enviroparks

APPENDIX 10.1

Standards and Guidance

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STANDARDS AND GUIDANCE

INTRODUCTION

This Technical Appendix document describes presents further detail on the national guidance and standards relevant to the noise assessment of the Enviroparks Energy From Waste (EFW) Facility.

Descriptive Noise Units

Noise is defined as unwanted sound. The range of audible sound is from 0dB to 140dB. The frequency response of the human ear is usually taken to be about 18Hz (number of oscillations per second) to 18,000Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and, because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument (the sound level meter). The weighting which is most widely used and which correlates best with subjective response to noise is the A-weighting. This is an internationally accepted standard for noise measurements.

For variable noise sources such as traffic, an increase of 1dB (A), which equates for example to an approximate 25% increase in road traffic, is barely perceptible. In addition, a doubling of traffic flow will increase the overall noise by 3dB (A), providing that a number of factors, including speed, remain unchanged. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/decrease of 10dB (A) corresponds to a doubling or halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to surrounding activities. In an attempt to produce a figure that relates this variable noise level to the subjective response, a number of noise metrics have been developed. These include:

The L_{Aeq} noise level

This is the 'equivalent continuous A-weighted sound pressure level, in decibels', and is defined in British Standard BS 7445 as the **"value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time"**. It is a unit commonly used to describe construction noise, and noise from industrial premises and is the most suitable unit for the description of many other forms of environmental noise.

The L_{Amax} noise level

This is the maximum noise level recorded over a particular measurement period.

The L_{A10} noise level

The L_{A10} is the noise level that is exceeded for 10% of the measurement period, and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

The L_{A90} noise level

The L_{A90} is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during quieter periods. It is often referred to as the 'background' noise level.

REGULATORY CONTEXT

Control of Pollution Act (CoPA) 1974

The Act of Parliament which specifically relates to the control of noise and vibration from construction sites is the Control of Pollution Act 1974 (CoPA). This is achieved by the means of the imposition of appropriate conditions and by the development of agreed working procedures.

Sections (S) 60 and 61 of the CoPA gives local authorities in Scotland, England and Wales special powers for controlling noise arising from construction and demolition works on any building or civil engineering sites. S60 refers to the control of noise on construction sites and provides legislation by which local authorities can control noise from construction sites to prevent noise disturbance occurring. In addition, it recommends that guidance provided by BS5228 be implemented to ensure compliance with S60. S61 refers to prior consent for work on construction sites and provides a method by which a contractor can apply for consent to undertake construction works in advance.

Environmental Protection Act (EPA)

The Environmental Protection Act (EPA) (Section 79, Part III of Chapter 43, Statutory Nuisances and Inspections) contains a definition of what constitutes a "statutory nuisance" with regard to noise and places a duty on Local Authorities to detect any such nuisances within their area. This section further defines "Best Practicable Means" (BPM) as **"reasonably practical having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to the financial implications".**

Local Authorities have the power under Section 80, Part III of Chapter 43 of the EPA (summary proceedings for statutory nuisances) to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence.

Technical Advice Note (TAN) 11

Details on the TAN 11 document are presented in the original ES document and have not changed since that publication.

RELEVANT GUIDANCE APPLICABLE TO THE ASSESSMENT OF NOISE

In addition to the regulatory guidance detailed above, assessment methodologies appropriate for this type of development will also be referred to within the completion of this study.

The relevant guidance and methodology documents are discussed in the following sections.

BS5228 'Code of practice for noise and vibration control on construction and open sites Part 1: Noise +A1:2014

Part 1 of BS5228, Code of practice for basic information and procedures for noise control, gives recommendations for basic methods of noise control relating to construction and open sites where work activities/operations generate significant noise. The document includes sections on: legislative background; community relations; training; occupational noise effects; neighbourhood nuisance; project supervision; and control of noise.

Annexes include information on: EC and UK legislation; noise sources, remedies and their effectiveness (mitigation options); sound level data for onsite equipment and site activities (source terms that are used for modelling); a methodology for estimating noise from sites (calculation procedures which form the basis of the modelling packages); and guidance relating to noise monitoring.

It is noted, that the guidance of BS5228 Part 1 provides example noise effect significance criteria within Annexe E, and states the key factors that must be considered. These include:

a) site location;

b) existing ambient noise levels;

c) duration of site operations;

d) hours of work;

e) attitude of the site operator; and

f) noise characteristics.

BS5228 contains two example methods of determining the significance of construction noise. Method 1 'The ABC Method' examines absolute levels based on various threshold categories and is detailed in the table below:

Table 10.1.1: BS5228 'ABC' Method Assessment Values

Assessment category and threshold value period (L_{Aeq})	*Threshold Value, in decibels (dB)*		
	Category A [A)]	*Category B* [B)]	*Category C* [C)]
Night-time (23:00 – 07:00)	45	50	55
Evening and Weekends [D)]	55	60	65
Daytime (07:00 – 19:00 and Saturdays 07:00 – 13:00)	65	70	75

NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.

NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.

NOTE 3 Applied to residential receptors only.

A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values

B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values

C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values

D) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.

Method 2 of BS5228 refers to a '5 dB(A) Change' and states that construction noise is deemed to be significant if the total noise level exceeds the pre-construction ambient noise level by 5 dB or more, subject to lower cut off values of 65 dB, 55 dB and 45 dB for the daytime, evening and night-time periods respectively.

The standard states it is good practice to attempt to minimise construction noise impacts through environmental controls defined in either a Construction Environmental Management Plan (CEMP) or a Code of Construction Practice.

BS5228 'Code of Practice for noise and vibration control on construction and open sites' Part 2: Vibration

Part 2 of BS5228 gives recommendations for basic methods of vibration control relating to construction and open sites. The standard also describes the legislative background to vibration control and offers advice regarding the establishment of effective liaison between developers, site operators and local authorities. The standard also contains guidance on measuring and assessing the effects of vibration.

With regard to the assessment of significance of vibration BS5228 refers to BS6472 (discussed in more detail later in this section). However, BS5228 also presents the following guidance on vibration levels and effects referenced to PPV criteria as reproduced below:

Table 10.1.2: BS5228 Vibration level guidance

BS5228 Guidance on effects of vibration levels	
Vibration Level	*Effect*
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibrations.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

With regard to structural response to vibration BS5228 refers to the damage threshold criteria presented in BS7385 discussed later in this section.

BS6472 'Guide to evaluation of human exposure to vibration in buildings; Part 1 and 2 2008

This British Standard presents guidelines for the evaluation of vibration issues relating to human perception. Part 1 of the document examines vibration from sources other than blasting and Part 2 deals with blast-induced vibration. Due to the nature of the potential vibration generating activities possible at the EFW development it is considered that only part 1 of the Standard is appropriate.

Part 1, vibration from sources other than blasting, categorises vibration as either being continuous, intermittent, occasional or impulsive in nature. The distinct classifications are as defined by the Standard as below:

I. Continuous Vibration – Vibration is continuous when it is uninterrupted for the assessment period. This can be either a daytime period of 16 h, e.g. 7:00 to 23:00, or a night-time period of 8 h, e.g. 23:00 to 7:00;
II. Intermittent Vibration – Intermittent vibration is vibration which is perceived in separately identifiable repeated bursts. Its onset can be sudden, or there might be a gradual onset and termination bounding a more sustained event. Bursts may happen several to many times in a day or night period;
III. Occasional Vibration – Occasional vibration occurs less often than intermittent vibration, and might be less predictable;
IV. Impulsive Vibration – whether continuous, intermittent or occasional is characterised by rapid build up to a peak, which may or may not be sustained for a period, followed by a damped decay, which may or may not involve several cycles of vibration (dependent upon frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short.

Table 10.1.3 below summarises the guidance of Part 1 with respect to human perception thresholds. The table presents values at which vibration from construction activities are likely to result in adverse comment from occupiers in terms of 16hr daytime (07:00 – 23:00) and 8hr night-time (23:00 – 07:00) Vibration Dose Values (VDV).

Table 10.1.3: BS5228 Vibration perception Thresholds

Building/ Location	*Period*	*Threshold Criterion mm/s*		
		Low probability of adverse comment ($ms^{-1.75}$)	*Adverse comment possible* ($ms^{-1.75}$)	*Adverse comment probable* ($ms^{-1.75}$)
Residential Buildings	Daytime	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings	Night-time	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8
NOTE – For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 hour day.				

BS7385 'Evaluation and measurement for vibration in buildings Part 1: 1990 and Part 2: 1992

With respect to damage criteria associated with ground borne vibration the appropriate guidance is contained within BS 7385.

It is stated within of BS7385 that "Peak Particle Velocity (PPV) has been found to be the best single descriptor" of vibration induced damage". The standard recommends the simultaneous measurement of the three orthogonal components of particle velocity (Longitudinal, Vertical and Transverse) in order to attain the maximum value in any plane. The figures stated below relate to this maximum value.

With regard to damage to buildings resulting from vibration, the following three categories have been defined in order to aid with description:

Cosmetic - the formation of hairline cracks or the growth of existing cracks in plaster, drywall surfaces or mortar joints.

Minor - the formation of large cracks or loosening and falling of plaster on drywall surfaces, or cracks through bricks / concrete blocks.

Major or Structural - damage to structural elements of a building.

The guidance limits proposed for the prevention of cosmetic damage within this BS are contained within Table 10.1.4 below. The table presents thresholds at which vibration from construction activities may result in damage as measured in Peak Particle Velocity (PPV).

Table 10.1.4: Vibration Damage Criteria

Line	*Type of Building*	*Peak component particle velocity in frequency range of predominant pulse*	
		4Hz to 15Hz	*15Hz and above*
1	Reinforced or framed structures. Industrial and heavy commercial buildings.	50mms^{-1} at 4Hz and above	
2	Un-reinforced or light framed structures. Residential or light commercial type buildings.	15mms^{-1} at 4Hz increasing to 20mms^{-1} at 15Hz.	20mms^{-1} at 15Hz increasing to 50mms^{-1} at 40Hz and above

It is further stated within BS7385 that the onset of Minor damage is possible at magnitudes greater than twice those presented within Table 10.1.4 above, with Major damage to the structural elements of a building occurring at values in excess of four times the values quoted above. With regard to cosmetic damage the "probability of damage tends towards zero at 12.5mms^{-1} peak component particle velocity".

Relating to cosmetic damage resulting from continuous vibration events (as defined within BS6472: 1992), the values as presented within Table 10.1.6 above may require to be reduced by a factor of up to 50%.

BS4142: 2014 'Methods for rating and assessing industrial and commercial sound

The standard method for assessing plant noise affecting nearby housing is British Standard BS 4142 "Method for rating and assessing industrial and commercial sound". A BS4142 assessment is made by determining the difference between the intrusive noise under consideration and the background sound level as represented by the L_{A90} parameter, determined in the absence of the plant noise, in this case, by the noise survey. As detailed above, the L_{A90} parameter is defined as the level exceeded for 90% of the measurement time. Therefore, it represents the underlying noise in the absence of short-term events.

The intrusive noise under consideration is assessed in terms of the ambient level, L_{Aeq}, but a character correction penalty can be applied where the noise exhibits certain characteristics such as distinguishable tones or impulsiveness. The L_{Aeq} is defined as the notional steady-state noise level which has the same energy as the actually time-varying noise. It can be thought of as the average noise level over the stated time period.

The plant noise level (L_{Aeq}) with the character correction (if appropriate) is known as rating level, L_{Ar}, and the difference between the rating level and the background noise is determined to make the BS 4142 assessment. The standard then states:

- "Typically, the greater the difference, the greater the magnitude of the impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;

- A difference of around +5dB 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 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."

In this case the proposed limit criterion for the facility (Background Noise (L_{A90}) +/-0dB with an upper permissible limit of L_{A90} +3dB will ensure a low impact according to the last bullet point. BS 4142 states that the 'typical' background noise level should be used, specifically:

"In using the background sound level … it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."

The guidance document highlights the importance of considering the context in which a sound occurs. The standard indicates that factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact.

Guidelines for Environmental Noise Impact Assessment

The institute of Environmental Management and Assessment (IEMA) guidance (Oct 2014) addresses the key principles of noise impact assessment and how these fit within the Environmental Impact Assessment (EIA) process. The guidance document is not intended as a prescriptive methodology for noise impact assessment.

The document offers guidance on the processes involved in the assessment of noise for both the EIA process and smaller scale developments including: scoping; establishing baselines; prediction of noise levels; assessment; and mitigation.

The guidance details a matrix of degree of effect which is summarised below:

Table 10.1.5: Degree of Effect Matrix

		Importance/ Sensitivity of Receptor			
		High	*Medium*	*Low*	*Negligible*
Magnitude of Change	Large	Very Substantial	Substantial	Moderate	None
	Medium	Substantial	Substantial	Moderate	None
	Small	Moderate	Moderate	Slight	None
	Negligible	None	None	None	None

The effect matrix should be read in conjunction with the effect descriptors below.

Table 10.1.6: Effect Descriptor

Very Substantial	*Greater than 10dB LAeq change in sound level perceived at a receptor of great sensitivity to noise.*
Substantial	Greater than 5dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9dB L_{Aeq} change in sound level at a receptor of great sensitivity to noise.
Moderate	A 3 to 4.9dB L_{Aeq} change in sound level at a sensitive or highly sensitive noise receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity.
Slight	A 3 to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity.
None/ Not Significant	Less than 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals.

Calculation of Road Traffic Noise Memorandum

The Technical Memorandum, Calculation of Road Traffic Noise (CRTN) (Department of Transport and Welsh Office, 1988) document details an empirical prediction methodology for the calculation of road traffic noise. The procedures described within the document set out the calculation methodology as well as the information requirements which includes traffic flow components, the type of ground cover, relevant heights and distances, and the presence of any barriers/obstructions.

These are used in order to calculate the source noise level of the given road link and the reduction in noise at a given receiver location due to propagation and screening effects.

The document further outlines where and how the monitoring of existing traffic noise conditions should be undertaken.