Statutory Consultation 2022

Preliminary Environmental Information Report

Volume 2: Main Report

Chapter 16: Noise and Vibration

Contents

Tables

16 NOISE AND VIBRATION

16.1 Introduction

16.1.1 To comply with government policy and regulations, this chapter considers the preliminary assessment of likely effects on health and quality of life due to noise exposure and the likely significant effects due to noise change (adverse and beneficial) that arise from the Proposed Development. The assessment is based on a Core Planning Case of expected growth; however, sensitivity testing was undertaken based on slower and faster growth cases, which consider throughput being achieved earlier or later than the core case to account for any uncertainties in forecasting.

16.1.2 The EIA Scoping Report set out the proposed scope for the assessment of noise and vibration. In summary, the following have been assessed in this PEIR:

a. the pre-Covid baseline noise environment at receptor locations within the Application Site and within the surrounding area based upon noise surveys at the Application Site and within the surrounding area;
b. noise and vibration from earthworks and construction of Proposed Development infrastructure;
c. changes in air noise[1] (including the taking off and landing of aircraft) resulting from the Proposed Development;
d. changes in on-site ground noise[2] resulting from the operation of the Proposed Development; and
e. changes in road traffic noise, including from the new road infrastructure resulting from the Proposed Development.

16.1.3 The remainder of this chapter consists of:

a. **Section 16.2** Legislation, policy and guidance relevant to the scope and methodology of the noise and vibration preliminary assessment;
b. **Section 16.3** Scope of the assessment;
c. **Section 16.4** Stakeholder engagement undertaken to inform the preliminary assessment;
d. **Section 16.5** Methodology applied to the preliminary assessment;
e. **Section 16.6** Assumptions and limitations at this stage of work;
f. **Section 16.7** Baseline conditions;
g. **Section 16.8** Embedded and good practice mitigation;
h. **Section 16.9** Preliminary assessment;

[1] Air noise is defined as noise emissions from all aircraft movements in the landing and take-off cycle associated with the airport
[2] Ground noise is defined as noise emissions from aircraft taxiing between stand and runway, engine testing, Auxiliary Power Units (APU) and fire training ground activities

i. **Section 16.10** Additional mitigation;
j. **Section 16.11** Residual effects;
k. **Section 16.12** In-combination climate change;
l. **Section 16.13** Monitoring;
m. **Section 16.14** Assessment summary; and
n. **Section 16.15** Completing the assessment - remaining work to complete the EIA for the Environmental Statement (ES).

16.1.4 Details of acoustic terminology used in this assessment are presented in **Appendix 16.1** in Volume 3 of this PEIR.

16.1.5 A summary of the key legislation, policies and guidance considered in defining the assessment are provided in **Section 16.2** of this chapter with more detail provided in **Appendix 16.1** in Volume 3 of this PEIR. A summary of the methodology, terminology and criteria employed, is provided in **Section 16.5** of this chapter.

16.1.6 The noise and vibration assessment relates to the likely effects on health and quality of life due to noise exposure and the likely significant effects due to noise change affecting human receptors. Reference should be made to the following chapters for noise effects on non-human receptors:

a. **Chapter 8** Biodiversity;
b. **Chapter 10** Cultural Heritage;
c. **Chapter 13** Health and Community; and
d. **Chapter 14** Landscape and visual.

16.1.7 A qualitative assessment of health effects has been undertaken for the PEIR in **Chapter 13**. A quantitative assessment of health effects will be undertaken in the ES.

16.2 Legislation, policy and guidance

16.2.1 This section identifies the key legislation, policy and guidance relevant to the scope and methodology for the noise and vibration assessment and which may influence the type of mitigation measures that could be incorporated into the Proposed Development during construction or operation.

16.2.2 **Table 16.1** to **Table 16.4** provides a description of the relevant legislation, policy and guidance, and where each of these have been addressed in the PEIR.

Legislation

Table 16.1: Noise and vibration legislation

Legislation	How and where addressed in PEIR
Control of Pollution Act 1974 (CoPA) (Ref. 16.1) Defines Best Practicable Means (BPM) and requires adoption of BPM mitigation to control construction noise. Prior consent for construction works can be obtained through Section 61 of the CoPA.	Best Practicable Means mitigation is covered in the Draft Code of Construction Practice (Draft CoCP) provided as **Appendix 4.2** in Volume 3 of this PEIR, and when defining embedded and good practice mitigation measures for construction activities (see **Section 16.8**).
Environmental Protection Act 1990 (Ref. 16.2) Gives Local Authorities duty to investigate and, if necessary, take enforcement against noise or vibration emissions that are identified as a statutory nuisance. Section 80 identifies BPM as a basis for defence against enforcement action. Section 82 provides for individuals to seek for abatement action to be taken by a magistrate's court against noise nuisance.	For the operation of the airport, the Civil Aviation Act states (s76) "No action shall lie in respect of …nuisance, by reason only of the flight of an aircraft over any property at a height above the ground which, having regard to wind, weather and all the circumstances of the case is reasonable, or the ordinary incidents of such flight, so long as the provisions of any Air Navigation Order and of any orders under section 62 above have been duly complied with". For construction activities, as set out in the Draft CoCP BPM will be applied as a basis minimising noise and will be agreed with the relevant local authority before construction starts and this will also provide defence against enforcement action. Good practice mitigation measures for construction activities that represent BPM are provided in the Draft CoCP (**Appendix 4.2**).
The Civil Aviation Act 1982 (Ref. 16.3) Provides that no action for trespass or nuisance can be taken as long as an	Referenced when defining embedded and good practice mitigation measures for aircraft noise (see **Section 16.8**) and

Legislation	How and where addressed in PEIR
aircraft observes the provisions of any Air Navigation Order and grants the Government powers to introduce noise control measures at designated airports.	additional mitigation measures (see **Section 16.10**).
The Civil Aviation Act 2006 (Ref. 16.4) Allows an airport to charge airline operators based on the aircraft noise emissions and to introduce noise control schemes aimed at avoiding, limiting or mitigating aircraft noise effects.	Referenced when defining embedded and good practice mitigation measures for aircraft noise (see **Section 16.8**).
The Civil Aviation Act 2012 (Ref. 16.5) Defines the scope of airport operations that the CAA has concurrent power over.	Referenced when defining embedded and good practice mitigation measures for aircraft noise (see **Section 16.8**) and additional mitigation measures (see **Section 16.10**).
The Infrastructure Planning (EIA) Regulations 2017 The regulations govern the process for undertaking an Environmental Impact Assessment in England.	Referenced when defining methodologies to identify likely significant noise and vibration effects that may occur as a result of the Proposed Development (see **Section 16.5**).
The Airports (Noise-related Operating Restrictions) (England and Wales) Regulations 2018 (Ref. 16.6) The regulations designate competent authorities for the purposes of EU Regulation 598/2014 (Ref. 16.7).	Referenced when defining embedded and good practice mitigation measures for aircraft noise (see **Section 16.8**) and additional mitigation measures (see **Section 16.10**).
Regulation (EU) No 598/2014 Establishes the rules and procedures on the introduction of noise-related operating restrictions at airports within a “balanced approach” to noise management, as promoted by the International Civil Aviation Organisation (ICAO). EU 598 seeks to ensure that “noise related operating restrictions” are only imposed: a. when other measures within the Balanced Approach have first been considered b. where those other measures are not in themselves sufficient	The approach to noise control in Regulation 598 was followed when defining the London Luton Airport Noise Action Plan (LLANAP) (Ref. 16.8) and the draft Operational Noise Management Plan (see **Section 16.8** and **Appendix 16.2**).

Legislation	How and where addressed in PEIR
to attain the specific noise abatement objectives for the airport.	
The Environmental Noise (England) Regulations 2006 (Ref. 16.9) Sets out the requirement for airports to implement a Noise Action Plan every five years. The latest LLANAP covers the period from 2019-2023. Also sets out Defra's five year cycles of strategic noise mapping and action plan making for road and railways.	Referenced when defining embedded and good practice mitigation measures for aircraft noise (see **Section 16.8**). There are several Important Areas around Luton, which are areas that are the most exposed to road traffic noise as identified through the noise action planning process for roads carried out by Defra (Ref. 16.10) in line with the regulations
The Noise Insulation Regulations 1975, as amended 1988 (Ref. 16.11) Sets out the duty and provisions to carry out noise insulation work or to make grants due to noise from new or realigned road schemes and/ or associated works.	Referenced when defining compensation proposals (see **Section 16.10**).
The Land Compensation Act 1973 (Ref. 16.12) Allows for compensation to be provided due to a depreciation in value of a residential property as a result of physical factors (such as noise and vibration).	Informs compensation proposals (see **Section 16.10**).

Policy

Table 16.2: Noise and vibration policy

Policy	How and where addressed in PEIR
Airports National Policy Statement (ANPS) (2018) (Ref. 16.13)	The relevance of the ANPS is covered in **Table 16.3**.
National Planning Policy Framework (2021) Refers to how local planning policy should contribute to and enhance the natural and local environment. New development should take into account impacts on health, living conditions and the natural environment. Noise adverse impacts	Adverse effect levels (LOAELs, SOAELs and UAELs) are set out in the **Section 16.5.** Unacceptable effects (none) and Significant adverse impacts are identified and information on how they are avoided are presented in **Section 16.9**. **Sections 16.8** and **16.10** provide details on how

Policy	How and where addressed in PEIR
should be mitigated and reduced to a minimum and noise giving rise to significant adverse impacts on health and quality of life should be avoided. Planning decisions should prevent unacceptable noise effects.	potential adverse effects will be mitigated and reduced to a minimum.
National Policy Statement for National Networks – December 2014 (NPSNN) (Ref. 16.14) The NPSNN sets out the need for, and Government's policies to deliver, development of nationally significant infrastructure projects on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects (NSIP) on the road and rail networks. The provisions of the NPSNN relevant to environmental assessment broadly mirror those as outlined in the ANPS.	There are no elements of the Proposed Development that would be classified as a NSIP on the national road or rail network. However, the NPSNN remains a relevant consideration as works are proposed on the SRN at Junction 10 as part of the Proposed Development. As provisions relevant to environmental assessment broadly mirror those as outlined in the ANPS they have been appropriately considered in this preliminary assessment. Further consideration of the proposals against relevant NPSNN policies will take place following this consultation and in preparation of the DCO application.
Noise Policy Statement for England (NPSE) (2010) (Ref. 16.15) The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It is supported by three aims in Paragraph 1.6: "*Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:* *a. Avoid significant adverse impacts on health and quality of life;* *b. Mitigate and minimise adverse impacts on health and quality of life; and* *c. Where possible, contribute to the improvements of health and quality of life*." Paragraph 2.20 identifies the LAOEL as "*the level above which adverse effects on health and quality of life can be detected*". Paragraph 2.21 identifies the SOAEL as "*the level above which significant adverse effects on health and quality of life occur*".	The Lowest Observed Adverse Effect Level (LOAEL) and the Significant Observed Adverse Effect Level (SOAEL) are defined in **Section 16.5** Embedded measures to mitigate and minimise adverse impacts on health and quality of life are identified in **Section 16.8**. Significant adverse impacts are identified in **Section 16.9**. Details on additional measures to avoid significant impacts where practicable are provided in **Section 16.10**. Improvements to existing impacts of noise on health and quality of life are identified in **Section 16.9** through the reduction of noise contours from the 2019 baseline.

Policy	How and where addressed in PEIR
Paragraph 2.22 states *"it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant negative impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available"*. Paragraph 2.24 states "*The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise negative effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such negative effects cannot occur"*.	
Aviation 2050: The Future of UK Aviation (2018) (Ref. 16.16). Sets out consultation proposals for the long-term UK aviation strategy and proposes improvements to DfT expectations for noise insulation schemes.	Proposals to update the current Luton Airport noise insulation scheme in line Aviation 2050 are presented in **Section 16.8** and details on setting noise control measure are presented in **Section 16.10**.
The Aviation Policy Framework (APF) (2013) (Ref. 16.17) Sets set out the framework for the management of noise at UK airports, which is summarised as: "*to limit and, where possible, reduce the number of people in the UK significantly affected by aircraft noise, as part of a policy of sharing benefits of noise reduction with industry*".	Information on the measures adopted to limit the number of people significantly affected by aircraft noise is provided in **Section 16.8**. The Noise Envelope in **16.10** provides details on how benefits from new technology will be shared.

Policy	How and where addressed in PEIR
Draft UK Airspace Policy: A framework for balanced decisions on the design and use of airspace (February 2017) (Ref. 16.18) and Consultation Response on UK Airspace Policy: A framework for balanced decisions on the design and use of airspace (October 2017) (Ref. 16.19) The response on the UK Airspace Policy has modified the APF and defined airspace policy. Reiterates the policy set out in the APF. Is consistent with the NPSE through the objective to "…*limit and, where possible, reduce the number of people in the UK significantly affected by the adverse impacts from aircraft noise".* Defines daytime and night-time LOAEL values based on the Survey of Noise Attitudes by the CAA (Ref. 16. 20_ for aircraft noise as 51 dB LAeq,16h during the daytime and 45 dB LAeq,8h during the night-time.	The LOAEL values for aircraft noise are defined with reference to UK Airspace Policy in **Section 16.5**. Information on the measures adopted to limit the number of people significantly affected by aircraft noise is provided in **Section 16.8**. The Noise Envelope in **16.10** provides details on how benefits from new technology will be shared. Compensation proposals (see **Section 16.10**) were drafted with reference to the Consultation Response on UK Airspace Policy.
Hertfordshire Local Transport Plan 2018-2031 (Ref. 16.21). Policy 21 seeks to minimise noise issues from surface access where practicable.	**Section 16.9** demonstrates that transport noise issues have been minimised.
Luton Local Plan 2011-2031 (Ref. 16.22) Policy LLP6 sets out requirements for airport expansion including an air noise, ground and noise assessment. Provision on how noise will be controlled and managed must be made.	**Section 16.9** provides details on air noise impacts due to increases in Air Traffic Movements (ATMs) and an assessment on ground noise. **Section 16.10** demonstrates how noise will be controlled and managed through the Noise Envelope.
Central Bedfordshire Council Local Plan 2035: Pre-submission, January 2018 (Ref. 16.23) Draft Policy CC8 requires measures to be implemented to reduce noise impacts from new developments.	**Section 16.9** assesses noise effects due to the Proposed Development. **Section 16.8** and **16.10** provide details on how noise effects will be minimised.
North Hertfordshire District Council Proposed Submission Draft Local Plan for 2011-2031, October 2016	**Section 16.9** assesses noise effects due to the Proposed Development. **Section 16.8** and **16.10** provide details on how noise effects will be minimised.

Policy	How and where addressed in PEIR
Paragraph 9.20 states that any impacts a development has should be identified and appropriate mitigation built into the scheme.	

16.2.3 The aim of the APF is to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise. The APF aims to strike a balance between the adverse impacts of noise and economic benefits of air travel. The general principle is that future growth in aviation should ensure that benefits are shared between the aviation industry and local communities. These concepts are expanded on in the ANPS.

16.2.4 Paragraph 1.41 of the ANPS states that the ANPS does not have effect in relation to an application for development consent for an airport development not comprised of an application relating to the Heathrow Northwest Runway. Nevertheless, as set out within paragraph 1.41 of the ANPS, the Secretary of State considers that the contents of the ANPS will be both important and relevant considerations in the determination of such an application, particularly where it relates to London or the south east of England.

16.2.5 Accordingly, whilst the ANPS does not have effect in relation to the Proposed Development, it will be an important and relevant consideration in the determination of Luton Rising's (a trading name of London Luton Airport Limited) application for development consent. A summary of the relevant provisions for the Noise and Vibration assessment and how these have been addressed in this PEIR is provided within **Table 16.3**.

Table 16.3: How relevant noise and vibration requirements of ANPS are addressed in the PEIR

ANPS Section	How and where addressed in PEIR
Paragraph 5.67 states that: "*The proposed development must be undertaken in accordance with statutory obligations for noise. Due regard must have been given to national policy on aviation noise, and the relevant sections of the Noise Policy Statement for England (NPSE), the National Planning Policy Framework (NPPF) and the Government's associated planning guidance on noise. However, the Airports NPS must be used as the primary policy on noise when considering the Heathrow Northwest Runway scheme and has primacy over other wider noise policy sources*".	Although this statement concludes with reference to the Heathrow Northwest Runway scheme, this information is considered relevant to the DCO application for the Proposed Development. The requirements of statutory obligations and policies cited are presented in **Appendix 16.1** Volume 3 of this PEIR.

ANPS Section	How and where addressed in PEIR
Paragraph 5.68 of the ANPS is concerned with the decision-making process and states: "*Development consent should not be granted unless the Secretary of State is satisfied that the proposals will meet the following aims for the effective management and control of noise, within the context of Government policy on sustainable development:* *Avoid significant adverse impacts on health and quality of life from noise;* *Mitigate and minimise adverse impacts on health and quality of life from noise; and* *Where possible, contribute to improvements to health and quality of life*."	**Section 16.9** shows that noise during the Project will reduce from 2019 Baseline scenario due to fleet transition to less noisy new generation aircraft, therefore, there will be no increase in significant adverse impacts on health and quality of life from noise as less people will be affected by significant levels of noise in the future. Noise insulation (**Section 16.8**) and the Noise Envelope (**Section 16.10**) demonstrates how the Project will mitigate and minimise adverse impacts on health and quality of life. Provision of noise insulation will improve acoustic conditions within dwellings and improve health and quality of life for occupants. The noise envelope will provide a mechanism for predictable growth and the sharing of noise benefits from new aircraft technology with local communities.
Paragraph 5.52 states: "*Pursuant to the terms of the Environmental Impact Assessment Regulations, the applicant should undertake a noise assessment for any period of change in air traffic movements prior to opening, for the time of opening, and at the time the airport is forecast to reach full capacity, and (if applicable, being different to either of the other assessment periods) at a point when the airport's noise impact is forecast to be highest. This should form part of the environmental statement.*"	The assessment years for identifying the likely significant effect of air noise are set out in **Section 16.9**.
Key points relating to the scope of this assessment are set out in Paragraph 5.52, which states that: *The noise assessment should include the following:* *"A description of the noise sources;* *An assessment of the likely significant effect of predicted changes in the noise environment on any noise sensitive premises (including schools and hospitals) and noise sensitive areas (including*	A description of the noise sources included in the assessment are set out in **Section 16.5**. The assessment of significant effects covering the identified source of noise and vibration are described in **Section 16.9**. The effect of noise on sensitive landscape and visual receptors is covered in **Chapter 14** Landscape and Visual. The characteristics of the existing noise environment are provided in **Section 16.7**.

ANPS Section	How and where addressed in PEIR
National Parks and Areas of Outstanding Natural Beauty); *The characteristics of the existing noise environment, including noise from aircraft, using noise exposure maps, and from surface transport and ground operations associated with the project, the latter during both the construction and operational phases of the project;* *A prediction on how the noise environment will change with the proposed project; and* *Measures to be employed in mitigating the effects of noise.* *These should take into account construction and operational noise (including from surface access arrangements) and aircraft noise".*	An assessment of effects due to construction activities and predictions on how the noise environment will change as a result of the Proposed Development is provided in **Section 16.9**. Measures to be employed in mitigating the effects of noise are described in **Section 16.10**.
Paragraph 5.52 goes on to state: *"The applicant's assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design. This may involve the use of appropriate design parameters and scenarios based on indicative flightpaths*".	Information on how airspace may change may not be available prior to submission of the DCO application. Consequently, the assessment has been undertaken based on current operational procedures. Should any airspace change proposals for the airport be submitted prior to the DCO application, sensitivity testing will be undertaken to show how these changes may affect the noise contours. Details on how airspace change is covered in the Project is provided in **Section 5.11** of **Chapter 5**.
Paragraph 5.53 states that: "*Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. For the prediction, assessment and management of construction noise, reference should be made to any British Standards and other guidance which give examples of mitigation strategies. In assessing the likely significant impacts of aircraft noise, the applicant should have regard to the noise assessment principles, including noise metrics, set out in the national policy on airspace*".	The noise requirements of the relevant policy, guidance and British Standards are set out in **Appendix 16.1** in Volume 3 of this PEIR. The assessment methodology, described in **Appendix 16.1** and summarised in **Section 16.5**, has been developed in line with the requirements set out in policy, guidance and British Standards.

ANPS Section	How and where addressed in PEIR
Paragraphs 5.54 to 5.66 of the ANPS provide details of the type of mitigation measures that could be incorporated into an airport development during construction or operation. Aspects of mitigation that are relevant to the Project are as follows: Paragraph 5.54 identifies Regulation 598, which establishes the balanced approach to noise management at airports. Paragraph 5.60 requires that the Applicant should put forward plans for a Noise Envelope. Paragraph 5.64 states that best practice noise mitigation measures should be adopted for the construction phase.	The balanced approach too aircraft noise management is covered in the Draft Operational Noise Management Plan (**Appendix 16.2**). A Noise Envelope is covered in **Section 16.10**. Best practice construction noise mitigation measures are secured through a draft Code of Construction Practice (**Appendix 4.2**)

Table 16.4: Noise and vibration guidance

Legislation	How and where addressed in PEIR
Air Navigation Guidance (October 2017) (Ref. 16.24) Provides guidance on environmental objectives on the process of airspace redesign. Identifies the objective to reduce adverse noise effects in airspace from the ground to below 4,000 feet. Identifies supplementary noise metrics to inform communities about changes in aircraft noise for air traffic movements below 7,000 feet.	Referenced in the definition of the air noise Study Area (see **Section 16.3**). **Section 16.8** and **16.10** provide details on measures adopted to reduce total adverse effects on health and quality of life from aviation noise. A commitment to provide information on supplementary noise metrics in the ES is covered in **Section 16.15**.
CAP 1616a: Airspace Design: Environmental Requirements Technical Annex, 2021 (Ref. 16.25) Published in response to Air Navigation Guidance 2017. Provides guidance on the environmental assessment for airspace changes. Sets out noise metrics to be used when assessing the impact of airspace redesign.	Guidance from CAP1616a was followed when defining the air noise modelling methodology (**Appendix 16.1**) and when presenting the results of the air noise assessment (**Section 16.9**)
CAP 2091: CAA Policy on Minimum Standards for Noise Modelling, 2021 (Ref. 16.26)	Advice in CAP 2091 was followed when determining the level of validation that is required for the Project air noise model. Details on how CAP 2091 was referenced

Legislation	How and where addressed in PEIR
Provides the minimum acceptable level of noise modelling that the CAA should undertake for an airport depending on the population exposed to air noise.	during the air noise model validation process are provided in **Appendix 16.1** in Volume 3 of this PEIR.
CAP 1506: Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Second Edition, 2021 (Ref. 16.19) Describes a research study undertaken by the CAA to obtain new and updated evidence on attitudes to aviation noise around airports in England, and how they relate to the UK aircraft noise exposure indices LAeq,16h, Lden, N70 and N65. It was found that the LAeq,16h correlated best with annoyance but there was merit in the use of N65 as a supplemental indicator.	The LAeq,16h is used when defining the methodology for identifying (**Section 16.5**) significant effects on health and quality of life due to noise exposure and the likely significant effects due to noise change (adverse and beneficial) that arise from the DCO Project. The N65 contours will be provided in the ES as a supplementary metric (**Section 16.15**)
Independent Commission on Civil Aviation Noise (ICCAN) (now disbanded) A Review of Aviation Noise Metrics and Measurement, 2020 (Ref. 16.27) Recommends an assessment of air noise using LAeq,T based metrics with supplementary metrics used to provide context	A commitment to provide information on supplementary noise metrics in the ES is covered in **Section 16.15**.
Planning Practice Guidance Noise (PPGN) (2019) (Ref. 16.28) Provides guidelines to assist with the implementation of the NPPF and NPSE.	Likely effects due to noise exposure and noise change (adverse and beneficial) that arise from the DCO Project are identified in **Section 16.9**. **Section 16.8**, **16.10** and **Appendix 16.2** provide details on how noise effects are managed.
Professional Practice Guidance: Planning and Noise (ProPG) (2017) (Ref. 16.29) ProPG provides planning guidance for the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources. Provides guidance for land use planning for residential developments around airports.	Referenced in **Appendix 16.2** when defining land use planning for the airport.

Legislation	How and where addressed in PEIR
World Health Organisation Guidelines for Community Noise, 1999 (Ref. 16.30) Provides guidelines based on scientific knowledge about the health impacts of community noise.	Referenced when defining the assessment methodology in **Section 16.5**.
World Health Organisation Night Noise Guidelines for Europe, 2009 (Ref. 16.31) Provides guidance on the effects that noise at night can have on sleep.	Referenced when defining the assessment methodology in **Section 16.5**.
World Health Organisation Environmental Noise Guidelines for the European Region, 2018 (Ref. 16.32) The updated guidelines identify a new dose-response relationship between noise and health effects. The Aviation Strategy states that UK policy will be underpinned with recent UK specific evidence in the Civil Aviation Authorities Survey of Noise Attitudes	Although the dose-response relationship in the new WHO Guidelines is not currently adopted in UK policy, sensitivity testing will be undertaken in the ES.
BS 7445 'Description and Measurement of Environmental Noise' (Ref. 16.33) Sets out the methods for undertaking environmental noise monitoring.	Guidance was referenced when undertaking baseline noise monitoring, as discussed in **Section 16.5**.
British Standard 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites Noise' (Ref. 16.34) Sets out methodologies for the calculation and assessment of construction noise.	BS 5228-1 was referenced to define the construction noise assessment methodology in **Section 16.5**. Noise predictions were undertaken using BS 5228-1 calculation methodologies and construction plant noise data was referenced as detailed in **Appendix 16.1**, Volume 3 of this PEIR.
British Standard 5228-2:2009+A1:2014: 'Code of practice for noise and vibration control on construction and open sites Vibration' (Ref. 16.35) Sets out methodologies for the calculation and assessment of construction vibration.	BS 5228-2 was referenced to define the construction vibration assessment methodology in **Section 16.5**. Data on vibration from construction activities in BS 5228-2 was referenced for the assessment presented in **Section 16.9**.

Legislation	How and where addressed in PEIR
BS 7385-2 Evaluation and Measurement for Vibration in Buildings – Part 2 – Guide to Damage Levels from Ground-borne Vibration, 1993 (Ref. 16.36) Provides guidance on assessing vibration induced damage in buildings/	BS 7385-2 was referenced to define the construction vibration assessment methodology in **Section 16.5**.
Calculation of Road Traffic Noise, 1988 (Ref. 16.37) Sets out methodologies for calculating road traffic noise levels.	Methodologies in the Calculation of Road Traffic Noise were applied to calculate road traffic noise for assessments in **Section 16.9**.
Design Manual for Roads and Bridges LA111 (DMRB), 2020 (Ref. 16.38). Sets out methodologies for assessing road traffic noise levels.	Used to assess the impact of changes in road traffic noise (see **Section 16.5**)

16.3 Scope of the assessment

16.3.1 This section describes the scope of the noise and vibration assessment, including how the assessment has responded to the Scoping Opinion. The temporal and spatial scope, the relevant receptors, and matters scoped in and out are identified. A description of engagement undertaken with relevant technical stakeholders to develop and agree this scope is provided in **Section 16.4**.

Scoping Opinion

16.3.2 The EIA Scoping Report set out the proposed scope and assessment methodologies to be employed in the EIA and is provided in **Appendix 1.1** of Volume 3 to this PEIR.

16.3.3 In response to that Scoping Report, a Scoping Opinion was received from the Planning Inspectorate on 9 May 2019 and is provided in **Appendix 1.3** in Volume 3 of this PEIR.

16.3.4 **Table 16.5** describes the main matters highlighted by the Planning Inspectorate in the Scoping Opinion and how these have been addressed in this PEIR. Final responses to all comments received during Scoping will be provided in an appropriate format in the ES.

Table 16.5: Noise and vibration Scoping Opinion comments

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
2.2.24	The Inspectorate understands the relationship between the Proposed Development and the future air space change process, which may not run in parallel. However, the Inspectorate considers that the ES methodology should be compatible with the methodological approaches outlined in the CAA's CAP 1616 and CAP 1616a documents to ensure consistency and continuity between the two assessment processes. Where the ES methodology is not consistent with the CAA's CAP approach, this should be identified and explained.	A comparison between the noise assessment methodologies adopted for the EIA and those recommended in CAP 1616a is presented in **Appendix 5.3** in Volume 3 of this PEIR. This shows that there is good degree of consistency between the two approaches through adoption of primary and supplementary assessment metrics from CAP 1616a. The only exceptions are those that specifically relate to airspace design and are not relevant to the Proposed Development. Our expectation is that airspace changes will be accommodated within the Noise Envelope (**Section 16.10**) should the DCO application be consented.
4.5.1	An assessment of vibration effects arising from construction vehicles on the existing road	Details have been provided in this PEIR on vibration from construction vehicles on the local

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
	network should be provided as part of the ES, in line with the methodological approach set out in the Design Manual for Roads and Bridges	road network (**Section 16.3**). The approach to construction traffic vibration was agreed with the Noise Working Group (**Section 16.4)**.
4.5.2	The ES should include an assessment of operational vibration, where likely significant effects could occur.	Construction and operational traffic vibration were scoped out of the assessment (**paragraph 16.3.13**) and was agreed with the Noise Working Group (**Section 16.4)**.
4.5.4	The ES should clearly describe how the monitoring locations have been selected and the extent to which they are agreed with the relevant consultation bodies.	Details of noise monitoring locations (**Appendix 16.1**) and how they have been agreed with the Noise Working Group (**Section 16.4**) are presented in the PEIR.
4.5.5	The ES should describe the study area used for the impact assessment and this must be clearly defined and justified in the ES.	The study area used in the impact assessment has been defined and justified in the PEIR (**Section 16.3**).
4.5.8	The ES should define and assess UAEL for the Proposed Development.	UAEL values are presented in **Section 16.5**. A precautionary UAEL for air noise has been defined at 69 dB LAeq,16h and 63 dB LAeq,8h (**Section 16.5**). No receptors are exposed to noise levels exceeding the UAEL.
4.5.10	Consistent with BS5228 Table E1, the assessment of construction noise effects should also include criteria for weekends and Saturdays 07:00-13.00. Whilst Example Method 2 in BS5228 makes reference to durations of one month, or more in the consideration of significant effects, the criteria also include the caveat 'unless works of a shorter duration are likely to result in significant effect'. The duration of effect should not be applied as a blanket principle to rule out any likelihood	Criteria for weekends and Saturdays 07:00-13:00 have been included in **Table 16.9**. Duration of effect will only be considered if high noise levels are experienced for a short period of time. Appendix E of BS 5228-1 is informative only and non-compliance with Appendix E does not necessarily mean non-compliance with BS 5228-1.

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
4.5.11	The text relating to vibration effects appears to mix peak particle velocity (PPV) and vibration dose value (VDV) as assessment criteria. The ES should distinguish between the vibration criteria for human receptors and those for buildings/structures. Relevant LOAEL and SOAEL criteria should be set out for both effects referencing relevant British Standards such as BS6472 and BS7385.	BS 6472 provides guidance on Vibration in terms of Vibration Dose Values (VDV). Section B.2 of BS 5228-2 states that: "*for construction it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage".* The PPV has been used to assess human disturbance due to construction vibration, which is in line with advice provided in BS 5228-2. BS 7385 contains advice on the potential for vibration induced building damage. Human disturbance typically occurs at levels significantly below those required for building damage. Where a likely significant vibration effect relating to human disturbance has been identified, an assessment of significance in terms of building damage will be undertaken. As no significant construction vibration effects are identified (**Section 16.9**) an assessment based on BS 7385 guidance is not required.
4.5.12	The ES should assess noise impacts associated with increased train movements relating to the Proposed Development where likely significant effects could occur.	There are no plans to increase rail services specifically in response to the airport expansion to 32 mppa. Committed improvements (e.g. those relating to Thameslink 20/20 and the new East Midlands Trains Franchise) are included in the "Do Nothing" and "Do Something" scenarios (defined in **paragraph 16.5.35**). The Luton DART will be extended as part of the Proposed Development; however, the extension would be located approximately 500 m from the

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
		nearest sensitive receptor, which is suitably far that Luton DART generated noise and vibration will not be perceptible.
4.5.13	The ES should assess on-site noise emissions from fixed plant relating to the Proposed Development where likely significant effects could occur. Static sources should be assessed using BS4142: 2014 Methods for rating and assessing industrial and commercial sound.	Fixed plant noise is managed through the application of guidance within BS 4142 post DCO consent when the fixed plant design elements are finalised. Noise criteria from fixed plant will be defined in the ES. There will be a requirement to design plant to comply with noise level criteria during the detailed design that will take place post-consent. Therefore, significant noise effects from fixed plant will not occur.
4.5.14	The ES should set out the Applicant's noise insulation policy, justifying any change from existing provisions. The policy should explain how it addresses the proposed policy changes set out in 'Aviation 2050: The future of UK aviation. A consultation.' The list of mitigation omits discussion of how embedded measures such as Fixed Electrical Ground Power and use of electrical vehicles can reduce emissions of noise.	Full details on the proposed noise insulation scheme and a new discretionary property compensation scheme are presented in the **Draft Compensation Policies and Measures** document published alongside this PEIR for statutory consultation. Embedded mitigation measures, which include the use of Fixed Electrical Power Units, are detailed in **Section 16.8** and additional mitigation measures are detailed in **Section 16.10**. Use of electric vehicles offers minor noise benefits as research shows there is only a difference of approximately 1 dB for vehicles travelling at 50 km/h (Ref. 16.39). Where vehicles are travelling slower (up to 20 km/h) and therefore quieter, a safety requirement is that vehicles should generate an alternative to engine noise so people can hear the vehicles and are aware of them. Consequently, to cover a worst-case assessment scenario, it is

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
		considered that there would not be a noticeable difference in noise on road links within the study area if there was a switch to electric vehicles and the assessment has been undertaken based on diesel/petrol-powered vehicles.
4.5.15	The Scoping Report proposes that a bespoke noise envelope will be developed to provide a mechanism to manage noise impacts. The relationship between the existing noise envelope and the proposed noise envelope must be set out in the ES and the basis for any departure from the established noise envelope must be fully justified. The ES should explain how the Noise Envelope Design Group provides continuity with existing noise controls at the airport and justify the need for any departures from the conditions of the existing operating consent.	A Noise Envelope Design Group has been established to agree the contents of the Noise Envelope. There is no formal existing noise envelope; however, there are noise contour limits, movement limits and quota count limits currently in place , which will be superseded by the Noise Envelope. The ANPS defines a noise envelope as more than just setting constraints but also how the benefit of any improvements in aircraft technology will be shared between the airport and affected communities. The purpose of the Noise Envelope is described in **Section 16.10**.
London Borough of Harrow Council	The ES should use both current and indicative proposed flightpaths and clearly articulate the impacts of the worse-case scenario (compared to present) as the basis of assessing the impact of the proposed expansion / increased number of flights.	An assessment of the worst-case scenario using current flight paths and operational procedures has been undertaken in the PEIR. The assessment compares noise generated from the proposed expansion with noise generated from the future baseline, which has smaller contours than the existing baseline due to the introduction of less noisy new generation aircraft. To date, submitted proposals for airspace changes (**Section 5.11** of **Chapter 5**) do not affect the extent of noise contours. Sensitivity testing of possible flight paths and operational procedures that may be adopted in the future will be undertaken in the ES to the extent

Scoping Opinion ID	Scoping Opinion comment	How is this addressed
		that the process of airspace modernisation has progressed to the stage where such changes can be identified and their impacts assessed.
Aylesbury Vale District Council and Buckinghamshire County Council	We understand the importance of the design of Luton airspace and the wider UK airspace in controlling noise, however, it seems unlikely that these re-designs will be confirmed in time for the production of this ES. On this basis the ES should primarily be based on current flight paths. As with future aircraft design, sensitivity testing should be applied to potential changes in impacts that could arise out of airspace changes. Potential significant effects should not be scoped out on the basis of airspace changes unless these changes are confirmed at the time of writing the ES.	The assessment of air noise has been undertaken using existing flight paths. At present, only change to approach paths have been submitted. As these result in marginal differences in properties affected, potential changes in approach paths are not considered to affect the results of the air noise assessment presented in this PEIR. Subject to further changes being proposed that might affect the results of the noise assessment, sensitivity tests will be undertaken based on any new information available prior to submission of the ES. Our expectation is that airspace changes will be accommodated within the Noise Envelope (**Section 16.10**) should the DCO application be consented.

Spatial scope

Study areas

16.3.5 Topic specific guidance has been used to define study area extents. Where guidance does not define study are extents, study areas are defined by the Lowest Observed Adverse Effect Level (LOAEL), which is identified in the NPSE. The LOAEL is defined in PPGN as the level above which, as an average response, adverse effects on health and quality of life can be detected. Noise below the LOAEL is identified in PPGN as No Observed Adverse Effect, which PPGN states that noise can be heard but does not affect the quality of life.

Air Noise Study Area

16.3.6 The study area for air noise has been defined based on guidance within Air Navigation Guidance, which states: "*Below 4,000 feet, there is a strong likelihood that aircraft could create levels of noise exposure above the LOAELs identified above, which is reflected in the Altitude Based Priorities*". In addition, the daytime and night-time LOAEL air noise contours for the assessment

scenarios have been referenced to define extents of the air noise study area. The Air Noise Study Area is illustrated in **Figure 16.1** in Volume 4 of this PEIR.

Ground Noise Study Area

16.3.7 For ground noise, the study area has been defined based on the extents of predicted daytime and night-time LOAEL noise contours arising from the Project. The Ground Noise Study Area is illustrated in **Figure 16.2** in Volume 4 of this PEIR.

Construction Noise and Vibration Study Area

16.3.8 For construction noise and vibration, the study area has been defined based on the extents of daytime and night-time LOAEL noise contours arising from the Project and the extent of haul routes connecting the Application Site with the M1. As ground-borne vibration does not propagate as far as noise, this area captures the construction vibration study area. The Construction Noise and Vibration Study Area is illustrated in **Figure 16.2**, Volume 4 of this PEIR.

Surface Access Noise Study Area

16.3.9 The assessment of surface access noise accounts for all road links in the strategic traffic model described in **Chapter 18** Traffic and Transportation of this PEIR. The study area for surface access noise is defined based on the extents of the study area for the transport assessment with a 600 m buffer around road links based on guidance in DMRB. The Surface Access Noise Study Area is illustrated in **Figure 16.1** in Volume 4 of this ES.

Zone of influence

16.3.10 The Zone of Influence for the noise and vibration assessment covers the combined Study Areas for each assessment topic. The full cumulative effects assessment is provided in **Chapter 21** In-Combination and Cumulative Effects of this PEIR.

Temporal Scope

16.3.11 The Proposed Development will be delivered over two phases (Phase 1 and Phase 2) within which construction and operation may take place simultaneously. For the purposes of assessment, three assessment years are considered as described in **Chapter 5** Approach to the Assessment of this PEIR. A summary of the assessment phases for the core case is presented in **Table 16.6**.

Table 16.6: Summary of assessment phases in the Core Planning Case

Assessment Phase	Passenger capacity	Construction start year	Construction Completion year	Year predicted passenger capacity reached
Phase 1	21.5 mppa	2025	2027	2027
Phase 2a	27 mppa	2033	2036	2039

Phase 2b	32 mppa	2037	2041	2043

Matters scoped in

16.3.12 The noise and vibration assessment considers the following assessments:

a. construction noise;
b. construction vibration;
c. construction traffic noise;
d. operational air noise;
e. operational ground noise; and
f. surface access traffic noise.

Matters scoped out

16.3.13 The following assessments have been scoped out and agreed through consultation with the Noise Working Group (NWG) (**Section 16.4**).

Construction traffic vibration

16.3.14 When considering traffic generated vibration, DMRB states that: "*Ground-borne vibrations are produced by the movement of rolling wheels on the road surface and can be perceptible in nearby buildings if heavy vehicles pass over irregularities in the road*" (Paragraph A5.25).

16.3.15 Occupants of buildings would be at risk to disturbance from traffic generated vibration if buildings were "…*founded on soft soils close to heavily trafficked older roads where the road surface is uneven or constructed from concrete slabs which can rock under the weight of passing heavy vehicles*" (paragraph A5.25).

16.3.16 Given that construction traffic will access/egress the Application Site using A-roads, construction traffic will use routes that are required to be kept in good condition due to heavy density traffic flows. Additionally, haul routes and access roads will be kept well maintained to minimise construction traffic induced vibration (see **Appendix 4.2**). Consequently, the conditions described above for risk of disturbance from construction traffic vibration are unlikely to occur on roads used by construction traffic and construction traffic vibration is not considered to be significant.

Operational vibration

16.3.17 The highest generating sources of ground-borne vibration are considered to originate from rail movements or aircraft operating on the ground (taxiing or ground-running). The nearest receptor to the proposed Direct Air Rail Transit and new hardstanding area on which aircraft will operate and extension is approximately 400m away. Given the separation distance from vibration source to receptor, it is unlikely that vibration from on-site sources will be perceptible at sensitive receptors. It is considered; therefore, that operational ground-borne vibration as a result of the Proposed Development will not be significant.

16.4 Stakeholder engagement and consultation

16.4.1 The **2019 Statutory Consultation Feedback Report** contains a full account of the previous statutory consultation process and issues raised in feedback. Matters raised regarding the scope, method, mitigation or compensation being considered as part of the noise and vibration assessment were then subject to further discussions directly with stakeholders during working group meetings. The main matters/themes raised during consultation considered relevant to the noise and vibration assessment were:

a. Concern over existing and potential future increases in noise pollution particularly with regards to night-time aircraft movements which have an impact on quality of life.

b. Concern that increased noise levels resulting from expansion will harm the surrounding countryside and towns.

c. Interest in how noise objectives will be monitored and enforced.

d. Concern that the noise modelling would have limited value until the noise model is fully validated.

e. Concern that if there is a significant increase in departures there may be a greater impact due to the increase in noise events that is not being reported.

16.4.2 Engagement in relation to noise and vibration has been undertaken with a number of prescribed and non-prescribed stakeholders. Consultation on noise and vibration with relevant local authorities has primarily been through the establishment of a NWG, which has been set up to facilitate ongoing discussion regarding scope, method and assessment findings. The NWG includes representation from the following boroughs and districts:

a. Luton Borough Council;

b. North Hertfordshire District Council;

c. Stevenage Borough Council;

d. Central Bedfordshire Council;

e. Dacorum Borough Council;

f. Welwyn Hatfield Borough Council;

g. East Herts District Council;

h. St Albans City and District Council;

i. Chilterns District Council; and

j. Aylesbury Vale District Council.

16.4.3 In addition to the NWG, a Noise Envelope Design Group (NEDG) has been set up to assist in defining a Noise Envelope to be submitted as part of the application for development consent. Provision of a Noise Envelope that contains a suite of noise control measures is a requirement of the ANPS (paragraph 5.60). Details on the Noise Envelope are provided in **Section 16.10**. Membership of the NEDG includes the following:

a. London Luton Airport Operations Limited (LLAOL);
b. National Air Traffic Services;
c. ICCAN (now disbanded, the CAA will take on some ICCAN duties in April 2022 and will be invited to any future meetings);
d. easyJet;
e. DHL;
f. Signature Flight Support;
g. Luton Borough Council;
h. Hertfordshire County Council;
i. North Hertfordshire District Council;
j. Central Bedfordshire Council;
k. Buckinghamshire County Council;
l. Bedford Chamber of Commerce;
m. Luton and District Association for Control of Aircraft Noise (LADACAN); and
n. London Luton Airport Town and Village Community Committee (LLATVCC).

16.4.4 **Table 16.7** provides a summary of engagement with relevant stakeholders, undertaken to inform the EIA to date, including the date and time of meetings and a summary of discussions to resolve matters raised.

Table 16.7: Stakeholder engagement relating to noise and vibration

Meeting name and date	Attendees (organisation)	Summary of discussion
Noise monitoring methodology email dated 21st June 2018	NWG	The NWG was consulted on the noise monitoring through a request to comment on a proposed methodology. Through this process, an approach to determining baseline conditions at communities affected by noise generated by airport operations was agreed. This agreed approach was followed when undertaking baseline noise monitoring.
Noise and Vibration Scoping Meeting 25th January 2019	NWG	A presentation on the contents of the scoping report, which covered the scope and methodology of the assessment, was made to the NWG. The NWG was given the opportunity to discuss the contents of the scoping report and request clarification on any topic.
Noise and Vibration ES Results	NWG	A presentation on the assessment methodology and results presented in the 2019 PEIR was made to the NWG. The NWG were asked for feedback on the draft 2019 PEIR, and it was

Meeting name and date	Attendees (organisation)	Summary of discussion
5th September 2019		discussed how ongoing work to be undertaken for the ES could be refined for a further assessment.
NWG Meeting on Statutory Consultation feedback 3rd March 2021	NWG	A presentation on statutory consultation feedback was made to the NWG. Details on how feedback would be addressed in future work was provided.
NWG Meeting 2022 PEIR	NWG	A presentation on the assessment methodology and results presented in the 2022 PEIR was made to the NWG. The NWG were asked for feedback on the draft 2022 PEIR, and it was discussed how ongoing work to be undertaken for the ES could be refined for a further assessment.
Noise Envelope Design Group meeting 14th October 2019	The Applicant and representatives NEDG	The following points were discussed: a. The requirement to establish a NEDG; and b. The purpose and objectives of the NEDG c. Confirmation of the Terms of Reference
Noise Envelope Design Group meeting 13th November 2019	The Applicant and representatives NEDG	The following points were discussed: a. An enforcement regime; b. Noise management controls for discussion to include aircraft movement caps, noise contour area and shape, noise quota counts, noise violation limits, supplementary metrics; c. NEDG process and management issues; and d. A presentation of noise contours predictions was also given to the group.
Noise Envelope Design Group meeting 4th December 2019	The Applicant and representatives NEDG	The following points were discussed: a. The relative pros and cons of each noise management control b. NEDG review periods post-submission of the DCO application c. Enforcement regime A presentation of Project movement forecasts was given to the group
Noise Envelope Design Group meeting	The Applicant and representatives	The following points were discussed: a. A Draft Position Paper on Movement Caps

Meeting name and date	Attendees (organisation)	Summary of discussion
17th December 2019	NEDG	b. The relative pros and cons of movement caps were discussed
Noise Envelope Design Group meeting 8th January 2020	The Applicant and representatives NEDG	The following points were discussed: a. A Draft Position Paper on Noise Violation Limits b. Cole Jarman presented an Addendum to Draft Position Paper on Noise Violation Limits c. The relative pros and cons of noise violation limits were discussed
Noise Envelope Design Group meeting 22nd January 2020	The Applicant and representatives NEDG	The following points were discussed: a. A Draft Position Paper on Quota Systems b. Cole Jarman presented an Addendum to the Draft Position Paper on Quota Systems c. The relative pros and cons of noise violation limits
Noise Envelope Design Group meeting 5th February 2020	The Applicant and representatives NEDG	The following points were discussed: a. A Draft Position Paper on Noise Contours b. The relative pros and cons of noise violation limits c. LAeq,T contours to be retained as a control measure d. 'Number above'[3] contours to be used for information only
Noise Envelope Design Group meeting 11th March 2020	The Applicant and representatives NEDG	The following points were discussed: a. A review of noise control measure discussions and a discussion of alternative measures that may be adopted b. A paper on how enforcement of the Noise Envelope may work
Noise Envelope meeting 25th March 2020	Chair of the NEDG The Applicant and representatives Cole Jarman	Discussion of feedback on noise control measures.

[3] Contours that provide information on the number of aircraft movements that exceed 65 dB L_{ASmax} during the daytime and 60 dB L_{ASmax} during the night-time.

Meeting name and date	Attendees (organisation)	Summary of discussion
Noise Envelope Design Group meeting 8th July 2020	The Applicant and representatives NEDG	The following points were discussed: a. How the noise model will be validated and provide values for thresholds and limits. b. 'Number above' contour banding c. Quota Count (QC) tolerances d. Noise monitoring location at 2.5 km from start-of-roll[4] e. Use of a fixed modal split for testing compliance with noise contour thresholds and limits f. Implementation of a 3 to 5-year review process to ensure that noise control measures remain relevant g. Discounted movements that will not contribute to noise contours A draft Interim Report to be prepared by the Applicant's representatives covering: a. how noise is controlled and measured b. the type of metrics to be applied c. the general principles of enforcement
Noise Envelope Design Group meeting 17th September 2020	The Applicant and representatives NEDG	The following points were discussed: a. Contents of the draft Interim Report with a view to finalising b. Noise model validation c. Way forward for the NEDG
LADACAN AND LLATVC meeting on noise model validation 17th June 2021	The Applicant's representatives LADACAN LLATVCC	A detailed presentation on noise model validation was provided to LADACAN and LLATVCC to provide more detail to interested parties in lieu of a presentation to the NEDG
Noise Envelope Design Group meeting 13th July 2021	The Applicant and representatives NEDG	The following points were discussed: a. Headline passenger forecasts b. Noise model validation c. Green Controlled Growth

[4] The position on the runway that departing aircraft typically start moving as part of their take-off procedure.

Meeting name and date	Attendees (organisation)	Summary of discussion
Noise Envelope Design Group meeting 7th November 2021	The Applicant and representatives NEDG	Presentations were provided to the NEDG as follows: a. Update from Luton Rising (a trading name of London Luton Airport Limited) on DCO project milestones b. Update on passenger forecast modelling and fleet mix modelling c. Update on noise model validation
Noise Envelope Design Group meeting 8th December 2021	The Applicant and representatives NEDG	Presentations were provided to the NEDG as follows: a. suggested metrics against the controls for the Noise Envelope b. use of noise contours as basis for setting thresholds and limits

16.4.5 Stakeholder engagement will continue as the Proposed Development progresses and will include further meetings with the NEDG and the NWG to discuss results of the PEIR and next steps for the ES.

16.5 Methodology

Overview

16.5.1 This section outlines the methodology employed for assessing the likely significant effects on noise and vibration from the construction and operation of the Proposed Development.

Baseline methodology

16.5.2 The general approach to defining future baseline is described in **Section 5.4** of **Chapter 5** Approach to the Assessment. The future baseline considered for noise and vibration is described **Section 16.7** of this chapter.

Receptors

16.5.3 The type of receptors that may experience significant effects sue to the construction and operation of the Proposed Development are identified in **Table 16.8** as residential and non-residential. The assessment of noise and vibration in this PEIR focuses on residential receptors (with locations of schools identified) as they are considered most sensitive to noise.

Table 16.8: Receptor types

Receptor Group	Receptors in Group
Residential	Individual dwellings and private open spaces (e.g. gardens)
Non-residential	Non-residential community facilities such as schools, hospitals, places of worship, and noise sensitive commercial properties

Defining the Assessment Baseline

16.5.4 A baseline year of 2019 was selected for the noise assessment. This year represents the last year of normal activity at the airport pre-Covid pandemic. Although it is acknowledged that, in 2019, existing noise contour limits[5] were exceeded for both day and night periods, the use of 2019 as a baseline is to identify if there will be any changes to health and quality of life from the last year of typical operating conditions.

16.5.5 To define consistent and representative baseline noise levels at community locations across the study area and to enable consistent comparison with future baseline, 'Do Nothing' and Do Something scenarios (defined in **paragraph 16.5.35**), the baseline for air noise and road traffic noise has been calculated as described below.

16.5.6 The 2019 air noise baseline was defined through noise modelling using the Aviation Environmental Design Tool (AEDT) and 2019 ATM data for the 92-day

[5] Noise contour limits for the airport to operate to its consented limit of 18 mppa, as modelled using INM, were set at 19.4 km^2 for the daytime 57 dB LAeq,16h noise contours and 37.2 km^2 for the night-time LAeq,8h noise contour.

summer period (16 June to 15 September inclusive). The 2019 air noise baseline is defined in **Section 16.7** and was validated using measured noise data from LLAOL's permanent and temporary monitoring stations. Details on noise data used for validation and the model validation method are provided in **Appendix 16.1** in Volume 3 of this PEIR.

16.5.7 The 2019 surface access noise baseline was calculated using the CRTN Basic Noise Level (BNL) (Ref. 16.37*)*, which represents the road traffic noise level at 10 m from the road edge, for the roads in the transport model in the baseline year. Detailed modelling of the surface access 2019 baseline will be provided in the ES, including validation of the baseline model using measured noise data (see **Section 16.15**).

16.5.8 Baseline monitoring has also been undertaken as described in the next sub-section. This is for two purposes: first to inform the baseline for the construction noise assessment; and second to support characterisation of the existing noise environment (contextual information that will be used to inform the refined noise assessment to be presented in the ES).

16.5.9 Noise monitoring was undertaken at locations agreed with the NWG (see **Section 16.4**) and at additional locations identified through 2019 statutory consultation (see **Appendix 16.1** in Volume 3 of this PEIR).

Baseline noise monitoring methodology

16.5.10 Baseline sound surveys were undertaken at locations surrounding the Proposed Development to define ambient noise conditions at community locations within the air noise study area and to define baseline road traffic noise levels at key road links in the surface access study area. The geographical extent of noise monitoring at community locations was based on the possible extent of potential adverse noise impacts arising from the Proposed Development, and monitoring locations were agreed through consultation with the NWG. The baseline noise survey has been undertaken following the principles contained in BS 7445-1 2003.

16.5.11 Baseline noise monitoring was undertaken during periods from 2018 to 2021. Ambient noise conditions may have changed in the intervening period; however, a change in noise of 1 dB would require either an approximate 20% reduction or a 25% increase in noise energy. As this level of change is unlikely in the intervening period between monitoring and submission of this PEIR, noise data is considered to be suitably representative of typical noise conditions at each monitoring location

16.5.12 Noise measurements are intended to cover a 'snapshot' of the existing soundscape at any location. Although the assessment of air noise is based on the 92-day summer period[6], it is not practical to measure at all locations during this period. Nevertheless, the noise data do provide relevant information on the current exposure from all sources at each location including those associated with the airport.

[6] Period from 16 June to 15 September inclusive

16.5.13 Meteorological conditions recorded by the Luton Airport weather station have been used to identify periods of adverse weather conditions[7] over the unattended monitoring periods. These periods have been removed from the monitoring results.

16.5.14 The measurement locations are illustrated in **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR. Details on baseline noise monitoring and noise monitoring results along with descriptions of the dominant and secondary noise sources from observations made at the start and end of the measurements are presented in **Appendix 16.1** in Volume 3 of this PEIR. Measured noise data will be used in the ES to provide additional context to the assessment of air noise.

Concepts for Assessing Noise

16.5.15 The NPSE sets definitions for 'significant adverse effects' and 'adverse effects' using the concepts:

a. Lowest Observed Adverse Effect Level (LOAEL) – the level above which, as an average response, adverse effects on health and quality of life can be detected; and

b. Significant Observed Adverse Effect Level (SOAEL) – the average response level above which, as an average response, significant adverse effects on health and quality of life occur.

16.5.16 The NPSE states that:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times".

16.5.17 Noise levels exceeding the SOAEL should be avoided as far as reasonably practicable. For noise levels exceeding the LOAEL, the NPSE states that:

"It requires that 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".

16.5.18 It is a requirement of the NPPF to prevent new developments causing unacceptable adverse impacts. PPGN defines this as:

"*Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress".*

16.5.19 This is referred to as the unacceptable adverse effect. For air noise, a precautionary Unacceptable Adverse Effect Level (UAEL) has been determined at the level where voluntary acquisition of a property would be offered.

[7] Adverse weather conditions may affect noise measurements and are periods of rain and wind speeds exceeding 5 m/s.

Construction assessment methodology

16.5.20 The construction assessment is of a new, temporary source of noise and vibration and is based on an assessment of absolute noise or vibration levels in terms of LOAEL and SOAEL. Although there is currently a lack of evidence relating to health effects to construction noise, the method for assessing construction noise effects are defined based on the current industry standard approach. Criteria for assessing construction noise effects have been defined with reference to 'example method 1 – the ABC method' as defined in Annex E of BS 5228 1:2009+A1:2014 (Ref. 16.34).

16.5.21 Criteria for assessing construction noise are presented in **Table 16.9**. The LOAEL and SOAEL for construction noise have been accepted in other EIAs[8] and are also defined in DMRB. The UAEL for construction noise is based on the trigger level for temporary rehousing as set out in section E.4 of BS 5228-1.

Table 16.9: Thresholds of potential effects of construction noise at residential buildings

Time Period	Threshold Value ($L_{Aeq,T}$ dB)		
	LOAEL	SOAEL	UAEL
Day (07:00 – 19:00) Saturday (07:00 – 13:00)	65	75	85
Evening (19.00 – 23.00) Weekends (13.00–23.00 Saturdays and 07.00–23.00 Sundays)	55	65	75
Night (23.00 – 07.00)	45	55	65

16.5.22 When defining assessment criteria, reference has been made to BS 5228-2:2009+A1:2014, which provides descriptions of the impact of vibration in terms PPV on human receptors. The PPV is applied to assess construction vibration in accordance with Section B.2 of BS 5228-2, which states that:

"*for construction it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based upon the more usual concern over potential building damage".*

16.5.23 Human disturbance typically occurs at levels significantly below those required for building damage. Where a likely significant vibration effect relating to human disturbance has been identified, an assessment of significance in terms of building damage will be undertaken with reference to guidance in BS 7385-2.

16.5.24 Criteria for assessing construction vibration are presented in **Table 16.10**. These PPV values are defined as LOAEL and SOAEL in DMRB.

[8] For example High Speed 2, A14 Cambridge to Huntingdon and Thames Tideway

Table 16.10: Thresholds of potential effects of construction vibration on occupants of residential buildings

Time Period	Threshold Value Peak Particle Velocity (mm/s)		
	LOAEL	SOAEL	UAEL
All time periods	0.3	1.0	10.0
Description of effect (BS 5228-2)	Vibration might be just perceptible in residential environments.	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

16.5.25 Although a significant effect due to construction activities may be determined through an assessment based on exceedances of the defined SOAELs for construction noise and vibration, consideration of the significance of the effect for temporary construction activities is undertaken through qualitative discussion of the following:

a. duration of activities;

b. frequency of events; and

c. sensitivity of receptor.

16.5.26 In terms of sound insulation or temporary rehousing due to construction noise, BS 5228-1 states that a property would be eligible if exposed to noise "*for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months*". Consequently, these durations will be considered where a significant effect is identified.

16.5.27 The assessment of construction traffic noise effects applies the LOAEL and SOAEL defined in **Table 16.13** and the short-term assessment criteria from DMRB presented in **Table 16.14.**

Operational assessment methodology

16.5.28 When describing aircraft, two terms are used in this chapter:

a. 'new generation' – these are aircraft that are currently in service in small numbers (i.e. Airbus neos and Boeing 737 MAX) but are forecast to form the majority of the fleet by 2039; and

b. 'next generation' – these are aircraft that will utilise future aircraft technologies (i.e. sustainable aviation fuel, hydrogen and electric) that are currently in development.

16.5.29 To date, LLAOL produce their noise contours with the Integrated Noise Model (INM) software, which was replaced by the AEDT in 2015. Both software packages were produced by the US Federal Aviation Administration (FAA). INM is no longer supported by the FAA and is considered to be a legacy software package. AEDT was used to produce noise contours for the 2019 PEIR.

16.5.30 The noise contours produced by the two models are reasonably similar at higher contour bands, but the contours diverge more noticeably at lower contour bands where contours produced using AEDT are, on average, larger than those produced by INM. As such, the results of noise modelling using INM and AEDT are not directly comparable. For this reason, the INM-modelled noise contour limits which currently apply to the airport have not been used as a comparator for the purposes of the preliminary assessments in this chapter. More details on the differences between INM and AEDT are provided in **Appendix 16.1**.

16.5.31 LLAOL have continued to use INM to calculate noise contours for their Annual Monitoring Reports due to the need to report consistently against the noise contour requirements of their currently permitted development. However, as the Proposed Development requires a new consent, it was considered appropriate to use AEDT to model air noise contours, especially as INM is no longer supported by the FAA.

16.5.32 The use of AEDT (along with the Civil Aviation Authority's (CAA) ANCON, which is the CAA's in-house noise modelling software) is advocated in CAP 1616a (Ref. 16.25). CAP1616a is more associated with the modelling of the noise impacts from airspace change; however, the advice within is considered to represent best practice. Additionally, the use of AEDT was discussed with the NEDG (**Section 16.4**) who agreed that it represented current best practice to model air noise.

16.5.33 Paragraph 5.52 of the ANPS requires a noise assessment to be undertaken. Consequently, the following assessment years were considered in the preliminary assessment of operational noise to cover the Proposed Development at full capacity and intervening years due to increases in aircraft movements but with a lower number of new generation aircraft:

a. 2027 – Terminal 1 passenger throughput 21.5 mppa;
b. 2039 – Terminal 2 reaches passenger throughout of 27 mppa; and
c. 2043 – Terminal 2 completed and airport at full capacity of 32 mppa.

16.5.34 The assessment of air noise considers growth defined by the Core Planning Case; however, sensitivity testing was undertaken based on slower and faster growth cases, which consider throughput being achieved earlier or later than the core case to account for any uncertainties in forecasting.

16.5.35 For each future assessment year, two scenarios have been considered:

a. Do Nothing (DN): In the future, the airport continues to operate at a capacity of 18 mppa and new generation aircraft are introduced into the operational fleet as assumed in demand forecasts. Road traffic flows increase through natural growth and as a result of the delivery of other new developments; and
b. Do Something (DS): Aircraft and road traffic associated with the Proposed Development are added to the DN scenario.

16.5.36 The assessment of air and road noise compares the DS scenario against the equivalent future DN scenario. For air noise, this provides the impact of the

Proposed Development against a scenario where the current permitted limit of 18 mppa is retained and noise contours reduce due to increased numbers of new generation aircraft.

16.5.37 As the assessment of construction traffic and operational noise considers the change in noise level of an existing noise source, receptors have been screened for assessment. Where receptors are predicted to experience future noise levels exceeding the LOAEL, an assessment of the impact due to a change in noise level has been undertaken. Receptors that experience future noise levels below the LOAEL are not considered to experience adverse levels of noise and have been screened out of the assessment.

16.5.38 The defined LOAEL and SOAEL for air noise during day and night periods are presented in **Table 16.11**. Whereas the LOAEL is defined in national policy, the SOAEL is defined following the approaches adopted in recent planning applications for UK airports (see **Appendix 16.1** for more details). A precautionary UAEL for air noise has been defined at 69 dB $L_{Aeq,16h}$[9]; however, no properties are exposed to noise exceeding these levels.

Table 16.11: Air and Ground Noise LOAEL and SOAEL

Time Period	Threshold Level dB $L_{Aeq,T}$ for Average Annual Day	
	LOAEL	SOAEL
07:00 to 23:00	51	63
23:00 to 07:00	45	55

16.5.39 The criteria that have been used to define the significance of effect in terms of changes in air noise are presented in **Table 16.12**. As there is no clear method to identify the significance of effect due to changes in air noise, the criteria are based on the approach adopted in the Bristol Airport application to increase airport capacity (Ref. 16.40). The criteria set different levels for identifying a significant effect depending on whether noise in the DS scenario is either above or below the SOAEL. This addresses the following point in PPGN, which states:

"In cases where existing noise sensitive locations already experience high noise levels, a development that is expected to cause even a small increase in the

[9] NPPF (para 174e) states: "*Planning …decisions should contribute to and enhance the natural and local environment by: e) preventing new .. development from contributing to .. unacceptable levels of .. noise pollution* ..". The PPG(N) definition of unacceptable adverse effect is: "*Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and nonauditory" and that "this situation should be prevented from occurring*" (para 005)
The threshold for these effects is described as an Unacceptable Adverse Effect Level (UAEL).
As an example of an action to prevent unacceptable adverse effects, the NPS for National Networks sets out that "*the applicant may consider it appropriate to provide noise mitigation through the compulsory acquisition of affected properties in order to gain consent for what might otherwise be unacceptable development*." (para 5.199). The APF states "The Government continues to expect airport operators to offer households exposed to levels of noise of 69 dB LAeq,16h or more, assistance with the costs of moving." 69 dB LAeq,16h may therefore be considered a 'precautionary UAEL' for daytime noise (because this is the threshold for assisting with the costs of moving rather than mandatory acquisition of homes that would be expected to be required at a high level of noise exposure where the actual UAEL is reached).

overall noise level may result in a significant adverse effect occurring even though little to no change in behaviour would be likely to occur".

Table 16.12: Magnitude of Impact Criteria for Changes in Air and Ground Noise

Significance of Effect	Change in Noise Level	
	DS Noise Between LOAEL and SOAEL	DS Noise Exceeding SOAEL
Major	5.9 dB or more	4.9 dB or more
Moderate	3.0 dB – 5.9 dB	2.0 dB – 3.9 dB
Minor	2.0 – 2.9 dB	1.0 – 1.9 dB
Negligible	0.1 – 1.9 dB	0.1 – 0.9 dB
No change	0.0 dB	0.0 dB

16.5.40 Moderate and Major Adverse effects due to changes in air and ground noise levels are defined as significant effects.

16.5.41 In addition to the assessment of the LAeq,16h and LAeq,8h noise metrics, context will be provided using supplementary noise metrics. Details on supplementary noise metrics are provided in **Section 16.15**.

16.5.42 The LOAEL and SOAEL for construction traffic and surface access noise during day and night periods are defined in DMRB and presented in **Table 16.13**. A precautionary UAEL has been set at 74 dB LAeq,16h[10].

Table 16.13: Road Traffic Noise LOAEL and SOAEL

Time Period	Threshold Level dB $L_{Aeq,T}$ for Average Annual Day (free-field)	
	LOAEL	SOAEL
07:00 to 23:00[11]	50	63
23:00 to 07:00	40	55

16.5.43 The criteria that are used to define the significance of effect in terms of the changes in road traffic noise are presented in **Table 16.14**. These criteria are based on guidance for assessing short-term changes in noise from DMRB.

Table 16.14: Magnitude of Impact Criteria for Short-Term Changes In Road Traffic Noise

Significance of Effect	Change in Noise Level
Major	5.0 dB or more
Moderate	3.0 dB – 4.9 dB

[10] Accepted in the DCO decision for the A14 Cambridge to Huntingdon Improvement Scheme DCO. Refer to ES Appendix 14.3: Noise and vibration significance criteria.
[11] LOAEL and SOAEL for the daytime period are calculated from DMRB LA10,18h values by applying a correction of -3 dB to convert from the façade level to a free-field level and by applying a further correction of -2 dB to convert from LA10,18h to LAeq,16h.

Significance of Effect	Change in Noise Level
Minor	2.0 – 2.9 dB
Negligible	0.1 – 0.9 dB
No change	0.0 dB

16.5.44 Under normal circumstances, Moderate and Major Adverse effects due to change in level of surface access noise are identified as significant. However, DRMB states that:

"Where any do-something absolute noise levels are above the SOAEL, a noise change in the short term of 1.0dB or over results in a likely significant effect".

16.5.45 Preliminary modelling indicates that changes in noise at high noise levels are minimal. As such, the assessment at this stage focuses on the significance of effect due to moderate and major changes in surface access noise. Additional detail will be provided in the ES to clarify the change in noise level at receptors where surface access noise exceeds the SOAEL.

Non-residential Receptors Air Noise Assessment Methodology

16.5.46 The approach to the assessment of non-residential receptors differs from that adopted for residential receptors. This is government policy for noise is based on community exposure response relationships and noise insulation of a typical dwelling.

16.5.47 Design guides for good internal conditions in non-residential receptor are usually set indoors. Consequently, screening criteria have been defined that will determine which non-residential receptors will be scoped into the non-residential receptors assessment of air noise in the ES. Screening criteria that have been defined from WHO Community Noise Guidelines, WHO Night Noise Guidelines and UK Noise Insulation Regulations are presented in **Table 16.15**.

Table 16.15: Screening Criteria for Non-residential Receptors

Location	Noise level (outdoors, free field)	
	Day (07:00-23:00)	Night (23:00-07:00)
Auditoria, concert halls, theatres and sound recording and broadcast studios	60 dB LAFmax and 50 dB LAeq,16h	60 dB LAFmax and 50 dB LAeq,18h
Places of worship, courts, lecture theatres and museums	50 dB LAeq,16h	n/a
Schools, colleges and libraries	50 dB LAeq,16h	n/a
Offices	55 dB LAeq,16h	n/a
Hospitals and hotels	50 dB LAeq,16h	45 dB LAeq,8h

16.6 Assumptions and limitations

16.6.1 This section provides a description of the assumptions and limitations to the noise and vibration assessment. The following assumptions on air noise predictions have been made:

a. Air noise predictions are based on the average daily aircraft movements in the 92-day summer period (16 June to 15 September inclusive), which is the peak period of aircraft activity.

b. Analysis of radar track data to provide information on aircraft operational procedures and flight tracks for the 2019 PEIR was based on 2017 data from the 92-day summer period. All modelled air noise levels in this PEIR are based on 2017 baseline radar track data and have been dispersed in accordance with the aircraft movement density of radar tracks. As aircraft flight procedures are unchanged since 2017, the radar data is representative of the 2019 baseline.

c. Air noise modelling has been undertaken based on a 30% easterly and 70% westerly modal split, which was identified as the 2019 average runway modal split in the London Luton Airport 2019 Annual Monitoring Report Ref (16.41) and tends to represent the long-term average.

d. Aircraft movements were split along departure routes for both DN and DS scenarios using the following percentages

   i. 3% on 07 Runway Olney beacon routes;
   ii. 11% on 07 Runway Compton beacon routes;
   iii. 15% on 07 Runway Detling beacon routes;
   iv. 8% on 25 Runway Olney beacon routes;
   v. 25% on 25 Runway Compton beacon routes; and
   vi. 37% on 25 Runway Detling beacon routes.

e. These splits of departure routes, taken from the **Draft Need Case** relate to the future assumptions as to the range of destinations that the airport will serve. They have been applied to the 2019, Baseline, DN and DS cases but it is recognised that the differ slightly from the actual split of departure routes in 2019. Whilst the shape of the noise contour may change marginally with different departure splits, the difference would be marginal in terms of area covered by the SOAEL. The actual departure splits for 2019 will be applied in air noise modelling for the ES.

f. Aircraft noise predictions have been validated using radar track data and measured noise data. Details on the validation process are presented in **Appendix 16.1** in Volume 3 of this PEIR. Although 2017 radar data was used in the validation process, it is considered unlikely that there have been any changes to aircraft operational procedures and the 2017 radar data is suitably representative of 2019 operational procedures.

g. As noise data for all the newest aircraft is not currently available, corrections have been applied to previous generation surrogate aircraft to provide data for the likely level of noise emissions from new

generation aircraft based on guidance within the Air Noise Performance (ANP) database (Ref. 16.42). For aircraft that are operational, measured noise data has been used to provide corrections. Details on assumptions for new generation aircraft are presented in **Appendix 16.1** in Volume 3 of this PEIR.

h. The performance of the A321neo at the airport is not currently as good as the expected performance from noise certification testing. Measured noise data was used to predict A321neo noise in the 2027 scenario; however, it is assumed that, by 2039, any issues with the A321neo performance will be resolved or alternative aircraft will transition into the fleet to reduce noise in future. Consequently, A321neo predictions for the 2039 and 2043 scenarios were modelled based on the modelling methodology referenced from the ANP database. Sensitivity testing has been undertaken in **Section 16.9** to analyse noise based on a scenario where A321neo noise performance is not resolved in future.

16.6.2 The following assumptions on ground noise predictions have been made:

a. Ground noise predictions have been based on the average daily aircraft movements in the 92-day summer period.

b. The following assumptions have been applied to activities contributing to ground noise emissions that are considered representative of a reasonable worst-case scenario for day and night periods:

   i. use of Ground Power Units (GPU) at existing aircraft stands based on the average use of GPUs per day and the average daily number of aircraft at each stand during the 92-day summer period;
   ii. engine ground-running – estimated to be 25 minutes at 7% power and 10 minutes at 100% power during a reasonable worst-case day;
   iii. aircraft taxi movements have been based on an assumed taxiing speed of 20 km/h and an engine thrust of 10%; and
   iv. fire training activities for 120-minutes during a reasonable worst-case day.

c. Ground-running and aircraft taxi noise emissions have been modelled in Cadna/A noise modelling software using the ISO 9613 calculation methodology. Ground noise sources have been derived from Aviation Environmental Design Tool (AEDT) outputs using the predicted noise level at the Application Site boundary.

d. Taxi movements associated with Terminal 2 have been averaged equally across the stands.

e. Noise emissions from fire training activities have been based on measured noise data.

Reasonable Worst Case

16.6.3 **Chapter 5** Approach to the Assessment describes the general approach adopted to ensure that a reasonable worst case is assumed in this assessment

including the use of parameters, accounting for uncertainty, and incorporating flexibility in design and demand forecasts.

16.6.4 Due to the dynamic and transient nature of construction activities, the assessment of construction noise is based on typical construction works that will occur during each year of the construction phase. This approach allows that any likely significant effects due to construction activities are captured in the assessment and is considered represent a reasonable worst-case approach.

16.6.5 Operational noise effects are assessed at the point when capacity is reached for each phase. These periods are considered to represent periods when likely significant effects due to the Proposed Development are most likely. Consequently, this approach is considered to represent a reasonable worst-case for operational noise. In addition, to ensure that the approach to defining a reasonable worst-case is robust, sensitivity testing was undertaken on a number of scenarios to determine the potential for greater impacts if demand levels are achieved more quickly or slowly and having regard for the potential for delays to the transition to new generation aircraft. Sensitivity tests are discussed in **Section 16.9**.

16.6.6 It is likely that next generation aircraft (i.e. sustainable aviation fuel, electric or hydrogen powered) will be operational within the lifespan of the Project. As no details on these aircraft nor the likely level of noise reduction they may provide are available at the time of preparing this PEIR, the assessment of air noise effects for the Core Planning Case assumes that only currently operating aircraft will comprise the fleet during the Project lifespan. Sensitivity testing in **Section 16.9** provides an estimate on the reduction in noise that next generation aircraft may provide.

16.7 Baseline conditions

16.7.1 This section provides a description of the existing baseline noise conditions. **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR shows the locations for noise monitoring.

Assessment Locations

16.7.2 A number of assessment locations have been considered in the assessment of ground noise and earthworks/ construction noise. The assessment locations are those receptors nearest to the Application Site within the study area, i.e. the receptors that have the most potential to experience likely significant effects due to noise and vibration. Although noise and vibration may be perceivable at other receptors in the ground noise and earthworks/ construction noise study area, the effects will not be significant if they are suitably controlled at the identified assessment locations.

16.7.3 The assessment locations for ground noise and earthworks/ construction noise are presented in **Table 16.16** and illustrated in **Figure 16.28** in Volume 4 of this PEIR.

Table 16.16: Ground and Earthworks/ Construction Assessment Locations

Location ID	Description
GR1	Someries receptors
GR2	65/66 Someries Arch
GR3	Copt Hall and Cottages
GR4	Dane Street Cottages
GR5	Dane Street Farm
GR6	Winch Hill House
GR7	Green Acres, Waldon End
GR8	Waldon End House
GR9	Waldon End Farm
GR10	Ivy Cottages
GR11	Malthouse Green Receptors
GR12	Bowbrookvale receptors
GR13	The Dell receptors
GR14	Laxton Close receptors
GR15	Colwell Rise receptors
GR16	Keeble Close receptors
GR17	Layham Drive receptors
GR18	Lindsay Road receptors
GR19	Barnston Close receptors
GR20	Raynham Way Community Centre

Location ID	Description
GR21	Eaton Place receptors
GR22	Eaton Green Road receptors
GR23	Hartop Court receptors
GR24	Chertsey Court receptors

16.7.4 Air noise assessment locations correlate with noise monitoring locations and schools that are likely to be affected by increases in air noise. These assessment locations have been selected to identify impacts in specific areas and any impacts identified can be applied to receptors in the general vicinity; however, the assessment is not limited to the locations listed in **Table 16.17** and covers the defined study area.

Table 16.17: Air Noise Assessment Locations

Location ID	Description
AR1	Someries receptors
AR2	Lye Hill, Breachwood Green
AR3	Langley
AR4	Breachwood Green
AR5	Bendish
AR7	Luton Hoo
AR8	Dagnall
AR9	Markyate
AR10	Caddington
AR11	Woodside Park
AR12	Slip End
AR13	Strathmore Avenue, Luton
AR14	Vauxhall Way, Luton
AR15	Eaton Green Road, Luton
AR16	Malthouse Green, Luton
AR17	Kensworth
AR18	Stevenage
AR19	Flamstead
AR20	Jockey End
AR21	Preston
AR22	Holywell
AR30	Pitstone
AR31	St Pauls Walden
AR32	Tennyson Road Primary School (and surrounding residential)

Location ID	Description
AR33	Hillborough Junior (and surrounding residential)
AR34	St Margaret of Scotland Primary School (and surrounding residential)
AR35	Wenlock Primary School (and surrounding residential)
AR36	Wigmore Primary School (and surrounding residential)
AR37	Breachwood Green JMI School (and surrounding residential)
AR38	Caddington Village School (and surrounding residential)
AR39	Slip End Lower School (and surrounding residential)
AR40	Surrey Street Primary (and surrounding residential)

Baseline Air Noise

16.7.5 The results of 2019 baseline air noise modelling undertaken for the PEIR using AEDT are illustrated as noise contour plots in **Figure 16.4** for daytime and **Figure 16.5** for night-time (Volume 4 of this PEIR). Analysis of 2019 baseline air noise contours for this assessment is presented in **Table 16.18** and **Table 16.19**.

Table 16.18: Daytime Baseline 2019 Air Noise for PEIR

Noise Contour $L_{Aeq,16h}$ dB	Cumulative Area (km^2)	Cumulative Number of Households	Cumulative Population
51	64.2	22,350	52,100
54	38.4	11,150	25,900
57	20.6	6,050	14,600
60	11.0	2,700	7,150
63	6.1	800	2,150
66	3.5	50	100
69	1.9	0	0

Table 16.19: Night-time Baseline 2019 Air Noise for PEIR

Noise Contour $L_{Aeq,8h}$ dB	Cumulative Area (km^2)	Cumulative Number of Households	Cumulative Population
45	88.6	36,650	90,900
48	52.3	16,200	37,400
51	30.0	8,750	20,400
54	15.7	4,200	10,550
55	12.8	3,300	8,450
57	8.4	1,850	4,950
60	4.8	400	1,000
63	2.7	0	0

Noise Contour $L_{Aeq,8h}$ dB	Cumulative Area (km^2)	Cumulative Number of Households	Cumulative Population
66	1.5	0	0
69	0.9	0	0

Baseline Modelling – Road Traffic

16.7.6 **Figure 16.6** in Volume 4 of this PEIR shows the CRTN BNL (Ref. 16.37), which represents the road traffic noise level at 10m from the road edge, for the roads in the transport model in the baseline year. The BNL is a measure of the noise generated by traffic; however, the exposure at nearby dwellings depends on their distance from the road, the type of intervening ground surface and whether or not any buildings or natural or purpose-built barriers are between them and the road.

16.7.7 Preliminary road traffic noise modelling indicates that receptors close to the major roads in the study area are likely to experience noise levels above the SOAEL. Most other receptors are predicted to be exposed to road traffic noise levels between the LOAEL and SOAEL. Exceptions to this include properties in the rural areas of Mangrove Green and Tea Green to the north east of the airport, some of which are exposed to road traffic noise levels below the LOAEL.

16.7.8 A further, more detailed, breakdown of baseline road traffic noise levels will be provided in the ES.

Future baseline

16.7.9 In the absence of the Proposed Development, there is likely to be a change to the future baseline air noise conditions as a result of fleet transition to less noisy aircraft. Similarly, road traffic noise conditions may change due to natural growth and new developments in proximity to the airport. The DN scenario is used, where appropriate, as a comparator for DS scenario, to show the effect of the Proposed Development against an appropriate reference point. The approach to defining future baseline and the developments identified for consideration are described in **Section 5.4** of **Chapter 5** Approach to the Assessment of this PEIR.

16.7.10 The change in the air noise baseline in terms of noise contour area is presented in **Table 16.20** for daytime noise and in **Table 16.21** for night-time noise. The air noise baseline tends to reduce as time progresses as the fleet is upgraded with new generation aircraft. By 2039, the fleet is assumed to be largely made up of new generation aircraft, so there is no reduction in noise contour area between the 2039 and 2043 daytime scenarios.

16.7.11 It should be noted that, although noise contour areas are presented up to 69 dB LAeq,16h, no properties are located within the identified contour areas.

Table 16.20: Evolution of daytime air noise baseline

Noise Contour $L_{Aeq,16h}$ dB	Cumulative Contour Area (km^2)			
	2019 Baseline	2027 DN	2039 DN	2043 DN
51	64.2	55.1	44.7	44.8
54	38.4	32.3	25.3	25.3
57	20.6	17.2	13.3	13.3
60	11.0	9.0	6.9	6.9
63	6.1	5.0	3.7	3.7
66	3.5	2.8	2.0	2.0
69	1.9	1.5	1.1	1.1

Table 16.21: Evolution of night-time air noise baseline

Noise Contour $L_{Aeq,8h}$ dB	Cumulative Contour Area (km^2)			
	2019 Baseline	2027 DN	2039 DN	2043 DN
45	88.6	67.0	57.6	59.4
48	52.3	40.6	33.4	34.8
51	30.0	22.4	18.1	18.9
54	15.7	11.8	9.3	9.7
55	12.8	9.6	7.5	7.9
57	8.4	6.4	4.9	5.2
60	4.8	3.5	2.7	2.8
63	2.7	1.9	1.4	1.5
66	1.5	1.1	0.9	0.9
69	0.9	0.7	0.5	0.6

16.7.12 Changes in road traffic flows resulting from natural growth and new developments has the potential to influence the evolution of baseline conditions throughout the lifespan of Proposed Development. Future noise conditions are accounted for in the assessment of road traffic noise effects. The road traffic assessment accounts for the increase in traffic flow associated with natural growth road traffic attributable to surrounding development through the use of the Central Bedfordshire and Luton Traffic Model. Details on the future baseline for surface access can be found in **Chapter 18** Traffic and Transportation of this PEIR.

16.7.13 Future noise conditions are accounted for in the assessment of road traffic noise effects presented in **Section 16.9**. Preliminary road traffic noise modelling indicates that, despite some small increases in road traffic noise resulting from traffic growth in the area, the future baseline sound environment may still be

described as in paragraph 16.7.7. A detailed assessment of the future baseline, in terms road traffic noise, will be presented in the ES.

16.7.14 Although there is a trend towards electric vehicles, use of electric vehicles offers minor noise benefits as research shows there is only a difference of approximately 1 dB for vehicles travelling at 50 km/h (Ref. 16.39). Where vehicles are travelling slower (up to 20 km/h) and therefore quieter, a safety requirement is that vehicles should generate an alternative to engine noise so people can hear the vehicles and are aware of them. Consequently, to cover a worst-case assessment scenario, it is considered that there would not be a noticeable difference in noise on road links within the study area if there was a switch to electric vehicles and the assessment has been undertaken based on diesel/petrol-powered vehicles.

16.8 Embedded and good practice mitigation measures

16.8.1 This section describes the embedded and good practice mitigation for noise and vibration that has been incorporated into the Proposed Development design or assumed to be in place before undertaking the assessment. A definition of these classifications of mitigation and how they are considered in the EIA is provided in **Chapter 5** Approach to the Assessment of this PEIR.

Construction Noise

16.8.2 Measures are included within the Draft CoCP, provided as **Appendix 4.2** in Volume 3 of this PEIR, to manage noise and vibration emissions from construction activities. The Draft CoCP contains details of Best Practicable Means (BPM), as defined in Section 72 of the Control of Pollution Act (Ref. 16.1). Examples of BPM that will be implemented during construction works are:

a. unnecessary revving of engines will be avoided, and equipment will be switched off when not in use;

b. internal haul routes will be kept well maintained;

c. rubber linings in, for example, chutes and dumpers will be used to reduce impact noise;

d. drop heights of materials will be minimised;

e. plant and vehicles will be sequentially started up rather than all together;

f. plant will always be used in accordance with manufacturers' instructions. Care will be taken to site equipment away from noise-sensitive areas. Where possible, loading and unloading will also be carried out away from such areas; and

g. regular and effective maintenance by trained personnel will be undertaken to keep plant and equipment working to manufacturer's specifications.

16.8.3 Prior to commencement of work that is proposed outside of core working hours, the Lead Contractor will be required to submit an application to the Local Authority for prior consent to carry out noisy work under Section 61 of the Control of Pollution Act (Ref. 16.1) regarding the methods that will be adopted to minimise noise and vibration as far as reasonably practicable. The Section 61 application will set out the specific method of working, the actual working hours required, noise (and if necessary, vibration) monitoring locations, details of communication measures and the mitigation measures implemented to minimise noise and vibration impacts.

Air Noise

16.8.4 Aircraft noise management is subject to the concept of a 'Balanced Approach' (ICAO Resolution A33/7 (Ref. 16.43)). This is given legal effect in the UK through Regulation (EU) 598/2014 (Ref. 16.7). Mitigation measures in line with the ICAO Balanced Approach to Aircraft Noise Management will be adopted to reduce aircraft noise as far as reasonably practicable. The balanced approach was taken into consideration when defining noise improvement methods in the

LLANAP, which is required under the Environmental Noise Regulations 2006 and sets out the framework for noise management at the airport. The four principles of the ICAO Balanced Approach are:

a. reduction of noise at source;
b. land-use planning and management;
c. noise abatement operational procedures; and
d. operating restrictions.

16.8.5 A Draft Operational Noise Management Plan (ONMP) has been prepared to describe how the Balanced Approach is currently adopted at the airport and any additional measures that would be adopted as part of the DCO application; this is provided as **Appendix 16.2** in Volume 3 to this PEIR. Details on operational management measures that are covered within the LLANAP are summarised in the ONMP.

16.8.6 In addition to covering the four principles of the ICAO Balanced Approach, the LLANAP contains details on the existing noise insulation scheme that is run by LLAOL. The scheme qualifies houses with habitable rooms within the 63 dB daytime $L_{Aeq,16h}$ noise contour and/or bedrooms within the 55 dB night-time $L_{Aeq,8h}$ noise contour to be eligible for noise insulation.

16.8.7 As part of the expansion proposals, the noise insulation scheme will be updated. The updated noise insulation scheme improves on the current scheme and government proposals set out in Aviation 2050 that the noise insulation policy threshold extends from 63 dB $L_{Aeq,16h}$. The proposed compensation scheme sets a four-tiered scheme starting at 54 dB $L_{Aeq,16h}$ as follows:

a. Scheme 1 – Properties within the 63 dB $L_{Aeq,16h}$ contour;
b. Scheme 2 – properties within the 60 dB $L_{Aeq,16h}$ contour;
c. Scheme 3 – properties within the 57 dB $L_{Aeq,16h}$ contour; and
d. Scheme 4 – properties within the 54 dB $L_{Aeq,16h}$ contour.

16.8.8 Full details on the proposed noise insulation scheme and a new discretionary property compensation scheme are presented in the **Draft Compensation Policies and Measures** document published alongside this PEIR for statutory consultation. The proposed compensation scheme would be secured through the DCO application

16.8.9 All properties experiencing a significant effect on health and quality of life (i.e. noise levels exceeding the SOAEL) are eligible for a contribution noise insulation under the current insulation scheme. The proposed noise insulation scheme offers a substantial improvement by offering a full package of insulation for habitable rooms for properties within the SOAEL noise contour. Additionally, properties outside the SOAEL contour and within the 54 dB LAeq,16h noise contour will receive a contribution to insulation costs. Noise insulation can help contribute to improvements to health and quality of life through provision of good internal acoustic conditions. This demonstrates compliance with Paragraph 5.68 of the ANPS.

16.8.10 The introduction of less noisy new generation aircraft would materially change aircraft noise. The existing aircraft fleet will change from current generation to new generation over the lifespan of the Project. Details of the forecast fleet mix for the different assessment scenarios are presented in **Appendix 16.1** in Volume 3 of this PEIR. Although the Core Planning Case assumes that the future fleets will be mostly made up of currently operating new generation aircraft, sensitivity testing (**Section 16.9**) has been undertaken on how noise contours may be affected by next generation aircraft.

Ground Noise

16.8.11 The Proposed Development introduces new building infrastructure that screens receptors to the north of the Proposed Development from ground-based operational noise sources. The design of the Proposed Development has been undertaken to minimise distances between the runway and Terminal 2 stands so that that noise emissions from taxiing aircraft are minimised. Additional management measures relating to ground noise in the LLANAP are summarised in Draft ONMP.

16.8.12 It is currently anticipated that the area designated for Engine Run-up Bay (ERUB) would be moved in the Proposed Development with temporary locations in Phase 1 and Phase 2a and a permanent location provided in Phase 2b. The existing ERUB is screened from receptors through use of a bund, which was estimated from ground height data to be approximately 5m in height. For Phase 1, the engine run-up area is moved approximately 50m to the east and a temporary 4m barrier will be constructed to screen noise. The locations of the ERUB for each phase are illustrated in **Figures 4.1 to 4.3** in Volume 4 of this PEIR.

16.8.13 For Phase 2a, the ERUB will be located approximately 300m to the east and 50m to the north from the original location. The new ERUB will be 12m in height to provide enhanced levels of screening of engine testing activities over the current set up. For Phase 2b, the ERUB will moved to a location approximately 550m to the east and 50m to the north from the original location.

16.8.14 LLAOL currently provides power for aircrafts at stands using Ground Power Units (GPUs), which function similar to a portable generator. GPUs are quieter than powering an aircraft using the on-board Auxiliary Power Unit (APU) and the use of GPUs at the airport is encouraged to minimise noise emissions. For Terminal 2, new stands will be fitted with Fixed Electrical Ground Power so aircraft can connect directly to the mains electricity supply so GPU use will not be required.

16.9 Preliminary assessment

16.9.1 This section presents the results of the preliminary assessment of likely significant effects with the embedded and good practice mitigation measures, described in the previous section, in place.

16.9.2 A summary of the assessment of effects is provided on **Table 16.50** in **Section 16.14**. Significant effects are discussed in further detail in this section.

16.9.3 Effects that may arise due to absolute levels of noise and vibration are defined in terms of 'below LOAEL', 'above LOAEL and below SOAEL' and 'above SOAEL' and are described in **Table 16.22** with reference to PPGN.

Table 16.22: Noise Effect Level Descriptions

Effect	Description from PPGN
'below LOAEL'	"*Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life*"
'above LOAEL and below SOAEL'	"*Noise can be heard and causes small changes in behaviour, attitude or other physiological response, 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 small actual or perceived change in the quality of life*"
'above SOAEL'	"*Noise causes a material change in behaviour, attitude or other physiological response, 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*"

Construction effects

Construction Noise

Phase 1

16.9.4 The assessment of construction noise in Phase 1 covers representative worst-case assessment scenarios for each year of the construction period from 2025 to 2027.

16.9.5 Details on works being undertaken during these periods are presented in **Appendix 16.1** in Volume 3 of this PEIR.

16.9.6 Predictions of reasonable worst-case construction noise levels have been undertaken at assessment locations detailed in **Table 16.16**, all of which are Medium sensitivity to noise. The predicted maximum construction noise level for

Phase 1 scenarios assessed at each assessment location are provided in **Table 16.23**. The construction noise effect at each assessment location has been identified based on criteria presented in **Table 16.9**. Effects in terms of LOAEL and SOAEL are described in **Table 16.22**.

16.9.7 Full details of predicted construction noise levels for each scenario are presented in **Appendix 16.1** in Volume 3 of this PEIR. Assessment locations are illustrated in **Figure 16.28** in Volume 4 of this PEIR.

Table 16.23: Phase 1 Predicted Reasonable Worst-case Construction Noise Levels

Receptor	Predicted Worst Case Construction Noise Level dB $L_{Aeq,T}$ (façade)	Effect
GR1	51	below LOAEL
GR2	45	below LOAEL
GR3	50	below LOAEL
GR4	56	below LOAEL
GR5	55	below LOAEL
GR6	68	above LOAEL and below SOAEL
GR7	72	above LOAEL and below SOAEL
GR8	68	above LOAEL and below SOAEL
GR9	71	above LOAEL and below SOAEL
GR10	68	above LOAEL and below SOAEL
GR11	70	above LOAEL and below SOAEL
GR12	66	above LOAEL and below SOAEL
GR13	65	below LOAEL
GR14	65	below LOAEL
GR15	66	above LOAEL and below SOAEL
GR16	68	above LOAEL and below SOAEL
GR17	70	above LOAEL and below SOAEL
GR18	74	above LOAEL and below SOAEL
GR19	72	above LOAEL and below SOAEL
GR20	69	above LOAEL and below SOAEL
GR21	67	above LOAEL and below SOAEL
GR22	64	below LOAEL
GR23	61	below LOAEL
GR24	55	below LOAEL

16.9.8 The assessment of construction noise indicates that there is unlikely to be any exceedances of the SOAEL during Phase 1 constructions. As such, Phase 1 construction activities are considered to be **not significant**.

16.9.9 Temporary exceedances of the LOAEL are noted at some receptors during the Phase 1 construction programme. An exceedance of the LOAEL represents noise that is considered to be noticeable and intrusive. Consequently, mitigation measures should be adopted to minimise noise as far as reasonably practicable. Mitigation measures secured through the CoCP (see **paragraph 16.8.2**) are considered to represent appropriate best practicable means and will ensure that construction noise is minimised at all times throughout the construction programme.

Phase 2a

16.9.10 The assessment of construction noise in Phase 2a covers representative worst-case assessment scenarios for each year of the construction period from 2032 to 2035.

16.9.11 Details on works being undertaken during these periods are presented in **Appendix 16.1** in Volume 3 of this PEIR.

16.9.12 Predictions of reasonable worst-case construction noise levels have been undertaken at assessment locations detailed in **Table 16.17**, all of which are Medium sensitivity to noise. The predicted maximum construction noise level for Phase 2a scenarios assessed at each assessment location are provided in **Table 16.24**. The construction noise effect at each assessment location has been identified based on criteria presented in **Table 16.9**. Effects in terms of LOAEL and SOAEL are described in **Table 16.22**.

16.9.13 Full details of predicted construction noise levels for each scenario are presented in **Appendix 16.1** in Volume 3 of this PEIR. Assessment locations are illustrated in **Figure 16.28** in Volume 4 of this PEIR.

Table 16.24: Phase 2a Predicted Reasonable Worst-case Construction Noise Levels

Receptor	Predicted Worst Case Construction Noise Level dB $L_{Aeq,10h}$ (façade)	Effect
GR1	55	below LOAEL
GR2	49	below LOAEL
GR3	54	below LOAEL
GR4	61	below LOAEL
GR5	61	below LOAEL
GR6	74	above LOAEL and below SOAEL
GR7	63	below LOAEL
GR8	62	below LOAEL
GR9	63	below LOAEL
GR10	63	below LOAEL
GR11	65	below LOAEL
GR12	65	below LOAEL
GR13	65	below LOAEL

Receptor	Predicted Worst Case Construction Noise Level dB $L_{Aeq,10h}$ (façade)	Effect
GR14	65	below LOAEL
GR15	66	above LOAEL and below SOAEL
GR16	66	above LOAEL and below SOAEL
GR17	64	below LOAEL
GR18	64	below LOAEL
GR19	63	below LOAEL
GR20	62	below LOAEL
GR21	60	below LOAEL
GR22	62	below LOAEL
GR23	58	below LOAEL
GR24	57	below LOAEL

16.9.14 The assessment of construction noise indicates that there is unlikely to be any exceedances of the SOAEL during Phase 2a constructions. As such, Phase 2a construction activities are considered to be **not significant**.

16.9.15 Temporary exceedances of the LOAEL are noted at some receptors during the Phase 2a construction programme. Mitigation measures secured through the CoCP (see **paragraph 16.8.2**) will ensure that construction noise is minimised as far as reasonably practicable throughout the construction programme.

Phase 2b

16.9.16 The assessment of construction noise in Phase 2a covers representative worst-case assessment scenarios for each year of the construction period from 2037-2040.

16.9.17 Details on works being undertaken during these periods are presented in **Appendix 16.1** in Volume 3 of this PEIR.

16.9.18 Predictions of reasonable worst-case construction noise levels have been undertaken at assessment locations detailed in **Table 16.17**, all of which are Medium sensitivity to noise. The predicted maximum construction noise level for Phase 2b scenarios assessed at each assessment location are provided in **Table 16.25**. The construction noise effect at each assessment location has been identified based on criteria presented in **Table 16.9**. Effects in terms of LOAEL and SOAEL are described in **Table 16.22**.

16.9.19 Full details of predicted construction noise levels for each scenario are presented in **Appendix 16.1** in Volume 3 of this PEIR. Assessment locations are illustrated in **Figure 16.28** in Volume 4 of this PEIR.

Table 16.25: Phase 2b Predicted Reasonable Worst-case Construction Noise Levels

Receptor	Predicted Worst Case Construction Noise Level dB $L_{Aeq,10h}$ (façade)	Effect
GR1	58	below LOAEL
GR2	47	below LOAEL
GR3	53	below LOAEL
GR4	59	below LOAEL
GR5	59	below LOAEL
GR6	72	above LOAEL and below SOAEL
GR7	62	below LOAEL
GR8	61	below LOAEL
GR9	62	below LOAEL
GR10	62	below LOAEL
GR11	66	above LOAEL and below SOAEL
GR12	66	above LOAEL and below SOAEL
GR13	66	above LOAEL and below SOAEL
GR14	67	above LOAEL and below SOAEL
GR15	68	below LOAEL
GR16	63	below LOAEL
GR17	62	below LOAEL
GR18	62	below LOAEL
GR19	63	below LOAEL
GR20	61	below LOAEL
GR21	59	below LOAEL
GR22	60	below LOAEL
GR23	57	below LOAEL
GR24	54	below LOAEL

16.9.20 The assessment of construction noise indicates that there is unlikely to be any exceedances of the SOAEL during Phase 2b constructions. As such, Phase 2b construction activities are considered to be **not significant**.

16.9.21 Exceedances of the LOAEL are noted at some receptors for some periods during the Phase 2b construction programme. Mitigation measures secured through the CoCP (see **paragraph 16.8.2**) will ensure that construction noise is minimised as far as reasonably practicable throughout the construction programme.

Construction Vibration

16.9.22 Construction vibration effects are defined in terms of 'below LOAEL', 'above LOAEL and below SOAEL' and 'above SOAEL'. Effects in terms of LOAEL and SOAEL are described in **Table 16.22**.

Phase 1

16.9.23 The nearest receptors, which are residential, to the Main Application Site are approximately 50m away. These receptors may experience perceptible levels of vibration during earthworks compaction, which will be undertaken using vibratory rollers[12].

16.9.24 The level of vibration experienced at sensitive receptors will depend on the ground conditions; however, calculations of vibration based on manufacturers specification for vibratory rollers (see **Appendix 16.1,** Volume 3 of this PEIR) indicates that there is a 5% probability that the PPV will exceed 0.3 mm/s (below SOAEL) at a distance of 50m.

16.9.25 Piling may also be required to build the foundation of the decked P9 car park. The nearest receptors, which are residential, to the P9 car park boundary are approximately 20m away. The level of vibration experienced at sensitive receptors will depend on the ground conditions; however, calculations of vibration based on BS 5228-2 data for piling activities (see **Appendix 16.1** in Volume 3 of this PEIR) provide a PPV of 0.5 mm/s (below SOAEL) at a distance of 25m. This assumes a continuous flight augur piling method will be adopted, which it typical for this type of construction and considered to be best practice.

16.9.26 Based on the results of vibration calculations, Phase 1 construction vibration is considered to be **not significant**.

Phase 2a

16.9.27 Piling will take place in Phase 2a to support earthworks, for the Luton DART extension and for Terminal 2 infrastructure; however, the distance to nearest receptors (minimum distance of approximately 500 m) that that piling induced vibration is unlikely to be perceptible. Earthworks may be required in proximity of GR6; however, the Main Application Site is at a distance of 40 m so calculations indicate that there is a 5% probability that the PPV will exceed 0.4 mm/s (below SOAEL). Consequently, Phase 2a construction vibration is considered to be **not significant**.

Phase 2b

16.9.28 Piling will take place in Phase 2b to support earthworks, New Century Park buildings and for Terminal 2 infrastructure; however, the distance to nearest receptors (minimum distance of approximately 200 m) that that piling induced vibration is unlikely to be perceptible. As with Phase 2a, earthworks may be required in proximity of GR6; however, the closest distance that earthworks may be undertaken does not change from Phase 2a so there remains a 5%

[12] A vibratory roller is a piece of machinery that is used to materials like compact soil or asphalt.

probability that the PPV will exceed 0.4 mm/s (below SOAEL). Consequently, Phase 2b construction vibration is considered to be **not significant**.

Construction Traffic Noise

16.9.29 The primary access route to the Main Application Site will be via Junction 10 of the M1, along the A1081 (New Airport Way), then via President Way or the proposed Airport Access Road (AAR). As no sensitive receptors are located with 50 m of President Way or proposed AAR, the construction traffic assessment focuses on potential changes in noise due to construction traffic on the A1081.

16.9.30 The A1081 has existing high density traffic flows. Consequently, as noise is not sensitive to small changes in traffic flows, it would require a large number of vehicle movements to result in an appreciable change in road traffic noise.

16.9.31 Construction traffic flow data was referenced from **Appendix 4.1** of Volume 3 of this PEIR.

Phase 1

16.9.32 The assessment of construction traffic noise for Phase 1 considers increases in road traffic noise from the 2019 baseline scenario This is taken as a conservative estimation of road traffic flows during Phase 2a.

16.9.33 During Phase 1, construction traffic data suggests that, during peak periods, there will be approximately, on average, 97 heavy vehicles per day. 2019 baseline data for the A1081 provides the lowest flow level for the section between the A505 and Percival Way, of 23,137 18-hour annual average weekday traffic (AAWT) with 161 HGVs. Construction traffic movements on this section of road would result in an increase in noise of 0.4 dB. This is equivalent to a **Very Low** impact which is **not significant**.

Phase 2a

16.9.34 The assessment of construction traffic for Phase 2a noise considers increases in road traffic noise from the 2027 DS scenario. This is taken as a conservative estimation of road traffic flows during Phase 2a.

16.9.35 During Phase 2a, construction traffic data suggests that, during peak periods, there will be approximately, on average, 198 heavy vehicles per day. 2027 DS data for the A1081 provides the lowest flow level for the section between the A505 and Percival Way, of 28,183 18-hour annual average weekday traffic AAWT with 603 HGVs. Construction traffic movements on this section of road would result in an increase in noise of 0.5 dB. This is equivalent to a Very Low impact and is **not significant**.

Phase 2b

16.9.36 The assessment of construction traffic noise for Phase 2b considers increases in road traffic noise from the 2039 DS scenario. This is taken as a conservative estimation of road traffic flows during Phase 2a.

16.9.37 During Phase 2b, construction traffic data suggests that, during peak periods, there will be, on average, approximately 127 delivery vehicles per day. 2039 DS data for the A1081 provides the lowest flow level for the section between the A505 and Percival Way, of 17,101 18-hour annual average weekday traffic (AAWT) with 185 HGVs. Construction traffic movements on this section of road would result in an increase in noise of 0.6 dB. This is equivalent to a Very Low impact and is **not significant**.

Operational effects

Air Noise

16.9.38 The assessment of air noise has been undertaken with reference to the three aims of paragraph 5.68 of the ANPS. The three aims and how they are responded to in this PEIR are as follows:

a. Avoid significant adverse effects[13] on health and quality of life from noise – significant adverse effects on health and quality of life are determined by the SOAEL noise contour. The 2019 baseline determines the number of properties last experiencing significant adverse effects on health and quality of life when the airport was previously operating under normal circumstances. In this section, future DS air noise predictions for each phase are compared to the 2019 baseline to demonstrate that there will be a reduction in properties experiencing significant adverse effects on health and quality of life. Continuing significant adverse effects due to exposure above SOAEL will be avoided by the enhanced noise insulation scheme (see **Draft Compensation Policies and Measures**).

b. Mitigate and minimise adverse impacts on health and quality of life from noise – embedded mitigation measures are covered in **Section 16.8,** which cover the draft noise insulation scheme and demonstrate compliance with the ICAO Balanced Approach. **Section 16.10** covers additional mitigation that will control aircraft noise through a Noise Envelope. The Noise Envelope is being designed to protect communities whilst enabling the airport to operate efficiently and allow it to grow in accordance with the limits defined by the Noise Envelope. The limits and thresholds in the Noise Envelope so any improvements in aircraft technology can be shared between local communities and the Applicant.

c. Where possible, contribute to improvements to health and quality of life – Properties experiencing noise levels exceeding the SOAEL are currently eligible for a contribution to insulation under the existing compensation scheme. These properties will now be eligible for a full package of sound insulation through the **Draft Compensation Policies and Measures**. Additionally, the sound insulation scheme will provide a contribution to insulation for properties experiencing noise below the SOAEL by setting eligibility at the 54 dB LAeq,16h noise contour. The **Draft Compensation Policies and Measures** represent a substantial improvement on the current insulation package offered and will allow a significantly increased

[13] The ANPS uses the term ‘impacts’’ however, this has been changed to ‘effects’ to align with terminology used in national noise policy and this PEIR chapter

number of properties to benefit from sound insulation. Sound insulation will contribute to improvements to heath and quality of life through achieving good internal acoustic conditions at properties affected by aircraft noise. Sound insulation also provides a mean to address the noise aim of the APF to limit and where possible reduce the number of people in the UK significantly affected by aircraft noise by providing a means to achieve good internal noise conditions in properties.

16.9.39 The assessment of air noise has been undertaken using the LAeq,T noise metric to assess the likely effects on health and quality of life due to noise exposure and the likely significant effects due to noise change (adverse and beneficial) that arise from increase ATMs as a result of the Proposed Development. Context to the assessment will be provided in the ES through the use of secondary noise metrics (see **Section 16.15**)

16.9.40 The noise assessment considers the impact of the Proposed Development against future baseline years which account for the noise benefits from fleet transition to new generation aircraft if current consented passenger limits were retained. The assessment of air noise is undertaken through consideration of both the change in noise level as a result of the Proposed Development and the absolute noise level as a result of the Proposed Development. Details on the methodology for the air noise assessment and results are presented in **Appendix 16.1**.

16.9.41 The predicted change in noise between the DN and DS scenarios for each phase has been identified at assessment locations in **Table 16.17**. The significance of effect of the change in noise is determined based on whether an assessment location experiences noise levels of between LOAEL and SOAEL or exceeding the SOAEL in the DS scenarios. Effects in terms of LOAEL and SOAEL are described in **Table 16.22**.

16.9.42 This assessment of air noise has been undertaken at assessment locations covering community locations and schools. An assessment of non-residential receptors will be provided in the ES.

16.9.43 The assessment of air noise considers primary metrics (the $L_{Aeq,T}$), which are used assessment of likely effects on health and quality of life due to noise exposure and the likely significant effects due to noise change (adverse and beneficial). Context will be provided in the ES through the use of secondary noise metrics (see **Section 16.15**)

Phase 1

16.9.44 Analysis of noise contours has been undertaken to ascertain the area coverage, number of households and population that are likely to be affected by air noise. The results of analysis are presented in the following tables below:

a. analysis of area coverage by Phase 1 2027 DN and DS air noise contours are presented in **Table 16.26** for daytime LAeq,16h (see **Figure 16.7** and **Figure 16.9** in Volume 4 of this PEIR) and **Table 16.29** for night-time LAeq,8h (see **Figure 16.8** and **Figure 16.10** in Volume 4 of this PEIR);

b. analysis of households within Phase 1 2027 DN and DS air noise contours are presented in **Table 16.27** for daytime LAeq,16h and **Table 16.30** for night-time LAeq,8h; and

c. analysis of population within Phase 1 2027 DN and DS air noise contours are presented in **Table 16.28** for daytime LAeq,16h and **Table 16.31** for night-time LAeq,8h.

Table 16.26: Phase 1 2027 Daytime Air Noise Analysis – Area

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2027 DN Cumulative Area (km^2)	2027 DS Cumulative Area (km^2)	Change in Cumulative Area (DS-Baseline) (km^2)	Change in Cumulative Area (DS-DN) (km^2)
51	64.2	55.1	60.5	-3.7	+5.4
54	38.4	32.3	36.1	-2.3	+3.8
57	20.6	17.2	19.4	-1.2	+2.2
60	11.0	9.0	10.2	-0.8	+1.2
63	6.1	5.0	5.6	-0.5	+0.6
66	3.5	2.8	3.1	-0.4	+0.3
69	1.9	1.5	1.7	-0.2	+0.2

Table 16.27: Phase 1 2027 Daytime Air Noise Analysis – Households

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2027 DN Cumulative Number of Households	2027 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
51	22,350	17,950	22,450	+100	+4,500
54	11,150	9,000	10,050	-1,100	+1,050
57	6,050	4,350	5,000	-1,050	+650
60	2,700	1,650	2,250	-450	+600
63	800	400	600	-200	+200
66	50	0	0	-50	0
69	0	0	0	0	0

Table 16.28: Phase 1 2027 Daytime Air Noise Analysis – Population

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Population	2027 DN Cumulative Population	2027 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
51	52,100	41,300	51,950	-150	+10,650
54	25,900	21,050	23,600	-2,300	+2,550
57	14,600	10,900	12,300	-2,300	+1,400
60	7,150	4,500	6,000	-1,150	+1,500
63	2,150	1,100	1,600	-550	+500
66	100	0	50	-50	+50
69	0	0	0	0	0

Table 16.29: Phase 1 2027 Night-time Air Noise Analysis – Area

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2027 DN Cumulative Area (km^2)	2027 DS Cumulative Area (km^2)	Change in Cumulative Area (DS-Baseline) (km^2)	Change in Cumulative Area (DS-DN) (km^2)
45	88.6	67.0	74.9	-13.7	+7.9
48	52.3	40.6	46.1	-6.2	+5.5
51	30.0	22.4	26.1	-4.9	+3.7
54	15.7	11.8	13.9	-1.8	+2.1
55	12.8	9.6	11.2	-1.6	+1.6
57	8.4	6.4	7.2	-0.8	+0.8
60	4.8	3.5	3.9	-0.9	+0.4
63	2.7	1.9	2.1	-0.6	+0.2
66	1.5	1.1	1.2	-0.3	+0.1
69	0.9	0.7	0.8	-0.1	+0.1

Table 16.30: Phase 1 2027 Night-time Air Noise Analysis – Households

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2027 DN Cumulative Number of Households	2027 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
45	36,650	26,850	30,550	-6,100	+3,700

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2027 DN Cumulative Number of Households	2027 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
48	16,200	11,650	13,300	-2,900	+1,650
51	8,750	6,050	6,600	-2,150	+550
54	4,200	2,550	3,150	-1,050	+600
55	3,300	2,000	2,250	-1,050	+250
57	1,850	800	900	-950	+100
60	400	50	150	-250	+100
63	0	0	0	0	0
66	0	0	0	0	0
69	0	0	0	0	0

Table 16.31: Phase 1 2027 Night-time Air Noise Analysis – Population

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Population	2027 DN Cumulative Population	2027 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
45	90,900	62,900	72,800	-18,100	+9,900
48	37,400	27,200	31,000	-6,400	+3,800
51	20,400	14,500	15,800	-4,600	+1,300
54	10,550	6,850	8,200	-2,350	+1,350
55	8,450	5,400	6,050	-2,400	+650
57	4,950	2,150	2,450	-2,500	+300
60	1,000	100	350	-650	+250
63	0	0	0	0	0
66	0	0	0	0	0
69	0	0	0	0	0

16.9.45 The results of noise predictions during daytime and night-time at air noise assessment locations identified in **Table 16.17** are presented in **Table 43** of **Appendix 16.1**, Volume 3 of this PEIR. The assessment locations are equivalently numbered to monitoring locations illustrated in **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR.

16.9.46 The precautionary UAEL is not predicted to be exceeded at any assessment location. Assessment locations that are predicted to experience noise levels exceeding the SOAEL in the 2019 baseline and still experience noise levels

exceeding the SOAEL in the Phase 1 DS scenario for either daytime or night-time are:

a. AR1 – Someries receptors (night-time only);
b. AR2 – Lye Hill, Breachwood Green
c. AR5 – Bendish;
d. AR13 – Strathmore Avenue, Luton;
e. AR37 – Breachwood Green JMI School (night-time only); and
f. AR40 – Surrey Street Primary.

16.9.47 The predicted difference in noise between the Phase 1 DN and DS scenarios are presented in **Figure 16.11** for the daytime period and **Figure 16.12** for the night-time period in Volume 4 of this PEIR. To further help understand potential noise impacts, noise contour predictions have been supplemented with predictions of air noise and associated changes in air noise at the assessment locations identified in **Table 16.17**. A summary of the results of changes in noise at assessment locations are presented in **Table 16.32**.

Table 16.32: Summary of Phase 1 Changes in Air Noise at Assessment Locations

DS Noise Level	Range of Daytime Changes in LAeq,16h dB Noise	Range of Night-time Changes in LAeq,8h dB Noise
Above LOAEL and below SOAEL	0.5-0.6	0.5-1.0
Above SOAEL	0.6-0.7	0.3-0.7

16.9.48 At assessment locations presented in **Table 16.17** that are predicted to experience air noise levels above the daytime LOAEL and below the SOAEL (both defined in **Table 16.11**) in the DS scenario, the difference in air noise during the daytime period resulting from Phase 1 of the Proposed Development is predicted to range from 0.5 to 0.6 dB $L_{Aeq,16h}$.

16.9.49 The difference in air noise during the daytime period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of approximately of 15%. The total increase in aircraft movements during the daytime period is forecast to be approximately 12%.

16.9.50 At assessment locations experiencing air noise levels above the night-time LOAEL and below the SOAEL in the DS scenario, the difference in air noise during the night-time period at the assessment locations presented in **Table 16.17** resulting from Phase 1 of the Proposed Development is predicted to range from 0.5 to 1.0 dB $L_{Aeq,8h}$.

16.9.51 The difference in air noise during the night-time period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of approximately of 28% and a shift in fleet preference with more A320neo aircraft operating at night than in the DN scenarios. The total increase in aircraft movements during the night-time period is forecast to be approximately 25%.

16.9.52 During the daytime period, there is a difference in population of +10,150 that experience DS noise levels exceeding the LOAEL but not exceeding the SOAEL. Differences in air noise during the daytime are predicted to be below +1 dB at all assessment location. Consequently, the population experiencing daytime noise between the LOAEL and the SOAEL are predicted to experience a **Negligible** effect, which is **not significant**.

16.9.53 During the daytime period, there is a difference in population of +500 that experience DS noise levels exceeding SOAEL. Differences in noise are predicted to be below +1 dB, which is equivalent to a **Negligible** effect for population experiencing noise levels above the SOAEL and **not significant**.

16.9.54 During the night-time period, there is a difference in population of +9,250 that experience DS noise levels exceeding the LOAEL but not exceeding the SOAEL. Differences in air noise during the daytime are, at worst, predicted to be an increase of 1 dB. Consequently, based on criteria in **Table 16.12**, the population experiencing night-time noise between the LOAEL and the SOAEL are predicted to experience a **Negligible** effect which is **not significant**.

16.9.55 During the night-time period, there is a difference in population of +650 that experience DS noise levels exceeding SOAEL. Differences in noise at assessment locations exceeding the SOAEL are predicted to be below 1 dB. This is equivalent to a **Negligible** effect for population experiencing noise levels above the SOAEL, which is **not significant**.

16.9.56 There is a decrease in the daytime SOAEL noise contour area from 6.1 km^2 in the 2019 Baseline scenario to 5.0 km^2 in Phase 1, which corresponds to a decrease in population of 550. During the night-time period, the SOAEL noise contour area decreases from 12.8 km^2 in the 2019 Baseline to 11.2 km^2 in Phase 1. The decrease in night-time contour area results in a decrease in population of 2,400 within the SOAEL noise contour. This reduction in SOAEL noise contour area aligns with ANPS policy to avoid significant adverse impacts on health and quality of life.

16.9.57 Properties experiencing noise levels exceeding the SOAEL are currently eligible for a contribution to insulation under the existing compensation scheme. These properties will now be eligible for a full package of sound insulation through the **Draft Compensation Policies and Measures**. Additionally, the sound insulation scheme will provide a contribution to insulation for properties experiencing noise below the SOAEL by setting eligibility at the 54 dB LAeq,16h noise contour.

16.9.58 The **Draft Compensation Policies and Measures** represent a substantial improvement on the current insulation package offered and will allow a significantly increased number of properties to benefit from sound insulation. Sound insulation will contribute to improvements to heath and quality of life through achieving good internal acoustic conditions at properties affected by aircraft noise. This demonstrates compliance with paragraph 5.68 of the ANPS.

Phase 2a

16.9.59 Analysis of noise contours has been undertaken to ascertain the area coverage, number of households and population that are likely to be affected by air noise. The results of analysis are presented in the following tables below:

a. analysis of area coverage by Phase 2a 2039 DN and DS air noise contours are presented in **Table 16.33** for daytime LAeq,16h (see **Figure 16.13** and **Figure 16.15** in Volume 4 of this PEIR) and **Table 16.36** for night-time LAeq,8h (see **Figure 16.14** and **Figure 16.16** in Volume 4 of this PEIR);

b. analysis of households within Phase 2a 2039 DN and DS air noise contours are presented in **Table 16.34** for daytime LAeq,16h and **Table 16.37** for night-time LAeq,8h; and

c. analysis of population within Phase 2a 2039 DN and DS air noise contours are presented in **Table 16.35** for daytime LAeq,16h and **Table 16.38** for night-time LAeq,8h.

Table 16.33: Phase 2a 2039 Daytime Air Noise Analysis – Area

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2039 DN Cumulative Area (km^2)	2039 DS Cumulative Area (km^2)	Change in Cumulative Area (km^2) (DS-Baseline)	Change in Cumulative Area (km^2) (DS-DN)
51	64.2	44.7	55.5	-9.7	+10.8
54	38.4	25.3	32.4	-6.0	+7.1
57	20.6	13.3	17.4	-3.2	+4.1
60	11.0	6.9	9.1	-1.9	+2.2
63	6.1	3.7	4.9	-1.2	+1.2
66	3.5	2.0	2.6	-0.9	+0.6
69	1.9	1.1	1.4	-0.5	+0.3

Table 16.34: Phase 2a 2039 Daytime Air Noise Analysis – Households

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2039 DN Cumulative Number of Households	2039 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
51	22,350	13,600	20,200	-2,150	+6,600
54	11,150	6,450	8,800	-2,350	+2,350
57	6,050	2,800	4,150	-1,900	+1,350
60	2,700	850	1,550	-1,150	+700

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2039 DN Cumulative Number of Households	2039 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
63	800	100	350	-450	+250
66	50	0	0	-50	0
69	0	0	0	0	0

Table 16.35: Phase 2a 2039 Daytime Air Noise Analysis – Population

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Population	2039 DN Cumulative Population	2039 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
51	52,100	31,150	46,700	-5,400	+15,550
54	25,900	15,450	20,700	-5,200	+5,250
57	14,600	7,350	10,450	-4,150	+3,100
60	7,150	2,350	4,100	-2,050	+1,750
63	2,150	200	950	-1,200	+750
66	100	0	0	-100	0
69	0	0	0	0	0

Table 16.36: Phase 2a 2039 Night-time Air Noise Analysis – Area

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2039 DN Cumulative Area (km^2)	2039 DS Cumulative Area (km^2)	Change in Cumulative Area (km^2) (DS-Baseline)	Change in Cumulative Area (km^2) (DS-DN)
45	88.6	57.6	72.5	-16.1	+14.9
48	52.3	33.4	44.0	-8.3	+10.6
51	30.0	18.1	24.5	-5.5	+6.4
54	15.7	9.3	12.8	-2.9	+3.5
55	12.8	7.5	10.2	-2.6	+2.7
57	8.4	4.9	6.7	-1.7	+1.8
60	4.8	2.7	3.6	-1.2	+0.9
63	2.7	1.4	1.9	-0.8	+0.5
66	1.5	0.9	1.1	-0.4	+0.2
69	0.9	0.5	0.7	-0.2	+0.2

Table 16.37: Phase 2a 2039 Night-time Air Noise Analysis – Households

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2039 DN Cumulative Number of Households	2039 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
45	36,650	21,650	32,550	-4,100	+10,900
48	16,200	8,900	14,300	-1,900	+5,400
51	8,750	4,150	6,250	-2,500	+2,100
54	4,200	1,500	2,500	-1,700	+1,000
55	3,300	950	2,000	-1,300	+1,200
57	1,850	350	800	-1,050	+450
60	400	0	50	-350	+50
63	0	0	0	0	0
66	0	0	0	0	0
69	0	0	0	0	0

Table 16.38: Phase 2a 2039 Night-time Air Noise Analysis – Population

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Population	2039 DN Cumulative Population	2039 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
45	90,900	50,250	76,250	-14,650	+26,000
48	37,400	21,000	32,800	-4,600	+11,800
51	20,400	10,400	15,050	-5,350	+4,650
54	10,550	4,050	6,650	-3,900	+2,600
55	8,450	2,500	5,250	-3,200	+2,750
57	4,950	900	2,100	-2,850	+1,200
60	1,000	0	150	-850	+150
63	0	0	0	0	0
66	0	0	0	0	0
69	0	0	0	0	0

16.9.60 The results of noise predictions during daytime and night-time at air noise assessment locations identified in **Table 16.17** are presented in **Table 44** of **Appendix 16.1,** Volume 3 of this PEIR. The assessment locations are

equivalently numbered to monitoring locations illustrated in **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR.

16.9.61 The precautionary UAEL is not predicted to be exceeded at any assessment location. Assessment locations that are predicted to experience noise levels exceeding the SOAEL in the 2019 baseline and still experience noise levels exceeding the SOAEL in the Phase 2a scenario for either daytime or night-time are:

a. AR1 – Someries receptors (night-time only);
b. AR2 – Lye Hill, Breachwood Green
c. AR5 – Bendish;
d. AR13 – Strathmore Avenue, Luton;
e. AR37 – Breachwood Green JMI School (night-time only); and
f. AR40 – Surrey Street Primary.

16.9.62 The predicted difference in noise between the Phase 2a DN and DS scenarios are presented in **Figure 16.17** for the daytime period and **Figure 16.18** for the night-time period in Volume 4 of this PEIR. To further help understand potential noise impacts, noise contour predictions have been supplemented with predictions of air noise and associated changes in air noise at the assessment locations identified in **Table 16.17**. A summary of the results of changes in noise at assessment locations are presented in **Table 16.39**.

Table 16.39: Summary of Phase 2a Changes in Air Noise at Assessment Locations

DS Noise Level	Range of Daytime Changes in $L_{Aeq,16h}$ dB Noise	Range of Night-time Changes in $L_{Aeq,8h}$ dB Noise
Above LOAEL and below SOAEL	1.2-1.4	1.1-1.7
Above SOAEL	1.3-1.4	1.2-1.6

16.9.63 At assessment locations presented in **Table 16.17** that are predicted to experience air noise levels above the daytime LOAEL and below the SOAEL(both defined in **Table 16.11**) in the DS scenario, the difference in air noise during the daytime period resulting from Phase 2a of the Proposed Development is predicted to range from +1.2 to +1.4 dB $L_{Aeq,16h}$.

16.9.64 The difference in air noise during the daytime period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of approximately of 39%. The total increase in aircraft movements during the daytime period is forecast to be approximately 30%.

16.9.65 For assessment locations experiencing air noise levels above the night-time LOAEL and below the SOAEL in the DS scenario, the difference in air noise during the night-time period at the locations presented in **Table 16.17** resulting from Phase 2a of the Proposed Development is predicted to range from +1.1 to +1.7 dB $L_{Aeq,8h}$.

16.9.66 The difference in air noise during the night-time period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of approximately of 54%. The total increase in aircraft movements during the night-time period is forecast to be approximately 48%. By 2039, when Phase 2a is at capacity, the majority of the fleet are forecast to be made up of new generation aircraft.

16.9.67 There is a difference in population of +14,800 during the daytime period and +23,250 during the night-time period that experience DS noise levels exceeding the LOAEL but not exceeding the SOAEL. Differences in air noise are predicted to range from 0 to +2 dB at all assessment locations. Consequently, based on criteria in **Table 16.12**, the population experiencing daytime noise between the LOAEL and the SOAEL are predicted to experience a **Negligible** effect, which is **not significant**.

16.9.68 There is a difference in population of +750 during the daytime period and +2,750 during the night-time period that experience DS noise levels exceeding SOAEL. Differences in noise are predicted to range from +1 to +2 dB, this is equivalent to a **Minor Adverse** effect for population experiencing noise levels above the SOAEL, which is **not significant**. Areas experiencing Minor Adverse effects are illustrated in the area within the SOAEL contour in **Figure 16.**17 (daytime) and **Figure 16.18** (night-time) of Volume 4 of this PEIR.

16.9.69 Assessment locations predicted to experience minor adverse effects during the daytime period are AR2, AR13 and AR40. Assessment locations predicted to experience minor adverse effects during the night-time period are AR1, AR2, AR5, AR13, AR37 and AR40.

16.9.70 In comparison to the 2019 baseline, there is a decrease in the daytime SOAEL noise contour area from 6.1 km^2 to 4.9 km^2 in Phase 2a, which corresponds to a decrease in population of 750. During the night-time period, the SOAEL noise contour area decreases from 12.8 km^2 in the 2019 baseline to 10.2 km^2 in Phase 2a. The decrease in night-time contour area results in a decrease in population of 3,200 within the SOAEL noise contour.

16.9.71 There is a decrease in the daytime SOAEL noise contour area from 5.6 km^2 in the 2027 Phase 1 scenario to 4.9 km^2 in Phase 2a, which corresponds to a decrease in population of 650. During the night-time period, the SOAEL noise contour area decreases from 11.2 km^2 in Phase 1 to 10.2 km^2 in Phase 2a. The decrease in night-time contour area results in a decrease in population of 800 within the SOAEL noise contour.

16.9.72 The reduction in SOAEL noise contour area from the 2019 baseline and Phase 1 aligns with ANPS policy to avoid significant adverse impacts on health and quality of life.

16.9.73 Properties experiencing noise levels exceeding the SOAEL are currently eligible for a contribution to insulation under the existing compensation scheme. These properties will now be eligible for a full package of sound insulation through the **Draft Compensation Policies and Measures**. Additionally, the sound insulation scheme will provide a contribution to insulation for properties

experiencing noise below the SOAEL by setting eligibility at the 54 dB LAeq,16h noise contour.

16.9.74 The **Draft Compensation Policies and Measures** represent a substantial improvement on the current insulation package offered and will allow a significantly increased number of properties to benefit from sound insulation. Sound insulation will contribute to improvements to heath and quality of life through achieving good internal acoustic conditions at properties affected by aircraft noise. This demonstrates compliance with paragraph 5.68 of the ANPS.

Phase 2b

16.9.75 Analysis of noise contours has been undertaken to ascertain the area coverage, number of households and population that are likely to be affected by air noise. The results of analysis are presented in the following tables below:

a. analysis of area coverage by Phase 2b 2043 DN and DS air noise contours are presented in **Table 16.40** for daytime LAeq,16h (see **Figure 16.13** and **Figure 16.15** in Volume 4 of this PEIR) and **Table 16.43** for night-time LAeq,8h (see **Figure 16.14** and **Figure 16.16** in Volume 4 of this PEIR);

b. analysis of households within Phase 2b 2043 DN and DS air noise contours are presented in **Table 16.41** for daytime LAeq,16h and **Table 16.44** for night-time LAeq,8h; and

c. analysis of population within Phase 2b 2043 DN and DS air noise contours are presented in **Table 16.42** for daytime LAeq,16h and **Table 16.45** for night-time LAeq,8h.

Table 16.40: Phase 2b 2043 Daytime Air Noise Analysis – Area

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2043 DN Cumulative Area (km^2)	2043 DS Cumulative Area (km^2)	Change in Cumulative Area (km^2) (DS-Baseline)	Change in Cumulative Area (km^2) (DS-DN)
51	64.2	44.8	61.9	-2.3	+17.6
54	38.4	25.3	37.0	-1.4	+11.9
57	20.6	13.3	20.2	-0.4	+7.1
60	11.0	6.9	10.5	-0.5	+3.6
63	6.1	3.7	5.6	-0.5	+1.9
66	3.5	2.0	3.0	-0.5	+1.1
69	1.9	1.1	1.6	-0.3	+0.5

Table 16.41: Phase 2b 2043 Daytime Air Noise Analysis – Households

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2043 DN Cumulative Number of Households	2043 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-Baseline)	Change in Cumulative Number of Households (DS-DN)
51	22,350	13,600	25,000	+2,650	+11,400
54	11,150	6,450	10,350	-1,200	+3,900
57	6,050	2,800	4,850	-1,200	+2,050
60	2,700	850	2,150	-550	+1,300
63	800	100	550	-250	+450
66	50	0	0	0	0
69	0	0	0	0	0

Table 16.42: Phase 2b 2043 Daytime Air Noise Analysis – Population

$L_{Aeq,16h}$ dB Noise Contour	2019 Baseline Cumulative Population	2043 DN Cumulative Population	2043 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
51	52,100	31,200	58,200	+6,100	+27,000
54	25,900	15,500	24,250	-1,650	+8,750
57	14,600	7,400	12,000	-2,600	+4,600
60	7,150	2,350	5,800	-1,350	+3,450
63	2,150	200	1,550	-600	+1,350
66	100	0	50	-50	+50
69	0	0	0	0	0

Table 16.43: Phase 2b 2043 Night-time Air Noise Analysis – Area

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2043 DN Cumulative Area (km^2)	2043 DS Cumulative Area (km^2)	Change in Cumulative Area (km^2) (DS-DN)	Change in Cumulative Area (km^2) (DS-DN)
45	88.6	59.4	81.2	-6.4	+21.8
48	52.3	34.8	49.7	-2.6	+14.9
51	30.0	18.9	28.0	-2.0	+9.1
54	15.7	9.7	14.8	-0.9	+5.1
55	12.8	7.9	11.8	-1.0	+3.9
57	8.4	5.2	7.7	-0.7	+2.5

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Area (km^2)	2043 DN Cumulative Area (km^2)	2043 DS Cumulative Area (km^2)	Change in Cumulative Area (km^2) (DS-DN)	Change in Cumulative Area (km^2) (DS-DN)
60	4.8	2.8	4.1	-0.7	+1.3
63	2.7	1.5	2.2	-0.5	+0.7
66	1.5	0.9	1.2	-0.3	+0.3
69	0.9	0.6	0.8	-0.1	+0.2

Table 16.44: Phase 2b 2043 Night-time Air Noise Analysis – Households

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Number of Households	2043 DN Cumulative Number of Households	2043 DS Cumulative Number of Households	Change in Cumulative Number of Households (DS-DN)	Change in Cumulative Number of Households (DS-DN)
45	36,650	22,750	36,650	0	+13,900
48	16,200	9,450	19,500	+3,300	+10,050
51	8,750	4,500	6,950	-1,800	+2,450
54	4,200	1,900	3,000	-1,200	+1,100
55	3,300	1,050	2,300	-1,000	+1,250
57	1,850	450	950	-900	+500
60	400	0	250	-150	+250
63	0	0	0	0	0
66	0	0	0	0	0
69	0	0	0	0	0

Table 16.45: Phase 2b 2043 Night-time Air Noise Analysis – Population

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Population	2043 DN Cumulative Population	2043 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
45	90,900	52,850	86,500	-4,400	+33,650
48	37,400	22,300	44,850	-7,450	+22,550
51	20,400	11,150	16,650	-3,750	+5,500
54	10,550	5,150	7,900	-2,650	+2,750
55	8,450	2,850	6,150	-2,300	+3,300
57	4,950	1,200	2,550	-2,400	+1,350
60	1,000	0	600	-400	+600
63	0	0	0	0	0

$L_{Aeq,8h}$ dB Noise Contour	2019 Baseline Cumulative Population	2043 DN Cumulative Population	2043 DS Cumulative Population	Change in Cumulative Population (DS-Baseline)	Change in Cumulative Population (DS-DN)
66	0	0	0	0	0
69	0	0	0	0	0

16.9.76 The results of noise predictions during daytime and night-time at air noise assessment locations identified in **Table 16.17** are presented in **Table 45** of **Appendix 16.1**, Volume 3 of this PEIR. The precautionary UAEL is not predicted to be exceeded at any receptor. The assessment locations are equivalently numbered to monitoring locations illustrated in **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR.

16.9.77 Assessment locations that are predicted to experience noise levels exceeding the SOAEL in the 2019 baseline and still experience noise levels exceeding the SOAEL in the Phase 2b scenario for either daytime or night-time are:

a. AR1 – Someries receptors (night-time only);
b. AR2 – Lye Hill, Breachwood Green
c. AR5 – Bendish;
d. AR13 – Strathmore Avenue, Luton;
e. AR37 – Breachwood Green JMI School (night-time only); and
f. AR40 – Surrey Street Primary.

16.9.78 The predicted difference in noise between the Phase 2b DN and DS scenarios are presented in **Figure 16.23** for the daytime period and **Figure 16.24** for the night-time period in Volume 4 of this PEIR. To further help understand potential noise impacts, noise contour predictions have been supplemented with predictions of air noise and associated changes in air noise at the assessment locations identified in **Table 16.17**. A summary of the results of changes in noise at assessment locations are presented in **Table 16.39**.

Table 16.46: Summary of Phase 2b Changes in Air Noise at Assessment Locations

DS Noise Level	Range of Daytime Changes in $L_{Aeq,16h}$ dB Noise	Range of Night-time Changes in $L_{Aeq,8h}$ dB Noise
Above LOAEL and below SOAEL	1.8-2.1	2.0-2.1
Above SOAEL	1.3-2.6	1.4-2.5

16.9.79 At assessment locations presented in **Table 16.17** that are predicted to experience air noise levels above the daytime LOAEL and below the SOAEL (both defined in **Table 16.11**) in the DS scenario, the difference in air noise

during the daytime period resulting from Phase 2b of the Proposed Development is predicted to range from +1.8 to +2.1 dB $L_{Aeq,16h}$.

16.9.80 The difference in air noise during the daytime period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of approximately of 62%. The total increase in aircraft movements during the daytime period is forecast to be approximately 48%.

16.9.81 At assessment locations with air noise levels above the night-time LOAEL in the DS scenario, the difference in air noise during the night-time period at the locations presented in **Table 16.17** resulting from Phase 2b of the Proposed Development is predicted to range from +1.4 to +2.7 dB $L_{Aeq,8h}$.

16.9.82 The change in air noise during the night-time period is due to an increase in commercial flights (freight and general aviation movements are unchanged) of 37 ATMs during the summer night-time period. This is equivalent to an increase in commercial flights of approximately of 76%.

16.9.83 By 2043, the majority of the fleet are forecast to be made up of new generation aircraft so the fleet composition for DN and DS scenarios are similar. The total increase in aircraft movements during the night-time period is forecast to be approximately 70%.

16.9.84 Due to restrictions on movements during the night quota period (from 23:30 to 06:00) the increase in movements during the night-time period will mostly occur in the periods from 06:00 to 07:00 and 23:00 to 23:30. These restrictions will be retained in future as part of the Noise Envelope (see **Section 16.10**).

16.9.85 There is a difference in population of +25,650 during the daytime period and +30,350 during the night-time period that experience DS noise levels exceeding the LOAEL but not exceeding the SOAEL. Changes in air noise are predicted range from +1 to +3 dB at all assessment locations. Consequently, based on criteria in **Table 16.12**, the population experiencing daytime noise between the LOAEL and the SOAEL are predicted to experience a **Negligible** to **Minor Adverse** effect, which is **not significant**.

16.9.86 Assessment locations predicted to experience minor adverse effects during the daytime period are AR1, AR4, AR9, AR16, AR32, AR33 and AR35. Assessment locations predicted to experience minor adverse effects during the night-time period are AR1, AR2, AR3, AR10, AR11, AR13, AR17, AR31 and AR38.

16.9.87 There is a difference in population of +1,350 during the daytime period and +3,300 during the night-time period that experience DS noise levels exceeding SOAEL. Differences in noise are predicted to be range from +1 to +3 dB. These locations are illustrated in **Figure 16.23** of Volume 4 of this PEIR by the area within the SOAEL contour experiencing a change in noise between 2 and 2.99 dB. This is equivalent **Moderate Adverse** effect for population experiencing noise levels above the SOAEL, which is **significant**.

16.9.88 During the daytime period, there is a population of approximately 1,100 predicted to experience changes in noise between 2 and 3 dB. During the night-time period, there is a population of approximately 800 predicted to experience changes in noise between 2 and 3 dB. These locations are illustrated in **Figure**

16.24 of Volume 4 of this PEIR by the area within the SOAEL contour and experiencing a change in noise between 2 and 2.99 dB. This is equivalent **Moderate Adverse** effect for population experiencing noise levels above the SOAEL, which is **significant**.

16.9.89 Assessment locations predicted to experience moderate adverse effects during the daytime period are AR2 and AR40. Assessment locations predicted to experience moderate adverse effects during the night-time period are AR5, AR37 and AR40.

16.9.90 More detailed information on the locations of population affected by significant noise effects will be provided in the ES.

16.9.91 In comparison to the 2019 baseline, there is a decrease in the daytime SOAEL noise contour area from 6.1 km^2 to 5.6 km^2 in Phase 2b, which corresponds to a decrease in population of 600. During the night-time period, the SOAEL noise contour area decreases from 12.8 km^2 in the 2019 baseline to 11.8 km^2 in Phase 2b. The decrease in night-time contour area results in a decrease in population of 2,300 within the SOAEL noise contour.

16.9.92 The daytime SOAEL noise contour area increases from 4.9 km^2 in Phase 2a to 5.6 km^2 in Phase 2b, which corresponds to an increase in population of 650. During the night-time period, the SOAEL noise contour are increase from 10.2 km^2 in Phase 2a to 11.8 km^2 in Phase 2b. The increase in night-time contour area results in an increase in population of 900 within the SOAEL noise contour.

16.9.93 The increase in noise contour area from Phase 2a to Phase 2b is due to the fact that the majority of the fleet transitions to new generation aircraft by 2039 so there is no fleet transition to offset the forecast increase in movements from 2039 to 2043. It is likely that next generation aircraft will be introduced into service within the Project lifespan. Consequently, sensitivity testing has been undertaken (**Table 16.47**) to determine how fleet transition to next generation aircraft may influence noise contour areas.

16.9.94 A Noise Envelope will be submitted as part of the DCO application and will provide a means to allow predictable growth and to share noise benefits from improvements in aircraft technology with local communities. The Noise Envelope is covered in **Section 16.10**. The Noise Envelope can provide the means to continually reduce the SOAEL noise contour area so the Project will align with ANPS policy to avoid significant adverse impacts on health and quality of life.

16.9.95 Properties experiencing noise levels exceeding the SOAEL are currently eligible for a contribution to insulation under the existing compensation scheme. These properties will now be eligible for a full package of sound insulation through the **Draft Compensation Policies and Measures** document. Additionally, the sound insulation scheme will provide a contribution to insulation for properties experiencing noise below the SOAEL by setting eligibility at the 54 dB LAeq,16h noise contour.

16.9.96 The **Draft Compensation Policies and Measures** represent a substantial improvement on the current insulation package offered and will allow a

significantly increased number of properties to benefit from sound insulation. Sound insulation will contribute to improvements to heath and quality of life through achieving good internal acoustic conditions at properties affected by aircraft noise. This demonstrates compliance with paragraph 5.68 of the ANPS.

Ground Noise

Phase 1

16.9.97 The results of ground noise predictions at assessment locations defined in **Table 16.16** and illustrated in **Figure 16.28** in Volume 4 of this PEIR are presented in **Table 65** of **Appendix 16.1** in Volume 3 of this PEIR. The results of ground noise predictions for Phase 1 indicate that exceedances of the LOAEL are common at the identified assessment locations; however, the SOAEL is not exceeded.

16.9.98 The predicted change in noise due to Phase 1 ground activities range from -0.2 to +0.6 dB during the daytime. According to the classification set out in **Table 16.12**, these changes in noise are equivalent to a **Negligible** effect and **not significant**. The predicted difference in noise range from -0.3 to +0.7 dB during the night-time. According to the classification set out in **Table 16.12**, these differences in noise are equivalent to a **Negligible** effect and **not significant**.

Phase 2a

16.9.99 The results of ground noise predictions at assessment locations defined in **Table 16.16** and illustrated in **Figure 16.28** in Volume 4 of this PEIR are presented in **Table 66** of **Appendix 16.1** in Volume 3 of this PEIR. The results of ground noise predictions for Phase 2a indicate that exceedances of the LOAEL are common at the identified assessment locations; however, the SOAEL is not exceeded.

16.9.100 The predicted difference in noise due to Phase 2a ground activities range from -0.7 to +1.7 dB during the daytime. According to the classification set out in **Table 16.12**, these differences in noise are equivalent to a **Negligible** effect and **not significant**. The predicted change in noise range from +0.2 to +1.6 dB during the night-time. According to the classification set out in **Table 16.12**, these changes in noise are equivalent to a **Negligible** effect and **not significant**.

Phase 2b

16.9.101 The results of ground noise predictions at assessment locations defined in **Table 16.16** and illustrated in **Figure 16.28** in Volume 4 of this PEIR are presented in **Table 67** of **Appendix 16.1** in Volume 3 of this PEIR. The results of ground noise predictions for Phase 2b indicate that exceedances of the LOAEL are common at the identified assessment locations; however, the SOAEL is not exceeded.

16.9.102 The predicted difference in noise due to Phase 2b ground activities range from -2.2 to +2.2 dB during the daytime. According to the classification set out in **Table 16.12**, these differences in noise are range from **Minor Beneficial** to

Minor Adverse and **not significant**. According to the classification set out in **Table 16.12**, these changes in noise are range from **Negligible** to **Minor Adverse** and **not significant**.

Surface Access Noise

16.9.103 The scale used to describe the expected change is given in **Table 16.14**. The full range of criteria for the magnitude of impact, for daytime and night-time noise respectively, will be reported in the ES.

16.9.104 At this stage roadside traffic noise levels, in terms of the BNLs, have been calculated with and without the Proposed Development for each Phase. The short-term change in level and changes to the road network for each of the associated years (2027, 2039 and 2043) have been analysed to ascertain where there could be significant effects associated with the Proposed Development.

16.9.105 Preliminary detailed modelling, involving the calculation of the road traffic noise level at all receptors in the study area, focusing on the areas potentially subject to significant effects through BNL analysis, has been carried out in inform the conclusions described in the PEIR. A detailed analysis of the results from this modelling, considering potential short-term and long-term significant effects on health and quality of life during both the day and night, will be presented in the ES.

Phase 1

16.9.106 **Figure 16.19** in Volume 4 of this PEIR shows the expected changes in daytime 16-hour roadside traffic noise levels between the DN and DS 2027 scenarios.

16.9.107 Preliminary road traffic noise modelling indicates that traffic increases are expected on most major routes but not to the extent that they would result in significant adverse effects in terms of road traffic noise exposure at receptors. In particular, the increase in traffic on President Way is not expected to lead to significant adverse effects for residents on Eaton Green Road.

16.9.108 The effect of surface access noise during Phase 1 is therefore considered to be **not significant** at all identified receptors.

Phase 2a

16.9.109 **Figure 16.20** in Volume 4 of this PEIR shows the expected changes in daytime 16-hour roadside traffic noise levels between the DN and DS 2039 scenarios.

16.9.110 The scale used to describe the expected change is given in **Table 16.14**. The full range of criteria for the magnitude of impact, for daytime and night-time noise respectively, will be reported in the ES.

16.9.111 Preliminary road traffic noise modelling indicates that traffic increases are expected on most major routes but not to the extent that they would result in significant adverse effects in terms of road traffic noise exposure at receptors. In particular, traffic expected to use the proposed AAR is not expected to lead to significant adverse effects for residents on Eaton Green Road as fewer vehicles

are expected to use Eaton Green Road itself, especially between Lalleford Road and Wigmore Lane.

16.9.112 The effect of surface access noise during Phase 2a is therefore considered to be **not significant** at all identified receptors.

Phase 2b

16.9.113 **Figure 16.21** in Volume 4 of this PEIR shows the expected changes in daytime 16-hour roadside traffic noise levels between the DN and DS 2043 scenarios.

16.9.114 As with Phase 2a, preliminary road traffic noise modelling indicates that traffic increases are expected on most major routes but not to the extent that they would result in significant adverse effects in terms of road traffic noise exposure at receptors. In particular, traffic expected to use the proposed AAR is not expected to lead to significant adverse effects for residents on Eaton Green Road as fewer vehicles are expected to use Eaton Green Road itself, especially between Lalleford Road and Wigmore Lane.

16.9.115 Increases in road traffic noise are expected in the vicinity of Tea Green and Cockernhoe as a result of increased traffic on Stony Lane and Chalk Hill although absolute road traffic noise levels are expected to remain relatively low (around the LOAEL). Despite this, there are some properties for which this increase in road traffic noise could be considered a **significant** effect.

Sensitivity Analysis

16.9.116 There are certain known scenarios or risks that may occur that could influence the conclusions of the Core Planning Case assessment. These scenarios and the general approach to considering them in this assessment are described in **Section 5.4** of **Chapter 5** Approach to the Assessment.

16.9.117 **Table 16.47** provides a summary of any likely changes to the conclusions of the air noise assessment reported in this chapter, in the event that that scenario or risk is realised. Where additional noise modelling was undertaken, details on the results are presented in **Appendix 16.1** in Volume 3 of this PEIR.

Table 16.47: Air Noise Sensitivity Analysis

Sensitivity scenario	Potential impact and change	Likely effect
LLAOL 19 mppa application granted	As the assessment of noise considers the difference in noise between the DS and DN scenarios for future assessment years, the change in baseline capacity would not affect the results of the assessment.	Unchanged
Faster growth scenario	The faster growth scenario accounts for uncertainties in forecasting and considers throughput being achieved earlier, with 23 mppa reached in 2029 for Phase 1 27 mppa reached in 2038 for Phase 2a and 32 mppa in 2042 for	Phase 1 – **Minor Adverse** effect (**not significant**)

Sensitivity scenario	Potential impact and change	Likely effect
	Phase 2b. As such, fleet mixes are comprised of less new/ next generation aircraft. As the Phase 2a and Phase 2b fast growth scenarios are only forecast to take place one year before the Core Planning Case, the noise effects are comparable but arrive one year earlier. Noise predictions for the 2029 Phase 1 fast growth scenario have been undertaken and results are presented in **Appendix 16.1**. The change in noise at assessment locations is predicted to range 0.8 to 1.4 dB during the day and night periods. Consequently, the faster growth would increase the significance of effect in Phase 1. The SOAEL noise contour would not increase during the day or night for Phase 1.	
Slower growth scenario	The slower growth scenario accounts for uncertainties in forecasting and considers throughput being achieved later. In the slower growth scenario, throughput is forecast to reach 21.5 mppa in 2037, 27 mppa in 2042 and 32 mppa in 2046. Consequently, the fleet mix would have a greater likelihood of including more new and next generation aircraft compared to the corresponding core case assessment years, so the noise impacts would be no worse than, and likely better than, the core case assessments.	Unchanged
A321neo noise does not improve	This scenario assumes that A321neo noise does not improve in future. Although more people will be affected by adverse levels of noise in future, there will be a difference in population affected by changes in noise as the increased A321neo noise applies to both the DN and DS scenarios. Although noise contour areas in Phase 2b would be equivalent to those in the Phase 1 scenario, by Phase 2b the noise contour areas would increase from the 2019 baseline contour areas. This would result in an increase on population experiencing significant adverse effects on health and quality of life. The Noise Envelope (**Section 16.10**) would provide a mechanism to mitigate this effect.	Phase 2a – **Minor Adverse** effect (**not significant**) Phase 2b – **Moderate Adverse** effect (**significant**)
Faster growth scenario and	A321neo is assumed to perform as per measured levels for Phase 1 so only the faster growth scenario affects the results of the Phase	Phase 1 – **Minor Adverse** effect (**not significant**)

Sensitivity scenario	Potential impact and change	Likely effect
A321neo noise does not improve	1 assessment of air noise; however, A321neo noise emissions will affect the results on the Phase 2a and Phase 2b assessments. As discussed for the fast growth sensitivity test, the noise contours area show very small increases from the Core Planning Case so results are comparable. However, if the A321neo performance does not improve, the SOAEL contour in Phase 2b will increase from the 2019 baseline. This would result in an increase on population experiencing significant adverse effects on health and quality of life. The Noise Envelope (**Section 16.10**) would provide a mechanism to mitigate this effect.	Phase 2a – **Minor Adverse** effect (**not significant**) Phase 2b – **Moderate Adverse** effect (**significant**)
Next generation aircraft in future years	No data is available on the noise performance of next generation aircraft. Consequently, next generation aircraft have been modelled assuming next generation will reduce aircraft noise by a similar level to that provided by new generation aircraft i.e. departure noise reduces by 4 dB and approach noise reduces by 1 dB. Next generation aircraft are forecast to enter into service by 2039 and make up approximately 10% of the Phase 2a fleet. This would result in a marginal change in the SOAEL noise contour with the daytime area reducing from the core case by 0.2 km^2 and the night-time contour reducing by 0.1 km^2. By 2043, 40% of the Phase 2b fleet are forecast to be made up of next generation aircraft. This is predicted to reduce the daytime SOAEL contour by 0.8 km^2 and reduce the night-time SOAEL contour by 0.6 km^2. Although there would be a reduced population affected by aircraft noise, the difference in noise between the DN and DS scenarios is likely to remain consistent. Consequently, the likely effects of aircraft noise would be unchanged.	Phase 2a – **Minor Adverse** effect (**not significant**) Phase 2b – **Moderate Adverse** effect (**significant**)

16.10 Additional mitigation

16.10.1 This section describes the mitigation measures identified as a result of the assessment process, that are proposed in addition to those already considered to be in place as described in **Section 16.8** Embedded and good practice mitigation measures. These are proposed to reduce or mitigate the effects on noise and vibration as a result of the construction and operation of the Proposed Development.

Construction

16.10.2 No significant construction noise or vibration effects have been identified . Consequently, no additional mitigation measures are recommended.

Operation

Noise Envelope

16.10.3 Having regard to the ANPS, the Applicant is putting forward Noise Envelope proposals as part of the application for development consent. Consequently, a Noise Envelope Design Group (NEDG) has been established to assist the Applicant in meeting the requirements set out in paragraph 5.60 of the ANPS, which are:

a. An envelope should be tailored to local priorities and include clear noise performance targets.

b. The design of the envelope should be defined in consultation with local communities and relevant stakeholders.

c. The benefits of future technological improvements should be shared between the applicant and its local communities, hence helping to achieve a balance between growth and noise reduction.

d. Suitable review periods should be set in consultation with the parties mentioned above to ensure the noise envelope's framework remains relevant.

16.10.4 The Noise Envelope will be secured as part of the DCO application through Green Controlled Growth (see the **Draft Green Controlled Growth** document) so will be a legally binding framework of limits and controls to manage aircraft noise. The **Draft Green Controlled Growth** document includes details on how the Noise Envelope will be enforced.

16.10.5 The Noise Envelope is being designed to protect communities whilst enabling the airport to operate efficiently and allow it to grow in accordance with the limits defined by the Noise Envelope. The Noise Envelope will provide certainty to the industry and communities about how noise will be managed to comply with government policy to contribute to improvements to health and quality of life.

16.10.6 The NEDG will have joint responsibility with the Applicant for ensuring that the Noise Envelope proposals submitted as part of the application for development consent:

a. include the principles and priorities on which the Noise Envelope is based;
b. include the enforceable limits or performance targets;
c. have a method for evaluating noise control measures;
d. have a mechanism for sharing the benefits of technological improvements between the community and the Applicant; and
e. have a review mechanism.

16.10.7 The NEDG membership is detailed in paragraph **16.4.3**. The NEDG has met and discussed approaches to various forms of control to be included in their recommendations for a noise envelope. A summary of the noise control measures under consideration by the NEDG are presented in **Table 16.48**.

16.10.8 The noise control measures in **Table 16.48** are presented in the form of limit values which are not to be exceeded. Threshold values have been defined below each limit; if these values are exceeded, the airport operator would be required to put forward proposals as to how future growth and operations would be managed to avoid the limit values being exceeded. As separate of targets were also identified by the NEDG which were considered as appropriate management tools which the airport operator should use to manage operations and achieve compliance with thresholds and limits.

16.10.9 Review periods will be defined to ensure that the Noise Envelope remains relevant so any improvements in aircraft technology can be shared between local communities and the Applicant.

Table 16.48: Proposed Noise Envelope Management Framework

Control Measure and Time Period	Limit	Threshold	Target (for management)
Night-time Quota Period – Movement Cap	9,650 movements over 12-month rolling average	90% of limit	-
Night-time Quota Period – QC Cap	12-month rolling average. Value to be determined	90% of limit	-
Annual Movement Cap	12-month rolling average. Value to be determined	90% of limit	-
Average Summer Day – Daytime	Area enclosed by 54 dB LAeq,16hr contour. Numerical value to be determined	85% of limit	Quota based target to be derived to be equivalent to threshold value but provide forward looking control that must be monitored through forecasting and scheduling

Control Measure and Time Period	Limit	Threshold	Target (for management)
Average Summer Day – Night-time	Area enclosed by 48 dB LAeq,8hr contour. Numerical value to be determined	85% of limit	Quota based target to be derived to be equivalent to threshold value but provide forward looking control that must be monitored through forecasting and scheduling
Noise Violation Limits[14]	Noise violation limits to be applied at current locations. Limit values to be graded based on departure QC of aircraft.		

16.10.10 The 'size' of the noise contours in **Table 16.48** will be determined based on the Environmental Statement that accompanies the DCO application. These limits will be set such that the benefits in aircraft technology from new generation and next generation aircraft will be shared between the airport operator and the local communities. The sharing of benefits of new aircraft technology can be demonstrated through a reduction in noise contour areas compared to the 2019 baseline.

16.10.11 Our expectation is that any airspace change proposals will be accommodated within the DCO Noise Envelope.

16.10.12 The NEDG will continue to meet throughout the development of the application to agree recommendations for the values of such limits and controls to manage aircraft noise that will be submitted as part of the application for development consent. The measures set out for the management and enforcement of GCG will form the mechanism for ensuring compliance with the limits set out within the Noise Envelope.

Airspace Redesign

16.10.13 Changes are being made to arrival routes to the airport, through an airspace change known as AD6, which will be implemented from 24th February 2022. However, the changes in approaches are only expected to affect communities at distance from the airport with results showing that there is a marginal change in properties exposed to air noise levels exceeding the LOAEL (Ref. 16.44). Consequently, airspace redesign has not been considered further in this PEIR.

16.10.14 The airport has initiated its airspace change proposal as part of Future Airspace Strategy Implementation South. This proposal has reached the Option Development stage but cannot progress to the next stage until the next iteration of the overall airspace Masterplan is approved. Hence, the timescale for any specific changes that would be made to departure routes from the airport is not yet clear.

16.10.15 Any further submissions on airspace redesign prior to submission of the ES that may affect the results of air noise modelling will be covered in line with advice presented in Paragraph 5.52 of the ANPS. Our expectation is that changes in

[14] Noise level limits relating to individual aircraft movements. Exceedance of the limit value results in a fine being imposed on the aircraft operator.

contour area resulting from any airspace change proposals will be accommodated within the DCO Noise Envelope (unless approved as a change to the DCO). Consequently, sensitivity testing on potential changes in air noise that may be provided through airspace design will be undertaken based on the best available information at the time of undertaking the ES assessment of air noise.

Surface Access

16.10.16 Preliminary noise predictions were undertaken to identify likely significant effects due to increases in road traffic noise. Where significant effects are identified, more detailed analysis of road traffic noise modelling will be undertaken to identify mitigation measures where practicable.

16.11 Residual effects

Construction

Phase 1

16.11.1 No additional mitigation has been proposed with respect to Phase 1 construction noise, construction traffic and vibration effects. As such, the effects would be as reported in **Section 16.9**.

Phase 2a

16.11.2 There is potential for significant effects to occur during Phase 2a construction of the TUI car park. It is considered that, through additional mitigation measures adopted through the Section 61 consent process, significant effects can be appropriately mitigated. Consequently, residual construction noise effects are considered to be **not significant**.

16.11.3 No additional mitigation has been proposed with respect to Phase 2a construction traffic and construction vibration effects. As such, the effects would be as reported in **Section 16.9**.

Phase 2b

16.11.4 No additional mitigation has been proposed with respect to Phase 2b construction noise, construction traffic and vibration effects. As such, the effects would be as reported in **Section 16.9**.

Operation

Air Noise

Phase 1

16.11.5 No significant noise effects are identified due to the Phase 1 increase in ATMs. As the Noise Envelope will not affect the results of the PEIR assessment of air noise, effects remain as those reported in **Section 16.9**.

Phase 2a

16.11.6 No significant noise effects are identified due to the Phase 2a increase in ATMs. As the Noise Envelope will not affect the results of the PEIR assessment of air noise, effects remain as those reported in **Section 16.9**.

Phase 2b

16.11.7 Significant noise effects are identified due to the Phase 2b increase in ATMs. The Noise Envelope will define limits and controls to manage aircraft noise that are part of the application for development consent. The Noise Envelope will be designed to protect communities while enabling the airport to operate efficiently and allow it to grow. As the contents of the Noise Envelope will not be finalised until the application is submitted, the implications that it will have on air noise levels cannot yet be determined.

16.11.8 It is expected that less noisy next generation aircraft will be part of the Phase 2b fleet and result in reduced noise levels. However, as no noise data on next generation aircraft are available, the Core Planning Case assessment is based on currently operational aircraft. It is anticipated that appropriate design of the Noise Envelope can limit growth if next generation aircraft have not come into service by 2043. Consequently, it is expected that the Noise Envelope can help avoid significant noise effects.

16.11.9 As the Noise Envelope will not affect the results of the PEIR assessment of air noise, effects remain as those reported in **Section 16.9**.

Ground Noise

Phase 1

16.11.10 No significant ground noise effects were identified in the preliminary assessment. No additional mitigation has been proposed with respect to Phase 1 ground noise. As such the effects would be as reported in **Section 16.9**.

Phase 2a

16.11.11 No additional mitigation has been proposed with respect to Phase 2a ground noise. As such the effects would be as reported in **Section 16.9**.

Phase 2b

16.11.12 No additional mitigation has been proposed with respect to Phase 2b ground noise. As such the effects would be as reported in **Section 16.9**.

Surface Access Noise

Phase 1

16.11.13 No significant surface access noise effects were identified in the preliminary assessment. No additional mitigation has been proposed with respect to Phase 1 surface access noise. As such the effects would be as reported in **Section 16.9**.

Phase 2a

16.11.14 No significant surface access noise effects were identified in the preliminary assessment. No additional mitigation has been proposed with respect to Phase 1 surface access noise. As such the effects would be as reported in **Section 16.9**.

Phase 2b

16.11.15 Significant adverse effects have been identified in the vicinity of Tea Green and Cockernhoe as a result of increased traffic on Stony Lane and Chalk Hill although absolute road traffic noise levels are expected to remain relatively low (around LOAEL).

16.11.16 At all other areas affected by changes in road traffic flows, changes in noise are expected to be not significant.

16.11.17 At this stage mitigation measures to minimise these significant effects have not been identified, although this will be revisited in the ES. As such the effects would be as reported in **Section 16.9**.

16.12 In-combination climate change effects

16.12.1 This section provides a preliminary assessment of potential changes to the findings of the noise and vibration assessment, taking into account the predicted future conditions as a result of climate change, known as In-combination Climate Change Impacts (ICCI). In combination and cumulative effects are reported in **Chapter 21** In-Combination and Cumulative Effects Assessment.

16.12.2 This assessment has been undertaken using the methodology and climate change predictions described in **Chapter 9** Climate Change Resilience of this PEIR. The results are provided in **Table 16.49**.

Table 16.49: Noise and vibration in-combination climate change impacts

Climate hazard	Likely ICCI	Consequence of ICCIs considering embedded environmental measures/good practice	Significance of ICCI effects
Increase in occurrence of heatwaves	Potential to exacerbate noise effects on communities in terms of individual dwellings and on a wider community, due to windows being open more often due to an increase in high temperatures.	The noise assessment criteria assume windows are open when internal noise levels are considered. Consequently, there is no further impact on noise effects arising from the ICCI.	Negligible Not significant
Increase in mean temperature and humidity	Increases in temperature and humidity of the air reducing the atmospheric attenuation of noise.	Over distances of a few hundred metres, atmospheric effects can be ignored for sound with low frequency prominence, such as aircraft noise. Consequently, increases in temperature and humidity is unlikely to affect ground-based noise sources such as ground noise, construction noise and surface access noise. Due to the longer distances that aircraft noise travels, the effect	Negligible Not significant

Climate hazard	Likely ICCI	Consequence of ICCIs considering embedded environmental measures/good practice	Significance of ICCI effects
		of increases in temperature and humidity can affect aircraft noise levels. However, the change in atmospheric absorption will only have a significant effect on high frequencies. Given the prominence of low frequencies in aircraft noise, it would take a substantial change in climate to result in a perceptible change in air noise. Consequently, it is expected that changes in noise will not result in additional impacts.	

16.13 Monitoring

Construction monitoring

16.13.1 Any requirements for monitoring during the construction phase will be agreed with the relevant Local Authority through the Section 61 process.

Operational monitoring

16.13.2 LLAOL has a noise monitoring scheme currently in place, which is covered by three permanent noise monitors and seven temporary noise monitors that are moved around periodically according to a yearly schedule. The CAA document CAP 1691 (Ref.45) recommends that additional permanent noise monitors on departure routes located beyond 6.5 km from start-of-roll could be adopted. Additionally, the NEDG has suggested that a monitor at 2.5 km from start-of-roll may be helpful to understand aircraft noise performance close to the airport.

16.13.3 LLAOL will explore the possibility of providing additional permanent noise monitoring stations along departure routes. LLAOL will decide whether the monitors should be subject to supplementary NVLs, advisory noise levels or whether monitors will be for informative purposes only.

16.13.4 The **Draft Green Controlled Growth** (GCG) document contains how monitoring will be undertaken to ensure compliance with the cap on the size of noise contours proposed in the Noise Envelope. On commencement of GCG at the point where passenger throughput increases above the existing consented baseline, a Monitoring Plan would be produced by the airport operator detailing when, where, and how noise monitoring and reporting will take place.

16.14 Preliminary assessment summary

16.14.1 **Table 16.50** provides a summary of the reasonable worst-case identified impacts, mitigation and likely effects of the Proposed Development on noise and vibration. The assessment was undertaken with reference to air noise receptors described in **Table 16.17**, which are numbers equivalent to monitoring locations illustrated in **Figure 16.3a** and **Figure 16.3b** in Volume 4 of this PEIR. Ground noise and construction noise receptors are described in **Table 16.16**. Additional mitigation and how it will be secured are described and its efficacy shown by the reported residual effect.

Table 16.50: Noise and vibration preliminary assessment summary

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Type	Description of effect and significance	Additional Mitigation and how secured	Residual Effect
Construction						
Phase 1 Construction Noise	Best practice construction noise management measures detailed in the Draft CoCP Section 61 consent to be obtained	n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.
Phase 2a Construction Noise		n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.
Phase 2b Construction Noise		n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.
Phase 1 Construction Vibration		n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.
Phase 2a Construction Vibration		n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.
Phase 2b Construction Vibration		n/a	Residential	Below the SOAEL – Not significant. All assessment locations	-	Below the SOAEL – Not significant.

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Type	Description of effect and significance	Additional Mitigation and how secured	Residual Effect
Phase 1 Construction Traffic Noise		Very Low	Residential	Negligible – Not significant	-	Negligible – Not significant
Phase 2a Construction Traffic Noise		Very Low	Residential	Negligible – Not significant	-	Negligible – Not significant
Phase 2b Construction Traffic Noise		Very Low	Residential	Negligible – Not significant	-	Negligible – Not significant
Operation						
Phase 1 Daytime and Night-time Air Noise	ICAO Balanced Approach covered in the Draft Operational Management Plan Noise insulation scheme	Very Low	Residential	Negligible – Not significant. All assessment locations	Noise Envelope	Negligible – Not significant
Phase 2a Daytime Air Noise		Low	Residential	Minor Adverse – Not significant. Population of approximately 750 people affected[15] Assessment locations AR2, AR13 and AR40 Negligible – Not significant		Minor Adverse – Not significant.

[15] Locations illustrated in **Figure 16.17** of Volume 4 of this PEIR in the area within the SOAEL contour

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Type	Description of effect and significance	Additional Mitigation and how secured	Residual Effect
				All other assessment locations		
Phase 2a Night-time Air Noise		Low	Residential	Minor Adverse – Not significant. Population of approximately 2,750 people affected[16] Assessment locations AR1, AR2, AR5, AR13, AR37 and AR40 Negligible – Not significant All other assessment locations		Minor Adverse – Not significant.
Phase 2b Daytime Air Noise		Low	Residential	Moderate Adverse – Significant. Population of approximately 1,100 people affected[17]		Moderate Adverse – Significant

[16] Locations illustrated in **Figure 16.18** of Volume 4 of this PEIR in the area within the SOAEL contour
[17] Locations illustrated in **Figure 16.23** of Volume 4 of this PEIR in the area within the SOAEL contour and change in noise between 2 and 2.99 dB

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Type	Description of effect and significance	Additional Mitigation and how secured	Residual Effect
				Assessment locations AR2 and AR40 Negligible – Not significant All other assessment locations		
Phase 2b Night-time Air Noise		Low	Residential	Moderate Adverse – Significant. Population of approximately 800 people affected[18] Assessment locations AR5, AR37 and AR40 Minor Adverse – Not significant All other assessment locations		Moderate Adverse – Significant Population of approximately 800 people affected Assessment locations AR5, AR37 and AR40
Phase 1 Ground Noise	-	Very Low	Residential	Negligible – Not Significant	-	Negligible – Not Significant

[18] Locations illustrated in **Figure 16.24** of Volume 4 of this PEIR in the area within the SOAEL contour and change in noise between 2 and 2.99 dB

Impact	Embedded/Good Practice Mitigation and how secured	Magnitude	Receptor Type	Description of effect and significance	Additional Mitigation and how secured	Residual Effect
				All assessment locations		
Phase 2a Ground Noise	ERUB Terminal 2 buildings partially screening ground noise Fixed electrical ground power units at Terminal 2	Very Low to Low	Residential	Negligible to Minor Adverse – Not Significant All assessment locations	-	Negligible to Minor Adverse – Not Significant
Phase 2b Ground Noise		Very Low to Low	Residential	Minor Beneficial to Minor Adverse – Not Significant All assessment locations	-	Minor Beneficial to Minor Adverse – Not Significant
Phase 1 Surface Access Noise	-	Very Low to Low	Residential	Minor beneficial to Minor Adverse - Not significant All assessment locations	-	Minor Beneficial to Minor Adverse – Not Significant
Phase 2a Surface Access Noise	-	Very Low to Low	Residential	Minor beneficial to Minor Adverse - Not significant	-	Minor Beneficial to Minor Adverse – Not Significant
Phase 2b Surface Access Noise	-	Very Low to Medium	Residential	Minor beneficial to Moderate Adverse - Significant	-	Minor Beneficial to Moderate Adverse – Significant

16.15 Completing the assessment

16.15.1 The following activities will be undertaken to complete the assessment, the results of which will be presented in the ES.

Engagement

16.15.2 Stakeholder engagement will be ongoing during preparation of the ES. The results of statutory consultation and discussions with the NWG and the NEDG will be covered in the ES.

Construction

16.15.3 The construction noise and vibration assessment will be updated to account for any changes in programme or methodology that may occur between Statutory Consultation and submission of the application for development consent. Where significant effects are identified as likely to occur, a qualitative discussion of the duration and frequency of effects will be provided.

Operation

Air Noise

16.15.4 Terrain data has not been included in the modelling work undertaken to date. Initial testing indicates that, the main difference in noise contour area with terrain data included is a reduction in contour area over Stevenage. This is due to the airport being approximately 70m higher than Stevenage, so noise has to travel further to reach the ground. Consequently, the results presented in this PEIR are considered to represent a worst-case. Terrain data will be implemented in modelling undertaken for the ES.

16.15.5 The preliminary assessment is based solely on the findings of $L_{Aeq,T}$ noise predictions, which are based on the average noise level of a period of time and may not represent the full range of response to aircraft noise that may occur due to individual aircraft movements. However, the assessment of $L_{Aeq,T}$ noise metrics allows the likely significant noise effects to be identified in line with EIA Regulations. The assessment of noise presented in the ES will account for supplementary noise metrics, which will provide additional context to the identification of potential significant effects. Supplementary noise metrics to be analysed are:

a. Number Above: The N65 (for daytime) and the N60 (for night-time) describe the number of aircraft generating noise above 65 dB LASmax and 60 dB LASmax;

b. Overflights: The overflight metric provides greater clarity on the number of aircraft movements that may affect specific communities;

c. LAeq,T noise contours for periods outside those defined in UK policy; and

d. The probability of awakening due to LASmax from individual aircraft movements.

16.15.6 Sensitivity testing will be undertaken of potential changes to air space (flight paths and operational procedures) based on the best available information at the time of assessment.

Non-residential Assessment

16.15.7 The assessment of air noise in the PEIR considers effects on residential receptors. The ES will include an assessment of noise effects on non-residential receptors that are defined for specific assessment based on screening criteria in **Table 16.15**.

Surface Access

16.15.8 Detailed analysis of the road traffic noise modelling will be undertaken in the ES covering all assessment years. This will include presenting road traffic noise changes for all noise sensitive receptors in the study area and a discussion of significant effects in both EIA and national policy terms. Additional mitigation measures to address the residual effects presented in the PEIR will be given further consideration.

COMPETENT EXPERTS

Topic	Role	Company	Qualifications/competencies/experience of author
Noise and vibration	Author	Aecom	Bsc Physics with Music, 15 years' experience in environmental and aviation acoustics, MioA
Noise and vibration	Sub-author	Aecom	Msci Mathematics, PhD Interior Wave Propagation, 18 years' experience in environmental acoustics and road traffic noise, MioA, MIMA, Cmath
Noise and vibration	Technical reviewer	Aecom	Msci / MA Physics, 21 years' experience in environmental acoustics consultancy and research, MIOA
Noise and vibration	Contributor	Aecom	BA(Hons) Geography, 21 years' commercial experience in geospatial and data science. Chartered Geographer – CGEOG(GIS)

GLOSSARY AND ABBREVIATIONS

Term	Definition
AAWT	Average Annual Weekday Traffic
AEDT	Aviation Environmental Design Tool
ANP	Air Noise Performance
ANPS	Airports National Policy Statement
BNL	Basic Noise Level
BPM	Best Practicable Means
CAA	Civil Aviation Authority
CRTN	Calculation of Road Traffic Noise
dB	Decibel
DfT	Department for Transport
DN	Do-Nothing
DS	Do-Something
ECAC	European Civil Aviation Conference
END	Environmental Noise Directive
EPA	Environmental Protection Act
FAA	Federal Aviation Administration
ICAO	International Civil Aviation Organization
ICCAN	Independent Commission on Civil Aviation Noise
INM	Integrated Noise Model
LLAOL	London Luton Airport Operations Limited
LLANAP	London Luton Airport Noise Action Plan
LOAEL	Lowest Observed Adverse Effect Level
NEDG	Noise Envelope Design Group
NOEL	No Observed Effect Level
NPD	Noise-Power-Distance
NPPF	National Planning Policy Framework
NPSE	Noise Policy Statement for England
PPGN	Planning Practice Guidance: Noise
SEL	Sound Exposure Level
SOAEL	Significant Observed Adverse Effect Level
SoNA	Survey of Noise Attitudes
SPL	Sound Pressure Level
UAEL	Unacceptable Adverse Effect Level
WHO	World Health Organization

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