

Eastern Green Link 4: Scottish Onshore Scheme

Volume 2: Main Report

Chapter 11: Noise and Vibration

December 2025



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11.

Noise and Vibration

11. Noise and Vibration

11.1 Introduction

This chapter of the EIA Report identifies and assesses the potential impacts and likely significant effects from noise and vibration effects during the construction and operation of the Scottish Onshore Scheme. It comprises approximately 16.2 km of proposed underground DC cable from a proposed landfall north of Kinghorn, Fife to a proposed converter station, adjacent to the existing Westfield Substation on the B9097 east of Ballingry, Fife.

The Scottish Onshore Scheme and the nearest Noise Sensitive Receptors (NSRs) are shown in **Figure 11.1 Noise Sensitive Receptors**. It is expected that the converter station will operate 24 hours a day with little variation in its sound emissions. There is no operational noise and vibration associated the proposed landfall or proposed underground cables.

This chapter is supported by the following figures and appendices:

- **Figure 11.1 Noise Sensitive Receptors**
- **Appendix 11.1 Noise Perception and Terminology (Volume 4 Appendices)**
- **Appendix 11.2 Proposed Development Layout (Volume 4 Appendices)**
- **Appendix 11.3 Baseline Survey Measurements (Volume 4 Appendices)**
- **Appendix 11.4 Model Setup (Volume 4 Appendices)**
- **Appendix 11.5 Noise Rating Curve Comparison (Volume 4 Appendices)**

A summary of noise terminology relevant to this chapter is included in **Appendix 11.1 Noise Perception and Terminology (Volume 4 Appendices)**.

11.2 Legislative and Planning Policy Context

Legislation

Environmental Protection Act 1990

The Environmental Protection Act 1990 (Ref 11.1) identifies that noise (and vibration) emitted from premises (including land) can, at certain levels, be prejudicial to health or give rise to statutory nuisance. Local authorities are required to investigate any public complaints of noise and if they are satisfied that a statutory nuisance exists, or is likely to occur or recur, they must serve a noise abatement notice. A notice is served on the person or company responsible for the nuisance. It requires either the abatement of the nuisance; or works to abate the nuisance to be carried out; or it prohibits or restricts the activity. Contravention of a notice without reasonable excuse is an offence. A right of appeal to the Sheriff Court exists within 21 days of the service of a noise abatement notice.

No statutory noise limits exist for determining a nuisance; therefore, the Local Authority can take account of various guidance documents and existing case law when investigating complaints. Lower noise level limits are generally applied when considering the acceptability

of a planning permission than those which would be used when considering whether an existing noise source amounts to a statutory nuisance. Demonstrating the use of Best Practicable Means (BPM) to minimise noise levels is an accepted defence against a noise abatement notice.

Control of Pollution Act 1974

The Control of Pollution Act 1974 (Ref 11.2) requires that BPM (as defined in Section 72) are adopted to control construction noise on any given site as far as reasonably practicable. Sections 60 and 61 provide the main legislation regarding enabling works and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the Local Authority with instructions to cease work until specific conditions to reduce noise have been adopted.

Section 61 provides a means to apply for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained onsite.

Whilst construction noise and vibration are factors which can be considered during the planning process, Local Authorities have alternative powers under Sections 60 and 61 to regulate these issues if complaints arise.

The Pollution Prevention and Control (Scotland) Regulations 2012

The Pollution Prevention and Control (Scotland) Regulations 2012 defines the framework in Scotland to control pollution from any installation or mobile plant carrying out operational activities through permits, inspections and control of emissions. The permit covers the inclusion of best available techniques (BAT) and, relating to noise, will typically require periodic review of BAT and compliance monitoring to be undertaken by the license holder.

Planning Policy

National Planning Policy

National Planning Policy Framework 4 (NPF4) is the national spatial strategy for Scotland, published in February 2023 (Ref 11.3). It sets out spatial principles, regional priorities, national developments, and national planning policy.

The policies concerned with the Scottish Onshore Scheme and noise are Policies 11 and 23.

Policy 11 supports development proposals for all forms of renewable, low-carbon and zero emissions technologies. Section (e) refers to project design and mitigation with respect to demonstrating how the following impacts are addressed:

“i. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;”

Policy 23 supports development proposals that will have positive effects on health, whilst proposals will not be supported where significant adverse effects on health are likely. Section (e) states:

“Development proposals that are likely to raise unacceptable noise issues will not be supported. The agent of change principle applies to noise sensitive development. A Noise

Impact Assessment may be required where the nature of the proposal or its location suggests that significant effects are likely.”

Planning Advice Note 1/ 2011 Planning and Noise

Current national guidance on noise is contained in Planning Advice Note (PAN) 1/2011 ‘Planning and Noise’ (Ref 11.4). Paragraph 2 states that PAN 1/2011 promotes:

“the principles of good acoustic design and a sensitive approach to the location of new development. It promotes the appropriate location of new potentially noisy development, and a pragmatic approach to the location of new development within the vicinity of existing noise generating uses, to ensure that quality of life is not unreasonably affected and that new development continues to support sustainable economic growth.”

Paragraph 3 of PAN 1/2011 states that:

“The Environmental Noise (Scotland) Regulations 2006 transposed the European Directive 2002/49/EC (the Environmental Noise Directive) into Scottish law. They require Scottish Ministers and airport authorities to manage noise through a process of strategic noise mapping and noise action plans. In the areas affected by the Regulations, planning authorities have a role in helping to prevent and limit the adverse effects of environmental noise.”

There are no Environmental Noise Directive (END) ‘noise action plans’ in proximity to the Scottish Onshore Scheme.

A Technical Advice Note (TAN) (Ref 11.5) accompanies PAN 1/2011 and provides technical guidance on noise assessment to support the PAN.

Paragraph 2.5 of the TAN states:

“For a quantitative assessment of the noise impacts, the noise level change needs to be related to the sensitivity of the receptor so that the significance of the noise level change can be determined. Hence, the significance of the noise impact at a particular receptor can be determined from the magnitude of the noise change and the sensitivity of that receptor to the change in noise. The magnitude of the noise level change can be assessed relative to an absolute threshold level or relative to the pre-existing ambient noise level.”

Paragraph 3.20 of the TAN also states:

“In deciding if a significant impact occurs in regard to the assessment of industrial noise, or noise of an industrial nature, using the methodology of BS 4142 (where appropriate); the Scottish Government consider impacts are normally not significant (in a quantitative sense only) the difference between the Rating and background noise levels is less than 5 dB(A), and that usually the threshold of minor significant impacts is when the difference between the Rating and background noise levels is at least 5 dB(A); and commonly do not become sufficiently significant to warrant mitigation until the difference between the Rating and background noise levels is more than 10 dB(A).”

Local Policy

Fife council have published a policy for development and noise (Ref 11.6 and Ref 11.7).

“FIFEplan 2017, Policy 2.2:Housing and Policy 5: Employment Land and Property Policy 10: Amenity are relevant to the consideration of noise issues in planning applications. The selection of a site, the design of a development and the conditions which may be attached to a planning permission can all play a part in preventing, controlling and mitigating the effects of noise. Discussions with the planning authority prior to submitting an application will assist in deciding the level of detail required from an applicant in respect of noise. The specification of mitigation measures required should be balanced against the degree of risk to environmental quality, public health and amenity. More detailed assessments may be required for proposals that are likely to generate significant noise; for noise sensitive proposals which may affect existing noise sources and for proposals that may affect noise levels within or close to Noise Management Areas or Quiet Areas ”

No other policy or guidance which is relevant to this assessment was identified amongst the published guidance on the Fife.gov website. However as stated in the FIFE plan 2017, the Local Authority was included in discussion regarding the assessment methodology and criteria which is discussed in section 11.3 subparagraph

Consultation Undertaken to Date.

Chapter Specific Guidance

The following documents have been referred to as part of this assessment. Further details can be found in the Assessment Methodology section below:

- BS 7445-1:2003 – ‘Description and Measurement of Environmental Noise’ (Ref 11.10)
- BS 5228-1:2009+A1:2014 – ‘Code of practice for noise and vibration control on construction and open sites- Part 1: Noise’ (Ref 11.8)
- BS 5228-2: 2009+A1:2014 – ‘Code of practice for Noise and Vibration control on construction and open sites. (Ref 11.8)
- BS 4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’ (Ref 11.9)
- BS 8233:2014 ‘Guidance on sound insulation and noise reduction for Buildings’ (Ref 11.12)
- Design Manual for Roads and Bridges LA111 Noise and Vibration (Revision 2), Transport Scotland, 2020 (Ref 11.13)
- Calculation of Road Traffic Noise (CRTN), Dept. for Transport, Welsh Office, 1998 (Ref 11.14)
- Noise Advisory Council (NAC), A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level Leq (Ref 11.15)

11.3 Assessment Methodology

This section discusses the specific guidance and assessment criteria, provides further detail on the scope of the assessment and outlines the limitations and assumptions made in undertaking the assessment.

Scope of Assessment

The scope of this assessment of potential effects is as follows:

Construction Phase

- Qualitative assessment of construction noise impacts from the proposed underground cable installation, including 11 HDD's sites and construction of the proposed converter station.
- Quantitative assessment of construction noise from Horizontal Directional Drilling (HDD) associated with the proposed landfall
- Quantitative assessment of changes in road traffic noise levels on public highways due to construction traffic
- Identification of specific construction noise mitigation measures if required.

Operational Phase

- Quantitative assessment of impact of the converter station sound emissions on NSRs in accordance with BS 4142:2014 + A1:2019 (Ref 11.9) and Noise Rating criteria.
- Identification of specific operational noise mitigation measures if required.

Study Area

The extent of the Study Area has been defined to include the closest NSRs in each direction from the Scottish Onshore Scheme for both the construction and operational phases. The closest NSRs are also the most sensitive.

The construction and operational noise Study Area is limited to the closest sensitive receptors north and south of the proposed converter station site. However, the construction Study Area also includes sensitive receptors within 300m of the proposed underground DC cable route (based on a centreline within the working corridor) and the proposed landfall site at Kinghorn.

The Study Area also includes those receptors that may be affected by changes in road traffic flows during the construction phase. This is based on the traffic links in the transport model (as discussed in Volume 2, Chapter 10 Traffic and Transport).

Noise Sensitive Receptors

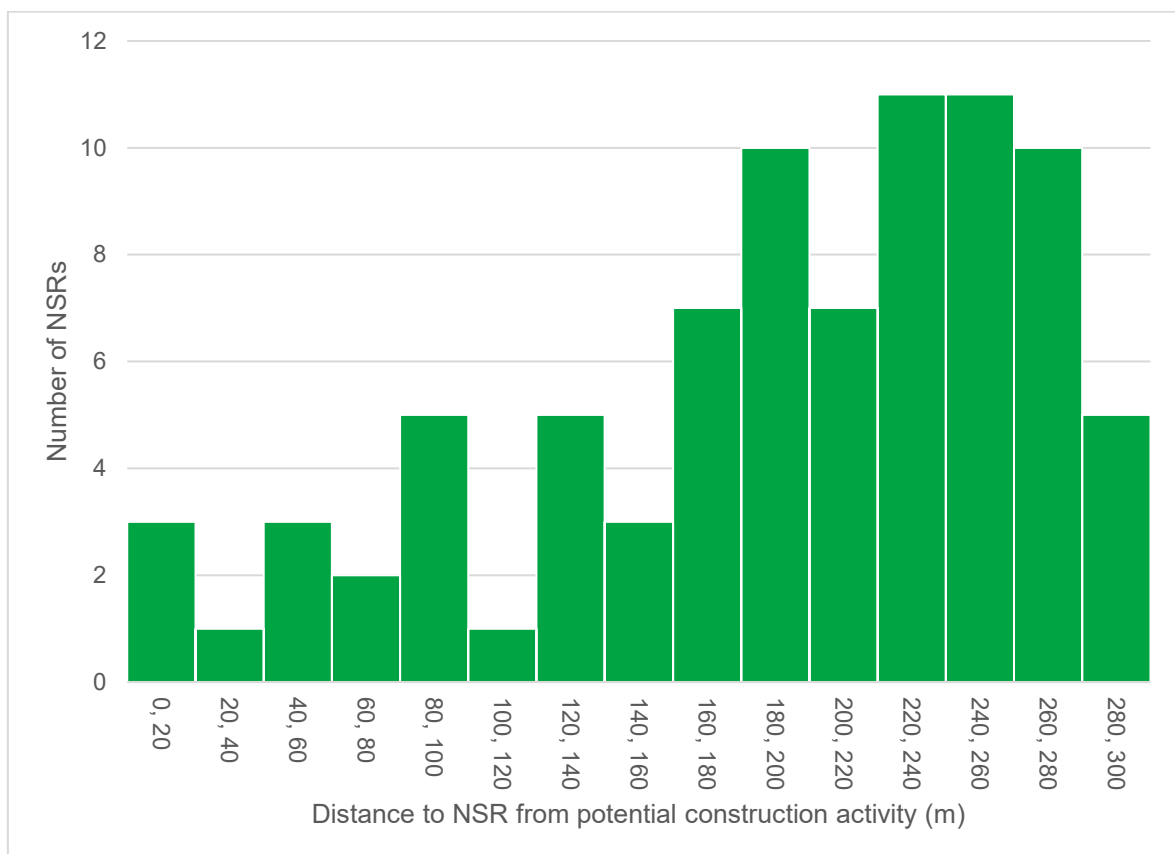
Receptors representing the closest NSRs to the Scottish Onshore Scheme have been identified and are shown in **Figure 11-1 Noise Sensitive Receptors** and **Plate 11-1 Histogram of NSR proximity to potential construction activities**, below. The following list of NSRs represent those closest to the HDD work sites along the proposed underground DC cable route:

- [NT 27086 87650] 5 Kirkcaldy Rd, Kinghorn, Burntisland KY3 9YP, 245m
- [NT 27552 87909] 6 Linton Ct, Kinghorn, Burntisland KY3 9YH 144m (C-NSR1)
- [NT 27018 88279] 6 Grange Farm Cottages, Kirkcaldy KY2 5UH, 115m (C-NSR2)
- [NT 22715 91308] Clentrie Farm Cottage, 3 Auchtertool, Kirkcaldy KY2 5XG, 115m (C-NSR47-49)

- [NT 22079 92330] Little Gleniston, Cardenden, Lochgelly KY5 0AS, 130m (C-NSR50)
- [NT 21052 93157] Nemphlar, Muirhead Quarry, Cardenden, Lochgelly KY5 0AU, 75m (C-NSR52-56)
- [NT 19799 94401] Boswellknowe, B981, Lochgelly , KY5 9HU, 225m (C-NSR58-59)
- [NT 20218 95164] 3, Pitcairn Road, Pitcairn, Cardenden, KY5 0AD, 170m (C-NSR61)
- [NT 25866 89674] 1-4, B9157, Kirkcaldy West, Burntisland, KY2 5UN, 110m (C-NSR10)
- [NT 22826 90901] New Cottoun, Boglily Road, Newbigging, Auchtertool, KY2 5XG, 180m (C-NSR46)

The distances to the closest receptors are approximate measurements to the HDD entry or exit.

Plate 11-1 Histogram of NSR proximity to potential construction activities



Regarding the proposed converter station at Westfield NSR-A and NSR-B are the closest receptors. Regarding the proposed landfall at Kinghorn NSR-C is representative of properties in closest proximity to the construction activities on Long Craigs Terrace. Any additional NSRs further away from the Scottish Onshore Scheme are likely to be less impacted by noise due to greater sound attenuation with distance on the basis baseline sound levels are comparable. The identified NSRs are also listed below in **Table 11.1 Nearest Sensitive Receptors**.

Table 11.1 Nearest Sensitive Receptors

ID	Representative Properties	Use	Relevant Source	Coordinates (Lat, Lon)	Approx. distance from relevant source (m)
NSR-A	MBM Healthcare Clinic and Cottage	Medical/ Residential	Converter Station	56.165630, -3.2964268	~180m (~70m to application boundary)
NSR-B*	Ha' House/North Pitkinny Farmhouse	Residential	Converter Station	56.158989, -3.2952896	~ 350m (0m to application boundary)
NSR-C	44 Long Craigs Terrace (and other properties on Long Craigs Terrace)	Residential	Landfall	56.0746310, -3.1703715	~170

* This property is currently unoccupied and in the control of the Applicant

Guidance and Standards

BS 5228-1: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites. Part 1: Noise (with 2014 amendment)'

Details of the proposed construction schedule and plant to be used are not available at this stage, therefore a quantitative construction noise and vibration assessment has not been possible. Instead, a qualitative assessment focussing on Best Practicable Means (BPM) has been completed. This considers the potential for significant effects to occur based on distance and timings of the proposed works but does not quantitatively assess the impact of the proposed works.

BS 5228-1 provides practical information on construction noise and vibration reduction measures and promotes a BPM approach to control noise and vibration. The calculation method provided in BS 5228-1 is based on the number and types of equipment operating, their associated sound power level (L_w), and the distance to NSRs, together with the effects of any screening.

BS 5228-1 contains a methodology for the assessment of the significance of effect of construction noise in relation to the ambient noise levels, known as the "ABC method". The criteria for significance provided in BS 5228-1 are reproduced in **Table 11.2 Construction noise threshold of potentially significant effect at dwellings**.

Table 11.2 Construction noise threshold of potentially significant effect at dwellings

Assessment Category and Threshold Value Period	Threshold Value (dB) ($L_{Aeq,T}$)		
	Category A (a)	Category B (b)	Category C (c)
Night-time (23:00 – 07:00)	45	50	55
Evenings and Weekends ^{d)}	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75

NOTE 1: A potentially significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the Scottish Onshore Scheme exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2: If the ambient noise level exceeds the Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values) then a potentially significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3 dB due to site noise.

NOTE 3: Applies to residential receptors only.

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

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

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

(d) 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays, 07:00 – 23:00 Sundays.

For the appropriate period (day, evening/weekend, night), the ambient noise level is determined and rounded to the nearest 5 dB. The appropriate Threshold Value is then derived. The construction noise level is then compared with this Threshold Value. If the noise level from the works exceeds the Threshold Value, then there is the potential for a significant effect to occur.

The overall classification of the magnitude of impact for construction noise originating from within the Scottish Onshore Scheme application boundary is based on the difference between the predicted construction noise level at each receptor and the “ABC method” Threshold Values for potentially significant effects defined in BS 5228-1:2009 and reproduced in **Table 11.3 Construction Noise Magnitude of Impact for Residential Receptors**.

Table 11.3 Construction Noise Magnitude of Impact for Residential Receptors

Construction and Demolition Sound Level above Threshold Value (dB)	Magnitude of Impact
Exceedance of ABC Threshold Value by $\geq +5$ dB	High
Exceedance of ABC Threshold Value by up to +5 dB	Medium
Equal to or below the ABC Threshold Value by up to -5 dB	Low
Below the ABC Threshold Value by ≥ -5 dB	Very Low

However, in line with best practice, this indicator of a potential significant effect is then further considered using professional judgement and accounting for a range of other factors, including:

- The duration of the impact. Based on the guidance in BS 5228-1, construction noise levels above the Threshold Value for less than 10-days (or 10-evenings/weekends or nights) in any 15 consecutive days, or 40-days or less (or 40 evenings/weekends or nights) in any 6-month consecutive period would not normally be considered significant.
- The timing of the impact, e.g. night-time impacts being more likely to be considered significant than daytime impacts.
- The location of the impact at the NSR, for example, an NSR may contain areas which are more or less sensitive than others, e.g. in a school, its office spaces or kitchens would be considered less sensitive than the classrooms.
- The nature, times of use and design of the NSR, e.g. an NSR which is not used at night would not be considered sensitive to night-time construction works.

BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites. Part 2: Vibration (with 2014 amendments)

BS 5228-2:2009 addresses the need for the protection against vibration for persons living in the vicinity of construction sites and recommends procedures for vibration control. BS 5228-2:2009 recommends that: '... it is considered more appropriate to provide guidance in terms of the PPV (Peak Particle Velocity), since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage'.

BS 5228-2:2009 provides empirical formulae relating resultant PPV for vibratory compaction, percussive and vibratory piling, dynamic compaction, the vibration of stone columns and tunnel boring operations.

Table 11.4 Effects of Vibration Levels and their Magnitude of Impact (adapted from Table B.1, BS 5228-2:2009) details PPV levels and their potential effect on humans, provides a semantic scale for description of vibration impacts on human receptors and assigns a Magnitude of Impact descriptor applied in this assessment.

Table 11.4 Effects of Vibration Levels and their Magnitude of Impact

Vibration Level (PPV mm/s)	Effect	Magnitude of Impact
0.14 to 0.3	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	Very Low
0.3 to < 1	Vibration might be just perceptible in residential environments.	Low
1.0 to <10	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.	Medium
>= to 10	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	High

BS 5228-2:2009 provides the following criteria which are the maximum vibration levels to which underground services should be subjected:

- Maximum PPV for intermittent or transient vibrations 30 mm/s;
- Maximum PPV for continuous vibrations 15 mm/s.

It goes on to state that “even a PPV of 30 mm/s gives rise to a dynamic stress which is equivalent to approximately 5 % only of the allowable working stress in typical concrete and even less in iron or steel.”

Design Manual for Roads and Bridges LA111 Noise and Vibration (Revision 2), Transport Scotland, 2020 & Calculation of Road Traffic Noise (CRTN), Dept. for Transport, Welsh Office, 1998 & Noise Advisory Council (NAC), A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level Leq

The Scottish Onshore Scheme has the potential to affect traffic flows on existing roads in the area surrounding it during construction - refer to **Chapter 10 – Traffic and Transport**. This assessment focuses on the impact at existing residential NSRs located in the vicinity of the local road network around the Scottish Onshore Scheme and major construction access routes to its main components (the proposed converter station site, the proposed underground DC cable route and the proposed landfall).

Construction traffic noise has been assessed by considering the increase in traffic flows during the construction works, following the guidance of CRTN (DfT/ Welsh Office, 1998) and DMRB (Transport Scotland, 2020).

18-hour (06:00 - 24:00) Annual Average Weekday Traffic (AAWT) flows for the construction phase, 'with' and 'without' construction traffic are used to predict road traffic noise levels. Basic Noise Level (BNL) calculations have been undertaken in accordance with CRTN to predict the change in noise level between the 'with' and 'without' scenarios where flows are

greater than 1000, in order to determine the level of effect due to predicted changes in 18-hour traffic noise levels.

The Noise Advisory Council (NAC) prediction method detailed in the document ‘A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level L_{eq} ’ is applicable for prediction of noise levels from low traffic flows. i.e. < 1000 vehicles per 18-hour where CRTN is not valid. This has been used as necessary to supplement the CRTN calculations.

The magnitude of the impact resulting from the construction traffic on public roads is based on the difference between predicted road traffic noise levels in the peak construction period ‘with’ and ‘without’ construction traffic included. The mapping of the predicted level differences to a magnitude of impact descriptor for traffic noise changes arising from construction works have been taken from Table 3.17 of DMRB and are provided below in **Table 11.5 Construction Traffic Noise Criteria**. The criteria are based on the current guidance on short-term changes in traffic noise levels in LA111.

Table 11.5 Construction Traffic Noise Criteria

Change in Traffic Noise Level, $L_{A10,18hr}$ dB	Magnitude of Impact
≥ 5.0	High
≥ 3.0 to < 5.0	Medium
≥ 1.0 to < 3.0	Low
< 1.0	Very Low

BS 4142:2014+A1:2019 ‘Methods for Rating and Assessing Industrial and Commercial Sound’

The impact of the sound levels from the proposed converter station on nearby NSRs has been assessed using BS 4142. This standard is widely used for assessing the effect of noise of an industrial nature, including substation noise. BS 4142 describes methods for rating and assessing sound of an industrial and/or commercial nature. The method compares the *rating level* of the sound source under consideration with the *background sound level* in the vicinity of residential locations. The relevant parameters are as follows:

- ambient sound level, L_a , $L_{Aeq,T}$ dB – defined in BS 4142 as the “equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far, at the assessment location over a given time interval, T. The ambient sound comprises the residual sound and the specific sound when present”;
- residual sound level, L_r , $L_{Aeq,T}$ dB – defined in BS 4142 as the “equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T’, where the residual sound is the ‘ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound”;

- background sound level – $L_{A90,T}$ dB – defined in BS 4142 as the “A-weighted sound pressure level that is exceeded by the residual sound for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels”;
- specific sound level – L_s ($L_{Aeq,Tr}$) dB – defined in BS 4142 as the “equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r ”; and
- rating level – $L_{A,r}$ dB – defined in BS 4142 as the “specific sound level plus any adjustment made for the characteristic features of the sound”, as follows:
 - Up to 6 dB for tonal characteristics, Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.
 - Up to 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible.
 - If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.
 - Where the specific sound features characteristics that are neither tonal nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.”

When comparing the background and the rating sound levels, BS 4142 states that:

- “Typically, the greater the difference, the greater the magnitude of impact.”*
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending upon the context.*
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending upon the context.*
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending upon the context.”*

Importantly, as indicated above, BS 4142 requires that the *rating level* of the sound source under assessment be considered in the context of the environment when defining the overall significance of the impact. BS 4142 suggests that in assessing the context, all pertinent factors should be taken into consideration, including the following:

- *“The absolute level of sound;*
- *The character and level of the residual sound compared to the character and level of the specific sound; and*

- *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions.”*

BS 4142 states that a 1-hour assessment period is considered during the day and a 15-minute assessment period at night as required.

Table 11.6 Construction Noise Magnitude of Impact for Residential Receptors illustrates the adopted magnitude of impact scale used in this assessment based upon the numerical level difference. For BS 4142 assessment purposes, for a residential receptor, a significant adverse effect is set at a rating level above the background sound level of +10 dB, while the level at which adverse effect occurs is +5 dB, although the consideration of context (including the absolute level of the sound under consideration) can vary the overall classification of effects.

Table 11.6 Construction Noise Magnitude of Impact for Residential Receptors

Magnitude of Impact	BS 4142 Descriptor	Rating Level – Background Sound Level (dB)
High	No BS 4142 descriptor for this magnitude level	+14/> =15
Medium/High	No BS 4142 descriptor for this magnitude level	+12/+13
Medium	Indication of a significant adverse effect, depending upon context	+9/+10/+11
Low/Medium	No BS 4142 descriptor for this magnitude level	+7/+8
Low	Indication of an adverse effect, depending upon context	+4/+5/+6
Very Low / Low	No BS 4142 descriptor for this magnitude level	+2/+3
Very Low	Indication of low impact, depending upon context	≤ 0/+1

BS 8233:2014 ‘Guidance on sound insulation and noise reduction for Buildings’

BS 8233 provides guidance for the control of noise in and around buildings. It provides design guidance for noise generated inside or outside the building including noise level criteria and control measures, and a methodology for calculating internal noise levels depending on the performance of the building fabric.

Of relevance to this assessment, for “steady external noise sources” it provides guideline values for internal ambient noise levels within dwellings. These are reproduced in **Table 11.7 Indoor Ambient Noise Levels for Dwellings**, below.

Table 11.7 Indoor Ambient Noise Levels for Dwellings

Activity		Location	07:00 to 23:00	23:00 to 07:00
Resting		Living room	35 dB $L_{Aeq,16hr}$	-
Dining		Dining Room	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom		35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

Noise Rating (NR) curves were established by the International Organization for Standardization (ISO) to define acceptable indoor sound environments for hearing preservation, speech intelligibility, and occupant comfort. These curves represent acceptable sound pressure levels across the frequency range of hearing for a given overall level. The appropriate NR curve depends on the type and intended use of the room, with each curve identified by an NR number, as discussed with Fife Council and reported in the next section.

Consultation Undertaken to Date

Survey and operational phase assessment methodology were discussed with the Fife Environmental Health Officer (EHO) by email.

The EHO confirmed that in addition to new survey locations, surveys undertaken earlier in 2025 on behalf of the applicant near the converter station (in relation to the proposed new Westfield Substation) were still relevant at NSR-A.

The EHO also confirmed that the operational noise assessment should follow the standard methodology set out in BS 4142:2014, with a rating level of up to +5 dB above the typical background sound level ($L_{A90,T}$) during both day and night considered acceptable at NSRs before mitigation is required. No character corrections are to be applied, as the Scottish Onshore Scheme is not expected to produce distinctive acoustic features compared to the prevailing ambient sound, with tonality designed out at receptor locations.

In addition to the BS 4142 assessment, the EHO stated a specific requirement and example condition:

“The total noise from all plant, machinery or equipment shall be such that any associated noise complies with NR 25 in bedrooms during the night and NR 30 during the day in all habitable rooms, when measured within any noise sensitive property with the windows open for ventilation.

If there is a discernible tone contained within the noise source, the NR curves should be reduced to NR 20 and NR 25 respectively.

For the avoidance of doubt, daytime shall be 0700 – 2300 hrs and night-time shall be 2300 – 0700 hrs.”

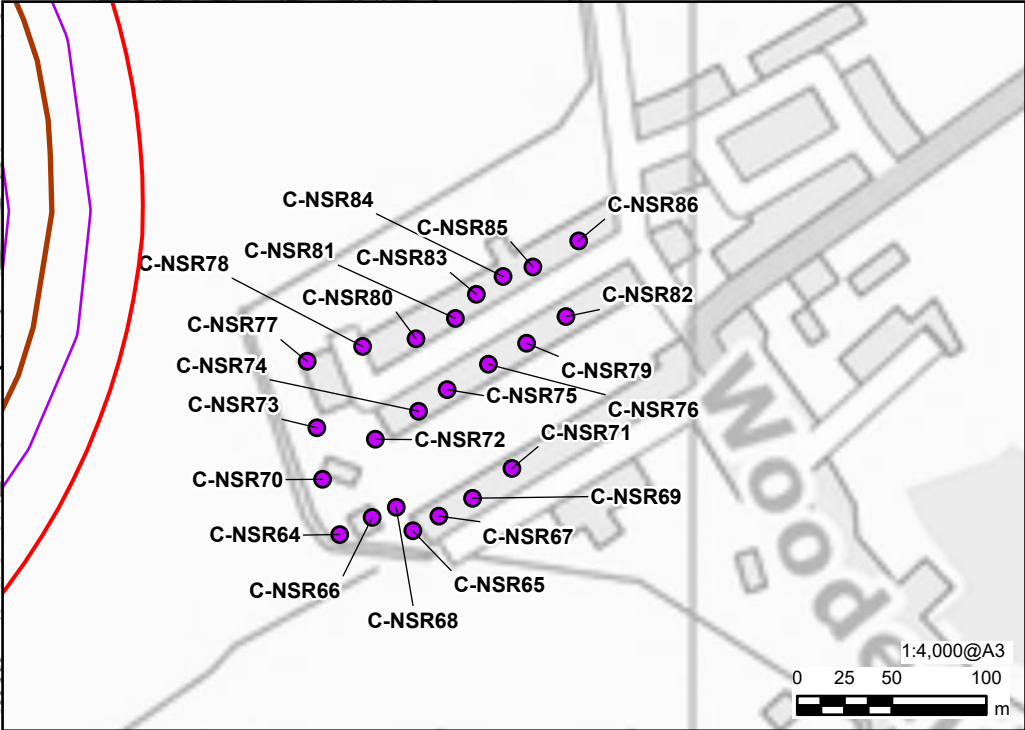
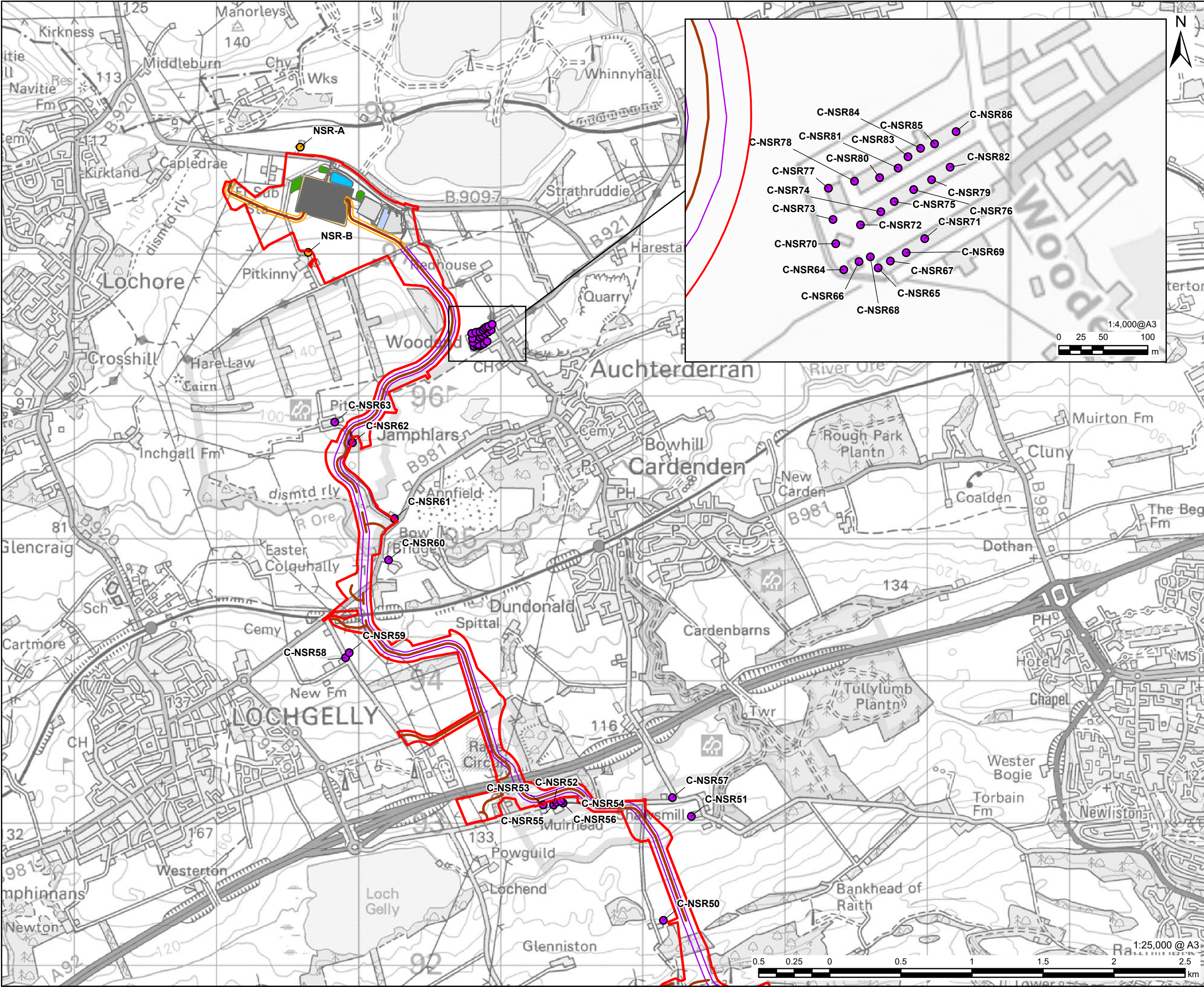
Furthermore, when transposing the internal NR criteria to an external location Fife Council EHO confirmed, “a 10-12 dB reduction for an open window” would be acceptable.

Baseline Survey Methodology

Baseline sound level surveys were conducted at two locations (NSR-B in relation to the proposed converter station and NSR-C in relation to the proposed landfall) with reference to BS 7445:2003 '*Description and Measurement of Environmental Noise*' (Ref 11.10). Sound monitoring equipment was positioned at the measurement locations (MLs) shown in Figure 11.1 **Noise Sensitive Receptors** to gather a representative free field profile of baseline ambient sound levels at NSRs over a minimum period of 5 days (including weekend and night) and accompanying weather monitoring.

Long-term measurements have been undertaken in 15-minute logging intervals for parameters L_{Aeq} , L_{A90} and L_{Amax} as a minimum over the relevant time period.

Any periods with windspeeds exceeding 5 m/s and periods of rainfall are excluded from the results based on observation while in the region, an installed weather station and from public weather reporting sources.



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Eastern Green Link 4

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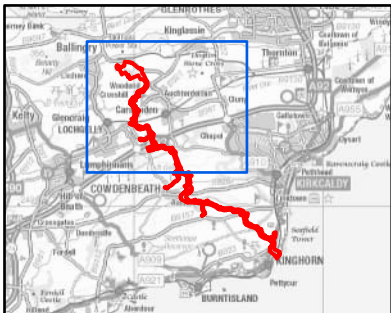
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LEGEND

- Planning Application Boundary
- Temporary Access - Haul Road
- Temporary Access - Pre-construction and de-mobilisation only
- Indicative AC Cable Route Alignment
- Indicative DC Cable Route Alignment
- Converter Station - Permanent Attenuation Basin
- Converter Station - Attenuation Basin Road
- Converter Station - Car Parking
- Converter Station - Temporary Construction Compound
- Converter Station - Finished Site Platform
- Converter Station - Permanent Earthworks
- Converter Station - Temporary Earthworks
- Converter Station - Landscape Mitigation (Permanent Landform Re-profiling)
- Converter Station - Permanent Access Road
- Converter Station - Temporary Access Road
- Noise Sensitive Receptor Cable Route
- Noise Sensitive Receptor Converter Station



NOTES

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PROJECT NUMBER

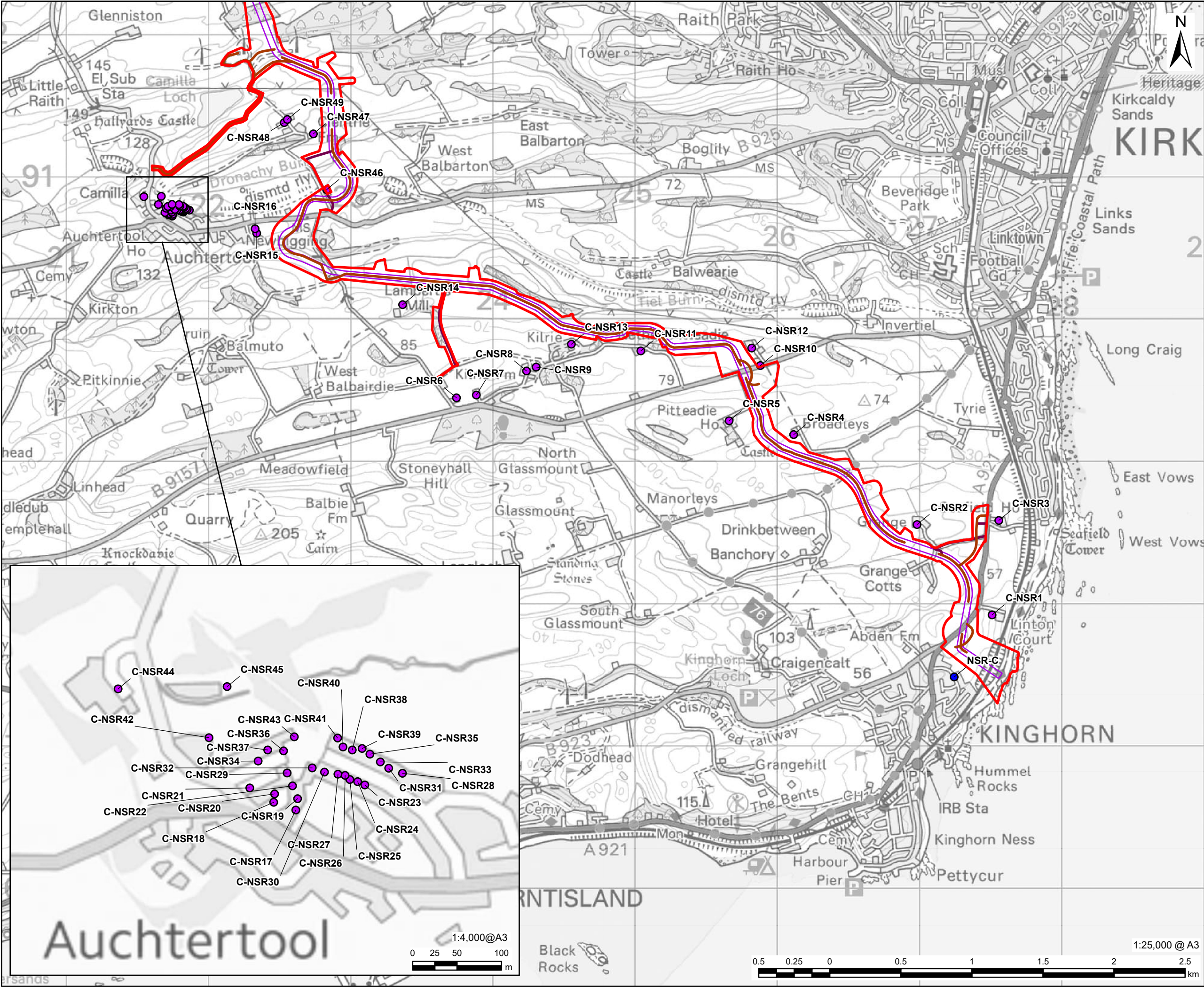
60707131

FIGURE TITLE

Noise Sensitive Receptors

FIGURE NUMBER

Figure 11.1 (Sheet 1 of 2)

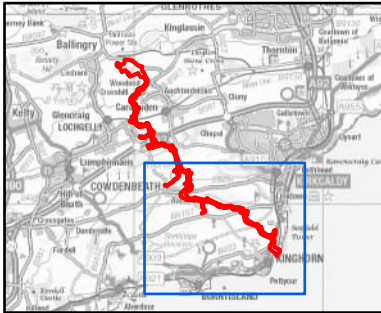


PROJECT
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- LEGEND**
- Planning Application Boundary
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 - Indicative DC Cable Route Alignment
 - Noise Sensitive Receptor Cable Route
 - Noise Sensitive Receptor Landfall



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ISSUE PURPOSE
EIA REPORT

PROJECT NUMBER
60707131

FIGURE TITLE
Noise Sensitive Receptors

FIGURE NUMBER
Figure 11.1 (Sheet 2 of 2)

Baseline conditions are discussed in the section below.

Determining Sensitivity of Receptors and Significance of Effect

The overall significance of effect is determined by combining magnitude of impact and receptor sensitivity.

Receptor sensitivity classification in **Table 11.8 Sensitivity/Value of Receptors** has been assigned based on the examples provided in Technical Advice Note to PAN 1/2011.

Table 11.8 Sensitivity/Value of Receptors

Sensitivity / value of resource / receptor	Description	Examples of receptor usage
Very High	Receptors where noise or vibration will significantly affect the function of a receptor.	Auditoria/studios; Specialist medical/teaching centres, or laboratories with highly sensitive equipment.
High	Receptors where people or operations are particularly susceptible to noise or vibration. Sensitive ecological receptors known to be vulnerable to the effects of noise or vibration.	Residential; Quiet outdoor areas used for recreation; Conference facilities; Schools/educational facilities in the daytime; Hospitals/residential care homes; Libraries.
Medium	Receptors moderately sensitive to noise or vibration where it may cause some distraction or disturbance	Offices; Restaurants/retail; Sports grounds when spectator or noise is not a normal part of the event and where quiet conditions are necessary (e.g. tennis, golf).
Low	Receptors where distraction or disturbance of people from noise or vibration is minimal	Residences and other buildings not occupied during working hours; Factories and working environments with existing high noise levels; Sports grounds when spectator or noise is a normal part of the event.

Non-residential receptors are not considered here as none were identified as being potentially affected by construction or operational phases of the Scottish Onshore Scheme.

The following terminology has been used in the assessment to define noise and vibration effects:

- Adverse - detrimental or negative effects to an environmental resource or receptor;
- Neutral - effects to an environmental resource or receptor that are neither adverse nor beneficial; or
- Beneficial - advantageous or positive effect to an environmental resource or receptor.

The effect resulting from each individual potential impact type above has been classified according to the magnitude of the impact and the sensitivity or value of the affected receptor using the matrix presented in **Table 11.9 Classification of Effects** but where necessary also considering the context of the acoustic environment.

Table 11.9 Classification of Effects

Sensitivity/ value of resource/ receptor	Magnitude of Impact			
	High	Medium	Low	Very Low
Very High	Major	Major	Moderate	Minor
High	Major	Moderate	Minor	Negligible
Medium	Moderate	Minor	Negligible	Negligible
Low	Minor	Negligible	Negligible	Negligible

Where adverse or beneficial effects have been identified, these have been assessed against the following significance scale, derived using the matrix presented in **Table 11.9 Classification of Effects**:

- Negligible – imperceptible effect of no significant consequence;
- Minor – slight, very short or highly localised effect of no significant consequence;
- Moderate – limited effect (by extent, duration or magnitude), which may be considered significant; or
- Major – considerable effect (by extent, duration or magnitude) of more than local significance or in breach of recognised acceptability, legislation, policy or standards.

For the purposes of this assessment, Negligible and Minor effects are considered to be Not Significant, whereas Moderate and Major effects are considered to be Significant.

Limitations and Assumptions

The following sources of information that define the Scottish Onshore Scheme have been reviewed and form the basis of the assessment of likely significant noise and vibration effects:

- Baseline sound monitoring survey data;
- Representative construction plant and equipment;

- Indicative layout plans for the proposed converter station and drilling site near Kinghorn (**Appendix 11.2 Proposed Development Indicative Layout, Volume 4 Appendices**);
- Items of operational buildings and equipment including sound power level data for the proposed converter station. This has been supplemented with representative octave-band frequency spectrum data where required.
- Ordnance Survey (OS) mapping of the Scottish Onshore Scheme and surrounding area; and
- Topographical data (Light Detection and Ranging (LIDAR) data) and aerial photography

In order to ensure a robust assessment of the likely significance of the environmental effects of the Scottish Onshore Scheme, the work has been undertaken adopting reasonable worst-case assumptions, where necessary.

The following assumptions have been made for the operational stage of the proposed converter station:

- Baseline sound surveys were carried out continuously over 5 days to obtain representative baseline data, although some variation can occur in both ambient activities and prevailing weather beyond this period, possibly due to atypical conditions. Weather conditions during the surveys were fair and suitable for environmental surveys. During periods of wind with speeds outside of the suitable range, or during precipitation, data have been excluded from the data used for the assessment. Therefore, environmental survey uncertainties raising the potential background sound level and informing the operational sound assessment have been reduced to a minimum or removed and are not considered significant.
- The proposed converter station site has been modelled as a hard standing with point sources representing the proposed transformers.
- The operational noise model has assumed that the proposed converter station will operate continuously at full load, 24 hours a day to present a worst-case 1-hour daytime and 15-minute night-time BS 4142:2014 assessment.
- It has been assumed that potential operational sound of a tonal, impulsive or intermittent nature will be designed out of the proposed converter station during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary.
- During design phase, bunds added to a height of 3.5m. These have been modelled as barriers at the same height. The final height of the bunds will be confirmed at detailed design stage once cut and fill balances are understood.

11.4 Baseline Conditions

The Scottish Onshore Scheme is located within the Fife Council area. The proposed converter station site is located around 2 kilometres north of Cardenden. It is bordered to the northeast by the B9097 and bordered to the east by Torres Loan, a minor single-track road. The whole site is additionally bordered by farmland. The site is adjacent to 275 kV substation and North Pitkenny access road.

The acoustic environment at the Measurement Locations (MLs) and NSRs is consistent with a rural area that is remote, featuring consistent minor continuous road traffic. The dominant sound source noted during measurements was distant road noise. Wind blowing through trees and intermittent plant noise from ongoing work related to the project also contributed to the background.

As mentioned in section **Consultation Undertaken to Date** previous data captured earlier in 2025 has been used represent the baseline sound levels at NSR-A.

Monitoring Location A (MLA) at North Pitkinny Farm is located south/southwest of the proposed converter station site. It is located 600m from the B9097, movements on this road are not continuous and at night would be infrequent and sporadic at most. MLA is located at NSR-B

MLB is located on Long Craigs Terrace south of the proposed landfall site at NSR-C. It is approximately 100m from the A921 and experiences consistent road noise, but the perceived soundscape is predominantly made up of wind blowing through trees and occasional bird song.

Unattended baseline monitoring was undertaken at sensitive receptors over ten days 3rd to 13th October 2025 to establish the contributing sources and allow the *background sound levels* to be determined. **Figure 11.1 Noise Sensitive Receptors** shows the receptor and monitoring locations. The results are presented in detail in **Appendix 11.3 Baseline Survey Measurements (Volume 4 Appendices)** and are summarised in **Table 11.10 Summary of measured sound levels at monitoring locations** below.

Table 11.10 Summary of measured sound levels at monitoring locations

	Daytime				Evening				Night-time			
Monitoring Location	$L_{Aeq,12h}$	L_{AFmax}	$L_{A90,15m}$ Mode	$L_{A90,15m}$ Mean	$L_{Aeq,4h}$	L_{AFmax}	$L_{A90,15m}$ Mode	$L_{A90,15m}$ Mean	$L_{Aeq,8hr}$	L_{AFmax}	$L_{A90,15m}$ Mode	$L_{A90,15m}$ Mean
MLA	44	79	33	35	47	85	30	32	35	62	23	26
MLB	42	71	32	34	37	63	24	28	39	67	23	25

11.5 Development Design and Embedded Mitigation

Construction

Measures to mitigate noise and vibration will be implemented during the Scottish Onshore Scheme construction phase to minimise impacts at local residential receptors and ecological receptors, particularly with respect to activities required outside of normal working hours.

Good practice would be included as part of a construction environmental management plan (CEMP) and include the following noise mitigation measures to reduce construction noise impacts to as low as practicable:

- Standard construction working hours should be adhered to as far as possible i.e. 08:00-18:00 weekdays and 08:00-13:00 Saturdays with no working on Sundays or Bank Holidays

(including site deliveries). Note some activities will require works outside of standard hours including trenchless crossings (i.e. HDDs) which will require short periods of 24 hour working;

- Fixed and semi-fixed ancillary plant such as generators, compressors and pumps will be located away from the northern and western boundaries at the converter station and landfall;
- All plant used on site will be regularly maintained, paying particular attention to the integrity of silencers and acoustic enclosures;
- All equipment will be shut down when not in use;
- The loading and unloading of materials will take place away from residential properties, ideally in locations which are acoustically screened from nearby noise sensitive receptors;
- Materials will be handled with care and placed rather than dropped where possible. Drop heights of materials from lorries and other plant will be kept to a minimum;
- Modern plant will be selected which complies with the latest EC noise emission requirements. Electrical plant items (as opposed to diesel powered plant items) should be used wherever practicable. All major compressors should be low noise models fitted with properly lined and sealed acoustic covers. All ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers;
- Site operations and vehicle routes will be organised to minimise the need for reversing movements, and to take advantage of any natural acoustic screening present in the surrounding topography;
- No employees, subcontractors and persons employed on the site will cause unnecessary noise from their activities e.g. excessive 'revving' of vehicle engines, music from radios, shouting and general behaviour etc. All staff inductions at the site should include information on minimising noise and reminding them to be considerate of the nearby residents;
- As far as practicable, noisier activities will be planned to take place during periods of the day which are generally considered to be less noise sensitive i.e. not particularly early or late in the day; and
- Measures will be put in place to ensure that employees know that minimisation of noise will be important at the site.

A final CEMP will be prepared prior to works commencing once specialist sub-contractors have been appointed and detailed information on the proposed methods are known and a more detailed consideration of the need for noise and/or vibration mitigation measures can be made, if required by Fife Council.

Regular communication with the local community throughout the construction period will also serve to publicise the works schedule, giving notification to residents regarding periods when higher levels of noise may occur during specific operations, and providing lines of communication where complaints can be addressed. A communication plan will be included in the final CEMP.

The appointed Principal Contractor should be a member of the ‘Considerate Constructors Scheme’.

Based on the information provided in BS 5228-1 (Ref 11.8) Table B.1 it is likely that the embedded measures can provide up to 5 to 10 dB of further reductions of construction noise levels at sensitive receptors.

Operational

With regard to the converter station – an earth bund has been included as embedded mitigation for noise modelling purposes. Whilst the bund is primarily for landscape and visual mitigation it also provides some limited noise attenuation/screening. It does not provide significant noise attenuation due to the barrier not being continuous around the perimeter of the converter station platform. The final height of the bund will be confirmed at detailed design stage once cut and fill balances are understood. See **Figure 11.1 Noise Sensitive Receptors** and note marked “Landscape Mitigation (Permanent Landform Reprofilng)” areas.

Where practical plant and equipment has been housed within buildings or enclosures to reduce noise emission from the proposed converter station at the site boundary and nearest NSRs. The converter station layout has been designed to position the external air handling units between two tall buildings that provide screening for the two closest NSRs, one to the north and one to the south of the site.

The development design has been undertaken on the assumption that potential operational sound of a tonal, impulsive or intermittent nature will be designed out of the proposed converter station during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary.

11.6 Assessment of Likely Impacts and Effects

Construction Phases

Construction work of any type that involves heavy plant activity will generate noise, which may result in complaints if appropriate scheduling and control of works is not exercised. Noise levels generated by construction activities and experienced by NSRs, depends upon a number of variables, the most significant of which are:

- The level of noise generated by plant or equipment used on-site, generally expressed as the sound power level;
- The periods of operation of the plant on the Site, known as its ‘on-time’;
- The distance between the noise source and the NSR; and,
- The attenuation of sound due to ground absorption, air absorption and barrier/screening effects.

To evaluate noise effects during the construction phases it is necessary to have knowledge of the variables listed above. Construction Contractors may use different working methods and plant to achieve the same ends. An accurate construction noise and vibration effect assessment is not possible until after the appointment of an approved Construction Contractor with knowledge of the exact working routine and plant schedule to be implemented.

The following subsections set out the basis on which the construction noise and vibration has been assessed for each stage of the construction: the converter station, underground cable route and horizontal directional drilling at the landfall.

Construction Phase: Converter Station

Construction works for the converter station are likely to involve initial earthworks to establish the converter station platform, construction of the new construction compounds (foundations, access roads and drainage), installation of the electrics and piling.

The initial earthworks stage, which is expected to involve the use of excavators and dump trucks, is likely to generate the highest noise levels. Based on AECOM's experience of similar projects, the remainder of the works are expected to generate lower noise levels. If piling is required, depending on the piling type adopted by the construction contractor, this activity may also generate relatively high noise and vibration levels.

For residential NSRs the ABC method sets construction noise thresholds for different time periods (e.g. day, evening, night and weekends) based on the existing ambient sound levels as set out in see **Table 11.2 Construction noise threshold of potentially significant effect at dwellings** Table 11.2. The predicted construction noise levels are then compared to these construction noise threshold values to indicate whether a potentially significant effect is likely to occur at residential NSRs.

The measured baseline ambient sound levels have been used to determine indicative BS 5228-1 ABC method threshold categories. All NSRs considered in this assessment fall within ABC Category A for all time periods. On this basis the applicable Threshold Values for the construction noise assessment at all receptors are:

- 65 dB $L_{Aeq,12hr}$ 07:00 – 19:00 Monday to Friday and 65 dB $L_{Aeq,6hr}$ 07:00 – 13:00 Saturdays;
- 55 dB $L_{Aeq,12hr}$ 19:00 – 23:00 weekdays, 55 dB $L_{Aeq,10hr}$ 13:00 – 23:00 Saturdays and 55 dB $L_{Aeq,16hr}$ 07:00 – 23:00 Sundays; and
- 45 dB $L_{Aeq,8hr}$ at night-time.

The closest properties to the proposed works are around ~70m from the application boundary with the exception of NSR-B which is an unoccupied farm house in the control and ownership of the Applicant. The Applicant can therefore directly manage the construction programme to avoid any potential noise and vibration. Otherwise NSR-A is 180m north of the converter station platform and at this distance it is considered that implementation of the BPM mitigation measures outlined above to reduce construction noise emissions would sufficiently control impacts such that the Threshold Values are unlikely to be exceeded for the vast majority of the works over day, evening and weekend periods. If exceedances do occur, these are likely to be infrequent and of short duration such that effects would not be significant.

Assuming that the construction noise and vibration threshold values are met and embedded mitigation in the form of BPM and implementation of a CEMP, with reference to **Table 11.2 Construction noise threshold of potentially significant effect at dwellings**, **Table 11.3 Construction Noise Magnitude of Impact for Residential Receptors** and **Table 11.4 Effects of Vibration Levels and their Magnitude of Impact** the magnitude of impact is Low at worst,

which for a high sensitivity receptor is classed as a **Minor Adverse** effect which is **Not Significant**.

Construction Phase: Underground Cable Route

To evaluate noise effects during the construction phases it is necessary to have knowledge of the significant variables listed previously. Specific details of the plant and equipment required and timing of its use at this early stage are not available. However, the cable route will require open trenches and a number of HDD crossings - the listed activities and equipment in **Table 11.11 Indicative Cable installation and activities and plant list** is typical of cable installation but not exhaustive.

Table 11.11 Indicative Cable installation and activities and plant list

Typical Cable Installation Activities	Representative Plant List
• Site clearance and preparation of working width • Topsoil stripping • Route excavation and preparation • HDD 24hr Drilling (where required) • Landscaping • HGV movements	• Tower Lights (Generator) • Pick-up Truck • Skip Lorry • Pumping/dewatering equipment • Vibratory roller \ plate compactor • Tracked Excavator • Mobile Drilling Equipment • Low Loader (cable drum transport)

Excluding the 24-hour HDD works, the cable installation works are progressive, short-term, and temporary; therefore, a qualitative assessment is considered appropriate for the level of potential effects from the cable installation works.

The use of construction plant and the likely noise effect from its use is determined using the guidance detailed in BS 5228-1. Where necessary, mitigation methods may be required to attenuate noise to acceptable levels at NSRs. Should complaints be received from local residents, Fife Council will determine whether BPM is being applied. Should this not be the case, action under the Control of Pollution Act 1974 may be taken.

With reference to **Plate 11-1 Histogram of NSR proximity to potential construction activities** and **Figure 11.1 Noise Sensitive Receptors** showing the NSR location along the proposed cable route it can be viewed that there are no more than four NSRs within 40m of the cable route and no more than 13 NSRs within 100m of the cable route.

Due to the intervening distance and benefit of any natural screening from the works it is expected that no single NSR greater than 40m from the proposed cable route will experience construction noise levels exceeding the day-time, evening and weekend BS 5228-1 Category A Threshold Values.

For the small number of receptors located less than 40m from the proposed cable route there is potential these may experience an exceedance of BS 5228-1 Category A Threshold Values in

the evening and weekend periods if works were undertaken in these more sensitive periods. However, due to the progressive nature of the works, it is expected that should any BS 5228-1 Category A Threshold Values be exceeded this will not occur on more than a few consecutive days.

Therefore assuming the benefit of embedded mitigation in the form of BPM is applied and implemented within a CEMP, with reference to **Table 11.2 Construction noise threshold of potentially significant effect at dwellings**, **Table 11.3 Construction Noise Magnitude of Impact for Residential Receptors** and **Table 11.4 Effects of Vibration Levels and their Magnitude of Impact** for NSRs greater than 40m from the proposed cable route the magnitude of impact is Low at worst, which for a high sensitivity receptor is classed as a **Minor Adverse** effect which is **Not Significant**.

As a precautionary approach, for NSRs less than 40m from the proposed cable route the magnitude of impact is Medium at worst, which for a high sensitivity receptor is classed as a **Moderate Adverse** effect which is **Significant**.

At HDD sites along the cable route (excluding Landfall which is discussed in the next section) the closest NSR is approximately 75 m from the HDD site at [NT 21052 93157] Nemphlar, Muirhead Quarry, Cardenden, Lochgelly KY5 0AU , a list of the closest NSRs to HDD sites is provided in Section 11.3 Assessment Methodology Noise Sensitive Receptors above. At HDD sites along the underground cable route the drilling requirements are less than that of the landfall site, and as such duration of the drilling works will be shorter for most HDD sites, the longer HDD sites will likely require longer but there is not sufficient information at this stage to be more precise. Where possible, the drilling would also begin at the location that maximises the distance to the nearest receptor.

On this basis for,

- *NSRs in the vicinity of shorter HDD spans* - magnitude of impact is Low at worst in any period, which for a high sensitivity receptor is classed as a **Minor Adverse** effect which is **Not Significant**.
- NSRs in the vicinity of longer HDD spans –
 - Weekday, Evening and Weekend the magnitude of impact is Low to Medium at worst in any period, which for a high sensitivity receptor is classed as **Minor to Moderate Adverse** effect which is potentially **Significant**.
 - Night-time the magnitude of impact is Medium to High at worst in any period, which for a high sensitivity receptor is classed as **Moderate to Major Adverse** effect which is **Significant**.

Construction Phase: Landfall

At the landfall site continuous 24-hour construction horizontal directional drilling (HDD) operations are planned. The level of noise generated by plant or equipment used on site is expressed as the sound power level in **Table 11.12 Construction Plant List and spectrum**. This is considered representative of the HDD activities planned at the landfall drilling location, actual plant and equipment levels will vary between manufacturer/model. This assessment

provides an indication of the likely effects and mitigation requirements of the proposed landfill works based on this equipment list.

Table 11.12 Construction Plant List and spectrum

Point Source at 3m above ground		Linear Lw Spectra dB (Hz)								Sound Power Level <i>L</i> _{WA}	dB
		63	125	250	500	1k	2k	4k	8k		
Mounting supports for HDD (hydraulic hammer)		105	111	101	96	101	108	112	105	114	
Directional (Generator) drill		95	108	102	100	100	100	96	89	104	
Point Source Total Sound Power Level		78	96	95	97	102	109	112	103	114	
Area Source at 1.5m above ground		63	125	250	500	1k	2k	4k	8k	Sound Power Level <i>L</i> _{WA}	dB
Tower Lights		106	99	94	90	87	83	84	77	98	
Site Pick-up		116	110	102	102	102	101	98	95	106	
Skip Lorries		110	112	106	103	99	98	93	87	105	
Generator		98	90	90	85	81	80	76	69	87	
Tracked Excavator		113	106	105	105	101	99	96	91	106	
All terrain mobile crane 80-100t		115	110	106	102	99	95	88	80	104	
Winch (Generator)		95	108	102	100	100	100	96	89	104	
Compressor		103	99	93	98	99	97	90	85	102	
Low Loader (cable drum transport)		113	111	104	103	103	100	100	89	107	
Area Source Total Sound Power Level		94	101	103	107	108	108	105	96	114	

Activities at the landfill site have been represented by a rectangular area source of 3690 m² (75 x 50 approx.) placed 1.5 metres above the ground, and the HDD works as a point source 3m above the ground centred on the cable alignment. This site area is located approximately 170 m north of NSR-C and construction noise level predictions from this area have been undertaken using the methodology provided in BS 5228-1.

Predicted level at the closest NSRs are presented in **Table 11.13 Predicted levels at closest Noise Sensitive Receptors to Landfall installation** below.

Table 11.13 Predicted levels at closest Noise Sensitive Receptors to Landfall installation

Receptor name	Predicted External Level at NSR dB $L_{Aeq,T}$	Magnitude of Impact Weekday & Saturday AM (T = 12hr & 6hr)	Magnitude of Impact Evening and Weekend (T = 4hr, 10hr, 16hr)	Magnitude of Impact Night-Time (T = 8hr)
33 Long Craigs Terrace	57	Very Low	Medium	High
44 Long Craigs Terrace	57	Very Low	Medium	High
46 Long Craigs Terrace	56	Very Low	Medium	High
31 Long Craigs Terrace	55	Very Low	Low	High
72 Long Craigs Terrace	56	Very Low	Medium	High
26 Long Craigs Terrace	54	Very Low	Low	High
76 Long Craigs Terrace	55	Very Low	Low	High
66 Long Craigs Terrace	55	Very Low	Low	High
25 Long Craigs Terrace	53	Very Low	Low	High
64 Long Craigs Terrace	54	Very Low	Low	High

Based on the predicted levels in **Table 11.13 Predicted levels at closest Noise Sensitive Receptors to Landfall installation** and resulting magnitude of impact, with reference to **Table 11.2 Construction noise threshold of potentially significant effect at dwellings** and **Table 11.3 Construction Noise Magnitude of Impact for Residential Receptors** the likely significance of effect in the:

- Weekday day-time and Saturday morning periods is **Negligible** which is **Not Significant** for all NSRs.
- Evening and weekend periods is **Moderate Adverse** at 4 properties which is **Significant** and **Minor Adverse** at all others which is **Not Significant**
- Night-time period is **Major Adverse** which is **Significant** for all NSRs.

On this basis further specific additional mitigation is considered in **Section 11.7 Mitigation and Residual Impacts** below. However, it is worth noting that that predictions do not include the benefit of any potential screening from garden boundary fences as a conservative approach.

Construction Phase: Construction Road Traffic on Public Highways

The potential changes in road traffic noise as a result of the proposed cable route have been considered for each road link in the Traffic and Movement Chapter defined study area. These links are shown in **Chapter 10 Access, Traffic & Transport Figure 10.1 – Study Area Roads**.

Construction traffic data are available for the following parameters for each road link for the baseline and construction year, 2029:

- Annual Average Weekday Traffic (AAWT);
- Percentage HGV; and
- Average vehicle speed estimation.

Table 11.14 Predicted Change in Road Traffic Noise Level due to Construction Vehicles on Public Highways presents the traffic flows for each road link along with the predicted BNL and the predicted change in BNL due to the construction phase. The resulting magnitude of impact is determined from **Table 11.5 Construction Traffic Noise Criteria** and for High Sensitivity receptors the Significance of Effect is the same as the magnitude of impact, see **Table 11.9 Classification of Effects**.

Table 11.14 Predicted Change in Road Traffic Noise Level due to Construction Vehicles on Public Highways

#	Link Name	2029 Baseline Traffic				2029 Baseline & Scottish Onshore Scheme Traffic				Change in BNL, dB	Magnitude of Impact
		18hr AAWT	% HGV	Speed (km/h)	Predicted Level dB $L_{Aeq,16h}$ at 10m	18hr AAWT	% HGV	Speed (km/h)	Predicted Level dB $L_{Aeq,16h}$ at 10m		
Link 1	M90 north	31,360	9	113	77.3	31,740	9	113	77.3	0.1	Very Low
Link 2	M90 south	33,235	8	113	77.3	33,615	8	113	77.3	0.1	Very Low
Link 3	B9097 Loch Leven	4,623	2	71	64.0	5,383	5	71	65.3	1.3	Low
Link 4	B9097 Ballingry	3,052	3	92	64.3	3,812	7	92	66.0	1.7	Low
Link 5	B921 / B981 Auchterderran	5,425	2	48	62.3	5,485	2	48	62.3	No Change	
Link 6	B981 Lochgelly	5,425	2	76	65.1	5,545	3	76	65.5	0.3	Very Low
Link 7	B9149 Lochgelly	14,130	2	60	67.7	14,250	3	60	67.8	0.2	Very Low
Link 8	U019 Lochgelly	1,275	13	39	56.9	1,395	16	39	58.2	1.2	Low
Link 9	C48 Loch Gelly	2,398	1	79	61.2	2,518	3	79	62.1	0.8	Very Low
Link 10	A92 Crossgates	52,556	5	113	78.8	52,736	5	113	78.9	No Change	
Link 11	A92 Lochgelly	48,990	8	113	79.0	49,170	8	113	79.0	No Change	
Link 12	U033 Auchtertool	321	0	49	49.2	441	14	49	52.3	3.1	Medium
Link 13	A909 Mossmorran	7,164	5	85	67.9	7,284	6	85	68.1	0.2	Very Low

#	Link Name	2029 Baseline Traffic				2029 Baseline & Scottish Onshore Scheme Traffic				Change in BNL, dB	Magnitude of Impact
		18hr AAWT	% HGV	Speed (km/h)	Predicted Level dB $L_{Aeq,16h}$ at 10m	18hr AAWT	% HGV	Speed (km/h)	Predicted Level dB $L_{Aeq,16h}$ at 10m		
Link 14	A909 Goathill Quarry	4,754	7	97	67.5	4,874	8	97	67.7	0.3	Very Low
Link 15	B925 Auchtertool	1719	1	73	58.6	1839	4	73	59.9	1.3	Low
Link 16	A921 Dalgety Bay	11868	2	75	68.3	11928	2	75	68.5	0.1	Very Low
Link 17	B9157 Aberdour	5192	2	85	65.8	5252	3	85	66.1	0.3	Very Low
Link 18	B9157 Inveriel	4289	2	80	64.4	4409	3	80	64.8	0.4	Very Low
Link 19	A921 Kinghorn	9041	1	57	65.0	9161	2	57	65.3	0.3	Very Low

The Predicted $L_{Aeq,16h}$ noise levels and Change in BNL values have been rounded to one decimal place following calculations. which may result in minor discrepancies of ± 0.1 due to rounding.

It is generally accepted that changes in noise levels of up to 1 dB L_{PA} are imperceptible, while changes between 1 dB and 3 dB L_{PA} are not widely perceptible.

As shown in **Table 11.14 Predicted Change in Road Traffic Noise Level due to Construction Vehicles on Public Highways**, 14 of the 19 links are predicted to experience a very Low magnitude of impact and are therefore considered Negligible and Not Significant. Four links are predicted to have a Low magnitude of impact, which is a Minor Adverse effect which is Not Significant.

Link 12 is predicted to experience a Medium magnitude of impact, corresponding to a Moderate Adverse effect which is potentially Significant. However, it is useful to consider

- BS 8233 recommended levels in amenity spaces upper guideline of 55 dB $L_{Aeq,16h}$;
- NSRs are located further from the road than the 10 m reference used in the predictions; and
- the potential benefit of screening from buildings and land topography,

In combination both magnitude of the noise and the sensitivity of NSRs on Link 12 are lower in practice meaning that it is unlikely that outdoor amenity spaces will exceed the upper guideline of 55 dB $L_{Aeq,16h}$. Therefore, the increase in traffic along Link 12 is considered to result in a **Minor Adverse** effect at worst which is **Not Significant**.

Overall, the predicted change in road traffic noise levels due to construction vehicles on public highways is no worse than a **Minor Adverse** effect depending on the affected link considered which is **Not Significant**.

Operational Phase

The operational phase of the Scottish Onshore Scheme relates to the converter station only. The converter station has the potential to produce audible sound beyond the site boundary and has been assessed using the methodology provided in BS 4142:2014. The key noise generating items within the converter station development that are assessed are shown in **Appendix 11.4 Model Setup Plate 1 Model Layout (Volume 4 Appendices)**

- AC Filters 1 & 2
- Amenities
- Control Building
- Converter Cooler 1 & 2
- Converter Hall 1 & 2
- DC Hall 1 & 2
- PLC Filter 1 & 2
- Storage
- Transformers 1 & 2

To undertake the BS 4142 assessment the *specific sound levels*, *rating level* and *background sound level* are required at each assessment location. The rating level is defined as the *specific*

sound level plus any character correction for the presence of tonal, intermittent, impulsive sound and sound that can be otherwise considered as distinctive.

The assessment is based on the difference between the *rating level*, $L_{A,T}$ dB and the representative *background sound level* $L_{A90,T}$ at each NSR. Positive differences indicate an excess of the *rating level* over the *background sound level*. Consultation with Fife Council was discussed in Section 11.3 - a *rating level* of up to +5 dB above the typical *background sound level* ($L_{A90,T}$) during both day and night is considered acceptable at NSRs before mitigation is required.

A model of the converter station and surroundings has been developed in CadnaA 2025 sound mapping software which calculates predictions in accordance with ISO 9613-2 (Ref 11.11). The model has been used to predict the Scottish Onshore Scheme's sound emissions from the converter station at the NSRs identified in **Table 11.1 Nearest Sensitive Receptors**. Sound power levels have been provided by the Applicant, and these have been used to represent the plant. Details of the model setup, sound power levels and spectrum used in the predictions are provided in **Appendix 11.4 Model Setup (Volume 4 Appendices)**.

The converter station sound is present 24 hours a day with little variation; hence no correction has been applied for on-time. As stated in the assumptions and limitations section, it has been assumed that potential operational sound of a tonal, impulsive or intermittent nature will be designed out of the Scottish Onshore Scheme during the detailed design phase by the selection of appropriate plant, building cladding, louvres and silencers/attenuators as necessary. The specific sound will likely be indistinct against the existing background sound which includes the existing substation and therefore no 'distinctiveness' correction has been included. A comparison of *specific sound level*, *rating level* and *background sound level* is provided in **Table 11.15 BS 4142 Assessment Results**.

Results are provided for daytime and night-time operation which are different only in the *background sound level* and height at which the sound level is predicted which is 1.5m in the day time and 4m at night-time, unless where the property is single storey.

Table 11.15 BS 4142 Assessment Results

Receptor	Specific sound level $L_{Aeq,15min}$ (dB)	Rating Correction (dB)	Rating level $L_{Ar,15min}$ (dB)	Background sound level $L_{A90,1hour}$ (dB)	Exceedance	BS 4142 Impact Category	BS 4142 Outcome & Magnitude of Impact
NSRA – Ground floor	38	0	38	33	5	Day	Low - Indication of an adverse effect depending on context
NSRA – First floor	38	0	38	23	15	Night	High – No better than Significant Adverse Effect depending on context
NSRB – Ground floor	38	0	38	34	4	Day	Low - Indication of an adverse effect depending on context
NSRB – First floor	39	0	39	25	14	Night	High – No better than Significant Adverse Effect depending on context

In the daytime the predicted operational sound levels at NSRs in absolute terms are generally considered low and are certainly well below the preferred and upper values of 50 dB $L_{Aeq,16h}$ and 55 dB $L_{Aeq,16h}$ in BS 8233 for external amenity spaces when combined with the ambient sound. Therefore, in the daytime the *rating level* is no more than +5 dB over the *background sound level* and the magnitude of impact at NSRs A and B is Low, this results in a **Minor Adverse** effect at worst which is **Not Significant**. This outcome also aligns with the Fife Council local policy on operational noise in the daytime including compliance with the daytime Noise Rating curve within living spaces of NR30.

Night-time is the most sensitive time period and is subject to the greatest impact in the quantitative assessment. In the night-time assessment period the *rating level* exceeds the *background sound level* by more than 10 dB which is a strong indication of a significant adverse effect depending on the context. The overall absolute sound level is less than 40 dB $L_{Aeq,8hr}$ which while noticeable against the very low *background sound level* in the night-time is not a high level of noise. Furthermore, the BS 4142 assessment methodology is applicable externally at the NSR at night-time – internal levels should also be considered as part of the context of the assessment.

The predicted free-field specific sound levels in **Table 11.15 BS 4142 Assessment Results** would be reduced further by a façade with windows partially open for ventilation. Internal levels would be well below BS 8233:2014 night-time guidance for bedrooms to avoid sleep disturbance 30 dB $L_{Aeq,T}$ when assuming the 10 to 12 dB reduction for a partially open window for ventilation in alignment with the Fife Council EHO response.

Further to this, the predicted external octave band levels has been used to predict the internal sound level in each octave band (32 Hz to 4 kHz) based on a typical residential building cavity wall envelope with a partially open window. It has been established that the calculated octave band level Noise Rating would meet NR25 requirement at NSRA and NSRB internally, see **Appendix 11.5 Noise Rating Curve Comparison (Volume 4 Appendices)**. This is contextual evidence that while the BS4142 quantitative outcome suggests significant adverse impact are possible at night, in practice the absolute operational level internally are unlikely to cause Significant effects and will instead be **Minor Adverse** which is **Not Significant** in the worst case.

Operational sound level predictions in this assessment are based on the assumption that all equipment is operating at maximum capacity which is likely to be a conservative assumption.

Overall given the absolute level of the sound, compliance with the Fife Council day and night time Noise Rating curve criteria and the conservative nature of the noise modelling approach the operational sound at NSRs is assessed as **Minor Adverse** at worst which is **Not Significant**.

11.7 Mitigation and Residual Impacts

Construction Mitigation

There is potential for adverse impacts if the ABC limits are exceeded. Construction plant and methodologies should be reviewed at later stages when more detail is available and compared against these limits. If exceedances are predicted to occur further mitigation should be implemented such as temporary screening and phasing of works.

However, at this stage it is predicted that at the converter station and along the underground cable route no additional mitigation is required beyond the embedded mitigation and best practice outlined previously. Therefore, residual impacts at NSRs near these sites will be **Minor Adverse** or less if the limits are met with the exception that NSRs less than 40m from the proposed cable route which may experience **Moderate Adverse** effects for a limited number of days at worst.

Along the cable route there is potential for Significant effects without mitigation at HDD sites requiring longer drilling periods. Mitigation is proposed in the form of a site specific noise management plan to be informed by detailed design. This plan will consider factors such as equipment selection, selecting the drilling site that maximises separation distance between the HDD and NSR and/or benefits from natural screening, as well as the implementation of temporary noise barriers. The outcome of this intervention would for the longer drilling periods in the:

- Weekday, evening and weekend, reduce the potential magnitude of impact to Low impact which is **Minor Adverse** and **Not Significant**.
- Night-time, reduce the potential magnitude of impact to Medium impact which is **Moderate Adverse** at worst and **Significant**.

At the landfall site **Moderate Adverse** and **Major Adverse** effects were predicted in evening/weekend and night periods respectively. Specific mitigation in the form of a temporary 10-metre-high barrier has been included around the modelled construction area to provide an indication of the potential reduction provided. The mitigated predicted levels from HDD works are presented in **Table 11.16 Predicted noise levels and Magnitude of Impact at the Landfall HDD site with barrier mitigation in place**.

Table 11.16 Predicted noise levels and Magnitude of Impact at the Landfall HDD site with barrier mitigation in place.

Receptor name	Magnitude of Impact Predicted External Level at NSR dB $L_{Aeq,T}$	Magnitude of Impact Weekday & Saturday AM (T = 12hr & 6hr)	Magnitude of Impact Evening and Weekend (T = 4hr, 10hr, 16hr)	Magnitude of Impact Night-Time (T = 8hr)
46 Long Craigs Terrace	48	Very Low	Very Low	Medium
33 Long Craigs Terrace	47	Very Low	Very Low	Medium
44 Long Craigs Terrace	48	Very Low	Very Low	Medium
72 Long Craigs Terrace	50	Very Low	Low	Medium
76 Long Craigs Terrace	50	Very Low	Low	Medium

Receptor name	Magnitude of Impact Predicted External Level at NSR dB $L_{Aeq,T}$	Magnitude of Impact Weekday & Saturday AM (T = 12hr & 6hr)	Magnitude of Impact Evening and Weekend (T = 4hr, 10hr, 16hr)	Magnitude of Impact Night-Time (T = 8hr)
66 Long Craigs Terrace	49	Very Low	Very Low	Medium
31 Long Craigs Terrace	47	Very Low	Very Low	Medium
26 Long Craigs Terrace	46	Very Low	Very Low	Medium
64 Long Craigs Terrace	47	Very Low	Very Low	Medium
25 Long Craigs Terrace	46	Very Low	Very Low	Medium

Operational Mitigation

No further specific mitigation has been included beyond the embedded mitigation previously identified.

Residual Effects

Table 11.17 Summary of Residual Effects

Receptor Name	Description of Effect	Effect without Mitigation	Additional Mitigation	Residual Level of Effects
NSR-A	Construction Noise: Converter Station	Minor Adverse	None	Based on the distance of works to the receptor, and included embedded mitigation of BPM and implementation of a CEMP – Minor Adverse (Not Significant)
NSR-B	Construction Noise: Converter Station	Minor Adverse	None - The property is unoccupied and managed by the Applicant.	No effect (Not Significant)
NSR's > 40m from Cable Route	Construction Noise: Underground Cable Route Installation	Negligible to Minor Adverse	None	Based on short duration, progressive nature of the works,

Receptor Name	Description of Effect	Effect without Mitigation	Additional Mitigation	Residual Level of Effects
	Daytime, Evening and Weekend			and embedded mitigation – Negligible to Minor Adverse at worst (Not Significant)
NSR < 40m from Cable Route (4 NSRs)	Construction Noise: Underground Cable Route Installation Daytime	Minor Adverse	None	Based on short duration, progressive nature of the works, and embedded mitigation – Negligible to Minor Adverse at worst (Not Significant)
NSR < 40m from Cable Route (4 NSRs)	Construction Noise: Underground Cable Route Installation Evening and Weekend	Moderate Adverse	None	Based on short duration, progressive nature of the works, and embedded mitigation – Moderate Adverse at worst (Significant)
NSRs in the vicinity of shorter HDD spans along the cable route	Construction Noise: Cable Route HDD Works All Periods	Minor Adverse		Minor Adverse at worst (Not Significant)
NSRs in the vicinity of longer HDD spans along the cable route	Construction Noise: Cable Route HDD Works Weekday, Evening and Weekend	Minor to Moderate Adverse	Site specific noise management plan	Minor Adverse at worst (Not Significant)
	Construction Noise: Cable Route HDD Works Night-time	Moderate to Major Adverse		Moderate Adverse at worst (Significant)
All NSRs at Long	Construction Noise: Landfall HDD works	Negligible		Negligible to Minor Adverse at worst

Receptor Description of Effect Name		Effect without Mitigation	Additional Mitigation	Residual Level of Effects
Craigs Terrace	Weekday & Saturday AM		Site specific noise management plan	(Not Significant)
All NSRs at Long Craigs Terrace, except 33, 44, 46 and 72	Construction Noise: Landfall HDD works Evening and Weekend	Minor Adverse	plan and Temporary Noise Barriers	
33, 44, 46 and 72 Long Craigs Terrace		Moderate Adverse		
All NSRs at Long Craigs Terrace	Construction Noise: Landfall HDD works Night-time	Major Adverse		Moderate Adverse at worst (Significant)
All NSR near all Links	Construction Traffic on Public Roads	Negligible to Minor Adverse	None	Based on short duration, progressive nature of the works, and embedded mitigation – Minor Adverse at worst (Not Significant)
NSR and B	A Converter Station Day time Operational Noise	Minor Adverse	None	Minor Adverse at worst (Not Significant)
NSR A and B	Converter Station Night-time Operational Noise	Minor Adverse when considering the context	None	Minor Adverse at worst (Not Significant)

11.8 Summary

This chapter of the Environmental Impact Assessment (EIA) Report evaluates potential noise and vibration impacts during the construction and operation of the Scottish Onshore Scheme. The scheme comprises approximately 16.2 km of proposed underground DC cable from a landfall north of Kinghorn, Fife, to a converter station near the existing Westfield Substation on the B9097 east of Ballingry, Fife. Noise-sensitive receptors (NSRs) along the route are shown in **Figure 11.1**. The assessment considers construction noise impacts associated with the

converter station, the cable route, drilling at the landfall location, and construction-related road traffic noise on public highways.

During operation, only the converter station is expected to generate noise, operating continuously with minimal variation. Residual operational noise effects have been assessed as Minor Adverse at worst and **Not Significant** during both day and night periods, and no additional noise mitigation is required.

Residual construction noise effects are predicted to be no worse than Moderate Adverse which is **Significant** in relation to Horizontal Directional Drilling (HDD) works along the cable route at longer HDD spans at night, and at the landfall HDD site at night. These effects are based on the implementation of a site-specific noise management plan, including the use of temporary noise barriers.

11.9 References

Ref 11.1 Environmental Protection Act 1990, c. 79. Available at <https://www.legislation.gov.uk/ukpga/1990/43/contents>

Ref 11.2 Control of Pollution Act 1974, c. 60 and 61. Available at <https://www.legislation.gov.uk/ukpga/1974/40/part/III/crossheading/construction-sites>

Ref 11.3 Scottish Government (2023). National Planning Framework 4 (NPF4)

Ref 11.4 The Scottish Government (2011). PAN 1/2011 Planning Advice Note, Planning and Noise.

Ref 11.5 The Scottish Government (2011). Technical Advice Note – Assessment of Noise.

Ref 11.6 <https://www.fife.gov.uk/kb/docs/articles/planning-and-building2/planning/development-plan-and-planning-guidance/local-development-plan-fifeplan>

Ref 11.7 https://www.fife.gov.uk/_data/assets/pdf_file/0026/255338/Planning-Policy-for-development-and-noise2.pdf

Ref 11.8 British Standards Institution (2014). BS 5228-1:2009+A1:2014 ‘Code of practice for noise and vibration control on construction and open sites – Part 1: Noise’

Ref 11.9 British Standards Institution (2019). BS 4142: 2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’

Ref 11.10 BS 7445 ‘Description and Measurement of Environmental Noise’, British Standards Institution, 2003.

Ref 11.11 International Standards Organisation (2024). ISO 9613-2 2024 ‘Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation’

Ref 11.12 BS 8233:2014 ‘Guidance on sound insulation and noise reduction for Buildings’

Ref 11.13 Design Manual for Roads and Bridges LA111 Noise and Vibration (Revision 2), Transport Scotland, 2020

Ref 11.14 Calculation of Road Traffic Noise (CRTN), Dept. for Transport, Welsh Office, 1998

Ref 11.15 Noise Advisory Council (NAC), A Guide to Measurement and Prediction of the
Equivalent Continuous Sound Level Leq