HS2

March 2020

Construction noise and vibration Monthly Report – January 2020

London Borough of Hillingdon

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 the London Borough of Hillingdon (LBH) during the month of January 2020.

This report presents data from noise monitor installations in the vicinity of the LTP#2 worksite located south of Dews Farm, the West Ruislip Portal worksite and the West Ruislip Northolt Corridor worksite. During the monitoring period site activities at the LTP#2 worksite included ground works, construction and testing of the platform and installation of a temporary water pipe. Activities at the West Ruislip Portal worksite included site set-up. Works at the West Ruislip worksite included installation of cable/walkway system, concrete troughing, completion of trail holes, ground works, installation of under track crossing, installation of trail sleepers, installation of rail location case/cabinet bases, ballast profiling, excavation of points heating control cubicle base and construction of shutters for PHCC base.

Further works were undertaken at the Ruislip Golf Course, including excavation and installation of ducts.

Noise levels measured near the West Ruislip worksite were above guideline criteria for significant adverse effects on a number of night-time periods due to HS2 related works. The night-time works were required in order to progress construction of the civils assets and realign tracks within the siding. There were no exceedances of Section 61 trigger levels. One complaint regarding night-time noise was reported to HS2 for the LBH region during the January monitoring period.

Abbreviations and descriptions

The abbreviations, descriptions and project terminology used within this report can be found in the Project Dictionary (HS2-HS2-PM-GDE-000-000002).

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 $L_{pAeq,T}$	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.
Façade	A facade noise level is the noise level 1m in front of a large reflecting surface. The effect of reflection, is to produce a slightly higher (typically +2.5 to +3 dB) sound level than it would be if the reflecting surface was not there.
Free-field	A free-field noise level is the noise level measured at a location where no reflective surfaces, other than the ground, lies within 3.5 metres of the microphone position.
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.
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.
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.
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 The nominated undertaker 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.

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 Hillingdon (LBH) for the period 1st to 31st January 2019.

1.1.2 Active construction sites potentially contributing to noise in the local authority area during this period include:

- LPT#2 worksite, where topsoil stripping, subsoil stabilisation, construction and testing of the platform and installation of a temporary water pipe was undertaken;

- West Ruislip Portal worksite, where site set-up was underway, including installation of hoarding and fencing, site security and aggregate deliveries via freight train.

- West Ruislip Northolt Corridor worksite, where deliveries, installation of cable/walkway system and concrete troughing, completion of trail holes, installation of hand rail bases, ground excavations, removal of lighting column, installation of under track crossing, skim digging and slue of existing track, installation of trail sleepers, signal testing, installation of rail location case/cabinet bases, ballast profiling, excavation of points heating control cubicle (PHCC) base and construction of shutters for PHCC base was undertaken.

Further works were undertaken at the Ruislip Golf Course, including excavation and installation of ducts.

1.1.3 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 Noise monitoring was undertaken adjacent to the load test pile (LTP#2) worksite, at the boundary to the worksite (ref: NMP1) and at the Hillingdon Outdoor Activities Centre (HOAC) (Ref: NMP2), and at two locations adjacent to the West Ruislip worksite located on the opposite side of the tracks, installed on a concrete post at about 80m northwest of the Ickenham road (ref: NMP3) and installed at a buffer stop at about 370m northwest of the Ickenham road (ref: NMP4).

1.2.2 Table 2 presents the position of the noise monitoring installation within the LBH area in January 2020. A map showing the position of the noise monitoring installation is presented in Appendix B.

Table 2: Monitoring locations

Worksite Reference	Measurement Reference	Address
LTP #2	NMP1	Hillingdon Outdoor Activity Centre (HOAC), Dews Lane, Harefield, Uxbridge
	NMP2	LTP #2 Worksite, Harvil Road, Harefield, Uxbridge
West Ruislip Porta/Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post
	NMP4	Down sidings, opposite worksite. Buffer stop

2 Summary of results

2.1 Exceedances LOAEL of SOAEL

2.1.1 The lowest observed adverse effect level (LOAEL) is defined in the Planning Practice Guidance – Noise 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".

2.1.2 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."

2.1.3 Table 3 presents a summary of recorded exceedances of the LOAEL and SOAEL due to HS2 related construction noise at each measurement location over the reporting period, including the number of exceedances during each time period.

Table 3: 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
LTP #2	NMP1	HOAC	All days	All periods	No exceedance	No exceedance
	NMP2	LTP #2 Worksite, Harvil Road, Harefield, Uxbridge	All days	All periods	No exceedance	No exceedance
West Ruislip Portal/Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	Weekday	0800-1800	10	No exceedance
			Sunday	0700-2200	5	3
			All days	Night	17	10
	NMP4	Down sidings, opposite worksite. Buffer stop	Weekday	0800-1800	15	No exceedance
			Sunday	0700-2200	1	1
			All days	Night	13	5

2.1.4 Exceedances of SOAEL occurred during overnight shifts works, at monitor NMP3 in proximity to the Ickenham Road bridge where the civils activities were being undertaken. Multiple machines were on site during the overnight hours of the 52hr possession between 17th and 20th of January to progress construction of the civils assets and realign track within the siding.

2.1.5 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 4 and may be lower than the total sum of individual exceedances reported in Table 3 for each location.

Table 4: Summary of total exceedances of SOAEL

Worksite Reference	Measurement Reference	Monitor Address	Total of SOAEL exceedances in the month
West Ruislip Portal/Northolt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	3
	NMP4	Down sidings, opposite worksite. Buffer stop	3

2.2 Summary of measured noise levels

2.2.1 Table 5 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.

2.2.2 Appendix C presents graphs of the noise monitoring data over the month for the measurement location. Data presented includes 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). 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.

2.2.3 Ambient noise levels for the NMP1 in the locality of HOAC are dominated by noise emanating from the activity centre and the use of the car park. Ambient noise levels for the NMP2 in the locality of LTP2 are dominated by noise emanating from local road traffic on Harvil Road to the east. Ambient noise levels for monitoring locations NMP3 and NMP4 adjacent to West Ruislip were dominated by road traffic from Ickenham Road bridge, there were also contribution from trains pass-bys and London Underground trains departing the nearby West Ruislip Station into the early hours.

Table 5: Summary of measured dB L_{Aeq} data over the monitoring period

Worksite Reference	Measurement Reference	Monitor 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
LTP #2	NMP1	HOAC	Free-field	55.5 (60.9)	62.0 (71.9)	53.5 (56.5)	51.8 (60.7)	47.8 (56.5)	53.8 (54.6)	55.0 (58.0)	51.8 (55.3)	49.8 (52.8)	46.2 (49.5)	50.7 (55.6)	48.1 (55.2)
	NMP2	LTP #2 Worksite, Harvil Road, Harefield, Uxbridge	Free-field	56.1 (59.6)	56.8 (61.6)	53.1 (57.3)	52.1 (60.0)	48.3 (57.4)	54.7 (56.8)	55.4 (57.6)	53.0 (56.8)	51.1 (54.6)	47.6 (58.4)	53.1 (59.5)	49.4 (56.5)
West Ruislip Portal/North olt Corridor	NMP3	Down sidings, opposite worksite. Concrete post	Free-field	66.9 (68.0)	71.2 (72.1)	72.2 (73.5)	71.5 (73.8)	65.2 (69.8)	64.8 (65.8)	68.0 (70.6)	67.1 (69.8)	67.5 (71.1)	66.5 (71.5)	68.0 (72.1)	61.5 (69.0)
	NMP4	Down sidings, opposite worksite. Buffer stop	Free-field	66.2 (70.6)	71.0 (73.3)	71.8 (74.3)	71.5 (74.5)	64.6 (74.5)	61.2 (62.7)	67.2 (70.1)	60.3 (68.4)	61.4 (70.9)	61.4 (68.4)	64.7 (71.6)	61.0 (68.3)

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
-	-	-	-	-	-

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

2.4 Complaints

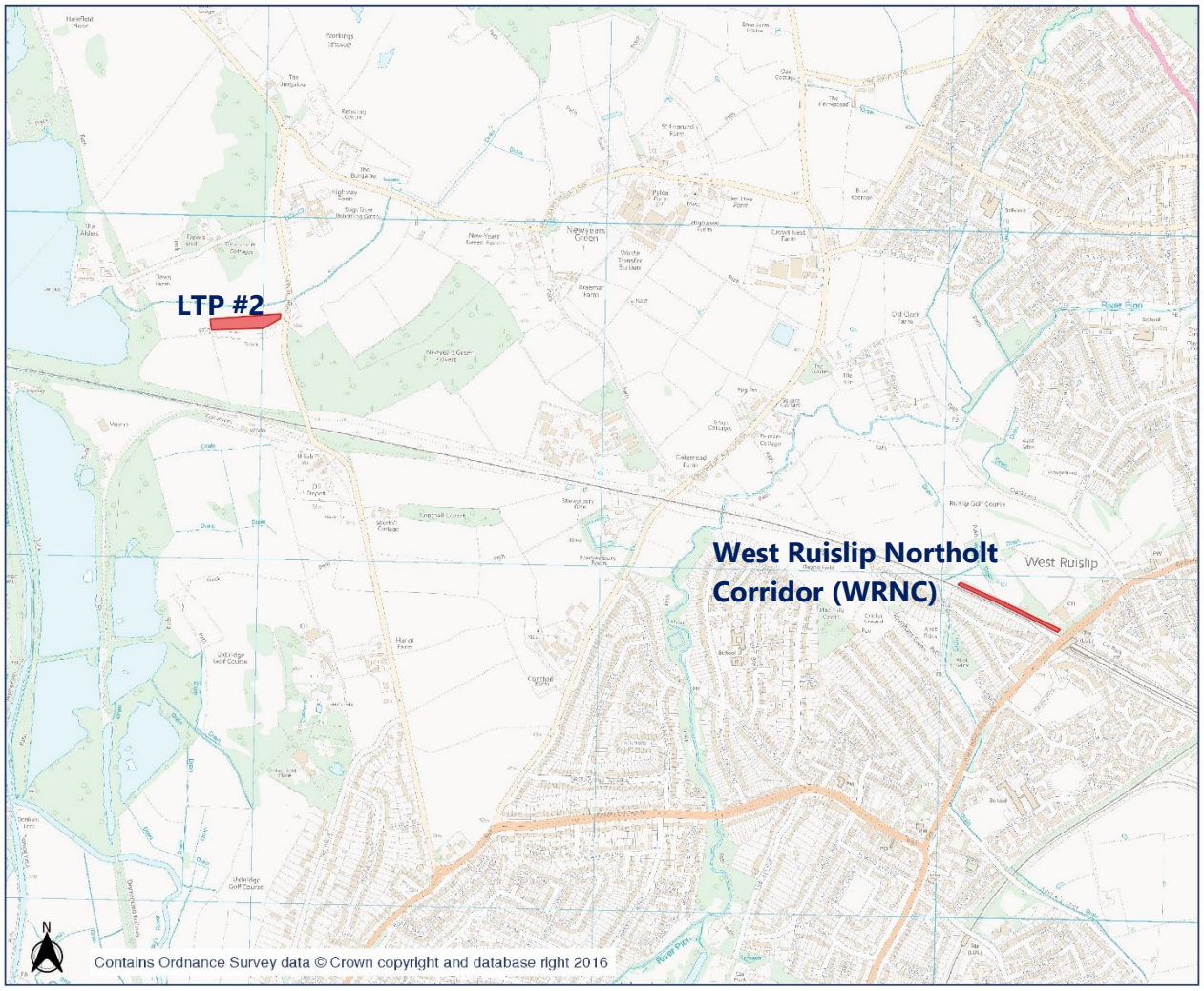
2.4.1 Table 7 provides a summary of complaint information related to noise and vibration received during the reporting period, along with the findings of any investigation.

Table 7: Summary of complaints

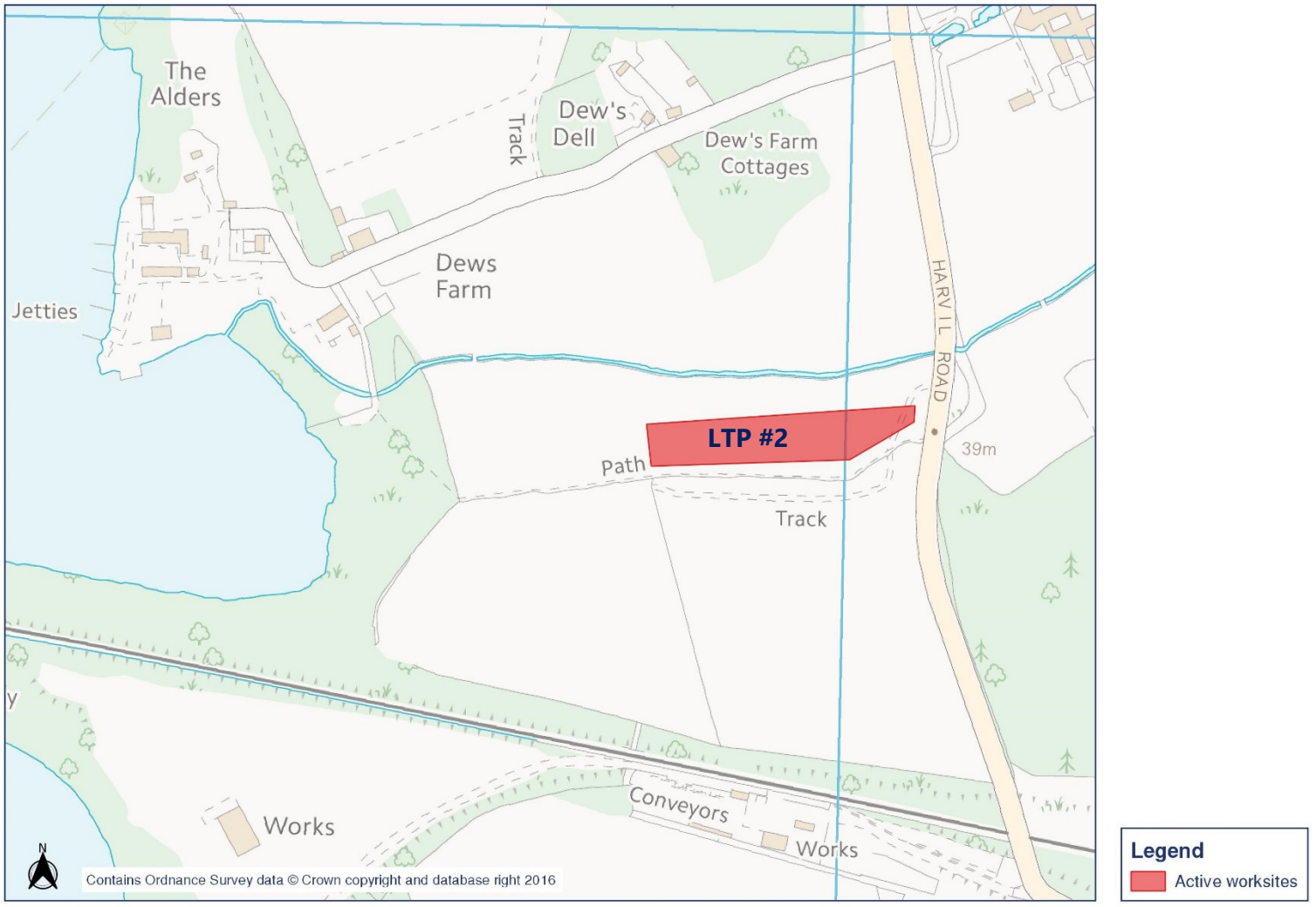
Complaint Reference Number	Worksite Reference	Description of Complaint	Results of Investigation	Actions Taken
HS2-20-14385-E	West Ruislip Northolt Corridor	Enquiry regarding noise and light disruptions caused by HS2 construction works. The stakeholder has expressed interest in receiving compensation for the disruption.	The SOAEL was exceeded, however all works were undertaken in accordance with the Section 61 agreement, with no trigger alerts received from the monitors.	Staff was briefed to ensure noise is kept to a minimum. A response was provided to the complainant.

Appendix A Site Locations

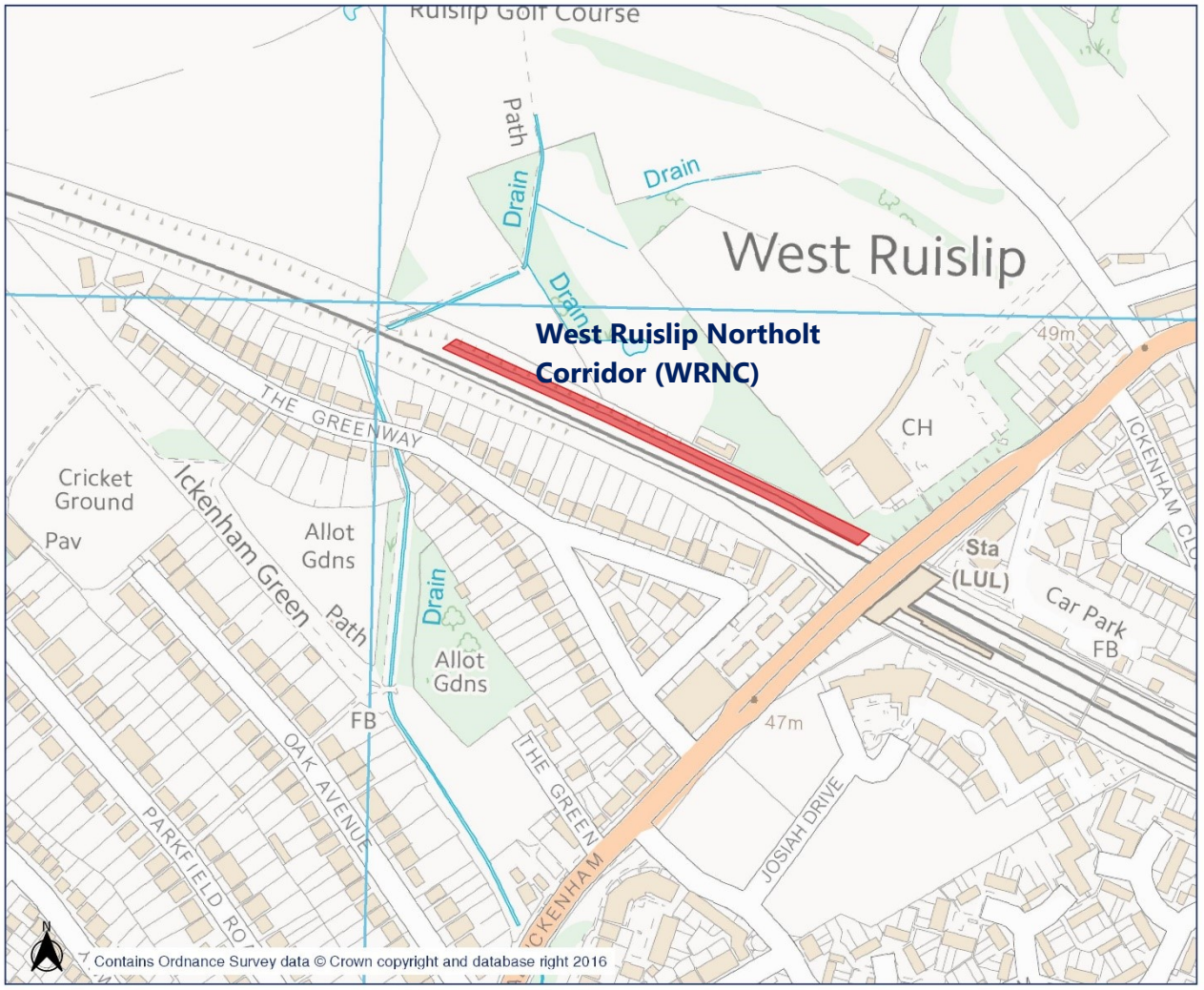
Worksite identification plan - 1



Worksite identification plan - 2

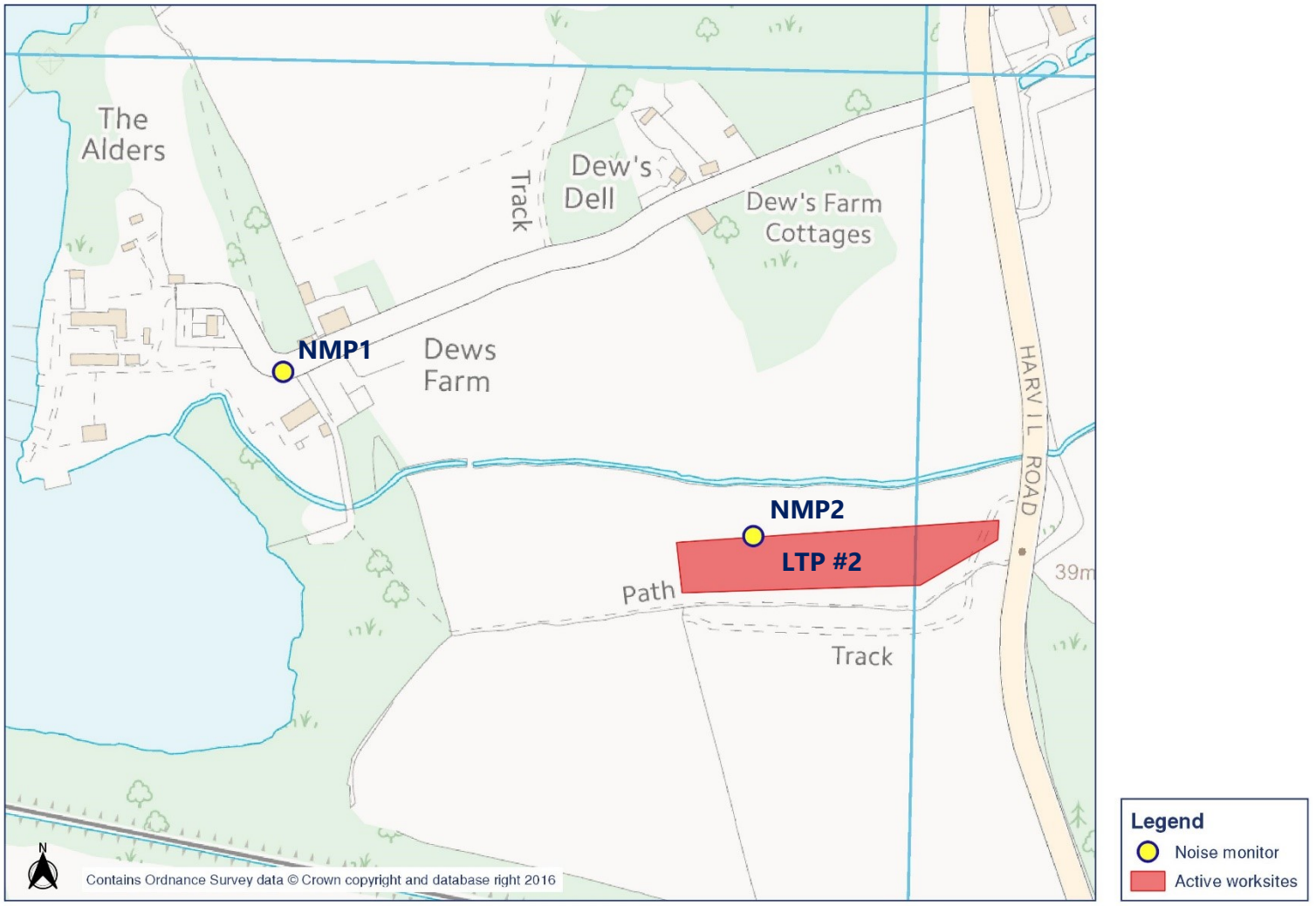


Worksite identification plan - 3



Appendix B Monitoring Locations

Noise monitoring plan - 1



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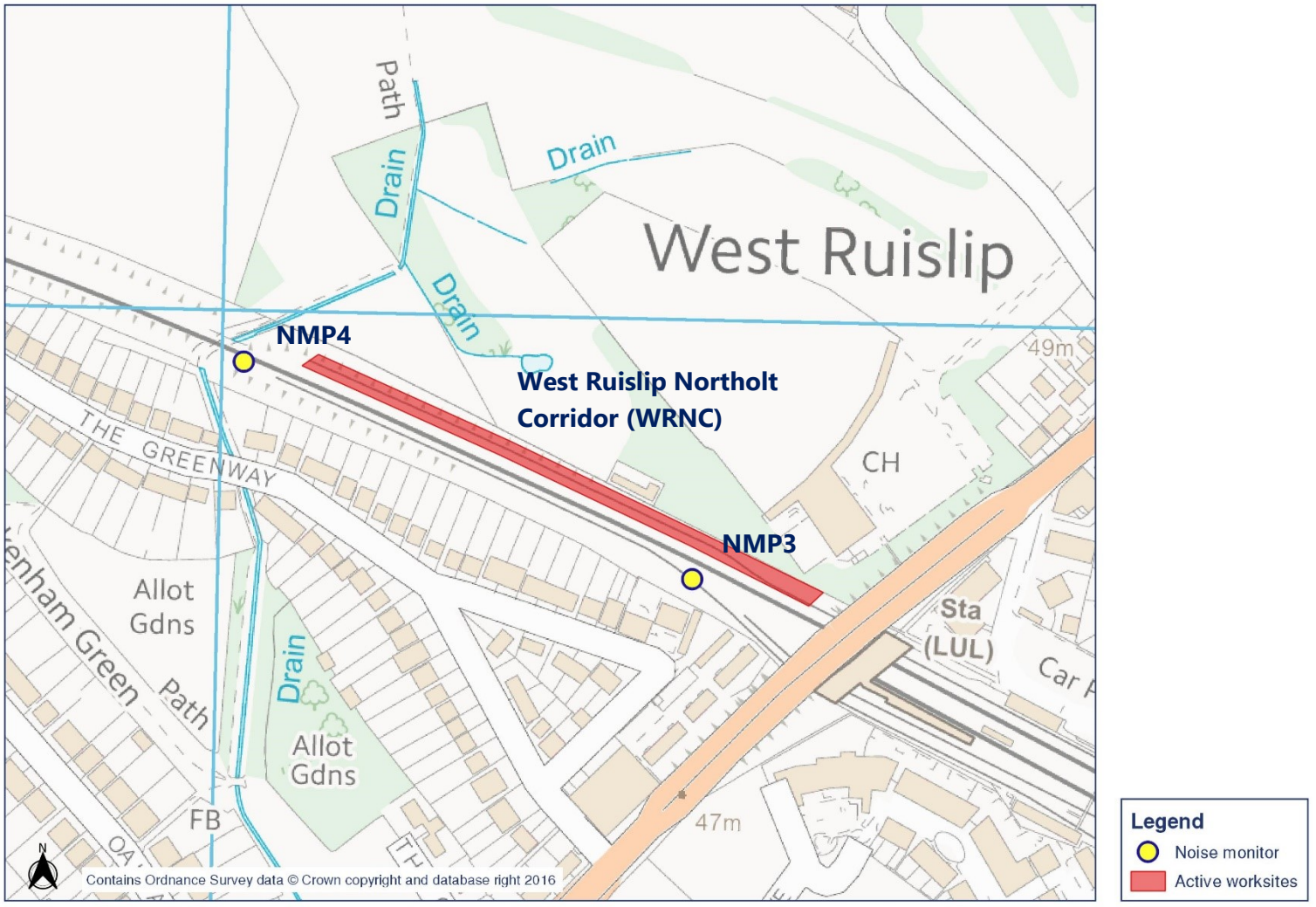
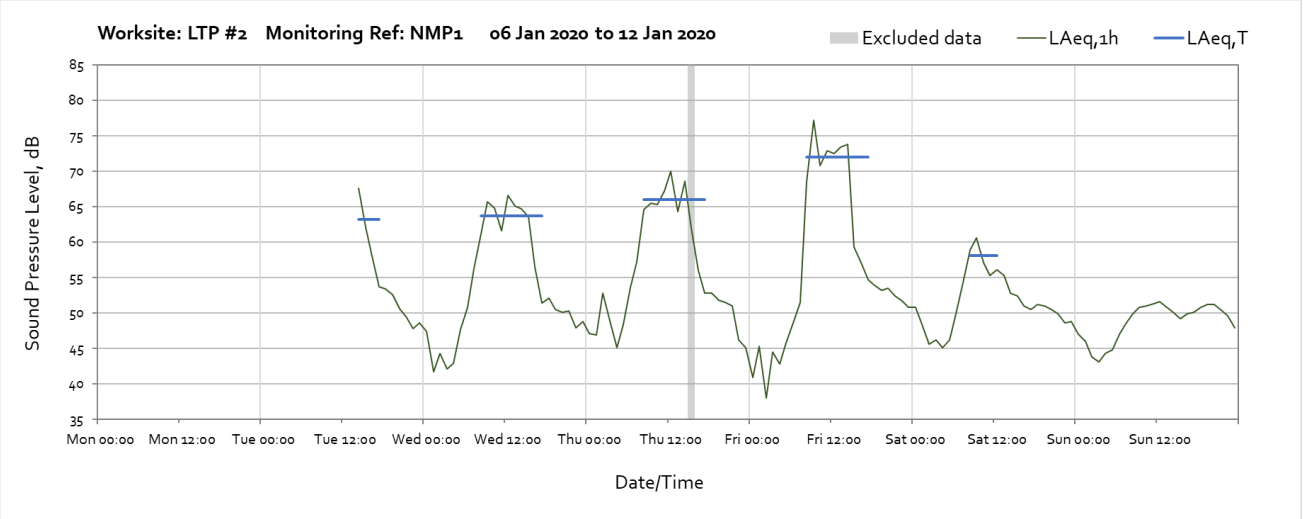
Noise monitoring plan - 2



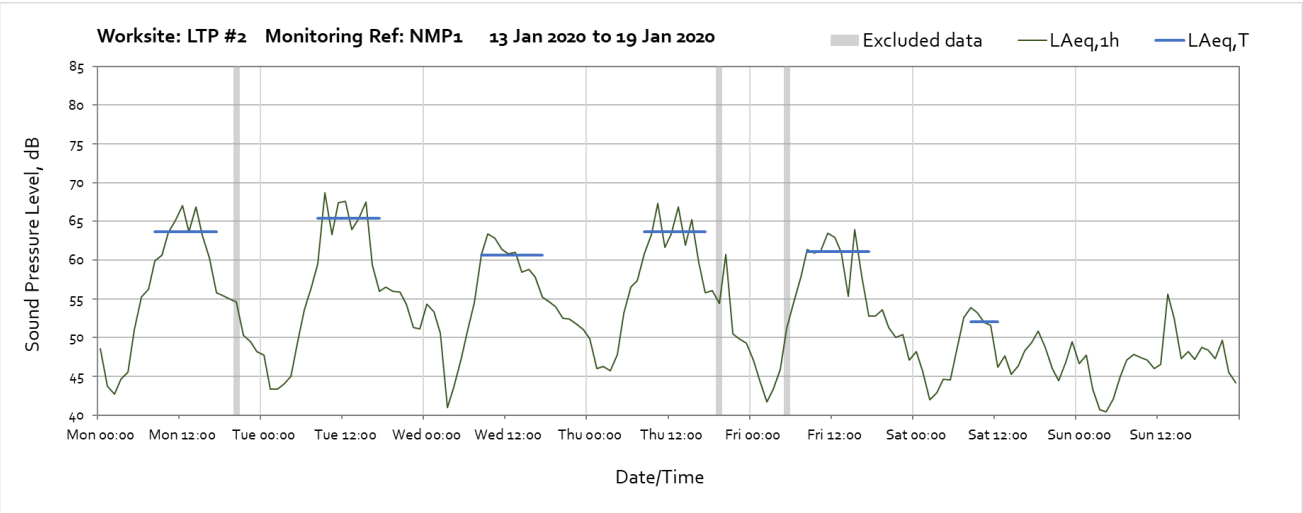
Appendix C Data

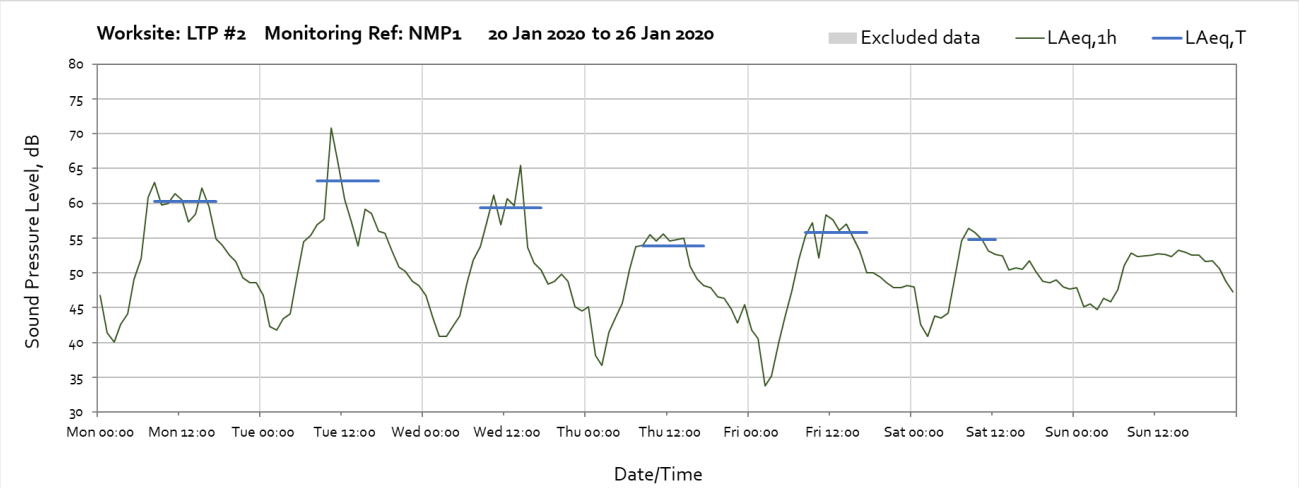
The following graphs show the hourly measured ambient noise level $L_{Aeq,1h}$ and, where relevant, the averaged noise level $L_{Aeq,T}$ values, where the time period T is as specified in Table 1 of HS2 Information Paper E23. Periods with adversely weather affected noise levels are greyed out and have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

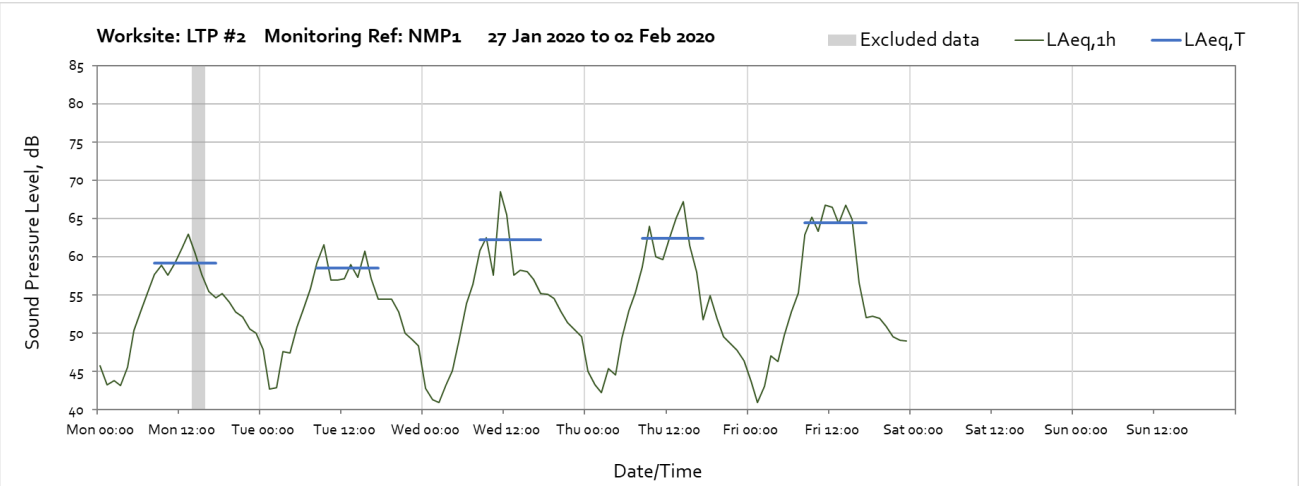
Worksite: LTP #2 – Monitoring Ref: NMP1



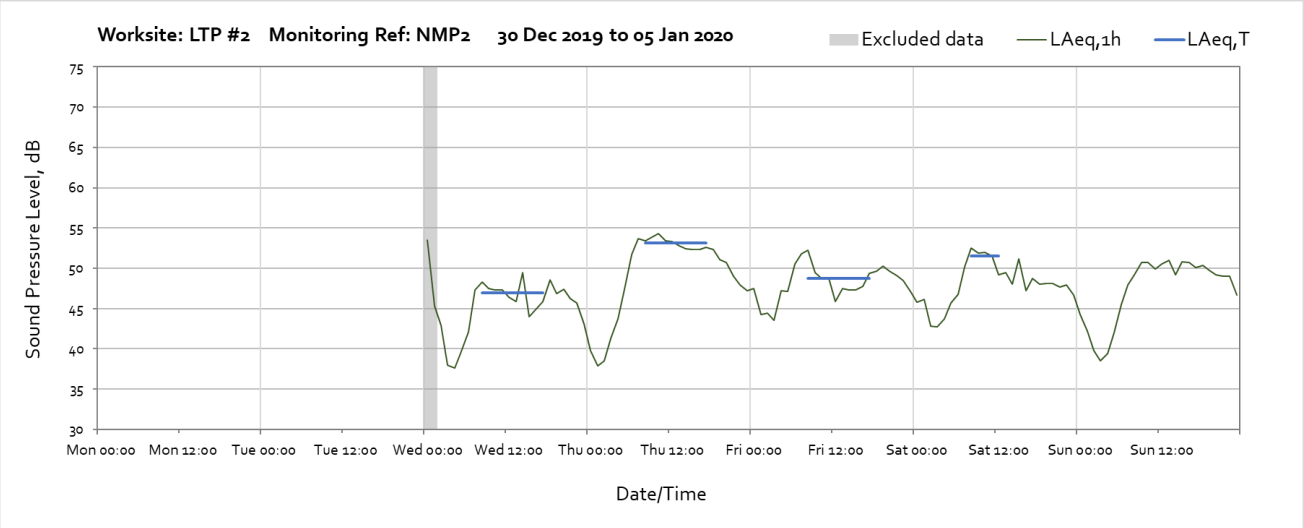
Note: Missing data between the start of the month and 14:00 on Tuesday 7th January was due to loss of external power to the noise monitor.



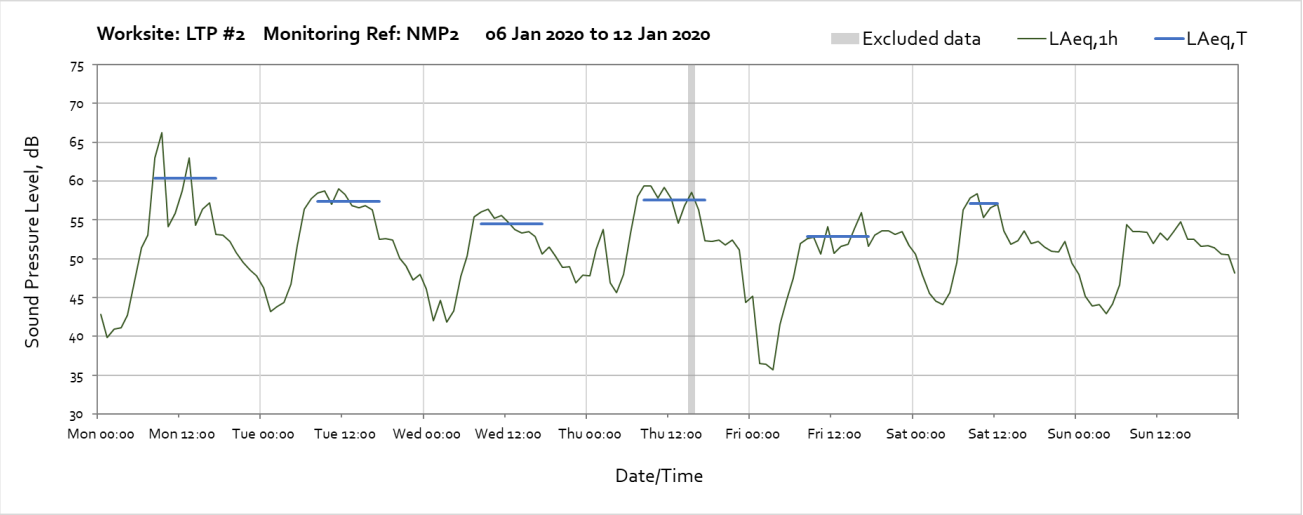


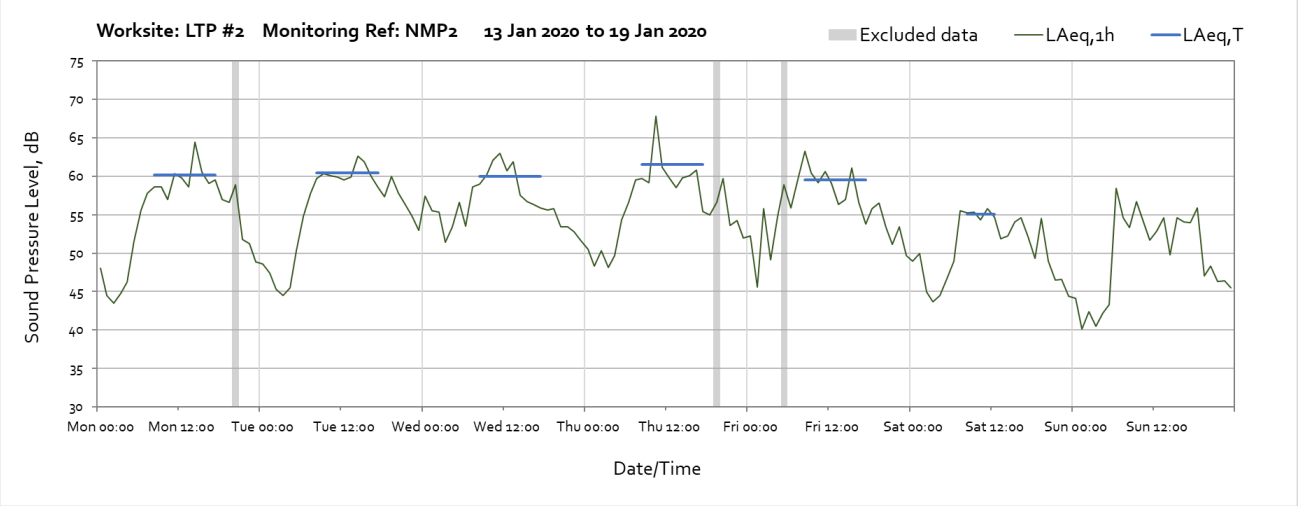


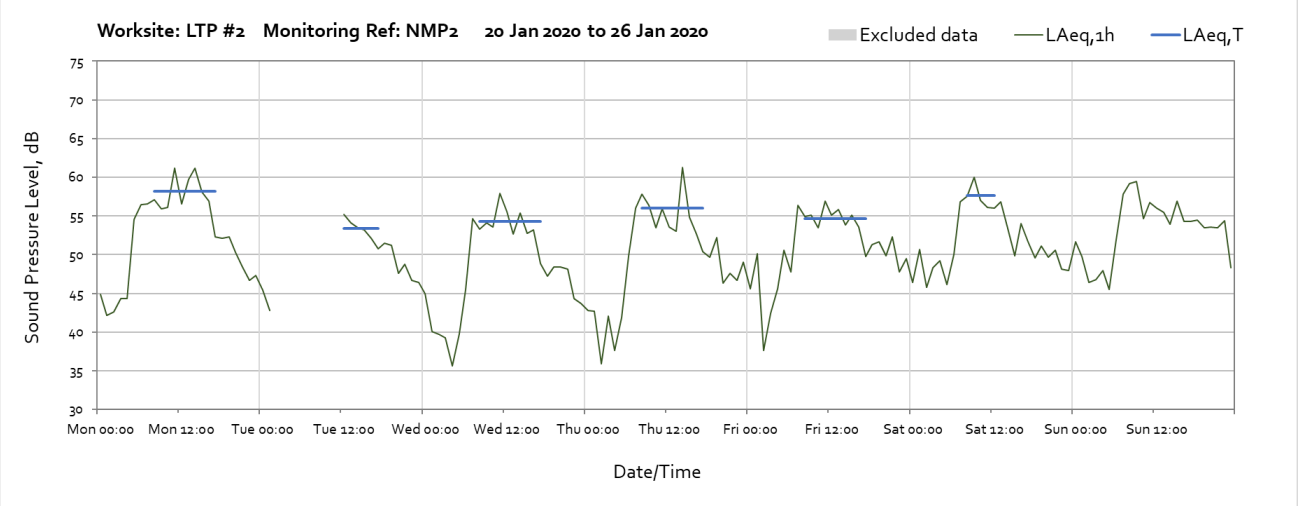
Worksite: LTP #2 – Monitoring Ref: NMP2



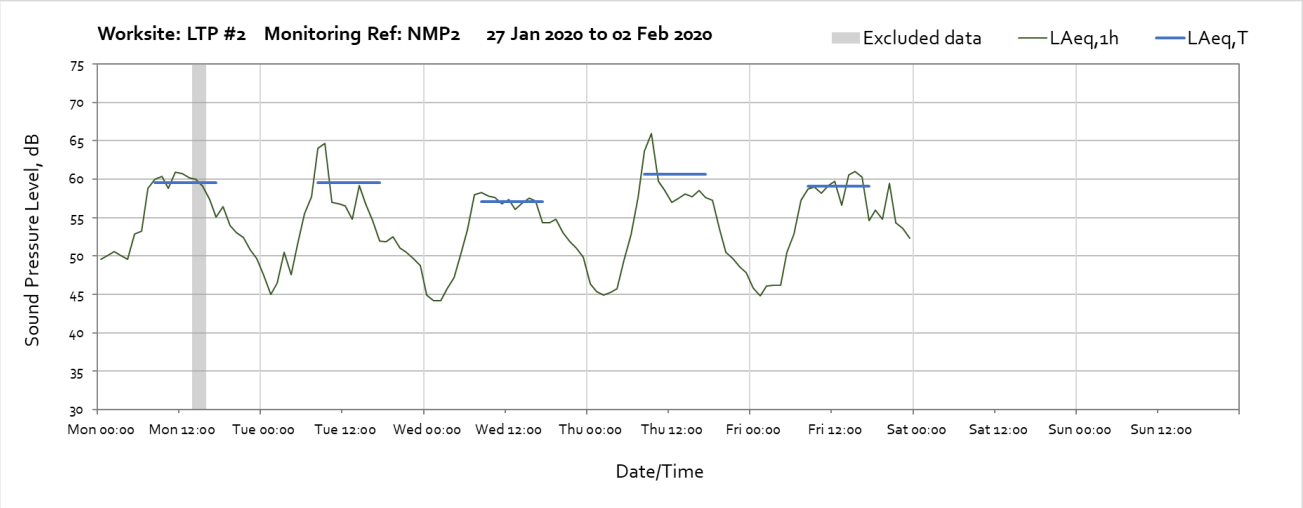
Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 5.



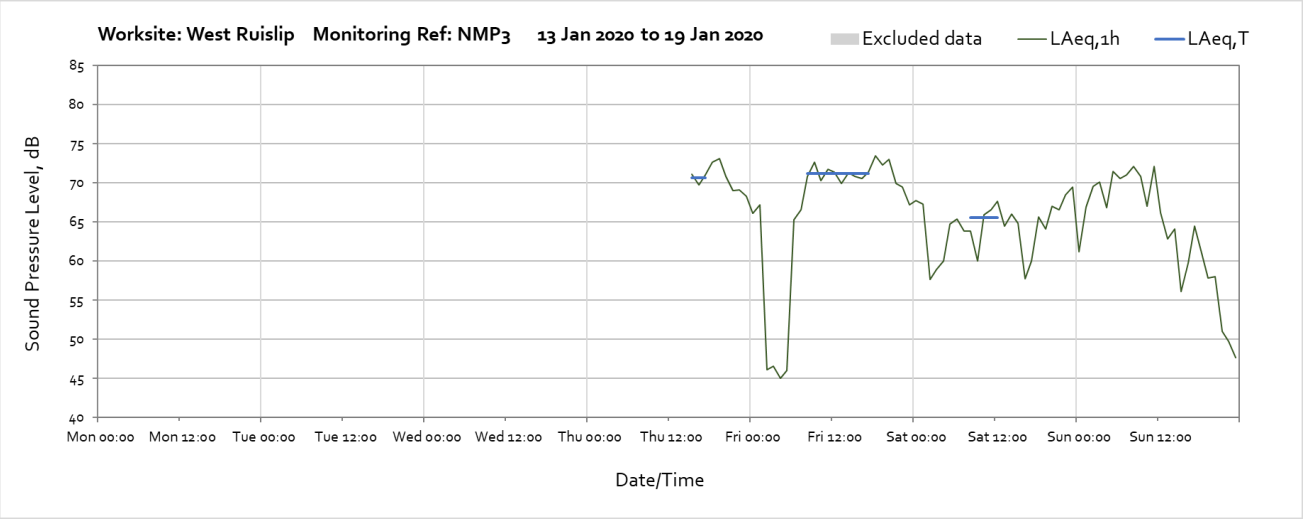




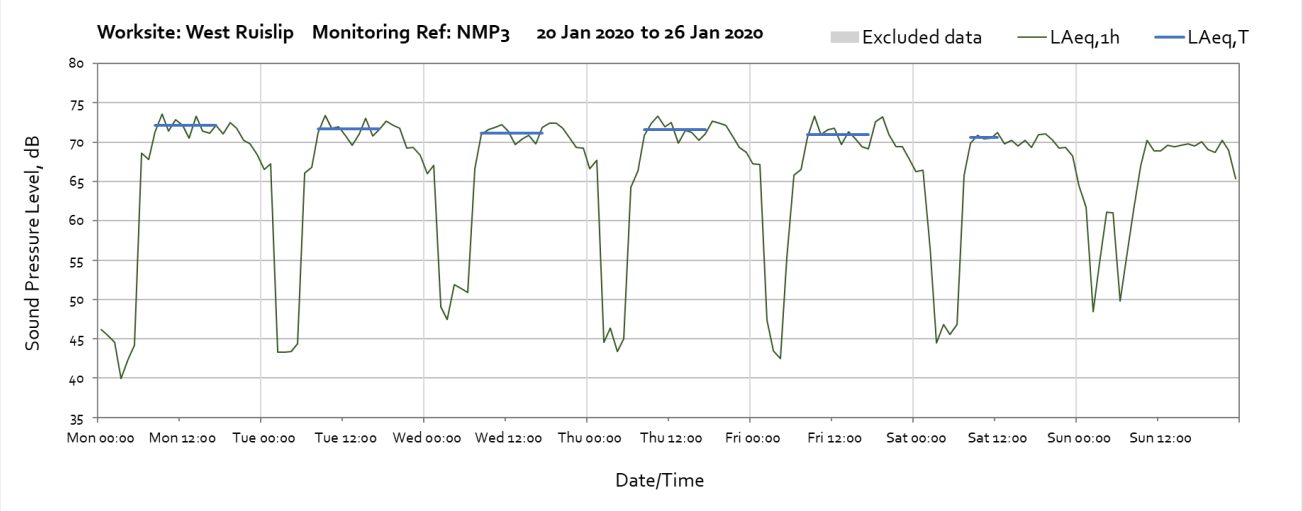
Note: Missing data between 02:00 and 12:00 on Tuesday 21st of January was due to loss of external power to the monitoring station.

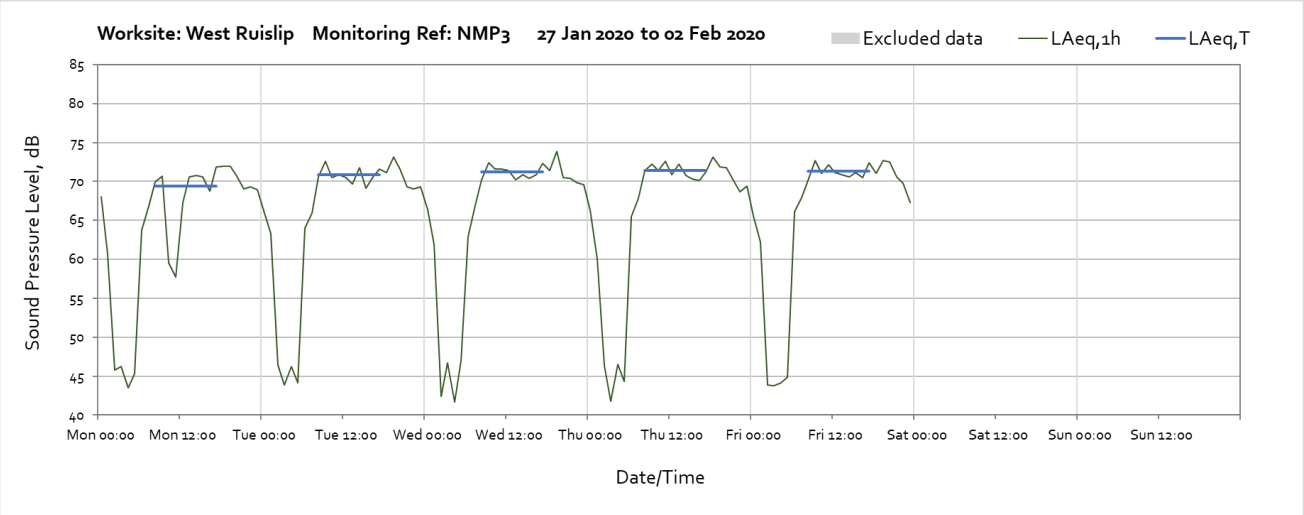


Worksite: West Ruislip – Monitoring Ref: NMP3

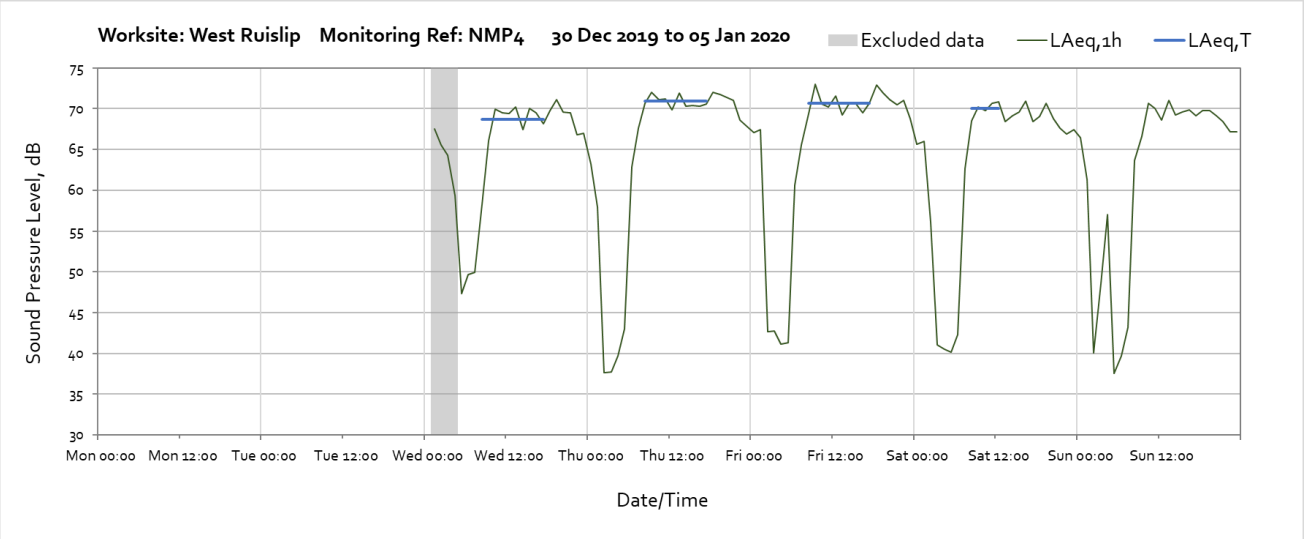


Note: Missing data between the start of the month and 15:00 on Thursday 16th of January was due a technical issue with the monitoring station solar power unit.

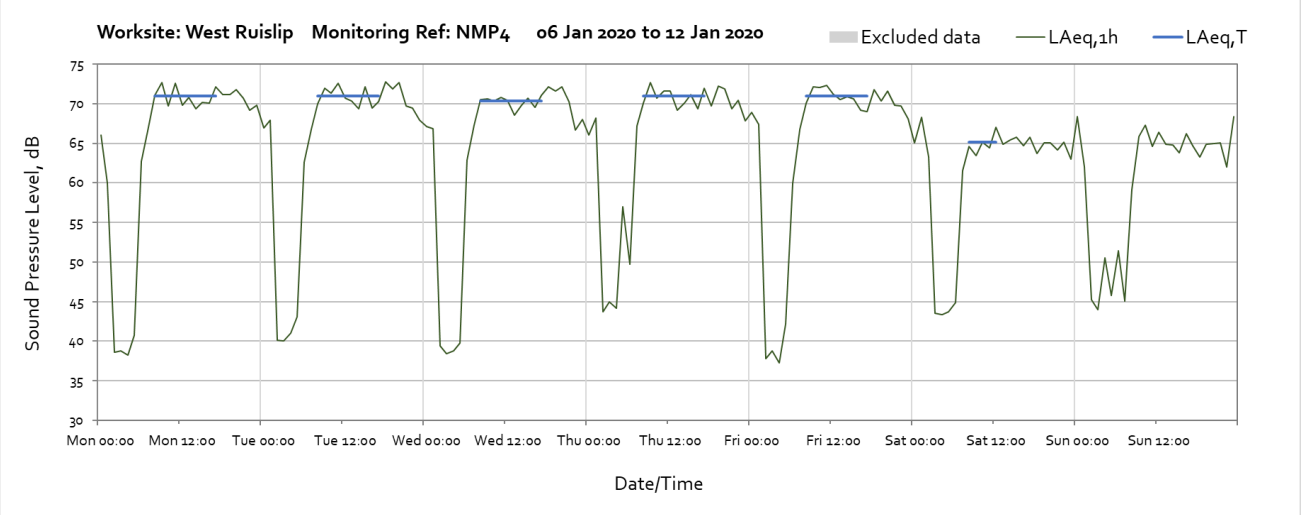


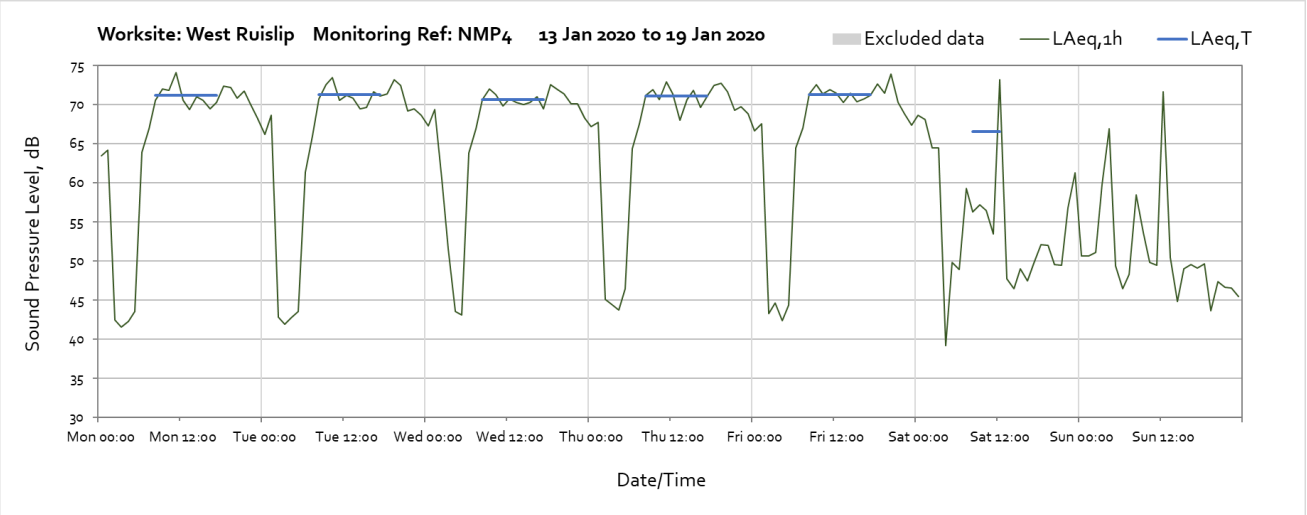


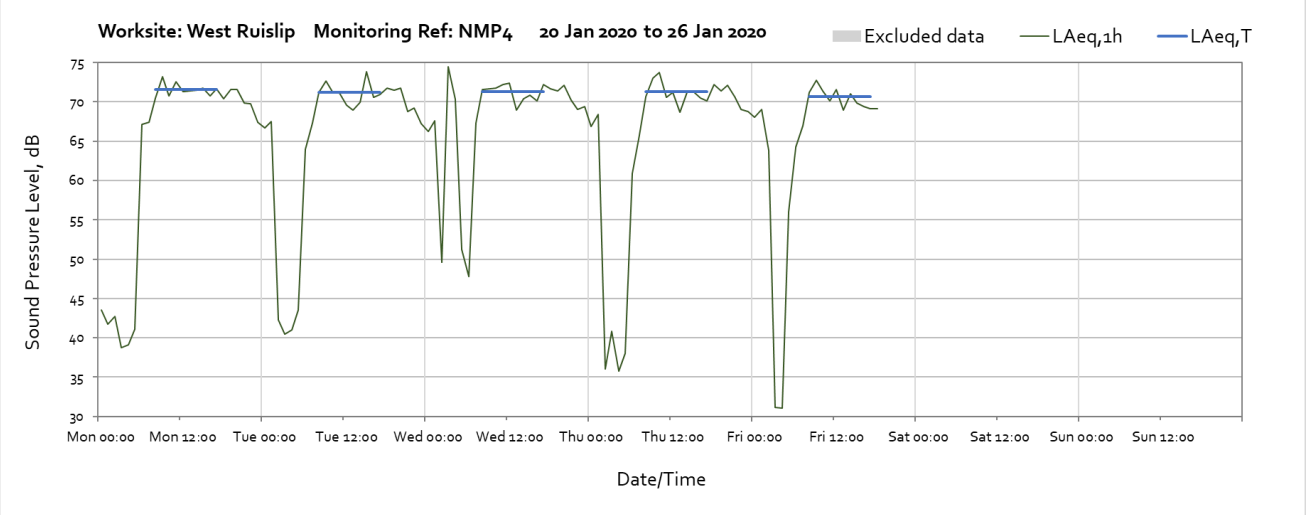
Worksite: West Ruislip – Monitoring Ref: NMP4

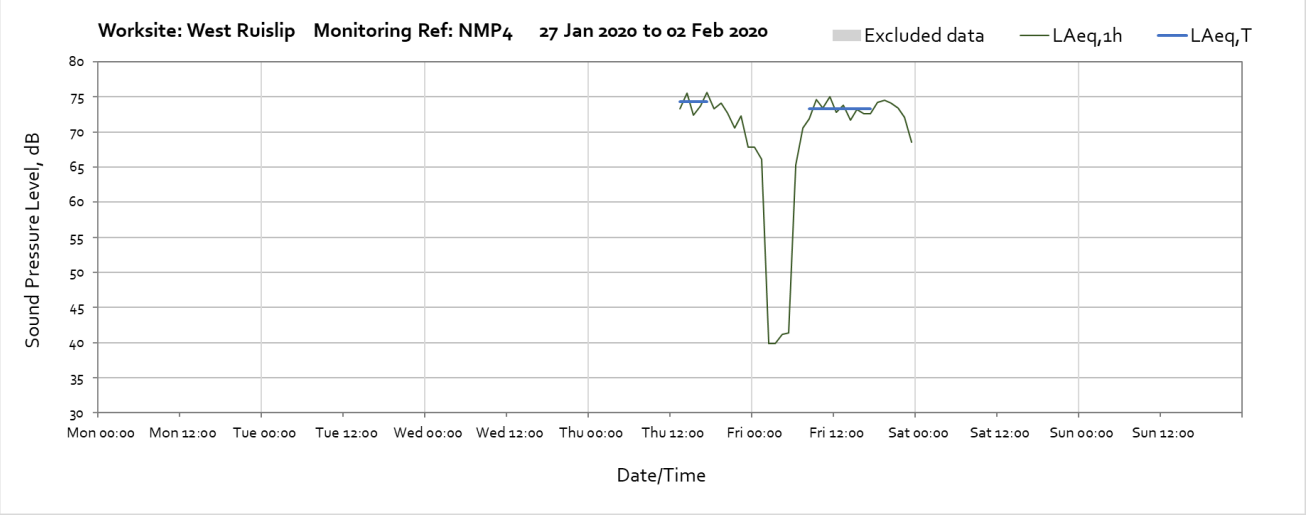


Note: High noise levels on the early hours of the 1st January were due to New Year's Eve celebrations and have been excluded to calculate values in Table 5.









Note: Missing data between 19:00 on Friday 24th and 13:00 on Thursday 30th of January was due a technical issue with the monitoring station solar power unit.