HS2

June 2022

Construction Noise and Vibration Monthly Report – April 2022

Lichfield District Council

gov.uk/hs2

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Non-Technical Summary

This Noise and Vibration Monitoring Report fulfils HS2 Limited's commitment detailed in the Environmental Minimum Requirements (EMRs), Annex 1, Code of Construction Practice, to present the results of noise monitoring carried out within the Lichfield District Council (LDC) area during the month of April 2022.

Within this period monitoring was undertaken at the following worksites:

- Noise and vibration monitoring was undertaken in the vicinity of the Streethay Cutting Retaining Structure (SCRS) site where the works included site establishment, stockpiling, piling platform installation, road widening, kerb-laying and concrete pouring.
- Noise and vibration monitoring was undertaken in the vicinity of the Cappers Lane Compound (ref.: CLC), where the works included fencing works, drainage works, piling works, laying and rolling stone for a piling mat area, excavating, rolling and muck shifting.
- Noise and vibration monitoring was undertaken in the vicinity of the Tamworth Road Overbridge Satellite (TROS) site where the works included site compound works, transport and stockpiling of stone, culvert works, earthworks, haul road construction and ground penetrating radar scanning.

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 April 2022.

There were no exceedances of trigger levels as defined in Section 61 consents during the reporting period at any monitoring position.

No complaint was 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, wind 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 veloDistrict, or PPV	Instantaneous maximum veloDistrict 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 Lichfield District Council (LDC) area for the period 1st to 30st April 2022.

1.1.3 There were three active construction sites in the local authority area. At all three sites monitoring was undertaken during this period:

- Streethay Cutting Retaining Structure ref: SCRS (see plan 1 in Appendix A), where work activities included:
  - Site establishment;
  - Stockpiling;
  - Piling platform installation;
  - Road widening;
  - Kerb laying; and
  - Concrete pouring.
- Cappers Lane Compound ref: CLC (see plan 2 in Appendix A), where work activities included:
  - Piling works;
  - Drainage works;
  - Fencing works;
  - Laying and rolling stone for a piling mat area; and
  - Excavating, rolling and muck shifting.

- Tamworth Road Overbridge Satellite ref: TROS (see plan 3 in Appendix A), where work activities included:
    - Site compound works;
    - Transport and stockpiling of stone;
    - Earthworks;
    - Culvert works;
    - Haul road construction; and
    - Ground penetrating radar scanning.

1.1.4 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 Four (4) noise monitoring and three (3) vibration monitoring installations were active in the LDC area at the start of April 2022. Table 2 summarises the positions of the noise and vibration monitoring installations within the LDC area in April 2022.

1.2.2 Maps showing the positions of the noise monitoring installations are presented in Appendix B.

Table 2: Monitoring Locations

Worksite Reference	Measurement Reference	Address
SCRS	SCRS-N1	Manor House, Burton Road, Streethay
	SCRS-V1	Manor House, Burton Road, Streethay
CLC	CLC-N1	Ivy Cottage, Park Lane, Fradley and Streethay
	CLC-V1	Ivy Cottage, Park Lane, Fradley and Streethay,
TROS	TROS-N1	West side of Tamworth Road Overbridge Site, Tamworth Road, Whittington
	TROS-N2	The Bungalow, Tamworth Road, Whittington
	TROS-V1	West side of Tamworth Road Overbridge Site, Tamworth Road, Whittington

2 Summary of Results

2.1 Summary of Measured Noise Levels

2.1.1 Table 3 presents a summary of the measured noise levels at the monitoring locations 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
SCRS	SCRS-N1	West of Manor House, Burton Road, Streethay	Free-field	56.9 (60.7)	56.0 (62.5)	55.2 (59.8)	54.6 (57.8)	53.4 (58.9)	53.6 (56.1)	53.2 (56.4)	53.3 (57.6)	52.7 (56.9)	49.4 (54.1)	54.0 (58.8)	52.9 (59.2)
CLC	CLC-N1	Ivy Cottage, Park Lane, Fradley and Streethay, Whittington	Free-field	57.0 (60.2)	56.3 (57.8)	55.7 (57.8)	55.7 (59.0)	53.9 (61.3)	54.2 (54.5)	54.2 (55.9)	53.8 (56.4)	54.3 (56.9)	48.6 (57.7)	52.8 (56.2)	50.1 (57.1)
TROS	TROS-N1	West side of Tamworth Road Overbridge Site, Tamworth Road	Free-field	59.6 (62.6)	59.1 (62.2)	58.4 (61.2)	56.4 (60.3)	51.7 (58.9)	56.2 (58.1)	57.9 (59.7)	57.8 (60.4)	57.1 (60.2)	50.9 (54.5)	55.5 (59.1)	49.8 (57.4)
	TROS-N2	The Bungalow, Tamworth Road, Whittington	Free-field	47.8 (56.3)	49.4 (60.8)	45.5 (54.6)	43.3 (48.5)	40.8 (51.0)	45.5 (47.0)	45.5 (49.7)	45.0 (52.4)	43.8 (51.6)	38.7 (48.9)	42.6 (49.5)	41.4 (50.2)

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

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

Worksite Reference	Measurement Reference	Monitor Address	Highest PPV measured in any axis, mm/s
SCRS	SCRS-V1	Manor House, Burton Road, Streethay	0.07 (Z-axis)
CLC	CLC-V1	Ivy Cottage, Park Lane, Fradley and Streethay, Whittington	0.78 (Y-axis)
TROS	TROS-V1	West side of Tamworth Road Overbridge Site, Tamworth Road, Whittington	1.10 (X-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 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
SCRS	SCRS-N1	West of Manor House, Burton Road, Streethay	All days	All periods	No exceedance	No exceedance
CLC	CLC-N1	Ivy Cottage, Park Lane, Fradley and Streethay, Whittington	All days	All periods	No exceedance	No exceedance
TROS	TROS-N1	West side of Tamworth Road Overbridge Site, Tamworth Road, Whittington	All days	All periods	No exceedance	No exceedance

2.2.6 No exceedances of the LOAEL or SOAEL were recorded during April 2022.

2.3 Exceedances of Trigger Level

2.3.1 Table 6 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 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

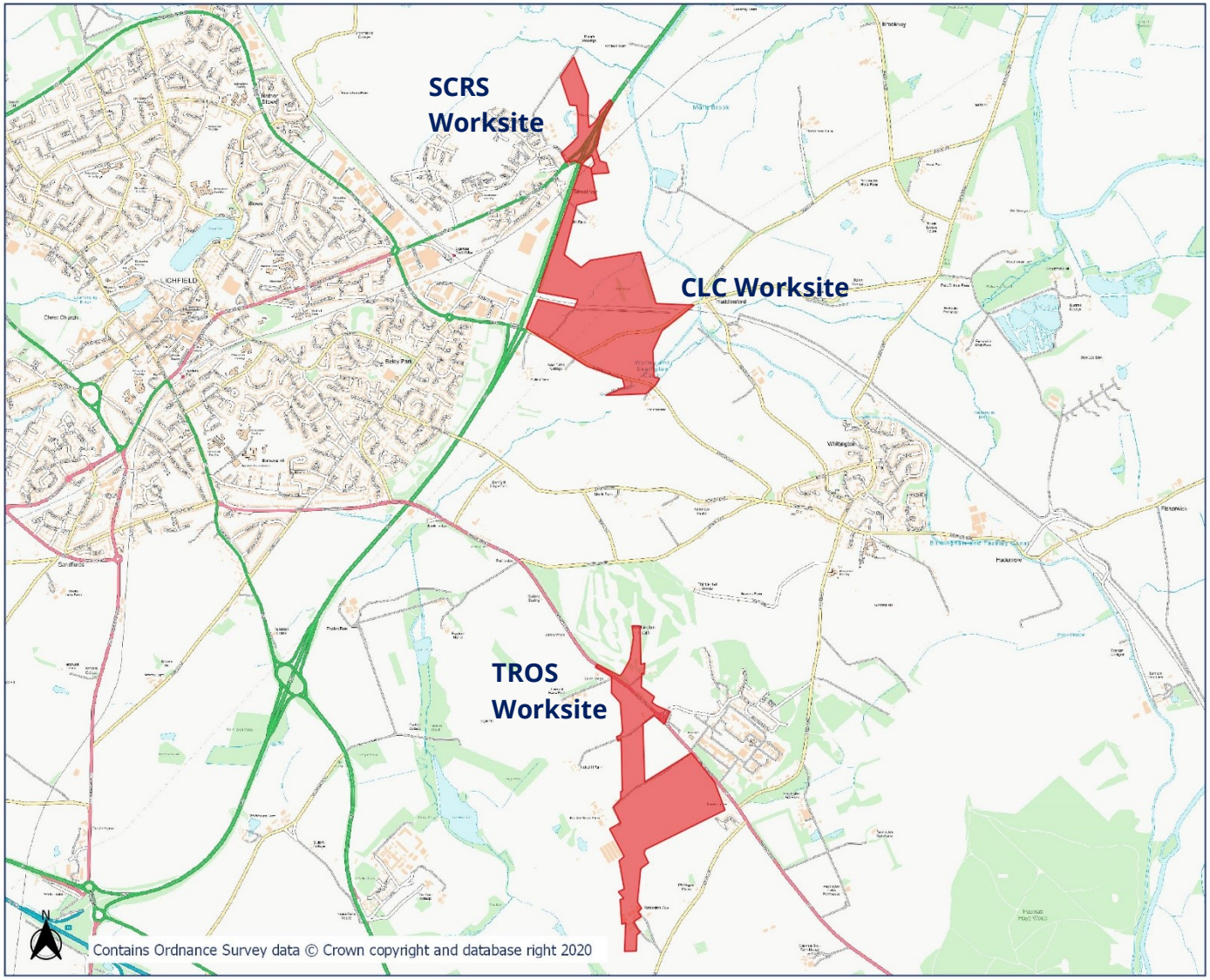
2.4.1 Table 7 provides a summary of complaint information related to noise received during the reporting period, along with the findings of any investigation.

Table 7: Summary of Complaints

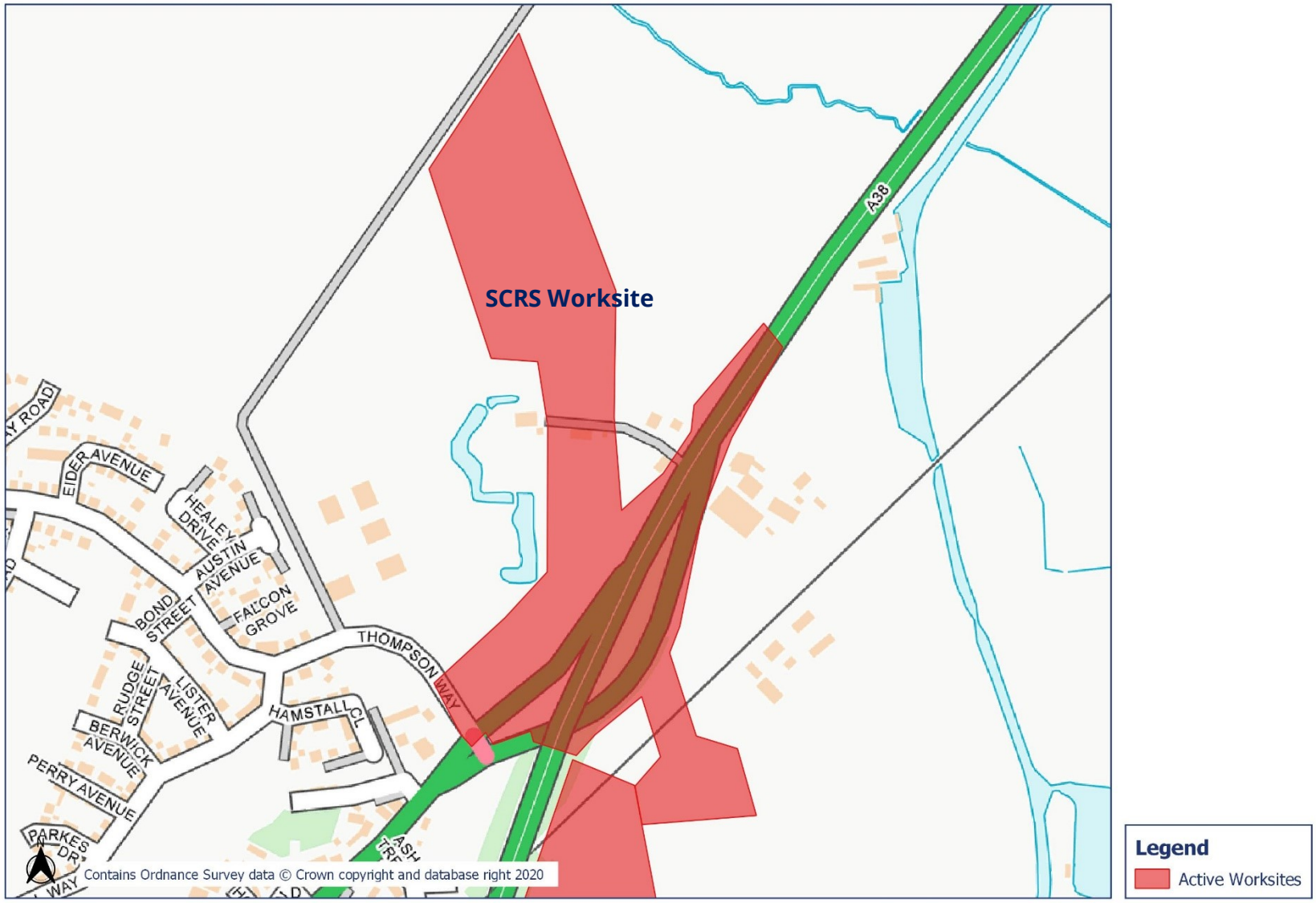
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken

Appendix A Site Locations

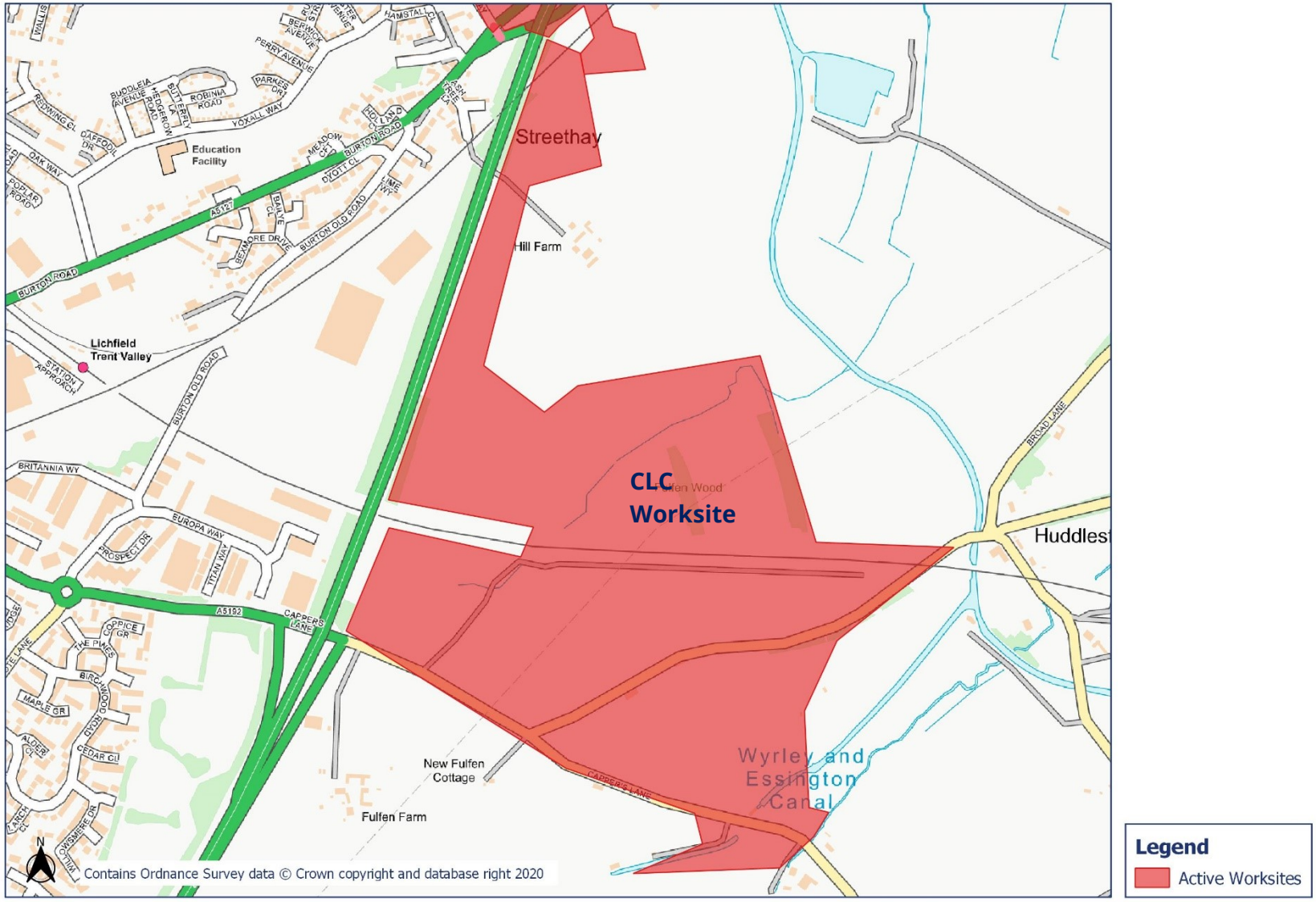
HS2 Worksite Identification Plan - Overview



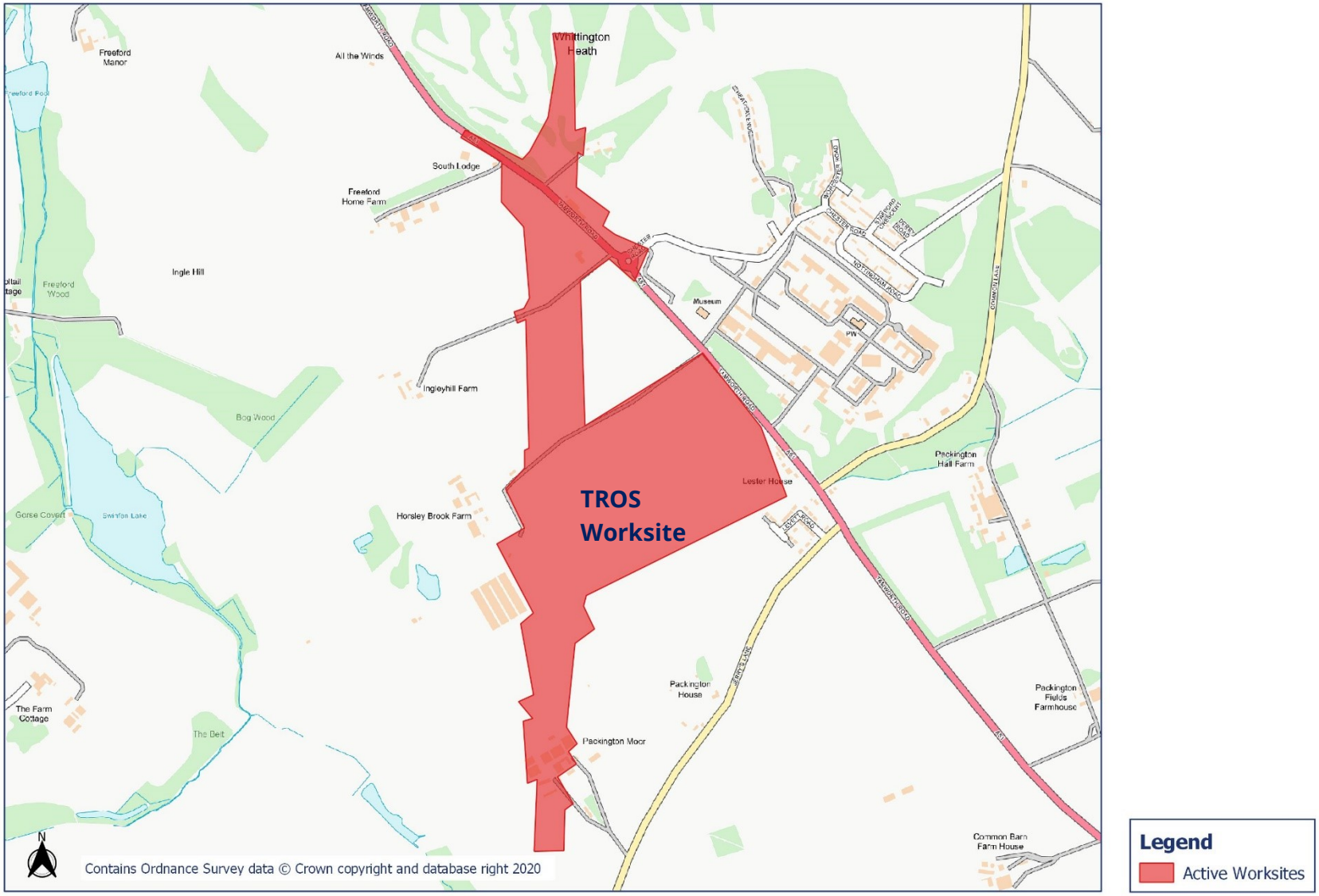
Worksite Identification Plan - 1



Worksite Identification Plan - 2

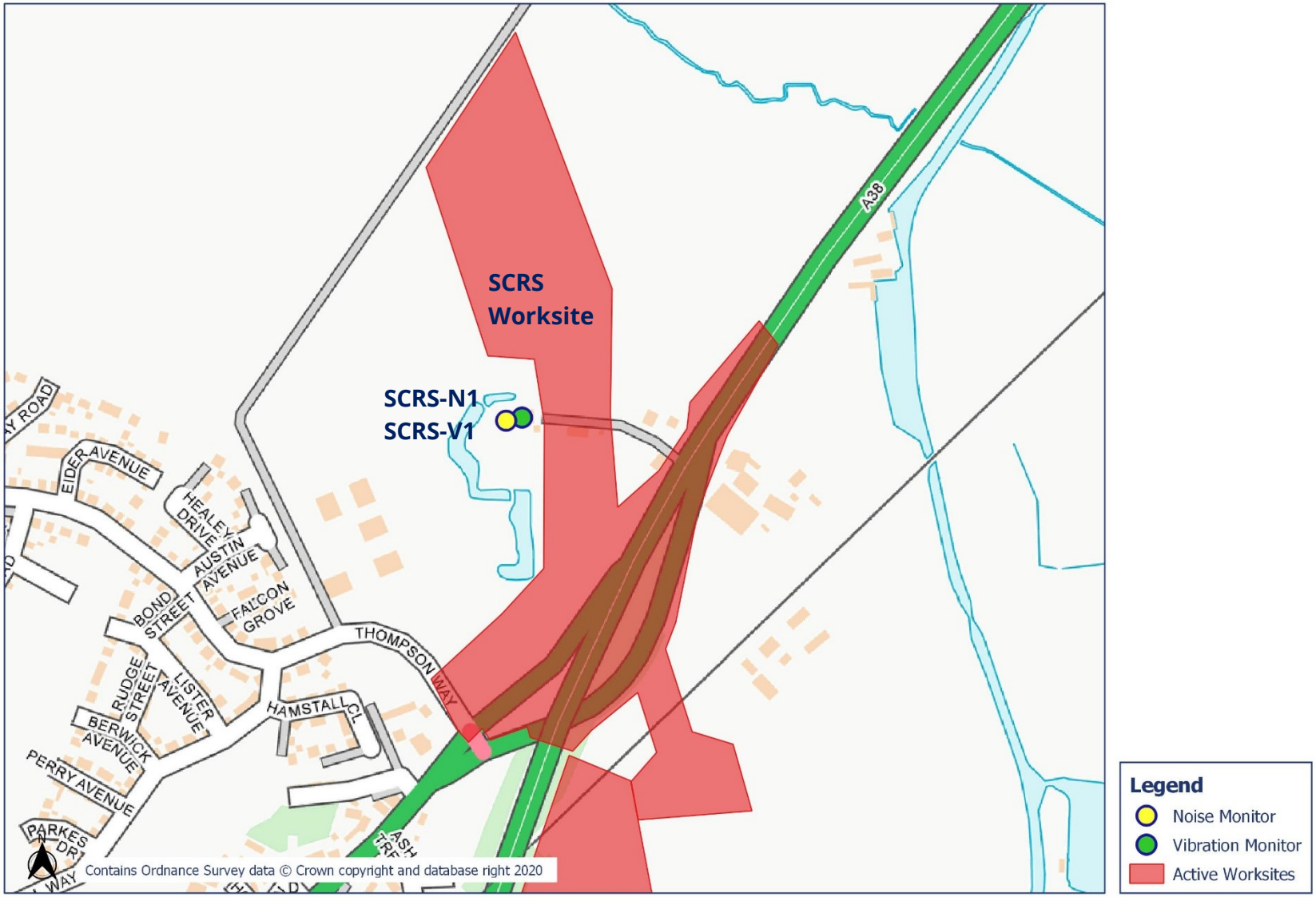


Worksite Identification Plan - 3

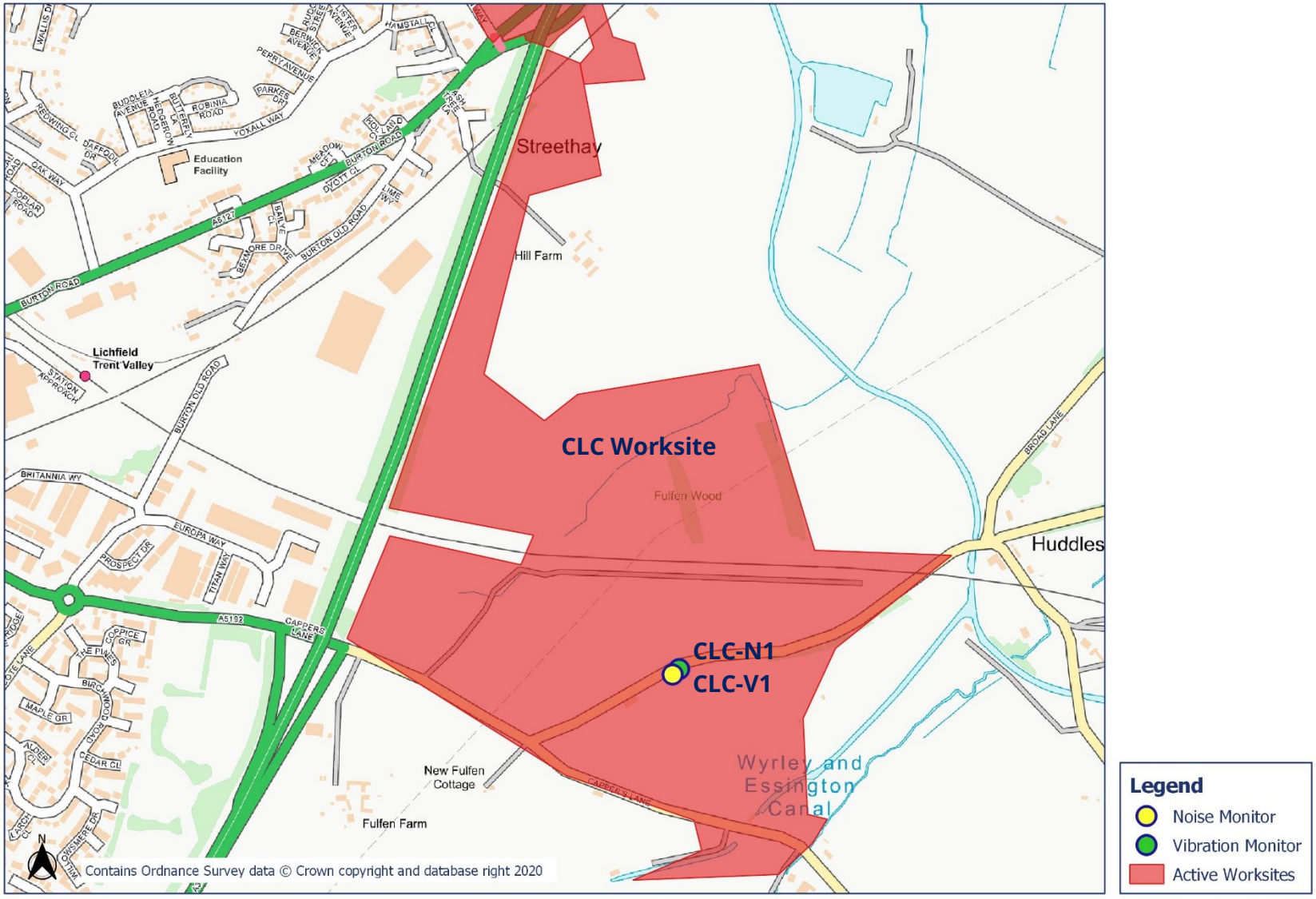


Appendix B Monitoring Locations

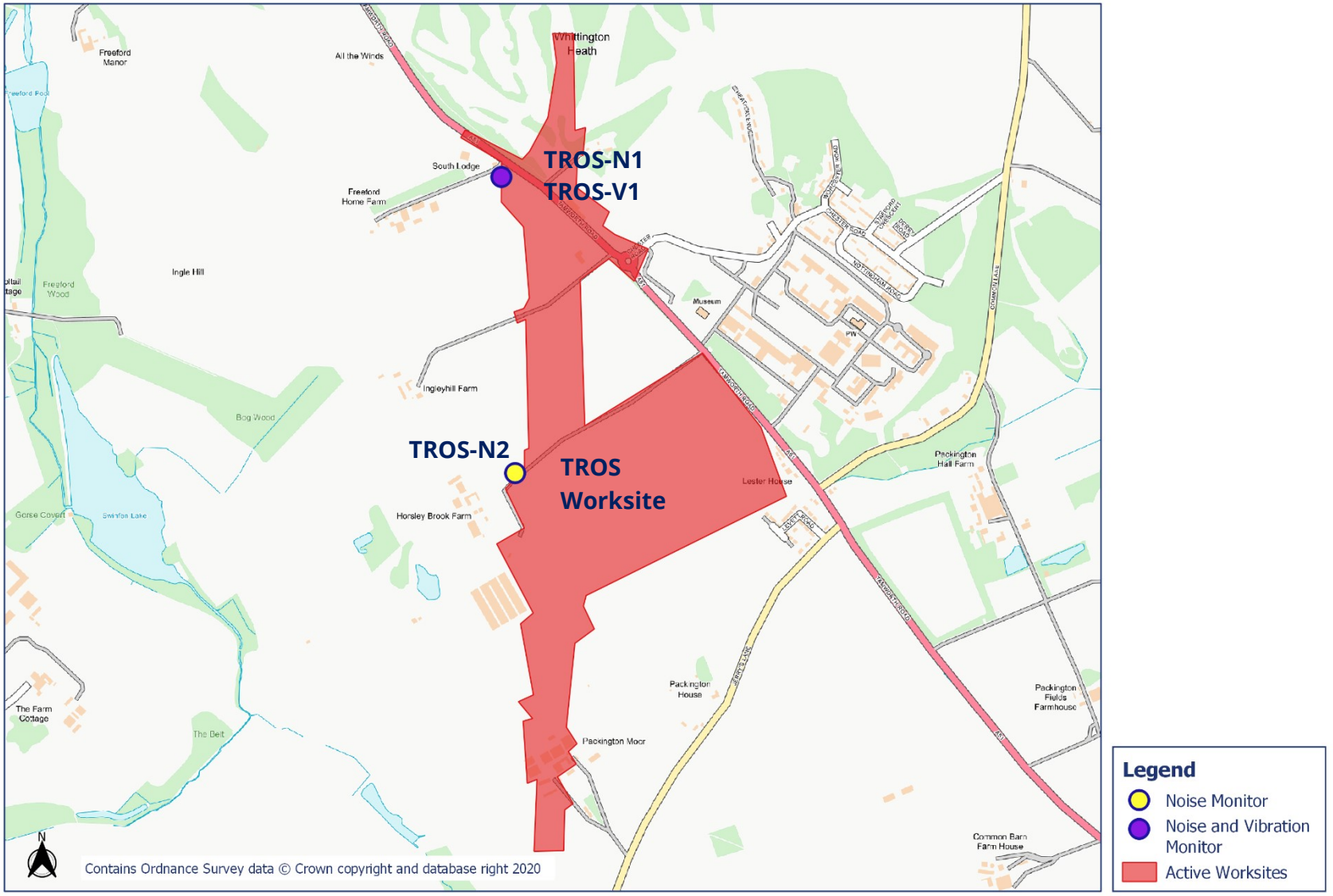
Noise and Vibration Monitoring Plan - 1



HS2 Noise and Vibration Monitoring Plan - 2



Noise and Vibration Monitoring Plan - 3



Appendix C Data

Noise

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

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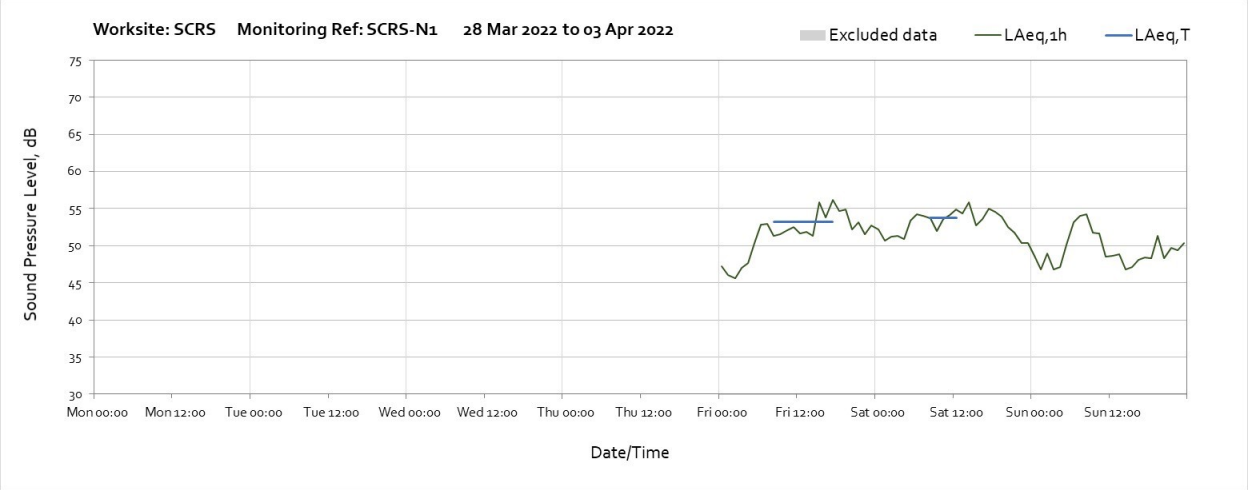


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LAeq,T
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50
45
40
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30
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Mon 12:00
Tue 00:00
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Wed 00:00
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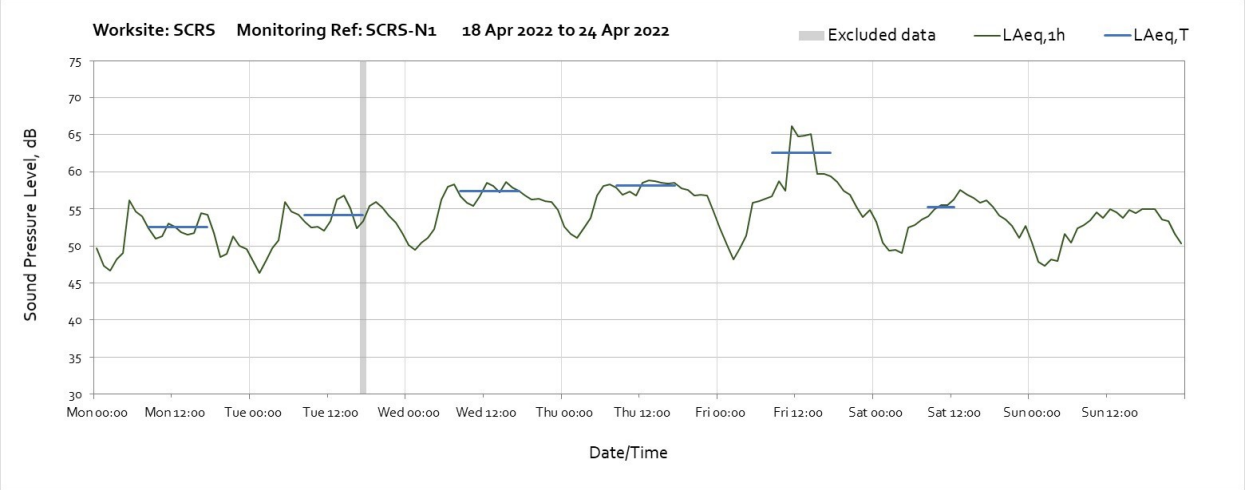
Date/Time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LAeq,T
Sound Pressure Level, dB
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55
50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
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Sat 12:00
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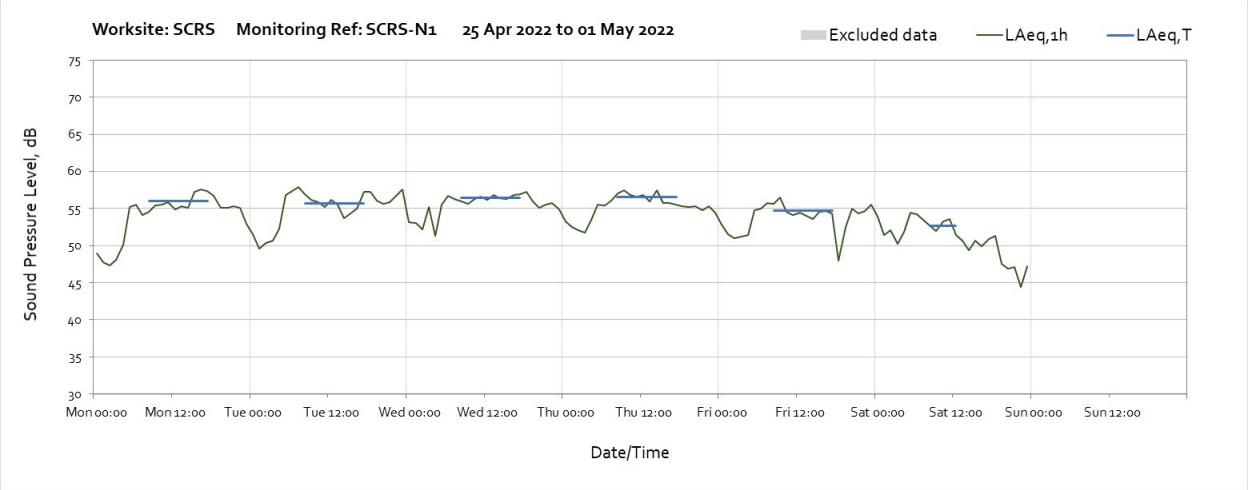
Date/Time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LAeq,T
Sound Pressure Level, dB
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70
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50
45
40
35
30
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
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Fri 12:00
Sat 00:00
Sat 12:00
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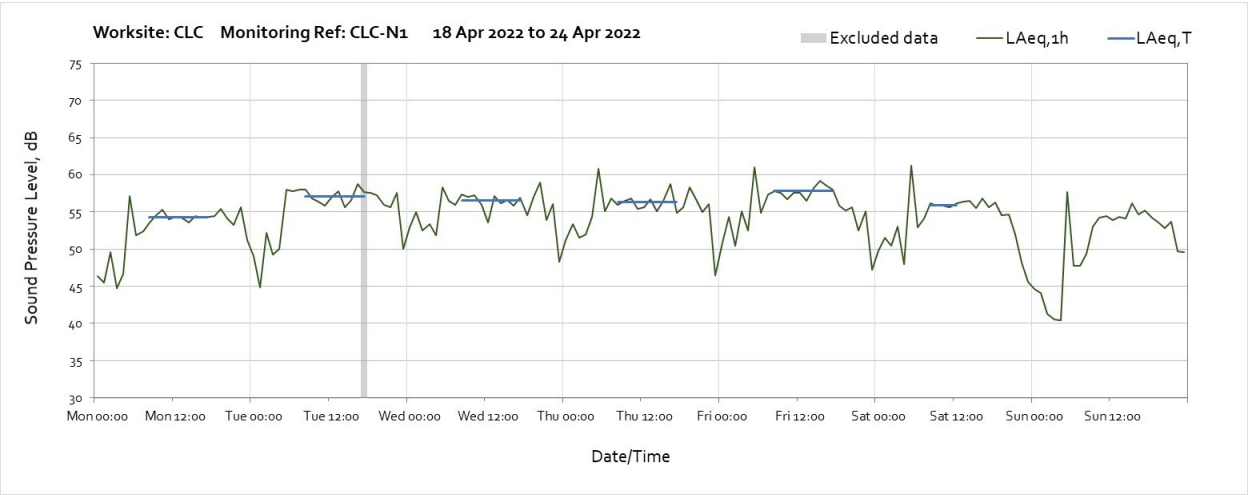
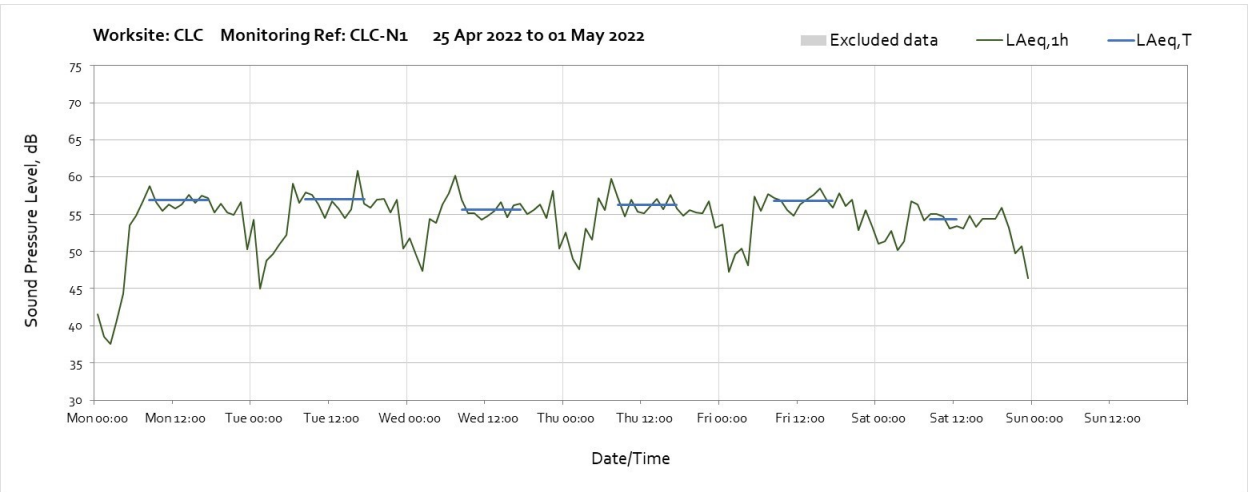
Date/Time

Worksite: CLC – Monitoring Ref: CLC-N1

Note: Missing data from the beginning of the month to 11:00 on 14 April is due to equipment power problems.





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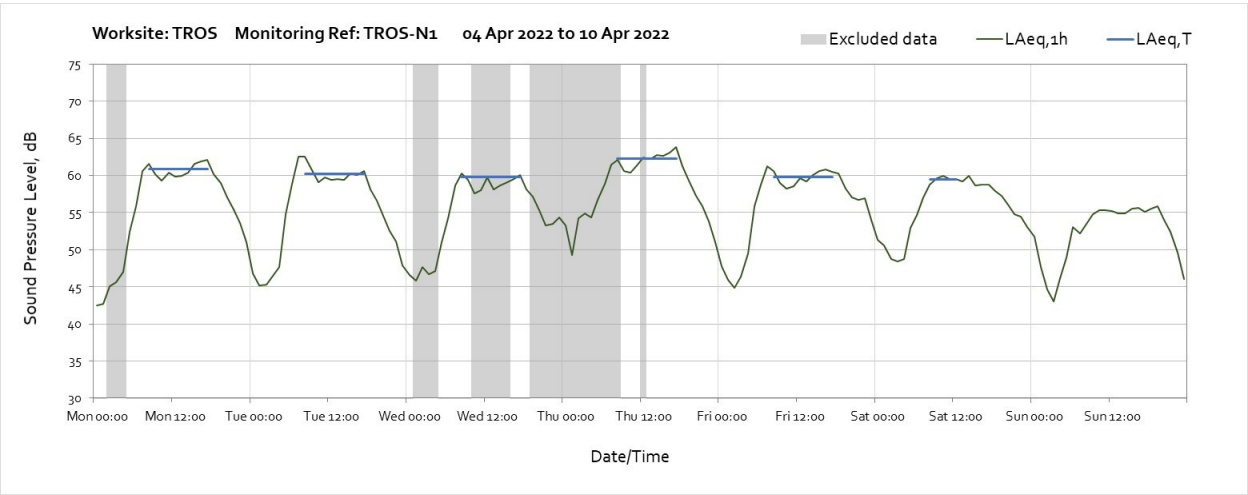

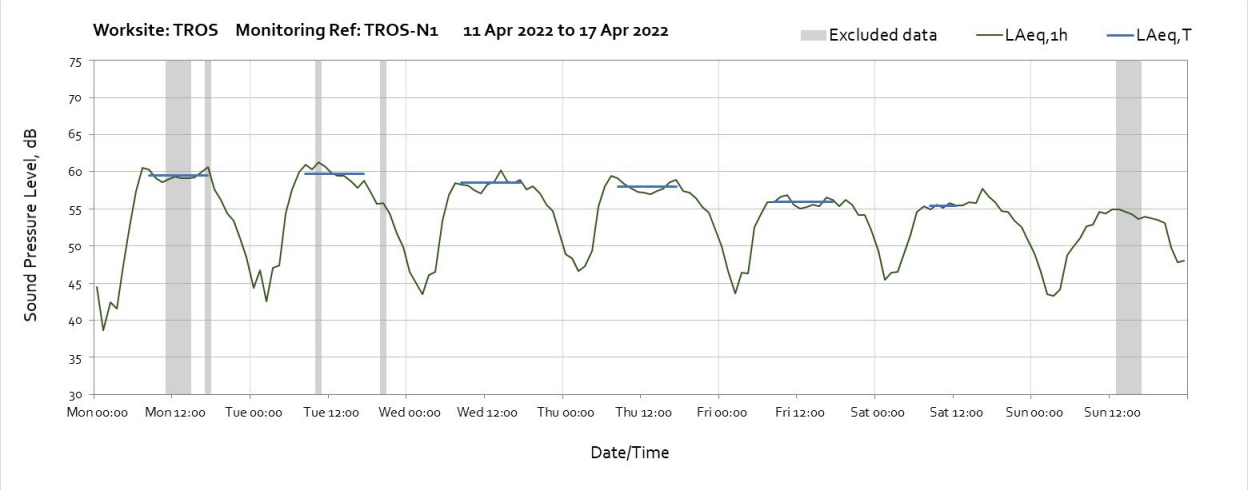
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LAeq,T
Sound Pressure Level, dB
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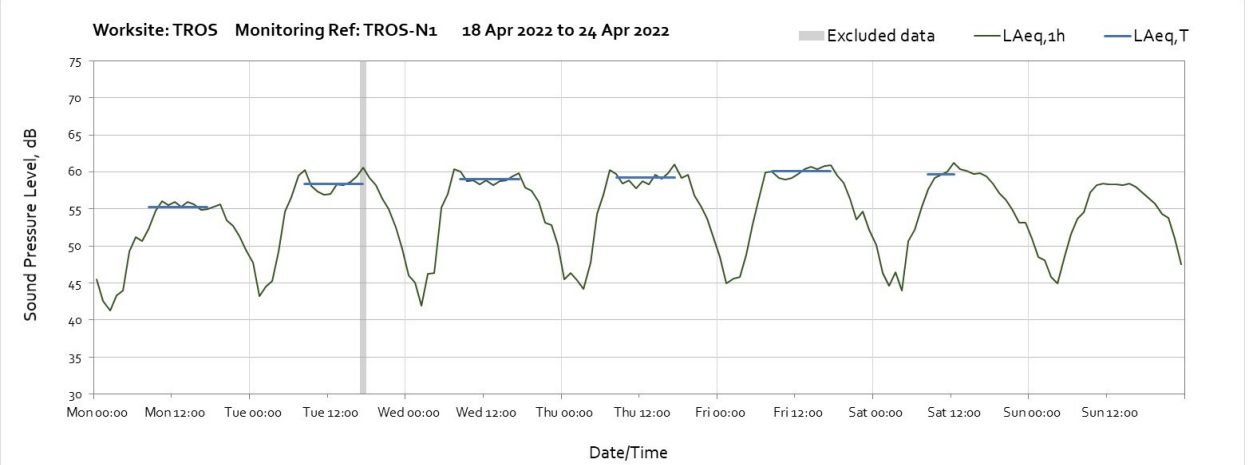
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Sound Pressure Level, dB
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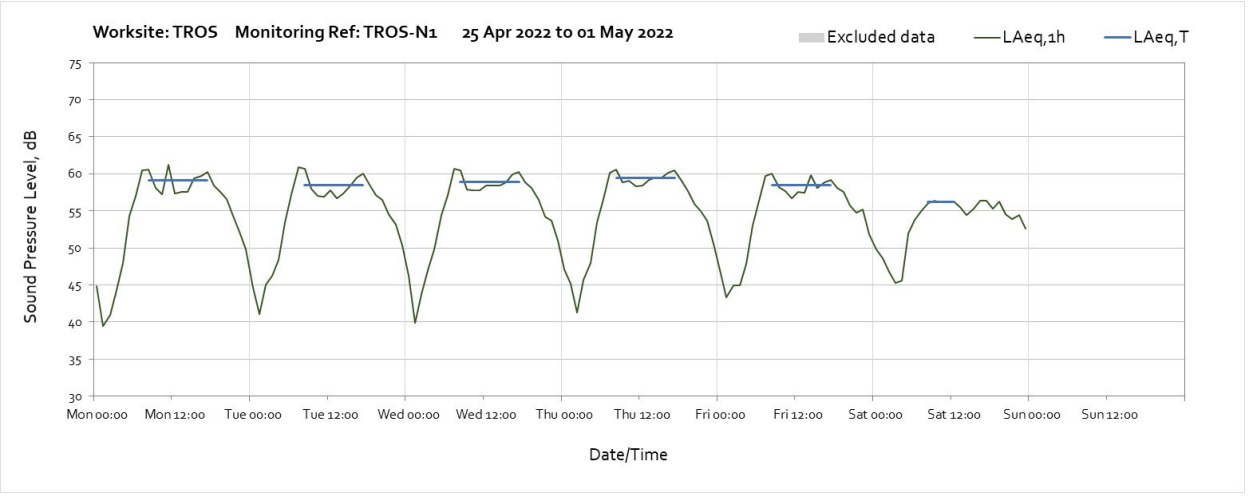
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LAeq,T
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Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
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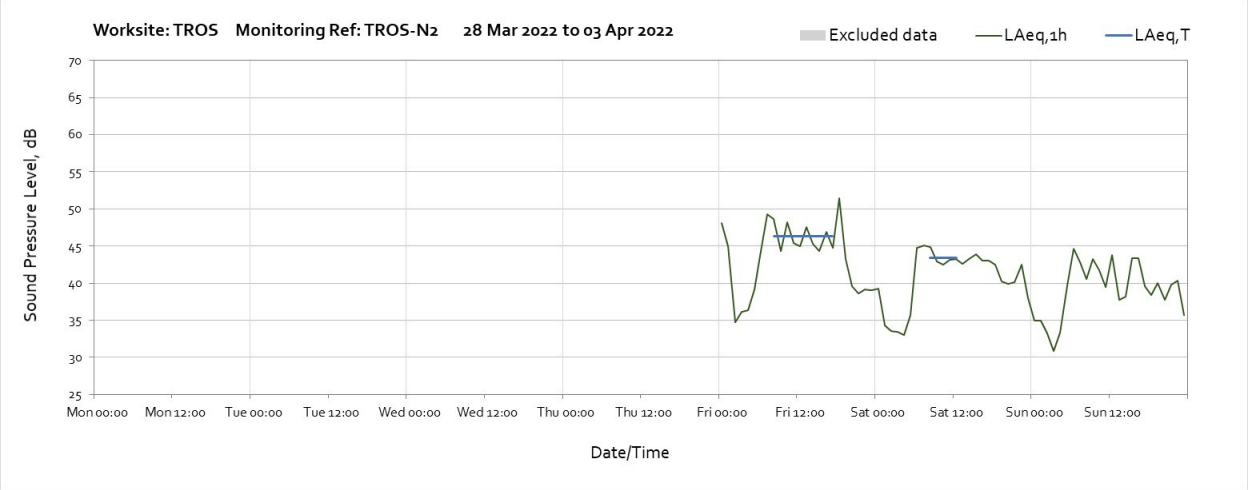
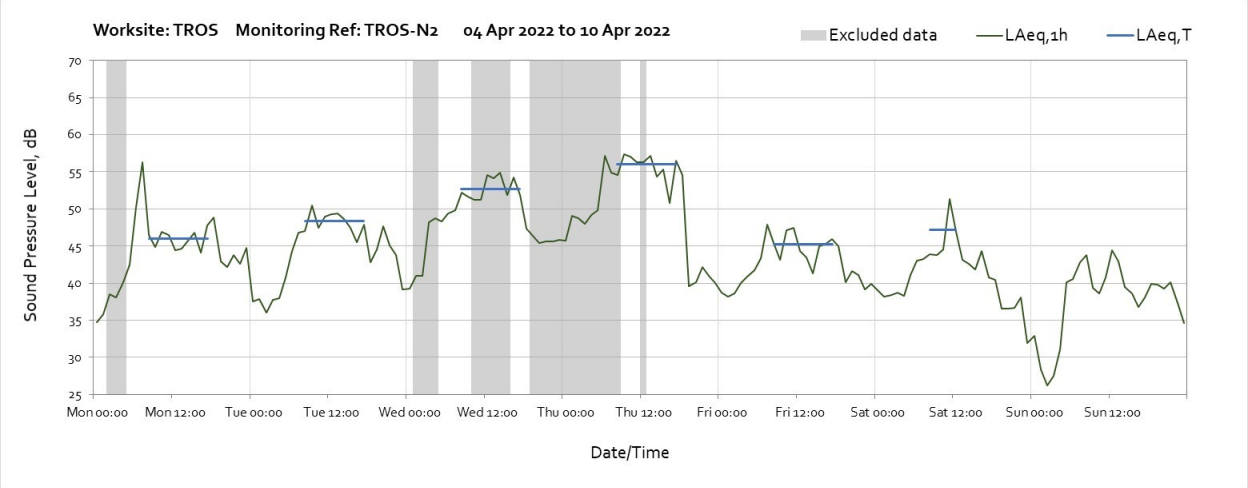
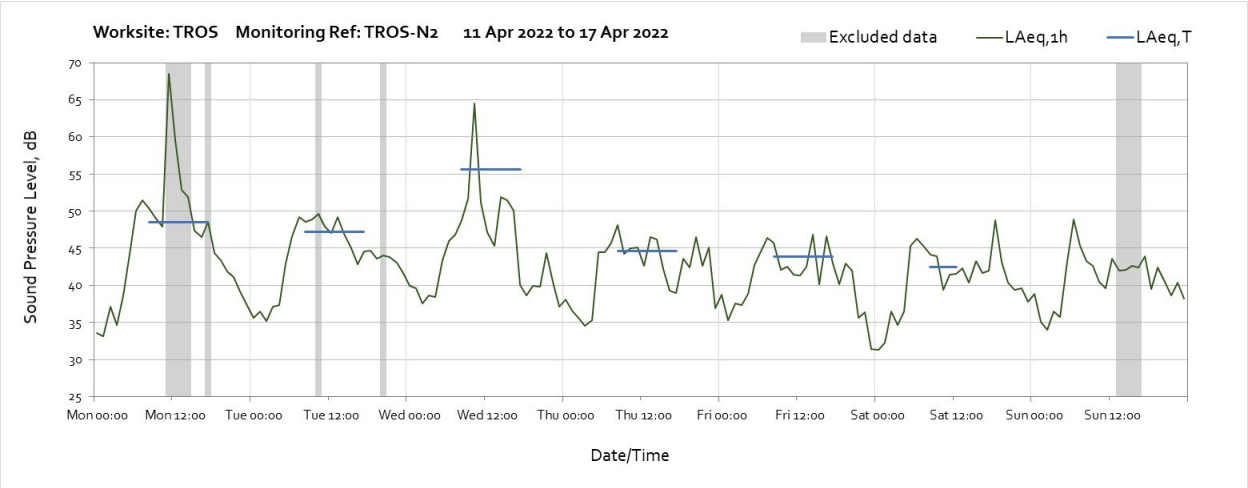
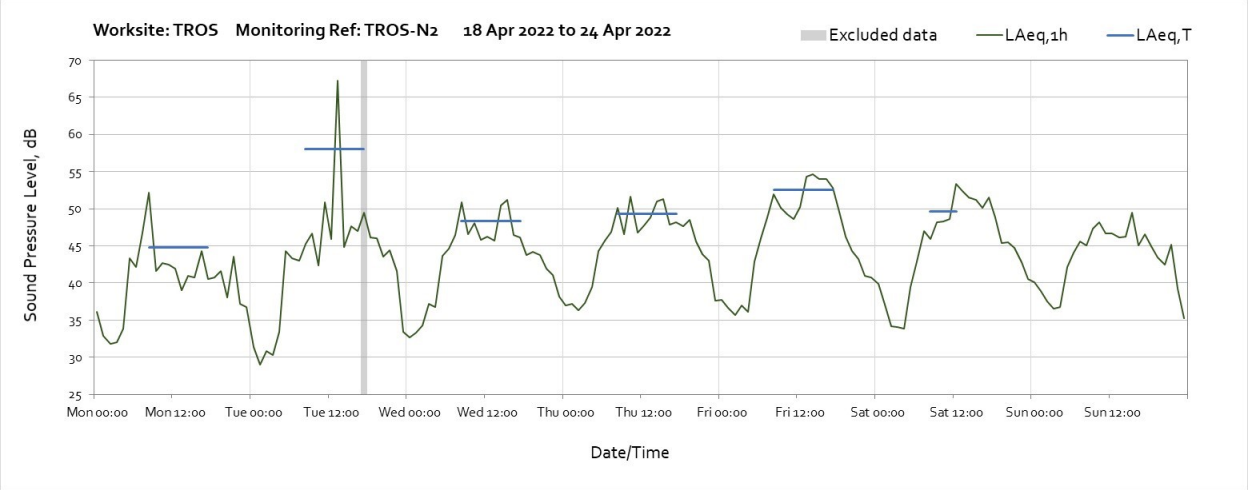
Date/Time

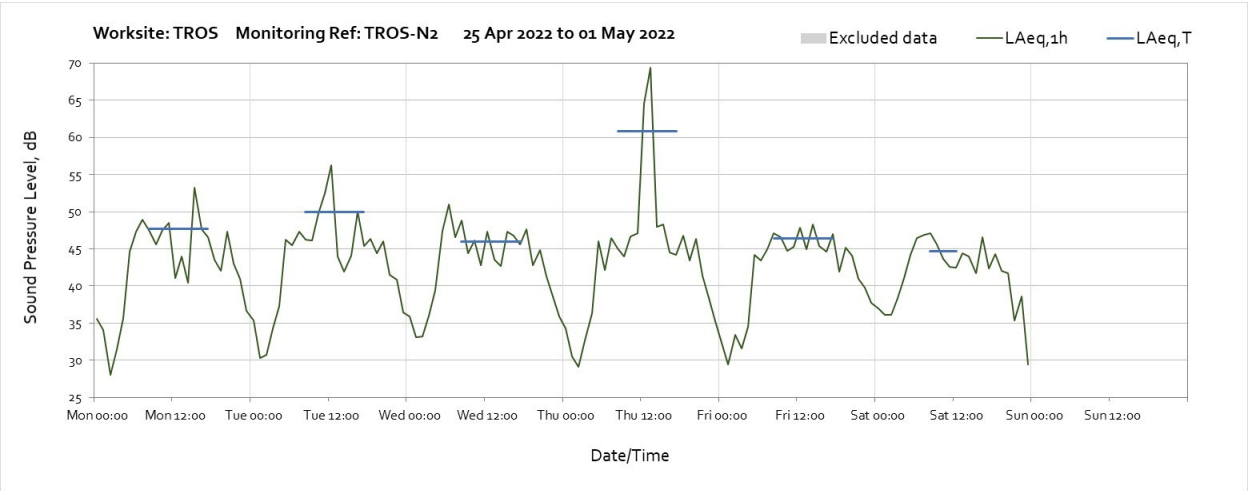
Worksite:TROS – Monitoring Ref: TROS-N2







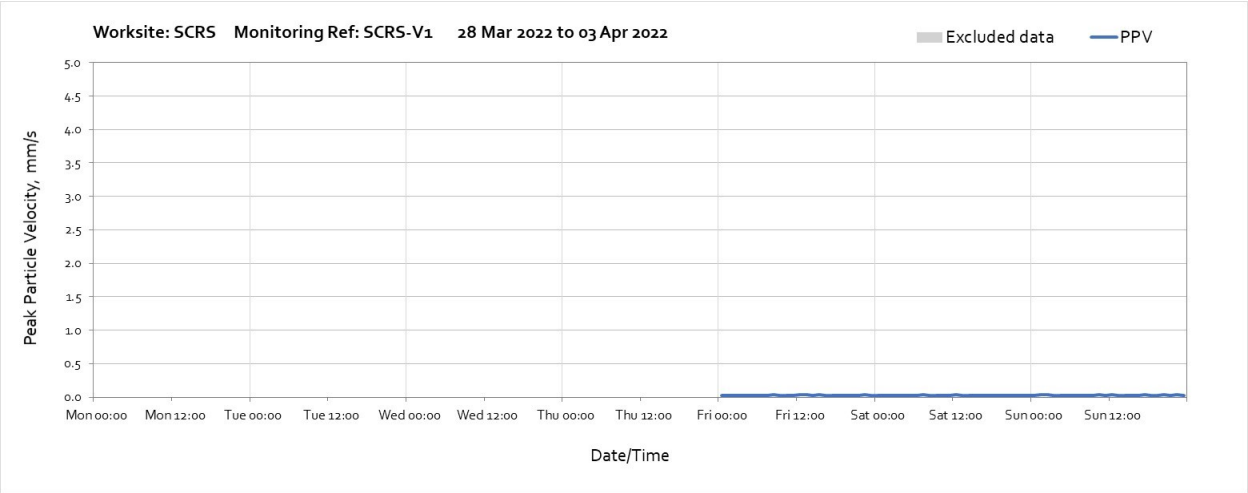

Worksite: TROS Monitoring Ref: TROS-N2 18 Apr 2022 to 24 Apr 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

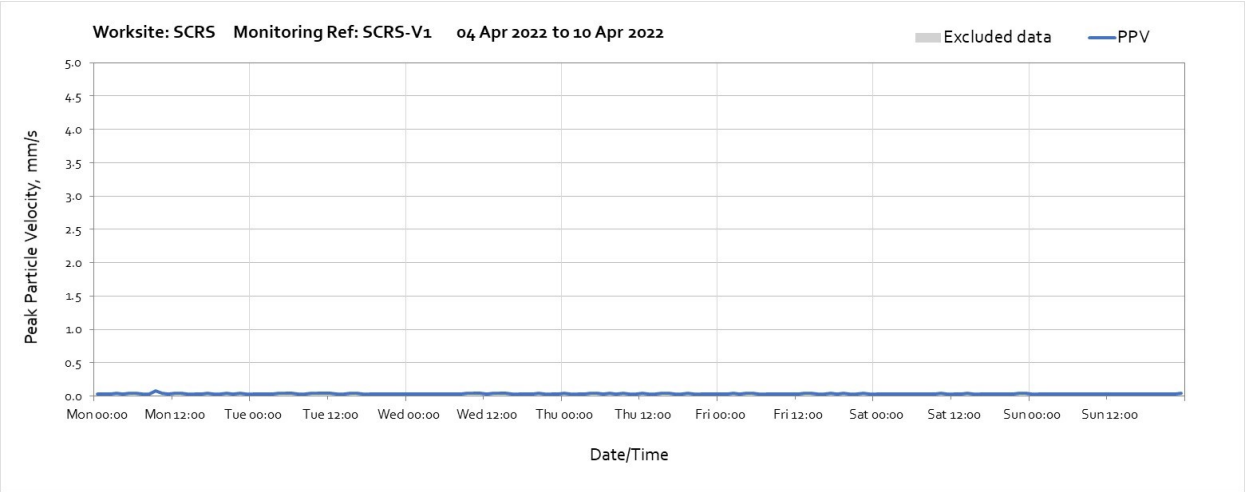

Worksite: TROS Monitoring Ref: TROS-N2 25 Apr 2022 to 01 May 2022
Excluded data
LAeq,1h
LAeq,T
Sound Pressure Level, dB
70
65
60
55
50
45
40
35
30
25
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

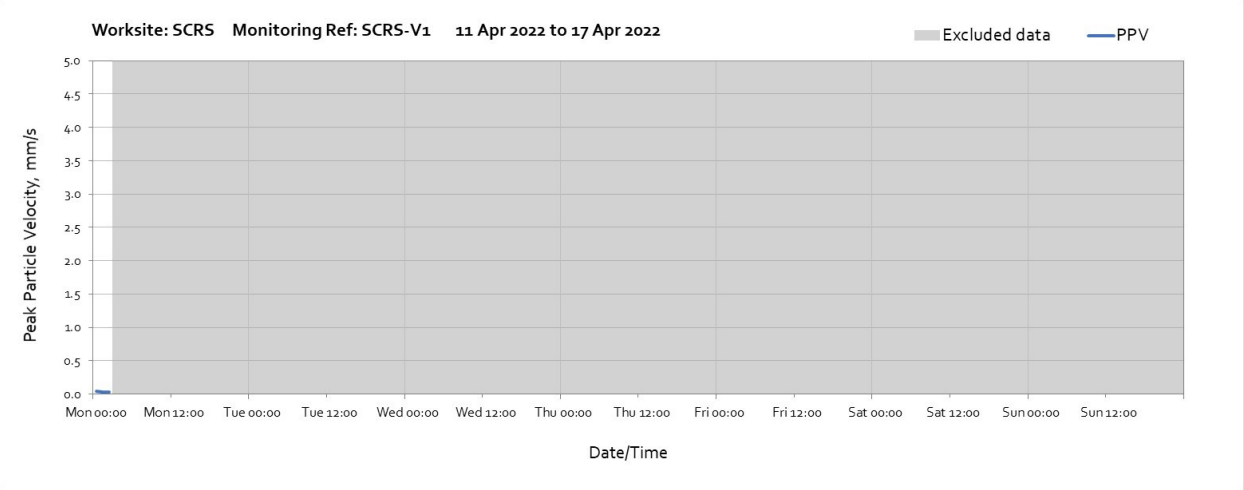
Vibration

The following graphs show the hourly measured peak particle veloDistrict 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: SCRS – Monitoring Ref: SCRS-V1

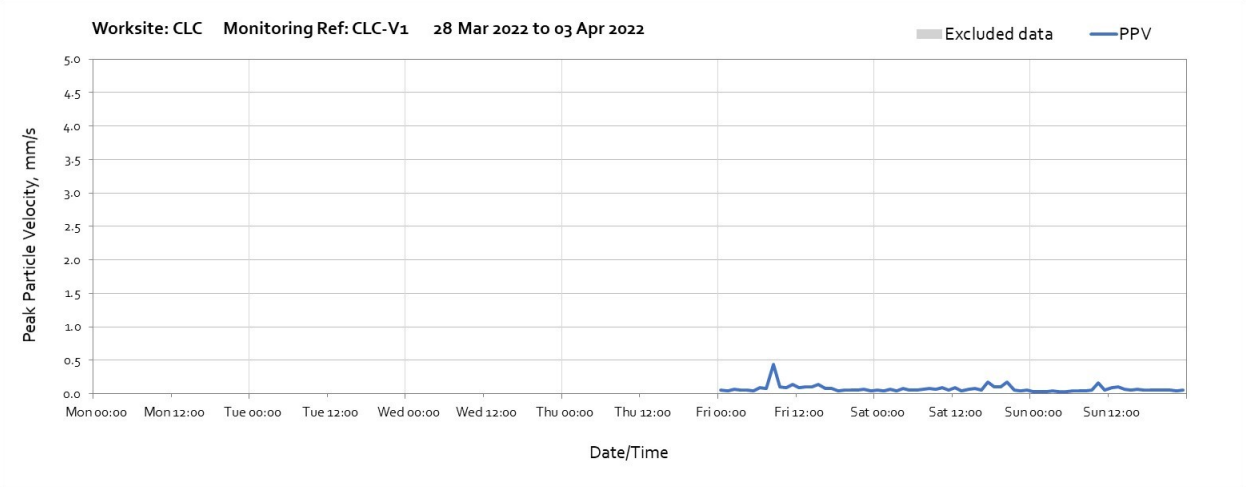


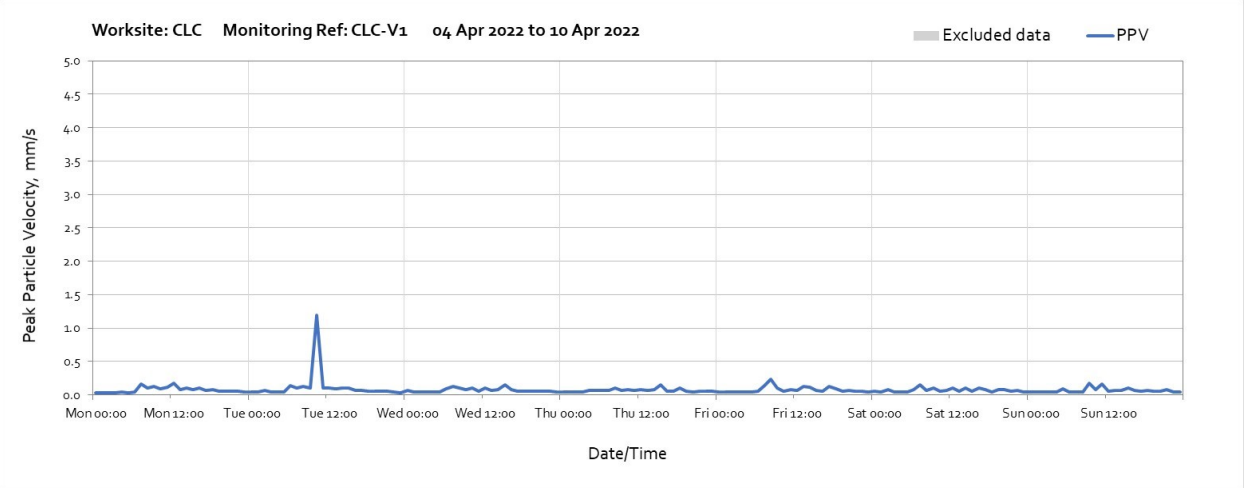


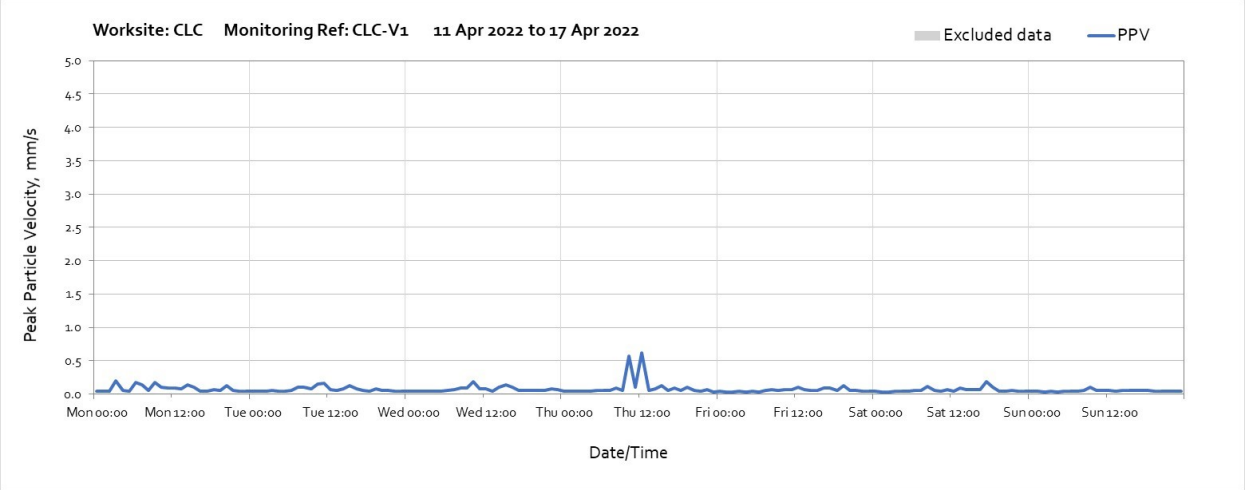


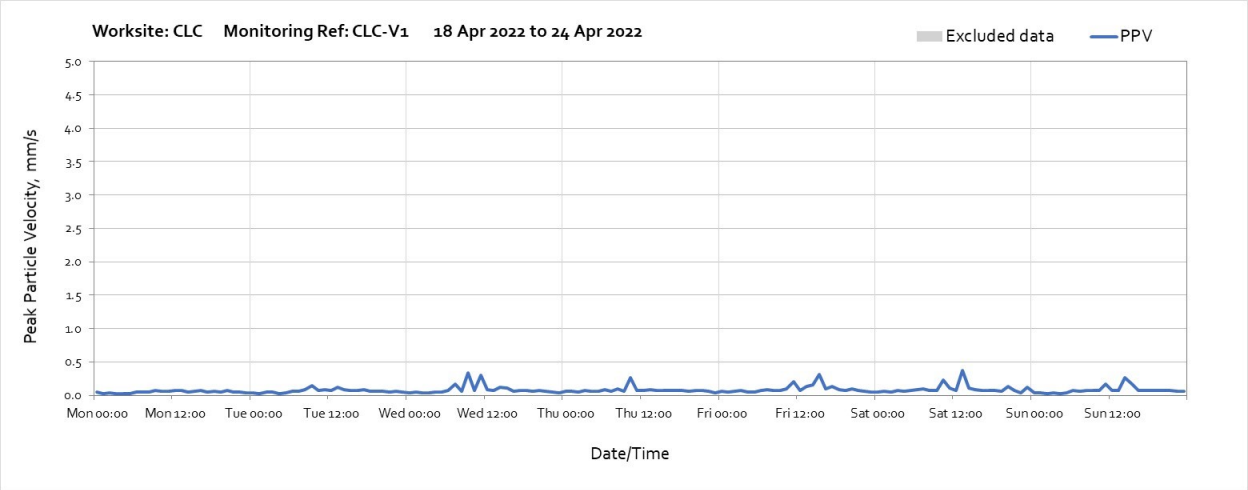
Note: Missing data from 03:00 on 11 April onwards to the end of the end of the month is because of theft of equipment.

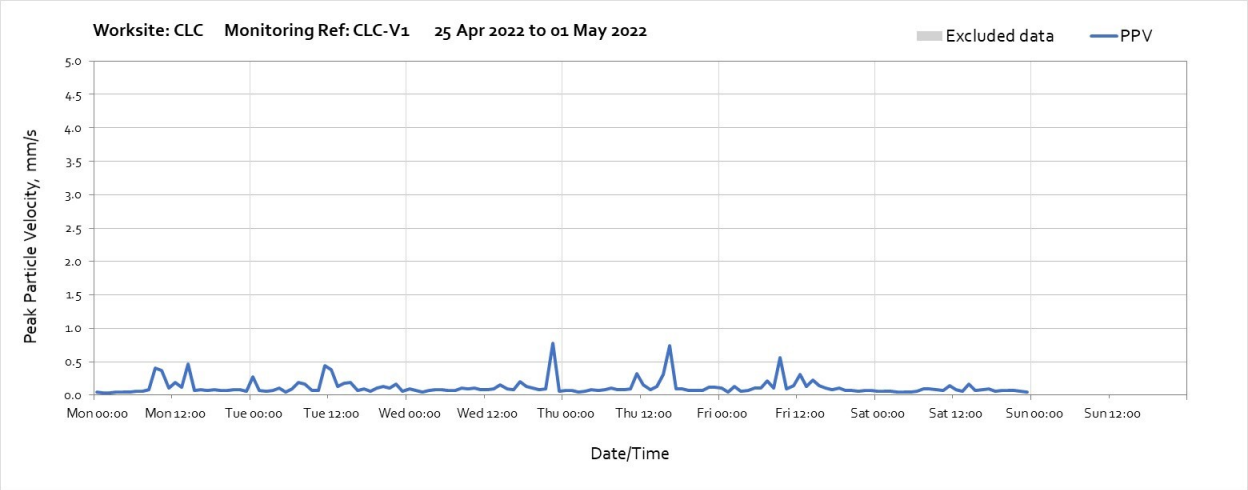
Worksite: CLC – Monitoring Ref: CLC-V1



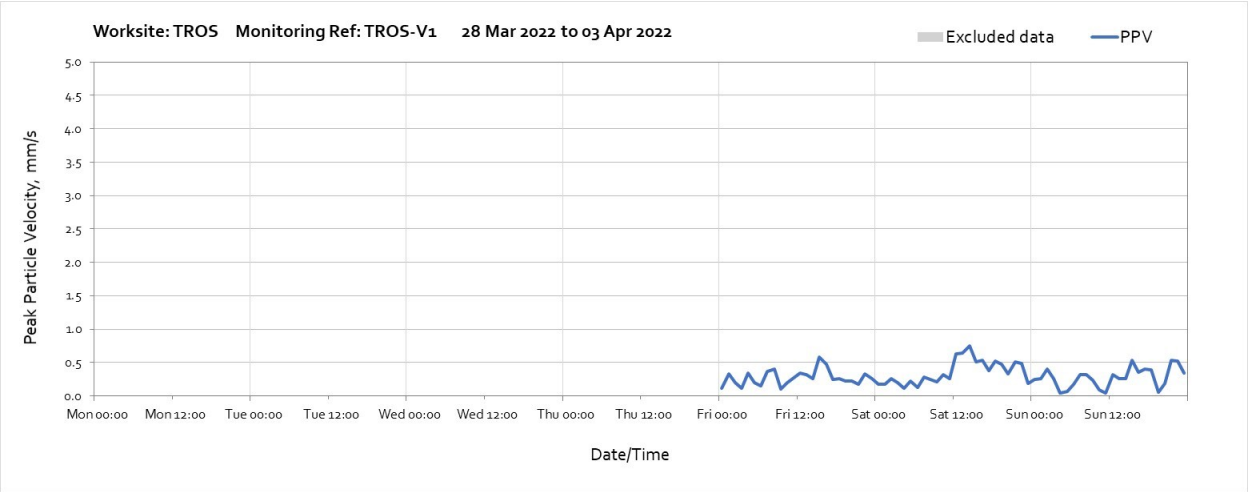


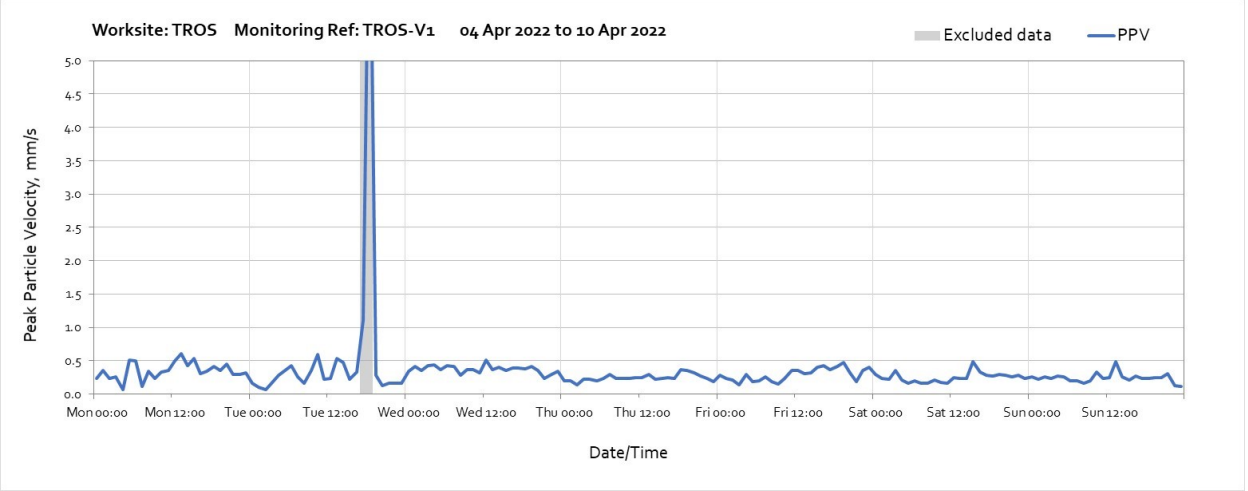

Worksite: CLC Monitoring Ref: CLC-V1 11 Apr 2022 to 17 Apr 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time


Worksite: CLC Monitoring Ref: CLC-V1 18 Apr 2022 to 24 Apr 2022
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

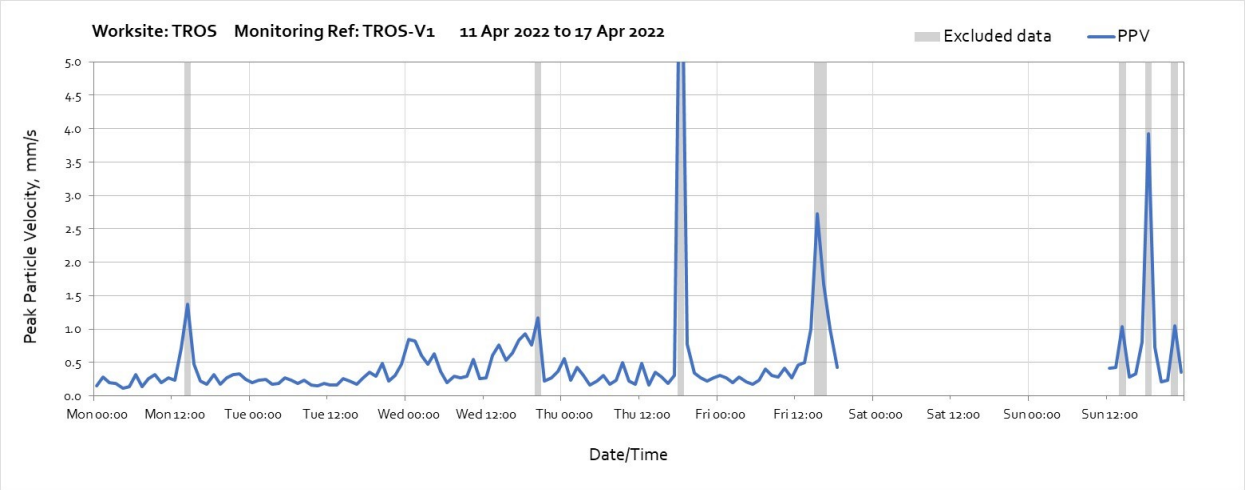

Worksite: CLC Monitoring Ref: CLC-V1 25 Apr 2022 to 01 May 2022
Excluded data
PPV
Peak Particle Velocity, mm/s
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Mon 00:00
Mon 12:00
Tue 00:00
Tue 12:00
Wed 00:00
Wed 12:00
Thu 00:00
Thu 12:00
Fri 00:00
Fri 12:00
Sat 00:00
Sat 12:00
Sun 00:00
Sun 12:00
Date/Time

Worksite: TROS – Monitoring Ref: TROS-V1

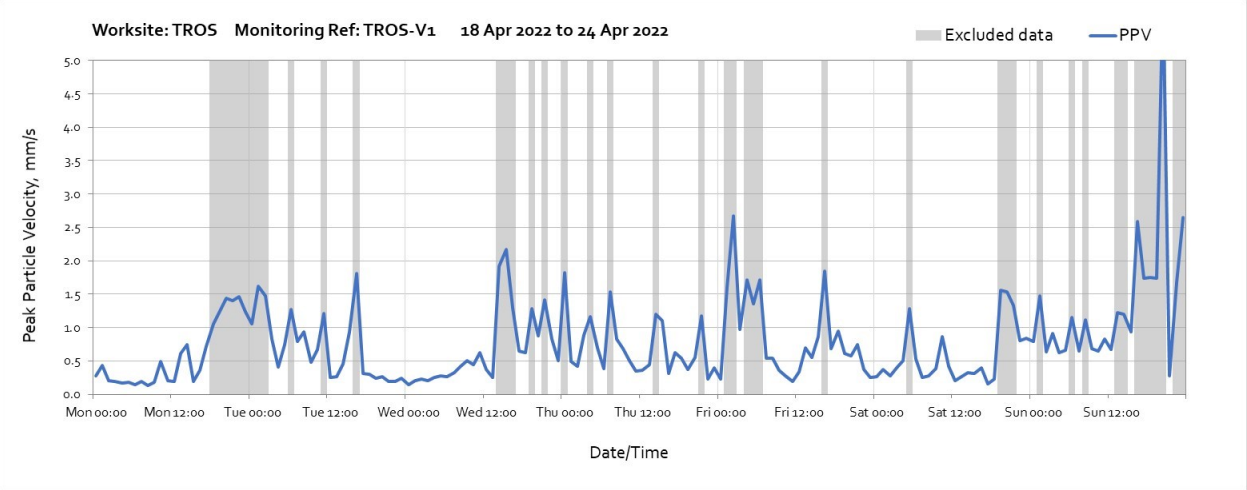




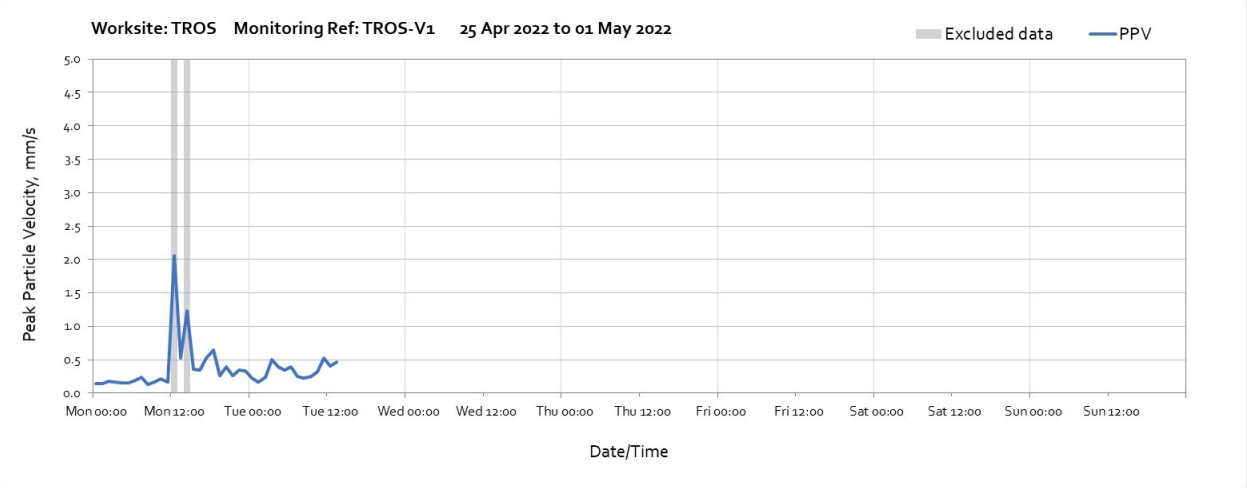
Note: The high PPV values between 17:00 and 19:00 on 5th April are attributed to high mole activity near to the monitor.



Note: High PPV values from 11 April to 17 April are attributed to high mole activity near to the monitor. Missing data between 19:00 on 15 April and 12:00 on 17 April is due to missing samples.



Note: High PPV values from 18 April to 24 April are attributed to high mole activity near to the monitor.



Note: High PPV values on 25 April are attributed to high mole activity near to the monitor. Missing data from 14:00 on 26 April onwards to the end of the end of the month is because the meter was decommissioned.