

Viking CCS pipeline

Preliminary Environmental Information Report Volume II

Main PEIR

Applicant: Chrysoar Production (U.K.) Limited,
a Harbour Energy Company

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Chapter 13

Noise and Vibration



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13 Noise and Vibration

13.1 Introduction

- 13.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of an initial assessment of the likely significant effects from noise and vibration as a result of the Viking CCS Pipeline (hereafter referred to as 'the Project'). For more details about the Project, refer to *Chapter 3: The Viking CCS Pipeline* of this PEIR.
- 13.1.2 This chapter considers noise and vibration effects on human receptors and excludes assessment of noise and vibration on ecological receptors. The potential disturbance of local ecological or heritage receptors from noise due to the introduction of the Project will be considered in *Chapter 6: Ecology and Biodiversity* and *Chapter 8: Historic Environment*. This chapter should also be read in conjunction with *Chapter 16: Socioeconomics* and *Chapter 17: Health and Wellbeing*.
- 13.1.3 This chapter is supported by *PEIR Volume IV - Appendix 13.1: Noise and Vibration - BS 5228 Calculations* in as well **Figure 13-1: Receptors and Noise Monitoring Locations**.

13.2 Legislation, Policy and Guidance

- 13.2.1 This section identifies and describes relevant legislation, policy and guidance documents applicable to the preliminary noise and vibration assessment.

Legislation

Control of Pollution Act 1974

- 13.2.2 The Control of Pollution Act 1974 (CoPA) (0) requires that Best Practicable Means (BPM), as defined in Section 72 of the CoPA, are adopted to control construction noise on any given site. Sections 60 and 61 of the CoPA 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 imposing requirements as to the way in which the works are to be carried out.
- 13.2.3 Section 61 of the CoPA provides a means to apply for prior consent to carry out noise generating activities during construction and allows the Local Authority to attach conditions to the consent.

Environmental Protection Act 1990

- 13.2.4 The Environmental Protection Act 1990 (EPA) (0) prescribes a statutory nuisance as noise (and vibration) emitted from premises (including land) that is prejudicial to health or a nuisance.
- 13.2.5 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 responsible for the nuisance. It requires either simply the abatement of the nuisance or works to abate the nuisance to be carried out, or it prohibits or restricts the activity.
- 13.2.6 In determining if a noise complaint amounts to a statutory nuisance the Local Authority can take account of various guidance documents and existing case law as no statutory noise limits currently exist for defining a statutory nuisance. Demonstrating the use of BPM to minimise noise levels is an accepted defence against failure to comply with a noise abatement notice.

Policy

National Planning Policy

13.2.7 The Project must have regard to the relevant policies of the relevant National Policy Statements (NPS) (Ref 13-4 and Ref 13-5) and National Planning Policy Framework (NPPF) (Ref 13-6). Key aspects of the relevant NPSs and NPPF, which have been considered during the development of this chapter, are outlined in **Table 13-1** below.

Table 13-1: Planning Policy Relevant to Noise and Vibration

Policy Reference	Policy Context
National Policy Statements	
Overarching National Policy Statement for Energy (EN-1) (Ref 13-4)	
Section 5.11, Paragraph 5.11.4	<i>“Where noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment: a description of the noise generating aspects of the development proposal leading to noise impacts, including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise; identification of noise sensitive premises and noise sensitive areas that may be affected; the characteristics of the existing noise environment; a prediction of how the noise environment will change with the proposed development; in the shorter term such as during the construction period; in the longer term during the operating life of the infrastructure; at particular times of the day, evening and night as appropriate. an assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; and measures to be employed in mitigating noise. The nature and extent of the noise assessment should be proportionate to the likely noise impact.”</i>
Section 5.11, Paragraph 5.11.5	<i>“The noise impact of ancillary activities associated with the development, such as increased road and rail traffic movements, or other forms of transportation, should also be considered.”</i>
Section 5.11, Paragraph 5.11.6	<i>“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 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.”</i>
Section 5.11, Paragraph 5.11.7	<i>“The applicant should consult Environment Agency (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</i>

Policy Reference	Policy Context
	<i>seasonality of potentially affected species in nearby sites may also need to be taken into account.”</i>
Section 5.11, Paragraph 5.11.9	<p>To aid the Secretary of State in decision making, paragraph 5.11.9 of NPS EN-1 sets out the three aims relating to noise emissions from new developments:</p> <ul style="list-style-type: none"> • <i>“avoid significant adverse impacts on health and quality of life from noise;</i> • <i>mitigate and minimise other adverse impacts on health and quality of life from noise; and</i> • <i>where possible, contribute to improvements to health and quality of life through the effective management and control of noise”.</i>
National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) (Ref 13-5)	
Paragraph 2.20.1	<i>“During the pre-construction phase there could be vibration effects from seismic surveys. During construction, tasks may include site clearance, soil movement, ground excavation, tunnelling, trenching, pipe laying and welding, and ground reinstatement. In addition, increased HGV traffic will be generated on local roads for the movement of materials. These types of noise and vibration impacts will need to be assessed.”</i>
Section 2.20 Gas and Oil Pipelines Impacts: Noise and Vibration, Paragraph 2.20.3	<i>“The commissioning of a new pipeline can involve extensive periods of drying after hydrotesting, using air compressors, and noise mitigation may be required for this type of activity.”</i>
National Planning Policy Framework (Ref 13-6)	
Paragraph 174	<i>“Planning policies and decisions should contribute to and enhance the natural and local environment by:[...] e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans.”</i>
Paragraph 185	<i>“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse</i>

Policy Reference	Policy Context
	<i>impacts on health and the quality of life; b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...</i>

Noise Policy Statement for England

- 13.2.8 The Noise Policy Statement for England (NPSE) (Ref 13-7) seeks to clarify the underlying principles and aims in existing policy documents, legislation, and guidance that relate to noise. The statement applies to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise.
- 13.2.9 The NPSE sets out the long-term vision of the government’s noise policy, which is to “promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”.
- 13.2.10 This long-term vision is supported by three aims: *“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
- *Avoid significant adverse impacts on health and quality of life;*
 - *Mitigate and minimise adverse impacts on health and quality of life; and*
 - *Where possible, contribute to the improvements of health and quality of life.”*
- 13.2.11 The ‘Explanatory Note’ within the NPSE provides further guidance on defining ‘significant adverse effects’ and ‘adverse effects’ using the concepts:
- No Observed Effect Level (NOEL) – the level below which no effect can be detected. Below this level, there is no detectable effect on health and quality of life due to noise;
 - Lowest Observable Adverse Effect Level (LOAEL) - the level above which adverse effects on health and quality of life can be detected; and
 - Significant Observed Adverse Effect Level (SOAEL) - the level above which significant adverse effects on health and quality of life occur.
- 13.2.12 With reference to the SOAEL, the NPSE states:
- “It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available.”*
- 13.2.13 For situations where noise levels are between the LOAEL and SOAEL, all reasonable steps should be taken to mitigate and minimise the effects. However, this does not mean that such adverse effects cannot occur.
- 13.2.14 Further consideration of health effects and the interaction of noise with other effects (e.g., land quality, transport, and landscape and visual amenity) is presented in *Chapter 17: Health and Wellbeing*, and *Chapter 19: Cumulative Effects*.

Local Planning Policy

- 13.2.15 Central Lincolnshire Local Plan 2012-2036 (Ref 13-8), adopted 24 April 2017: with particular reference to Policy LP26: Design and Amenity, which states *“Proposals should demonstrate, where applicable and to a degree proportionate to the proposal, how the following matters have been considered, in relation to both the construction and life of the development: [...]. Adverse noise and vibration”*.
- 13.2.16 North East Lincolnshire Local Plan 2013-2032 (Ref 13-9), adopted 22 March 2018: with particular reference to Policy 5: Development Boundaries, which states *“All development proposals located within or outside of the defined boundaries will be considered with regard to suitability and sustainability, having regard to: [...]. Adverse noise and vibration”*. Policy 31: Renewable and low carbon infrastructure states *“Developments and their associated infrastructure will be assessed on their merits and subject to the following impact considerations, taking account of individual and cumulative effects: [...]. local amenity, including noise [...] impact”*.
- 13.2.17 East Lindsey Local Plan (Ref 13-10), adopted July 2018: with particular reference to paragraph 14.5, which states *“[...] development should not have an impact on residential amenity, for example with regard to [...] noise [...] or vibration”*.

Guidance

Planning Practice Guidance Noise

- 13.2.18 The Planning Practice Guidance concerned with noise (PPGN) (Ref 13-11) advises that *“Noise needs to be considered when development may create additional noise, or would be sensitive to the prevailing acoustic environment (including any anticipated changes to that environment from activities that are permitted but not yet commenced)”*.
- 13.2.19 It also provides guidelines that are designed to assist with the implementation of the NPPF.
- 13.2.20 The PPG states that local planning authorities should take account of the acoustic environment and in doing so consider:
- *“whether or not a significant adverse effect is occurring or likely to occur;*
 - *whether or not an adverse effect is occurring or likely to occur; and*
 - *whether or not a good standard of amenity can be achieved.”*
- 13.2.21 Factors to be considered in determining whether noise is a concern are identified including the absolute noise level of the source, the existing ambient noise climate, time of day, frequency of occurrence, duration, character of the noise, and cumulative effects.
- 13.2.22 Further details on the hierarchy of noise effects are presented in **Table 13-2**, which has been reproduced from PPGN.

Table 13-2: Planning Practice Guidance Noise Exposure Hierarchy

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			

Perception	Examples of Outcomes	Increasing Effect Level	Action
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude, or other physiological response, e.g., avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening, and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically	Unacceptable Adverse Effect	Prevent

Perception	Examples of Outcomes	Increasing Effect Level	Action
	definable harm, e.g. auditory and non-auditory		

13.3 Scoping Opinion and Consultation

- 13.3.1 A scoping exercise was undertaken in early 2022 to establish the content of the noise and vibration assessment and the approach and methods to be followed.
- 13.3.2 The Scoping Report (Ref 13-20) records the findings of the scoping exercise and details the technical guidance, standards, best practice and criteria to be applied in the assessment to identify and evaluate the likely significant effects of the Project on noise and vibration.
- 13.3.3 Following receipt of the Scoping Opinion (*PEIR Volume IV: Appendix 5.2*), the following requirements have been identified by the Planning Inspectorate which will be taken account of as part of the ongoing noise and vibration assessment:
- The assessment of the vibration impacts arising from operation of the Project. An assessment should be provided to establish the absence of likely significant effects.
- 13.3.4 Following receipt of the Scoping Opinion (*PEIR Volume IV - Appendix 5.2*), the following items were confirmed by the Planning Inspectorate to be scoped out of the noise and vibration assessment:
- Ambient vibration monitoring for construction as no major vibration sources are identified in the Study Area. Any vibration impacts will be assessed on the absolute levels;
 - Assessment of noise impacts arising from road traffic movement associated with the operation of the Project.; and
 - Assessment of operational noise from the new pipeline. The new pipeline would be installed below ground and would not produce any operational noise emissions that would be perceptible at ground level. Consequently, an assessment of operational noise associated with the pipeline has been scoped out of the assessment.
- 13.3.5 A summary of the EIA Scoping Opinion comments received in relation to Noise and Vibration are provided in **Table 13-3**.

Table 13-3: Summary of the EIA Scoping Opinion in relation to Noise and Vibration

Section Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
Paragraph 13.3.7	Ambient vibration monitoring	Given the nature of the scoping area and the information provided in the Scoping Report regarding likely vibration impacts, the Inspectorate agrees with the proposed approach to assess construction vibration on absolute levels.	Noted, construction vibration effects have been considered in Table 13-12 and will be assessed on absolute levels in ES.
Paragraph 13.4.5, Table 13-1	Noise impacts from operational road traffic	The Inspectorate has considered the information provided, and accepts that significant effects are unlikely given the likely scale of operational traffic, however limited information on noise sensitive receptors that could be affected is provided in the Scoping Report. The Inspectorate advises that the ES should include the information on noise sensitive receptors used to establish that likely significant effects can be excluded, and demonstrate where this has been informed by the outcomes of consultation with stakeholders.	The identified noise-sensitive receptors are summarised in Table 13-10 and shown in Figure 13-1 . The selection of receptors presented will be agreed with local planning authorities through the consultation process.
Paragraph 13.4.8, Paragraph 13.5.5, Table 13-1	Vibration impacts from operational activities	In the absence of information on the likely vibration generated by operational activities, in particular the operation of equipment at Immingham, the offshore tie-in and outlet, and shutdown valves associated with the Proposed Development, the Inspectorate is not in a position to agree to scope operational vibration from the assessment. Accordingly the ES should include an assessment, or provide the relevant information, supported by advice from the relevant consultation bodies, to establish the absence of likely significant effects.	An assessment of the potential operational vibration effects has not been undertaken at this stage. Once more detailed information on the plant that will be used at the Immingham Facility, Block Valves Stations and Theddlethorpe Facility is obtained, the scope of the operational vibration assessment will be reviewed and consulted on with the relevant consultation body, the outcomes of which will be presented in the ES.

Section Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
Paragraph 13.5.4, Table 13-1	Operational noise from the new pipeline	The Inspectorate has considered the information provided and agrees that significant effects are unlikely and that this matter can be scoped out of the ES.	The new pipeline would be installed below ground and would not produce any operational noise emissions that would be perceptible at ground level. Consequently, an assessment of operational noise associated with the pipeline has been scoped out of the assessment and it is noted that this has been agreed with the Planning Inspectorate.
Paragraph 13.3.2	Noise monitoring	<p>The Scoping Report describes the intention to undertake long-term unattended measurements at the Pipeline Offtake Facility at Immingham, the offshore pipeline tie-in and outlet at the former TGT Site and at selected shutdown valves along the pipeline. Short-term unattended measurements are proposed at selected locations along the pipeline route.</p> <p>The ES should contain detailed monitoring reports providing the data required by BS7445-1:2003.</p>	Section 13.5.8 provisionally describes the noise monitoring methodology. The method will be agreed with the relevant stakeholders and the ES will contain the monitoring results required according to BS7445-1.
Paragraph 13.6.1	Mitigation and control measures	The Inspectorate welcomes the intention to describe mitigation and control measures in the ES, and advises that the ES clearly describes the efficacy of these measures in terms of the residual effects following their implementation. Where applicable, the ES should include an assessment of any environmental effects generated by the presence of noise mitigation measures e.g. the visual effects of noise attenuation measures.	Preliminary mitigation and control measures have been described in section 13.6. This will be developed for the ES and assessed as other topics as and where it is appropriate to do so.

Section Reference to Scoping Opinion	Applicant's proposed matter	Planning Inspectorate / prescribed consultee comments	Response
North Lincolnshire Council	Scope	The Council's Environmental Health Officer has confirmed that this proposed approach is acceptable.	This is noted.

13.4 Assessment Method

- 13.4.1 This preliminary assessment is based on baseline and design information available at the time of writing this PEIR. The assessment will be developed and refined following Statutory Consultation and as additional information becomes available, with a final assessment presented within the Environmental Statement (ES).
- 13.4.2 The noise and vibration assessment considers the following:
- Construction noise;
 - Construction vibration;
 - Construction traffic noise; and
 - Operational noise from the Theddlethorpe Facility and the Block Valve Stations.
- 13.4.3 The nearest receptors to the Immingham Facility are approximately 800m away. As no receptors are located in the Study Area, the noise effects associated with the construction and operation of the Immingham Facility have not been assessed.
- 13.4.4 The Study Area for construction and operational noise (defined in paragraph 13.5.2) includes receptors within 300m of the Draft Order Limits.

Assumptions and Limitations

Baseline Assumptions and Limitations

- 13.4.5 Any measurement of existing ambient or background sound levels will be subject to a degree of uncertainty. Environmental sound levels vary between days, weeks, and throughout the year due to variations in source levels and conditions, meteorological effects on sound propagation, and other factors. Hence, any measurement survey can only provide a sample of the ambient levels. Every effort will be made to ensure that measurements are undertaken in such a way as to provide a representative sample of conditions, such as avoiding periods of adverse weather conditions, and school holiday periods (which are often considered to result in atypical sound levels). However, a small degree of uncertainty will always remain in the values taken from such a measurement survey.

Construction Noise Assumptions and Limitations

- 13.4.6 The preliminary assessment of construction noise (and vibration) has considered construction activities that have the potential to result in significant effects on identified receptors, based on information presented in *Chapter 3: The Viking CCS Pipeline* and previous experience of construction sites and professional judgement. These assessments are based on a reasonable representative worst-case scenario.
- 13.4.7 Construction noise calculations have been undertaken based on an example schedule of plant items that are typically used in such developments for the purposes of carrying out a quantitative assessment at this stage (Appendix 13.1).
- 13.4.8 Calculations have been undertaken using BS 5228:2014+A1:2019 'Code of practice for noise and vibration control on construction and open sites' (Ref 13-12) methodologies and AECOM library data of sound sources associated with the proposed construction activities. These sound sources are taken to be representative of the plant and/or activities that will be used during the construction process of the Project. Noise predictions have been carried out to provide a conservative scenario where construction plant is operational nearest to the identified receptors and do not take into account quieter periods when limited activities take place or at further distances. Consequently, noise predictions may overestimate construction noise levels and are therefore considered to be a reasonable likely worst case.

13.4.9 Noise effects during the decommissioning phase of the Project will be similar or less than noise effects during the construction phase. The noise assessment presented for the construction phase will therefore be considered representative (or an overestimate) of the decommissioning phase. As such a separate assessment for noise from the decommissioning phase is not included.

Operational Assumptions and Limitations

13.4.10 A series of industry standard assumptions have been made for the generation of the operation noise model as follows:

- Digital noise modelling of the operational Project is based on the parameters set out in the drawings, plans, and construction and operation details as set out in *Chapter 3: The Viking CCS Pipeline*;
- Surrounding ground conditions will be modelled as 80% soft ground;
- Air temperature will be assumed to be 10 degrees and humidity 70%, which are considered typical annual average weather conditions;
- One order of reflection will be modelled;
- Land topography will be incorporated into the noise modelling; and
- All receptor points will be set at a standard height of 1.5 m above local ground levels to calculate representative noise levels at sensitive receptors.

13.4.11 Operational noise will be predicted with all plant being in maximum operation at all times of day.

Impact Assessment Methodology

13.4.12 A new source of noise is assessed through the absolute noise level it generates at sensitive receptors. Where an exceedance of the defined SOAEL for each noise source occurs, it is an indication of a likely significant effect. However, where an existing noise source is changed (i.e., construction traffic changing road traffic noise levels), the assessment of the effect level due to the change in noise refers to guidance within DMRB and consideration of the absolute noise level based on national policy guidance.

13.4.13 Government policy for noise is based on community exposure response relationships and noise insulation of a typical dwelling. Consequently, an assessment based on LOAELs and SOAELs cannot be applied to non-residential sensitive receptors. As such, the approach to the assessment of non-residential receptors differs from that adopted for residential receptors. Non-residential receptors are considered on a case-by-case basis by considering the applicable design criteria for good internal noise levels.

Construction and Decommissioning Phase

13.4.14 A detailed construction schedule has yet to be developed, but the construction of the Project is anticipated to commence in 2026 and complete in 2027. A working day of 12 hours (07:00 to 19:00) Monday to Friday, five days a week, and six and a half hours (07:00 to 13:30) on Saturday is expected. Special circumstances could include continual 24 hour working, such as where Horizontal Directional Drilling (HDD) is required at major watercourse crossings.

13.4.15 Noise and vibration effects during the decommissioning phase of the Project will be similar to or less than noise effects during the construction phase; therefore, construction and decommissioning impacts are considered together. The noise assessment presented is considered representative (or an overestimate) of the decommissioning phase.

Pipeline Construction

13.4.16 The following activities will be undertaken to construct the pipeline:

- Creation of access tracks;
- Topsoil stripping;
- Pipe stringing, bending and welding;
- Excavation of pipe trench using mechanical excavators or specialised trenching machine;
- Placement of welded pipe using boom cranes;
- Dewatering of the trench and other excavations; and
- Reinstatement.

Pipeline Crossing

13.4.17 The following techniques could be used for pipeline crossing:

- Open-cut crossing;
- Auger boring;
- Guided auger boring; and
- HDD.

Construction and Decommissioning Noise

13.4.18 Noise levels experienced by sensitive receptors during construction and decommissioning works depend upon several variables, the most significant of which are:

- the noise generated by plant or equipment used on site, generally expressed as sound power levels (L_w);
- the periods of use of the plant on site, known as its 'on-time';
- the distance between the noise/vibration source and the receptor;
- the noise attenuation due to ground absorption, air absorption and barrier effects;
- in some instances, the reflection of noise due to the presence of hard surfaces such as the sides of buildings; and
- the time of day or night the works are undertaken.

Construction and Decommissioning Noise Criteria

13.4.19 Noise and vibration levels associated with construction works will be assessed (at chosen sensitive receptors, agreed with the Environmental Health Officers of the relevant Local Authorities) using the data and procedures given in BS 5228:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open sites Part 1: Noise and Part 2: Noise*' (Ref 13-12).

13.4.20 Construction works noise levels will be predicted following guidance from BS 5228 Part 1 which provides a realistic estimate of sound propagation from construction plant. The predictions will use representative noise levels, sourced from industry standard guidance documents such as BS 5228, for typical items of plant that are used in such developments. Construction noise will be assessed based on guidance from BS 5228 Part 1. The 'ABC'

method will be used. This method compares predicted construction noise levels to existing levels of ambient noise.

13.4.21 Annex E of BS 5228-1 provides example methods for the assessment of the significance of construction noise effects. With reference to the NPSE, the LOAEL and SOAEL thresholds have been set in **Table 13-4** below.

Table 13-4: Thresholds of Potential Effects of Construction Noise at Residential Buildings

Time Period	Threshold Value (L _{Aeq,T} dB)	
	LOAEL	SOAEL
Day (07:00 – 19:00) Saturday (07:00 – 13:00)	65	75
Evening (19.00 – 23.00) Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays)	55	65
Night (23.00 – 07.00)	45	55

13.4.22 Although there is currently a lack of evidence relating to health effects from construction noise, the method for assessing construction noise effects is defined based on the current industry standard approach followed in other applications for development consent.

13.4.23 In terms of sound insulation or temporary rehousing due to construction noise, BS 5228-1 states that a property would be eligible if exposed to significant levels of noise “for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months”. Consequently, these durations will be considered should a significant effect be identified.

Construction and Decommissioning Vibration Criteria

13.4.24 BS 5228-2 provides further guidance on the perception of vibration within occupied buildings. This provides a simple method of determining annoyance alongside evaluation of cosmetic damage associated with construction and decommissioning induced vibration. **Table 13-5** details Peak Particle Velocity (PPV) levels (a standard measure of vibration effects) and their potential effect on humans.

Table 13-5: Criteria for Construction and Decommissioning Vibration (Human Response)

Magnitude of Impact	PPV Vibration Level	BS 5228-2 Description of Impact
LOAEL	0.3 mm/s	Vibration might be just perceptible in residential environments.
SOAEL	1.0 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but it can be tolerated if prior warning and explanation has been given to residents.

13.4.25 The recommended PPV vibration limits for transient vibration, above which cosmetic damage could occur for different types of buildings are provided in BS 5228-2 and presented in **Table 13-6**. For these limits, 'minor damage' is possible at vibration magnitudes that are greater than twice those given in **Table 13-6**, and 'major damage' can occur at values greater than four times the tabulated values. Consequently, the significance of effect has been provided based on the sensitivity of a building to vibration induced cosmetic damage. Cosmetic damage would precede the onset of any structural damage.

Table 13-6: Criteria for Construction and Decommissioning Vibration (Cosmetic Building Damage)

Type of building	Peak component particle velocity in frequency range of predominant pulse, at which cosmetic damage could occur	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures, Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
Industrial and heavy commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note 1: A potential negligible effect (not significant) is indicated at vibration levels up to the threshold values.
 Note 2: A potential minor adverse effect (not significant) is indicated at vibration levels up to a magnitude of twice the threshold values.
 Note 3: A potential moderate adverse effect (significant) is indicated at vibration levels up to a magnitude of four times the threshold values.
 Note 4: A potential major adverse effect (significant) is indicated at vibration levels equal to or greater than a magnitude of four times the threshold values

Construction and Decommissioning Traffic Noise

13.4.26 Traffic during decommissioning is expected to be similar (or lesser) than the construction phase. Construction and decommissioning traffic noise has been preliminarily assessed for a representative worst-case day during the construction stage based on information in *Chapter 3: The Viking CCS Pipeline*. Predicted construction traffic noise levels along the main access routes have been compared to measured ambient noise levels so a potential change in noise can be derived.

13.4.27 Road traffic noise levels have been calculated with reference to the methodology included within the Calculation of Road Traffic Noise (CRTN) (Ref 13-13), which provides an equation for the calculation of the Basic Noise Level (BNL) from a road in terms of the 18-hour Average Annual Weekday Traffic (AAWT) flow from 06:00 to 24:00. The temporary changes in road traffic noise levels along the local road network due to construction traffic have been assessed based on short-term changes in noise from Table 3.54a of the Design Manual for Roads and Bridges LA111 (Ref 13-14). Assessment criteria are presented in **Table 13-7**.

Table 13-7: Construction Traffic Noise Assessment Criteria

Effect Level	Magnitude criteria
Negligible	≥ 0 dB and < 1 dB

Effect Level	Magnitude criteria
Minor	≥ 1 dB and < 3 dB
Moderate	≥ 3 dB and < 5 dB
Major	≥ 5 dB

13.4.28 DMRB defines the LOAEL as 55 dB $L_{A10,18h}$ and the SOAEL as 68 dB $L_{A10,18h}$. DRMB goes on to state that:

“Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect”.

13.4.29 This implies that receptors experiencing noise levels exceeding the SOAEL are more sensitive to smaller changes in noise than receptors experiencing absolute noise levels below the SOAEL. As the BNL is calculated at 10 m from the roadside, the absolute noise level is not considered to be representative of what nearby receptors may experience; however, it is appropriate for defining a change in noise level. Should an increase in noise of greater than 1 dB be identified from a road where the BNL exceeds the SOAEL, additional calculations are undertaken to identify the absolute noise levels at nearby receptors and the likelihood of significant effects.

Operational Noise

13.4.30 The impact of operational noise from the Theddlethorpe Facility and Block Valve Stations will be assessed following the methodology set out in BS 4142 (Ref 13-15), whereby the rating level of noise emissions from activities are compared against the background sound level of the pre-development noise climate.

13.4.31 The relevant parameters for this methodology are as follows:

- Background sound level – $L_{A90,T}$ – defined in the Standard as the ‘A’ weighted sound pressure level that is exceeded by the residual sound at the assessment location 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 – $L_{Aeq,Tr}$ – the equivalent continuous ‘A’ weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, Tr; and
- Rating level – $L_{Ar,Tr}$ – the specific sound level plus any adjustment made for the characteristic features of the noise.

13.4.32 BS 4142 recognises that certain acoustic features of a sound source can increase the impact over that expected based purely on the sound level. The standard identifies the following features to be considered:

- Tonality - a penalty of 2 dB is applied for a tone which is just perceptible at the receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible;
- Impulsivity - a penalty of 3 dB is applied for impulsivity which is just perceptible at the receptor, 4 dB where it is clearly perceptible and 6 dB where it is highly perceptible. An impulse is defined as the sudden onset of a sound;
- Intermittency - a penalty of 3 dB can be applied if the intermittency of the specific sound is readily identifiable against the residual acoustic environment at the receptor i.e., it has identifiable on/off conditions; and

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

13.4.33 BS 4142 states the following regarding the assessment of impacts, comparing the rating level of the new noise source with the existing background level:

- *"Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on 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 on the context."*

13.4.34 BS 4142 advises that where rating levels and background levels are low, which is the case in rural areas surrounding the Draft Order Limits, the assessment of operational noise should take into context the absolute noise level. BS 8233:2014 Guidance on sound insulation and noise reduction for buildings. (Ref 13-16) and the World Health Organization (WHO) 'Guidelines for Community Noise' (1999) (Ref 13-17) provide guidance levels for internal noise within dwellings and external noise levels in gardens. For gardens, a precautionary approach has been taken when defining the LOAEL by applying a minimum LOAEL of 35 dB $L_{Aeq,T}$, which is applicable for relaxation within a property. A similar approach has been taken for night-time noise when defining the minimum LOAEL of 30 dB $L_{Aeq,T}$. However, at night, residents are likely to be inside their properties. Assuming that a partially open window attenuates noise by 15 dB an external SOAEL 45 dB $L_{Ar,Tr}$ during the night-time.

Operational Noise Criteria

13.4.35 The assessment criteria for noise from fixed plant installations in low background noise environments are summarised in **Table 13-8**.

Table 13-8: Operational Noise Assessment Criteria

Effect Level	Rating Level (External) at Receptor, $L_{Ar,Tr}$	
	Daytime (07:00-19:00) and Evening (19:00-23:00)	Night-time (23:00-07:00)
LOAEL	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 35 dB $L_{Ar,Tr}$	Less than or equal to the typical background level ($L_{A90,T}$) – minimum of 30 dB $L_{Ar,Tr}$
SOAEL	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$	Greater than 10 dB above the background noise level – minimum of 45 dB $L_{Ar,Tr}$

Non-Residential Receptors

13.4.36 Design guides for good internal conditions in non-residential receptors are set indoors. The only identified non-residential receptor that is sensitive to noise is a hotel. BS8233: 2014 states that the recommendations for ambient noise in hotel bedrooms are similar to those

for residential receptors. Consequently, the same methodology has been used for the hotel as for residential receptors.

Defining an Effect

13.4.37 All noise effects are local, only affecting the Project and nearby sensitive receptors, and are direct in nature; however, defining a likely effect and whether it is significant or not depends on the nature of a noise source. A new source of noise is assessed through the absolute noise level it generates at sensitive receptors. This assessment follows guidance for identification of significant effects set out in national policy. Where an existing noise source is changed, an assessment of the significance of effect due to the change in noise using guidance within DMRB and consideration of the absolute noise level based on national policy guidance.

13.4.38 The duration of temporary changes in noise as a result of construction traffic are defined as follows:

- Short-term – period lasting for no longer than 3 months;
- Medium-term – period lasting for more than 3 months but no longer than 2 years; or
- Long-term – period lasting for longer than 2 years.

13.4.39 Likely effects for new sources of noise (i.e., demolition/construction and building services plant) have been defined based on guidance set out in national policy. Where an exceedance of the defined SOAEL for each noise source occurs is an indication of a likely significant effect.

13.4.40 Although a significant effect due to construction activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise and vibration, additional consideration of the overall significance of the effect for temporary construction activities will be provided through qualitative discussion of the following:

- Duration of temporary likely effects;
- Frequency of events; and
- Receptor type.

13.5 Baseline Environment and Study Area

13.5.1 Based on information presented in the 2017 (Round 3) DEFRA Strategic noise mapping dataset (Ref 13-18), the dominant sources of sound in the area are considered to be the local road network including the A16 and A18. Additional sound sources include agricultural activities on surrounding road networks along the extent of the pipeline route, the Humberside Airport, and current extremely limited on site works at the Theddlethorpe Gas Terminal.

13.5.2 The Study Area for construction and operational noise effects will include receptors within 500m of the Theddlethorpe Facility, Block Valve Stations and within 300m of the Draft Order Limits. These distances have been selected based on previous experience that operational noise sources are likely to be negligible at distances greater than 500m and that construction noise predictions (based on guidance in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise' are generally reliable up 300m.

13.5.3 There are no identified Noise Important Areas and Noise Action Plan Priority Areas within the Study Area.

Sensitive Receptors

- 13.5.4 Potential sensitive receptors (i.e., buildings whose occupants may be disturbed by adverse noise and vibration levels, and structures that are sensitive to vibration) have been taken into consideration when assessing the effects associated with noise and vibration levels from the construction and operational phases of the Project.
- 13.5.5 The type of receptors that may experience significant effects due to the construction and operation of the Project are identified in **Table 13-9** as residential and non-residential.

Table 13-9: Receptor Types

Receptor Group	Receptors in Group
Residential	Individual dwellings and private open spaces (e.g. gardens)
Non-residential	Non-residential community facilities such as schools, hospitals, places of worship, and noise sensitive commercial properties

- 13.5.6 The effect of noise and vibration generated during the construction and operational phases of the Project has been considered at nearby sensitive receptors. A number of receptors that may potentially be affected have been considered in this assessment. The sensitive receptors considered are the nearest receptors to the Project (i.e., the receptors that will experience the highest levels of noise and vibration). Although noise and vibration may be perceivable at other receptors in the area around the Project, effects will not be significant if they are suitably controlled at the identified receptors.
- 13.5.7 The identified noise-sensitive receptors are summarised in **Table 13-10** and shown in **Figure 13-1**. The selection of receptors presented will be agreed with local planning authorities through the consultation process.

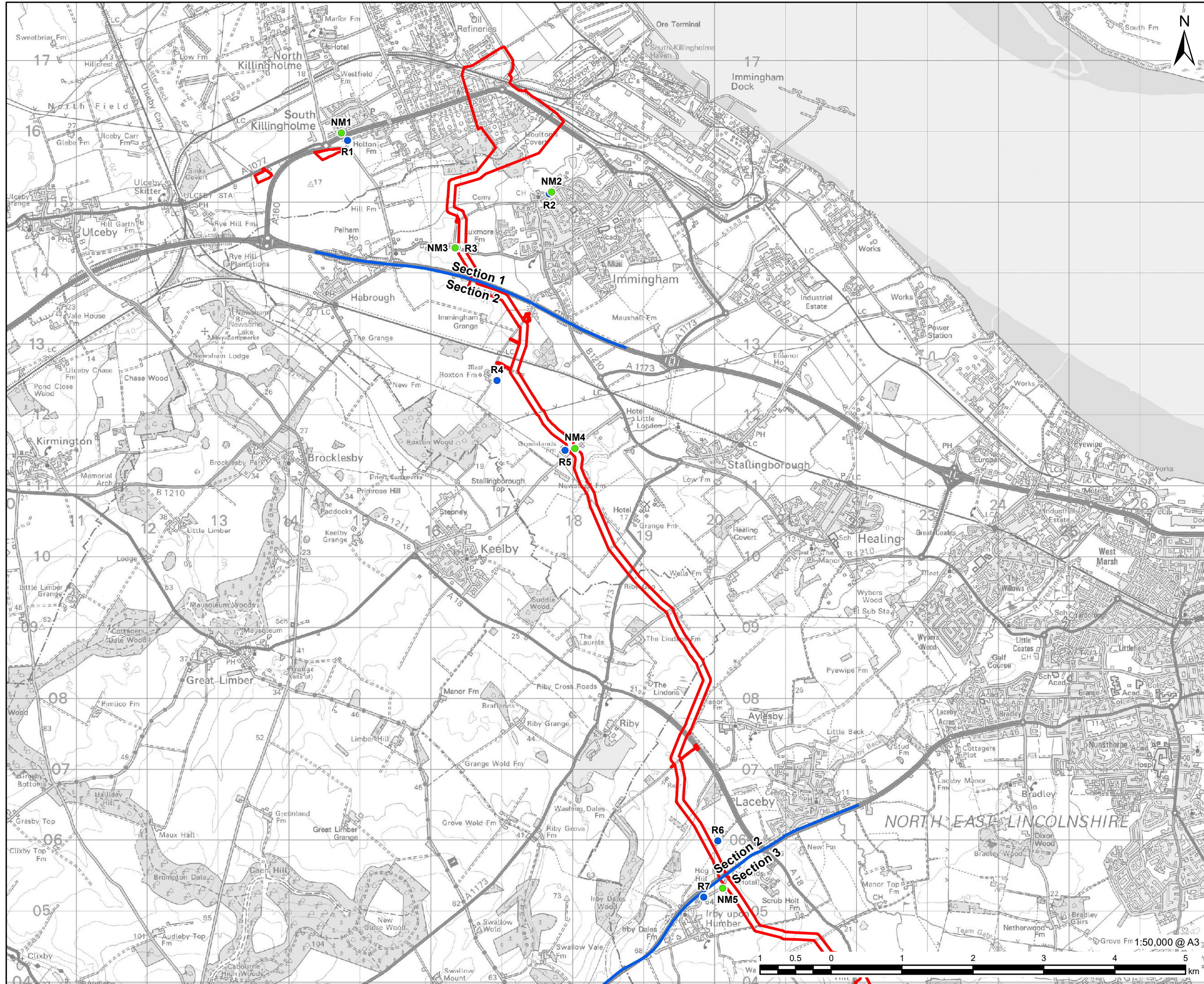
Table 13-10: Sensitive Receptors

Receptor Reference	Location	Description	Coordinates
R1	Properties on School Rd, South Killingholme, Immingham	Residential	53°37'40.49"N 0°15'54.64"W
R2	Church Lane Properties Immingham	Residential	53°37'10.05"N 0°13'21.05"
R3	Immingham Rd Properties, Habrough, Immingham	Residential	53°36'47.12"N 0°14'33.67"W
R4	Roxton Farm, Roxton Rd, Immingham	Residential	53°35'45.32"N 0°14'4.54"W
R5	Keelby Rd Properties, Stallingborough, Grimsby	Residential	53°35'12.63"N 0°13'13.98"W
R6	The Crofts, Barton St, Laceby, Grimsby	Residential	53°32'12.82"N 0°11'24.54"W
R7	Old Main Rd Properties, Irby upon Humber, Grimsby	Residential	53°31'47.33"N 0°11'36.23"W

Receptor Reference	Location	Description	Coordinates
R8	Waithe Beck Lodge, Barton St, Hatcliffe, Grimsby	Residential	53°30'17.38"N 0° 8'53.81"W
R9	Manor House, Cherry Cobb Lane, Barnoldby-le-Beck, Grimsby	Residential	53°30'26.93"N 0° 8'33.09"W
R10	Moorhouse Farm, Brigsley Rd, Ashby cum Fenby, Grimsby	Residential	53°29'47.45"N 0° 7'47.87"W
R11	Moorhouse, Brigsley Rd, Ashby cum Fenby, Grimsby	Residential	53°29'42.30"N 0° 7'18.98"W
R12	Brigsley Rd Properties, Ashby cum Fenby, Grimsby	Residential	53°29'44.90"N 0° 6'59.42"W
R13	Ashby Lane Properties, Ashby cum Fenby, Grimsby	Residential	53°29'35.00"N 0° 7'3.66"W
R14	Hall Farm Hotel & Restaurant, Ashby Lane, Ashby cum Fenby, Grimsby	Non-residential	53°29'30.20"N 0° 6'34.53"W
R15	South Farm, Barton St, Ashby cum Fenby, Grimsby	Residential	53°28'37.69"N 0° 6'13.55"W
R16	Corner Cottage, Hawerby, Grimsby	Residential	53°27'55.29"N 0° 6'10.47"W
R17	Barton Street Properties, Hawerby, Grimsby	Residential	53°27'45.10"N 0° 5'51.06"W
R18	Westfield Farm, White Rd, North Thoresby, Grimsby	Residential	53°27'41.97"N 0° 5'22.67"W
R19	Westfield Cottage, White Rd, North Thoresby, Grimsby	Residential	53°27'29.71"N 0° 5'9.48"W
R20	Park Farm, White Rd, North Thoresby, Grimsby	Residential	53°27'46.15"N 0° 4'56.30"W
R21	Throstles Nest, White Rd, North Thoresby, Grimsby	Residential	53°27'41.38"N 0° 4'35.31"W
R22	Gamekeepers Cottage, Autby Drive, North Thoresby, Grimsby	Residential	53°27'18.92"N 0° 4'11.58"W
R23	The Larches, Station Rd, Ludborough, Grimsby	Residential	53°26'52.09"N 0° 2'47.07"W
R24	Station Rd, Properties, Ludborough, Grimsby	Residential	53°26'42.16"N 0° 2'5.18"W

Receptor Reference	Location	Description	Coordinates
R25	Pear Tree Lane Properties, Fulstow, Louth	Residential	53°26'12.64"N 0° 1'13.50"W
R26	Yew Tree Cottage, Ings Lane, Fotherby, Louth	Residential	53°25'6.72"N 0° 0'10.14"W
R27	Woodhouse Farm, Fotherby Rd, Little Grimsby, Louth	Residential	53°24'48.98"N 0° 0'3.76"E
R28	Grange Farm, Little Grimsby, Louth	Residential	53°24'52.30"N 0° 0'31.47"E
R29	The Lodge, Alvingham Lakes, Lock Rd, Alvingham, Louth	Residential	53°23'35.53"N 0° 2'48.27"E
R30	Highfield House, Louth Rd, North Cockerington, Louth	Residential	53°23'22.74"N 0° 3'16.25"E
R31	Rushmoor Farm, Louth Rd, North Cockerington, Louth	Residential	53°23'8.90"N 0° 3'12.44"E
R32	Louth Rd Properties, North Cockerington, Louth	Residential	53°23'4.91"N 0° 3'46.19"E
R33	The Stables, Mill Hill Way, South Cockerington, Louth	Residential	53°22'57.97"N 0° 4'16.31"E
R34	Red Leas Lane Properties, South Cockerington, Louth	Residential	53°23'33.46"N 0° 5'4.86"E
R35	Marsh Lane Farm, Marsh Lane, South Cockerington, Louth	Residential	53°23'19.13"N 0° 5'26.83"E
R36	Pickhill Farm, Pickhill Lane, Grimoldby, Louth	Residential	53°22'57.88"N 0° 6'4.93"E
R37	Lordship Farm, Lordship Rd, Great Carlton, Louth	Residential	53°21'44.12"N 0° 8'31.95"E
R38	Windswept, Lordship Rd, Great Carlton, Louth	Residential	53°21'23.58"N 0° 8'10.84"E
R39	Grove Rd Properties, Theddlethorpe, Mablethorpe	Residential	53°21'57.97"N 0°11'55.33"E
R40	Mill Rd Properties, Theddlethorpe, Mablethorpe	Residential	53°21'55.70"N 0°12'26.00"E
R41	Harps Bridge Lane Properties, Theddlethorpe, Mablethorpe	Residential	53°22'0.24"N 0°13'20.80"E

Receptor Reference	Location	Description	Coordinates
R42	Mablethorpe Rd Properties, Theddlethorpe, Mablethorpe	Residential	53°21'51.00"N 0°13'7.65"E
R43	Kent Avenue Properties, Theddlethorpe, Mablethorpe	Residential	53°21'32.28"N 0°14'18.74"E
R44	Pelham Rd Properties, Holton le Clay, Grimsby	Residential	53°30'23.71"N 0° 4'0.55"W



- LEGEND
- Draft Order Limits
 - Route Section Break
 - Receptor Location
 - Noise Monitoring Location

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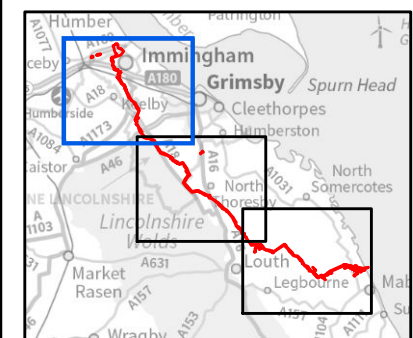
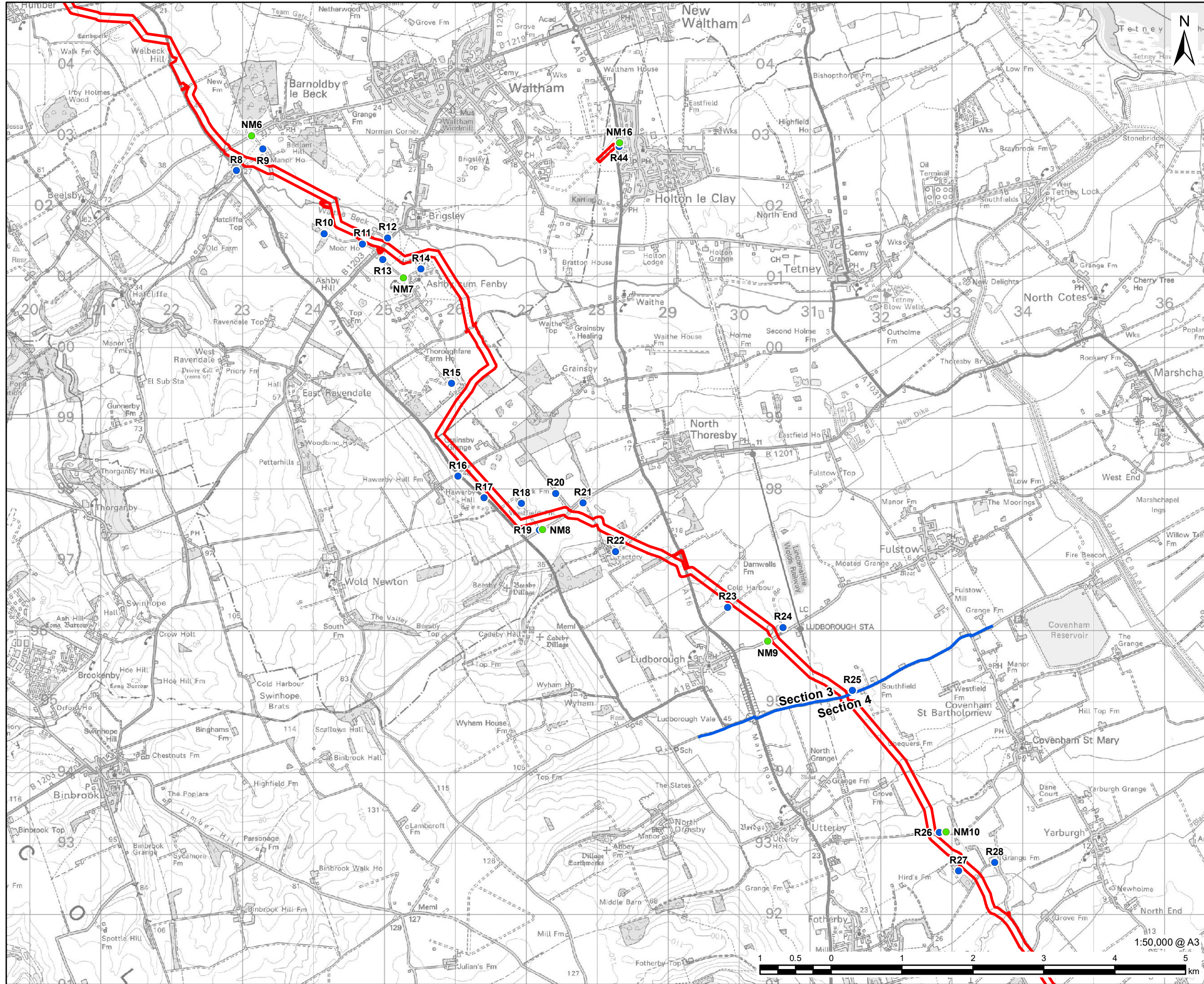


FIGURE TITLE
Figure 13-1 (1 of 3)
Receptors and Noise Monitoring Locations

ISSUE PURPOSE
 PEIR

PROJECT NUMBER / REFERENCE
 60668955 / VCCS_221102_PEIR_13-1

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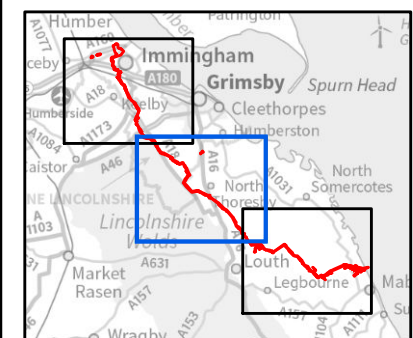


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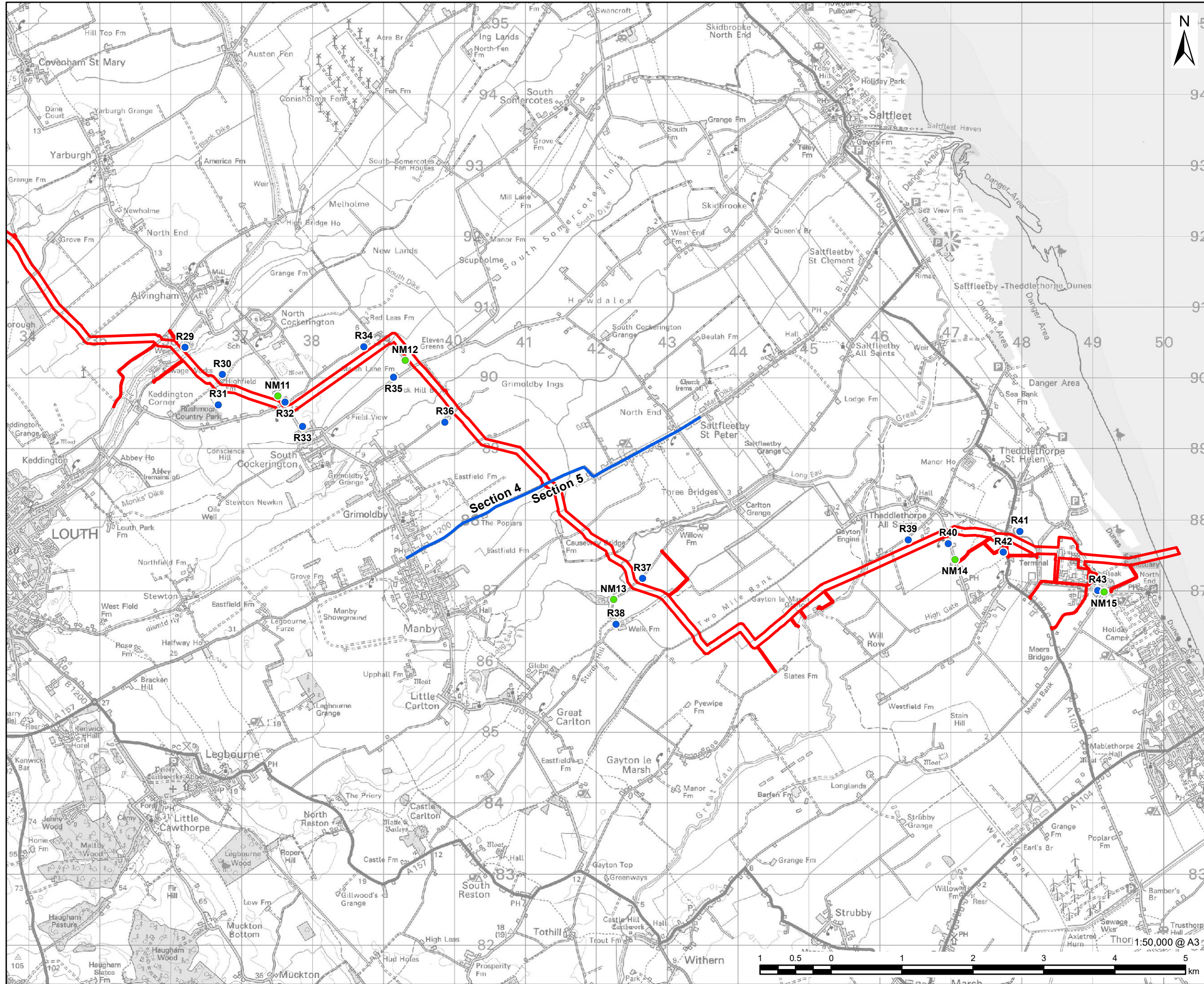
- Draft Order Limits
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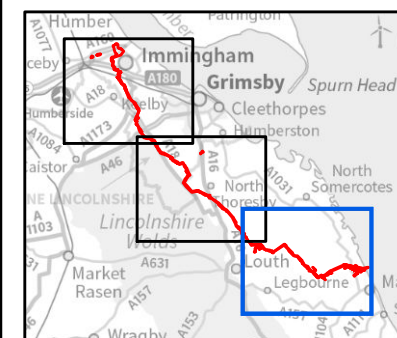


LEGEND

- Draft Order Limits
- Route Section Break
- Receptor Location
- Noise Monitoring Location

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Planned Surveys

- 13.5.8 Baseline noise monitoring will be carried out to establish the existing noise climate in the area. The monitoring procedures followed guidance from BS 7445-1:2003 ‘Description and environment of environmental noise – Part 1: Guide to quantities and procedures’ (Ref 13-19) and BS 4142:2014+A1:2019 ‘Methods for rating and assessing industrial and commercial sound’ (Ref 13-15). All noise measurements included $L_{Aeq,T}$ and $L_{A90,T}$ sound level indicators.
- 13.5.9 The proposed monitoring locations are summarised in **Table 13-11** and shown on **Figure 13-1**. Based on their surroundings and relative distance to nearby sound sources (in particular road traffic), the monitoring locations have been allocated as representative of the local noise environment at each of the various noise-sensitive receptors.
- 13.5.10 Surveys will be carried out following the agreement of their scope and methodology in consultation with the Environmental Health Officers of the relevant Local Authorities including Lincolnshire County Council, North Lincolnshire Council, North East Lincolnshire Council, East Lindsey District Council and West Lindsey District Council. The proposed monitoring locations will also take into consideration the safety of the operators, security of monitoring equipment and accessibility.
- 13.5.11 Noise monitoring is expected to be undertaken to avoid school holidays, during which, noise generating activities are not considered to be typical. Long-term unattended measurements will be undertaken at the Theddlethorpe Facility and the Block Valve Stations. Short-term attended measurements are proposed to be carried out at selected locations along the extent of the Draft Order Limits.

Table 13-11: Proposed Noise Monitoring Locations

Location Reference	Measurement Duration	Representative of Receptors	Approximate Coordinates
NM1	Short-term measurement	R1	53°37'40.02"N 0°15'59.38"W
NM2	Long-term measurement	R2	53°37'10.68"N 0°13'19.20"W
NM3	Short-term measurement	R3	53°36'46.47"N 0°14'34.30"W
NM4	Short-term measurement	R4, R5	53°35'13.51"N 0°13'6.07"W
NM5	Long-term measurement	R6, R7	53°31'51.09"N 0°11'21.74"W
NM6	Short-term measurement	R8, R9	53°30'33.11"N 0° 8'41.53"W
NM7	Long-term measurement	R10, R11, R12, R13, R14, R15	53°29'26.33"N 0° 6'48.30"W
NM8	Short-term measurement	R16, R17, R18, R19, R20, R21, R22	53°27'29.82"N 0° 5'7.07"W

Location Reference	Measurement Duration	Representative of Receptors	Approximate Coordinates
NM9	Short-term measurement	R23, R24, R25	53°26'36.06"N 0° 2'17.11"W
NM10	Short-term measurement	R26, R27, R28	53°25'6.78"N 0° 0'4.95"W
NM11	Long-term measurement	R29, R30, R31, R32, R33	53°23'12.11"N 0° 3'57.83"E
NM12	Short-term measurement	R34, R35, R36	53°23'26.63"N 0° 5'35.94"E
NM13	Short-term measurement	R37, R38	53°21'34.79"N 0° 8'9.67"E
NM14	Short-term measurement	R39, R40, R41, R42	53°21'48.22"N 0°12'30.76"E
NM15	Long-term measurement	R43	53°21'31.54"N 0°14'23.64"E
NM16	Short-term measurement	R44	53°30'25.23"N 0° 4'0.05"W

13.6 Mitigation

Embedded Mitigation

- 13.6.1 EIA is an iterative process which informs the development of project design. Where the outputs of the preliminary assessment identify likely significant effects changes to the design can be made or mitigation measures can be built-in to the proposal to reduce these effects.
- 13.6.2 This type of mitigation is defined as embedded mitigation, as mitigation measures which have been identified and adopted as part of the evolution of the project design (“embedded” into the project design). One example is the routing itself, a key driver of which has been to avoid passing close to communities wherever possible, to reduce disruption during construction.
- 13.6.3 The design of the Project will be further developed to reflect the findings of ongoing environmental studies, comments raised during this statutory consultation and ongoing engagement with stakeholders. As the design develops, the embedded mitigation measures will also be refined as part of an iterative process.
- 13.6.4 Embedded mitigation measures that will be applied are summarised as follows:
- Plant selection (quiet as possible);
 - Screening of noise sources; and
 - Design of layout.
- 13.6.5 Plant that will be used in the development has not yet been finalised. Quieter plant would be the most effective way of controlling noise emissions.

13.6.6 It is assumed that the plant will be designed to achieve the operational limits consistent with the requirements of BS 4142, which may require mitigation to be incorporated into the fixed plant design. Should the noise exhibit any such acoustic features then the relevant penalty/correction should be applied in accordance with BS 4142 to ensure that the resultant rating level falls within the limit levels.

13.6.7 These embedded mitigation measures will be covered in more detail in the ES.

Additional Mitigation

13.6.8 Measures to control noise as defined in Annex B of BS 5228-1 and measures to control vibration as defined in Section 8 of BS 5228-2 will be adopted where reasonably practicable. These measures will be secured within a Draft Construction Environmental Management Plan (CEMP) for the construction phase.

13.6.9 A Preliminary Draft Construction Environmental Management Plan (CEMP) has been prepared as part of this PEIR and can be found in *PEIR Volume IV - Appendix 3.1*. This sets out the preliminary additional and enhancement mitigation measures identified in this preliminary assessment of significant effects. The mitigation presented in the Draft CEMP will be secured through a requirement within the DCO, which requires a CEMP to be submitted for approval after the grant of development consent.

13.6.10 This section summarises the types of mitigation measures that will be considered to mitigate against the effects on noise and vibration where required. These measures should be adopted during the construction phase and will be refined and be developed as part of the construction assessment for the ES:

- *I1: Pre-construction noise monitoring surveys will be undertaken as agreed with the relevant local authorities to establish a pre-construction baseline for the derivation of construction noise limits;*
- *I2: Following any changes to the design, the Contractor would ensure that an updated noise assessment has been carried out to ensure there would be no additional or increase in negative effects on nearby receptors;*
- *I3: The majority of works activities would be completed under normal working hours/restrictions as follows: Monday to Friday: 07.00 to 19.00; Saturday: 07.00 to 13:30; and no working on Sundays, or Bank Holidays unless otherwise agreed with the relevant local authority. The agreed working hours will be set out in the Final CEMP;*
- *I4: The Contractor would be responsible for notifying the local residents of particularly noisy work prior to commencement of those works. Effective communication should be established, keeping residents informed of the type and timing of works involved;*
- *I5: A set of generic best practice working methods referred to as Best Practicable Means (BPM) would be employed during the construction phase. Typical BPM are outlined in the following commitments;*
- *I6: Closed board fencing would be installed around the construction compounds;*
- *I7: Provision of contact details for a site representative in the event that disturbance due to noise or vibration from the construction works occurs; ensuring that any complaints are dealt with pro-actively and that subsequent resolutions are communicated to the complainant;*
- *I8: Site access routes would be in good condition and well maintained with no potholes or other significant surface irregularities;*
- *I9: Plant machinery would be turned off when not in use;*

- *I10: All vehicles and mobile plant would be well maintained such that loose body fittings or exhausts do not rattle or vibrate;*
- *I11: Silenced equipment would be used where possible, in particular silenced power generators and pumps;*
- *I12: All equipment used would be properly maintained and operated by trained staff;*
- *I13: Plant and equipment covers/hatches would be properly secured and there would be no loose fixings causing rattling;*
- *I14: Static noisy plant, including generators, would be located as far away from noise sensitive receptors as is feasible for the particular activity;*
- *I15: On site speed limits would be in place to reduce the effect of construction traffic noise. Speed limits would be enforceable within the main works sites, with all nonsurfaced roads restricted to 10mph and any surfaced roads restricted to 15mph;*
- *I16: To minimise vibration from HGV movements, there would be monthly condition assessments to inspect for defects such as pot holes which could cause an increase in noise levels. Existing potholes would need to be considered by a condition assessment prior to the commencement of works;*
- *I17: As part of the plant selection process the contractor should adopt a procedure to ensure the quietest plant and equipment, techniques and working practices available would be selected and used; and*
- *I18: No music or radios would be played on site.*

13.7 Preliminary Assessment of Effects

Construction

- 13.7.1 Noise during the construction phase of the Project could lead to potential impacts at the receptors identified in **Table 13-10** and shown on **Figure 13-1**.
- 13.7.2 An initial construction assessment has been undertaken and the results presented in **Table 13-12** below. The plant schedules used for this initial assessment can be found in *PEIR Volume IV - Appendix 13-1*. This assessment assumes a worst-case scenario. Therefore, the pipe stringing, pipe bending and pipeline welding construction phase has been used for this assessment as these activities have the highest sound pressure level at 10m.
- 13.7.3 The sound pressure levels for plant at 10 m were used to calculate the distance from the Draft Order Limits that the construction noise SOAEL and LOAEL (as defined in **Table 13-4**) would be exceeded. The SOAEL would be exceeded up to 30m away and the LOAEL would be exceeded up to 90m away from the Draft Order Limits.
- 13.7.4 The construction information in *PEIR Volume IV - Appendix 13-1* was also used to determine the impact of the use of the HDD technique at pipeline crossings. The sound pressure levels for this activity were used to determine the distance from the Draft Order Limits that the SOAEL and LOAEL would be exceeded. The SOAEL would be exceeded up to 45m away and the LOAEL would be exceeded up to 140m away from the Draft Order Limit.

Table 13-12: Preliminary Noise and Vibration Assessment for the Construction Phase

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
Construction Noise and Vibration					
<p>R3 - Immingham Rd Properties, Habrough</p> <p>R11 - Moorhouse, Brigsley Rd, Ashby cum Fenby</p> <p>R26 - Yew Tree Cottage, Ings Lane, Fotherby</p> <p>R32 - Louth Rd Properties, North Cockerington</p> <p>R42 - Mablethorpe Rd Properties, Theddlethorpe</p> <p>R44 - Pelham Rd Properties, Holton le Clay</p>	<p>Noise during the construction phase of the pipeline could lead to potential impacts at these receptors.</p> <p>These receptors are within 30m of the Draft Order Limits and are likely to experience an exceedance of the SOAEL threshold during construction.</p>	<p><u>Short term impact</u></p>	<p>BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites provides advice regarding implementation of BPM. These mitigation techniques are outlined in the Preliminary Draft CEMP (Appendix 3.1).</p>	<p>Significant – however, the further the distance from the construction works the lower the level of potential impact. The significance of the effect will depend on the location, duration of works, and equipment being used.</p>	<p>Moderate – the construction programme and the assessment of construction impacts is still progressing. The identification of plant to be used during the construction phase and the final alignment of the pipeline within the Draft Order Limits is still progressing.</p>

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
<p>R5 - Keelby Rd Properties, Stallingborough</p> <p>R12 - Brigsley Rd Properties, Ashby cum Fenby</p> <p>R13 - Ashby Lane Properties, Ashby cum Fenby</p> <p>R17 - Barton Street Properties, Hawerby</p> <p>R23 - The Larches, Station Rd, Ludborough</p> <p>R25 - Pear Tree Lane Properties, Fulstow</p> <p>R27 - Woodhouse Farm, Fotherby Rd, Little Grimsby</p>	<p>Noise during the construction phase of the pipeline could lead to potential impacts at these receptors.</p> <p>These receptors are between 30m and 90m from the Draft Order Limits and are likely to experience an exceedance of the LOAEL during construction.</p>	<p><u>Short term impact</u></p>	<p>BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites provides advice regarding implementation of BPM. These mitigation techniques are outlined in the Preliminary Draft CEMP (Appendix 3.1).</p>	<p>Not Significant – however the further the distance from the construction works the lower the level of potential impact. The significance of the effect will depend on the location, duration of works, and equipment being used.</p>	<p>Moderate – the planning of the construction programme and the assessment of construction impacts is still progressing. The identification of plant to be used during the construction phase and the final alignment of the pipeline within the Draft Order Limits is still progressing.</p>

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
R29 - The Lodge, Alvingham Lakes, Lock Rd, Alvingham					
R34 - Red Leas Lane Properties, South Cockerington					
R37 - Lordship Farm, Lordship Rd, Great Carlton					
R38 - Windswept, Lordship Rd, Great Carlton					
R39 - Grove Rd Properties, Theddlethorpe					
R40 - Mill Rd Properties, Theddlethorpe					
R43 - Kent Avenue Properties, Theddlethorpe					

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
<p>R29 - The Lodge, Alvingham Lakes, Lock Rd</p> <p>R39 - Properties on Grove Road, Theddlethorpe</p>	<p>These receptors are located near to the watercourse crossings where HDD is likely to be used.</p> <p>These receptors are between 45m and 140m from the Draft Order Limits and are likely to experience an exceedance of the LOAEL threshold during construction:</p> <p>24/7 working may be used for this pipeline crossing technique so there could be increased noise levels at these receptors during the night-time.</p>	<p><u>Short term impact</u></p>	<p>BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites provides advice regarding implementation of BPM. These mitigation techniques are outlined in the Preliminary Draft CEMP (Appendix 3.1).</p> <p>Due to 24/7 works, a Section 61 application will be required. This will contain details of any additional mitigation and monitoring that may be required. The principal contractor, once appointed, will be responsible for submitting the Section 61 application.</p>	<p>Not Significant – however the further the distance from the construction works the lower the level of potential impact. The significance of the effect will depend on the location, duration and working hours used for HDD.</p>	<p>Moderate – the planning of the watercourse crossings by HDD is still progressing. Consequently, a conservative qualitative approach to defining noise effects has been adopted that assumes there is a high level of certainty that significant effects will occur due to the requirement for noisy works outside of core work hours.</p>
<p>R29 - The Lodge, Alvingham Lakes, Lock Rd</p>	<p>These receptors are located near pipeline crossings where HDD may be used.</p>	<p><u>Short term impact</u></p>	<p>BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and</p>	<p>Not Significant – Receptor R29 is approximately 75m away from the Draft</p>	<p>Moderate – the planning of the watercourse crossings by HDD is still progressing.</p>

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
R39 - Properties on Grove Road, Theddlethorpe	24/7 working may be used for this pipeline crossing technique so there could be increased vibration levels at these receptors during the night-time.		Open Sites provides advice regarding implementation of BPM. These mitigation techniques are outlined in a Draft CEMP.	Order Limit and R39 is approximately 90m away from the Draft Order Limit. Perceivable vibration levels from drilling at this distance from construction works would unlikely exceed the SOAEL.	Consequently, a detailed assessment of the construction vibration impacts will be undertaken once the HDD locations are finalised.
All other receptors	Typical pipeline construction activities could result in increased noise and vibration levels at the receptors.	<u>Short term impact</u>	BS 5228: 2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites provides advice regarding implementation of BPM. These mitigation techniques are outlined in the Preliminary Draft CEMP (Appendix 3.1).	Not Significant – the LOAEL or SOAEL threshold is not expected to be exceeded at these receptors as they are greater than 60m from the Draft Order Limits.	Moderate – the planning of the construction programme and the assessment of construction impacts is still progressing. The identification of plant to be used during the construction phase and the final alignment of the pipeline within the Draft Order Limits is still progressing.
Construction Traffic Noise					
R15 - South Farm, Barton St	Increased flows due to construction traffic on the thoroughfare to the north of South Farm could lead to	<u>Short term impact</u>	A Traffic Management Plan will be implemented specifying access	Not Significant – the effects of construction traffic are likely to have a minor adverse effect	Moderate – the planning of traffic routes and the assessment of additional vehicle movements is still progressing. An

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
	increased noise at the receptor. A change in BNL of 1.7 dB has been calculated on Thoroughfare Road. The construction traffic will include HGVs and LGVs.		routes and movement restrictions.	on Thoroughfare Road. South Farm is approximately 500m away from the road and the increase in noise at the receptor is expected to be negligible.	initial quantitative construction traffic assessment has been undertaken.
All other receptors	Increased flows on nearby roads due to construction traffic could lead to increased noise at receptors that are located adjacent to the construction traffic routes. The construction traffic will include HGVs and LGVs.	<u>Short term impact</u>	A Traffic Management Plan will be implemented specifying access routes and movement restrictions.	Not Significant – road traffic noise calculations indicate that construction traffic will result in a negligible noise effect on all other road links affected by construction traffic.	Moderate – the planning of traffic routes and the assessment of additional vehicle movements is still progressing. An initial quantitative construction traffic assessment has been undertaken.

Operation

13.7.5 Noise during the operation phase of the Project could lead to potential impacts at the receptors identified in **Table 13-10** and shown on **Figure 13-1**. As a baseline survey has not yet been undertaken, noise limits of the operational phase have not been defined. As such, a qualitative assessment of likely significant effects due to operational noise from the Block Valve Stations and Theddlethorpe Facility has been undertaken for the following sensitive receptors:

- Isolated Properties and Farms near Irby upon Humber;
- Isolated Properties and Farms near Ashby cum Fenby;
- Isolated Properties and Farms near North Cockerington; and
- Theddlethorpe/Mablethorpe.

13.7.6 The operational noise assessment will be updated to a quantitative assessment in the ES using the results of baseline noise monitoring.

Table 13-13: Preliminary Noise and Vibration Assessment for the Operational Phase

Receptor	Potential Impact	Duration	Mitigation	Likely significance of effect	Confidence in Prediction
R43 - Kent Avenue Properties, Theddlethorpe	Limited increase in noise from the electrical and mechanical equipment associated with the Theddlethorpe Facility.	<u>Long term impact</u> – plant will be operational for the lifetime of the Project.	The pipeline alignment has been developed to avoid residential areas as far as possible. Further operation noise mitigation techniques are outlined in Section 13.6.	Not Significant - the potential significance of effects for operation of the Theddlethorpe Facility is not likely to exceed the SOAEL.	Moderate – baseline noise monitoring is to be undertaken. Once baseline data are obtained, operational noise will be assessed according to BS4142 and reported in the ES.
R6 to R7 - Isolated Properties and Farms near Irby upon Humber R10 to R14 - Isolated Properties and Farms near Ashby cum Fenby R29 to R33 - Isolated Properties and Farms near North Cockerington	Noise during the operation phase at nearby Valve Station. (No noise is expected from the day-to-day operation of the Block Valve Station save for when maintenance/testing/venting operations are conducted as necessary on a periodic basis).	<u>Long term impact</u> – plant will be operational for the lifetime of the Project.	The pipeline alignment has been developed to avoid residential areas as far as possible. Further operation noise mitigation techniques are outlined in Section 13.6.	Not Significant - the potential significance of effects for Block Valve Station maintenance is not likely to exceed the SOAEL.	Moderate – baseline noise monitoring is to be undertaken. Once baseline data is obtained, operational noise will be assessed according to BS4142.

Decommissioning

13.7.7 Noise effects during the decommissioning phase of the Project will be similar or less than noise effects during the construction phase. The noise assessment presented for the construction phase is therefore considered representative (or an overestimate) of the decommissioning phase. As such a separate assessment for noise from the decommissioning phase is not included. A further assessment will be included within the ES.

13.8 Summary and Next Steps

- 13.8.1 Baseline noise monitoring will be carried out to establish the noise environment within the Study Area in locations that are representative of surrounding noise sensitive receptors. The methodology (to be agreed with relevant Local Authorities) and results will be presented in the ES.
- 13.8.2 Potential significant noise and vibration effects may occur during the construction phase due to works activities and construction-related traffic. Potential significant noise effects may occur during the operational phase due to operations of certain supporting components of the Project. These effects will be assessed quantitatively in the ES.
- 13.8.3 The noise and vibration assessments in the ES will focus on the likely significant effects and mitigation measures will be proposed to address significant adverse noise and vibration effects. Residual effects, with these mitigation measures in, place will be assessed and reported.
- 13.8.4 An assessment of the potential operational vibration effects has not been undertaken at this stage. Once more detailed information on the plant which will be used at the Immingham Facility, Block Valves Stations and Theddlethorpe Facility is obtained, the scope of the operational vibration assessment will be reviewed and consulted on with the relevant consultation body.

13.9 References

Ref 13-1 Her Majesty's Stationery Office (1974); Control of Pollution Act

Ref 13-2 Her Majesty's Stationery Office (1995); Environmental Protection Act.

Ref 13-3 Ministry of Housing, Communities & Local Government (2021); National Planning Policy Framework.

Ref 13-4 Department of Energy and Climate Change (2011); Overarching National Policy Statement for Energy (EN-1).

Ref 13-5 Department of Energy and Climate Change (2011); National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4).

Ref 13-6 Ministry of Housing, Communities & Local Government (2012); National Planning Policy Framework.

Ref 13-7 Department for Environment Food and Rural Affairs (2010); Noise Policy Statement for England.

Ref 13-8 Lincolnshire County Council (2017); Central Lincolnshire Local Plan 2012-2036

Ref 13-9 North East Lincolnshire Council (2018); North East Lincolnshire Local Plan 2013-2032

Ref 13-10 East Lindsey District Council (2018); Local Plan 2013-2032 – Core Strategy

Ref 13-11 Ministry of Housing, Communities & Local Government (2019); Planning Practice Guidance - Noise.

Ref 13-12 British Standards Institute (2009 with 2014 amendments); BS 5228:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites, BSi, London.

Ref 13-13 Department of Transport/Welsh Office (1988); Calculation of Road Traffic Noise. Her Majesty's Stationery Office, London.

Ref 13-14 Highways England (2020); Design Manual for Road and Bridges LA111: Noise and Vibration, Revision 2.

Ref 13-15 British Standards Institute (2014 with 2019 amendments); BS 4142 – Methods for rating and assessing industrial and commercial sound, BSi, London.

Ref 13-16 British Standards Institute (2014); BS 8233 – Guidance on sound insulation and noise reduction for buildings, BSi, London.

Ref 13-17 World Health Organization (1999); Guidelines for Community Noise.

Ref 13-18 Department for Environment, Food & Rural Affairs; “Strategic noise mapping (2017)” (2019)

Ref 13-19 British Standards Institute (2003); BS 7445 – Description and environment of environmental noise – Part 1: Guide to quantities and procedures, BSi, London.

Ref 13-20 (AECOM) V Net Zero Pipeline Project Environmental Impact Assessment - Scoping Report. Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN070008/EN070008-000018-V%20Net%20Zero%20Pipeline_EIA%20Scoping%20Report.pdf