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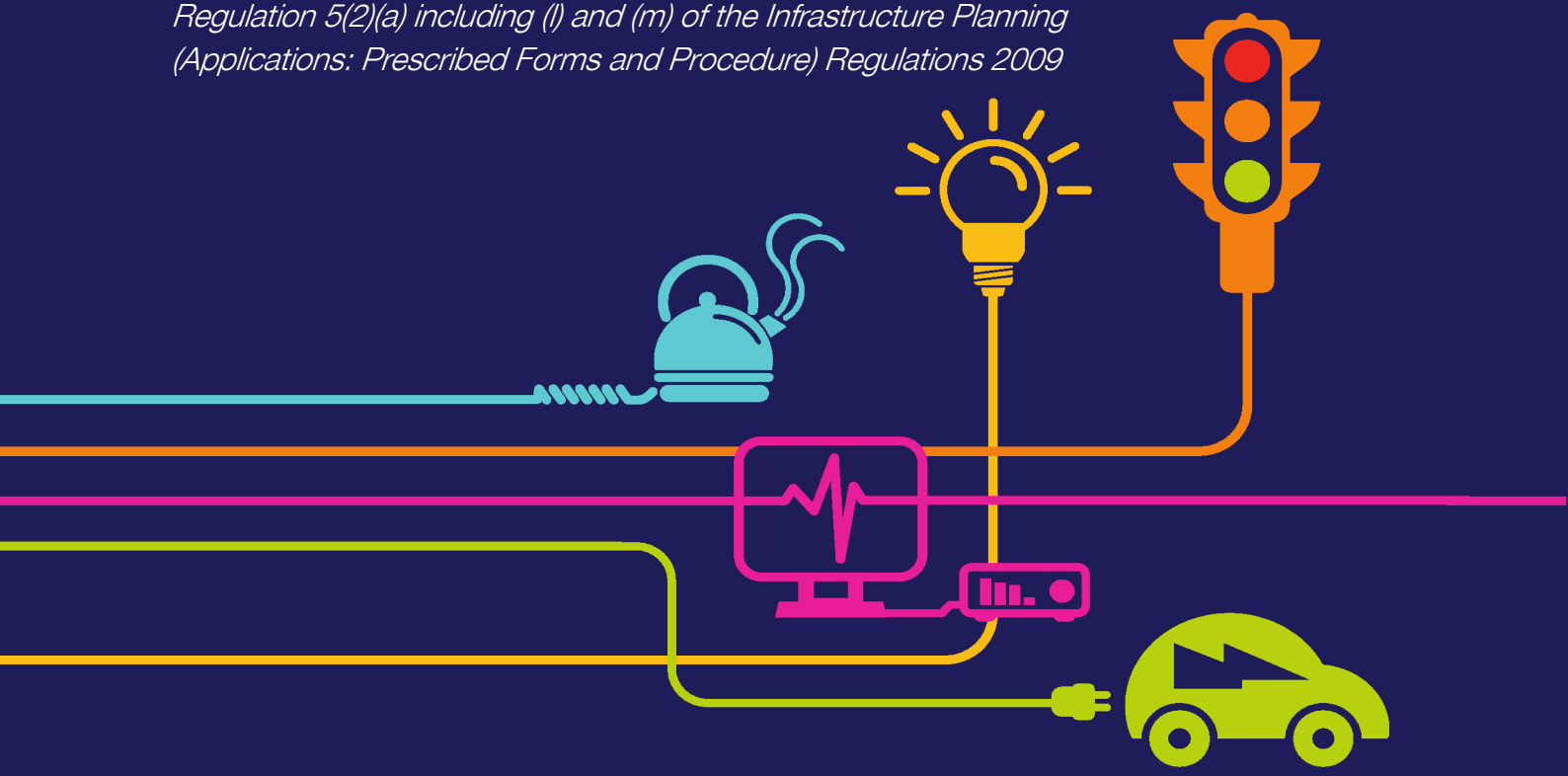
DOCUMENT 5.16

Environmental Statement Chapter 16 Operational Noise

National Grid (North Wales Connection Project)

Regulation 5(2)(a) including (l) and (m) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009



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National Grid
National Grid House
Warwick Technology Park
Gallows Hill
Warwick
CV34 6DA

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Author		Simon Stephenson/Jon Baldwin	
Approved by		Richard Morris	
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1 Introduction

1.1 INTRODUCTION

1.1.1 This chapter presents information about the potential noise effects that could occur as a result of the operation of the Proposed Development (as described in Chapter 3, Description of the Proposed Development (Document 5.3). Vibration effects are not reported, having been scoped out of the assessment.

1.1.2 Construction noise and vibration effects are considered within Chapter 15, Construction Noise and Vibration (**Document 5.15**).

1.1.3 Potential effects of operational noise on ecological receptors are considered within Chapter 9, Ecology and Nature Conservation (**Document 5.9**).

1.1.4 Potential effects of operational noise on social and economic factors are considered within Chapter 17, Socio Economics (**Document 5.17**).

1.1.5 Effects of noise on Health and Wellbeing are considered in the Wellbeing Report (**Document 5.27**).

1.1.6 Intra-Project Effects are considered within Chapter 19, Intra-Project Effects (**Document 5.19**)

1.1.7 Inter-Project Effects are considered within Chapter 20, Inter-Project Effects (**Document 5.20**)

1.1.8 The Construction Environmental Management Plan is provided in **Document 7.4**

1.1.9 This chapter is supported by a number of Appendices as listed below:

- Appendix 15.2 (**Document 5.15.2.2**) – Baseline Sound Monitoring Report;
- Appendix 16.1 (**Document 5.16.2.1**) – Representative Baseline Area Map;
- Appendix 16.2 (**Document 5.16.2.2**) – Local Planning Policy – Operational Noise;

- Appendix 16.3 (**Document 5.16.2.3**) – OHL Conductor Assessment Methodology Summary;
- Appendix 16.4 (**Document 5.16.2.4**) – Taking into Account the Existing 400 kV OHL;
- Appendix 16.5 (**Document 5.16.2.5**) – Noise Model Output Assessment Tables; and
- Appendix 16.6 (**Document 5.16.2.6**) – TR(T)94 A Method for Assessing the Community Response to Overhead Line Noise.

1.1.10 All technical terms and abbreviations used within this chapter are defined in the Glossary (**Document 1.6**).

2 Legislation and Planning Policy

2.1 INTRODUCTION

2.1.1 This section outlines the legislative and planning policy framework that is relevant to the operational noise assessment. A full review of compliance with national and local planning policy is provided in the Planning Statement (**Document 7.1**) and a full review of relevant legislation is set out in the Legislation Compliance Audit (**Document 5.28.2.1**).

2.2 LEGISLATION

2.2.1 There is no legislation that is specifically relevant to the operational noise effects of the Proposed Development. The project is exempt from statutory nuisance; however, as a Statement of Statutory Nuisance (**Document 5.24**) has been prepared, guidance on the Environmental Protection Act 1990 is provided for reference.

Environmental Protection Act 1990, Part III

2.2.2 The Environmental Protection Act 1990 (EPA) [Ref 16.1] deals with statutory nuisance, including noise.

2.2.3 Section 79, Part III of the EPA, 'Statutory nuisances and inspections therefor', places a duty on local authorities to regularly inspect their areas to detect whether a statutory nuisance exists. This section also considers and defines the concept of 'Best Practicable Means' (BPM) which originates from Section 72, Part III of the Control of Pollution Act 1974 (CoPA) [Ref 16.2], where BPM is defined as:

'reasonably practicable having regard, among other things, to local conditions and circumstances, to the current state of technical knowledge and to the financial implications'.

2.2.4 Where a local authority is satisfied that a statutory nuisance does exist, or is likely to occur or recur, it must serve an abatement notice. Section 80, Part III of the EPA, 'Summary proceedings for statutory nuisances', provides local authorities with the power to serve an abatement notice requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence; and/or carrying out such works or other action necessary to abate the nuisance.

2.2.5 Section 82, Part III of the EPA, 'Summary proceedings by persons aggrieved by statutory nuisances', allows a Magistrates' court to act on a complaint made by any person on the grounds that they are aggrieved by a statutory nuisance, such as noise.

2.2.6 The procedures for appeals against abatement notices are detailed in the Statutory Nuisance (Appeals) Regulations 1995.

2.3 NATIONAL PLANNING POLICY

National Policy Statements EN-1 and EN-5

2.3.1 National Policy Statements set out the primary policy test against which the application for a DCO for the Proposed Development will be considered. The overarching National Policy Statement (NPS) for Energy (EN-1) [Ref 16.3] is part of a suite of NPSs issued by the Secretary of State for Energy and Climate Change in 2011. The other NPS of direct relevance is EN-5 [Ref 16.4] which deals with electricity networks infrastructure.

2.3.2 EN-1 refers to noise and vibration assessment; para 5.11.1 explains that the Government's policy on noise is set out in the Noise Policy Statement for England (NPSE). Although this is a reference to policy applicable to England there is no similar reference to policy in Wales and, as such, the NPSE is referred to in this assessment for guidance in relation to compliance with the NPS. With regard to an 'Applicant's Assessment', paragraph 5.11.4 of the NPSE states that:

'Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment:

- a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise;
- identification of noise sensitive premises and noise sensitive areas that may be affected;
- the characteristics of the existing noise environment;
- a prediction of how the noise environment will change with the proposed development;
    - in the shorter term such as during the construction period;
    - in the longer term during the operating life of the infrastructure; and

- at particular times of the day, evening and night as appropriate.

- an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and

- measures to be employed in mitigating noise.

The nature and extent of the noise assessment should be proportionate to the likely noise impact.'

2.3.3 Section 2.9 of NPS EN-5 refers to Section 5.11 of EN-1 with regard to the generic considerations. However, it also states that there are specific considerations that apply to electricity networks infrastructure and that all high voltage overhead transmission lines (OHL) have the potential to generate noise under certain conditions, with the highest noise levels generated during rain when water droplets may collect on the surface of the conductor and initiate corona discharge. Similar but lesser effects may occur during fog.

2.3.4 Section 2.9.6 of NPS EN-5 describes the characteristics of transmission line audible noise and states:

'Transmission line audible noise is generally categorised as 'crackle' or 'hum' according to its tonal content. Crackle may occur alone, but hum will usually occur only in conjunction with crackle. Hum is only likely to occur during rain when rates of rainfall exceed 1 mm/hr. Crackle is a sound containing a random mixture of frequencies over a wide range, typically 1 kHz to 10 kHz. No individual pure tone can be identified for any significant duration. Crackle has a generally similar spectral content to the sound of rainfall. Hum is a sound consisting of a single pure tone or tones.'

2.3.5 Noise impacts can also arise from substation reactive plant such as transformers, shunt and series reactors, quadrature boosters and mechanically switched capacitors. Transformers and reactors are installed at many substations and generate tonal noise at 100 Hz and harmonics thereof at source.

2.3.6 With regard to assessments for OHL, the EN-5 indicates that standard methods and interpretation are satisfactory for dry weather, but they might not be appropriate for assessing noise during rain. For this, reference should be

made to National Grid report TR(T)94[1] [Appendix 16.6, Ref 16.5, Ref 16.6, Ref 16.7, Ref 16.8, Ref 16.9].

2.3.7 With regard to mitigation, Section 2.9.12 of EN-5 identifies the following potential measures:

- the positioning of lines;
- ensuring that the appropriately sized conductor arrangement is used to minimise potential noise;
- avoiding damage to overhead line conductors which can increase potential noise effects; and
- ensuring conductors are kept clean and free of surface contaminants during stringing/installation.

2.3.8 Compliance with these and other requirements relevant to operational noise and vibration set out in EN-1 and EN-5 is detailed in Table 16.1.

Table 16.1 Compliance with NPS (EN-1) and NPS (EN-5) Requirements

NPS EN-1 Section	Where covered in the ES
5.11.8 Requires the project to demonstrate good design, layout and landscape considerations to optimise noise mitigation. 5.11.10 When preparing the development consent order, the IPC should consider including measureable requirements or specifying the mitigation measures to be put in place to ensure that noise levels do not exceed any limits specified in the development consent.	• Chapter 2, Alternatives and Proposed Development History (**Document 5.2**) • Design Report (**Document 7.17**) • DCO Schedule 3, Requirement 19, Operational Noise
5.11.4 Where noise effects are likely to arise from the proposed development, the applicant should include the following in the noise assessment:	

[1] Technical Report TR(T)94 broadly follows the recommendations contained in ISO 1996:1982 [Ref 16.5], which is identical to BS 7445-1:1991 [Ref 16.6], (which has been superseded by BS 7445-1:2003 [Ref 16.7]) and in that respect is consistent with BS 4142:1997 [Ref 16.18], (which has been superseded by BS 4142:2014 [Ref 16.9])

Table 16.1 Compliance with NPS (EN-1) and NPS (EN-5) Requirements	
• A description of the noise generating aspects of the development proposal leading to noise impacts including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise. • Identification of noise sensitive premises and noise sensitive areas that may be affected. • A description of the characteristics of the existing noise environment. • A prediction of how the noise environment will change with the proposed development. • In the longer term during the operating life of the infrastructure. • At particular times of the day, evening and night as appropriate. • An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive area. • Measures to be employed in mitigating noise.	• The potential sources of noise during operational conditions are reported in section 8, Potential Effects • Appendix 15.2 (**Document 5.15.2.2**) - Baseline Sound Monitoring Report; and • Section 7, Baseline Conditions • Section 9, Mitigation and Residual Effects
5.11.6 Operational noise, with respect to human receptors should be assessed using the principles of the relevant British Standards and other guidance. 5.11.7 The applicant should consult with Countryside Council for Wales, as necessary	• Appendix 16.3 (**Document 5.16.2.3**) – OHL Conductor Assessment Methodology Summary • Section 5, Methodology • Chapter 5, EIA Consultation (**Document 5.5**)
NPS EN-5 Section	Where covered in the ES

Table 16.1 Compliance with NPS (EN-1) and NPS (EN-5) Requirements	
2.9.2 recognises that '*all high voltage transmission lines have the potential to generate noise under certain conditions*.'	• Paragraph 8.2.1 to paragraph 8.2.22
2.9.3 states that *'…surface contamination on a conductor or accidental damage during transport or installation can cause local enhancement of electric stress and initiate discharge activity leading to the generation of noise.'*	• Construction Environmental Management Plan (**Document 7.4**) • Section 8, Potential Effects
2.9.4 states that '*Water droplets may collect on the surface of the conductor and initiate corona discharges with noise levels being dependent on the level of rainfall. Fog may also give rise to increased noise levels, although these levels are lower than those during rain.'*	• Section 8, Potential Effects
2.9.5 states that contamination build up due to prolonged periods without rain can lead to higher noise levels. Noise levels return to normal after rainfall when the contaminants have been washed away. The paragraph also states that '*surface grease on conductors can also give rise to audible noise effects... This can be mitigated by conductor cleaning or replacement.'*	• Section 8, Potential Effects
2.9.6 describes the noise characteristics of transmission line audible noise.	• Section 8, Potential Effects
2.9.7 states that '*audible noise effects can also arise from substation equipment such as transformers, quadrature boosters and mechanically switched capacitors'* and *'noise may also arise from discharges on overhead*	• Section 8, Potential Effects

Table 16.1 Compliance with NPS (EN-1) and NPS (EN-5) Requirements	
line fittings such as spacers, insulators and clamps'.	
2.9.8 sets out the requirements for an applicant's audible noise assessment: '*Standard methods of assessment and interpretation using the principles of the relevant British Standards are satisfactory for dry weather conditions, they are not appropriate for assessing noise during rain, which is when overhead line noise mostly occurs, and when the background noise itself will vary according to the intensity of the rain'* 2.9.9 continues: '*Therefore an alternative noise assessment method to deal with rain-induced noise is needed, such as the one developed by National Grid as described in report TR(T)94,1993. This follows recommendations broadly outlined in ISO 1996 (BS 7445:1991) and in that respect is consistent with BS4142:1997 [superseded by BS4142:2014].*'	• Appendix 16.6 – TR(T)94 (**Document 5.16.2.6**) • Appendix 16.3 – OHL Conductor Assessment Methodology Summary (**Document 5.16.2.3**) • Section 5, Methodology • Appendix 16.6 – TR(T)94 (**Document 5.16.2.6**)
2.9.12 requires the applicant to consider mitigation measures, specifically: • The positioning of lines to help mitigate noise. • The use of an appropriately sized conductor arrangement to minimise potential noise; • Quality assurance through manufacturing and transportation to avoid damage to overhead line conductors; • Ensuring that conductors are kept clean and free of surface contaminants during installation.	• Design Report (**Document 7.17**) • Construction Environmental Management Plan (**Document 7.4**)

2.3.9 According to the NPSE (as referenced in EN-1), the 'Noise Policy Vision' is to 'promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development'. Through effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development, this long-term vision is supported by the following aims,:

i. avoid significant adverse impacts on health and quality of life;
ii. mitigate and minimise adverse impacts on health and quality of life; and
iii. where possible, contribute to the improvement of health and quality of life.

2.3.10 The aims of the policy differentiate between noise impacts on health (e.g. sleep disturbance, hypertension and stress) and noise impacts on quality of life (e.g. amenity and enjoyment of property). The aims also differentiate between 'significant adverse impacts' and 'adverse impacts'. The explanatory note to the NPSE clarifies that a significant adverse impact is deemed to have occurred if the 'Significant Observed Adverse Effect Level' (SOAEL) is exceeded. An adverse effect, on the other hand, lies between the 'Lowest Observed Adverse Effect Level' (LOAEL) and the SOAEL.

2.3.11 In assessing whether a development should be permitted, there are therefore four questions that should be answered with reference to the principles of sustainable development: Will the development result in…

a) a significant adverse impact to health;

b) a significant adverse impact to quality of life;

c) an adverse impact to health; or

d) an adverse impact to quality of life?

2.3.12 If the answer to question a) or b) is yes, then the NPSE provides a clear guidance that the development should be viewed as being unacceptable (item 'i.' above). If the answer to question c) or d) is yes, then the NPSE provides a clear steer that the impact should be mitigated and minimised (item 'ii.' above).

2.3.13 Paragraph 2.22 of the NPSE acknowledges that:

'it is not possible to have a single objective noise based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently

the SOAEL is likely to be different for different noise sources, for different receptors, at different times'.

Planning Policy Wales

2.3.14 The Planning Policy Wales (PPW) Edition 9 [Ref 16.10] sets out the land use planning policies of the Welsh Government, providing advice for both policy makers and developers. The document is supported by a series of Technical Advice Notes (TANs). The PPW sets out the Welsh Government's commitment to sustainable development whilst ensuring an efficient and effective planning system.

2.3.15 With regards to noise, the PPW states:

'Noise can affect people's health and well-being and have a direct impact on wildlife and local amenity. Noise levels provide an indicator of local environmental quality. The objective of a policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard.'

2.3.16 The document goes on to state:

'Noise can be a material planning consideration, for example in proposals to use or develop land near an existing source of noise or where a proposed new development is likely to generate noise. Local planning authorities should make a careful assessment of likely noise levels and have regard to any relevant Noise Action Plan before determining such planning applications and in some circumstances it will be necessary for a technical noise assessment to be provided by the developer.'

2.3.17 A draft of Planning Policy Wales: Edition 10 [Ref 16.11] was issued on 12 February 2018. Whilst this document is still out for consultation, reference to relevant sections has been provided for completeness.

2.3.18 Paragraphs 4.109 to 4.113 of the draft document consider the electricity grid network and associated infrastructure. It is noted that:

'An effective electricity grid network is required to fulfil the Welsh Government's renewable and low carbon ambitions.'

2.3.19 With regards to noise, paragraph 4.143 of the draft document states:

'Planning authorities should seek to identify and consider ways to avoid, mitigate or compensate identified adverse impacts, taking into account:

- *the need to minimise impacts on local communities, such as from noise and air pollution, to safeguard quality of life for existing and future generations…'*

2.3.20 Paragraphs 5.125 to 5.135 of the draft document describes the importance of an appropriate soundscape, stating that they:

'…contribute to a positive experience of place as well as being necessary for public health, amenity and well-being.'

Planning Guidance (Wales) TAN 11 - Noise

2.3.21 Planning Guidance (Wales) Technical Advice Note (Wales) 11, Noise (TAN 11) [Ref 16.12] and amendment [Ref 16.13] provide advice to local authorities on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development. For noise from industrial and commercial developments, TAN 11 1997 refers to BS 4142:1990 'Methods for rating industrial noise affecting mixed residential and industrial areas' [Ref 16.14] and BS 8233:1987: 'Code of practice for sound insulation and noise reduction for buildings' [Ref 16.15]. Both of these standards have been extensively revised since the publication of TAN 11 and as such the updated versions are used in the assessment method. Consequently the assessment method is considered to be consistent with TAN 11.

2.4 LOCAL PLANNING POLICY

2.4.1 Local planning policy is provided within the Joint Local Development Plan 2017 [Ref 16.16] which has now been formally adopted by Isle of Anglesey County Council (IACC) and Gwynedd Council. This document has been considered in relation to this assessment. Local planning policies that are relevant to operational noise are detailed in Appendix 16.2 (**Document 5.16.2.2**).

3 Scope of Assessment and Consultation

3.1 INTRODUCTION

3.1.1 This section provides an overview of the outcome of the consultation process with reference to the Secretary of State's (SoS) Scoping Opinion. Where the consultation process has influenced the scope of the operational noise assessment this is set out below. An overview of responses from key consultees to the Preliminary Environmental Information Report (PEIR) and draft Environmental Statement (ES) are set out in Chapter 5, EIA Consultation (**Document 5.5**).

Welsh Language

3.1.2 Consideration has been given to the potential for this topic to impact on the Welsh language in any way, drawing upon the findings of the Welsh Language Impact Assessment (**Document 5.26**). It has been concluded that there is no potential for the sources of effects or affected receptors dealt with in this chapter to have any effects upon the Welsh language.

3.2 SECRETARY OF STATE'S SCOPING OPINION

3.2.1 Responses to issues raised in the Scoping Opinion [Ref 16.17] provided by the SoS are summarised in Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion below.

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
3.42	Paragraph 13.6.2 of the Scoping Report explains that overhead lines do not produce any significant sources of vibration; the Secretary of State agrees that this can be scoped out.	Vibration effects relating to the OHL are not considered any further in this chapter.
3.43	Paragraph 13.7.3 of the Scoping Report explains that there would be no large items of rotating plant at the substations. The Secretary of State notes the proposal for the anti-vibration pads for transformers and reactors, which it considers will go towards mitigating potential vibration impacts; however the proximity of receptors is critical in understanding the potential for impacts. With the relative uncertainty of the location of the transformer and reactors, the Secretary of State does not agree to scope this out at this stage. However, it is acknowledged that as the proposal is further refined it could be acceptable to scope this out.	No new reactive plant is planned for Wylfa substation, and there is therefore no assessment of effects required. A new shunt reactor would be required at Pentir Substation, see Chapter 3, Description of the Proposed Development (**Document 5.3**). This would be located within the existing substation boundary, within the zone shown on Design Plan DCO_DE/PS/01 Sheet 3 of 9 (**Document 4.13**) and would be over 500 m from the nearest residential receptor. The shunt reactor would be placed on an anti-vibration pad. Vibration effects are not usually perceptible beyond approximately 6 m from the plant; hence there would be no vibration effects at receptors due to the installation of this shunt reactor. Further information on potential noise effects from the Pentir Substation is provided in section 8, Potential Effects, para 8.2.27 to 8.2.29 and section 9.5, Pentir Substation.

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
3.44	Paragraph 13.6.3 of the Scoping Report states that underground cables and cable sealing ends do not make operational noise or cause vibration and that noise from access tracks and tunnelling works is associated with the construction phase. However, paragraph 13.5.27 states that 'the SEC is considered to be part of the overhead line for the purposes of the operational noise assessment'. As such, the Secretary of State is unclear whether the Applicant is proposing to scope in or out operational noise from the SECs. Therefore, the Secretary of State agrees to scoping out potential noise and vibration from underground cables, access tracks and tunnelling works, but not from the SECs.	The Cable Sealing End Compounds (CSECs) are at the transitional point between the OHL and the underground cable. The OHL conductors up to the terminal gantries, which would be within the CSEC, have been assessed. Further information on potential noise and vibration effects from the CSEC is provided in section 8, Potential Effects, para 8.2.13 to 8.2.15.
3.45	Paragraphs 13.6.15-13.6.18 of the Scoping Report propose to scope out noise from pylon fixtures and fittings on the basis that they would meet National Grid Technical Specifications. As the project is still being developed and refined and there are newer technologies available such as the T-pylon, the Secretary of State considers that it is premature to scope this out of the EIA at this stage.	The proposed design is a lattice pylon structure with a conductor system which utilises Type Registered fittings, which are designed to minimise the occurrence of corona and wind noise. Further information is provided in section 8, Potential Effects, para 8.2.16 to 8.2.22, and section 9, Mitigation and Residual Effects.
3.46	Paragraph 13.6.19 of the Scoping Report identifies insulators as a source of noise on the existing overhead line, primarily due to salt deposition. However, it further states	Information about insulator noise is provided in section 8, Potential Effects, para 8.2.16 to 8.2.22 and section 9, Mitigation and Residual Effects, para 9.2.3 to 9.2.4.

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
	that the most appropriate type of insulator will be considered during detail design and therefore the Applicant proposes to scope out insulator noise from the assessment. However, on the basis that there are noise issues on the existing line (which would remain) and as no evidence has been provided within the Scoping Report to demonstrate that salt deposition would not be an issue on the proposed line, the Secretary of State does not agree to scope this out. The Secretary of State also considers with newer technologies being available, it is not appropriate to scope out noise from pylon fittings, including insulators. In this regard, the Applicant's attention is drawn to the comments of the Councils (see Appendix 3 of this Opinion) regarding the need to present a qualitative assessment of insulator noise.	A description of the types of insulators used on the transmission network and their principal characteristics is provided in Chapter 3, Description of the Proposed Development (**Document 5.3**).
3.48	Operational noise from substation auxiliary plant (including standby diesel generators) is proposed to be scoped out from the assessment by the Applicant in paragraph 13.6.25 and 13.7.4 of the Scoping Report. This is because such plant does not run continuously and is housed in a building or outdoor acoustic enclosure; therefore noise is seldom discernible beyond the substation perimeter fence. The Scoping Report states that if present, emergency	It is not proposed to install standby generators at the tunnel head houses or substations. In an emergency situation generators would be brought to site. Outages are unlikely to occur, and if they did, the generators would not be in constant use. Other items of auxiliary plant are considered in sections 8 and 9 of this chapter.

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
	generators would be tested for a few minutes on a weekly basis during daytime working hours only. The Secretary of State notes that there is some potential for generators to work for longer periods of time in the event of outages which could cause noise impacts. Without guarantees that this would not occur and further information on the likely levels, the Secretary of State does not agree that sufficient information has been provided at this stage to be able to scope this out of the EIA.	
3.49	Paragraphs 13.6.29 and 13.7.4 of the Scoping Report proposes to scope out noise and vibration effects from routine maintenance activities which would be infrequent, slight, temporary and unlikely to result in noise or vibration disturbance. On the basis that non-routine repairs (i.e. extensive refurbishment) would be addressed in the Construction Noise and Vibration assessment and unlikely to generate significant effects, the Secretary of State agrees maintenance activities can be scoped out of the operational noise and vibration assessment.	This comment has also been addressed in Chapter 15, Construction Noise and Vibration (**Document 5.15**).
3.155	The Applicant's attention is drawn to the detailed comments of the Councils (see Appendix 3 of this Opinion) in relation to the baseline survey and assessment methodology. The Applicant is advised to discuss and agree the operational noise study area and the requirements for	National Grid has welcomed the engagement of IACC and Gwynedd Council. Regular discussion has taken place in the form of the Thematic Group Meetings.

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
	detailed baseline surveys with IACC (Isle of Anglesey County Council) and GC (Gwynedd Council).	The Baseline Sound Monitoring Report is included as Appendix 15.2 (**Document 5.15.2.2**). The OHL Conductor technical assessment methodology is outlined in Appendix 16.3 (**Document 5.16.2.3**).
3.156	The Scoping Report explains that a uniform night-time noise background (L_{A90}) of 30dB is proposed as the baseline noise levels for all sections of the overhead line, the substations, SECs and tunnel head houses unless surveys, if required, confirm this value should be higher. BS 4142:2014 suggests background sound level measurements should be undertaken when new sound sources would be introduced; therefore should background surveys not be undertaken, this should be justified within the ES. The Secretary of State recommends that the approach to determining the baseline should be agreed with IACC and Gwynedd Council.	Baseline surveys have been undertaken, the results of which are presented in Appendix 15.2 (**Document 5.15.2.2**) and discussed further in section 4.3 and section 7, Baseline Conditions. Regular discussion around the determination of representative baseline levels has taken place with IACC and Gwynedd Council in the form of Thematic Group Meetings.
3.157	The Scoping Report states that detailed noise modelling would be undertaken for *'receptors where the magnitude of impact is likely to be classified as significant'*. The ES should explain how effects on such receptors have been determined as likely to be significant and the Applicant is advised to agree these with IACC and Gwynedd Council.	The methodology for determining significance is set out in section 4, Methodology. This has been discussed and agreed with IACC/Gwynedd Council. A full list of identified receptors is given in Appendix 16.5 (**Document 5.16.2.5**). These include residential, non-standard dwellings

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
		and non-residential and amenity receptors.
3.158	With reference to paragraph 13.5.21 of the Scoping Report, the Secretary of State considers that if there is the potential for impacts on non-residential receptors to be significant (i.e. moderate), then they should be assessed within the ES.	A number of non-residential receptors have been identified within the study area for operational noise. These have been considered in the assessment.
3.159	The significance matrix in Table 13.4 of the Scoping Report identifies four levels of impact magnitude, whereas Table 13.3 defines five levels of impact magnitude. The Applicant should avoid such inconsistencies within the assessment and present a robust approach within the ES.	The significance matrix has been amended and is presented in Table 16.13, Table 16.14 Magnitude of Impact - Operational Noise and Table 16.15 Effect – Operational Noise.
3.160	The ES should explain how the mitigation measures detailed in paragraph 2.9.12 of NPS EN-5 have been considered for the proposed development.	See Table 16.1. The positioning of the OHL and the selection of the most appropriately sized conductors are discussed in the Design Report (**Document 7.17**). Avoidance of damage to conductors and ensuring conductor surfaces are kept clean is covered in the Construction Environmental Management Plan (CEMP) (**Document 7.4**)
3.161	Consideration should be given to monitoring noise complaints, both during construction and when the development is operational.	During the construction phase any complaints about noise would be monitored according to the procedures set out for Community Engagement as described in the CEMP (**Document 7.4**).

Table 16.2 Issues Raised and Responses to the SoS Scoping Opinion		
Para-graph	Issue Raised by SoS	Response
		Once operational, National Grid would follow its normal stakeholder engagement practices, which includes the monitoring and investigation of complaints about noise.

3.3 CONSULTATION

3.3.1 Meetings have been held with IACC and Gwynedd Council to discuss the scope, methodology and assessment results of the operational noise assessment, as described within this chapter. Chapter 5, EIA Consultation (**Document 5.5**) lists all the meetings that have taken place and the topics discussed.

3.3.2 Responses to comments from Stage 3 Consultation are provided in Chapter 5, EIA Consultation, Appendix 5.2, Schedule of responses to the Preliminary Environmental Information Report and the Consultation Report (**Document 6.1**).

3.3.3 Responses to comments provided during the technical stakeholder review of the draft ES are provided in Chapter 5, Appendix 5.3 Schedule of responses to the technical stakeholder review of the draft Environmental Statement (**Document 5.5.2.3**).

4 Methodology

4.1 INTRODUCTION

4.1.1 This section outlines the technical methods used to determine the baseline, how it could be affected by the Proposed Development (i.e. the impacts) and how significant the effects of these impacts are likely to be. Supporting technical Appendix 16.3 (**Document 5.16.2.3**) and Appendix 16.4 (**Document 5.16.2.4**) provide further details on the assessment methodology used in this assessment.

4.2 GUIDANCE SPECIFIC TO OPERATIONAL NOISE

4.2.1 The guidance set out below has been used within this ES as part of the assessment methodology in the determination of the significance of operational noise effects. A summary of how the guidance has been used within this assessment is provided in Table 16.6 at the end of this section.

BS 4142:2014 – Methods for rating and assessing industrial and commercial sound

4.2.2 British Standard 4142:2014 describes a method for rating and assessing sound of an industrial and/or commercial nature. The standard is applicable to the determination of the rating level of industrial or commercial sound as well as the ambient, background and residual noise levels for the purposes of investigating complaints, assessing sound from proposed new, modified or additional sources or assessing sound at proposed new dwellings. The determination of whether a noise amounts to a nuisance is beyond the scope of the standard, as is rating and assessment of indoor noise levels.

4.2.3 BS 4142:2014 states that the standard is not intended to be applied to the rating and assessment of sound from other sources falling within the scope of other standards or guidance. Although noise associated with the OHL falls within the scope of TR(T)94, as identified in EN-5, the TR(T)94 methodology followed in this ES has been revised to reflect BS 4142:2014.

4.2.4 The standard compares the ‘rating level’ of the noise (i.e. the specific noise level from the site under investigation adjusted using penalties for acoustic

character such as tonality or impulsiveness) with the pre-existing background sound level.

4.2.5 Clause 11 of the standard specifies that:

'a) Typically, the greater this difference [between rating level and background sound], the greater the magnitude of impact.

b) a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

c) a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source 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.'

4.2.6 The standard notes that:

'Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact.'

4.2.7 It goes on to state that:

'where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

1) The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2) The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

NOTE 3 Consideration ought to be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the "Effects on humans of industrial and commercial sound" portion of the "Further reading" list in the Bibliography.

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

i) façade insulation treatment;

ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and

iii) acoustic screening.'

4.2.8 Other pertinent factors include professional judgement, the sound environment, the situational context and the circumstances of the assessment.

4.2.9 The standard notes that where background sound levels and rating levels are both "low", absolute noise levels might be as, or more, relevant than the margin by which the rating level exceeds the background, especially at night.

4.2.10 With regards to the rating correction, paragraph 9.2 of BS 4142:2014 states:

'Consider the subjective prominence of the character of the specific sound at the noise-sensitive locations and the extent to which such acoustically distinguishing characteristics will attract attention.'

4.2.11 The commentary to paragraph 9.2 of BS 4142:2014 suggests the following subjective methods for the determination of the rating penalty for tonal, impulsive and/or intermittent specific sounds:

'Tonality - For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6 dB for tonality. Subjectively, this can be converted to a rating penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

Impulsivity – A correction of up to +9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.

Other sound characteristics - Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Intermittency - When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. … If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.'

4.2.12 The above rating penalties are established based on a subjective assessment of the characteristics of the sound. An objective assessment method is not applicable as the specific sound from the proposed noise sources are based on predictions.

TR(T)94

4.2.13 TR(T)94, a copy of which is provided as Appendix 16.6 (**Document 5.16.2.6**), is a National Grid report, referenced in EN-5, describing a method to assess the likely effects of dry and rain induced ('wet') noise from new OHLs. It follows the principles of the now superseded BS 4142:1990 methodology for assessing dry noise and describes a different method for assessing the effects of wet noise. This is because the background sound level during wet periods will be influenced by the sound of rainfall.

4.2.14 The method is based on empirical electrical stress data and measured noise data from selected twin-bundle 400 kV OHLs. OHL noise will vary depending on whether there are wet or dry conditions. In general, the noise produced during wet conditions increases with rain rate and tone inception occurs when the rain rate reaches approximately 1 mm/h. Furthermore, the background sound level also increases as the rainfall rate increases (due to the sound of rain falling on the ground), meaning that the difference between rating level

and background level varies under different rates of rainfall. The behaviour of an example OHL conductor configuration during wet conditions can be seen in the TR(T)94 graph as shown in Image 16.1.

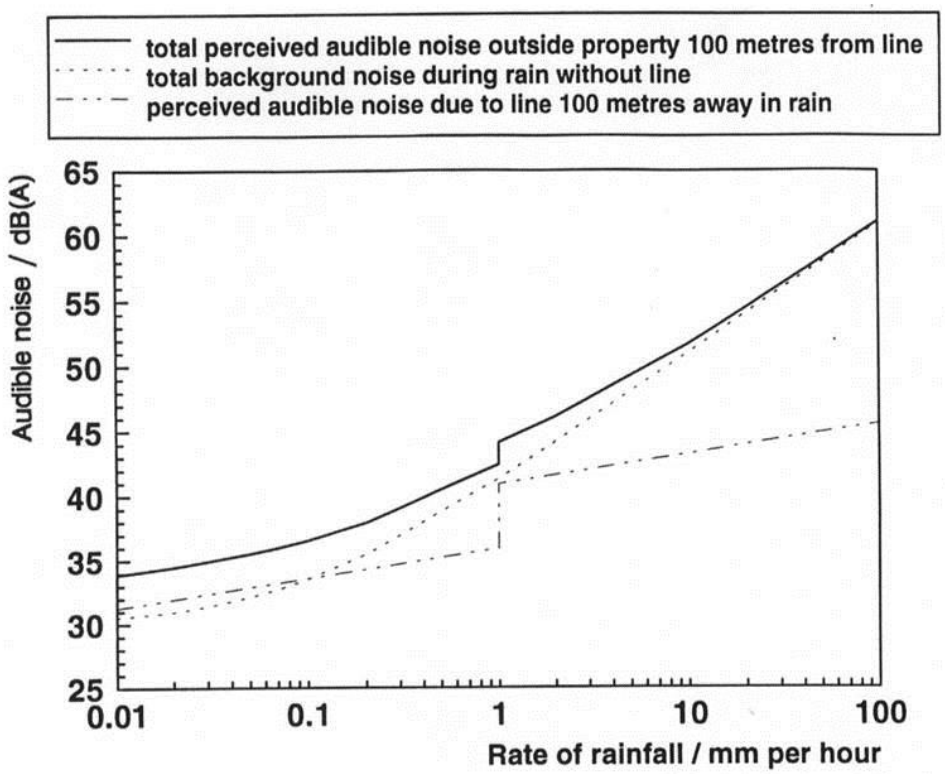

Image 16.1 Graph showing example of total rain induced audible noise exceeding background sound during rain

4.2.15 The TR(T)94 method is based on empirical electrical stress and measured noise data from in-service twin aluminium conductor steel reinforced (ACSR) (28.6 mm diameter) and twin all aluminium alloy conductor (AAAC) (31.5 mm diameter) systems on a range of lattice pylon types operated at 400,000 Volts (400 kV). These conductor systems are inherently noisier due to their smaller geometry and much higher surface electrical voltage gradient (electrical stress) than the 41 mm diameter conductor proposed for the Proposed Development. This empirical data is then extrapolated to calculate noise levels for larger twin conductor systems with lower electrical stress gradients. The result of this modelling is consistent with National Grid's experience of owning and operating the high voltage transmission system across England and Wales.

4.2.16 TR(T)94 does not predict how a particular individual may perceive noise from an OHL, instead it produces assessment levels that can then be compared to significance criteria to assess the effect on populations living within a study area. The wet noise prediction method calculates a normal distribution curve weighted annual average change in noise level, taking into account typical

rainfall rates and durations. This methodology does not follow the principles of BS 4142:2014 (which is based on the difference between the rating level and background sound level, as opposed to an annual weighted mean increase in noise) and it has therefore been necessary to adapt the methodology in order to undertake an assessment according to the British Standard.

4.2.17 In order to ensure that the predicted impact is robust, the BS 4142:2014 assessment of dry noise is carried out relative to measured night-time (i.e. lowest typical) background sound levels, while the wet noise assessment assumes a rate of rainfall sufficient to induce 'hum' on the OHL and also a ground terrain that produces a low level of masking due to the sound of rainfall on the ground. The wet noise assessment includes a +6 dB penalty to account for the tonal character of the noise in accordance with BS 4142:2014 and the dry noise assessment includes a +3 dB penalty to account for its characteristic 'crackle', again in accordance with BS 4142:2014.

BS 8233:2014 – Guidance on Sound Insulation and Noise Reduction for Buildings

4.2.18 BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' [Ref 16.18], provides guidance on design criteria for internal ambient noise levels in new or refurbished buildings. The scope of the Standard states that it should not be used to assess the effects of changes in the external noise level to an occupant of an existing building. It should be noted, however, that the standard is still useful as a reference to absolute levels of noise when assessing noise change on existing buildings.

4.2.19 A summary of the recommended levels for rooms used for resting, dining and sleeping is provided in Table 16.3. The guideline values in Table 16.3 are annual average values and do not have to be achieved in all circumstances.

4.2.20 The guidance in BS 8233:2014 applies to external noise as it affects the internal acoustic environment from sources without a specific character. The Standard states:

'…Occupants are usually more tolerant of noise without a specific character than, for example, that from neighbours which can trigger complex emotional reactions. …'

'NOTE Noise has a specific character if it contains features such as a distinguishable, discrete and continuous tone, is irregular enough to attract attention, or has a strong low-frequency content, in which case lower noise limits might be appropriate.'

4.2.21 The application of a rating level penalty, as required by BS 4142:2014, offsets the need to apply lower noise limits to those given in BS 8233:2014, as noted above. The applied penalty correction takes account of the specific character of the sound and therefore noise limits given in Table 16.3 are still considered applicable.

Table 16.3 BS 8233:2014 Indoor Ambient Noise Levels for Dwellings			
Activity	Location	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Resting	Living room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

IEMA Guidelines for Noise Impact Assessments

4.2.22 The Institute of Environmental Management and Assessment (IEMA) Guidelines for Noise Impact Assessments [Ref 16.19] use a similar type of classification method as the NPSE with regards to defining the generic relationship between impact magnitude and noise effect.

4.2.23 The IEMA Guidelines provide guidance on key principles of noise impact assessments that are applicable to all development proposals where noise effects are likely to occur. They cover:

- how to scope a noise assessment;
- issues to be considered when defining the baseline noise environment;
- prediction of changes in noise levels as a result of implementing development proposals; and
- definition and evaluation of the significance of the effect of changes in noise levels.

4.2.24 The document provides definitions of terminology to be used in a noise impact assessment:

- **Noise Impact** – the difference between the acoustic environment before and after the implementation of the proposals (also known as the magnitude of change);

- **Noise Effect** – the consequence of the noise impact, e.g. a change in annoyance caused, disturbance due to the change in acoustic environment or potential to change the character of the area such that there is a perceived change in the quality of life; and

- **Significance of Effect** – the evaluation of the Noise Effect and whether or not it is significant.

4.2.25 When the impact of a scheme has been suitably described and assessed, the guidelines state that it is then necessary to assess the effect of the development on receptors likely to be impacted. The guidance sets out a generic scale for describing a range of effects on a receptor, as shown in Table 16.4.

Table 16.4 IEMA Guidelines: Description of Effect and Likely Significance

Magnitude	Description of Effect	Significance
Severe (High)	Receptor perception = Physically harmful Significant changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/ awakening; loss of appetite, significant medically definable harm, e.g. auditory and non-auditory.	Significant
Substantial (Medium)	Receptor perception = Disruptive Causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in character of the area.	**More Likely to be Significant** (Greater justification needed - based on impact magnitude and receptor sensitivities - to justify a non-significant effect) ↕ (Greater justification needed - based on
Moderate (Low)	Receptor perception = Intrusive Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of TV; speaking more loudly; closing windows. Potential for non-awakening sleep disturbance. Affects the character of the area such that there is a perceived change in the quality of life.	

Table 16.4 IEMA Guidelines: Description of Effect and Likely Significance		
Magnitude	Description of Effect	Significance
Slight (Negligible)	Receptor perception = Non-intrusive Noise impact can be heard, but does not cause any change in behaviour or attitude, e.g. turning up volume of TV; speaking more loudly; closing windows. Can slightly affect the character of the area but not such that there is a perceived change in the quality of life	impact magnitude and receptor sensitivities - to justify a significant effect) **Less Likely to be Significant**
(No Effect)	N/A = No discernible effect on the receptor	Not Significant
This table had been adapted from the IEMA Guidelines for Environmental Noise Impact Assessment [Ref 19], Table 7-7 'Generic Relationship Between Noise Impact (Magnitude) and Noise Effect (Magnitude + Sensitivity) Including the Evaluation of Effect Significance'.		

World Health Organisation (WHO) Guidelines

4.2.26 In 2009 a report was published presenting the conclusions of a World Health Organisation (WHO) working group responsible for preparing guidelines for exposure to noise during sleep entitled 'Night Noise Guidelines for Europe' [Ref 16.20]. The document can be seen as an extension to the original WHO Guidelines for Community Noise [Ref 16.21].

4.2.27 Various effects are described including biological effects, sleep quality, and well-being. The document gives threshold levels for observed effects expressed as $L_{max, inside}$ and $L_{night, outside}$. The L_{night} is a year-long average night-time noise level, not taking into account the façade effect of a building. In an exposed population a noise exposure of 40 dB $L_{night, outside}$ is stated as equivalent to the 'lowest observed adverse effect level' for night noise. Above this level adverse health effects observed are self-reported sleep disturbance, environmental insomnia and increased use of somnifacient drugs and sedatives. Above 55 dB $L_{night, outside}$, cardiovascular effects become the major public health concern. Threshold levels for waking in the night, and/or too early in the morning are given as 42 dB $L_{Amax, inside}$. Lower thresholds are given that may change sleep structure.

Table 16.5 Summary of Observed Health Effects in the Population (WHO NNG)	
Noise level, $L_{night, outside}$	Observed Effect
Up to 30 dB(A)	No substantial biological effects are observed
30 to 40 dB(A)	A number of effects are observed to increase: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and on the number of events, even in the worst cases the effects seem modest.
40 to 55 dB(A)	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are now severely affected.
Above 55 dB(A)	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a high percentage of the population is highly annoyed and there is limited evidence that the cardiovascular system is coming under stress.

4.2.28 The effects of different levels of night noise on the population's health in the Night Noise Guidelines are summarised in Table 16.5.

4.2.29 It is relevant to note that taking into account typical night-to-night variation in noise levels, which will often occur due to meteorological effects and the effects of a façade, the Night Noise Guideline's 'lowest observed adverse effect level' for night noise (40 dB $L_{night, outside}$) is similar to the threshold for onset of sleep disturbance previously given in the 1999 WHO report, although defined in a different way.

4.2.30 The WHO guidelines have not been formally adopted into UK legislation or guidance, hence it remains a source of information reflecting a high level of health care with respect to noise, rather than a standard to be rigidly applied. The WHO guideline values give the lowest threshold noise levels below which the occurrence rates of particular effects can be assumed to be negligible. Exceedances of the WHO guideline values do not necessarily imply significant noise impact and, indeed, it may be that significant impacts do not occur until much higher degrees of noise exposure are reached.

4.2.31 Guidance on desirable levels of environmental noise is also given in the 1999 report. Section 4.3.1 of the document states:

'to protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the sound pressure level should not exceed 50 dB L_{Aeq}. These values are based on annoyance studies but most countries in Europe have adopted 40 dB L_{Aeq} as the maximum allowable level for new developments.'

4.2.32 The daytime value of 40 dB L_{Aeq} for new developments is very low and is not consistent with the criteria adopted for new developments (be it new noise sensitive development or new noise sources) in the UK. The values for moderate and serious annoyance are, however, consistent with historic UK planning policy such as PPG24 [Ref 16.22].

4.2.33 The major concern in Europe is with respect to noise from transportation systems, and most of the studies on which these guidelines are based relate to this type of noise source. There can be no certainty that the same effects will be observed from noise from electricity transmission infrastructure in rural areas, but in the absence of any more detailed information some weight should be attached to the WHO guidance when assessing noise from electricity transmission infrastructure.

Summary of guidance used in assessment of the Proposed Development

4.2.34 Various aspects of the above guidance have been incorporated into the methodology used for the assessment of the proposed development. Table 16.6 provides a summary of where the guidance has been considered within this document.

Table 16.6 Summary of Guidance used in Assessment

Guidance	Where used
BS 4142:2014	The Standard forms the basis of the assessment methodology for the consideration of operational noise impact from the Proposed Development. Further guidance on how this Standard is used within the assessment methodology is presented in Appendix 16.3 (**Document 5.16.2.3**).
TR(T)94	The document provides a methodology for predicting OHL noise in both wet and dry conditions. Guidance contained within this document has been used in conjunction with BS 4142:2014 to inform the adopted

Table 16.6 Summary of Guidance used in Assessment	
Guidance	Where used
	assessment methodology. The full document is provided in Appendix 16.6 (**Document 5.16.2.6**), and further guidance on how this document is used within the assessment methodology is presented in Appendix 16.3 (**Document 5.16.2.3**).
BS 8233:2014	The Standard does not form part of the assessment methodology, however, stated internal noise level thresholds within dwellings have been considered when determining the potential significance of operational noise impacts at receptors.
IEMA Guidelines	IEMA Guidelines have been considered in the determination of the magnitude of impact and significance of effect matrix on which the predicted noise levels from the Proposed Development have been assessed.
WHO Guidelines	WHO Night Noise Guideline thresholds for observed health effects in the general population have been used to determine the magnitude of operational noise impacts as given in Table 16.14. Threshold levels have also been used in determining the potential significance of operational noise impacts at receptors.

4.3 BASELINE DATA GATHERING AND FORECASTING METHODS

4.3.1 Baseline sound measurements were undertaken between 27 March and 13 April 2017 in order to determine the baseline sound environment near selected receptors within the study areas. A description of the baseline survey methodology, as well as the survey results, is presented in the Baseline Sound Monitoring Report in Appendix 15.2 (**Document 5.15.2.2**).

4.3.2 Measurements were carried out at 18 long-term unattended monitoring locations at positions along the proposed alignment that were identified as being critical to the assessment process. The surveys were established during the day and observations made of sound sources and other conditions in accordance with the requirements of BS 4142:2014. In addition to each long-term survey location, concurrent attended surveys were carried out during the day (07:00-19:00), evening (19:00-23:00) and night-time (23:00-07:00) periods at additional ‘satellite’ locations.

4.3.3 Short-term attended surveys consisted of the following; three 15 minute discontinuous periods over one day between 07:00-19:00 for daytime, one 15 minute period during the evening between 19:00-23:00, and one 15 minute period during the night between 23:00-07:00.

4.3.4 Surveys were undertaken following the guidance contained in BS 7445-2:1991 'Description and measurement of environmental noise, Part 2: Guide to the acquisition of data pertinent to land use' [Ref 16.23].

4.3.5 Meteorological conditions were monitored during the survey using unattended weather stations installed at six positions along the route. Periods of adverse weather, such as high winds (>5 m/s) or precipitation (>1 mm/h – precipitation rate at which noise from the existing OHL may have influenced background sound levels at nearby monitoring locations) have been removed from the data set for subsequent analysis.

4.3.6 BS 4142:2014 requires that the background sound levels adopted for the assessment be representative for the period being assessed. The Standard recommends that the background sound level should be derived from continuous measurements of normally not less than 15 minute intervals, which can be contiguous or disaggregated. However, the Standard states that there is no single background sound level that can be derived from such measurements. It is particularly difficult to determine what is representative of the night-time period because it can be subject to a wide variation in background sound levels between the 'shoulder' night periods, i.e. 23:00 – 00:00 and 06:00 – 07:00 when the greatest increase or decrease in background sound levels are likely to occur. The accompanying note to paragraph 8.1.4 states that:

'a representative level ought to account for the range of background sounds levels and ought not automatically to be assumed to be either the minimum or modal value.'

4.3.7 One approach which is commonly adopted is to use the 25th percentile (lower quartile) of the night-time background and ambient sound levels. This method has been adopted in order to characterise the baseline sound environment. This level excludes 75% of the noisier levels and, although it is not the lowest sound level encountered, it is typically lower than that obtained using the average, median or modal values. It therefore represents somewhere in the range of lower sound levels that are likely to be encountered over a defined period and consequently represents a precautionary assessment.

4.3.8 This is considered to represent a very stringent method to obtain representative background sound levels and hence underpins the robustness

of the operational noise assessment. This is further strengthened by removing data gathered at wind speeds greater than 5 m/s and precipitation rates over 1 mm/h.

4.3.9 For locations where long-term monitoring was not undertaken, the baseline sound levels used in the assessment have been based on the sample attended noise survey data. Although the quantity of data used in deriving the baseline sound levels at these locations is less than at the unattended monitoring locations, this is ameliorated by the fact that a surveyor was present during the measurement and therefore able to ensure that no extraneous noise sources, unrepresentative of the location, were included in the measurements. The data obtained could then be analysed and compared against other datasets in order to obtain a representative baseline sound level.

4.3.10 The night-time baseline sound levels measured at each long-term unattended measurement location are summarised in Table 16.18.

4.4 TECHNICAL ANALYSIS

4.4.1 Detailed computer modelling has been carried out to predict operational noise levels from all new-build sections of OHL and cable sealing end compounds (CSECs) during wet and dry conditions, tunnel head houses (THHs) at Braint and Tŷ Fodol and Pentir Substation.

4.4.2 The model has been developed using noise modelling software package SoundPlan 7.4. The model follows the sound propagation modelling method defined in ISO 9613 'Attenuation of sound during propagation outdoors – Part 2: General method of calculation' [Ref 16.24].

Model Parameters

4.4.3 The ground between the Proposed Development and the receiver locations has been assumed to be soft[2]. Terrain contour data has also been entered in the model based on OS land contours. The effect of screening due to buildings, barriers and vegetation has not been included within the model.

4.4.4 The receptors have been modelled at a height of 4 m above ground to represent first floor level in order to investigate the noise impact from night time operational noise. The assessment at first floor level is considered to

[2] Soft ground is defined in ISO 9613-2 1996 as; 'Porous Ground, which includes ground covered by grass, trees, or other vegetation, and all other ground surfaces suitable for the growth of vegetation, such as farming land', this is considered to be representative of the ground conditions in the vicinity of the Proposed Development

represent a worst case due to ground effects, topography and pylon geometry, and has therefore been considered for all receptors, including bungalows. Where caravans have been identified, receptors have been modelled at 1.5 m above ground level. Representative baseline sound levels during the night time period have been determined at each receptor.

4.4.5 The noise model calculates the contribution from each noise source input as a specified source type (e.g. point, line, area) octave (or third-octave) band sound power levels at selected locations. It predicts noise levels under light down-wind conditions based on geometrical divergence, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613.

Modelling (OHL and CSECs)

4.4.6 OHL conductors have been modelled as line sources. The sound power levels of these line sources are derived from the National Grid TR(T)94 model referenced in NPS EN5. Wet noise levels have been based on a rain fall rate of 1 mm/h, the rate at which conductors are fully wetted and hum inception is assumed to occur due to the formation of stable water droplets on the conductor surface. As discussed previously, this represents a worst case assessment in terms of the rating level difference between OHL noise and background rain noise. The calculated sound levels, presented in Table 16.7, are based on a lattice pylon with a twin 41 mm diameter conductor (the Proposed Development). The outputs of this model are based on a predicted conductor surface electrical stress of 13.9 kV/cm with standard height pylons.

Table 16.7 Conductor Noise Source – Model Inputs for with Standard Height Pylons

Condition	Position	Average Span Height, m	Distance from Centreline, m	Sound Power Level per m length, dB L_{WA}/m
Dry	Bottom	16.7	7.12	36.3
Dry	Middle	25.4	9.12	36.4
Dry	Top	34.7	6.3	34.2
Wet	Bottom	16.7	7.12	51.9
Wet	Middle	25.4	9.12	52.0
Wet	Top	34.7	6.3	49.8

4.4.7 The Proposed Development includes low height pylons on the approaches to the CSECs. The conductors are held in a different geometry on these pylons. The calculated sound levels, presented in Table 16.8 are based on a low height lattice pylon with a twin 41 mm diameter conductor. The outputs of this model are based on a predicted conductor surface electrical stress of 14.3 kV/cm with low height pylons.

Table 16.8 Conductor Noise Source – Model Inputs (low height pylon)

Condition	Position	Average Span Height, m	Distance from Centreline, m	Sound Power Level per m length, dB L_{WA}/m
Dry	Inner	12.4	7.1	38.6
Dry	Outer	13.1	14.9	37.6
Dry	Top	22.1	9.2	37.6
Wet	Inner	12.4	7.1	54.2
Wet	Outer	13.1	14.9	53.2
Wet	Top	22.1	9.2	53.2

4.4.8 In accordance with BS 4142:2014, a character correction has been applied to the sound levels that have been predicted in the sound propagation model. The Standard states that a rating penalty can be applied to the specific sound if the source is considered to be tonal, impulsive, intermittent, or otherwise contain distinguishable characteristics. In the case of conductor noise, it is considered that a +6 dB rating penalty should be applied to account for the 'hum' of wet noise and that a +3 dB rating penalty is appropriate to account for the broadband 'crackle' that may, at times, be present during dry conditions.

Accounting for Existing OHL Infrastructure

4.4.9 To address concerns raised by stakeholders during the S42 consultation, section 9, Mitigation and Residual Effects includes consideration of the combined effect on receptors potentially affected by both the proposed new OHL and unchanged sections of the existing OHL. This is relevant to receptors on Anglesey between Wylfa and near Gaerwen where the proposed OHL parallels the existing OHL.

4.4.10 The following approach has been taken:

- All new or modified OHL infrastructure is assessed according to the noise assessment method described in section 4, Methodology, and Appendix 16.3 (**Document 5.16.2.3**). This assessment is carried out relative to a very low baseline that does not include a contribution from the existing OHL, and includes the sections (termed transposition sections) where the existing OHL would be removed and rebuilt along a different alignment.

- Receptors nearest the existing and new OHLs that may experience a combined effect from both are grouped into one of four categories (P1, P2, P3 or P4) described in Appendix 16.4 (**Document 5.16.2.4**) depending on their location relative to the two OHLs.

4.4.11 A qualitative approach, based on professional judgement, is followed to identify the factors that might determine whether the proximity or location of the identified receptors relative to the existing OHL justifies a higher level of significance of effect at that receptor than already identified from the assessment of the new OHL alone.

4.4.12 The assessment therefore considers the unmodified sections of the existing OHL in combination with the new-build sections of OHL. Further detail of the approach is given in Appendix 16.4 (**Document 5.16.2.4**).

Modelling (THHs and Pentir Substation)

Braint and Tŷ Fodol THHs

4.4.13 Within the noise model noise sources for the THHs have been modelled as an area source on a building in order to represent the fan noise breakout through the louvres. The noise model has not considered the proposed landscaping of the surrounding area and as such does not account for the potential attenuation provided by this screening. The sound power level for the fans and the orientation of the louvres is summarised in Table 16.9. It is currently anticipated that two fire-rated reversible tunnel ventilation fans fitted with acoustic attenuation between the fans and louvre would be installed at Tŷ Fodol.

4.4.14 Both THHs at Braint and Tŷ Fodol have been modelled with stairwell ventilation fans terminating at a louvre on the façade of the THH buildings. It has been assumed that an attenuator (1,000 mm) would be fitted between the fan and the louvre. Although it is anticipated that the stairwell fans would only operate when personnel are using the stairwells, they have been included in the model to ensure a worst-case scenario is assessed.

4.4.15 Table 16.9 presents the sound power level and louvre orientation for the ventilation and stairwell fans. The sound power data for tunnel ventilation fans at Tŷ Fodol includes attenuation afforded by silencers fitted between the fans and louvre and assumes operation at 100% capacity.

Table 16.9 Ventilation Fans – Model Inputs (100% capacity)

Type	Location	Louvre Orientation	Sound Power Level, dB
Fire Rated Tunnel Ventilation Fan, Reversible Fan (including attenuator); operating at full design rating.	Tŷ Fodol	South -west	107
Stairwell Ventilation Fan (including attenuator)	Tŷ Fodol	South-east	98
Stairwell Ventilation Fan (including attenuator)	Braint	South-west	98

4.4.16 It has not been considered appropriate to apply a character correction to the sound levels for either the tunnel ventilation fans or stairwell ventilation fans due to the broadband character of the sound. Whilst the noise of the fan may vary depending on operating conditions, it is not considered to be intermittent in nature. Following guidance contained within BS 4142:2014, the sound source is not considered to be tonal, impulsive, intermittent, or otherwise contain distinguishable characteristics, and therefore a rating penalty has not been applied.

4.4.17 The tunnel ventilation fans would operate according to cable tunnel cooling demand. A very worst case assessment is based on the assumption that both of the tunnel ventilation fans are operating concurrently and towards their peak capacity. This would not be the case during normal operating conditions as:

- one or both fans working concurrently towards their peak capacity would only occur during emergency conditions or during testing;
- during normal operation, the tunnel ventilation fans would be operating in a duty/standby arrangement, with only one tunnel ventilation fan operating at any one time; and
- during normal operation, the circuit loadings would be shared between the cables on the new connection and the OHL on the existing connection, meaning that the duty fan would not be required to operate towards its peak capacity.

4.4.18 It is therefore expected that a typical operating condition would consist of one tunnel ventilation fan operating up to 50% of peak capacity, assisted by natural ventilation and the tunnel's thermal inertia. During this time the other tunnel ventilation fan would be on standby. This condition could occur at any period during the day or night for extended periods of time. A realistic worst case would consist of one fan operating at 100% for a short period of time. This would likely occur during the day on a monthly basis during routine testing of the ventilation fans when each fan would be manually run up to 100%.

4.4.19 Based on manufacturer's sound power data for the proposed tunnel ventilation fans, a summary of assumed sound power levels under different operating conditions is provided in Table 16.10.

Table 16.10 Ventilation Fans – Operating Scenario Sound Power Levels

Scenario	Operating Condition	Anticipated Occurrence	% Peak Capacity		Sound Power, dB
			Fan 1	Fan 2	
Very worst case	Emergency only	Very rarely	100	100	110
Realistic worst case	Routine testing	Two hours per month, day only	100	0	107
High cooling demand	Normal operation	Continuous operation, day or night	50	0	93
Medium cooling demand	Normal operation	Continuous operation, day or night	25	0	79
No cooling demand	Normal operation	Continuous operation, day or night	0	0	n/a

4.4.20 At each THH site there would be an electricity supply from the local distribution network which would comprise a small containerised switch room and one or two small transformers to provide site electricity supplies. These are not considered to be dominant noise sources and have not been considered further in this assessment.

4.4.21 The only other potential noise sources of note are dewatering pumps located in sumps at the base of the tunnel shafts. These would not be audible at ground level and so are not included in the assessment.

Pentir Substation

4.4.22 It is proposed that a new shunt reactor would be installed at Pentir Substation within the zone shown on Design Plan DCO_DE/PS/01 Sheet 3 of 9 (**Document 4.13**). There are no other items of reactive plant or significant noise sources proposed to be installed within the substation. The assessment has therefore only considered the noise impact from this additional plant item within the model. Existing reactive plant items within the substation perimeter are accounted for within the baseline sound surveys[3] undertaken at receptors surrounding the existing substation.

4.4.23 In accordance with BS 4142:2014, a character correction has been applied to the sound levels from the shunt reactor. It is considered that a +6 dB rating penalty should be applied to account for the tonal nature of the sound from the shunt reactor. This is considered to represent a robust and precautionary approach as the prominence of the tonal sound may be masked by background sound resulting in a less distinct tonal characteristic at the nearest receptors.

4.4.24 The sound power levels presented in Table 16.11 have been used in the noise model.

Table 16.11 Substation Reactive Plant – Model Inputs

Type	Location	Sound Power Level, dB(A)
400 kV Shunt Reactor	Pentir	95
Cooler bank for Shunt Reactor	Pentir	84

[3] Tonal analysis has been undertaken of the baseline sound levels measured at the two closest long-term measurement locations to Pentir Substation. The assessment, following guidance in BS 4142:2014, found no distinctive tonal characteristic at 100 Hz and harmonics (dominant tones usually produced by substation transformers and reactive plant) within the data set at either location. It is therefore considered that noise from the substation does not contribute to the representative baseline levels at these locations.

OHL Noise Technical Analysis

4.4.25 For the prediction of dry noise, a free-field BS 4142:2014 assessment has been carried out at all identified receptors within the operational noise study area (see Appendix 16.5 (**Document 5.16.2.5**) for the OHL, with consideration given for receptors just outside of this based on their assigned sensitivity. The output of the assessment presents a rating level difference which may be positive or negative depending on the level of OHL noise and background sound level.

4.4.26 Typical annual rainfall data for the Proposed Development area are presented in Table 16.12. The data presented in this table have been provided by the Met Office. Wet hours are recorded for rainfall over 0.3 mm within each hour and yearly averages are taken over the 10 year period from 2001 to 2010.

Table 16.12 Met Office Rainfall Data (10 year period 2001 to 2010)

Location	Annual Average Wet Hours	Annual Average Rainfall Total (mm)
Anglesey North	600 – 750	800 – 1,000
Anglesey Middle	600 – 750	1,000 – 1,200
Anglesey South	600 – 750	1,000 – 1,200
Gwynedd North	750 – 1050	1,000 – 1,500

4.4.27 The assessment methodology for the calculation of OHL wet noise deviates from the method given in TR(T)94 in that annual average rainfall data is not needed to predict resultant noise levels. Data provided in Table 16.12 is, however, useful in the determination of significance when considering the likely number of hours per year that receptors may be exposed to wet noise conditions.

4.4.28 In order to assess the rating level difference for wet noise, it is necessary to estimate the increase in background sound levels due to the sound of falling rain. Miller [Ref 16.25], presents a series of curves (r-1 to r-5) for sound from rainfall on different ground and vegetation conditions. The Miller curve ‘r-2’ has been selected as it most closely represents the terrain along the Proposed Development route and is the second most onerous of the five curves (r-1 representing terrain with the lowest sound due to rain).

4.4.29 The output of the assessment presents the difference between the rating level and background sound level during periods of rain, assuming a 1 mm/h intensity rainfall in accordance with TR(T)94, which is the worst case point at

which the difference between the rating level and background sound is at a maximum due to hum inception.

4.5 ASSUMPTIONS AND LIMITATIONS

4.5.1 The methodology that has been adopted for this assessment follows the same noise modelling techniques that have been used by National Grid on numerous sites in the UK. There is therefore a high degree of confidence in both the model and the assessment approach.

4.5.2 It should be noted that the TR(T)94 model does not predict insulator noise and that there are no known reliable methods for doing so. Consequently, it is necessary to assess potential noise from insulators in a qualitative manner. Further information on insulator noise is provided in section 8, Potential Effects.

4.5.3 The acoustics standards and guidance adopted for the Proposed Development are based on the subjective response of the majority of the population. This is considered to be the best that can be achieved in a population of varying subjective responses, which are dependent upon a wide range of factors.

4.5.4 There are uncertainties in any sound propagation prediction methodology. ISO 9613-2 is applicable in practice to a great variety of noise sources and environments. The estimated accuracy for values of an A-weighted sound level down-wind LAT (DW) is stated as +/-3 dB for a mean source/receptor height of up to 5 m and source/propagation separation distance of up to 1 km. For a mean source height between 5 and 30 m, the estimated accuracy is given as +/-1 dB for a source/propagation separation distance of 0 to 100 m and +/-3 dB for a source/propagation separation distance of >100 m. This is a standard approach and is considered to be an acceptable and robust prediction methodology.

4.6 ASSESSMENT CRITERIA

Sensitivity

It is considered appropriate to determine sensitivity on a case-by-case basis at a local level. The WHO guidelines offer some comment on degrees of sensitivity, identifying ‘vulnerable subgroups’ such as those suffering from particular medical conditions. Taking this into account, the sensitivity scale shown in Table 16.13 is based on the considered sensitivity of receptors to operational noise.

Table 16.13 Sensitivity of Receptor	
Sensitivity of Receptor	Receptor Description
High	Patients in hospitals/hospices – defined as a 'vulnerable subgroup' with very high or continuous rates of occupancy.
Medium	Residential receptors, including residential schools and residential caravans and cabins.
Low	Area used primarily for leisure activities, including amenity areas, hotels, camping and caravanning facilities, Public Rights of Way (PRoW), sports facilities and sites of historic or cultural importance, non-residential schools and businesses.
Very Low	All other areas such as those used primarily for industrial or agricultural purposes.

4.6.1 The lowest ambient sound levels have been measured during the night time. It is likely for operational noise from the OHL to become more discernible during this period and result in the greatest noise impact. Non-residential Schools have been deemed low sensitivity as they will not be occupied during the night time period and therefore have a low sensitivity to night time noise[4].

4.6.2 People living within hospitals, hospices and care homes may be identified as belonging to 'vulnerable subgroups' according to the WHO guidelines and therefore, it is considered appropriate to assign a high sensitivity to receptors of this type.

4.6.3 Caravans that have been identified as being in use as residential or semi-residential dwellings have been assigned a medium sensitivity to bring them in line with residential receptors of standard construction. Camping and caravanning facilities used on a holiday stay basis are considered to be of low sensitivity in line with other commercial receptors including hotels.

4.6.4 The receptor sensitivities given in Table 16.13 are determined based on their assumed sensitivity to operational noise from the Proposed Development. In determining sensitivity, the following factors have been considered; times

4 The assessment uses criteria based on BS4142:2014 which is intended for assessing sound at dwellings or premises used for residential purposes. An alternative approach would have been for schools to be identified as of high sensitivity but to specify different thresholds for determining magnitude of impact. However, no schools are present within the study area.

when the receptor is occupied, day and night time background sound levels, human response to operational noise sources, and duration of time residents are likely to be exposed to operational noise impacts. Whilst the assigned sensitivities in Table 16.13 are unique to the operational noise assessment, effort has been made to ensure consistency between receptor sensitivity presented in this chapter and Chapter 15, Construction Noise and Vibration (**Document 5.15**) where practicable to do so.

4.6.5 It is recognised that there are a number of receptors that may not fit the receptor categories and sensitivity classifications given in Table 16.13. It is therefore considered appropriate to consider sensitivity on a case-by-case basis at a local level.

Magnitude

4.6.6 The magnitude of effect thresholds provided below in Table 16.14 are based on the assessed levels during the quietest night-time hours (typically between midnight and 04:00), when people are likely to be sleeping. In addition, the levels assessed are free-field calculations of external levels, and take no account of building attenuation effects to predict levels inside the residential dwellings. As such, the above criteria are considered to be robust.

Table 16.14 Magnitude of Impact - Operational Noise

Magnitude of Impact	Operational Noise – Substation, THH, CSEC or OHL (Dry and Wet Noise)
High	Predicted rating levels are 5 dB or more above the existing background sound level (background sound levels for wet noise assessment include sound due to rainfall) and rating levels are greater than or equal to 35 dB
Medium	Predicted rating levels are between 4.9 dB and 0 dB above the existing background sound levels (background sound levels for wet noise assessment include sound due to rainfall); or Predicted rating levels are 5 dB or more above the existing background sound levels (background sound levels for wet noise assessment include sound due to rainfall) and rating levels are less than 35 dB
Low	Predicted rating levels are between 0.1 dB and 5 dB below the existing background sound levels (background

Table 16.14 Magnitude of Impact - Operational Noise	
Magnitude of Impact	Operational Noise – Substation, THH, CSEC or OHL (Dry and Wet Noise)
	sound levels for wet noise assessment include sound due to rainfall)
Very Low	Predicted rating levels are between 5.1 dB and 10 dB below the existing background sound levels or baseline level (background sound levels for wet noise assessment include sound due to rainfall)
No Effect	Predicted rating levels are 10.1 dB or more below the existing background sound levels (background sound levels for wet noise assessment include sound due to rainfall)

4.6.7 The proposed assessment levels as detailed in Table 16.14 are based on an absolute rating threshold level of 35 dBA. Paragraph 2.22 of the NPSE acknowledges that it is not possible to have a single objective noise-based measure that defines the LOAEL and SOAEL that is applicable to all sources of noise in all situations. The absolute rating threshold level of 35 dBA and significance criteria, as used in this assessment, are based on a consideration of absolute noise levels contained within WHO guidance and the NNG, National Grid's experience of operating the electricity transmission system in England and Wales, as well as the approach to assessing industrial noise as defined in BS 4142:2014. The character of the noise source has been taken into consideration through the use of rating levels, as defined in BS 4142:2014. This is described in Appendix 16.2.3 (**Document 5.16.2.3**).

Significance

4.6.8 A combination of receptor sensitivity and magnitude of impact has been used to determine a significance of effect (hereon referred to as the 'effect') at each receptor. Table 16.15 shows the effects criteria that have been used in the assessment.

Table 16.15 Effect – Operational Noise				
Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible

Table 16.15 Effect – Operational Noise				
Magnitude of Impact	Sensitivity of Receptor			
	High	Medium	Low	Very Low
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible
No Effect	Negligible	Negligible	Negligible	Negligible

4.6.9 The above significance criteria are based on BS 4142:2014 which considers noise external to a building.

4.6.10 For operational noise, a major effect is considered to be significant, while a moderate effect may be significant, depending on the consideration of a number of factors. The factors may include the likely duration of the noise source (this is of relevance to both dry noise and wet noise from OHL, which do not occur all the time), taking into account the existing OHL, and consideration of the context of the assessment (as required by BS 4142:2014). Professional judgement has been used when determining whether a potentially significant effect is significant or not, taking these factors into account.

4.6.11 Since the noise predictions are based on a number of worst case assumptions, it would be inappropriate to conclude the significance of an effect simply because the moderate magnitude threshold is met. The amount by which a threshold is exceeded, along with the duration of effect has also been taken into account.

5 Basis of Assessment

5.1 INTRODUCTION

5.1.1 The basis of assessment section sets out the assumptions that have been made in respect of the design flexibility maintained within the draft DCO, and the consideration that has been given to alternative scenarios and the sensitivity of the assessment to changes in the construction commencement year.

5.1.2 Details of the available flexibility are included in Chapter 3 Description of Proposed Development, (**Document 5.3**), Chapter 4 Construction, Operation, Maintenance and Decommissioning (**Document 5.4**) and are also considered in Chapter 6 EIA Methodology (**Document 5.6**).

5.2 FLEXIBILITY ASSUMPTIONS

5.2.1 The primary assessment has considered the proposed alignment of the OHL and the location of Braint and Tŷ Fodol Tunnel Head Houses and Cable Sealing End Compounds based on the Proposed Development shown on the Works Plan (**Document 4.4**). Flexibility provided by the LOD has not been considered in the primary assessment. Table 16.16 sets out the primary assessment and the worst case assumptions with regards to movements within the LOD that have been considered in the subsequent assessment. The secondary assessment considers movement of OHL only as allowed by the LOD and as such, is not applicable to the THH/substation assessment.

Table 16.16 Flexibility Assumptions

Element of Flexibility	Proposed Development assumption for initial assessment (Primary Assessment)	Flexibility assumptions considered (Secondary Assessment)
Horizontal Limits of Deviation for pylons,	The assessment has considered the pylon in its current location as shown on the Works Plans (**Document 4.4**).	20 m (see paragraphs 5.2.2 and 5.2.3) either side of the alignment shown on the Works Plans (**Document 4.4**), except

Table 16.16 Flexibility Assumptions		
Element of Flexibility	Proposed Development assumption for initial assessment (Primary Assessment)	Flexibility assumptions considered (Secondary Assessment)
conductors and CSECs	The conductors have been assessed based on the location of the pylons and centreline shown in on the Works Plans (**Document 4.4**).	in certain locations where the LOD has been restricted Flexibility of pylon locations along the alignment is not applicable to the operational noise assessment as is the conductors that are assessed.
Vertical Limits of Deviation for pylons and conductors and CSECs	The assessment has considered the average span heights for each phase as detailed in Table 16.7, taking into account the use of low height pylons and gantries.	Not applicable as vertical LOD allows average span heights to be maintained along the OHL.
Braint and Tŷ Fodol THHs and Pentir Substation	The assessment has considered the parameters shown on the Design Plans (**Document 4.13**) and operational assumptions as described in section 4.4 Technical Analysis.	n/a
Pylon footprint and foundation type	Not applicable to the operational noise assessment	n/a
Tunnel alignment, depth and construction compounds	Not applicable to the operational noise assessment	n/a
Access tracks, working areas and construction compounds	Not applicable to the operational noise assessment	n/a
Third Party Services	Not applicable to the operational noise assessment	n/a

5.2.2 In most instances the horizontal LOD extends approximately 50 m either side of the centreline of the alignment shown in the Works Plan. In order to ensure conductor spans do not over sail areas beyond the LOD boundary (accounting for conductor swing), pylon bases have been modelled at a maximum distance of 20 m in either direction. Whilst it may be possible for individual spans to move further than this, accounting for conductor swing and span length, 20 m is considered to represent a maximum reasonable limit for horizontal movement within the LOD.

5.2.3 The extent of the LOD has been restricted in some locations to avoid potential pylon locations within close proximity to a receptor. Where the LOD has been restricted, the secondary assessment has assumed the OHL would be moved as far as possible up to 20 m, whilst ensuring the conductor span does not exceed the LOD boundary, assuming still air conditions. The lesser of the 20 m limit or the more restricted limit is referred to hereafter as the 'reasonable limit'.

5.3 EXISTING NATIONAL GRID INFRASTRUCTURE

5.3.1 With the exception of a short deviation near Capel Coch, the proposed OHL would run in parallel to the existing OHL infrastructure between Wylfa and the point at which the OHLs diverge near Gaerwen. Receptors within close proximity to the two OHLs are likely to be impacted by operational noise from both OHLs.

5.3.2 Where the new OHL transposes from one side of the existing OHL to the other (see explanation provided in Chapter 3, Description of Proposed Development (**Document 5.3**) there are sections where the existing OHL would be removed and two new parallel OHLs constructed. In these sections, two new OHLs have been modelled; this includes the section through Rhos-y-bol where it is proposed to remove six pylons to enable the routeing of two OHLs through this area.

5.3.3 In order to account for the in-combination effect from sections where the proposed new OHL would be constructed alongside sections of existing OHL which remain unchanged as a result of the Proposed Development, the three step approach outlined in sections 4.4.9 to 4.4.12 is followed. The results of the assessment of new OHL only and the in-combination effects are presented in section 9, Mitigation and Residual Effects.

5.3.4 Receptors surrounding the Pentir Substation and Braint and Tŷ Fodol THH sites may also experience a combined operational noise effect from proposed new plant items and the new OHL. The combined operational noise impact

from these sources has been considered within this assessment and is presented under section 9.

Consideration of Temporary Alignment

5.3.5 To maintain an electricity supply to Anglesey, it would be necessary to construct two temporary pylons in order to realign the existing 400 kV OHL. The temporary pylons are 4ZA030T to the south of Pen-yr-Orsedd and 4ZA034T directly east of the B5111, both in Section B as shown on the Works Plans (**Document 4.4**). As a result of the temporary alignment, the 4ZA OHL at these locations would move further east than the existing alignment, but would remain within the LOD. On completion of the construction on this section, these pylons would be removed.

5.3.6 The temporary alignment of the existing OHL would bring it closer to receptors to the east of the two pylon locations. The secondary assessment in section 9.3 considers horizontal movement of the permanent OHL infrastructure within the LOD. As such, it is considered that the temporary alignment of OHL to the east will likely result in the same effect, albeit for a shorter duration, as that reported within the secondary assessment. It is therefore considered that further assessment of the temporary alignment is not necessary.

5.4 CONSIDERATION OF SCENARIOS

5.4.1 There are three sets of options which have been considered by the assessment. These are:

- options A and B as explained in Chapter 3, Description of the Proposed Development (**Document 5.3**);
- direction of tunnelling (Scenarios 1 and 2) as explained in Chapter 4, Construction, Operation, Maintenance and Decommissioning (**Document 5.4**); and
- construction traffic using the existing A5025 alignment or using the new alignment as proposed by Horizon Nuclear Power as explained in Chapter 4, Construction, Operation, Maintenance and Decommissioning (**Document 5.4**).

5.4.2 Table 16.17 details where these options are relevant to the Operational Noise assessment and how they have been assessed in section 9, Mitigation and Residual Effects.

Table 16.17 Consideration of Scenarios	
Option	How it has been considered within the assessment
Option A and B	The primary OHL noise assessment considers an alignment which maintains a close parallel with the existing OHL near Talwrn ('Option A'). An 'Option B' alignment, which diverges slightly from parallel near Talwrn to maintain an offset from the residential property Dolydd Newydd (R4/01483), is also considered. Under the Option A assessment, Dolydd Newydd would not be occupied when the OHL is operational (**Document 7.4.2.1**). Predictions of noise impact at this receptor under this alignment option are therefore not applicable. Further information on Option A and Option B is presented in Chapter 3, Description of the Proposed Development (**Document 5.3**) The assessment of Option A is therefore covered by the primary assessment presented in section 9.2, from paragraph 9.2.6. The assessment of Option B is presented in section 9.2, from paragraph 9.2.51.
Direction of tunnelling (Scenarios 1 and 2)	Not applicable to the assessment of operational noise.
Construction traffic using the existing A5025 alignment or using the new alignment as proposed by Horizon Nuclear Power	Not applicable to the assessment of operational noise.

5.5 SENSITIVITY TEST

5.5.1 Under the terms of the draft DCO (**Document 2.1**), construction could commence in any year up to five years following the grant of DCO. It is considered that the residual effects reported in this chapter would not be any different if construction were to commence in any year up to and including the fifth year. It has therefore not been necessary to undertake a more detailed assessment for an alternative programme to that set out in Chapter 4, Construction, Operation, Maintenance and Decommissioning (**Document 5.4**).

6 Study Area

6.1 INTRODUCTION

6.1.1 There is no national UK or Welsh government legislation or guidance that provides guidance on the extent or size of a study area to adopt for the assessment of noise and vibration effects from electrical infrastructure or the construction or operation of industrial facilities. The study areas in this chapter have been selected on the basis of professional judgement of the distances over which potentially significant noise effects may occur and consideration of the sensitivity of receptors.

6.1.2 The following study areas have been adopted for the assessment of operational noise following discussions with IACC and Gwynedd Council.

Overhead Line and Cable Sealing End Compound Study Area

6.1.3 The level of operational noise from OHL and the CSECs falls quickly with distance (over tens of metres), hence the distance between the OHL/CSEC and the noise sensitive receptor (NSR) being assessed is an important factor. The study areas for the CSECs are included within the OHL study area.

6.1.4 The study area for the proposed 400 kV OHL operational noise assessment extends approximately 200 m either side of the Limits of Deviation (LOD). National Grid's experience of operating the existing high voltage transmission system in England and Wales shows that there are no significant audible noise effects beyond this distance for the proposed technology option.

6.1.5 A list of identified receptors within this 200 m study area, including their sensitivity is presented in the results tables in Appendix 16.5 (**Document 5.16.2.5**).

6.1.6 No additional receptors were identified beyond 200 m that would necessitate a change to this study area and it is therefore considered that the study area is robust.

Pentir Substation and both Tunnel Head House Study Areas

6.1.7 Potentially significant noise effects from Pentir Substation, and both Braint and Tŷ Fodol THHs are only likely to occur at distances well within a 1,000 m

radius. The exact study areas for Pentir, Braint and Tŷ Fodol are defined by the noise contours for each source; however, it is considered to be a robust approach to identify all receptors within a 1,000 m radius search area. Allowances have been made based on the sensitivity of the surrounding receptors and directionality of the noise source in order to identify the receptors likely to be most susceptible to noise effects.

6.1.8 The draft DCO does not propose any additional noise sources at Wylfa Substation and therefore a study area for the potential effects of operational noise from this site has not been considered.

6.1.9 Given that levels of vibration attenuate very rapidly through the ground within a few metres, residual vibrational effects from the proposed operation of either the THH or substation sites are not likely to be perceptible or significant beyond a few metres from the source. It is therefore considered that a significant effect would not occur at any identified receptors.

7 Baseline Conditions

7.1 INTRODUCTION

7.1.1 Anglesey is a rural island mainly occupied by farmland, with some areas protected for their nature conservation value. Consequently, much of the island is subject to low background sound levels during the daytime and very low levels during the night-time. Although there are some busy main roads, including the A5 and A55 around the Menai crossing, the noise level from traffic decreases in the late-evening and night-time.

7.1.2 The area of the Proposed Development in Gwynedd is generally rural in nature and subject to low background sound levels during the daytime and very low levels during the night-time. As on Anglesey, although there are some busy main roads, including the A5 and A55 around the Menai crossing, and local roads including A487 and B4547, the noise level from traffic drops off in the late-evening and night-time.

7.2 BASELINE SOUND LEVELS

7.2.1 Sound surveys have been undertaken in order to determine the baseline acoustic environment along the Proposed Development. A summary of the baseline survey results and assessment methodology are given in the Baseline Sound Monitoring Report presented in Appendix 15.2 (**Document 5.15.2.2**). A map showing the representative baseline areas and levels assumed in this assessment are presented in Appendix 16.1 (**Document 5.16.2.1**).

7.2.2 Table 16.18 provides a summary of the night-time baseline sound levels measured at the long-term monitoring locations.

Table 16.18 Summary of Measured Baseline Sound Levels, Night-time

Survey ID	Location (near to receptor)	Background, dB L_{A90} (25^{th} Percentile)
LT_A	Llety, Cemaes Bay, LL67 0DA	23

Table 16.18 Summary of Measured Baseline Sound Levels, Night-time		
Survey ID	Location (near to receptor)	Background, dB L_{A90} (25th Percentile)
LT_B	Cae-Adda Fach, Cemaes Bay, LL67 0DS	23
LT_C	Dymchwa, Llanfechell, Amlwch, LL68 0RT	22
LT_D	Trigfa, Rhosgoch, LL66 0AB	21
LT_E	Gorslwyd Bach, Rhos-y-bol, Amlwch, LL68 9PY	21
LT_F	Bryn Goleu, Llandyfrydog, Llanerchymedd, LL71 8AP	23
LT_G	Bryn Awel, Llanerchymedd, LL71 8AF	23[1]
LT_H	Maen Goch, Capel Coch, LL77 7UT	20
LT_I	Maen Eryr, Tregain, Llangefni, LL77 7UH	19
LT_J	Madryn, Talwrn, LL77 7TE	22
LT_K	Tyn Y Felin, Lon Cae Cwta, Llangefni, LL77 7SF	30
LT_L	Near Bryn Gwallen Farm, Llangefni, LL77 7SL	25
LT_M	Tyn Cae, Gaerwen LL60 6AS	27
LT_N	Rhos Bothan, Llanddaniel, Gaerwen, LL60 6HE	29
LT_O	Tyddyn Fadog, Llanfairpwll, LL61 6PS	27
LT_P	Hafodol, Fodolydd Lane, Y Felinheli, LL56 4QD	29
LT_Q	Rhos Farm/Garth Farm, Y Felinheli, LL56 4QE	28
LT_R	Tyn Llwyn, Pentir, Bangor, LL57 4DY	28
LT_S	Garth Fawr Farm/Lleifior, Y Felinheli, LL56 4QF	29
[1] Monitoring carried out by IACC. Level presented is representative of the background $L_{A90,8hr}$		

7.2.3 In the sections where the proposed new OHL parallels the existing OHL it is likely that noise from the existing OHL would have contributed to the measured levels at the monitoring locations. However, as OHL noise varies and mostly occurs during damp or windy weather, the exclusion of data during adverse (windy or rainy) weather means that any noise from the existing OHL will also have been excluded. This is evident in Table 16.18 where some of the locations closest to the existing OHL (LT_B, LT_C and LT_D, all of which

were within 100 m of the existing OHL) reported some of the lowest 25th Percentile values.

7.2.4 The majority of receptors identified along the Proposed Development alignment, within the 200 m study area, are residential receptors and are therefore classed as medium sensitivity. Table 16.19 details the number, and classification of receptors that have been identified within the operational noise study areas. There are no identified receptors that fall within the study areas for operational noise effects that have been assigned a high sensitivity.

Table 16.19 Summary of Identified Receptors

Study Area	Number of Identified Receptors	Receptor Types
OHL/CSEC	199[1]	16 commercial receptors, including one hotel identified as the Ring Hotel, Rhosgoch and two caravan and camping sites (Bryn Goleu Caravan Park and Coed Cottages Camping and Caravanning). 183 residential receptors, including a proxy residential receptor for static caravans at Bryn Goleu Caravan Park.
Braint THH	55	Two commercial receptors. 53 residential receptors, including one caravan.
Tŷ Fodol THH	52	Eight commercial receptors, including one B&B identified as Swn Y Nant, Bangor, two short-term holiday accommodation properties, and one campsite. 44 residential receptors, including four caravans.
Pentir Substation	21	Two commercial receptors. 19 residential receptors, including three caravans.

[1] R4/01483 (Dolydd Newydd) is included in the receptor total; however this property would not be occupied under Option A.

High Sensitivity Receptors

7.2.5 No receptors of high sensitivity have been identified within the OHL, THH and substation study areas. However, the following receptor, presented in Table 16.20, has been identified as operating as a care home and, as such, would be considered to have a high sensitivity. Although this receptor falls just outside of the study area for operational noise from the OHL, it has been identified through a search of the wider area and is the closest high sensitivity receptor to the Proposed Development.

Table 16.20 High Sensitivity Receptors

Receptor ID	Receptor Type	Receptor Address	Assumed Sensitivity	Location
R2/00045	Residential Care Home	Glyn Ewryd, Rhosgoch, LL66 0AB	High	215 m from LOD

7.2.6 It is considered that receptors outside of the chosen study areas, irrespective of their assumed sensitivity, are highly unlikely to be exposed to a significant effect from operational noise and as such have not been considered for further assessment.

Non-standard residential receptors

A number of residential receptors have been identified that are considered to be of non-standard construction, i.e. caravans and mobile homes. Due to the nature of these receptors it is assumed that the sound attenuation afforded by the façade is likely to be less than that of a receptor of standard construction. The assessment methodology is based on assessing the rating level difference at an external location, taking no account of building attenuation effects to predict levels inside receptors. It is therefore not considered appropriate to increase the receptor sensitivity based on assumed sound attenuation of the façade. It is instead considered more appropriate to review the individual circumstances and context of the assessment for these receptors on a case by case basis. Table 16.21 below, presents the receptors that have been identified as residential caravans or chalets that fall within the study areas for the operational noise assessment.

Table 16.21 Residential Caravans/Chalets within Study Areas			
Receptor ID (parent location)	Receptor Type	Receptor Classification	Location
C1/13707 Coed Cottages	Commercial	Caravan	Approx. 140 m west of new OHL
R1/00162 [1] Gwyddelyn Fach	Residential	Caravan	Approx. 100 m north-east of new OHL
R2/13706 Bryn Goleu	Residential	Caravan	Directly over sailed by new OHL
R3/13332 Dolwena & Bodwena	Residential	Caravan	Approx. 185 m west of new OHL
R5/13562 Garnedd Fawr	Residential	Caravan	Approx. 90 m east of new OHL
R5/13595 Garnedd Isaf	Residential	Caravan	Approx. 100 m north-east of new OHL
R5/03013 Bryn Gof	Residential	Caravan	Approx. 950 m north of Braint THH
R5/07169 Fodol Cottage	Residential	Caravan	Approx. 350 m north of Tŷ Fodol THH
R5/08699 Fodol Newydd	Residential	Caravan	Approx. 750 m north-east of Tŷ Fodol THH
R5/08700 Fodol Newydd	Residential	Caravan	Approx. 750 m north-east of Tŷ Fodol THH
R5/08540 Tyddyn Forgan	Residential	Caravan	Approx. 400 m west of Pentir Substation
R5/09356 Rhos Fawr Caravan	Residential	Caravan	Approx. 300 m north of Pentir Substation
R5/10768 Ty'n Llwyn	Residential	Caravan	Approx. 550 m south-east of Pentir Substation

Table 16.21 Residential Caravans/Chalets within Study Areas			
Receptor ID (parent location)	Receptor Type	Receptor Classification	Location
[1] R1/00162 has been verified as not present and has been assessed jointly with its parent location as R1/00161 / 00162. Not all other caravans listed have been verified as present or in use.			

Non-standard commercial receptors

7.2.7 The Bryn Goleu Caravan Park near Llandfrydog has been identified as requiring detailed assessment. The caravan park has operated for a number years and is directly over sailed by the existing OHL, which would remain unchanged. The proposed OHL parallels the existing OHL at this point approximately 90 m to the south-west, over sailing the south-western perimeter of the caravan site. It is understood the caravans are privately owned and, although none have been identified as permanent residences, many are used on a semi-permanent basis. In order to ensure a worst-case approach, a receptor location has been considered within Bryn Goleu Caravan Park (Bryn Goleu Caravan Receptor - R2/13706) to account for caravans positioned directly underneath the new OHL. This receptor has been assigned a medium sensitivity to account for semi-permanent residential use.

7.2.8 The permanent residential dwellings in and around Bryn Goleu Caravan Park are assessed according to the standard methodology as having medium sensitivity. The business function of Bryn Goleu Caravan Park is assessed qualitatively assuming it as a commercial receptor which is assigned a low sensitivity to operational noise.

7.2.9 Another caravan park has been identified at Coed Cottages Camping and Caravanning site near Llanfechell. An additional receptor code (C1/13707) has been allocated to this site to account for the closest point on-site to the proposed OHL. As this site is used only for short-term holiday accommodation it has been assigned a low sensitivity to account for its commercial use.

7.3 FUTURE BASELINE PREDICTIONS

7.3.1 The decommissioning of Wylfa Nuclear Power Station and the construction and operation of Wylfa Newydd Power Station have the potential to impact on the baseline sound environment around Wylfa, during the operation of the Proposed Development. These developments are not considered as future

baseline, but are considered in section **Error! Reference source not found.** Inter-project Cumulative Effects.

7.3.2 Other than these developments, there is no anticipated change from the existing baseline as reported.

8 Potential Effects

8.1 INTRODUCTION

8.1.1 This section describes the potential operational noise sources and effects associated with the Proposed Development. Potential sources of operational noise from each identified source are detailed below.

8.1.2 Noise considerations in this chapter are limited to the operation of the Proposed Development and the potential effect is very specific to the proximity to the receptors. As such, the potential effects are described in terms of the sources of noise only, with the reporting of the assessment considered within section 9, Mitigation and Residual Effects.

8.2 POTENTIAL NOISE SOURCES

Conductor Noise from OHL and CSEC

8.2.1 400 kV transmission lines can produce audible noise under certain conditions, the characteristics of which can depend on the design of the OHL and weather conditions. The principal noise source is corona discharge on the surface of the conductors. The proposed OHL would be in continuous operation except during maintenance and fault outages.

8.2.2 Conductor system noise occurs when the conductor surface electrical stress gradient exceeds the inception level for corona discharge activity, a level of around 17 to 20 kV/cm. Most transmission line conductors are designed to operate below this threshold and so usually operate quietly in dry weather conditions. Electrical stress is a function of operating voltage and the geometry of the pylon and conductor system combination. The typical conductor surface electrical stress on the twin conductor proposed for the Proposed Development would be approximately 13.9 kV/cm or less in ideal operating conditions, significantly below the inception level for corona discharge. However, small areas of surface contamination, typically due to dust or pollution, spoiling the otherwise smooth conductor surface, can cause a local enhancement of electric stress which may be sufficiently high to initiate localised corona discharge activity. At each discharge site a limited electrical breakdown of the air occurs. A portion of the energy associated with the

corona discharge process is released as acoustic energy which radiates into the air as sound pressure waves.

8.2.3 After a prolonged spell of dry weather, without heavy rain to wash the conductors, contamination may accumulate sufficiently to result in increased noise. Under these circumstances, the noise is referred to as 'dry noise'. During the next occurrence of heavy rain these discharge sources are washed away and the OHL resumes its normal quieter operation once dry.

8.2.4 Higher noise levels can also be generated by conductors during and soon after periods of rainfall. Water droplets may accumulate on the surface of the conductor and initiate multiple corona discharges. The number of droplets and the resultant noise level will depend primarily on the rate of rainfall. Fog may also give rise to increased noise levels, although these levels are less than those during rain. Noise generated under these circumstances is referred to as 'wet noise'. However, some of the effect of this increased noise is masked by increased ambient noise due to the noise of the rainfall itself (either directly due to raindrops falling on hard surfaces or nearby foliage, or indirectly due to increased vehicle tyre/road interaction noise on local wet roads).

8.2.5 Transmission line audible noise is generally categorised as a 'crackle', a 'buzz' or a 'hum', according to its tonal content. Crackle may occur alone, but hum will usually occur only in conjunction with crackle.

8.2.6 Crackle is a sound containing a random mixture of frequencies over a wide range, typically 1 kHz to 10 kHz where individual tones are not audible. Crackle has a generally similar spectral content to the sound of rainfall.

8.2.7 Hum is a sound containing a single pure tone, or tones. For OHLs in wet weather, generally 100 Hz is the most significant, but other higher order harmonics, i.e. 200 Hz and 300 Hz may also occur to a lesser extent. Hum typically occurs during rain when the rate of rainfall exceeds about 1 mm per hour.

8.2.8 The conductor surface electric stress is a function of the voltage of the OHL (in this case 400 kV) and the geometry of the conductor system and pylon. Conductor bundles come in a variety of types and sizes, primarily determined by the rating requirement for the route and the capability of the pylon to carry the weight and size of the bundle.

8.2.9 Twin conductor bundles are two conductors side by side. There are variations in design and rating which include:

- the diameter of the individual conductors;

- the distance between conductors in the bundle; and
- the geometry of the pylons on which they are strung.

8.2.10 All of these factors influence the electric field strength on the surface of the conductor and hence the overall noise behaviour of the system.

8.2.11 In general, and for a given voltage, the more compact an OHL design the higher the conductor surface electric stress will be and hence the noisier the design is likely to be.

8.2.12 New conductors are likely to be noisier on energisation as residual drawing oils on the new 'shiny' aluminium alloy means the surface can retain water droplets for a longer period of time. The drawing oils quickly erode allowing the surface to form a duller aluminium oxide layer which becomes increasingly hydrophilic, meaning that the conductors shed water more readily. This process is known as 'aging' and is usually well established after a few months and complete in about one year.

8.2.13 The potential noise sources in CSECs are the same as for the OHL. The configuration of the conductor and fittings, however, may give rise to additional noise effects.

8.2.14 At Braint CSEC the conductors would terminate in a flat (horizontal) formation on the terminal gantry and transition from the OHL via two low height pylons at 4AP086 and 4AP087. The alteration in geometry and electrical stress due to low height configuration is taken into account in the noise model.

8.2.15 At Tŷ Fodol CSEC the conductors would terminate in a flat (horizontal) formation on the terminal gantry and transition via a low height pylon at 4AP088. The alteration in geometry and electrical stress due to low height configuration is taken into account in the noise model.

Insulator Noise from OHL

8.2.16 OHL fittings, including insulators, are designed and installed to minimise audible noise when in operation. However, insulators have the potential to generate noise primarily due to contamination on the surface of the insulator resulting in tracking currents across the surface of the insulators, usually heard as a 'crackle' or a 'buzz' during damp or wet weather.

8.2.17 Insulators are procured in accordance with National Grid Technical Specifications and must be Type Registered before being approved for use. Type Registration involves a series of tests to ensure compliance with the relevant technical specifications. These tests include performance

requirements for corona inception and audible noise on all fittings along with wind tunnel testing of insulators for audible tones generated by the wind. Where noise does occur, appropriate actions can be taken to try to remedy the cause through cleaning or replacement. It is therefore considered that any noise generated by the insulators is likely to be temporary and localised.

8.2.18 The principal source of noise on the existing OHL is likely to be corona tracking due to salt deposition on the surface of the insulators. Wind induced noise can also occur from insulators. The majority of pylons are fitted with glass insulators while a few pylons have a porcelain design.

8.2.19 For the new OHL, the most appropriate designs would be considered, taking into account, as far as practicable, local conditions, operational requirements and best practicable means from a noise perspective. Available options are likely to include glass, porcelain and polymeric designs. All are required to pass the same Type Registration requirements; however operational experience shows each type can have different audible noise behaviour which is often location specific. The glass and porcelain designs can also be coated with hydrophobic coatings which repel moisture and contamination, a technique which has been trialled on fittings at Wylfa Substation. Operational experience has shown that coated insulators are less prone to corona tracking and hence audible noise in contaminating environments. Polymeric insulators are made of a naturally hydrophobic polymeric material. They are not currently widely used on the UK transmission network although trials are ongoing and it is anticipated that their availability and use will increase in the future. Operating experience shows their audible noise performance is likely to be favourable compared to glass or porcelain.

Wind Induced Noise from OHL

8.2.20 Although the mechanisms of wind noise production are well understood, there are no known reliable methods to model wind noise from conductors, pylon structure, insulators, fixtures and fittings when in operation.

8.2.21 Wind induced noise may occur under certain wind conditions from conductors, pylon structures and insulators, as well as fixtures and fittings. Insulators and fixtures and fittings used on the OHL must comply with Type Registration to be used on the transmission network, which includes wind tunnel tests designed to reduce the occurrence of tonal noise due to wind.

8.2.22 Qualitative consideration has been given to potential wind noise impact, which is reported in section 9, Mitigation and Residual Effects.

Braint THH

8.2.23 Stairwell ventilation fans would be located in the THH building. These fans would only be required for operation when personnel are using the stairways to access the tunnel and this is only likely to occur during routine daytime inspection visits. However, access on a non-routine basis may be required at night. As it is possible that the fans may be required at any time in a 24 hour period, the assessment assumes night-time operation.

Tŷ Fodol THH

8.2.24 Ventilation systems operating within THHs are potential sources of operational noise. The noise level from such plant will depend on a number of factors, including placement, power output and design. The Tŷ Fodol THH would include two types of fan; stairwell ventilation fans, as at Braint THH, but also tunnel ventilation fans. The louvre for the main tunnel ventilation fans would be orientated to the south-west.

8.2.25 The tunnel ventilation fans within the THH would operate according to cable tunnel cooling demand (see table 16.10). Hence it has to be assumed the fans would be operating at any time of the day or night. The fans would operate on a 'soft start'[5] basis with a minimum run time of approximately 30 minutes. 'High cooling demand' operation is likely to be one fan running at 50% load; however, for robustness the assessment has also considered the 'a realistic worst case' scenario for routine testing of one fan running at maximum output, a situation that is likely to occur for approximately two hours per month during routine daytime testing.

8.2.26 Stairwell ventilation fans would also be located in the THH building. These fans would only be required for operation when personnel are using the stairways to access the tunnel and this is only likely to occur during routine daytime inspection visits. However access on a non-routine basis may be required at night. As it is possible that the fans may be required at any time in a 24 hour period the assessment assumes night-time operation.

Pentir Substation

8.2.27 An additional shunt reactor is proposed at Pentir Substation as part of the extension works. The shunt reactor would be located within the existing footprint of Pentir Substation.

[5] A 'soft start' refers to the temporary reduction in power to the fan during start up to ensure a gradual increase to full operating conditions.

8.2.28 The shunt reactor would be in constant operation and therefore has the potential to contribute to the combined noise impact at nearby receptors from reactive plant within Pentir Substation.

8.2.29 There are no large rotating plant items planned to be installed at Pentir Substation. The proposed additional shunt reactor is not considered to generate significant levels of vibration. In any case, given that levels of vibration attenuate very rapidly through the ground and the nearest receptor is over 500 m from the proposed shunt reactor, vibration would not result in a significant effect at receptors.

9 Mitigation and Residual Effects

9.1 INTRODUCTION

9.1.1 This section presents the results of the operational noise assessment for the OHL (including the CSECs), THHs and substation. Where practicable, mitigation measures have been included for operational noise sources and these are presented below. The operational noise sources, as identified in section 8, Potential Effects, are assessed individually and also as a combined effect from multiple sources related to the Proposed Development.

9.1.2 The assessment of the OHL and CSECs follow the assessment methodology as summarised under paragraph 4.4.10 to 4.4.12 in order to take account of existing and proposed infrastructure. The assessment considers Option A and B for both the Primary and Secondary Assessment as detailed in Table 16.16 and Table 16.17.

9.1.3 Residual significance for the most affected receptors is summarised in Table 16.36 at the end of this section.

9.2 PRIMARY ASSESSMENT - OHL AND CSECS

9.2.1 Potential operational noise effects that could affect receptors within the study area for the OHL and CSECs are detailed in section 8, Potential Effects. The potential noise source for the CSEC is the same as the OHL and therefore reference throughout this section is made only to OHL. The following potential noise effects have been considered:

- conductor noise – paragraph 8.2.1 to 8.2.13; and
- insulator noise – paragraph 8.2.16 to 8.2.19.

9.2.2 The following mitigation measures for the OHL have been included:

The potential for noise emission from the conductor system has been mitigated through the draft DCO design choice. The chosen configuration is one of the quietest conductor bundle formations that can be deployed on the National Grid transmission system that meets the rating requirements. Further justification for the chosen conductor system is given in the Design Report (**Document 7.17**) and Back Check Report (**Document 7.18**).

Operational noise impacts have been considered when determining the pylon siting and route alignment. Further details on the consideration of pylon siting is given in the Design Report (**Document 7.17**).

All fixtures and fittings, including insulators that would be installed on the proposed OHL infrastructure would have undergone Type Registration. Best Practicable Means would be followed for the selection of the most appropriate insulator type, which will include consideration of hydrophobic coatings to reduce audible noise.

Damage to, or contamination of, OHL conductors during handling and stringing can lead to a potential increase in operational noise once the OHL is energised. To reduce the likelihood of damage or contamination of conductors, National Grid would require the appointed construction contractor to follow a rigorous quality assurance process during procurement, manufacturing and transportation of the conductors. In addition, any appointed construction contractor would be required to follow National Grid's suite of technical specifications and codes of practice to ensure that care would be taken during installation to ensure that conductors are kept clean and free of surface contaminants during stringing. Further details are provided in the CEMP (**Document 7.4**).

Once the design and routeing options for a new OHL are fixed, and the specifications and installation requirements are met, there are no further practicable mitigation options available.

Insulator Noise

9.2.3 As mentioned in section 8, Potential Effects, all insulators used on National Grid infrastructure undergo Type Registration, the requirements of which include tests for corona inception and wind generated noise.

9.2.4 It is considered that any noise generated by insulators as a result of contamination is likely to be localised and temporary. It is therefore anticipated that noise from insulators is unlikely to result in a significant effect at any receptor within the OHL study area.

Conductor Noise

9.2.5 The following section reports the Primary Assessment as described in Table 16.16.

Option A

9.2.6 This section presents a summary of the assessment of the OHL in both dry and wet conditions. The detailed results tables are presented in Appendix 16.5 (**Document 5.16.2.5**). The number of receptors that fall within each magnitude of impact and significance of effect band are presented for each condition. The results of the assessment have assumed a night time period when background sound levels are at their lowest, therefore representing a worst case scenario.

9.2.7 Following discussions with IACC and Gwynedd Council, a summary of results for the assessment of new infrastructure only is presented in Table 16.22 (dry noise) and Table 16.23 (wet noise). The results of the in-combination assessment are presented in Table 16.24. OHL noise contour plots for both dry and wet conditions are presented on Figures 16.1 and 16.2.

Table 16.22 Magnitude and Significance Bands – New OHL Dry Noise

Magnitude of Impact	Number of Receptors[1]	Effect	Number of Receptors
High	0	Major	0
Medium	8	Moderate	8
Low	49	Minor	49
Very Low	82	Negligible	141
No Effect	59		

[1] Option A does not consider Dolydd Newydd as a receptor and as such it is not accounted for in this results table

9.2.8 During dry conditions the majority of receptors would be exposed to a **negligible** effect (**not significant**) from OHL operational noise. There would be 49 receptors exposed to a **minor** effect (**not significant**), the majority of which are located in close proximity to Rhosgoch, Rhos-y-bol and Llannerch-y-Medd. There are no identified receptors within the assessment for dry noise that would be exposed to a major effect (significant) as a result of the new OHL only. Eight receptors would experience a **moderate** effect (**potentially significant**) as a result of dry noise from the new OHL alone.

Table 16.23 Magnitude and Significance Bands – New OHL Wet Noise			
Magnitude of Impact	Number of Receptors[1]	Effect	Number of Receptors
High	0	Major	0
Medium	1	Moderate	1
Low	32	Minor	29
Very Low	116	Negligible	168
No Effect	49		
[1] Option A does not consider Dolydd Newydd as a receptor and as such it is not accounted for in this results table			

9.2.9 During wet conditions the majority of receptors would be exposed to a **negligible** effect (**not significant**). There would be 28 receptors exposed to a **minor** effect (**not significant**), the majority of which are located in close proximity to Rhosgoch and Llannerch-y-Medd. There are no identified receptors within the assessment for wet noise that would be exposed to a major effect (significant) as a result of the new OHL only. One receptor would experience a **moderate** effect (**potentially significant**) as a result of wet noise from the new OHL alone.

9.2.10 Due to the very low baseline levels measured throughout the Proposed Development area, the noise effects during dry noise conditions are leading to higher levels of significance than wet noise effects the assessment. The dry noise assessment is based on a worst case assumption of a certain level of contamination on the conductor surface, resulting in corona discharge. There is not an accurate method of estimating the yearly average number of hours that predicted dry noise levels may occur. Dry noise most commonly occurs due to surface contamination in the form of pollens and dust settling on the conductors during the Summer period and following ploughing and harvesting. As much of the Proposed Development area is pasture, it is thought dry noise of this type would rarely occur. In National Grid's operating experience, conductors tend to operate at lower noise levels than those predicted due to surface contamination being washed off during periods of heavy precipitation. It is therefore likely that the dry noise assessment is over-precautionary and that noise levels would be lower than predicted for much of the year.

9.2.11 Following the assessment methodology, as described within technical Appendix 16.3 (**Document 5.16.2.3**) and Appendix 16.4 (**Document 5.16.2.4**), the assessment has then considered the potential effects of the existing OHL in addition to the new OHL, to determine if the effects in combination may be of greater significance. No receptors would have a major effect as a result of the proposed and existing OHL infrastructure in-combination. Receptors included in Table 16.24are those identified as being exposed to a **moderate** effect (**potentially significant**) as a result of the proposed and existing OHL infrastructure in-combination.

9.2.12 The assessment has identified 14 receptors that would be exposed to a potentially significant effect during wet and/or dry noise conditions as a result of the in-combination effects of the new and existing OHL infrastructure. The position of each receptor relative to the new and existing OHLs (referred to as P1, P2, P3 or P4[6]), as stated below Table 16.24 for each receptor, is described in Appendix 16.4 (**Document 5.16.2.4**).

Table 16.24 Receptors Exposed to Potentially Significant Effect from New and Existing OHL and CSEC

Receptor ID[1]	Receptor Name	Effect	
		Dry	Wet
R1/01193	Dymchwa	Moderate	Minor
R2/00027	Tyn Cae	Moderate[3]	Minor[3]
R2/00076	Pen Yr Orsedd	Moderate	Minor
R2/00171	Dafarn Dyweirch	Moderate	Minor
R2/00353	Dryll	Moderate	Minor
R2/13706	Bryn Goleu Caravan Receptor[2]	Moderate	Moderate
R3/00259	Ysgol Ty Mawr	Moderate[3]	Minor[3]

[6] Receptors nearest the existing and new OHLs that may experience a combined effect from both are grouped into one of four categories; P1, P2, P3 and P4, depending on their location relative to the two OHLs.

P1 – The new OHL would pass between a P1 receptor and the existing OHL.

P2 – Receptors would be between the existing and new OHLs.

P3 – The new OHL passes on the far side of the existing OHL to the receptor.

P4 – Receptors are in the transposition areas where the existing OHL would be removed and two new OHLs would be constructed.

Table 16.24 Receptors Exposed to Potentially Significant Effect from New and Existing OHL and CSEC			
Receptor ID[1]	Receptor Name	Effect	
		Dry	Wet
R3/00271	Pen Llain	Moderate[3]	Minor[3]
R3/00277	Cae Fabli Annexe_1	Moderate[3]	Moderate[3]
R3/00280	Cae Fabli	Moderate	Moderate[3]
R3/00289	Cae Fabli Annexe_2	Moderate[3]	Minor
R3/13295	Maen Goch	Moderate	Moderate[3]
R3/00351	Maen Eryr	Moderate	Minor
R4/01479	Madryn	Moderate[3]	Minor

[1] Receptor IDs with the prefix 'R', denote a residential receptor.

[2] This receptor is representative of a caravan located at the closest point to the proposed new OHL at Bryn Goleu. This receptor is not representative of the primary (permanent) residential/commercial receptor on site.

[3] Effect has been increased for a receptor due to in-combination effects with existing OHL.

Residential receptors

Dymchwa

9.2.13 At Dymchwa (R1/01193), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 22 dB $L_{Ar,Tr}$ is predicted at Dymchwa. The representative background night time sound level at this location is 22 dB L_{A90}. This represents a predicted rating level equal to background during dry noise conditions. During wet noise conditions a rating level of 40 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level, during wet noise conditions, at this location is 41 dBA. This represents a predicted rating level 1 dB below background during wet noise conditions.

9.2.14 This receptor would be located in a 'P1' position, approximately 35 m from the proposed OHL and 105 m from the existing OHL. The proposed OHL would over sail the curtilage of the receptor. It is considered that the proposed OHL would be the primary noise source at this receptor and it is unlikely that any contribution from the existing OHL would result in an increase of effect.

Tyn Cae

9.2.15 At Tyn Cae (R2/00027), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 18 dB $L_{Ar,Tr}$ is predicted at Tyn Cae. The representative background night time sound level at this location is 21 dB L_{A90}. This represents a predicted rating level 3 dB below background during dry noise conditions. During wet noise conditions a rating level of 36 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 5 dB below background during wet noise conditions.

9.2.16 This receptor is located in a 'P3' position, approximately 64 m from the existing OHL, and would be close to the beginning of a transposition section where there would be two new OHLs approximately 70 m and 150 m away. Tyn Cae would be likely to be exposed to a noise impact from both the new and existing OHL infrastructure due to the close proximity to a transposition section. As such, the effect has been increased from minor to **moderate** during dry noise conditions to account for the potential in-combination effect.

Pen Yr Orsedd

9.2.17 At Pen Yr Orsedd (R2/00076), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 21 dB $L_{Ar,Tr}$ is predicted at Pen Yr Orsedd. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 1 dB above background during dry noise conditions. During wet noise conditions a rating level of 39 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 2 dB below background during wet noise conditions.

9.2.18 This receptor would be located in a 'P4' transposition section adjacent to two parallel spans of new twin conductored OHL, at a distance of approximately 60 m to the nearest OHL. Due to the distance between the receptor and the closest span of existing OHL (approximately 900 m), Pen Yr Orsedd would not be exposed to an in-combination effect from new and existing OHL and as such, the effect has not been increased.

Dafarn Dyweirch

9.2.19 At Dafarn Dyweirch (R2/00171), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 21 dB $L_{Ar,Tr}$ is predicted at Dafarn

Dyweirch. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 1 dB above background during dry noise conditions. During wet noise conditions a rating level of 39 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 2 dB below background during wet noise conditions.

9.2.20 This receptor would be located in a 'P4' transposition section adjacent to two parallel spans of new twin conductor OHL, at a distance of approximately 65 m to the nearest OHL. Due to the distance between the receptor and the closest span of existing OHL (>1 km), Dafarn Dyweirch would not be exposed to an in-combination effect from new and existing OHL and as such, the effect has not been increased.

Dryll

9.2.21 At Dryll (R2/00353), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 22 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 21 dB L_{A90}. This represents a predicted rating level 1 dB above background during dry noise conditions. During wet noise conditions a rating level of 39 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 2 dB below background during wet noise conditions.

9.2.22 This receptor would be located in a 'P4' transposition section adjacent to two parallel spans of new twin conductor OHL, at a distance of approximately 55 m to the nearest OHL. Due to the distance between the receptor and the closest span of existing OHL (approximately 650 m), Dryll would not be exposed to an in-combination effect from new and existing OHL and as such, the effect has not been increased.

Bryn Goleu Caravan Park Proxy Receptor (residential)

9.2.23 As discussed in paragraphs 7.2.7 and 7.2.8, a proxy residential receptor, (R2/13706), located within Bryn Goleu Caravan Park has been selected as a representative of the semi-permanent residential caravans within close proximity to the new OHL in a 'P2' position between the two OHLs. This is considered to represent a worst case receptor location at the most westerly point within the site, with regards to noise impact from the new OHL. Other caravans situated further from the new OHL are likely to be exposed to lower noise levels.

9.2.24 During dry noise conditions a rating level of 25 dB $L_{Ar,Tr}$ is predicted at the proxy caravan receptor (R2/13706) for Bryn Goleu. The representative background night time sound level at this location is 23 dB L_{A90}. This represents a predicted rating level 2 dB above background during dry noise conditions. During wet noise conditions a rating level of 44 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 3 dB above background during wet noise conditions. This results in a **moderate** effect during wet and dry noise conditions. It is not considered appropriate to further increase the overall effect due to moderate wet and dry noise effects due to the low predicted rating levels at this receptor.

9.2.25 Caravans located in the 'P2' positions within Bryn Goleu Caravan Park would be exposed to OHL noise from more than one direction as a result of the Proposed Development. Whilst the noise levels at these caravans may increase as a result of the in-combination effect, based on the predictions at the proxy caravan receptor, it is not considered appropriate to increase the effect at these receptors from moderate to major.

9.2.26 Caravans located in the 'P3' position within Bryn Goleu Caravan Park would be situated further from the new OHL and as such, the in-combination effect of the two OHLs would be likely to result in a **minor** to **negligible** effect.

9.2.27 Although there is a permanent residential dwelling (receptor R2/00857) located within Bryn Goleu Caravan Park, effects were identified as minor and no further reporting is therefore required.

Ysgol Ty Mawr

9.2.28 At Ysgol Ty Mawr (R3/00259), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 18 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 2 dB below background during dry noise conditions. During wet noise conditions a rating level of 36 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level 5 dB below background during wet noise conditions.

9.2.29 This receptor would be located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This

receptor would be located approximately 90 m from the new OHL and 35 m from the existing OHL. It is considered that due to the location of Ysgol Ty Mawr between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during dry noise conditions to account for the potential in-combination effect.

Pen Llain

9.2.30 At Pen Llain (R3/00271), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 18 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 2 dB below background during dry noise conditions. During wet noise conditions a rating level of 36 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level 5 dB below background during wet noise conditions.

9.2.31 This receptor is located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This receptor would be located approximately 85 m from the new OHL and 40 m from the existing OHL. It is considered that due to the location of Pen Llain between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during dry noise conditions to account for the potential in-combination effect.

Cae Fabli

9.2.32 At Cae Fabli Annexe_1 (R3/00277), a **moderate** effect is predicted during wet and dry noise conditions. During dry noise conditions a rating level of 20 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level equal to background during dry noise conditions. During wet noise conditions a rating level of 38 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level 3 dB below background during wet noise conditions.

9.2.33 This receptor is located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This receptor would

be located approximately 70 m from the new OHL and 65 m from the existing OHL. It is considered that due to the location of Cae Fabli Annexe_1 (R3/00277) between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during dry and wet noise conditions to account for the potential in-combination effect.

9.2.34 It is not considered appropriate to further increase the overall effect due to moderate wet and dry noise effects due to the low predicted rating levels at this receptor.

9.2.35 At Cae Fabli (R3/00280), a **moderate** effect is predicted during wet and dry noise conditions. During dry noise conditions a rating level of 21 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 1 dB above background during dry noise conditions. During wet noise conditions a rating level of 38 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level 3 dB below background during wet noise conditions.

9.2.36 This receptor would be located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This receptor would be located approximately 50 m from the new OHL and 80 m from the existing OHL. It is considered that due to the location of Cae Fabli between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during wet noise conditions to account for the potential in-combination effect. It is not considered appropriate to further increase the overall effect due to moderate wet and dry noise effects due to the low predicted rating levels at this receptor.

9.2.37 At Cae Fabli Annexe_2 (R3/00289), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 19 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level of 1 dB below background during dry noise conditions. During wet noise conditions a rating level of 36 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level 5 dB below background during wet noise conditions.

9.2.38 This receptor would be located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This receptor would be located approximately 90 m from the new OHL and 50 m from the existing OHL. It is considered that due to the location of Cae Fabli Annexe_2 (R3/00289) between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during dry noise conditions to account for the potential in-combination effect.

Maen Goch

9.2.39 At Maen Goch (R3/13295), a **moderate** effect is predicted during wet and dry noise conditions. During dry noise conditions a rating level of 23 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 20 dB L_{A90}. This represents a predicted rating level 3 dB above background during dry noise conditions. During wet noise conditions a rating level of 41 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location during wet noise conditions is 41 dBA. This represents a predicted rating level equal to background during wet noise conditions.

9.2.40 This receptor would be located between the new and existing OHL infrastructure in a 'P2' position and as such, would be exposed to OHL noise from more than one direction as a result of the Proposed Development. This receptor would be located approximately 30 m from the new OHL and 100 m from the existing OHL. It is considered that due to the location of Maen Goch between the new and existing OHLs, the in-combination effect of the two OHLs is likely to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during wet noise conditions to account for the potential in-combination effect. It is not considered appropriate to further increase the overall effect due to moderate wet and dry noise effects due to the low predicted rating levels at this receptor.

Maen Eryr

9.2.41 At Maen Eryr (R3/00351), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 19 dB $L_{Ar,Tr}$ is predicted at Maen Eryr. The representative background night time sound level at this location is 19 dB L_{A90}. This represents a predicted rating level equal to background during dry noise conditions. During wet noise conditions a rating level of 37 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night

time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 4 dB below background during wet noise conditions.

9.2.42 The receptor would be located in a 'P1' position, approximately 70 m from the new OHL and 155 m from the existing OHL. It is considered that the proposed OHL would be the dominant noise source at this receptor and, whilst there may be a contribution from the existing OHL; this would be unlikely to result in an increase of effect.

Madryn

9.2.43 At Madryn (R4/01479), a **moderate** effect is predicted during dry noise conditions, with a **minor** effect predicted during wet noise conditions. During dry noise conditions a rating level of 22 dB $L_{Ar,Tr}$ is predicted at Madryn. The representative background night time sound level at this location is 22 dB L_{A90}. This represents a predicted rating level equal to background during dry noise conditions. During wet noise conditions a rating level of 40 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 1 dB below background during wet noise conditions.

9.2.44 The receptor would be located in a 'P1' position, approximately 35 m from the new OHL and 100 m from the existing OHL. Whilst it is considered that the new OHL would be the dominant noise source at this receptor, due to the close proximity to the two OHLs, there is the potential for the existing OHL to result in an increased magnitude of impact. As such, the effect has been increased from minor to **moderate** during dry noise conditions to account for the potential in-combination effect.

Commercial receptors

9.2.45 There are no commercial receptors identified within the OHL study area that would be exposed to a significant or potentially significant effect from OHL noise during wet or dry noise conditions. A summary of the worst affected commercial receptors are provided below. See Appendix 16.5 (**Document 5.16.2.5**) for the predicted effects on all commercial developments.

9.2.46 The highest predicted rating level at a commercial receptor is Meddygta Star Surgery (C5/13300). During dry noise conditions a rating level of 22 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 29 dB L_{A90}. This represents a predicted rating level 6 dB below background during dry noise conditions. During wet noise conditions a rating level of 40 dB $L_{Ar,Tr}$ is predicted at this receptor. The

representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 1 dB below background during wet noise conditions.

9.2.47 Meddygta Star Surgery is identified as a **low** sensitivity receptor and it is considered that this receptor would not operate during the night time period, with daytime baseline sound levels likely to be higher than night-time levels. As such, a **negligible** effect (**not significant**) is predicted during both wet and dry noise conditions.

9.2.48 The highest effect at a commercial receptor is predicted at Coed Cottages Caravan Receptor (C1/13707). During dry noise conditions a rating level of 15 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level at this location is 23 dB L_{A90}. This represents a predicted rating level 8 dB below background during dry noise conditions. During wet noise conditions a rating level of 33 dB $L_{Ar,Tr}$ is predicted at this receptor. The representative background night time sound level during wet noise conditions at this location is 41 dBA. This represents a predicted rating level 8 dB below background during wet noise conditions.

9.2.49 This receptor is representative of a temporary, non-standard dwelling using the Coed Cottages Caravan site and positioned at the closest point to the two OHLs. This receptor is located in close proximity to the existing OHL. It is therefore considered that this receptor may be exposed to a noise impact from both OHLs and as such, the effect has been increased from negligible to **minor** (**not significant**) in both wet and dry noise conditions.

Bryn Goleu Caravan Park Proxy Receptor (commercial)

9.2.50 Whilst the proxy receptor at Bryn Goleu Caravan Park has been assessed as a residential receptor in the assessment (paragraphs 9.2.23 to 9.2.27), additional consideration has been given for the site as a commercial receptor with low sensitivity. In this instance, due to the lower sensitivity as a commercial receptor (**medium** to **low**), effects would likely be **minor** (**not significant**) during both wet and dry noise conditions.

Option B

9.2.51 In order to maintain an offset from receptor Dolydd Newydd R4/01483, Option B proposes to deviate from parallel routeing with the existing OHL near Talwrn. Consideration has been given for Option B and the deviated route has been modelled to assess the impact on nearby receptors. The results of the assessment of Option B are based on night time baseline sound levels with rating levels taken at first floor level.

9.2.52 Predictions show that although the effect would not change at Madryn R4/01479, the contribution from the new OHL would increase. In terms of rating levels, during dry noise conditions, predicted levels would increase from 22 dB $L_{Ar,Tr}$ to 23 dB $L_{Ar,Tr}$ between Options A and B. During wet conditions, predicted levels would increase from 40 dB $L_{Ar,Tr}$ to 41 dB $L_{Ar,Tr}$. Predicted rating levels for Option B at Madryn are still low; 1 dB above background during dry noise conditions and equal to wet background sound levels during wet noise conditions.

9.2.53 Under Option A, Dolydd Newydd R4/01479 is not considered as a residential receptor and as such, an effect has not been calculated. Predictions have shown that Option B would result in a **moderate** effect during wet and dry noise conditions at this receptor.

9.2.54 Table 16.25 presents the results of the Option B assessment.

Table 16.25 Change of Effect between Options A & B

Option	Receptor Name/ID	Effect - Wet	Effect - Dry
A	Madryn[1] R4/01479	Minor	Moderate
	Dolydd Newydd R4/01483	N/A	N/A
B	Madryn R4/01479	Minor	Moderate
	Dolydd Newydd[1] R4/01483	Moderate	Moderate

[1] Receptors for which significance has been modified due to in combination effects with existing line.

9.2.55 As a result of Option B, Dolydd Newydd R4/01483 would be positioned between the new and existing OHL infrastructure (4AP066 and 4ZA067). Predictions show that this receptor would be exposed to a minor effect from new OHL infrastructure only during wet and dry noise conditions. As this receptor is located between the new and existing OHL infrastructure it would be exposed to OHL noise from more than one direction as a result of the Proposed Development. The effect at this receptor has therefore been increased to **moderate** due to the in-combination effect of the two OHLs. Predicted rating levels at Dolydd Newydd R4/01483 are low; 1 dB below background during wet noise conditions and equal to background during dry noise conditions.

9.2.56 There are no other receptor types that have been identified that would be impacted by the change of alignment between Options A and B.

Determination of Significance – Primary Assessment

9.2.57 Potentially significant effects are predicted at those receptors identified in Table 16.24 and Table 16.25. In determining whether an effect is significant at any of these residential receptors, it is necessary to consider a number of factors:

- the predicted rating levels considered against absolute noise level criteria;
- the assumed background sound levels;
- the temporal characteristics of dry and wet noise; and
- the methodology and the context of the assessment.

9.2.58 As set out in section 4, the assessment methodology follows BS 4142:2014 and predicts a rating level at an external location, i.e. it does not account for the effects to internal receptors by taking into consideration the absolute sound, and the attenuation afforded by the façade. It is therefore of relevance, when determining whether an effect is significant or not, to consider the resultant internal noise level, taking into account the façade attenuation.

9.2.59 Firstly it is important to consider the predicted rating levels in combination with assumed background sound levels. Due to the very low background sound levels and rating levels during dry noise conditions (18-25 dB L_{ArTr}) at receptors identified as being exposed to a potentially significant effect, an assessment against absolute noise level criteria is also of relevance.

9.2.60 In terms of the absolute noise level assessment, the rating levels for the new OHL (which include a 3 dB rating penalty (see paragraph 4.2.17)) at the receptors identified above in dry noise conditions, during the night-time period, would be well below the level for the onset of sleep disturbance (i.e. lowest observed adverse effect level) contained in the WHO Guidance, of 45 dB L_{Aeq} (façade – equivalent to a free-field level of 42 dB L_{Aeq}). The predicted rating levels during dry conditions, at these receptors, are also less than the 30 dB $L_{night, outside}$ threshold, as stated in the WHO NNG, at which '*no substantial biological effects are observed*'. It is therefore considered that due to the low predicted noise levels during dry noise conditions, and the temporal characteristics of dry noise occurrence (see paragraph 9.2.10), noise from the OHL and CSECs would **not result in a significant effect** at any of the identified receptors. It is considered that the determination of a non-significant

effect is further justified in that predicted noise levels from the OHL are inclusive of rating penalties, which would not usually apply to the comparison of absolute noise levels.

9.2.61 With regard to wet noise conditions, predicted rating levels at receptors identified as being exposed to a potentially significant effect would be between 36 – 44 dB L_{ArTr}. Background sound levels during wet noise conditions are assumed to be 41 dB which is 3 dB below the predicted rating level at the worst affected receptor.

9.2.62 Rainfall data supplied by the Met Office indicates that the highest average annual rainfall rate throughout the Proposed Development area occurs at Gwynedd, with approximately 900 wet hours (approximately 10% of the year). The predicted wet noise conditions are therefore likely to occur for only 10% of the time as a maximum. Taking into account the temporal characteristics of wet noise and the low rating levels the assessment is based on, it is considered that OHL noise during wet noise conditions would **not result in a significant effect** at the identified receptors.

9.2.63 It is considered that the proxy residential receptor considered within Bryn Goleu Caravan Park represents a worst case residential receptor location on the site. The effect at this location would be moderate in both dry and wet conditions and based on the above justification is considered to be **not significant**. As such, noise levels from the OHL at other caravan locations would likely **not result in a significant effect** in wet or dry noise conditions.

Public Rights of Way (PROW)

9.2.64 An assessment of potential noise effects from the operation of the proposed OHL on existing Public Rights of Way (PROW) has been undertaken based on the outcome of the noise model. The results of this assessment are presented in Appendix 16.5 (**Document 5.16.2.5**).

9.2.65 For outdoor areas in parkland and conservation areas, the WHO Guidelines for Community Noise states, under 'Note 3' of 'Table 4.1: Guideline values for community noise in specific environments', that;

'existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low'.

9.2.66 The WHO guidelines do not provide a specific threshold level or guidance on noise levels on PROW. They do, however, provide guidance on the recommended daytime noise levels within outdoor spaces. Although this guidance refers to outdoor spaces with respect to dwellings, the noise

thresholds can be used as a benchmark on which to assess the potential noise impact on pedestrians using the affected PROW.

9.2.67 The guidance states:

'To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq}.'

9.2.68 A summary of the results of the assessment of operational noise levels on PROW is presented in Table 16.26 below.

Table 16.26 Summary of Noise Impact on PROW

Contour Scenario	PROW Reference	Length of PROW within band, m			Total length of PROW within 200 m of LOD, m
		40-45 dBA	45-50 dBA	50-55 dBA	
Wet	44/023/1 Anglesey ROW	45	0	0	514
Wet – 20 m west	44/023/1 Anglesey ROW	47	0	0	514
Wet – 20 m west	Anglesey Coastal Path	9	0	0	374
Wet – 20 m east	44/023/1 Anglesey ROW	51	0	0	514

9.2.69 Predictions have shown that conductor noise from the operation of the proposed OHL infrastructure would not exceed 45 dBA at any identified PROW within Anglesey and Gwynedd. Absolute noise levels of 40-45 dBA are predicted along sections of the Anglesey Coastal Path and Anglesey ROW 44/023/1.

9.2.70 When determining the effect at the identified PROW it is necessary to consider the duration a pedestrian using the right of way is likely to be within the stated noise contour band. Assuming an average pedestrian walking

speed, it is considered that the likely duration spent within the 40 - 45 dBA contour band is likely to be less than a few minutes.

9.2.71 As pedestrian use of PROW is only for a short duration, it is considered that a threshold level of 50 dB L_{Aeq} for the onset of annoyance is a conservative approach to the assessment of operational OHL noise effects. As such, based on the predicted noise levels presented in Table 16.26, and the likely duration of wet and dry noise conditions, operational noise from the OHL for both Option A and B, would **not result in a significant effect** at the identified PROW.

9.3 SECONDARY ASSESSMENT - OHL AND CSECS

Conductor Noise - Assessment of Horizontal Movement within the LOD

9.3.1 The following section references the Secondary Assessment as described in Table 16.17.

9.3.2 Further assessment has been undertaken to predict the change in effect on identified receptors due to any movement of the OHL within the horizontal LOD applied for and shown on the Works Plans (**Document 4.4**) and as described in Table 16.16 Flexibility Assumptions Proposed pylon sites on both the 4ZA and 4AP have been remodelled at a reasonable limit of the LOD, as described in paragraphs 5.2.2 and 5.2.3. Where the LOD has been restricted this has been taken into account and the limits of the movement of the OHL reduced as required.

9.3.3 The extent of the LOD has been restricted where practicable to do so to avoid potential OHL alignment that may give rise to significant effects, including operational noise, at neighbouring receptors.

9.3.4 The effects reported within this section are considered representative of the potential effect of the temporary alignment of the 4ZA OHL during the construction phase of the Proposed Development.

Option A

9.3.5 Table 16.27 below presents those receptors for which an increase in effect has been identified as a result of proposed new OHL infrastructure moving to the reasonable LOD limit to the east. The assessment is based on the worst case night-time background sound levels, with predictions made at first floor level.

9.3.6 Receptors where the movement of the closest conductor span from the proposed alignment is restricted below 20 m are identified in Table 16.27.

There are no receptors identified in Table 16.28 where movement of the closest conductor span has been restricted below 20 m due to LOD restriction.

Table 16.27 Receptors Impacted by Movement to East within LOD

Receptor ID[1]	Receptor Name	Effect			
		Works Plan Proposed Alignment		Movement to East	
		Wet	Dry	Wet	Dry
R1/00152	Llety, Cemaes Bay[2]	Minor	Minor	Moderate	Moderate
R1/01193	Dymchwa[2]	Minor	Moderate	Moderate	Moderate
R2/00029	Trigfa	Minor	Minor	Minor	Moderate
R2/00489	Gorslwyd Bach	Negligible	Minor	Minor	Minor
R2/00588	7 Garreg Wen Estate	Negligible	Negligible	Negligible	Minor
R3/13295	Maen Goch	Minor	Moderate	Moderate	Moderate
R5/02649	Dolfeirig	Minor	Negligible	Moderate	Negligible
R5/09355	Rhos Fawr[2]	Negligible	Negligible	Minor	Negligible
R5/09356	Rhos Fawr Caravan[2]	Negligible	Negligible	Minor	Negligible

[1] Receptor IDs with the prefix ‘R’, denote a residential receptor

[2] The movement of the closest conductor span from the proposed alignment is below 20 m

9.3.7 Whilst the LOD is restricted at Maen Goch R3/13295 and Dolfeirig R5/02649, conductor spans are still able to move up to the reasonable limit of 20 m east. At Llety R1/00152, Dymchwa R1/01193 and Rhos Fawr R5/09355 and R5/09356, LOD restrictions have limited movement of the OHL to the east. It should be noted that due to the LOD restrictions at these receptors, conductor swing is not taken into account when moving the OHL and as such, can be considered to represent a reasonable worst case scenario as the OHL has been modelled during still air conditions. In reality, conductor swing has been considered when determining LOD and therefore OHL movements will be limited by the need for conductors to not oversail the LOD boundary during windy conditions.

9.3.8 Predictions have shown that as a result of moving the proposed new infrastructure to the reasonable limits of the LOD to the east, there would be

an increase of effect at nine receptors. Of these nine receptors, five would be exposed to a **moderate** effect (**potentially significant**) as a result of the relocation of proposed infrastructure; Llety R1/00152, Dymchwa R1/01193, Trigfa R2/00029, Maen Goch R3/13295, Dolfeirig R5/02649.

9.3.9 Table 16.28 below presents those receptors that have been identified as increasing in effect as a result of proposed new OHL infrastructure moving to the reasonable LOD limit to the west. The assessment is based on the worst case night-time background sound levels, with predictions made at first floor level.

Table 16.28 Receptors Impacted by Movement to the West within LOD

Receptor ID[1]	Receptor Name	Effect			
		Works Plan Proposed Alignment		Movement to West	
		Wet	Dry	Wet	Dry
C5/13300	Meddygta Star Surgery	Negligible	Negligible	Minor	Negligible
R2/00352	Llety, Almwch	Negligible	Minor	Minor	Minor
R2/00353	Dryll	Minor	Moderate	Moderate	Moderate
R2/00397	Penrhyn Newydd	Negligible	Minor	Minor	Minor
R2/00417	Eithinog	Negligible	Minor	Minor	Minor
R5/02592	Tyddyn Isaf	Negligible	Negligible	Minor	Negligible

[1] Receptor IDs with the prefix 'R', denote a residential receptor.

9.3.10 Whilst the LOD at Dryll R2/00353 is narrower than the standard LOD, conductor spans are still able to move up to the reasonable limit of 20 m west. Further restriction of the LOD is not practicable as this is a transposition section.

9.3.11 Predictions have shown that as a result of moving the proposed new infrastructure to the reasonable limits of the LOD to the west, there would be an increase of effect at six receptors. Of these six receptors, only one receptor, Dryll R2/00353, would be exposed to a **moderate** effect (**potentially significant**) as a result of the movement within the LOD of proposed infrastructure.

Option B

9.3.12 The change in effect on identified receptors due to movement of the OHL within the LOD assuming Option B would be the same for Option A with the exception of those receptors identified in this section.

9.3.13 At Dolydd Newydd there would be an increase in contribution from the new OHL as a result of proposed new OHL infrastructure moving to the reasonable LOD limit to the east. The effect, however, would not change at this receptor from that identified within the primary assessment.

9.3.14 Table 16.28 below presents those receptors that have been identified as increasing in effect as a result of proposed new OHL infrastructure moving to the reasonable LOD limit to the west. The assessment is based on the worst case night-time background sound levels, with predictions made at first floor level.

Table 16.29 Receptors Impacted by Movement to the West within LOD– Option B

Receptor ID[1]	Receptor Name	Effect			
		Works Plan Proposed Alignment		West	
		Wet	Dry	Wet	Dry
R4/01479	Madryn[2]	Minor	Moderate	Moderate	Moderate

[1] Receptor IDs with the prefix 'R', denote a residential receptor

[2] The movement of the closest conductor span from the proposed alignment is restricted below 20 m

9.3.15 At Madryn R4/01479, Option B LOD restrictions have limited movement of the OHL to the west. As stated in paragraph 9.3.7, due to the LOD restrictions, conductor swing is not taken into account when moving the OHL and as such, this assessment can be considered to represent a reasonable worst case scenario where the OHL has been modelled during still air conditions. In reality, conductor swing has been considered when determining LOD and therefore OHL movements will be limited by the need for conductors to not over sail the LOD boundary during windy conditions.

9.3.16 Predictions have shown that as a result of moving the proposed new infrastructure to the reasonable limits of the LOD to the west, assuming Option B, there would be an increase of effect at Madryn. This would result in an increase from the primary assessment to a **moderate** effect at this receptor during wet noise conditions.

Determination of Significance – Secondary Assessment

9.3.17 In determining whether an effect is significant at any of the receptors identified in Table 16.27, Table 16.28 and Table 16.29, it is necessary to consider a number of factors;

- the predicted rating levels considered against absolute noise level criteria;
- the assumed background sound levels;
- the temporal characteristics of dry and wet noise; and
- the methodology and the context of the assessment.

9.3.18 As set out in section 4, the assessment methodology follows BS 4142:2014 and predicts a rating level at an external location, i.e. it does not account for the effects to internal receptors by taking into consideration the absolute sound, and the attenuation afforded by the façade. It is therefore of relevance when determining whether an effect is significant or not, to consider the resultant internal noise level, taking into account the façade attenuation.

9.3.19 Firstly it is important to consider the predicted rating levels in combination with assumed background sound levels. Due to the very low background sound levels and rating levels during dry noise conditions (16-25 dB L_{ArTr}) at receptors identified as being exposed to a potentially significant effect as a result of movement within the horizontal LOD, an assessment of noise levels against absolute noise criteria is also of relevance.

9.3.20 In terms of the absolute noise level assessment, the rating levels for the new OHL (which include a 3 dB rating penalty (see paragraph 4.2.17)) at the receptors identified above in dry noise conditions, during the night-time period, would be well below the level for the onset of sleep disturbance (i.e. lowest observed adverse effect level) contained in the WHO Guidance, of 45 dB L_{Aeq} (façade – equivalent to a free-field level of 42 dB L_{Aeq}). The predicted rating levels during dry conditions, at these receptors, are also less than the 30 dB $L_{night, outside}$ threshold, as stated in the WHO NNG, at which '*no substantial biological effects are observed*'. It is therefore considered that due to the low predicted noise levels during dry noise conditions, and the temporal characteristics of dry noise occurrence (see paragraph 9.2.10), noise from the OHL and CSECs as a result of movement within the LOD during dry noise conditions would **not result in a significant effect** at any of the identified receptors. It is considered that the determination of a non-significant effect is further justified in that predicted noise levels from the OHL are inclusive of

rating penalties, which would not usually apply to the comparison of absolute noise levels.

9.3.21 With regard to wet noise conditions, predicted rating levels at receptors identified as being exposed to a potentially significant effect would be between 33 – 43 dB L_{ArTr}. Background sound levels during wet noise conditions are assumed to be 41 dB which is 2 dB below the predicted rating level at the worst affected receptor.

9.3.22 Rainfall data supplied by the Met Office indicates that the highest average annual rainfall rate throughout the Proposed Development area occurs at Gwynedd, with approximately 900 wet hours (approximately 10% of the year). The predicted wet noise conditions are therefore likely to occur for only 10% of the time as a maximum. Taking into account the temporal characteristics of wet noise and the low rating levels the assessment is based on, it is considered that OHL noise during wet noise conditions as a result of movement within the LOD would **not result in a significant effect** at the identified receptors.

9.3.23 Irrespective of where a pylon is located outside the restricted areas, but within the LOD, it can be confirmed that although the effect may increase or decrease, there is no realistic potential for movement within the LOD to the east or west to result in a significant effect at any receptor. It is therefore considered that whilst it has not been practicable to restrict the LOD at Trigfa R2/00029, Gorslwyd Bach R2/00489, Garreg Wen Estate R2/00588, Meddygta Star Surgery C5/13300, Llety R2/00352, Penrhyn Newydd R2/00397, Eithinog R2/00417 and Tyddyn Isaf R5/02592, no significant effects are predicted and as such, additional restrictions to LOD are not warranted at these locations.

9.4 TUNNEL HEAD HOUSES (THH)

9.4.1 Potential operational noise sources that could affect receptors within the study area for the THH sites are detailed in section 8, Potential Effects. Receptors within the THH study area that may be affected by multiple Proposed Development sources are considered in section 9.5. The following potential noise sources have been considered:

- Braint THH – paragraph 8.2.23;
- Tŷ Fodol THH – paragraph 8.2.24 to 8.2.26.

9.4.2 The following mitigation measures for the THHs have been included:

Predicted operational noise effects from the THHs have been mitigated through appropriate design and louvre orientation. Equipment at the THH, including fans, would be selected based on the noise emissions sufficient to meet the committed noise levels at receptors, with the application of attenuators as required for the tunnel and stairwell ventilation fans.

Braint Tunnel Head House

9.4.3 Table 16.30 presents a summary of the assessment of Braint THH. The detailed results tables are presented in Appendix 16.5 (**Document 5.16.2.5**) with noise contours presented in Figure 16.5. The number of receptors that fall within each magnitude of impact and significance of effect band are presented. The results of the assessment have assumed a night time period when background sound levels are at their lowest, therefore representing a worst case scenario.

Table 16.30 Magnitude and Significance Bands – Braint THH

Magnitude of Impact	Number of Receptors	Effect	Number of Receptors
High	0	Major	0
Medium	0	Moderate	0
Low	0	Minor	0
Very Low	2	Negligible	55
No Effect	53		

9.4.4 Due to the relatively large distance between the proposed Braint THH and the surrounding receptors (>300 m), predictions show that all identified receptors within the 1,000 m study area would be exposed to a **negligible** effect (**not significant**) from operational noise associated with Braint THH.

9.4.5 The most affected receptor is identified as Tyddyn Fadog (R5/02815). A rating level of 21 dB $L_{Ar,Tr}$ is predicted at this receptor which is 6 dB below the background sound level.

9.4.6 There are two commercial receptors that have been identified within 1,000 m of Braint THH. The most affected commercial receptor is identified as C5/00490. The predicted rating level at this receptor is 7 dB $L_{Ar,Tr}$, which is 28 dB below the background sound level. A **negligible** effect (**not significant**) is predicted at this receptor.

Tŷ Fodol Tunnel Head House

9.4.7 Table 16.31 presents a summary of the assessment of Tŷ Fodol THH. The detailed results tables are presented in Appendix 16.1. (**Document 5.16.2.1**) with noise contours presented in Figures 16.6 and 16.7. The number of receptors that fall within each magnitude of impact and significance of effect band are presented in Table 16.31. The results of the assessment have assumed a night time period when background sound levels are at their lowest. The operating conditions of the tunnel ventilation fans have considered a worst case scenario (as defined in section 4, Table 16.10 Ventilation Fans – Operating Scenario Sound Power Levels, of one fan running at 100% load).

Table 16.31 Magnitude and Significance Bands – Tŷ Fodol THH in 'Realistic Worst Case' Operating Conditions

Magnitude of Impact	Number of Receptors	Effect	Number of Receptors
High	0	Major	0
Medium	2	Moderate	2
Low	5	Minor	4
Very Low	7	Negligible	46
No Effect	38		

9.4.8 Predictions show that the majority of receptors within 1,000 m of Tŷ Fodol THH would be exposed to a **negligible** effect (**not significant**) from operational noise associated with Tŷ Fodol THH.

9.4.9 There are eight commercial receptors that have been identified within 1,000 m of Tŷ Fodol THH. Of these eight, the most affected commercial receptor is identified as C5/01011, a landfill site. The predicted rating level at this receptor is 28 dB $L_{Ar,Tr}$, which is 1 dB below the background sound level. This receptor has been assigned a **very low** sensitivity and as such, a **negligible** effect is predicted (**not significant**).

9.4.10 Due to the relatively large distances between Tŷ Fodol and the surrounding receptors (>200 m), only four residential receptors would be exposed to a **minor** effect (**not significant**). These receptors are: Hafan y Wennol R5/07236; Tyn y Coed R5/07260; Llys y Gwynt R5/07307 and Garth Fawr Farm R5/07524. The predicted rating levels at these receptors range from 27 to 28 dB $L_{Ar,Tr}$.

9.4.11 Receptors that have been identified as being exposed to a **moderate** effect (**potentially significant**) are presented in Table 16.32.

Table 16.32 Receptors Exposed to Potentially Significant Effect from Tŷ Fodol THH Noise – Realistic Worst Case Operating Conditions - Night time

Receptor ID	Receptor Name	Sensitivity	Magnitude of Impact	Effect
R5/07284	Garth Bach	Medium	Medium	Moderate
R5/07322	Lleifior	Medium	Medium	Moderate

9.4.12 The results indicate that there are two receptors that would be exposed to a **moderate** effect as a result of the operation of Tŷ Fodol THH, identified as; Garth Bach R5/07284 and Lleifior R5/07322.

9.4.13 The predicted noise level from Tŷ Fodol THH at Lleifior and Garth Bach is 30 dB $L_{Ar,Tr}$. The representative background night time sound level at these locations is 29 dB L_{A90}. In this case, both the background sound levels and rating levels are very low and an assessment of absolute noise levels against WHO thresholds is therefore also of relevance.

9.4.14 In terms of the absolute noise level assessment, the rating level from Tŷ Fodol THH, during the night-time period, would be well below the level for the onset of sleep disturbance (i.e. lowest observed adverse effect level) contained in the WHO Guidance, of 45 dB L_{Aeq} (façade) or 40 dB $L_{night, outside}$. Consequently, noise from Tŷ Fodol THH is considered highly unlikely to result in sleep disturbance at the identified receptors.

9.4.15 In considering the potential impact from Tŷ Fodol THH it is worth noting that the assessment has considered the realistic worst case scenario of one tunnel ventilation fan running at 100% load, in combination with the stairwell ventilation fans. With reference to Table 16.10, this operating scenario is only likely to occur during routine daytime testing for approximately two hours per month.

9.4.16 Table 16.33 presents a summary of the assessment of Tŷ Fodol THH assuming normal operation of the tunnel ventilation fans (high cooling demad scenario) with one fan running at 50% load.

Table 16.33 Magnitude and Significance Bands – Tŷ Fodol THH in Normal Operating Conditions			
Magnitude of Impact	Number of Receptors	Effect	Number of Receptors
High	0	Major	0
Medium	0	Moderate	0
Low	0	Minor	0
Very Low	9	Negligible	52
No Effect	43		

9.4.17 As can be seen from the predicted noise impact resulting from normal operating conditions at Tŷ Fodol THH, there are no identified NSRs exposed to a minor effect or greater. Normal operating conditions as defined above are likely to occur for the majority of the time, and as such, it is considered that noise from the Tŷ Fodol THH would **not result in a significant effect** at identified receptors.

DCO Requirement

9.4.18 To ensure noise emissions from Tŷ Fodol and Braint THH do not result in a significant effect at identified NSRs, noise levels from each site would not exceed 30 dB $L_{Ar,Tr}$ when measured at the nearest NSR, as set out in DCO Schedule 3, Requirement 19, Operational Noise. The most significant noise source would be the tunnel ventilation fans at Tŷ Fodol. For the purposes of the Requirement, 'normal operation' is defined as one ventilation fan running across its full duty range at Tŷ Fodol, and all other equipment operating as required at Braint and Tŷ Fodol. The Requirement would not apply during emergency or routine testing conditions, as described in paragraphs 4.4.17 to 4.4.19 and Table 16.10, when one or both ventilation fans may be run up to peak duty.

9.5 PENTIR SUBSTATION

9.5.1 Potential operational noise effects that could affect receptors within the study area for Pentir Substation are detailed in section 8, Potential Effects. The following potential noise effects have been considered:

- additional shunt reactor at Pentir Substation – paragraph 8.2.27 to 8.2.29.

9.5.2 The following mitigation measures for Pentir Substation have been included::

Noise from the shunt reactor would be minimised through design and selection, following guidance in National Grid's guidelines for procurement of new reactive plant. The shunt reactor will therefore not exceed the noise levels as set out in this assessment.

9.5.3 Table 16.34 presents a summary of the assessment of Pentir Substation. The detailed results tables are presented in Appendix 16.5 (**Document 5.16.2.5**) with noise contours presented in Figure 16.8. The number of receptors that fall within each magnitude of impact and significance of effect band are presented. The results of the assessment have assumed a night time period when background sound levels are at their lowest, therefore representing a worst case scenario.

Table 16.34 Magnitude and Significance Bands – Pentir Substation

Magnitude of Impact	Number of Receptors	Effect	Number of Receptors
High	0	Major	0
Medium	0	Moderate	0
Low	11	Minor	10
Very Low	10	Negligible	11
No Effect	0		

9.5.4 Predictions show that 11 receptors within 1,000 m of Pentir Substation would be exposed to a **negligible** effect (**not significant**). The following receptors have been identified as being exposed to a **minor** effect (**not significant**); Rhos Aeron R5/07749, Nant Y Garth R5/07785, Cae Gwydryn R5/07945, Tyddyn Forgan R5/08539, R5/08541, Garth Farm R5/08574, Rhos Fawr R5/09355, Rhos Fawr Caravan R5/09356, Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098. The highest predicted rating level arising from the additional shunt reactor at Pentir is 26 dB $L_{Ar, Tr}$ at Rhos Fawr, which is 2 dB below the background sound level.

9.5.5 The proposed shunt reactor at Pentir would be in addition to a number of reactive plant items already in operation within the substation perimeter. It is therefore necessary to consider the noise change as a result of the operation of the additional shunt reactor within the context of the baseline sound environment at the identified receptors. Based on observations made on-site, it is considered that the existing sound environment in the area around the substation is already characterised by the existing operational reactive plant.

9.5.6 Tonal analysis has been undertaken of the baseline sound levels measured at the two closest long-term measurement locations to Pentir Substation. The objective, third octave band assessment method (following guidance in BS 4142:2014) found no distinctive tonal characteristic at 100 Hz and harmonics (dominant tones usually produced by substation transformers and reactive plant) within the baseline data set at either location. It is therefore considered that existing noise from the substation does not significantly contribute to the representative baseline levels at these locations and, as such, the assessment has taken account of existing reactive plant located within the Pentir Substation site.

9.6 MULTIPLE PROPOSED DEVELOPMENT SOURCES OF OPERATIONAL NOISE

9.6.1 Based on the study areas for operational noise effects given in section 3, there are likely to be receptors that would be exposed to noise from more than one element of the Proposed Development. Receptors situated around the Tŷ Fodol and Braint THHs and Pentir Substation may also be impacted by operational noise from the OHL.

9.6.2 An assessment has been undertaken to predict whether the effect at receptors identified as falling within more than one study area may be impacted as a result of a combination of operational noise sources. The outcome of the assessment is based on the combined rating levels from different operational noise sources at receptors that fall within more than one study area. Receptors are reported where a moderate effect (potentially significant) may arise as a result of the combined sources. Both dry and wet conditions have been assumed for the OHL, with wet background sound conditions assumed for the latter. The determination of magnitude and significance is consistent with that of the main assessment as presented in Appendix 16.3 (**Document 5.16.2.3**).

Braint THH and OHL

9.6.3 Predictions show that the effect would not change at any of the identified receptors due to combined noise from both Braint THH and the OHL (as noted above the OHL includes the associated CSECs) during wet or dry noise conditions.

9.6.4 The nearest receptor to both Braint and the OHL is Rhos Bothan (R5/02725), located approximately 165 m from the OHL and over 650 m from the THH. The primary assessment predicted a **negligible** effect for OHL noise during dry and wet noise conditions and a **negligible** effect for operational noise

from Braint. A **negligible** effect (**not significant**) is also predicted at this receptor for the combined noise assessment.

9.6.5 There are no commercial receptors identified that fall within the study area of the proposed OHL and Braint THH.

Tŷ Fodol THH and OHL

9.6.6 Predictions show that the effect would not change at any of the identified receptors due to combined noise from both Tŷ Fodol THH and the OHL (as noted above the OHL includes the associated CSECs) during wet or dry noise conditions. Predictions are based on Tŷ Fodol THH operating under the realistic worst case scenario of one tunnel ventilation fan running at 100% load.

9.6.7 The nearest receptor to both Tŷ Fodol and the OHL is Hafodol R5/07647, located approximately 160 m from the OHL and over 300 m from the THH. The primary assessment predicted a **negligible** effect for OHL noise during dry and wet noise conditions and a **negligible** effect for operational noise from Tŷ Fodol. A **negligible** effect (**not significant**) is also predicted at this receptor for the combined noise assessment.

9.6.8 One commercial receptor has been identified within the study area for both the proposed OHL and Tŷ Fodol THH. The combined rating levels for the two sources would not result in a change in effect at this receptor.

Pentir Substation and OHL

Predictions show that the effect would increase from negligible to **minor** at one receptor as presented in Table 16.35, due to the combined rating levels from new reactive plant at Pentir Substation and the new OHL. The increase in effect would occur during dry noise conditions.

Table 16.35 Combined Operational Noise Effect from Pentir Substation and OHL

Receptor ID	Receptor Location	Predicted Effect from Pentir Substation	Predicted Effect from Pentir Substation and OHL (dry)
R5/08715	Pennant	Negligible	Minor

9.6.9 Although there would be an increase in the effect at the identified receptor from negligible to **minor**, the combined noise from new reactive plant at Pentir and the OHL would **not result in a significant effect**.

9.6.10 There are three other residential receptors in the vicinity of Pentir and the OHL (R5/09355 and R5/09356 Rhos Fawr, and R5/08574 Garth Farm) which would potentially experience a combined effect from Pentir and the OHL. The predicted effect due to the new OHL at these receptors is **minor** (**not significant**) and there is no increase in effect due to consideration of the combined effect of new reactive plant at Pentir and the new OHL. This is because the predicted magnitude of impact (Table 16.14) at these receptors in both cases is low, meaning the predicted effect (Table 16.15) does not change.

9.6.11 There are no commercial receptors identified that fall within the study area of the proposed OHL and Pentir Substation.

Pentir Substation and Tŷ Fodol THH

9.6.12 Due to the distance between Pentir Substation and Tŷ Fodol THH noise sources (approximately 1.4 km), it is likely that noise resulting from the two sources in combination with the OHL would not result in a significant effect at NSRs.

9.6.13 Given that there is unlikely to be a combined effect of Pentir Substation and Tŷ Fodol THH, it is not considered necessary to consider these two noise sources in addition to the OHL.

9.7 SUMMARY OF POTENTIALLY SIGNIFICANT EFFECTS

9.7.1 Table 16.36 in section 11 provides a summary of receptors that have been identified as being exposed to a potentially significant effect as a result of operational noise impact from the Proposed Development.

10 Cumulative Effects

10.1 INTRODUCTION

10.1.1 This section of the assessment considers the cumulative effects of the various elements of the Proposed Development and the accumulated effects of the proposals with other developments proposed in the vicinity.

10.2 INTRA PROJECT CUMULATIVE EFFECTS

10.2.1 Intra-project effects are reported in Chapter 19, Intra-Project Effects (**Document 5.19**).

10.3 INTER PROJECT CUMULATIVE EFFECTS

10.3.1 Inter-project cumulative effects occur when two or more planned developments have an effect on the same receptor leading to an overall effect of greater significance. Note that these 'other developments' are developments that have not yet been constructed and are not operational; where developments are constructed and operational they are considered to form part of the existing baseline.

10.3.2 Chapter 20 Inter-Project Cumulative Effects (**Document 5.20**) presents a methodology for determining whether inter-project cumulative effects could occur as a result of these 'other developments' being built and/or operated at the same time as the Proposed Development. This methodology is based upon the Planning Inspectorate Advice Note 17, which deals with cumulative effects assessment. A long list of other developments needs to be developed and agreed initially. Once this is agreed, the methodology consists of four main stages as follows:

- Stage 1: a long list of other developments is identified and outline information gathered. Consideration is given to whether the other development is within the zone of influence (ZOI) for each topic; if it is, then the assessment progresses to stage 2.

- Stage 2: consideration is given to the potential temporal overlap i.e. whether the construction or operational effects of the other development could coincide with those of the Proposed Development. Consideration is also given to the scale and nature of the other development, the nature

of the receiving environment and whether there are shared receptors, and whether there is a 'pathway' for a cumulative effect to occur. At the end of stage 2 a shortlist of other developments is considered in stages 3 and 4.

- Stage 3: detailed information is gathered about each of the shortlisted other developments, typically in the form of ESs or Scoping Reports.

- Stage 4: cumulative effects are assessed and mitigation identified, and apportioned, where necessary. The securing mechanism for any necessary mitigation is identified.

10.3.3 The potential for cumulative effects to occur is considered for any effects that are minor, moderate or major. However, where the residual effects on a shared receptor are concluded to be negligible for either the Proposed Development or the other development, it is not considered possible for there to be a resulting inter-project cumulative effect. Where all effects related to a particular topic are negligible, for either the proposed Development or other development, the other development is screened out at stage 2.

10.3.4 Details about the 'other developments' on the long list considered at stage 1 are provided in Chapter 20 Inter-Project Cumulative Effects (**Document 5.20**) and its appendices.

Stage 1 and Stage 2

10.3.5 Table 16.36 provides a summary of stages 1 and 2 of the inter-project cumulative effects assessment on operational noise receptors. Where the effects of other developments are either outside the ZOI or outside the temporal scope of the Proposed Development, they have not been included in this table.

Table 16.36 Summarising Stage 1 and Stage 2 of the Inter-Project CEA

Development Name	Stage 1		Stage 2		
	Within ZOI?	Progress to Stage 2?	Overlap in Temporal Scope?	Is the Scale and Nature of Development likely to have a Significant Cumulative Effect? Relevant Shared Receptors and/or Pathways?	Progress to Stage 3/4?
Wylfa Newydd Nuclear Power Station	Yes	Yes	Potential overlap between the construction/ operation of Wylfa Newydd (specifically the routine testing of backup generators) and the Proposed Development	Shared receptors: receptors in close proximity to the Proposed Development in and around Tregele and to the west of Cemaes. No potentially significant or significant effects predicted at nearby receptors from the Proposed Development. The operational phase of the Proposed Development would not commence until the construction phase of Wylfa Newydd is complete. As such, there is no possibility of a cumulative effect between these phases. The assessment of Operational Noise is based on night time noise levels to ensure a worst-case, precautionary approach to assessment. It is unlikely that there would be any night time traffic related to the Wylfa Newydd Development under normal circumstances and therefore cumulative effects with the reported effects of the Proposed Development are not likely to occur. Increased daytime vehicle movements as a result of the operation of Wylfa Newydd may increase the traffic noise levels along public highways routes. Increased vehicular movements on the public highways may mask daytime noise from the OHL therefore resulting in a lesser perceived effect of operational noise from the Proposed Development during the daytime. **Minor** Adverse effects are predicted at receptors to the west of the Wylfa Newydd Development Area (WNDA) due to the routine testing of backup generators. These receptors would fall outside of the study area for the Proposed Development.	No
Wylfa Nuclear Power Station Decommissioning	Yes	Yes	Overlap between all phases of the Wylfa Nuclear Power Station Decommissioning and the construction and operation of the Proposed Development.	Shared receptors: receptors in close proximity to the Proposed Development in and around Tregele and to the west of Cemaes. No potentially significant or significant effects predicted at nearby receptors from the Proposed Development. The assessment of Operational Noise for the Proposed Development is based on night time noise and very low baseline sound levels to ensure a worst-case, precautionary approach to assessment. It is not anticipated that decommissioning activity would take place at night and as such, a cumulative effect during the night-time period is unlikely. During the day time, any effect due to the Proposed Development is likely to be **negligible** due to higher baseline sound levels and also the fact that absolute noise levels due to the Proposed Development would be low. Noise from decommissioning activity, increased traffic and vehicle movements may result in a cumulative effect at the nearest receptors during the daytime. However, as the absolute noise levels would be low, the contribution from the Proposed Development would be low, and therefore this is unlikely to result in an overall increased effect at receptors. Furthermore, increased vehicle movements on the public	No

Table 16.36 Summarising Stage 1 and Stage 2 of the Inter-Project CEA

Development Name	Stage 1		Stage 2		
	Within ZOI?	Progress to Stage 2?	Overlap in Temporal Scope?	Is the Scale and Nature of Development likely to have a Significant Cumulative Effect? Relevant Shared Receptors and/or Pathways?	Progress to Stage 3/4?
				highways may mask daytime noise from the OHL therefore resulting in a lesser perceived effect of operational noise from the Proposed Development during the daytime.	
Penrhos Leisure Village	No	No			
Anglesey Eco Park	No	No			
Parc Cybi	No	No			
Rhyd-y-Groes Re-power	No	No			
Holyhead Waterfront Redevelopment	No	No			
Glyn Rhonwy Pumped Storage	No	No			
Pumped Storage	No	No			
Underground Grid Connection between Glyn Rhonwy Pumped Storage Development and Pentir Substation	Yes	Yes	The connection is expected to take less than a year however as the start date is not currently known, it is assumed there would be an overlap in the construction phase with the operational phase of the Proposed Development	Shared receptors: receptors within close proximity to Pentir Substation. No potentially significant or significant effects predicted at nearby receptors from the Proposed Development. All shared receptors are exposed to a **minor** or **negligible** effect from the Proposed Development. Construction of a trench for underground cables is likely to be of short duration in any particular location and based on professional experience of similar schemes it is considered likely that the effects, when assessed, would be **negligible.** Therefore cumulative effects if construction of this development occurred during operation of the Proposed Development are unlikely.	No
West Anglesey Demonstration Project	No	No			
Holyhead Deep	No	No			
A487 Caernarfon to Bontnewydd Bypass	No	No			
Menai Science Park	No	No			
Third Menai Crossing	No	No			

Table 16.36 Summarising Stage 1 and Stage 2 of the Inter-Project CEA

Development Name	Stage 1		Stage 2		
	Within ZOI?	Progress to Stage 2?	Overlap in Temporal Scope?	Is the Scale and Nature of Development likely to have a Significant Cumulative Effect? Relevant Shared Receptors and/or Pathways?	Progress to Stage 3/4?
A55 - Junction 15 & Junction 16 Improvement	No	No			
A55 Abergwyngregyn to Tai'r Meibion Improvement	No	No			
Nant y Garth Landfill Site	Yes	Yes	Overlap of operation of landfill (time-limited to the end of July 2021) and construction of the Proposed Development.	Shared receptors: Hafan y Wennol R5/07236, Tyn y Coed R5/07260, Llys y Gwynt R5/07307, Garth Bach R5/07284, Lleifior R5/07322 and Garth Fawr Farm R5/07524. It is understood that the application to deposit further waste at Nant Y Garth is restricted within the limitations of the existing consent, including noise limitations. It is considered that future operations at Nant Y Garth landfill site would be similar to existing operations, and therefore the existing baseline would not change and it is therefore unlikely that there would be any cumulative operational noise effects.	No
Caernarfon Brickworks Quarry	No	No			
Amlwch Liquid Natural Gas (LNG)	No	No			
Green Wire	Yes	Yes	Timescales currently unknown. If connection in place as per the agreement (completed by end of 2020) there would be an overlap with the OHL and tunnel construction however not with works at Pentir. Likely to be an overlap in operation phases.	Shared receptors: R5/10768, Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098. As **negligible** effect from the Proposed Development have been predicted at shared receptor R5/10768 therefore potential significant cumulative effects are considered unlikely for this receptor and this receptor will not be considered further in this assessment. However, as **minor** effects are predicted at Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098 there is some potential for significant cumulative effects on these shared receptors.	Yes - Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098
Llanbadrig Solar Farm	No	No			
Codling Wind Park	No	No			

Table 16.36 Summarising Stage 1 and Stage 2 of the Inter-Project CEA					
Development Name	Stage 1		Stage 2		
	Within ZOI?	Progress to Stage 2?	Overlap in Temporal Scope?	Is the Scale and Nature of Development likely to have a Significant Cumulative Effect? Relevant Shared Receptors and/or Pathways?	Progress to Stage 3/4?
Grŵp Llandrillo Menai Llangefni Campus	No	No			
Dinorwig Cables	Yes	Yes	Potential overlap between construction phases (cable installation is programmed for between 2019 and 2025) along with overlap in the operational phases.	Shared receptors: R5/10768, Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098. It is understood that current plans for the Dinorwig Cables project include a connection into Pentir Substation. The addition of any reactive plant at Pentir Substation, or within close proximity, would require the developer to consider the potential for significant effects from operational noise, either alone or cumulatively. As **negligible** effects from the Proposed Development have been predicted at shared receptor R5/10768 potential significant cumulative effects are considered unlikely for this receptor. However, as **minor** effects are predicted at Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098 there is some potential for significant cumulative effects on these shared receptors.	Yes - Ty'n Llwyn R5/10846 and Fferm Cae Sgubor R5/11098
Holyhead Port Expansion	No	No			

Stage 3 and Stage 4

10.3.6 At the end of Stage 2 the original long list of other developments was reduced to a short list of other development where there would be potential for a significant cumulative effect to occur. The short list of other developments is as follows:

- Green Wire; and
- Dinorwig Cables.

10.3.7 Stage 3 requires the gathering of detailed information; however, a substantial amount of information about the other developments had already been gathered to support stages 1 and 2.

10.3.8 The results of the Stage 4 assessment of cumulative effects and mitigation are presented in Table 16.37 below.

10.3.9 Professional judgement has been applied in determining whether the combination of effects from two developments could result in a significant effect overall. In the case of minor effects, it is considered highly unlikely that effects could prove to be additive; however, professional judgement has been applied to check that two or more minor effects do not have potential to accumulate, thereby resulting in a potentially significant effect.

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Table 16.37 Operational Noise CEA					
Development Name	Effects on shared receptors from the Proposed Development	Effects on shared receptors from the 'other development'	Assessment of Cumulative effect with Proposed Development	Proposed Mitigation applicable to the Proposed Development including any apportionment	Residual Cumulative Effect
Green Wire	Ty'n Llwyn R5/10846 – **Minor** Adverse (not significant) effects	No information available.	No potentially significant or significant effects predicted at nearby receptors from the Proposed Development. There is insufficient information as yet about the effects of the other development and, as such, the potential cumulative effects with the Proposed Development during the worst-case night time period would need to be a consideration during the relevant assessment and consenting for that development. The assessment of Operational Noise for the Proposed Development is based on night time noise and very low baseline sound levels to ensure a worst-case, precautionary approach to assessment. It is not anticipated that construction activity would take place at night, therefore a cumulative effect due to construction of the other development during the night-time is unlikely. During the day time, any effect due to the Proposed Development is likely to be **negligible** due to higher baseline sound levels and also the fact that absolute noise levels due to the Proposed Development would be low. Noise from construction or operation of Green Wire may result in a cumulative effect at the nearest receptors during the daytime. However, as the absolute noise levels would be low, the contribution from the Proposed Development would be low, and therefore this is unlikely to result in an overall increased effect at receptors.	n/a	n/a
	Fferm Cae Sgubor R5/11098 – **Minor** Adverse (not significant) effects	No information available.		n/a	n/a
Dinorwig Cables	Ty'n Llwyn R5/10846 – **Minor** Adverse (not significant) effects	No information available.	No potentially significant or significant effects predicted at nearby receptors from the Proposed Development. There is insufficient information as yet about the effects of the other development and, as such, the potential cumulative effects with the Proposed Development during the worst-case night time period would need to be a consideration during the relevant assessment and consenting for that development. The assessment of Operational Noise for the Proposed Development is based on night time noise and very low baseline sound levels to ensure a worst-case, precautionary approach to assessment. It is not anticipated that	n/a	n/a
	Fferm Cae Sgubor R5/11098 – **Minor** Adverse (not significant) effects	No information available.		n/a	n/a

Table 16.37 Operational Noise CEA					
Development Name	Effects on shared receptors from the Proposed Development	Effects on shared receptors from the 'other development'	Assessment of Cumulative effect with Proposed Development	Proposed Mitigation applicable to the Proposed Development including any apportionment	Residual Cumulative Effect
			construction activity would take place at night, therefore a cumulative effect due to construction of the other development during the night-time is unlikely. During the day time, any effect due to the Proposed Development is likely to be **negligible** due to higher baseline sound levels and also the fact that absolute noise levels due to the Proposed Development would be low. Noise from construction or operation of Dinorwig Cables may result in a cumulative effect at the nearest receptors during the daytime. However, as the absolute noise levels would be low, the contribution from the Proposed Development would be low, and therefore this is unlikely to result in an overall increased effect at receptors.		

Conclusion

10.3.10 Taking into consideration all of the other developments for which a potential cumulative effect has been identified, it is determined that there are no potential for cumulative effects from the Proposed Development and other developments likely to result in a significant adverse effect at any of the shared receptors.

11 Summary

11.1.1 This section provides a summary of the potential operational noise effects resulting from the Proposed Development.

11.2 PRIMARY ASSESSMENT - OHL AND CSECS

Conductor Noise

Option A

11.2.1 An assessment of the potential effects from conductor noise on receptors within the study area for Option A has been undertaken. The assessment has followed the methodology as detailed in technical Appendix 16.3 (**Document 5.16.2.3**), with in-combination effects with the existing OHL taken into consideration in the determination of significance, as detailed in technical Appendix 16.4 (**Document 5.16.2.4**).

11.2.2 Predictions have shown that a **moderate** effect (**potentially significant**) would occur at 14 receptors:

- Dymchwa during dry noise conditions;
- Tyn Cae during dry noise conditions;
- Pen Yr Orsedd during dry noise conditions;
- Dafarn Dyweirch during dry noise conditions;
- Dryll during dry noise conditions;
- Bryn Goleu Caravan Park Proxy Receptor (residential) during wet and dry noise conditions;
- Ysgol Ty Mawr during dry noise conditions;
- Pen Llain during dry noise conditions;
- Cae Fabli Annexe_1 R3/00277 during wet and dry noise conditions;

- Cae Fabli during wet and dry noise conditions;
- Cae Fabli Annexe_2 R3/00289 during dry noise conditions;
- Maen Goch during wet and dry noise conditions;
- Maen Eryr during dry noise conditions; and
- Madryn during dry noise conditions.

11.2.3 Due to the relatively low predicted rating levels at those receptors identified as being exposed to a moderate effect during wet and dry noise conditions, it is not considered that the effect should be increased to account for the combined wet and dry noise effects.

11.2.4 In determining whether the predicted effect at the receptors identified above is significant or not, the following factors have been considered:

- the predicted rating levels considered against absolute noise level criteria;
- the assumed background sound levels;
- the temporal characteristics of dry and wet noise; and
- the methodology and the context of the assessment.

11.2.5 It is considered that, taking into consideration the factors listed above, which are explained further in paragraphs 9.2.57 to 9.2.63, OHL noise during wet and dry noise conditions would **not result in a significant effect** at the identified receptors.

11.2.6 It is considered that the proxy residential receptor considered within Bryn Goleu Caravan Park represents a worst case residential receptor location on the site. The effect at this location would be moderate in both dry and wet conditions and is considered to be **not significant**. As such, noise levels from the OHL at other caravan locations would likely **not result in a significant effect** in wet or dry noise conditions.

Option B

11.2.7 An assessment of the potential effects from conductor noise on receptors within the study area for Option B has been undertaken.

11.2.8 Predictions have shown that as Dolydd Newydd is not considered as a receptor for Option A, the effect would not change at any identified receptor as a result of Option B. Under Option B, Dolydd Newydd would

be exposed to a **moderate** effect during both wet and dry noise conditions. The effect at this receptor has been increased due to the in-combination effect of new and existing OHL infrastructure.

11.2.9 In determining whether a significant effect is likely to occur at this receptor, the factors identified in paragraph 11.2.4 have been considered, which are explained further in paragraph 9.2.57 to 9.2.63. As such, it is considered that noise from the OHL during wet and dry conditions would **not result in a significant effect** at Dolydd Newydd as a result of Option B.

Assessment of Conductor Noise on PROW

11.2.10 Predictions have shown that conductor noise from the proposed OHL would not exceed 45 dBA at any identified section of PROW, which is 5 dB below the assumed threshold level for the onset of annoyance of 50 dB following WHO guidance. It is therefore considered that conductor noise from the proposed OHL would **not result in a significant effect** at any of the identified PROW.

11.3 SECONDARY ASSESSMENT – OHL AND CSECS

Conductor Noise - Assessment of Horizontal Movement within LOD

Option A

11.3.1 An assessment of the potential effects on receptors as a result of movement of infrastructure to the east and west within the LOD has been undertaken.

11.3.2 Predictions have shown that as a result of moving the proposed new infrastructure to the reasonable limits of the LOD to the east, there would be an increase of effect at nine receptors. Five of these receptors would be exposed to a **moderate** effect (**potentially significant**);

- Llety;
- Dymchwa;
- Trigfa;
- Maen Goch; and
- Dolfeirig.

11.3.3 In determining whether a significant effect is likely to occur at these receptor, the factors identified in paragraph 11.2.4 have been considered, which are explained further in paragraph 9.3.17 to 9.3.22. As such, it is considered that noise from the OHL during wet and dry conditions would **not result in a significant effect** at the identified receptors.

11.3.4 Predictions have shown that as a result of moving the proposed new infrastructure to the reasonable limits of the LOD to the west, there would be an increase of effect at six receptors. One of these receptors, would be exposed to a **moderate** effect (**potentially significant**);

- Dryll.

11.3.5 In determining whether a significant effect is likely to occur at this receptor, the factors identified in paragraph 11.2.4 have been considered, which are explained further in paragraph 9.3.17 to 9.3.22. As such, it is considered that noise from the OHL during wet and dry conditions would **not result in a significant effect** at this receptors.

Option B

11.3.6 An assessment of the potential effects on receptors as a result of movement of infrastructure within the LOD assuming Option B has been undertaken.

11.3.7 The change in effect on identified receptors due to any movement of the pylons within the LOD, assuming Option B and taking account of restrictions, would be the same for the Option B primary assessment with the exception of Madryn where the effect during wet noise conditions would increase from minor to **moderate**.

11.3.8 In determining whether a significant effect is likely to occur at this receptor, the factors identified in paragraph 11.2.4 have been considered, which are explained further in paragraph 9.3.17 to 9.3.22. As such, it is considered that noise from the OHL during wet and dry conditions would **not result in a significant effect** at this receptors.

Summary

11.3.9 Irrespective of where a pylon is located outside the restricted areas, but within the LOD, it can be confirmed that although the effect may increase or decrease, there is no realistic potential for movement within the LOD to the east or west to result in a significant effect at any receptor. It is therefore considered that whilst it has not been practicable to restrict the

LOD at Trigfa R2/00029, Gorslwyd Bach R2/00489, Garreg Wen Estate R2/00588, Meddygta Star Surgery C5/13300, Llety R2/00352, Penrhyn Newydd R2/00397, Eithinog R2/00417 and Tyddyn Isaf R5/02592, no significant effects are predicted and as such, additional restrictions to LOD are not warranted at these locations.

11.4 TUNNEL HEAD HOUSES (THH)

Braint

11.4.1 Predictions have shown that there are no receptors within 1,000 m of Braint THH that would be exposed to a significant effect due to the operation of Braint THH.

11.4.2 Due to the relatively large distance between Braint THH and the surrounding receptors (>300 m), predictions show that all identified receptors within 1,000 m of the Braint THH would be exposed to a **negligible** effect from operational noise associated with Braint THH.

Tŷ Fodol

11.4.3 Predictions have shown that there are two receptors that would be exposed to a **moderate** effect due to the operation of Tŷ Fodol THH, assuming a realistic worst case operating scenario; Garth Bach and Lleifior. It is assumed that the realistic worst case operating scenario for Tŷ Fodol THH would be likely to occur for approximately two hours per month during routine testing.

11.4.4 The assessment has been carried out during the night-time period when background sound levels are very low and when operational noise from Tŷ Fodol THH would be likely to be most noticeable. Due to the low specific noise and baseline sound levels being assessed, consideration has been given to the absolute noise level in accordance with guidance within the WHO NNG.

11.4.5 The rating level from Tŷ Fodol THH during the night-time period would be well below the threshold level for the onset of sleep disturbance as given in the WHO NNG.

11.4.6 An additional assessment of Tŷ Fodol THH under normal operating conditions (high cooling demand) has also been undertaken. The results of this assessment indicate that no receptors would be exposed to a minor effect or greater.

11.4.7 It is therefore considered that as normal operating conditions, as defined above, are likely to occur for the majority of the time, noise from the operation of Tŷ Fodol THH would **not result in a significant effect** at identified receptors.

11.5 PENTIR SUBSTATION

11.5.1 Predictions have shown that there are no receptors within 1,000 m of Pentir Substation that would be exposed to a significant effect due to the operation of new equipment at the substation.

11.5.2 The highest predicted rating level arising from the additional shunt reactor at Pentir is 26 dB $L_{Ar,Tr}$ at Rhos Fawr and R5/09356 (residential caravan), which is 2 dB below the background sound level. This results in a **minor** effect at these receptors.

11.5.3 The assessment of operational noise from the additional shunt reactor at Pentir Substation has taken into consideration the existing plant items on the substation site that are already in operation. Based on the results of a tonal analysis of measured baseline levels and observations whilst on-site, it is considered that noise from the substation does not contribute to the representative baseline levels at the closest long-term measurement locations which are representative of the nearest receptors.

11.6 MULTIPLE PROPOSED DEVELOPMENT SOURCES

Braint THH and OHL

11.6.1 An assessment of the potential effects from the combined operation of Braint THH and the proposed OHL on receptors within both study areas has been undertaken.

11.6.2 One receptor has been identified as falling within the two study areas for the two sources, Rhos Bothan (R5/02725). Predictions show that at this receptor, the effect would not change due to combined noise from Braint THH and the OHL, during wet or dry noise conditions.

Tŷ Fodol THH and OHL

11.6.3 An assessment of the potential effects from the combined operation of Tŷ Fodol THH and the proposed OHL on receptors within both study areas has been undertaken.

11.6.4 Predictions show that the effect would not change at any of the identified receptors due to combined noise from both Tŷ Fodol THH and the OHL,

during wet or dry noise conditions. The assessment has considered the realistic worst case operating conditions for Tŷ Fodol THH.

Pentir Substation and OHL

11.6.5 An assessment of the potential effects from the combined operation of Pentir Substation and the proposed OHL on receptors within both study areas has been undertaken.

11.6.6 Predictions show that the effect would increase from negligible to minor at Pennant R5/08715.

11.6.7 Although there would be an increase in the effect at this receptor from negligible to **minor**, the combined noise from new reactive plant at Pentir and the OHL would **not result in a significant effect**.

Pentir Substation and Tŷ Fodol THH

11.6.8 An assessment of the potential effects from the combined operation of Pentir Substation and Tŷ Fodol THH on receptors within both study areas has been undertaken.

11.6.9 Due to the distance between Pentir Substation and Tŷ Fodol THH noise sources (approximately 1.4 km), it is likely that noise resulting from the two sources in combination with the OHL would not result in a significant effect at NSRs.

Summary of Potentially Significant Effects

11.6.10 Table 16.36 provides a summary of receptors that have been identified as being exposed to a potentially significant effect as a result of operational noise impact from the Proposed Development.

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted						
Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
Primary Assessment - OHL and CSECs – Option A						
Dymchwa R1/01193	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Tyn Cae R2/00027	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Pen Yr Orsedd R2/00076	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Dafarn Dyweirch R2/00171	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted

Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
Dryll R2/00353	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Bryn Goleu Caravan Receptor R2/13706	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.2.57 to 9.2.63
Ysgol Ty Mawr R3/00259	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Pen Llain R3/00271	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted

Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
Cae Fabli Annexe_1 R3/00277	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Cae Fabli R3/00280	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in wet noise conditions and Medium in dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Cae Fabli Annexe_1 R3/00289	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in wet and dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Maen Goch R3/13295	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in wet noise conditions and Medium in dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Maen Eryr R3/00351	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted						
Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
						9.2.57 to 9.2.62
Madryn R4/01479	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Primary Assessment - OHL and CSECs – Option B* *As above, with the exception of the below receptors						
Dolydd Newydd R4/01483	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Low in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.2.57 to 9.2.62
Secondary Assessment –(LOD) OHL and CSECs – Option A & B* *Receptors where an increase in significance of effect has been identified						
Llety, Cemaes Bay R1/00152	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.3.17 to 9.3.22

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted

Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
Dymchwa R1/01193	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.3.17 to 9.3.22
Trigfa R2/00029	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in dry noise conditions	Moderate in dry noise conditions	No. See paragraphs 9.3.17 to 9.3.22
Maen Goch R3/13295	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.3.17 to 9.3.22
Dolfeirig R5/02649	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet noise conditions	Moderate in wet noise conditions	No. See paragraphs 9.3.17 to 9.3.22
Dryll R2/00353	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs

Table 16.36 Summary of Receptors where a Potentially Significant Effect is Predicted

Receptor	Sensitivity	Potential Effects	Mitigation	Magnitude of Impact	Effect	Is the Effect Considered Significant?
						9.3.17 to 9.3.22
Madryn R4/01479	Medium	Conductor Noise, see paragraphs 8.2.1 to 8.2.15	See paragraph 9.2.2	Medium in wet and dry noise conditions	Moderate in wet and dry noise conditions	No. See paragraphs 9.3.17 to 9.3.22
Tŷ Fodol THH						
Garth Bach R5/07284	Medium	Ventilation fan and stairwell fan noise, see paragraphs 8.2.24 to 8.2.26	See paragraph 9.4.2	Medium in realistic worst case operating conditions	Moderate	No. See paragraph 9.4.17
Lleifior R5/07322	Medium	Ventilation fan and stairwell fan noise, see paragraphs 8.2.24 to 8.2.26	See paragraph 9.4.2	Medium in realistic worst case operating conditions	Moderate	No. See paragraph 9.4.17

References

1 The Stationery Office Limited. Environmental Protection Act, Chapter 43, Part III. 1990.

2 The Stationery Office Limited. Control of Pollution Act, Chapter 40, Part III. 1974.

3 Department of Energy and Climate Change (2011). Overarching National Policy Statement for Energy (EN-1). The Stationery Office.

4 Department of Energy and Climate Change (2011). National Policy Statement for Electricity Networks Infrastructure (EN-5). The Stationery Office.

5 International Standards Organization. International Standard ISO 1996-1:1982. Description and measurement of environmental noise - Part 1: Guide to environmental quantities and procedures.

6 British Standards Institution. British Standard 7445-1:1991. Description and measurement of environmental noise - Part 1: Guide to environmental quantities and procedures.

7 British Standards Institution. British Standard 7445-1:2003. Description and measurement of environmental noise - Part 1: Guide to environmental quantities and procedures.

8 British Standards Institution. British Standard 4142:1997. Method for Rating industrial noise affecting mixed residential and industrial areas.

9 British Standards Institution. British Standard 4142:2014. Methods for rating and assessing industrial and commercial sound.

10 Welsh Government (November 2016), Planning Policy Wales: Edition 9

11 Welsh Government (February 2018), Draft Planning Policy Wales: Edition 10

12 Welsh Office, (1997); Technical Advice Note (Wales) 11

13 Welsh Government (2015). CL-01-15 Updates to Tan 11- Noise Action Plan (2013-18) Commitments

14 British Standards Institution. British Standard 4142:1990. Method for rating industrial noise affecting mixed residential and industrial areas.

15 British Standards Institution. British Standard 8233:1987. Code of practice for sound insulation and noise reduction for buildings.

16 Isle of Anglesey County Council and Gwynedd Council (July 2017), Joint Local Development Plan (Anglesey and Gwynedd).

17 The Planning Inspectorate, (July 2016); Scoping Opinion – Proposed North Wales Connection

18 British Standards Institution. British Standard 8233:2014. Guidance on sound insulation and noise reduction for buildings.

19 Institute of Environmental Management and Assessment (2014); Guidelines for Environmental Noise Impact Assessment.

20 European Centre for Environment and Health. Night Noise Guidelines (NNGL) for Europe. World Health Organisation. 2009.

21 Berglund, B. et al. Guidelines for Community Noise. World Health Organisation. 2000.

22 Department of the Environment. Planning Policy Guidance: Planning and Noise (PPG 24). HMSO. 1994.

23 British Standards Institution. British Standard 7445-2:1991 Description and measurement of environmental noise - Part 2: Guide to the acquisition of data pertinent to land use.

24 ISO. International Standard ISO 9613-2:1996. Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation.

25 Miller, L N (1978). Sound Levels of Rain and of Wind in the Trees, Noise Control and Engineering, Volume 11 / 3, pp 101-109.