8.0 Noise and Vibration

INTRODUCTION

8.1 This chapter of the Environmental Statement (ES) considers the potential for the Proposed Development to impact upon the noise environment in the vicinity of the application site and the potential vibration impacts associated with the construction phase of the Proposed Development.

8.2 This chapter summarises the primary legislative and policy framework and describes the methodology followed for the assessment along with the assessment assumptions and limitations. The chapter identifies the potential impacts as a result of the Proposed Development described in **Chapter 4**, and details the design, mitigation and enhancement measures that have been identified and reports the assessment of the significant effects of the Proposed Development.

LEGISLATION, GUIDANCE AND PLANNING POLICY

Legislation

Control of Pollution Act 1974:

8.3 The Control of Pollution Act 1974 (COPA) Section 61, sets out procedures for contractors to obtain 'prior consent' for construction works within agreed noise limits.

8.4 Applications for prior consent are made to the local authority. These would contain a method statement of the proposed works and the steps that would be taken to minimise and mitigate noise to acceptable levels and time periods during the construction period.

8.5 Section 60 of COPA describes the process that local authorities may follow to impose controls over potentially noisy demolition and construction works.

Environmental Protection Act 1990:

8.6 Under Part III of the Environmental Protection Act 1990, local authorities have a duty to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. This includes noise arising from demolition and construction sites.

8.7 If the Environmental Health Officer (EHO) from the local authority is satisfied that the problem complained about amounts to a statutory nuisance and is prejudicial to health or a nuisance, then the authority must serve an abatement notice on the person responsible or in certain cases the owner or occupier of the property. The notice could require that the noise or nuisance must be stopped altogether or limited to certain times of the day.

8.8 In determining if a noise complaint amounts to a statutory nuisance, various guidance documents and existing case law can be taken into account. Subsection 80(7) of the Environmental Protection Act 1990 provides an acceptable defence against an abatement notice in respect of a statutory nuisance if it is proved that the 'best practicable means' were used to prevent, or to counteract the effects of, the nuisance.

National Planning Policy Context

National Planning Policy Framework

8.9 National Policy guidance with respect to noise is found in the National Planning Policy Framework (NPPF), published in July 2021. With regard to noise and planning, NPPF contains the following statement at paragraph 174:

> *"Planning policies and decisions should contribute to and enhance the natural and local environment by: …*
> *e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality".*

8.10 Paragraph 185 of the NPPF is also considered relevant and states that:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new 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 …"

8.11 Furthermore, paragraphs 187 and 188 state:

"Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

Noise Policy Statement for England

8.12 The Noise Policy Statement for England (NPSE), published in March 2010 by Defra, 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.

8.13 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.'*

8.14 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.

8.15 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:

'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.'

8.16 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.'

Guidance

Planning Practice Guidance

8.17 The Planning Practice Guidance (PPG) is to complement the NPPF and provides further advice with regard to the assessment of noise within the context of planning policy. The overall aim of this guidance, tying in the principles of the NPPF and NPSE as detailed above, is to,

'identify whether the overall effect of noise exposure is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation'.

British Standard (BS) 5228:

8.18 BS 5228-1:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites, Part 1: Noise' sets out a method for measuring and predicting noise from construction works including those relating to highway works. The method considers the noise emission level of the construction plant or activity, the distance between the source and receiver, and the effect of the intervening topography and structures.

8.19 BS 5228-2:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites, Part 2: Vibration' provides recommendations for the control of vibration from construction activity and open sites. The standard includes guidance on methods of measuring and predicting levels of vibration and assessing its effects on the environment.

World Health Organisation Guidelines for Community Noise (1999)

8.20 The WHO Guidelines for Community Noise (1999) and the WHO Environmental Noise Guidelines for the European Region (2018) associates scientific knowledge on the health effects of community noise and provide guidance to environmental health authorities and professionals trying to protect people from the harmful effects of noise in non-industrial environments. The main sources of community noise are identified as road, rail and air traffic, industries, construction and the neighbourhood.

8.21 The WHO Night Noise Guidelines for Europe (2009) were published for the development of future legislation and policy action in the area of assessment and control of night noise exposure. It also sets noise levels at which adverse health effects are observed.

BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

8.22 BS 4142 'Method for Rating Industrial Sound Affecting Mixed Residential and Industrial Areas' has been considered for matters related to noise emissions from fixed external plant associated with a development.

8.23 This standard can be used for assessing the effect of noise from mechanical services plant. The method compares the difference between the 'rating level' of the new sound source, with the 'background level' at the receptor position. This method is described in more detail in the Methodology section of this chapter.

The Design Manual for Roads Road Bridges (DMRB)

8.24 The DMRB is the standard method in the UK for assessing, reporting, and management of environmental effects from proposed road schemes. DMRB LA 111 'Noise and vibration'[1] (hereafter referred to as "DMRB LA111") sets out the requirements for noise and vibration assessments from road projects, applying a proportionate and consistent approach using best practice and ensuring compliance with relevant legislation.

8.25 DMRB LA111 presents assessment methodologies that apply to the potentially significant noise and vibration effects of proposed road schemes and these are described further in the following Sections.

The Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment

8.26 The IEMA Guidelines (2014) set out key principles and advice on how to effectively integrate noise impacts and effects into the consenting process of all types of development, from EIA to smaller scale projects.

AQTAG09 Guidance on the Effects of Industrial Noise on Wildlife

8.27 AQTAG09, Guidance on the Effects of Industrial Noise on Wildlife, was drafted to provide guidance to assist planning officers involved with applications for industrial installations with relevant noise limits and relate these to the requirements of The Conservation of Habitat and Species Regulations, 2017. It specifies noise from industry, measured at the habitat/nest site, is below the indicated levels in **Table 8-1** it is considered unlikely that it will have an adverse impact on designated species.

[1] DMRB LA 111: 'Noise and Vibration', Revision 2, Highways England, 2020.

Table 8-1: Specific Noise Levels at Habitat / Nest Site

Parameter	Noise Level (dB)
$L_{Aeq,1hr}$	55

Local Planning Policy

North Lincolnshire Local Plan 2003

8.28 The North Lincolnshire Local Plan was adopted in May 2003, and some of the policies have been saved. Following a review of the saved policies, the following are related to Noise:

"DS1 - General Requirements A high standard of design is expected in all developments in both built-up areas and the countryside and proposals for poorly designed development will be refused. All proposals will be considered against the criteria set out below:

…

Amenity iii) No unacceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or other nuisance, or through the effects of overlooking or overshadowing; and North Lincolnshire Local Plan - Adopted Plan May 2003 243 Development Standards iv) amenity open space in the area should be retained, wherever possible; and v) no pollution of water, air or land should result which poses a danger or creates detrimental environmental conditions.

DS11 - Polluting Activities Planning permission for development, including extensions to existing premises and changes of use, will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas."

Emerging North Lincolnshire Local Plan

8.29 On review of the emerging North Lincolnshire Local Plan preferred option February 2020, the following policies are related to the Proposed Development and noise:

"Policy CSC1p: Health and Wellbeing:

The Council will seek to improve health and wellbeing in North Lincolnshire. In order to achieve this the Council will:

…

7. Ensure development does not have an adverse impact on the environment or residential amenity through air, noise, vibration and water pollution;"

"Policy DM1p: General Requirements

All new development, including extensions and alterations to existing buildings must achieve high quality sustainable design that contributes positively to local character, landscape and townscape, and supports diversity, equality and access for all. Development proposals will be assessed against the following relevant design and amenity criteria:

…

Amenity Considerations: The amenities which occupiers of neighbouring properties may reasonably expect to enjoy must not be harmed by or as a result of the development (including extensions to existing premises and change of use). Proposals should demonstrate, where appropriate, how the following matters have been considered, in relation to both the construction and life of the development:

1. *Compatibility with neighbouring land uses;*
2. *Overlooking;*
3. *Overshadowing;*
4. *Loss of light;*
5. *Adequate storage, sorting and collection of household and commercial waste, including provision for increasing recyclable waste;*
6. *Creation of safe environments.*

Planning permission for development will only be permitted where it can be demonstrated that the levels of potentially polluting emissions, including effluent, leachates, smoke, fumes, gases, dust, steam, smell or noise do not pose a danger by way of toxic release; result in land contamination; pose a threat to current and future surface or underground water resources; or create adverse environmental conditions likely to affect nearby developments and adjacent areas.

"Policy DM3p: Environmental Protection

Development proposals as appropriate to their nature and scale, should demonstrate that environmental risks have been evaluated and appropriate measures have been taken to minimise the risks of adverse impacts to air, land and water quality, whilst assessing vibration, heat, energy, light and noise pollution.

…

Noise pollution 6: Development generating noise which is likely to create significant adverse impacts on health and quality of life and cannot be mitigated and controlled through the use of conditions will not be permitted. All proposals will be assessed as follows: a. Amenity - No unacceptable loss of amenity to neighbouring land uses should result in terms of noise, smell, fumes, dust or other nuisance".

METHODOLOGY USED FOR THE ASSESSMENT

Introduction

8.30 This section sets out the approach that has been taken for the assessment of potentially significant effects due to noise and vibration as a result of the Proposed Development.

8.31 Potential temporary changes to the existing noise and vibration environment could arise as a result of the construction phase of the Proposed Development. The activities that have the potential to change the existing noise and vibration environment include:

- construction traffic (HGV's) using the public highways;
- site preparation and scheme construction activities;

8.32 The potential effects of increases in noise, include annoyance and/or sleep disturbance, both of which impact upon quality of life. In addition, there is growing evidence that long-term exposure to road traffic noise may result in an increased risk of health effects such as cardiovascular disease. These potential effects could arise at Existing Sensitive Receptors (ESRs) in the vicinity of the application site., such as residential properties and other facilities sensitive to environmental noise.

8.33 Significant ground-borne vibration can affect quality of life and interfere with the working efficiency of building occupants. For very high levels of vibration there is the potential for structural damage to buildings and infrastructure.

Consultation

8.34 Formal consultation was undertaken with NLC following the submission of a combined EIA Screening and Scoping Request (May 2022). The scope and methodology of the EIA was set out in the LPA's formal Scoping Opinion dated 27th July 2022 (LPA Reference: PA/SCO/2022/7).

8.35 **Table 8-2** below sets out the key issues raised in the EIA Scoping Opinion (July 2022) in relation to noise and vibration.

. ***Table 8-2: Scoping Opinion Response – Noise and Vibration***

Topic	Comments raised to be addressed in ES

Noise & Vibration	• The LPA agree that noise should be scoped into the assessment.
	• The Council's Environmental Protection team have raised no concerns with the proposed approach to the assessment of noise and agree that this should include:
	  • Construction noise, including construction traffic;
	  • Construction vibration; and
	  • Cumulative effects.
	• The LPA request the construction assessment is conducted using Method 2 detailed in BS5228-1 2009 + A1 2014. Method 2 stated that noise levels generated by site activities are deemed to be potentially significant if the total noise (construction noise plus existing ambient noise levels) exceed the pre-construction ambient noise by 5dB or more.
	• Operational effects have been scoped out of this ES Chapter as operational effects are considered imperceptible given the works being proposed.

Study Area

8.36 In terms of construction noise, the extent of the assessment is limited to areas where the calculated total noise (construction noise plus pre-construction ambient noise) could exceed the pre-construction ambient noise level by 5 dB or more subject to threshold values for daytime, evenings and weekends, and night periods. This is largely restricted to the Proposed Development envelope, although could extend along elements of the existing road network, depending on haul routes and the quantity of construction-related traffic.

8.37 In terms of construction vibration, the extent of the assessment is limited to areas where vibration from key construction activities could be perceptible.

Baseline conditions

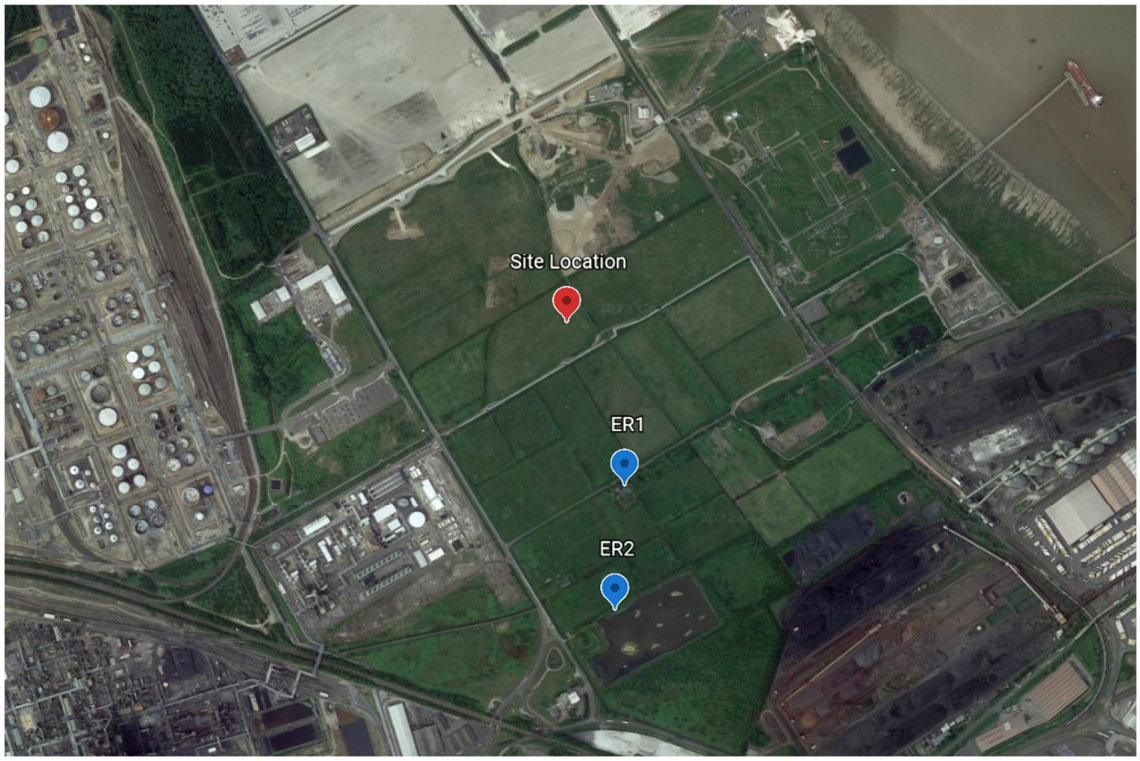
8.38 Noise monitoring was undertaken in 2016 by SLR for a previous planning application that was subsequently withdrawn (planning reference: PA/2017/2141). As there has been no significant development in the area near to the receptors since this time, the data has therefore been used within this assessment and is still considered to be representative of existing noise levels in the surrounding area. Monitoring was carried out by deploying two unattended noise monitors between 15th and 22nd July 2016, and was undertaken in two locations:

- ER1: Hazel Dene; and
- ER2: Rosper Road Pools Nature Reserve.

8.39 As stated in the SLR report (2016), the microphones were placed at 1.5m above the ground in free field conditions and weather conditions during the survey were considered acceptable, with conditions predominately dry with low wind levels.

8.40 Residential buildings located to the north east of the site are in the ownership of the applicant, are currently unoccupied and are programmed to be demolished. Consequently, they are not considered within this assessment and baseline monitoring is not required to assess those receptors. **Figure 8-1** below identifies the noise monitoring locations.

Figure 8-1: Noise Monitoring Locations – 2016



8.41 At both measurement locations the following noise level indices were recorded:

- $L_{Aeq,T}$ – The A-weighted equivalent continuous noise level over the measurement period.
- L_{A90} – The A-weighted noise level exceeded for 90% of the measurement period.
- L_{A10} – The A-weighted noise level exceeded for 10% of the measurement period.
- L_{Amax} – The maximum A-weighted noise level during the measurement period.

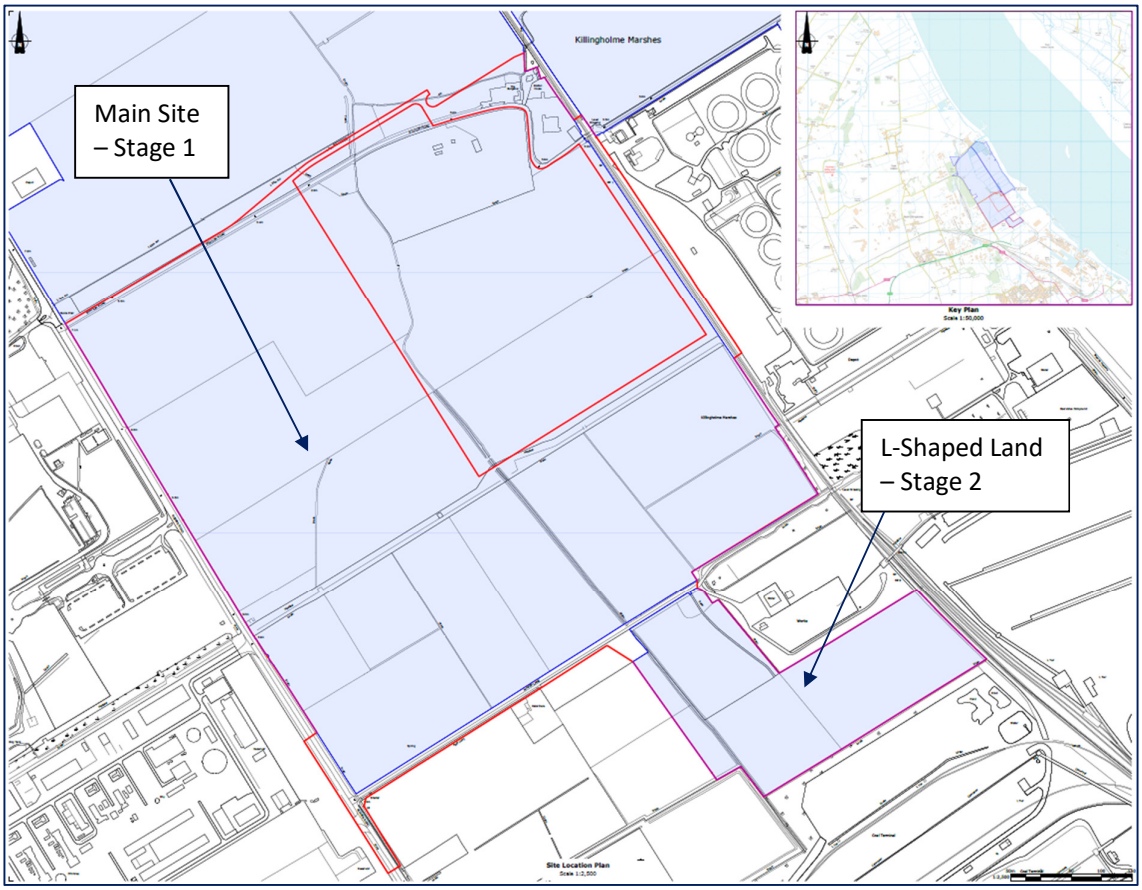
Phasing Plan

8.42 To determine the construction noise environment at the application site a CadnaA noise model of the area has been developed using the methodology set out in BS5228-1:2009+A1:2014.

8.43 The assessment has been based on a generic outline construction methodology and programme.

8.44 It is understood that the enabling works will take place on the main site (Stage 1) first, with HGV's entering site on Station Road to the north and exiting site on Marsh Lane, to the west of the Hazel Dene residential property, after the overground pipes have been bridged (also referred to as Stage 1b). Once road construction works have been undertaken to Marsh Lane, enabling works will commence on the L-shaped parcel land (Stage 2) to the south of Marsh Lane and Station Road. During this stage of works, all HGV's will utilise Marsh Lane to access the L-shaped parcel of land. The two stages are shown in **Figure 8-2** below.

Figure 8-2: Plan showing Stages of Development



8.45 For the purpose of predicting the likely noise impact of construction works, operations have been divided into the following periods:

- **Demolition of the existing buildings (Main Site – Stage 1)**: The existing buildings to the north corner of the site are to be demolished.
- **Earthworks and Ground Reprofiling Works (Main Site – Stage 1 & L-Shaped Parcel – Stage 2):** The general principle of the Proposed Development is to raise the site to a minimum level of 3.1m which is the minimum level required to the new drainage ditch banks. In general, the typical site level will be 3.1-6.0m AOD. As existing ground levels are in the range 2.1-2.6m AOD, east and 2.4–6.4m AOD to the west, there is a requirement to import approximately 700,000 m3 of general fill and 350,000 m3 of stone pavement material. The application site shall be stripped to remove vegetation where necessary and then be brought to the required formation level by the imported fill. Up to 300 HGV deliveries will be made

each day. All HGVs will leave the site from Station Road or Marsh Lane turning left on to Rosper Road. Although it is expected that HGVs will enter the site mainly from Station Road, it has been assumed within this assessment (through discussions with the Transport Consultant) HGVs will also enter and leave the site from Marsh Lane, turning left onto Rosper Road. As per the transport assessment, no HGV's during this phase will directly pass Hazel Dene residential property via Marsh Lane.

- **Drainage and North East Lindsey Drainage Board (NELDB) Ditch Works (Main Site – Stage 1 & L-Shaped Parcel – Stage 2):** It is proposed that perforated drainage pipe will be laid in trench surrounded by filter material on a 1:500 fall to ditches. Manholes shall be pre-cast concrete or brick and comprise 150mm concrete (20N/mm^2) base, 225mm sides in Class B engineering bricks in cement mortar (1:3) flush pointed internally, 150mm precast concrete cover slab and fine concrete benching to channels. Ditches shall be constructed in accordance with the approved NELDB surface water drainage strategy. Generally, the new ditches will be formed to a trapezoidal cross section with bank levels set at 3.1m AOD and side slopes at a 2:1 gradient.
- **Footpaths and New Road Construction and Improved Road Construction (Main Site – Stage 1)**: Improvements to the junction of Marsh Lane and Rosper Road are proposed along with the construction of the new road to the north of the Proposed Development, and will be in accordance with adoptable highway standards. Additionally, the widening of Marsh Lane involves the construction of a footpath.
- **Construction of Rail Sidings (Main Site – Stage 1)**: New rail sidings are to be constructed to the north of the Proposed Development and will connect to the current rail lines located there.
- **Construction of Bridges of Existing Pipelines (Main Site – Stage 1):** Bridges will be constructed over the existing pipeline located across the site.
- **Construction of Substation (Main Site – Stage 1):** A substation is to be constructed to the west of the site.

8.46 During the Stage 1 works, it is expected that construction activity that will occur on site, will predominately be more than 50m away from the Hazel Dene receptor. For short periods of time throughout all assessed phases, construction works will occur closer than 50m to the Hazel Dene receptor. However, as most construction works will occur at much greater distances than 50m, to provide a representative and robust assessment, sources have been located 50m from the centre of the road.

Impact Assessment Methodology

Construction Phase (Temporary)

8.47 In terms of construction noise, the extent of the assessment is limited to areas where the calculated total noise (construction noise plus pre-construction ambient noise) could exceed the pre-construction ambient noise level by 5 dB or more subject to threshold values for daytime, evenings and weekends, and night periods. This is largely restricted to the Proposed Development envelope, although could extend along elements of the existing road network, depending on haul routes and the quantity of construction-related traffic. The assessment of construction vibration assessment has focused on sensitive receptors that are closest to the construction works. These study areas include receptors at which there is the greatest potential for significant adverse effects due to construction noise and/ or vibration.

8.48 The level of noise and vibration due to construction has been estimated at sensitive receptors, by applying the following methods.

8.49 Prediction method: construction noise:

- The level of noise from each phase of the construction activity has been predicted by modelling proposed plant and traffic in accordance with BS 5228-1, using CadnaA modelling software;
- The construction noise level predictions account for the type and sound output of each plant item, the number of plant items and are assumed to be operating simultaneously.

8.50 Prediction method: construction vibration:

- Construction vibration has been predicted only for piling as this is typical the main source of vibration.

Operational Phase (Permanent)

8.51 Operational effects have been scoped out of this assessment as they are considered imperceptible given the works being proposed.

Sensitivity of Receptor

8.52 Key receptors to noise generally include individual or groups of residential properties, hospitals and schools. **Table 8-3** provides examples of the different sensitivities for different receptors which are applicable to this assessment.

8.53 The sensitivity of receptors is also assessed on existing tranquillity levels that are based on the mapping data published by Campaign to Protect Rural England (CPRE). This uses a colour coded system and a 500m assessment grid for the whole of England, and a tranquillity rating of between 1 and 10 is assigned (1 being least tranquil and 10 being most).

Table 8-3: Criteria for Assessing Sensitivity of Receptors to Noise and Vibration

Sensitivity	Example of Receptor
High	Residential Properties (permanent tenants), schools and hospitals CPRE rated tranquillity (Zone 8-10)
Medium	Transient residential receptors such as users of hotels* CPRE rated tranquillity (Zone 4-7)
Low	Commercial Premises CPRE rated Tranquillity (Zone 1-3)

*Financially involved properties are considered as medium sensitivity receptors.

8.54 For the purposes of this assessment, all receptors are considered to be of 'high' sensitivity.

Magnitude of Impact

8.55 Guidance with regard to assessing the magnitude of noise impact is presented within the Guidelines for Environmental Noise Impact Assessment, published by IEMA in 2014. The guidance indicates broad parameters with respect to categorising the significance of the basic

noise change. For the purposes of this assessment, the categories outlined in **Table 8-4** below form a basis to assess the adverse impact magnitude.

Table 8-4: Criteria for Assessing the Magnitude of Noise Impact

Magnitude of Impact	Assessed Effect Level
High	Unacceptable Observed Adverse Effect Level
Medium	Significant Observed Adverse Effect Level
Low	Lowest Observed Adverse Effect Level
Negligible	No Observed Adverse Effect Level

8.56 The magnitude of the construction noise is determined by comparing the predicted levels at the sensitive receptors against the criteria to determine the adverse magnitude of impact for daytime noise levels associated with construction are derived from BS 5228:2009+A1: 2014 and are presented in **Table 8-5**.

Table 8-5: Magnitude of Impact - Construction Phase Noise

Magnitude of Impact	Criteria
High	Total noise levels exceed 75dB
Medium	Total noise levels exceed existing ambient noise levels by 5dB or more, subject to a lower cut off value of 65dB
Low	Total noise levels are between 0-4.9dB above existing ambient noise level, or below a level of 65dB
Negligible	Total noise levels fall below existing ambient noise levels, and below a level of 65dB

8.57 The magnitude of the construction traffic noise is determined by comparing the predicted levels at the sensitive receptors against the criteria to determine the magnitude of impact for daytime noise from in DMRB LA111 and are presented in **Table 8-6.**

Table 8-6: Magnitude of Impact – Construction Traffic Noise

Magnitude of Impact	Criteria
High	Greater than or equal to 5.0dB increase in baseline noise levels
Medium	Greater than or equal to 3.0dB and less than 5.0dB in baseline noise levels
Low	Greater than or equal to 1.0dB and less than 3.0dB in baseline noise levels
Negligible	Less than 1.0dB increase in baseline noise levels.

8.58 The magnitude of the construction vibration is determined by comparing the predicted levels at the sensitive receptors against the criteria to determine the magnitude of impact for vibration levels associated with construction are derived from BS 5228-2:2009 and are presented in **Table 8-7**.

Table 8-7: Magnitude of Impact - Construction Phase Vibration (Human Response)

Magnitude of Impact	Criteria
	Human Response
High	Vibration levels exceed 10 mm/s *Vibration is likely to be intolerable for any more than a brief exposure to this level*
Medium	Vibration levels exceed 1.0 mm/s *It is likely that vibration of this level in residential environments will cause complaint but it can be tolerated if prior warning and explanation has been given to residents.*
Low	Vibration levels exceed 0.3 mm/s *Vibration might be just perceptible in residential environments*
Negligible	Vibration levels exceed 0.14 mm/s *Vibration might be just perceptible in most sensitive situations for most vibration frequencies associated with construction. At lower frequencies people are less sensitive to vibration*

8.59 In terms of cosmetic damage, BS5228-2:2009 outlines that building damage is likely to occur in unreinforced or light framed structures (such as residential or light commercial buildings) at levels of 15mm/s at 4Hz, increasing to 20mm/s at 15 Hz and 20mm/s at 15Hz, increasing to 50mm/s at 40 Hz and above.

8.60 Therefore, taking the lowest value at 4Hz, a significant effect (i.e a medium magnitude of impact) will likely occur at vibration levels of 15mm/s and above and this criterion has been adopted as the basis of this assessment.

Significance of Effect

8.61 The overall significance of effects, detailed in **Table 8-8**, was determined taking into account sensitivity and magnitude, as set out above.

Table 8-8: EIA Matrix - Assigning significance of Effect

Sensitivity	Magnitude of Impact			
	High	**Medium**	**Low**	**Negligible**
High	**Substantial**	**Moderate/ Substantial**	Slight/ Moderate	Slight
Medium	**Moderate/ Substantial**	**Moderate**	Slight	Negligible/ Slight
Low	**Moderate**	Slight/ Moderate	Negligible/ Slight	Negligible

8.62 For the purpose of this assessment, the threshold between a significant effect and a not significant effect is defined as follows:

- A construction effect identified as being of **Moderate** or above as shown in bold in the table above are considered to be significant. Effects classified as **Slight/Moderate** and below are considered to be not significant.

Limitations to Assessment

Construction noise and vibration

8.63 Outline information regarding construction programme, schedule, construction compounds and works phasing have been made available at this stage by the design team.

8.64 It is anticipated that the construction works will take place during the standard working hours only as specified within the embedded mitigation section below.

8.65 Should any works be required outside of these standard working hours, these will need to be considered in further detail as construction methods are refined and proposals for night-time work discussed and agreed with the environmental health department at the local authority.

8.66 The construction plant noise assumptions have been derived from plant information provided by the client and with professional judgement.

8.67 For the purposes of the initial assessment of construction noise, it is assumed that the permanent noise barriers will not be constructed prior to main construction phases.

Construction traffic

8.68 It is assumed that most construction traffic movements on the local road network will be to and from the Proposed Development compound via the existing trunk road network. It is expected that the majority of heavy goods vehicle traffic movements, which is expected to be up to 300 deliveries per day, will initially enter the site on Station Road turning right from Rosper Road and leaving site from Marsh Lane, turning left onto Rosper Road. A temporary haul route will form part of this application to enable HGVs to exit onto Marsh Lane to the west of Hazel Dene before continuing to Rosper Road. This is referred to as Stage 1 works, as discussed in Chapter 6 of the ES (Construction).

8.69 Following improvement works to Marsh Lane to accommodate two-way traffic, up to 300 daily heavy good vehicles, will enter the L-Shaped parcel of land (located south of Marsh Lane/Station Road) from Marsh Lane turning right from Rosper Road and leave site turning left onto Rosper Road from Marsh Lane. This is referred to as Stage 2 works. HGV's will also be able to enter Stage 1 works following the improvement works to Marsh Lane, however the entrance to this site will be prior to the Hazel Dene Receptor.

8.70 There is the potential for material to be imported partly or wholly by rail, however this assessment has been undertaken on the basis that all imports are through HGVs to assess the worst-case scenario.

Modelling

Table 8-9: Modelling Assumptions

Model element	Assumption and limitations
Road alignments	1) The road alignments have been modelled based on scheme drawings provided by the Client and supplemented using OS data.
Study area and model extent	1) In terms of construction noise, the extent of the assessment is limited to areas where the calculated total noise (construction noise plus pre-construction ambient noise) could exceed the pre-construction ambient noise level by 5 dB or more subject to threshold values for daytime, evenings and weekends, and night periods. This is largely restricted to the proposed scheme envelope, although could extend along elements of the existing road network, depending on haul routes and the quantity of construction-related traffic.
Road surfaces	1) All roads have been assumed a surface correction of -1dB with reference to Section A2, point 6.C of LA111.
Topography	1) The topography has been modelled based on 10 metre resolution Digital Terrain Model (DTM) for the wider study area. 2) The topography contours modelled for the Proposed Development were produced based on 3D drawings provided by the engineering team.
Ground cover	1) Intervening ground between any road and a receiver has been modelled as mixed ground (50% hard ground) in built-up areas. 2) Roads have been included as acoustically hard (i.e., reflective).

BASELINE CONDITIONS

8.71 The results of the noise monitoring undertaken in 2016 by SLR are summarised in the tables below.

Table 8-10: ER1 (Hazel Dene) Summary of Measured Noise Levels, free-field, dB - 2016

Date	Period	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
Friday 15th July 2016	Daytime 07:00 – 23:00	55.1	51.4	55.8	76.1
	Night-time 23:00 – 07:00	54.2	51.8	55.1	76.4
Saturday 16th July 2016	Daytime 07:00 – 23:00	54.8	51.5	55.7	77.0
	Night-time 23:00 – 07:00	53.4	51.1	54.2	76.1
Sunday 17th July 2016	Daytime 07:00 – 23:00	56.5	50.0	54.5	83.4
	Night-time 23:00 – 07:00	54.3	51.3	54.8	75.6
Monday 18th July 2016	Daytime 07:00 – 23:00	56.4	45.6	54.6	83.7
	Night-time 23:00 – 07:00	58.6	50.8	60.0	89.2
Tuesday 19th July 2016	Daytime 07:00 – 23:00	51.9	44.6	49.6	82.5
	Night-time 23:00 – 07:00	47.3	41.6	46.8	72.4
Wednesday 20th July 2016	Daytime 07:00 – 23:00	53.0	47.2	53.8	80.3
	Night-time 23:00 – 07:00	52.3	49.6	52.9	72.4
Thursday 21st July 2016	Daytime 07:00 – 23:00	54.5	43.9	52.2	85.2.
	Night-time 23:00 – 07:00	51.8	46.8	52.4	79.8
Friday 22nd July 2016	Daytime 07:00 – 23:00	50.8	43.7	50.1	77.0
	Night-time 23:00 – 07:00	-	-	-	-
Overall	**Daytime 07:00 – 23:00**	**54.7**	**45.1**	**54.2**	**85.2**
	Night-time 23:00 – 07:00	**54.2**	**44.6**	**54.2**	**89.2**

Table 8-11: ER2 (Rosper Road Pools) Summary of Measured Noise Levels, free-field, dB - 2016

Date	Period	$L_{Aeq,T}$	L_{A90}	L_{A10}	L_{Amax}
Friday 15th July 2016	Daytime 07:00 – 23:00	57.5	51.9	59.0	75.3
	Night-time 23:00 – 07:00	55.3	52.3	56.0	82.6
Saturday 16th July 2016	Daytime 07:00 – 23:00	55.7	51.8	57.6	75.7
	Night-time 23:00 – 07:00	54.5	51.6	55.7	75.0
Sunday 17th July 2016	Daytime 07:00 – 23:00	54.5	50.9	55.9	73.7
	Night-time 23:00 – 07:00	56.6	52.0	57.3	74.3
Monday 18th July 2016	Daytime 07:00 – 23:00	55.7	48.6	56.8	83.4
	Night-time 23:00 – 07:00	57.0	53.1	58.1	78.5
Tuesday 19th July 2016	Daytime 07:00 – 23:00	52.8	48.0	53.8	71.7
	Night-time 23:00 – 07:00	50.9	46.2	51.4	73.1
Wednesday 20th July 2016	Daytime 07:00 – 23:00	55.4	49.8	56.5	83.4
	Night-time 23:00 – 07:00	54.2	50.3	54.7	74.0
Thursday 21st July 2016	Daytime 07:00 – 23:00	55.1	46.8	55.6	86.0
	Night-time 23:00 – 07:00	53.6	47.7	54.7	69.0
Friday 22nd July 2016	Daytime 07:00 – 23:00	53.4	48.9	54.6	78.2
	Night-time 23:00 – 07:00	-	-	-	-
Overall	**Daytime 07:00 – 23:00**	**55.2**	**48.6**	**56.1**	**86.0**
	Night-time 23:00 – 07:00	**55.0**	**48.1**	**55.7**	**82.6**

8.72 The noise climate at each location as described in SLR 2016 noise assessment is summarised below:

- ER1 Hazel Dene: The noise climate at Hazel Dene during the attended part of the survey consisted of road traffic on Marsh Lane, distant road traffic noise, distant industrial noise, and construction noise from the A160/A180 improvement scheme.

- ER2 Rosper Road Pools Nature Reserve: The noise climate at Rosper Road Pools during the attended part of the survey consisted of distant road traffic noise, and construction noise from the A160/A180 improvement scheme.

ASSESSMENT OF LIKLEY EFFECTS

Embedded Mitigation

8.73 The following mitigation measures have been included within our assessment and form part of the embedded mitigation as they are not as a result of the assessment outcomes. The following measures are aligned with those set out in Condition 19 of the recent planning consent: PA/2021/1525, for the construction of a monopile manufacturing facility which is located in close proximity, and are expected to be acceptable as part of the Proposed Development.

"Construction, demolition, and site clearance operations shall be limited to the following days and hours:

Between 1st October each year and 31st March the following year

- *08:00 to 18:00hrs Monday to Friday.*
- *08:00 to 13:00hrs Saturday.*

Between 1st April each year and 30th September the following year

- *07:00 to 19:00hrs Monday to Friday.*
- *07:00 to 15:00hrs Saturday.*

No construction, demolition or site clearance operations on Sundays or public holidays.

HGV movements shall not be permitted outside these hours during the construction phase without prior written approval from the Local Planning Authority.

Installation of equipment on site shall not be permitted outside these hours without prior written approval from the Local Planning Authority."

Construction Phase - Noise

Phasing Plan

8.74 As detailed earlier within this chapter, these are the following construction phases proposed as part of the Proposed Development:

- Demolition of the existing buildings;
- Earthworks and Ground Reprofiling Works;
- Drainage and North East Lindsey Drainage Board (NELDB) Ditch Works Site;
- Footpaths and New Road Construction and Improved Road Construction;
- Construction of Rail Sidings;
- Construction of Bridges of Existing Pipelines; and
- Construction of Substation

8.75 As part of this chapter the following phases have been included within the modelling and assessment:

- Earthworks and Ground Reprofiling Works (Stage 1 and Stage 2)
- Drainage and North East Lindsey Drainage Board (NELDB) Ditch Works Site (Stage 1 and Stage 2)
- Footpaths and New Road Construction and Improved Road Construction (Stage 1)

8.76 Only these three phases have been assessed as they are considered to be the most intense construction phases in terms of machinery and plant being used and will last the longest duration. Additionally, these three phases are where construction plant and construction traffic are likely to be located closest to the assessed receptors. The other construction phases will occur at a greater distance from the assessed receptors, and as similar construction plant and vehicle movements are likely to occur for the unassessed phases, the three assessed phases are considered representative of the worst-case assumptions.

Plant and Vehicle Movements Model inputs

8.77 The plant and anticipated vehicle movements that are expected to occur during each of the assessed three construction phases are listed in **Table 8-12** below. The sound pressure level for each item has been obtained from Annex C of BS5228-1:2009+A1:2014.

8.78 For sources modelled as a point source, it is assumed that this item is operating at full capacity within any hourly period, with the exception of 'Driven cast in situ segmental piling', which is assumed to be operating 50% of the time. For mobile sources (which have been modelled as a line source) the assumptions for number of movements within an hourly period and expected operating time is detailed in the table below. The assumptions used within the assessment are considered worst-case and robust.

Table 8-12: Plant and Vehicular Movement during each construction phase

Construction Phase	Item of equipment	Assumed Hourly Movements	Octave band sound pressure levels at 10m, Hz								A-weighted sound pressure level L_{Aeq} dB at 10m
			63	125	250	500	1k	2k	4k	8k	
Earthworks & Ground Reprofiling	Dozers	-	75	79	77	77	74	71	65	57	80
	Dumpers	10	82	76	75	74	68	68	64	55	76
	Wheel Washing Plant	-	78	73	74	80	70	68	60	56	78
	Road Sweeper	2	80	75	69	75	71	67	61	58	76
	Dust Suppression tractor	2	78	73	74	80	70	68	60	56	78
	Diesel Generator	-	80	74	57	54	53	48	45	37	61
	Vibratory Roller	-	82	78	67	71	67	64	60	57	73
	Articulated dump truck dumping fill	-	80	76	73	70	69	66	63	58	74
	HGV Movements	35	-	-	-	-	-	-	-	-	77
Drainage & NELDB Ditches	Tracked/Wheeled 360-degree excavator	-	77	86	75	75	71	69	64	55	77
	Water Pump	-	73	68	62	62	61	56	53	41	65
	Wheel washing plant	-	78	73	74	80	70	68	60	56	78
	Road Sweeper	2	80	75	69	75	71	67	61	58	76
	Diesel Generator	-	80	74	57	54	53	48	45	37	61
	HGV movements	35	-	-	-	-	-	-	-	-	77

Construction Phase	Item of equipment	Assumed Hourly Movements	Octave band sound pressure levels at 10m, Hz								A-weighted sound pressure level L_{Aeq} dB at 10m
			63	125	250	500	1k	2k	4k	8k	
Road Construction	Tracked/Wheeled 360-degree excavator	-	77	86	75	75	71	69	64	55	77
	Dumper	10	82	76	75	74	68	68	64	55	76
	Concrete Pump & Cement Mixer	-	79	80	73	72	69	68	59	53	75
	Wheel Washing Plant	-	78	73	74	80	70	68	60	56	78
	Diesel Generator	-	80	74	57	54	53	48	45	37	61
	Asphalt Paver	-	78	77	72	72	71	69	62	56	75
	Driven cast in situ segmental piling	-	-	-	-	-	-	-	-	-	80
	Road Sweeper	2	80	75	69	75	71	67	61	58	76
	Road Roller	10	87	85	75	73	75	73	69	63	80
	HGV Movements	35	-	-	-	-	-	-	-	-	77

Assessed Receptors

8.79 The receptors considered as part of this assessment comprise:

- ER1 – Hazel Dene: for the assessment the Hazel Dene evaluation point is located on the northern façade of the property;
- ER2 – Rosper Road Pools Nature Reserve: for the assessment the Rosper Road Pools Nature Reserve evaluation point is located at the water's edges on the northern boundary of the Nature Reserve.

Distance of plant to receptors assessment assumptions

8.80 During the Stage 1 works, for all three phases assessed, it is expected that construction activity that will occur on site, will predominately be more than 50m away from the Hazel Dene receptor. It is noted that during short periods of time throughout all three phases, construction works will occur closer than 50m to the Hazel Dene receptor. However, as stated, as most of the time throughout these construction works on the Proposed Development., works will occur

at much greater distances than 50m, to provide a representative and robust assessment, sources have been located 50m from the centre of the road.

8.81 Additionally, the assessment assumes all items of plant are operating simultaneously, in a similar location with respect to the closest sensitive receptor. However, in reality each construction activity will more likely to be operational at separate times and different locations through an entire daytime period, as such the assumption made in this assessment are considered worst-case and robust.

Construction Noise Assessment – Plant and Machinery

8.82 The calculated construction noise levels at both receptors are shown in **Table 8-13** below for the three construction phases that have been assessed.

8.83 As requested by North Lincolnshire Council, the impact magnitude has been determined using method 2 of British Standards 5228-1 2009 +A1 2014. Method 2 states that noise levels generated by site activities are deemed to be potentially significant if the total noise (construction noise plus existing ambient noise levels) exceed the pre-construction ambient noise by 5dB or more.

Table 8-13: On-site Plant and Vehicular Movement during each construction phase

Construction Phase	Receptor	Existing Ambient Noise Levels dB L_{Aeq}	Calculated Site Levels dB L_{Aeq}	Total Noise (Existing Site Levels + Construction Site Levels) dB L_{Aeq}	Difference between Existing Ambient and Total Noise	Receptor Sensitivity	Impact Magnitude	Significant of Effect
Main Site (Stage 1)								
Earthworks & Ground Reprofiling *(Drawing 8.1)*	ER1	54.7	65.8	66.1	11.4	High	Medium	Moderate/ Substantial
	ER2	55.2	60	61.2	6	High	Low	Slight/Moderate
Drainage & NELDB Ditches *(Drawing 8.2)*	ER1	54.7	62.4	63.1	8.4	High	Low	Slight/Moderate
	ER2	55.2	59.8	61.1	5.9	High	Low	Slight/Moderate
Road Construction and Footpath *(Drawing 8.3)*	ER1	54.7	67	67.2	12.5	High	Medium	Moderate/ Substantial
	ER2	55.2	61.1	62.1	6.9	High	Low	Slight/Moderate
L Shaped Land (Stage 2)								
	ER1	54.7	72.8	72.9	18.2	High	Medium	Moderate/ Substantial

Construction Phase	Receptor	Existing Ambient Noise Levels dB L_{Aeq}	Calculated Site Levels dB L_{Aeq}	Total Noise (Existing Site Levels + Construction Site Levels) dB L_{Aeq}	Difference between Existing Ambient and Total Noise	Receptor Sensitivity	Impact Magnitude	Significant of Effect
Earthworks & Ground Reprofiling *(Drawing 8.4)*	ER2	55.2	60	61.2	6	High	Low	Slight/Moderate
Drainage & NELDB Ditches *(Drawing 8.5)*	ER1	54.7	72.7	72.8	18.1	High	Medium	Moderate/ Substantial
	ER2	55.2	60	61.2	6	High	Low	Slight/Moderate

8.84 With reference to the table above, it is expected at ER1 during the majority of construction phases, there will be a **Medium** magnitude of impact which is considered to represent a **Moderate/Substantial** effect. Therefore, the predicted effect from on-site construction plant and vehicular movements is **Significant**. However, the predicted impacts from construction works would be temporary rather than permanent.

8.85 At ER2 it is expected that during all phases the magnitude of impact will be **Low** which is considered to represent a **Slight/Moderate** effect. Therefore, the predicted effect from on-site construction plant and vehicular movements is **Not Significant**.

8.86 Additionally, DMRB LA 111 advises that a significant effect would occur when a moderate or major impact is expected for 10 or more days or nights in any 15 consecutive days or nights; or for a total number of days exceeding 40 in any six consecutive months. Therefore, further mitigation may be required for construction works occurring in close proximity to the assessed receptors, should the guideline values be exceeded for prolonged periods.

8.87 At this stage, in the absence of finalised phasing plans from the contractor, the duration of any works in close proximity to the receptor locations is unknown.

8.88 The accompanying noise contours in which shows the predicted noise levels across the site, associated with each phase of construction are detailed in Volume 3 of this ES Chapter. The Table above details which drawing is associated with each phase of construction that has been modelled.

8.89 Traffic movements during the construction phase of the Proposed Development have been provided by Sanderson Associates Consulting Engineers in AAWT format (Appendix 8.2 as found in **Volume 2** of this ES). The results of the 'do minimum' and 'do something' scenarios are shown in **Table 8-14** below.

8.90 The traffic data has been calculated from a supporting Transport Technical Note for planning application PA/2021/1525, however the data from this only shows traffic associated with shift patterns. As such to fill in the hours not shown in this application, and to account for deliveries associated with the AMEP DCO, Sanderson Associates have used the Transport Assessment submitted for the original AMEP DCO application dated 7th September 2011. The traffic data has been split into two stages for the enabling works, Stage 1 consists of the main site and Stage 2 consists of the L-Shaped land to the south of Roper Road, which will be undertaken following Stage 1 and improvements to Marsh Lane. Based on this the traffic data predicted for this proposal is detailed below.

Table 8-14: AAWT Traffic Summary

Link	Do Minimum		Do Something		Percentage Change in Traffic %
	AAWT	HGV%	AAWT	HGV%	
Main Site (Stage 1)					
A160 East	10746	21	11378	25	5.9%
A160 West	15422	24	16054	27	4.1%
Eastfield Road North	4252	26	4252	26	0.0%
Eastfield Road South	1317	48	1317	48	0.0%
Rosper Road (N)	4801	10	4801	14	0.0%
Rosper Road (S)	11488	12	12120	16	5.5%
Marsh Lane (West of Hazel Dene)	213	3	529	58	148.4%
L Shaped Land (Stage 2)					
A160 East	10746	21	11378	25	5.9%
A160 West	15422	24	16054	27	4.1%
Eastfield Road North	4252	26	4252	26	0.0%

Link	Do Minimum		Do Something		Percentage Change in Traffic %
	AAWT	HGV%	AAWT	HGV%	
Eastfield Road South	1317	48	1317	48	0.0%
Rosper Road (N)	4801	10	4801	10	0.0%
Rosper Road (S)	11488	12	12120	16	5.5%
Marsh Lane	213	3	845	72	296.7%

8.91 Typically, a 25% increase in road traffic volumes would result in a 1 dB(A) change in noise level which is considered to be a negligible impact; the table above shows that traffic flows on local roads, for both Stage 1 and Stage 2, with the exception of Marsh Lane, are to increase by no more than 5.9% during the Proposed Development with percentage of HGVs to only increase by a maximum of 4% on any given link.

8.92 A noise level change of less than 1 dB(A) is predicted on all surrounding roads of the Proposed Development with the exception of Marsh Lane. Therefore, with the exception of Marsh Lane, traffic movements on all other assessed road links, are expected to have a Negligible impact on existing sensitive receptors which results in a potential **Slight** significance of effect, which is **Not Significant**.

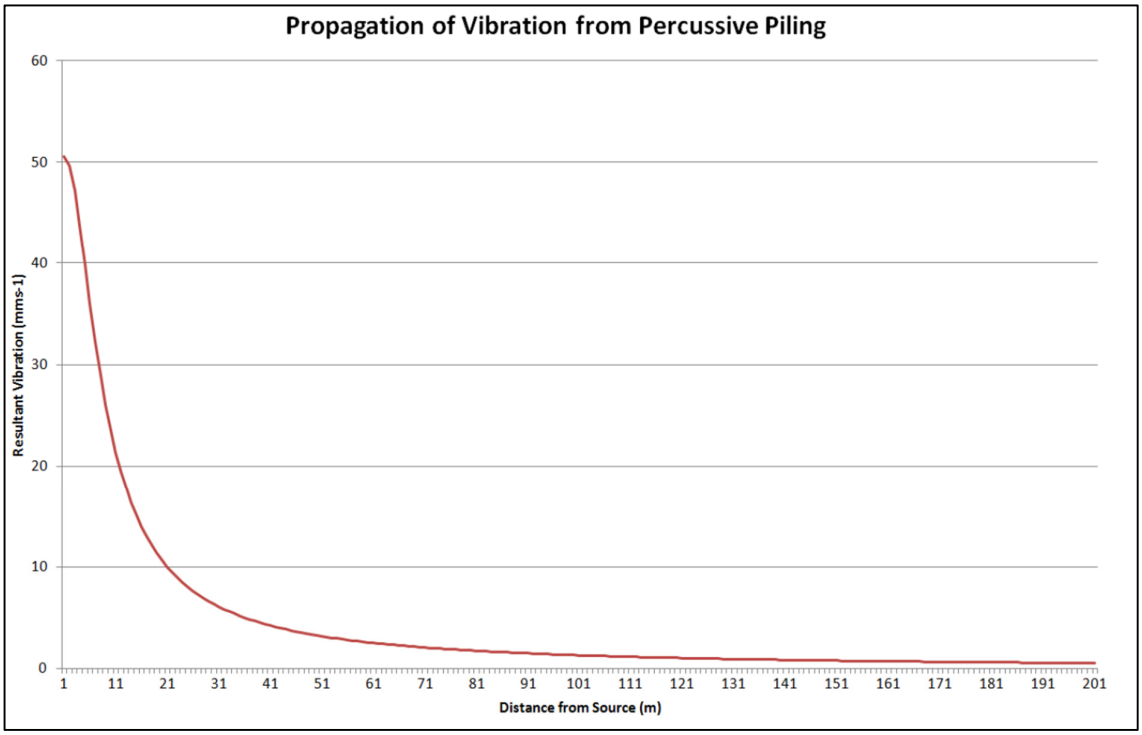
8.93 For Stage 1, traffic associated with the Proposed Development will exit the site to the west of Hazel Dene and the traffic will not pass the property directly using Mash Lane. As such although the table above indicates that on Marsh Lane there will be a significant increase in traffic and HGV numbers, as they do not directly pass the receptor, any increase in noise levels is expected to have a Negligible impact on Hazel Dene receptor, which results in a potential **Slight** significance of effect, which is **Not Significant**.

8.94 For Stage 2, following the road improvement works to Marsh Lane, traffic associated with the Proposed Development will pass the Hazel Dene receptor using Marsh Lane to gain access to the L-Shaped Parcel of land. Therefore, due to the increase of traffic using Marsh Lane, noise levels at the Hazel Dene receptor are expected to have a **High** magnitude of impact, resulting in a **Substantial** adverse effect , which is **Significant**.

Construction Phase – Vibration

8.95 As explained in **Chapter 6 (Construction)** of this ES, some piling will be required for the Proposed Development bridge crossings. Calculation of vibration levels resulting from such piling activities were carried out to determine at what distance it might yield impacts. Piling is the most common source of vibration and other activities are likely to produce significantly less vibration; **Figure 8-3** below shows the reduction in levels over distance from the works.

Figure 8-3: Graphical representations of the propagation of vibration from percussive piling



8.96 The graph presented in **Figure 8-3** above indicates that cosmetic damage to buildings (15mm/s) is unlikely to occur beyond 14m from piling activities. The closest sensitive property, Hazel Dene, is identified as being approximately at a minimum distance of 25m from the edge of land that is part of the Proposed Development, however it is expected that any piling works, if these were to occur, will happen at a greater distance than this and would be expected to not be any closer than 100m and therefore vibration levels would range between 1mm/s to 7mm/s.

Construction Vibration Assessment – Cosmetic Damage

8.97 In term of cosmetic damage, during piling operations the predicted magnitude of impact is **Low** on a **High** sensitive receptor, which will yield **Slight/Moderate adverse** effects (**Not Significant)**.

Construction Vibration Assessment – Human Response

8.98 In terms of human response to vibration, during piling operations the magnitude of impact is **Medium** on a **High** sensitive receptor which will result in **Moderate/Substantial** effects (**Significant)**.

Do Nothing Scenario

8.99 Under the 'do nothing scenario', the majority of the application site would remain vacant. However, as noted in **Chapter 5 (Alternatives and Design Evolution)** of the ES, this scenario was dismissed on the grounds that part of the application site for the Proposed Development includes land allocated for 'Proposed Development' / industrial development and covered by Policy SHBE-1, 'The South Humber Bank Employment Site' within the North Lincolnshire Housing & Employment Land Allocation Development Plan Document (March 2016). It is therefore reasonably foreseeable that a development similar in nature to that proposed by this application will come forward over the plan period.

Climate Change

8.100 Given the nature of this assessment, there are no likely effects on Climate Change as a result of noise and vibration.

MITIGATION, MONITORING AND RESIDUAL EFFECTS

Mitigation/ Monitoring

8.101 Where the assessments have identified potential effects of significance greater than 'slight adverse', consideration has been given to additional mitigation measures.

8.102 The implementation of a site-specific Construction Environmental Management Plan (CEMP) would form an integral part of the construction phase. This would set out appropriate measures to protect sensitive receptors against noise and vibration disturbance. Measures that would likely be included within the site-specific CEMP would include the following:

- Starting-up plant and vehicles sequentially rather than all together;
- Minimise drop heights of materials;
- Plant should be orientated and located to be in the quietest practicable location in terms of affected noise sensitive receptors;
- Noisy works, except where unavoidable, should be undertaken during the least sensitive hours of the day;
- Construction workers will be trained to employ appropriate techniques to keep noise to a minimum and will be effectively supervised to ensure the best working practice in respect of noise reduction is followed;
- Using 'silenced' plant and equipment;
- Switching off engines where vehicles are standing for a significant period of time;
- Fitting of acoustic enclosures to suppress noisy equipment;
- Operating plant at low speeds and incorporating automatic low speed idling;
- Properly maintaining all plant (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
- Considering the use of temporary screening or enclosures for static noisy plant to reduce noise emissions;
- Certifying plant to meet any relevant EC Directive standards;
- Undertaking awareness training of all contractors in regard to BS 5228 (Parts 1 and 2) which would form a prerequisite of their appointment;

8.103 Additional mitigation measures in the form of temporary noise barriers shall be considered to mitigate construction noise effects, including off-site HGV noise. These shall be provided where construction noise is otherwise expected to exceed the Significant Observed Adverse Effect Level (SOAEL) at the receptor for a duration that exceeds 10 days or nights in any 15 consecutive days or nights; or for a total number of days exceeding 40 in any six consecutive months. The precise locations and heights of any temporary barriers is to be determined by the Contractor(s) and confirmed to the local authority as part of any further detailed construction noise assessments. Where possible, if any permanent noise barriers are to be proposed for any future operational noise across the site, these should be built as early as possible in the construction programme so that they can offer noise mitigation during construction.

8.104 In addition, to temporary noise barriers, for off-site construction noise associated with HGV movements for the Hazel Dene property during Stage 2 works, a specific site management plan is required to help control noise from passing HGV's. Measures that would likely be included, but not limited to, within the specific management plan would include the following:

- No use of horns when passing Hazel Dene (other than in emergencies);
- Travelling at a reduced speed when passing Hazel Dene;
- Keeping vehicle revs low when passing Hazel Dene;
- Ensuring the resident of Hazel Dene is aware of the Proposed Development construction traffic and ongoing dialogue between the site and property during the duration of the works; and
- Where possible, scheduling deliveries and removal of material from the site during the least sensitive times of the day (i.e midday rather than the mornings).

8.105 In terms of human response to vibration, BS5288-2 stipulates that in scenarios where vibration levels exceed 1.0mm/s, '*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.'*

8.106 There it is imperative that as part of the CEMP prior written warning is given to the closest residents during any event which likely to result in higher than usual vibration levels – such as piling.

Residual Effects

8.107 Where receptors are exceeding the noise criteria from construction works, the introduction of a solid barrier will provide a sound reduction of 5-12dB, dependant on the location, height, length of the barrier, and the proximity of the construction sources relative to the barrier and receptor location.

8.108 Assuming the noise and vibration related elements detailed above are implemented into the site CEMP, and are enforced during site operations, along with solid barriers where appropriate, it is expected that the residual magnitude of impact for the assessment of both onsite plant and vehicle movements and off-site construction traffic will be **Low,** which represents a **Slight/Moderate** and the residual effects will be **Not Significant**.

8.109 The above approach can further incorporate ongoing compliance monitoring to determine when any exceedances are experienced. Where exceedances are identified, then temporary barriers can be erected and any particularly noisy plant replaced or limited in times or duration of use.

Summary of Effects

8.110 **Table 8-15** below details the summary of effects. The worst-case assessment outcome has been detailed below for both Stage 1 and Stage 2. The significance of the noise and vibration related residual effects from construction works associated with the Proposed Development range from Slight to Slight/Moderate which is considered Not Significant in EIA terms.

Table 8-15: Summary of effects – Noise and Vibration

Assessments	Construction Stages	Potential Effect	Additional Mitigation	Residual Effect
Construction Noise Assessment – Plant & Machinery	Stage 1	Moderate/Substantial and Significant	CEMP and temporary noise barriers	Slight/Moderate and Not Significant
	Stage 2			
	Stage 1	Slight and Not Significant	N/A	Slight and Not Significant

Assessments	Construction Stages	Potential Effect	Additional Mitigation	Residual Effect
Noise Traffic Assessment	Stage 2	Substantial and Significant	CEMP, CTMP and temporary noise barriers	Slight/Moderate and Not Significant
Construction Vibration Assessment - Cosmetic Damage	Stage 1	Slight/Moderate and Not Significant	N/A	Slight/Moderate and Not Significant
	Stage 2			
Construction Vibration Assessment – Human Response	Stage 1	Moderate/Substantial and Significant	CEMP	Slight/Moderate and Not Significant
	Stage 2			

CUMULATIVE EFFECTS

8.111 There is the potential for cumulative effects caused from construction noise and construction traffic, should the construction phases of nearby developments overlap. Following a review of the committed and reasonably foreseeable projects identified in **Chapter 13** of this ES it is possible that construction phase works could occur simultaneously.

8.112 However, each of the projects considered in the cumulative assessment is subject to their own, separate and specific Construction Environmental Management Plan ('CEMP') or equivalent best practice measures, which should mitigate any potential cumulative construction effects and as such residual cumulative effects in terms of noise and vibration would be negligible.

SUMMARY

8.113 A noise and vibration assessment has been undertaken for the Proposed Development at Land East of Rosper Road, Killingholme.

8.114 The assessment shows that with the embedded mitigation construction noise levels associated with site activities at ER1 will potentially have a **Moderate/Substantial** effect, and as such is **Significant**. Noise levels associated with site activities at ER2 will potentially have a **Slight/Moderate** effect and as such is **Not Significant**.

8.115 The increase in traffic on all roads with the exception of Marsh Lane, is expected to have a **Slight** effect in terms of noise, and as such is **Not Significant**.

8.116 The increase in traffic on Marsh Lane during Stage 2, is expected to have a **Substantial** effect in terms of noise, and as such is **Significant**.

8.117 In terms of cosmetic damage, during piling operations, construction vibration is expected to have a **Slight/Moderate** effect, and as such is **Not Significant**.

8.118 In terms of human response, during piling operations, construction vibration will potentially have a **Moderate/Substantial** effect, and as such is **Significant**.

8.119 However, with the implementation of the mitigation measures detailed within this ES Chapter (to be further evaluated and controlled by the CEMP), noise and vibration levels associated with the construction works are expected to reduce to **Slight/Moderate** significance, and as such is **Not Significant.**

8.120 Due to the temporary nature of the construction phase works, any residual effects at the sensitive receptor locations would not be permanent.

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