Preliminary Environmental Information Report
Chapter 14: Noise and Vibration

September 2021

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14 Noise and Vibration

14.1. Introduction

14.1.1 This chapter of the Preliminary Environmental Information Report (PEIR) presents the findings of the Environmental Impact Assessment (EIA) work undertaken to date concerning the potential effects of the proposal to make best use of Gatwick's existing runways (referred to within this report as 'the Project') on the following types of noise:

- air noise – noise from aircraft in the air or departing or arriving (including reverse thrust) on a runway, generally assessed to a height up to 7,000 feet above ground level;
- ground noise – noise generated from airport activities at ground level including aircraft taxiing and traffic within the airport boundary;
- road traffic noise – noise from road traffic vehicles outside the airport on the public highway; and
- construction noise and vibration – noise and vibration from temporary construction of the Project, including the use of construction compounds.

14.1.2 In particular, this PEIR chapter:

- sets out the existing and future environmental baseline noise conditions, established from modelling carried out by the Civil Aviation Authority (CAA);
- presents the potential environmental effects on noise and vibration arising from the Project, based on the information gathered and the analysis and assessments undertaken to date;
- identifies any assumptions and limitations encountered in compiling the environmental information; and
- highlights mitigation measures that are proposed to minimise the likely environmental effects identified in the EIA process.

14.1.3 The noise and vibration assessment considers the likely significant effects arising from the construction and operation of the Project on:

- people, primarily where they live ('residential receptors') on an individual dwelling basis and on a community basis, including any shared community open areas;
- community facilities such as schools, hospitals, places of worship; and
- commercial properties such as offices and hotels, collectively described as 'non-residential receptors'.

14.1.4 Air noise has the potential to affect residents, and other Noise Sensitive Receptors (NSRs) over a wide area beyond the airport boundary. This chapter reports the results of modelled changes in noise that can be expected over this area. It uses a number of noise metrics to quantify the changes in noise that are expected following established guidance, and also provides additional detail on the changes that are expected at representative communities.

14.1.5 This chapter is accompanied by Appendices 14.9.1 to 14.9.5 and a set of figures. A glossary of acoustics terminology is provided in Section 14.15.

14.1.6 The PEIR will inform pre-application consultation. Following consultation, comments on the PEIR will be reviewed and taken into account in preparation of the Environmental Statement (ES) that will accompany the application to the Planning Inspectorate for development consent.

14.2. Legislation and Policy

Legislation

14.2.1 This section provides an overview of the legislation relevant to the assessment of noise and vibration.

Land Compensation Act 1973

14.2.2 This Act provides for depreciation in property price caused by noise as a physical factor from public works (highway or aerodrome) to be compensated by the responsible authority. Compensation is payable where the noise either arises from activity on land taken (injurious affection) (Part II of the Act) or is physically unconnected to the land interest (Part 1 claims). It also provides powers to enable the sound-proofing of (noise insulate) buildings from noise from highways and aerodromes and the payment of expenses of persons moving temporarily during construction works (due to noise).

Control of Pollution Act 1974

14.2.3 The Control of Pollution Act 1974 provides the definition of Best Practicable Means (BPM) to minimise noise (including vibration). Section 60 of the Act deals with the control of noise on construction sites and for the circumstances where a local authority may serve a notice on the person carrying out the works to undertake them in accordance with particular conditions. When considering the conditions, the local authority is to have regard to the BPM available to minimise noise. Section 61 of the Act allows the person carrying out construction works to seek prior consent by adopting BPM – effectively providing a defence against a Section 60 notice. The Act also provides the basis for defining codes of practice (eg BS 5228: 2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise and Part 2: Vibration (BSI, 2014a, b)).

Environmental Protection Act 1990

14.2.4 The Environmental Protection Act 1990 sets out duties for local authorities to investigate and, where identified, take abatement action against noise nuisance. The Act provides the definition of BPM to minimise noise (including vibration), the basis for defence against noise abatement action taken by a local authority (Section 80). The Act additionally provides for individuals to pursue abatement action to be taken by a magistrate's court against noise nuisance (Section 82).

Civil Aviation Act 1982 and 2012

14.2.5 The Civil Aviation Act 1982 provides that no action for trespass or nuisance can be taken as long as an aircraft observes the provisions of any Air Navigation Order. It also grants the Government powers to introduce noise control measures at designated airports (Gatwick is a designated airport), for example night restrictions.

14.2.6 The Civil Aviation Act 2012 was introduced to modernise the regulatory framework for civil aviation in the United Kingdom. It sets out the legislative framework for the economic regulation of airports and the CAA and confers certain aviation security functions on the CAA.

The Environmental Noise (England) Regulations 2006

14.2.7 These regulations implement the EU Environmental Noise Directive (END) 2002/49/EC relating to the assessment and management of environmental noise. The regulations set out the requirement to undertake strategic noise mapping and implement Noise Action Plans on a five year basis, for agglomerations and major roads, railways and airports. Gatwick Airport produced its latest Noise Action Plan in 2019 covering the period 2019-2024 (Gatwick Airport Limited (GAL), 2019).

Regulation (EU) No 598/2014

14.2.8 Regulation (EU) No 598/2014 relates to the establishment of rules and procedures with regard to the introduction of noise-related operating restrictions at European Union airports within a 'balanced approach'. Following the departure of the UK from the European Union, Regulation (EU) No 598/2014 was adopted into UK law on 15 January 2021.

14.2.9 The aim of EU 598/2014 is to ensure that the International Civil Aviation Organization (ICAO) balanced approach (ICAO, 2008) is adopted for aircraft noise management at airports where a noise problem has been identified. Regulation EU 598/2014 requires a range of noise mitigation measures to be considered in accordance with the balanced approach, with a view to determining the most effective measure or combination of measures. The balanced approach consists of four main elements:

- noise at source;
- land use planning;
- operating procedures; and
- operating restrictions.

14.2.10 Regulation EU 598/2014 seeks to ensure that 'noise related operating restrictions' are only imposed when other measures within the balanced approach have first been considered, and where those other measures are not in themselves sufficient to attain the specific noise abatement objectives for the airport. Following this, if a noise based operating restriction is considered necessary, it can only be imposed after the 'cost effectiveness' of the restriction has been considered and if the measures together are no more than is necessary to achieve the environmental noise abatement objectives set for the airport. Appendix 14.9.2 gives further details.

Noise Insulation Regulations 1975

14.2.11 The Noise Insulation Regulations 1975 (as amended) apply to 'new' or 'altered' roads, and make provisions to carry out or give grants for noise insulation. Traffic noise changes on unaltered roads are not subject to the regulations. They also provide discretionary powers to provide noise insulation or temporary rehousing for construction of new or altered roads.

Planning Policy Context

National Policy Statements

14.2.12 The Airports National Policy Statement (NPS) (Department for Transport, 2018a), although primarily provided in relation to a new runway at Heathrow Airport, remains a relevant consideration for other applications for airport infrastructure in London and the south east of England.

14.2.13 The NPS for National Networks (Department for Transport, 2015)[1] sets out the need for development of road, rail and strategic rail freight interchange projects on the national networks and the policy against which decisions on major road and rail projects will be made. Table 14.2.1 provides a summary of the relevant requirements of these NPSs and how these are addressed within the PEIR.

Table 14.2.1: Summary of NPS Information Relevant to this Chapter

Summary of NPS requirement	How and where considered in the PEIR
Airports NPS	
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.'*	The noise assessment has had due regard to noise guidance within the NPSE and the NPPF, as discussed in the section below this table.
Paragraph 5.68 states that *'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.'	The noise assessment has had due regard to guidance as it echoes the NPSE. Mitigation measures have been developed to avoid significant adverse effects (eg noise insulation schemes). A wide range of mitigation measures will be used to minimise adverse effects and in accordance with the third objective, opportunities have been taken to reduce road traffic noise when designing the highway improvements. (see Section 14.8 and Appendix 14.9.2).
Paragraph 5.5.2 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 noise assessment should include the following:* ▪ A description of the noise sources;	The air traffic scenarios modelled are in accordance with this guidance (see Section 14.7). Table 14.7.1 lists the maximum design parameters and is followed by an explanation of the worst case noise assessment. The NSRs listed are all assessed. National Parks and Areas of Outstanding Natural Beauty (AONBs)

[1] It is noted that the Transport Decarbonisation Plan published by Department for Transport (DfT) on 14 July 2021 announced DfT's intention to review the NPS for National Networks in due course once demand patterns post-pandemic become clearer. It is understood DfT intends to commence the review by the end of 2021 and complete it by Spring 2023. In the interim and whilst the review is undertaken, DfT has confirmed the NPS for National Networks remains relevant government policy and has full force and effect for the purposes of the Planning Act 2008.

Summary of NPS requirement	How and where considered in the PEIR
▪ 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 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 DCO project, the latter during both the construction and operational phases of the DCO project; ▪ A prediction on how the noise environment will change with the proposed DCO 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. 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.'*	are assessed in Chapter 8: Landscape, Townscape and Visual Resources. Road traffic noise is assessed within this chapter and mitigation is recommended where appropriate. Construction noise is assessed in this chapter and mitigation is recommended where appropriate. Whilst the development of a third runway at Heathrow is contingent on major revisions to airspace in the south east of England, this Project is not. As such, the noise assessment is based on the flight paths required for the Project which are the flight paths currently flown.
Paragraph 5.53 first *states '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.'*	The assessment draws on various British Standards including BS 5228 (BSI, 2014a, b) for construction noise as described in Section 14.4.
Paragraph 5.53 goes on to state *'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 assessment of aircraft noise follows guidance for airspace change, see Section 14.4.
Para 5.52 states *'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'*. The Airports NPS further notes that: *'Precise flight path designs can only be defined at a later stage after detailed airspace design work has taken place. Once the design work has been completed, the airspace proposal will be subject to extensive consultation as part of the separate airspace decision making process established by the Civil Aviation Authority.'* (para 5.50).	Whilst the development of a third runway at Heathrow is contingent on major revisions to airspace in the south east of England, this Project is not. As such, the noise assessment is based on the flight paths required for the Project which are the flight paths currently flown.

Summary of NPS requirement	How and where considered in the PEIR
The Airports NPS also states that *'The noise mitigation measures should ensure the impact of aircraft noise is limited and, where possible, reduced compared to the 2013 baseline assessed by the Airports Commission.'* (para 5.58).	Reference is made to the 2013 baseline in the assessment of effects in Section 14.9.
Paragraphs 5.54-5.66 set out requirements relating to noise mitigation.	Mitigation measures included as part of the design of the Project are presented in Section 14.8.
NPS for National Networks	
In accordance with paragraph 4.7 of the Airports NPS, the NPS for National Networks is also relevant to surface access elements of the project. Of particular relevance to the assessment of road traffic noise is paragraph 5.189, which states: *'Where a development is subject to EIA and significant noise impacts are likely to arise from the proposed development, the applicant should include the following in the noise assessment, which should form part of the environment statement:* ▪ A description of the noise sources including likely usage in terms of number of movements, fleet mix and diurnal pattern. For any associated fixed structures, such as ventilation fans for tunnels, information about the noise sources including the identification of any distinctive tonal, impulsive or low frequency characteristics of the noise; ▪ Identification of noise sensitive premises and noise sensitive areas that may be affected; ▪ The characteristics of the existing noise environment; ▪ A prediction on how the noise environment will change with the proposed development; - In the shorter term such as during the construction period; - In the longer term during the operating life of the infrastructure; - At particular times of the day, evening and night as appropriate; ▪ An assessment of the effect of predicted changes in the noise environment on any noise sensitive premises and noise sensitive areas; ▪ Measures to be employed in mitigating the effects of noise; ▪ Applicants should consider using best available techniques to reduce noise impacts; and ▪ The nature and extent of the noise assessment should be proportionate to the likely noise impact.'	The traffic noise assessment meets these requirements (see Section 14.9). Impacts at night will be reported in the Environmental Statement.

National Planning Policy Framework, 2021

14.2.14 The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, 2021) provides the Government's policies to promote sustainable development and sets out that the purpose of the planning system is to contribute to the achievement of sustainable development. Sustainable development includes three dimensions: economic, social and environmental, and thus, when planning decisions are made, the process requires weighing the relative balance of these three factors.

14.2.15 The NPPF at paragraph 185 states the following, referring to the NPSE for further explanation:

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

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[2];

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and

c) limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.'

Noise Policy Statement for England (NPSE), 2010

14.2.16 In 2010, the NPSE (Defra, 2010) set out the long-term vision of the Government's noise policy to: *'Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development'.*

14.2.17 The aims of the policy are: *'Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*

1. Avoid significant adverse impacts on health and quality of life.

2. Mitigate and minimise adverse impacts on health and quality of life.

3. Where possible, contribute to the improvement of health and quality of life.'

14.2.18 To identify "*significant adverse*" and "*adverse*" impacts in line with the three aims of NPSE, the policy statement notes that there are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organization (WHO). They are:

[2] See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs (Defra), 2010).

- NOEL – No Observed Effect Level: this is the level below which no effect can be detected. In simple terms, below this level there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level: this is the level above which adverse effects on health and quality of life can be detected.

14.2.19 Extending these concepts for the purpose of the NPSE leads to the concept of a significant observed adverse effect level.

- SOAEL – Significant Observed Adverse Effect Level: this is the level above which significant adverse effects on health and quality of life occur.

14.2.20 The policy 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 adverse 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 adverse effects cannot occur.'*

14.2.21 The NPSE notes 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. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse 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'*.

Aviation Policy Framework, 2013

14.2.22 In 2013, the Aviation Policy Framework (Department for Transport, 2013) set out the framework for the management of noise at UK airports. It noted the role of the Government to set the overall national policy framework for aviation noise, and to use its powers under the Civil Aviation Act 1982 (as amended) to set noise controls at specific airports which it designates for noise management purposes (which includes Gatwick).

14.2.23 The Aviation Policy Framework notes that the Government fully recognises the ICAO Assembly 'balanced approach' principle to aircraft noise management. In addition, the overall aviation noise policy objective 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.'

14.2.24 This is consistent with the Government's noise policy, as set out in the NPSE.

Consultation Response on UK Airspace Policy: A Framework for Balanced Decisions on the Design and Use of Airspace, October 2017

14.2.25 In February 2017, the Department for Transport launched a consultation on airspace policy (Department for Transport, 2017a). The response to consultation was published in October 2017 (Department for Transport, 2017b) and reiterated the overall policy objective given in the Aviation Policy Framework, adding to it as follows:

'The government's overall policy on aviation noise is 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 between industry and communities in support of sustainable development.'

14.2.26 Following the Survey of Noise Attitudes (SONA) report (Civil Aviation Authority, 2014), the consultation response was able to give further guidance on LOAELs for aircraft noise as follows:

- 'The government acknowledges the evidence from recent research which shows that sensitivity to aircraft noise has increased, with the same percentage of people reporting to be highly annoyed at a level of 54 dB $L_{Aeq,\ 16\ hour}$ as occurred at 57 dB $L_{Aeq,\ 16\ hour}$ in the past. The research also showed that some adverse effects of annoyance can be seen to occur down to 51 dB L_{Aeq}.
- Taking account of this and other evidence on the link between exposure to noise from all sources and chronic health outcomes, we will adopt the risk based approach proposed in our consultation so that airspace decisions are made in line with the latest evidence and consistent with current guidance from the World Health Organization.
- So that the potential adverse effects of an airspace change can be properly assessed, for the purpose of informing decisions on airspace design and use, we will set a LOAEL at 51 dB $L_{Aeq,\ 16\ hour}$ for daytime, and based on feedback and further discussion with CAA we are making one minor change to the LOAEL night metric to be 45 dB $L_{Aeq,\ 8\ hour}$ rather than L_{night} to be consistent with the daytime metric. These metrics will ensure that the total adverse effects on people can be assessed and airspace options compared. They will also ensure airspace decisions are consistent with the objectives of the overall policy to avoid significant adverse impacts and minimise adverse impacts.'

14.2.27 Thus, the LOAELs for aircraft noise had been established as 51 dB $L_{Aeq\ 16\ hour}$ for daytime, and 45 dB $L_{Aeq,\ 8\ hour}$ for night-time.

14.2.28 The Government recognises that a small number of people may be annoyed below the LOAEL and sets out in the consultation that it would consider which additional metrics be used to inform on effects:

'5.43 As explained above, a small number of people may consider themselves adversely affected by aircraft noise at levels below the LOAEL. Reactions to recent airspace changes and trials have clearly indicated that increases in the number of aircraft that people are exposed to can be noticeable and can annoy individuals, even at a noise exposure below 51 dB $L_{Aeq,\ 16\ hour}$. We have therefore considered which additional metrics for assessing aviation noise could be included in our guidance.'

14.2.29 Subsequently in 2018, CAP 1616 *Airspace Design: Guidance on the Regulatory Process for Changing Airspace, Design including Community Engagement Requirements* was published and provides the methodology for assessing the noise effects of an airspace change using L_{eq} and WebTAG to quantify significant effects. The document was updated in 2021 (CAA, 2021). It defines a series of "secondary noise metrics" to assess adverse effects of noise including: number above contours, L_{max} contours, difference contours, and overflight contours (not a noise metric, but a secondary metric for the purposes of decision making). These are discussed in Section 14.4.

14.2.30 The consultation response also confirms the following from the Aviation Policy Framework:

- the Government continues to expect airport operators to offer assistance with the costs of moving households exposed to levels of noise of 69 dB $L_{Aeq, 16\ hour}$ or more;
- the Government also expects airport operators to offer acoustic insulation to noise sensitive buildings, such as schools and hospitals, exposed to levels of noise of 63 dB $L_{Aeq, 16\ hour}$ or more; and
- as a minimum, the Government would expect airport operators to offer financial assistance towards acoustic insulation to residential properties which experience an increase in noise of 3 dB or more which leaves them exposed to levels of noise of 63 dB $L_{Aeq, 16\ hour}$ or more.

Aviation 2050: The Future of UK Aviation, A Consultation, December 2018

14.2.31 The consultation period for Aviation 2050 closed in June 2019. The submitted consultation document (Department for Transport, 2018b) indicates the Government's views in developing the Aviation Strategy and seeks views on these. In paragraph 3.114, it acknowledges that noise may decrease or may increase:

'The government intends to put in place a stronger and clearer framework which addresses the weaknesses in current policy and ensures industry is sufficiently incentivised to reduce noise, or to put mitigation measures in place where reductions are not possible'.

14.2.32 The consultation goes on to discuss various proposed measures including setting noise caps as part of planning applications, lower noise levels and better standards for noise insulation, and the future role of the Independent Commission on Civil Aviation Noise to assist in enforcement etc. Section 14.8 discusses the proposed lower noise levels and how these have been adopted as a mitigation standard for this Project. The Aviation Strategy was due to be released at the end of 2019. It is likely that these proposals will be clarified as the Project progresses, in which case the assessment of air noise impacts from the Project will take account of the policy guidance at the time.

Independent Commission on Civil Aviation Noise (ICCAN)

14.2.33 The Independent Commission on Civil Aviation Noise (ICCAN) is a non-statutory advisory body, established in 2019 to act as the impartial expert adviser to Government and others on all matters relating to aviation noise. ICCAN published its first Corporate Strategy in Spring 2019 and in March 2021 published a new Corporate Strategy for 2021-2024 (ICCAN, 2021a). In its first two years ICCAN has consulted widely with stakeholders and commissioned a number of studies to help inform better noise management including:

- a summary of aviation noise's health effects (ICCAN, 2020a);
- a survey of people's experience of aviation noise during lockdown (ICCAN, 2020b);
- the future of aviation noise management ICCAN's emerging view (ICCAN, 2020c);
- best practice for engagement between airports and communities on aviation noise (ICCAN, 2020d); and
- a review of airport noise insulation schemes (ICCAN, 2021b).

14.2.34 ICCAN's Corporate Strategy proposes a varied work plan producing guidelines, supporting research, offering advice etc. It also proposes that ICCAN is given *statutory adviser* status within the next five years, with the power to:

- make recommendations to Government on the management and mitigation of aviation noise; and
- provide advice and guidance that must be considered by the Government, devolved administrations and delegated authorities on all aviation noise related issues. This could take the form of standardised, national guidance for airports and others to follow on a range of key issues, or it could be bespoke, ad hoc advice for stakeholders to consider on local challenges.

14.2.35 ICCAN has also recommended that it is becomes a statutory consultee on planning applications and airspace change proposals. The DfT is currently carrying out a review of ICCAN's performance. The Corporate Strategy assumes that statutory powers will not be granted within the next three years, and so lays out a work plan that is not dependent on those powers.

14.2.36 GAL has engaged with ICCAN since its formation, publicly through the Noise Management Board, and through regular direct communications. GAL would welcome ICCAN's views on the Northern Runway Project, in particular on the noise mitigation measures described in Section 14.8 which have been developed taking account of ICCAN's work to date.

WHO Environmental Noise Guidelines for the European Region

14.2.37 In October 2018, the WHO published its Environmental Noise Guidelines for the European Region (WHO, 2018). These guidelines cover external noise levels for specific noise sources, not mixed sources. The majority of people experiencing aircraft noise also experience other sources of noise, generally road traffic.

14.2.38 The WHO Community Noise Guidelines (WHO, 1999) general recommendations on non-specific noise and internal noise levels remain relevant. The 2018 Environmental Noise Guidelines use the same standardised EU noise metrics L_{den} (an annual average day, evening, night weighted L_{eq} level) and L_{night} (the annual average 8 hour night L_{eq}). Similarly, the guidance in the WHO Night Noise Guidelines (WHO, 2009) using other metrics is not superseded.

14.2.39 The 2018 Environmental Noise Guidelines are based on a detailed review of the literature from 1999 to 2015. In the case of aircraft noise, the scatter in the dose/response relationships is considerable, but a single dose response is offered for each health effect with associated target levels for aircraft noise in terms of the European annual average noise metrics L_{den} and L_{night}. However, in Section 5, Implementation of the Guidelines, the WHO note:

'Furthermore, cultural differences in what is considered annoying are significant, even within Europe. Therefore, it is not possible to determine the "exact value" of % HA [highly annoyed] for each exposure level in any generalized situation. Instead, data and exposure-response curves derived in a local context should be applied whenever possible to assess the specific relationship between noise and annoyance in a given particular situation.'

14.2.40 The SONA study assessed annoyance in the UK and reported in 2017, after the cut-off date for studies considered in the WHO report. The SONA study gives the local annoyance response relationship relevant to the UK. It shows, in the UK, about 7% of the population in 2014 was annoyed by aircraft noise at $L_{eq,\ 16\ hour}$ 51 dB, and the Department for Transport has adopted this as the LOAEL.

Recent Planning Cases and SOAEL

14.2.41 Government guidance, as summarised above, does not explicitly define SOAEL for aviation noise. However, a number of recent applications for airport development have considered this to ensure suitable mitigation is included to comply with the NPSE and NPPF requirement to 'avoid' significant adverse effects.

14.2.42 Since 2014 noise policy has been interpreted by, variously, the local planning authorities, public inquiry inspectors, the Mayor of London and the Secretary of State for Transport, in the following applications for new airport infrastructure:

- Birmingham International Airport Runway Extension, 2014;
- London City Airport Development Plan, 2015-2016;
- Cranford Agreement Secretary of State's Decision, February 2017 (DCLG, 2017);
- Stansted Airport Planning Appeal Decision, May 2021

14.2.43 In the Cranford case, the inspector noted *'the parties do not differ about the SOAEL for aircraft noise: it is 63dB $L_{Aeq,\ 16\ hour}$ (or its equivalent if other metrics are considered). Noise impacts at that level require to be avoided.'*

14.2.44 These planning decisions have been considered when developing the assessment criteria described in Section 14.4.

Local Planning Policy

14.2.45 Gatwick Airport lies within the administrative area of Crawley Borough Council and adjacent to the boundaries of Mole Valley District Council to the north west, Reigate and Banstead Borough Council to the north east and Horsham District Council to the south west. The administrative area of Tandridge District Council is located approximately 1.9 km to the east of Gatwick Airport, while Mid Sussex District Council lies approximately 2 km to the south east. Gatwick Airport is located in the county of West Sussex and immediately adjacent to the bordering county of Surrey.

14.2.46 The relevant local planning policies applicable to noise based on the extent of the study area for this assessment are summarised in Table 14.2.2.

Table 14.2.2: Local Planning Policy

Administrative Area	Plan	Policy
Adopted Policy		
Crawley	Crawley 2030: Crawley Borough Local Plan 2015-2030 (2015)	GAT1 Development of the Airport with a Single Runway
		ENV11 Development & Noise, and the Local Plan Noise Annex
Reigate and Banstead	Reigate and Banstead Local Plan: Core Strategy (2014)	CS10 Sustainable Development
		DES8 Construction Management

Administrative Area	Plan	Policy
	Reigate and Banstead Local Plan Development Management Plan (2019)	DES9 Pollution & Contaminated Land
Mole Valley	Mole Valley Core Strategy (2009)	CS 19 Sustainable Construction, Renewable Energy & Energy Conservation
	Mole Valley Local Plan (2000) (saved policies)	ENV22 General Development Control Criteria
Horsham	Horsham District Planning Framework (2015)	Policy 24 Environmental Protection
Tandridge	Tandridge District Core Strategy (2008)	CSP 16 Aviation Development
		CSP 18 Character & Design
	Tandridge Local Plan Part 2: Detailed Policies 2014-2029 (2014)	DP22 Minimising Contamination, Hazards & Pollution
Mid Sussex	Mid Sussex District Plan 2014-2031 (2018)	DP29 Noise, Air & Light Pollution
	Mid Sussex District Local Plan 2004 (saved policies)	B23: Noise Pollution
		CS22: Pollution
Emerging Policy		
Crawley	Draft Crawley Borough Local Plan 2021-2037 (2021)	SD1: Presumption in Favour of Sustainable Development
		EP4: Development and Noise and Local Plan Noise Annex (topic Paper 7)
		GAT2: Safeguarded Land
Tandridge	Our Local Plan 2033 (Regulation 22 Submission) (2019)	TLP45 Energy Efficient & Low Carbon Development
		TLP46 Pollution and Air Quality
Mole Valley	Future Mole Valley, 2018-2033, Consultation Draft Local Plan (2020)	Policy EN13: Promoting Environmental Quality
Horsham	Draft Horsham District Local Plan 2019-2036 (2020)	Policy 25 - Strategic Policy: Environmental Protection

14.3. Consultation and Engagement

14.3.1 In September 2019, GAL submitted a Scoping Report to the Planning Inspectorate. This described the scope and methodology for the technical studies being undertaken to provide an assessment of any likely significant effects and, where necessary, to determine suitable mitigation measures for the construction and operational phases of the Project. It also described those topics or sub-topics which are proposed to be scoped out of the EIA process and provided

justification as to why the Project would not have the potential to give rise to significant environmental effects in these areas.

14.3.2 Following consultation with the statutory bodies, the Planning Inspectorate (on behalf of the Secretary of State) provided a Scoping Opinion on 11 October 2019.

14.3.3 Key issues raised during the scoping process specific to the noise and vibration chapter are listed in Table 14.3.1 together with details of how these issues have been addressed within the PEIR.

Table 14.3.1: Summary of Scoping Responses

Details	How/where addressed in PEIR
Planning Inspectorate	
The Scoping Report attests that the "study area for noise and vibration effects…cannot be determined until noise levels resulting from the Project have been modelled". Therefore, the Inspectorate cannot agree that impacts to 'Quiet Areas' (as designated within Local Plans or Neighbourhood Development Plans or areas identified as Quiet Areas through the Environmental Noise (England) Regulations 2006)) can be scoped out of the ES. The assessment should assess impacts on these areas, where significant effects are likely to occur.	No designated Quiet Areas within the areas modelled have been identified. Overflights of areas valued for their landscape have been quantified for use in the landscape and visual impact assessment. See Sections 14.9 and 14.11.17.
The Applicant seeks to scope out consideration of APUs on the basis that previous ground noise studies and operational reports demonstrate that the need for APUs is rare (as ground power is generally available) and that the sound power of a taxiing jet aircraft exceeds that of an APU such that increases to the overall sound power (when APU noise is combined) are 'inconsequential'. The Inspectorate does not consider that the Applicant has provided sufficient information to justify scoping this matter out. The ES should assess impacts associated with noise from APUs where significant effects are likely to occur.	Noise from aircraft auxiliary power units (APUs) has been scoped into the assessment and is considered within Section 14.9.
The Scoping Report contains limited information with regards to potential sources of construction or operational vibration and the Inspectorate is therefore unable to scope this matter out. The ES should include an assessment of operational vibration, where likely significant effects could occur.	Given the separation of the construction worksites from neighbouring sensitive receptors, significant vibration effects from construction are generally unlikely. However, this conclusion regarding vibration from construction plant and construction traffic will be tested in the ES. In accordance with the May 2020 DMRB guidance (LA111) vibration during operation of the highway is not likely and can be scoped out. LA111 states that:

Details	How/where addressed in PEIR
	'*Operational vibration is scoped out of the assessment methodology as a maintained road surface will be free of irregularities as part of project design and under general maintenance, so operational vibration will not have the potential to lead to significant adverse effects'*. Ground vibration from sources within the airport are highly unlikely to be significant at receptors off site.
The Scoping Report provides very little information on the type and nature of road traffic and the junction designs necessary to support the statement that "vibration from operational road traffic…is expected to be below the scoping thresholds". Accordingly, the Inspectorate does not agree to scope this matter out. The Inspectorate considers that an assessment of vibration effects arising from construction vehicles on the existing road network should be provided as part of the ES, in line with the methodological approach established in the Design Manual for Roads and Bridges (DMRB). It is unclear whether the Applicant also proposes to scope out vibration from construction traffic, but for the avoidance of doubt, the Inspectorate's comments above apply equally in the context of construction traffic (noting the additional relevance of BS:5228 'Code of practice for noise and vibration control on construction and open sites' in this regard).	Vibration from construction plant and construction traffic is unlikely to give rise to significant effects. However, this conclusion will be tested further in the ES. As discussed above, in accordance with the May 2020 DMRB guidance vibration during operation of the highway can be scoped out.
The assessment should provide a clear description to distinguish between where "air noise" and "ground noise" begin and end. The description should have regards to the activities such as landing and taxiing planes. For example, once a plane lands and is off the runway, at what point does it become part of the "ground noise". Particular consideration will also need to be given to the provisions of the 'end around' taxiways and new holding spurs in this regard as they bring taxiing aircraft closer to existing sensitive receptors. The ground noise assessment should also be clear as to how other 'key components' of the project have been factored in (including substations, heating plant, engine testing and the north and south terminal extensions) in terms of any additional contributions over aircraft ground noise at sensitive receptors.	The distinction between air, ground, road and construction noise has been clarified (see Section 14.1). Ground noise includes all taxiway noise, including end around taxiways. Noise from engine testing has been assessed (see Section 14.9). Significant noise effects from the operation of substations, heating plant and other permanent fixed noise sources are not expected but will be assessed in the ES.
The Applicant explains that the project does require the routings of aircraft "close to the airport" to be changed, which would appear to contradict the later assertion that "any noise impacts of the Project	As further explained in Section 14.8 and Appendix 14.9.2, aircraft using the

Details	How/where addressed in PEIR
will be the result of increases in noise due to the increased number of flights on the northern runway, rather than new noise impacts over areas previously unaffected". The ES should assess the likely significant effects associated with these changes and assess effects on additional affected noise receptors. The ES should also assess the extent to which the Proposed Development would result in an increased capacity on the main runway (potentially) allowing for additional movements by larger, nosier aircraft which could generate further increases in noise on the main runway compared to current operation. The baseline and future baseline assumptions in terms of usage of the northern runway should also be clearly set out so as to understand the number of additional movements being modelled in predicting significance of effect.	altered northern runway would use the same flight paths as currently flown from the existing northern runway but displaced some 12 metres further to the north (equating to about a third of a wingspan of the average sized aircraft). The main and northern runway flight paths run parallel to each other maintaining the track of the respective extended runway centrelines. At the point that aircraft begin to turn to the north or south (between 5 and 16 km from the runway) the main and northern runway flight paths merge. Flights from both runways are included in the assessment, and the forecast allows for growth in operations of larger aircraft from the main runway. The numbers of movements are set out in the Table 14.7.1 in Section 14.7.
The Airports NPS states that the assessment of aircraft noise should be undertaken in accordance with the developing indicative airspace design, which may involve the use of appropriate design parameters and scenarios based on indicative flight paths. The ES should ensure that it presents an assessment of the realistic worse-case scenarios for the Proposed Development, including consideration of any airspace change implications for the noise assessment and the introduction of performance-based navigation. The assumed Air Traffic Movements (ATM) should be clearly stated for all assessment scenarios. Furthermore, a WebTAG analysis to value and compare the noise impact of these options should be provided consistent with the requirements of the Air Navigation Guidance 2017 (as cited by the Applicant at 7.14.7 of the Scoping Report). When considering the introduction of quieter aircraft each year against growth in ATMs, the ES should clearly identify the worst case scenarios in terms of noise effects (against CAA's latest estimates as set out at paragraph 7.8.30 of the Scoping Report).	Whilst the development of a third runway at Heathrow is contingent on major revisions to airspace in the south east of England, this Project is not. It is not currently possible to consider in detail the airspace change that will be required for a third runway at Heathrow because the design of that airspace is being developed separately to a different programme. As such, the noise assessment is based in the flight paths required for the Project which are the flight paths currently flown. As above, air traffic forecasts are provided in Section 14.7. Appendix 14.9.2 provides the WebTAG assessment. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will transition based on assumptions around airlines' fleet procurement programmes and business models. The 'central case' used in the noise assessment is based on what

Details	How/where addressed in PEIR
	is considered today to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to the global pandemic and the financial impact on the airlines. Therefore, noise modelling has also been carried out for a 'slower transition fleet' based on ATM forecasts in which the rate of fleet transition is delayed by about five years and which would result in higher noise levels than the central case. A sensitivity analysis was carried out that concluded 2032 would be the year of greatest noise impacts, as explained in Section 14.7.
The Applicant explains that the baseline for the air noise assessment will be the 2018 summer season. There is also reference to Gatwick Airport Noise and Track Keeping (NTK) sites being "live with others at various stages of planning and installation". Reference is then made to additional baseline noise level measurements were conducted in August 2016 at locations shown in Figure 7.8.1. 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. The methodology used for the baseline noise surveys should be described in the ES and/or accompanying technical appendices. The Inspectorate recognises the importance of establishing an accurate and current baseline in order to determine the need for noise mitigation measures. The ES should demonstrate regard to the Airports NPS in this respect.	Baseline survey details are provided in Section 14.6. Baseline conditions have informed the development of mitigation, taking into account the requirements of the Airports NPS.
The Inspectorate notes the study area for the aircraft noise assessment is yet to be defined. The Inspectorate considers that the study area should include receptors beneath flight paths within the High Weald AONB, Surrey Hills AONB, Kent Downs AONB and South Downs National Park, including the potential for cumulative noise impacts with other development (including airports). This should also extend to the consideration of noise effects at heritage sites and historic parks and gardens that may be subject to adverse noise effects. Paragraphs 7.2.9 and 7.8.28 explain that the Applicant intends to consider such matters as part of the LVIA chapter, but the noise	Overflight analysis for landscape and visual and heritage assessments has been included up to 35 miles from the airport (see Sections 14.9 and 14.11.17).

Details	How/where addressed in PEIR
chapter should assess the potential for interrelated effects in this regard.	
The definition of the study area for the noise assessment should also assess noise effects of the Proposed Development on future residential amenity of existing allocations under the relevant local plan proposals where significant effects are likely to occur (with reference to the study area as informed by the noise modelling results).	An assessment of noise impacts on committed residential areas is provided in Section 14.11.17.
There is no reference to any consideration of noise sensitive ecological receptors in addition to human receptors. The ES should clearly identify the sensitive receptors considered in the impact assessment and include cross-referencing between aspect chapters, as appropriate.	There are no species that have been identified as specifically sensitive to noise in the study area.
Reference is made to the assessment years of 2026, 2029 and 2038. The ES should explain and assess the “maximum effect” in terms of noise generation which may not coincide precisely with the assessment years presented in the Scoping Report.	As explained elsewhere the runway opening date is now 2029 and noise is assessed in 2029, 2032, 2038 and 2047. An explanation as to why 2032 is the year of maximum effect is provided in Section 14.7.
NOEL, LOAEL and SOAEL are not defined in the main body of the Scoping Report in terms of the approach to the assessment, and no definition is provided anywhere in the Scoping Report for an Unacceptable Adverse Effect Level (UEAL). The ES should use and define these for the purposes of the assessment in line with the requirements of the NPSE. The Applicant has acknowledged the World Health Organization (Environmental Noise Guidelines for the European Region (2018)) at paragraph 7.8.2 of the Scoping Report. The Inspectorate notes that this publication recommends adverse effects from aircraft noise can begin at lower levels than the corresponding figures in The Environmental Noise (England) Regulations 2006. The Applicant should specifically address how this and other relevant guidance has been factored in to the defined NOEL, LOAEL, SOEAL and UEALs.	LOAELs and SOAELs for air, ground, traffic and construction noise are described in Section 14.4 based on national guidance including government guidance that takes account of WHO guidance since the NPSE was published in 2010. NOELs are referred to in the NPSE, but since only effects above the LOAEL require mitigation, a NOEL standard is not required for EIA purposes. UAELs are not mentioned in the NPSE. The Gatwick modelling shows zero population counts for air noise contours above the Heathrow UAELs $L_{eq,\ 16\ hour}$ 71 dB and $L_{eq,\ 8\ hour}$ 66 dB (Heathrow UAELs used as a reference point).
The ES should factor in relevant assumptions in relation to aborted landings based on actual statistics held by the Applicant. The Inspectorate considers that where the number of arrivals increase then the number of aborted landings will increase proportionally which could cause a higher than normal level of effect on noise	Aborted landings result in ‘go-arounds’, the standard procedure that occurs when an arriving aircraft aborts landing during the final stages of approach. They occur most often as a result of a departing aircraft or preceding arriving aircraft not

Details	How/where addressed in PEIR
sensitive receptors due to the low altitude and displaced location of the aircraft.	fully vacating the runway ahead of a landing aircraft. On these occasions the pilot takes averting action under a defined standard missed approach procedure. On westerly operations, typically these aircraft abort landing at low level, climb to 3,000 feet and loop round over Crawley to make a fresh approach to the runway. However, the CAA do not model noise from go-arounds at UK airports because their effect on the resultant noise contours is not significant. In the busy summer season in 2019 there were approximately three go-arounds each day. 85% of these occurred within the 16 hour day and evening period, with 15% at night (23:00-07:00 hours). The Project includes 8 new exit/entrance taxiways, plus the end around taxiways and has been designed so that the numbers of go-arounds do not significantly increase. As such, noise disturbance from go-arounds is not expected to increase.
The Inspectorate understands that future growth on a single runway operation will be achieved by 'peak spreading' as set out in section 4.5 of the Scoping Report and that this is also the case for the dual-runway operation (off peak periods are expected to experience a greater increase in ATMs than peak periods (paragraph 4.5.1, and as shown on diagram 4.5.1 of the Scoping Report). As such, although the summer months may still represent peak activity, the magnitude of change as a result of the Proposed Development is greater outside of these peak periods. Therefore, the ES should clearly set out how the use of the 'summer contours' accounts for the full impact of 'peak spreading'. The assessment should also include Lden and Lnight contours (in line with the Air Navigation Guidance 2017, CAP1616, and the Airports Commission noise 'scorecard') that are based on flights year round (therefore also accounting for flights outside the busy summer period).	Diagram 4.5.1 of the Scoping Report related to growth in air traffic without the Project and indicated clearly that the highest numbers of flights would continue to occur in the months of June to September (20% above winter months) as captured by the Leq noise modelling period from 16 June to 15 September. This is confirmed by current forecasts (see Chapter 4: Existing Site and Operation). Annual L_{den} and L_{night} contours are provided for baseline and with Project conditions in Section 14.6 and 14.9 to illustrate noise changes over the whole year including the winter months.
Paragraphs 7.8.31-44 do not specifically outline the approach in relation to construction noise, other than a brief statement in	The approach to assessment is set out in Section 14.4, with the assessment of

Details	How/where addressed in PEIR
paragraph 7.8.44 that effects of construction noise will be predicted and assessed using BS 5228. Assumptions around noise generating constriction activities and plant should be clearly presented in the ES to support understanding of the modelled assessment years and scenarios. The construction noise assessment should include criteria for the assessment of noise effects during weekends and night-time hours where such works are proposed or not otherwise restricted. In particular paragraph 5.3.18 of the Scoping Report explains that much of the construction work will take place overnight to reduce impact on the operation of the airport, and access roads. The outline CoCP should detail specific mitigation measures to address effects from such works where significant effects are likely. Impacts associated with the potential increased use of Crawley Goods Yard during the construction phase should be addressed as part of the assessment as such activities may also occur overnight.	construction noise and vibration provided in Section 14.9.
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. The ES should also include an assessment of groundborne noise from increased rail movements associated with the Proposed Development and any other relevant sources.	Noise emissions from fixed operational facilities are not expected to cause significant effects and will be assessed in the ES. Groundborne noise is not understood to be an issue for the railways around Gatwick and is not proposed to be assessed in the ES.
The peak period of construction traffic flows used to inform the assessment should be explained with reference to the schedule of construction activity. Given the spatial extent of the works, the assessment should also consider whether peak periods of activity may vary by receptor or groups of receptors. Table 5.4.1 of the Scoping Report explains that the construction of the Proposed Development is due to commence in 2022 with completion of the work between 2028-2034, thereby a construction phase of up to 12 years. The approach to the assessment of construction traffic should therefore ensure that it is suitably representative of such a duration. Paragraph 7.8.44 also states that “the assessment of construction traffic noise will be based on a period of peak traffic flow” whereas paragraphs 5.3.17 – 5.3.18 imply that the construction will be scheduled at night to minimise disruption (ie outside of peak traffic flows). The ES should define the worst case scenario in this respect or present both peak construction activity and peak traffic flow scenarios as part of the assessment of effects.	Two periods of peak construction traffic will be assessed in the ES. Construction noise has been modelled from the largest teams of plant expected to carry out the all the main works and assessed cumulatively as a worst case at this stage. The assessment will be updated when the construction programme is further refined for the ES. See Appendix 14.9.1.

Details	How/where addressed in PEIR
ES should explain how the Proposed Development interacts with the existing Noise Insulation Scheme prepared in accordance with the Noise Action Plan 2019-2024. If the assessment establishes that the action plan needs to be "enhanced as part of a package of noise mitigation measures" in order to mitigate adverse effects of the Proposed Development then the ES should explain how this will be achieved. The full package of potential mitigation measures will need to be presented as part of the ES and options explained in terms of a mitigation hierarchy as the Inspectorate considers noise insulation to be a 'last resort'. Where noise insulation is proposed, the ES should describe what forms of ventilation are proposed eg acoustic louvres and/or mechanical ventilation. The Inspectorate notes that there is no reference to a defined 'noise envelope' as referred to in paragraph 5.60 of the Airports NPS, and the Applicant should make efforts to agree the need for such provisions with relevant consultation bodies as a mechanism to manage noise effects.	A full package of mitigation is proposed, including a noise envelope (see Section 14.8).

14.3.4 Key issues raised during consultation and engagement with interested parties specific to the noise and vibration chapter are listed in Table 14.3.2, together with details of how these issues have been addressed within the PEIR.

Table 14.3.2: Summary of Consultation

Consultee	Date	Details	How/where addressed in PEIR
Crawley Borough Council, Mid Sussex District Council, West Sussex District Council, Reigate and Banstead District Council, Mole Valley District Council, Horsham District, Council Surrey County Council, East Sussex County Council and Kent County Council.	29/08/2019	DCO Project Local Authority Noise Topic Working Group stakeholder meeting. Noise assessment methodology.	Assessment methodology has taken into account comments raised, where appropriate, see Section 14.4.
	05/02/2020, 10/08/2021	DCO Project Local Authority Noise Topic Working Group stakeholder meetings. Noise assessment emerging results.	Assessment methodology was discussed resulting in clarifications in Section 14.4. Further detail of noise mitigation from construction, the Noise Insulation Scheme (NIS) and proposed noise envelope was requested and is added to Section 14.8. Appendix 14.9.5 has been prepared to describe

Consultee	Date	Details	How/where addressed in PEIR
			the proposed noise envelope in more detail.
CAA	07/05/2021	Meeting to discuss air noise assessment methodology	As reported in Section 14.4, various aspects of the noise assessment were discussed and agreed including the choice of noise metrics, the estimation of overflights and application of the DfT WebTAG workbook.

14.4. Assessment Methodology

Relevant Guidance

14.4.1 Section 14.2 provides a brief summary of the most recent policy that has informed the methodology (described later in this section) used to quantify and assess noise. Details of relevant guidance documents are provided in this section. A glossary of the acoustics terms and metrics used in this section is provided in Section 14.15.

British Standard Institution BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014a, b)

14.4.2 BS5228 provides a method for predicting noise levels, including a database of plant noise sound power levels, and a description of calculation procedures to enable noise to be predicted at NSRs. It also provides guidance on controlling construction noise and methods with which it can be assessed. The 'ABC' assessment method defines three thresholds, which can be used to determine when construction noise would cause significant noise effects. The appropriate threshold is selected on the basis of existing noise levels as set out in later in this section.

CAP 1616 Airspace Design: Guidance on the Regulatory Process for Changing Airspace Design including Community Engagement Requirements, fourth edition (CAA, 2021)

14.4.3 Government has been developing aviation policy, and hence aviation noise policy, since the completion of the Airports Commission work in 2015 (Airports Commission, 2015) because the industry is growing and, as confirmed in the Airports NPS (Department for Transport, 2018a), major changes are planned. In particular, a new runway at Heathrow is supported, maximising the use of existing infrastructure is promoted and a future aviation strategy is being developed to modify UK airspace. Some of these projects would bring about changes to flight paths which would be regulated and assessed separately under the CAA's airspace change process. CAP 1616 describes the requirements for airspace change and its Appendix B *Environmental Metrics and Assessment Requirements* includes guidance on noise assessment processes and metrics. The noise metrics used to assess the Project take account of this guidance as discussed later in this section. However, it is important when considering the noise impacts of the Project to note that the Project does not require the routings of aircraft to or from the airport to be changed, but rather increases the numbers of flights on existing routes, as discussed below.

14.4.4 The existing northern runway centreline is located some 198 metres north of the main runway centreline. The Project would increase the difference between the two runway centrelines by 12 metres. The existing northern runway is currently only used when the main runway is unavailable; for example, due to maintenance work at night. In the 2019 summer season (16 June to 15 September), the northern runway was used by 1,292 flights. The Project would make alterations to the existing northern runway, resulting in increased use of this runway using the same flight paths offset 12 metres to the north. The smaller ICAO 'Code C' aircraft (ie <36 metre wingspan (not larger types, eg B787 and A350)) would use the northern runway. Given the close proximity between the existing and proposed runway centrelines, and the fact that the existing northern runway is already in regular (if limited) use, any noise impacts of the Project would not be over areas currently unaffected by noise from Gatwick. This would therefore avoid most of the noise impacts often associated with new flight paths which are routed over areas not previously overflown. Nonetheless, the noise metrics recommended in CAP 1616 have been adopted where appropriate, as discussed within the Assessment Criteria and Assignment of Significance sub-section of this section.

BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

14.4.5 BS 4142:2014+A1:2019 (BSI, 2019) defines the significance of noise effects, as rating levels, relative to background sound levels. The effect of an industrial development is described as:

- significant adverse, when the operational noise levels are 10 dB or greater above the measured background sound level, depending on context;
- adverse, when the operational noise levels are around 5 dB above the measured background sound level, depending on context; and
- low, where the rating level does not exceed the background sound level, depending on context.

14.4.6 In addition to the assessment against background sound levels, it is stated that *'where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background'.*

DMRB – Design Manual for Roads and Bridges

14.4.7 DMRB Volume 11, Section 3, Part 7 (LA111 – Noise and Vibration, Revision 2) (Highways England *et al.,* 2020) is published by Highways England and sets out requirements for the assessment and reporting of noise and vibration impacts for highways schemes. The guidance was updated in November 2019 and May 2020 with the intention of describing a proportionate approach to environmental assessment for highways, taking into account best practice and compliance with current relevant legislation.

14.4.8 The scope of analysis includes noise related to construction, vibration related to construction, and noise related to operation. The guidance states that operational noise assessments are required if the Project meets specific criteria involving expected increases in noise levels, proximity to sensitive receptors, and stakeholder expectations.

14.4.9 Predicted changes in operational noise are considered, together with comparisons of predicted noise levels to SOAEL and LOAEL thresholds. Methods for assessing the magnitude of impacts

and significance of effects are provided. Criteria for construction noise and vibration are also provided.

Scope of the Assessment

14.4.10 The scope of this PEIR has been developed in consultation with relevant statutory and non-statutory consultees and is detailed in Table 14.3.1 and Table 14.3.2.

14.4.11 The assessment of noise and vibration considers the likely significant effects arising from the construction and operation of the Project on:

- people, primarily where they live ('residential receptors') on an individual dwelling basis and on a community basis, including any shared community open areas;
- community facilities such as schools, hospitals, places of worship, community buildings; and
- commercial properties such as offices and hotels, collectively described as 'non-residential receptors.

14.4.12 Impacts may be adverse from increased noise, or beneficial from decreased noise, and may arise in the vicinity of the Project site or, in the case of traffic, in locations remote from the Project site.

14.4.13 Taking into account the scoping and consultation process, Table 14.4.1 summarises the issues considered as part of this assessment.

Table 14.4.1: Issues Considered within the Assessment

Activity	Potential Effects
Construction Phase (including Demolition): Noise and Vibration	
Construction and demolition activities, including upgraded highway junctions and use of construction compounds	Construction noise and vibration.
	Traffic noise.
	Construction traffic vibration.
Operational Phase: Noise and Vibration	
Use of airport, including upgraded highway junctions	Aircraft noise (air noise).
	Ground noise (aircraft on the ground, eg aircraft manoeuvring, engine ground running).
	Noise emissions from airport operations/plant (not aircraft).
	Traffic noise – upgraded highway systems, increased usage of airport and highway junctions. Traffic noise changes on existing roads not physically changed by the Project.

14.4.14 Effects which are not considered likely to be significant have been scoped out of further assessment. A summary of the effects scoped out is presented in Table 14.4.2.

Table 14.4.2: Issues Scoped Out of the Assessment

Issue	Justification
Designated 'Quiet Areas'	No 'Quiet Areas' designated within Local Plans or Neighbourhood Development Plans as Local Green Spaces or areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations 2006 have been identified within the study area that could be affected by the Project. No impact pathway has been identified and, therefore, consideration of Quiet Areas has been scoped out of the assessment process.
Groundborne noise from railways	Groundborne noise is not understood to be an issue for the railways around Gatwick and has been scoped out of the EIA process.
Groundborne vibration from traffic	Operational vibration from traffic has been scoped out of the assessment methodology as a maintained road surface would be free of irregularities as part of design and under general maintenance, so operational vibration would not have the potential to lead to significant adverse effects, as confirmed in the most recent DMRB guidance.

Study Area

14.4.15 The study area for noise and vibration effects includes all receptors that may experience potential adverse impacts. For example, for some air noise metrics, this area extends more than 20 km from the airport and overflights are considered beyond this. Whereas for ground noise, the nearest receptors around the airport have been assessed, as at greater distances, the impacts would be lower. This approach has ensured that the most critical receptors have been considered.

14.4.16 The road traffic noise assessment study area for the Project was identified through modelling to understand which NSRs could potentially experience significant adverse effects. The modelled study area includes all roads that are anticipated to experience a change in road traffic noise from the Project, or where their position would be changed and could give rise to changes in noise levels at nearby properties. It does not include roads south of the airport's South Terminal, where traffic changes are not expected to result in significant noise changes.

14.4.17 Road links outside of the modelled study area have been assessed using a comparison of traffic flows to identify whether or not any significant changes in noise could be identified due to the Project.

Methodology for Baseline Studies

Desk Study

14.4.18 Aircraft ground noise predictions were undertaken for the current baseline situation for comparison with the results of the baseline noise level measurements. The source sound power level data for the aircraft taxiing around the airport were reviewed to ensure that appropriate assumptions were made in the modelling. Details of a literature review and study into relevant research are provided in Appendix 14.9.3 where the methodology is also discussed for obtaining up to date source sound power level data.

14.4.19 The air noise baseline for 2019 has been modelled by the CAA's Environmental Research and Consultancy Department (ERCD) using their ANCON noise model, which is validated each year

based on noise and flight track data collected by the Gatwick Noise and Track Keeping (NTK) system. In recent years, 32 locations have been used with typically eight in use at any one time. In April 2019, the system was upgraded to improve functionality and ease of access for the public online. In December 2020 the following 23 sites were live with others at various stages of planning and installation: Rusper, Russ Hill, Orltons, Oaklands Farm, Faygate, South Holmwood, Newdigate, Charlwood, Ifold, Alfold, Slinfold, Ruckmans, Kingsfold (all to the west), Moat House, Bellwood (Burstow), Outwood, Lingfield, Cowden, Hever Castle, Chiddingstone, Withyham (Crowborough) and Rusthall (all to the east) and Slinfold (to the north). The NTK data are used by GAL to respond to complaints, and to engage with the public over noise and track performance.

Site-Specific Surveys

14.4.20 For the ground noise assessment, baseline noise level measurements were conducted in August 2016 at 16 locations, 12 of which are considered to be relevant to the Project (see Figure 14.4.1). Measurements were conducted continuously over a two week period. Overall baseline noise levels are not likely to have changed significantly between mid-2016 and spring 2020 when the Covid pandemic began.

14.4.21 On-airport (airside) noise measurements to verify taxi noise levels were carried out in March and April 2019. The results of these measurements were used to determine more up to date source noise data to improve the accuracy of the modelling and to allow next generation aircraft to be taken into account within the changing fleet. See Appendix 14.9.3 for more details.

14.4.22 For road traffic noise, baseline conditions were modelled using the Predictor noise model. Calibration surveys were carried out in the Riverside Garden Park in May 2019 (see Appendix 14.9.4). For construction noise, the ground noise baseline survey results have been used, as similar areas and receptors are likely to be affected.

Assessment Criteria and Assignment of Significance

Methodology for Identifying Significant Effects

Overview

14.4.23 This section sets out the approach to identifying the significance of noise effects, beneficial and adverse, that are likely to arise from the Project. The methodology uses the following overarching concepts, explained in this section, as follows:

- significant effects, adverse and beneficial (due to noise levels and noise change resulting from the Project), including effects on health and quality of life;
- combined noise effects (due to the various Project noise sources); and
- cumulative noise effects (due to noise from the Project together with other proposed developments).

Effects on Health and Quality of Life

14.4.24 As described in 14.2, the Airports NPS (paragraph 5.68) states that: ‘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.'

14.4.25 The approach to assessing noise effects from the Project therefore firstly identifies the potential for significant adverse effects on health and quality of life that may arise where noise at a receptor newly exceeds the SOAEL, and it identifies mitigation measures to avoid these. Secondly, the assessment identifies adverse effects that may arise above the LOAEL but below the SOAEL and identifies mitigation measures to minimise these as far as practicable. Thirdly, opportunities to reduce noise levels from the base case so as to improve health and quality of life have been explored.

Environmental Significant Effects

14.4.26 In addition to effects that exceed the SOAEL and result in significant adverse impacts on health and quality of life from noise that should be avoided, other likely significant environmental noise effects have been identified.

14.4.27 In line with the Airports NPS and the NPSE, the above approach is adopted for construction noise, air noise, ground noise, and road traffic noise, as explained in the following four sections. For each of the four types of noise, LOAELs and SOAELs are identified, and additional factors are described that inform the likely significance of an environmental effect, including effects where the noise level would be between the LOAEL and the SOAEL or where there would be a change in noise level. Methods used to predict levels are also summarised and metrics used to describe noise levels are also explained.

14.4.28 This PEIR chapter presents the preliminary findings of the assessment. As such, the conclusions presented here are preliminary and may be refined by further work throughout the EIA process and reported in the ES following consultation. Consequently, the assessment method may also develop further from that used in the PEIR. For example, consultation may reveal noise or vibration sensitive receptors with particular sensitivities requiring specific attention.

Combined Effects

14.4.29 Combined effects are those arising from the combination of different types of noise arising from the Project. As there is no reliable means of quantitatively assessing the overall noise effect resulting from different noise sources, this PEIR considers the overall effect of noise from combined sources qualitatively. This approach will also be used within the ES. Section 14.11 considers potential combined effects due to various types of noise.

Cumulative Effects

14.4.30 Cumulative effects that may arise as a result of the Project, when considered together with other proposed developments are considered in Section 14.11.

Inter-Related Effects

14.4.31 Section 14.11.17 provides noise impact information for the assessment of inter-related effects from noise, landscape and visual, historic environment and ecological/biodiversity impacts. The methodology used to assess effects on landscape, townscape and visually sensitive receptors, on receptors of historic importance and on ecological receptors is described in Chapters 7, 8, and 9 of this PEIR.

Construction Noise

Metrics

14.4.32 Construction noise has been assessed using BS5228-1:2009+A1:2014 (Code of practice for noise and vibration control on construction and open sites – noise) (BSI, 2014a). The metric used for construction noise assessment is the L_{Aeq}.

Noise Criteria

14.4.33 Construction noise has been assessed with reference to the 'ABC method' described in BS5228-1:2009+A1:2014. The ABC method defines the thresholds at building facades on the basis of existing noise levels as set out in Table 14.4.3.

14.4.34 Where the forecast construction noise exceeds the relevant threshold, this is an indicator of a potentially significant effect, ie where the level of impact is sufficient that it may lead to a likely significant effect once other aspects are considered.

14.4.35 For daytime, the widely used threshold of 75 dB L_{Aeq} (category C) being exceeded for one month or more has been taken to be the SOAEL for construction noise. The threshold was originally set to avoid interference with normal speech indoors, with windows closed (Wilson, 1963). The daytime SOAEL and the corresponding SOAELs for the evening and night periods (shown in Table 14.4.3) indicate likely significant effects on heath and quality of life at a receptor, assuming construction noise is dominant and of sufficient duration, as discussed below.

14.4.36 Also shown are the category A and B noise criteria, which are applied as the LOAEL assessment criteria from BS 5228 depending on the existing noise levels, as noted in Table 14.4.3.

Table 14.4.3: Airborne Sound from Construction – Impact Criteria at Residential Receptors (construction noise only)

Period	Assessment Category dB $L_{Aeq, T}$		
	A (LOAEL)	B (LOAEL)	C (SOAEL)
Day: T=12hr, Weekdays, 07:00-19:00, T=6hr, Saturday, 07:00-13:00	>65	>70	>75
Evenings and weekends: T=1hr, Weekdays 19:00–23:00, Saturdays 13:00-23:00, Sundays 07:00-23:00	>55	>60	>65
Night: T=1hr, Every day 23:00-06:00	>45	>50	>55

Notes:
All sound levels are defined at the façade of the receptor.
Assessment Category A: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are less than these values.
Assessment Category B: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are the same as category A values.
Assessment Category C: impact criteria to use when baseline ambient sound levels (rounded to the nearest 5 dB) are higher than category A values.

Significance of Effects

14.4.37 When predicted noise levels are above LOAEL thresholds, but below the SOAEL, other factors have been taken into account in determining whether the effect could be significant, such as the

number of people affected, and the duration of the activity causing the noise impact in determining the significance of the noise effects.

14.4.38 Taking account of these and considering any additional factors, the following ratings have been used to describe the significance of the predicted noise effects.

- **Negligible**: Below LOAEL or of short duration <1 month.
- **Minor**: Below SOAEL but above LOAEL with low noise exceedances (1-2 dB) or affecting low population size.
- **Moderate**: Above LOAEL with noise exceedances (>2 dB), or affecting high population size, but at levels not at SOAEL.
- **Major**: Above SOAEL, or above LOAEL affecting high population size.
- **Substantial**: Above SOAEL affecting high population size.

14.4.39 For the purposes of this assessment, effects of moderate significance and above are considered significant in terms of the EIA Regulations.

Air Noise

Air Noise Modelling

14.4.40 Air noise has been modelled using the CAA's ANCON v2.4 model, as used to produce Gatwick's noise exposure contours annually, and validated for Gatwick on an annual basis. The summer season contours for 2019 form the baseline, as reported below. Air traffic has been modelled for the four operational forecast years as described elsewhere in this report: 2029, 2032, 2038 and 2047. For the 2029, 2032, 2038 and 2047 scenarios, base case (do-minimum) and with Project noise modelling has been undertaken to allow comparisons between with and without Project cases in these years.

14.4.41 The basis of these models is the 2019 ANCON model. For current aircraft types, ANCON uses source noise levels, climb rates and dispersion within Noise Preferential Routes (NPRs) based on those measured in the NTK system at Gatwick. Noise emission levels from future aircraft types have been taken from the CAA's latest estimates and reported in the noise assessment, along with all other relevant input data. Further details are provided in Appendix 14.9.2. The noise modelling of all future cases, ie 2029, 2032, 2038 and 2047, is based on forecasts of air traffic movements and fleets expected to operate, so is unavoidably approximate albeit based on best available information at this stage. At the current time, as the aviation industry has been impacted by the Covid pandemic, there is some uncertainty as to how airlines will invest in new quieter aircraft in the future. To address this uncertainty a range of future fleets have been considered in the air noise modelling. The 'central case' fleet represents the transition envisaged from current generation to next generation, quieter, aircraft. The 'slower transition fleet' case represents a delayed transition leading to higher noise levels in the future, in both the future baseline and Project cases. Section 14.5 and Appendix 14.9.5 provide further details.

Primary and Secondary Noise Metrics

14.4.42 The following noise metrics are used to assess air noise in accordance with CAP 1616 (CAA, 2018).

14.4.43 Primary Noise Metrics:

- $L_{eq,\ 16\ hour}$ day 51 to 72 dB; and

- $L_{eq, 8\ hour}$ night 45 to 72 dB.

14.4.44 Secondary Noise Metrics:

- N65 day 20, 50, 100, 200, 500; and
- N60 night 10, 20, 50, 100.

14.4.45 N65 day refers to the number of aircraft during an average summer day above L_{max} 65 dB, while N60 night refers to the number of aircraft during an average summer night above L_{max} 60 dB. Thus, for example, an N65 day 20 contour plots the locations at which twenty noise events above L_{max} 65 dB occur on an average summer day.

14.4.46 Secondary Non-Noise Metric:

- Overflight (<7,000 feet) >48.5 degrees to the horizontal[3] (see Appendix 14.9.2 Section 3).

14.4.47 Flight paths above 7,000 feet would not be affected by the Project.

14.4.48 These noise metrics relate to the 92 day summer period from 16 June to 15 September, as used conventionally in the UK because it represents the busiest, and hence noisiest, season. A description of the noise metrics is presented in the glossary at Section 14.15.

14.4.49 $L_{eq, 16\ hour}$ day and $L_{eq, 8\ hour}$ night have been used as the primary metrics to quantify impacts in terms of the areas and population within the various 3 dB noise contour bands in the ranges above. Noise difference contours have also been used to show areas where noise levels are expected to increase and decrease.

14.4.50 In addition annual average L_{den} and L_{night} noise contours have been produced to illustrate the changes in noise levels averaged over the whole year.

Lmax Levels at Representative Community Locations

14.4.51 In addition to noise contours, more detail has been provided on the changes to be expected at a selection of specific locations that represent communities most affected:

- Rusper Primary School
- Charlwood Village Infant School
- Lingfield Primary School
- Chiddingstone Church of England School
- Capel Pre School
- Willow Tree Pre-school, Ifield; and
- Barnfield Care Home, Horley.

14.4.52 At these seven Community Representative Locations, the changes in noise to be expected as a result of the Project have been described in terms of changes in day and night noise levels ($L_{eq, 16\ hour}$ day and $L_{eq, 8\ hour}$ night), and in terms of numbers of aircraft above the day L_{max} 65 dB and night L_{max} 60 dB levels, for easterly and westerly operations. This is to provide greater detail as to the noise changes that affected communities can expect in terms of peak noise levels as well as accumulated noise levels.

[3] As defined in CAP 1498 Definition of Overflight (CAA 2017).

14.4.53 In addition to assessing impacts on residential properties, and those receptors listed above, air noise has been modelled and assessed at schools, hospitals, community buildings and places of worship.

Lmax Contours

14.4.54 The noise modelling assumes aircraft would fly along already used flight paths. Flight paths to and from the main runway would not be affected. Only departures would routinely use the northern runway (other than during maintenance of the main runway when arrivals and departures may use it as is the case now). These would fly straight ahead until they turn onto the relevant Standard Instrument Departure (SID) Route within the Noise Preferential Route generally 5 to 16 km from the end of the runway. These flight paths would be 210 metres north of the equivalent flight paths from the main runway. Thus, areas to the north of the existing extended runway centreline, to the east and to the west of the airport up to about 5 to 16 km from the runway ends, would experience more aircraft closer to them every day. The changes in noise from individual aircraft taking off on the northern runway compared to the main runway have been illustrated using L_{max} 60 dB contours.

Overflights

14.4.55 The methodologies for assessing airspace change (CAP 1616) adopted for the EIA process require an assessment of a new metric called overflight, and to consider overflights in two areas as follows.

- Air Noise – 'Overflight' as defined by CAP 1498 (CAA, 2017).
- Tranquillity – CAP 1616 requires consideration of increased overflights affecting particular areas, such as AONBs and National Parks.

14.4.56 This secondary non-noise metric, 'overflights' has been computed within a Geographic Information System, as described in Appendix 14.9.2, Section 3. Three-dimensional radar tracks from 128,000 aircraft flying to and from Gatwick and other airports within 35 miles of Gatwick were analysed to count overflights below 7,000 feet in accordance with the CAA guidance. The results are used to illustrate how the numbers of overflights would change with the Project.

Noise Criteria

14.4.57 In order to follow the approach required in the NPSE, it is necessary to define the LOAEL and SOAEL for aircraft noise.

14.4.58 LOAELs are provided in the Consultation Response on UK Airspace Policy: A Framework for Balanced Decisions on the Design and Use of Airspace (Department for Transport, 2017b), as described in paragraph 14.2.27.

14.4.59 SOAELs are defined with reference to Government expectations of compensation and noise insulation schemes specified in the Aviation Policy Framework (2013). For daytime, the SOAEL is set at $L_{eq,\ 16\ hour}$ 63 dB. This represents the exposure level at which the most recent UK annoyance survey (CAA, 2014) indicates that 23% of the population would be highly annoyed. The SOAEL value for night-time is taken from the interim target of the WHO Night Noise Guidelines 2009 at $L_{eq,\ 8\ hour}$ 55 dB, which is described in those guidelines as the level above which *'Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed.'* (WHO, 2009).

14.4.60 The LOAELs and SOAELs for air noise are summarised in Table 14.4.4.

Table 14.4.4: Air Noise LOAELs and SOAELs

Issue	LOAEL	SOAEL
Day	$L_{eq,\ 16\ hour}$ day 51 dB	$L_{eq,\ 16\ hour}$ day 63 dB
Night	$L_{eq,\ 8\ hour}$ night 45 dB	$L_{eq,\ 8\ hour}$ night 55 dB

Significance of Effects

14.4.61 The evaluation of significant air noise effects has been undertaken in two stages.

- If the level is newly above SOAEL as a result of the Project – a significant effect on health and quality of life that should be avoided is likely, subject to consideration of any additional factors present.
- If the level is below SOAEL but above LOAEL as a result of the Project, then the following have been considered:

  - How large is the noise change?
  - How large is the population affected?
  - How close is the noise level to SOAEL?

14.4.62 In the first stage, a significant effect is likely if the noise level is or would be below SOAEL in the base case but rises above it as a result of the Project. A significant effect can arise at a single property or at a group of properties. Additional factors that could affect this include the use and nature of the receptors, other noise sources and the duration of the effect.

14.4.63 In the second stage assessment where the predicted noise level is below SOAEL but above LOAEL, the first consideration is the extent of noise change; increases leading to adverse impacts, decreases leading to beneficial impacts. CAP 1616 (paragraph 1.31) can be used to give the following L_{eq} ranges.

- Negligible <1 dB
- Low 1-2 dB
- Medium 3-5 dB
- High 6-9 dB
- Very High >9 dB

14.4.64 The second consideration is how many people are affected by the noise increase. The following ranges have been drawn from Institute of Environmental Management and Assessment (IEMA) Guidance on Environmental Noise Assessment (IEMA, 2014). It is noted that these ranges have also been used in the PEIR produced for the third runway at Heathrow, with reference to that project's Noise Expert Review Group.

- Very Low 10-99
- Low 100-399
- Medium 400-699
- High 700-1000
- Very High >1,000

14.4.65 The third consideration is how close the predicted noise level is to the SOAEL, with noise levels closer to SOAEL more likely to give rise to significant effects.

14.4.66 Noise assessment takes account of the difference in the sensitivity of different NSRs by applying different LOAEL and SOAEL values to different types of buildings, if necessary, to assess impacts. This assessment considers residential buildings, which are sensitive during the day and night. All residential buildings are assumed to be similarly sensitive, unless they have noise insulation, as discussed below. The LOAELs and SOAELs given above are for residential buildings. The assessment also considers hospitals, which are sensitive during the day and night, and it considers schools, places of worship and community buildings that are sensitive to noise in the daytime and evening only. For non-residential buildings, sensitivity to noise tends to depend not just on the building use, but also its construction and other factors. For non-residential buildings specific noise assessment criteria are used where significant noise increases are expected, with reference to their particular use, design and circumstances.

14.4.67 Noise insulation forms part of the noise control measures relied upon to avoid significant adverse effects on health and quality of life in line with Government policy (Department for Transport, 2018a).

14.4.68 Taking account of these additional factors, the following noise effect ratings have been used to describe the significance of the predicted noise effects.

- **Negligible**: Below LOAEL, or above LOAEL negligible noise change (<1 dB) affecting high or very high population size, or high noise change affecting low population size.
- **Minor**: Below SOAEL but above LOAEL with low noise changes (1-2 dB), or affecting low population size, or at levels not near SOAEL.
- **Moderate**: Above SOAEL. Or above LOAEL with noise changes of medium or above (>3 dB), or affecting high population size, but at levels not close to SOAEL.
- **Major**: Above SOAEL. Or above LOAEL with noise changes above medium, or affecting high population size, near SOAEL.
- **Substantial**: Above SOAEL by a margin affecting high population size.

14.4.69 The assessment of significance is based primarily on the predicted levels and changes in the primary noise metrics, but additional noise metrics (the secondary noise metrics) are used to provide more detail on the changes that would arise.

14.4.70 For the purposes of this assessment, effects of moderate significance and above are considered significant in terms of the EIA Regulations.

Ground Noise

Metrics

14.4.71 The assessment of aircraft ground noise has been carried out by comparing the predicted noise levels against benchmark criteria for the LOAEL and SOAEL, defined for the night-time and daytime hours separately, and by comparing the predicted change in noise levels arising at receptors around the airport against the baseline noise levels.

14.4.72 Ground noise has been assessed using a methodology closely aligned with air noise and, for this reason, similar metrics are used. The primary metric used for assessment is the L_{Aeq} as defined over the 16 hour daytime period (07:00-23:00) and the 8 hour night-time period (23:00-07:00) and

predicted for an average day over the 92 day summer period. A secondary metric that is used to assess ground noise is the L_{max} which is used to assess the peak level of noise that could be expected from ground noise rather than the inherent average value that is represented by the primary L_{Aeq} metric. The secondary L_{max} metric is calculated separately for a number of individual noise sources including aircraft taxiing, engine ground runs, APU operation on stands and end around taxiway (EAT) usage since the peak levels are experienced as individual events.

Noise Criteria

14.4.73 The LOAELs and SOAELs for ground noise (L_{Aeq}) are the same as for air noise, as listed in Table 14.4.4. This approach to setting the observed effect levels is considered appropriate and is also in line with the approach adopted in the PEIR produced for the third runway at Heathrow.

14.4.74 For maximum noise levels, L_{max} occurring at NSRs from aircraft ground noise, a potentially significant effect is defined as occurring if there are sufficient numbers of noise events over the following thresholds:

- during the night-time (23:00-07:00 hours) L_{max} 60 dB; and
- during the daytime (07:00-23:00 hours) L_{max} 65 dB.

14.4.75 The 60 dB L_{max} night-time benchmark is referred to in Planning and Noise (Association of Noise Consultants *et al.*, 2017) where it is stated that the number of noisy events exceeding 60 dB L_{max} may be inversely related to the quality of sleep. It is also the basis of the N60 metric used as a supplementary metric for air noise at night. $L_{max.}$ 65 dB is the basis of the N65 noise metric that is used as a supplementary metric for air noise during the day,

14.4.76 The secondary L_{max} metric is calculated for a number of different ground noise activities separately (as listed above) and then the number of events are looked at as a whole. If there are fewer than 10 events predicted to occur above the criteria specified, then the noise impact is considered less likely to give rise to a significant effect. Guidance on the effects of increasing numbers of events above the L_{max} threshold has been taken from the air noise secondary metrics and professional judgement relating to the numbers of events has been used to help determine the magnitude of impact:

- N65 day 20, 50, 100, 200, 500; and
- N60 night 10, 20, 50, 100.

Significance of Effect

14.4.77 The significance of the effects of aircraft ground noise on NSRs has been determined by taking into account the sensitivity of the receptor, the magnitude of the impact and other factors as follows. As with other types of noise the sensitivity of the receptor is accounted for in the numerical value of the LOAEL and SOAEL. The focus of this assessment is on residential receptors. A nursery, a primary school and a mental health facility have also been identified, and are all considered to be of high sensitivity and are assessed on a case by case basis. However, there are around 2,500 receptors, both residential and non-residential buildings, that have been modelled within the LOAEL (but outside the airport boundary) and of these, around 10 are on the list of noise sensitive buildings (including schools, hospitals and community spaces) identified for the air noise assessment. Since some of these receptors may be considered more sensitive, predictions will be carried out for these 10 (or so) locations so that they can be assessed specifically within the ES.

14.4.78 As with air noise, in the first stage, a significant effect is likely if the noise level is or would be below SOAEL in the base case but rises above it as a result of the Project. A significant effect can arise at a single property or at a group of properties. Additional factors that could affect this include the use and nature of the receptors, other noise sources and the duration of the effect and if the receptor has noise insulation.

14.4.79 In the second stage assessment where the predicted noise level is below SOAEL but above LOAEL, the first consideration is the extent of noise change; increases leading to adverse impacts, decreases leading to beneficial impacts.

14.4.80 To assess the change in the noise above the LOAEL the same magnitudes of noise change as for air noise have been used, as follows.

- Negligible <1 dB
- Low 1-2 dB
- Medium 3-5 dB
- High 6-9 dB
- Very High >9 dB

14.4.81 The same terms are used to describe corresponding decreases.

14.4.82 The change in noise level and the secondary L_{max} metric have also been used to assist in determining the magnitude of impact.

14.4.83 Where the level of ground noise is below SOAEL but above LOAEL as a result of the Project, the evaluation of significant effects considers the magnitude of the noise change and other factors including:

- how large is the noise change?
- how large is the population affected?
- how close is the noise level to SOAEL?

14.4.84 Taking account of these additional factors, the following noise effect ratings are used to describe the significance of the predicted noise effects.

- **Negligible**: Below LOAEL, or above LOAEL with negligible noise change (<1 dB) affecting high or very high population size, or above LOAEL with high noise change affecting low population size.
- **Minor**: Below SOAEL but above LOAEL with minor noise changes (1-3 dB), or affecting low population size, or at levels not close to SOAEL.
- **Moderate**: Above SOAEL. Or above LOAEL with noise changes of moderate or above (>3 dB), or affecting high population size, but at levels not close to SOAEL.
- **Major**: Above SOAEL. Or above LOAEL with noise changes above moderate, or affecting high population size, close to SOAEL.
- **Substantial**: Above SOAEL by a margin affecting high population size.

14.4.85 It is noted that the above changes are initially considered as changes in predicted ground noise alone. However, where the overall measured baseline across all sources is high, other sources, primarily road traffic noise, may lessen the effect of changing ground noise and the resulting change in overall noise levels may be lower than the predicted changes in ground noise. Therefore, where high overall noise levels have been measured, the likely effect of other sources

of ambient noise has been taken in to account in the assessment of significance of the change in ground noise.

14.4.86 Where a range of significance levels are presented based on differing magnitudes of impact and modifying factors, the final assessment for each effect is based upon professional judgement.

14.4.87 As for air noise, the assessment of significance is based primarily on the predicted levels and changes in the primary noise metrics, but the noise metric (the secondary L_{max} noise metric) is used to provide more detail on the changes that would arise.

14.4.88 For the purposes of this assessment, effects of moderate significance and above are considered significant in terms of the EIA Regulations.

Road Traffic Noise

Metrics

14.4.89 The key metric used for the assessment of road traffic noise during the day in the UK is the $L_{A10,\ 18\ hour}$ which is referred to in the DMRB and the Noise Insulation Regulations, and which is predicted using the methodology in the Calculation of Road Traffic Noise (CRTN) guidance document (Department of Transport, Welsh Office, 1988). The DMRB also refers to the $L_{night,\ outside}$, which is effectively equivalent to a free-field $L_{eq,\ 8\ hour}$.

Criteria

14.4.90 The DMRB specifies values to define the LOAEL for road traffic noise. The daytime LOAEL value is 55 dB $L_{A10,\ 18\ hour}$ at the façade of the building, to consider effects of annoyance. A LOAEL of 40 dB $L_{Aeq,\ 8\ hour}$ night in the free-field has been adopted based on DMRB to consider effects from sleep disturbance.

14.4.91 The SOAEL value for daytime road traffic noise is 68 dB $L_{A10,\ 18\ hour}$ at the façade based on the Noise Insulation Regulations, where 68 dB $L_{A10,\ 18\ hour}$ is the trigger level for insulation from new or altered highways. The DMRB also proposes the value quoted in the regulations.

14.4.92 The SOAEL value for night-time road traffic noise is consistent with the interim target of the WHO Night Noise Guidelines 2009 at 55 dB $L_{Aeq,\ 8\ hour}$ to avoid sleep disturbance.

14.4.93 The LOAELs and SOAELs for road traffic noise are summarised in Table 14.4.5. The DMRB notes that specific variations may be required (eg where upgraded noise insulation has been fitted to a property). These will be reviewed in the ES.

Table 14.4.5: Traffic Noise LOAELs and SOAELs

Issue	LOAEL	SOAEL
Day	$L_{A10,\ 18\ hour}$ day 55 dB (façade)	$L_{A10,\ 18\ hour}$ day 68 dB (façade)
Night	$L_{eq,\ 8\ hour}$ night 40 dB (free-field)	$L_{eq,\ 8\ hour}$ night 55 dB (free-field)

Significance of Effects

14.4.94 As stated in the overall approach to noise assessment above, when predicted noise levels are newly above the SOAEL significant effects are likely, and mitigation measures have been identified to avoid these. However, for traffic noise, more specific procedures for establishing

significance based on considering LOAEL and SOAEL values and other factors are set out in the DMRB, and these have been adopted for the road traffic noise assessment.

14.4.95 The DMRB procedures include a scoping procedure which determines whether further comparison should be undertaken. This procedure consists of two acoustic tests relating to noise change, and non-acoustic tests to determine whether new road links (or roads physically changed by the Project) would be within 600 metres of receptors, and whether there would be a reasonable stakeholder expectation that an assessment would be undertaken. In this case both of the non-acoustic tests are met, and therefore a preliminary assessment of noise impacts is included here and a more detailed assessment will be included within the ES.

14.4.96 For the PEIR, the available traffic information has been used to make an initial assessment of the likely significance of the effects. This has used the scoping procedure set out within the DMRB to identify the relevant road links – for roads which are not physically changed by the Project, this is usually restricted to an area within 50 metres of the roads.

14.4.97 For road links requiring consideration, the DMRB sets out an initial procedure for assessment based on the noise change. There are two sets of noise magnitude criteria in the DMRB which apply to people's noise reaction to road changes following the opening of a road, and to the situation when the road has been open for some time, and has become an established part of the noise environment.

14.4.98 To assess the change in the noise above LOAEL the following magnitudes of noise change are used for the short term, i.e. the comparison in the year of opening, drawn from the DMRB[4]:

Table 14.4.6: Traffic Noise Change Magnitude, Short Term

Short Term Magnitude	Short Term Noise Change (dB)
High	Greater than equal to 5.0
Medium	3.0 to 4.9
Low	1.0 to 2.9
Negligible	Less than 1.0

14.4.99 To assess the change in the noise above LOAEL the following magnitudes of noise change are used for the long term, i.e. the comparison 15 years after opening, drawn from the DMRB.

Table 14.4.7: Traffic Noise Change Magnitude, Long Term

Long Term Magnitude	Long Term Noise Change (dB)
High	Greater than equal to 10.0
Medium	5.0 to 9.9
Low	3.0 to 4.9
Negligible	Less than less than 3.0

[4] It is noted that in DMRB the terms Negligible, Minor, Moderate, and Major are used to describe the magnitude of change criteria above rather than Negligible, Low, Medium and High, but in this PEIR a consistent terminology has been taken in all sections, and therefore the terms negligible, low, medium and high have therefore been used to describe magnitude here.

14.4.100 The same terms are used to describe increases and decreases.

14.4.101 The DMRB indicates that impacts of medium or high magnitude are more likely to give rise to significant effects. However, other factors are considered to determine the final operational significance level. These include: whether the noise change is close to a boundary between two impact magnitude ratings (eg whether it is close to the boundary between a low and a medium impact); whether the change in the long term is similar to the short term change (and therefore whether the difference may not be due to the Project); the location of noise sensitive parts of the receptor; changes in acoustic context (including effects on acoustic character of an area); and whether the Project results in obvious changes in the landscape or setting of a receptor which make it likely that noise level change would be more acutely perceived. These factors can affect the point at which noise changes are considered likely to give rise to a likely significant effect.

14.4.102 A final factor is considered if the 'with Project' noise level exceeds the SOAEL, and this is to consider noise change in the short term of 1 dB or over as resulting in a likely significant effect. This is more stringent than when noise levels are below SOAEL when noise changes in the short term of 3 dB or over are classed as more likely to be significant.

14.4.103 Where adverse effects may arise above the LOAEL but below the SOAEL, mitigation measures have been identified to minimise these as far as practicable. Opportunities to reduce noise levels from the baseline case and identify improvements to the noise environment have also been explored. This is particularly relevant to the assessment of traffic noise where it has been possible to design additional mitigation into the proposed highway design.

14.4.104 For the purpose of this assessment, impacts of medium magnitude (moderate significance) and above are considered likely to give rise to a significant effect at individual properties, as identified within the DMRB, unless the factors discussed above indicated that effects of low magnitude (minor significance) may give rise to significant effects. In this respect, significance has been determined taking into account the advice in DMRB and other factors that may affect the significance of the overall effect in line with normal EIA practice.

14.5. Assumptions and Limitations of the Assessment

Construction Noise

14.5.1 Construction noise has been modelled from the main works required to construct the Project based on current knowledge of the likely construction works programme, as outlined in Chapter 5: Project Description. At this stage the programme of works has allowed the main construction works areas to be grouped into 13 periods: the 12 individual years between 2024 and 2035 and the period 2036 to 2038. In order to not under-estimate the possible cumulative effect of overlapping works, all works likely to occur within any of these periods have been modelled concurrently, resulting in thirteen noise models. For each type of work, indicative noise emission levels have been taken from equivalent projects and modelling during the day, evening and/or night periods according to current understanding from the construction team.

14.5.2 Minor works or those expected to last less than a month have been excluded as they are unlikely to lead to significant effects. Vibration from construction works will be assessed as details of methods of working develop, such as piling of the highway works, and will be reported in the ES.

Air Noise

14.5.3 The air noise assessment assumes the routing of aircraft to and from the main runway and from the northern runway would remain as it is today, as discussed in Section 14.4. This is because the Project can operate using these routes without need for an airspace change process. When the likely outcome of the FASI-South airspace is known then the noise impacts of that change will be assessed following the relevant guidance. Further details of FASI-South and the approach are set out in Chapter 6: Approach to Environmental Assessment.

14.5.4 The air noise assessment is based on the air traffic forecasts summarised in Section 14.7. The accuracy of the assessment depends primarily on these forecasts in terms of the number and types of aircraft that will operate in the future. Estimations of the noise emissions of future aircraft types are also important. These have been made by the CAA based on the latest state of knowledge as reported in Section 3 of Appendix 14.9.2 and clearly show the extent to which newer aircraft types are quieter than their older equivalents.

14.5.5 In 2019 about 13% of the aircraft operating at Gatwick were 'next generation' aircraft, eg A320 NEO, B737 MAX etc, which are quieter than 'current generation' aircraft. As aircraft age, airlines replace them with next generation aircraft so that over time the fleet transitions to next generation aircraft and, other things being equal, overall noise levels reduce. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will transition based on assumptions around airlines' fleet procurement programmes and business models. The '*central case'* used in the noise assessment is based on what is considered today to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to the global pandemic and the financial impact on the airlines. Therefore noise modelling has also been carried out for a '*slower transition fleet'* case, based on ATM forecasts in which the rate of fleet transition is delayed by about five years and which would result in higher noise levels than the central case. Appendix 14.9.2 gives further details. The assessment reported in this chapter gives full details of noise levels expected from the central case fleet forecast and gives the ranges of noise levels expected under the central and slower fleet transition cases. Full results of all noise modelling are provided Section 5 of Appendix 14.9.2.

14.5.6 Appendix 14.9.2 also provides a sensitivity analysis of the effect of varying the runway modal split giving an indication of the range of possible noise contours that could arise.

Ground Noise

14.5.7 The aircraft ground noise assessment in this report covers taxiing noise, engine testing and APU noise but does not cover reverse thrust. Reverse thrust is included in the air noise assessment. Engine testing at idle power on aircraft stands immediately prior to departure as part of normal operations is subsumed within normal taxiing operations and is not separately identifiable at receiver locations outside the airport boundary.

14.5.8 Topographical noise barriers and acoustic walls have been included in the model (bunds are included as part of the general topography) as these form an essential part of existing and future mitigation measures in place for airport ground noise.

14.5.9 Predictions of aircraft ground noise have been carried out using a bespoke prediction model implemented in the noise modelling software CadnaA. Modelling has been carried out for an average day based on the 92 day summer period (as used for air noise) and the assessment is

focused on the 12 assessment locations discussed at paragraph 14.4.19. The pattern of ground operations on the airfield is different between the two runway modes of operation (26 and 08). The differences are more marked than for air noise and unlike air noise there is no research to indicate that overall effects are best assessed using long term average noise levels. As a result, noise predictions for the two runway modes are reported separately. Details of the bespoke ground noise prediction model which is used in the assessment are provided at Appendix 14.9.3.

14.5.10 The aircraft ground noise results are presented for daytime and night-time periods because the night period is more sensitive than the day and some taxi-routes are different at night.

Road Traffic Noise

14.5.11 The DMRB states that noise levels should be assessed in both the year of opening of a road scheme and at a future assessment year which represents 15 years after opening. The first year of assessment for road traffic noise has been taken to be 2032 (by which date key highway works would be completed and operational). A future year representing 15 years after opening, 2047 has also been considered.

14.5.12 Data for traffic flows in the night-time are not currently available. It is considered to be unlikely at this stage that night-time noise will give rise to significant effects because noise changes during the day are usually larger than during the night, however, this will be confirmed in the ES.

Conclusions

14.5.13 As the Project design progresses, the details required for an updated assessment of noise and vibration impacts will become available to inform the final assessment reported in the ES. At this stage, the assessment focuses on the main impacts and the mitigation measures likely to be necessary. For the PEIR, sufficient information on the Project has been made available to identify the key sources of potential significant effects, to assess them and to outline the required mitigation measures.

14.6. Baseline Environment

Current Baseline

Construction Noise

14.6.1 The baseline noise environment for the construction noise assessment is assumed to be unchanged from that measured in 2016, as reported under ground noise below.

Air Noise

Aircraft Operations

14.6.2 Noise levels from Gatwick Airport are reported annually from noise modelling carried out by the Environmental Research and Consultancy Department of the CAA. The annual reports also record the numbers and pattern of flights that generate the airports' noise contours for the summer period used in their noise modelling. The numbers of flights in the day and night period in 2019 are listed in Section 14.7 below. In general, aircraft would take-off and land into a headwind for safety and performance reasons to maximise lift during take-off and landing. The wind direction, which varies over the course of a year, would therefore have an important influence on the usage of runways. The ratio of westerly (ie Runway 26) and easterly (ie Runway 08)

operations is referred to as the runway modal split. In the summer daytime of 2019 this was 73% westerly and 27% easterly. Because wind conditions vary from year to year, so does modal split. To facilitate year on year comparisons, two sets of noise contours are produced each year:

- using the 'actual' modal split over the L_{eq} day period; and
- assuming the 'standard' modal split over the L_{eq} day period, ie the long-term modal split calculated from the 20-year rolling average.

14.6.3 For 2019, this was the 20-year period from 2000 to 2019. The 16 hour daytime 'standard' modal split in 2019 was 75/25 and this modal split has been used in the baseline and all forecast years used in this assessment.

14.6.4 Wind conditions at night vary from those in the daytime, so modal splits can be slightly different. The night-time actual runway modal split for the 2019 summer period was 72% westerly and 28% easterly. The summer night-time 10-year (2010-2019) average modal split was 75% westerly 25% easterly, and this modal split has been used in all baseline and forecast years used in this assessment. The night-time standard modal split is averaged over 10 years because night-time contours have not been produced for so long at daytime contours, so older values are not available.

14.6.5 Aircraft leaving Gatwick Airport depart along Standard Instrument Departure (SID) routes; five to the west and four to the east. Aircraft arriving into Gatwick Airport are routed from the south to converge on the extended runway centrelines where they join the Instrument Landing System to arrive at the thresholds to runway 26 and 08. Further details are available in CAA ERCD Report 2002: Noise Exposure Contours for Gatwick Airport 2019 (CAA, 2020).

Primary Noise Metrics

14.6.6 The air noise baseline in 2019 can be summarised in general terms using the primary noise metrics (described below) in Table 14.6.1.

Table 14.6.1: 2019 (Standard Mode) Air Noise Baseline, Leq Day and Night

Noise Metric	Noise Contour Area (km²)	Population
$L_{eq,\ 16\ hour}$ day:		
>51 dB	136.0	24,050
>54 dB	74.0	9,850
>57 dB	38.7	2,550
>60 dB	22.4	1,450
>63 dB	12.6	500
>66 dB	6.7	250
>69 dB	3.5	100
$L_{eq,\ 8\ hour}$ night:		
>45 dB	159.4	27,650
>48 dB	90.3	12,100
>51 dB	46.5	5,550

Noise Metric	Noise Contour Area (km^2)	Population
>54 dB	24.8	1,550
>55dB	22.6	1,250
>57 dB	14.0	750
>60 dB	7.4	300
>63 dB	3.8	150

14.6.7 Figure 14.6.1 shows the 2019 Baseline, $L_{eq,\ 16\ hour}$ contours. The population currently within the LOAEL $L_{eq,\ 16\ hour}$ 51 dB contour is approximately 24,050 people (9,400 households). The population currently within the SOAEL $L_{eq,\ 16\ hour}$ 63 dB contour is approximately 500 people (150 households). These properties lie within the existing Noise Insulation Scheme (NIS) boundary, discussed in Section 14.8 below, with the exception of two residential properties in the Partridge Lane area west of Charlwood.

14.6.8 Figure 14.6.2 shows the 2019 Baseline, $L_{eq,\ 8\ hour}$ night contours. The population currently within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is approximately 27,650 people (10,800 households). The population currently within the SOAEL $L_{eq,\ 8\ hour}$ 55 dB contour is approximately 1,250 people (500 households). These properties lie within the existing NIS boundary, discussed in Section 14.8 below, with the exception of a few in Northchapel, several west of Charlwood on Russ Hill Road and Partridge Lane, and two south of the A23 south of the airport.

Secondary Noise Metrics

14.6.9 In addition to the primary L_{eq} noise metrics reported above, the air noise baseline in 2019 can be quantified using the Number Above metrics, N65 day and N60 night, in Table 14.6.2. The Number Above metrics identify the number of aircraft during an average summer day and night above a certain peak noise threshold (L_{max} 65 dB for day and L_{max} 60 dB for night).

Table 14.6.2: 2019 (Standard Mode) Air Noise Baseline, N65 Day and N60 Night

Noise Metric (number of aircraft)	Noise Contour Area (km^2)	Population
N65 day:		
>20	149.9	24,100
>50	97.7	14,600
>100	72.7	9,500
>200	50.8	5,750
>500	2.4	100
N60 night:		
>10	204.2	33,850
>20	126.8	15,250
>50	56.4	7,600
>100	2.7	150

14.6.10 Figure 14.6.3 shows the 2019 Baseline N65 day contours. The population currently exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is approximately 24,100.

14.6.11 Figure 14.6.4 shows the 2019 Baseline, N60 night contours. The population currently exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is approximately 33,850.

14.6.12 In addition, and to illustrate noise levels over the whole year, annual average Day, Evening Night (L_{den}) and Night (L_{night}) noise levels have also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours are summarised in Table 14.6.3.

Table 14.6.3: 2019 (Standard Mode) Annual L_{den} and L_{Night} Baseline Noise Levels (1)

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	92.1	12,900
>60 dB	31.5	2,000
>65 dB	12.2	550
>70 dB	4.1	150
>75 dB	1.6	0
L_{night}:		
>45 dB	116.0	17,150
>50 dB	39.8	4,300
>55 dB	15.2	750
>60 dB	5.4	200
>65 dB	2.0	0
>70 dB	0.8	0

14.6.13 Figure 14.6.5 shows the annual average 2019 Baseline L_{den} contours.

14.6.14 Figure 14.6.6 shows the annual average 2019 Baseline L_{night} contours.

Secondary Non-Noise Metrics

14.6.15 Figure 14.6.7 shows the 2018 baseline for Gatwick Airport overflights (2019 was within 1% of 2018, see Appendix 14.9.2). The area within which there is at least one overflight on an average summer (24 hour) day extends approximately 50 km east and west of the airport, and approximately 30 km south and extending further to the south coast over Seaford where there is an air navigation beacon. The densities of overflights increase closer to the airport, particularly under the two arrivals swathes that loop in from the south to both extended runway centrelines.

14.6.16 Figure 14.6.8 shows the 2018 baseline for Non-Gatwick Airport overflights within 35 miles (56 km) of the centre of Gatwick Airport. Areas around Gatwick where there are overflights from other airports can be seen, for example, north of Gatwick with flights from Heathrow and Redhill

aerodrome, east of Gatwick with other flights over Tunbridge Wells and further south, and near the south coast over Worthing, Brighton etc.

14.6.17 Figure 14.6.9 shows the 2018 baseline overflights for aircraft from all airports within 35 miles (56 km) of the centre of Gatwick Airport.

Ground Noise

14.6.18 Baseline ground noise levels have been assessed at the nearest NSRs listed below and as shown in Figure 14.4.1.

- 1 Blue Cedars
- 2 3 Charlwood Road
- 3 Brook Farm
- 4 Bear and Bunny Nursery
- 5 April Cottage
- 6 Oakfield Cottage
- 7 103 Cheyne Walk
- 8 82 The Crescent
- 9 Hyders Farm House
- 10 Myrtle Cottage
- 11 Rowley Farmhouse
- 12 Trent House.

14.6.19 For the assessment of ground noise, around the perimeter of the airport, baseline L_{Aeq} noise levels over the day (07:00-23:00) and night (23:00-07:00) periods have been predicted for easterly operations ('runway 08') and westerly operations ('runway 26') using the model (as described elsewhere) validated from the results of baseline noise measurements in 2016. Appendix 14.9.3 gives details of the baseline survey and Table 14.6.4 gives the modelled baseline noise levels.

Table 14.6.4: Summary of Ground Noise 2016 Predicted Baseline Noise Levels (dB L_{Aeq})

Descriptor	Location ($L_{Aeq,T}$ dB)											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
26 Daytime (16 hour)	51	50	55	54	49	57	58	61	51	62	58	54
26 Night (8 hour)	49	48	53	51	47	54	54	57	50	59	53	49
08 Daytime (16 hour)	57	59	60	57	52	58	54	54	62	63	56	46
08 Night (8 hour)	53	55	56	54	50	55	53	53	59	60	54	45

14.6.20 The predicted levels are modelled for average wind speeds and wind directions during easterly operations and separately during westerly operations (measured in 2018), as detailed in Appendix 14.9.3.

14.6.21 The baseline noise survey was carried out over a 16 day period in August 2016 covering a range of wind speeds and directions. The survey locations were chosen because of their proximity to the airport but ground noise was not the only noise source contributing to the total noise levels that were measured. The measured levels show a range of ambient noise levels at each site due to varying wind and other conditions, and the predicted levels of ground noise fall within these ranges and towards the upper end of the range, confirming the modelling represents a worst case assessment. Appendix 14.9.3 gives further details.

Road Traffic Noise

14.6.22 The baseline NSRs for the study were identified based on their close proximity to the Project and noise sensitivity (see Figure 14.6.10). They include the residential properties nearest to the new or altered road links and the amenity area in the Riverside Garden Park adjacent to the A23 and M23 roads as listed below:

- NSR1 The Crescent East;
- NSR2 The Crescent West;
- NSR3 Woodroyd Gardens;
- NSR4 Cheyne Walk;
- NSR5 Longbridge Road East;
- NSR6 Longbridge Road West;
- NSR7 Povey Cross Road;
- NSR8 Meadowcroft Close
- NSR9 B2036 Balcombe Road;
- NSR10 Riverside Garden Park north;
- NSR11 Riverside Garden Park centre;
- NSR12 Riverside Garden Park south;
- NSR13 First Point office building; and
- NSR14 Premier Inn.

14.6.23 Using initial data from the Vissim traffic model, a noise model was created for the 2018 baseline road traffic to represent the current noise environment due to traffic in the study area and to provide the tool for predicting future baseline and Project noise. The baseline model was calibrated against the Riverside Garden Park measurements that were undertaken by ERM in May 2019, and the baseline measurements carried out for ground noise. Figure 14.6.10 shows the baseline noise modelling results. Detailed results from the model can be found in Appendix 14.9.4.

Future Baseline Conditions

Initial Construction Phase: 2024-2029

14.6.24 For the purposes of the construction noise assessment, the baseline at NSRs around the airport perimeter is dominated by road traffic noise (which is unlikely to change in the near term) and airport ground noise. The baseline during construction (in the short term) is assumed to be as measured in 2016.

First Full Year of Opening: 2029

Air Noise

14.6.25 Baseline air noise modelling has been carried out for the assessment years 2029, 2032, 2038 and 2047 and baseline levels and impacts from the Project are reported in Appendix 14.9.2. A sensitivity analysis was undertaken to assess the likely year of highest air noise impact, ie the greatest change in noise over baseline, and it was found that the greatest air noise impacts are expected in 2032. This chapter therefore provides the results of the baseline and assessment in this worst-case year, with baseline and impacts in the other assessment years (2029, 2038 and 2047) summarised briefly in Section 14.9 when discussing the trends in future noise levels under the Interim Assessment Year 2032 heading, and also reported within Appendix 14.9.2.

Ground Noise

14.6.26 Baseline ground noise predictions have been carried out for the assessment years 2029, 2032 and 2038 but only the worst-case assessment year has been presented within this chapter. The worst case assessment year (highest combination of predicted noise levels and noise change for development scenario) is 2032 and baseline noise predictions for 2029 and 2038 have therefore only been included within Appendix 14.9.3.

Interim Assessment Year: 2032

Air Noise

14.6.27 The 2032 baseline has been modelled based upon air traffic forecasts which include changes in the fleet to quieter types as modelled using the relevant noise emission levels described in Appendix 14.9.2. As described above, a central fleet forecast case and a slower transition fleet case have been modelled to give a range if future baseline conditions.

14.6.28 The air noise baseline in 2032 can be summarised in general terms using the primary noise metrics (described below) in Table 14.6.5.

Table 14.6.5: 2032 (Standard Mode) Air Noise Baseline, Leq Day and Night (1)

Noise Metric	Noise Contour Area (km^2)	Population
$L_{eq,\ 16\ hour}$ day:		
>51 dB	107.3 – 125.8	16,100 – 23,500
>54 dB	54.1 – 67.1	6,700 - 9,100
>57 dB	28.4 – 34.9	1,800 – 2,200
>60 dB	16.6 – 20.3	900 – 1,200
>63 dB	9.2 – 11.5	400 – 500
>66 dB	4.7 – 6.2	200
>69 dB	2.5 – 3.1	100
$L_{eq,\ 8\ hour}$ night:		
>45 dB	141.5 – 143.9	18,800 – 25,400
>48 dB	78.5 – 80.1	8,900 – 10,800

Noise Metric	Noise Contour Area (km^2)	Population
>51 dB	39.3 – 40.3	3,600 – 4,700
>54 dB	21.9 – 22.3	1,000 – 1,300
>55 dB	18.2 – 18.5	900 – 1,100
>57 dB	12.4 – 12.5	500
>60 dB	6.7	300
>63 dB	3.5	200

(1) Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.6.29 Figure 14.6.11 shows the 2032 Baseline, $L_{eq,\ 16\ hour}$ day contours. For each noise contour level (51, 54, 57, 60, 63, 66, and 69 dB), contours for the central case fleet and the slower transition fleet noise modelling are plotted with the area between shaded grey to depict the range of contours predicted. The slower transition fleet case is the noisier, forming the outer edge of the shaded range for each noise contour level. The population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is approximately 16,100 to 23,500 people, reduced from 24,050 people in 2019. The population within the SOAEL $L_{eq,\ 16\ hour}$ 63 dB contour is approximately 400 to 500 people, reduced from 500 people in 2019 (these estimates are rounded to the nearest 100). This demonstrates the extent to which the airport is expected to become quieter in future. For example, in the central case approximately 100 people fewer with significant effects on health and quality of life from daytime noise are predicted in 2032 than in 2019.

14.6.30 Figure 14.6.12 shows the 2032 Baseline, $L_{eq,\ 8\ hour}$ night contours. The population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is approximately 18,800 to 25,400 people, reduced from 27,650 in 2019. The population within the SOAEL $L_{eq,\ 16\ hour}$ 55 dB contour is approximately 900 to 1,100 people, reduced from 1,250 in 2019. This again demonstrates the extent to which the airport is expected to become quieter in future, with, for example in the central case, approximately 350 people fewer with significant effects on health and quality of life from noise at night in 2032 than in 2019.

14.6.31 In addition to the primary L_{eq} noise metrics reported above, the air noise baseline in 2032 can be quantified using the Number Above metrics, N65 day and N60 night, as shown in Table 14.6.6.

Table 14.6.6: 2032 (Standard Mode) Air Noise Baseline, N65 Day and N60 Night (1)

Noise Metric (number of aircraft)	Noise Contour Area (km^2)	Population
N65 day:		
>20	106.2 – 136.4	15,300 – 28,300
>50	75.4 – 89.4	10,900 – 12,900
>100	53.5 – 64.5	6,200 – 7,700
>200	39.6 – 44.3	4,500 – 5,000
>500	3.2 – 3.5	100
N60 night:		
>10	176.4 – 193.0	28,900 – 31,500
>20	112.9 – 121.6	13,700 - 14,700

Noise Metric (number of aircraft)	Noise Contour Area (km^2)	Population
>50	53.2 – 55.3	7,000 – 7,400
>100	2.6 – 2.7	100

(1) Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.6.32 Figure 14.6.13 shows the 2032 Baseline N65 day contours. The population exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is approximately 15,300 to 28,300 in 2032, compared to 24,100 in 2019.

14.6.33 Figure 14.6.14 shows the 2032 Baseline, N60 night contours. The population exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is approximately 28,900 to 31,500 in 2032, reduced from 33,850 in 2019.

14.6.34 In addition, and to illustrate noise levels over the whole year, annual average Day, Evening Night (L_{den}) and Night (L_{night}) noise levels has also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours are summarised in Table 14.6.7.

Table 14.6.7: 2032 (Standard Mode) Annual L_{den} and L_{night} Baseline Noise Levels (1)

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	73.1 - 86.5	9,700 – 11,800
>60 dB	24.1 - 29.2	1,400 – 1,800
>65 dB	9.3 - 11.3	400 - 500
>70 dB	3 - 3.8	100 - 200
>75 dB	1.2 - 1.4	0 - 0
L_{night}:		
>45 dB	90.7 - 105.5	11,900 – 14,800
>50 dB	29.5 - 35.5	2,000 – 3,400
>55 dB	11.4 - 13.6	500 - 700
>60 dB	3.8 - 4.7	200 - 200
>65 dB	1.4 - 1.7	0 - 0
>70 dB	0.6 - 0.7	0 - 0

(1) Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.6.35 Figure 14.6.15 shows the baseline L_{den} contours in 2032.

14.6.36 Figure 14.6.16 shows the baseline L_{night} contours in 2032.

Ground Noise

14.6.37 The predicted ground noise baseline in 2032 is presented in Table 14.6.8.

Table 14.6.8: Summary of Ground Noise 2032 Future Baseline Predicted Levels (dB L_{Aeq})

Descriptor	Location ($L_{Aeq, T}$ dB)											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
2032 – 26 Daytime	45	45	50	50	45	53	54	58	47	57	53	50
2032 – 26 Night	45	44	49	48	43	51	51	54	46	55	50	46
2032 – 08 Daytime	52	55	55	54	49	54	50	50	59	61	51	41
2032 – 08 Night	48	50	51	49	45	51	47	48	56	57	48	39

Road Traffic Noise

14.6.38 Figure 14.6.17 provides road traffic noise contours for the 2032 future baseline (without Project) case. Detailed results are given in Appendix 14.9.4.

Design Year: 2038

Air Noise

14.6.39 Between 2032 and 2038, the fleet would continue to change to quieter types, resulting in further reduction in baseline levels. Full results of modelling primary and secondary noise metrics are provided in Appendix 14.9.2. The following figures show the future baseline noise contours.

- Figure 14.6.18 shows the 2038 Baseline, $L_{eq, 16\ hour}$ day contours.
- Figure 14.6.19 shows the 2038 Baseline, $L_{eq, 8\ hour}$ night contours.
- Figure 14.6.20 shows the 2038 Baseline, N65 day contours.
- Figure 14.6.21 shows the 2038 Baseline, N60 night contours.
- Figure 14.6.22 shows the 2038 Baseline, Lden contours.
- Figure 14.6.23 shows the 2038 Baseline, Lnight contours.

Ground Noise

14.6.40 As discussed above, baseline ground noise predictions for 2038 have not been presented here but are available at Appendix 14.9.3. The ground noise predictions presented in this chapter focus on the worst-case assessment year which is 2032.

Road Traffic Noise

14.6.41 The assessment of significant effects from road traffic noise follows the methodology prescribed in the DMRB which requires future noise to be modelled 15 years after opening, ie in 2047. Future baseline levels of road traffic noise are reported in Section 14.9.

14.7. Key Project Parameters

14.7.1 The assessment has been based on the parameters identified within Chapter 5: Project Description.

14.7.2 Table 14.7.1 below identifies the key parameters relevant to this assessment. Where options exist, the maximum design scenario selected is the one having the potential to result in the greatest effect on an identified receptor or receptor group. Effects of greater adverse significance are not predicted to arise should any other option identified in Chapter 5: Project Description be taken forward in the final design of the Project.

Table 14.7.1: Maximum Design Scenarios (Air Traffic Movements)

Potential Impact	Base Case Scenario	Maximum Design Scenario	Justification
Baseline 2019			
Existing ATMs	16 hour day 766 8 hour night 127	N/A	Base case for assessment.
Initial Construction Phase: 2024-2029			
Construction noise and vibration		Worst case (eg concurrent work, works that may be at night see Appendix 14.9.1).	Ensures that impacts are not under-estimated, so that adequate mitigation is provided for.
First Full Year of Opening: 2029			
Air noise and ground noise ATMs	16 hour day 811 8 hour night 125	16 hour day 848 8 hour night 127	See explanation of assessment years in Chapter 6: Approach to Environmental Assessment and ATM forecast in Chapter 4: Existing Site and Operation and Chapter 5: Project Description.
Interim Assessment Year: 2032			
Air noise and ground noise ATMs	16 hour day 818 8 hour night 125	16 hour day 976 8 hour night 137	See explanation of assessment years in Chapter 6: Approach to Environmental Assessment and ATM forecast in Chapter 4: Existing Site and Operation and Chapter 5: Project Description.
Road traffic noise		Worst case approach is to assess changes in traffic noise in the year of opening of the highway.	As required by DMRB.

Potential Impact	Base Case Scenario	Maximum Design Scenario	Justification
Design Year: 2038			
Air noise and ground noise ATMs	16 hour day 825 8 hour night 124	16 hour day 983 8 hour night 137	See explanation of assessment years in Chapter 6: Approach to Environmental Assessment and ATM forecast in Chapter 4: Existing Site and Operation and Chapter 5: Project Description.
15 Years After Opening: 2047			
Air noise and ground noise ATMs	16 hour day 831 8 hour night 124	16 hour day 988 8 hour night 137	See explanation of assessment years in Chapter 6: Approach to Environmental Assessment and ATM forecast in Chapter 4: Existing Site and Operation and Chapter 5: Project Description.
Road traffic noise		Worst case approach is to assess changes in traffic noise 15 years after the year of opening of the highway. DMRB also requires an assessment of changes between the situation with the Project in 2047 and without the Project in the year of opening (2032).	As required by DMRB to predict highest noise levels 15 years after highway opening.

14.7.3 The construction noise and vibration assessment is based on current understanding of the likely works required to build the Project, as summarised in Chapter 5: Project Description. Key parameters include:

- the plant likely to be used, and hence its noise and vibration emissions;
- the hours of working, night being more sensitive than day (see Appendix 14.9.1);
- location and proximity to NSRs; and
- duration.

14.7.4 At this stage, the exact methods of working have not been defined and therefore, in common with standard practice, where there is uncertainty, a reasonable worst case has been adopted. Appendix 14.9.1 summarises the key works that have been assessed.

14.7.5 For air noise and airport ground noise, the extent of noise impacts would depend largely on the numbers and types of ATMs. These have been forecast and provided for an average summer day and night in the 92 day summer period used in the noise assessments, as summarised in the

table above. Forecasts indicate the runway design capacity would be met in 2038, so this case has been assessed, as noise levels are expected to fall after this. The first full year of year of opening, 2029, has also been assessed. An analysis of the fleet forecast between 2029 and 2038 indicated that 2032 would be the year in which the greatest difference in noise levels with the Project compared to the baseline in that year is likely to arise. So air and ground noise is assessed for 2032 as the likely worst case year. This chapter provides full details of noise levels and expected impacts in 2032, as well as commentary on impacts in these other assessment years, with detail in Appendix 14.9.2.

14.7.6 The Project includes some key changes to the airport (other than increased traffic flow) which affect ground noise impacts. It would be necessary to remove a bund at the western end of the northern runway in order to allow for alterations to taxiways. This bund currently provides mitigation for ground noise affecting properties in the Charlwood area and it would be replaced with a longer (~600 metres) combination of bund and barrier shifted slightly north and west relative to the existing bund. To allow for usage of the northern runway, all taxiing from or to the western end of the runways would take place on Taxiway Juliet, which would have to be moved slightly further north to provide a safe distance between the taxiway and the northern runway in accordance with CAA regulations. In addition, the Project requires an extension to Taxiway Lima, which would join up to Taxiway Juliet providing the main route for all aircraft taxing to or from the western end of the runways. This extension to Taxiway Lima and the planned intensification of usage mean that a large number of taxiing aircraft would be routed further north and west than for previous operations, bringing ground noise sources closer to properties in the direction of Charlwood.

14.7.7 For the road traffic noise assessment, traffic flows for the 2018 base case, and forecasts for the 2029 and 2047 assessment years have been provided by the traffic and transport team, as reported in Chapter 12: Traffic and Transport. Appendix 14.9.4 provides further details.

14.7.8 The overflights analysis contained within the air noise assessment has been used in Chapter 8: Landscape, Townscape and Visual Resources assessment of tranquillity and in Chapter 7: Historic Environment assessment of impacts on sensitive heritage assets. The results of the noise assessment have also been used in Chapter 9: Ecology and Nature Conservation.

14.7.9 WebTAG worksheets for air noise were completed by the CAA to estimate the health impacts and costs associated with the Project. These are provided in Appendix 14.9.2 and have informed the health and socio-economic appraisal, detailed in Chapter 16: Socio-economics. For road traffic noise WebTAG worksheets will also be developed for the ES.

14.8. Mitigation and Enhancement Measures Adopted as Part of the Project

Construction Noise

14.8.1 Construction would be undertaken in accordance with a Code of Construction Practice (CoCP). The CoCP sets out the key management measures that contractors would be required to adopt and implement. These measures would be developed based on those identified during the EIA process. They include strategies and control measures for managing the potential environmental effects of construction and limiting disturbance from construction activities as far as reasonably practicable. An outline CoCP is provided at Appendix 5.3.1.

14.8.2 The outline CoCP forms the basis for the final CoCP and more detailed plans and method statements to be prepared during the pre-construction period, once a Principal Contractor has been appointed.

14.8.3 Specific to noise and vibration, the main mitigation measures likely to be required and set out within the Outline CoCP include the following:

- Best Practicable Means (BPM) as defined by the Control of Pollution Act 1974 (CoPA) and Environmental Protection Act 1990 (EPA), which would be applied during construction activities to minimise noise (including vibration) at neighbouring residential properties and other sensitive receptors[5].
- As part of BPM, mitigation measures would be applied in the following order:
  - noise and vibration control at source: for example, the selection of quiet and low vibration equipment, review of construction methodology to consider quieter methods, location of equipment on-site, control of working hours, the provision of acoustic enclosures and the use of less intrusive alarms, such as broadband vehicle reversing warnings;
  - screening: for example, local screening of equipment or perimeter hoarding or the use of temporary stockpiles; and
  - where, despite the implementation of BPM, the noise exposure exceeds the criteria defined in the outline CoCP, noise insulation or ultimately temporary re-housing would be offered at qualifying properties.
- Lead contractors would seek to obtain prior consent from the relevant local authority under Section 61 of the CoPA for the proposed construction works. The consent application would set out BPM measures to minimise construction noise and vibration, including control of working hours, and provide a further assessment of construction noise and vibration, including confirmation of noise insulation/temporary re-housing provision.
- Contractors would undertake and report monitoring as is necessary to assure and demonstrate compliance with all noise and vibration commitments. Monitoring data would be provided regularly to, and be reviewed by GAL and made available to the local authorities.
- Contractors would be required to comply with the terms of the CoCP and appropriate action would be taken by the nominated undertaker as required to ensure compliance.

14.8.4 Noise insulation would be offered for qualifying buildings, where noise levels exceed defined criteria. Noise insulation or, if other measures are not possible, temporary re-housing would avoid residents being significantly affected by levels of construction noise inside their dwellings. The assessment reported in ES will provide an estimate of the buildings that are likely to qualify for noise insulation or to qualify for temporary rehousing, if any.

14.8.5 Qualification for noise insulation and, where appropriate, temporary re-housing would be confirmed, as part of seeking prior consent from the local authority under Section 61 of the CoPA. Qualifying buildings would be identified, as required in the CoCP, so that noise insulation can be installed, or where appropriate any temporary re-housing provided, before the start of the works predicted to exceed noise insulation or temporary re-housing criteria.

[5] Including local businesses and quiet areas designated by the local authority.

14.8.6 Construction traffic routes have been chosen to avoid routing lorries through villages and past NSRs on minor roads.

Air Noise

Approach to Air Noise Mitigation

14.8.7 From engagement with the local community, Gatwick Airport is aware of the level of concern that aircraft noise might increase as a result of the Project. The Gatwick Airport master plan gave an initial assessment of noise impacts based on preliminary air traffic forecasts and noise modelling carried out at that time. This enabled mitigation to be developed as part of the Project, which has been further developed as part of the EIA process.

14.8.8 The ICAO balanced approach to mitigation (see Section 14.2) consists of four main elements:

- noise at source;
- land use planning;
- operating procedures; and
- operating restrictions.

14.8.9 Gatwick Airport has a comprehensive noise management system that follows this approach, as reported in the Noise Action Plan that is updated by GAL and reviewed by DfT every five years. Section 4 of Appendix 14.9.2 provides a summary of the main noise mitigation activities that will continue as part of Gatwick's ongoing noise management programme as the Project is developed and into the future. The following text focuses on some of the noise mitigation measures that are most relevant to the Project.

Air Noise Mitigation at Source

14.8.10 Aircraft noise is generated by a number of different 'sources'. Though the dominant one is still the engines, on approach airframe noise is now becoming important. Through the work of ICAO and the development of the aircraft chapter standards, the industry has invested heavily in research and development to continually reduce the noise impact of aviation. The way in which aircraft noise levels are measured and reported is described in more detail in Appendix 14.9.2 Section 4.

14.8.11 GAL operates a system of aircraft movement charges that are based on each aircraft's noise levels measured under ICAO certification processes. Each type of aircraft is placed in to one of five noise categories according to the margin by which it is quieter than the ICAO Chapter 3 Standard that was defined in 1977. These movement charges for the 2021 summer season are given in Table 14.8.1. Winter season changes are lower and do not include day charges, with the exception of Fuel Over Pressure Protector (FOPP) charges (see below).

14.8.12 In certain flight configurations the Airbus A320 family of aircraft is known to produce a high-pitched whine, generated by the FOPP cavities under the wings. A modification to the FOPP is available that eliminates this characteristic whine. In recognition of this, any Airbus A320 Family aircraft not declared as having the FOPP modification is subject to a higher unmodified A320 family noise charge. This is intended to incentivise airlines to carry out the low-cost modification required to eliminate the specific noise disturbance associated with unmodified A320 family aircraft.

Table 14.8.1: Gatwick Airport 2021 Summer Season Movement Charges

Noise Category	Chapter 3 Margin dB	Day Charge £	Night Charge £
Chapter 14 Minus	>=23	£17.45	£458.25
Chapter 14 Base	20 to 23	£21.82	£572.80
Chapter 14 High	17 to 20	£26.19	£687.37
Chapter 4	10 to 17	£43.65	£1,145.62
Chapter 3 and below	<=10	£87.28	£2,291.25
Unmodified A320 Family		£872.85	£2,291.25

14.8.13 The ICAO certification process gives noise levels measured at three locations, and the Chapter 3 margins are for the summation of these three noise levels. Thus a margin of 20 dB does not imply a noise level measured on the ground 20 dB lower, rather about 1/3 of this, or around 7 dB lower.

14.8.14 The higher landing charges for noisier aircraft are intended to incentivise airlines to operate quieter aircraft at Gatwick, especially at night. GAL regularly reviews these charges so that operators with noisier aircraft are incentivised further to re-equip with quieter types.

Land Use Planning

14.8.15 Land use planning is largely the responsibility of local planning authorities. However, Gatwick Airport works with local authorities and provides noise exposure information to assist them. The noise modelling forecasts provided in this PEIR will provide further information to assist local authorities in fulfilling their role in avoiding new housing being built in unsuitably noisy locations without suitable noise insulation provided in their design.

14.8.16 Guidance to planners and house builders is provided in Planning and Noise (Association of Noise Consultants *et al.,* 2017). Gatwick Airport will continue to liaise with planning authorities to help ensure land use planning is used to avoid unsuitable noise sensitive development in the relevant noise zones.

14.8.17 The Noise Management Board has included in its work plan a project to work with local authorities to help improve land use planning with regards noise sensitive developments affected by noise from the airport. (See https://www.gatwickairport.com/business-community/aircraft-noise-airspace/engagement/noise-management-board/ for more details of the Noise Management Board and its work plan).

Air Noise Operating Procedures

14.8.18 The Project does not require new flight paths; this would avoid the noise impacts that can be associated with new flight paths. Only departures would use the northern runway, except during maintenance as is currently the case. The majority of these would be above 1,000 feet before they leave the airfield.

14.8.19 At this stage, the noise modelling has assumed that use of the northern runway would be limited to the period 06:00-23:00 hours, avoiding scheduling flights in the majority of the more sensitive night-time period.

14.8.20 GAL would operate flights from the northern runway using procedures designed to minimise noise impacts, compliant with established noise abatement procedures and in line with the commitments of the Noise Action Plan. The Noise Action Plan lays out a series of actions to manage and reduce noise which equally apply to flights using the northern runway. GAL would continue to work with stakeholders to develop ways to minimise noise for all operations at the airport.

14.8.21 GAL operates a system of Departure Noise Limits in which all aircraft leaving the airport are measured at a set of locations about 3 km from the airport, and airlines are fined if they exceed defined noise limits as follows:

- Day (07:00-23:00 hour) L_{max} 94 dB
- Shoulder (23:00- 23:30 and 06:00-07:00 hours) L_{max} 89 dB; and
- Night (23:00 to 06:00 hours) L_{max} 87 dB.

14.8.22 Departure noise limits are the responsibility of the DfT and have applied at Gatwick since 1968, and were last reduced in 2001.

14.8.23 Airlines are fined £500 if their aircraft exceed these limits by up to 3 dB, and £1000 if they exceed by more than 3 dB. Monies from fines are passed to the Gatwick Airport Community Trust.

14.8.24 Departure noise limits are intended to incentivise good operational procedures on departure, ie flying a given aircraft as quietly as possible. In 2021 GAL carried out a review of compliance with these limits that showed only about three infringements of the limits since 2017. The lack of infringement is strong evidence of the improvements in aircraft technology since 2001. GAL proposes to review the present limits and fines to recalibrate for modern aircraft performance capabilities and incentivise continued reductions of noise at source.

14.8.25 In paragraph 3.119 of the consultation document for the Aviation Strategy (Department for Transport, 2018b), the government stated it wished to… *'define better targeted maximum departure noise limits which incentivise quietest performance across different aircraft types rather than a 'one size fits all' limit'*.

14.8.26 One way to reduce the departure noise limits would be to simply lower the three noise limits for the day, shoulder and night periods. However, this would increase the number of noise infringements for the larger noisier aircraft and create little incentive for the smaller aircraft to improve their operating procedures. Instead the current proposal (independent of this Project) is to set departure noise limits for three categories of aircraft grouped according to their noise Quota Count[6] (QC) so as to incentivise good operational practice across all aircraft, not just the noisiest. The proposed aircraft Categories and noise limits are as follows:

- Category A – QC 0 to 0.125 – L_{max} 80 dB;
- Category B – QC 0.25 to 0.5 L_{max} 83 dB; and
- Category C – QC 1 and above 2 L_{max} 86 dB.

14.8.27 It is estimated that up to around 100 aircraft a year would need to reduce departure noise in order to avoid breaching these limits. The current proposal is for the fines that GAL apply to be set

[6] Under the Quota Count system each aircraft is given a QC that relates to its noise levels measured when the aircraft was certificated for air worthiness.

higher during the more sensitive night period and for the noisier categories, so as to provide greater incentives but not at levels that would restrict airlines from operating.

14.8.28 GAL is engaging with airlines and considering the administration of a revised system, as outlined above, and seeks views from consultees on these proposals. The proposed review is independent of the Project and would proceed in its absence (and so would form part of the future baseline).

Noise Insulation Scheme

14.8.29 Since 2014, noise policy and the need for mitigation has been tested in the following successful applications for new airport infrastructure:

- Birmingham International Airport Runway Extension, 2014;
- London City Airport Development Plan, 2015-2016;
- Cranford Agreement Secretary of State's Decision, February 2017 (DCLG, 2017); and
- Stansted Airport Planning Application and Appeal Decision, May 2021.

14.8.30 The main mitigation measure relied upon for homes affected by high noise levels was noise insulation. In the Birmingham case, properties above L_{eq} 63 dB were offered noise insulation, consistent with the Aviation Policy Framework, NPPF and NPSE requirement to 'avoid' significant adverse effects above SOAEL. Transport infrastructure projects (eg HS2) have used noise insulation as a mitigation measure where necessary to comply with the 'avoid' requirement, and this has been accepted by the relevant authorities[7].

14.8.31 The current Government consultation document Aviation 2050 (Department for Transport, 2018b) proposes improvements to noise insulation schemes as follows:

'3.121 The government is also:

- *proposing new measures to improve noise insulation schemes for existing properties, particularly where noise exposure may increase in the short term or to mitigate against sleep disturbance.*

3.122 Such schemes, while imposing costs on the industry, are an important element in giving impacted communities a fair deal. The government therefore proposes the following noise insulation measures:

- *to extend the noise insulation policy threshold beyond the current 63 dB $L_{Aeq, 16\ hour}$ contour to 60 dB $L_{Aeq, 16\ hour}$;*
- *to require all airports to review the effectiveness of existing schemes. This should include how effective the insulation is and whether other factors (such as ventilation) need to be considered, and also whether levels of contributions are affecting take-up;*
- *the government or ICCAN to issue new guidance to airports on best practice for noise insulation schemes, to improve consistency;*

[7] See also Cranford Appeal report, §1087 *"Against this background I consider that the proffered mitigation between SOAEL and UAEL* [Unacceptable Effects Level of 69dBALeq] *is consistent with the APF and would be sufficient to avoid significant observed adverse effects."*

- *for airspace changes which lead to significantly increased overflight, to set a new minimum threshold of an increase of 3 dB L_{Aeq}, which leaves a household in the 54 dB $L_{Aeq, 16\ hour}$ contour or above as a new eligibility criterion for assistance with noise insulation.'*

14.8.32 The recent planning application for Stansted Airport included a three tier noise insulation scheme offering the greatest level of noise insulation for properties above $L_{Aeq\ 16\ hr}$ 66 dB, a mid level of protection in the range $L_{Aeq\ 16\ hr}$ 60 to 63 dB and a lower level of insulation package above $L_{Aeq\ 16\ hr}$ 57 dB.

14.8.33 The current Gatwick NIS is based on a 60 dB L_{eq} contour. The extent of the scheme is shown as the red line in Figure 14.8.1. It is based on a future Leq, 16 hour 60 dB contour forecast in 2014, with 15 km extensions from under the runway centrelines, and adjusted to accommodate various residential areas. There are about 2,000 homes within this area of which about 1,090 have taken up the scheme. Within this zone residents are entitled to £3,000 towards acoustic glazing and doors. Under the existing Noise Action Plan commitments, GAL is reviewing the scheme, which is expected to result in an enhanced offer within the same zone.

14.8.34 An enhanced NIS would be introduced for the Project to replace the current scheme and to address expected increases in air noise, and to offer additional mitigation for the housing already worst affected by noise, comprising two zones.

- Inner Zone.
- Outer Zone.

14.8.35 A new NIS Inner Zone would offer the highest level of noise insulation sufficient to avoid noise levels above the SOAEL ($L_{eq, 16\ hour}$ 63 dB and $L_{eq, 8\ hour}$ 55 dB). The highest noise levels forecasts, for 2032, predict the following dimensions to these contours for the slower transition fleet case:

- $L_{eq, 16\ hour}$ day 63 dB: 13.9 km^2, approx. 600 people, 250 households; and
- $L_{eq, 8\ hour}$ night 55 dB: 20.7 km^2, approx.1,200 people, 450 households.

14.8.36 The NIS Inner Zone is formed by the larger of these, the $L_{eq, 8\ hour}$ night 55 dB contour, which fully encloses the $L_{eq, 16\ hour}$ day 63 dB contour. The NIS Inner Zone is shown as the black contour line in Figure 14.8.1 for the slower transition fleet case. Residential properties within this zone would be offered noise insulation in the form of replacement acoustic glazing or internal secondary glazing to all windows, acoustic ventilators and blinds to noise sensitive rooms (bedrooms, sitting rooms, dining rooms and studies), and replacement doors to noise sensitive rooms if necessary. Additionally, the offer would include acoustic upgrading of bedroom ceilings where practicable if they are found to be allowing more noise intrusion than the closed acoustic glazing provided. Overall properties in this new Inner Zone would receive a significantly improved level of noise mitigation.

14.8.37 A new NIS Outer Zone would be created for homes within the forecast $L_{eq, 16\ hour}$ 54 dB daytime noise contour in 2032. This noise level was chosen in view of the Government consultation document Aviation 2050 (Department for Transport, 2018b) and best practice at UK airports. The new Outer Zone is shown in blue in Figure 14.8.1. This zone would be extended where necessary (eg along the extended runway centreline to the west) to ensure it includes all properties within the current scheme, as shown in Figure 14.8.1. Approximately 3,300 homes are predicted to be within this zone and outside the Inner Zone. In this zone noise levels are modelled below SOAEL and residents would be offered acoustic ventilators to noise sensitive rooms. This would allow

windows to remain closed with ventilation, which, with modern double glazed windows, would increase the sound attenuation of the window by more than 10 dB. For properties with older single glazed windows with poor acoustic performance, double glazed windows would be offered to noise sensitive rooms in addition to ventilators to ensure equivalent levels of protection.

14.8.38 A schools NIS is proposed for all schools with noise sensitive teaching spaces within the forecast 2032 $L_{eq, 16\ hour}$ 51 dB noise contour. Where schools are concerned that aircraft noise could be affecting teaching, each classroom area would be surveyed to assess the effects of all types of noise including local road traffic. If noise insulation measures, such as improved glazing and acoustic air ventilation, would be practicable to implement, and would have the potential to significantly improve the overall teaching conditions, then GAL would work with the school to deliver a suitable noise insulation package.

Home Owners Assisted Moving Scheme

14.8.39 In order to offer home owners the option to move from the areas most affected by the highest noise levels, home owners newly within the $L_{eq, 16\ hour}$ 66 dB noise contour as a result of the Project coming into operation would be offered a package to assist them in moving.

Monitoring Performance

14.8.40 Gatwick Airport reports its air noise management performance through a number of mechanisms including:

- quarterly and annual Flight Performance Team (FPT) reports that provide information on performance against noise control measures;
- live online NTK; and
- annual Noise Contour Reports.

14.8.41 In addition to the above reporting, Gatwick Airport also regularly engages with stakeholders including airlines, air navigation service providers, local community groups, local authorities, ICCAN and Government bodies. This is done through various engagement forums such as the:

- Gatwick Airport Consultative Committee (GATCOM);
- GATCOM Steering Group;
- Noise and Track Monitoring Advisory Group (NaTMAG);
- Noise Management Board;
- Section 106 Steering Group; and
- The Gatwick Noise Monitoring Group.

14.8.42 Consultation with community noise groups through the Noise Management Board since 2017 has shown that those residents most affected by noise are keen to see not just monitoring of past or current performance but also forecasts of noise exposure in the near future. Community noise groups want certainty in how noise would change in the near term. There is good evidence, from the SONA study, that residents expecting an airport to become noisier in the future are more annoyed by the noise than those who expect it to become quieter. The research found that this expectation factor (referred to as a confounding factor) alone can change the proportion of a population highly annoyed by 30-50%. Working with community noise groups Gatwick Airport agreed to develop a process by which the noise change associated with the growth of the airport could be forecast for the coming years, and reported, to help manage the expectations of local

residents, and to forecast future noise management performance. The Project would take forward this process as described in the next section.

Noise Envelope

14.8.43 This section summarises the options considered and the noise envelope proposed for the Project. Appendix 14.9.5 provides further details of the options considered and how the proposed envelope has been developed within the ICAO balanced approach as required under EU Regulation No 598/2014, as adopted in UK law.

14.8.44 The Airports NPS (paragraph 5.60) requires Heathrow to put forward a 'noise envelope' for its third runway proposal:

'Such an envelope should be tailored to local priorities and include clear noise performance targets. As such, the design of the envelope should be defined in consultation with local communities and relevant stakeholders and take account of any independent guidance such as from the Independent Commission on Civil Aviation Noise. 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. Suitable review periods should be set in consultation with the parties mentioned above to ensure the noise envelope's framework remains relevant.'

14.8.45 In its Scoping Opinion for the Gatwick Northern Runway Project, the Planning Inspectorate stated:

'The Inspectorate notes that there is no reference to a defined 'noise envelope' as referred to in paragraph 5.60 of the Airports NPS, and the Applicant should make efforts to agree the need for such provisions with relevant consultation bodies as a mechanism to manage noise effects.'

14.8.46 CAP 1129 Noise Envelopes (CAA, 2013) gives guidance as to the forms that noise envelopes can take, and how they can be implemented. Appendix 14.9.5 discusses each of these options and its merits for this Project. This section briefly summarises the options available and describes the preferred options and the noise envelope that GAL proposes as most appropriate for the Project.

14.8.47 Noise envelopes for airports, as with noise conditions attached to planning consents for other types of noise generating development, can either restrict 'inputs' (eg numbers of flights) or noise 'impacts' in some way. Night restrictions are an example of a noise envelope already in place that restricts inputs. In their case, the restrictions relate to numbers of night flights and total quota counts (QCs) of night flights, in the summer and winter seasons. Noise envelopes that restrict or limit inputs have the advantage of being relatively easy to predict and administer, but they do not give a direct measure or limit on the noise impact experienced in the communities around the airport. Neither do they provide any incentive for the airport or airlines to bring forward quieter operating procedures.

14.8.48 Noise envelopes that restrict noise impacts can be set in terms of the extent of noise effects eg Schiphol Airport has limits of populations highly annoyed and populations sleep disturbed.

However, these rely on applying dose/response relationships for the effects, which can generate uncertainty.

14.8.49 More commonly, noise envelopes that restrict noise impacts use noise contours to either limit the area of the contour or the population within it. The choice of noise contour metric should reflect the impact. $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night contours are the most common contours used because their relationships to annoyance and sleep disturbance in the UK are well understood. Noise event metrics such as L_{max} are less effective, because, taking no allowance for numbers of noise events, they are not good indicators of health effects when used in isolation, and provide no certainty on the numbers of events.

14.8.50 Setting a noise envelope in terms of the population within a given noise contour, such as $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night, has the advantage that it directly relates to the noise impact on the community. However, the population within the area around Gatwick is not within the airport's control and a contour set on this basis could not be monitored or applied with any certainty.

14.8.51 Using the physical size of the $L_{eq,\ 16\ hour}$ day or $L_{eq,\ 8\ hour}$ night contours is therefore considered to be the most appropriate option. A contour which fixes the maximum noise footprint of the airport would limit the throughput of the airport, unless quieter planes can be encouraged to operate. It would incentivise the airport to encourage airlines to use the quietest aircraft and quietest operating procedures, whilst allowing growth to occur within a clear noise limit. It would also provide local communities with certainty on future noise levels.

14.8.52 GAL proposes a noise envelope, therefore, that sets limits in terms of the areas of the daytime LOAEL contour $L_{eq,\ 16\ hour}$ day 51 dB, and the night-time LOAEL contour $L_{eq,\ 8\ hour}$ night 45 dB. The LOAEL contours have been chosen because they represent the lowest level of observable adverse effects during the day and night.

14.8.53 The limiting $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contour areas are proposed with reference to the forecast noise impacts reported in this PEIR, taking account of operating and other measures to limit noise[8].

14.8.54 The noise assessment reporting in this chapter has reported the most likely noise impacts based on the central case fleet ATM forecasts, as discussed in Section 14.5. This is considered the most likely rate of fleet transition based on current assumptions regarding the airlines' fleet procurement programmes and business models. The noise assessment in this chapter also reports the noise impacts associated with a slower transition fleet that supposes the rate of fleet transition is delayed by about five years, particularly owing to uncertainties due to Covid. Whilst the central case fleet is considered most likely to occur, the slower transition fleet could still occur and therefore the noise envelope proposed is based on the noise modelling of this fleet. Appendix 14.9.5 discusses details of the slower transition fleet and the propositions of the quieter next generation aircraft that it expects in the future years used in the noise assessment. The slower transition fleet still builds in assumptions that the noisiest aircraft currently flying at Gatwick are phased out by the point the northern runway opens and that substantial investment in next generation aircraft will occur. For example, in 2019, around 2% of the Gatwick fleet did not meet the ICAO Chapter 4 noise standard, however, these aircraft produce the highest individual

[8] This is consistent with the approach approved by the Planning Inspectors for the Stansted planning application appeal (ref: APP/C1570/W/20/3256619) in May 2021), which consented the expansion of the airport with planning conditions that included limits on the areas of the $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contour areas (albeit at higher noise levels of $L_{eq,\ 16\ hour}$ day 54 dB, and $L_{eq,\ 8\ hour}$ night 48 dB) based on the forecasts used in the Environmental Statement that accompanied the application.

noise levels and make a disproportionate contribution to the contour areas. Therefore, the expected removal by airlines of a proportion of these aircraft will deliver a significant improvement in the noise environment.

14.8.55 The noise assessment has considered noise levels from the Project in 2029, 2032, 2038 and 2047 and demonstrated that for the central case the day and night noise contour areas would decrease relative to the 2019 airport in all successive assessment years with the Project. The effect of the Project on opening in 2029 is to increase the noise levels relative to the future baseline, with maximum contour areas about three years later in 2032, before dropping slightly in 2038, the design year for the runway, when 382,000 commercial ATMs/year would be operating. GAL proposes to set the noise envelope to limit noise levels between opening of the northern runway and the peak noise year and then to set a lower noise envelope limit to provide certainty that noise levels would reduce when the runway design throughput of 382,000 ATMs/year is reached and beyond.

14.8.56 Regulation EU 598/2014 seeks to ensure that 'noise related operating restrictions' are only imposed when other measures within the balanced approach have first been considered, and where those other measures are not in themselves sufficient to attain the specific noise abatement objectives for the airport. The proposed noise envelope has been assumed to be a noise related operating restriction under the Regulation.

14.8.57 GAL propose the following noise objective for the Project:

- The Project will:
  - 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;
  - where possible, contribute to improvements to health and quality of life; and
  - provide certainty to the communities around Gatwick that noise will not exceed contour limits and will reduce over time,

  consistent with the ICAO Balanced Approach.

14.8.58 Appendix 14.9.5 gives further details on the application of Regulation EU 598/2014. The proposed noise envelope limits are as set out below.

14.8.59 By the end of the first year after opening of the reconfigured northern runway pursuant to the Project, and thereafter, the area enclosed by the 92 day summer season average mode noise contours produced by the CAA shall not exceed the following:

- $L_{eq\ 16\ hour}$ day 51 dB: 146.7 km^2; and
- $L_{eq\ 8\ hour}$ night 45 dB: 157.4 km^2.

14.8.60 By the end of the first year in which annual commercial ATMs exceed 382,000, and thereafter, the area enclosed by the 92 day summer season average mode noise contours produced by the CAA shall not exceed the following:

- $L_{eq\ 16\ hour}$ day 51 dB: 125.7 km^2; and
- $L_{eq\ 8\ hour}$ night 45 dB: 136.1 km^2.

14.8.61 The area of the L_{eq} day and night contours would not exceed the limits above, and the noise envelope would provide certainty to the community that noise levels would be limited and would

reduce in the future as the airport grows so as to share the benefits of that growth and new technologies with the community.

14.8.62 GAL will report on performance within the noise envelope annually and set in place internal management processes to forecast performance in the years ahead so as to pre-empt potential non-compliance and put in place operating practices and measures to reduce noise before an exceedance arises. Such measures would be subject to consultation with industry and community stakeholders if they trigger the requirements of Regulation (EU) 598/2014.

14.8.63 GAL seeks views from stakeholders on the proposed noise envelope for consideration as part of this consultation.

Ground Noise

14.8.64 Mitigation is proposed as part of the Project on the airport boundary where practicable to do so, as a combination of new earthwork bunding and acoustic barriers. These would be provided to the west of the airfield where changes in the taxiway infrastructure would be affected as a result of the Project. Additionally, very large buildings, such as the Boeing Hangar and new buildings proposed would themselves act as noise barriers.

14.8.65 At night when there are less aircraft it would be possible to adopt different taxi-routings to reduce taxiing closest to residential areas to the west.

14.8.66 The measures that have been designed into the Project to reduce the potential for impacts on sensitive receptors affected by aircraft ground noise are listed in Table 14.8.2.

Table 14.8.2: Mitigation and Enhancement Measures – Ground Noise

Measures Adopted as Part of the Project	Justification
Mitigation*	
Earthworks, bunding at least 8 metres in height situated at the western end of northern runway.	Required to screen noise close to the source to reduce noise outside the airport. Necessary to replace functionality of existing bund that would be removed as part of the design.
Noise barriers 10 metres in height adjoining the bund installed at the western end of the northern runway and running for approximately 500 metres just to the north of the relocated Juliet taxiway.	Required to screen noise close to the source to reduce noise outside the airport. Necessary to replace functionality of existing bund that would be removed as part of the design and to hopefully improve on the functionality where possible.

* It should be noted that all mitigation measures listed in this table are included in the prediction model, they are not separate alternative options

Road Traffic Noise

14.8.67 A number of measures have been designed into the Project to reduce the potential for impacts from traffic noise. These are listed in Table 14.8.3.

Table 14.8.3: Mitigation and Enhancement Measures – Road Traffic Noise

Measures Adopted as Part of the Project	Justification
Mitigation	
2 metre noise barrier stretching along the A23 on the edge of Riverside Garden Park.	Mitigation can be built into the design of the new roundabouts and surrounding roads, given the high existing noise levels in the Riverside Park and surrounding residential area, to address the third aim of the NPSE to reduce adverse effect of noise where opportunities arise.
1 metre noise barrier along the North Terminal roundabout flyover elevated section (facing Riverside Garden Park).	
1 metre noise barrier along the South Terminal roundabout flyover elevated section, north side.	

14.8.68 A low noise surface may be provided by the Project, but may also be provided in the do-minimum case. The possible benefit of this has therefore been omitted from the assessment of the Project, as a worst case. Also, given the relatively low speed of the road traffic, the noise reduction would be lower than would be the case on high speed roads.

14.9. Assessment of Effects

Initial Construction Phase: 2024-2029

Construction Noise

14.9.1 Construction noise has been modelled based on a series of worst case simplifying assumptions as reported in Section 14.5. The 73 main construction works areas modelled are listed in Appendix 14.9.1 with their currently expected hours of working: day; evening; or night. At this stage the programme of works has allowed the main construction works areas to be grouped into 13 periods: the 12 individual years between 2024 and 2035 and the period 2036 to 2038. In order to not under-estimate the possible combined noise levels and effects of overlapping works, all works likely to occur within any of these periods have been modelled concurrently, resulting in 13 noise models. The results of this initial worst case noise modelling are given in Appendix 14.9.1. This section discusses the works related to the main airfield areas, and the surface access (highway improvements) works which take place from 2024 to 2029 based on current program information.

14.9.2 The initial construction phase noise modelling indicates that there is potential for adverse noise impacts in the communities bordering the airport, and that the scale of those impacts is likely to be larger at night, reflecting the current expectation that much of the work would need to be carried out at night. The significance of the effects on all communities will be further assessed in detail in the ES, based on the construction programme, duration of each main works, better knowledge of the plant likely to be used and further consideration of noise mitigation measures available to reduce noise levels on site. It is expected that noise mitigation would be identified to reduce noise levels, including quieter methods of working, reducing plant noise levels for night works near sensitive areas, site perimeter noise barriers and receptor-based mitigation where appropriate (noise insulation and temporary rehousing). Based on the available information, and the likely extent of mitigation that would be available, residual noise effects are likely and the magnitude of noise impact from construction is assessed as medium magnitude, which would give rise to a **moderate adverse** effect which may be considered significant, in some areas.

14.9.3 The construction noise assessment will be refined in the ES in order to develop further mitigation on site and to estimate the likely extent of the construction noise insulation scheme that would be required in accordance with the CoCP to ensure significant adverse effects on health and quality of life are avoided.

14.9.4 It is important to note that this assessment is worst case, based on a series of cautious assumptions, in order to provide an indication of the potential scale of adverse effects at this stage. The noise modelling will be refined as more details of some construction works become available for the ES, in particular to consider mitigation of noise levels on site.

14.9.5 Potential for vibration impacts will also be assessed in the ES including the likely need for percussive piling at the South Terminal roundabout.

Road Traffic Noise

14.9.6 Construction traffic on public highways has the potential to create noise disturbance. The extent of noise impact would depend on the numbers of NSRs along the relevant routes, and the extent to which noise levels on routes is increased, which depends on the numbers of construction vehicles compared to base flows during the day and night. The three main routes to be adopted by construction traffic are from the M23 Junction 9 into the main construction compounds on the airfield and next to the South Terminal roundabout. They pass along the following routes:

- M23 and A23 – highly trafficked roads with generally few nearby NSRs;
- Perimeter Road East – inside the airport with few nearby NSRs;
- Longbridge Way and Perimeter Road North – inside the airport with few nearby NSRs; and
- Larkins Road, inside the airport with no nearby NSRs.

14.9.7 The route for construction traffic from Junction 10 of the M23 passes along the following roads:

- A2011 dual carriageway – highly trafficked road with generally few nearby NSRs;
- along Gatwick Road from the Hazelwick Roundabout – busy roads though commercial areas of Crawley past few NSRs; and
- into the airport from the Gatwick Road roundabout.

14.9.8 It is not proposed to route construction traffic on smaller roads or through villages such as Charlwood. This would avoid direct noise impacts from construction traffic in these areas. However, there would be construction traffic at night to support the night work, and during highways works, usual road traffic may choose to divert to other routes which may increase noise levels elsewhere. To assess the significance of these potential effects, modelling of construction traffic noise during peak airfield and peak highways works will be undertaken and reported in the ES.

First Full Year of Opening: 2029

Construction Noise

14.9.9 Construction noise has the potential to create noise disturbance in 2029 and up to 2038 when the final works would be complete. This section summarises the likely construction noise impacts from 2029 to 2038, based on current program information. It also summarises impacts expected over the entire construction period.

14.9.10 The construction phase noise modelling indicates that there is potential for adverse noise impacts in the communities bordering the airport in 2029 and beyond, and that the scale of those impacts is likely to be larger at night, reflecting the current expectation that work would be required to be carried out at night. The results are summarised in Appendix 14.9.1 and indicate that in total across all the works, there is potential for adverse noise effects at approximately 150 properties during the day and approximately 500 during the night. The area of greatest potential impact is in Horley due to night works required for the highway alterations, mainly over the period 2029 to 2032. The significance of the effects on all communities will be assessed in detail in the ES, based on the construction programme, duration of each main works, better knowledge of the plant likely to be used and consideration of noise mitigation measures available to reduce noise levels on site. It is expected that noise mitigation would be identified to reduce noise levels, including quieter methods of working, reducing plant noise levels for night works near sensitive areas, and site perimeter noise barriers and receptor-based mitigation where appropriate (noise insulation and temporary rehousing). Based on the currently available information, and the likely extent of mitigation that would be available, residual noise effects are likely and the magnitude of noise impact from construction is assessed as medium magnitude, which would give rise to a **moderate adverse** effect which may be considered significant, in some areas.

14.9.11 Initial predictions show that making a conservative assumption regarding the effect of additional mitigation, the numbers of households affected would be substantially reduced as shown in Appendix 14.9.1. The residual noise effects that are likely are mainly predicted at residential properties in Horley which are close to highway works where works at night are required. The construction noise assessment will be refined in the ES in order to develop further mitigation on site and to estimate the likely extent of the construction noise insulation scheme that would be required in accordance with the CoCP to ensure significant adverse effects on health and quality of life are avoided.

14.9.12 It is important to note that this assessment is based on a series of cautious assumptions, in order to provide an indication of the potential scale of adverse effects at this stage. The noise modelling will be refined as more details of the construction works and programme become available for the ES.

14.9.13 Potential for vibration impacts will also be assessed in the ES including the likely need for percussive piling at the South Terminal roundabout.

Air Noise

14.9.14 The results of modelling air noise levels in the 2029 base and 2029 ‘with Project’ cases are presented in Section 4 of Appendix 14.9.2. The northern runway is anticipated to add approximately 40 additional movements in the summer daytime period and 2 additional movements at night. By 2032 the northern runway is anticipated to add approximately 160 additional movements in the summer daytime period and 10 additional movements at night. The impacts predicted in 2029 are lower than in those predicted for 2032, as discussed in the following Interim Assessment Year section (2032).

Ground Noise

14.9.15 The results of modelling of predicted ground noise for the Project in the first year of opening (2029) and the associated assessment of effects are presented in Appendix 14.9.3. The changes between future baseline and with Project predicted noise levels in 2029 are smaller than in 2032

because the use of the northern runway is expected to increase between 2029 and 2032. The assessment therefore focuses on the 2032 assessment year as a worst-case (see section on 2032 effects). Appendix 14.9.3 includes information on the noise emissions levels from current and next generation aircraft used for the ground noise modelling.

Road Traffic Noise

14.9.16 Construction traffic on public highways has the potential to create noise disturbance and would continue into 2029. The potential for noise impacts from this source has been considered in the assessment for the initial construction phase: 2024-2029.

14.9.17 It is also acknowledged that there would be operational traffic associated with the Project during 2029. This will be assessed at the ES stage.

Interim Assessment Year: 2032

Air Noise

14.9.18 As discussed in Section 14.4, the assessment of air noise uses a number of noise metrics to quantify the noise changes expected from the Project, as reported in the following sections.

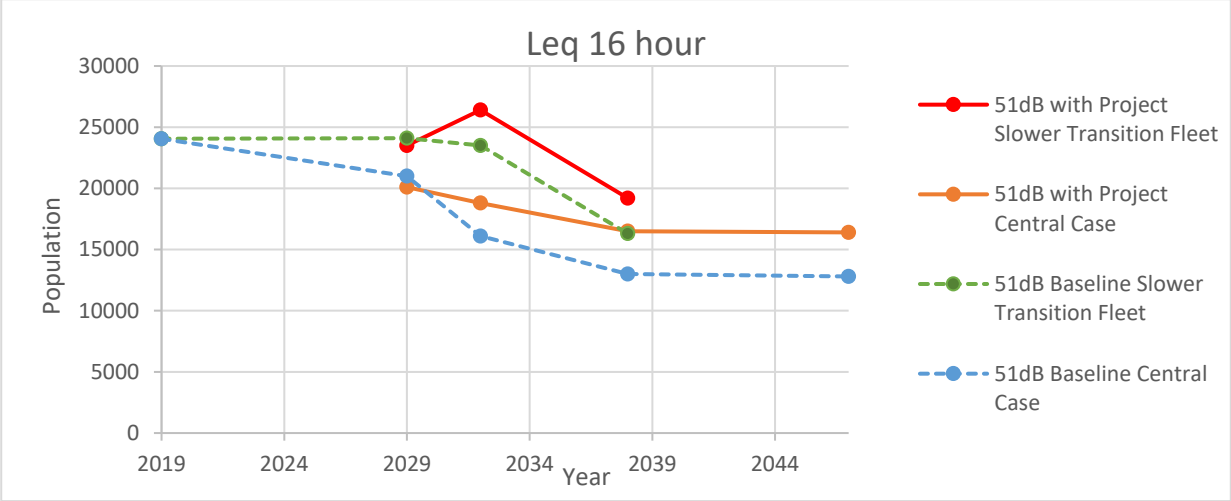
- Primary noise metrics – $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night contours are used to quantify changes in community noise exposure in terms of populations affected and areas of noise contours, and likely significant effects on health and quality of life. $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night difference contours are used to show noise changes across the area.
- Secondary Noise metrics – N65 day and N60 night contours are used to quantify changes in community noise exposure measured in terms of the numbers of noise events (above L_{max} 65 dB and L_{max} 60 dB) as populations affected and areas of noise contours.
- L_{den} and L_{night} annual average noise contours are provided to illustrate noise changes over the entire year.
- Community Representative Locations – Noise levels in terms of primary and secondary noise metrics at these particular locations are used to describe in more detail how noise would change in terms of changes in L_{eq} decibel levels and number of flights above L_{max} 60 and L_{max} 65 dB on average summer easterly and westerly operating days.
- L_{max} 60 and 65 dB – footprints from a common aircraft type are plotted to illustrate how L_{max} levels would change for departures from the northern runway compared to the main runway.
- Noise Sensitive Buildings – noise levels at schools, hospitals, places of worship and community buildings are considered to assess impacts on these non-residential noise sensitive buildings.
- Overflights – change in the numbers of overflights expected within a wider area up to 35 miles from the airport are estimated to inform those experiencing aircraft in the sky further from the airport.

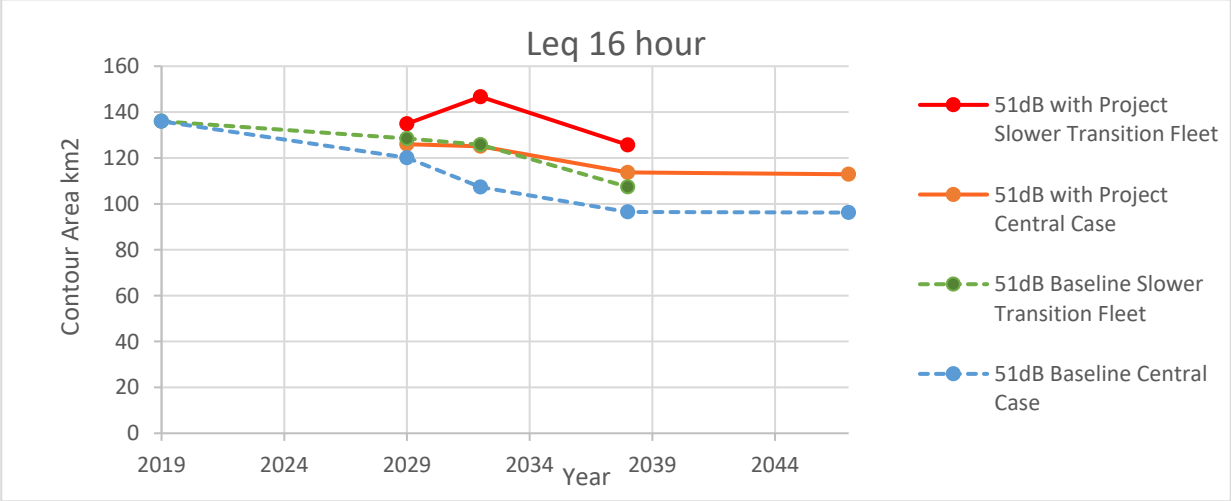
Primary Noise Metrics

14.9.19 Figure 14.9.1 shows the 2032 scenario with the Project $L_{eq,\ 16\ hour}$ day noise contours. Also included on Figure 14.9.1 are the seven Community Representative Locations referred to elsewhere in this chapter. Diagram 14.9.1 shows how the area and populations within the $L_{eq,\ 16\ hour}$ 51 LOAEL contours are expected to change compared to the baseline situation in 2019, 2029, 2032, 2038 and 2047. Full results are provided in Appendix 14.9.2. As described in Section

14.5 the central fleet forecast case and a slower transition fleet case have been modelled to give the range of baseline and with Project conditions in the future.

Diagram 14.9.1: Leq, 16 hour Day Contour Populations and Areas: 2019, 2029, 2032, 2038 and 2047





14.9.20 In 2032, the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to rise from 16,100 to 23,500 in the base case to 18,800 to 26,400 with the Project but remain below the 2019 level of 24,050 except in the slower transition fleet case. Thus, the Project is predicted to increase the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour by 2,700 to 2,900 people in 2032. In 2032, the area of the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to increase from 107.3 to 125.8 km^2 in the base case to 125.1 km^2 to 146.7 with the Project and would remain below the 2019 area of 136.0 km^2 in the central case but exceed it in the slower transition fleet case before dropping back to below it by 2038.

14.9.21 In the year of opening, 2029, for both the central and slower transition fleet cases, the area of the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to increase slightly above the baseline in 2029, but the population within it is predicted to reduce slightly. This is because of the slight shift in the noise contour near the airport northwards away from the Forge Wood residential area to the south.

14.9.22 In 2032, the population within the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB contour is predicted to rise from approximately 400 to 500 in the base case to approximately 500 to 600 with the Project, and approximately equal the 500 people in 2019. These population counts are rounded to the nearest 100, as discussed below.

14.9.23 Inspection of the central case $L_{eq,\ 16\ hour}$ day 63 dB contours in detail shows approximately 30 additional residential properties (approximately 80 people) within the SOAEL contour in 2032 compared to the 2032 baseline situation, at which significant adverse effects on health and quality of life would be expected, and mitigation is proposed in the form of noise insulation.

14.9.24 Inspection of the slower transition case $L_{eq,\ 16\ hour}$ day 63 dB contours in detail shows approximately 60 additional residential properties (approximately 160 people) within the SOAEL contour in 2032 compared to the 2032 baseline situation, at which significant adverse effects on health and quality of life would be expected, and mitigation is proposed in the form of noise insulation. Of these approximately 60 additional residential properties only approximately 5, in the Russ Hill area, are not in the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB in 2019.

14.9.25 In both the central and slower transition fleet cases, to the south of the airport approximately 10 properties would be removed from the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB zone, the level above which there are significant effects on health and quality of life.

14.9.26 Figure 14.9.2 shows the 2032 with Project versus 2032 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours for the central case. Figure 14.9.3 shows the 2032 with Project versus 2032 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours for the slower transition case. The changes in $L_{eq,\ 16\ hour}$ day noise levels in 2032 as a result of the Project are summarised in Table 14.9.1. Only areas and populations within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contours with the Project are counted, changes outside this are not.

Table 14.9.1: Changes in $L_{eq,\ 16\ hour}$ Day Noise Levels; 2032 With Project Versus 2032 Baseline [(1)]

Noise Change Band $L_{eq,\ 16\ hour}$ Day dB	Area (km^2)	Population	Comment
-6 to -3	0.5 - 0.9	-	Lowfield Farm on Charlwood Road and mostly within the airport boundary south of the main runway.
-3 to -2	1.2 – 1.4	<100	Approximately 20 houses on Charlwood Road, Poles Lane and Bonnetts Lane south of the airport.
-2 to -1	2.8 – 2.8	500	South of the airport on Charlwood Road, Bonnetts Lane and houses on the north tip of Ifield near the Crawley Rugby Club.
-1 to 0	4.7 – 6.4	1,200 – 4,300	South west of the airport in the area of Ifield Wood Road west of Ifield, and in the Tinsley Green area (Radford Road, Balcombe Road, Forge Wood) south east of the airport.
0 to +1	83.6 – 96.7	12,800 – 16,000	East of the airport (excluding an area around Smallfields) and west of the airport south of the extended runway centerline including Rusper and Kingsfold. The northern part of Charlwood, north of Horley Road.

Noise Change Band $L_{eq, 16 hour}$ Day dB	Area (km^2)	Population	Comment
+1 to +2	25.2 – 32.6	4,800 – 6,500	West of the airport north of the extended runway centerline including the southern part of Charlwood and Capel. East of the airport north of the extended runway centerline including parts of Smallfield.
+2 to +3	4.0 – 4.2	300 - 400	West of the airport north of the extended runway centerline including parts of Russ Hill Road, Ifield Road and Partridge Lane to the South of Charlwood.
+3 to +6	2.1 - 2.3	<100	Mainly within the airport. Approximately 20 properties on Ifield Road approximately 1 km west of the airport boundary and approximately 20 properties in Russ Hill approximately 2 km west of the airport.
>+6	0.8	0	Within the airport.

1. Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.9.27 The following paragraphs describe the significance of these predicted noise changes using the methodology described in Section 14.4.

14.9.28 Approximately 1,700 to 4,800 people living south of the airport are predicted to experience small reductions in noise because some aircraft that would have used the main runway in 2032 would be using the northern runway instead, on a flight path 200 metres further north. These are negligible to low noise reductions affecting medium to very high populations and likely to lead to **minor beneficial** but not significant effects.

14.9.29 The majority (61 to 68%%) of the population within the LOAEL $L_{eq, 16 hour}$ day 51 dB contour are predicted to experience an increase in noise level of less than 1 dB as a result of the Project in 2032 compared to the 2032 baseline. These are negligible increases and would give rise to **negligible** effects.

14.9.30 To the north of the extended runway centreline, and predominantly to the west, approximately 4,800 to 6,500 people are predicted to experience increases in noise of 1 to 2 dB. These are low increases in noise and because noise levels in this area are well below SOAEL are likely to result in **minor adverse** and not significant effects. The majority of the residential properties in these areas would be eligible for the new Outer Zone NIS, which would further reduce noise effects in these areas.

14.9.31 To the west, approximately 300 to 400 people are expected to experience noise increases of 2 to 3 dB. The majority of this area is covered by the existing NIS. These are low increases in noise affecting a low sized population giving rise to generally **minor adverse** effects. All of the residential properties in these areas would be eligible for the new Outer Zone NIS, which would further reduce noise effects in these areas. Some of these properties are above SOAEL and are likely to experience potentially **moderate adverse** significant effects. However, these residential properties would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects.

14.9.32 Approximately 2 km to the west of western end of the northern runway approximately 20 properties in the Russ Hill area have been identified as experiencing increases of greater than 3 dB. These properties are predicted to experience medium to high noise increases, so these effects are potentially **moderate adverse** significant effects. All the residential properties in this area would be eligible for the new Inner Zone NIS, which would avoid significant noise effects in this area.

14.9.33 Approximately 1 km to the west of western end of the northern runway the following 20 properties on Ifield Road have been identified as experiencing increases of 3-6 dB:

- Longmeadow Villas (8 dwellings)
- Cottesmore House
- The Seasons
- Oak Gates
- Pine Trees
- Squirrels Leap
- Beech Hay
- Little Oaks
- The Gallops
- Birchfield House, and
- Woodcote (approximately 3 dwellings).

14.9.34 These properties on Ifield Road are predicted to experience medium to high noise increases for properties already above the SOAEL, so are potentially subject to **moderate adverse** significant effects. These houses would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects.

14.9.35 All residential properties forecast to be within the $L_{eq\ 16\ hour}$ day 63 dB contour would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects. The extent of the NIS is shown in Figure 14.8.1. Figure 14.9.4 shows the central case 2032 with Project versus 2019 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows larger areas with noise levels reducing from the 2019 baseline to 2032 with the Project than increasing, reflecting the overall reduction in the size of all the noise contours in the central case.

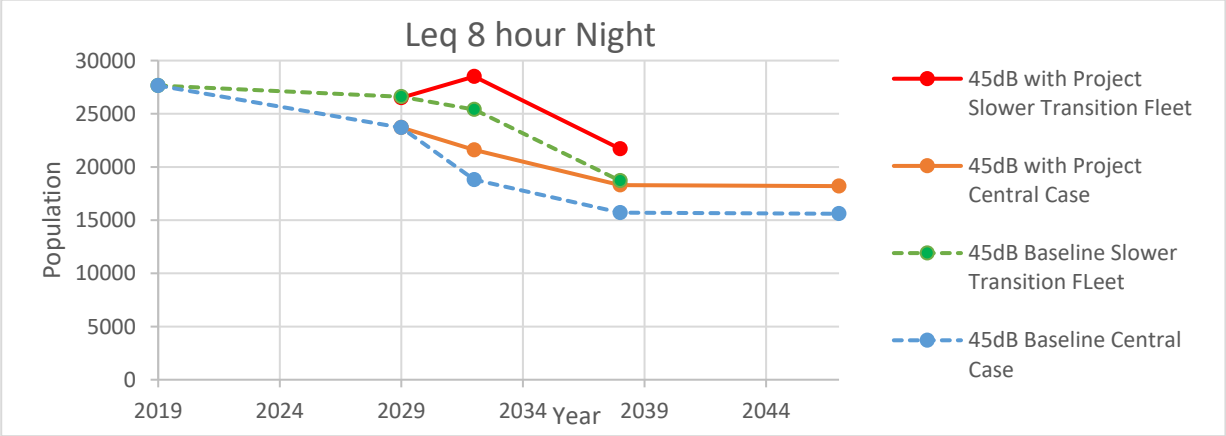
14.9.36 Figure 14.9.5 shows the slower transition fleet case in 2032 with Project versus 2019 baseline difference, $L_{eq,\ 16\ hour}$ day noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows larger areas with noise levels increasing from the 2019 baseline to 2032 with the Project than reducing, reflecting the overall increase in the size of all the noise contours in the slower transition fleet case. Note however, the slower transition fleet noise contours would reduce to be smaller than those in 2019 by 2038 (see Appendix 14.9.2 for details).

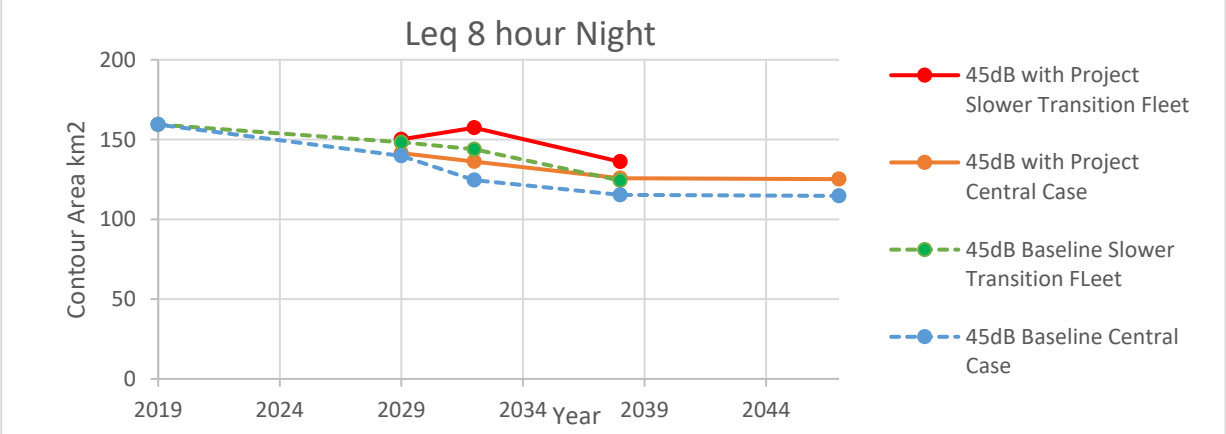
14.9.37 Figure 14.9.6 shows the 2013 baseline $L_{eq,\ 16\ hour}$ day noise contours. The areas and populations within each are provided in Appendix 14.9.2. At that time 51 dB levels were not produced. The largest contour, $L_{eq,\ 16\ hour}$ day 54 dB had an area of 77.1 km^2 and a population of 9,700 people. The forecast 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour has an area of 66.1 to 80.5 km^2 and a population of 9,000 to 10,900. Thus, for the central case forecast the 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour is smaller than in 2013 and for the slower transition case in 2032 it is slightly larger. In the years following 2013 the noise contours grew slightly and in 2016 and 2017 the $L_{eq,}$

$_{16\ hour}$ day 54 dB had a areas of 86.5 and 82.7 km^2, which are larger than the slower transition case forecast in 2032.

14.9.38 Figure 14.9.7 shows the 2032 with Project $L_{eq,\ 8\ hour}$ night contours. Diagram 14.9.1 shows how the area and populations within the $L_{eq,\ 8\ hour}$ night 45 dB contours are expected to change compared to the baseline in 2019, 2029, 2032, 2038 and 2047. As described in Section 14.5 the central fleet forecast case and a slower transition fleet case have been modelled to give the range of baseline and with Project conditions in the future. Full results are provided in Appendix 14.9.2.

Diagram 14.9.2: Populations and $L_{eq,\ 8\ hour}$ Night Contour Areas: 2019, 2029, 2032, 2038, 2047





14.9.39 In 2032, the population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is predicted to rise from 18,800 to 25,400 in the base case to 21,600 to 28,500 with the Project. Thus, the Project is predicted to increase the population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour by 2,800 to 3,100 people in 2032. In 2019 there were approximately 27,650 people living with in the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour. Thus, compared to 2019, in 2032 with the Project the population within the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is predicted to decrease by 6,050 in the central case and to increase by 850 in the slower transition case. In 2032, the area of the LOAEL $L_{eq,\ 8\ hour}$ night 45 dB contour is predicted to increase from 124.6 to 143.9 km^2 in the base case to 136.2 to 157.4 km^2 with the Project and would remain below the 2019 area of 159.4 km^2 in both the central case and slower transition fleet cases.

14.9.40 In 2032, the population within the SOAEL $L_{eq, 8\ hour}$ night 55 dB contour is predicted to rise from approximately 900 to 1,100 in the base case to approximately 1,000 to 1,200 with the Project, and remain below the approximately 1,250 people in 2019. Thus, the Project is predicted to increase the population within the SOAEL $L_{eq, 8\ hour}$ night 55 dB contour by approximately 100 people in 2032 compared to the baseline in 2032. These population counts are rounded to the nearest 100. Inspection of the 55 dB contours in detail shows approximately 60 additional residential properties (approximately 160 people) are within the SOAEL contour in 2032 compared the 2032 base, at which significant adverse effects on health and quality of life would be expected, and mitigation is proposed in the form of noise insulation, as discussed below. The areas within the day and night SOAEL contours overlap so that the total number of properties within the day or night SOAEL contour due to noise increases from the Project in 2032 is approximately 80 (approximately 200 people).

14.9.41 Figure 14.9.8 shows the 2032 situation with the Project versus the 2032 baseline difference $L_{eq, 8\ hour}$ night noise contours for the central case. Figure 14.9.9 shows the 2032 with Project versus 2032 baseline difference, $L_{eq, 8\ hour}$ night noise contours for the slower transition case. The changes in $L_{eq, 8\ hour}$ night noise levels in 2032 as a result of the Project are summarised in Table 14.9.2. Only areas and populations within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contours with the Project are counted, changes outside this are not.

Table 14.9.2: Changes in $L_{eq, 8\ hour}$ Night Noise Levels; 2032 With Project Versus 2032 Base (1)

Noise Change Band dB	Area (km^2)	Population	Comment
-1 to 0	3.2	100 - 200	South west of the airport in the area of Poles Lane, Bonnetts Lane and Charlwood Road.
0 to +1	124.9	20,900 – 28,100	East of the airport and west of the airport.
+1 to +2	6.6	300 - 500	West of the airport north of the extended runway centerline including properties on Ifield Road south of Charlwood, in Russ Hill and on Partridge Lane to the west.
+2 to +3	0.7	0	Within the airport and immediately west of the west end of the northern runway.
>+3dB	0.8	0	Within the airport.

(1) Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.9.42 Approximately 100 to 200 people living south of the airport are predicted to experience reductions in $L_{eq, 8\ hour}$ night noise levels of less than 1 dB. This is a negligible decrease, likely to give rise to **negligible** effects.

14.9.43 The vast majority (97 to 99 %) of the population within the LOAEL $L_{eq, 8\ hour}$ night 45 dB contour are predicted to experience increases in noise level of less than 1 dB at night as a result of the Project in 2032 compared to the 2032 baseline. This is a negligible increase, likely to give rise to **negligible** effects.

14.9.44 To the west of the northern runway west end approximately 300 to 500 people would experience an increase of 1 to 2 dB. These are low increases affecting a low size of population, so are likely

to give rise to generally **minor adverse** effects. All of the residential properties in these areas would be eligible for the new Outer Zone NIS, which would further reduce noise effects in these areas. Some of these properties are above SOAEL and are likely to experience potentially **moderate adverse** significant effects. However, these residential properties would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects.

14.9.45 All residential properties forecast to be within the $L_{eq\ 8\ hour}$ day 55 dB contour would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects. The extent of the NIS is shown in Figure 14.8.1.

14.9.46 The changes in noise levels expected from the Project at night-time are smaller than during the day because the northern runway would not generally be used between 23:00 and 06:00 hours and because the night flight restrictions are assumed to limit growth in night flights.

14.9.47 Figure 14.9.10 shows the central case 2032 with Project versus 2019 baseline difference, $L_{eq,\ 8\ hour}$ night noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. Figure 14.9.10 shows that compared to 2019 night noise levels with the Project in 2032 would reduce in nearly all areas around the airport.

14.9.48 Figure 14.9.11 shows the slower transition fleet case in 2032 with Project versus 2019 baseline difference, $L_{eq,\ 8\ hour}$ night noise contours, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline. This shows areas to the west with noise levels increasing slightly and larger areas to the east with noise levels reducing slightly from the 2019 baseline to 2032 with the Project, reflecting the overall slight decrease in the size of all the noise contours in the slower transition fleet case.

14.9.49 Figure 14.9.12 shows the 2013 baseline $L_{eq,\ 8\ hour}$ night noise contours. The areas and populations within each are provided in Appendix 14.9.2. At that time 45 dB contours were not produced. The largest contour, $L_{eq,\ 8\ hour}$ night 48 dB had an area of 91.2 km^2 and a population of 11,200 people. The forecast for 2032 with the Project $L_{eq,\ 8\ hour}$ night 48 dB contour has an area of 75.1 to 88.0 km^2 and a population of 9,900 to 11,900 indicating that the 2032 $L_{eq,\ 8\ hour}$ night 48 dB contour area would be lower than in 2013 and the population would be lower in the central case but slightly higher in the slower transition case. The population living in the area around the airport will have increased between 2013 and 2032 which accounts for this smaller contour yet larger population.

Secondary Noise Metrics

14.9.50 Noise levels are presented in this section using the set of required noise metrics that are supplementary to the main metrics used to judge significance of noise impacts. They provide additional information to illustrate where noise changes are expected.

14.9.51 Figure 14.9.13 shows the 2032 northern runway N65 day contours. The population exposed to at least 20 aircraft noise events above L_{max} 65 dB on an average summer day is predicted to be approximately 17,400 to 32,200 compared to 15,300 to 28,300 in the 2032 baseline. This would be below the 2019 level of 24,100 in the central case, but above it in the slower transition fleet case.

14.9.52 Figure 14.9.14 and Figure 14.9.15 show the 2032 with Project versus 2032 baseline difference N65 day noise contours, for the central and slower transition cases, illustrating how noise levels in 2032 with the Project would change compared to the 2032 baseline. Areas to the south are

expected to experience some reductions in numbers of flights above L_{max} 65 dB during the day including the northern edge of Crawley. North of the airport, N65 levels would increase and under the main arrivals and departure routes on the extended runway centrelines increases of 50 to 100 noise events above L_{max} 65 dB per day are expected. These changes are described more specifically in the following section on Community Representative Locations.

14.9.53 Figure 14.9.16 and Figure 14.9.17 show the 2032 with Project versus 2019 baseline difference N65 day noise contours, for the central and slower transition cases, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline.

14.9.54 Figure 14.9.18 shows the 2032 with Project N60 night contours. The population exposed to at least 10 aircraft noise events above L_{max} 60 dB on an average summer night is predicted to be approximately 29,600 to 33,800 compared to 28,900 to 31,500 in the 2032 baseline, and below the 2019 level of 33,850.

14.9.55 Figure 14.9.19 and Figure 14.9.20 show the 2032 with Project versus 2032 Baseline difference N60 night noise contours, for the central and slower transition fleet cases, illustrating how noise levels in 2032 with the Project would change compared to the 2032 baseline. As seen above for $L_{eq,\ 8\ hour}$ night noise levels, the changes predicted due to the Project at night are smaller than during the day, with areas further from the airport seeing increases of less than 5 and areas closer seeing increases of 5-10. These changes are described more specifically in the following section on Community Representative Locations.

14.9.56 Figure 14.9.21 and Figure 14.9.22 show the 2032 with Project versus 2019 baseline difference N60 night noise contours, for the central and slower transition fleet cases, illustrating how noise levels in 2032 with the Project would change compared to the 2019 baseline.

Lmax Levels

14.9.57 Figure 14.9.23 shows L_{max} 60 dB and L_{max} 65 dB noise footprints for an A320 departing the main runway and the northern runway along each of the main departure routes to the east and west. The A320 was chosen because it is one of the most common aircraft at Gatwick. The changes in L_{max} levels as a result of A320s using the northern runway instead of the main runway can be seen, with no or very small change in areas further from the airport.

14.9.58 Figure 14.9.24 shows L_{max} 60 dB and L_{max} 65 dB noise footprints for an A320 Neo departing the main runway and the northern runway along each of the main departure routes to the east and west. As with the A320 footprints, it can be seen that the changes in L_{max} levels as a result of A320 Neos using the northern runway instead of the main runway are small with very small or no change in areas further from the airport. The extent to which A320 Neos are quieter than the A320s on departure is also clearly illustrated by the much smaller footprints.

14.9.59 Figure 14.9.25 shows the A320's L_{max} difference contours for a single departure on the northern runway compared to on the main runway. To illustrate the difference in L_{max} levels for departures, a Standard Instrument Departure to the west (Bognor, BOG) and to the east (Clandon, CLN) are shown. L_{max} levels increase to the north and decrease to the south of the runways, as would be expected, as discussed in more detail as follows.

14.9.60 For departures from the northern runway to the east, the area within which L_{max} levels would increase by more than 3 dB is mainly within the airfield and reaches to the east just beyond the Balcombe Road including a small area of houses. Similarly to the east the area within which L_{max}

levels would decrease by more than 3 dB to the south affects a small area of housing as far as the Balcombe Road.

14.9.61 For departures from the northern runway to the west, the area within which L_{max} levels would increase by more than 3 dB reaches as far as Russ Hill encompassing a population of up to 300 people who may perceive A320 departures as noticeably louder. Also to the west, the area within which L_{max} levels would decrease by at least 3 dB to the south includes housing areas of Langley Green and north Ifield, indicating that over 1,000 people would perceive A320 departures from the northern runway as noticeably quieter. This benefit is partly because the northern runway would move departures 200 metres to the north, but also because for westerly departures they would also be moved west approximately 750 metres because the northern runway eastern end is moved west by 750 metres.

Lden and Lnight Annual Average Noise Levels

14.9.62 The primary and secondary noise metrics ($L_{eq,\ 16\ hr}$ day, $L_{eq,\ 8\ hr}$ night, N65 day and N60 night) are all predicted for an average summer day because this is when the airport is usually busiest and noisiest. However, in order to illustrate how noise levels over the whole year will change with the Project, L_{den} and L_{night} noise levels has also been modelled, consistent with common practice in the European Union and associated regulations. The areas and population within these contours in 2032 with the Project are summarised in Table 14.9.3.

Table 14.9.3: 2032 (Standard Mode) Annual L_{den} and L_{night} Noise Levels with Project (1)

Noise Metric	Noise Contour Area (km^2)	Population
L_{den}:		
>55 dB	86.1 - 100.9	11,500 – 14,700
>60 dB	28.2 - 34	1,800 – 2,200
>65 dB	11.3 - 13.6	500 - 500
>70 dB	4 - 5	200 - 200
>75 dB	1.7 - 2	0 - 0
L_{night}:		
>45 dB	101.6 - 117.5	13400 - 18000
>50 dB	33.6 - 40.3	3200 - 4400
>55 dB	13.2 - 15.6	600 - 800
>60 dB	4.7 - 5.7	200 - 300
>65 dB	1.8 - 2.1	0 - 0
>70 dB	0.9 - 1.1	0 - 0

(1) Ranges cover the central case fleet noise modelling and the slower transition fleet noise modelling.

14.9.63 Figure 14.9.26 shows the L_{den} contours in 2032 with the Project for the central case and slower transition fleet cases.

14.9.64 Figure 14.9.27 shows the L_{night} contours in 2032 with the Project for the central case and slower transition fleet cases.

14.9.65 L_{night} is a measure of the 8 hour night noise levels averaged over the whole year. In all cases the summer $L_{eq\ 8\ hr}$ noise contours are larger than the annual average L_{night} contours (by about 35%) indicating how the summer noise levels, that have been used in this assessment, are higher than the annual average.

14.9.66 The increase in size of the annual L_{night} contours in 2032 due to the Project compared to the 2032 base is 11-12%, which is slightly larger than the increase in the summer $L_{eq\ 8\ hr}$ noise contours of 9%. The increase in area of the annual day evening night L_{den} noise levels due to the Project in 2032 compared to the 2032 base is 17% which is the same as the increase in the summer daytime $L_{eq\ 16\ hr}$ 51 dB contours in 2032. Overall this suggest that any seasonality in the way the extra capacity delivered by the Project is used has little effect on noise levels across seasons.

Overflights

14.9.67 CAP 1616 notes that where a proposal is expected to change traffic patterns below 7,000 feet, the Secretary of State has specified that 'overflight' must be portrayed.

14.9.68 Close to the extended northern runway centreline, such as in the area south of Charlwood, there are areas that are currently 'overflown' only when the northern runway is used during maintenance/standby use, that would be routinely overflown when the northern runway is in use daily. Using the CAA definition of overflight (see Appendix 14.9.2), an analysis of the areas overflown by the most common rapid climbing aircraft, the A319, has been undertaken for the main runway and the northern runway, using the mean departure profile for this aircraft. Figure 14.9.28 shows the areas (in red) that would be routinely overflown by A319 departures from the northern runway but which are not overflown by departures from the main runway. Similarly Figure 14.9.28 shows areas that are overflown by A319 departures from the main runway but not the northern runway (in blue).

14.9.69 Figure 14.9.28 shows the areas (in red) that would be routinely newly overflown by the routine departures from the northern runway, as follows.

- To the east – an approximately 200 metre wide strip of land extending 6 km from the eastern edge of the airport as far as the point where departures using the KEN/SAM (Kenet/Sampton) standard instrument departure (SID) route on the main runway and northern runways converge as they turn north.
- To the west – an approximately 200 metre wide strip of land extending 5 km from the western edge of the airport as far as the point where departures using the LAM/BIG/CLN/DVR SID route (Route 4) on the main runway and northern runways converge as they turn north. Beyond this, further west than the Route 4 northerly turn, the area extends a further 9 km as far as the where departures using the KEN/SAM, HAR/BOG and SFD SID routes on the main runway and northern runways converge as they turn south.

14.9.70 The area to be newly routinely overflown to the east crosses the A23 and mainly sparsely populated areas, apart from the area south of Smallfields which includes approximately 100 houses.

14.9.71 The area to be newly routinely overflown to the west crosses mainly sparsely populated areas, apart from approximately 10 properties on the Ifield Road and scattered properties beyond. West of the Route 4 turn the area crosses the village of Wallis Wood but in this area an A319 has typically reached a height of at least 4,500 feet.

14.9.72 This analysis is for a typical A319 aircraft. Other aircraft would climb at different rates and of course, aircraft disperse from the centreline modelled, but the analysis is intended to give an indication of size of the areas that would see more aircraft in the sky due to routine use of the northern runway. Figure 14.9.28 also shows the areas to the south for which the movement of flights from the main runway to the northern runway in itself would lessen overflights.

14.9.73 Figures 14.6.7 to 14.6.9 show the baseline modelling of overflights in 2018, with Figure 14.6.7 showing all flights within 35 miles of Gatwick below 7,000 feet above ground level. In Figure 14.9.29 the number of Gatwick flights has been increased by 20% on the 2018 value while keeping all other 2018 baseline parameters (non-Gatwick flights and their airspace routings) the same. This is to provide some indication of the scale of change brought by the Project purely in the terms of current cumulative overflights. Implementation of the Government's FASI-S programme would result in a different cumulative track density as a result of higher numbers of movements from other airports routing around London, but there is insufficient information available at this time to assess this. The 20% increase in flight movements equates to approximately the increase to 2032 traffic levels (see Appendix 14.9.2 for details).

14.9.74 Clearly under the arrivals and departure routes close to Gatwick the increase of 20% in Gatwick flights gives a 20% increase in total flights. In areas away from the extended runway centrelines, where there are overflights from other airports as well as from Gatwick, this is not the case, for example over parts of Tunbridge Wells.

14.9.75 This overflights analysis has been used in the Chapter 8: Landscape, Townscape and Visual Resources assessment of tranquillity and in the Chapter 7: Historic Environment assessment of impacts on sensitive heritage assets, as reported further in Section 14.11.17.

Community Representative Locations

14.9.76 Figure 14.9.1 shows the location of the following seven Community Representative Locations that were chosen at which describe the noise changes expected from the Project in more detail. In this section on the changes expected at Community Representative Locations for the central case are described. The equivalent information for the slower transition fleet case can be found in Section 5 of Appendix 14.9.2.

- Rusper Primary School – in the centre of the village of population approximately 1,400, located 5 km to the west of the airport on the 2032 with Project $L_{eq,\ 16\ hour}$ day 51 dB contour.
- Charlwood Village Infant School – in the north of the village of population approximately 2,400, located 1 km to the north west of the airport near the 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour.
- Lingfield Primary School – near the centre of the village of population approximately 4,400, located 10 km to the east of the airport under the approach flight path near the 2032 with Project $L_{eq,\ 16\ hour}$ day 57 dB contour.
- Chiddingstone Church of England School – in the centre of the village of population approximately 1,300, located 7 km to the west of the airport near the 2032 with Project $L_{eq,\ 16\ hour}$ day 51 dB contour.
- Capel Pre School – in the east side of the village of population approximately 1,200, located 22 km to the east of the airport near the 2032 with Project $L_{eq,\ 16\ hour}$ day 54 dB contour.
- Willow Tree Pre-school, Ifield – on the north side of Ifield which is the northern district of Crawly, located 1.3 km to the south of the airport outside the 2032 with Project $L_{eq,\ 16\ hour}$ day 51 dB contour.

- Barnfield Care Home, Horley – within the residential area of Horley, located 600 m to the north of the airport just outside the 2032 with Project $L_{eq, 16\ hour}$ day 51 dB contour.

14.9.77 These seven locations represent approximately half of the population within the 2032 $L_{eq, 16\ hour}$ day 51 dB contour with the Project in the central case. Appendix 14.2 provides seven tables giving the full results of modelling for all noise metrics at each of these locations. $L_{eq, 16\ hour}$ day, $L_{eq, 8\ hour}$ night, N65 day and N60 night levels are provided for easterly and westerly operating days, for 2019, the 2032 base case and the 2032 with Project case, to illustrate the changes in the noise environment that can be expected in each location. These tables are provided for the central case and the slower transition fleet case. The following sections summarise the changes in the noise environment that can be expected in 2032 with the Project, for the central case, compared with the 2032 baseline and 2019 baseline in each of these areas. Each paragraph is intended to give more detail for stakeholders interested in noise impacts in that area or near to it.

Rusper Primary School

14.9.78 At Rusper Primary School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.3 dB for daytime and 0.5 dB for night-time compared to the 2032 base case, and to reduce daytime and night-time levels by 1.4 dB and 0.9 dB compared to 2019. Situated to the west and offset from the arrivals route, this location has higher noise levels for westerly operations. On westerly operations the 2019 number of noise events above L_{max} 65 dB in the day was 26 and this is predicted to reduce to 7 by 2032 both with and without the Project. On easterly operations, Rusper in 2019 had no L_{max} events above 65 dB in the day and this is not expected to change with the Project. On easterly operations, Rusper in 2019 had one Lmax events above 60 dB in the night and this is expected to reduce to none with or without the Project. In the future Rusper would benefit from the gradual reduction in aircraft noise levels on departure in the base case and the slight movement of some flights away from it with the Project.

Charlwood Infant School

14.9.79 At Charlwood Infant School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.5 dB for daytime and 0.5 dB for night-time compared to the 2032 base case, and to reduce daytime and night-time levels by 1.9 dB and 1.4 dB compared to 2019. Situated to the north west of the airport, the village is exposed to noise from departures on westerlies, and noise from arrivals on easterlies. On westerly operations there are currently about 158 events above L_{max} 65 dB in the daytime in 2019. This is forecast to reduce in the future, in 2032, both in the base case, to 32, and with the Project, to 102. This is because aircraft are becoming quieter on departure, and the altered northern runway would not generally be used by the largest aircraft. On easterly operations there are currently about 23 events above L_{max} 65 dB in the daytime in 2019. This is forecast to reduce in the future, in 2032 in the base case, to 4, and with the Project to 7, as the number of arrivals on the main runway increases.

Lingfield Primary School

14.9.80 At Lingfield Primary School, in 2032 the Project is predicted to increase average summer day L_{eq} noise levels by 0.8 dB for daytime and 0.3 dB for night-time compared to the 2032 base case, and to increase daytime noise levels by 0.3 dB and decrease night-time levels by 0.4 dB compared to 2019. Situated under the arrivals flight path to the east of the airport, noise levels are higher by about 5 dB L_{eq} on westerlies than easterlies. On westerly operations, there are currently about 286 events above L_{max} 65 dB in the daytime (in 2019). This is forecast to increase

in the future, in 2032 in the base case, to 301, and with the Project, to 367. On easterly operations there are roughly half as many events above L_{max} 65 dB compared to westerly operations and similar changes are predicted. At Lingfield and Chiddingstone, average summer day noise levels are dominated by arrivals noise because they are located to the east of the airport. Of the seven Community Representative Locations, they are the only two locations where increased $L_{eq, 16\ hour}$ day noise levels, by 0.3 and 0.8 dB respectively, are expected in 2032 with the Project compared to 2019. Night noise levels are predicted to reduce over this period, by 0.8 and 0.7 dB.

Chiddingstone Church of England School

14.9.81 At Chiddingstone Church of England School in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 0.8 dB for daytime and 0.4 dB for night-time compared to the 2032 base case, and to increase daytime noise levels by 0.6 dB and decrease night-time levels by 0.7 dB compared to 2019. Situated under the arrivals swathe 22 km to the east of the airport, noise levels are higher by about 8 dB L_{eq}, on westerlies than easterlies. On easterly operations there are very few events above L_{max} 65 dB in the daytime, only one in 2019. On westerly operations there are currently about 38 events above L_{max} 60 dB in the night, and this is predicted to drop slightly to 36 with the Project in 2032 as opposed to dropping slightly to 34 in the 2032 base case.

Capel Pre-School

14.9.82 At Capel Pre-School in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 1.2 dB for daytime and 0.7 dB for night-time compared to the 2032 base case, and to reduce daytime and night-time levels by 0.7 dB and 0.8 dB compared to 2019. Capel is situated to the west of the airport under a westerly departure route, and is offset from the arrivals route so this location has substantially higher noise levels for westerly operations. On westerly operations in 2019 the number of noise events above L_{max} 65 dB in the day was 146 and this is predicted to increase to 163 by 2032 with the Project and to reduce to 128 in the base case. On easterly operations Capel in 2019 had no L_{max} events above 65 dB in the day or above L_{max} 60 dB at night, and this is not expected to change with the Project.

Willow Tree Pre-School

14.9.83 At Willow Tree Pre-School, Ifield, in 2032, the Project is predicted to decrease average summer day L_{eq} noise levels by 0.6 dB for daytime and to increase them by 0.2 dB for night-time compared to the 2032 base case, and to reduce daytime and night-time levels by 3.3 dB and 1.9 dB compared to 2019. Situated to the south of the airport, the area is affected by arrivals from the west and departures to the west, and noise levels on easterly and westerly operations are similar. On westerly operations there are currently very few (11) events above L_{max} 65 dB in the daytime in 2019 and this is forecast to reduce to 2 in the 2032 with or without the Project. On easterly operations similar changes are expected.

Barnfield Community Care Home

14.9.84 At Barnfield Community Care Home, Horley, in 2032, the Project is predicted to increase average summer day L_{eq} noise levels by 0.7 dB for daytime and 0.6 dB for night-time compared to the 2032 base case, and to reduce daytime and night-time levels by 1.4 dB and 1.1 dB compared to 2019. Situated to the north east of the airport, the area is affected by arrivals from the east and departures along the runway to the west, and overall noise levels on easterly and westerly

operations are similar. The numbers of noise events above L_{max} 65 dB during the day on westerly operations was zero in 2019. On easterly operations in 2019 the number of noise events above L_{max} 65 dB in the day was 19 and this is predicted to increase to 22 by 2032 with the Project and to reduce to 4 in the base case. This location is also affected by ground noise from the airport and road traffic noise, as discussed elsewhere in this chapter, including in Section 14.11.17 (Inter-related Effects).

Noise Sensitive Buildings

14.9.85 Figure 14.9.30 shows 50 noise sensitive community buildings taken from the 'PointX' (2018) database (see PointX.co.uk) that are predicted to be within the $L_{eq, 16\ hour}$ day 51 dB noise contour in 2032 with the Project in the central case. These comprise 21 schools, one hospital, 18 places of worship and seven community buildings. Details of the predicted noise levels at each are provided in Appendix 14.9.2 for the central and slower transition fleet cases. At 42 of these buildings noise levels are predicted to either decrease or increase by less than 1 dB, ie a negligible change, as a result of the Project compared to the 2032 baseline. The predicted noise increases above 1 dB are as follows:

- Scott Broadwood C of E Infant School, RH5 5JX +1.3 dB;
- Capel Pre School, RH5 5JX +1.2 dB;
- Aurora Redehall School, RH6 9QA +1.2 dB;
- St John the Baptist's Church, Capel, RH5 7JY +1.3 dB;
- The Chapel, RH6 0DQ +1.3 dB; and
- Capel Village Hall, RH5 5LB +1.3 dB.

14.9.86 There are two places of worship where the Project is predicted to reduce $L_{eq, 16\ hour}$ daytime noise levels:

- St Michael and All Angels' Church, Crawley RH11 0PQ -1.2 dB; and
- Gurjar Hindu Union, Ifield, RH11 0AF -1.2 dB.

14.9.87 These predicted increases and decreases may or may not result in increases or decreases in total noise levels at these buildings (or at the community representative locations as discussed above, or elsewhere) depending on the level of noise from other ambient noise sources, in particular road traffic. In all cases the changes in aircraft noise are low and would result in **negligible or minor** effects, which would not be significant.

Ground Noise

Leq Noise Levels

14.9.88 As part of the Project, mitigation in the form of noise barriers has been proposed and has been included in the predicted ground noise levels that are presented in Table 14.9.4 with the difference between the predicted levels and the 2032 baseline shown in Table 14.9.5 along with the worst case magnitude of impact. Day and night periods are modelled and reported separately, as are noise levels when flight are towards the west (westerly operation - runway 26) and when flights are towards the east (easterly operations - runway 08).

Table 14.9.4: Summary of 2032 Ground Noise Predicted Levels including Mitigation (dB)

Descriptor	Location ($L_{Aeq, T}$ dB)											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
2032 – Runway 26 Daytime	49	50	56	54	48	55	55	59	50	61	53	50
2032 – Runway 26 Night	48	48	53	51	46	52	51	54	50	59	50	46
2032 – Runway 08 Daytime	55	57	57	55	50	55	51	50	58	60	53	42
2032 – Runway 08 Night	47	50	50	49	45	50	47	47	53	56	50	40

Table 14.9.5: Summary of 2032 Ground Noise Predicted Levels including Mitigation versus 2032 Baseline, Differences (dB)

Descriptor	Location (Difference in $L_{Aeq, T}$ dB)											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
2032 – Runway 26 Daytime	4	5	6	4	3	1	1	1	4	3	0	0
2032 – Runway 26 Night	3	4	4	2	2	1	1	0	4	4	0	0
2032 – Runway 08 Daytime	2	3	2	2	1	1	1	0	-1	-1	1	1
2032 – Runway 08 Night	-1	0	-1	0	0	-1	0	-1	-3	-2	1	1
Magnitude of change impact (worst case)	Medium impact at (1), (2), (3), (4), (9) and (10); Low impact at (5), (6), (7), (11) and (12). At all other the remaining locations (8) the impact is negligible											

14.9.89 Table 14.9.4 indicates that Myrtle Cottage is the only area where ground noise levels are predicted to be above the SOAEL at night, with none above the SOAEL in the daytime. Analysis of the noise model indicates that, as represented by this assessment location, there are likely to be approximately 10 residential receptors above the SOAEL.

14.9.90 The significance of the effect at the areas represented by each assessed location is described in the relevant paragraphs below. Where relevant this assessment also considers the results of modelling L_{max} noise levels, discussed in the following section.

14.9.91 It should be noted that the screening effect of residential buildings has not been included in the model as the standard approach for modelling barriers presented in ISO9612:2 is not generally appropriate over larger distances (>1 km) and needs further consideration to ensure the effect is not overestimated. The predicted levels have been conservatively corrected for average wind direction and wind speed noise propagation conditions as detailed in Appendix 14.9.3. Therefore, the assessment results presented are for typical wind conditions but are still worst-case, particularly in terms of the wider area represented by each specific assessment location. Consideration will be given to refining the model to include screening from buildings within the ES.

Maximum Noise Levels

14.9.92 Maximum noise levels (L_{max}) generated by aircraft in the noise model depend only on the aircraft types included in the model, the relative locations of aircraft in relation to receptor locations and the presence of any barriers affecting the propagation. Varying traffic forecast data do not affect the maximum noise levels that might be experienced at a particular location when a particular aircraft is at the closest position on the closest taxiway. For this reason, the calculated maximum levels for the baseline and with Project scenarios are the same for all design years and scenarios, although the numbers of noise events at these levels generally will change.

14.9.93 The results of the predicted maximum levels of aircraft taxi noise, for the baseline and with Project cases, arising at NSRs are shown in Table 14.9.6 (predicted maximum levels are calculated across both day and night periods).

Table 14.9.6: Summary of 2032 Ground Noise Predicted Maximum Levels (dB L_{Amax})

Descriptor	Location (L_{Amax} dB)											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
Baseline – 26	60	61	66	66	53	65	63	68	60	71	61	56
Baseline – 08	60	63	65	65	55	67	62	63	69	69	59	51
With Project – 26	59	60	67	63	54	65	63	71	62	71	60	56
With Project – 08	61	63	65	63	55	67	62	66	70	67	59	48

14.9.94 The predictions show that the maximum noise levels occurring for the baseline and with Project cases have the potential to exceed the 65 and 60 dB L_{max} criteria.

14.9.95 The significance of these L_{max} events depends on the number of events above the criteria and the relative change in number of events over the baseline conditions. The number of maximum noise level events exceeding the day and night criteria, for each scenario, are summarised in Table 14.9.7.

Table 14.9.7: Summary of 2032 Baseline and With Project Aircraft Taxiing Events Exceeding L_{Amax} Criteria

Descriptor	Total number of L_{Amax} events											
	Blue Cedars (1)	3 Charlwood Road (2)	Brook farm (3)	Bear and Bunny Nursery (4)	April Cottage (5)	Oakfield Cottage (6)	103 Cheyne Walk (7)	82 The Crescent (8)	Hyders Farm House (9)	Myrtle Cottage (10)	Rowley Farmhouse (11)	Trent House (12)
Baseline – 26 Day (>65 dB)	0	0	0	0	0	0	0	8	0	32	0	0
Baseline – 08 Day (>65 dB)	0	0	0	0	0	23	0	0	8	53	0	0
Baseline – 26 Night (>60 dB)	0	3	22	0	0	8	3	6	0	88	8	0
Baseline – 08 Night (>60 dB)	0	0	0	0	0	11	0	0	21	127	0	0
With Project – 26 Day (>65 dB)	0	0	16	0	0	0	0	21	0	124	0	0
With Project – 08 Day (>65 dB)	0	0	0	0	0	22	0	0	8	30	0	0
With Project – 26 Night (>60 dB)	0	0	77	0	0	9	2	16	22	170	0	0
With Project – 08 Night (>60 dB)	0	5	1	1	0	10	0	0	18	62	0	0

14.9.96 During the night, the maximum number of noise events over 60 dB L_{Amax} would be 170, which is predicted to occur at location 10 (Myrtle Cottage) under westerly operations, an increase in the number of events of 82 over the 2032 future baseline scenario. The number of events during the night at any location where the number of events is predicted to increase is generally more than 10 except for 3 Charlwood Road, Bear and Bunny Nursery and Rowley Farmhouse (locations 2, 4 and 11) (if there are fewer than 10 events predicted to occur above the criteria specified, then the noise impact is considered less likely to give rise to a significant effect). When considered alongside the primary L_{Aeq} metric, the change in L_{Amax} levels and numbers of events is broadly consistent with the predicted changes in L_{Aeq}. The biggest increases in the number of events over 60 dB L_{Amax} during the night occur for westerly (26) operation at Myrtle Cottage.

14.9.97 During the daytime, the maximum number of noise events over 65 dB L_{Amax} is predicted to be 124, which occurs at location 10 (Myrtle Cottage), and this is an increase in the number of events

of 92 over the 2032 future baseline scenario. A lower (but comparable) magnitude of change is also seen at Brook Farm (location 3) where the with Project scenario brings maximum noise levels above the 65 dB daytime threshold.

14.9.98 Maximum noise levels generated by engine ground running (EGR) have been predicted based on current operational procedures and proposed operational procedures, which do not vary significantly apart from the potential number of engine ground run tests. EGR testing takes place at one of four fixed locations on the airport apron including at the eastern and western ends of Taxiway Juliet, on Taxiway Yankee and on the northern runway. Logs of EGR tests indicate that testing times can vary considerably but that longer tests can take up to an hour or so to complete. However, analysis of EGR noise measurements shows that peak levels when engines are run at up to 70% of full power usually only last a couple of minutes and that for the majority of the time noise levels are considerably lower. The predicted noise levels with the Project indicate that levels would only potentially exceed 65 dB L_{max} at three locations due to engine testing and that this is no different to noise levels experienced from this source under the current operational procedures. The predictions also indicate that the highest noise level that could be expected from engine testing would be unlikely to exceed 73 dB L_{max}, which is only slightly higher than the maximum levels produced by taxiing aircraft. EGRs are controlled closely by the airport. Analysis of data shows that runs occur during the operational day and that there are rarely more than two Lmax events generated from this noise source per day. Current records show that there were fewer than 200 EGR tests in 2018 and it is predicted that there would be up to 267 EGR tests by 2038 with the Project, so there would be a number of days per year where no EGR tests would be taking place at all.

14.9.99 In the context of the predicted noise levels from taxiing aircraft, EGR is considered to generate a **negligible** effect, which is not significant. Details of the EGR predictions are included within Appendix 14.9.3 which includes tables of results and information on the source data.

14.9.100 Maximum noise levels generated by APU operation on stands have been predicted, which indicate that levels would only potentially exceed 60 dB L_{max} at up to three locations. Tables of predicted maximum noise levels due to APU operation at each assessment location are included at Appendix 14.9.3.

14.9.101 Internal (GAL) airport reports indicate that APUs are very rarely used on stand and that this occurs less than 3% of the time based on survey information. Forecast traffic data for 2032 indicate that 479 arrivals could be expected in a 24-hour period and, assuming that 3% of these were to use an APU, this would result in fewer than 14 instances of APU usage. Unless this was a result of certain stands with faulty power units, it would be unlikely that all of these events would occur on the same stand and therefore would be unlikely to generate more than 2 or 3 L_{max} events at a particular property. However, if APUs are in use on stands during turnaround of an aircraft, the maximum noise levels could be present for up to an hour at a time.

14.9.102 In order to allow for a small number of Category F size aircraft under dual runway operation, end around taxiways (EATs) have been incorporated into the design. At this stage, the EATs have not been integrated into the main aircraft taxi noise model but the model can be updated to include them for the ES. However, the EATs have been modelled separately based on forecast traffic data for Category F aircraft and it has been confirmed that the additional noise level generated by them would increase L_{Aeq} noise levels by no more than 1 dB at Hyders Farmhouse (location 9) and that at all other locations the change would be less (no more than 0.5 dB). The maximum

noise levels L_{max} generated by the proposed EAT usage would be 2 to 4 dB higher than the currently modelled development case at three locations (1, 2 and 9) but there would be very little change to the predicted numbers of events above the L_{max} criteria since in the 2032 year there are only forecast to be 7-8 Category F movements per day and this is no different between the base and with Project case.

1. Blue Cedars

14.9.103 At Blue Cedars, predicted night-time noise levels are up to 3 dB above the night LOAEL of 45 dB $L_{Aeq,}$ during westerly operation and 2 dB above the night time LOAEL during easterly operation. Predicted night-time noise levels are at least 7 dB below the night SOAEL of 55 dB L_{Aeq}. The magnitude of the night-time change of 3 dB on westerly operations would be medium (see para. 14.4.80 and Table 14.9.5), which is considered to result in a **minor adverse** effect based on the absolute predicted noise levels and maximum noise levels.

14.9.104 During the daytime, the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 4 dB, which is 8 dB below the SOAEL of 63 dB L_{Aeq}. The daytime exceedance of 4 dB above the LOAEL is combined with a medium increase in noise of 4 dB during the day on westerly operations but in the context of the margin below the SOAEL and the maximum noise levels it is considered to be a medium impact resulting in a **minor adverse** effect.

14.9.105 This location is representative of the quieter parts of Charlwood (including the primary school) which are more distant from the main road through the village. This area contains approximately 330 properties, and as a worst case the conclusions presented above could be considered to apply to the residential properties in this area. In practice impacts and resultant effects could be lower at some of the properties in this area due to localised acoustic screening – this will be further addressed in the ES.

2. 3 Charlwood Road

14.9.106 At 3 Charlwood Road, predicted night-time noise levels exceed the night LOAEL of 45 dB $L_{Aeq,}$ by a maximum of 5 dB, and this is in the context of a worst-case predicted increase in night-time ground noise of 4 dB resulting in a medium magnitude of impact. Predicted night-time noise levels are at least 5 dB below the night-time SOAEL of 55 dB L_{Aeq}. The highest predicted night-time noise for this location is under easterly operations which occur less frequently than westerly operations. The predicted night-time noise is slightly higher for this location than it is for Blue Cedars but in the context of the SOAEL and the maximum levels, this is still considered to be a medium impact resulting in a **minor adverse** effect.

14.9.107 During the daytime, the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 6 dB under easterly operations, which is 6 dB below the SOAEL of 63 dB L_{Aeq}. The Project would result in a change of up to 5 dB in the daytime noise levels, resulting in a medium magnitude of impact. Given the level below SOAEL and the maximum noise levels, the daytime noise impact is considered to result in a **minor adverse** effect.

14.9.108 This location is representative of the busier area of Charlwood, close to the main road through the village, which contains approximately 230 properties, and the conclusions presented above could be considered to apply to all residential properties in this area. In practice, impacts and resultant effects could be lower at some of the properties in this area due to localised acoustic screening – this will be further addressed in the ES.

3. Brook Farm

14.9.109 At Brook Farm, predicted night-time noise levels exceed the night LOAEL of 45 dB L_{Aeq} by a maximum of 8 dB, which is 2 dB below the SOAEL of 55 dB L_{Aeq}. This property would experience a predicted increase in night-time ground noise of up to 4 dB (medium magnitude of impact) along with up to 77 night-time L_{max} events exceeding the 60 dB criterion. Assessed overall, the night-time noise effect is therefore considered to be a **moderate adverse** significant effect.

14.9.110 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 6 dB, and predicted levels are at least 6 dB below the SOAEL of 63 dB L_{Aeq}. There are predicted changes in ground noise level of 4 and 6 dB during the day resulting in a medium and high magnitude of impact. During the daytime there would be a maximum of 16 events above the daytime 65 dB L_{Amax} criterion at Brook Farm and this is in the context of no events above the criterion for the baseline scenario. It is therefore considered that due to the predicted change in L_{Aeq} and L_{Amax} ground noise levels with and without the Project, the daytime noise impact would result in a **moderate adverse** significant effect.

14.9.111 This location is one of approximately 50 properties on Charlwood Road to the north west of the airport, but the conclusions presented above do not necessarily apply to all residential properties in this area as some receive greater benefits from the noise bund resulting in lower predicted noise levels. Therefore, impacts and resulting effects may be lower at some of the properties in this area. This will be further addressed in the ES. It should be noted that this area of approximately 50 properties includes the Bear and Bunny nursery but this is considered separately below as it is not residential.

4. Bear and Bunny Nursery

14.9.112 The nursery is only in use during daytime hours and therefore the night-time effects have not been assessed.

14.9.113 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 4 dB, which is 8 dB below the SOAEL of 63 dB L_{Aeq}. There would be a medium magnitude of impact from the change in predicted levels on westerly operations, and a low change on easterly operations, but the maximum noise levels do not exceed the 65 dB L_{Amax} criterion. The daytime noise impact is considered to result in a **minor adverse** effect due to the reduced maximum noise levels compared with Brook Farm.

14.9.114 This location is representative only of the nursery.

5. April Cottage

14.9.115 At April Cottage, predicted night-time noise levels are up to 1 dB above the night LOAEL of 45 dB $L_{Aeq,}$ and the property would experience very little change in the predicted noise level resulting in a low magnitude of impact. This affects a low number of properties. The night noise impact is therefore considered to result in a **negligible** effect.

14.9.116 During the daytime the 51 dB L_{Aeq} LOAEL is not predicted to be exceeded and there is a potential increase in ground noise of up to 2 dB resulting in a low magnitude of impact. The daytime noise impact is therefore considered to result in a **negligible** effect.

14.9.117 This location is representative of properties further to the north of Charlwood Road that experience a quieter noise environment than those represented by Brook Farm. The assessment

location is within an area that contains approximately 20 properties, and the conclusions presented above are likely to apply to the other residential properties in the vicinity.

6. Oakfield Cottage

14.9.118 At Oakfield Cottage, predicted night-time noise levels exceed the night LOAEL of 45 dB L_{Aeq} by a maximum of 7 dB for westerly operations but the property would experience a change of 1 dB in ground noise levels resulting in a negligible magnitude of impact. The night noise impact is therefore considered to result in a **negligible** effect.

14.9.119 During the daytime, the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by 4 dB which is 8 dB below the SOAEL of 63 dB L_{Aeq}. A change in ground noise of 1 dB is expected, resulting in a negligible magnitude of impact. The ground noise impact is therefore considered to result in a **negligible** effect.

14.9.120 This location is representative of Povey Cross, encompassing an area that contains approximately 220 properties, and as a worst-case assessment the conclusions presented above are considered to apply to the residential properties in the vicinity. In practice, impacts and resultant effects would be lower at some of the properties in this area due to localised acoustic screening. This will be further addressed in the ES.

7. 103 Cheyne Walk

14.9.121 At 103 Cheyne Walk, predicted night-time noise levels are up to 6 dB above the night LOAEL of 45 dB $L_{Aeq,}$ but there is little or no predicted change in night ground noise, and the magnitude of impact would be negligible. The night noise impact is therefore considered to result in a **negligible** effect.

14.9.122 During the daytime, the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by up to 4 dB. There is a predicted increase in ground noise level of 1 dB or less resulting in a negligible magnitude of impact. The ground noise impact is therefore considered to result in a **negligible** effect.

14.9.123 This location is representative of properties in the Horley area that are closer to the main roads and therefore busier and noisier than properties more distant from major road traffic noise sources. This area contains approximately 560 properties, and as a worst case, the conclusions presented above are considered to apply to the residential properties in the vicinity. In practice, impacts and resultant effects would be lower at some of the properties in this area due to localised acoustic screening. This will be further addressed in the ES.

8. 82 The Crescent

14.9.124 At 82 The Crescent, predicted night-time noise levels exceed the night LOAEL of 45 dB L_{Aeq} by a maximum of 9 dB, and the property would experience a predicted decrease in night ground noise of 1 dB, resulting in a negligible magnitude of impact. Predicted night-time noise levels are at least 1 dB below the night SOAEL of 55 dB L_{Aeq}. Under easterly operations, the predicted levels are slightly lower than the 2032 baseline levels and the night noise impact is considered to result in a **negligible** effect.

14.9.125 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 8 dB, and would be at least 4 dB below the SOAEL of 63 dB L_{Aeq}. Predicted ground noise levels would increase by less than 1 dB with the Project resulting in a negligible magnitude of impact. Although there are some increases in the number of maximum noise events above the daytime

and night time L_{Amax} criteria, it is unlikely that these would be perceived since predicted 2032 noise levels are at least 1-2 dB below the measured overall baseline noise levels due to high levels of road traffic noise. The ground noise impact is considered to result in a **negligible** effect.

14.9.126 This location is representative of an area to the north east of Riverside Garden Park that contains approximately 840 properties, and as a worst case the conclusions presented above are considered to apply to the residential properties in the vicinity. In practice, impacts and resultant effects would be lower at some of the properties in this area due to localised acoustic screening. This will be further addressed in the ES.

9. Hyders Farm House

14.9.127 At Hyders Farm House, predicted night-time noise levels are a maximum of 8 dB above the night LOAEL of 45 dB $L_{Aeq,}$ and the property would experience a predicted change in night ground noise ranging from -3 to +4 dB, resulting in a medium magnitude of impact during westerly operations. Predicted night-time noise levels are at least 2 dB below the night SOAEL of 55 dB L_{Aeq}. This property is representative of a small number of residential properties but it should be noted that night time L_{Amax} increases above the 60 dB threshold resulting in 22 maximum noise events exceeding this night time criterion where there would be none with the baseline. The night noise impact is therefore considered to result in a **moderate adverse** significant effect.

14.9.128 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 7 dB, and would be 5 dB below the SOAEL of 63 dB L_{Aeq}. Predicted ground noise levels change by just under 4 dB for westerly operations, resulting in a medium magnitude of impact. The number of maximum noise events above the daytime L_{Amax} criterion decrease compared with the baseline and overall the ground noise impact is therefore considered to result in a **minor adverse** effect.

14.9.129 This location is representative of an area to the south west of the airport that contains approximately 30 properties, and the conclusions presented above are considered likely to apply to the residential properties in this vicinity.

10. Myrtle Cottage

14.9.130 At Myrtle Cottage, predicted night-time noise levels are 14 dB above the night LOAEL of 45 dB $L_{Aeq,}$ and up to 4 dB over the night SOAEL of 55 dB L_{Aeq}. This location would experience a change in night-time noise of -2 dB to +4 dB, resulting in a medium magnitude of impact. The night-time noise impact is therefore considered to result in a **moderate adverse** significant effect due to the predicted exceedance of the SOAEL.

14.9.131 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by a maximum of 10 dB, and to be 2 dB below the SOAEL of 63 dB L_{Aeq}. The predicted change in ground noise level is no more than 4 dB resulting in a medium magnitude of impact. This location is not densely populated and there are also notable decreases in the number of maximum noise events exceeding the daytime L_{Amax} criterion which means that the ground noise impact is considered to result in a **minor adverse** effect.

14.9.132 This location is representative of an area of buildings in the locality of Poles Lane which contains approximately 10 properties, and the conclusions presented above are likely to apply to the residential properties in this vicinity.

11. Rowley Farmhouse

14.9.133 At Rowley Farmhouse, predicted night noise levels exceed the night LOAEL of 45 dB L_{Aeq}, by up to 5 dB and the property would experience a change in night ground noise of 1 dB, resulting in a negligible magnitude of impact. The night-time noise impact is therefore considered to result in a **negligible** effect.

14.9.134 During the daytime the 51 dB L_{Aeq} LOAEL is predicted to be exceeded by up to 2 dB with a change of 1 dB generating a negligible magnitude of impact. The ground noise impact is therefore considered to result in a **negligible** effect.

14.9.135 This location is representative of an area on a hill to the south of the airport that contains approximately 10 properties, and the conclusions presented above are likely to apply to all residential properties in this vicinity.

12. Trent House

14.9.136 At Trent House, predicted night-time noise levels are 1 dB above the night LOAEL of 45 dB $L_{Aeq,}$ and there would be up to 1 dB of change in night-time ground noise levels resulting in a negligible magnitude of impact. The night-time noise impact is therefore considered to result in a **negligible** effect.

14.9.137 During the daytime the 51 dB L_{Aeq} LOAEL would not be exceeded and noise change is predicted to be 1 dB resulting in a negligible magnitude of impact. The ground noise impact is therefore considered to result in a **negligible** effect.

14.9.138 This location is representative of an area of Balcombe Road that contains approximately 90 properties, and the conclusions presented above are considered likely to apply to the residential properties in this vicinity. In practice, impacts and resultant effects would be lower at some of the properties in this area due to localised acoustic screening. This will be further addressed in the ES.

Overall Results

14.9.139 The assessment has considered L_{max} and L_{eq} noise modelling results and has shown the contributions of maximum noise levels from APU, EGR and EAT usage are all negligible in comparison to taxiing aircraft.

14.9.140 The results show predicted ground noise effects would not be significant (negligible or minor) at 9 of the representative receptors studied with moderate adverse effects at three receptors. The effects rated as moderate are considered significant and these are predicted in the Charlwood area and the area immediately south of the airport (location 9, Hyders Farm and location 10, Myrtle Cottage), at a total of approximately 90 properties. These are conservative estimates that will be further refined in the ES.

14.9.141 The majority of the NSRs around the airport perimeter that may be adversely impacted by ground noise are within the areas covered by the current or proposed noise insulation scheme (NIS), as shown in Figure 14.8.1. The noise insulation available would reduce noise levels inside properties to mitigate the predicted impacts. The up to 10 properties where the SOAEL may be exceeded are within or close to the NIS Inner Zone boundary. The Inner Zone NIS will be modified if necessary when the assessment is completed to include these properties if necessary, so that significant effects on heath and quality of life are avoided.

Road Traffic Noise

14.9.142 The traffic noise changes from roads, which include those that are physically affected by the Project, ie around the North and South Terminal roundabouts, have been modelled, and the results are discussed below.

14.9.143 The results of modelling of traffic noise in 2032 with the noise barrier mitigation described above, are presented in the following figures:

- Figure 14.9.32 – 2032 Traffic Noise Levels with Project.
- Figure 14.9.33 – 2032 Traffic Noise Levels with Project with Mitigation.

14.9.144 Table 14.9.8 shows $L_{A10,18\ hour}$ dB road traffic noise predictions at a selection of receptor locations representing the closest nearby communities/dwellings to the Project (see Figure 14.6.12). Full results are provided in Appendix 14.9.4. Scenarios for future baseline (business as usual (BAU)), have been included. A comparison of the noise levels with the Project against the future baseline has been carried out.

14.9.145 Predicted noise changes have been reported to one decimal place in order to show clearly which impact category applies to the stated noise change. Although decibels are often quoted as integers, quoting to one decimal place allows a change to be compared to the noise change boundary more precisely. For example a noise change of 1.2 dB is clearly higher than the integer boundary value for low impacts.

Table 14.9.8: Road Traffic Noise at Key Receptors (Short Term DMRB Assessment, 2032)

Scenario	Receptor ID/Description, $L_{A10, 18\ hour}$ dB Results (Façade)						
	NSR1 The Crescent East	**NSR2 The Crescent West**	**NSR3 Woodroyd Gardens**	**NSR4 Cheyne Walk**	**NSR5 Longbridge Road East**	**NSR9 B2036 Balcombe Road**	**NSR12 Riverside Garden Park South[2]**
BAU	69.2	64.9	69.8	71.4	70.5	74.3	64.0
With Project[1]	69.3	64.7	66.7	68.9	71.0	72.8	63.5
DMRB Short-term Assessment (With Project – BAU Difference in 2032)	0.1	-0.2	-3.1	-2.5	0.5	-1.5	-0.5

[1] Scenario contains noise mitigation as described in Section 14.8.

[2] Noise-sensitive receptors represent open park areas, and results are presented as free-field values.

14.9.146 Figure 14.9.33 provides a noise contour map showing the difference in traffic noise levels predicted with the Project compared to without in 2032.

14.9.147 Comparing the traffic noise levels with the Project in 2032 to the future baseline scenario in 2032 shows predicted reductions in noise at the majority of residential receptors and in the Riverside Garden Park. This is a result of the noise mitigation that has been incorporated into the highway design.

14.9.148 Noise mitigation is not practicable in the area near the Longbridge roundabout, where there are small increases in noise level predicted to affect a small number of receptors. More detailed results at all fourteen receptor locations, along with results without mitigation can be found in Appendix 14.9.4.

14.9.149 The predicted noise levels above are daytime façade values of $L_{A10,\ 18\ hour}$, with the exception of the Riverside Garden Park which are presented as free-field noise levels. Noise levels that exceed 68 dB would exceed the SOAEL. It can be seen that although the noise levels at receptors 1, 4, 5 and 9 are above the SOAEL threshold, they were also above it in the base case, and therefore, do not count as significant on this basis. The DMRB 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*." The noise increases in all cases are less than 1.0 dB. It can also be noted that noise levels at receptor 3 are above the SOAEL threshold without the Project and below with the Project's implementation, with a noise reduction of 3.1 dB. It can therefore be concluded that a medium magnitude positive noise change at receptor 3 would also result in a likely significant effect.

14.9.150 The DMRB does not specifically say that noise levels below LOAEL are not significant, however, the interpretation has been made that where noise levels are below or equal to LOAEL, the effect cannot be significant, and only noise changes above this level need to be considered. Since the predicted noise levels are above LOAEL, the next step in the assessment is to consider the changes in noise as a result of the new or altered parts of road network. The changes in traffic noise are generally reductions. A reduction of 3.1 dB at Receptor 3: Woodroyd Gardens indicates a medium beneficial impact. Reductions of between 1 and 3 dB, which indicates a low beneficial noise impact, are predicted at Receptor 4: Cheyne Walk and at Receptor 9: B2036 Balcombe Road. Other noise changes are less than 1 dB and would be negligible. As previously stated, all medium impacts are classed as giving rise to significant effects, and in this case the low magnitude impacts at Receptors 4: Cheyne Walk, and 9: B20356 Balcombe Road are also considered significant positive impacts, because the absolute predicted noise levels exceed the SOAEL value.

14.9.151 Noise levels in the Riverside Garden Park are already high and have a negative impact on the park users. The Project would be designed to include noise barriers that will offset the traffic noise effects of the Project and result in a small noise reduction in the park.

14.9.152 Overall, with the inclusion of the noise barriers described in Section 14.8, the road modifications are expected to reduce noise levels slightly and result in a low beneficial impact, with some receptors experiencing a medium beneficial impact. An assessment of the numbers of properties affected by the difference noise changes will be undertaken and reported in the ES, and is likely to conclude that the benefits are of **negligible or minor significance** in most areas with some **moderate significant** benefits in small areas where the highest baseline noise levels are predicted to reduce.

Other Areas

14.9.153 Basic Noise Levels (BNL) were calculated for roads on the network away from the highway elements of the Project that would not be subject to physical works in 2032 (the year of opening of the road alterations). The results of these predictions identified that noise changes would be small on most roads, with noise changes greater than 1 dB predicted on very few minor road links due to the Project.

14.9.154 The DMRB states that it can be sufficient to define a study area within 50 metres of road links that are not physically changed or the Project, where a BNL change of more than 1.0 dB is likely to occur. The majority of road links that were identified with noise changes greater than 1 dB were within industrial areas to the south of the South Terminal further than 50 metres from receptors and therefore the roads were not close enough to the receptors to be included within the study area. A single road link, on Charlwood Road and Ifield Avenue in the Langley Green area is predicted to experience a short-term change in noise level of 1.1 dB. Approximately 30 dwellings in the front row of properties lie within 50 m of the road experience a short-term change in noise.

14.9.155 The DMRB provides guidance on assessing the impact of noise for motorways and all-purpose trunk roads, not specifically smaller roads which are less likely to dominate the total noise levels at NSRs. The predicted noise changes will be studied in more detail in the ES, but the overall noise effects are likely to be **Negligible to Minor adverse**.

Design Year: 2038

Air Noise

14.9.156 Appendix 14.9.2 provides the predicted noise contour areas and populations. In all cases, noise contours are smaller and levels forecast for 2038 with the Project are lower than those forecast for 2032 with the Project (on average by $L_{eq,\ 16\ hour,}$ day 0.6 dB and $L_{eq,\ 8\ hour}$ night 0.5 dB). This is because the growth in air traffic forecast from 2032 to 2038 is not sufficient to offset the reduction in noise levels from the aircraft fleet predicted over this period. The noise contours in 2038 are also smaller than in 2019, so that under the slower transition fleet case if noise contours do rise above 2019 levels when they peak in 2032, they would fall back below 2019 levels by 2038.

14.9.157 Noise contours are provided for 2038, as listed below. Noise contour areas and population for all noise metrics for 2038 are reported in Appendix 14.9.2.

- Figure 14.9.34 shows the 2038 with Project $L_{eq,\ 16\ hour}$ day noise contours.
- Figure 14.9.35 shows the 2038 with Project $L_{eq,\ 8\ hour}$ night noise contours.
- Figure 14.9.36 shows the 2038 with Project N65 day noise contours.
- Figure 14.9.37 shows the 2038 with Project N60 night noise contours.
- Figure 14.9.38 shows the 2038 with Project L_{den} annual noise contours.
- Figure 14.9.39 shows the 2038 with Project L_{night} annual noise contours.

14.9.158 A detailed assessment of the 2038 effects is not necessary because the effects of the Project would be lower than in 2032 and any mitigation provided for the impacts in 2032 would also be adequate in 2038. The noise envelope proposed (see Section 14.8) acknowledges the predicted reduction of noise contour areas after 2032 and proposes a mechanism to give certainty that noise contours will be smaller by 2038 and beyond.

Ground Noise

14.9.159 The modelling of predicted ground noise for the Project in the 2038 design year and the associated assessment of effects are presented in Appendix 14.9.3.

Road Traffic Noise

14.9.160 The DMRB does not require an assessment of road traffic noise in 2038. Instead road traffic noise 15 years after the opening of the roads associated with the Project (2047) has been assessed, consistent with the DMRB. This is reported below.

Year 2047

Air Noise

14.9.161 Appendix 14.9.2 Section 5 contains details of air noise levels contour areas and populations predicted in 2047, as summarised above in the main air noise assessment section under the Interim Year 2032 heading. This shows the trends in air noise levels predicted in 2019, 2029, 2032, 2038 and 2047 and demonstrates that noise levels would be lower in 2047 than in 2032. This is because fleet transition to quieter new generation aircraft would continue beyond 2038 offsetting the projected increase in air traffic, in all cases.

Ground Noise

14.9.162 Levels of ground noise and impacts of ground noise with the Project in 2047 would be lower than those in 2038 and have not therefore been assessed.

Road Traffic Noise

New or Altered Roads

14.9.163 The DMRB requires an assessment of the traffic noise changes from roads in the Long Term: Do Minimum Opening Year (DMOY) (ie the situation in the opening year of the highway scheme without the Project) versus Do Something Future Year (DSFY) (ie the situation 15 years after opening with the Project and associated traffic changes). Non-project noise changes (ie Do Minimum Future Year (DMFY) compared against DMOY) have also been considered. Similar noise changes in the long term with the Project and in the Do Minimum scenario can indicate changes are not likely due to the Project, therefore not indicating a likely significant effect. These scenarios have been modelled, and the results are discussed below.

14.9.164 The results of modelling of traffic noise in 2047 with the noise barrier mitigation described above, are presented in the following figures:

- Figure 14.9.40 – 2047 Traffic Noise Levels Business as Usual;
- Figure 14.9.41 – 2047 Traffic Noise Levels with the Project with Mitigation.

14.9.165 Table 14.9.9 shows $L_{A10,18\ hour}$ road traffic noise predictions at a selection of receptor locations representing the closest nearby communities/dwellings to the Project (see Figure 14.6.17), as required for the DMRB long term assessment. Full results are provided in Appendix 14.9.4.

14.9.166 Predicted noise changes have also been reported to one decimal place in order to show clearly which impact category applies to the stated noise change.

Table 14.9.9: Road Traffic Noise at Key Receptors (Long Term DMRB Assessment)

Scenario	Receptor ID/Description, $L_{A10, 18\ hour}$ dB Results (Façade)						
	NSR1 The Crescent East	NSR2 The Crescent West	NSR3 Woodroyd Gardens	NSR4 Cheyne Walk	NSR5 Longbridge Road East	NSR9 B2036 Balcombe Road	NSR12 Riverside Garden Park South[2]
BAU 2032	69.2	64.9	69.8	71.4	70.5	74.3	64.0
BAU 2047	69.5	65.2	70.1	71.6	70.7	74.5	64.3
With Project[1] 2047	69.6	65.0	66.9	69.2	71.4	73.0	63.8
DMRB Long-term Assessment (With Project 2047 – BAU 2032 Difference)	0.4	0.1	-2.9	-2.2	0.9	-1.3	-0.2
DMRB Non-scheme Assessment (BAU 2047 – BAU 2032 Difference)	0.3	0.3	0.3	0.2	0.2	0.2	0.3

[1] Scenario contains noise mitigation as described in Section 14.8.

[2] Noise-sensitive receptors represent open park areas, and results are presented as free-field values.

14.9.167 Figure 14.9.42 provides a noise contour map showing the difference in traffic noise levels predicted with the Project in 2047 with mitigation versus Baseline Traffic Noise Levels in 2032.

14.9.168 Comparing the predicted traffic noise levels from the Project in 2047 to the baseline scenario in 2032, reductions are predicted at the majority of residential receptors and in the Riverside Garden Park. Changes as a result of non-Project traffic increases have also been predicted for these years, and the predicted increases were found not to have a significant influence on the results, so that these predicted noise reductions were shown to be as a result of the Project.

14.9.169 More detailed results at all fourteen receptor locations, along with results without mitigation can be found in Appendix 14.9.4.

14.9.170 The changes in traffic noise in Table 14.9.9 show that for the Project, the long term noise changes at all receptors would be less than 3 dB and would therefore be negligible.

14.9.171 Overall, with the inclusion of the noise barriers described in Section 14.8, the road modifications are expected to reduce noise levels slightly, resulting in a negligible impact. An assessment of the

numbers of properties affected by the different noise changes will be undertaken and reported in the ES, and is likely to conclude that the benefits are of **negligible significance** in most areas in the long term.

Other Areas

14.9.172 Basic Noise Levels (BNL) (ie noise levels at 10 m from the carriageway) were calculated for roads elsewhere on the network that are not subject to physical works from the Project in the year of opening (2032). The BNLs were also calculated for 2047 (the situation 15 years after opening with the Project), therefore enabling an assessment of potential long-term effects of the Project in the wider area, as required by the DMRB. The change in BNL between 2032 and 2047 without the Project was also calculated to enable the (long-term) effect of non-Project traffic growth in the area to be taken into account when indirect noise effects of the Project on the wider road network are assessed.

14.9.173 The results of these predictions identified that noise changes in the long-term would be small on most roads, with noise changes greater than 3 dB predicted on a small number of minor road links well away from the Project area. However, in all these cases the noise changes were identified in the long-term with or without the Project, indicating the changes due to the Project in the long-term are not significant.

14.10. Potential Changes to the Assessment as a Result of Climate Change

14.10.1 Changes in the climate could affect aircraft performance and hence climb rates which could alter noise levels on the ground. However, such effects are likely to be small.

14.10.2 Changes in the climate could affect wind speeds and direction and hence runway modal split. The results of modelling runway modal splits from 50% to 90% westerly are given in Table 6.1.1 of Appendix 14.2 and show variations in contour areas of 3% for daytime $L_{eq,\ 16\ hour}$ 51 dB contours and 2% for night-time $L_{eq,\ 8\ hour}$ 45 dB contours. The variation in contour populations are 22% for daytime $L_{eq,\ 16\ hour}$ 51 dB contours and 5% for night-time $L_{eq,\ 8\ hour}$ 45 dB contours. It is not known to what extent climate change could affect runway modal split, but this analysis suggests that in itself it is not likely to have major changes in the noise impacts of the Project.

14.10.3 Changes in weather could affect the propagation of noise from airborne aircraft to the ground, and hence noise levels at receptors. Modelling an increase in summer temperature of 4 degrees Celsius (with a corresponding reduction in relative humidity of 8%) showed noise levels within 1 dB compared to current weather conditions, so these effects are likely to be insignificant.

14.10.4 Changes in climate could increase heatwaves in the summer months and lead to more residents opening windows more frequently for cooling in the day and at night. This could lead to greater impacts in terms of disturbance to indoor activities and sleep. The proposed enhanced noise insulation scheme for homes within the forecast $L_{eq,\ 16\ hour}$ 54 dB daytime air noise contour includes acoustic ventilators to allow residents to keep windows closed. The scheme is voluntary, and it may be that climate change would increase uptake, allowing for greater mitigation of noise impacts.

14.10.5 Any change in the climate may affect the amount of time that APUs are running as they may be required for greater cooling and or warming of the aircraft as they taxi. As noted above, APU noise is considered to be insignificant in relation to the engine noise when taxiing, and when the

aircraft are at the stands they generally do not operate the APU as they are connected to Ground Power Units (GPUs). Any change, therefore, in the use of the APU as a result of climate change, assuming there is no increase in its use at the stands, would be insignificant in terms of the assessment and results presented here.

14.10.6 Potential changes to the climate in a future baseline scenario would not affect the traffic noise assessment. The CRTN method does not take into account atmospheric conditions and temperature to calculate predicted noise levels. Whilst wet roads are noisier than dry roads, and climate change may change the pattern of rainfall in the future, the CRTN methodology does not consider the effect of wet roads as a result the assessment would not be affected by climate change.

14.11. Cumulative Effects

Combined Effects

14.11.1 This section considers the combined effects of noise and vibration from the various parts of the Project which are reported separately in the chapter as defined in paragraph 14.1.1, ie:

- construction noise;
- air noise;
- ground noise; and
- road traffic noise.

14.11.2 As there is no reliable means of quantitatively assessing the overall noise effect resulting from different noise sources, this section considers the overall effect of noise from combined sources qualitatively. This takes account of factors including the following:

- whether the effects from the different sources would be likely to occur at the same time, or the same time of day;
- the duration of any combined effects;
- whether one effect dominates or whether effects might be additive; and
- whether the effects on individual receptors are likely to be on the same façade of the property.

14.11.3 During construction, there is potential for short term effects from construction noise and vibration. The construction noise assessment criteria take account of baseline noise levels. Impacts of the Project due to air, ground and road traffic noise would not arise until after the Project is operational, ie after 2029. Some construction works would continue after this time. However, the changes in air, ground and road traffic noise are small compared to the likely levels of construction noise that are required to generate significant short term effects at particular receptors. So combined noise effects are likely to be minor.

14.11.4 During operation, there is potential for air, ground and traffic noise impacts to combine. Road traffic noise increases near the highways improvements would be mitigated within the design, so mitigating the potential for combined impacts in the Horley area next to the highway works. Traffic noise increases elsewhere are expected to be small so that combined traffic noise effects are expected to be minor.

14.11.5 There is potential for ground noise and air noise impacts to combine at receptors in the vicinity of the airport where ground noise impacts are predicted. However, all these properties would be included within the NIS which would be designed to mitigate air and ground noise effects.

14.11.6 Vibration effects during construction will be assessed in the ES, however, they are likely to be short-lived and in localised areas only, making combined effects unlikely.

14.11.7 This assessment will be updated in ES based on the updated construction, air, ground and road traffic noise assessments.

Cumulative Effects

Zone of Influence

14.11.8 The zone of influence (ZoI) for noise has been identified based on the spatial extent of likely effects, which in general is the area within which noise levels above the LOAEL are expected. The largest of these are for air noise and are the 2032 with Project $L_{eq,\ 16\ hour}$ 51 dB and $L_{eq,\ 8\ hour}$ night contours shown in Figures 14.9.1 and 14.9.7.

Screening of Other Developments and Plans

14.11.9 The cumulative effect of additional road traffic noise from other developments is included within the assessment, as the traffic noise modelling is based on traffic forecasts that take these developments into account (see Chapter 12: Traffic and Transport).

14.11.10 It is possible for concurrent construction works to have cumulative impacts on particular NSRs. However, in practice such effects are rare because for an additive noise effect to arise, the works have to arise at the same time on the same day, affecting the same façade of a noise sensitive building. It is more common for noise disturbance from adjacent sites to add to the duration of the disturbance. At this stage it is not possible to consider the timing of adjacent developments in this level of detail, but overlap of noisy construction works sufficiently nearby to sensitive receptors to add significantly to the predicted noise levels are unlikely and hence cumulative effects are unlikely. The ES will give further consideration to potential for cumulative construction noise effects when the programme of works will be more accurately understood.

14.11.11 The Cumulative Effect Assessment (CEA) takes into account the impact associated with the Project together with other developments and plans. The projects and plans selected as relevant to the CEA presented within this chapter are based upon the results of a screening exercise undertaken as part of the 'CEA short list' of developments (see Appendix 19.4.1). Each development on the CEA long list has been considered on a case by case basis for scoping in or out of this chapter's assessment based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved.

14.11.12 In undertaking the CEA for the Project, it is important to bear in mind that the likelihood of other developments and plans being constructed varies depending on how far along the planning process they are. For example, relevant developments and plans that are already under construction are likely to contribute to a cumulative impact with the Project (providing impact or spatial pathways exist), whereas developments and plans not yet approved or not yet submitted are less certain to contribute to such an impact, as some may not achieve approval or may not ultimately be built due to other factors. For this reason, all relevant development and plans considered cumulatively alongside the Project have been allocated into 'Tiers', reflecting their

current stage within the planning and development process. Appropriate weight is therefore given to each Tier in the decision-making process when considering the potential cumulative impact associated with the Project (eg it may be considered that greater weight can be placed on the Tier 1 assessment relative to Tier 2). Further details of the screening process for the inclusion of other developments and plans in the short list and a description of the Tiers is provided in Chapter 19: Cumulative Effects and Inter-relationships.

14.11.13 The specific developments scoped into the CEA for noise and vibration are outlined in Table 14.11.1. Only residential developments of at least 50 units and other noise sensitive developments have been included. All projects are Tier 1. The developments included as operational in this assessment have been commissioned since the baseline studies for this Project were undertaken and as such were excluded from the baseline assessment. Full details of each of the developments are provided in Appendix 19.4.1.

Table 14.11.1: List of Other Developments and Plans considered within CEA

Description of Development/Plan	Planning Phase	Distance from the Project
CR/2016/0083/ARM: 249 dwellings	Permitted	2.1 km
CR/2016/0962/ARM: 151 dwelling	Permitted	2.2 km
CR/2016/0114/ARM: 75 dwellings	Permitted	2.1 km
CR/2016/0780/ARM: 225 dwellings	Permitted	2.2 km
CR/2018/0544/OUT: 150 dwellings	No decision	2.1 km
CR/2018/0894/OUT: 185 dwellings	No decision	1.3 km
CR/2017/0997/OUT: 182 dwellings	Permitted	3.3 km
04/02120/OUT: Approximately 1510 dwellings	Permitted	5 km
2019/548/EIA: 360 dwellings	No decision	1.5 km
2018/2567: 51 dwellings	Permitted	1.9 km
DC/17/2481: 227 dwellings	Permitted	6.3 km
13/04127/OUTES: 500 dwellings	Permitted	2.7 km
CR/2015/0552/NCC: Forge Wood, up to 1900 dwellings	Allocated in Crawley Local Plan 2030 (Adopted)	1.6 km
CR/2019/0542/FUL: up to 152 apartments	Unknown	4 km
CR/2015/0718/ARM: up to 169 dwellings	Allocation within Crawley Local Plan 2021-2037 (Regulation 19).	1.6 km
DC/10/1612: approximately 2,500 dwellings	site allocated in the Horsham DC Planning Framework (Adopted 2015).	6.7 km
EIA/20/0004: 3,250 to 4,000 homes	EIA Scoping for West of Ifield	1.5 km
13/04127/OUTES: 500 homes	Outline planning application	2.7 km

Description of Development/Plan	Planning Phase	Distance from the Project
Tinsley Lane: 150 dwellings	Permitted	2.2 km
Land north of Rosemary Lane: 150 housing units	Housing & Traveler Site Plan (Adopted 2014)	1.4 km
Land east of Ifield Road: 150 housing units	Housing & Traveler Site Plan (Adopted 2014)	1.4 km
Land adjacent to Desmond Anderson: 150 dwellings	Housing allocation	6.6 km
Land to the southeast of Heathy Farm, Balcombe Road: 150 dwellings	Housing allocation	4.1 km
Telford Place/ Haslett Avenue: 300 dwellings	Town Centre Key Opportunity Site	5 km
Crawley College: 400 dwellings	Town Centre Key Opportunity Site	4.7 km
Land at Plough Road and Redehall Road, Smallfield; 160 residential units	Proposed Plan	3.6 km
Land North of Plough Road, Smallfield: 120 residential units	Proposed Plan	4.0 km
Land West of Reigate Road, Hookwood Site Allocation Policy SA42: 450 dwellings and two gypsy and travelers pitches	Site identified in the Reg 18 consultation draft local plan (Feb 2020 to March 2020)	0.3 km
Heathrow Third Runway	PEIR 2019	37 km

Cumulative Effects Assessment

14.11.14 The majority of the development sites, particularly Tier 1, are to the south of the airport, and although they are within a short distance, in most cases these fall within the lower air noise contour bands, and in areas where the Project would slightly reduce air noise levels. Nonetheless, there is potential for noise impacts on the future residents of these developments as a result of Gatwick's operations which in some cases would increase or decrease due to the Project. The site West of Ifield (EIA/20/0004) is a large site that could introduce 3,250 to 4,000 homes to a site partly within the airports LOAEL noise contours.

14.11.15 In seeking permission to develop sites for residential use in noisy areas, in accordance with the NPPF and other policy, developers are required to consider the potential for noise impacts on future residents and to design the developments with suitable mitigation accordingly. Local planning authorities have a duty to enforce this requirement though through the local planning application process. Professional Planning Guidance on Planning and Noise (2017), local plans (including supplementary planning guidance, eg the Draft Crawley Borough Local Plan 2021-2037 Noise Annex) and other guidance give guidance on the process and mitigation that should be used to ensure good acoustics design mitigates noise impacts. This PEIR provides forecasts of air noise, ground noise and road traffic noise that will assist in designing for future conditions to ensure adverse effects are minimised and significant effects are avoided.

14.11.16 Proposals for a third runway at Heathrow approximately 37 km from Gatwick would increase aircraft noise over a wide area including in the area between the two airports. Heathrow Airspace and Future Operations consultation material shows that airspace design envelopes could bring aircraft south towards Gatwick below 7,000 ft so there is potential for additional overflights in the areas overflown by aircraft using Gatwick with the Project. The design of the airspace required to facilitate a third runway at Heathrow is not developed to a stage that allows cumulative assessment at this stage because noise levels cannot be modelled without defined air traffic routes. It seems unlikely that that LOAEL noise contours from the two projects would overlap, but a cumulative assessment will be undertaken by others to accompany the Airspace Change Proposal that would be required of the Heathrow third runway project if/when this is brought forward. The noise impact assessment for the Northern Runway Project will consider any further information on the Heathrow third runway proposal that comes forward ahead of preparing the ES and consider cumulative noise impacts further, where practicable.

14.11.17 The ATM forecasts used for the noise assessment in this PEIR are for the case without a third runway at Heathrow. The ES will also consider the case with a third runway at Heathrow. The ATM forecasts for Gatwick with a third runway at Heathrow will be used to predict noise levels from the Project. In this scenario, ATMs at Gatwick will be lower than reported in this PEIR and noise impacts will be lower.

14.12. Inter-Related Effects

Introduction

14.12.1 Noise impacts have the potential to affect the assessments carried out under the following related topics:

- landscape and visual impacts;
- historic environment;
- health; and
- economics.

14.12.2 The following sections discuss how each inter-related effect has been considered and assessed. In general, the approach is to assess the significance of the noise effect within the chapter, and then to provide information from the noise modelling results to these other topic areas to inform their assessment of significant effects for these other topics.

Landscape and Visual Effects

14.12.3 The assessment of landscape and visual impacts has drawn on the assessment of overflights reported in this chapter, using two sets of results. Firstly, the mapping of overflights from the northern runway close to the airport, as reported in Section 14.9 (see Figure 14.9.28), has been used to assess visual impacts in those areas.

14.12.4 Secondly, the assessment of landscape and visual impacts has used the overflight analysis covering the wider area 35 miles around Gatwick Airport, as reported in Section 14.9 and illustrated in Figures 14.6.7, 14.6.8, 14.6.9, and 14.9.29. In addition, the change in the numbers of overflights expected at eight locations that are representative of important landscapes have been assessed individually. These eight locations were chosen by the landscape and visual

assessment team to represent the more sensitive landscapes in the areas and are shown on each of the overflight figures.

14.12.5 The assessment of the Project in 2032 is approximated by considering the change in the total number of overflights at these locations that would arise if 20% more Gatwick fights were added to the actual number of overflights in 2018. Appendix 14.9.2 gives details of the methodology. In practice, non-Gatwick overflights would also increase slightly from 2018 to 2029, so the proportional increase of the additional Gatwick flights would be slightly diluted, ie this is a worst case approximation. The results are summarised in Table 14.12.1.

Table 14.12.1: Daily Overflights at Landscape Assessment Locations

Landscape Assessment Location	Non-Gatwick Daily Overflights	Gatwick Daily Overflights	Non-Gatwick and Gatwick Daily Overflights	Non-Gatwick Overflights and Gatwick +20% Overflights	Increase in Overflights with Gatwick +20%	% Increase with Gatwick +20%
Witley and Milford Commons	17.2	1.3	18.6	18.8	0.3	1
Hever Castle	9.0	246	254.6	303.8	49.2	19
Wakehurst Place	1.1	11.5	12.6	14.9	2.3	18
Leith Hill	0.8	3.3	4.1	4.8	0.7	16
Petworth House	10.6	1.6	12.2	12.5	0.3	3
Temple of the Winds, Blackdown	15.9	4.2	20.2	21.0	0.8	4
Ditchling Beacon	8.9	3.7	12.6	13.4	0.7	6
Firle Beacon	6.4	10.0	16.4	18.4	2.0	12
Ashdown Forest	2.7	84.9	87.6	104.5	17.0	19

14.12.6 For example, at Hever Castle, there were 246 Gatwick overflights each 24 hour day on average within the 92 day summer period. There were nine overflights from other airports, giving 255 in total. If there were 20% more Gatwick flights this total would rise by 19% to 304. This is because Hever is directly aligned with the easterly arrivals runway centreline so is overflown by most arrivals from the east, and is also overflown by departures to the East.

14.12.7 Temple of the Winds, Blackdown is located to the west under a Gatwick departure route but some 35 km from the airport by which time Gatwick fights are partly dispersed. It is also overflown by some arrivals from the west, but again few in number due to the distance from the airport. On an average summer day it had four overflights from Gatwick flights. It was overflown by aircraft from other airports including Heathrow, on average 16 times a day, giving a total of 20 overflights per day. The effect of increasing Gatwick flights by 20% here would increase this daily total overflights from 20 to 21, ie by only 4%. Witley and Milford Commons, Petworth House, and Ditchling Beacon would see similarly small changes as a result of the Project.

14.12.8 The changes in tranquillity and overall effects on the designated areas that the eight locations represented are discussed in Chapter 8: Landscape, Townscape and Visual Resources.

Historic Environment

14.12.9 The assessment of impacts on historic environment resources has considered the noise changes reported in this chapter where relevant, as reported in Chapter 7: Historic Environment.

14.12.10 For air noise, consultation with Historic England confirmed that changes in noise levels should be used to scope the assets that could potentially affected by noise. Noise modelling was carried out and two heritage assets were identified as potentially affected by noise increases of more than $L_{eq\ 16\ hour}$ 1 dB as follows:

- Lowfield Heath Windmill, RH6 0EQ +2.0 dB
- Thunderfield Castle, RH6 9PP +1.2 dB

14.12.11 Noise modelling results were provided to the historic environment assessment team, the details of which are given in Appendix 14.9.2.

Health and Economic Appraisal

14.12.12 Transport Appraisal Guidance (WebTAG) offers a method to appraise the following quantifiable health effect of noise and to assign a cost to each based on a 60 year net present value (NPV):

- sleep disturbance;
- annoyance (amenity);
- acute myocardial infarction (AMI) heart attacks;
- strokes; and
- dementia.

14.12.13 For the air noise assessment, the CAA noise modelling team carried a WebTAG assessment for air noise using the 2029, 2032, 2038 and 2047 noise modelling results for the Project. Details are provided in Appendix 14.9.2. The results are summarised in Table 14.12.2 (negative values are costs due to noise increase).

Table 14.12.2: Summary of NPV (Net Present Value) Information Relevant to this Chapter

Health Effect	NPV in 2010 Prices (£)
Sleep Disturbance	-£3,482,621
Amenity	-£5,133,847
Acute Myocardial Infarction	-£48,372
Strokes	-£826,173
Dementia	-£1,246,250
Total	-£10,737,264

14.12.14 A number of assumptions are made in order to complete the workbook. There is an assumption that for the 47 years beyond 2038 noise levels are assumed constant in order to arrive at a 60 year discounted appraisal result. This is unlikely and more so for night noise given the night noise restrictions which are expected to prevail and reduce night noise levels.

14.12.15 The sleep disturbance costs are less than half the total. This is shown in the night-time noise contours changing less with the Project than day contours.

14.12.16 These results are used in the economic appraisal reported in Chapter 16: Socio-economics.

14.12.17 Similar WebTAG appraisals will be prepared for ground noise and road traffic noise in the ES. The results for these are likely to be smaller than for air noise.

14.13. Summary

Overview

14.13.1 The noise and vibration assessment considers the following sources and their potential impact on NSRs:

- construction noise and vibration – noise and vibration from temporary construction of the Project, including the use of construction compounds;
- air noise – noise from aircraft in the air or departing or arriving (including reverse thrust) on a runway;
- ground noise – noise generated from airport activities at ground level including aircraft taxiing and traffic within the airport boundary; and
- road traffic noise – noise from road traffic vehicles outside the airport on the public highway.

14.13.2 All four types of noise have been modelled based on forecasts of plant, road and airport traffic expected in the various assessment years. The noise changes are compared to the do-minimum in the relevant year, and also to the baseline conditions in 2019. The noise assessment results are summarised in this chapter, with five supporting appendices and illustrated by 67 figures.

Approach

14.13.3 The EIA Regulations require the identification of likely significant effects and mitigation to avoid or reduce significant effects. This PEIR chapter presents the preliminary findings of the assessment. As such the conclusions presented here are preliminary and may be revised by more detailed work throughout the EIA process and reported in the ES following consultation. Consequently, the assessment method may also develop further from that used in the PEIR. For example, consultation may reveal noise or vibration sensitive receptors with particular sensitivities requiring specific attention.

14.13.4 As described in Section 14.2, the Airports NPS states that '*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*.'

14.13.5 The approach to assessing noise effects from the Project therefore firstly identifies significant adverse effects on health and quality of life that may arise where noise at a receptor newly exceeds the SOAEL, and it identifies mitigation measures to avoid these. Secondly, the assessment identifies adverse effects that may arise above LOAEL but below SOAEL and

identifies mitigation measures to minimise these as far as practicable. Thirdly, opportunities to reduce noise levels from the base case so as to improve health and quality of life have been explored.

Construction Noise and Vibration

14.13.6 Construction noise has been assessed based on the preliminary design of the works, making a series of worst case approximations where necessary. Noise levels have been predicted for 13 phases of construction for the 12 individual years between 2024 and 2035 and the period 2036 to 2038. Much of the work on the airfield would be required to be undertaken at night. This has potential to impact various communities outside the airport the perimeter, around Charlwood village, in the area immediately south of the airport (Lowfield Heath) and on the south side of Horley where night works are likely to be required to build the highway works at the North and South Terminal roundabouts and at the Longbridge Roundabout. Overall the assessment results indicate that there is potential for adverse noise effects at approximately 150 properties during the day and approximately 500 during the night. The potential for impacts arising from construction traffic will be assessed in the ES.

14.13.7 A variety of mitigation measures are proposed to reduce the potential noise impacts, including reducing noise at source through quieter methods of working, screening, limiting hours of work and, as a last resort, noise insulation. A noise insulation scheme for construction noise would be developed to mitigate any predicted impacts above the SOAEL so as to avoid significant effects of health and quality of life. The initial predictions suggest that night time impacts may be sufficient to require this type of mitigation; this will be reviewed based on refined project information and mitigation in the ES. The Project would also adopt the Section 61 process whereby plans for noisy works must be done using the BPM to minimise impacts and submitted to the local authority for prior approval before work can begin. An outline CoCP has been developed, to deliver these mitigation measures through the construction contract, and will be refined as the EIA process continues to ensure that all adverse noise effects are mitigated as far as practicable.

14.13.8 Vibration is unlikely to give rise to significant effects, but will be assessed and reported in the ES.

Air Noise

14.13.9 Air noise has the potential to affect residents, and other NSRs over a wide area beyond the airport boundary. The assessment has included modelling changes in noise that can be expected over this area. It uses a number of noise metrics to quantify the changes in noise that are expected following established guidance, and also provides additional detail on the changes that are expected at representative communities and noise sensitive community buildings. Air noise modelling carried out by the CAA's Environmental Research and Consultancy Department (ERCD) indicates that noise impacts would be greatest in the 2032 interim assessment year. After this, the effect of the aircraft fleet shifting to quieter types outweighs the effect in increasing ATMs.

14.13.10 The air noise assessment has considered the range of noise levels likely in each future assessment year that would result from the range of aircraft fleet that could operate. As aircraft age, airlines replace them with next generation aircraft so that over time the fleet transitions to next generation aircraft and, other things being equal, overall noise levels reduce. The ATM forecasts used for the modelling of noise in the future are based on estimates of how the fleet will

transition based on assumptions around airlines' fleet procurement programmes and business models. The 'central case' used in the noise assessment is based on what is considered today to be the most likely rate of fleet transition. However, there is uncertainty around this, particularly at the current time due to the global pandemic and the financial impact on the airlines. Therefore air noise modelling has also been carried out for a 'slower transition fleet' case, based on ATM forecasts in which the rate of fleet transition is delayed by about five years and which would result in higher noise levels than the central case.

14.13.11 The existing northern runway is currently only used when the main runway is unavailable; for example, due to maintenance work at night. In 2018, the northern runway was used by 3,543 flights, and in 2019 it was used for 2,842 flights. The Project would make alterations to the existing northern runway, resulting in increased use of this runway using the same flight paths. The smaller ICAO 'Code C' aircraft (ie <36 metre wingspan (not larger types, eg B787 and A350)) would use the northern runway. Consequently, any noise impacts of the Project would be the result of increases in noise due to the increased number of flights on the northern runway, rather than new noise impacts over areas previously unaffected. This would therefore avoid the noise impacts often associated with new flight paths.

14.13.12 In 2032, the population within the SOAEL $L_{eq,\ 16\ hour}$ day 63 dB contour is predicted to rise from approximately 400 to 500 (the ranges provided cover the range of noise levels arising from the central case and slower transition fleet cases) in the base case to approximately 500 to 600 with the Project. The Project is expected to result in significant adverse effects on health and quality of life in the daytime for about 160 people in the slower transition case, and mitigation is proposed through the Inner Zone NIS to avoid these effects.

14.13.13 In 2032, the population within the daytime LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour is predicted to rise from 16,100 to 23,500 in the base case to 18,800 to 26,400 with the Project and remain below the 24,050 in 2019 except in the slower transition fleet case. Thus the Project is predicted to increase the population within the LOAEL $L_{eq,\ 16\ hour}$ day 51 dB contour by 2,700 to 2,900 people in 2032. However, for the majority (61 to 68% for daytime and 97 to 99% for night-time) of those affected the noise changes would be less than 1 dB and negligible. Approximately 1,800 to 4,900 people living to the south of the airport would see noise levels reduce, with 1,200 to 4,300 of these being negligible (<1 dB) and about 600 low (1-3 dB).

14.13.14 To the north and in the Smallfields area to the north east, approximately 4,800 to 6,500 people are predicted to experience 1 to 2 dB increases in daytime noise, which is likely to result in minor adverse and not significant effects. The majority of the residential properties in this area would be eligible for the new Outer Zone NIS, which would further reduce noise effects in this area.

14.13.15 To the west, approximately 300 to 400 people are expected to experience noise increases of 2-3 dB, which are likely to be minor adverse and not significant effects. All the residential properties in this area would be eligible for the new Outer Zone NIS, which would further reduce noise effects in this area.

14.13.16 To the west of the western end of the northern runway approximately 40 properties on Ifield Road and near Russ Hill have been identified as experiencing increases of 3-6 dB which are potentially moderate significant effects. These houses would be eligible for full noise insulation under the new Inner Zone NIS, to mitigate the potentially significant effects.

14.13.17 Noise changes at night would be lower than during the day because it is assumed that the current night restrictions would continue to cap aircraft numbers in the 23:30-06:00 hours period. In 2032, the population within the SOAEL $L_{eq,\ 8\ hour}$ night 55 dB contour is predicted to rise from approximately 900 to 1,100 in the base case, by approximately 160 with the Project. As a result the Project is expected to result in moderate significant adverse effects on health and quality of life in the night-time for about 160 people, and mitigation is proposed through the Inner Zone NIS to avoid these effects. The areas within the day and night SOAEL contours overlap so that the total number of people within the day or night SOAEL contours due to noise increases from the Project in 2032 is approximately 200 people, all of which are within the Inner Zone NIS.

14.13.18 50 noise sensitive community buildings within the $L_{eq,\ 16\ hour}$ day 51 dB noise contour in 2032 with the Project have been assessed. These comprise 21 schools, one hospital, 18 places of worship and seven community buildings. At two places of worship in Crawley noise levels are expected to reduce by 1-2 dB. At 42 of these buildings noise levels are predicted to either decrease or increase by less than 1 dB, ie a negligible increase, as a result of the Project compared to the 2032 baseline, with low increases of 1-2 dB at the others. A noise insulation scheme would be developed for any school adversely affected.

14.13.19 The assessment of significant effects is based primarily on the predicted levels and changes in the primary noise metrics, $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night, but additional noise metrics are used to provide more detail on the changes that would arise. Number Above metrics N65 and N60 night show how the numbers of aircraft above L_{max} 65 dB and L_{max} 60 dB are expected to change. Seven Community Representative Locations have been used to illustrate the effects on the most populated areas affected by aircraft noise. The European metrics L_{den} and L_{night} have also been used to report air noise changes as annual averages for day evening and night and also separately for night.

14.13.20 Beyond the noise contours, the extent to which the number of overflights below 7,000 feet would change have been computed to give stakeholders further from the airport information on how many more aircraft would overfly them as a result of the Project.

14.13.21 A noise envelope is proposed to set limits on noise from future operations at the airport in terms of the areas of $L_{eq,\ 16\ hour}$ day and $L_{eq,\ 8\ hour}$ night noise contour areas. Noise limits are proposed for two periods, first for the period from when the northern runway opens up to when the noise impacts are expected to be greatest about three years later, and second for when the airport grows to operate at 382,000 commercial ATMs and thereafter. The latter noise contour areas are smaller. The area of the L_{eq} day and night contours would not exceed these limits, and the noise envelope would provide certainty to the community that noise levels would be limited and would reduce in the future so as to share the benefits of new technologies with the community. Appendix 14.9.5 provides details of the noise envelope, the options considered and its possible implications for consultees to consider.

Ground Noise

14.13.22 Ground noise from aircraft taxiing and within the airfield has been modelled using a model calibrated with measurements made on the airfield in spring 2019 and baseline measurements made at 12 representative receptors. The increase in numbers of aircraft and the addition of taxiways closer to neighbouring properties to the north has the potential to lead to noise increases, and mitigation has been incorporated including: bunding 8 metres in height situated at the western end of northern runway, and noise barriers 10 metres high adjoining the bund

installed at the western end of the northern runway and running for approximately 500 metres just to the north of the relocated Juliet Taxiway.

14.13.23 The results show predicted ground noise impacts are not significant (negligible or minor) at the majority of the represented receptors studied with moderate adverse effects at three of the 12 receptor areas. The effects rated as moderate are considered significant and these are predicted in the Charlwood and Povey Cross areas and the area immediately south of the airport, at a total of approximately 90 properties. These are conservative estimates that will be further refined in the ES.

14.13.24 The majority of the NSRs around the airport perimeter that may be adversely impacted by ground noise are within the areas covered by the current or proposed NIS, as shown in Figure 14.8.1. The 10 properties where SOAEL may be exceeded are within or close to the Inner Zone NIS boundary. The Inner Zone NIS will be modified, if necessary, when the ES assessment is completed, so that significant effects on heath and quality of life are avoided.

Road Traffic Noise

14.13.25 The remodelling of the Longbridge, North Terminal and South Terminal roundabouts and associated highways works have potential to increase noise levels in the adjacent Riverside Garden Park and residential area. A detailed noise model has been used to predict noise levels and to compare them to the do-minimum in 2032 and 2047 as required by the DMRB methodology. Noise barriers have been incorporated in the elevated sections of new highway. These would ensure that at most receptors, including within the park, noise levels would reduce as a result of the Project. Further modelling of traffic forecasts will be undertaken and reported in the ES, the numbers of properties affected by the different noise changes will be assessed, and is likely to conclude that the benefits are of negligible or minor significance in most areas with some moderate significant benefits in small areas where the highest baseline noise levels would be reduced.

14.13.26 Noise levels on other roads not part of the highway works could be changed by traffic changes resulting from the Project. Initial modelling indicates these noise changes would be insignificant, and further modelling will be carried out and reported in the ES.

Next Steps

14.13.27 Further meetings will be held with the Local Authorities Noise Working Topic Group to discuss methodologies and particular sensitivities and receptors.

14.13.28 Further work will be undertaken to identify particular non-residential receptors that may be affected, and an assessment of effects at relevant properties will be included in the ES.

14.13.29 The noise modelling carried out in respect of construction noise will be reviewed in light of any potential changes to the proposed construction methods between the submission of the PEIR and the ES, and further mitigation will be developed to minimise adverse effects.

14.13.30 The air noise assessment will be extended to also consider air traffic forecasts for the Project in the future with a third runway at Heathrow, where sufficient information is available at the time. A final noise envelope will be proposed taking account of stakeholders views.

14.13.31 The assessment carried out in respect of ground noise will be updated, if necessary, in light of future refinements and additional ground noise modelling.

14.13.32 Further road traffic noise modelling will be carried out to quantify temporary noise impacts from construction traffic during the day and night, and for the operational traffic flows during the night up to 15 years after opening.

Table 14.13.1: Summary of Effects

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
Initial construction phase (2024-2029)							
Properties adjacent to the works	Residential (high) and non-residential (various) NSRs	Construction noise during daytime, evening and night-time	Short term	Medium. For whole construction period potential for adverse effects at approximately 150 properties during the day and approximately 500 during the night without mitigation	Moderate after mitigation, subject to further assessment	Subject to further assessment	Mitigation through CoCP
Properties adjacent to construction traffic routes	Residential (high) and non-residential (various) NSRs	Construction traffic noise during daytime, evening and night-time	Short term	To be assessed in ES	To be assessed in ES	To be assessed in ES	

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
First full year of operation (2029)							
Properties above LOAEL construction noise	The construction noise impacts in 2029 and beyond are included in the estimates for 2024 to 2029 above.						
Properties within LOAEL air noise contours	The air noise impacts in 2029 would be lower than those for 2032 reported below						
Properties within LOAEL ground noise contours	The ground noise impacts in 2029 would be lower than those for 2032 reported below						
Interim assessment year (2032)							
Properties south of airport	Residential (high) and non-residential (various) NSRs	Air noise disturbance	Permanent	Day 1,700 to 4,800 people: negligible to medium Night 100- 200 people: negligible	Minor beneficial (day) Negligible (night)	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
Population above LOAEL		Air noise disturbance	Permanent	Day 13,000 to 16,000 people: negligible. Night 21,000 to 28,000 people: negligible.	Negligible	Not significant	
North of airport and Smallfields, and west (day) West of runway (night)		Air noise disturbance	Permanent	Day 5,200 to 7,000 people: low. Night 300 to 500 people: low.	Minor adverse	Not significant	Homes within the $L_{eq\ 16\ hour}$ 54 dB contour will be eligible for the Outer Zone NIS
West of runway Ifield Road, Russ Hill		Air noise disturbance	Permanent	Day 40 homes: medium to high. Night 60 homes: medium to high. Approximately 80 homes above SOAEL due to Project.	Moderate adverse	Significant	All homes eligible for Inner Zone NIS to avoid significant effects
Community receptors	21 schools, one hospital, 18 places of worship and seven	Air noise disturbance	Permanent	Negligible/low	Negligible or minor	Not significant	A noise insulation scheme will be developed for any school adversely affected

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
	community buildings						
Properties within LOAEL ground noise	Residential (high) and non-residential (various) NSRs	Ground noise disturbance	Permanent	Negligible or low	Negligible or Minor	Not Significant	
Properties in Charlwood and Povey Cross areas and the area immediately south of the airport		Ground noise disturbance	Permanent	Approximately 90 properties (conservative estimate to be refined)	Moderate adverse, subject to further study	Significant	Noise bund and barrier minimises impacts to below SOAEL.
Area immediately south of the airport	Residential (high)	Ground noise disturbance	Permanent	Approximately 10 properties	Moderate adverse, subject to further study	Significant	The Inner Zone NIS will be offered to mitigate significant effects (above SOAEL) predicted at approximately 10 properties in the Myrtle Cottage area.
Community receptors	Non-residential properties	Ground noise disturbance	Permanent	Bear and Bunny Nursery – Moderate.	Minor. Others to be assessed	Not significant	

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
				Impacts at other properties to be assessed in ES			
Properties within LOAEL road traffic noise contours	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance from roads modified by the Project	Permanent	Negligible to low/medium beneficial.	Not significant/ significant	Not significant to significant beneficial	Includes noise barriers
Properties within 50 m of non-Project road links	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance on unchanged roads	Permanent	Negligible to low noise changes	Not significant	Not Significant	
Design year (2038)							
Properties within LOAEL air noise contours	The air noise impacts in 2038 would be lower than those for 2032 reported above						
Properties within LOAEL	The ground noise impacts in 2038 would be lower than those for 2032 reported above						

Receptor	Receptor Sensitivity	Description of Impact	Short / medium / long term / permanent	Magnitude of Impact	Significance of Effect	Significant / not significant	Notes
ground noise contours							
Properties within LOAEL road traffic noise contours	Road traffic noise has been assessed 15 years after opening, in 2047. in accordance with the DMRB, see below.						
Year (2047)							
Properties within LOAEL road traffic noise contours	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance from roads modified by the Project	Permanent	Negligible	Not significant	Not significant	Includes noise barriers
Properties within 50 m of non-Project road links	Residential (high) and non-residential (various) NSRs	Road traffic noise disturbance on unchanged roads	Permanent	Negligible noise reductions	Not significant	Not Significant	

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14.15. Glossary

Table 14.15.1: Glossary of Terms

Term	Description
AONB	Area of Outstanding Natural Beauty
APF	Aviation Policy Framework
APU	Auxiliary Power Unit
ATM	Air Traffic Movement
A-Weighting	Environmental noise measurements and levels are usually expressed using a variation of the decibel scale, which gives less weight to low frequencies and very high frequencies. This system was derived to correspond to the reduced sensitivity of the human hearing mechanism to these frequencies.
Background Noise	Background noise is the noise without the proposed changes in the use of the airport. The L_{Aeq} is used in the ground noise study parameter to indicate the ambient noise conditions that exist in the background noise.
BAU	Business as Usual
BNL	Basic Noise Level
BPM	Best Practicable Means
CAA	Civil Aviation Authority
CEA	Cumulative Effects Assessment
CoCP	Code of Construction Practice
CRTN	Calculation of Road Traffic Noise
DfT	Department for Transport
DMRB	Design Manual for Roads and Bridges
EAT	End around taxiway
EGR	Engine Ground Running
EIA	Environmental Impact Assessment
ERCD	Environmental Research and Consultancy Department
FPT	Flight Performance Team
GATCOM	Gatwick Airport Consultative Committee
GPU	Ground Power Unit
ES	Environmental Statement
ICAO	International Civil Aviation Organization
ICCAN	Independent Commission on Civil Aviation Noise
$L_{Aeq, T}$ - Equivalent Continuous Sound Level	The L_{Aeq} level gives a single figure to describe a sound that varies over a given time period, T. It is the A-weighted steady sound level that would result in the same sound energy at the receiver as occurred in practice with the varying level. It is derived from the logarithmic summation of the sound signal and so unlike a conventional (linear) average it gives additional weighting to higher levels.
$L_{Aeq, 16 hours}$	The L_{Aeq} over the daytime and evening period 07:00 to 23:00 hours, for aircraft noise for an average summer day between 16 June and 15 September. In this report all noise levels are A-weighted and in places the A is omitted for simplicity written $L_{eq, 16 hour}$

Term	Description
$L_{Aeq, 8\ hours}$	The L_{Aeq} over the night period 23:00 to 07:00 hours, for aircraft noise for an average summer night between 16 June and 15 September. In this report all noise levels are A-weighted and in places the A is omitted for simplicity written $L_{eq, 8\ hour}$
L_{max}	The L_{max} s is the highest value of the sound level over the specified period. It is sometimes referred to as 'peak' noise level. However, the term 'peak' has a special meaning in acoustics and the expression 'maximum' is preferable to avoid confusion. The 's' stands for slow response, which is the metric usually used for aircraft noise. In this report all L_{max} levels are A-weighted.
LOAEL	Low Observed Adverse Effect Level
N60 night	Numbers of aircraft during an average summer night above L_{max} 60 dB
N65 day	Numbers of aircraft during an average summer day above L_{max} 65 dB
NaTMAG	Noise and Track Monitoring Advisory Group
NIS	Noise Insulation Scheme
NOEL	No Observed Effect Level
NPPF	National Planning Policy Framework
NPRs	Noise Preferential Routes
NPS	National Policy Statement
NPSE	Noise Policy Statement for England
NPV	Net Present Value
NSR	Noise Sensitive Receptor
NTK	Noise and Track Keeping
Overflight	An aircraft overflying a receptor on the ground at a height of less than 7,000 ft above the ground and at an angle of at least 48.5 degrees from the horizontal, as defined by CAP1498.
PEIR	Preliminary Environmental Information Report
Quiet Areas	Designated under Local Plans or Neighbourhood Development Plans as Local Green Spaces and areas identified as Quiet Areas through implementation of the Environmental Noise (England) Regulations 2006
QC	Quota Count
SID	Standard Instrument Departure
SOAEL	Significant Observed Adverse Effect Level
SONA	Survey of Noise Attitudes
Standard Mode	Year on year the proportion of aircraft taking off to the east and to the west varies according to wind conditions. Standard mode contours take the 20 rolling average runway modal split; in 2018 this was 75% west/25 % east for the L_{eq} period. At night a 10 year average is used, and in 2018 this was 76% west/24% east.
TRL	Transport Research Laboratory
WHO	World Health Organization
WebTAG	Web based Transport Appraisal Guidance: https://www.gov.uk/guidance/transport-analysis-guidance-webtag\
ZoI	Zone of Influence