

12 NOISE AND VIBRATION

12.1 Introduction

- 12.1.1 This chapter of the Environmental Statement (ES) presents the findings of the Environmental Impact Assessment (EIA) undertaken to consider the noise and vibration effects of the construction, operation and decommissioning of the Redcar Energy Centre (REC) on surrounding noise and vibration sensitive receptors (NVSRs).
- 12.1.2 This chapter begins by setting out the policy, legislative context and relevant standards and guidance for the assessment. The methods and criteria used to assess potential adverse noise and vibration effects are then described.
- 12.1.3 In particular, this ES chapter:
- presents a qualitative analysis of the existing acoustic baseline based on a desktop study;
 - presents the potential environmental effects of noise and vibration arising from the REC, based on the information gathered and the analysis and assessments undertaken to date;
 - identifies any assumptions and limitations encountered in compiling the environmental information; and
 - identifies any potentially significant effects on the NVSRs and highlights any necessary monitoring and/or mitigation measures that could prevent, minimise, reduce or offset the possible environmental effects identified in the EIA process.

12.2 Assessment Methodology

Legislation and Planning Policy Context

Legislation

Control of Pollution Act, 1974

- 12.2.1 Part III of the Control of Pollution Act (CoPA) 1974 is specifically concerned with pollution. With regards to noise it covers construction sites; noise in the street; noise abatement zones; codes of practice and 'best practicable means' (BPM).
- 12.2.2 Section 60, Part III of the CoPA refers to the control of noise on construction sites. It provides legislation by which local authorities can control noise from construction sites to prevent noise disturbance occurring.
- 12.2.3 The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015 approved British Standard (BS) 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 1: Noise' (British Standards Institution, 2014) and BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration' (British Standards Institution, 2014) for the purpose of giving guidance on appropriate methods for minimising noise from construction and open sites in exercise of the powers conferred on the Secretary of State by sections 71(1)(b), (2) and (3) of the CoPA.
- 12.2.4 The CoPA enables a local authority, in whose area work is going to be undertaken, or is being undertaken, the power to serve a notice imposing requirements as to the way in which

construction works are to be carried out. This notice can specify the plant or machinery that is or is not to be used, the hours during which the construction work can be carried out, the level of noise and vibration that can be emitted from the premises in question or at any specified point on these premises or that can be emitted during specified hours, or for any change of circumstances.

- 12.2.5 Section 61, Part III of the CoPA refers to prior consent for work on construction sites. It provides a method by which a contractor can apply for consent to undertake construction works in advance. If consent is given, and the stated method and hours of work are complied with, then the local authority cannot take action under Section 60.
- 12.2.6 Section 71, Part III of the CoPA refers to the preparation and approval of codes of practice for minimising noise.
- 12.2.7 Section 72, Part III of the CoPA refers to BPM, which is defined as:

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

- 12.2.8 If BPM is applied, then it can provide a defence against prosecution by the local authority.

Environmental Protection Act 1990, Part III

- 12.2.9 The Environmental Protection Act 1990 (EPA) deals with statutory nuisance, including noise.
- 12.2.10 Section 79, Part III of the EPA, ‘Statutory nuisances and inspections therefor’, places a duty on local authorities to regularly inspect their areas to detect whether statutory nuisances exist. This section also considers and defines the concept of BPM which originates from Section 72, Part III of the CoPA.
- 12.2.11 Where the local authority is satisfied that a statutory nuisance does exist, or is likely to occur or recur, it must serve an abatement notice. Section 80, Part III of the EPA, ‘Summary proceedings for statutory nuisances’, provides local authorities with the power to serve an abatement notice requiring the abatement of the nuisance or prohibiting or restricting its occurrence or recurrence; and/or carrying out such works or other action necessary to abate the nuisance.
- 12.2.12 Section 82, Part III of the EPA, ‘Summary proceedings by persons aggrieved by statutory nuisances’, allows a Magistrates’ court to act on a complaint made by any person on the grounds that he is aggrieved by a statutory nuisance, such as noise. Page 12-2
- 12.2.13 The procedures for appeals against abatement notices are detailed in the Statutory Nuisance (Appeals) Regulations 1995.

National Planning Policy

National Planning Policy Framework

- 12.2.14 The ‘National Planning Policy Framework’ (NPPF) (Ministry of Housing, Communities and Local Government, 2019) sets out the Government’s planning policies for England and how these are expected to be applied. The emphasis of the Framework is to allow development to proceed where it can be demonstrated to be sustainable. In relation to noise, Paragraph 180 of the Framework states:

“Planning policies and decisions should 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 the development – and avoid noise giving rise to significant adverse 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; and*
- c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.”*

- 12.2.15 The point ‘a)’ refers to ‘significant adverse impacts’ which relates to the ‘significant observed adverse effect level’ (SOAEL) in the ‘Noise Policy Statement for England’ (NPSE) (Defra, 2010) (see below), although the term ‘effect’ is used instead of the term ‘impact’. However, these have been deemed to be interchangeable in this context.
- 12.2.16 Therefore, given the comments above on the NPSE with regard to assessment methods and criteria, the current content of the NPPF does not require any change in previously adopted approaches.

Noise Policy Statement for England

- 12.2.17 The NPSE, aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.
- 12.2.18 Paragraph 1.6 of the NPSE sets out the long-term vision and aims of Government noise policy:

“Noise Policy Vision

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

“Noise Policy 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 improvement of health and quality of life.”*

- 12.2.19 The aims require that all reasonable steps should be taken to avoid, mitigate and minimise adverse effects on health and quality of life whilst also taking into account the guiding principles of sustainable development, which include social, economic, environmental and health considerations.
- 12.2.20 With regard to the terms ‘significant adverse’ and ‘adverse’ included in the ‘Noise Policy Aims’, these are explained further in the ‘Explanatory Note’ as relating to established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation which are:

Page 12-3

“NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on human health and quality of life due to noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.”

- 12.2.21 Defra has then extended these concepts for the purpose of the NPSE to introduce the concept of:

“SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

- 12.2.22 The accompanying explanation 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”.

- 12.2.23 With regard to ‘further evidence’, Defra had commissioned research to try and identify the levels at which the above effects occur. However, this research has been largely inconclusive and varies with source. On this basis, and until further guidance becomes available, and given that there is no specific guidance in the NPPF on noise, there is no justification to vary assessment methods and criteria from those previously adopted from British Standards etc.

National Planning Practice Guidance – Noise

- 12.2.24 The National Planning Practice Guidance – Noise (NPPG) (Ministry of Housing, Communities and Local Government, last update July 2019) reiterates general guidance on noise policy and assessment methods provided in the NPPF, NPSE and British Standards, and contains examples of acoustic environments commensurate with various effect levels.

Page 12-4

- 12.2.25 A summary of the guidance from the NPSE and NPPG is set out in Table 12.1 below.

Table 12.1: Summary of guidance from NPSE and NPPG.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not present	No Effect	No Observed Effect	No specific measures required
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			

Perception	Examples of Outcomes	Increasing Effect Level	Action
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 (SOAEL)			
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, medically definable harm e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

- 12.2.26 The NPPG describes noise that is not noticeable to be at levels below the NOEL. It describes a range of noise exposure that is noticeable but not to the extent there is a perceived change in quality of life. Noise exposures in this range are below the LOAEL and need no mitigation. On this basis, the audibility of noise from a development is not an appropriate criterion to judge noise effects.
- 12.2.27 The NPPG advises that noise exposures above the LOAEL cause small changes in behaviour. Examples of noise exposures above the LOAEL provided in the NPPG include:
- having to turn up the volume on the television;
 - needing to speak more loudly to be heard; or
 - where there is no alternative ventilation, closing windows for some of the time because of the noise.
- 12.2.28 In line with the NPPF and NPSE, the NPPG states that consideration needs to be given to mitigating and minimising effects above the LOAEL but taking account of the economic and social benefits being derived from the activity causing the noise.
- 12.2.29 The NPPG advises that noise exposures above the SOAEL cause material changes in behaviour. An example of noise exposures above the SOAEL provided in the NPPG are:
- where there is no alternative ventilation, keeping windows closed for most of the time; or
 - avoiding certain activities during periods when the noise is present.
- 12.2.30 In line with the NPPF and NPSE, the NPPG states that effects above the SOAEL should be avoided and that while the economic and social benefits derived from the activity causing the noise must be taken into account, such exposures are undesirable.

Page 12-5

Local Planning Policy

Redcar and Cleveland Local Plan

- 12.2.31 The Redcar and Cleveland Local Plan (Redcar and Cleveland Borough Council, 2018) sets out the vision and overall development strategy for the area and how it will be achieved for the period until 2032.
- 12.2.32 Policy SD 4 ‘General Development Principles’ of the Local Plan relates to new development and noise and states:

“In assessing the suitability of a site or location, development will be permitted where it:

- a. meets the requirements of the Locational Policy and accords with other Local Plan policies and designations;*
- b. will not have a significant adverse impact on the amenities of occupiers of existing or proposed nearby land and buildings;*
- c. will not result in the unacceptable loss or significant adverse impact on important open spaces or environmental, built or heritage assets which are considered important to the quality of the local environment;*
- d. minimises the loss of best and most versatile agricultural land;*
- e. avoids locations that would put the environment, or human health or safety, at unacceptable risk;*
- f. will not increase flood risk either on site or downstream of the development;*
- g. will have access to adequate infrastructure, services and community facilities to serve the development; and*
- h. will not result in an adverse effect on the integrity of a Natura 2000 site, either alone or in combination with other plans or projects.*

All development must be designed to a high standard. Development proposals will be expected to:

...

- n. minimise pollution including light and noise and vibration levels to meet or exceed acceptable limits;*

...”

Relevant Guidance

- 12.2.33 The following standards and guidance documents, specific to the noise and vibration assessment have been considered:
- BS 5228:2009+A1:2014 – Part 1 Noise and Part 2 Vibration;
 - BS 5228:2009+A1:2014 – Part 1 Noise and Part 2 Vibration;

- Calculation of Road Traffic Noise (Department of Transport, 1998);
- Design Manual for Roads and Bridges, 'LA 111 Noise and Vibration' (Highways Agency, 2020);
- Avian Hearing and the Avoidance of Wind Turbines (R. Dooling, 2002)
- Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance (Institute of Estuarine & Coastal Studies, 2009); and
- International Organization for Standardization (ISO) 9613-2:1996 'Acoustics: Attenuation of sound during propagation outdoors. Part 2: General method of calculation' (ISO, 1996).

Study Area

- 12.2.34 There is no national government guidance or legislation on the extent of the study area to adopt for the assessment of construction or operational noise or vibration effects from industrial facilities on NVSRs.
- 12.2.35 The chosen study area for this assessment has therefore based on professional judgment of the distances over which significant noise effects may occur and consideration of the likely magnitude and duration of impact and the sensitivity of receptors.
- 12.2.36 As outlined in the 'Consultation' section below, the nearest residential NVSRs to the Application Site are located approximately 2.3 km to the south-east (Marsh Farm). Due to attenuation effects, noise and vibration levels received at these NSRs, during both the construction and operational phases of the REC, would very likely be negligible and effectively result in no change to the baseline acoustic environment. As such, noise and vibration effects would very likely be below the LOAEL and potentially below the NOEL at the closest NVSRs.
- 12.2.37 On the basis of the above, the study area does not need to extend to cover the nearest residential NVSRs and therefore this is limited to the area around the Application Site where there is the potential for adverse noise and/or vibration effects (approximately 1.5 km from the Application Site boundary) within which the following important ecological sites are located:
- the Teesmouth and Cleveland Coast Site of Special Scientific Interest (SSSI);
 - the Teesmouth and Cleveland Special Protection Area (SPA) and Ramsar site;
 - the Teesmouth National Nature Reserve; and
 - the Saltholme Nature Reserve.
- 12.2.38 From a noise perspective, potential adverse effects on these important ecological sites would include disturbance of birds. The closest of these sites to be designated for their bird population is the Teesmouth and Cleveland Coast SPA and Ramsar site. Further details on important ecological sites in the area can be found in Chapter 7 (Ecology and Ornithology).

Page 12-7

Baseline Methodology

- 12.2.39 No baseline acoustic survey has been undertaken at the nearest residential NSRs on the basis that, an assessment of noise effects at residential NSRs has been scoped out of this ES (refer to Consultation section).
- 12.2.40 In addition, no baseline acoustic survey has been undertaken at the important ecological sites listed in paragraph 12.2.37. The assessment of noise effects associated with the construction and operation of the REC is based on absolute noise levels (as detailed below), rather than a

comparison between noise from the REC site and baseline conditions, therefore, a baseline survey is not needed to determine the significance of effects.

Consultation

- 12.2.41 During the EIA scoping process, a Scoping Request was submitted to Redcar and Cleveland Borough Council (and subsequently issued to appropriate stakeholders), outlining the proposed scope of the overall EIA including the noise and vibration assessment.
- 12.2.42 The Scoping Request outlined the proposed baseline study and assessment approach, as well as noise and vibration issues proposed to be ‘scoped out’ of the EIA for further assessment, on the basis that significant effects would be very unlikely.
- 12.2.43 Noise and vibration issues proposed to be scoped out included:
- noise and vibration effects on residential NSRs associated with the construction and operation of the proposed development. These issues were proposed to be scoped out on the basis the nearest residential NSRs to the REC are located approximately 2.3 km to the south-east at Marsh Farm. Any noise and vibration emissions associated with the construction and operation of the REC would be significantly attenuated over 2.3 km due to distance, ground and atmospheric attenuation effects, assuming a typical industrial spectrum. On this basis, adverse noise and/or vibration effects, significant or otherwise, would be very unlikely to result from either the construction or operation of the REC; and
 - noise effects associated with construction traffic flows on the local highway network. This was proposed to be scoped out on the basis that construction traffic movements would be negligible and that for a potentially significant, moderate adverse effect to result (medium sensitivity NSR, medium magnitude of impact) would require a 100% increase in road traffic movements compared to baseline road traffic flows (a short-term noise change of at least +3 dB, equivalent to a moderate/medium adverse impact with reference to Table 3.54a of LA 111).
- 12.2.44 Although an assessment of operational noise effects on residential NSRs was scoped out of the assessment, a brief analysis has been undertaken for the assessment to demonstrate that no significant effects are envisaged.
- 12.2.45 Two responses have been received with regard to the submitted scoping report and noise and vibration, which are summarised in Table 12.2 below.

Table 12.2: Consultation Responses Relevant to Noise and Vibration

Page 12-8

Date	Consultee and Issues Raised	How/ Where Addressed
15 May 2020	<u>Natural England</u> Potential impacts from the development could arise during construction and operation, including noise disturbance to SPA and SSSI bird interests on Bran Sands, and to the dune habitats of the SSSI from emissions and deposition.	Noise levels associated with the construction and operation of the REC have been calculated for the full area around the REC, including the ecologically sensitive areas. This data is reported and assessed in Chapter 7 (Ecology and Ornithology). Results are summarised in this chapter.
02 June 2020	<u>South Tees Development Corporation</u> The Scoping Report advises that embedded mitigation measures will be included within the scheme to reduce the effects on air quality, noise and vibration (for example, the type of	This ES Chapter assesses potential noise and vibration effects associated with the construction and operation of the REC and provides the detail of mitigation measures as necessary.

Date	Consultee and Issues Raised	How/ Where Addressed
	feedstock for the facility and stack height), however, no further details are given and we look forward to seeing these details in due course.	

Assessment Criteria and Assignment of Significance

- 12.2.46 The significance of an effect is determined based on the magnitude of an impact and the sensitivity of the receptor affected by the impact. This section describes the criteria applied in this chapter to characterise the sensitivity of receptors and magnitude of potential impacts.

Receptor Sensitivity

- 12.2.47 There is no nationally adopted guidance on how the sensitivities of NVSRs should be determined. Therefore, for this chapter, the sensitivity of classes of receptor is defined through consideration of the vulnerability, recoverability and value/importance of that receptor class. The criteria for defining sensitivity in this chapter are outlined in Table 12.3.

Table 12.3: Definitions of Sensitivity or Value

Sensitivity	Typical Descriptors
Very High	Subject to particular circumstances.
High	Designated sites of ecological significance (SPA/SSSI/Ramsar etc.). Schools, churches and concert halls etc.
Medium	Dwellings, hotels, hospitals, nursing homes and care homes and sites of historic or cultural importance.
Low	Area used primarily for leisure activities, including Public Rights of Way (PRoW), sports facilities, offices and retail businesses.
Negligible	All other areas such as those used primarily for industrial or agricultural purposes.

Magnitude of Impact

Construction and Operational Noise: Impacts at Ecologically Significant NSRs

Page 12-9

- 12.2.48 There is no specific national guidance on the effects of noise disturbance upon birds, however a number of studies have been undertaken to assess the likely cause and thresholds at which disturbance is likely to occur.
- 12.2.49 In the majority of cases, the concept of disturbance relates to changes in feeding and roosting behaviour as a result of a noise induced startle effect. The temporal character of the noise (i.e. its impulsiveness) is more likely to lead to this type of disturbance rather than the absolute noise level.
- 12.2.50 Startle disturbance will be different to that experienced by birds whose habitat is near a source of continuous noise and where high noise levels may lead to masking or changing characteristics of bird song with an associated effect on species bonding.
- 12.2.51 In both of the above cases, it is important to consider the frequency characteristics of the noise when determining the potential impact. The A-weighting scale is based on human sensitivity to noise and as such, cannot be assumed to be representative of the auditory sensitivity of birds. It is

therefore important to review the frequency characteristics of the noise source in relation to the sensitivity of birds and also to consider the temporal variation of the different noise sources.

- 12.2.52 Data presented in the 'Avian Hearing and the Avoidance of Wind Turbines' report, published by the National Renewable Energy Laboratory (NREL) (NREL, 2002), shows the average audiograms for different bird species relative to A-weighting frequency characteristics and normalised to a frequency of 1 kHz.
- 12.2.53 The data demonstrates that if a noise with a given sound pressure level had predominantly low frequency characteristics, a bird would be expected to exhibit less response to this than to a source of noise with the same overall sound pressure level but with higher frequency (>500 Hz) characteristics.
- 12.2.54 The 'Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance' report summarises the findings of several studies undertaken by the 'Institute of Estuarine & Coastal Studies' (IECS) (IECS, 2009) regarding the disturbance of birds in response to flood defence works at Saltend on the Humber estuary and the effects of piling noise on estuarine birds etc.
- 12.2.55 It should be noted that, whilst the report is primarily focussed on disturbance associated with construction activity, regular and steady state noise effects are also considered. In this regard, the IECS report states that:
- "Birds were also seen to; in general, accept a wide range of steady state noise level from between 55 dB(A) to 85 dB(A) in some cases."*
- 12.2.56 In lieu of explicit operational noise impacts on birds, it is considered that the threshold for impacts due to steady state or regular noise associated with construction activity (50 dBA for regular noise as outlined in Table 3 of the IECS report) would be equivalent for steady state and/or regular noise from operational industrial facilities, such as the REC.
- 12.2 On the basis of the above, the magnitude of construction and operational noise impacts on the important ecological sites (principally the Teesmouth and Cleveland Coast SPA and Ramsar) is summarised in Table 12.4.

Table 12.4: Magnitude of Impact Criteria (Impacts at Ecological NSRs)

Magnitude of Impact	Disturbance Effect	Noise Level (dBA)	Type of Noise
High	Movement off site	Not defined	Page 12-10
	Movement out of zone but remaining on site	>851	Piling (impulsive)
Medium	Movement within zone	70 to 851	Piling (impulsive)
Low	Behavioural changes (alarm calls, heads up, change in feeding/roosting activity)	<701	Piling (impulsive)
Negligible	No disturbance	<502	Regular / Steady State
Notes:			
1. Considered to be L_{AFmax}			
2. Considered to be $L_{Aeq,T}$			

Operational Traffic: Impacts at Residential NSRs

- 12.2.1 The noise changes identified in Table 12.5 below have been used in the assessment of noise impacts associated with operational traffic on the local road network at residential NSRs (an assessment of construction traffic noise effects has been scoped out, as construction traffic flows

would be lower than during operation). These are based on the guidance in DMRB LA 111 (Highways Agency et al, 2020) for the classification of magnitude of noise change in the long term (Table 3.54b of LA 111).

Table 12.5: Magnitude of Impact Criteria (Operational traffic)

Magnitude of Impact	Noise Change (dB $L_{A10,18h}$ or L_{night})
High (<i>Major</i>)	>10.0
Medium (<i>Moderate</i>)	5.0 to 9.9
Low (<i>Minor</i>)	3.0 to 4.9
Negligible	<3.0
No Change	0

Significance of Effects

- 12.2.2 The significance of the effect with regard to noise is determined by correlating the magnitude of the impact and the sensitivity of the receptor.
- 12.2.3 The particular method employed for this assessment is presented in Table 12.6. Where a range of significance of effect levels is presented in Table 12.6, the final assessment for each effect is based upon expert judgement.
- 12.2.4 For the purpose of this assessment, any effects with a significance level of minor or less are considered to be not significant in EIA terms. Effects with a significance level of moderate are not automatically considered to be significant. Further consideration of the assessment outcome is given where a moderate effect is predicted before a determination of whether an effect is significant/not significant in EIA terms is made. Effects with a significance level of major or substantial are considered to be significant in EIA terms.

Table 12.6: Assessment Matrix

Sensitivity	Magnitude of Impact				
	No Change	Negligible	Low	Medium	High
Negligible	None	Negligible	Negligible or Minor	Negligible or Minor	Minor Page 12-11
Low	None	Negligible or Minor	Negligible or Minor	Minor	Minor or Moderate
Medium	None	Negligible or Minor	Minor	Moderate	Moderate or Major
High	None	Minor	Minor or Moderate	Moderate or Major	Major or Substantial
Very high	None	Minor	Moderate or Major	Major or Substantial	Substantial

Limitations of the Assessment

- 12.2.5 At this stage, exact construction techniques and required plant are unknown. As such, noise levels associated with construction activity are not able to be predicted with certainty.

- 12.2.6 However, in order to allow for a robust assessment of noise effects, construction noise levels have been predicted on the basis of a 'worst case' scenario, based on construction activity that may result in the highest levels of noise generated.
- 12.2.7 Similarly, exact operational activity and associated noise emissions are unknown at this stage. As such an assessment of operation noise effects on ecologically sensitive areas has been undertaken based on RPS' professional judgment of assessing other similar facilities to the REC in the past.

Baseline Acoustic Environment

- 12.2.8 No baseline acoustic survey has been undertaken at the nearest residential NVSRs to the Application Site, as an assessment of noise effects at residential NVSRs has been scoped out for assessment. This is on the basis that adverse noise effects, significant or otherwise, would be very unlikely, due to the approximate 2.3 km separation distance between the nearest residential NVSRs and the Application Site.
- 12.2.9 Nevertheless, it is expected that the baseline acoustic environment at the nearest residential NVSRs would be affected primarily by noise from the sea (wind and waves), road traffic movements on the A1085 Trunk Road and train movements on the 'Bishop and Tees Valley Line'. Other noise sources typical of the urban environment, including commercial land uses, would also contribute to the baseline acoustic environment.
- 12.2.10 Due to the close proximity of the North Sea coast (approximately 700 metres east of the nearest residential NVSR) to the Application Site (Marsh Farm), it is likely that natural 'sea sound' would affect the baseline acoustic environment, particularly at night, when other environmental noise sources are suppressed.
- 12.2.11 Similarly, no baseline acoustic survey has been undertaken at the Teesmouth and Cleveland Coast SPA and Ramsar or the other ecological NVSR locations listed in paragraph 12.2.37. However, as the assessment of noise effects associated with the construction and operation of the REC is based on absolute noise levels, rather than a comparison between noise from the REC site and baseline conditions, no survey is necessary to determine effects.
- 12.2.12 As other industrial and commercial land uses are located in close proximity to Teesmouth and Cleveland Coast SPA and Ramsar, it is considered very likely that sound from these land uses would have been historically affecting the baseline acoustic environment. As such, birds making use of the SPA are likely to have developed a level of tolerance to the type of noise that would be introduced through the construction and operation of the REC.

Future Baseline Conditions

- 12.2.13 In the future baseline, there would be a minor increase in road traffic flows due to natural growth; however, the increases would likely be very low and are unlikely to have an influence on the assessment.
- 12.2.14 There is no evidence to suggest new NVSRs would be introduced into the future baseline which would be closer than those which have been assessed; therefore, the adopted baseline assumptions are considered representative of the future baseline conditions over the operational life of the proposed development.

12.3 Mitigation Measures Adopted as Part of the Project

Construction

- 12.3.1 Good construction practices, in accordance with Best Practicable Means, would be applied to minimise noise and vibration emissions during the construction of the REC. These construction practices would be set out in the Code of Construction Practice and agreed with the Local Planning Authority post consent. The measures would include:
- the use of quieter alternative methods, plant and equipment, where reasonably practicable;
 - plant, ancillary plant, equipment, site offices, storage areas and worksites will be positioned away from existing noise sensitive receptors, where reasonably practicable;
 - portable acoustic enclosures/screens will be used for static activities where necessary and practicable;
 - all construction plant and equipment will comply with EU noise emission limits;
 - machinery in intermittent use will be shut down in the intervening periods between works or throttled down to a minimum;
 - no plant or machinery engines will be left running unnecessarily;
 - materials will be handled as carefully as possible when loading lorries and skips to minimise noise;
 - as far as reasonably practicable, the noise from reversing alarms will be controlled and limited (e.g. setting reversing alarms to the minimum output noise levels required for health and safety compliance);
 - all vehicles, plant and equipment will be maintained and operated in an appropriate manner, to ensure that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum; and
 - as far as reasonably practicable, any plant or machinery fitted with noise control equipment found to be defective will not be operated until repaired.

Operation

- 12.3.2 A 5 metre high wall will be erected along the north-eastern boundary of the Application Site, which will act to attenuate noise levels at the nearest ecologically sensitive area (the Salholme Nature Reserve), creating both a sound and visual barrier. The IBA building will contain IBA processing equipment and will act as a further sound and visual barrier.
- 12.3.3 In response to a concern raised by Natural England during the Scoping consultation about the location of the processing building on the IBA part of the REC, which had been located close to the northern boundary of the Application Site and therefore adjacent to the SSSI, the layout has been re-designed. Though the processing activity will be enclosed, it will still generate some noise from the conveyor and machinery used to move the IBA. A decision was made post-consultation to move the processing building to the western boundary of the IBA area to increase the distance between the building and the SSSI as a means of reducing disturbance.

12.4 Assessment of Construction Effects

Impacts of Construction Noise on Ecological Receptors

- 12.4.1 In order to predict noise levels associated with noisiest aspects of construction activity, for which adverse effects would be most likely, i.e. piling, a 3-D noise model has been built using SoundPLAN v8.2 noise modelling software.
- 12.4.2 The model predicts sound levels under light downwind conditions based on hemispherical propagation, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613:1996.
- 12.4.3 Two piling scenarios have been modelled, one for impact piling and one for 'continuous flight auger' (CFA) piling. Both scenarios have included piling noise sources modelled as point sources at 12.5 m above ground level (AGL), located on the REC site closest to where piling would be undertaken to the ecologically significant sites (this is approximately the centre of the site, no piling is proposed along the site boundary). Impact piling and CFA piling sources have been modelled with sound power levels (SWLs) of 140 and 108 dBA L_W respectively.
- 12.4.4 The piling source term has been based on data obtained by RPS during attended measurements when piling was undertaken at the Port of Dover. Similar piling source term data is included with BS 5228-1:2008+A1:2014, with the input data used in this assessment at the upper range of this data.
- 12.4.5 The CFA source has been based on data from BS 5228-1:2008+A1:2014, with the input data used in this assessment at the top range of noise levels shown (reference C.12#42 'Soilmec CM45').
- 12.4.6 On the basis of the above, noise levels predicted at the Teesmouth and Cleveland Coast SPA and Ramsar would be the highest that would occur during all construction activity and for the majority of construction period would likely be lower, both due to being undertaken further from the important ecological site and with the piling activity likely generating lower levels of noise.
- 12.4.7 The results of the modelling for the two piling scenarios, in terms of a graphical presentation of noise levels, are provided as Figure 12.1 and Figure 12.2 for impact and CFA piling respectively.
- 12.4.8 It should be noted that the indicated levels are the maximum (L_{AFmax}) and the energetical average (L_{Aeq}) for impact and CFA piling respectively (impact piling would be irregular noise, CFA steady noise).
- 12.4.9 With reference to Figures 12.1 and 12.2, maximum noise levels at the Teesmouth and Cleveland Coast SPA and Ramsar are 60-70 dB L_{AFmax} and 35-50 dB $L_{Aeq,T}$, for impact and CFA piling respectively, with noise levels for the majority of the important ecological sites listed in paragraph 12.2.37 well below these levels. It is likely that a contractor would prefer the option of impact piling, as that is likely to result in shorter construction times and earlier commissioning and operation.
- 12.4.10 On the basis of the above and with reference to Table 12.4, maximum noise impacts associated with impact and CFA piling would be of low and negligible magnitude respectively, with the magnitude of impact appropriately lower for the majority of the important ecological sites.
- 12.4.11 The important ecological sites listed in paragraph 12.2.37 are all of high sensitivity during the non-breeding season (September to April) when birds are more sensitive to disturbance and of medium sensitivity during the breeding season (May to August inclusive).
- 12.4.12 Overall, it is predicted that a low adverse impact on a high sensitivity receptor (during the non-breeding season) would result in a minor, potentially moderate, adverse effect. It is considered that the potentially moderate adverse effect may be significant in EIA terms.

- 12.4.13 However, as shown on Figure 12.1, construction noise levels across the wider Teesmouth and Cleveland Coast SPA and Ramsar site are lower (with a lower associated noise impact and lower adverse effect) the further away from the REC. Furthermore, during the breeding season, the sensitivity of these sites is lower, such that at worst, minor adverse effects would result. In addition, some tolerance to the type of noise introduced during the construction phase may have already occurred across the SPA/Ramsar as a whole. On this basis, the potentially moderate adverse effect would not be significant overall.
- 12.4.14 Further assessment of construction effects on ecological receptors is provided in Chapter 7 'Terrestrial Ecology and Ornithology' of this ES and the separate Habitats Regulations Assessment (HRA).

Further Mitigation

- 12.4.15 In addition to the construction BPM to mitigate noise emissions, a method statement for the piling works would be prepared and agreed with Natural England prior to construction. The method statement would set out specific mitigation measures for reducing disturbance to birds. With the implementation of the measures in the method statement the moderate effect would be reduced to minor adverse, which is not significant.

Future Monitoring

- 12.4.16 On the basis that no significant adverse effects are predicted, no monitoring is proposed. [subject to ecology conclusions]

Accidents and/or Disasters

- 12.4.17 It is considered that any construction accidents and/or disasters (explosion or similar) would not result in higher levels of noise than considered for the construction scenario above, i.e. from impact piling.
- 12.4.18 On this basis any construction accidents and/or disasters would not result in significant noise effects.

12.5 Assessment of Operational Effects

Impacts of Operational Noise on Ecological Receptors

Page 12-15

- 12.5.1 In order to predict noise levels associated with the operation of the REC facility, a 3-D noise model has been built using SoundPLAN v8.2 noise modelling software.
- 12.5.2 The model predicts sound levels under light downwind conditions based on hemispherical propagation, atmospheric absorption, ground effects, screening and directivity based on the procedure detailed in ISO 9613:1996.
- 12.5.3 At this stage, the precise detail of operational activity and associated noise emissions are unknown. Therefore, the model has been constructed with input acoustic data based on RPS professional judgment of assessing other similar facilities to the REC in the past. In this regard, Table 12.7 below summarises the modelling inputs used.

Table 12.7: Operational Noise Inputs

Noise Source	Notes
All Buildings (MRF, Tipping Hall, Bunker, Boiler, Turbine Hall)	Modelled as 10 metre high buildings with internal reverberant sound pressure levels of 80 dB L_{PA} , and a generic industrial based spectrum. Facades of the building modelled as Kingspan KS1000RW with an overall attenuation of 25 dB R_w .
ACC	Modelled as an area source at 2 metres AGL with a SWL of 111 dBA L_w , with an ACC spectrum based on RPS data.
IBA Conveyor	Modelled as line source at 4 metre AGL with a unit SWL of 81 dBA L_w , with and a spectrum based on data from BS 5228-1:2008+A1:2014 (C10.23).
IBA Area	Front end loader within IBA area modelled as a 100 x 120 m area source at 1 m AGL with a SWL of 104 dBA L_w , with and a spectrum based on data from BS 5228-1:2008+A1:2014 (C6.34). A 5 metre high wall surrounding the IBA area is included

- 12.5.4 In addition, the following generic assumptions have been incorporated into the noise model:
- 12.5.5 the topography of the site and the surrounding area has been obtained from site surveyed topographical data and Ordnance Survey (OS) open data (Terrain 50);
- 12.5.6 the effect of screening from solid structures (buildings) has been incorporated into the modelling process by importing OS Open Data 'Settlement Area' shape file data into the model and including buildings to be constructed; and
- 12.5.7 the ground type in the model has been generally set to soft (G=1), although bodies of water have been set to soft (G=1).
- 12.5.8 The results of the operational modelling, in terms of a graphical presentation of noise levels, are provided as Figure 12.3. The indicated levels are the energetical average (L_{Aeq,T}), representative of steady or continuous noise.
- 12.5.9 With reference to Figure 12.3, maximum operational noise levels at Teesmouth and Cleveland Coast SPA and Ramsar, are less than 50 dB L_{Aeq,T}, with noise levels for the majority of the SPA/Ramsar well below this level.
- 12.5.10 On the basis and with reference to Table 12.4, maximum operational noise impacts associated with would be of a negligible magnitude.
- 12.5.11 The important ecological NVSRs (as listed in paragraph 12.2.37) are all of high sensitivity. Page 12-16
- 12.5.12 Overall, it is predicted that a negligible impact on high sensitivity receptors would result in a minor adverse effect, which would not be considered significant in EIA terms.
- 12.5.13 Further assessment of operational effects on ecological receptors is provided in Chapter 7 'Terrestrial Ecology and Ornithology' of this ES and the separate Habitats Regulations Assessment (HRA).

Impacts of Operational Traffic Noise on Residential NSVRs

- 12.5.14 With reference to the 'Traffic and Transport' section of the Scoping Report (see Appendix XX):

"When the proposed development is operational, assuming 75% of waste is bulked via a Waste Transfer Station (WTS) and 25% is delivered to the site directly by RCVs, initial estimations suggest there would be 204 two-way HGV movements per day. Over a 10-hour working day, this would equate to approximately 20 two-way HGV movements per hour, or over a 24-hour working day approximately 9 two-way HGV movements per hour"

- 12.5.15 With reference to Table 12.3, Table 12.5. and Table 12.6, for a potentially significant adverse noise effect to result due operational road traffic movements at residential NSRs, a noise change of at least +5 dB would need to occur in the long term, i.e. a medium impact at a medium sensitivity NSR resulting in a moderate adverse effect.
- 12.5.16 For road traffic noise levels to increase by at least 5 dB requires over a 300% increase in road traffic moments compared to the baseline traffic movements.
- 12.5.17 As operational traffic would be routed via trunk roads (A1085 Trunk Road), baseline traffic flows would be relatively high such that operational traffic movements of up to 10 per hour from the REC would be negligible in comparison.
- 12.5.18 On the basis of the above, operational road traffic movements from the REC would not increase baseline noise levels. The magnitude of impact would be no change on a residential NSR of medium sensitivity, therefore the significance of effect would be no change.

Impacts of Operational Noise on Residential NSVRs

- 12.5.19 Using the 3-D noise model for the operational REC facility, as described above, the specific sound level at the nearest residential NSR, Marsh Farm, has been calculated to be 30 dB $L_{Aeq,T}$. This is a relatively low level and would not be likely to be audible/discernible above the residual acoustic environment.
- 12.5.20 Sound from industrial and/or commercial land uses at residential receptors is typically assessed following guidance within BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound' (British Standards Institution, 2019).
- 12.5.21 As detailed in BS 4142:2014+A1:2019, the specific sound level can be 'corrected' to account for acoustic features present, such as tonality, impulsivity and intermittency, with the addition of a 'character correction' (or rating penalty).
- 12.5.22 In this instance no such correction is considered appropriate as the noise emissions from facilities similar to the REC do not typically contain acoustic features such as tonality and/or impulsivity. Furthermore, in the event these acoustic features are present at the source location, they would very likely not be discernible at the NSR location, due to attenuation. As such, the calculated specific sound level is equal to the rating level.
- 12.5.23 The rating level is then compared to the baseline background sound level, with the greater the difference between the rating level and the baseline background sound level, indicating an increasing risk for adverse impact/effect (depending on the context). Page 12-17
- 12.5.24 As outlined in this chapter, baseline sound levels have not been surveyed; however it is anticipated, based on professional judgement, that background sound levels would be in the region of 35 to 40 dB $L_{A90,T}$ during the daytime period and 30 to 35 dB $L_{A90,T}$ during the night-time period.
- 12.5.25 On the basis of the above, it is considered very likely that the rating level would be below the background sound level at all times which, with reference to BS 4142, would be *"...an indication of the specific sound source having a low impact, depending on the context."*
- 12.5.26 In terms of the context, a rating level of 30 dB $L_{A,T,r}$ is considered to be a very low level and would not be likely to be audible/discernible above the residual acoustic environment external to NSRs, or internally within dwellings.
- 12.5.27 Consequently, noise effects associated with the operation of the REC at residential NSRs would very likely be below the LOAEL and likely below the NOEL. As such, operation of the REC would be in accordance with the Redcar and Cleveland Local Plan, 2018.

Further Mitigation

- 12.5.28 On the basis that no significant adverse noise effects are predicted, further mitigation is not considered necessary.

Future Monitoring

- 12.5.29 On the basis that no significant adverse effects are predicted, no monitoring is proposed [subject to ecology conclusions].

Accidents/Disasters

- 12.5.30 It is considered that any operational accidents and/or disasters (explosion or similar) would not result in higher levels of noise than considered for the operation scenario.
- 12.5.31 On this basis, any operational accidents and/or disasters would not result in significant noise effects.

Potential Changes to the Assessment as a Result of Climate Change

- 12.5.32 The Met Office Hadley Centre (MOHC) UK Carbon Projections ('UKCP18') dataset (MOHC, 2018) provides probabilistic projections of change in climatic parameters over time for 25 km grid squares across the UK.
- 12.5.33 Projected changes for a RCP8.5 future global greenhouse gas emissions scenario have been reviewed for the 2050–2069 and 2080–2099 periods, representing changes towards the likely end of the proposed development's lifetime and changes for the period beyond that should operation continue.
- 12.5.34 The likely ranges of change in climatic parameters including precipitation, temperature, wind speed, humidity and frequency of extreme weather are not considered to materially affect the future baseline described above for noise and vibration or increase the sensitivity of receptors to impacts beyond that described.

12.6 Assessment of Decommissioning Effects

- 12.6.1 Noise effects associated with the decommissioning of REC would be similar to those occurring during the construction phase, i.e. impact piling noise levels would be similar to noise levels from concrete breakers etc.
- 12.6.2 On this basis, noise effects associated with the decommissioning of REC would not be significant.

12.7 Assessment of Cumulative Effects

- 12.7.1 The assessment of cumulative effects considers the impacts associated with the REC together with other developments and plans. The developments and plans selected as relevant to the cumulative assessment presented within this chapter are based upon the cumulative screening exercise described in Chapter 4: Environmental Assessment Methodology and Appendix 4.2). Details of the projects considered in the cumulative assessment in this chapter are provided in Table 12.8 below:

Table 12.8: Cumulative Developments Considered in the Assessment of Cumulative Effects on Noise and Vibration

Cumulative development	Distance from the site	Potential effects
<p>York Potash Port and Materials Handling Facilities</p> <p>R/2015/0218/DCO R/2015/0218/DCO R/2014/0626/FFM, R/2014/0627/FFM</p> <p>DCO made 20/07/16</p>	681 metres	No cumulative noise effects on ecological NVSRs due to the distance of the development from the Application Site and Teesmouth and Cleveland Coast SPA and Ramsar.
<p>Tees Cluster Carbon Capture and Usage</p> <p>Scoping opinion issued 02/04/19</p>	951 metres (some of the associated infrastructure is shown to be on and adjacent to the Application Site)	No cumulative noise effects on ecological NVSRs due to the distance of the development from the Application Site and Teesmouth and Cleveland Coast SPA and Ramsar.

12.8 Inter-relationships

- 12.8.1 There are inter-relationships between noise and vibration and other topics within the ES. These include synergies with ecology and ornithology and also traffic and transportation.
- 12.8.2 Noise impacts associated with the construction and operation of the REC primarily affect the Teesmouth and Cleveland Coast SPA and Ramsar site, due to the birds that make use of these areas. Other impacts to ecology and ornithology are considered in Chapter 7 (Ecology and Ornithology).

12.9 Summary of Effects

- 12.9.1 An assessment of the potential noise and vibration effects associated with the construction and operation of the REC has been undertaken. Page 12-19
- 12.9.2 Predictions have shown that noise from construction activity would result in, at worst, a low magnitude of impact at the nearest parts of the most-affected receptor to the REC site, the Teesmouth and Cleveland Coast SPA and Ramsar, which is considered to be of high sensitivity during the non-breeding season (September to April) when birds are more sensitive to disturbance and of medium sensitivity during the breeding season (May to August inclusive).
- 12.9.3 A low impact on the, at times, high sensitivity receptor would result in a minor to moderate adverse effect, which is potentially significant in EIA terms.
- 12.9.4 However, construction noise levels across the wider Teesmouth and Cleveland Coast SPA and Ramsar site are lower, with a lower associated noise impact and lower adverse effect (minor to negligible). Furthermore, during the breeding season the sensitivity of the SPA and Ramsar site is lower, such that during this period at worst minor adverse effects would result. In addition, some tolerance to the type of noise introduced during the construction phase may have already occurred

across the SPA/Ramsar as a whole. On this basis, it is considered that the potentially moderate adverse effect would not be significant overall for the Teesmouth and Cleveland Coast SPA and Ramsar.

- 12.9.5 Furthermore, a method statement for the piling activity would be agreed with Natural England prior to construction setting out appropriate site-specific measures to limit the potential for disturbance. With the implementation of these measures the level of effect would reduce to minor adverse which is not significant.
- 12.9.6 Predictions have shown that noise from operation of the REC would result in, at worst, a negligible magnitude of impact at the most-affected receptor, Teesmouth and Cleveland Coast SPA and Ramsar, which is considered to be of high sensitivity.
- 12.2 A negligible impact on the high sensitivity receptor would result in a minor adverse effect, which is not considered significant in EIA terms.
- 12.3 Operational road traffic movements on the public highway are negligible compared to baseline and there would be no change in road traffic noise levels and as such no adverse impact at residential NSRs.

References

British Standards Institution. British Standard 4141:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

British Standards Institution (BSI) (2014) British Standard 5228-1:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites - Part 1: Noise. London, BSI.

British Standards Institution (BSI) (2014) British Standard 5228-2:2009+A1:2014. Code of practice for noise and vibration control on construction and open sites - Part 2: Vibration. London, BSI.

Department for Environment, Food and Rural Affairs (Defra) (2010) Noise Policy Statement for England. London, Defra.

Department of Transport (1988) Calculation of Road Traffic Noise. London, HMSO.

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

Ministry of Housing, Communities & Local Government (2019) National Planning Practice Page 12-20 Guidance: Noise. [Online] Available at: <https://www.gov.uk/guidance/noise--2> [Accessed 07 November 2019]

Ministry of Housing, Communities & Local Government (2019) National Planning Policy Framework. London, APS Group

MOHC (2018) UK Climate Projections User Interface v1.1.2, available <https://ukclimateprojections-ui.metoffice.gov.uk/ui/home>, accessed 24 December 2019

The Highways Agency, Transport Scotland, Welsh Government and the Department for Regional Development Northern Ireland (2020) Design Manual for Roads and Bridges, Volume 11, Section 3, Part 7: Noise and Vibration (LA 111)

Table 12.9: Summary of Likely Environmental Effects on Noise and Vibration

Receptor	Sensitivity of receptor	Description of impact	Mitigation measure	Magnitude of impact	Significance of effect	Significant / Not significant
Construction						
Teesmouth and Cleveland SPA and Ramsar	High	Disturbance from constructions activities	Piling sheath to reduce impact piling noise if work is to be undertaken during the non-breeding season for waterbirds when sensitivity to noise disturbance is at its highest	Low	Minor adverse	Not significant
Operation and maintenance						
Teesmouth and Cleveland SPA and Ramsar	High	Disturbance from the operation of the REC	-	Negligible	Minor adverse	Not significant
Residential NSRs	Medium	Change in baseline noise levels as a result of operational traffic	-	No change	No change	Not significant
Decommissioning						
Teesmouth and Cleveland SPA and Ramsar	High	Disturbance from decommissioning activities	-	Up to low	Minor or Moderate adverse	Not significant