9. NOISE AND VIBRATION

9.1 Introduction

9.1.1 Enzygo Limited (Enzygo) has been commissioned to undertake a Noise and Vibration Assessment to support a planning application for Hownsgill Park Energy Facility, Hownsgill Park, Consett, Durham. The assessment is set out within this chapter and forms part of the Environmental Impact Assessment (EIA) undertaken for this project.

9.1.2 The Chapter considers the potential environmental impacts of the development proposals on the baseline environment, the mitigation measures required to prevent, reduce or offset any significant adverse impacts and the likely residual effects after any necessary mitigation measures have been applied.

9.1.3 Technical terms and references are used throughout the Chapter. To assist the reader, a glossary of terms is included in Appendix 9.1.

9.2 Aims and Objectives

9.2.1 The aims of this assessment were to prepare a noise and vibration assessment which demonstrates that the proposed development can be operated without adversely affecting the amenity of nearby noise-sensitive receptors. Where an adverse impact is identified, this assessment suggests measures to mitigate such impacts.

9.3 Legislation and Policy Context

Legislation

Control of Pollution Act, 1974

9.3.1 The Control of Pollution Act 1974 (CoPA), Chapter 40 gives Local Authorities powers for controlling noise and vibration from construction sites and other similar works, plant and machinery, codes of practice for minimising noise and Best Practical Means (BPM).

National Planning Policy

National Planning Policy Framework, February 2019

9.3.2 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England and how these should be applied. It provides a framework within which local plans for housing and other development can be produced and should be read in conjunction with other Government planning policies.

9.3.3 With respect to noise, the NPPF states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- Identify and protect area of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

9.3.4 The guidance contained in the NPPF further determines that consideration should be given to the Noise Policy Statement for England (March 2010).

Noise Policy Statement for England (NPSE, March 2010)

9.3.5 The Noise Policy Statement for England (NPSE) considers three types of noise:

1. Environmental Noise – which includes noise from transportation sources.
2. Neighbour Noise – which includes noise from inside and outside people's homes.
3. Neighbourhood Noise – which includes noise arising from within the community such as industrial and entertainment premises, trade and business premises, construction sites and noise in the street.

9.3.6 In line with the aims determined in the NPPF, the NPSE determines three aims:

1. Avoid significant adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
2. Mitigate and minimise adverse impacts on health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development.
3. Where possible, contribute to the improvement of health and quality of life from environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development

9.3.7 The guidance detailed within the NPSE relates key phrases with regards to adverse effects which can be applied to noise impacts as used by the World Health Organisation.

NOEL – **N**o **O**bserved **E**ffect **L**evel

The level below which no health effect of detrimental impact on the quality of life is observed.

LOAEL – **L**owest **O**bserved **A**dverse **E**ffect **L**evel

The level below which adverse effects on the quality of life can be detected.

SOAEL – **S**ignificant **O**bserved **A**dverse **E**ffect **L**evel

The level below which adverse effects on the quality of life can be detected.

9.3.8 The guidance indicates that it is not possible to have a single objective noise-based measure that defines SOAEL, and as such the SOAEL is likely to be different for different noise sources and receptors. The guidance indicates that further research is required to establish what may constitute a significant adverse impact on health and quality of life from noise.

9.3.9 While the NPSE determines the NOEL, LOAEL and SOAEL descriptions the guidance indicates that, unlike other environmental disciplines, there are currently no European or national noise limits which must be met. Although the NPSE states that "*there can be specific local limits for specific developments*" allowing for negotiation.

Planning Practice Guidance for Noise

9.3.10 The guidance contained within the Planning Practice Guidance for Noise (PPGN) indicates that noise should be considered when:

- New development may create additional noise; and/or
- New development would be sensitive to the prevailing acoustic environment.

9.3.11 The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so should consider:

- Whether or not a significant adverse effect is occurring or is likely to occur;
- Whether or not an adverse effect is occurring or is likely to occur; and
- Whether or not a good standard of amenity can be achieved.

9.3.12 The impact of noise is rated with the policy document in terms of the relative '*observed effect level*'. The PPGN provides the matrix shown in Table 9-1.

Table 9-1 Planning Practice Guidance – Noise Exposure Hierarchy

Perception	Example of Outcomes	Increasing Effect Level	Action
NO OBSERVED EFFECT LEVEL - NOEL			
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable but not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. 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			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up television volume, speaking more loudly or, where there is no alternative ventilation, having to close windows for some of the time because of noise. Potential sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life	Observed adverse effect	Mitigate and reduce to a minimum
SIGNIFICANT OBSERVED ADVERSE EFFECT LEVEL – SOAEL			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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 getting back to sleep. Quality of life diminished due to changes in the acoustic character of the area.	Significant observed adverse effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation and/or awakening; loss of appetite, significant medically definable harm, e.g. auditory and non-auditory.	Unacceptable adverse effect	prevent

9.4 Assessment Methodology

Relevant Guidance

9.4.1 This assessment has been conducted following the relevant guidance, including:

- BS5228:2009+A1:2014 *Code of practice for noise and vibration control on construction and open sites*.
- BS4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound*.

- BS8233:2014 *Guidance on sound insulation and noise reduction for buildings*.
- World Health Organisation *Guidelines for Community* Noise.
- ISO9613-2 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*.

British Standard 5228:2009+A1:2014

9.4.2 British Standard 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise (BS5228-1) sets out a methodology for predicting noise levels arising from a wide variety of construction and related activities.

9.4.3 Noise levels generated by construction activities and experienced at local receptors will depend on several variables, the most significant of which are:

- The sound power outputs of the plant and/or processes.
- The periods of operation of the plant and/or processes.
- The distance between the sources and receptors.
- The presence of screening by buildings or barriers.
- The potential reflection of sound.
- Soft ground attenuation.

9.4.4 BS5228-1 gives several examples of acceptable limits for construction noise. It is assumed that construction operations would only occur during normal working daytime hours, i.e. between 07:00 and 19:00 hours Monday to Friday and 07:00 and 13:00 hours on Saturdays.

9.4.5 The assessment of noise from construction works has been made using the ABC methodology outline in Section E of BS5228-1.

9.4.6 The ABC Method gives examples of the thresholds of potential significant effects at dwellings when the noise level from construction operations, rounded to the nearest decibel, exceeds the tabulated value. The values are shown in Table 9-2 below.

9.4.7 The table is designed to be used as follows:

"*for the appropriate period (night, evening/weekends or day), the ambient noise level is determined and rounded to the nearest 5dB. This is then compared to the site noise level. If the site noise level exceeds the appropriate category value, then a potential significant effect is indicated. The assessor then needs to consider other project-specific factors, such as the*

number of receptors affected and the duration and character of the impact, to determine if there is a significant impact."

Table 9-2 BS5228 – Example threshold of potential significant effect at dwellings

Assessment category and threshold value period	Threshold value, in decibels (dB) $L_{Aeq,T}$		
	Category A[A)]	Category B[B)]	Category C[C)]
Night-time (23:00 – 07:00)	45	50	55
Evenings and weekends [D)]	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1 *A potential significant effect is indicated if the $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.*			
NOTE 2 *If the ambient noise level exceeds Category C threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise.*			
NOTE 3 *Applies to residential receptors only.*			
A) *Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.*			
B) *Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.*			
C) *Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.*			
D) *19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays*			

9.4.8 BS5228-1 also sets out a method for predicting noise levels generated by mobile plant using a well-defined haul route such as an access road. For the purposes of this assessment, and due to the low traffic flow numbers associated with the proposed development, noise levels for traffic movements have been calculated using this method.

9.4.9 The general expression for predicting the L_{Aeq} alongside a haul road used by single-engine vehicles is:

$$L_{Aeq} = L_{WA} - 33 + 10Log_{10}Q - 10Log_{10}V - 10Log_{10}d$$

Where

L_{WA} = the sound power level of the plant in decibels (dB);

Q = the number of vehicles per hour

V = the average vehicle speed in kilometres per hour (km/h)

d = the distance from the centre of the road to the receptor in meters (m)

9.4.10 An angle of view correction is also applied where appropriate by using the following expression:

$$A = 10Log_{10}(a_V/180)$$

9.4.11 The noise modelling software used for calculating the predicted noise levels for this assessment uses these expressions when calculating noise levels from haul roads.

9.4.12 British Standard 5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 2: Vibration (BS5228-2) gives recommendations for basic methods of vibration control relating to construction site where work activities/operations generate significant levels of vibration.

9.4.13 BS5228-2 indicates that most people are known to be very sensitive to vibration with the threshold of perception being typically in the 0.14mms^{-1} to 0.30mms^{-1} peak particle velocity range. Vibration levels above these values can cause disturbance.

9.4.14 Table 9-3 details the guidance on the effects of construction vibration outlined in BS5228-2.

Table 9-3 BS5228 Guidance on the effects of vibration levels

Vibration level mms^{-1}	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might just be perceptible in residential environments
1.00	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure at this level.

British Standard 4142:2014+A1:2019

9.4.15 British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS4142) provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes.
- Sound from fixed installations which comprise mechanical and electrical plant and equipment.
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises.
- Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

9.4.16 The Standard is based on the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background sound level measured, but

the typical background sound level at the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be determined based upon the premise that typically 'the greater the difference, the greater the magnitude of the impact'. This difference is then considered as follows:

- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB 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 will have an adverse impact of a significant adverse impact.

9.4.17 BS4142 goes on to state that "where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact", again depending on the specific context of the site.

9.4.18 The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment, stating that "not all adverse impacts will lead to complaints and not every compliant is proof of and adverse impact", thus implying that all sites should be assessed on their own merits and specifics.

9.4.19 BS4142 quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical daytime	07:00 to 23:00 hours	1-hour assessment period
Typical night-time	23:00 to 07:00 hours	15-minute assessment period

9.4.20 The Standard outlines methods for defining appropriate 'character corrections' within the rating levels to account for tonal, impulsive or other sound characteristics of the sound source and or its intermittency, these are a) the Subjective Method, b) the Objective Methods for Tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific sound level.

9.4.21 The Subjective Method is based on the following corrections:

Table 9-4 BS4142 Subject Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsive Correction	Correction for 'other sound characteristic'	Intermittency Correction
No perceptibility	+0dB	+0dB	Where neither tonal nor impulsive but clearly identifiable +3dB	If intermittency is readily identifiable +3dB
Just perceptible	+2dB	+3dB		
Clearly perceptible	+4dB	+6dB		
Highly perceptible	+6dB	+9dB		

British Standard 8233:2014

9.4.22 British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS8233) gives guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use.

9.4.23 The Standard suggests appropriate criteria and limits for differing situations which are primarily intended to guide the design of new, or refurbished buildings undergoing a change of use, rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels in this instance.

9.4.24 The Standard suggests suitable guidance values for residential dwellings which is shown in Table 9-5.

Table 9-5 BS8233 Indoor Ambient Noise Levels for Dwellings

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

9.4.25 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated within the Standard which states:

"*if relying on closed windows to meet guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation of the resulting noise level.*"

9.4.26 The Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

9.4.27 BS8233 also provides design range guidance for ambient noise levels within non-domestic buildings which should not be exceeded. These are shown in Table 9-6 below.

Table 9-6 BS8233 Design Range Guidance Levels for Non-domestic Buildings

Activity	Location	Design Range dB $L_{Aeq,T}$
Speech or telephone communication	Department store, cafeteria, canteen, kitchen	50 – 55
	Concourse, corridor, circulation space	45 – 55
Study or work requiring concentration	Library	40 – 50
	Staff/meeting room, training room	35 – 45
	Executive office	35 – 40
Listening	Place of worship, counselling, meditation, relaxation	30 – 35

World Health Organisation – Guidelines for Community Noise

9.4.28 The World Health Organisation (WHO) document *Guidelines for Community Noise* states that, during the daytime, noise levels of 55dB $L_{Aeq,16hr}$ in outdoor living areas are likely to lead to serious annoyance during the daytime and evening. With noise levels of 50dB $L_{Aeq,16hr}$ leading to moderate annoyance.

"4.2.7 Annoyance responses

During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55dB; or moderately annoyed with L_{Aeq} levels below 50dB. Sound pressure levels during the evening and night should be 5 – 10dB lower than during the day…"

9.4.29 For night-time noise sources the WHO guidelines recommend a night-time (23:00 to 07:00 hours) 8-hour noise level of 30dB L_{Aeq} inside bedrooms (for reasonably steady noise sources) to avoid sleep disturbance.

9.4.30 The WHO guidelines also recommend a night-time maximum noise level of 45dB $L_{Aeq.8hr}$ or 60dB L_{Afmax} outside bedrooms to avoid sleep disturbance.

International Standard ISO9613-2

9.4.31 International Standard ISO9613 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO9613) sets out a calculation methodology for predicting the noise levels generated by operations at the proposed development to the noise-sensitive receptors. The methodology considers the distance between the sources of noise and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

9.4.32 The methodology assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to the receptors.

Consultation

9.4.33 In carrying out the noise and vibration assessment, consultation has included the formal scoping process only.

The Study Area

9.4.34 The study area for the noise and vibration assessment is not likely to extend far beyond the site boundary. The proposed development site is located within Hownsgill Park which includes light industrial premises, workshop units and other factories.

9.4.35 The proposed development is located on the northern side of the Hownsgill Park main access road between the road and the Consett & Sunderland Railway Path.

Baseline Assessment

9.4.36 The baseline assessment considers the potential noise impact of the proposed development at the nearest noise-sensitive receptors to the development site including the nearest residential receptors, offices within Hownsgill Park and the Consett & Sunderland Railway Path.

9.4.37 Whilst undertaking the baseline noise survey it was noted that the main sources of noise in the area were road traffic noise, natural sounds and reverse warning beepers from Hownsgill Park.

Assessment of Impact

9.4.38 The method outlined below is designed to lead to an assessment of the significance of effect of the proposed development on the noise climate. It is based on guidance presented in the Standards and guidance documents outlined above and includes the following:

- Assessment of the baseline noise environment via the undertaking of strategic noise monitoring at the nearest noise-sensitive receptors identified.
- Noise modelling of both the proposed construction works and operational activities associated with the proposed development.
- Assessment of construction noise and vibration in accordance with the guidance contained in BS5228:2009+A1:2014 Part 1: Noise and Part 2: Vibration.
- Assessment of operational noise in accordance with the guidance contained in BS4142:2014+A1:2019, BS8233:2014, and WHO guidelines.

- Provision of mitigation advice to ensure that the proposed development can operate without causing significant adverse impacts at the nearest noise-sensitive receptors identified.

Cumulative

9.4.39 Reference has been made to any major existing/proposed developments within the vicinity of the project which would lead to a significant change in the baseline situation.

Limitations

9.4.40 This report is based upon a range of measurements, a system of calculations and noise predictions using drawings provided by the client. As such, the report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the drawings, noise modelling software and information provided. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

9.4.41 All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This had been quantified and assessed as follows:

- Rounding errors – systemic tolerance of ±1dB.
- Class 1 sound level meter – operational tolerance of ±1.1dB.
- Meteorology – allowance of ±1.9dB.
- CadnaA noise modelling software – data input and operational accuracy of ±2.1dB

9.4.42 The most influential uncertainty factors for the assessment of noise are considered equipment tolerance, weather conditions and software accuracy.

9.4.43 A root-sum-square statistical average has been used to provide an overall margin of uncertainty of ±3dB.

9.5 Baseline Conditions

9.5.1 Environmental baseline noise surveys were undertaken at locations considered representative of the nearest noise-sensitive receptors to the proposed development site to capture typical ambient and background noise levels.

9.5.2 The noise monitoring locations which were identified are considered the nearest noise-sensitive receptor locations and are shown in Figure 9-1. The locations were selected based on a review of available online aerial imagery and access availability at site, namely:

- Properties north of Consett Road, to the north.
- Properties on The Chequers, to the east.
- Properties on Knitsley Lane, to the southeast.
- Howns Farm, to the southwest.

9.5.3 Measurements were taken at each location, in 15-minute sample periods, for at least 2-hours during the daytime and for at least 1-hour during the night. Table 9-7 details the noise monitoring equipment used for the surveys. The sound level meters were set to record the $L_{Aeq,T}$, L_{AFmax}, L_{AF90} and L_{AF10} parameters.

Table 9-7 Noise Monitoring Equipment

Location	Equipment Description	Serial Number	Calibration Date
MP1 & MP2	01dB Solo Class 1 sound level meter	065396	05/02/2020
MP3 & MP4	01dB Solo Class 1 sound level meter	065446	23/02/2020
All	Cirrus CR:515 Acoustic calibrator	59522	29/01/2019

9.5.4 The sound level meters were set to fast time-weighting and frequency weighting A. The meters were field calibrated prior to and upon completion of the survey with no significant drift in calibration observed in either meter. The external calibration documentation for the equipment used is available to view upon request.

Weather Conditions

9.5.5 Weather conditions during the baseline survey periods were noted and are detailed in Table 9-8 below.

Table 9-8 Weather Conditions

Period	Precipitation	Cloud Cover	Max. wind-speed	Temperature
Daytime	None	90%	<5ms^{-1}	18°C
Overnight	None	40%	<5ms^{-1}	15°C

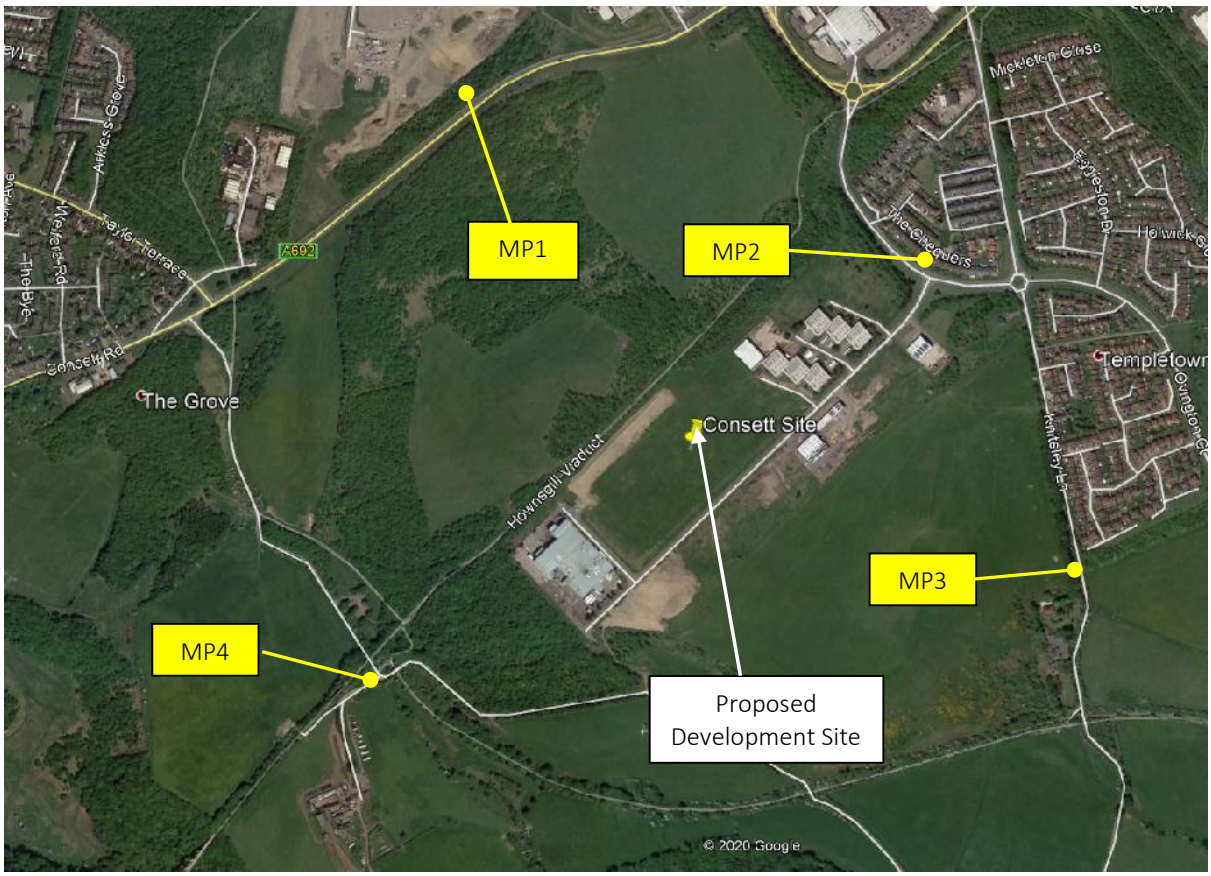
Baseline Survey Results

9.5.6 The results of the baseline surveys are summarised in Table 9-9. These are included in full in Appendix 9.2.

Table 9-9 Summary of baseline survey results

Location	Period	$L_{Aeq,T}$	L_{AFmax}	L_{A90}	L_{A10}
MP1 Consett Road	Day	76.1	91.7	60.6	79.7
	Night	64.5	90.7	25.5	58.9
MP2 The Chequers	Day	68.4	87.1	41.8	73.0
	Night	53.0	79.4	31.5	37.7
MP3 Knitsley Lane	Day	50.4	77.3	35.8	47.3
	Night	39.8	56.3	26.7	37.2
MP4 Howns Farm	Day	50.7	78.2	35.2	46.4
	Night	46.7	78.4	30.5	37.8

Figure 9-1 Noise monitoring locations



Subjective Field Observations

MP1 – Properties North of the A692, Berry Edge Development

9.5.7 The daytime noise climate at this location was dominated by road traffic using the A692, which has a 50mph speed limit. The night-time noise climate comprised road traffic using the A692. Lorry loading activities were also audible with some reverse warning systems audible at times.

MP2 – The Chequers

9.5.8 The daytime noise climate comprised road traffic using the adjacent road, distant road traffic, birdsong and wind in nearby trees. The night-time noise climate comprised occasional traffic on the adjacent road, distant background road traffic, a constant low frequency buzzing from Hownsgill Park was audible as were occasional metallic bangs.

MP3 – Knitsley Lane

9.5.9 The daytime noise climate at this location consisted of background road traffic noise, occasional vehicles passing on Knitsley Lane, birdsong and wind in nearby trees. The night-time noise climate was similar to that during the daytime but to a lesser extent. Sheep bleating was also audible during the night.

MP4 – Howns Farm

9.5.10 The noise climate during the daytime at this location comprised distant road traffic, occasional farm vehicles and occasional passing vehicles. Natural sounds such as birdsong and sheep bleating were also audible. During the night the noise climate was similar to that during the daytime but to a lesser extent. A constant sound 'like gas being burned' was audible from the east and was thought to be roof vents at the food factory on Hownsgill Park.

9.6 Identification and Evaluation of Key Impacts

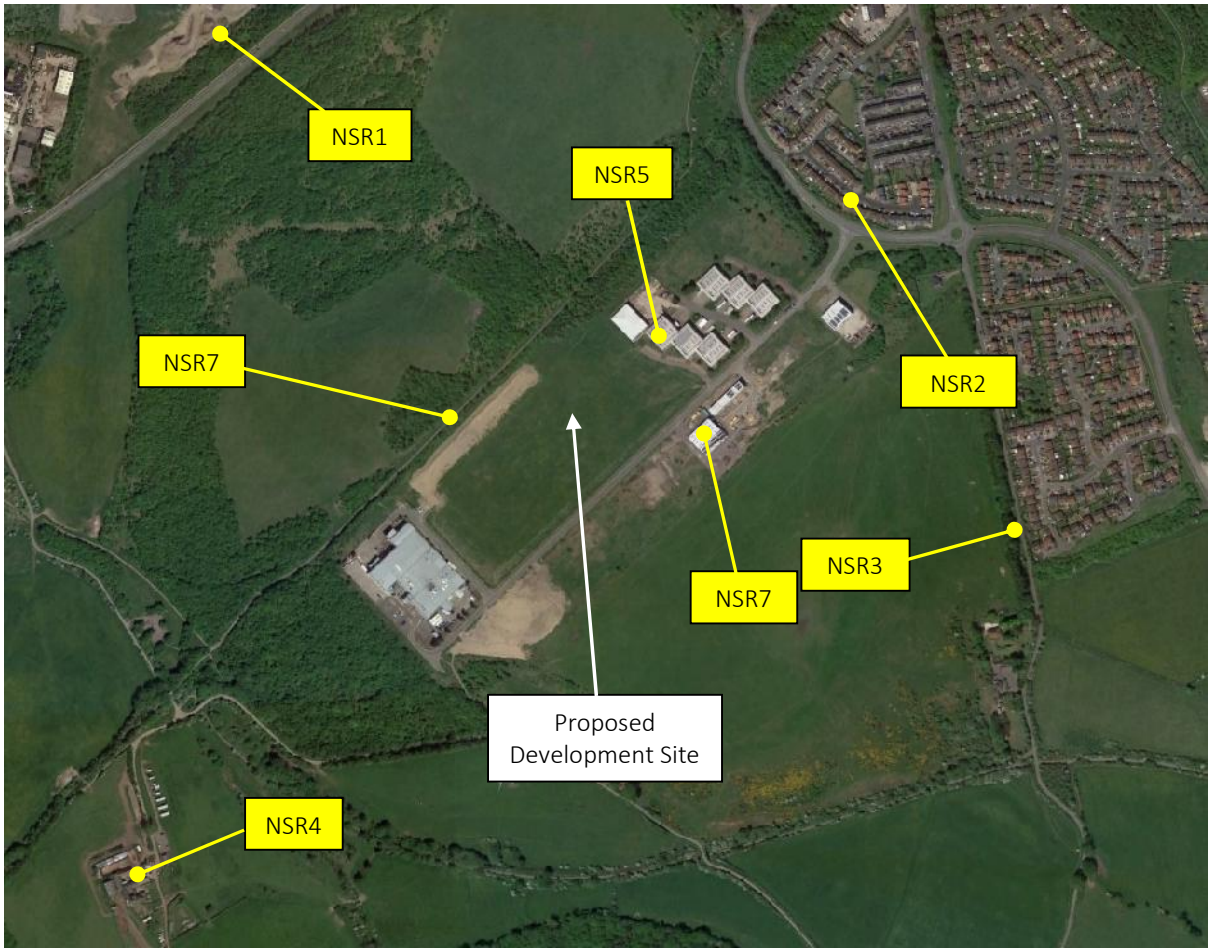
Noise-Sensitive Receptors

9.6.1 The nearest residential receptors are located to the northwest, northeast, east and southwest of the site. The nearest offices to the site include the 2-storey offices adjacent to the site to the northeast occupied by 'Tanfield Food Co.' which face the site.

9.6.2 The identified receptors are shown in Figure 9-2, namely:

- NSR1 Berry Edge Development
- NSR2 The Chequers
- NSR3 Knitsley Lane
- NSR4 Howns Farm
- NSR5 Tanfield Food Offices
- NSR6 The Consett & Sunderland Railway Path
- NSR7 Offices in Factory on opposite side of Hownsgill Park

Figure 9-2 Noise Assessment Locations



Noise Propagation Modelling

9.6.3 Noise emissions from the proposed development site have been predicted using the proprietary noise modelling software, CadnaA. Contour plots for construction noise and operational daytime and night-time noise levels are shown in Appendix 9.3.

9.6.4 The following protocols have been followed in the construction of the noise models:

- Noise emission levels have been predicted using the calculation methodology outlined in ISO9613-2.
- Wind and temperature assisted noise propagation modelling has been applied to every receptor.
- Daytime noise levels are predicted to 1.5m above local ground level, to represent ground floor amenity space receptors, and night-time noise levels are predicted to 4.0m above local ground level, to represent first-floor bedroom windows.

Construction Noise

9.6.5 Noise levels generated by construction works have been predicted and assessed in accordance with the guidance contained in BS5228-1 as stated earlier in this Chapter.

9.6.6 It is inevitable, with developments of this nature, that construction works may cause some disturbance to those living nearby. However, disruption due to construction works is, typically, a localised phenomenon and generally temporary in nature. Only people living within approximately 100 to 200m of the site are likely to be significantly impacted by construction noise.

9.6.7 An estimate of the likely effects of noise from construction activities has been made to the nearest noise-sensitive receptors, identified in paragraph 9.6.2, over a normal working day.

9.6.8 At this stage there are no specific details of the likely construction plant to be used during the construction of the proposed development. Therefore, a generic list of construction plant is shown in Table 9-10.

9.6.9 It is acknowledged that there may be other, sub-phases, of the construction works. However, in the absence of more detailed/specific information pertaining to the construction methodology and make and model of plant to be used, the assessment has been made for a worst-case situation where all plant is operating simultaneously and at their closest approach to the identified receptors.

9.6.10 The predictions include the noise level generated by construction traffic movements between the A692 and the construction area.

9.6.11 Average speeds of 25kph has been assumed for all construction traffic from the roundabout on the A692 to, and within, the site. It is assumed, for a worst-case situation, that there would be 5 two-way movements per hour associated with construction operations.

9.6.12 Table 9-11 details the construction noise assessment against the 'threshold of potential significant effect at dwellings' values from the 'ABC Method' in BS5228. Predicted noise levels have been rounded to the nearest whole number.

Table 9-10 Assumed Construction Plant & Equipment

Activity	Plant Item	No. of Plant	Plant L_{WA}, dB
Site Clearance	Tracked Excavator	2	108
	Dozer	1	109
	Articulated Dumper	2	108
	Grader	1	104
Hardstanding Preparation	Road Roller	1	108
	Vibratory Roller	1	108
	Asphalt Paver (including truck & hopper)	1	103
	Road Sweeper	1	104
Piling Operations	Piling Rig	1	115
Building Foundations & Erection	Concrete Truck – Pouring	2	108
	Concrete Pump	2	107
	Tracked Excavator	2	108
	Mobile Crane	2	110
	Mobile Work Platform	2	95
	Power Tools	2	108
	JCB Telehandler	2	99
	Delivery Trucks (5 per hour worst-case)	5	116

Table 9-11 Construction Noise Assessment - Dwellings

Receptor	Measured Ambient Noise Level dB $L_{Aeq,T}$	Ambient Noise Level Rounded to the Nearest 5dB	Predicted Noise Level from Construction Operations dB $L_{Aeq,1hr}$	ABC Category and/or Derived Limit based on Ambient Noise Levels, dB(A)	Difference dB(A)
NSR1 – Berry Edge	76	75	41	C (75)	-34
NSR2 – The Chequers	68	70	52	B (70)	-18
NSR3 – Knitsley Lane	50	50	49	A (65)	-16
NSR4 – Howns Farm	51	50	48	A (65)	-17

9.6.13 Table 9-11 shows that predicted noise levels from construction works would meet the noise limits derived in accordance with the guidance contained in BS5228-1 at the nearby residential receptors without the need for mitigation.

9.6.14 Table 9-12 details the construction noise assessment for nearby offices using the 'potential significance based on fixed noise limits' method outlined in BS5228-1. The assessment uses the fixed value of 75dB(A) for urban areas near main roads and heavy industrial areas.

Table 9-12 Construction Noise Assessment – Non-residential

Receptor	Predicted Noise Level from Construction Operations dB $L_{Aeq,1hr}$	Derived Limit based on Fixed Noise Limits dB(A)	Difference dB(A)
NSR5 – Tanfield Food Offices	66	75	-9
NSR7 – Offices on Hownsgill Park (opp)	72		-3

9.6.15 Table 9-12 shows that worst-case predicted noise levels generated by construction operations would be below the derived noise limit at all office receptors assessed.

9.6.16 As the site is located within an existing industrial site, close to significant transport infrastructure and other industrial development, it is considered that the results show that there would be no significant effects from construction noise.

9.6.17 Based on the results of the construction noise assessment, it is considered that specific mitigation measures to reduce potential noise impacts from construction operations are not necessary.

Construction Vibration

9.6.18 BS5228-2 gives recommendations for controlling vibration on construction sites. It is considered that the main source of vibration during the construction works would relate to piling activities.

9.6.19 Table 9-13 shows the predicted vibration levels generated by piling operations for building foundations at the nearest noise-sensitive receptors identified and provides an indication of the probable perception levels as described in BS5228-2.

Table 9-13 Vibration Level Assessment

Receptor	Distance from Source to Receptor m	Predicted Vibration Level mms^{-1}ppv	Perception Level
NSR1 – Berry Edge	620	0.06	Vibration might just be perceptible in the most sensitive situations.
NSR2 – The Chequers	465	0.09	
NSR3 – Knitsley Lane	650	0.06	
NSR4 – Howns Farm	675	0.02	
NSR5 – Tanfield Food	180	0.31	Vibration might be just perceptible in residential environments
NSR7 – Offices (opp)	190	0.29	

9.6.20 Table 9-13 shows that predicted vibration levels due to piling operations associated with the construction of the proposed development are at a level better than that which '*might be just perceptible in the most sensitive situations*' at the nearby residential receptors.

9.6.21 At the adjacent offices, predicted vibration levels due to piling operations are at a level that is below that which '*might be just perceptible in residential environments'.*

9.6.22 Based on the results of the construction vibration assessment, it is considered that mitigation measures to reduce the likelihood of complaints due to piling operation vibration are not required.

Operational Noise

9.6.23 The operational noise sources associated with the proposed development are likely to include the following:

- Buildings containing operational plant.
- External plant.
- Vehicle movements.

9.6.24 Table 9-14 details the noise source data provided by the client.

Table 9-14 Noise Source Data

Description		Noise Source Level
Enclosed Process Building	Average reverberant sound pressure level measured at the internal face of the building wall, L_i	80dB(A)
Plastics Recovery Plant	Average reverberant sound pressure level measured at the internal face of the building wall, L_i	80dB(A)
Energy Centre	Average reverberant sound pressure level measured at the internal face of the building wall, L_i	80dB(A)
Turbine Room	Average reverberant sound pressure level measured at the internal face of the building wall, L_i	85dB(A)
Stack Outlet	Sound Power Level, L_W	108dB(A)
Odour Control Plant	Sound Pressure Level @ 10m, L_P	53dB(A)
Odour Control Outlet	Sound Pressure Level @ 10m, L_P	53dB(A)
Dry Air Coolers	Sound Pressure Level @ 10m, L_P	53dB(A)
HGV Movements	Drive-by sound power level, L_W (BS5228-1:2009+A1:2014)	111dB(A)

9.6.25 The final design of the building would be subject to minor alterations to suit evolving site conditions and final equipment configurations. However, based on our experience with other sites, the building construction would be based on a portal steel frame design, clad with plastic-coated sheet steel panels to the walls and roof. Personnel access doors would

be a composite construction and acoustically treated (if necessary) and vehicle access roller shutter doors would be double skinned with insulated infill. The overall sound reduction index, R_W, used for the finished buildings is 25dB to reflect a conservative reduction.

9.6.26 An assessment of the potential impacts during the daytime at the nearest noise-sensitive residential receptors has been made in accordance with the guidance contained in the latest version of BS4142 with the night-time assessment made in accordance with the guidance contained in BS8233.

9.6.27 An assessment of the potential impacts at nearby offices has been made in accordance with the guidance contained in BS2833 for the daytime only.

9.6.28 Noise predictions have been made using the proprietary noise modelling software CadnaA, which implements the full range of UK calculation methodologies. In this instance, the calculation algorithms set out in ISO9613-2 have been used.

9.6.29 For the purposes of this assessment, the predictions assume that all plant is operating at 100% load and on-time.

9.6.30 The attenuation provided by intervening buildings and landforms has been considered as part of the assessment.

9.6.31 The client has advised that there would be 12no. HGV visiting the site during the day (deliveries would take place between 07:00 and 19:00 hours). It is expected that these will be distributed evenly over the working day; however, it is possible that two HGV could be visit the site in any working hour therefore the predictions are based on 4no. HGV movements per hour (2no. in and 2no. out). Predictions are based on HGV vehicle speeds of 25kph between the site and the round-about.

9.6.32 Noise predictions to the receptor locations have been made to a height of 1.5m for outdoor residential amenity space, ground floor offices and the Consett & Sunderland Railway Path and to a height of 4.0m for upstairs residential bedrooms and first floor offices as appropriate. The noise contour plots for daytime, evening and night-time periods are shown in Appendix 9-C.

9.6.33 Table 9-15 details the resulting specific sound levels at the nearest noise-sensitive receptors identified.

Table 9-15 Predicted Specific Sound Levels

Receptor Location	Period (hrs)	Receptor Height, m	Predicted Specific Sound Level, $L_{Aeq,T}$
NSR1 – Berry Edge Development	07:00 – 19:00	1.5	34.9
	19:00 – 23:00	1.5	34.9
	23:00 – 07:00	4.0	35.0
NSR2 – The Chequers	07:00 – 23:00	1.5	42.0
	19:00 – 23:00	1.5	38.0
	23:00 – 07:00	4.0	42.1
NSR3 – Knitsley Lane	07:00 – 23:00	1.5	34.8
	19:00 – 23:00	1.5	34.8
	23:00 – 07:00	4.0	38.9
NSR4 – Howns Farm	07:00 – 23:00	1.5	34.5
	19:00 – 23:00	1.5	34.5
	23:00 – 07:00	4.0	38.6
NSR5 – Tanfield Food Co. GF	07:00 – 19:00	1.5	45.7
NSR5 – Tanfield Food Co. 1F	07:00 – 19:00	4.0	49.9
NSR6 – Consett & Sunderland Railway Path	07:00 – 19:00	1.5	54.8
	19:00 – 23:00	1.5	54.8
NSR7 – Offices opposite. GF	07:00 – 19:00	1.5	45.7
NSR7 – Offices opposite. 1F	07:00 – 19:00	4.0	49.6

BS4142 Assessment

9.6.34 It is considered that any tonal content of the noise sources located within the building would be negated by the building structure and unlikely to be audible at the nearest noise-sensitive residential receptors. It is understood that the processes within the building do not contain any impulsive or intermittent features. Therefore, no acoustic feature corrections have been applied and the sound rating level would equal the specific sound level.

9.6.35 The stack outlet may have a tonal content that may be just audible at night. Therefore, a 2dB penalty has been added to the predicted night-time noise levels.

9.6.36 The results of the assessment undertaken in accordance with BS4142 are shown in Table 9-16. The background noise level and sound rating level have been rounded to the nearest whole decibel.

Table 9-16 BS4142 Assessment - Midweek

Receptor Location	Period (hrs)	Measured Background Noise Level dB L_{A90}	Predicted Sound Rating Level dB $L_{Ar,T}$	Difference
NSR1 – Berrys Edge	07:00 – 19:00	61	35	-26
	19:00 – 23:00	61	35	-26
	23:00 – 07:00	26	37	+11
NSR2 – The Chequers	07:00 – 19:00	42	42	0
	19:00 – 23:00	42	38	-4
	23:00 – 07:00	32	44	+12
NSR3 – Knitsley Lane	07:00 – 19:00	36	35	-1
	19:00 – 23:00	36	35	-1
	23:00 – 07:00	27	41	+14
NSR4 – Howns Farm	07:00 – 19:00	35	35	0
	19:00 – 23:00	35	35	0
	23:00 – 07:00	31	41	+10

9.6.1 Table 9-16 shows that the predicted daytime sound rating levels generated by the proposed development would be equal to or below the prevailing background noise level at the nearest residential receptors assessed. This would indicate that the specific sound level would have a low impact.

9.6.2 Table 9-16 also shows that the predicted sound rating levels at night would exceed the measured background noise levels by at least 10dB at all residential receptors assessed. This would indicate that the specific sound would have a significant adverse impact, depending on the context.

9.6.3 The context in this instance is that it is unlikely that residents would be using outdoor amenity spaces during the night. Therefore, an assessment of internal noise levels would be more appropriate. It should be noted that BS4142 is not suitable guidance for assessing internal noise levels from external sources, rather the guidance contained in BS8233 should be used.

BS8233 Assessment - Residential

9.6.4 An assessment of the predicted internal noise levels has been made against the guideline values for internal ambient noise levels for sleeping in bedrooms outlined in BS8233. Table 9-17 details the results of the assessment when considering a 15dB reduction for a partially open window as described by the guidance.

Table 9-17 BS8233 Assessment of Internal Noise Levels – Residential

Description	Predicted Internal Noise Level in Bedroom, dB L_{Aeq}	Guideline Value for Night-time Sleeping, dB $L_{Aeq,8hr}$	Difference
NSR1 – Berry Edge	22	30	-8
NSR2 – The Chequers	29		-1
NSR3 – Knitsley Lane	26		-4
NSR4 – Howns Farm	26		-4

9.6.5 Table 9-17 shows that predicted internal noise levels at night would meet the guideline value for sleeping in bedrooms at the nearest noise-sensitive receptors assessed.

BS8233 Assessment – Non-domestic Buildings

9.6.6 An assessment of the predicted internal noise levels has been made against the guideline values for typical noise levels in non-domestic buildings. For offices, the assessment has been made against the guideline design range for 'study and work requiring concentration' in an executive office.

9.6.7 It is assumed that the offices would only be occupied during the daytime and therefore the assessment has been made for the daytime 07:00 to 19:00 hours period only.

9.6.8 Table 9-18 details the results of the assessment when considering a 15dB reduction for a partially open window as described by the guidance.

Table 9-18 BS8233 Assessment of Internal Noise Levels

Description	Predicted External Noise Level dB $L_{Aeq,T}$	Reduction from a partially Open Window	Predicted Internal Noise Level dB $L_{Aeq,T}$	Design Range dB $L_{Aeq,T}$	Difference
NSR4 – Tanfield Food Co. GF Office	46	15	31	35 to 40	-4 to -9
NSR4 – Tanfield Food Co. 1F Office	50		35		0 to -5
NSR7 – Office opposite. GF Office	46		31		-4 to -9
NSR7 – Office opposite. 1f Office	50		35		0 to -5

9.6.9 Table 9-18 shows that predicted internal noise levels at nearby offices would meet the design range adopted for the assessment of internal noise levels in non-domestic buildings.

WHO Assessment – Consett & Sunderland Railway Path

9.6.10 Users of the Consett & Sunderland Railway would not remain close to the proposed development site for any significant period and therefore any disturbance to route users would not be considered significant or permanent.

9.6.11 An assessment of the predicted noise levels at the nearest point within the route has been made against the guideline value moderate annoyance in outdoor living areas outlined in the World Health Organisation's document Guidelines for Community Noise, i.e. 50dB $L_{Aeq,16hrs}$.

9.6.12 The length of the route which would experience noise levels of 50dB, or greater, is approximately 250m. It is assumed that an individual walking along the route, at a slow pace, would take approximately 5-minutes to traverse 250m.

9.6.13 The maximum predicted $L_{Aeq,1hr}$ noise level at the closest point to the proposed development would be 55dB. Using the following formula, the average noise level over the 5-minute traverse period would be 44dB.

$$L_{Aeq,1hr} = 10Log_{10}\left(\frac{1^{\frac{5}{1}}\times 5}{6}\right) \text{ dB}$$

9.6.14 Table 9-19 details the results of the assessment

Table 9-19 WHO Guidance Assessment

Description	Predicted External Noise Level dB $L_{Aeq,T}$	Moderate Annoyance Noise Level dB $L_{Aeq,16hr}$	Difference
NSR6 – Consett & Sunderland Railway Path	44	50	-6

9.6.15 Table 9-19 shows that predicted noise levels during the traverse period on the path would remain below the level which would cause moderate annoyance to walkers using the route.

Cumulative Impacts

9.6.16 A cumulative impact assessment has been made based of the potential change in ambient noise levels due to the introduction of the proposed development. The existing ambient noise levels measured include contributions from existing development in the area including existing operations in the area and transport infrastructure use.

9.6.17 The Institute of Environmental Management and Assessment (IEMA) effect descriptors shown in Table 9-20 have been used to determine the potential impact.

Table 9-20 IEMA Effect Descriptors

Very Substantial	Greater than a 10dB L_{Aeq} change in sound level perceived at a receptor of great sensitivity to noise
Substantial	Greater than a 5dB L_{Aeq} change in sound level at a noise-sensitive receptor, or a 5 to 9.9dB L_{Aeq} change in sound level at a receptor of great sensitivity
Moderate	A 3 to 4.9dB L_{Aeq} change in sound level at a sensitive or highly sensitive receptor, or a greater than 5dB L_{Aeq} change in sound level at a receptor of some sensitivity
Slight	A 3 to 4.9dB L_{Aeq} change in sound level at a receptor of some sensitivity
None/Not Significant	Less than a 2.9dB L_{Aeq} change in sound level and/or all receptors are of negligible sensitivity to noise or marginal to the zone of influence of the proposals

9.6.18 Table 9-21 summarises the cumulative impact at each receptor assessed for the daytime and night-time periods based on the above.

Table 9-21 Cumulative impact assessment

Location	Period	Ambient Noise Level		Predicted Change in Ambient Noise Level	Potential Impact
		Existing	Predicted Future		
NSR1 – Berry Edge	Day	76.1	76.1	0	None
	Night	64.5	64.5	0	None
NSR2 – The Chequers	Day	68.4	68.4	0	None
	Night	53.0	53.3	+0.3	Not Significant
NSR3 – Knitsley Lane	Day	50.4	50.5	+0.1	Not Significant
	Night	39.8	42.4	+2.6	Not Significant
NSR4 – Howns Farm	Day	50.7	50.8	+0.1	Not Significant
	Night	46.7	47.3	+0.6	Not Significant

9.6.19 Table 9-21 shows that the predicted change in ambient noise levels due to the introduction of the proposed development would have no significant impact on the prevailing ambient noise levels at all receptors assessed.

9.7 Design Response and Mitigation

Site Preparation & Construction Noise

9.7.1 The assessment has shown that the predicted construction noise levels would be well within the limits derived in accordance with BS5228-1 therefore, mitigation measures to control construction noise are considered unnecessary.

9.7.2 However, it is recommended that good practice methods are followed during construction operations. There are several safeguards which exist to minimise the effects of construction noise, including:

- The various EC Directives and UK Statutory Instruments that limit noise emissions from construction plant.
- The guidance outlined in BS5228-1:2009+A1:2014.
- The powers that exist for local planning authorities, under the relevant sections of the current version of the Control of Pollution Act, to control environmental noise and pollution on construction sites.

9.7.3 The following generic measures are given to illustrate the range of best practice techniques available. The adoption of Best Practicable Means, as defined in COPA, is usually the most effective means of controlling noise from construction sites. In addition, the following measures should be considered where appropriate:

- Phasing of construction works to maximise the benefit from other on-site structures.
- Any compressors, etc., used on site should be silenced or sound reduced models fitted within acoustic enclosures.
- All pneumatic tools should be fitted with silencers/mufflers.
- Delivery vehicles should be routed to minimise disturbance to nearby residents and deliveries should be programmed to arrive during the least sensitive times of the day.
- Delivery vehicles should be prohibited from waiting within the site with their engines running.
- Care should be taken when unloading vehicles to avoid creating unnecessary noise.
- All plant items should be properly maintained and operated according to the manufacturers' recommendations.
- Potential problems concerning construction noise can sometimes be avoided by taking a considerate and neighbourly approach to relations with nearby residents.
- Construction works should not be undertaken outside of the hours agreed with the Local Planning Authority.

Construction Vibration

9.7.4 The nearest vibration-sensitive residential receptor, to any area of the proposed development where perceptible levels of vibration may occur, is over 450m from the location where plant may give rise to vibration. At this distance vibration levels, due to piling

operations, are likely to be well below the level which might be just perceptible in residential environments.

9.7.5 It is considered that, due to the short-term nature of the piling operations and the relative low levels of vibration perceptible, further mitigation measures are unnecessary.

Operation

9.7.6 Although the noise assessment has shown that daytime external and night-time internal noise levels meet the relevant guidance, the BS4142 assessment has shown that predicted night-time noise levels may lead to adverse impacts due to noise emissions from the stack outlet.

9.7.7 The client has advised that additional attenuation can be achieved by installing single column silencer. The single column silencer would provide 18dB of noise reduction at the stack outlet effectively reducing the sound power level at the stack outlet to 90dB L_{WA}.

9.7.8 Table 9-22 details the results of the night-time BS4142 assessment with the above mitigation measures in place.

Table 9:22 Single Column Silencer Mitigated BS4142 Assessment

Receptor Location	Period (hrs)	Measured Background Noise Level dB L_{A90}	Predicted Sound Rating Level dB $L_{Ar,T}$	Difference
NSR1 – Berry Edge	23:00 – 07:00	26	22	-4
NSR2 – The Chequers		32	29	-3
NSR3 – Knitsley Lane		27	25	-2
NSR4 – Howns Farm		31	26	-5

9.7.9 The table also shows that the predicted mitigated sound rating levels at night would be below the measured background noise levels at all residential receptors assessed. This would indicate that the specific sound level would have a low impact depending on the context.

9.7.10 The context under the mitigation scenario remains the same as before mitigation, i.e. it is unlikely that residents would be using outdoor amenity spaces during the night. Therefore, an assessment of internal noise levels would be more appropriate. Under the mitigation scenario internal noise levels would reduce accordingly.

9.7.11 Table 9-23 details the cumulative impact assessment based on the application of the single column silencer mitigation suggested above.

Table 9-23 Mitigated Cumulative impact assessment

Location	Period	Ambient Noise Level		Predicted Change in Ambient Noise Level	Potential Impact
		Existing	Predicted Future		
NSR1 – Berry Edge	Day	76.1	76.1	0	None
	Night	64.5	64.5	0	None
NSR2 – The Chequers	Day	68.4	68.4	0	None
	Night	53.0	53.0	0	None
NSR3 – Knitsley Lane	Day	50.4	50.4	0	None
	Night	39.8	39.9	+0.1	Not Significant
NSR4 – Howns Farm	Day	50.7	50.7	0	None
	Night	46.7	46.7	0	None

9.7.12 Table 9-23 shows that the mitigated predicted change in ambient noise levels due to the introduction of the proposed development would have no significant impact on the prevailing ambient noise levels at all receptors assessed.

9.8 Residual Impact

9.8.1 Based on the findings of the noise and vibration assessment, no residual impacts are expected subject to the application of the suggested mitigation measures.

9.9 Conclusions

9.9.1 The assessment has considered the potential of the proposed development to give rise to noise impacts at the identified noise-sensitive receptors close to the application site.

9.9.2 Noise levels during construction operations would remain below the levels derived in accordance with the guidance contained in BS5228.

9.9.3 Vibration levels during construction operations would remain well below the level at which vibration might just be perceptible in residential environments.

9.9.4 The BS4142 assessment of operational noise levels, including site operations and vehicle movements, would remain below the prevailing background noise levels at all residential receptors assessed during the daytime. However, overnight, predicted noise levels would exceed the prevailing background noise levels, mitigation measures to reduce this exceedance to a minimum have been suggested.

9.9.5 The BS833 assessment of operational noise levels at nearby receptors has shown that:

- Predicted internal noise levels at nearby offices would fall within the design range adopted for the assessment of internal noise levels in non-domestic buildings prior to the application of the mitigation measures suggested.
- predicted internal noise levels at the nearby residential receptors would meet the guideline value for sleeping in bedrooms prior to the application of the mitigation measures suggested.

9.9.6 The cumulative impact assessment has shown that the proposed development would have no significant impact on the ambient noise levels at the receptors assessed.

9.9.7 Based on the results of the assessment and conclusions drawn, noise and/or vibration should not pose a material constraint for the proposed development.

9.9.8 Table 9-23 below contains a summary of the likely impacts of the proposed development.

Table 9-23 Likely Impacts

Phase	Nature of Effect	Significance of Impact	Magnitude of Impact	Duration	Mitigation	Residual	Level
Construction	Residential	Minor	Minor	Temporary	BAT	Minor	Local
Operation	Residential	None	None	Permanent	Silenced stacks	Neutral	Local