

## 11.0 Noise and Vibration

### 11.1 Introduction

This chapter has been prepared by M-EC Ltd who are competent and experienced in undertaking Noise and Vibration chapters and reports for inclusion within Environmental Statements. The team involved in the preparation of this chapter area as follows:

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This chapter of the ES has been prepared to assess the likely significant effects of noise and vibration as a result of the proposed development. The chapter considers specifically the effects of existing and future conditions at the site and the effects of noise generated by the development on nearby receptors during construction and occupation of the proposed development.

The chapter describes the assessment methodology, the baseline conditions at the site and surroundings, likely significant effects and mitigation measures required to prevent, reduce or offset identified significant adverse effects.

A Noise Assessment report (*Appendix 11.1*) has been prepared to accompany the planning application for the development and should be read alongside this ES Chapter.

Appendices	Title
<i>Appendix 11.1</i>	Noise Assessment
<i>Appendix 11.2</i>	Scoping Correspondence
<i>Appendix 11.3</i>	Predicted Road Traffic Noise Change

### 11.2 Scoping, Consultation and Overview of Potential Effects

#### 11.2.1 Scoping and Consultation

The proposed assessment methodology was described within the EIA Scoping Report (*Appendix 2.1*). CCC's Scoping Opinion advised that, "*The proposal is for consideration of traffic noise on existing and proposed receptors. It should also consider any new commercial units proposed as part of committed development that may impact on proposed receptors if applicable*".

In addition, scoping discussions were previously undertaken with the Environmental Health department at CCC to ensure that the assessment addresses CCC's noise concerns regarding the development proposals. Scoping correspondence is included in *Appendix 11.2*.

## 11.2.2 Overview of Potential Effects

The nearest existing sensitive receptors to the site are those residential properties located along Tamworth Road to the west and Fivefield Road to the east. It is noted that there is a proposed new housing development located immediately to the south of this proposed development (ref: OUT/2014/2282).

Future receptors will be located at the site during the phased construction (occupying dwellings in completed phases) and once the proposed development is complete and occupied.

## 11.3 Assessment Methodology

### 11.3.1 Legislation and Guidance

Details of relevant legislation and guidance that have informed this assessment is set out in *Appendix 11.1*. This includes applicable standards for both internal and external noise levels.

### 11.3.2 Baseline Noise Survey

Existing environmental sound levels at the site have been established by undertaking an on-site noise survey. The noise survey was carried out in accordance with BS7445: 2003 'Description and Measurement of Environment Noise'.

Noise surveys were undertaken at three locations:

- **Location 1:** At the western site boundary, adjacent to the Tamworth Road, at approximately 8m from the carriageway edge. Survey was undertaken for a continuous period, between 17:00 on the 9<sup>th</sup> January 2018 and 17:00 on the 10<sup>th</sup> January 2018.
- **Location 2:** At the eastern site boundary, adjacent to Fivefield Road, at approximately 4m from the carriageway edge. Survey was undertaken for a continuous period, between 18:00 on the 9<sup>th</sup> January 2018 and 18:00 on 10<sup>th</sup> January 2018.
- **Location 3:** At the south eastern site boundary, adjacent to Fivefield Road, at approximately 4m from the carriageway edge. Survey was undertaken for a continuous period, between 04:15 and 07:15 on 14<sup>th</sup> January 2018.

Noise survey locations are shown on the noise survey location plan in *Appendix 11.1*.

$L_{Aeq,T}$  and  $L_{AFmax}$  sound levels were recorded using a Type 1 Norsonic 131 Sound Analyser (serial numbers 1312808) and a Type 1 Norsonic 140 Sound Analyser (serial numbers 1406248). Measurements were A-weighted and recorded using a fast time response. The sound level meter was set to log every 5 minutes.

The sound level meter was calibrated using a CEL-177 Sound Calibrator (serial number 372032) and Norsonic 1251 (serial number 34315) at the start and finish of the survey period. No significant calibration drifts were observed.

The sound level meters were set at a height of approximately 1.5m above ground height in a free field position. The sound level meters were left in-situ for the monitoring periods described above.

### 11.3.3 Construction Phase Noise Assessment

Assessment of sound levels from construction works upon nearby sensitive receptors has been undertaken with reference to guidance contained within BS5228-1:2009 + A1:2014, 'Code of practice for noise and vibration control on construction and open sites'.

Sound power levels for the various plant items to be used on site have been taken from Annex C of BS5228.

Details of the types of construction methods and plant likely to be used during the construction phases have yet to be formulated, and at this stage in the scheme's design, it is not possible to state precisely where plant will operate and for how long during the working day. Therefore, sound levels have been predicted, to provide an estimate of the construction-related sound levels at the nearest receptors. It is usual for more detailed assessment to be undertaken at a later stage, once contractors have been appointed and a method statement is available.

The main construction phases are likely to include ground excavation, concreting, building construction and new road construction.

Table 11.1 contains BS5228 sound pressure level data at a reference distance of 10 metres in the absence of noise controls such as screening and operational constraints. This information has been used to derive indicative sound levels during construction at selected receptors and distance bands from the site boundary using the data and procedures of BS5228.

Table 11.1 - BS5228:2009 Typical Construction Sound Level Data	
Plant (Typical)	L <sub>Aeq,T</sub> at 10m (dB(A))
Earth moving	85
Supply vehicles	80
Auger piling	85
Truck concrete mixer	80
Poker vibrators	84
Crane	74
Vibratory roller	76
Asphalt Spreader/chip spreader/roller/lorry	80
Wheeled Loader	76
Compressors	74
Welding Generators	42

### 11.3.4 Construction Phase Vibration Assessment

The construction of new residential development is not usually considered to be a potential significant source of vibration, since impulsive operations such as piling are generally not required. Where they are required, they can be undertaken using methods such as continuous flight auguring which does not involve driving piles into the ground using impulsive forces.

### 11.3.5 Occupation Phase Noise Assessment

To undertake a quantitative analysis of the changes in sound levels at existing sensitive receptors as a result of the proposed development, baseline noise levels (BNLs) from road traffic have been calculated, with reference to procedures contained within the Calculation of Road Traffic Noise (CRTN) 1988.

The CRTN describes procedures for measuring and predicting noise levels from road traffic in terms of the  $LA_{10,1\text{hour}}$  or  $LA_{10,18\text{hour}}$ . The  $LA_{10,T}$  is the A-weighted sound level exceeded for 10% of the time, which in this case is the 18 hour period between 06:00 and 24:00 hours. This noise index has been shown to correlate best with resident's expressed dissatisfaction with traffic noise over a wide range of exposures.

The calculation methods take into account a number of variables to calculate the Basic Noise Level (BNL) at a reference distance of 10m from the nearside carriageway edge, at 0.5m above the ground. Factors include Annual Average Weekday Traffic 18 hour traffic flow (AAWT), speed, percentage of heavy vehicles, road surface and gradient. The procedures also allow for the calculation of noise levels at specific receptors up to 300m from a road. In this case the receiver location is taken to be 10m from the carriageway edge. Traffic data inputs are provided in *Appendix 11.3*.

The expected changes in sound levels at existing receptors on Tamworth Road (B4098), Fivefield Road, Bennetts Road, Watery Lane, Long Lane and Sandpits Lane that will result from highway proposals and development traffic have been determined, by comparing the following scenarios:

- 2026 'Do Minimum' (Including extant Lioncourt Site - OUT/2014/2282);
- 2026 'Do Something 1' (Do Minimum including the proposed development); and
- 2026 'Do Something 2' (Do Something 1 including other proposed developments in the Keresley SUE (i.e. cumulative assessment).

### 11.3.6 Receptor Sensitivity

The most sensitive receptors to changes in noise from new developments include new and existing residents, as well as schools and hospitals. Other less sensitive receptors include hotel guests and occupiers of commercial premises.

Table 11.2 provides an overview of receptor sensitivities.

Sensitivity	Receptor
High	Residents, schools and hospitals
Medium	Other residential receptors, such as hotel guests
Low	Occupiers of commercial premises

### 11.3.7 Magnitude of Impact

#### Construction Phase

The assessment of potential impacts resulting from the construction phase has taken into account both on-site plant and changes in traffic flows.

With reference to advice contained within BS5228 and the DMRB, *Tables 11.3, 11.4 and 11.5* summarise the terms used to define the magnitude of potential noise impacts during construction. Impacts due to increases in noise are described as adverse, with impacts due to reductions in noise described as beneficial.

Table 3.1 of the Design Manual for Roads and Bridges Volume 11, Section 3, Part 7 (HD/213/11) (DMRB) provides guidance for assessing the magnitude of short-term changes in sound levels from road traffic and states that “A change of 1 dB(A) in the short-term (e.g. when a project is opened) is the smallest that is considered perceptible”. On this basis, changes of less than 1dB(A) considered to be negligible in Table 11.5.

It is noted that assessment has not been carried out for evening or night-time working as this would only be undertaken in exceptional circumstances and with prior approval.

<b>Table 11.3 - BS5228 Construction Noise Thresholds</b>			
<b>Assessment category and threshold value period (<math>L_{Aeq, T}</math>)</b>	<b>Threshold Value dB(A)</b>		
	<b>Category A <sup>A</sup></b>	<b>Category B <sup>B</sup></b>	<b>Category C <sup>C</sup></b>
Night-time (23:00-07:00)	45	50	55
Evenings and weekends <sup>D</sup>	55	60	65
Daytime (07:00 – 19:00) and Saturday (07:00 – 13:00)	65	70	75
<p>Note 1: A significant effect has been deemed to occur if the total <math>L_{Aeq}</math> noise level, including construction exceeds the threshold level for the category appropriate to the ambient noise level.</p> <p>Note 2: If the ambient noise level exceeds the threshold values given in the table (i.e the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total <math>L_{Aeq}</math> noise level for the period increase by more than 3dB due to construction activity.</p> <p>Note 3: Applied to residential receptors only.</p> <p>A Category A: threshold values to use when ambient noise levels (when round to the nearest 5dB) are less than these values.</p> <p>B Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.</p> <p>C Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.</p> <p>D 19:00-23:00-23:00 weekdays, 13:00-23:00 Saturday and 07:00-23:00 Sundays</p>			

<b>Table 11.4 – Construction Noise Impact Magnitude</b>	
<b>Change in Sound Level dB(A) Compared to Construction Noise Threshold</b>	<b>Magnitude of Change</b>
>+10	High
+5.0 to +9.9	Medium
+0.1 to +4.9	Low
0	Negligible
<p>Note: Applicable only where construction sound levels are predicted to exceed threshold values in Table 11.3.</p>	

Change in Sound Level dB(A)	Magnitude of Change
>+5.0	High
+3.0 to +4.9	Medium
+1.0 to +2.9	Low
0 to +0.9	Negligible

Source: DMRB Volume 11, Section 3

### Occupation Phase

For long-term development traffic-related impacts, DMRB Volume 11, Section 3 states that “*In the long-term, a 3 dB(A) change is considered perceptible*”.

Table 11.6 sets out how the impact magnitude is derived for road traffic during the occupation phase.

Change in Sound Level dB(A)	Impact Magnitude
0	No Impact
0.1 to 2.9	Negligible
3 to 4.9	Minor
5 to 9.9	Moderate
10+	Major

### **11.3.8 Significance Criteria**

The significance of effect is derived through a combination of receptor sensitivity and impact magnitude, as shown in Table 11.7.

Receptor Sensitivity	Impact Magnitude			
	Major	Moderate	Minor	Negligible
High	Substantial	Substantial	Moderate	Negligible
Medium	Substantial	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible

For the purposes of this ES, where predicted noise levels are determined to fall within the adopted noise limits, the effect will be negligible.

### **11.3.9 Limitations and Assumptions**

At this stage, final construction methodologies are not known. The construction noise assessment has been based upon an indicative strategy and using reasonable assumptions as to the types of activity that might reasonably be expected to take place.

Baseline noise surveys have been undertaken, which are presumed to be typical of existing sound levels at the site. Sound levels may be subject to change in the future.

Assessment of changes in road traffic sound levels have been undertaken using supplied traffic flow data. The formulae used when converting AAWT traffic flows to a BNL, presumes the resultant noise level at 10m from the carriage way edge at 0.5m high, in accordance with CRTN procedure.

## 11.4 Baseline Conditions

### 11.4.1 Existing Sources of Noise

The noise survey described in *Section 11.3* identified road traffic using Tamworth Road and Fivefield Road as the main sound sources affecting the site.

*Table 11.8* provides a summary of measured  $L_{Aeq,1hour}$  and  $L_{AFmax}$  sound level data for each survey location.

Measurement Location	Period	$L_{Aeq,T}$ (dB(A))	$L_{AFmax}$ (dB(A))
Location 1	Daytime	68	-
	Night-time	62	85
Location 2	Daytime	57	-
	Night-time	48	76
Location 3	Night-time	59	77

### 11.4.2 Sensitive Noise Receptors

The nearest existing noise receptors to the site are residential properties located along Tamworth Road and Fivefield Road and the proposed housing development located immediately to the south of this proposed development (ref: OUT/2014/2282).

Further details are included in *Appendices 11.1 and 11.3*.

## 11.5 Mitigation Measures

### 11.5.1 Inherent Mitigation Measures

No specific measures to mitigate noise impacts have been designed in to the proposed development at the outline stage.

### 11.5.2 Standard Mitigation Measures

#### *Construction Phase*

Noise associated with the construction of a development may increase sound levels temporarily at nearby sensitive receptors. In accordance with modern working practices, the principles of “best practicable means” (BPM), as defined in the Control of Pollution Act 1974, would be used to reduce emissions throughout the construction period. This would incorporate the use of measures to control noise and vibration that do not unreasonably inhibit overall construction progress, and the use of working methods that result in minimum effects compatible with normal working practices.

A Construction Environment Management Plan (CEMP) will be implemented to minimise noise and vibration during construction. A draft CEMP is included in *Appendix 4.1* which includes mitigation measures for construction noise and it is anticipated that approval and implementation of the CEMP will be secured by a suitably worded planning condition.

No significant adverse vibration impacts are expected during the construction works, however, appropriate vibration control measures, consistent with the requirement to apply best practicable means under the Control of Pollution Act 1974 (CoPA), would be implemented at all times.

### ***Occupation Phase***

The assessment indicates that to achieve acceptable internal and external sound levels at proposed dwellings adjacent to Tamworth Road and within 10m of Fivefield Road, mitigation measures will be required for individual dwellings.

Mitigation measures would include dwelling orientation, close-boarded fencing to external areas and improved glazing and ventilation. The specific mitigation requirements for each dwelling will be determined at reserved matters stage as part of a detailed noise assessment.

In addition to dwelling-specific measures, a Travel Plan for the proposed development will be implemented, which aims to reduce the number of vehicle movements to and from the proposed development and associated noise impacts.

#### ***11.5.3 Actionable Mitigation Measures***

No actionable mitigation measures are proposed.

## **11.6 Assessment of Environmental Impacts**

### ***11.6.1 Impact Assessment***

#### ***Construction Phase***

##### Noise

Noise associated with the construction phase of the development may increase sound levels temporarily at nearby sensitive receptors. Noise sources associated with the development include plant on-site and construction-related traffic, both on-site and on the local road network.

The highest noise levels tend to be associated with plant that will be employed during earthmoving and concreting. In the absence of specific details on the phasing and siting of construction activities, this information has been used to derive indicative noise levels at selected distance bands from the site boundary using the data and procedures of BS 5228. Results are presented in *Table 11.9*.

Activity	Distance from Site (m)						
	10	15	20	30	40	50	100
Earthmoving	85	81	79	75	73	71	65
Concreting	86	82	80	76	74	72	66
Road Pavement	80	76	74	70	68	66	60

With regard to receptors located along Fivefield Road (adjacent to the northern site boundary), the measured ambient daytime L<sub>Aeq,T</sub> sound level was 57dB(A) see Table 11.8). With reference to the predicted indicative construction sound levels contained within Table 11.9, without mitigation, there is the potential for significant adverse impact.

However, in practice, the main construction activities, such as ground excavation works and new build construction, will affect a limited number of dwellings temporarily. As construction moves away from receptors, sound levels will fall below the threshold value. It is also anticipated that there would not be works outside of the general permitted working hours, unless a variation is agreed with the LPA in advance.

In addition, the majority of the works associated with the construction of new dwellings involves manual labour and the use of hand-tools, which will reduce the sound emitted from the proposed site.

With appropriate noise controls and mitigation implemented through the CEMP, the proposed development is likely to have **negligible** effects on existing and future receptors during construction.

### Vibration

With respect to potential vibration effects, the construction of new residential development is not usually considered to be a potentially significant source of vibration, since impulsive operations, such as piling using a drop hammer rig, are generally not required.

Where they are required however, they can be undertaken using methods that minimise operational vibration levels, such as continuous flight augering (CFA) which does not involve driving piles into the ground using impulsive forces i.e. a drop hammer.

Therefore, **negligible** effects due to vibration are expected during construction.

<b>Table 11.10 - Summary of Impact Assessment – Construction Phase</b>						
<b>Receptor</b>	<b>Sensitivity</b>	<b>Description of Impact</b>	<b>Inherent &amp; Standard Mitigation Measures</b>	<b>Nature of Effect</b>	<b>Type of Effect</b>	<b>Significance of Effect</b>
Existing and future human receptors	High	Noise and vibration impacts to existing and future residents due to construction activities.	See draft CEMP in <i>Appendix 4.1</i> .	Negligible	Temporary Short-term Direct	Negligible

## Occupation Phase

### Existing Receptors

Expected changes in sound levels at existing receptors resulting from development-related traffic have been determined by comparing predicted 'Do Minimum' against 'Do Something 1' Basic Noise Levels (BNLs) at 10m from the road for the future year scenario. The resulting BNLs for these scenarios are shown in *Appendix 11.3*.

With reference to the criteria contained within *Table 11.6*, the magnitude of noise impact for the 'Do Something 1' scenario at all receptors is negligible, resulting in a **negligible** significance of effect.

### Proposed Receptors

The daytime  $L_{Aeq,16hour}$  at the nearest proposed dwellings to Tamworth Road is 68dB(A), which exceeds the criteria of 55dB(A) for outdoor living areas. Therefore, mitigation will be required to reduce sound levels in private gardens.

The daytime  $L_{Aeq,16hour}$  at the nearest proposed dwellings to Fivefield Road is 53dB(A), which is within the criteria of 55dB(A). Therefore, specific mitigation measures will not be required to reduce sound levels in private gardens in the northern area of the site.

With regard to sound levels in living rooms and bedrooms during the daytime, for façades with a direct line of sight to Tamworth Road, the measured  $L_{Aeq,16hour}$  of 64dB(A) is up to approximately 29 dB above the recommended value of 35dB(A). For façades with a direct line of sight to Fivefield Road, the measured  $L_{Aeq,16hour}$  of 53dB(A) is up to approximately 18 dB above the recommended value of 35dB(A).

With regard to sound levels in bedrooms during the night-time, for façades with a direct line of sight to Tamworth Road, the measured  $L_{Aeq,8hour}$  of 58dB(A) is up to approximately 28dB above the recommended value of 30dB(A). For façades with a direct line of sight to Fivefield Road, the measured  $L_{Aeq,8hour}$  of 55dB(A) is up to approximately 25dB above the recommended value of 30dB(A).

With regard to  $L_{Amax}$  sound levels in bedrooms during the night-time, for façades with a direct line of sight to Tamworth Road, the highest measured  $L_{Amax}$  of 81dB(A) is up to approximately 36dB above the recommended value of 45dB(A). For façades with a direct line of sight to Fivefield Road, the highest measured  $L_{Amax}$  of 73dB(A) is up to approximately 28dB above the recommended value of 45dB(A).

As described in *Section 11.5*, suitable mitigation measures in the form of dwelling orientation, close-boarded fencing, improved glazing and ventilation will be agreed with the local planning authority at reserved matters stage to ensure that internal and external noise levels are within acceptable standards. Therefore, effects on proposed receptors will be **negligible**.

### Vibration

There are no significant sources of vibration during the occupation phase and therefore, the effects of vibration have not been assessed further.

<b>Table 11.11 - Summary of Impact Assessment – Occupation Phase</b>						
<b>Receptor</b>	<b>Sensitivity</b>	<b>Description of Impact</b>	<b>Inherent &amp; Standard Mitigation Measures</b>	<b>Nature of Effect</b>	<b>Type of Effect</b>	<b>Significance of Effect</b>
Existing residential receptors	High	Impact of noise on existing receptors generated by road vehicles.	Travel Plan to reduce private vehicle use.	Negligible	Permanent Long-term Direct / Indirect	Negligible
Proposed residential receptors	High	Impact of noise on proposed receptors generated by road vehicles.	Consideration of dwelling orientation, improved glazing and ventilation in certain dwellings.	Negligible	Permanent Long-term Direct / Indirect	Negligible

## 11.6.2 Residual Impact Assessment

As no actionable mitigation measures are proposed, residual effects will be as set out in Section 11.6.1.

## 11.7 Cumulative Impact Assessment

The 'Do Something 2' scenario considers the impact of changes in sound levels resulting from cumulative road traffic flows (i.e. including other proposed developments in the Keresley SUE).

The magnitude of noise impact for the 'Do Something 2' scenario at Receptor 10 (Sandpits Lane) is minor beneficial, resulting in a **moderate beneficial** effect.

The effects at all other receptors will be **negligible**.

## 11.8 Summary

A Noise Assessment has been carried out to assess the effects of existing and future conditions at the site and the effects of noise and vibration generated by the proposed development on nearby receptors during construction and occupation phases.

Sound levels across the proposed development site have been established by undertaking noise survey at three locations. Measured sound levels have been assessed against recommended external and internal noise criteria for new dwellings.

During construction, suitable mitigation measures will be included in a Construction Environmental Management Plan to ensure that effects will be **negligible**.

With respect to potential vibration effects, the construction of new residential development is not usually considered to be a potentially significant source of vibration, since impulsive operations, such as piling using a drop hammer rig, are generally not required. Where they are required however, they can be undertaken using methods that minimise operational vibration levels. Therefore, **negligible** effects due to vibration are expected during construction.

Following occupation, the proposed development will lead to changes in traffic flows on local roads and the assessment of the significance of changes in sound levels due to the introduction of development-related traffic has been determined by comparing predicted 'Do Minimum' against 'Do Something 1' (i.e. do minimum including development).

Results and assessment indicate that mitigation will be required to achieve recommended external and internal noise criteria for new dwellings in certain areas of the proposed development. The proposed general mitigation strategy for the site comprises:

- Careful consideration of layout and dwelling orientation;
- The installation of acoustically sound garden fencing; and
- Selection of glazing and acoustically attenuated passive ventilation for dwellings in certain areas of the proposed development.

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With the implementation of the proposed mitigation strategy, effects on proposed receptors will be **negligible**.

With regard to changes in sound levels resulting from development-related traffic, effects on existing receptors will be **negligible**.

Potential cumulative effects with other developments within the wider Keresley SUE have been assessed by comparing the predicted 'Do Minimum' with the 'Do Something 2' (i.e. Do Something 1 including other proposed developments in the Keresley SUE) scenario sound levels. The assessment identified **moderate beneficial** cumulative effects on Receptor 10 (Sandpits Lane), with **negligible** effects at all other receptors.