

**Xpress Vehicle
Solutions
Tesco Extra car park
Princess Road
Chelmsford
CM29XW**

BS4142: ENVIRONMENTAL SOUND SURVEY

DATE OF ASSESSMENT:	31 st of May 2017
ASSESSMENT CARRIED OUT BY:	Paul Vickers
EQUIPMENT USED:	CEL-63x 633 Class 1 SOUND LEVEL METER, CEL-120/1 Class 1 calibrator

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Introduction

This report assesses the sound levels that may be generated at the proposed Xpress Vehicle Centre which will be located in the car park of Tesco's Extra in Chelmsford.

In order to assess the sound generated an existing vehicle centre in Chesterfield was monitored on the 30th of May 2017, as shown in Figure 1. The Chelmsford site was monitored on the 31st of May 2017.

The proposed hours of operation are 8am to 5pm Monday to Friday.

Xpress Vehicle Centre is a small, standalone unit used to undertake vehicle panel repairs. Activities at the site include spray painting, occasional sanding, panel beating, and the use of an airline. Noise generating activities are carried out inside of the building with the doors closed.

The Tesco's Extra operates 24 hours a day Monday to Friday with reduced hours on Saturday and Sunday. Existing sound is generated from cars arriving and leaving, car doors slamming and trolleys being pushed.

Deliveries appear to be at the back of the store with access from Princess road.

Landscape description and sound sensitive receptors

To the left of the proposed building is a mud embankment that inclines to around 1 metre above floor level. A 1.8 metre high fence belonging to the neighbours on Bruce Grove is located at the top of the embankment and is 11.5 metres away from the proposed location. The embankment is soft and is covered in trees and bushes.

Figures 2 to 5 show the proposed location of the vehicle centre at Chelmsford and the neighbours who may be affected. It should be noted that the building work shown in the aerial pictures was complete at the time of the assessment with more parking spaces having been added.

Figure 4 also shows the monitoring positions at the Chelmsford site.

Measurement locations

Measurements were taken at the Chesterfield site at, the front, right side, and at the back of the building when viewed from the entrance.

Measurements were taken at the Chelmsford site at the proposed location of the building 3.5 metres from the proposed fans location and 11.5 metres from the fence of the nearest neighbour, a further reading was taken next to the B1007 30 metres from the proposed site. Further information is given in the measurement procedure.

Pictures and site plans



Figure 1. Existing building in Chesterfield.

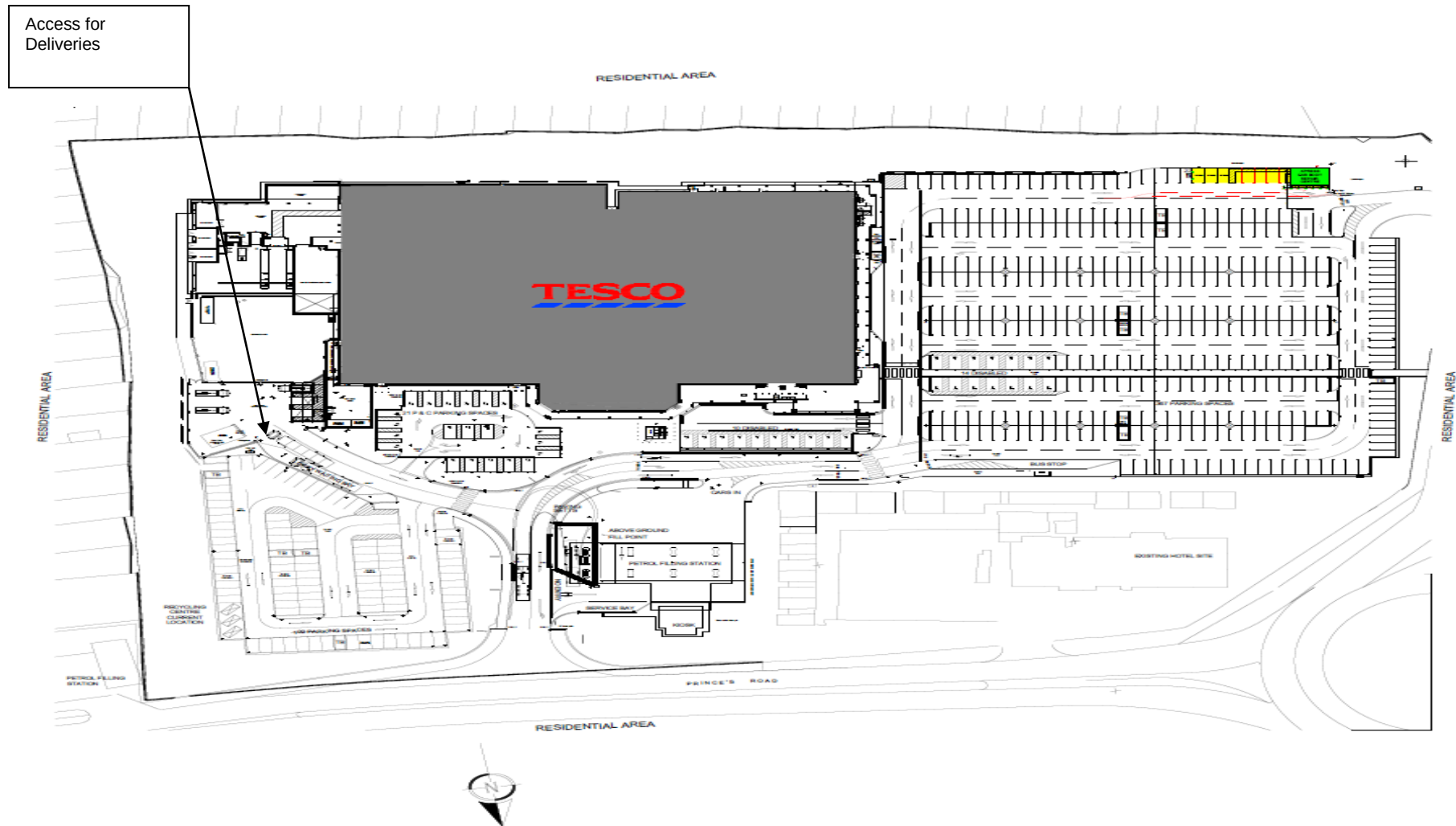


Figure 2 site plan of Chelmsford Tesco

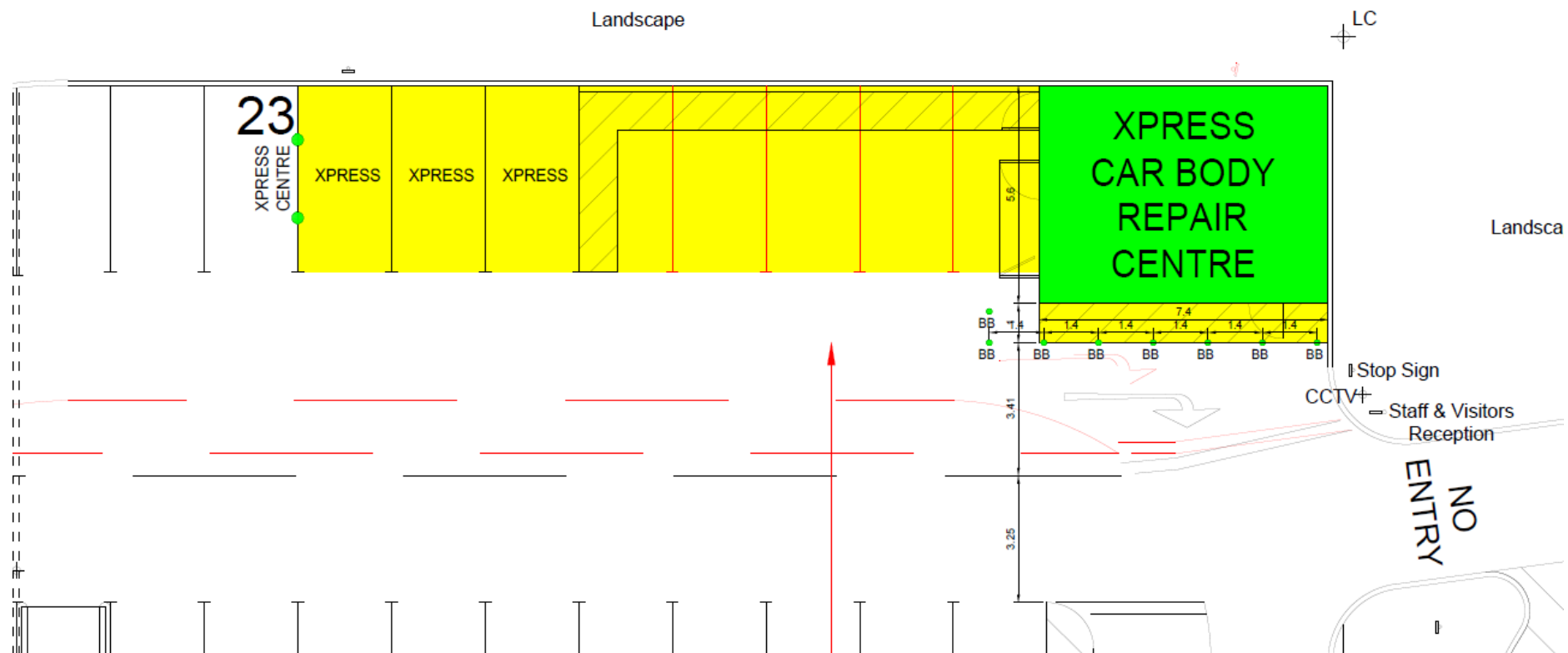


Figure 3 schematic of proposed building at Chelmsford

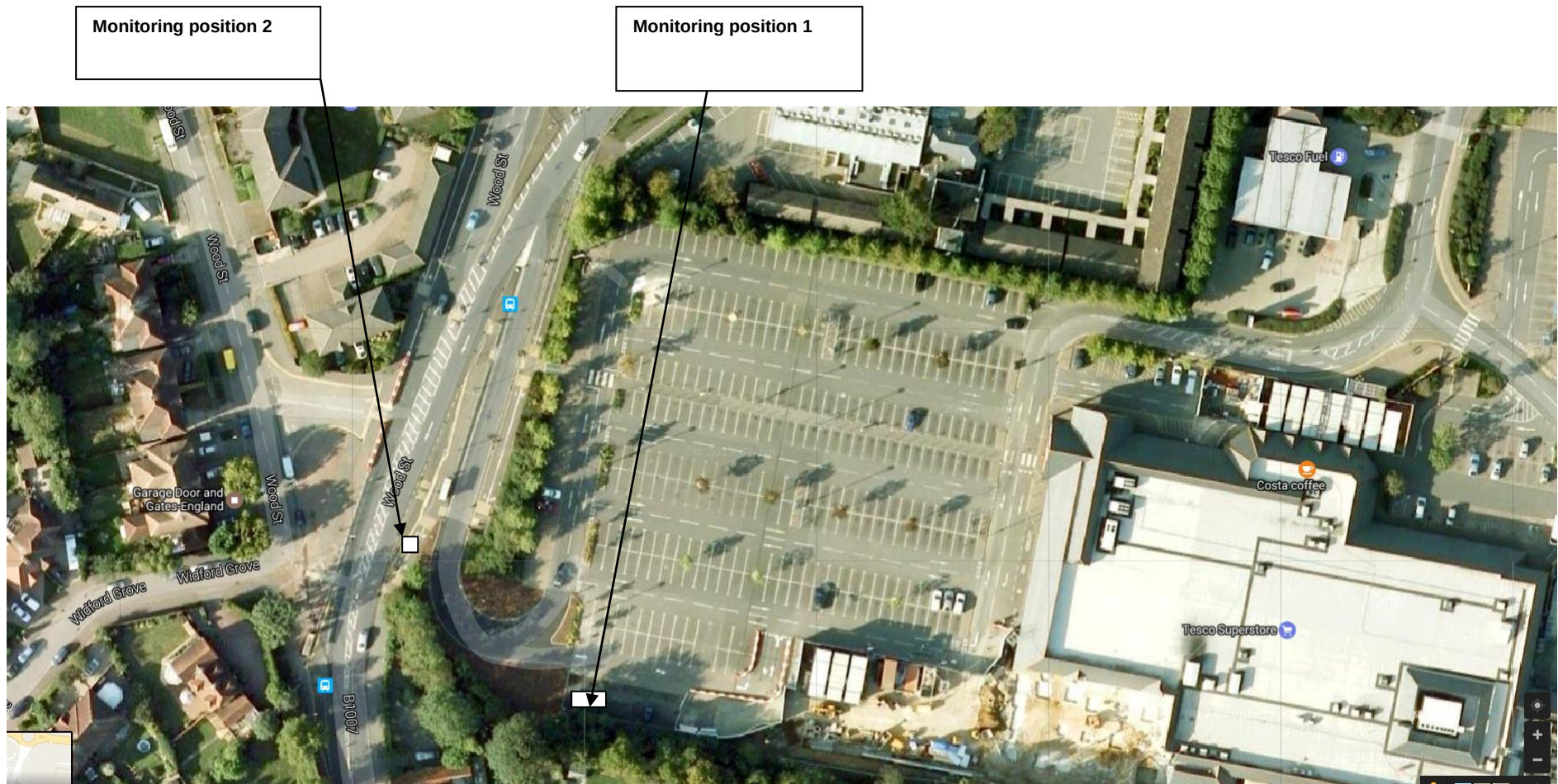


Figure 4 Aerial view of the proposed location and monitoring positions at Chelmsford site



Sound sources

Site 1 Chesterfield

A prevalent sound source in the form of an extraction fan on the top back right side of the building was present at site 1 and will be present at the new site in Chelmsford. The extraction fan sounded like a low rumbling and could easily be heard at the measurement locations. The fan is used two times a day for an average of 30 minutes each time.

A smaller fan located on the top back left side could also be heard when the extraction was not on. This fan is part of the airflow system and is on the entire time of operation and is switched off at the end of the day.

A busy road located 9 meters away from the rear of the building added to the overall sound in the area.

The sound of cars, trolleys, people talking, and car doors being closed was present within the Tesco car park area.

The occasional use of tools for sanding, and panel beating and an air line to remove dust can be heard from the front of the building.

No other sources of sound were observed at site 1.

Site 2 Chelmsford

A busy road located 30 meters away from the rear of the proposed building added to the overall sound in the area.

The sound of cars, trolleys, people talking, and car doors being closed was present within the Tesco car park area.

No other sources of sound were observed at site 2.

Weather conditions during monitoring

Site 1 Chesterfield

Date	30/5/2017
Wind	A Westerly wind of between 0.0- 4.9 meters per second (M/S) was recorded at the monitoring site.
Cloud cover	Between 90 and 100%.
General Weather	A very light fine rain occurred sporadically throughout the monitoring period. This will not have had an effect on the noise levels during the monitoring.
Temperature	20°C-22°C was measured during the monitoring period.

Site 2 Chelmsford

Date	31/5/2017
Wind	A North easterly wind of 0.0 – 0.6 meters per second (M/S) was recorded at the monitoring site.
Cloud cover	Between 40 and 80%.
General weather	Dry, overcast with sun appearing during the second measurement
Temperature	22-25°C

Equipment list

CEL-63x 633 Class 1 SOUND LEVEL METER

CEL- 120/1 Class 1 calibrator

Wind shield

Tripod

Outdoor monitoring kit

Wind speed indicator and temperature gauge

Tape measure

Compass

Notebook and pen

Measurement procedure

All measurements were taken in line with BS4142:2014 Methods for rating and assessing industrial and commercial sound.

A CEL63x Class 1 Sound Level Meter with a wind shield and an outdoor kit was used to take the measurements. The Sound Level Meter was set on a tripod 1.4 metres above the ground. The sound level meter was set in a vertical position.

The Vehicle centre operates between the hours of 8am and 5pm Monday to Friday which means that day time readings are suitable for the measurements with a reference time of one hour.

Site 1 Chesterfield

The sound level meter was set up 3.5 metres away, at the rear of the building being monitored, 4 metres away at the front of the building, and 16 metres to the right hand side of the building.

The ground was assessed to be hard mud and stone, which reflects more sound towards the meter as opposed to being absorbed by the ground, and therefore adds 3 decibels (dB) to the sound received at the meter.

Measurements were recorded on the sound level meter and in a notebook.

The distance from the source and height of the sound level meter were measured by a tape measure.

Site 2 Chelmsford

The sound level meter was set up at the location of the proposed building, 3.5 metres away from the proposed location of the fan and 11.5 metres away from the fence line of the neighbours.

The sound level meter was set up next to the busy B1007 road 30 metres away from the proposed new building.

Calibration

The sound level meter was calibrated to 114dB using a portable CEL- 120/1 Class 1 calibrator before and after the readings were taken.

The Sound Level Meter and portable Calibrator were calibrated in a UKAS accredited laboratory within the last 2 years.

Measurement period

Measurements were taken on Tuesday the 30th of May 2017 at the Chesterfield site between the hours of 8am and 2pm.

Measurements were taken at the Chelmsford site on Wednesday the 31st of May 2017 between the hours of 8 am and 1 pm.

Results

Results of significance are shown below.

Site 1 Chesterfield

Reading	Location	Ambient dB(A)	Residual dB(A)	Background L _{A90} dB(A)	Duration
1	Residual 3.5 metres from source	-	64.0	59.0	60 minutes
2	Ambient constant fan 3.5 metres from source	69.0	-	61.0	60 minutes
3	Ambient Intermittent extraction fan 3.5 metres from source	70.0	-	65.5	60 minutes

Site 2 Chelmsford

Reading	Location	Ambient dB(A)	Residual dB(A)	Background L _{A90} dB(A)	Duration
1	Residual 3.5 metres from potential source	-	55.0	51	60 minutes
2	Residual 30 metres from potential source	-	69.0	51	15 minutes

The results from the Chesterfield site for the constant small fan suggest that 6dB(A) should be added to the overall sound in the environment at the Chelmsford site.

The results for the large infrequent extraction fan suggest that 9dB(A) should be added to the overall sound in the environment at the Chelmsford site when the fan is in use.

Calculations

Site 2 Chelmsford

Small constant fan

Expected Ambient 3.5m from proposed fan location= Residual + small fan =61.0dB(A)

Residual 3.5m from fan = 55.0dB(A)

Specific = $10 \times \log(10^{61.0/10} - 10^{55.0/10}) = 60.0\text{dB(A)}$

Distance attenuation to 11.5 metres= $60.0 - 20 \times \log(11.5/3.5) = 50.0\text{dB(A)}$

Penalty rating- (constant hum) + 3dB

Rating $50.0 + 3 = 53.0 \text{ } L_{A,T,r}$

Background distanced attenuated to 11.5m from source= 41.0dB(A)

Rating minus background= $53 - 41 = +12\text{dB(A)}$

Large intermittent fan

Expected ambient 3.5m from proposed fan location = residual + small fan + large fan = 64.0dB(A)

Residual 3.5m from fan = 55.0dB(A)

Specific = $10 \times \log(10^{64.0/10} - 10^{55.0/10}) = 63.0\text{dB(A)}$

Distance attenuation to 11.5 metres= $63.0 - 20 \times \log(11.5/3.5) = 53.0\text{dB(A)}$

Time attenuation= $10 \times \log((6.07 \times 10^{53.0/10})/60) = 43.0\text{dB(A)}$

Penalty rating- (Intermittent sound) + 3dB

Rating $43.0 + 3 = 46.0 \text{ } L_{A,T,r}$

Background at 11.5m from source= 41.0dB(A)

Rating minus background= $46 - 41 = +5$

BS4142 guidance on assessing the impact of sound

BS4142 gives the following guidance on assessing the impact of sound based on the rating and background level.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- The lower the rating level is relative to the measured background sound level; the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

Discussion

The result for the sound rating for the constant hum from the fan is plus 12dB(A) which in relation to BS4142: 2014 suggests that the sound source will have a significant adverse impact on the nearby residential properties. Therefore it is prudent to use noise mitigating measures. For instance the installation of a fence around the back and side of the building which continues on past the front of the building for a few metres should be considered. The use of silencers on the extraction units may also be a prudent measure. The existing neighbour's fence has gaps in between each slat and therefore would not be effective for mitigating noise.

The operating times of the unit are currently 8am to 5pm and therefore it is expected that disruption from sound during these times would be less when compared to other times of the day.

It should also be noted that daytime sound levels within the outdoor area of a residence are recommended to be kept below 55dB(A). The sound generated at the fence line is predicted to be 53dB(A).

The tools used at the site during the day are used so infrequently it was not possible to attain readings at the front of the building with the tools in use. Furthermore the level of traffic changed which led to a higher residual reading than the ambient reading. The generation of intermittent sound from tool use is more likely to lead to complaints, however all tools are used during the day with the doors closed.

The results for the neighbours next to the B1007 suggest that no adverse affects will occur from added sound to the area during the day.

Conclusion

BS4142: 2014 states that a result of plus 12dB(A) is likely to have a significant adverse impact on the nearby residential properties. Therefore the use of noise mitigating barriers and silencers is recommended.

Limitations

The location of the building being assessed at the Chesterfield site was next to a closed business car park area which would be equivalent to the houses at the Chelmsford site, however there was no access to this area on the day of the monitoring; furthermore there was no access down the side of the building due to trees and bushes. Therefore readings had to be taken at the back, side and front of the building.

Cars were passing by on a nearby road at both sites and therefore sound levels will vary throughout the day and dependant on the day of the week; however this is part of the overall background sound in the area.

The ideal measurement location at the Chelmsford site was near to the fence of the closet neighbour, however this was inaccessible with the equipment. The second best measurement location where the fan is expected to be was blocked by an abandoned car.

The tools are used so infrequently it was not possible to attain readings at the front of the building with the tools being used. Furthermore the level of traffic changed which led to a higher residual reading than the ambient reading.

Readings at different distances from a sound source will be different; however there can also be discrepancies between the expected Ambient and Residual readings at both locations.

Definition of terms

The Ambient sound consists of the sound of the fan and the general sound in the area over the time of the monitoring, and is expressed as the L_{Aeq} .

The residual sound consists of the sound in the area when the fan is switched off, with results expressed as the L_{Aeq} .

The background sound is the sound in the area that exceeds a certain level 90% of the time, and is expressed as the L_{A90} .

Specific sound is the specific sound source that is being assessed.

L_{Aeq} = equivalent continuous sound pressure level in dB measured over a period of time.

$L_{Ar,Tr}$ Rating level is the measured level adjusted for characteristics which may enhance the effect of sound on people.

A Weighting - as in dB(A)

dB is decibel. The human ear does not hear all sounds equally and is more receptive to noise which falls into the speech range so we can communicate more clearly. This means that when we measure noise we cannot just take all frequencies (the deep bass noises up to the high pitch whistles and squeaks) and measure them equally. The A Weighting is a process which makes sure the result is comparable to how a human hears noise.

Free field is a measurement of sound taken in a location that is free from reflective surfaces, not including the ground. Free field measurements should be taken 3.5 metres away from any reflective surfaces.

Certificate of Competence in Environmental Noise Measurement

This is to certify that

Paul Vickers

*has completed a course of instruction approved by the
Institute of Acoustics and designed to enable the candidate
to undertake environmental noise measurements in a
competent manner and has achieved a satisfactory
performance in the written and practical examinations
thereof and that this fact has been recorded in a
Register kept by the Institute for this purpose.*



Education Committee Chairman



Institute Secretary

Date 7 October 2016

Centre EEF Sheffield

Reference Number EC108

*For the purposes of Credit Transfer or Professional Development this Certificate
may be considered to be equivalent to 25 points or hours*

The Institute of Acoustics Limited, 3rd Floor, St Peter's House, 45-49 Victoria Street, St Albans, Hertfordshire AL1 3WZ.
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Calibration certificate

Certificate of Calibration Issued by University of Salford (Acoustics Calibration Laboratory)		University of Salford MANCHESTER
Page 1 of 2		
APPROVED SIGNATORIES Claire Lomax [x] Andy Moorhouse [] Gary Phillips [] Danny McCaul []		
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Certificate Number: 02363/4

Date of Issue: 3 August 2015

PERIODIC TEST OF A SOUND LEVEL METER to IEC 61672-3:2006

FOR:	3A Technology Limited 28D Vernon Mill Mersey Street Stockport Cheshire SK1 2HX
FOR THE ATTENTION OF:	Jon Stanswood
CALIBRATION DATE:	31/07/2015
TEST PROCEDURE:	CTP08 (Laboratory Manual)

Sound Level Meter			
Manu:	CEL	Model:	CEL-63x Serial No: 1939556
Microphone			
Manu:	CEL	Model:	CEL-251 Serial No: 2239
Preamp			
Manu:	CEL	Model:	CEL-495 Serial No: 001796

Test Engineer (initial): GP Name: Gary Phillips

This certificate provides traceability of measurement to recognised national standards, and to the units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)

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Certificate Number: 02363/2

Date of Issue: 31 July 2015

Procedures from IEC 61672-3: 2006 and TPS 49 Edition 2 June 2009 were used to perform the periodic tests.

The manufacturer's instruction manual was marked as follows: CEL-63x HB3356-02.

Adjustment data used to adjust the sound levels indicated in response to the application of a multi-frequency sound calibrator to sound levels equivalent to those that would be indicated in response to plane, progressive sound waves were obtained from the manufacturer's instruction manual referred to in this certificate.

The sound level meter calibration check frequency is 1000 Hz, the reference level is 114 dB. As this instrument only has a single range, this range is the reference level range.

The environmental conditions in the laboratory at the start of the test were:
Static pressure 101.314 kPa, air temperature 23.0 °C, relative humidity 47.3 %.

The initial response of the instrument to application of the suitable laboratory sound calibrator was 114.0 dB (Z). The instrument was then adjusted to indicate 113.8 dB (Z). This indication was obtained from the calibration certificate of the calibrator, and information in the manufacturer's instruction manual specified in this certificate, when the instrument set to Freefield. The instrument was calibrated without a windshield. Consult manufacturer's instructions if using a windshield.

With the microphone replaced by the electrical input device specified in the manufacturer's instruction manual, the levels of self-generated noise were:

A: 12.0 dB
C: 15.6 dB
Z: 23.0 dB

The environmental conditions in the laboratory at the end of the test were:
Static pressure 101.287 kPa, air temperature 23.1 °C, relative humidity 43.2 %.

The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

Instruments used in the verification procedure were traceable to *National Standards*. The multi-frequency calibrator method was employed in the acoustical tests of a frequency weighting.

The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.

This certificate provides traceability of measurement to recognised national standards, and to the units of measurement realised at the National Physical Laboratory or other recognised national standards laboratories. This certificate may not be reproduced other than in full except with the prior written approval of the issuing laboratory.