9. NOISE AND VIBRATION

9.1 Introduction

This section of the ES considers the likely significant effects of the Proposed Development in terms of noise and vibration. This chapter describes the assessment methodology; the baseline conditions currently existing at the Site and surroundings; the likely significant environmental effects during the construction and operational phases of the Proposed Development; the mitigation measures required to prevent, reduce or offset any significant adverse effects; and the significance of residual effects after these measures have been employed.

A brief introduction to noise and vibration terms used in this chapter is presented in **Appendix 9.1**.

9.2 Scope of Assessment

A detailed assessment of noise and vibration impacts was carried out in relation to the Consented Development and presented in the 2016 ES. The 2016 ES found that the receptors around the Site are affected by industrial/ commercial/transportation related noise. The baseline noise environment of the Site is assumed to remain similar to that documented in the 2016 as the Site remains a vacant plot and there have been no material changes in proximate land uses.

The arrangement, components and sound levels of the Proposed Development differ from the Consented Development which could lead to different operational noise impacts. The EIA has therefore included an updated assessment of the impact of operational noise which is presented in this ES chapter.

The construction noise and vibration and operational road traffic noise assessments of the 2016 ES have also been considered in relation to the description of the Proposed Development and minor, non-material amendments have been made to the assessment included in the 2016 ES.

9.3 Assessment Methodology and Significance Criteria

9.3.1 Introduction

This section of the ES has been based on the 2016 ES because there have been no material changes in methodology or guidance. Where minor changes have been made, these are noted.

Three principal noise control measures have been considered to gauge the suitability of the Site for development purposes, these are as follows.

- Engineering: reduction of noise at source (by using quieter machines or quieter methods of working), or by containment of noise (by insulating buildings, housing, machinery and/or by providing purpose-built barriers), and by protecting noise sensitive buildings (by improving the sound insulation of these buildings and/or by screening them by using purpose-built barriers).
- Layout: providing adequate distance the between the noise source and noise sensitive buildings, and by screening using natural barriers such as buildings or non-critical rooms in a building.
- Administrative: limiting times of operation, restricting activities on site, or specifying an acceptable noise limit.

9.3.2 Construction Noise and Vibration

The impact of noise and vibration during construction of the Proposed Development requires prediction and assessment in accordance with the guidance presented in BS 5228: 2009: ‘Code of practice for noise and vibration control on construction and open sites’ (Ref. 9.1).

9.3.3 Changes in Road Traffic Noise

The impact of changes in noise level resulting from changes in traffic flow and composition on existing roads as a result of the operation of the development requires assessment in accordance with the guidance presented in the Design Manual for Roads and Bridges (DMRB): 2011: Volume 11 'Environmental Assessment: Section 3 Environmental Assessment Techniques' (Ref 9.2).

9.3.4 Building Services Noise/Operational Noise

The impact of noise from operational activities or any building services associated with the Proposed Development requires assessment in accordance with British Standard 4142:2014: 'Method for rating and assessing industrial and commercial sound' (Ref 9.3) either assessing the impact of, or proposing limits for, such equipment.

9.3.5 Assessment Criteria

The noise and vibration levels associated with the Proposed Development and the significance of their potential effects have been assessed in accordance with national guidance and recognised codes of practice. In general in the ES, a three stage process has been adopted. First, the sensitivity of the noise and vibration receptors is assessed, this is followed by an assessment of the magnitude of the noise and vibration impacts and finally the significance of effects is evaluated. However, it is noted that for noise, the sensitivity of the receptor is taken account of in the criterion used to establish the impact magnitude. Therefore, the sensitivity of the receptor is not used to influence the significance of the effect in this assessment. This approach is slightly different to the 2016 ES, but is a robust approach. These factors are discussed below and have been specifically applied to the following conceptual significance impact matrix as appropriate.

9.3.6 Sensitivity

The criteria set out in **Table 9.1** have been applied to identify noise/vibration sensitive receptors where people may be affected by in the area around to the Site.

Table 9.1 Noise and Vibration Receptors

Sensitivity	Description	Receptor
High	Receptors that are especially susceptible to noise/vibration	Residential dwellings, Schools, Hospitals, Care Homes
Medium		Offices
Low		Retail shops, restaurants
Negligible	Receptors where noise is not likely to be a factor	Sports Grounds, commercial and industrial environments

The scale shown in **Table 9.2** has been adopted to assess the significance of both noise and vibration effects. The basis of this scale is derived from the 2016 ES with minor change to the significance categories noted.

Table 9.2 Significance Matrix

		Magnitude Of Impact		
Receptor sensitivity	**Large**	**Medium**	**Small**	**Negligible**
High	Major	Moderate	Minor	Negligible
Medium	Major	Moderate	Minor	Negligible
Low	Major	Moderate	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible

In this assessment, residential buildings are the key noise sensitive receptors in the area, and therefore the assessment focuses on these. Once specific context issues are taking into account a decision can be made as the whether an impact is significant or not significant. Generally impacts that are minor or negligible are Not Significant. Specific discussions are included in the relevant assessment sections.

9.3.7 Impact Magnitude: Construction Phase

Noise levels generated by construction activities have the potential to affect nearby noise-sensitive receptors. However, the magnitude of the potential impact will depend upon a number of variables, such as:

- the noise levels generated by plant or equipment used on site;
- the period of time construction plant is operational;
- the distance between the noise source and the receptor; and
- the level of likely attenuation due to ground absorption and barrier effects.

BS 5228 sets out a methodology for predicting, assessing and controlling noise levels arising from a wide variety of construction and related activities. As such, it can be used to predict noise levels arising from the operations at proposed construction sites. BS 5228 also sets out tables of sound power levels generated by a wide variety of construction plant to facilitate such predictions.

The prediction procedure essentially involves taking the source noise level of each item of plant and correcting it for (i) distance effects between source and receiver (ii) percentage operating time of the plant; (iii) barrier attenuation effects; (iv) ground absorption; and (v) facade corrections. The latter correction involves a 3dB noise increase due to the reflection effects for a receiving point location 1m in front of a building facade. All predictions presented in this section include the façade correction and in addition, assume that the ground between the source and receiver is acoustically hard, to represent worst case.

BS 5228 gives several examples of acceptable limits for construction or demolition noise. The most simplistic is based on the exceedance of fixed noise limits, and it states in paragraph E.2:

“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut”.

“Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed: 70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise or 75 decibels (dBA) in urban areas near main roads in heavy industrial areas. These limits are for daytime working outside living rooms and offices."

These have been applied to residential and educational institutions in this assessment.

Table 9.3 shows the construction noise criteria used in the assessment.

Table 9.3 Construction Noise Magnitude

Noise Level $L_{Aeq,T}$ dB	Description
>75	Large Adverse
70 – 74.9	Medium Adverse
55 – 69.9	Small Adverse
<55	Negligible

It is worth noting that the purpose of the construction noise criteria is to control the impact of construction noise insofar as is reasonably practicable, whilst recognising that it is unrealistic for developments of this nature to be constructed without causing some degree of disturbance in the locality. Hence, even if the criteria adopted for this assessment is achieved, noise from construction activities is likely to be readily noticeable and as such, has been assumed to be approaching an adverse impact level of moderate significance. It is further noted that the local authority may restrict the hours of construction and construction related traffic on the Site.

The assessment focuses on the most likely construction scenario which is when work is carried out during the day. Although some work may be required during the evening and night, this will be limited to minor works, or works that occur within the buildings so that noise levels at the nearest off-site residential receptors, which are approximately 750 m from the facility, are not likely to result in significant noise disturbance. Therefore, noise criteria have not been presented for these times.

9.3.8 Construction Vibration

Vibration may be impulsive, such as that due to hammer-driven piling; transient, such as that due to vehicle movements along a railway; or continuous, such as that due to vibratory driven piling. The primary cause of community concern generally relates to building damage from both construction and operational sources of vibration, although, the human body can perceive vibration at levels which are substantially lower than those required to cause building damage.

Damage to buildings associated solely with ground-borne vibration is not common and although vibration may be noticeable, there is little evidence to suggest that it produces cosmetic damage such as a crack in plaster unless the magnitude of the vibration is excessively large. The most likely impact, where elevated levels of vibration do occur during the construction phase, is associated with perceptibility and disturbance.

BS 5228 indicates that the threshold of human perception to vibration is around 0.15 mm/s, although it is generally accepted that for the majority of people vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity (PPV) are just perceptible.

British Standard BS5228 provides a methodology to predict levels of vibration from construction activities. In view of the large distance between vibration sensitive receptors and the construction works, a screening approach has been adopted, in the same way as in the 2016 ES.

For completeness a criterion of 1 mm/s ppv has been selected as the assessment criterion to control the impact of construction vibration for residential properties, with the criteria for assessing the magnitude of vibration impacts according to the margin by which this target criterion is achieved or exceeded presented in **Table 9.4**. This target criterion is based on the guidance contained within BS 5228, experience from previous sites and accepted vibration policy criteria across a range of

enforcing authorities elsewhere in the UK. The criterion is presented in terms of peak particle velocity (PPV) as it is the simplest indicator for both perceptibility and building damage. Levels would need to be exceeded persistently rather than from a one-off occurrence which would be unlikely to cause significant disturbance.

Table 9.4 Construction Vibration Magnitude

Vibration Level, PPV mm/s	Description
>1.0	Large Adverse
0.3 – 1.0	Medium Adverse
0.15 – 0.29	Small Adverse
<0.15	Negligible

Again, it is worth noting that the purpose of the construction vibration criterion is to control the impact of construction vibration as far as is reasonably practicable and is entirely based on the likelihood of the vibration being perceptible and causing disturbance, rather than causing damage to property. Hence, although vibration levels in excess of 1 mm/s ppv would be considered a Large Adverse impact in respect of the likelihood of disturbance, they would not be considered significant in terms of the potential for building damage, which would require levels of at least 15 mm/s ppv to result in minor cosmetic damage in light / unreinforced buildings. It is noted that other factors such as duration need to be taken into account when assessing vibration impacts from construction, and very short-term activities are not classed as likely to lead to significant effects. Industrial or commercial buildings are expected to be far less sensitive to vibration than residential properties. The guidance in BS 5228 suggests that vibration magnitudes of 10 mm/s ppv might be likely to be intolerable for any more than a brief exposure to this level in most building environments. This level of vibration is unlikely to be generated beyond the boundary of a construction site, and the sensitivity of industrial or commercial buildings has therefore been stated as negligible to reflect this.

9.3.9 Impact Magnitude: Completed Development

The aim of noise policy within the UK is to protect individuals from excessive noise levels both in the workplace and within their homes. It has been recognised that severe annoyance to individuals due to noise can lead to sleep disturbance and adverse health effects.

The NPPF (2018) does not give a set of criteria for external noise assessment and therefore guidance within contemporary British Standards and other internationally published documents has been considered. For the purposes of this assessment, external noise levels at nearby noise sensitive receptors (e.g. residential uses) have been derived on the basis of the guidance given in BS4142.

BS 4142 sets out an “initial assessment” method to assess whether noise from factories, industrial premises or fixed installations is likely to give rise to an adverse effect at noise-sensitive receptors in the vicinity. The procedure contained in BS 4142 for assessing the likelihood of an adverse effect is to compare the measured or predicted noise level from the source in question, outside the dwelling, the $L_{Aeq,T}$ ‘specific’ noise level, with the measured $L_{A90,T}$ ‘background’ noise level.

Where the noise contains acoustic features including tonality, intermit noise, and impulsivity and other specific sound features, corrections are added to the specific noise level to obtain the ‘rating’ $L_{Ar,Tr}$ noise level.

The guidance presented in BS 4142 has been used to derive criteria for assessing the impact of building services plant noise and other on-site operational noise sources, as presented in **Table 9.5**.

Table 9.5 Operational / Building Services Noise Level Assessment (Magnitude)

Excess of $L_{Ar,Tr}$ Rating Noise Level above Existing $L_{A90,T}$ Background Noise Level	Description
10 dB or more	Large Adverse
5.1 – 10 dB	Medium Adverse
0 – 5 dB	Small Adverse
0 dB or less	Negligible

The guidance then requires a consideration of the "context" of the noise impact including consideration of absolute noise levels and local conditions, which can be used to modify the assessment of significance.

9.3.10 Road Traffic Noise

The impact of any changes in road traffic noise levels has been assessed in accordance with the principles and guidance presented within the Design Manual for Roads and Bridges (DMRB).

The DMRB states that *"The impact of a project at any location can be reported in terms of changes in absolute noise level. In the UK the standard index used for traffic noise is the LA10,18hr level, which is quoted in decibels".*

In order to determine whether changes in traffic noise levels are likely to occur as a result of the Proposed Development, noise levels have been predicted in accordance with the methodology contained within the Calculation of Road Traffic Noise (CRTN 1988) (Ref 9.4), based on traffic flow data for the local road network with and without the development.

The DMRB also presents an impact significance matrix for assessing the magnitude of changes in noise level, which has been used as criteria for assessing the impact of any changes in road traffic noise levels and is summarised in **Table 9.6.**

Table 9.6 Changes in Road Traffic Noise Magnitude

Change in Noise Level, dB(A)	Description
>5.0	Large Adverse
3.0 - 4.9	Medium Adverse
1.0 - 2.9	Small Adverse
0.0 - 0.9	Negligible

9.3.11 Development Vibration

Given the large distance to the nearest vibration sensitive receptors and the lack of vibration sources during operation of the Development, a quantitative assessment of vibration has not been undertaken, and therefore numerical criteria are not required. This is the same approach as was adopted in the 2016 ES.

9.4 Legislation, Planning Policy and Guidance

9.4.1 National Policy: National Planning Policy Framework (NPPF)

The NPPF 2018 (Ref 9.5) sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Under Section 15; Conserving and enhancing the natural environment, the following is stated:

> *"Planning policies and decisions should contribute to and enhance the natural and local environment by:*
>
> *e) preventing both 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"*

The NPPF goes on to state:

> *"Planning policies and decisions should also ensure that new development is appropriate for its location… In doing so they should 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".*

9.4.2 Local Policy

North Northamptonshire Joint Core Strategy (2016) (Ref. 9.6) and the North Northamptonshire Minerals & Waste Local Plan (Ref 9.7) outline the Council's policies on renewable energy and waste management. The policies refer to a need to minimise noise pollution and ensure that local noise sensitive receptors are not unduly disturbed by noise.

9.5 Baseline Conditions (No material change from the 2016 ES)

9.5.1 Introduction

This section has been reproduced from the 2016 ES, with minor and non-material changes.

The baseline conditions at the nearest residential receptors Gretton Way (R1) have been determined by noise and vibration measurements undertaken for the 2016 ES. The existing noise conditions at the Site boundary with noise-sensitive receptors were determined by attended environmental noise and vibration measurements, which commenced on 6 June 2016 and completed by 9 June 2016.

The primary purpose of the noise survey was to gather sufficient acoustic information on noise levels at the Site and at existing noise-sensitive receptor locations in the vicinity of the Site during daytime and night-time periods.

The existing residential receptors are approximately 750m away (Error! Reference source not found.) and the ambient noise survey was undertaken at the Site's eastern boundary. A review of the existing baseline noise measurements at other developments in the area showed similar noise levels to those that were measured for the 2016 ES for the closest receptor, Gretton Way, based on measurements associated with the Prior's Hall development (Ref 9.8), and therefore, the measurements at the site boundary are assumed to be a reasonable indicator of the noise environment at the nearest residential receptor.

Measurements for the Hub Rockingham development at a location which was set back from the the Gretton Brook Road at a similar distance to the Brookfield Travellers' site in 2015 (Ref 9.9) also showed very similar noise levels to those taken at the eastern site boundary. Since the other receptors are also near to noise sources such as roads and industry, it would be expected that noise levels would be no lower than at R1. For example, the residential receptors on the Prior's Hall development are affected by traffic noise from the roads in the area, and the Brookfield Traveller's site is located on Gretton Brook Road and is close to the Rockingham Motor Speedway site and a large car storage area.

Noise Receptor

Site Boundary

Noise Receptors

Industrial / Commercial

Residential areas

School / Community

0 250 500 750 1,000

Metres

N

Figure 9.1
Noise Receptors

Willowbrook East Industrial Estate, Shelton Road, Corby, Northamptonshire, NN17 5XH

SCALE:	See Scale Bar	VERSION:	A01
SIZE:	A4	DRAWN:	AA
PROJECT:	0488636	CHECKED:	MF
DATE:	20/02/2019	APPROVED:	CB

ERM

PROJECTION: British National Grid

SOURCE: ERM

Path: \\UKLONSV01\Data\London\Projects\0488636 KSP Renewables Ltd Corby EfW EIA.CB\Working\GIS\MAPS\0488636_NoiseReceptors_A01.mxd

9.5.2 Measurement Survey

The environmental noise measurements were carried out between the 6 and 9 June 2016, to determine the prevailing noise levels during daytime and night-time periods. Although new housing has been built as part of the Priors Hall development since the survey was carried out, it would not be likely to result in significant increases in the background noise levels as a result of traffic increases and t.he nearest sensitive housing receptor remains 750m from the Site. The Priors Hall development has been considered as part of the assessment of cumulative effects in section 9.7.

The weather conditions during the attended surveys were conducive to noise surveys, with mostly dry conditions, with wind speeds ranging from 1 to 5 m/s.

All noise measurements were undertaken between 1.2 and 1.5 metres above local ground level and under free-field conditions. The microphones were fitted with protective windshields for the measurements.

A full inventory of this equipment is presented in **Table 9.7.**

Table 9.7 Inventory of Acoustic Measurement Equipment

Item	Make & Model	Serial Numbers
Sound Level Meter	Larson Davis LD820	1350
Calibrator	LD CAL200	3724
Sound Level Meter	Larson Davis LD824	1309
Calibrator	LD CAL200	3723

All noise measurements were undertaken by consultants competent in environmental noise monitoring, and, in accordance with the principles of BS 7445: 2003 (Ref 9.10). The noise parameters of $L_{Aeq,T}$, $L_{A10,T}$, $L_{A90,T}$, and L_{Amax} were recorded at each location.

Recorded noise measurement results for the measurement locations are presented in **Table 9.8** (see **Appendix 9.2** for full results).

Table 9.8 Summary of Measured Noise Levels, Location 1

Date		Daytime		
	$L_{Aeq,\ 16\ hr}$ dB	**L_{Amax} dB**	**L_{A90} dB**	**BS4142 Mode L_{A90} dB**
6 June 2016	53.5	68.1	46.2	
7 June 2016	47.2	62.4	37.5	
8 June 2016	50.2	64.8	39.2	
Average, daytime	**51.0**	**65.1**	**41.0**	**37.0**
		Night-time		
	$L_{Aeq,\ 8\ hr}$ dB	**LAmax dB**	**L_{A90} dB**	**BS4142 Mode L_{A90} dB**
6/7 June 2016	49.5	61.6	36.6	
7/8 June 2016	40.8	52.2	35.8	
8/9 June 2016	49.9	58.1	42.5	
Average, night-time	**48.2**	**57.3**	**38.3**	**33.0**

During the surveys, it was observed that noise from nearby industrial units was audible from time to time but did not contribute greatly to the overall ambient noise climate.

9.6 Identification and Evaluation of Key Effects

This section considers the potential effects associated with the noise during the construction and operation of the Proposed Development.

Potential sources of noise arising from the completed development will include on-site vehicles, building services noise, noise breakout from buildings as well as externally mounted equipment which will operate over a 24-hour period.

9.6.1 During Construction (No material change from the 2016 ES)

The operation of equipment associated with site preparation and construction of the Proposed Development has the potential to result in noise effects at existing noise sensitive receptors in the vicinity.

In order to estimate and assess the effect of noise during construction of the Proposed Development, noise predictions have been undertaken using the calculation methods outlined in BS 5228.

Details of the plant and assumptions made in the construction noise predictions are provided in **Appendix 9.3**. The predictions are based on source noise data for the various items of plant, as presented in BS 5228.

In order to provide as detailed an assessment as possible at this early stage, reasonable assumptions about the type and quantity of construction plant likely to be required have been made. The assumed construction works associated with the proposals have been divided into three discrete sub-phases: enabling works (including site preparation); substructure (including foundations) and super-structure (building erection). Piling noise is also considered for assessment purposes.

With regard to barrier attenuation effects, consideration has been given to the acoustic screening that will be provided by permanent structures on the intervening land between the proposed construction areas and receptor, in addition to the natural screening created by the topography of the area. To provide a robust assessment however, the construction noise predictions assume no attenuation from site hoardings at receptor locations.

Construction noise levels have been predicted at the closest existing representative noise sensitive receptor locations to the Proposed Development. This is taken from the 2016 ES, which did not contain a plan of the receptor locations. However, they represented the nearest noise sensitive receptors around the Site.

The predicted noise levels are ‘worst case’, assuming the shortest distance between the source of construction noise and the receptor. The noise levels predicted at the closest façade of each construction assessment position during each phase and sub-phase of the works are shown in **Table 9.9**.

Table 9.9 Worst Case Façade Construction Noise Levels L_{AeqT} dB

Receptor	Construction Phase			
	Enabling Works	**Sub-structure**	**Superstructure**	**Piling**
Brookfield	45	47	43	51
Corby Business Academy	44	46	43	51
73 Pen Green Lane	42	44	41	49

Priors Hall Development	48	50	47	55

The comparison of the results presented in **Table 9.10** with the noise criterion of 75 dB $L_{Aeq,T}$ identifies that façade noise levels for the nearest existing residential settlements located at Priors Hall (Gretton Road R1) are predicted to be below the criterion. It should be noted that not all construction plant will be operating simultaneously nor will it be operated at the closest distance to the residential areas for all of the time as assumed for the purposes of a worst-case scenario assessment. (ERM has also carried out check predictions, which showed that the construction works would not exceed the daytime noise criterion even if all of the plant were to be operated together.)

Comparison of these results with the criteria presented in **Table 9.3** identifies that for all phases, the magnitude of construction noise impacts would be classified as 'negligible'. The significance is classed as 'Negligible' and is Not Significant.

To reduce the adverse impacts to a minimum, good practice mitigation measures are considered in line with good practice later in this chapter.

9.6.2 Construction Vibration (No material change from the 2016 ES)

Table 9.10 details the distances at which certain construction activities could give rise to a just perceptible level of vibration. These figures are based on historical field measurements.

Table 9.10 Distances at which vibration may be just perceptible

Construction Activity	Distance (m)
Excavation	10-15
Heavy Vehicles (e.g. dump trucks)	5-10
Hydraulic Breakers	15-20
Large Rotary Piling Rig	20-30
Driven Piling Rig (if required)	10-100

On the basis of the figures presented in **Table 9.10** regarding the distances at which vibration from various construction activities is likely to be perceptible, the residential properties are unlikely to be affected and vibration levels would be below the criteria in **Table 9.4**, and would therefore be of Negligible magnitude at the nearest residential receptors and to be Not Significant. Although industrial/commercial buildings are generally over 100 m from the site, there are two buildings to the south of the site which could experience perceptible vibration during construction at times. The magnitude will depend on the location and nature of plant. However, as noted above, industrial or commercial buildings are generally much less sensitive to vibration than residential ones, and the vibration from construction is unlikely to be of sufficient magnitude to cause a significant impact at this type of building.

9.6.3 Operational Phase (Updated Assessment)

9.6.3.1 Introduction

The Site will incorporate the plant within purpose-built buildings. All buildings will be beyond 750 m from the nearest residential areas and are substantially shielded by other existing commercial/industrial premises in some directions and therefore unlikely to significantly affect the ambient noise climate. However, since changes in the design and noise assumptions have been made, the operational noise was re-assessed based on the current design to establish if noise from the operation of the site would remain Not Significant.

ERM carried out noise modelling to calculate reference ($L_{Aeq,15min}$) noise levels at six receptors, during continuous operation of the Corby EfW plant, in accordance with BS 4142 requirements for night-time noise level assessment and the $L_{Aeq,1hr}$ for daytime. The location of the six receptors in relation to the Corby EfW plant is shown in Error! Reference source not found., and a description of the receptors and their elevation height as input into the noise model is presented in **Table 9.11**.

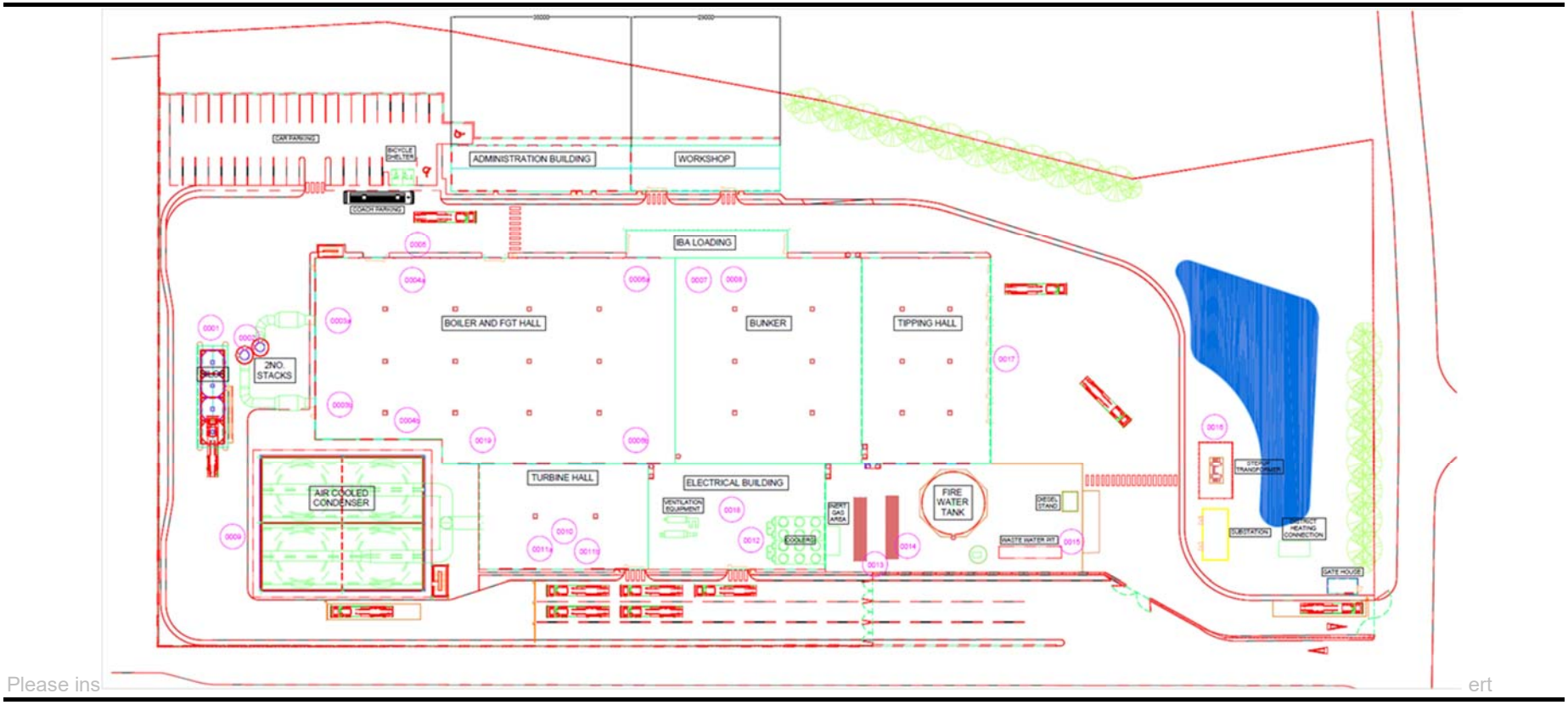
Table 9.11 Identified Noise Sensitive Receptors

Receptor ID	Receptor Description	Modelled Elevation Height (m)
R1	Gretton Way, residential estate	4
R2	Corby Business Academy, educational institute	4
R3	Prior's Hall, Park View residential estate	4
R4	Weldon, residential estate	4
R5	Pen Green, residential estate	4
R6	Brookfield Travellers' Site, residential site	1.5

9.6.3.2 Noise Model Assumptions

Following discussions with the project team's design engineers regarding the detailed assumptions to be used for noise modelling, the following sources were identified (see **Figure 9.9.2**) and the noise modelling assumptions for these sources are summarised in **Table 9.12**. It should be noted that in **Table 9.12** two different noise parameters are referred to. One parameter is the sound pressure level, which is the noise level that would be measured with a sound level meter at a specific location relative to a noise source, whilst the other is the sound power, which is a function of the sound energy emitted by the noise sources and is not dependent on the acoustic environment. The sound power is often derived from the sound pressure level data which were available from other facilities.

Figure 9.2 Noise Source Locations



Please ins ert

Table 9.12 Noise Sources and Model Assumptions

Source ID	Noise Source	Noise Data from Previous Projects (Sound Pressure Level - Lp)	Sound Power Level (Lw)	Noise Model Assumptions
0001	Air Pollution Control Residue (APCR) Silos	75 dB(A) at 1 m	83 dB(A) per silo	Four units are located within the APCR silo building (21.5 m height). However, only one unit operates at a time. Building cladding designed with 25 dB insertion loss. Therefore, 58 dB(A) sound power assumed. Approximately two operations per day, with silo generating noise for approximately 1.5 hrs during each operation. As a worst-case assumption, it was assumed that the silo would operate during the day and the night.
0002	Stacks - Line 1 & 2	70 dB(A) at 1m (measured at 90 degree angle to vertical i.e. to the side)	78 dB(A) per stack	Modelled at the stack exhausts at 75 m elevation above ground.
0003 a&b	ID Fans Line 1 and 2	Measured Boiler and FGT Building – Internal noise level 80 dB(A) reverberant level		80 dB(A) assumed to be reverberant sound pressure level inside the 39.5 m high building. Building cladding assumed to have an insertion loss of 25 dB.
0005	Lime and PAC offloading, offload blower on tanker	80 dB(A) at 1 m	88 dB(A)	Modelled at 1 m elevation above ground.
0007	Hydraulic Packs	Typical reverberant noise level in Bunker Hall is 80 dB(A).	N/A	80 dB(A) assumed to be reverberant noise level inside the 32.5 m high building. Building cladding assumed to have an insertion loss of 25 dB.- Although noise level close to this equipment item could be higher than assumed reverberant level, it is likely these will be inside a small concrete building within the bunker hall. This is likely due to fire mitigation, but this concrete building will also avoid any noise from this equipment inside the bunker hall.
0008	Compressors	Typical noise level in Bunker Hall is 80 dB(A)	N/A	Although noise level close to this equipment item could be higher than assumed reverberant level, it is likely these will be inside a small concrete building within the bunker hall. This is likely due to fire mitigation, but this concrete building will also avoid any noise from this equipment inside the bunker hall.
0009	Air Cooled Condenser (ACC)	65 dB(A) at 1 m to the side of fans	Approximately 73 dB(A) per fan	Fans have an elevation of 11.6 m to 12.6 m above the ground.

Source ID	Noise Source	Noise Data from Previous Projects (Sound Pressure Level - Lp)	Sound Power Level (Lw)	Noise Model Assumptions
0009	ACC vacuum unit	Typically 85 dB(A) at 1 m	93 dB(A)	ACC vacuum unit mounted at 5 m elevation from the ground, at the north-western corner of the ACC.
0010	Turbine	Measured Turbine Building – Internal noise level 85 to 86 dB(A) reverberant level. 86 dB(A) adopted for modelling.	N/A	86 dB(A) assumed to be reverberant noise level inside 21.5 m high building. Building cladding assumed to have an insertion loss of 25 dB.
0012	Air Blast Cooler	81 dB(A) at 1 m – for unit with 8 fans running	89 dB(A) per fan; total of 100 dB(A) for 12 fans	Modelled at ~3 m elevation above the Electrical Building roof.
0013	Emergency Diesel Generator (EDG)	75 dB(A) at 1 m	83 dB(A)	The main source is the exhaust, which is modelled at 2.5 m elevation above the ground. This was modelled as operating simultaneously with the other operational equipment in order to generate worst-case noise levels. However, this unit will only operate, if everything else is offline – i.e. power outage on the site. The contribution of this plant to total noise levels is insignificant and would not lead to significant noise impacts if operated on its own.
0014	Fire Water Pumps (Electric and Diesel)	75 dB(A) at 1 m	83 dB(A)	The main source is the exhaust, which is modelled at 2.5 m elevation above the ground.
0015	Waste Water Pumps	72 dB(A) at 1 m	80 dB(A) per pump	Three pumps modelled at 0.5 m elevation above the ground as a worst-case assumption because these might be submersible rather than surface mounted pumps.
0016	Transformer	60 dB(A) at 1 m	68 dB(A)	68 dB(A) sound power, at assumed height of 3 m above ground.
0017	Tipping Hall doors	Internal level typically up to 80 dB(A) reverberant level	N/A	The five roller doors on the eastern façade of the tipping hall constantly emit noise, but at a lower level as compared to when they are opened. 80 dB(A) assumed to be reverberant noise level inside the 18 m high building and building cladding modelled with an insertion loss of 24 dB(A) to simulate typical roller door performance during most of the operation. To simulate noise breakout when the doors are opened, a sound power per unit area of 74 dB(A) was modelled emerging from each open door. It was assumed that the door would remain open for 5 minutes at a time, so an emission on-time of 33 % was modelled against a 15 minute LAeq reference level as required by BS 4142.

It was further assumed that two HGVs would be running their engines continuously at the apron outside the tipping hall. This is intended to simulate a worst-case situation where there are two waste vehicles manoeuvring, or driving to/from the site during the assessment period. A sound power level of 108 dB(A) was assumed with reference to measured noise levels of lorries as presented in the British Standard code of practice for noise and vibration control on construction and open sites (BS 5228). The noise levels from smaller waste vehicles would be expected to be lower.

Non-emitting buildings that might have a screening effect on receptors eg buildings and warehouses within the Willowbrook East and Weldon North Industrial Estates, were input into the model. Building heights were conservatively estimated from a review of the buildings using Google Earth street view. A 50 m grid digital terrain model was also obtained from Ordnance Survey for input into the noise model.

9.6.3.3 Noise Results

The predicted noise levels are presented in **Table 9.13**

Table 9.13 Predicted Reference Levels Before and With Mitigation

Receptor ID	Receptor Description	Worst Case Unmitigated Noise Levels, $L_{Aeq,15min}$ dB(A)	Mitigation Scenario, $L_{Aeq,15min}$ dB(A)
R1	Gretton Way, residential estate	40	37
R2	Corby Business Academy, educational institute	39	35
R3	Prior's Hall, Park View residential estate	36	34
R4	Weldon, residential estate	34	34
R5	Pen Green, residential estate	37	37
R6	Brookfield Travellers' Site, residential site	38	37

The top contributing noise sources for the worst-case assumption were the two HGVs operating at the apron outside the Tipping Hall, and the 12 Air Blast Cooler fans located on the Electrical Building roof. The effect of erecting a 4 m high noise barrier on the eastern boundary of the apron wasere therefore explored.

9.6.3.4 Noise Assessment

The current predictions have been based on refined noise modelling, including all of the major potential noise sources that are likely to operate at the Site and the current layout.

- To assess whether the predicted noise levels result in a material change in noise, they have been assessed against the guidance in BS 4142. BS 4142 requires a rating level to be calculated which takes into account additional corrections for acoustic features where this is applicable. No correction for acoustic features has been added to the predicted noise levels. This is on the assumption that noise levels from the facility will be relatively close to background noise at the nearest receptors and that it assumed that tonal reversing alarms will not be permitted on site, as was required in the noise planning conditions associated with the Consented Development. The guidance requires two tests as follows: an initial calculation of the magnitude of exceedance (see Table 9.5) of the noise level (with additional corrections for tonality and other acoustic features) above the background noise (L_{A90}); and

- consideration of the context of the noise impact including consideration of absolute noise levels.

The predicted noise levels for normal daytime operation are shown in **Table 9.14** and the predicted noise levels for normal night-time operation are shown in **Table 9.15.**

The background noise level at all receptors, has been assumed to be the same as was measured at the boundary of the Site, and which has been used to represent background noise at R1. Since the other receptors are near to noise sources such as roads and industry, it would be expected that noise levels would be no lower than at R1, and therefore basing an assessment on this value is a worst-case.

Table 9.14 Daytime Operational Noise – Predicted Noise Levels dB $L_{Aeq\ 1\ hour}$

	R1	R2	R3	R4	R5	R6
Predicted Noise Level: No Mitigation	40	39	36	34	37	38
Predicted Noise Level (Scenario 1): 4 m Barrier Around Yard	37	35	34	34	37	37
Background Noise (Approximately) – Modal Value of L_{A90}	37	37	37	37	37	37
Magnitude of Exceedance of Background Noise – No Mitigation	3	2	-1	-3	0	1
Magnitude of Exceedance of background noise – 4 m Barrier Around Yard –	0	-2	-4	-3	0	0

Based on the initial assessment the daytime noise levels are likely to be between 0 to 5 dB above background noise at four receptors, which is the point at which is an adverse impact of low magnitude according to the BS 4142 initial assessment. Taking into account the context of the daytime impacts (i.e. that overall noise levels are low and noise from the HGVs will not be present throughout the daytime period) the impact has been rated as Not Significant.

Table 9.15 Night-time Operational Noise – Predicted Noise Levels dB $L_{Aeq\ 15\ minutes}$

	R1	R2	R3	R4	R5	R6
Predicted Noise Level: No Mitigation	40	39	36	34	37	38
Predicted Noise Level : HGVs at night + 4m barrier	37	35	34	34	37	37

	R1	R2	R3	R4	R5	R6
Background Noise (Approximately) – Modal Value of L_{A90}	33	33	33	33	33	33
Exceedance of Background Noise – No Mitigation	7	6	3	1	4	5
Exceedance of Background Noise (Scenario 1) – HGVs at night + 4m barrier	4	2	1	1	4	4

The initial assessment would indicate that night-time noise levels are more than 5 dB above background levels at two receptors if no mitigation is applied, which results in a medium impact magnitude. BS 4142 suggests that differences of around 10 dB are significant. It is also noted that the assessment is based on conservative assumptions regarding noise output from all sources, and there may be no need to implement specific noise mitigation once more detailed information is available regarding the design and noise emissions from the sources.

Based on the initial assessment, and assuming a barrier around the yard, the noise levels are likely to be less than 5 dB above background noise, which is the point at which an adverse impact would occur according to the BS 4142 initial assessment subject to context. This would be of Small magnitude based on the Table 9.5.

This assessment assumes that no acoustic feature corrections are required. These could be required for distinguishing features such as noise from HGVs fitted with tonal reversing alarms. It has been assumed that, in keeping with the planning conditions for the Consented Development, non-tonal reversing alarms would be required. As a result of this the magnitude of the noise impact during operation has been assumed to be Small Adverse once mitigation is incorporated into the design.

In addition to the results of the initial assessment, it is necessary to take into account the context of noise levels including their relatively low noise level. It is noted that noise would not be expected to result in night-time effects in terms of sleep disturbance at noise levels that are less than 40 to 45 dB L_{Aeq} (Ref 9.11). Predicted noise levels do not exceed this level under any of the scenarios tested. The area is also a mixed area including existing industrial noise sources, and noise levels from the Proposed Development should be less individually discernible at the nearest residences. Also, the noise from HGVs would not occur throughout the night and noise levels would be below background noise when they are not present. Given this context the significance of operational noise has been classified as Not Significant during the day and night.

The BS4142 noise assessment will be confirmed with detailed noise modelling at the detailed design stage of the process, however, the assessment indicates that significant noise effects can be avoided through appropriate mitigation during detailed design.

9.6.4 Road Traffic Noise (Non material change from the 2016 ES)

The traffic flow data provided from the Transport Assessment has been used as the basis for the road traffic noise assessment. As described above, 18-hour Annual Average Weekday Total (AAWT) flows were provided for the local road network surrounding the Proposed Development for the 2023 and 2028 situations with and without development.

Traffic noise predictions have been made using the CRTN prediction methodology. The methodology has been used to predict the magnitude of any change in noise level resulting from the development proposals at the roadside of the local network. As for the Consented Development, traffic noise changes were predicted to be very small. Inspection of the roads on which the site-related traffic will pass shows that there are no noise sensitive buildings facing the roads. Any existing noise-sensitive receptors further from the road network are likely to experience increases in noise level of less than 1 dB and with reference to the criteria adopted for this assessment, such changes in noise level would be classified as 'negligible' magnitude and are Not Significant.

9.6.5 Development Vibration

There are no major sources of vibration associated with EfW plants, and it likely that vibration will not be perceptible beyond the site boundary, and therefore the effects have been defined as Not Significant.

9.7 Assessment of Cumulative Effects

A summary of cumulative schemes is presented in Chapter 3 (EIA Methodology) (Table 3.2).

Since the cumulative schemes are only likely to have a cumulative impact in terms of increase in traffic on the existing road network, and the Proposed Development has a negligible impact in terms of off-site traffic, it can be concluded that cumulative effects will not be significant.

Cumulative noise impacts during the construction phase are also considered negligible magnitude and Not Significant.

9.8 Enhancement, Mitigation and Residual Effects

9.8.1 Mitigation - Construction (No material change from 2016 ES)

To control the impact of noise during construction of the Proposed Development, contractors will ensure that works are carried out in accordance with best practicable means (BPM) as described in BS 5228 comprising the following.

- Where possible, 'silenced' plant and equipment will be used.
- Where vehicles are standing for a significant period of time, engines will be switched off.
- Acoustic enclosures will be fitted where possible to suppress noisy equipment.
- Plant will operate at low speeds, where possible, and incorporate automatic low speed idling.
- Where possible, electrically driven equipment will be selected in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant.
- All plant will be properly maintained (greased, blown silencers replaced, saws kept sharpened. Teeth set and blades flat, worn bearings replaced etc.).
- Consideration will be given to temporary screening or enclosures for static noisy plant to reduce noise emissions and plant should be certified to meet any relevant EC Directives.
- All contractors will be made familiar with the guidance in BS 5228 (Parts 1 and 2) which will form a pre-requisite of their appointment.
- Early and good public relations with the adjacent tenants and occupants of buildings will also reduce the likelihood of complaints.

These general measures to control construction noise will be incorporated within the Construction Environmental Management Plan (CEMP) and/or detailed in construction method statements.

The CEMP will present procedures to control the potential noise impact at any proposed residential units that are occupied prior to the completion of the construction activities at the Site.

All residential vibration sensitive receptors are at a distance greater than 750 m and therefore further mitigation measures are not necessary. Industrial and commercial buildings are unlikely to be sufficiently sensitive to vibration for construction to result in significant impacts, therefore further mitigation measures are not necessary.

9.8.2 Mitigation - Operation (Updated Mitigation)

All noise sources will be adequately controlled by design of the buildings and with appropriate operational or engineering mitigation measures as required. This has been assumed as inherent in the design, and is not considered separately in this section.

Noise modelling indicates that standard mitigation such as a noise barrier around the yard would be sufficient to avoid significant noise effects at receptors. The position of the screen is not shown on plans since it will be optimised through further modelling. A 4 m screen in the context of the Proposed Development, its wider light industry setting and the locations of visually sensitive receptors will have no significant effects on visual amenity as discussed in section 10.6, Chapter 10 (Townscape and Visual Amenity).

In accordance with the terms of the extant planning consent the design of the yard and the lorries must be such that tonal reversing alarms are not needed, and tipping lorries are routed or managed to minimise reversing manoeuvres.

A noise management plan will be formulated in order to keep delivery noise (e.g. use of tonal reversing alarms, doors opening etc) to an acceptable minimum.

9.9 Residual Effects

9.9.1 Construction (No material change from 2016 ES)

With the implementation of the mitigation outlined above, a reduction in general construction noise levels at receptors of approximately 10 dB(A) would be expected and is presented in **Table 9.16**.

Table 9.16 Residual Worst-case Façade Construction Noise Levels $L_{Aeq.T}$ dB (rounded)

Receptor		Construction Phase		
	Enabling Works	**Sub-structure**	**Superstructure**	**Piling**
Brookfield	35	37	33	41
Corby Business Academy	34	36	33	41
73 Pen Green Lane	32	35	31	39
Priors Hall Development	38	40	37	45

Comparison of these results with the criteria presented in **Table 9.3** identifies that construction noise effects would be classified as Negligible magnitude and not significant. (ERM has also carried out check predictions, which showed that the construction works would not exceed the daytime noise criterion even if all of the plant was operated together.)

9.9.2 Operation (Updated Assessment)

No further mitigation measures are considered necessary to control the effect of noise and vibration, therefore the effects remain 'Minor', and fully compliant with BS 4142 and Not Significant. Operational vibration will be negligible and Not Significant.

9.10 Differences to the Consented Development

No changes in the significance of construction noise and vibration, operational vibration and off-site traffic noise have been predicted. These effects of the Proposed Development remain Not Significant. Operational noise has been re-assessed, and the effects are expected to be Not Significant, and in full compliance with the appropriate British Standard (BS 4142).

9.11 Summary

This Chapter has considered the effects of noise and vibration generated by the Proposed Development on surrounding properties, during construction and operational phases. The assessment has been based on a series of environmental noise measurements undertaken at the Site and noise predictions.

During the construction phase of the Proposed Development, there is likely to be a negligible impact on nearby receptors and although the construction works are temporary by their very nature, mitigation measures have been recommended to minimise the noise disturbance. With appropriate mitigation in place the significance of effect on the noise receptors will remain of negligible magnitude and Not Significant.

During the operational phase of the Proposed Development, the noise impacts will not have a significant effect on existing sensitive receptors due to the appropriate design and mitigation of the buildings and yard.

Table 9.17 Noise and Vibration Summary Table

Potential Effect	Nature of Effect (Permanent or Temporary)	Significance	Mitigation/ Enhancement Measures	Residual Effects
Noise: Construction Impacts	Direct, Temporary Short-Term Local	Not Significant	Implementation of Best Practicable Means to control noise emissions	Not Significant
Vibration: Construction Impacts	Direct, Temporary Short-Term Local	Not Significant	Implementation of Best Practicable Means to control vibration	Not Significant
Noise: Operational Noise	Direct, Permanent Long-Term Local	Not Significant	Appropriate sound Insulation, design of yard	Not Significant
Vibration: Operational Vibration	Direct, Permanent Long-Term Local	Not Significant	None	Not Significant
Noise: Changes in road traffic noise	Direct, Permanent Long-Term Local	Not Significant	None	Not Significant

9.12 References

Ref 9.1: British Standard 5228: 2009 +A1 2014: Code of practice for noise and vibration control on construction and open sites. BSI, 2009.

Ref 9.2: Design Manual for Roads and Bridges (DMRB): 2008: Volume 11 *Environmental Assessment*: Section 3 *Environmental Assessment Techniques..* The Stationary Office, 2011.

Ref 9.3: British Standard 4142:2014: Method for rating and assessing industrial and commercial sound. BSI, 2014.

Ref 9.4: Calculation of Road Traffic Noise (CRTN), The Department of Environment, The Stationary Office, 1988

Ref 9.5: The National Planning Policy Framework, July 2018, HMSO, 2018

Ref 9.6: North Northamptonshire Joint Planning Unit (2016) North Northamptonshire Joint Core Strategy 2011 – 2031

Ref 9.7: Northamptonshire County Council (2017) Northamptonshire Minerals and Waste Local Plan

Ref 9.8: Priors Hall, Urban Extension: Environmental Assessment Chapter 14: Noise, Corby Developments Limied, 2004

Ref 9.9: Hub Rockingham, Noise Limits Report 15/0215/R1 Cole Jarman, 2015.

Ref 9.10: British Standard 7445: 2003: Description and measurement of environmental noise.

BSI, 2003.

Ref 9.11: BS 8233, Guidance on Sound Insulation and Noise Reduction for Buildings, BSi, 2014.