EASTERLY ALTERNATION INFRASTRUCTURE PROJECT

Environmental Impact Assessment
Environmental Statement, Volume III
Appendix 7.6: Ground Noise

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1. Introduction

1.1 Overview

1.1.1 This appendix supports the aircraft 'ground' noise assessment which relates to the operational phase of the Proposed Development and is presented in **Chapter 7: Noise and Vibration, Volume II** of the Environmental Statement.

1.1.2 This appendix provides:

- An overview of aircraft 'ground' noise, study area and noise sensitive receptors (NSRs);
- Aircraft 'ground' noise modelling methodology, assumptions and model parameters;
- Design development and embedded mitigation;
- Full assessment results tables for:
  - Noise exposure (standard modal split); and
  - Noise level (sensitivity test for 100% easterly alternation).

1.1.3 The Proposed Development is described in detail in **Chapter 3: Description of the Proposed Development. Volume II** of the Environmental Statement and in summary comprises ground-based infrastructure (such as new taxiways) required to allow regular and scheduled departures on the northern runway in an easterly direction.

1.1.4 In respect of aircraft 'ground' noise, the most pertinent component of the Proposed Development is the change to ground-based aircraft operations associated with the change in easterly departures and arrivals. Importantly, the number of aircraft movements will be unchanged by the Proposed Development.

1.1.5 The assessment has therefore been conducted in relation to the following dominant and routine aircraft 'ground' noise sources:

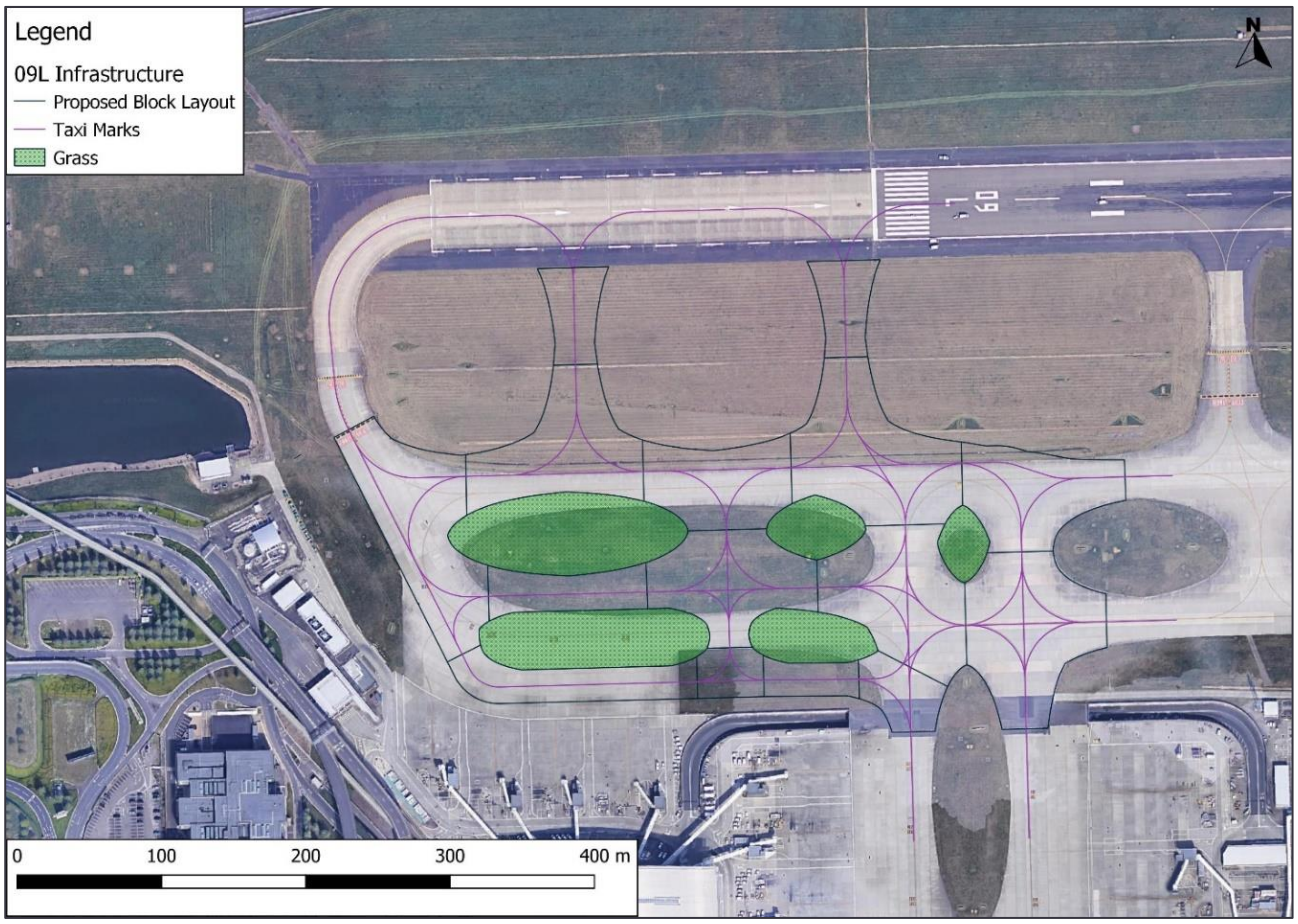
- Aircraft taxiing i.e. aircraft movements to and from stand and runway;
- Aircraft holding i.e. where aircraft are stationary on the airfield at designated hold points or intersections, and following pushback; and
- Aircraft emissions at stand i.e. noise emissions from the running of Auxiliary Power Units (APUs) on stand.

1.1.6 Noise sources such as engine ground running, landside road vehicles, airside vehicles and ground support equipment, and fixed plant will be unchanged and have not been included in the assessment of aircraft 'ground' noise.

1.1.7 Additionally, aircraft 'ground' noise does not encompass aircraft activity on the runways as part of aircraft in the landing and take-off (LTO) cycle. Noise associated with this activity is included in the assessment of aircraft 'air' noise in **Chapter 7: Noise and Vibration** and **Appendix 7.5: Air Noise, Volume III** of the Environmental Statement.

1.1.8 The primary focus of the Proposed Development is the provision of Runway Access Taxiways (RATs) at the western end of the northern runway (Runway 09L) to enable aircraft to access the runway safely and efficiently so to deliver Heathrow's aircraft schedule. These works are described as '09L airfield infrastructure' works and shown in **Graphic A7.6.1**.

Graphic A7.6.1 Proposed 09L airfield infrastructure



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1.2 Detailed proposals

1.2.1 In respect of aircraft 'ground' noise, during departures on Runway 09L, the Proposed Development would result in the introduction of scheduled aircraft taxiing and holding activity towards the northwest of the airfield. This is not currently the case during easterly operations within Heathrow's operational day (from 06:00hrs). Likewise, during departures on Runway 09R, this would result in a commensurate reduction in aircraft taxiing and holding activity towards the southwest of the airfield.

1.2.2 During departures on Runway 09L, taxiing activity towards the west of the airfield will be dominated by departing aircraft. These aircraft may necessarily have to queue, resulting in more noise generation than is the case for arriving aircraft, which would experience minimal queuing upon exiting the runway. Additionally, taxiing activity for departing aircraft is necessarily concentrated towards the very runway ends and therefore potentially closer to noise sensitive receptors beyond the airport boundary.

1.2.3 During arrivals on Runway 09R, a reduction in aircraft taxiing and holding activity towards the northeast of the airfield and an increase towards the southeast would be observed. As

taxiing activity towards the east of the airfield under this mode of operation is dominated by arriving aircraft, this would result in significantly less noise being produced than is the case for departing aircraft at the west of the airfield.

1.2.4 Consequently, only Longford Village towards the northwest of the airfield is at risk of experiencing an appreciable increase in aircraft ground noise. For this reason, mitigation is proposed in the form of a noise barrier between the 09L runway end and Longford Village. The proposed alignments and heights of the noise barrier are shown in **Graphic A7.6.2.**

Graphic A7.6.2 Noise barrier alignment

1.2.5 The aircraft 'ground' noise impact assessment has been carried out with regard to the bespoke methodologies developed having regards to Institute of Environmental Management and Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (2014). The adopted health and quality of life thresholds have been aligned with those adopted for the aircraft 'air' noise assessment, in addition to the magnitude of change scale and assessment framework for likely significant effects (see **Chapter 7: Noise and Vibration**).

1.2.6 The assessment has been informed by airfield measurements of aircraft ground activity and noise modelling. This has been selected in preference to conducting landside ground noise measurement surveys due to other ambient sound such as surface transportation (road traffic) affecting such measurements.

1.2.7 The ground noise assessment focusses on an assessment year of 2028 which represents the first full year of implementation.

1.2.8 The primary assessment considers the scenario with and without the Proposed Development, based on a 2028 forecast schedule for a '92-day summer' 'standard' modal split of 79%W/21%E in the daytime and 76%W/24%E during the night. Considering overall impacts in the context of aircraft 'air' noise exposure this approach is considered proportionate as a Primary Assessment, however sensitivity tests for 100% easterly scenarios are also provided for information and to provide context.

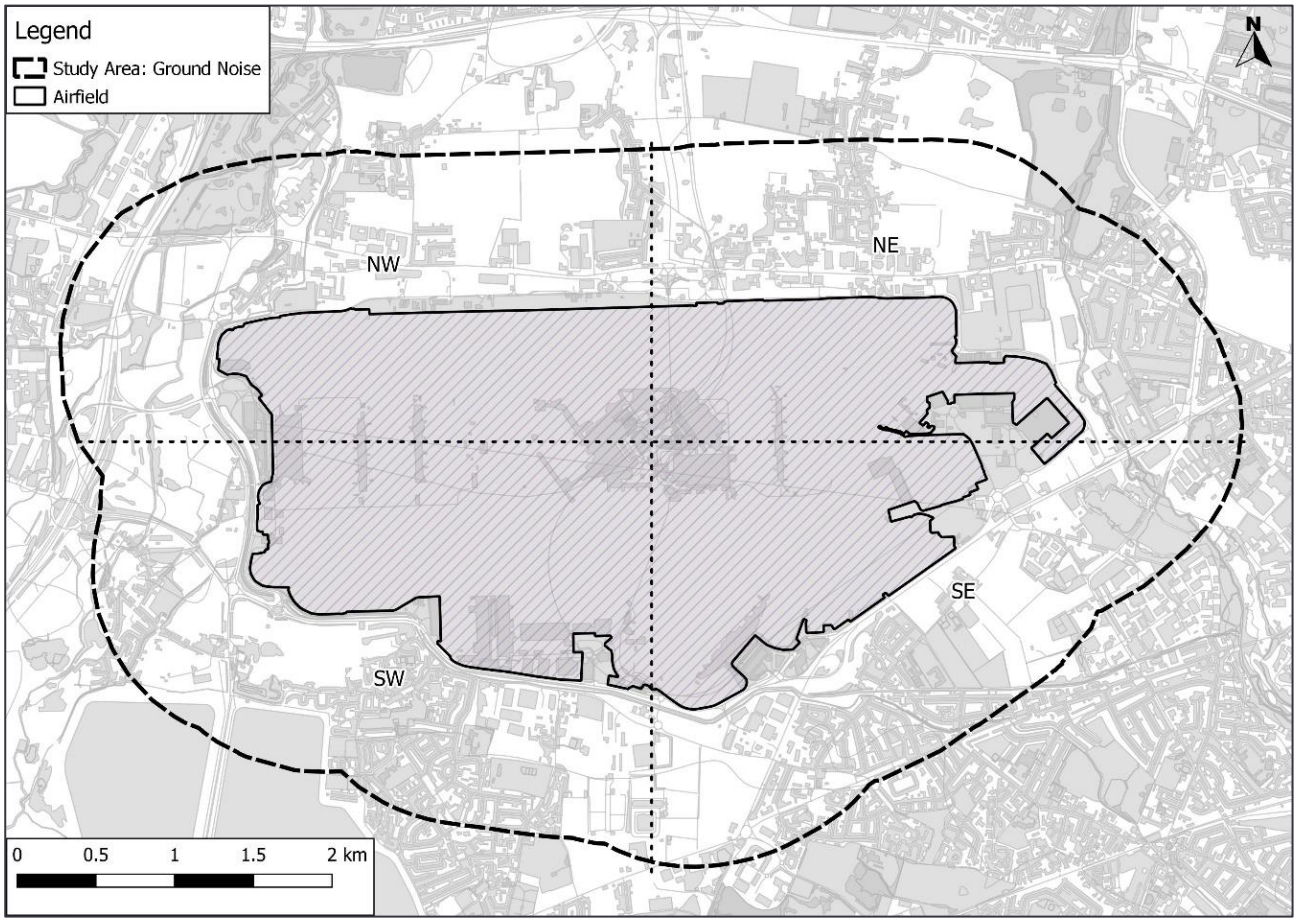
1.2.9 Throughout this document, 'without development' and 'with development' scenarios are described as 'WoD' and 'WD' respectively. Where the terminology 'noise exposure' is used this usually represents the long-term average noise level, whereas the phrase 'noise level' is commonly used to refer to short-term exposure, typically during a single mode of operation.

1.3 Study area

1.3.1 The aircraft 'ground' noise study area covers a distance of approximately 1 km from the airfield, however, in practice, those receptors most likely to see a significant change in noise exposure will be those which are closest to the runway ends.

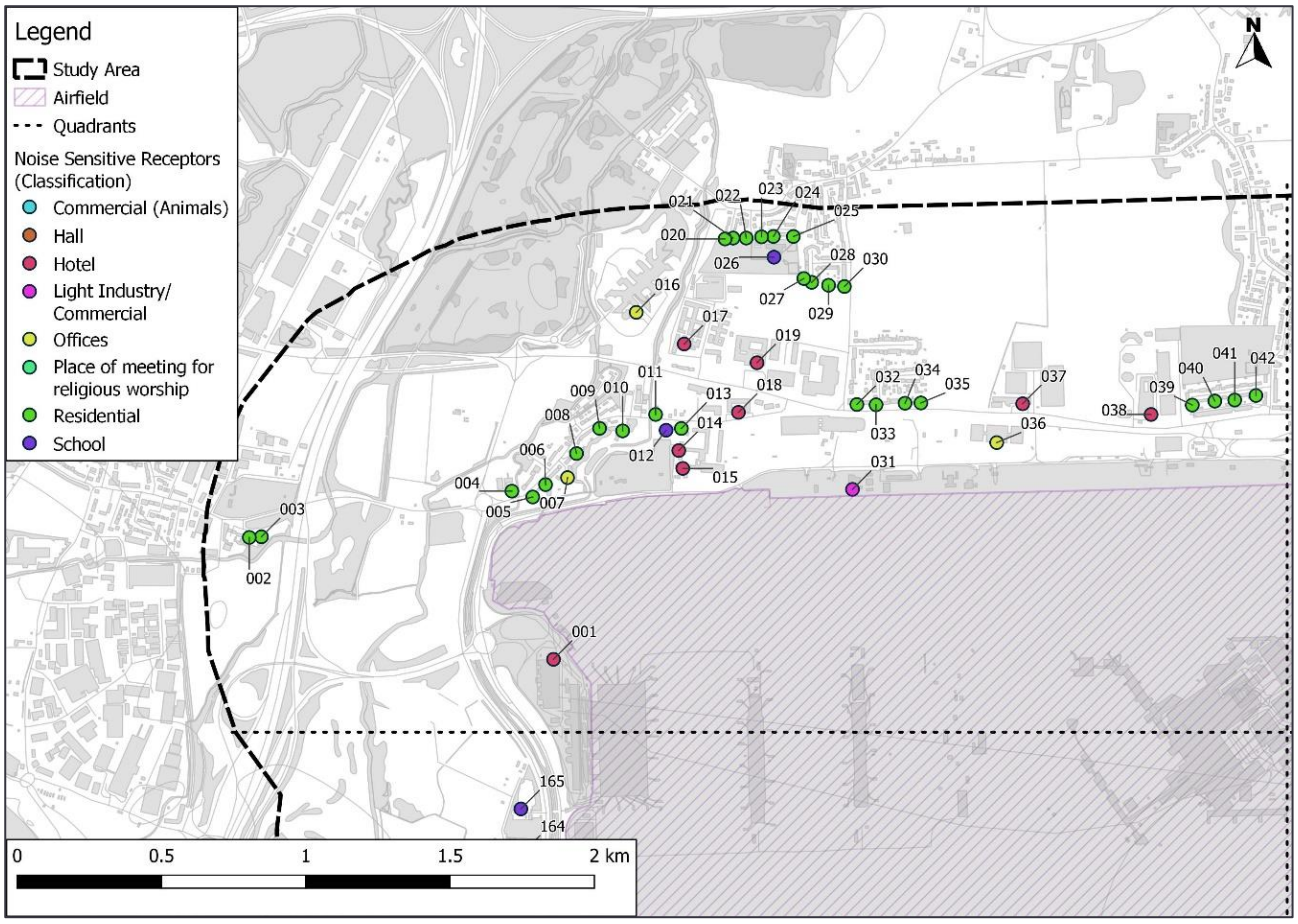
1.3.2 The study area for the aircraft 'ground' noise assessment is presented in **Graphic A7.6.3**. The study area has been divided into quadrants for reporting purposes.

Graphic A7.6.3: Aircraft 'ground' noise study area

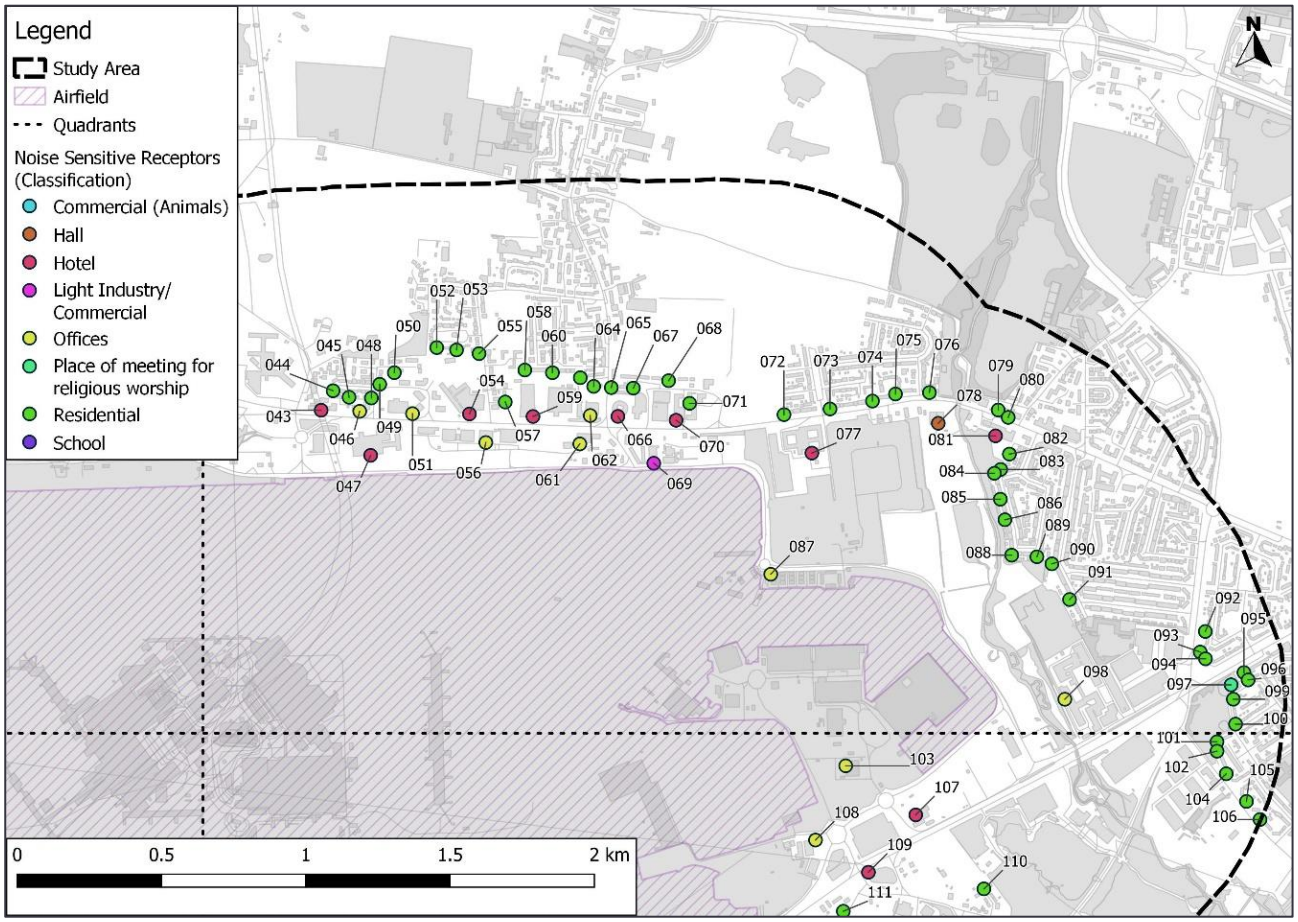


1.3.3 Specific NSR locations have been used in the aircraft 'ground' noise assessment, which are identified in **Graphic A7.6.4** to **Graphic A7.6.7** for each quadrant. All NSRs are residential except where reported in **Table A7.6.1**. In some cases, where a non-residential use is directly adjacent to a residential use, the receptor is classified as residential on the basis of having the same or higher sensitivity. The locations represent key receptor groups which are most exposed to ground noise.

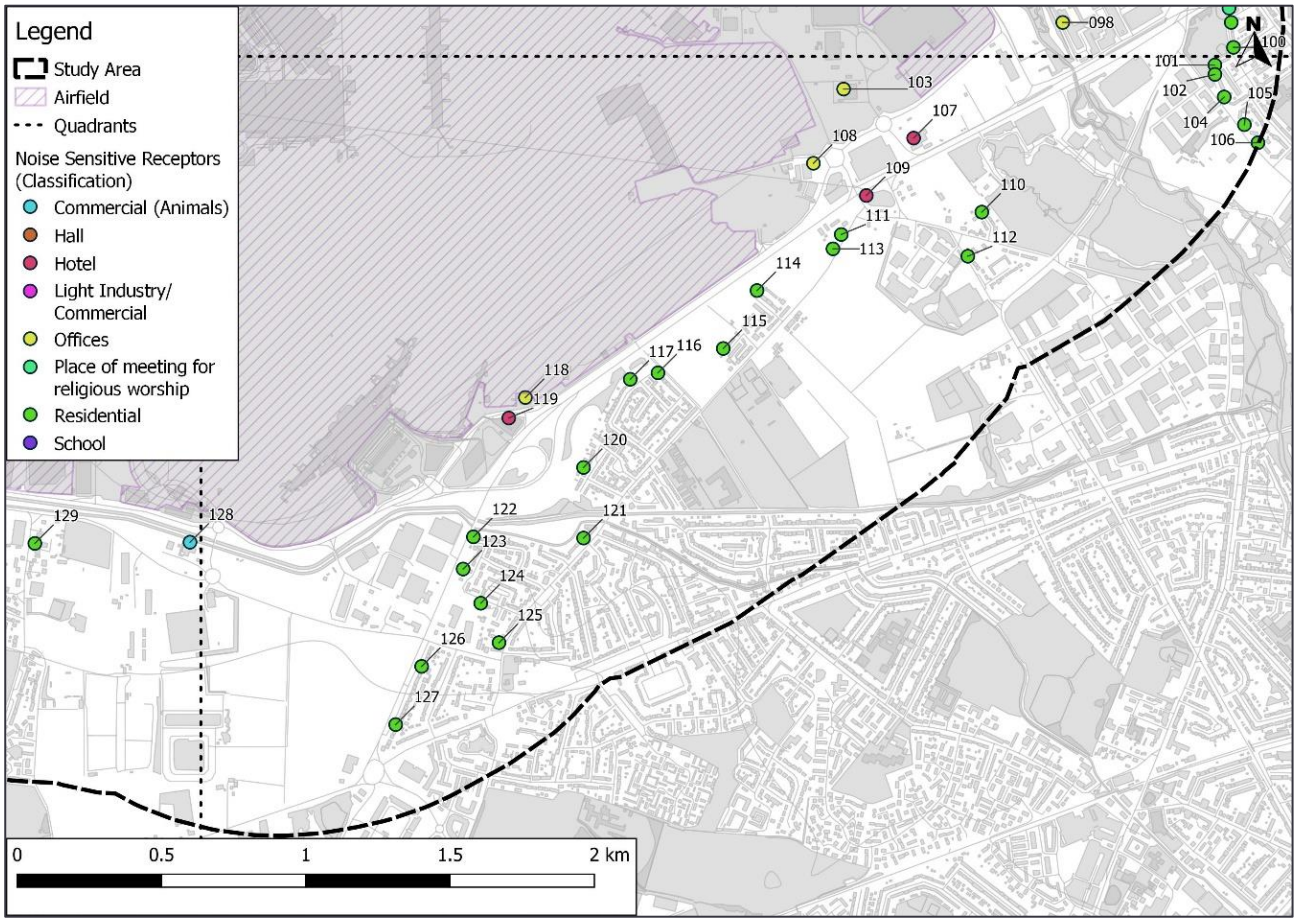
Graphic A7.6.4 Noise sensitive receptor locations (Northwest quadrant)



Graphic A7.6.5 Noise sensitive receptor locations (Northeast quadrant)



Graphic A7.6.6 Noise sensitive receptor locations (Southeast quadrant)



Graphic A7.6.7 Noise sensitive receptor locations (Southwest quadrant)

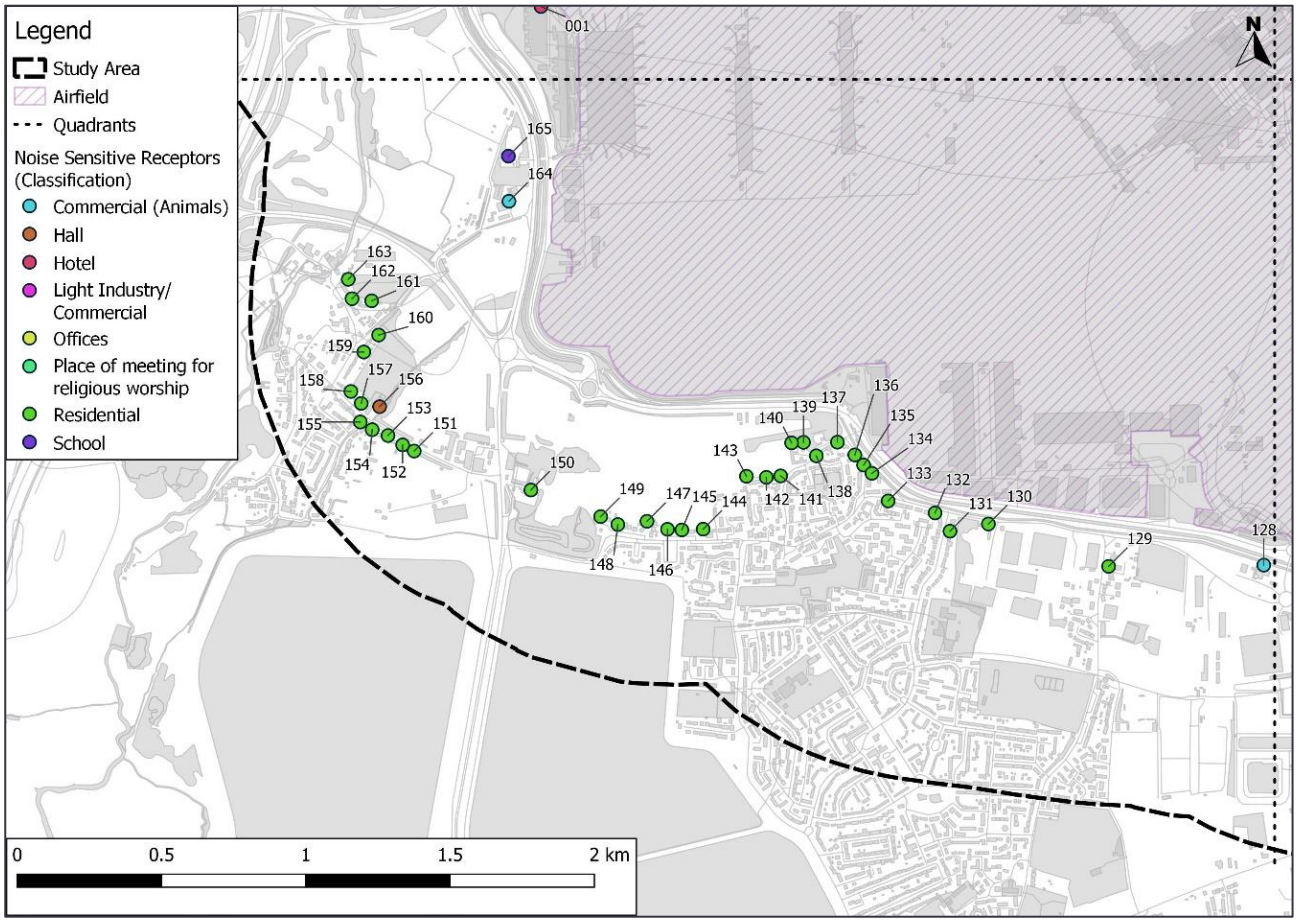


Table A7.6.1 Non-residential noise sensitive receptors

Receptor	Area	Primary Use	Notes
Northwest Quadrant			
1	Longford	Hotel	Sofitel
4	Longford	School	Heathrow Special Needs Centre (Equestrian)
7	Longford	Offices	
12	Longford	School	Littlebrook Nursery
14	Longford	Hotel	Thistle Hotel
15	Longford	Hotel	Thistle Hotel
16	Harmondsworth	Offices	
17	Harmondsworth	Hotel	Immigration Detention Centre
18	Longford	Hotel	Premier Inn
19	Harmondsworth	Hotel	Sheraton
26	Harmondsworth	School	Harmondsworth Primary School
31	North Longford	Light industry/ commercial	Car Hire
36	North Longford	Offices	The Compass Centre
37	North Longford	Hotel	Hyatt Place
38	Sipson	Hotel	Staybridge Suites/Holiday Inn
Northeast Quadrant			
43	Harlington	Hotel	Ibis Styles
46	Harlington	Offices	Axis House
47	Harlington	Hotel	Renaissance
51	Harlington	Offices	
54	Harlington	Hotel	Radison Blu
56	Harlington	Offices	
59	Harlington	Hotel	Marriott and Sheraton
61	Harlington	Offices	
62	Harlington	Offices	
66	Harlington	Hotel	Best Western and Marriott
69	Harlington	Light industry/ commercial	Heathrow Engineering and car hire
70	Harlington	Hotel	Ibis
77	Harlington	Hotel	Premier Inn
78	Harlington	Hall	Riverside Venue
81	Hounslow	Hotel	Moxy

Receptor	Area	Primary Use	Notes
87	Hounslow	Office	Eastern Business Park Epsom Square
97	Hounslow	Place of meeting for religious worship	Church of the Good Shepherd
98	Hounslow	Offices	
Southeast Quadrant			
103	Feltham	Offices	
107	Feltham	Hotel	Hilton
108	Feltham	Offices	
109	Feltham	Hotel	Atrium Hotel
118	Feltham	Offices	
119	Feltham	Hotel	Premier Inn, Hilton, Holiday Inn
Southwest Quadrant			
128	Stanwell	Commercial	Animal services/quarantine
156	Stanwell Moor	Hall	Village Hall
164	Stanwell Moor	Commercial	Animal services/quarantine
165	Stanwell Moor	School	Green Corridor at Main Road Nurseries

2. Ground noise modelling methodology

2.1 Noise Modelling Software

2.1.1 There are no current standards or guidance available specific to modelling and assessment of aircraft 'ground' noise. However, Annex II of the Environmental Noise Directive[1] states that the noise produced during aircraft ground operations may be considered transport infrastructure and that the attenuation due to atmospheric absorption may be predicted using ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation' (ISO 9613-2:1996)[2,3].

2.1.2 Aircraft 'ground' noise assessments prepared previously for Heathrow Airport have utilised the ISO9613-2:1996 method. It has also been used for the preparation of similar assessments for DCO applications currently under examination for Gatwick Airport and Luton Airport.

2.1.3 All aircraft 'ground' noise calculations prepared for the Project have therefore been carried out using the ISO 9613-2:1996 method as implemented in LimA® (2023) environmental noise modelling software, as developed by Stapelfeldt.

2.1.4 It should be noted that ISO9613-2:1996 states that the methodology provides nominal accuracy in most propagation conditions of ±3 dB as part of its prediction model[4]. The ISO9613-2:1996 methodology is valid for two cases:

- moderate downwind conditions of propagation; or
- where corrections are made accounting for meteorological conditions.

2.1.5 For the ground noise assessment, all calculations have assumed moderate downwind conditions in all directions. This is a conservative assumption.

2.1.6 **Section 2.2** describes the processes adopted in developing the inputs to the aircraft 'ground' noise model.

2.2 Model inputs

2.2.1 The following emissions have been considered as part of the aircraft 'ground' noise assessment:

[1] *Commission Directive (EU) 2015/996 of 19 May 2015 establishing common noise assessment methods according to Directive 2002/49/EC of the European Parliament and of the Council*. [online] Available at: https://eur-lex.europa.eu/eli/dir/2015/996/oj (Accessed 17 October 2024).

[2] International Organization for Standardization (1996). *ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.* Geneva: ISO.

[3] It is noted that a revision of ISO 9613-2 was published in January 2024. However, the Standard was only incorporated within the noise modelling software used for this project in June 2024. At the time of writing the 1996 version is still relevant because of its reference within the Environmental Noise Directive (END).

[4] ISO9613-2:1996, Table 5

- Aircraft taxiing i.e. aircraft movements to and from stand and runway;
- Aircraft holding i.e. where aircraft are stationary on the airfield at designated hold points or intersections, and following pushback; and
- Aircraft emissions at stand i.e. namely noise emissions from the running of Auxiliary Power Units (APUs) on stand.

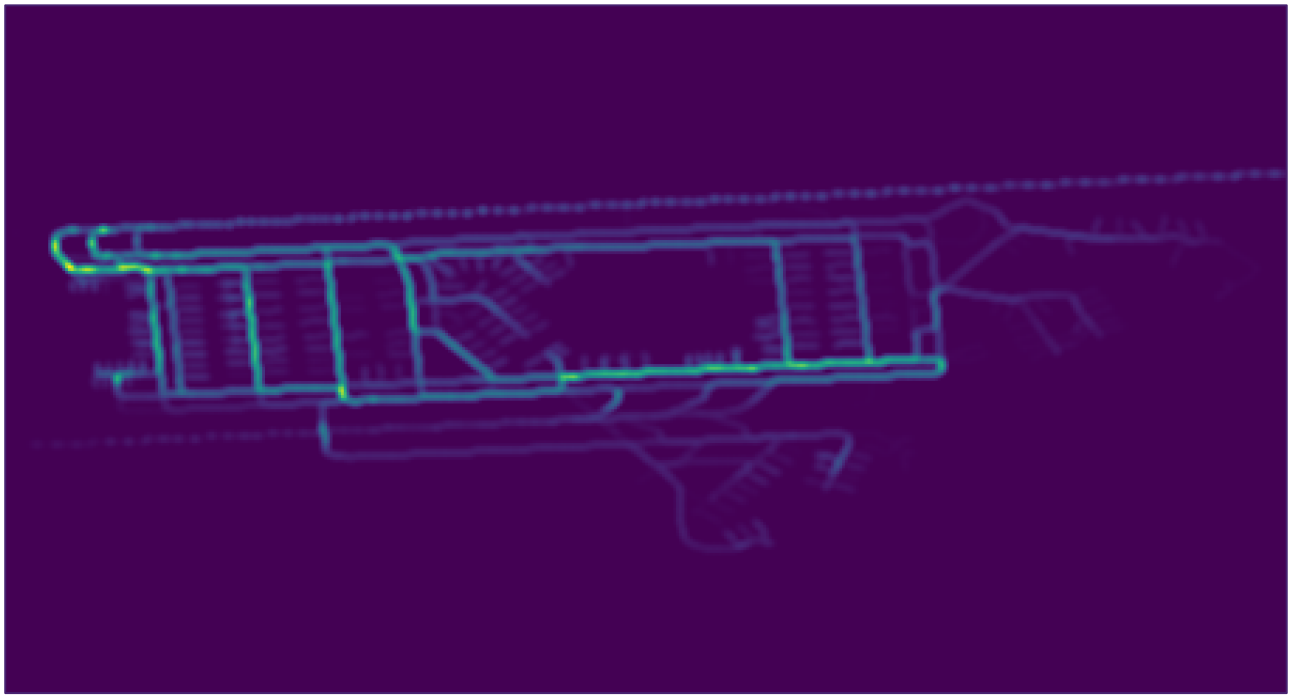
2.2.2 Due to the constrained nature of Heathrow's airfield and the dominance of the abovementioned activities on the ambient noise emissions, no other airfield noise sources have been included in the modelling. Exclusions include building services plant and maintenance activities, neither of which would change because of the Proposed Development. Another exclusion is aircraft engine ground running (EGR). The locations of ground running on the airfield and the location of ground running enclosures (GREs) will not change due to Proposed Development, nor will the number of runs.

2.2.3 The calculation of aircraft 'ground' noise emissions has been based on ground operations data simulated in CAST. CAST is simulation software which utilises the following information to simulate aircraft ground movements. CAST considers the following:

- Location and naming convention of taxiways;
- Average taxi speeds / engine on-times per metre length of taxiway;
- Movements by aircraft type on the taxiways;
- Location of aircraft holding and hold points and time in hold;
- Stand locations and names; and
- Stand turnaround times.

2.2.4 The CAST simulation outputs show the location of all aircraft on the airfield every 5 seconds. Such outputs can then be processed to allow sources of aircraft ground noise emissions to be calculated by on their occurrence and time spent across the airfield. An example of the CAST simulations for 09L departures / 09R arrivals (the mode of operation that Proposed Development specifically enables) is presented in **Graphic A7.6.8** in the form of a heatmap.

Graphic A7.6.8 Heatmap of CAST Simulations for 09L Departures and 09R Arrivals



Post processing of CAST simulation data

2.2.5 The 2028 schedule has been used to inform the CAST simulations. A summary of the number and fleet mix of the aircraft within the 2028 schedule is provided in **Appendix 7.5: Air Noise**. This is the same schedule utilised for the air quality assessment in **Chapter 6: Air Quality, Volume II** of the Environmental Statement.

2.2.6 The outputs from the CAST simulations have been processed within Safe Software's Feature Manipulation Engine (FME) software, to determine the number and speed of ground movements for each aircraft type and section of taxiway, for each hour of the day. The CAST outputs have also allowed for the calculation of the number and duration of aircraft on hold on the airfield. For completeness this analysis has included locations where aircraft are stationary following pushback from stands.

Aircraft 'ground' noise emission data

2.2.7 The processed CAST simulation data has been combined with noise emission datasets for aircraft ground activities, obtained from a combination of measurement surveys and literature review.

2.2.8 The emission data has comprised:

- Noise emissions levels of aircraft in the form of sound power levels (L_{WA});
- Directivity patterns relating to aircraft noise emissions; and
- Data describing the spectral frequency content of aircraft noise emissions.

Taxiing and hold emissions and directivity data

2.2.9 Heathrow operates a variety of aircraft ranging from smaller Code C jets (e.g. Airbus A320) to Code F jet aircraft (Airbus A380). Different aircraft types are of different sizes and have different noise emission characteristics on the ground.

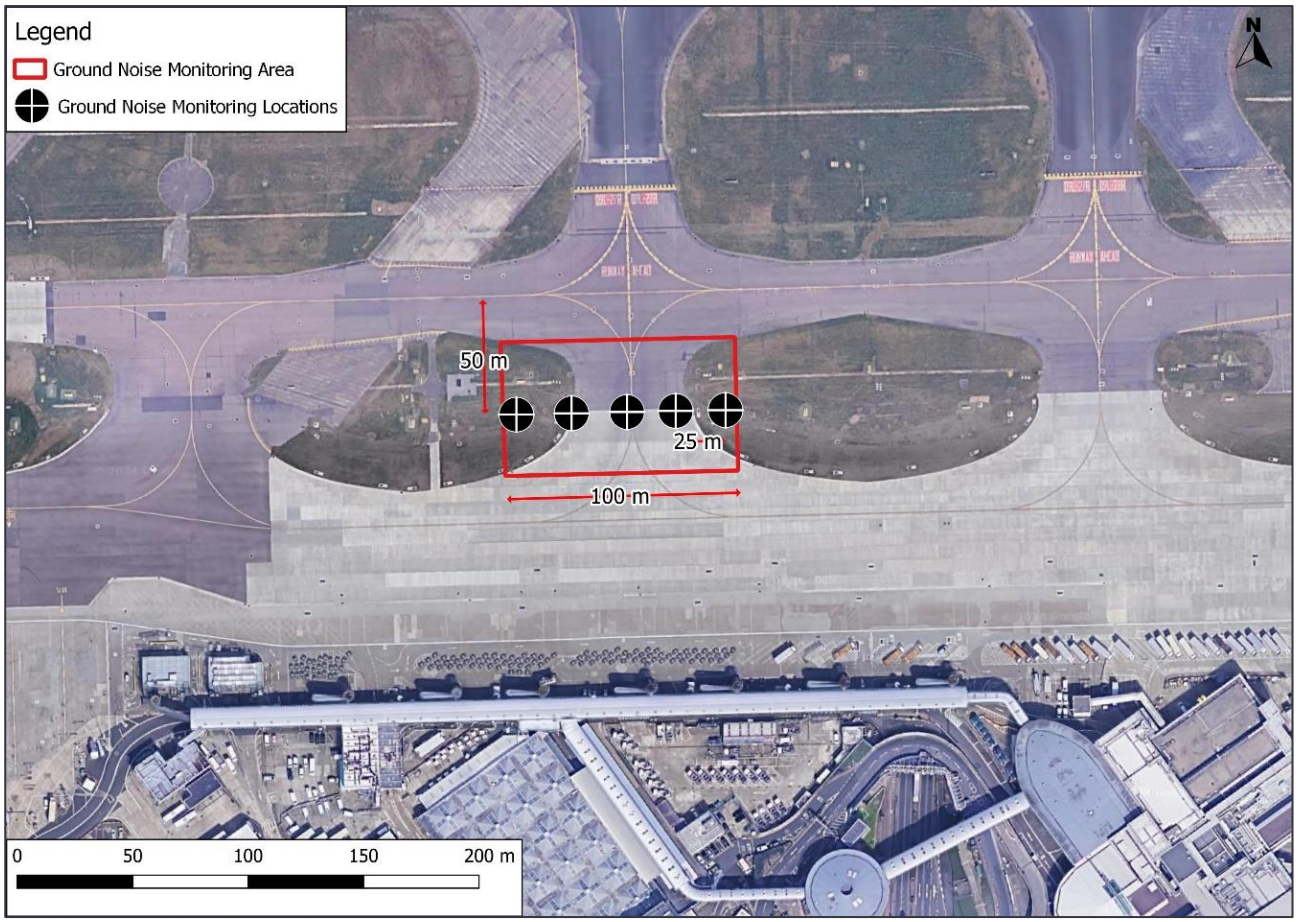
2.2.10 Due to the range of aircraft operating at Heathrow, sound source surveys were carried out to inform the sound power levels and directivity patterns of each aircraft type within the aircraft 'ground' noise model.

2.2.11 Measurements of aircraft passages were undertaken in the vicinity Link 12, off Taxiway Alpha, south of runway 09L-27R during measurement surveys in July and December 2017. The location of Link 12 and the associated measurement positions are shown in **Graphic A7.6.9** and **Graphic A7.6.10.**

Graphic A7.6.9 Measurement survey location in context of Heathrow Airport

Google Satellite ©2024 Airbus, Maxar Technologies, Map data ©2024

Graphic A7.6.10 Measurement survey location including monitoring locations



Google Satellite ©2024 Airbus, Maxar Technologies, Map data ©2024

2.2.12 The monitoring equipment (**Graphic A7.6.10**) consisted of five Sound Level Meters (SLMs) deployed 50m from the aircraft taxiway centreline. The SLMs were positioned at a total array length of 100m with the SLMs spaced 25m apart.

Graphic A7.6.11 Photograph of source noise measurement survey

2.2.13 Using the process described by Gibbs et al[5], the measurement results were assigned to an aircraft type based on observations and OPAS ground radar data, with sound power levels and directivity patterns prepared for each measured movement. These measurements were then averaged to provide overall A-weighted and octave band sound power level and directivity patterns.

2.2.14 The emissions derived using the methodologies set out above have been reviewed against other data sources. This includes ground noise measurement data reported at Madrid-Barajas Airport[6], and for the purposes of Gatwick North Runway project[7].

2.2.15 From this review the taxiing and hold noise emission values have been determined, as summarised in **Table A7.6.2** and **Table A7.6.3** The source of the adopted emission values is also reported. The allocation for each aircraft type against its ground noise emission values is also set out alongside the aircraft type reported in the 2028 schedule. The effective emission heights are based on the estimated height of the top edge of the aircraft engines. This has been determined from a review of aircraft schematic drawings.

[5] Gibbs. et al, (2022). *Measurement of acoustic source data of taxiing aircraft for noise modelling*. Internoise

[6] Asensio, C., Pavon, I, Ruiz, M. Pagan, R, & Recuero, M (2009). *Aircrafts' taxi noise. Sound power level and directivity frequency band results*. Applied Acoustics, 70(7), 986-1008.

[7] Gatwick Airport Limited (2023), *Gatwick Airport Northern Runway Project, Environmental Statement, Appendix 14.9.3: Ground Noise Modelling*. Gatwick Airport Limited.

Table A7.6.2 Taxiing and holding sound power levels (dB L_w) by aircraft type

Generic Type	Allocated Aircraft from Schedule	Effective Emission Height (m)	A	Octave Band Centre Frequency (Hz)							
				63	125	250	500	1k	2k	4k	8k
A320-232/214	A320	3.79	130	129	127	120	121	124	124	122	120
A318	A318	3.80	130	126	124	117	121	125	125	122	119
A321-231	A321	3.79	129	126	122	116	119	122	124	123	119
A380-800	A388	6.38	137	134	131	127	130	128	130	131	130
737-800	B738	3.00	131	130	128	122	122	126	125	123	122
747-436	B744	5.40	143	128	130	121	127	131	136	138	139
767-336	B772	4.60	128	128	125	124	121	120	122	121	118
777-300	B77W	5.00	131	126	126	130	123	121	124	124	121
787-800	B788	4.60	127	125	123	121	122	120	120	121	119
787-900	B789	4.62	126	126	125	117	119	119	118	118	120
A350-900	A359	4.53	135	132	129	125	128	126	128	129	128
A330-300	A333	4.28	133	131	128	124	122	125	128	127	125
ATR 72	DH8D	2.50	133	121	128	122	125	126	126	126	125
A320neo	A20N	3.79	127	121	121	117	126	118	118	120	116

Table A7.6.3 Taxiing and holding sound directivity patterns by aircraft type

Generic Type	Allocated Aircraft from Schedule	Angle (Degrees) and associated directivity pattern correction, dB																		
		0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°	140°	150°	160°	170°	180°
A320-232/214	A320	-2	-1	0	0	-1	-3	-6	-8	-10	-9	-8	-6	-4	-3	-5	-7	-7	-8	-8
A318	A318	-2	-1	0	0	-1	-3	-6	-8	-10	-9	-8	-6	-4	-3	-5	-7	-7	-8	-8
A321-231	A321	-2	-1	0	0	-1	-3	-6	-8	-10	-9	-8	-6	-4	-3	-5	-7	-7	-8	-8
A380-800	A388	-6	-5	-4	-5	-4	-4	-5	-8	-10	-10	-8	-4	-2	0	-2	-6	-9	-10	-10
737-800	B738	-2	-1	0	-1	-1	-3	-6	-8	-10	-10	-8	-5	-3	-3	-5	-8	-7	-8	-8
747-436	B744	-2	-1	0	-2	-1	0	-2	-4	-7	-7	-6	-3	0	0	-3	-9	-12	-13	-13
767-336	B772	-4	-3	-2	-2	0	0	-2	-5	-8	-8	-7	-5	-5	-6	-10	-11	-6	-7	-7
777-300	B77W	-2	-1	0	0	-1	-2	-4	-5	-5	-4	-3	-1	0	-1	-5	-11	-15	-16	-16
787-800	B788	-2	-1	0	0	-1	-2	-4	-5	-5	-4	-3	-1	0	-1	-5	-11	-15	-16	-16
787-900	B789	-2	-1	0	-1	-1	-3	-5	-8	-9	-9	-8	-6	-5	-5	-7	-8	-4	-5	-5
A350-900	A359	-2	-1	0	-1	-1	-3	-5	-8	-9	-9	-8	-6	-5	-5	-7	-8	-4	-5	-5
A330-300	A333	-2	-1	0	0	-2	-5	-8	-10	-10	-8	-5	-3	-2	-5	-9	-12	-8	-9	-9
ATR 72	DH8D	4	4	4	2	0	-1	-3	-4	-6	-7	-7	-7	-6	-4	-2	0	0	0	0
A320neo	A32N	-2	-1	0	0	-1	-3	-6	-8	-10	-9	-8	-6	-4	-3	-5	-7	-7	-8	-8

Auxiliary power unit (APU) emissions, directivity data and durations

2.2.16 Sound power levels and directivity data has been based on APU measurements taken at other UK airports. Based on this, a single assumed sound power level of 130 dB L_{WA} has been assigned for all aircraft APUs.

2.2.17 Running times for APUs on stand are derived from monitoring undertaken between 2013 and 2022 to ensure compliance with Heathrow's Operational Safety Instructions (OSIs). Times are given in **Table A7.6.4.**

Table A7.6.4 APU on-stand running times

Aircraft body class	Time on arrival (minutes)	Time on departure (minutes)
Narrow (737, A320)	10.1	20.6
Wide (757, 787, A330, A350)	12.2	26.9
A380	11.0	36.1

2.2.18 Using CAST simulations, the on-times for APUs at each stand have been determined.

Modelling process

2.2.19 All of the above data (CAST outputs, aircraft noise emissions and directivity) has been prepared for inclusion in the noise model using custom processing routines in FME. The on-time and movement corrected emissions have been imported into LimA® (2023) to undertake the calculations within the ground noise propagation model.

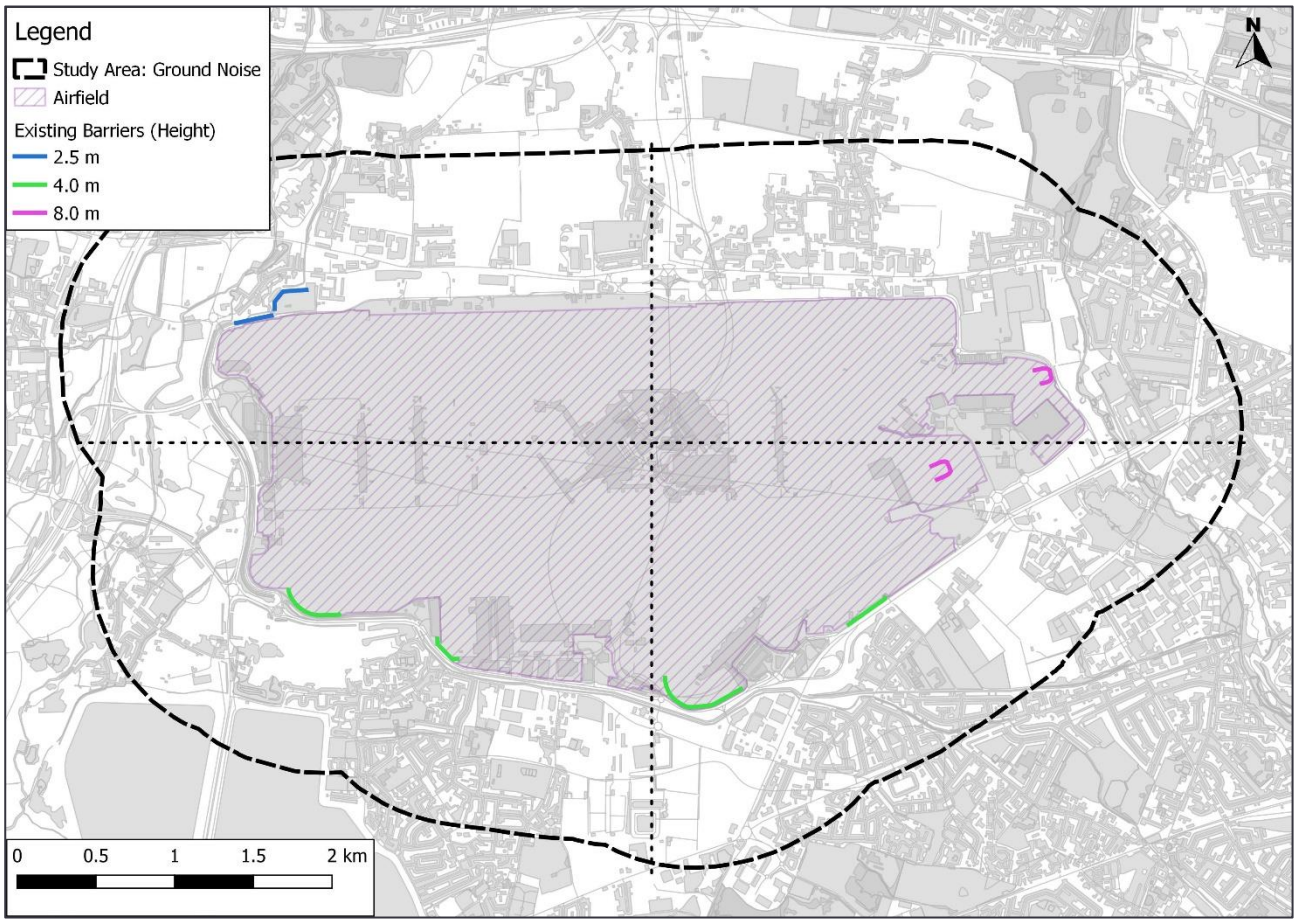
Noise model parameters

2.2.20 **Table A7.6.5** sets out the parameters used for the noise modelling of aircraft 'ground' noise.

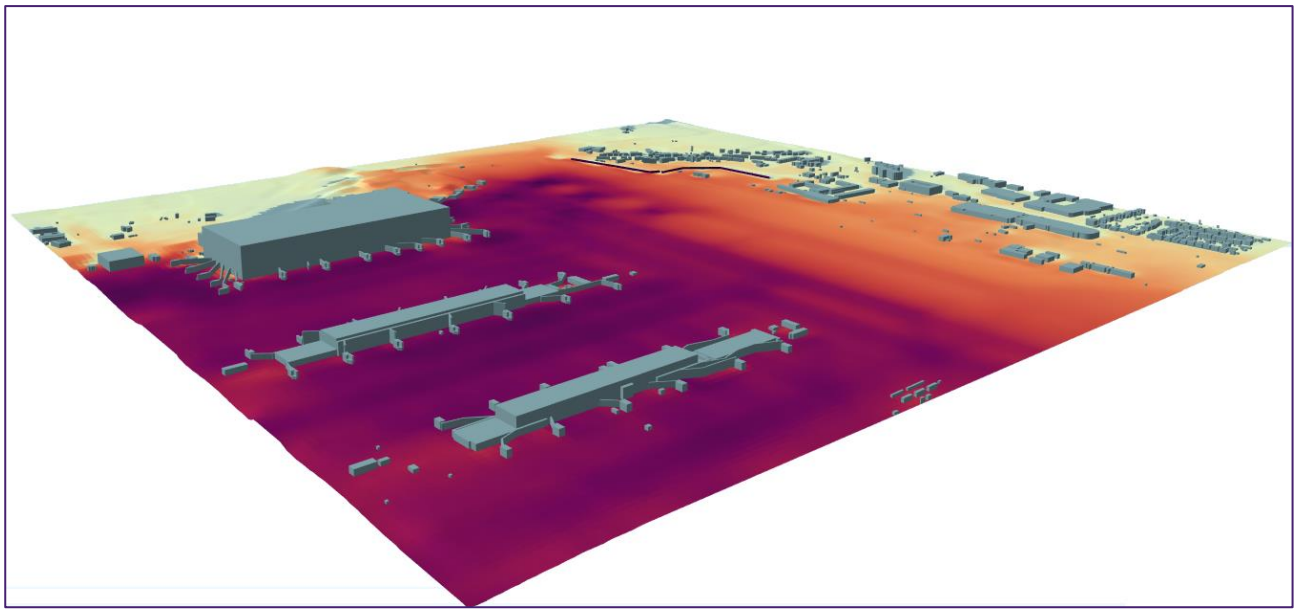
Table A7.6.5 Noise model parameters

Modelling Parameter	Input Parameter
Calculation Methodology	ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation'
Topography	Obtained from Environment Agency's National LiDAR Programme
Order of reflections	All buildings and obstacles have been assumed to be reflective
Ground Absorption, G	OS MasterMap topology objects have been reviewed and classified to provide ground absorption coefficients
Temperature / Humidity	10 degrees / 70% relative humidity
Adverse propagation conditions	Moderate Downwind
Heights of existing buildings and structures	Ordnance Survey (OS) features draped onto LiDAR
Massing and Noise Barriers (existing)	All buildings and structures both on and off the airfield captured in the OS MasterMap dataset have been included in the ground noise model. Additionally, existing noise barriers / structures have been included as presented in **Graphic A7.6.12**
Massing and Noise Barriers (proposed)	The noise barrier alignment has been taken from Jacobs drawing – TEMP-XX-GA-200-000001 v1.4 Proposed Noise Barrier General Arrangement dated 21 May 2024 as presented in **Graphic A7.6.13**
Sources Heights	All propagation sources are modeled based on specific aircraft types as described **Table A7.6.3**
Noise Sensitive Receptors	All receptor points have been digitized at 1 m from the relevant building façade of interest. Receptor points have automatically been generated at 1.5 metres above ground and every 2.5 metres above that. Receptors point results are presented for the top floor representing a very worst case, whereas noise mapping is presented at 4.0 metres above ground, representing a typical worst case.

Graphic A7.6.12 Existing noise barriers and structures



Graphic A7.6.13 Example 3D View of the Ground Noise Model



Noise model outputs

2.2.21 Noise modelling outputs have been produced as noise maps, noise difference maps (provided in **Volume IV** of the Environmental Statement) and at the individual receptors points described in **Section 1.3** (provided in tables in **Section 3**).

2.2.22 The calculated metrics for the ground noise assessment are presented in **Table A7.6.6.** Both metrics are considered 'primary metrics' in line Government aviation policy[8] and as advised by the Civil Aviation Authority[9]. These metrics are used to assess effects of aircraft noise on health and quality of life.

Table A7.6.6 Ground noise metrics

Metric	Description
$L_{Aeq,16hr}$	The L_{Aeq} for daytime noise measured between 7am-11pm measured over a 92-day summer period from 16 June to 15 September inclusive.
$L_{Aeq,8hr}$	The L_{Aeq} for nighttime noise measured between 11pm-7am measured over a 92-day summer period from 16 June to 15 September inclusive.

2.2.23 As described in **Appendix 7.5: Air Noise**, the '92-day summer' 'standard' modal split takes into account the proportion of the time that the airport operates in easterly and westerly directions. The current 'standard' modal split is 79%W/21%E in the daytime and 76%W/24%E during the night.

2.2.24 The aircraft 'ground' noise model outputs therefore consider a scenario with and without the Proposed Development, based on a 2028 forecast schedule for a '92-day summer' 'standard' modal split. Additionally, sensitivity tests for 100% easterly scenarios are provided for information and to provide context.

[8] Department for Transport and Civil Aviation Authority, (2017). *UK Air Navigation Guidance.* [online] Available at: https://www.gov.uk/government/publications/uk-air-navigation-guidance-2017 (Accessed 17 October 2024).

[9] Civil Aviation Authority, (2023). *CAP1616: The Process for Changing the Notified Airspace Design.* [online]. Available at: https://www.caa.co.uk/our-work/publications/documents/content/cap1616/ (Accessed 17 October 2024).

3. Ground Noise Figures and Tables

3.1.1 The noise modelling outputs have been produced as noise maps, noise difference maps, provided in **Volume IV** of the Environmental Statement in support of the ground noise assessment provided in **Chapter 7: Noise and Vibration**.

3.1.2 The Tables and accompanying Figures are summarised in **Table A7.6.7** below.

3.1.3 Throughout this document, 'without development' and 'with development' scenarios are described as 'WoD' and 'WD' respectively.

Table A7.6.7 Aircraft Ground Noise Tables and Figures

Content	Table Number	Figure Number
Noise Sensitive Receptors	-	Figure 7.6.1
Without alternation Daytime ($dBL_{Aeq,16h}$) – 79% westerly / 21% easterly	**Table A7.6.8**	Figure 7.6.2 WoD
With alternation Daytime ($dBL_{Aeq,16h}$) – 79% westerly / 21% easterly		Figure 7.6.2 WD
Without alternation Night-time ($dBL_{Aeq,8h}$) – 76% westerly / 24% easterly	**Table A7.6.9**	Figure 7.6.3 WoD
With alternation Night-time ($dBL_{Aeq,8h}$) – 76% westerly / 24% easterly		Figure 7.6.3 WD
Difference map Daytime ($dBL_{Aeq,16h}$) – 79% westerly / 21% easterly	**-**	Figure 7.6.4
Difference map Night-time ($dBL_{Aeq,8h}$) – 76% westerly / 24% easterly	**-**	Figure 7.6.5
Without alternation Daytime ($dBL_{Aeq,16h}$) – 0% westerly / 100% easterly	**Table A7.6.10**	Figure 7.6.6 WoD
With alternation Daytime ($dBL_{Aeq,16h}$) – 0% westerly / 100% easterly		Figure 7.6.6 WD
Without alternation Night-time ($dBL_{Aeq,8h}$) – 0% westerly / 100% easterly	**Table A7.6.11**	Figure 7.6.7 WoD
With alternation Night-time ($dBL_{Aeq,8h}$) – 0% westerly / 100% easterly		Figure 7.6.7 WD
Difference map Daytime ($dBL_{Aeq,16h}$) – 0% westerly / 100% easterly	-	Figure 7.6.8
Difference map Night-time ($dBL_{Aeq,8h}$) – 0% westerly / 100% easterly	-	Figure 7.6.9
Combined Aviation Noise Without Alternation Daytime (dBL_{DEN}) – 79% Westerly / 21% Easterly	-	Figure 7.6.10-WoD
Combined Aviation Noise Without Alternation Daytime (dBL_{DEN}) – 79% Westerly / 21% Easterly	-	Figure 7.6.10-WD

Content	Table Number	Figure Number
Combined Aviation Noise Without Alternation Night-time (dBLNight) – 79% Westerly / 21% Easterly	-	Figure 7.6.11-WoD
Combined Aviation Noise Without Alternation Night-time (dBLNight) – 79% Westerly / 21% Easterly	-	Figure 7.6.11-WD

3.2 Noise exposure

3.2.1 **Table A7.6.8** and **Table A7.6.9** present the predicted aircraft 'ground' noise levels at the façade of each noise sensitive receptor (NSR) in terms of noise exposure (standard modal split). Numbers shown in **bold** represent noise changes which are more than negligible (≥±1.0 dB). For residential receptors noise exposure above Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) have been highlighted green and amber respectively.

3.2.2 **Figure 7.6.2-WoD** (**Volume IV** of the Environmental Statement) presents the daytime $L_{Aeq,16hr}$ noise exposure contours for 2028 without Development (WoD) and **Figure 7.6.2-WD** (**Volume IV** of the Environmental Statement) presents the corresponding noise exposure contours with Development (WD). **Figure 7.6.4** (**Volume IV** of the Environmental Statement) presents the change in noise exposure for daytime.

3.2.3 **Figure 7.6.3-WoD** (**Volume IV** of the Environmental Statement) presents the night-time $L_{Aeq,8hr}$ noise exposure contours for 2028 without Development (WoD) and **Figure 7.6.3-WD** (**Volume IV** of the Environmental Statement) presents the corresponding noise exposure contours with Development (WD). **Figure 7.6.5** (**Volume IV** of the Environmental Statement) presents the change in noise exposure for night-time.

Table A7.6.8 Predicted daytime aircraft 'ground' noise exposure

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
Northwest Quadrant				
1	Non-residential	67.7	68.6	+0.9
2		31.6	37.5	**+5.9**
3		41.2	44.6	**+3.4**
4		55.7	56.6	+0.9
5		56.0	57.3	**+1.3**
6		54.0	55.5	**+1.5**
7	Non-residential	59.6	58.4	**-1.2**

[10] 'without development' and 'with development' scenarios are described as 'WoD' and 'WD' respectively.

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
8		58.8	57.9	-0.9
9		57.7	56.0	**-1.7**
10		58.8	56.7	**-2.1**
11		58.0	56.7	**-1.3**
12	Non-residential	60.4	58.9	**-1.5**
13		56.7	57.3	+0.6
14	Non-residential	54.5	57.6	**+3.1**
15	Non-residential	62.7	63.6	+0.9
16	Non-residential	53.5	54.2	+0.7
17	Non-residential	55.7	56.3	+0.6
18	Non-residential	61.0	61.3	+0.3
19	Non-residential	56.8	57.0	+0.2
20		45.9	47.0	**+1.1**
21		45.9	47.0	**+1.1**
22		46.2	47.2	**+1.0**
23		46.2	47.0	+0.8
24		45.1	45.9	+0.8
25		47.0	47.7	+0.7
26	Non-residential	48.2	48.9	+0.7
27		49.4	50.0	+0.6
28		50.3	50.8	+0.5
29		50.6	51.0	+0.4
30		51.0	51.4	+0.4
31	Non-residential	66.3	66.4	+0.1
32		57.7	57.9	+0.2
33		60.1	60.2	+0.1
34		61.1	61.2	+0.1
35		61.0	61.1	+0.1
36	Non-residential	63.9	63.9	0.0
37	Non-residential	61.5	61.5	0.0

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
38	Non-residential	62.9	62.8	-0.1
39		58.7	58.6	-0.1
40		50.7	50.5	-0.2
41		48.6	48.5	-0.1
42		58.6	58.2	-0.4
Northeast Quadrant				
43	Non-residential	61.6	61.2	-0.4
44		54.0	53.7	-0.3
45		55.7	55.3	-0.4
46	Non-residential	59.1	58.7	-0.4
47	Non-residential	64.9	64.4	-0.5
48		55.5	55.2	-0.3
49		55.0	54.6	-0.4
50		53.6	53.2	-0.4
51	Non-residential	61.3	60.9	-0.4
52		54.9	54.6	-0.3
53		53.7	53.6	-0.1
54	Non-residential	56.1	55.9	-0.2
55		55.0	54.8	-0.2
56	Non-residential	64.0	63.8	-0.2
57		58.6	58.5	-0.1
58		47.6	47.3	-0.3
59	Non-residential	63.1	63.0	-0.1
60		50.4	50.2	-0.2
61	Non-residential	65.3	65.2	-0.1
62	Non-residential	58.6	58.4	-0.2
63		52.0	51.9	-0.1
64		54.2	53.9	-0.3
65		54.5	54.4	-0.1
66	Non-residential	63.1	63.0	-0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
67		55.5	55.5	0.0
68		54.7	54.7	0.0
69	Non-residential	66.5	66.4	-0.1
70	Non-residential	60.4	60.4	0.0
71		45.6	45.6	0.0
72		58.5	58.4	-0.1
73		53.5	53.4	-0.1
74		50.7	50.7	0.0
75		51.4	51.4	0.0
76		50.3	50.3	0.0
77	Non-residential	56.1	56.1	0.0
78	Non-residential	50.9	50.9	0.0
79		47.2	47.3	+0.1
80		45.1	45.1	0.0
81	Non-residential	50.7	50.7	0.0
82		49.0	49.0	0.0
83		48.4	48.4	0.0
84		51.1	51.1	0.0
85		50.7	50.7	0.0
86		51.3	51.3	0.0
87	Non-residential	62.9	63.0	+0.1
88		52.1	52.1	0.0
89		51.1	51.1	0.0
90		48.9	48.9	0.0
91		49.4	49.4	0.0
92		43.7	43.7	0.0
93		40.1	40.0	-0.1
94		40.5	40.5	0.0
95		39.7	39.7	0.0
96		38.8	38.8	0.0

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
97	Non-residential	40.7	40.7	0.0
98	Non-residential	52.5	52.5	0.0
99		42.2	42.2	0.0
100		40.0	40.1	+0.1
Southeast Quadrant				
101		41.1	41.1	0.0
102		40.8	40.8	0.0
103	Non-residential	62.3	62.2	-0.1
104		38.7	38.7	0.0
105		38.0	38.1	+0.1
106		37.0	37.0	0.0
107	Non-residential	57.2	57.2	0.0
108	Non-residential	60.3	60.3	0.0
109	Non-residential	57.0	57.1	+0.1
110		47.1	47.1	0.0
111		51.2	51.3	+0.1
112		47.2	47.3	+0.1
113		56.2	56.3	+0.1
114		60.5	60.6	+0.1
115		60.6	60.7	+0.1
116		61.6	61.7	+0.1
117		59.2	59.3	+0.1
118	Non-residential	64.3	64.3	0.0
119	Non-residential	63.4	63.5	+0.1
120		56.8	56.9	+0.1
121		52.2	52.3	+0.1
122		53.8	53.9	+0.1
123		50.2	50.3	+0.1
124		50.3	50.3	0.0
125		47.5	47.5	0.0

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
126		50.6	50.6	0.0
127		48.8	48.8	0.0
Southwest Quadrant				
128	Non-residential	60.1	60.0	-0.1
129		48.3	48.4	+0.1
130		53.5	53.3	-0.2
131		52.7	52.5	-0.2
132		55.7	55.4	-0.3
133		56.8	56.6	-0.2
134		59.5	59.6	+0.1
135		59.0	59.0	0.0
136		58.8	58.9	+0.1
137		61.3	60.7	-0.6
138		61.4	60.8	-0.6
139		60.8	60.3	-0.5
140		61.8	61.1	-0.7
141		59.0	58.4	-0.6
142		59.1	58.5	-0.6
143		58.9	58.5	-0.4
144		55.0	54.3	-0.7
145		55.2	54.5	-0.7
146		53.6	53.1	-0.5
147		54.2	53.4	-0.8
148		53.0	52.0	**-1.0**
149		53.1	52.2	-0.9
150		54.1	53.2	-0.9
151		49.7	49.0	-0.7
152		50.1	49.2	-0.9
153		50.1	49.2	-0.9
154		49.5	48.5	**-1.0**

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
155		48.3	47.3	**-1.0**
156	Non-residential	50.3	49.4	-0.9
157		50.0	49.2	-0.8
158		49.4	48.6	-0.8
159		50.2	49.6	-0.6
160		50.9	50.2	-0.7
161		51.2	50.7	-0.5
162		50.2	49.9	-0.3
163		50.8	50.2	-0.6
164	Non-residential	61.0	61.0	0.0
165	Non-residential	57.9	57.7	-0.2
Key				
Colour-Coding	**Residential Adverse Effect Level**			
	<LOAEL			
	>=LOAEL			
	>=SOAEL			

Table A7.6.9 Predicted night-time aircraft 'ground' noise exposure

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
Northwest Quadrant				
1	Non-residential	66.3	66.8	+0.5
2		28.7	32.6	**+3.9**
3		38.6	41.0	**+2.4**
4		53.0	52.5	-0.5
5		53.1	53.1	0.0
6		51.0	51.2	+0.2
7	Non-residential	56.5	54.2	**-2.3**
8		55.8	53.7	**-2.1**
9		54.8	52.2	**-2.6**
10		56.1	53.1	**-3.0**
11		55.3	53.3	**-2.0**
12	Non-residential	57.4	55.5	**-1.9**
13		53.7	53.8	+0.1
14	Non-residential	51.0	52.5	**+1.5**
15	Non-residential	59.9	60.2	+0.3
16	Non-residential	50.7	50.7	0.0
17	Non-residential	53.0	53.1	+0.1
18	Non-residential	58.3	58.3	0.0
19	Non-residential	54.2	54.2	0.0
20		43.6	43.9	+0.3
21		43.6	43.9	+0.3
22		44.0	44.3	+0.3
23		44.0	44.2	+0.2
24		43.0	43.1	+0.1
25		45.1	45.2	+0.1
26	Non-residential	46.0	46.1	+0.1
27		47.2	47.2	0.0
28		48.0	48.1	+0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
29		48.3	48.3	0.0
30		48.7	48.6	-0.1
31	Non-residential	63.9	63.9	0.0
32		54.9	54.8	-0.1
33		57.7	57.6	-0.1
34		58.4	58.4	0.0
35		58.5	58.4	-0.1
36	Non-residential	61.0	60.9	-0.1
37	Non-residential	58.5	58.3	-0.2
38	Non-residential	59.9	59.6	-0.3
39		55.7	55.5	-0.2
40		48.3	48.0	-0.3
41		46.0	45.7	-0.3
42		55.2	54.8	-0.4
Northeast Quadrant				
43	Non-residential	58.3	57.7	-0.6
44		51.0	50.5	-0.5
45		51.8	51.2	-0.6
46	Non-residential	55.7	55.1	-0.6
47	Non-residential	61.6	60.8	-0.8
48		52.1	51.7	-0.4
49		51.5	51.0	-0.5
50		49.9	49.4	-0.5
51	Non-residential	57.7	57.2	-0.5
52		51.3	50.8	-0.5
53		48.9	48.6	-0.3
54	Non-residential	51.8	51.4	-0.4
55		50.4	50.0	-0.4
56	Non-residential	59.8	59.3	-0.5
57		52.0	51.8	-0.2

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
58		43.3	42.9	-0.4
59	Non-residential	57.7	57.4	-0.3
60		46.6	46.2	-0.4
61	Non-residential	59.5	59.2	-0.3
62	Non-residential	54.2	53.8	-0.4
63		46.3	45.9	-0.4
64		50.3	49.8	-0.5
65		48.9	48.6	-0.3
66	Non-residential	56.6	56.4	-0.2
67		49.7	49.3	-0.4
68		48.0	47.7	-0.3
69	Non-residential	59.6	59.2	-0.4
70	Non-residential	53.4	53.1	-0.3
71		39.3	39.0	-0.3
72		52.0	51.7	-0.3
73		47.3	47.0	-0.3
74		44.4	44.4	0.0
75		44.7	44.5	-0.2
76		43.2	43.1	-0.1
77	Non-residential	50.4	50.3	-0.1
78	Non-residential	44.4	44.3	-0.1
79		39.0	38.9	-0.1
80		36.2	36.0	-0.2
81	Non-residential	43.7	43.6	-0.1
82		42.5	42.4	-0.1
83		40.4	40.1	-0.3
84		43.8	43.6	-0.2
85		44.0	44.0	0.0
86		44.6	44.6	0.0
87	Non-residential	58.2	58.3	+0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
88		45.4	45.4	0.0
89		44.5	44.5	0.0
90		42.8	42.7	-0.1
91		42.7	42.7	0.0
92		37.7	37.8	+0.1
93		34.5	34.6	+0.1
94		34.5	34.5	0.0
95		32.2	32.3	+0.1
96		31.1	31.2	+0.1
97	Non-residential	33.9	34.0	+0.1
98	Non-residential	43.4	43.5	+0.1
99		35.4	35.5	+0.1
100		31.9	32.0	+0.1
Southeast Quadrant				
101		33.8	33.8	0.0
102		33.4	33.5	+0.1
103	Non-residential	51.5	51.4	-0.1
104		29.9	30.0	+0.1
105		28.8	28.9	+0.1
106		27.5	27.6	+0.1
107	Non-residential	47.6	47.6	0.0
108	Non-residential	51.4	51.4	0.0
109	Non-residential	49.5	49.7	+0.2
110		36.6	36.8	+0.2
111		45.0	45.2	+0.2
112		38.4	38.6	+0.2
113		49.3	49.6	+0.3
114		54.5	54.8	+0.3
115		54.9	55.0	+0.1
116		56.1	56.1	0.0

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
117		53.9	54.0	+0.1
118	Non-residential	58.0	58.2	+0.2
119	Non-residential	57.6	57.8	+0.2
120		51.5	51.7	+0.2
121		47.0	47.2	+0.2
122		49.0	49.1	+0.1
123		45.2	45.3	+0.1
124		45.6	45.7	+0.1
125		42.1	42.2	+0.1
126		46.2	46.3	+0.1
127		44.8	44.8	0.0
Southwest Quadrant				
128	Non-residential	56.2	56.3	+0.1
129		45.0	45.1	+0.1
130		50.4	50.4	0.0
131		49.8	49.8	0.0
132		52.7	52.7	0.0
133		53.0	53.0	0.0
134		54.8	54.9	+0.1
135		55.2	55.2	0.0
136		55.9	56.0	+0.1
137		57.8	57.7	-0.1
138		58.4	58.3	-0.1
139		57.6	57.5	-0.1
140		58.4	58.3	-0.1
141		55.9	55.8	-0.1
142		55.9	55.8	-0.1
143		56.0	55.9	-0.1
144		51.9	51.7	-0.2
145		52.2	52.0	-0.2

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
146		50.8	50.8	0.0
147		51.0	50.8	-0.2
148		49.5	49.3	-0.2
149		49.5	49.3	-0.2
150		50.4	50.0	-0.4
151		46.1	45.8	-0.3
152		46.9	46.6	-0.3
153		46.8	46.5	-0.3
154		46.1	45.8	-0.3
155		44.8	44.4	-0.4
156	Non-residential	47.0	46.7	-0.3
157		46.8	46.5	-0.3
158		46.1	45.8	-0.3
159		47.2	47.0	-0.2
160		47.8	47.5	-0.3
161		48.0	47.9	-0.1
162		47.1	47.0	-0.1
163		47.0	46.8	-0.2
164	Non-residential	56.9	57.0	+0.1
165	Non-residential	56.0	56.0	0.0
Key				
Colour-Coding	**Residential Adverse Effect Level**			
	<LOAEL			
	>=LOAEL			
	>=SOAEL			

3.3 Noise level

3.3.1 **Table A7.6.10** and **Table A7.6.11** present the predicted aircraft 'ground' noise levels at the façade of each noise sensitive receptor (NSR) in terms of noise level (100% easterly operations). Numbers shown in **bold** represent noise changes which are more than negligible (≥±1.0 dB). For residential receptors noise levels above Lowest Observed Adverse Effect Level (LOAEL) and Significant Observed Adverse Effect Level (SOAEL) have been highlighted green and amber respectively.

3.3.2 **Figure 7.6.6-WoD** (**Volume IV** of the Environmental Statement) presents the daytime $L_{Aeq,16hr}$ noise level contours for 2028 without Development (WoD) and **Figure 7.6.6-WD** (**Volume IV** of the Environmental Statement) presents the corresponding noise level contours with Development (WD). **Figure 7.6.8** (**Volume IV** of the Environmental Statement) presents the change in noise level for daytime.

3.3.3 **Figure 7.6.7-WoD** (**Volume IV** of the Environmental Statement) presents the night-time $L_{Aeq,8hr}$ noise level contours for 2028 without Development (WoD) and **Figure 7.6.7-WD** (**Volume IV** of the Environmental Statement) presents the corresponding noise level contours with Development (WD). **Figure 7.6.9** (**Volume IV** of the Environmental Statement) presents the change in noise level for night-time.

Table A7.6.10 Predicted daytime aircraft 'ground' noise levels (100% easterly operations)

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
Northwest Quadrant				
1	Non-residential	67.7	71.0	**+3.3**
2		31.5	43.3	**+11.8**
3		41.7	49.5	**+7.8**
4		55.8	60.9	**+5.1**
5		56.1	61.7	**+5.6**
6		53.9	59.7	**+5.8**
7	Non-residential	59.6	62.2	**+2.6**
8		58.9	61.7	**+2.8**
9		57.5	59.0	**+1.5**
10		58.7	59.6	+0.9
11		57.8	58.9	**+1.1**
12	Non-residential	60.3	61.2	+0.9
13		56.5	60.0	**+3.5**
14	Non-residential	54.7	62.3	**+7.6**

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
15	Non-residential	62.4	65.7	**+3.3**
16	Non-residential	53.2	56.2	**+3.0**
17	Non-residential	55.3	57.9	**+2.6**
18	Non-residential	60.4	61.9	**+1.5**
19	Non-residential	56.4	57.6	**+1.2**
20		44.9	49.2	**+4.3**
21		44.8	49.3	**+4.5**
22		45.3	49.3	**+4.0**
23		45.4	48.6	**+3.2**
24		44.6	47.5	**+2.9**
25		46.1	49.3	**+3.2**
26	Non-residential	47.4	50.4	**+3.0**
27		48.9	51.3	**+2.4**
28		49.8	51.9	**+2.1**
29		50.2	52.0	**+1.8**
30		50.7	52.2	**+1.5**
31	Non-residential	65.3	65.8	+0.5
32		57.8	58.3	+0.5
33		60.2	60.5	+0.3
34		60.7	61.2	+0.5
35		60.6	61.0	+0.4
36	Non-residential	63.8	63.7	-0.1
37	Non-residential	61.8	61.5	-0.3
38	Non-residential	63.7	62.9	-0.8
39		59.0	58.6	-0.4
40		51.3	50.5	-0.8
41		49.3	48.5	-0.8
42		59.9	58.7	**-1.2**
Northeast Quadrant				
43	Non-residential	63.5	62.0	**-1.5**

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
44		55.6	54.3	**-1.3**
45		57.3	55.8	**-1.5**
46	Non-residential	60.8	59.3	**-1.5**
47	Non-residential	67.2	65.6	**-1.6**
48		56.4	55.4	**-1.0**
49		56.3	55.0	**-1.3**
50		54.9	53.5	**-1.4**
51	Non-residential	62.6	61.3	**-1.3**
52		55.8	54.5	**-1.3**
53		52.7	51.7	**-1.0**
54	Non-residential	56.2	55.3	-0.9
55		54.5	53.5	**-1.0**
56	Non-residential	64.4	63.3	**-1.1**
57		55.2	54.6	-0.6
58		48.5	47.5	**-1.0**
59	Non-residential	61.5	60.7	-0.8
60		51.2	50.5	-0.7
61	Non-residential	63.1	62.4	-0.7
62	Non-residential	59.1	58.1	**-1.0**
63		50.4	49.9	-0.5
64		55.6	54.5	**-1.1**
65		52.1	51.5	-0.6
66	Non-residential	60.3	59.8	-0.5
67		52.7	52.1	-0.6
68		52.0	51.7	-0.3
69	Non-residential	63.6	63.0	-0.6
70	Non-residential	57.5	57.0	-0.5
71		43.6	43.3	-0.3
72		56.5	55.8	-0.7
73		52.0	51.6	-0.4

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
74		49.5	49.6	+0.1
75		49.7	49.6	-0.1
76		48.0	48.0	0.0
77	Non-residential	54.7	54.6	-0.1
78	Non-residential	49.5	49.6	+0.1
79		44.7	44.8	+0.1
80		41.6	41.6	0.0
81	Non-residential	49.2	49.2	0.0
82		47.8	47.9	+0.1
83		45.4	45.3	-0.1
84		49.2	49.3	+0.1
85		49.8	49.8	0.0
86		50.4	50.5	+0.1
87	Non-residential	61.9	62.5	+0.6
88		51.3	51.3	0.0
89		50.5	50.6	+0.1
90		48.4	48.5	+0.1
91		48.8	48.9	+0.1
92		43.4	43.4	0.0
93		40.0	39.9	-0.1
94		40.4	40.4	0.0
95		39.3	39.5	+0.2
96		38.5	38.6	+0.1
97	Non-residential	40.3	40.4	+0.1
98	Non-residential	52.0	52.2	+0.2
99		41.7	41.9	+0.2
100		39.7	39.8	+0.1
Southeast Quadrant				
101		40.8	40.8	0.0
102		40.4	40.5	+0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
103	Non-residential	61.9	61.6	-0.3
104		38.0	38.2	+0.2
105		37.4	37.5	+0.1
106		36.4	36.5	+0.1
107	Non-residential	56.1	56.2	+0.1
108	Non-residential	59.8	59.9	+0.1
109	Non-residential	55.5	55.9	+0.4
110		45.7	46.1	+0.4
111		48.8	49.8	**+1.0**
112		45.6	46.2	+0.6
113		54.2	54.9	+0.7
114		58.3	59.4	**+1.1**
115		57.9	58.8	+0.9
116		58.4	59.0	+0.6
117		56.9	57.5	+0.6
118	Non-residential	62.1	62.4	+0.3
119	Non-residential	61.7	61.9	+0.2
120		55.5	56.0	+0.5
121		50.6	51.3	+0.7
122		52.3	53.0	+0.7
123		48.7	49.5	+0.8
124		49.4	49.6	+0.2
125		46.3	46.4	+0.1
126		50.2	50.4	+0.2
127		48.8	48.7	-0.1
Southwest Quadrant				
128	Non-residential	60.7	60.8	+0.1
129		47.8	48.3	+0.5
130		54.5	54.1	-0.4
131		55.0	54.1	-0.9

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
132		57.5	56.7	-0.8
133		58.6	57.9	-0.7
134		59.9	60.2	+0.3
135		59.9	59.8	-0.1
136		59.0	59.6	+0.6
137		64.7	63.1	**-1.6**
138		64.6	63.0	**-1.6**
139		63.7	62.3	**-1.4**
140		65.3	63.6	**-1.7**
141		62.2	60.7	**-1.5**
142		62.2	60.7	**-1.5**
143		61.6	60.4	**-1.2**
144		58.4	56.7	**-1.7**
145		58.6	56.9	**-1.7**
146		56.6	55.2	**-1.4**
147		58.0	56.2	**-1.8**
148		57.1	55.1	**-2.0**
149		57.1	55.2	**-1.9**
150		58.2	56.3	**-1.9**
151		53.2	51.5	**-1.7**
152		54.0	52.0	**-2.0**
153		54.1	52.0	**-2.1**
154		53.5	51.4	**-2.1**
155		52.4	50.2	**-2.2**
156	Non-residential	53.9	52.0	**-1.9**
157		53.6	51.7	**-1.9**
158		53.2	51.3	**-1.9**
159		53.1	51.5	**-1.6**
160		54.2	52.4	**-1.8**
161		54.1	53.0	**-1.1**

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Daytime (07:00-23:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
162		52.9	51.8	**-1.1**
163		54.2	52.7	**-1.5**
164	Non-residential	63.0	62.8	-0.2
165	Non-residential	59.3	58.6	-0.7
	Key			
Colour-Coding	**Residential Adverse Effect Level**			
	<LOAEL			
	>=LOAEL			
	>=SOAEL			

Table A7.6.11 Predicted night-time aircraft 'ground' noise levels (100% easterly operations)

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
Northwest Quadrant				
1	Non-residential	66.3	67.9	**+1.6**
2		28.6	37.2	**+8.6**
3		38.6	44.6	**+6.0**
4		52.9	55	**+2.1**
5		52.9	55.5	**+2.6**
6		50.5	53.5	**+3.0**
7	Non-residential	56.1	56.0	-0.1
8		55.5	55.5	0.0
9		53.9	53.1	-0.8
10		55.3	53.7	**-1.6**
11		54.6	53.5	**-1.1**
12	Non-residential	56.8	55.7	**-1.1**
13		53.1	54.5	**+1.4**
14	Non-residential	50.8	55.2	**+4.4**
15	Non-residential	58.9	60.1	**+1.2**
16	Non-residential	49.8	50.7	+0.9
17	Non-residential	52.3	52.9	+0.6
18	Non-residential	57.3	57.6	+0.3
19	Non-residential	53.6	53.6	0.0
20		41.5	43.1	**+1.6**
21		41.6	43.1	**+1.5**
22		42.0	43.4	**+1.4**
23		42.4	43.1	+0.7
24		41.9	42.2	+0.3
25		43.5	44.1	+0.6
26	Non-residential	44.5	45.2	+0.7
27		46.3	46.7	+0.4
28		47.3	47.4	+0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
29		47.6	47.7	+0.1
30		48.0	47.9	-0.1
31	Non-residential	62.3	62.0	-0.3
32		54.8	54.5	-0.3
33		57.3	56.8	-0.5
34		57.8	57.5	-0.3
35		57.7	57.3	-0.4
36	Non-residential	60.7	60.1	-0.6
37	Non-residential	58.8	58.0	-0.8
38	Non-residential	60.8	59.6	**-1.2**
39		55.9	55.1	-0.8
40		48.8	47.6	**-1.2**
41		46.6	45.4	**-1.2**
42		57.2	55.7	**-1.5**
Northeast Quadrant				
43	Non-residential	60.7	59.1	**-1.6**
44		53.4	51.9	**-1.5**
45		54.2	52.5	**-1.7**
46	Non-residential	58.3	56.7	**-1.6**
47	Non-residential	64.6	62.9	**-1.7**
48		53.9	52.7	**-1.2**
49		53.5	52.1	**-1.4**
50		52.2	50.7	**-1.5**
51	Non-residential	59.9	58.6	**-1.3**
52		53.3	51.9	**-1.4**
53		50.2	49.0	**-1.2**
54	Non-residential	53.7	52.6	**-1.1**
55		52.0	50.7	**-1.3**
56	Non-residential	61.7	60.4	**-1.3**
57		51.7	50.7	**-1.0**

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
58		45.4	44.2	**-1.2**
59	Non-residential	58.7	57.6	**-1.1**
60		48.4	47.3	**-1.1**
61	Non-residential	60.3	59.2	**-1.1**
62	Non-residential	56.4	55.1	**-1.3**
63		47.9	46.8	**-1.1**
64		52.9	51.6	**-1.3**
65		49.7	48.5	**-1.2**
66	Non-residential	57.2	56.2	**-1.0**
67		50.6	49.3	**-1.3**
68		48.9	48.0	-0.9
69	Non-residential	60.7	59.5	**-1.2**
70	Non-residential	54.5	53.5	**-1.0**
71		40.7	39.9	-0.8
72		53.6	52.4	**-1.2**
73		48.7	47.8	-0.9
74		45.0	44.9	-0.1
75		45.6	45.1	-0.5
76		43.5	43.1	-0.4
77	Non-residential	51.4	50.9	-0.5
78	Non-residential	44.9	44.7	-0.2
79		39.8	39.3	-0.5
80		37.0	36.4	-0.6
81	Non-residential	44.5	44.2	-0.3
82		43.4	43.1	-0.3
83		41.8	40.8	**-1.0**
84		44.7	44.3	-0.4
85		44.8	44.6	-0.2
86		45.2	45.2	0.0
87	Non-residential	58.7	59.1	+0.4

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
88		45.8	45.7	-0.1
89		45.2	45.2	0.0
90		43.6	43.5	-0.1
91		42.8	42.9	+0.1
92		37.8	38.1	+0.3
93		34.6	34.7	+0.1
94		34.7	34.8	+0.1
95		31.9	32.2	+0.3
96		30.7	31.0	+0.3
97	Non-residential	33.8	34.2	+0.4
98	Non-residential	42.7	43.2	+0.5
99		35.1	35.5	+0.4
100		31.6	31.8	+0.2
Southeast Quadrant				
101		33.6	33.9	+0.3
102		33.2	33.6	+0.4
103	Non-residential	52.4	52.2	-0.2
104		29.1	29.5	+0.4
105		27.9	28.4	+0.5
106		26.7	27.1	+0.4
107	Non-residential	49.0	49.0	0.0
108	Non-residential	53.0	53.0	0.0
109	Non-residential	50.8	51.4	+0.6
110		36.9	37.7	+0.8
111		46.2	47.0	+0.8
112		39.1	39.8	+0.7
113		50.5	51.4	+0.9
114		55.7	56.6	+0.9
115		56.3	56.7	+0.4
116		57.2	57.1	-0.1

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
117		55.1	55.4	+0.3
118	Non-residential	59.0	59.6	+0.6
119	Non-residential	58.1	58.7	+0.6
120		52.7	53.4	+0.7
121		48.0	48.6	+0.6
122		49.8	50.2	+0.4
123		45.8	46.3	+0.5
124		44.6	45.3	+0.7
125		41.4	42.2	+0.8
126		45.2	45.8	+0.6
127		44.0	44.2	+0.2
Southwest Quadrant				
128	Non-residential	56.5	57.0	+0.5
129		43.6	44.4	+0.8
130		49.2	49.3	+0.1
131		48.5	48.4	-0.1
132		51.6	51.6	0.0
133		52.2	52.1	-0.1
134		52.9	53.9	**+1.0**
135		53.9	54.2	+0.3
136		53.9	54.7	+0.8
137		58.0	57.4	-0.6
138		58.5	57.9	-0.6
139		57.4	57.0	-0.4
140		58.6	58.0	-0.6
141		56.1	55.5	-0.6
142		55.8	55.3	-0.5
143		55.2	55.1	-0.1
144		52.1	51.3	-0.8
145		51.9	51.2	-0.7

Receptor (See Figure 7.6.1)	Receptor Type	Façade Noise Levels (dB, $L_{Aeq,T}$)		
		Night-time (23:00-07:00hrs)		
		2028 WoD[10]	2028 WD[10]	Change
146		49.9	49.7	-0.2
147		50.9	50.2	-0.7
148		49.8	48.9	-0.9
149		50.2	49.3	-0.9
150		52.0	50.8	**-1.2**
151		46.8	45.7	**-1.1**
152		47.1	45.8	**-1.3**
153		47.2	45.9	**-1.3**
154		46.6	45.3	**-1.3**
155		45.2	43.7	**-1.5**
156	Non-residential	47.0	45.8	**-1.2**
157		47.1	45.8	**-1.3**
158		46.3	45.3	**-1.0**
159		47.0	46.2	-0.8
160		47.9	46.9	**-1.0**
161		48.4	47.9	-0.5
162		47.4	47.1	-0.3
163		47.6	46.9	-0.7
164	Non-residential	57.3	57.5	+0.2
165	Non-residential	55.7	55.7	0.0
Key				
Colour-Coding	**Residential Adverse Effect Level**			
	<LOAEL			
	>=LOAEL			
	>=SOAEL			