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SUEZ WTS WASTE COLLECTION VEHICLE WORKSHOP, HAYES

SOUND IMPACT ASSESSMENT

CONTENTS

LIST OF ATTACHMENTS

Project Ref:	AS14094	**Project Name:**	SUEZ WTS Vehicle Workshop, Hayes
Report Ref:	AS14094.250901.R1.2	**Report Title:**	Sound Impact Assessment
Client Name:	SUEZ Recycling and Recovery UK Ltd		
Project Manager:	Michael Symmonds		
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1.0 INTRODUCTION

1.1 A waste collection vehicle workshop is proposed at an existing SUEZ Waste Transfer Site (WTS) in Hayes, London UB3 1ET. The workshop would predominantly service and maintain vehicles based at the Site but could occasionally be required to service other SUEZ waste vehicles on a limited ad-hoc basis. The wider WTS operates under permission 643/APP/2002/1592 which includes permission for a workshop, with similar dimensions to the proposed workshop, directly adjacent to the WTS building. This workshop has not been built.

1.2 Clarke Saunders Acoustics has been appointed by SUEZ Recycling and Recovery UK Ltd (SUEZ) to assess the potential sound generated by the proposed waste collection vehicle workshop and impacts on surrounding noise sensitive receptors.

1.3 A glossary of technical terminology used throughout this report is presented in Appendix A.

2.0 SITE DESCRIPTION & PROPOSALS

2.1 SUEZ WTS, Hayes UB3 1ET (the Site) occupies a relatively large yard and waste management site on the Swallowfield Way Industrial Estate, within the London Borough of Hillingdon council area. The WTS is bound by industrial and commercial premises to the north, east and west and, to the south, by the major London to Bristol railway and overground sections of a number of London Underground Lines. Residential dwellings on Denbigh Drive lie further to the south. One line is elevated on a circa 6 metre high concrete embankment, effectively blocking line of sight between the dwellings and the Site.

2.2 The wider WTS does not have any restrictions on operating hours under its planning permission. Waste processing activities at the WTS generally take place on Site between 07:00 and 19:00 hours Monday to Sunday including bank and public holidays. The wider site also includes a vehicle depot with waste collection vehicles exiting from around 04:00 hours with some vehicles returning to park up around 00:00 to 02:00 hours.

2.3 The new vehicle workshop is proposed at the south-eastern corner of the SUEZ site, as presented in the attached site plan AS14094/SP1.

2.4 The operations within the workshop will vary depending on the needs of the facility. It has been confirmed that all major work and repairs will be carried out within the workshop. The facility will only operate when works on the fleet are required with the possibility of this occurring outside of daily working hours.

3.0 ASESSMENT METHODOLOGY

3.1 LOCAL AUTHORITY REQUIREMENTS

3.1.1 The London Boroughs of Hillingdon; Hounslow; Richmond upon Thames Supplementary Planning Document (SPD) *Development Control for Noise Generating and Noise Sensitive Development: 2016*,[1] provides the following guidance when considering noise standards for new industrial and commercial development:

[1] https://democraticservices.hounslow.gov.uk/documents/s127525/SPD%20Noise%20Generating%20and%20Noise%20Sensitive%20Development%202016%20Finalv1.pdf

> "*All industrial and commercial development with the potential to generate noise will be assessed and, where relevant, controlled by planning conditions in order to protect residential amenity. Conditions may be used, for example, to restrict noise levels and to control hours of operation. The most relevant standard for assessing new industrial and commercial development is BS4142:2014.*"

3.1.2 The SPD also provides a summary of the BS4142:2104 methodology along with a table describing the planning advice correlating to a range of assessment levels. This table is reproduced below.

Noise Impact From Relevant Proposed Industrial Or Commercial Premises Or Plant	Development Outcome
Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90	Normally acceptable
Rating level (LAr,Tr) is no more than 5 dB(A) above the Background Level LA90	Acceptable only if there are overriding economic or social reasons for development to proceed
Rating level (LAr,Tr) is more than 5 dB(A) above the Background Level LA90	Normally unacceptable

3.1.3 The SPD goes on to provide further commentary on the how the council will evaluate such assessments. This is reproduced below.

> "*The Boroughs will not impose unreasonable restrictions on businesses but applicants should be aware that it is usually simpler and less expensive to design in noise management and noise control measures at the planning stage rather than wait for complaints to arise.*"

3.2 BS4142:2014+A1:2019

3.2.1 BS4142:2014+A.1:2019[2] provides a methodology to assess the likelihood of adverse impact arising from sound generated by industrial and commercial sound sources. A summary of the BS4142:2014+A1:2019 assessment methodology is presented in Appendix B.

4.0 ENVIRONMENTAL SOUND SURVEY & EQUIPMENT

4.1 PROCEDURE AND EQUIPMENT

4.1.1 Automated measurements of consecutive 5-minute L_{Aeq}, L_{Lmax}, L_{A10} and L_{A90} sound pressure levels were undertaken at the position indicated in the attached site plan AS14094/SP1, between 12:00 hours Friday 13 June and 09:45 hours Tuesday 17 June 2025, following procedures in BS41412:2014+A1:2019 and BS7445-2:1991.[3]

4.1.2 Weather conditions were noted during installation and retrieval of the monitoring equipment. These observations were supplemented with historical weather data for the duration of the monitoring period. Conditions were generally dry with light winds and, therefore, suitable for environmental sound monitoring.

[2] British Standard BS4142:2014+A.1:2019 *Methods for rating and assessing industrial and commercial sound*
[3] British Standard BS7445-2:1991 *Description and measurement of environmental noise Part 2: Acquisition of data pertinent to land use*

4.1.3 The equipment used during the survey was as follows:

- 1 no. Nti sound level meter type XL2; and
- 1 no. Rion sound level calibrator type NC74.

4.1.4 Calibration of the sound level meter was verified before and after the survey, with no significant calibration drift detected. All CSA equipment has current traceable laboratory calibration which is available for inspection upon request.

4.2 SURVEY RESULTS

4.2.1 The average ambient and typical background sound levels at the monitoring position are shown in Table 1. Typical background sound pressure levels are derived from the lowest 10th percentile of the $L_{A90,5min}$ dataset.

MONITORING PERIOD	AVERAGE SOUND PRESSURE LEVEL $L_{Aeq,5mins}$	TYPICAL BACKGROUND SOUND PRESSURE LEVEL L_{A90}
Daytime (07:00 to 23:00hrs)	72 dB	46 dB
Night-time (23:00 to 07:00hrs)	57 dB	43 dB

Table 1: Measured average and typical background sound levels [dB ref. 20µPa]

4.3 The appended time histories AS14094/TH1-TH4 show the variation of sound levels at the measurement position over the measurement period.

5.0 ASSESSMENT

5.1 SOUND EMISSION DATA

5.1.1 A number of operations will be carried out at the workshop. Activities and features have been cited in a similar facility by vehicle workshop staff at the SUEZ Guildford vehicle workshop. These are summarised below and are understood to be representative of the intent at the Hayes WTS vehicle workshop.

- Engines of vehicles under repair or inspection to run continuously during servicing/repair;
- Air-powered impact guns will be used for removing wheel nuts;
- Grinders used for a variety of tasks;
- Welders used for a variety of tasks;
- Forklift movements;
- Hydraulic lift / ramp operating regularly; and
- Air compressors commonly in operation.

5.1.2 Based on professional experience at other vehicle workshops it is expected that the most commonly occurring, noisier activities include engine work, hydraulic lift operation and air-powered impact tools.

5.1.3 All major works will be undertaken within the confines of the workshop. The exact construction of the envelope is not known, however, the building will feature roller-shutter doors which may be left open whilst work is being undertaken. The workshop itself will have three internal bays, with one roller-shutter door serving each bay.

5.1.4 CSA library data for the most significant operations have been used to undertake this assessment and are presented in Table 2.

ACTIVITY	FREQUENCY (Hz)								
	63	125	250	500	1k	2k	4k	8k	dBA
General Work on Engines [$L_{eq,5min}$ @ 2m]	60	53	53	58	57	61	63	62	68
Ramp lifting [$L_{eq,30sec}$ @ 2m]	55	70	69	67	68	64	57	49	71
Impact Wrench [$L_{eq,10sec}$ @ 2m]	59	60	60	69	68	76	77	77	82

Table 2: CSA library reference data **[dB ref. 20µPa]**

5.1.5 The exact operations in the vehicle workshop will vary significantly. In a typical daytime one-hour period, however, an example scenario could feature two engines being worked on for the full hour; two hydraulic ramp/lifts operating up to four times total within the hour; and air-powered impact tools in use for up to 25% of the hour.

5.1.6 Accounting for distance propagation (circa 90m) and screening effects from the elevated railway line, a cumulative specific sound level of L_{Aeq} 18 dB is predicted. Detailed calculations are presented in Appendix C.

5.2 BS4142:2014+A1:2019 ASSESSMENT

5.2.1 Sound impact at Denbigh Drive has been assessed following procedures in BS4142:2014+A1:2019. The workshop will primarily operate during WTS operational hours (described in section 1.0), although occasional out of hours operation may be required.

5.2.2 Given the low predicted Specific Sound Level, no character corrections have been applied as per Section 9 of BS4142:2014+A1:2019. A summary of the assessment is shown in Table 3.

ASSESSMENT STEP	CALCULATION
Specific Sound Level	L_{Aeq} 18 dB
Acoustic Character Corrections	+ 0 dB
Rating level	$L_{Ar,Tr}$ 18 dB
Background Sound Level (Daytime)	L_{A90} 46 dB
Assessment Level	-28 dB

Table 3: BS4142:2014+A1:2019 Assessment Summary

5.2.3 The assessment level indicates that the proposals are unlikely to result in an adverse noise impact. It should be noted that these levels represent pessimistic conditions where work is being carried out near the entrance whilst roller shutter doors are open. In reality, these levels would be lower still when activities are taking place within the facility with the shutters closed. Furthermore, workshop noise, if audible, will be characterised by periods of high activity and lulls between this would be commensurate with soundscape next to train lines.

5.2.4 In context, these events are unlikely to be distinguishable against the existing conditions. Although some uncertainty remains over the specific activities that may take place in and around the vehicle workshop, the above assessment demonstrates that source levels would need to increase considerably, by circa 30 dB(A), in order to equate the existing background level. In such an event, source levels would be in the order of $L_{Aeq,1hr}$ 100 dB, a level fundamentally unrealistic for such a facility and would generally be controlled to lower levels by occupational noise regulations.

5.2.5 Impact of occasional night-time work would follow a similar relationship, given the mere 3 dB reduction in background levels between daytime and night-time periods. When considered in the context of the infrequency of such activity, impact at night-time is expected to be similar if not lower to that of daytime activity.

6.0 UNCERTAINTY

6.1 As per the requirements of BS4142:2014+A1:2019, the uncertainty in the assessment is considered and reported. This is not an indication of error, but an acknowledgement of possible variability of the factors contributing to the assessment.

6.2 Use of a calibrated type 1 sound level meter reduces measurement instrumentation error to insignificant levels as compared to environmental variations.

6.3 First-hand measurements of representative activities for the workshop operations have been used, and the similarity of these actions from the desktop assessment to in-practice operations has been corroborated by representatives of the site operator (SUEZ).

6.4 The environmental sound survey was conducted over five days, including a weekend, thereby allowing variability in the primary sound sources to be noted and accounted for.

6.5 Uncertainty remains with the schedule of activities in a ‘typical’ work scenario. As described in Section 5.2.3, however, it is unlikely that a common operational pattern would generate sound approaching the levels required to escalate the assessment determination to one of any risk and, therefore, the level of uncertainty for this aspect can be considered insignificant.

7.0 CONCLUSIONS

7.1 Clarke Saunders Acoustics has conducted a sound impact assessment of the proposed vehicle workshop at the SUEZ Waste Transfer Station in Hayes.

7.2 An environmental sound survey has been undertaken to determine representative background sound levels of the nearest noise sensitive receptors.

7.3 Site activities have been confirmed by SUEZ staff operating a similar vehicle workshop at another SUEZ site.

7.4 CSA library sound data has been used together with the results of the environmental sound survey to assess the likelihood of impact upon the closest noise sensitive residential dwellings.

7.5 The assessment has been undertaken following procedures in BS4142:2014+A1:2019 and determines that a low likelihood of adverse impact on the basis of noise is expected as a result of the proposed development.

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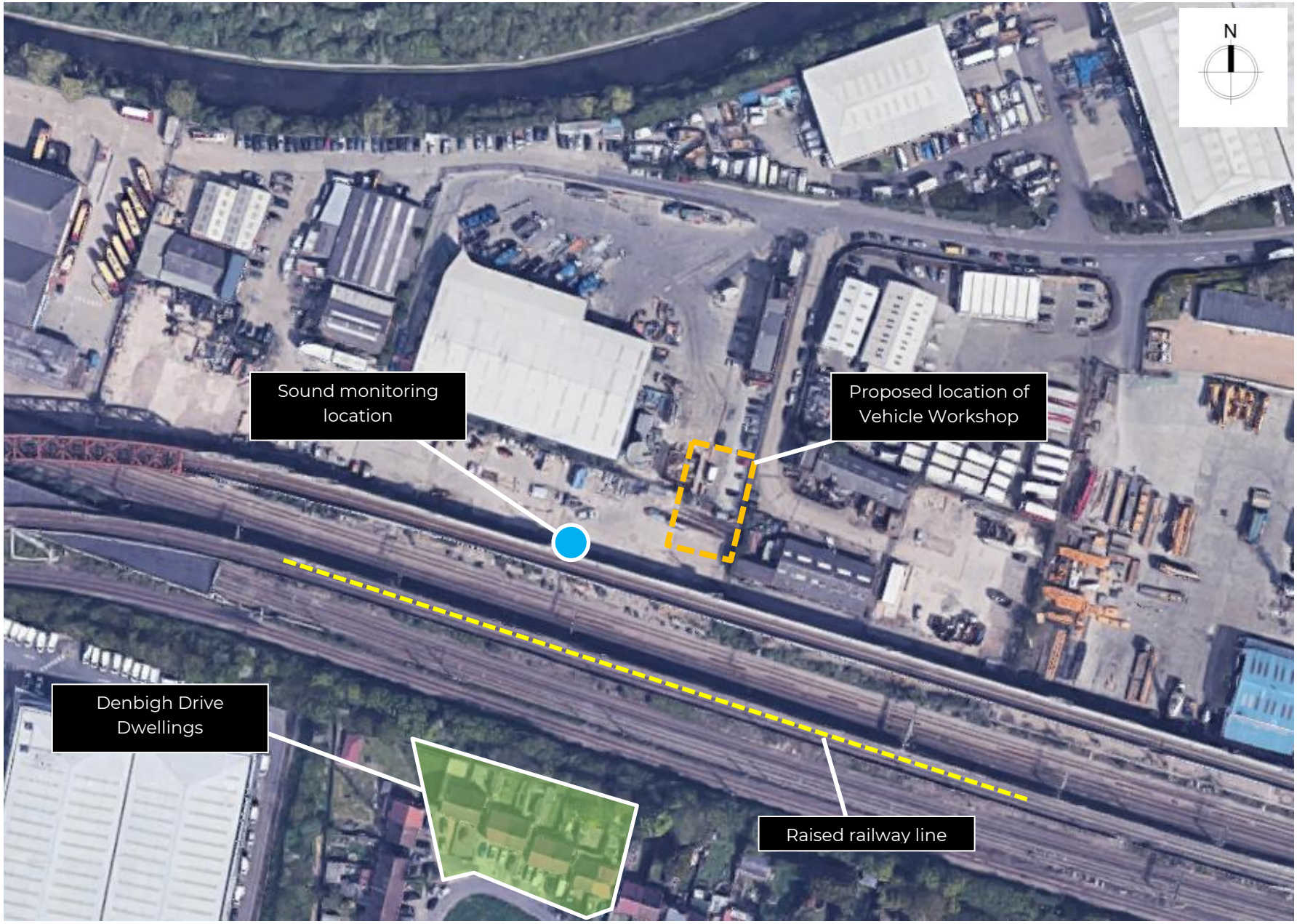

Indicative Site Plan

Figure AS14094/SP1

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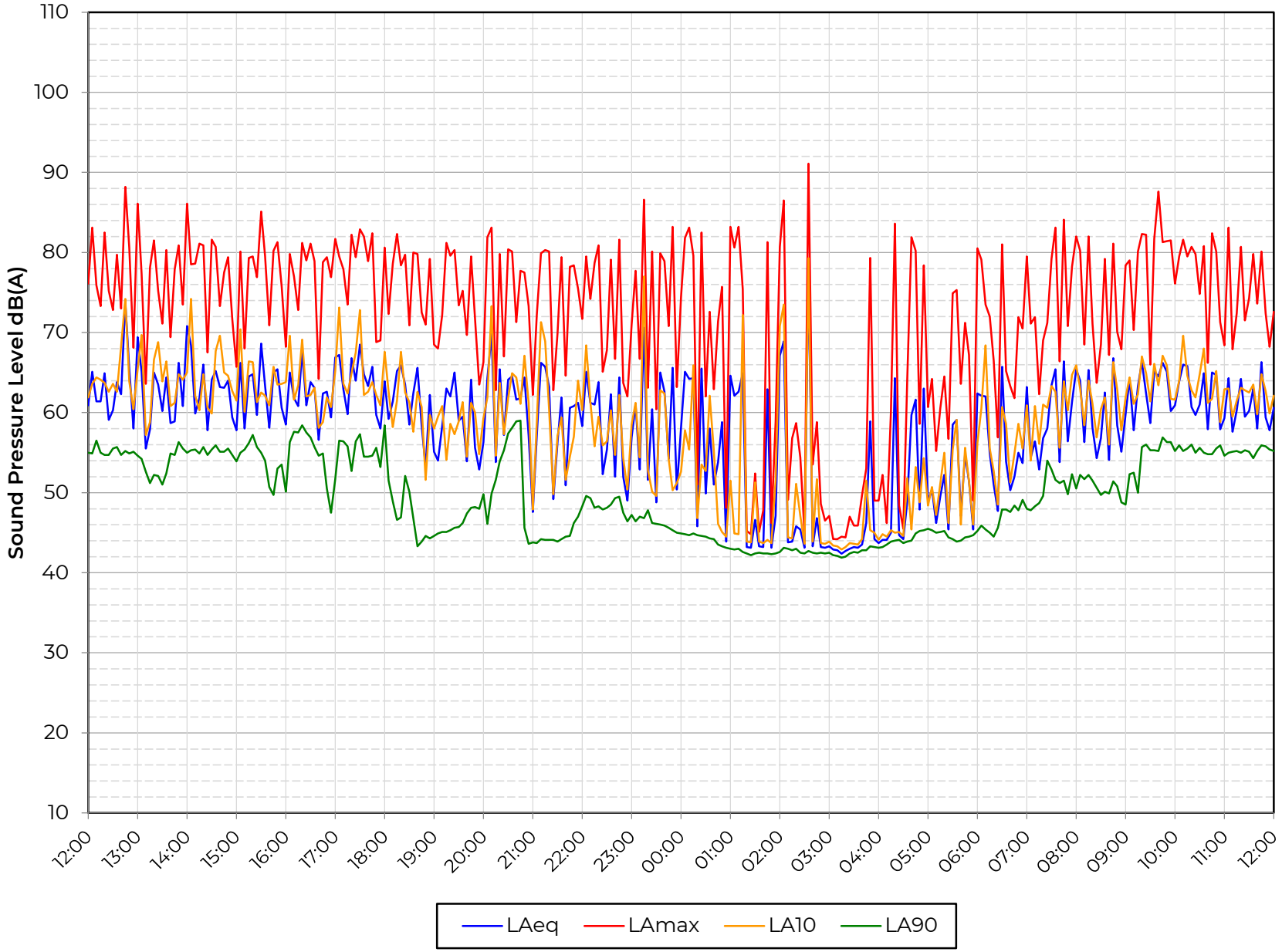
Vehicle Workshop, Hayes WTS



Fri 13 Jun to Sat 14 Jun

Figure AS14102/TH1

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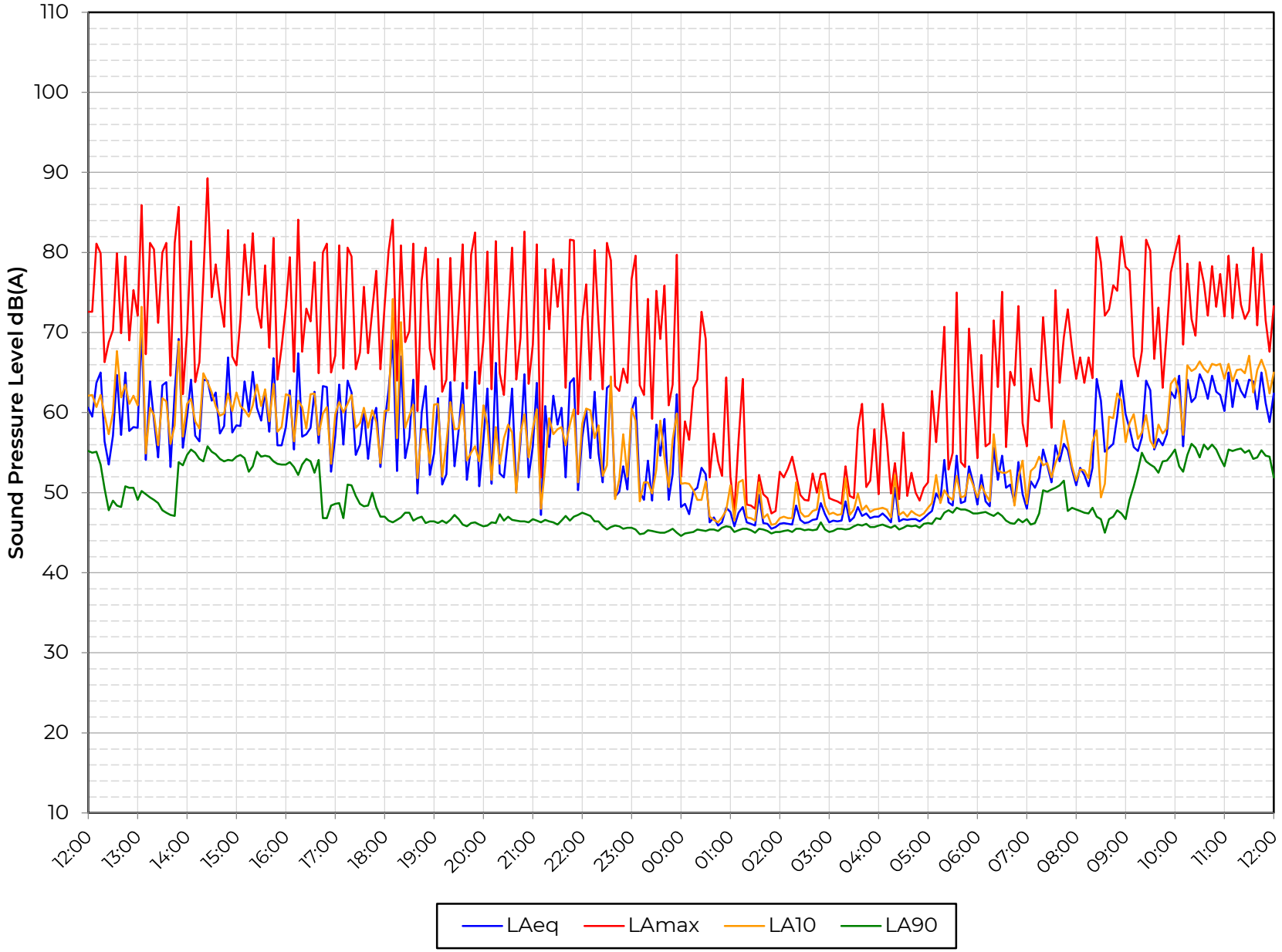
Vehicle Workshop, Hayes WTS



Sat 14 Jun to Sun 15 Jun

Figure AS14102/TH2

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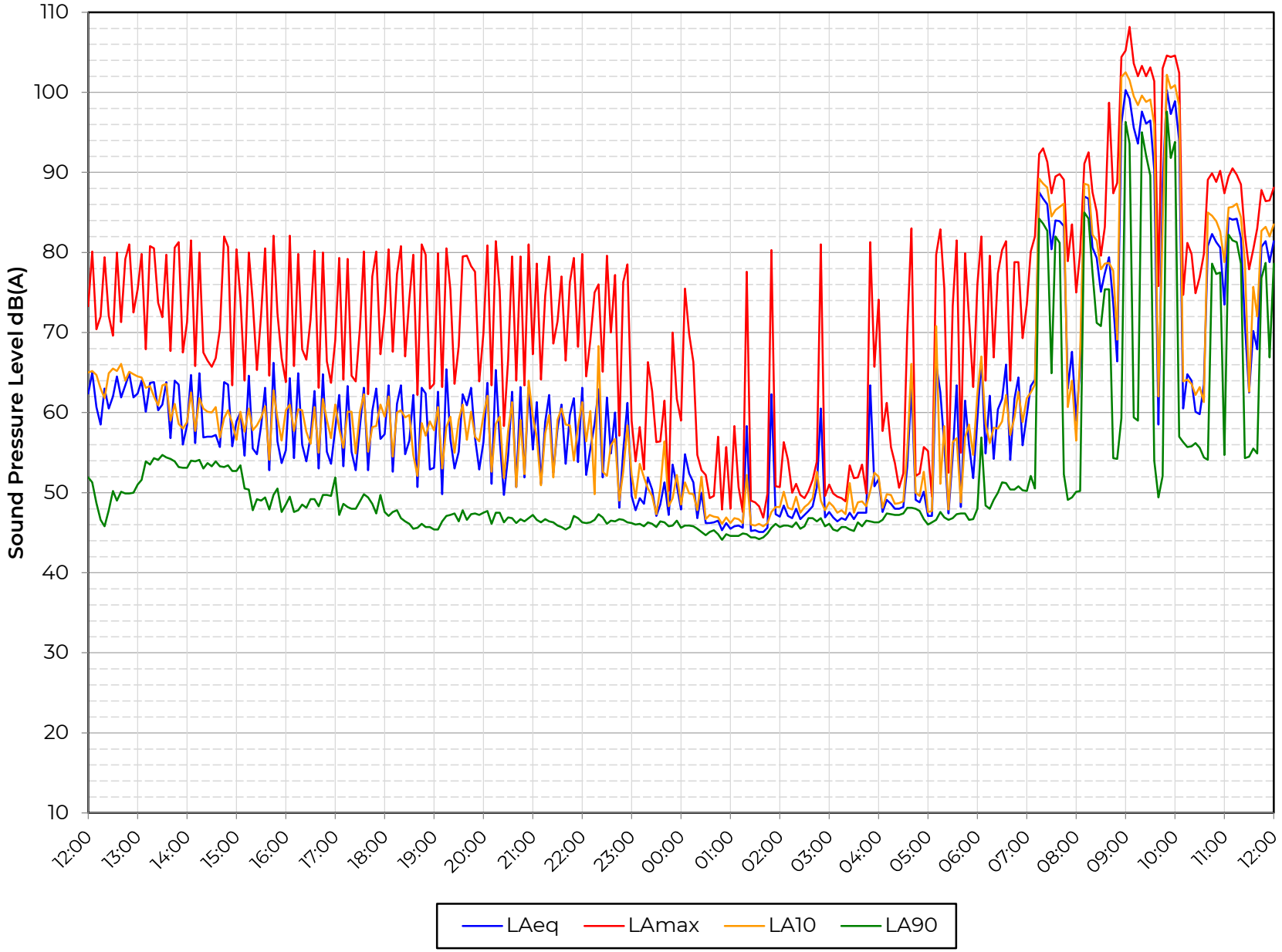
Vehicle Workshop, Hayes WTS



Sun 15 Jun to Mon 16 Jun

Figure AS14102/TH3

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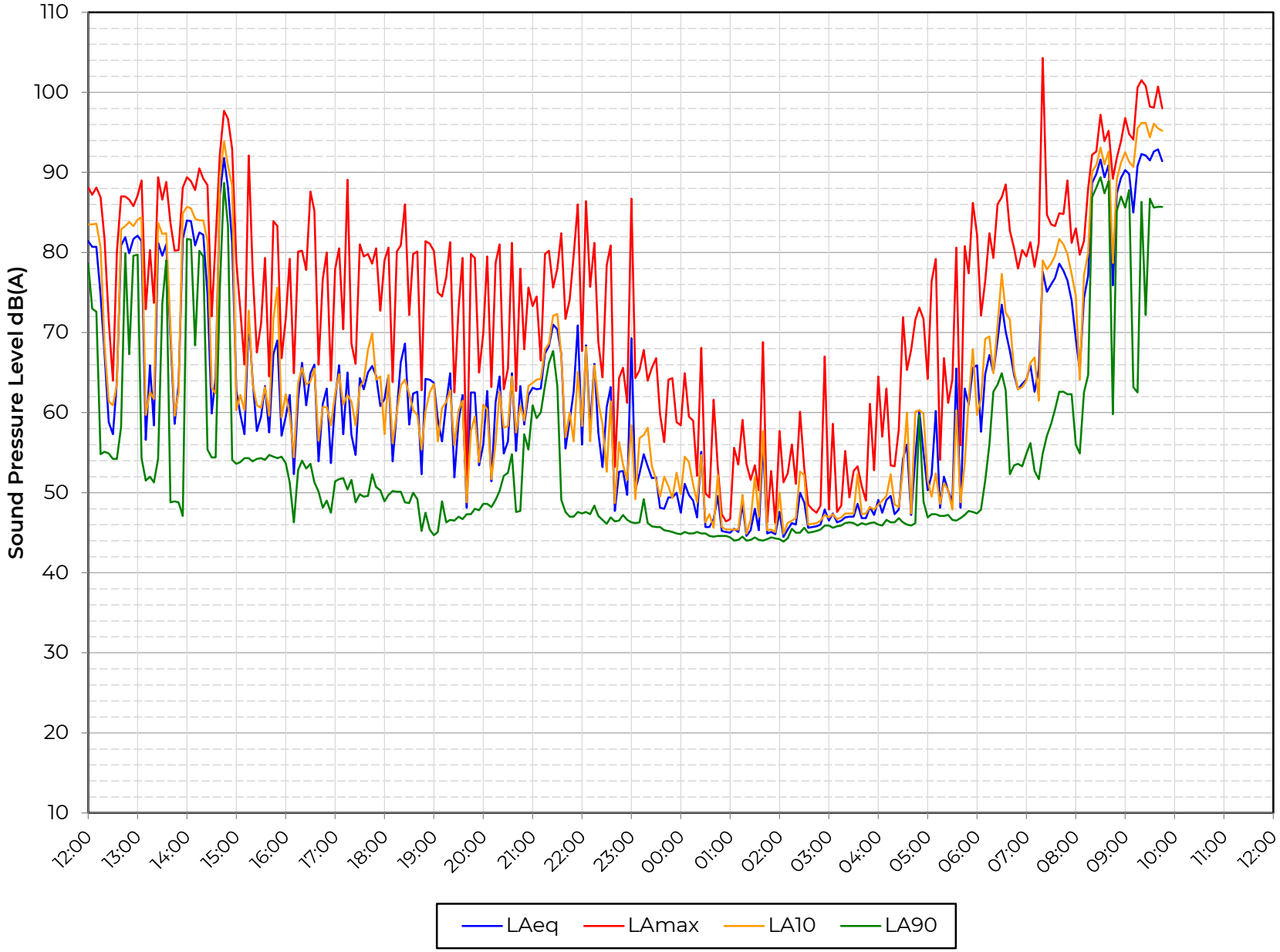
Vehicle Workshop, Hayes WTS



Mon 16 Jun to Tue 17 Jun

Figure AS14102/TH4

Acoustic Terminology

The human impact of sounds is dependent upon many complex interrelated factors such as 'loudness', its frequency (or pitch) and variation in level. In order to have some objective measure of the annoyance, scales have been derived to allow for these subjective factors.

Sound Vibrations propagating through a medium (air, water, etc.) that are detectable by the auditory system.

Noise Sound that is unwanted by or disturbing to the perceiver.

Frequency The rate per second of vibration constituting a wave, measured in Hertz (Hz), where 1Hz = 1 vibration cycle per second. The human hearing can generally detect sound having frequencies in the range 20Hz to 20kHz. Frequency corresponds to the perception of 'pitch', with low frequencies producing low 'notes' and higher frequencies producing high 'notes'.

dB(A): Human hearing is more susceptible to mid-frequency sounds than those at high and low frequencies. To take account of this in measurements and predictions, the 'A' weighting scale is used so that the level of sound corresponds roughly to the level as it is typically discerned by humans. The measured or calculated 'A' weighted sound level is designated as dB(A) or L_A.

L_{eq}: A notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (e.g. 8 hour, 1 hour, etc).

The concept of L_{eq} (equivalent continuous sound level) has primarily been used in assessing noise from industry, although its use is becoming more widespread in defining many other types of sounds, such as from amplified music and environmental sources such as aircraft and construction.

Because L_{eq} is effectively a summation of a number of events, it does not in itself limit the magnitude of any individual event, and this is frequently used in conjunction with an absolute sound limit.

L_{10} & L_{90}: Statistical L_n indices are used to describe the level and the degree of fluctuation of non-steady sound. The term refers to the level exceeded for n% of the time. Hence, L_{10} is the level exceeded for 10% of the time and as such can be regarded as a typical maximum level. Similarly, L_{90} is the typical minimum level and is often used to describe background noise.

It is common practice to use the L_{10} index to describe noise from traffic as, being a high average, it takes into account the increased annoyance that results from the non-steady nature of traffic flow.

L_{max}: The maximum sound pressure level recorded over a given period. L_{max} is sometimes used in assessing environmental noise, where occasional loud events occur which might not be adequately represented by a time-averaged L_{eq} value.

Octave Band Frequencies

In order to determine the way in which the energy of sound is distributed across the frequency range, the International Standards Organisation has agreed on "preferred" bands of frequency for sound measurement and analysis. The widest and most commonly used band for frequency measurement and analysis is the Octave Band.

In these bands, the upper frequency limit is twice the lower frequency limit, with the band being described by its "centre frequency" which is the average (geometric mean) of the upper and lower limits, e.g. 250 Hz octave band extends from 176 Hz to 353 Hz. The most commonly used octave bands are:

Octave Band Centre Frequency Hz	63	125	250	500	1000	2000	4000	8000

Human Perception of Broadband Noise

Because of the logarithmic nature of the decibel scale, it should be borne in mind that sound levels in dB(A) do not have a simple linear relationship. For example, 100dB(A) sound level is not twice as loud as 50dB(A). It has been found experimentally that changes in the average level of fluctuating sound, such as from traffic, need to be of the order of 3dB before becoming definitely perceptible to the human ear. Data from other experiments have indicated that a change in sound level of 10dB is perceived by the average listener as a doubling or halving of loudness. Using this information, a guide to the subjective interpretation of changes in environmental sound level can be given.

INTERPRETATION

Change in Sound Level dB	Subjective Impression	Human Response
0 to 2	Imperceptible change in loudness	Marginal
3 to 5	Perceptible change in loudness	Noticeable
6 to 10	Up to a doubling or halving of loudness	Significant
11 to 15	More than a doubling or halving of loudness	Substantial
16 to 20	Up to a quadrupling or quartering of loudness	Substantial
21 or more	More than a quadrupling or quartering of loudness	Very Substantial

Earth Bunds and Barriers - Effective Screen Height

When considering the reduction in sound level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a tall barrier exists between a sound source and a listener, with the barrier close to the listener, the listener will perceive the sound as being louder if he climbs up a ladder (and is closer to the top of the barrier) than if he were standing at ground level. Equally if he sat on the ground the sound would seem quieter than if he were standing. This is explained by the fact that the "effective screen height" is changing with the three cases above. In general, the greater the effective screen height, the greater the perceived reduction in sound level.

Similarly, the attenuation provided by a barrier will be greater where it is aligned close to either the source or the listener than where the barrier is midway between the two.

BS4142 is designed to allow contextual assessment of impact from commercial, or industrial sound on sensitive receptors. Examples covered by the Standard include:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises, and
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes.

In brief, the assessment procedure involves establishing sound levels from the items or processes of interest, (the specific sound source(s)), corrected for any acoustic features to derive the Rating Level, ($L_{Ar,Tr}$), at the relevant assessment position(s). The Rating Level is compared against the existing Background Sound Level, ($L_{A90,T}$), to provide an initial estimate of impact. The Standard offers the following guidance with regard to the significance of estimated impact:

a) Typically, the greater this difference, the greater the magnitude of the impact;

b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;

c) A difference of around +5dB could be an indication of an adverse impact, depending on the context;

d) Where the rating level does not exceed the background sound level, this is an indication of the specific sound having a low impact, depending on the context. The lower the rating level is relative to the background sound level, the less likely it is that the specific sound source will have an adverse impact.

Where relevant, the initial estimate should then be modified by accounting for contextual aspects of the operation of the specific sound source and / or the context of the character of the area.

Other Assessment Parameters and Guidance on Character Corrections

The Specific Sound Level (L_s) is expressed in terms of an L_{Aeq} for a reference time interval, (T_r) of one-hour during the daytime (07:00 – 23:00 hours) and a fifteen-minute period during the night-time (23:00 – 07:00 hours). The Rating Level is also expressed in terms of the reference time interval, T_r.

The Specific Sound Level can be determined by various means, which can include prediction based on manufacturer's data and accompanying propagation calculations to the assessment position(s). This method could be used, for instance, where the specific sound source is not yet in-situ, or is in-situ but not yet operational.

Where the specific sound source is already operational and in-situ, measurements of the sound climate resulting from both the specific sound source and all other contributing sources, (knows as the Ambient Sound Level, L_a = $L_{Aeq,T}$) should be measured over a representative time period, ideally at the assessment position(s).

Depending on the relative contribution of other sources not related to the specific sound, (known as the residual sound), the Specific Sound Level can be derived by logarithmically subtracting the Residual Sound Level, $L_r = L_{Aeq,T}$, from the Ambient Sound Level.

With justification, representative proxy locations can be used for the measurement of the ambient and/or residual sound climate. Where these measurement locations are not fully representative of the assessment position(s), measurement can be supplemented with calculation.

The Background Sound Level should ideally also be measured at the assessment position(s) but can be measured at representative proxy locations where suitable reasons can be provided. The Background Sound Level should be measured over a period which is suitable to characterise the background sound climate during the period of interest and should normally be at least 15 minutes.

When deriving the Rating Level from the Specific Sound Level, consideration is given to the character of the sound. The Standard provides several methods for deriving appropriate character corrections, offering the following advice for subjective assessment:

Tonality

For sound ranging from not tonal to prominently tonal, the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be allocated as a penalty of 2 dB for a tone which is just perceptible at the sound receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible.

Impulsivity

A correction of up to +9dB can be applied for sound that is highly impulsive considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be allocated as a penalty of 3dB for impulsivity which is just perceptible at the receiver, 6dB where it is clearly perceptible and 9dB where it is highly perceptible.

Other sound characteristics

Where the specific sound contains characteristics that are neither tonal nor impulsive, but are otherwise startling, disturbing or incongruous with the residual acoustic environment, a penalty of +3dB can be applied.

Intermittency

When the specific sound has identifiable on/off conditions, if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3dB can be applied.

APPENDIX C

ASSESSMENT TO DWELLINGS ALONG DENBIGH DRIVE	FREQUENCY (Hz)								dBA
	63	125	250	500	1 k	2 k	4 k	8 k	
General work on engine (2m ref.)	60	53	53	58	57	61	63	62	68
Accumulation (2)	3	3	3	3	3	3	3	3	
On-time (100%)	0	0	0	0	0	0	0	0	
Distance (90m)	-39	-39	-39	-39	-39	-39	-39	-39	
Screening	-9	-11	-14	-17	-19	-22	-25	-28	
Subtotal	14	6	4	5	2	2	1	-3	9
Hydraulic ramp lifting (2m ref.)	55	70	69	67	68	64	57	49	71
Accumulation (4)	6	6	6	6	6	6	6	6	
On-time (30sec cycle)	-21	-21	-21	-21	-21	-21	-21	-21	
Distance (90m)	-39	-39	-39	-39	-39	-39	-39	-39	
Screening	-9	-11	-14	-17	-19	-22	-25	-28	
Subtotal	-2	11	8	3	0	-6	-16	-28	5
Impact wrench (wheel nut) (2m ref.)	59	60	60	69	68	76	77	77	82
Accumulation (50)	17	17	17	17	17	17	17	17	
On-time (5sec cycle)	-29	-29	-29	-29	-29	-29	-29	-29	
Distance (90m)	-39	-39	-39	-39	-39	-39	-39	-39	
Screening	-9	-11	-14	-17	-19	-22	-25	-28	
Subtotal	-1	-2	-5	2	-2	2	1	-2	8
Total Specific Sound Level	21	15	12	13	10	12	10	6	18