SHARPS REDMORE
ACOUSTIC CONSULTANTS • Established 1990

Report

Land North of Gardenia Close and Garden Square, Rendlesham, Suffolk

Environmental Noise Assessment

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Project No 1919177

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1.0 Introduction

1.1 Sharps Redmore (SR) have been instructed to undertake a noise assessment at a site of a proposed residential development, at land at north of Gardenia Close and Garden Square, Rendlesham, Suffolk. The site location is shown in Figure 1 below:

FIGURE 1: Site Location

1.2 The site is located to the north of Rendlesham and is currently an agricultural field which has been allocated for housing in the Site Allocations and Area Specific Policies document.[1] The immediate area feature woodland to the immediate north and west, with existing residential development along the eastern and southern boundaries. In the north east of the site is an Anglian Water (AW) waste water treatment plant.

1.3 A planning application for a phased residential development of 75 properties[2] was refused by East Suffolk Council. The reasons for refusal did not include any noise issues however the consultation response received from the Council's Environmental Protection Officer stated the following:

"The proximity of the sewage treatment plant may have noise implications for nearby dwellings and the impact of the works will need to be assessed using the appropriate standard;

2. The internal and external noise level must achieve standards as per BS8233:2014 and listed below:

- Daytime noise levels for indoor living spaces of 35 dB $L_{Aeq16hr}$ (between the hours of 0700 -2300 hours)
- Daytime noise levels for outdoor areas; garden and amenity space of 50 dB $L_{Aeq16hr}$ (between the hours of 0700 -2300 hours)

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[1] Policy SSP12 (Land west of Garden Square, Rendlesham)

[2] East Suffolk Council Planning Reference DC/19/1499 – Phased development of 75 dwellings, car parking, public open space, hard and soft landscaping and associated infrastructure and access/

- Night-time noise levels for bedrooms of 30 dB $L_{Aeq,8hr}$ and 45 dB L_{Amax} (between the hours of 2300 – 0700 hours)

A noise assessment should be submitted prior to determination of the planning application, with mitigation measures identified as required."

1.4 The purpose of this report is to consider the impact of noise on the proposed residential properties in line with the comments received from the Environmental Protection Officer.

1.5 Section 2.0 of this report sets out the government guidance on how the noise impact of such proposals should be assessed. In particular this section considers suitable criteria for the assessment of noise impact from such proposals including BS 8233:2014.

1.6 Section 3.0 contains details of surveys of the existing noise climate and of baseline noise source levels.

1.7 The assessment of the noise is displayed in section 4.0.

1.8 Section 5.0 contains a summary and conclusions.

1.9 Appendix C contains details of acoustic terminology employed in this report.

2.0 Assessment Methodology and Criteria

National Policy

2.1 The National Planning Policy Framework (NPPF), February 2019, sets out the Government's planning policies for England and "these policies articulate the Government's vision of sustainable development." In respect of noise, Paragraph 180 of the NPPF states the following:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation".

2.2 Guidance on the interpretation of the policy aims contained within the NPPF is contained within National Planning Policy Guidance (NPPG). The NPPG introduces the concept of a noise exposure hierarchy based on likely average response. The guidance contained in the NPPG is summarised in the table below:

TABLE 1: Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes 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.	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of Outcomes	Increasing Effect Level	Action
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The 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.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

2.3 The NPPF and NPPG reinforce the March 2010 DEFRA publication, "Noise Policy Statement for England" (NPSE), which states three policy aims, as follows:

"Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life."*

2.4 Together, the first two aims require that no significant adverse impact should occur and that, where a noise level which falls between a level which represents the lowest observable adverse effect and a level which represents a significant observed adverse effect, then according to the explanatory notes in the statement:

"… all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur."

Local Policy

2.5 With regard to local policy reference is made to Development Management Policy DM23 'Residential Amenity' which states the following:

"When considering the impact of new development on residential amenity, the Council will have regard to the following:

(a) privacy/overlooking;

(b) outlook;

(c) access to daylight and sunlight;

(d) noise and disturbance;

(e) the resulting physical relationship with other properties;

(f) light spillage, air quality and other forms of pollution; and

(g) safety and security.

Development will be acceptable where it would not cause an unacceptable loss of amenity to adjoining or future occupiers of the development."

2.6 Taking an overview of national policy aims and guidance it is clear that when considering the impact of noise, the fact a noise can be heard and causes impact is not reason to refusal an application. Consideration should also be given to the significance of the impact.

Design Guidance

2.7 As referred to by the Council's Environmental Protection Officer the current nationally recommended internal noise levels for dwellings are given in BS 8233:2014 'Guidance on Sound Insulation & Noise Reduction for Buildings'. BS 8233 recommends the following internal noise standards:

TABLE 2: Guideline noise values

BS 8233:2014 Table 4 – Indoor ambient noise levels for dwellings			
Activity	Location	0700 to 2300	2300 to 0700
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.8 There is no longer a L_{AMAX} standard for bedrooms In BS 8233. However, footnote 4 to Table 4 states that *"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values."* In this case, it is proposed that the previous BS 8233 internal standard (also referenced in World Health Organisation Guidelines for Community Noise) is applied. This is 45 dB L_{AMAX}, inside bedrooms.

2.9 For outdoor areas (i.e. balconies), BS 8233:2014 recommends that "it is desirable that the external noise level does not exceed 50 dB L_{AeqT}, with an upper guideline value of 55 dB L_{AeqT}" However, the document recognises that that these guideline values are not achievable in all circumstances and in higher noise areas, a compromise might be warranted. In such circumstances, development should be designed to achieve the lowest practicable levels in these external amenity spaces.

2.10 The above guideline values predominantly relate to noise from 'anonymous' sources such as road traffic. Noise from the adjacent waste water treatment works will be of an 'industrial' type character and therefore regard should also be had to the BS 4142:2014:A1:2019 Method for rating and assessing industrial and commercial sound.

2.11 BS 4142 provides a method for rating and assessing sound of an industrial and/or commercial nature including for the purposes of assessing sound at proposed new dwellings or premises used for residential purposes according to the following summary process:

i) Carry out a numerical assessment by comparing the rating level of sound from deliveries (specific sound plus feature correction) against the existing background noise level. The greater the difference between the two the greater the impact. Differences (rating – background) of around +10 dB is likely to be an indication of significant adverse impact (SOAEL) depending on context; a difference of +5 dB is likely to be an indication of adverse impact, depending on context. 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 upon context.

ii) Consider the impact of noise from deliveries against the context of the site in which it is placed. There are many contextual points to consider when determine the impact of the sound including the following:

- The absolute level of sound;
- The character and level of the specific sound compared to the existing noise climate;
- The sensitivity of the receptors;
- The time and duration that the specific sound occurs;
- The conclusions of assessments undertaken using alternative assessment methods, for example WHO guideline noise values or change in noise level;
- The ability to mitigate the specific sound through various methods.

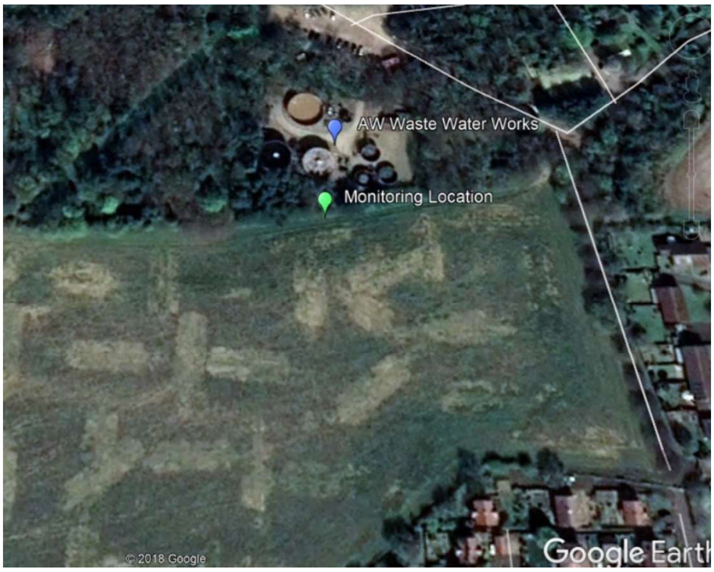
2.12 The assessment method is not intended to be applied to the assessment of indoor sound levels. In such cases the absolute levels in BS 8233 as described above may be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night when background noise levels are low.

2.13 Based on the above and the guidance received from the Council's Environmental Protection Officer it is recommended that during the day to avoid significant adverse impact noise from the treatment works should not exceed the background noise level by more than 10 dB in any garden subject to a maximum level of 50 dB $L_{Aeq16hr.}$ During the night the rating level of noise from the treatment works should not exceed 30 dB when determined internally within the bedrooms of the properties.

3.0 Existing Noise Climate

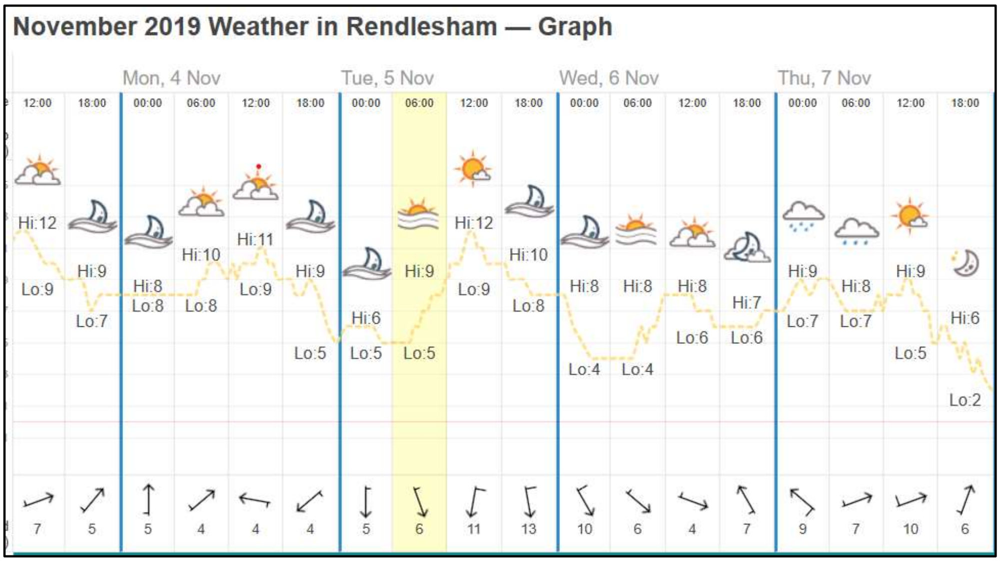
3.1 To determine existing baseline conditions a survey of the existing noise climate was carried out between 4th and 7th November 2019. Measurements were carried out at a location on the boundary of the site adjacent to the waste water treatment works as shown in Figure 2 below. The duration of the survey was agreed with the Environmental Protection Officer at East Suffolk Council prior to being carried out.

FIGURE 2: Survey Location



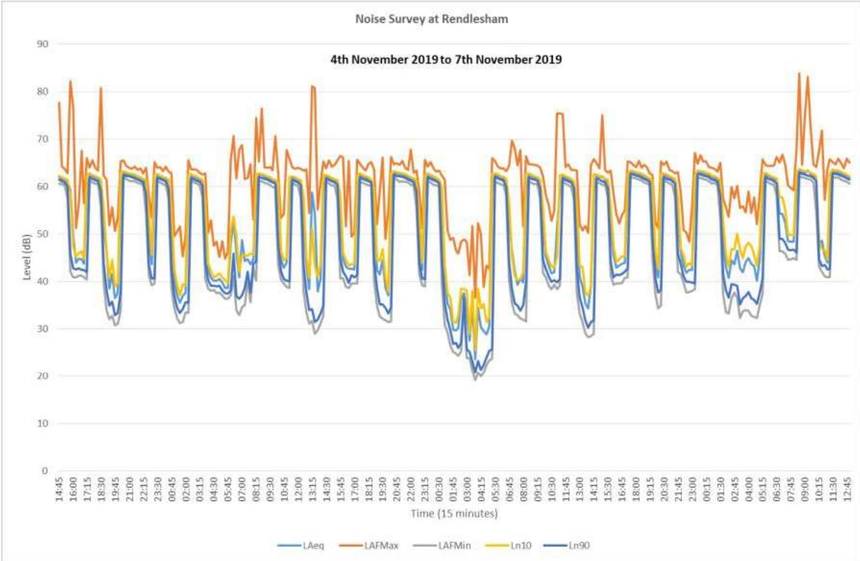
3.2 Noise measurements were taken using a Cirrus Type 1 sound level meter which was calibrated at the start and end of the survey. No variation in level was noted. With the exception of a period on 7th November weather conditions during the survey were generally dry, with light winds and suitable for taking noise measurements. A summary of the weather is shown in Figure 3 below:

FIGURE 3: Weather Data Rendlesham (www.timeanddate.com)



3.3 Full details of the survey results are included in Appendix A to this report and summarised in the graph and Table 3 below.

FIGURE 4: Survey Results



3.4 Using the above noise data the overall existing daytime and night-time noise levels have been determined. The results are shown in Table 3 below:

TABLE 3: Noise Levels – Site Boundary

Date	Day (0700 – 2300 hrs)	Night time (2300 – 0700 hrs)	
	$L_{Aeq16hr}$	L_{Aeq8hr}	L_{Amax}
4.11.19	60	57	65
5.11.19	59	57	65
6.11.19	59	59*	66*
7.11.19	61*	--	--

*Noise levels affected by period of heavy rain from 00:00 hrs and 10.00 hrs on 7.11.19

3.5 It is evident from the results above that noise levels are influenced by plant at the adjacent treatment works. The above graph clearly shows that during periods when the pumps were operating noise levels were at least 20 dB higher than those measured during periods when the plant was not operating. Table 4 shows the noise levels from the plant operating.

TABLE 4: AW Waste Water Treatment Works Site Noise – Boundary

Octave band centre frequency Hz							Awgt
63	125	250	500	1k	2k	4k	
50	51	49	49	53	56	54	61 dB

4.0 Assessment – Noise Impact

4.1 The proposed layout of the site is shown in Appendix B to this report. In the north east corner of the site is proposed an area of public open space which is within the cordon sanitaire associated with the Anglian Water waste water treatment plant. Whilst primarily designed to protect residential development against odour, as a result the nearest residential properties have been set back from treatment plant. The nearest properties are plot 26 approx. 100m to the west and plot 35 approx. 80m to the south of the treatment works.

4.2 In the open, known as free field, sound attenuates from a point source such as a pump will reduce at a rate of 6dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances).

4.3 The measurement location was 20 metres from the pump area, taking into account the distance attenuation the resultant noise level at Plot 26 and Plot 35 will be 45 dB and 46 dB respectively.

<u>Daytime</u>

4.4 Using the above calculations an assessment of delivery activity noise levels using methodology in BS 4142:2014 has been carried out for the daytime periods. Background noise levels used in the assessment are based on noise levels recorded when the pumps at the waste water plant were not in operation. The typical daytime background level recorded was 35 dB $L_{A90.}$ The results of the assessment are shown in Table 5 below:

TABLE 5: Noise Assessment - Daytime

Results	Plot 26	Plot 35	Commentary
Specific Sound Level	45 dB $L_{Aeq60min}$	46 dB $L_{Aeq60min}$	
Background Sound Level	35 dB $L_{A90,1hr}$	35 dB $L_{A90,1hr}$	
Acoustic Character Correction	+5 dB	+5dB	+3 dB for intermittency and +2 dB for tonality
Rating Level	(45+5 dB)=50 dB	(46+5 dB)=51 dB	
Difference between rating level and background level	+15 dB	+16 dB	
Assessment	Assessment indicates a likelihood of a significant adverse impact subject to context and prior to mitigation.		

4.5 As explained in section 2.0 of this report, Section 11 of BS 4142:2014 explains *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs."*

4.6 The first contextual consideration is how the predicted delivery activity noise levels compare to the guideline noise values in BS 8233:2014. Predicted noise levels will be at least 4 dB below suggested target level of 50 dB as suggested by the Environmental Protection Officer at East Suffolk Council.

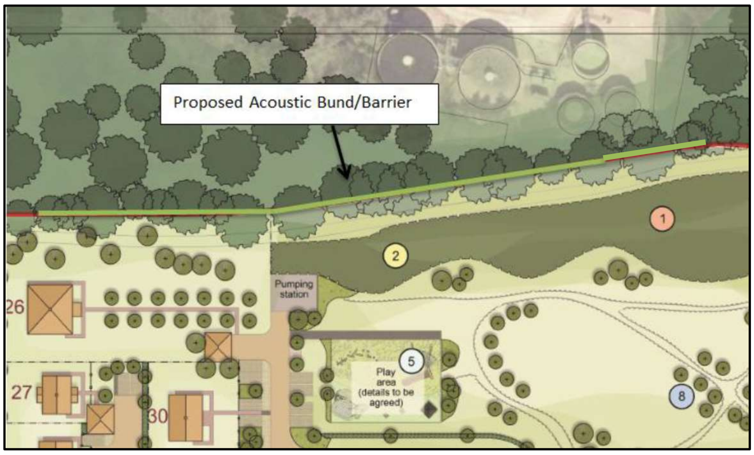
4.7 The second contextual consideration in this case is the mitigation measures that can be incorporated into the design of the scheme. As described in para. 4.1 the area immediately adjacent to the treatment works is part of the cordon sanitaire around the works. To reduce noise from the pumping station this area can be landscaped to include an earth bund to screen the treatment works. Where there is insufficient space to have a bund, such along the boundary of Plot 26 an acoustic fence could be used.

4.8 Any solid structure between a noise source and receiver will provide a "screening effect", as long as the barrier structure cuts the line of sight from the receiver to the source. A barrier which just cuts the line of sight will, as a rule of thumb, provide a screening effect of 5 dB. It is unusual in practice to obtain screening losses of more than 15 dB or so because of the physical constraints on barrier height, length and construction. The screening effect of a barrier is determined by the difference in the direct noise path (without barrier) to the receiver and the path over the top of the barrier taken by the noise when the barrier is in place.

4.9 A 5m bund/barrier along the northern boundary of the site as shown in Figure 5 below will reduce noise levels from the treatment works by approx. 12 dB resulting in external noise levels within the gardens of between 33 – 34 dB L_{Aeq1hr}. The rating level of noise from the treatment works would be just above existing background noise levels and significantly below the suggested criteria for external amenity spaces in BS 8233:2014.

4.10 Assuming a 12 dB reduction through an open window, resultant internal noise levels during the daytime will be 21 – 22 dB $L_{Aeq,}$ this is significantly below the criteria recommended by the Environmental Protection Officer at East Suffolk Council.

FIGURE 5: Proposed acoustic bund/barrier



Night time

4.11 As discussed in section 2.0 of this report at night absolute may be as, or more, relevant than the margin by which the rating level exceeds the background noise level. A 5m high bund/barrier as suggested will reduce noise levels from the treatment works by approx. 10 dB at first floor level and 8 dB at second floor level. Assuming a 12 dB reduction through a partially open window internal noise levels at night in first floor bedrooms will between 23 and 24 dB L_{Aeq} and in second floor bedrooms between 25 and 26 dB L_{Aeq}. Noise levels will be below the criteria in BS 8233:2014 as advised by the Environmental Protection Officer at East Suffolk Council.

4.12 Taking into account the screening that can be provided it is concluded that noise from the treatment works will not cause significant adverse impacts to future residents in line with local and national policy aims.

4.13 Notwithstanding the above conclusions it is recommended that consideration should also be given to reducing the noise at source. This will involve liaising with Anglia Water who operate the treatment works to identify any measures that can carried out reduce noise from the site. This would reduce the screening requirements discussed above.

5.0 Summary and Conclusions

5.1 Sharps Redmore has undertaken an environmental noise assessment of a proposed residential development at land north of Gardenia Close and Garden Square, Rendlesham, Suffolk.

5.2 The objective of the assessment was to determine the effect of noise from the existing AW waste water treatment works on the proposed residential properties.

5.3 A noise survey has been carried out over four days, as agreed with the Environmental Protection Department at East Suffolk Council to determine noise levels from the treatment works.

5.4 Criteria were selected by reference to relevant government and international guidance documents and from the recommendations made by the Environmental Protection Department.

5.5 Taking into account the cordon sanitaire around the works noise and the proposed screening that will provided along the northern boundary of the site noise from the treatment works will be below the daytime and night time (both external and internal) criteria recommended by the Environmental Protection Officer

5.6 The above mitigation measures can be enforced through a suitably worded planning condition.

APPENDIX A

NOISE SURVEY RESULTS

Appendix A: Survey Results

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
04/11/2019 14:45	62	77.6	60.6	62.3	61.4
04/11/2019 15:00	61.6	64.2	60.5	61.9	61.1
04/11/2019 15:15	61.4	63.7	60.2	61.7	60.9
04/11/2019 15:30	60.9	62.7	57.4	61.3	60
04/11/2019 15:45	59.3	82.1	42.1	58.4	45.7
04/11/2019 16:00	49.5	76.6	40.9	47.4	42.8
04/11/2019 16:15	43.9	51.2	40.8	45.1	42.5
04/11/2019 16:30	44.8	56.5	41.2	46	42.8
04/11/2019 16:45	44.7	67.5	41.2	46.3	42.4
04/11/2019 17:00	43.7	56.5	40.8	44.7	42.4
04/11/2019 17:15	58.6	66	40.4	62.5	41.9
04/11/2019 17:30	62.3	64	61.2	62.7	61.9
04/11/2019 17:45	62.1	65.5	60.8	62.4	61.6
04/11/2019 18:00	61.8	64	60.6	62.1	61.3
04/11/2019 18:15	61.5	63.4	60.5	61.9	61.1
04/11/2019 18:30	61.2	80.7	55.8	61.5	59.1
04/11/2019 18:45	51.2	62.3	39.8	55.2	43.8
04/11/2019 19:00	46.5	61.5	34	46.5	38.2
04/11/2019 19:15	38.5	51.8	32	40.7	34.9
04/11/2019 19:30	41.6	55.6	32.8	44.6	35.8
04/11/2019 19:45	36.4	50.6	30.8	38.9	32.9
04/11/2019 20:00	37.5	53.5	31.1	39.7	33.4
04/11/2019 20:15	58.9	65.2	33.8	62.8	37.8
04/11/2019 20:30	62.8	65.5	61.8	63.2	62.4
04/11/2019 20:45	62.6	64.3	61.6	63	62.2
04/11/2019 21:00	62.5	64	61.2	62.8	62.1
04/11/2019 21:15	62.3	63.7	61.1	62.6	61.9
04/11/2019 21:30	62.2	64.2	61.1	62.5	61.7
04/11/2019 21:45	61.9	63.5	60.7	62.2	61.5
04/11/2019 22:00	61.6	63.8	60.6	61.9	61.2
04/11/2019 22:15	61.3	62.8	60.2	61.6	60.9
04/11/2019 22:30	60.7	63.9	54.2	61.4	58.4
04/11/2019 22:45	49.7	58	41.2	54	43.5
04/11/2019 23:00	43.6	53.5	39.2	45.6	40.6
04/11/2019 23:15	58.5	65.1	39.5	62.4	40.6
04/11/2019 23:30	62.3	63.9	61.2	62.6	61.8
04/11/2019 23:45	62	64.1	60.9	62.3	61.6
05/11/2019 00:00	61.7	63.2	60.5	62	61.3
05/11/2019 00:15	61.4	64.2	60.3	61.8	61
05/11/2019 00:30	60.9	63.1	57.5	61.4	59.6
05/11/2019 00:45	51.5	62.7	38.6	55.7	42.5
05/11/2019 01:00	40.3	49.5	34.4	42.6	37.1
05/11/2019 01:15	37.1	50.5	32.3	39.2	34.4

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
05/11/2019 01:30	35.5	51.6	31.2	37	33.4
05/11/2019 01:45	36.9	45.3	31.5	39.4	34.2
05/11/2019 02:00	37.6	49.7	33.5	39.2	35.6
05/11/2019 02:15	58.8	65.5	33.4	62.6	35.5
05/11/2019 02:30	62.2	63.6	61.1	62.6	61.8
05/11/2019 02:45	62	63.6	60.8	62.3	61.5
05/11/2019 03:00	61.7	63.5	60.6	62	61.2
05/11/2019 03:15	61.4	62.9	60.3	61.7	61
05/11/2019 03:30	60.9	62.5	57.7	61.4	60.2
05/11/2019 03:45	52.7	62.7	40.5	57.1	43.8
05/11/2019 04:00	42.3	50.2	38.5	43.9	40.3
05/11/2019 04:15	40.7	52.9	38	42.1	39.1
05/11/2019 04:30	40.1	47.5	38.2	40.9	39.1
05/11/2019 04:45	40.2	48.3	37.5	41.2	38.9
05/11/2019 05:00	40.5	45.1	37.7	41.7	39.1
05/11/2019 05:15	39.8	48.5	37.1	40.8	38.1
05/11/2019 05:30	38.6	44.8	36.3	40.3	37.5
05/11/2019 05:45	38.6	46.2	36.3	39.7	37.4
05/11/2019 06:00	48	65.5	37	50.7	38.1
05/11/2019 06:15	53.2	70.6	41.1	53.7	45.9
05/11/2019 06:30	46.2	61.7	33.9	49.4	36.9
05/11/2019 06:45	40.9	67.8	32.9	42	36.3
05/11/2019 07:00	48.7	68.7	34.5	45.6	37.1
05/11/2019 07:15	44.3	61.6	35	45.5	38.7
05/11/2019 07:30	44.7	61.8	40.4	45.4	42
05/11/2019 07:45	43.6	64.7	35.6	45.8	37.7
05/11/2019 08:00	44.7	53	42.6	45.6	43.7
05/11/2019 08:15	58.8	74.4	40.2	62.5	44.3
05/11/2019 08:30	62.5	65.2	61.1	62.8	62
05/11/2019 08:45	62.5	76.4	61.1	62.6	61.8
05/11/2019 09:00	62	64	60.7	62.4	61.6
05/11/2019 09:15	61.8	64	60.6	62.2	61.4
05/11/2019 09:30	61.5	64.1	60.2	61.9	61.1
05/11/2019 09:45	61.3	63.3	59.9	61.6	60.9
05/11/2019 10:00	61.1	70.6	59.7	61.3	60.6
05/11/2019 10:15	57.2	63	43.5	60.8	47.7
05/11/2019 10:30	44.5	53.4	40.4	46.5	42.2
05/11/2019 10:45	42.9	54.2	39.6	44.4	40.5
05/11/2019 11:00	44	67.6	38.8	44.9	40.1
05/11/2019 11:15	58.1	65.8	38.6	61.9	40
05/11/2019 11:30	61.8	64.1	60.7	62.2	61.4
05/11/2019 11:45	61.5	63.7	60.4	61.9	61.1
05/11/2019 12:00	61.3	63.9	60.1	61.6	60.8
05/11/2019 12:15	60.8	63.7	57.8	61.3	60.3

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
05/11/2019 12:30	53	63.4	38	58	43.6
05/11/2019 12:45	43.7	63.6	33.5	45.1	37.7
05/11/2019 13:00	38.4	54.4	31.1	40.7	33.9
05/11/2019 13:15	58.7	81.1	31.7	51.1	34.2
05/11/2019 13:30	54.2	80.7	29	43.4	31.4
05/11/2019 13:45	37.9	55.1	29.7	41	31.9
05/11/2019 14:00	40.5	60.7	31.1	43.5	33.3
05/11/2019 14:15	58.7	65.2	32.8	62.4	34.9
05/11/2019 14:30	62.1	63.8	61	62.4	61.7
05/11/2019 14:45	61.8	65.5	60.6	62.2	61.3
05/11/2019 15:00	61.5	64.2	60.3	61.8	61.1
05/11/2019 15:15	61.3	64.5	60.1	61.6	60.8
05/11/2019 15:30	60.9	65.5	57.4	61.3	60.4
05/11/2019 15:45	53.7	66.4	40.6	58.3	45
05/11/2019 16:00	44.7	66.1	40.6	46.1	42.1
05/11/2019 16:15	43.1	51.6	38.8	44.4	41.1
05/11/2019 16:30	42.7	65.4	38.6	43.3	39.7
05/11/2019 16:45	42.7	49.4	39.6	43.6	41.3
05/11/2019 17:00	42.5	50.2	39.5	43.7	40.8
05/11/2019 17:15	58.4	65.6	39.5	62.4	41.3
05/11/2019 17:30	62.4	64.8	61.1	62.7	61.9
05/11/2019 17:45	62.1	64	60.7	62.4	61.6
05/11/2019 18:00	61.8	63.3	60.5	62.1	61.3
05/11/2019 18:15	61.5	64.8	60.2	61.9	61.1
05/11/2019 18:30	61.2	65.1	60.1	61.5	60.8
05/11/2019 18:45	54.9	63.5	40	59.4	44.2
05/11/2019 19:00	42.4	52	34.9	44.6	38.6
05/11/2019 19:15	41.5	59.2	32.6	44.4	35.1
05/11/2019 19:30	44.6	66.1	32.2	46.8	35.2
05/11/2019 19:45	38.6	49	31.8	41	34.4
05/11/2019 20:00	37.1	55	31.5	37.8	33.3
05/11/2019 20:15	59	66.2	31.6	62.8	34.5
05/11/2019 20:30	62.9	64.6	61.8	63.2	62.5
05/11/2019 20:45	62.7	64.9	61.5	63	62.2
05/11/2019 21:00	62.6	64.5	61	62.9	62.1
05/11/2019 21:15	62.5	65.4	61.1	62.8	62
05/11/2019 21:30	62.2	63.9	61	62.6	61.8
05/11/2019 21:45	61.9	63.5	60.8	62.3	61.5
05/11/2019 22:00	61.6	67.7	60.4	61.9	61.2
05/11/2019 22:15	61.4	62.9	60.3	61.7	60.9
05/11/2019 22:30	60.7	63.4	55.4	61.3	58.9
05/11/2019 22:45	50.1	59	41.4	54.4	43.8
05/11/2019 23:00	42.4	51.2	39.2	44	40.6
05/11/2019 23:15	58.6	65.6	39	62.5	40.5

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
05/11/2019 23:30	62.3	64.2	61.1	62.7	61.9
05/11/2019 23:45	62.1	65.1	60.8	62.4	61.6
06/11/2019 00:00	61.8	63.8	60.4	62.1	61.3
06/11/2019 00:15	61.5	63.1	60.3	61.8	61.1
06/11/2019 00:30	61.2	63.3	60	61.5	60.7
06/11/2019 00:45	55.5	62.3	39.4	59.9	44.6
06/11/2019 01:00	40.8	61.4	30.9	43.3	35.4
06/11/2019 01:15	35.3	50.7	29.2	37.5	31.9
06/11/2019 01:30	34.1	48.7	26.5	36.6	29.7
06/11/2019 01:45	29.8	49.2	25.2	31.5	26.8
06/11/2019 02:00	29.7	46.6	24.8	31.3	27
06/11/2019 02:15	30.1	45.8	24.3	32.9	26
06/11/2019 02:30	36.2	48.4	25.3	38.5	27
06/11/2019 02:45	37.5	48.8	35.5	38.4	36.5
06/11/2019 03:00	34	48.3	23.9	38.1	25.7
06/11/2019 03:15	27.5	41.3	23.8	28.9	25.2
06/11/2019 03:30	35	51.7	21.1	38	23.1
06/11/2019 03:45	23.6	36.6	19.1	25.5	20.7
06/11/2019 04:00	34.4	52.3	20.7	38.5	23.3
06/11/2019 04:15	30.4	50	19.9	34.3	21.4
06/11/2019 04:30	29.6	38.8	20.7	35.3	22.4
06/11/2019 04:45	28.8	43.3	22.4	31.4	24
06/11/2019 05:00	30.5	42.7	23.4	32.4	25.4
06/11/2019 05:15	58.6	66	23.7	62.7	25.8
06/11/2019 05:30	62.5	65.4	61.1	62.8	62
06/11/2019 05:45	62.2	64.2	60.7	62.6	61.7
06/11/2019 06:00	61.9	63.8	60.5	62.2	61.4
06/11/2019 06:15	61.6	63.8	60.3	62	61.2
06/11/2019 06:30	61.1	63.2	58.1	61.6	59.9
06/11/2019 06:45	52.8	64.3	40.3	56.8	44.2
06/11/2019 07:00	46.5	69.6	35.5	45.5	38.5
06/11/2019 07:15	42.3	68	33.3	41.2	35.4
06/11/2019 07:30	39.3	64.4	32.9	40.3	34.9
06/11/2019 07:45	40.6	67.6	32.2	40.5	33.8
06/11/2019 08:00	39.8	51.6	31.9	41.9	35
06/11/2019 08:15	59.1	66.3	31.6	62.8	39.8
06/11/2019 08:30	62.4	64.7	61.1	62.7	61.9
06/11/2019 08:45	62.1	64.6	60.7	62.4	61.6
06/11/2019 09:00	61.8	64.5	60.5	62.2	61.4
06/11/2019 09:15	61.6	64.4	60.5	61.9	61.2
06/11/2019 09:30	61	64	57.4	61.5	59.7
06/11/2019 09:45	51.8	62.1	41.8	55.7	44.5
06/11/2019 10:00	45.3	58.2	40.8	46.5	42.7
06/11/2019 10:15	43.3	56.2	39.2	44.6	41.1

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
06/11/2019 10:30	41.7	52.8	38.3	43.2	39.9
06/11/2019 10:45	41.9	54.9	39.3	42.9	40.3
06/11/2019 11:00	51.3	75.4	38.4	45.1	39.8
06/11/2019 11:15	58.7	75.4	39.2	62.4	40.5
06/11/2019 11:30	62.2	75.3	61	62.5	61.7
06/11/2019 11:45	61.8	64.1	60.6	62.1	61.3
06/11/2019 12:00	61.5	64.6	60.3	61.9	61.1
06/11/2019 12:15	61.2	63.5	59.9	61.6	60.8
06/11/2019 12:30	60.7	63.5	57.3	61.1	59.6
06/11/2019 12:45	52.2	63.3	37.7	56.7	42.7
06/11/2019 13:00	41	52	33.2	43.3	36.7
06/11/2019 13:15	39	50.7	31.4	43	34.5
06/11/2019 13:30	35.4	51.7	29.1	37.6	31.8
06/11/2019 13:45	34.3	50.3	28.2	37	30.3
06/11/2019 14:00	39.2	64.5	28.5	39	31.5
06/11/2019 14:15	58.7	65.7	28.9	62.5	31.8
06/11/2019 14:30	62.2	64.9	60.9	62.5	61.7
06/11/2019 14:45	61.9	63.8	60.7	62.2	61.4
06/11/2019 15:00	62.2	75	60.4	62.1	61.1
06/11/2019 15:15	61.3	63.5	60.2	61.6	60.9
06/11/2019 15:30	60.9	62.9	57.6	61.4	59.6
06/11/2019 15:45	51.7	63.4	41.2	56	44.2
06/11/2019 16:00	45.5	58.3	39.3	47.4	40.9
06/11/2019 16:15	42.9	54.2	39.6	44.1	41.5
06/11/2019 16:30	43.3	52.2	39.5	44.7	41.3
06/11/2019 16:45	43.7	54	39.7	45.3	41.6
06/11/2019 17:00	44	55	40.7	45.3	42.1
06/11/2019 17:15	58.6	65.3	40.9	62.6	42.8
06/11/2019 17:30	63.1	65.1	62	63.4	62.6
06/11/2019 17:45	62.9	64.5	61.8	63.2	62.5
06/11/2019 18:00	62.7	64.1	61.7	63	62.3
06/11/2019 18:15	62.6	65.4	61.4	62.9	62.1
06/11/2019 18:30	62.3	64	61.2	62.6	61.8
06/11/2019 18:45	62	64.5	60.8	62.4	61.6
06/11/2019 19:00	61.7	64.1	60.6	62	61.3
06/11/2019 19:15	61.4	62.8	60.4	61.7	61
06/11/2019 19:30	58.3	62.4	44.7	61.2	49
06/11/2019 19:45	44.1	52.5	37.4	46.5	40.9
06/11/2019 20:00	40.8	51.2	34.3	42.7	37.6
06/11/2019 20:15	58.9	65.2	34.9	62.7	38.2
06/11/2019 20:30	62.4	64.5	61.2	62.7	61.9
06/11/2019 20:45	62.2	65.3	61	62.5	61.6
06/11/2019 21:00	61.8	63.5	60.6	62.1	61.4
06/11/2019 21:15	61.6	63.2	60.4	61.9	61.1

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
06/11/2019 21:30	61.1	62.8	57.8	61.6	60.6
06/11/2019 21:45	53.3	63	41.9	57.7	45.8
06/11/2019 22:00	46.3	58.7	41.6	47	43.7
06/11/2019 22:15	43.4	50.8	39.7	45.4	41.1
06/11/2019 22:30	41.8	50.2	37.7	43.1	39.9
06/11/2019 22:45	42.4	48.4	37.8	43.8	39.9
06/11/2019 23:00	42.4	55.5	38	43.3	39.8
06/11/2019 23:15	58.4	67	38.3	62.4	39.6
06/11/2019 23:30	63	64.8	61.8	63.3	62.6
06/11/2019 23:45	62.9	66.6	61.8	63.2	62.5
07/11/2019 00:00	62.7	65.2	61.6	63.1	62.3
07/11/2019 00:15	62.6	65.2	61.4	62.9	62.1
07/11/2019 00:30	62.3	64.1	61.1	62.7	61.9
07/11/2019 00:45	62	64	60.6	62.3	61.5
07/11/2019 01:00	61.7	63.7	60.7	62.1	61.3
07/11/2019 01:15	61.4	63.1	60.3	61.8	61
07/11/2019 01:30	60.6	65	53.4	61.4	58
07/11/2019 01:45	48.7	57.5	37.3	52.7	41.7
07/11/2019 02:00	43	55.6	33.6	45.9	38.1
07/11/2019 02:15	40.7	53.6	33.2	43.1	36.6
07/11/2019 02:30	44.4	59.9	36.5	46.8	39.4
07/11/2019 02:45	43.6	57.5	37.7	46.7	39.3
07/11/2019 03:00	46.4	60.1	36.6	50	39.1
07/11/2019 03:15	42.8	55.5	32.3	46.7	35.1
07/11/2019 03:30	41.9	55.9	33.7	44.9	36.5
07/11/2019 03:45	44.1	54.5	33.9	47.4	36.9
07/11/2019 04:00	44.9	58.9	33.8	48.1	37.8
07/11/2019 04:15	43.7	54.4	32.8	47.4	36.4
07/11/2019 04:30	43.2	57.6	32.5	45.6	36.1
07/11/2019 04:45	40.2	52	32.3	43.3	35.3
07/11/2019 05:00	44.8	58.7	35	47.6	37.6
07/11/2019 05:15	58.6	65.7	37.4	62.6	40.6
07/11/2019 05:30	62.5	64.5	61.2	62.9	62
07/11/2019 05:45	62.1	64.3	60.9	62.5	61.6
07/11/2019 06:00	61.9	64.3	60.5	62.2	61.4
07/11/2019 06:15	61.6	64.4	60.4	61.9	61.1
07/11/2019 06:30	61.2	66.2	58	61.7	60.6
07/11/2019 06:45	54.3	65	46.3	57.7	48.9
07/11/2019 07:00	54.2	66.7	46.3	57.6	48.9
07/11/2019 07:15	52.4	64.6	45.8	55.1	48.1
07/11/2019 07:30	48.5	60.2	44.6	49.9	46.7
07/11/2019 07:45	48.4	59.6	44.7	49.8	46.6
07/11/2019 08:00	48.4	59.2	44.9	49.7	46.7
07/11/2019 08:15	59.4	67.7	44.6	63.1	46.1

Time	Noise Level dB				
	L_{Aeq}	L_{AFMax}	L_{AFMin}	L_{A10}	L_{A90}
07/11/2019 08:30	63.5	83.8	62.1	63.7	62.9
07/11/2019 08:45	63.1	64.5	61.9	63.4	62.6
07/11/2019 09:00	62.9	75	61.8	63.2	62.5
07/11/2019 09:15	63.3	83.1	61.6	63.1	62.3
07/11/2019 09:30	62.6	72.5	61.4	62.9	62.1
07/11/2019 09:45	62.2	64.6	60.8	62.6	61.8
07/11/2019 10:00	61.6	64.1	54.8	62.1	61.1
07/11/2019 10:15	47.8	67.5	43.1	48.4	44.7
07/11/2019 10:30	48.6	71.8	42	46.8	43.2
07/11/2019 10:45	45.4	57.1	41.1	46.6	43.5
07/11/2019 11:00	43.9	63.8	40.8	44.5	42.5
07/11/2019 11:15	58	65.7	40.9	62.6	42.6
07/11/2019 11:30	63.2	65.1	62.1	63.6	62.8
07/11/2019 11:45	63	64.6	61.8	63.3	62.6
07/11/2019 12:00	63	65.9	61.9	63.3	62.5
07/11/2019 12:15	62.7	64.9	61.5	63.1	62.3
07/11/2019 12:30	62.5	63.8	61.2	62.8	62
07/11/2019 12:45	62.2	65.9	61	62.5	61.7
07/11/2019 13:00	61.9	65	60.6	62.2	61.4

APPENDIX B

PROPOSED SITE LAYOUT


WOODLAND
WOODLAND
WOODLAND
WOODLAND
N
Pumping station
Play area (details to be agreed)
Feature Space (subject to detailed design)
Feature Space (subject to detailed design)
Road access from Garden Square and Sycamore Drive
Road access from Tidy Road, Mayhew Road and Sycamore Drive
GARDEN SQUARE
TIDY ROAD
GARDENS
PEACE PALACE
Maharishi Peace Palace
1 2 3 4 5 6 7 8 9 10 11 12 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
MAIN SITE PLAN
KEY SITE ELEMENTS
Site boundary
Existing trees
Proposed trees and shrubs/hedges
Vehicle & PTW parking
Footway (adoptable)
Footway
Cycle store (apmts)
Bin collection points
Minor access road
Raised platform junction
Shared surface road
Shared driveway
38 Individual plots
Speed bump
Swale
Pedestrian access
Vehicular access
2m height closeboarded wooden fence (varied designs)
1m height fence to include: iron railings, picket, wood panels, some with brick piers at gates.
KEY PROPERTY TYPES
4nr Wilby SF 1 bed FF 2 bed GF 3 bed apartments
1nr single garage
1 nr Deben 3 bed detached house
2nr Easton 5 bed detached house
Woodbridge 8nr 5 bed detached house
Framlingham 6 nr 3 bed detached house
6nr Bealings FF/SF 3 bed GF 2 bed maisonettes
4nr Glemham 3 bed (N) 4 bed (S) semi-detached houses
5nr double garage
5nr Sudbury SF 2 bed FF 2 bed FF 1 bed GF 2 bed GF 1 bed apartments
Bramfield 1nr 3 bed detached house
Designed by:
CAPITAL COMMUNITY DEVELOPMENTS LTD
30 Gardenia Close, Rendlesham, Suffolk IP12 2GX
T: 01394 420936 • E: enquiries@ccdevelopments.co.uk
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Drawing based on CCD dwg: 84 SP / P rev E, re-presented by:
Revision description XX XX DD-MM-YYYY
Revision Number By Date
thelandscapepartnership
planning and designing environments for life
Project
Area 8 Rendlesham
Drawing
Site plan
Status
Planning
Bedford 01234 261315
Woodbridge 01394 380509
London 020 3092 4141
Norwich 01603 230777
Job No. E18836
Dwg. No E18836-001
Scale 1:500@A1
Drawn LH
Checked SN
Date 05-04-2019
North (magnetic)
Do not scale off drawing. All dimensions & levels to be checked on site. Any discrepancies must be reported to the landscape architect immediately.
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APPENDIX C

ACOUSTIC TERMINOLOGY

Acoustic Terminology

C1 Noise, defined as unwanted sound, is measured in units of decibels, dB. The range of audible sounds is from 0 dB to 140 dB. Two equal sources of sound, if added together will result in an increase in level of 3 dB, i.e. 50 dB + 50 dB = 53 dB. Increases in <u>continuous</u> sound are perceived in the following manner:

1 dB increase - barely perceptible.

3 dB increase - just noticeable.

10 dB increase - perceived as twice as loud.

C2 Frequency (or pitch) of sound is measured in units of Hertz. 1 Hertz (Hz) = 1 cycle/second. The range of frequencies audible to the human ear is around 20Hz to 18000Hz (or 18kHz). The capability of a person to hear higher frequencies will reduce with age. The ear is more sensitive to medium frequency than high or low frequencies.

C3 To take account of the varying sensitivity of people to different frequencies a weighting scale has been universally adopted called "A-weighting". The measuring equipment has the ability automatically to weight (or filter) a sound to this A scale so that the sound level it measures best correlates to the subjective response of a person. The unit of measurement thus becomes dBA (decibel, A-weighted).

C4 The second important characteristic of sound is amplitude or level. Two units are used to express level, a) sound power level - L_w and b) sound pressure level - L_p. Sound power level is an inherent property of a source whilst sound pressure level is dependent on surroundings/distance/directivity, etc. The sound level that is measured on a meter is the sound pressure level, L_p.

C5 External sound levels are rarely steady but rise or fall in response to the activity in the area - cars, voices, planes, birdsong, etc. A person's subjective response to different noises has been found to vary dependent on the type and temporal distribution of a particular type of noise. A set of statistical indices have been developed for the subjective response to these different noise sources.

C6 The main noise indices in use in the UK are:

L_{A90}: The sound level (in dBA) exceeded for 90% of the time. This level gives an indication of the sound level during the quieter periods of time in any given sample. It is used to describe the "background sound level" of an area.

L_{Aeq}: The equivalent continuous sound level in dBA. This unit may be described as "the notional steady noise level that would provide, over a period, the same energy as the intermittent noise". In other words, the energy average level. This unit is now used to measure a wide variety of different types of noise of an industrial or commercial nature, as well as aircraft and trains.

L_{A10}: The sound level (in dBA) exceeded for 10% of the time. This level gives an indication of the sound level during the noisier periods of time in any given sample. It has been used over many years to measure and assess road traffic noise.

L_{AMAX} The maximum level of sound measured in any given period. This unit is used to measure and assess transient noises, i.e. gun shots, individual vehicles, etc.

C7 The sound energy of a transient event may be described by a term SEL - Sound Exposure Level. This is the L_{Aeq} level normalised to one second. That is the constant level in dBA which lasting for one second has the same amount of acoustic energy as a given A weighted noise event lasting for a period of time. The use of this unit allows the prediction of the L_{Aeq} level over any period and for any number of events using the equation;

$$L_{AeqT} = SEL + 10 \log n - 10 \log T \text{ dB.}$$

Where

n = Number of events in time period T.

T = Total sample period in seconds.

C8 In the open, known as free field, sound attenuates at a rate of 6 dB per each doubling of distance. This is known as geometric spreading or sometimes referred to as the Inverse Square Law. As noise is measured on a Logarithmic scale, this attenuation in distance = 20 Log (ratio of distances), e.g. for a noise level of 60 dB at ten metres, the corresponding level at 160 metres is:

$$60 - 20 \text{ Log } {}^{160}/_{10} = 60 - 24 = 36 \text{ dB}$$