Scottish & Southern Electricity Networks
TRANSMISSION

Dunoon to Loch Long 132 kV OHL Rebuild

Environmental Impact Assessment

Volume 4 | Technical Appendix

Appendix 11.2 – Noise and Vibration Legislation

NOISE AND VIBRATION LEGISLATION

1.1.1 For a development of this nature, there is no specific all-encompassing legislation relating to the standards associated with noise emission/ effects. Noise legislation, where it does exist, tends to be either EC-derived and focussed on specific items of noise-emitting plant or on more general nuisance, such as that addressed by the provisions of the Environmental Protection Act 1990.

1.1.2 In lieu of any specific legislation, assessing the effect of such a development during the construction and operational phases must draw on information from a variety of sources. Therefore, this assessment refers to Scottish Government guidance notes, a number of British Standards, official planning advice notes and national guidance.

1.1.3 The noise and vibration assessment has taken account of the relevant legislative, policy and guidance framework internationally and nationally. The relevant legislation, policies and guidance, are summarised below.

International:

- Directive 2002/49/EC of the European Parliament and of the Council of 25 June 2002 relating to the assessment and management of environmental noise (the Environmental Noise Directive (END))[1]

National:

- UK Government (1974). The Control of Pollution Act (1974)[2]
- The Environmental Noise (Scotland) Regulations (2006)[3]
- Planning and Noise: Planning Advice Note 1/2011 (2011)[4]
- Assessment of Noise: Technical Advice Note (2011)[5]

Guidance

- Guidelines for Community Noise (1999)[6]
- Environmental Noise Guidelines for the European Region (2018)[7]
- Guidelines for Environmental Noise Impact Assessment (2014)[8]
- John W Leverton, Acoustics Bulletin Volume 35 Part 2 "Public Acceptance Of Helicopters (The Virtual Noise Component)", Institute of Acoustics (IOA) March/April 2010)[9]
- D. A. Moorhouse, D. D. Waddington, and D. M. Adams, "DEFRA NANR45: Proposed criteria for the assessment of low frequency noise disturbance," University of Salford 2005)[10]

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[1] The European Parliament and the Council of the European Union (2002), Directive 2002/49/EC relating to the assessment and management of environmental noise (the Environmental Noise Directive (END)). Available at: https://www.legislation.gov.uk/eudr/2002/49/contents

[2] UK Government (1974). The Control of Pollution Act (1974). Available at: https://www.legislation.gov.uk/ukpga/1974/40/contents

[3] The Scottish Government (2006). The Environmental Noise (Scotland) Regulations 2006. Available at: https://www.legislation.gov.uk/ssi/2006/465/introduction/made

[4] Scottish Government (2011). Planning and Noise: Planning Advice Note 1/2011 (2011) Available at: Planning Advice Note 1/2011: planning and noise - gov.scot (www.gov.scot)

[5] Scottish Government (2011). Assessment of Noise: Technical Advice Note (2011). Available at: https://www.gov.scot/publications/technical-advice-note-assessment-noise/

[6] Berglund, Birgitta, Lindvall, Thomas, Schwela, Dietrich H & World Health Organization. Occupational and Environmental Health Team. (1999). Guidelines for community noise. World Health Organization. Available at: https://apps.who.int/iris/handle/10665/66217

[7] World Health Organisation (2018). Environmental Noise Guidelines for the European Region (2018). Available at: https://www.euro.who.int/__data/assets/pdf_file/0008/383921/noise-guidelines-eng.pdf

[8] Institute of Environmental Management & Assessment (2014) Guidelines for Environmental Noise Impact Assessment.

[9] Institute of Acoustics (2010). Public Acceptance of Helicopters (IOA Bulletin: March/April 2010). Available at: https://www.ioa.org.uk/catalogue/article/public-acceptance-helicopters-virtual-noise-component

[10] Waddington, DC and Kendrick, P, Department of Environment, Food and Rural Affairs (DEFRA) (2008). Research into the Improvement of the Management of Helicopter Noise (DEFRA NANR 235: 2008). Available at: https://usir.salford.ac.uk/id/eprint/30805/1/nanr235-project-report.pdf

- Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD 213/11 revision 1. Noise and Vibration (2011)[11]

Technical Standards

- Acoustics – Description, measurement and assessment of environmental noise (ISO 1996-2:2017)[12]
- Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation (ISO 9613 :1996)[13]
- Acoustics – Attenuation of sound during propagation outdoors (ISO 9613:1996)[14]
- Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1: 2009 + A1:2014)[15]
- Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BS 5228-2: 2009 + A1:2014)[16]
- Guidance on sound insulation and noise reduction for buildings (BS 8233:2014)[17]
- Description and Measurement of Environmental Noise – Part 1: Guide to quantities and procedures (BS 7445: 2003)[18]
- Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration (BS 7385-2: 1993)[19]
- Calculation of Road Traffic Noise (CRTN)[20]

1.1.4 Further details regarding the content of these documents is as follows.

Planning Advice Note (PAN) 1/2011: 'Planning and Noise'

1.1.5 This document provides advice on the role of the planning system in helping to prevent and limit adverse effects of noise (Scottish Government, 2011). Information and advice on noise assessment methods are provided in the accompanying Technical Advice Note (TAN): Assessment of Noise. Included within the PAN document and the accompanying TAN are details of the legislation, technical standards and codes of practice for specific noise issues.

1.1.6 Neither PAN or TAN provide specific guidance on the assessment of noise from construction activities, but does refer to BS 5228:2009 with reference to Environmental Impact Assessments. TAN states that BS5228:2009 *"incorporates the 2005 and 2006 Department for Environment, Food and Rural Affairs (Defra) updates on construction plant noise and provides several examples of noise level and exposure matrices that have been used on major infrastructure projects across the UK."*

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[11] The Highways Agency, Scottish Government, Welsh Assembly Government and the Department for Regional Development Northern Ireland (2011). Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7, HD 213/11 revision 1. Noise and Vibration (2011).

[12] International Organization for Standardization. (2017) Acoustics – Description, Measurement and assessment of environmental noise (ISO 1996-2:2017)

[13] International Organization for Standardization (1996). Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation (ISO 9613 :1996)

[14] International Organization for Standardization (1996). Acoustics – Attenuation of sound during propagation outdoors (ISO 9613:1996)

[15] The British Standards Institution (2014). Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1: 2009 + A1:2014)

[16] The British Standards Institution (2014). Code of practice for noise and vibration control on construction and open sites –Part 2: Vibration (BS 5228-2: 2009 + A1:2014))

[17] The British Standards Institution (2014). Guidance on sound insulation and noise reduction for buildings (BS8233:2014)

[18] The British Standards Institution (2003). Description and measurement of environmental noise (BS 7445: 2003)

[19] The British Standards Institution (1993). Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration (BS 7385-2: 1993)

[20] Department of Transport and Welsh Office (1988). Calculation of Road Traffic Noise. HMSO

BS 5228, Parts 1&2 (2009) + A1 (2014): Code of practice for noise and vibration control on construction and open sites

1.1.7 BS5228:2009, A1:2014, titled *'Code of practice for noise and vibration control on construction and open sites'*, has an approved methodology for predicting noise levels from construction sites, and assessing its effects on those exposed to it. It is considered suitable as it the industry approved code of practice in the United Kingdom, and it complies with EU requirements for assessing noise from construction phases.

1.1.8 BS5228 provides guidance on the potential significance of construction impact. The assessment of construction noise is proposed to be based on the ABC method outlined in Table E1 included in Annex E of BS 5228-1. This provides threshold noise levels which indicate a potential significant adverse effect from site specific construction noise on residential properties.

1.1.9 The ABC method defines thresholds of potentially significant effects based on the baseline ambient noise level, as presented in Table 1~~Table 3~~.

Table 1~~3~~– Threshold of potential significant effect at dwellings

Evaluation Period	Assessment Category (dB L_{Aeq})		
	A[A]	B[B]	C[C]
Night-time (23:00-07:00)	45	50	55
Evening and Weekends[D]	55	60	65
Daytime (07:00-19:00)	65	70	75

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.

1.1.10 Additionally, noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the preconstruction ambient by 5 dB or more.

1.1.11 Within public open space, the impact may be deemed to cause significant effects if the total noise exceeds the ambient noise ($L_{Aeq, T}$) by 5 dB or more for a period of one month or more. However, BS5228 states that the extent of the area impacted, relative to the total area available, should be taken into consideration when determining the significance of the impact.

The Institute of Environmental Management & Assessment (IEMA) - Guidelines for Environmental Noise Impact Assessment, 2014

1.1.12 The Institute of Environmental Management & Assessment (IEMA): Guidelines for Environmental Noise Impact Assessment published in October 2014 address the key principles of noise impact assessment and are applicable to all development proposals.

1.1.13 The document describes the process of assessing noise by identifying 'Sensitive Receptors' and determining a 'Magnitude of Impact' for each of the identified receptors. The process by which magnitude of impact is identified includes assessment of noise level change with 'context' being provided by absolute noise levels. The guidelines provide the following examples:

> *"A development proposal which would cause an increase in an existing level that is already well above an existing guideline should probably be regarded as worse than if the existing level were below the guideline."*
>
> *"Similarly, but at the other end of the scale, for an area which is valued because of the soundscape, a relatively small impact could be considered as having a potentially substantive effect if the quality of the noise environment were to be eroded. This particularly relates to tranquil, quiet or calm areas."*

1.1.14 The process detailed within the guidelines also considers several other relevant factors, including:

- time of day;
- averaging time period;
- nature of source;
- frequency of occurrence;
- spectral characteristics; and
- noise indicators (the measurement parameters used in the assessment).

1.1.15 Once the Magnitude of Impact and Sensitivity of Receptor are established, the resulting effects are described/ classified. For a standalone noise impact assessment, the noise effect of the proposal is then determined. For an EIA development the significance of each effect is evaluated before the noise effect of the proposals is determined.

Public Acceptance of Helicopters, IOA Bulletin March/April 2010

1.1.16 An article published in the Institute of Acoustics (IOA) Bulletin highlighted the lack of correlation with noise complaints associated with helicopter noise and the maximum, or peak, noise level. It suggested that small helicopters, which generate low overall levels of noise, provoke at least the same level of complaints as larger helicopters which produce much higher noise levels. The article also suggests that a significant factor in noise complaints is the character of the helicopter noise. The more impulsive or tonal the sound, the more likely complaints are to occur.

1.1.17 Other issues discussed are the perceived uncontrolled manner in which helicopters fly with authorities having no power over flight paths and flying heights.

1.1.18 The article concludes that 'the reaction of helicopters and heliports is dependent on several factors, some of which are completely unrelated to the sound generated by the helicopter'. The non-acoustical elements (virtual noise) including concerns about safety and the 'startle effect' of low level flying helicopters often dictates the level of public response to helicopters.

DEFRA NANR235: Research into the Improvement of the Management of Helicopter Noise

1.1.19 Research carried out on behalf of Defra highlights that response to helicopter noise is not well correlated with generally accepted acoustic parameters and that non-acoustic factors may be of equal or greater importance.

1.1.20 Studies attempting to relate dose-response with annoyance due to helicopter operations have produced poor correlation and no generally accepted simple relationship between objective noise and subjective annoyance. Similarly, little correlation between established acoustic parameters and complaints has been found.

1.1.21 The Defra report notes that 'Helicopters can be up to 15 dB more annoying than fixed-wing aircraft. However, helicopter noise levels alone do not account for annoyance trends in communities'. This is based upon social surveys carried out by the Civil Aviation Authority (CAA) in the UK which found that helicopters in the London area were up to 15dBA more annoying than fixed wing aircraft, whilst helicopters operated in Aberdeen, servicing the North Sea oil industry, generated a similar annoyance as fixed wing aircraft for a similar sound level. This discrepancy suggests the significance

of the non-acoustic factors in the perception of helicopter noise, which it has been suggested might include soundscape, flight safety, poor community relations with or a negative attitude towards the operators.

1.1.22 The study also considers evidence for the way in which particular features of helicopter noise such as low frequencies, the impulsive features and amplitude modulation (often described as blade slap) could influence perception. Whilst various corrections for the specific acoustic artefacts associated with helicopters have previously been suggested, these have not gained widespread approval.

1.1.23 In reviewing the available literature for helicopter noise, the Defra study concludes that "there is no single satisfactory noise index for the measurement or prediction of the impact of noise on the community" and that "while L_{eq} or L_{den} are not ideal, currently there is not a better option", with further research being required in order to develop a dose-response relationship to correlate helicopter noise with annoyance.

Calculation of Road Traffic Noise (CRTN)

1.1.24 The CRTN memorandum describes the methodology to calculate the road traffic noise at a given distance from the road. This is referred to as the Basic Noise Level (BNL).

1.1.25 The methodology takes into account the intervening ground cover, road configuration and road layout. The calculation assumes typical traffic (i.e. free flowing) and noise propagation conditions. Noise levels are presented in terms of the noise descriptor $L_{A10,18h}$ which is the noise level exceeded for just 10 % of the time between 06:00 and 24:00 hours. The variables used in the calculation of the traffic noise level are:

- the annual average weekday traffic flow (AAWT) for the 18-hour period from 06:00 to 24:00 hours;
- mean traffic speed;
- percentage heavy vehicles;
- road gradient;
- type of road surface;
- distance of the receptor from the road; and
- nature of the ground cover between the road and the receptor.

1.1.26 Section III of CRTN provides guidance on the measurement method and includes a shortened measurement procedure for determining the road traffic noise over an 18-hour period. Measurements are made over three consecutive hours between 10:00 and 17:00 hours in order to estimate the $L_{A10,18h}$.

Design Manual for Roads and Bridges (DMRB) LA 111 – Noise and Vibration (2020)

1.1.27 The key part of the Design Manual for Roads and Bridges (DMRB) with relevance to this assessment is LA 111 Revision 2 (May 2020). DMRB advises that the CRTN method should be used to model road noise emissions. DMRB also provides additional procedural guidance on the use of CRTN that reflects more recent developments in understanding of road noise prediction.

Attenuation of Sound During Propagation Outdoors (ISO 9613:1996)

1.1.28 ISO 9613:1996, titled Part 2 'Acoustics – Attenuation of Sound During Propagation Outdoors', specifies an international engineering method to calculate the attenuation of noise propagating outdoors under meteorological conditions favourable for propagation.

1.1.29 The conditions for propagation are downwind, or equivalent, under a moderate ground-based temperature inversion, such as that encountered at night.

1.1.30 The method consists of octave band algorithms to calculate the propagation originated from a point source, or several sources, taking into account the following physical effects:

- geometrical divergence;
- atmospheric absorption;
- ground effect;
- reflection from surfaces; and
- screening by obstacles.

1.1.31 The assessment methodology for noise and vibration has been derived in accordance with local and national policy and guidance documents. The determination of the magnitude of change and the sensitivity of receptors is provided in this section.

Description and measurement of environmental noise (BS7445: 2003)

1.1.32 BS7445:2003 'Description and Measurement of Environmental Noise' defines and prescribes best practice during recording and reporting of environmental noise. It is inherently applied in all instances when making environmental noise measurements and is applicable to the baseline noise measurements taken to inform this chapter. The document advises that the information to be reported should include:

- measurement technique;
- conditions prevailing during measurements;
- qualitative data; and
- connotation of the sound.

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