George Best Belfast City Airport – 2020 Annual Performance Report

On Compliance with the Requirements of the 2019 Planning Agreement

Contents

1. Introduction

This report has been prepared to meet the requirements of the Planning Agreement (the Agreement) between Belfast City Airport and the Department for Infrastructure (the Department) dated 22 July 2019. Specifically –

Covenant 1.1: To submit the Annual Performance Report by 31st March in each calendar year and within the Annual Performance Report to report on the performance and compliance with the covenants in this Agreement in the preceding calendar year in a form which shall include all the annual reporting requirements contained in this Agreement or as agreed with the Department from time to time and which shall be published on the Company's website.

The report aims to address each of these reporting requirements either directly within the sections of this report or by reference to further reports (or sections of these) which are provided as appendices.

2. Summary of Reporting Requirements

Table 1 summarises the current reporting requirements within the covenants of the Agreement, as understood by Belfast City Airport.

Table 1 – Reporting Requirements

Covenant Reference	Reporting Requirement (summarised)
2.4.2	Written details of every delayed aircraft outside of permitted hours and circumstances for any aircraft during extended hours
2.4.3	Written report of the payments into and out of the Community Fund
6.7.1.1	Noise exposure contours for year x-1* based on actual ATM (air traffic movements) data
6.7.1.2	Forecast noise contours for years x and x+1 based on predicted ATM data
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6.7.7	Record of movements by aircraft types not permitted to use the Aerodrome in year x-1 (ie to only accept those which meet the requirements of ICAOC Chap 3, Annex 16 and which are not Marginally Compliant Aircraft)
6.7.8	Record of the use by Aircraft of approaches and climb-outs over Belfast Lough in year x-1

6.7.9	Record of ATM within extended hours and fines administered in year x-1
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6.7.11	Summary of noise complaints received by the Company, the responses given and the actions taken for year x-1
6.7.12	Review of the degree of adherence to any published noise abatement procedures in operation
6.7.13	Information to verify the accuracy and consistency of the operation of the integrated noise and track keeping system
6.7.14	Evaluation of the data reported including a description of any trends and identification of any relevant features of the Aerodrome operation which may have affected the results
6.7.15	Where the results of the comparison described in 6.7.2 show that the area within the 57 dB $LA_{eq,\ 16h}$ contour of 4.68km2 was exceeded in year x-1 or is likely to be exceeded in year x or x+1, submit (and promptly implement) proposed actions to ensure compliance in year x (and report in the subsequent Annual Performance Report)
6.9	In the Annual Performance Report for 2020, provide data showing the percentage of total arrivals in year x-1 that implemented Continuous Descent Approaches and any agreed improvement
6.11	In the Annual Performance Report for 2020, details of the number and type of departing aircraft breaching the departure noise limits (which are to be introduced by 22 July 2020 along with a mechanism to fine breaches of the limits) and a report of payments into and out of the Community Fund in year x-1
6.12.3	Report regarding compliance with the obligation to ensure the availability of fixed electrical ground power (FEGP) (as described in 6.12 and 6.12.1 to 6.12.2.2 in the Agreement) for year x-1 and agreed actions for improvements (if any) in each Annual Performance Report
7	Include a written report on the operation of a noise insulation scheme

*In this report 'year x-1', 'year x' and 'year x+1' refer to 2020, 2021 and 2022, respectively

3. Reports by Requirement

This section provides a report by each requirement – in the order in which these are covered within the Agreement.

2.4.2 Written details of every delayed aircraft outside of permitted hours and circumstances for any aircraft during extended hours

Details of each delayed aircraft are provided at Appendix 1 - *Extensions Log for 2020.*

2.4.3 Written report of the payments into and out of the Community Fund

Table 2 shows the payments into and out of the Community Fund in 2020, including a summary of the types of projects receiving funding. This should be viewed in conjunction with Appendix 3 – *Extension Charges for 2020*.

Table 2 – Community Fund Payments

	£	£
Payments In		
Extensions Jan-Dec		8,275
Extensions over 480		0
Subtotal		8,275
Payments Out		
Local schools support (2 schools)	3,500	
Community education initatives (2 initiatives)	5,000	
Community events/awards (1 event; 1 award)	6,000	
Local sports	0	
Local charities/community groups support (2 groups)	3,703	
Subtotal		18,203
Balance		**(9,928)**

6.7.1.1 to 6.7.1.3 Noise Exposure Contours

These are discussed in Section 4 and shown in Figures 2 to 5 of the report prepared by Bickerdike Allen Partners on behalf of Belfast City Airport, provided at Appendix 2 – *Bickerdike Allen Partners Report 2020.*

6.7.2 Comparison of the area within the 57 dB LAeq, 16h contours for the cases described in 6.7.1.1 and 6.7.1.2 with a 5.2km^2 area

Table 3 shows a comparison of the area within the 57 dB LAeq,16h contour with a 5.2 km^2 area for 2020 with forecasts for 2021 and 2022. Further details are provided in Section 4 of *Bickerdike Allen Partners Report 2020* (Appendix 2).

Table 3 – Area of the 57 dB LAeq,16h contour compared with a 5.2km^2 area

Contour Level (dB LAeq,16h)	Area of Daytime Air Noise Contours (km2)			Contour Area Limit (km)2
	2020	2021 (forecast)	2022 (forecast)	
57	0.8	2.8	4.6	5.2

6.7.3 Total number of ATM by aircraft type and actual modal split (for year x-1) and assumed modal split (for years x and x+1) for the cases described in 6.7.1.1 and 6.7.1.2

Total number of ATM by aircraft type for the cases described in 6.7.1.1 and 6.7.1.2 is provided at *Table 1: 2020, 2021 and 2022 Summer Fixed Wing Movements* in Section 2 of *Bickerdike Allen Partners Report 2020* (Appendix 2).

The term 'modal split' refers to the split of movements by runway – at Belfast City Airport this is between Runway 04 (c 040° bearing) and Runway 22 (c 220° bearing). This is generally determined by wind direction as aircraft will take off and land into a headwind to maximise lift - so variation is likely between individual years.

Table 4 shows the actual modal split for 2020 and the long-term average summer modal split for 2016-2020 (the assumed modal split for the cases described in 6.7.1.1 and 6.7.1.2). The actual modal split and the long-term average modal split were used to produce the 2020 contour and the forecast contours respectively, as discussed in Section 3.2 of *Bickerdike Allen Partners Report 2020* (Appendix 2).

Table 4 – 2020 and Long-Term Average Summer Modal Split

Runway	% of Summer Movements			
	2020		2016-2020 Average	
	Arrivals	Departures	Arrivals	Departures
04	26%	33%	25%	30%
22	74%	67%	75%	70%

6.7.4 Number of monthly and annual ATM and a comparison against 48,000 in any period of twelve months

Table 5 shows the monthly ATM in 2019 and 2020 along with the rolling 12-month total from January 2020 onwards – which remained lower than the upper limit of 48,000 movements.

Table 5 – Rolling 12 Month ATM

ATM 2019		ATM 2020		Rolling 12 Mth ATM
Jan-19	2,622	Jan-20	2,418	**35,178**
Feb-19	2,537	Feb-20	2,404	**35,045**
Mar-19	2,892	Mar-20	800	**32,953**
Apr-19	3,076	Apr-20	82	**29,959**
May-19	3,249	May-20	83	**26,793**
Jun-19	3,133	Jun-20	169	**23,829**
Jul-19	3,397	Jul-20	412	**20,844**
Aug-19	3,310	Aug-20	449	**17,983**
Sep-19	3,006	Sep-20	887	**15,864**
Oct-19	2,974	Oct-20	1,211	**14,101**
Nov-19	2,621	Nov-20	660	**12,140**
Dec-19	2,565	Dec-20	890	**10,465**

6.7.6 The Quota for year x-1 and a comparison against 4,665

The Quota Count total for the Quota Period 2020 was 287.75, which is lower than the upper limit of 4,665. Details of how the Quota Count has been calculated are provided in *Table 9: Summer 2020 Quota Count* in Section 5 of *Bickerdike Allen Partners Report 2020* (Appendix 2) including details of how the Quota Count has been calculated.

6.7.7 Record of movements by aircraft types not permitted to use the Aerodrome in year x-1

In 2020 there were no movements of aircraft that do not meet the requirements of ICAOC Chap 3, Annex 16 or are only marginally compliant. Details are provided in Section 6 of *Bickerdike Allen Partners Report 2020* (Appendix 2).

6.7.8 Record of the use by Aircraft of approaches and climb-outs over Belfast Lough in year x-1

The Agreement requires Belfast City Airport to maintain a bias in favour of approaches and climb-outs by aircraft over Belfast Lough (the 'Lough Bias'). Whilst direction of approach/climb-out is generally determined by wind direction, Air Traffic Control aims to maximise additional opportunities to direct aircraft over Belfast Lough (for example during light wind conditions, if safe to do so) ie departure using runway 04 and arrival using runway 22. Table 6 shows the number of arrivals and departures over both the City and Belfast Lough throughout 2020. There were 5,420 movements over the Lough from a total of 10,465 movements. On average, 52% of movements each month were over the Lough, so a bias in favour of arrivals and departures over Belfast Lough was maintained, in compliance with the Agreement.

Table 6 – Arrivals and Departures over the City and Belfast Lough

	Jan-20	Feb-20	Mar-20	Apr-20	May-20	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Total
Arrivals over City (04*)	25	52	58	24	11	33	36	114	133	139	10	98	**733**
Departures over City (22)	1,175	1,125	323	13	24	42	155	97	275	443	306	334	**4,312**
Total over City	*1,200*	*1,177*	*381*	*37*	*35*	*75*	*191*	*211*	*408*	*582*	*316*	*432*	***5,045***
Arrivals over Lough (22)	1,182	1,150	341	18	30	48	169	112	312	467	319	348	**4,496**
Departures over Lough (04)	36	77	78	27	18	46	52	126	167	162	25	110	**924**
Total over Lough	*1,218*	*1,227*	*419*	*45*	*48*	*94*	*221*	*238*	*479*	*629*	*344*	*458*	***5,420***
Total ATMs	2,418	2,404	800	82	83	169	412	449	887	1,211	660	890	**10,465**
Percentage over Lough	50%	51%	52%	55%	58%	56%	54%	53%	54%	52%	52%	51%	**2020 average 52%**

*Runway in use

6.7.9 Record of ATM within extended hours and fines administered in year x-1

Appendix 3 – *Extension Charges for 2020* provides a record of ATM within extended hours and associated fines administered.

6.7.10 Log of engine ground runs including time & duration for year x-1

Belfast City Airport operates restrictions on engine ground runs. These are prohibited between 22:30 and 06:00 and require prior approval by Airfield Operations, with further restrictions in place according to location and the power level of runs. All engine ground runs in 2020 complied with these requirements. Details of engine ground run requirements are provided in Appendix 4 – *AOI-07 Aircraft Ground Running and Use of Auxiliary Power Units and Ground Power Units.* A log of engine ground runs is provided at Appendix 5 – *Engine Run Log 2020*. It should be noted that no ground runs were required during July 2020 (as recorded at Appendix 5).

6.7.11 Summary of noise complaints received by the Company, the responses given and the actions taken for year x-1

A summary of noise concerns logged in 2020 is provided at Appendix 6 – *Noise Concerns Summary 2020*. All noise concerns received are acknowledged upon receipt and responded to by letter, email or telephone within 14 days.

Various responses are provided according to the nature of the concern lodged. In the case of general queries, information on the procedures and standards applied at the airport will be provided. In the case of concerns relating to specific noise events, the results of investigation will be provided. In the case of concerns relating to movements during extended hours, our response will include reference to the relevant requirements of our Planning Agreement and to the guidance issued by the Department of Infrastructure relating to extensions.

Where applicable, action will be taken to address noise issues and/or make improvements to noise management. This has included dialogue with airlines to ensure effective implementation of the noise abatement procedures in place at the aerodrome.

6.7.12 Review of the degree of adherence to any published noise abatement procedures in operation

Belfast City Airport's noise abatement procedures are published at https://www.aurora.nats.co.uk/htmlAIP/Publications/2020-01-30-AIRAC/html/eAIP/EG-AD-2.EGAC-en-GB.html#AD-2.EGAC. These determine specific paths to be flown by aircraft on departure/arrival to minimise the impact of noise on local populations. 'Track violations' occur when aircraft deviate from these paths. Whilst the incidence of track violations is relatively low, in certain situations adherence to the noise abatement procedures may prove problematic, for example in poor weather conditions. Belfast City Airport reports track violations to Airlines on a monthly basis and maintains dialogue with Airline representatives with the aim of minimising the number of occurrences.

Table 7 summarises the occurrence of track violations in 2020.

Table 7 – Track Violations

Runway	A / D	Number Flights	Number Violations	Percentage
04	D	912	23	2.5%
04	A	745	3	0.4%
22	D	4327	17	0.4%
22	A	4481	5	0.1%
	Total	**10465**	**48**	**0.5%**

At only 0.5% of all flights, the number of track violations is well below the target level of 5% set out in the Airport's Environmental Noise Directive Noise Action Plan 2019-2023 *(available at https://www.belfastcityairport.com/our-community/environment/noise).*

6.7.13 Information to verify the accuracy and consistency of the operation of the integrated noise and track keeping system

Belfast City Airport operates a Noise & Flight Track Monitoring System which provides ongoing data on aircraft movements including noise levels and tracks flown. An ongoing maintenance and support contract has been in place with Topsonic Systemhaus GmbH since 2007 when the system was installed. This includes daily system checks by Topsonic (further details are available on request). Third-party calibration of microphones and monitoring equipment is conducted on a two-yearly basis. A record of current equipment calibration status is provided at Appendix 7 – *Calibration Records 2020*. In 2020, local radar maintenance took place over a period of 17 days in total - from 6 to 17 July and from 30 November to 4 December

(during which times a secondary radar feed was provided by the nearby Crow Hill installation). During these periods the Noise & Flight Track Monitoring System continued to record data on flight movements and noise events.

6.7.14 Evaluation of the data reported including a description of any trends and identification of any relevant features of the Aerodrome operation which may have affected the results

Belfast City Airport has fully complied with the requirements of the Agreement during 2020.

The Airport has continued to provide bi-monthly performance reports to the Department since the Agreement came into effect in July 2019, including details of delayed aircraft using the aerodrome outside permitted hours (06:30 to 21:30) and the circumstances for any aircraft using the aerodrome during extended hours (21:31 to 23:59). The following summarises key data and trends:

- In 2020, delayed flights after 21:30 constituted only 0.4% of all movements
- Of these, the majority (63%) occurred within the period 21:30 to 22:00
- In 2020, 75% of delays after 21:30 were due to the late arrival of aircraft from another flight or previous sector
- Most delayed flights after 21:30 were on the following routes: Heathrow (27.5%), Manchester (17.5%) and Birmingham (15%).

The COVID-19 pandemic has had a dramatic effect on the number of ATMs when compared with recent years (only 10,465 compared with 35,382 in 2019). This is reflected in a number of aspects of performance in relation to the Agreement, including the following:

- The size of the 57 dB LAeq,16h noise contour area was reduced by 75% in 2020 compared with 2019 (from 3.3 km^2 down to 0.8 km^2)
- None of the noise contours produced for 2020 contained any dwellings or population
- The Quota Count total for summer 2020 was 287.75 - significantly lower than the 2019 total of 2,216.375.

Whilst forecasts have been made with regard to aspects of performance in 2021 and 2022, due to the impacts of the COVID-19 pandemic on the aviation sector, there remains a significant degree of uncertainty over future numbers of ATM.

6.7.15 Where the results of the comparison described in 6.7.2 show that the area within the 57 dB LAeq, 16h contour of 4.68km2 was exceeded in year x-1 or is likely to be exceeded in year x or x+1, submit (and

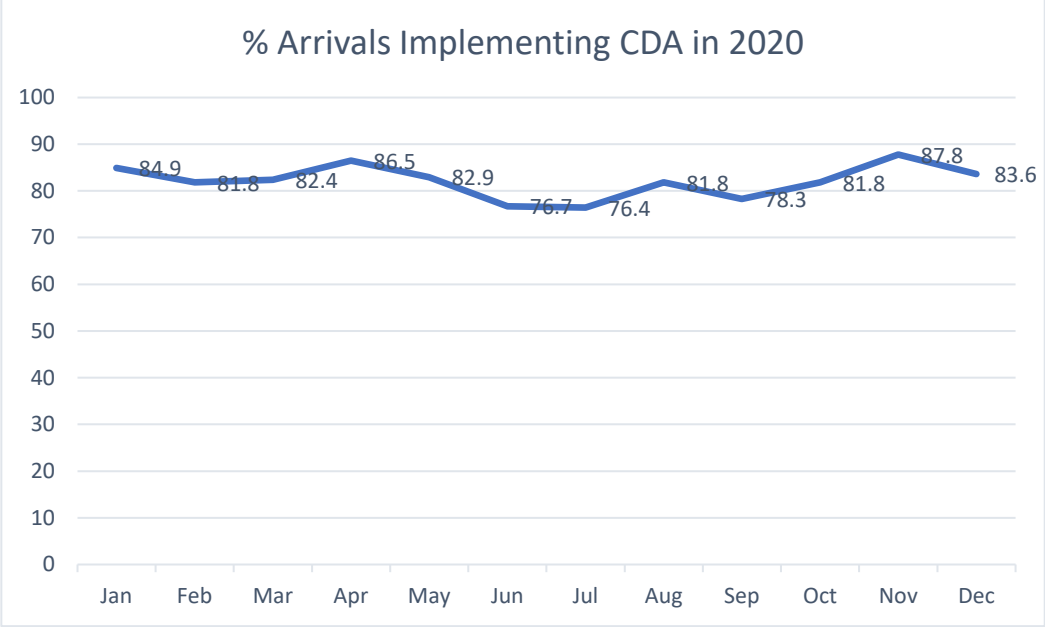
promptly implement) proposed actions to ensure compliance in year x (and report in the subsequent Annual Performance Report)

Not applicable, as the area within the 57 dB LAeq, 16h contour of 4.68km2 was not exceeded in 2020 and is not likely to be exceeded in years 2021 or 2022. The areas of the 2020 contour and forecast 2021 and 2022 contours are shown in Table 3 (above).

6.9 In the Annual Performance Report for 2020, provide data showing the percentage of total arrivals in year x-1 that implemented Continuous Descent Approaches and any agreed improvement

Continuous Descent Approach (CDA) is an operating technique in which arriving aircraft follow a constant-angle descent (rather than a series of steps) in order to reduce noise and fuel consumption.

The chart below shows the percentage of arrivals implementing Continuous Descent Approaches by month. On average, 82.1% of arrivals in 2020 implemented CDA. Subject to safety constraints and the operational requirements of individual aircraft, the Airport will continue to maximise implementation of CDA.



Data provided by NATS (Air Traffic Control provider at Belfast City Airport)

6.11 In the Annual Performance Report for 2020, details of the number and type of departing aircraft breaching the departure noise limits and a report of payments into and out of the Community Fund in year x-1

The following departure noise limits are in place at Belfast City Airport: 83 dB LAsmax for aircraft departing towards the City and 87 dB LAsmax for aircraft departing towards Belfast Lough (as measured by the Airport's noise monitoring terminals). Any breaches of these noise limits will be identified through the Airport's Noise and Track Monitoring System. During 2020 there were no breaches of the departure noise limits.

6.12.3 Report regarding compliance with the obligation to ensure the availability of fixed electrical ground power (FEGP) (as described in 6.12 and 6.12.1 to 6.12.2.2 in the Agreement) for year x-1 and agreed actions for improvements (if any) in each Annual Performance Report

All stands at Belfast City Airport are equipped with FEGP. In 2020, 98% of flights used FEGP. Occasions when FEGP was not used were due to the requirement to park ATR aircraft in non-standard orientation due to weather (nose to the wind). Whilst operational and available for use at the stand, FEGP in these cases could not be reached due to aircraft orientation.

FEGP at Belfast City Airport is subject to an ongoing maintenance regime aimed at achieving maximum serviceability.

7 Include a written report on the operation of a noise insulation scheme

At present, no residential dwellings are affected by the level of noise at which a noise insulation scheme must be implemented (ie as defined by the 63 dB LAeq, 16h contour). For this reason, the scheme is not yet operating.

4. Appendices

Appendix 1 - *Extensions Log for 2020*

Appendix 2 – *Bickerdike Allen Partners Report 2020*

Appendix 3 – *Extension Charges for 2020*

Appendix 4 – *AOI-07 Aircraft Ground Running and Use of Auxiliary Power Units and Ground Power Units*

Appendix 5 – *Engine Run Log 2020*

Appendix 6 – *Noise Concerns Summary 2020*

Appendix 7 – *Calibration Records 2020*

Date	Airline Code	Sch Time	Actual Time	Arr / Dep	Registration	Flight #	Airport	Delay code 1	Description 1	Delay code 2	Description 2	
13/01/2020	EI	21:05	23:14	A	EIDVE	937	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Due to weather diversions earlier in the day (Storm Brendan)
13/01/2020	BE	21:10	22:25	A	GJEDU	416	BHX	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Due to earlier technical problems at Belfast City
13/01/2020	BE	21:05	21:33	A	GPRPC	368	EMA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
13/01/2020	BE	21:15	21:58	A	EIGHK	1360	LCY	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
13/01/2020	BE	17:00	21:39	D	GJECP	127	GLA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
16/01/2020	BE	21:10	22:02	A	GJECR	416	BHX	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector	41	AIRCRAFT DEFECTS.	
16/01/2020	BE	21:00	21:44	A	GJEDU	740	LBA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector	84	ATFM due to WEATHER AT DESTINATION	
19/01/2020	BE	21:20	22:09	A	EIGHK	486	MAN	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Fog at Manchester Airport
31/01/2020	PVT	21:30	22:09	D	GMCGR			99	OTHER REASON, not matching any code above			UK Coastguard. Rescue flight.
09/02/2020	BE	21:10	21:39	A	GECOR	4558	CWL	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Adverse weather across UK (Storm Ciara)
10/02/2020	BA	18:40	21:39	A	GTTNB	1420	LHR	71	WEATHER DEPARTURE STATION	96	OPERATIONS CONTROL, re-routing, diversion, consolidation, aircraft change for reasons other than technical	
10/02/2020	BA	19:25	22:59	D	GTTNB	1421	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
10/02/2020	BE	21:15	21:37	A	GJEDT	486	MAN	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
10/02/2020	BE	21:05	21:40	A	GECOR	368	EMA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
10/02/2020	BE	20:45	21:43	D	GPRPI	487	MAN	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
11/02/2020	EI	21:05	21:45	A	EIFNJ	937	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector	89	RESTRICTIONS AT AIRPORT OF DEPARTURE WITH OR WITHOUT ATFM RESTRICTIONS, including Air Traffic Services, start-up and pushback, airport and/or runway closed due to obstruction or weather, industrial action, staff shortage, politcal unrest, noise abatement, night curfew, special flights	
11/02/2020	BE	20:55	22:00	D	GEJCO	129	GLA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector	41	AIRCRAFT DEFECTS.	
16/02/2020	BA	20:05	22:42	A	GTTNA	1422	LHR	87	AIRPORT FACILITIES, parking stands, ramp congestion, lighting, buildings, gate limitations, etc.			
16/02/2020	BA	19:00	22:17	A	GEUPG	1420	LHR	87	AIRPORT FACILITIES, parking stands, ramp congestion, lighting, buildings, gate limitations, etc.			
16/02/2020	EI	21:05	22:38	A	EIFNJ	937	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
16/02/2020	BE	21:25	21:31	A	GPRPA	1360	LCY	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
16/02/2020	BA	19:40	23:11	D	GEUPG	1421	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
21/02/2020	BE	21:15	21:32	A	EIGHK	1360	LCY	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
22/02/2020	EI	21:05	22:11	A	EIDVI	937	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Congestion at London Heathrow
23/02/2020	BE	21:00	22:08	A	GECOF	740	LBA	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Aircraft technical issues in Amsterdam
23/02/2020	BE	21:10	21:32	A	EIGHK	416	BHX	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
24/02/2020	BE	21:15	21:42	A	EIGHK	1360	LCY	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Congestion at London City Airport
25/02/2020	BE	20:50	21:38	D	GJEDW	417	BHX	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
28/02/2020	EI	21:05	22:18	A	EIDVI	937	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Congestion at London Heathrow
04/03/2020	BE	21:30	21:46	D	EIGHK	703P	DUB	99	OTHER REASON, not matching any code above			
04/03/2020	BE	21:10	21:54	A	GPRPE	416	BHX	99	OTHER REASON, not matching any code above			
04/03/2020	BE	21:15	23:39	A	GPRPB	486	MAN	99	OTHER REASON, not matching any code above			
11/10/2020	EI	21:15	21:50	A	EIFSL	3659	EDI	41	AIRCRAFT DEFECTS.	96	OPERATIONS CONTROL, re-routing, diversion, consolidation, aircraft change for reasons other than technical	Aircraft technical issues and replacement aircraft positioned from Dublin
01/11/2020	EI	21:15	21:47	A	EIFAX	3679	LBA	71	WEATHER DEPARTURE STATION			
08/11/2020	EI	21:15	22:30	A	EIFCZ	3679	LBA	72	WEATHER DESTINATION STATION			
06/12/2020	BA	15:10	21:35	D	GTTNL	1417	LHR	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			Aircraft had to divert to Belfast International due to fog and
07/12/2020	EI	21:20	21:48	A	EIFCY	3619	MAN	86	IMMIGRATION, CUSTOMS, HEALTH			Regulatory inspection on crew in Manchester.
20/12/2020	EI	21:10	21:34	A	EIFCY	3649	BHX	16	COMMERCIAL PUBLICITY/PASSENGER CONVENIENCE, VIP, press, ground meals and missing			
21/12/2020	EI	21:20	21:38	A	EIFAS	3619	MAN	93	AIRCRAFT ROTATION, late arrival of aircraft from another flight or previous sector			
30/12/2020	EI	21:20	21:31	A	EIFSL	3619	MAN	75	DE-ICING OF AIRCRAFT, removal of ice and/or snow, frost prevention excluding unserviceability of			

Bickerdike Allen Partners
Architecture
Acoustics
Technology

GEORGE BEST BELFAST CITY AIRPORT

2020 ANNUAL REPORT

Report to

George Best Belfast City Airport
Sydenham By-Pass
Belfast
BT3 9JH

A11298_04_RP003_3.0
18 March 2021

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Construction Technology Consultants: Expertise in building cladding, technical appraisals and defect investigation and provision of construction expert witness services.

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Appendices

1.0 INTRODUCTION

The planning agreement[1] between Belfast City Airport Limited (BCA) and the Department for Infrastructure dated 22 July 2019 sets out regular reporting that the airport is required to make. The required reporting includes an Annual Performance Report (APR) which is to be submitted annually on 31 March. The content of the APR is detailed in paragraphs 6.7.1 to 6.7.15 of *PART II The Covenants* of the agreement.

Bickerdike Allen Partners LLP (BAP) have been retained by George Best Belfast City Airport (GBBCA) to produce some of the information required for the APR, specifically the information related to the following paragraphs:

- 6.7.1 Noise exposure contours
- 6.7.2 Comparison of noise contour areas
- 6.7.3 Air traffic movements the contours are based on
- 6.7.6 The Quota Count for the previous year
- 6.7.7 A record of movements by aircraft types not permitted to use the airport in the previous year (those only marginally compliant with Chapter 3)
- 6.7.14 (Partial) An evaluation of the data reported, specifically that we are preparing.

Noise contours have been produced for 2020 based on the actual aircraft movements over the 92 day summer period, and for 2021 and 2022 based on forecasts provided by GBBCA. All of the noise contours have been produced using the Federal Aviation Administration's prediction software, the Integrated Noise Model (INM) version 7.0d. This methodology has been validated for the key aircraft types operating at the airport, using results from the Noise Monitoring Terminals (NMTs) installed at GBBCA.

Section 2 of this report gives details of the air traffic movements used to produce the noise contours. Section 3 gives details of the methodology used to produce the noise contours. Section 4 reports the areas of the noise contours and compares them with the 57 dB $L_{Aeq,16h}$ noise contour area limit. Population counts for the key noise exposure contours are also provided. Section 5 reports the results of the quota count assessment for 2020. Section 6 gives details of movements in 2020 by aircraft types that were only marginally compliant with Chapter 3.

[1] Agreement Pursuant to Section 77(1)(a) of the Planning Act (Northern Ireland) 2011

A glossary of acoustic and aviation terms can be found in Appendix 1, with Appendix 2 containing details of BAP's validation exercise with respect to noise.

2.0 AIRCRAFT MOVEMENTS

The basis for the 2020 noise contours are the actual movements during the 92 day summer period, 16 June to 15 September inclusive. Detailed information was provided by GBBCA for all aircraft movements during this period. Although a small proportion of movements occur early in the morning between 6:30 and 7:00 or late in the evening between 23:00 and 23:30 over the 92 day period, for the production of the noise contours all movements have been modelled as taking place within the "daytime period" of 07:00 to 23:00.

The actual movements in 2020 include 4 movements by helicopters. Historically helicopters have not been modelled at GBBCA, as they typically comprise less than 1% of the total movements, and this was also the case in 2020. Their continued omission is not considered significant to the overall contours due to their small number of movements and maintains consistency with previous contouring.

Compared to movements in 2019, those for 2020 show a dramatic reduction due to the effects on travel of the COVID-19 pandemic, with the total number of movements reducing from 9,745 to 1,325. Much of the reduction is due to the absence of Bombardier Dash 8-Q400 activity in the summer of 2020, whereas it was the most common type in 2019, but there are reductions for almost every type.

Forecasts for 2021 and 2022 have been provided for the 92 day summer period. These include an allowance for unscheduled aircraft, for which aircraft types have been assigned proportionally based on the general aviation and business jet movements of summer 2019. Summer 2019 has been used in this instance, as due to the impact of the COVID-19 pandemic summer 2020 is not considered representative of the future fleet mix.

The INM software includes noise information for many common aircraft types, but as with all noise modelling software, it does not include every aircraft type. This means that substitutions are required, where an alternative aircraft type is used to model the actual type. For larger aircraft this generally does not involve a change but for the smaller types, and in particular the general aviation aircraft, substitutions occur. Where INM has no guidance, an aircraft type has been assigned based on the aircraft size and engine details. Table 1 below shows the aircraft movements by aircraft type in summer 2020 and those forecast for 2021 and 2022. It also includes the INM type used for each aircraft type in the modelling.

Total movements are forecast to return to closer to pre-pandemic levels over the next two years, with the number of movements forecast in 2021 around 18% less than occurred in 2019 and those forecast in 2022 around 13% more. The ATR-72 and Airbus A320 are forecast to continue to comprise the majority of passenger aircraft movements, with significant numbers of movements also by the Embraer E145 and E190. The Airbus A319 is forecast to cease operation after 2020, but in 2022 the Boeing 737-800 is forecast to begin operating regularly.

Aircraft Type	INM Type(s)	Summer Fixed Wing Movements		
		2020 Actual	2021 Forecast	2022 Forecast
Airbus A319ceo	A319-131(1)	126	0	0
Airbus A320ceo	A320-211(1)	439	1,403	1,435
Airbus A320neo	A320-211(1)	32	74	478
ATR 72-600	DO328/DHC6(1)	204	4,622	5,350
Beechcraft Super King Air	CNA441	14	0	0
Boeing 737-800	737800	0	0	978
Cessna Citation Mustang	CNA510	10	0	0
Cessna Citation Excel	CNA560XL	28	0	0
Embraer E145	EMB145	86	966	1,376
Embraer E170	EMB170	13	0	0
Embraer E175	EMB175/737500(1)	32	0	0
Embraer E190	EMB190(1)	44	580	1,009
Embraer Legacy 600	EMB145	10	0	0
BAe Jetstream 41	SF340	130	0	0
Pilatus PC12	CNA208	36	0	0
Saab 2000	HS748A	21	0	0
Other (less than 10 movements)	Various	100	368	368
Total		**1,325**	**8,013**	**10,994**

(1) INM type modified based on results of a validation exercise.

Table 1: 2020, 2021 and 2022 Summer Fixed Wing Movements

3.0 NOISE CONTOUR METHODOLOGY

3.1 General

The aircraft movement data, provided by GBBCA, has been assessed in relation to aircraft type, departure and arrival route, flight profiles and runway usage to enable input into the noise computation program, the Integrated Noise Model (INM). This section of the report describes how this information has been compiled in a form suitable for analysis purposes.

3.2 Runway Usage

The overall split of movements by runway during the 2020 summer period is given in Table 2, and is compared with the long term average (2016-2020). For the 2020 actual contours, the actual runway usage for each individual movement was used. For the 2021 and 2022 forecast contours the long term average modal split has been used.

Runway	% of Summer Movements			
	2020		2016-2020 Average	
	Arrivals	Departures	Arrivals	Departures
04	26%	33%	25%	30%
22	74%	67%	75%	70%

Table 2: 2020 and Long Term Average Summer Modal Split

The usage of the runways is dependent on the direction of the wind, therefore some variation is to be expected between individual years. Compared to the long term average there was around 1% more usage of runway 04 by arrivals and around 3% more usage of runway 04 by departures in 2020, with corresponding decreases in the usage of runway 22.

3.3 Flight Tracks

For each runway there is a single modelled arrival route, which follows the runway centreline. There is one modelled initial departure route on runway 22, but four modelled initial departure routes on runway 04.

A validation exercise was undertaken in 2011 to validate the flight tracks used in the INM software. The details of this exercise are shown in Appendix B of BAP's report Ref: A9443-R01-NW dated November 2011. The resulting main departure tracks are shown in Figure 01 and have been used for the contours as there have been no changes to the published routes since 2011.

The method of determining the split of aircraft between the routes from runway 04 takes into account both aircraft type and destination. Where the destination is in Scotland or in Northern Europe (Iceland, Norway, etc.) the initial route heading in a north easterly direction is used. The remaining traffic is split amongst the three routes which turn south. The particular route depends on the distance at which the aircraft type involved is expected to have achieved one of a set of specific altitudes, as required by the airport's noise abatement procedures. These altitudes are 1,500 ft for small propeller aircraft (maximum takeoff weight of up to 13,000 kg); 2,000 ft for large propeller aircraft; and 3,000 ft for jet aircraft.

3.4 Dispersion

Aircraft on departure are allocated a departure route to follow. In practice, this route is not followed precisely by all aircraft. To allow for this the INM software was used to generate a mean track for each of the five initially distinct routes, and these mean tracks were then dispersed as described below.

The dispersion model has the common assumption that there are five "dispersed" tracks associated with each departure route; these comprise the mean track of each route and two sub-tracks either side, as the actual pattern of departing aircraft is dispersed about the route's centreline. The degree of dispersion is normally a function of the distance travelled by an aircraft along the route after take-off and also on the form of the route.

When considering many departures, it is commonly found that the spread of aircraft approximates to a "normal distribution" pattern. A simplified mathematical model can be adopted to represent a normal distribution of events, based on standard deviations. Five "dispersed" tracks associated have been used to model each departure route; these comprise the mean track of each route and two sub-tracks either side. The resulting allocation of movements to each track is as follows:

- 53.3% departures along the main track;
- 22.2% departures split equally along two inner sub tracks either side of the main track and offset by a distance of 1.355 standard deviations;
- 1.15% departures split equally along two outer sub tracks either side of the main track and offset by a distance of 2.71 standard deviations.

This dispersion model has been used in the INM software, which generates the sub-tracks with distances supplied by the user. The distances and percentages used have been determined by BAP from analysis of similar activity at other airports.

3.5 Flight Profiles

For departure movements the INM software offers a number of standard flight profiles for most aircraft types, particularly for the larger aircraft types. These relate to different departure weights which are greatly affected by the length of the flight, and consequently the fuel load. In the INM software this is referred to as the stage length. The stage length increases in increments of 500 nmi up to 1,500 nmi and then in increments of 1,000 nmi. The INM software assumes all aircraft take off with a full load irrespective of stage length. As the stage length increases, the aircraft has to depart with greater fuel, and so its flight profile is slightly lower than when a shorter stage length is flown.

For the 2020 contours, destination airports were given with the actual movements. Stage lengths have been assigned, where INM offers the option, based on the distance of these airports from GBBCA. The 2021 and 2022 forecast movements do not provide specific destination airports. Stage lengths have therefore been assigned based on the most common destinations served by each aircraft type in 2019 given the unusual nature of 2020 activity.

3.6 INM Model

All contours and population counts have been determined using the Integrated Noise Model (INM) version 7.0d software. GBBCA data relevant to the INM study is taken from the latest edition of the UK Aeronautical Information Package. A 3.0° approach angle has been used for all aircraft and the ground topography has been assumed to be flat. The INM default headwind of 14.8 km/h has been assumed.

Results from the airport's Noise Monitoring Terminals (NMTs) from the period October 2019 to September 2020 have been used in the 2020 validation exercise to review the INM assumptions for the key aircraft types operating at GBBCA. In addition, NMT data for the period September 2020 to December 2020 for the ATR72-600 was used as the type only began operating at GBBCA in significant numbers recently, but it is forecast to perform a significant number of movements in 2021 and 2022, so including it in the validation was desirable.

As INM does not have a default type for the Bombardier Dash 8-Q400, it has also been included in the validation despite it performing only a small number of movements in summer 2020.

The 2020 validation exercise found that modifications were required for seven aircraft types, to better model their operations at GBBCA. These included types such as the Bombardier Dash 8-Q400 for which the INM does not contain specific data. The result is that the modelled noise characteristics of these aircraft have been adjusted by modifying the INM aircraft used and/or the noise level of the INM aircraft types. Where modifications have been made to the noise levels, this has been done using a movement multiplier. These adjustments are detailed in Table 3 below.

Aircraft Type	Default INM Type	Modification to INM Assumptions	
		Departures	Arrivals
Airbus A319ceo	A319-131	A319-131 × 1.4	A319-131 × 0.7
Airbus A320ceo	A320-211	A320-211 × 1.1	A320-211 × 1.0
Airbus A320neo	-	A320-211 × 0.4	A320-211 x 0.8
ATR 72-600	DO328	DHC6 × 0.9	DO328 × 0.7
Bombardier Dash 8-Q400	-	DHC6 × 0.8	SD330 × 1.4
Embraer E175	EMB175	737500 × 1.3	EMB175 × 1.4
Embraer E190	EMB190	EMB190 × 1.5	EMB190 × 1.3

Table 3: Modifications to INM Assumptions Used for the Contours

The modifications to the INM assumptions are the same for most of the types as those used for the 2019 contours, following the previous validation. The changes are to the multiplier for arrivals by the Airbus A320neo, which has been increased from 0.6 to 0.8, and to the multiplier for arrivals by the Embraer E175, which has been increased from 1.2 to 1.4.

There has also been a change to some of the types involved. As the proportion of operations by the Embraer E190 has increased, it has been included for 2020. Conversely the Boeing 737-300, which was previously validated in 2019, has been removed as there were no movements by this aircraft type in the 2020 summer period. The ATR 72-600 has been included due to the significant number of movements forecast by it in 2021 and 2022. Full details of the 2020 validation exercise are given in Appendix 2.

4.0 NOISE CONTOURS

Noise contours for 2020, 2021 and 2022 in terms of the $L_{Aeq,16h}$ metric have been produced for the 16 hour daytime period, 07:00 to 23:00; although they also include the movements that occur between 06:30 and 07:00 and the small number that occurred between 23:00 and 23:30. They are based on the actual movements for the 92 day summer period in 2020 and the forecasts provided for 2021 and 2022 as detailed in Section 2. The areas of the noise contours are given in Table 4, where they are compared with the 57 dB $L_{Aeq,16h}$ contour area limit.

The 2020 actual, 2021 forecast and 2022 forecast noise contours are shown in Figures 02, 03 and 04 respectively at values from 54 to 69 dB $L_{Aeq,16h}$ in 3 dB steps. The 57 dB contours for all three years are compared in Figure 05.

Contour Level (dB $L_{Aeq,16h}$)	Area of Daytime Air Noise Contours (km^2)			Contour Area Limit $(km)^2$
	2020	2021	2022	
54	1.3	5.4	8.5	-
57	0.8	2.8	4.6	5.2
60	0.5	1.5	2.4	-
63	0.3	0.8	1.3	-
66	0.2	0.5	0.7	-
69	0.1	0.3	0.4	-

Table 4: 2020, 2021 and 2022 Noise Contour Areas

The area of the 2020 57 dB $L_{Aeq,16h}$ contour area is 0.8 km^2, which is well below the contour area limit of 5.2 km^2. The area of the 2019 57 dB $L_{Aeq,16h}$ contour area was 3.3 km^2. The areas of the noise contours for 2020 have reduced significantly compared to 2019, due to the reduction in the number of flights at the airport as a result of the COVID-19 pandemic. The noise contour areas are forecast to increase back to pre-pandemic levels along with the number of aircraft movements over the next two years. In 2022 the areas are forecast to surpass the 2019 areas, although the 57 dB contour area is still predicted to remain well below the area limit.

4.1 Population and Dwelling Counts

The population and dwelling data has been derived from a 2019 postcode database supplied by CACI Ltd. Population counts for the 2020, 2021 and 2022 $L_{Aeq,16h}$ daytime contours are given in Table 5 and Table 6 below, the corresponding dwelling counts are given in Table 7 and Table 8.

Contour Level (dB $L_{Aeq,16h}$)	2020 Population	2021 Population	2022 Population
54	0	9,453	19,309
57	0	1,627	7,772
60	0	0	981
63	0	0	0
66	0	0	0
69	0	0	0

Table 5: Comparison of 2020, 2021 and 2022 Population Counts – Cumulative Totals

Year	Population by Contour Band (dB $L_{Aeq,16h}$)						Total
	> 69	69 – 66	66 – 63	63 – 60	60 – 57	57 – 54	
2020	0	0	0	0	0	0	0
2021	0	0	0	0	1,627	7,826	9,453
2022	0	0	0	981	6,791	11,537	19,309

Table 6: Comparison of 2020, 2021 and 2022 Population Counts

Contour Level (dB $L_{Aeq,16h}$)	2020 Dwellings	2021 Dwellings	2022 Dwellings
54	0	4,435	9,325
57	0	726	3,638
60	0	0	430
63	0	0	0
66	0	0	0
69	0	0	0

Table 7: Comparison of 2020, 2021 and 2022 Dwelling Counts – Cumulative Totals

Year	Dwellings by Contour Band (dB $L_{Aeq,16h}$)						Total
	> 69	69 – 66	66 – 63	63 – 60	60 – 57	57 – 54	
2020	0	0	0	0	0	0	0
2021	0	0	0	0	726	3,709	4,435
2022	0	0	0	430	3,208	5,687	9,325

Table 8: Comparison of 2020, 2021 and 2022 Dwelling Counts

There are no people or dwellings within the 2020 contours due to the significant reduction in aircraft movements. The number of people and dwellings within each contour is forecast to increase over the next two years, mainly due to the forecast return to closer to pre-pandemic levels of aircraft movements. There are forecast to be 430 dwellings and 981 people within the 63 – 60 dB $L_{Aeq,16h}$ contour band in 2022, but none in 2021.

5.0 QUOTA COUNT

As part of their planning agreement BCA are required to report the quota count for the year just completed. The quota count is based on the aircraft movements in the 92 day summer period and is limited to 4,665.

The quota count production methodology is described in paragraphs 6.4 to 6.6 of *PART II The Covenants* of the agreement. In summary, the method requires the certification data for the aircraft type, which is then processed and compared to a scale to determine the quota count for the aircraft type when arriving, and separately when departing.

For the aircraft that operated, the noise certification data has been obtained either from the noise certificate of the specific aircraft, or for those registered in the UK from the CAA G-INFO database[2] and those registered in Switzerland from the FOCA Swiss Aircraft Register[3]. Where certification data was not available, quota count values have been taken from the tables in the latest UK AIP Supplement[4]. In some cases the tables offer more than one value for an aircraft type, in these cases the expected QC value based on available information has been used, and where only limited information is available the higher QC value has been taken.

The resulting quota count total for summer 2020 was 287.75, which is much less than the limit of 4,665. The total for 2020 was significantly lower than the figure of 2,216.375 for 2019 due to the reduction in the number of flights at the airport as a result of the COVID-19 pandemic.

[2] https://siteapps.caa.co.uk/g-info/

[3] https://www.bazl.admin.ch/bazl/en/home/specialists/aircraft/aircraft-noise-certification.html

[4] https://www.aurora.nats.co.uk/htmlAIP/Publications/2020-11-05-AIRAC/html/index-en-GB.html

Table 9 below gives details of how the quota count for summer 2020 has been calculated, including the specific arrival and departure quota count values used for the key aircraft types. Where more than one quota count value has been used for an aircraft type based on the individual noise certificates, both values are shown.

Aircraft Type	Arrivals	Arrival QC	Departures	Departure QC	QC Total
Airbus A319ceo	63	0.25	63	0.25	31.500
Airbus A320ceo	218	0.25	220	0.5	165.500
			1	1	
Airbus A320neo	16	0.125	16	0.125	4.000
ATR72-600	105	0.125	99	0.125	25.500
Beechcraft Super King Air	7	Exempt	7	Exempt	0.000
Cessna Citation Mustang	5	Exempt	5	Exempt	0.000
Cessna Citation Excel	10	0.125	14	0	2.250
	4	0.25			
Embraer E145	43	0.125	43	0.125	10.750
Embraer E170	6	0.25	7	0.5	5.000
Embraer E190	22	0.125	20	0.25	8.750
			2	0.5	
Embraer Legacy 600	5	0.125	5	0.125	1.250
Embraer E175	16	0.25	16	0.25	8.000
BAe Jetstream 41	65	0	65	0.25	16.250
Pilatus PC12	18	Exempt	18	Exempt	0.000
Saab 2000	11	0	10	0.125	1.250
Other[1]	49	Various	55	Various	7.750
Total	**663**	**-**	**666**	**-**	**287.750**

[1] Includes 4 movements by helicopters

Table 9: Summer 2020 Quota Count

6.0 MARGINALLY COMPLIANT CHAPTER 3 AIRCRAFT MOVEMENTS

As part of their planning agreement BCA are required to accept in respect of jet aircraft, only those air traffic movements that comply with the certificate limits, as laid down in Chapter 3 of Annex 16, of the standards adopted by the International Civil Aviation Organisation Council and which are not Marginally Compliant Aircraft. In the agreement these are defined as:

> 11. 'Marginally Compliant Aircraft' means civil subsonic jet aeroplanes, that meet the certification limits as laid down in Chapter 3 of Annex 16 by a cumulative margin of not more than 5 EPNdB, whereby the cumulative margin is a figure expressed in EPNdB obtained by adding the individual margins at each of the three reference noise management points as defined in Chapter 3 of Annex 16

BCA are required to report any movements in the year just completed by any aircraft not permitted to use the airport.

For the aircraft that operated in 2020, the noise certification data has been obtained either from the noise certificate of the specific aircraft, or for those registered in the UK from the CAA G-INFO database[2] and those registered in Switzerland from the FOCA Swiss Aircraft Register[3]. Where specific certification data was not available, certification values have been taken from the latest EASA Approved Noise Levels[5]. In some cases, the EASA database offers more than one possible classification for an aircraft type. In cases where one of the possible classifications is for non-compliance with Chapter 3 or only marginal Chapter 3 compliance, then the movements by these aircraft will be counted as “Unknown Classification”. However, there were no instances of this in 2020.

The were no movements in 2020 by jet or large propeller aircraft types that do not meet the requirements of Chapter 3 or are only marginally compliant with Chapter 3, as shown below in Table 10. The table also includes the number of movements that fully comply with Chapter 3, or comply with the more stringent Chapter 4 or Chapter 14, and the number where the classification is unknown. The certification of helicopters and light propeller aircraft is to different standards and so these aircraft have been separately recorded.

[5] https://www.easa.europa.eu/easa-and-you/environment/easa-certification-noise-levels

2020 Aircraft Movements				
Chapter 3 Marginally Compliant	**Chapter 3 Fully Compliant / Chapter 4 / Chapter 14**	**Unknown Classification**	**Helicopters and Light Propeller Aircraft**	**Total**
0	10,049	0	412	10,461

Table 10: 2020 Aircraft Noise Classification

7.0 SUMMARY

$L_{Aeq,16h}$ noise contours and the associated population counts have been produced, based on the actual movements during the 92 day summer period in 2020, and the forecast summer movements for 2020 and 2021. The movements used to produce them have been reported in addition to the contours and the number of people they contain.

The area of the 2020 57 dB $L_{Aeq,16h}$ contour area at 0.8 km^2 is well below the contour area limit of 5.2 km^2. The noise contour areas are forecast to increase over the next two years as the forecast aircraft movements return to closer to pre-pandemic levels. Consequently, in 2022 the noise contours are forecast to be larger than those for 2019. However, the area of the 57 dB contours for 2021 and 2022 are forecast to remain below the contour area limit.

Due to the significant reduction in the area of the 2020 contours, they contain no dwellings or people. The number of people and dwellings within the contours is forecast to increase over the next two years, mainly due to the forecast return to closer to pre-pandemic levels of aircraft movements. There are forecast to be 430 dwellings and 981 people within the 63 – 60 dB $L_{Aeq,16h}$ contour band in 2022 but none in 2021.

The quota count total for summer 2020 was 287.75, which is much less than the limit of 4,665.

There were no movements in 2020 by jet or large propeller aircraft types that do not meet the requirements of Chapter 3 or are only marginally compliant with Chapter 3, in compliance with the restriction on the airport.

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Duncan Rogers
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David Charles
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LEGEND:

Initial Departure Routes

REVISIONS

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Belfast City Airport
Regular Reporting

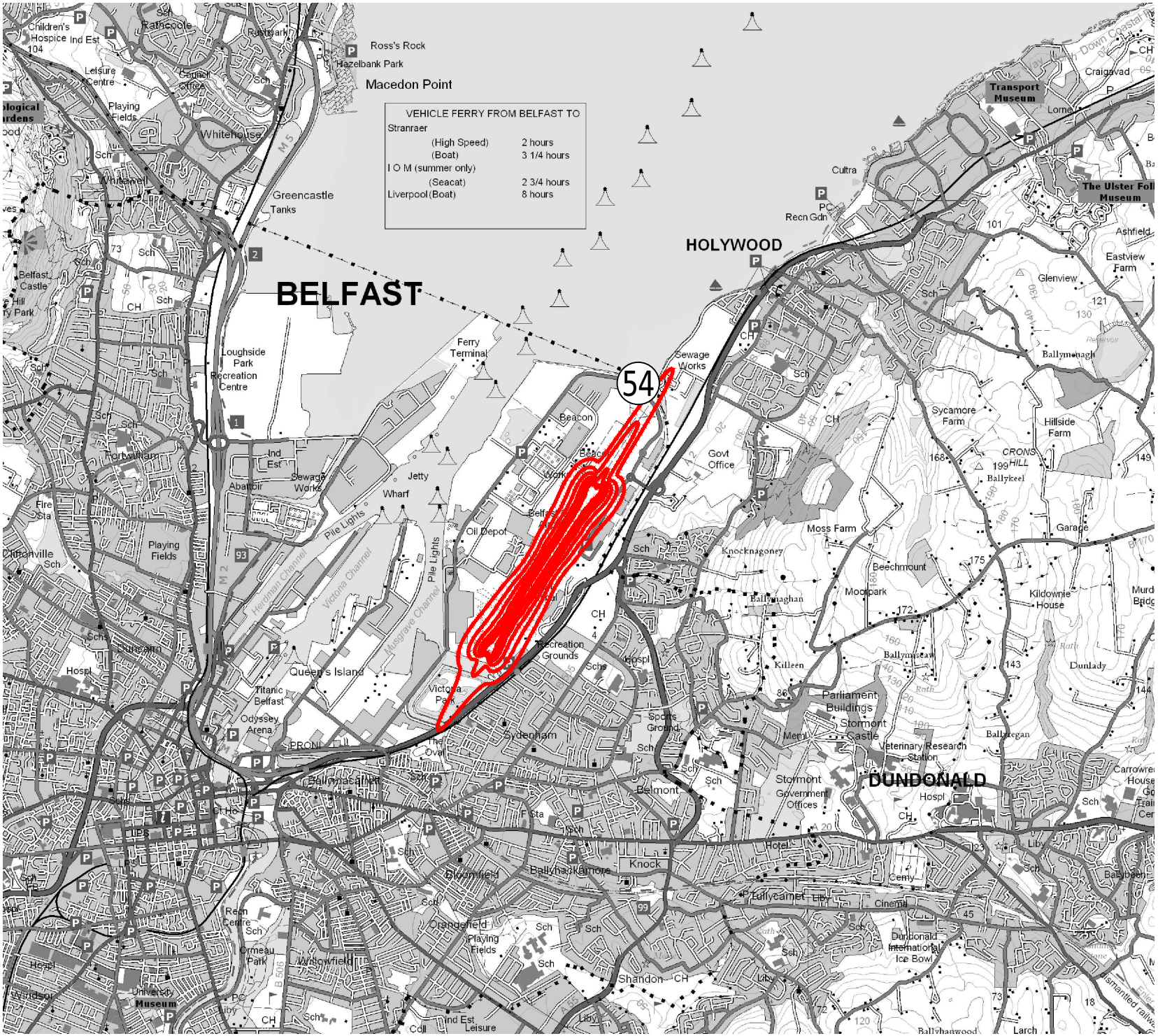
Figure 01
Initial Departure Routes

DRAWN: MP CHECKED: DR

DATE: November 2020 SCALE: 1:125000@A4

FIGURE No:

A11298_04_DR001_1.0



LEGEND:

Noise Contours,
54 to 69 dB $L_{Aeq,16h}$ in 3 dB steps

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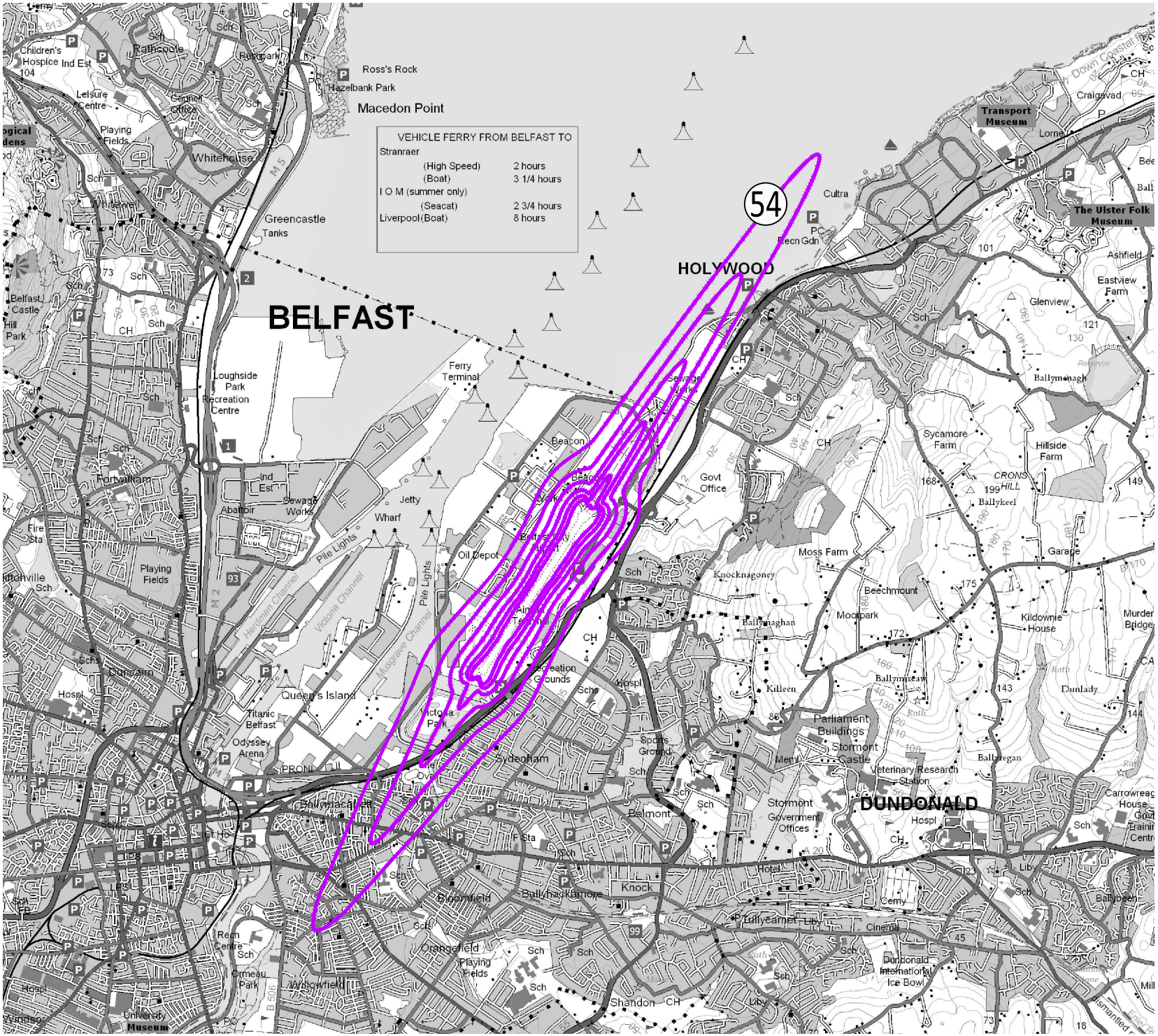
Figure 02
Summer Daytime Noise Contours
2020

DRAWN: MP CHECKED: DR

DATE: January 2021 SCALE: 1:50000@A4

FIGURE No:

A11298_04_DR002_2.0



LEGEND:

Noise Contours,
54 to 69 dB $L_{Aeq,16h}$ in 3 dB steps

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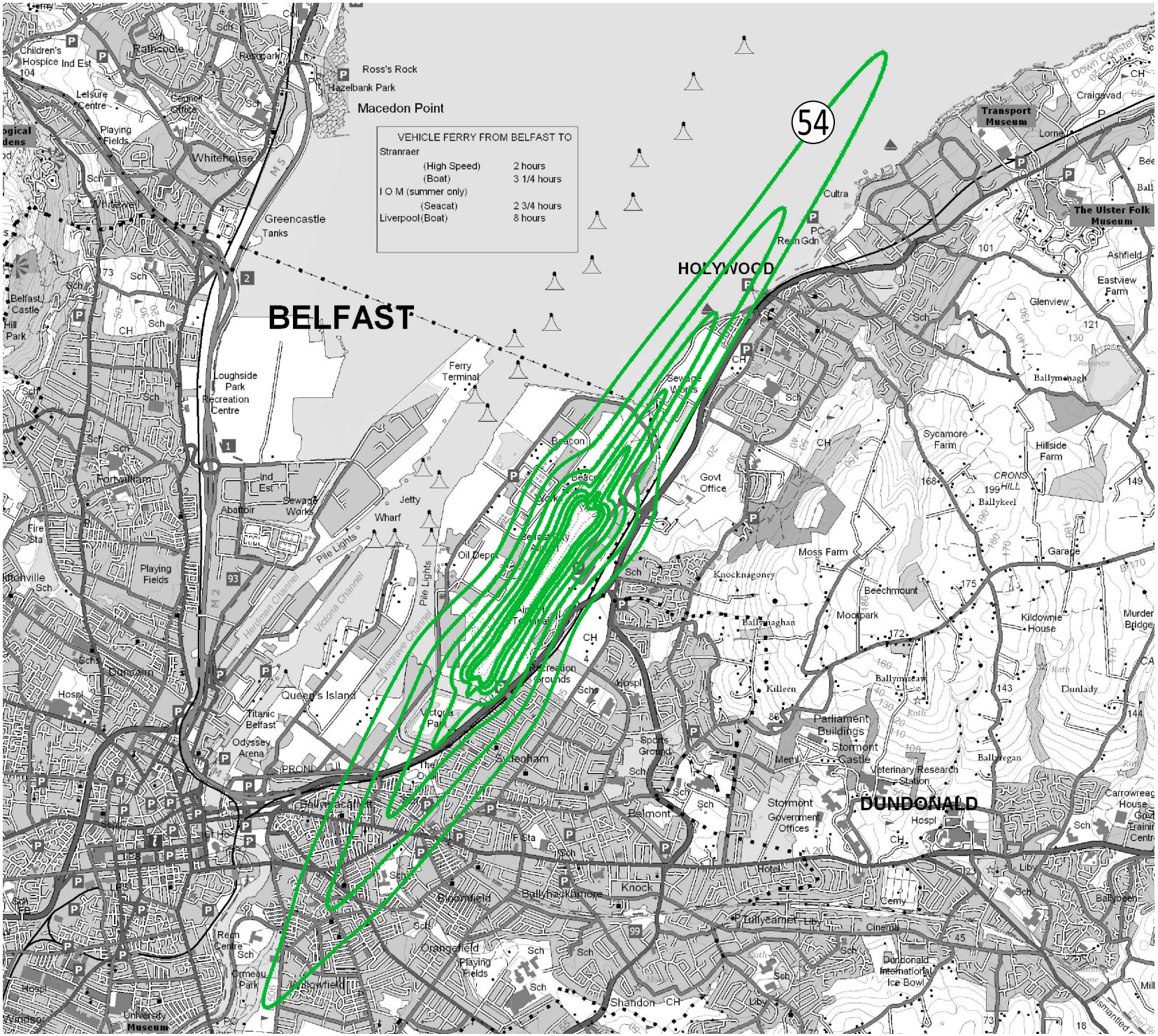
Figure 03
Summer Daytime Noise Contours
2021 Forecast

DRAWN: MP CHECKED: DR

DATE: January 2021 SCALE: 1:50000@A4

FIGURE No:

A11298_04_DR003_1.0



LEGEND:

Noise Contours,
54 to 69 dB $L_{Aeq,16h}$ in 3 dB steps

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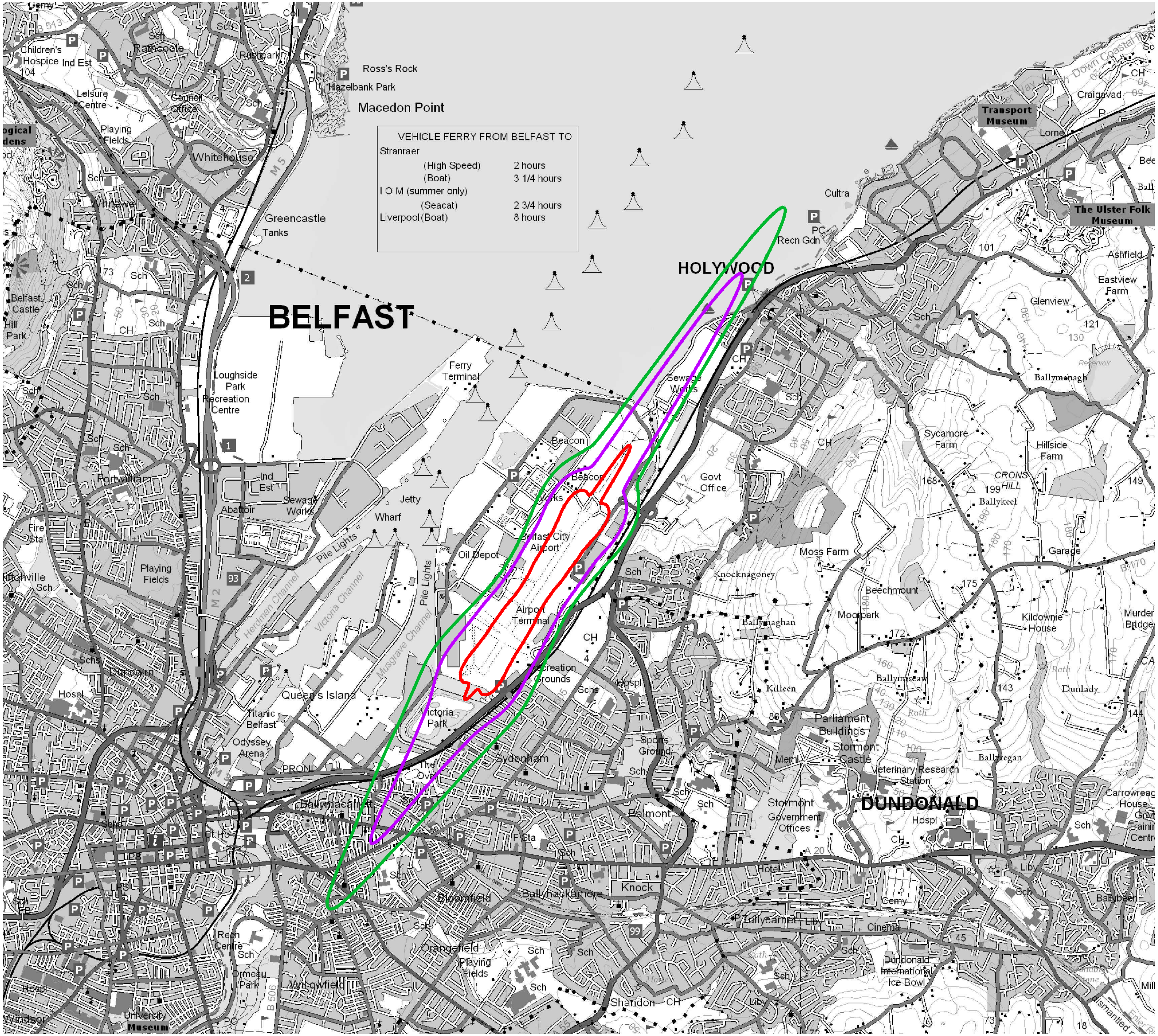
Figure 04
Summer Daytime Noise Contours
2022 Forecast

DRAWN: DR CHECKED: DC

DATE: March 2021 SCALE: 1:50000@A4

FIGURE No:

A11298_04_DR004_2.0



This drawing contains Ordnance Survey data © Crown Copyright and database right 2021.

LEGEND:

Noise Contours,

- 2020 (red)
- 2021 (purple)
- 2022 (green)

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Figure 05
Summer Daytime Noise Contours
2020, 2021 and 2022 57 dB $L_{Aeq,16h}$

DRAWN: DR CHECKED: DC

DATE: March 2021 SCALE: 1:50000@A4

FIGURE No:

A11298_04_DR005_2.0

APPENDIX 1

GLOSSARY OF ACOUSTIC AND AVIATION TERMINOLOGY

Sound

This is a physical vibration in the air, propagating away from a source, whether heard or not.

The Decibel, dB

The unit used to describe the magnitude of sound is the decibel (dB) and the quantity measured is the sound pressure level. The decibel scale is logarithmic and it ascribes equal values to proportional changes in sound pressure, which is a characteristic of the ear. Use of a logarithmic scale has the added advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers. The threshold of hearing occurs at approximately 0 dB (which corresponds to a reference sound pressure of 2×10^{-5} Pascals) and the threshold of pain is around 120 dB.

The sound energy radiated by a source can also be expressed in decibels. The sound power is a measure of the total sound energy radiated by a source per second, in Watts. The sound power level, L_w is expressed in decibels, referenced to 10^{-12} Watts.

Frequency, Hz

Frequency is analogous to musical pitch. It depends upon the rate of vibration of the air molecules which transmit the sound and is measure as the number of cycles per second or Hertz (Hz). The human ear is sensitive to sound in the range 20 Hz to 20,000 Hz (20 kHz). For acoustic engineering purposes, the frequency range is normally divided up into discrete bands. The most commonly used bands are octave bands, in which the upper limiting frequency for any band is twice the lower limiting frequency, and one-third octave bands, in which each octave band is divided into three. The bands are described by their centre frequency value and the ranges which are typically used for building acoustics purposes are 63 Hz to 4 kHz (octave bands) and 100 Hz to 3150 Hz (one-third octave bands).

A-Weighting

The sensitivity of the ear is frequency dependent. Sound level meters are fitted with a weighting network which approximates to this response and allows sound levels to be expressed as an overall single figure value, in dB(A).

Effective Perceived Noise Level

Effective Perceived Noise Level (EPNL) is a measure used to express noise levels which analyses the frequency spectra of noise events as well as the duration of sound. The measurement unit for EPNL is EPNdB. This measure is used for the noise certification of aircraft, and the subsequent quota count determination.

Quota Count

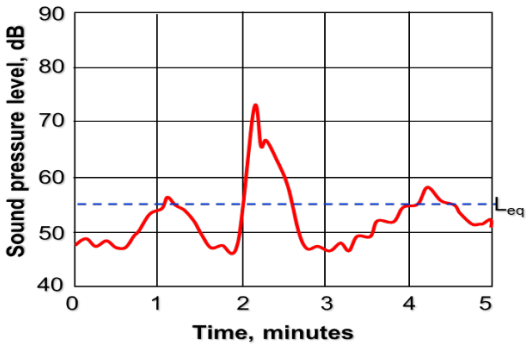
The value assigned to one take-off or to one landing by the aircraft in question, this number being related to its noise classification. The classification is determined from the noise level band in EPNdB, for take-off or landing, as the case may be, for the aircraft in question, as defined in the individual aircraft's noise certificate.

Environmental noise descriptors

Where noise levels vary with time, it is necessary to express the results of a measurement over a period of time in statistical terms. Some commonly used descriptors follow.

$L_{Aeq,T}$ The most widely applicable unit is the equivalent continuous A-weighted sound pressure level ($L_{Aeq,T}$). It is an energy average and is defined as the level of a notional sound which (over a defined period of time, T) would deliver the same A-weighted sound energy as the actual fluctuating sound.

This is shown in the graph below:



Noise Contour

A line which joins points on the ground which receive the same noise exposure from the nearby airborne aircraft; often for daytime studies the exposure is considered over a 16 hour period ($L_{Aeq,16h}$) and for night studies over a 8 hour period ($L_{Aeq,8h}$) with a range of levels used to express the different exposures.

Sound transmission in the open air

Most sources of sound can be characterised as a single point in space. The sound energy radiated is proportional to the surface area of a sphere centred on the point. The area of a sphere is proportional to the square of the radius, so the sound energy is inversely proportional to the square of the radius. This is the inverse square law. In decibel terms, every time the distance from a point source is doubled, the sound pressure level is reduced by 6 dB.

Meteorological effects

Temperature and wind gradients affect noise transmission, especially over large distances. The wind effects range from increasing the level by typically 2 dB downwind, to reducing it by typically 10 dB upwind – or even more in extreme conditions. Temperature and wind gradients are variable and difficult to predict.

Aviation terms

NPR

Noise preferential route – departure flight ground tracks to be followed by aircraft to minimise noise disturbance on the surrounding population.

Dispersion

Due to the effect of the wind, aircraft speed, and pilot choice differing aircraft tracks about the nominal track are flown; this is known as dispersion around a nominal track.

Start of Roll

The position on a runway where aircraft commence their take-off runs.

Threshold

The beginning of that portion of the runway usable for landing.

Radar Vectoring

Aircraft are provided by Air Traffic Control (ATC) with various instructions which result in changes of heading, altitude and speed. The controller affects safe separation from other traffic by use of radar.

Nominal Tracks

Using recognised international design techniques, tracks across the ground can be delineated for departing and arriving aircraft. These tracks are nominal because they can be influenced by the wind, ATC instructions, the accuracy of navigational systems and the flight characteristics of individual aircraft. In UK it is usual to permit a 1500m swathe to be established about the nominal track for the purposes of assessing whether an aircraft has stayed on track.

Altitude

Height of aircraft above sea level.

Bickerdike
Allen
Partners
Architecture
Acoustics
Technology

APPENDIX 2

GEORGE BEST BELFAST CITY AIRPORT

CONTOUR VALIDATION – NOISE

INTRODUCTION

Summer noise contours have been prepared for George Best Belfast City Airport (GBBCA) for a number of years. This has involved the use of the Federal Aviation Administration (FAA) prediction methodology, the Integrated Noise Model (INM).

The INM software has been used around the world in over 50 countries and consequently is flexible enough to allow local circumstances to be taken into account. This can be achieved by entering specific departure routes, operational profiles or weather conditions but also by creating or modifying specific noise information for aircraft types.

In order to improve the accuracy of the modelling at GBBCA, validation exercises have been conducted which compare predicted noise levels for individual aircraft movements with noise levels measured at Belfast. This is particularly useful for aircraft types where the INM does not have actual data and so suggests a substitute type.

CURRENT VALIDATION

Validation using NMT Results

The validation exercises use the measured results from the permanent noise monitoring system at GBBCA. Specifically, the results from the Noise Monitoring Terminal (NMT) at Nettlefield Primary School (MP01) and at Kinnegar Army Camp (MP02). These NMTs are located approximately 4.5 km from the start of roll location of runway 22 and 3.9 km from the start of roll location of runway 04 respectively. The validation exercise for the 2020 actual and 2021 and 2022 forecast contours uses recent results from the NMTs. These include the results for the period October 2019 to September 2020, which comprise over 5,000 individual aircraft measurements. This is less than in previous years due to the impact of the COVID-19 pandemic reducing the amount of activity, however for the key aircraft types there is generally still sufficient noise data available.

The ATR72-600 only began operating at GBBCA in significant numbers recently. However, as it is forecast to perform a significant number of movements in 2021 and 2022 it was included in the validation. NMT data for the period September 2020 to December 2020 was used in the validation of this aircraft, in order to have a sufficient number of measured results.

Seven aircraft types have been selected to be analysed in the validation exercise. These are the Airbus A319ceo, A320ceo and A320neo, the ATR 72-600, the Bombardier Dash 8-Q400, and the Embraer E175 and E190. These aircraft types comprised around 66% of the summer period movements in 2020 and, except for the ATR 72-600 and Embraer E190, were also selected for the 2019 validation.

The Boeing 737-300, which was previously validated, has not been validated this year as there were no movements by this aircraft type in the summer period. There were also very few movements by the Bombardier Dash 8-Q400 in summer 2020. However, there were a significant number of measured results for this type from operations earlier in the year. As the INM does not contain a default type for this aircraft it has been included in the validation.

The resulting average measured noise levels used for the 2020 validation exercise are given below in Table A2.1 for these aircraft types, where they are compared with the corresponding measured results used for the 2019 validation exercise. This shows that the average measured noise levels for these types have not generally varied by more than 1 dB compared to 2019. The exception is operations by the Embraer E175 on runway 04, but there are very few measured results for these operations in 2020.

Aircraft Type	Operation	2020 Validation Measured Noise Levels (SEL dB)		2019 Validation Measured Noise Levels (SEL dB)	
		Average	Number	Average	Number
Airbus A319ceo	Arrival Rwy 04	85.1	8	84.5	111
	Arrival Rwy 22	89.4	105	89.1	317
	Departure Rwy 04	89.5	6	90.0	98
	Departure Rwy 22	87.3	129	87.4	298
Airbus A320ceo	Arrival Rwy 04	86.9	14	85.9	314
	Arrival Rwy 22	90.9	215	90.3	984
	Departure Rwy 04	90.2	12	90.7	304
	Departure Rwy 22	87.4	251	87.6	904
Airbus A320neo	Arrival Rwy 04	85.0	1	84.1	15
	Arrival Rwy 22	89.6	28	88.9	28
	Departure Rwy 04	86.6	1	86.5	12
	Departure Rwy 22	83.8	26	83.5	26
ATR 72-600	Arrival Rwy 04	84.5	13	-	-
	Arrival Rwy 22	88.0	124	-	-
	Departure Rwy 04	81.2	115	-	-
	Departure Rwy 22	82.5	17	-	-
Bombardier Dash 8-Q400	Arrival Rwy 04	83.2	85	82.6	1,956
	Arrival Rwy 22	87.3	1,411	87.0	6,351
	Departure Rwy 04	82.2	101	81.3	1,951
	Departure Rwy 22	80.0	1,457	79.9	5,481
Embraer E175	Arrival Rwy 04	87.8	2	85.7	235
	Arrival Rwy 22	90.1	69	89.7	645
	Departure Rwy 04	89.6	2	91.1	230
	Departure Rwy 22	87.3	79	88.2	598
Embraer E190	Arrival Rwy 04	85.3	1	-	-
	Arrival Rwy 22	90.2	122	-	-
	Departure Rwy 04	89.5	2	-	-
	Departure Rwy 22	87.8	129	-	-

Table A2.1: Measured Noise Levels used for Validation in 2020 and 2019

For each aircraft type there are four sets of measured results; arrivals and departures at each of the two monitors. As the monitors are not located symmetrically with regard to the runway the noise levels at each will differ and so they need to be considered separately. For the individual movements within a set there is some variation, so every arrival by an aircraft type does not produce exactly the same noise level. There are a number of factors which contribute to this, in particular the weather conditions.

Measured Results

The spread of results is illustrated in Figures A2.1 to A2.2 below. These show the distribution of measured noise levels from October 2019 to September 2020 for the most common operations, arrivals from the north and departures to the south, for the most common aircraft type in the summer period of 2020, the Airbus A320ceo.

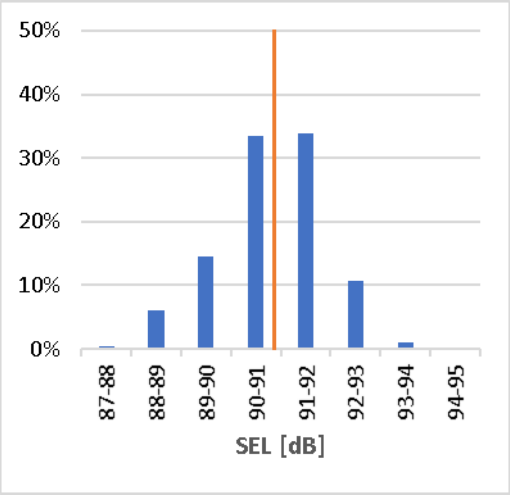


Figure A2.1 – Airbus A320ceo Arrivals

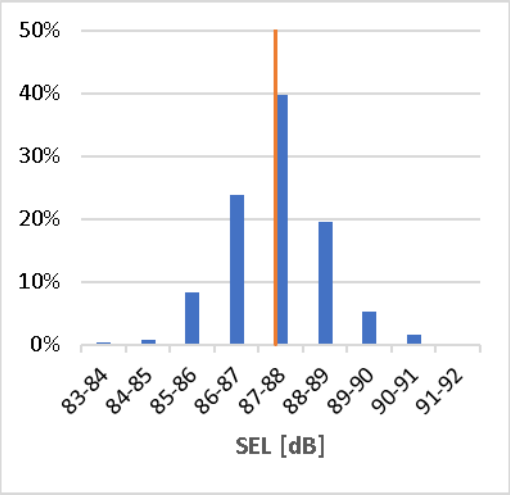


Figure A2.2 – Airbus A320ceo Departures

The distributions have the large majority of measured noise levels closely grouped together around the averages, shown as a vertical red line on the figures, with a pattern that approximates to a normal distribution with a standard deviation of less than 2 dB. Such distributions of measured noise levels are commonly found at airport fixed noise monitors at a similar distance from the runway. From the distributions of measured noise levels for each of the aircraft types considered, the averages have been determined and compared to INM standard predicted noise levels. Table A2.2 gives the latest measured average noise levels for the seven aircraft types validated in 2020.

Aircraft Type	Operation	2020 Validation Measured Noise Levels (SEL dB)		INM Standard Assumptions (SEL dB)	
		Average	Number	Type	Level
Airbus A319ceo	Arrival Rwy 04	85.1	8	A319-131	87.0
	Arrival Rwy 22	89.4	105		90.0
	Departure Rwy 04	89.5	6		87.9
	Departure Rwy 22	87.3	129		87.0
Airbus A320ceo	Arrival Rwy 04	86.9	14	A320-211	87.4
	Arrival Rwy 22	90.9	215		90.2
	Departure Rwy 04	90.2	12		89.4
	Departure Rwy 22	87.4	251		88.2
Airbus A320neo[(1)]	Arrival Rwy 04	85.0	1	A320-211	87.4
	Arrival Rwy 22	89.6	28		90.2
	Departure Rwy 04	86.6	1		89.4
	Departure Rwy 22	83.8	26		88.2
ATR 72-600	Arrival Rwy 04	84.5	13	DO328	86.3
	Arrival Rwy 22	88.0	124		89.7
	Departure Rwy 04	81.2	115		75.4
	Departure Rwy 22	82.5	17		74.6
Bombardier Dash 8-Q400[(1)]	Arrival Rwy 04	83.2	85	SD330 DHC6	82.2
	Arrival Rwy 22	87.3	1,411		84.5
	Departure Rwy 04	82.2	101		82.1
	Departure Rwy 22	80.0	1,457		81.6
Embraer E175	Arrival Rwy 04	87.8	2	EMB175	85.5
	Arrival Rwy 22	90.1	69		88.3
	Departure Rwy 04	89.6	2		86.0
	Departure Rwy 22	87.3	79		85.6
Embraer E190	Arrival Rwy 04	85.3	1	EMB190	86.6
	Arrival Rwy 22	90.2	122		89.0
	Departure Rwy 04	89.5	2		86.8
	Departure Rwy 22	87.8	129		86.0

[(1)] INM does not contain specific data for this type so alternatives used.

Table A2.2: Measured and Standard Predicted Noise Levels

Approach to Validation

The general approach to validation modifications has been to only change from the INM standard type when the measured results show clear divergence, i.e. an apparent prediction error in excess of 1.5 dB at a single NMT or an average error of over 1.0 dB across both NMTs. If the type has historically been modified from the standard type, then the approach has been to only change from the previous validation when there is an apparent prediction error or change in measured level in excess of 1.0 dB at a single NMT. Also, the approach seeks to determine any modification by aircraft type and aircraft operation, but not by runway used. This means one modification is adopted for all arrivals by an aircraft type, and one for all departures by an aircraft type.

In 2020 there were relatively few measurements for some aircraft types, particularly for operations on Runway 04. Changes have therefore been minimised and only made where not doing so would result in a large underprediction in noise for a particular aircraft type.

Comparison of Measured and Predicted Results

For the Airbus A319ceo, Airbus A320ceo and Bombardier Dash 8-Q400, the measured levels have not changed sufficiently to warrant a change from the validation used for the 2019 contours. Arrivals by the Airbus A320neo and the Embraer E175 were slightly louder than in 2019, their multipliers have therefore been increased from 0.6 to 0.8 and 1.2 to 1.4 respectively.

The final validation modifications are summarised below in Table A2.3. These have been used for the 2020, 2021 and 2022 contours.

Aircraft Type	INM Type	Modification to Movements Numbers	
		Departures	Arrivals
Airbus A319ceo	A319-131	A319-131 × 1.4	A319-131 × 0.7
Airbus A320ceo	A320-211	A320-211 × 1.1	A320-211 × 1.0
Airbus A320neo	A320-211	A320-211 × 0.4	A320-211 x 0.8
ATR 72-600	DHC6/DO328	DHC6 × 0.9	DO328 × 0.7
Bombardier Dash 8-Q400	DHC6/SD330	DHC6 × 0.8	SD330 × 1.4
Embraer E175	737500/EMB175	737500 × 1.3	EMB175 x 1.4
Embraer E190	EMB190	EMB190 × 1.5	EMB190 x 1.3

Table A2.3: 2020 Validation Modifications

Table A2.3 shows that for the three Airbus types, modifications to the number of movements have been made. For the Airbus A319ceo arrival movements have been factored down, while the departure movements factored up. For the Airbus A320ceo, no modification was necessary for arrival movements, and departure movements have been factored up slightly. For the Airbus A320neo both arrival and departure movements have been factored down.

The need for modifications for the larger aircraft types in particular is not unexpected as they are available in a range of specifications with different engine types, sometimes from different manufacturers. This means that the actual type operated by the airline may differ to the one in the INM software and this is the case here for both the Airbus A319ceo and A320ceo. The Airbus A320neo is a new quieter version of the A320ceo and is therefore quieter as expected.

For the ATR 72-600, modifications were needed to the INM type as the substitute type it suggests does not agree well with the measured departure results. On arrival the standard type was used, but with movements factored down.

For the Dash 8-Q400 the INM software does not suggest a type. The validation finds that using the Dash 6 (DHC6) for departures and the Shorts 330 (SD330) for arrivals, with movement numbers factored, agrees well with measured noise levels.

For the Embraer E175, modifications were needed to the INM type as the standard type does not agree well with the measured departure results. On arrival the standard type was used, but with movements factored up.

For the Embraer E190, the standard INM type has been used, but with both arrivals and departures movements factored up. This has primarily been informed by noise data for runway 22 movements.

Effect of Validation

The effect of the validation exercise on the predicted noise levels for the seven aircraft types is detailed in Table A2.4 which gives the differences between the measured noise levels and those predicted after allowing for the validation modifications.

Aircraft Type	Operation	Noise Levels (SEL dB)			
		Measured Average	INM Validated Prediction	Difference Predicted - Measured	Operation Weighted Average Difference
Airbus A319ceo	Arrival Rwy 04	85.1	85.5	+0.4	-0.8
	Arrival Rwy 22	89.4	88.5	-0.9	
	Departure Rwy 04	89.5	89.4	-0.1	+1.2
	Departure Rwy 22	87.3	88.5	+1.2	
Airbus A320ceo	Arrival Rwy 04	86.9	87.4	+0.5	-0.6
	Arrival Rwy 22	90.9	90.2	-0.7	
	Departure Rwy 04	90.2	89.8	-0.4	+1.1
	Departure Rwy 22	87.4	88.6	+1.2	
Airbus A320neo	Arrival Rwy 04	85.0	86.4	+1.4	-0.4
	Arrival Rwy 22	89.6	89.2	-0.4	
	Departure Rwy 04	86.6	85.4	-1.2	+0.3
	Departure Rwy 22	83.8	84.2	+0.4	
ATR 72-600	Arrival Rwy 04	84.5	84.8	+0.3	+0.2
	Arrival Rwy 22	88.0	88.2	+0.2	
	Departure Rwy 04	81.2	81.6	-0.4	+0.2
	Departure Rwy 22	82.5	81.1	+0.4	
Bombardier Dash 8-Q400	Arrival Rwy 04	83.2	83.7	+0.5	-1.2
	Arrival Rwy 22	87.3	86.0	-1.3	
	Departure Rwy 04	82.2	81.1	-1.1	+0.5
	Departure Rwy 22	80.0	80.6	+0.6	
Embraer E175	Arrival Rwy 04	87.8	87.0	-0.8	-0.3
	Arrival Rwy 22	90.1	89.8	-0.3	
	Departure Rwy 04	89.6	88.9	-0.7	+1.1
	Departure Rwy 22	87.3	88.5	+1.2	
Embraer E190	Arrival Rwy 04	85.3	87.7	+2.4	-0.1
	Arrival Rwy 22	90.2	90.1	-0.1	
	Departure Rwy 04	89.5	88.6	-0.9	0.0
	Departure Rwy 22	87.8	87.8	0.0	

Table A2.4: Measured and Validated Predicted Noise Levels

Table A2.4 shows that with the validation modifications there is good correlation between measured and predicted noise levels with differences of less than 1.5 dB when results from both NMTs are operationally averaged.

The effect of the validation exercises on the contours depends both on the modifications made and the contribution of those aircraft types to the overall noise. Changes to infrequent aircraft types are likely to have very little effect on the contours.

SUMMARY

The validation of noise contours at George Best Belfast City Airport has been continually improved, more recently by checking predictions against the results obtained from GBBCA's noise monitors. This has demonstrated that without validation the standard INM assumptions would be less accurate.

The latest contours have taken into account over 5,000 individual aircraft noise measurements at GBBCA between October 2019 and September 2020, and measurements of the ATR72-600 for the period September 2020 to December 2020. This has identified the need to modify the standard INM assumptions for seven aircraft, the Airbus A319ceo, Airbus A320ceo, Airbus A320neo, ATR 72-600, Bombardier Dash 8-Q400, Embraer E175 and Embraer E190.

GBBCA will continue to collect further detailed information from the fixed noise monitors at Nettlefield Primary School and in Kinnegar, which will be used to regularly validate future GBBCA contours. This is in line with the EiP Panel's advice on contour validation.

Extension Charges for 2020

Timeband	Arr	Dep	Total	Charge	Cost
21:31 - 21:45	14	4	18	£100	£1,800
21:46 - 22:00	5	2	7	£125	£875
22:01 - 22:15	4	1	5	£150	£750
22:16 - 22:30	4	0	4	£300	£1,200
22:31 - 22:45	2	0	2	£400	£800
22:46 - 23:00	0	1	1	£550	£550
23:01 - 23:15	1	1	2	£700	£1,400
23:31 - 23:45	1	0	1	£900	£900
Total	**31**	**9**	**40**		**£8,275**

AIRPORT OPERATIONAL INSTRUCTION (AOI)

AOI-07

Issue 7.1

Subject:	**Aircraft Engine Ground Running and Use of Auxiliary Power Units and Ground Power Units**
Date of issue:	**08 April 2019**
Authorised by:	DocuSigned by: 14438788A10A4AE... **Michael McDowell, Airfield Operations Manager**

It is the responsibility of all employers to ensure that relevant Airport Operational Instructions (AOIs) and Operational Safety Notices (OSNs) are brought to the attention of their staff. However, individuals remain responsible for their own actions and those who are in doubt should consult their supervisor or manager within their own organisation.

1. Introduction

Belfast City Airport (BCA) is responsible for taking adequate measures to ensure the safety of aircraft, vehicles and persons using the airside environment.

Environmental Policy:
"Through its programme of sustainable development, GBBCA is committed to achieving a balance between the social and economic benefits of the airport's growth and its environmental impacts. We will work with all airport 'stakeholders', including statutory authorities, airlines, business partners and local residents to minimise the impact of our operations on the environment".

2. Distribution and Control

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BT3 9JH

Telephone: 028 9093 5006

3. Acronyms

AOI	Airport Operational Instruction
APU	Auxiliary Power Unit
ATC	Air Traffic Control
BCA	Belfast City Airport
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
FEGP	Fixed Electrical Ground Power
FOD	Foreign Object Debris
GPU	Ground Power Unit
OPS	Airfield Operations
OSN	Operational Safety Notice
SMS	Safety Management System

4. Requirements

Aircraft Engine Ground Running

Aircraft engine ground runs are required under certain conditions to enable engineers to certify that an aircraft is "fit for service".

However, engine ground runs cause both significant adverse impact on the environment and create hazards on the apron. They are therefore strictly controlled within the terms of the BCA Environmental Policy, and CAP 642 guidelines.

CAP 642 (Airside Safety Management) advises:
"Engine runs and check starts should be controlled and only carried out with prior approval of the aerodrome operator who should specify the conditions to be applied." This AOI outlines these conditions.

5. Definitions

Engine Ground Run

An engine ground run is defined in **CAP 642 (Airside Safety Management)** as:

"Any engine start-up not followed immediately by the departure of the aircraft concerned."

Person in Charge

The Person in Charge is that ground engineer in contact with the flight deck (usually via headset). This person has full view of the surrounding area and can indicate to the flight deck immediately to cut the engine power in the event of an incident or potential hazard.

Auxiliary Power Units (APU)

Small gas turbines normally mounted in the rear fuselage of most aircraft. They are used to power electrical systems on board, to run air circulation and conditioning systems and to supply bleed air for starting main engines before or during push back.

Mobile Ground Power Units (GPU)

A vehicle capable of supplying power to aircraft parked on the ground usually powered by diesel fuel.

Fixed Electrical Ground Power (FEGP)

Ground based power system which uses grid electricity. An electrical supply cable is plugged into the underside of the aircraft and draws its power from the airport's electricity supply.

6. Hazards

Engine ground runs present an extremely dangerous and complex operation. They carry a high risk of engine ingestion and pose a hazard to ramp personnel and vehicular traffic.

7. General Rules

It must always be ensured that:

- The 'Person in Charge' is in communication with the flight deck (ideally via a headset).
- All the aircraft wheels are chocked (aprons only).
- If on the main apron, the rear of stand roadway has been closed off.

Use of aircraft Auxiliary Power Units (APUs)

Aircraft APUs generate high levels of noise and significant fumes which can cause disturbance to those on nearby aprons, in buildings and in residential areas.

BCA has provided Fixed Electrical Ground Power (FEGP) on Stands 1–10 for the purpose of minimising levels of ambient noise and emissions.

On stands where FEGP is available, it must be used in preference to APUs, where possible.

Airlines and handlers are to ensure that APUs are used for the absolute minimum time necessary to meet operational needs.

APUs are not to be used as a substitute for either FEGP or GPUs.

Use of mobile Ground Power Units (GPUs)

Constantly running mobile GPUs can cause high noise levels on the apron, are an additional obstruction to free movement around a parked aircraft and, if poorly maintained, may deposit oil spillage on the stand.

BCA has provided FEGP on Stands 1–10 for the purpose of minimising levels of ambient noise and emissions.

On stands where FEGP is available, it must be used in preference to GPUs, where possible.

Where there is no alternative to the use of GPUs they should be parked outside the stand (when aircraft parked nose in) and promptly shut down when power is no longer required. The GPU should never be parked over a drain.

When purchasing new GPUs airlines and handling agents are urged to make low working noise levels a prime requirement in the selection process.

8. Approval

Aircraft Engine Ground Running

8.1 Aircraft Parked on Apron Areas (Main Apron & General Aviation Apron)

All engine ground runs shall be subject to the prior approval of Airfield Operations (extension **5027**). Airfield Operations (OPS) will record details electronically for audit purposes.

Requests to carry out engine ground runs must be made no later than 2130 hours' local time.

All engine ground runs are strictly prohibited between 2230 – 0600 hours.

Engine ground runs are permitted on apron areas at "engine idle" setting for short periods of time only. **All other engine runs including high powered runs** require the aircraft to be positioned to the north side of the airfield at "**Sierra"**.

A map illustrating the location of "Sierra" on the north side of the airfield is contained at **Annex A**.

Prior to making a request for permission to carry out an engine ground run the 'Person in Charge' must assess the surrounding area for potential hazards.

The 'Person in Charge' should then seek prior permission to conduct the engine ground run by contacting OPS (extension **5027**) or alternatively by contacting Flight Dispatch on the ground handling frequency. Flight Dispatch staff shall in turn contact OPS.

OPS will advise if the engine ground run is approved.

Once approval has been obtained pilots/engineers must seek permission to start engines from Air Traffic Control (ATC) – Radio contact must be maintained with ATC at all times.

8.2 Aircraft parked on "Sierra" (Airfield north side)

Engine ground runs in this area may be of a higher power.

Engine ground runs in this area are permitted between 0630 – 2130 hours. Pilots/engineers who wish to carry out engine grounds runs on the north side of the airfield between these hours should seek prior permission from OPS (extension **5027**).

If it is anticipated that a high powered engine run will be required between 2130 hours – 2230 hours, then permission must be sought from OPS (extension **5027**). A **request for an airfield extension** must also be sought from the BCA Duty Manager (extension **5053**).

Annex B sets out the 'Follow-me' procedure for engineers taxiing aircraft between the apron and Sierra.

8.3 Use of Auxiliary Power Units (APUs)

Use of APUs for aircraft maintenance purposes is strictly prohibited between 2230 – 0600 hours unless there is no alternative power source available (FEGP or GPU).

Should APU use be required outside of permitted hours (0600 hours – 2230 hours), prior approval must be sought from OPS (extension **5027**).

9. Safety

All personnel concerned with engine ground running must be fully conversant with this instruction, which must be complied with at all times.

The 'Person in Charge' of the engine ground run is responsible for ensuring the safety of personnel and equipment in the vicinity of the aircraft.

The use of aircraft strobe lighting is strictly prohibited during engine ground runs.

Consistent with CAA guidance, aircraft strobe lighting should not be displayed for any reason when an aircraft is on the apron or taxiway areas.

Any essential engineering work requiring a strobe light test shall only be carried out when the airport has closed.

9.1 Aircraft Parked on Apron Areas (Main Apron & General Aviation Apron)

The 'Person in Charge' of the engine ground run must ensure that all apron equipment is placed at a safe distance from the aircraft.

The aircraft must be positioned correctly on the stand in such a way that the engine running will not harm persons or cause damage to aircraft, buildings, installations, vehicles or equipment in the vicinity.

On the main apron, the rear of stand road must be closed to safeguard vehicular traffic, before the engine ground run is commenced. This must be undertaken by the airline engineering department or handling agent.

In the event that the closure of the rear of stand road will cause severe disruption to the timely dispatch of other aircraft, OPS may deny approval or request ATC to stop the engine ground run.

If aircraft are parked in a non-standard fashion (e.g. not nose in due to high winds) then all engine ground runs are prohibited on the main apron at this time.

The engine anti-collision beacons must be switched on for the duration of the engine ground run.

The 'Person in Charge' of the engine ground running activities must ensure that all the aircraft wheels are chocked and that the aircraft cannot move under any circumstances.

Engine ground running must not take place and must be ceased when passengers are being embarked/disembarked on any adjacent stands.

The 'Person in Charge' must be in communication with the flight deck at all times during engine ground runs. This will ensure that the engine(s) can be shut down if persons or vehicles move into a dangerous position in front of, behind or in the vicinity of a live engine.

In all instances where aircraft are unserviceable they must be relocated to the General Aviation apron or to the north side of the airfield.

9.2 Aircraft parked on "Sierra" (Airfield north side)

The aircraft must be positioned in such a way that the engine running will not harm persons or cause damage to aircraft, buildings, installations, vehicles or equipment in the vicinity. The aircraft must also be positioned within the white circle provided.

The "Person in Charge" must ensure that the ground area behind the aircraft is free from loose tarmac, stones and other materials.

The engine anti-collision beacon(s) must be switched on for the duration of the ground run.

The "Person in Charge" must be in communication with the flight deck at all times during engine ground runs. This will ensure that the engine(s) can be shut down if persons or vehicles move into a dangerous position in front of, behind or in the vicinity of a live engine.

NOTE: Where OPS find that the procedures outlined here are not being complied with, or where it is necessary in the interests of safety, they will request ATC, or directly to the 'Person in Charge', to have the engine ground run halted.

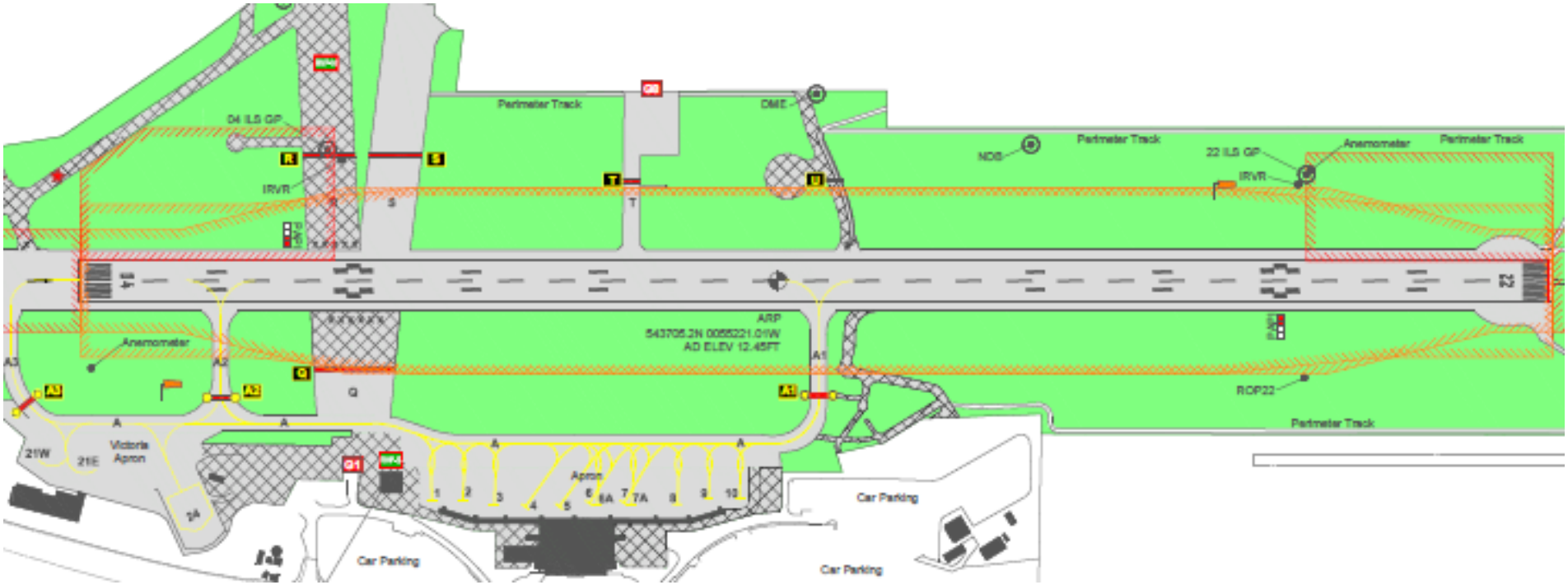
10. Monitoring of Standards

BCA, as the Airport Authority, operates a cautioning mechanism in airside areas.

Where individuals are found to be in breach of regulations, they may be subject to a Written Caution, which shall be formally recorded. This may also involve the issuing of penalty points

Airside Penalty Points will be issued in accordance with **AOI 05 – Airside Safety Regulation Scheme** which contains a sample Caution Slip.

ANNEX A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IRVR
Perimeter Track
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NDB
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22 ILS GP
Anemometer
Perimeter Track
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Car Parking

ANNEX B

‘Follow-me’ Procedures	
1.	OPS contact ATC and pass the following information: Aircraft registration, type, current stand, and destination e.g. Sierra.
2.	When pushback clearance is received, OPS pass this on to pushback crew (verbally). OPS then move to the ROSR (to halt vehicle movements) and when in place give ‘thumbs-up’ for the pushback to commence.
3.	When the pushback is complete and all equipment and personnel are clear of the aircraft, the pushback team signal to engineers and OPS. OPS now position their ops vehicle in front of the aircraft (so the vehicle is visible from the cockpit).
4.	When the engineers are ready to taxi they should signal to the ops vehicle with their taxi light.
5.	OPS will now request permission to escort aircraft to destination.
6.	On receiving positive clearance, OPS will illuminate the ‘Follow-me’ sign on top of the Ops vehicle and move off slowly. The aircraft will follow. The engineers must keep a listening watch on the frequency so they are aware of clearance i.e. holding point only, or full clearance to Sierra.
7.	Once both ops vehicle and aircraft are clear of the holding point the ops vehicle will call runway vacated. The airline engineers will self-position the aircraft in the circle provided.
8.	Engineers must follow the safety instructions detailed in AOI-07.
9.	OPS are not required to remain with the engineers during the engine runs.
10.	Engineers should contact OPS by telephone when the engine run is complete.
11.	OPS will position the ops vehicle in front of the aircraft and contact ATC for clearance to cross the runway to the allocated stand.
12.	Once positive clearance has been received the ‘follow-me’ sign will be switched on.
13.	The allocated stand should be checked for FOD and stand guidance activated where appropriate.
14.	Once aircraft is on stand OPS will report taxiway and runway vacated.
Exceptions	
15.	If this procedure is from stand 21 then the aircraft engineer will contact ATC and ask for start-up. Then follow points 4 – 14.
16.	If LVPs are in force, then ATC will refer to AOI-12 and MATS part 2.
17.	Overspeed checks may be carried out on the taxiway at the discretion of ATC.

Count of Registration Month	High	Low	Grand Total
Jan	6	14	20
Feb	2	10	12
Mar		28	28
Apr		30	30
May		32	32
Jun	1	24	25
Aug	1	8	9
Sep	8	13	21
Oct	2	10	12
Nov	8	11	19
Dec		6	6
Grand Total	**28**	**186**	**214**

Date	Month	Registration	Start Time	Finish Time	Stand	Power
02-Jan-20	Jan	GECOD	09:40	09:45	21	Low
02-Jan-20	Jan	GECOD	10:40	10:50	Sierra	High
03-Jan-20	Jan	GPRPL	08:48	08:53	Sierra	High
03-Jan-20	Jan	GECOD	10:50	11:07	Sierra	High
12-Jan-20	Jan	GPRPC	08:50	09:05	Sierra	High
12-Jan-20	Jan	GPRPH	20:53	20:59	10	Low
13-Jan-20	Jan	GPRPC	09:20	09:27	Sierra	High
15-Jan-20	Jan	GPRPO	14:23	14:29	08	Low
15-Jan-20	Jan	GECOP	14:22	14:29	08	Low
16-Jan-20	Jan	GJECM	22:00	22:10	01	Low
17-Jan-20	Jan	GJEDW	11:20	11:25	08	Low
18-Jan-20	Jan	GJECM	09:40	09:55	7a	Low
19-Jan-20	Jan	GJEDU	20:07	20:10	7a	Low
19-Jan-20	Jan	GFLBE	20:34	20:37	09	Low
21-Jan-20	Jan	EIGHK	06:32	06:35	6a	Low
22-Jan-20	Jan	EIGHK	06:30	06:35	08	Low
22-Jan-20	Jan	GJECO	21:06	21:12	02	Low
24-Jan-20	Jan	GPRPE	19:00	19:04	10	Low
30-Jan-20	Jan	GECOI	08:55	09:00	Sierra	High
30-Jan-20	Jan	G-FLBE	21:50	21:55	08	Low
01-Feb-20	Feb	GPRPO	16:26	16:32	01	Low
05-Feb-20	Feb	GJECK	12:30	12:35	10	Low
06-Feb-20	Feb	GJECK	07:47	07:50	08	Low
06-Feb-20	Feb	GJECK	09:30	09:40	08	Low
06-Feb-20	Feb	GJECK	09:31	09:41	08	Low
07-Feb-20	Feb	GJECK	08:49	08:54	08	Low
07-Feb-20	Feb	GJECK	08:50	08:55	08	Low
07-Feb-20	Feb	GPRPO	19:22	19:38	Sierra	High
07-Feb-20	Feb	GPRPO	19:22	19:40	Sierra	High
18-Feb-20	Feb	GJECN	09:10	09:17	02	Low
21-Feb-20	Feb	GPRPN	22:00	22:05	01	Low
27-Feb-20	Feb	GECOA	08:02	08:06	08	Low
01-Mar-20	Mar	GJECN	08:09	08:11	08	Low
12-Mar-20	Mar	GPRPB	09:40	10:06	24	Low
12-Mar-20	Mar	GFLBA	11:10	11:33	10	Low
13-Mar-20	Mar	GJEDU	11:50	12:03	Sierra	Low
13-Mar-20	Mar	GPRPF	12:44	12:48	01	Low
13-Mar-20	Mar	GJEDT	12:54	13:00	02	Low
13-Mar-20	Mar	GPRPE	13:18	13:24	09	Low
18-Mar-20	Mar	GPRPB	09:05	09:36	24	Low

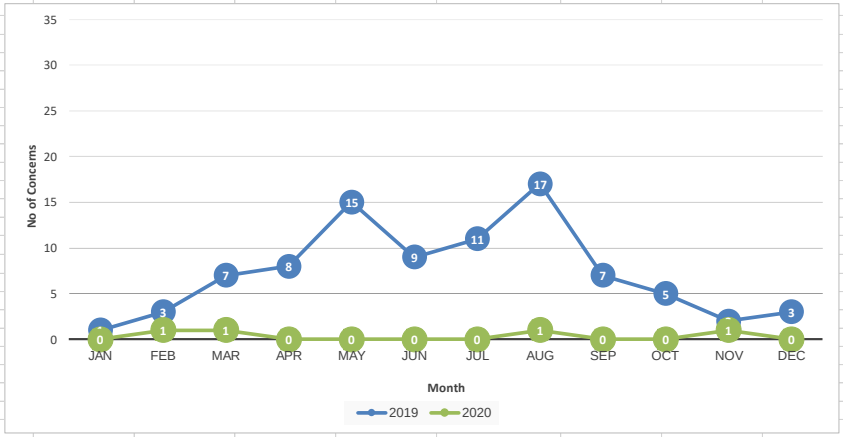
18-Mar-20	Mar	GFLBA	11:00	11:40	10	Low
19-Mar-20	Mar	GPRPG	08:44	09:12	Sierra	Low
19-Mar-20	Mar	GJEDT	14:08	14:49	Sierra	Low
19-Mar-20	Mar	GJEDT	14:08	14:49	Sierra	Low
19-Mar-20	Mar	GJEDU	11:15	11:45	Sierra	Low
19-Mar-20	Mar	GFLBA	12:10	12:15	10	Low
20-Mar-20	Mar	GPRPF	09:15	09:58	Sierra	Low
20-Mar-20	Mar	GPRPE	10:10	10:50	Sierra	Low
23-Mar-20	Mar	GPRPB	10:20	10:45	Sierra	Low
23-Mar-20	Mar	GJEDU	11:12	11:52	Sierra	Low
24-Mar-20	Mar	GFLBA	09:39	10:13	10	Low
24-Mar-20	Mar	GPRPG	13:58	14:28	Sierra	Low
24-Mar-20	Mar	GFLBA	16:23	16:27	10	Low
25-Mar-20	Mar	GPRPE	09:40	10:24	Sierra	Low
26-Mar-20	Mar	GJEDU	09:35	09:55	Sierra	Low
26-Mar-20	Mar	GPRPF	10:00	10:20	Sierra	Low
30-Mar-20	Mar	GJEDU	10:00	10:31	Sierra	Low
30-Mar-20	Mar	GPRPB	10:36	11:07	Sierra	Low
31-Mar-20	Mar	GPRPG	13:12	13:45	Sierra	Low
31-Mar-20	Mar	GFLBA	14:00	14:30	10	Low
01-Apr-20	Apr	GPRPE	10:25	10:31	Sierra	Low
01-Apr-20	Apr	GPRPE	10:25	11:10	Sierra	Low
01-Apr-20	Apr	GJEDT	10:35	11:10	Sierra	Low
01-Apr-20	Apr	GJEDT	10:35	11:10	Sierra	Low
03-Apr-20	Apr	GPRPB	09:30	10:05	Sierra	Low
03-Apr-20	Apr	GPRPF	09:30	10:06	Sierra	Low
03-Apr-20	Apr	GJEDU	10:07	10:30	Sierra	Low
06-Apr-20	Apr	GFLBA	09:25	10:00	10	Low
06-Apr-20	Apr	GPRPG	10:30	11:00	Sierra	Low
08-Apr-20	Apr	GPRPG	09:01	09:06	Sierra	Low
08-Apr-20	Apr	GJEDT	10:24	10:41	Sierra	Low
09-Apr-20	Apr	GPRPB	09:53	10:53	Sierra	Low
09-Apr-20	Apr	GJEDU	10:00	10:35	Sierra	Low
17-Apr-20	Apr	GPRPB	09:35	10:00	Sierra	Low
20-Apr-20	Apr	GPRPG	08:55	09:33	Sierra	Low
20-Apr-20	Apr	GFLBA	10:00	10:41	10	Low
22-Apr-20	Apr	GJEDT	09:41	10:15	Sierra	Low
22-Apr-20	Apr	GPRPE	09:41	10:15	Sierra	Low
23-Apr-20	Apr	GPRPF	09:15	09:50	Sierra	Low
23-Apr-20	Apr	GJEDU	09:15	09:50	Sierra	Low
23-Apr-20	Apr	GPRPB	10:40	11:10	Sierra	Low
24-Apr-20	Apr	EIDES	10:45	11:05	24	Low
27-Apr-20	Apr	GPRPG	09:05	09:38	Sierra	Low
27-Apr-20	Apr	GFLBA	10:58	11:18	10	Low
27-Apr-20	Apr	GFLBA	12:12	12:20	10	Low
27-Apr-20	Apr	GFLBA	12:27	12:32	10	Low
29-Apr-20	Apr	GJEDT	08:30	09:02	Sierra	Low
29-Apr-20	Apr	GPRPE	09:34	10:03	Sierra	Low
30-Apr-20	Apr	GPRPF	08:32	09:01	Sierra	Low
30-Apr-20	Apr	GJEDU	09:44	10:12	Sierra	Low
01-May-20	May	GPRPB	09:33	10:04	Sierra	Low
01-May-20	May	EIDEN	09:48	10:11	7a	Low
04-May-20	May	GPRPG	08:35	09:10	Sierra	Low
04-May-20	May	GFLBA	10:10	10:45	10	Low
06-May-20	May	GJEDT	09:30	10:10	Sierra	Low
06-May-20	May	GPRPE	10:20	11:00	Sierra	Low
06-May-20	May	GFLBA	11:45	11:52	10	Low
07-May-20	May	GJEDU	09:30	10:14	Sierra	Low
07-May-20	May	GPRPF	09:30	10:15	Sierra	Low

08-May-20	May	GPRPB	09:40	10:20	Sierra	Low
11-May-20	May	GPRPG	09:04	09:44	24	Low
11-May-20	May	GFLBA	11:04	11:44	10	Low
13-May-20	May	GPRPE	08:55	09:25	Sierra	Low
13-May-20	May	GJEDT	09:35	10:05	Sierra	Low
13-May-20	May	GPRPF	10:15	10:45	Sierra	Low
14-May-20	May	GJEDT	09:10	09:40	Sierra	Low
15-May-20	May	GPRPB	09:47	10:17	Sierra	Low
15-May-20	May	EIDVJ	09:58	10:25	6a	Low
18-May-20	May	GPRPB	08:42	09:09	Sierra	Low
18-May-20	May	GFLBA	09:14	09:55	10	Low
18-May-20	May	GFLBA	15:53	16:03	10	Low
21-May-20	May	GPRPF	09:30	10:00	Sierra	Low
21-May-20	May	GJEDU	09:30	10:00	Sierra	Low
22-May-20	May	GPRPB	08:30	09:10	Sierra	Low
22-May-20	May	GFLBA	09:37	09:42	10	Low
22-May-20	May	GFLBA	13:45	14:30	10	Low
24-May-20	May	EIDES	10:30	10:55	24	Low
25-May-20	May	GPRPG	10:10	10:45	Sierra	Low
28-May-20	May	GPRPE	09:20	09:55	Sierra	Low
28-May-20	May	GPRPF	10:10	10:50	Sierra	Low
29-May-20	May	GJEDU	09:15	09:55	Sierra	Low
29-May-20	May	GPRPB	10:05	10:45	Sierra	Low
01-Jun-20	Jun	GPRPG	09:59	09:45	Sierra	Low
01-Jun-20	Jun	EIDEN	10:30	11:00	07	Low
01-Jun-20	Jun	EIDEJ	14:24	14:30	05	Low
02-Jun-20	Jun	GPRPE	09:25	09:54	Sierra	Low
03-Jun-20	Jun	GJEDT	09:30	10:10	Sierra	Low
04-Jun-20	Jun	GPRPF	09:30	10:00	Sierra	Low
05-Jun-20	Jun	GPRPB	09:52	10:30	Sierra	Low
05-Jun-20	Jun	GJEDU	09:52	10:30	Sierra	Low
08-Jun-20	Jun	GPRPG	09:25	09:52	Sierra	Low
08-Jun-20	Jun	GPRPE	13:00	13:28	Sierra	Low
08-Jun-20	Jun	GPRPE	14:32	14:40	Sierra	Low
09-Jun-20	Jun	GPRPF	09:30	10:00	Sierra	Low
11-Jun-20	Jun	GPRPE	09:40	10:25	Sierra	Low
12-Jun-20	Jun	GPRPB	08:35	08:55	Sierra	Low
12-Jun-20	Jun	EIDVJ	10:05	10:28	6a	Low
15-Jun-20	Jun	GPRPF	09:14	09:45	Sierra	Low
15-Jun-20	Jun	GPRPG	12:16	12:45	Sierra	Low
16-Jun-20	Jun	GJEDT	08:48	09:25	Sierra	Low
19-Jun-20	Jun	GJEDT	12:45	13:23	Sierra	Low
22-Jun-20	Jun	GPRPG	09:56	10:23	Sierra	Low
22-Jun-20	Jun	EIDES	11:14	11:37	24	Low
22-Jun-20	Jun	GPRPB	12:33	13:01	21	Low
24-Jun-20	Jun	GJEDT	10:40	11:07	Tango	Low
25-Jun-20	Jun	GPRPB	11:25	11:41	Sierra	Low
30-Jun-20	Jun	EIDES	12:30	13:20	Sierra	High
12-Aug-20	Aug	EIFAW	13:33	13:47	08	Low
12-Aug-20	Aug	EIFAT	14:04	14:14	09	Low
12-Aug-20	Aug	EIFAS	14:21	14:37	10	Low
26-Aug-20	Aug	EIFAS	17:15	17:25	09	Low
27-Aug-20	Aug	EIFAT	17:40	17:50	v1	Low
28-Aug-20	Aug	EIFAW	15:37	15:45	21	Low
28-Aug-20	Aug	EIFAW	17:05	17:15	02	Low
29-Aug-20	Aug	EIFAW	10:30	10:37	02	Low
29-Aug-20	Aug	EIFAW	11:30	12:00	Sierra	High
04-Sep-20	Sep	EIFAS	20:25	20:35	08	Low
05-Sep-20	Sep	EIFAS	11:58	12:05	08	Low

08-Sep-20	Sep	EIFCZ	15:35	15:40	02	Low
09-Sep-20	Sep	EIFAS	13:05	13:08	08	Low
11-Sep-20	Sep	EIFAS	14:32	14:32	08	Low
11-Sep-20	Sep	EIFAS	14:38	14:42	08	Low
11-Sep-20	Sep	EIFAX	19:20	19:25	10	Low
15-Sep-20	Sep	EIFAX	15:21	15:35	Sierra	High
15-Sep-20	Sep	EIFAX	15:26	15:35	Sierra	High
16-Sep-20	Sep	EIFCZ	19:50	20:15	Sierra	High
17-Sep-20	Sep	EIFAX	15:20	15:30	03	Low
17-Sep-20	Sep	EIFAX	20:10	20:20	Sierra	High
23-Sep-20	Sep	EIFAX	15:20	15:25	08	Low
27-Sep-20	Sep	EIFAT	20:31	20:43	09	Low
28-Sep-20	Sep	EIFCY	18:03	18:08	10	Low
29-Sep-20	Sep	EIFAX	16:25	16:40	24	Low
29-Sep-20	Sep	EIFAX	16:30	16:38	24	Low
30-Sep-20	Sep	EIFAX	09:40	10:02	Sierra	High
30-Sep-20	Sep	EIFAX	09:46	10:04	Sierra	High
30-Sep-20	Sep	EIFAX	10:06	10:11	Sierra	High
30-Sep-20	Sep	EIFAX	16:30	16:40	Sierra	High
01-Oct-20	Oct	EIFAX	15:50	16:12	Sierra	High
03-Oct-20	Oct	EIFAX	14:10	14:35	Sierra	High
04-Oct-20	Oct	EIFAW	11:48	12:09	03	Low
05-Oct-20	Oct	EIFCY	13:04	13:10	09	Low
08-Oct-20	Oct	EIFCY	08:15	08:22	09	Low
09-Oct-20	Oct	EIFAW	17:28	17:38	21	Low
13-Oct-20	Oct	EIDVG	10:40	10:55	6a	Low
17-Oct-20	Oct	EIFAU	15:01	15:10	08	Low
17-Oct-20	Oct	EIFAW	16:39	16:45	09	Low
18-Oct-20	Oct	EIFAW	12:05	12:10	09	Low
21-Oct-20	Oct	EIFAT	19:58	19:54	01	Low
28-Oct-20	Oct	EIFAX	18:47	18:55	02	Low
04-Nov-20	Nov	EIFAW	16:07	16:15	24	Low
04-Nov-20	Nov	EIFAX	16:49	16:59	10	Low
04-Nov-20	Nov	EIFAW	18:40	18:43	Sierra	High
06-Nov-20	Nov	EIFAT	08:32	08:40	01	Low
06-Nov-20	Nov	EIFAW	08:55	09:02	03	Low
06-Nov-20	Nov	EIFAX	12:32	12:31	10	Low
06-Nov-20	Nov	EIFAX	15:32	15:39	Sierra	High
07-Nov-20	Nov	EIFAX	09:26	09:31	10	Low
07-Nov-20	Nov	EIFAX	15:28	15:42	Sierra	High
08-Nov-20	Nov	EIFAU	13:18	13:22	09	Low
08-Nov-20	Nov	EIFAX	16:38	16:57	Sierra	High
11-Nov-20	Nov	EIFCY	08:15	08:25	08	Low
12-Nov-20	Nov	EIFAX	16:08	16:18	01	Low
13-Nov-20	Nov	EIFAX	10:36	10:51	Sierra	High
14-Nov-20	Nov	EIFAX	08:29	08:39	Sierra	High
15-Nov-20	Nov	EIFCZ	19:35	19:51	Sierra	High
15-Nov-20	Nov	EIFAW	20:36	20:43	09	Low
17-Nov-20	Nov	EIFAX	10:44	11:02	Sierra	High
25-Nov-20	Nov	SEDJI	20:50	20:53	21	Low
03-Dec-20	Dec	EIFCZ	16:40	16:50	01	Low
04-Dec-20	Dec	EIFAX	09:20	09:25	09	Low
10-Dec-20	Dec	EIFSL	17:15	17:25	02	Low
12-Dec-20	Dec	EIFSL	07:43	07:54	09	Low
19-Dec-20	Dec	EIFAS	11:00	11:05	08	Low
19-Dec-20	Dec	EIFAU	14:27	14:36	09	Low

Concerns by Type and Area, 2020																
Area	Bias over City / Flight paths	Low	Noise	Track keeping	After 2130	Disturbed Sleep / Pre-0700 / Early / Weekend	Aircraft Type / Size	Frequency / Too many flights	Ground Noise	Air Quality / Pollution	Specific Aircraft	Other	TOTAL Concerns by Area	% Concerns by Area	TOTAL Individuals logging Concerns By Area	Concern Area by Runway End
Comber / D'adee / Bangor / Dundonald													0	0%		Lough
Carnalea / Crawfordsburn													0	0%		Lough
Helen's Bay													0	0%		Lough
Craigavad													0	0%		Lough
Seahill / Cultra / Marino													0	0%		Lough
Holywood													0	0%		Lough
Kinnegar													0	0%		Lough
Knocknagoney / Old Holywood Road													0	0%		Lough
Sydenham / Inverary				1									1	1%	1	City
Ballymacarret													0	0%		City
City Centre													0	0%		City
Beersbridge / Albertbridge													0	0%		City
Newtownards Road / Ballymacarret / Connswater					1								1	1%	1	City
Donegall Road													0	0%		City
Ravenhill / Cregagh / Castlereagh			1										1	1%	1	City
Ormeau / Annadale													0	0%		City
Stranmillis / Malone	1												1	1%	1	City
Drumbeg / Tullyard													0	0%		City
G'wally / C'duff / N'breda / K'breda / Rosetta / Four Winds													0	0%		City
Not Given													0	0%		Not given
TOTALS	1	0	1	1	1	0	0	0	0	0	0	0	4	3%	4	
Percent	25%	0%	25%	25%	25%	0%	0%	0%	0%	0%	0%	0%	100%			

Concerns by Month		
	2019	2020
Jan	1	0
Feb	3	1
Mar	7	1
Apr	8	0
May	15	0
Jun	9	0
Jul	11	0
Aug	17	1
Sep	7	0
Oct	5	0
Nov	2	1
Dec	3	0
Total	88	4



Type	Model	Serial No.	Calibration Date	Certificate No.	Lab/On-site Calibration	Notes
Meter	NOR-118	32112	26/02/20	34181	On-site calibration	In use at NMT1 Kinnegar
Pre-amp	GRAS-41AM	56262	26/02/20	34181	On-site calibration (with 32112)	In use at NMT1 Kinnegar
Mic	GRAS-42AS	69414	26/02/20	34181	On-site calibration (with 32112/56262)	In use at NMT1 Kinnegar
Meter	NOR-118	32117	26/02/20	34180	On-site calibration	In use at NMT2 Nettlefield
Pre-amp	GRAS-41AM	95491	26/02/20	34180	On-site calibration (with 32117)	In use at NMT2 Nettlefield
Mic	GRAS-42AS	73643	26/02/20	34180	On-site calibration (with 32117/95491)	In use at NMT2 Nettlefield

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Certificate of Field Calibration

Certificate Number:- 34180

Test Object:	**Sound Level Meter Class 1 (Precision)**
Manufacturer:	**Norsonic**
Type:	**118**
Serial no:	**32117 NMT1 - Nettlefield**
Customer:	Belfast City Airport
Address:	Sydenham Bypass Belfast
Contact Person	Ian Nuttall

Method:

The unit's absolute acoustic sensitivity has been set in accordance with the manufacturer's recommendations using an associated calibrator. A series of acoustic tests have then been performed to verify the performance of the unit over its operating range. The units self noise has also be verified. The results of these tests are detailed overleaf.

	Producer:	Type:	Serial No:	Certificate number:
Microphone:	GRAS	41AM	95491	Included
Calibrator:	Norsonic	1251	30873	U33781

Additional items that have been used for verification:

Multi-frequency calibrator	Nor-1253	Serial No:	27765
Calibrator	Nor-1257	Serial No:	125725145
Calibrator	Nor-1253	Serial No:	21816
Calibration coupler for GRAS-41AM	GRAS-RA0009	Serial No:	429
Dummy microphone	GRAS-RA0041		

These items have been taken into account wherever possible.

Date of calibration	26/02/2020
Date of issue	27/02/2020

Engineer

[redacted]

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Certificate of Field Calibration

Certificate Number:- 34181

Test Object:	**Sound Level Meter Class 1 (Precision)**
Manufacturer:	**Norsonic**
Type:	**118**
Serial no:	**32112 - Mobile Noise Monitor**
Customer:	Belfast City Airport
Address:	Sydenham Bypass Belfast
Contact Person	Ian Nuttall

Method:

The unit's absolute acoustic sensitivity has been set in accordance with the manufacturer's recommendations using an associated calibrator. A series of acoustic tests have then been performed to verify the performance of the unit over its operating range. The units self noise has also be verified. The results of these tests are detailed overleaf.

	Producer:	Type:	Serial No:	Certificate number:
Microphone:	GRAS	41AM	56262	Included
Calibrator:	Norsonic	1251	30873	U33781

Additional items that have been used for verification:

Multi-frequency calibrator	Nor-1253	Serial No:	27765
Calibrator	Nor-1257	Serial No:	125725145
Calibrator	Nor-1253	Serial No:	21816
Calibration coupler for GRAS-41AM	GRAS-RA0009	Serial No:	429
Dummy microphone	GRAS-RA0041		

These items have been taken into account wherever possible.

Date of calibration	26/02/2020
Date of issue	27/02/2020

Engineer

[redacted]