

**BRIAN DENNIS  
NOISE  
APPENDICES**

**TOWN & COUNTRY PLANNING ACT 1990 (INQUIRIES PROCEDURE)  
(ENGLAND) RULES 2000**

**APPEAL REF: APP/D0340/A/09/2113075/NWF**

**Land at Rostowrack Farm, Wheal Remfry, Goonvean and  
Parkandillick Dryers, St Dennis, St Austell**

## **Noise Proof of Evidence Appendices**

**On behalf of SITA Cornwall Limited**

**February 2010**

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**APPENDIX A      Planning Policy, Legislation & General Guidelines**

**APPENDIX B      Environmental Statement Assessment Criteria**

**APPENDIX C      Measured Noise Levels**

## **APPENDIX A: Planning Policy, Legislation & General Guidelines**

A.1 The regulatory system for environmental noise in England is a complex framework which draws upon guidance and standards from a number of sources. However, the overriding framework placing noise considerations into the context of the planning system is Planning Policy Guidance Note PPG24 'Planning and Noise'. This therefore forms the starting point of the discussion contained in this section of my evidence which deals with planning policy, legislation and general guidelines on noise and planning.

### **National Planning Policy and Advice Relating to Noise**

A.2 PPG 24 provides general guidance and policy concerning noise associated with new developments in England. The Introduction to PPG24 sets out the importance of appropriately considering noise in planning applications. The ultimate aim of the guidance is to:

'provide advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.'

A.3 This need to balance essential development against potential adverse noise effect is reiterated in Section 10 of PPG24 where the issue of development control is discussed:

*'Much of the development which is necessary for the... improvement of essential infrastructure will generate noise. The planning system should not place unjustifiable obstacles in the way of such development. Nevertheless, local planning authorities must ensure that development does not cause an unacceptable degree of disturbance.'*

A.4 Annex 3 of PPG 24 provides detailed guidance on the assessment of noise from different sources. Paragraph 19 of Annex 3 relates to noise from industrial and commercial developments. Paragraph 19 refers to BS 4142:1990 as relevant guidance for assessing the likelihood of complaints about noise from industrial or commercial developments.

A.5 Paragraphs 23 and 24 of Annex 3 provide guidance on noise from landfill waste disposal sites. In particular, paragraph 24 states:

*'The main sources of noise will be from vehicular movement, tipping operations, and site plant. Appropriate planning or licensing conditions might therefore relate to hours of working; the number and/or capacity of vehicles using the site and their points of ingress and egress; and the provision of acoustic screening. Useful information on predicting the noise will be found in BS 5228: Part 1: 1984. In addition, general guidance can be found in paragraph 9 of MPG 11.'*

A.6 Following the publication of PPG 24, MPG 11 was replaced in 2005 by Minerals Policy Statement 2 (MPS 2). MPS 2 retains advice relevant to the assessment of noise from sites involving waste disposal. It is this updated document, MPS 2, which is subsequently referenced in this assessment.

A.7 In terms of traffic noise, PPG 24 makes reference to the Noise Insulation Regulations 1975 which sets out noise trigger levels for the provision of insulation packages for dwellings affected by new or significantly altered highway developments. There are no direct references specifically applicable to intermittent HGV movements on site access tracks.

**Pollution Prevention and Control (England and Wales) Regulations 2000**

A.8 The proposed CERC is a scheduled form of development under the Pollution Prevention and Control (England and Wales) Regulations 2000 (PPC Regulations). The PPC Regulations establish a requirement for new and existing operations such as waste disposal sites to acquire a permit for their emissions. To acquire a permit, operators will have to show that they have systematically developed proposals to apply Best Available Techniques (BAT) and meet certain other requirements, taking account of relevant local factors to control environmental emissions. Under the PPC Regulations, noise and vibration are included within the definition of the types of emissions that must be accounted for. For specific guidance on noise and vibration related emissions, the PPC Regulations are supported by general and sector industry specific guidance referred to as 'Horizontal Guidance' and 'Sector Guidance' respectively.

### **Specific Planning Policy and Advice Relating to Construction Noise & Vibration**

- A.9 In England and Wales there are two legislative instruments which address the effects of environmental noise with regard to construction noise and vibration, and nuisance. The Environmental Protection Act 1990 (EPA) and the Control of Pollution Act 1974 (CoPA). The CoPA provides two means of controlling construction noise and vibration. Section 60 provides the Local Authority with the power to impose at any time operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the Local Authority prior to commencement of site works.
- A.10 To assess construction noise and vibration, PPG 24 refers to BS5228 parts 1 to 4 as the appropriate source of guidance. In the time since PPG24, the ES, and Regulation 19 information was produced, a revised version of BS5228 was released in January 2009. The new standard is separated into two parts which consolidate the advice of all superseded parts referred to in PPG24 and introduces additional guidance on a range of subjects including impact significance and ground borne vibration. It is this new document which is subsequently referred to in my evidence; specifically BS 5228 Part 1 2009 which addressed airborne construction noise.

### **Specific Planning Policy and Advice Relating to Operational Noise**

- A.11 PPG 24 makes reference to a number of policies and guidance documents that are relevant to the assessment of operational noise

from the proposed development as discussed below. The underlying philosophy of all these documents is to promote the implementation of best practical and reasonable measures for the control of noise emissions with a specific emphasis on controlling the noise at the point of generation rather than at affected locations. The documents provide various objective methods for setting environmental noise limits which may be broadly categorised as follows:

- Absolute limit values which are not to be exceeded.
- Relative limit values which define the margin that must be maintained between the background noise at the affected locations and the noise from the source in question.

A.12 PPG 24 refers to BS 4142:1990 as an appropriate assessment methodology for evaluating the likelihood of complaints from commercial or industrial activities. Since publication of PPG 24, BS 4142 was updated in 1997 with only slight textual modifications to an effectively unaltered assessment methodology. Accordingly, the 1997 standard is considered the currently valid document for reference purposes.

A.13 The basis of BS 4142 is a "relative assessment" methodology which compares the source noise in question with the prevailing background noise at the assessment location of interest. Tonal or impulsive characteristics of the noise are likely to increase the scope for complaints and this is taken into account by the "rating level" defined in BS 4142. This "rating level" should be used when stipulating the level of noise that can be permitted. The likelihood of complaints is

indicated by the difference between the noise from the new development (expressed in terms of the rating level) and the existing background noise. The Standard states that a difference of around 10 dB or higher indicates that complaints are likely. A difference of around 5 dB is of marginal significance.

A.14 The rating level is defined by the  $LA_{eq,T}$  which is the equivalent A-weighted noise level measured over a time period T, accounting for any adjustments which are required for the characteristics of the noise. The background noise level is the  $LA_{90,T}$  which is the A-weighted noise level that is exceeded for 90% of a time period T (alternatively, this may be considered as the quietest 10% of a time period). The time period T varies from 1 hour during the day time to 5 minutes at night time. The day and night periods are not specifically defined, but the standard states that the night time should generally cover the hours in which the general adult population are preparing to sleep or are actually sleeping. General industry practice is to define the day and night boundaries as 07:00 and 23:00 hours in accordance with PPG 24.

A.15 PPG 24 also indicates the relevance of minerals planning guidance to waste disposal operations. MPS 2 reiterates this under the section titled "Purpose of the Guidance", paragraph 5:

*'...Industries involving similar processes (i.e. aggregates recycling, construction and waste disposal etc.) should take into account relevant*

*elements of this Statement in planning their own development proposals, in the expectation that they will be applied by planning authorities.'*

A.16 For advice on managing noise and setting limits, MPS 2 is supplemented by a separate document titled MPS 2 Annex 2 which relates solely to noise. MPS 2 Annex 2 similarly states in paragraph 2.4 that it:

*'.. covers both surface mineral extraction, including waste disposal and recycling operations that form an integral part of a mineral working operation. It is not framed with direct reference to other waste disposal and recycling operations. Since these share many operational features with surface mineral operations, waste management operators and waste planning authorities should take account of this Annex ...'*

A.17 Paragraph 2.19 of MPS Annex 2 provides guidance on planning condition limits and states that operations should attempt to achieve day time (07:00 to 19:00) noise levels less than 10dB(A) above the background, but states this is likely to impose unreasonable burdens in many instances, and thus permits a limit up to a maximum of 55 dB LAeq, 1 hour. Operations during evening hours (19:00 23:00) are recommended to be limited to not more than 10 dB above the background noise with no absolute limits stated. Operations during night time hours (23:00 to 07:00) are recommended to remain within an absolute limit of 42 dB LAeq, 1 hour. For brief periods where noise levels will be higher, the guidance suggests an allowance of up to 70 dB LAeq, 1 hour for no more than 8 weeks in one year. Note is also

made of peak or impulsive noise which may include some reversing beepers, and that for such noise, separate limits that are independent of background noise (e.g. maximum instantaneous noise levels at relevant frequencies of noise) should be applied, but should not regularly be permitted to occur at night. All stated levels are free-field.

A.18 In terms of PPC Regulations, supporting guidance on the assessment of noise from the development is provided by:

- IPPC H3 - Horizontal Guidance for Noise, Part 1 - Regulation and Permitting, 2004 (Horizontal Guidance)
- Sector Guidance Note IPPC S5.01: Guidance for the Incineration of Waste and Fuel Manufactured from or Including Waste, 2004 (Sector Guidance)

A.19 To assess whether a proposed development has implemented Best Available Techniques (BAT), the Horizontal & Sector Guidance state the following criteria:

- Are noise rating levels proposed greater than background and, if so, are the justifications adequate?
- Are noise rating levels proposed greater than a free-field level of 50 dB LAeq by day or a facade level of 45 dB LAeq by night and, if so, are the justifications adequate?
- Is the L<sub>Amax</sub> measured with the fast time weighting less than 60 dB at the façade of any room regularly used for sleeping (this may include hospitals and the like by day and night)?

**Advice Relating to Operational Traffic Movements on the Access Route**

A.20 PPG24 does not provide assessment methodologies specific to the type of operational traffic that would occur as a result of this development.

That is, traffic which is composed predominantly of HGV's and only occurs during restricted weekday hours.

- A.21 The only direct PPG24 reference to the assessment of noise from road developments is that of the Noise Insulation Regulations. In other aspects of road traffic noise assessment, notably the assessment of new residential development in areas affected by existing road traffic noise, PPG24 then refers to the WHO Guidelines as a basis for setting relevant benchmarks.
- A.22 The other key ratified UK reference for the assessment of traffic noise arising from road modifications and developments is the Highways Agency Design Manual for Roads and Bridges Volume 11 (Environmental Assessment) , Section 3 (Environmental Assessment Techniques), Part 7 Noise and Vibration. This document is subsequently referred to as DMRB throughout the remainder of my proof.
- A.23 Whilst the documents cited above all provide guidance relevant to traffic noise, all of the methodologies relate to traffic noise which is composed of relatively constant and mixed traffic flows which continue throughout the day, evening, and night, 7 days per week. Their direct application to the present situation must be considered in the context of two key factors; firstly, that the traffic considered here almost entirely comprises intermittent HGV movements, and secondly, the traffic in this instance does not extend into the evening, night, or weekend periods. This latter point is particularly important, as the

above references all make reference to increased sensitivity to noise during evening and night periods, and recognised respite periods such as the weekend. Thus, direct application of these documents could on the one hand not properly reflect the specific characteristics of the traffic composition on the haul route and simultaneously potentially overestimate the magnitude of impact on the assumption of continued evening, night and weekend flows which do not occur in this instance.

A.24 Notwithstanding the above limitations, the documents are referenced as the only objective benchmarks which can be used for indicative purposes.

A.25 The Noise Insulation Regulations suggest a day time noise level of 68 dB LA10, 18hour (the level exceeded for 10% of the 18 hour period between 6 am and midnight) as the trigger level for the provision of sound insulation to affected dwellings. This level can only be considered as a threshold at which noise levels may be so great as to warrant direct compensation measures, and thus noise effects can be expected to occur at lower noise levels.

A.26 The World Health Organization, Community Noise Guidelines 2000 (WHO Guidelines) provide guidance on the assessment of noise in a range of contexts. The WHO Guidelines were the result of numerous international studies relating to the effects of noise on humans, and is referenced internationally for guidance on the suitability of internal and external noise levels. In addition, PPG 24 makes reference to WHO

guidelines in relation to external and internal noise criteria adopted in the formulation of target environmental noise levels.

A.27 The WHO Guidelines present a set of health based noise limit values for different types of environments. In the case of residential environments, the following noise levels are defined for the exterior of the dwelling and for external amenity areas:

- The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time.
- During the daytime, few people are moderately annoyed at LAeq levels below 50 dB(A). Day time levels between 50 dB and 55 dB LAeq, 16hour (free-field) are sufficient to invoke moderate annoyance and few people are highly annoyed at LAeq levels below 55 dB(A). Levels greater than 55 dB(A) LAeq. 16hour (free-field) are sufficient to invoke serious annoyance.
- To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.
- Night time noise levels greater than 45 dB LAeq, 8 hour (facade) and 60 dB LMax (façade) are sufficient to induce sleep disturbance. These levels have been derived on the basis of internal noise targets for good sleeping conditions that have been correlated to external noise levels assuming a standard outdoor to indoor reduction for a partially open window.

A.28 DMRB provides guidance to aid the assessment of impacts that road projects may have on levels of noise and vibration. DMRB provides a comprehensive discussion of considerations relating to the assessment

of road traffic noise, and includes an example methodology for rating the magnitude of impacts associated with noise changes caused by a new road project. In providing this advice, DMRB clearly states that the example method is only intended for assessing impact magnitude. Specifically, paragraphs 3.2 and 3.3 state:

*"... For the assessment of noise and vibration covered by this document, a classification is only provided for the magnitude of impact, as currently the methodology has not been developed to assign a significance according to both the value of a resource and the magnitude of an impact."*

*"Specific guidance on what is a significant change in the level of noise or vibration has not been provided in this document as it is considered the Designer is best suited to determine this using professional judgement on a project by project basis."*

A.29 The example impact magnitude methodology provided by DMRB is reproduced below. DMRB notes that this example methodology may not be applicable to all situations or projects, notes that other important factors will influence the magnitude of impact including "for example, the time of day, spectral content and the absolute level of noise". The following example classifications are provided for different levels of change to the LA10, 18 hour:

- 0 dB – example impact magnitude of "no change"
- 0.1 to 0.9 dB – example impact magnitude of "negligible"
- 1 to 2.9 dB – example impact magnitude of "minor"
- 3 to 4.9 dB – example impact magnitude of "moderate"

- 5 + dB – example impact magnitude of “major”

A.30 The supporting Annex to DMRB provides an extended discussion of the research and studies referenced in formulating the example methodology. The Annex notes considerations relating to traffic which is not freely flowing, as would be the case on the access route, but reiterates that the example methodology should still be applied to these types of roads. The Annex also notes that the method set out in DMRB gives an estimate for an “average” site, and the level of annoyance caused by changes at an individual site may differ from the average estimate. In this respect, it is important to note that the methodology was derived from surveys at sites where noise exposures ranged from 65 to 78 dB LA10, 18 hour, the changes in noise level were up to 10 dB LA10, 18 hour, and the dwellings were up to 18 metres from the kerb.

A.31 In addition to the advice contained in DMRB, the Institute of Environmental Management and Assessment (IEMA) has produced a draft guideline document for noise impact assessment. To our knowledge, this document remains in draft format, and IEMA were unable to advise of an imminent release date for a final version. Notwithstanding the documents draft status, it is noted the IEMA guidance introduces an example impact assessment methodology which is structured in a similar manner to the DMRB example impact magnitude methodology; the only difference being the introduction of an additional classification band to separate the DMRB assessment

band for changes greater than 5 dB into two sub-categories relating to changes which are greater than 5 dB and changes that are greater than 10 dB.

## **APPENDIX B: Environmental Statement Assessment Criteria**

### **Construction – Site and Traffic Significance Criteria**

- B.1 BS 5228 indicates a number of factors are likely to affect the acceptability of construction noise including site location, existing ambient noise levels, duration of site operations, hours of work, attitude of the site operator and noise characteristics of the work being undertaken. The standard notes that the sound pressure level will give an indication of the loudness of noise at a noise sensitive property, however attitudinal and other important factors will influence reaction to construction noise.
- B.2 Section 7.1 of BS 5228 notes an important principle in relation to balancing all implications of any construction noise mitigation measures:
- 'The intention throughout any construction programme should be to minimize levels of site noise whilst having due regard to the practicability and economic implication of any proposed control or mitigation measures'*
- B.3 BS 5228 informative Annex E provides example criteria that may be used to consider the impact significance of construction noise. The criteria do not represent mandatory limits but rather a set of example approaches intended to reflect the type of methods commonly applied to construction noise. The example methods are presented as a range of possible approaches (both facade and free-field noise levels, hourly and day-time averaged noise levels) according to the ambient noise

characteristics of the area in question, the type of development under consideration, and the expected hours of construction activity. In broad terms, the example criteria are based on a set fixed limit values which, if exceeded, will result in a significant impact unless ambient noise levels (i.e. regularly occurring levels without construction) are sufficiently high to provide a degree of masking of construction noise.

B.4 The example criteria set out in the following table represent a complicated range of methods utilising different averaging parameters, threshold levels, and measurement positions (facade or free field levels). Example points of differentiation to note include:

- Lower limit thresholds: the annex introduces assessment methodologies based on assessing the change in noise level subject to lower cut off values. Below these lower cut off values, the change in noise level does not influence the assessment outcome. Example methods 1 and 2 of E.3 stipulate a lower threshold of 65 dB for day time working (combined construction and ambient). Example method E.4 indicates threshold values of 70 (hourly levels prior to 8 am) to 75 dB (daily averaged levels during normal day time hours) for general working conditions, but with no lower thresholds for the assessment of level change during prescribed shorter periods (up to 80 days in a year). Example method E.5 is based solely on a fixed level of 55 dB.
- Level position: Example methods 1 and 2 of E.3 do not explicitly define whether levels are free-field or facade levels. Example method E.4 stipulates the levels to be facade levels (despite hourly thresholds corresponding to MPS 2 values which are free-field, and are referred to subsequently in example method E.5) whilst E.5 stipulates criteria in terms of free-field levels.

- Averaging duration: Example methods 1 and 2 of E.3 do not explicitly define an averaging period, but imply averaging the noise over the entire working periods of day, evening and night where relevant. Example method E.4 stipulates 1 hour averaging for works prior to 8 am, and period averaging (e.g. average levels over 10 hrs

**Table B1.1: BS5228 Annex E Example Significance Criteria**

| <b>BS5228<br/>Annex E<br/>Example<br/>Methods</b> | <b>Relevant Extracted Text (shown in italics) &amp;<br/>Accompanying Significance Threshold Values Relevant to<br/>the CERC (based on day time working and existing<br/>ambient noise levels less than 55 dB)</b>   |
|---|---|
| E.3<br>Example<br>Method 1                        | <p><i>Table E.1 shows an example of the threshold of significant effect at dwellings when the total noise level, rounded to the nearest decibel, exceeds the listed value. The table can be used as follows: for the appropriate period (night, evening / weekends or day), the ambient noise level is determined and rounded to the nearest 5 dB. This is then compared with the total noise level, including construction. If the total noise level exceeds the appropriate category value, then a significant effect is deemed to occur.</i></p> <p>Table E.1 relevant value: 65 dB <math>L_{Aeq}</math></p>   |
| E.3<br>Example<br>Method 2                        | <p><i>Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB ... for the daytime...; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.</i></p>   |
| E.4<br>Example<br>Method                          | <p><i>Noise insulation or the reasonable costs thereof will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, if either of the following apply to property lawfully occupied as a permanent dwelling:</i></p> <p><i>2.1 where the predicted noise level exceeds the noise insulation trigger level, as presented in Table E.2; or</i></p> <p><i>2.2 where the total noise (pre-construction ambient plus construction noise) is 5 dB above the existing airborne noise level for the corresponding times of day, whichever is the higher; and for a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period.</i></p> <p>Table E.2 relevant values:<br/>           Monday to Saturday 07:00 – 08:00 70 dB <math>L_{Aeq, 1 \text{ hour}}</math><br/>           Monday to Friday 08.00 – 18.00 75 dB <math>L_{Aeq, 10 \text{ hour}}</math><br/>           Saturday 08:00 to 13:00</p> |
| E.5<br>Example<br>Method                          | <p><i>Where construction activities involve large scale and long-term earth moving activities, then this is more akin to surface mineral extraction than to conventional construction activity. ...</i></p> <p><i>...it is suggested that the a limit of 55 dB <math>L_{Aeq, 1 \text{ h}}</math> is adopted for daytime construction noise for these types of activities, but only where the works are likely to occur for a period in excess of six months. Precedent for this type of approach has been set within</i></p>  |

*a number of landmark appeal decisions associated with the construction of ports.*

for weekday works between 8 am and 6pm). Example method E.5 stipulates 1 hour averaging for all day time works in conjunction with a much lower limit value.

- Concession periods for higher noise activities: Example method 1 does not stipulate any concession period. Example method 2 stipulates threshold levels which lead to significant effects if exceeded for 1 month. Example method E.4 does not stipulate durations for fixed level comparisons, but in terms of ambient noise comparisons, notes the exceedence threshold relates to a period of ten or more days of working in any fifteen consecutive days or for a total of days exceeding 40 in any 6 month period. Example method E.5 does not stipulate the periods or working that the levels must be exceeded for. However, method E.5 derives from minerals policy guidance MPS2 which in turn refers to increased permissible limits for periods up to 8 weeks, particularly for works close to a property which may give rise to longer term benefits such as the construction of earth mounds.

B.5 Literal direct application of these methods beyond their purpose as examples can result in conflicting outcomes or assessment interpretations contrary to conventional practice. As an example, the use of a 65 dB threshold in example method 1 of E.3 implies that a level of 65 dB solely attributable to construction would not be significant in very low noise environments. Conversely, the method indicates this same level would actually be significant in a higher noise environment (normally considered to be beneficial for masking construction noise) where the ambient was sufficient to add to the level and result in a

combined level greater than 65 dB. Irrespective, BS5228 remains the current relevant guidance and provides a comprehensive account of the types of target measures that may be considered. The differences highlighted above demonstrate the potential complexity of construction noise criteria and reinforce that the methods must only be used according to their intended purpose as examples which guide the selection of appropriate site-specific criteria.

B.6 A set of impact significance criteria were outlined in the ES which were broadly consistent with the example methods discussed above. The following provides a discussion of the construction noise impact significance criteria I have adopted in my evidence and the reasoning for their choice:

- Lower Limit Thresholds: a range of lower thresholds are used for impact significance ranging from negligible to major impacts. These lower threshold values are chosen to correspond to the example range presented in Annex E of 5228. Adherence to alternative approaches based solely on comparisons with the existing ambient noise environment would not be practical to implement for this site, nor the majority of major construction projects, and would inevitably translate to a requirement for less intensive working activity, in turn prolonging the duration of construction works.
- Level Position: for consistency with general noise assessment methodologies outlined in other planning policy and standards (e.g. PPG24, MPS2, PPS22, BS 4142), and the assessment criteria used throughout my evidence, all stated levels are free-field limits. In instances where the significance criteria draws on BS 5228 Annex E

facade related limits, a factor of 3 dB is subtracted from the threshold to arrive at the relevant free-field value.

- Averaging duration: the significance criteria I consider suitable for this site relate to noise levels averaged over the duration of a working day. Given the most intensive site activity during construction will be between 8 am and 4 pm on weekdays, this is consistent with BS 5228 Annex E example methods E.3 (method 1 and 2) and E.4. The example method of E.5 relates to situations where a receptor may be affected by heavy earth works for more than 6 months. Whilst the haul route construction and site works will span considerably longer than 6 months, the duration for which any property would experience noise from heavy earth moving work is less than 6 months; the remainder of the construction period is characterised by more typical construction works (such as enclosure erection, concrete pouring, cranes for plant installation). Accordingly, the example method E.5 and the shorter 1 hour averaging periods it suggests are not applicable in this instance.
- Concession periods for higher noise activities: the significance criteria presented in the ES referred to a period of 8 weeks in each year as an allowance for brief periods of high noise levels. This duration of 8 weeks corresponds to the provision made in minerals policy MPS2 and remains relevant to this assessment. BS 5228 Annex E does however introduce a range of different periods including 1 month, and more detailed designations which refer to the number of days in any 15 day period and cumulative total permissions of up to 80 days per year. Day to day variations in noise levels in any given 15 day period cannot be realistically determined with any confidence at this point in the planning process; this type of consideration is most practically factored into final detailed working plans in the event that the scheme is granted permission. A pragmatic approach to factoring the example methods into the assessment is therefore to draw reference to the broader

periods of 4 weeks from example method E.3 and the 8 weeks of MPS2 in deriving impact significance criteria. Activities which span between 4 and 8 weeks are considered in terms of their regularity during the construction programme.

B.7 Based on the above principles, the following paragraphs provide the relevant definitions for the range of significance thresholds.

- Negligible Significance Threshold: this level has been set at 55 dB LAeq, T, where T is the duration of working on weekdays and Saturdays. This level corresponds to the World Health Organisation upper limit for residential environments. This level is below all of the relevant thresholds of significance set out in BS5228 Annex E. The upper bound for shorter periods of working has then be chosen to correspond to threshold values in the Annex E E.3 example methods (60 dB LAeq, T as discussed subsequently for minor impact significance).
- Minor Significance Threshold: this level has been set at 60 dB LAeq, T, where T is the duration of working on weekdays and Saturdays. This value is consistent with the value of 65 dB stipulated in the Annex E E.3 example methods. The value is derived from the 65 dB total ambient and construction level, minus a maximum contribution of 2 dB from ambient conditions (conservative given ambient levels are below 55 dB), and minus 3 dB to convert from facade to free-field levels. The upper bound for shorter periods of working has then be chosen to correspond to values outline in the introduction of Annex E (67 dB LAeq, T as discussed subsequently for moderate impact significance).
- Moderate Significance Threshold: this level has been set at 67 dB LAeq, T, where T is the duration of working on weekdays and Saturdays. This value is consistent with the value of 70 dB LAeq, T discussed in the introduction of Annex E which relates to former

Environment Agency guidance for rural environments, minus 3 dB to convert to free-field values (BS 5228 states the 70 dB value relates to facade levels). The upper bound for shorter periods of working has then be chosen to correspond to threshold values in the Annex E E.4 example method (72dB LAeq, T as discussed subsequently for major impact significance).

- Major Significance Threshold: this this level has been set at 72 dB LAeq, T, where T is the duration of working on weekdays and Saturdays. This value is consistent with the value of 75 dB LAeq, T (minus 3 dB to convert to free-field levels) identified in the Annex E E.4 example method as the threshold at which noise is sufficient to warrant the developer providing noise insulation measures to affected dwellings. There is no defined period to allow for higher noise levels on occasion, however construction noise criteria are only applied to sustained impacts relevant to the EIA process, and should therefore not be strictly applied to atypical activities which occur for less than 1 week.

B.8 Based on the approach outlined above, Table 4.x summarises the impact significance criteria applied to the assessment of construction works. To confirm, these criteria are consistent with a range of policy and advice documents including MPS2, BS5228, and the WHO guidelines. All parameters relate to free-field day time noise levels occurring over a time period, T, equal to the duration of a working day on site. In this instance, the time period relates to day time hours from 08:00 to 18:00 on weekdays, and 08:00 to 13:00 on Saturdays. The impact significance criteria is consistent with the original ES criteria

**Table B1.2: Free-field Noise Criteria against which Construction Impacts are Assessed**

| <b>Significance</b> | <b>Condition</b>   |
|---------------------|--|
| Major               | Construction noise is generally greater than 72 dB $L_{Aeq,T}$ or exceeds 67 dB $L_{Aeq,T}$ for more than 4 to 8 weeks in any 12 month period  |
| Moderate            | Construction noise is generally less than or equal to 67 dB $L_{Aeq,T}$ throughout the construction period, with periods up to 72 dB $L_{Aeq,T}$ lasting not more than 4 to 8 weeks in any 12 month period.. |
| Minor               | Construction noise is generally less than or equal to 60 dB $L_{Aeq,T}$ with periods up to 67 dB $L_{Aeq,T}$ lasting not more than 4 to 8 weeks in any 12 month period.                                      |
| Negligible          | Construction noise is generally less than or equal to 55 dB $L_{Aeq,T}$ with periods up to 60 dB $L_{Aeq,T}$ lasting not more than 4 to 8 weeks in any 12 month period.                                      |

### **Operational Site Noise Significance Criteria**

B.9 Section 2.7 of the ES provided a tabular summary of the criteria set out in the range of assessment guidance and policy relevant to operational noise from the proposed development. This table is reproduced below. For ease of reference and consistency, the criteria are presented as free-field noise levels (i.e. noise levels that do not include reflections from vertical surfaces in the immediate vicinity of the prediction/measurement location). To convert to free-field limits, a value of 3 dB has been subtracted from the facade limits – a value consistent with a range of British Standards and UK planning guidance.

**Table B1.3: Criteria summary for policy and guidance relevant to operational site noise from the development**

| <b>Criterion</b> | <b>Maximum Possible Noise Level, <math>L_{Aeq, T}</math></b>                 |   |
|------------------|--|---|
|                  | <b>Day</b>   | <b>Night</b>                              |
| MPS 2            | 07:00 to 19:00: 55 dB<br>19:00 to 23:00:<br>Background + 10 dB<br>T = 1 hour | 42 dB & Background +10dB<br>T = 5 minutes |
| IPPC H3 Part 1   | 50 dB & Background + 0 dB  | 42 dB & Background + 0dB                  |

|                      | T = 1 hour   | T = 5 minutes                             |
|----------------------|--|---|
| Sector Guidance Note | 50 dB & Background + 0 dB<br>T = 1 hour  | 42 dB & Background + 0dB<br>T = 5 minutes |
| WHO Guidelines       | Below 50 dB few experience moderate annoyance<br>Below 55 dB few experience serious annoyance<br>T = 16 hours<br>7 am to 11 pm                   | 42 dB<br>T = 8 hours<br>11 pm to 7 am     |
| BS 4142              | Background + 5 dB for complaint likelihood of marginal significance<br>T = 1 hour between 7 am and 11 pm<br>T = 5 minutes between 11 pm and 7 am |   |

B.10 The guidance documents referenced above do not specify objective methods for determining when or how large a correction should be applied to predicted/measured noise levels to produce a rating level that accounts for acoustic features. The PPC guidance does however refer to BS 7445 (British adoption of ISO 1996) as relevant guidance. In this respect, the PPC guidance notes that the procedure for determining rating values should refer to BS 4142 rather than BS7445, however the former standard does not provide any objective method of determining rating values (the BS 4142 method is based on subjective characterisations of annoying features). BS 7445 Part 2 "Description and measurement of environmental noise - guide to the acquisition of noise data pertinent to land use" does however provide objective methods for identifying and ranking the presence of tonal or impulsive noise components, and it is therefore proposed that this method is adopted for this application. In relation to tonal noise components, BS 7445 provides the following key guidance:

- A prominent tonal component may be detected in one-third octave spectra if the level of a one-third band exceeds the level in the adjacent bands by more than 5 dB or more. In this instance, and if the tone is clearly audible, the adjustment to produce the rating level may require the addition of 5 to 6 dB to the measured or predicted LAeq, T level.
- A narrow band analysis may be required in order to detect the occurrence of one or more tonal components in a noise signal. In this instance, and if the tones are only just detectable by the observer, the adjustment to produce the rating level may require the addition of 2 to 3 dB to the measured or predicted LAeq, T level.
- BS 7445 also provides guidance on corrections appropriate for evaluating the effect of impulsive noise, however the prevalent noise emissions (in terms of the 1 hour and 5 minute day and night assessment time periods considered in this assessment) of the CERC are characterised by constant operation of fixed items of plant and occasional vehicle movement. For these reasons, the noise from the CERC is not expected to comprise impulsive components and further discussion of the impulsive corrections is not warranted in my evidence.

B.11 Based on the above range of policies and guidance documents applicable to operational plant noise, effect significance criteria in the ES were defined as follows:

- Negligible Significance Threshold: this criterion was chosen as adherence to the relevant PPC guidance including both fixed and relative limits. The relative limit is based on the rating level not exceeding the numeric value of the background; in practice, this means that the total ambient day and night noise levels would not change by more than 2 dB(A), and more likely, not more than 1 dB(A) (based on the ambient day and night time noise level

typically being greater than the background noise level by more than 2 dB(A)).

- **Minor Significance Threshold:** this criterion was chosen as adherence to the relevant fixed value limits for day and night time prescribed by the relevant PPC guidance, but with a relevant limit extending to not more than 5 dB(A) above background noise levels. This relative limit corresponds to a complaint likelihood of marginal significance according to BS4142 and is significantly lower than the 10 dB(A) margin suggested by MPS2.
- **Moderate Significance Threshold:** this criterion was chosen as adherence to both the fixed value and relative limits set out in MPS2.
- **Major Significance Threshold:** this criterion was chosen as levels which exceed either of the fixed value or relative limits set out in MPS2.

B.12 Based on the above principles, the following significance criteria were outlined in the ES.

**Table B1.4: Fixed installation significance criteria applicable to the operational development**

| Significance | Fixed installation free field noise level at receptor locations   |
|--------------|---|
|              | $L_{Aeq, 1 \text{ hour}}$ Day<br>$L_{Aeq, 5 \text{ minute}}$ Night                                      |
| Major        | Greater than background plus 10 dB<br>or<br>Greater than 55 dB during the day and 42 dB at night        |
| Moderate     | Less than or equal to background plus 10 dB<br>and<br>Less than 55 dB during the day and 42 dB at night |
| Minor        | Less than or equal to background plus 5 dB,<br>and<br>Less than 50 dB during the and 42 dB at night     |
| Negligible   | Less than or equal to background<br>and<br>Less than 50 dB during the day and 42 dB at night            |

### **Operational Traffic Noise Significance Criteria**

B.13 The starting point for developing impact significant criteria for operational traffic flows associated with the CERC development was to determine the relevant criterion which could be used to separate impacts which would be judged as significant and not significant in EIA terms.

B.14 The most appropriate noise criterion for this purpose was chosen to be the World Health Organization guidelines for day time outdoor amenity in residential environments. The following extract of WHO Guideline text was provided in the Technical Report accompanying the CERC ES:

*Day time levels between 50 dB and 55 dB  $L_{Aeq, 16hour}$  (free-field) are sufficient to invoke moderate annoyance. Levels greater than 55 dB(A)  $L_{Aeq, 16hour}$  (free-field) are sufficient to invoke serious annoyance.*

B.15 In considering these threshold values of 50 and 55 dB, it is worth drawing additional reference to the WHO Guidelines to understand the concepts of invoking moderate and serious annoyance. Section 4 of the WHO Guidelines Executive Summary states:

*The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. During daytime, few people are highly annoyed at  $L_{Aeq}$  levels below 55 dB(A), and few are moderately annoyed at  $L_{Aeq}$  levels below 50 dB(A).*

*To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB  $L_{Aeq}$  on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB  $L_{Aeq}$ . Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.*

B.16 The above guidance firstly establishes that noise annoyance depends on a range of factors including its characteristics, level and other variables. It also indicates that irrespective of the level, 50 or 55 dB, there will always be a portion of the population which will experience a degree of annoyance to an audible sound. In reality, the extent of the perceived annoyance will be down to each individual and their own interpretation of an audible sound. Importantly, no objective criterion can categorically define an audible level below which no individual would experience annoyance – it is a matter of individual opinion.

B.17 However, it can be gleaned from these definitions that levels less than 55 dB are an indication that the majority of people would be unlikely to experience serious annoyance, and at levels less than 50 dB, the majority of people would be unlikely to experience moderate annoyance.

B.18 It is important to note that whilst the wording of "moderate" and "serious" in the WHO guidelines are similar to the language used in

assessing EIA significance, the two are not directly related. As set out previously, the concept of significance and acceptability in EIA and planning carries separate and specific definitions. The WHO's classification of the onset of moderate annoyance does not directly translate to moderate EIA significance, since the WHO is primarily concerned with effects on people, whilst a planning system is concerned with balancing the need for development with amenity protection.

B.19 In determining how these values should relate to significance criteria, additional reference is made to the Noise Exposure Category (NEC) scheme set out in PPG 24. This system is used for rating the suitability of noise conditions at potential residential development sites, particularly those affected by transport noise. PPG 24 stipulates that the NEC scheme is not intended to be used for the assessment of new noise sources on existing residential environments. However, the discussion of the derivation of the NEC bands in PPG 24 Annex A provides a useful insight to the interpretation of these values in the planning system. The following definition is provided in relation to the upper bound of the NEC A band – a band which means noise levels should not be a determining factor when choosing whether to grant planning permission for a new residential development.

*The level at the boundary of NEC A and NEC B is therefore based on guidance provided by the World Health Organisation that "general daytime outdoor noise levels of less than 55 dB (A)  $L_{eq}$  are desirable to prevent any significant community annoyance".*

B.20 It is noted that the reference to WHO advice in the above extract from PPG 24 relates to the advice set out in the superseded 1980 WHO document which did not contain reference to the lower 50 dB value introduced in the 1999 WHO guidelines. However, despite the introduction of the lower value in the 1999 guidelines, the definition of the 55 dB level remained consistent between the 1980 and 1999 documents, and PPG 24 remains as the current overarching planning guidance on noise.

B.21 Whilst the NEC scheme is intended for a very specific purpose, the above extract demonstrates the concept of the planning system being structured as a balanced approach, with thresholds chosen to avert “significant community annoyance” rather than being set at a lower level focussed on preventing all annoyance. In the case of the NEC scheme, the balance reflected in the policy is that of providing a development framework which meets the needs of growing demand for residential accommodation, and the need for this development in urban areas where transport noise is prevalent.

B.22 Taking account of the above principles, and recognising the proposed CERC as an important infrastructure project, the test of acceptability for operational traffic for the proposed development was based on the 55 dB WHO criterion. This choice was based on the premise that the noise arising from operational traffic associated with an infrastructure project of wider regional significance should not be considered a reason for refusal of the development provided that the majority of people do not

experience serious annoyance. It is implicit that levels below this threshold could still represent a significant change to the noise environment of neighbouring areas, and an individual may judge this to be a significant impact. However, the 55 dB is proposed as a benchmark which will provide an acceptable level of protection for the majority of people. According to the EIA principles discussed above, this 55 dB value is then used as the benchmark to separate impacts defined as significant and non-significant impacts in EIA terms.

B.23 The adoption of 55 dB value as the upper bound of non-significant effects requires levels below 55 dB to be separately categorised as either negligible or minor. The 50 dB WHO guideline value has been chosen as the appropriate threshold for this purpose. At levels below 50 dB, the WHO Guidelines indicate that the majority of people would be unlikely to experience moderate annoyance, and that the 50 dB value represents an ideal target value. On this basis, and the premise that a negligible impact corresponds to an ideal target for new development, the 50 dB value has been chosen as the upper threshold for negligible transport impacts associated with an infrastructure project. Again, even at levels below 50 dB, an individual may still consider the noise change associated with the development to be personally significant, however the designation of a negligible impact is linked to providing an acceptable level of protection, in accordance with the planning principles set out in PPG 24.

B.24 In applying the WHO guideline values to operational traffic associated with the scheme, it must be emphasized that the WHO criteria relate to traffic noise continuing throughout the day from 7 am to 11 pm, and assume that the traffic noise persists seven days per week. In contrast, operational traffic noise associated with the development will not occur on weekends, and will not occur outside of the hours of 7 am to 5 pm. It therefore follows that application of the WHO values which implicitly seek to protect evening and weekend periods will to some degree overstate the impact of the noise when activity does not continue into the more sensitive evening and weekend periods. This must however be considered in light of the specifics of traffic associated with the operational development which is composed entirely of intermittent HGV movements rather than the constant noise of a mix of vehicles to which the WHO criteria directly relate.

B.25 At noise levels above 55 dB, the value used to separate moderate and major impacts was derived from the Noise Insulation Regulations trigger level. This defines the level above which the impacts would be so great as to warrant enhanced dwelling insulation for the affected properties in order to maintain an acceptable internal resting environment.

B.26 Table 4.5 below summarised the impact significance based on the above principles, as originally presented in the ES.

**Table B1.5: Operational traffic noise significance criteria**

| Significance | Operation HGV movement free field noise level at receptor locations<br>T =10 hours, weekdays between 7 am and 5 pm |
|--------------|--|
| Major        | Greater than 66 dB $L_{Aeq,T}$   |

|            |                                    |
|------------|------------------------------------|
| Moderate   | Less than or equal to 66 dB LAeq,T |
| Minor      | Less than or equal to 55 dB LAeq,T |
| Negligible | Less than or equal to 50 dB LAeq,T |

### **Operational Traffic Noise Impact Magnitude Criteria**

B.27 Operational traffic noise associated with the development will represent the most pronounced change to the noise environment in the surrounding area. Traffic noise will occur at the rear of residential locations which currently do not directly overlook road traffic routes. Accordingly, in addition to the significance criteria outlined above to rate the acceptability of absolute noise levels, additional assessments are provided to rate the impact magnitude associated with change in noise levels which would arise from operational traffic.

B.28 In my proof, the impact magnitude is considered firstly in terms of the specific characteristics of audible noise that would occur at surrounding dwellings.

B.29 Impact magnitude is then assessed by considering the potential subjective interpretation of the change in noise levels, in combination with the noise level range within which the changes occur and the number of affected properties. To assess the impact magnitude associated with the change in noise level, the example DMRB method is used to compare the change in total ambient noise levels occur over the normal hours of HGV movements to and from the site.

B.30 In adopting the DMRB example method for this application, it is noted that the method relies on comparisons of the 18 hour upper traffic noise

level between the period of 6 am and midnight. In this instance, the assessment is provided on the basis of comparing equivalent ambient and operational traffic noise levels over the working day from 7 am to 5 pm to reflect the period when operational traffic will be present. In terms of the parameter, the equivalent noise level is the most relevant parameter to reference in this instance. This is based on the equivalent noise level being the parameter produced by the BS 5228 prediction methodology for HGV movements on the access route, and the absence of a reliable method for translating a 10 hour equivalent noise level composed entirely of intermittent HGV movements to an 18 hour upper noise level. Given that the method is used in this instance for indicative purposes only due to the particulars of this development and how it differs from the basis upon which the DMRB method was derived, comparisons of the working period equivalent noise level are considered consistent with the intent of the methodology.

B.31 Based on the various relevant guidance and standards set out in the preceding paragraphs, the key environmental noise criteria were provided in the ES and are set out in the following table. For ease of reference and consistency, the criteria are presented as free-field noise levels (i.e. noise levels that do not include reflections from vertical surfaces in the immediate vicinity of the prediction/measurement location). To convert to free-field limits, a value of 3 dB has been subtracted from the facade limits – a value consistent with a range of British Standards and UK planning guidance

**Table B1.6: Key Environmental Noise Criteria**

| Criterion                  | Maximum Possible Noise Level, $L_{Aeq}$                                 |                          |
|----------------------------|---|--------------------------|
|                            | Day   | Night                    |
| BS 4142                    | Background + 5 dB for marginal significance                             |                          |
| MPG 11                     | Generally: 55dB & Background + 10dB<br>Quiet (<35dB) environments: 45dB | 42dB & Background + 10dB |
| MPS 2                      | 07:00 to 19:00: 55 dB<br>19:00 to 23:00: Background + 10 dB             | 42 dB & Background +10dB |
| IPPC H3<br>Part 1          | 50 dB & Background + 0 dB   | 42 dB & Background + 0dB |
| Sector<br>Guidance<br>Note | 50 dB & Background + 0 dB   | 42 dB & Background + 0dB |
| WHO<br>Guidelines          | 50 dB for moderate annoyance<br>55 dB for serious annoyance             | 42 dB                    |

## APPENDIX C: Measured Noise Levels

C.1 The following tables and charts reproduce the original noise data provided with the ES for the development. The results data are presented here for confirmation purposes only. Full details of the surveys and noise field attributes should be referred to in the discussion provided in Section 3 of the ES.

**Table C1.1: Unattended measurement data reproduced from the ES**

| Location        | Noise Levels  |  |
|-----------------|---|--|
|                 | Background $L_{A90, 5min}$  | Ambient $L_{Aeq, 5min}$  |
| Rostowrack Farm | Typically 40 dB(A)<br>Variations typically between 38 and 42 dB(A)                      | Typically 40 to 45 dB(A)<br>Some noisier periods extending to 45 to 50 dB(A) |
| Bodella Farm    | Typically 48 dB(A)<br>Variations typically between 46 and 50 dB(A)                      | Typically 50 dB(A)<br>Variations typically between 49 and 53 dB(A)           |
| Carsella Farm   | Typically 35 to 40 dB(A)<br>Brief quieter night periods noted to fall to 30 to 35 dB(A) | Typically 40 to 50 dB(A)   |

**Table C1.2: Attended measurement data reproduced from the ES.**

| Location                 | Time                       | Typical Background Level $L_{A90}$ dB | Comment  |
|--------------------------|----------------------------|---------------------------------------|--|
| Western end of St Dennis | 18:00 to 20:00<br>01/03/07 | 36 to 37                              | Distant traffic, mining activities, and India Quays substation audible. Goonvean/Imerys only faintly audible (cross-wind). |
|                          | 06:00 to 07:00<br>02/03/07 | 42 to 44                              | Subjectively dominated by Goonvean/Imerys (downwind)   |
| Carsella                 | 18:00 to                   | 37 to 38                              | Distant traffic, mining activities,  |

|                          |                               |                                      |  |
|--------------------------|-------------------------------|--------------------------------------|--|
| Farm                     | 20:00<br>01/03/07             | during lulls in activity at Carsella | and India Quays substation audible. Goonvean/Imerys only faintly audible (cross-wind).   |
|                          | 06:15<br>02/03/07             | 43                                   | Subjectively dominated by Goonvean/Imerys (downwind)   |
| Trece near Green Meadows | 18:00 to<br>20:00<br>01/03/07 | 38                                   | Distant traffic and mining activities. Goonvean/Imerys inaudible (upwind)  |
|                          | 06:30<br>02/03/07             | 40                                   | Subjectively dominated by Goonvean/Imerys & Treviscoe driers (downwind)  |
|                          | 09:00<br>02/03/07             | 39                                   | Noise levels composed of several distant activities – subjectively no distinctly dominant source. Influences audible from Goonvean, Imerys, Treviscoe driers and mining activities |
| Western end of Treviscoe | 17:00<br>01/03/07             | 40                                   | Mixed contributions from Goonvean, Imerys, Treviscoe driers and mining activities  |
|                          | 06:45<br>02/03/07             | 41                                   | Subjectively dominated by Goonvean/Imerys & Treviscoe driers (downwind)  |

C.2 In addition to the form of data originally presented, and reproduced above, the measurement data has been analysed to produce the hourly and working period ambient noise levels. This data is referenced in the assessment of noise change associated with operational traffic associated with the development. This analysis has been carried out for the logged data obtained at Bodella and Rostowrack Farms given that development traffic noise is a consideration for each of these locations.

C.3 The analysis has not been carried out for the logged data obtained at Carsella Farm for two reasons; firstly, the ambient data is known (and was previously reported) to have been contaminated by local sources around the dwelling, and secondly, Carsella Farm is distant from traffic movements and will experience much lower associated noise levels than the key locations considered in the study.

C.4 The logged data from Bodella and Rostowrack Farms was sampled continuously in 5 minute measurement intervals for the duration of the survey period. This data was analysed to produce reference ambient noise data as follows:

- Data recorded during adverse weather conditions was excluded from the analysis. Adverse weather conditions were defined as periods in which rainfall was recorded and the maximum wind speed exceeded 3 m/s. Common measurement guidance suggests up to 5m/s to be acceptable however such guidance does not account for wind speed variations in the period and is primarily concerned with noise generated on the tip of the microphone – the choice of 3 m/s in this instance as a limiting factor therefore represents a cautious choice.
- Data recorded on Saturdays and Sundays were excluded. This exclusion was made on the basis that the development traffic will not occur on Saturday afternoons or Sundays. Also, Saturday morning data could potentially be influenced by domestic noise at the dwelling to a greater extent than during normal weekday operating hours associated with the development.
- Data recorded during weekdays before 07:00 and after 17:00 were excluded as these periods fall outside of the proposed normal

working hours in which HGV traffic would arrive and depart from the site.

- Based on inspection of the time-history of the measurement data (already filtered for the removal of adverse weather conditions) as depicted above in figures 2.2 and 2.4, periods in which the measured level appears atypically high have been removed as a precautionary measure to account for the potential that the increased noise occurred as result of local noise at the dwelling. In relation to Bodella Farm, all 5 minute equivalent noise levels greater than 55 dB(A) were removed on this basis. In relation to Rostowrack, all data greater than the median value of 48 dB(A) were discarded on this basis. For clarity, it is noted that there is no definitive measurement analysis procedure that is either ratified, or applicable to every scenario. These removals were made on a judgement basis with respect to the typical range of noise levels occurring at each property.

C.5 Following implementation of the above filtering processes, the equivalent hourly noise level,  $L_{Aeq, 1 \text{ hour}}$ , for each period commencing on the hour, was calculated from the 5 minute equivalent noise levels. The equivalent noise level for the working period of the day,  $L_{Aeq, 10 \text{ hour}}$  was then calculated as the energy (logarithmic) average of all available filtered data points. The table below presents a summary of the values derived in this way.

**Table C1.3: Derived hourly and working period ambient noise levels at Bodella & Rostowrack Farms**

| Noise Parameter                                      | Bodella Farm | Rostowrack Farm |
|--|--------------|-----------------|
| $L_{Aeq, 1 \text{ hour}}$ – minimum                  | 46.9         | 42.4            |
| $L_{Aeq, 1 \text{ hour}}$ – maximum (filtered limit) | 54.8         | 47.9            |
| $L_{Aeq, 1 \text{ hour}}$ – mean                     | 51.3         | 45.9            |
| $L_{Aeq, 10 \text{ hour}}$                           | 51.6         | 46.0            |

