Heathrow

EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Environmental Impact Assessment
Environmental Statement, Volume II
Chapter 9: Public Health

Document Reference: 19309-XX-EC-XXX-000015

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Heathrow

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9. Public Health

9.1 Introduction

9.1.1 This Chapter reports the outcome of the assessment of likely significant effects arising from the Proposed Development upon human health. This Chapter considers the public health implications of individual and community effects reported in other parts of the Environmental Statement, including effects on health inequalities[1].

9.1.2 The assessment considers the effects of the Proposed Development arising from the change in the pattern of aircraft movements on the ground and in the air, during easterly operations. Potential effects on health outcomes would arise from the increase in the number of aircrafts departing on the northern runway (09L) and arriving on the southern runway (09R) during easterly operations, and the decrease in the number of aircraft departing on the southern runway (09R) and landing on the northern runway (09L) during the same mode of operations. These changes may result in both positive and negative effects on health outcomes in the local populations.

9.1.3 This Chapter (and its associated figures and appendices) is intended to be read as part of the wider Environmental Statement. Baseline population health data supporting the public health assessment is set out in **Appendix 9.1: Health and Wellbeing Baseline Tables** (**Volume III** of the Environmental Statement). Public health Figures are set out in **Appendix 9.2: Public Health Figures** (**Volume III** of the Environmental Statement).

9.1.4 This Chapter has been informed by primary assessments set out in the following chapters included in **Volume II** and associated appendices within **Volume III**:

- **Chapter 6: Air Quality**;
- **Chapter 7: Noise and Vibration** (which includes assessment of health and quality of life as defined by the Noise Policy Statement for England (NPSE)); and
- **Chapter 10: Landscape and Visual Impact Assessment**.

9.1.5 These chapters provide the basis of the assessment for the effects on public health. To avoid duplication, this Chapter does not repeat text, rather it extends the analysis to consider the population level health implications of those assessment findings, including taking into account the mitigation described in those assessments.

9.1.6 Informed by the findings of other assessments, this Chapter assesses the public health implications of:

[1] Institute of Environmental Management and Assessment (2022) *Effective Scoping of Human Health in Environmental Impact Assessment*. [online] Available at: https://www.researchgate.net/publication/376488593_IEMA_Guide_Effective_Scoping_of_Human_Health_in_Environmental_Impact_Assessment [Accessed: 09 October 2024].

- Air quality operational impacts, including redistribution of emissions, with potential effects on physical health;
- Noise and vibration construction and operational impacts, including redistribution of ground and air noise, with potential effects on mental and physical health;
- Physical activity, open space and recreation construction and operational impacts, including from noise, vibration, air quality and visual changes, with potential effects on people's ability or inclination to undertake physical and recreational activities;
- Community infrastructure construction and operational impacts, including from noise, vibration, air quality and visual changes, with potential effects on users of community facilities and infrastructure; and
- Educational attainment operational impacts, with the potential to affect users of educational facilities.

9.1.7 Following principles of public health, human health in Environmental Impact Assessment (EIA) takes a population health approach[2, 3, 4]. Population health means "*the health outcomes of a group of individuals, including the distribution of such outcomes within the group*"[5]. The conclusions of this chapter therefore relate to the health outcomes to defined populations, not the health outcomes of individuals.

9.1.8 The assessment of health considers any likely significant effects arising from the construction and operation of the Proposed Development on:

- Populations of people, primarily relating to where they live ('residential receptors'); and
- Populations using community and recreation facilities such as schools, hospitals, places of worship, and open space.

[2] Institute of Environmental Management and Assessment (2022) *Determining Significance for Human Health in Environmental Impact Assessment*. [online] Available at: https://gat04-live-1517c8a4486c41609369c68f30c8-aa81074.divio-media.org/filer_public/30/09/30092d8c-08f2-4f57-9f67-9446ac52daa5/cd3802_institute_of_environmental_management_and_assessment_guide_determining_significance_for_human_health_in_eia.pdf [Accessed: 15 October 2024].

[3] Institute of Public Health (2021) *Health Impact Assessment Guidance: A Manual. Standalone Health Impact Assessment and health in environmental assessment*. [online] Available at: https://www.publichealth.ie/sites/default/files/resources/guidance_2.pdf [Accessed: 15 October 2024].

[4] International Association for Impact Assessment and European Public Health Association (2020) *Human health: Ensuring a high level of protection A reference paper on addressing Human Health in Environmental Impact Assessment As per EU Directive 2011/92/EU amended by 2014/52/EU*. [online] Available at: https://eupha.org/repository/sections/HIA/Human%20Health%20Ensuring%20Protection%20Main%20and%20Appendices.pdf [Accessed: 15 October 2024].

[5] Kindig, D. and Stoddart, G. (2003) 'What Is Population Health?', *American journal of public health*, 93(3), pp. 380-383. [online] Available at: https://ajph.aphapublications.org/doi/full/10.2105/AJPH.93.3.380 [Accessed: 09 October 2024].

9.1.9 Health is influenced by a range of factors, termed the 'wider determinants of health'. Determinants of health considered in EIA span environmental, social, behavioural, economic and institutional factors and include:

- Environmental changes, such as changes in air quality, noise, water quality;
- Social environment, such as changes in transport and access to community facilities;
- Economy, such as changes in employment and skills; and
- Institutional, such as changes in access to healthcare.

9.2 Relevant legislation, policy and technical guidance

9.2.1 This Section identifies the legislation, policy and technical guidance that has informed the scope of the assessment presented in this chapter.

Legislation

9.2.2 A summary of the legislation relevant to the public health assessment is provided in **Table 9.1**.

Table 9.1 Relevant legislation

Document / Reference	Summary
The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (EIA Regulations 2017)[6]	The EIA Regulations 2017 states that the EIA shall "*identify, describe and assess in an appropriate manner, in the light of each individual case, the direct and indirect significant effects of a project on … population and human health…*" (paragraph 4). This arises from the objective of EIA, which is "*to ensure a high level of protection of the environment and of human health*" (Recital 41[7]).
Equality Act 2010[8]	The aim of the Equality Act 2010 is to protect individuals from unfair treatment and promote a fair and more equal society. The legislation acts to protect those under unfair treatment based on certain personal characteristics. This applies to discrimination based on: age, race, sex, gender reassignment, disability, religion or belief, sexual orientation, marriage or civil partnership, pregnancy and maternity.

[6] HM Government (2017) *The Town and Country Planning (Environmental Impact Assessment) Regulations 2017*. [Online]. Available at: https://www.legislation.gov.uk/uksi/2017/571/contents [Accessed: 09 October 2024].

[7] European Parliament and the Council of the European Union (2014) *Directive 2014/52/EU amending Directive 2011/92/EU*. [online]. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0052&from=EN [Accessed: 09 October 2024].

[8] HM Government (2010) *Equality Act 2010*. [online]. Available at: https://www.legislation.gov.uk/ukpga/2010/15/contents [Accessed: 09 October 2024].

Document / Reference	Summary
Health and Safety at Work etc. Act 1974[9]	The Health and Safety at Work etc. Act 1974 places duties on employers to ensure, 'so far as is reasonably practicable': the health, safety and welfare at work of all their employees; and that persons not in their employment are not exposed to risks to their health or safety as a result of the activities undertaken.
Environmental Protection Act 1990 (as amended)[10]	Part IIA covers contaminated land and Part III manages the control of emissions (including dust, noise and light) that may be prejudicial to health or a nuisance.
Environment Act 1995[11]	The Environment Act 1995 sets provisions for protecting certain environmental conditions of relevance to health in the UK. Part II covers contaminated land and Part IV covers air quality. Part IV requires that Local Authorities periodically review air quality within their individual areas and assess whether prescribed air quality objectives are being achieved or are likely to be achieved within a specified period.
The Air Quality (England) Regulations 2000[12] and The Air Quality (England) (Amendment) Regulations 2002[13]	The Air Quality (England) Regulations 2000 (SI 2000 No, 928) and The Air Quality (England) (Amendment) Regulations 2002 (SI 2002 No, 3043) specify the objectives to be met, and dates when they are to be met, by local authorities through the Local Air Quality Management process defined in the Environment Act 1995 (as amended)[11].
The Air Quality Standards Regulations 2010[14] and The Air Quality Standards (Amendment) Regulations 2016[15]	The Air Quality Standards Regulations 2010 sets out statutory health protection standards on ambient air quality. The legal duty under The Air Quality Standards Regulations 2010 is on the Secretary of State to ensure the limit values are not exceeded. This is in contrast to the Air Quality (England) Regulations 2000[12] and the Air Quality (England) (Amendment) Regulations 2002[13], which impose duties on local

[9] HM Government (1974) *Health and Safety at Work etc. Act 1974*. [online]. Available at: https://www.legislation.gov.uk/ukpga/1974/37/part/I/crossheading/general-duties [Accessed: 09 October 2024].

[10] HM Government (1990) *Environmental Protection Act 1990*. [online] Available at: https://www.legislation.gov.uk/ukpga/1990/43/contents [Accessed: 11 September 2024].

[11] HM Government (1995) *Environment Act 1995*. [online] Available at: https://www.legislation.gov.uk/ukpga/1995/25/contents [Accessed: 11 September 2024].

[12] HM Government (2000) *The Air Quality (England) Regulations 2000*. [online] Available at: https://www.legislation.gov.uk/uksi/2000/928/contents/made [Accessed: 11 September 2024].

[13] HM Government (2002) *The Air Quality (England) (Amendment) Regulations 2002*. [online] Available at: https://www.legislation.gov.uk/uksi/2002/3043/contents/made [Accessed: 11 September 2024].

[14] HM Government (2010) *The Air Quality Standards Regulations 2010*. [online] Available at: https://www.legislation.gov.uk/uksi/2010/1001/contents [Accessed: 11 September 2024].

[15] HM Government (2016) *The Air Quality Standards (Amendment) Regulations 2016*. [online] Available at: https://www.legislation.gov.uk/uksi/2016/1184/contents/made [Accessed: 11 September 2024].

Document / Reference	Summary
	authorities to meet the objectives. Limit values are therefore not the same as objectives in legal terms, although many are numerically the same.
The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 (SI 2023 No. 96)[16]	The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023 sets two new targets, and two new interim targets, for $PM_{2.5}$ concentrations in England. One set of targets focuses on absolute concentrations. The long-term target is to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by the end of 2040, with the interim target being a value of 12 µg/m^3 by the start of 2028. The second set of targets relate to reducing overall population exposure to $PM_{2.5}$. By the end of 2040, overall population exposure to $PM_{2.5}$ should be reduced by 35% compared with 2018 levels, with the interim target being a reduction of 22% by the start of 2028.
Civil Aviation Act 2012[17]	The Civil Aviation Act 2012 gives the Civil Aviation Authority a role in promoting better public information about the environmental effects of civil aviation in the UK, their impact on human health and safety, and measures taken to mitigate adverse impacts.
Control of Pollution Act 1974[18]	The Control of Pollution Act 1974 makes provisions in relation to waste disposal, water pollution, noise, atmospheric pollution and public health. It describes licensing of certain activities to avoid danger to public health or serious detriment to the amenity of the locality affected. It also covers control of, and consent for, noise on construction sites (sections 60 and 61), including defining 'best practicable means' (section 72).
Environment Act 2021[19]	The Environment Act 2021 established The Office for Environmental Protection (OEP) as a public body in England and Northern Ireland. The OEP sets targets and takes enforcement action to prevent, or mitigate, serious damage to the natural environment or to human health. This includes reducing adverse impacts on public health. The OEP objective[20] is for environmental law (including EIA legislation) and its implementation to be well designed and delivered, so that positive outcomes for the environment and people's health and wellbeing are achieved.

[16] HM Government (2023) *The Environmental Targets (Fine Particulate Matter) (England) Regulations 2023*. [online] Available at: https://www.legislation.gov.uk/uksi/2023/96/contents/made [Accessed: 11 September 2024].

[17] HM Government (2012) *Civil Aviation Act 2012*. [online] Available at: https://www.legislation.gov.uk/ukpga/2012/19/contents/enacted [Accessed: 11 September 2024].

[18] HM Government (1974) *Control of Pollution Act 1974*. [online] Available at: https://www.legislation.gov.uk/ukpga/1974/40 [Accessed: 11 September 2024].

[19] HM Government (2021) *Environment Act 2021*. [online] Available at: https://www.legislation.gov.uk/ukpga/2021/30/contents [Accessed: 11 September 2024].

[20] Office for Environmental Protection (2022) *Our Strategy and Enforcement Policy*. [online] Available at: https://www.theoep.org.uk/report/our-strategy-and-enforcement-policy [Accessed: 11 September 2024].

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Public Health (Control of Disease) Act 1984 (as amended)[21]	The Act relates to disease control and establishing of port health authorities. Port health authorities carry out a range of health controls at the UK borders. These include checks on imported food, inspecting aircraft for food safety and infectious disease control, as well as general public and environmental health checks.

Policy

9.2.3 A summary of policy relevant to the health assessment is provided in **Table 9.2**.

Table 9.2 Relevant policy

Document / Reference	Summary
National Planning Policies	
National Planning Policy Framework (NPPF)[22]	The NPPF sets out the Government's planning policies for England and how these should be applied. It provides a framework within which locally prepared plans for housing and other development can be produced. Paragraph 96 states that "*Planning policies and decisions should aim to achieve healthy, inclusive and safe places [..] which c) enable and support healthy lifestyles, especially where this would address identified local health and well-being needs – for example through the provision of safe and accessible green infrastructure, sports facilities, local shops, access to healthier food, allotments and layouts that encourage walking and cycling*". Paragraph 97 states "*To provide the social, recreational and cultural facilities and services the community needs, planning policies and decisions should: a) plan positively for the provision and use of shared spaces, community facilities (such as local shops, meeting places, sports venues, open space, cultural buildings, public houses and places of worship) and other local services to enhance the sustainability of communities and residential environments; b) take into account and support the delivery of local strategies to improve health, social and cultural well-being for all sections of the community; c) guard against the unnecessary loss of valued facilities and services, particularly where this would reduce the community's ability to meet its day-to-day needs*". Paragraph 191 states "*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*

[21] HM Government (1984) *Public Health (Control of Disease) Act 1984*. [online] Available at: https://www.legislation.gov.uk/ukpga/1984/22 [Accessed: 11 September 2024].

[22] Ministry of Housing, Communities and Local Government (2023) *National Planning Policy Framework*. [online] Available at: https://assets.publishing.service.gov.uk/media/669a25e9a3c2a28abb50d2b4/NPPF_December_2023.pdf [Accessed: 09 October 2024].

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	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". Paragraph 192 states "*Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and Clean Air Zones, and the cumulative impacts from individual sites in local areas*". Paragraph 194 states "*The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively*".
Aviation Policy Framework (APF)[23]	The APF identifies the need for a "*fair balance between the negative impacts of noise (on health, amenity (quality of life) and productivity) and the positive economic impacts of flights*" with benefits shared between the aviation industry and local communities, particularly as noise levels fall with technology improvements. It states that "*planning policies and decisions should aim to avoid a situation where noise gives rise to significant adverse impacts on health*" and mitigation should "*reduce to a minimum other adverse impacts on health*".
Airports National Policy Statement (NPS): New runway capacity and infrastructure at airports in the South East of England[24] (updated June 2018)	The Airports NPS is not directly relevant for the Proposed Development as it relates to an increase in airport capacity. Whilst not directly applicable, the NPS, as well as covering the wider effects on people and communities as identified in Section 8, addresses health stating that "*any environmental statement should identify and set out the assessment of any likely significant health impacts*". It notes that airports infrastructure may have both direct and indirect effects on health arising from "*traffic, noise, vibration, air quality and emissions, light pollution, community severance, dust, odour, polluting water, hazardous waste and pests"* with effects on *"access to key public services, local transport, opportunities for cycling and walking, or the use of open space for recreation and physical activity*" and notes that effects should be mitigated. Related, paragraph 5.56 notes that "*The Government also recognises that predictable periods of relief from aircraft noise (known as respite) are important for communities affected, and that noise at night is widely regarded as the least acceptable aspect of aviation noise for those communities, with the costs*

[23] Department for Transport (2013) *Aviation policy framework*. [online] Available at: https://www.gov.uk/government/publications/aviation-policy-framework [Accessed: 09 October 2024].

[24] Department for Transport (2018) *Airports National Policy Statement: new runway capacity and infrastructure at airports in the South East of England*. [online] Available at: https://assets.publishing.service.gov.uk/media/5e2054fc40f0b65dbed71467/airports-nps-new-runway-capacity-and-infrastructure-at-airports-in-the-south-east-of-england-web-version.pdf [Accessed: 09 October 2024].

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	on communities of aircraft noise during the night (particularly the health costs associated with sleep disturbance) being higher." Paragraph 5.61 goes on to state *"The applicant should put forward plans for a runway alternation scheme that provides communities affected with predictable periods of respite (though the Government acknowledges that the duration of periods of respite that currently apply will be reduced)".*
Overarching Aviation Noise Policy Statement[25]	In March 2023 the Department for Transport published a short policy paper on their overarching aviation noise policy, as an interim statement of overarching noise policy to help frame the Night Restrictions objective for Night Restrictions Consultation that was launched, ahead of a full noise policy statement expected later in 2023.The policy paper states: "*The government's overall policy on aviation noise is to balance the economic and consumer benefits of aviation against their social and health implications …*". "*The impact of aviation noise must be mitigated as much as is practicable and realistic to do so, limiting, and where possible reducing, the total adverse impacts on health and quality of life from aviation noise*". "*An overall reduction in total adverse effects is desirable, but in the context of sustainable growth an increase in total adverse effects may be offset by an increase in economic and consumer benefits. … In circumstances where there is an increase in total adverse effects, "limit" would mean to mitigate and minimise adverse effects, in line with the Noise Policy Statement for England. … noise mitigation as well as noise reduction can contribute to reducing total adverse effects of noise*".
The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)[26]	This sets air pollution standards to protect people's health and the environment. The Strategy sets out the National Air Quality Objectives (AQOs) and Government policy on achieving these objectives. "*The UK Government's and devolved administrations' primary objective is to ensure that all citizens should have access to outdoor air without significant risk to their health, where this is economically and technically feasible. This strategy is based on standards from expert recommendations representing levels at which no significant health effects would be expected in the population as a whole and on the standards and principles of better regulation*" [paragraph 15, emphasis added].

[25] Department for Transport (2023) *Overarching Aviation Noise Policy Statement*. [online] Available at: https://www.gov.uk/government/publications/aviation-noise-policy-statement/overarching-aviation-noise-policy [Accessed: 09 October 2024].

[26] Department for Environment, Food and Rural Affairs (2007) *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (Volume 1)*. [online] Available at: https://assets.publishing.service.gov.uk/media/5a758459ed915d731495a940/pb12654-air-quality-strategy-vol1-070712.pdf [Accessed: 09 October 2024].

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	"*…The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups …*" [paragraph 17, emphasis added]. The Government define the statutory air quality standards as: "*Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment*".[27]
The National Health Service (NHS) Long Term Plan[28]	The plan covers a 10-year programme of phased improvements to services and outcomes and has an emphasis on the NHS and built environment sectors working together to improve health and wellbeing.
Public Health England (PHE) Strategy 2020-25[29]	The PHE Strategy includes the aims of reducing air pollution, promoting good mental health and contributing to the prevention of mental illness.
Local Development Policies	
The London Plan 2021[30]	The Spatial Development Strategy for Greater London sets out a framework for how London will develop over the next 20-25 years and the Mayor's vision for Good Growth. Policies relevant to the population, health and land use assessment are: GG1: Building Strong and Inclusive Communities; GG3: Creating a Healthy City; D1: London's Form, Character and capacity for Growth; D14: Noise; SI1: Improving Air Quality; T2: Healthy Streets; and T4: Assessing and Mitigating Transport Impacts (which covers the walking and cycling network). "*To improve Londoners' health and reduce health inequalities, those involved in planning and development must: …ensure that the wider determinants of health are addressed in an integrated and co-ordinated way, taking a systematic approach to improving the mental and physical health of all Londoners and reducing health inequalities …*" [GG3 Creating a healthy city]. "*The Mayor supports the role of the airports serving London in enhancing the city's spatial growth… The environmental and health impacts of aviation must be fully acknowledged and aviation-related development proposals should*

[27] Department for Environment Food and Rural Affairs (n.d.) *UK Air Quality Limits*. [online] Available at: https://uk-air.defra.gov.uk/air-pollution/uk-limits.php#:~:text=Air%20Quality%20Standards%20are%20concentrations,health%20and%20on%20the%20environment [Accessed: 09 October 2024].

[28] National Health Service (2019) *The NHS Long Term Plan*. [online] Available at: https://www.longtermplan.nhs.uk/wp-content/uploads/2019/08/nhs-long-term-plan-version-1.2.pdf [Accessed: 11 September 2024].

[29] Public Health England (2019) *PHE Strategy 2020 to 2025*. [online] Available at: https://assets.publishing.service.gov.uk/media/5d7b72c8ed915d5257b5b66c/PHE_Strategy_2020-25.pdf [Accessed: 11 September 2024].

[30] Greater London Authority (2021) *The London Plan*. [online] Available at: https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf [Accessed: 11 September 2024].

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	include mitigation measures that fully meet their external and environmental costs, particularly in respect of noise, air quality and climate change. Any airport expansion scheme must be appropriately assessed …" [Policy T8 Aviation].
Hillingdon Local Plan: Part 1[31]	The Local Plan sets out Hillingdon's vision for the borough, which includes: "*Improved environment and infrastructure is supporting healthier living and helping the borough to mitigate and adapt to climate change: Areas lacking the social, physical and green infrastructure required to support healthy lifestyles have been identified and measures are well under way to address these*".
Health and Wellbeing Strategies and Joint Strategic Needs Assessments	
Ealing Health and Wellbeing Strategy[32] **(current in 2024)**	The Strategy focuses on reducing health inequalities by addressing key social determinants of health, such as access to housing, education, employment, and a healthy environment. The Strategy is built around three main commitments: • Putting communities at the heart of decision-making by prioritising listening to and learning from local residents; • Ensuring that systems and structures promote equal opportunities for health and wellbeing for everyone in the Borough; and • Strengthening partnerships between the council, NHS, voluntary organisations, and local communities to address the root causes of health inequalities and improve overall health outcomes.
Ealing's Joint Strategic Needs Assessment[33]	The Ealing Joint Strategic Needs Assessment (JSNA) offers a detailed assessment of the current and future health and social care needs of residents in the borough. It highlights key health inequalities driven by social factors like housing, income, and education. The JSNA serves as an evidence base for planning and prioritising services, aiming to support better health outcomes by identifying gaps in service provision. It guides the design and delivery of health services to reduce disparities and improve overall wellbeing, aligning closely with Ealing's Health and Wellbeing Strategy.

[31] London Borough of Hillingdon (2012) *Hillingdon Local Plan: Part 1 – Strategic Policies*. [online] Available at: https://www.hillingdon.gov.uk/media/3080/Local-Plan-Part-1---Strategic-Policies/pdf/npLocal_Plan_Part_1_Strategic_Policies_15_feb_2013_a_1_1.pdf?m=1598370401647 [Accessed: 11 September 2024].

[32] London Borough of Ealing (2023) *Health and Wellbeing Strategy 2023-28*. [online] Available at: https://www.ealing.gov.uk/download/downloads/id/18933/health_and_wellbeing_strategy.pdf [Accessed: 11 September 2024].

[33] London Borough of Ealing (n.d.) *Ealing's Joint Strategic Needs Assessment*. [online] Available at: https://www.ealing.gov.uk/info/201072/strategies_plans_and_policies/1963/ealings_joint_strategic_needs_assessment [Accessed: 11 September 2024].

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Hillingdon Joint Health and Wellbeing Strategy 2022-2025[34] (current in 2024)	The Joint Health and Wellbeing Strategy provides summary information on the health characteristics of the current population and objectives (key metrics) over the three-year period to 2025.
Hillingdon Council Joint Strategic Needs Assessment[35] (current in 2024)	The Hillingdon JSNA provides an overview of the current and future health and wellbeing needs of the local population to: 1) Identify health inequalities within the Borough; 2) Inform commissioning of services; and 3) Support local planning for health and care services. The assessment focuses on areas such as mental health, aging populations, long-term conditions, and health behaviours like smoking and obesity. The JSNA aims to improve health outcomes by ensuring that resources are effectively targeted where they are most needed.
Hounslow Joint Health and Wellbeing Strategy 2023 - 2026[36]	Hounslow Council outlines its Joint Health and Wellbeing Strategy, which is designed to: 1) Improve the health and wellbeing of residents; 2) Tackle health inequalities across the borough; and 3) Promote preventive health measures. The Strategy focuses on collaborative efforts between the council, NHS, and community partners to address public health challenges and enhance service delivery, with a priority on mental health, early intervention, and integrated care.
Hounslow Joint Strategic Needs Assessment[37] (current in 2024)	Hounslow Council state that material related to the JSNA can be accessed through the Hounslow Data Hub website which is stated to support commissioning and health planning to: 1) Reduce health inequalities in the borough;

[34] London Borough of Hillingdon (2022) *Joint Health and Wellbeing Strategy 2022-2025*. [online] Available at: https://www.hillingdon.gov.uk/media/7917/Joint-Health-and-Wellbeing-Strategy/pdf/dbHealth_and_wellbeing_strategy_2022-2025_WEB.pdf?m=1639499231780#:~:text=Hillingdon's%20Joint%20Health%20and%20Wellbeing,care%20partners%20in%20the%20borough [Accessed: 11 September 2024].

[35] London Borough of Hillingdon (2022) *Joint Strategic Needs Assessment 2022*. [online] Available at: https://www.hillingdon.gov.uk/media/9690/Hillingdons-full-JSNA-report-2022/pdf/hpHillingdons_Joint_Strategic_Needs_Assessment_2022.pdf?m=1654598108797 [Accessed: 11 September 2024].

[36] London Borough of Hounslow (2023) *Hounslow Joint Health and Wellbeing Strategy 2023 – 2026*. [online] Available at: https://www.hounslow.gov.uk/download/downloads/id/4209/health_and_wellbeing_strategy_2023-26.pdf [Accessed: 11 September 2024].

[37] London Borough of Hounslow (2024) *Joint strategic needs assessment*. [online] Available at: https://www.hounslow.gov.uk/info/20122/joint_strategic_needs_assessment [Accessed: 11 September 2024].

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	2) Assess current and future health care and wellbeing needs of the local population; and 3) Improve service access and delivery.
Richmond upon Thames Joint Local Health and Wellbeing Strategy[38] (current in 2024)	Richmond's '18 Steps to Health and Wellbeing' Strategy for 2024 to 2029 emphasises improving health and reducing inequalities across different life stages: Start Well, Live Well, and Age Well. The key priorities include mental health in young people, adult immunisations, cardiovascular health, and supporting older people with dementia and frailty. This Strategy is designed through partnerships between the council, NHS, and voluntary sectors.
Richmond Joint Strategic Needs Assessment[39]	Richmond's JSNA provides detailed insight into the health and social care needs of the community. It focuses on population health trends, service use, and identifies inequalities in areas such as childhood obesity and long-term conditions.
Slough Wellbeing Strategy 2020–2025[40] (current in 2024)	Slough's Strategy aims to address health inequalities by focusing on mental health, obesity reduction, and improving access to healthcare services for disadvantaged populations.
Slough Joint Strategic Needs Assessment[41]	Slough's JSNA highlights the borough's diverse population and health challenges, such as high rates of diabetes and heart disease. It provides the data needed to guide public health efforts in reducing health disparities and enhancing service delivery.
Spelthorne Health and Wellbeing Strategy 2022–2027[42] (current in 2024)	Spelthorne's Health and Wellbeing Strategy, developed under the Surrey-wide framework, targets mental health support, increasing physical activity, and improving access to health services for all age groups. It also emphasises reducing health disparities within the community.

[38] London Borough of Richmond upon Thames (2022) *Joint Local Health and Wellbeing Strategy*. [online] Available at: https://www.richmond.gov.uk/joint_health_and_wellbeing_strategy [Accessed: 11 September 2024].

[39] London Borough of Richmond upon Thames (2024) *Joint Strategic Needs Assessment*. [online] Available at: https://www.richmond.gov.uk/jsna [Accessed: 11 September 2024].

[40] Slough Borough Council (2020) *Slough Wellbeing Strategy 2020-2025*. [online] Available at: https://www.slough.gov.uk/downloads/file/866/slough-wellbeing-board-strategy-2020-2025 [Accessed: 11 September 2024].

[41] Slough Borough Council (n.d.) *Joint Strategic Needs Assessment*. [online] Available at: https://www.slough.gov.uk/strategies-plans-policies/joint-strategic-needs-assessment [Accessed: 11 September 2024].

[42] Spelthorne Borough Council (2022) *Health and Wellbeing Strategy 2022-2027*. [online] Available at: https://www.spelthorne.gov.uk/media/15700/Spelthorne-Health-and-Wellbeing-Strategy-2016-2019/pdf/Final_Spelthorne_Health_and_Wellbeing_Strategy.pdf [Accessed: 11 September 2024].

Document / Reference	Summary
Surrey Joint Strategic Needs Assessment[43]	Surrey's JSNA, which includes Spelthorne, outlines the health challenges of the Borough, focusing on issues such as mental health, substance abuse, and elderly care. It provides data to support health planning and address gaps in service provision across the county.
Windsor and Maidenhead Health and Wellbeing Strategy[44] (current in 2024)	Windsor and Maidenhead's Strategy focuses on promoting mental wellbeing, addressing lifestyle factors like smoking and obesity, and ensuring that the elderly population is supported. The Strategy integrates health and social care services, tackling both immediate health issues and preventive care.
Windsor and Maidenhead Joint Strategic Needs Assessment[45]	The JSNA for Windsor and Maidenhead analyses population health, focusing on chronic diseases, elderly care, and health inequalities.

Technical guidance

9.2.4 A summary of relevant technical guidance is provided in **Table 9.3**.

Table 9.3 Relevant guidance

Document / Reference	Summary
Effective Scoping of Human Health in Environmental Impact Assessment[1] and Determining Significance for Human Health in EIA[2] ("Institute of Environmental Management and Assessment (IEMA) 2022 Guidance")	EIA practitioner guidance on assessing human health, applicable to England. Guidance sets out principles and methods of assessment. This is the most recent guidance and directly relevant to this assessment.
Institute of Public Health (IPH) Health Impact	Public health guidance on assessing Human Health in EIA and Health Impact Assessment (HIA). Whilst focusing on Northern Ireland, this is the most detailed health assessment methodology guidance for the UK context.

[43] Surrey County Council (n.d.) *Joint Strategic Needs Assessment*. [online] Available at: https://www.surreyi.gov.uk/jsna/ [Accessed: 11 September 2024].

[44] Royal Borough of Windsor and Maidenhead (2021) *Health and Wellbeing Strategy 2021-2025*. [online] Available at: https://ehq-production-europe.s3.eu-west-1.amazonaws.com/490cd3c485b4a56a59a94bef3ff167e2668eca64/original/1649668048/ae8c5706fa7d4fb086f238e52d9922d6_RBWM_JHW-Place_Strategy_FINAL.pdf?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIA4KKNQAKICO37GBEP%2F20240911%2Feu-west-1%2Fs3%2Faws4_request&X-Amz-Date=20240911T141502Z&X-Amz-Expires=300&X-Amz-SignedHeaders=host&X-Amz-Signature=97bef7c48b78ce3d9b9a3d9e4c7eb8f0f24c6827b78624c8715f13745cb80e8b [Accessed: 11 September 2024].

[45] Royal Borough of Windsor and Maidenhead (n.d.) *Joint Strategic Needs Assessment*. [online] Available at: https://rbwm.berkshireobservatory.co.uk [Accessed: 11 September 2024].

Document / Reference	Summary
Assessment Guidance: A Manual and Case Study[46]	
International Association for Impact Assessment (IAIA) and European Public Health Association, Human health: Ensuring a high level of proportion[47]	This international consensus piece on assessing Human Health in EIA, including taking a population health approach. The approach has informed both the IPH and IEMA guides.
International Association for Impact Assessment Health Impact Assessment, international best practice principles, 2021[48]	International consensus confirmation of the relationship between HIA and EIA.
Public Health England Health Impact Assessment in spatial planning[49]	Government public health guidance on assessing HIA and human health in EIA.

9.2.5 Regard has also been given to World Health Organisation (WHO) advisory guidelines for noise[50,51] and for air quality[52].

[46] Institute of Public Health (2021) *Health Impact Assessment Guidance: A Manual and Case Study*. [online] Available at: https://www.publichealth.ie/hia-guidance [Accessed: 11 September 2024].

[47] International Association for Impact Assessment and European Public Health Association (2020) *Human health: Ensuring a high level of proportion*. [online] Available at: https://eupha.org/repository/sections/HIA/Human%20Health%20Ensuring%20Protection%20Main%20and%20Appendices.pdf [Accessed: 11 September 2024].

[48] International Association for Impact Assessment (2021) *Health Impact Assessment, International Best Practice Principles*. [online] Available at: https://www.researchgate.net/publication/352573139_Health_impact_assessment_international_best_practice_principles_International_Association_for_Impact_Assessment [Accessed: 11 September 2024].

[49] Public Health England (2020) *Health Impact Assessment in spatial planning*. [online] Available at: https://assets.publishing.service.gov.uk/media/5f93024ad3bf7f35f184eb24/HIA_in_Planning_Guide_Sept2020.pdf [Accessed: 11 September 2024].

[50] World Health Organisation (2009) *Night noise guidelines for Europe*. [online] Available at: https://iris.who.int/bitstream/handle/10665/326486/9789289041737-eng.pdf?sequence=1&isAllowed=y [Accessed: 15 October 2024].

[51] World Health Organisation (2018) *Environmental Noise Guidelines for the European Region (2018)*. [online] Available at: https://who-sandbox.squiz.cloud/en/health-topics/environment-and-health/noise/publications/2018/environmental-noise-guidelines-for-the-european-region-2018 [Accessed: 15 October 2024].

[52] Carvalho, H. (2021) 'New WHO global air quality guidelines: more pressure on nations to reduce air pollution levels', *The Lancet Planetary Health*, 5(11), pp. 760-761. [online] Available at:

9.2.6 Other sources taken into account include: the WHO Health Impact Assessment guidance, tools and methods[53]; Department of Health HIA guidance[54]; Public Health England (2021) Spatial planning and health: Getting Research Into Practice[55]; NHS London Healthy Urban Development Unit (2019) Planning for Health, Rapid Health Impact Assessment Tool (fourth edition)[56]; Town and Country Planning Association (2018) Securing constructive collaboration and consensus for planning healthy developments, a report from the Developers and Wellbeing project[57]; Public Health England (2017) Spatial Planning for Health, An evidence resource for planning and designing healthier places [58]; and Guidance produced by the United Kingdom Public Health England: Health and Environmental Impact Assessment: A Briefing for Public Health Teams in England (2017)[59].

9.2.7 It is helpful to clarify that all these guides direct that a population health outcomes approach should be adopted. This approach is consistent with the originating European Commission EIA guidance[60] which states that "*environmentally related health issues … would concern the commissioning, operation, and decommissioning of a Project in relation to workers on the*

https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(21)00287-4/fulltext [Accessed: 11 September 2024].

[53] World Health Organisation (2021) *Health impact assessment (HIA) methods*. [Online] Available at: https://www.who.int/tools/health-impact-assessments [Accessed: 11 September 2024].

[54] Department of Health (2010) *Health Impact Assessment of Government Policy*. [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/216009/dh_120110.pdf [Accessed: 11 September 2024].

[55] Public Health England (2021) *Spatial planning and health: Getting Research into Practice (GRIP)*. [online] Available at: https://www.gov.uk/government/publications/spatial-planning-and-health-getting-research-into-practice-grip [Accessed: 11 September 2024].

[56] National Health Service (2019) *Healthy Urban Development Unit Planning for Health, Rapid Health Impact Assessment Tool*. [online] Available at: https://www.healthyurbandevelopment.nhs.uk/wp-content/uploads/2019/10/HUDU-Rapid-HIA-Tool-October-2019.pdf [Accessed: 11 September 2024].

[57] Town and Country Planning Association (2018) *Securing constructive collaboration and consensus for planning healthy developments*. [online] Available at: https://tcpa.org.uk/wp-content/uploads/2021/11/TCPA-Securing_Constructive_Collaboration.pdf [Accessed: 11 September 2024].

[58] Public Health England (2017) *Spatial Planning for Health, An evidence resource for planning and designing healthier places*. [online] Available at: https://assets.publishing.service.gov.uk/media/5b59b090e5274a3ff828c70c/spatial_planning_for_health.pdf [Accessed: 11 September 2024].

[59] Public Health England (2017) *Health and Environmental Impact Assessment: A Briefing for Public Health Teams in England*. [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/629207/Health_and_environmental_impact_assessment.pdf [Accessed: 11 September 2024].

[60] European Commission (2017) *Environmental impact assessment of projects, Guidance on the preparation of the environmental impact assessment report (Directive 2011/92/EU as amended by 2014/52/EU)*. [online] Available at: https://op.europa.eu/en/publication-detail/-/publication/2b399830-cb4b-11e7-a5d5-01aa75ed71a1# [Accessed: 11 September 2024].

Project and surrounding population". This follows the European Commission guidance[61] on assessing the health impacts of its own work programs, which takes the approach of assessing the effects on "*the health of the population*".

9.2.8 The WHO policy brief on incorporating health into environmental assessments[62] directs a focus on "*the potential for population health effects that are likely and significant*". This is consistent with the WHO publication on health in EIA[63] which states that "*good practice for human health in … EIA is met when … the focus is on assessing the likely significant effects of a proposal on population health outcomes*". That WHO publication specifically cites the IPH guidance[3] and EUPHA guidance[4] as approaches that represent good practice. The former directs to take a "*population health outcome perspective*". The latter confirms "*EIA takes a population health approach*." The IEMA guidance[2] was published after these two guides and follows their approach, confirming that "*a population health approach should be taken*", but also acknowledging that "*Where the effect is best characterised as only affecting a few individuals, … such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change*." The UK Government guidance[49] is also consistent in framing assessment in terms of population health effects, for example stating, "*identify the expected health impacts and effects on population groups and their significance*".

9.2.9 Informed by these European Commission, WHO, pan-European, national and practitioner guidance documents a robust health assessment has been undertaken that focuses on population health outcomes, but in doing so also has regard to individual level effects.

[61] European Commission (2001) *Ensuring a high level of health protection, A practical guide*. [online] Available at: https://ec.europa.eu/health/ph_overview/Documents/key07_en.pdf [Accessed: 11 September 2024].

[62] World Health Organisation (2023) *A place in the public health toolbox: policy brief 1 on health impact assessments and incorporating health into environmental assessments*. [online] Available at: https://iris.who.int/bitstream/handle/10665/373930/WHO-EURO-2023-8254-48026-71136-eng.pdf?sequence=1&isAllowed=y [Accessed: 12 September 2024].

[63] World Health Organisation (2022) *Learning from Practice: Case Studies of Health in Strategic Environmental Assessment and Environmental Impact Assessment across the WHO European Region*. [online] Available at: https://iris.who.int/bitstream/handle/10665/353810/WHO-EURO-2022-4889-44652-63378-eng.pdf?sequence=1 [Accessed: 15 October 2025].

9.3 Technical and public engagement

Introduction

9.3.1 This Section describes relevant technical and public engagement undertaken in relation to the health assessment. This is in addition to the submission of a Scoping Report, requesting a Scoping Opinion from LBH which was submitted on 01 November 2023 (see **Appendix 1.5: Scoping Report**). A Scoping Opinion was provided on 01 February 2024 (see **Appendix 1.6: Scoping Opinion**). Information received in the Scoping Opinion (**Appendix 1.6**) has informed the scope of the health assessment. This is summarised in **Table 9.21** of this Chapter.

9.3.2 The Scoping Opinion (**Appendix 1.6**) confirmed the general approach to the assessment of health to be acceptable. The Scoping Opinion requested clarification of how the evidence base supports a determination of sensitivity and how noise metrics support a determination of significance. Such clarifications are set out in the methods **Section 9.5** and assessment **Section 9.7** of this Chapter.

9.3.3 Technical engagement activities on air quality and noise and vibration have been undertaken and are set out in **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration** respectively.

9.3.4 Meetings with the Longford Residents Association, Heathrow's Local Community Forum, the Noise and Airspace Community Forum and the Council for the Independent Scrutiny of Heathrow Airport are set out in the **Statement of Community Involvement Report**. Engagement with the community has included information events, letters, postcards, emails, social media, door knocking and information boards. Events during September 2024 took place in: Isleworth Public Hall; Southall – Havelock Family Centre; Longford – Thistle Hotel; Cranford Community College; Stanwell Moor Village Hall; Old Windsor Memorial Hall; and Longford – Thistle Hotel. The following themes recorded from the engagement are particularly relevant to the health assessment and have been taken into account in reaching assessment conclusions:

- Noise: timing of noise; distribution of noise changes; eligibility for noise insulation; and nature of the mitigation. Awareness of the Cranford Agreement was reported, by the engagement team, as more limited for members of the public attending events held in Cranford.
- Airspace: whether flights would increase and if there would be changes to flight paths or if mixed mode operations would occur.
- Air quality: changes in air quality in Longford.
- Next steps: request of information to understand the process, how to raise concerns and the timing of the changes.

9.3.5 The responses provided to the public on these issues are set out in the **Statement of Community Involvement Report** and it is noted that the next steps include for London Borough of Hillingdon to undertake their own stakeholder consultation exercise following the submission of the planning application.

9.4 Baseline Conditions

Method of baseline data collection

Desk study

9.4.1 Communities where polluting human activities are sited often show disadvantage in terms of social and economic variables. The majority of associations support an increased burden on vulnerable groups, especially ethnic minorities and unemployed. However, several relationships are found in the opposite direction or in both ways, particularly with wealth and education, reflecting a mixed reality where potential discrimination in siting decisions coexists with socioeconomic benefits for nearby communities due to industrial development [64].

9.4.2 A desktop review of statistical information has been undertaken to inform the assessment and develop an understanding of the different communities within the relevant study areas.

9.4.3 The approach to defining the baseline involved collation and interpretation of published demographic, socio-economic and existing public health data. The following opensource websites and datasets have been used, which provide information at a local and regional level:

- Office for National Statistics;
- Ministry of Housing, Communities and Local Government indices of multiple deprivation;
- Office for Health Improvement and Disparities, Public Health data; and
- Local authority Health and Wellbeing Board publications.

9.4.4 The baseline data helps to develop an understanding of local health and socio-economic circumstances.

Surveys

9.4.5 The surveys which provide noise and air quality data are relevant to the assessment of effects as they indicate the baseline environmental conditions for people and communities. The results of surveys, and subsequent analysis for air quality and noise, have been used to define areas where impacts on human health may occur (See **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration** respectively).

Study Area

9.4.6 Consistent with IEMA 2022 guidance[1], the assessment of health effects arising from the Proposed Development uses study areas to determine the sensitivity of the populations in the areas, not set a limit on the extent of all health effects. This reflects that health study areas do not necessarily define the boundaries of all potential health effects, particularly mental health

[64] Di Fonzo, D., Fabri, A. and Pasetto, R.(2022) 'Distributive Justice in Environmental Health Hazards from Industrial Contamination: A Systematic Review of National and near-National Assessments of Social Inequalities', *Social Science and Medicine*, 297, p. 114834. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/35217367/ [Accessed: 15 October 2024].

effects. The health study areas represent the locations that would drive any likely significant population health effect, i.e. where the great majority of the impact is anticipated to occur. Any effects beyond the study areas would not change the conclusions reached in relation to the likely significant population health effects of the Proposed Development.

9.4.7 The following study area related terms are used in the health assessment:

- The 'site-specific' population relates to the most localised effects close to sources (see below for definitions of representative geographies comprised of Lower Layer Super Output Areas (LSOA)).
- The 'local' population relates to the wider community effects (see below for the local authorities).
- The 'regional' population is defined using the areas of London and the South East.
- The 'national' population is defined with reference to England.

9.4.8 The Local Health Study Area is determined by identifying areas where indirect and direct impacts may be experienced as a result of the Proposed Development. This has drawn upon the study areas used within **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration** (for example **Figure 7.5.1: Air Noise Study Area** in **Volume IV** of the Environmental Statement), as these determinants of health are likely to be the most pertinent to the public health assessment.

9.4.9 The Local Health Study Area encompasses the following local authorities reflecting the broader context of the areas of effect:

- London Borough of Hillingdon;
- London Borough of Hounslow;
- London Borough of Ealing;
- London Borough of Richmond upon Thames;
- London Borough of Wandsworth;
- Slough Borough Council;
- The Royal Borough of Windsor and Maidenhead;
- South Bucks District Council (Buckinghamshire Council for data from April 2020)[65];
- Runnymede Borough Council; and
- Spelthorne Borough Council.

[65] Buckinghamshire Council (2022) *Overview of authority area.* [online]. Available at: https://www.buckinghamshire.gov.uk/planning-and-building-control/planning-policy/planning-reporting/view-the-authority-monitoring-report-amr/authority-monitoring-report-2020-to-2021/overview-of-authority-area/ [Accessed: 09 October 2024].

9.4.10 In addition, some temporary and permanent components of the Proposed Development may result in impacts that occur at a more localised scale. These site-specific locations are driven by the Proposed Development's air noise effects, as shown in **Chapter 7: Noise and Vibration Figure 7.5.4** (**Volume IV** of the Environmental Statement). Regard has also been given to the localised air quality effects shown in **Chapter 6: Air Quality Figure 6.17** (**Appendix 6.3**).

9.4.11 For the purposes of the health assessment a best fit to LSOAs has been applied to the areas in **Figure 7.5.4** (**Volume IV** of the Environmental Statement) with the changes greater than 1dB. The consideration of these small area effects allows for baselining and discussion of how the changes affect particular populations, beneficially and adversely.

9.4.12 Each LSOA's local authority is identified below so the authorities can readily identify the relevant effects for their areas. The Health Site-Specific Study Areas (HSSSA) for the site-specific populations are set out below and are related to the arrival or departure routes they are most relevant to. The assessment should be read in conjunction with the following Figures in **Appendix 9.2**:

- **Figure 9.1 – Health site-specific study areas**;
- **Figure 9.2 – Route usage for easterly operations**;
- **Figure 9.3 – Annual mean NO_2 concentrations in 2018 (ug/m^3) over LSOA – North-West**;
- **Figure 9.4 – Annual mean NO_2 concentrations in 2018 (ug/m^3) over LSOA – South-West**;
- **Figure 9.5 – Annual mean NO_2 concentrations in 2018 (ug/m^3) over LSOA – East**;
- **Figure 9.6 – 2028 With Vs No Alternation Laeq,16hr Modal Split- 79% Westerly - 21% Easterly over LSOA -West**;
- **Figure 9.7 – 2028 With Vs No Alternation Laeq,16hr Modal Split- 79% Westerly - 21% Easterly over LSOA -North-East**;
- **Figure 9.8 – 2028 With Vs No Alternation Laeq,16hr Modal Split- 79% Westerly - 21% Easterly over LSOA -South-East**; and
- **Figure 9.9 – Indices of Deprivation – Overall**.

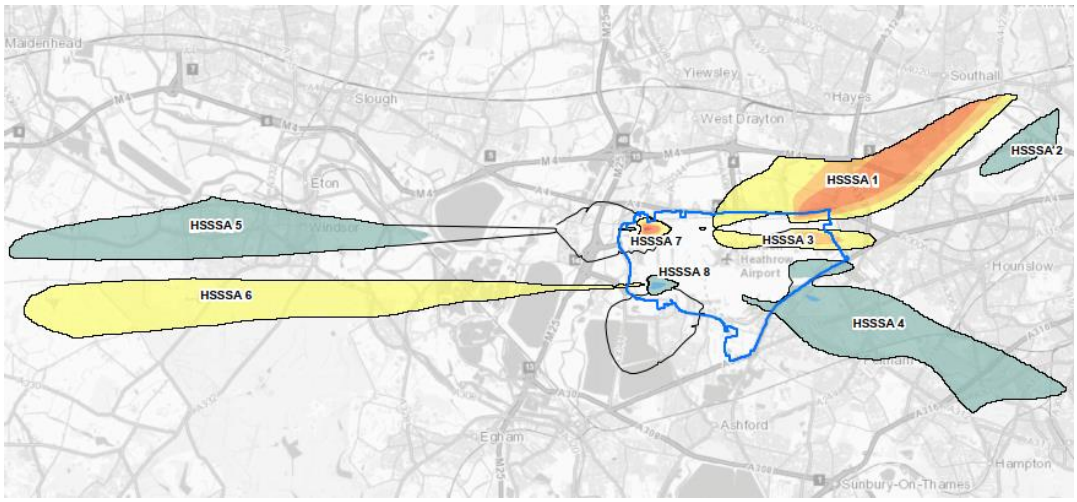
9.4.13 **Figure 9.1** sets out the HSSSAs discussed in this Chapter, which includes noise level changes for reference as these are the main drivers for defining the study areas. **Figure 9.2** provides context in understanding the reason for the areas identified in **Figure 9.1** by showing the existing departure routes from the Airport under easterly operations. These routes are not changed by the Proposed Development, but variation in which route is used drives the noise and air quality changes that have been used to define the HSSSAs shown in **Figure 9.1**.

9.4.14 **Figures 9.3** to **9.5** are relevant to the discussion of operational air quality effects. **Figures 9.6** to **9.8** are relevant to the discussion of operational noise and vibration effects.

9.4.15 Whilst the HSSSAs are used across the assessment, HSSSA 1 to 6 are particularly relevant to air noise related effects, and HSSSA 7 and HSSSA 8 particularly relevant to the discussion of air quality and aviation ground noise effects.

9.4.16 For ease of reference, **Graphic 9.1** summarises the HSSSAs shown in **Figure 9.1** (**Appendix 9.2**).

Graphic 9.1 HSSSAs



- HSSSA 1, Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, adverse change:
  - Hillingdon LSOAs of E01002444, E01002447, E01002448, E01002449, E01002443.
  - Hounslow LSOAs of E01002583, E01002584, E01002585, E01002625, E01002626, E01002631, E01002632, E01002633, E01002634, E01002635, E01002636, E01002637, E01002638.
  - Ealing LSOAs of E01001254, E01001333, E01001334, E01001335, E01001336, E01001337, E01001339, E01001340, E01001369, E01001371, E01001372.
- HSSSA 2, Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, beneficial change:
  - Richmond upon Thames LSOA of E01003895.
  - Ealing LSOAs of E01001337, E01001253, E01001248, E01001305.
  - Hounslow LSOAs of E01002626, E01002627, E01002678, E01002628, E01002676.
- HSSSA 3, Departure Route DET, east towards Hounslow and Richmond upon Thames, adverse change:
  - Hounslow LSOAs of E01002585, E01002586, E01002589, E01002587, E01002588, E01002660, E01002661, E01002665, E01002646, E01002663, E01034038, E01034039, E01002649, E01002657, E01034040, E01034041, E01002655, E01002656, E01002651, E01002666.
  - Richmond upon Thames LSOAs of E01003895, E01003905, E01003906, E01003908, E01003867, E01003869, E01003870, E01003910, E01003896, E01003897.

- HSSSA 4, Departure Route GASGU and MODMI, southeast towards Hounslow and Elmbridge, beneficial change:
  - Hounslow LSOAs of E01002650, E01002555, E01002556, E01002590, E01002592, E01002595, E01002557, E01002558, E01002559, E01002560, E01002561, E01002591, E01002593, E01002594, E01002611, E01002612, E01002613, E01002598, E01002599, E01002603, E01033000, E01033030, E01002604, E01002605, E01002606, E01002607, E01002615, E01002608, E01002609.
  - Richmond upon Thames LSOAs of E01003907, E01003840, E01003841, E01003842, E01003843, E01003844, E01003845, E01003898, E01003899, E01003900, E01003901, E01003902, E01003903, E01003904, E01003880, E01003884, E01003885, E01003829.
  - Spelthorne LSOA of E01030746.
- HSSSA 5, Arrival to 09L (northern runway), west from Windsor and Maidenhead and Slough, beneficial change:
  - Windsor and Maidenhead LSOAs of E01016540, E01016543, E01016544, E01016567, E01016565, E01016566, E01016577, E01016545, E01016547, E01016550, E01016552, E01016551, E01016553, E01016557, E01016558, E01016548, E01016549, E01016554, E01016555, E01016556, E01016546, E01016597.
  - Slough LSOA of E01016482.
- HSSSA 6, Arrival to 09R (southern runway), west from Windsor and Maidenhead and Spelthorne, adverse change:
  - Hillingdon LSOA of E01002444.
  - Spelthorne LSOAs of E01030747, E01030735.
  - Windsor and Maidenhead LSOAs of E01016543, E01016577, E01016595, E01016596, E01016597, E01016575, E01016587, E01016588, E01016589.
  - Bracknell Forest LSOA of E01016252.
- HSSSA 7, Departure on 09L (northern runway) west end, near Longford, adverse effect:
  - Hillingdon LSOA of E01002444.
  - Slough LSOA of E01016482.
- HSSSA 8, Departure on 09R (southern runway) west end, near Stanwell and Stanwell Moor, beneficial effect:
  - Hillingdon LSOA of E01002444.
  - Spelthorne LSOAs of E01030743, E01030744, E01030745, E01030747, E01030746.

Current baseline

9.4.17 This section summarises the baseline conditions for the populations within the spatial scope of this public health assessment. The section is in two parts, firstly the Local Health Study Area profiles, then the HSSSA profiles. Regional (South East or Greater London) and National (England) averages have been used as relevant comparators.

9.4.18 The environmental baseline is also relevant to the assessment and is set out in within **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration**. In particular, the 'future aircraft air noise baseline' for 2028 set out in **Section 7.4** of **Chapter 7: Noise and Vibration** and **Appendix 7.5: Air Noise** (**Volume III** of the Environmental Statement) gives important context to the distribution of air noise under easterly operations without ending the Cranford Agreement. The 2028 assessment year allows direct comparison between the 'without development' (WoD) and 'with development' (WD) scenarios. A key feature of this public health assessment is considering how that air noise baseline situation is changed by the Proposed Development, i.e. WD compared to WoD. This is considered in terms of the population health effects, as well as what this means for the equity of influences on long-term health outcomes around the Airport. Such population health and health equity considerations include accounting for baseline health profiles of the communities that experience the changes, which are set out in the following sections.

Local Health Study Area

9.4.19 As of the 2021 Census, the total population of the Local Health Study Area was 2,212,600. Population growth in the Study Area between 2011 and 2021 was 9.1%, which exceeds the England and South East regional averages of 7.5% and 6.6%, respectively.

Table 9.4 Population change

Area	*All Persons, 2011*	*All Persons, 2021*	*Change (%)*
Local Health Study Area	2,326,488	2,540,107	9.1
South East	8,634,750	9,278,100	7.5
England	53,012,456	56,489,800	6.6

Source: Office for National Statistics (2021)

9.4.20 The age structure in the Local Health Study Area reveals a high proportion of the population aged between 10 to 14 and 25 to 54 years. Overall, the age structure profile closely resembles the national trend. **Graphic 9.1 i**llustrates the age structure of the Study Area.

Graphic 9.2 Age Structure of the Study Area

Source: Office for National Statistics (2021)

Economy and Employment

9.4.21 Within the Local Health Study Area, the majority of the local authority areas have higher levels of economic activity when compared to the South East region (60.1%), and the England average (58.6%). The exception to this is Runnymede which is slightly lower than the national average at 58.3%. In comparison, Wandsworth has the highest proportion of economically active population at 76.2%.

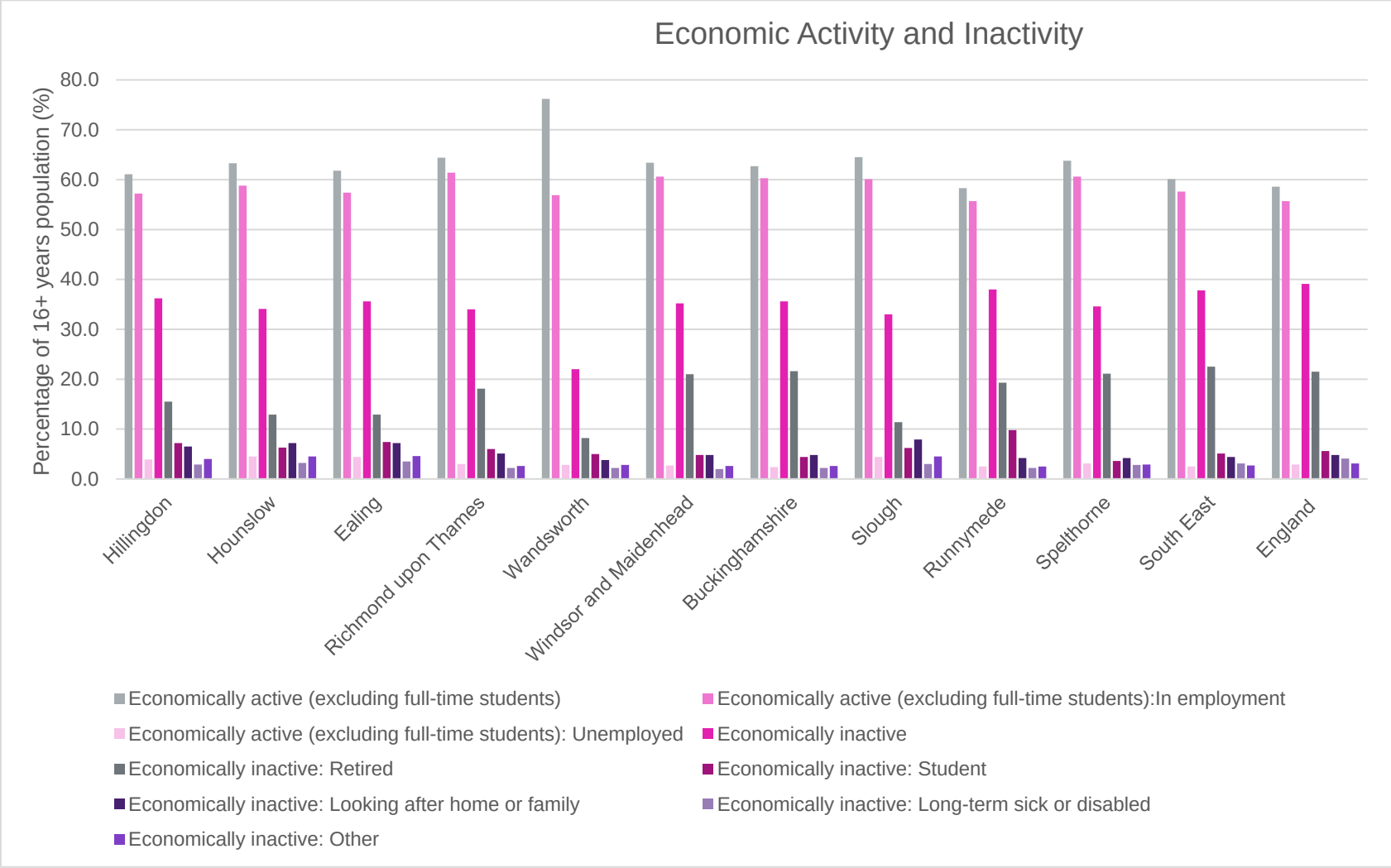
9.4.22 The South East has a relatively high proportion of retired people at 22.5% compared to the national average of 21.5%. Of the local authorities within the Study Area, Windsor and Maidenhead, and Buckinghamshire have the highest percentage of retired people at 21.0% and 21.6%, respectively.

9.4.23 Runnymede has the highest proportion of students that are economically inactive at 9.8%, which is significantly higher than the regional and national average of 5.1% and 5.6%, respectively.

9.4.24 Hounslow (4.5%) and Ealing (4.4%) have the highest levels of unemployment within the Local Health Study Area which is significantly higher than the regional and national averages of 2.5% and 2.9%, respectively.

9.4.25 **Graphic 9.3** presents economic activity within the Local Health Study Area, the South East region and England.

Graphic 9.3 Economic activity and inactivity status within the Study Area (16+ years population)



Source: Office for National Statistics (2021)

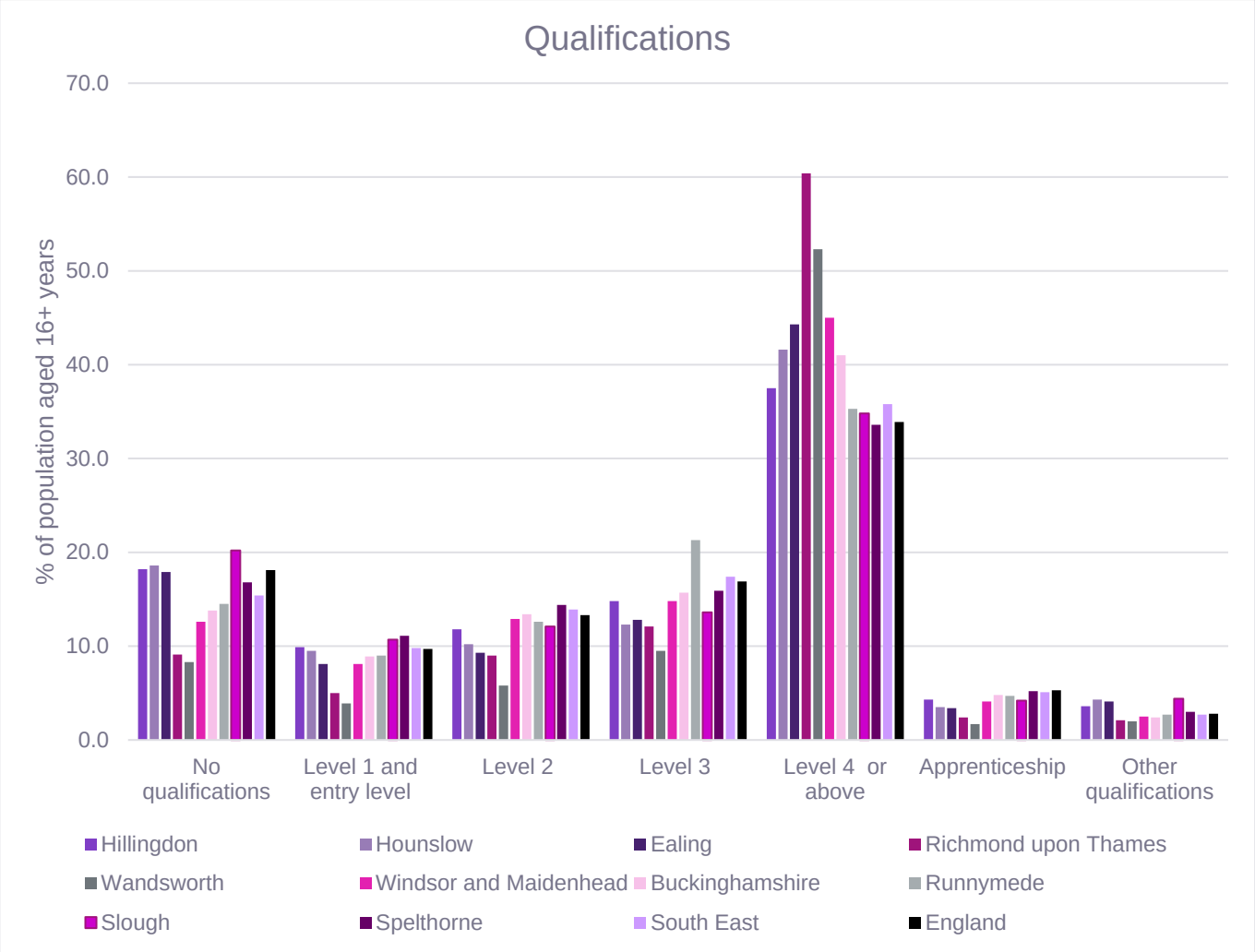
Skills and Learning

9.4.26 The proportion of people with no qualifications in the Local Health Study Area is in line with the regional (15.4%) average, but lower than the national average (18.1%) at 15.0%.

9.4.27 When looking at individual local authorities, Slough (20.2%), Hounslow (18.6%), and Hillingdon (18.2%) had a higher than the average proportion of people with no qualifications when compared to both the regional and national averages (see **Graphic 9.4**). In comparison Wandsworth has the lowest proportion of the population aged over 16 years old with no qualifications at 8.3%.

9.4.28 In 2021, the percentage of residents aged 16 years and above within Richmond upon Thames with a Level 4 qualification or above (broadly equivalent to a Higher National Diploma, degree or higher qualification) was almost double that of the South East region (35.8%) and England's average (33.9%) at 60.4%.

Graphic 9.4 Highest level of qualification within Study Area (16+ years population)



Source: Office for National Statistics (2021)[66]

Deprivation

9.4.29 The Indices of Deprivation present a comprehensive measure of relative deprivation across small areas of England, known as Lower Super Output Area (LSOA). These indices comprise seven 'domains' of deprivation, which are combined to produce the overall Index of Multiple Deprivation (IMD). The IMD 2019 are relative measures of deprivation, showing that only one area is more deprived than another.

9.4.30 **Table 9.5** presents the IMD 2019 scores for overall and health deprivation across the Local Health Study Area, also see **Figure 9.9** and **Figure 9.10** (**Appendix 9.2**). This shows the overall rank of scores across all 317 local authorities, where a rank of 1 is the most deprived and rank of 317th is the least deprived.

[66] Level 1 qualifications include GCSE at grades 3/D or lower, level 1 diplomas/NVQs. Level 2 qualifications include GCSE at grades C/4 or above, intermediate apprenticeships and level 2 diplomas/NVQs.

9.4.31 Slough has the highest levels of deprivation ranking 73rd for overall deprivation and 100th for health deprivation. Conversely, in terms of overall deprivation, Windsor and Maidenhead is the least deprived ranking 304th whilst for health deprivation Richmond Upon Thames is the least deprived ranking 310th.

9.4.32 Looking more closely at neighbourhoods (or Lower Layer Super Output Areas – LSOAs) all local authorities have areas of high deprivation, with a number of LSOAs in the Local Health Study Area falling amongst the top 10-20% of most deprived neighbourhoods nationally. This is most notable in Hillingdon, Slough and Hounslow (see **Figure 9.9** and **Figure 9.10** (**Appendix 9.2**)).

Table 9.5 IMD Score within Study Area 2019

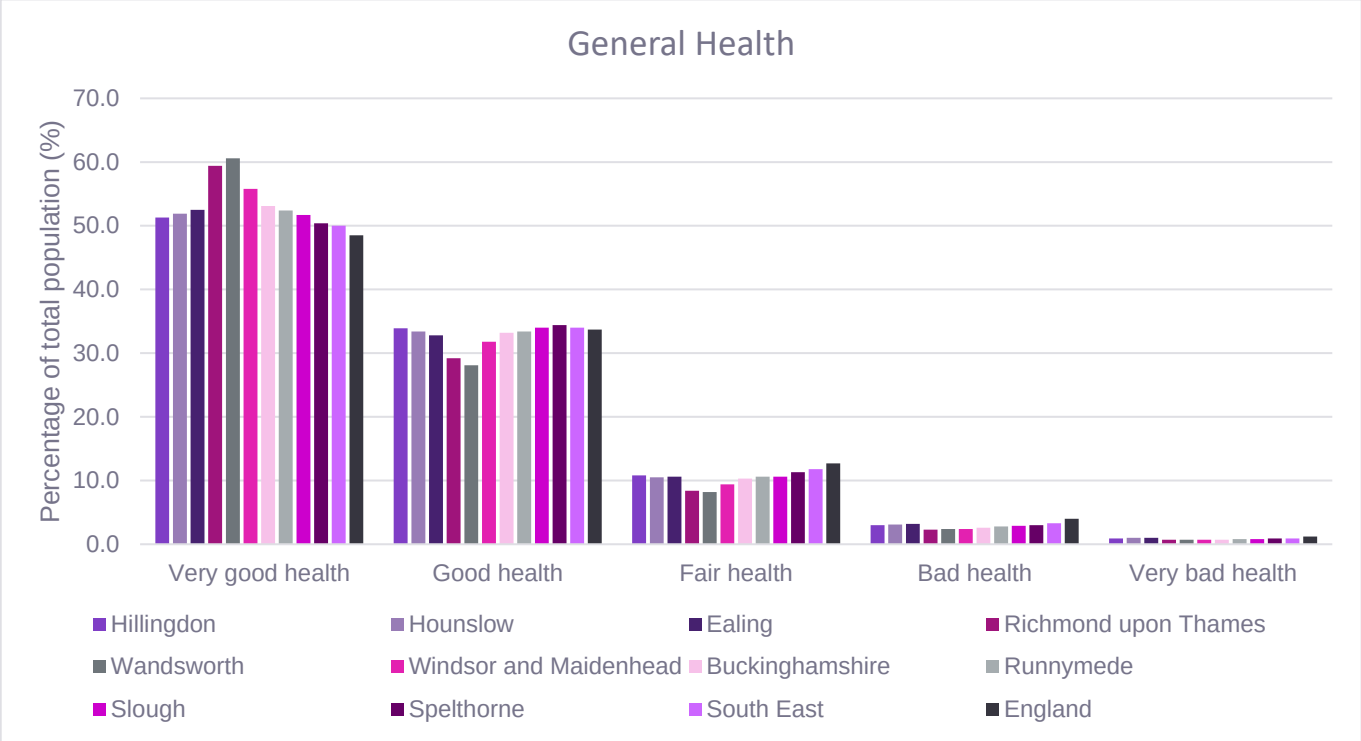
Area	*Overall Deprivation*	*Health Deprivation*
Hillingdon	151st	194th
Hounslow	95th	181st
Ealing	88th	189th
Richmond upon Thames	297th	310th
Wandsworth	173rd	193rd
Windsor and Maidenhead	304th	287th
Slough	73rd	100th
South Bucks	292nd	306th
Runnymede	256th	263rd
Spelthorne	201st	232nd

Source: IMD 2019

Health Profile

9.4.33 The self-reported health condition of all residents aged 16 years and above in the Local Health Study Area, the South East region and England is depicted in **Graphic 9.5**. This Graphic illustrates that a higher percentage of the residents reported to have very good health within the Study Area compared to regional and national averages.

Graphic 9.5 General Health within Study Area (16+ years population)

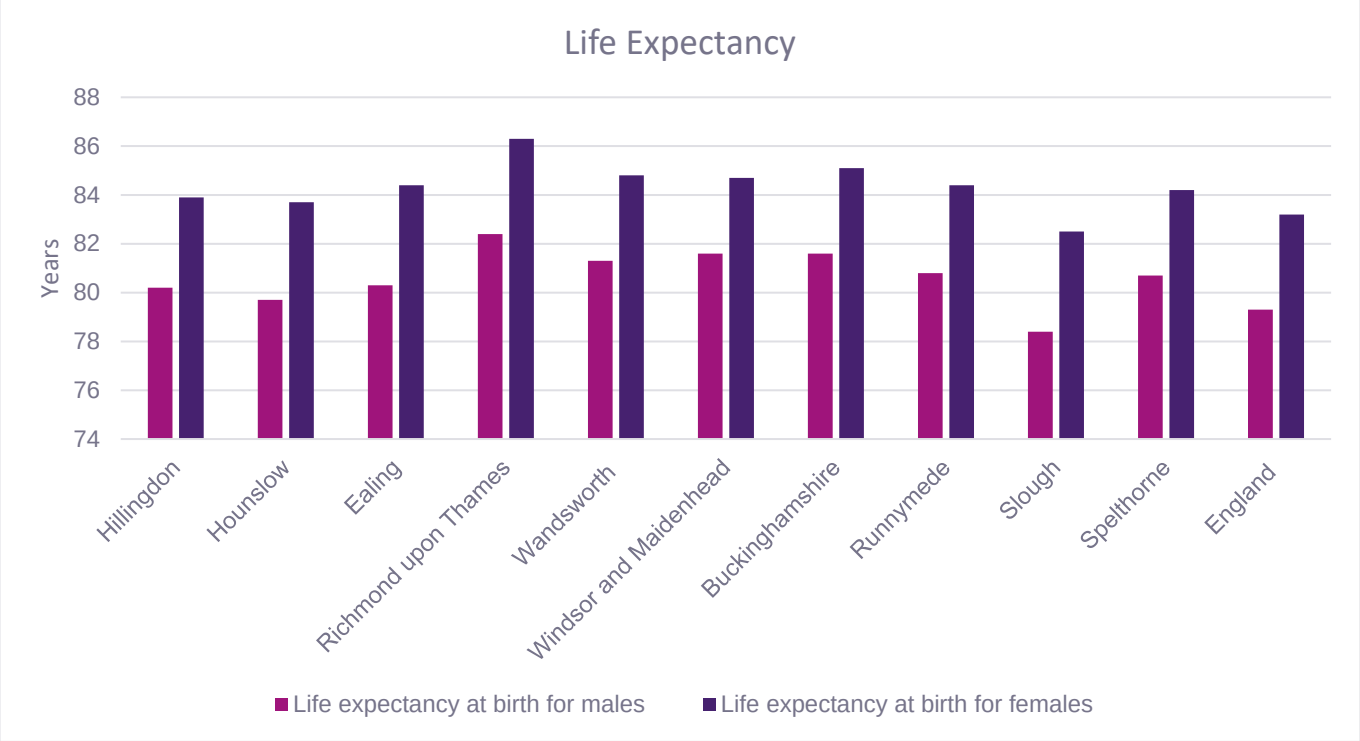


Source: Office for National Statistics (2021)

9.4.34 The trends for male and female life expectancy at birth (one year range) in the Local Health Study Area are consistently higher than the national average of years for 79.3 males and 83.2 years for females except for Slough.

9.4.35 Slough exhibits a lower life expectancy at birth for both males and females (78.4 years for males and 82.5 years for females) compared to other local councils within the Local Health Study Area and the national average, whereas Wandsworth has the highest life expectancy at 81.3 years for males and 84.8 years for females (see **Graphic 9.6**).

Graphic 9.6 Life expectancy at birth within the Study Area (male and female, 1year range)



Source: Office for Health Improvement and Disparities (OHID), 2023. Local Health

9.4.36 **Table 9.6** shows the mortality rates per 100,000 people for respiratory diseases. Mortality rates for respiratory diseases is generally in line with the regional (84.9 per 100,000 people) and national (106.9 per 100,000 people) averages across the Local Health Study Area. Richmond upon Thames has the lowest mortality rate at 61.1 per 100,000 people whereas Runnymede, Slough and Spelthorne have higher rates at 137.4, 129.5 and 110.2 per 100,000 people, respectively.

9.4.37 Mortality from Chronic Obstructive Pulmonary Disease (COPD) is highest in Slough, accounting for 94 deaths per 100,000 people. Levels in Runnymede (42.8) and Spelthorne (38.4) are higher than the regional average (38.2) and the same or slightly lower than the national average (42.8).

Table 9.6 Mortality Rates from Respiratory Disease (rates per 100,000 people)

Local Authority	Mortality rate from respiratory disease (all ages)	Under 75 mortality rate from respiratory disease considered preventable	Mortality rate from COPD
Hillingdon	98.1	14.1	42.1
Hounslow	89.5	12.1	29.7
Ealing	98.8	11.1	36.4
Richmond upon Thames	61.1	7.1	24.2
Wandsworth	84.4	19.3	38.1
Windsor and Maidenhead	106.9	7.1	23.3
Buckinghamshire	84	9.9	27.8
Runnymede	137.4	14.3	42.8
Slough	129.5	16	94
Spelthorne	110.2	14.7	38.4
South East	94.9	15.1	38.2
England	106.9	30.7	42.8

Source: OHID, 2023. Respiratory Disease.

9.4.38 Mortality rates from ischemic heart disease is significantly higher than the national average[67] in Slough equating to 66.3 deaths per 100,000 people (national average of 40.6 per 100,000). Rates are also higher in Ealing (41.6) and Hillingdon (41.2). It should be noted that regional and district council data is unavailable for this dataset, so mortality rates in Runnymede, Spelthorne and the South East are not known[68].

9.4.39 **Table 9.7** below shows levels of physical activity across the Local Health Study Area. Levels of physical activity for adults (19+ years) in Wandsworth and Richmond upon Thames are higher than both the regional (70.2%) and national (67.1%) averages at 78.7% and 74.8% respectively[69].

[67] Statistical significance is determined by OHID.

[68] Department of Health and Social Care (2024) *Public Health Data, Cardiovascular Disease*. [online] Available at: https://fingertips.phe.org.uk/profile/cardiovascular [Accessed: 15 October 2024].

9.4.40 Conversely, levels in Hillingdon, Hounslow, Slough and Spelthorne are worse than both the regional and national averages. The lowest number of physically active adults are in Hounslow at 55.8%[69].

9.4.41 The levels of physically active children and young people is better than those for adults, with the majority of local authorities within the Local Health Study Area outperforming the regional and national averages. The exception to this is Hillingdon, where 38.6% are physically active (compared to the regional average of 47.2% and national average of 47%)[69].

Table 9.7 Physical Activity (%)[70]

Local Authority	Physical active adults (19+) (%)	Physically active children and young people (%)
Hillingdon	59.4	38.6
Hounslow	55.8	47.4
Ealing	68.6	54.7
Richmond upon Thames	74.8	56.2
Wandsworth	78.7	58.8
Windsor and Maidenhead	67.5	N/A
Buckinghamshire	71.4	48.8
Runnymede	67.5	47.2
Slough	56.6	N/A
Spelthorne	61.9	48.8
South East	70.2	47.2
England	67.1	47

Mental Health

9.4.42 **Table 9.8** below shows the prevalence of mental disorders within the Local Health Study Area. This shows that the mental disorders are more prevalent than the regional (14.8%) and national (16.9%) averages in Slough (19.3%), Ealing (19.2%), Wandsworth (18.8%), Hounslow (18.3%) and Hillingdon (17.4%).

[69] Department of Health and Social Care (2024) *Public Health Data, Physical Activity*. [online] Available at: https://fingertips.phe.org.uk/profile/physical-activity [Accessed: 15 October 2024].

[70] OHID, 2023. Physical Activity

Table 9.8 Estimated prevalence of Mental disorders 16+

Local Authority	Estimated prevalence of Mental disorders 16+ (%)
Hillingdon	17.4
Hounslow	18.3
Ealing	19.2
Richmond upon Thames	13.2
Wandsworth	18.8
Windsor and Maidenhead	12.7
Buckinghamshire	13.4
Runnymede	13.3
Slough	19.3
Spelthorne	13.5
South East	14.8
England	16.9

Source: OHID, 2023. Severe Mental Illness

Housing

9.4.43 **Table 9.9** shows that a very small number of properties in the Local Health Study Area are owned outright, with Slough having the highest number of properties owned outright at 6.3% and 11.3% own their home with either a mortgage, loan or shared ownership. Richmond Upon Thames has the lowest levels of home ownership either outright (0.8%) or with either a mortgage, loan or shared ownership (1.9%).

9.4.44 All local authorities in the Local Health Study Area have high levels of overcrowding when compared to the regional (3.5%) and national averages (4.4%). This issue is most prevalent in Ealing (20.9%), Hounslow (20.1%) and Hillingdon (19.5%).

Table 9.9 Home Ownership[71]

	Owned Outright (%)	Owned with a mortgage, loan or shared ownership (%)	Privately rented (%)	Social rents that are overcrowded (%)
Ealing	3.8	8.4	19.1	20.9
Hillingdon	2.5	7.6	19.8	19.5
Hounslow	3.8	9.8	22.2	20.1
Richmond Upon Thames	0.8	1.9	7.0	11.5
Wandsworth	2.1	2.7	8.0	18.4
Buckinghamshire	1.0	2.2	5.7	8.6
Runnymede	1.1	2.3	7.0	8.7
Slough	6.3	11.3	24.4	18.6
Spelthorne	1.0	3.6	10.9	11.6
Windsor and Maidenhead	1.1	1.9	5.8	9.5
South East				3.5
England				4.4

Source: ONS, 2024, Home Ownership

9.4.45 The Local Authority Annual Housing Statistics Survey[72], is a questionnaire issued to all local authorities to respond to with regards to housing type and quality. Some local authorities have limited data available with regards to quality and state of repair. The only local authorities in the Local Health Study Area that responded to this part of the questionnaire were Hounslow and Runnymede. Within these local authorities, Hounslow identified 1,460 properties in an unreasonable state of repair, whilst Runnymede identified 626.

[71] Office for National Statistics (2023) *Overcrowding and under-occupancy by household characteristics, England and Wales: Census 2021*. [online] Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/overcrowdingandunderoccupancybyhouseholdcharacteristicsenglandandwales/census2021 [Accessed: 15 October 2024].

[72] Ministry of Housing, Communities and Local Government (2024) *Local Authority Housing Statistics data returns for 2022 to 2023.* [online]. Available at: https://www.gov.uk/government/statistical-data-sets/local-authority-housing-statistics-data-returns-for-2022-to-2023 [Accessed: 15 October 2024].

Access to Green Space

9.4.46 *According to the Green Space Index*[73] a minimum of 24m^2 of green space per individual is needed to enable everyone to participate in recreation, sport, play and reap the wellbeing benefits.

9.4.47 **Table 9.10** below shows the levels of access to green space within the Local Health Study Area. This includes publicly accessible green spaces. This shows that Ealing, Slough, Wandsworth and Spelthorne, fall short of the recommended provision per person at 17.9m^2, 13.2m^2, 18.2 m^2, and 19.3m^2 respectively.

9.4.48 Richmond Upon Thames has the highest provision of publicly open space and subsequently has over four times the recommended average of provision per person at 112.2m^2.

Table 9.10 Green Space Index, 2024

Local Authority	Total provision (hectares)	Provision per person (m2)	Population not within a 10 min walk
Hillingdon	438.1	24.5	12,205
Hounslow	639.6	31.4	3,668
Ealing	282.4	17.9	2,554
Richmond upon Thames	1,988.2	112.2	1,372
Wandsworth	488.5	18.1	2,628
Windsor and Maidenhead	85.2	87	22,679
Buckinghamshire	849.2	30.9	82,901
Runnymede	467	62.9	10,601
Slough	106.8	13.2	3,086
Spelthorne	92.2	19.3	3,408

Source: Green Space Index, 2024

[73] Fields in Trust (2024) *Green Space Index 2024*. [online]. Available at: https://experience.arcgis.com/experience/405187bb87f041c9a4d70c6b346c5bc4#data_s=id%3AdataSource_24-18fa0e80e62-layer-4%3A284 [Accessed: 09 October 2024].

Health Site Specific Study Areas

9.4.49 Small area data relevant to the specific geographies of the main changes due to the Proposed Development is set out below. The full data for the LSOAs within each HSSSA is set out in **Appendix 9.1**.

9.4.50 As discussed in the operational noise assessment (**Section 9.7**), there are relevant pairings of HSSSAs in terms of beneficial and adverse effects. There are two key pairings. The first relates to contrasting the adverse effects in HSSSA 1 with corresponding beneficial effects in HSSSA 4, both effects to the east of the Airport. The second relates to contrasting the beneficial effects in HSSSA 5 with corresponding adverse effects in HSSSA 6, both effects to the west of the Airport. The following commentary discusses these two pairings.

Table 9.11: Age by broad categories

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Total Population	57,721	18,630	56,417	92,886	43,711	23,022	3,629	10,491	8,799,726	56,490,047
Aged 0 to 15 years (%)	20.6	19.4	20.6	22.0	19.1	18.0	17.5	19.5	19.2	18.5
Aged 15 to 64 years (%)	68.0	65.8	66.9	65.4	63.8	61.9	70.4	66.9	68.8	63.0
Aged 65 years and above (%)	11.4	14.8	12.6	12.6	17.1	20.1	12.1	13.6	11.9	18.3

9.4.51 The age distribution in HSSSA 1 and HSSSA 4 is variable. The proportion of the young age population in both study areas is around 20%, with HSSSA 4 slightly higher than HSSSA 1. These are higher than the regional Greater London and the national England averages. Considering the working-age group, HSSSA 1 has a higher proportion of 68% which aligns closely with the regional average of 68.8% and is higher than the national average of 63.0%. In contrast, HSSSA 4 has a slightly lower proportion of 65.4% which is lower than the regional average but slightly higher than the national average. For the elderly population, the proportion is similar in both study areas, with 11.4% in HSSSA 1 and 12.6% in HSSSA 4. These are lower than the regional Greater London average and the national England average.

9.4.52 The age distribution in HSSSA 5 and HSSSA 6 is variable. The proportion of the young age population is similar in both study areas with 19% and 18% in HSSSA 5 and HSSSA 6 respectively. These are similar to the regional and national averages. When considering the working age population, the proportion in HSSSA 5 is slightly higher than that in HSSSA 6. However, both are notably lower than the regional average and similar to the national average.

For the elderly population, the proportion is slightly variable in both study areas, with 17.1% in HSSSA 5 and 20.1% in HSSSA 6. These are higher than the regional Greater London average and similar to the national England average.

Table 9.12: General Health

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Very good health (%)	49.5	52.1	52.5	51.8	54.8	54.4	48.1	47.8	53.6	48.5
Good health (%)	34.6	34.3	33.7	33.1	32.4	32.2	36.2	35.1	31.8	33.7
Fair health (%)	11.4	9.8	10.2	10.9	9.8	10.0	11.9	12.6	10.3	12.7
Bad health (%)	3.4	3.0	2.7	3.2	2.4	2.4	3.2	3.5	3.2	4.0
Very bad health (%)	1.1	0.9	0.9	1.0	0.6	0.7	0.7	0.9	1.0	1.2

9.4.53 General health in HSSSA 1 and HSSSA 4 are similar. In both cases around half the population report being in very good health, a third in good health, around 11% in fair health, around 3% in bad health and around 1% in very bad health. These are similar to the regional Greater London average and both slightly better than the national England average.

9.4.54 General health in HSSSA 5 and HSSSA 6 are similar. In both cases around half the population report being in very good health, a third in good health, around 10% in fair health, around 2% in bad health and around 1% in very bad health. These are similar to the regional Greater London average and both slightly better than the national England average.

Table 9.13: Household Deprivation

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Household is not deprived in any dimension (%)	34.9	49.3	44.6	**44.2**	56.5	56.2	39.4	38.2	48.1	48.4
Household is deprived in one dimension (%)	38.0	33.8	35.6	35.0	30.7	32.1	38.4	38.6	32.9	33.5
Household is deprived in two dimensions (%)	20.6	13.2	15.4	16.1	10.5	9.9	16.6	17.4	14.4	14.2
Household is deprived in three dimensions (%)	6.0	3.5	4.0	4.4	2.2	1.7	5.2	5.2	4.3	3.7
Household is deprived in four dimensions (%)	0.5	0.2	0.3	0.4	0.1	0.1	0.5	0.7	0.4	0.2

9.4.55 Household deprivation in HSSSA 1 and HSSSA 4 are variable. Considering households that are not deprived, HSSSA 1 has a lower proportion compared to HSSSA 4. Both areas are relatively worse (lower) than the regional Greater London and national England averages. In contrast, the proportion of households that are deprived is higher in HSSSA 1 across all four dimensions of deprivation compared to HSSSA 4. Both study areas experience higher levels of deprivation than the regional and national averages.

9.4.56 Household deprivation in HSSSA 5 and HSSSA 6 are similar. In both study areas, households that are not deprived are around 56%, which are higher than the regional Greater London and national England averages. Households deprived in one dimension are around 30%, around 10% in two dimensions, 2% in three dimensions and less than 1% in four dimensions. These are better than the regional and national averages.

Table 9.14: Ethnicity

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Asian, Asian British or Asian Welsh: All **(%)**	55.3	35.6	39.4	24.7	13.7	15.4	38.4	25.3	20.7	9.6
Asian, Asian British or Asian Welsh: South Asian[74] (%)	**45.2**	27.9	31.9	16.9	10.8	12.9	33.9	19.5	14.5	7.2
Black, Black British, Black Welsh, Caribbean or African **(%)**	9.0	7.3	4.8	6.2	2.1	1.8	4.3	4.4	13.5	4.2
Mixed or Multiple ethnic groups (%)	3.3	4.8	4.2	4.6	4.0	3.4	4.9	3.9	5.7	3.0
White (%)	21.8	44.5	45.5	59.4	77.6	76.5	48.2	61.2	53.8	81.0
Other ethnic group	10.6	7.9	6.1	5.0	2.6	2.8	4.4	5.2	6.3	2.2

9.4.57 South Asian ethnicity has been strongly linked to an increased risk of cardiovascular diseases (CVD).

9.4.58 Around half the population in HSSSA 1 are Asian, Asian British or Asian Welsh which is higher than the proportion of the same in HSSSA 4, Greater London and England. Similarly, around 45% of the population in HSSSA 1 are South Asian which is notably higher than the proportion of the same in HSSSA 4, Greater London and England. The proportion of those who are Black or from other ethnic groups in HSSSA 1 are also slightly higher than those in HSSSA 4.

9.4.59 More than half the population in HSSSA 4 are white which is higher than the proportion of the same in HSSSA 1, similar to the regional average and lower than the national average.

9.4.60 More than 70% of the population in both HSSSA 5 and HSSSA 6 are White consistent with the national average, but, higher than the regional average. Considering the South Asian ethnic group, the proportion of those who are either Pakistani, Indian or Bangladesh in HSSSA 5 is 10.8% which is slightly lower than those in HSSSA 6 (12.9%). Both these are lower than the Greater London regional average and higher than the national England average. In both study areas, around 15% of the population are Asian, 2% are Black, 4% are Mixed and 3% are from other ethnic groups.

[74] Data for the South Asian ethnic group has been obtained by aggregating data for India, Bangladesh and Pakistan.

Table 9.15: Household Language

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Household with no people that have English in England, or English or Welsh in Wales as a main language (%)	**22.3**	14.6	16.7	11.2	5.4	4.5	15.0	10.1	12.4	5.0

9.4.61 This indicator is relevant to effective communication with residents, including on access to applicable noise insulation schemes.

9.4.62 English proficiency in HSSSA 1 and HSSSA 4 vary. 22.3% of households in HSSSA 1 have no people with English as their main language. This is two times higher than the proportion in HSSSA 4 which is 11.2%. Similarly, the proportion for HSSSA 1 is higher than the regional and national averages.

9.4.63 English proficiency in HSSSA 5 and HSSSA 6 are similar. Around 5% of households in both study areas have no people with English as their main language. These are lower than the regional average and similar to the national average.

Table 9.16: Disability under the Equality Act

Indicators	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8	Greater London (Regional)	England (National)
Disabled under the Equality Act %	11.8	11.8	11.6	**13.5**	12.4	12.5	11.5	14.5	13.2	17.3
Not disabled under the Equality Act %	88.2	88.2	88.4	86.5	87.6	87.5	88.6	85.5	86.8	82.7

9.4.64 Disability under the Equality Act in HSSSA 1 and HSSSA 4 slightly differs. The proportion of those who are disabled is slightly higher in HSSSA 4 than in HSSSA 1. These are similar to the regional Greater London average and lower than the national England average.

9.4.65 Disability under the Equality Act in HSSSA 5 and HSSSA 6 is similar. Around 12% of the population are disabled under the Equality Act. These are similar to the regional Greater London average and lower than the national England average. Around 87% of the population are not disabled, which are similar to the regional average and higher than the national average.

Future Baseline

9.4.66 The South East region is the most populous region in the UK and this trend is set to continue with the population projected to increase by a further 1.4% by 2028. The Local Health Study Area itself is anticipated to grow by 0.4%[75].

9.4.67 Over the same period, all local authorities are set to experience population growth, with the exception of Ealing, South Bucks and Slough where the population is predicted to decrease by -0.8%, -0.22% and -0.01% respectively.

9.4.68 As well as an increasing population in the South East, the population is also predicted to age, with those of State Pension age rising by 8.3% by 2028 compared to a slight decrease in those of working age (-0.1%)[75].

9.4.69 Across the Local Health Study Area the increase in those of state pension age by 2028 is anticipated to be slightly higher than the regional average at 8.8%, whilst those of working age will decrease by 0.5%[75].

9.4.70 All local authorities in the Local Health Study Area are projected to experience an increase in the number of people of State Pension age, most notably in Richmond Upon Thames which would see an increase of 20.4% by 2034. Runnymede would experience the lowest increase of 10.3%. Windsor and Maidenhead, South Bucks and Ealing are all expected to see their working age populations decrease over the same period.

9.4.71 Although challenging to predict future health baseline, as the population of older people in the Study Area is expected to continue to grow, it may cause a strain on services, community facilities, and transportation due to rising inequalities in healthcare.

9.4.72 A population with a larger proportion of older people would also likely result in an increase in the number of people in the Local Health Study Area with physical and sensory impairments which could result in a greater demand for access to health and social care services.

Local Health Priorities and Needs Assessments

9.4.73 The following section considers relevant health priorities and needs assessments relevant to the local authorities of the Local Health Study Area that overlap with the HSSSAs. This provides additional baseline context to specific health challenges and vulnerable groups relevant to site-specific effects.

Hillingdon

Hillingdon Joint Health and Wellbeing Strategy 2022 – 2025

9.4.74 The Hillingdon Joint Health and Wellbeing Strategy 2022 – 2025[34] identifies the following priorities relevant to this assessment:

[75] Office for National Statistics (2020) *2018-based Subnational Population Projections* [online]. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/datasets/localauthoritiesinenglandtable2 [Accessed: 09 October 2024].

- ‘Priority 1: Support for children, young people and their families to have the best start and to live healthier lives’ (p. 11).
  - Focuses on ensuring children have the best start in life and promoting healthier lifestyles for young people.
  - Key actions include addressing childhood obesity, improving mental health support, and reducing inequalities in health outcomes for children and their families.
- ‘Priority 3: Helping people to prevent the onset of long-term health conditions such as dementia and heart disease.’ (p. 12)
  - Focuses on preventing the onset of diseases such as dementia, heart disease and diabetes.
  - Actions include promoting healthier lifestyles (e.g. physical activity, smoking cessation, better diet) and increasing early detection of chronic conditions.
- ‘Priority 4: Supporting people to live well, independently and for longer in older age and through their end of life’. (p. 12).
  - Aims to help the ageing population live longer, healthier, and more independent lives.
  - Key actions include reducing hospital admissions and promoting end-of-life care that aligns with personal preference.
- ‘Priority 5: Improving mental health services through prevention and self-management’ (p. 12 – 13).
  - Focuses on mental health prevention and self-management, with specific attention to reducing mental health crises.
  - Key areas include expanding community mental health support, addressing suicide rates, and providing better support for those with learning disabilities and/or autism.

Hillingdon Joint Strategic Needs Assessment

9.4.75 The Hillingdon Joint Strategic Needs Assessment[35] has been reviewed in relation to local health challenges and vulnerable groups.

Hounslow

Hounslow Joint Health and Wellbeing Strategy 2023 – 2026

9.4.76 The Hounslow Joint Health and Wellbeing Strategy 2023 – 2026[36] identifies the following priorities relevant to this assessment:

- ‘Priority 1: Start Well: Getting the healthiest start in life [and] develop well into adulthood’ (p. 20 – 21).
  - Focuses on improving pre-pregnancy, maternity and early years health, particularly for women and infants from deprived communities.

- Key actions include halting the rise in childhood obesity, ensuring children are healthy and ready to learn by reception age, and improving the mental health of children and young people through effective universal services.

- ‘Priority 2: Live Well: Prevention and early detection of illness to reduce people developing long term conditions; promoting good mental health; [and] participation in physical activity’ (p. 20 – 21).
  - Aims to reduce health inequalities, increase awareness of mental health and improve access to mental health services, and promote healthy lifestyles and leisure services.
  - Key aims include reducing early deaths from respiratory diseases such as asthma and COPD, improving cancer screening, providing responsive mental health services, and increasing the number of people being physically active.

- ‘Priority 3: Ageing well: Early Intervention – proactively identify frailty and providing the best end of life care [and] supporting people to maintain independence and live well into older age’ (p. 20 – 21).
  - Focuses on helping older residents maintain independence, reducing the risks of falls, and providing personalised care for those with frailty and dementia.
  - Key actions include creating ‘dementia-friendly’ spaces and improving care for end-of-life decisions to reduce hospital admissions during crises.

- ‘Priority 4: Healthy places: people live in good homes and pleasant neighbourhoods [and][people are safe, connected and part of a community’ (p. 20 -21).
  - Aims to improve living conditions by ensuring residents live in safe, warm and affordable homes, reducing fuel poverty and supporting climate change initiatives.
  - Key actions include promoting social connectivity to reduce loneliness and encouraging community engagement through local initiatives.

Hounslow Joint Strategic Needs Assessment

9.4.77 The Hounslow Joint Strategic Needs Assessment[37] has been reviewed in relation to local health challenges and vulnerable groups.

Ealing

Ealing Health and Wellbeing Strategy 2022 – 2025

9.4.78 The Ealing Health and Wellbeing Strategy 2022 – 2025[32] identifies the following theme relevant to this assessment:

- ‘Theme 3: Connecting the building blocks of health and wellbeing’ (p. 40).
  - Focuses *on community engagement and improving health and wellbeing outcomes particularly for vulnerable groups.*

Ealing Joint Strategic Needs Assessment

9.4.79 The Ealing Joint Strategic Needs Assessment[33] has been reviewed in relation to local health challenges and vulnerable groups.

Richmond upon Thames

Richmond upon Thames Joint Local Health and Wellbeing Strategy

9.4.80 The Richmond upon Thames Joint Local Health and Wellbeing Strategy[38] identified the following principle relevant to this assessment:

- '1. Tackling inequality' (p. 5).
  - Commitment to tackle health inequalities and reduce unfair health outcomes.

Richmond upon Thames Joint Strategic Needs Assessment

9.4.81 The Richmond upon Thames Joint Strategic Needs Assessment[39] has been reviewed in relation to local health challenges and vulnerable groups.

Windsor and Maidenhead

Windsor and Maidenhead Health and Wellbeing Strategy 2021 – 2025

9.4.82 The Windsor and Maidenhead Health and Wellbeing Strategy 2021 – 2025[44] identified the following principle relevant to this assessment:

- '1. Community centric (p. 1).
  - 'Investing in communities and their assets and connecting individuals to them' (p. 1).

Windsor and Maidenhead Joint Strategic Needs Assessment

9.4.83 The Windsor and Maidenhead Joint Strategic Needs Assessment[45] has been reviewed in relation to local health challenges and vulnerable groups.

Slough

Slough Wellbeing Strategy 2020 – 2025

9.4.84 The Slough Wellbeing Strategy[40] identified the following principle relevant to this assessment:

- 'Priority One: Starting Well' (p. 7)
  - Focuses on giving children the best start in life by improving infant health.
  - Aims to reduce health inequalities from birth and promote mental and physical health for children and young people
- 'Priority Three: Strong, Health and Attractive Neighbourhoods' (p. 9)

- Aims to tackle health inequalities influenced by socio-economic factors, environmental quality and deprivation.
- Focuses on building strong, healthy and attractive neighbourhoods.

Slough Joint Strategic Needs Assessment

9.4.85 The Slough Joint Strategic Needs Assessment[41] has been reviewed in relation to local health challenges and vulnerable groups.

Spelthorne

Spelthorne Health and Wellbeing Strategy 2022 – 2027

9.4.86 The Spelthorne Health and Wellbeing Strategy 2022 – 2027[42] identified the following principle relevant to this assessment:

- "*1. People – enable residents to take positive action to improve their own health*
  - *Support residents to manage their mental health positively following Covid-19*
  - *Enable residents to increase their physical activity in an accessible and affordable way"* (p. 9).
- "*2. Place – encourage a positive environment to improve health*
  - Residents are happy in their neighbourhoods
  - Maximise use of parks and open spaces*" (p. 9).*
- "3. *Community – foster communities which are integrated where residents feel connected*
  - Maximise use of parks and open spaces*" (p. 9).*

Surrey Joint Strategic Needs Assessment

9.4.87 Spelthorne is covered under the Surrey Joint Strategic Needs Assessment[43], which has been reviewed in relation to local health challenges and vulnerable groups.

9.5 Assessment Methodology

9.5.1 The generic project-wide approach to the assessment methodology is set out in **Chapter 5: Approach to the EIA**, which has informed the approach used in this assessment. The methodology used for assessing significance does, however, differ from that set out in **Chapter 5: Approach to the EIA**.

9.5.2 The assessment methodology for public health effects has drawn on effects after mitigation is applied identified in other EIA aspect assessments to identify impacts on health determinants and community receptors. These chapters include **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration** as well as an **Equality Statement** presented in **Appendix 8.1: Equality Statement**.

9.5.3 For the purpose of the assessment, health effects have been identified when an environmental, social or economic factor that influences health and wellbeing (known as a health determinant – defined in **Section 9.6**) is potentially impacted, and the degree of change and number of people affected is considered sufficient to cause a change in health at population level.

9.5.4 Whilst the assessments presented in **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration** look at the potential health related impacts, these chapters are subject to their own methodologies and guidance. The human health assessment considers the effects reported within these chapters and applies the methodology set out below, which is based on the guidance set out in **Table 9.3**.

9.5.5 For each determinant of health, this health assessment identifies relevant inequalities through consideration of the differential effect to the 'general population' of the relevant study area and effects to the 'vulnerable population group' of that study area. The vulnerable population group being comprised of relevant sensitivities for that determinant of health. The differentiation of the general population from the vulnerable group population, allows a discussion of any likely significant health inequalities and the targeting of any mitigation. The following population groups have been considered:

- The 'general population' including residents, passengers, visitors, workers, service providers, and service users.
- The 'vulnerable group population' comprised of the vulnerabilities due to young age, older age, income, health status, social disadvantage and access or geographic reasons.

9.5.6 That there is variation between people is widely acknowledged in public health. Public health frames this variation in terms of a likely distribution of effects within a population. This distribution can be applied conceptually or statistically but tends to show that most individuals are likely to experience an average level of change. This links to the 'general population' analysis.

9.5.7 Because there are invariably people towards the extremes of the distribution, e.g. experiencing much smaller or larger effects, it is relevant to also consider sub-populations who may be more likely to experience such extremes because of certain characteristics. This links to the 'vulnerable group' analysis.

Assessment Methodology

9.5.8 The methodology outlined in this section follows the IEMA 2022 guidance on determining EIA health significance[1]. The IEMA guidance was informed by the international consensus publication between impact assessment and public health practitioners[4] and other UK guidance on health methods appropriate to EIA[3,49]. The health assessment has drawn on effects identified in other EIA aspect assessments to identify impacts on health determinants and community resources.

9.5.9 The EIA health chapter conclusions are presented in both EIA categories, such as major, moderate, minor or negligible, and a narrative explaining this 'score' with reference to evidence, local context and any inequalities. The IEMA guidance sets out the criteria and indicative levels that support the professional judgement in 'scoring' and presenting a narrative.

Sensitivity

9.5.10 Within a defined population, individuals will range in level of sensitivity due to a series of factors such as age, socio-economic deprivation, and the prevalence of any pre-existing health conditions which could become exacerbated. Sensitive individuals can be considered particularly vulnerable to changes in environmental and socio-economic factors (both adversely and beneficially), whereby they could experience disproportionate effects when compared to the general population.

9.5.11 The criteria for receptor sensitivity are outlined in **Table 9.17**.

Table 9.17 Health Sensitivity Methodology Criteria

Level	Indicative criteria
High	*high* levels of deprivation (including pockets of deprivation); *reliance* on resources shared (between the population and the Proposed Development); existing *wide* inequalities between the most and least healthy; a community whose outlook is predominantly *anxiety or concern*; people who are prevented from undertaking daily activities; dependents; people with *very poor* health status; and/or people with a *very low* capacity to adapt
Medium	*moderate* levels of deprivation; few alternatives to shared resources; existing *widening* inequalities between the most and least healthy; a community whose outlook is predominantly *uncertainty* with some concern; people who are *highly* limited from undertaking daily activities; people providing or requiring a lot of care; people with *poor* health status; and/or people with a *limited* capacity to adapt
Low	*low* levels of deprivation; *many* alternatives to shared resources; existing *narrowing* inequalities between the most and least healthy; a community whose outlook is predominantly *ambivalence* with some concern; people who are *slightly* limited from undertaking daily activities; people providing or requiring *some* care; people with *fair* health status; and/or people with a *high* capacity to adapt
Very Low	*very low* levels of deprivation; no shared resources; existing *narrow* inequalities between the most and least healthy; a community whose outlook is predominantly *support* with some concern; people who are *not* limited from undertaking daily

Level	Indicative criteria
	activities; people who are *independent* (not a carer or dependent); people with *good* health status; and/or people with a *very high* capacity to adapt

Magnitude of impact

9.5.12 The criteria for defining magnitude of health impacts are outlined in **Table 9.18**.

Table 9.18 Health Magnitude Methodology Criteria

Level	Indicative criteria
High	*high* exposure or scale; *long-term* duration; *continuous* frequency; severity predominantly related to *mortality* or changes in morbidity (physical or mental health) for very severe illness/injury outcomes; *majority* of population affected; *permanent* change; *substantial* service quality implications
Medium	*low* exposure or *medium* scale; *medium-term* duration; *frequent* events; severity predominantly related to moderate changes in *morbidity* or major change in quality-of-life; *large minority* of population affected; *gradual* reversal; *small* service quality implications
Low	*very low* exposure or *small* scale; *short-term* duration; *occasional* events; severity predominantly related to minor change in morbidity or moderate change in *quality-of-life*; *small* minority of population affected; *rapid* reversal; *slight* service quality implications
Very Low	*negligible* exposure or scale; *very short-term* duration; *one-off* frequency; severity predominantly relates to a minor change in *quality-of-life*; *very few people* affected; *immediate* reversal once activity complete; *no* service quality implication.

9.5.13 Drawing on **Table 9.18**, the following general characterisations of how the 'general population' may differ from 'vulnerable group populations' were considered when scoring sensitivity. These statements are not duplicated in each assessment and apply (as relevant) to the issues discussed for both construction and operation.

- In terms of life stage, the general population can be characterised as including a high proportion of people who are independent, as well as those who are providing some care. By contrast, the vulnerable group population can be characterised as including a high proportion of people who are providing a lot of care, as well as those who are dependant.
- The general population can be characterised as experiencing low deprivation. However, the professional judgment is that the vulnerable group population experiences high deprivation (including where this is due to pockets of higher deprivation within low deprivation areas).

- The general population can be characterised as broadly comprised of people with good health status. Vulnerable groups, however, tend to include those parts of the population reporting bad or very bad health status.
- The general population tends to include a large majority of people who characterise their day-to-day activities as not limited. The vulnerable group population tends to represent those who rate their day-to-day activities as limited a little or limited a lot.
- Based on a professional judgement the general population's resilience (capacity to adapt to change) can be characterised as high whilst the vulnerable group population can be characterised as having limited resilience.
- Regarding the usage of affected infrastructure or facilities, the professional judgement is that the general population are more likely to have many alternatives to resources shared with the Proposed Development. For the vulnerable group population, the professional judgement is that they are more likely to have a reliance on shared resources.
- The general population includes the proportion of the community whose outlook on the Proposed Development includes support and ambivalence. The vulnerable group population includes the proportion of the community who are uncertain or concerned about the Proposed Development.

Significance criteria

9.5.14 The determination of significance is derived with reference to information about the nature of the development, the receptors that could be significantly affected (beneficial or adverse) and their sensitivity or value, together with the magnitudes of change that are likely to occur. **Section 5.8** of **Chapter 5: Approach to the EIA** sets out the standardised general approach that this Environmental Statement has taken to determining significance.

9.5.15 For the health assessment this is refined, with significance based on the indicative matrix set out in **Table 9.19**, which is transposed from the IEMA 2022 guidance (Pyper, et al., 2022a). This shows how the significance of the effect takes into account the sensitivity of the population and the magnitude of the impact due to the Proposed Development.

Table 9.19 Indicative Assessment Matrix

Magnitude of Impact	**Sensitivity**			
	High	**Medium**	**Low**	**Very low**
High	Major	Moderate or major	Moderate or minor	Minor or negligible
Medium	Moderate or major	Moderate	Minor	Minor or negligible
Low	Moderate or minor	Minor	Minor	Negligible
Negligible	Minor or negligible	Minor or negligible	Negligible	Negligible

9.5.16 Where the matrix offers more than one significance option, professional judgement is used to decide which option is most appropriate.

9.5.17 Effects of moderate and above are considered significant in terms of the EIA Regulations.

9.5.18 **Table 9.17**, **Table 9.18** and **Table 9.20** together summarise the assessment criteria. The approach uses professional judgement, drawing on consistent and transparent criteria for sensitivity and magnitude. It also references relevant contextual evidence to explain what significance means for human health in public health terms. While a judgment is made based on most relevant criteria, it is likely in any given analysis that some criteria will span score categories.

Table 9.20 Health Significance Methodology Criteria

Category/ Score	Indicative criteria
Major (significant)	The narrative explains that this is significant for public health because: • Changes, due to the Proposed Development, have a *substantial* effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size (magnitude and sensitivity scores), and as informed by consultation themes among stakeholders, particularly public health stakeholders, that show *consensus* on the importance of the effect. • Changes, due to the Proposed Development, could result in a regulatory threshold or statutory standard being *crossed* (if applicable). • There is likely to be a *substantial* change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a *causal* relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of *specific relevance* to the determinant of health or population group affected by the Proposed Development.
Moderate (significant)	The narrative explains that this is significant for public health because: • Changes, due to the Proposed Development, have an *influential* effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by referencing relevant policy and effect size, and as informed by consultation themes among stakeholders, which may show *mixed* views. • Change, due to the Proposed Development, could result in a regulatory threshold or statutory standard being *approached* (if applicable). • There is likely to be a *small* change in the health baseline of the population, including as evidenced by the effect size and scientific literature showing there is a *clear* relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of *general relevance* to the determinant of health or population group affected by the Proposed Development.

Category/ Score	Indicative criteria
Minor (not significant)	The narrative explains that this is not significant for public health because: • Changes, due to the Proposed Development, have a *marginal* effect on the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size of limited policy influence and/or that *no* relevant consultation themes emerge among stakeholders. • Change, due to the Proposed Development, would be *well within* a regulatory threshold or statutory standard (if applicable); but could result in a guideline being crossed (if applicable). • There is likely to be a *slight* change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is only a *suggestive* relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are of *low relevance* to the determinant of health or population group affected by the Proposed Development.
Negligible (not significant)	The narrative explains that this is not significant for public health because: • Changes, due to the Proposed Development, are *not related* to the ability to deliver current health policy and/or the ability to narrow health inequalities, including as evidenced by effect size or lack of relevant policy, and as informed by the Proposed Development having *no* responses on this issue among stakeholders. • Change, due to the Proposed Development, would *not* affect a regulatory threshold, statutory standard or guideline (if applicable). • There is likely to be a *very limited* change in the health baseline of the population, including as evidenced by the effect size and/or scientific literature showing there is an *unsupported* relationship between changes that would result from the Proposed Development and changes to health outcomes. • In addition, health priorities for the relevant study area are *not* relevant to the determinant of health or population group affected by the Proposed Development.

9.5.19 As all development has the potential for adverse effects to some particularly vulnerable individuals, the role of EIA health significance conclusions is not to set a threshold of 'no harm' from development, but to show where, at a population level, the harm should weigh strongly in the balance alongside the development's benefits for health and other outcomes (para 5.8 of the IEMA guidance[1]).

9.5.20 Furthermore, where the effect is best characterised as only affecting a few individuals, this may indicate that a population health effect would not occur. Such individuals should still be the subject of mitigation and discussion, but in EIA and public health terms the effect may not be a significant population health change' (para 8.18 of the IEMA guidance[1]).

9.5.21 The health methods triangulate relevant evidence sources, including scientific literature, health policy, local health priorities, baseline data, regulatory standards and consultation responses. In this regard health in EIA is like other aspects of public health, where the scientific literature and WHO position statements are important but must be applied within the local context. The health assessment therefore has regard to WHO advisory guidelines but acknowledges that they are not always the most appropriate reference point in UK planning decisions. Where there are national health protection standards these are given weight, to do otherwise would undermine public confidence in them and the institutions that set them. In adopting this context-based approach, the health assessment follows guidance and good practice that is itself advocated by the WHO[63].

9.5.22 In relation to regulatory thresholds or statutory standards the IEMA 2022 guidance states[1]:

- 'Regulatory thresholds, or statutory standards … cover the formal standards adopted by national jurisdictions. This may include statutory air quality standards, as well as standards set by, or commonly adopted in relation to, government noise policy. Where thresholds have been set these do not mean that there would be no health effect below these levels. … In such cases an informed discussion about what is acceptable for the jurisdiction is appropriate. For example, giving the public confidence in thresholds and standards set by government for the purpose of health protection having taken into account other social, economic and environmental considerations' (para 8.19 of the IEMA guidance[1]).

Limitations and assumptions

9.5.23 This chapter has relied, in part, on data provided by third parties (e.g., OS Mapping, Local Authorities, NOMIS) which are the most up-to-date, available at the time of writing. No significant changes or limitations in these datasets have been identified that would affect the robustness of the assessment.

9.5.24 The assessment of effects on human health relies on the use of reasonable assumptions, professional judgement, and above guidance to determine the significance of effects.

9.5.25 Vulnerable groups, including those with protected characteristics as defined by the Equality Act 2010 are assumed to be present throughout the health assessment study areas (including the Local Health Study Area and HSSSAs), additionally where specific areas have been identified as deprived.

9.5.26 The methods take into account that a change in a determinant of health does not equate directly to a change in population health outcomes. Rather the change in a determinant alters risk factors for certain health outcomes. The assessment considers the degree and distribution of change in these pathways. The analysis of health pathways focuses on the risk factors and health outcomes that are most relevant to the determinants of health affected by the Proposed Development. As there are both complex and wide-ranging links between determinants of health, risk factors and health outcomes, it would not be proportionate or informative for an assessment to consider every interaction.

9.5.27 The health and wellbeing assessment partially draws from and builds upon, the technical outputs from inter-related technical disciplines, as a consequence, the assumptions and limitations of those assessments also apply to any information used in this chapter (e.g. for

modelling work undertaken). It is, however, considered that the information available provides a suitable basis for assessment.

9.5.28 Baseline data includes indicators where the available public data is pre COVID-19 pandemic, e.g. in relation to indices of deprivation, or that have yet to show the full impacts of the pandemic for public health. The baseline has also been prepared at a time when there are ongoing releases of 2021 census data. The baseline is however considered sufficient and robust in evidencing that there are vulnerable population groups with high sensitivity. New data would be unlikely to change that conclusion and as a 'high' sensitivity is already assigned to vulnerable groups, would not change the assessment.

9.5.29 All decision making is within the context of imperfect information and the following steps have been taken to allow confidence in the EIA health assessment conclusions:

- Methods are used that triangulate evidence sources and professional perspectives.
- The scientific literature reviews undertaken give priority to high quality study design, such as systematic reviews and meta-analysis, and strength of evidence.
- Quantitative inputs for other assessments have been used, which included model validation, as described in other chapters.
- The health assessment has been cautious, with conservative assessments, for example in taking account of non-threshold effects and vulnerable group findings.
- The health assessment has been transparent in its analysis and follows good practice.

9.5.30 Regarding the application of the precautionary principle in public health, this is discussed by the WHO [76]. The WHO note how the precautionary principle is a two-stage test, requiring both uncertainty and serious threats to health, i.e. large effect sizes indicated by available *evidence.* The WHO describe health impact assessments (such as this health assessment) as a *"compass to guide public health decisions under uncertainty" and that "a centrepiece of precautionary assessment is environment and health assessment, which weighs the science of hazards and exposure. In this step, evidence of risk and uncertainty is examined to determine the possibility (and plausibility) of a significant health threat and the need for precautionary action."* Such an approach has been taken by this health assessment, which considers levels of exposure, extent of the population exposed and the scale of change in relevant risk factors for health outcomes.

[76] World Health Organisation (2004) *The precautionary principle: protecting public health, the environment and the future of our children*. [online] Available at: https://iris.who.int/bitstream/handle/10665/346211/9789289010986-eng.pdf?sequence=1&isAllowed=y [Accessed: 15 October 2024].

9.6 Scope of the assessment

Introduction

9.6.1 The scope of this assessment has been established through the obtainment of a formal Scoping Opinion (**Appendix 1.6**) which was received from LBH on 01 February 2024. Further information can be found in **Chapter 5: Approach to the EIA**.

9.6.2 This section provides an update to the scope of the assessment based on the most up to date information and the Scoping Opinion. It updates the evidence base for scoping out elements following further iterative assessment and is summarised in **Table 9.21** and **Table 9.22**.

Scoping Opinion

9.6.3 **Table 9.21** sets out the comments received and how they have been addressed in this Environmental Statement.

Table 9.21 Responses to Scoping Opinion comments

Scoping Opinion comment	How is this addressed?
"The topics scoped into the assessment is accepted noting that further understanding of the evidence base may require different measurements (i.e. specific types of health effects) to be included."	Following on from scoping, this chapter provides more comprehensive baseline (**Section 9.4**) information which is aligned to those aspects scoped into the assessment. The assessment (**Section 9.7**) identifies specific health effects, looking at both receptors and vulnerable groups.
"Clarification on the evidence base, assigning sensitivity to receptors, how the noise metrics will be used and how significant effects will be defined would be welcomed."	Details on the noise methodology and how noise metrics have been determined are included in **Chapter 7: Noise and Vibration**. A detailed health methods statement is set out in **Section 9.5**, with further discussion of how noise metrics are specifically related to these methods within the assessment (**Section 9.7**). Sensitivity of individual receptors has not been applied as the health assessment considers those groups that use those facilities. Sensitivity has been applied at a population level.

Elements Scoped out

9.6.4 Informed by the Scoping Report, the Scoping Opinion states at paragraph 10.1 "The general approach to the assessment of health is broadly acceptable although noting the request for clarity in relation to the assessment of noise", followed by stating in paragraph 10.2 that the scope of the health assessment is accepted.

9.6.5 The following determinants of health shown in **Table 9.22** were presented as scoped out in the Scoping Report (and as such this was agreed by LBH in their Scoping Opinion) as they are not considered to give rise to likely significant effects as a result of the Proposed Scheme. These determinants have therefore not been considered within this assessment.

Table 9.22 Elements scoped out of the assessment

Element scoped out	Justification
Risk taking behaviour	Negligible effect of Proposed Development
Diet and nutrition	Negligible effect of Proposed Development
Transport modes, access and connections	Negligible effect of Proposed Development
Community safety	Negligible effect of Proposed Development
Employment and income	Negligible effect of Proposed Development (See Section 8)
Climate change mitigation and adaptation	Negligible effect of Proposed Development
Water quality or availability	The Proposed Development is not expected to affect the water regime
Land quality	The Proposed Development would result in effects which are above the surface and do not affect land quality
Radiation	Negligible effect of Proposed Development
Built environment	Negligible effect of Proposed Development

Elements scoped in

Construction phase

9.6.6 The following elements are considered to have the potential to give rise to likely significant effects during construction of the Proposed Development and the public health implications, informed by other assessments, have therefore been considered within this assessment:

- Noise and vibration construction impacts, with potential effects on mental and physical health;

- Physical activity, open space and recreation construction impacts, including from noise, vibration, air quality and visual changes, with potential effects on people's ability or inclination to undertake physical and recreational activities; and
- Community infrastructure construction impacts, including from noise, vibration, air quality and visual changes, with potential effects on users of community facilities and infrastructure.

Operational phase

9.6.7 The following elements are considered to have the potential to give rise to likely significant effects during operation of the Proposed Development and the public health implications, informed by other assessments, have therefore been considered within this assessment:

- Air quality operational impacts, including redistribution of emissions, with potential effects on physical health;
- Noise and vibration operational impacts, including redistribution of ground and air noise, with potential effects on mental and physical health;
- Physical activity, open space and recreation operational impacts, including from noise, vibration, air quality and visual changes, with potential effects on people's ability or inclination to undertake physical and recreational activities;
- Community infrastructure operational impacts, including from noise, vibration, air quality and visual changes, with potential effects on users of community facilities and infrastructure; and
- Educational attainment operational impacts, with the potential to affect users of educational facilities.

Proportionate assessment and reporting

9.6.8 The scoping stage identified a series of relevant determinants of health with the potential for significant population health effects. In line with principles or proportionate assessment and reporting it has been identified during preliminary assessment that to avoid repetition it is appropriate to combine the assessment of several of these determinants. This is set out in **Table 9.23**.

9.6.9 This integrated assessment and reporting reflects that the underlying sources of impact are the same and the influences on population health outcomes related. For example, the effects of the proposed changes on public spaces and buildings, through a combination of noise, air quality and visual change, influence not only conditions in these amenities but also linked outcomes of community identity and social interactions. Similarly, the effects of aviation related exposures affect health outcomes both directly and mediated through financial implications of home modification (noise insulation installation) and how changes in amenity, including of private outdoor spaces, may influence decisions or desires on where to live.

9.6.10 The health determinants considered in this assessment are outlined in **Table 9.23**. These has been determined using IEMA's 2022 Effective Scoping of Human Health[1] guidance and professional judgement. The table explains where each of these determinants is covered within the assessment.

Table 9.23 Wider Determinants of Health

Determinant of health	***Scoping stage justification***	***Where potential for likely significant effects are assessed and reported***
Health-related behaviours		
Physical activity	Operation of the Airport during easterlies may affect individual's ability or inclination to take physical activity, which may directly influence population health.	**Section 9.7**, construction and operational phase assessment of 'Physical Activity, Open Space and Recreation'.
Social environment		
Housing	Operation of the Airport during easterlies may affect investment needs (e.g. in noise insultation) as well as quality of the home environment, which may indirectly influence population health.	No new housing is proposed as part of the Proposed Development. This determinant is considered in relation to the impacts to occupants of dwelling receptors identified in **Chapter 6: Air Quality**, and **Chapter 7: Noise and Vibration**. The relevant health assessments are in **Section 9.7**, construction and operational phase assessments of 'Air quality' and 'Noise and vibration'. Relevant links to existing and additional noise insulation support measures for qualifying properties are noted.
Relocation	Operation of the Airport during easterlies may affect incentives for relocation, which may indirectly influence population health.	No relocations or resettlements are proposed as part of the Proposed Development. This determinant is considered in relation to the impacts to occupants of dwelling receptors identified in **Chapter 6: Air Quality**, and **Chapter 7: Noise and Vibration**. The relevant health assessments are in **Section 9.7**, construction and operational phase assessments of 'Air quality' and 'Noise and vibration'. Relevant links to existing home relocation support measures for qualifying properties are noted.

Determinant of health	*Scoping stage justification*	*Where potential for likely significant effects are assessed and reported*
Open space, leisure and play	Operation of the Airport during easterlies may affect the quality of the outdoor environment, which may directly and indirectly influence population health.	**Section 9.7**, construction and operational phase assessment of 'Physical Activity, Open Space and Recreation'.
Community identity, culture, resilience and influence	Operation of the Airport during easterlies may affect environmental characteristics influencing community identity and health resilience, which may indirectly influence population health.	In relation to private spaces, the relevant assessments are in **Section 9.7**, construction and operational phase assessments of 'Air quality' and 'Noise and Vibration'. In relation to public outdoor spaces, **Section 9.7** construction and operational phase assessment of 'Physical Activity, Open Space and Recreation', including considering the visual impacts associated with the new Longford Noise Barrier. In relation to public indoor spaces, **Section 9.7**, construction and operational phase assessment of 'Community Infrastructure'.
Social participation, interaction and support	Operation of the Airport during easterlies may affect regular and ad-hoc community events, which may indirectly influence population health.	In relation to private spaces, the relevant assessments are in **Section 9.7**, construction and operational phase assessments of 'Air quality' and 'Noise and Vibration'. In relation to public outdoor spaces, **Section 9.7**, construction and operational phase assessment of 'Physical Activity, Open Space and Recreation'. In relation to public indoor spaces, **Section 9.7**, operational phase assessment of 'Community Infrastructure'. No community meeting spaces were identified as potentially significantly affected during construction in **Chapter 7: Noise and Vibration.**
Economic environment		
Education and training	Operation of the Airport during easterlies may affect educational attainment, which may indirectly influence population health.	**Section 9.7**, construction phase assessment of 'Community Infrastructure'. **Section 9.7**, operational phase assessment of 'Educational Attainment'.
Bio-physical environment		

Determinant of health	*Scoping stage justification*	*Where potential for likely significant effects are assessed and reported*
Air quality	Operation of the Airport during easterlies and construction effects in Longford may directly influence population health.	The primary assessment is set out in **Chapter 6: Air Quality**. **Section 9.7** discusses the public health implications of the anticipated changes in construction and operational phase air quality. Consistent with the approach set out in the Scoping Report (paragraph 5.4.16) (**Appendix 1.5**), with which the Scoping Opinion (**Appendix 1.6**) did not disagree, ultra-fine particles are scoped out of the air quality assessment. This is considered proportionate. Similarly, odour was scoped out in the Scoping Report (paragraph 5.4.39) and the Scoping Opinion did not disagree.
Noise and vibration	Operation of the Airport during easterlies and construction effects may directly and indirectly influence population health. Exposure to high levels of noise can affect people's health and it has been linked to a number of adverse health outcomes	The primary assessment is set out in **Chapter 7: Noise and Vibration**. **Section 9.7** of this chapter discusses the public health implications of the anticipated changes in construction and operational phase noise and vibration.
Institutional and built environment		
Health and social care services	Spatial distribution of health needs may be affected by new pattern of noise and air quality exposures.	That no significant noise effects to health and social care facilities are anticipated is discussed in **Section 9.7**, operational phase assessment of 'Community Infrastructure'. Furthermore, healthcare demand implications are considered in all assessment magnitude discussions.
Wider societal infrastructure and resources	Operation of the Airport during easterlies may affect incentives for investment, which may indirectly influence population health.	The Proposed Development does not materially alter infrastructure that society depends for good population health. This determinant is considered in general terms in relation to **Section 9.7**, construction and operational phase assessments of 'Physical Activity, Open Space and Recreation' and of 'Community Infrastructure'.

Sensitive receptors

9.6.11 The health assessment considers the impacts of the Proposed Development on the environmental, social, or economic factors that influence health (referred to as 'health determinants'). The receptors for the health assessment are population groups, including vulnerable groups (defined in **Table 9.24**) within the Local Health Study Area who are likely to experience changes to health determinants as a result of the Proposed Development.

9.6.12 Effects would likely vary depending on the geographic extent of an impact and its nature, which may affect sub-groups of the population (e.g. users of a particular facility or a particular vulnerable group), which may make them more vulnerable. The assessment of health effects is provided at a population, rather than individual level, albeit consideration is given to small area (site-specific) effects and to the presence of vulnerable sub-populations within these areas.

9.6.13 The assessment will consider the effects arising from impacts on the users of community facilities and how this may affect their physical and mental health. Those sensitive receptors most likely to be affected by the Proposed Development are those associated with the following:

- Residential properties;
- Educational facilities;
- Healthcare facilities (care homes, nursing homes, hospitals, GP surgeries);
- Community Centres;
- Places of Worship;
- Public Rights of Way; and
- Sports, leisure and recreation facilities (including open spaces).

9.6.14 Where applicable, the assessment will identify the specific properties and/or facilities which may be affected by the Proposed Development.

Vulnerable Groups

9.6.15 Based on the characteristics of the communities described in the baseline above, **Table 9.24** summarises the disadvantaged and/or vulnerable groups present. The most disadvantaged and/or vulnerable groups are those that exhibit a number of characteristics, for example, children living in poverty.

9.6.16 The groups that have been identified as applicable to this assessment are those that are identified as having the potential to be differentially affected by the Proposed Development. The representation of these groups in the study areas (Local Health Study Area) are described in relation to regional and national averages. Where data is not available for the representation of a particular vulnerable group, unknown has been used throughout the table to indicate its absence.

Table 9.24 Vulnerable groups and subgroups in the Study Area

Vulnerable Groups	Vulnerable sub-groups	Prevalence within Local Health Study Area
Age related groups	Children and young people	Above Average
	Older people	Below Average
Income related groups	People on low income	Above Average
	Economically inactive	Above Average
	Unemployed	Above Average
Poor health vulnerability	People with existing poor physical and mental health or physical or intellectual disability.	Above average (general health) and Below average (mental health)
Groups who suffer discrimination or other social disadvantage	People classified as disabled under the Equality Act	Below Average
	Refugee groups	Unknown
	People seeking asylum	Unknown
	Single parent families	Unknown
	Religious groups	Above Average
	Lesbian, gay and bisexual people	Below Average
	Transgender people	Above Average
	Black and minority ethnic groups	Above Average
Geographical Groups	People living in areas known to exhibit poor economic and/or health indicators	Average

Embedded environmental measures

9.6.17 The Proposed Development would incorporate a number of environmental measures to avoid or reduce likely significant effects. This approach is described in **Chapter 5: Approach to the EIA**.

9.6.18 This section describes the environment measures that the Applicant proposes to implement to manage the effects of the Proposed Development, including those that are an inherent part of the design.

9.6.19 Embedded and additional environmental design measures and mitigation that are particularly relevant to human health are set out in **Table 9.25**, **Table 9.26** and **Table 9.27**.

Table 9.25 Embedded noise and vibration environmental measures for the construction phase

Environmental measure	Additional Reference
Longford Noise Barrier A 5m to 7m high noise barrier is proposed. This barrier will run to the south of Longford Village running along Wright Way before extending around the boundary of the Heathrow Terminal 5 Pod Car Park. The noise barrier location is shown in **Figure 7.3** (**Volume IV**). The barrier is designed to mitigate aircraft 'ground' noise at NSRs in Longford. It is proposed that the barrier be constructed in advance of any construction activities on the airfield. This will provide acoustic screening and mitigation with respect to construction noise during the '09L infrastructure' construction works. The noise barrier design has been refined in coordination with other disciplines (landscape and visual, ecology and flood risk) to reduce the potential for other environmental effects occurring as a result of its construction.	
Construction Environmental Management Plan (CEMP) Significant construction noise effects on health and quality of life as well as in EIA terms will be managed and minimised through a CEMP and through the submission of Section 61 application(s) to secure the noise mitigation and management approach during the construction phase. Where identified through the CEMP/Section 61 process, construction noise monitoring will be carried out to ensure that impacts are managed and minimised as far as practicable by enabling the prompt response to any exceedances of noise limits and the adjustment of working methods accordingly. The requirement for a CEMP will be secured by a planning condition, to ensure that best practicable means (BPM) mitigation measures are employed.	**Construction Environmental Management Plan** **Appendix 7.4: Construction Noise and Vibration**
Section 61 applications under the Control of Pollution Act 1974 Higher impact construction activities will be controlled through a Section 61 application process. This approach allows for some flexibility in construction noise management and would allow London Borough of Hillingdon LBH to scrutinise the proposed construction methodology and mitigation approach to ensure noise is being kept as low as practically possible during higher impact activities. Importantly, it is common for this process to lead to construction noise being further reduced.	**Appendix 7.4: Construction Noise and Vibration**
Night-time off-site disposal assessment and mitigation In respect of the off-site disposal of construction waste at night, several candidate locations have been identified, with potential impacts only anticipated near the	**Appendix 7.4: Construction**

Environmental measure	Additional Reference
disposal site once away from the strategic road network. The final site will be selected once a contractor is appointed. The CEMP includes the requirement for a review of the construction traffic route and an assessment of the construction traffic noise effects. Where noise impacts are significant, alternative approaches will be adopted, such as temporary stockpiling of materials at night for subsequent disposal during the day.	**Noise and Vibration**

Table 9.26 Embedded noise and vibration environmental measures for the operational phase

Environmental measure	Additional Reference
Longford Noise Barrier Designed to mitigate aircraft 'ground' noise at NSRs in Longford. The 'Longford Noise Barrier' will be constructed in advance of any construction activities on the airfield in respect of '09L infrastructure' construction works to provide inherent noise screening benefits to NSRs during that construction phase. The noise barrier design has been refined in coordination with other disciplines (landscape and visual, ecology and flood risk) to minimise aircraft 'ground' noise impacts as far as is practical and sustainable. The noise barrier location is shown in **Figure 7.3** (**Volume IV**).	**Chapter 3: Description of the Proposed Development** **Appendix 7.4: Construction Noise and Vibration** **Appendix 7.6: Ground Noise**
Predictable Respite through Easterly Runway Alternation The overriding design intent of the Proposed Development is to distribute noise more fairly around the Airport and extending the benefits of runway alternation to communities under the flight paths during periods of easterly winds. Upon completion of the Proposed Development, easterly alternation would be adopted in the same manner as westerly alternation is currently provided (i.e. easterly runways (either runway 09L (northern runway) or runway 09R (southern runway) are designated as the arrival runway and used for the majority of landings from 06:00 to 15:00hrs local time; and the other from 15:00hrs local time until after the last departure for the day's schedule). The benefits of runway alternation would be to provide affected communities with a predictable break from or reduction in aircraft noise (respite). **Figure 7.22** (**Volume IV**) illustrates the locations that would experience predicable respite due to the Proposed Development. Notably the Prosed Development proposes no changes to night-time runway alternation (this being from the time after the last departure until 06:00hrs).	**Chapter 3: Description of the Proposed Development** **Appendix 7.5: Air Noise** **Appendix 7.6: Ground Noise**

Environmental measure	Additional Reference
Revision to the QNS Eligibility Boundary The existing eligibility boundary for Heathrow's QNS is based on a 2026 noise forecast without easterly alternation in place. The Proposed Development has the potential to change the locations and relevant receptors as a result of them being exposed to summer average daytime and night-time noise levels of 63 dB $L_{Aeq,16hr}$ and 55 dB $L_{Aeq,8hr}$ in 2028. In line with the QNS, where the Proposed Development results in locations becoming exposed to levels of 63 dB $L_{Aeq,16hr}$ and 55 dB $L_{Aeq,8hr}$ in 2028 that are not already captured by the existing QNS eligibility boundary, the boundary of the QNS will be updated to reflect the impact of the Proposed Development. Although the QNS eligibility boundary is also informed by the location of a one additional awakening contour for operations between 04:30 and 06:00 and the extent of the 90 dB SEL contour for an A380 arrival, these elements of the QNS eligibility boundary will not change due to the Proposed Development. Where this occurs, residential dwellings will be eligible for the same benefits as those in the existing QNS boundary, i.e.100% funding of noise insulation costs subject to a maximum expenditure of £34,000 per dwelling.	**Appendix 7.5: Air Noise**

Table 9.27 Additional Noise Mitigation Measures for the Operational Phase

Measures
Easterly Alternation Noise Mitigation Package – Residential Dwelling Insulation Heathrow has prepared a package of mitigation for residential dwellings forecast to experience significant increases in air noise of 3 dB $L_{Aeq,16hr}$ or more leaving them exposed to at least 54 dB $L_{Aeq,16hr}$ due to Easterly Alternation. This mitigation package is designed to provide financial assistance towards the costs of noise insulation for households that do not already qualify for insulation measures under the QNS. This scheme is based on the emerging policy as set out in Aviation 2050. The amount of financial assistance to be provided will be tiered dependent on the forecast level of aircraft air noise exposure due to the Proposed Development, as indicated below.

Air Noise Exposure due to the Proposed Development	Offer of financial assistance towards noise insulation
54 – 60 dB $L_{Aeq,16h}$ and a ≥ 3 dB increase	Fixed Contribution of £3,000
60 – 63 dB $L_{Aeq,16h}$ and a ≥ 3 dB increase	Contribution of up to £12,000 to be determined following an independent survey and assessment

Easterly Alternation Noise Mitigation Package – Schools Insulation

Heathrow will offer a package of bespoke insulation and ventilation to:

Measures
(a) **those schools that are forecast to become eligible for noise insulation under the QNS** as a result of **the Proposed Development, namely Littlebrook Nursery and Khosla House; and** (b) those **school**s that are **forecast to experience significant increases in air noise of 3 dB $L_{Aeq,16hr}$ or more** leaving them **exposed to at least 54 dB $L_{Aeq,16hr}$** as a result of **the Proposed Development**, namely Cranford Community College and Cedars Primary School**.** Works provided under this package of mitigation will be capped at a total value of £2.5m per school with the actual amount offered to be determined following independent survey and assessment.
Easterly Alternation Noise Mitigation Package – Noise Induced Vibration In addition to any eligibility under the QNS, Heathrow will offer additional funding of up to £10,000 to all households within 500m of aircraft start of roll at Runway 09L. This additional funding is to provide households with assistance towards the costs of mitigating the effects of noise induced vibration and will be most effective for dwellings with lightweight structures attached to their main residence. Additional measures that may be available through this funding include strengthening of reinforcing structural elements such as raised floors.
Easterly Alternation Noise Mitigation Package – Parks and Gardens Heathrow will make a financial contribution of up to £250,000 in total towards the enhancement of those parks and gardens which are forecast to experience an adverse likely significant effect on a 'wide' scale as a result of the Proposed Development, namely Berkeley Meadows, Avenue Park and Cranford Park. The enhancement measures for which the financial contribution will be used will be discussed and agreed with the relevant authorities. Furthermore, Heathrow will proactivity engage with authorities to ensure that the runway alternation schedule is available and accessible so that potential visitors are aware of when these areas would be overflown during both easterly and westerly operations. This will be primarily achieved online through Heathrow's website.
Extension to Home Relocation Assistance Scheme Where the Proposed Development results in a residential dwelling being exposed to a summer average daytime noise exposure level of 69 dB $L_{Aeq,16hr}$ but outside of the HRAS eligibility boundary (which is based on a 2019 69 dB $L_{Aeq,16hr}$ contour) eligibility to HRAS will be extended.

9.7 Assessment of likely effects

Construction phase

Noise and Vibration Public Health Implications

Approach

9.7.1 This section focuses on the public health implications of construction noise and vibration directly affecting populations due to the Proposed Development. Consideration is given

to the threshold levels of LOAEL and SOAEL, which are set out in **Table 7.11** of **Chapter 7: Noise and Vibration**, as well as other contextual commentary and metrics in **Chapter 7: Noise and Vibration**.

Effect pathways and health outcomes

9.7.2 Exposure to high levels of noise can affect people's health and it has been linked to a number of health outcomes, such as cardiovascular and metabolic effects, poor sleep and annoyance in adults, as well as cognitive impairment in children[77]. Exposure of noise above 45 dB at night brings increased risk of hypertension, and this leads to increased risk of hypertensive stroke and dementia[78]. Further noise literature that has general relevance to construction effects is discussed in more detail within the operational noise effects assessment section.

9.7.3 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- the source is construction noise and vibration;
- the pathway is pressure waves through the air and ground; and
- receptors are residents, visitors and people working in the local communities near the Airport.

Populations affected

9.7.4 The population groups relevant to this assessment relate to the areas of effect set out in **Chapter 7: Noise and Vibration Figure 7.3.1** (**Volume IV** of the Environmental Statement), which indicatively correspond with HSSSA 7, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**.

9.7.5 The health assessment has particular regard to the sub-population vulnerable due to: young age, old age, low-income, poor health, social disadvantage or access and geographical factors.

Sensitivity of population

9.7.6 The population sensitivity is informed by the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the

[77] European Environment Agency (2019) *Unequal exposure and unequal impacts: social vulnerability to air pollution, noise and extreme temperatures in Europe, No.22/2018.* [online]. Available at: https://www.eea.europa.eu/publications/unequal-exposure-and-unequal-impacts [Accessed: 09 October 2024].

[78] Civil Aviation Authority (2013) *ERCD Report 1208: Aircraft Noise, Sleep Disturbance and Health Effects: A Review*. [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/ercd-report-1208/ [Accessed: 09 October 2024].

vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.7 The sensitivity of the general population is considered **low**. The general population comprise those members of the community in good physical and mental health, and with resources that enable a high capacity to adapt to change. Additionally, most people live, work or study at a distance from the construction works where construction activities would be unlikely to be a source of concern, disruption or disturbance.

9.7.8 The sensitivity of the vulnerable sub-population is considered **high**. The sub-population more sensitive to noise includes children, elderly and those receiving care due to poor health. This sub-population may experience existing widening inequalities due to living in areas with increased noise and elevated deprivation, with limited capacity to adapt to changes. Vulnerability particularly relates to those living close to construction activities, including those spending more time in affected dwellings, e.g., due to low economic activity, shift work or poor health. People who are concerned or have high degrees of uncertainty about noise and its effect on their wellbeing may be more sensitive to changes in noise.

Health noise effect characterisation

9.7.9 **Chapter 7: Noise and Vibration** concludes that night time construction of the Longford Noise Barrier, would result in exceedances of SOAEL at four residential receptors during the night-time noise barrier construction works along Wright Way. There would be no exceedances of SOAEL during the daytime noise barrier construction works around the Terminal 5 Pod Parking. Night-time 09L airfield infrastructure works would result in exceedances of SOAEL at two residential receptors. There would be no exceedances of SOAEL during the daytime 09L airfield infrastructure works.

9.7.10 **Chapter 7: Noise and Vibration** describes the approach to mitigation, which includes the CEMP and Section 61 applications. The combination of refined construction plans and implementation of QNS mitigation at relevant receptors prior to commencement of construction works would reduce the levels of noise exposure experienced.

9.7.11 Construction would be phased, with the first phase of work on the noise barrier anticipated to commence mid-2025 and all works are anticipated to be complete by mid-2027. A significant proportion of the construction is anticipated to be carried out during weekdays. However, there may be some weekend and bank holiday working. Dayshifts would occur with work carried out between 07:30 and 17:30, while night shifts would occur between 23:00 and 05:30.

Magnitude of health effect

9.7.12 The following conclusions on the magnitude of construction noise effects are reached. These have been made with reference to **Chapter 7: Noise and Vibration Table 7.9** on the nature and duration of activities and **Table 7.33**, **Table 7.34**, **Table 7.35** and **Table 7.36** on the predicted noise level of each Activity and its phases.

9.7.13 For public health, the magnitude of construction change due to the Proposed Development is **low to negligible**. In terms of population health, whilst **Chapter 7: Noise**

and Vibration predicts some exceedances of thresholds, these relate to a small number of dwellings close to the Airport. Whilst there would be some annoyance associated with the construction activities, the greatest effects relate to the installation of the Longford Noise Barrier, a measure that will bring community benefits. Health outcomes are likely to predominantly relate to a moderate change in quality of life, or a very minor change in risk factors for cardiovascular or mental wellbeing morbidity for very few people. The changes would be of frequent construction related noise exposures over a short- to medium-term duration. Annoyance related health outcomes would be expected to reverse rapidly on completion of the works. No healthcare service implications as a result of construction noise and vibration are anticipated.

Significance of population health effect

9.7.14 For public health the temporary construction effects have the potential for minor adverse health effects, including in relation to vulnerable sub-populations. The effect is characterised as being adverse in direction, direct, short- to medium-term. Although the scientific literature indicates a clear association between elevated and sustained noise and vibration disturbance and reduced health outcomes, the temporary changes would result in a very limited effect in the health baseline of the population. The distribution of effects is not expected to affect health inequalities. The level of effect is not expected to affect the ability to deliver local or national health policy.

9.7.15 The context of the initial works to construct the new Longford Noise Barrier having a protective effect on the neighbouring community for subsequent construction activities on the airfield, as well as benefits during operation, is noted and may mediate community attitudes to the disturbance inherent in constructing that barrier.

9.7.16 The noise and vibration impacts from construction activities and associated construction traffic will be mitigated through the use of best practice measures set out in the Construction Environmental Management Plan, as well as Section 61 controls for construction activities where **Chapter 7: Noise and Vibration** identifies significant effects. The expectation is that such measures, including measures that refine the construction methods and programme, as well as clear communication with the occupiers of affected dwellings with regards to the timings and durations of disturbance, will further reduce effects. It is expected that such measures would reduce the population health effect to **negligible adverse** (not significant).

Physical Activity, Open Space and Recreation Public Health Implications

Approach

9.7.17 This section focuses on the public health implications of the Proposed Development's construction noise, vibration, air quality and visual changes affecting people's ability or inclination to undertake physical and recreational activities.

9.7.18 Consideration is given to the threshold levels of LOAEL and SOAEL, which are set out in **Chapter 7: Noise and Vibration** **Table 7.11**, as well as other contextual commentary and metrics in **Chapter 7: Noise and Vibration**. Similarly, consideration has been given to **Chapter 6: Air Quality** **Section 6.7** which sets out predicted annual mean

contributions of nitrogen dioxide (NO_2) and particulate matter (PM), including PM_{10} and $PM_{2.5}$.

9.7.19 The most relevant health study areas for these effects are HSSSA 7 and HSSSA 8.

Effect pathways and health outcomes

9.7.20 Access to green space and nature is also a key contributor to the quality of life and healthy living. Greenspace is a valued resource for physical activity and has been associated with reducing levels of stress across a range of social groups[79,80]. Exercising in natural, green environments creates greater improvements in adults' self-esteem than exercise undertaken in urban or indoor settings and has the potential to engage more active children in exercise[81].

9.7.21 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- the source is construction noise, vibration, air quality, and visual change;
- the pathway is exposures, disruption and disturbance in a context of recreation, physical activity and active travel; and
- receptors are residents in the local communities near the Airport making use of recreational routes and open spaces.

Populations affected

9.7.22 The population groups relevant to this assessment relate to the areas of effect set out in **Chapter 7: Noise and Vibration Figure 7.3.1** (**Volume IV** of the Environmental Statement), which indicatively correspond with HSSSA 7, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**. The **Chapter 6: Air Quality** study area for construction traffic shown in **Figure 6.1.5** (**Appendix 6.3**) has also been taken into account.

9.7.23 The health assessment has particular regard to sub-populations vulnerable due to: young age, old age, low-income, poor health, social disadvantage or access and geographical factors. This includes as users of routes and public open spaces.

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[79] Roe, J.J. *et al.* (2013) 'Green Space and Stress: Evidence from Cortisol Measures in Deprived Urban Communities', *International Journal of Environmental Research and Public Health*, 10(9), pp. 4086-4103.[online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3799530/ [Accessed: 15 October 2024].

[80] Matsuoka, R.H. and Kaplan, R. (2008) 'People needs in the urban landscape: Analysis of Landscape and Urban Planning contributions', *Landscape and Urban Planning*, 84(1), pp. 7-19. [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S016920460700240X [Accessed: 15 October 2024].

[81] Reed, K. *et al.* (2013) 'A repeated measures experiment of green exercise to improve self-esteem in UK school children', *PLoS ONE*, 8(7), p. e69176. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/23894426/ [Accessed: 15 October 2024].

9.7.24 The closest public rights of way are:

- The Y23 Byway that runs through the Colne Valley Heathrow Biodiversity Site to the west of Longford, approximately 300m west of the location of the new Longford Noise Barrier on Wright Way;
- The Y21 Footpath to the west of the Premier Inn London Heathrow, approximately 200m northeast of the most easterly part of the new Longford Noise Barrier at the Terminal 5 Pod Parking; and
- Physical activity (e.g. walking, jogging, running, wheeling or cycling) may also be undertaken on the pavements and roads of Bath Road, approximately 65m north of the Terminal 5 Pod Parking.

9.7.25 The closest public open spaces are:

- Longford Pocket Park also known as Peggy Bedford Heathrow Biodiversity Site, approximately 10m north of the Terminal 5 Pod Parking;
- Colne Valley Heathrow Biodiversity Site, approximately 80m west of Wright Way and Duke of Northumberland River beyond Stanwell Moor Road; and
- Heathrow Close Children's Playground, approximately 150m north of Wright Way and Duke of Northumberland River.

9.7.26 All these locations would primarily relate to construction of the new Longford Noise Barrier. The other on-airfield construction works are more distant and would also have their effects reduced once the new Longford Noise Barrier was in place.

9.7.27 More distant recreational areas are noted as included in the **Chapter 7: Noise and Vibration** **Figure 7.3.1** (**Volume IV** of the Environmental Statement) noise study area, such as Harmondsworth Moor, approximately 800m north of the Airport. Whilst effects at such distant locations have been considered, they are unlikely to be associated with the potential for significant public health effects due to distance and other noise sources, including the M25.

9.7.28 All of these areas are located within the London Borough of Hillingdon, where levels of physical activity in the population are significantly lower than both the regional and national averages for adults and children.

Sensitivity of population

9.7.29 The population sensitivity has had regard to the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.30 The sensitivity of the general population is considered **low**. The rationale is the same as set out in **paragraph 9.7.3**.

9.7.31 The sensitivity of the vulnerable sub-population is considered **high**. The sub-population more sensitive to behavioural change in physical activity, recreation and leisure includes children, elderly and those in poor health, particularly those with low levels of physical

activity and obesity. This sub-population may experience existing widening inequalities due to living in areas with construction disruption or disturbance and having limited alternatives or resources that enable them to adapt to changes.

Magnitude of health effect

9.7.32 The following conclusions on the magnitude of construction noise effects are reached. These have been made with reference to **Chapter 7: Noise and Vibration** **Table 7.9** on the nature and duration of activities and **Table 7.33**, **Table 7.34**, **Table 7.35** and **Table 7.36** on the predicted noise level of each Activity and its phases. Regard has also been given to the air quality effects reported in **Chapter 6: Air Quality** for NO_2, PM_{10} and $PM_{2.5}$, for the peak number of construction traffic movements in 2025 for off-site receptors.

9.7.33 Construction activities could result in users of these open spaces and routes potentially experiencing increased levels of visual disturbance, dust, noise and vibration which may make them less inclined to partake in activities in these areas or reduce their levels of enjoyment whilst undertaking recreational activities, and reduce their time spent in nature.

9.7.34 The greatest effects are expected to relate to construction of the new Longford Noise Barrier. As noted in **Chapter 7: Noise and Vibration** **Section 7.7**, this is predominantly a night-time activity and as such has limited potential to affect recreation, physical activity or active travel, which are activities predominantly undertaken during the day-time. Disturbance that reduced the likelihood of participation in recreation, physical activity or active travel the following day is also limited due to the transitory nature of the works. The greatest potential for effects relates to daytime noise barrier construction around Terminal 5 Pod Parking, which is expected to last 10 weeks (short-term) and is in proximity to Longford Pocket Park also known as Peggy Bedford Heathrow Biodiversity Site. Once the Longford Noise Barrier is in place it reduces the noise impacts of other construction works. The changes in air quality reported in **Chapter 6: Air Quality** for NO_2, PM_{10} and $PM_{2.5}$ are considered incremental and unlikely to have a discernible public health impact even accounting for non-threshold effects. **Chapter 10: Landscape and Visual Impact Assessment** concludes that visual impacts associated with the new Longford Noise Barrier would not be significant, including due to screening effects of vegetation and other buildings.

9.7.35 For public health, the magnitude of construction impacts on recreation, physical activity and active travel due to the Proposed Development is considered **negligible**. In terms of population health, whilst **Chapter 7: Noise and Vibration** predicts some localised effects, these relate to a small number of dwellings and predominantly night-time activities. The small scale of change in recreation, physical activity and active travel opportunity is likely to predominantly relate to a very minor change in quality of life, and very minor change in risk factors for cardiovascular and mental wellbeing morbidity outcomes for very few people. The changes would be of frequent construction related noise exposures over a short- to medium-term duration. Any effect on recreation, physical activity and active travel is not considered so great as to result in any lasting behavioural change at a population level. No healthcare service implications as a result of construction noise and vibration are anticipated.

Significance of population health effect

9.7.36 For public health the temporary construction effects on recreation, physical activity and active travel are considered to be very limited. The effect is characterised as being adverse in direction, direct and short- to medium-term. Although physical activity is a local public health priority and the scientific literature on the benefits of physical activity to health shows an established causal relationship; the scale of noise, dust and visual change due to the Proposed Development is very small, localised and temporary at locations and times relevant to recreation, physical activity and active travel. The change is unlikely to result in significant differential or disproportionate effects between the general population (low sensitivity) and the vulnerable sub-population (high sensitivity). Consequently, no widening of health inequalities would be expected, and no influence is expected on the ability to deliver local or national health policy.

9.7.37 The noise and vibration impacts from construction activities and associated construction traffic will be mitigated through the use of best practice measures set out in the Construction Environmental Management Plan, as well as Section 61 controls for construction activities where **Chapter 7: Noise and Vibration** identifies significant effects. It is expected that such measures would reduce the population health effect to **negligible adverse** (not significant).

Community Infrastructure Public Health Implications

Approach

9.7.38 There are impacts in the construction phase from noise, vibration, air quality and visual changes which may affect users of community facilities and infrastructure. This section focuses on the public health implications of such impacts, which are set out in **Chapter 7: Noise and Vibration Section 7.7**. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**.

Effect pathways and health outcomes

9.7.39 Construction activities could result in community infrastructure users experiencing increased levels of visual disturbance, dust, noise and vibration. This includes facilities used by children and young people as well as those with special educational needs (SEN). Noise does not affect all children equally and pupils with autism are often very sensitive to specific types of noise[82]. Sound sensitivity is more prominent in younger children (aged between 2-6 years old). Throughout childhood it is normal for children to have a phase of increased reactions to new sounds[83]. The time taken for students to

[82] University College London (2021) *The impact of noise and soundscape on children with autism in schools*. [online] Available at: https://www.ucl.ac.uk/bartlett/environmental-design/news/2021/dec/impact-noise-and-soundscape-children-autism-schools [Accessed: 15 October 2024].

[83] Gloucestershire Hospitals NHS Foundations Trust (n.d.) *Sound Sensitivity in Children*. [online] Available at: https://www.gloshospitals.nhs.uk/your-visit/patient-information-leaflets/sound-sensitivity-children-ghpi1602/ [Accessed: 15 October 2024].

recover from auditory disruptions shows that having high noise levels can impact adversely on students' ability to concentrate.

9.7.40 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- the source is construction noise, vibration, air quality and visual changes;
- the pathway is pressure waves through the air and ground; and
- receptors are workers at and users of community infrastructure in the local communities near the Airport.

Populations affected

9.7.41 The population groups relevant to this assessment relate to the areas of effect set out in **Chapter 7: Noise and Vibration Figure 7.3.1** (**Volume IV** of the Environmental Statement), which indicatively correspond with HSSSA 7, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**.

9.7.42 The health assessment has particular regard to the sub-population vulnerable due to: young age, old age, low-income, poor health, social disadvantage or access and geographical factors.

9.7.43 The closest community infrastructure facilities used by the affected population are:

- Littlebrook Nursery, adjacent to the north of the Terminal 5 Pod Parking;
- Green Corridor Special Education School, approximately 500m northwest of southern runway (09R), and around 100m west of the Airport at its closest; and
- Heathrow Special Needs Centre, approximately 250m northwest of northern runway (09L).

9.7.44 The Heathrow Special Needs Centre includes outdoor education, horse riding, sensory gardens and animal care facilities. Construction activities may make users less inclined to partake in activities in these areas or reduce their levels of enjoyment whilst undertaking recreational activities, and reduce their time spent in nature.

9.7.45 Impacts at all these locations would primarily relate to construction of the new Longford Noise Barrier. The other on-airfield construction works are more distant and would also have their effects reduced once the new Longford Noise Barrier was in place.

Sensitivity of population

9.7.46 The population sensitivity has had regard to the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.47 The sensitivity of the general population is considered **low**. The rationale is the same as set out in **paragraph 9.7.3**. The general population includes workers at and users of

community infrastructure that is sufficiently distant from the construction activities that any exposures, disturbance or disruption would be unlikely to affect the use or quality of services delivered at those locations.

9.7.48 The sensitivity of the vulnerable sub-population is considered **high**. The sub-population more sensitive to noise, vibration, air quality and visual changes includes service users such as children, elderly, those receiving care due to poor health and those with a physical or intellectual disability, or neurodiversity associated with highted sensitivity to visual or auditory stimuli. This sub-population also includes carers and service providers who are affected by the extent to which service users use and benefit from the community infrastructure. Those reliant on services offered at community infrastructure, particularly those with fewer resources to adapt to changes, are considered vulnerable. People who are concerned or have high degrees of uncertainty about how emissions, disturbance or disruption may affect their wellbeing are also considered vulnerable.

Magnitude of health effect

9.7.49 The following conclusions on the magnitude of construction noise effects are reached. These have been made with reference to **Chapter 7: Noise and Vibration** **Table 7.9** on the nature and duration of activities and **Table 7.33**, **Table 7.34**, **Table 7.35** and **Table 7.36** on the predicted noise level of each Activity and its phases. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**.

9.7.50 For public health, the magnitude of construction change due to the Proposed Development is **negligible**. The construction works are predominantly night-time works so would have a *negligible* scale of change for users of community infrastructure that operated during the daytime. The greatest potential for effects relates to daytime noise barrier construction around Terminal 5 Pod Parking, which is expected to last 10 weeks (short-term) and is in proximity to Littlebrook Nursery. Health outcomes are likely to predominantly relate to a *minor* change in *quality of life*, or a *very minor* change in physical or mental wellbeing *morbidity* for *very few people*. The changes would be of *occasional* daytime construction related noise exposures over a *short- to medium-term* duration. *No* healthcare service implications as a result of construction impacts to community facilities are anticipated.

Significance of population health effect

9.7.51 The effect is characterised as being adverse in direction, direct, short- to medium-term. Although the scientific literature indicates a *clear* association between elevated and sustained exposures to noise, vibration, air quality and visual disturbance and reduced health outcomes, the occasional and temporary nature of the daytime works when community facilities were open would result in a *very limited* effect in the health baseline of the population. Although potentially affecting more vulnerable service users, the nature and timing of impacts means there are *not* expected to be implications for health inequalities. The level of effect is *not* expected to affect the ability to deliver local or national health policy.

9.7.52 As described in **Chapter 7: Noise and Vibration**, the construction impacts and associated construction traffic would be mitigated through the use of appropriate construction hours and best practice measures set out in the Construction Environmental Management Plan, including Section 61 controls as appropriate. For public health the construction effects are considered to be of **negligible adverse** (not significant).

Monitoring

9.7.53 Consistent with guidance[2], as no significant adverse population health effects are anticipated, and as this conclusion is not predicated on the effectiveness of novel or atypical mitigation measures, it is not considered proportionate to undertake health related monitoring.

9.7.54 However, precursors to health effects will be monitored within other chapters including **Chapter 6: Air Quality** and **Chapter 7: Noise and Vibration**.

Operational phase

9.7.55 The following context to assessing the public health implications is noted:

- The decision by the Government to end the Cranford Agreement was taken in 2009, so the changes are not unexpected for the affected population. The ending of the Cranford Agreement is fundamentally about a more equitable distribution of exposures around the Airport, including predicable respite periods. It remains the case that there are overall benefits in the way exposures are distributed.
- In considering the public health implications it is relevant to emphasise that the changes affect a relatively small proportion of the operational activities of the Airport. The changes would be limited to the alternation periods during the northern runway (09L) departures and (09R) arrivals which, based on current trends in modal split, would occur for around 10% of the time during the summer, and around 14% over the course of a year.
- It is also relevant to note that there is no change in the ATM cap at Heathrow as part of the Proposed Development, albeit the types of aircraft would vary as fleet continue to modernise. The increases in exposures in one area therefore have a near simultaneous corresponding reduction in exposures in other areas. I.e. For departures, the same plane simply takes off from a different runway in the same direction at a similar time.
- The population effects therefore relate to changes in exposures associated with the frequency of use of existing departure and arrival routes. Albeit the assessment conservatively considers some areas, and therefore populations, are newly affected as the nature and distribution of the exposures does change.
- The redistribution of effects, whilst relatively balanced has some nuances, and these are discussed in this chapter. This includes weighing the public health implications of a relatively smaller benefits to a population who were adversely affected under the Cranford Agreement; compared to relatively larger adverse effects to a

population who were benefiting under the Cranford Agreement. The role of mitigation for those newly adversely affected is also discussed.

Air quality Public Health Implications

Approach

9.7.56 This section focuses on the public health implications of changes, beneficial and adverse, in the distribution of for NO_2, PM_{10} and $PM_{2.5}$ air pollutants due to the Proposed Development. The discussion is with reference to the analysis and thresholds set out in **Chapter 6: Air Quality**.

9.7.57 Whilst the potential for changes in air quality across a wide area have been considered, as explained in **Chapter 6: Air Quality**, the nature of the Proposed Development means that the air quality changes are in fact highly localised to the areas close to the Airport. These effects relate to take-off effects in the vicinity of the western end of the runways (where take-off roll commences under easterly operations). Landings have a reduced effect as typically planes land midway down the runway and the surrounding airfield provides a sufficient area for dispersion to concentration levels experienced without the Proposed Development.

9.7.58 Whilst the literature supports there being thresholds set for health protection purposes, it also acknowledges that for both $PM_{2.5}$ and NO_2 there is no identifiable threshold below which there is no risk to health [84].

9.7.59 The differences in terminologies and legal compliance requirements between air quality 'standards', 'objectives', 'limit values' and 'target values' are noted [84].

- Air Quality Standards are concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment.
- An Objective is the level set in regulations under the Local Air Quality Management regime, which may allow a certain number of exceedances of a Standard. The objective is a duty for the Local Authority and accounts for practicalities of economic and technical feasibility.
- Limit values are EU Air Quality Directive derived parameters that are legally binding parameters transposed into UK law. Limit values relate to a programme of national monitoring and a national level duty.
- Target values are similar to limit values and it is the duty of the Secretary of State to ensure that the targets are met by the specified date. As with limit values the targets relate to a programme of national monitoring and a national level duty. These include

[84] Department for Environment, Food and Rural Affairs (2023) *Environmental Improvement Plan 2023*. [online] Available at: https://www.gov.uk/government/publications/environmental-improvement-plan [Accessed: 15 October 2024].

the new $PM_{2.5}$ annual mean concentration targets in England for 2028 (12 µg/m^3; policy interim target) and 2040 (10 µg/m^3; statutory target).

- In addition, the GLA has set a policy target for annual mean $PM_{2.5}$ of 10 µg/m^3 to be met across London by 2030.

9.7.60 For the public health assessment, the relevant consideration is compliance with pollutant levels that have been set by the jurisdiction to indicate an acceptable level of health protection, as measures at a local level. In most cases this relates to the UK Government's Air Quality Objectives.

9.7.61 Health in EIA guidance[2,4] indicates that the assessment should give the public confidence in thresholds set by government for the purpose of health protection having taken into account other social, economic and environmental considerations. The guidance directs discussion to considering the extent to which regulatory or statutory limit values would be met. In this context, where non-threshold health effects may occur, there should be a discussion about "*what is acceptable for the jurisdiction*" (emphasis added).

9.7.62 The Government notes that "*The standards are based on assessment of the effects of each pollutant on human health including the effects on sensitive subgroups*" [85].

9.7.63 Section 9.2 sets out the relevant policy context which includes the NPPF paragraph 192 direction that planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants.

9.7.64 The health assessment takes into account the non-threshold nature of air pollutants, including having regard to WHO guidelines and how the air quality chapter modelling results compare to them. The 2021 WHO guidelines and interim targets are not referenced in national, regional or local policies. The 2021 values remain a relevant public health contextual consideration; however, the national objectives are the more relevant benchmark for informing an assessment of significance in the context of a UK planning determination. This approach aligns with Government policy, as well as EIA and HIA good practice [84].

9.7.65 **Chapter 6: Air Quality**, **Section 6.2**, discusses the implications of the new $PM_{2.5}$ annual mean concentration targets in England for 2028 (12 µg/m^3) and 2040 (10 µg/m^3). As noted in that chapter there is currently no planning guidance on how such targets should be assessed or met. The London Environment Strategy GLA[86] target to achieve an annual mean $PM_{2.5}$ concentration of 10 µg/m^3 by 2030 is also noted. These sources indicate a direction of travel within national health protection standards to a 10 µg/m^3 annual mean for $PM_{2.5}$. This level is consistent with the 2005 WHO recommendation, but

[85] Department for Environment, Food and Rural Affairs and Department for Transport (2017) *UK plan for tackling roadside nitrogen dioxide concentrations*. [online] Available at: https://assets.publishing.service.gov.uk/media/5a823aca40f0b6230269b873/air-quality-plan-overview.pdf [Accessed: 15 October 2024].

[86] Greater London Authority (2018) *London Environment Strategy*. [online] Available at: https://www.london.gov.uk/sites/default/files/london_environment_strategy_0.pdf [Accessed: 15 October 2024].

twice that of the WHO 2021 guideline of 5 µg/m^3; but is equal to the fourth and last of WHO 2021's interim targets for $PM_{2.5}$ (the other interim targets are 35 µg/m^3, 25 µg/m^3 and 15 µg/m^3).

9.7.66 In accordance with the aforementioned guidance, the assessment of health significance is with reference to air quality concentration levels set for the purpose of health protection by the Government. WHO air quality guideline values are referenced as an aspirational target. Relevant assessment criteria applicable to human health are set out in **Chapter 6: Air Quality Table 6-4**. **Table 9.28** below summarises relevant parameters. **Chapter 6: Air Quality** (paragraph 6.5.11) discusses short-term exposures and the basis on which these would be met given compliance well within annual mean exposures.

Table 9.28 Air quality parameters – annual mean exposures

Pollutant (µg/m^3)	Standard	Objective	Limit value	Target	WHO 2005	WHO 2021
NO_2	40	40	40	-	40	10
PM_{10}	40	40	40	-	20	15
$PM_{2.5}$	20	-	20	12* 10**	10	5***

Notes:

* 2028 interim target, national

** 2040 target, national & 2030 target, GLA

*** Interim targets: 35 µg/m^3, 25 µg/m^3, 15 µg/m^3 and 10 µg/m^3.

Effect pathways and health outcomes

9.7.67 The scientific literature identifies the following general points relevant to potential exposures and health outcomes. The main health outcomes are likely to relate to increased risk of cardiovascular and respiratory related conditions or events (including reduced lung function, hypertension and myocardial infraction) (i.e., due to fine PM and NO_2 interacting within the body), as well as general measures of population mortality and hospital service use (e.g. emergency department visits). Such outcomes relate generally to long-term ambient exposure, but may also be affected by short-term exposure peaks, e.g. due to meteorological conditions reducing normal levels of pollutant dispersion.

9.7.68 Environmental air pollution is associated with increased risk of respiratory and cardiovascular diseases. Environmental pollution exerts its detrimental effects on the heart by developing pulmonary inflammation, systemic inflammation, oxidative stress, endothelial dysfunction and prothrombotic changes[87]. The adverse effects on health of

[87] Meo, S.A. and Suraya, F. (2015) '*Effect of environmental air pollution on cardiovascular diseases*', *European Review for Medical and Pharmacological Sciences*, 19(24), pp. 4890-4897. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/26744881/ [Accessed: 15 October 2024].

PM and NO_2 indicate that the effects can occur at air pollution concentrations lower than those in guidelines[88]. Long term exposure to particulate matter is associated with incidence of coronary events, and this association persists at levels of exposure below the current limits[89]. The magnitude of the long-term effects of NO_2 on mortality is at least as important as that of $PM_{2.5}$.

9.7.69 Age is the most consistent effect modifier of the association between short-term exposure to particulate matter and death and hospitalisation, with older persons experiencing higher risks. In addition to physiological changes that accompany age, older persons likely have different indoor/outdoor activity patterns, occupational exposures, and social networks. The very young may also be susceptible. Children face higher risks because their biological systems are under development, they breathe more air per body weight than adults, and they typically spend more time outdoors[90]. Those with lower socio-economic status (SES) face higher particulate matter associated risks, although there is only limited/suggestive evidence for modification by educational level, income, and employment status. SES could modify particulate matter associated health risks through differences in access to health care, baseline health status, occupational exposures, and nutrition[90]. The evidence suggests adverse effects of ambient air pollutants exposure (especially for PM) on type 2 diabetes and that people with diabetes might be more vulnerable to air pollutants exposure[91,92]. Elevated air pollution episodes across a wide area are significantly associated with an increase in ambulance transfer data, including those for cardiac arrest, all-respiratory, and asthma transfers[93].

9.7.70 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

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[88] World Health Organisation (2021) *Review of evidence on health aspects of air pollution: REVIHAAP project: technical report*. [online] Available at: https://www.who.int/europe/publications/i/item/WHO-EURO-2013-4101-43860-61757 [Accessed: 15 October 2024].

[89] Cesaroni, G. *et al.* (2014) 'Long term exposure to ambient air pollution and incidence of acute coronary events: prospective cohort study and meta-analysis in 11 European cohorts from the ESCAPE Project', *BMJ.*, 348, p. f7412-f7412. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/24452269/ [Accessed: 15 October 2024].

[90] Bell, M. *et al.* (2013) 'Evidence on vulnerability and susceptibility to health risks associated with short-term exposure to particulate matter: a systematic review and meta-analysis', *Am J Epidemiol.*, 178(6), pp. 865-876. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/23887042/ [Accessed: 15 October 2024].

[91] Yang, B-Y. *et al.* (2020) 'Ambient air pollution and diabetes: A systematic review and meta-analysis', *Environmental Research*, 180, p.108817. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/31627156/ [Accessed: 16 October 2024].

[92] Liu, F. *et al.* (2019) 'Associations between long-term exposure to ambient air pollution and risk of type 2 diabetes mellitus: A systematic review and meta-analysis', *Environmental Pollution*, 252(Pt B), pp. 1235-1245. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/31252121/ [Accessed: 16 October 2024].

[93] Sangkharat, K. *et al.* (2019) 'The impact of air pollutants on ambulance dispatches: A systematic review and meta-analysis of acute effects', *Environmental Pollution*, 254(Pt A), p. 112769. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/31419665/ [Accessed: 16 October 2024].

- the source is air pollutants (particularly NO_2, PM_{10} and $PM_{2.5}$) from aviation (air and ground) emissions;
- the pathway is transport and dispersion through the air; and
- receptors are residents, visitors and people working in the local communities near the Airport and its flightpaths.

Populations affected

9.7.71 The population groups relevant to this assessment focus on the areas of effect set out in **Chapter 6: Air Quality Figure 6.17** (**Appendix 6.3**), which indicatively correspond with HSSSA 7 and 8 (a best fit of relevant LSOAs), see **Figure 9.1** (**Appendix 9.2**):

- HSSSA 7: Departure on 09L (northern runway) west end, near Longford. Adverse effect with respect to NO_2 and beneficial effect with respect to PM. Health profiles are set out in **Section 9.4**.
- HSSSA 8: Departure on 09R (southern runway) west end, near Stanwell and Stanwell Moor. Beneficial effect with respect to NO_2 and adverse effect with respect to PM. Health profiles are set out in **Section 9.4**.

9.7.72 Regard to smaller degrees of change in the Local Health Study Area has also been taken into account.

9.7.73 The health assessment has particular regard to the sub-population vulnerable due to:

- Young age vulnerability (children and young people, including pregnant women).
- Old age vulnerability (older people).
- Low-income vulnerability (people living in deprivation, including those on low incomes may have fewer resources to adapt. Furthermore, those who are economically inactive may spend more time in affected dwellings).
- Poor health vulnerability (people with existing poor physical and mental health or physical or intellectual disability may spend more time in affected dwellings or be more sensitive to air pollutants).
- Social disadvantage vulnerability (spending more time at home may be linked to social isolation).
- Access and geographical vulnerability (people for whom close proximity to Proposed Development change increases sensitivity).

Sensitivity of population

9.7.74 The population sensitivity has had regard to the health baseline, including findings from the relevant Health and Wellbeing Strategies and Joint Strategic Needs Assessments, as set out in **Section 9.2**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.75 The general population sensitivity of HSSSA 7 and 8 are considered to be **medium**, reflecting proximity to the Airport and above average deprivation within Longford, Stanwell Moor and Stanwell. This group includes the majority of the population of these areas who live and work at distances from the Airport where **Chapter 6: Air Quality** identifies that they are unlikely to experience any discernible change in air quality due to the Proposed Development.

9.7.76 The sensitivity of vulnerable groups is considered **high**. This reflects the presence of populations who, while at work or at home, are likely to spend extended periods near to the air quality changes associated with the Proposed Development. Groups with generally higher sensitivity to air pollution include children and older people. Within these groups those with existing respiratory conditions, including asthma and COPD, may be particularly sensitive.

Magnitude of health effect

9.7.77 The following conclusions on the magnitude of health air quality effects are reached. These have been made with reference to **Chapter 6: Air Quality** **Section 6.7**, which predicts concentrations of NO_2, PM_{10} and $PM_{2.5}$ at relevant receptor locations for the 2028 assessment year in the Without Development and With Development scenarios. Detailed tables are set out in **Appendix 6.2**, **Table 6.2.6** to **6.2.8** for NO_2, **Table 6.2.9** to **6.2.11** for PM_{10} and **Table 6.2.12** to **6.2.14** for $PM_{2.5}$.

9.7.78 The **Chapter 6: Air Quality** assessment identified that the effects are localised, and discernible changes are confined to: HSSSA 7 (adverse effects associated with additional take-off commencements on the northern runway, but beneficial effects associated with reduced numbers of landings on the northern runway); and HSSSA 8 (beneficial effects associated with fewer corresponding take-off commencements on the southern runway, but adverse effects associated with increased numbers of landings on the northern runway).

9.7.79 Impacts on NO_2 are primarily due to emissions from aircraft engines on take-off, whereas impacts on PM are primarily due to wear from brakes and tyres on landing. The Proposed Development will increase take-offs and reduce landings on the northern runway and reduce take-offs and increase landings on the southern runway. The result is that, for the most part, any given receptor is likely to experience simultaneously adverse impacts with regard to one pollutant but beneficial impacts with regard to the other pollutant.

9.7.80 For effects in HSSSA 8:

9.7.81 In relation to NO_2 the scale of changes is **small and beneficial**.

- The greatest degree of decrease due to the Proposed Development in annual mean concentration of NO_2 at any relevant receptor is 1.1 µg/m^3.
- The highest predicted annual mean concentration of NO_2 in the 2028 With Development scenario at any relevant receptor in HSSSA 8 is 23.4 µg/m^3.

9.7.82 In relation to PM_{10} the scale of changes is **small and adverse**.

- The greatest degree of increase due to the Proposed Development in annual mean concentration of PM_{10} at any relevant receptor is 0.2 µg/m^3.
- The highest predicted annual mean concentration of PM_{10} in the 2028 With Development scenario at any relevant receptor in HSSSA 8 is 15.7 µg/m^3.

9.7.83 In relation to $PM_{2.5}$ the scale of changes is **small and adverse**.

- The greatest degree of increase due to the Proposed Development in annual mean concentration of $PM_{2.5}$ at any relevant receptor is 0.1 µg/m^3.
- The highest predicted annual mean concentration of $PM_{2.5}$ in the 2028 With Development scenario at any relevant receptor in HSSSA 8 is 8.3 µg/m^3.

9.7.84 For effects in HSSSA 7:

9.7.85 In relation to NO_2 the scale of changes is **small and adverse**.

- The greatest degree of increase due to the Proposed Development in annual mean concentration of NO_2 at any relevant receptor is 2.3 µg/m^3.
- The highest predicted annual mean concentration of NO_2 in the 2028 With Development scenario at any relevant receptor in HSSSA 7 is 22.7 µg/m^3.

9.7.86 In relation to PM_{10} the scale of changes is **small and beneficial**.

- The greatest degree of decrease due to the Proposed Development in annual mean concentration of PM_{10} at any relevant receptor is 0.2 µg/m^3.
- The highest predicted annual mean concentration of PM_{10} in the 2028 With Development scenario at any relevant receptor in HSSSA 7 is 16.2 µg/m^3.

9.7.87 In relation to $PM_{2.5}$ the scale of changes is **small and beneficial**.

- The greatest degree of decrease due to the Proposed Development in annual mean concentration of $PM_{2.5}$ at any relevant receptor is 0.1 µg/m^3.
- The highest predicted annual mean concentration of $PM_{2.5}$ in the 2028 With Development scenario at any relevant receptor in HSSSA 7 is 8.4 µg/m^3.

9.7.88 It is noted that the exact numbers depend on the weather conditions and the frequency of easterly operations. However, the values presented above are the greatest from the three years of meteorological data used in the air quality modelling.

9.7.89 Outside of HSSSA 7 and HSSSA 8, changes due to the Proposed Development will be smaller in magnitude. However, total concentrations are higher at certain locations outside these areas due to non-airport sources. For example, the highest predicted annual mean concentrations of PM_{10} and $PM_{2.5}$ in the 2028 With Development scenario at any relevant receptor across the air quality study area are 17.8 µg/m^3 and 9.2 µg/m^3 respectively, close to the M4 motorway.

9.7.90 The concentrations presented above represent the greatest values at any individual relevant location. These are not representative of population-level exposure. In particular, it should be noted that the population of Longford is smaller than that of

Stanwell and Stanwell Moor. To take this into account, the **Chapter 6: Air Quality** assessment has calculated the population-average change in exposure across the whole of the 9 km × 9 km air quality study area.

9.7.91 This shows that the overall net effect is a small decrease in population-average exposure to NO_2 of 0.01 µg/m^3, and a small increase in population-average exposure to PM_{10} and $PM_{2.5}$ of 0.002 µg/m^3, averaged across the 69,000 households in the air quality study area.

9.7.92 For public health the beneficial and adverse changes in NO_2, PM_{10} and $PM_{2.5}$ represents a *very low* change in exposure experienced *frequently* (i.e. during easterly operations) over the *long-term*. The small scale of change is likely to relate to a *very minor* change in morbidity and mortality related population health risk, e.g. associated with respiratory and cardiovascular health outcomes, for *a small minority* of the population. *No* healthcare service implication is expected. The overall public health effect is considered balanced. With **low to negligible** adverse and **low to negligible** beneficial magnitudes assigned.

Significance of population health effect

9.7.93 The majority of people living and working in the local authority areas around the Airport would experience no change. The effects of the Proposed Development are localised, and these have been assessed with reference to site-specific study areas (HSSSA 7 and HSSSA 8), as well as taking into account that there may be very minor changes in air pollution (beneficial and adverse) associated with flight paths beyond HSSSA 7 and HSSSA 8. It is noted that air pollution is a specific local public health priority.

9.7.94 The professional judgement is that there would be *very limited* changes in the health baselines of HSSSA 7 and HSSSA 8. Most receptors will experience either a beneficial effect with respect to changes in NO_2 exposure and an adverse effect with respect to changes in PM exposure, or vice versa. Regard has been given to the baseline context, the WHO 2021 advisory guidelines[94], the recently introduced $PM_{2.5}$ targets and to non-threshold effects. The health assessment conclusion reflects that there is a *very limited* scale of change in air pollutants due to the Project.

9.7.95 The significance of the population health effect would be **negligible** (**not significant**). The score notes that Government health protection standards for air quality are met. It also takes into account scientific evidence on the non-threshold health effects of NO_2, and $PM_{2.5}$, and acknowledges the relative health effects of the very slight increases and decreases in the different pollutants. Any effect on health inequalities or delivery of local or national public health policy would be at most *marginal*. This is a public health acknowledgement of the very small incremental contribution to air pollution that the Proposed Development would make, but also recognition that at the Proposed Development level this should not be considered a significant effect on population health or health inequalities.

[94] World Health Organisation (n.d.) *New WHO Global Air Quality Guidelines: More Pressure on Nations to Reduce Air Pollution Levels*.

Noise and Vibration Public Health Implications

Approach

9.7.96 This section focuses on the public health implications of changes, beneficial and adverse, in the distribution of noise due to the Proposed Development. The discussion is with reference to the analysis and thresholds set out in **Chapter 7: Noise and Vibration**, its appendices and figures, which sets out the primary analysis of direct effects of noise on health and quality of life. Key reference material is included in **Appendix 7.5: Air Noise** and **Figures 7.5.2 to 7.5.35** in **Volume IV** of the Environmental Statement.

9.7.97 Noise mitigation that has been taken into account by the public health assessment is set out in **Chapter 7: Noise and Vibration** **Table 7.31** and **Table 7.32**. This includes: the Longford Noise Barrier; Predictable Respite through Easterly Runway Alternation, Revision to the QNS (sound insulation scheme) Eligibility Boundary; and Easterly Alternation Noise Mitigation Package, including measures relating to Residential Dwelling Insulation and Noise Induced Vibration. The role of Heathrow's Home Relocation Assistance Scheme is also noted and taken into account.

9.7.98 The following without development (WoD) and with development (WD) figure pairs are relevant to the public health analysis. These focus on the impacts under easterly operations, which more clearly shows the change due to the Proposed Development. Daytime and night-time metrics are referenced, though it should be noted that there are limited night-time effects due to the Proposed Development. The more even distribution of impacts around the Airport underpinned the Government's rationale for ending the Cranford Agreement in 2009. This redistribution remains evident in the figures below:

- Comparing **Figure 7.5.23 WoD** and **Figure 7.5.23 WD** (**Volume IV** of the Environmental Statement) shows how daytime average noise ($L_{Aeq,16hr}$) is more evenly redistributed around the Airport with the Proposed Development. I.e. there is greater symmetry in how the noise is distributed around the Airport. Given the relatively similar population densities that now exist around the Airport (see **Figure 7.11** (**Volume IV** of the Environmental Statement)) such symmetry corresponds with more equal distribution of impacts on the population.
- Comparing **Figure 7.5.24 WoD** and **Figure 7.5.24 WD** (**Volume IV** of the Environmental Statement) shows how night-time average noise ($L_{Aeq,8hr}$) is more evenly redistributed around the Airport with the Proposed Development.
- **Figure 7.5.25** (**Volume IV** of the Environmental Statement) shows how the change due to the Proposed Development in daytime average noise ($L_{Aeq,16hr}$) is distributed. This is showing the change, which is the focus of analysis in **Chapter 7: Noise and Vibration** but, importantly, it is not showing the overall noise environment achieved by this change.
- **Figure 7.5.26** (**Volume IV** of the Environmental Statement) shows how the small change due to the Proposed Development in night-time average noise ($L_{Aeq,8hr}$) is distributed. This is also showing the change but, importantly, it is not showing the overall noise environment achieved by this change.

- Comparing **Figures 7.5.27 WoD** and **Figure 7.5.27 WD** (**Volume IV** of the Environmental Statement) shows how the size of the population who experience high numbers of daytime aircraft events (N65[95]) is both greatly reduced and is more evenly redistributed around the Airport with the Proposed Development.
- Comparing **Figures 7.5.28 WoD** and **Figure 7.5.28 WD** (**Volume IV** of the Environmental Statement) shows how night-time aircraft events (N60[96]) are more evenly redistributed around the Airport with the Proposed Development.
- **Figures 7.5.29** (**Volume IV** of the Environmental Statement) shows how the change due to the Proposed Development in daytime aircraft events (N65) is distributed. This is showing the change but, importantly, it is not showing the overall aviation event environment achieved by this change.
- **Figures 7.5.30** (**Volume IV** of the Environmental Statement) shows how the small change due to the Proposed Development in night-time aircraft events (N60) is distributed. This is showing the change but, importantly, it is not showing the overall aviation event environment achieved by this change.
- **Figures 7.5.35** (**Volume IV** of the Environmental Statement) shows that the change due to the Proposed Development in awakenings[97] is very low (up to plus or minus one awakening). A healthy adult briefly awakens about 20 times during an eight-hour night and most of these awakenings are too short to be remembered the next morning[100]. This is showing the change but, importantly, it is not showing the overall noise environment achieved by this change.
- **Figures 7.5.46 to 7.5.49** (**Volume IV** of the Environmental Statement) show a range of small areas that **Chapter 7: Noise and Vibration** discusses in relation to how the 'change' due to the Proposed Development relates to potentially likely significant effects (LSE) and consequent mitigation. Such LSEs are discussed in this public health assessment. The public health analysis also places these 'changes' in the context of the overall redistribution of noise around the Airport.

9.7.99 It should be noted that **Chapter 7: Noise and Vibration** identifies a number of significant adverse effects, particularly linked to the 'change' shown in **Figures 7.5.25** and **7.5.26** (**Volume IV** of the Environmental Statement) and the specific areas shown in **Figures 7.5.46 to 7.5.50** (**Volume IV** of the Environmental Statement). In this regard **Chapter 7: Noise and Vibration** and this public health chapter are complementary. **Chapter 7: Noise and Vibration** assesses the changes due to the Proposed Development against relevant noise criteria and degrees of noise change. In this public health assessment,

[95] The number of aircraft events above 65 dB L_{ASmax}.

[96] The number of aircraft events above 60 dB L_{ASmax}.

[97] In noise and health, biological awakenings as a reaction to a noise event are referred to as 'additional' awakenings: this reflects that all humans experience a number of spontaneous biological awakenings per night and studies assess how noise events relate to 'additional' awakenings beyond that expected for the individual.

any exceedances are also taken into account, but consideration is given to what these changes represent in terms of an overall redistribution of noise around the Airport.

9.7.100 In extending the analysis to reach population level health conclusions this section takes account of the **Chapter 7: Noise and Vibration** data on extent and degree of change in effects in average noise ($L_{Aeq,16hr}$ and $L_{Aeq,8hr}$) above the Significant Observed Adverse Effect Level (SOAEL), as well as changes that are anticipated to occur between the SOAEL and the Lowest Observed Adverse Effect Level (LOAEL). Supplementary and informative metrics discussed in **Chapter 7: Noise and Vibration**, such as N65, N60, Overflight L_{den}, L_{night}, $L_{Aeq,8hr}$ (alternation period), N65, 8hr (alternation period), Average L_{ASmax}, are also taken into account. **Figure 7.5.33** shows the change due to the Proposed Development in terms of L_{den} (a combined day-evening-night), a metric often used in the health literature, this is a sensitivity test within **Chapter 7: Noise and Vibration**. The figure shows there are only small shifts in the noise contours and that the changes in dB terms are essentially as shown in **Figure 7.5.29**, reflecting the changes are driven by daytime impacts.

9.7.101 Consistent with the analysis discussed in **Chapter 7: Noise and Vibration**, this health assessment is based on a comparison between the With Development and Without Development scenarios in 2028.

9.7.102 The health assessment makes reference to relevant site-specific populations, which are defined in **Section 9.4**. Within these populations, vulnerabilities to disproportionate noise effects are taken into account, including for example due to poor health, disability or age.

9.7.103 The effects of ground noise are noted and have also been considered but are less extensive and affect a subset of areas discussed in relation to air noise. The conclusions focus on air noise and take into account the ground noise contribution in localised areas close to the Airport. Ground noise is discussed in detail in **Chapter 7: Noise and Vibration** and predominantly relates to the community of Longford where the new noise barrier reduces exposures[98].

9.7.104 The significance of the population health effect has had regard to the following evidence sources:

- Scientific literature summarised from **paragraph 9.7.105** that indicates an established relationship between changes in noise and changes in health outcomes.
- Baseline population health indicators relevant to the areas of greatest noise change are set out in **Section 9.4**, further details are set out in **Appendix 9.1**. Relevant considerations for the two main pairings of effects (see the discussion of HSSSAs in **Section 9.4**) include:

[98] Daytime ground noise with or without Proposed Development does not exceed SOAEL at any residential receptor. At night, one residential receptor newly exceeds SOAEL and all residential receptors exceeding SOAEL are eligible under the QNS (and will likely have been insulated by legacy insulation schemes already). Such mitigations are expected to reduce effects within dwellings. No population level health effects are anticipated from ground noise.

- HSSSA 1 (adverse change) has a population of around 58,000 people and HSSSA 4 (beneficial change) around 93,000 people. Age profiles are relatively similar, although HSSSA 4 has a slightly greater proportion of children (22%) and older people (12.6%), compared to HSSSA 1 (20.6% and 11.4% respectively).
- General health in HSSSA 1 and HSSSA 4 are similar.
- HSSSA 1 has a lower proportion of households that are not deprived (34.9%) compared to HSSSA 4 (44.2%).
- 45.2% of the population in HSSSA 1 are South Asian which is notably higher than the proportion in HSSSA 4 (16.9%). This is linked to cardiovascular risk profile.
- 22.3% of households in HSSSA 1 have no people with English as their main language. This is two times higher than the proportion in HSSSA 4 which is 11.2%. Communicating mitigation in alternative languages is therefore a consideration.
- However, the proportion of those who are disabled under the Equality Act is slightly higher in HSSSA 4 (13.5%) than in HSSSA 1 (11.8%).
- HSSSA 5 (beneficial change) has a population of around 44,000 people and HSSSA 6 (adverse change) around 23,000 people. Across metrics the populations of HSSSA 5 and HSSSA 6 are similar.

- Health priorities that have been taken into account from a review of local JSNAs and HWSs, which are set out in **Section 9.4**.
- Health policy on the consideration of health in planning decisions and reference to use of national limit values as a refence point, as set out in **Section 9.2**.
- Consultation and engagement responses as outlined in **Section 9.3** and the **Statement of Community Involvement**.
- **Chapter 7: Noise and Vibration** describes how appropriate thresholds are set, including for LOAEL and SOAEL, see **Table 7.19**.
- Regard has also been had to WHO advisory guidelines[50,51] including the supporting systematic reviews[99], for example on sleep disturbance[100].
- **Appendix 7.5: Air Noise** sets out monetisation of health outcomes. This includes sensitivity tests (**Table 6.3** and **Table 6.4**). These show an overall beneficial effect of the Proposed Development, particularly when the exposure response functions

[99] Multidisciplinary Digital Publishing Institute (n.d.) *WHO Noise and Health Evidence Reviews*. [online] Available at: https://www.mdpi.com/journal/ijerph/special_issues/WHO_reviews [Accessed: 16 October 2024].

[100] Basner, M. and McGuire, S. (2018) 'WHO Environmental Noise Guidelines for the European Region: A Systematic Review on Environmental Noise and Effects on Sleep', *International Journal of Environmental Research and Public Health*, 15(3), p. 519. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/29538344/ [Accessed: 16 October 2024].

additionally account for mental health. **Appendix 7.5: Air Noise** also includes sensitivity tests using WHO Environmental Noise Guideline 2018 guideline values of 45 dB L_{den} and 40 dB L_{night} for highly annoyed (**Table 5.1**) and highly sleep disturbed (**Table 5.2**). These show that with the Proposed Development there are fewer people highly annoyed and fewer highly sleep deprived.

Effect pathways and health outcomes

9.7.105 The scientific literature identifies the following general points relevant to potential exposures and health outcomes. The main health outcomes relevant to this determinant of health are cardiovascular and cardio-metabolic, as well as mental health outcomes (e.g. stress, anxiety or depression relating to annoyance). Sleep disturbance, particularly associated with changes to night-time noise levels, has the potential to affect daytime functioning, physical health and mental health. Cognitive performance in children, particularly at school, is also a potential outcome.

9.7.106 Noise is an important public health issue. It has negative impacts on human health and well-being and is a growing concern. [122] Noise is pervasive in everyday life and can cause both auditory and non-auditory health effects[100]. Noise is linked to health outcomes such as annoyance, sleep disturbance, cardiovascular and metabolic disease, and cognitive impairment in schoolchildren[101]. Physiologically, noise leads to oxidative stress, vascular dysfunction, autonomic imbalance, and metabolic abnormalities[102].

9.7.107 In terms of mental health, wellbeing and quality of life, evidence from UK studies is mixed. The national Survey of Noise Attitudes 2014 failed to find associations between aircraft noise and self-reported health or the Warwick Edinburgh Mental Wellbeing Scale. A UK study using census data for people living around 17 airports and a measure of wellbeing, found that daytime aircraft noise was associated with wellbeing, but no association was found between night-time aircraft noise exposure and wellbeing. Another study from the UK using census data from around Belfast Airport failed to find an association between aircraft noise and self-reported mental health. Overall, the quality of evidence for aircraft and road traffic noise effects on physiological and psychological health outcomes in a UK context remains low-quality[103].

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[101] Peris, E. and Fenech, B. (2010) 'Associations and effect modification between transportation noise, self-reported response to noise and the wider determinants of health: A narrative synthesis of the literature', *Science of the Total Environment*, 748, p. 141040. [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0048969720345691 [Accessed: 16 October 2024].

[102] Münzel, T. *et al.* (2018) 'The Adverse Effects of Environmental Noise Exposure on Oxidative Stress and Cardiovascular Risk', *Antioxid Redox Signal.*, 28(9), pp. 873-908. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/29350061/ [Accessed: 16 October 2024].

[103] Clark, C. *et al.* (2020) 'Evidence for Environmental Noise Effects on Health for the United Kingdom Policy Context: A Systematic Review of the Effects of Environmental Noise on Mental Health, Wellbeing, Quality of Life, Cancer, Dementia, Birth, Reproductive Outcomes, and Cognition', *International Journal of Environmental Research and Public Health*, 17(2), p. 393. [online] Available at: https://www.researchgate.net/publication/338466472_Evidence_for_Environmental_Noise_Effects_on_Health_for_the_United_Kingdom_Policy_Context_A_Systematic_Review_of_the_Effects_of_Environmental_Noise_on_Mental_Health_Wellbeing_Quality_of_Life_Cancer_Dem [Accessed: 16 October 2024].

9.7.108 The circumstance of how noise is associated with health outcomes is also important. A WHO systematic review[100] found that when individuals were asked whether road, rail, or aircraft noise affected sleep, a significant increase in the odds of being highly sleep disturbed was found for a 10 dBA increase in outdoor noise levels for all sources. However, no significant increase was found when the noise source was not mentioned in the question. This suggests that for self-reported measures it is annoyance or attitude to the noise that may be driving the increase of reported disturbance. Whilst the literature supports there being thresholds at which effects (such as annoyance and sleep disturbance) are likely, it also acknowledges the subjective nature of responses to noise and the higher sensitivity and vulnerability of subsets of the population. In this regard, noise effects can be considered to have non-threshold effects, with characteristics other than sound levels also determining the influence on health outcomes. Issues such as frequency, tone and character have been taken into account, e.g. the sound characteristics of the A220 aircraft.

9.7.109 Night-time noise is a focus in the health literature. Relevant literature is therefore included, including to reflect that people may be resting at times other than the night-time period. However, it is relevant to note that Heathrow does not schedule departures between 23:00 and 06:00 and the level of night-time arrivals is tightly limited. The Proposed Development will facilitate easterly runway alternation schedule from 06:00 but notably the Proposed Development proposes no changes to night-time runway alternation (this being from the time after the last departure until 06:00hrs).

9.7.110 The following points from the WHO systematic review on noise are also noted as they give context to any change in noise levels:

- Noise is only one reason for sleep disturbance. There are many other external (e.g. temperature, humidity, light levels) and internal (e.g. sleep disorders, health conditions, bad dreams) causes.
- Whether or not noise will disturb sleep also depends on situational (e.g. depth of sleep phase, background noise level) and individual (e.g. noise sensitivity) moderators.
- It is normal for a healthy adult to briefly awaken approximately 20 times during an 8hr bed period (most of these awakenings are too short to be remembered the next morning).

9.7.111 The WHO 2009 night noise guidelines[50] find that where a population is exposed to average annual night-time noise above 55dB (the SOAEL used in this assessment) "*The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases*". Such conclusions are a clear indication that where the SOAEL is experienced across the whole or great majority of a population (which is not the case here), this would be significant for public health. The WHO noise guidelines[100] also confirms on a composite day-evening-night metric (L_{den}) that the evidence for changes in cardiovascular health outcomes is limited, particularly where changes are much smaller than 10 dB (which is the case here):

- there is "*very low quality*" evidence for a change in health outcome risk, as described by the concentration response function (CRF) for ischaemic heart disease incidence (CRF of 1.09, 95% CI: 1.04–1.15, per 10 dB increase above 47dB).
- there is "*low quality*" evidence for a change in health outcome risk, as described by the CRF for hypertension incidence (CRF of 1.0 (i.e. no risk change), 95% CI: 0.77–1.30 per 10 dB increase).

9.7.112 Effects related to annoyance are likely to be the dominant health outcome. Effects may also relate to sleep disturbance and educational outcomes (WHO Environmental Noise Guidelines 2018, Section 3.3, Tables 29 and 31).

- Effects related to annoyance[104] are likely to be the dominant health outcome, with "moderate quality" evidence that the percentage of the population highly annoyed having an odds ratio of 4.78 (95% CI: 2.27–10.05) per 10 dB increase above 33 dB.
- Effects related to sleep disturbance[105] are also likely, with "moderate quality" evidence that the percentage of the population highly sleep-disturbed having an odds ratio of 1.94 (nearly twice as likely) (95% CI: 1.61–2.33) per 10 dB increase above 35 dB.
- There is also "moderate quality" evidence for a change in educational outcomes[104], with a 1-2 month delay in reading and total oral comprehension per 5 dB increase above 55 dB L_{den}.

9.7.113 In terms of vulnerable groups, the results from sleep studies in children have suggested that they are less likely to awaken to noise events than adults, with a difference in sensitivity of approximately 10 dBA. However, despite being less sensitive, children are still considered a vulnerable group due to their developmental state and also because of the difference in their sleep patterns. Children have earlier bedtimes and longer sleep durations than adults, which may overlap with periods not accounted for by night-time metrics[100]. Children are also more vulnerable for cognitive effects of noise. They are not per se more vulnerable as a group, but more at risk because of less-developed coping strategies, and they are in a sensitive developmental period. This is indicative of a life phase effect rather than an age effect. Children seem to be less vulnerable for awakenings due to noise but more vulnerable for physiological effects during sleep and related motility[106]. Evidence does not indicate that the elderly are more vulnerable to noise in terms of annoyance and sleep disturbance. Age-specific comparisons rather show an inverted U-shaped relation and indicate that both young and older people are less at risk as far as annoyance and disturbance are concerned. But possibly, the elderly

[104] Section 3.3 Aircraft noise, Table 29[51].

[105] Section 3.3 Aircraft noise, Table 31[51].

[106] van Kamp, I. and Davies, H. (2013) 'Noise and health in vulnerable groups: a review', *Noise & Health*, 15(64), pp. 153-159. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/23689296/ [Accessed: 16 October 2024].

are more vulnerable regarding cardiovascular effects, and this may be a combined effect of air pollution and noise.

9.7.114 South Asian ethnicity has been strongly linked to an increased risk of cardiovascular diseases (CVD). Individuals of South Asian descent have been shown to be at a higher risk of developing coronary artery diseases and other cardiovascular condition compared to other ethnic groups. For example, Pursnani and colleagues (2020)[107] found that South Asian ethnicity, compared to the White ethnic group, was associated with an increased risk of coronary heart disease outcomes even after adjustment for traditional risk factors (adjusted odds ratio (aOR): 2.04 (95%CI: 1.83, 2.28). Similarly, a 2022 UK Biobank observation study found that South Asian, but not black African or Caribbean individuals, have a higher risk of CVD compared to white European individuals. This higher risk in South Asians was independent of sociodemographic, lifestyle, environmental and clinical factors [108]. A meta-analysis of nine studies showed a higher incidence of coronary heart disease in South Asians compared to other ethnic groups (HR 1.35 95% CI 1.30 to 1.40)[109]. A rapid review of Ethnic disparities in the major causes of mortality and their risk factors by the Commission on Race and Ethnic Disparities, UK, observed that mortality due to ischemic heart disease is significantly worse in the South Asian ethnic group including Indian, Pakistani and Bangladeshi compared to the White ethnic group[110]. Similarly, the same report noted significantly worse outcomes for stroke in the South Asian group compared to the White ethnic group. Links between South Asian ethnicity, cardiovascular risk and noise are however not well established. A 2023 published case-crossover study in a population of 6.3 million people residing near Heathrow Airport found no significant associations with South Asian ethnicity and cardiovascular disease or stroke hospital admissions associated with noise[111].

9.7.115 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

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[107] Pursnani, S. and Merchant, M. (2020) 'South Asian ethnicity as a risk factor for coronary heart disease', *Atherosclerosis*, 315, pp. 126-130. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/33317714/ [Accessed: 16 October 2024].

[108] Razieh, C. *et al.* (2022) 'Differences in the risk of cardiovascular disease across ethnic groups: UK Biobank observational study', *Nutr Metab Cardiovasc Dis.*, 32(11), pp. 2594-2602. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/36064688/ [Accessed: 16 October 2024].

[109] Stefil, M. *et al.* (2023) 'Heightened risks of cardiovascular disease in South Asian populations: causes and consequences', *Expert Rev Cardiovasc Ther.*, 21(4), pp. 281-291. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/36866613/ [Accessed: 16 October 2024].

[110] Commission on Race and Ethnic Disparities (2021) *Ethnic disparities in the major causes of mortality and their risk factors – a rapid review*. [online] Available at: https://www.gov.uk/government/publications/the-report-of-the-commission-on-race-and-ethnic-disparities-supporting-research/ethnic-disparities-in-the-major-causes-of-mortality-and-their-risk-factors-by-dr-raghib-ali-et-al [Accessed: 16 October 2024].

[111] Itzkowitz, N. *et al.* (2023) 'Aircraft noise and cardiovascular morbidity and mortality near Heathrow Airport: A case-crossover study', *Environment International*, 177, p. 108016. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/37329756/ [Accessed: 16 October 2024].

- the source is aviation related noise (air noise and ground noise);
- the pathway is pressure waves through the air; and
- receptors are residents, visitors and people working in the local communities near the Airport and its flightpaths.

Populations affected

9.7.116 **Graphic 9.1** summarises the HSSSAs shown in **Figure 9.1** (**Appendix 9.2**).

9.7.117 The population groups relevant to this assessment relate primarily to the areas of effect set out in **Chapter 7: Noise and Vibration** **Figure 7.5.4** (**Volume IV** of the Environmental Statement), which indicatively correspond with the HSSSAs (a best fit of relevant LSOAs), see **Figure 9.1** and **Figure 9.2** (**Appendix 9.2**):

- HSSSA 1: Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, adverse change. Health profiles are set out in **Section 9.4**.
- HSSSA 2: Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, beneficial change. Health profiles are set out in **Section 9.4**.
- HSSSA 3: Departure Route DET, east towards Hounslow and Richmond upon Thames, adverse change. Health profiles are set out in **Section 9.4**.
- HSSSA 4: Departure Route GASGU and MODMI, southeast towards Hounslow and Elmbridge, beneficial change. Health profiles are set out in **Section 9.4**.
- HSSSA 5: Arrival to 09L (northern runway), west from Windsor and Maidenhead and Slough, beneficial change. Health profiles are set out in **Section 9.4**.
- HSSSA 6: Arrival to 09R (southern runway), west from Windsor and Maidenhead and Spelthorne, adverse change. Health profiles are set out in **Section 9.4**.
- HSSSA 7: Departure on 09L (northern runway) west end, near Longford, adverse effect. Health profiles are set out in **Section 9.4**.
- HSSSA 8: Departure on 09R (southern runway) west end, near Stanwell and Stanwell Moor, beneficial effect. Health profiles are set out in **Section 9.4**.

9.7.118 Smaller degrees of change in the Local Health Study Area have also been taken into account.

9.7.119 The health assessment has particular regard to the sub-population vulnerable due to:

- Young age vulnerability (children and young people including for educational disturbance).
- Old age vulnerability (older people may spend more time in affected dwellings).
- Low-income vulnerability (people living in deprivation, including those on low incomes may have fewer resources to adapt, e.g. seek respite or install insulation. Furthermore, those who are economically inactive may spend more time in affected dwellings).

- Poor health vulnerability (people with existing poor physical and mental health or physical or intellectual disability may spend more time in affected dwellings or be more sensitive to noise changes). Health related risk factors such as South Asian ethnicity are also taken into account.
- Social disadvantage vulnerability (spending more time at home may be linked to social isolation and those that experience high degrees of discrimination may be more sensitive to changes in their health outcomes, particularly mental health outcomes). Experiencing multiple domains of deprivation is also taken into account.
- Access and geographical vulnerability (people for whom close proximity to Proposed Development change increases sensitivity).

9.7.120 **Table 9.29** summarises the HSSSAs, illustrative communities to support interpretation, relevant areas of likely significant effect discussed in **Chapter 7: Noise and Vibration** and the corresponding LSAOs most relevant (on a best fit approach) to those areas of likely significant effects.

Table 9.29 Populations discussed in the health noise assessment

Health Site Specific Study Areas (HSSSA)	Illustrative communities associated with HSSSA	Chapter 7: Noise and Vibration LSE Areas that fall within HSSSA	LSOA corresponding with Chapter 7: Noise and Vibration LSE
HSSSA 1: Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, adverse change	Harlington, Cranford, Heston, North Hyde, Southall Green, Norwood Green.	LSE-D07 (**Figure 7.33**, **Volume IV**) Residential areas in southeast Hillingdon, northwest Hounslow and southwest Ealing comprising a population of circa 15,500 people.	Hillingdon: E01002443, Hounslow: E01002583, E01002584, E01002633, E01002634, E01002638, E01002631, E01002625, Ealing: E01001333, E01001369, E01001371, E01001372, E01001336, E01001334, E01001339.
		LSE-D03 (**Figure 7.30**, **Volume IV**) –Residential areas north of Bath Road, Harlington including Triumph Close, Brendan Close, Cheviot Close and Hall Lane comprising a population of circa 850 people	Hillingdon: E01002447, E01002449.

Health Site Specific Study Areas (HSSSA)	Illustrative communities associated with HSSSA	Chapter 7: Noise and Vibration LSE Areas that fall within HSSSA	LSOA corresponding with Chapter 7: Noise and Vibration LSE
		LSE-D02 (**Figure 7.30**, **Volume IV**) –Residential areas off Bath Road, Cranford comprising a population of circa 900 people.	Hounslow: E01002584, E01002583.
HSSSA 2: Departure Routes ULTIB and BPK, northeast towards Hounslow and Ealing, beneficial change	Osterley, Hanwell.	N/A	N/A
HSSSA 3: Departure Route DET, east towards Hounslow and Richmond upon Thames, adverse change	Cranford, Hounslow, Twickenham.	LSE-D01 (**Figure 7.30**, **Volume IV**) – Residential areas including Byron Avenue, Chaucer Avenue and Stansfield Road in Hounslow comprising a population of circa 1,100 people.	Hounslow: E01002586, E01002585.
HSSSA 4: Departure Route GASGU and MODMI, southeast towards Hounslow and Elmbridge, beneficial change	Hatton, North Feltham, Hanworth, Twickenham.	LSE-D06 (**Figure 7.32**, **Volume IV**) Residential areas in Feltham comprising a population of circa 300 people.	Hounslow: E01002555.
HSSSA 5: Arrival to 09L (northern runway), west from Windsor and Maidenhead and Slough, beneficial change	Oakley Green, Dedworth, Clewer Green, Clewer New Town, Windsor, Poyle, Longford.	N/A	N/A
HSSSA 6: Arrival to 09R (southern runway), west from Windsor and Maidenhead and Spelthorne, adverse change	Old Windsor, Wraysbury, Stanwell Moor.	LSE-D04 (**Figure 7.31**, **Volume IV**) – Residential receptors located off Horton Road in Stanwell Moor comprising a population of circa 50 people.	Spelthorne: E01030747.
		LSE-D05 (**Figure 7.31**, **Volume IV**) – Residential receptors located off Coppermill Road in Wraysbury comprising a	Windsor and Maidenhead: E01016577.

Health Site Specific Study Areas (HSSSA)	Illustrative communities associated with HSSSA	Chapter 7: Noise and Vibration LSE Areas that fall within HSSSA	LSOA corresponding with Chapter 7: Noise and Vibration LSE
		population of circa 200 people.	
		LSE-N01 (**Figure 7.34**, **Volume IV**) Residential receptors located in Wraysbury, in the vicinity of Coppermill Road.	Windsor and Maidenhead: E01016577.
		LSE-N02 (**Figure 7.34**, **Volume IV**) Residential receptors located in Stanwell Moor, in the vicinity of Horton Road and Spout Lane. LSE-N01 and LSE-N02 collectively comprise a population of circa 200 people.	Spelthorne: E01030747.
HSSSA 7: Departure on 09L (northern runway) west end, near Longford, adverse effect	Longford, Poyle.	N/A	N/A
HSSSA 8: Departure on 09R (southern runway) west end, near Stanwell and Stanwell Moor, beneficial effect	Stanwell, Stanwell Moor.	N/A	N/A

Sensitivity of population

9.7.121 The population sensitivity has had regard to the health baseline, including findings from the relevant Health and Wellbeing Strategies and Joint Strategic Needs Assessments, as set out in **Section 9.2**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.122 Geographic variation in sensitivity:

- General population sensitivity is typically rated as low for the reasons set out in **paragraph 9.5.13**.

- The general population sensitivity of HSSSAs 1-4 are considered to be **medium**. This reflects that levels of deprivation and population densities tend to be greater to the east of the Airport.
- The general population sensitivity of HSSSA 5 and 6 is considered to be **low,** consistent with the points made in **paragraph 9.5.13**. This reflects that to the west of the Airport population densities are typically lower[112] and where they are higher the population tends to be less deprived.
- The general population sensitivity of HSSSA 7 and 8 are considered to be **medium**, reflecting proximity to the Airport and above average deprivation within Longford, Stanwell Moor and Stanwell.

9.7.123 The classification of medium also reflects that existing noise stressors, including current Airport operations, affect a wide area and the population is likely to have heightened sensitivity to aviation noise as an issue. Existing proximity to the baseline noise conditions of the Airport and its flightpaths, as well as local road network, suggests the affected population already has a level of exposure to transport noise that affects health outcomes, including cardio-metabolic, annoyance, educational and sleep disturbance.

9.7.124 For all the HSSSAs, the sensitivity of the vulnerable sub-population is considered **high**. This reflects the presence of populations who (while at work or at home) are likely to spend extended periods near to the Airport and its flightpaths (including areas close to the Airport in HSSSA 5 and 6). Vulnerability in this case is particularly linked to: living close to sources of noise; age (both young people and older people); existing poor health (e.g. long-term medical conditions, existing poor mental health or certain intellectual disabilities); heightened sensitivity to noise due to neurodiversity; underlying risk factors for relevant health outcomes, including related to ethnicity; spending more time in affected dwellings (e.g. due to low economic activity, shift work, social isolation, disability or ill health); vulnerability due to deprivation or health inequalities (including potential for more deprived communities to live in areas of high noise disturbance); or having strong views or high degrees of uncertainty about the Proposed Development (which may be associated with health effects even below thresholds that are generally considered acceptable).

9.7.125 Areas where deprivation is noted include:

- E01016555: Windsor and Maidenhead O14D is amongst the 20% most health deprived neighbourhoods in the country. The Proposed Development would bring beneficial effects.
- E01002593: Hounslow 024B, E01033000: Hounslow 025F and E01002606: Hounslow 026C are amongst the 30% most health deprived neighbourhoods in the country. The Proposed Development would bring beneficial effects.

[112] See Figure 7.11.

- E01002633: Hounslow 005A is amongst the 30% most health deprived neighbourhoods in the country. The Proposed Development would bring adverse effects.
- E01002633: Hounslow 005A, E01002634: Hounslow 005B and E01002638: Hounslow 005D are amongst the 20% most income deprived neighbourhoods in the country. The Proposed Development would bring adverse effects.
- E01002585: Hounslow 013C is amongst the 30% most income deprived neighbourhoods in the country. The Proposed Development would bring adverse effects.
- E01001334: Ealing 029C is amongst the 10% most income deprived neighbourhoods in the country. The Proposed Development would bring adverse effects.
- E01002633: Hounslow 005A, E01002638: Hounslow 005D, E01001333: Ealing 038A and E01001339: Ealing 029F are amongst the 20% most income deprived neighbourhoods in the country. The Proposed Development would bring adverse effects.

9.7.126 In considering the effects of the Proposed Development in relation to the sensitivity of the affected population it is relevant to note that only a portion of the sub-population who experience increased noise and who are potentially more sensitive to its effects would experience a change in health risk factors. For example, some may not experience a change in risk factors as they already benefit from existing installed noise insulation; and of those with a change in risk factors, only a further sub-population may experience an actual change in health outcomes. The proportion of the population potentially experiencing a change in health outcomes is further reduced by access to new noise insulation under the Quieter Neighbourhood Scheme (QNS) and Heathrow's proposed Easterly Alternation Noise Mitigation Package.

Health noise effect characterisation

9.7.127 For public health, the key changes that arise due to the Proposed Development are a more equal redistribution of effects around the Airport. The effects redistribute to more closely match how aircraft noise is distributed under westerly operations when both runways can be used for take-off and landing. The Proposed Development also affords predicable respite when the runways switch over in their respective predominant take-off or landing roles. Under easterly operations the Proposed Development's redistribution means the following changes relative to the baseline situation of the Cranford Agreement operating. These changes result in more equal noise distributions but to do so requires a series of relative beneficial and adverse effects. In considering the health equity of these changes it is relevant to group them so that the corresponding beneficial and adverse changes can be placed in geographic and social context.

9.7.128 Departure paired effects (aircraft taking-off into an easterly wind):

- An adverse effect arises to the northeast of the Airport associated with increased departures from 09L (northern runway) when the Airport is under easterly

operations. The effects relate to the population of HSSSA 1 and HSSSA 3 depending on the departure route. A corresponding adverse effect at the western end of 09L also arises from more aircraft commencing their take-off, affecting the population of HSSSA 7. This is referred to as 'public health noise effect 1'.

- Simultaneously a beneficial effect arises to the southeast of the Airport associated with reduced departures from 09R (southern runway) when the Airport is under easterly operations. The effects relate to the population of HSSSA 4. A corresponding beneficial effect at the western end of 09R also arises from fewer aircraft commencing their take-off, affecting the population of HSSSA 8. This is referred to as 'public health noise effect 2'.
- A smaller beneficial effect also arises to the northeast of the Airport associated with less use of the north east departure routes (ULTIB and BPK) from 09R (southern runway) under the Proposed Development. The effects relate to the population of HSSSA 2. This is referred to as 'public health noise effect 3'.

9.7.129 Arrival paired effects (aircraft landing into an easterly wind):

- A beneficial effect arises to the northwest of the Airport under easterly operations associated with fewer aircraft arrivals on 09L (northern runway), as it is being used for departures. The effects relate to the population of HSSSA 5. This is referred to as 'public health noise effect 4'.
- Simultaneously an adverse effect arises to the southwest of the Airport under easterly operations associated with more aircraft arrivals on 09R (southern runway). The effects relate to the population of HSSSA 6. This is referred to as 'public health noise effect 5'.

Health equity considerations

9.7.130 Health equity is defined as "*the absence of unfair and avoidable or remediable differences in health among population groups defined socially, economically, demographically or geographically*" [113].

9.7.131 In considering health equity it is relevant to note that the effect pair, public health noise effect 1 (adverse change) and public health noise effect 2 (beneficial change), are both predominantly occurring to the east of the Airport over areas of similar demography, high population density and elevated deprivation. The same principle applies to public health noise effect 3.

9.7.132 Similarly, the effect pair public health noise effect 4 (beneficial change) and public health noise effect 5 (adverse change) both occur to the west of the Airport over areas of similar demography, lower population density and lower deprivation (albeit noting potential for pockets of higher deprivation in both areas).

[113] World Health Organisation (2006) *Levelling up (part 1) : a discussion paper on concepts and principles for tackling social inequities in health / by Margaret Whitehead and Göran Dahlgren*. [online] Available at: https://iris.who.int/handle/10665/107790 [Accessed: 16 October 2024].

9.7.133 The paired redistributions of effects are therefore geographic but with limited difference in terms of socially, economically or demographically drivers of health inequity. The geographical redistribution is in the context of the underlying premise of the ending of the Cranford Agreement being to more evenly distribute noise effects around the Airport. Such a geographic redistribution is therefore not in itself considered a challenge to health equity.

9.7.134 Effect magnitude is also a relevant factor to consider in relation to health equity. Public health noise effect 1 (adverse change) is related to a larger change in exposures due to the Proposed Development than public health noise effect 2 (beneficial change). The targeted use of mitigation in relation to public health noise effect 1 is a relevant equity consideration. The application of noise insulation for the worst affected properties means that the effects are partially remediated and that the focus of this remediation is directed to provide a more equitable and balanced outcome.

9.7.135 The inequity of the without development situation under easterly operations is particularly evident from:

- Comparing **Figure 7.5.23 WoD** and **Figure 7.5.23 WD** (**Volume IV** of the Environmental Statement) shows how daytime average noise ($L_{Aeq,16hr}$) is more evenly redistributed around the Airport with the Proposed Development.
- Comparing **Figure 7.5.27 WoD** and **Figure 7.5.27 WD** (**Volume IV** of the Environmental Statement) shows how the size of the population who experience high numbers of daytime aircraft events (N65[114]) is both greatly reduced and is more evenly redistributed around the Airport with the Proposed Development.

Magnitude of health effect

9.7.136 The following conclusions on the magnitude of health noise effects are reached. These have been made with reference to **Chapter 7: Noise and Vibration** **Table 7.40** and **Table 7.44** for daytime effects and **Table 7.42** and **Table 7.46** for night-time effects, as well as other contextual commentary and metrics in **Chapter 7: Noise and Vibration**. The scale of the increase in exposure varies, with consideration given to both the degree of change and the threshold levels of LOAEL and SOAEL, which are set out in **Chapter 7: Noise and Vibration** **Table 7.39**.

9.7.137 For beneficial effects between the LOAEL and SOAEL:

- For daytime, **Table 7.44** (**Chapter 7: Noise and Vibration**) shows the degree of beneficial change in noise exposure between LOAEL and SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$) and all less than 2 dB $L_{Aeq,16hr}$. These beneficial effects are *very low* exposures below the 63 dB $L_{Aeq,16hr}$ SOAEL threshold.
  - Approximately 62,200 people are expected to experience slight reductions of 1.0-1.9 dB $L_{Aeq,16hr}$ in the day, i.e. a beneficial effect.

[114] The number of aircraft events above 65 dB L_{ASmax}.

- For night-time, **Table 7.46** (**Chapter 7: Noise and Vibration**) shows the degree of beneficial change in noise exposure between LOAEL and SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$) and all less than 2dB $L_{Aeq,8hr}$. These are *very low* exposures below the 55 dB $L_{Aeq,8hr}$ SOAEL threshold.
  - Approximately 28,800 people experience slight reductions of 1.0-1.9 dB $L_{Aeq,8hr}$ at night.
- For public health the beneficial change between LOAEL and SOAEL is characterised as affecting a *large minority* of the population with a *minor* change in *quality-of-life* and a *very minor* change in *morbidity risk*, for cardiovascular, cardio-metabolic and low severity mental health outcomes.

9.7.138 For adverse effects between the LOAEL and SOAEL:

9.7.139 The changes in exposure between the LOAEL and SOAEL are noted, as chronic noise exposure across all or the great majority of a population may also contribute to adverse population health outcomes. The degree of change is also relevant and a change of 2 dB or less has very limited potential to affect population health[115,116,117].

- For daytime, **Table 7.44** (**Chapter 7: Noise and Vibration**) shows the degree of adverse change in noise exposure between LOAEL and SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$), although of note is that there is a 3.0-5.9 dB $L_{Aeq,16hr}$ increase between LOAEL and SOAEL for approximately 15,400 people. No exposure increases of 6.0 dB $L_{Aeq,16hr}$ or greater are expected. Although likely to be discernible, these are *low* exposures below the 63 dB $L_{Aeq,16hr}$ SOAEL threshold.
  - During the day, approximately 13,800 people are expected to experience slight increases of 1.0-1.9 dB $L_{Aeq,}$16hr; 7,200 people minor increases of 2.0-2.9 dB $L_{Aeq,16hr}$; and 15,400 people moderate increases of 3.0-5.9 dB $L_{Aeq,16hr}$ in the day.
- For night-time, **Table 7.46** (**Chapter 7: Noise and Vibration**) shows the degree of adverse change in noise exposure between LOAEL and SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$), with no changes of 2.0 dB $L_{Aeq,8hr}$ or greater expected. These are *very low* exposures below the 55 dB $L_{Aeq,8hr}$ SOAEL threshold.

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[115] Health Protection Agency (2010) *Environmental Noise and Health in the UK*. [online] Available at: https://www.researchgate.net/profile/Andrew-Smith-36/publication/279231460_Environmental_Noise_and_Health_in_the_UK/links/559129ef08ae47a3490f05d7/Environmental-Noise-and-Health-in-the-UK.pdf [Accessed: 16 October 2024].

[116] Civil Aviation Authority (n.d.) *Measuring and modelling noise, How aviation noise can be measured and modelled*. [online] Available at: https://www.caa.co.uk/passengers-and-public/environment/noise/measuring-and-modelling-noise/ [Accessed: 16 October 2024].

[117] Stansfeld, S.A. *et al.* (2009) 'Reduction of road traffic noise and mental health: an intervention study', *Noise & Health*, 44, pp. 169-175. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/19602771/ [Accessed: 16 October 2024].

- During the night approximately 10,900 people are expected to experience slight increases of 1.0-1.9 dB $L_{Aeq,8hr}$; and 1,000 people minor increases of 2.0-2.9 dB $L_{Aeq,8hr}$.

9.7.140 For public health the adverse change between LOAEL and SOAEL is characterised as a *minor to moderate* change in *quality-of-life* (depending on subjective response) for a *large minority* of the population and a *minor* change in morbidity risk, for cardiovascular, cardio-metabolic and low severity mental health outcomes, for a *small minority* of the population (i.e. those at noise levels approaching SOAEL).

9.7.141 The overall magnitude of change for population health between the LOAEL and SOAEL:

- As shown in **Table 7.44** (**Chapter 7: Noise and Vibration**), the overall change due to the Proposed Development under easterly operations is to reduce the number exposed between the LOAEL and SOAEL by approximately 3,900 people in the daytime; as well as a reduction of approximately 9,600 people in the night-time. These beneficial changes would be experienced frequently (i.e. during easterly operations) over the long-term. Any healthcare service implication is expected to be slight given the relatively small scale of change.

- The overall effect for population health between the LOAEL and SOAEL can be characterised as: an adverse change that affects relatively fewer people but with a greater degree of noise change, albeit below the SOAEL threshold; and a beneficial change that affects relatively more people, but with a lower degree of noise change. The overall public health effect is considered relatively balanced. With low adverse and low beneficial magnitudes assigned.

- In reaching this magnitude conclusion, regard has been had to the key contrasting impacts of: approximately 15,400 people experiencing a 3.0-5.9 dB $L_{Aeq,16hr}$ increase in the day-time between LOAEL and SOAEL for around 10% of the time during the summer, and around 14% over the course of a year; and the overall position that approximately fewer 3,900 people would experience noise exposures between the LOAEL and SOAEL for the same periods. The temporal dimension to these impacts is noted in reaching a conclusion on the public health outcomes, i.e. the changes relate to a relatively short period of annual noise exposures. This includes having regard to the benefits of predicable respite for all affected people with the Proposed Development. The mitigation context is also relevant, with approximately 12,100 people of the 15,400 experiencing an increase in exposure of 3.0-5.9 dB $L_{Aeq,16hr}$ being within the 51-54 dB $L_{Aeq,16hr}$ contour. These are exposures just above the LOAEL and whilst noise mitigation is not proposed, these are levels where the degree of influence on health outcomes is likely to be low. For example, **Table 7.44** (**Chapter 7: Noise and Vibration**), notes that these 12,100 people are below the approximate onset of any significant community annoyance. At higher noise exposures mitigation is proposed. Approximately 2,500 people between 54-60 dB $L_{Aeq,16hr}$ would receive a fixed £3,000 contribution to noise insulation under the Easterly Alternation Noise Insulation Scheme; and the remaining approximately 900 people would be eligible for a contribution of up to £12,000 under the Easterly Alternation Noise Insulation Scheme.

9.7.142 For beneficial effects above the SOAEL:

- For daytime, **Table 7.44** (**Chapter 7: Noise and Vibration**) shows the degree of beneficial change in noise exposure above the SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$) and all less than 2dB $L_{Aeq,16hr}$. For the health assessment the impact is characterised as *low* exposure.
  - Approximately 300 people are expected to experience slight reductions of 1.0-1.9 $L_{Aeq,16hr}$ in the day.
- For night-time, **Table 7.46** (**Chapter 7: Noise and Vibration**) shows the degree of beneficial change in noise exposure above the SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$) and all less than 2dB $L_{Aeq,8hr}$. For the health assessment the impact is characterised as *low* exposure.
  - Approximately 200 people experience slight reductions of 1.0-1.9 $L_{Aeq,8hr}$ at night.
- For public health the beneficial change above the SOAEL is characterised as affecting a *very small minority* of the population with a *minor* change in *quality-of-life* and a *minor* change in *morbidity risk*, for cardiovascular, cardio-metabolic and low severity mental health outcomes.

9.7.143 For adverse effects above the SOAEL:

9.7.144 The number of people experiencing noise effects at or above the SOAEL is a guide for the health assessment as to the potential for health effects within a population. If the SOAEL is experienced by all, or the majority, of a population the potential for a significant adverse population health effect is high. If, as is the case here, the SOAEL is experienced by a small minority of a population the potential for a significant adverse population health effect is more limited. In these circumstances additional context is informative, for example the degree of change experienced. In this case the great majority of changes are no greater than 2dB. To treat the SOAEL as a hard threshold where population health effects become significant with a minority of the population experiencing exceedances would not reflect the actual change in population health outcomes that would be expected.

- For daytime, **Table 7.44** (**Chapter 7: Noise and Vibration**) shows the degree of adverse change in noise exposure above the SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$), with no changes of 3.0 dB $L_{Aeq,16hr}$ or greater expected. Although above the 63 dB $L_{Aeq,16hr}$ SOAEL, these exposure changes are relatively small and are all expected to have access to the QNS noise insulation mitigation to reduce effects indoors. For the health assessment the expected impact with mitigation taken into account is therefore characterised as *low* exposure.
  - During the day, approximately 3,000 people are expected to experience slight increases of 1.0-1.9 $L_{Aeq,16hr}$; and 100 people minor increases of 2.0-2.9 $L_{Aeq,16hr}$.
  - The effects relate to five areas (LSE-D01 to LSE D05 and LSEA-D07) around the Airport which are discussed in detail in **Chapter 7: Noise and Vibration Section 7.8** and correspond to **Figure 7.30, Figure 7.31** and **Figure 7.33** (**Volume IV** of the Environmental Statement).

- In addition to mitigation under the QNS, including modifications to its boundaries as part of this Application, the affected population would also benefit from predictable respite during easterly operations.

- For night-time, **Table 7.46** (**Chapter 7: Noise and Vibration**) shows the degree of adverse change in noise exposure above the SOAEL is predominantly negligible (less than 1dB $L_{Aeq,16hr}$), with no changes of 2.0 dB $L_{Aeq,8hr}$ or greater expected. Although above the 55 dB $L_{Aeq,8hr}$ SOAEL threshold these exposure changes are relatively small and are all expected to have access to the QNS noise insulation mitigation to reduce effects indoors. For the health assessment the expected impact with mitigation taken into account is therefore characterised as *low* exposure.
  - During the night approximately 400 people are expected to experience slight increases of 1.0-1.9 $L_{Aeq,8hr}$.
  - The effects relate to two areas (LSE-N01 to LSE N02) around the Airport which are discussed in detail in **Chapter 7: Noise and Vibration Section 7.8** and correspond to **Figure 7.34** (**Volume IV** of the Environmental Statement).
  - All receptors are eligible for mitigation under the QNS.
- For public health the adverse change above the SOAEL is characterised as affecting a *small minority* of the population with a *minor* change in *quality-of-life* and a *minor* change in *morbidity risk*, for cardiovascular, cardio-metabolic and low severity mental health outcomes.

9.7.145 The overall magnitude of change for population health above the SOAEL:

- The overall change due to the Proposed Development under easterly operations is to increase the number exposed above the SOAEL by approximately 1,100 people in the daytime; as well as an increase of approximately 1,700 people in the night-time. These changes would be experienced *frequently* (i.e. during easterly operations) over the *long-term*. Any healthcare service implication is expected to be *slight* given the relatively *small* scale of change. This reflects that all those affected would have access to QNS noise insulation mitigation to reduce the effects, which relate to relatively small degrees of change, all less than 2dB $L_{Aeq,16hr}$ or $L_{Aeq,8hr}$.
- The overall effect for population health above the SOAEL can be characterised as: an adverse change that affects relatively more people, with a small degree of noise change once mitigated through noise insulation; and a beneficial change that affects relatively fewer people, with a similar degree of noise change. The overall public health effect is considered balanced. With **low** adverse and **low** beneficial magnitudes assigned.

9.7.146 Magnitude of change for population health in relation to the number of aircraft events, N65 (daytime)[118]:

[118] N60 (nigh-time) changes have also been considered and the changes due to the Proposed Development reduce the population exposed in all bands. The night-time effects are less pronounced so are not set out in detail but are also likely to be associated with a net beneficial population health effect.

- Although average noise metrics ($L_{Aeq,16h}$) correlate better with annoyance[119], N65 is a supplementary indicator that provides context into the experience of aviation noise. SoNA14[120] used three metrics to determine annoyance: annoyance from overall aeroplane noise (question CAN1i); an 11-point annoyance score (question CAN34); and general attitudes to aviation 5-point scale (question A9a). The results, in Table 23 of that publication, indicate two step changes. The first is for N65 events above 50 per day, where the percentage of the population highly annoyed increases from around 5% to around 11%. The second is for N65 events above 200 per day, where the percentage of the population highly annoyed increases from around 11% to around 21%.

- An analysis of **Chapter 7: Noise and Vibration** **Table 7.37** (population exposed to N65 – busy easterly day) against the step changes in SoNA14 has been used to inform the likely population health effect. There is not a number of aircraft events that represents a threshold for health effects, however the SoNA14 step changes are used in this analysis as a proxy for influences on health outcomes. In this regard higher frequencies of aviation events are linked with greater changes in health outcomes.

  - The great majority of changes due to the Proposed Development occur below the 50 aviation events per day level, with approximately 282,400 additional people experiencing such levels. Assuming around 5% highly annoyed is a broad proxy for health effects, around 14,120 people may experience adverse changes in health outcomes, and these are likely to relate to very minor severity outcomes given the low aviation event frequency.

  - The analysis shows that approximately 126,400 people are introduced into the 50 to 200 aviation events per day category. Assuming around 11% highly annoyed is a broad proxy for health effects, around 13,904 people may experience adverse changes in health outcomes, and these are likely to relate to minor severity outcomes given the intermediate aviation event frequencies.

  - However, approximately 118,800 people are removed from the aviation events above 200 per day category. Assuming around 21% highly annoyed is a broad proxy for health effects, around 24,948 people may experience beneficial changes in health outcomes, and these are likely to relate to higher severity outcomes given the higher aviation event frequencies.

- The N65 supplementary metric, particularly when considering the easterly operations in isolation, shows a position that is likely to be beneficial for public health. Whilst more people are exposed to low numbers of aviation events (less than

[119] Civil Aviation Authority (2018) *CAP 1588: Aircraft Noise and Annoyance: Recent findings.* [Online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1588/ [Accessed: 16 October 2024].

[120] Table 23 – Civil Aviation Authority (2021) *CAP 1506: Survey of Noise Attitudes 2014: Aircraft Noise and Annoyance, Second Edition.* [Online] Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1506/ [Accessed: 16 October 2024].

50 per day), these are less likely to be associated with any discernible change in population health outcomes. There is an approximate balance between the increase in the population exposed to 50 to 200 aviation events per day and the decrease in the population exposed to more than 200 aviation events per day. Although slightly fewer people experience the latter reduction, it would be expected that the benefit to health outcomes would be greater for this category. This reflects that frequency of aviation events is likely to be a factor in health outcome severity, albeit the aetiological pathways are not well established in the literature. The overall public health effect is considered balanced. With **low** adverse and **low** beneficial magnitudes assigned.

9.7.147 Magnitude of change for population health in relation to number of people highly annoyed and highly sleep disturbed:

- **Appendix 7.5: Air Noise Table 5.1** shows that when measured using WHO exposure response functions (ERF), the effect of the Proposed Development in 2028 would be to reduce the total number of people highly annoyed above the WHO guideline value of 45 dB L_{den} by 8,200.
- **Appendix 7.5: Air Noise Table 5.2** shows that for night-time periods, when measured using the WHO ERF, the effect of the Proposed Development in 2028 would be reduce the total number of people highly sleep disturbed above the WHO guideline value of 40 dB L_{night} by 1,800.
- These reductions in the total number of people highly annoyed and highly sleep disturbed indicate that the overall position reached by the changes is likely to be beneficial for public health. A **low** beneficial magnitude is assigned.

9.7.148 Magnitude of change in population health is informed by the **Appendix 7.5** monetisation assessment using the Department for Transport's (DfT) Transport Analysis Guidance (TAG) methodology:

- It is noted that TAG methodology is intended for use by DfT when considering 'government interventions'[121] on policy options, such as the different options relevant to Airspace Change Proposals and is not required in the case of this application for planning permission[122]. TAG, as with other quantifications of health outcomes has noted limitations. These include that only a subset of health pathways is included in the model (in this case just noise-health pathways) and of these only a subset of health outcomes is included based on whether they have reasonably reliable ERFs established in the scientific literature. Consequently, the results of such quantification are only pragmatic estimates to identify the direction of effect and the very broad scale of change.

[121] TAG Unit A5.2 para 1.1.1.

[122] TAG Unit A5.2 para 1.1.4 makes clear that *"Decisions on planning applications for airport development will be considered in the normal way, including to take account of relevant material considerations which may include evidence relating to the strategic, commercial, financial and management case of a development proposal."*

- The TAG analysis is set out in **Appendix 7.5: Air Noise Section 6**. The assessment finds that there is a clear net benefit in monetised health outcomes due to the Proposed Development. This is whether using the standard TAG workbook (net benefit of £949,292), or particularly when updating that workbook with recent WHO and other relevant health ERFs (net benefit of at least £17,181,337[123]).
- The TAG results indicate that the overall direction of effect is positive and that this indicates a net beneficial influence on population health in terms of direct noise related health outcomes. A **low** beneficial magnitude is assigned.

9.7.149 Magnitude of change for population health in relation to respite (predictable periods of noise relief). Respite varies under the Proposed Development, with the detail on runway alternations and respite set out in **Appendix 7.5: Air Noise Section 2.3** and **Section 3**.

- During the day when aircraft are landing and taking off to the west (westerly operations), Heathrow alternates the use of the two runways to provide local communities with noise respite. The alternation pattern means that for the first part of the day one runway is used for landings and the other for take-offs, then at 15:00hrs they switch over. At the end of each week this arrangement is reversed, so the configuration used in the evening during the previous week is now used in the morning, and vice versa. This is so that communities experience respite from aircraft in the mornings in one week and in the evening the following week.
- The position under easterly operations without the Proposed Development is for communities to the northeast of the Airport to experience an unscheduled, i.e. not managed, respite from take-off noise (100% benefit), whilst communities to the southeast of the Airport experience no relief or respite (0% benefit). Correspondingly in relation to landing noise, similar experiences arise to the northwest (0% benefit) and southwest (100% benefit) of the Airport under easterly operations.
- The position under easterly operations with the Proposed Development is that runway alternations are enabled, which allows predictable, i.e. managed, respite from take-off noise to be shared between the communities to the northeast (50% benefit) and southeast (50% benefit) of the Airport. Similarly, landing related predictable respite arises for the communities to the northwest (50% benefit) and southwest (50% benefit) of the Airport.
- For the communities to the northeast and southwest of the Airport the change under easterly operations from 100% benefit to 50% benefit is a reduction and thus an adverse effect. For the communities to the southeast and northwest of the Airport the change under easterly operations from 0% benefit to 50% benefit is an increase and thus a beneficial effect. The overall position is relatively balanced and is

[123] Sum of £1,499,987 for sleep disturbance; £295,529 lower option for amenity, £5,376,304 for AMI and 10,009,526 for stroke. Conservatively, this excludes any additional benefit associated with dementia and mental health metrics, the latter an additional £18,583,826 reported in Table 6.3. These are lower benefits than if adopting the ERF specific thresholds, Table 6.4 reports that total benefit as high as £179,482,448.

considered more equitable, with **low** adverse and **low** beneficial magnitudes assigned.

Significance of population health effect

9.7.150 The application concerns the redistribution of noise effects around the Airport.

9.7.151 The majority of people living and working in the local authority areas around the Airport would experience no discernible change. The effects of the Proposed Development are localised, and these have been assessed with reference to site-specific study areas (HSSSA 1 to HSSSA 8) as appropriate, as well as analysis that considers the overall change. The metrics considered include the average noise levels ($L_{Aeq,16hr}$ and $L_{Aeq,8hr}$) as well as supplementary and informative metrics, in particular N65, percentage of the population highly annoyed and highly sleep disturbed, TAG health outcome monetisation, and changes in respite.

9.7.152 Within the HSSSAs the great majority of effects are between the LOAEL and SOAEL, with an overall picture of adverse effects representing a greater degree of change, whilst beneficial effects cover a greater population extent. The net effect is for fewer people to be within the LOAEL to SOAEL band with the Proposed Development (3,900 fewer people in the daytime and 9,600 fewer people in the night-time). Whilst the scientific literature notes that chronic transport noise exposures are *causally* associated with poorer health outcomes, it is relevant that the proposed changes relate to a relatively small proportion of annual exposures and in most cases a small degree of change. Where there is a higher degree of change (between 3.0-5.9 dB $L_{Aeq,16hr}$) the change would be noticeable and relate mainly to daytime annoyance at levels predominantly just above the LOAEL. Whilst local amenity affects may arise, the associated change in the population health baseline due to the Proposed Development is likely to be *slight*, with beneficial and adverse influences relatively balanced. The effect on health inequalities from the changes themselves is likely to be *marginal*, including because the Easterly Alternation Noise Insulation Scheme provides targeted support to help reduce the effects for those who experience moderate increases in exposure within the LOAEL to SOAEL band. It also reflects that the health noise effects are inherently paired (additional take-offs on one runway correspond directly with reduced take-offs near simultaneously on the other runaway, and vice versa for landings); and these pairings occur over relatively similar population profiles (beneficial and adverse take-off effects are both predominantly east of the Airport and beneficial and adverse landing effects are both west of the Airport). These changes exceed the LOAEL but are *within* the SOAEL threshold indicating that widespread high severity beneficial and adverse effects on health outcomes are unlikely. The incremental beneficial and adverse effects to a larger number of people is in population health terms noteworthy; but equally it is not considered a significant public health effect. The net reduction of people within the LOAEL to SOAEL band with the Proposed Development is likely to be the greatest influence on public health, driving an overall minor beneficial population health effect.

9.7.153 Within the HSSSAs a number of even more localised areas are expected to experience adverse effects above the SOAEL (1,100 more people in the daytime and 1,700 move people in the night-time). A smaller number of beneficial effects for 300 people above the SOEAL are also noted (LSE-D06). All the adverse effects relate to areas LSE-D01

to LSE-D05, LSE-D07 and LSE-N01 and LSE-N02 defined in **Chapter 7: Noise and Vibration**. The scientific literature identifies that such exposures are *causally* risk factors for adverse health outcome changes. However, all dwellings affected by adverse changes above the SOAEL due to the Proposed Development would be eligible for QNS noise insulation support. Consequently, it is anticipated that the majority of those affected would have their effects reduced. It is taken into account that not all people would take up the scheme and there may be practical limitations on its effectiveness for some people, e.g. for structural reasons, outdoor activities or due to personal choice to open windows in summer even where ventilation is provided. In line with good practice, the QNS enables specific regard to acoustic ventilation as part of tailored packages of support determined on a property-by-property basis. This enables solutions to supplement fresh air supply through acoustic ventilators to allow windows to remain closed. Taking account of noise mitigation (an approach that is in line with the Government Overarching Aviation Noise Policy, DfT, March 2023) there is likely to be only a *slight* change in the population health baseline, even accounting for the presence of more vulnerable sub-populations. As the SOAEL effects are distributed to affect generally more deprived areas there is the potential to widen health inequalities. However, the focusing of mitigation into the SOAEL affected areas in the form of QNS noise insulation, including specific measures within the noise mitigation to specifically respond to hardship and exceptional circumstances, is relevant and supports a conclusion of only a *marginal* effect on health inequalities and health policy delivery. Accounting for the mitigating effect of the QNS an overall minor adverse population health effect is likely.

9.7.154 In relation to the number of aircraft events experienced, as indicated by the N65 (daytime) metric, there is an approximate balance between the increase in the population exposed to 50 to 200 aviation events per day and the decrease in the population exposed to more than 200 aviation events per day. The latter is likely to have a slightly more beneficial effect on public health. A net beneficial position is also indicated by there being a reduction of 8,200 people highly annoyed above the WHO guideline value of 45 dB L_{den} and a reduction of 1,800 people highly sleep disturbed above the WHO guideline value of 40 dB L_{night}. Such findings are consistent with the TAG analysis, which shows a net benefit in monetised health outcomes due to the Proposed Development. These metrics support the likelihood of a minor beneficial population health effect.

9.7.155 With regard to respite, the enabling of runway alternations under easterly operations allows for predictable respite for all communities around the Airport, which is considered more equitable. However, the communities to the northeast and southwest of the Airport would experience the change as adverse in the short- to medium-term, i.e. prior to the experience of respite being normalised in the long-term. In contrast, the communities to the southeast and northwest of the Airport would experience the benefits of respite from the commencement of runway alternation under easterly operations. Both minor beneficial and minor adverse effects are likely to be associated with these varying experiences of changes in respite. In the long-term having predicable respite for all communities around the Airport is likely to be more beneficial for population health than the current situation.

9.7.156 The overall position for public health, when triangulating evidence across a range of relevant noise metrics, is a combination of **minor beneficial** (not significant) and **minor adverse** (not significant) population health effects. Those people who experience the greatest adverse effects also receive the greatest mitigation support. With weight given to such mitigation, the effects of the Proposed Development are likely to be neutral for public health overall in EIA Human Health terms.

Physical Activity, Open Space and Recreation *Public Health Implications*

Approach

9.7.157 This section focuses on the public health implications of the Proposed Development's operational noise, vibration, air quality and visual changes affecting people's ability or inclination to undertake physical and recreational activities.

9.7.158 The assessment is informed by the approach set out in **Chapter 7: Noise and Vibration Table 7.23**, as well as other contextual commentary and metrics in **Chapter 7: Noise and Vibration**. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**.

9.7.159 Noise mitigation that has been taken into account by the public health assessment is set out in **Chapter 7: Noise and Vibration Table 7.32**. Notably, the Easterly Alternation Noise Mitigation Package – Parks and Gardens.

Effect pathways and health outcomes

9.7.160 The scientific literature identifies the following general points relevant to potential effects and health outcomes. The main health outcomes are likely to relate to the health benefits of accessing areas of public open space including physical activity, as well as general wellbeing benefits from social interactions, recreation, leisure and play. Health outcomes span physical health (e.g. cardiovascular health) and mental health (e.g. stress, anxiety or depression).

9.7.161 The availability of a natural environment and attractive views of nature within an individual's living environment are important contributors to physical activity. People's experiences in using the natural environment can enhance attitudes toward physical activity and perceived behavioural control via positive psychological states and stress-relieving effects, which lead to firmer intentions to engage in physical activity[124]. Improvements in health behaviour influence health outcomes like mortality, chronic diseases, mental and obesity disorders[125]. Physical activity can improve cognitive and

[124] Giovanna Calogiuri and Stiliani Chroni, 'The Impact of the Natural Environment on the Promotion of Active Living: An Integrative Systematic Review', *BMC Public Health*, 14 (2014), p. 873, doi:10.1186/1471-2458-14-873.

[125] Salgado, M. *et al.* (2020) 'Environmental determinants of population health in urban settings. A systematic review', *BMC Public Health*, 20(1), p. 853. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/32493328/ [Accessed: 16 October 2024].

mental health, particularly improvements in physical self-perceptions, which accompany enhanced self-esteem[126]. Access to greenspace has beneficial associations with all-cause and stroke-specific mortality, cardiovascular disease morbidity, cardiometabolic factors, mental health, low birth weight, physical activity and sleep quality[127].

9.7.162 There is evidence of an inverse association between surrounding greenness and all-cause mortality. Physical activity may explain only 2% of the association between green spaces and mortality. Other pathways include: attenuation of air pollution, noise, and heat-island effects; and stress reduction and improved relaxation and restoration[128].

9.7.163 Transportation noise has the potential to affect health through various pathways. Because noise is a psychosocial stressor it is linked to physical activity, use of green spaces and social interactions. Greenness, having access to quiet areas, and covering noise sources either visually or acoustically with natural features seems to decrease people's negative responses to noise[101].

9.7.164 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- The source is aviation related noise (air noise and ground noise), vibration, air quality, and visual change;
- The pathway is exposures, disruption and disturbance in a context of recreational use of public outdoor spaces; and
- Receptors are residents in the local communities near the Airport and its flightpaths making use of public open spaces.

Populations affected

9.7.165 The population groups relevant to this assessment relate primarily to HSSSA 1, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**. Regard to smaller degrees of change in the Local Health Study Area has also been taken into account.

9.7.166 The health assessment has particular regard to the sub-population vulnerable due to: young age, old age, low-income, poor health, social disadvantage or access and geographical factors. This includes as users of routes and public open spaces.

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[126] Lubans, D. *et al.* (2016) 'Physical Activity for Cognitive and Mental Health in Youth: A Systematic Review of Mechanisms', *Pediatrics*, 138(3), p. e20161642. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/27542849/ [Accessed: 16 October 2024].

[127] Yang, B-Y. *et al.* (2021) 'Greenspace and human health: An umbrella review', *The Innovation*, 2(4), p. 100164. [online] Available at: https://www.sciencedirect.com/science/article/pii/S2666675821000898 [Accessed: 16 October 2024].

[128] Rojas-Rueda, D. *et al.* (2019) 'Green spaces and mortality: a systematic review and meta-analysis of cohort studies', *Lancet Planet Health.*, 3(11), pp. e469-e477. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/31777338/ [Accessed: 16 October 2024].

9.7.167 As discussed in **Chapter 7: Noise and Vibration** the public open spaces where likely significant effects are expected are:

- Avenue Park, Hounslow, approximately 800m northeast of the Airport Northern Perimeter Road.
- Berkely Meadows, Hillingdon, approximately 700m northeast of the Airport Northern Perimeter Road.
- Cranford Park, Hillingdon, approximately 800m northeast of the Airport Northern Perimeter Road.

9.7.168 Other public open spaces have been considered and **Appendix 7.5: Air Noise** **Table 8.1** explains the screening criteria applied to determine if the impacts due to the Proposed Development have the potential for likely significant effects.

9.7.169 Linked with these parks is London Loop section 10, Cranford Park Bridleway, Cranford Park circular walk and Byway H907.

9.7.170 The communities most likely to be affected due to their proximity to the affected open spaces are Harlington, northwest Cranford and west Heston. Separation by the M4 suggests less regular use of the affected open spaces by the communities of Hayes, West Drayton and Southall Green.

9.7.171 For these parks, mitigation will be made available through the Easterly Alternation Noise Mitigation Package. This will involve Heathrow making a financial contribution towards enhancing these parks in other ways. Such measures will be discussed and agreed with the relevant authorities. Furthermore, Heathrow will proactively engage with authorities to ensure that the runway alternation schedule is available and accessible so that potential visitors are aware of when these areas would be overflown during both easterly and westerly operations.

9.7.172 More distant recreational areas are noted as included in the **Chapter 7: Noise and Vibration** **Figure 7.5.1** (**Volume IV** of the Environmental Statement) noise study area, such as Windsor Great Park, Windsor, and Manor House Ground, Hillingdon. **Chapter 7: Noise and Vibration** explains that significant adverse effects on the amenity of these locations is not expected.

Sensitivity of population

9.7.173 The population sensitivity has had regard to the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.174 The sensitivity of the general population is considered **low**. The general population comprise those members of the community in good physical and mental health and with greater resources to respond to change, for example accessing alternative open spaces. The affected open spaces are clustered close to the northeast of the Airport boundary, south of the M4, and consequently many of the HSSSA 1 residents would be expected to use alternative open spaces closer to their homes.

9.7.175 The sensitivity of the vulnerable sub-population is considered **high**. The sub-population more sensitive to behavioural change in physical activity, recreation and leisure includes children, elderly and those in poor health or underlying risk factors, particularly those with low levels of physical activity and obesity. This sub-population may experience existing widening inequalities due to using public open spaces that experience notable changes in aviation related disturbance and having limited alternatives or resources that enable them to adapt to changes.

Magnitude of health effect

9.7.176 The following conclusions on the magnitude of operational noise effects are reached. These have been made with reference to **Chapter 7: Noise and Vibration** **Table 7.48**, **Table 7.49**, **Table 7.50**, **Table 7.51** and **Table 7.52**. These tables include the degree of noise change and N65 effects and percentage of the open space affected. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**. For example, **Chapter 10: Landscape and Visual Impact Assessment** concludes that visual impacts associated with the new Longford Noise Barrier would not be significant, including due to screening effects of vegetation, topography and other buildings.

9.7.177 Additional aviation activities, notably overflights, would result in users of these open spaces and routes experiencing increased levels of disturbance, particularly noise and visual, which may make them less inclined to use these spaces, or reduce their levels of enjoyment whilst undertaking recreational activities, and reduce their time spent in nature.

9.7.178 For public health, the magnitude of operational impacts on use of open spaces due to the Proposed Development is considered **low**. As described in **Chapter 7: Noise and Vibration** direct mitigation of the effects is not feasible and therefore the mitigation relates to alternative enhancements of these open spaces to promote their use. This provision of incentives to uses these spaces is, for many people, likely to mean that there would not be sustained behavioural change to forgo physical activity and recreation, as their enjoyment of those spaces would be met in other ways.

9.7.179 Examples of potential improvements to affected open spaces include: upgrading of sport pitch and court surfaces and facilities; additional outdoor adult gym equipment; additional play equipment suited to a range of ages; and new and upgraded walking, wheeling and cycling routes. All with appropriate sensory and mobility considerations. Such improvements could be accompanied by clear signage at the affected open spaces signposting to information on the respite periods. Ongoing maintenance of all installed mitigation measures would be important to their continued effectiveness, corresponding with the long-term nature of the proposed changes.

9.7.180 Whilst there is likely to be a medium scale of change in aviation disturbance (noting that effects occur around 10% of the time during the summer, and around 14% over the course of a year), with commensurate mitigation to provide additional incentives to use the affected open spaces, the scale of public health effect is expected to be small. The effect would predominantly relate to a *minor* change in *quality of life*, and a minor change in risk factors for cardiovascular and mental wellbeing *morbidity* outcomes for *a small*

minority of the study area population. These changes would be experienced *frequently* (i.e. during easterly operations) over the *long-term*. Any healthcare service implication is expected to be *slight*.

9.7.181 Whilst the assessment focuses on those areas adversely affected, as with the assessment of residential impacts, there would also be areas that experienced less aviation related disturbance of outdoor spaces under easterly operations.

Significance of population health effect

9.7.182 For public health the operational effects on recreation, physical activity and active travel are considered to be **minor adverse** (not significant). This judgement assumes that a package of high quality and effective mitigation measures are agreed with local communities to enhance their open spaces in ways that maintain community use into the long-term. This also takes into account the balance of beneficial and adverse effects from redistribution of exposures and disturbance to open spaces around the Airport (all HSSSAs). Whilst geographically and temporally localised adverse effects in HSSSA 1 are noted as the most influential, the corresponding reduction in aircraft impacts in HSSSA 4 are also noted as being a relevant public health consideration. The professional judgment is that, following mitigation to enhance the affected open spaces in HSSSA 1, there would be a *slight* adverse change in the health baseline for the population close to the affected open spaces. This reflects that aviation disturbance is not directly mitigatable, so there would likely be some influence on health-related behaviours even with mitigation taken into account. This conclusion acknowledges that physical activity and use of opens spaces are local public health *priorities* and the scientific literature on the benefits of use of open space for physical and mental health outcomes shows an established *causal* relationship. There may be a marginal effect on health inequalities, as the adverse effects of the Proposed Development on open spaces tend to affect more deprived communities. For example, the HSSSA 1 baseline indicates a slightly higher proportion of households who experience deprivation compared to HSSSA 4. By contrast the baseline also shows slightly lower levels of Equality Act 2010 defined disability in HSSSA 1 compared to HSSSA 4, which may indicate that on other measures inequalities would slightly narrow. Such equality considerations are not considered to give rise to significant effects and would have only a *marginal* influence on delivery local and national health policy.

Community Infrastructure Public Health Implications

Approach

9.7.183 The operational impacts from noise, vibration, air quality and visual changes may affect users of community facilities and infrastructure. This section discusses the public health implications of such impacts. As operational noise impacts are the predominant change in terms of both degree of change and distance of effect, the focus of the health assessment is with particular reference to the analysis and thresholds set out in **Chapter 7: Noise and Vibration** in relation to non-residential noise sensitive receptors. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**.

9.7.184 Non-residential receptor types screened into **Chapter 7: Noise and Vibration** are: places of meeting for religious worship; libraries; community halls; hospitals or other healthcare settings (including nursing homes and hospices); hotels; schools or registered nurseries; colleges, and offices. Schools are discussed separately in relation to health outcomes linked to educational attainment.

9.7.185 In considering impacts to community facilities, for public health the impacts to health and social-care related settings are particularly relevant, although the wider role of all social infrastructure in promoting cohesive communities is also acknowledged and taken into account. Effects to hotels and offices are discussed in **Chapter 7: Noise and Vibration**.

Effect pathways and health outcomes

9.7.186 Community life and social connections make a vital contribution to health and wellbeing. These community level determinants build control and resilience and can help buffer against disease and influence health related behaviour[129]. Provision of community facilities and infrastructure provides opportunities for social interactions and can reduce the risk of social isolation.

9.7.187 People in neighbourhoods with higher levels of social cohesion experience lower rates of mental health problems than those in neighbourhoods with lower cohesion, independent of how deprived or affluent a neighbourhood is[130].Neighbourhood social cohesion is associated with a reduction in depressive symptoms particularly in older people[131]. Noise annoyance can be associated with less social cohesion, and in turn worse mental health. Noise annoyance is also associated with lower neighbourhood restorative quality[132].

9.7.188 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

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[129] World Health Organisation (2013) *Review of social determinants and the health divide in the WHO European Region: executive summary*. [online] Available at: https://www.instituteofhealthequity.org/resources-reports/review-of-social-determinants-and-the-health-divide-in-the-who-european-region-final-report/who-european-review-exec-summary.pdf [Accessed: 16 October 2024].

[130] Fone, D. *et al.* (2014) 'Effect of neighbourhood deprivation and social cohesion on mental health inequality: a multilevel population-based longitudinal study', *Psychol Med.*, 44(11), pp. 2449-2460. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/24451050/ [Accessed: 16 October 2024].

[131] Stafford, M. *et al.* (2011) 'Neighbourhood social environment and depressive symptoms in mid-life and beyond', *Cambridge University Press*, 31(6). [online] Available at: https://www.cambridge.org/core/journals/ageing-and-society/article/abs/neighbourhood-social-environment-and-depressive-symptoms-in-midlife-and-beyond/BEF753F67BD707AA44F7F238BCDFC9BE [Accessed: 16 October 2024].

[132] Dzhambov, A. *et al.* (2017) 'Residential road traffic noise and general mental health in youth: The role of noise annoyance, neighborhood restorative quality, physical activity, and social cohesion as potential mediators', *Environment International*, 109, pp. 1-9. [online] Available at: https://www.sciencedirect.com/science/article/abs/pii/S0160412017312400 [Accessed: 16 October 2024].

- the source is aviation related noise (air noise and ground noise), vibration, air quality, and visual change;
- the pathway is exposures, disruption and disturbance in a context of use of community infrastructure; and
- receptors are workers at and users of community infrastructure in the local communities near the Airport and its flightpaths.

Populations affected

9.7.189 The population groups relevant to this assessment correspond primarily with HSSSAs 1 to 8, with a focus on HSSSAs 1 and 3 where the greatest degrees of adverse change are expected to occur, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**. Regard to smaller degrees of change in the Local Health Study Area has also been taken into account.

9.7.190 The health assessment has particular regard to the sub-population vulnerable due to: young age, old age, low-income, poor health, social disadvantage or access and geographical factors.

Sensitivity of population

9.7.191 The population sensitivity has had regard to the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed **in paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.192 The sensitivity of the general population is considered **low**. The general population comprise those members of the community in good physical and mental health and with greater resources to respond to change, for example accessing alternative community infrastructure. It also includes workers at and users of community infrastructure that are sufficiently distant from the operational impacts that any exposures or disturbance would be unlikely to affect the use or quality of services delivered at those locations.

9.7.193 The sensitivity of the vulnerable sub-population is considered **high**. The rationale is the same as set out in **paragraph 9.7.48**. In addition, the vulnerable sub-population includes members of the congregations of affected religious facilities and members of communities or groups whose usual local halls or meeting places are affected and have limited alternatives or resources that enable them to adapt to changes.

Magnitude of health effect

9.7.194 The following conclusions on the magnitude of operational noise effects are reached. These have been made with reference to **Appendix 7.5: Air Noise** **Table 9.34 to Table 9.39 and Table 9.46**. Regard has also been given to effects reported in **Chapter 6: Air Quality**, **Chapter 8: People and Communities** and **Chapter 10: Landscape and Visual Impact Assessment**.

9.7.195 **Chapter 7: Noise and Vibration** notes the following non-significant effects:

- 6 places of meeting for religious worship are forecast to experience beneficial effects (≥1 dB decrease) and 6 are forecast to experience adverse effects (≥1 dB increase);
- 3 community halls are forecast to experience beneficial effects (≥1 dB decrease) and 4 are forecast to experience adverse effects (≥1 dB increase);
- 1 library is forecast to experience adverse effects (≥1 dB increase);
- 6 hospitals or other healthcare settings are forecast to experience beneficial effects (≥1 dB decrease) and 1 is forecast to experience adverse effects (≥1 dB increase).

9.7.196 **Chapter 7: Noise and Vibration** notes the following significant effects in relation to noise assessment thresholds and criteria prior to mitigation:

- 2 places of meeting for religious worship are forecast to experience significant adverse effects (Holy Angels Anglican Church and St Christopher Roman Catholic Church); and 1 is forecast to experience significant beneficial effects (Hatton Baptist Church, Hatton Road, TW14 9QS)
  - Holy Angels Anglican Church (High Street, TW5 9RG) is in HSSSA 1, approximately 1,600m northeast of the northern runway (09L)
  - St Christopher Roman Catholic Church (High Street, TW5 9RG) is in HSSSA 1, approximately 1,600m northeast of the northern runway (09L)

9.7.197 **Chapter 7: Noise and Vibration** concludes that no significant effects (beneficial or adverse) are predicted at community halls, libraries, hospitals, nursing homes, hospices or other healthcare settings.

9.7.198 For public health, the magnitude of operational impacts on community infrastructure due to the Proposed Development is considered **low to negligible**. It is of note that **Chapter 7: Noise and Vibration** does not predict significant adverse effects at health and social care related settings or at community halls or libraries. The additional noise impacts at two religious facilities are noted and an impact on the amenity of these facilities is likely. However, the degree of change is unlikely to result in widespread reductions in use of these facilities to an extent that public health outcomes would discernibly decline linked to reduced wellbeing and community cohesion.

9.7.199 Predicable respite at community infrastructure locations is also noted and could be optimised though clear signage at the affected facilities signposting to information on the respite periods. For example, this information could be beneficial to those seeking to use religious facilities for contemplation or small gatherings outside of scheduled event, service or prayer times.

9.7.200 With mitigation measures taken into account, the scale of change to community infrastructure that provides a protective public health effect for the population around the Airport is considered *small* (noting that effects relate to around 10% of the time during the summer, and around 14% over the course of a year). The effect would predominantly relate to *minor* changes in *quality of life* and mental wellbeing *morbidity* outcomes related to community cohesion, social networking and religious participation for *a very small minority* of the study area population. These changes would be experienced *frequently*

(i.e. during easterly operations) over the *long-term*. Any healthcare service implication is expected to be *slight*.

Significance of population health effect

9.7.201 For public health the operational impacts from noise, vibration, air quality and visual changes that may directly and indirectly affect users of community facilities and infrastructure are considered to be of **negligible adverse** (not significant). This judgement assumes that community facilities eligible for noise insulation fully take up such mitigation to maintain community use into the long-term. In this regard the importance of reducing social isolation and promoting cohesive communities is noted as being *clearly* established in the scientific literature and being generally linked to local health priorities. Whilst geographically and temporally localised adverse effects in HSSSA 1 are noted as the most influential, account has also been taken to the balance of beneficial and adverse effects from redistribution of exposures and disturbance to community infrastructure around the Airport (all HSSSAs). The professional judgment is that, following mitigation there would be a *very limited* adverse change in the health baseline for the population using community facilities. Any effect on health inequalities and delivery of local or national health policy is likely to be *marginal*.

Educational Attainment Public Health Implications

Approach

9.7.202 Operational aviation noise has the potential to affect educational facilities used by the population around the Airport. The discussion is with reference to the analysis and thresholds set out in **Chapter 7: Noise and Vibration** in relation to non-residential noise sensitive receptors.

9.7.203 Noise mitigation that has been taken into account by the public health assessment is set out in **Chapter 7: Noise and Vibration Table 7.32**. Notably, the Easterly Alternation Noise Mitigation Package – Schools Insulation.

Effect pathways and health outcomes

9.7.204 Clear evidence exists on the links between the effect of school noise exposure on children's cognitive skills such as reading and memory[133] [134] [135]. High levels of noise have

[133] Evans, G.W. *et al.* (1995) 'Chronic Noise and Psychological Stress', *Psychological Science*, 6(6), pp. 333-338. [online] Available at: https://www.jstor.org/stable/40062885 [Accessed: 16 October 2024].

[134] Evans, G.W. *et al.* (1998) 'Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living Under Environmental Stress', *Psychological Science*, 9(1). [online] Available at: https://journals.sagepub.com/doi/10.1111/1467-9280.00014 [Accessed: 16 October 2024].

[135] Hygge, S. *et al.* (2002) 'A prospective study of some effects of aircraft noise on cognitive performance in schoolchildren', *Psychological Science*, 13(5), pp. 469-474. [online] Available at: https://pubmed.ncbi.nlm.nih.gov/12219816/ [Accessed: 16 October 2024].

also been linked to lower scores on tests of reading, spelling and related tasks[136]. These impacts are even greater for children with special education needs. Educational attainment is linked to health behaviours and outcomes throughout a person's life and varies considerably by socioeconomic position[137].

9.7.205 Children affected by noisy areas often have a higher degree of helplessness and are more likely to give up on difficult tasks than those children in quieter areas[138]. Evidence also suggests that children do not habituate to aircraft noise over time, and that an increase in noise can be correlated with a delay in reading comprehension compared to those children not exposed to high levels of aircraft noise[138].

9.7.206 The population health effect is considered likely because there is a plausible source-pathway-receptor relationship established in the scientific literature, the occurrence of which in the particular context of the Proposed Development is considered plausible:

- the source is aviation related noise and vibration;
- the pathway is pressure waves through the air and ground affecting use of educational facilities; and
- receptors are workers at and users of educational facilities in the local communities near the Airport and its flightpaths.

Populations affected

9.7.207 The population groups relevant to this assessment correspond primarily with HSSSAs 1 to 8, with a focus on HSSSAs 1 and 3 where the greatest degrees of adverse change are expected to occur, see **Figure 9.1** (**Appendix 9.2**). Health profiles are set out in **Section 9.4**. Regard to smaller degrees of change in the Local Health Study Area has also been taken into account.

9.7.208 The health assessment has particular regard to the sub-population vulnerable due to: young age, low-income, poor health, social disadvantage or access and geographical factors.

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[136] Ecophon (n.d.) *Impact of Noise in Education*. [online] Available at: https://www.ecophon.com/globalassets/media/pdf-and-documents/lv/broras/ecophonresearch-summary-education-220204_lr_eng.pdf/#:~:text=They%20discovered%20that%20students%20learning,poorer%20learning%20outcomes%20and%20behaviour.&text=Noise%20survey%20of%20274%20lessons10,classrooms%20with%20lower%20noise%20levels [Accessed: 16 October 2024].

[137] Public Health England (2018) *Chapter 6: wider determinants of health.* [online] Available at: https://www.gov.uk/government/publications/health-profile-for-england-2018/chapter-6-wider-determinants-of-health [Accessed: 16 October 2024].

[138] Civil Aviation Authority (n.d.) *Aviation noise and health, The effects of aviation noise*. [online] Available at: https://www.caa.co.uk/passengers-and-public/environment/noise/aviation-noise-and-health/#:~:text=Children's%20cognitive%20performance&text=The%20results%20are%20not%20completely,reading%20comprehension%20and%20reading%20ability [Accessed: 16 October 2024].

Sensitivity of population

9.7.209 The population sensitivity has had regard to the health baseline set out in **Section 9.4**. Common factors that differentiate the sensitivity of the general population and the vulnerable group population have been taken into account and are listed in **paragraph 9.5.13**. Significance conclusions are driven by vulnerable sub-population sensitivity.

9.7.210 The sensitivity of the general population is considered **low**. The general population includes staff, children and young people associated with educational facilities that are sufficiently distant from the operational impacts that any exposures or disturbance would be unlikely to affect educational attainment and related health outcomes.

9.7.211 The sensitivity of the vulnerable sub-population is considered **high**. The sub-population more sensitive to noise and vibration includes children and students receiving care and education at facilities where **Chapter 7: Noise and Vibration** identifies the potential for significant effects, including those with special educational needs, poor health and those with a physical or intellectual disability, or neurodiversity associated with heightened sensitivity to auditory stimuli. This sub-population also includes carers and staff who are affected by the extent to which care and educational activities can be effectively delivered.

Magnitude of health effect

9.7.212 The following conclusions on the magnitude of operational noise effects are reached. These have been made with reference to **Appendix 7.5: Air Noise** **Table 9.42 to Table 9.45**.

9.7.213 **Chapter 7: Noise and Vibration** notes the following non-significant effects: 45 schools, registered nurseries or colleges are forecast to experience beneficial effects (≥1 dB decrease) and 16 are forecast to experience adverse effects (≥1 dB increase).

9.7.214 **Chapter 7: Noise and Vibration** discusses potential for adverse effects at 8 schools, registered nurseries or colleges (Khosla House, The Cedars Primary School, De Lacey Day Nursery, Wolf Fields Primary School, Sybil Elgar School, Clifton Primary School, Havelock Primary School and Cranford Community College).

- Khosla House is in HSSSA 1 (Park Lane, TW5 9WA), approximately 1,300m northeast of the northern runway (09L)
- The Cedars Primary School is in HSSSA 1 (High Street, Cranford, TW5 9RU), approximately 1,700m northeast of the northern runway (09L). The special needs school is for children who have an education, health and care plan with a primary need of social, emotional and mental health difficulties. This including supporting children with autistic spectrum condition, speech, language and communication needs and ADHD.
- De Lacey Day Nursery is in HSSSA 1 (237A North Hyde Road, UB2 5TZ) approximately 3,750m northeast of the northern runway (09L).
- Wolf Fields Primary School is in HSSSA 1 (160 Norwood Road, UB2 4JS), approximately 4,300m northeast of the northern runway (09L).

- Sybil Elgar School is in HSSSA 1 (Havelock Road, UB2 4NY), approximately 4,800m northeast of the northern runway (09L). The school is for autistic children and young people aged 4 ½ to 22 years old.
- Clifton Primary School is in HSSSA 1 (Clifton Road, UB2 5QP), approximately 4,120m northeast of the northern runway (09L).
- Havelock Primary School is in HSSSA 1 (Havelock Road, UB2 4PA), approximately 4,800m northeast of the northern runway (09L).
- Cranford Community College is in HSSSA 1, approximately 1,900m northeast of the northern runway (09L).

9.7.215 Khosla House would become eligible for noise insulation under QNS community buildings scheme (CBS) due to the Proposed Development. The Cedars Primary School and Cranford Community College are eligible for noise insulation under the Easterly Alternation Noise Mitigation Package.

9.7.216 Whilst De Lacey Day Nursery; Wolf Fields Primary School; Sybil Elgar School; Clifton Primary School; and Havelock Primary School are not eligible for noise insulation, summer average aircraft noise exposure at these schools is forecast to be less than 54 dB $L_{Aeq,16hr}$ in 2028 due to the Proposed Development. **Chapter 7: Noise and Vibration** notes that even during periods of 09RL departures under easterly operations (around 10 to 14% of the time) internal noise conditions are likely to be below 40 dB $L_{Aeq,30min}$[139] assuming standard façade and roof construction, and a closed window. For public health, the relevant educational attainment outcome is reading and oral comprehension, which as noted at **paragraph 9.7.112**, the WHO indicate starts at "around 55 dB" L_{den} and there is a 1-2 month delay per 5 dB increase. In the case of the Proposed Development, De Lacey Day Nursery is the only school/nursery without mitigation that would become exposed above 55 dB L_{den} in 2028 due to the Proposed Development and the change is 3.0 – 3.1dB. The level of exposure is therefore at the lowest level of exposure across studies where a change in reading and oral comprehension is detected and the level of change is less than a 5dB increase. The scale of change in educational attainment is likely to be very low, likely two to four weeks delay in reading and oral comprehension at this single school.

9.7.217 For public health, the magnitude of operational impacts on educational attainment and related health outcomes due to the Proposed Development is considered **low**. The coverage of many of the affected educational settings by historic or new noise insulation mitigation is noted, which would be expected to reduce exposure levels within the buildings. Whilst outdoor educational activities would not be mitigated by these measures, the main links in the health evidence base are to reading and oral comprehension progression, which is typically an indoor activity.

9.7.218 With L_{den} exposure and mitigation measures taken into account, the scale of change to educational facilities used by the population around the Airport is considered *small*

[139] Building Bullet 93 defines 40 dB LAeq,30min as an 'upper limit' for indoor ambient noise levels in nursery, primary and secondary school rooms class and teaching rooms for refurbished schools.

(noting that effects relate to around 10% of the time during the summer, and around 14% over the course of a year). The effect would predominantly relate to *minor* changes in educational outcome related risk factors for *quality of life* and physical and mental wellbeing *morbidity* for *a small minority* of the study area population. These changes would be experienced *frequently* (i.e. during easterly operations) over the *long-term*. Any healthcare service implication is expected to be *slight*.

Significance of population health effect

9.7.219 For public health the operational impacts from noise and vibration on educational attainment and associated health outcomes is considered to be of **minor adverse** (not significant). This judgement takes into account effects to vulnerable groups, including those with special educational needs and heightened noise sensitivity (e.g. at Cedars Primary School and Sybil Elgar School) and gives weight to the role of noise insulation in reducing classroom noise exposures at Khosla House, The Cedars Primary School and Cranford Community College. The minor adverse conclusion acknowledges there is some impact even with mitigation taken into account, including to use of educational outdoor spaces and indoors effects at De Lacey Day Nursey. The balance of beneficial and adverse effects from redistribution of noise around the Airport is noted and taken into account. The professional judgment is that, following mitigation there would be a *slight* adverse change in the health baseline for the population accessing educational facilities where **Chapter 7: Noise and Vibration** predicts potential for significant effects. The conclusion acknowledges the scientific literature makes *clear* links between educational attainment and health outcomes later in life, as well as the role of noise in behavioural response within educational and care settings, including where this is associated with neurodiversity. As generally more deprived populations are affected by the adverse changes, and the consequences on poor educational attainment remain as risk factors throughout people's life course, there is potential for widening health inequalities. The effectiveness of the mitigation is relied on in concluding that the effect with migration taken into account would be *marginal*, including in relation to local and national public health policy delivery.

Monitoring

9.7.220 Consistent with guidance[140], as no significant adverse population health effects are anticipated, and as this conclusion is not predicated on the effectiveness of novel or atypical mitigation measures, it is not considered proportionate to undertake health related monitoring. However, ongoing and annual monitoring of both air quality and noise is required at the Airport.

In-combination effects

9.7.221 In-combination effects are the impacts and associated effects of different aspects of the Proposed Development on the same receptor. These are as follows.

[140] Pyper, Waples, and others.

- Receptor led effects: Assessment of the assessed individual determinants of health to interact, spatially and temporally, to create in-combination effects on a receptor population.
- Project lifetime effects: Assessment of the effects on the health of a population that occur through impacts in more than one phase of the Proposed Development (i.e. combined effects of construction and operation).

9.7.222 The human health effects identified and assessed in this chapter have the potential to interact with each other. The areas of potential interaction between effects for a given geographic population are presented in **Table 9.30** and **Table 9.31** below, for the construction and operational phases of the Proposed Development, respectively.

Construction in-combination effects

Table 9.30: In-combination effects – construction

Determinant	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8
Noise and vibration							✓	
Physical activity, open space and recreation							✓	
Community infrastructure							✓	

HSSSA 7

9.7.223 During construction, noise, vibration, air quality and visual changes impacts have the potential to affect the population of HSSSA 7 through a combination of effects to residential properties, public open spaces and community infrastructures. These effects are individually negligible adverse (not significant), and predominantly relate to the communities living in and around the village of Longford. Whilst these combined effects may have a slightly greater influence on mental wellbeing and physical activity outcomes, the collective degree of change is note considered to represent a significant effect for public health. Consequently, the in-combination effect remains as **negligible adverse** (**not significant**).

9.7.224 No new or materially different significant population health effects are anticipated from in-combination effects during construction.

Operation in-combination effects

Table 9.31: In-combination effects – operation

Determinant	HSSSA 1	HSSSA 2	HSSSA 3	HSSSA 4	HSSSA 5	HSSSA 6	HSSSA 7	HSSSA 8
Air quality							✓	✓
Noise and vibration	✓	✓	✓	✓	✓	✓	✓	✓
Physical activity, open space and recreation	✓							
Community infrastructure	✓					✓		
Educational attainment	✓		✓					

HSSSA 7 and HSSSA 8

9.7.225 During operation of the Proposed Development underly easterly operations, greater departures commencing roll from the western end on the northern runway may result in a combination of adverse noise and air quality effects on Longford (HSSSA 7). The individual effects for air quality are negligible adverse (not significant) and for noise minor adverse (not significant). Whilst both air quality and noise effects represent an influence on cardiovascular and cardio-metabolic outcomes, the in-combination effect, although likely slightly greater is still not considered to represent a significant population health effect. As such the in-combination effect remains **minor adverse** (**not significant**).

9.7.226 Correspondingly fewer departures commencing roll from the western end on the southern runway result in combined beneficial noise and air quality effects on near Stanwell and Stanwell Moor (HSSSA 8). The individual effects for air quality are negligible adverse (not significant) and for noise minor beneficial (not significant). The combined effects are not considered to be greater, for the same reason as set out in **paragraph 9.7.225**, and remain as an in-combination **minor beneficial** (**not significant**) effect.

HSSSA 1

9.7.227 During operation of the Proposed Development underly easterly operations, take-offs from the eastern end of the northern runway may result in combined impacts of noise on residential dwellings, public open spaces, community infrastructure and educational facilities in HSSSA 1. Whilst the impacts are likely to influence similar physical and mental health outcomes, the in-combination effect, although likely slightly greater are still not considered to represent a significant population health effect. This includes that a high number of the same individuals within the population are unlikely to be affected by every impact. It also reflects that impacts act on a range of different health pathways, and thus represent a series of separate incrementally increased risk factors, rather than

a single greater risk factor for a relevant health outcome. The in-combined effects remain a **minor adverse** (**not significant**) effect.

HSSSA 3

9.7.228 There is also potential for in-combination effects from operational noise in HSSSA 3 affecting a combination of residential dwellings and users of educational facilities, Cranford Junior School, and Cranford Infant and Nursery School. This is not considered significant. The individual effects are minor adverse (not significant). The combined effects are not considered to be greater, for the same reason as set out in **paragraph 9.7.227**, and remain as an in-combination **minor adverse** (**not significant**) effect.

HSSSA 6

9.7.229 There is also potential for in-combination effects from operational noise in HSSSA 6 affecting a combination of residential dwellings and users of one community library, Old Windsor Memorial Hall Library. The individual effects are minor beneficial (not significant) for noise and negligible adverse (not significant) for community infrastructure. The combined effects are not considered to be greater, for the same reason as set out in **paragraph 9.7.227**, and remain as an in-combination **minor beneficial** (**not significant**) effect.

9.7.230 No new or materially different significant population health effects are anticipated from in-combination effects during operation. The overall balance of their being both minor beneficial and negligible to minor adverse population health influences is unchanged from the main assessment.

Project lifetime effects

9.7.231 In terms of project lifetime effects, i.e. those that will occur during the construction and operational phases of the Proposed Development, these are anticipated for populations in HSSSA 7 (Longford). Populations in HSSSA 7 will experience in-combination effects from construction noise on residential dwellings, public open spaces and community infrastructure. They will also experience in-combination effects from operational from noise, vibration, air quality and visual changes on dwellings. The individual construction and operational phases in-combination effects are negligible to minor adverse (not significant). The combined effects across construction and operation remain as a **minor adverse** (**not significant**) effect. Whilst the project lifetime effects extend the duration of disruption and disturbance to the Longford community, the changes are of different characters. For example, construction noise is largely transitory as the Longford Noise Barrier is constructed, compared to aviation noise. The overall combined changes are not considered to result in a significant public health effect.

9.7.232 No new or materially different significant population health effects are anticipated from project lifetime effects. The beneficial nature of the Longford Noise Barrier in providing both construction and operational reductions in noise exposures is noted.

Cumulative effects

9.7.233 Cumulative effects with other projects are assessed in **Chapter 13: Cumulative Effects**.

Opportunities for Environmental Enhancement

9.7.234 Through the course of the assessment the opportunities to enhance the Proposed Development have been considered and have informed the submitted scheme. This includes provisions relevant to vulnerable groups access to the noise mitigation measures discussed in this chapter. For example, recognising that communication of the noise impacts and insulation schemes should have regard to the presence of households who do not speak English (noting the above average rates in HSSSA 1, see **Table 9.15**); and that the surveying and installation of insulation and related works in homes and schools will need to have appropriate protocols for safeguarding and having clear communication with vulnerable persons. Furthermore, measures are proposed for local community open spaces that are significantly adversely affected by the Proposed Development which can be tailored to promotes access and use of these sites by vulnerable groups, including those with additional sensory or mobility needs or measures related to inclusivity in terms of age. These measures are considered appropriate and proportionate. No additional measures are proposed.

9.8 Assessment Summary

9.8.1 **Table 9.32** and **Table 9.33** provide a summary of the findings of the assessment for both the construction and operational phases:

Construction effects

Table 9.32 Assessment of likely effects during construction with embedded measures and migration and monitoring taken into account.

Activity	Receptors	Significance	Summary rationale
Construction noise and vibration effects on the general population and vulnerable groups	Population (including vulnerable groups)	Not significant	Although construction noise may cause adverse effects, given the relative short-term nature of effects and the measures that will mitigate noise in the CEMP and Section 61 applications, construction noise is not anticipated to be significant.
Effects on physical activity, open space and recreation on the general population and vulnerable groups	Users of parks and open spaces, public rights of way, community centres, and sports facilities	Not significant	There is likely to be a very limited change in the current health baseline of the population. This is due to the majority of construction works being undertaken at night when very few people would likely be using open spaces or undertaking physical activity. Daytime effects would be short-term and temporary with mitigate measures set out in the CEMP and Section 61 applications.
Effects on community infrastructure on the general population and	Schools, nurseries, healthcare facilities, community centres	Not significant	There is likely to be a very limited change in the current health baseline of the population. This is due to the majority of construction works being undertaken at night when the majority of these facilities would be closed. Daytime effects would be short-term and temporary with mitigate measures set out in the CEMP and Section 61 applications.

Activity	Receptors	Significance	Summary rationale
vulnerable groups			

Operational phase

Table 9.33 Assessment of likely effects during operation with embedded measures and migration and monitoring taken into account.

Activity	Receptor	Significance	Summary rationale
Operational effects of air quality on the general population and vulnerable groups	Population (including vulnerable groups)	Not significant	Discernible changes in air quality are largely limited to the airfield. Where there are slight changes in exposure within community areas the changes are incremental and within statutory objectives set in relation to health protection. The conclusion takes into account non-threshold effects and very small changes in air quality for vulnerable groups around the Airport and its flightpaths.
Operational noise and vibration effects on the general population and vulnerable groups	Population (including vulnerable groups)	Not significant	The Proposed Development gives rise to a range of beneficial and adverse changes in the distribution of noise around the Airport. The changes allow for more equitable distribution of noise and predicable periods of respite. The adverse effects tend to be of greater degrees of change and affect a population with slightly greater sensitivity. The beneficial effects tend to represent a smaller degree of change for a larger number of people and that population tends to be slightly less sensitive on some measures, though also includes vulnerable groups. The adverse effects above the SOAEL are accompanied by insulation schemes that are likely to reduce the potential for changes in health outcomes, albeit effects on amenity inducing of private outdoor spaces will not be reduced by such measures. The redistribution of noise reduces the number of people exposed between the LOAEL and SOAEL and

Activity	Receptor	Significance	Summary rationale
			the majority of those adversely affected above the LOAEL are close to this threshold, which represents the point at which effects on health and quality of life can just be detected. In public health terms there is likely to be a slight benefit in terms of how the changes reduce the number of people experiencing high numbers of aviation events. There is also a net reduction in the number of people highly annoyed and highly sleep disturbed, as well as a net beneficial health effect indicated by a monetization calculation (TAG). The public health implication of the balance of individual receptor level effects reported in **Chapter 7: Noise and Vibration** represents a combination of minor beneficial and minor adverse population health effects. All these effects are limited to around 10% of the time during the summer, and around 14% over the course of a year. Overall, the Proposed Development is likely to be neutral for public health in EIA Human Health terms.
Effects on physical activity, open space and recreation on the general population and vulnerable groups	Population (including vulnerable groups) Users of Avenue Park, Berkley Meadows, Cranford Park, Manor House Grounds, Windsor Great Park	Not significant	Disturbance, disruption and changes in exposures at public open spaces close to the Airport may reduce the appeal of these locations for their local communities. This may change health related behaviours linked to these locations, adversely affecting physical, mental and social wellbeing. Whilst the direct impact on these sites is not feasibly mitigated, the enhancement of these locations to provides alternative appeal is noted as a relevant mitigation. Communicating the predictable respite periods will also support communities in making best use of these spaces. With such mitigation taken into account, including tailored to vulnerable groups, significant population health effects are not anticipated.
Effects on community infrastructure on the general	Population (including vulnerable groups) Users of Cranford Memorial Hall, Holy Angels Anglican	Not significant	The public health effects linked to impacts of the Proposed Development on individual community buildings used as halls, libraries or meeting places have been considered. This consideration has been informed by the individual receptor effects discussed in **Chapter 7: Noise and Vibration**, including taking

Activity	Receptor	Significance	Summary rationale
population and vulnerable groups	Church, St Christopher Roman Catholic Church, Heathrow Jamia Masjid, Old Windsor Memorial Hall Library, First Cranford Scouts Hall.		account of existing or new insulation scheme entitlements. As relatively few facilities are affected and the timings of effect are limited to around 10% of the time during the summer, and around 14% over the course of a year the potential for a significant population level health effect is considered unlikely. No significant effects to health-related facilities are expected.
Effects on educational attainment on the general population and vulnerable groups	Population (including vulnerable groups) Users of Cedars Primary school, Cranford Community College, Cranford Junior School, Cranford Infant and Nursery School, Khosla House.	Not significant	Educational attainment can have a lasting influence on health outcomes through the life course so is a relevant public health consideration where it may be affected. Whilst the Proposed Development does give rise to a range of effects, the application of noise insulation, existing and under new schemes, mitigates against there being a significant population health effect due to the Proposed Development.

Conclusion

9.8.1 The conclusion of the public health assessment is that whilst there are a range of beneficial and adverse influences due to the Proposed Development, overall, the effect for public health is likely to be neutral in EIA Human Health terms. This conclusion reflects that a range of noise metrics indicate net benefits and the potential for adverse effects, including for vulnerable groups, is addressed through targeted mitigation. This mitigation includes the Longford Noise Barrier, QNS extension and the Easterly Alternation Noise Mitigation Package, the latter including residential, open space and school measures. The Proposed Development is fundamentally about achieving a more equal distribution of aviation emissions (principally air noise) around the Airport, and this is evident from, for example, comparing **Figure 7.5.23 WoD** and **Figure 7.5.23 WD** (**Volume IV** of the Environmental Statement). The changes facilitate short- to medium-term predictable respite benefits under easterly operations for communities that are currently disadvantaged by the Cranford Agreement. In the long-term, once there is normalisation of the experience of full runway alternation for all communities, predictable respite is likely to represent an improved position for health equity around the Airport.