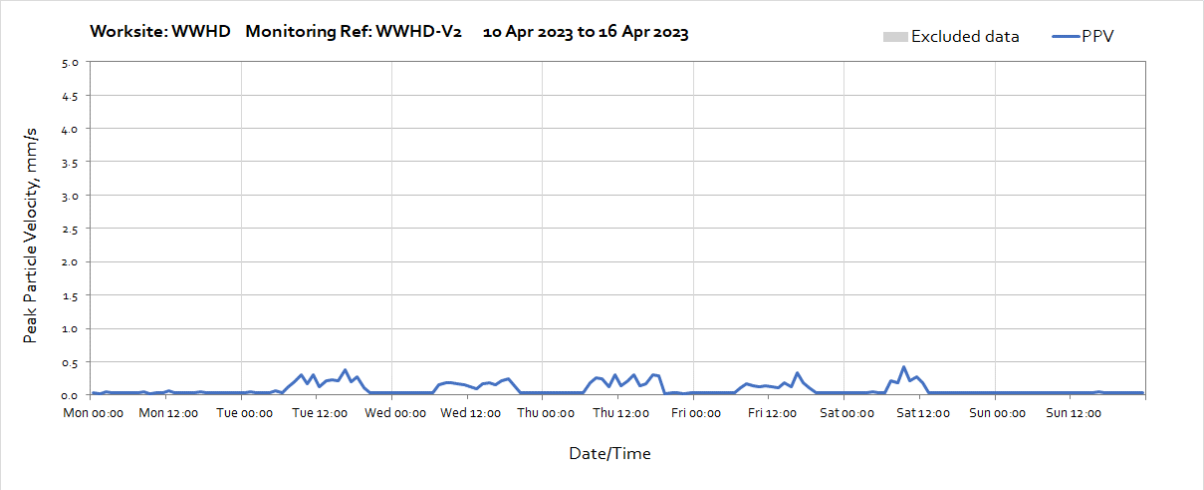


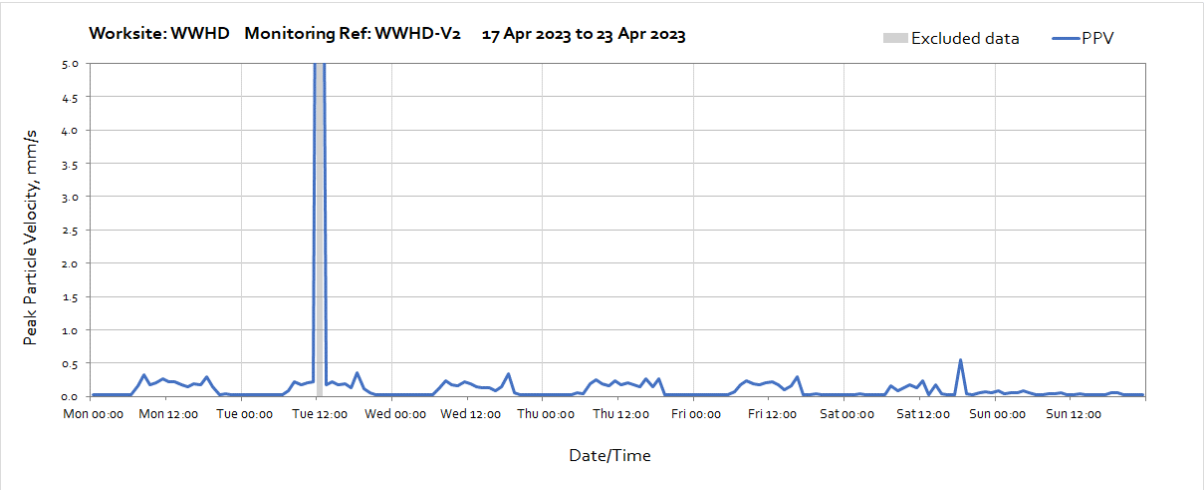


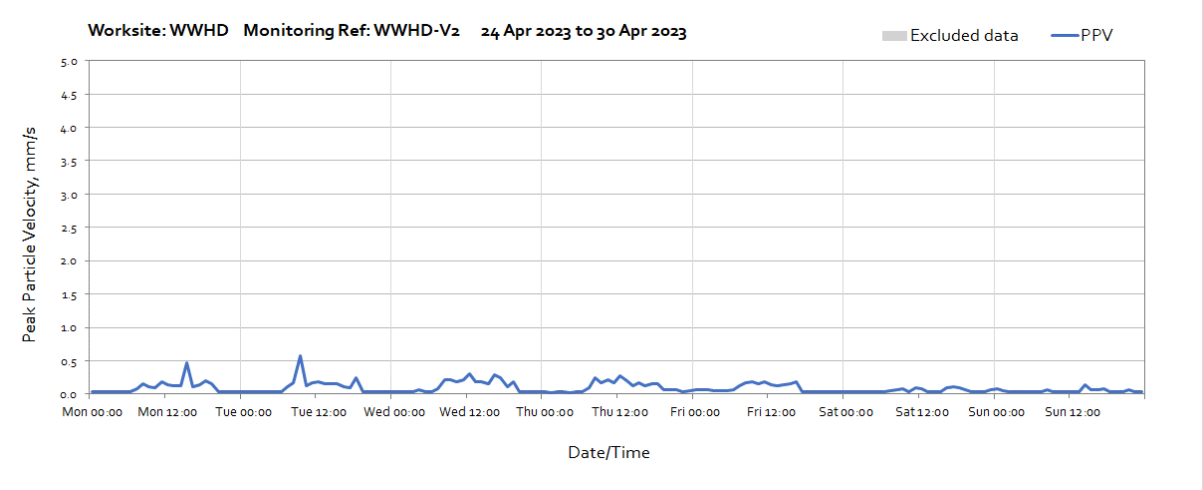
Worksite: WWHD – Monitoring Ref: WWHD-V2



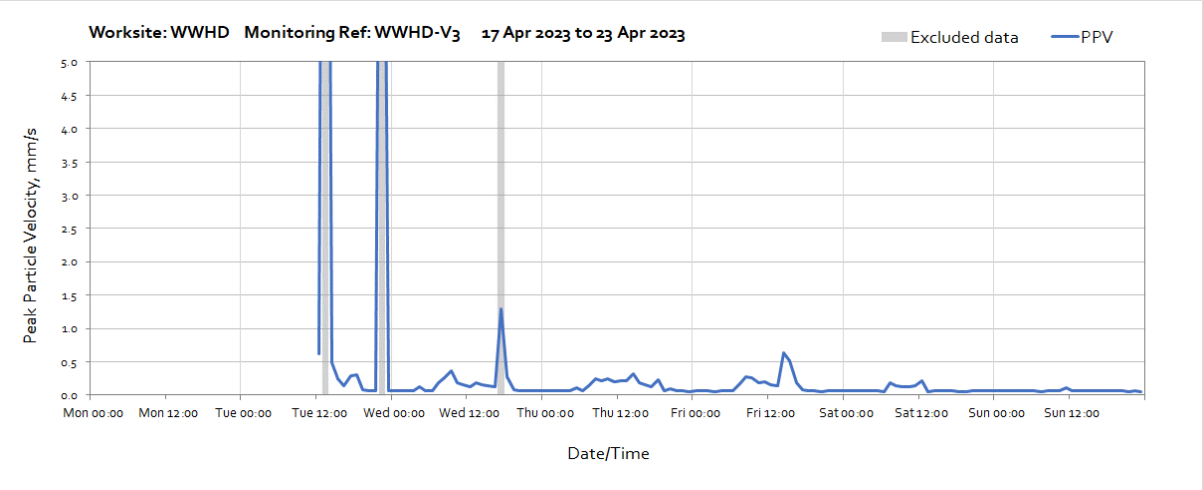

Worksite: WWHD Monitoring Ref: WWHD-V2 03 Apr 2023 to 09 Apr 2023
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: WWHD Monitoring Ref: WWHD-V2 10 Apr 2023 to 16 Apr 2023
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

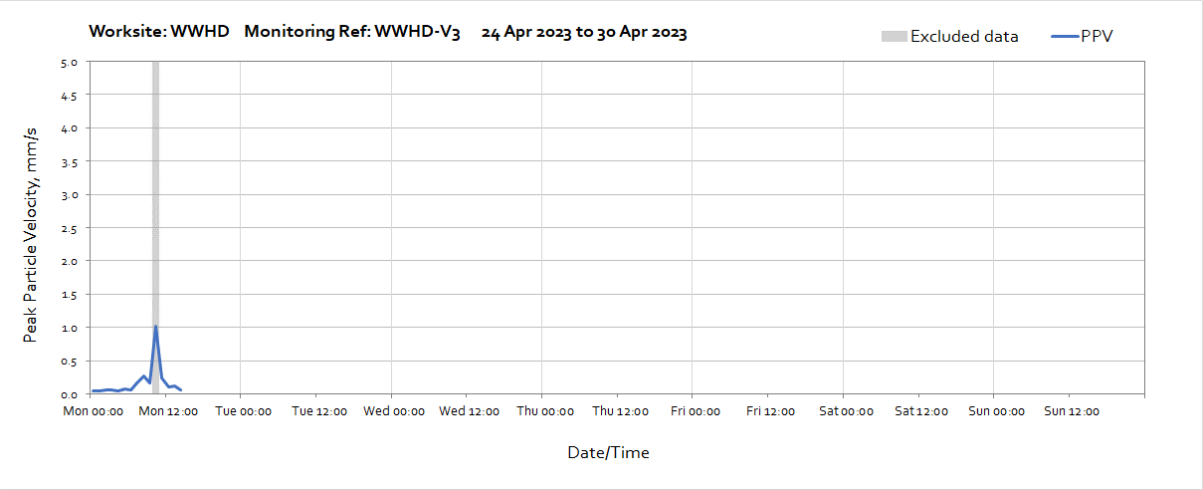

Worksite: WWHD Monitoring Ref: WWHD-V2 17 Apr 2023 to 23 Apr 2023
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time



Worksite: WWHD – Monitoring Ref: WWHD-V3



Note: Missing data from the beginning of the month until 12:00 on Tuesday 18th April was due to loss of power at the monitoring station.



Note: missing data from 15:00 on Monday 24th April to the end of the months were due to loss of power at the monitoring station.