RSP | Manston Airport

Manston Airport Airspace Design and Procedures

Initial Options Appraisal

Issue 3

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Glossary

Acronym	Meaning
aal	above aerodrome level
ACP	Airspace Change Proposal
AEDT	Aviation Environment Design Tool
AIP	Aeronautical Information Publication
AMS	Airspace Modernisation Strategy
ANSP	Air Navigation Service Provider
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
AQS	Air Quality Standards
ATC	Air Traffic Control
ATM	Air Transport Movement
ATS	Air Traffic Service
ATZ	Aerodrome Traffic Zone
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CAS	Controlled Airspace
CNS	Communication, Navigation and Surveillance
dB	Decibel
DCO	Development Consent Order
DfT	Department for Transport
FAA	Federal Aviation Administration (US)
FASI-S	Future Airspace Strategy Implementation - South

Glossary (continued)

Acronym	Meaning
FIR	Flight Information Region
ft	feet
GA	General Aviation
GDP	Gross Domestic Product
HazID	Hazard Identification
ICAO	International Civil Aviation Organisation
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INM	Integrated Noise Model
LOA	Letter of Agreement
LOAEL	Lowest Observed Adverse Effect Level
m	Metre(s)
MOU	Memorandum of Understanding
MAP	Missed Approach Procedure
NATS	formerly National Air Traffic Services
NDB	Non-Directional Beacon
NSIP	Nationally Significant Infrastructure Project
PEIR	Preliminary Environmental Information Report
PM	Particulate Matter
RNAV	Area Navigation
RSP	RiverOak Strategic Partners Ltd

Glossary (continued)

Acronym	Meaning
SAC	Special Area of Conservation
SID	Standard Instrument Departure
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
WHO	World Health Organisation

1. Introduction

1.1 Introduction

The Manston Airport Airspace Design and Procedures project is currently at Stage 2 – Develop and Assess – of the Civil Aviation Publication (CAP) 1616 Airspace Design process. Step 2B requires the change sponsor to carry out an 'Initial Options Appraisal' of the impacts of each of the options identified in Step 2A.

This document provides a narrative explanation of steps taken in Step 2B. The full analysis of the options is contained in the Initial Options Appraisal Table Issue 1, that can be found alongside this document on the Civil Aviation Authority (CAA) airspace portal:
https://airspacechange.caa.co.uk/PublicProposalArea?pID=112

The Initial Options Appraisal was carried out on the long list of options. The results are shown in Table 8, Section 7 and are colour coded to identify the rejected options, the preferred options and the alternative viable options, all considered during the CAP 1616 Stage 2 – Develop and Assess phase.

1.2 Background

Manston Airport is a disused airport on the Isle of Thanet in Kent. RiverOak Strategic Partners (RSP) is proposing to secure the future of the airport by redeveloping and reopening it as a successful hub for international air freight which also offers passenger travel, executive travel and aircraft engineering services.

RSP has applied to the Planning Inspectorate for a Development Consent Order (DCO) to build Manston Airport. In addition, RSP must also secure approval from the CAA, through the CAP 1616 process, for its use of any airspace and/or procedures.

This document relates only to the CAP 1616 process and the proposal to introduce the airspace and Instrument Flight Procedures (IFPs) required to enable safe and efficient operations to and from the airport.

1.3 CAP1616 Airspace Change Process

The implementation of any changes to UK airspace is subject to the guidance contained in CAP 1616. CAP 1616 is a seven-stage process published by the CAA that provides guidance on the steps to follow when seeking to change the way airspace is used. The whole Manston Airport CAP 1616 process is envisaged to take approximately 3 years. The seven stages of the process are as follows:

- Stage 1 – Define
- Stage 2 – Develop and Assess (current stage)
- Stage 3 – Consultation
- Stage 4 – Update and Submit
- Stage 5 – Decide
- Stage 6 - Implement
- Stage 7 – Post-Implementation Review

The project is currently at Stage 2 which requires the development of options that seek to meet the original Statement of Need. The options are required to align, where practicable, with the Design Principles generated in Stage 1. These options are then assessed to understand the positive/negative impacts before progressing to the Stage 2 Gateway.

1.4 Progress So Far

In November 2018, RSP submitted a Statement of Need to the CAA. This is the formal explanation as to why the Airport wishes to change the airspace. The CAA indicated that an airspace change was an appropriate mechanism to achieve the objectives in RSP's Statement of Need. A copy of the Statement of Need and other associated documentation can be viewed on the CAA airspace portal.

At the end of February 2020, the first stage in the change process was successfully completed when the Airport's submission passed through the Stage 1 Define Gateway.

The work undertaken during Stage 1 established a prioritised shortlist of Design Principles to act as a framework against which Design Options have been drawn up. The prioritised list of Design Principles can be found in the documents uploaded at Stage 1B on the portal.

1.5 Step 2A – Options Development

1.5.1 Introduction

During Step 2A, RSP developed a list of design options for the new procedures. The options took into account the fixed constraints identified during Stage 1A and the Design Principles established in Stage 1B.

1.5.2 Constraints

Four constraints were identified as being applicable:

- C1: Instrument Flight Procedures must be safe.
- C2: Instrument Flight Procedures must be PANS-OPS 8168 compliant.
- C3: The airspace solution must integrate with Future Airspace Strategy Implementation (South) – FASI-S[1].
- C4: Fixed runway position.

1.5.3 Application of the Constraints to the Options Development

The Instrument Flight Procedures (IFP) must be safe **(C1)** and therefore the designers have to take into account the minimum requirements for separation from terrain and obstacles, and from other procedures/volumes of airspace. Stakeholder input was sought at the beginning of Step 2A from Air Navigation Service Providers (ANSP) and FASI-S co-sponsors to elicit specific details of where possible routes to and from Manston Airport could interact with their procedures and operations. The primary means by which it is intended to provide safety assurance to support the options is a Safety Case developed in accordance with CAP 760[2]. Detail on the Safety Assessment is contained in Section 8 of this document.

The requirement for all design options to be PANS-OPS 8168 compliant **(C2)** means that the parameters of the IFPs e.g. shape, accuracy, turn areas and obstacle clearances are predetermined (to a degree) in ICAO document *PANS OPS 8168 Aircraft Operations - Volume 2 Construction of Visual and Instrument Flight Procedures.* This document details the international standard for all IFPs, and must be designed by a CAA Approved Procedure Designer (APD).

Constraints **C3** (Integration with FASI-S) and **C4** (Fixed Runway position) are the necessary starting points for developing the design options to enable full connectivity between Manston Airport and the en-route airways network:

- The runway position is fixed and designated 10/28; this means that the runway orientation is on a bearing of 100° (the 10 direction) and the opposite direction 280° (the 28 direction). The runway direction in use on a given day is selected based on a range of factors including, but not limited to, wind direction. Aircraft generally take-off and land in the same direction i.e. into the wind. Runway direction may change during the day if the wind changes. In favourable wind conditions, it may be possible for aircraft to land on Runway 10 and take off from Runway 28 (aircraft landing from, and taking off to, the west) in order to limit the noise impact on the nearby town of Ramsgate.

[1] FASI-S is the umbrella name for the concept to modernise air traffic services (ATS) in the south east of England. This is a collaborative exercise between 15 airports, and NATS as the UK's en-route air navigation services provider (ANSP).

[2] CAP 760: Guidance on the Conduct of Hazard identification, Risk Assessment and the Production of Safety Cases: For Aerodrome Operators and Air Traffic Service Providers

- Traffic departing from Manston Airport must fly straight ahead on runway heading until achieving 500 feet (ft) above aerodrome level (aal) before any turns are permitted. Aircraft will then follow a series of turns and straight sections known as a Standard Instrument Departure (SID), which finishes at an airway's entry point.
- Traffic arriving at Manston Airport leave the airways at fixed points and fly a Transition route to join an Approach procedure, which ends in a straight section lined up to the runway.

1.5.4 High-Level Design Criteria

In accordance with the requirements in paragraph E18 of CAP 1616, a set of high-level criteria was developed from the Design Principles to support the design process; the application of these criteria to the initial comprehensive list (tested with the stakeholders) generated the long list of designs to take forward to Design Principle Evaluation. The best practice guidance contained in the government Green Book[3] was used to develop five high-level objectives or criteria. These criteria are listed below along with the quantitative 'measures' used to gauge each option against the objective:

- Ob 1: The option shall be acceptably safe
  - o Obstacle clearance, other procedures/airspace, PANS-OPS 8168
- Ob 2: The option must accord with the Airspace Modernisation Strategy and any associated plans
  - o FASI-S
- Ob 3: Minimise the impact of noise
  - o Numbers overflown
  - o Noise sensitive areas
  - o Multiple routes to spread the noise burden equitably
- Ob 4: Minimise the impact on other airspace users
- Ob 5: Minimise emissions
  - o Facilitates optimum aircraft power to minimise greenhouse gases and air quality effects
  - o Enables continuous climb and descent operations
  - o Minimise track miles

1.6 Step 2A – Design Principle Evaluation

Each of the procedure options developed have been assessed against the prioritised list of Design Principles developed in Stage 1. The Design Principles Evaluation shows to what extent the options meet the Design Principles and can be found at Step 2A on the CAA airspace portal.

Any options taken forward **must** be designed to meet acceptable levels of flight safety (Design Principle 1) and accord with the CAA's published Airspace Modernisation Strategy and any current or future plans associated with it (Design Principle 2). If an individual option was assessed as not meeting these highest priority Design Principles, it was not taken forward to Step 2B. Regardless of how the individual options respond to the other Design Principles, if an option is assessed to meet Design Principles 1 and 2, it is considered to be a viable option and will be accepted to go forward to the Initial Options Appraisal.

1.7 Step 2B – Initial Options Appraisal

At Step 2B, the long list of procedure options was tested against the criteria contained in CAP 1616, Appendix E, Table E2, with the addition of a Qualitative Safety Assessment and a Qualitative Noise Assessment as required for a Level 1 change at this stage.

The methodology used for the Initial Options Appraisal is discussed in Section 2.

The Initial Options Appraisal is summarised in Section 7 and it resulted in a shortlist of options to be taken forward to Stage 3 for detailed technical design and consultation. The Shortlist is contained in Section 9.

[3] The Green Book: appraisal and evaluation in central government:
https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

2. Guidance and Methodology for Options Appraisal

2.1 CAP 1616 Options Appraisal Requirements

The Options Appraisal process was carried out in accordance with the guidance in CAP 1616, and in conjunction with The Green Book[4] and the Department of Transport's WebTAG[5], which constitute best practice in options appraisal.

Options Appraisal is used as an iterative tool throughout the CAP 1616 process to help refine the options from an initial long list, down to a short list and a final set of preferred options.

The appraisal process typically consists of the following elements:

- High-level objective and assessment criteria
- Baseline definition – current operations
- Long list of options (including a do-nothing/minimum option)
- Shortlist of options
- Preferred or final option(s)

The Options Appraisal requirement of CAP 1616 evolves through three iterations with the CAA reviewing at each phase as follows:

1. 'Initial' appraisal at Step 2B with the CAA review at the Stage 2 – Develop and Assess gateway;
2. 'Full' appraisal at Step 3A with the CAA review at Step 3B and the subsequent Consult gateway;
3. 'Final' appraisal at Step 4A, with the CAA review after the formal submission of the Airspace Change Proposal at the end of Stage 4.

Iteration 1, Initial Options Appraisal, is the subject of this document, to be submitted to the CAA as part of Step 2B. The remainder of this section of the document focusses on the definition of the 'high-level objective and assessment criteria' and the assessment methodology.

[4] The Green Book: Appraisal and Evaluation in Central Government;
https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-governent

[5] DfT transport analysis guidance WebTAG:
https://www.gov.uk/guidance/transport-analysis-guidance-webtag

2.2 High Level Objectives and Assessment Criteria

For a Level 1 Airspace Change, the Criteria against which the appraisal options must be assessed are contained in Table E2 of CAP 1616. Table 1 below describes these with the addition of the Safety Assessment Criteria at the bottom.

Affected Group	Impact	Description
Communities	Noise impact on health and quality of life	Requires consideration of noise impact on communities including residents, schools, hospitals, parks and other sensitive areas
Communities	Air Quality	Any change in air quality is to be considered
Wider Society	Greenhouse Gas impact	Assessment of changes in greenhouse gas levels in accordance with WebTAG is required
Wider Society	Capacity and resilience	A qualitative assessment of the impact on overall UK airspace structure
General Aviation	Access	A qualitative assessment of the effect of the proposal on the access to airspace for GA users
General Aviation / commercial airlines	Economic impact from increased effective capacity	Forecast increase in air transport movements and estimated passenger numbers or cargo tonnage carried
General Aviation / commercial airlines	Fuel burn	The change sponsor must assess fuel costs based on its assumptions of the fleets in operation
Commercial airlines	Training costs	An assessment of the need for training associated with the proposal
Commercial airlines	Other costs	Where there are likely to be other costs imposed on commercial aviation, these should be described
Airport / Air navigation service provider	Infrastructure costs	Where a proposal requires a change in infrastructure, the associated costs should be assessed
Airport / Air navigation service provider	Operational costs	Where a proposal would lead to a change in operational costs, these should be assessed
Airport / Air navigation service provider	Deployment costs	Where a proposal would lead to a requirement for retraining and other deployment, the costs of these should be assessed
Safety Assessment	Safety Assessment	CAP 1616 requires a safety assessment of the proposal to be undertaken in accordance with CAP 760

Table 1 - Assessment Criteria for Level 1 Change

2.3 Method

2.3.1 Overview

The Initial Options Appraisal was carried out by comparing all of the options side by side against the CAP 1616 criteria in tabular form. The Appraisal also included the results of a Qualitative Safety Assessment as described in Section 8. The assessment is based around a qualitative assessment at this stage of the CAP 1616 process, with a full quantitative appraisal being conducted during Stage 3. At this point, for the purpose of the economic assessment required for the Full Options Appraisal, each of the procedure designs will be considered in combination with other procedures to assess the holistic options (procedure combinations) that deliver the operational requirement at Manston Airport. Each option will include arrival and departure procedures that work for each runway direction.
A comprehensive environmental assessment was previously conducted as part of the DCO process; some of the results of that assessment have been included in this document to provide a better understanding of the potential environmental impacts of this ACP. The full analysis of all the options is described in Appendix A1 and included as a separate MS Excel spreadsheet.

In accordance with CAP 1616, a baseline will be required for all environmental assessments. This will allow the change sponsor to conduct an assessment to understand the current impacts so that a comparison can be made with the impacts of the options. Section 6 describes the Do Minimum option, which represents the opening of the airport without any approved procedures or airspace. This will be the baseline against which the impact of each of the options has been assessed.

To allow an assessment of the impact of each of the individual procedure options, the Options Appraisal compares the implementation of each of the proposed procedures against that part of the 'Do Minimum' Option that relates to the procedure option being assessed. That is, the impact of each of the departure options has been assessed against the likely impact of the departure profiles of the Do Minimum option. In that way, stakeholders will be able to assess the likely impact of each individual option in relation to the Do Minimum baseline. As mentioned above, the Full Options Appraisal conducted at Stage 3 will assess each of the procedure designs in combination with other procedures to assess the holistic options that deliver the operational requirement at Manston Airport. This will be assessed against the impact of the Do Minimum option.

2.3.2 Shortlisting

Once all the options had been assessed against the criteria, the list of options was refined to identify the shortlist to be taken forward to Stage 3. The shortlist is contained in Section 9.

3. Noise Assessment

3.1 Introduction

An initial appraisal of the impacts of noise have been based around a qualitative assessment. However, a comprehensive noise assessment was conducted as part of the DCO process. Details of that assessment are included in this section to provide an overview of the likely noise impacts associated with the reopening of Manston Airport and although the route options developed through the ACP process are likely to be different to those used during the DCO process, the impacts are likely to be similar in the vicinity of the airport.

3.2 CAP 2091 Minimum Standards or Noise Modelling

As part of Gateway 2 for ACPs, CAP 2091 – CAA Policy on Minimum Standards for Noise Modelling requires the change sponsor to justify to the CAA which Category its noise modelling methodology is required to fall into from the definitions contained in CAP 2091 and summarised in Table 2 below, and which Category it currently falls into.

Aircraft noise			**Aircraft tracks (arrival and departure routes)**		
Category	**Noise data**	**Flight profiles**	**Centreline (mean track)**	**Dispersion (variation around centreline)**	**Usage (allocation of traffic to routes)**
A	ICAO dataset modified for local noise monitor data for all aircraft types	Local track-keeping data	Local track-keeping data	Local track-keeping data	Local track-keeping data
B	ICAO dataset validated by local noise monitor data for major aircraft types	Local track-keeping data	Local track-keeping data	Local track-keeping data	Local track-keeping data
C	ICAO dataset	Local track-keeping data	Local track-keeping data	Local track-keeping data	Local track-keeping data
D	ICAO dataset	ICAO dataset	Local data from airport	ECAC guidance or data from airport	Local data from airport
E	ICAO dataset	ICAO dataset	Local data from airport	ECAC guidance or data from airport	Local data from airport

Table 2 - Assessment Criteria for Level 1 Change

As the airport is currently closed, there is no noise modelling category associated with current operations.

CAP 2091 states that where some noise calculation is required, then the minimum level of sophistication of the modelling process should depend on the size of the current or proposed noise effect of an airport on its local community. CAP 2091 defines the thresholds of population exposed; once the likely number of residents reaches the minimum recommended threshold, a stakeholder should consider upgrading its noise modelling to that Category. The thresholds for noise modelling categories are shown in Table 3 below:

Category	Lower Threshold	Recommended Minimum Threshold	Mandated Minimum Threshold	Maximum Threshold
A	0	400,000	500,000	none
B	0	160,000	200,000	500,000
C	0	20,000	25,000	200,000
D	0	1,600	2,000	25,000
E	0	0	0	2,000

Table 3 - Thresholds for Noise Modelling Categories

The same thresholds have been set for population in the day and night contours for each of the noise Categories since the different Lowest Observed Adverse Effect Levels for day and night already capture the difference in noise perception between day and night noise.

Results from the DCO noise modelling, shown in Figure 1 below, would indicate that the noise modelling methodology should fall into Category D. However, the definition of Category D is not defined, so is currently the same as category E.

	Design principle	Annoyance*	Sleep Disturbance*	Population 51 dB $L_{Aeq,\ 16\ hours}$	Population 45 dB $L_{Aeq,\ 8\ hours}$	Household 51 dB $L_{Aeq,\ 16\ hours}$	Household 45 dB $L_{Aeq,\ 8\ hours}$
Year 20	Avoiding Urban Concentration	£14,530,000	£15,810,000	23,600	18,700	11,194	8,942
	Swathe Centreline (probable)	£14,480,000	£15,790,000	23,500	18,700	11,167	8,930
	Over or Near Urban Concentration	£14,450,000	£16,090,000	23,600	19,100	11,213	9,106
Year 2	Swathe Centreline (probable)	£7,520,000	£6,700,000	7,600	8,700	3,396	3,963

Figure 1 - DCO Noise Appraisal

In addition, with no air traffic associated with Manston Airport and no current noise modelling methodology, then it will be acceptable for it to use Category E to assess the required Category that applies to that airport, in accordance with paragraph 4.7 in CAP 2091. Therefore, the noise modelling methodology for this ACP will fall into Category E. Category E noise modelling as defined in CAP 2091 is shown below:

- Category E – There is no adaptation of the noise model and standardised reference values only are used. The standard ICAO dataset is used (flight profiles, noise data), with no amendments for local effects. Data reported from the modelled airport (rather than track-keeping data) is used to identify the usage of arrival and departure routes for a typical day. The track over the ground for each arrival and departure route is derived from the published coordinates in the UK AIP or as advised by the airport. Dispersion around the nominal track of each such route is based on the dispersion guidance contained in the latest version of ECAC Doc. 29.

3.3 DCO Noise Modelling

Although a more detailed quantitative environmental assessment will be conducted at Step 3A as part of the Full Options Appraisal, it was necessary to conduct an assessment of noise resulting from the reopening of Manston Airport as part of the DCO process. To conduct this assessment, it was necessary to develop an aircraft noise model to determine the potential effect of aircraft noise based on the route options identified as part of the DCO process. The results of that noise assessment are included here to give an idea of the scale of potential impacts that could result from the re-opening of Manston Airport.

The assessment of aircraft noise presented in the DCO Environmental Statement was based on indicative prototype routes which would be subject to authorisation and/or modification via the ACP, hence the impact of aircraft noise will be subject to change. It should be noted that close to the airport, on landing, final approaches and immediately after take-off, airspace options are limited, hence noise effects have been predicted with the greatest certainty. This area is also where the highest noise effects are expected.

3.4 Modelling Parameters

For the purposes of modelling aircraft air noise for the reopening of Manston Airport, the latest version of the Federal Aviation Administration's (FAA) Integrated Noise Model (INM) was used. All options appraisal work and modelling presented as part of the Preliminary Environmental Information Report (PEIR) was undertaken using INM. The Aviation Environment Design Tool (AEDT) was not used because at the time when work for the PEIR commenced, early versions of AEDT were not endorsed for use in UK. Furthermore, it was considered that both AEDT and INM produce near identical outputs. Aircraft noise models for the reopening of Manston Airport were first set up in 2016 with INM, hence INM was retained for consistency.

3.4.1 Glide Slope

The glide slope refers to the angle of approach for aircraft and is an imaginary line that travels from the approach end of the runway upwards to the aircraft. Typically, most airports operate a 3° glide slope, which is considered industry standard. The effect of a larger approach angle is a steeper approach and therefore aircraft are kept higher for longer.

3.4.2 Threshold Crossing Height

Threshold crossing height refers to the height at which aircraft cross the threshold when landing and therefore is used to represent the theoretical touch down zone. For this study, the INM standard threshold crossing height of 15.2m (50 feet) was used and therefore if an aircraft was arriving at an approach angle of 3° the aircraft would touchdown approximately 290m further along the runway.

3.4.3 Average Meteorological Conditions

Meteorological conditions can influence the propagation of sound; therefore, to model accurate noise levels representative ambient weather conditions for the period are required. For the purposes of the noise modelling it was determined the INM standard setting were appropriate, and these are as follows:

- Temperature: 14.7° C
- Pressure: 759.97 mmHg (1013.2 mbar)

• Average Headwind: 14.8 km/h

• Humidity 70%

3.4.4 Terrain

The surrounding topography or terrain can influence propagation of sound, particularly where the landform can produce reflections and shielding. Terrain data was obtained under license for the modelling as 50m digital terrain mapping.

3.4.5 Population

Population data was fed into the model to enable a count of the number of people and dwellings exposed to certain levels of noise. Population data was obtained under license for this project from CACI and was based on the most recent census data with uplifts for population growth across the year. The population data is presented at postcode level and contains details of the total number of dwellings and inhabitants at that postcode point.

3.5 Aircraft Movements Forecast

The assessment of aircraft noise is presented for both Year 2 and Year 20 using the forecast aircraft movements as shown in Table 4 below. Year 2 is considered the 'opening year' and Year 20 is considered the 'worst-case' year in terms of noise.

Forecast Aircraft Movements							
	Air Transport Movements	Non-ATM Movements	Total		Air Transport Movements	Non-ATM Movements	Total
Year 1	0	0	0	**Year 11**	19030	5840	24870
Year 2	5252	5840	11092	**Year 12**	19733	5840	25573
Year 3	10736	5840	16576	**Year 13**	20464	5840	26304
Year 4	14724	5840	20564	**Year 14**	21224	5840	27064
Year 5	15000	5840	20840	**Year 15**	22015	5840	27855
Year 6	16846	5840	22686	**Year 16**	22837	5840	28677
Year 7	17626	5840	23466	**Year 17**	23693	5840	29533
Year 8	17938	5840	23778	**Year 18**	24582	5840	30422
Year 9	18146	5840	23986	**Year 19**	25507	5840	31347
Year 10	18354	5840	24194	**Year 20**	26469	5840	32309

Table 4 - Forecast Aircraft Movements

The aircraft forecast predicts a gradual increase in aircraft movements between Year 2 and Year 20. This would lead to an increase in aircraft noise over time. Over this period there will also be changes in aircraft, with airlines phasing out older aircraft. This could reduce aircraft noise levels over time. However, Year 20 is considered to be the likely "worst-case" year in terms of noise, even considering the phasing out of some louder aircraft. The forecast assumes that total aircraft traffic will grow from approximately 33 Air Transport Movements (ATMs) for a typical busy day in Year 2 to 79 ATMs per typical busy 24-hour day in Year 20. These figures are considered the maximum number of movements for a typical busy day with fewer daily movements during less busy periods. An Air Transport Movement (ATM) is defined as each landing and take-off of commercial flights related to the transport of passengers and freight. There will also be an average of approximately 16 non-ATMs per 24-hour day in all years including general aviation and training flights.

During a busy typical day in Year 20, Manston Airport is forecast to handle approximately 72 aircraft movements during the daytime period (between 07:00 to 23:00) and an average of 7 aircraft movements during the night-time period (between 23:00 and 07:00).

Typically, the assessment of aircraft noise considers an 'average summer's day' period of movement from 16th June to 15th September. This 92-day period is used to account for the increased aircraft traffic during the summer season seen at many UK airports. However, a reopened Manston Airport will focus on freight aircraft and the largest number of flights is likely to be during the winter season rather than the summer season. The majority of the cargo anticipated to be handled at Manston will have no particular seasonality associated. The exception to this is perishables (fresh fruit, vegetables and cut flowers) the volumes (and thus flight numbers) of which will be larger in winter than summer; this is due to the higher import demand during the period when the UK is non-productive in this sector. Therefore, the assessment of aircraft noise undertaken for the DCO was based on a 'typical busy day' during the busier winter season and used a 'busy day' multiplier to ensure that a worst-case assessment was fully considered.

3.5.1 Future Aircraft Type

In later years next generation aircraft types currently not in operation are forecast, namely the Boeing 777X. The Boeing 777X is an updated version of the Boeing 777 and is expected to be significantly quieter on departure and marginally quieter on arrival, however actual noise emissions are uncertain and therefore, the aircraft was modelled as the Boeing 777-200 aircraft. This is considered a conservative approach since the new generation Boeing 777X is expected to be quieter on both arrival and departure.

3.6 Aircraft Flight Paths

The assessment of aircraft air noise for Environmental Statement considered six indicative airspace route options which were contained within a design swathe. The design swathe developed took into account the 'knowns' of the local airspace, including airways and navigational aids.

The route swathe and indicative flight paths are presented in Figure 2 and show the different routes within the design swathe for future departure and approach routes and Table 5 presents the six design principles considered.

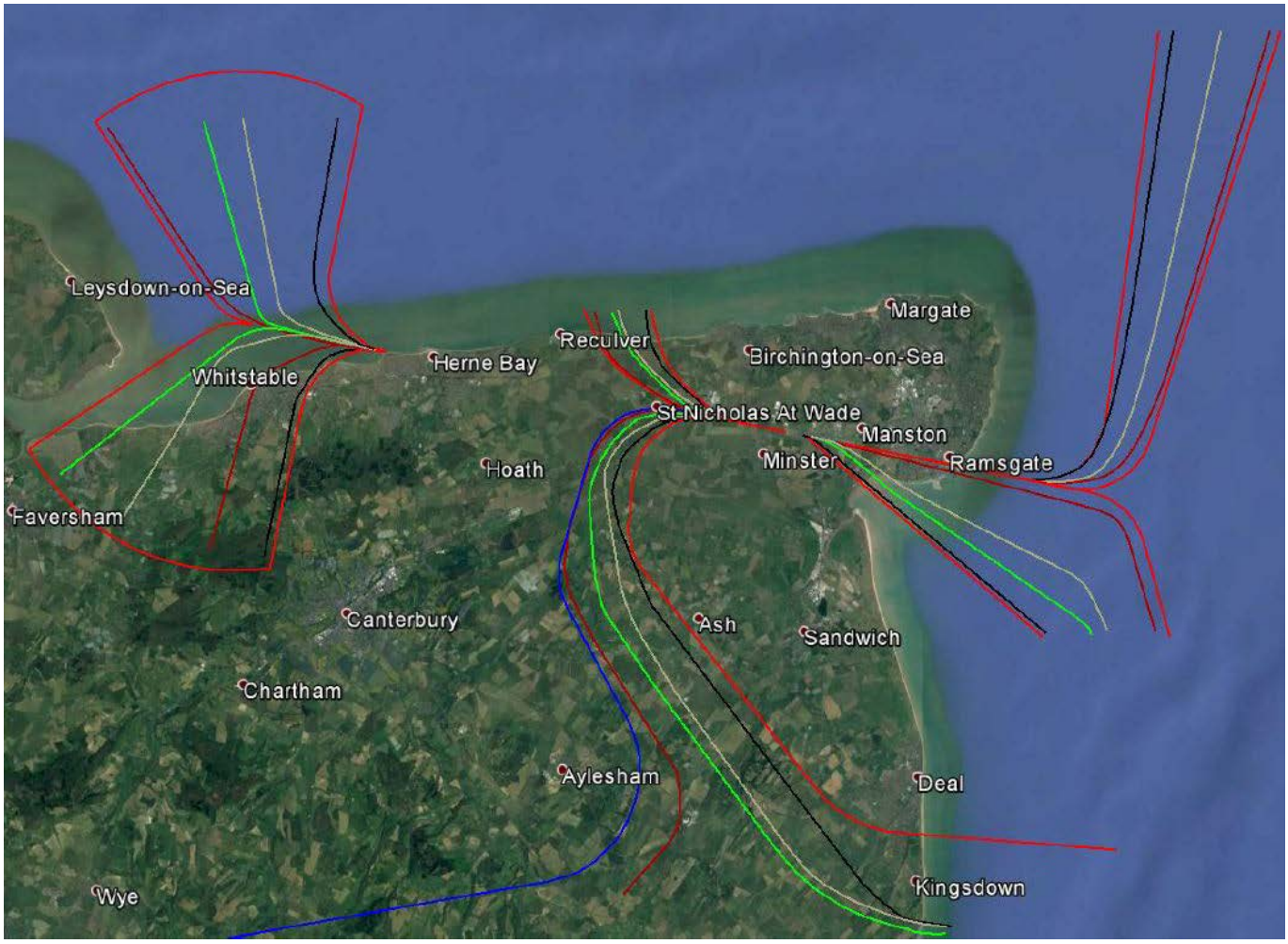


Figure 2 - Routes Modelled

Design principle	ARR 10	ARR 28	DEP 10 N	DEP 10 S	DEP 28 N	DEP 28 S
Avoiding urban concentration	Green	Straight In	Grey (No green route available)	Green	Green	Green
Swathe Centreline	Grey	Straight In	Grey	Grey	Grey	Grey
Tight Turns	Black	Straight In	Black	Black	Black	Black
Over or Near Urban Concentration	Dark Red	Straight In	Dark Red	Dark Red	Dark Red	Dark Red
Swathe Line (closest to airport)	Red – Swathe (earliest turn)	Straight In	Red – Swathe (earliest turn)	Red – Swathe (earliest turn)	Red – Swathe (earliest turn)	Red – Swathe (earliest turn)
Swathe Line (Furthest from airport)	Red- Swathe (latest turn)	Straight In	Red- Swathe (latest turn)	Red- Swathe (latest turn)	Red- Swathe (latest turn)	Blue

Table 5 - Indicative airspace option design principles

3.6.1 Lateral Track Dispersion

Typically, at airports operating RNAV routes aircraft are dispersed laterally around the route centreline due to several factors including prevailing weather conditions, instructions from Air Traffic Control (ATC) and pilot judgement. The INM model therefore allows dispersion around a 'main' route or track to be modelled. In locations where noise levels are dominated by aircraft departures, dispersion has the effect of widening the air noise contours but reducing the length.

Manston Airport is not currently operating and therefore no radar data is available and hence the standard INM binomial dispersion pattern was assumed with four sub tracks either side of the centre track.

3.6.2 Track Proportion

Typically, aircraft arrive and depart into wind and therefore to determine the future runway direction historical weather data was assessed. The historical weather data suggests that for an average year approximately 70% of arriving aircraft will arrive over Ramsgate and 30% will arrive over Herne Bay. For departing aircraft approximately 70% will depart to Herne Bay and 30% towards Ramsgate. For aircraft departing to the west there are two likely flight paths, one turning north and one turning south; it is assumed that there will be a 50/50 traffic distribution across these two routes. Table 5 presents the traffic distribution along each flight path as a percentage of the total aircraft movements.

Runway ID	Operation Type	Nominal Direction	Traffic Distribution
RWY 10	Arrival	All Instrument Approaches Runway 10 (from North)	7.5%
RWY 10	Arrival	All Instrument Approaches Runway 10 (from South)	7.5%
RWY 10	Departure	Heading North	7.5%
RWY 10	Departure	Heading South	7.5%
RWY 28	Arrival	All Instrument Approaches Runway 28	35%
RWY 28	Departure	Heading North	17.5%
RWY 28	Departure	Heading South	17.5%

Table 6 - Traffic Split

3.7 Options Appraisal Approach

The assessment of the noise impact of the airport in the Environmental Statement was based on the indicative route options. The purpose of the options appraisal presented in the Environmental Statement was to provide an indication of the potential noise impact.

There were three stages to the option appraisal process for noise:

- Stage A – Appraisal of noise abatement procedures.
- Stage B – Airspace routes options appraisal (with adopted procedures from Stage 1):
  - o Modelling of annual scenario using each route design principle.
  - o Modelling of 100% LAeq for individual tracks, e.g. 100% of departures on one track.
- Stage C – Model refinement;
  - o Model refinements after early turn for easterly departures was discounted due to location of Pegwell Bay Ramsar Site.
  - o Noisy aircraft removed from fleet.
  - o Inclusion of General Aviation traffic.

3.7.1 Stage A – Noise Abatement Procedures

A review of potential noise abatement procedures for Manston Airport was undertaken and considered a number of aircraft noise abatement operational procedures that Manston Airport could implement in an Aircraft Noise Abatement Operational Procedure strategy.

Inset thresholds were determined to have a very minimal impact on noise and were therefore deemed not feasible as part of an aircraft noise abatement operational procedure strategy.

Increased approach angles were also found to have a theoretical effect on the reduction of noise however operational evidence suggests that when actually undertaken, the more technically challenging approach may result in an increased level of aborted approaches nullifying noise benefits. Equally, in the context of the Manston Airport project, the theoretical noise benefit gained, compared to potential operational impacts, could not justify use of this non-standard procedure.

A preferential runway strategy would have a significant noise reduction effect. The biggest limiting factor to preferential runway operations would be the movement rate that Manston Airport would like to be able to achieve. Above a movement rate of 5 movements per hour, Manston Airport would no longer be able to support opposite runway direction operations. Modelling data indicates that employing a preferential runway strategy at night could reduce the impact of noise by over 80%.

3.7.2 Stage B - Airspace Routes Options Appraisal

Stage B appraised the different route options within the design swathe. The routes were appraised in terms of the design principles (for example. all aircraft on avoid population routes) and with 100% of traffic using a single route. The modelling adopted the realistic avoid Ramsgate scenario from Stage A (i.e. preferential runway strategy). This was adopted as it was identified as being the most realistic scenario when annual weather conditions are considered and provided a significant improvement in noise exposure, whilst being operationally feasible and safe to operate.

Detailed results of the Stage B Options Appraisal can be found in the document *'5.2-12 environmental Statement - Volume 12 - Appendices 10.1 Appendix B (Part 2)'* submitted to the Planning Inspectorate as part of the DCO submission at the following link:
TR020002-002431-5.2-12 - Environmental Statement - Volume 12 - 2 of 2 - Appendix 10.1, Appendix B, Part 2.pdf (planninginspectorate.gov.uk)

3.7.3 Stage C – Refinement of Route Modelling

For Stage C, the modelling assumed an annual scenario using the best and worst routes from Stage B. However, for Stage C the early turn before Ramsgate was discounted after it became apparent the route was not operationally feasible given the location of the Pegwell Bay Ramsar Site and also the night runway preference was not applied after advice from the airspace consultants. Further refinements to the model were also undertaken including:

- Aircraft fleet was updated and the Ilyushin IL-76 and Antonov An-124 were replaced in the fleet by the Boeing 747-400 after discussions with forecasting team;
- The night preference was removed after advice from Airspace Consultants that the preference is unlikely to be achieved until airspace change proposal assessment; and
- General Aviation (GA) traffic was added, comprising of a worst-case daily scenario of 40 arrivals and departures, eight circuits flight comprising six circuits per flight and eight touch and go operations. General Aviation flights will only occur during the daytime and therefore there is no change in-terms of night-time contours.

Detailed results of the Stage C Options Appraisal can also be found in the document *'5.2-12 environmental Statement - Volume 12 - Appendices 10.1 Appendix B (Part 2)'* submitted to the Planning Inspectorate as part of the DCO submission.

3.8 Modelling Results

For simplicity, the assessment of effects was based upon the design swathe centreline, or 'probable route', as this is considered the most operable route and hence the 'probable' route to be operated. Also, the Preferential Runway Strategy was not employed during the assessment. Instead, the historical meteorological data of a 70/30 spilt was used, with traffic split as detailed in Table 5 above.

CAP 1616 states that sponsors should use Leq noise contours to portray noise impacts and contours should be portrayed down to 51 dB LAeq, 16 hours (for daytime) and 45 dB LAeq, 8 hours (for night time). Department for Transport policy is that these values represent the Lowest Observed Adverse Effect Level (LOAEL), the point at which it regards adverse effects begin to be seen on a community basis.

For the purposes of the assessment in the Environmental Statement, the daytime LOAEL was set at 50 dB LAeq,16hr (free-field), based upon advice set out within WHO guidance. It is noted that since the production of the Scoping Report in 2016, aviation policy has defined daytime LOAEL at 51 dB LAeq,16hr (free-field), however, for the purposes of the assessment the lower value of 50 dB LAeq,16hr (free-field) was considered appropriate.

The night-time LOAEL for aircraft noise is set at 40 dB LAeq,8hr (free-field) and is based upon advice set out within WHO Night Noise Guidelines. It is noted that since the production of the Scoping Report in 2016, draft aviation policy has defined night-time LOAEL at 45 dB LAeq,16hr (free-field), however, for the purposes of the assessment the lower value of 40 dB LAeq,16hr (free-field) was considered appropriate.

The following figures present noise contours which have informed the assessment of significant effects for operational noise:

- Aircraft noise – daytime LAeq, 16hr contours - opening year;
- Aircraft noise – night-time LAeq, 8hr contours - opening year;
- Aircraft noise – daytime LAeq, 16hr contours - year of maximum forecast capacity;
- Aircraft noise – night-time LAeq, 8hr contours - year of maximum forecast capacity;

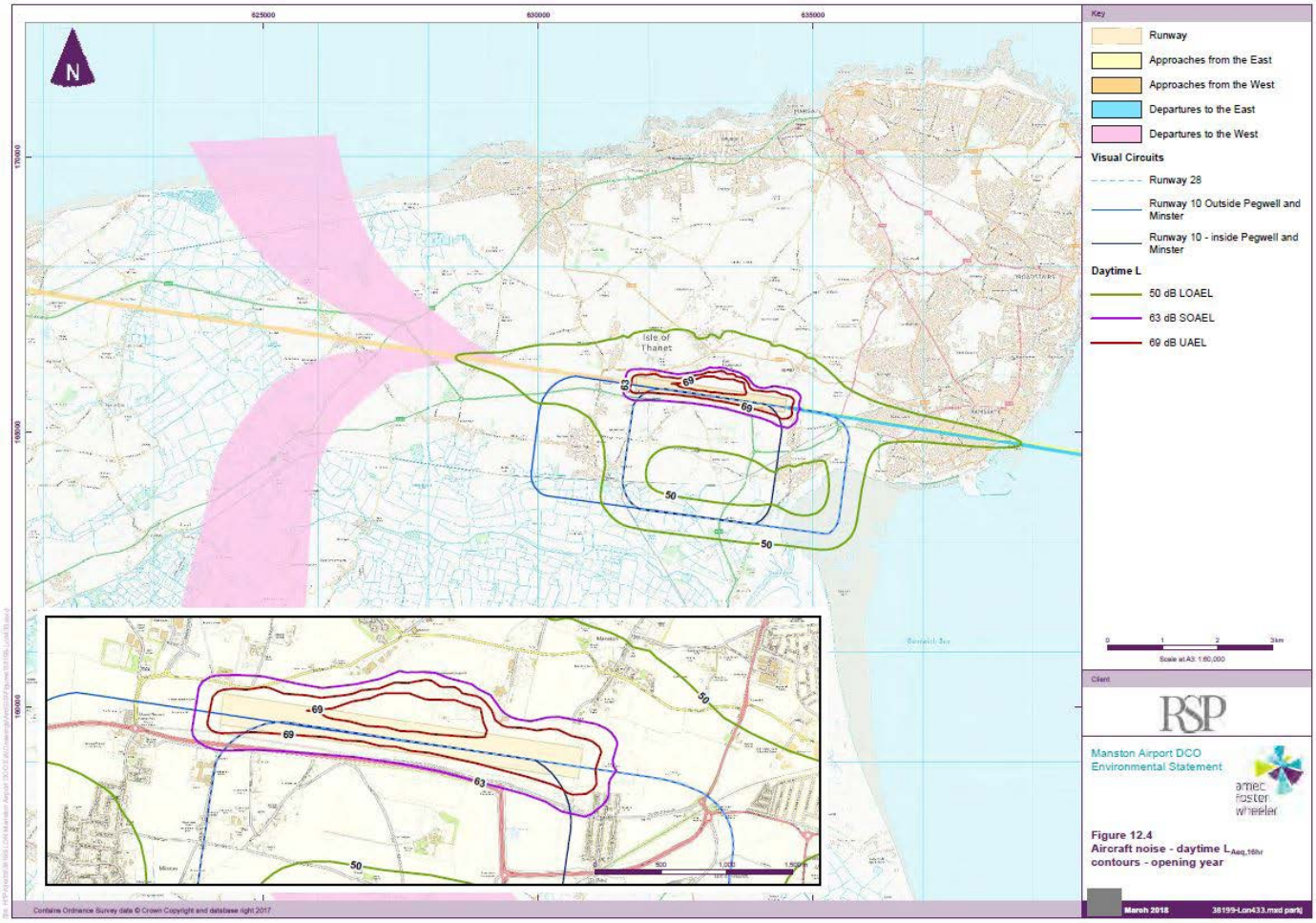


Figure 3 - Opening Year Daytime LAeq, 16hr Contours

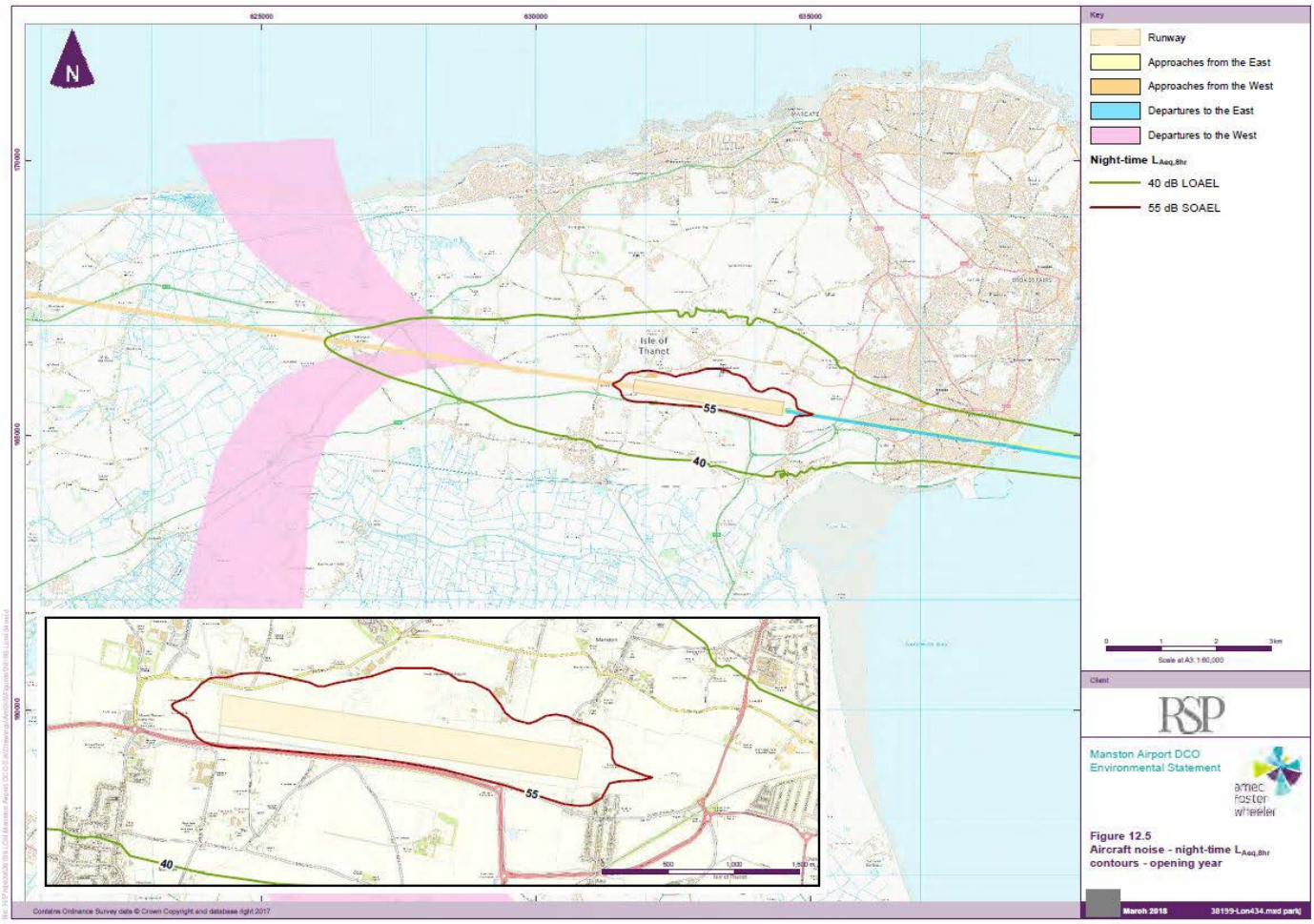


Figure 4 - Opening Year Night-time LAeq, 8hr Contours

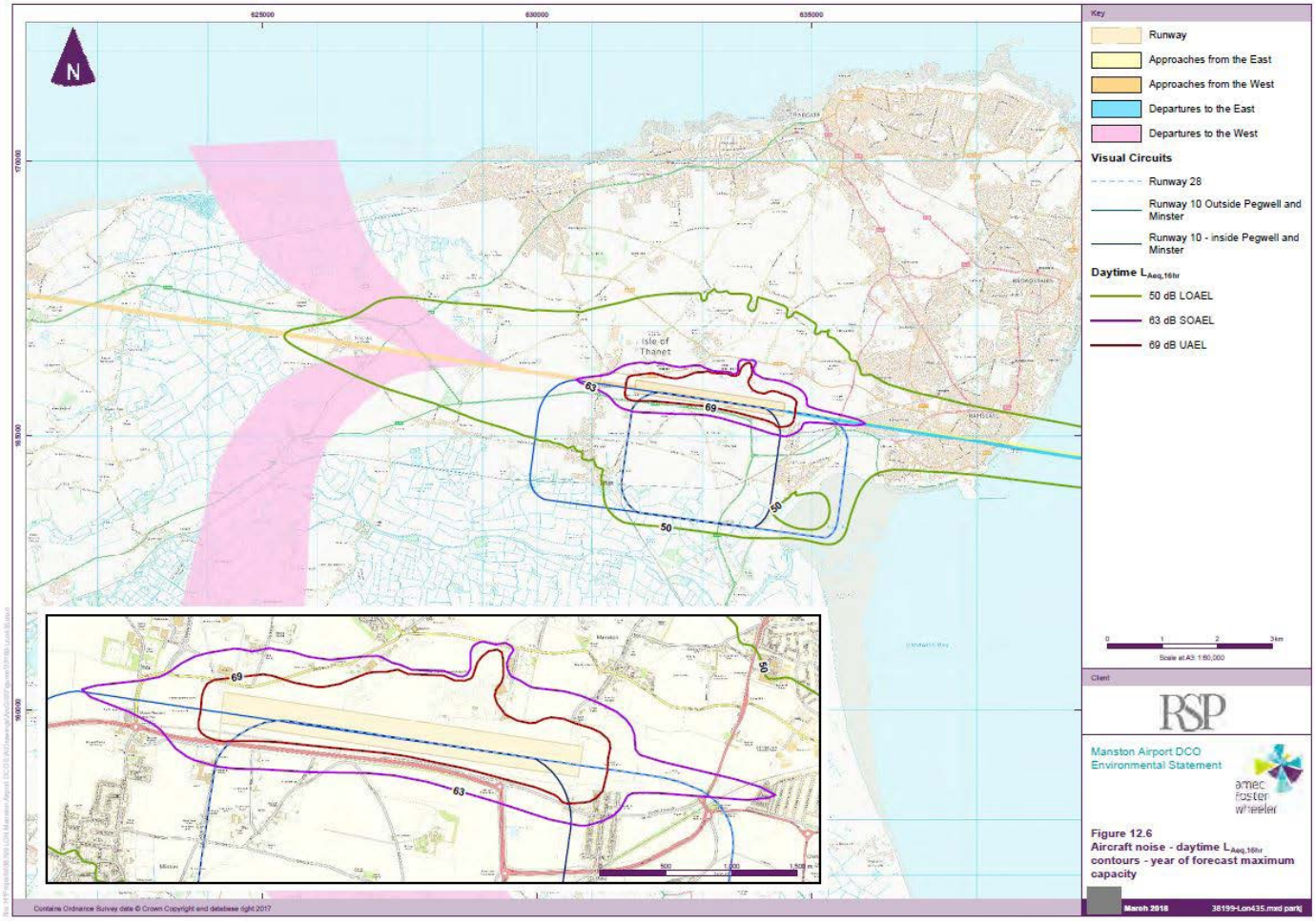


Figure 5 - Year of Maximum Forecast Capacity Daytime LAeq, 16hr Contours

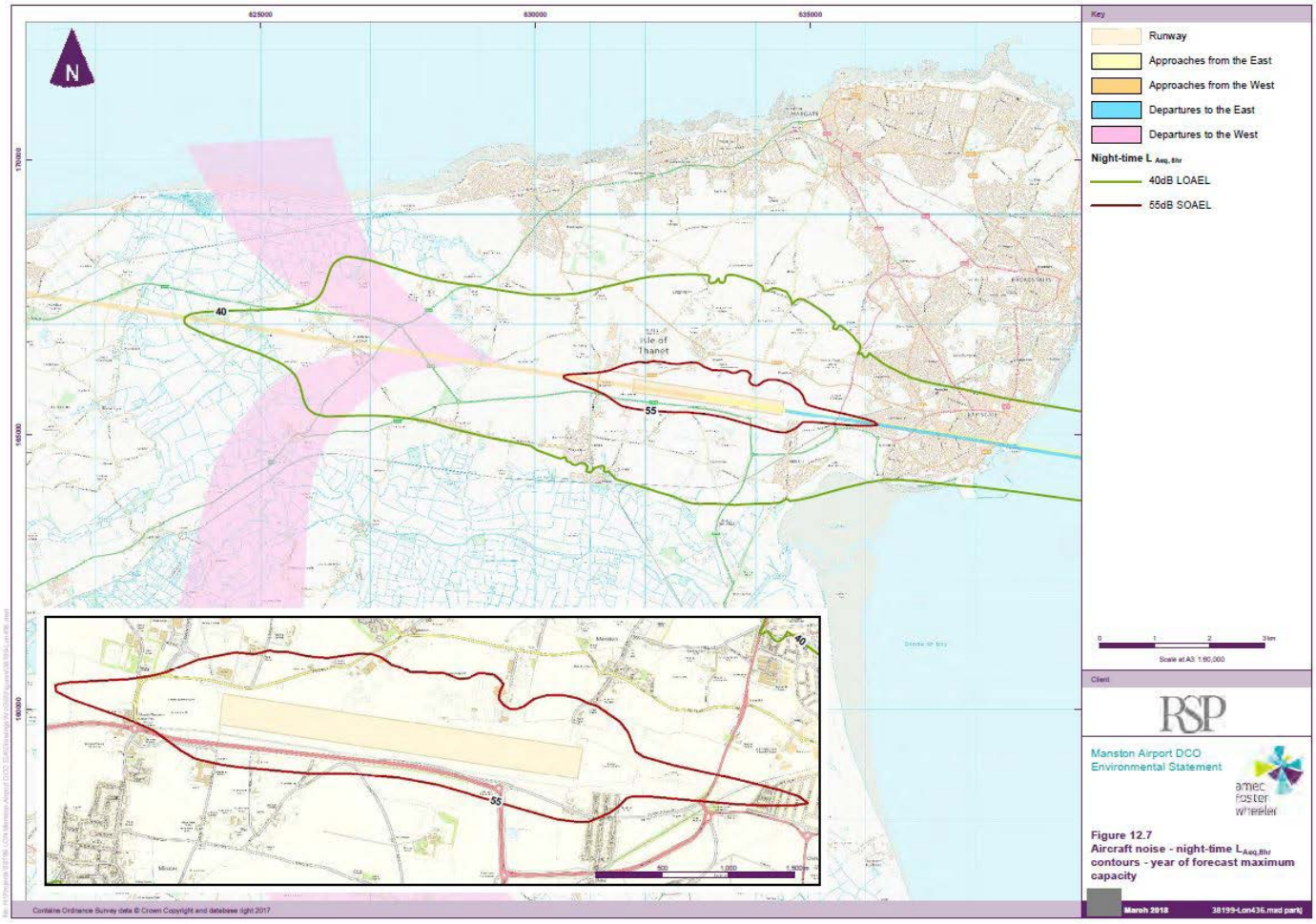


Figure 6 - Year of Maximum Forecast Capacity Night-time LAeq, 8hr Contours

3.9 Qualitative Noise Assessment

In order to support the assessment of the noise related criteria in Section 6 below, RSP carried out a qualitative assessment of the likely noise impacts of each option on people on the ground. A comparative assessment was made amongst the options for each procedure taking into account the following contributors to noise exposure:

- length of track overpopulated areas/qualitative assessment of numbers overflown;
- overflight of sensitive areas and communities below 7,000 ft e.g. schools, hospitals, care homes;
- overflight of National Parks, Areas of Outstanding Natural Beauty (AONB), parkland, habitats;
- comparative power setting of aircraft engines required to execute the procedure;
- continuous ascent/descent profile of procedure;

Three Design Principles are applicable to the assessment of noise.

- **Design Principle 3:** Procedures should be designed to minimise the impact of noise below 7,000 feet.
- **Design Principle 4:** Where practicable, designs should seek to minimise the impact of noise on particularly sensitive areas. Locations considered will be National Parks and Areas of Outstanding Natural Beauty (AONB), plus any locally identified 'tranquil' areas that have been identified through community engagement, and noise-sensitive buildings, including hospitals, care homes and educational establishments.
- **Design Principle 7:** Designs should make provision for multiple routes that can be used to spread the noise burden more equitably.

The qualitative noise assessment[6] of the options was supported by analysis of whether each option met the above stated Design Principles.

3.10 Summary

Although the routes developed through the ACP process will be different to those modelled for the DCO Environmental Statement, close to the airport the options are limited and hence the noise effects predicted should present a reasonable representation of the likely noise impacts experienced as a result of this ACP. Departures to, and landings from the east (over Ramsgate) are unlikely to be different to those modelled in the DCO due to the location of the airport in relation to Ramsgate. Arrivals from the west are likely to result in a similar noise impact due to the requirement to be lined up with the runway from approximately 8 nautical miles. Departures to the west, further from the airport, are likely to be subject to more variation depending on the number and position of the routes developed.

[6] See assessment against 'Communities, Noise Impact on health and Quality of life' criteria in Appendix A1

4. Air Quality

4.1 Introduction

The DCO Environmental Assessment included an assessment of the effects of the proposals for the reopening of Manston Airport on air quality. Changes in air quality were assessed with reference to Air Quality Management Areas (AQMA), specifically the Thanet Urban AQMA. The results of the air quality assessment are included here to give an idea of the scale of potential impacts that could result from the re-opening of Manston Airport.

Thanet District Council declared the Thanet Urban Air Quality Management Area (AQMA) in November 2011 to monitor the quality of air in a number of urban areas within Thanet. The area encompassed by the Thanet Urban AQMA is shown in Figure 7 below in relation to the runway at Manston Airport.

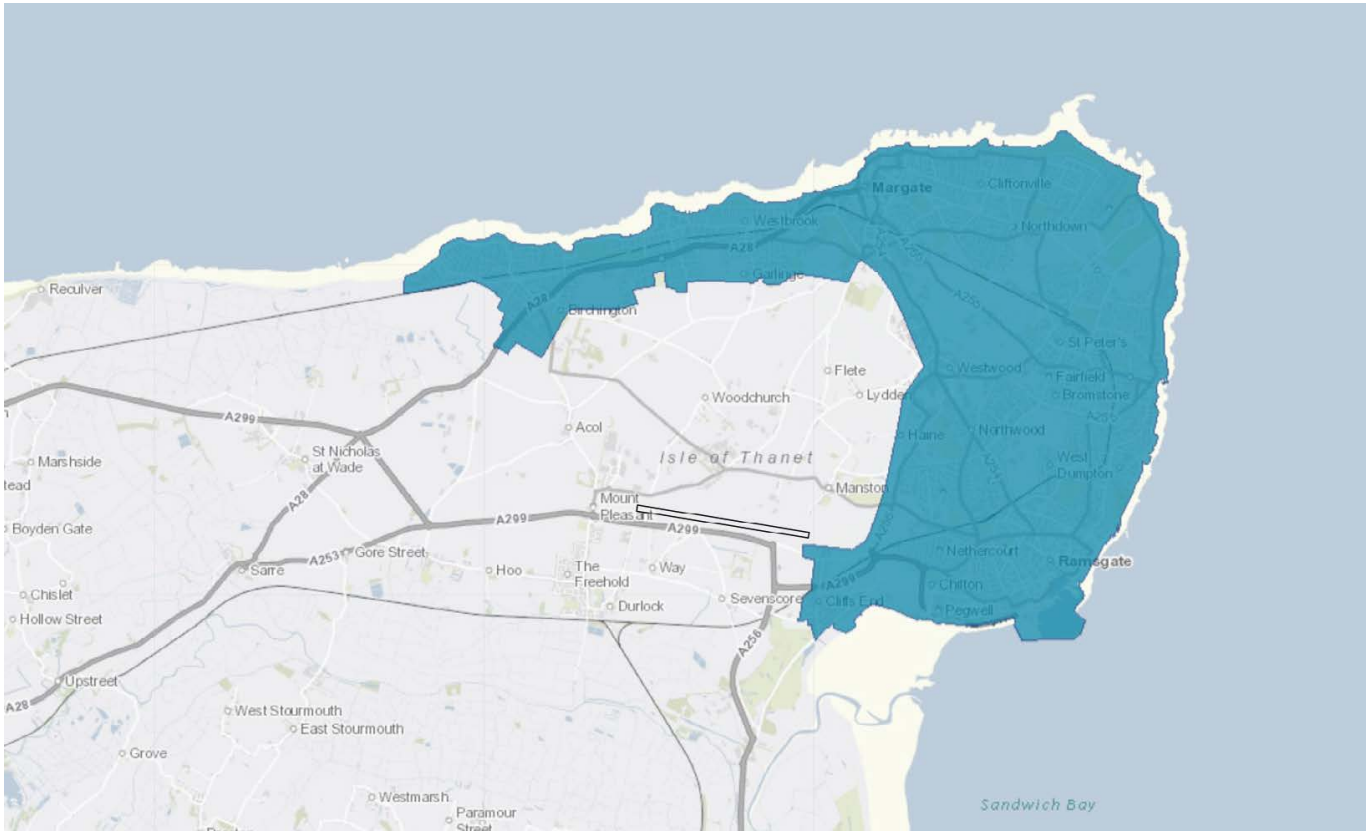


Figure 7 - Thanet Urban AQMA

The assessment process included selecting a number of receptors that could be affected by the reopening of the airport and assessed the potential effects on those receptors. The positions of the receptors modelled included:

- Gridded receptors – a 7 km x 4 km Cartesian grid with a receptor resolution of 100m to enable contour plots to be generated.
- Human receptors – based on a selection of locations where people may be present that are most likely to be affected. Receptors were selected that represented the nearest boundaries of the AQMA to the airport.
- Ecological receptors – local wildlife and habitat sites, encompassing Special Protection Areas (SPA), Special Areas of Conservation (SAC), Ramsar sites, Sites of Special Scientific Interest (SSSI) or local nature sites, National Nature Reserves and Local Nature Reserves.

4.2 Air Quality

The principal sources of air quality impacts are emissions to atmosphere from:

- Plant and equipment used during the construction phase;
- Road traffic generated during the construction phase;
- Aircraft and airside plant and equipment during the operation phase; and
- Road traffic generated during the operation phase.

The assessment calculated rates of emissions of air pollutants from the above sources and used a dispersion model to calculate the resulting ground-level concentrations of air pollutants, averaged over both short and long-term periods. Those concentrations were then evaluated for significance in relation to the Air Quality Standards (AQS) and assessment levels set in legislation and in Government and international guidance.

The assessment made a number of worst-case assumptions to ensure that the predicted impacts were not underestimated, and it was likely that the impacts were overestimated. The results should be interpreted acknowledging that they present a worst-case scenario.

Emissions from the following sources had been calculated:

- Aircraft on the ground, including landing roll, taxi-in, taxi-out, hold, take-off-roll, Auxiliary Power Unit usage, brake wear, tyre wear and testing ground runs;
- Aircraft in the air up to 3,000ft (914m), including approach, initial climb and climb-out;
- Ground Support Equipment, including emergency diesel generators;
- Road traffic; and
- Construction activity, including construction-related road traffic.

Assessments were conducted for the following years:

- Year 2, representing the first year of aircraft operation;
- Year 6, representing the point at which the aircraft exceeds 10,000 movements per year; and
- Year 20, representing the worst-case year in terms of likely emissions from aircraft and vehicular movements.

Throughout the modelling process, care was taken not to risk underpredicting impacts. A number of conservative assumptions were made which meant that impacts were very likely to be overpredicted, that is to say this is very much a worst-case assessment. The modelled air quality impacts were found to be generally low, so it was not necessary to use less conservative modelling to demonstrate that the redevelopment and reopening of the airport would have low significance for air quality.

The atmospheric emissions of a number of pollutants were identified as requiring detailed dispersion modelling. The emitted pollutants of primary concern to the local environment are oxides of Nitrogen and particulate matters. An assessment of effects was produced for each of the following criterion:

- Human health effects – annual and hourly mean NO_2
- Human health effects – PM10[7]
- Human health effects – PM2.5[8]
- Ecological effects – annual mean NO_x concentration in air
- Ecological effects – nutrient Nitrogen deposition
- Ecological effects – acid deposition

[7] PM is the term used to describe all suspended solid matter. PM10 is particulate matter 10 micrometres or less in diameter.
[8] PM2.5 is particulate matter 2.5 micrometres or less in diameter. PM2.5 is generally described as fine particles.

4.3 Summary

The results of the assessment concluded there would be no significant impact on air quality around the airport and, specifically, in the Thanet Urban AQMA as a result of the proposals for the reopening of Manston Airport. The results presented a worst-case scenario and included the impact of road traffic and construction activities, as well as the impact of aircraft.

5. Biodiversity

5.1 Introduction

The DCO Environmental Assessment included an assessment of the potentially significant effects of reopening Manston Airport on biodiversity, both within the site boundary and the surrounding area, where appropriate. The results of the assessment are included here to give an idea of the scale of potential impacts that could result from the re-opening of Manston Airport.

In terms of the activities associated with the re-development of Manston Airport, potential effects may be associated with the:

- Construction of cargo facilities, hangars, aircraft stands, taxiways and associated infrastructure (e.g. fuel farm, road junctions etc.).
- Operation of aircraft and associated activities (e.g. aircraft loading, taxiing etc.) whilst within the bounds of the airport.
- Operation of aircraft approaching and leaving the airport (i.e. outside of the bounds of the airport).
- Road traffic associated with the construction and operational phases of the re-development of the airport.

5.2 Assessment Methodology

Information for the assessment derived from the results of a desk study, baseline surveys, traffic, air quality and noise modelling, supplemented by published information (e.g. on potential biodiversity receptors' status, distribution, sensitivity to environmental changes and ecology) and professional knowledge of ecological processes and functions.

The assessment of effects was also considered during the construction and operational phases of Year 2, Year 6 and Year 20. During the construction phases, the assessment of effects considered the air quality impacts on designated sites and priority habitats of plants and invertebrate species. These impacts were also considered during the operational phase, along with the predicted effects caused by potential habitat loss for several bird species as a result of aircraft flights.

5.3 Summary

The DCO process assessments concluded that the redevelopment of Manston Airport would have no significant impact on biodiversity, despite the significant amount of ground-based infrastructure work that would be undertaken. As this assessment also included the operation of aircraft both on the ground (whilst within the bounds of the airport) and approaching and leaving the airport (outside the bounds of the airport), it can be assumed that there would also be no significant impact on biodiversity as a result of introducing the proposed flight procedures at Manston Airport.

6. Manston Airport Baseline Definition

6.1 Baseline Definition

In accordance with CAP 1616, a baseline will be required for all environmental assessments. This will allow the change sponsor to conduct an assessment to understand the current impacts so that a comparison can be made with the impacts of the options. In most cases, the baseline will be the 'Do Nothing' option and will largely reflect the current-day scenario. In certain cases, doing nothing is not a feasible option and in such cases, the change sponsor must set out its informed view of the future and the minimum changes required to address the issues identified – a 'Do Minimum' option.

6.2 The Do Nothing Option

Prior to closure, the aerodrome at Manston had conventional flight procedures and an Aerodrome Traffic Zone (ATZ) to offer protection to aircraft in the critical stages of flight. All such measures were removed when the aerodrome closed.

The Do Nothing option represents the current situation where there is no airport at Manston, and no air traffic. There is no environmental impact associated with this option and therefore no measurable comparative baseline against which to assess the options. The airport development can only proceed with approval of the DCO. Should the DCO not be approved and the development of Manston Airport is not able to proceed, this ACP will be withdrawn. An assumption must be made that airport consent leads to the introduction of a level of air traffic into the environment for which we must, at the very least, identify a set of minimal safe operational procedures. Therefore, the Do Nothing option is not a feasible option in terms of an airspace change proposal, and is not an acceptable baseline against which to assess alternative options.

6.3 The Do Minimum Option

The Do Minimum option represents the opening of the airport without any approved procedures or airspace. The minimum requirement would be for the airport details to be promulgated in Part 3 of the UK Aeronautical Information Publication (AIP). Later on in the process, the requirements for updating the AIP will be agreed with the CAA.

When it opens, Manston Airport will have a surveillance capability and will be able to provide aircraft with an Air Traffic Service (ATS). Aircraft operating to or from Manston Airport will be able to receive an ATS appropriate to their flight conditions (IFR[9] or VFR[10]) in Class G airspace. Manston ATC will also be able to provide an ATS to other air traffic operating in the vicinity of the airport if the aircraft captain requests such a service. There is no obligation for aircraft operating VFR in the vicinity of the airport to talk to ATC or receive an ATS. Basic Service and Traffic Service will be available to flights in Class G airspace operating under both Instrument Flight Rules (IFR) and Visual Flight Rules (VFR), whereas a Deconfliction Service will only be available to flights in Class G airspace operating under IFR. It is anticipated that the majority of commercial air traffic operating from Manston Airport will operate under IFR.

[9] Instrument Flight Rules (IFR) - Rules and regulations to govern flight under conditions in which flight by outside visual reference is not safe. IFR flight depends upon flying by reference to instruments in the flight deck, and navigation is accomplished by reference to electronic signals.

[10] Visual Flight Rules (VFR) – The set of regulations under which a pilot operates an aircraft in weather conditions generally clear enough to allow the pilot to see where the aircraft is going. Specifically, the weather must be better than the basic weather minima as specified in the rules of the relevant aviation authority. The pilot must be able to operate the aircraft with visual reference to the ground, and by visually avoiding obstructions and other aircraft.

- Departures – aircraft departing IFR from Manston Airport will route direct to their nominated airways joining point. It is likely that the majority of commercial air traffic will route south east towards the Flight Information Region (FIR) boundary via the reporting points KONAN or VABIK with some traffic routing towards DOVER for onwards transit to the south or west. Aircraft departing from Runway 10 are likely to continue straight ahead over Ramsgate to a point over the sea to the east of Ramsgate before commencing direct routing to their airway's entry point. However, this cannot be guaranteed and as long as aircraft achieve a height of 500 ft above aerodrome level before turning, some aircraft may commence their turn whilst over the populated area of Ramsgate. Aircraft departing from Runway 28 will turn either left or right initially to achieve the most direct routing to their airway's entry point. Whilst transiting Class G airspace, aircraft in receipt of a Deconfliction Service may receive deconfliction advice from ATC and be required to alter their track to ensure deconfliction with other air traffic.
- Arrivals – with no published procedures, aircraft arriving at Manston Airport will be required to perform a visual approach. It is likely that the majority of commercial traffic will perform a straight in approach where aircraft will need to be lined up on runway heading from approximately 7-8 nm from the airport in order to carry out the approach to land. This approach will require the aircraft captain to carry out a descent and approach in Visual Meteorological Conditions (VMC). In poor weather conditions, descent to a safe altitude may be carried out under ATC surveillance but the aircraft may not always be able to achieve VMC in order to fly the approach, resulting in either multiple approaches needing to be flown, or a diversion to an airfield with suitable approach aids. Transitions from leaving the airways to a point suitable to carry out a visual approach would be dependent on the route flown towards the airport and where the aircraft is able to leave Controlled Airspace (CAS). For Runway 28 arrivals, these are all likely to be over the sea. For Runway 10 arrivals, these could either be over the sea, north of the extended centreline or overland to the south of the extended centreline.

Forecast aircraft movements as shown in Table 7 below. Year 2 is considered the 'opening year. The traffic forecast for the Do Minimum option is the same as that assessed by the DCO.

Forecast Aircraft Movements							
	Air Transport Movements	Non-ATM Movements	Total		Air Transport Movements	Non-ATM Movements	Total
Year 1	0	0	0	**Year 11**	19030	5840	24870
Year 2	5252	5840	11092	**Year 12**	19733	5840	25573
Year 3	10736	5840	16576	**Year 13**	20464	5840	26304
Year 4	14724	5840	20564	**Year 14**	21224	5840	27064
Year 5	15000	5840	20840	**Year 15**	22015	5840	27855
Year 6	16846	5840	22686	**Year 16**	22837	5840	28677
Year 7	17626	5840	23466	**Year 17**	23693	5840	29533
Year 8	17938	5840	23778	**Year 18**	24582	5840	30422
Year 9	18146	5840	23986	**Year 19**	25507	5840	31347
Year 10	18354	5840	24194	**Year 20**	26469	5840	32309

Table 7 - Forecast Aircraft Movements

The aircraft forecast predicts a gradual increase in aircraft movements between Year 2 and Year 20. Over this period there will also be changes in aircraft types, with airlines phasing out older aircraft. The forecast assumes that total aircraft traffic will grow from approximately 33 Air Transport Movements (ATMs) for a typical busy day in Year 2 to 79 ATMs per typical busy 24-hour day in Year 20. These figures are considered the maximum number of movements for a typical busy day with fewer daily movements during less busy periods. An Air Transport Movement (ATM) includes all landings and take-offs of commercial flights related to the transport of passengers and freight. There will also be an average of approximately 16 non-ATMs per 24-hour day in all years including general aviation and training flights.

During a busy typical day in Year 20, Manston Airport is forecast to handle approximately 72 aircraft movements during the daytime period (between 07:00 to 23:00) and an average of 7 aircraft movements during the night-time period (between 23:00 and 07:00).

6.4 Noise Impact for Communities

The aircraft forecast predicts a gradual increase in aircraft movements between Year 2 and Year 20. This would lead to an increase in aircraft noise over time from the current position of no noise impact. Over this period there will also be changes in aircraft, with airlines phasing out older aircraft, which could reduce the impact of aircraft noise over the same period. However, Year 20 is considered to be the likely "worst-case" year in terms of noise, even considering the phasing out of some louder aircraft.

Figure 8 below shows the calculated noise contour that was presented in the DCO Environmental Statement for the year of maximum forecast capacity and shows the area around the airport within which noise levels can be expected to exceed 50dBA LAeq 16hr (see Section 3 for further information).

Stakeholders should note that this assessment of noise was based on the use of indicative prototype routes during a 'typical busy day' during the busier winter season to ensure that a worst-case assessment was undertaken. It is represented here to give stakeholders an idea of where and what the impact of noise could be. It does not represent the expected level of noise associated with the Do Minimum option, where aircraft will depart and arrive at the airport without the use of designated routes. A full assessment of the likely noise impact of the Do Minimum option will be conducted at Stage 3 of the CAP 1616 process. This will be included as part of the consultation documentation for this ACP to give those who may be affected a better understanding of the likely noise impacts associated with the Do Minimum option.

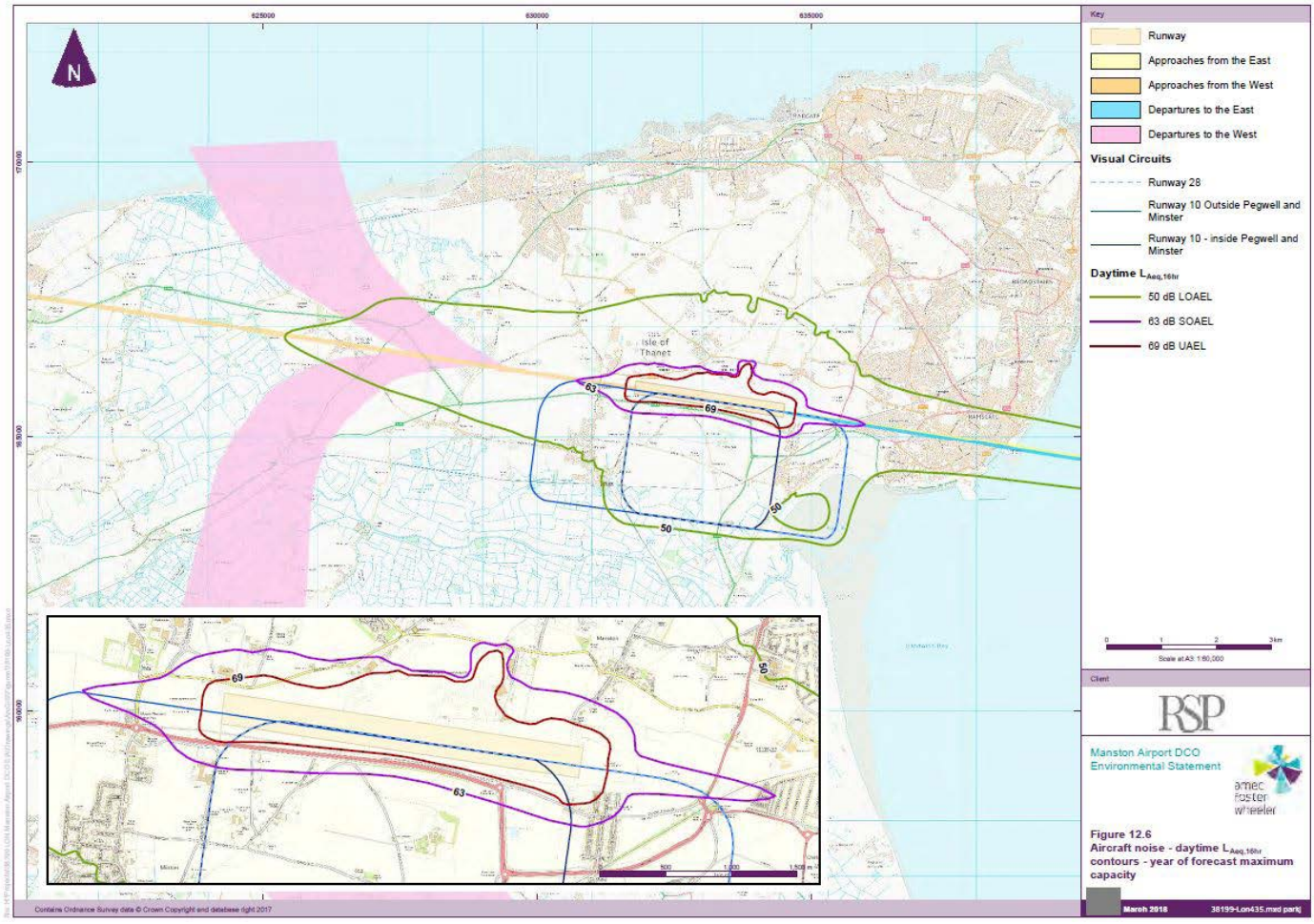


Figure 8 - DCO Environmental Statement Year of Maximum Forecast Capacity Daytime LAeq, 16hr Contours

As can be seen from the contour, the use of the indicative prototype routes used for the DCO Environmental Statement would result in the main noise impact for communities being on the residents of Ramsgate, to the east of the airport. The narrow contour over Ramsgate is a result of the routes requiring departing aircraft to continue straight ahead after take-off until over the sea beyond the town and approaching aircraft being required to be lined up with the runway direction prior to landing.

As can be seen from the contour, the use of the indicative prototype routes used for the DCO Environmental Statement would result in the main noise impact for communities being on the residents of Ramsgate, to the east of the airport. The narrow contour over Ramsgate is a result of the routes requiring departing aircraft to continue straight ahead after take-off until over the sea beyond the town and approaching aircraft being required to be lined up with the runway direction prior to landing.

Although the Do Minimum option represents the opening of the airport without any approved procedures or airspace, the noise effects associated with the Do Minimum option are likely to be similar to those based on the indicative prototype routes presented in the DCO Environmental Statement. This is because there is likely to be less variation in the position of the aircraft close to the airport, on landing, final approaches and immediately after take-off, even without approved procedures, due to the physical position of the runway.

Regardless of whether procedures are available or not, departing commercial aircraft are to maintain runway direction to a minimum height of 500 ft above aerodrome level before commencing a turn. For aircraft departing to the east of the airport, this height is likely to occur whilst the aircraft are close to or over the town of Ramsgate.

Even without approved procedures (the Do Minimum option), aircraft should be operated at all times in a manner calculated to cause the least noise disturbance on the ground. For large commercial aircraft operating out of Manston Airport, this should mean that aircraft avoid turns over the town and continue straight ahead until over the sea before commencing any turns. Therefore, the impact would be similar to those calculated for the DCO Environmental Statement. However, there is always the possibility that some aircraft may commence a turn over populated areas, resulting in a greater impact over a wider area and a wider noise contour over the town than that represented in Figure 8 above.

It is likely that aircraft arriving at the airport over Ramsgate will follow the same route as assessed for the DCO due to the proximity to the runway. However, lack of approach procedures is likely to increase the occurrence of a missed approach with aircraft requiring higher power settings to achieve a safe climb-out. This is likely to increase the noise impact over the town.

The noise impact from aircraft departing to the west of the airport is likely to be similar to that assessed for the DCO. This is due to the fact that the aircraft will need to turn left or right after take-off to avoid climbs into the London TMA. The position that aircraft are likely to commence their turns after take-off are likely to be different to those modelled for the DCO assessment. This is because the aircraft will not be following prescribed routes but will be able to turn as soon as it is safe to do so. Although the impact is likely to be similar to the effect of the dispersion modelled for the DCO assessment, the resulting noise contour is likely to be wider, but shorter than that shown in Figure 7.

The noise impact of aircraft arriving from the west is likely to be similar to the assessed impact due to the proximity to the runway. However, the increased likelihood of aircraft needing to execute a Missed Approach will increase the noise impact not only to the west of the airport, but over the populated areas of Ramsgate too.

Further from the airport, the Do-Minimum option provides little or no consistency of traffic distribution. Aircraft routing, particularly to the south of the airport, will vary depending on the position of the airway joining or leaving point, increasing both the noise impact and the number of population overflown below 7,000 ft. The likelihood of avoiding action in Class G airspace and delays in entry into Controlled Airspace and the airways structure are likely to increase the impact of noise on local communities.

6.5 Air Quality

Thanet District Council declared the Thanet Urban Air Quality Management Area (AQMA) in November 2011 to monitor the quality of air in a number of urban areas within Thanet. The area encompassed by the Thanet Urban AQMA is shown in Figure 6 in Section 4, and includes the urban areas of Ramsgate, extending to the boundary of the airport.

Due to the effects of mixing and dispersion, emissions from aircraft above 1,000 feet are unlikely to have a significant impact on local air quality. The DCO Environmental Assessment included an assessment of the effects of the proposals for the reopening of Manston Airport on air quality, which included the impact of aircraft in the air up to 3,000ft. The results of the assessment concluded that there would not be any significant impact on air quality around the airport and specifically in the Thanet Urban AQMA as a result of the proposals for the reopening of Manston Airport. The results presented a worst-case scenario and included the impact of road traffic and construction activities, as well as the impact of aircraft.

Although the DCO assessment was conducted based on indicative prototype routes, the positions of the aircraft below 1,000 ft without approved procedures (the Do Minimum option) are likely to be very similar (immediately after take-off, or on final approach) and hence there should be no significant impact on air quality as a result of implementing the Do Minimum option. This represents no significant change from the Do Nothing option.

6.6 Tranquillity

For the purposes of airspace change proposals, the impact upon tranquillity need only be considered with specific reference to Areas of Outstanding Natural Beauty (AONB) and National Parks as well as local areas identified through community engagement. The lack of predictable routing is likely to result in an impact on the Kent Downs AONB from both aircraft departing towards the south west and from aircraft arriving from the south west for approaches to Runway 10. There is also likely to be an impact on locally identified areas of tranquillity, such as the Sandwich and Pegwell Bay National Nature Reserve with the Do Minimum option. This represents an increase in the impact on tranquillity over the Do Nothing option. Aircraft departing to the south from Runway 10 may also have an impact on Goodwin Sands. Goodwin Sands were highlighted during stakeholder engagement as an area to avoid, the area is a Marine Conservation Zone with managed marine activities and is not considered a noise sensitive tranquil area. Although there are tourist boat trips to the area, any impact from aircraft operating from Manston Airport is however, expected to be minimal.

6.7 Biodiversity

The DCO Environmental Assessment included an assessment of the potentially significant effects of the reopening of Manston Airport on biodiversity, both within the site boundary and the surrounding area, where appropriate. The assessment concluded that there would be no significant impact on biodiversity as a result of the redevelopment of Manston Airport, despite the significant amount of ground-based infrastructure work that would be undertaken. Implementing the Do Minimum option can therefore be assumed to have no significant impact on biodiversity. This represents no significant change from the Do Nothing option.

6.8 Emissions

The lack of approved procedures do not support optimum aircraft performance. Aircraft are unlikely to be able to perform continuous climb or descent operations and departing aircraft in particular are likely to be restricted in height waiting for clearance to join the airways. This will mean higher engine power settings and greater track miles, which will have an impact on fuel burn and emissions. Whilst awaiting airways joining clearance, there is also the likelihood of avoiding action in relation to other airspace users operating in Class G airspace. This represents a significant increase over the Do Nothing option.

6.9 Capacity and Resilience

The Do Minimum option is an ineffective way of managing airspace. Manston Airport would not meet the airspace modernisation priorities, including the coordination with other airspace users as part of the FASI-S programme. In poor weather conditions, there is a higher likelihood of aircraft having to carry out multiple approaches or divert to other airports with suitable approach aids, which will have a significant impact on the resilience of the airport.

6.10 General Aviation Access

The Do Minimum option is not proposing any changes to the parameters of the current airspace structure around Manston Airport and therefore no change to airspace access is predicted.

6.11 Economic Impact: Commercial Airliners and GA

The reopening of Manston Airport is expected to realise a positive economic impact with an increase in air transport movements from the current position of zero movements. The reopening of the airport is forecast to support the local and regional economies and create a considerable number of direct, indirect, induced and catalytic jobs. Additionally, other socio-economic impacts that can accrue from an airport's operation, such as education and training opportunities, raising the aspirations of young people, providing connectivity, attracting inward investment, supporting inbound tourism, and generating wealth would benefit the area. These impacts were assessed as part of the DCO process, which commenced in 2018. To date, none of the RSP forecasts have changed so no update is required. Socio-economic impacts expected from the operation of Manston Airport include:

- Job creation – Direct on-site jobs are predicted to be 2,150 by Year 5, of which the airport operator will create 697 posts. The direct employment figure is forecast to rise with increasing freight tonnage and passenger numbers. By Year 5, the indirect and catalytic jobs forecast to result from the operation at Manston Airport are 3,870 and 8,600 respectively. Forecasts for Year 20 are approximately 3,420 direct jobs, 6,150 indirect/induced jobs and 13,700 catalytic jobs. These figures represent a wide range of long-term, aspirational career opportunities.
- Connectivity – Increased connectivity improves the GDP of a region and Manston Airport would dramatically improve the connectivity of the area, which is even more essential with the advent of the UK's exit from the EU.
- Attracting inward investment – The presence of an airport supports inward investment and business location decisions.
- Generating wealth – GDP figures based on the airport's impact have been calculated together with the tax revenues the projected job creation it is likely to produce. By Year 20, a GDP of approximately £1.2 billion and tax revenues of approximately £400 million are expected.
- Tourism – Thanet has a long-established tourism sector that can be expected to benefit from the operation of Manston Airport both in its role as a generator of wealth and for the potential to commence passenger services. Additionally, there will be benefits to the hospitality and leisure sectors. These impacts have been demonstrated by the operation of airports at other coastal areas such as Southend-on-Sea, Southampton and Bournemouth, where vibrant airports support tourism in the area and increase demand for visitor accommodation.
- Maritime sector development – The Kent coast has a long and illustrious history of boat building and maritime operations. RSP/Manston's interest in developing a connection between Manston and Central London and Dagenham Docks for the new Combined Markets (Billingsgate, Smithfield and Spitalfields) is likely to stimulate a new era in marine activity from the rundown and underused Port of Ramsgate. Using a hydrogen propulsion system on a specialised marine vessel will remove the need for large numbers of trucks entering and leaving London. The project is in line with and has support from a range of agencies including the Thames Estuary Growth Commission.

Any impact as a result of operating the airport without approved procedures is likely to be a negative impact on the estimates above due to the increased likelihood of aircraft having to divert due to poor weather.

The reopening of the airport and use by GA aircraft could also have a positive economic benefit for the area with an increase in accessibility to the area for visitors.

6.12 Fuel Burn: Commercial Airliners and GA

The Do Minimum option represents an increase in fuel burn over the Do Nothing option, which has zero aircraft movements. The lack of approved procedures with the Do Minimum option will also have a greater (and less predictable) impact due to:

- Potential extended track miles in level flight due to:
  - o height restrictions and clearance delays
  - o avoiding action in Class G airspace

- Unpredictable routes due to:
  - o Variation in airways joining and leaving positions
  - o tactical ATC intervention, including radar vectoring of arrivals onto final approach
- The opportunity to optimise aircraft performance through continuous climb and descent operations unlikely to be achieved.

6.13 Infrastructure Costs

The proposal to reopen Manston Airport as a global freight hub was submitted for consideration as a Nationally Significant Infrastructure Project (NSIP) to be granted by the Secretary of State for Transport. This multi-million pound redevelopment plan will involve building new cargo facilities, improving the passenger terminal and building new aircraft parking stands. It will also include all the necessary infrastructure associated with airport operations, including Communication, Navigation and Surveillance (CNS) equipment, none of which exists on the site at the moment. The CNS equipment planned as part of the redevelopment of the airport will be as follows:

- Communication – Ground to Air and Ground to Ground communications
- Navigation – CAT III ILS installed on both runways, single NDB
- Primary Surveillance Radar (PSR) and Secondary Surveillance Radar (SSR)

The necessary entry requirements in the UK AIP for Manston Airport to open as an airport will be delivered by a separate project.

This represents an increase in cost over the Do Nothing option. However, all costs associated with this project are privately-funded costs and although this will have an impact on the Cost Benefit Analysis conducted at Stage 3, this will have no impact on other stakeholders. The cost of the ILS system will not be included in the cost of the Do Minimum option, as this system will not be required if there are no approved procedures.

6.14 Operational Costs

There will be significant operational costs associated with the reopening of Manston Airport as a NSIP. In addition, the increased likelihood of aircraft needing to divert due to poor weather at Manston Airport may induce increased operational costs at the airport.

6.15 Training Costs

There will be no training costs associated the reopening Manston Airport. No additional training would be required by commercial airlines or GA as a result of reopening the airport without any approved procedures.

6.16 Other Costs

The lack of approved procedures, specifically Instrument Approach Procedures could lead to additional costs to commercial airlines due to the higher likelihood of aircraft being unable to land at Manston Airport due to poor weather. Extra costs would include additional fuel usage during diversion to alternate airports, additional airport fees, time and fuel to return to Manston Airport or ground transport costs for moving cargo from an alternate location.

6.17 Deployment Costs

There will be significant deployment costs associated with the reopening Manston Airport as a NSIP, including the training of staff across all parts of the airport and the development of internal documentation.

6.18 Safety Assessment

When it opens, Manston Airport will have a surveillance capability and will be able to provide aircraft with an Air Traffic Service (ATS). Aircraft operating to or from Manston Airport will be able to receive an ATS appropriate to their flight conditions (IFR or VFR) in Class G airspace. Basic Service and Traffic Service will be available to flights in Class G airspace operating under both IFR and VFR, whereas a Deconfliction Service will only available to flights in Class G airspace operating under IFR.

Manston ATC will also be able to provide an ATS to other air traffic operating in the vicinity of the airport if the aircraft captain requests such a service. There is no obligation for aircraft operating VFR in the vicinity of the airport to talk to ATC or receive an ATS or to operate a transponder. ATC monitoring would be able to provide safe separation from known or unknown traffic using either Primary or Secondary Surveillance Radar. However, the overland areas that would be used for aircraft transiting to or from Manston Airport are used extensively by gliders operating in Class G airspace. Gliders will not be detectable by Primary Surveillance Radar and may not be radio or transponder equipped. It is unlikely that agreed operating procedures (LOA or MOU) would offer robust separation leading to significant safety concerns with no suitable mitigation.

Without any regulated airspace at the airport, there would be no protection afforded to aircraft during the critical stages of flight. Commercial aircraft will be unable to carry out avoiding action from conflicting air traffic other than climbing straight ahead at high engine power

7. Initial Options Appraisal Results

7.1 Introduction

This section of the report summarises the full long list of options and presents a summary of the results extracted from Appendix A1. Section 9 describes the shortlist of procedure options that will be taken forward to Stage 3. The complete analysis is contained in Appendix A1 to this report 'Initial Options Appraisal Tables' (included as a separate document).

7.2 Long List of Options

7.2.1 Proposed New Procedures

The proposed new procedures include the following:

- Instrument Departures from each runway allowing onward routing to the north, south east and west
- Transitions to both runway directions
- ILS and RNAV Approaches to Runway 10 and Runway 28

7.2.2 Longlist of Options

Table 8 presents a summary of the procedures and the long list of options under consideration. For each proposed procedure, the 'Do Minimum' procedure against which all the options are compared, is identified in row 1.

Procedure	Number of Options	Basic Description
Do Minimum Option		Prior to closure the aerodrome at Manston had conventional flight and an Aerodrome Traffic Zone (ATZ) to offer protection to aircraft in the critical stages of flight. All such measure were removed when the aerodrome closed. This option represents the opening of the airport without any approved procedures or airspace.
Runway 28 departures to the north	9	All options include a right-hand turn after take-off, with 3 different overland routes followed by 3 different oversea alternates.
Runway 10 departures	3	All options go straight ahead until over the sea, followed by either a left-hand turn onto north or a right-hand turn onto south. The southern option then splits either east (towards FIR boundary) or west (towards DVR).
Runway 28 Transitions	5	Five separate routes from the en-route network to join the approach procedure.
Runway 10 Transitions	4	Two options for each of the different approach options. One option from the north utilising the existing London City Point Merge arrival procedure, and one option from the south leaving the en-route network to join the approach procedure.
Runway 28 Approach	4	An ILS and an RNAV straight-in approach, each with 2 options for the Missed Approach Procedure.

Procedure	Number of Options	Basic Description
Runway 28 Approach	4	An ILS and an RNAV straight-in approach, each with 2 options for the Missed Approach Procedure.
Runway 10 Approach	4	Two ILS and 2 RNAV straight-in approaches; one of each from a 2,500 ft final descent and one of each from a 3,000 ft final descent. Each approach has one option for the Missed Approach Procedure.
NDB Hold	3	Standard one-minute racetrack based on the NDB position, only for light GA aircraft.
Regulated Airspace	1	Aerodrome Traffic Zone (ATZ) to protect aircraft during the final critical stages of flight.

Table 8 - Long List of Design Options

The full list of options, including map overlays is published on the CAA airspace portal at Step 2A.

7.3 Results Summary

The table containing the full analysis carried out at the Initial Options Appraisal stage is delivered as a separate Appendix to this document – see Appendix A1 for details.

Table 9 below summarises the Initial Options Appraisal.

Colour Key	
Carry Forward	Meets objectives, insignificant impact, and is the Preferred Option for this procedure
Carry Forward	Meets objectives or has an insignificant impact but is less attractive
Reject	Fails to meet one or more objectives or has a significant impact that cannot be effectively mitigated
	No further options for this procedure

	Procedure							
	Runway 28 Departures	**Runway 10 Departures**	**Runway 28 Transitions**	**Runway 10 Transitions**	**Runway 28 Approach**	**Runway 10 Approach**	**NDB Hold**	**Regulated Airspace**
Do Minimum								
Proposed Option	North (East) to North	North	North	North to 2,500 ft Approach	Approach MAP North (East)	2,500 ft Approach MAP North	North East	ATZ
Proposed Option	North (Centre) to North	South to East	North East	South to 2,500 ft Approach (West)	Approach MAP North (West)	3,000 ft Approach MAP North	North West	
Proposed Option	North (West) to North	South to West	East	North to 3,000 ft Approach			South West	
Proposed Option	North (East) to South		South East	South to 3,000 ft Approach (West)				
Proposed Option	North (Centre) to South		South					
Proposed Option	North (West) to South							
Proposed Option	North (East) to East							
Proposed Option	North (Centre) to East							
Proposed Option	North (West) to East							

Table 9 - Initial Options Appraisal Results Summary

8. Qualitative Safety Assessment

8.1 Safety Assessment Activities Required by CAP 1616

A qualitative Safety Assessment is required for all options identified during Step 2B, and a detailed final safety assessment must be completed by the change sponsor prior to submission in Step 4B. RSP is carrying out the safety assessment activities in accordance with CAP 760, the separate guidance provided by the CAA for safety assessment.

RSP is developing a full four-part Safety Case iteratively throughout the CAP 1616 process which will be submitted to the CAA at Step 4B.

8.2 Assessment Method

The Qualitative Safety Assessment uses the results of a formal Hazard Identification (HazID) workshop held on 30th September 2020 during which the hazards, causes and consequences relating to each of the long list of options were identified. Further safety assessments will be conducted during subsequent steps of the CAP 1616 process. At Step 3A, commensurate with the Full Options Appraisal, a Safety Case Part 2 Report will be developed as part of the final Safety Assessment at Stage 4A.

8.3 Safety Assessment Results – Non-Technical Summary

The HazID identified a number of dependencies and/or influencing factors that were common to all the IFP options e.g. Loss of surveillance, loss of GNSS signal in space.

The findings of the qualitative safety assessment of the individual options are summarised as:

- A number of options, or individual aspects of the options, have significant safety implications resulting from conflict with gliders operating under VFR conditions. These IFP options were rejected during the Design Principles Evaluation stage.
- No other significant safety implications have been identified with the IFP options however there are some safety issues which need to be managed:
  - o Aircraft operating IFR in Class G airspace will require a deconfliction service provided by Manston ATC for separation with other traffic operating in the area.
  - o A number of the proposed IFPs have the potential to conflict with arrival routes for other London airports. Altitude restrictions on the Manston procedures would provide deconfliction.
  - o The potential loss of aircraft identification in Windfarm clutter, requiring implementation of technical or operational mitigation for the impact of wind turbine generators on Primary Surveillance Radar.
  - o Some aspects of the IFPs route close to existing airspace restrictions e.g. the current and proposed Southend Control Areas and Shoeburyness Danger Area. Amendments can be made to the procedure designs to ensure safety compliance.
  - o The NDB holds may conflict with commercial aircraft executing a missed approach. The NDB hold will only be used by GA aircraft when there are no aircraft inbound on an approach procedure.

Except for the options which conflict with glider operations, the safety implications for all options are not considered to be significant at this stage. Notwithstanding this, those options that are taken forward to shortlist are subject to a full risk assessment as an element of developing the four-part Safety Case prior to submission of the ACP proposal at Step 4B.

There were no significant safety implications identified associated with the introduction of an ATZ. It was considered that this would have a positive safety impact on operations at Manston Airport. Without any regulated airspace at the airport, there would be no protection afforded to aircraft during the critical stages of flight.

9. Design Options Shortlist

9.1 Shortlist of Options Taken Forward

Table 9 presents the shortlist of options carried forward to Stage 3 along with a summary of the Initial Appraisal Outcome for that option. The original options were reduced to fifteen preferred options and four less attractive but viable options.

Shortlist Option	Initial Appraisal Outcome
Runway 28 North (East) to East (Procedure Option 10	Preferred Option Shortest overland route, minimising noise impact. Greater track miles for some route directions but best climb profile, minimising fuel burn and emissions. Best option for network integration.
Runway 10 North (Procedure Option 13)	Preferred Option Shortest route with optimum climb profile, minimising track miles, noise, fuel burn and emissions.
Runway 10 South to East (Procedure Option 14)	Preferred Option Optimum climb profile minimising fuel burn and emissions. Opportunity for more direct routing, minimising track miles, fuel burn and emissions.
Runway 10 South to West (Procedure Option 15)	Preferred Option Opportunity to amend route to avoid conflict with other arrival routes would optimise climb profile, reducing noise impact, fuel burn and emissions.
Runway 28 Transition from North (JACKO) (Procedure Option 16)	Preferred Option Only one practical option for most expeditious route, minimising environmental impacts.
Runway 28 Transition from North East (SUMUM) (Procedure Option 17)	Preferred Option Only one practical option for most expeditious route, minimising environmental impacts.
Runway 28 Transition from East (RAPIX) (Procedure Option 18)	Preferred Option Only one practical option for most expeditious route, minimising environmental impacts.
Runway 28 Transition from South East (KONAN) (Procedure Option 19)	Preferred Option Only one practical option for most expeditious route, minimising environmental impacts.
Runway 28 Transition from South (OKVAP) (Procedure Option 20)	Preferred Option Only one practical option for most expeditious route, minimising environmental impacts.

Shortlist Option	Initial Appraisal Outcome
Runway 10 Transition from North to 2,500 ft approach (Procedure Option 21)	Preferred Option Direct track and oversea, minimising noise and environmental impacts. Further track miles to join the procedure for aircraft arriving from the west and south, but aircraft will be above 7,000 ft.
Runway 10 Transition from south to 2,500 ft approach (West) (Procedure Option 23)	Preferred Option Most direct track for aircraft arriving from the west, minimising track miles, fuel burn and emissions. Greater noise impact for aircraft arriving from the west and south. Requires network traffic density to be low to use to avoid conflict with outbound London TMA traffic.
Runway 10 Transition from North to 3,000 ft approach (Procedure Option 24)	Viable Alternative Option Direct track and oversea, minimising noise and environmental impacts. Further track miles to join the procedure for aircraft arriving from the west and south, but aircraft will be above 7,000 ft.
Runway 10 Transition from south to 3,000 ft approach (West) (Procedure Option 26)	Viable Alternative Option Most direct track for aircraft arriving from the west, minimising track miles, fuel burn and emissions. Greater noise impact for aircraft arriving from the west and south. Requires network traffic density to be low to use to avoid conflict with outbound London TMA traffic.
Runway 28 Approach MAP North (East) (Procedure Option 27)	Preferred Option Offers fewest practical track miles whilst minimising exposure to noise and numbers overflown.
Runway 10 2,500 ft Approach MAP North (Procedure Option 30)	Preferred Option Offers fewest practical track miles whilst minimising exposure to noise and numbers overflown. South eastern Initial Approach Segment removed due to significant safety impact with gliders.
Runway 10 3,000 ft Approach MAP North (Procedure Option 32)	Viable Alternative Option Approach slightly longer than previous option due to higher approach height but still offers fewest practical track miles for approach from 3,000 ft whilst minimising exposure to noise and numbers overflown. South eastern Initial Approach Segment removed due to significant safety impact with gliders.
NDB Hold Do Minimum	Viable Alternative Option Should the airport decide not to install an NDB, aircraft will be required to hold VFR away from the airport which will potentially increase the noise impact in the local area.
NDB Hold South West (Procedure Option 36)	Preferred Option Situated over sparsely populated area minimising noise impact. Aircraft will hold for the minimum amount of time, minimising fuel burn and emissions.
ATZ (Procedure Option 37)	Preferred Option Minimum requirement for the protection of aircraft in the vicinity of the airport.

Table 10 - Shortlist of options carried forward to Stage 3

9.2 Next Step - Full Options Appraisal

9.2.1 CAP 1616 Requirement

A Full Options Appraisal of each of the options is required during preparation for consultation in Stage 3 to provide a fully developed quantitative assessment of the relevant costs and benefits associated with each option. This analysis will inform the selection of the Preferred Option(s) and form part of the consultation materials.

9.2.2 Full Options Appraisal (FOA) Evidence Capture

Consistent with the requirements of CAP 1616, the IOA is a qualitative analysis of each option against a defined baseline. This is expanded on within the FOA, which is conducted at Stage 3, to include quantitative analysis. The FOA, requires change sponsors to assess each of the design options against each other in relation to the criteria defined in CAP 1616, Appendix E using primarily quantitative metrics. These metrics include the assessment of the environmental impacts of the proposed change.

As defined in CAP 1616a, the FOA requires change sponsors to collect quantitative environmental metrics that describe the baseline scenario and conduct a series of modelling activities for each of the design options, to enable an environmental comparison. The required metrics include:

- 10-year traffic forecasts.
- Standard noise metrics (to Category E standards):
  - o LAeq noise contours
  - o 100% noise mode contours
  - o Nx contours
  - o Difference contours
  - o Lmax spot point levels
- Operational diagrams.
- Overflight (based on the CAA definition of overflight found in CAP 1498 – Definition of Overflight.
- Fuel/CO2 modelling analysis using the most recent appropriate version of Eurocontrol's Base of Aircraft Data (BADA) as the data source.

Data for the modelling will be based on the information provided for the DCO process but updated to reflect any changes since the DCO analysis was conducted. Further information regarding the likely usage of the airport, including any changes to the number of flights or aircraft types expected to operate at the airport, will be provided during the FOA at Stage 3.

The costs and benefits of each option e.g. in terms of greenhouse gasses, noise, fuel burn etc. will be monetised using quantitative estimates from the Department for Transport's (DfT) appraisal guidance[11] for health impacts associated with noise, and for the other impacts where this is possible. The DfT's Web-based Transport Analysis Guidance (WebTAG) toolkit will be used to quantify and analyse the costs and benefits of each **combined** shortlist option (see 9.2.3 below).

The modelling is intended to provide a comparison between what is happening today (the baseline), in order to show the impact of the proposed change at the point of implementation and also 10 years post-implementation. Modelling is also required to show the situation at the proposed implementation date and 10 years post-implementation without applying the proposed change. More information regarding these metrics shall be provided during the FOA at Stage 3.

A cost-benefit analysis will be performed, and a preferred option (or combination of options) will be stated. Compromises and trade-offs may be necessary between airports taking part in the FASI-S regional airspace change. These will be guided by the advice and tools provided by the Airspace Change Organising Group ACOG, the independent team tasked with coordinating the redesign of the UK's airspace.

[11] https://www.gov.uk/guidance/ transport-analysis-guidance-webtag

9.2.3 Combining the Procedures for the Full Options Appraisal

For the purpose of the assessment required for the Full Options Appraisal, we will consider each of the procedure designs in combination with other procedures to assess the holistic options that deliver the operational requirement at Manston Airport. Each option will include arrival and departure procedures that are operationally viable for each runway direction.

The Instrument Departures, Transitions and Approach IFPs are combined in various ways to create an 'operational picture' of where aircraft arriving and departing Manston Airport will fly. Figure 9 below illustrates an example 'option' of a viable option that includes arrivals (Transitions and Approaches) and departures (SIDs) for each runway that work together. Figure 9 is an example for illustrative purposes only, and does not represent any of the actual proposed procedure options.

Although only one runway direction will be used at any given time, each combined option will need to reflect anticipated operating times for both runway directions, for periods representative of local meteorological conditions. The proposed methodology for assessment and combination of options will be discussed with the CAA prior to completing the Full Options Appraisal.

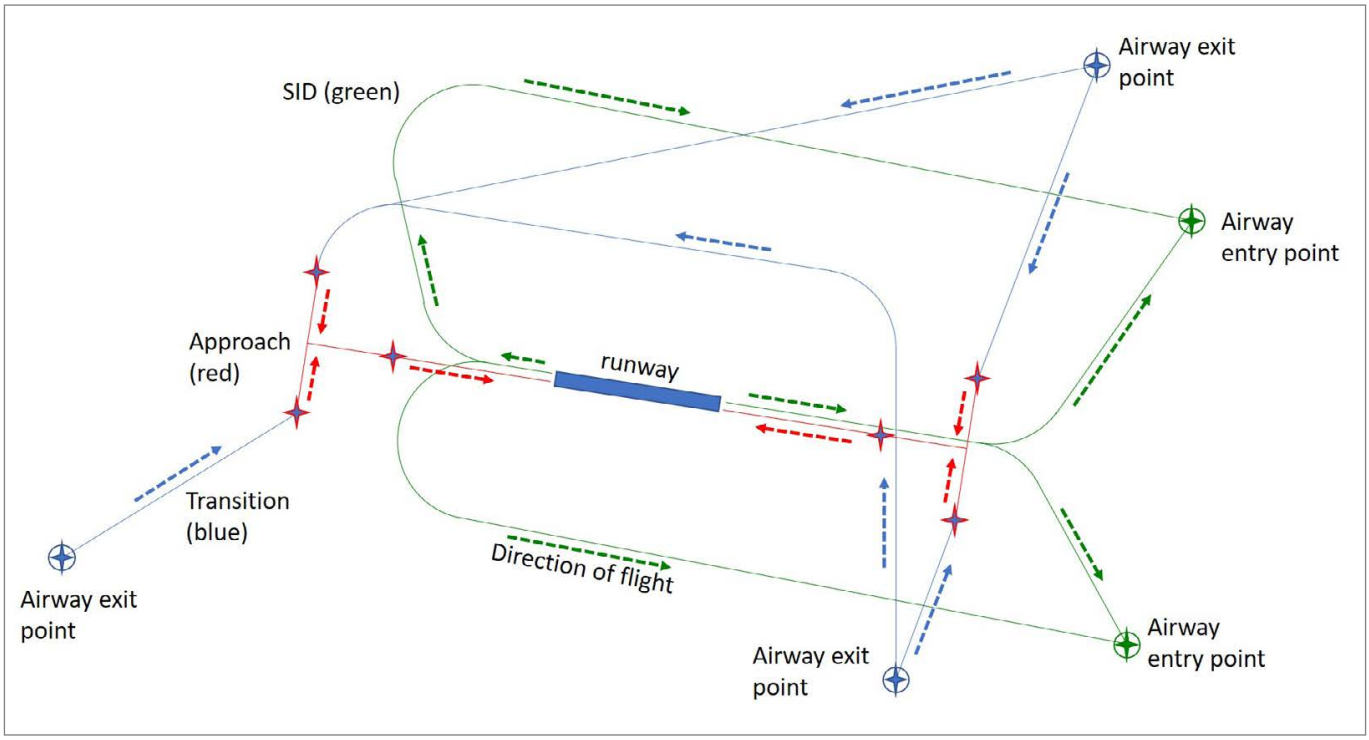
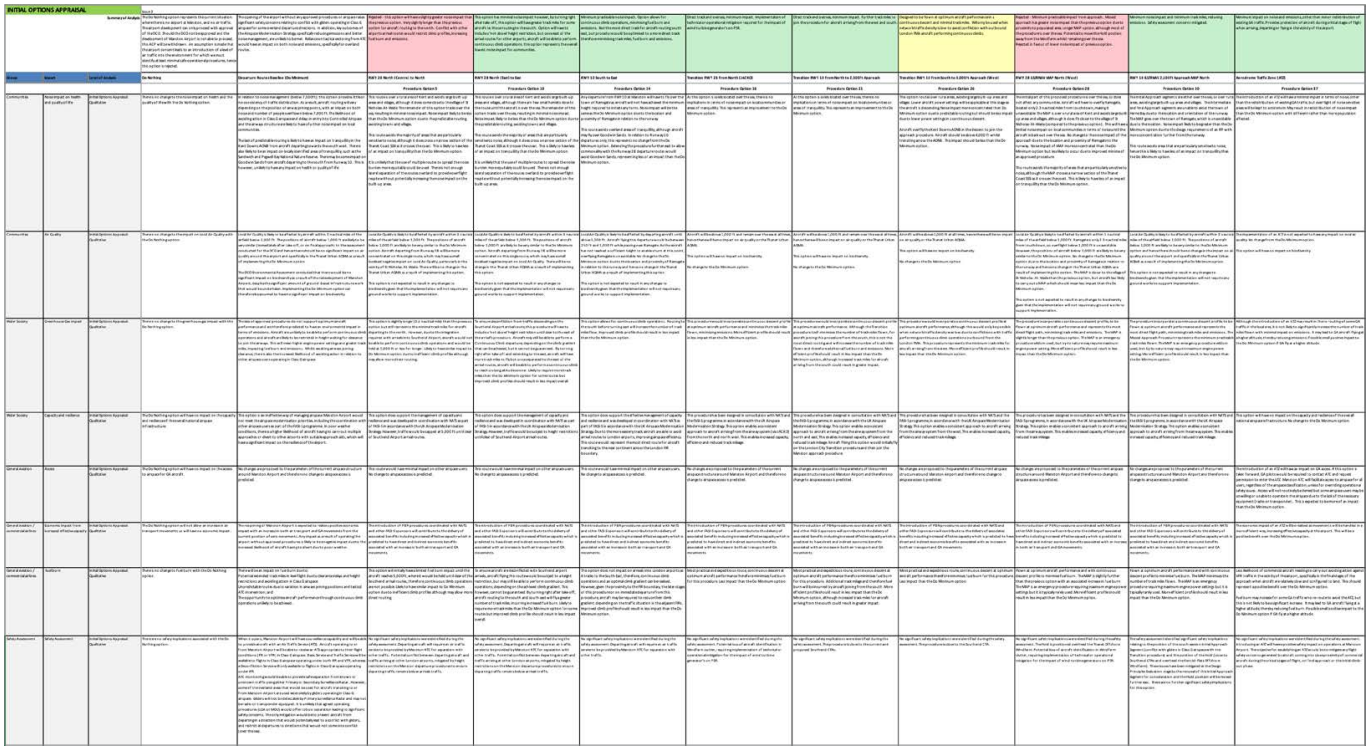


Figure 9 - Illustrative Example of Combined Arrivals and Departures

A1. Initial Options Appraisal (Full Table Analysis)

A1.1 Initial Options Appraisal Table

This Appendix is delivered as a separate MS Excel-based file with the format as shown in the extract below. The Appendix contains the full analysis carried out on the long list of procedure options, as considered during CAP 1616 Stage 2 – Develop and Assess. The full analysis of the options is contained in the Initial Options Appraisal Table Issue 1, that can be found in PDF format alongside this document on the CAA airspace portal.



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