

## Appendix 5A

### Construction Dust Assessment

## Contents

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|       |                              |   |
|-------|------------------------------|---|
| 5A1.1 | Construction dust assessment | 1 |
|-------|------------------------------|---|

## 5A1.1 Construction dust assessment

Table 5A.1: Dust emission magnitude

| Dust emission magnitude                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Small                                                                                                                                                                                                                                                                                                                                                             | Medium                                                                                                                                                                                                                                                                                                                                     | Large                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Demolition</b>                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• total building volume &lt;20,000m<sup>3</sup></li> <li>• construction material with low potential for dust release (e.g. metal cladding or timber)</li> <li>• demolition activities &lt;10m above ground</li> <li>• demolition during wetter months</li> </ul>                                                           | <ul style="list-style-type: none"> <li>• total building volume 20,000 - 50,000m<sup>3</sup></li> <li>• potentially dusty construction material</li> <li>• demolition activities 10 - 20m above ground level</li> </ul>                                                                                                                     | <ul style="list-style-type: none"> <li>• total building volume &gt;50,000m<sup>3</sup></li> <li>• potentially dusty construction material (e.g. concrete)</li> <li>• on-site crushing and screening</li> <li>• demolition activities &gt;20m above ground level</li> </ul>                                                                                                                   |
| <b>Earthworks</b>                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• total site area &lt;2,500m<sup>2</sup></li> <li>• soil type with large grain size (e.g. sand)</li> <li>• &lt;5 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds &lt;4m in height</li> <li>• total material moved &lt;10,000 tonnes</li> <li>• earthworks during wetter months</li> </ul> | <ul style="list-style-type: none"> <li>• total site area 2,500m<sup>2</sup> - 10,000m<sup>2</sup></li> <li>• moderately dusty soil type (e.g. silt)</li> <li>• 5 – 10 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds 4 – 8m in height</li> <li>• total material moved 20,000 - 100,000 tonnes</li> </ul> | <ul style="list-style-type: none"> <li>• total site area &gt;10,000m<sup>2</sup></li> <li>• potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size)</li> <li>• &gt;10 heavy earth moving vehicles active at any one time</li> <li>• formation of bunds &gt;8m in height</li> <li>• total material moved &gt;100,000 tonnes</li> </ul> |
| <b>Construction</b>                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• total building volume &lt;25,000m<sup>3</sup></li> <li>• construction material with low potential for dust release (e.g. metal cladding or timber)</li> </ul>                                                                                                                                                            | <ul style="list-style-type: none"> <li>• total building volume 25,000 - 100,000m<sup>3</sup></li> <li>• potentially dusty construction material (e.g. concrete)</li> <li>• on-site concrete batching</li> </ul>                                                                                                                            | <ul style="list-style-type: none"> <li>• total building volume &gt;100,000m<sup>3</sup></li> <li>• on-site concrete batching</li> <li>• sandblasting</li> </ul>                                                                                                                                                                                                                              |
| <b>Trackout</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                              |
| <ul style="list-style-type: none"> <li>• &lt;10 HDV (&gt;3.5t) outward movements in any one day</li> <li>• surface material with low potential for dust release</li> <li>• unpaved road length &lt;50m</li> </ul>                                                                                                                                                 | <ul style="list-style-type: none"> <li>• 10 – 50 HDV (&gt;3.5t) outward movements in any one day</li> <li>• moderately dusty surface material (e.g. high clay content)</li> <li>• unpaved road length 50 – 100m;</li> </ul>                                                                                                                | <ul style="list-style-type: none"> <li>• &gt;50 HDV (&gt;3.5t) outward movements in any one day</li> <li>• potentially dusty surface material (e.g. high clay content)</li> <li>• unpaved road length &gt;100m</li> </ul>                                                                                                                                                                    |

Table 5A.2: Sensitivity of the area to dust soiling effects

| Receptor sensitivity | Number of receptors | Distance from the source (m) |        |        |       |
|----------------------|---------------------|------------------------------|--------|--------|-------|
|                      |                     | < 20                         | < 50   | < 100  | < 350 |
| High                 | > 100               | High                         | High   | Medium | Low   |
|                      | 10 – 100            | High                         | Medium | Low    | Low   |
|                      | < 10                | Medium                       | Low    | Low    | Low   |
| Medium               | > 1                 | Medium                       | Low    | Low    | Low   |
| Low                  | > 1                 | Low                          | Low    | Low    | Low   |

Table 5A.3: Sensitivity of the area to human health impacts

| Background PM <sub>10</sub> concentrations (annual mean) | Number of receptors | Distance from the source (m) |        |        |        |       |
|----------------------------------------------------------|---------------------|------------------------------|--------|--------|--------|-------|
|                                                          |                     | < 20                         | < 50   | < 100  | < 200  | < 350 |
| High receptor sensitivity                                |                     |                              |        |        |        |       |
| > 32µg/m <sup>3</sup>                                    | > 100               | High                         | High   | High   | Medium | Low   |
|                                                          | 10 – 100            |                              |        | Medium | Low    |       |
|                                                          | < 10                |                              | Medium | Low    |        |       |
| 28 – 32µg/m <sup>3</sup>                                 | > 100               | High                         | High   | Medium | Low    | Low   |
|                                                          | 10 – 100            |                              | Medium | Low    |        |       |
|                                                          | < 10                |                              |        |        |        |       |
| 24 – 28µg/m <sup>3</sup>                                 | > 100               | High                         | Medium | Low    | Low    | Low   |
|                                                          | 10 – 100            |                              |        |        |        |       |
|                                                          | < 10                | Medium                       | Low    |        |        |       |
| < 24µg/m <sup>3</sup>                                    | > 100               | Medium                       | Low    | Low    | Low    | Low   |
|                                                          | 10 – 100            | Low                          |        |        |        |       |
|                                                          | < 10                |                              |        |        |        |       |
| Medium receptor sensitivity                              |                     |                              |        |        |        |       |
| > 32µg/m <sup>3</sup>                                    | > 10                | High                         | Medium | Low    | Low    | Low   |
|                                                          | < 10                | Medium                       | Low    |        |        |       |
| 28 – 32µg/m <sup>3</sup>                                 | > 10                | Medium                       | Low    | Low    | Low    | Low   |
|                                                          | < 10                | Low                          |        |        |        |       |
| 24 – 28µg/m <sup>3</sup>                                 | > 10                | Low                          | Low    | Low    | Low    | Low   |
|                                                          | < 10                |                              |        |        |        |       |
| < 24µg/m <sup>3</sup>                                    | > 10                | Low                          | Low    | Low    | Low    | Low   |
|                                                          | < 10                |                              |        |        |        |       |
| Low receptor sensitivity                                 |                     |                              |        |        |        |       |
| –                                                        | > 1                 | Low                          | Low    | Low    | Low    | Low   |

Table 5A.4: Sensitivity of the area for ecological impacts

| Receptor sensitivity | Distance from the source (m) |        |
|----------------------|------------------------------|--------|
|                      | < 20                         | < 50   |
| High                 | High                         | Medium |
| Medium               | Medium                       | Low    |
| Low                  | Low                          | Low    |

Table 5A.5: Risk of dust impacts

| Sensitivity of area | Dust emission magnitude |                  |                  |
|---------------------|-------------------------|------------------|------------------|
|                     | Large                   | Medium           | Small            |
| <b>Demolition</b>   |                         |                  |                  |
| High                | High risk site          | Medium risk site | Medium risk site |
| Medium              | High risk site          | Medium risk site | Low risk site    |
| Low                 | Medium risk site        | Low risk site    | Negligible       |
| <b>Earthworks</b>   |                         |                  |                  |
| High                | High risk site          | Medium risk site | Low risk site    |
| Medium              | Medium risk site        | Medium risk site | Low risk site    |
| Low                 | Low risk site           | Low risk site    | Negligible       |
| <b>Construction</b> |                         |                  |                  |
| High                | High risk site          | Medium risk site | Low risk site    |
| Medium              | Medium risk site        | Medium risk site | Low risk site    |
| Low                 | Low risk site           | Low risk site    | Negligible       |
| <b>Trackout</b>     |                         |                  |                  |
| High                | High risk site          | Medium risk site | Low risk site    |
| Medium              | Medium risk site        | Low risk site    | Negligible       |
| Low                 | Low risk site           | Low risk site    | Negligible       |

## Appendix 6A

### Terminology

## Contents

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|            |                                         |          |
|------------|-----------------------------------------|----------|
| <b>6A1</b> | <b>Glossary of acoustic terminology</b> | <b>1</b> |
| 6A1.1      | Decibel (dB)                            | 1        |
| 6A1.2      | dB(A)                                   | 1        |
| 6A1.3      | Equivalent continuous sound level       | 1        |
| 6A1.4      | Frequency                               | 1        |
| 6A1.5      | Maximum noise level                     | 1        |
| 6A1.6      | Sound power level                       | 2        |
| 6A1.7      | Sound pressure level                    | 2        |
| 6A1.8      | Statistical noise levels                | 2        |
| 6A1.9      | Typical levels                          | 3        |
| 6A1.10     | Vibration                               | 3        |
| 6A1.11     | Vibration dose value (VDV)              | 3        |

## 6A1 Glossary of acoustic terminology

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### 6A1.1 Decibel (dB)

The ratio of sound pressures which we can hear is approximately 106:1 (one million:one). For convenience, therefore, a logarithmic measurement scale is used. The resulting parameter is called the 'sound pressure level' ( $L_p$ ) and the associated measurement unit is the decibel (dB). As the decibel is a logarithmic ratio, the laws of logarithmic addition and subtraction apply.

### 6A1.2 dB(A)

The unit used to define a weighted sound pressure level, which correlates well with the subjective response to sound. The 'A' weighting follows the frequency response of the human ear, which is less sensitive to low and very high frequencies than it is to those in the range 500Hz to 4kHz.

In some statistical descriptors the 'A' weighting forms part of a subscript, such as  $L_{A10}$ ,  $L_{A90}$ , and  $L_{Aeq}$ .

### 6A1.3 Equivalent continuous sound level

An index for assessment for overall noise exposure is the equivalent continuous sound level,  $L_{eq}$ . This is a notional steady level which would, over a given period of time, deliver the same sound energy as the actual time-varying sound over the same period. Therefore, fluctuating levels can be described in terms of a single figure level.

### 6A1.4 Frequency

Frequency is the rate of repetition of a sound wave. The subjective equivalent in music is pitch. The unit of frequency is the hertz (Hz), which is identical to cycles per second. A 1000Hz is often denoted as 1kHz, eg 2kHz = 2000Hz. Human hearing ranges approximately from 20Hz to 20kHz. For design purposes the octave bands between 63Hz to 8kHz are generally used. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For more detailed analysis, each octave band may be split into three one-third octave bands or in some cases, narrow frequency bands.

### 6A1.5 Maximum noise level

The maximum noise level identified during a measurement period. Experimental data has shown that the human ear does not generally register the full loudness of transient sound events of less than 125ms duration and fast time weighting (F) has an exponential time constant of 125ms which reflects the ear's response. Slow time weighting (S) has an exponential time constant of 1s and is used to allow more accurate estimation of the average sound level on a visual display.

The maximum level measured with fast time weighting is denoted as  $L_{Amax,F}$ . The maximum level measured with slow time weighting is denoted  $L_{Amax,S}$ .

## 6A1.6 Sound power level

The sound power level ( $L_w$ ) of a source is a measure of the total acoustic power radiated by a source. The sound power level is an intrinsic characteristic of a source (analogous to its volume or mass), which is not affected by the environment within which the source is located.

## 6A1.7 Sound pressure level

The sound power emitted by a source results in pressure fluctuations in the air, which are heard as sound.

The sound pressure level ( $L_p$ ) is ten times the logarithm of the ratio of the measured sound pressure (detected by a microphone) to the reference level of  $2 \times 10^{-5}$  Pa (the threshold of hearing).

Thus  $L_p \text{ (dB)} = 10 \log (P/P_{ref})^2$  where  $P_{ref}$ , the lowest pressure detectable by the ear, is 0.00002 pascals (ie  $2 \times 10^{-5}$  Pa).

The threshold of hearing is 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB $_{pA}$  and a change of 3dB is only just detectable. A change of 10dB is subjectively twice, or half, as loud.

## 6A1.8 Statistical noise levels

For levels of noise that vary widely with time, for example road traffic noise, it is necessary to employ an index which allows for this variation. The  $L_{10}$  is the level exceeded for 10% of the time period under consideration, and can be used for the assessment of road traffic noise (note that  $L_{Aeq}$  is used in BS 8233 for assessing traffic noise). The  $L_{90}$ , the level exceeded for 90% of the time, has been adopted to represent the background noise level. The  $L_1$ , the level exceeded for 1% of the time, is usually a good indicator of the maximum levels recorded during the sample period. A weighted statistical noise levels are denoted  $L_{A10}$ ,  $dB_{LA90}$  etc. The reference time period (T) is normally included, e.g.  $dB_{LA10,5min}$  or  $dB_{LA90,8hr}$ .

## 6A1.9 Typical levels

Some typical dB(A) noise levels are given below:

Table 6A.1: Typical noise levels and examples

| Noise Level, dB(A) | Example                               |
|--------------------|---------------------------------------|
| 130                | Threshold of pain                     |
| 120                | Jet aircraft take-off at 100m         |
| 110                | Chain saw at 1m                       |
| 100                | Inside disco                          |
| 90                 | Heavy lorries at 5m                   |
| 80                 | Kerbside of busy street               |
| 70                 | Loud radio (in typical domestic room) |
| 60                 | Office or restaurant                  |
| 50                 | Domestic fan heater at 1m             |
| 40                 | Living room                           |
| 30                 | Theatre                               |
| 20                 | Remote countryside on still night     |
| 10                 | Sound insulated test chamber          |

## 6A1.10 Vibration

Vibration may be expressed in terms of displacement, velocity and acceleration. Velocity and acceleration are most commonly used when assessing human comfort or structureborne noise issues.

Vibration magnitude may be quantified as a peak value, or as a root mean squared (rms) value. The rms value is of benefit because it takes into account both time history variation and energy content. The rms value is equal to 0.707 times the peak value.

The peak value, expressed as the peak particle velocity (PPV) is commonly used for construction vibration and is the parameter best correlated with building damage. PPV can also be related to the perceptible to people of vibration.

Generally humans are more sensitive to changes in vibration amplitude than they are to changes in the duration of the exposure to vibration.

## 6A1.11 Vibration dose value (VDV)

This is a complex metric that has been identified as being the best objective measure of human disturbance from intermittent/transient vibration. The VDV is the fourth root of the time integral of the fourth power of the weighted acceleration. VDV are measured in units of  $\text{ms}^{-1.75}$ . The frequency weightings are defined in BS 6472-1: 2008 and in BS 6841: 1987.

The VDV doubles in magnitude with a doubling of vibration amplitude. However, a 16-fold increase in the duration of exposure to the vibration is required to double the VDV (without any change in amplitude).

## Appendix 6B

### Policy, Legislation, and Guidance

## Contents

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|            |                                                                                     |          |
|------------|-------------------------------------------------------------------------------------|----------|
| <b>6B1</b> | <b>National planning policy</b>                                                     | <b>1</b> |
| 6B1.1      | National Planning Policy Framework (NPPF)                                           | 1        |
| 6B1.2      | Noise Policy Statement for England                                                  | 1        |
| 6B1.3      | Planning Practice Guidance – Noise (PPG-N)                                          | 2        |
| <b>6B2</b> | <b>Legislation</b>                                                                  | <b>4</b> |
| 6B2.1      | The Control of Pollution Act, 1974                                                  | 4        |
| 6B2.2      | Environmental Protection Act, 1990                                                  | 4        |
| 6B2.3      | Noise Insulation (Railways and Other Guided Transport Systems) Regulations, 1996    | 5        |
| <b>6B3</b> | <b>Guidance</b>                                                                     | <b>5</b> |
| 6B3.1      | Design Manual for Roads and Bridges LA111 – Noise and vibration (formerly HD213/11) | 5        |
| 6B3.2      | Calculation of Railway Noise (CRN)                                                  | 5        |
| 6B3.3      | Calculation of Road Traffic Noise (CRTN)                                            | 5        |

## 6B1 National planning policy

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### 6B1.1 National Planning Policy Framework (NPPF)

Paragraphs 170 and 180 of the National Planning Policy Framework<sup>1</sup> (NPPF) contain key information regarding the assessment of environmental noise.

Paragraph 170 requires planning policies and decisions to “*contribute to and enhance the natural and local environment by ... Preventing both new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by unacceptable levels of ... noise pollution*”.

Paragraph 123 of NPPF states that “*... planning policies and decisions should ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*

- *mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.*”

### 6B1.2 Noise Policy Statement for England

In the case of environmental noise, the NPPF planning objectives are addressed through the Noise Policy Statement for England<sup>2</sup> (NPSE).

The NPSE states the following aims:

*“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

- *Avoid significant adverse health 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.*”

Within these aims, the NPSE uses the key phrases “significant adverse” and “adverse”. In clarifying what these mean the policy notes that “*...there are two established concepts from toxicology that are currently being applied to noise effects, for example, by the WHO*”. These concepts are:

- NOEL - no observed effect level, the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and

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<sup>1</sup> Ministry of Housing, Communities & Local Government (2019); *National Planning Policy Framework*

<sup>2</sup> Department for Environment, Food & Rural Affairs (2010); *Noise Policy Statement for England*

- LOAEL - lowest observed adverse effect level, the level above which adverse effects on health and quality of life can be detected.

The policy extends these concepts to include:

- SOAEL - significant observed adverse effect level, the level above which significant adverse effects on health and quality of life occur.

### **6B1.3 Planning Practice Guidance – Noise (PPG-N)**

Planning Practice Guidance - Noise<sup>3</sup> (PPG-N) draws on the principles of the NPSE in particular the concepts of No Observed Effect Level (NOEL), Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL). PPG-N presents example outcomes to help characterise these effects (see Table 6B.1).

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<sup>3</sup> Ministry of Housing, Communities & Local Government (2019); *Planning Practice Guidance - Noise*

Table 6B.1: Noise exposure hierarchy according to likely average response (based on PPG-N)

| ← Increasing noise level ← | Perception                   | Examples of outcomes                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Increasing effect level             | Action                           |
|----------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------------------------------|
|                            | Not noticeable               | No effect                                                                                                                                                                                                                                                                                                                                                                                                                                                            | No observed effect                  | No specific measures required    |
|                            | NOEL                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
|                            | Noticeable and not intrusive | Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.                                                                                                                                                                                                                                                             | No observed adverse effect          | No specific measures required    |
|                            | LOAEL                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
|                            | Noticeable and intrusive     | Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.                                                          | Observed adverse effect             | Mitigate and reduce to a minimum |
|                            | SOAEL                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                     |                                  |
|                            | Noticeable and disruptive    | The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area. | Significant observed adverse effect | Avoid                            |

The NPSE notes that it is not possible to have a single objective noise-based measure to define SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL threshold is likely to vary for depending on many factors such as the types of noise sources, the sensitivity of receptors and the time period(s) in question. It is for individual assessments to identify relevant SOAEL thresholds, taking account of the different sources of exposure and different receptors.

Where the overall noise exposure from the proposed Scheme exceeds the relevant SOAEL threshold at a specific receptor, that receptor is identified as being subject to a significant adverse impact on health and quality of life under Government noise policy, and is hence identified as a likely significant adverse effect.

Where the overall noise exposure from the proposed Scheme falls between the LOAEL and SOAEL thresholds, the NPSE states:

*“all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”*

Other factors, such as the number of dwellings affected and the magnitude of noise change, can result in impacts between the LOAEL and SOAEL thresholds being reported as likely significant effects in EIA terms. The EIA process requires that likely significant effects are identified along with the envisaged mitigation to avoid or reduce these significant effects.

## 6B2 Legislation

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### 6B2.1 The Control of Pollution Act, 1974

The Control of Pollution Act<sup>4</sup> provides Local Authorities with the power to control noise from construction sites. This may include specific controls to restrict certain activities identified as causing noise problems. Conditions regarding hours of operation will generally be specified and noise and vibration limits at certain locations may be applied in some cases.

Powers include prosecution for failure to comply with the requirements of a notice served under the act, and a system of providing prior consents for works to be carried out in a specified manner so as to reduce the likelihood of causing disturbance (Section 61 consents). Noise-generating parties can use the defence that ‘best practicable means’, as defined in Section 72, have been employed to minimise noise emissions.

### 6B2.2 Environmental Protection Act, 1990

The Environmental Protection Act<sup>5</sup> provides Local Authorities and individuals with powers to serve, or request a magistrate to serve, abatement notices against noise and/or vibration from premises that are considered to be a nuisance. Noise-generating parties can use the defence that ‘best practicable means’ have been used to control noise emissions or, in relation to construction noise, that the alleged nuisance arose from activities that were compliant with an extant consent under Section 61 of the Control of Pollution Act (prior consent).

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<sup>4</sup> HM Government (1974); *Control of Pollution Act*

<sup>5</sup> HM Government (1990); *Environmental Protection Act*

## 6B2.3 Noise Insulation (Railways and Other Guided Transport Systems) Regulations, 1996

The Noise Insulation (Railways and Other Guided Transport Systems) Regulations<sup>6</sup> (NIRR) consider the noise impact of railways and other systems on existing residential properties, and describe the process and criteria to be used when determining eligibility for noise insulation to dwellings.

## 6B3 Guidance

### 6B3.1 Design Manual for Roads and Bridges LA111 – Noise and vibration (formerly HD213/11)

Design Manual for Roads and Bridges LA111 – Noise and vibration (LA111)<sup>7</sup> sets out the requirements for assessing and reporting the effect of operational highways noise. Whilst not directly applicable to the proposed Scheme, it provides a good practice basis for assessing the impact of changes in operational noise levels (see Table 6B.2 reproduced from Table 3.54a/3.54b in LA111).

Table 6B.2: Magnitude of road traffic noise change from LA111

| Magnitude of change | Short term noise change (dB<br>L <sub>A10,18h</sub> or L <sub>night</sub> ) | Long term noise change (dB<br>L <sub>A10,18hr</sub> or L <sub>night</sub> ) |
|---------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| Major               | Greater than or equal to 5.0                                                | Greater than or equal to 10.0                                               |
| Moderate            | 3.0 to 4.9                                                                  | 5.0 to 9.9                                                                  |
| Minor               | 1.0 to 2.9                                                                  | 3.0 to 4.9                                                                  |
| Negligible          | Less than 1.0                                                               | Less than 3.0                                                               |

### 6B3.2 Calculation of Railway Noise (CRN)

The Department of Transport Memorandum Calculation of Railway Noise (CRN)<sup>8</sup> presents a procedure for the prediction of railway noise. The relevant parts of this procedure have been used to predict the baseline noise level for operational railway traffic.

### 6B3.3 Calculation of Road Traffic Noise (CRTN)

The Department of Transport Memorandum Calculation of Road Traffic Noise (CRTN)<sup>9</sup> presents a procedure for the prediction of road traffic noise. The relevant p

<sup>6</sup> HM Government (1996); *Noise Insulation (Railways and Other Guided Transport Systems) Regulations*

<sup>7</sup> Highways England (2020); *Design Manual for Roads and Bridges LA111 Noise and vibration*

<sup>8</sup> Department of Transport (1995); *Calculation of Railway Noise*

<sup>9</sup> Department of Transport Welsh Office (1988); *Calculation of Road Traffic Noise*

arts of this procedure have been used to predict, for a given road at a reference distance, the change in noise level resulting from the change in road traffic between the baseline and the assessment case for operational road traffic.

## Appendix 6C

### Baseline Information

## Contents

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|            |                                      |          |
|------------|--------------------------------------|----------|
| <b>6C1</b> | <b>Introduction</b>                  | <b>1</b> |
| <b>6C2</b> | <b>Modelling approach</b>            | <b>1</b> |
| <b>6C3</b> | <b>Road traffic flow information</b> | <b>1</b> |
| <b>6C4</b> | <b>Rail noise model</b>              | <b>1</b> |
| 6C4.1      | Rolling stock and movements          | 1        |
| 6C4.2      | Other assumptions                    | 1        |

## 6C1 Introduction

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This appendix presents the input information and assumptions made when establishing the baseline and future noise environments through prediction.

## 6C2 Modelling approach

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The environmental noise software SoundPLANnoise v8.2 (SoundPLAN GmbH) was used to predict noise levels due to existing and proposed road and rail sources. The software provides implementations of both CRN and CRTN methodologies for modelling road traffic noise and rail noise respectively, along with an implementation of ISO 9613 for modelling industrial point, line and area sources.

## 6C3 Road traffic flow information

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Road traffic flow data used for establishing the baseline and future scenarios are provided in Table 6C.1.

Table 6C.1: Traffic data used for noise modelling

| Link                                            | 18hr (day) |           |           |        |      |      |                    |      |      | 6hr (night) |      |      |        |      |      |                    |      |      |
|-------------------------------------------------|------------|-----------|-----------|--------|------|------|--------------------|------|------|-------------|------|------|--------|------|------|--------------------|------|------|
|                                                 | 18hr AAWT  |           |           | % HGVs |      |      | Average speed, kph |      |      | 18hr AAWT   |      |      | % HGVs |      |      | Average speed, kph |      |      |
|                                                 | 2021       | 2023      | 2028      | 2021   | 2023 | 2028 | 2021               | 2023 | 2028 | 2021        | 2023 | 2028 | 2021   | 2023 | 2028 | 2021               | 2023 | 2028 |
|                                                 | BL         | DM        | DS        | BL     | DM   | DS   | BL                 | DM   | DS   | BL          | DM   | DS   | BL     | DM   | DS   | BL                 | DM   | DS   |
| Bank Lane<br>(north of<br>Shevington's<br>Lane) | 1414<br>9  | 2095<br>2 | 2100<br>5 | 5%     | 4%   | 4%   | 48                 | 48   | 48   | 561         | 831  | 856  | 5%     | 4%   | 4%   | 48                 | 48   | 48   |
| Shevington's<br>Lane (W)                        | 1187<br>3  | 1210<br>5 | 1232<br>7 | 2%     | 2%   | 2%   | 48                 | 48   | 48   | 471         | 480  | 508  | 2%     | 2%   | 2%   | 48                 | 48   | 48   |
| Bank Lane<br>(south of<br>Shevington's<br>Lane) | 1543<br>1  | 2225<br>9 | 2253<br>3 | 4%     | 3%   | 3%   | 48                 | 48   | 48   | 612         | 883  | 918  | 4%     | 3%   | 3%   | 48                 | 48   | 48   |
| Bank Lane<br>(north of<br>Headbolt<br>Lane)     | 1487<br>7  | 2169<br>4 | 2206<br>4 | 4%     | 3%   | 3%   | 48                 | 48   | 48   | 590         | 861  | 899  | 4%     | 3%   | 3%   | 48                 | 48   | 48   |
| Boyes Brow                                      | 6250       | 6372      | 6381      | 1%     | 1%   | 1%   | 48                 | 48   | 48   | 248         | 253  | 263  | 1%     | 1%   | 1%   | 48                 | 48   | 48   |
| A506 County<br>Road (N)                         | 1479<br>8  | 2161<br>4 | 2219<br>2 | 5%     | 3%   | 3%   | 48                 | 48   | 48   | 587         | 857  | 904  | 5%     | 3%   | 3%   | 48                 | 48   | 48   |
| A506 County<br>Road (S)                         | 1467<br>7  | 2179<br>0 | 2236<br>7 | 5%     | 3%   | 3%   | 48                 | 48   | 48   | 582         | 864  | 910  | 5%     | 3%   | 3%   | 48                 | 48   | 48   |
| St Kevin's<br>Drive                             | 2047       | 3469      | 3469      | 1%     | 0%   | 0%   | 48                 | 48   | 48   | 81          | 138  | 141  | 1%     | 0%   | 0%   | 48                 | 48   | 48   |

|                                           |      |      |             |    |    |           |    |    |           |     |          |           |    |    |           |    |    |           |
|-------------------------------------------|------|------|-------------|----|----|-----------|----|----|-----------|-----|----------|-----------|----|----|-----------|----|----|-----------|
| Headbolt Lane<br>(west of site<br>access) | 5802 | 5916 | 6872        | 3% | 3% | 2%        | 48 | 48 | 48        | 230 | 235      | 282       | 3% | 3% | 2%        | 48 | 48 | 48        |
| <i>Site access</i>                        |      |      | <i>1196</i> |    |    | <i>0%</i> |    |    | <i>49</i> |     | <i>0</i> | <i>47</i> |    |    | <i>0%</i> |    |    | <i>49</i> |
| Fallowfield                               | 342  | 349  | 349         | 1% | 1% | 1%        | 48 | 48 | 48        | 14  | 14       | 15        | 1% | 1% | 1%        | 48 | 48 | 48        |
| Headbolt Lane<br>(east of site<br>access) | 6367 | 6492 | 6732        | 3% | 3% | 3%        | 48 | 48 | 48        | 253 | 258      | 281       | 3% | 3% | 3%        | 48 | 48 | 48        |
| Headbolt Lane<br>(E)                      | 3557 | 3627 | 3781        | 3% | 3% | 3%        | 48 | 48 | 48        | 141 | 144      | 158       | 3% | 3% | 3%        | 48 | 48 | 48        |
| Dale Lane                                 | 5161 | 5263 | 5307        | 6% | 6% | 6%        | 48 | 48 | 48        | 205 | 209      | 221       | 6% | 6% | 6%        | 48 | 48 | 48        |
| Pingwood<br>Lane                          | 6764 | 6896 | 7006        | 6% | 6% | 6%        | 48 | 48 | 48        | 268 | 274      | 292       | 6% | 6% | 6%        | 48 | 48 | 48        |
| Shevington's<br>Lane (E)                  | 5885 | 6000 | 6108        | 2% | 2% | 2%        | 48 | 48 | 48        | 233 | 238      | 255       | 2% | 2% | 2%        | 48 | 48 | 48        |
| Stopgate Lane                             | 1811 | 1847 | 1849        | 6% | 6% | 6%        | 64 | 64 | 64        | 72  | 73       | 77        | 6% | 6% | 6%        | 64 | 64 | 64        |
| Windermere<br>Drive                       | 554  | 565  | 660         | 1% | 1% | 1%        | 48 | 48 | 48        | 22  | 22       | 27        | 1% | 1% | 1%        | 48 | 48 | 48        |

## 6C4 Rail noise model

### 6C4.1 Rolling stock and movements

Information pertaining to train classification, CRN sound exposure level corrections and operation frequency is presented for each situation as follows.

#### 6C4.1.1 2021 Baseline

| Operating company | Train classification | CRN vehicle description | CRN correction dB(A) | Frequency of operation (day) | Frequency of operation (night) |
|-------------------|----------------------|-------------------------|----------------------|------------------------------|--------------------------------|
| Merseyrail        | 507 & 508/1          | 465 EMU                 | +8.4                 | 97                           | 14                             |
| Northern Rail     | 150                  | 165 DMU                 | +7                   | 22                           | 2                              |

Table 6C.2: Rail rolling stock assumptions, baseline

#### 6C4.1.2 2023 Do-Minimum

| Operating company | Train classification | CRN vehicle description | CRN correction dB(A) | Frequency of operation (day) | Frequency of operation (night) |
|-------------------|----------------------|-------------------------|----------------------|------------------------------|--------------------------------|
| Merseyrail        | 507 & 508/1          | 465 EMU                 | +8.4                 | 97                           | 14                             |
| Northern Rail     | 150                  | 165 DMU                 | +7                   | 22                           | 2                              |

Table 6C.3: Rail rolling stock assumptions, Do-Minimum

#### 6C4.1.3 2028 Do-Something

| Operating company | Train classification | CRN vehicle description | CRN correction dB(A) | Frequency of operation (day) | Frequency of operation (night) |
|-------------------|----------------------|-------------------------|----------------------|------------------------------|--------------------------------|
| Merseyrail        | 777                  | 465 EMU                 | +8.4                 | 120                          | 24                             |
| Northern Rail     | 95                   | 165 DMU                 | +7                   | 30                           | 6                              |

Table 6C.4: Rail rolling stock assumptions, Do-Something

### 6C4.2 Other assumptions

The following key assumptions have been made when undertaking the operational rail noise modelling.

- In order to quantify a baseline suitable for a reasonable worst-case assessment, the actual speeds of trains were assumed to be 60% of the maximum allowed line speed.
- Changes in train speed when arriving at or leaving a station have been accounted for by segmenting the track into 200m sections, and applying typical acceleration/deceleration profiles to segments as necessary.

- In line with guidance in CRN, a minimum train speed of 20km/h has been adopted.
- A standard correction of 2.5dB has been applied to the track segment containing the new points.

## Appendix 6D

### Construction Assumptions

## Contents

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|            |                                                        |          |
|------------|--------------------------------------------------------|----------|
| <b>6D1</b> | <b>Construction phases</b>                             | <b>1</b> |
| <b>6D2</b> | <b>Construction activities</b>                         | <b>1</b> |
| <b>6D3</b> | <b>Vibration – empirical data used for bored piles</b> | <b>5</b> |

## 6D1 Construction phases

This section provides the construction activity assumptions which form the basis for the prediction of construction noise in accordance with British Standard 5228-1:2009+A1:2014<sup>1</sup>.

Noise levels from the rationalised construction phases in Table 6D.1 have been predicted at the closest assessment locations to identify potential significant effects.

Table 6D.1: Rationalised construction phases for assessment of noise impact

| Construction phase |                                                    | Working hours                |
|--------------------|----------------------------------------------------|------------------------------|
| A                  | Temporary power supply                             | 07:30 – 17:30                |
| B                  | Hoarding installation                              | 07:30 – 17:30                |
| C                  | Main compound construction                         | 07:30 – 17:30                |
| D                  | Road rail access point (RRAP) installation         | Sat 20:30 – Mon 05:30        |
| E                  | Haul road construction                             | 07:30 – 17:30                |
| F                  | Bailey bridge install                              | 07:30 – 17:30                |
| G                  | Devegetation of rail corridor                      | Sun 08:00 – 18:00            |
| H                  | Earthworks (Kingpost)                              | Sat 20:30 – Mon 05:30        |
| I                  | Plain line install                                 | Sat 20:30 – Mon 05:30        |
| J                  | Track drainage                                     | Sat 20:30 -Mon 05:30         |
| K                  | Cable routing                                      | 20.30 – 05.30, 7 day working |
| L                  | LOC/signal, hardstandings and signage installation | 20.30 – 05.30, 7 day working |
| M                  | Switches and crossings (S&C)                       | Sat 20:30 -Mon 05:30         |
| N                  | Car park drainage                                  | 07:30 – 17:30                |
| O                  | Car park construction                              | 07:30 -17:30                 |
| P                  | Railway underbridge construction                   | 24/7 working                 |
| Q                  | Platform construction                              | 20.30 – 05.30, 7 day working |
| R                  | Station building construction                      | 07:30 -17:30                 |
| S                  | Rail systems install and commissioning             | 24/7 working                 |

## 6D2 Construction activities

For each construction phase, a set of assumptions have been made regarding operational plant types, locations and typical durations of time for which plant would be operating during a working day. These assumptions are summarised in Table 6D.2.

<sup>1</sup> British Standards Institute (2014); *Code of practice for noise and vibration control on construction and open sites. Noise*

No mitigation has been accounted for in the calculations, with the exception of screening provided by existing buildings.

Construction works would be managed in accordance with the principles of ‘best practicable means’ (BPM) as required by the Control of Pollution Act. Therefore, additional screening not accounted for in these calculations may be provided for particularly noisy activities.

The equipment activity levels presented represent the worst case for a single phase of the construction programme. It is assumed that activities within a phase will generally occur sequentially rather than simultaneously, but that different phases of construction could overlap.

A worst case has been assumed, using the shortest distance between each receptor group and the edge of the construction works for each phase. There would be some variability in noise level during the day and for different locations, depending on variations in distance and the amount of screening present.

For linear activities, the closest point of approach to the relevant receptor has been used to calculate noise levels. In reality, activities would be here for only a short duration, and noise levels would decrease as the activity moved further from this location.

Table 6D.2: Construction activity assumptions

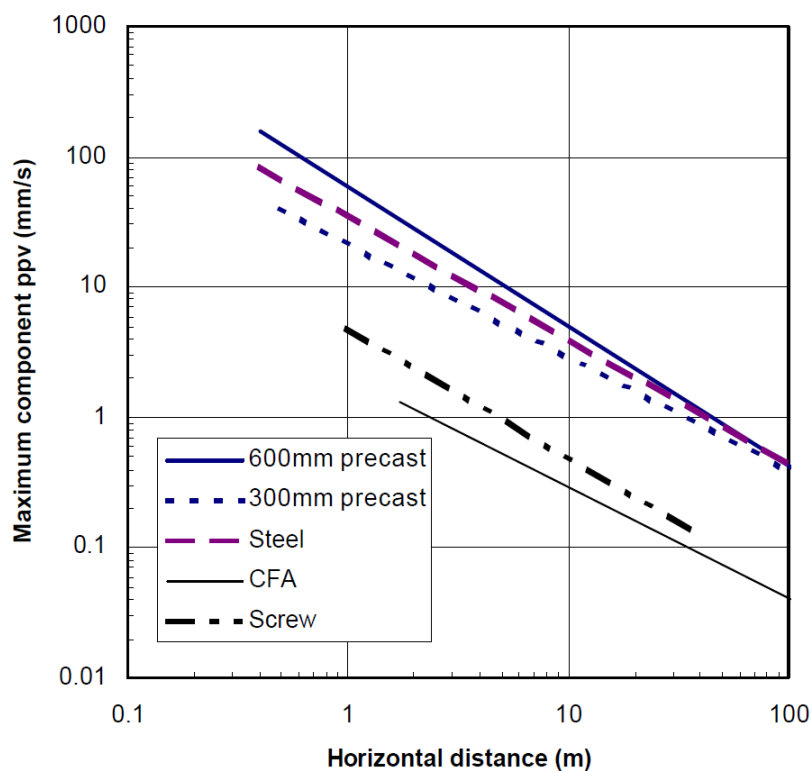
| Activity                                                                                                                          | Equipment                                                    | Quantity | % on-time | Lw dB(A) | Source              |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|----------|-----------|----------|---------------------|
| Temporary power supply<br>LOC/Signal, hardstanding and<br>signage<br>RRAP installation                                            | Bobcat (mini excavator)                                      | 1        | 50        | 96       | BS5228 Table C 3-20 |
|                                                                                                                                   | Concrete Pump + Cement Mixer Truck (Discharging)             | 1        | 50        | 95       | BS5228 Table C 4-24 |
|                                                                                                                                   | Concrete Mixer Truck                                         | 1        | 10        | 108      | BS5228 Table C 4-20 |
|                                                                                                                                   | Poker vibrator                                               | 1        | 20        | 97       | BS5228 Table C 4-34 |
|                                                                                                                                   | Electric Drill                                               | 1        | 20        | 104      | BS5228 Table D 6-54 |
|                                                                                                                                   | Diesel Generator                                             | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                                                                                                                   | Roller                                                       | 1        | 25        | 101      | BS5228 Table C 2-38 |
|                                                                                                                                   | Hand-held circular saw                                       | 1        | 10        | 112      | BS5228 Table C 4-73 |
|                                                                                                                                   | Breakers ( kango )                                           | 1        | 10        | 111      | BS5228 Table C 1-6  |
| Hoarding installation                                                                                                             | Vibratory plate                                              | 1        | 20        | 108      | BS5228 Table C 2-41 |
|                                                                                                                                   | Tracked Excavator                                            | 1        | 30        | 105      | BS5228 Table C 2-2  |
|                                                                                                                                   | Diesel Generator                                             | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                                                                                                                   | Handheld Cordless Nail Gun                                   | 2        | 10        | 101      | BS5228 Table C 4-95 |
|                                                                                                                                   | Compressor for Hand-held Pneumatic Breaker                   | 1        | 30        | 93       | BS5228 Table C 5-5  |
| Main compound construction<br>Underbridge construction<br>Platform construction<br>Station building<br>Bailey bridge construction | Wheeled mobile Crane                                         | 1        | 25        | 98       | BS5228 Table C 4-43 |
|                                                                                                                                   | Wheeled Excavator                                            | 1        | 20        | 105      | BS5228 Table C 4-12 |
|                                                                                                                                   | Lorry with Lifting Boom                                      | 1        | 10        | 105      | BS5228 Table C 4-53 |
|                                                                                                                                   | Hand-held Circular Saw (Petrol-Cutting concrete blocks)      | 1        | 10        | 107      | BS5228 Table C 4-72 |
|                                                                                                                                   | Wheeled mobile Crane                                         | 1        | 25        | 98       | BS5228 Table C 4-43 |
|                                                                                                                                   | Road Breaker (Hand-held Pneumatic)                           | 1        | 5         | 110      | BS5228 Table C 5-3  |
|                                                                                                                                   | Angle Grinder (Grinding Steel)                               | 1        | 10        | 108      | BS5228 Table C 4-93 |
|                                                                                                                                   | Concrete Mixer Truck (Discharging) & Concrete Pump (Pumping) | 1        | 30        | 103      | BS5228 Table C 4-28 |
| Car park construction<br>Haul road construction                                                                                   | Vibratory Roller                                             | 1        | 20        | 103      | BS5228 Table C 5-20 |
|                                                                                                                                   | Wheeled Excavator                                            | 2        | 40        | 105      | BS5228 Table C 4-12 |
|                                                                                                                                   | Lorry with Lifting Boom                                      | 1        | 10        | 105      | BS5228 Table C 4-53 |
|                                                                                                                                   | Wheeled mobile Crane                                         | 1        | 10        | 98       | BS5228 Table C 4-43 |
|                                                                                                                                   | Road Breaker (Hand-held Pneumatic)                           | 1        | 5         | 110      | BS5228 Table C 5-3  |
| Earthworks (Kingpost)                                                                                                             | Vibratory Roller                                             | 1        | 40        | 103      | BS5228 Table C 5-20 |
|                                                                                                                                   | Tracked Excavator                                            | 1        | 50        | 105      | BS5228 Table C 2-19 |
|                                                                                                                                   | Dumper                                                       | 1        | 70        | 104      | BS5228 Table C 4-3  |
|                                                                                                                                   | Telescopic Handler                                           | 1        | 30        | 99       | BS5228 Table C 2-35 |
|                                                                                                                                   | Lorry with Lifting Boom                                      | 1        | 5         | 105      | BS5228 Table C 4-53 |
|                                                                                                                                   | Vibratory Piling Rig                                         | 1        | 20        | 116      | BS5228 Table C 3-8  |
|                                                                                                                                   | Vibratory Plate (Petrol)                                     | 2        | 10        | 108      | BS5228 Table C 2-41 |

| Activity                             | Equipment                             | Quantity | % on-time | Lw dB(A) | Source              |
|--------------------------------------|---------------------------------------|----------|-----------|----------|---------------------|
|                                      | Roller                                | 1        | 70        | 101      | BS5228 Table C 2-38 |
| Devegetation of rail corridor        | RRV (mini excavator)                  | 1        | 50        | 93       | BS5228 Table C 4-68 |
|                                      | Hand tools                            | 1        | 50        | 100      | Estimated           |
|                                      | Electric Drill                        | 1        | 20        | 104      | BS5228 Table D 6-54 |
|                                      | Generator                             | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                      | Strimmer (Stihl FR 130T brush cutter) | 1        | 50        | 105      | measured            |
| Track drainage<br>Cable routing      | Bobcat (mini excavator)               | 1        | 50        | 96       | BS5228 Table C 3-20 |
|                                      | Hiab delivery lorry                   | 1        | 5         | 105      | BS5228 Table C 4-53 |
|                                      | Generator                             | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                      | Hand tools                            | 1        | 20        | 100      | Estimated           |
|                                      | Roller                                | 1        | 25        | 101      | BS5228 Table C 2-38 |
|                                      | Breakers ( kango )                    | 1        | 10        | 111      | BS5228 Table C 1-6  |
| Plain line install                   | Generators                            | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                      | RRV                                   | 1        | 20        | 105      | BS5228 Table C 4-12 |
|                                      | Power tools                           | 1        | 25        | 105      | measured            |
|                                      | Hand-Held Welder (Welding Piles)      | 1        | 20        | 101      | BS5228 Table C 3-31 |
|                                      | Rail saw 14inch                       | 1        | 10        | 119      | BS5228 Table C 4-70 |
|                                      | Bance / airgun                        | 2        | 10        | 105      | measured            |
|                                      | Engineering Train                     | 1        | 10        | 114      | BS5228 Table C 6-3  |
| Switches and crossings               | Angle Grinder (Grinding Steel)        | 1        | 10        | 108      | BS5228 Table C 4-93 |
|                                      | RRV                                   | 1        | 10        | 114      | BS5228 Table C 6-3  |
|                                      | Engineering Train                     | 1        | 25        | 107      |                     |
|                                      | Kirow Crane                           | 2        | 10        | 108      | BS5228 Table C 2-41 |
|                                      | Vibratory Plate (Petrol)              | 1        | 10        | 119      | BS5228 Table C 4-70 |
|                                      | Rail saw 14inch                       | 1        | 100       | 93       | BS5228 Table C 4-86 |
|                                      | Generators                            | 1        | 25        | 95       | Estimated           |
|                                      | Bance impact wrench                   | 2        | 20        | 101      | BS5228 Table C 3-31 |
|                                      | Hand-Held Welder (Welding Piles)      | 2        | 10        | 105      | measured            |
|                                      | Bance / airgun                        | 2        | 10        | 106      | BS5228 Table C 6-41 |
| Systems install and<br>commissioning | Compressor                            | 1        | 10        | 114      | BS5228 Table C 6-3  |
|                                      | RRV                                   | 2        | 25        | 105      | BS5228 Table C 4-12 |
|                                      | Hand tools                            | 1        | 25        | 100      | Estimated           |
|                                      | Angle Grinder (Grinding Steel)        | 1        | 10        | 108      | BS5228 Table C 4-93 |
|                                      | Generators                            | 1        | 100       | 93       | BS5228 Table C 4-86 |

## 6D3 Vibration – empirical data used for bored piles

Vibration has been estimated using the methods set out in BS 5228–2:2009+A1:2014<sup>2</sup>. Vibration for bored piling is not provided in the standard, it has therefore been estimated based on the published<sup>3</sup> data presented in Figure 6D.1 which compares data from hammer driven concrete and steel piles with continuous flight auger (CFA) and displacement (screw) piles.

Figure 6D.1 Regression lines for vibration from each pile type



<sup>2</sup> British Standards Institute (2014); *Code of practice for noise and vibration control on construction and open sites. Vibration*

<sup>3</sup> Hiller D (2001) A comparison of noise and vibration from percussive and bored piling. Proc Underground Construction 2001.

## Appendix 6E

### Road Traffic Noise Assessment

## Contents

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|            |                                              |          |
|------------|----------------------------------------------|----------|
| <b>6E1</b> | <b>Road traffic noise assessment results</b> | <b>1</b> |
|------------|----------------------------------------------|----------|

## 6E1 Road traffic noise assessment results

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This appendix provides the results of the traffic noise modelling study; refer to Table 6E.1.

The basic noise level (BNL), which is the level at 10m from the kerb, has been calculated in accordance with CRTN based on data provided by the transport consultant. Results are presented in terms of BNL because this enables a direct comparison of the change in noise level associated with particular sections of road.

The method for determining potential significant effects is described in Chapter 6. In summary, the traffic noise levels for the Do-Something (DS) (with scheme) scenario have been compared with the Do-Minimum (DM) (without scheme) scenario to establish the magnitude of change. Depending on the policy effect level, impact magnitudes and potential significant effects can then be determined.

The baseline (BL) information has also been provided for reference.

Table 6E.1: Results of operational road traffic noise assessment

| Link                                            | 18hr AAWT |       |       | % HGVs |      |      | Average speed, kph |      |      | BNL at 10m,<br>dBL <sub>A10,18hr</sub> |      |      | Change in noise, dB |      |       | Policy<br>effect level           | Impact<br>magnitude |
|-------------------------------------------------|-----------|-------|-------|--------|------|------|--------------------|------|------|----------------------------------------|------|------|---------------------|------|-------|----------------------------------|---------------------|
|                                                 | 2021      | 2023  | 2028  | 2021   | 2023 | 2028 | 2021               | 2023 | 2028 | 2021                                   | 2023 | 2028 | 2021                | 2023 | 2028  |                                  |                     |
|                                                 | BL        | DM    | DS    | BL     | DM   | DS   | BL                 | DM   | DS   | BL                                     | DM   | DS   | BL                  | DS-B | DS-DM |                                  |                     |
| Bank Lane<br>(north of<br>Shevington's<br>Lane) | 14149     | 20952 | 21005 | 5%     | 4%   | 4%   | 48                 | 48   | 48   | 70                                     | 71   | 71   | 1.2                 | 1.2  | 0.0   | Above<br>SOAEL                   | No change           |
| Shevington's<br>Lane (W)                        | 11873     | 12105 | 12327 | 2%     | 2%   | 2%   | 48                 | 48   | 48   | 68                                     | 68   | 68   | 0.1                 | 0.2  | 0.1   | Above<br>SOAEL                   | Negligible          |
| Bank Lane<br>(south of<br>Shevington's<br>Lane) | 15431     | 22259 | 22533 | 4%     | 3%   | 3%   | 48                 | 48   | 48   | 70                                     | 71   | 71   | 1.2                 | 1.2  | 0.0   | Above<br>SOAEL                   | No change           |
| Bank Lane<br>(north of<br>Headbolt Lane)        | 14877     | 21694 | 22064 | 4%     | 3%   | 3%   | 48                 | 48   | 48   | 69                                     | 71   | 71   | 1.2                 | 1.3  | 0.1   | Above<br>SOAEL                   | Negligible          |
| Boyes Brow                                      | 6250      | 6372  | 6381  | 1%     | 1%   | 1%   | 48                 | 48   | 48   | 65                                     | 65   | 65   | 0.1                 | 0.1  | 0.0   | Between<br>LOAEL<br>and<br>SOAEL | No change           |
| A506 County<br>Road (N)                         | 14798     | 21614 | 22192 | 5%     | 3%   | 3%   | 48                 | 48   | 48   | 69                                     | 71   | 71   | 1.2                 | 1.3  | 0.1   | Above<br>SOAEL                   | Negligible          |
| A506 County<br>Road (S)                         | 14677     | 21790 | 22367 | 5%     | 3%   | 3%   | 48                 | 48   | 48   | 69                                     | 71   | 71   | 1.2                 | 1.3  | 0.1   | Above<br>SOAEL                   | Negligible          |
| St Kevin's Drive                                | 2047      | 3469  | 3469  | 1%     | 0%   | 0%   | 48                 | 48   | 48   | 59                                     | 62   | 62   | 2.2                 | 2.2  | 0.0   | Between<br>LOAEL<br>and<br>SOAEL | No change           |
| Headbolt Lane<br>(west of site<br>access)       | 5802      | 5916  | 6872  | 3%     | 3%   | 2%   | 48                 | 48   | 48   | 65                                     | 65   | 65   | 0.1                 | 0.6  | 0.5   | Above<br>SOAEL                   | Negligible          |
| Site access                                     |           |       | 1196  |        |      | 0%   |                    |      | 49   | 0                                      | 0    | 57   | 0.0                 | 57.0 | 57.0  | N/A                              | N/A                 |

|                                     |      |      |      |    |    |    |    |    |    |          |          |          |          |          |          |                         |            |
|-------------------------------------|------|------|------|----|----|----|----|----|----|----------|----------|----------|----------|----------|----------|-------------------------|------------|
| Fallowfield                         | 342  | 349  | 349  | 1% | 1% | 1% | 48 | 48 | 48 | Low Flow | Low Flow | Low Flow | Low Flow | Low Flow | Low Flow | N/A                     | N/A        |
| Headbolt Lane (east of site access) | 6367 | 6492 | 6732 | 3% | 3% | 3% | 48 | 48 | 48 | 65       | 65       | 65       | 0.1      | 0.2      | 0.1      | Above SOAEL             | Negligible |
| Headbolt Lane (E)                   | 3557 | 3627 | 3781 | 3% | 3% | 3% | 48 | 48 | 48 | 63       | 63       | 63       | 0.1      | 0.2      | 0.1      | Between LOAEL and SOAEL | Negligible |
| Dale Lane                           | 5161 | 5263 | 5307 | 6% | 6% | 6% | 48 | 48 | 48 | 65       | 65       | 65       | 0.1      | 0.1      | 0.0      | Above SOAEL             | No change  |
| Pingwood Lane                       | 6764 | 6896 | 7006 | 6% | 6% | 6% | 48 | 48 | 48 | 66       | 67       | 67       | 0.1      | 0.1      | 0.0      | Above SOAEL             | No change  |
| Shevington's Lane (E)               | 5885 | 6000 | 6108 | 2% | 2% | 2% | 48 | 48 | 48 | 65       | 65       | 65       | 0.1      | 0.1      | 0.1      | Between LOAEL and SOAEL | Negligible |
| Stopgate Lane                       | 1811 | 1847 | 1849 | 6% | 6% | 6% | 64 | 64 | 64 | 62       | 62       | 62       | 0.1      | 0.1      | 0.0      | Between LOAEL and SOAEL | No change  |
| Windermere Drive                    | 554  | 565  | 660  | 1% | 1% | 1% | 48 | 48 | 48 | Low Flow | Low Flow | Low Flow | Low Flow | Low Flow | Low Flow | N/A                     | N/A        |

