8 NOISE & VIBRATION

8.1 INTRODUCTION

8.1.1 This chapter considers the potential noise and vibration effects that may arise as a result of the construction and operation of the proposed Northampton Gateway Strategic Rail Freight Interchange (SRFI) and proposed Roade Bypass.

8.1.2 The Proposed Development has the potential to generate noise from the following sources:

- Construction of the SRFI (including warehousing), associated highway improvements and the Roade Bypass;
- The change in road traffic flows on the surrounding road network to the SRFI and around the village of Roade as a consequence of the Roade Bypass;
- The SRFI traffic travelling on the roads within the Main Site boundary;
- The additional freight trains travelling on the Northampton Loop rail line;
- Freight train activity such as manoeuvring and loading/unloading taking place at the SRFI;
- Heavy goods vehicles (HGVs) and other operational activity at the Main Site such as manoeuvring and loading and unloading at the proposed warehouses and rail freight terminal;
- Mechanical services plant associated with the warehousing at the SRFI.

8.1.3 There is also potential that additional rail freight activity on the Northampton Loop associated with the SFRI may lead to an increase in perceptible vibration at receptors near to the railway line.

8.1.4 To assist with the understanding of this chapter a Glossary of Acoustic Terms is provided in Appendix 8.1.

8.2 RELEVANT POLICY AND LEGISLATION

8.2.1 The overarching government policy on noise is set out in the Noise Policy Statement for England (NPSE). For nationally significant road, rail and strategic rail freight infrastructure projects (as defined in the Planning Act 2008), the National Policy Statement for National Networks (NPSNN) sets out the relevant policy objectives. Furthermore, at paragraph 5.193, it states that, in decision making, due regard be given to the NPSE, the National Planning Policy Framework and the Government's associated planning guidance on noise.

National Policy Statement for National Networks (NPSNN) [1]

[1] National Policy Statement for National Networks, Department for Transport, December 2014

8.2.2 In terms of human receptors, the document specifies that noise and vibration

> should be assessed using the principles of the relevant British Standards and other guidance. The prediction of road traffic noise should be based on the method described in Calculation of Road Traffic Noise and prediction of noise from railways should be based on the method described in Calculation of Railway Noise. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies. (Paragraph 5.191).

8.2.3 With respect to wildlife and biodiversity, impacts should be assessed in accordance with the Biodiversity and Ecological Conservation section of the NPSNN (Paragraph 5.20 – 5.38). With regard to noise, the NPSNN states that the

> *applicant should consult Natural England with regard to assessment of noise on designated nature conservation sites, protected landscapes, protected species or other wildlife. (Paragraph 5.192)*

It goes on

> *The results of any noise surveys and predictions may inform the ecological assessment.*

8.2.4 The NPSNN also states that

> *Applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process. (Paragraph 5.200)*

8.2.5 Regarding mitigation, the NPSNN advocates that measures should be proportionate and reasonable. (Paragraph 5.198) It also states that for most projects, the relevant Noise Insulation Regulations will apply and an indication of likely eligibility for such compensation should be included in the assessment. (Paragraph 5.199)

8.2.6 In paragraph 5.195 the NPSNN states that the Secretary of State should not grant development consent

> *unless satisfied that the proposals will meet the following aims, within the context of Government policy on sustainable development:*
>
> - *avoid significant adverse impacts on health and quality of life from noise as a result of the new development;*
> - *mitigate and minimise other adverse impacts on health and quality of life from noise from the new development; and*
> - *contribute to improvements to health and quality of life through the effective management and control of noise, where possible.*

8.2.7 These statements reflect the aims of the Noise Policy Statement for England

Noise Policy Statement for England (NPSE) [2]

8.2.8 The NPSE is the overarching Government policy on noise. It seeks to clarify the underlying principles and aims in past and existing policy documents, legislation and guidance in relation to all forms of noise including environmental noise, neighbour noise and neighbourhood noise (but not noise in the workplace).

8.2.9 It uses the concepts of the No Observed Effect Level (NOEL) and Lowest Observed Adverse Effect Level (LOAEL). The NPSE extends these concepts by introducing Significant Observed Adverse Effect Level (SOAEL). This is the level above which significant adverse effects on health and quality of life occur. However, the explanatory note to the NPSE states that it is not possible to identify a single objective noise value that defines SOAEL that is applicable to all sources of noise in all situations. It is likely to be different for different noise sources, for different receptors and at different times.

8.2.10 The NPSE's vision is to

> *Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.*
>
> *This long-term vision is supported by the following aims:*
>
> - *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*
>
> *through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development*

8.2.11 The second aim of NPSE refers to noise impacts that lay somewhere between LOAEL and SOAEL. The NPSE asserts that while this means that all reasonable steps should be taken to mitigate and minimise adverse effects, this does not mean that such adverse effects cannot occur [3].

8.2.12 In a decision letter associated with the Thames Tideway Tunnel project, the Government clarified the meaning of the phrase 'sustainable development' as follows:

> The National Planning Policy Framework, the National Planning Practice Guidance on noise and the Noise Policy Statement for England are all clear that noise management should be determined in the context of sustainable development including the environmental, economic and social benefits of the proposal.

[2] Noise Policy Statement for England, Defra, March 2010
[3] Ibid, paragraph 2.24.

National Planning Policy Framework (NPPF) [4]

8.2.13 The NPPF sets out the Government's planning policy for England. At its heart is an intention to promote more sustainable development. The NPPF addresses noise as a planning issue principally through a statement of four principles at paragraph 123:

Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established, and
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

8.2.14 It can be seen how the NPPF reflects the aims of the NPSE and the decision tests in the NPSNN. Furthermore, the NPPF makes reference to the NPSE for advice on the achievement of these policy aims, and particularly in connection with the explanation of 'adverse impacts'.

Planning Practice Guidance (Noise) (PPG(N)) [5]

8.2.15 Further guidance in relation to the NPPF has been published on the Government Planning Portal. The Planning Practice Guidance: Noise supports the NPPF by providing a range of advice and includes a noise exposure hierarchy based on the likely average response.

8.2.16 In line with the NPPF, the NPSE and the decision tests in the NPSNN, the guidance confirms that significant adverse effects should be avoided. At the next level down in the hierarchy, where there is an observed adverse effect, the PPG(N) confirms that effects should be mitigated and reduced to a minimum (as far as reasonably practicable). No mitigation measures are required for effects which are considered to be below the lowest observed adverse effect level.

Local Policy

8.2.17 The local planning policy context is addressed in detail in the separate Planning Statement which forms part of the submitted application. The West Northamptonshire Joint Core Strategy Local Plan (Part 1) 2014 contains two policies that are considered relevant to the assessment of noise impacts arising from the Proposed Development.

[4] National Planning Policy Framework, Department for Communities and Local Government (DCLG), (2012),
[5] Planning Practice Guidance: Noise - http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/

8.2.18 Policy S10 Sustainable Development Principles, indicates that

development will … minimise pollution from noise air and run off'.

8.2.19 Policy BN9 Planning for Pollution Control, states that

proposals which are likely to cause pollution or likely to result in exposure to sources of pollution ….. will need to demonstrate that they provide opportunities to minimise, and where possible, reduce pollution issues that are a barrier to achieving sustainable development and healthy communities, including …

e) reducing the adverse impacts of noise.

8.2.20 This policy also states that

Development that is likely to cause pollution, either individually or cumulatively, will only be permitted if measures can be implemented to minimise pollution to a level which provides a high standard of protection for health and environmental quality.

8.2.21 It can be seen that the specific local policies are consistent with the national policy objectives and therefore achieving the national policy objectives will also satisfy the local policy requirements.

Noise Insulation Regulations 1975 (as amended 1988)[6]

8.2.22 These regulations apply to new and altered highways and places various duties and powers on the relevant highway authority to offer compensation in the form of secondary glazing and alternative ventilation. Paragraph 5.199 of the NPSNN states that these regulations would apply for most national network projects. Although not formally a highway authority, the developer will apply these regulations in connection with the Roade bypass.

8.2.23 The regulations apply to residential properties. To be eligible for an offer of this compensation, the final road traffic noise exposure at the façade of the dwelling has to be at least 68 dB, $L_{A10,18h}$ (06.00 – 24.00 hours) as a result of noise from the new road. Other criteria have also to be met concerning the increase in road traffic noise that would be experienced and the contribution being made by noise from the new highway to the overall noise at the property.

[6] The Noise Insulation Regulations 1975 (SI 1975/1763), as amended by The Noise Insulation (Amendment) Regulations 1988 (SI 1988/2000)

The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996[7]

8.2.24 These regulations apply to additional and altered railways works and places various duties and powers on the relevant rail authority to offer compensation in the form of secondary glazing and alternative ventilation. Paragraph 5.199 of the NPSNN states that these regulations would apply for most national network projects. Although not formally a rail authority, the developer will apply these regulations in connection with the new railway associated with the SRFI.

8.2.25 The regulations apply to residential properties. To be eligible for an offer of this compensation, the final railway noise exposure at the façade of the dwelling has to be at least either 68 dB, $L_{Aeq,18h}$ (06.00 – 24.00 hours) or 63 dB $L_{Aeq,6h}$ (00.00 – 06.00 hours) as a result of noise from the new railway. Other criteria have also to be met concerning the increase in railway noise that would be experienced and the contribution being made by noise from the new railway to the overall noise at the property.

8.3 ASSESSMENT METHODOLOGY & SIGNIFICANCE CRITERIA

Assessment Methodology

8.3.1 The proposed development has the potential for several different types of impacts. Broadly speaking these comprise:

- Noise and vibration that occurs during the construction phase;
- Noise resulting from the additional freight train movements associated with the SRFI;
- Vibration resulting from the additional freight train movements associated with the SRFI;
- Noise resulting from changes in road traffic associated with the operation of the SRFI;
- Noise arising from the SRFI site including loading/unloading and manoeuvring of HGVs and freight trains and any mechanical services plant noise emission associated with the buildings on the Main Site; and
- The change in noise impact as a result of the operation of the Roade bypass

8.3.2 For the most part, the assessment methodology used for each element is different in terms of how the potential noise and vibration impact is predicted and how the effect is assessed. The degree of the potential impact and the significance of the expected effect is dependent upon several factors, including the noise level from the particular activity, the existing sound environment and the duration, timing and character of the various noise sources.

8.3.3 The assessment methodologies that will be used for each element of the assessment are described below.

[7] The Noise Insulation (Railways and Other Guided transport Systems) Regulations 1996 (SI 1996/428)

Construction Noise

8.3.4 An indication of the potential effect of construction works associated with the proposed development will be determined at the various noise sensitive receivers. The approach will determine the predicted noise levels based on the preliminary estimates of construction plant and machinery that are likely to be used. The noise predictions will follow the principles of the methodology contained within Annex F of BS 5228 – 1:2009+A1:2014[8], as required by the NPSNN (Paragraph 5.191). This standard has been formally adopted by Government as the Code of Practice to use in this situation[9].

8.3.5 The significance of potential adverse effects will be determined using the thresholds set out in Table 8.1. The values reflect the guidance in BS 5228–1:2009+A1:2014 and the effects that noise can have on those affected. The thresholds are expressed in terms of current Government policy.

Table 8.1 Thresholds of potential effects of construction noise at residential buildings

Effect	Time Period	Threshold Value ($L_{Aeq,T}$)[a]
LOAEL	Day (07:00 – 23:00)	65
	Evening (19.00 – 23.00)	55
	Night (23.00 – 07.00)	45
SOAEL	Day (07:00 – 23:00)	75
	Evening (19.00 – 23.00)	65
	Night (23.00 – 07.00)	55

Note:
a This level is the monthly average value at a position one meter from the façade containing a window to a habitable room of a residential building, but ignoring the effect of the acoustic reflection from that façade.

Construction Vibration

8.3.6 Of the anticipated works that would be required to construct the development, it is only piling that may give rise to vibration that may adversely affect nearby receptors. It is understood that no piling would be required for the main SRFI site, but that there could be some piling associated with the Roade bypass.

[8] BS 5228-1:2009+A1:2014 – Code of Practice for noise and vibration control on construction and open sites, Part 1: Noise
[9] Statutory Instrument 2015/227 – The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015

8.3.7 The significance of the potential adverse vibration effects will be determined based on the relevant guidance set out in BS 5228-2:2009+A1:2014[10]. The potential adverse effects will be determined using the thresholds set out in Table 8.2. These are based on the advice in BS 5228-2:2009+A1:2014, with the threshold being expressed in terms of Government policy.

Table 8.2 Thresholds of potential effects of construction vibration at residential buildings

Effect	Threshold Value (PPV, mm/s)[a]
LOAEL	0.5
SOAEL	1.0[b]

Note:
a) This is the level at a residential receptor.
b) Guidance in BS 5228-2:2009+A1:2014 states that this level of exposure can be tolerated by those affected if prior warning and explanation has been given. It goes on to state that a level of 10mm/s is likely to be intolerable for any more than a very brief exposure in most building environments.

Operational Phase – Rail Noise

8.3.8 Rail traffic using the network will change due to the operational phase of the project. The effects resulting from the change in rail noise have been predicted using IMMI 3D noise modelling software and has been based on the methodology contained within the Calculation of Railway Noise (CRN) as required by the NPSNN. The noise source terms used are those contained in both CRN and in report published by DEFRA in 2007[11]. This methodology assumes downwind propagation between the source and the receiver.

8.3.9 The noise levels arising from passenger and freight train activity on the Northampton Loop and Weedon Line have been predicted at the relevant receptor locations for the following scenarios:

- 2017 Baseline;
- 2021 Do Minimum (2021 DM) - future baseline;
- 2021 Do Something (2021 DS) - with the Proposed Development;
- 2033 Do Minimum (2033 DM) - future baseline;
- 2033 Do Something (2033 DS) - with the Proposed Development;
- 2043 Do Minimum (2043 DM) - future baseline, and
- 2043 Do Something (2043 DS) - with the Proposed Development.

[10] BS 5228-2:2009+A1:2014 – Code of Practice for noise and vibration control on construction and open sites, Part 2: Vibration
[11] DEFRA, 2007, Additional railway noise source terms for "Calculation of Railway Noise 1995"

8.3.10 The predictions have been based on information provided by the rail consultant about

- the current level of freight and passenger train activity on the two lines;
- the likely background growth in freight train activity;
- the anticipated additional freight train movements associated with the proposed development; and
- the changes in passenger train activity once HS2 Phase 1 opens in 2026 and HS2 Phase 2b opens in 2033.

8.3.11 It should be noted that once HS2 opens there will be changes to train services on both lines, however at the current time there is some uncertainty over the extent of those changes.

8.3.12 The 2017 baseline information has been based on an analysis of current passenger and freight train movements on the Northampton Loop and Weedon line. For the future scenarios, the background growth in freight numbers has been based on Network Rail's 2016 Freight Network Study which indicated intermodal traffic will grow at 5.2% per annum. The additional freight activity associated with the Proposed Development, has been based on the 'high forecast' data from the forecast rail traffic levels provided by the rail consultant.

8.3.13 The predictions are representative of normal operations when there are no engineering works on either the Northampton Loop or Weedon Line during the night time period.

8.3.14 A summary of the assumptions for the rail predictions can be found in Appendix 8.3.

8.3.15 The significance of potential adverse effects has been based on a combination of the change in noise exposure and the resulting noise exposure. The data set out in Table 8.3 show the threshold values used. These have been derived from the effects that railway noise can have on those affected, and are expressed in terms of Government policy.

Table 8.3 Thresholds of potential effects of railway noise at residential buildings

Effect	Time Period	Threshold Value ($L_{Aeq,T}$)[a,b]
LOAEL	07.00 – 23.00	50
	23.00 – 07.00	40
SOAEL	07.00 – 23.00	65
	23.00 – 07.00	55

Note:
a This is the level at the most exposed façade containing a window to a habitable room of a residential building, but ignoring the effect of the acoustic reflection from that façade.
b For the period 23.00 – 07.00. the relevant noise indicator is L_{night}.

8.3.16 If the daytime LOAEL threshold is exceeded, the data in Table 8.4 sets out how the change in daytime noise exposure is described and whether or not, in combination with the resulting exposure, that impact is significant.

Table 8.4 Descriptors of Magnitude of Daytime Rail Noise Change

Magnitude of Impact	Resulting Exposure	
	Between LOAEL & SOAEL	Above SOAEL
No Change	0	0
Negligible	Up to 2.9dB	Up to 0.9 dB
Minor	3 – 4.9 dB	1.0 – 2.9 dB
Moderate	5.0 – 9.9 dB	3.0 – 4.9 dB
Major	10.0 dB and over	5.0 dB and over

8.3.17 The shaded boxes indicate that any property falling into these categories due to the noise increase is regarded as experiencing a significant adverse effect with respect to Government policy.

8.3.18 If the night-time LOAEL threshold is exceeded, the data in Table 8.5 sets out how the change in night-time noise exposure is described and whether or not, in combination with the resulting exposure, that impact is significant.

Table 8.5 Descriptors of Magnitude of Night-time Rail Noise Change

Magnitude of Impact	Resulting Exposure	
	Between LOAEL & SOAEL	Above SOAEL
No Change	0	0
Negligible	Up to 0.9dB	Up to 0.9 dB
Minor	1.0 - 2.9 dB	1.0 – 2.9 dB
Moderate	3.0 – 4.9 dB	3.0 – 4.9 dB
Major	5.0 dB and over	5.0 dB and over

8.3.19 The shaded boxes indicate that any property falling into these categories due to the noise increase is regarded as experiencing a significant adverse effect with respect to Government policy.

8.3.20 In accordance with CRN, the information provided by the rail consultant was based on an 18 hour day time period (06:00 – 24:00) and 6 hour night time period (00:00 – 06:00). The noise exposure results were, therefore, generated in terms of the 18 hour and 6 hour period. Equivalence has been assumed with the corresponding 16 hour and 8 hour periods, based on the advice in the Department for Transport document TAG Unit A3[12]. Consequently, the 16 hour values have been assumed to be the same as the 18 hour values, and the 8 hour values have been assumed to be the same as the 6 hour values.

Operational Phase – Rail Vibration

8.3.21 The Proposed Development has the potential to generate vibration from additional freight train movements on the rail network. The assessment of vibration from the operational phase of the development has been undertaken following the principles of BS 6472-1:2008[13]. This standard describes the determination of the vibration dose that is experienced over a period of time from measurements or predictions of vibration levels. The standard identifies the probability of adverse comment from the vibration dose value (VDV) as summarised in Table 8.6.

Table 8.6 Vibration dose value ranges which result in various probabilities of adverse comment.

Place and Time	Low probability of adverse comment ($mm/s^{1.75}$)	Adverse comment possible ($mm/s^{1.75}$)	Adverse comment probable ($mm/s^{1.75}$)
Residential buildings 16 hour day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 hour night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

8.3.22 The expected Vibration Dose Values (VDV) arising from passenger and freight train movements on the Northampton Loop have been predicted at the two receptors closest to the railway line for the following scenarios:

- 2017 Baseline;
- 2021 Do Minimum (2021 DM) - future baseline in development opening year;
- 2021 Do Something (2021 DS) - with the Proposed Development opening year;
- 2033 Do Minimum (2033 DM) - future baseline opening year for HS2 phase 2b;
- 2033 Do Something (2033 DS) - with the Proposed Development opening year for HS2 phase 2b;

[12] Transport Appraisal Guidance Unit A3, Department for Transport, 2015
[13] BS 6472 – 1: 2008 – Guide to evaluation of human exposure to vibration in buildings. Part 1: Vibration sources other than blasting

- 2043 Do Minimum (2043 DM) - future baseline based on National Rail long term planning horizon, and
- 2043 Do Something (2043 DS) - with the Proposed Development based on National Rail long term planning horizon.

8.3.23 The predictions have been undertaken based on sample measurements of vibration levels from freight and passenger train activity at these receptor locations and the information on train movements provided by the rail consultant for the assessment of operational rail noise.

8.3.24 The sample measurements were undertaken following the methodology in BS 6472-1:2008. The predictions were based upon the method set out in section 3.5 of BS 6472-1:2008.

8.3.25 In accordance with CRN, the information provided by the rail consultant was based on an 18 hour day time period (06:00 – 24:00) and 6 hour night time period (00:00 – 06:00). The criteria in BS 6472-1:2008 are based on a 16 hour day time period (07:00 – 23:00) and 8 hour night time period (23.00 – 07.00). However, it is not anticipated that this would make a material difference to the predicted VDVs, as it is the magnitude of the vibration events which is usually more important rather than the number of events or their duration[14]. Furthermore, between 06:00 – 07:00 hours most train movements are and will continue to be passenger trains which have a lower vibration magnitude than freight trains.

8.3.26 Although the concepts in Government policy regarding LOAEL and SOAEL only strictly apply to noise exposure, it is helpful to adopt the same principles with regard to vibration impact and effect.

8.3.27 Table 8.7 shows the threshold values used together the descriptors adopted for the degree of impact.

Table 8.7 Threshold of likely effects of vibration for residential buildings (derived from BS 6472-1:2008)

Effect	Impact Description	Vibration Exposure[a]	
		VDV Daytime ($mm/s^{1.75}$)	VDV Night time ($mm/s^{1.75}$)
-	Negligible	< 0.2	<0.1
LOAEL	Minor	0.2	0.1
-	Moderate	0.21 – 0.79	0.11 – 0.39
SOAEL	Major	0.8	0.4
Note: a Usually determined in the centre of a normally loaded floor within the dwelling.			

Operational Phase - Road Traffic Noise

[14] Thompson, D, 2009, Railway Noise and Vibration, Mechanisms, Modelling and Means of Control, Chapter 12

8.3.28 The effects resulting from the change in road traffic noise due to the operation of the development will be predicted using IMMI 3D noise modelling software and the methodology contained within the Calculation of Road Traffic Noise (CRTN). The methodology assumes downwind propagation between the source and the receiver.

8.3.29 For the road traffic noise assessment, noise levels are being predicted for the following scenarios:

- 2015 Baseline;
- 2021 Do Minimum (2021 DM) - future baseline for SRFI opening year;
- 2021 Do Something (2021 DS) - with the proposed development in its opening year with 1 million sq ft of development operational and no Roade Bypass;
- 2031 Do Minimum (2031 DM) - future baseline year;
- 2031 Do Something (2031 DS) - with the Proposed Development with SRFI at full capacity, and Roade Bypass fully operational.

8.3.30 The 'Do Minimum' and 'Do Something' scenarios include the cumulative effect of all committed development and infrastructure schemes. This includes the Smart Motorway scheme for the M1 between junction 13 and 16 which is anticipated to be operational by 2021. Furthermore the 'Do Something' scenarios also include the effect of the relevant proposed transport mitigation and junction improvements that would be operational in 2021 and 2031. As identified above, the Roade Bypass is not operational in the '2021 Do Something' scenario, but is assumed to be operational in the '2031 Do Something' scenario.

8.3.31 The ES traffic data in the form of Annual Average Daily Traffic (AADT) and Annual Average Weekday Traffic (AAWT) flows have been provided by WSP from the Northamptonshire Strategic Transport Model (NSTM2), which they maintain and operate on the behalf of Northamptonshire County Council (NCC). WSP have produced the ES traffic data in accordance with their standard methodology for this process. This involves the use of peak period to AADT and AAWT conversion factors, which are applied across the whole of the NSTM2 modelled area. Whilst this approach is satisfactory to provide a broad understanding of AADT and AAWT flows over the whole of the modelled highway network, it is considered that a review of this conversion methodology is warranted to ensure that the resulting data is appropriate to examine the more localised impacts that could arise from the Northampton Gateway development proposals. This will be discussed with NCC and alterations to the conversion methodology agreed prior to submission of the DCO application. Where appropriate, updated ES traffic data will be incorporated into the Environment Statement.

8.3.32 The effects resulting from the change in road traffic noise due to the operation of the development will be predicted using IMMI 3D noise modelling software and the methodology contained within the Calculation of Road Traffic Noise (CRTN).

8.3.33 The model has been verified as described in Appendix 8.4.

8.3.34 The significance of potential adverse effects has been based on a combination of the change in noise exposure and the resulting noise exposure. The data set out in Table 8.8

show the threshold values used. These have been derived from the effects that railway noise can have on those affected, and are expressed in terms of Government policy.

Table 8.8 Thresholds of potential effects of road traffic noise at residential buildings

Effect	Time Period	Threshold Value ($L_{Aeq,T}$)[a,b]
LOAEL	07.00 – 23.00	50
	23.00 – 07.00	40
SOAEL	07.00 – 23.00	65
	23.00 – 07.00	55

Note:
a This is the level at the most exposed façade containing a window to a habitable room of a residential building, but ignoring the effect of the acoustic reflection from that façade.
b For the period 23.00 – 07.00 the relevant noise indicator is L_{night}.

8.3.35 If the daytime LOAEL threshold is exceeded, the data in Table 8.9 sets out how the change in daytime noise exposure is described and whether or not, in combination with the resulting exposure, that impact is significant.

Table 8.9 Descriptors of Magnitude of Daytime Road Traffic Noise Change

Magnitude of Impact	Resulting Exposure	
	Between LOAEL & SOAEL	Above SOAEL
No Change	0	0
Negligible	Up to 2.9dB	Up to 0.9 dB
Minor	3 – 4.9 dB	1.0 – 2.9 dB
Moderate	5.0 – 9.9 dB	3.0 – 4.9 dB
Major	10.0 dB and over	5.0 dB and over

8.3.36 The shaded boxes indicate that any property falling into these categories due to the noise increase is regarded as experiencing a significant adverse effect with respect to Government policy.

8.3.37 If the night-time LOAEL threshold is exceeded, the data in Table 8.10 sets out how the change in night-time noise exposure is described and whether or not, in combination with the resulting exposure, that impact is significant.

Table 8.10 Descriptors of Magnitude of Night-time Road Traffic Noise Change

Magnitude of Impact	Resulting Exposure	
	Between LOAEL & SOAEL	Above SOAEL
No Change	0	0
Negligible	Up to 0.9dB	Up to 0.9 dB
Minor	1.0 - 2.9 dB	1.0 – 2.9 dB
Moderate	3.0 – 4.9 dB	3.0 – 4.9 dB
Major	5.0 dB and over	5.0 dB and over

8.3.38 The shaded boxes indicate that any property falling into these categories due to the noise increase is regarded as experiencing a significant adverse effect with respect to Government policy.

8.3.39 CRTN generates results in terms of the $L_{A10,18h}$ noise indicator. In order to obtain the corresponding values for the $L_{Aeq,16h}$ and L_{night}, the method 3 conversion was used as described in the TRL report: Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping[15].

Operational Phase – Strategic Rail Freight Interchange Activities at Main Site

8.3.40 Noise from operational activities at the SRFI has the potential to impact surrounding receptors during both the day and night time periods. The likely noise sources include HGVs manoeuvring and loading/unloading, the operation of forklift trucks, crane movements and other manoeuvring and loading/unloading sources associated with the rail terminal.

8.3.41 The noise levels arising from operational activity at the SRFI have been predicted based upon the methodology in ISO 9613-2:1996[16], CRN and CRTN. All prediction methodologies assume downwind propagation between the source and the receiver.

8.3.42 Predictions have been made for operational noise when the SRFI reaches capacity and all units are operational. The predictions have been based on;

- The layout of the site shown in the illustrative masterplan,
- The proposed site topography and inherent mitigation provided by the bunding and landscaping.
- Information provided by the traffic consultant regarding the expected level of HGV activity at the proposed warehouse units and the rail terminal.

[15] Converting the UK traffic noise index $L_{A10,18h}$ to EU noise indices for noise mapping, Report PR/SE/451/02, TRL, 2002

[16] ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of calculation, ISO (1996)

- Information provided by the rail consultant about the expected operations in the rail terminal including freight train and shunter movements, gantry cranes, reach stackers and telehandlers.

8.3.43 A summary of the assumptions for the indicative predictions of the noise anticipated to arise from operational activities at the SRFI can be found in Appendix 8.5. With regard to the prediction of operational noise from the rail terminal part of the SRFI, a visit to an existing operational rail terminal was undertaken in late Summer 2017. The purpose of this visit was to obtain reference measurements of the noise levels from various activities and observe the nature of activities undertaken at the site, so the predictions reflect as accurately as possible the likely level and pattern of activity that would occur at the rail terminal. Work is still ongoing with regard to this element of the predictions, and as a consequence, the results currently exclude the contribution of the noise from the gantry cranes, reach stackers and telehandlers that would operate at the rail terminal. However, the noise from HGVs, train movements into the SRFI, and shunting movements within the site e.g. to the rail served warehousing have been included.

8.3.44 The methodology contained in BS 4142:2014[17] has been adopted to determine and assess the potential impacts from the SRFI. The method focuses on the difference between sound from the source being assessed (the specific sound level) and the existing background sound level.

8.3.45 The standard also states that certain characteristics can increase the extent of the impact over that expected from a simple difference in noise levels. These characteristics include tonality, impulsivity and intermittency. The standard describes various options for taking any such features into account and for determining what is described as a 'rating level'.

8.3.46 The standard states that the extent of the impact can be determined by subtracting the representative background sound level from the rating level. The greater the difference the greater the magnitude of the impact. The standard states that:

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context; and
- The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact.

8.3.47 The standard states that while the difference between the rating level and background sound level provides an initial estimate of the impact, other factors should be considered such as the absolute noise levels and how the character and level of the specific sound source relates to the existing sound environment.

[17] BS 4142:2014: Method for rating and assessing industrial and commercial sound, BSI (2014)

8.3.48 Regarding consideration of the absolute noise levels, the relevant guideline values provided in BS 8233:2014[18] have been used. Table 4 of that standard sets out desirable internal levels to be achieved in new dwellings from external sources. Information is also provided regarding desirable noise levels for external amenity spaces associated with dwellings. The various values from BS 8233:2014 are summarised in Table 8.11.

Table 8.11 Summary of guideline values from BS 8233:2014

Recommended Level/Situation	Time Period	Desirable Noise Level not to be exceeded (dB)
Inside Bedrooms and Living Rooms	Day (07:00 – 23:00)	35 - 40 dB $L_{Aeq,T}$
Inside Bedrooms	Night (23:00 – 07:00)	30 - 35 dB $L_{Aeq,T}$
Inside Dining Room/area	Day (07:00 – 23:00)	40 - 45 dB $L_{Aeq,T}$
Outside Amenity Space	Day (07:00 – 23:00)	50 - 55 dB $L_{Aeq,T}$

8.3.49 It should be noted that the lower values shown in the table above are generally regarded as the LOAEL for steady external noise, i.e. no adverse effect due to the noise impact would be expected. If the noise has character, it might be appropriate to consider a lower value (e.g. 5dB) as the LOAEL.

8.3.50 The World Health Organisation's Guidelines for Community Noise[19] have been used to consider the potential impact from any maximum short-term noise levels arising from operational activities at the Main Site at night. The guidelines state that, for a good sleep, indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10–15 times per night. This equates to a level at the outside façade of 60 dB L_{AFmax} assuming the noise reduction with a window partially open is 15 dB. It is generally accepted that this criterion is a LOAEL.

8.3.51 The Institute of Environmental Management and Assessment (IEMA) published their Guidelines for Environmental Noise Impact Assessment in 2014[20]. The document describes the recommended process for undertaking such assessments. It notes that the extent of the effects of noise impact can rarely be determined solely by the difference between current and future noise levels, and that there are other factors to consider when determining the effect. These principles have been followed in this assessment.

[18] BS 8233:2014: Guidance on sound insulation and noise reduction for buildings, BSI (2014)
[19] Guidelines for Community Noise, WHO (1999)
[20] Guidelines for Environmental Noise Impact Assessment, IEMA (2014)

Receptors

8.3.52 As the Proposed Development comprises several different elements, not all receptors will be affected by the same sources of noise and not all receptors will be affected by vibration. Therefore, the potential impacts have been considered at different receptors locations depending on which sources might affect them.

8.3.53 The receptors that have been considered for each element of the assessment are shown in Table 8.12. These are also shown in Appendix 8.6

Table 8.12 Receptors Considered in Assessment

Receptor	Construction Noise (TBC)	Operational Rail Noise	Operational Noise from SRFI (TBC)	Road Traffic Noise	
				Main Site	Roade Bypass
R1 Woodpecker Way		Y	-	Y	-
R2 Northampton South SUE W		Y	Y	Y	-
R3 Northampton South SUE S		Y	Y	Y	-
R4 Collingtree Ct		-	Y	Y	-
R5 Collingtree Ct		-	Y	Y	-
R6 Waterling Ln		-	-	Y	-
R7 Windingbrook Ln		-	-	Y	-
R8 Hilton West		-	Y	Y	-
R9 Hilton East		-	-	Y	-
R10 Saxon Ave		-	-	Y	-
R11 Holiday Inn West		-	Y	Y	-
R12 Maple Farm East		-	Y	Y	-
R13 Maple Farm South		-	Y	Y	-
R14 Collingtree Rd		-	Y	Y	-
R15 Collingtree Rd North		Y	-	Y	-
R16 Collingtree Rd South		Y	Y	Y	-
R17 Collingtree Rd West		Y	-	Y	-
R18 Collingtree Rd North		Y	-	Y	-
R19 Collingtree Rd South		Y	Y	Y	-
R20 Stockwell Way		Y	-	Y	-
R21 Barn Lane		Y	Y	Y	-
R22 Rectory Ln		-	-	Y	-
R23 Barn Ln		Y	Y	Y	-
R24 Lodge Farm		Y	Y	Y	-
R25 Barn Ln		Y	Y	Y	-
R26 Northampton Rd		-	-	Y	-
R27 Blisworth High St		-	-	Y	-

Receptor	Construction Noise (TBC)	Operational Rail Noise	Operational Noise from SRFI (TBC)	Road Traffic Noise	
				Main Site	Roade Bypass
R28 Courteenhall Rd		Y	Y	Y	-
R29 Northampton Rd West		-	Y	Y	-
R30 Northampton Rd East		-	-	Y	-
R31 Bridge Cottage North		Y	-	Y	-
R32 Bridge Cottage South		Y	-	Y	-
R33 Bridge Cottage West		-	-	Y	-
R34 Courteenhall West		-	-	Y	-
R35 Thorpewood Farm North		-	-	Y	-
R36 Thorpewood Farm South		-	-	Y	-
R37 Plain Woods Farm		-	-	-	Y
R38 Hyde Farm		-	-	-	Y
R39 Bailey Brooks Ln West		Y	-	-	Y
R40 London Rd		-	-	-	Y
R41 Blisworth Rd N		-	-	-	Y
R42 Dovecote Road		-	-	-	Y
R43 Abbots Way		-	-	-	Y
R44 Stratford Road 2		-	-	-	Y
R45 Northampton Rd		-	-	-	Y
R46 Blisworth Rd S-Left		-	-	-	Y
R47 Blisworth Rd S-Right		-	-	-	Y
R48 Hyde Rd		-	-	-	Y
R49 Dovecote Farm		-	-	-	Y
R50 Stratford Rd West		-	-	-	Y
R51 Stratford Rd East		-	-	-	Y
R52 Roade High St		-	-	-	Y
R53 Eliz Wood School		-	-	-	Y
R54 Ashton Rd W		Y	-	-	Y

8.3.54 With regard to the assessment of vibration from additional freight trains on the rail network, effects have been predicted at R18 (Collingtree Road) and R24 (Lodge Farm), the locations of which are shown in Appendix 8.6.

8.4 BASELINE CONDITIONS

Noise Surveys

8.4.1 To determine and quantify the existing baseline sound environment around the Main Site and Roade, the first round of baseline noise surveys were undertaken during September, October and November 2016. Following a review of the measured data and weather data from the initial surveys, a second round of monitoring was conducted in June and July 2017. This is discussed further below.

8.4.2 The primary source of noise in the area is from road traffic on the M1, which runs along the north-east boundary of the main site. The other main sources of noise are the West Coast Main Line and Northampton Loop railway lines, which run through the village of Roade and diverge just south of the main site, and local road traffic noise. Both railway lines are used by passenger and freight services.

8.4.3 The village of Collingtree, to the north-east of the main site, is on the southern outskirts of the urban area of Northampton. The properties in closest proximity to the development site are also close to the M1 and subsequently experience high levels of road traffic noise. There is also existing industrial and commercial development around Junction 15 of the M1.

8.4.4 The area to the south of the M1 around the Main Site and around Roade could be considered semi-rural, and is predominantly composed of farmland, villages and individual dwellings. All of which are affected to some extent by road traffic noise from the M1. Through the centre of Roade, there are high volumes of road traffic and consequently there are high levels of road traffic noise.

8.4.5 As noted above, following the first round of baseline surveys the results were reviewed along with measured weather data for the same period. This indicated that the wind direction was atypical for a large proportion of the survey's duration. The predominant wind direction in the UK is south-westerly, however during the first round of surveys there were several periods with northerly winds.

8.4.6 Wind direction can have a significant effect on noise levels. This can be particularly important when there is a dominant, static, and steady source of noise such as the M1. The effect of the wind is greater as the distance from the source increases. Noise levels generally increase downwind of the source, and decrease upwind of the source. Some of the noise indices measured will reflect the effect of different wind directions more than others. At positions which experience distant road traffic noise from the M1, the background noise level (LA90) could vary significantly with the wind direction. If there is local road or rail noise at the same positions, this will usually dominate the ambient noise level (LAeq) which consequently will show less variation with wind direction.

8.4.7 As a result, further baseline surveys were carried out in June and July 2017 to ensure that a robust set of measurement data that included noise levels representative of different wind directions had been collected. This was particularly important at locations surrounding the Main Site where the background noise level would be used in the assessment of operational noise from the SRFI. This second round of monitoring also

captured some locations where access could not be obtained in time for the first round of baseline surveys.

8.4.8 The dates of the surveys were chosen so that monitoring was not carried out during atypical periods, i.e. school or bank holidays.

8.4.9 The surveys comprised 15 static monitoring locations left unattended for the duration of the monitoring, and 8 locations where short-term attended measurements were undertaken. The locations were selected to be representative of the existing noise sensitive receivers around Proposed Development. At all measurement positions, the microphones were in the acoustic free field and at a height of 1.5 to 2.0 m above local ground level.

8.4.10 In addition, short-term measurements of road traffic noise were made at 3 locations to assist in verifying the road traffic noise model.

8.4.11 A summary of the survey dates, number of day and night-time periods recorded, and observations of main noise sources at each location are summarised in Table 8.13 for the unattended measurements, Table 8.14 for attended measurements, and Table 8.15 for the road traffic noise model verification measurements.

8.4.12 Plans showing the monitoring locations are provided in Appendix 8.7, and details of the monitoring equipment used are given in Appendix 8.8. Note that the monitoring location designations L3, S1, S2 and S9 were not used.

Table 8.13 Details of Unattended Noise Surveys

Unattended Survey Location		Survey Dates		No. of Full Continuous Periods Recorded		Observations of Main Noise Sources
		Start	End	Day (16hr)	Night (8hr)	
L1	Collingtree Road	14/10/16	28/10/16	13	14	Road traffic on Collingtree Road and M1; passenger/freight trains.
		13/06/17	27/06/17	13	14	
L2	Collingtree Court	14/10/16	31/10/16	16	17	Road traffic on M1.
L4	Barn Lane	29/09/16	13/10/16	13	14	Road traffic on M1 (distant); light aircraft overhead.
		13/06/17	27/06/17	13	14	
L5	Courteenhall Road	30/09/16	13/10/16	12	13	Road traffic on M1 (distant); passenger/freight trains.
		13/06/17	27/06/17	13	14	
L6	Lodge Farm	14/06/17	12/07/17	27	28	Passenger/freight trains; road traffic on M1 (distant).
L7	Collingtree Road	14/10/16	31/10/16	16	17	Passenger/freight trains; road traffic on Collingtree Road and M1.
		13/06/17	27/06/17	13	14	
L8	Hilton Hotel (west)	29/09/16	13/10/16	13	14	Road traffic on M1 and A45.
		14/06/17	27/06/17	12	13	
L9	Holiday Inn	30/09/16	13/10/16	12	13	Road traffic on M1.

Unattended Survey Location		Survey Dates		No. of Full Continuous Periods Recorded		Observations of Main Noise Sources
L10	Northampton Road	13/10/16	31/10/16	17	18	Road traffic on Northampton Road.
		13/06/17	27/06/17	13	14	
L11	Windingbrook Lane	14/10/16	31/10/16	16	17	Road traffic on A45 and M1.
		13/06/17	27/06/17	13	14	
L12	Woodleys Farm	02/11/16	18/11/16	15	16	Road traffic on Northampton Road; light aircraft overhead.
L13	Bailey Brooks Lane	01/11/16	18/11/16	16	17	Passenger/freight trains; road traffic on M1 (distant).
L14	Blisworth Road	01/11/16	18/11/16	16	17	Road traffic on A508, Blisworth Road and M1 (distant); passenger/freight trains.
L15	Dovecote Road	01/11/16	18/11/16	16	17	Road traffic on A508, Blisworth Road and M1 (distant); passenger/freight trains.
L16	Dovecote Farm	01/11/16	18/11/16	16	17	Road traffic on M1 (distant).

Table 8.14 Details of Attended Noise Surveys

Attended Survey Location		Date	Start Time	No. of Full 15min Intervals Recorded	Observations of Main Noise Sources
S3	Hilton Hotel (east)	30/09/16	11:51	3	Road traffic on A45.
		13/10/16	10:54	4	
S4	Rathvilly Farm	14/06/17	12:23	3	Passenger/freight trains; road traffic on M1 (distant).
		12/07/17	15:07	3	
S5	Stockwell Way	14/10/16	13:47	4	Road traffic on M1 and Collingtree Road; passenger/freight trains.
		31/10/16	10:44	3	
S6	Saxon Avenue	14/10/16	14:07	3	Road traffic on Saxon Avenue, Finney Drive, A45 and M1.
		31/10/16	10:44	3	
S7	Courteenhall	30/09/16	12:55	3	Road traffic on M1.
		13/10/16	11:05	3	
NML3	Bridge Cottage	30/09/16	10:29	3	Road traffic on Courteenhall Road and M1 (distant); passenger/freight trains.
		13/10/16	12:58	4	
NML4	Courteenhall Road	30/09/16	10:25	3	Road traffic on Courteenhall Road and M1 (distant); passenger/freight trains.
		13/10/16	12:57	3	
NML5	Northampton Road	14/06/17	14:58	3	Road traffic on Northampton Road.
		12/07/17	13:48	3	

Table 8.15 Details of Road Traffic Noise Surveys

Road Traffic Noise Survey Location		Date	Start Time	No. of Full 1hr Intervals Recorded	Observations of Main Noise Sources
S8	London Road	01/11/16	14:56	3	Road traffic on A508
S10	Stratford Road	01/11/16	13:42	3	Road traffic on A508
S11	Northampton Road	01/11/16	09:45	3	Road traffic on A508

8.4.13 A field calibration check was undertaken prior to and following each set of measurements and no significant drift in calibration was identified. All of the sound level meters (SLMs) and field calibrators used for the surveys were Class 1 approved and had been laboratory calibrated within 2 years in the case of the SLMs, and within 1 year for the calibrators.

8.4.14 The results of the surveys are presented in Appendix 8.9. Time history graphs have been produced for the long-term unattended survey locations, and tables provided summarising the measured noise levels at the short-term attended and road traffic noise survey locations.

8.4.15 A weather station was installed near position L5 to log the precipitation, wind speed and wind direction from 9th October 2017 to the end of the survey period. Prior to this date, and to cover any gaps in the data caused by downloading our weather station, a nearby weather station (INORTHAM9) for which data is publicly available, has been used to provide the relevant information.

8.4.16 The noise data will be analysed alongside the prevailing weather conditions to exclude periods where data is like to have been contaminated by high wind speeds and precipitation. Furthermore, given the strong influence of wind direction on the measured sound levels at several of the monitoring (and receptor) positions, the data will also be analysed for wind direction. Once analysed, typical baseline noise levels will be derived which will be used to assess the potential operational noise impacts from the SRFI. This analysis is ongoing and will be fully reported in the final ES Chapter. In the interim, an initial analysis based upon wind direction has been undertaken to provide an indication of the background sound levels for the assessment of noise from the SRFI. This is discussed further below.

8.4.17 The NPSNN identifies that applicants should consider opportunities to address the noise issues associated with the Important Areas as identified through the noise action planning process. The following important areas have been identified near the Proposed Development:

- Properties adjacent to the existing railway track in Roade (railway noise);
- A section of the A508 through Roade (road traffic);
- High Street, Collingtree at the properties adjacent to the M1 (road traffic).

8.4.18 The locations of these Important Areas are shown in Appendix 8.11 in Figures 1, 2 and 3 respectively.

Indicative Background Sound Levels

8.4.19 As discussed previously, the assessment of operational noise impacts from the SRFI is based on the difference between the predicted sound level from operational activities and the existing background sound level (LA90). BS 4142:2014 states that it is important to ensure that the background sound levels used in the assessment are reliable and suitably represent the particular circumstances and periods of interest. The objective is to quantify what is typical during the periods when the noise sources would be operational rather than ascertaining the lowest background sound level.

8.4.20 To determine the indicative background sound levels for the initial assessment of noise from the SRFI, the frequency of occurrence of the different measured background sound levels was examined.

8.4.21 As the wind direction has a strong influence on the measured levels at several monitoring locations, and the surveys captured a range of conditions, the noise levels were split into two data sets;

- Southerly to westerly winds (i.e. any wind from west, west south west, south westerly, south south westerly or southerly winds).
- North westerly to south easterly winds (i.e. any wind from west north west, north west, north north west, north, north north east, north east, east north east, east, east south east, south east, south south east).

8.4.22 In general, for monitoring positions to the south of the M1, south westerly winds result in lower background sound levels due to motorway noise being blown away from the monitoring position. However, these same conditions would cause higher background sound levels at monitoring positions to the north of the M1. For locations north of the M1 background levels would be lower under northerly and easterly winds, but higher for monitoring positions to the south of the M1.

8.4.23 Based on the analysis undertaken to date, a background sound level for each monitoring position has been initially selected by identifying the most commonly occurring LA90,15 minute values for the day (07.00- 23.00) and night (23:00 – 07:00) periods. These values are presented in Appendix 8.5. The appendix also identifies the most relevant monitoring location for each receptor location.

8.4.24 Further analysis to determine the final set of background sound levels to use in the assessment is ongoing and will be reported in the final ES chapter.

Vibration Survey

8.4.25 As identified above, receptors in proximity to the Northampton Loop are already exposed to frequent passenger and freight train passes. At the closest receptors to the lines, vibration from the train passes is experienced.

8.4.26 To determine and quantify the existing levels of vibration generated by both freight and passenger trains currently using the Northampton Loop, Vibration Dose Value (VDV) measurements of train passes were undertaken at two of the closest receptors. These are shown as locations V1 and V2 on the monitoring location plan in Appendix 8.7. These measurements will also be used to help predict the potential increase in perceptible vibration at sensitive receptors due to additional freight trains on the Northampton Loop.

8.4.27 Measurements were carried out following the principles of BS 6472-1:2008. A triaxial accelerometer was attached to a mounting plate conforming to the German standard DIN 45669-2. At V1 the mounting plate was placed in the middle of a concrete slab used for car parking on the side of the residence closest to the railway. At V2 it was placed on a concreted yard/driveway area in-line with the closest point of the residence to the track. Both positions are considered representative of the floor vibration experienced inside the properties.

8.4.28 Both monitoring locations were to the west of the railway, and so closer to the northbound line. V1 was approximately 22 m to the centre of the northbound track, and V2 was approximately 87 m.

8.4.29 A measurement was started as a train approached the monitoring location and stopped as it moved away.

8.4.30 The measurements indicated that the weighted acceleration in the vertical axis was the dominant direction of vibration. In accordance with BS 6472-1:2008, only this axis has been considered further.

8.4.31 The number and type of the measured train passes along with the average and maximum VDV_b results for each train type are summarised in Table 8.16.

Table 8.16 Summary of Measured VDV_b Levels for Train Passes

Survey Location	Train Type	Northbound (nearside)			Southbound (farside)		
		No. of Passes	Avg, VDV_b	Max, VDV_b	No. of Passes	Avg, VDV_b	Max, VDV_b
V1	Freight	4	0.016	0.019	3	0.008	0.011
	Passenger (4 carriage)	14	0.009	0.012	13	0.005	0.006
	Passenger (8 carriage)	-	-	-	3	0.007	0.008
	Passenger (12 carriage)	1	0.011	0.011	-	-	-
V2	Freight	3	0.004	0.004	3	0.004	0.004
	Passenger (4 carriage)	4	0.001	0.002	4	0.003	0.003

8.5 Anticipated Likely Impacts and Effects

Construction Noise

8.5.1 Construction activity has the potential to cause short-term disturbance at the surrounding noise sensitive receptors. The assessment of construction noise impacts is yet to be completed in detail, but the assessment is being informed by the ongoing work regarding the phasing of works on the main site.

8.5.2 Construction work within the development site would generally be confined to the following hours;

- 07:00 – 19:00 hours Monday to Friday
- 07:00 – 16:00 hours on Saturdays

8.5.3 All deliveries would also have to comply with the same time restrictions, except for any large items of plant which are typically required to arrive when there is generally less traffic on the roads. Site personnel would be permitted to access the site shortly before and after these hours.

8.5.4 Some out of hours works may be required in exceptional circumstances. These might include long concrete pours, which cannot be interrupted once started and the power floating of the rail terminal which has to be undertaken within a certain time window after the concrete is poured. These works will be appropriately managed to minimise potential noise emissions.

8.5.5 Some construction works outside of the Main Site will require works outside of these hours and at night to comply with the requirements of Highways England. Again, these works will be appropriately managed to minimise potential noise emissions.

8.5.6 The outline construction programme indicates that the majority of construction activity (highway works, bulk earth works, landscaping, road construction and rail terminal) are expected to occur during a 3 year period. Depending on the rate of take up of the development plots, work on constructing the warehouse buildings could extend for a further two years beyond this period. However, by this time the inherent mitigation will have been erected and it is unlikely the construction of the warehouse units would generate any significant effects.

8.5.7 The effects of construction noise will vary considerably during the different phases of works depending on the tasks being undertaken and where works are concentrated within the development site. The worst impacts are likely to occur towards the start of the construction period and when construction activity is taking place on parts of the site which are in closest proximity to the noise sensitive receivers. These initial works include the creation of the landscaping bunds. As they are being built, the temporary noise impacts from construction will increasingly be screened by the bunding, which will reduce the noise impact of other construction works at the noise sensitive receivers.

8.5.8 Whilst there are a number of individual properties in proximity to the Main Site boundary, properties on the outskirts of Milton Malsor are approximately 300m from the boundary. This distance will assist in reducing the construction noise impacts at these locations.

Given the high ambient noise levels from the M1 at receptors to the north of the M1, it is unlikely that any significant temporary effects would arise from construction activities at the main site.

8.5.9 Prior to the appointment of a construction contractor, detailed information regarding the programme and methods of construction is not known. Consequently, the potential impact of the construction works at the application site will be predicted for various noise sensitive receptors based on preliminary estimates of the likely construction plant and machinery that would be needed for the anticipated site activities. These predictions will be based upon the methodology within Annex F section F2.2 of BS 5228-1:2009+A1:2014, and the results presented in the final version of the ES. Where required, appropriate mitigation measures will be identified in line with the principles of best practicable means and the guidance in BS 5228-1:2014.

8.5.10 As with the operational phase, construction site traffic will approach the site using the A508 Northampton Road. The total number of daily vehicle movements generated by construction works at the SRFI is anticipated to be smaller than that generated by the operation of the Proposed Development. Therefore, the construction traffic noise impact will be no worse than that predicted for the Main Site and consequently no significant effects are anticipated.

Construction Vibration

8.5.11 Of the anticipated works that would be required to construct the development, it is only piling that may give rise to vibration that may adversely affect nearby receptors.

8.5.12 It is understood that the only element of the scheme for which piling works would be required is constructing the foundations of the bridge over the railway line for the Roade Bypass. The bridge is proposed to be approximately 110m from the nearest receptors located off Bailey Brooks Lane.

8.5.13 The propagation of vibration will depend upon the piling method, the equipment used, the soil and geology type. Consequently, it is difficult to predict in detail the likely impacts at this stage. However, it has previously been found that, in general, no material vibration impacts occur when the distance to the nearest receiver is over 100m. Consequently, no significant effects are expected in this case.

Operational Rail Noise

8.5.14 The predicted operational noise levels from rail activity on the Northampton Loop and Weedon Line are presented in Table 1 (16 hour day) and Table 5 (8 hour night) of Appendix 8.13 for the relevant receptor locations. This Appendix also contains assessment tables for each scenario for the day and night time periods.

8.5.15 It can be seen from Tables 2 to 4 of Appendix 8.13, that during the day time period, there is generally only a small difference between the predicted noise levels for the Do Something and Do Minimum scenarios. This indicates that the additional freight trains

associated with the SRFI would have little impact on the overall noise level from rail activity likely to be experienced at the receptor locations.

8.5.16 The day time assessment of operational rail noise for every scenario indicates that the highest change in noise level would be an increase in the $L_{Aeq,16h}$ value of 0.2 dB. In accordance with the criteria set out in Table 8.4, this is a negligible impact and consequently there is not expected to be any significant effect.

8.5.17 As all receptor locations are predicted to have either no change in noise level or, at worse, a negligible impact magnitude, no significant effects are expected as a result of additional freight train movements associated with the Proposed Development during the day time period.

8.5.18 A similar pattern is evident in the night time assessment as shown in Tables 6 to 8 of Appendix 8.13. The highest change in noise level is an increase of 0.8 dB in the L_{night} noise exposure which is expected to occur in 2043 at location R54, Ashton Road. This relatively higher increase is due to a greater level of activity expected during the night time period. According to Table 8.5, the magnitude of this impact is negligible and consequently no significant effect is expected.

8.5.19 Therefore, at all receptor locations no significant effects are expected as a result of additional freight train movements associated with the Proposed Development during the night time period.

8.5.20 The Roade Cutting geological SSSI is also identified as a potential Local Wildlife Site. It is anticipated that the additional freight train activity would have a negligible impact at this location and therefore no significant effect on the wildlife site would be expected.

8.5.21 In terms of overall impact, those currently affected may notice the increase in movements due to the operation of the Proposed Development. However, as this assessment has shown, no additional adverse effect is anticipated. Consequently, no specific mitigation measures are required to address the noise from the operational rail noise.

8.5.22 No properties would be eligible for noise insulation under the Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996 as the qualifying criteria are not met at any residential properties.

8.5.23 As identified in paragraph 5.200 of the NPSNN, applicants should consider opportunities to address noise issues associated with Important Areas. Receptors R31, 32, 33 and 54 are most representative of the properties in the Important Area adjacent to the railway line (as shown in Appendix 8.11). The predicted levels show that the proposed development would result in an increase in railway noise of up to 0.1 dB during the day time period, and up to 0.2 dB during the night time period at R31 to R33 (Bridge Cottage). At R54, representative of the new housing development off Ashton Road in Roade, the proposed development is predicted to result in a 0.2 dB increase in railway noise during the day and a 0.8 dB increase during the night. These increases are negligible and consequently no significant adverse effects are expected.

8.5.24 Given the expected impact and the nature of the scheme there is no opportunity to address further the noise issues associated with this Important Area.

Operational Rail Vibration

8.5.25 The predicted vibration dose values (VDVs) at receptors R18 Collingtree Road and R24 Lodge Farm, for each scenario are presented in Table 8.17 and 8.18 for the day and night time periods respectively. These predictions are based on the maximum VDVs for passenger and freight trains measured during the baseline survey at each receptor location.

Table 8.17 Predicted VDV for the day time period based on maximum measured VDV for each train type

Receptor	Predicted VDV,b Day m s $^{-1.75}$						
	2017 Baseline	2021 DM	2021 DS	2033 DM	2033 DS	2043 DM	2043 DS
R18 Collingtree Rd	0.05	0.05	0.05	0.05	0.05	0.05	0.06
R24 Lodge Farm	0.01	0.01	0.01	0.01	0.01	0.01	0.02
Note: DM = Do Minimum, DS = Do Something							

Table 8.18 Predicted VDV for the night time period based on maximum measured VDV for each train type

Receptor	Predicted VDV,b Night m s $^{-1.75}$						
	2017 Baseline	2021 DM	2021 DS	2033 DM	2033 DS	2043 DM	2043 DS
R18 Collingtree Rd	0.03	0.03	0.03	0.04	0.04	0.04	0.04
R24 Lodge Farm	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Note: DM = Do Minimum, DS = Do Something							

8.5.26 It can be seen from Tables 8.17 and 8.18, that there is very little difference between the predicted VDVs for the Do Minimum and Do Something scenarios. There is also very little difference between the predicted VDVs for the 2017 Baseline and the 2043 Do Something scenario when freight trains associated with the SRFI are expected to be at their highest intensity. This indicates that the additional freight trains associated with the SRFI would be expected to have little impact on the overall VDVs likely to be experienced at the receptor locations.

8.5.27 Table 8.17 also indicates that the highest VDV for the day time is expected to occur at receptor R18 in the 2043 Do Something scenario, where the predicted value is 0.06 ms$^{-1.75}$. In accordance with the criteria in Table 8.6 this is below the level at which there is a low probability of adverse comment due to vibration. It is considered to be a negligible impact and is below the LOAEL. Therefore, no significant adverse effect would be experienced from the overall increase in vibration during the day time period.

8.5.28 For the night time period, Table 8.18 indicates that the highest VDV would be expected to occur at R18 in the 2043 Do Something scenario, where the predicted value is 0.04 ms^{-}

$^{1.75}$. This is below the level at which there is a low probability of adverse comment due to the vibration, is below the LOAEL and is considered to be a negligible impact. Therefore, no significant adverse effect would be experienced from the overall increase in vibration during the night-time period.

Operational Road Traffic Noise – Main Site

8.5.29 The predicted noise levels at the relevant receptors arising from road traffic using the road network surrounding the Main Site are presented in Appendix 8.14 for the 2015 Baseline, 2031 Do Minimum and 2031 Do Something scenarios. Work is still ongoing with regard to the 2021 Do Minimum and 2021 Do Something scenarios.

8.5.30 It can be seen from Table 1 of Appendix 8.14, that during the day time period the change in road traffic noise exposure at the receptor locations between the 2031 Do Minimum and 2031 Do Something scenarios is expected to be relatively small. In accordance with the criteria set out in Table 8.9, this would result in negligible impacts at worse. Furthermore, several receptors would be expected to experience a small decrease in road traffic noise. At receptor R13 Maple Farm (south façade) a minor beneficial impact is predicted due to the screening that will be provided by the Main Site between that receptor and the M1. As the magnitude of impact at all receptor locations is negligible at worst, no significant effects are expected during the daytime as a result of traffic associated with the Main Site.

8.5.31 Table 2 of Appendix 8.14 presents the change in road traffic noise between the 2031 Do Minimum and 2031 Do Something Scenarios for the 8 hour night time period. Using the criteria in Table 8.10, the expected magnitude of impact is negligible at worse. Minor beneficial impacts are anticipated at several receptor locations, especially those where the development at the Main Site will provide screening against road traffic noise from the M1. Based on the magnitude of impact at all receptor locations it is not expected that the change in night-time road traffic noise associated with the proposed development would have any significant adverse effects.

8.5.32 No properties would be eligible for noise insulation under the Noise Insulation Regulations 1975 (amended 1988) as the qualifying criteria are not met at any residential properties.

8.5.33 Given the magnitude of impacts there is no requirement to consider specific mitigation measures to reduce the level of impact.

8.5.34 As identified in paragraph 5.200 of the NNNPS, applicants should consider opportunities to address noise issues associated with Important Areas. Receptors R4 and R5 are most representative of the properties in the Important Area in Collingtree for road traffic noise (shown in Appendix 8.11). The predicted levels show that the proposed development would result in no increase in road traffic noise at these receptors during the day time period and up to a 0.1 dB increase during the night time period. As identified above, these impacts are negligible and consequently no significant adverse effects are expected. Given that, at these receptors, the noise levels are dominated by road traffic noise using the M1, the scheme does not provide any opportunity to address further the noise issues associated with this Important Area.

Operational Noise from SRFI Activities at the Main Site

8.5.35 The predicted operational noise levels from the SRFI are presented in Appendix 8.15 together with the comparison against the relevant baseline noise levels. For the day time assessment period the assessment has been undertaken for the peak hour of the day and for the night time assessment period the assessment considers a 15 minute period during the peak hour at night.

8.5.36 The predictions reflect the level of operational activity when the site has reached capacity and all units are operational. As discussed, there is ongoing analysis of the background noise levels so the levels presented are indicative. Furthermore, the predicted noise levels currently exclude noise from the gantry cranes, reach stackers and telehandlers at the rail terminal, as modelling work is still ongoing for these sources.

8.5.37 BS 4142:2014 states that where certain acoustic characteristics are likely to be audible at the receiving location, these features should be taken into account by corrections added to the specific noise level. As there are still elements of the assessment where work is ongoing, as a cautious approach, the 3 dB correction for 'other sound characteristics' has been applied to the assessments regardless of the difference between the background sound level and the rating level.

8.5.38 Table 1 and 2 of Appendix 8.15 present the day time and night time operational noise assessment against the background sound levels under southerly to westerly wind conditions. This is the prevailing wind direction for the UK and is also the conditions under which background sound levels would be lower, and hence the impact potentially greater, for receptors to the south of the M1.

8.5.39 Table 1 (Appendix 8.15) indicates that at all receptor locations, the rating level does not exceed the background sound level during the day time assessment period. At most locations it is at least 10 dB below the background sound level. The smallest differences between the rating and background levels occur at R21, R23, R24 R25 and R28 (Barn Lane and Courteenhall Road) where the background sound levels are generally lower than at other receptor locations. According to BS 4142:2014, this would indicate less than a 'low' impact. Therefore, under southerly to westerly wind conditions the overall impact during the day is negligible and no significant adverse effect is expected. It should also be noted that as the prediction methodologies inherently assume downwind propagation from the source to the receiver, for properties to the south of the SRFI, a south westerly wind would reduce the propagation of noise towards these receptors, so the levels experienced may be lower than presented.

8.5.40 For the night time assessment period, it can be seen from Table 2 (Appendix 8.15) that at all receptors except R28 (Courteenhall Road), the rating level does not exceed the background sound level. Although, because the background sound levels during the night are generally lower than during the day, the differences between the background and the rating level for the night time assessment are generally smaller than during the day time assessment period. According to BS 4142:2014, this would indicate less than a 'low' impact at these receptor locations. Therefore, under southerly to westerly wind conditions the overall impact during the night is negligible and no significant adverse effect is expected at these receptor locations.

8.5.41 At location R28 the rating level during the peak 15 minutes at night is anticipated to exceed the background sound level by 3 dB(A). According to the standard this would be above a 'low' impact but below the level at which an 'adverse' impact is likely. Taking the context into account, as required by the standard, the predicted specific level is 35 dB(A). Assuming a 12 dB(A) noise reduction through a partially open window, the BS 8233:2014 guideline internal criteria would be met and no adverse impact would be expected.

8.5.42 Tables 3 and 4 of Appendix 8.15 present the day time and night time assessment under north westerly to south easterly wind conditions. Under these conditions the background noise levels at receptors to the south of the M1 are likely to be higher as motorway noise will be higher due to the receptors being downwind of the source. For receptors north of the M1 the baseline levels may be lower due to being upwind of the M1.

8.5.43 Table 3 (Appendix 8.15) indicates that, during the day assessment time period at all receptor locations the rating level does not exceed the background sound level and at most locations it is at least 10 dB below the background sound level. According to BS 4142:2014, this would indicate less than a 'low' impact. Therefore, under north westerly to south easterly wind conditions the overall impact during the day is negligible and no significant adverse effect is expected.

8.5.44 For the night time assessment period, it can be seen from Table 4 (Appendix 8.15) that at all receptors, the rating level does not exceed the background sound level. According to BS 4142:2014, this would indicate less than a 'low' impact at most receptor locations. Therefore, under north westerly to south easterly wind conditions the overall impact during the night is negligible and no significant adverse effect is expected.

8.5.45 Overall, the initial assessment of operational noise from the SRFI indicates that the impacts would be negligible and no significant adverse effect would occur.

Operational Road Traffic Noise - Roade Bypass

8.5.46 The predicted noise levels at the relevant receptors from road traffic related to the proposed Roade Bypass are presented in Appendix 8.16 for the 2015 Baseline, 2031 Do Minimum and 2031 Do Something scenarios. Appendix 8.17 also illustrates graphically the change in noise level during the day time between the 2031 Do Minimum and 2031 Do Something scenarios.

8.5.47 Table 1 of Appendix 8.16 and Appendix 8.17 indicate that, with the proposed bypass, there is predicted to be a notable decrease in road traffic noise at properties in the centre of Roade resulting from a reduction in traffic volume through the village. This predicted decrease in exposure of between 7.2 and 9.6 dB $L_{Aeq,16h}$ would, according to Table 8.9 result in a moderate beneficial impact at receptors in the centre of Roade (R44, R50 and R51).

8.5.48 Table 1 (Appendix 8.16) also shows that during the day time period, properties on the outskirts of Roade, in closest proximity to the bypass, would experience an increase in noise exposure. The predictions indicate that moderate adverse impacts are expected at R38 (Hyde Farm), R39 (Bailey Brooks Lane West), R41 (Blisworth Road N), R46 (Blisworth Road S-right), and R49 (Dovecote Farm). The worst affected receptors are R38

and R46 where increases of 8.9 dB and 8.6 dB are predicted. The absolute noise levels for the 2031 Do Something scenario are predicted to be either below the LOAEL or between the LOAEL and SOAEL. According to Table 8.9, this impact is not significant.

8.5.49 At the remaining receptor locations, the change in noise level is expected to result in minor adverse (R37 and R42) or negligible impacts. Appendix 8.17 illustrates that, with the proposed bypass, the vast majority of dwellings in Roade, are predicted to experience a change in noise level of between -3 dB to + 3dB, which is classed as a negligible impact. It is considered that there would be no significant effects at these receptor locations.

8.5.50 Table 2 of Appendix 8.16 presents the change in road traffic noise between the 2031 Do Minimum and 2031 Do Something Scenarios for the 8-hour night time period. The change in noise level at the receptor locations is generally similar to the day time period, although at some receptors e.g. R38, a higher change in noise level is predicted due to the receptor height being 4.5m to represent bedroom windows.

8.5.51 According to the assessment criteria set out in Table 8.10, major beneficial impacts are anticipated through the centre of Roade (R44, R50 and R51).

8.5.52 Properties on the outskirts of Roade in closest proximity to the bypass (R38, R41 and R46) are predicted to experience a major adverse impact during the night time period. Moderate and minor adverse impacts are also predicted at several locations on the outskirts of Roade. At all receptor locations, the predicted absolute level under the 2031 Do Something scenario are either below the LOAEL or between the LOAEL and SOAEL. According to the criteria set out in Table 8.10, this is not a significant effect. Having said that, in line with government policy, mitigation should be considered to minimise the magnitude of impact at those dwellings which are predicted to experience a major adverse impact.

8.5.53 No properties would be eligible for noise insulation under the Noise Insulation Regulations 1975 (amended 1988) as the qualifying criteria are not met at any residential properties.

8.5.54 As identified in paragraph 5.200 of the NNNPS, applicants should consider opportunities to address noise issues associated with Important Areas. The centre of Roade is one such Important Area and, as has been demonstrated, a beneficial impact has been identified during both the day and night time for those properties in the vicinity of that important area as a result of the proposed by-pass (see Appendix 8.17).

8.5.55 Consequently, the impact of road traffic noise in the Important Area will be reduced.

Summary

8.5.56 A summary of the impacts and effects is presented in Table 8.19 below. These are the effects in the absence of any further mitigation beyond that already designed into the scheme:

Table 8.19 Summary of Likely Effects

Description	Receptors	Impact Magnitude	Significant?	Mitigation required?
Construction Noise	TBC	TBC	TBC	TBC
Construction Traffic Noise	All	Negligible at worst	No	No
Construction Vibration	All	N/A	No	No
Operational Noise from SRFI - Day	R2, R3, R4, R5, R6, R8, R11, R12, R13, R14, R15, R16, R17, R19, R21, R23, R24, R25, R28, R29	Low / Negligible	No	No
Operational Noise from SRFI - Night	R2, R3, R4, R5, R6, R8, R11, R12, R13, R14, R15, R16, R17, R19, R21, R23, R24, R25, R28, R29	Low / Negligible	No	No
Operational Rail Noise from increased train activity	R1, R2, R3, R15, R16, R17, R18, R19, R20, R21, R23, R24, R25, R28, R31, R32, R33, R39 and R54	Negligible or No change	No	No
Operational Rail Vibration	R18 and R24	Negligible	No	No
Main Site - Road Traffic Noise - Day 2031	R13	Minor Beneficial	No	No
	R1, R2, R4, R5, R9, R12	No Change	No	No
	R3, R6, R7, R8, R10, R11, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35 and R36	Negligible	No	No
Main Site - Road Traffic Noise – Night 2031	R13, R14, R16, R23, R24, R25, R28, R31, R32, R33	Minor Beneficial	No	No
	R1, R3, R8, R9, R12, R26	No Change	No	No
	R2, R4, R5, R6, R7, R10, R11, R15, R17, R18, R19, R20, R21, R22, R27, R29, R30, R34, R35, R36	Negligible	No	No
Roade Bypass – Road Traffic Noise – Day 2031	R44, R50, R51	Moderate Beneficial	No	No
	R40	Minor Beneficial	No	No
	R43, R45, R47, R48, R52, R53, R54, R55, R56	Negligible	No	No
	R37, R42	Minor Adverse	No	No
	R38, R39, R41, R46, R49	Moderate Adverse	No	No
Roade Bypass – Road Traffic Noise – Night 2031	R44, R50, R51	Major Beneficial	No	No
	R40	Moderate Beneficial	No	No
	R52	No Change	No	No

Description	Receptors	Impact Magnitude	Significant?	Mitigation required?
	R45, R54, R55, R56	Negligible	No	No
	R43, R47, R48, R53	Minor Adverse	No	No
	R37, R39, R42	Moderate Adverse	No	No
	R38, R41, R46, R49	Major Adverse	No	Yes

8.6 MITIGATION

8.6.1 The assessment likely significant effects has identified that no significant adverse effects are anticipated from operational rail noise or vibration, operational activities at the SRFI or road traffic associated with the Main Site and the proposed Roade Bypass.

8.6.2 However, a few properties on the outskirts of Roade are expected to experience major adverse impacts as a result of the proposed Bypass. In line with government policy, mitigation is being considered to minimise the magnitude of impact at those dwellings which are predicted to experience a major adverse impact. At the time of writing, the assessment is continuing with a view to optimising the overall mitigation package provided to reduce the magnitude of these impacts. Consideration is being given to the use of additional bunding, and targeted use of acoustic fencing at the Bypass site. Therefore, the effects presented above are likely to be worst-case in the absence of further specific mitigation measures.

8.6.3 Work is still ongoing with regard to the likely construction noise and vibration effects and finalising the likely effects of operational noise from the SRFI. If the assessments indicate that mitigation is required to minimise the adverse impacts, appropriate measures will be proposed. For construction noise this is likely to be in the form of temporary site hoardings, selection of appropriate equipment and appropriate management of noisier tasks during working hours. For operational noise effects from the SRFI, likely mitigation measures would be use of additional bunding and acoustic fencing.

8.7 FURTHER WORK

8.7.1 The following tasks are being undertaken in relation to the noise and vibration assessment:

- Prediction and assessment of 2021 Do Minimum and Do Something scenarios for Road Traffic noise (capturing any changes to the traffic data following the wider review of the traffic models with NCC).
- Determination of residual and cumulative effects.
- Proposals for noise and vibration monitoring during the construction and operational phases.