Middlesbrough Council

Stainton Way/Dixons Bank Widening

Noise and Vibration Assessment

AAc/251434-00/R01

Issue | 16 November 2018

Job number 251434-00

Ove Arup & Partners Ltd
1 West Regent Street
Glasgow G2 1RW
United Kingdom
www.arup.com

ARUP

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Executive Summary

Arup has been appointed to carry out a Noise Impact Assessment to assess the potential significant effects arising from the widening of the carriageways on Stainton Way and Dixons Bank. This report covers the assessment of effects associated with the construction and operation of the proposed scheme.

The assessment is undertaken following best practice guidance and following consultation with the Middlesbrough Borough Council. A 3D traffic noise prediction model has been built to enable an assessment in line with the Design Manual of Road and Bridges requirements for a 'Simple Assessment'. The model includes traffic flow information, topography of the site and proposed scheme, and receptor details as given in the Ordnance Survey Address Base Plus.

This report is an update to the original report AAc/251434-00/R01. The update was required as it reports the assessment of the effect that arises from replacing the Hot Rolled Asphalt (HRA) road surface of Stainton Way and Dixons Bank with Stone Mastic Asphalt (SMA), which is a low road noise surface.

A noise baseline survey has been also carried out to establish the prevailing conditions of the site, and to validate the predictions of the traffic noise prediction model.

It has been concluded that neither the construction or operation of the proposed scheme, would give rise to new significant effects. However, it has been identified that there are existing receptors which are exposed to relatively high levels of noise and therefore mitigation measures are recommended as a scheme enhancement to eliminate such effects.

As for construction noise, it is assumed that a Code of Construction Practice or similar will be employed, where Best Practicable Means are presented and described.

1 Introduction

This report is set out in the same format as the previous report for ease of cross reference and describes the noise and vibration assessment and the likely environment impacts of the proposed Stainton Way/Dixons Bank widening project, which takes place to the south of Middlesbrough, England.

The following sections describe the baseline noise climate, assessment methodology, results and conclusions for a 'Simple' assessment of the Scheme according to the Design Manual for Roads and Bridges (DMRB) HD 213/11. Potential noise effects have been considered for both construction and operation of the Scheme. Details of proposed mitigation measures and an assessment of residual noise impacts and effects are presented.

Appendix A of this report, includes the glossary of acoustics terminology, details of the baseline noise survey, details on the approach to assessment of effects of operational road traffic noise, assumptions on construction noise and results of the operational noise model including grid noise maps and tabulated levels.

2 Legislative and Policy Framework

The following sub-sections set out the legislation, policy, regulations, guidance and standards that are considered relevant to this assessment.

2.1 Legislation

Relevant legislation includes the Control of Pollution Act 1974[1], the Environmental Protection Act 1990, the Noise and Statutory Nuisance Act 1993[2] and the Land Compensation Act 1973[3], all as amended.

This legislation provides the foundation stones for the Government's noise policy described below. The noise and vibration assessment and envisaged mitigation have been informed by this legislation. Specific references have been made to sections of legislation as necessary. As defined in Section 72 of the Control of Pollution Act, 'Best Practicable Means' are a requirement and prior consent for the construction method and steps to minimise noise will be sought from local authorities under Section 61 of the Control of Pollution Act[1].

[1] Available at: https://www.legislation.gov.uk/ukpga/1974/40
[2] Available at: http://www.legislation.gov.uk/ukpga/1993/40/contents
[3] Available at: https://www.legislation.gov.uk/ukpga/Eliz2/9-10/33/contents

2.2 National Policy

The Government's noise policy is set out in the Noise Policy Statement for England (NPSE) [4]. In legislative and policy terms noise is taken to include vibration.

Government noise policy sets out three aims, which are to be met within the context of government policy on sustainable development:

- to avoid significant adverse impacts on health and quality of life;
- to mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.

The same three aims are also reflected in:

- NPPF (National Planning Policy Framework);
- Planning Practice Guidance – Noise (PPG-Noise)[5]; and
- NPSE.

PPG-Noise[5] provides guidance on the application of government noise policy. PPG-Noise[5] notes that unacceptable adverse effects on health and quality of life due to noise exposure (set at a level higher than significant adverse impacts on health and quality of life) should be 'prevented'.

Thresholds for identifying policy adverse effect levels[6] are not defined numerically in any government document, rather they are to be established specifically for each scheme and context. The values adopted for this assessment are summarised in Section 8.

The thresholds adopted for noise policy adverse effect levels have been applied following the precedent set out in recent major infrastructure schemes (e.g. A14 Cambridge to Huntingdon Improvement Scheme, High Speed 2 and the Thames Tideway Tunnel).

In addition to government noise policy, the scope and methodology for this assessment has also taken account of relevant guidance, particularly DMRB HD 213/11 as described below.

2.3 Regulations

Relevant regulations include the Noise Insulation Regulations 1975 (NIR)[7] as amended (daughter regulations to the Land Compensation Act 1973), the

[4] Defra, 2010. Noise Policy Statement for England (NPSE). Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf
[5] Available at: https://www.gov.uk/guidance/noise--2
[6] By 'policy adverse effect levels' it is meant adverse effects, significant adverse effects and unacceptable adverse effects on health and quality of life

[7] Available at: https://www.legislation.gov.uk/uksi/1975/1763/contents/made

Infrastructure Planning (Environmental Impact Assessment) Regulations 2009[8] and the Environmental Noise (England) Regulations 2007[9], all as amended.

The NIR[7] sets out:

- The qualifying criteria (including noise thresholds) at which the relevant authority is mandated to provide noise insulation to owners and occupiers of eligible residential buildings;
- The noise insulation 'package' to be offered and the process for communicating the outcome of the noise insulation assessment to interested parties; and
- Discretionary powers to provide noise insulation for construction noise.

The noise insulation trigger values are relevant to the scope and methodology for this assessment as they should align with the threshold for identifying significant adverse impacts on health and quality of life in response to government noise policy. It therefore follows that where all sustainable mitigation has been integrated into the scheme but the resulting noise inside a dwelling would result in a significant observed adverse effect on health and quality of life as a consequence of the scheme, then the provision of noise insulation would avoid this significant impact. This ensures compliance with the first aim of government noise policy.

As outlined in the Calculation of Road Traffic Noise (CRTN)[10], the following criteria must be met in order to qualify for noise insulation:

i. The combined expected maximum traffic noise level, i.e. the relevant noise level, from the new or altered highway together with other traffic in the vicinity must not be less than the specified noise level ($68dBL_{Al0,18hr}$);

ii. The relevant noise level is at least 1dB(A) more than the prevailing noise level, i.e. the total traffic noise level existing before the works to construct or improve the highway were begun;

iii. The contribution to the increase in the relevant noise level from the new or altered highway must be at least 1dB(A).

The Town and Country Planning (Environmental Impact Assessment) Regulations, 2017 (EIA Regulations) requires '*a description of any features of the proposed development, or measures envisaged in order to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment'*.

The scope and methodology sets out how likely significant effects, in terms of the EIA Regulations, have been identified for noise and vibration, taking account of government noise policy and all other relevant regulations, guidance and standards.

The Environmental Noise Regulations[9] set out the requirements on competent authorities to undertake strategic noise mapping of major roads and then establish

[8] Available at: http://www.legislation.gov.uk/uksi/2009/2263/contents/made
[9] Available at: https://www.legislation.gov.uk/uksi/2007/415
[10] Department of Transport Welsh Office (1988), Calculation of Road Traffic Noise, HMSO

action plans. The second-round action plan for roads (including major roads) was published in January 2014[11]. It identifies a series of Important Areas where it is *"anticipated that the relevant highway authority will examine each Important Area having regard to any on-going noise mitigation initiatives, schemes and plans"*.

There are a number of Important Areas (IA) identified within the study for this scheme. These are identified and assessed and mitigation proposed where required throughout this assessment.

2.4 Guidance and Standards

Relevant overarching guidance includes:

- DMRB HD 213/11[12];
- PPG - Noise[5];
- Night Noise Guidelines for Europe[13];
- Guidelines for Community Noise[14];
- Guidelines for the Assessment of Groundborne Noise and Vibration[15]; and
- Environmental Noise Measurement Guide[16].

Relevant guidance and standards include:

DMRB HD 213/11

The DMRB is the regulatory standard for the design of a new road or improvements to an existing road. DMRB HD 213/11[12] sets out the method for assessing noise and vibration associated with road traffic. DMRB HD 213/11 provides guidance on the selection of the scheme assessment area and the relevant assessment years. This assessment has been based upon these procedures.

Calculation of Road Traffic Noise

DMRB HD 213/11 requires that road traffic noise is calculated under the method described in Calculation of Road Traffic Noise (CRTN). This describes a

[11] Noise Action Plan: Roads (Including Major Roads) – Environmental Noise (England) Regulations 2006, as amended. January 2014. Taken from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276237/noise-action-plan-roads-201401.pdf
[12] The Highways Agency, Transport Scotland, Welsh Assembly, The Department for Regional Development Northern Ireland DRD (2011), Design Manual for Roads and Bridges Volume 11, Section 3, Part 7, HD 213/11 – Revision 1, TSO
[13] WHO, 2009. Night Noise Guidelines for Europe. Available at: http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf
[14] WHO, 1999. Guidelines for Community Noise.
[15] Association of Noise Consultants, 2012. Guidelines for the Assessment of Groundborne Noise and Vibration.
[16] ANC guidelines - Environmental noise measurement guide. Published by The Association of Noise Consultants, 2013. ISBN: 978-0-9572543-3-6

procedure for determining the level of noise from the highway based upon the traffic flow parameters, road surface, propagation distance, screening, intervening ground cover and topographical features between the highway and receptor. This is the accepted methodology to quantify traffic noise levels within highway noise assessment procedures.

BS 5228-1:2009+A1:2014 and BS 5228-2 Code of Practice for noise and vibration on construction and open sites

BS 5228-1[17] provides guidance on the assessment and control of noise and vibration from construction operations. The Standard contains detailed information on noise reduction measures and promotes the 'best practicable means' approach to control noise and vibration to minimise the impact on local residents and construction workers. The Standard also provides criteria for vibration disturbance to people.

BS ISO 4866: 2010 Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures

BS ISO 4866[18] provides guidance and methodologies for the measurement and effects of vibration upon buildings.

BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

BS 8233[19] provides advice for the control of noise in and around buildings and guidance criteria for noise levels inside new buildings.

World Health Organization

The World Health Organization Guidelines for Community Noise 1999 provide guidance on acceptable levels of noise in a variety of scenarios and arising from sources such as road, rail and air traffic, industries and construction.

3 Consultation

Consultation with the Public Health and Public Protection Service Department of the Middlesbrough Council (MC) has been undertaken and the following has been agreed:

[17] British Standards Institution (2014); BS 5228-1:2009+A1:2014 and BS 5228-2:2009+A1:2014 Code of Practice for Noise and Vibration Control on Open Construction Sites
[18] British Standards Institution (2010) BS ISO 4866: 2010, Mechanical vibration and shock – Vibration of fixed structures – Guidelines for the measurement of vibrations and evaluation of their effects on structures, British Standards Institution
[19] British Standards Institution (2014) BS 8233 Guidance on sound insulation and noise reduction for buildings, British Standards Institution

'A robust defendable approach should be used. The changes in noise levels from the existing road layout to the proposed road layout should be modelled and have verification of the model by establishing the existing noise environment by check measurement of current noise levels. The impact of noise due to widening the road upon the noise environment should be assessed to determine:

- *Whether the Noise Insulation Regulations would come into force to provide insulation to properties on a 15-year traffic projection;*
- *An assessment of whether changes in noise levels were likely to lead to claims under the Land Compensation Act; and*
- *An assessment of noise impact in relation to the current MC planning criteria for road noise of 60dBL$_{10,18hr}$ in gardens and where this level is exceeded 35dBL$_{10,18hr}$ for habitable rooms based on a 15-year traffic projection.*

The noise assessment for Longlands to Ladgate Road was along the same lines as the above.'

4 Study Area

The determination of the study area was based on the DMRB HD 213/11 guidance. For the 'Simple' level of assessment used in this study, DMRB HD 213/11 requires that a quantitative noise impact study is made for all noise sensitive properties within 600m of all route options. Also, sections of existing roads within 1km of the route options that are predicted 1dB(A) because of the scheme at the baseline year, are also assessed[20].

Existing roads subject to a change of 1dB(A) or more are identified by forecast traffic changes arising from the scheme. DMRB HD 213/11 notes that a change in noise level of 1dB is associated with an increase in flow by at least 25% or decrease by 20% in the scheme opening year. The area for which these detailed quantitative calculations are made is defined as the calculation area (DMRB HD 213/11).

5 Baseline Conditions

A baseline noise survey has been carried out at locations that are considered to be representative of sensitive areas in proximity of the proposed scheme. The baseline survey is also used to validate the noise model used to assess operational road traffic noise assessment.

The noise survey was performed in accordance with the 'shortened measurement procedure' described in paragraph 43 of CRTN. This is the accepted method to take measurements of these types of roads with a consistent traffic flow. The volume and consistency of traffic, mean that shortened measurements can be used to reliably estimate noise levels over a longer period as described in section 43-44

[20] Or a change of 3dB(A) in the future assessment year, but the more sensitive test is the 1dB change in the baseline year.

of CRTN. The noise survey was undertaken on 15 May 2018 during periods considered to be representative of the prevailing noise climate.

The noise climate around the proposed scheme is dominated by road traffic on Stainton Way and A172 Dixons Bank.

The range of measured daytime noise levels experienced during the survey are presented in Table 1. Detailed survey methodology and results are reported in Appendix A2. Measurements were taken at four representative locations within the study area, listed as follows and shown in Figure 1.

Table 1 Summary of baseline noise levels (attended measurements)

Measurement location	Measured noise level dB (re 20µPa)			
	$L_{pA90,T}$	$L_{pAeq,T}$	$L_{pA10,T}$	$L_{pAmax,\ F}$
Location 1 – Stainton Way, near roundabout with Fairway	51-54	60-62	63-65	70-82
Location 2 – Stainton Way, near junction with Dixons Bank	49-51	54-56	56-59	66-69
Location 3 – Dixons Bank, towards St Cuthbert Avenue	56-60	71-72	74-75	80-84
Location 4 – Dixons Bank, towards junction with Stainton Way	59-60	72-73	75-76	85-89

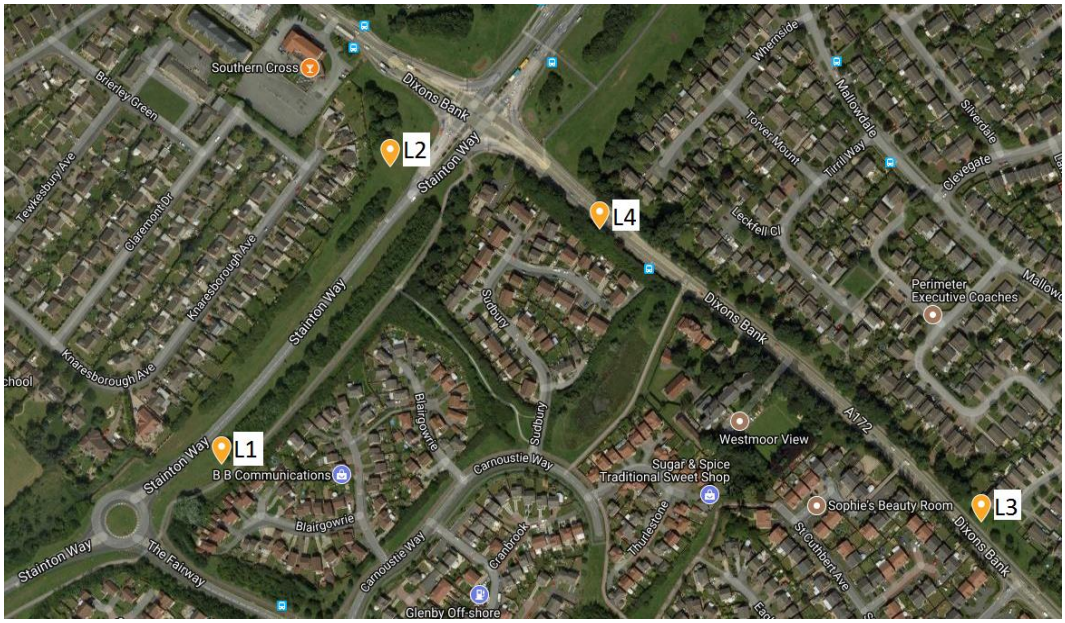

Figure 1 Measurement locations

6 Potential Impacts

The following activities have the potential to give rise to temporary significant impacts upon existing receptors:

- Construction traffic noise;
- Construction activity noise; and
- Construction vibration.

Additionally, the operation of the proposed scheme has the potential to give rise to the following:

- Direct impacts upon existing receptors arising from the proposed links associated with the development; and
- Indirect impacts arising from changes in traffic flows in the nearby road network.

7 Assessment Methodology

7.1 Construction Activity Noise

The construction activity noise and vibration assessment has been undertaken at a relatively high level in line with BS 5228 Part 1 and Part 2[17] and is based upon methodology assumptions and experience from similar projects. Construction noise levels are predicted based upon the plant sound power level (either provided by the manufacturer or benchmarked with similar construction activities), typical percentage on-times, and allowances for distance, reflections and screening attenuation.

At this stage of the project there is currently no confirmed detailed programme and construction methods. Construction method assumptions are considered to provide a sufficient level of accuracy for this assessment and a list of activities, plant items and sound levels are presented in Appendix A4.

A limited number of locations have been chosen using typical worst-case construction activities, which is considered appropriate for this stage in the project.

7.2 Construction Traffic Noise

The number of heavy vehicles passing along nearby roads is likely to increase due to construction activities during the different stages of the project. It is therefore necessary to assess the potential for change in noise levels along the construction vehicle route.

At this early stage in the project there is insufficient data to quantitatively predict any potential noise effects due to construction vehicle movements. However, it is likely that construction traffic will use existing major roads in order to access the site. It is therefore unlikely that the relatively low number of additional heavy vehicles movements associated with construction will result in significant noise effects in the immediate location.

7.3 Operational Road Traffic Noise

7.3.1 Overview

The assessment of operational road traffic noise was undertaken in line with DMRB HD 213/11. The scope of the assessment was confirmed and agreed through liaison with Middlesbrough Council (MC).

The approach for the environmental assessment is as follows:

- 'Simple' level of assessment required in accordance with DMRB HD 213/11; and
- Assessment undertaken during daytime only.

7.3.2 Traffic model assumptions

It has been advised by the traffic consultants, that various housing developments and infrastructure projects were considered as part of the traffic model used as the basis for the traffic noise assessment. They can be seen in Figure 2 below, and are listed below:

- Prissick;
- Brookfield;
- Ladgate Lane;
- Hemlington Grange;
- Stainton;
- Newham Hall Farm;
- Grey Towers;
- South of Guisborough Road; and
- Low Gill.

The model also accounted for two infrastructure projects: the Longlands to Ladgate Link, and the Stainton Way Western Extension.

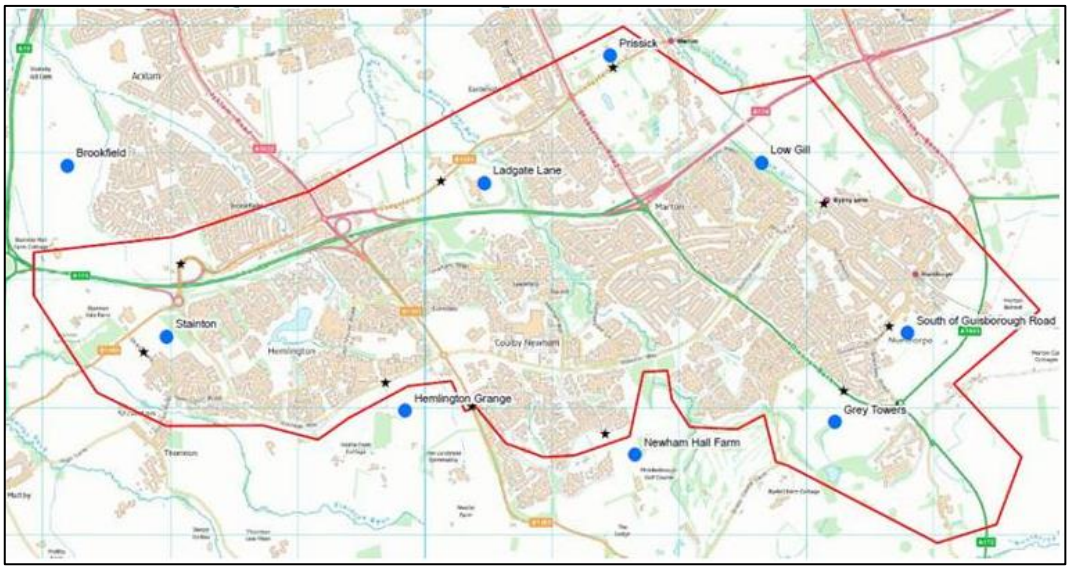

Figure 2 Housing developments included in the traffic model

7.3.3 Road surface

The current sections of the road surface of Stainton Way and Dixons Bank enclosed within the redline boundary i.e. between the Fairway roundabout and the A172 junction for Stainton Way, and between the A172 junction and St Cuthbert Avenue junction, is Hot Rolled Asphalt (HRA). As part of the mitigation measures of the scheme, the project has committed to the provision of Stone Mastic Asphalt (SMA), which is a low noise road surface, within the redline boundary described above.

As per Annex 4 of DMRB, where an existing surface is to be replaced with a thin surfacing system, and where the mean traffic speed is less than 75 km/h, a 1dB(A) surface correction attenuation should be applied to a new low-noise surface.

Appropriate road surface corrections have been applied to the 3D noise prediction model.

7.3.4 Methodology for determining impacts

Prediction of absolute levels with noise model

A topographically accurate 3-dimensional traffic noise prediction model of the calculation area has been constructed using GIS to predict absolute levels within each route option. The model includes terrain data, buildings and other structures that may screen or reflect noise, ground cover types and road links.

For each road link in the model, data on traffic flow, speed, proportion of heavy goods vehicles (HGVs) and road surface type were obtained for inclusion into the model.

Noise level calculations were carried out in accordance with the CRTN methodology, using proprietary noise modelling software. Traffic noise levels were calculated across a grid of receptor positions over the calculation area, and

noise level exposure contours were established. Additional calculations were also conducted at specific assessment locations to represent noise sensitive receptors (e.g. residential properties). The assessment is undertaken at a height of 4m above local ground, in terms of the free-field $L_{pA10,18h}$ index as required by DMRB HD 213/11.

The $L_{pA10,18h}$ index represents the arithmetic mean of all the hourly values of L_{A10} during the period between the hours of 06:00 and 24:00. The CRTN procedure is based upon empirical data with a positive wind vector component blowing downwind from source to receptor. The CRTN prediction therefore assumes an adverse wind component to represent a typical worst-case scenario. Prediction methodology also accounts for the additional advice in DMRB HD 213/11 relating to CRTN procedures, including revisions to vehicle classification, traffic data and corrections due to road surface.

For the purposes of this assessment, the $L_{pA10,18h}$ results are converted to the corresponding L_{Aeq} scale for daytime noise, i.e. $L_{pAeq,16h}$, as required. This provides a direct comparison with the quantitative criteria described in Section 8 for assessing significance with respect to NPSE.

Baseline noise survey results (see Appendix A2) were used to provide indicative information to validate the predicted noise climates across the study area.

Do-Minimum and Do-Something scenarios prediction

As requested by MC, the traffic data used in the model are those forecasted under the Do-Something (DS) and Do-Minimum (DM) scenarios for the future assessment year, in this case 2030. The traffic data was used in the noise models to produce predictions for the following scenarios:

- DM (without the scheme) in the future assessment year (DM 2030);
- DS (with the scheme) in the future assessment year (DS 2030).

Magnitude of change for a simple assessment

As part of the procedure for a simple assessment, DMRB HD 213/11 requires that the noise impact is reported using a suggested scale of magnitude to describe the increase or decrease in noise level associated with the route options. It is noted that this change could be adverse if there is an increase in noise or beneficial if there is a decrease in noise. The magnitude scale is described in more detail in Section 8.

The assessment has focused on the long-term noise effects i.e. with-Scheme 2030 (Do-Something) vs without-Scheme 2030 (Do-Minimum).

The DMRB HD 213/11 simple assessment describes a procedure which considers night-time noise associated with the route options. Knowledge of night-time flows is unlikely to be a deciding factor in option choice beyond that for daytime, therefore the night-time assessment is scoped out.

Once the noise levels have been predicted in all scenarios, and the level of change identified, the next step is to assess whether the effects are significant.

Methodology for determining significance of effects – all sources and receptors

The method for identifying likely significant effects of noise and vibration from construction and operation of the scheme, as required by the EIA Regulations, draws on best practice from other major infrastructure projects and is aligned with DMRB HD 213/11 and NPSE.

Taking NPSE and PPG-Noise together, they are based on the premise that once noise becomes perceptible, the effect on people in dwellings and other receptors used by people (for example schools and hospitals) increases as the total level of noise increases. Government policy and practice guidance defines four levels of effect on health and quality of life in increasing severity:

- No effect;
- Adverse effect;
- Significant adverse effect; and
- Unacceptable adverse effect.

NPSE, NPPF and PPG-Noise note that thresholds should be set to define the onset of these levels of effect. These are listed as follows:

- Lowest Observed Adverse Effect Levels (LOAEL) to identify the onset of adverse impact on health and quality of life;
- Significant Observed Adverse Effect Levels (SOAEL) to identify the onset of significant impacts on health and quality of life; and
- Unacceptable Adverse Effect Levels (UAEL) to identify the onset of unacceptable impacts on health and quality of life.

Policy notes that these thresholds should reflect the nature of the noise source, the sensitivity of the receptor and the local context.

To allow a direct comparison between EIA and government policy, Table 2 which outlines the assessment approach to address all policy requirements has been developed. The table briefly describes the assessment methodology, the actions and mitigation measures.

Significant adverse effects on health and quality of life

The EIA Regulations require the identification of 'likely significant effects' Where the calculated noise or vibration indicates a significant adverse impact on health and quality of life (i.e. the level exceeds the relevant SOAEL), this is assessed as a likely significant observed adverse effect at each receptor i.e. such levels would disrupt activities indoors, in accordance with PPG-noise.

Adverse effects on health and quality of life

In line with best practice, DMRB HD 213/11 and previous projects, this assessment also identifies likely significant effects where the calculated noise or vibration is only an adverse impact on health and quality of life. Specifically, this

describes a situation when operational noise is greater than the relevant LOAEL but is less than SOAEL.

In this case, the basis for the likely significant effect is the change in noise caused by the route option and the number of dwellings in a community that are subject to the change. In relation to PPG-Noise, such likely significant effects relate to, for example, a change in the outdoor 'acoustic character' of an area due to a noise increase, or decrease because of the scheme option.

Table 2 summarises how noise levels in terms of Government policy and change in noise levels (in terms of DMRB HD 213/11) has been used to identify likely significant effects.

Table 2 Noise and vibration assessment approach to address both the EIA and government policy requirements

	Perception	Government policy		EIA		Mitigation	
		Effect	Action	Assessment	Effect	Project	Receptor
← Increasing level of noise or vibration	Not noticeable	No observed effect	No specific measures required	Special cases	No adverse effect	Special cases	None
	Noticeable and not intrusive	No observed adverse effect	No specific measures required				
	Lowest observed adverse effect level – LOAEL						
	Noticeable and intrusive	Observed adverse effect	Mitigate and reduce to a minimum	The magnitude of noise level change is assessed giving consideration to contextual significance criteria	Change or absolute level may cause adverse effect on acoustic character. May be considered significant in EIA terms on a community basis	Maximise mitigation as far as sustainable	None
	Significant observe adverse effect level – SOAEL						
	Noticeable and disruptive	Significant observed adverse effect	Avoid	Absolute noise levels exceeding SOAEL indicates significant effect	Significant adverse effect on each receptor	Maximise mitigation as far as sustainable. Prevent UAELs where possible	Noise insulation
	Noticeable and very disruptive	Unacceptable adverse effect	Prevent	Exceeding UAEL is a significant effect			Potentially re-house where noise arises from the scheme

7.3.5 Types of receptor

The assessment approach considers the following receptors:

- Residential receptors: direct effects – individual dwellings (including Noise IA);
- Non-residential receptors: direct effects; and
- All above receptors: indirect effects – i.e. those effects not resulting directly from the scheme itself, such as changes in noise on existing roads due to construction traffic or additional traffic on existing roads due to operation of the Scheme.

8 Assessment Criteria

Assessment criteria have been established and respond to the requirements of:

- Government policy, set out in NPSE[4], NPPF and PPG-Noise[5];
- DMRB HD 213/11;
- Relevant regulations, guidance and standards (see Section 2.4); and
- Best practice as set by previous relevant projects.

8.1 Construction Noise Assessment Criteria

Potential adverse effect thresholds in government policy terms have been established based upon the ABC Method described in BS 5228-1:2009+A1:2014. These thresholds shown below, have been used to establish assessment criteria for monthly average noise levels.

Table 3 Thresholds of potential effects of construction noise at residential buildings in terms of government policy

Effect threshold (residential)	Threshold value, 1m in front of the relevant façade
LOAEL	Day 65dB$L_{pAeq,\ daytime}$ Evening 55dB$L_{pAeq,1hr}$ Night 45dB$L_{pAeq,1hr}$
SOAEL	Day 75dB$L_{pAeq,\ daytime}$ Evening 65dB$L_{pAeq,1hr}$ Night 55dB$L_{pAeq,1hr}$
Note: Day is 07:00 to 19:00, evening is 19:00 to 23:00 and night is 23:00 to 07:00	

Where the monthly average construction noise level at the receptor is between LOAEL and SOAEL, the threshold of potential adverse effect in EIA terms is evaluated in accordance with Table 4.

Table 4 Threshold of potential significant effect at dwellings according to ABC method in BS 5228–1:2009 + A1:2014[17] (potential significance in EIA terms)

Assessment category and threshold value period	**Threshold value, dB(A)**		
	Category A	**Category B**	**Category C**
Night-time (23:00 – 07:00)	45	50	55
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
Other: Weekday evenings (19:00 – 23:00) Saturdays (13:00 – 23:00) Sundays (07:00 – 23:00)	55	60	65
Category A: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are less than these values Category B: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are the same as Category A values Category C: threshold value to use when ambient noise levels (rounded to the nearest 5dB) are higher than Category A values.			

The adverse impact threshold is determined at a dwelling using the existing ambient noise level, rounded to the nearest 5dB. This is then used to determine the assessment category: A, B or C, which defines the adverse noise impact threshold. The predicted construction noise level is then compared to the appropriate noise impact threshold level. If the $L_{Aeq,T}$ construction noise level exceeds the appropriate noise impact threshold level shown in Table 4, then an adverse impact with the potential to cause a significant effect is identified.

For example, for a site exposed to an existing ambient noise level of 68dB(A), this would be rounded to 70dB(A). An ambient level of 70dB(A) is higher than the Category A value of 65dB(A), therefore the Category C value of 75dB(A) would apply as a threshold for potential significant effect.

Having established if there is a potentially significant effect using the ABC method, the final assessment of significance is determined by evaluating the construction noise thresholds along with other factors, such as:

- The number of receptors;
- The receptors sensitivity;
- The duration of the impact; and
- Absolute levels arising from construction noise.

For non-residential receptors, significant effects have been evaluated on a receptor-by-receptor basis, using established noise impact criteria for the type of receptor, professional judgement and the factors presented above.

8.2 Construction Vibration Assessment Criteria

BS 5228-2:2009+A1+2014[17] indicates that the threshold of perception in residential environments corresponds with a Peak Particle Velocity (PPV) of 0.3mm/s. The Standard also states that a complaint is likely where levels occur above 1.0mm/s PPV at residential properties but this exposure can be tolerated if prior warning and explanation has been given to residents. Levels of vibration of 10mm/s PPV and above are likely to be intolerable for any more than a very brief exposure to this level.

The overall significance of the effect is assessed using professional judgement by considering not only the criteria above, but also other factors such as the duration of exposure and the particular characteristics of the source.

Risk of damage to buildings from groundborne vibration is assessed using the criteria in Table 5, and is based upon the criteria to avoid the risk of any damage, even 'cosmetic damage', defined in BS ISO 4866[18]. However, effects in terms of cosmetic damage to buildings would occur only when vibration exposures are much higher than the lowest perceptible levels.

Table 5 Vibration impact criteria for buildings (conservative criteria below where there is no risk of cosmetic damage)

Category of building	**Peak particle velocity[1] (mms^{-1})**	
	Transient[2] vibration	**Continuous[3] vibration**
Potentially vulnerable buildings	6	3
Structurally sound buildings	12	6

Notes:

[1] At the building foundation

[2] Transient relative to building response e.g. from percussive piling

[3] Continuous relative to building response e.g. from vibratory piling, vibrating rollers

8.3 Operational Noise Assessment Criteria

8.3.1 Residential Receptors

Adverse effect levels have been set in Table 6 in accordance with government noise policy (NPPF, NPSE[4], and PPG-Noise[5]) and with regard to the guidance from the World Health Organisation (Guidelines for Community Noise)[14]; and WHO Night Noise Guidelines for Europe[13], the NIR, and best practice from other projects.

Table 6 Thresholds of likely effects of operational noise at residential buildings in terms of government policy

Effect threshold (residential)	Threshold value (free-field unless stated)
LOAEL	Day 50dB$L_{pAeq,16hr}$
SOAEL	Day 68dB$L_{pA10,18hr}$ at the façade of a property (equivalent to ~63dB$L_{pAeq,16hr}$)
UAEL	Day 74dB$L_{pAeq,16hr}$

The magnitude of the impact caused by long term change in noise levels attributable to the scheme, where the overall 'end state' (i.e. operational noise level of the completed scheme), is between LOAEL and SOAEL is evaluated in accordance with Table 7. It is noted that the magnitude of impact could be adverse if there is an increase in noise levels, or beneficial if there is a decrease in noise levels.

Table 7 Classification of magnitude of noise impact on residential communities in the long-term under DMRB HD 213/11, where the 'end-state' of overall exposure is between LOAEL and SOAEL

Noise change [dB(A)]	Magnitude of impact in the long-term
0	No change
0.1 to 2.9	Negligible
3.0 to 4.9	Minor
5.0 to 9.9	Moderate
10.0 +	Major

Where the overall exposure is greater than the SOAEL, there is increasing risk of likely health effects associated with long term (permanent) exposure.

Some areas in the scheme noise study area already have a designated status as being exposed to high levels of road traffic noise (i.e. Noise IAs). It is therefore considered appropriate to give greater weight to noise change where the existing baseline noise level is already in excess of the relevant SOAEL. This is to reflect the consideration of health effects. In these situations, the magnitude of the impact caused by change in noise levels attributable to the scheme is shown in Table 8.

Table 8 Classification of magnitude of noise impact on residential communities in the short-term under DMRB HD 213/11, where the baseline noise level is greater than SOAEL

Noise change [dB(A)]	Magnitude of impact in the long-term
0	No change
0.1 to 0.9	Negligible
1.0 to 2.9	Minor
3.0 to 4.9	Moderate
5.0 +	Major

A minor impact (3dB or greater) is taken as an indicator of a potential significant effect for noise exposures between the LOAEL and SOAEL (Table 7). For areas exposed to higher noise level (above SOAEL), a small impact (1dB or greater) may be taken as an indicator of potential significance with the magnitude of impact and effect being evaluated using Table 8.

For clarity, Table 7 and Table 8 are based on the DMRB tables for short-term and long-term respectively, but for the purpose of this assessment and as requested by MC, they are used to assess impacts only in the long term, i.e. DM future year against DS future year.

8.3.2 Non-Residential Receptors

For non-residential buildings, the assessment considers the noise and vibration exposure at each receptor and the receptor's generic sensitivity. Table 9 summarises the assessment criteria used for assessment on a likely worst-case basis.

In order to identify a potential impact upon a non-residential receptor, there must be:

- A change of 3dB or more when assessing the DM scenario opening year against the DS future year (long term); and
- An exceedance of absolute levels defined in Table 9 below.

If both conditions are met, then a potential impact is identified and an assessment at that particular receptor should be undertaken in line with relevant national and international guidance. This is described in further details in Appendix A3.1.

Table 9 Noise impact screening criteria at non-residential receptors (construction and operation)

Description	Impact (screening) criterion		Outcome	Reference
	Day 0700-2300	Night 2300-0700		
Places of meeting for religious worship; courts; cinemas; lecture theatres; museums; and small auditoria or halls	50dB$L_{pAeq,T}$ and a change >3dB	--	Disturbance	BS 8233: 2014[19], EFAs Acoustics Performance Standards[21], HTM08-01[22], WHO guidelines[14]
Schools; colleges; hospitals*; hotels*; and libraries	50dB$L_{pAeq,T}$ and a change >3dB	*45dB$L_{pAeq,T}$ and a change >3 dB	Disturbance and sleep disturbance*	
Offices	55dB$L_{pAeq,T}$ and a change >3dB	--	Disturbance	BS 8233[19]
**The night-time criteria of 45dB$L_{pAeq,T}$ for sleep disturbance applies to hospitals and hotels only*				

9 Assessment Assumptions and Limitations

At this project stage, detailed construction information is not available to inform the precise construction noise and vibration calculations. Appropriate assumptions have been made as to the type and number of construction plant and the intensity and duration of the construction processes. These data have been taken from similar highway construction works where construction method data was available and from the Scheme design engineers. The assumptions are shown in Appendix A and are considered suitable to represent the types of works and associated impacts for this scheme assessment.

The accuracy of the results for the operational road traffic noise section is dependent upon the quality of information provided by the traffic consultants.

[21] Acoustic Performance Standards for the Priority Schools Building Programme. Version 1.1 2012. Education Funding Agency. Available at: http://dera.ioe.ac.uk/15722/6/acoustic%20performance%20standards%20for%20the%20priority%20schools%20building%20programme%20september%202012.pdf

[22] Department of Health, 2013. Health sector buildings: acoustic design requirements (HTM 08-01), Department of Health - Health technical memoranda, 2013. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/144248/HTM_08-01.pdf

10 Assessment of Effects

The following sub-sections present the magnitude of the noise and vibration impacts associated with construction and operation. Based upon the assessment approach and assessment criteria described in previous sections, it is simplest to present the resulting significance of the effects alongside the impact data. Hence the impacts and assessed significance of effects are discussed together in this section.

10.1 Construction Noise

The threshold of potential significant effects for construction noise have been established upon measured ambient noise levels ($dBL_{pAeq,T}$) as shown in Table 10 based on the BS 5228 ABC method. The levels were estimated based on the baseline noise measurements.

Table 10 Thresholds of potential significant effects for construction noise

Noise sensitive receptors	**Equivalent survey position**	**Category / Threshold value in $dBL_{pAeq,T}$**	
		Daytime (07:00-19:00) and Sat (07:00-13:00)	
42 Knaresborough Avenue	L1	A	65
26 Knaresborough Avenue	L1	A	65
Sudbury	L2	A	65
21 Tirril Way	L4	B	70
Westmoor View Care Home	L4	C	75
18 Darnbrook Way	L3	B	70
53 St Cuthbert Ave	L3	C	75

It is assumed that the site working hours are as follows:

- Monday to Friday: 07:00 to 19:00; and
- Saturday: 07:00 to 13:00.

Any works required to be undertaken outside the core hours will need agreement between the contractor and the MC. This will be reflected and specified in the Code of Construction Practice, or similar.

The predicted level of noise from construction depends on the particular items of plant used. At this stage, a fully detailed schedule of construction equipment is not available. Therefore, a typical schedule has been assumed for a development such as that proposed, based on plant assumptions used for similar residential developments.

These assumptions have been reviewed and the numbers of plant items have been adjusted accordingly to represent the scale and likely programme of the proposed development. This is considered to be a reasonable approach to represent the likely construction noise and vibration effects for the purpose of this assessment.

Noise from the following construction activities have been assessed:

- Activity 1 - Site clearance – grubbing, surface excavation, tree felling and wood chipping;
- Activity 2 - Earthworks – ground levelling, construction of earth dams;
- Activity 3 – Sub-structure – wheeled excavator, dumper, vibratory plate and concrete mixer truck;
- Activity 4 – Road surfacing – paver and tipper lorry, roller (static) and dump.

Appendix A describes the plant items assumed for the assessment and the basis of the calculations. Two scenarios have been assessed for each of the receptors: the 'worst-case scenario' and the 'typical scenario'.

The presented 'worst-case scenario' assumes that the entirety of the activity is located at the closest separation distance from the site to the receptors. The 'typical scenario' assumes the activity is located at the average separation distance from the site to the receptor. The calculations also assume continuous operation of all construction activity plant items.

The results represent a reasonable worst-case for each but construction noise may vary when considered over shorter periods of time and at greater separation distances.

10.1.1 Assessment of Effects upon Residential Receptors

Results of the noise emissions from construction activities upon the closest Noise Sensitive Receptors (NSR) are presented in Table 11 and Table 12 for the 'worst-case scenario' and 'typical scenario, respectively. The relevant significance threshold and exceedances are also show in the tables.

Table 11 Estimated construction noise for the worst-case scenario

NSR	Loc Ref	Threshold $dBL_{Aeq,T}$	Construction noise level ($dBL_{pAeq,T}$)/Exceedance (dB)									
			Activity 1		Activity 2		Activity 3		Activity 4		Cumulative at receptor	
42 Knaresborough Avenue	R1	65	71	6	68	3	65	0	67	2	74	9
26 Knaresborough Avenue	R2	65	67	2	65	0	61	0	64	0	71	6
Sudbury	R3	65	75	10	72	7	69	4	71	6	78	13
21 Tirril Way	R4	70	75	5	73	2	69	1	72	0	79	9
Westmoor View Care Home	R5	75	75	0	73	0	69	0	72	0	79	4
18 Darnbrook Way	R6	70	75	5	73	3	69	0	72	1	79	9
53 St Cuthbert Ave	R7	75	79	4	76	1	73	0	75	0	82	7

Table 12 Estimated construction noise for the typical scenario

NSR	Loc Ref	Threshold $dBL_{Aeq,T}$	Construction noise level ($dBL_{pAeq,T}$)/Exceedance (dB)									
			Activity 1		Activity 2		Activity 3		Activity 4		Activity 1	
42 Knaresborough Avenue	R1	65	61	0	58	0	55	0	57	0	64	0
26 Knaresborough Avenue	R2	65	61	0	58	0	55	0	57	0	64	0
Sudbury	R3	65	63	0	61	0	58	0	60	0	67	2
21 Tirril Way	R4	70	63	0	60	0	57	0	59	0	66	0
Westmoor View Care Home	R5	75	63	0	60	0	57	0	59	0	66	0
18 Darnbrook Way	R6	70	63	0	60	0	57	0	59	0	66	0
53 St Cuthbert Ave	R7	75	63	0	60	0	57	0	59	0	66	0

As shown in the tables above, during the construction of the proposed development, there are predicted exceedances of the significance threshold criteria at all receptors. Note that exceedances occur only in the 'worst-case scenario' when the assessment is undertaken with the shortest distance between the construction site and the receptor. Moreover, it is unlikely that the exceedances will take place for considerably long periods of time i.e. less than one month, as the construction works would progress along the proposed scheme. The magnitude of the exceedance would consequently be reduced.

In the 'typical scenario' there are no exceedances predicted at receptors, except the properties located on Sudbury Street, which are about 33m from the proposed scheme. The effect of 2dB is identified for the cumulative noise arising from all the activities. It is unlikely, however, that these activities would be simultaneous for considerably long periods of time, and therefore the effect is assessed as not significant. Equally, the exceedances are predicted to take place only during the daytime.

It is also assumed that the contractor would employ Best Practice Means (BPM) developed and contained within a Code of Construction Practice (or similar) to minimise any potential effects of construction noise on the residential receivers.

Based on the above, it is concluded that noise effects arising from the construction of the proposed scheme are not significant.

10.2 Construction Vibration

Construction vibration would potentially be generated as a result of construction of substructures and from road surfacing. At this stage, it is not possible to define with accuracy the operations for which vibration may be an issue, but these could include (but are not limited to):

- Dynamic compaction;
- Vibratory compaction; and
- Pavement compaction (road roller).

It is unlikely that works causing vibration will take place closer than 10m from any sensitive receivers. With appropriate controls (which would be part of BPM) any impacts on building occupants would be for short periods and are assessed as not significant.

With appropriate BPM, for the likely high vibration operations, the risk of excessive groundborne vibration in relation to threshold levels associated with building damage has been assessed to be not significant. It should be noted that thresholds for building damage are considerably higher than those for effects on people.

10.3 Construction Traffic Noise

Slight increase in traffic caused by transport delivering materials and machines to/from the construction site might be noticeable for short periods of time (up to a few hours during the daytime). However, given the relatively small scale of the proposed development, it is unlikely that the increase in construction traffic numbers will give rise to a significant noise effect.

10.4 Operational Road Traffic Noise

10.4.1 Overview

This section presents the daytime traffic noise levels within the study area predicted and assessed in terms of Government Policy and Environmental Impact Assessment significance.

The assessment results are supported by the figures and tables in Appendix A (section A5) and should be consulted throughout.

For context, a total of 3240 residential receptors and 5 non-residential receptors have been assessed with reference to the thresholds set out in Table 6.

10.4.2 Residential Receptors: Direct and Indirect Effects upon Individual Dwellings

Based upon the criteria defined in section 8.3.1, there are no identified direct or indirect adverse effects upon any assessed residential receptors. The change in noise levels is not sufficient to give rise to a new adverse significant effect. This is due to the predicted changes being less than 1dB as there are relatively small changes in traffic flows between the Do-Something 2030 and the Do-Minimum 2030 scenarios, and the inclusion of low noise surfacing offsets the increase in noise of the new running lanes. As the change is less than 1dB, any potential impacts are assessed as negligible (as per DMRB) and there are no receptors eligible for noise insulation (as per Noise Insulation Regulations).

There are receptors identified with a potential beneficial change as a result of the reduction in traffic and low noise surfacing, however the change is relatively small meaning that the perceived benefit at the receptors is likely to be minimal. It is also noted, that there are receptors exposed to levels at or above a SOAEL in the baseline and Do-Minimum scenario (i.e. without the proposed scheme) as explained in section 10.4.4 and in Table 8.

10.4.3 Noise Important Areas (IA)

IAs are areas which are already exposed to high levels of noise and therefore receptors are exposed to levels higher than a SOAEL.

The three IAs that fall within the study area defined for this assessment are listed in Table 13 below, and are presented in the contour maps of Appendix A.

Table 13 Noise Important Areas identified within calculation area

Important Area reference number	Asset Owner	Significance of effect
2323	MC	Not significant
2324	MC	Not significant
2322	MC	Not significant

The change in noise levels in the areas covered by the IA is less than 1dB (refer to Table 8) and therefore effects associated with the proposed scheme are assessed as not significant. It is noted however, that some of these areas are still exposed to high levels of road traffic noise. Section 10.4.4 below discusses further.

10.4.4 Residential Receptors Exposed to Levels Higher than a SOAEL

This assessment has shown that the change in noise levels as a result of the proposed scheme is not significant upon any of the assessed receptors. However, it has been identified that a total of 144 residential receptors, out of the 3240 assessed, are already exposed (without the scheme) to levels higher than a SOAEL. For clarity, the noise model assessed every single receptor within the study area, but only those with a noise exposure greater than SOAEL are presented in Table A.8 of Appendix A5.

This means that even though the proposed scheme does not result in significant changes at these receptors (more than 1dB, as set out in section 8.3.1, Table 8), the levels of traffic noise are still high. These levels are noticeable and disruptive and the action, as per government legislation, is to 'avoid'[23].

As a scheme enhancement, mitigation measures alongside the assessed receptors are recommended, in the form of acoustic barriers, off-site mitigation or a combination of these. It is important to note that these are recommendations for scheme enhancement and do not constitute a requirement to mitigate noise effects introduced by the scheme.

It is also noted that there are 20 receptors located immediately to the southwest of Dixons Bank, which would experience a potential beneficial change. These receptors are above a SOAEL in the baseline and Do-Minimum scenarios and are predicted to have a reduction of 1dB or more with the proposed scheme in operation. However, the predicted beneficial change is relatively small meaning that the perceived benefit at the receptors is likely to be minimal.

10.4.5 Non-Residential Sensitive Receptors: Direct and Indirect Effects

There are no identified direct or indirect effects upon the assessed non-residential receptors. The change in noise levels is not sufficient to give rise to a new

[23] https://www.gov.uk/guidance/noise--2

significant effect. This is due to the relatively small change in traffic flows between the Do-Something 2030 and the Do-Minimum 2030 scenarios.

10.4.6 MC Criterion

The MC has requested an assessment of noise levels upon gardens where the prediction is higher than 60dB$L_{A10,18hr}$ (or 58dB$L_{Aeq,T}$). Whenever there is an exceedance of this outdoor level, then an assessment of internal noise levels of habitable rooms (closest to such garden) is required. The internal noise level should not exceed 35dB$L_{10,18hr}$ (equivalent to approximately 33dB$L_{Aeq,T}$) in the Do-Something 2030 scenario.

Figures A.13, A.14 and A.15 of Appendix A, shows the predicted Do-Something 2030 scenario, with the areas where noise levels are in excess of 60dB$L_{A10,18hr}$ in a red contour.

For the gardens of the receptors that fall within this red contour, the highest predicted levels of noise are approximately 70dB$L_{A10,T}$ in free-field (or approximately 68dB$L_{Aeq,16hr}$). Most of these values take place on the residential receptors alongside Dixon's Bank and Stainton Way as shown in Figure A.13 to Figure A.15 of Appendix A.

At these receptors it is unlikely that the daytime noise levels can be achieved with open windows, which would provide approximately 15dB(A) attenuation. In a worst-case scenario of the closest receptor to the scheme, the resulting internal levels would be 55dB$L_{A10,18hr}$ (or approximately 53dB$L_{pAeq,T}$) which is 20dB in excess of the MC criterion.

Assuming a typical double-glazed window, the level of attenuation would be approximately 27dB(A) when closed, and so the internal levels would be around 43dB$L_{pA10,18hr}$, which is 8dB in excess of the criterion.

The MC planning requirement of 35dB$L_{A10,10hr}$ internal is consistent with the criteria presented in the WHO and in BS8223 for daytime, although it is presented in $L_{Aeq,T}$ form. BS8223 states however, that where the development is considered to be necessary or desirable, the internal target may be relaxed by up to 5dB and reasonable internal conditions may still be achieved.

In conclusion, the noise levels in the Do-Something 2030 scenario are in excess of the adopted planning requirement by the MC at the receptors which fall within the red contour band of Figures A.13, A.14 and A.15, although the criterion could be relaxed if development is considered to be necessary. It is important to clarify that the exceedances are not a result of the proposed scheme, and rather, are caused by the existing noise levels of the roads and natural traffic growth in the future year associated with various committed developments.

In order to reduce these noise levels, the mitigation measures presented in Section 11 are recommended. These recommendations are a scheme enhancement and not a mitigation requirement, as the significant effect is not introduced by the proposed scheme.

10.4.7 Operational Vibration

Details on operational vibration are presented in Appendix A. Given the scale of the project and the nature of the assessed receptors, it is concluded that there are no significant effects associated with vibration of the operational scheme.

11 Mitigation

11.1 Construction Noise and Vibration Mitigation

To minimise the level of noise and vibration to which sensitive receptors will be exposed, all construction works will be conducted in accordance with a Code of Construction Practice (CoCP) or similar. Assuming a scheme CoCP is implemented, no significant effects were identified and therefore no further mitigation is required.

The CoCP will contain established control measures for environmental protection which will be adopted during construction in order to achieve BPM. The CoCP measures will be based upon BS5228-1.

11.2 Operational Road Traffic Noise Mitigation

The assessment of operational road traffic noise concluded that there are no new significant adverse effects arising from the proposed scheme. The proposed scheme includes the use of SMA low noise road surfacing.

However, a number of receptors are exposed to noise levels higher than a SOAEL which is an indication of a significant effect in government noise policy terms although not as a result of the scheme to alter the road. Any mitigation considered in these locations, such as roadside screening, would be a scheme enhancement.

12 Residual Effects

12.1 Residual Effects from Construction

The assessment of construction noise, vibration and construction road traffic concluded that effects arising from construction activities will be not significant.

12.2 Residual Effects from Operation of Scheme

With the implementation of the SMA road surface, the assessment of operational road noise concluded that there are no adverse new significant effects from the proposed scheme.

For those receptors already exposed to levels of noise at or above a SOAEL, mitigation has been recommended, and if in place, any effects are likely to be eliminated.

Note that these mitigation measures are a scheme enhancement and not a requirement as there is no impact as a result of the scheme.

13 Summary and Conclusions

An assessment of the construction and operation of the proposed road scheme has been carried out in line with EIA and Government guidance.

There are no noise and/or vibration significant effects associated with the construction of the scheme, and any disturbance risk can be mitigated with the implementation of Best Practicable Means which are assumed to be described and contained in a project Code of Construction Practice or similar.

There are no new adverse significant effects upon residential and non-residential receptors, associated with the operation of the proposed scheme. Consequently, there are no direct or indirect effects and none of the receptors are potential qualifiers for noise insulation with reference to the Noise Insulation Regulations 1975.

The assessment identifies that there are 20 receptors which would experience a potential beneficial change, which is relatively small meaning that the perceived benefit at the receptors is likely to be minimal.

The assessment concludes that 144 (out of the 3240 receptors) are exposed to levels above a SOAEL (which is defined as 63dB$L_{pAeq,T}$ for the purpose of this assessment), however, this level is not a result of the scheme. Any mitigation considered in the identified receptors, such as roadside screening, would be a scheme enhancement.

The noise levels in the Do-Minimum 2030 scenario exceed the adopted MC planning requirement at a number of receptors. The criterion could be relaxed if the development is considered necessary to reduce the magnitude of exceedance, however it is important to clarify that such exceedances are not a result of the proposed scheme, and rather, are caused by the existing noise levels of the roads and natural traffic growth in the future year associated with various committed developments.