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PROPOSED SKATEPARK: LOWER TELEGRAPH HILL: LEWISHAM

AS6259.101020.NIA

An Assessment of the Impact of a Proposed New Skatepark on nearby Residential Premises

Prepared: 20th October 2010

Green Scene
Wearside Service Centre
Wearside Road
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CONTENTS

List of Attachments

AS6259/SP1	Site Plan showing noise survey locations and the proposed skatepark location
AS6259/TH1 – 10	Time Histories showing the current typical noise levels at nearby residential properties
AS6259/SP2	Showing the location of nearby residents and mitigation measures proposed for the skatepark.
Appendix A	Acoustical parameters

1. INTRODUCTION

It is proposed to construct a new skatepark in the Lower Telegraph Hill Park. The proposed location is to the east of the basket ball cage on the eastern side of the park.

The closest affected residential properties are to the east on Pepys Road at approximately 40 metres, and to the west on Erlanger Road at approximately 105 metres from the centre of the skatepark location. The area is subject to moderate road traffic noise from vehicles on the above mentioned roads.

Alan Saunders Associates have been commissioned by Green Scene to undertake a background noise survey of the prevailing noise climate and subsequently assess the suitability of the site for the skateboard park facility in relation to current standards and guidance documents and other appropriate assessment procedures.

2. SURVEY PROCEDURE

An environmental noise survey was carried out over the weekend period from 12:30 hours on Friday 8th to 14:15 hours on Wednesday 13th October 2010. Measurements of the $L_{Amax:\ fast}$, L_{A10}, L_{Aeq}, and L_{A90} noise levels were made over consecutive 15-minute periods. The following equipment was used for the survey.

- Norsonic Data Logging Sound Level Meter type 118
- Norsonic Data Logging Sound Level Meter type 116
- Norsonic Sound Level Calibrator type 1253

The measurement location was considered to be representative of the typical noise levels existing at the closest and most affected residential properties to the east of the skatepark site. The microphones were set up on first floor level of 178 Erlanger Road (Position 1) and 127 Pepys Road (Position 2), both overlooking the Lower Telegraph Hill Park and the skatepark location. These measurement locations are shown in the site plan AS6259/SP1.

Additional manual measurements were undertaken near to the other noise sensitive receivers which confirmed that noise levels were similar to those measured contemporaneously at the monitoring location.

The calibration of the equipment was verified before and after use. No calibration drift was observed. Measurements were made generally in accordance with BS 7445: 1991

description and measurement of environmental noise Part 2 - *Acquisition of data pertinent to land use* as far as possible.

The weather during the site visit and over the survey period was mainly dry with occasional light rain. Wind speeds were very light from the west during the survey period.

An explanation of the acoustic terminology used in this report is in given in Appendix A.

3. RESULTS

The typical $L_{Amax: fast,}$ $L_{A10,}$ L_{Aeq} 15-minute environmental noise levels over the survey period are shown in the Time Histories AS6259/TH1-TH5 for Position 1 at Erlanger Road and Time Histories AS6259/TH6-TH10 for Position 2 at Pepys Road. Based on an operational period for the skatepark from 09:00 – 21:00 hours, typical noise levels measured on site are shown in Table 3.1.

Monitoring period 09:00 – 21:00 hrs.	**Typical $L_{Aeq,15min}$ (dB)**	**Typical $L_{A90,15min}$ (dB)**	**$L_{Amax\ fast}$ (dB)**
178 Erlanger Road	55	48	76
127 Pepys Road	60	47	78

Table 3.1 – Current measured noise levels: dB ref 20μPa

The above measured levels show that the underlying background noise levels at both measurement positions are similar with the buses and passing road traffic giving a slightly higher L_{Aeq} level at Pepys Road.

4. METHODS OF ASSESSMENT

In relation to the noise produced by leisure activities, such as skateboarding, there are no specific assessment methods or criteria in relation to noise impact. There are, however, a number of assessment methods which are related to this type of activity and have been used extensively by Alan Saunders Associates in relation to this type of skateboard noise. These methods were accepted by the court in the landmark case in relation to skateboard noise, Richardson v Devizes Town Council and have been adopted buy a number of local authorities.

In order to assess the impact of noise from the skatepark, reference should be made to published guidelines which reflect current scientific thinking and Government advice. This

'good practice' of using assessment methods which are relevant and helpful, is endorsed by the procedures set out in BS9142: *Guidelines for Environmental Noise Management* whose final draft is now with the British Standards Institute.

Measurements of skateboard/skatepark use noise have been undertaken at numerous other sites previously by Alan Saunders Associates as part of design and research projects. The data that will be used for this assessment were measured at a concrete skatepark, which is the same as the proposed construction material and semi bowl type for this site. The data used for this assessment uses the average noise level generated by approximately 20 skaters with 5 using the skatepark ramps measured at a distance of 40m. To ensure a robust assessment, this level has been used throughout, although it is unlikely that this many skaters would use the park during all of the opening hours. Maximum noise levels of events have also been measured at this distance, which will be used to assess event noise. The noise levels will be calculated to 1m outside the windows of the nearest residential receivers using standard sound propagation theory and including the acoustic screening currently existing for Pepys Road by virtue of the landform of the Park.

From experience, all of the following three methods of assessment need to show acceptable noise levels for a new skatepark to ensure that complaints in relation to activity noise are unlikely to occur. In practice, the third method of assessment based on the '*Clay Target Shooting, Guidance on the Control of Noise*' which relates specifically to the maximum noise levels, the most common cause of complaints, is the most sensitive.

4.1 British Standard BS4142: 1997

British Standard BS4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas* is designed explicitly to assess the noise impact from industrial noise on residential properties, and does not refer to any recreational areas. However, due to the lack of guidance when assessing skatepark noise and the quantification of tonal, impulsive or intermittent noise upon residential receivers, BS4142 can at least provide some guidance as to the likelihood from complaints, even though it may not be specifically designed for this purpose. As stated earlier, this assessment methodology has been accepted by the court in the case Richardson v. Devizes Town Council with regard to skatepark noise impact.

In order to quantify the impact of the skateboard activities, the British Standard BS 4142:1997 *Rating industrial noise affecting mixed residential and industrial areas* is useful

since it considers the character of the noise. This standard compares the noise levels in terms of an L_{Aeq} for a one hour period during the daytime (07:00 – 23:00 hours) and a five minute period during the night-time (23:00 – 07:00 hours) for the noise source in operation, the *'Specific Noise Level'*, with the existing background noise level in terms of an L_{A90} when the noise source is not operating.

As part of the assessment, consideration is given to the character of the noise. The standard states:

> *'If the noise contains a distinguishable, discrete, continuous note (whine, hiss, screech, hum, etc.), or if there are distinct impulses in the noise (bangs, clicks, clatters, or thumps), or if the noise is irregular enough to attract attention, add 5dB to the Specific Noise Level to obtain the Rating Level'.*

From observations, skateboarding noise is transient with many bangs as the skaters hit the top of the ramps or jump on and off the equipment. This + 5dB *'character correction'* has, therefore, been applied in subsequent calculations.

This standard then compares the noise level corrected for any *'character correction'* as an $L_{Aeq\ 1\ hour}$ (for daytime) for the noise source in operation, called the *'rating level'* with the existing underlying *'background noise level'* in terms of an L_{A90} when the noise source is not operating. The arithmetical difference between the *'rating level'* and the background is called the *'assessment level'*.

BS4142 indicates for the *'assessment level'*, that in relation to noise sources of an industrial nature:

- *'A difference of around +10 dB or higher indicates that complaints are likely.'*
- *'A difference of around +5 dB is of marginal significance.'*
- *'If the rating level is more than 10 dB below* [i.e. -10dB(A)] *the measured background noise level then this is a positive indication that complaints are unlikely.'*

For skateparks, however, an assessment level of 0dB is used as a criterion of acceptability.

The measured noise levels for skateboarding activities at another small concrete bowl skatepark being used simultaneously by about 5 skaters have been used as the basis for this assessment. These measured levels have been corrected for distance so as to give the

levels outside the closest properties. The residences that would be most affected by noise from the skate park would be at Erlanger Road to the west and Pepys Road to the east.

These noise levels are shown in Table 4.1. These indicate the *Specific Noise Level:* $L_{Aeq:1\ hour}$ values for skateboarding which have been used for the BS4142 assessments.

Condition	Location	*'Specific Noise Level'* $L_{Aeq:1hour}$ (dB)	Background $L_{A90\ 5min}$ (dB)	*'Rating Level'* $L_{Aeq\ T\ :1hr}$ (dB)
Skateboarding noise to 178 Erlanger Road (west)	Position 1	46.1	48	51.1
Skateboarding noise to 127 Pepys Road (east)	Position 2	39.5	47	44.5

Table 4.1 – Measured skateboarding noise levels **dB ref 20μPa**

Summarising the differences between the *'rating level'*, and the *'background'* L_{A90} level when there is no skateboarding activity over the proposed opening hours of 08:00 – 21:00 hours, the following *'assessment levels'* have been predicted.

Location	*'Assessment Level'* (dB)	BS4142:1997 Assessment
Skateboarding noise to 178 Erlanger Road (west)	+3dB	Not Acceptable for skateboarding noise
Skateboarding noise to 127 Pepys Road (east)	-2.5dB	Acceptable for skateboarding noise

Table 4.2 – Predicted 'assessment levels' **dB ref 20μPa**

The above indicates that the predicted rating noise levels at 178 Erlanger Road property from the new skatepark without mitigation (to be dealt with subsequently) would be above the current typical background noise levels and not achieve the rating level criterion for skateboard noise of 0dB.

For the nearby properties on Pepys Road the predicted rating noise levels from the new skatepark would be below the current typical background noise levels and achieve the rating level criterion for skateboard noise of 0dB.

4.2 World Health Organisation: Guidelines on Community Noise: 1999

The WHO document *Guidelines for Community Noise* sets out guidance on external noise levels at which there will be an unacceptable impact on communities. This guidance considers many different types of noise sources. In paragraph 4.1.7 the impact of noise on dwellings is considered. The document states:

> *'During the daytime, few people are seriously annoyed by activities with* [steady] L_{Aeq} *levels below 55dB; or moderately annoyed with* L_{Aeq} *levels below 50dB. Sound pressure levels during the evening and night should be 5 -10dB lower than during the day* [i.e. 45 – 50dB serious annoyance; 40 – 45dB moderate annoyance]. *It is emphasised that for intermittent noise* [such as the skateboarding activities] *it is necessary to take into account the maximum* [i.e. the L_{Amax}] *sound pressure level as well as the number of events.'*

The levels referred to above are $L_{Aeq:16\ hour}$ values. As a worst case, assuming pessimistically that skateboarding on the new park is continuous for 9 of the 16 daytime hours, the $L_{Aeq:16hour}$ in front gardens of the receivers at Erlanger Road and Pepys Road would be approximately 37 - 44dB(A). This value is well below any of the limits indicated above for day or evening and indicates that the WHO Guidelines would consider these levels to be within acceptable levels in nearby gardens. Around Lower telegraph Park, in common with many urban areas, general levels of noise are already above this the levels recommended by the WHO Guidelines.

4.3 Comparison of Skateboard Noise to Gunshot Noise

The sudden nature, duration and the character of the skateboard impact noise during jumps and turns, etc., by skateboarders bears close aural similarity with the noise from gunshots at a distance.

There have been a number of research investigations into what levels of gunshot noise cause annoyance to residential occupants, notably by Sörensen S & Magnusson J, G F Smoorenburg and Hoffman. The current thinking on their impact which generally agrees with the previous research, has been published as *'Clay Target Shooting, Guidance on the Control of Noise'* published by the Chartered Institute of Environmental Health Engineers in January 2003. Measurement and social survey work carried out by the Building Research Establishment during 1996/1997 provides the basis for applying limits at noise sensitive premises, which range between the *'mid fifties'* to the *'mid sixties'* $SNL_{25\ Shots:30minutes}$.

The above research suggests that there is no fixed level for annoyance to occur. Annoyance is, however, *'unlikely'* below a level in the *'mid fifties'*: $SNL_{25\ Shots:30minutes}$ and *'highly likely'* above a level in the *'mid sixties'* $SNL_{25\ Shots:30minutes}$ as measured at the noise sensitive premises. The $SNL_{25\ Shots:30minutes}$ is the logarithmic average of the loudest 25 shots measured as a maximum (L_{Amax}) in a 30 minute period.

From the predicted levels of noise for skateboarding activity taking place, the levels at the Pepys Road properties would be 56B: $L_{Amax(fast)}$ and at the properties on Erlanger Road 63.5dB: $L_{Amax(fast)}$. These levels are equivalent to an SNL of 56dB at Pepys Road and 63.5dB at Erlanger Road.

Using the above assessment method, this level represents one at which annoyance by the skateboard noise levels at the properties on Pepys Road would be *'unlikely'*, but the noise levels at the properties on Erlanger Road would be approaching a level at which it is *'highly likely'*.

On the basis of this assessment, without mitigation measures there would be a possibility that these maximum skateboard noise levels may cause some complaints from the residents living on Erlanger Road.

5. MITIGATION MEASURES REQUIRED

In order to reduce the predicted adverse noise levels from skateboarding at the properties on Erlanger Road from the BS4142 and those using the clay target shooting guidance mitigation measures will be required. It is recommended that a fence of a solid construction (not less than 12kg/m^2 superficial density e.g. cementitious board) 1.2 metres high, be erected along the boundary to the north, south and west of the basketball court where it abuts the proposed skatepark. This will mean that the skateboard noise levels are acceptable using the BS4142 assessment method and with respect to the clay target shooting guidelines, the SNL will then be below the *'mid fifties'* at which annoyance is *'unlikely'*. The typical location of this fence is shown in the plan AS6259/SP2 in orange.

6. DISCUSSION

The above assessment methods have demonstrated that provided the proposed mitigation measures indicated above and in the site plan AS6259/SP2 are included in the design of the new skatepark it is unlikely that it would cause complaints and disturbance to nearby residents over the proposed operational hours of 09:00 – 21:00 hours. This operational period will coincide with the normal period over which the park is open to the public.

7. SUMMARY AND CONCLUSIONS

Noise measurements of skateboarding on a concrete bowl skatepark have been used to predict the possible noise impact of the proposed new skatepark in Lower Telegraph Hill Park, Lewisham.

There is no directly specific guidance as to the impact of skateboarding noise on the occupants of residential premises, but there is relevant guidance given by British Standard BS4142: 1997 *Rating industrial noise affecting mixed residential and industrial areas* the World Health Organisation document *Guidelines on Community Noise: 1999* and the *Clay Target Shooting, Guidance on the Control of Noise* published by the Chartered Institute of Environmental Health Engineers in January 2003.

The most sensitive properties (Pepys Road) are some 40 metres from the proposed skatepark location, with other properties at Erlanger Road (105 metres).

From the predicted noise levels at these residences, the likely impact of the skateboarding noise on the residential amenity has been considered using the three documents referred to above. This initial evaluation procedure has been used successfully at other currently operational skateparks.

An assessment in accordance with BS4142:1997 has shown that the complaints are not likely at Pepys Road but levels at Erlanger Road require some marginal mitigation.

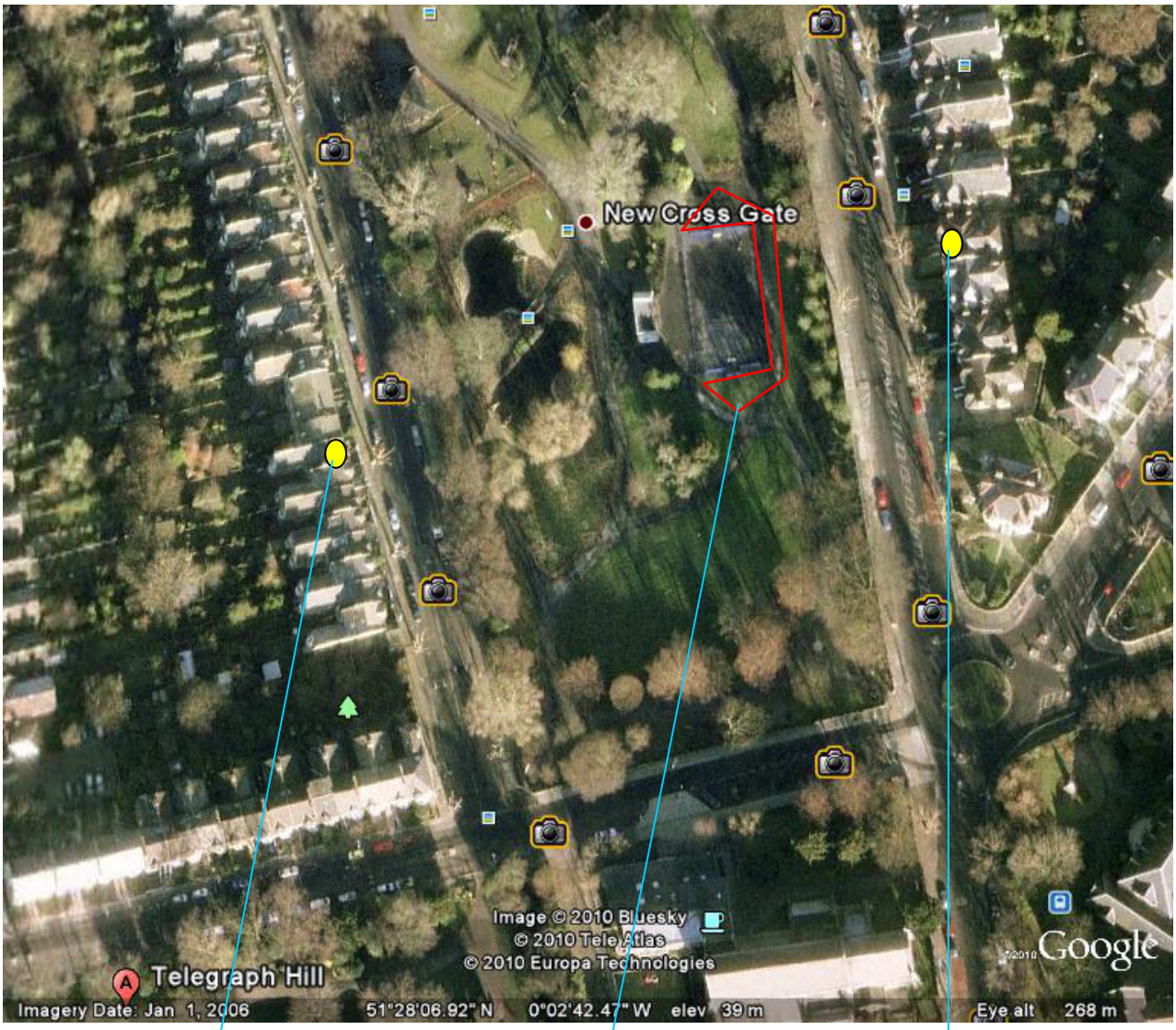
Comparison of the measured levels during skateboarding activities at nearby residential premises with the guidance given in the WHO document *Guidelines on Community Noise: 1999*, indicates that noise levels are within acceptable levels to maintain external levels of amenity for nearby residents. The document does not, however, consider the maximum levels (L_{Amax}) during the daytime and this aspect of skateboard noise is generally the most annoying.

There is a considerable aural similarity between gunshots and the bangs which occur regularly during skateboarding during jumps and turns. Considering the predicted noise levels at properties at Erlanger Road and Pepys Road from skateboarding activities, the most recent guidance on the impact of gunshots (clay pigeon shooting) on residential premises considers that annoyance would be *'unlikely'* provided that all the mitigation measures indicated in this report are adopted.

On the basis of the above three assessments and guidance, there is agreement from all these methods that the proposed skatepark, with the mitigation measures proposed, is unlikely to cause annoyance to the closest residences over the normal operational period.

Alan Saunders

ALAN SAUNDERS ASSOCIATES



Microphone Position;
178 Erlanger Road

Proposed Location
of Skatepark

Microphone Position;
128 Pepys Road

Title: Environmental Noise Survey Measurement Location

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Project:

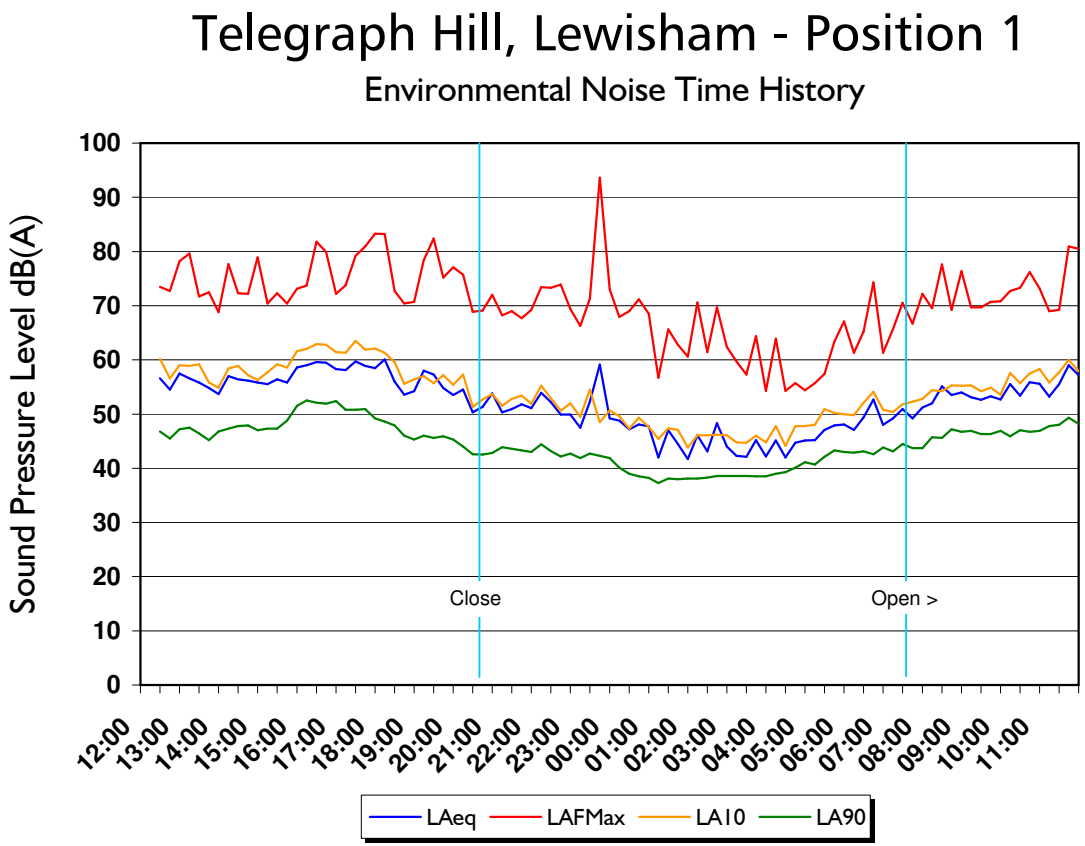
Telegraph Hill
Skatepark

Date: 20/10/2010

Scale: NTS

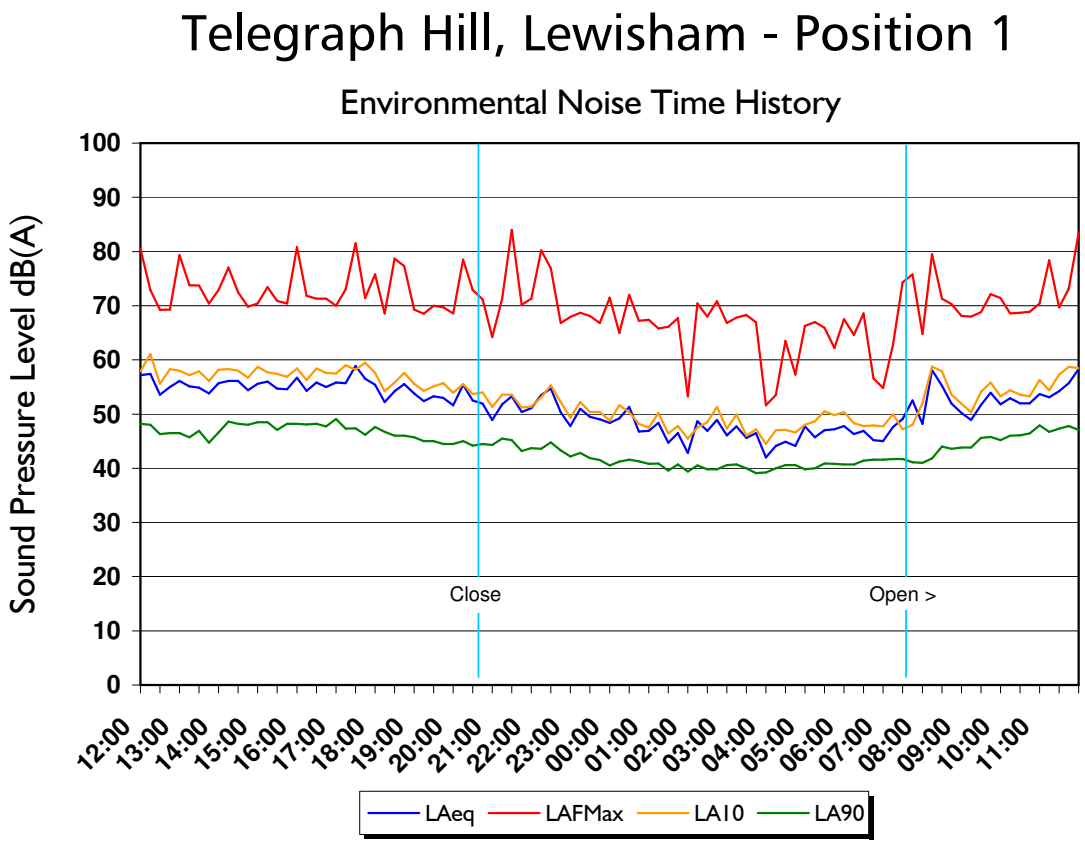
Figure No:

AS6259/SP1



Friday 08 October to Saturday 09 October 2010

Figure AS6259/TH1

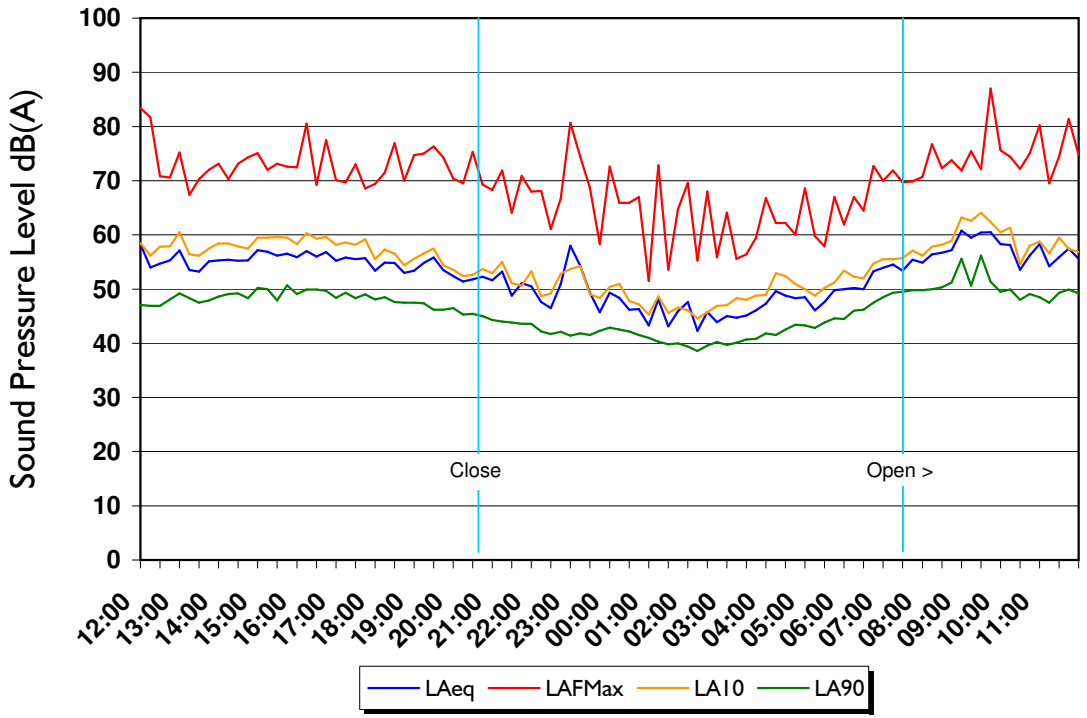


Saturday 09 October to Sunday 10 October 2010

Figure AS6259/TH2

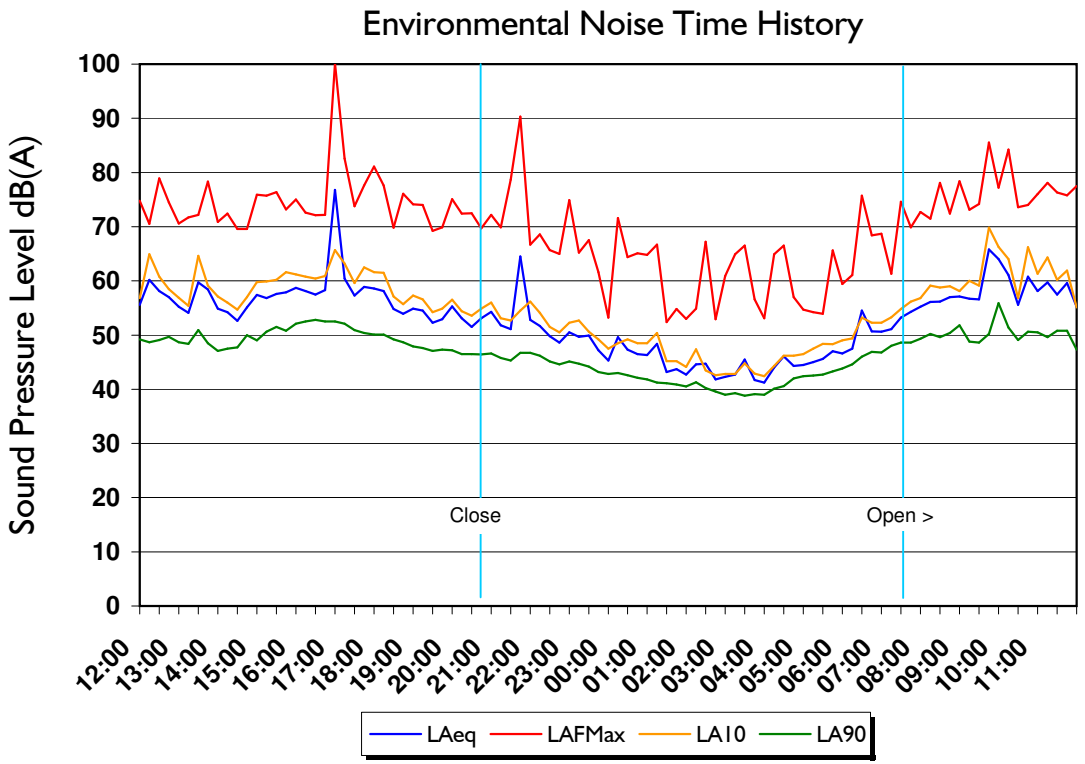
Telegraph Hill, Lewisham - Position 1

Environmental Noise Time History



Sunday 10 October to Monday 11 October 2010

Figure AS6259/TH3

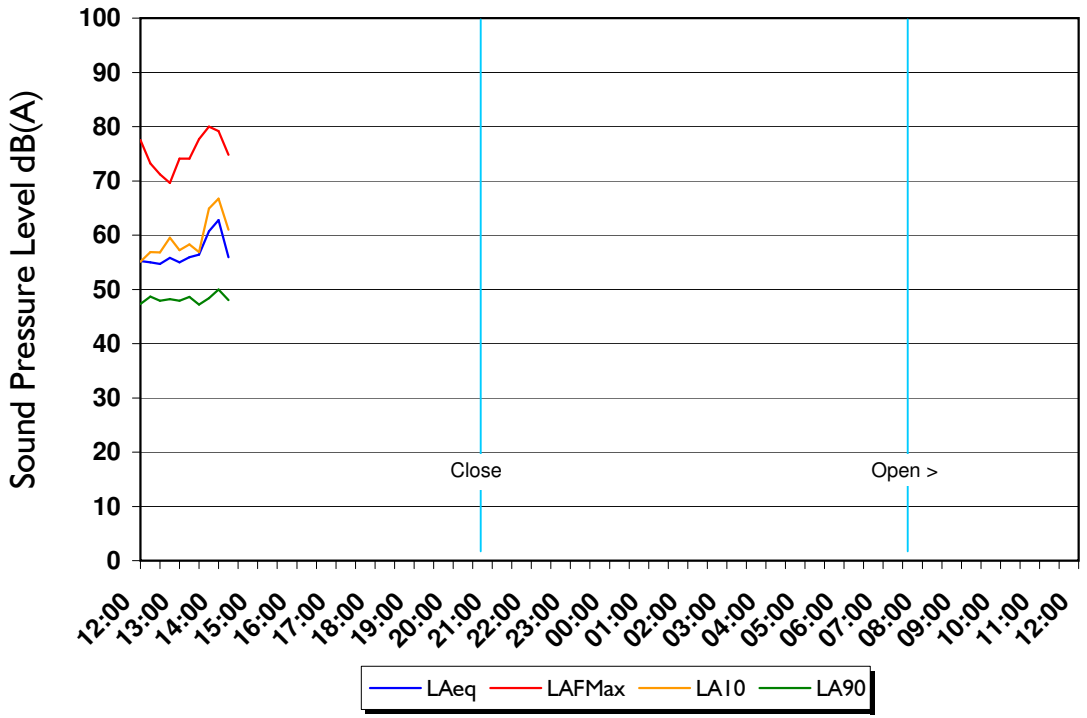


Monday 11 October to Tuesday 12 October 2010

Figure AS6259/TH4

Telegraph Hill, Lewisham - Position 1

Environmental Noise Time History

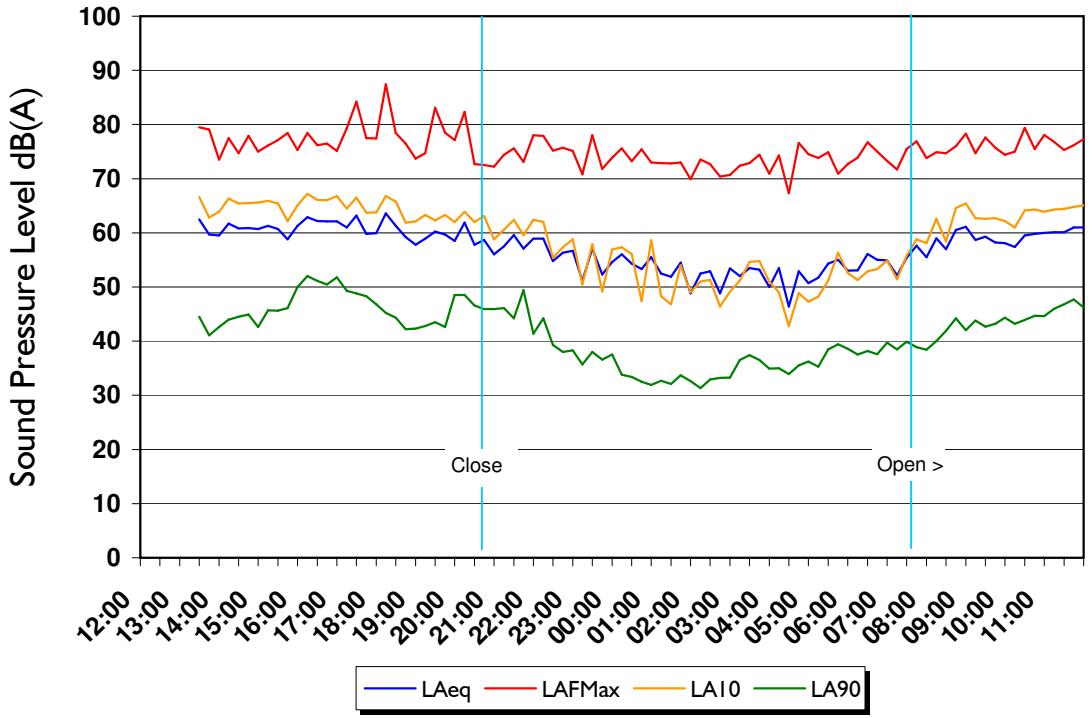


Tuesday 12 October to Wednesday 13 October 2010

Figure AS6259/TH5

Telegraph Hill, Lewisham - Position 2

Environmental Noise Time History

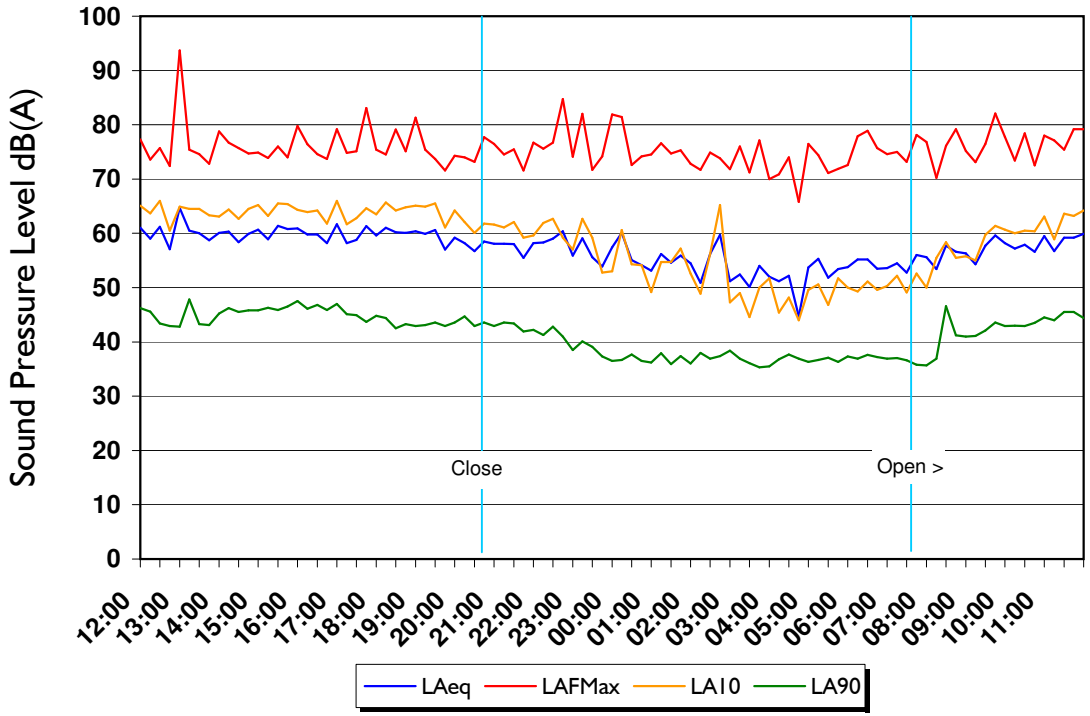


Friday 08 October to Saturday 09 October 2010

Figure AS6259/TH6

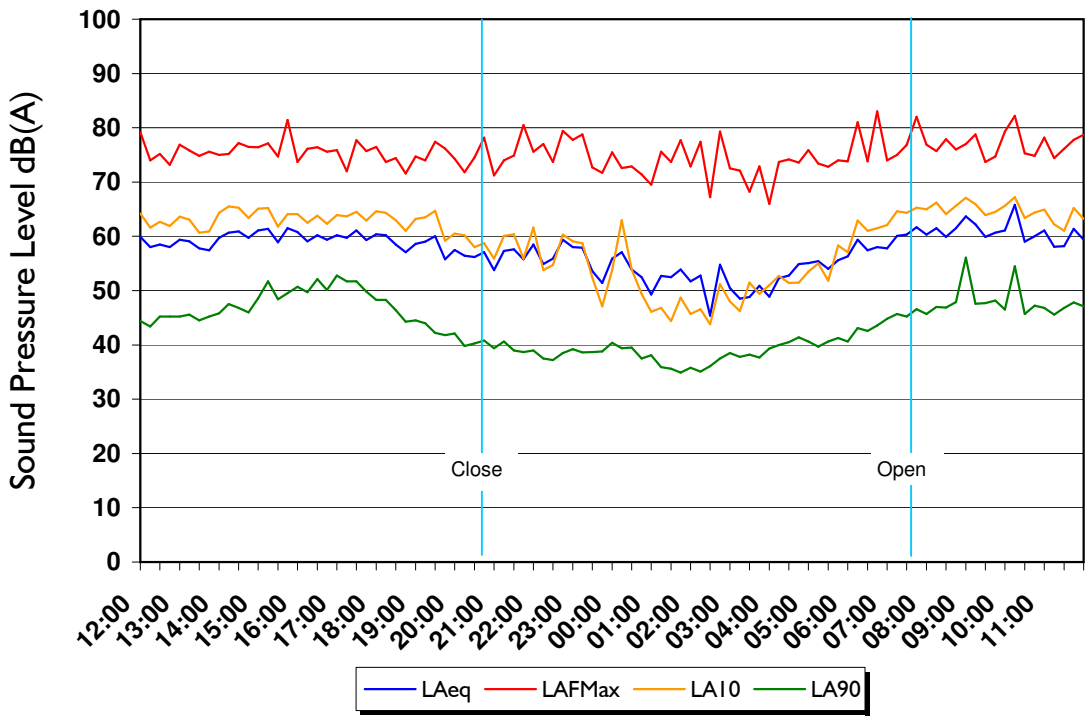
Telegraph Hill, Lewisham - Position 2

Environmental Noise Time History



Saturday 09 October to Sunday 10 October 2010

Figure AS6259/TH7

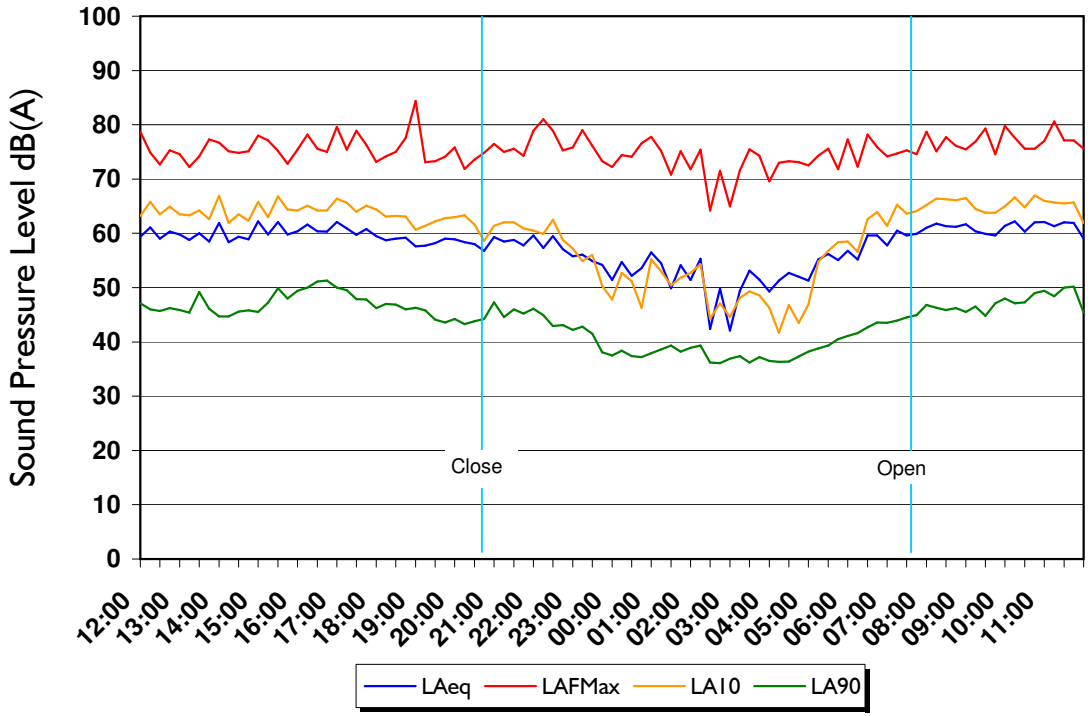


Sunday 10 October to Monday 11 October 2010

Figure AS6259/TH8

Telegraph Hill, Lewisham - Position 2

Environmental Noise Time History

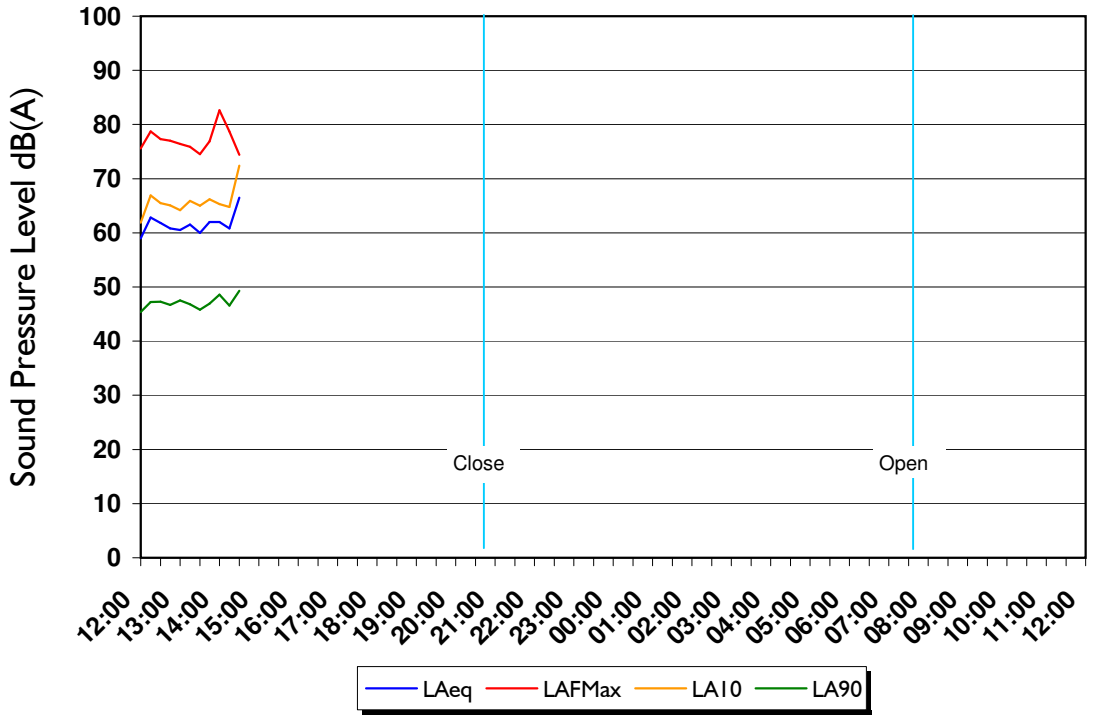


Monday 11 October to Tuesday 12 October 2010

Figure AS6259/TH9

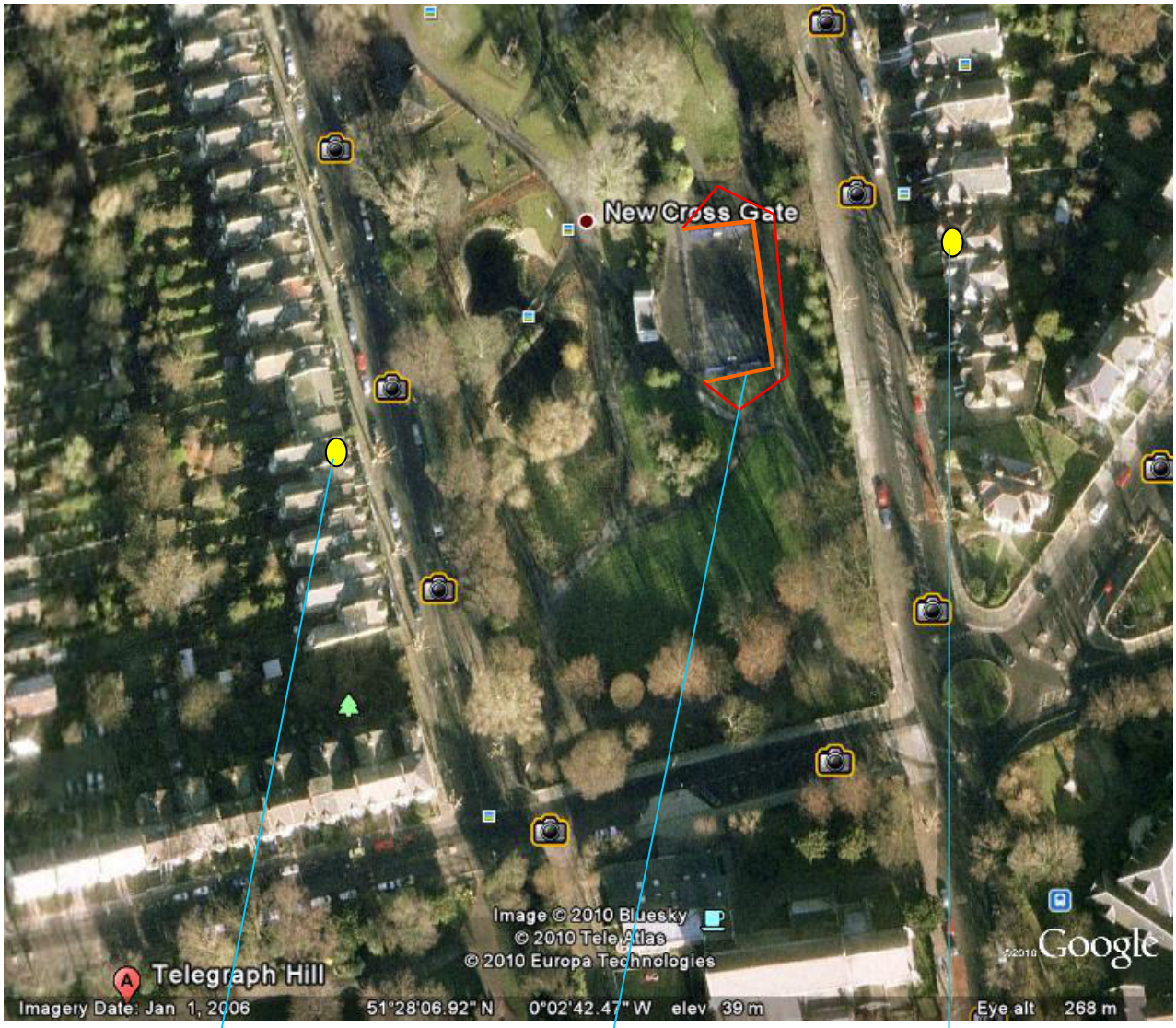
Telegraph Hill, Lewisham - Position 2

Environmental Noise Time History



Tuesday 12 October to Wednesday 13 October 2010

Figure AS6259/TH10



Microphone Position;
178 Erlanger Road

Basketball court
boundary

Microphone Position;
128 Pepys Road

Title: Environmental Noise Survey Measurement Location

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Project:
Telegraph Hill
Skatepark

Date: 20/10/2010

Scale: NTS

Figure No:
AS6259/SP2

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

1.0 ACOUSTIC TERMINOLOGY

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

dB (A): The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level.

L_{10} & L_{90}: If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and 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 the `average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.

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

L_{eq}: The concept of L_{eq} (equivalent continuous sound level) has up to recently been primarily used in assessing noise in industry but seems now to be finding use in defining many other types of noise, such as aircraft noise, environmental noise and construction noise.

L_{eq} is defined as 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 use of digital technology in sound level meters now makes the measurement of L_{eq} very straightforward.

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

L_{max}: L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

D The sound insulation performance of a construction is a function of the difference in noise level either side of the construction in the presence of a loud noise source in one of the pair of rooms under test. *D*, is therefore simply the *level difference* in decibels between the two rooms in different frequency bands.

D_w D_w is the *Weighted Level Difference* The level difference is determined as above, but weighted in accordance with the procedures laid down in BS EN ISO 717-1.

$D_{nT,w}$ $D_{nT,w}$ is the *Weighted Standardised Level Difference* as defined in BS EN ISO 717-1 and represents the *weighted level difference*, as described above, corrected for room reverberant characteristics.

C_{tr} C_{tr} is a spectrum adaptation term to be added to a single number quantity such as $D_{nT,w}$, to take account of characteristics of a particular sound.

$L'_{nT,w}$ $L'_{nT,w}$ is the *Weighted Standardised Impact Sound Pressure Level* as defined in BS EN ISO 717-2 and represents the level of sound pressure when measured within room where the floor above is under excitation from a calibrated tapping machine, corrected for the receive room reverberant characteristics.

APPENDIX A

ACOUSTIC TERMINOLOGY & HUMAN RESPONSE TO BROADBAND NOISE

2.0 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 have 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, eg. 250 Hz octave band runs from 176 Hz to 353 Hz. The most commonly used bands are:

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

3.0 HUMAN PERCEPTION OF BROADBAND NOISE

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

INTERPRETATION

Change in Sound Level dB(A)	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

4.0 EARTH BUNDS AND BARRIERS - EFFECTIVE SCREEN HEIGHT

When considering the reduction in noise level of a source provided by a barrier, it is necessary to establish the "effective screen height". For example if a 3 metre high barrier exists between a noise source and a listener, with the barrier close to the listener, the listener will perceive the noise source is 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 noise source would seem quieter than it was if he were standing. This may be explained by the fact that the "effective screen height" is changing with the three cases above, the greater the effective screen height, in general, the greater the reduction in noise level.

Where the noise sources are various roads, the attenuation provided by a fixed barrier at a specific property will be greater for roads close to the barrier than for roads further away.