

# NOISE STATEMENT SYDNEY AVENUE PLANNING APPLICATION

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Manchester Airport Ltd  
MAG Landside - FI, SA & VCC  
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## NOISE STATEMENT SYDNEY AVENUE PLANNING APPLICATION

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|---------------|---------------------------------------------|--------------------------|---------------|
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| Project name: | MAG Landside - FI, SA & VCC                 |                          |               |
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## 1. Introduction

Manchester Airports Group (MAG) continues to invest in its airport infrastructure. MAG are close to completion of the Manchester Airport Transformation Programme (MAN-TP), a £1.3bn investment programme that will transform passenger experiences and help attract yet more of the world's leading airlines. The transformation was first announced in 2015 with a 10-year vision to revolutionise the customer experience at the Northern hub and unlock the potential of its two full-length runways. The programme involves an extension, doubling the size of Terminal 2 (T2) and refurbishing the original terminal, including the construction of two new aircraft piers, creation of a state-of-the-art baggage hall, installing next generation scanners in a new security hall, additional retail and food and beverage outlets as well upgrading the airfield and taxiways to cater for next generation aircraft. It also includes the development of the landside road network to allow sufficient capacity and access to the terminal to drop off passengers, pick-up passengers as well as additional car parking.

In review of this landside road network, a traffic modelling exercise has been undertaken to review various parts of the road network and the impacts of increasing traffic numbers in the area following the opening of the full Terminal 2 following the completion of MAN-TP in 2025. This exercise has concluded the need for changes to the road network at the western end of T2. With the existing layout, the Sydney Avenue junction with Thorley Lane is anticipated to be over capacity with queues extending into the West End Roundabout and Palma Avenue, therefore blocking the forecourt exit. An optioneering exercise for solutions was undertaken and the option now progressed is for the closure of the existing short Sydney Avenue and construction of a new link road/carriageway from the western side of the existing West End roundabout and connecting into Thorley Lane via a new signal-controlled junction. The proposed project includes the following:

- A new carriageway from the West End Roundabout (where Palma Avenue and Sydney Avenue meet) via the existing Staff West Car Park to Thorley Lane (including a 3.0m wide shared footway/cycleway)
- Widening of Thorley Lane to accommodate a signal-controlled junction between the new carriageway and Thorley Lane
- The upgrade of the existing Thorley Lane junction with Runger Lane to a signalised junction.
- Creation of a 3m wide shared footway/cycleway on Thorley Lane.
- Closure of the existing Sydney Avenue carriageway from the West End Roundabout to Thorley Lane and associated retention and realignment of the existing footpaths and cycleway
- Creation of a new exit from the West End Roundabout into the existing Staff West car park

The planning application is limited to seeking planning permission for the creation of a new access from the northern end of the new road to the Thorley Lane carriageway. The extent of the planning application boundary and the extent of the project boundary are shown on the plan in Appendix A.

This report presents the results of the noise and vibration assessment undertaken for the proposed development.

The following elements of the proposed development have been assessed in this report:

- Construction noise assessment
- Construction vibration assessment

During the construction period peak times, the proposed works would result in approximately eight Light-Duty Vehicles (LDV) and four Heavy-Duty Vehicles (HDV) daily over approximately a period of 12 months. No diversions are expected as Thorley Lane is expected to remain open using a single operational lane, with traffic management lights in place. Due to the low number of construction vehicles and no traffic diversions being required, it is not anticipated that the construction of the proposed development will result in significant adverse construction noise effects. Therefore, a construction traffic noise assessment has been scoped out of the noise and vibration assessment.

It is assumed that road and access track surfaces used during construction will be well maintained and therefore be free of irregularities, so construction traffic vibration will not have the potential to lead to significant adverse effects. Therefore, a construction traffic vibration assessment has been scoped out of the noise and vibration assessment.

The proposed development, which primarily facilitates local access arrangements, is not expected to result in material changes in road traffic volumes across the wider road network. Instead, the impacts of the proposed development would be primarily limited to physical changes in the immediate vicinity of the proposed development. These changes are expected to result in a slight decrease in traffic with a portion of the existing traffic diverted along the section of Thorley Lane between Sydney Avenue and the proposed new section of road linking to the Sydney Avenue Roundabout. This would result in such road traffic moving further away from the nearest noise sensitive receptors. Otherwise, traffic flows are expected to be largely unaffected by the proposed development. Therefore, an operational road traffic noise assessment has been scoped out of the noise and vibration assessment.

To assist the reader, a glossary of acoustics terminology is included as Appendix B.

## 2. Policy and legislative framework

### 2.1 Introduction

The assessment and mitigation of noise and vibration has been undertaken according to established prediction and assessment methodologies that are governed or guided by the following key documents:

- BS 5228:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites, Part 1: Noise and Part 2: Vibration (British Standards Institution, 2014a and 2014b), which provides guidance for predicting construction noise and vibration and also provides advice on noise and vibration control techniques. These are hereafter referred to as 'BS 5228-1' and 'BS 5228-2'.
- Design Manual for Roads and Bridges (DMRB) LA 111 – Noise and Vibration (Revision 2) (Highways England, 2020), which includes guidance on the assessment methods for noise and vibration for new highway schemes. The latest revision, issued in May 2020, has been used in this assessment and is referred to as 'DMRB LA 111'.

Table 1 presents a summary of the relevant legislation considered through this assessment of the proposed development.

**Table 1 – Summary of Legislation Relevant to the Noise and Vibration Assessment**

| Legislation                                             | Summary of Relevant Issues                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Land Compensation Act 1973                              | Part 1 of the Act provides a means for compensation to be paid to owners of land or property which has experienced a loss in value caused by the use of public works, such as new or improved roads. Noise and vibration are two factors that would be considered in any claims for compensation, but the claim should consider all changes and effects, including betterment. Claims can be made up to seven years after the opening year of the highway scheme.                                                                                            |
| The Noise Insulation Regulations 1975 (as amended 1988) | The Regulations (under Part 2 of the Land Compensation Act 1973) imposes a duty on authorities to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings. This is subject to meeting certain criteria given in the Regulations.<br><br>Regulation 5 provides relevant authorities with discretionary powers to undertake or make a grant in respect of the cost of undertaking noise insulation work in or to eligible buildings with respect to construction noise.                              |
| Control of Pollution Act (CoPA) 1974                    | The CoPA allows for those undertaking works to obtain "Prior Consent" for construction works within agreed noise and vibration limits.<br><br>Applications for such consent are made to the local authority and contain steps to be taken to minimise noise and vibration. The local authority has powers to attach conditions to limit or qualify any consent to allow for changes and limit the duration of any consents.<br><br>Some local authorities request demonstration of 'best practicable means' rather than formal 'Prior Consent' applications. |

### 2.2 National Planning Policy

The National Planning Policy Framework (NPPF) (Department for Levelling Up, Housing and Communities, 2023), Section 15 – Conserving and Enhancing the Natural Environment, seeks for planning policies and decisions to contribute and enhance the natural and local environment by, among other things, preventing new and existing development from contributing to noise pollution.

The Noise Policy Statement for England (NPSE) (Department for Environment, Food and Rural Affairs, 2010) sets out the Government's vision of promoting good health and quality of life through the effective management of noise. It provides the framework to enable decisions to be made, both nationally and locally, regarding what is an acceptable noise burden to place on society. It is supported by 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 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.'*

The Explanatory Note to the NPSE sets out the following definitions of adverse effects:

- NOEL: No Observed Effect Level. This is 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 noise;
- LOAEL: Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected; and,
- SOAEL: Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

Government policy and guidance do not state required values for the NOEL, LOAEL and SOAEL. They are different for different noise sources, for different receptors and at different times and should be defined on a strategic or project basis considering the specific features of the area, source or project.

Planning Practice Guidance – Noise (Ministry of Housing, Communities and Local Government, 2019) sets out how potential noise impacts from new developments can be managed through planning. It advises the following:

*'Plan-making and decision making need to take account of the acoustic environment and in doing so consider:*

- *whether or not a significant adverse effect is occurring or likely to occur;*
- *whether or not an adverse effect is occurring or likely to occur; and*
- *whether or not a good standard of amenity can be achieved.'*

## **2.3 Local Planning Policy**

The Manchester Core Strategy Development Plan Document (Manchester City Council, 2012) brings together all major planning policies, proposals, and actions to meet the environmental, social, and economic challenges facing the area from 2012-2027, for the district into a single document.

Noise and vibration are covered by Policy DM 1 which states: *'All developments should have regard to the following specific issues for which more detail guidance may be given within a supplementary planning document:- ...Effects on amenity including privacy, light, noise, vibration, air quality, odours, litter, vermin, birds, road safety and traffic generation. This could also include proposals which would be sensitive to existing environmental conditions, such as noise...'*

### 3. Methodology

#### 3.1 Study Areas

The construction study areas have been defined in accordance with DMRB LA 111. The study area for construction noise is 300 m from the construction works footprint, and the study area for construction vibration is 100 m from construction activities with the potential to generate vibration (for example, vibratory compaction). The construction assessment has considered all sensitive receptors located within these study areas.

#### 3.2 Sensitivity of Receptors

Table 2 provides definitions of the types of noise and vibration sensitive receptor considered in the assessment, which are the terms and definitions provided in DMRB LA 111.

**Table 2 – Definition of Noise and Vibration Sensitive Receptors**

| Type                         | Definition                                                                                                                                                                                                                                                                        |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Noise sensitive receptor     | Receptors which are potentially sensitive to noise, including dwellings, hospitals, healthcare facilities, community facilities, END quiet areas or potential END quiet areas, international and statutorily designated sites, public rights of way and cultural heritage assets. |
| Vibration sensitive receptor | Receptors which are potentially sensitive to vibration, including dwellings, hospitals, healthcare facilities, education facilities, community facilities, buildings containing vibration sensitive equipment and cultural heritage assets.                                       |

Further guidance has also been taken from BS 5228-1 which defines noise sensitive premises as '*any occupied premises outside a site used as a dwelling (including gardens), place of worship, educational establishment, hospital or similar institution, or any other property likely to be adversely affected by an increase in noise level*'.

DMRB LA 111 does not provide a sliding scale of receptor sensitivity; receptors are either classed as sensitive or not sensitive. Noise and vibration sensitive receptors have therefore been defined using the above definitions.

#### 3.3 Construction Noise Assessment Methodology

##### 3.3.1 Construction Noise Approach

There is the potential for temporary noise effects to occur during the construction phase of the proposed development, both at residential properties and other sensitive receptors in the vicinity of the proposed development.

DMRB LA 111 has been followed for assessing the impacts from construction noise. DMRB LA 111 refers to BS 5228-1 as additional guidance to follow when undertaking an impact assessment of construction noise.

BS 5228-1 describes a calculation methodology to determine the impact from construction noise, including guidance on the determination of potential significant effects.

Predicted noise levels during the worst-case construction activities have been calculated in accordance with BS 5228-1. The construction noise levels have been predicted at all noise sensitive properties in the construction noise calculation area.

The construction noise predictions have used noise emission data from plant equipment reported in Annexes C and D of BS 5228-1.

The calculations of construction noise have assumed 50% ground absorption between the proposed scheme and the noise sensitive receptors. Any attenuation provided by existing screening obstacles such as topographical features or existing buildings has not been considered in the calculations.

A contractor has not yet been appointed for the proposed development and a preliminary construction programme is not available at this stage of the assessment. The predicted noise levels should be considered indicative only and have been based on a series of technical, generally conservative, assumptions, based on professional judgement, in lieu of specific guidance available at this stage regarding the likely plant and equipment that could be used during construction.

Some construction activities are transient and noise impacts are dependent upon the receptor's proximity to the proposed activity. Where the entire footprint of a specific activity was located at more than 300 m from the receptor, that activity has not been considered, as this extends beyond the study area for construction noise.

### 3.3.2 Construction Noise Magnitude of Impact

When determining the magnitude of impact, DMRB LA 111 uses 'effect levels' that have been introduced into English noise policy by the Noise Policy Statement for England 2010 (NPSE). The 'effect levels' SOAEL and LOAEL are defined in accordance with the guidance within DMRB LA 111 and are shown in Table 3 which summarises Table 3.12 of DMRB LA 111. Defining the SOAEL and LOAEL requires knowledge of the existing noise levels at the sensitive receptors.

**Table 3 – Construction Noise LOAEL and SOAEL Values at Residential Receptors**

| Construction Noise Effect Level                   | How Effect Level is Defined                                             |
|---------------------------------------------------|-------------------------------------------------------------------------|
| Lowest Observed Adverse Effect Level (LOAEL)      | Baseline noise level $L_{Aeq,T}$ for day, evening or night-time period. |
| Significant Observed Adverse Effect Level (SOAEL) | Threshold level determined as per BS 5228-1 Section E3.2 and Table E.1. |

The SOAEL is determined as per Table E.1 of BS 5228-1, which is reproduced in Table 4.

**Table 4 – Threshold of Potential Significant Effect at Dwellings**

| Assessment Category and Threshold Value Period       | How Effect Level is Defined |                          |                          |
|------------------------------------------------------|-----------------------------|--------------------------|--------------------------|
|                                                      | Category A <sup>A)</sup>    | Category B <sup>B)</sup> | Category C <sup>C)</sup> |
| 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                       |

NOTE 1 A potential significant effect is indicated if the  $L_{Aeq,T}$  noise level arising from the site exceeds the threshold level for the category appropriate to the ambient noise level.

NOTE 2 If the ambient noise levels exceeds the Category C threshold values given in the table (i.e., the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total  $L_{Aeq,T}$  noise level for the period increases by more than 3 dB due to site noise.

NOTE 3 Applied to residential receptors only.

<sup>A)</sup> Category A: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are less than these values.

<sup>B)</sup> Category B: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values.

<sup>C)</sup> Category C: threshold values to use when the ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.

<sup>D)</sup> 19:00 – 23:00 weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays

To assign the LOAEL and SOAEL, information on the existing noise climate is required. Reference has been made to baseline noise levels published as part of the strategic noise mapping undertaken by Defra in 2017 to satisfy the requirements of the Environmental Noise Directive (relevant for roads with over 3 million

vehicles per year and railways with more than 30,000 vehicles passages per year). These results (Extrium, 2019) have been used to describe existing traffic noise levels at noise sensitive receptors in the construction noise study area. The noise mapping presents noise levels as  $L_{Aeq,16hr}$  whilst the LOAEL values for the weekday daytime period are  $L_{Aeq,12hr}$ ; therefore, it is necessary to convert the baseline noise levels from the strategic noise mapping from  $L_{Aeq,16hr}$  to  $L_{Aeq,12hr}$  to obtain the daytime LOAEL. This conversion has been undertaken using the guidance in Transport Analysis Guidance (TAG) Unit A3 – Environmental Impact Assessment (Department for Transport, 2023) and Method 3 of Transport Research Laboratory (TRL) Report PR/SE/451/02 Converting the UK traffic noise index  $L_{A10,18hr}$  to EU noise indices for noise mapping (TRL, 2002).

The adopted magnitude scale for construction noise is presented in Table 5. This table is taken from DMRB LA 111, Table 3.16.

**Table 5 – Magnitude of Impact and Construction Noise Descriptions**

| Magnitude of Impact | Construction Noise Level                       |
|---------------------|------------------------------------------------|
| Major               | Above or equal to SOAEL + 5 dB                 |
| Moderate            | Above or equal to SOAEL and below SOAEL + 5 dB |
| Minor               | Above or equal to LOAEL and below SOAEL        |
| Negligible          | Below LOAEL                                    |

### 3.3.3 Construction Noise Assessment of Significance

Assessment of significance for construction noise has followed the guidance in DMRB LA 111, which states, 'Construction noise and construction traffic noise shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or,
- a total number of days exceeding 40 in any 6 consecutive months.'

## 3.4 Construction Vibration Assessment Methodology

### 3.4.1 Construction Vibration Approach

Ground borne vibration from construction works may be perceptible to nearby receptors, which at higher levels can cause annoyance to residents. High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction. In extreme cases, cosmetic or structural building damage can occur.

DMRB LA 111 has been followed for assessing the impacts from construction vibration. DMRB LA 111 refers to BS 5228-2 as additional guidance to follow when undertaking an impact assessment of construction vibration.

BS 5228-2 contains guidance on vibration levels in structures from construction works. It provides prediction methodologies for mechanised construction works, such as compaction and piling works, which allow for the prediction of vibration in terms of Peak Particle Velocity (PPV). The standard also presents guidance for the control of vibration from construction works. These calculation methods rely on detailed information, including the type and number of plants being used, their location and correction factors for operational state, and the probability that the vibration level might be exceeded.

### 3.4.2 Construction Vibration Magnitude of Impact

The magnitude of impact scale for vibration is presented in Table 6. This has been derived from BS 5228-2, Table B.1. For the human response to vibration, a value of LOAEL and SOAEL has been assigned in accordance with the values provided in Tables 3.31 and 3.33 of DMRB LA 111.

**Table 6 – Construction Vibration Magnitude and Human Response**

| Magnitude of Impact | Vibration Level, PPV mm/s                    | Human Response                                                                                                                                                                                  |
|---------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Major               | ≥10                                          | Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.                                                                      |
| Moderate            | Above or equal to 1.0 (SOAEL) and below 10   | It is likely that vibration of this level in residential environments would cause complaint, but can be tolerated if prior warning and explanation has been given to residents                  |
| Minor               | Above or equal to 0.3 (LOAEL) and below 1    | Vibration might be just perceptible in residential environments.                                                                                                                                |
| Negligible          | Above or equal to 0.14 and below 0.3 (LOAEL) | Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration. |
|                     | <0.14                                        | Vibration is below levels of perception.                                                                                                                                                        |

### 3.4.3 Construction Vibration Assessment of Significance

Assessment of significance for construction vibration has followed the guidance in DMRB LA 111, which states, 'Construction vibration shall constitute a significant effect where it is determined that a major or moderate magnitude of impact will occur for a duration exceeding:

- 10 or more days or nights in any 15 consecutive days or nights; or,
- a total number of days exceeding 40 in any 6 consecutive months.'

### 3.4.4 Construction Vibration Building Structure Response

For building structure response, BS 5228-2 reproduces the advice given in BS 7385-2:1993 Evaluation and measurement for vibration in buildings: guide to damage levels from ground borne vibration (British Standard Institution, 1993) (hereafter referred to as 'BS 7385-2'). The response of a building to ground borne vibration is affected by the type of foundation, underlying ground conditions, the building construction and the state of repair of the building. Table 7 presents guidance detailed on building classification and associated guide values for ground borne vibration with regards to risk of building damage. The values for structurally sound buildings are taken from BS 7385-2, which states that '*the probability of damage tends towards zero at 12.5mm/s peak component particle velocity*'. It is also stated that these values can be reduced by 50% for a conservative estimate of damage from continuous vibration. These values have been rounded down to the integer for a structurally sound building. If a building is structurally unsound, then these values may be reduced; a reduction of 50% has been applied in Table 7. BS 7385-2 also states that '*a building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive*'.

**Table 7 – Guidance on the Onset of Damage for Buildings, Based on Guidance in BS 7385-2**

| Type of Building                           | Vibration Level, PPV (mm/s), at Building Foundation <sup>1</sup> |                      |
|--------------------------------------------|------------------------------------------------------------------|----------------------|
|                                            | Transient Vibration                                              | Continuous Vibration |
| Structurally unsound building <sup>2</sup> | 6                                                                | 3                    |
| Structurally sound building                | 12                                                               | 6                    |

<sup>1</sup> BS 7385-2 highlights that the criteria need to be lower if the buildings are structurally unsound. The standard also notes that criteria should not be set lower simply because a building is important or historic. Properties shall be considered as structurally sound, unless stated otherwise.

<sup>2</sup> A reduction of 50% has been assumed for structurally unsound buildings.

Based on the guidance in BS 7385-2, the vibration level which indicates a risk for damage considered for this study has been conservatively set to 12mm/s for transient vibration, assuming the sensitive buildings are structurally sound. If these were to be structurally unsound a 6mm/s limit from transient vibration can be considered suitable.

Although not specified in DMRB LA 111, construction vibration has also been considered a significant effect if there is deemed to be a risk of damage at a building due to construction vibration.

### 3.4.5 Sources of Vibration Considered

Vibratory compaction is considered to be the most likely and most substantial source of vibration at nearby vibration sensitive receptors in the vicinity of the proposed development. For vibratory compaction, BS 5228-2 details the following empirical equations for deriving likely ground borne vibration levels:

$$v_{res}=k_s\sqrt{n_d}\{A/(x+L_d)\}^{1.5} \text{ (Steady state – continuous activity)}$$

$$v_{res}=k_t\sqrt{n_d}\{A^{1.5}/(x+L_d)^{1.3}\} \text{ (Start up and run down – intermittent activity)}$$

Where:

- $v_{res}$  is the resultant Peak Particle Velocity (PPV) in millimetres per second;
- $k_s$  and  $k_t$  are scaling factors for the probability (ranging from 5% to 50%) of the predicted value being exceeded;
- $n_d$  is the number of vibrating drums;
- $A$  is the maximum amplitude of drum vibration in millimetres;
- $x$  is the distance measured along the ground surface in metres; and,
- $L_d$  is the vibrating roller drum width in metres.

Steady state continuous vibratory activity can be defined as vibratory stimulus that is maintained through a sequence of cycles where the cyclic variation in amplitude is repeated many times over.

Intermittent activity (start-up and run down), where the plant has a distinct start-up cycle, can result in the machine vibrating at the natural frequency of the ground structure at some point in the start-up and run-down phase. At these frequencies maximum amplitudes of vibration can result for short durations as the machine passes through the natural frequency of the ground structure.

Ground borne vibration level predictions during soil compaction have been undertaken assuming the use of a Caterpillar CS78B soil compactor as an indicative plant item. This is a large single drum compactor with an operating weight of 18.9 tonnes, and gross power of 130 kW and a compaction width of 2.1 m. The compactor can be operated at either a low or high nominal vibration amplitude (1.0 mm or 2.1 mm).

## 4. Baseline Description and Evaluation

In total, six noise sensitive receptors and three vibration sensitive receptors (all dwellings) have been identified within the noise and vibration study areas:

- Keepers Cottage
- 1 and 2 Hale Top Farm Cottages
- Holly Cottage, Rose Cottage and Yew Tree Cottage (all within noise study area only)

The baseline noise environment in the vicinity of the proposed development is likely to be dominated by road traffic noise from the M56 and local road network. Aircraft noise and operational airport noise are also likely to contribute to the baseline noise environment.

Defra have produced a list of Noise Important Areas (NIAs), identified as areas requiring action to reduce noise levels. NIAs highlight locations where the highest 1 % of noise levels for road or rail at residential locations can be found. Four of the noise sensitive receptors within the noise study area are within NIAs for roads (Keepers Cottage, 1 and 2 Hale Top Farm Cottage and Holly Cottage).

As described in Section 3.3.2, predicted noise levels from the Round 3 mapping have been used to estimate baseline noise levels at the noise sensitive receptors in the noise study area and are provided in Table 8.

**Table 8 – Estimated Free-field Baseline Noise Levels at Noise Sensitive Receptors**

| Receptor                                                                               | Free-field Baseline Noise Level $L_{Aeq,12hr}$ dB |
|----------------------------------------------------------------------------------------|---------------------------------------------------|
| Keepers Cottage                                                                        | 70                                                |
| Hale Top Farm Cottages <sup>1</sup>                                                    | 67                                                |
| Holly Cottage <sup>2</sup>                                                             | 69                                                |
| <sup>1</sup> Hale Top Farm Cottages represents 1 and 2 Hale Top Farm Cottage           |                                                   |
| <sup>2</sup> Holly Cottage represents Holly Cottage, Rose Cottage and Yew Tree Cottage |                                                   |

## 5. Construction Noise and Vibration Impacts

### 5.1 Construction Noise Impacts

In lieu of detailed methods of working, the draft plant presented in Table 9, developed through experience of similar schemes and professional judgement, form the basis of the assessment of potential noise impacts during construction. These are considered to be the construction activities most likely to result in significant adverse noise effects.

**Table 9 – Indicative Plant and Equipment Associated with the Construction Works**

| Activity                   | Plant                                              | No. | % on time | Noise Level dB(A) at 10 m | BS 5228-1 Source Term |
|----------------------------|----------------------------------------------------|-----|-----------|---------------------------|-----------------------|
| Initial topsoil strip      | 35t excavator                                      | 2   | 83        | 75                        | C.2.16                |
|                            | 20t articulated dump truck (tipping fill)          | 4   | 83        | 74                        | C.2.32                |
|                            | Dozer                                              | 1   | 83        | 81                        | C.2.12                |
|                            | Lorries                                            | 2   | 10        | 80                        | C.2.34                |
| Earthworks                 | 35t excavator                                      | 2   | 83        | 75                        | C.2.16                |
|                            | 20t articulated dump truck (tipping fill)          | 4   | 83        | 74                        | C.2.32                |
|                            | Motor grader                                       | 1   | 83        | 80                        | *                     |
|                            | Vibrator roller                                    | 1   | 83        | 74                        | C.2.39                |
|                            | Dozer                                              | 1   | 83        | 81                        | C.2.12                |
|                            | Hydraulic vibratory compactor (tracked excavator)  | 1   | 83        | 78                        | C.2.42                |
|                            | Lorries                                            | 2   | 10        | 80                        | C.2.34                |
| Surfacing                  | Asphalt paver (+ tipper lorry); 112kW; 12 t hopper | 1   | 83        | 75                        | C.5.30                |
|                            | Twin drum vibratory roller                         | 1   | 83        | 75                        | C.5.20                |
|                            | Dozer                                              | 1   | 83        | 81                        | C.2.12                |
|                            | Single drum vibratory roller                       | 1   | 83        | 74                        | C.2.39                |
|                            | 17t road planer                                    | 1   | 83        | 82                        | C.5.7                 |
|                            | Lorries                                            | 2   | 10        | 80                        | C.2.34                |
| Site compound installation | Dozer                                              | 1   | 20        | 81                        | C.2.12                |
|                            | Tracked excavator                                  | 1   | 20        | 71                        | C.4.65                |
|                            | Dumper                                             | 1   | 15        | 79                        | C.4.6                 |
|                            | Vibratory roller                                   | 1   | 15        | 80                        | C.5.21                |
|                            | Lorry with lifting boom                            | 1   | 20        | 77                        | C.4.53                |
|                            | Diesel generator                                   | 1   | 50        | 60                        | C.4.80                |

\*Noise source data provided by construction contractor (to Jacobs) for a similar scheme assessed in 2016.

The anticipated construction sequence and programme is not yet available for the proposed development. For the purpose of this assessment, a sequential phased construction programme has been assumed, with each construction activity assessed as a separate phase.

Table 10 shows the predicted daytime construction noise levels per construction activity at noise sensitive receptors in the construction noise study area, along with magnitude of impact derived in line with Table 5. Those construction activities predicted to be above or equal to the applicable SOAEL, and therefore predicted to experience a moderate or major magnitude of impact, are highlighted in bold text.

It should be noted that the predicted noise levels presented in Table 10 assume that the activity is occurring at the edge of the proposed development nearest to each noise sensitive receptor, with all plant working concurrently at this nearest point, thereby representing a worst-case scenario. The majority of construction activities are transient in nature; therefore, noise levels would be reduced as these activities move further from the receptor.

**Table 10 – Predicted Construction Noise Levels**

| Receptor                            | Construction Activity | Construction Noise       | LOAEL <sup>1</sup> | SOAEL <sup>2</sup> | Magnitude of Impact |
|-------------------------------------|-----------------------|--------------------------|--------------------|--------------------|---------------------|
|                                     |                       | L <sub>Aeq,12hr</sub> dB |                    |                    |                     |
| Keepers Cottage                     | Topsoil strip         | 67                       | 70                 | 75                 | Negligible          |
|                                     | Earthworks            | 69                       |                    |                    | Negligible          |
|                                     | Surfacing             | 68                       |                    |                    | Negligible          |
|                                     | Compound              | 53                       |                    |                    | Negligible          |
| Hale Top Farm Cottages <sup>3</sup> | <b>Topsoil strip</b>  | <b>76</b>                | 67                 | 70                 | <b>Major</b>        |
|                                     | <b>Earthworks</b>     | <b>78</b>                |                    |                    | <b>Major</b>        |
|                                     | <b>Surfacing</b>      | <b>77</b>                |                    |                    | <b>Major</b>        |
|                                     | Compound              | 52                       |                    |                    | Negligible          |
| Holly Cottage <sup>4</sup>          | Topsoil strip         | 53                       | 69                 | 75                 | Negligible          |
|                                     | Earthworks            | 55                       |                    |                    | Negligible          |
|                                     | Surfacing             | 54                       |                    |                    | Negligible          |
|                                     | Compound              | N/A <sup>5</sup>         |                    |                    | N/A                 |

<sup>1</sup> The LOAEL is the baseline noise level presented in Table 8, which has been estimated based on Round 3 strategic noise mapping.

<sup>2</sup> The SOAEL is the BS 5228-1 threshold, as defined in Table 4

<sup>3</sup> Hale Top Farm Cottages represents 1 and 2 Hale Top Farm Cottage

<sup>4</sup> Holly Cottage represents Holly Cottage, Rose Cottage and Yew Tree Cottage

<sup>5</sup> Holly Cottage is greater than 300 m from the likely site compound location

As set out in Section 3.3.3, an impact of moderate magnitude or above is considered potentially significant, dependent upon the duration of the activity.

At Hale Top Farm Cottages, topsoil stripping, earthworks and surfacing are predicted to result in a major magnitude of impact when at the point nearest to this noise sensitive receptor. A detailed draft construction programme for the proposed development is not available at this stage. However, based on the proposed development layout, with most of the development substantially further away from the receptor, it is considered unlikely that the total number of days with a moderate or major impact would exceed 10 or more days in any 15 consecutive days, or a total number of days exceeding 40 in any six consecutive months. Therefore, these construction activities are not considered to result in a significant effect.

At Keepers Cottage and Holly Cottage, a negligible magnitude of impact is predicted for all construction activities, which is not considered a significant effect.

## 5.2 Construction Vibration Impacts

Table 11 shows the predicted construction vibration levels when operating the Caterpillar CS78B soil compactor with the higher vibration amplitude setting at the construction sensitive receptors within the construction vibration study area. Predicted vibration levels above or equal to the SOAEL (1.0 mm/s PPV), therefore predicted to experience a moderate or major magnitude of impact, are highlighted in bold text. It should be noted that the predicted vibration levels presented in Table 11 assume that the activity is occurring at the edge of the proposed development's site boundary nearest to each receptor, thereby representing a worst-case scenario. The majority of construction activities are transient in nature, and therefore, vibration levels would be reduced as these activities move further from the receptor.

**Table 11 – Predicted PPV Levels due to Vibratory Earthworks Compaction – Higher Vibration Amplitude Setting**

| Receptor               | Predicted Vibration Level for 5 % and 50 % Probability of Predicted Value being Exceeded |            |                       |            |
|------------------------|------------------------------------------------------------------------------------------|------------|-----------------------|------------|
|                        | Steady State                                                                             |            | Start-up and Run-down |            |
|                        | 50 %                                                                                     | 5 %        | 50 %                  | 5 %        |
| Keepers Cottage        | 0.5                                                                                      | <b>1.9</b> | <b>1.0</b>            | <b>2.7</b> |
| Hale Top Farm Cottages | <b>1.8</b>                                                                               | <b>6.7</b> | <b>3.0</b>            | <b>8.2</b> |

The calculations indicate that vibration levels have the potential to be above or equal to the SOAEL and below 10 mm/s at the nearest sensitive receptors to the proposed development, indicating moderate adverse magnitudes of impact, and the potential for significant vibration effects.

The predicted vibration levels presented in Table 12 reflect the use of the Caterpillar CS78B soil compactor using the lower vibration amplitude setting.

**Table 12 – Predicted PPV Levels due to Vibratory Earthworks Compaction – Lower Vibration Amplitude Setting**

| Receptor               | Predicted Vibration Level for 5 % and 50 % Probability of Predicted Value being Exceeded |            |                       |            |
|------------------------|------------------------------------------------------------------------------------------|------------|-----------------------|------------|
|                        | Steady State                                                                             |            | Start-up and Run-down |            |
|                        | 50 %                                                                                     | 5 %        | 50 %                  | 5 %        |
| Keepers Cottage        | 0.2                                                                                      | 0.6        | 0.3                   | 0.9        |
| Hale Top Farm Cottages | 0.6                                                                                      | <b>2.2</b> | <b>1.0</b>            | <b>2.7</b> |

The predicted vibration levels presented in Table 12 show that, with the lower vibration setting selected, vibration levels at the nearest sensitive receptors are substantially reduced. However, it is observed that potential moderate adverse magnitudes of impact are still predicted at Hale Top Farm Cottages.

Table 11 indicates that the Caterpillar CS78B soil compactor, when used with a high vibration amplitude setting, is not suitable for use when at the nearest point to the vibration sensitive receptors. Further vibration calculations indicates that the Caterpillar CS78B soil compactor, when used with a high vibration amplitude setting, is not suitable for use within 100 m of vibration sensitive receptors as it results in vibration levels above the SOAEL. Therefore, it would initially be anticipated that the high amplitude setting would not be used within 100 m of receptors.

With the lower amplitude setting, Table 12 indicates the potential for moderate adverse impacts to occur when vibratory compaction plant is working in close proximity to Hale Top Farm Cottages. These works are transient in nature and the assessment performed assumes that the vibratory compaction plant is operating at the nearest point of the proposed development's site boundary to the receptor. As such, the vibration levels presented in Table 12 are considered to represent the worst case and, at other times, would be lower than those presented.

Based on the significance criteria provided in Section 3.4.3, none of the moderate impacts predicted are considered to be significant adverse effects as the duration of the impact is likely to be less than ten days in a 15-day period or 40 days in a six-month period.

After comparing the calculated vibration levels presented in Table 11 and Table 12 with the guidance in Table 7, it is considered that compaction is unlikely to result in damage to Keepers Cottage and Hale Top Farm Cottages. However, it is considered that there is a small chance that operation of the indicative plant at its higher vibration amplitude setting at the nearest point to Hale Top Farm Cottages could result in potential cosmetic damage. However, should the use of the higher amplitude vibration setting be restricted to beyond 100 m from receptors, as suggested above, then it is concluded that there is unlikely to be a risk of damage. It is recommended that this is reconsidered at the construction phase by the contractor, to ensure that construction vibration levels will be below the guidance vibration levels.

## 6. Mitigation

This assessment demonstrates that potential significant adverse noise and vibration effects during the construction phase are unlikely. Therefore, specific mitigation measures are not currently proposed in addition to embedded good practice noise and vibration mitigation measures.

It should be noted that the construction noise and vibration assessments are indicative as they are based on assumed plant/equipment, construction programme and working methods. The appointed contractor should update the assessment once the working methods, working times, plant and construction equipment and the construction programme have been finalised.

All construction work would be undertaken in accordance with the best practice measures (BPM) set out in BS 5228-1 and BS 5228-2. It is anticipated that the following mitigation measures would be employed on site to ensure that noise and vibration levels are adequately controlled (all of which are considered to be examples of BPM):

- Appropriate selection of plant and equipment, construction methods and programming. Only plant conforming with, or better than, relevant national or international standards, directives or recommendations on noise or vibration emissions would be used. Construction plant would be maintained in good condition;
- Training of site personnel to raise awareness of noise and nearby noise sensitive receptors;
- Ensuring good stakeholder engagement with local residents and other stakeholders, including provision of information to the public on expected construction noise and vibration, including duration, especially to those likely to be exposed to moderate and major magnitude effects. A manned complaints phone number should also be provided to residents in advance of works commencing;
- All vehicles, plant and equipment would be switched off when not in use;
- Use of appropriate noise abatement site hoardings and screens, where appropriate;
- Where practicable, gates (to compounds and construction areas) would not be located close to noise sensitive receptors;
- Careful selection of routes and programming for the transport of construction materials, spoil and personnel to avoid noise sensitive receptors or noise sensitive periods, where practicable;
- Vehicle and mechanical plant/equipment used for the purpose of the works would be fitted with exhaust silencers;
- The positioning of construction plant and activities to minimise noise at sensitive locations;
- Equipment that breaks concrete by pulverising or similar, rather than by percussion, would be used where practicable;
- Mufflers shall be used on pneumatic tools;
- The use, where necessary, of effective sound reducing enclosures or barriers;
- Programming works so that the requirement for noisy construction activity outside normal working hours is minimised;
- Minimise the potential for higher vibration levels from vibratory rollers, by considering the guidance within TRL Report 429 Ground borne vibration caused by mechanised construction works (Transport Research Laboratory, 2000) to ensure that the vibratory roller is not started, stopped, or the direction of travel reversed close to sensitive receptors; and,
- Use lower vibration settings on plant when working within 100 m of a vibration sensitive receptor.

It is also anticipated that, as part of a Construction Environment Management Plan (CEMP), the appointed contractor would update this noise and vibration assessment once their construction programme is known and develop a specific noise and vibration mitigation plan to demonstrate how they plan to minimise construction noise and vibration at the nearest sensitive receptors. This noise and vibration mitigation plan

should include a combination of the mitigation measures outlined above and, if required once the noise and vibration assessment is updated, additional receptor specific mitigation.

Although Manchester Airport operates 24/7 and the contractor can work at any time within this, normal working hours are 07:00 to 18:00 Monday to Friday. The noise and vibration assessment has been undertaken based on construction activities occurring during the normal working hours. If the contractor seeks to work during other periods, this will need additional assessment and consideration as part of the development of the CEMP.

## 7. Conclusions

A noise and vibration assessment has been undertaken to assess the likely impacts from the construction of the proposed development. The assessment has considered all noise and vibration sensitive receptors in the noise and vibration study areas.

It should be noted that the noise and vibration assessments are indicative as they are based on assumed plant/equipment, construction programme and working methods. The appointed contractor should update the assessment once such information have been finalised.

The assessment presents potential major adverse noise impacts and moderate adverse vibration impacts at Hale Top Farm Cottages. However, no potential significant noise and vibration effects have been identified because, assuming BPM are applied to minimise noise and vibration, the duration of moderate or major noise and vibration impacts is considered likely to be less than 10 days in a 15-day period or 40 days in a six-month period.

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Appendix A. Proposed Site Layout



## Appendix B. Noise and Vibration Terminology

### Introduction

This appendix provides definitions of some of the terms used in the report to aid understanding of the assessment undertaken.

The sound wave travelling through the air is a regular disturbance in ambient atmospheric pressure. These pressure fluctuations, when of frequencies within the audible range, are detected by the human ear which passes nerve responses to the brain, producing the sensation of hearing. Noise has been defined in a variety of ways and is very much dependant on factors such as the listener's attitude to the source of the sound and their environment but is essentially any sound that is unwanted by the recipient.

The human ear is sensitive to a wide range of sound levels; the sound pressure level of the threshold of pain is over a million times that of the quietest audible sound. In order to reduce the relative magnitude of the numbers involved, a logarithmic scale of decibels (dB) based on a reference level of the lowest audible sound is used.

Also, the response of the human ear is not constant over all frequencies. It is therefore usual to weight the measured frequency to approximate human response. This is achieved by using filters to vary the contribution of different frequencies to the measured level. The A-weighting is the most commonly used and has been shown to correlate closely to the non-linear and subjective response of humans to sound.

### Glossary of Terms

**Noise:** Unwanted sound

**Decibel:** The range of audible sound pressures is approximately  $2 \times 10^{-5}$  Pascals (Pa) to 200 Pa. Using decibel (dB) notation presents this range in a manageable range, 0 dB to 140 dB.

**Sound Pressure Level:** The sound pressure level ( $L_p$  or SPL) is the instantaneous acoustic pressure and is measured in dB. Since the ear is sensitive to variations in pressure, rather than source power or intensity the measurement of this parameter gives an indication of the impact on people. The  $L_p$  is defined as:

$$L_p = 20 \times \log_{10}(p/p_0)$$

Where:

$p$  is the root mean square (r.m.s.) pressure of the sound in question (in Pa); and

$p_0$  is the reference sound pressure level of  $2 \times 10^{-5}$  Pa.

**A-Weighting:** The human ear does not respond uniformly to different frequencies A-weighting is commonly used to simulate the frequency response of the ear. It is used in the assessment of risk of damage of hearing due to noise and is usually expressed with a capital A in the unit abbreviation (i.e.,  $L_{Amax}$ ,  $L_{Aeq}$ , etc.) or a capital A in brackets after a dB level (i.e., 3dB(A)).

**Frequency:** Frequency is defined as the number of cycles per second and is denoted in Hertz (Hz). For sound this is subjectively perceived as pitch.

**Frequency Spectrum:** Analysis of the relative contributions of different frequencies that make up a noise.

**$L_{Aeq,T}$ :** The equivalent continuous A-weighted sound pressure level. The value of the A-weighted sound pressure level in dB of continuous steady sound within a specified time interval, T, has the same r.m.s. sound pressure as a sound that varies with time.

**$L_{A10,T}$ :** The A-weighted sound pressure level exceeded for 10% of the time during the measurement period. This is the noise index typically used to describe road traffic noise, for example, when calculating road traffic noise in accordance with the Department of Transport and Welsh Office publication: Calculation of Road Traffic Noise (CRTN 1988).

**LOAEL:** Lowest Observed Adverse Effect Level. The level above which adverse effects on health and quality of life can be detected.

**SOAEL:** Significant Observed Adverse Effect Level. The level above which significant adverse effects on health and quality of life can occur.