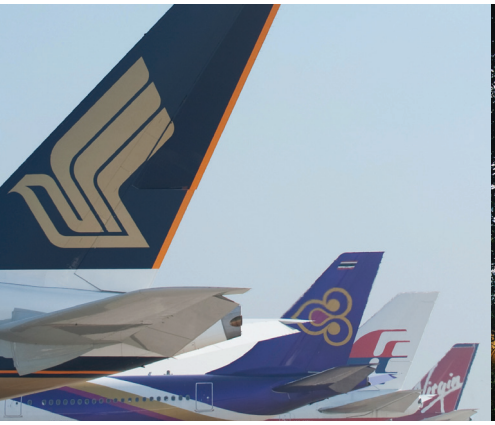
Health and Equalities Impact Assessment

Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport

May 2013



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Issue and revision record

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Content

1. Introduction

1.1 Health and Equalities Impact Assessment

1.1.1 This document sets out the findings of a Health Impact Assessment (HIA) and Equalities Impact Assessment (EqIA) of the proposed enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport.

1.1.2 Heathrow Airport is one of the world's busiest airports. It is located approximately 15 miles west of Central London, wholly within the London Borough of Hillingdon. The airport operates two parallel runways in segregated mode[1] which, in the 12 months to November 2012 handled approximately 472,022 Air Traffic Movements (ATMs).

1.1.3 The Cranford Agreement was a Ministerial undertaking given in 1952 to use best endeavours to avoid the operation of the northern runway for aircraft departures in an easterly direction over Cranford. After public consultation, the previous Government ended the Cranford Agreement in 2009, with the aim of distributing noise more fairly around the airport and to enable runway alternation to be introduced when the airport is on easterly operations to give affected communities predictable periods of relief from airport noise. The Coalition Government reaffirmed their support for this decision in September 2010.

1.1.4 Following the ending of the Cranford Agreement, Heathrow Airport Limited (HAL) is proposing enabling works to allow implementation of full runway alternation during easterly operations. HAL has commissioned Mott MacDonald / Ben Cave Associates to undertake an independent HIA/EqIA of the proposed scheme. The team includes specialists in the health effects of both noise and air quality.

1.1.5 The purpose of HIA/EqIA is to ensure that decision-makers consider the positive and negative effects of their proposals on health. The objectives of this HIA/EqIA are to identify any health consequences (unintended or otherwise) that would result from the change in the pattern of aircraft operations at Heathrow Airport following the implementation of full runway alternation during easterly operations, and to suggest measures to mitigate negative effects and improvements to enhance positive effects. HIA/EqIA also assesses whether these consequences would affect the whole population, within the spatial scope under consideration, or just certain groups within that population.[2] The EqIA component will identify the extent to which there are any disproportionate impacts on certain groups within the population.

1.1.6 The HIA/EqIA involves a process of screening and scoping prior to assessment and the subsequent formulation of conclusions and recommendations. Screening determines whether a HIA will be undertaken or not. Scoping identifies all of the potential effects on the health of the populations within the study area under consideration, and then prioritises those which are likely to result in important health outcomes. Health outcomes and equality groups within the scope are assessed using robust evidence based methodologies. In some cases it has been appropriate to undertake relatively high level qualitative assessments (e.g. visual disturbance from the noise

[1] Segregated mode for parallel runway operations means that one runway is used for aircraft arrivals with the other used for aircraft departures.

[2] Department of Health (2010): 'Health Impact Assessment of Government Policy'

barrier at Longford); in other cases more detailed quantitative assessments have been used (e.g. air quality and noise). The conclusions drawn from the assessment on the significance of likely health outcomes have informed the recommendations and accompanying health management plan. These outputs of the HIA/EqIA reporting process will assist developers and stakeholders with the ongoing management of relevant health outcomes as the scheme proceeds.

1.1.7 This structure of this document is as follows:
Chapter 2 – Objectives;
Chapter 3 – Scheme Description;
Chapter 4 – Approach;
Chapter 5 – Assessment Methodology;
Chapter 6 – Stakeholder Engagement;
Chapter 7 – Potential Health and Equality Effects;
Chapter 8 – Conclusions; and
Chapter 9 – Health and Equality Management Plan

2. Objectives

2.1 Objectives of the HIA/EqIA

2.1.1 This chapter sets out the objectives for the HIA/EqIA. Our approach to the HIA integrates an EqIA. EqIA is a systematic assessment of the likely or actual effects of policies or developments on the equality strands covered by the Equality Act 2010[3]:

2.1.2 HIA and EqIA objectives:

- To identify the potential positive and negative health effects associated with the changes resulting from the proposal for enabling works to allow the implementation of full runway alternation during easterly operations at Heathrow Airport;
- To identify any disproportionate positive or negative effects on the equality strands covered by *Equality Act 2010*;
- To identify opportunities for improving health and promoting health equity; and
- To identify opportunities to mitigate negative effects on health, vulnerable sections of society and reduce health inequalities.

2.1.3 This HIA uses the World Health Organization's (WHO) definition of health as a 'state of complete physical, mental and social well being and not merely the absence of disease or infirmity'[4]. In ending the Cranford Agreement the government intended to achieve a fairer distribution of aircraft noise around Heathrow Airport. Ensuring that the outcomes of policy decisions are fair is central to reducing health inequalities and so the HIA seeks to compare the probable health outcomes and their social determinants among specific population groups[5]. Issues around cumulative health effects will be considered in so far as to identify where potential effects combine to affect a particular population; either in spatial terms such as a particular community or in demographic terms such as particular group or section of society.

2.1.4 The HIA/EqIA has been informed by the following guiding principles:

- Adopt a wide definition of health and wellbeing;
- Follow an evidence-based approach;
- Focus on the likely changes to health as a result of the enabling works to implement full runway alternation during easterly operations to identify significant effects and scope out the issues that are not significant or not related to the specific proposals;
- Quantify effects where possible;
- Engage with stakeholders and ensure the assessment reflects their concerns;
- Identify vulnerable populations to recognise the equitable, or inequitable, nature of potential effects; and

[3] Certain protected characteristics are covered by the new Equality Duty which replaces the existing three separate duties which relate to gender; race and disability. EqIA is referred to as Equality Analysis in the Equalities Bill 2010

[4] World Health Organization. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June 1948

[5] Marmot, M.et al. Fair society, healthy lives. Strategic review of health inequalities in England post 2010 (Marmot Review). 2010. Available at www.ucl.ac.uk/gheg/marmotreview and P. Braveman and S. Gruskin. Defining equity in health. J.Epidemiol.Community Health 57 (4):254-258, 2003

- Ensure that recommendations are based on evidence.

3. Project description

3.1 Overview

3.1.1 This chapter describes the context to the proposals for enabling works to allow full runway alternation during easterly operations at Heathrow Airport. This section also summarises the main development components of the enabling works.

3.2 Heathrow Airport

3.2.1 Heathrow Airport is located approximately 15 miles west of Central London, within the London Borough of Hillingdon. It is situated on approximately 1,227 hectares of land and operates two parallel runways[6], which are orientated in an east-west alignment.

3.2.2 Heathrow Airport is bounded by the A4 (Bath Road – Colnbrook Bypass), the Western Perimeter Road and Wright Way to the north, the A3044 (Stanwell Moor Road) to the west, the Southern Perimeter Road and the A30 to the south, and the River Crane Corridor to the east. The nearest major urban areas to the airport are Hounslow (to the east) and Staines to the south-west. Smaller urban areas immediately surrounding the airport (in a clockwise direction from the north) include: Sipson; Harlington; Cranford; Heston; Hatton; East Bedfont; Stanwell; Stanwell Moor; Horton; Poyle; Colnbrook; Longford; and Harmondsworth.

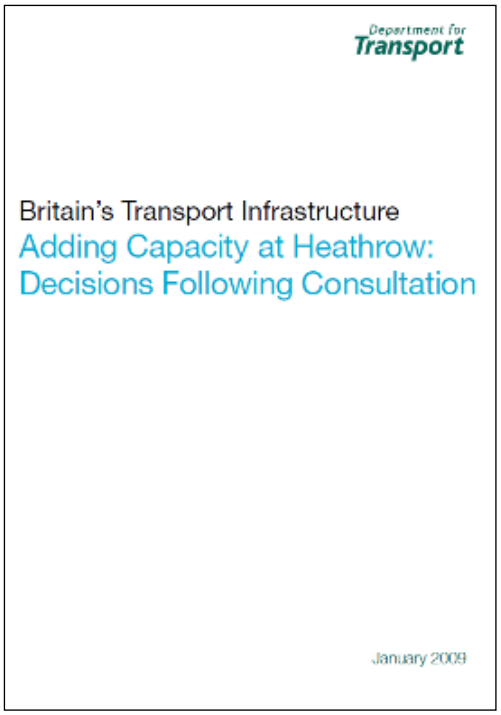
3.3 Aviation Policy and the Cranford Agreement[7]

3.3.1 The Cranford Agreement was a Ministerial undertaking given in 1952 to use best endeavours to avoid the operation of the northern runway for aircraft departures in an easterly direction over Cranford. Easterly departures from the northern runway can only happen when the airport is on 'easterly operations' when the wind is blowing from the east. This typically occurs for around 29% of the year. The Cranford Agreement has therefore historically prevented the implementation of runway alternation when the airport is on easterly operations i.e. it has not been possible to alternate the use of the northern and southern runways for departures and arrivals, so that typically only the northern runway is used for easterly arrivals and only the southern runway is used for easterly departures.

3.3.2 This has protected the residents of Cranford from aircraft departure noise. However, it has also resulted in residents living in areas such as Windsor, Stanwell and Hatton receiving a disproportionate amount of noise from arrivals and departures when the airport is on easterly operations. The reason for the introduction of the Cranford Agreement was to protect the residents of Cranford, which until the runways were extended westwards in the 1960s, was the nearest residential area to the airport, from aircraft departure noise.

[6] The two runways operate in segregated mode for parallel runway operations means that one runway is used for aircraft arrivals with the other used for aircraft departures. Generally, there is no interaction between arriving and departing aircraft on the same runway.

[7] This information is drawn from the Scoping Report prepared as part of the Environmental Impact Assessment (EIA) of the proposals for the enabling works to implement the ending of the Cranford Agreement. The EIA Scoping Report was submitted to the London Borough of Hillingdon in June 2011.



The Department for Transport (DfT) consulted on the prospect of ending the Cranford Agreement in the document 'Adding Capacity at Heathrow Airport' published in November 2007. Further to comments received, the Government's policy decision to end the Cranford Agreement was subsequently published in the document "Adding Capacity at Heathrow: Decisions following Consultation" dated 15 January 2009. Paragraph 75 of this document stated: *"The Secretary of State has…decided in the interests of equity to confirm the provisional view set out in the consultation document. Therefore the operating practice which implements the Cranford agreement should end as soon as practicably possible. He notes that this would enable runway alternation to be introduced when the airport is operating on easterlies, giving affected communities predictable periods of relief from airport noise".* This decision was reaffirmed by the Coalition Government in a Ministerial Statement delivered by Theresa Villiers on the 7th September 2010.

3.4 Enabling full runway alternation during easterly operations

3.4.1 The Cranford Agreement has ended but HAL has not yet implemented a new operating regime as physical works to the airfield are required to the airfield to facilitate the operational changes. A planning application is being submitted for these works: **Enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport**. This is development that is being assessed in this study.

3.4.2 Preliminary work on this planning application and assessments was undertaken in 2011 and HAL intended to submit a planning application in November 2011. This was postponed, with reasons related to ongoing Operational Freedoms Trials that may have led to stakeholder confusion with the planning application.

Proposed Development

3.4.3 Full runway alternation during easterly operations would not give rise to any increase in ATMs which will remain within the limit of 480,000 ATMs per annum (set as a condition of the Terminal 5 Planning Permission). The level of ATMs at Heathrow Airport varies from year to year and is influenced by several factors, including passenger demand and economic conditions, for example in 2007/08, Heathrow Airport handled about 471,000 ATMs, but in 2010 Heathrow Airport handled approximately 450,000 ATMs.

3.4.4 The physical works consist of a small amount of additional on-airfield infrastructure and the construction of a noise barrier at Longford. The airfield infrastructure works would enable the operational changes associated with the implementation of full runway alternation. This section describes these works and provides information on the construction of the infrastructure.

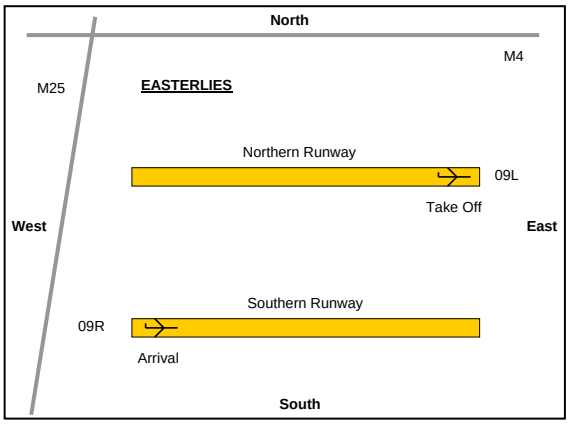


Figure 3.2. Implementing a new operating routine would enable Heathrow Airport to operate easterly departures from the northern runway as part of normal practice

Source: Heathrow Airport

Airfield infrastructure

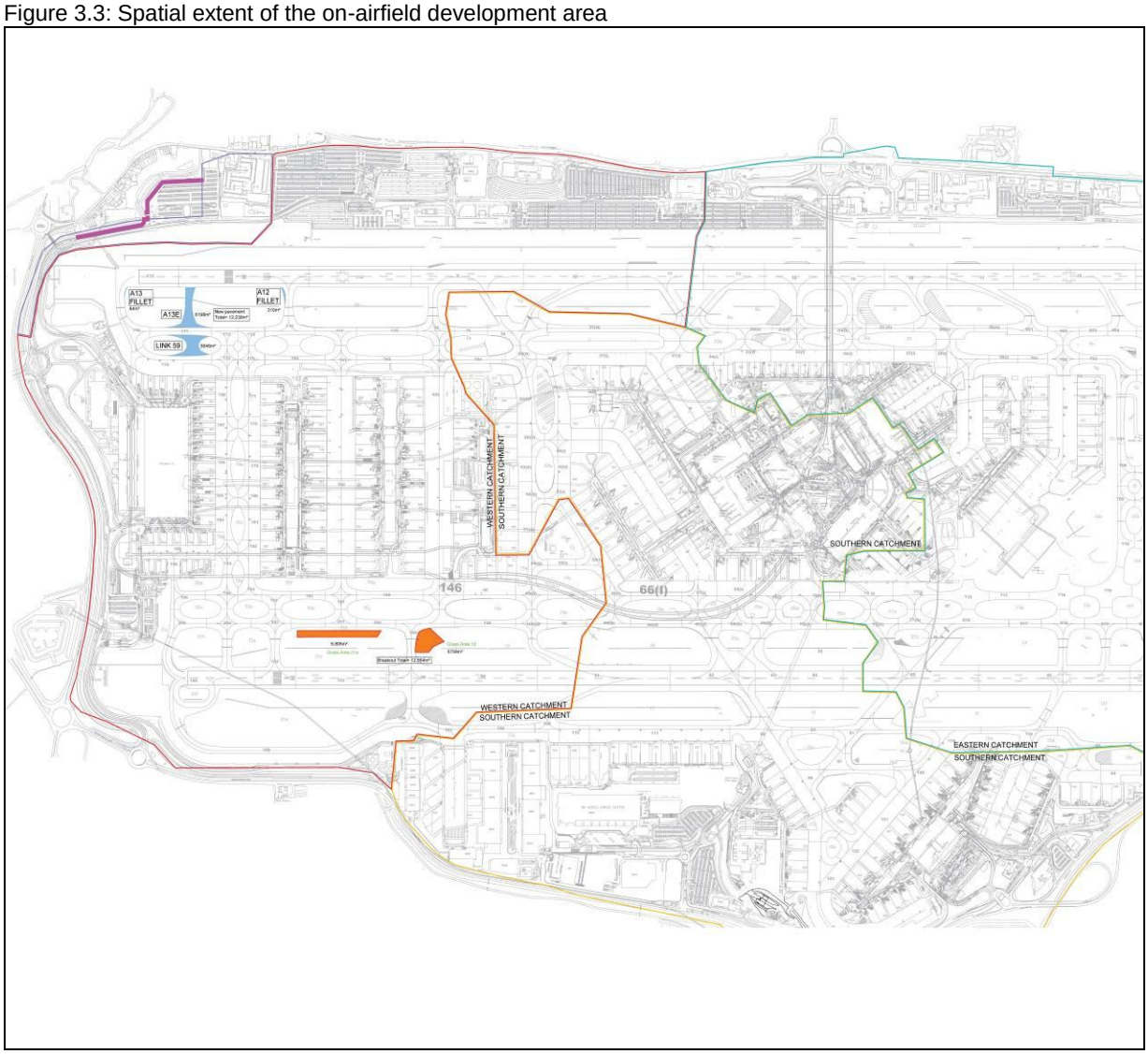
3.4.5 The proposed new infrastructure required to enable full alternation during easterly operations would be located wholly within the existing airport boundary and land ownership of HAL. The main development components of the airfield works are set out below.

3.4.6 Creation of a 'hold area' at the western end of Runway 09L comprising:

- Construction of a new Runway Access Taxiway (RAT) between Alpha Taxiway and Runway 09L;
- Construction of a new connector taxiway linking the existing Alpha and Bravo Taxiways situated immediately to the south of the proposed new RAT;
- Construction of two small areas of additional pavement to assist larger aircraft in safely accessing the runway. routine

3.4.7 The total area of new airfield infrastructure would be approximately 1.22 hectares (12,238m^2).

Figure 3.3: Spatial extent of the on-airfield development area

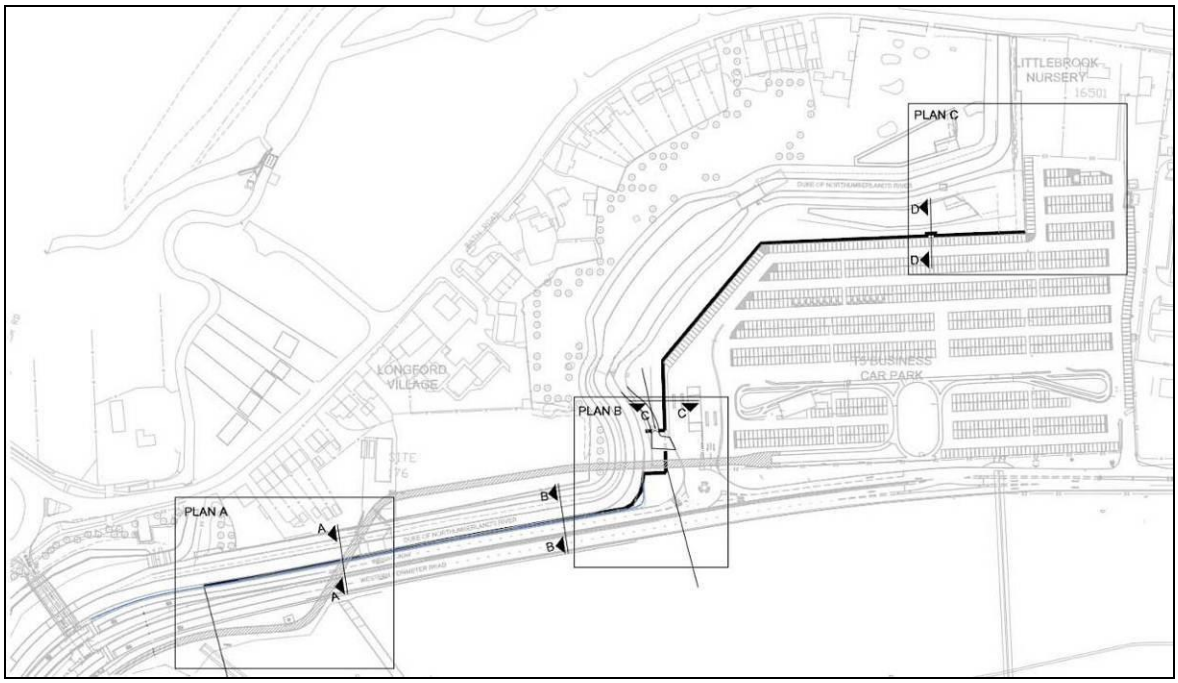


Source: Heathrow Airport Limited

Noise barrier at Longford

3.4.8 It is also proposed to construct a noise barrier to the south of the village of Longford. The barrier would be constructed in two sections, with a total length of 593m. The whole length of the barrier would be 5m in height. The western section (shown in Figure 3.4) would be located predominantly along the route of the existing highway noise barrier (i.e. a 3m high timber fence) adjacent to the Duke of Northumberland River and Wright Way. The eastern section would follow the route of the existing timber perimeter fenceline around the Terminal 5 Business car park. The bottom three metres of the noise barrier would be constructed from material of sufficient mass to provide the required noise attenuation benefits and the upper two metres would be constructed of a transparent material to minimise any visual impact.

Figure 3.4: Location map of the proposed noise barrier



Operational changes

3.4.9 The Cranford Agreement has historically limited to extent to which runway alternation can be implemented and has prevented the scheduled use of the northern runway for easterly departures when the airport is on easterly operations (i.e. when the wind is blowing from the east, which requires landing over Windsor and taking off towards London). Currently all scheduled easterly departures are from the southern runway and all easterly arrivals after 7am are onto the northern runway. Implementing full runway alternation would lift this restriction and enable the alternation of both runways for easterly operations.

3.4.10 In summary, implementing full runway alternation during easterly operations would result in:

- The introduction of regular departures from the northern runway (Runway 09L) in an easterly direction over Cranford, i.e. an increase in the number of easterly departures over Cranford;
- A decrease in the number of aircraft arriving on the northern runway in an easterly direction;
- An increase in the number of aircraft arriving on the southern runway (Runway 09R) in an easterly direction; and
- A decrease in the number of aircraft departing from the southern runway in an easterly direction.

3.4.11 When the airport is on westerly operations there will be no change. The expected split of time between easterly and westerly operations is 29% on easterly operations and 71% on westerly operations.

Construction

3.4.12 The approach to construction of the physical infrastructure considers the safety of aircraft, existence of airfield services and navigation systems, along with the need to maintain airport operations that are largely unaffected by the works. To this end, demolition and construction activities would take place largely at night, with some daytime working where appropriate.

- The construction work is expected to take approximately 10 to 12 months and is anticipated to be from April 2014 to early 2015;
- The majority of works would be carried out during weekdays but there may be some weekend and bank holiday working;
- Working hours are: night 22.30 – 05.45 and day 05.45 – 22.30;
- Comprise a total average daily workforce including staff and operatives working on the project in the range of 60 to 80 people.

3.4.13 The construction period of the Longford Noise Barrier is estimated to take about 10 weeks and comprise a construction workforce of about five.

3.4.14 HAL will prepare a detailed Construction Environmental Management Plan to manage and minimise potential adverse environmental effects during construction, including noise, dust, traffic and visual effects. An Outline Construction Environmental Management Plan will be submitted with the planning application.

4. Approach

4.1 Overview

4.1.1 This chapter sets out the overarching approach to the HIA and EqIA processes. Although this report presents a unified and integrated approach between health and equality assessment, for clarity the two approaches are presented separately.

4.2 The Health Impact Assessment process

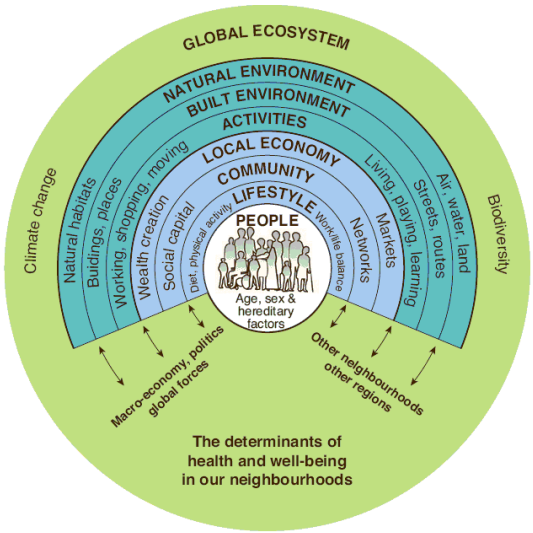
Approach to the HIA

4.2.1 HIA is a systematic process used to assess the potential health effects arising from policies, plans, programmes and projects and to help reduce health inequalities. HIA generally uses the WHO definition of health as a 'state of complete physical, mental and social well being and not merely the absence of disease or infirmity'[8].

4.2.2 There are a number of determinants of health, as illustrated in Figure 4.1, which can affect individuals directly or indirectly. Examining how a policy or project influences these determinants and the likely effects on the health of communities and individuals is the primary role of HIA.

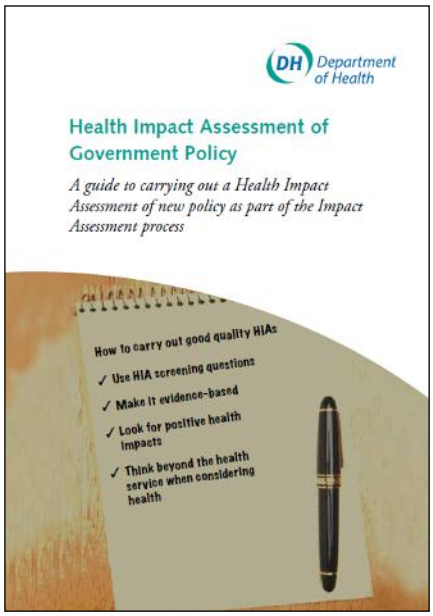
4.2.3 This assessment is prospective, which means that it is undertaken in advance of the implementation of the project, thereby providing sufficient opportunity to enable 'constructive modifications' to be made to the project should potential effects that are negative, and thus harmful to health, be identified and mitigations required. The assessment will also identify beneficial effects to health.

Figure 4.1: Determinants of health and well-being.



Source: Based on the Whitehead and Dahlgren (1991) diagram as amended by Barton and Grant (2006) and the UKPHA Strategic Interest Group (2006)

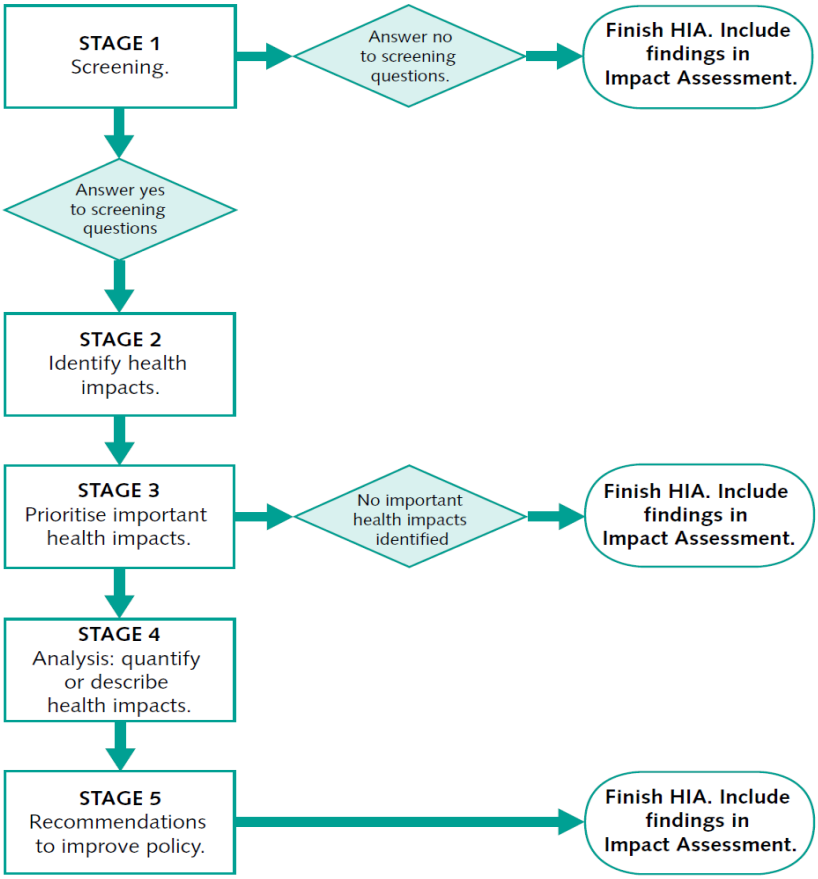
[8] World Health Organization. Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, New York, 19-22 June 1948



HIA is a specific impact test within the mandatory impact assessment process. The Department of Health (DoH) has set out guidelines on HIA of Government Policy. These guidelines establish an HIA methodology as illustrated in Figure 4.2 and described below.

These guidelines are relevant to this document as (a) the proposed development will enable implementation of Government policy; and (b) the guidelines provide the framework for scoping which are used in this document.

Figure 4.2: HIA Stages



Source: Department for Health (2010) 'Health Impact Assessment of Government Policy'

4.2.4 The process set out in DoH guidance has informed the approach to this HIA and the key stages of this HIA are:

- **Stage 1**: Screening – determining whether or not an HIA is necessary;
- **Stage 2**: Identify health impacts – developing a long list of all of the potential impacts on the health of the population;
- **Stage 3**: Identify impacts with important health outcomes – determining whether impacts are universal or affect some community groups disproportionately; are permanent or reversible; are short, medium or long term; could be publicly sensitive; or could have cumulative or synergistic effects;
- **Stage 4**: Quantify or describe important health impacts – reaching a qualitative and quantitative judgement about the important health impacts and their potential costs and benefits; and
- **Stage 5**: Recommendations to achieve most health gains – setting out how the policy or project could be amended to maximise health benefits and reduce health inequalities.

HIA and EqIA interdependencies

4.2.5 There are inherent links between health and equality impact assessments; the two exercises can overlap and be mutually supportive. There are strong and well-established links between health outcomes and inequality. Often equality groups, due to positions of socio-economic disadvantage, are amongst those most likely to experience poorer health outcomes and health inequalities. The two assessments are interdependent.

4.2.6 HIAs and EqIAs, therefore, are frequently undertaken concurrently and often rely on similar evidence bases. For example, many of the datasets that are mapped to assess health impacts can be derived from the datasets gathered for an EqIA. Most notably, population density, populations of particular age groups, disability groups, and groups who experience deprivation feature prominently in both types of assessment.

4.3 The Equality Impact Assessment process

Approach to the EqIA

4.3.1 Equality analysis (including EqIAs) is a systematic assessment of the likely or actual effects of policies / developments on the following statutory equality strands (as defined by Equality Act 2010)[9]:

- Gender
- Age
- Disability
- Race (including ethnic or national origins, colour or nationality)
- Religion or belief (including lack of belief)
- Gender reassignment

[9] These protected characteristics are covered by the new Equality Duty which replaces the existing three separate duties which relate to gender; race and disability.

- Sexual orientation
- Pregnancy and maternity
- Marriage and civil partnership

4.3.2 The objective is to identify opportunities to promote equality more effectively or to a greater extent, as well as identifying negative impacts, which need to be removed or mitigated to prevent any unlawful discrimination or disproportionate negative effects.

> Guidance published by the Government Equalities Office (GEO)[10] and Equality and Human Rights Commission (EHRC) from December 2010, makes clear that undertaking equality analysis is something that should occur early in the development process:
>
> 'Equality analysis starts prior to policy development or at the early stages of a review. It is not a one-off exercise, it is ongoing and cyclical and it enables equality considerations to be taken into account before a decision is made.
>
> Equality analysis of proposed policies will involve considering their likely or possible effects in advance of implementation. It will also involve monitoring what actually happens in practice. Waiting for information on the actual effects will risk leaving it too late for your equality analysis to be able to inform decision-making.'[11]

In the early stages of the development process there is an opportunity for equality considerations to be integrated, ensuring that issues further along in the project cycle are avoided.

4.3.3 Typically, the key stages of equality analysis or EqIA involve:

- **Stage 1**: Screening – determining whether or not the analysis or an EqIA is necessary.
- **Stage 2**: Scoping – identifying potential impacts of the policy or proposal and which equality strands are particularly sensitive to these and, therefore, could experience positive or negative impacts to a disproportionate extent. This identifies those groups that need to be the focus of later stages of the analysis. The scoping stage also sets out the geographic scope of the assessment.
- **Stage 3**: Identifying demographic distribution of sensitive equality groups – understanding the representation of sensitive equality groups within the geographic boundaries of the assessment and mapping proportions and density. This helps to later examine the 'distribution' of impacts i.e. how many people from equality groups live in areas where impacts are expected. – determining whether impacts are universal or affect some community groups disproportionately; are permanent or reversible; are short, medium or long term; could be publicly sensitive; or could have cumulative or synergistic effects;
- **Stage 4**: Quantifying or describing equality impacts – reaching a qualitative and quantitative judgement about what type of impacts are likely and the 'magnitude' of these impacts i.e. the extent of the impact on quality of life and whether the impact reduces or increases existing inequalities; and
- **Stage 5**: Recommendations to maximise the equality of outcomes – setting out whether proposals should be amended, and if so how, in order to minimise any adverse equality effects

[10] The GEO has now been formally incorporated into the Home Office and is no longer a standalone body.

[11] Equality and Human Rights Commission (2010): 'Equality analysis and the Equality Duty'

and maximise benefits. This section also highlights the extent to which the impacts accord local equality policy objectives.

4.3.4 The outputs of each of these stages are contained within this report.

5. Methodology

5.1 Overview

5.1.1 This chapter sets out the stages of the HIA and EqIA. The two assessments have been integrated, however at some stages separate methodologies are presented for clarity.

5.2 Screening

5.2.1 This methodology section addresses Stage 1 of the DoH HIA guidance. Equalities issues are considered in parallel; the DoH HIA guidance requires consideration of effects on socio-economic or equalities groups. The screening process determines and documents whether to proceed with a HIA/EqIA and the populations that may be affected.

5.2.2 The DoH HIA guidance which sets out five screening questions that help identify whether or not to proceed with the subsequent stages of the HIA process. These questions are set out in Table 5.1.

Table 5.1: Department of Health guidance screening questions

	Screening question*
1	Will the proposal have a direct impact on health, mental health and wellbeing? *For example would it cause ill health, affecting social inclusion, independence and participation?*
2	Will the proposal have an impact on social, economic and environmental living conditions that would indirectly affect health? *For example would it affect housing, transport, child development, education, good employment opportunities, green space or climate change?*
3	Will the proposal affect an individual's ability to improve their own health and wellbeing? *For example will it affect their ability to be physically active, choose healthy food, reduce drinking and smoking?*
4	Will there be a change in demand for or access to health and social care services? *For example: Primary Care, Hospital Care, Community Services, Mental Health and Social Services?*
5	Will the proposal have an impact on global health?

* Particular effects on socio-economic or equalities groups should be considered.

5.2.3 In answering these questions the screening process had regard for the socio-economic or equalities groups set out in Table 5.2.

Table 5.2: Socio-economic and equalities groups considered during screening

Groups identified in the Equalities Act 2010	Other vulnerable and/or disadvantaged population groups
• Gender • Age • Disability • Race (including ethnic or national origins, colour or nationality) • Religion or belief (including lack of belief) • Gender reassignment • Sexual orientation • Marriage and civil partnership • Pregnancy and maternity	• People living in areas exhibiting poor economic indicators • People living in areas exhibiting poor health indicators • People unable to access services and facilities • Travellers

5.2.4 Through answering the DoH screening guidance questions in relation to the identified socio-economic and equalities groups it was determined that a HIA incorporating an EqIA would be undertaken.

5.2.5 It was identified that the key issues for the HIA/EqIA were likely to be the effects on the population associated with changes to the distribution of noise and air quality.

5.3 Scoping

5.3.1 This section addresses Stages 2 and 3 of the DoH HIA guidance. As part of the methodology, scoping studies were undertaken for both the health and equalities components. The scoping study focuses the assessment on the key health issues relevant to the implementation of full runway alternation. The EqIA scoping study identifies where important differences in the distribution of health outcomes may be experienced within the affected population.

HIA Scoping

5.3.2 HIA scoping identifies all of the potential effects on the health of the populations, characterises the potential effects and then prioritises those for further assessment. The scoping process has drawn on the DoH guidance on HIA[12] to formulate the fields in the scoping table set out in Table 5.3.

[12] Health Impact Assessment of Government policy, Department of Health, 2010 available at www.dh.gov.uk/en/Publicationsandstatistics/Legislation/Healthassessment/DH_120104

Table 5.3: Scoping exercise fields drawn from DoH guidance on HIA

Scoping Questions
Potential health issue – what activities could result in health effects?
Health pathway / determinant – which determinants of health would potentially experience a change?
Potential health effect – what health conditions would be expected to be experienced?
Population affected – which communities or demographic groups would experience the effects?
Feature of the project – whether the activity of potential health issue is something that would arise (or is relevant) to the enabling works and subsequent operations implementing full runway alternation during easterly operations?
Will the health effects be difficult to remedy or have an irreversible effect?
Potential health effect timescales
Are the health effects likely to generate public concern?
Are the health effects likely to generate cumulative and/or synergistic effects?

5.3.3 In completing the scoping exercise the following factors were considered:

- Project scope – the details of the enabling works to allow the implementation of full runway alternation during easterly operations and the resulting change in operating practices at Heathrow Airport.
- Subject scope - focusing the HIA/EqIA on the potential health effects that are likely to experience the greatest change and/or have the greatest effect on the determinants of health.
- Geographic scope - the geographic scale / study area. Including relevant local authorities as well as London Boroughs.
- Temporal scope - the time period over which effects may act, including consideration of: baseline, construction and operational conditions.
- Scheme alternatives – considering the 'with development' scenario against the 'no development' scenario.

5.3.4 The fields drawn from the DoH guidance on HIA (Table 5.3) were used to construct a scoping matrix. The matrix examined a broad set of potential health issues, consistent with the wider determinants of health approach described in Section 4. Based on the responses to the questions in Table 5.3, potential health issues were classified as follows:

- If the potential effects would result in prioritised health outcomes, the potential effect is 'scoped in' meaning that it will be considered for further assessment.
- If the potential effect is not considered to result in important health outcomes, the potential effect is 'scoped out' meaning that it will not be considered for further assessment.

5.3.5 The potential health effects for both the construction and operation phases have been set out and grouped thematically in Table 5.4.

Table 5.4: Potential health effects identified in the scoping exercise

Phase	Theme	Features of the project	Potential health effect
Construction	Noise	▪ Noise generation from construction plant (particularly at night)	These activities could have health effects related to annoyance and sleep deprivation.
Operation	Air quality	▪ Redistribution of emissions to the atmosphere from aircraft as a result of a change in runway alternation practices during easterly operations. ▪ The evaluation of air quality will also note important links with: ▪ Community concerns, perceptions and beliefs about aircraft air pollution; and ▪ Change in demand for local health and social care services as a result of redistributed air pollution.	These activities could have health effects related to respiratory and cardiovascular functions.
	Noise	▪ Redistribution of ground noise[13] generated by aircraft as a result of a change in runway alternation practices during easterly operations ▪ Redistribution of air noise[14] generated by aircraft as a result of a change in runway alternation practices during easterly operations ▪ Changes in noise exposures at sensitive locations such as buildings and facilities used for housing (residential), education (primary schools), and healthcare (hospitals).	These activities could have the following health effects: Annoyance, sleep deprivation, hearing damage, morbidity, coronary health, changes in wellbeing, changes in educational attainment, changes in hospital recovery rates.
	Visual amenity	▪ Change to the visual amenity in the area of the proposed Longford Noise Barrier.	These activities could have health effects related to annoyance and a change in wellbeing.

[13] Ground noise is all noise emitted from airside sources that contribute materially to noise levels heard outside the airport, including aircraft up to start-of-roll (SOR) and after completion of the ground run on landing, i.e. including taxiing to the runway, queuing and holding prior to the SOR, and aircraft using reverse thrust to increase their braking after touchdown and taxiing from the runway via taxiways to their stand locations.

[14] Air noise is all noise caused by departing and arriving aircraft between SOR and completion of the landing run, including the use of reverse thrust where relevant.

EqIA Scoping

5.3.6 EqIA scoping identifies the equalities groups that may be affected by the scheme, and then prioritises those which are likely to experience disproportionate effects. The equality strands and the potentially affected groups are set out in Table 5.5. Evidence was reviewed to identify any linkages between the Project and potential impacts on each equality strand and the population groups within that equality strand.

Table 5.5: Affected groups for each equality strand of the Equality Act 2010

Equality Strand	Affected groups
Age	Children (aged under 16) People of working age (aged 16-64) Older people (aged 65+)
Disability	People with long term respiratory illnesses People with mental wellbeing disabilities
Gender reassignment	None
Pregnancy and maternity	Pregnant women Parents with newborn children
Race (including ethnic/ national origins, colour or nationality	People from Black, Asian and Minority Ethnic (BAME) groups
Religion or belief, including lack of belief	None
Sex / Gender	None
Sexual orientation	None
Marriage or civil partnership	None

5.3.7 The population distribution for each equality strand was also mapped. This information was used to determine if and how certain groups within each equality strand could potentially experience disproportionate impacts as a result of implementing full runway alternation during easterly operations. Where affected groups are considered likely to experience effects that are disproportionate to the effects felt by the whole population, they have been scoped in to the EqIA.

5.3.8 For each of the potential health effects set out in the HIA scope above, particular sections of the population, including equality groups, may experience disproportionate effects. The population groups identified (see Appendix A) for further analysis are set out in Table 5.6.

Table 5.6: Affected groups and the factors influencing health

Affected Group	Factors influencing health
Children (aged under 16)	▪ Air quality influencing respiratory conditions such as Asthma ▪ Noise affecting cognitive development in primary school children
People of working age (aged 16-64)	▪ Noise influencing sleep disturbance and annoyance
Older people (aged 65+)	▪ Air quality influencing respiratory conditions ▪ Noise at night time
People with long term respiratory illnesses	▪ Air quality influencing respiratory conditions
People with mental well-being disabilities	▪ Environmental noise affecting the rate of onset or intensity of latent mental disorder
Pregnant women	▪ Noise influencing sleep disturbance and annoyance
Parents with newborn children	▪ Noise influencing sleep disturbance and annoyance
People from Black, Asian and Minority Ethnic (BAME) groups	▪ Noise influencing cardiovascular and hypertension

Summary of Scoping

5.3.9 The scoping study concluded that the enabling works to allow implementation of full runway alternation during easterly operations are likely to have health effects resulting from the proposed changes in the pattern of aircraft operations, with a consequent effect on environmental issues of noise and air quality, and that these effects could have disproportionate effects for some equality groups. The key issue is that the total effect of the proposed changes is not likely to increase significantly as experienced by the population as a whole, but the effects would be redistributed. Therefore some populations would benefit through reduced effects and some populations would experience new or increased effects. Analysis for the HIA/EqIA will attempt to identify whether this redistribution is more or less equitable; and whether the redistribution of health effects would reduce or widen existing health inequalities.

5.4 The study area

5.4.1 The study area for the HIA/EqIA has been identified as being the geographical area covered by the following ten local authorities:

- 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
- Royal Borough of Windsor and Maidenhead
- South Bucks District Council
- Runnymede Borough Council
- Spelthorne Borough Council

5.4.2 This area represents the greatest geographic area that effects attributable to the proposed changes could be felt. Specifically, effects on noise levels within the air noise contours being considered for this assessment are not expected to be noticeable outside of this area. Each topic/issue being assessed will have its own study area that is relevant to the extent of the likely effects.

5.5 HIA evaluation method

5.5.1 This method section addresses Stage 3 and 4 of the DoH guidance. The evaluation methodology is laid out thematically for the three topics of: noise, air quality and noise barrier visual disturbance. These methodologies have been used to derive the results presented and analysed: by theme; by geographic community; and by vulnerable populations, in Chapter 7.

Air Quality

5.5.2 This topic will be subject to comprehensive assessment, reflecting the empirical nature of the information available and the opportunity to undertake a robust quantitative assessment. The issues to be addressed under this topic are:

Construction: No issues to be addressed.

Operation: Redistribution of emissions to the atmosphere from aircraft as a result of a change in runway alternation practices during easterly operations.

Overview of methodology

5.5.3 The following section outlines the methodology used to determine health outcomes from changes in air quality as a result of implementing full runway alternation during easterly operations. The adopted methodology is based on that presented in 'Clean Air For Europe' (CAFE) as developed by the DoH and the European Commission.

5.5.4 The study area used in the assessment of air quality effects is analogous to that used for the air quality assessment presented in the Environmental Statement (ES)[15]. This covers a 9km x 9km area centred on Heathrow Airport and therefore covers a large area of the London Borough of Hounslow and the London Borough of Hillingdon.

5.5.5 A range of potential health impacts have been considered, consistent with the CAFE method. These are:

- All causes of mortality
- Cardiopulmonary mortality
- Lung cancer mortality
- Chronic Bronchitis
- Cardiovascular hospital admissions
- Respiratory hospital admissions
- GP Consultation Asthma
- Lower Respiratory Symptoms (LRS) children
- Lower Respiratory Symptoms (LRS) adults
- Mortality - Deaths (non-traumatic) brought forward

5.5.6 The impact of the proposed changes to on each of the potential health effects relating to air pollution has been assessed based on the following method:

$$\Delta E = \beta \times \Delta C \times P \times E$$

Where:

Parameter	Description
ΔE	The change in the prevalence rate of the health impact being considered
B	The exposure-response coefficient represents the percentage increment in the baseline rates of health conditions for a given increment of pollutant concentration change.
ΔC	The change in the pollutant concentration across the study area as a result of the intervention (i.e. the concentration with the project minus the concentration without the project)
P	The population within the study area exposed to the change in pollutant concentrations
E	The baseline rate for the health impact being considered within the study area population

[15] The Environmental Statement reports the findings of the Environmental Impact Assessment (EIA) of the proposed development. The ES accompanies the planning application.

5.5.7 This method produces results for the aggregated change over the study area, although impacts on individual areas can also be analysed as appropriate. The results of applying this methodology are set out in Section 7.2.

Noise

5.5.8 This topic will be subject to comprehensive assessment, reflecting the empirical nature of the information available and the opportunity to undertake a robust quantitative assessment. Issues to be addressed under this topic:

Construction: Noise generation from construction plant (particularly at night)

Operation:

- Redistribution of ground noise generated by aircraft as a result of a change in runway alternation practices during easterly operations
- Redistribution of air noise generated by aircraft as a result of a change in runway alternation practices during easterly operations
- Changes in noise exposure at sensitive locations such as buildings and facilities used for housing (residential), education (primary schools), and healthcare (hospitals).

Overview of methodology

5.5.9 The following section outlines the methodology used to determine health outcomes from changes in noise levels resulting from the implementation of full runway alternation during easterly operations.

5.5.10 Published literature has been reviewed to identify not only the issue of “strength of evidence” but also the general consensus on “exposure-response” relationships between various health outcomes and noise levels. Based on the various views of the strength of evidence from published studies, there is the strongest evidence of a relationship between noise and health for:

- Annoyance
- Sleep disturbance
- Cognitive performance in school children.

Some recent studies have assessed:

- Cardiovascular and coronary health

The HIA also reports the outputs from the noise assessment documented in the ES. This includes assessments of:

- Healthcare facilities
- Construction noise

5.5.11 All of these issues will be assessed in this HIA. For each issue, the noise metrics (the way in which noise is measured) that inform the assessment are stated. These differ for each potential health effect to reflect (and be consistent with) the evidence from studies that connects noise to health effects. Therefore, a range of metrics are used. The source information (noise modelling and population numbers) is the same as that used for the noise assessment reported in the ES. It should be noted that the ES is required to focus on identifying the likely significant environmental effects and the analysis has a different emphasis from that of this HIA.

5.5.12 Effects for which evidence is less conclusive and does not form part of this HIA are:

- Mental health
- Task performance
- Foetal effects

(a) Annoyance

5.5.13 There are a number of possible exposure-response curves which have been developed and published in recent years. These models seek to chart the relationship between noise exposure and response, which is measured as annoyance; specifically, the percentage of people 'Highly Annoyed' (HA) by noise. Changes in noise will be measured by L_{Aeq} contours above 57dB$_{LAeq}$, using data generated to produce the noise assessment presented in the ES. This is the metric that was considered by the Government in the decision to end the Cranford Agreement (see Section 3.3).

5.5.14 The assessment of annoyance will compare the number of people Highly Annoyed in the baseline scenario with the implementation of full runway alternation in 2015. The methodology will follow that set out in the 2002 EU Position Paper on Annoyance[16]. The LAeq values will be adjusted from Lden by the addition of 2dB.

The relevant equation is:

$$\% \text{ HA} = -9.199 * 10^{-5} (L_{den} - 42)^3 + 3.932 * 10^{-2} (L_{den} - 42)^2 + 0.2939 (L_{den} - 42)$$

Metrics to be used: 57dB $L_{Aeq\ 16\ hr}$ for air noise contours.

(b) Sleep disturbance

5.5.15 The methodology for estimating the response in a population to aircraft noise at night is based on the relationship between noise expressed as L_{night}, i.e. the weighted average over the night time period, and self-reported sleep disturbance. This is a convenient method for considering a chronic effect using a metric that is readily calculated. It does, however, suffer from considerable uncertainty and variability in the responses, which are self-reported, rather than using an objective measure of effect. Percentages of people Highly Sleep Disturbed (HSD) will be calculated using Lnight contours starting at 45 dB L_{night} and the following relationship from the EU Position Paper on Dose-Effect Relationships for Night Time Noise[17].

$$\%HSD = 18.147 - 0.956L_{night} + 0.01482(L_{night})^2$$

[16] European Commission 2002. *Position paper on dose response relationships between transportation noise and annoyance*.
http://ec.europa.eu/environment/noise/pdf/noise_expert_network.pdf

[17] European Commission 2004. *Position paper on dose-effect relationships for night time noise.*
http://ec.europa.eu/environment/noise/pdf/positionpaper.pdf

Metrics: 45dB L_{night} for air noise contours.

(c) Cognitive performance in schoolchildren

5.5.16 The method to assess cognitive performance of primary school children is based on the RANCH study, reported in The Lancet in 2005[18] . This was a robust multi-centre study, which measured different aspects of cognitive ability children who attended schools exposed to various levels of road traffic and aircraft noise around three airports, including Heathrow in the UK. One outcome noted by the study was that a 5 dB difference in aircraft noise was equivalent to a 2-month reading delay in the UK.

5.5.17 The uncertainties present in measuring reading performance in the classroom, the uncertainties in translating actual test scores into 'reading age' and the fact that reading age cannot be quantified in units of less than one month using the Suffolk Reading Scale, together with uncertainties in estimating noise exposure, mean that it is probably unwise to use the relationship to quantify the effects of changes in reading age development of less than one month, or to use the relationship in too precise a manner. If used to quantify effects on reading age, the result ought to be expressed in relatively coarse units, with an acknowledgement of the degree of uncertainty around individual numbers. Furthermore, the study found that the effects on reading age were reversible.

5.5.18 Thus a simplified approach will be adopted in the HIA, with schools being classified as being in one of the following categories, based on contours of $L_{Aeq\ 16\ hr}$.

Table 5.7: Change in noise and duration of reading age effects

Noise change in LAeq, 16 hour	Reading age effects
< 2dB	No effect
2 to 3dB	Less than one month
3 to 5 dB	One to two months
> 5 dB	More than 2 months

Metrics: 57dB $L_{Aeq\ 16\ hr}$ for air noise contours.

(d) Cardio-vascular and coronary health

5.5.19 The relationship between noise and cardio-vascular and coronary health is included in the HIA, although uncertainties remain on the strength of the relationships. The calculation for the effects on cardiovascular disease is based on an exposure-response relationship between the health effect (expressed as the Relative Risk for Myocardial Infarction - MI or heart attack)[19] and the exposure of the population to noise, as measured using L_{day} contours. This was originally

[18] S A Stansfeld , B Berglund , C Clark et al. 2005. *Aircraft and road traffic noise and children's cognition and health: a cross-national study.* Lancet 365: 1942-1949.

[19] This relationship is based on the Babisch risk curve, 2006, showing the relationship between noise (Lday) and a case weighted Odds Ratio (or Relative Risk) for incidence of myocardinal infarction. See: B F Berry 2008. *Effect of noise on physical health risk in London. Report on Phase 2 – Estimates of the numbers of people at risk*. BEL Technical Report 2008-2 July 2008.

developed from an analysis of studies on road traffic noise, but the assumption is made that the relation would be the same for aircraft noise. The relevant equation is;

RR = 1.629657 – 0.000613*Noise level2 + 0.000007356734623455*Noise level^3

5.5.20 The number of people affected, either within a given Noise Exposure category, or in total, is known as the Population Attributable Risk (PAR). PAR is itself calculated by multiplying the Population Attributable Risk percentage (PAR%) by Nc, the total number of cases of MI as follows:

PAR = (PAR%/100) * Nc

5.5.21 PAR% is calculated from the Relative Risk (RR) at a given noise level - which is itself derived from the exposure-response relationship - together with the Percentage of the population exposed at that noise level Pe, from the following equation:

PAR% = [Pe/100 * (RR-1)] / [(Pe/100 * (RR-1) + 1)] * 100

5.5.22 The total number of cases of MI for the study area (the ten local authorities) relates to the total population of the study area. The method will calculate the number of people within the 55L_{day} contour and calculate the proportion of cases of MI that would be expected within this smaller population.

5.5.23 The difference in the integer values for PAR% for the baseline and PAR% with full runway alternation will be presented.

Metrics: 55dB L_{day} for combined air and ground noise contours.

(e) Healthcare facilities

5.5.24 The methodology for assessing the effects of noise on healthcare facilities is derived from the DoH Specialist services, Health Technical Memorandum 08-01: Acoustics (HTM 08-01 Acoustics). This document contains a table of criteria for noise intrusion from external sources in new buildings.

5.5.25 Accounting for outside-to-inside differences in noise (around 15dB during the day), the lower cut-off value for outdoor noise levels is 55dB $L_{Aeq\ T}$ (where T = 1 hour). Therefore, healthcare facilities that experience a change of over 3dB $L_{Aeq\ 16\ hr}$ will be considered to experience a significant impact from the proposed development.

Metrics to be used: 55dB $L_{Aeq\ 1hr}$ for air noise contours

(f) Construction noise

5.5.26 The methodology for assessing the effects of construction noise is based on BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites. Annex E of BS 5228-1:2009 provides a methodology for assessment based on the change in ambient noise

levels as a result of construction activity. The methodology considers that construction noise is a significant impact where:

- a change of 5dB occurs subject to a lower cut-off value of 65dB $L_{Aeq\ T}$ during the day; and/or
- a change of 5dB occurs subject to a lower cut-off value of 45dB $L_{Aeq\ T}$ during the night.

Metrics to be used: Change in ambient noise levels of 5dB $L_{Aeq\ T}$ with different cut-off values for day and night.

Visual Amenity (of the Longford Noise Barrier)

5.5.27 This topic will be subject to 'rapid' assessment reflecting the more subjective nature of the information available. The assessment places a greater reliance on expert opinion and any stakeholder views rather than empirical data in reaching a conclusion that, whilst robust, will necessarily be qualitative in nature. The issues to be addressed under this topic are:

Construction: No issues to be addressed.

Operation: Change to the visual amenity in the area of the proposed Longford Noise Barrier, once constructed.

Overview of methodology

5.5.28 The following methods statement sets out an evidence based approach to assessing health outcomes derived from HIA experience at UK airports[20]. Given the paucity of quantifiable evidence linking visual effects to health outcomes and the subjectivity of the associated effects, a qualitative approach is considered to be the most appropriate for this assessment.

5.5.29 The criteria set out in Table 5.8 allow for the assessment of health effects associated with changes to the landscape and visual effects. These were originally derived with large-scale development works in mind. In this assessment the criteria are applied to the more focused issue of the visual change caused by the noise barrier that is being constructed as part of the enabling works to allow the implementation of full runway alternation.

Table 5.8: Visual Amenity Assessment Criteria

Degree of Effect	Effect	Extent	Ability to adapt	Health Outcome
Low	Little change in visual amenity.	Few viewers affected and/or long distance views.	Adapting to the change is likely, and only takes a short period of time. Screening hides development.	Inconvenience and slight annoyance. No deterioration of the built environment and therefore no effect on wellbeing or quality of life.
Moderate	Moderate changes over localised area.	Moderate number of viewers affected and/or	Adapting to the change is likely, but takes a long period	Annoyance.

[20] Principally, adapted from work undertaken for the BAA Stansted G2 HIA. For details of the literature review underpinning this approach and for further methodological detail see the Stansted G2 HIA, available at: http://www.apho.org.uk/resource/item.aspx?RID=49289

		moderate proximity.	of time. Screening mainly blocks development.	 Increased concern over other health effects. Some deterioration of the built environment therefore decreased wellbeing and quality of life.
High	Notable changes in landscape character or visual amenity over an extensive area or intensive change over a more limited area.	Many viewers affected and/or close proximity.	Adapting to the change is unlikely in the foreseeable future. Development still visible in part or in total.	Annoyance. Increased concern over other health effects. Deterioration of the built environment therefore decreased wellbeing and quality of life.

The results of applying this methodology are set out in Section 7.3.

5.6 EqIA evaluation method

Overview

5.6.1 There is not a prescriptive methodology for EqIAs; guidance developed by various organisations exists but there is not a definitive approach. The evaluation method used for this EqIA makes reference to the various published guidance documents and also draws on good practice in undertaking EqIAs across a variety of industry sectors.

5.6.2 EqIAs also tend to rely more on qualitative rather than quantitative evidence; they are often based on the review of existing literature and the views of local equality stakeholders. However, there are some quantitative elements to the evaluation, particularly in terms of assessing the distribution of impacts[21] as explained in further detail below.

Issues to be addressed under this topic

5.6.3 The EqIA addresses the same issues as those considered for the HIA. These topics, together with the groups for which impacts are assessed, are set out in Table 5.9 below.

[21] This quantitative element is dependent on the availability of datasets on the particular equality group. Table 5.7 above indicates whether quantitative analysis is possible.

Table 5.9: Affected groups for each equity strands of the Equality Act 2010

Issue / Impact	Relevant Equality Groups
AIR QUALITY	
• **Operation**: Redistribution of emissions to the atmosphere from aircraft as a result of a change in runway alternation practices during easterly operations	Children (aged under 16) Older people (aged 65 +) People with long term respiratory illnesses
NOISE	
• **Construction**: Noise generation from the construction plant • **Operation**: Redistribution of air and ground noise generated by aircraft as a result of a change in runway alternation practices during easterly operations and changes in noise exposures at primary schools and hospitals.	Children (aged under 16) People of working age (aged 16-64) Older people (aged 65+) People with mental well-being disabilities Black, Asian and Minority Ethnic (BAME) communities Pregnant women and parents with newborn children

5.6.4 In order to consider whether there are any disproportionate visual amenity effects, the composition of the community immediately around the Longford Noise Barrier is also analysed to determine whether any equality groups could experience disproportionate effects.

Evaluation methodology

5.6.5 In order to fully understand and assess each impact identified, it is important to consider two key factors so that a balanced assessment can be reached. These factors are summarised below:

- **Magnitude:** this considers the impacts for each group, the extent of the impact on each equality group and whether the impact is negative or positive. The evidence which feeds into this includes findings from desk research into health and clinical publications looking at groups which are susceptible to air quality and noise impacts. It is also informed by comments from stakeholders. Magnitude of effects is summarised in the evaluation in Chapter 7.
- **Distribution:** this provides an indication of the number of people from each of the sensitive equality groups within the areas affected by changes in air quality and noise, that would experience either positive or negative impacts. This element of the evaluation considers the density of these groups within these impact areas but also looks at the relative distribution by comparing the proportional representation of groups to the whole study area[22] and regional averages (London and the South East) and the average across the whole study area (the ten local authority areas). Analysing distribution provides an indication of whether impacts are being experienced in areas where there disproportionately high numbers of vulnerable groups.

5.6.6 Considering the above two variables together allows an assessment of the significance of impacts on each group to be reached.

5.7 Reporting method

5.7.1 This report aims to report the findings of the HIA and EqIA in an accurate and accessible manner. Supporting information relevant to the assessment is contained in Appendices. A separate document – the HIA/EqIA Evidence Base – contains information on the study area, literature and data that help set the context for the assessment.

[22] The whole study area, as described in Section 5.3, comprises the following ten local authority areas: Ealing; Hillingdon; Hounslow; Richmond-upon-Thames; Runnymede; Slough; Spelthorne; South Buckinghamshire; Wandsworth; and Windsor and Maidenhead.

5.8 Managing and reporting effects

5.8.1 It is important that the effects identified in this assessment are managed to ensure that potentially negative impacts are mitigated and that potentially positive impacts are maximised. Proposed management measures are set out in Chapter 9 provides a framework within which to manage these impacts.

6. Stakeholder engagement

6.1 Overview

6.1.1 Stakeholder engagement is an important part of HIA and EqIA. The views of stakeholders provide information that informs the assessment of the likely effects of the proposed changes. This section summarises the views of health stakeholders, representatives of equalities groups and feedback provided as part of the consultation on noise mitigation schemes.

6.1.2 In communicating with stakeholders, the enabling works to implement full runway alternation was referred to as 'ending the Cranford Agreement'. Although the policy decision by the Government to end the Cranford Agreement has already been taken, this terminology remains for this section, as a true reflection of the discussion with stakeholders.

6.2 Health stakeholders

6.2.1 The HIA team originally proposed a Steering Group to comment on and provide governance for the HIA. In discussion with stakeholders it was agreed that a Steering Group would not be used as there was a potential for conflict with planned studies being co-ordinated by London Borough of Hillingdon. It was agreed that the HIA team would alternatively conduct one-to-one interviews with those people who had been preliminarily identified as potential steering group members, and with Directors of Public Health in the surrounding Boroughs (see Table 6.1).

6.2.2 The HIA Team also attended two public exhibitions hosted by HAL in respect of the review of Heathrow Airport's Noise Mitigation Scheme, in Cranford and in Hounslow.

Table 6.1: Interviewees for HIA

Organisation	Name	Title	Date/response	
			2011	2013
HACAN ClearSkies	John Stewart	Chair	27th July	23rd January
Health Protection Agency[23]	Dr Samuel Ejide	Consultant in Communicable Disease Control	25th August	Directed to RBWM
London Borough of Hillingdon	Val Beale	Environmental Protection Unit	7th Sept	No response
London Borough of Hounslow	Rob Gibson	Head of Environmental Strategy	1st July	5th February & intro to Dr Heffernan
NHS Berkshire East	Dr Pat Riordan	Director of Public Health	25th August	See Dr Ejide response (2013)
London Borough of Ealing	Dr Jackie Chin	Director of Public Health	No response	6th February
NHS Hillingdon	Dr Ellis Friedman	Director of Public Health	20th June	24th January
NHS Hounslow	Dr Mike Robinson	Director of Public Health	Directed to Rob Gibson	No longer in post
London Borough of Hounslow	Dr Catherine	Deputy Director of	(2013 contact only)	13th February

[23] Thames Valley Health Protection Unit

Organisation	Name	Title	Date/response	
			2011	2013
/NHS Hounslow	Heffernan	Public Health		
Royal Borough of Windsor and Maidenhead	Terry Gould	Head of Public Protection	[2013 contact]	7th February
Royal Borough of Windsor and Maidenhead	Phillip Turner	Environmental Protection	No response	Retired

6.2.3 The HIA Team contacted the stakeholders in Table 6.1. This was undertaken in two stages.

- In 2011 an outline agenda was sent to the interviewee prior to the discussion. At the outset of the interview this was agreed and used to structure the discussion. In turn, the agenda items were used to structure the notes of the discussion that were subsequently sent to the interviewees for comment.

- In 2013 the interviewees were contacted by email. The email explained the reason for the break in the programme and updated the interviewees on any subsequent changes. The notes of the 2011 discussion were also sent to the interviewees and they were asked to check that they were still happy with the record of matters discussed. A verbal briefing and a further interview was also offered. It was made clear that interviewees needed only to get in touch if they wished to discuss anything additional. In this second round we spoke to two new interviewees who agreed with the approach the HIA is taking.

6.2.4 These notes and issues raised are summarised below.

Topics

6.2.5 The main topics for this HIA were explained as being air quality and noise[24]. The main focus of the HIA is to identify the changes in exposure to air emissions and air noise that would occur due to the changes in airport operations, i.e. the scheduled use of the northern runway for departures in an easterly direction over Cranford and the southern runway for easterly arrivals, and the resulting redistribution of air traffic.

6.2.6 The consultees were informed that the HIA team had been looking at quality of life. With respect to this proposal, the HIA team had found no way of dissociating quality of life from air quality and, principally, air noise. All interviewees agreed with this analysis.

6.2.7 The noise barrier is expected to affect people, in Longford, who live very close to this new structure. This is being assessed qualitatively. The effects on air quality and on noise and health will be assessed quantitatively.

Issues

6.2.8 The following issues were raised in the interviews. Comment was sought from HAL and a response provided in the interview notes.

[24] Noise was understood to mean noise generated by aircraft on the ground and in the air.

Issue: Whether ending the Cranford Agreement and thus a more efficient operation of the airport would mean an increase in flights.

- **Response**: The Government's decision to end the Cranford Agreement and the associated infrastructure works that are required for HAL to be able to implement full runway alternation during easterly operations are one part of the ongoing capital investment programme at Heathrow. HAL is working towards a more efficient airport: this entails reducing delays and delivering more reliable journeys for travellers. HAL state that implementing full runway alternation during easterly operations would not result in an increase in flights.[25] The number of flights, or passengers, at Heathrow is driven by a range of factors, for example, passenger demand, airline business plans, fleet mix and passenger numbers. The maximum number of flights at Heathrow ia already fixed by a condition of the Terminal 5 planning permission.

Issue: Reference to reports[26] which forecast that the ending of the Cranford Agreement would (a) lead to an increase in flight numbers and (b) to increased noise in Windsor due to runway alternation and (c) the effect of ending the Cranford Agreement on night flights and inquired whether it would lead to an increase in night flights.

- **Response**: (a) Number of flights: ending the Cranford Agreement and the associated infrastructure works are one part of the ongoing capital investment programme at Heathrow. HAL is working towards a more efficient airport: this entails reducing delays and delivering more reliable journeys for travellers. HAL state that removing the Cranford Agreement would not result in an increase in flights. The number of flights, or passengers, at Heathrow is driven by a range of factors, for example, passenger demand, airline business plans, fleet mix and passenger numbers.
- **Response**: (b) Increased noise in Windsor due to runway alternation: Residents in parts of Windsor are expected to perceive the largest reductions in aircraft noise as a result of ending the Cranford Agreement. When the airport is on easterly operations, runway alternation would result in the transfer of half of arrivals away from Windsor and onto the arrivals flight track for the southern runway (thus affecting Old Windsor for half of the day).
- **Response**: (c) Night flights: There are a number of restrictions to night flights at Heathrow and, as with the total number of flights, there would not be an increase in night flights. It may be that some of the existing scheduled night flights are redistributed and would take off over Cranford rather than over another community during easterly operations.

Issue: Some people have been opposing developments at the airport for a long time and are likely to see this as further unwelcome activity. It may be possible to ascribe a small psychological effect, from this proposal, to this group but that air noise and air quality would be the determining factors.

- **Response:** This cumulative psychological effect, if present, is considered to be very small and only affect a very small number of people. It is therefore difficult to take into account in the

[25] It is a requirement of the Terminal 5 planning permission that the number of flights is capped at 480,000 ATMs per annum and this remains unaffected by the ending of the Cranford Agreement.

[26] HACANClearSkies. No more quiet periods. 2005. Available at http://www.notrag.org/pdf/nomorequietperiods.pdf; HACANClearSkies. At a glance: runway alternation; Cranford Agreement; Westerly preference. 2007. Available at http://www.hacan.org.uk/resources/reports/alternation.cranford.agreement.explained.pdf

assessment of noise and air quality, only to note that some of those people affected by any noise or air quality effects could also be affected psychologically as well as physiologically.

Issue: whether the public safety zones at the end of the northern runway are going to be changed as a result of the proposed changes. Under the Cranford Agreement flights would depart in an easterly direction from the northern runway only in exceptional circumstances. If the Cranford Agreement is lifted then easterly flights from the northern runway would become more frequent. Does this mean that the safety zones would change?

- **Response**: HAL to discuss with Department for Transport. The established Public Safety Zones will need to be remodelled by NATS, the National Air Traffic Service. Exactly how and when this will occur is the subject of discussions with the Civil Aviation Authority.

Issue: people living in Cranford would have to get accustomed to the noise of aircraft taking off. This was a potentially serious impact.

- **Response**: the assessment of noise impacts is based on the change in noise at the implementation of the changes. Therefore this assumes that people will not have had the opportunity to become accustomed to the noise. There is anecdotal evidence that people become accustomed to exposure to noise, but this is not an assumption in the assessment.

6.3 Representatives of equalities groups

6.3.1 Critical to any EqIA is the involvement of stakeholders who can contribute informed views on potential impacts, opportunities and mitigations. Engaging with those who could experience disproportionate effects is important in order to ensure full representation of potential effects. The EqIA team approached a number of organisations including local authorities, local equality and diversity councils, charities, community organisations, tenants and residents associations, and representative groups. The full list of organisations contacted is detailed in Appendix A.

6.3.2 The discussion in the EqIA consultation focussed upon:

Impact on operations: the impact on flexibility at Heathrow; increases in departures from the northern runway; decreases in aircraft landing on the northern runway; increases in the number of aircraft landing on the southern runway; and decreases in aircraft departing form the southern runway.

Noise: Government estimates that redistributing noise would result in people experiencing less noise; the major exception is an increase in noise in the area around Cranford (due to more aircraft taking off in this direction).

Air quality: redistribution of local air quality effects with increases and decreases in different areas.

Impacts on different equality groups: covering all those groups scoped into the assessment including younger people; older people; people of working age; people from BAME communities; and people with mental wellbeing disabilities.

Mitigations and opportunities: the ways in which any disproportionate impacts on members of these groups could be mitigated and how any opportunities to maximise equality could be implemented.

7. Potential health and equality impacts

7.1 Overview

7.1.1 This chapter identifies the potential health effects associated with the enabling works and subsequent operations implementing full runway alternation during easterly operations. This chapter assess the effects of air quality, noise and visual amenity, considering the implications for communities and populations. In addition, this chapter identifies which populations or communities are most likely to be sensitive or 'vulnerable' to change, in order to understand whether and to what extent there are disproportionate effects on certain groups.

7.2 Air Quality Effects

7.2.1 This section presents the assessment of the effects of the redistribution of aircraft movements on the runways and the consequent health effects and the distribution of these effects.

Evaluation of effects

7.2.2 An assessment of the change in baseline rates of a range of health effects relating to changes in air pollutant concentrations due to the implementation of full runway alternation has been undertaken in accordance with the methodology presented in Section 5.5.The assessment has used predictions of changes in air quality as presented in the air quality assessment of the EIA. Accordingly the baseline rate implicitly includes the effects associated with the existing operations at Heathrow Airport.

7.2.3 The results of the assessment are presented in Table 7.1, which represents the calculated change in prevalence of the health effects relevant to air quality across the study area as a whole (the 9km x 9km area centred on Heathrow Airport).

Table 7.1: Change in indicators due to implementing full runway alternation

	Disease	Baseline Rate (per 1000 population)	Extra cases in study area (per 1000 population)	Extra cases in study area population (annual)	Years for one case in study area population
$PM_{2.5}$	All causes of mortality	5.82 [a]	0.000037	0.0084	119
	Cardiopulmonary mortality	1.14 [b]	0.000008	0.0018	564
	Lung cancer mortality	0.26 [c]	0.000002	0.0004	2745
PM_{10}	Chronic Bronchitis (attack rates)	3.94 [d]	0.000043	0.0099	101
	Cardiovascular Hospital admissions	18.03 [e]	0.000017	0.0039	257
	Respiratory hospital admissions	14.86 [e]	0.000027	0.0061	164
	GP Consultation Asthma	409.12 [f]	0.001604	0.3678	3
	Lower Respiratory Symptoms (LRS) Children	3.19 [f]	0.000000	0.000005	217812
	Lower Respiratory Symptoms (LRS) Adults	2.51 [f]	0.000000	0.00002	65069
NO_2	Respiratory hospital admissions	18.03 [g]	-0.000116	-0.0266	-
	Cardiovascular Hospital admissions	14.86 [h]	-0.000181	-0.0416	-
	Deaths (non-traumatic) brought forward	8.52 [h]	-0.000032	-0.0073	-

(a) London Health Observatory: Indicator 13.18: Directly Standardised Rate for All Causes of Mortality per 100,000 population, those aged < 75 and all ages, 2006-2008 (average of English LAs)
(b) London Health Observatory: 13.10 Mortality from all circulatory diseases, 2006-2008
(c) London Health Observatory: 13.11 Mortality from lung cancer ,2006-2008
(d) Institute of Occupational Medicine, Health Impact Assessment for the National Emissions Ceiling Directive (NECD),Long-term average attack rates calculated
(e) HES: Admissions 2011/12 - Tables E,G&D; Provider level analysis 2011-12,
(f) Royal College of General Practitioners: Annual Report 2011 Weekly Returns Service,
(g) ONS: "Mortality Statistics - Deaths Registered in 2011" - Table 5.19
(h) ONS: Life expectancy at birth and at age 65 by local areas in the United Kingdom, 2008-10

7.2.4 The implementation of full runway alternation would not lead to any change in the numbers of aircraft using Heathrow Airport. As reported in the ES, total emissions from the airport would remain broadly the same between the existing and proposed operations (a small increment in emissions is expected, due to a slight increase in the amount of taxiing aircraft may need to do under the proposed use of the runways, but does not significantly affect the total emissions). Therefore, with full runway alternation, effects are redistributed rather than extended compared with the current situation. Accordingly, the changes in pollutant concentrations are generally dependent on where the changes occur, rather than broad increases or decreases. Additionally, the changes at ground level are such that the areas closest to the runways are generally those that experience the greatest changes in pollutant concentrations.

7.2.5 When considering the study area as a whole, only very small changes in the prevalence of the health effects considered are predicted. Heath effects associated with increases in particulates as a whole show a very small increase in prevalence, while those associated with NO_2 show a very small decrease in prevalence. Over the study area for the air quality assessment, the health effects are considered to be negligible.

Geographic location of effects

7.2.6 The previous section presented the predicted air quality effects for the whole air quality study area (a 9km x 9km square centred on Heathrow Airport). Within this area, there are two areas where predicted changes are most pronounced.

7.2.7 The first area is Stanwell (to the south and west of the southern runway). The air quality in the area around Stanwell is predicted to improve slightly, as fewer emission sources (i.e. aircraft) would be using this part of the runway (especially for departures).

7.2.8 The second area is Longford (to the north and west of the northern runway). The population of Longford is less than 700. There is predicted to be a reduction in PM_{10} concentrations and therefore a small reduction in associated ill health effects. There is predicted to be a slight deterioration in air quality associated with an increase in concentrations of $PM_{2.5}$ and NO_2. The Air Quality chapter of the ES provides detail on the change in concentrations; for example, the increase in PM2.5 concentrations is less than 0.1 μgm^3). The magnitude of this change for cardiovascular hospital admissions related to NO_2 is predicted to be an extra 0.0114 per annum per 1,000 population, which is equivalent to an extra case every 197 years for the population of Longford. The different pollution concentration changes are due to the change in the distribution of brake/tyre wear and aircraft engine emissions associated with the proposed change in

operations. Given the very small changes in air quality result in very small changes to health indicators, the predicted health effects are considered to be negligible.

Population groups experiencing effects

7.2.9 Given that the changes in air quality, and the associated health effects, are considered to be negligible and the population affected is very small, there are not considered to be any population groups that would experience negative effects associated with the proposed development.

7.2.10 However, a systematic analysis of the population around Longford has been undertaken as part of the equalities assessment to consider potential effects for each of the groups identified in Section 5.3 as being particularly sensitive to deteriorations or improvements in air quality and who are therefore more likely to experience effects on health outcomes due to air quality changes. These groups are:

- Children (aged under 16);
- Older people (aged 65+); and
- People with long term respiratory illnesses (and, to a lesser extent, circulatory illnesses).

7.2.11 The EqIA evaluation is reported in Appendix A. This concludes that none of the groups above in the Longford area are predicted to experience disproportionate effects resulting from changes (compared to the population in the whole study area).

Summary of air quality effects

7.2.12 With full runway alternation, air quality effects are redistributed rather than extended compared with the current situation. When considering all of the populated areas study area as a whole, only very small changes in the prevalence of the health effects considered are predicted. Heath effects associated with increases in particulates as a whole show a very small increase in prevalence, while those associated with NO_2 show a very small decrease in prevalence. Over the study area for the air quality assessment, the health effects are considered to be negligible.

7.2.13 Thus, the effects of the development are distributed: the area around Stanwell is predicted to experience a slight improvement in air quality. The area around Longford is predicted to experience a slight deterioration associated with an increase in concentrations of $PM_{2.5}$ and NO_2. The results of modelling show that the changes in air quality are small and they are expected to result in very small changes to health outcomes. The potential health effects are considered to be negligible.

7.3 Noise Effects

7.3.1 This section presents the assessment of the health effects of changes in noise, considering the distribution of these effects and any effects on vulnerable groups. The key features of the proposed development that affect noise are:

- Redistribution of ground noise generated by aircraft as a result of a change in runway alternation practices during easterly operations;
- Redistribution of air noise generated by aircraft as a result of a change in runway alternation practices during easterly operations;

- Changes in noise exposures at sensitive locations such as buildings and facilities used for housing (residential), education (primary schools), and healthcare (hospitals); and
- Noise generation from construction plant (particularly at night).

Evaluation of effects

(a) Annoyance

7.3.2 The methodology described in Section 5.5 has been applied to calculate the number of people categorised 'Highly Annoyed'. The results are shown in Table 7.2 below.

Table 7.2. Number of people Highly Annoyed - LAeq

Annoyance Air noise contours 57dB LAeq and above	Populations		
	2015 Baseline	With Full Easterly Runway Alternation	Change
Highly Annoyed	55,200	55,150	-50

Source: Data from the Air and Ground Noise assessment in the Environmental Statement

7.3.3 With full runway alternation in place there is an overall decrease in the number of people Highly Annoyed, of 50 people, which is not considered to be a material change.

(b) Sleep disturbance

7.3.4 As described in the methodology, sleep disturbance is calculated based on an equation using L_{night} to calculate the percentage of the population that are 'Highly Sleep Disturbed' as given in the EU Position Paper on dose-effect relationships for night time noise[17.]

Table 7.3: L_{night} air noise contours and population Highly Sleep Disturbed

Lnight Band - Air and Ground Noise contours (dB)		Baseline			Full Runway Alternation		
	%HSD	Population	Number Highly Sleep Disturbed		Population	Number Highly Sleep Disturbed	Difference
≥ 45	6.3	658,500	41,486		654,600	41,240	-246
≥ 50	8.9	187,500	16,688		188,500	16,777	89
≥ 55	12.3	54,150	6,660		55,200	6,790	129
≥ 60	16.5	12,150	2,005		12,400	2,046	41
≥ 65	21.4	1,950	417		1,950	417	0
≥ 70	27.0	5	1		5	1	0
≥ 75	33.4	0	0		0	0	0
TOTAL			67,257			67,271	+14

Source: Data from the Air and Ground Noise assessment in the Environmental Statement

7.3.5 There are small increases in the L_{night} 50dB, 55dB and 60dB bands. There is a larger decrease in the numbers of people Highly Sleep Disturbed in the 45dB band. Overall, there are predicted to be 14 more people who are Highly Sleep Disturbed with the implementation of full runway alternation. This is not considered to be a material change.

(c) Cognitive effects on schoolchildren

7.3.6 The assessment of the effects of noise on the cognitive development in schoolchildren is derived from the RANCH study conducted on primary school children, as described in the methodology section. Table 7.5 identifies the number of primary schools that are predicted to experience a change in noise with the implementation of full runway alternation.

Table 7.4: Change in noise exposure at primary schools

Noise change in LAeq, 16 hour	Reading age effects	Number of schools predicted to experience a change in noise
3 to 5 dB	One to two months	8 schools
> 5 dB	More than 2 months	None

7.3.7 There are no schools that are expected to experience a change of over 5dB. The schools with full time primary school children where a change of over 3dB is predicted are set out in Table 7.6 below.

Table 7.5. Schools affected by change in noise

3 to 5 dB	> 5 dB
The Cedars Primary School, Cranford*	No schools
Clifton Primary School, Southall	
Dairy Meadow Primary & Nursery School	
Dormers Wells Infant School, Southall	
Dormers Wells Junior School, Southall	
Featherstone Primary & Nursery School, Southall	
Havelock Primary School, Southall	
St Anselm Roman Catholic Primary School	

* The Cedars is a special school for children who have Social, Emotional and Behavioural Difficulties. Other specialist education facilities within this category of change in noise include Ealing Tuition Services and Education otherwise than at school (EOTAS). These facilities provide support on a part time and short term basis with the aim of returning primary school-aged children to schools.

7.3.8 The implementation of full runway alternation is not predicted to result in increases in noise of over 5dB at any school. In-line with the findings of the RANCH study any effects on reading age are subject to uncertainties and cannot be predicted with confidence and therefore the relatively course units of schools has been used to express changes above 3dB. The results for all Educational Establishments (i.e. not just for primary schools) are presented in the Air and Ground Noise assessment in the ES.

(d) Cardiovascular disease

7.3.9 Assessing the effects of aircraft noise on cardiovascular disease is expressed as the likely number of hospital admissions for Myocardial Infarction (heart attack) within the population around Heathrow. This relationship is subject to uncertainties as described in the methodology (section 5.5.19). Data has been supplied by the NHS for the numbers of hospital admissions in the 10 local authorities that form the study area[27]. A total of 1,670 cases were recorded in a total population of 1,888,067. Table 7.7 shows the "distribution" of the percentage of the population exposed to different noise levels in 5dB bands.

Table 7.6: The distribution of population in Lday noise contour bands

Lday Air and Ground Noise contour bands (dB)	Baseline			Full Runway Alternation	
	Population	% of population		Population	% of population
>55	446,025	76.9		444,240	76.3
>60	111,414	19.2		112,175	19.3
>65	19,717	3.4		22,987	3.9
>70	2,559	0.4		2,811	0.5
>75	5	0.0		5	0.0
Total population within 55dB	579,720			582,218	

7.3.10 Applying the formula described in the methodology (section 5.5.19), the Population Attributable Risk – the number of people affected – for the baseline scenario and the full runway alternation scenario results in a difference of 0.36. This is some distance from being a full case and therefore the number of cases can be concluded to remain constant. There is no change in risk of Myocardial Infarction related to the implementation of full runway alternation.

(e) Healthcare facilities

7.3.11 The assessment of healthcare facilities draws from the noise assessment reported in the ES, considering combined air and ground noise during the daytime and night-time periods. The ES concludes there would be significant adverse effect during the daytime for the following five healthcare facilities:

- The Limes (rehabilitation recovery and independent living), Southall
- Penny Sangam Day Hospital, Southall
- Whitefriars Nursing and Residential Home, Southall
- Roshini Care home, Southall;
- Raj Nursing Home, Southall.

7.3.12 The ES concludes that there would be no significant adverse effects upon healthcare facilities during night-time periods.

[27] NHS ICD disease classification codes I21 and I22 for 2009/10

(f) Construction noise

7.3.13 The assessment of construction noise is drawn from the noise assessment reported in the ES. The majority of the construction activities are planned to take place during the night. In addition, noise modelling predicts that there would not be any receptors that would experience noise effects above the lower cut-off value of 65dB $L_{Aeq\ T}$.

7.3.14 For night, noise increases of up to 8dB above the lower cut-off value of 65dB $L_{Aeq\ T}$ are predicted at several receptors as a result of construction of the noise barrier. One of these is Littlebrook Nursery, which is not likely to be in use at night and is therefore discounted. The ES predicts that approximately 6 residential properties on Bath Road, Longford, would be exposed to noise levels of around 58dB $L_{Aeq\ 8hr}$. The ES concludes that the night time noise effects associated with construction of the noise barrier at Longford result in a significant adverse effect.

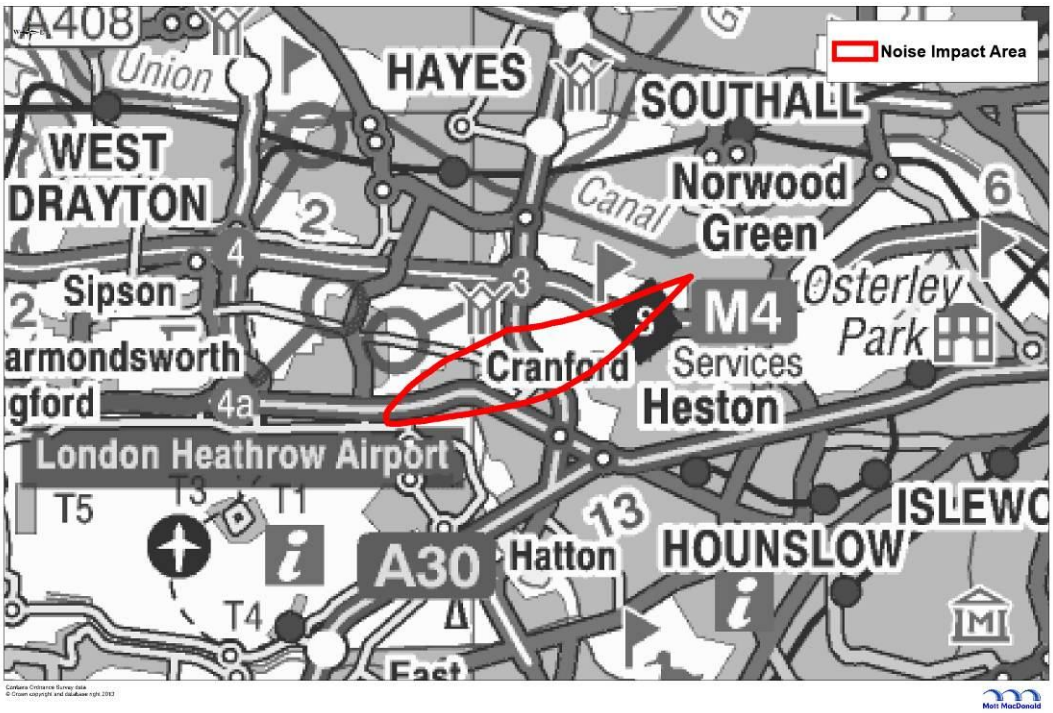
7.3.15 There is little evidence to indicate the occurrence of health effects from construction noise other than annoyance and sleep disturbance. The temporary nature of construction activities (about 10 weeks) means that there are no studies examining longer-term effects. Given the small number of affected individuals, examining proportions of 'highly' annoyed or sleep disturbed is unlikely to reveal any health effects. Therefore, prioritising mitigation measures to reduce the noise associated with constructing the noise wall at the properties in Longford is considered to be the most appropriate approach.

Geographic location of effects

7.3.16 The assessment of noise effects has identified some effects occurring at points around the airport. For annoyance and sleep disturbance, the geographical area where increases in noise of 3dB or more is predicted is illustrated in Figure 7.1 below. This is referred to as the 'noise impact area'[28]. The noise assessment in the ES predicts that 4,250 people would experience an increase in noise of 3dB or more within the 57dB L_{Aeq} (combined air and ground) contour.

[28] When determining policy relating to the Cranford Agreement, the Government identified changes in noise of +3dB LAeq as a key metric – the EIA categorises changes of 3dB L_{Aeq} as a significant effect.

Figure 7.1: Noise Impact Area



Population groups experiencing effects

7.3.17 There are certain groups who are particularly sensitive to deteriorations or improvements in noise levels, primarily due to their propensity to experience cardio-vascular conditions, and who are therefore likely to experience effects on health outcomes due to noise changes. These groups are:

- Children (aged under 16)
- People of working age (aged 16-64)
- Older people (aged 65+)
- People with mental well-being disabilities
- People with South Asian ethnic backgrounds
- Pregnant women and parents with newborn children
- People from deprived communities

7.3.18 As part of the EqIA and in considering health inequalities, this section considers the extent to which these population groups living within the noise impacted area could be affected by changes in the noise environment. The assessment has been undertaken in accordance with the methodology set out in section 5.6 above.

7.3.19 The analysis of population groups compares the composition of the population in the noise impact area compared with the composition of the study area – the ten local authority areas. The comparison has been conducted using data from ONS to allow comparison over both geographical areas. This is different to the population data used in the ES as the data from the ONS enables a greater range of population groups and to be analysed. The noise impact area

does not fit neatly into existing administrative areas for data collection, therefore demographic information has been analysed by using a methodology that uses Address Point data to apportion statistics to a bespoke geographical area – in this case the 'noise impact area'. This provides a better estimation of the population within the noise impact area and forms the basis of the following statistics. The total population of the noise impact area is estimated at 4,595 using this methodology. The proportions of the populations presented are considered to be representative and enable identification of any disproportionate effects on certain population groups. Table 7.8 below shows the number of people within each age group within the noise impacted area.

Table 7.7: Age groups within the noise impacted area

Population		Population in Noise Impact Area					
		Children (under 16)		Working age (16-64)		Older people (65 & over)	
Study Area	Noise impacted area	No.	%	No.	%	No.	%
1,888,067	4,595	1,069	23%	3,116	68%	411	9%

7.3.20 Table 7.9 below shows the number of people within each the other equality groups which are considered sensitive to noise increases.

Table 7.8: Vulnerable populations within the noise impacted area

Population		Population in Noise Impact Area					
		People with mental well-being disabilities		South Asian People		People from quintile of most deprived communities	
Study Area	Noise impacted area	No.	%	No.	%	No.	%
1,888,067	4,595	38	1%	1,960	43%	1,588	35%

7.3.21 Each of these groups is considered in turn below in accordance with the EqIA evaluation methodology set out in section 5.2 above.

Children

7.3.22 Increases in noise levels can be particularly disruptive to children. For example, the after-effects of night time noise[29] can increase fatigue whilst exposure to noise during school hours can impair children's cognitive development, particularly at primary level. Population figures show that the percentage of children within the noise impacted area (23%) is slightly higher than the proportions of the overall study area and the two regional comparators, both of which are around 19%. In terms of distribution, given their relative high representation in the impact area, the distribution of noise impacts could disproportionately affect under 16s.

[29] World Health Organisation (2000): 'Guidelines for Community Noise', pp.26-27

People of working age

7.3.23 Increased aircraft noise after dark, can have a negative impact on sleep. This, in turn, can have knock-on impacts on good physiological and mental functioning, affecting those who work during the day. Table 7.8 above indicates that 68% of people within the impact area are of working age. This is in line with the percentages for the overall study area (68%) and London (69%). Noise impacts would not, therefore, be disproportionately distributed and experienced by this group.

Older people

7.3.24 There are around than 400 people aged over 65 within the noise impact area; the proportion of older people over 65 (9%) is also low compared to the overall study area (12%) and London (11%). Older people, therefore, are not considered as a group who would be disproportionately affected by noise increases.

People with mental well-being disabilities

7.3.25 Environmental noise such as aircraft noise is believed to accelerate and intensify the development of latent mental disorders and persons considered vulnerable to mental disorders are particularly sensitive to the effects of night time noise. The number of people within the noise impact area who have a mental well-being disability is very low (less than 40); this represents around 1% of people within the noise impact area. This proportion is consistent with the percentage for the overall impact area and lower than the proportions for London (1%) and the South East (1%). Therefore, noise impacts are not considered to be disproportionately distributed in terms of this equality group.

People with South Asian ethnic backgrounds

7.3.26 People from South Asian communities (including Indian, Pakistani and Bangladeshi communities) have been shown to be at greatest risk of CVD and CHD. As such they are one of the groups who would potentially experience impacts due to changing noise levels. There are nearly 2,000 people from South Asian origin in the noise impact area; this represents 43% of the total population which is much higher than the overall study area (15%) and London (12%). This shows that people from South Asian backgrounds experience disproportionate impacts from noise.

Pregnant women and parents with newborn children

7.3.27 The EqIA scoping report identified pregnant women and parents with newborn children as amongst those who could potentially experience negative effects of noise changes relating to night time noise, sleep disruption and the associated after-effects such as fatigue and depression. Whilst they are considered to be an equality group sensitive to change it is not possible to quantify these impacts by looking at the demographic distribution due to the lack of data on this equality strand.

People from deprived communities

7.3.28 Although not a statutory equality group, there is strong evidence to suggest that people from deprived communities have a high susceptibility to conditions requiring vascular care. They are,

therefore, amongst the 'at risk' groups in terms of noise impacts. The noise impact area contains a high number (over 1,500) and a high proportion (35%) of people from the most deprived quintile. Given these numbers, socio-economically deprived populations may be disproportionately represented amongst those who are likely to experience negative noise impacts.

Summary of noise effects

7.3.29 The assessment of the potential health effects from noise, in regards to annoyance, shows no material change. Around 1,500 people are expected to experience a decrease in noise at the lower noise contour levels, i.e. in the 63dB$_{LAeq}$ and under noise bands and around 1,250 people in the 55-65dB$_{Lden}$ noise bands. The analysis predicts that there is going to be an increase in the number of people experiencing higher levels of noise, i.e. an increase of 112 people in the 72dB$_{LAeq}$ noise band and an increase of 168 people in the 75dB$_{Lden}$ noise band.

7.3.31 Therefore, people living closer to the airport and closer to the easterly departure routes on the northern runway are expected to experience higher levels of noise. As the aircraft movements are redistributed, those people living at other locations around the airport (principally further away from the airport) are expected to experience decrease in noise exposure.

7.3.32 Analysis of the population in the noise impact area shows that any effects do not appear likely to disproportionately affect equality groups: this conclusion is reached by comparing the population in the noise impact area (Figure 7.1) with the population of the whole study area (the ten local authorities) and regional comparators. The exception is that the population in the noise impact area has a slightly higher proportion of younger people. Whilst this difference is small, the cumulative effects on some children resulting from the combination of an increase in annoyance (and potentially sleep disturbance at home) and increase in noise whilst as school (only potentially affecting children attending those schools set out in Table 7.6) could have a combined impact on this group of the population. The other exception is for people from a South Asian ethnic background who make up a large proportion of the population in the noise impact area.

7.3.33 In addition, around 35% of the population in the noise impact area is likely to be in living in deprived communities (the top 20% of deprived communities across England). It is therefore likely that the proposed changes could have a disproportionate impact on this population and widen inequalities. However, deprivation is calculated using different measures and indices to the equality strands and can vary between neighbourhoods and streets within the large area on which the estimates are based so this would need to be verified. The number is sufficiently large to warrant additional analysis to determine the whether the communities within the noise impact area are less than or more deprived than the administrative area in which they sit for the purposes of analysing statistics.

7.3.34 There are predicted to be 125 fewer people who are Highly Sleep Disturbed with the implementation of full runway alternation and no additional cases of cardiovascular episodes. There are no significant effects on healthcare facilities.

7.3.35 Construction of the noise barrier at Longford is likely to cause disturbance to a small number of properties on Bath Road.

7.4 Visual Amenity Effects (of the Longford Noise Barrier)

7.4.1 This section presents the assessment of the change to visual amenity resulting from the proposed Longford Noise Barrier, once constructed.

7.4.2 The key features of the proposed development that affect visual amenity are:

- The project requires a 5m high noise barrier to be constructed.
- The bottom 3 metres would be made of a material giving a mass per square metre of at least 3.8kgm^2 to provide the required noise attenuation benefits. The upper two metres of the barrier would be constructed of a transparent material.
- The noise barrier would have a total length of 593m and would be typically between 55m and 90m (approximately) from the residential properties along the southern side of Bath Road (the residential receptors most likely to be affected).

Effects reported in the Environmental Statement

7.4.3 Chapter 9 of the Environmental Statement (ES) contains an assessment of the Landscape and Visual effects of the proposed development. This includes an assessment of the visual effects of the proposed noise barrier. The ES concludes that there would be no significant visual effects as a result of the proposed noise barrier on recreational receptors within Longford pocket park and along the banks of the Duke of Northumberland River or residential receptors on nearby Bath Road.

7.4.4 Figure 7.2 and Figure 7.3 illustrate the visual change associated with the proposed noise barrier. The distance to the noise barrier (from the location at which the photograph is taken) is approximately 30m (the same as the closest residential properties). The figures represent a view point approximately 50m to the west of the closest residential properties. These images therefore provide a good indication of the change that would be experienced by the closest residential receptors – i.e. the worst case. Chapter 9 of the ES also contains further viewpoints of the proposed noise barrier.

Figure 7.2: Existing noise barrier (reproduced from ES viewpoint 6: King's Bridge on Bath Road – looking south, summer)

Figure 7.3: New noise barrier (reproduced from ES viewpoint 6: King's Bridge on Bath Road – looking south, summer)

Evaluation of effects

7.4.5 The assessment has been conducted based on the criteria set out in Section 5.5. The changes relevant to this assessment are the restriction of views or reduced exposure to natural light as a result of the proposed noise barrier. The type of health effects that could be expected should there be a large change in views or natural light levels would be: annoyance, reduced wellbeing or reduced quality of life.

7.4.6 The existing noise barrier is a highway noise barrier/timber fence between 1.8m and 3m high along its length. The proposed noise barrier would be 5m tall overall, with the top 2m being a transparent material. The noise barrier would be between 30m and 75m from the end of the gardens of residential properties along Bath Road.

7.4.7 The residential property boundaries typically have trees along their fringe, providing some visual screening of Heathrow Airport. Such screening would also breakup views of the proposed noise barrier. The remaining area between the proposed noise barrier and the residential properties boundaries comprises relatively open ground with grass or scrub.

7.4.8 The additional 1.2m is not expected to affect the existing views and residents on nearby Bath Road are not anticipated to experience a notable change to their existing views.

7.4.9 The proposed noise barrier is considered to demonstrate good compliance with the recommendations made by the European Commission in their 'Science of Environmental Policy' series[30]. Table 7.10 sets out design features of the proposed noise barrier against the EC recommendations.

[30] European Commission, Environmental sound barriers: a mixed blessing, "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol, News Alert Issue 127, October 2008. Available at: http://ec.europa.eu/environment/integration/research/newsalert/pdf/127na5.pdf

Table 7.9: Demonstration of good practice against EC recommendations for noise barriers

European Commission summary noise barrier recommendations	Features of the proposed noise barrier that demonstrate good practice
Noise barriers should be placed as far from residents as possible	The positioning of the noise barrier is in most cases approximately 75 metres from residents. The closest distance is approximately 30 metres. The positioning at this point is as far as it is possible to go due to the location of the western perimeter road.
Noise barriers should blend in with the neighbourhood where possible	The noise barrier uses materials that are in keeping with the neighbourhood. The use of wood rather than concrete is in keeping with the existing noise barrier/fence and helps the structure to blend into its baseline surroundings. The transparent upper part of the barrier will also help to reduce the barrier obscuring the local environment.
Noise barrier design should be incorporated at the beginning of projects and shaped by ecological considerations as well as the impacts on road-users and residents	The design of the noise barrier has been shaped by consideration of the impact on residents and the local environment. The final design uses a transparent material for the top 2 metres to minimise the visual change from baseline conditions.
Noise barriers covered with native vegetation, to make the structure more aesthetically appealing, are preferable	Although the noise barrier would not be 'covered' by natural vegetation, views of it would be screened by planting of natural tree species in front of the structure. This replaces the loss of any existing trees like for like. Such planting is expected to have ecological as well as visual benefits.

7.4.10 Based on the methodology, the degree of effect is considered to be 'low' with consequent health outcomes of only slight annoyance and no effect on wellbeing or quality of life.

Table 7.10: Overall evaluation of visual amenity effects of the Longford noise barrier

Thematic issue	Factors influencing health	Health outcome	Numbers of people affected	Importance of effect
Visual impact of the noise barrier	Change in visual amenity, e.g. restriction of views	Inconvenience and slight annoyance. No deterioration of the built environment and therefore no effect on wellbeing or quality of life.	Less than 50	Low

Distribution of effects

7.4.11 The evaluation of health effects has concluded that the health effects of the Longford Noise Barrier would be only slight annoyance. Any discernible effect is likely to be highly localised to those residential properties that border the noise barrier directly.

Population groups experiencing effects

7.4.12 There is no evidence to suggest that a particular population group would be more sensitive to the effects of a noise barrier than the population as a whole.

Summary of visual amenity effects

7.4.13 The potential health effects associated with a change in visual amenity from the construction of the Longford Noise barrier have been assessed. There is not expected to be a significant change in visual amenity and any discernible health effects are likely to relate to slight annoyance. The effects are expected to be highly localised (affecting a small number of people) and no population groups have been identified as being particularly sensitive to the proposals.

7.5 Cumulative & Synergistic Effects

7.5.1 This section considers how the effects identified above may combine to generate additional effects.

7.5.2 In terms of geography, some communities across the study area are expected to experience slight reductions in noise from aircraft. The community of Longford is expected to experience small increases in NO_2, although the health effects of this increase have been shown to be negligible. In addition, the community is predicted to experience the effects of a slight increase in noise resulting from a small increase in the number of aircraft using the eastern end of the northern runway for take-off. The effects of this noise would be mitigated by the construction of a noise barrier. However, construction of the noise barrier itself would generate some noise impacts and minor changes to visual amenity for a very localised population. Therefore, the population of Longford could perceive themselves to experience a combination of effects which may result in negative health effects.

7.5.3 The majority of the population that are expected to experience an increase of noise of over 3dB ($57dB_{Leq}$) increase are resident in and around Cranford. An increase in the number of aircraft taking off in this direction is likely to be noticeable and evidence from stakeholder consultation suggests that enjoyment of outdoor space and perceived reduction in property values are concerns.

7.5.4 This HIA/EqIA has found that changes to air quality and noise are the main influences on people's quality of life around the Airport. The environmental factors are accepted as being what they are; there is a trade-off with being able to live close to the Airport, which is a source of employment (direct or indirect) for many local people.

7.5.5 In interviews, stakeholders posited that a very small section of the population may see this as one more change in a series of proposals to alter or expand Heathrow Airport's operations and that this could result in slight psychological effects. The magnitude of this effect is not known but it may reasonably be expected to be small. This is not considered to be a health effect resultant from this analysis.

7.6 Summary

7.6.1 This section provides a summary of the predicted health effects and effects on equalities groups. Conclusions based on the analysis summaries within this section have identified (a) the predicted health effects through determinants of health; (b) the distribution of these effects, identifying the communities where the effects occur; and (c) whether any groups in the population, including equalities groups, would be disproportionately affected.

8. Conclusions

8.1 Conclusions

8.1.1 This section draws on the summaries of the analysis in Chapter 7 to present the conclusions of the HIA / EqIA.

Air Quality

8.1.2 Across study area there is a slight increase in health cases related to particulate matter. However, these increases are so small (taking hundreds of years before one additional case would be presented) that the changes are considered to be negligible. Across the study area, there is predicted to be a reduction in the health effects associated with NO_2 concentrations.

8.1.3 Stanwell (to the south of the southern runway) is predicted to experience a reduction in all health cases directly attributable to the Airport. Longford (to the north of the northern runway) is predicted to experience a very small increase in emissions of NO_2; the small nature of this increase means that the associated health effects are considered to be negligible.

Noise

8.1.4 Overall, there is predicted to be a decrease in the number of people 'highly annoyed' of 50 based on 57dB $_{LAeq\ 16\ hr}$ air noise contours.

8.1.5 People living closer to the airport and closer to the easterly departure routes on the northern runway are expected to experience higher levels of noise, i.e. residents in Cranford. As the aircraft movements are redistributed, those people living at other locations around the airport (principally further away from the airport) are expected to experience decrease in noise exposure.

8.1.6 The analysis predicts the number of people categorised as Highly Sleep Disturbed is expected to stay about the small (a small increase) and no health effects are predicted for cardiovascular disease resulting from changes to noise. The analysis predicts that no schools would experience an increase of over 5dB and therefore likely result in a delay to cognitive development and reading age. There are a number of uncertainties in applying this methodology to smaller increases. If this approach was applied, eight primary schools are predicted to experience an increase in noise of over 3dB, which could be interpreted to be equivalent to a one to two month delay in reading age. Research has shown that this effect is reversible, but it would be prudent to undertake further investigations to identify any appropriate management measures relevant to these schools.

Visual Amenity (of the Longford Noise Barrier)

8.1.7 The construction of a noise barrier at Longford would reduce the effects of ground noise for the local residents. The noise barrier is not expected to be visible from most of viewpoints around Longford. The height and selected materials (including a transparent upper 2m) would help prevent potentially adverse effects. There may be slight annoyance for a very small number of residents.

Communities

8.1.8 Some communities in the ten local authorities around Heathrow Airport would experience a slight reduction in noise. Closer to the Airport, Stanwell is predicted to benefit from improvement to air quality.

8.1.9 To the north of the runways, Longford is expected to experience an increase in noise, which is partly mitigated through provision of a noise barrier, although this may be a source of slight annoyance (in terms of slightly reduced visual amenity) for a small number of properties. The slight increase in NO_2 emissions predicted at Longford is not anticipated to influence health outcomes.

8.1.10 With a greater number of aircraft taking off in an easterly direction from the northern runway, the areas around Cranford are predicted to experience the greatest increase in noise, with the anticipated changes in health outcomes associated with annoyance and sleep disturbance to be largely found in this area.

Population groups

8.1.11 This report has identified the groups within the population that are more likely to be susceptible to changes associated with the project, principally those groups vulnerable to changes in the noise environment, based on a review of medical evidence. Systematic consideration of these groups has identified that the majority of them are affected in the same way as the rest of the population, i.e. there are no disproportionate effects on equality groups.

8.1.12 The potential exception to this conclusion is that the area most affected by increases in noise contains a higher proportion of younger people. The combination of an increase in annoyance (and potentially sleep disturbance at home) and increase in noise whilst at school could have a combined impact on this group of the population throughout the day and night. The other exception is for people from a South Asian ethnic background who make up a large proportion of the population in the noise impact area and are at greater risk from cardiovascular diseases.

8.1.13 Although not a statutory equality group, the analysis has identified that there are a relatively high number of people living in deprived communities in the area that is likely to experience an increase in aircraft noise.

9. Health and equality management measures

9.1 Management Measures

9.1.1 This section sets out a management plan to capture recommendations from the HIA and to facilitate their implementation. The plan includes responsibilities, monitoring points and enforcement measures.

9.1.2 It is important that the effects identified in this assessment are managed to ensure that potentially negative impacts are mitigated and that potentially positive impacts are maximised. Based on the conclusions reported in Chapter 8, Table 9.1 proposes management measures to help ensure that the proposed development is implemented in a responsible manner.

Table 9.1: Proposed management measures for the HIA/EqIA

	Objective	Proposed Measure
1	Support practical measures to manage the effects of aircraft noise on local school children.	Consider providing support to those local schools where an increase of 3dB is predicted in the 57dB Leq noise contour. This support may include practical measures that help to manage the effects of air noise inside and outside of the classroom.
2	Support residents in understanding when they are likely to experience aircraft noise, including full runway alternation on easterly operations.	Informal feedback supports the view that residents value the certainty of knowing when they are likely to be overflown and to what extent. The implementation of full runway alternation on easterly operations is largely governed by wind direction and so the extent of its implementation will, by its nature, be partial and allow residents to gradually get used to the associated effects. Communication with residents to provide clear and comprehendible information on how the air noise effects of the airport's operations will affect each of the neighbourhoods around the airport. Mechanisms to provide weekly schedules and real time information on westerly/easterly operations and alternations should be developed. This should be accessible to local residents, particularly community and voluntary networks and organisations, and make use of local media (without solely communicating via the internet).
		There are a number of residents who are predicted to experience a change of over 3dB as a result of implementing full runway alternation on easterly options (above 57dBLAeq). These residents are more likely to experience annoyance as an indicator of a change in their community and their well-being. Measures to provide benefit to this community should be explored and feedback from existing pilot schemes should be considered to optimise community benefit measures.
3	Support vulnerable population groups around the airport in understanding the predicted changes.	Make use of analysis of the demography in geographical locations around the airport to understand the composition of the populations living near the airport. This should include vulnerable population groups or those groups that are predicted to experience disproportionate effects, compared to

Appendices

Appendix A. Equalities Impact Assessment

A.1. Introduction

A.1.1 This appendix sets out the findings of the Equality Impact Assessment (EqIA) of the proposed enabling works to allow implementation of full runway alternation during easterly operations at Heathrow Airport.

A.1.2 The proposed development works consist of a small amount of additional on-airfield infrastructure, the construction of a noise barrier at Longford and operational changes[1]. Heathrow Airport Limited (HAL) is the proponent of the enabling works under assessment, which have been designed to implement full runway alternation during easterly operations. The Cranford Agreement was a Ministerial undertaking given in 1952 to use best endeavours to avoid the operation of the northern runway for aircraft departures in an easterly direction over Cranford. After public consultation, the previous Government ended the Cranford Agreement in 2009, with the aim of distributing noise more fairly around the airport and to enable runway alternation to be introduced when the airport is on easterly operations to give affected communities predictable periods of relief from airport noise. The Coalition Government reaffirmed their support for this decision in September 2010.

A.1.3 In 2011 HAL commissioned Mott MacDonald / Ben Cave Associates to undertake an independent EqIA. The submission of a planning application for the proposed development was postponed. Work recommenced in late 2012 and early 2013 and relevant features of this report have been updated. It was decided that the EqIA should be undertaken alongside and integrated with the Health Impact Assessment (HIA) due to the inherent interdependencies between the assessment processes; the two exercises tend to overlap and are mutually supportive. There are strong and well-established links between health outcomes and inequality. Often equality groups, due to positions of socio-economic disadvantage, are amongst those most likely to experience poorer health outcomes and health inequalities. The two assessments often rely on similar evidence bases and are, therefore, frequently undertaken concurrently.

A.1.4 The integrated findings of the HIA/EqIA are presented in the main report.

About equality impact assessments

A.1.5 Equality Impact Assessments are a systematic assessment of the likely or actual effects of policies / developments on the following statutory equality strands (as defined by Equality Act 2010)[2]:

- Age
- Disability
- Gender reassignment

[1] More details on the proposed development can be found in the main report, Chapter 3.

[2] These protected characteristics are covered by the new Equality Duty which replaces the existing three separate duties which relate to gender; race and disability.

- Pregnancy and maternity
- Race (including ethnic or national origins, colour or nationality)
- Religion or belief (including lack of belief)
- Sex / Gender
- Sexual orientation
- Marriage and civil partnership

People from deprived communities are not a statutory equality group. However, this population has been included in the assessment of effects (where appropriate) as, in combination with the HIA, it is important to identify where potential health inequalities could occur.

A.1.6 The findings and recommendations of the EqIA ensure that decision-makers are aware of the impacts on people with characteristics protected by the Equality Act; EqIAs help them make an informed choice.

Why conduct equality analysis?

A.1.7 Undertaking equality analysis is an important part of the policy development process. There is a legal requirement for public bodies (and bodies providing public services) to undertake equality analysis. This originates from the Race Relations (Amendment) Act 2000, and now codified in the Equality Act 2010.

A.1.8 On 6th April 2011, the Public Sector Equality Duty came into force. This is one of legislative instruments to support the implementation of the Equality Act. It put a statutory obligation onto public bodies, and other organisations carrying out public functions, requiring them to pay due regard to the above groups. The Duty aims to embed equality considerations into the work of public bodies to tackle discrimination; advance equality of opportunity; and foster good community relationships and cohesion.

A.1.9 Aside from assisting compliance with the Duty, EqIAs also offer the following benefits:

- They ensure that programmes impact in a fair way, and where there is evidence that particular groups will be negatively affected, action is taken to address this.
- They ensure decisions are based on evidence, providing a clear and structured way to collect, assess and put forward relevant evidence.
- EqIAs make decision-making more transparent, involving those affected by a programme. This is more likely to engender trust in decision-makers and in decisions.
- They can provide a platform for working in partnership to consider the impact on members of a shared community and how they might best collaborate and co-ordinate financial decisions.[3]

A.2. Assessment methodology

A.2.1 The objectives of an EqIA are to assess whether there will be any disproportionate effects (positive or negative) on equality groups; identify opportunities to promote equality more effectively or to a greater extent; and develop ways in which any negative impacts can be mitigated or minimised to prevent any unlawful discrimination or disproportionate negative effects.

A.2.2 There is not a prescriptive methodology for EqIAs; however guidance has been published by various organisations. The approach used for this EqIA makes reference to these

[3] See: http://www.equalityhumanrights.com/uploaded_files/Wales/brief_note_for_decision_makers.doc

various documents and also draws on good practice in undertaking EqIAs across a variety of industry sectors.

Timing

A.2.3 Guidance published by the Government Equalities Office (GEO)[4] and also Equality and Human Rights Commission (EHRC) from January 2011, makes clear that undertaking equality analysis is something that should occur as early as possible in the development process:

Equality analysis starts prior to policy development or at the early stages of a review. It is not a one-off exercise, it is ongoing and cyclical and it enables equality considerations to be taken into account before a decision is made.

Equality analysis of proposed policies will involve considering their likely or possible effects in advance of implementation. It will also involve monitoring what actually happens in practice. Waiting for information on the actual effects will risk leaving it too late for your equality analysis to be able to inform decision-making.[5]

A.2.4 In the early stages of the project process there is an opportunity for equality considerations to be integrated, ensuring that issues further along in the project cycle are avoided.

Stages in EqIA

A.2.5 Typically, the key stages of equality analysis or EqIA involve:

- **Stage 1**: **Screening** – determining whether or not the analysis or an EqIA is necessary.[6]
- **Stage 2**: **Scoping** – identifying potential impacts of the policy or proposal and which equality strands are most sensitive to proposed changes and are, therefore, most likely to experience positive or negative impacts to a disproportionate extent. This helps to examine the 'magnitude of impacts (i.e. the extent of the impact on quality of life and whether the impact reduces or increases existing inequalities). It also identifies those groups that need to be the focus of later stages of the analysis. In addition, the scoping stage sets out the geographic scope of the assessment.
- **Stage 3**: **Developing a socio-demographic profile** – understanding the representation of sensitive equality groups within the geographic boundaries of the assessment and mapping proportions and density. This helps to later examine the 'distribution' of impacts i.e. how many people from equality groups live in areas where impacts are expected.
- **Stage 4**: **Stakeholder engagement** - building on the desk research conducted as part of the scoping stage, this involves engaging with local equality representatives to explore impacts further and discuss opportunities or mitigation.
- **Stage 5**: **Assessment of equality impacts** – reaching a qualitative and quantitative judgement about what type of impacts are likely and the 'magnitude' and 'distribution' of these impacts to understand how 'significant' they are and whether they require mitigation.

[4] The GEO has now been formally incorporated into the Home Office and is no longer a standalone body. See: http://www.homeoffice.gov.uk/publications/equalities/equality-act-publications/equality-act-guidance/

[5] Equality and Human Rights Commission (2010): 'Equality analysis and the Equality Duty'

[6] This was undertaken in parallel

- **Stage 6**: **Recommendations** – setting out whether mitigation measures are required to reduce disproportionate negative effects and identifying opportunities to maximise any positive impacts and increase the equality of outcomes.

A.2.6 The outputs of each of these stages are contained within this report. The tasks involved in each of these stages are described in more detail below.

Stage One – Screening

A.2.7 The screening exercise was undertaken in conjunction with the HIA. This process identified that incorporating an EqIA within the HIA process was the most appropriate solution given the links and overlaps between HIAs and EqIAs and the Department of Health's guidance[7] that socio-economic and equality groups should be a specific consideration of HIAs. See Appendix A for the Record of Screening.

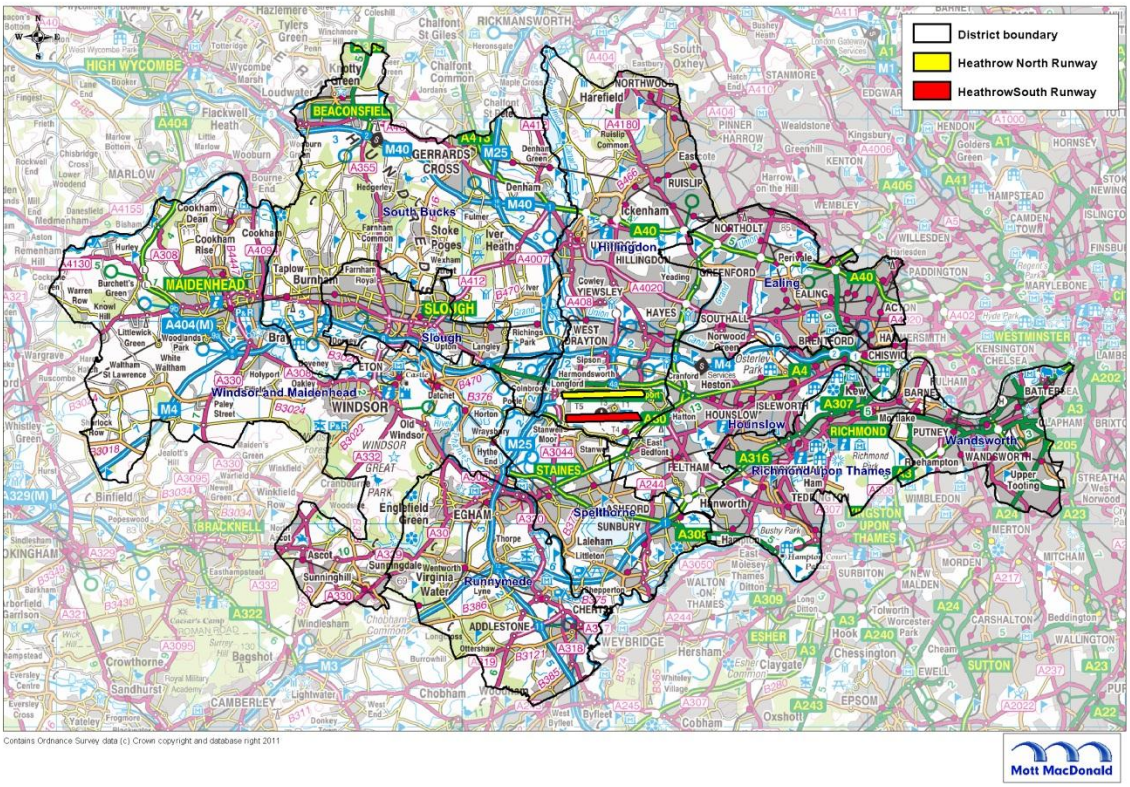
Stage Two – Scoping

A.2.8 One of the findings of the HIA screening exercise was that the key issues that needed to be assessed were likely to be the effects on the population associated with changes in the distribution of noise and air quality. As such, the objective of the scoping exercise was to explore the sensitivities of each of the groups with characteristics protected by the Equality Act to changes in noise and air quality levels. This involved an extensive desk research exercise, consulting clinical publications and also material published by equality groups to understand which equality groups needed to be considered in more detail in the next stages of the assessment.

A.2.9 During the scoping stage, the scope of the EqIA was also confirmed in parallel with the HIA team. The overall study area was confirmed as comprising ten local authorities in total illustrated in Fig below. The area comprises five London Boroughs (Ealing, Hillingdon, Hounslow, Richmond upon Thames, and Wandsworth) and five Districts and Boroughs which fall within the ceremonial county of Buckinghamshire, part of the South East region (Slough, Windsor and Maidenhead, Spelthorne, South Buckinghamshire, and Runnymede). This represents the *greatest* geographic area that effects attributable to the proposed changes *could* be felt; effects on noise or air quality were not expected to be noticeable outside of this area. The findings from the scoping stage are reported in Section A.3.

[7] Department of Health (2010): 'Health Impacts Assessment of Government Policy'

Figure A.1: Study area



Source: Ordnance Survey, 2011

Stage Three - Socio-demographic profile

A.2.10 This exercise developed a comprehensive profile of communities within the spatial scope of the assessment and also the south east and London as regional comparators and England as a national comparator. Socio-demographic data was collected and the densities of each equality group were then mapped using GIS software. This task highlighted areas in which people with protected characteristics are high in numbers and, therefore, where the equality analysis should be focused. The profiling results are presented in full in the separate Evidence Base Report.

Stage Four - Stakeholder engagement

A.2.11 The views of stakeholders are an important in order to identify and evaluate potential effects on health and equalities. Stakeholder engagement is crucial for the delivery of an effective EqIA; it ensures that impacts are fully explored with local equality groups and that recommendations are developed with direct input from those on whom they targeted.

A.2.12 In 2011 nearly 100 local stakeholders were contacted and asked to participate in the consultation process (see Table A.1 below). These stakeholders included representative bodies of each of the equality groups and local authority equality officers. A briefing note was circulated with the invitations to inform them about the proposed enabled works and highlight that they were invited to share their views on:

- Potential positive and negative impacts on local equality groups in the surrounding communities
- Ways in which any disproportionate impacts could be mitigated or minimised
- Ways in which any positive impacts could be maximised to increase the equality of outcomes

A.2.13 The views of the stakeholders collected throughout the consultation exercise have been incorporated into the assessment of impact in Section A.4.

Table A.1: Organisations contacted as part of the EqIA

Action on Hearing Loss		
Acton Asian Association	Elders Network in Hounslow	Maidenhead Centre For The Handicapped
Afghan Association of London	Evreham Youth Centre	MENCAP
African Caribbean Initiative	Forced Marriage Unit	Middlesex Association for the blind
Age Concern	Fountains Mill Young People's Centre	Middlesex Federation of Women's Institute
Age Link	Friday Fellowship Group	Middlesex Young People's Club
Age UK Hillingdon	Gay Business Association	MIND
All Saints Mothers' Union	Harefield Children's Centre	Newham Asian Women's Project
Anand Mandal Asian Elderly Group:	Hayes and Harlington Older People's Welfare Committee	North West London Lesbian and Gay Group
An-nisa Slough Muslim Women's Group	Help the Aged	Outwest
Arab Club of Brtiain	Highfield Senior Citizens Club	Pakistan Welfare Association Youth and Community Care
Arab Women Group	Hillingdon Asian Women's Group	Parvaaz Project
Asian Community Care Services	Hillingdon Borough Central Mosque	Pinner Youth and Community Centre
Asian Women's Group Maidenhead	Hillingdon Carers Information and Advice Centre	PUKAAR
Autistic Spectrum Disorder Support Group	Hillingdon Children and Families Trust	Retired Members Association (Asian Elders):
Barnardo's	Hillingdon Children's Fund	Royal National Institute of Blind People
Barra Hall Children's Centre	Hillingdon Older Women's Group	Ruislip Crusaders (Urban Saints)
Berkshire Disability Information Network	Hillingdon Somali Women's Group	Sahara black Women's Refuge
Berkshire East & South Bucks Women's Aid	Hillingdon Women's Centre	Save the Children
Berkshire Education & Youth Centre	Hillingdon Youth Council	Scope
Birthmatters	Hindu Cultural Association - Hillingdon	Solas Anois - Irish Women's Domestic Violence Project
Breast Feeding Support Group	Hounslow Afro-Caribbean Association (HACA)	Swahili Support Network
Britwell Youth & Community Project	Hounslow Multi-Cultural Centre	The Asian People's Disability Alliance (APDA)
Cherry Lane Children's Centre	Hounslow Muslim Women's Association:	The Council of Christians and Jews - Hillingdon Branch
Colham Manor Children's Centre	Hounslow Somali Association	The National Society for Epilepsy
Disablement Association Hillingdon	Hounslow Youth Centre	Townswomen's Guild Cox Green Maidenhead
Ealing Community & Voluntary Service	Hounslow Youth Service	Vietnamese Women's Group
Ealing Gay Group	Identity LGBT Youth Group	West London Asian Society
Ealing Somali Welfare and Cultural Association	Irish Lesbian & Gay Group	Women's Centre Harrow
East African Asian Senior Citizens	Jagrudi Women's Group	Women's Institute
East Berkshire Auistic Support Group	Kalimata Mandir	Women's Royal Voluntary Service
Edgware and Harrow Jewish Day	LGBT London (Hillingdon Association	Yeading Children's Centre

Centre	of Voluntary services)	
Edo State Women Association	London Gay Christians Movement	Young Mums and Mums 2 Be Group
Edward Carpenter Community of Gay Men		

A.2.14 Note that additional consultation has not been undertaken as part of this refresh of the EqIA.

Stage Five - Assessment of impacts

A.2.15 Analysis for EqIAs considers both quantitative and qualitative evidence; they are often based on the review of existing literature and the views of local equality stakeholders and quantitative information on the demography of the populations and communities affected by the proposed development.

Stage Six – Recommendations

A.2.17 The final stage of the EqIA was to set out any necessary management measures (to eliminate or reduce any disproportionate adverse effects for one or more equality groups) and opportunities (ways in which to enhance proposals to maximise the equality of outcomes). The EqIA recommendations are summarised in Section A.5.

A.3. Scoping

A.3.1 As outlined above, the purpose of the scoping exercise was to explore which (if any) equality groups would be disproportionately affected by changes in the distribution of noise and air quality. The findings of this exercise are summarised in Table A.2 below and presented in full in Table A.3. The grey shaded rows indicate where an equality strand has been scoped out of further assessment; the desk research did not identify any disproportionate effects.

Table A.2: Affected groups and the factors influencing health

Affected Group	Factors influencing health
Children (aged under 16)	■ Air quality influencing respiratory conditions such as asthma ■ Noise affecting cognitive development in primary school children
People of working age (aged 16-64)	■ Noise influencing sleep disturbance and annoyance
Older people (aged 65+)	■ Air quality influencing respiratory conditions ■ Noise at night time
People with long term respiratory illnesses	■ Air quality influencing respiratory conditions
People with mental well-being disabilities	■ Environmental noise affecting the rate of onset or intensity of latent mental disorder
Pregnant women and parents with newborn children	■ Noise influencing sleep disturbance and annoyance
People from Black, Asian and Minority Ethnic (BAME) groups	■ Noise influencing cardiovascular and hypertension
People with different faith and beliefs	■ No disproportionate effects identified
People who have experienced gender-reassignment	■ No disproportionate effects identified
Lesbian, gay men and bi-sexual individuals	■ No disproportionate effects identified
Men	■ No disproportionate effects identified

Affected Group	Factors influencing health
Women	■ No disproportionate effects identified

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
Age	Children (aged under 16)	- Changes are likely to result in the deterioration of air quality. Air pollution has a generally negative societal effect. Such effects could be particularly pronounced for younger people and children who tend to suffer disproportionately from respiratory illnesses, such as asthma and acute bronchitis.[8] [9] - Exposure to environmental stressors can impair children's cognitive development. Recent studies have shown that aircraft noise constitutes an acute environmental stress factor and can specifically harm reading comprehension. Schools exposed to high levels of aircraft noise are not considered as to be healthy educational environments.[10] - Prolonged exposure to both day-time and nocturnal aircraft noise can increase children's vulnerability to developing systolic and diastolic blood pressure, increasing the risk of developing adverse health conditions in adulthood.[11]	- All but two of the Boroughs in the study area have a mean population age less than or equal to the national average (39). Only South Bucks (at 41) and Spelthorne (at 40) have older mean population ages. - All of the London Boroughs within the impact area have a younger than average mean population age. Several of the Boroughs also have higher than average proportions of young children aged 0-4. - The south east Boroughs have similar or slightly lower proportions of children than national averages. Slough is the notable exception to this with a significantly higher proportion of children (particularly those aged 5-9 and 10-14) than national and south east averages.	✓
	People of	- The World Health Organisation (WHO)	- Working age populations in all Boroughs are broadly	✓

[8] Asthma is more widespread in children than in adults. It is the most common long-term childhood medical condition, affecting 1.1 million in the UK – one in ten children. (Asthma UK). See: http://www.asthma.org.uk/all_about_asthma/for_parents/asthma_your_child/index.html and http://www.asthma.org.uk/all_about_asthma/asthma_triggers_az/

[9] UC Davis School of Medicine (2011): 'Childhood respiratory illness associated with air pollution'

[10] S Stansfeld, B Berglund, C Clark, I Lopez-Barrio, P Fischer, E Öhrström, MM Haines, J Head, S Hygge, I van Kamp, B F Berry, on behalf of the RANCH study team (2005): 'Aircraft and road traffic noise and children's cognition and health: a cross-national study', *Lancet*, Issue 365, pp.1942–49. See: http://www.teamsofangels.org/publication/medical_journal_articles/Noise.pdf

[11] London Borough of Hounslow (2011) The effect of nocturnal aircraft noise on health: A review of recent evidence

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
	working age (aged 16-64)	asserts that sleep is a pre-requisite for good physiological and mental functioning. Increases in external noise, as a result of increased aircraft noise after dark, can have a highly negative impact on sleep, with knock-on impacts on health. Noise during sleep can in crease blood pressure, heart rate and vasoconstriction, respiration and cardiac arrhythmia. - In addition, prolonged exposure to both day-time and nocturnal aircraft noise has been linked to increased levels of morning cortisol (stress hormone).[12] Increased levels of stress are directly linked to adverse health conditions such as anxiety disorders and depression, which are common causes of long term sick leave from employment.[13] [14] - Various after-effects (on the day following noise-disturbed sleep) such as increased fatigue, depressed mood and decreased performance may have particularly acute effects on people who work. The WHO identifies shift workers as being particularly sensitive to noise. [15] - WHO research shows that people get severely annoyed at 55 dB.[16] A recent guide	consistent with England and south east averages. - Almost all of the London Boroughs have higher proportions of working age people than England and south east average. In particular the proportion of people aged 20-44 is significantly higher (and in some areas, such as Hammersmith, is almost double the England average). - Other Districts have numbers of working age people closer to the national average, though many have higher [proportions of 30-44 year olds than England or the south east overall. Slough has a higher proportion of people of working age than England, the south east and the majority of other Districts, with particularly significant proportions of 20-44 year olds.	

[12] London Borough of Hounslow (2011) The effect of nocturnal aircraft noise on health: A review of recent evidence

[13] NHS Choices (2012) 'Struggling with stress?'

[14] Allen, K on behalf of the Guardian (2011) 'Stress now the commonest cause of long term sick leave'

[15] World Health Organisation (2000): 'Guidelines for Community Noise', pp.26-27

[16] World Health Organisation (2000): 'Guidelines for Community Noise'

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
		from the European Environment Agency backs this up.[17] Annoyance increases with volume.		
	Older people (aged 65+)	- Like children, older people are more susceptible to deterioration in air quality which may lead to respiratory illnesses such as asthma. [18] - In addition, the WHO identifies older people, in particular the elderly, as being particularly sensitive to the effects of night time noise. [19] [20] - In addition, older adults are more prone to sleeping lightly and finding it difficult to fall to sleep once woken; sleep disruption due to external noise could therefore make older people more vulnerable to developing insomnia.[21]	- Proportions of older people in the study area are generally similar to or slightly below England and south east averages. - All the London boroughs have lower than average proportions of older people, reflecting the younger mean population age of these areas. - Non-London districts have proportions of older people closer to England and south east averages, with higher than average proportions of some age groups higher than averages (for example, in South Bucks, 9% of the population are aged 65-74 compared with 8% across England). - However, Slough has a far smaller proportion of older people than national averages, and of most of the other districts in the study area.	✓
Disability	People with long term respiratory illnesses	- People with long term respiratory disabilities such as asthma[22] are likely to be particularly sensitive to changes in air quality.[23] - Pollutants which are emitted by aircrafts such as nitrogen dioxide, sulphur dioxide and particle matter can cause increased	- In those London Boroughs considered as part of the study area, the proportion of both the total population and the working age population with Long term Limiting Illnesses was below the average for London (15% of the total population, and 12% of the working age population). - In the non-London Districts considered as part of the	✓

[17] See: http://www.aef.org.uk/downloads//Noise_document_Jan2011AW.pdf and http://www.eea.europa.eu/publications/good-practice-guide-on-noise

[18] See: http://www.asthma.org.uk/all_about_asthma/asthma_adults/asthma_older_peopl.html

[19] World Health Organisation (2000): 'Guidelines for Community Noise', pp.26-27

[20] World Health Organization (2011): 'burden of Disease from Environmental Noise'

[21] National Sleep Federation (2011): 'Aging and Sleep'

[22] Asthma is classed as a disability if it has a substantial and long-term adverse effect on a person's ability to carry out normal daily activities.

[23] See: http://www.nhs.uk/Conditions/Asthma/Pages/living-with.aspx

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
		irritation and inflammation of the airways and lungs, which can be particularly harmful for those suffering from asthma, bronchitis and chronic lung disease.[24] [25]	study area, the proportion of both the total population and the working age population with Long term Limiting Illnesses was below the average for the south east (15% of the total population, and 11% of the working age population).	
	People with mental wellbeing disabilities	- Environmental noise such as aircraft noise is believed to accelerate and intensify the development of latent mental disorder. Symptoms such as anxiety, emotional stress, nervous complaint, nausea, headaches, instability and argumentativeness are all believed to be exacerbated by increased exposure to noise.[26] - The WHO warns that persons vulnerable to mental disorders are particularly sensitive to the effects of night time noise. [27] - In addition, increased expose to night time noise has been shown to be increase the use of medications such as sedatives and sleeping pills. [28]	- See above - In all London Boroughs and other Boroughs and Districts considered within the study scope (with the exception of Hammersmith and Fulham), Incapacity Benefit claimant rates on mental health grounds were below the England average, and considerably below the worst in England.	✓
Gender reassignment	None	No evidence identifying disproportionate effects on this population group.	n/a	✘
Pregnancy and maternity	Pregnant women	- Pregnant women are likely to experience similar impacts relating to night time noise and sleep disruption and their after effects,	- There is currently no demographic information available on rates of pregnancy	✓

[24] DEFRA (2011) Air pollution in the UK 2011

[25] DEFRA (2012) What are the effects of air pollution? See http://uk-air.defra.gov.uk/air-pollution/effects

[26] World Health Organisation (2000): 'Guidelines for Community Noise', p.30

[27] World Health Organisation (2000): 'Guidelines for Community Noise', pp.26-27

[28] World Health Organisation (2000): 'Guidelines for Community Noise', p.26

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
		as well as annoyance and disruption, to those outlined above. - In addition, increased exposure to high levels of air pollution and transport fumes during pregnancy can impact negatively upon children's brain function, contributing towards poorer health outcomes and decreased cognitive abilities of children.[29]		
	Parents with newborn children	- Parents with newborn and very young children are also likely to experience similar impacts relating to night time noise and sleep disruption as well as to annoyance and disruption to those outlined above.	- There is currently no information available on number of parents with newborn and young children.	✓
Race (including ethnic/ national origins, colour or nationality	People from Black, Asian and Minority Ethnic (BAME) groups	- Members of Black, Asian and minority ethnic (BAME) groups have, in the last 15 years, been shown to be at greater risk from cardiovascular diseases ranging from Coronary Heart Disease to renal failure.[30] In particular, people from South Asian communities including Indian, Pakistani and Bangladeshi communities, have been shown to be at greatest risk. - Noise during sleep can increase blood pressure, heart rate and vasoconstriction, respiration and cardiac arrhythmia, impacts which may be more severe for groups with proven tendencies towards higher rates of cardio-vascular illness.	- Overall, the majority of Districts and Boroughs under consideration have a higher proportion of BAME groups than the proportion for England. - London has a higher proportion of people from BAME groups than both the south east and England. In particular Ealing and Hounslow have particularly large BAME populations (with 55.10% and 44.23% respectively. - There is a comparable or higher proportion of White British people in the remainder of the Districts within the study area. The exception to this is Slough which has a high proportion of people from BAME groups.	✓

[29] Sram, R, Binkova, B, Dejmek, J, and Bobak, M on behalf of the WHO (2005): 'Intrauterine growth retardation, low birth weight, prematurity and infant mortality' and Persaud, R and Morris, N (2013) : 'Early childhood near traffic elevates chances of later autism: Do our brains need protecting from the modern world?'

[30] This phenomena is now well documented. See, for example: F Cappuccio (1997): 'Ethnicity and cardiovascular risk: variations in people of African ancestry and South Asian origin' in the *Journal of Human Hypertension* Vol.11, pp.571–576

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
		- Prolonged exposure to noise by susceptible individuals may lead to the development of permanent effects such as hypertension and ischemic heart disease. The link between aircraft noise and such effects is considered to be strongest for noise levels of 65-70dB or above.[31] - Chronic noise burden – such as aircraft noise – is associated with the risk of cardiovascular diseases such as myocardial infarction. The increase in risk is currently generally accepted to be more closely associated with sound levels than with subjective annoyance (causing stress, though this is also a factor).[32] Members of BAME communities are therefore at greater risk than the general population from the impacts of excessive noise burden.		
Religion or belief, including lack of belief	None	No evidence identifying disproportionate effects on this population group.	n/a	✗
Sex / Gender	None	No evidence identifying disproportionate effects on this population group.	n/a	✗
Sexual orientation	None	No evidence identifying disproportionate effects on this population group.	n/a	✗
Marriage or civil	None	No evidence identifying disproportionate effects on this population group.	n/a	✗

[31] World Health Organisation (2000): 'Guidelines for Community Noise', p.29

[32] Stefan N. Willich, Karl Wegscheider, Martina Stallmann and Thomas Keil (2005): 'Noise burden and the risk of myocardial infarction' European Heart Journal, Volume 27, Issue3 Pp. 276-282. See: http://eurheartj.oxfordjournals.org/content/27/3/276.abstract

Equality Strand	Affected groups	Supporting evidence	Population distribution	Scoped in?
partnership				

A.4. Assessment of impacts

A.4.1 This section identifies the impacts associated with the enabling works and subsequent operations implementing full runway alternation during easterly operations. It evaluates the effects of changes to air quality and noise on the equality groups within the local population who have been scoped in to the full assessment.

Table A.1**Error! No text of specified style in document.**: Affected groups for each equality strand of the Equality Act 2010

Issue / Impact	Relevant Equality Groups
AIR QUALITY	
• Operation: Redistribution of emissions to the atmosphere from aircraft as a result of a change in runway alternation practices during easterly operations	Children (aged under 16) Older people (aged 65 +) People with long term respiratory illnesses
NOISE	
• Construction: Noise generation from the construction plant • Operation: Redistribution of air and ground noise generated by aircraft as a result of a change in runway alternation practices during easterly operations and changes in noise exposures at primary schools and hospitals.	Children (aged under 16) People of working age (aged 16-64) Older people (aged 65+) People with mental well-being disabilities People from south Asian ethnic backgrounds Pregnant women and parents with newborn children

Air quality

A.4.2 The HIA identified that changes in air quality are very small and the consequent change in health outcomes is assessment as being negligible. Within this conclusion, there are two areas where air quality changes are predicted to be most pronounced. These are Stanwell (to the south and west of the southern runway) where a slight improvement in air quality is predicted and Longford (to the north and west of the northern runway) where a slight decrease in air quality is predicted. Given that the overall area in which decreases in air quality is predicted to be experienced is very small, a detailed quantification of impacts on particular social groups is not possible. Data analysed for EqIAs is at Lower Super Output Area (LSOA); Longford, which is where the main air quality impacts will be experienced, forms one part of a larger LSOA which includes the Heathrow site and also half of the village of Harmondsworth to the north. The overall population of this LSOA is 1,833 residents.

A.4.3 The commentary below is based on figures for the whole LSOA but it is assumed that fewer than half of the 1,833 population is located in Longford itself. The HIA concluded that the changes to air quality and the influence on health outcomes only relate to NO_2 and, would have negligible effects in Longford. The following sections considering the equality groups sensitive to air quality impacts should be read within this context.

A.4.4 Children

- **Magnitude**: Any degradation of air quality could have particularly pronounced effects for younger people and children who tend to suffer disproportionately from respiratory illnesses, such as asthma.[33] The immaturity of children's respiratory organ systems makes them more susceptible to the damaging effects of poor air quality and air pollutants and can reduce

[33] Asthma is more widespread in children than in adults. It is the most common long-term childhood medical condition, affecting 1.1 million in the UK – one in ten children. (Asthma UK). See: http://www.asthma.org.uk/all_about_asthma/for_parents/asthma_your_child/index.html and http://www.asthma.org.uk/all_about_asthma/asthma_triggers_az/

children's lung development.[34] Under 16s are, therefore, an at risk group in terms in the areas in which air quality levels are set to worsen.

- **Distribution**: The number of children in the affected LSOA is, however, very small (248). This represents 14% of the LSOAs population which is less than the proportions of children in the overall impact and in either London of the South East.
- **Significance:** Under 16s are not considered to be at risk of experiencing disproportionate negative impacts.

A.4.5 Older people

- **Magnitude**: Older people tend to be more vulnerable to air pollution because they have a higher incidence of pre-existing health problems such as respiratory and heart disease.[35] There is a bank of evidence that suggests that the need for vascular surgery increases with age, particularly over 60s and over 70s.[36] Statistics show that older people are at greater risk of mortality from circulatory diseases than any other cause; 2008 figures show that 35% of people over 65 died from circulatory diseases.[37] Death from respiratory conditions is also high (16% of over 65s died from respiratory diseases in 2008). As such, the absolute and relative risks of exposure to air pollutants are greater for older people than for many other societal groups.[38] These health traditional health problems make older people susceptible to changes in air quality.
- **Distribution**: As with children, the number of over 65s within the LSOA is small (194). The proportion of older people is 11% which is slightly lower than that for the overall study area (12%).
- **Significance**: Based on the above evidence it is not considered that air quality impacts will disproportionately affect those over 65.

A.4.6 People with long term respiratory illness

- **Magnitude**: People with long term respiratory disabilities such as chronic asthma[39] are likely to be particularly sensitive to changes in air quality[40] and are, therefore, another key group for whom air quality changes could be significant.
- **Distribution**: Population figures for the LSOA in which air quality impacts are likely to be witnessed show that there are no people recorded as having existing respiratory illnesses.
- **Significance**: The impacts on this group are not necessary to consider further.

Noise

A.4.7 The assessment of noise effects (from the HIA) identified that there would not be a large change in the number of people highly annoyed or experiencing sleep disturbance. The Environmental Statement identifies areas experiencing an increase of 3dB or more within the 57_{Lden} air noise contour and the principal communities affected are in and around the village of Cranford and in south west Southall. This is referred to as the 'noise impact area'[41].

[34] California Environmental Protection Agency: Air Resources Board (2005): 'The Children's Health Study'

[35] ClientEarth – see http://www.clientearth.org/the-impacts-of-air-pollution

[36] Vascular Society of Great Britain and Ireland (2009): ' The National Vascular Database Report'

[37] British Heart Federation (2010): Coronary Heart Disease Statistics

[38] DH – Committee on Medical Effects of Air Pollutants (2006): Op. cit.

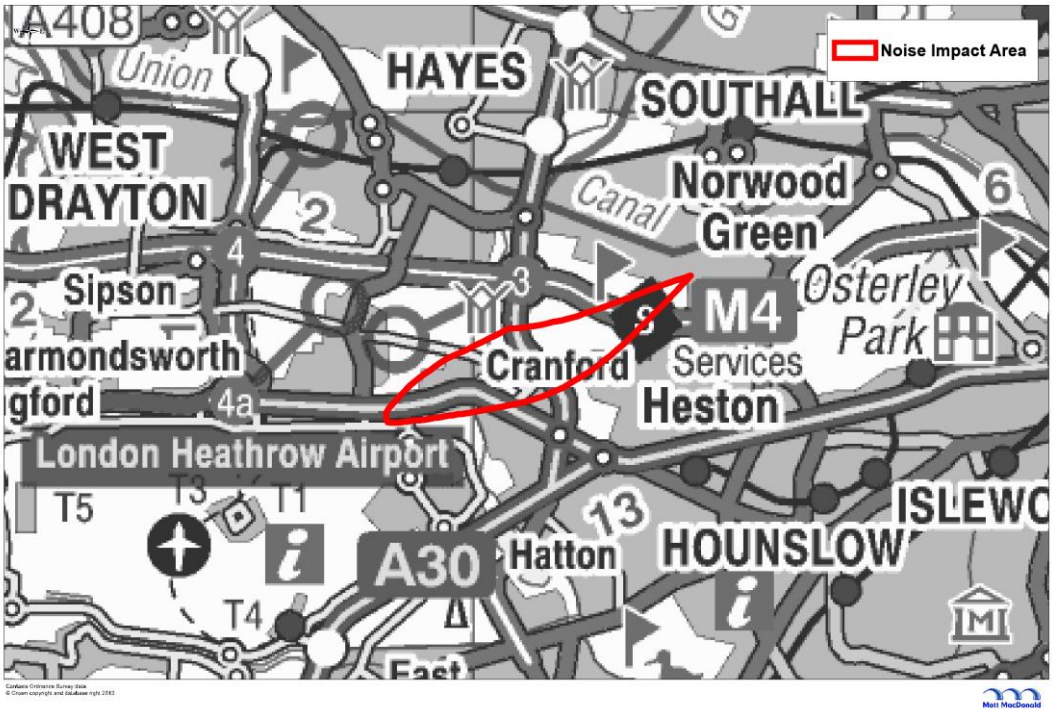
[39] Asthma is classed as a disability if it has a substantial and long-term adverse effect on a person's ability to carry out normal daily activities.

[40] See: http://www.nhs.uk/Conditions/Asthma/Pages/living-with.aspx

[41] When determining policy relating to the Cranford Agreement, the Government identified changes in noise of +3dB LAeq as a key metric – the EIA categorises changes of 3dB as a significant effect.

A.4.8 The analysis of population groups compares the composition of the population in the noise impact area compared with the composition of the study area – the ten local authority areas. The comparison has been conducted using data from ONS to allow comparison over both geographical areas. The noise impact area does not fit neatly into existing administrative areas for data collection, therefore demographic information has been analysed by using a methodology that uses Address Point data to apportion statistics to a bespoke geographical area – in this case the 'noise impact area'. This provides a better estimation of the population within the noise impact area and forms the basis of the following statistics. The total population of the noise impact area is 4,595. The proportions of the populations presented are considered to be representative and enable identification of any disproportionate effects on certain population groups.

Figure A.2: Noise impact area



A.4.9 This section considers the impacts for equality groups considered as sensitive in this noise impact area. Table A.5 below shows the number of people within each age group within the noise impact area.

Table A.5: Age groups within the noise impacted area

Population		Population in Noise Impact Area					
		Children (under 16)		Working age (16-64)		Older people (65 & over)	
Study Area	Noise impacted area	No.	%	No.	%	No.	%
1,888,067	4,595	1,069	23	3,116	68	411	9

A.4.10 Table A.6 below shows the number of people within each the other equality groups which are considered sensitive to noise increases.

Table A.6: Vulnerable populations within the noise impacted area

Population		Population in Noise Impact Area					
		People with mental well-being disabilities		South Asian People		People from most quintile deprived communities	
Study Area	Noise impacted area	No.	%	No.	%	No.	%
1,888,067	4,595	38	1	1,960	43	1,588	35

A.4.11 Children

- **Magnitude**: Aircraft noise has been identified as an environmental stress factor and can impair children's cognitive development[10]. There is also some evidence to suggest links between prolonged exposure of day time and night time aircraft noise to increases in blood pressure in children[11,12].
- **Distribution**: Population figures show that the percentage of children within the noise impacted area (23%) is higher than the proportions of the overall study area and the two regional comparators, all of which are around 19%.
- **Significance**: In terms of distribution, given their relative high representation in the impact area, the distribution of noise impacts is likely to disproportionately affect under 16s.

A.4.12 People of working age

- **Magnitude**: Increased aircraft noise after dark, can have a negative impact on sleep. This, in turn, can have knock-on impacts on good physiological and mental functioning, affecting those who work during the day.
- **Distribution**: Table A.5 above indicates that 68% of people within the impact area are of working age. This is in line with the overall study area (68%) and London (69%).
- **Significance**: Noise impacts will not, therefore, be disproportionately distributed and experienced by this group; however, it is worth noting that there are still over 3,000 people within this age bracket who could potentially experience adverse impacts from sleep disturbance.

A.4.13 Older people

- **Magnitude**: Older people tend to be more sensitive to the effect of night time noise[19,20]. In addition, older adults are more prone to sleeping lightly and finding it difficult to fall to sleep once woken; sleep disruption due to external noise could therefore make older people more vulnerable to developing insomnia[21].
- **Distribution**: There are fewer than 450 people aged over 65 within the noise impact area; the proportion of older people over 65 (9%) is also low compared to the study area (12%), London (11%) and the South East (17%).
- **Significance**: Older people, therefore, are not considered as a group who will be disproportionately affected by noise increases.

A.4.14 People with mental well-being disabilities

- **Magnitude:** Environmental noise such as aircraft noise is believed to accelerate and intensify the development of latent mental disorders and persons considered vulnerable to mental disorders are particularly sensitive to the effects of night time noise.

- **Distribution:** The number of people within the noise impact area who have a mental well-being disability is very low (38); this represents around 1% of people within the noise impact area. This proportion is consistent with the percentage for the overall impact area and in line with the proportions for London (1%) and the South East (1%).
- **Significance:** Noise impacts are not considered to be disproportionately distributed in terms of this equality group.

A.4.15 People with South Asian ethnic backgrounds

- **Magnitude**: Members of some BAME communities have a higher propensity to experience heart and circulatory conditions (for example Coronary Heart Disease (CHD) and renal failure) compared with those from white ethnic groups. In particular, people from South Asian communities including Indian, Pakistani and Bangladeshi communities, have been shown to be at greatest risk.[42] [43] [44] Research shows that South Asian men have an age standardised mortality rate from CHD about 40% higher than the average population.[45] Some of this can be explained by the higher likelihood of South Asians to have diabetes[46] which is known to be a high risk factor in terms of developing a CVD.[47] [48]
- **Distribution**: There are over 1,900 people from South Asian origin in the noise impact area; this represents 43% of the total population which is much higher than the overall impact area (15%) and London (12%).
- **Significance**: Given the large numbers and proportion of the population, people from South Asian backgrounds are expected to experience disproportionate impacts from the proposed development.

A.4.16 Pregnant women and parents with newborn children

- The EqIA scoping report identified pregnant women and parents with newborn children as amongst those who could potentially experience negative effects of noise changes relating to night time noise, sleep disruption and the associated after-effects such as fatigue and depression. Whilst they are considered to be an equality group sensitive to change it is not possible to quantify these impacts by looking at the demographic distribution due to the lack of data on this equality strand.

A.4.17 People from deprived communities

- Although not a statutory equality group, there is strong evidence to suggest that people from deprived communities have a high susceptibility to conditions requiring vascular care. They are, therefore, amongst the 'at risk' groups in terms of noise impacts. The noise impact area contains a high number (over 1,500) and a high proportion (35%) of people from the most deprived quintile.[49] Given these numbers, socio-economically deprived populations may be

[42] This phenomenon is now well documented. See, for example: F Cappuccio (!997): 'Ethnicity and cardiovascular risk: variations in people of African ancestry and South Asian origin' in the *Journal of Human Hypertension* Vol.11, pp.571–576

[43] Parliamentary Office of Science and Technology (2007): Postnote: Ethnicity and health'

[44] Economic and Social Research Council (2011): 'The ethnicity of heart disease'

[45] See: http://heart.bmj/content/83/5/495.extract and http://www.patient.co.uk/doctor/Diseases-and-Different-Ethnic-Groups.htm

[46] Almost one in five people of south Asian origin living in the UK develop diabetes, compared to one in 25 among the general population. This increased prevalence is coupled with earlier disease onset. Race Equality Foundation and Communities and Local Government (CLG) (2010): Better health briefing 16: 'Ethnicity and coronary heart disease: making sense of risk and improving care'

[47] People with diabetes have an up to fivefold increased risk of CVD compared to those without diabetes. See Diabetes UK and Race Equality Foundation and CLG (2010): Op. cit.

[48] CVD is the major cause of death and disability amongst people with diabetes, accounting for 52% of fatalities in people with Type 2 diabetes. Diabetes UK (2010): 'Diabetes in the UK: Key statistics on diabetes'

[49] As measured by the Index of Multiple Deprivation.

disproportionately represented amongst those who are likely to experience negative noise impacts.

A.5. Conclusions and recommendations

A.5.1 This section of the appendix reports the conclusions and recommendations from the equality impact assessment.

Air quality

A.5.2 This EqIA has identified that children, older people and those with respiratory conditions are the equality groups most susceptible to changes in air quality levels. However, these groups are not high in numbers or disproportionately represented in the air quality impact area. As such, it is note considered that any of these groups would be particularly adversely affected by the proposed enabling works. Moreover, the assessment of the changes in air quality concentrations and the resultant effects on health outcomes has concluded that the effects are negligible.

Noise

A.5.3 In terms of noise impacts this EqIA suggests that there are six equality strands groups who tend to be most at risk when noise levels increase: children; people of working age; older people; people with mental well-being disabilities; people from south Asian communities; and pregnant mothers and those with newborn children. Most of these groups are not considered to be high in numbers in the noise impact area. However, children there are higher proportions of children in the area as well as there being over 5,000 people of working age. In addition, the high population of people from a South Asian ethnic background, principally residing in south west Southall are also predicted to experience disproportionate impacts. Furthermore, information on deprivation indicates that the noise impact area could be classified as deprived and therefore more detailed analysis of the data specific to the noise impact area (rather than the larger LSOA within which it is placed) would help determine whether widening health inequalities is a potential issue.

Recommendations

A.5.4 As identified above, there is the potential for children and people of working age to experience disproportionate negative effects as a result of the enabling works. In order to develop ways in which to address these issues the following action is recommended:

- Engagement with primary schools predicted to be affected by changes in air noise;
- Engagement with the South Asian community and care providers for this population; and
- Further investigation of the population within the noise impact area to identify whether this population are a deprived community.

A.5.5 During the stakeholder consultation exercise, stakeholders consulted also identified a key opportunity to enhance the implementation of the enabling work programme. They suggested the development of a community communication strategy in the run up to the planning application process in order to allay and/or respond to community concerns. This should be governed by the following principles:

- There should be clear and regular communication with the community specifically relating to the schedules for runway use and alternation, impacts and who to contact for more information.
- Methods of communication that people actually use should be deployed, making full use of available community channels such as dissemination through network organisations such as the local community and voluntary service and local media, with an emphasis on real time

information – particularly relevant during easterly operations (where the weather dictates a change from the planned runway operation schedule).

- The internet should be used but not as a sole means of communication, in recognition that not everybody has internet access, particularly, amongst equality groups (older people and those from deprived communities in particular).
- Where there are communities with large proportions of people from non-white British ethnic groups the communication programme should provide information in different languages and, if necessary, local cultural groups should be engaged.
- The use of community forum events was advocated as a popular and active ways of engaging local people.