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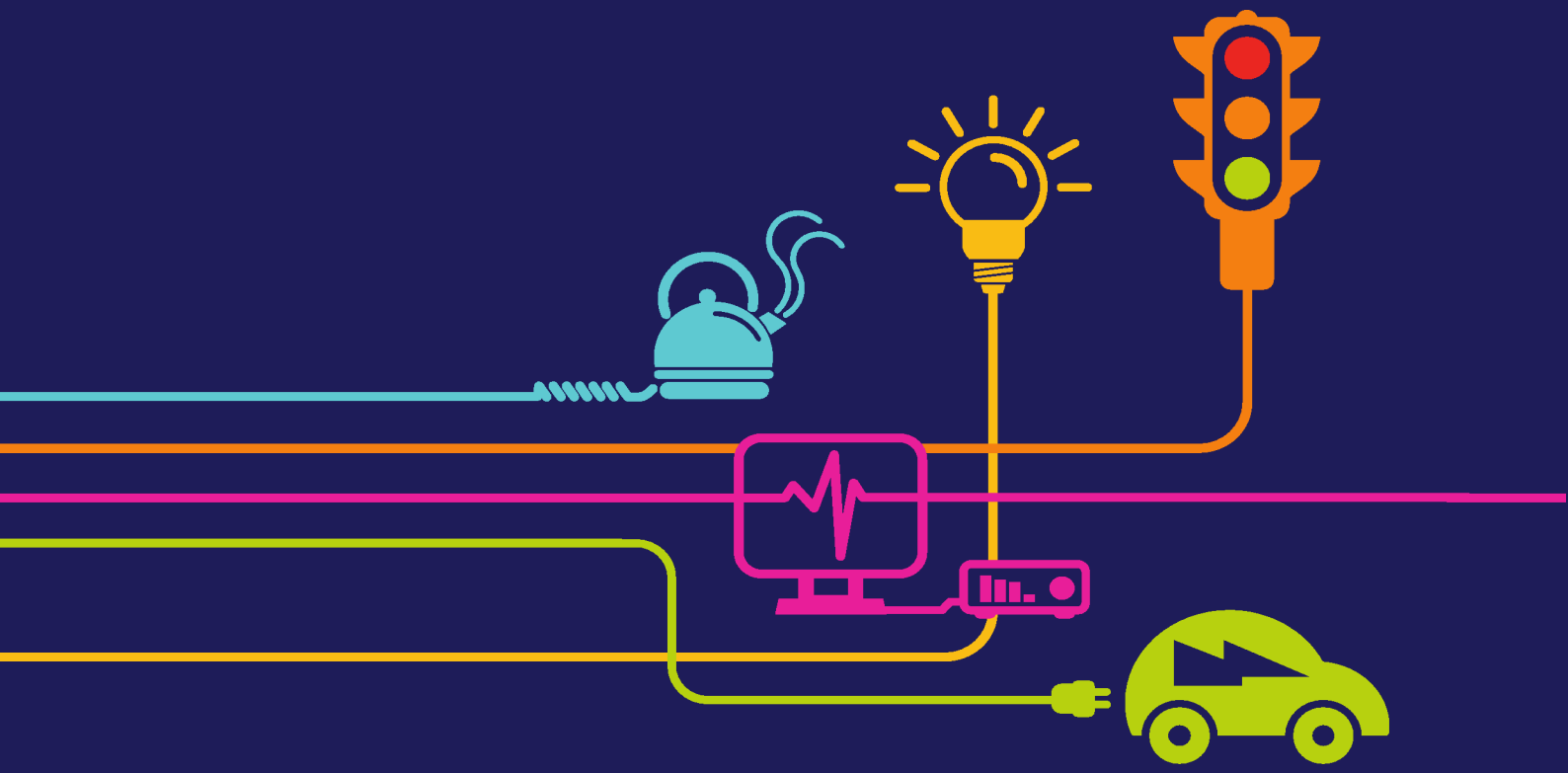
DOCUMENT 5.15

Environmental Statement Chapter 15 Construction Noise and Vibration

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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Document 5.15 Chapter 15 Construction Noise and Vibration

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1 Introduction

1.1 INTRODUCTION

1.1.1 This chapter presents the assessment of noise and vibration effects that could arise from the construction of the Proposed Development (as described in Chapter 3, Description of the Proposed Development (**Document 5.3**) and Chapter 4, Construction, Operation, Maintenance and Decommissioning (**Document 5.4**). It also considers the noise and vibration effects that could arise during the maintenance and decommissioning phases, although effects during these phases are likely to be similar to, or less than, those for the construction phase.

1.1.2 This chapter is supported by a number of appendices as listed below:

- Appendix 15.1 Local Planning Policy – Construction Noise and Vibration **(Document 5.15.2.1)**.
- Appendix 15.2 Baseline Sound Monitoring Report **(Document 5.15.2.2)**.
- Appendix 15.3 Baseline Sound Levels Used for Numerical Assessment of Effects **(Document 5.15.2.3)**.
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- Appendix 15.10 Assessment of Noise Effects from Pylon Construction, Conductor Stringing and Pylon Dismantling **(Document 5.15.2.10)**.

- Appendix 15.11 Assessment of Vibration Effects from Pylon Construction **(Document 5.15.2.11)**.

- Appendix 15.12 Assessment of Noise Effects from Tunnelling Works at the Braint Construction Compound **(Document 5.15.2.12)**.

- Appendix 15.13 Assessment of Noise Effects from Tunnelling Works at the Tŷ Fodol Construction Compound **(Document 5.15.2.13)**.

- Appendix 15.14 Assessment of Vibration Effects from Underground Tunnelling Works **(Document 5.15.2.14)**.

- Appendix 15.15 Assessment of Noise Effects from Access Tracks used by Construction Vehicles **(Document 5.15.2.15)**.

- Appendix 15.16 Assessment of Noise Effects from Traffic Routes used by Construction Traffic **(Document 5.15.2.16)**.

- Appendix 15.17 Summary of Residual Noise and Vibration Effects from All Construction Activities **(Document 5.15.2.17)**.

- Appendix 15.18 Assessment of Cumulative Noise Effects from Traffic Routes used by Construction Traffic **(Document 5.15.2.18)**.

1.1.3 Other chapters that are associated with this chapter are:

- Chapter 13, Traffic and Transport **(Document 5.13)**;

- Chapter 16, Operational Noise **(Document 5.16)**;

- Chapter 17, Socio Economics **(Document 5.17)**;

1.1.4 Reference is also made to the Construction Environmental Management Plan (CEMP) **(Document 7.4)** and the Noise and Vibration Management Plan (NVMP) **(Document 7.9)**.

1.1.5 All technical terms and abbreviations used within this chapter are defined in the Glossary **(Document 1.4)**.

2 Legislation and Planning Policy

2.1 INTRODUCTION

2.1.1 This section sets out the legislation, planning policy framework and planning guidance that is relevant to the construction noise and vibration assessment. A full review of compliance with national and local planning policy is provided in the Planning Statement **(Document 7.14)** 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 Details of how the Proposed Development is compliant with relevant legislation are provided in **Document 5.28.2.1**.

Control of Pollution Act

2.2.2 Section 60, Part III of the Control of Pollution Act (CoPA), Chapter 40 (HMSO, 1974) (Ref 15.1) refers to the control of noise (including vibration) on construction sites. It provides legislation by which local planning authorities can control noise, by stopping activities if necessary, to prevent noise disturbance occurring. The CoPA provides the local planning authority, in whose area work is going to be undertaken, or is being undertaken, with the power to serve a notice imposing requirements as to the way in which construction works are to be carried out. This notice can specify, the plant or machinery that is or is not to be used, the hours during which the construction work can be carried out, the level of noise and vibration that can be emitted from the premises in question or at any specified point on these premises or that can be emitted during specified hours, or for any change of circumstances.

2.2.3 Section 61, Part III of Chapter 40 of the CoPA (s. 61) refers to prior consent for work on construction sites. It provides a method by which a contractor can apply for consent to undertake construction works in advance. If consent is given, and the stated method and hours of work are complied with, then the local authority cannot take action under Section 60.

2.2.4 Section 71, Part III of Chapter 40 of the CoPA refers to the preparation and approval of codes of practice for minimising noise. The current, June 2014,

version of BS 5228 is one such approved code as ratified by the Welsh Assembly.

2.2.5 Section 72, Part III of Chapter 40 of the CoPA refers to 'best practicable means' (BPM), which is defined as:

'reasonably practicable, having regards among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications'. Whilst 'Means' includes 'the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.'

2.2.6 If BPM is applied, then it can provide a defence against prosecution by the consenting body, usually the local authority.

2.3 NATIONAL POLICY

2.3.1 The policies provided in the section below have been taken into consideration within the assessment of construction noise and vibration effects and proposals for mitigation which are outlined in 'section 9 mitigation and residual effects'.

National Policy Statements

2.3.2 National Policy Statements set out the primary policy test against which the application for a DCO for the Proposed Development will be considered. Noise and vibration is covered in Part 5, Section 11 of EN-1 under four sections:

- Introduction - which explains the general effects of noise and factors that determine the likely noise impact.
- Applicant's assessment - which describes what should be included in a noise assessment, where impacts may occur, and the bodies that should be consulted.
- Decision making - which indicates that the project should be of good design through selection of the quietest cost-effective plant available and other noise minimisation considerations and that the following aims should be achieved:
    - avoid significant adverse impacts on health and quality of life from noise;

- mitigate and minimise other adverse impacts on health and quality of life from noise; and
- where possible, contribute to improvements to health and quality of life through the effective management and control of noise.

- Mitigation - whereby the decision maker should consider whether mitigation measures are needed both for operational and construction noise over and above any which may form part of the project application. These measures may include engineering, layout and administration. It is also recognised that, when all other forms of mitigation have been exhausted, further mitigation through sound insulation of dwellings should be considered.

2.3.3 Table 15.1 below indicates how this chapter demonstrates compliance with the 'Overarching National Policy Statement for Energy (Ref 15.2)' as it relates to construction noise and vibration effects (EN-1). However, the National Policy Statement for Electricity Networks Infrastructure (EN-5) (Ref 15.3) is primarily concerned with operational noise effects, which have been assessed in Chapter 16, Operational Noise and Vibration **(Document 5.16)**.

Table 15.1: Compliance to Relevant Section of EN-1 and/or EN-5

Relevant Section of EN-1	How Addressed in ES
5.11.4 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 on 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;	This Environmental Statement (ES) chapter describes noise generating aspects of the Proposed Development for the construction phase including ancillary activities such as changes in traffic flows on construction traffic routes. Noise sensitive areas have been identified within the study area for each assessment. See 'section 6 study area'. The existing noise environment has been characterised in 'section 7 baseline conditions'. Predictions have been made of the change in noise levels with the Proposed Development at noise

Table 15.1: Compliance to Relevant Section of EN-1 and/or EN-5	
Relevant Section of EN-1	How Addressed in ES
• 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; • at particular times of the day, evening and night as appropriate; • an assessment of the effects 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.	sensitive premises and areas in 'section 9 mitigation and residual effects' for the relevant times of day, as appropriate for each type of works. Mitigation measures have been employed where appropriate as set out in 'section 9 mitigation and residual effects'. Noise impacts during the operational stage of the Proposed Development have been assessed in Chapter 16, Operational Noise **(Document 5.16)**.
5.11.5 The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should be considered.	The noise impact of the construction phase road traffic on the construction traffic routes and adjacent receptors is assessed in 'section 9.9 traffic on construction traffic routes'. In addition, traffic on the access tracks that are part of the Proposed Development are assessed in 'section 9.8 traffic on access tracks'.
5.11.6 Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. Further information on assessment of particular noise sources	BS 5228:2009+A1:2014 Parts 1 and 2 have been used as a basis for the assessment of construction noise and vibration – see 'section 4 methodology'.

Table 15.1: Compliance to Relevant Section of EN-1 and/or EN-5	
Relevant Section of EN-1	How Addressed in ES
may be contained in the technology-specific NPSs. In particular, for renewables (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.	
5.11.7 The applicant should consult EA and Natural England (NE), or the Countryside Council for Wales (CCW), as necessary and in particular with regard to assessment of noise on protected species or other wildlife. The results of any noise surveys and predictions may inform the ecological assessment. The seasonality of potentially affected species in nearby sites may also need to be taken into account.	Natural Resources Wales (NRW), as the relevant body in Wales, has been consulted. Noise and vibration effects on ecological receptors have been considered in 'Chapter 9, Ecology and Nature Conservation' **(Document 5.9)**.

Planning Policy Wales (Edition 9)

2.3.4 Planning Policy Wales (PPW) (Ref 15.4) sets out the land use planning policies of the Welsh Government. It is supplemented by a series of Technical Advice Notes of which TAN 11 (Ref 15.5), as revised by letter in November 2015, relates to noise.

2.3.5 The PPW document itself generally provides direction for local authorities to inform their local plans and therefore does not contain specific policy for developers but emphasises issues that should be considered. PPW provides the following introduction to national planning policy with regards to noise (and by implication vibration), which sets out the objectives of the Welsh Government:

'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. Noise Action Plans, drawn up by the Welsh Ministers in relation to Wales under the Environmental Noise Directive, and the Wales Regulations, aim to prevent and reduce environmental noise where necessary and preserve environmental noise quality where it is good. They are a planning consideration in the use and development of land.'

2.3.6 Chapter 13 'Minimising and Managing Environmental Risks and Pollution' contains the following text in relation to noise (and by implication vibration):

'13.15.1 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 (see Chapter 13 Section 8.5.5).

13.15.2 Special consideration is required where noise-generating development is likely to affect a protected species, or is proposed in or near statutorily designated areas, including urban 'quiet areas' designated in Noise Action Plans. The effect of noise on the enjoyment of other areas of landscape, wildlife and historic value should also be taken into account.'

Draft Planning Policy Wales (Edition 10) Consultation Document

2.3.7 A draft of the 10th Edition of Planning Policy Wales (PPW) (Ref 15.6) has been issued for consultation by the Welsh Government. Within the section 'Development Management and Renewable and Low Carbon Energy', the document states:

'Planning authorities should also 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; The document provides a framework for addressing soundscape,'

2.3.8 Within the section 'Framework for Addressing Air Quality and Soundscape' the document provides the following broad objectives (addressing air quality as well as noise):

- 'consider the long-term effects of current and predicted levels of air and noise pollution on individuals, society and the environment as part of supporting the development of sustainable places;
- prevent the creation of any new, or the worsening of any current, air quality or noise pollution problems from arising as a consequence of development; and
- identify and pursue any opportunities to minimise increases in, or preferably reduce, current levels of population exposure to air and noise pollution, and improve soundscapes, where it is practical and feasible to do so and the measure can achieve what it is intended to.'

2.3.9 It then goes on to state:

'5.1.29 In taking forward these broad objectives planning authorities will need to consider the effects which proposed developments may have on air or soundscape quality and the effects which existing air or soundscape quality may have on proposed developments. In doing so, they should:

- address any implication arising as a result of its association with, or location within, air quality management areas, noise action planning priority areas, or areas where statutory nuisance are more likely to arise;
- not create new areas where pollution becomes a problem;
- consider the relationship between pollution sources and receptors (such as sensitive uses); and
- seek to incorporate measures which reduce overall exposure to airborne pollution and create appropriate soundscapes, including using best practice in terms of acoustic design and safeguarding tranquillity.

5.130 To assist decision making it will be important that the most appropriate level of information is provided and it may be necessary for a technical air quality and noise assessment to be provided by the developer. Mitigation measures must be capable of being effectively implemented for their intended purpose, and could include those related to:

- traffic management and road safety;

- ensuring progress towards a shift to low or zero emissions means of road transport (such as electrical charging points);
- supporting low or zero emissions public transport;
- providing active travel infrastructure; and
- incorporating green infrastructure, where it can improve air quality by removing air pollution and aiding its dispersal, reduce real or perceived noise levels by absorbing and scattering noise and introducing natural sounds to soften man-made noise, provide areas of relative tranquillity, and reduce exposure by putting a buffer between sources of pollution and receptors.'

Technical Advice Note 11, Noise

2.3.10 Further national planning guidance is contained within Technical Advice Note 11 (TAN 11) (Welsh Government 1997), and the update letter provided on 25 November 2015. The document refers to BS 5228-1:2009+A1:2014 (Ref 15.7) for the assessment of construction noise and BS 5228-2:2009+A1:2014 (Ref 15.8) for the assessment of construction vibration.

Mineral Technical Advice Note 1: Aggregates

2.3.11 Additional planning guidance in relation to noise and vibration is provided within Mineral Technical Advice Note 1: Aggregates (MTAN1) (Welsh Government 2004) (Ref 15.9). The document provides guidance on criteria for noise and vibration from blasting activities, as well as noise limits for general mineral related activities. Although MTAN1 does not relate directly to the assessment of noise or vibration from construction sites, the criteria contained therein are more appropriate for works that are being carried out in the medium to longer term and, at the request of Isle of Anglesey County Council (IACC) and Gwynedd Council, these criteria have been applied for construction works that are to be carried out over a period of six months or more. This is also consistent with best practice for major longer term infrastructure construction projects in quieter areas.

2.3.12 The MTAN1 guidance also provides guidance for noise and vibration from blasting and includes vibration limits but no noise limits. The reason for not including noise limits is that air overpressure levels from surface blasts are very unpredictable and a pragmatic approach to control through blast design is taken. Notwithstanding this, if the tunnel is constructed using the drill and blast method, air overpressure will not occur.

2.3.13 The only source of air overpressure from the Proposed Development would be from shaft construction and blasting would only commence when the shaft is well below surface level. Hence there would be no open face blasting.

2.4 LOCAL PLANNING POLICY

2.4.1 IACC and Gwynedd Council have now adopted the Joint Local Development Plan (JLDP) (Ref 15.10). Policy 7.2 from the JLDP relevant to the assessment of construction noise and vibration is provided in Appendix 15.1 **(Document 5.15.2.1)**. The policy requires that the amenity of occupiers of local residences, other land and property uses or characteristics of the locality are not adversely impacted by noise among other matters.

2.4.2 The JLDP has been taken into consideration within the assessment of construction noise and vibration effects and proposals for mitigation which are outlined in ‘section 9 mitigation and residual effects’.

3 Scope of Assessment and Consultation

3.1 INTRODUCTION

3.1.1 This section provides details of the scope of the construction noise and vibration assessment. Reference has been made below to the Secretary of State's (SoS) Scoping Opinion, the Stage 3 Consultation responses and other consultation with key consultees that has influenced the scope of this assessment.

3.2 SECRETARY OF STATE'S SCOPING OPINION

3.2.1 Table 15.2 outlines the issues that were raised in the SoS' Scoping Opinion and how these have been addressed in this ES chapter.

Table 15.2: Issues Raised in the Secretary of State's Scoping Opinion

Paragraph	Issue Raised by SoS	Response
3.142	The ES should justify the chosen study areas and detail whether these are based on any specific guidance. The Applicant is directed to the comments of the Councils in Appendix 3 of this Opinion in this regard.	The comments from IACC and Gwynedd Council have been considered and these have been further informed by site visits and, as a result, the Study Areas have been revised as defined in 'section 6 study area'.
3.143	The SoS welcomes that the Applicant intends to agree the methodology for the proposed noise surveys, including the survey locations with IACC and Gwynedd Council. Any baseline noise surveys for the construction phase assessment should be designed to complement those required for the operational phase assessment. The Councils have provided	These comments have been addressed; the construction and operational baseline monitoring were integrated. Full details of the monitoring surveys are provided in Appendix 15.2 **(Document 5.15.2.2)** and the monitoring locations are provided on Figure 15.1 **(Document 5.15.1.1)** of this chapter. The data requirements for the

Table 15.2: Issues Raised in the Secretary of State's Scoping Opinion		
Paragraph	Issue Raised by SoS	Response
	comments on the surveys in Appendix 3 of this Opinion.	construction and operational noise assessments differ, so there are some differences in how the data have been interpreted which are described in each chapter. Refer to 'section 7 baseline conditions' and Chapter 16, Operational Noise and Vibration **(Document 5.16)**. Monitoring locations and the use of monitoring data were discussed and agreed with IACC and Gwynedd Council.
3.144	The Scoping Report states that the assessment would be undertaken in accordance with BS 5228-1:2009+A1:2014. The Applicant's attention is drawn to the comments from the Councils (see Appendix 3 of this Opinion) regarding the application of this standard.	IACC and Gwynedd Council's comments have been addressed and the methodology is explained in this chapter which now also includes criteria from Minerals Technical Advice Note (MTAN) 1: Aggregates (March 2004) for longer term construction activity. See 'section 5.5 determining the significance of effects'.
3.145	Table 12.1 of the Scoping Report identifies the receptors to be considered and their sensitivity, but is limited to human receptors only. The SoS should ensure that cross-reference is made to the ecology chapter of the ES so that potential impacts on ecological receptors are appropriately assessed. This should include any potential impacts on marine species in relation to the Menai Strait crossing	Noise and vibration effects on ecological receptors are presented in Chapter 9, Ecology and Nature Conservation **(Document 5.9)**.

Table 15.2: Issues Raised in the Secretary of State's Scoping Opinion		
Paragraph	Issue Raised by SoS	Response
	and on freshwater species within any watercourses to be crossed.	
3.146	Paragraph 12.6.7 of the Scoping Report states that predictions of sound levels from existing road traffic would be undertaken so it should not be necessary to carry out baseline monitoring along access routes. The SoS recommends that this approach is agreed with IACC and Gwynedd Council and that the ES clearly details how any predictions have been made.	This is a standard approach for changes in traffic flow on the existing highway. Further information on construction traffic predictions has been provided in 'section 4.5 assessment criteria'.
3.147	The ES should provide the details of any modelling used to predict the noise levels from construction works and construction traffic.	Information regarding modelling methodologies is provided in 'section 4.5 assessment criteria' and the results of the modelling are provided in 'section 9 mitigation and residual effects'.
3.148	Paragraph 12.7.7 of the Scoping Report states that assessments of noise and vibration from underground cable routes would only be undertaken if sensitive receptors are located very close and/or any prolonged or unusual works are required. The SoS recommends that it is agreed with IACC and Gwynedd Council where such an assessment would be required.	The use of direct buried underground cables for the 400 kilovolt (kV) connection does not form part of the Proposed Development and the connection would be placed within the tunnel beneath the Menai Strait; please refer to Chapter 3, Description of the Proposed Development **(Document 5.3)**.
3.149	The assessment should consider the potential for noise from the tunnel ventilation fans and pumping equipment.	Tunnel ventilation fans and pumping equipment have been considered in the assessment. Further

Table 15.2: Issues Raised in the Secretary of State's Scoping Opinion		
Paragraph	Issue Raised by SoS	Response
		information on the tunnelling works is provided in 'section 9.7 tunnelling works'.
3.150	Paragraph 2.7.11 of the Scoping Report identifies the potential for helicopters to be used during the construction phase; the potential noise impacts of this activity should be considered within the ES. In undertaking the assessment, the Applicant should describe the circumstances under which this construction method would be employed.	There is now no intention to use helicopters during construction of the Proposed Development.
3.151	The assessment should consider the potential impacts of noise and vibration on the special qualities of the Anglesey AONB.	Impacts on the Anglesey AONB have been considered within 'section 9 mitigation and residual effects' and are not likely to be significant.
3.152	The methodology within the Scoping Report does not explain how significant effects will be determined; this should be clarified within the ES.	This is explained in 'section 4.5 determining the significance of effects'.
3.153	Noise impacts on people should be specifically addressed and particularly any potential noise disturbance at night and other unsocial hours such as weekends and public holidays (including when 24 hour working is required). This also applies to operational noise and vibration which is discussed separately below.	Noise impacts on people have been fully assessed. 'Section 4.5 determining the significance of effects' describes how different criteria have been applied for evening, weekend and night-time works (including 24 hour working) as appropriate and the residual effects are presented in 'section 9 mitigation and residual effects'.

Table 15.2: Issues Raised in the Secretary of State's Scoping Opinion		
Paragraph	Issue Raised by SoS	Response
3.154	The ES should assess the impacts of noise and vibration on protected species and detail any required mitigation and/or compensation. Cross reference should be made to the Ecology chapter.	Effects on protected species are assessed in Chapter 9, Ecology and Nature Conservation **(Document 5.9)**.

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 construction noise and vibration assessment, as described within this chapter. Chapter 5, EIA Consultation **(Document 5.5)** lists all the meetings which have taken place and the topics discussed.

3.3.2 Responses to comments from the Stage 3 Consultation can be found in Chapter 5 Appendix 5.2 Schedule of responses to the Preliminary Environmental Information Report **(Document 5.5.2.2)** and the Consultation Report **(Document 6.1)**. 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)**.

3.4 UPDATES SINCE SCOPING

3.4.1 There have been no changes to the main aspects considered within the scope of this assessment since the scoping process was completed. However, some of the details of how various aspects have been assessed have changed as identified in section 4 'Methodology'.

3.5 SCOPE OF ASSESSMENT

3.5.1 The scope of the construction noise and vibration assessment includes noise and vibration from the construction, maintenance and decommissioning activities listed below on receptors within the study areas identified within 'section 6 study area'. Construction works that have the potential to generate significant noise and vibration effects are as follows:

- instatement of, and works within, construction compounds and substations;

- installation of access tracks, culverts and bridges;
- pylon construction – instatement of working areas, piling or excavation of foundations, pylon erection and conductor stringing;
- tunnelling and shaft construction - including instatement of construction compounds; tunnel boring machine (TBM) or drill and blast (D&B) tunnelling; processing, cleaning and removal of material; installation, operation and removal of the tunnel boring machine; operation of dewatering plant and other ancillary plant; cable installation; and construction of the tunnel head houses (THHs) and cable sealing end compounds (CSEC);
- heavy goods vehicle (HGV) movements on access tracks;
- HGV movements on construction traffic routes (public highway); and
- decommissioning works.

Welsh Language

3.5.2 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.

4 Methodology

4.1 INTRODUCTION

4.1.1 This section outlines the technical methods used to determine the baseline noise and vibration environment, how it could be affected by the Proposed Development (i.e. the magnitude of effects) and how significant these effects are likely to be.

4.2 GUIDANCE SPECIFIC TO NOISE AND VIBRATION

4.2.1 The following section provides information on the guidance used for the construction noise and vibration assessments, including the criteria adopted and calculation methodology undertaken.

BS 5228-1&2: 2014 'Code of practice for noise and vibration control on construction and open sites' Parts 1 & 2

4.2.2 British Standard (BS) 5228 is a two part standard which comprises:

- BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 1: Noise'; and
- BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration'.

4.2.3 The Standard provides guidance, information and procedures for the control of noise and vibration from demolition and construction sites. BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 gained approval for the purpose of giving guidance on appropriate methods for minimising noise from construction and open sites under the relevant sections of the Control of Pollution Act 1974 by the Welsh Assembly on the 24 February 2017.

4.2.4 There are no set standards for the definition of the significance of construction noise effects; however, for noise, example criteria are provided in BS 5228-1:2009+A1:2014 Annex E and for vibration, example criteria are provided in BS 5228-2:2009+A1:2014 Annex B.

4.2.5 BS 5228-1:2009+A1:2014 provides basic information and recommendations for methods of noise control relating to construction and open sites where work activities/operations generate significant noise levels. It includes sections on: community relations; noise and persons on-site, neighbourhood nuisance; project supervision; and control of noise. However, annexes

include: information on legislative background; noise sources, remedies and their effectiveness (mitigation options); current and historic sound level data on-site equipment and site activities; significance of noise effects; calculation procedures estimating sound emissions from sites and sound level monitoring; types of piling; and air overpressure.

4.2.6 BS 5228-2:2009+A1:2014 covers basic information and recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels. It includes sections on: community relations; vibration and persons on-site; neighbourhood nuisance; project supervision; control of vibration and measurement. BS 5228-2:2009+A1:2014 refers to BS ISO 4866:2010; BS 7385-2:1993; BS 6472-1:2008, and BS 6472-2:2008 for further advice on the significance of vibration.

4.3 BASELINE DATA GATHERING AND FORECASTING METHODS

Noise

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

4.3.2 Measurements were carried out at 19 long term unattended monitoring locations at representative locations within the study area. The surveys were set up during the day and observations made of any existing sources and other conditions.

4.3.3 Concurrent attended surveys were carried out at an additional 49 locations, eight of which were located along the proposed construction traffic routes. All short-term attended surveys consisted of at least three, 15 minute discontinuous periods over one day between 07:00-19:00 hrs for daytime, and other than those located along the construction traffic routes, they included one 15 minute period during the evening between 19:00 and 23:00 hrs, and one 15 minute period during the night between 23:00 and 07:00 hrs. Further information is included in the Baseline Sound Monitoring Report in Appendix 15.2 **(Document 5.15.2.2)**.

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 15.11).

4.3.5 Meteorological conditions were monitored during the survey using unattended weather stations installed at six of the noise monitoring positions. Periods of adverse weather, such as high winds (>5 metres per second (m/s)) or heavy precipitation (>1 millimetres per hour (mm/hr)) have been removed from the data set before subsequent analysis.

4.3.6 For the majority of works, of 6 months duration or less, Method 2 Appendix E2 of BS 5228-1:2009+A1:2014 has been used for the assessment. This requires that the pre-construction ambient noise level ($L_{Aeq,T}$) be evaluated at each receptor. However, it does not explicitly state how the ambient level should be determined. A review of the baseline data indicated that, for the long term surveys, in general, the 50th percentile ($L_{A50,T}$) of the measured ambient noise levels was a more appropriate index than the $L_{Aeq,T}$, as it is less influenced by peaks in noise levels over short durations. For locations where the short-term surveys were in a more representative location than the nearest long term noise survey, the ambient noise level has been evaluated from a combination of the short-term data and the data at the nearest long term location. Some of the monitoring locations have not been included within the assessment of construction noise, where they have not been required.

4.3.7 For works greater than 6 months, the guidance limits in MTAN1 have been adopted. However, the same approach as above has been applied with respect to baseline sound levels i.e the baseline sound levels have been derived from the $L_{A50,T}$ or $L_{Aeq,T}$ as appropriate.

4.3.8 The majority of works would only be carried out during the proposed working hours for the Proposed Development of 07:00 to 19:00 hrs Monday to Saturday and 09:00 to 17:00 hrs on Sundays. From BS 5228-1:2009+A1:2014, standard 'daytime' construction hours are between 07:00 and 19:00 hrs Monday to Friday and between 07:00 and 13:00 hrs on Saturdays, as indicated in Table 15.7. The remaining proposed working hours fall into the more sensitive 'evening and weekend' period. Therefore, baseline sound levels have been evaluated over the following two periods for each location:

- Day: 07:00 to 19:00 hrs Monday to Friday and 07:00 to 13:00 hrs Saturday.
- Weekend: 13:00 to 19:00 hrs Saturday and 09:00 to 17:00 hrs Sunday.

4.3.9 Only tunnelling works and works within the tunnelling construction compounds at Braint and Tŷ Fodol would be carried out outside the standard proposed construction hours and would be 24 hour, 7 days a week. For receptors within the study areas for the Braint and Tŷ Fodol construction

compounds, night-time sound levels between 23:00 hrs and 07:00 hrs have also been evaluated. The evening period between 19:00 hrs and 23:00 hrs has not been specifically assessed as the works carried out during this period would not be different from the works carried out during the more sensitive night-time period from 23:00 to 07:00 hrs.

4.3.10 Following a review of the baseline data, it was decided that, at some locations, the representative existing ambient noise levels could not be evaluated solely from baseline monitoring, particularly during the daytime period. These locations were in less sensitive areas around main roads, where only short-term monitoring was undertaken. In these locations, the existing ambient sound level for the daytime has been determined from the traffic data provided for the assessment for the base year (2016) and from existing traffic data for the A55. Although the opening year is now 2020, the differences in baseline traffic between 2016 and 2020 are sufficiently low that baseline traffic noise levels are not likely to change by more than around +/- 0.5 dB between 2016 and 2020. Therefore, 2016 can still be considered appropriate as a base year for the noise assessment.

4.3.11 An adjustment of -3 dB has been used to convert weekday daytime levels to weekend levels, based on professional judgement and the observed differences at other long term locations. Night-time levels have been determined from the most representative long term monitoring location. Details of which locations this applies to are provided in section 7 ‘baseline conditions’.

4.3.12 The baseline sound levels from road traffic on the highway have been evaluated from the traffic data for each construction traffic route road link which would be used to access the work sites for the Proposed Development (Figure 15.1) **(Document 5.15.1.1)**. Measurements carried out on a sample of the construction traffic routes have been compared to those modelled within the baseline scenario to validate the modelled data.

Vibration

4.3.13 As is usually the case, there are no significant existing sources of vibration within the area and, therefore, a baseline vibration survey was not considered necessary for this assessment. This was agreed with IACC and Gwynedd Council.

4.4 TECHNICAL ANALYSIS

4.4.1 Various calculation methods have been employed dependent upon the nature of the works and the most effective modelling technique. A summary of each of the modelling methodologies is provided below, along with a list of where

these methodologies have been employed. Further details of the calculation methods are provided in Appendix 15.4 Construction Noise and Vibration Model Inputs **(Document 5.15.2.4)**.

BS 5228-1:2009+A1:2014 Calculation Method

4.4.2 For the majority of the works, an assessment has been carried out using a spreadsheet calculation implementing the calculation method in Section F.2.2.2 of BS 5228-1:2009+A1:2014.

4.4.3 This calculation method has been employed for the following assessments:

- pylon construction, conductor stringing and pylon dismantling;
- construction and use of construction compounds; and
- construction activities at substations.

ISO 9613-2:1996 Calculation Method

4.4.4 Other works have been modelled in SoundPLAN 7.4 implementing the methodology in ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation' (Ref 15.12). The ground terrain has been determined from OS data. No buildings, except those forming part of the Proposed Development, have been included in the model.

4.4.5 This calculation method has been employed for the following assessments:

- tunnel and shaft construction activities within the tunnel construction compounds; and
- traffic on temporary access tracks.

BS 5228-2:2009+A1:2014 Calculation Method

4.4.6 Calculations have been carried out for works that are likely to produce high levels of vibration, based upon the appropriate methodologies in Table E.1 of BS 5228-2:2009+A1:2014. This calculation method has been employed for the following assessment:

- piling works for pylon construction.

4.4.7 For other works that have potential to generate vibration, including very short-term works such as vibratory compaction and tunnelling (either by TBM or D&B), effects have been considered qualitatively.

Calculation of Road Traffic Noise

4.4.8 Road traffic on the public highway has been modelled using a computer generated model in SoundPLAN v7.4 implementing the methodology in the 'Calculation of Road Traffic Noise' (Ref 15.13). The ground terrain has been determined from OS data. No buildings, in terms of screening, have been included in the model.

4.5 ASSESSMENT CRITERIA

4.5.1 Our approach to determining the significance of effects resulting from the Proposed Development broadly follows that described in Chapter 6, EIA Approach and Methodology **(Document 5.6)**, but has been modified to better reflect the specific methodologies adopted for the noise and vibration assessment.

Sensitivity of Receptors

4.5.2 In general, the guidance thresholds in BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 applies to the occupants of noise and vibration sensitive development such as residential buildings, hotels, buildings for religious use, buildings for educational use and buildings for health and community use. The noise and vibration assessment and adopted criteria therefore apply primarily to the occupants of these receptors, which are categorised as having a 'medium' sensitivity.

4.5.3 The WHO '*Guidelines for Community Noise*' (Ref 15.14) offer some comment on degrees of sensitivity, identifying 'vulnerable subgroups' such as those suffering from particular medical conditions. These are categorised as having a 'high' sensitivity with respect to noise and vibration. There are also other less sensitive receptors included in the assessment which are categorised as having 'low' sensitivity, and those that are not considered noise and vibration sensitive are categorised as having a 'very low' sensitivity.

4.5.4 A summary of the sensitivities of receptors used for the assessment of construction noise and vibration effects is provided in Table 15.3 below.

Table 15.3: Sensitivity of Receptor – Construction Noise and Vibration

Sensitivity of Receptor	Receptor Description
High	Patients in hospitals/hospices etc. – defined as a 'vulnerable subgroup' with very high or continuous rates of occupancy.

Medium	Residential receptors, hotels, hostels, B&Bs, caravans and chalets, places of worship, education facilities, hospitals (general), community facilities. AONB, Faenol Park and Plas Newydd are included within this category.
Low	Areas used primarily for leisure activities, including Public Rights of Way (PRoW), sports facilities, visitor attractions, sites of historic or cultural importance, businesses (e.g. offices).
Very Low	All other areas such as those used primarily for industrial or agricultural purposes.

Magnitude of Effects

4.5.5 For the majority of works, the magnitude of construction noise effects has been determined on the basis of the assessment criteria in BS 5228-1:2009+A1:2014 and MTAN1. However, for traffic movements on the local highway, guidance in DMRB Volume 11, Section 3, Part 7 'Noise and Vibration' (Highways Agency et al 2011) (Ref 15.15) has been used as a basis for the assessment of effects. Therefore, the assessment of noise has been split into two categories below, which follow different assessment methodologies.

4.5.6 For quantitative assessments of vibration, the magnitude of effect has been determined from the guidance in BS 5228-2:2009+A1:2014. For qualitative assessments, professional judgement has been applied to determine the magnitude of effects.

Magnitude of Effect from Construction Noise – All Works Excluding Construction Traffic Routes

4.5.7 The determination of the magnitude of effect from construction noise has taken a dual approach, which takes into consideration the duration of the works with two durations being considered. Generally, noise generating works are only considered significant if they take place for a period of greater than one month, or thirty days within a six month period. The magnitude of effects for works enduring for shorter periods than this have been determined on a case-by-case basis. At the request of IACC and Gwynedd Council, for works taking place over a period of greater than six months, or 180 days over a longer period, alternative noise limits based on the guidance in MTAN1 have been applied. This approach is consistent with many long duration major infrastructure projects located in rural locations.

4.5.8 All other works have been assessed according to the guidance in BS 5228-1:2009+A1:2014. Therefore, for the purposes of the construction noise assessment, these have been split as follows:

- **Short-term works** – Greater than one month or more, or 30 days within a six month period. Less than six months or 180 days over a longer period.
- **Long term works** - Greater than six months or 180 days over a longer period.

Short-term Works

4.5.9 The significance criteria for assessing the magnitude of potential noise effects from short-term construction works are based on Example Method 2 contained within Annex E.3.3 of BS 5228-1:2009+A1:2014. This indicates that:

'Noise levels generated by site activities are deemed to be potentially significant if the total noise (pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB LAeq, Period, from site noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant effect.'

4.5.10 Table 15.4 summarises the criteria that have been used to determine the magnitude of construction noise effects. The guidance in BS 5228-1:2009+A1:2014 applies to receptors of medium sensitivity, i.e. residential buildings, hotels, religious buildings, educational buildings and health or community buildings. For these receptors, the overall significance of effects would be moderate for a medium magnitude of effect, and would be treated as significant. For the purposes of this assessment, the same magnitude of effect has been applied to receptors of low and high sensitivity; albeit the overall significance of effect will differ.

Table 15.4 Magnitude of Construction Noise Effects for Short-Term Works					
Assessment category and threshold value period (L_{Aeq})	Threshold value, façade level in decibels (dB) *(Lower cut off value)*				
	No Effect	Very Low	Low	Medium	High
Night-time (23:00 to 07:00 hrs)	>10 below baseline ambient noise level	<40 or <1 above baseline ambient noise level	≥40 & <45 or <5 above baseline ambient noise level	≥45 & <55	≥55
Evenings (19:00 to 23:00 hrs weekdays). Weekends (13:00 to 23:00 hrs Saturdays and 07:00 to 23:00 hrs Sundays)	>10 below baseline ambient noise level	<50 or <1 above baseline ambient noise level	≥50 & <55 or <5 above baseline ambient noise level	≥55 & <65	≥65
Daytime (07:00 to 19:00 hrs) weekdays and Saturdays (07:00 to 13:00 hrs)	>10 below baseline ambient noise level	<60 or <1 above baseline ambient noise level	≥60 & <65 or <5 above baseline ambient noise level	≥65 & <75	≥75

4.5.11 The calculation method of BS 5228-1:2009+A1:2014 takes account of the duration of an activity per hour, the 'on-time' and the attenuation of sound due to the effects of distance, ground attenuation and barrier effects. The assessment has been based on reasonably expected construction phases, plant items and on-times based on the information provided within BS 5228-1:2009+A1:2014.

4.5.12 Where predicted construction noise levels are less than 5 dB below the levels assessed as per the above, this will be considered to have, at most, a low adverse magnitude of effect. Construction noise levels that are more than 10 dB below the existing ambient noise level would have no effect. Examples of how the table is used are provided below (note that addition of sound pressure levels is logarithmic so where the difference in levels is 10 dB, the total will be rounded up to a level that is the same as the greater level):

- Example 1: Measured daytime baseline is 50 dB $L_{Aeq,12\ hr}$; noise from construction is predicted at 60 dB $L_{Aeq,12\ hr}$ so total baseline + construction noise = 60 dB $L_{Aeq,12\ hr}$ (logarithmic addition). 60 dB $L_{Aeq,12\ hr}$ is 5 dB below the lower cut off value of 65 dB for the daytime. From Table 15.4, this indicates a Low magnitude of effect.

- Example 2: Measured daytime baseline is 50 dB $L_{Aeq,12\ hr}$; noise from construction is predicted at 68 dB $L_{Aeq,12\ hr}$ so total baseline + construction noise = 68 dB $L_{Aeq,12\ hr}$ (logarithmic addition). From Table 15.4, this indicates a Medium magnitude of effect.

- Example 3: Measured daytime baseline is 55 dB $L_{Aeq,12\ hr}$; noise from construction is predicted at 59 dB $L_{Aeq,12\ hr}$ so total baseline + construction noise = 60 dB $L_{Aeq,12\ hr}$ (logarithmic addition). From Table 15.4, this indicates a Low magnitude of effect.

4.5.13 The commentary above relates to the 45, 55, 65 dB lower cut off values as represented by the vertical line between Low and Medium (double line). So, levels that are more than 5 dB below gives a Negligible magnitude of effect or No Effect; for levels between 5 dB below and equal to the criteria, the magnitude of effect is Low; levels that are equal to or up to less than 10 dB above the magnitude of effect is Medium, and at levels of 10 dB or more above the criteria, the magnitude of effect is High.

4.5.14 The above criteria apply for works of greater than one month, or thirty days within a six month period. Where works would take place for a shorter duration, then professional judgement has been applied to determine the appropriate magnitude of effect.

Long term Works

4.5.15 For construction sites where works are being carried out for a period of greater than six months, lower noise limits would apply than those identified above. A daytime façade noise limit of 58 dB $L_{Aeq,12hr}$ between 07:00 and 19:00 hrs and a night-time facade noise limit of 45 dB $L_{Aeq,12\ hr}$ (adjusted to façade level from free-field to be consistent with the levels in Table 15.5) between 19:00 and 07:00 hrs at noise sensitive receptors would apply. For any works being

carried out for more than six months, a magnitude of effect above these limits at residential receptors, would result in moderate/major adverse effects, and magnitudes of effect below would result in negligible/minor adverse effects. The corresponding assessment levels are provided in Table 15.5 below.

Table 15.5: Magnitude of Construction Noise Effects for Long Term Works

Assessment category and threshold value period (L_{Aeq})	Threshold value, façade level in decibels (dB) *(Lower cut off value)*				
	No Effect	Very Low	Low	Medium	High
Night-time (19:00 to 07:00 hrs)	>10 below baseline ambient noise level	<40 or <1 above baseline ambient noise level	≥40 & <45 or <5 above baseline ambient noise level	≥45 & <55	≥55
Weekends (13:00 to 19:00 hrs Saturdays and 07:00 to 19:00 hrs Sundays)	>10 below baseline ambient noise level	<50 or <1 above baseline ambient noise level	≥50 & <55 or <5 above baseline ambient noise level	≥55 & <65	≥65
Daytime (07:00 to 19:00 hrs) weekdays and Saturdays (07:00 to 13:00 hrs)	>10 below baseline ambient noise level	<53 or <1 above baseline ambient noise level	≥53 & <58 or <5 above baseline ambient noise level	≥58 & <68	≥68

Magnitude of Effect from Construction Noise – Construction Traffic Routes

4.5.16 The noise changes identified in Table 15.6 below have been used to determine the magnitude of noise effects associated with construction traffic on the local road network and from temporary diversion routes resulting from construction of the Proposed Development. These are based on the guidance in DMRB, Volume 11, Section 3, Part 7 'Noise and Vibration'

(Highways Agency et al 2011, now Highways England), for the classification of magnitude of noise effects in the short-term.

Table 15.6: Classification of Magnitude of Temporary Noise Effects	
Noise Change, $L_{A10,18\ hr}$	Magnitude of Effect
0	No change
0.1 - 0.9	Very Low
1.0 - 2.9	Low
3.0 - 4.9	Medium
5+	High

4.5.17 The magnitude of effect is considered to be 'Very Low' at NVSRs if noise levels are sufficiently low such they do not have the potential to cause or contribute to some harmful or otherwise unwanted effect. Similarly a small change in noise level where noise levels are already high would result in a greater magnitude of effect than those above. Consequently, the absolute levels of road traffic noise have also been considered in terms of guidance contained within the WHO 'Guidelines for Community Noise' and the Noise Insulation Regulations (NIR) (Ref 15.16).

4.5.18 The NIR provides a $L_{A10,18h}$ level above which insulation would be offered, assuming other factors are satisfied. This level applies to permanent traffic or construction traffic where the road is being altered or built and therefore the need to provide noise insulation does not apply here. However, they have been used to evaluate significance. For daytime traffic, the combined traffic noise level from the new or altered highway together with other traffic in the vicinity must not be less than 68 dB $L_{A10,18hr}$ and the contribution to the increase in the relevant noise level from the new or altered highway must be at least 1 dB. This corresponds to a free-field level of 63 dB $L_{Aeq,16h}$. Therefore a change in traffic noise levels of greater than 1 dB would result in a 'medium' magnitude effect, and a change of 3 dB would result in a 'high' magnitude of effect if the combined traffic noise level exceeds 63 dB $L_{Aeq,16h}$.

4.5.19 The WHO '*Guidelines for Community Noise*' provides guidance on noise levels for typical situations. For daytime external noise levels, it is considered that:

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

the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.'

4.5.20 On the basis of this guidance, noise effects from road traffic are only considered to be significant if the traffic noise level exceeds a level of 50 dB $L_{Aeq,16hr.}$ Below this level, the magnitude of effect is at most 'very low' from this source alone.

Magnitude of effect from Construction Vibration

4.5.21 Criteria for assessing the significance of construction vibration have been based on the guidance given in BS 5228-2:2009+A1:2014. Table 15.7 below details potential vibration levels measured in terms of Peak Particle Velocity (PPV) based on the guidance in BS 5228-2:2009+A1:2014 and provides a semantic scale for construction vibration effects on human receptors. For magnitudes of medium or high effect, consideration has been given to the duration of the proposed works.

Table 15.7: Criteria for Magnitude of Effect from Vibration

Peak Particle Velocity	Description	Magnitude of Effect
< 0.14 mm/s	Vibration is unlikely to be perceptible	No effect
≥ 0.14 mm/s < 0.3 mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very Low
≥ 0.3 mm/s < 1.0 mm/s	Vibration might just be perceptible in residential environments.	Low
≥ 1.0 mm/s < 10 mm/s	It is likely that vibration of this level in residential environments would cause complaint, but can be tolerated if prior warning	Medium

Table 15.7: Criteria for Magnitude of Effect from Vibration		
Peak Particle Velocity	Description	Magnitude of Effect
	and explanation has been given to residents.	
≥ 10 mm/s	Vibration is likely to be intolerable for any more than a brief exposure to this high level.	High

4.5.22 Vibration from construction activities can impact on adjacent buildings. The criteria used in this assessment relate to the potential for cosmetic damage, not structural damage. Table 15.8 below provides the vibration limits contained within BS 5228-2:2009+A1:2014 above which cosmetic damage could occur. Minor damage is possible at vibration magnitudes that are greater than twice those given in Table 15.8 and major damage to a structure may occur at values greater than four times the tabulated values. The limits are the same as are found in BS 7385-2:1993 '*Evaluation and measurement of vibration in buildings - Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings*' (British Standards Institution 1993) (Ref 15.17), which would be applicable for effects beyond the construction phase.

Table 15.8: Threshold Vibration Values for the Evaluation of Cosmetic Buidling Damage (BS 5228-2:2009+A1:2014)			
Building Classification	Frequency of Range of Vibration (Hz)	PPV mm/s[1]	
		Transient Vibration	Continuous Vibration
Unreinforced or light framed structures[2] Residential or light commercial type buildings[2]	4 Hz to 15 Hz	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	7.5 mm/s at 4 Hz increasing to 10 mm/s at 15 Hz
	15 Hz and above	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above	10 mm/s at 15 Hz increasing to 25 mm/s at 40 Hz and above
Reinforced or framed structures	4 Hz and above	50	25

Table 15.8: Threshold Vibration Values for the Evaluation of Cosmetic Buidling Damage (BS 5228-2:2009+A1:2014)			
Building Classification	Frequency of Range of Vibration (Hz)	PPV mm/s[1]	
		Transient Vibration	Continuous Vibration
Industrial and heavy commercial buildings			
Notes: 1. Values relate to the base of the building. 2. For lightweight structures, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded			

4.5.23 The scale adopted for the magnitude of effect due to building damage has been based upon the criteria contained within Table 15.8 and is provided in Table 15.9 below.

Table 15.9: Scale for Magnitude of Effect - Construction Vibration - Building Damage	
Vibration Level (PPV mm/s[1])	Magnitude of Effect
Below the values provided in Table 15.8	Very Low
Equal, to twice the values provided in Table 15.8	Low
Twice to four times the values provided in Table 15.8	Medium
More than four times the values provided in Table 15.8	High
Notes: 1. Values relate to the base of the building.	

4.5.24 For working areas, where there is the potential for blasting activity to take place, additional vibration criteria following guidance in MTAN1 have been applied. At these working areas, ground vibration at the nearest sensitive

receptor, as a result of blasting, should not exceed a PPV of 6 mm/s in 95% of all blasts measured over any six month period. Additionally, no individual blast should exceed a PPV of 10 mm/s.

Significance of Effects

4.5.25 The significance has been evaluated at each individual receptor for each activity. With the exception of building damage, the significance of effects has generally been evaluated from the matrix provided in Table 15.10 below. However, this matrix is not exhaustive to all situations, and professional judgement has been applied at times where it has been considered necessary to deviate from this approach. In particular, for works that are likely to be of shorter duration than one month the resulting significance of effects has been determined on a case-by-case basis taking into account the activities involved and the overall duration of the works.

Table 15.10: Significance of Effects

Magnitude of Effect	Sensitivity of Receptor			
	High	Medium	Low	Very Low
High	Major	Major	Moderate	Minor/Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor/Negligible	Negligible	Negligible	Negligible
No Effect	No Effect	No Effect	No Effect	No Effect

4.5.26 Unlike other effects identified in this ES chapter, the significance of effect for building damage is not dependent upon the occupant and use of the building. Therefore, for all identified receptors the significance of effect equates to the magnitude of effect as provided in Table 15.9.

4.5.27 There is potential for noise and vibration effects from each construction source to be combined with noise and vibration effects from other construction sources. For receptors where there is the potential for noise effects from multiple construction sources, the effects of each source at each receptor has

been reviewed in order to gauge the combined potential significance of noise effects on that receptor. This is provided in 'section 9.11 combined effects from all sources of construction noise and vibration'.

4.6 ASSUMPTIONS AND LIMITATIONS

4.6.1 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.

4.6.2 Due to the scale (linear extent and overall size) of the Proposed Development, it was not possible, or considered necessary, to carry out sound monitoring at a representative location for every receptor that could be affected by the Proposed Development. However, monitoring has been carried out at the receptors that are in closest proximity to the main construction compounds and tunnelling construction compounds. Where proxy locations or alternative baseline data have been used, these are generally at receptors that would be less affected by noise from the Proposed Development. Uncertainty in the baseline data has been reduced significantly by carrying out long term monitoring over a period of at least seven days, allowing analysis of how representative the baseline data is given the naturally varying noise level at the receptors. This approach has been discussed and agreed with IACC and Gwynedd Council,

4.6.3 Uncertainty due to instrumentation error has been significantly reduced with the introduction of modern instrumentation and is reduced further by ensuring that all instrumentation is calibrated before and after each measurement period and is within accepted laboratory calibration intervals.

4.6.4 Where quantitative assessments have been undertaken, these are based on likely source levels provided by manufacturers, existing empirical data and relevant British Standards. This approach minimises uncertainty associated with the source inputs in sound propagation models that have been used.

4.6.5 There are uncertainties in any sound propagation prediction methodology. The methodology in Annex F of BS 5228-1:2009+A1:2014 is generally only applicable for distances of up to 300 m due to the exclusion of meteorological effects, which have a greater bearing on the propagation of sound as the distance between the source and receiver is increased. In general, this method is more likely to result in an over-estimate than an underestimate of effects at more remote receptors.

4.6.6 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 kilometre (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.

4.6.7 For the traffic noise model, predictions only consider noise from road links for which traffic data have been provided. The predictions do not include noise from any other sources, such as wind/environmental noise, agricultural activity or industry.

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, 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 main assessment has been undertaken based upon the design shown on the Works Plans **(Document 4.4)**, the Construction Plans **(Documents 5.4.1.1 and 5.4.1.2)** and the Design Plans **(Document 4.13)**. To take account of the flexibility allowed for in the DCO, consideration has been given to the potential for effects to be of greater significance should any of the permanent or temporary infrastructure elements be moved within the Limits of Deviation (LOD) or Order Limits.

5.2.2 Where relocating temporary or permanent infrastructure within the LOD may result in an increase to the significance of an effect, an environmental commitment has been made, where possible, to restrict works in these areas. The Schedule of Environmental Commitments is provided in Volume 7 **(Document 7.4.2.1)** for more information. Although no environmental commitments have been made specifically for construction noise or vibration, this assessment has been carried out on the basis that the commitments outlined in this Schedule would be in place. In addition, the engineering constraints described in Chapter 6, 'EIA Methodology and Basis of Assessment' **(Document 5.6)** have been taken into consideration within this assessment.

5.2.3 The assumptions made regarding the use of flexibility for the main assessment, and any alternative assessment, are set out in Table 15.11 below.

Table 15.11 Flexibility Assumptions		
Element of flexibility	Proposed Development assumption for main assessment	Alternative assumptions made for worst case, if different from main assessment
Horizontal Limits of Deviation for pylons and conductors	The pylon is assessed in its current lateral location as shown on the Works Plans **(Document 4.4)**. The conductors have been assessed based on the location of the pylons and centreline shown in on the Works Plans **(Document 4.4)**.	The assessment has considered the possible effects of locating pylons or conductors anywhere else within the LOD. This is discussed further in section 9.5 'installation of pylons and conductors and pylon dismantling'.
Vertical Limits of Deviation for pylons	Assessed at the height shown on the Pylon Schedule **(Document 5.3.2.1)**.	N/A
Pylon footprint	The potential variation in the size of the pylon footprint has not been considered relevant to the assessment of construction noise and vibration effects.	N/A
Pylon foundation type	Tube piling would generate a higher level of noise than pad foundations and, due to the height of the rig, is more difficult to mitigate. Therefore, the assessment has been carried out on the basis that all working areas would require tube piling. In practice, pad foundations would be used in some locations due to the ground conditions.	N/A

Table 15.11 Flexibility Assumptions		
Element of flexibility	Proposed Development assumption for main assessment	Alternative assumptions made for worst case, if different from main assessment
	Augered piling may also be used in some locations, which would result in a lower magnitude of effect at receptors. Therefore, the assessment in this ES can be considered as a worst case for this aspect.	
Tunnel alignment within LOD	The assessment considers that the tunnel alignment could be located anywhere within the LOD.	N/A
Tunnel depth	Assessed at the minimum depth below ground at each location based on the vertical LOD.	N/A
Braint and Tŷ Fodol Tunnel construction compounds	The plant is located in the position indicated on the Design Plans **(Document 4.13)**.	Although in practice plant may be relocated to a different location within the construction compounds, the works would be subject to the s. 61 application process, so the noise and vibration effects would be controlled. Therefore an alternative worst-case assessment is not required.
Pentir Substation Extension	The assessment has been undertaken based on the Design Plans **(Document 4.13)**.	N/A
Wylfa Substation	The assessment has been undertaken based on the	N/A

Table 15.11 Flexibility Assumptions		
Element of flexibility	Proposed Development assumption for main assessment	Alternative assumptions made for worst case, if different from main assessment
	Design Plans **(Document 4.13)**.	
Access tracks and working areas	Access tracks and working areas would be located where they are currently shown on the Construction Plans **(Document 5.4.1.1)**.	The assessment has considered the possible effects of locating access tracks and working areas anywhere else within the Order Limits.
Penmynydd Road Construction Compound	Construction work could take place anywhere within the compound area identified on the Works Plans **(Document 4.4)**.	N/A
Pentir Construction Compound	Construction work could take place anywhere within the compound area identified on the Works Plans **(Document 4.4)**.	N/A
Third Party Services	It has been assumed that all third party services would be undergrounded within the LOD shown on the Third Party Services Construction Plans **(Document 5.4.1.2)**. Access tracks and working areas would be located where they are currently shown on the Third Party Services Construction Plans **(Document 5.4.1.2)**.	N/A

5.3 CONSIDERATION OF SCENARIOS

5.3.1 Three sets of scenarios have been considered in the assessment which are:

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

5.3.2 Table 15.12 details where these scenarios are relevant to the noise and vibration assessment and how they have been assessed in 'section 9 mitigation and residual effects'.

Table 15.12 Assumptions for Scenarios

Option	How it has been considered within the assessment
Option A and B	For the majority of assessments, there are no differences in the effects on receptors between Options A and B. The only exceptions are traffic on the access tracks and pylon construction. For these assessments, the calculations have been provided for each receptor and, where there are any differences in the resulting significance of effect, these have been reported.
Direction and method of tunnelling (Scenarios 1, 2 and 3)	There would be more noise generating plant within the drive shaft site compound. Therefore, only the worst case of Scenarios 1 and 2 (i.e. the drive shaft) has been assessed at each of the Tunnelling Construction Compounds. Scenario 3 has been assessed for both Tunnelling Construction Compounds. To summarise, the following scenarios have been considered: Braint TCC – Scenarios 1 and 3 Tŷ Fodol TCC – Scenarios 2 and 3
Construction traffic using the existing A5025 (Link 1) alignment or using the new alignment as proposed by	These works would only influence receptors within the study area for construction traffic routes. Therefore, an additional scenario has been considered within the traffic assessment for

Table 15.12 Assumptions for Scenarios	
Option	How it has been considered within the assessment
Horizon Nuclear Power.	receptors that would be affected by this re-routeing.

5.4 SENSITIVITY TEST

Construction Start Date

5.4.1 Under the terms of the draft DCO **(Document 2.1)**, construction could commence in any year up to five years following the grant of the DCO. Consideration has been given to whether the potential mitigation or residual effects reported in this chapter would differ if construction were to commence in any year up to and including the fifth year.

5.4.2 There is the potential for long term changes to the baseline due to, for example, traffic growth; however, the quieter baseline condition is a worst case for the assessment of construction noise. 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 of the Proposed Development **(Document 5.4)**.

Duration of Construction Activities.

5.4.3 It is possible that some construction activities may take a longer or shorter length of time to complete than currently predicted in the construction programme used for the purposes of the assessment. Certain assessment methodologies use defined durations when considering effects within the assessment, for example in relation to peak periods of construction, such as that considered for construction traffic effects (consideration is given to the peak week of traffic and the average weekly traffic over the peak year). To ensure a robust assessment, additional consideration has been given to any difference in the effects as assessed should there be any increases or decreases in the duration of individual construction activities, or indeed the construction programme as a whole.

5.4.4 For construction noise and vibration, it is considered that there is no potential for changes to the duration of construction activities, or the programme as a whole, to alter the assessment findings as reported in ‘section9 Mitigation and Residual Effects’.

6 Study Area

6.1 NOISE

6.1.1 For the assessment of construction noise impacts, the study area is dependent upon the source of noise, the duration of works and the times of day at which works are likely to take place. This is considered necessary as some works are likely to generate higher levels of noise and the time and duration of work has been taken into account when determining the threshold at which a significant noise effect is likely to occur.

6.1.2 The following study areas for noise generating works have therefore been adopted.

- Construction compounds with daytime use only – 500 m from the boundary of the construction compound; these are identified in Figure 15.2 **(Document 5.15.1.2)**.
- Overhead line (OHL) pylon construction, pylon dismantling and pulling positions – 250 m from the edge of the working areas; these are identified in Figure 15.3 **(Document 5.15.1.3)**.
- Construction compounds and tunnelling sites with 24 hr use – 1 km from the boundary of the construction compound; these are identified in Figure 15.4 **(Document 5.15.1.4)**.
- Underground tunnelling works – 50 m from the LOD for the tunnel for the TBM method and 100 m from the LOD for the D&B method; these are identified in Figure 15.5 **(Document 5.15.1.5)**.
- Construction access tracks – 250 m from the order limits; these are identified in Figure 15.6 **(Document 5.15.1.6)**.
- Construction Traffic Routes – 250 m from either side of each road link on which construction traffic would be generated, i.e. a 500 m corridor; these are identified in Figure 15.7 **(Document 5.15.1.7)**.

6.1.3 These study areas align with standard practice for construction projects and have been discussed with IACC and Gwynedd Council.

6.2 VIBRATION

6.2.1 Vibration levels attenuate very rapidly within the ground. Therefore, smaller study areas have been defined for working areas where activities may include significant vibration sources; these have been identified as follows.

- Construction compounds and tunnel construction compounds – 100 m from the boundary of the construction compound; these are identified in Figure 15.2 **(Document 5.15.1.2)**.
- OHL pylon construction – 100 m from the edge of the working areas; these are identified in Figure 15.3 **(Document 5.15.1.3)** where piling may be required.
- Vibratory compaction for construction of access tracks, culverts and bridges – 100 m from the edge of the access tracks; these are identified in Figure 15.6 **(Document 5.15.1.6)**.
- Underground tunnelling works – 50 m from the LOD for the tunnel for the TBM method and 100 m from the LOD for the D&B method; these are identified in Figure 15.5 **(Document 5.15.1.5)**.

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 baseline 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, 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. Although there are some busy main roads, including the A5, A55, A487 and B4547, the noise level from traffic also decreases in the late evening and night-time.

7.1.3 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 data processing methodology are given in the Baseline Sound Monitoring Report presented in Appendix 15.2 **(Document 5.15.2.2)**.

7.1.4 Significant baseline sources of vibration have not been identified in the area and, therefore, detailed baseline studies of vibration have not been undertaken as is consistent with most similar studies. Effects from vibration during the construction phase have been determined on the basis of the thresholds in the relevant guidance independent of the baseline levels which will be very low and below levels of perception.

7.2 CONSTRUCTION NOISE AND VIBRATION SENSITIVE RECEPTORS

7.2.1 Table 15.13 details the number and classification of receptors that have been identified within the study areas for construction noise and vibration.

7.2.2 The majority of receptors are residential and are of medium sensitivity. There are also a high proportion of holiday lets, hotels, caravans, caravan parks, chalets, campsites and places of worship that are all of medium sensitivity. There are two care homes that fall within the study areas for the OHL construction and access tracks that are of high sensitivity. There are various

other commercial and industrial uses that have been classified as low or very low sensitivity.

7.2.3 The Anglesey AONB and part of the grounds for Plas Newydd lie within the study areas for the Braint Tunnel Construction Compound (TCC) and underground tunnelling works and Faenol Park lies within the study area for underground tunnelling works. It is understood that these areas are recognised for their tranquillity and are visited by holidaymakers and day visitors for this reason. The users of the AONB, Plas Newydd and Faenol Park have therefore been recognised as receptors of medium sensitivity.

Table 15.13 Summary of Identified Receptors

Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
Penmynydd Road Construction Compound	Noise	21	7 residential (houses): **medium** sensitivity. 7 commercial (unclassified): **low** sensitivity 7 commercial (workshop/industrial): **very low** sensitivity
	Vibration	0	n/a
Pentir Construction Compound	Noise	5	2 residential (houses): **medium** sensitivity. 2 caravans: **medium** sensitivity. 1 restaurant/cafeteria: **low** sensitivity.
	Vibration	0	n/a
Wylfa Substation Construction Compound	Noise	0	n/a
	Vibration	0	n/a
Pentir Substation Construction Compound	Noise	5	3 residential (houses): **medium** sensitivity. 1 caravan: **medium** sensitivity. 1 holiday let: **medium** sensitivity.
	Vibration	0	n/a
	Noise	10	6 residential (houses): **medium** sensitivity.

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
Pentir Substation Extension			3 caravans: **medium** sensitivity. 1 holiday let: **medium** sensitivity.
	Vibration	0	n/a
Installation of pylons and conductors and pylon dismantling	Noise	289 Option A	2 care / nursing home: **high** sensitivity 253 residential (houses / flats): **medium** sensitivity 3 hotel / motel / holiday let / short-term accommodation: **medium** sensitivity 11 caravans / caravan parks / chalets: **medium** sensitivity 2 places of worship: **medium** sensitivity 1 cattery / kennel: **low** sensitivity 5 commercial (unspecified): **low** sensitivity 1 public house / bar / night-club: **low** sensitivity 8 retail (incl shop / showroom / warehouse & premises): low sensitivity 3 industrial (warehouse / store / storage depot / manufacturing): **very low** sensitivity
		288 Option B	252 residential (houses / flats): **medium** sensitivity All others identical to Option A

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
	Vibration	52 Options A and B	44 residential (houses): **medium** sensitivity 4 caravans / chalets / caravan parks: **medium** sensitivity 2 retail / shop: **low** sensitivity 2 commercial (unspecified): **low** sensitivity
Braint Tunnel Construction Compound	Noise	113	94 residential (houses): **medium** sensitivity 3 caravan / chalet: **medium** sensitivity 1 educational establishment (Conway Centre): **medium** sensitivity Anglesey AONB and Plas Newydd: **medium** sensitivity 11 shop / showroom / retail unit: **low** sensitivity 1 commercial (unspecified): **low** sensitivity 1 workshop / light industrial: **very low** sensitivity
	Vibration	0	n/a
Tŷ Fodol Tunnel Construction Compound	Noise	102	82 residential (houses / flats): **medium** sensitivity 2 holiday let / boarding / guest house: **medium** sensitivity 1 campsite: **medium** sensitivity 8 caravan / caravan park: **medium** sensitivity

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
			1 restaurant / cafeteria: **low** sensitivity 1 office / work studio: **low** sensitivity 1 leisure facility: **low** sensitivity 2 shop / showroom: **low** sensitivity 4 warehouse / factory / workshop: **very low** sensitivity
	Vibration	0	n/a
Underground Tunnelling Works	Noise and Vibration	13 (TBM method)	8 residential (houses): **medium** sensitivity 1 caravan: **medium** sensitivity 1 educational establishment (Conway Centre): **medium** sensitivity Anglesey AONB, Plas Newydd and Faenol Park (users of): **medium** sensitivity
		19 (D&B method)	12 residential (houses): **medium** sensitivity 1 caravan: **medium** sensitivity 1 educational establishment (Conway Centre): **medium** sensitivity Anglesey AONB, Plas Newydd and Faenol Park (users of): **medium** sensitivity 1 leisure centre: **low** sensitivity 1 restaurant / cafeteria: **low** sensitivity
Construction of Access Tracks	Noise	619 Option A	2 care / nursing home: **high** sensitivity 545 residential (houses / flats): **medium** sensitivity

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
Culverts and Bridges Traffic on Access Tracks			11 hotel / motel / holiday let / short-term accommodation / guest house: **medium** sensitivity 21 caravans / caravan parks / chalets: **medium** sensitivity 3 places of worship: **medium** sensitivity 1 campsite: **medium** sensitivity 1 school: **medium** sensitivity 1 cattery / kennel: **low** sensitivity 11 commercial (unspecified): **low** sensitivity 1 public house / bar / night-club: **low** sensitivity 16 retail (incl shop / showroom / warehouse & premises): low sensitivity 5 industrial (warehouse / store / storage depot / manufacturing): **very low** sensitivity 1 petrol station: **very low** sensitivity
		620 Option B	2 care / nursing home: **high** sensitivity 546 residential (houses / flats): **medium** sensitivity All others identical to Option A 11 hotel / motel / holiday let / short-term accommodation / guest house: **medium** sensitivity 21 caravans / caravan parks / chalets: **medium** sensitivity 3 places of worship: **medium** sensitivity

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
			1 campsite: **medium** sensitivity 1 school: **medium** sensitivity 1 cattery / kennel: **low** sensitivity 11 commercial (unspecified): **low** sensitivity 1 public house / bar / night-club: **low** sensitivity 16 retail (incl shop / showroom / warehouse & premises): low sensitivity 5 industrial (warehouse / store / storage depot / manufacturing): **very low** sensitivity 1 petrol station: **very low** sensitivity
	Vibration	259	219 residential (houses / flats): **medium** sensitivity 5 hotel / motel / holiday let / short-term accommodation / guest house: **medium** sensitivity 8 caravans / caravan parks / chalets: **medium** sensitivity 2 places of worship: **medium** sensitivity 6 commercial (unspecified): **low** sensitivity 1 public house / bar / night-club: **low** sensitivity 14 retail (incl shop / showroom / warehouse & premises): low sensitivity 4 industrial (warehouse / store / storage depot / manufacturing): **very low** sensitivity

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
			(note that although the number of receptors is identical for Options A and B, there is one residential property which is in the study area for Option A and not for Option B, and vice versa)
Construction Traffic Routes	Noise	4,561 with existing A5025 (Link 1) alignment (see Section 7.3 'existing baseline')	4 care / nursing home: **high** sensitivity 4020 residential (houses / flats): **medium** sensitivity 30 caravan / chalet / caravan park: **medium** sensitivity 27 hotel / motel / holiday let / short-term accommodation / guest house: **medium** sensitivity 1 campsite: **medium** sensitivity 21 place of worship / village hall / community centre: **medium** sensitivity 14 school / college: **medium** sensitivity 3 hospital / healthcare service: **medium** sensitivity 4 library / museum / educational establishment: **medium** sensitivity 7 leisure facility: **low** sensitivity 114 offices / workplace: **low** sensitivity 90 commercial (unspecified): **low** sensitivity 12 public house / bar / night-club: **low** sensitivity 120 retail: **low** sensitivity

Table 15.13 Summary of Identified Receptors			
Study Area	Type of Effect	Number of Identified Receptors	Receptor Types
			12 restaurant / cafeteria: **low** sensitivity 77 industrial (factory/ warehouse / workshop / storage depot / manufacturing): **very low** sensitivity 5 petrol station: **very low** sensitivity
		468 along the revised A5025 (Link 1) alignment and the other offline highway improvements (see Section 7.4 'future baseline')	442 residential (houses / flats): **medium** sensitivity 3 caravan / chalet / caravan park: **medium** sensitivity 1 campsite: **medium** sensitivity 2 place of worship / village hall / community centre: **medium** sensitivity 3 school / college: **medium** sensitivity 1 offices / workplace: **low** sensitivity 3 commercial (unspecified): **low** sensitivity 2 public house / bar / night-club: **low** sensitivity 6 retail: **low** sensitivity 4 industrial (factory/ warehouse / workshop / storage depot / manufacturing): **very low** sensitivity 1 petrol station: **very low** sensitivity

7.3 EXISTING BASELINE

7.3.1 The baseline sound levels have been evaluated for each receptor. Receptors have been grouped to the most appropriate monitoring location and a numerical level has been applied for the appropriate periods based on an appraisal of the long term and short-term data as indicated in 'section 4.3 baseline data gathering and forecasting methods'. At some locations, existing ambient sound levels during the daytime and weekend periods have been

determined from the traffic data provided for the assessment for the base year (2016) in 'section 7 Baseline Conditions' of Chapter 13 Traffic and Transport **(Document 5.13)** and from existing traffic data for the A55. These data are considered appropriate to reflect the baseline conditions for reasons explained in 'section 4.3 baseline data gathering and forecasting methods'.

7.3.2 Table 15.14 provides a summary of the representative baseline ambient sound levels that have been used for the numerical assessment of construction noise effects, where applicable. Each of the areas to which these apply are indicated in Figure 15.1 (**Document 5.15.1.1**). A full list of the baseline levels adopted for each receptor is provided in Appendix 15.3 Baseline Sound Levels Used for Numerical Assessment of Effects (**Document 5.15.2.3**). Levels have been rounded to the nearest whole number in accordance with best practice.

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks
A	47	46	-	0	0	0	0	0	10	13
A2	45	44	-	0	0	0	0	0	20	83
B	43	42	-	0	0	0	0	0	16	27
B1	48	47	-	0	0	0	0	0	12	38
C	46	44	-	0	0	0	0	0	7	13
C2	50	48	-	0	0	0	0	0	3	6
D	47	45	-	0	0	0	0	0	23	36

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks
E	49	48	-	0	0	0	0	0	35	44
F	44	42	-	0	0	0	0	0	15	26
H	48	46	-	0	0	0	0	0	46	57
I	41	39	-	0	0	0	0	0	1	2
I2	51	49	-	0	0	0	0	0	9	17
J	46	45	-	0	0	0	0	0	14	50
K	60	59	-	1	0	0	0	0	0	1

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks
L	48	43	-	2	0	0	0	0	2	4
L1	51	50	-	22	0	0	0	0	3	5
M	49	46	-	0	0	0	0	0	6	7
M1	46	43	-	0	0	0	0	0	3	3
N	48	45	38	0	0	0	5	0	2	8
N1	55 - 66[2]	52 - 63[2]	38	0	0	0	17	0	13	62
N2	57 - 67[2]	54 - 64[2]	38	0	0	0	11	0	15	29

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks
N3	52 - 58[2]	49 - 55[2]	38	0	0	0	4	0	6	10
O	45	41	37	0	0	0	7	0	0	4
O1	48	44	38	0	0	0	5	0	0	6
O2	53 - 65[2]	50 - 62[2]	38	0	0	0	14	0	0	0
O4	52 - 66[2]	49 - 63[2]	38	0	0	0	46	0	0	38
P	49	44	39	0	0	0	0	30	5	10
P2	52 - 61[2]	49 - 58[2]	39	0	0	0	0	28	0	0

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks
Q	47	44	35	0	3	7	0	25	5	10
R	47	46	-	0	1	3	0	0	0	0
S	49	45	37	0	1	0	0	19	3	10
T	49	45	37	0	1	0	0	0	0	0

Notes:

1. Periods identified are as follows: Daytime (Monday to Friday 07:00 to 19:00 hrs, Saturday 07:00 to 13:00 hrs), Weekend (Saturday 13:00 to 19:00 hrs, Sunday 09:00 to 17:00 hrs), Night-time (23:00 to 07:00 hrs).

Table 15.14 Representative Baseline Ambient Sound Levels Used for Assessment

Area ID	Representative Baseline Ambient Sound Levels L_{Aeq} dB			Number of Receptors in Assessment for Each Study Area						
	Daytime[1]	Weekend[1]	Night-time[1]	Penmynydd Road Construction Compound	Pentir Construction Compound	Pentir Substation Construction Compounds	Braint Tunnel Construction Compound	Tŷ Fodol Tunnel Construction Compound	Pylon Construction, Conductor Stringing and Pylon Dismantling	Construction of Access tracks, Culverts and Bridges and Traffic on Access Tracks

2. These levels have been determined from traffic data and a range of levels all of the receptors within this study area has been provided here. Refer to Appendix 15.3 **(Document 5.15.2.3)** for full list.

7.4 FUTURE BASELINE PREDICTIONS

7.4.1 The future baseline traffic data indicate that there would be a minor increase in baseline noise levels from road traffic due to natural growth. However, the increases are very low and are unlikely to have an influence on the assessment. Therefore, these changes have only been accounted for within the road traffic noise assessment as they are unlikely to influence other assessments. The future baseline does not include traffic generated by the decommissioning of the existing Wylfa Nuclear Power Station or the construction of the Wylfa Newydd Power Station; this is considered in 'section 10 cumulative effects' as cumulative development.

7.4.2 The assessment of traffic on construction traffic routes has considered two scenarios for future baseline, one using the existing A5025 (Link 1) alignment and the other based on the offline highway improvements being delivered by Horizon as part of the Wylfa Newydd Power Station development. For the second scenario, only receptors within 250 m of the revised A5025 (Link 1) alignment have been considered.

8 Potential Effects

8.1 INTRODUCTION

8.1.1 This section describes the potential noise and vibration effects that could occur as a result of the construction, maintenance and decommissioning of the Proposed Development in the absence of any mitigation. As maintenance activities would be similar to construction activities, albeit less extensive, the construction assessment has also been used as a proxy for maintenance works. This is with the exception of the shaft and tunnel construction as no similar maintenance works would occur. Potential sources of noise and vibration are provided in Table 15.15, for the construction (C), decommissioning (D) and maintenance (M) phases.

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development

Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise from preparation and use of construction compounds for the OHL and substations, and construction of the substation extensions.	Preparatory works would take place over a period of around three weeks. The preparatory works associated with construction compounds require the use of noise generating equipment including excavators, backhoe loaders, rollers and dump trucks transporting material. A generator is also likely to be required to provide power for site offices and lighting. During the construction of the Proposed Development the construction compounds would be used to store equipment and	A study area of 500 m from the boundary of construction compounds has been considered. A total of 21 receptors from the Penmynydd Road Construction Compound, 5 receptors from the Pentir Construction Compound and 5 receptors from	✓	✓	

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	therefore there is potential for noise from vehicles moving around the construction compound offloading and reloading. This would take place over the full construction period for the Proposed Development. Reinstatement works would require similar plant and equipment to preparatory works. Substation extension works include the installation of and removal of equipment and are not significantly different from activities within the construction compounds which are closer to noise sensitive receptors. The installation of gantries is considered within pylon construction works below. Works at Penmynydd Road and Pentir construction compounds would take place during standard working hours for the Proposed Development i.e. 07:00 – 19:00 hrs Monday to Saturday and 09:00 to 17:00 on Sundays. Works at the Substation construction compounds would take place during standard working hours from BS 5228-1:2009+A1:2014 i.e. 07:00 –	the Pentir Substation Construction Compound have been identified within these study areas. No receptors have been identified within the study area around Wylfa Substation Construction Compound, so this has not been included in the assessment. These study areas are identical for Options A and B.			

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	19:00 hrs Monday to Friday and 07:00 to 13:00 on Saturdays.				
Vibration from preparation and use of construction compounds for the OHL and substations.	There is potential for vibration effects during the preparatory phase if vibratory rollers are used depending on the ground type and distance between the source and receiver.	A study area of 100 m from the boundary of construction compounds has been considered. These study areas are identical for Options A and B. No receptors have been identified within the study area around Penmynydd Road Construction Compound, Pentir Construction Compound, Pentir Substation Construction Compound or Wylfa Substation Construction Compound. Therefore there is no requirement to assess this aspect.	✓	✓	

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise from substation works.	Substation works would include the levelling and creation of the substation platform for construction; the construction of equipment foundations; removal and installation of security fence; installation of equipment and the installation and removal of the cables. Substation works would take place during standard working hours from BS 5228-1:2009+A1:2014 i.e. 07:00 – 19:00 hrs Monday to Friday and 07:00 to 13:00 on Saturdays.	A study area of 500 m from the boundary of substation working areas has been considered. A total of 10 receptors for works at Pentir Substation have been identified within these study areas. No receptors have been identified within the study area around Wylfa Substation, so this has not been included in the assessment. These study areas are identical for Options A and B.	✓	✓	✓
Vibration from substation works.	There is potential for vibration effects during the preparatory phase if vibratory rollers are used depending on the ground type and distance between the source and receiver.	A study area of 100 m from the boundary of the substation working areas has been considered. These study	✓	✓	

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
		areas are identical for Options A and B. No receptors have been identified within the study area around Pentir Substation or Wylfa Substation.			
Noise from installation of access tracks, culverts and bridges.	Construction of access tracks, culverts and bridges is likely to comprise similar activities for those associated with the instatement of construction compounds and work areas identified above and therefore could result in noise effects at locations within close proximity to the working areas. Access track construction would progress at a rate of approximately 50 m per day, and therefore would only be within the vicinity of each receptor for around a week or less. Works would take place during standard working hours. Installation of culverts and bridges have the potential to result in noise effects. These activities are very temporary, i.e. generally less than a week.	A study area of 250 m from the order limits excluding a small section around the Menai Strait where no access tracks are proposed. A total of 619 receptors have been identified within the study area for Option A and 620 within the study area for Option B.	✓		

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	Reinstatement works would require similar plant and equipment to preparatory works. All works associated with installation of access roads culverts and bridges would take place during standard working hours.				
Vibration from installation of access tracks, culverts and bridges.	There is potential for vibration effects during the preparatory phase if vibratory rollers are used depending on the ground type and distance between the source and receiver.	A study area of 100 m from the order limits excluding a small section around the Menai Strait where no access tracks are proposed. A total of 259 receptors have been identified within the both the study area for Option A and for Option B. Although the number of receptors is identical for Options A and B, there is one residential property which is in the study area for Option A and not for Option B, and vice versa.	✓		

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise from installation of pylon working areas and works within, including pylon construction, conductor stringing and dismantling of existing pylons.	The overall works associated with each pylon working area would take approximately two to three months for each pylon. Preparatory works would take place over a period of approximately three weeks. The preparatory works associated with working areas require the use of noise generating equipment, including excavators, backhoe loaders, rollers and dump trucks transporting material. The most noise generating aspect of pylon construction would be the foundation works. Pylon foundations would either be installed pad foundations or as piled foundations. The type of foundation used would be dependent upon local ground conditions and other specific requirements for that working area. However, both methods have the potential to cause a noise effect. The erection of the steelwork, installation of insulators and conductor stringing would result in lower effects than the foundation construction. Pylon foundation piling would take place over a period of approximately three weeks.	A study area of 250 m from the edge of each working area has been considered. A total of 289 receptors have been identified within the study area for Option A and 288 for Option B.	✓	✓	✓

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	Other activities including pylon erection and conductor stringing would be for a shorter duration, interspersed with quiet periods where no works would take place. All works associated with pylon construction, other than the installation and removal of conductors, pilot wires and associated protective netting across highways, railway lines or watercourses would take place during standard working hours.				
Vibration from installation of pylon working areas, and works within including pylon construction, conductor stringing and dismantling of existing pylons.	There is potential for vibration effects during the preparatory phase if vibratory rollers are used, depending on the ground type and distance between the source and receiver. There is also potential for vibration from piling works for new pylon foundations.	A study area of 100 m from the edge of each pylon working area has been considered. A total of 52 receptors are within these study areas for both Option A and Option B.	✓	✓	✓

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise and vibration from activities within the tunnel construction compounds including enabling works, construction of the shafts and works associated with tunnelling.	Enabling works within the TCCs would take approximately three months and would be during standard daytime construction hours only i.e. 07:00 – 19:00 hrs Mondays to Fridays and 07:00 – 13:00 hrs on Saturdays. Typical plant during this phase would include excavators, dump trucks, loading shovels and bulldozers. The current engineering design schedules indicate that the initial stages of shaft construction works could be carried out during the enabling phase at Braint TCC. This would include advanced peripheral curtain grouting around the shaft to fill all voids within the ground around the extrados of the shaft and reduce the transverse water flow during shaft excavation. Tunnel construction would commence with a shaft being constructed within each tunnel construction compound by caisson down to a depth of around 11 m and then drill and blast down to the depth at which the tunnelling would commence. Shaft construction, would take approximately 6 to 9 months for each shaft and could result in	A study area of 1 km from the edge of the tunnel construction compounds has been considered. A total of 113 receptors from Braint construction compound and 102 receptors from at Tŷ Fodol construction compound have been identified within these study areas. There are no receptors within the 100 m study area around either Braint or Tŷ Fodol Tunnelling Construction Compound. Therefore there is no requirement to assess this aspect. These study areas are identical for Options A and B.	✓		

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	both noise and vibration effects on the surface. Tunnelling could be either by TBM from either direction (Scenarios 1 and 2) or D&B (Scenario 3) from both directions. Therefore, there is potential for noise and vibration effects to occur at receptors around either or each of the tunnelling construction compounds dependent upon the method chosen. The TBM method would either be an Earth Pressure Balance Machine (EPBM) or a slurry TBM. TBM sections and associated equipment would be lowered down using cranes and would be lifted out with cranes at the opposite end. The majority of works within the tunnel construction compounds would be similar whichever method is used. Both the TBM and D&B methods would require use of a gantry crane to lower equipment and materials into the shaft and to hoist equipment, materials and spoil out of the tunnel/shaft. A concrete batching plant may also be required to operate for the D&B method which would not be required for the TBM				

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	method. If a slurry TBM is used, the majority of material would be pumped from the tunnel and fed into a slurry screening system within the construction compound of the drive site. This would operate continuously throughout the tunnel boring works as required. For the EPBM and D&B method, spoil would be removed by wagons on the temporary construction railway (TCR). Ventilation of the tunnel would be provided by fans located around the base of the shaft and along the tunnel as necessary. For either method, pumps would be required for dewatering in both the drive shaft site and reception shaft site. Generators would be used during the enabling works, which would be during the daytime only. However, for the main tunnel works, the TCC would be mains powered, so large generators would not be required except for emergency use. The main noise generating plant would be compressors, pumps and, if the TBM method is used, slurry screening plant, all of which would be running continuously				

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	throughout the tunnel construction period. Spoil would be stockpiled within the tunnel construction compounds and transported off-site during standard working hours. Reinstatement works would require similar plant and equipment to enabling works. Service shafts and tunnels would be also be constructed at the TCCs. These works would be for a shorter duration and employ a similar method to those for the tunnel construction.				
Noise and vibration from underground tunnelling works.	Perceptible vibration and/or groundborne noise from underground tunnel boring or D&B works is only likely to occur for a short duration at any one receptor as the TBM or blast face traverses past. The duration of perceptibility/audibility would depend upon machine progress/speed or blast progress but is unlikely to extend beyond one to two days at any one receptor for the TBM but possibly a few additional days for D&B due to the more	For groundborne noise and vibration, a study area of 50 m from the horizontal LOD has been adopted for the TBM method and 100 m from the horizontal LOD has been adopted for the D&B method. There are a total of 13 receptors within the study area for the TBM	✓		

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
	impulsive nature of the blasting. Effects are also only likely to be perceptible/audible at receptors that are within close proximity of around 50 m from the tunnel or less, either horizontally or vertically for the TBM method, and around 100 m for the D&B method. For the TBM method, whilst spoil would be pumped from the TBM to the slurry plant on the surface for processing, a small temporary TCR would be provided within the tunnel for the transport of men and materials. However, if an EPBM type TBM is used or the tunnelling is by D&B, the TCR will also transport spoil arisings from the face back the base of the shaft for EPBM or shafts for D&B. The passage of this railway would result in groundborne noise effects which may be audible at noise sensitive receptors, possibly during the day but more likely at night. There is potential for effects where receptors would be within 50 m of the tunnel alignment.	method and 19 receptors within the study area for the D&B method. This study area is identical for Options A and B.			

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise and vibration from traffic on the access tracks.	The use of the access tracks would generate noise from construction vehicles, including HGVs within the vicinity. Traffic would follow the approved routeings in the Construction Traffic Management Plan **(Document 7.5)** and HGV movements would only take place during the standard construction hours. HGVs or other traffic on the access tracks are unlikely to generate vibration due to low speeds and assuming that the tracks will be well maintained to provide a smooth running surface. On this basis, this is not considered further and there is no separate section on vibration from traffic on access tracks.	A study area of 250 m from the order limits excluding a small section around the Menai Strait where no access tracks are proposed. A total of 619 receptors have been identified within the study area for Option A and 620 within the study area for Option B.	✓	✓	

Table 15.15: Potential Noise and Vibration Effects of the Proposed Development					
Potential Effect	Description	Receptor	Phase		
			C	D	M
Noise from road traffic on the construction traffic routes	There would be increased heavy goods traffic generation during the construction of the Proposed Development, which would cause increases in noise levels on the public highway. Traffic would follow the approved routeings in the Construction Traffic Management Plan **(Document 7.5)** and HGV movements would only take place during the standard construction hours.	A study area of 250 m from the edge of each construction traffic route has been considered. A total of 4,561 receptors have been identified within the study area for construction traffic routes with the existing A5025 (Link 1) alignment. A total of 468 receptors have been identified within the study area for the revised A5025 (Link 1) alignment and the other offline highway improvements (see Section 7.4 'future baseline'). These study areas are identical for Options A and B.	✓		

9 Mitigation and Residual Effects

9.1 INTRODUCTION

9.1.1 This section sets out the mitigation and residual effects for noise and vibration during construction, decommissioning and maintenance of the Proposed Development. The initial effects have been evaluated for each activity identified. Mitigation measures have been proposed where appropriate and residual effects have been evaluated. A final summary has been provided of the potential effects at individual receptor locations.

9.1.2 Within this section, effects of maintenance and decommissioning are not reported separately, as those related to noise and vibration would typically be the same, or possibly lower, than those experienced during construction.

9.2 MITIGATION

Mitigation by Design

9.2.1 As construction effects are, in general terms, temporary (although works at the tunnelling sites will be longer term), they have not been a prominent factor in the design of the Proposed Development, although some mitigation by design has been possible.

9.2.2 The Penmynydd Road Construction Compound would be sited in its proposed location, rather than the field directly adjacent, to increase the distance to the nearest residential property at Tyn y Felin.

Control and Management Measures

9.2.3 General mitigation measures as set out in the CEMP **(Document 7.4)** that help to manage construction noise effects are summarised in Table 15.16. In addition to these, and as referred to in NV11 in the CEMP and below, a Noise and Vibration Management Plan (NVMP) **(Document 7.9)** has been produced which sets out the noise and vibration control measures, and other processes, in more detail that would be employed to minimise adverse noise and vibration effects.

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
General Principles	
GP11	**GP11** Construction hours are set out in Requirement 8 of the draft DCO (**Document 2.1**). The core working hours will be between the hours of 0700 to 1900 hrs Monday to Saturday and between 0900 and 1700 on Sundays. Percussive piling works will be limited to 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Tunnelling works may take place outside of the core working hours subject to the following restrictions: • blasting at the tunnel shaft locations are limited to 10:00 to 16:00 hours Monday to Friday and 10:00 to 13:00 on Saturdays; and • surface drilling and curtain grouting associated with shaft construction is limited to Monday to Friday 07:00 to 19:00 hours and 07:00 to 13:00 hours on Saturdays.
GP21 to GP27	These measures relate to community engagement and public information. They include the provision of a 24 hour free telephone hotline and a project website which would be established and managed by the community relations team. Also included is a procedure for dealing with complaints. Full details are provided in the CEMP **(Document 7.4)**.
Noise and Vibration Control	
NV11	A Noise and Vibration Management Plan (NVMP) **(Document 7.9)** has been produced which sets out the noise and vibration control

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
	measures, and other processes, that would be employed by the contractors to minimise adverse noise and vibration effects.
NV12	Noise and vibration monitoring will be carried out as appropriate at or around residential properties or any other identified sensitive structures during the construction phase to check compliance with the construction noise and vibration limits and thresholds as set out in the NVMP (**Document 7.9**).
NV13	The proposed hours of work during the construction phase are set out in section 2.2 of the CEMP (**Document 7.4**) and Requirement 8 (**Document 2.1**). If necessary, consent will be sought by the contractor under Section 61 of the Control of Pollution Act 1974 (CoPA) as described in the NVMP (**Document 7.9**).
NV14	Standard best practice construction working methods would be adopted, which include: • all vehicles, plant and equipment associated with the construction works will be properly maintained in good efficient working order, fitted with effective exhaust silencers and operated in such a manner to avoid causing excessive noise emissions; • low noise generators and quieter plant and equipment will be used, as far as reasonably practicable; • as far as reasonably practicable, all major compressors will be 'sound-reduced' models fitted with properly lined and sealed acoustic covers which will be kept closed whenever the machines are in use and all ancillary pneumatic percussive tools shall be fitted with mufflers or silencers of the type recommended by the manufacturers; • static plant (such as pumps, compressors and generators) and equipment liable to create noise and/or vibration whilst in operation will, as far as reasonably practicable, be positioned so as to cause minimum noise disturbance, i.e. located away from sensitive receptors;

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
	• audible warning systems, such as vehicle reversing sirens, will normally be set to as low a setting as is compatible with safety requirements; white noise reversing alarms will be used where it is considered safe to do so; • loading and unloading activities will be located as far a reasonably practicable away from sensitive receptors; • construction traffic movements will be undertaken in accordance with the Outline Construction Traffic Management Plan (**Document 7.5**); • access tracks will be well maintained during construction works and any potholes will be filled in and any uneven surfaces smoothed out as soon as reasonably practicable; • plant and equipment will be shut down when not in use; • drop heights of materials will be minimised; • employees, subcontractors and persons employed on site will not cause unnecessary noise from engine revving etc; and • temporary hoardings or noise barriers around worksites or noisy activities will be provided where necessary to ensure the construction noise limits/thresholds specified in the NVMP (**Document 7.9**) are met.
Noise and Vibration – Overhead Line Construction	
NV21	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, the following will be implemented: • quality assurance through manufacturing and transportation to avoid damage to OHL conductors; and • ensuring that conductors are kept clean and free of surface contaminants during stringing / installation.

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
NV22	For whatever ground conditions and commensurate foundation construction is required for each pylon, the contractor will employ the quietest plant and methods of construction appropriate to the foundation type required for the ground conditions.
Noise and Vibration – Tunnel Construction	
NV31	Surface drilling and curtain grouting associated with shaft construction is limited to Monday to Friday 07:00 to 19:00 hours and 07:00 to 13:00 hours on Saturdays.
NV32	During the drill and blast activities, the following measures will be implemented to limit noise and vibration: • During shaft construction a specially designed blast mat will be placed on the base of the shaft prior to each blast as required to reduce the generated noise among other purposes. • Blasting of the shafts will only take place between 10:00 hrs and 16:00 hrs Monday to Friday and between 10:00 hrs and 13:00 hrs on Saturdays as set in in GP11. • Local residents and businesses will be given advanced warning of when periods of blasting would take place. • Vibration and air overpressure from blasting will be assessed and controlled by the appropriate contractor. • Air overpressure and vibration monitoring will be carried out to determine levels relative to any required noise or vibration limits as required. • Will be implemented to prevent exceedance of limits/thresholds as set out in the NVMP (**Document 7.9**). • Blast design measures will include refraining from simultaneous blasting (i.e. blasting from both ends of the tunnel at the same time), whilst beneath the Menai Strait.

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
	• Other design measures include not exceeding The maximum total blast weight per round for drill and blast of the tunnel will not exceed 300 kg under the Menai Strait. • As stipulated in the design, and not exceeding The maximum number of blasts for drill and blast of the tunnel per 24 hours will not exceed six.
NV33	Ground vibration as a result of blasting, would be controlled such that it would not exceed a peak particle velocity (PPV) of 6 mm.s-1 in 95% of all blasts measured over any six month period at the nearest sensitive receptor. Additionally, no individual blast would exceed a PPV of 10 mm.s-1 at the nearest sensitive receptor.
NV34	A power supply will be provided to the Braint and Tŷ Fodol construction compounds to power tunnelling activities. Generators will only be used as back up or in the case of an emergency
NV35	Works within the construction compounds at Braint and Tŷ Fodol, where 24-hour working will be required, will be subject to full noise predictions and consequential Section 61 applications which will demonstrate the applied BPM.
NV36	Surface vibration from underground works, excluding TBM and drill and blast, but including the temporary construction railway, would be controlled such that it would not exceed noise and vibration a levels/thresholds at nearest sensitive receptors as set out in the NVMP (**Document 7.9**).
NV37	The following measure will be applied to the temporary construction railway (TCR) within the tunnel where identified as being necessary: • Smooth rails (reconditioned or new rails without corrugations or discrete irregularities) will be installed at the start of the

Table 15.16: General CEMP Measures Relevant to Noise and Vibration Effects	
Code	Description
	works with joints which won't exceed a variation in rail height difference of than 2 mm; • adequate elasticity in the track support system will be provided in order to reduce the transmission of vibration and groundborne noise from the passage of rail vehicles, for example the use of resilient rail pads in the fastening system between the rails and the sleepers; • the locomotive speed will be appropriately restricted; • a maintenance programme will be instigated that ensures the condition of the track does not deteriorate over time thereby causing excess noise or vibration levels; and • should the final alignment of the tunnel pass within 100 m of any properties considered sensitive (either due to effects on residents or effects on sensitive building contents or fabrics), then appropriate noise and vibration monitoring will be carried prior to and during tunnelling and during the initial use of the TCR. •
NV38	Residents within 100 m of the tunnel alignment will be provided with written notification in advance of the tunnelling activities

Mitigation Measures

Noise has been considered in the design and layout of the tunnel construction compounds at Braint and Tŷ Fodol. The following measures have been employed:

- sensitive positioning of the plant with high noise emissions within the construction compounds; and
- use of enclosures and screens around plant, where required.

9.2.4 Further details regarding mitigation assumptions are provided in Appendix 15.4 **(Document 5.15.4.4)**.

9.2.5 It should be noted that the above measures are outline only and the final design would be dependent on the outcome of the s. 61 process and any further commitments made within the CEMP **(Document 7.4)** or the NVMP **(Document 7.9)** as these are further developed.

9.2.6 In some cases, additional mitigation measures have been provided that are not included above or in the CEMP **(Document 7.4)**. These additional measures have been identified within the relevant sections below.

9.3 CONSTRUCTION COMPOUNDS (OHL AND SUBSTATIONS)

Noise

9.3.1 Noise levels resulting from typical activities in the OHL and substation construction compounds have been assessed at the nearest noise sensitive receptors (NVSRs) through calculations based on the methodology in BS 5228-1:2009+A1:2014. It is not anticipated that 24-hour working would be required at these construction compounds and that weekend working would not be required for substation works. On this basis, assessments have been provided for the daytime and weekend periods for the OHL construction compounds and the daytime period for the substation construction compounds.

9.3.2 Calculations have been carried out both for the temporary works involved in the instatement of construction compounds and typical activities within the construction compounds for the ongoing works.

9.3.3 A description of works within the construction compounds is provided in Chapter 4, Construction, Operation, Maintenance and Decommissioning of the Proposed Development **(Document 5.4)**, section 2. Temporary works involved in the instatement of the construction compounds have been assessed according to the criteria for short-term works. The construction compounds would be in use throughout the construction period, so the assessment of typical on-going activities has been carried out according to the criteria for long term works.

9.3.4 Works within the OHL and substation construction compounds could take place anywhere within the areas identified on the Works Plans **(Document 4.4)**. The locations of the construction compounds and substation works are fixed and are identical for Options A and B.

9.3.5 Mitigation measures that apply for the construction compounds for the OHL and substations are set out below:

CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14

Penmynydd Road Construction Compound

9.3.6 The following receptor types are located in the study area for noise from the Penmynydd Road Construction Compound:

- seven residential (houses): **Medium** sensitivity;
- seven commercial (unclassified): **Low** sensitivity; and
- seven commercial (workshop/industrial): **Very Low** sensitivity.

9.3.7 The results of the calculations for the above receptors are provided in Appendix 15.5 **(Document 5.15.2.5)**.

9.3.8 A summary of the residual effects for each type of receptor are provided in Table 15.17 below. It should be noted that, during the installation of the construction compound, there would be an effect of medium magnitude at one receptor and a low magnitude at the remaining receptors during the weekend period. However, as these works would be for less than one month, and would only exceed the criterion for a medium or low magnitude of effect at the weekend, this has not been considered in the overall magnitude or significance of effect below.

Table 15.17: Summary of Residual Noise Effects from works at Penmynydd Road Construction Compound

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
1	Medium	Low	Minor
6	Medium	Very Low	Negligible
6	Low	Low	Negligible
1	Low	Very Low	Negligible
6	Very Low	Low	Negligible
1	Very Low	Very Low	Negligible

9.3.9 The magnitude of effects would be **low** to **very low** for 21 receptors of **medium**, **low** and **very low** sensitivity, resulting in residual effects that would

be **minor** (**not significant**) at one receptor and **negligible (not significant)** at the remaining 20 receptors.

Pentir Construction Compound

9.3.10 The following receptor types are located in the study area for noise from the Pentir Construction Compound:

- two residential (houses): **Medium** sensitivity;
- two caravans: **Medium** sensitivity; and
- one restaurant/cafeteria: **Low** sensitivity.

9.3.11 The results of the calculations for the above receptors are provided in Appendix 15.6 **(Document 5.15.2.6)**.

9.3.12 A summary of the residual effects for each type of receptor are provided in Table 15.18 below. It should be noted that, during the installation of the construction compound, there would be an effect of low magnitude at all five receptors during the weekend period. However, as these works would be for less than one month and would only exceed the criterion for a low magnitude of effect at the weekend, this has not been considered in the overall magnitude of effect below.

Table 15.18: Summary of Residual Noise Effects from works at Pentir Construction Compound

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
4	Medium	Very Low	Negligible
1	Low	Very Low	Negligible

9.3.13 The magnitude of effects would be **very low** for five receptors of **medium** and **low** sensitivity. Therefore the residual effects would be **negligible (not significant)**.

Pentir Substation Construction Compound

9.3.14 The following receptor types are located in the study area for noise from the Pentir Substation Construction Compound:

- three residential (houses): **Medium** sensitivity;
- one caravan: **Medium** sensitivity; and

- one holiday let: **Medium** sensitivity.

9.3.15 The results of the calculations for the above receptors are provided in Appendix 15.7 **(Document 5.15.2.7)**.

9.3.16 A summary of the residual effects for each type of receptor are provided in Table 15.19 below.

Table 15.19: Summary of Residual Noise Effects from works at Pentir Substation Construction Compound

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
5	Medium	Very Low	Negligible

9.3.17 The magnitude of effects would be **very low** for five receptors of **medium** sensitivity, resulting in a **negligible (not significant)** residual effect.

Wylfa Substation Construction Compound

9.3.18 No receptors fall within the 500 m study area for noise from the Wylfa Substation Construction Compound. Therefore, noise from works within the construction compound at Wylfa is not anticipated to result in significant adverse noise effects.

Vibration

9.3.19 No receptors fall within the 100 m study areas for vibration from the Penmynydd Road, Pentir, Pentir Substation or Wylfa Substation Construction Compounds. Therefore, vibration from works within the construction compounds is not anticipated to result in significant adverse effects.

9.4 SUBSTATION WORKS

Noise

Pentir Substation

9.4.1 The installation and removal of equipment associated with the substation works at Pentir would include the levelling and creation of the substation platform for construction; the construction of equipment foundations; removal and installation of security fence; installation of equipment and the installation and removal of cables. Works could take place at any time during the construction period. However, there are likely to be periods of inactivity between phases and the total duration of noise generating works is likely to

be under three years. In general, the installation of equipment and cables would involve less noise generating plant and activities than the preliminary phases. The highest noise levels would be experienced during the installation of security fences when pneumatic breakers would be required to break out existing concrete, which would be for a period of approximately three months. Other phases would generate lower levels of noise but take place over a longer period.

9.4.2 It is anticipated that these works would all take place during the daytime period, so only this period has been considered in this assessment. Any works outside of this period would be subject to s. 61 applications.

9.4.3 Mitigation measures that apply for substation works are set out below:

CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14

9.4.4 The following receptor types are located in the study area around Pentir substation:

- six residential (houses): **Medium** sensitivity;
- three caravans: **Medium** sensitivity; and
- one holiday let: **Medium** sensitivity.

9.4.5 The results of the calculations for the above receptors are provided in Appendix 15.8 **(Document 5.15.2.8)**.

9.4.6 A summary of the residual effects for each type of receptor over all phases of working are provided in Table 15.20 below.

Table 15.20: Summary of Residual Noise Effects from works at Pentir Substation

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
3	Medium	Low	Minor
7	Medium	Very Low	Negligible

9.4.7 The magnitude of effects would be **low** for three receptors of **medium** sensitivity, resulting in a **minor** (**not significant**) residual effect. There would

be a **negligible (not significant)** residual effect at the remaining seven receptors.

Wylfa Substation

9.4.8 No receptors fall within the 500 m study area for noise from Wylfa Substation. Therefore, noise from works within Wylfa Substation is not anticipated to result in significant adverse noise effects.

Vibration

9.4.9 No receptors fall within the 100 m study areas for vibration from Pentir or Wylfa Substation. Therefore, vibration from works within the substations is not anticipated to result in significant adverse vibration effects.

9.5 INSTALLATION OF ACCESS TRACKS, CULVERTS AND BRIDGES

9.5.1 A description of works within the construction compounds are provided within Chapter 4, Construction, Operation, Maintenance and Decommissioning of the Proposed Development **(Document 5.4)**, section 2. It is estimated that both topsoil stripping and access road construction would be carried out at a rate of approximately 50 m per day. Therefore, any noise and vibration exposure to these works would be for very short durations at the nearest receptors. Culvert crossings are estimated to take a total of two days per crossing and bridges between four and 20 days per crossing dependent on bridge foundations.

9.5.2 Mitigation measures that apply for the installation of access tracks, culverts and bridges for the OHL and substations are set out below:

CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14.

Noise

9.5.3 Table 15.21 provides details of the receptor types located in the study area for noise from the construction of access tracks, culverts and bridges. These are also shown on Figure 15.6 **(Document 5.15.1.6).** Appendix 15.9 **(Document 5.15.2.9)** provides a full list of the receptors considered in the assessment and the results of the assessments of noise effects from these works.

Table 15.21: Summary of Receptors within Noise Study Area for Construction of Access Tracks, Culverts and Bridges

Receptor Type	Sensitivity	Total
Care / Nursing Home	High	2
Residential (flats / houses)	Medium	545 Option A 546 Option B
Caravan / Caravan Park / Chalet	Medium	21
Holiday Let / Hotel / Guest House	Medium	11
Campsite	Medium	1
Place of Worship	Medium	3
School	Medium	1
Commercial (unspecified)	Low	11
Public House / Bar / Nightclub	Low	1
Cattery / Kennel	Low	1
Retail / Shop / Showroom	Low	16
Industrial (Warehouse / Store / Storage Depot / Workshop	Very low	5
Petrol Filling Station	Very low	1

9.5.4 Where receptors are within 250 m of a bridge crossing, there is the potential the that overall works could be for a duration of slightly longer than one month and, therefore, the magnitude of effect at these receptors from construction of access tracks, culverts and bridges would be **low**. At the remaining receptors, the magnitude of effect would be **very low**, A summary of the effects at receptors from construction of access tracks, culverts and bridges is provided in Table 15.22 below.

Table 15.22: Summary of Residual Noise Effects from Construction of Access Tracks, Culverts and Bridges

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
2	High	Very Low / No Effect	Minor / Negligible
39	Medium	Low	Minor

544	Medium	Very Low / No Effect	Negligible
2	Low	Low	Negligible
27	Low	Very Low / No Effect	Negligible
2	Very Low	Low	Negligible
4	Very Low	Very Low / No Effect	Negligible

9.5.5 The two receptors that are of **high** sensitivity are the care homes at Beudygwyn Farm and Glyn Ewryd. Beudygwyn Farm is circa 200 m from the order limits and Glyn Ewryd is circa 120 m from the order limits. Both have other buildings between them and the nearest section of the order limits that would partially screen any noise from works within these areas. Therefore, it is considered that the effect is **negligible (not significant)** in these locations. There would be a **low** magnitude of effect at 39 receptors that are of **medium** sensitivity, resulting in a **minor** (**not significant**) effect. For all other receptors that are of a **medium** sensitivity or lower, the effect would be **negligible (not significant)**.

Vibration

9.5.6 Table 15.23 provides details of the receptor types located in the study area for vibration from the construction of access tracks, culverts and bridges. These are also shown on Figure 15.6 **(Document 5.15.1.6).** Appendix 15.9 **(Document 5.15.2.9)** provides a full list of the receptors considered in the assessment and the results of the assessments of vibration effects from these works.

Table 15.23: Summary of Receptors within Vibration Study Area for Construction of Access Tracks, Culverts and Bridges

Receptor Type	Sensitivity	Total
Residential (flats / houses)	Medium	219
Caravan / Caravan Park / Chalet	Medium	8
Holiday Let / Hotel / Guest House	Medium	5
Place of Worship	Medium	2
Commercial (unspecified)	Low	6
Public House / Bar / Nightclub	Low	1
Retail / Shop / Showroom	Low	14

Table 15.23: Summary of Receptors within Vibration Study Area for Construction of Access Tracks, Culverts and Bridges		
Receptor Type	Sensitivity	Total
Industrial (Warehouse / Store / Storage Depot / Workshop	Very low	4

9.5.7 There is one receptor within 100 m of a bridge crossing that could be exposed to works for a duration of more than one month. However, vibration from works is likely to be intermittent and, therefore, less than one month in practice. As the actual duration of vibration exposure is likely to be less than one week for most locations, the magnitude of effect is considered to be at most **very low** and, therefore, as all receptors are of **medium** sensitivity or lower, the effect would be **negligible (not significant)** for all receptors.

9.6 INSTALLATION OF PYLONS AND CONDUCTORS AND PYLON DISMANTLING

Noise

9.6.1 Table 15.24 contains a list of the receptor types that are located in the study area for pylon construction, conductor stringing and dismantling works. This study area has been defined as a distance of 250 m from each working area. Therefore, not all of these receptors would be in the study areas for all of the activities associated with installation or dismantling of pylons.

Table 15.24: Summary of Receptors within Noise Study Area for Installation of Pylons and Conductors and Pylon Dismantling		
Receptor Type	Sensitivity	Total
Care / Nursing Home	High	2
Residential (Flats / Houses)	Medium	253 Option A 252 Option B
Caravan / Caravan Park / Chalet	Medium	11
Hotel / Motel / Holiday Let / Short-term Accommodation	Medium	3
Place or Worship	Medium	2
Cattery / Kennel	Low	1
Commercial (unspecified)	Low	5

Table 15.24: Summary of Receptors within Noise Study Area for Installation of Pylons and Conductors and Pylon Dismantling		
Receptor Type	Sensitivity	Total
Public House / Bar / Nightclub	Low	1
Retail / Shop / Showroom	Low	8
Industrial (Warehouse / Store / Storage Depot /Workshop	Very low	3

9.6.2 Mitigation measures required are set out below:

CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.

Pylon construction

9.6.3 Instatement of the pylon working areas would be a similar activity to access track construction as identified in section 9.5 'installation of access tracks, culverts and bridges'.

9.6.4 Each working area would take approximately one week to construct. As instatement works would be of a relatively short duration compared to piling, and would result in lower levels of noise at NVSRs, only noise from foundation construction works has been considered for pylon construction working areas.

9.6.5 Construction of pylon foundations would either be pad, mini pile or tube pile. The selection of foundation type would depend upon the ground conditions encountered. The installation of pad foundations would take approximately three weeks for each pylon (four pads). Mini pile or tube pile foundations would take approximately four weeks for each pylon including pile caps.

9.6.6 All three foundation methods have the potential to generate high levels of noise, although in practice, driven tube piling is likely to be worst-case, as it is difficult to mitigate the noise level when using this method due to the height of the main source. An assessment has therefore been carried out on the basis that driven tube piling would be employed for each pylon base.

9.6.7 An assessment of noise levels from piling works, should this worst case method be required for these works, has been carried out at the nearest noise sensitive receptors through a calculation based on the methodology in BS

5228-1:2009+A1:2014. The calculations include typical plant associated with piling works.

9.6.8 Noise generating works within pylon construction areas would be limited to 07:00 to 19:00 hrs Mondays to Fridays and 07:00 to 13:00 hrs on Saturdays, so assessments have been provided for the daytime period. Individual receptors are unlikely to be affected by these works for a period of greater than six months so the criteria for short-term works have been used. The results of the calculations are provided in Appendix 15.10 **(Document 5.15.2.10)**.

9.6.9 A summary of the residual noise effects for each sensitivity of receptor are provided in Table 15.25 below, as well as the number of working areas for which each magnitude of effect threshold is exceeded. Note that where there is a difference in the magnitude/significance of effect for Options A and B, the worst-case of the two options has been presented for that receptor.

9.6.10 It is important to note that, for the purposes of this assessment, it has been assumed that all foundations would be piled, in reality this is unlikely to be the case, Appendix 3.1, Indicative Pylon Schedule **(Document 5.3.2.1)** provides the indicative foundation method for each pylon.

Table 15.25: Summary of Residual Noise Effects from Pylon Construction Works									
Quantity of Receptors	Sensitivity of Receptor	Total Number of Pylon Construction Working Areas	Number of Pylon Construction Working Areas Producing Magnitude of Effect					Magnitude of Effect	Significance of Effect[1]
			High	Medium	Low	Very Low	No Effect		
1	Medium	1	1	0	0	0	0	High	Major
Total									
1									**Major**
8	Medium	1	0	1	0	0	0	Medium	Moderate
5	Medium	2	0	1	0	1	0	Medium	Moderate
9	Medium	2	0	1	1	0	0	Medium	Moderate
1	Medium	3	0	1	1	1	0	Medium	Moderate
1	Medium	3	0	2	1	0	0	Medium	Moderate
Total									
24									**Moderate**
1	High	2	0	0	0	2	0	Very Low	Minor
18	Medium	1	0	0	1	0	0	Low	Minor
38	Medium	2	0	0	1	1	0	Low	Minor
7	Medium	2	0	0	2	0	0	Low	Minor

Table 15.25: Summary of Residual Noise Effects from Pylon Construction Works									
Quantity of Receptors	Sensitivity of Receptor	Total Number of Pylon Construction Working Areas	Number of Pylon Construction Working Areas Producing Magnitude of Effect					Magnitude of Effect	Significance of Effect[1]
			High	Medium	Low	Very Low	No Effect		
4	Medium	3	0	0	1	2	0	Low	Minor
1	Medium	3	0	0	3	0	0	Low	Minor
3	Medium	4	0	0	2	2	0	Low	Minor
1	Medium	4	0	0	3	1	0	Low	Minor
2	Medium	5	0	0	2	3	0	Low	Minor
1	Medium	6	0	0	3	3	0	Low	Minor
1	Low	1	0	1	0	0	0	Medium	Minor
Total									
76									**Minor**
111	Medium	1	0	0	0	1	0	Very Low	Negligible
42	Medium	2	0	0	0	2	0	Very Low	Negligible
1	Medium	4	0	0	0	4	0	Very Low	Negligible
6	Low	1	0	0	0	1	0	Very Low	Negligible
1	Low	2	0	0	1	1	0	Low	Negligible

Table 15.25: Summary of Residual Noise Effects from Pylon Construction Works

Quantity of Receptors	Sensitivity of Receptor	Total Number of Pylon Construction Working Areas	Number of Pylon Construction Working Areas Producing Magnitude of Effect					Magnitude of Effect	Significance of Effect[1]
			High	Medium	Low	Very Low	No Effect		
5	Low	2	0	0	2	0	0	Low	Negligible
1	Low	3	0	0	1	2	0	Low	Negligible
3	Very Low	2	0	0	0	2	0	Very Low	Negligible
Total									
171									**Negligible**

[1]The significance is based upon effects of 1 or month more; the duration of effects as a result of construction of the pylons would be around 1 month, and not continuous, and is therefore only just at the necessary duration to be considered as significant in this assessment.

9.6.11 The assessment, assuming piling is required for every tower leg, indicates that the magnitude of effect would be **high** at one receptor that is of **medium** sensitivity, resulting in a **major (significant)** effect. However, it is noted that this receptor (R1/01193, Dymchwa) is only affected by one working area which is for pylon number 4ZA016. The indicative foundation type for this pylon, as set out in Appendix 3.1 Indicative Pylon Schedule **(Document 5.3.2.1),** would be a pad foundation and the magnitude of effect would reduce to **medium** and the effect to **moderate (significant)**. Typically, each pylon foundation would only take one month to complete and piling would not be continuous throughout this period. Therefore, these effects are very short-term, i.e. only just within the one to six month period identified in the methodology as a 'short term' effect.

9.6.12 The assessment indicates the magnitude of effect would be **medium** at a total of 26 receptors that are of **medium** sensitivity, resulting in a **moderate (significant)** effect. Where these **moderate** (**significant**) effects occur, these would be from one or two pylon working areas for each receptor. However, in practice, as pad foundations are likely to be used for many locations, it is likely that effects would be reduced in the majority of these locations to **minor (not significant)**, and **moderate** (**significant**) effects would only occur in a few locations. Typically, each area would only take one month to complete and piling would not be continuous throughout this period. Therefore, these effects are very short-term and hence this would reduce the significance of effect.

9.6.13 The magnitude of effect would be **very low** at one receptor of a **high** sensitivity, **low** at a total of 74 receptors that are of **medium** sensitivity, and **medium** at one receptor that is of **low** sensitivity, resulting in **minor** (**not significant**) effects. However, for the reasons stated above, it is expected that some of these effects would reduce to **negligible (not significant)** in practice.

9.6.14 At the remaining 167 receptors, the effect would be **negligible (not significant)**.

9.6.15 There is a variation in the significance of effects at eight locations between Options A and B. One of these is only within the 250 m study area for Option A and is subject to a **negligible (not significant)** effect. For one of these, the effect is **very low** for Option A and **low** for Option B. For six of these, Option B introduces an additional pylon and therefore results in exposure to a longer duration of noise from pylon construction works from the Proposed Development, although the significance of effect remains the same.

9.6.16 There is the potential for pylons to be relocated to another location within the LOD for the Proposed Development. However, it is unlikely that there would be any significant alteration in the location of pylons as shown on the Works Plans **(Document 4.4)** due to the reasons explained in section 8.3 of Chapter 6, EIA Methodology and Basis of Assessment **(Document 5.6)** and the environmental commitments detailed in the Schedule of Environmental Commitments **(Document 7.4.2.1)**. In practice, only minor alterations to the current pylon locations are likely to occur. This would be not dissimilar to the differences in effects between Options A and B, i.e. for the majority of receptors that are affected by more than one working area, the movement of one pylon closer to the receptor would likely be offset by the movement of another further from the receptor.

Conductor Stringing

9.6.17 The working areas for conductor stringing would be located within the pylon conductor pulling positions. Stringing the conductors would take approximately four weeks per section. The machinery is likely to generate a very low level of noise and therefore would result in a magnitude of effect that would be very low or no effect for all receptors within 250 m of each pulling position as summarised in Table 15.26 below. A full list of receptors at which these effects apply is provided in Appendix 15.10 **(Document 5.15.2.10)**.

Table 15.26: Summary of Residual Noise Effects from Conductor Stringing

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
1	High	Very Low	Negligible
53	Medium	Very Low	Negligible
4	Low	Very Low	Negligible

9.6.18 The magnitude of effect would be **very low** at one receptor that is of **high** sensitivity. As this receptor is around 230 m from the edge of the pulling position, it has been considered that the effect would be **negligible (not significant)**. At the remaining 57 receptors, which are of **medium** and **low** sensitivity, the magnitude of effect would be **very low** and therefore the effect would be **negligible (not significant)**.

Dismantling of Existing Pylons

9.6.19 Pylon dismantling would require similar plant and equipment to installation works. Potential noise generating equipment would include cranes during the

removal of pylons and excavators, backhoe loaders and dump trucks during the reinstatement of soils. An assessment of noise levels from dismantling works has been carried out at the nearest noise sensitive receptors through calculations based on the methodology in BS 5228-1:2009+A1:2014. Dismantling works would take place during core working hours, so assessments have been provided for the daytime and weekend periods. Individual receptors are unlikely to be affected by these works for a period of greater than six months, so the criteria for short-term works have been used.

9.6.20 The results of the calculations are provided in Appendix 15.10 **(Document 5.15.2.10)**.

9.6.21 A summary of the residual noise effects for each sensitivity of receptor are provided in Table 15.27, as well as the number of working areas for which each magnitude of effect threshold is exceeded.

Table 15.27: Summary of Residual Noise Effects from Pylon Dismantling Works									
Quantity of Receptors	Sensitivity of Receptor	Total Number of Pylon Dismantling Working Areas	Number of Pylon Construction Working Areas Producing Magnitude of Effect					Magnitude of Effect	Significance of Effect
			High	Medium	Low	Very Low	No Effect		
4	Medium	1	0	1	0	0	0	Medium	Moderate
1	Medium	2	0	1	1	0	0	Medium	Moderate
Total									
5									**Moderate**
29	Medium	1	0	0	1	0	0	Low	Minor
2	Medium	2	0	0	2	0	0	Low	Minor
Total									
31									**Minor**
1	Medium	1	0	0	0	1	0	Very Low	Negligible
Total									
1									**Negligible**

9.6.22

9.6.23 The magnitude of effect would be **medium** at a total of five receptors that are of **medium** sensitivity, resulting in **moderate** (**significant**) effects. The magnitude of effect would be **low** at a total of 31 receptors that are of **medium** sensitivity, resulting in **minor** effects.

9.6.24 At the remaining receptor, the effect would be **negligible (not significant)**.

9.6.25 Where moderate effects occur, these would only be from one working area for each receptor and would likely be short in duration.

Vibration

9.6.26 The main source of vibration during pylon construction works would be vibration from piling. Although vibratory compaction plant may be used for the establishment of the working area, this would be very short-term. Therefore, piling has been assessed as a worst case effect. The assessment has been carried out based upon the appropriate methodologies in Table E.1 of BS 5228-2:2009+A1:2014.

9.6.27 The following receptors are located within the study area for vibration from pylon construction works:

- 22 (Option A) / 23 (Option B) residential (houses): **Medium** sensitivity;
- three caravans / chalets / caravan parks: **Medium** sensitivity;
- one commercial (unclassified): **Low** sensitivity; and
- one retail: **Low** sensitivity.

9.6.28 For building damage, the above sensitivity criteria do not apply and all receptors are treated as of medium sensitivity. No specific mitigation measures have been proposed to minimise vibration from piling works.

9.6.29 Appendix 15.11 **(Document 5.15.2.11)** provides a prediction of the level of vibration from vibratory piling works over distance for all of the above receptors. A summary of the results of the assessment is provided in Table 15.28. Where there is a difference in the magnitude/significance of effect between Options A and B, the more worst-case of the two options has been presented.

Table 15.28: Summary of Residual Effects from Vibration from Piling Works			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
7	Medium	Low	Minor
41	Medium	Very Low	Negligible
4	Low	Very Low	Negligible

9.6.30 The assessment indicates that the magnitude of effect would be **low** at seven receptors which are all of **medium** sensitivity. Therefore, the effect would be **minor (not significant)**. At the remaining 45 locations, the magnitude of effect is **very low** for receptors of medium or low sensitivity, therefore, the effect is **negligible (not significant).**

9.6.31 The majority of receptors are only within the study area for one pylon working area, with the exception of one receptor (R2/00076, Pen Yr Orsedd) which would be in the study area for two working areas, the temporary pylon 4ZA030T and the permanent pylon 4ZA080. These effects are therefore all short-term.

9.6.32 There is a slight variation in the significance of effects at two locations between Options A and B. One of these is only within the 100 m study area for Option B, and is subject to an effect of **negligible (not significant)**. The other has a **minor (not significant)** effect for Option A and **negligible (not significant)** effect for Option B.

9.6.33 There is the potential for pylons to be relocated to another location within the LOD for the Proposed Development. However, it is unlikely that there would be any significant alteration in the location of pylons as shown on the Works Plans **(Document 4.4)** due to the reasons explained in section 8.3 of Chapter 6, EIA Methodology and Basis of Assessment **(Document 5.6)** and environmental commitments as detailed in the Schedule of Environmental Commitments **(Document 7.4.2.1)**. In practice, only minor alterations to the current pylon locations are likely to occur and the significance of effects at receptor locations are unlikely to vary from those determined in this assessment.

9.6.34 The movement of pylons could introduce more receptors into the study area of 100 m from each working area. However, due to the horizontal constraints, these receptors would be at some distance from a pylon base and therefore the magnitude of vibration effects would be **very low**, and the effect would therefore be negligible (**not significant)**.

9.7 SUMMARY OF EFFECTS FROM OVERHEAD LINE CONSTRUCTION WORKS

9.7.1 There would be combined construction noise and vibration effects from various aspects of construction of the overhead line as receptors in the study area for pylon construction and dismantling works would also be subject to noise and vibration from the construction of the access tracks, culverts and bridges. Some would also be subject to noise from works in construction compounds. A summary of the effects for each construction noise and vibration activity at each receptor is provided in Appendix 15.17 **(Document 5.15.2.17)**.

9.7.2 In general, the worst case activity for each phase of working has been considered in this assessment and the activity resulting in the greatest significance of effect has been considered as the overall effect at that receptor. Thus, although a receptor subject to a moderate effect from pylon construction works could also be subject to a minor effect from the construction of working areas, access tracks, culverts and bridges, and the overall duration is longer than a month, the overall significance of effects would still be moderate. This is even more so as the works would not be continuous for the various different elements and they would be at different distances from receptors. Furthermore, only some of these elements would be required near any receptor, e.g. there may be a combination of a couple but not all of them.

9.8 TUNNELLING WORKS

Noise from Works in Tunnel Construction Compounds

Enabling Works

9.8.1 Enabling works within the TCCs would take approximately three months and would be during standard daytime construction hours only i.e. 07:00 to 19:00 hrs Mondays to Fridays and 07:00 to 13:00 hrs on Saturdays. Typical plant during this phase would include excavators, dump trucks, loading shovels and bulldozers. There would also be generators in the TCC during this phase as the mains power would not be available; however, these would be specified as low noise. Full details of the required plant for this phase of works are provided in Appendix 15.4 ‘Construction Noise and Vibration Model Inputs’ **(Document 15.2.1.4)**.

9.8.2 The construction programme, as set out in Chapter 4, Construction, Operation, Maintenance and Decommissioning **(Document 5.4),** indicates that the initial stages of shaft construction works could be carried out during the enabling phase at Braint TCC. This would include advanced peripheral

curtain grouting around the shaft to fill all voids within the ground around the extrados of the shaft and reduce the transverse water flow into the shaft during shaft excavation. A grouting ring of approximately 19 m in diameter (2 m from the shaft intrados) is set out to drill grout holes at 1 to 1.5 m centres, depending on the permeability of the till. The sequence of drilling and grouting would be determined after the ground investigation during the temporary works design. It is likely that curtain grouting would be required to a depth of 15 m at Braint, due to the likelihood of water ingress, but would not be required at Tŷ Fodol.

9.8.3 Due to the potential for adverse noise effects to occur from surface drilling, noise from this activity has been evaluated at the nearest noise sensitive receptors to the Braint TCC, and included in a separate assessment within the enabling works phase. As this activity is unlikely to be required at Tŷ Fodol, this additional scenario has not been considered within the assessment of works at that site.

Shaft Sinking / Drill and Blast

9.8.4 Shaft sinking would be carried out in two phases. Phase 1 includes segmental caisson construction which, due to the initial soft ground, is likely to be required for both shafts; for approximately 11 m depth at Braint; and 16 m depth at Tŷ Fodol. The caisson method involves lining rings being built on the surface with additional rings continuously added as the caisson sinks as spoil is excavated from surface or within the shaft. Due to the size of the shaft, a pre-cast segmental lining would likely be used. A cutting shoe is included on the base of the first ring.

9.8.5 The excavation can be undertaken from the surface by a grab, allowing the shaft to be excavated in a flooded condition. Alternatively, in dry ground, dry caisson sinking can be undertaken, with excavation from within the shaft. However, in weak and water bearing permeable ground, the dry caisson method combined with advanced peripheral curtain walling grouting around the shaft to provide a dry condition would be used.

9.8.6 The second phase of the shaft sinking works would require drilling of shot holes across the base of the shaft with subsequent blasting and rock clearance, which would commence from the bottom of caisson level. Blasting would be limited to 10:00 to 16:00 hrs Mondays to Fridays and 10:00 to 13:00 on Saturdays. Drilling preparation is expected to occur every other day (drilling and placing charges). It is therefore intended that the blasting would be carried out every other day under controlled conditions at the shaft locations for a period of approximately 6 to 9 months.

9.8.7 The drill and blast technique would be used for the main shaft excavation. During this stage, it would also be necessary to provide initial shaft stabilisation to prevent water ingress by drilling around the shaft circumference and grouting up. This could take place at any time within a 24-hour construction period. However, as the Stage 2 drilling would take place inside the shaft at a depth of greater than 10 m, it is unlikely to result in any significant effects on the surface.

9.8.8 The rock material would be removed using cranes and deposited in muck skips, where it would then be transferred via a conveyor to a storage area. The material would then be shovelled into stone tippers for road transfer away during the day.

9.8.9 There is the potential for vibration and air-overpressure to arise from the blasting activity. Potential noise and vibration from ancillary surface plant, i.e. cranes/HGVs etc., is likely to similar to that generated within the tunnel boring process. These effects have therefore been considered in the following section.

9.8.10 Mains power would have been made available prior to the main shaft sinking works. Therefore, generators would not be required during this period.

9.8.11 A quantitative assessment of noise from activities within the TCCs during the shaft sinking phase has been carried out using plant that is anticipated to be required for this phase. Full details are provided in Appendix 15.4 'Construction Noise and Vibration Model Inputs' **(Document 15.2.1.4)**. The current programme indicates that these works could be carried out at any time during a 24-hour period; therefore, all periods have been included in the assessment. Works would be reduced during the evenings and night-time between 19:00 hrs and 07:00 hrs to exclude mobile plant and HGV movements within the construction compound or on access tracks.

9.8.12 Blasting works would be controlled by blast design and monitoring. Therefore, this aspect has been considered qualitatively. Noise and vibration effects associated with the construction of the service shaft would be the same or lower than those from the main shaft and have therefore not been considered separately.

<u>Noise from Tunnelling Related Works in Tunnel Construction Compounds</u>

9.8.13 The tunnel may either be constructed using a tunnel boring machine (TBM) (Scenarios 1 and 2) or a drill and blast (D&B) (Scenario 3) method. The majority of works within the tunnelling construction compounds would be similar whichever of the two methods is used. Both methods would require use of a gantry crane to lower equipment and materials into the shaft and to

hoist equipment, materials and spoil out of the tunnel/shaft. A concrete batching plant may also be required to operate within the drive shaft site for the D&B method (Scenario 3) which would not be required for the TBM method (Scenarios 1 and 2).

9.8.14 For the TBM method (Scenarios 1 and 2), either an Earth Pressure Balance TBM (EPBM) or slurry TBM system will be used. If the slurry TBM is used, the arisings, in a bentonite slurry, would be pumped from the face along the tunnel and up into a slurry screening system on the surface within the drive shaft site. This would operate continuously throughout the tunnel boring works as required. For the EPBM and the D&B methods (Scenario 3), spoil would be removed by wagons on the TCR and craned up from the base of the shaft to the spoil processing area of the TCC.

9.8.15 Mains power would be used to power the tunnelling activities including the TBM although less power would be required for the D&B method. Therefore, generators would not be required during this phase of works.

9.8.16 Tunnel ventilation during construction would be provided by fans located within the drive shaft and the tunnel as necessary. These would be lowered into the tunnel using a mobile crane or the gantry crane and used to provide cooling/ventilation and fume extraction (for the D&B method) during the tunnelling process. Although these would remain underground for much of the construction period (until the head houses are complete), there would be exhausts located at the surface throughout the tunnelling process.

9.8.17 For both methods, pumps would be required for dewatering in both the drive and reception shaft sites.

9.8.18 For the TBM method, tunnelling could be in either direction but just from one site, so effects have been assessed for both methods at both TCC locations on the assumption that either of the TCCs could be drive sites, as this is the worst-case with respect to potential sources of noise. For the D&B method, the tunnel is likely to be driven from both sites but would join under land so one drive would be much longer than the other.

9.8.19 The works would take place over a period of longer than 6 months and 24-hour working would be required. Therefore, daytime, evening, night-time and weekend works have been considered and the criteria for long term works have been applied for the assessment of effects.

9.8.20 Typical tunnel construction plant and activities have been evaluated using a computer generated model in SoundPLAN v7.4 which utilises the noise propagation calculation from ISO 9613-2. A full list of the plant and equipment

used for each of the two methods for each TCC is provided in Appendix 15.4 'Construction Noise and Vibration Model Inputs' **(Document 15.2.1.4)**.

9.8.21 Noise and vibration effects associated with the construction of the service tunnels would be the same or lower than those from the main tunnel and have therefore not been considered separately.

9.8.22 Mitigation measures for works within the TCCs are as follows:

- CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV31, NV32, NV33, NV34, NV35

Mitigation Measures required to achieve noise limits may include, as necessary:

- Generators used in the enabling works phase to be a low noise specification.
- Ventilation plant for the tunnel fitted with silencers if required to ensure the noise levels on the surface are low.
- During shaft construction and tunnelling works, construction plant will be mitigated to not exceed the noise limits as set out in the NVMP **(Document 7.9)**.
- A solid hoarding of 2.4 m erected around the perimeter of the TCCs.
- During tunnelling works, a 2 m shunt wall positioned on three sides around the temporary spoil storage area.

Braint Construction Compound

9.8.23 The following receptors have been identified within the study area for the Braint Construction Compound:

- 94 residential (houses): **Medium** sensitivity;
- three caravans / chalets: **Medium** sensitivity;
- one educational establishment (Conway Centre): **Medium** sensitivity;
- visitors to areas of the Anglesey AONB and Plas Newydd within 1 km of the construction compound : **Medium** sensitivity;
- eleven shops / showrooms / retail units: **Low** sensitivity;
- one commercial (unspecified): **Low** sensitivity; and

- one workshop: **Very Low** sensitivity.

Enabling Works

9.8.24 The results of the assessment of noise impacts from enabling works in the Braint Construction Compound are provided in Appendix 15.12 **(Document 5.15.2.12)**. A summary of the results of the assessment is provided in Table 15.29 below.

Table 15.29: Summary of Residual Noise Effects from Enabling Works within Braint Construction Compound

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
28	Medium	Very Low	Negligible
2	Low	Very Low	Negligible
72	Medium	No Effect	No Effect
10	Low	No Effect	No Effect
1	Very Low	No Effect	No Effect

9.8.25 During enabling works, the effects would be **negligible (not significant)** or **no effect (not significant)** at all receptors.

Enabling Works with Surface Drilling and Grouting

9.8.26 The results of the assessment of noise impacts from enabling works with surface drilling and grouting in Braint Construction Compound is provided in Appendix 15.12 **(Document 5.15.2.12)**. A summary of the results of the assessment is provided in Table 15.30 below.

Table 15.30: Summary of Residual Noise Effects from Enabling Works with Surface Drilling and Grouting within Braint Construction Compound

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
34	Medium	Very Low	Negligible
5	Low	Very Low	Negligible
66	Medium	No Effect	No Effect
7	Low	No Effect	No Effect

Table 15.30: Summary of Residual Noise Effects from Enabling Works with Surface Drilling and Grouting within Braint Construction Compound			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
1	Very Low	No Effect	No Effect

9.8.27 During enabling works with surface drilling and grouting, the effects would be **negligible (not significant)** or **no effect (not significant)** at all receptors.

Initial Shaft Construction Works – Drill and Blast

9.8.28 With the mitigation measures specified in the mitigation summary box above in place, the magnitude of effects at the nearest locations would be reduced to a **medium** magnitude at the nearest receptor locations. However, these effects would only occur over very short durations during the periods when blasting occurs. Therefore, the residual effects from blasting would be **minor (not significant)** adverse.

Shaft Sinking

9.8.29 The results of the assessment of noise impacts from shaft sinking works in Braint Construction Compound is provided in Appendix 15.12 **(Document 5.15.2.12)**. A summary of the results of the assessment is provided in Table 15.31 below.

Table 15.31: Summary of Residual Noise Effects from Shaft Sinking within Braint Construction Compound			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
10	Medium	Low	Minor
1	Low	Low	Negligible
78	Medium	Very Low	Negligible
5	Low	Very Low	Negligible
12	Medium	No Effect	No Effect
6	Low	No Effect	No Effect
1	Very Low	No Effect	No Effect

9.8.30 During shaft sinking, the magnitude of effect would be **low** at nine receptors which are of **medium** sensitivity, resulting in a **minor** (**not significant**) effect. At the remaining receptors, the effect would be **negligible (not significant)** or **no effect**.

Tunnelling Related Works within the Braint Construction Compound

9.8.31 The results of the assessment of noise impacts from tunnel construction related works within the Braint Construction Compound are provided in Appendix 15.11 **(Document 5.15.2.13)**. A summary of the results of the assessment is provided in Table 15.32 for the TBM method (Scenario 1) and Table 15.33 for the D&B (Scenario 3).

Table 15.32: Summary of Residual Noise Effects from Tunnelling Related Works within the Braint Construction Compound - TBM Method (Scenario 1)

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
10	Medium	Low	Minor
1	Low	Low	Negligible
80	Medium	Very Low	Negligible
11	Low	Very Low	Negligible
1	Very Low	Very Low	Negligible
10	Medium	No Effect	No Effect

Table 15.33: Summary of Residual Noise Effects from Tunnelling Related Works within the Braint Construction Compound – D&B Method (Scenario 3)

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
10	Medium	Low	Minor
1	Low	Low	Negligible
87	Medium	Very Low	Negligible
11	Low	Very Low	Negligible
1	Very low	Very Low	Negligible
3	Medium	No Effect	No Effect

9.8.32 During tunnelling, using the TBM method (Scenario 1), the magnitude of effect would be **low** at ten receptors which are of **medium** sensitivity, resulting in **minor (not significant)** effects. At the remaining receptors the effect would be **negligible (not significant)** or **no effect)**.

9.8.33 During tunnelling, using the D&B method (Scenario 3), the magnitude of effect would be **low** at ten receptors which are of **medium** sensitivity, resulting in **minor (not significant)** effects. At the remaining receptors, the effect would be **negligible (not significant)** or **no effect**.

Tŷ Fodol Tunnel Construction Compound

9.8.34 The following receptors have been identified within the study area for the Tŷ Fodol TCC:

- 82 residential (houses/flats): **Medium** sensitivity;
- two holiday let / boarding / guest house: **Medium** sensitivity
- one campsite: **Medium** sensitivity;
- eight caravans: **Medium** sensitivity;
- one restaurant / cafeteria: **Low** sensitivity;
- one office / work studio: **Low** sensitivity;
- one leisure facility: **Low** sensitivity;
- two shop / showroom: **Low** sensitivity; and
- four warehouse / factory / workshop: **Very Low** sensitivity.

Enabling Works

9.8.35 The results of the assessment of noise impacts from enabling works in the Tŷ Fodol Construction Compound are provided in Appendix 15.13 **(Document 5.15.2.13)**. A summary of the results of the assessment is provided in Table 15.34.

Table 15.34: Summary of Residual Noise Effects from Enabling Works within Tŷ Fodol Construction Compound			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
75	Medium	Very Low	Negligible
3	Low	Very Low	Negligible
3	Very Low	Very Low	Negligible
18	Medium	No Effect	No Effect
2	Low	No Effect	No Effect
1	Very Low	No Effect	No Effect

9.8.36 During enabling works, the effects would be **negligible (not significant)** or **no effect** at all receptors.

Shaft Construction Works – Drill and Blast

9.8.37 With the mitigation measures specified in the mitigation summary box above, the CEMP **(Document 7.4)** and the NVMP **(Document 7.9)** in place, the magnitude of effects at the nearest receptors would reduce to **medium**. However, these effects would only occur over very short periods when blasts occur. Therefore, the residual effects from blasting would be **minor (not significant)**.

Shaft Sinking

9.8.38 The results of the assessment of noise impacts from shaft sinking works in the Tŷ Fodol Construction Compound is provided in Appendix 15.13 **(Document 5.15.2.13)**. A summary of the results of the assessment is provided in Table 15.35 below.

Table 15.35: Summary of Residual Noise Effects from Shaft Sinking within Tŷ Fodol Construction Compound			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
11	Medium	Low	Minor
1	Very Low	Low	Negligible
60	Medium	Very Low	Negligible

Table 15.35: Summary of Residual Noise Effects from Shaft Sinking within Tŷ Fodol Construction Compound			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
3	Low	Very Low	Negligible
2	Very Low	Very Low	Negligible
22	Medium	No Effect	No Effect
2	Low	No Effect	No Effect
1	Very Low	No Effect	No Effect

9.8.39 During shaft sinking, the magnitude of effect would be **low** at 11 receptors which are of **medium** sensitivity, resulting in **minor (not significant)** effects. At the remaining receptors, the effect would be **negligible (not significant)** or **no effect**.

Tunnelling Related Works within the Tŷ Fodol Construction Compound

9.8.40 The results of the assessment of noise impacts from tunnelling related works in the Tŷ Fodol Construction Compound are provided in Appendix 15.13 **(Document 5.15.2.13)**. A summary of the results of the assessment is provided in Table 15.36 for the TBM method (Scenario 2) and Table 15.37 for the D&B method (Scenario 3).

Table 15.36: Summary of Residual Noise Effects from Tunnelling Related Works within Tŷ Fodol Construction Compound – TBM Method			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
15	Medium	Low	Minor
73	Medium	Very Low	Negligible
5	Low	Very Low	Negligible
1	Very Low	Low	Negligible
3	Very Low	Very Low	Negligible
5	Medium	No Effect	No Effect

9.8.41 During tunnelling works using the TBM method (Scenario 2), the magnitude of effect would be **low** at 15 receptors which are of **medium** sensitivity,

resulting in **minor (not significant)** effects. At the remaining receptors the effect would be **negligible (not significant)** or **no effect)**.

Table 15.37: Summary of Residual Noise Effects from Tunnelling Related Works within Tŷ Fodol Construction Compound – D&B Method

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
14	Medium	Low	Minor
70	Medium	Very Low	Negligible
5	Low	Very Low	Negligible
1	Very Low	Low	Negligible
3	Very Low	Very Low	Negligible
9	Medium	No Effect	No Effect

9.8.42 During tunnelling works using the D&B method (Scenario 3), the magnitude of effect would be **low** at 14 receptors which are of **medium** sensitivity, resulting in **minor (not significant)** effects. At the remaining receptors, the effect would be **negligible (not significant)** or **no effect**.

Vibration from Works in Tunnel Construction Compounds

9.8.43 No receptors fall within the 100 m study area for vibration from works at the Braint or Tŷ Fodol Tunnel Construction Compounds. Therefore, vibration from works within the construction compounds are not anticipated to result in vibration effects.

Noise and Vibration from Underground Tunnelling Works

Surface Vibration and Groundborne Noise from Tunnel Boring Machine (Scenarios 1 and 2)

9.8.44 Vibration and groundborne noise from underground tunnel boring works is only likely to occur for a short duration at any one receptor as the TBM cutting face and front section traverses beneath. The duration of perceptibility/audibility would depend upon machine progress/speed but is unlikely to extend beyond one to two days. Effects are also only likely to be perceptible/audible at receptors that are within close proximity, around 50 m or less from the tunnel. Around the shaft locations, the depth from surface to tunnel is much more than this with the shallowest parts of the tunnel occurring

under the Menai Strait. On this basis, effects upon NVSRs of any significance or duration are most unlikely.

9.8.45 Mitigation measures that have been included within the Proposed Development for underground tunnelling works are set out below:

CEMP Measures: NV36, NV37, NV38.

9.8.46 The following few receptors have been identified within the study area for underground tunnel boring works:

- eight residential (houses): **Medium** sensitivity;
- one caravan: **Medium** sensitivity;
- one educational establishment (Conway Centre): **Medium** sensitivity; and
- Anglesey AONB, Plas Newydd and Faenol Park (users of): **Medium** sensitivity.

9.8.47 The results of the assessment of noise and vibration impacts from tunnelling works at these locations is provided in Appendix 15.14 **(Document 5.15.2.14)**. A summary of the results of the assessment is provided in Table 15.38 below.

Table 15.38: Summary of Residual Noise and Vibration Effects from Tunnel Boring Underground Works

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
1	Medium	Low	Minor
8	Medium	Very Low	Negligible
4	Medium	No Effect	No Effect

9.8.48 There would be a **low** magnitude of effect at one receptor that is of **medium** sensitivity, resulting in a **minor** effect (**not significant**). At the remaining receptors, the effects would be **negligible (not significant)** or **no effect**.

9.8.49 The Anglesey AONB, Plas Newydd and Faenol Park are within the study area for groundborne noise and vibration from tunnel boring. The magnitude of effect in these areas would be **very low**, and the users of the Anglesey AONB,

Plas Newydd and Faenol Park are of **medium** sensitivity; therefore, the effect would be **negligible (not significant)**.

Groundborne Noise and Vibration from the Drill and Blast Tunnelling Method (Scenario 3)

9.8.50 The general process for each round (blast section of the tunnel) would be as follows:

- Drill blast holes for a round length of approximately 2.5 m to 5 m – approximate duration 1 to 2.5 hrs.
- Blast including setting charges etc. – approximate duration 0.5 hrs.
- Extract dust and fumes – approximate duration 0.5 hrs.
- Inspection – approximate duration 0.25 hrs.
- Muckout – approximate duration 1 to 2 hrs.
- Scaling (smooth face) – approximate duration 0.3 hrs.
- Geological survey – approximate duration 0.3 hrs.
- Set rock bolts – approximate duration 1 to 2 hrs.
- Shotcrete lining – approximate duration 0 to 1 hrs.

9.8.51 Of the above, only the drilling, blasting, and potentially the setting of rock bolts would generate noise; the latter assumes further holes would be drilled. This would be a continually repeating process with two to three rounds of the process per day dependent upon rock quality and round length. The arisings from each blast would be mucked into wagons of the TCR.

9.8.52 Vibration and groundborne noise from underground D&B construction works is only likely to occur for a short duration at any one receptor as the excavation face progresses beneath. The duration of perceptibility/audibility would depend upon face progress, and other factors, but is unlikely to extend beyond four to five days in total at any NVSR. Effects are also only likely to be perceptible/audible at receptors that are within 100 m from the tunnel. This is further than for the TBM method due to the more impulsive nature of the method.

9.8.53 The tunnel would have a minimum of 10 m overburden/ground cover above it across both the marine and land sections of the tunnel. However, for the majority of the tunnel, the cover above it would be much greater dependent upon the final vertical alignment but this may be from 30 to 70 m in parts.

Other than under the Menai Strait, the other area where cover is reduced is in Gwynedd around the valley in which the A87/A4087/B457 are situated at the roundabout junction. On this basis, effects upon NVSRs of any significance or duration are most unlikely.

9.8.54 Prediction of groundborne noise and vibration effects from the D&B tunnelling method has very high uncertainty in relation to actual levels that may occur. This is because the variables are greater relative to the TBM method, and that is very uncertain, and hence there is even greater reliance on noise and vibration monitoring prior to the face reaching the NVSRs. This is necessary to prevent adverse effects occurring and to provide greater controls to minimise effects. These controls can include: reducing charge weights per delay and the overall total blast weight; increasing delays per charge; and decreasing round lengths. Also, unlike the TBM, close to sensitive receptors, tunnelling/blasting can cease at night if required to prevent sleep disturbance with progress being made up during the day.

9.8.55 Mitigation measures that have been included within the Proposed Development for D&B tunnelling works are set out below:

CEMP Measures: NV36, NV37, NV38

9.8.56 The following few receptors have been identified within the study area for underground tunnel boring works:

- twelve residential (houses): **Medium** sensitivity;
- one caravan: **Medium** sensitivity;
- one educational establishment (Conway Centre): **Medium** sensitivity;
- Anglesey AONB, Plas Newydd and Faenol Park (users of): **Medium** sensitivity;
- one leisure centre: **Low** sensitivity; and
- one restaurant / cafeteria: **Low** sensitivity.

9.8.57 The results of the assessment of noise and vibration impacts from D&B tunnelling works at these locations is provided in Appendix 15.14 **(Document 5.15.2.14)**. A summary of the results of the assessment is provided in Table 15.39 below.

Table 15.39: Summary of Residual Noise and Vibration Effects from D&B Tunneling Works			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
6	Medium	Low	Minor
9	Medium	Very Low	Negligible
2	Medium	No Effect	No Effect
2	Low	No Effect	No Effect

9.8.58 There would be a **low** magnitude of effect at six receptors that are of **medium** sensitivity, resulting in a **minor** effect (**not significant**). At the remaining receptors the effects would be **negligible (not significant)** or **no effect**.

9.8.59 The Anglesey AONB, Plas Newydd and Faenol Park are within the study area for groundborne noise and vibration from D&B tunnelling works. The magnitude of effect in these areas would be **very low**, and the users of the Anglesey AONB are of **medium** sensitivity; therefore, the effect would be **negligible (not significant)**.

Groundborne Noise from the Temporary Construction Railway

9.8.60 For the slurry TBM method of tunnelling, whilst spoil would be pumped from the TBM to the slurry plant on the surface for processing, a small TCR would be provided within the tunnel for the transport of workers and materials from the main shaft to the rear of the TBM as it continuously tunnels forward.

9.8.61 For the EPBM, there is no pumpable slurry and the arisings will be fed onto the wagons of the TCR so this will be used to transport workers and materials to the face and arisings back to the base of the drive shaft. For the D&B method, the tunnel will be driven from both shafts with a TCR in each tunnel to transport workers and materials to the face and arisings back to the base of each shaft. The TCR will be loaded with arisings after each blast and these will then be transported back to each shaft base.

9.8.62 The loco is likely to be rail based with either steel or rubber tyres; however, it may also be a multipurpose loco system that is driven along the tunnel. The loco or system is likely to be battery powered.

9.8.63 The passage of this railway would result in the emissions of groundborne noise from the rail/wheel interface into the tunnel lining. This would then transfer into the ground and propagate upwards into building foundations

which may be audible as rumble at NVSRs possibly during the day but more likely at night but only where these NVSRs are within 50 m or so of the tunnel alignment.

9.8.64 Given that this would be less of a temporary effect than the passage of the TBM, e.g. for any receptors near the start of the tunnel, or each tunnel, the effects would last for the duration of the tunnelling, various control and mitigation provisions would be made, as provided for under requirement NV37 of the CEMP (see Table 15.19). These would be implemented where the TCR passes within 50 m of any properties on the surface. Around the shaft locations, the depth from surface to tunnel is much more than this, with the shallowest parts of the tunnel occurring under the Menai Strait. On this basis, effects upon NVSRs of any significance are unlikely.

9.8.65 On the basis of these common controls to minimise noise emissions and effects associated with the use of the TCR, any significant effects would be mitigated such that adverse effects from this source would not arise and residual effects would be **negligible (not significant).**

9.9 TRAFFIC ON ACCESS TRACKS

9.9.1 The study area for noise from traffic on access tracks is the same as that provided for installation of access tracks, culverts and bridges and, therefore, the receptors are as provided in Table 15.24.

9.9.2 Mitigation measures required are set out below:

- CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14

9.9.3 Traffic data assessed for each access track are based upon annual average flow for the most intensive year in the construction period. These data have been used to predict the traffic noise level at receptors within the study area using a computer generated model in SoundPLAN v7.4. Traffic has been split into Light Goods Vehicle (LGVs) and Heavy Goods Vehicles (HGVs). The assessment has used a standard 20 tonne articulated dump truck to represent HGVs. LGVs comprise of various vehicle sizes ranging from a car to a van. It has been assumed that LGVs would be significantly quieter, so these have been modelled using the same source as HGVs but with a sound reduction of 10 dB.

9.9.4 Traffic would use the access tracks during standard construction hours; therefore, assessments have been undertaken for daytime and weekend periods. Traffic on access tracks would be active at various times throughout the duration of the construction of the Proposed Development. Therefore, the

criteria for long term works have been applied for the assessment of effects; however, for the OHL, the use of access tracks by construction traffic would not endure for this length of time, being for considerably shorter/infrequent periods.

9.9.5 Predictions have been made for both Options A and B. The differences in noise levels at receptors for Options A and B were calculated to be less than 1 dB and are, therefore, not material to the assessment. Where a small difference between the two options is expected, the worst case has been evaluated.

9.9.6 There is a difference in the anticipated number of vehicles expected depending upon whether a TBM (Scenarios 1 and 2) or D&B (Scenario 3) tunnelling method would be used. Therefore, predictions have been carried out for traffic related to both tunnelling methods.

9.9.7 The model input data and results of the numerical assessment of noise impacts from access tracks at the locations provided in Table 15.24 is provided in Appendix 15.15 **(Document 5.15.2.15)**. A summary of the residual noise effects resulting from traffic on access tracks, for each type of receptor, are provided in Table 15.40 for traffic associated with the TBM tunnelling method (Scenarios 1 and 2) and Table 15.41 for traffic associated with the D&B tunnelling method (Scenario 3).

Table 15.40: Summary of Residual Noise Effects from Traffic on Access Tracks for TBM Tunnelling Method (Scenarios 1 and 2)

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
1	Medium	Medium	Moderate
Total			
1			**Moderate**
2	High	Very Low	Minor
7	Medium	Low	Minor
Total			
9			**Minor**
315	Medium	Very Low	Negligible
1	Low	Low	Negligible
5	Low	Very Low	Negligible

Table 15.40: Summary of Residual Noise Effects from Traffic on Access Tracks for TBM Tunnelling Method (Scenarios 1 and 2)			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
3	Very Low	Very Low	Negligible
Total			
324			**Negligible**
260	Medium	No Effect	No Effect
23	Low	No Effect	No Effect
3	Very Low	No Effect	No Effect
Total			
286			**No Effect**

9.9.8 The assessment of noise from construction traffic on access tracks for the TBM tunnelling method (Scenarios 1 and 2) indicates that there would be a **medium** magnitude of effect at one receptor that is of **medium** sensitivity and, therefore, the effect would be **moderate (significant)**. This receptor (R5/08715, Pennant) is close to the Tŷ Fodol TCC access track, so these effects could be for the majority of the construction period.

9.9.9 There would be a **low** magnitude effect at seven receptors that are of **medium** sensitivity, and a **very low** magnitude of effect at two receptors that have a **high** sensitivity resulting in **minor (not significant)** effects at nine receptors. At the remaining receptors, the effects would be **negligible (not significant)** or **no effect**.

Table 15.41: Summary of Residual Noise Effects from Traffic on Access Tracks for D&B Tunnelling Method (Scenario 3)			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
1	Medium	Medium	Moderate
Total			
1			**Moderate**
2	High	Very Low	Minor

Table 15.41: Summary of Residual Noise Effects from Traffic on Access Tracks for D&B Tunnelling Method (Scenario 3)			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
8	Medium	Low	Minor
Total			
10			**Minor**
319	Medium	Very Low	Negligible
1	Low	Low	Negligible
6	Low	Very Low	Negligible
3	Very Low	Very Low	Negligible
Total			
329			**Negligible**
255	Medium	No Effect	No Effect
22	Low	No Effect	No Effect
3	Very Low	No Effect	No Effect
Total			
280			**No Effect**

9.9.10 The assessment of construction traffic on access tracks for the D&B tunnelling method (Scenario 3) indicates that there would be a **medium** magnitude of effect at one receptor (R5/08715, Pennant) that is of **medium** sensitivity and, therefore, the effect would be **moderate (significant)**. This receptor is close to the Tŷ Fodol TCC access track, so these effects could be for the majority of the construction period.

9.9.11 There would be a **low** magnitude effect at eight receptors that are of **medium** sensitivity, and a **very low** magnitude of effect at two receptors that have a **high** sensitivity resulting in **minor (not significant)** effects at nine receptors. At the remaining receptors, the effects would be **negligible (not significant)** or **no effect**.

9.10 TRAFFIC ON CONSTRUCTION TRAFFIC ROUTES

9.10.1 Noise effects from traffic on the local road network have been assessed for all receptors that are within 250 m of road links that are included within the

HGV routes for the traffic and transport assessment as illustrated on Figure 13.8 **(Document 5.13.1.8)**. For further information refer to Chapter 13, Traffic and Transport **(Document 5.13)**. A summary of the calculations and assessment is provided in Appendix 15.16 **(Document 5.15.2.16)**.

9.10.2 Baseline traffic data have been provided for the base year (2016), the base construction year (2020) and the peak construction year (2023). Development traffic date have been provided for the peak construction year of 2023. DMRB states that for an assessment of temporary noise impacts such as construction activities, the baseline year should be that immediately prior to the start of works. Therefore, 2020 has been taken as a suitable baseline year for the assessment of noise from construction traffic routes. In order to provide a reasonable worst case assessment, development traffic for the peak construction year has been assessed against the base year. Although not a requirement of DMRB, the peak construction year with the Proposed Development has also been assessed against the forecast traffic flows for the peak construction year without the Proposed Development, to provide a realistic assessment of the noise levels arising from the development.

9.10.3 An assessment of effects has been carried out for the two scenarios described above both for traffic that has been estimated if both the TBM method (Scenarios 1 and 2) or the D&B method (Scenario 3) were used with the existing A5025 (Link 1) alignment, i.e. a total of four assessment scenarios which are as follows:

- ‘Peak Construction Year (2023) with Development using TBM Method (Scenarios 1 and 2)' minus ‘Peak Construction Year (2023) without Development'.
- ‘Peak Construction Year (2023) with Development using TBM Method (Scenarios 1 and 2)' minus ‘Base Construction Year (2020) without Development'.
- ‘Peak Construction Year (2023) with Development using D&B Method (Scenario 3)' minus ‘Peak Construction Year (2023) without Development'.
- ‘Peak Construction Year (2023) with Development using D&B Method (Scenario 3)' minus ‘Base Construction Year (2020) without Development'.

9.10.4 The same scenarios have been considered for the future A5025 (Link 1) alignment with the offline highway improvements being delivered as part of the Wylfa Newydd Power Station being in place. However these scenarios

have only considered receptors along the existing and proposed A5025 (Link 1) alignment.

Noise from Traffic on Construction Traffic Routes (including Existing A5025 Alignment)

9.10.5 A total of 4,594 receptors have been identified within the study area for traffic on the local road network, including the existing A5025 (Link 1) alignment. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**, with a summary in Table 15.42.

Table 15.42: Summary of Receptors within Study Area for Noise from Traffic on the Construction Traffic Routes with Existing A5025 (Link 1) Alignment

Receptor Type	Sensitivity	Total
Care / Nursing Home	High	4
Residential (Houses / Flats)	Medium	4020
Caravan / Chalet / Caravan Park	Medium	30
Hotel / Motel / Holiday Let / Short-term Accommodation / Guest House	Medium	27
Campsite	Medium	1
Place of Worship / Village Hall / Community Centre	Medium	21
School / College	Medium	14
Hospital / Healthcare Service	Medium	3
Library / Museum / Educational Establishment	Medium	4
Leisure Facility	Low	7
Office / Workplace	Low	114
Commercial (unspecified)	Low	90
Public House / Bar / Night-club	Low	12
Retail	Low	120
Restaurant / Cafeteria	Low	12
Industrial (factory/ warehouse / workshop / storage depot / manufacturing)	Very Low	77
Petrol Station	Very Low	5

TBM Tunnelling Method

9.10.6 A summary of the results for the first scenario: 'Peak Construction Year (2023) with Development using TBM method (Scenarios 1 and 2)' minus 'Peak Construction Year (2023) without Development' is provided in Table 15.43 below. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**.

Table 15.43: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Existing A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development using TBM Method (Scenarios 1 and 2)' minus 'Peak Construction Year (2023) without Development'

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
4	High	Very Low	Minor
Total			
4			**Minor**
3812	Medium	Very Low	Negligible
345	Low	Very Low	Negligible
79	Very Low	Very Low	Negligible
Total			
4236			**Negligible**
308	Medium	No Effect	No Effect
10	Low	No Effect	No Effect
3	Very Low	No Effect	No Effect
Total			
321			**No Effect**

9.10.7 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development using TBM method' minus 'Peak Construction Year (2023) without Development' indicate that there would be a **very low** magnitude of effect at four receptors that are of **high** sensitivity resulting in a **minor (not significant)**effect. There would be a **negligible** effect **(not significant)** at 4236 receptors and **no effect** at the remaining 321 receptors.

9.10.8 A summary of the results for the second scenario: 'Peak Construction Year (2023) with Development using TBM method (Scenarios 1 and 2)' minus

'Base Construction Year (2020) without Development' is provided in Table 15.44 below. Full details are provided in Appendix 15.43 **(Document 5.15.2.16)**.

Table 15.44: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Existing A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development using TBM method (Scenarios 1 and 2)' minus 'Base Construction Year (2020) without Development'

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
4	High	Very Low	Minor
1	Medium	Low	Minor
Total			
5			**Minor**
4079	Medium	Very Low	Negligible
353	Low	Very Low	Negligible
82	Very Low	Very Low	Negligible
Total			
4514			**Negligible**
40	Medium	No Effect	No Effect
2	Low	No Effect	No Effect
Total			
42			**Negligible**

9.10.9 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development using TBM method (Scenarios 1 and 2)' minus 'Base Construction Year (2020) without Development' indicate that there would be **very low** magnitude of effect at four receptors that are of **high** sensitivity, and a **low** magnitude of effect at one receptor of **medium** sensitivity, resulting in a **minor (not significant)** effects at five receptors. There would be a **negligible** effect **(not significant)** at 4514 receptors and **no effect** at the remaining 42 receptors.

D&B Tunnelling Method

9.10.10 A summary of the results for the first scenario: 'Peak Construction Year (2023) with Development using D&B method (Scenario 3)' minus 'Peak Construction

Year (2023) without Development' is provided in Table 15.45 below. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**.

Table 15.45: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Existing A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development using D&B Method (Scenario 3)' minus 'Peak Construction Year (2023) without Development'

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
4	High	Very Low	Minor
2	Medium	Low	Minor
Total			
6			**Minor**
3814	Medium	Very Low	Negligible
345	Low	Very Low	Negligible
79	Very Low	Very Low	Negligible
Total			
4238			**Negligible**
304	Medium	No Effect	No Effect
10	Low	No Effect	No Effect
3	Very Low	No Effect	No Effect
Total			
317			**No Effect**

9.10.11 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development using D&B method (Scenario 3)' minus 'Peak Construction Year (2023) without Development' indicate that there would be a **very low** magnitude of effect at four receptors that are of **high** sensitivity and a **low** magnitude of effect at two receptors that are of medium sensitivity, resulting in a **minor (not significant)** effect at six receptors. There would be a **negligible** effect **(not significant)** at 4238 receptors and **no effect** at the remaining 317 receptors.

9.10.12 A summary of the results for the second scenario: 'Peak Construction Year (2023) with Development using D&B method (Scenario 3)' minus 'Base

Construction Year (2020) without Development' is provided in Table 15.46 below. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**.

Table 15.46: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Existing A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development using D&B method (Scenario 3)' minus 'Base Construction Year (2020) without Development'

Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
4	High	Very Low	Minor
3	Medium	Low	Minor
Total			
7			**Minor**
4077	Medium	Very Low	Negligible
353	Low	Very Low	Negligible
82	Very Low	Very Low	Negligible
Total			
4512			**Negligible**
40	Medium	No Effect	No Effect
2	Low	No Effect	No Effect
Total			
42			**Negligible**

9.10.13 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development using D&B method (Scenario 3)' minus 'Base Construction Year (2020) without Development' indicate that there would be a very low magnitude of effect at four receptors that are of high sensitivity, and a low magnitude of effect at three receptors of medium sensitivity, resulting in a **minor (not significant)** effects at seven receptors. There would be a **negligible** effect **(not significant)** at 4512 receptors and **no effect** at the remaining 42 receptors.

Noise from Traffic on Construction Traffic Routes - Revised A5025 (Link 1) Alignment Only

9.10.14 A total of 468 receptors have been identified within the study area for the revised A5025 (Link 1) alignment with the offline highway improvements being delivered as part of the Wylfa Newydd Power Station being in place. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**, with a summary in Table 15.47 below.

Table 15.47: Summary of Receptors within Study Area for Noise from Traffic on the Construction Traffic Routes with Revised A5025 (Link 1) Alignment

Receptor Type	Sensitivity	Total
Residential (Houses / Flats)	Medium	442
Caravan / Chalet / Caravan Park	Medium	3
Campsite	Medium	1
Place of Worship / Village Hall / Community Centre	Medium	2
School / College	Medium	3
Office / Workplace	Low	1
Commercial (unspecified)	Low	3
Public House / Bar / Night-club	Low	2
Retail	Low	6
Industrial (factory/ warehouse / workshop / storage depot / manufacturing)	Very Low	4
Petrol Station	Very Low	1

9.10.15 A summary of the results for the first scenario: 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Peak Construction Year (2023) without Development' is provided in Table 15.48 below. Traffic on the A5025 (Link 1) is identical whether a TBM or D&B tunnelling method is used. Therefore these scenarios apply both for the TBM and D&B method i.e. Scenarios 1, 2 and 3. Full details are provided in Appendix 15.16 **(Document 5.15.2.16)**.

Table 15.48: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Revised A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Peak Construction Year (2023) without Development'			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
448	Medium	Very Low	Negligible
11	Low	Very Low	Negligible
5	Very Low	Very Low	Negligible
3	Medium	No Effect	No Effect
1	Low	No Effect	No Effect
Total			
468			**Negligible**

9.10.16 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Peak Construction Year (2023) without Development' indicate that there would be a **negligible** effect or **no effect (not significant)** at all 468 receptors.

9.10.17 A summary of the results for the second scenario: 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Base Construction Year (2020) without Development' is provided in Table 15.49 below. Full details are provided in Appendix 15.16 **(Document 5.15.2.16**).

Table 15.49: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Revised A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Base Construction Year (2020) without Development'			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
451	Medium	Very Low	Negligible
12	Low	Very Low	Negligible
5	Very Low	Very Low	Negligible
Total			

Table 15.49: Summary of Residual Noise Effects from Traffic on Construction Traffic Routes with Revised A5025 (Link 1) Alignment - 'Peak Construction Year (2023) with Development (Scenarios 1, 2 and 3)' minus 'Base Construction Year (2020) without Development'			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance off Effect
468			**Negligible**

9.10.18 The results of the calculations for the comparison between the 'Peak Construction Year (2023) with Development' minus 'Base Construction Year (2020) without Development' indicate that there would be a **negligible** effect **(not significant)** at all 468 receptors.

9.11 COMBINED EFFECTS FROM ALL SOURCES OF CONSTRUCTION NOISE AND VIBRATION

9.11.1 A summary of the worst-case noise and vibration effects for each receptor based on all activities is provided in Table 15.50 below. For receptors that are affected by different scenarios, provided in Table 15.12, i.e. the effects are slightly different for Option A and B; Scenarios 1, 2 and 3; or there are differences between the various scenarios for noise from road traffic on construction traffic routes considered in 'Section 9.10 traffic on construction traffic routes', the worst case has been presented in Table 15.50. Appendix 15.17 **(Document 5.15.2.17)** provides a full summary of the effects for each construction noise and vibration activity at each receptor, and indicates receptors where the effects differ between the scenarios provided in Table 15.12. The text below provides a summary of all significant effects, i.e. those that are **moderate** or **major**.

Table 15.50: Summary of Residual Effects from all Sources of Construction Noise and Vibration			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
1	Medium	High	Major
25	Medium	Medium	Moderate
4	High	Very Low	Minor/Negligible
140	Medium	Low	Minor
1	Low	Medium	Minor

Table 15.50: Summary of Residual Effects from all Sources of Construction Noise and Vibration			
Quantity of Receptors	Sensitivity of Receptor	Magnitude of Effect	Significance of Effect
4104	Medium	Very Low	Negligible
9	Low	Low	Negligible
350	Low	Very Low	Negligible
3	Very Low	Low	Negligible
79	Very Low	Very Low	Negligible
112	Medium	No Effect	No Effect
12	Low	No Effect	No Effect
6	Very Low	No Effect	No Effect

9.11.2 There is one receptor of **medium** sensitivity at which a high magnitude of effect could occur corresponding to **major** (**significant**) effects. This is due to noise from piling and is therefore very short-term. In addition, from the indicative pylon schedule **(Document 5.3.2.1)**, it is likely that a pad foundation would be used for this pylon (4ZA016). If a pad foundation is used, the magnitude of effect would reduce to **medium** and the effects to **moderate (significant)**.

9.11.3 There are a further 25 receptors of **medium** sensitivity at which a **medium** magnitude of effect could occur, corresponding to **moderate (significant)** effects. The majority of these receptors, 24 in total, only experience a **medium** magnitude of effect from pylon construction and dismantling works, and therefore this effect is very short-term. In addition, at many of these locations, piling may not be used, so the magnitude of effect would reduce to **low** and the effect to **minor**.

9.11.4 At one location, there would be a **medium** magnitude of effect from traffic on construction access tracks resulting in a **moderate** adverse effect.

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 15.51 provides a summary of stages 1 and 2 of the inter-project cumulative effects assessment on construction noise and vibration 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.

10.3.6 With the exception of noise from traffic on construction traffic routes, cumulative effects have been considered qualitatively, based on the information provided in the supporting information for the Cumulative Development and the outcome of the assessment for the Proposed Development.

10.3.7 Calculations of the cumulative noise effects from traffic on construction traffic routes are provided in Appendix 15.18 **(Document 5.15.2.18)**. There are three other developments that have the potential for shared effects due to noise from construction traffic. These have been modelled cumulatively with the Proposed Development in two scenarios as follows:

- Wylfa Newydd Power Station and Wylfa Nuclear Power Station -shared receptors on the following links:
    - A5025 between A5 at Valley Crossroads and Wylfa (Link 1)
    - B5111 Between Llanerchymedd access B8 (Link 4.1)
    - B5110 between B5111 and access C8 (Link 5)
    - Between Llangefni Link Road and Access D4 (Link 7)
    - Between A55 J6 Llangefni Link Road (Link 8)
    - Britannia Bridge between A55 J9 and A55 J8a (Link 21)
    - A5025 / Ffordd y Felin between Wylfa Access and Brynddu Road (Link 23)
    - B5112 between A55 J5 and B5111 (Link 26)
- Glyn Rhonwy - shared receptors on the following link:
    - Between B4547 and A55 J9 (Link 18)

10.3.8 The models have used the same scenarios as provided in Section 9.10 ‘traffic on construction traffic routes’. For Wylfa Newydd Power Station and Wylfa Nuclear Power Station, the assessment has been carried out on the basis of the future A5025 (Link 1) alignment with the offline highway improvements being delivered as part of the Wylfa Newydd Power Station being in place. Model input data is provided in Appendix 15.4 (**Document 5.15.2.4**).

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Table 15.51 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 both the construction and operational phases.	Shared receptors: circa 170 common receptors have been identified around Wylfa, Tregele and Llanfechell. 1645 receptors have been identified within 250 m of common construction traffic routes. There are potential noise effects from the Proposed Development pylon construction, conductor stringing and dismantling works and vehicle movements on access tracks that could overlap with works at Wylfa Newydd Power Station. Works in this area are likely to be short-term. Effects from Wylfa Newydd Power Station are likely to be significant at common receptors as works are more intensive and for a longer duration. Therefore works from the Proposed Development could increase already significant effects and will therefore be taken to stage 3/4. **Negligible** effects at 140 of the shared receptors have been concluded in the Proposed Development assessment therefore significant cumulative effects on these receptors are considered unlikely and these receptors are not considered further in this assessment. Both developments require a substantial quantity of traffic along common traffic routes across Anglesey and Gwynedd.	Yes - other than 140 receptors
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: approximately 110 receptors around Wylfa and Tregele, and between Tregele and Cemaes Bay. 1645 receptors have been identified within 250 m of common construction traffic routes. There are potential noise effects from the Proposed Development pylon construction, conductor stringing and dismantling works and vehicle movements on access tracks that could overlap with the decommissioning of Wylfa Nuclear Power Station. Works in this area are likely to be short-term. There are no receptors at which an effect greater than **negligible** would occur from both the Proposed Development and Wylfa Nuclear Power Station Decommissioning works. Therefore cumulative effects on these shared receptors are considered unlikely. As decommissioning works had commenced when the traffic surveys were conducted, the decommissioning traffic noise is already included in the calculation of the baseline (and therefore also the future baseline) noise. As such the effects of the two developments together are not separately identifiable, as the construction noise assessment is based on the increase over the baseline.	No
Penrhos Leisure Village	No	No			

Table 15.51 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?
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	Yes	Yes	Construction is expected to last four years with the development operational by 2019. However as construction does not appear to have started yet, it is assumed that there could be an overlap between construction and operational phases.	Shared receptors: 177 receptors have been identified within 250 m of common construction traffic routes. Both developments require a substantial quantity of construction traffic along common traffic routes in Gwynedd. Predictions of the cumulative effect with the Proposed Development and Glyn Rhonwy Pumped Storage have indicated that effects would be **negligible** at all 177 shared receptors. Therefore cumulative effects on construction traffic routes shared receptors are considered unlikely and are not considered further in this assessment.	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 could be overlap in the construction phases.	Shared receptors: approximately eleven receptors around Pentir Construction Compound and Pentir Substation Construction Compound. The Proposed Development has predicted **negligible** effects at four residential receptors, one caravan and one restaurant/cafeteria, which are shared receptors therefore cumulative effects on these shared receptors are considered unlikely.	Yes – 5 receptors
West Anglesey Demonstration Project	No	No			
Holyhead Deep	No	No			
A487 Caernarfon to Bontnewydd Bypass	Yes	Yes	Overlap between construction phases in 2020 to 2021 and the operational phases.	Shared receptors: receptors along common construction traffic routes. Effects on common receptors as a result of the Proposed Development are **negligible**. Therefore potential significant cumulative effects are considered unlikely.	No
Menai Science Park	Yes	Yes	The first phase of the development would be	Shared receptors: three receptors to the east of Gaerwen.	No

Table 15.51 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?
			completed prior to the construction phase of the Proposed Development however the remainder of the development would take approximately 10 years to complete (more detailed timescale currently unknown) therefore is likely to overlap with both the construction and operation phases of the proposed development.	**Negligible** effects are predicted on the potential shared receptors by the Proposed Development therefore significant cumulative effects are unlikely.	
Third Menai Crossing	Yes	Yes	Potential for the construction phases to overlap (construction timescale currently unknown anticipated to be 2020/2021 to 2022/2023). The operations phases would also overlap.	Shared receptors: receptors along common construction traffic routes. Effects on common receptors as a result of the Proposed Development are **negligible**. Therefore potential significant cumulative effects are considered unlikely	No
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: fifteen receptors within 500 m of Nant-y-Garth that lie within the study area for the Proposed Development. There are **moderate** residual effects from the Proposed Development due to pylon construction works at some of the shared receptors, as well as **minor** effects from works within the Tŷ Fodol Construction Compound, pylon construction works and traffic on access tracks.	No

Table 15.51 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?
				The Nant-y-Garth Landfill Site reported that the new proposals would be unlikely to result in any change to the noise levels the nearest receptors. Therefore significant cumulative effects are unlikely.	
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.	Shared receptors: seven receptors within 500 m of Green Wire that lie within the Pentir area and are within the study area of the Proposed Development. Although there is some overlap in programme the Green Wire works are expected to take place in 2020 which is before the works at Pentir Substation and the overhead line would take place in the area. Therefore the only overlap would be traffic in connection with the enabling works at Tŷ Fodol. These effects are likely to be **negligible** at the shared receptors and therefore significant cumulative effects are unlikely.	No
Llanbadrig Solar Farm	Yes	Yes	It is likely that this development would be constructed before the construction phase of the Proposed Development.	Shared receptors: receptors along common construction traffic routes. Llanbadrig Solar Farm would be complete prior to the construction of the Proposed Development. The operational traffic is therefore included within the future baseline therefore the assessment of effects from the Proposed Development includes this 'other development'.	No
Codling Wind Park	No	No			
Grŵp Llandrillo Menai Llangefni Campus	Yes	Yes	Although some elements would be completed prior to the construction phase of the Proposed Development there is the potential for overlap between the full build out of the site (timescale currently unknown) and the construction of the Proposed Development.	Shared receptors: around 1200 receptors in Llangenfni along common traffic routes. The Grŵp Llandrillo Menai Llangefni Campus assessment does not state what the significance of effects from construction noise and vibration would be. However it is anticipated that only **minor** effects are likely to occur at the nearest receptors. Operational phase impacts of the Grŵp Llandrillo Menai Llangefni Campus are **negligible** and therefore unlikely to result in significant cumulative impacts with the construction of the Proposed Development. Noise and vibration effects from the Proposed Development at shared receptors are of **negligible** significance and therefore significant cumulative effects are unlikely.	No

Table 15.51 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?
Dinorwig Cables	Yes	Yes	Potential overlap between construction phases (cable installation is programmed for between 2019 and 2025).	Shared receptors: potential overlap with receptors around Pentir. Potential for cumulative effects on shared receptors to occur as a result of construction phase due to noise and vibration. The Proposed Development has predicted **negligible** effects at four residential receptors, one caravan and one restaurant/cafeteria, which are shared receptors therefore cumulative effects on these shared receptors are considered unlikely.	Yes
Holyhead Port Expansion	No	No			

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Stage 3 and Stage 4

10.3.9 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:

- Wylfa Newydd Nuclear Power Station;
- Underground Grid Connection between Glyn Rhonwy Pumped Storage Development and Pentir Substation; and
- Dinorwig Cables.

10.3.10 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.

10.3.11 The results of the Stage 4 assessment of cumulative effects and mitigation are presented in Table 15.52 below.

10.3.12 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 15.52 Construction Noise and Vibration 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
Wylfa Newydd Power Station	<u>Residential receptors</u> – **Major/Moderate** Adverse effects (significant) at five shared residential receptors. **Minor** Adverse effects (not significant) at 18 shared residential receptors.	<u>Residential receptors</u> – **Major/Moderate/Minor** Adverse effects at up to 154 shared residential receptors[1].	Details of effects at individual receptor locations for Wylfa Newydd Power Station are not available. Therefore, it is not possible to determine precisely where effects would coincide. However, as effects from Wylfa are mainly **major/moderate** adverse and effects from the Proposed Development are mainly **minor** adverse, it is likely that cumulative effects could occur and would be **major/moderate** adverse in places, but this would be mainly due to construction noise and vibration from Wylfa Newydd Power Station.	At receptors that are subject to cumulative noise and vibration effects from the Proposed Development and Wylfa Newydd Power Station, Wylfa Newydd Power Station contributes more to the noise levels than the Proposed Development. Furthermore, works from the Proposed Development are likely to be for a relatively short duration. Therefore no additional mitigation measures are planned for the Proposed Development to reduce the significance of effects.	**Significant.**
	<u>Care/nursing home</u> – **Minor** Adverse effects (not significant) at one shared receptor.	<u>Care/nursing home</u> – **Major/Moderate** Adverse effects at one shared receptor[3].			
	<u>Caravans/chalets</u> – **Minor** Adverse effects (not significant) at three shared receptors.	<u>Caravans/ chalets/ holiday lets/ campsite</u> – **Major/Moderate/Minor** Adverse effects at up to seven shared caravans/ chalets/ holiday lets/ campsite[3].			
		<u>Commercial receptors</u> – **Moderate/Minor** Adverse effects at up to five shared commercial receptors[3].			

[1] Note that these are the maximum potential shared effects, and effects may be lower as individual receptors are not identified in the noise assessments for Wylfa Newydd Power Station.

Table 15.52 Construction Noise and Vibration 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
Underground Grid Connection between Glyn Rhonwy Pumped Storage Development and Pentir Substation	<u>Residential receptors</u> – **Moderate** Adverse effect at one residential receptor. **Minor** Adverse (not significant) effect at one residential receptor.	No information available.	A detailed assessment of construction noise and vibration of the Underground Grid Connection works has not been undertaken. However the works would be subject to a CEMP. With these controls in place it is anticipated that the construction noise and vibration effects would be no greater than **minor.** The effects from the Proposed Development are **moderate/minor**. The receptor at which a **moderate** effect would occur is some 600 m from Underground Grid Connection, so it is unlikely that this effect would be increased with the two developments. The locations at which a **minor** effect from the Proposed Development would occur are all some 400 m to 600 m from the Underground Grid Connection so it is unlikely that the effect level would increase from **minor**.	There is a **moderate** effect from the Proposed Development that is unlikely to be increased by the other development. For the remaining common receptors the mitigation applied to each development is likely to be sufficient to ensure that combined effects remain as minor. Therefore no additional mitigation should be required.	**Not significant.**
	<u>Caravans/holiday let</u> – **Minor** Adverse (not significant) effects at two caravans and one holiday let.	No information available.			**Not significant.**
Dinorwig Cables	<u>Residential receptors</u> – **Minor** Adverse (not significant) effects at two residential receptors.	No information available.	There is insufficient information as yet about the effects of the other development, and as such the potential cumulative effects with the Proposed Development would need to be a consideration during the relevant assessment and consenting for that development. There is potential for **moderate** effects, although it is more likely that effects would be **minor**. The potential for Dinorwig construction to align precisely with that of the Proposed Development, in respect of these specific works at this location, are relatively low and as a result significant cumulative effects are considered to be unlikely.	n/a	**Not significant.**
	<u>Caravans/holiday let</u> – **Minor** Adverse (not significant) effects at two caravans and one holiday let.	No information available.		n/a	**Not significant.**

Conclusion

10.3.13 Taking into consideration all of the other developments for which a potential cumulative effect has been identified, the overall effect, in combination with the Proposed Development ranges between not significant and significant. Where the effect is significant, this is mostly due to effects from either the Proposed Development or the other development, and not the combined effect of the two. Therefore, the need for additional mitigation for construction noise and vibration in relation to potential significant effects is not considered to be necessary.

11 Summary

11.1.1 A summary of the residual construction noise and vibration effects that would result from the construction of the Proposed Development is provided in Table 15.53 overleaf.

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development

Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
Patients in hospitals / hospices etc. – defined as a 'vulnerable subgroup' with very high or continuous rates of occupancy.	High	Noise from construction of pylons, conductor stringing and dismantling of existing pylons.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.	Very Low	Minor / Negligible
		Noise from construction of access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14.	Very Low	Negligible
		Noise from traffic on access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Very Low	Minor
		Noise from traffic on construction traffic routes.	None specified.	Very Low	Minor
		All above.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.	Very Low	Minor / Negligible
Residential, hotels, hostels, B&Bs, caravans and chalets, places of worship, education facilities, hospitals and healthcare facilities, community facilities.	Medium	Noise from instatement of construction compounds and works therein.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Low / Very Low	Minor / Negligible
		Noise and vibration from construction of access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14.	Very Low	Negligible
		Noise and vibration from construction of pylons, conductor stringing and dismantling of existing pylons.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.	High / Medium / Low / Very Low	Major / Moderate / Minor / Negligible
		Noise from works in construction compounds for the tunnel.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV31, NV32, NV33, NV34, NV35. Mitigation Measures: • Generators to be used in enabling works will be to a low noise specification.	Low / Very Low	Minor / Negligible

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development

Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
			• Ventilation plant for the tunnel will be fitted with silencers if required to ensure the noise levels on the surface are low.. • During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds. • During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.		
		Noise and vibration from underground tunnelling works.	CEMP Measures: NV36, NV37, NV38.	Low / Very Low	Minor / Negligible
		Noise from traffic on access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Medium / Low / Very Low	Moderate / Minor / Negligible
		Noise from traffic on construction traffic routes.	None specified.	Low / Very Low	Minor / Negligible
		All above.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22, NV31, NV32, NV33, NV34, NV35, NV36, NV37, NV38. Mitigation Measures: • Generators to be used in enabling works will be to a low noise specification. • Ventilation plant for the tunnel will be fitted with silencers if required to ensure the noise levels on the surface are low. • During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds.	Medium / Low / Very Low	Moderate / Minor / Negligible

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development

Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
			• During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.		
Area used primarily for leisure activities, including Public Rights of Way (PRoW), sports facilities, visitor attractions, sites of historic or cultural importance, businesses (e.g. offices).	Low	Noise from instatement of construction compounds and works therein.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Low / Very Low	Negligible
		Noise and vibration from construction of access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14.	Very Low	Negligible
		Noise and vibration from construction of pylons, conductor stringing and dismantling of existing pylons.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.	Medium / Low / Very Low	Minor / Negligible
		Noise from works in Construction compounds for the tunnel.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV31, NV32, NV33, NV34, NV35. Mitigation Measures: • Generators to be used in enabling works will be to a low noise specification. • Ventilation plant for the tunnel will be fitted with silencers if required to ensure the noise levels on the surface are low.. • During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds. • During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.	Low / Very Low	Negligible
		Noise and vibration from underground tunnelling works.	CEMP Measures: NV36, NV37, NV38	Very Low	Negligible

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development

Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
		Noise from traffic on access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Medium / Very Low	Minor / Negligible
		Noise from traffic on construction traffic routes.	None specified	Low / Very Low	Negligible
		All above.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22, NV31, NV32, NV33, NV34, NV35, NV36, NV37, NV38. Mitigation Measures: • Generators to be used in enabling works will be to a low noise specification. • Ventilation plant for the tunnel will be fitted with silencers if required to ensure the noise levels on the surface are low.. • During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds. • During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.	Medium / Low / Very Low	Minor / Negligible
All other areas such as those used primarily for industrial or agricultural purposes.	Very Low	Noise from instatement of construction compounds and works therein.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Low / Very Low	Negligible
		Noise and vibration from construction of access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV13, NV14.	Very Low	Negligible
		Noise and vibration from construction of pylons, conductor stringing and dismantling of existing pylons.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22.	Low / Very Low	Negligible

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development

Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
		Noise from works in Construction compounds for the tunnel.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV31, NV32, NV33, NV34, NV35. Mitigation Measures: • Air overpressure during blasting would be controlled to ensure appropriate limits are not exceeded, nominally 120 dB (Lin) at the nearest dwellings. • Generators to be used in enabling works will be to a low noise specification. • Ventilation plant for the tunnel will be fitted with silencers if required to ensure the noise levels on the surface are low.. • During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds. • During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.	Low / Very Low	Negligible
		Noise from traffic on access tracks.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14.	Very Low	Negligible
		Noise from traffic on construction traffic routes.	None specified.	Low / Very Low	Negligible
		All above.	CEMP Measures: GP11, GP21-GP27, NV11, NV12, NV13, NV14, NV21, NV22, NV31, NV32, NV33, NV34, NV35 NV36, NV37, NV38. Mitigation Measures: • Air overpressure during blasting would be controlled to ensure appropriate limits are not exceeded, nominally 120 dB (Lin) at the nearest dwellings. • Generators to be used in enabling works will be to a low noise specification. • Ventilation plant for the tunnel will be fitted with silencers.	Low / Very Low	Negligible

Table 15.53 Potential Construction Noise and Vibration Effects of the Proposed Development					
Resource / Receptor	Sensitivity	Potential effects	Mitigation	Residual Magnitude	Significance
			• During shaft construction and tunnelling works, construction plant to be used during the night-time will be enclosed as required to construct in accordance with the agreed noise limits – see Appendix 15.4 **(Document 5.15.2.4)**. • A solid hoarding of 2.4 m will be erected around the perimeter of the tunnel construction compounds. • During tunnelling works a 2 m shunt wall positioned on three sides around the temporary soil storage area.		

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