7 Noise

Executive Summary

7.1 An application was made in 2011 to amend the Article 40 Agreement to remove the “Seats for Sale” limit and introduce an indicative noise control contour as part of an effective noise management system. The latter would introduce a clearly stated noise cap expressed in terms of the area falling within the daytime noise contours, and include other noise control measures addressing both air noise and ground noise. The impact of these changes sought in the Airport’s Article 40 Agreement has been assessed in terms of airborne aircraft noise, the noise of ground operations on the taxiways and aprons, the noise related to increased road traffic and any potential construction noise.

7.2 An assessment of air noise has been undertaken to appraise conditions both now and in the future both with and without the proposed modification agreed. For the locations considered the largest difference in the future situation with and without the modification agreed is 0.7 dB $L_{Aeq,16h}$. Such a change is significantly below the change of 3 dB(A) that Government guidance advises is the minimum perceptible under normal conditions. It is not therefore considered subjectively significant. The impact of the increase in population due to the modification is classed as minor.

7.3 GB BCA will continue to operate and, where appropriate, seek to improve the various noise control measures in place at the airport that have successfully ensured that noise effects to the local community have been, and will continue to be, minimised. The modification sought will not cause significant noise impact when considering the increase in noise level; the changes in noise forecast for 2025 without SFS as compared to the 2025 Fallback situation (with SFS) are small, so small as to be normally considered insignificant. However there is a slight increase in the number of people exposed to noise at night.

7.4 For noise from aircraft ground operations and road access traffic, future impacts are predicted to be negligible. Preliminary consideration has also been given to any temporary noise effects related to construction activity associated with any of the potential physical aspects of the project as described in Chapter 4. The limited construction work related to this proposal is not likely to cause any significant impacts.

Introduction

7.5 The noise arising from flying operations at GB BCA has been addressed for many years by the Airport and the Department for Regional Development (DRD), the Department of the Environment (DoE) and the Belfast Airport Forum. The current process relates to putting in place a clearly stated noise contour cap, and further improvements to the extensive noise management measures currently in place. This Chapter provides a summary of the detailed assessment, separately reported in Appendix 7.1, of the current (2013) noise climate at the Airport and in the surrounding community and what is forecast to occur in 2025. To allow for proper consideration of the scale and magnitude of the potential impacts the noise in 2025 has been assessed on the basis of retention of the
“Seats for Sale” (SFS) limitation given in the Airport’s Article 40 Agreement, and separately on the basis that the proposed modification to the Article 40 agreement is agreed. In the latter circumstance the noise at the Airport and in the local community will be a function of the noise characteristics of the aircraft operated within the proposed noise contour cap.

**Scope of Assessment**

7.6 The noise assessment has considered the noise arising from aircraft flying into and out of the Airport, the noise of aircraft ground operations on the taxiways and aprons, and the noise related to road access traffic. For noise from aircraft ground operations and road access traffic, future impacts are predicted to be negligible. Preliminary consideration has also been given to any temporary noise effects related to construction activity associated with any of the potential physical aspects of the project as described in Chapter 4. The limited construction work related to this proposal is not likely to cause any significant impacts. The assessment described here therefore concentrates on the impacts of airborne aircraft noise, and as such only the results of the air noise assessment have been presented in this chapter. The assessments of noise impact from this and other sources are contained within Appendix 7.1.

**Study Area**

7.7 With respect to ground noise and construction noise the study areas are close to the Airport. Also with regard to road traffic noise due to Airport traffic immediately joining the national road network the related assessment is only of areas near the Airport. With regard to airborne aircraft noise the study area extends from the perimeter of the Airport along the areas exposed to noise from aircraft on final approach and on initial departure.

**Scoping and Consultation**

7.8 Technical dialogue has taken place over the last few years on noise management at GB BCA, and the appropriate noise impact methodology and assessment methods. The dialogue has been held with noise specialists retained by Belfast City Council, and separately DoE Planning.

**Methodology**

7.9 To predict noise due to the modification in operations sought, different methods have been adopted for each noise source; methods used commonly in studies of UK airports. With respect to the noise from airborne aircraft the latest version, 7.0d, of the FAA’s Integrated Noise Model (INM) software has been used. This is the most widely used software for airborne aircraft noise in the world. It has been used at GB BCA to produce annual contours for many years. It has been validated for GB BCA by study of the results from Airport’s noise monitors, which include many thousands of results.
7.10 With regard to ground noise, no such widely accepted prediction model exists. CadnaA software has been used after being calibrated against BAP's internal database of measured ground noise levels at various airports.

7.11 The road traffic noise has been computed using the UK national method, the Calculation of Road Traffic Noise (CRTN), Department of Transport 1988.

7.12 Construction noise has been assessed using information given in BS 5228:2009.

7.13 The noise impact has been assessed using criteria based on guidance given in the Aviation Policy Framework (APF), Noise Planning Policy Framework (NPPF), PPG 24, CAP 725 and in light of experience with other airport impact assessments.

**Desk Study**

7.14 The noise in 2013 has been assessed mainly by a desk study, complemented by study of the numerous noise measurements made by the Airport’s fixed noise monitors at Nettlefield Primary School, which is approximately 4.5 km from the start of roll location for aircraft departing using runway 22 and Kinnegar Army Camp, which is approximately 3.9 km from the start of roll location for aircraft departing using runway 04.

7.15 The noise in 2025 has been assessed using the same methodology.

**Assessment of Effects**

**Sensitivity/Importance**

7.16 The noise emission from the Airport produces the risk of impact with regard to people in the vicinity. Environmental noise is defined in the Environmental Noise Directive (END) as “unwanted or harmful outdoor sound created by human activities, including noise emitted by means of transport, road traffic, rail traffic, air traffic, and from sites of industrial activity”. The extent to which noise affects people depends on its nature, intensity, duration, the activity being undertaken by the individual at the time of exposure and the individual's sensitivity. The effects of noise are also dependent on the quality of the sound and the individual's attitude towards it.

7.17 The recent Community Attitudes Survey, described in the Airport’s draft Noise Action Plan, dated October 2013, indicates that in 2013 in the postcode areas covering south and east Belfast and North Down which are overflown by aircraft to and from GB BCA, aircraft noise was rated one of the least important factors to the quality of life of the respondents. In total 90% of the respondents in the 2013 survey responded that they were either ‘not at all’ or ‘slightly’ bothered, disturbed or annoyed by aircraft noise in their home over the last 12 months or so.

7.18 Recent surveys around EU airports have found considerable differences in reaction to aircraft noise for the same aircraft noise level at different airports.
**Magnitude of Effect**

7.19 In light of the recently published Aviation Policy Framework, the main assessment for aviation noise has been taken as the 57 dB $L_{Aeq,16h}$ Summer daytime contour. This has been monitored in the annual contouring at GB BCA for many years, and is the control contour proposed by GB BCA in the proposed modification.

7.20 With regard to night time noise, assessments have been made using 90 dB(A) SEL footprints and $L_{night}$ contours. The latter, although used for the END mapping, must be treated with caution as night activity at GB BCA is largely restricted to activity in the half hour period 0630-0700 and so the eight hour average arising from the use of the $L_{night}$ metric may not be representative.

**Significance of Effect**

7.21 The significance of effect with regard to daytime airborne aircraft noise increases as the level of noise increases. The general approach to UK airport noise assessments has been to relate values of daytime noise levels, as below:

- 57 dB $L_{Aeq,16h}$ to the onset of significant community annoyance
- 63 dB $L_{Aeq,16h}$ to moderate levels of significant community annoyance
- 69 dB $L_{Aeq,16h}$ to high levels of significant community annoyance

7.22 With regard to night noise, exceedance of the WHO interim night noise guideline, 55 dB $L_{night}$, represents significant night noise and inclusion within the 90 dB(A) SEL footprint indicates the presence of a very slight risk of night time disturbance (awakenings or general disturbance).

7.23 With regard to schools, the UK Government policy guideline is set out in the White Paper, *The Future of Air Transport*, and is that those located inside the 63 dB $L_{Aeq,16h}$ Contour and subject to an increase of 3 dB $L_{Aeq,16h}$ or more resulting from airport development should be eligible for sound insulation. This is echoed in the updated Aviation Policy Framework.

**Limitations to the Assessment**

7.24 The limitations of the assessment relate to the need to forecast future movements and future noise characteristics of aircraft in 2025. The impacts of the movement cap have been assessed based on aircraft types currently in operation and this cap will remain constant and enforceable under the proposed modification.

**Baseline & Fallback Conditions**

7.25 This section provides commentary on the baseline (2013) and Fallback (2025 With SFS) conditions. The potential effects section which follows provides commentary on the potential change to these conditions if the proposed modification is agreed. To avoid the need to repeat tabulated information and for ease of comparison, Tables 7.2 to 7.5 in the
7.26 A mixture of turbo-prop and turbo-fan aircraft types are currently in operation at the Airport. These range from small general aviation aircraft including corporate jets, up to passenger aircraft such as the Bombardier Dash 8-Q400 (turbo-prop) and the Airbus A320 (turbo-fan).

7.27 Figure 7.1 depicts the 57 dB L_{Aeq,16h} noise contours arising for the years 2010-2013. This illustrates the modification in air noise over the last few years.

7.28 Figure 7.2 depicts the 57 dB L_{Aeq,16h} contours forecast for the 2013, 2025 Fallback and 2025 without SFS scenarios. The 2025 contours are of a similar shape to those for 2013, but are larger in size.

7.29 These changes occur due to changes in the mix of aircraft using GB BCA and an increase in annual aircraft movements up to the 48,000 permitted by the Planning Agreement.

7.30 Three schools lie inside the 57 dB L_{Aeq,16h} contour in 2013, this will increase to eight in the 2025 With SFS scenario. No schools are subject to noise levels of 63 dB L_{Aeq,16h} or greater, or to an increase of 3 dB or greater, in either 2013 or 2025, and therefore none would be eligible for sound insulation under the guidelines set out in the White Paper, “The Future of Air Transport”, and the APF.

7.31 The contour representing the onset of significant community annoyance, 57 dB L_{Aeq,16h}, in 2013 extends to the west of Holywood and into Ballymacarrett and there are residential properties within that contour. These properties are mainly located in Sydenham, Ballymacarrett and the Kinnegar area of Holywood. The population contained within this contour in 2013 is estimated to be approximately 7,200. In the 2025 With SFS scenario this contour extends further into the same areas, and the population within the contour rises to approximately 14,600.

7.32 The contour representing moderate levels of annoyance, 63 dB L_{Aeq,16h} in 2013 is significantly smaller than the 57 dB contour and is largely contained within the Airport site and dock area. Where it does extend beyond this area it is slightly to the south into Victoria Park and to the north where it does not reach the sewage works. There are no residential properties located within this contour. In the 2025 With SFS scenario this contour extends past Victoria Park to the A2, just crossing it to the south, and into the sewage works to the north, containing approximately 70 people located in Sydenham.

7.33 The contour representing high levels of annoyance, 69 dB L_{Aeq,16h}, in 2013 is smaller still and is completely contained within the airport site and therefore does not contain any residential properties. This is also the case in the future.

7.34 Figure 7.3 depicts the 55 dB L_{night} contours for the current and future scenarios. The difference between the contours is of a similar magnitude to the daytime.

7.35 The 55 dB L_{night} contours are similar in shape to the 63 dB L_{Aeq,16h} Contours, albeit slightly smaller. Similarly they contain no population in 2013 but in the 2025 With SFS scenario
extend just past the A2 to the south of the airport and will contain a small number of people there, approximately 40.

7.36 There will be a slight increase in exposure from the most common operations between 2013 and the 2025 With SFS scenario, however it should be noted that no individual operation occurs more than once per night, with the most frequent operation in any scenario being the A320 departure over city in both 2025 scenarios, with 358 annual movements.

7.37 An assessment has been made of the estimated number of awakenings caused by these aircraft, based on the assumption that aircraft depart at their scheduled time and runway usage is equal to the 5-year average between 2009 and 2013, that is 43% of the departures using runway 04..

7.38 The results of this assessment are that the scheduled traffic in 2013 is likely to cause approximately 291 awakenings per night, with this rising to 352 awakenings in the 2025 Fallback scenario.

7.39 Research in CAP 725 states that the average person experiences 18 awakenings per night due to all causes, meaning that the people exposed to the most frequent aircraft departure over the city in 2025 would collectively experience approximately 160,000 awakenings per night due to all causes, suggesting that the aircraft impact is low, causing an average of 0.18% of the awakenings in 2013, increasing to 0.22% in the 2025 Fallback scenario.

7.40 During the years of GB BCA operations a complaint system has been operated. All complaints are investigated and responses are made to the complainants. The complaint analysis is regularly advised to the Departments, and reported to the Airport Forum meetings. Table 7.1 summarises the complaints received since 2003. The number of complaints relating to air noise received by GB BCA has been consistently low.

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<td>107</td>
<td>58</td>
<td>135</td>
<td>41</td>
<td>85</td>
<td>87</td>
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<td>8</td>
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<td>17</td>
<td>5</td>
<td>14</td>
<td>7</td>
<td>17</td>
<td>8</td>
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Main Complaint Locations (>10 Complaints)

<table>
<thead>
<tr>
<th>Location</th>
<th>2003</th>
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<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Part(1)</th>
<th>2013</th>
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<tr>
<td>Kinnegar</td>
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<td>Sydenham</td>
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<td>Ravenhill</td>
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<tr>
<td>Stranmillis</td>
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<td></td>
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</tr>
</tbody>
</table>

Table 7.1 - Analysis of GB BCA Complaints 2003-2013
Potential Effects

7.41 The baseline conditions will alter in the future as GB BCA increases in activity, annual passengers increasing from just over 2.6 mppa now to 3.0 mppa in the 2025 Fallback scenario. There will be some change in aircraft mix between 2013 and 2025, e.g. Embraer 175 aircraft replacing the Bombardier Dash 8-Q400. This will have an impact on the airborne aircraft noise irrespective of whether the proposed modification is agreed. Therefore the key comparison is between the 2025 Fallback and 2025 without SFS scenarios.

7.42 If the proposed modification is agreed, the annual passengers are forecast to increase to over 3.7 mppa in 2025, with aircraft movements increasing by approximately 25% compared to the 2025 Fallback scenario.

7.43 Figure 7.2 depicts the 57 dB L_{Aeq,16h} contours for the 2013, 2025 Fallback and 2025 without SFS scenarios. The difference between the noise impacted areas is small.

7.44 The number of people exposed to at least 57 dB L_{Aeq,16h} is increased by about 3,500 due to the proposed modification. For those people the actual change in noise is less than 1 dB; such that it would be expected that the increase would not be noticeable. Table 7.2 below records the areas for the 57 dB L_{Aeq,16h} contours and the population contained within them, for the current and future scenarios.

<table>
<thead>
<tr>
<th>Year of Assessment</th>
<th>57 dB L_{Aeq,16h} Contour Area (km²)</th>
<th>Population(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>4.4</td>
<td>7,200</td>
</tr>
<tr>
<td>2025 With SFS</td>
<td>6.5</td>
<td>14,600</td>
</tr>
<tr>
<td>2025 No SFS</td>
<td>7.5</td>
<td>18,100</td>
</tr>
</tbody>
</table>

Table 7.2 – Daytime Contour Areas and Populations

(1) Values under 1,000 rounded to nearest 10, values over 1,000 rounded to nearest 100

7.45 The eight schools inside the 57 dB L_{Aeq,16h} contour in the 2025 With SFS scenario would increase to eleven if the proposed modification is agreed, however the increase in noise level would again be less than 1 dB, and so is not subjectively significant. There would be no schools within the 63 dB L_{Aeq,16h} contour. Table 7.3 below summarises the number of schools within each daytime noise contour, for the current and future scenarios.
<table>
<thead>
<tr>
<th>Contour Value</th>
<th>No. of Schools within Noise Contours</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2013 Baseline</td>
</tr>
<tr>
<td>54 dB $L_{Aeq,16h}$</td>
<td>11</td>
</tr>
<tr>
<td>57 dB $L_{Aeq,16h}$</td>
<td>3</td>
</tr>
<tr>
<td>60 dB $L_{Aeq,16h}$</td>
<td>0</td>
</tr>
<tr>
<td>63 dB $L_{Aeq,16h}$</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 7.3 – No. of Schools Within Daytime Noise Contours

7.46 Figure 7.3 depicts the 55 dB $L_{night}$ contours for 2013, 2025 Fallback and 2025 without SFS scenarios. The difference between the noise impacted areas is small. Table 7.4 below records the actual areas for the 55 dB $L_{night}$ contours, and the population contained within them.

<table>
<thead>
<tr>
<th>Year of Assessment</th>
<th>55 dB $L_{night}$ Contour Area (km$^2$)</th>
<th>Population$^{(1)}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>1.1</td>
<td>0</td>
</tr>
<tr>
<td>2025 With SFS</td>
<td>1.6</td>
<td>40</td>
</tr>
<tr>
<td>2025 No SFS</td>
<td>1.9</td>
<td>370</td>
</tr>
</tbody>
</table>

Table 7.4 – Night-time Contour Areas and Populations

$^{(1)}$ Values rounded to nearest 10

7.47 The 2025 without SFS scenario increases aircraft traffic by approximately 14% compared to the 2025 Fallback scenario, and increases the number of people exposed to at least 55 dB $L_{night}$ by about 330. For those people the actual change in noise is considered negligible, less than 1 dB; such that it would be expected that the increase would not be noticeable.

7.48 Table 7.5 below indicates the populations contained within the 90 dB(A) SEL footprints which have been produced for both the most common and loudest aircraft departing at night, both currently and in the future.
### Table 7.5 – Population Exposure from Night Operations (90 dB(A) SEL and above)

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Aircraft Type</th>
<th>Population Estimate Within 90 dB(A) SEL Footprint&lt;sup&gt;(1)&lt;/sup&gt;</th>
<th>Departure Over Lough</th>
<th>Departure Over City</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013 Baseline</td>
<td>Typical (A319)</td>
<td>40</td>
<td>7,800</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noisiest (E195)</td>
<td>1,600</td>
<td>14,600</td>
<td></td>
</tr>
<tr>
<td>2025 With SFS</td>
<td>Typical (A320)</td>
<td>40</td>
<td>9,100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noisiest (E195)</td>
<td>1,600</td>
<td>14,600</td>
<td></td>
</tr>
<tr>
<td>2025 No SFS</td>
<td>Typical (A320)</td>
<td>40</td>
<td>9,100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noisiest (A321)&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>520</td>
<td>18,600</td>
<td></td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Values under 1,000 rounded to nearest 10, values over 1,000 rounded to nearest 100

<sup>(2)</sup> While the Airbus A321 is the noisiest aircraft in the 2025 No SFS scenario, due to a differing contour shape there are fewer people exposed to 90 dB(A) SEL when departing over Lough

7.49 As shown in Table 7.5, the introduction of the Airbus A321 aircraft is forecast to operate between 06.30 and 07.00 and this is slightly louder than the current loudest ‘night’ time operator, the Embraer 195. However there are only forecast to be 140 departures by this aircraft over the city at night during the year.

7.50 An awakenings assessment shows that the expected number of nightly awakenings due to aircraft noise in 2025 will increase from 352 to 448 as a result of the proposed modification, increasing the percentage of total awakenings for people exposed to the most frequent aircraft departure over the city from 0.22% to 0.28%. This is still many fewer awakenings than people are likely to experience due to non-aircraft noise factors and represents a fraction of the awakenings that arise in any event due to all causes.

### Mitigation and Enhancement

7.51 GB BCA requires operators to follow various noise abatement procedures and obey local traffic regulations which they set out in the UK Aeronautical Information Package (AIP). These include:

- Every operator of aircraft using, or intending to use the Aerodrome shall ensure at all times that aircraft are operated in such a manner calculated to cause the least disturbance practicable to areas around the Airport.
- Belfast City Airport is only available to noise certified Chapter III aircraft except in emergency or a diversion.
- No ground running of engines is permitted between 2230-0600.
- Runway 22 is the preferred landing runway.
- Runway 04 is the preferred departure runway.
• Aircraft shall instigate their aircraft manufacturers Noise Abatement recommended procedures on departure and up to (FL 100), or take off with reduced thrust at 1,500-3,000 ft.

• On Runway 04, descent profiles shall be optimised to establish on the final approach track at 5 nm not below 1,500 ft.

• On Runway 04, aircraft making an approach shall follow a descent profile which will not result in it being at any time lower than the approach path which would be flown during an ILS GP approach.

• Departures Runway 04
  o Propeller Aircraft 13000 kg MTOW or less
    ▪ On passing 500 ft QNH, left turn TRACK 033°M and climb to altitude 1500 ft QNH before commencing turn.
  o Propeller Aircraft greater than 13000 kg MTOW
    ▪ On passing 500 ft QNH, left turn TRACK 033°M and climb to altitude 2000 ft QNH before commencing turn.
  o All Jet Aircraft
    ▪ On passing 500 ft QNH, left turn TRACK 033°M and climb to altitude 3000 ft QNH before turning.

• Departures Runway 22
  o Propeller Aircraft 13000 kg MTOW or less
    ▪ Climb straight ahead to altitude 1500 ft before turning.
  o Propeller Aircraft greater than 13000 kg MTOW
    ▪ Climb straight ahead to altitude 2000 ft before turning.
  o All Jet Aircraft
    ▪ Climb straight ahead to altitude 3000 ft before turning.

7.52 GB BCA operates these mitigation measures to ensure that air noise is adequately controlled, and these measures will be retained and implemented. Additional noise management measures include:

• Penalty system on flights outside scheduled operating hours
• The operation of a Noise and Track Monitoring System
• Monitoring and reporting on airline adherence to noise abatement procedures
• Maintaining a noise complaint management system.
• Commitment to a Sound Insulation Scheme using the eligibility criterion trigger level of 63 dB $L_{Aeq,16h}$ for air noise. (This is the eligibility criterion trigger level recommended by Government for major airports in the Aviation Policy Framework).

7.53 GB BCA keeps under review its noise control and mitigation measures, and further measures are contained in the Airport’s Noise Action Plan prepared pursuant to the Environmental Noise Directive and the Environmental Noise Regulations (Northern Ireland) 2006, the latest draft of which, dated October 2013, has been submitted for formal adoption by the Department of the Environment and the Environment Minister for Northern Ireland.

7.54 In addition to the measures in the Noise Action Plan, a limit on the area enclosed by the annually produced 57 dB $L_{Aeq,16h}$ contours is proposed as an integral part of the modification.

**Monitoring**

7.55 The Airport will continue to monitor both the tracks flown and the noise levels of aircraft using the Airport’s two fixed noise monitors. It will also report on complaints, movement numbers, and provide annual contours.

**Residual Effects**

7.56 Due to the overall limit on aircraft movements, there are no residual effects anticipated with regard to air noise over and above those identified above.

**Cumulative Effects**

7.57 None have been identified; and none are foreseeable with regard to aircraft noise.

**Statement of Significance**

7.58 In summary, the noise impact of the proposed modification has been assessed in terms of airborne aircraft noise, the noise of ground operations on the taxiways and aprons and the noise related to increased road traffic and construction.

7.59 For noise from aircraft ground operations and road access traffic, future impacts are predicted to be negligible. Preliminary consideration has also been given to any temporary noise effects related to construction activity associated with any of the potential physical aspects of the project. The limited construction work related to this proposal is not likely to cause any significant impacts.

7.60 The modification sought will not cause significant noise impact when considering the increase in airborne aircraft noise level; the changes in noise forecast for the 2025 without SFS as compared to the 2025 Fallback situation are small, so small as to be normally considered insignificant. However there is a slight increase in the number of people exposed to noise at night.
References

7.61 The following documents have been referred to as part of this assessment:


