Full Options Appraisal for the Introduction of PBN Approaches

CAP1616 Stage 3 Gateway Submission Document

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Glossary

ACP	Airspace Change Proposal
AIP	Aeronautical Information Publication
AMS	Airspace Modernisation Strategy
ANG	Air Navigation Guidance
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATM	Air Traffic Management
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CDA	Continuous Descent Arrival
CoDA	City of Derry Airport
DfT	Department for Transport
DME	Distance Measuring Equipment – a radio navigation aid used by pilots
eAIP	Electronic Aeronautical Information Publication
FA	Final Approach
FOA	Full Options Appraisal
GA	General Aviation
GNSS	Global Navigation Satellite System
IAA	Irish Aviation Authority
ICCAN	Independent Commission on Civil Aviation Noise
IFP	Instrument Flight Procedures
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IOA	Initial Options Appraisal
LNAV	Lateral Navigation
LPV	Localiser Performance with Vertical Guidance
MA	Missed Approach
MAP	Missed Approach Procedure
MoD	Ministry of Defence
NATS	Primary UK Air Navigation Service Provider
PBN	Performance Based Navigation
RNP	Required Navigation Performance
RWY	Runway
SoN	Statement of Need
VFR	Visual Flight Rules
VNAV	Vertical Navigation
WebTAG	UK Government Online Transport Analysis Guidance Tool

1. Introduction

1.1. City of Derry Airport (CoDA) is located seven miles northeast of Derry/Londonderry and serves as the main gateway for the entire North West of Ireland. It provides a vital air access link for the local community and performs a pivotal role in the economics of the region.

1.2. The past decade has seen a revolution in the European aviation market; 'Open Skies', globalisation and the advent of low-cost carriers has resulted in a proliferation of air travel. The low-cost model has provided a safe and affordable alternative to the traditional full-service carriers, opening up the market to a new generation of traveller. CoDA has benefited from this proliferation and now provides an essential link to the UK and Ireland. It is expected that the recent downturn caused by the COVID-19 pandemic will recover and therefore the long-term demand facing the sector is expected to remain.

1.3. CoDA is undertaking an Airspace Change Proposal (ACP) to introduce satellite-based approach procedures which will utilise Performance Based Navigation (PBN), meet the governments Airspace Modernisation Strategy (AMS), and provide a contingency for the existing ground based navigational aid infrastructure. As part of this ACP, CoDA is proposing the following:

- To introduce satellite-based (PBN) approaches to RWY 08 & RWY 26.
- To introduce satellite-based (PBN) direct arrival procedures to compliment the above.
- To introduce satellite-based (PBN) Missed Approach Procedures, Aircraft Holds and holding procedures.

1.4. As much as possible, the aim is to design PBN approaches and arrival procedures to replicate the existing routes which would result in little or no noticeable change to stakeholders.

1.1 Airspace Modernisation

1.1.1 The UK's airspace is some of the busiest in the world. The Department for Transport (DfT) has notified aviation stakeholders that, with the demand for aviation forecast to continue growing, delays and environmental impacts are expected to increase if the UK's airspace is not upgraded to introduce additional capacity. In response, the Government tasked the CAA to develop the UK Airspace Modernisation Strategy (AMS)[1], which was published in December 2018 and describes the changes that the industry should make to meet the growing demand form aviation in a safe, efficient, and environmentally sustainable way.

1.1.2 The overall programme of changes required to implement the AMS is considered one of the most significant airspace and air traffic management (ATM) developments ever undertaken. Some of the most important changes described in the AMS concern the widespread adoption of satellite-based navigation technology (known as Performance based Navigation or PBN).

[1] Airspace Modernisation Strategy

1.1.1 Performance-Based Navigation (PBN)

1.1.1.1 The introduction of PBN is the key to achieving airspace modernisation. PBN improves the accuracy of where aircraft fly by moving away from outdated conventional navigation using ground-based beacons, to modern satellite navigation. PBN is being introduced across the world. The new technology allows more flexible positioning of routes and enables aircraft to fly them more accurately. This helps improve operational performance and reduce delays.

1.1.1.2 As part of the European Union, the UK was required to follow regulation EU 2018/1048[2], which lays down airspace usage requirements and operating procedures concerning performance-based navigation and describes the wider implication for UK airports and airfields. To comply with the EU regulation, specifically AUR.PBN.2005, the City of Derry Airport was to introduce PBN by 2024.

1.1.1.3 The EU (Withdrawal) Act 2018 converts existing EU law into UK law and preserves existing UK laws that implement EU obligations. CoDA understands that the AUR.PBN.2005 requirement was not incorporated into that act, but CoDA still wish to implement PBN procedures owing to the significant operational resilience they bring.

[2] EU 2018/1048

1.2 CAP1616

1.2.1 In December 2017 the Civil Aviation Authority (CAA) published CAP1616 Airspace Design: Guidance on the regulatory process for changing airspace design, including community engagement requirements. The guidance sets out the steps for the airspace change process, which a change sponsor of any permanent change to the published airspace design must follow. The airspace change process is split into 7 Stages;

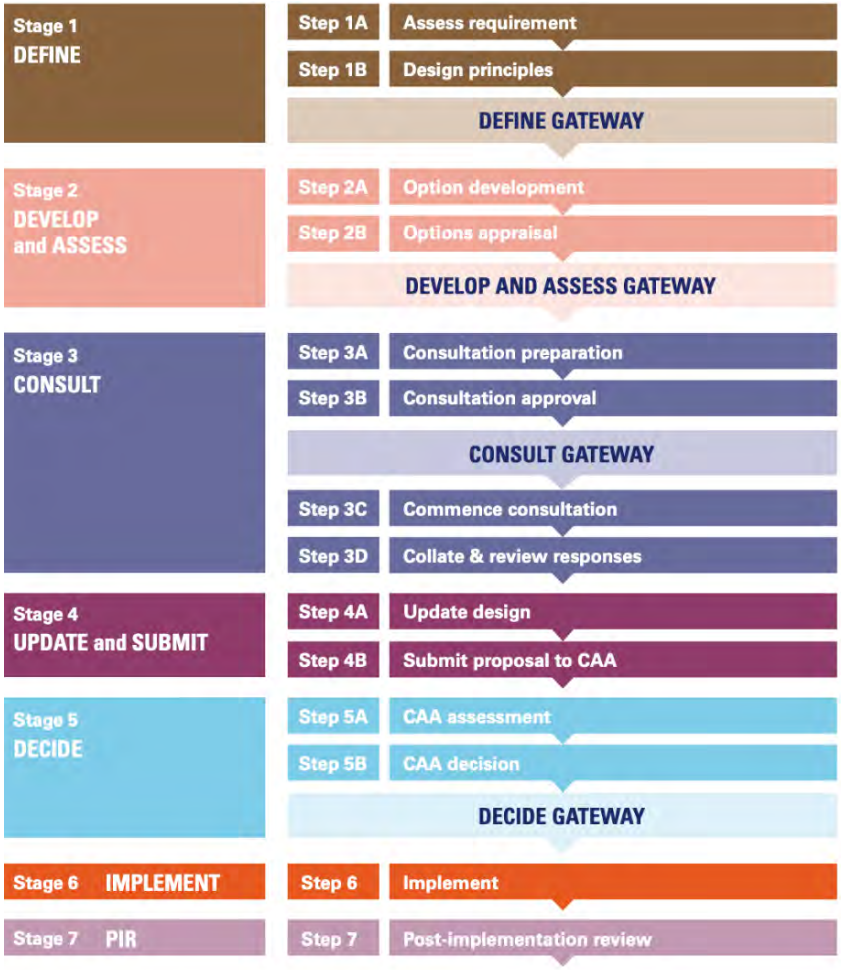


Figure 1 CAP1616 7 Stages

1.3 CoDA Airspace Change Proposal

1.3.1 This CoDA Airspace Change Proposal is required to follow the CAP1616 process detailed in the section above. Table 1 below summarises the CAP1616 stages already undertaken for this ACP and the stage where we are at now, providing links to previous submission documents with further information.

Table 1 CoDA ACP Stages to date

Airspace Change Stage	Summary	Link to Documents (Also available on the ACP portal)
Stage 1A	CoDA submitted a statement of need (SoN) to the CAA. The SoN explained that aircraft currently operate using the Instrument Landing System (ILS) when arriving at Derry and this is a ground based navigational system. CoDA would like to introduce satellite based PBN approach procedures for contingency purposes that, as far as practicable, replicate the existing procedures at EGAE. To ensure that the required contingencies are available, CoDA intends to introduce GNSS approach procedures (now known as RNP Approach) to both Runway 26 and Runway 08 as follows: • Introduction of PBN approaches to RWY 08 and RWY 26; • Introduction of PBN direct arrival procedures to compliment the above; • Introduction of PBN Missed Approach Procedures, Aircraft Holds and holding procedures.	Full Statement of Need
	CoDA participated in an assessment meeting with the CAA on the 20th March 2019 as part of Step 1A of the CAP1616 process. The purpose of the assessment meeting is for the change sponsor to present and discuss their SoN and to enable the CAA to consider whether the proposal falls within the scope of the formal airspace change process.	Assessment meeting minutes
Stage 1B	At Stage 1B CoDA developed a set of design principles with identified Stakeholders. The aim of the design principles is to provide high-level criteria that the proposed airspace design options should meet. They also provide a means of analysing the impact of different design options and a framework for choosing between or prioritising options. The final design principles were given a priority order as this would help with the comparison of different design options developed at Stage 2 of the ACP process.	Stage 1B Design Principle Submission Report

Stage 2A	Stage 2A requires change sponsors to develop and assess options for the airspace change. In Stage 2A, we first developed a comprehensive list of options that address the Statement of Need and that align with the design principles from Stage 1. We then shared those options with our Stakeholder representatives (the same ones engaged with on the Design Principles). Feedback from the engagement could then be used to generate further options where proposed[3], or feedback used to understand their impacts and feed into the Design Principle Evaluation. Finally, we qualitatively assessed all options developed against the Design Principles and produced a Design Principle Evaluation. This evaluation allowed us to discount certain options. The remaining options following the Design Principle Evaluation were grouped together into 'Airspace Design Options' and were brought forward to Stage 2B. These options are outlined in Section 2 of this document.	Stage 2A Design Principle Evaluation
Stage 2B	At Stage 2B an Airspace Change Sponsor is required to undertake an Initial Options Appraisal (IOA) of the airspace change options which proceed from Stage 2A. The IOA document initially describes the options under assessment and the baseline option, followed by explaining the methodology used to assess each option, and then the IOA outcome. At the end of the document we explain, based on the IOA, the options which we intend to take forward to Stage 3 and our preferred option.	Stage 2B Initial Options Appraisal
Stage 3	At Stage 3A, an Airspace Change Sponsor is required to plan for stakeholder consultation and engagement by preparing a Consultation Strategy, Consultation documents, and a Full Options Appraisal (FOA). This is where we are now. This document is the Full Options Appraisal (FOA) document which is the second-phase appraisal, following the IOA at Stage 2B, with more rigorous analysis of the impacts and benefits of the proposed airspace change options. It initially describes the options taken forward from Stage 2B and how they have been developed further following technical Instrument Flight Procedure (IFP analysis). It then describes the options under assessment at Stage 3 and the baseline option, followed by explaining the methodology used to assess each option, and then the FOA outcome. At the end of the document we explain, based on the outcome of the FOA, our preferred option.	Stage 3 Consultation Strategy Stage 3 Consultation Document Full Options Appraisal (This document)

[3] No new options were proposed by stakeholders

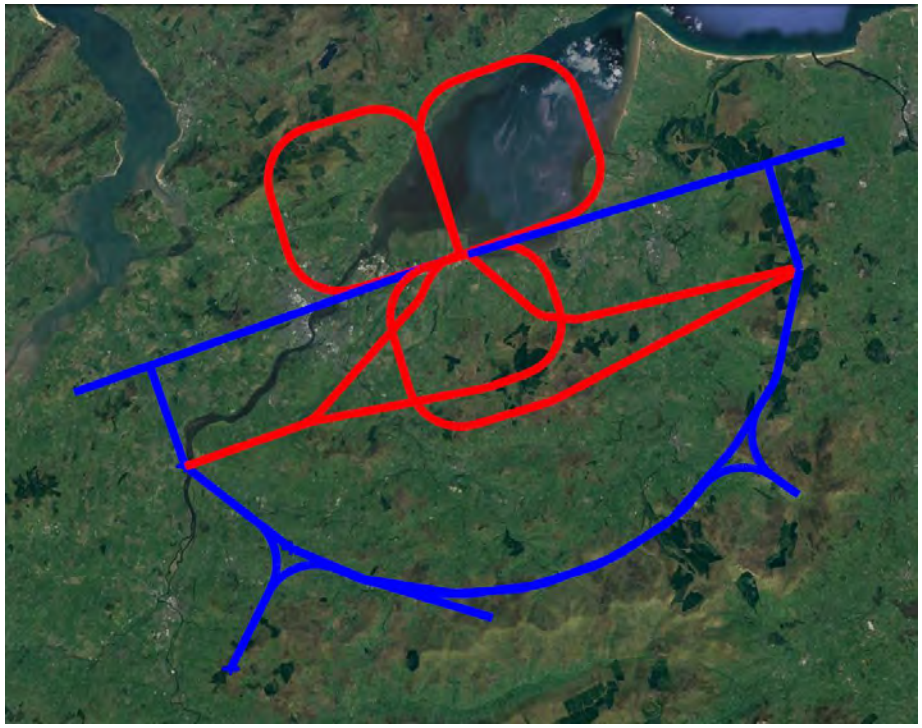
2. Options Progressed from Stage 2B

2.1. Two main airspace change options progressed from Stage 2B (Initial Options Appraisal) to Stage 3. Within each airspace option there was a subset of missed approach options (two for each runway); these options were applicable to either of the main Airspace Change Options. These two options, which are outlined below, were created from the component parts that were assessed as part of the Design Principle Evaluation. More information regarding this is available in the Design Principle Evaluation and Initial Options Appraisal submission documents.

All diagrams contained within this section of the document are illustrative for the purposes of explaining the core concept at Stage 2B. Please note that the options look similar in the diagrams within this document, but the core difference is between an RNP Approach to Runway 08 which is either aligned with the runway centreline or one that is slightly offset, as well as the multiple options for Missed Approaches.

2.1 Airspace Option 1

Table 2 IOA Airspace Change Option 1 Details

Airspace Option 1			
Description	08 Offset final approach, 26 Straight In final approach		
Components (from Stage 2A)		**Approach (Blue)**	
	26DE	Rwy 26, Direct arrival from the East	
	26TSS	Rwy 26, T BAR from the South, short final	
	08DWO	Rwy 08, Direct arrival from the West, Off-set	
	08TSO	Rwy 08, T BAR from the South, Off-set	
	08DAR	Rwy 08, Direct Arrival Replication	
	26DAR	Rwy 26, Direct Arrival Replication	
		Missed Approach Sub Options (Red)	
	26MAROH	Rwy 26, Missed Approach, Right Turn to Overhead hold	
	26MALST	Rwy 26, Missed Approach, Left Turn to South T Bar	
	08MALOH	Rwy 08, Missed Approach, Left Turn to Overhead hold	
	08MARST	Rwy 08, Missed Approach, Right Turn to South T Bar	

2.2 Airspace Option 2

Table 3 IOA Airspace Change Option 2 Details

Airspace Option 2			
Description	08 Straight In, 26 Straight In final approach		
Components (from Stage 2A)	26DE 26TSS 08DWS 08TSS 08DAR 26DAR **Missed Approach Sub Options (Red)** 26MAROH 26MALST 08MALOH 08MARST	Rwy 26, Direct arrival from the East Rwy 26, T BAR from the South, short final Rwy 08, Direct arrival from the West, Straight-in Rwy 08, T BAR from the South, Straight-in Rwy 08, Direct Arrival Replication Rwy 26, Direct Arrival Replication Rwy 26, Missed Approach, Right Turn to Overhead hold Rwy 26, Missed Approach, Left Turn to South T Bar Rwy 08, Missed Approach, Left Turn to Overhead hold Rwy 08, Missed Approach, Right Turn to South T Bar	

3. Instrument Flight Procedure Development

3.1. As part of our Initial Options Appraisal (IOA), we explained that we had chosen to progress both airspace change options through to Stage 3, as the IOA had demonstrated that that there were very small differences between the two options in terms of the benefits and impacts and it would be valuable to analyse both in detail once the options have been developed into detailed Instrument Flight Procedures (IFPs). We also noted in the IOA document that some areas, for example the requirement for new controlled airspace (CAS), would require detailed IFP development before they could be fully assessed.

3.2. When designing new procedures, Approved Procedure Designers (APDs) have to follow the International Civil Aviation Organisation (ICAO) rules used for designing instrument approach and departure routes, which are outlined in a document called PANS-OPS.

3.3. The options developed at Stage 2 of the Airspace Change Process were indicative directions of procedures that have been developed only by applying the basic principles of PANS-OPS. This was considered proportionate at this stage of the ACP where there were many options initially developed in our comprehensive list and it would not have been feasible to design all of these to full PANS-OPS standards.

3.4. Following the successful completion of Stage 2B, we therefore considered further the technical detail of the two options and their associated sub-set of missed approach options with regards to PANS-OPS. We also considered the Irish Aviation Authorities (IAA) requirements to ensure that the primary protection area of a procedure is contained within Controlled Airspace. The outcomes of this technical analysis are outlined within the following diagrams which summarise the components of Airspace Option 1 and 2. Further details of the IFP assessment are then outlined in the subsequent subsections of this document.

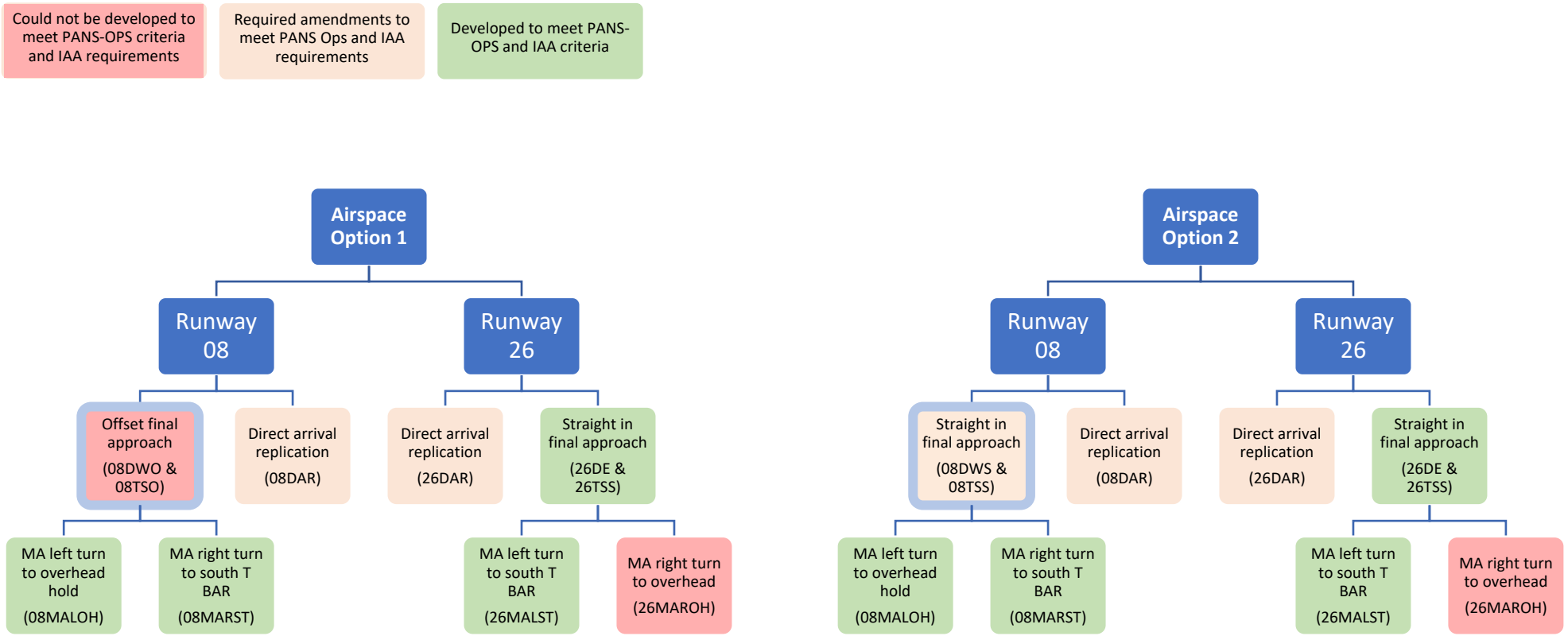


Figure 2 IFP development outcomes

3.1 Runway 26 Final Approach

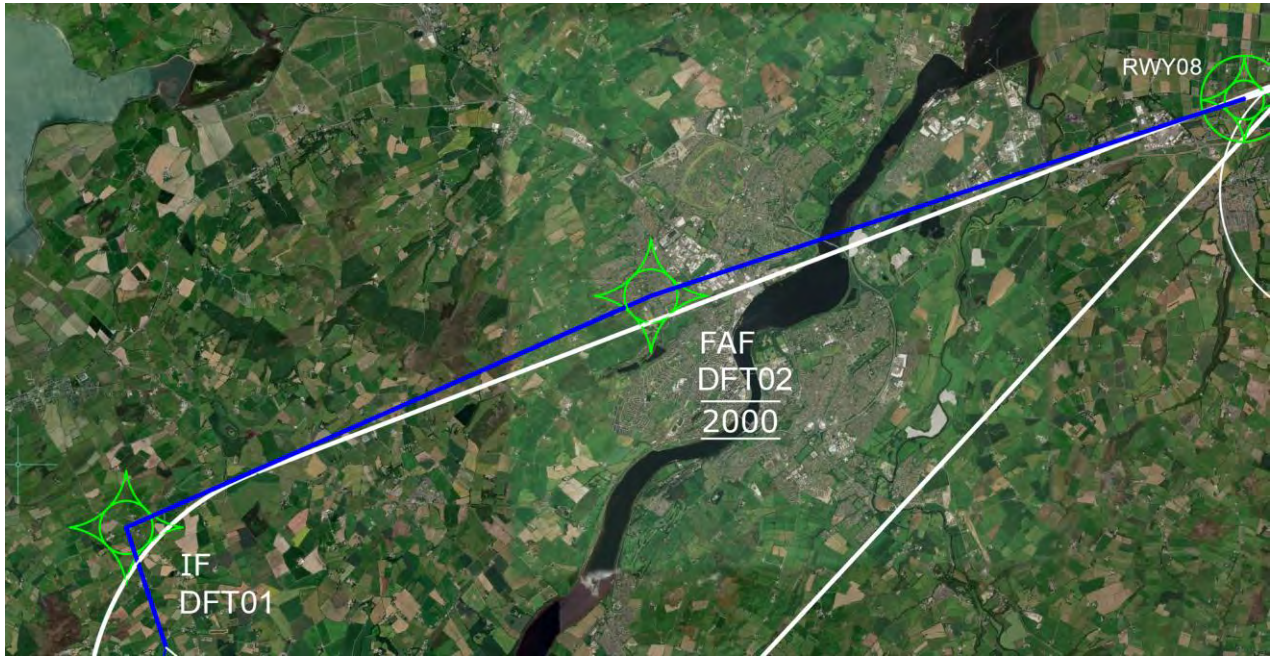
Table 4 Outcome of Runway 26 IFP development

Components	Description	Outcome of IFP development investigation
Airspace Option 1 and 2 26DE and 26TSS	Rwy 26, Direct arrival from the East Rwy 26, T BAR from the South, short final	Airspace Option 1 and 2 both have the same component parts for the straight in final approach to runway 26, 26DE and 26TSS (Direct arrival from the East and T BAR from the south, short final). Detailed IFP development has demonstrated that these are feasible and further details of the IFP that has been developed to take through to this Full Options Appraisal at Stage 3 are available in Section 6 of this document.

3.2 Runway 08 Final Approach

Table 5 Outcome of Runway 08 IFP development

Components	Description	Outcome of IFP development investigation
Airspace Option 1 08DWO and 08TSO	Rwy 08, Direct arrival from the West, Off-set Rwy 08, T BAR from the South, Off-set	At CoDA, due to the location of the localiser and NDB on the aerodrome, aircraft today fly an offset ILS or NDB approach to runway 08; this means that the aircraft are initially slightly offset from the extended runway centreline and, as the aircraft descend towards the airport, once the pilot can see the runway, a small adjustment to the aircraft's course is made to align with the runway before landing. Following Stage 2B, when we developed the IFPs in further detail we found that the offset components 08DWO and 08TSO could not be developed into PANS-OPS compliant procedures. This was because to replicate the existing ILS track would result in a nominal glide path that reaches a height above the threshold below the required 55m (180ft) PANS-OPS requirement. It was therefore not possible to progress with an offset approach to runway 08. As this was the key differentiator between Airspace Option 1 and Airspace Option 2, this meant that we could not continue Airspace Option 1.
Airspace Option 2 08DWS and 08TSS	Rwy 08, Direct arrival from the West, Straight-in and Rwy 08, T BAR from the South, Straight-in	We next looked at the straight in approach components 08DWS and 08TSS for runway 08 and we found that we could develop a PANS-OPS compliant procedure for this option. When developing the IFPs one of our aims was to ensure that the associated direct arrival 08DAR (which would be termed an RNAV1 'Approach transition') could be used for both an ILS or RNP approach and therefore we needed to investigate the location of the Intermediate Fix (IF) that could complement both the ILS and RNP approaches. The detailed IFP development of 08DWS and 08TSS resulted in the runway 08 RNP approach having a slightly off-set intermediate segment with the IF aligned with the extended ILS track to allow for the same IF to be used for

		the offset ILS approach[4] followed by a straight in final approach segment. The turn at the Final Approach Fix (FAF) would be 5.24° to align with a straight in final approach track. This design is PANS-OPS compliant however not a typical approach configuration. Figure 3 below shows the IF and FAF of the 08 final approach compared with the existing ILS approach.  *Figure 3 Runway 08 RNP Approach (Blue) and existing ILS approach (White)* The development of the IFPs for the Airspace Option 2 design means that compared to the analysis undertaken in the Initial Options Appraisal, Airspace Option 2 is now a closer replication of current day with a smaller distance between the nominal track of the ILS procedure and the nominal track of this new procedure; the Full Options Appraisal will review this in further detail. We also considered the westerly T-Bar (08DWS) which was intended to cater for arrivals from the west. The development of the IFP found that this procedure's primary protection area could not be contained within the existing airspace and therefore an extension to CTA 2 would be required. Given that it is anticipated that this would be used 10-15 times per year based on 2019 movements, we were concerned that it was not proportionate to continue with this component given the requirements for additional controlled airspace. The IAA airspace review

[4] CoDA ILS approach charts would require updating to reflect the new IF

		is currently considering lowering the base of airspace to the west of the CTA in the Shannon FIR. If this is progressed it would allow oceanic arrivals from the west to position themselves for the RNP approach and perform a continuous descent operation (CDO) which would remain inside controlled airspace without the requirements to create an IAF out to the west (An IAF to the west would have required even more low level airspace via a CTA extension). The 08DWS component was therefore not continued into Airspace Option 2.

3.3 Missed Approach Sub Options

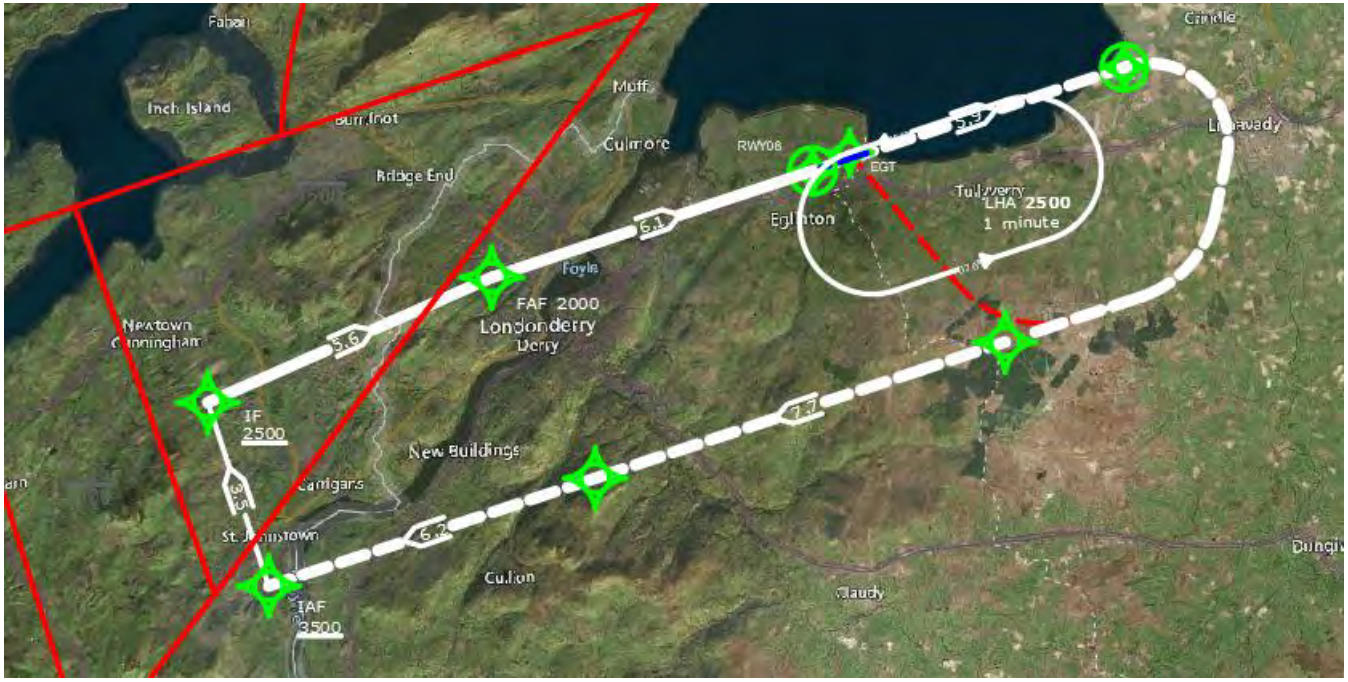
3.3.1 Four missed approach sub options were progressed from Stage 2B; these sub-options were applicable to both Airspace Option 1 and Airspace Option 2. As part of our IFP development, we have looked at these four missed approach options and investigated their feasibility. The table below outlines the four options and the outcome of our investigations:

Table 6 Outcome of Missed Approach IFP Development

Components (from Stage 2A)	Description	Outcome of IFP development investigation
26MAROH	Rwy 26, Missed Approach, Right Turn to Overhead hold	At Stage 2B we explained that this missed approach option aims to replicate the published ILS procedure however it may differ from how some aircraft fly today as ATC are known to tactically instruct some aircraft to turn south. As part of the assessment in the IOA it was also highlighted that: • There may be the requirement for some additional Irish Controlled airspace to the north west of the first turn in order to ensure that the primary protection area is contained within controlled airspace (CAS). (The Irish Aviation Authority requires all primary protection areas of procedures to be contained within CAS). • Pilots have reported the existing missed approach generates high workload owing to the early turn at 600ft and therefore there may be a requirement for initial straight-ahead segment for longer than today. • The option is within close proximity of an area of high ground with wind turbines (to the north of the airport) which would require investigation when an IFP is fully developed. Our IFP development work therefore investigated these points, initially starting with the requirement for more CAS. Detailed development of the procedure showed that it is not possible to design a right turn missed approach for runway 26 without the requirement for additional CAS. This seemed disproportionate to any benefits identified in the IOA given it is estimated that the missed approach will be used for 11 flights per year, and it goes against Design Principle 5 to 'minimise impact on other airspace users and limit any requirement for additional Controlled Airspace (CAS)'.

Components (from Stage 2A)	Description	Outcome of IFP development investigation
		Initial review also showed that there would likely be a requirement for a longer straight-ahead segment to mitigate some pilot workload concerns around an initial turn at 600ft and the surrounding obstacle environment. This option therefore could not replicate the current published procedure of today, and also would not replicate what is typically flown today. Taking this information, the outcomes of the IOA, and knowing how few aircraft are expected to operate RNP missed approaches we therefore concluded that it was not a feasible option and it would not be progressed to Stage 3 Full Options Appraisal.
26MALST	Rwy 26, Missed Approach, Left Turn to South T Bar	Detailed IFP development has demonstrated that this missed approach option is feasible. The IFP was developed to climb straight ahead to 3500ft to replicate how aircraft are tactically managed today. The CAA do not permit Airspace Change Sponsors to share draft IAP charts and therefore the figure below shows an indicative chart overlaid on a satellite map:  *Figure 4 Indicative runway 26 Missed Approach Chart* Indicative Missed Approach Text: Continuous Climb to 3500, initially climb straight ahead to waypoint XX, then turn left to waypoint XY – XZ waypoint – XA waypoint to join the IAF or as directed by ATC. If Holding is required, route waypoint XX – waypoint XY - EGT. Further details of the IFP that has been developed to take through to this Full Options Appraisal at Stage 3 are available in section 6 of this document.

Components (from Stage 2A)	Description	Outcome of IFP development investigation
08MALOH	Rwy 08, Missed Approach, Left Turn to Overhead hold	Detailed IFP development has demonstrated that this missed approach option is feasible. The IFP was developed to climb straight ahead to 3500ft before turning. The differences between conventional navigation and PBN design criteria mean that this missed approach cannot be perfectly replicated however PBN waypoints can be used to align it as closely as possible. In addition to this, in PBN criteria a left or right turn cannot be allocated after a DR leg and therefore as part of the design we needed to consider how we can ensure that an aircraft consistently turns in the desired direction. The missed approach procedure has been constructed with a flyover waypoint to ensure aircraft reach a safe altitude (3500ft) before the turn. A second waypoint positioned 3nm and a 30º splay from overhead EGT has been used to replicate the current track back to the hold and ensure that aircraft flying the PBN missed approach turn left. This design is a new PBN configuration which meets PANS-OPS criteria but will require testing and validation in a flight simulator to ensure it performs as expected. The CAA do not permit Airspace Change Sponsors to share draft IAP charts and therefore the figure below shows an indicative chart overlaid on a satellite map:  *Figure 5 Indicative Runway 08 Missed Approach Chart - Left Turn to Overhead hold*

Components (from Stage 2A)	Description	Outcome of IFP development investigation
08MARST	Rwy 08, Missed Approach, Right Turn to South T Bar	Detailed IFP development has demonstrated that this missed approach option is feasible however there are considerations to be balanced against how tight aircraft initially turn vs how aircraft will enter the overhead hold (EGT) if required. Initially, two IFPs were developed that followed the principle of the turn right to the south T-Bar option. The first had a right hand turn back to the south T-BAR, however if holding overhead the airport was required, it would result in the aircraft making a parallel entry to the holding pattern. The alternative option enabled a Direct Entry into EGT but resulted waypoint positioning that were more challenging, although still PANS OPS compliant. These two IFPs were shared with some of CoDA's airlines to understand any operational or safety concerns. Representatives from the airlines expressed a preference for a direct entry. The direct entry IFP was therefore developed further into the IFP shown on the indicative image below.  *Figure 6 Runway 08 Missed Approach - Right Turn to South T Bar*

Components (from Stage 2A)	Description	Outcome of IFP development investigation
		Details of the engagement can be found in Appendix A. Some feedback suggested extending the straight ahead climb out length and a series of flyby waypoints to enable a smoother direct entry to EGT, if required. Such fine detail will be explored in the IFP Validation activity in Stage 4 however, we decided to wait for more airspace user feedback from this consultation to help inform the specifics, together with that IFP Validation activity. Similar to 08MALOH above, although this existing configuration meets PANS-OPS criteria, it will require testing and validation to ensure it performs as expected with the potential for further refinements possible. Owing to the estimated low frequency of RNP RWY 08 Missed Approaches (9 per year by 2032) the impacts of such small variations will not affect those articulated in this FOA.

3.4 Direct Arrival Replication

Table 7 Direct Arrival IFP Development

Components (from Stage 2A)	Description	Outcome of IFP development investigation
08DAR 26DAR	Rwy 08, Direct Arrival Replication Rwy 26, Direct Arrival Replication	The conventional published direct arrivals at CoDA utilise three holds, COLRE, DUNGV and LUNEX and a distance measuring equipment (DME) arc that is determined by the distance from I-EGN DME. The IFP development to replicate these arrivals demonstrated that although it is possible to closely replicate a large portion of the DME arc, the approach transition legs from the DUNGV hold onto the arc involve very tight turns and few track miles between waypoints. This meant that the initial turns onto the arcs could not be developed to be fully PANS-OPS compliant without adding overly restrictive altitude and speed constraints. We therefore investigated how we could amend these IFPs to as closely replicate current day whilst also ensuring they were compliant and operationally efficient. This involved applying a 20° splay to the approach transition legs to reduce the turn onto the sections replicating the arc.  *Figure 7 Indicative runway 08 & 26 Transitions from DUNVG hold* Based on the appraisal already undertaken as part of the IOA, we were confident that this small change would not significantly impact noise or other environmental metrics as this occurs above 7000ft. As part of the Full Options Appraisal we will analyse this small adjustment in full detail to understand the benefits and impacts, if any, of this change.

3.5 Approach angles greater than 3.0˚

3.5.1 At Stage 1B, an airspace Design Principle was developed that outlined 'Design options will investigate approach angles greater than 3.0˚, subject to Regulatory acceptance'. This was requested from stakeholders representing local gliding and microlight interests. As part of our Stage 2B document, we explained that this would be investigated at Stage 3 when the procedures are developed into detailed IFPs.

3.5.2 Following the IFP review undertaken on the options outlined above, we next turned to investigating slightly steeper approach angles to understand whether it would be feasible for these to be implemented and the benefits and impacts if they were.

3.5.3 Based on precedent within the UK[5], we reviewed the possibility of increasing the approaches to 3.2° rather than the standard 3.0° approach angle. This results in a height difference of approximately 210ft when an aircraft is 10nm from touchdown between a 3.2° and a 3.0° approach.

3.5.4 We know from studies that there are some noise and environmental benefits when aircraft fly SSA however these benefits are very small and a large number of flights need to operate SSA in order for any the benefits to be materially realised.

3.5.5 In the case of the CoDA, a very low number of aircraft are anticipated to fly the RNP approaches. The estimates used within this FOA are an ambitious one with an average 2-3 RNP approaches per day. Given that 78% of these flights will approach via runway 26 across the water, it results in less than one easterly arrival per day on average that could fly the slightly steeper approach angle. Any incremental noise advantages of this would be so negligible that it is not considered beneficial compared against the costs that the project would incur in being able to demonstrate whether 3.2˚ approaches were operationally safe and acceptable.

3.5.6 Finally, due to the conventional 3.0° procedures remaining, there would also be no benefit to controlled airspace or airspace users under the final approach as other aircraft in Class G airspace would not be aware of which approach a particular aircraft was flying.

3.5.7 On balance, it was therefore concluded the possibility of increasing the approach angle from 3.0° would not be continued into Stage 3 of this ACP.

[5] ACP-2017-49

3.6 Instrument Flight Procedure Development Outcome

3.6.1 Following the IFP development and analysis, Airspace Change Option 2 was evolved into the main option that would be taken forward to the Full Options Appraisal alongside the three associated missed approach options:

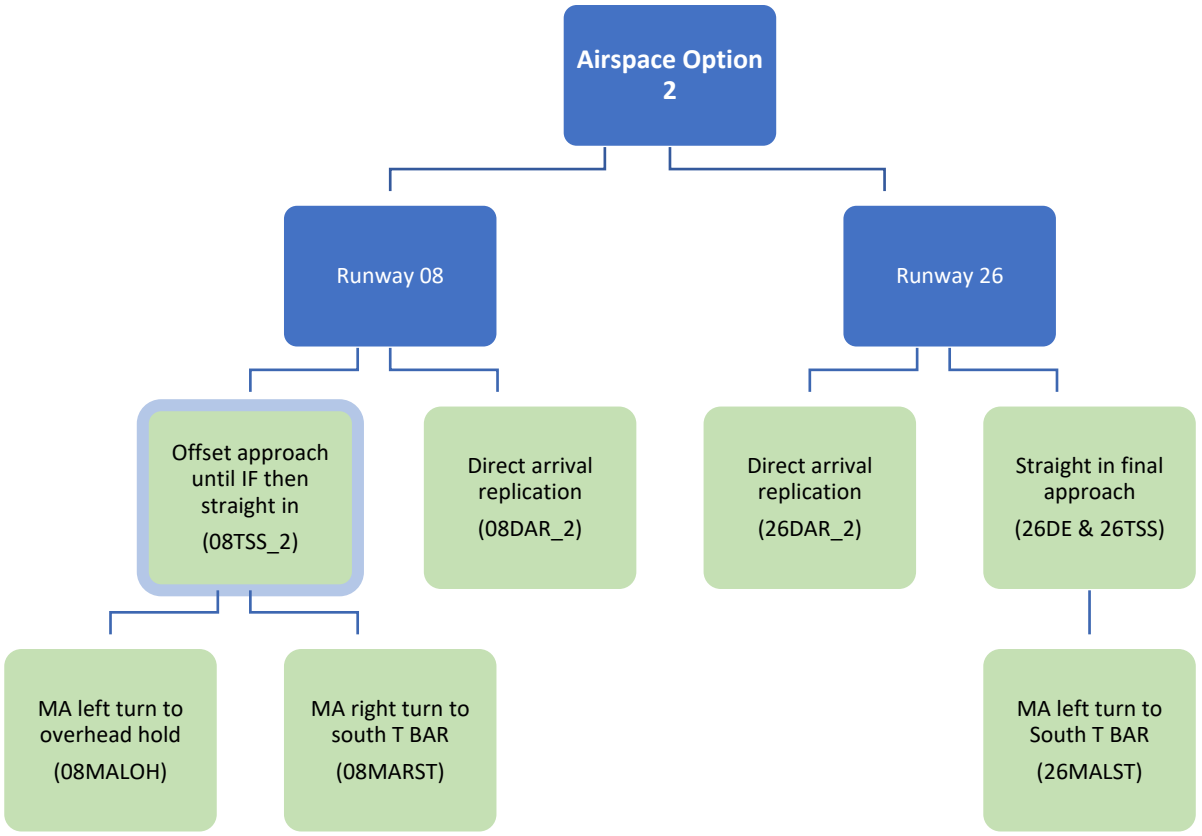


Figure 8 Outcome of the IFP Development

4. Stage 3 Options for Consultation

4.1. Subsequent to the IFP development post Stage 2, the following section outlines the Stage 3 Options for Consultation and the specific questions we will be asking Stakeholders against each of these options.

4.1 Airspace Option 2

Table 8 Airspace Option 2 Overview

Stage 3 Option Name	Component names	Description	Stage 3 Consultation Question
Airspace Option 2 (Our Core Proposal)	26DE 26TSS 08TSS2_2 08DAR_2 26DAR _2	Rwy 26, Direct arrival from the East Rwy 26, T BAR from the South, short final Rwy 08, T BAR from the South, offset until the FAF then straight-in Rwy 08, Direct Arrival Replication Rwy 26, Direct Arrival Replication	Do you have any concerns, or are there any further considerations we should take into account for Airspace Option 2?
Missed Approach Sub-Options			
26 MA Option 1	26MALST	Rwy 26, Missed Approach, Left Turn to South T Bar	Do you have any concerns, or are there any further considerations we should take into account for runway 26 missed approach option 1?
08 MA Option 1	08MALOH	Rwy 08, Missed Approach, Left Turn to Overhead hold	Our preferred Runway 08 missed approach is option 2 where the missed approach turns to the right (the south). Do you agree with this? Please provide more details if required. Do you have any concerns, or are there any further considerations we should take into account for the runway 08 missed approach options?
08 MA Option 2	08MARST	Rwy 08, Missed Approach, Right Turn to South T Bar	

4.1.1 Further details about the options are available in Section 6 of this document. Our Consultation Document also contains detailed operational diagrams.

4.2 ‘Do nothing’ Scenario

4.2.1 Alongside the airspace change options, there is a baseline ‘Do nothing’ scenario as required by CAP1616. The ‘do nothing’ option was discounted at the Design Principle Evaluation stage for the following reasons:

- It did not meet the requirements of the Airspace Modernisation Strategy;
- It did not offer CoDA resilience;
- It therefore did not address the Statement of Need;
- Overall it did not perform as well as other options against the metrics applied to each design principle.

4.2.2 Although the ‘do nothing’ option did not progress to Stage 2B, CAP1616 requires the baseline scenario to be appraised, as it provides a means of testing the options against the current day operations, to better understand and highlight the benefits and impacts of each option.

5. Full Options Appraisal Methodology

5.1. The Full Options Appraisal (FOA) is the second stage in a three-phase appraisal of airspace change options which builds upon the work already undertaken as part of the Initial Options Appraisal (IOA). The FOA requires us to develop more rigorous evidence for the remaining options and compare these against the 'do nothing' option. This clearly describes to change sponsors, stakeholders, and the CAA the relative difference between the impacts, both positive and negative, of each option. The methodology used for our FOA is drawn on the Independent Commission on Civil Aviation Noise (ICCAN) best practice.

5.1 Baseline

5.1.1 As part of this Full Options Appraisal CAP1616 requires airspace change sponsors to set a baseline year which is used for environmental evaluation of the options.

5.1.2 Due to the impacts of COVID-19 (C-19), CoDA saw an unprecedented drop in aircraft movements of almost 41% in 2020. We have therefore selected 2019 as the baseline year for this ACP as it is more representative of a typical year of operations expected once industry has recovered from C-19, and it reflects a more typical scenario than the movement levels experienced in 2020. For this reason, we have based the below data on the 92-day period between 16 June and 15 September in 2019.

5.2 Movement Information

5.2.1 As part of the IOA we reviewed the following movement data for a 92-day summer period in 2019 for the purposes of environmental analysis. We have therefore included this information again in the FOA to illustrate the typical operation at Derry.

5.2.2 Overall, there were 1498 arrival movements in the 92-day period; which is an average of just over 16 arrivals per day. Owing to the percentage of General Aviation and helicopter movements, many of the overall arrival movements are not within the scope of this ACP as they have operated visually rather than using Instrument Flight Procedures (IFPs) which use the airport's ground based navigational equipment.

Table 9 CoDA Summer 2019 Movement Data. Source CoDA ALDIS system

Aircraft Type	Flight Rules	Number of Arrivals 92 day summer period 2019
Fixed Wing	Instrument	690
	Visual	531
Rotary	Instrument	17
	Visual	260
Total		1498

5.2.3 Analysis of the data showed that in total 17 rotary aircraft (helicopters) operated during the 92-day period using the published IFPs, however only 6 of these operated to the main runway; the remaining 11 operated directly to the apron. Given the very small numbers, and that it is anticipated that only a very small number of suitably equipped rotary aircraft per year could operate RNP Approaches, we have focused the following information on Instrument Flight Rules (IFR) fixed wing arrival movements.

5.2.4 Based on the above, on average, **IFR fixed wing movements account for approximately 7-8 arrivals per day to CoDA.**

5.2.5 After analysing the IFR data we next reviewed the runway usage. CoDA has one main runway for Instrument Flight Rules (IFR) arrivals which, depending on the direction of operations, is either called Runway 08 or Runway 26. In the summer of 2019 around **27% of arrivals operated on Runway 08** (landing from the west towards the east, known as 'Easterly operations'), and **73% of arrivals operated on Runway 26** (landing from the east towards the west, known as 'Westerly operations'). For safety and performance reasons, aircraft take-off and land into the wind and therefore the wind direction is the key reason for which direction is used for landing.

5.2.6 Next, we have reviewed the movement data and used this to determine the average number of IFR arrivals from each direction across the summer, as shown in Figure 9 below. Note that radar data is unavailable at the airport so the orange tracks shown in this FOA are taken from Flight Radar 24. Owing to the limitation of that data, not all arrival tracks may be represented.

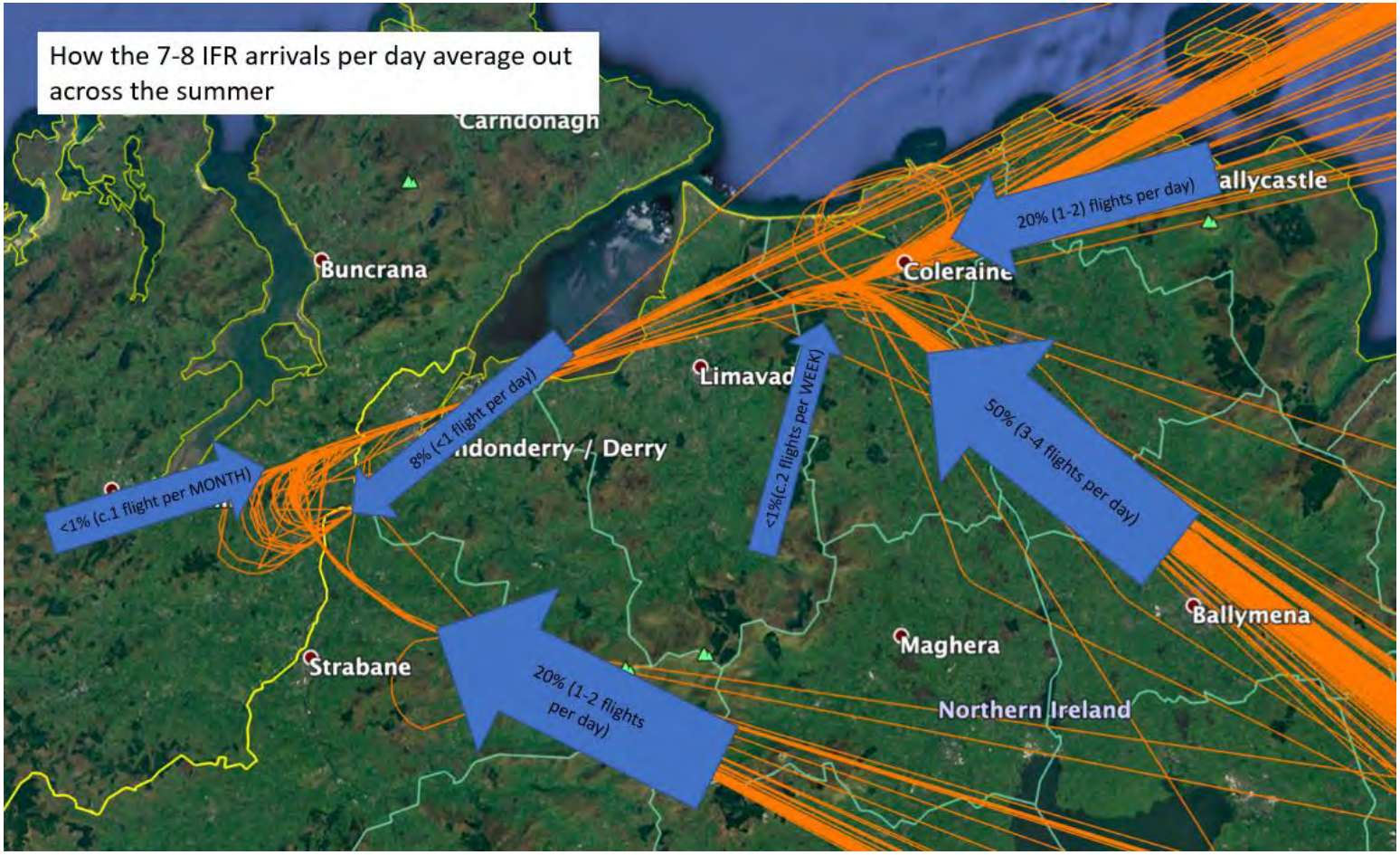


Figure 9 Average arrival directions across 2019 summer period

5.3 Expected PBN Route Usage

5.3.1 The proposed RNP approach procedures are intended to be published alongside the existing conventional IFPs used by IFR flights. Even with RNP approaches available, most arrivals will still elect to use the existing Instrument Landing System (ILS) procedures. As such, we currently ambitiously estimate that a **maximum 25% of IFR flights would use these RNP approaches**, which equates to around 1-2 flights per day (based on 2019 movement figures). In reality, it will most likely be a lower number than this. Figures 10 and 11 below show the average number of arrivals using RNP approaches from each direction if all aircraft were on either easterly or westerly operations and 25% of them operated RNP approaches in 2019.

Figure 10 Easterly Operations. 25% of all IFR arrivals choose RNP APCH (2 RNP APCH arrivals per day)

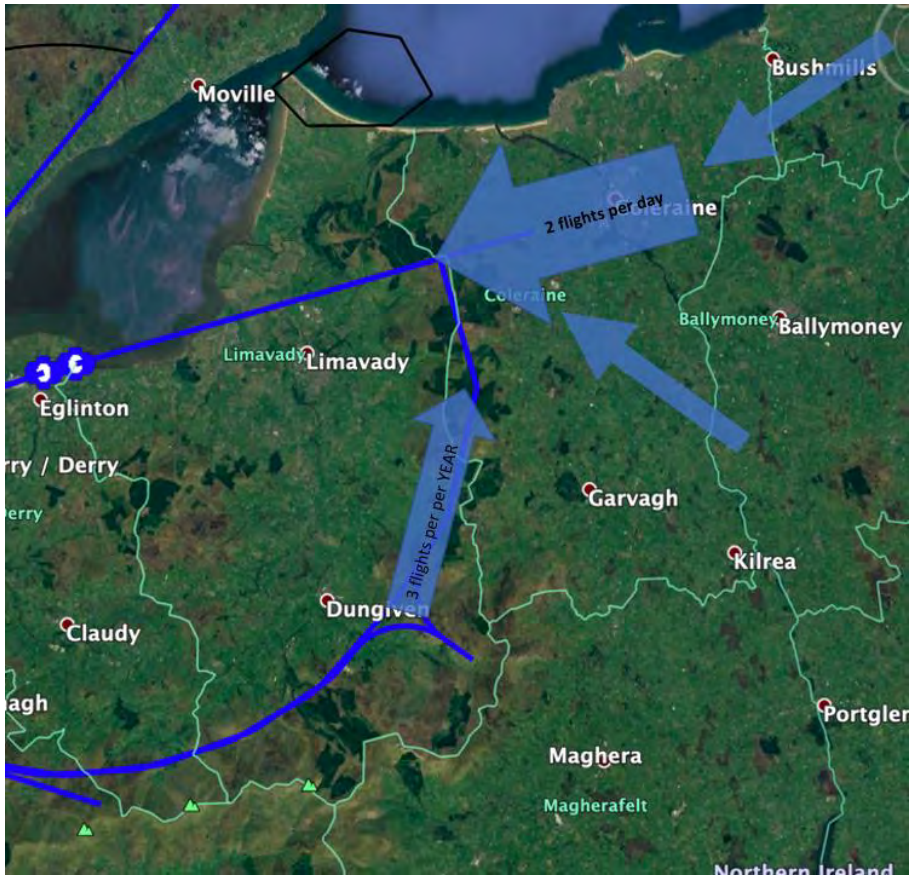


Figure 11 Westerly Operations. 25% of all IFR arrivals choose RNP APCH (2 RNP APCH arrivals per day)

5.4 Future Traffic Forecasts

5.4.1 As part of the requirements of CAP1616, Airspace Change Sponsors are required to provide data and analysis for the year of implementation, and a 10 year forecast following implementation. For the CoDA, if successful with this ACP, we would expect to implement in 2022 and therefore our 10-year forecast year would be 2032. The baseline 2019 information has therefore been developed to 2022 and 10 years after to be used as part of the modelling and metrics shown in Appendix B (Noise Metrics).

5.4.2 The main focus of this ACP is to meet the governments Airspace Modernisation Strategy (AMS) and provide a contingency for the existing ground based navigational aid infrastructure. As it does not increase capacity or the number of movements at CoDA, the following forecasts apply to the scenario with or without this ACP implemented:

Table 10 Future Traffic Forecasts

Year	2022 Implement	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Forecast Total Movements (year)	3414	4114	5594	5906	5906	5906	6950	7054	7158	7158	7159
PBN (25% of total arrivals) (year)	427	514	699	738	738	738	869	882	895	895	895
Average PBN (day)	1-2	1-2	1-2	2	2	2	2-3	2-3	2-3	2-3	2-3
Total estimated missed approach (year)	66	78	108	114	114	114	138	138	138	138	138
Average PBN missed approach (year)	17	20	27	29	29	29	35	35	35	35	35

5.4.3 When considering modal split, in 2022, on average there would be less than 1 arrival per day on runway 08 and less than 2 arrivals per day on runway 26. By 2032, this would average less than 1 arrival per day on runway 08 and less than 3 per day on runway 26. In terms of the missed approach modal split, in 2022 it is anticipated that there will be around 5 per year on runway 08 and around 12 per year on runway 26. By 2032, this would increase to around 9 per year on runway 08 and around 26 per year on runway 26.

5.4.4 The increase in forecast movements between 2022 and 2032 is based on CoDA's highest growth scenario from our long term business plan which is driven by forecast growth in charter flights and private business aviation. As stated above, the ACP does not increase the number of arrival and departure movements at CoDA.

5.4.5 As outlined in the sections above, the proposed PBN procedures are intended to be published alongside the existing conventional IFPs used by IFR flights. This is expected to remain in future and therefore we have continued to apply the percentage splits outlined in figure 9 above, and the estimate of a maximum of 25% of IFR flights using the RNP approaches, across all future forecast models within the FOA.

5.5 Full Options Appraisal Methodology and Baseline 'Do nothing' scenario

5.5.1 At Stage 3 CAP1616 requires sponsors to carry out a detailed appraisal that introduces quantitative and where possible monetised assessment that builds upon the qualitative assessments undertaken as part of the Initial Options Appraisal at Stage 2B. This allows sponsors, stakeholders and the CAA to understand the differences between the impacts and advantages of each option.

5.5.2 Our assessment criteria shown in table 11 below have been categorised based on the example in CAP1616 Appendix E. Given the scope of this airspace change, where it is estimated a maximum of 2-3 flights per day would operate RNP Approaches by 2032, and the overall aim of the project to minimise any change to tracks over the ground, proportionality has been used where appropriate, with the FOA assessments.

5.5.3 As the baseline 'do nothing' option did not progress following the Design Principle Evaluation, the information below is provided for comparison purposes. The table below presents the baseline 'do nothing' information alongside the FOA methodology; this methodology and information will be used to compare Airspace Option 2 and the missed approach sub options against the baseline (today's operations).

5.5.4 The information within the below table regarding the 'do nothing' scenario is a technical summary; we would recommend reading the 'What happens today' section of our Consultation Document for further information, diagrams, and an introduction to the technical terms used.

Table 11 Full Options Appraisal Assessment Criteria (Based on CAP1616 Appendix E) and Methodology

Baseline 'Do Nothing' and FOA Methodology	
 Flight Radar 24 data (Orange)	**Description:** Aircraft operate as they do today. **Final approach** **Runway 08:** Offset Instrument Landing System (ILS), Localiser (LOC)/Distance Measuring Equipment (DME) and Non-Directional beacon (NDB)/DME approaches. **Runway 26:** Straight in ILS/DME/NDB, LOC/DME/NDB, and NDB/DME approaches. **Direct Arrivals** **Runway 08:** There is a published direct arrival available which utilises the two holds and a DME arc, however typically ATC route aircraft to LUNEX and then aircraft follow the last part of the DME arc before joining the final approach. Aircraft arriving from the west typically directly join the final approach. **Runway 26:** There is a published direct arrival available which utilises the three holds and a DME arc, however typically ATC route aircraft direct to COLRE and then directly on to final approach.

		Missed Approach **Runway 08:** The published missed approach turns aircraft north before returning to the overhead where aircraft either hold or make another approach to land. **Runway 26:** The published missed approach turns aircraft north before returning to the overhead where aircraft either hold or make another approach to land. ATC report that missed approaches are sometimes tactically turned south before repositioning for another approach.
Technical Information		
Published charts AIP **(Click here for full AIP)**		INSTRUMENT APPROACH CHART ILS/DME z (OFFSET LOC) RWY 08 - ICAO
		INSTRUMENT APPROACH CHART ILS/DME y (OFFSET LOC) RWY 08 (CAT A,B) - ICAO
		INSTRUMENT APPROACH CHART DIRECT ARRIVALS RWY 08 - ICAO
		INSTRUMENT APPROACH CHART ILS/DME/NDB(L) RWY 26 - ICAO
		INSTRUMENT APPROACH CHART DIRECT ARRIVALS ILS/DME/NDB(L) RWY 26 - ICAO
Group	**Impact**	**FOA Methodology Overview and Baseline 'Do Nothing' Information**
Communities	Noise impact on health and quality of life	**Noise Modelling Methodology** The FOA noise assessment has followed the requirements outlined in the CAA's Policy on Minimum Standards for Noise Modelling (CAP2091). As CoDA has not previously had any requirement to model noise, following the CAP2091 policy, we are required to model the 51dB day-time and 45dB night-time Lowest Observed Adverse Effect level (LOAEL) contours applying the Category E methodology. Once the population level within the contours is known, then this will be used to determine the methodology for the noise modelling throughout the ACP. The LOAEL metrics shown in Appendix B demonstrate that the population levels are above 0 within the 51dB contour but below the recommended minimum Category D threshold of 1600, and therefore CoDA is required to follow the Category E methodology when modelling noise. There is not any population within the 45dB night time contour. CAT E methodology requires the noise model to use the ICAO standard dataset for noise data and flight profiles, and some limited local data from the airport around mean centrelines, dispersion, and usage. This is the methodology we have used to generate the contours in Appendix B and this has been informed based on the current published final approach tracks, FlightRadar24 data, and the movement data outlined in the 'Movement information' section of this document.

Understanding Noise Contours

CoDA has not previously had a requirement to model noise and therefore this will be the first time that many stakeholders are presented with noise contours.

Noise contours are generated by a computer model which calculates noise emissions and propagation from arriving and departing aircraft. The magnitude and extent of the noise around the airport is then depicted on maps using contour lines. These contours are used alongside population data to understand the number of dwellings or people impacted by noise.

This ACP presents three types of contour and their associated population and dwelling count within the contour:

- **L_{Aeq}, 16hr**. Daytime aircraft noise exposure metric for calculated for an average summer day over the period from 16 June to 15 September inclusive, for traffic in the busiest 16 hours of the day, between 0700 and 2300 local time. This metric is the measure of noise exposure adopted by Government for the purposes of considering aircraft noise annoyance. It forms the basis of the Government's policies in relation to daytime aircraft noise.

- **L_{Aeq}, 8hr.** Night-time aircraft noise exposure metric for calculated for an average summer night over the period from 16 June to 15 September inclusive, for traffic for 8 hours of the night, between 2300 and 0700 local time. This metric is the measure of noise exposure adopted by Government for the purposes of considering aircraft noise annoyance. It forms the basis of the Government's policies in relation to sleep disturbance arising from aircraft noise. It forms the basis of the Government's policies in relation to night-time aircraft noise.

- **N65.** The number of noise events greater than 65dBA Lmax during the day (07:00 – 23:00). The N65 metrics are a measure used as part of the Airspace Change Process to help communicate airspace changes. These are required by the CAA to help with engagement on noise and airspace change, and to further differentiate between airspace options which have a similar impact with respect to the LAeq metrics.

CAP1616 also requires sponsors to present N60 noise contours and metrics. These show the number of noise events greater than 60dBA Lmax during the night (23:00 – 07:00) however due to the very low number of night movements at Derry, N60 contours have not been included as the noise model results in less than 1 movement per night over 60dB LAmax.

Alongside the contours outlined above, we have also provided overflight contours. Overflight contours are a way of defining the pattern and dispersion of aircraft below 7000ft and showing the frequency that they occur. These are based on the CAA's definition of overflight.

The vast majority of the variance between proposed airspace change options fall outside of the L_{Aeq} contour areas, or has very little impact on the L_{Aeq} contours, and therefore we will qualitatively assess noise as part of this FOA based on the N65 data and overflight contours.

Although this ACP is only looking at arrivals into CoDA, the noise contour modelling takes into account the overall noise at the airport including departures. It is important to keep this in mind when reviewing the contour information as it often explains parts of the data as demonstrated in the example below:

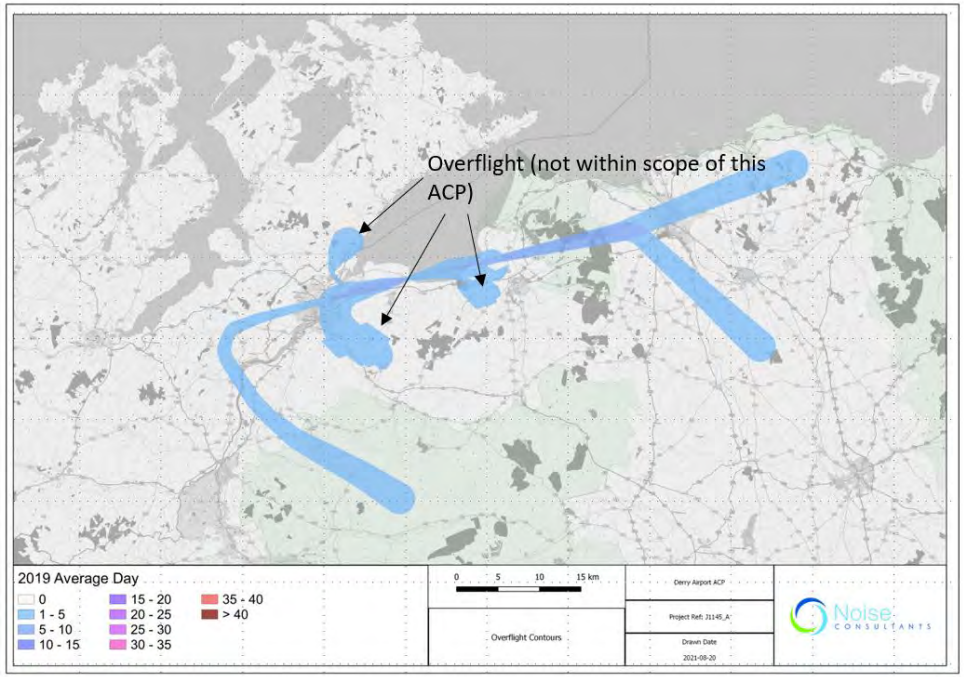


Figure 13 Example overflight contour

WebTAG and cost benefit analysis.
As part of the CAP1616 requirements, airspace change sponsors are required to undertake an assessment using WebTAG[6], the Department for Transport's appraisal guidance, for health impacts associated with noise, and potentially for other impacts, where possible. For aviation, WebTAG's main objective is to evaluate airspace changes where flight paths may change.

With regards to noise, the webTAG workbook uses the annual value of the impact of a 1dB change in aircraft noise levels from 45 to 81 dB $L_{Aeq,\ 16hr}$ and $L_{Aeq,\ 8hr}$ to monetise the health impacts/benefits of an airspace change. The formulae and calculations that form this workbook are defined by the government.

In the case of this CoDA ACP, where we are looking to replicate as closely as possible the existing routes, there is very little, almost immeasurable, difference between what happens today, and Airspace Option 2 and further more, as only 25% of flights would fly the PBN option, the majority of aircraft will continue to operate as they do today. The outcome of the L_{Aeq} 16hr and 8hr analysis has therefore shown that there are no changes in the number of dwellings or population within the L_{Aeq} contours between the baseline and Airspace Option 2. It is therefore not possible to use WebTAG to monetise this Airspace Change.

As part of larger airspace changes, where there are substantial differences between the options and current day, it is typical to also to provide Cost Benefit analysis of the options. This looks at other areas as well as noise which may be impacted. In the case of this CoDA ACP, where the procedures are replicated as closely as possible and a very small number of aircraft will use the PBN routes, any impacts or benefits are so marginal that it is not considered proportionate to try to quantify and monetise. We have therefore provided qualitative analysis which outlines any expected marginal benefits or impacts.

Missed Approach sub options
For our missed approach sub options, we have provided qualitative analysis of the differences between the baseline and our missed approach options. Due to the very low numbers of aircraft expected to operate PBN missed approaches, it is very difficult to quantify the noise; it is estimated that there would need to be at least 1-2 missed approaches per day to register on the L_{Aeq} metrics, however it is estimate that by 2022 at CoDA there will be only be 66 per year (around 5-6 per month), which results in an estimate of 17 per year for the PBN missed approaches. By 2032 it is estimated there will be 138 missed approaches (35 PBN missed approaches) per year, which remains less than 1 missed approach per day.

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

Baseline ‘Do Nothing’ – what happens today

Noise Contours

Based on the 92-day summer 2019 period, Appendix B shows the L_{Aeq} 16hr and 8hr contours for 2019. We know from the data that there is a population count of 31 people within the 51dB day time Lowest Observed Adverse Effect level (LOAEL) contour and there is no population within the 45dB night time LOAEL contours. By 2032, the population within the 51dB daytime LOAEL is 151 and there is no population within the night time LOAEL:

Table 12 L_{Aeq} contour population within baseline 'do nothing' scenario (See Appendix B for full data)

Population Contour LAeq, 16hr (dB)	2019	2022	2032
51	31	106	151
54	12	12	106
57	12	12	12
60	0	0	12

The N65 contours also in Appendix B show the number of noise events greater than 65dB Lmax during the day (07:00 – 23:00). The table below shows the population counts within the contours:

Table 13 N65 population within baseline 'do nothing' scenario (See Appendix B for full data)

Population N65 Contour	2019	2022	2032
1	44587	46514	69964
5	989	1003	3112
10	12	12	1003
20	0	0	12

The appraisal of Airspace Option 2 will review the difference between all of the data for these contours to understand any differences between Airspace Option 2 and the baseline ‘do nothing’ scenario.

<table>
<tr><td></td><td></td><td>Overflight
In 2019, on average there are 16-17 arrivals into CoDA per day, of these 7-8 per day are IFR flights that are within scope of this airspace change. Of these 7-8 flights, we conservatively assume through verbal engagement with operators that, on average, 25% (up to 2 flights per day) would operate the RNP Approaches. The overflight contours in Appendix B depict these overflights for 2019.

As part of our appraisal of Airspace Option 2 we have compared these contours to understand the differences between Option 2 and the ‘do nothing’ scenario. We have also looked at the year of implementation and future forecast contours.</td></tr>
<tr><td></td><td>Air Quality</td><td>Impacts to air quality are considered for changes below 1000ft; government guidance outlines that aircraft flying above 1000ft are unlikely to have a significant impact on local air quality.

Aircraft arriving at CoDA fly a standard 3-degree angle of approach and descend through 1000ft typically between 5 - 7km before the landing threshold, which is in the last stages of the final approach.

The FOA will qualitatively review the overflight contours generated to understand any differences between this baseline and Airspace Option 2 within the last 7km of flight to understand potential impacts/changes to Air Quality.</td></tr>
<tr><td>Wider Society</td><td>Greenhouse gas impact</td><td>As emissions of greenhouse gases arise from the combustion of aviation fuel we will quantitatively assess the track length of a nominal track of this baseline against the nominal tracks of Airspace Option 2 to understand if there are any anticipated advantages/disadvantages compared to current day. As CO_2 emissions are linked to the difference in aviation fuel burnt, this will allow us to qualitatively appraise the greenhouse gas impacts as a result of the option.

It is important to note however that owing to the anticipated number of flights expected to operate the RNP approaches, and the overall aim to replicate as closely as possible, any small changes in track miles are so marginal that it is not considered proportionate to monetise.

Table 14 Nominal Track Miles from LUNEX and DUNGV
<table><tr><th>Waypoint/Hold</th><th>Existing nominal Track Miles (nm)</th></tr><tr><td>LUNEX (Runway 08)</td><td>23.20</td></tr><tr><td>DUNGV (Runway 26)</td><td>24.85</td></tr></table>Owing to the very small number of flights that will operate missed approaches (estimated at 35 PBN per year by 2032), we will qualitatively assess the missed approach options.</td></tr>
</table>

	Capacity / resilience	There are no current capacity issues at CoDA and this ACP does not seek to increase the capacity at CoDA or within the surrounding airspace; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy whilst replicating what happens today as closely as possible. CoDA does not have radar and therefore ATC manage capacity by utilising the three holds and the DME arc of direct arrivals to ensure time-based separation of aircraft. At present CoDA does not have any PBN procedures and is therefore reliant on ground-based navigation infrastructure. As part of the FOA we will provide a qualitative assessment of resilience.
	Tranquillity	CAP1616 outlines the consideration of impacts upon tranquillity is with specific reference to National Parks and Areas of Outstanding Natural Beauty (AONB), plus any locally identified 'tranquil' areas that are identified through community engagement and are subsequently reflected within an airspace change proposal's design principles. Today, Direct Arrivals and aircraft arriving from the south and south east, overfly the Sperrin AONB, typically between 4,000ft and 7,000ft. Aircraft arriving from the east and north east, and aircraft on Final Approach on Runway 26 fly over the Binevenagh AONB from around 2,000ft and above. Aircraft also overfly the Causeway Coast AONB however they are above 7000ft at this point. Appendix C contains a map of AONB and AONBs are also shaded in green on the noise metric figures presented in Appendix B. Given that this airspace change aims to replicate the existing arrivals at CoDA, there is no design principle which specifically references tranquillity, and there is currently not a universally accepted metric for the measurement of tranquillity. As part of the FOA, we will undertake a qualitative assessment of tranquillity which is informed by the noise contours and whether any changes have the potential to impact tranquillity with regards to noise and AONB. We will also qualitatively assess the missed approach options.
	Biodiversity	Research shows Biodiversity disturbance effects associated with aircraft typically occur during the landing and take-off stage, when an aircraft is flying at or below 500m (1,640 feet)[7]. Aircraft arriving at CoDA fly a standard 3-degree angle of approach and descend through 1,640ft typically between 9-10km before the landing threshold, under final approach. The FOA will qualitatively describe the differences between Airspace Option 2 and the baseline in the last 10km of flight to understand potential impacts/changes to Biodiversity. It will use the noise assessment as an indicator of potential impacts to biodiversity particularly with regards to changes within the L_{Aeq} and overflight contours and the overall number of movements anticipated.

[7] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature Birds Network Information Note

<table>
<tr><td rowspan="1">General Aviation</td><td>Access</td><td>The airspace around CoDA borders UK and Irish airspace. The majority of the procedures are within UK airspace, however parts of the approach procedures and the direct arrival for runway 08 are within the Irish Flight Information Region (FIR).

The Irish Aviation Authority (IAA) requires instrument flight procedures to be contained wholly within controlled airspace and therefore parts of the existing 08 procedures that fall within Irish Airspace are contained within Class C airspace.

The detailed IFPs that have been developed following Stage 2 of this ACP will be used to indicate CAS adjustments which may be required as a result of the options. The FOA will therefore outline the differences in CAS requirements between this baseline and the options and indicate any additional CAS required in order to implement an option.</td></tr>
<tr><td rowspan="2">General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.</td></tr>
<tr><td>Fuel burn</td><td>We will assess any impacts to fuel burn by quantitatively assessing the track length of a nominal track of this baseline against the nominal tracks of Airspace Option 2 to understand if there are any anticipated advantages/disadvantages compared to current day.

It is important to note that owing to the anticipated number of flights expected to operate the RNP approaches, and the overall aim to replicate as closely as possible, any small changes in track miles may be so marginal that it is very difficult to quantify. Alongside track miles, we will consider whether Airspace Option 2 has the potential to affect thrust which also impacts fuel burn.
Table 15 Nominal Track Miles from LUNEX and DUNGV
<table><tr><th>Waypoint/Hold</th><th>Existing nominal Track Miles (nm)</th></tr><tr><td>LUNEX (Runway 08)</td><td>23.20</td></tr><tr><td>DUNGV (Runway 26)</td><td>24.85</td></tr></table>
Owing to the very small number of flights that will operate missed approaches (estimated at 35 PBN per year by 2032), and the current configuration of the missed approaches where a turn at an altitude results in variations in the number of track miles flown, we will qualitatively assess the missed approach options against current day to understand any differences in fuel burn.</td></tr>
</table>

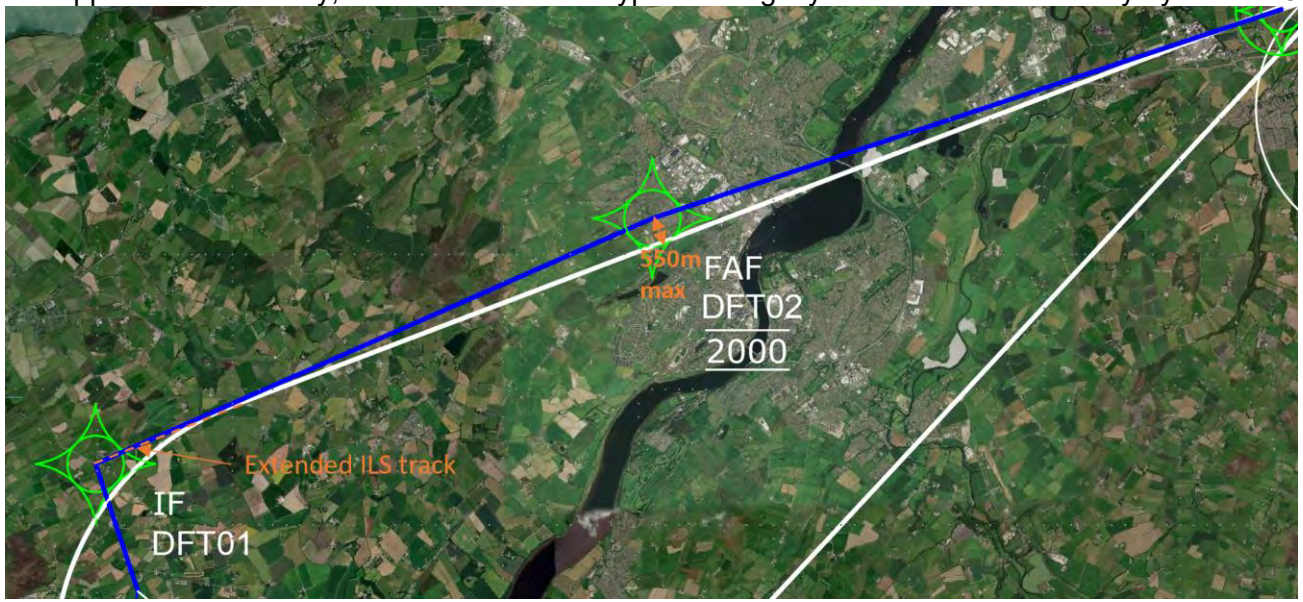
Commercial airlines	Training costs	The FOA will assess whether any training costs would be incurred by Commercial airlines in order to implement the option.
	Other costs	The FOA will assess whether any other costs would be incurred by Commercial airlines in order to implement the option.
Airport / Air navigation service provider	Infrastructure costs	The FOA will assess whether any infrastructure costs would be incurred by the airport or ANSP in order to implement the option.
	Operational costs	The FOA will assess whether any operational costs would be incurred by the airport or ANSP in order to implement the option.
	Deployment costs	The FOA will assess whether any deployment costs would be incurred by the airport or ANSP in order to implement the option.
All	Safety	A qualitative safety assessment of each option will be undertaken which compares against the baseline. Today, all direct arrivals and Instrument Approach Procedures are currently safely in operation with no known safety concerns. All IFPs that are within, or are partially within, the Irish FIR are safely contained within CAS. The UK CAA does not have such a requirement. There is a danger area D505 to the east of the airport, and also a number of paradrop zones to the south east. To the north and north west of the airport there is a known area of high ground with wind turbines and to the north east as an area where gliders are known to frequently operate.

6. Full Options Appraisal

6.1. The following section of this document provides detailed technical information about our Airspace Change Options and provides the outcome of our Full Options Appraisal of the benefits and costs of these options. For non-technical descriptions and high resolution images of the options, please see our Consultation Document.

6.1 Airspace Option 2

Table 16 Airspace Option 2 Full Options Appraisal

Airspace Option 2
 Airspace Option 2 (Blue) Existing published procedures (Green)
Option 2 closely replicates what happens today however based on the IFP development outlined in section 3, there are some minor amendments to the procedures to make them PANS-OPS compliant. This FOA will review these amendments as part of our overall appraisal of Airspace Option 2 against the baseline 'do nothing' scenario to understand any benefits and/or impacts. The runway 08 and runway 26 direct arrivals are a replication of the direct arrival published today, subject to some differences around the DUNGV holds as articulated in Section 3 above. On runway 08, aircraft have the option of the southern T-Bar which replicates where most aircraft operate today. The intermediate fix (IF) of the final approach is initially aligned with the extended ILS centreline; this allows an aircraft flying the proposed direct arrival to fly an ILS or RNP approach. At Airspace Option 2's Final Approach Fix (FAF), aircraft are aligned with the runway centreline rather than the 2.7° offset like the ILS approach used today, and therefore the waypoint is slightly further north than today by around 550m.    *Figure 14 Runway 08 RNP Approach (Blue) and existing ILS nominal track (White)*

		Over the course of 2019, 27% of arrivals used Runway 08 and therefore even if growth is achieved by 2032, on average less than one arrival per day will use the runway 08 approaches. On runway 26 (westerlies), aircraft have the option of the eastern T-Bar, which replicates aircraft flying directly to COLRE as most do today, or the southern T-Bar, which replicates the published Direct Arrival procedure. The final approach track replicates the current ILS final approach. The 2019 movement data showed that 73% of arrivals used Runway 26 and therefore this direction will be used for the majority of flights arriving at CoDA. In the event of ILS unserviceability, the availability of RNP Approaches will result in significant reduction in ATC workload compared to reliance on NDB approaches. This could also result in fewer diversions owing to improved minima compared to NDB approaches which would provide both operational and environmental benefit as well as an improved social experience.
Technical Information		**Components from Stage 2**
Technical Information		26DE (Rwy 26, Direct arrival from the East) and 26TSS (Rwy 26, T BAR from the South, short final)
		08TSS2_2 (Rwy 08, T BAR from the South, offset until the FAF then straight-in)
		26DAR_2 (Rwy 26, Direct Arrival Replication)
		08DAR_2 (Rwy 08, Direct Arrival Replication)
Group	**Impact**	**Qualitative assessment supported by quantitative information shown in Appendix B**
Communities	Noise impact on health and quality of life	The approach to runway 26 will replicate what happens today, and therefore there is no expected change to noise for westerly arrivals. This is reflected in the noise contours shown in Appendix B where there are no changes to the L_{Aeq}, N65 or overflight contours between Airspace Option 2 and the baseline. On average, the airport is operating on westerlies for 73% of the year and therefore this makes up a large proportion of arrivals. The remaining 27% of aircraft operate easterly arrivals to runway 08. When considering the expected PBN usage, this equates to less than 1 aircraft per day on average across the year arriving on runway 08 (based on current day and future forecast levels). Aircraft arriving on runway 08 using the RNP approaches would operate a slightly different approach compared to existing runway 08 ILS arrivals. This would be a marginal change compared to the majority of aircraft that operate an ILS approach onto runway 08 today and would continue to do so following this ACP.

The Intermediate Fix (IF) of the runway 08 RNP approach would be aligned with the extended ILS track centreline and therefore at this stage in the final approach, when compared against the swathe shown in the FR24 data, aircraft would be largely replicating as they arrive today. From the IF there is a 5.4° offset to join the Final Approach Fix (FAF) in order to enable a straight in approach from the FAF. This results in the FAF being around 550m north of the existing ILS FAF as shown in the figures below.

Figure 15 Runway 08 RNP Approach (Blue) and existing ILS nominal track (Green)

Figure 16 Runway 08 RNP Approach (Blue), existing ILS nominal track (White) and FR24 data (Orange)

When this is overlaid with FlightRadar 24 data, as shown in figure above, there is currently some dispersion around this point. The greatest difference occurs around the FAF however given that this is less than 550m lateral difference, and this will apply to less than one arrival per day on average across the year, and given the dispersion shown within the FR24 data, it is not anticipated that this will make a noticeable difference to noise impacts. This is reflected in the noise data analysis shown below:

When reviewing this change against the 2019, 2022 and 2032 $L_{Aeq\ 16hr}$ contours shown in Appendix B, although there were small changes in the contour shape and size, the population and dwelling counts showed that there would be no change between the Airspace Option 2 or the 'Do nothing' baseline scenario. Our analysis also showed that there would be no change in the counts of noise sensitive buildings.

Table 17 LAeq population comparison between Airspace Option 2 and the baseline 'do nothing' scenario

Population	2019		2022		2032	
Contour L_{Aeq}, 16hr (dB)	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
51	31	31	106	106	151	151
54	12	12	12	12	106	106
57	12	12	12	12	12	12
60	0	0	0	0	12	12
63	0	0	0	0	0	0
66	0	0	0	0	0	0
69	0	0	0	0	0	0
72	0	0	0	0	0	0

The data from the L_{Aeq} 8hr night time contours also showed that there would be no impact when comparing Airspace Option 2 against the do nothing baseline scenario as no population fell within any of these contours.

With regards to the N65 contours, the data for most contours in most scenarios remained the same between the baseline and Airspace Option 2 however there is an increase in the number of people experiencing up to one noise event greater than 65dB LMax in the 2022 and 2032 scenarios. This is due to the small change in the runway 08 final approach track which expands the N65 (1) contour to the north and therefore captures more population. It is also this change that leads to a positive impact of decreasing the number of population experiencing up to five 65dB LMax noise next steps in the 2032 scenario as 25% of the traffic which would previously have flown down the offset ILS approach is now using the PBN approach.

Table 18 N65 population comparison between Airspace Option 2 and the baseline 'do nothing' scenario

Population	2019		2022		2032	
Contour N65	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	44587	44587	46514	47324	69964	70083
5	989	989	1003	1003	3112	1964
10	12	12	12	12	1003	1003
20	0	0	0	0	12	12
50	0	0	0	0	0	0
100	0	0	0	0	0	0
200	0	0	0	0	0	0

Finally, with regards to overflight, the contours in Appendix B show very small changes to overflight on the 08 final approach which is due to the small shift of the FAF to the north of the existing ILS FAF. On average, less than one flight per day across the year are forecast to fly this approach and this, combined with the very small lateral change leads to a very small change in the overflight contour.

The overflight contours extend to 7000ft and therefore they allow us to analyse the noise impacts of the changes that were made to the direct arrivals as part of the IFP development work. In order to meet PANS-Ops criteria, minor changes to the initial joining point of the arc section of the direct arrival from the DUNGV hold were made which meant the direct arrival transition was no longer a perfect replication of current day.

When looking at the noise impacts of this change, it's firstly important to note that this direct arrival is flown very very rarely; it is estimated at current levels to be used for around 3 flights per year. Analysis of the overflight contours shows that these changes occur above the 7000ft level of aircraft (based on FR24 data) and are outside of the L_{Aeq} and N65 metrics. We can therefore conclude that no noise impacts are expected as a result of this slight change.

	Conclusion In conclusion, the noise analysis of Airspace Option 2 has demonstrated that there will be no impact to the L_{Aeq} 16hr or 8hr contours. As changes to population within the L_{Aeq} contours are primary measure of noise impact for ACPs[8], and in the case of Airspace Option 2 there is no change, we can conclude that implementation of this option will not change the number of people adversely affected by the impacts from aircraft noise. The data from the L_{Aeq} metrics is also the main input into WebTAG, the Department for Transport's appraisal guidance for health impacts associated with noise, and therefore there is also no monetary difference between the Airspace Option 2 and the 'do nothing' scenario. As part of our noise analysis we have also reviewed secondary metrics presented as Overflight contours and N65 contours and data tables. Secondary metrics are those that are not being used to determine significant impacts but which are still able to convey noise effects. Our analysis of the N65 and overflight contours showed that the small change in approach to runway 08 would result in a change in the distribution of aircraft noise, however owing to the scale of the change and the number of aircraft expected to fly the runway 08 PBN approach, this would lead to very marginal adverse impacts. There will be no change in noise to the runway 26 approach, or either direct arrival as a result of implementing Airspace Option 2. We therefore conclude that Airspace Option 2 will have no impact on population adversely affected by the impacts of aircraft noise. There will however be a very small change in distribution under the runway 08 final approach however any adverse impacts of this are so marginal that they will not lead to any significant effects.
Air Quality	Impacts to air quality are considered for changes below 1000ft. Based on a standard 3.0° approach, this equates to any changes that occur from around 5-7km before the landing threshold. The approach to runway 26 will replicate what happens today, and therefore there is no expected change to air quality for westerly arrivals. On average, the airport is operating on westerlies for 73% of the year and therefore this makes up a large proportion of arrivals. The remaining 27% of aircraft operate easterly arrivals to runway 08. When considering the expected PBN usage, this equates to less than 1 aircraft per day on average across the year arriving on runway 08 (based on current day and future forecast levels). The proposed easterly approaches will adjust the approach trajectory of aircraft below 1,000ft, with the centreline of the easterly approach being moved to the north compared to the current approach centreline. The distance between the approach centrelines is

[8] Paragraph B47, page 164 CAP1616

		approximately 210m[9] at 1,000ft and reduces to zero at the point of touchdown. There are very few sensitive receptors (e.g. residential properties) below the approach path and most are to the south at Station Road; as the new approach centreline is moved to the north, contributions of aircraft emissions will be very slightly lower at these properties as a result of the ACP. Some very small increases may be experienced at properties north of the approach centreline at Donnybrewer Road, but properties here are very isolated. In both cases, the changes in pollutant concentrations as a result of the ACP will be very small indeed and will not lead to significant effects. Air quality is also impacted by changes in movement numbers, however there will be no change to the number of movements as a result of this option or the overall airspace change. **Conclusion** The air quality analysis of Airspace Option 2 has demonstrated that there would be no significant impact to Air Quality due to the majority of the procedures replicating current day. The very small lateral change of the runway 08 approach may result in some impacts (both positive and negative) to pollutant concentrations however due to the number of aircraft expected to operate these approaches and the scale of the lateral change, these will be very small and will not lead to any significant effects.
Wider Society	Greenhouse gas impact	One of the key objectives of this ACP is to replicate the procedures flown today. The ACP does not materially change the track length of easterly or westerly approaches (see fuel burn section below) and will therefore not materially affect carbon emissions. A change in track length may increase or decrease fuel burn and increase or decrease carbon emissions accordingly. There will be some variation in flight by flight track length associated with a change from an ILS to RNP approach, but averaged across the annual arrivals at Derry Airport this will not significantly affect average track length (either by shortening or lengthening) and will therefore not affect fuel burn. The ACP does not involve other changes that would affect aircraft thrust and therefore fuel burn. As such, the influence of the proposed ACP on carbon emissions is expected to be not significant. **Conclusion** Our Greenhouse gas impact analysis has shown that there will be no material changes to track length and fuel burn and therefore no there is no significant impact to carbon emissions if Airspace Option 2 were to be implemented.
	Capacity / resilience	The introduction of RNP approaches to both runway ends improves resilience for CoDA. This option, and the overall airspace change, is not expected to have an impact on airport and airspace capacity.

[9] Please note this has reduced from 300m stated in the Initial Options Appraisal following detailed IFP development

Tranquillity	Westerly approaches onto runway 26 currently overfly Binevanagh AONB. The westerly approaches that form part of Airspace Option 2 replicate current day and the overflight contours shown in Appendix B demonstrate that there will be no change in these contours when compared against the 'do nothing' scenario. Similarly, the direct arrival for runway 08 replicates current day and the contours show that there will be no change in overflight. The changes in overflight which occur as a result of the RNP approach into runway 08 lie outside of the Sperrin and Binevanagh AONB. Other than the 08 final approach, this option replicates current day and therefore aircraft will continue to fly over Sperrin and Binevenagh AONB, as they do today. **Conclusion** This option will not impact the number of movements (nor will the overall ACP), and will not change flight paths overflying AONBs, and therefore there is no impact anticipated on tranquillity as a result of this option.
Biodiversity	Research shows Biodiversity disturbance effects associated with aircraft typically occur during the landing and take-off stage when an aircraft is flying at or below 500m (1,640 feet). Based on a 3.0° standard angle of approach, this area is typically around 5nm (9-10km) before the landing threshold when aircraft are on final approach. This ACP does not facilitate growth and so the key consideration around biodiversity is whether the ACP results in changes in ground paths or use of the routes already being flown. When looking at the runway 26, the Lough Foyle Ramsar site, protected because of its importance for birdlife, lies to the eastern end of the runway and is already subject to overflying by aircraft landing in a westerly direction and taking off in an easterly direction. The noise analysis of Airspace Change 2 has demonstrated that there will be no change in overflight and noise between the PBN approaches and the 'do nothing' scenario and therefore there are no anticipated impacts to this site. Within the last 5nm of the runway 08 approach there is a very small change in the lateral position of aircraft as shown in the figure below. A straight in final approach track will alter the final approach track of aircraft slightly to the north; at 1640ft/around 5nm before the landing threshold this lateral difference is approximately 360m[10]. The FR24 data shows that at 5nm before the threshold, there is already a small concentration of flights which are further north than the offset ILS final approach track although they are south of the straight in track.

[10] Please note this has reduced from 450m stated in the Initial Options Appraisal following detailed IFP development

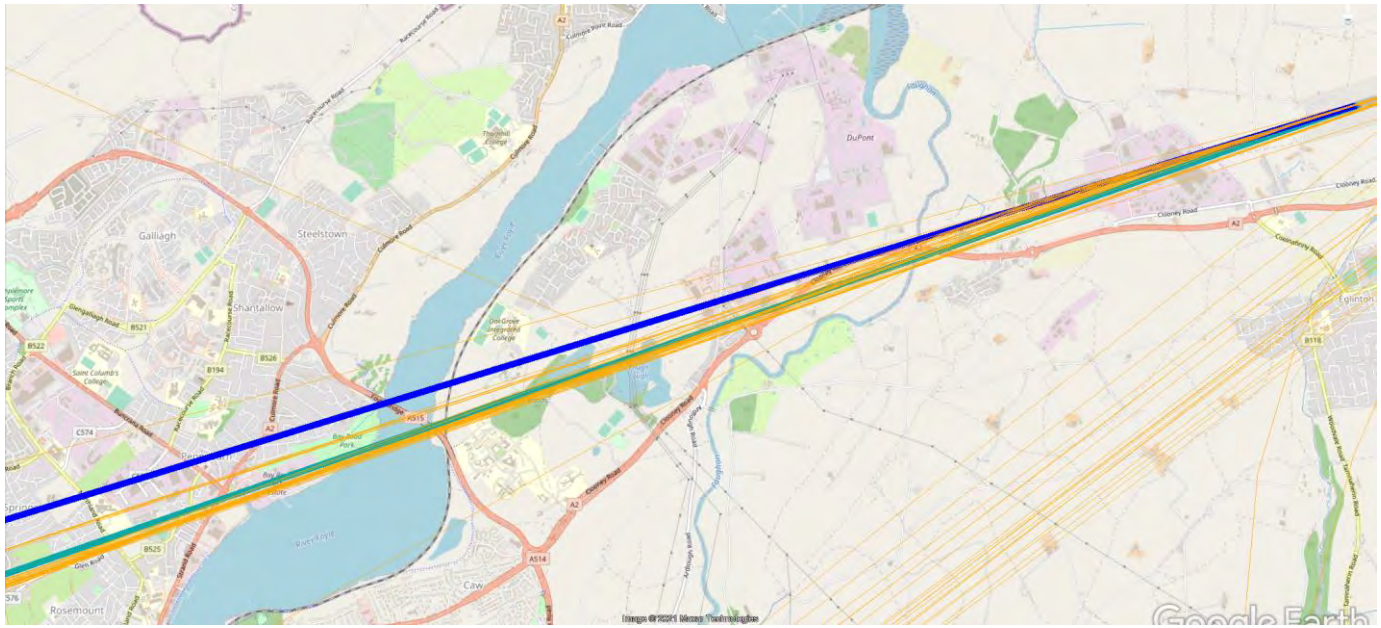


Figure 17 Runway 08 RNP Approach from approx. 5nm (Blue) existing ILS nominal track (Green) and FR24 data (Orange)

As discussed as part of the overflight assessment, this is a very small lateral change, which would be flown by less than one aircraft per day on average across the year. The noise assessment of this option has demonstrated that there is no change to noise within the 51dB and 45dB L_{Aeq} contours, which would be an indicator of potential disturbance to biodiverse receptors. The N65 and overflight contours show very marginal positive and negative changes to noise beyond the LAeq contours as a result of Airspace Option 2, however these are so minor that they are not considered to have any significant impact on biodiversity.

Conclusion

The biodiversity assessment of Airspace Option 2 has demonstrated that there would be no significant impact to Biodiversity as the majority of the procedures replicate current day. The very small lateral change of the runway 08 approach does not impact the LAeq contours which as used as an indicator of biodiversity disturbance. The lateral change could lead to some very small impacts positive and negative as shown in the N65 and overflight contours, however due to the number of aircraft expected to operate these approaches and the scale of the lateral change, these are considered to be so minor that the ACP will result in no effects to biodiversity.

<table>
<tr><td>General Aviation</td><td>Access</td><td>The Irish Aviation Authority (IAA) requires Instrument Flight Procedures to be contained within controlled airspace (CAS). As part of the IFP development work that was undertaken in preparation for this FOA the primary protection areas of the procedures were drawn. Due to impacts to Irish controlled airspace, the 26 missed approach right turn and the westerly T-BAR for runway 08 were removed (please see section 3 for further details) and it was demonstrated that all of the remaining procedures that form Airspace Option 2 are contained within existing CAS.

As Airspace Option 2 largely replicates what happens today, with a few very minor amendments to make the PBN procedures PANS-OPS compliant, it is not anticipated that there would be any impact to general aviation as a result of this Airspace Change option.</td></tr>
<tr><td rowspan="2">General Aviation / Commercial airlines</td><td>Economic impact from increased effective capacity</td><td>It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy. We therefore do not expect any economic impact as a result of the implementation of Airspace Option 2.</td></tr>
<tr><td>Fuel burn</td><td>The large majority of Airspace Option 2 replicates how aircraft arrive at CoDA today and therefore there will be no material change to the track length which would impact fuel burn.

As part of the IOA we raised that there may a small increase in fuel burn as a result of the runway 08 approach however following the IFP development, the evolution of this option means that there is now very marginal track length difference between aircraft flying a current day ILS approach or a RNP approach.

As part of our FOA analysis, we have taken the nominal tracks from LUNEX (08) and DUNGV (26) to understand any potential changes. It is important to note however that currently there is some dispersion (as shown in the FR24 data) and therefore actual flight track miles may be marginally longer or shorter than the nominal track shown in the table below for the ‘do nothing’ scenario.

Table 19 Nominal Track Comparison

<table>
<tr><th>Waypoint/Hold</th><th>‘Do nothing’ nominal track miles (nm)</th><th>Airspace Option 2 nominal track miles (nm)</th><th>Difference (nm)</th></tr>
<tr><td>LUNEX (Runway 08)</td><td>23.20</td><td>22.90</td><td>0.30</td></tr>
<tr><td>DUNGV (Runway 26)</td><td>24.85</td><td>24.50</td><td>0.35</td></tr>
</table>
</td></tr>
</table>

		The analysis has shown that there are very small differences between the track miles which is what we would expect given one of the aims of this ACP is to replicate as closely as possible. As these are so marginal and because the numbers of movements associated with this ACP are so low, it is not proportionate to try and quantify this any further. **Conclusion** Overall, there will be some variation in flight by flight track length associated with a change from an ILS to RNP approach, but averaged across the annual arrivals at Derry Airport this is will not significantly affect average track length (either by shortening or lengthening) and will therefore not affect fuel burn. The procedures that form Airspace Option 2 do not involve other changes that would affect aircraft thrust and therefore fuel burn. As such, the influence of the proposed ACP on fuel burn is expected to be not significant.
Commercial airlines	Training costs	There are no training costs anticipated as a result of the introduction of RNP approaches at CoDA. As part of Regulation (EU) No. 539/2016 Performance Based Navigation (PBN), pilots who fly PBN procedures should already have endorsement. The current published conventional approaches will still be available for any aircraft/crew unable to fly an RNP Approach.
	Other costs	There are no other known costs anticipated as a result of the introduction of RNP approaches at CoDA.
Airport / Air navigation service provider	Infrastructure costs	PBN approaches are not dependent on ground based infrastructure and will not require any change of existing infrastructure and therefore there are no anticipated infrastructure costs as a result of this option.
	Operational costs	The RNP approaches require maintenance of the approach procedure on a five yearly basis. This ongoing cost is estimated to be in the region of £4-10K. The conventional procedures that form part of the 'do nothing' scenario, also require maintenance on a five yearly basis.
	Deployment costs	Costs associated with the RNP approaches are ANSP training costs which will be covered within the normal operating costs of the ATC unit.
All	Safety	As this option directly replicates the baseline scenario, and there are no known safety issues, there are no new safety concerns as a result of this option. CoDA ATC have advised that the minor differences in FAF positioning between ILS and RNP Approaches will have no effect on the ATC function. As part of the engagement undertaken at Stage 3 following the IFP Development, CoDA airlines were engaged about the runway 08 approach and there was no feedback that suggested there are any safety concerns from an airline perspective; this stage 3 consultation will also provide an opportunity for a wider group of stakeholders to respond should they have any concerns.

	The procedures that form Airspace Option 2 have been designed by a UK Approved Procedure Design Organisation and will be validated in accordance with CAA Policy. Implementation of RNP Approach procedures can be expected to enhance safety in the event of ILS unserviceability where operators would otherwise be reliant on Non-Precision Approaches (NPA). PBN approaches are widely claimed to enhance safety over NPAs by reducing the risk of Controlled Flight Into Terrain (CFIT). As part of the ACP submission in Stage 5, it will require a Safety Case to be presented for the RNP Approaches together with new ATC operating procedures in the form of MATS Part 2 Supplementary Instructions, together with supporting Hazard Analysis as required by the CoDA Safety Management System.

6.2 Missed Approach Sub-options

6.2.1 A missed approach is flown when the aircraft is unable to land; pilots follow the missed approach procedure before joining the final approach to perform another landing. Holding is normally available as part of the procedure, if required.

6.2.2 It's important to note that Missed Approach procedures are flown very infrequently (In 2019, around 5 per month on average at the airport, the majority of which are for training purposes). Given that only 25% of IFR flights are anticipated to fly RNP approaches, it is expected that only around 15 missed approach movement per year would fall within the scope of this ACP. By 2032, based on forecast growth, this would increase to 35 PBN per year. Subsequently, the appraisal of these missed approach options has taken a proportionate methodology.

6.3 Runway 26 Missed Approach Option 1

Table 20 Full Options Appraisal Runway 26 Missed Approach Option 1

26 MA Option 1		
The CAA do not permit Airspace Change Sponsors to publish draft IAP charts or full chart details of the missed approach, however the above image shows an indicative part of the chart overlaid on a satellite map. Below is indicative text describing the missed approach:  MAPt: RW26 Continuous Climb to 3500, initially climb straight ahead to waypoint XX, then turn left to waypoint XY – XZ waypoint – XA waypoint to join the IAF or as directed by ATC. If Holding is required, route waypoint XX – waypoint XY - EGT.		
Technical Information		
Stage 2 Components:		26MALST (Rwy 26, Missed Approach, Left Turn to South T Bar)
Group	**Impact**	**Qualitative Assessment**
Communities	Noise impact on health and quality of life	This missed approach option as closely as possible replicates how aircraft are tactically turned today to the south, although it then directs aircraft back to re-join the final approach, rather than the overhead hold.

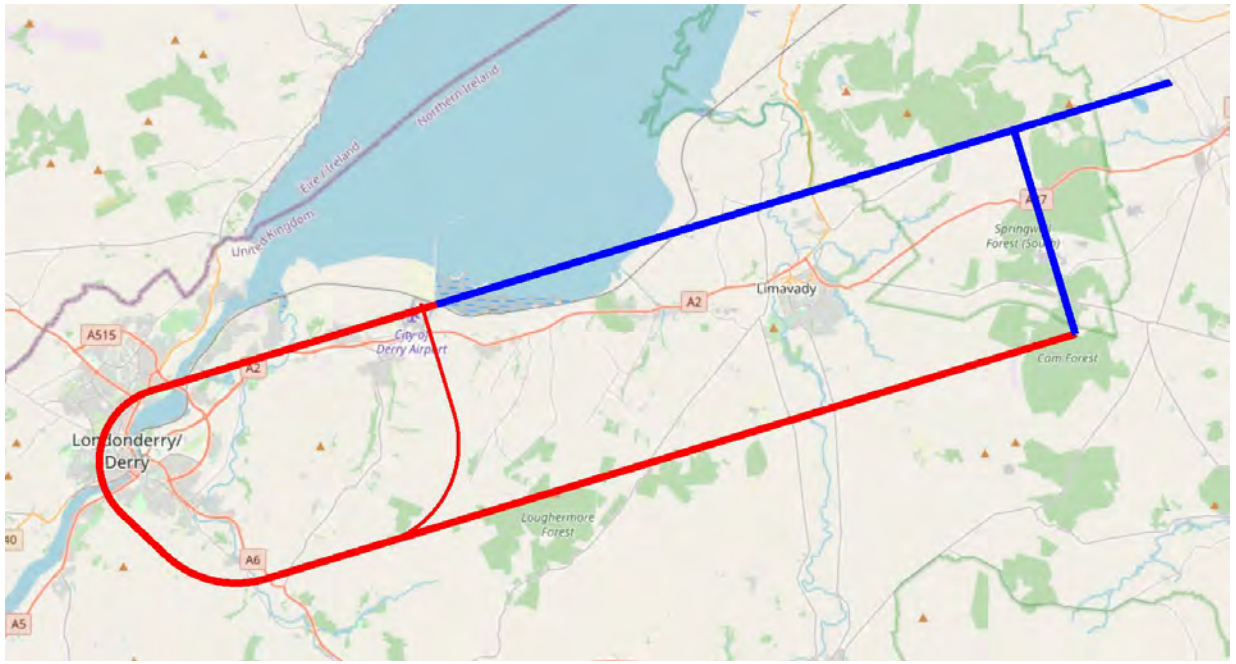


Figure 18 Runway 26 Missed Approach (Red: Missed Approach Blue: RNP Approach)

This option differs from the published missed approach for runway 26 which climbs to 600ft before turning right before turning again to join the overhead EGT hold.
CoDA have explained that typically today, missed approaches from runway 26 are directed to climb straight ahead for 5nm to 3500ft before turning left or right and joining the overhead hold. As part of the IFP development, the PBN missed approach was refined to replicate this as closely as possible whilst balancing against the IAA requirement for additional CAS to contain the primary protection area of the any IFP. Subsequently, the initial section of the missed approach was determined to be straight ahead for 5.8nm with a 3500ft altitude restriction. This is optimised for a typical 6% climb gradient whilst also ensuring that the turning point using the PANS-OPS required 2.5% gradient is contained within existing CAS boundaries.

Compared to how runway 26 missed approaches are tactically directed today, this does present a small change as aircraft travel straight ahead for 0.8nm longer however as explained as part of the noise analysis below, due to the number of flights expected per year, the impact of this will be very small. As part of the Initial Options Appraisal, we explained that this option may have

		the opportunity to avoid overflight of the city however due to obstacle clearance requirements to the south of the aerodrome, the straight-ahead section before the initial turn was required and therefore this could not be avoided. In terms of noise, it is important to first note that it is expected that a very low number of aircraft are expected to operate PBN missed approaches; in 2022 it is forecast that there will be 13 PBN missed approaches on runway 26, and by 2032 this is expected to increase to 26 per year. It is estimated that there would need to be at least 1-2 missed approaches per day to register on the LAeq metrics and therefore given the very low numbers, these missed approaches will not impact the primary noise metrics. The N65 contours are also modelled using average flights per day across summer period, and similar to the LAeq contours, due to the very low number of these would not be impacted by this missed approach option. Although the overflight contours in Appendix B do not consider missed approaches, from the contours we can see that the first turn of the missed approach occurs in an area already overflown today by arrivals and departures and therefore based on a typical 6% climb gradient, we would not expect any change in overflight footprint below 4000ft for this missed approach option given the number of flights per year. Overall, although there will be a small change in the missed approach track compared to how flights operate today, the very low number of missed approach movements result in a negligible impact to noise.
	Air Quality	Impacts to air quality are considered for changes below 1000ft. This missed approach option climbs straight ahead to 3500ft, which is different from the published ILS missed approach procedure however it more closely follows how some aircraft are directed by ATC today. There will be no changes below 1000ft and so there is no anticipated change or impact to air quality as a result of this missed approach option.
Wider Society	Greenhouse gas impact	This option offers a more direct route to re-join the final approach and so offers an improvement compared to current day in terms of track mileage. This subsequently reduces fuel burn and results in less greenhouse gas emissions however, due to the number of aircraft expected to operate this missed approach (approximately 13 per year, rising to 26 per year by 2032), the benefits will be negligible.
	Capacity / resilience	N/A Missed Approaches are a requirement of Instrument Approach Procedures. Please see Airspace Option 2 section.

	Tranquillity	This missed approach option overflies Binevenagh AONB however due to the very low number of flights per year (estimated at 26 per year by 2032), there is no significant impact expected to tranquillity as a result of this missed approach option.
	Biodiversity	Research shows Biodiversity disturbance effects associated with aircraft typically occur during the landing and take-off stage when an aircraft is flying at or below 500m (1,640 feet)[11]. This missed approach option climbs straight ahead to 3500ft, which is different from the published ILS missed approach procedure however it more closely follows how aircraft are tactically directed by ATC today. Subsequently, there will be no changes between 26 MA Option 1 and current day below 1640ft, and given the low movement numbers, there is no anticipated change or impact to biodiversity as a result of this missed approach option.
General Aviation	Access	The IFP for 26 MA Option 1 has been developed to ensure that there is no additional CAS required to implement this option. The very low usage (anticipated 26 RNP missed approaches per year by 2032) mean that although this option will introduce a new published missed approach track, we do not anticipate any impact to General Aviation as a result of this option.
General Aviation / Commercial airlines	Economic impact from increased effective capacity	It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.
	Fuel burn	This option offers a more direct route to re-join the final approach and so offers an improvement compared to current day in terms of track mileage. This subsequently reduces fuel burn and since Missed Approaches may be taken into account in fuel uplift calculations a reduction in miles could be applied to all planned RNP arrivals. However, due to the number of aircraft expected to operate PBN approaches and this missed approach (approximately 26 per year by 2032), the benefits will be negligible.
Commercial airlines	Training costs	There are no training costs for commercial airlines anticipated as a result of the introduction of RNP approaches at CoDA. As part of Regulation (EU) No. 539/2016 Performance Based Navigation (PBN), pilots who fly PBN procedures should already have endorsement. The current published conventional approaches will still be available for any aircraft/crew unable to fly an RNP Approach.
	Other costs	There are no other known costs anticipated as a result of the introduction of RNP missed approaches at CoDA.

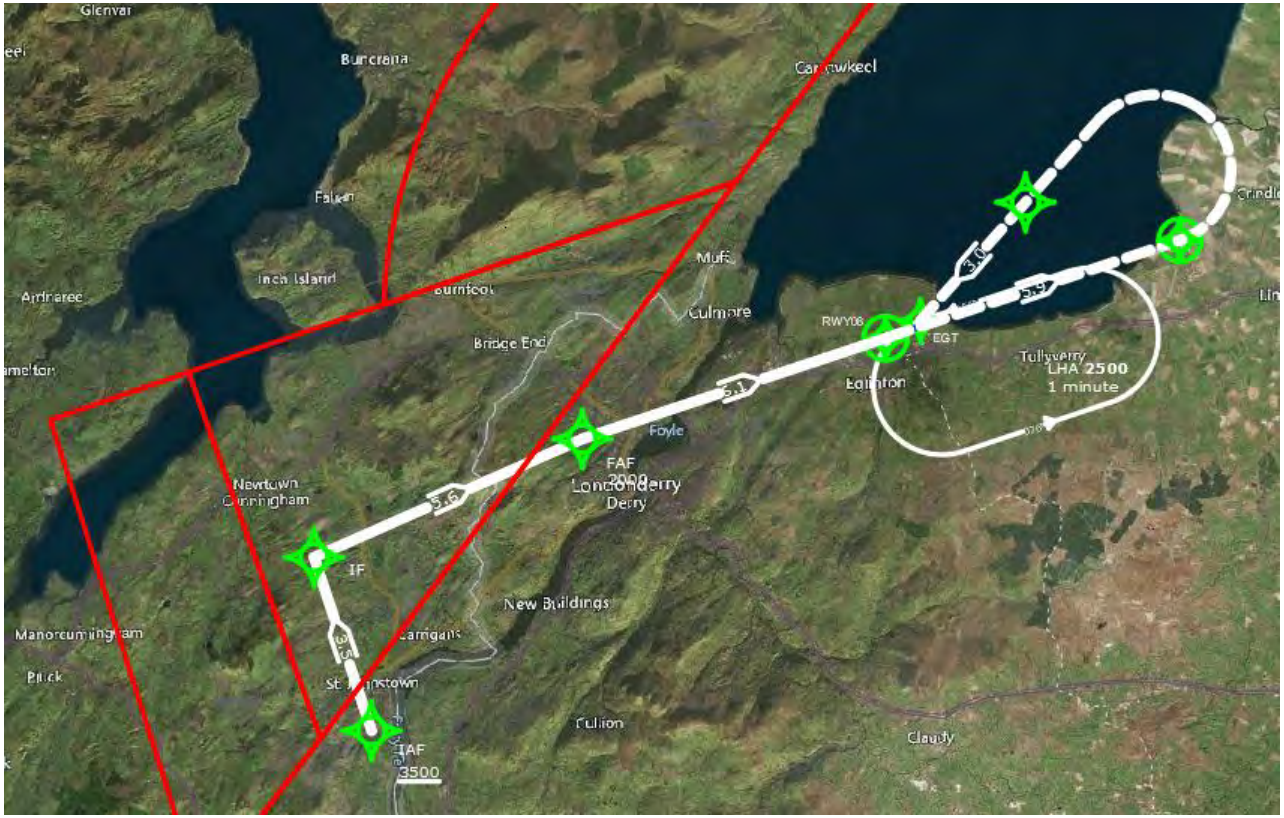
[11] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature Birds Network Information Note

Airport / Air navigation service provider	Infrastructure costs	There are no anticipated infrastructure costs as a result of this option.
	Operational costs	The operational costs will be the same as covered in Airspace Option 2.
	Deployment costs	The operational costs will be the same as covered in Airspace Option 2.
All	Safety	The runway 26 approach and missed approach procedure has been designed by a UK Approved Procedure Design Organisation and will be validated in accordance with CAA Policy. A turn to the South for this Missed Approach would be different to that published for ILS and NDB procedures however CoDA ATC have confirmed that this more closely reflects how aircraft are tactically directed today. Although aircraft are typically directed differently to the published procedure, there may be a Human factors consideration to address for both ATCOs and pilots as the turn would differ from the published procedure for the ILS. Therefore ATC will need to be fully cognisant of when an RNP approach is being flown at any time. ATC have confirmed that a left turn would be the preferred missed approach for operational reason and will also help reduce the impact of Wind Farm development to the North on the aerodrome.

6.4 Runway 08 Missed Approach Option 1

Table 21 Full Options Appraisal Runway 08 Missed Approach Option 1

08 MA Option 1
The CAA do not permit Airspace Change Sponsors to publish draft IAP charts or full chart details of the missed approach, however the above image shows an indicative part of the chart overlaid on a satellite map. Below is indicative text describing the missed approach:



MAPt: RW08
Climb straight ahead to 3500 or XX waypoint, whichever is later, then turn left to XY waypoint and EGT to join the hold or as directed by ATC.

Technical Information	
Component from Stage 2	08MALOH (Runway 08, Missed Approach, Left Turn to Overhead hold)

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	This missed approach option largely replicates what happens today, climbing straight ahead, making use of Lough Foyle, and avoiding the overflight of communities to the south of the aerodrome.  *Figure 19 Runway 08 Missed Approach Option 1 (Red: Missed Approach Blue: RNP Approach)* The existing ILS missed approach climbs straight ahead to 2500ft and then turns left to EGT to hold. CoDA ATC have confirmed that they typically, tactically direct aircraft to climb to 3500ft before turning. 08 MA Option 1 climbs to 3500ft and turns to the EGT hold where aircraft can then either join a holding pattern or fly directly back to join the final approach. Due to the IFP design criteria, it is not possible to perfectly replicate the conventional procedure as part of the first turn– there is more information about this in the IFP development section of this document. The portion of flight back to the final approach also leads to small changes in track compared to today.

		In terms of noise, it is important to first note that it is expected that a very low number of aircraft are expected to operate PBN missed approaches; in 2022 it is forecast that there will be 4 PBN missed approaches on runway 08, and by 2032 this is expected to increase to 9 per year. It is estimated that there would need to be at least 1-2 missed approaches per day to register on the LAeq metrics and therefore given the very low numbers, these missed approaches will not impact the primary noise metrics. The N65 contours are also modelled using average flights per day across summer period, and similar to the LAeq contours, due to the very low number of these would not be impacted by this missed approach option. Although the overflight contours in Appendix B do not consider missed approaches, from the contours we can see that the initial straight ahead section of the missed approach would occur over areas that are already overflown by arrivals and departures. The remained of the missed approach procedure following the turn would overfly areas outside of the overflight contours however other areas however when considered alongside how many movements there would be per year any adverse impacts of noise are almost immeasurable. Overall, although there will be a small change in the missed approach track compared to how flights operate today, the very low number of missed approach movements result in a negligible impact to noise.
	Air Quality	Impacts to air quality are considered for changes below 1000ft. This missed approach option closely replicates the published ILS procedure to 1000ft. It is also expected that very few aircraft will operate these missed approaches in a year (around 9 per year by 2032) and therefore there is no anticipated measurable change to air quality as a result of this missed approach option.
Wider Society	Greenhouse gas impact	This option aims to replicate the published ILS procedure however due to PBN design criteria there may be some marginal differences in track miles compared to current day. These will be so small that it would not be proportionate to try and quantify them, especially given that only 9 flights per year are expected to operate these missed approaches by 2032. Any changes, either adverse or beneficial will likely be very small compared to current day and therefore the impacts to greenhouse gas emissions will be negligible.
	Capacity / resilience	N/A Missed Approaches are a requirement of Instrument Approach Procedures.
	Tranquillity	Currently runway 08 missed approaches overfly the Binebenagh AONB. 08 MA Option 1 largely replicates what happens today and therefore it is expected that this too will overfly Binebenagh.

		Due to PBN design criteria, the left turn may not be exactly replicated compared to today however the easterly missed approaches are only anticipated to be flown around 9 times per year by 2032, and therefore any benefits or impacts in terms of tranquillity are negligible.
	Biodiversity	Research shows Biodiversity disturbance effects associated with aircraft typically occur during the landing and take-off stage when an aircraft is flying at or below 500m (1,640 feet)[12]. 08 MA Option 1 climbs straight ahead, as aircraft do today, and then turns to the north which is the same as the published ILS missed approach procedure. Aircraft will climb above 1640ft in the straight ahead section of this missed approach and therefore there will not be a change compared to current day. Given this and considering how few aircraft will operate this missed approach (around 9 per year when considering 27% Easterly operations in 2032), there is no anticipated measurable impact to biodiversity as a result of this missed approach option.
General Aviation	Access	This option closely replicates what happens today and does not require any additional CAS, however it is within close proximity of an area used by Ulster Gliding Club for flying. As part of the IOA we raised the possibility of turning earlier that the existing ILS missed approach in order to enhance safety in the area around Ulster Gliding Club. This was explored as part of the IFP development which found that the turn developed was the closest feasible which met PANS-OPS criteria and balanced the considerations around safety, general aviation access, and replicating current day. As this option closely replicates what happens today, does not require any new CAS, and is only anticipated to be operated around 9 times a year by 2032, overall there are not expected to be any impacts to General Aviation users.
General Aviation / Commercial airlines	Economic impact from increased effective capacity	It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.
	Fuel burn	This option aims to replicate the published ILS procedure however due to PBN design criteria there may be some marginal differences in track miles compared to current day. These will be so small that it would not be proportionate to try and quantify them, especially given that only 9 flights per year are expected to operate these missed approaches by 2032.

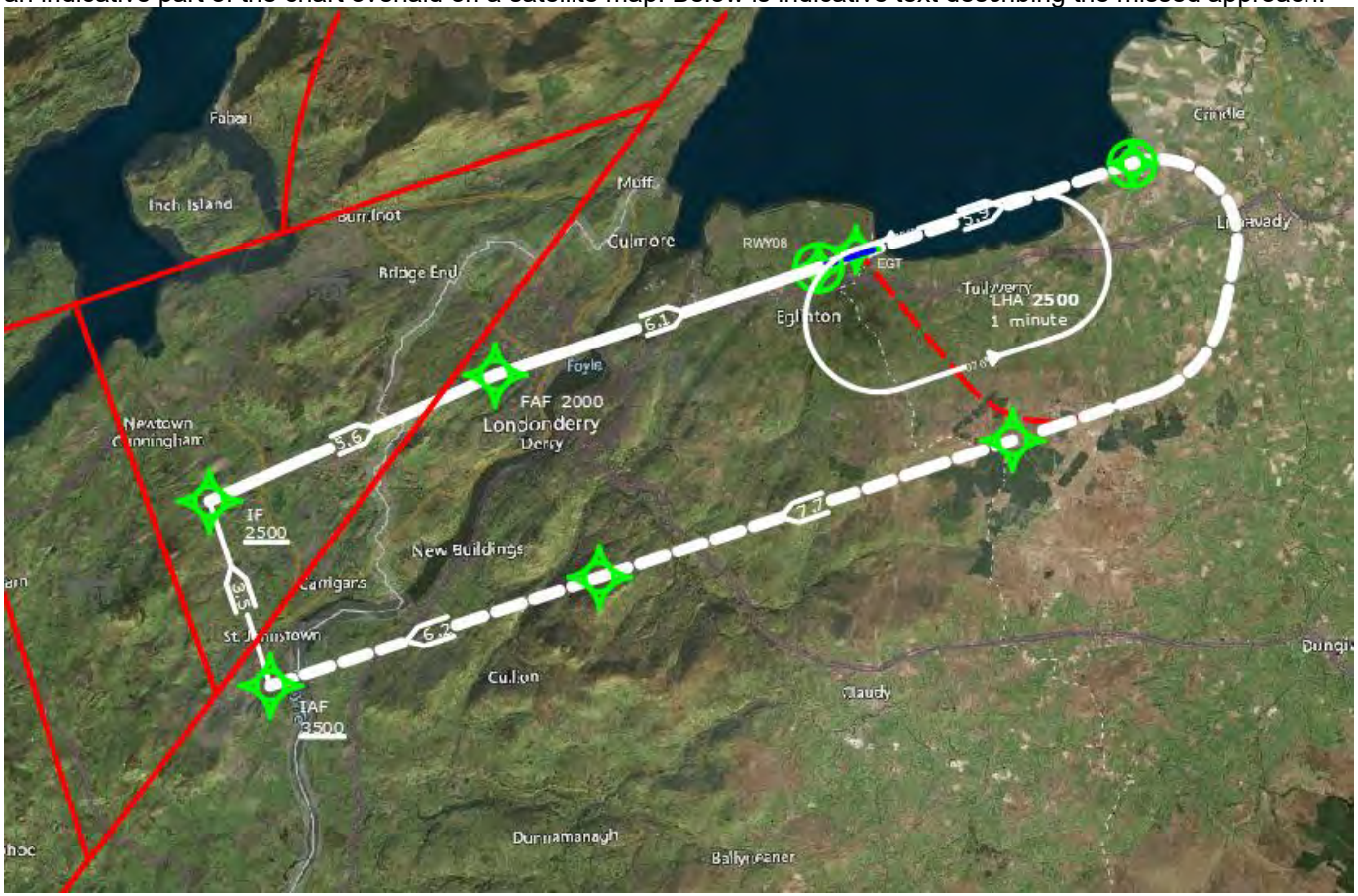
[12] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature Birds Network Information Note

		Any changes, either adverse or beneficial will likely be very small compared to current day and therefore the impacts to fuel burn will be negligible.
Commercial airlines	Training costs	There are no training costs anticipated as a result of the introduction of RNP approaches at CoDA. As part of Regulation (EU) No. 539/2016 Performance Based Navigation (PBN), pilots who fly PBN procedures should already have endorsement. The current published conventional approaches will still be available for any aircraft/crew unable to fly an RNP Approach.
	Other costs	There are no other known costs anticipated as a result of the introduction of RNP approaches at CoDA.
Airport / Air navigation service provider	Infrastructure costs	There are no anticipated infrastructure costs as a result of this option.
	Operational costs	The operational costs will be the same as covered in option 1 and 2.
	Deployment costs	The deployment costs will be same as covered in option 1 and 2.
All	Safety	There are no expected safety issues as this option largely aims to replicate how aircraft are directed to fly missed approaches today. As explained within the IFP development section of this document, the procedure has been designed to meet PANS-OPS criteria, however it does present a new configuration which will require testing as part of flight simulators to ensure it performs as expected.

6.5 Runway 08 Missed Approach Option 2

Table 22 Full Options Appraisal Runway 08 Missed Approach Option 2

08 MA Option 2
The CAA do not permit Airspace Change Sponsors to publish draft IAP charts or full chart details of the missed approach, however the above image shows an indicative part of the chart overlaid on a satellite map. Below is indicative text describing the missed approach:



MAPt: RW08
Continuous Climb to 3500, initially climb straight ahead to XX waypoint, then turn right to XY waypoint, direct to XZ waypoint – XA waypoint to join the IAF or as directed by ATC.
If Holding is required, route XB waypoint – XC waypoint - EGT.

Technical Information	
Component from Stage 2	08MARST (Runway 08, Missed Approach, Right Turn to South T Bar)

Group	Impact	Qualitative Assessment
Communities	Noise impact on health and quality of life	This missed approach option is a change from current day and therefore it introduces new areas of overflight that are not regularly overflown by missed approaches today although, when reviewing the overflight contours generated for Airspace Option 2, some areas are already being overflown by other existing traffic patterns. Although there is a change in overflight, this new option avoids overflying the south of Londonderry, which is an improvement compared to current day. The RNP approach does however fly close to Limavady however the nominal track avoids the main populated areas. The current missed approach overflies the water whereas this RNP approach only initial climbs over the water before turning right. Following the right turn it avoids all densely populated areas before re-joining the final approach.  *Figure 20 Runway 08 Missed Approach Option 2 (Red: Missed Approach Blue: RNP Approach)* Given the above, this option is anticipated to have some small benefits and impacts in terms of the populations exposed noise when aircraft operate a missed approach however as this change only applies to approximately 9 flights per year by 2032, any marginal benefits or impacts are considered negligible.

	Air Quality	Impacts to air quality are considered for changes below 1000ft. This missed approach option would climb straight ahead until above at least 1000ft, and then turn to the south. Combined with how few aircraft will operate this missed approach, there is therefore no anticipated change or impact to air quality as a result of this missed approach option.
Wider Society	Greenhouse gas impact	This option offers a more direct route back to re-join the final approach and so offers an improvement compared to current day in terms of track mileage and also compared to 08 MA Option 1. This subsequently reduces fuel burn which results in less greenhouse gas emissions, however due to the number of aircraft expected to operate this missed approach (approximately 9 per year by 2032) the benefits will be negligible. However, since Missed Approaches may be taken into account in fuel uplift calculations a reduction in miles could be applied to all planned RNP arrivals.
	Capacity / resilience	N/A Missed Approaches are a requirement of Instrument Approach Procedures.
	Tranquillity	This missed approach option does not overfly Sperrin AONB or Binevenagh AONB. Compared to the published missed approach procedure, this option would remove the overflight of Binevenagh AONB. Easterly RNP missed approaches are only anticipated to be flown around 9 times per year, and therefore any benefits in terms of tranquillity will be very marginal.
	Biodiversity	Research shows Biodiversity disturbance effects associated with aircraft typically occur during the landing and take-off stage when an aircraft is flying at or below 500m (1,640 feet)[13]. This missed approach option climbs straight ahead, as aircraft do today, and then turns to the south which is different from the published ILS missed approach procedure. Based on a minimum 2.5% climb gradient, it is anticipated that aircraft will climb above 1,000ft before turning however if we consider a steeper climb gradient, which in reality most aircraft would operate, then aircraft are likely to be well above 1640ft before turning. In the case of biodiversity up to 1640ft, this means that there would be a very small part of the missed approach which could potentially overfly a new area compared to the missed approaches today. Considering how few aircraft will operate this missed approach (9 per year by 2032) and they are expected to climb at a rate of greater than 2.5%, there is no anticipated measurable change to biodiversity as a result of this missed approach option.
General	Access	There is no additional CAS required to implement this option. The right turn avoids an area

[13] Drewitt, A. (1999) Disturbance effects of aircraft on birds. English Nature Birds Network Information Note

Aviation		regularly used by Ulster Gliding Club and therefore presents some very small benefits compared to 08 MA Option 1; it is important to note however that this missed approach is only expected to be flown by around 9 flights per year and therefore any benefits are very marginal.
General Aviation / Commercial airlines	Economic impact from increased effective capacity	It is not intended that this Airspace Change will facilitate any future growth for the airport or offer any increased capacity; the purpose of the change is to provide resilience and meet the requirements of the Airspace Modernisation Strategy.
	Fuel burn	This option offers a more direct route back to re-join the final approach and so offers an improvement compared to current day in terms of track mileage. This subsequently reduces fuel burn however since Missed Approaches may be taken into account in fuel uplift calculations a reduction in miles could be applied to all planned RNP arrivals. There may therefore be some marginal benefits to fuel burn for this missed approach option, however given the number of flights per year, these are expected to be negligible.
Commercial airlines	Training costs	There are no training costs anticipated as a result of the introduction of RNP approaches at CoDA. As part of Regulation (EU) No. 539/2016 Performance Based Navigation (PBN), pilots who fly PBN procedures should already have endorsement. The current published conventional approaches will still be available for any aircraft/crew unable to fly an RNP Approach.
	Other costs	There are no other known costs anticipated as a result of the introduction of RNP approaches at CoDA.
Airport / Air navigation service provider	Infrastructure costs	There are no anticipated infrastructure costs as a result of this option.
	Operational costs	The operational costs will be the same as covered in option 1 and 2.
	Deployment costs	The deployment costs will be same as covered in option 1 and 2.
All	Safety	Safety may be enhanced slightly as a right turn can be initiated to move aircraft away from known glider activity in Class G airspace earlier than today, subject to IFP design criteria and obstacle protection. An early right turn may be impeded by high ground to the south of the airport. A turn to the South for this Missed Approach would be different to that published for ILS and NDB procedures. There may be a Human factors consideration to address for both ATCOs and pilots. Therefore ATC will need to be fully cognisant of when an RNP approach is being flown at any time.

7. Conclusions and next steps

7.1 Full Options Appraisal conclusion and our preferred option

7.1.1 The following table summarises the outcome of our Full Options Appraisal:

Negative impacts or costs compared to baseline FOA has identified significant impacts or costs	Neutral impact compared to baseline FOA has identified minor benefits or impacts which overall are considered neutral	Positive benefits compared to baseline FOA has identified significant benefits

Table 23 Full Options Appraisal Summary

Group	Impact	Airspace Option 2	26 MA Option 1	08 MA Option 1	08 MA Option 2
Communities	Noise impact on health and quality of life	Minor impacts and benefits	Minor impacts and benefits	Minor impacts and benefits	Minor impacts and benefits
	Air Quality	Minor impacts and benefits	No impact	No impact	No impact
Wider Society	Greenhouse gas impact	Minor impacts and benefits	Minor benefits	Minor impacts or benefits	Minor benefits
Wider Society	Capacity / resilience	Improves resilience	Improves resilience	Improves resilience	Improves resilience
	Tranquillity	No impact	Minor impacts	Minor benefits and impacts	Minor benefits
	Biodiversity	Minor impacts and benefits	No impact	No impact	Minor benefits and impacts
General Aviation	Access	No impact	No impact	No impact	Minor benefits
General Aviation/Commercial Airlines	Economic impact from increased effective capacity	No impact	No impact	No impact	No impact

	Fuel burn	Minor impacts and benefits	Minor benefits	Minor impacts or benefits	Minor benefits
Commercial airlines	Training costs	No costs	No costs	No costs	No costs
	Other costs	No costs	No costs	No costs	No costs
Airport / Air Navigation Service Provider	Infrastructure costs	No costs	No costs	No costs	No costs
	Operational costs	Ongoing maintenance of the new procedures estimated £4-10k every five years.			
	Deployment costs	Business as usual – no additional costs			
All	Safety	Improves safety	Minor benefits	No impact	Minor benefits

7.1.2 The Full Options Appraisal has demonstrated that Airspace Option 2 meets the aims of the ACP which are to:

- Design PBN approaches and arrival procedures to replicate the existing routes which would result in little or no noticeable change to stakeholders,
- Provide a contingency for the existing ground based navigational aid infrastructure, and
- Meet the governments Airspace Modernisation Strategy (AMS).

7.1.3 We therefore plan to proceed with our proposal to implement Airspace Option 2 at CoDA (to be operated alongside the existing conventional approaches), and this is our preferred option for this ACP.

7.1.4 The analysis of the Missed approach sub options has shown that there are only very marginal differences between the options and they too meet the overall aims of the ACP. In terms our preferred missed approach option:

- Our preferred option for runway 26 is to proceed with 26 Missed Approach Option 1 as the full options appraisal demonstrated that there are no significant impacts to stakeholders and when combined with the runway 26 approach that forms part of Airspace Option 2, this improves resilience at CoDA.
- Our preferred option for runway 08 is 08 Missed Approach Option 2 however due to operational considerations we are aware that Option 1 may be more suitable, and we will be guided by the outcome of the consultation together with IFP Validation activity. Option 2 is our preferred due to the small benefits in safety and track mileage as outlined in the full options appraisal. When combined with the runway 08 approach that forms part of Airspace Option 2, this also improves resilience at CoDA.

7.2 Next Steps in the Airspace Change Process

7.2.1 This Full Options Appraisal document forms part of a set of three documents created for our Stage 3 consultation. To read our other documents, please use the following link to our Consultation site. To respond to the consultation, please also use the below link.

CoDA Consultation Site

7.2.2 Once our Consultation has closed on 21st January 2022, we will collate, review, and categorise the consultation responses. Responses will be categorised into those which present information that may lead to a change in the design and those that could not. The CAA will review our categorisation and the categorisation document will then be published on the CAA portal; this forms part of Step 3D of the airspace change process.

7.3 Reversion Statement

7.3.1 CAP1616 requires sponsors to be clear with stakeholders the extent to which the proposed airspace change once implemented is reversible if it does not meet the objectives it's designed to achieve as part of the post-implementation review at Stage 7. As this ACP looks to introduce RNP approaches alongside the existing conventional procedures, it is possible for this change to be reversed if required.

7.3.2 In the event that the ACP does not meet the objectives it has been designed to achieve as part of the post-implementation review at Stage 7, CoDA would withdraw the RNP procedures from the AIP. As this ACP is proposing to introduce these procedures alongside the conventional procedures and the majority of aircraft will continue to fly conventional procedures post implementation, in the event that the RNP procedures are withdrawn all IFR flights would revert to conventional. Given the very small changes anticipated as part of this ACP (see section 6 for further information), we do not anticipate any significant impacts to most external stakeholders, however the withdrawal would result in reduced resilience for CoDA and it's airlines as well as a missed opportunity to enhance safety and meet the government's AMS.

8. Appendix A: Stakeholder Engagement during IFP Development

APPENDIX A

STAKEHOLDER ENGAGEMENT LOG & MATERIAL

(Post Stage 2 Gateway)

DATE	STAKEHOLDER	METHOD OF ENGAGEMENT	SUBJECT OF ENGAGEMENT	EVIDENCE	LOCATION IN APPENDIX A
14-Apr-21	IAA	Email	Cross border query, following CAA Feedback	Email	Page 5
28-Apr-21	Dept of Agriculture, Environment & Rural Affairs	Email	Delayed response to Stage2A Engagement	Email Letter	Pages 2-3 Page 4
14-May-21	IAA	Email	Follow up to 14 Apr 21 Email	Email	Pages 6-7
14-May-21	IAA	Email	Holding reply to 14 May 21 Email	Email	Page 8
22-Jun-21	IAA	Email	Follow up to April & May Emails	Email	Page 9
8-Jul-21	IAA	Email	Request for meeting	Email	Page 10
27-Jul-21	Logan Air	Email	Request for technical feedback	Draft Chart Options Email	Pages 13-18 Page 25
27-Jul-21	Ryanair	Email	Request for technical feedback	Email	Page 33
27-Jul-21	Logan Air	Email	Date confirmation	Email	Page 27
27-Jul-21	Ryanair	Email	Date confirmation	Email	Page 34
27-Jul-21	Logan Air	Email	Receipt of email	Email	Page 28
27-Jul-21	Logan Air	Email	Acknowledgement	Email	Page 29
27-Jul-21	Albastar	Email	Request for technical feedback	Email	Page 19
5-Aug-21	Logan Air	Email	Holding reply to request for feedback	Email	Page 30
11-Aug-21	Logan Air	Email	Technical Feedback	Email	Page 31
17-Aug-21	Albastar	Email	Reminder for Feedback	Email	Page 21
17-Aug-21	Logan Air	Email	Response to feedback	Email	Page 32
18-Aug-21	Albastar	Email	Technical Feedback	Email	Pages 22-23
19-Aug-21	Albastar	Email	Response to feedback	Email	Page 24
25-Aug-21	IAA	Email	Follow up to previous emails	Email	Page 11

RE: City of Derry Airport - Airspace Change Proposal - Comprehensive List of Options Engagement

DAERA CDP Planning Consultations [redacted]
Wed 28/04/2021 10:07

To: City of Derry Airport <coda-acp@traxinternational.co.uk>

1 attachments (175 KB)
Consultation - City of Derry Airport - Airspace Change Proposal - Comprehensive List of Options Engagement - 28.04.2021.pdf;

Dear [redacted]

I refer to your e-mail below and apologise for the delay in responding.

Please find attached NIEA, CDP response.

Regards

[redacted]

From: City of Derry Airport [mailto:coda-acp@traxinternational.co.uk]
Sent: 20 January 2021 17:03
Subject: City of Derry Airport - Airspace Change Proposal - Comprehensive List of Options Engagement

Good Afternoon,

In September 2020 we got in touch with you to inform you of the small changes that the City of Derry airport are looking to make to the way in which aircraft arrive at the airport, by introducing arrivals, missed approach and airborne holding procedures which use satellite technology to navigate instead of relying on old, ground-based navigation aids. To make these changes we are undertaking the Civil Aviation Authority's (CAA) airspace change process (known as CAP1616). The process places great importance on engaging and consulting on airspace proposals throughout the process with a wide range of stakeholders. Following our engagement with you during Stage 1, we submitted our proposed Design Principles to the CAA in November 2020 and were approved to move forward to Stage 2 of the process. Our Stage 1 submission can be found here.

Stage 2A of CAP1616 requires us to develop a first comprehensive list of options and engage with the same stakeholders we engaged with during Stage 1. Attached is a presentation which shows you our comprehensive list of options and asks for your feedback:

- We would like to know if you are satisfied that the design options are comprehensive and broadly aligned with our design principles
- Are there any other options that you think we can consider at this stage, to make the list more comprehensive?

We would like to highlight that this is NOT the consultation phase of the process and **we are not requesting feedback on the merits of each option at this stage**. That will come later in the process.

Due to the current situation, we are unable to engage in the face-to-face manner we would prefer. We appreciate that there is some very technical information contained within this presentation and we apologise for the slide pack being quite lengthy, this is to try and articulate the options more clearly to those stakeholders without an aviation background. If you would like to arrange an online meeting/briefing with us, please get in touch at coda-acp@traxinternational.co.uk by **Friday 5th February 2021**- this will allow us time to explain the information to you and for you to provide feedback prior to the deadline. The deadline for feedback is **COP Thursday 11th February 2021**.

Following this engagement period, we will take on board any feedback we receive and, where feasible, generate further options based on that feedback. Following this, we will qualitatively assess those options against the Design Principles and produce a Design Principle Evaluation. The list of options & the Design Principle Evaluation will be published on the CAA Portal.

If you have any questions at all about this airspace change, please contact us at coda-acp@traxinternational.co.uk.

Kind Regards,

[redacted]

[redacted]
Web: www.traxinternational.co.uk

Environment, Marine & Fisheries Group
Natural Environment Division
Conservation, Designation and Protection Unit

Department of
Agriculture, Environment and Rural Affairs
www.daera-ni.gov.uk

[redacted]
Trax International

2ND Floor
Klondyke Building
Cromac Avenue
Belfast BT7 2AJ
Email: [redacted]
Reference:
Date: 28/04/2021

RE: City of Derry Airport - Airspace Change Proposal - Comprehensive List of Options Engagement

With specific reference to international and nationally designated sites, Conservation, Designation and Protection Casework Team have the following comments to make:

Designated Site Considerations

The City of Derry Airport lies adjacent to Lough Foyle ASSI/SPA/Ramsar site. The fauna of Lough Foyle includes a large and diverse population of waders and other bird species and regularly supports a wintering bird assemblage of over 5,000 waterfowl.

Internal consultation with the Biodiversity Conservation Science Ornithology (BCS) highlighted that the new proposals do not differ sufficiently from the current situation to cause concern. The new green routes pass close to an area that held a population of breeding Curlew in 1987, but BCS hold no new information on the current status of the species there. BCS also consider that the aircraft using these routes would be flying at a height where there would be negligible risk of disturbance.

Therefore, CDP is content that that the proposal is unlikely to cause a significant impact to the ornithological features of these designated sites.

If you require any further information, please contact the CDP casework team using the contact details above.

Regards
CDP Casework Team

City of Derry Airspace Change

[redacted]
Wed 14/04/2021 15:33

To: [redacted]

Hi [redacted]

I hope you're keeping well.

We've now progressed to Stage 3 in the CAP1616 Airspace Change process to introduce RNP Approaches at CoDA. As part of the preparatory work for this stage we're having a look at the methodology required to assess the impacts of the change.

Please may you let me know whether you are happy for us to assess changes across the border to the same requirements as CAP1616 or whether there are any further aspects the IAA would like us to consider? I've included our question and the CAA's response below as further information.

Also a quick update with regards to CAS - at present the IFPs for the options are being developed in detail and we will be in touch once the IFP work is complete to discuss any CAS impacts/requirements.

Many thanks in advance for your help and if you have any questions please do get in touch.

Best wishes,

[redacted]

Question to the CAA: Are we required by the UK CAA to assess the impacts of the change on the other side of the border, in the Shannon FIR? E.g. overflown population counts. If so, do we assess these in accordance with CAP1616 requirements or IAA requirements?

CAA response:
Although the UK has, in a pure sense, no regulatory influence regarding what might be required to assess the environmental impacts across the border, CAP1616 requires a fair, consistent and transparent approach to assessing the remaining options and for developing the final solution. This applies across all domains (technical, environmental, economic and engagement/consultation). In our view this would likely lead you to the point where the principles of CAP1616 would need to be applied across all options irrespective of which side of the border is being considered – you would need to confirm if the IAA are content with your approach or if there are any additional aspects they require you to consider (such as you have already identified regarding CAS). If IAA requirements create a clash with CAP1616 principles, or if you need to develop a hybrid strategy, then please discuss this with us. It should be noted that you are able to present an argument for scaling and proportionality based on the degree of anticipated impact, which may help with finding a way through the cross-border issues. The engagement/consultation aspects can be captured within the Stage 3 Consultation Strategy.

[redacted]
W: www.traxinternational.co.uk

RE: City of Derry Airspace Change

[redacted]
Fri 14/05/2021 09:25
To: [redacted]

Hi [redacted]

I hope you're well.

Is there any update on the below question with regards to assessment of impacts across the border?

If it's easier to have a quick call to discuss then please do let me know,

Best wishes,

[redacted]

From: [redacted]
Sent: 14 April 2021 15:33
To: [redacted]
Subject: City of Derry Airspace Change

Hi [redacted]

I hope you're keeping well.

We've now progressed to Stage 3 in the CAP1616 Airspace Change process to introduce RNP Approaches at CoDA. As part of the preparatory work for this stage we're having a look at the methodology required to assess the impacts of the change.

Please may you let me know whether you are happy for us to assess changes across the border to the same requirements as CAP1616 or whether there are any further aspects the IAA would like us to consider? I've included our question and the CAA's response below as further information.

Also a quick update with regards to CAS - at present the IFPs for the options are being developed in detail and we will be in touch once the IFP work is complete to discuss any CAS impacts/requirements.

Many thanks in advance for your help and if you have any questions please do get in touch.

Best wishes,

[redacted]

Question to the CAA: Are we required by the UK CAA to assess the impacts of the change on the other side of the border, in the Shannon FIR? E.g. overflown population counts. If so, do we assess these in accordance with CAP1616 requirements or IAA requirements?

CAA response:
Although the UK has, in a pure sense, no regulatory influence regarding what might be required to assess the environmental impacts across the border, CAP1616 requires a fair, consistent and transparent approach to assessing the remaining options and for developing the final solution. This applies across all domains (technical, environmental, economic and engagement/consultation). In our view this would likely lead you to the point where the principles of CAP1616 would need to be applied across all options irrespective of which side of the border is being considered – you would need to

confirm if the IAA are content with your approach or if there are any additional aspects they require you to consider (such as you have already identified regarding CAS). If IAA requirements create a clash with CAP1616 principles, or if you need to develop a hybrid strategy, then please discuss this with us. It should be noted that you are able to present an argument for scaling and proportionality based on the degree of anticipated impact, which may help with finding a way through the cross-border issues. The engagement/consultation aspects can be captured within the Stage 3 Consultation Strategy.

[redacted]
W: www.traxinternational.co.uk

EMAIL RECIEVED FROM THE IAA - MAY 2021

RE: City of Derry Airspace Change

[redacted]

Fri 14/05/2021 09:27

To: [redacted]
Cc: [redacted]

Good morning [redacted]

I'll review and revert next week to you

Stay safe
[redacted]

RE: City of Derry Airspace Change

[redacted]
Tue 22/06/2021 10:37

To: [redacted]

Hi [redacted]

Please may you let me know if there is any update on the below question?

Many thanks,

[redacted]

From: [redacted]
Sent: 14 May 2021 09:27
To: Nichola Shaw <nichola@traxinternational.co.uk>
Cc: [redacted]
Subject: RE: City of Derry Airspace Change

Good morning [redacted]

I'll review and revert next week to you

Stay safe
[redacted]

City of Derry Airport Airspace Change Proposal - Meeting Request

[redacted]

Thu 08/07/2021 09:57

To: [redacted]

Good Morning [redacted]

I hope you are well?

We were hoping to get some time with you and your team in the next couple of weeks, to discuss the following topics regarding the CoDA ACP:

- Base of controlled airspace
- Assessment of impacts across the border

We would be looking for about 45 mins of your time - if you could let me know some date/time options that would work for you?

Thanks very much.

Kind Regards,

[redacted]

[redacted]

EMAIL SENT TO IAA - AUGUST 2021

11

RE: City of Derry Airspace Change

[redacted]

Wed 25/08/2021 14:15

To: [redacted]

Hi [redacted]

I hope you're well?

We're just finalising our Derry ACP Stage 3 documents due for submission on the 10th of September and I was wondering if you have had a chance to review the CAA's question below? If I don't hear from you by the 1st, we'll assume that you're happy with the CAP1616 criteria and we'll apply this across all of the ACP.

If you have any questions please get in touch with us as soon as possible,

Best wishes,

[redacted]

TECHNICAL MATERIAL DISTRIBUTED TO ALBASTAR, LOGAN AIR & RYANAIR

SECTION REDACTED
The CAA do not permit Airspace Change Sponsors to publish draft charts

REDACTED
The CAA do not permit
Airspace Change Sponsors
to publish draft charts

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The CAA do not permit
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Airspace Change Sponsors
to publish draft charts

REDACTED
The CAA do not permit
Airspace Change Sponsors
to publish draft charts

Re: New GNSS procedures for runway 08 and runway 26

[redacted]

Tue 27/07/2021 17:34

To: [redacted]
Cc: [redacted]

6 attachments (1 MB)

Draft_Chart_RWY08_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option2_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option3_v1.2_DJ.pdf; Draft_Chart_RWY08_Transition_v1.2_DJ.pdf; Draft_Chart_RWY26_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY26_Transition_v1.2_DJ.pdf;

Hi [redacted]

Thank you for volunteering to review our proposed procedures. This email is rather complicated as there are a number of options for consideration. They will be the subject of consultation later this year but first we would welcome some technical feedback to make sure the options are viable. We appreciate Albastar are not currently operating into EGAE but we would still very much welcome some feedback from a Boeing operator's perspective to make sure they are fit for purpose for an Albastar return in the future.

With this in mind I have attached some draft charts for the design options. The 'options' actually revolve largely around the Missed Approaches but we do have a few other questions.

To summarise, we are proposing RNAV1 replications of CoDA's Direct Arrivals which then connect to the new RNP Instrument Approach Procedures. The RWY26 RNP APCH is a direct overlay of the existing ILS however for RWY08, it's slightly different due to the existing Loc being offset. The RWY08 RNP APCH has a straight-in segment from the FAF because it was not possible, at Derry, to have an offset RNP APCH arrival within PANS OPS criteria. It also provides slightly higher minima. We also want the RNAV1 Direct Arrival (which would be termed 'Approach Transitions') to be fit for purpose for both RNP APCH and ILS arrivals. For this reason we are proposing a new IF is added to the ILS charts for each end which are both complementary with the positioning of the IFs for the RNP Approaches and vice-versa. The result is that the RWY08 RNP APCH has a slightly off-set Intermediate segment (because the IF would be the same IF as for the offset ILS) followed by a straight-in Final Approach Segment. It's a 5.24˚ turn at the FAF to align with the straight-in Final Approach Track. This is all PANS OPS compliant but slightly unusual.

The Approach Transition legs from DUNGV onto 'the arcs' is also very tight given the 90˚ turns and little mileage between waypoints. These are not quite PANS OPS compliant unless we apply a max 6000ft restriction at DUNGV which is not optimal and want to avoid. We can't move them because otherwise they won't be replications (we want to avoid changes to tracks over the ground compared to what happens today) and they'd be different distances compared to the conventional DME arc which would create issues for ATC. In addition, they are very rarely flown and RWY26 arrivals from the SW go direct to COLRE and from the SW and W, they don't go via DUNGV. RWY08 arrivals from the SE go direct to LUNEX and miss DUNGV all together and from the E and NE would go to EGT or the Southerly T Bar.

Regarding the Missed Approaches, for RWY 26 we've had to design a Left Turn missed approach. This is due to an IAA requirement for the primary protection areas to remain inside CAS and it's not possible to design a Right Turn PBN missed approach that does this. In addition, a left-turn works well because it enables the aircraft to re-position onto the T-BAR more easily for another approach (there is no T Bar to the North). Holding available at EGT if required.

For RWY08, it's possible to design both a left and right turn. The left (Option 1) would go back to the EGT. Like RWY26 there's no T Bar to the north so the next approach would have to fly over the top of the airfield to go DWRH. Also, to ensure the aircraft turns left back to the overhead and not right, we have added an extra waypoint (DFT04) to ensure this. Otherwise with a strong NW wind, the FMS could take the shortest route to the EGT with an unexpected right turn which would catch ATC (and maybe the crew) out. Again, PANS-OPS compliant but we haven't seen this in the UK before. We have 2 options for the right turn. Both enable easier re-positioning for a subsequent DWRH approach. However, Option 2 has a more comfortable right turn to DFT09 but if holding was needed at EGT it

would result in a Parallel Entry. Option 3 enables a direct entry to EGT but results in some quite sporty turns to achieve it. At this moment in time, option 3 is CoDA's preferred option.

There's a lot going on there so please let me know if you'd rather talk through everything and I'd be happy to set up a call.

We'd really appreciate some feedback on whether you foresee any issues especially with:

1. The Approach Transitions from DUNGV with close waypoints and large turn
2. The proposal to terminate the RNAV1 Approach Transitions at new IFs that serve both ILS and RNP APCH
3. The slightly offset Intermediate segment on the RWY08 RNP APCH into a Final Approach Segment which is aligned with the runway centreline
4. Any of the Missed Approach options and if there are any that are more preferable for RWY08 from an Albastar/B738 perspective.

It would be great to get some thoughts from you in the next 2 weeks if possible (by 11th August) but let me know if that's going to be an issue.

Many thanks,

[redacted]
[redacted]uk
Web: www.ifpdesign.co.uk

Re: New GNSS procedures for runway 08 and runway 26

[redacted]

Tue 17/08/2021 09:01

To: [redacted]

6 attachments (1 MB)

Draft_Chart_RWY08_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option2_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option3_v1.2_DJ.pdf; Draft_Chart_RWY08_Transition_v1.2_DJ.pdf; Draft_Chart_RWY26_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY26_Transition_v1.2_DJ.pdf;

Good morning[redacted]

I wondered if you'd had any time to consider the email below and attachments?

Many thanks,

[redacted]

Web: www.traxinternational.co.uk
Web: www.ifpdesign.co.uk

RE: New GNSS procedures for runway 08 and runway 26

[redacted]

Wed 18/08/2021 08:58

To: [redacted]

Good morning [redacted]

Yes, I have had the opportunity to look at it, although I'm sorry couldn't meet the initial deadline of August 11th.

For your convenience I have embedded my comments and replies in your e-mail in **green**, so you can check it out below.

I'm up for any call should you consider it necessary, and remain at your disposal for further questioning.

Best regards

[redacted]

Flight Operations Manager / Responsable de Operaciones de Vuelo
Training Manager / Responsable de Entrenamiento de Tripulaciones

[redacted]

AlbaStar.es
Follow the star

Albastar S.A.
Av. Conde de Sallent, 23 – 5 A
07003 Palma de Mallorca, Spain
Tel: +34 971 575 072
www.albastar.es

Regarding the Missed Approaches, for RWY 26 we've had to design a Left Turn missed approach. This is due to an IAA requirement for the primary protection areas to remain inside CAS and it's not possible to design a Right Turn PBN missed approach that does this. In addition, a left-turn works well because it enables the aircraft to re-position onto the T-BAR more easily for another approach (there is no T Bar to the North). Holding available at EGT if required.

For RWY08, it's possible to design both a left and right turn. The left (Option 1) would go back to the EGT. Like RWY26 there's no T Bar to the north so the next approach would have to fly over the top of the airfield to go DWRH. Also, to ensure the aircraft turns left back to the overhead and not right, we have added an extra waypoint (DFT04) to ensure this. Otherwise with a strong NW wind, the FMS could take the shortest route to the EGT with an unexpected right turn which would catch ATC (and maybe the crew) out. Again, PANS-OPS compliant but we haven't seen this in the UK before. We have 2 options for the right turn. Both enable easier re-positioning for a subsequent DWRH approach. However, Option 2 has a more comfortable right turn to DFT09 but if holding was needed at EGT it would result in a Parallel Entry. Option 3 enables a direct entry to EGT but results in some quite sporty turns to achieve it. At this moment in time, option 3 is CoDA's preferred option.

There's a lot going on there so please let me know if you'd rather talk through everything and I'd be happy to set up a call.

We'd really appreciate some feedback on whether you foresee any issues especially with:

1. The Approach Transitions from DUNGV with close waypoints and large turn

The speed constraint of 220kias at DUNGV looks pretty reasonable, and it may work as long as TRA07 be not a flyover point (right now this is how I understand it). The FMC, given 3nm leg from DUNGV to TRA07 and the 4.5nm leg from TRA07 to TRA06, will initiate the turn to join the arc towards TRA06 after passing DUNGV. TRA07 will be a flyby waypoint. You might consider to reduce the constraint at DUNGV to 200kias, but with average landing weights that will mean an indicated airspeed lower that minimum clean and thus the selection of Flap 1, increasing drag and noise.

2. The proposal to terminate the RNAV1 Approach Transitions at new IFs that serve both ILS and RNP APCH

No problem at all. Simplifies procedures and mitigates the risk of confusion between different IF's

3. The slightly offset Intermediate segment on the RWY08 RNP APCH into a Final Approach Segment which is aligned with the runway centreline

Again, this is no problem as long as it is well depicted and adequately noted in the approach plates with, for instance, a boxed text insert.

4. Any of the Missed Approach options and if there are any that are more preferable for RWY08 from an Albastar/B738 perspective.

For RWY08: I'd go for Option 1 without question. Straight forward procedure leading to a holding pattern on a direct entry path.
For RWY26: If I may weigh in also in this, and having the 737 in mind, I'd build the procedure marking DFT20 as the point where to turn to EGT from, if flying a holding pattern is needed. The way it is depicted now, induces you to turn to EGT before reaching DFT15, therefore leading into a parallel entry.

It would be great to get some thoughts from you in the next 2 weeks if possible (by 11th August) but let me know if that's going to be an issue.

Many thanks,

[redacted]
[redacted]uk
Web: www.ifpdesign.co.uk

Re: New GNSS procedures for runway 08 and runway 26

[redacted]

Thu 19/08/2021 18:30

To: [redacted]

Hi [redacted]

Thanks you very much for taking the time to feedback. We will take it on board.

[redacted]

Web: www.traxinternational.co.uk
Web: www.ifpdesign.co.uk

City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 14:49

To: S [redacted]

6 attachments (1 MB)

Draft_Chart_RWY08_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option2_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option3_v1.2_DJ.pdf; Draft_Chart_RWY08_Transition_v1.2_DJ.pdf; Draft_Chart_RWY26_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY26_Transition_v1.2_DJ.pdf;

Hi [redacted]

I hope you are well and Loganair are starting to see some signs of recovery.

We are planning to be consulting on CoDA's proposed RNP Approach designs in October 2021 however we would really appreciate some technical feedback from yourself ahead of that. With this in mind I have attached some draft charts for the design options. The 'options' actually revolve largely around the Missed Approaches but I do have a few other questions.

To summarise, we are proposing RNAV1 replications of CoDA's Direct Arrivals which then connect to the new RNP Instrument Approach Procedures. The RWY26 RNP APCH is a direct overlay of the existing ILS however for RWY08, it's slightly different due to the existing Loc being offset. The RWY08 RNP APCH has a straight-in segment from the FAF because it was not possible, at Derry, to have an offset RNP APCH arrival within PANS OPS criteria. It also provides slightly higher minima. We also want the RNAV1 Direct Arrival (which would be termed 'Approach Transitions') to be fit for purpose for both RNP APCH and ILS arrivals. For this reason we are proposing a new IF is added to the ILS charts for each end which are both complementary with the positioning of the IFs for the RNP Approaches and vice-versa. The result is that the RWY08 RNP APCH has a slightly off-set Intermediate segment (because the IF would be the same IF as for the offset ILS) followed by a straight-in Final Approach Segment. It's a 5.24˚ turn at the FAF to align with the straight-in Final Approach Track. This is all PANS OPS compliant but slightly unusual.

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3. The slightly offset Intermediate segment on the RWY08 RNP APCH into a Final Approach Segment which is aligned with the runway centreline
4. Any of the Missed Approach options and if there are any that are more preferable for RWY08 from a Loganair perspective.

It would be great to get some thoughts from you in the next 2 weeks if possible (by 4th August) but let me know if that's going to be an issue.

Many thanks,

[redacted]uk
Web: www.ifpdesign.co.uk

Re: City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 14:54

To: [redacted]

Sorry [redacted], I meant 11th August!

[redacted]
[redacted]uk
Web: www.ifpdesign.co.uk

RE: City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 15:01

To: [redacted]

Afternoon [redacted] – many thanks. There's certainly a lot to consider there. [redacted] In principle I'll have office time available up there so could contribute, albeit at a slower pace than otherwise. My team are pretty axed-out at the moment or have leave coming up, so 11 August will be a challenge to meet. I'll see what we can do.

Cheers

[redacted]

[redacted]

Web: http://www.loganair.co.uk

Re: City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 17:16

To: [redacted]

Roger. Thanks [redacted]

[redacted]
[redacted]uk
Web: www.ifpdesign.co.uk

RE: City of Derry (EGAE) RNP APCH Options.

[redacted]

Thu 05/08/2021 15:02

To: [redacted]

Afternoon [redacted]

I hadn't forgotten about you! I'm crafting a response to send you later today. Should be with you by 6pm.

Cheers

[redacted]

[redacted]

Web: http://www.loganair.co.uk

RE: City of Derry (EGAE) RNP APCH Options.

[redacted]

Wed 11/08/2021 12:24

To: [redacted]

Apologies [redacted] – my response didn't make it as promised.

Regarding the 3 options for 08, 1 is the most 'conventional' in terms of the missed approach, routing back to the EGT in a 'conventional' manner. 2 & 3 look like typical RNP missed approach layouts and would therefore be consistent in pattern with others. However the route to the EGT, if that was required, has elicited comment and we suggest something like moving DFT09/DFT80 upwind to make a direct hold entry easier (option 2 draws a parallel entry which is a bit clumsy given the opportunity for a direct).

We have no view on the offset at the FAF for 08, nor do we have any view on the arc replications which look manageable for the ERJ.

I hope this is of some use, and apologies again for the late reply.

Regards,

[redacted]

[redacted]

Web: http://www.loganair.co.uk

Re: City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 17/08/2021 17:46

To: [redacted]

2 attachments (462 KB)

Draft_Chart_RWY08_RNP_Option2_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option3_v1.2_DJ.pdf;

Hi [redacted]

Sorry for the delay in replying. Many thanks for this, most helpful.

Please can I just check regarding your comment for a direct entry. Option 2 does not achieve that but Option 3 should just about enable a Direct Entry- do you suggest that to make the Direct Entry easier, the waypoints should shift east slightly in Option 3 like below, or was it just that Option 2 isn't ideal due to the Parallel Entry?

Image showing section of draft chart redacted

[redacted]uk
Web: www.ifpdesign.co.uk

City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 14:52

To: [redacted]

6 attachments (1 MB)

Draft_Chart_RWY08_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option2_v1.2_DJ.pdf; Draft_Chart_RWY08_RNP_Option3_v1.2_DJ.pdf; Draft_Chart_RWY08_Transition_v1.2_DJ.pdf; Draft_Chart_RWY26_RNP_Option1_v1.2_DJ.pdf; Draft_Chart_RWY26_Transition_v1.2_DJ.pdf;

Hi [redacted]

I hope you are well and Ryanair are starting to see some signs of recovery.

We are planning to be consulting on CoDA's proposed RNP Approach designs in October 2021 however we would really appreciate some technical feedback from yourself ahead of that. I appreciate RYR are not currently operating into EGAE but we would still very much welcome some feedback from a Boeing operator's perspective to make sure they are fit for purpose for a RYR return in the future.

With this in mind I have attached some draft charts for the design options. The 'options' actually revolve largely around the Missed Approaches but I do have a few other questions.

To summarise, we are proposing RNAV1 replications of CoDA's Direct Arrivals which then connect to the new RNP Instrument Approach Procedures. The RWY26 RNP APCH is a direct overlay of the existing ILS however for RWY08, it's slightly different due to the existing Loc being offset. The RWY08 RNP APCH has a straight-in segment from the FAF because it was not possible, at Derry, to have an offset RNP APCH arrival within PANS OPS criteria. It also provides slightly higher minima. We also want the RNAV1 Direct Arrival (which would be termed 'Approach Transitions') to be fit for purpose for both RNP APCH and ILS arrivals. For this reason we are proposing a new IF is added to the ILS charts for each end which are both complementary with the positioning of the IFs for the RNP Approaches and vice-versa. The result is that the RWY08 RNP APCH has a slightly off-set Intermediate segment (because the IF would be the same IF as for the offset ILS) followed by a straight-in Final Approach Segment. It's a 5.24˚ turn at the FAF to align with the straight-in Final Approach Track. This is all PANS OPS compliant but slightly unusual.

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would result in a Parallel Entry. Option 3 enables a direct entry to EGT but results in some quite sporty turns to achieve it. At this moment in time, option 3 is CoDA's preferred option.

There's a lot going on there so let me know if you'd rather talk through everything. We'd really appreciate some feedback on whether you foresee any issues especially with:

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2. The proposal to terminate the RNAV1 Approach Transitions at new IFs that serve both ILS and RNP APCH
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4. Any of the Missed Approach options and if there are any that are more preferable for RWY08 from a Ryanair/B738 perspective.

It would be great to get some thoughts from you in the next 2 weeks if possible (by 4th August) but let me know if that's going to be an issue.

Many thanks,

[redacted]
Web: www.traxinternational.co.uk
Web: www.ifpdesign.co.uk

Re: City of Derry (EGAE) RNP APCH Options.

[redacted]

Tue 27/07/2021 14:54

To: [redacted]

Sorry both, I meant 11th August!

[redacted]

Web: www.traxinternational.co.uk
Web: www.ifpdesign.co.uk

9. Appendix B: Noise Metrics

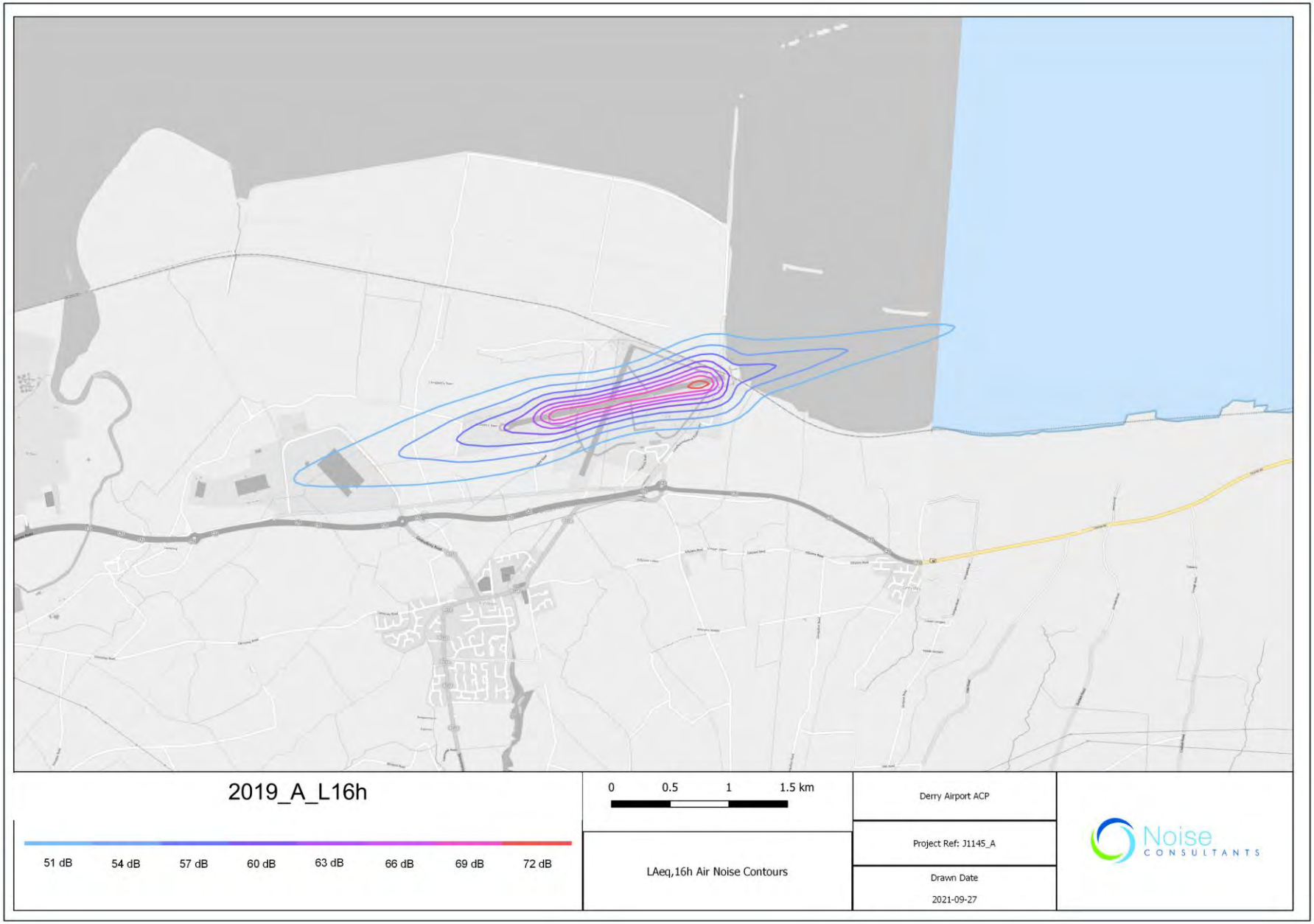
Appendix B Noise Metrics

The following noise metrics have been prepared as per the requirements of CAP1616 and CAP2091.

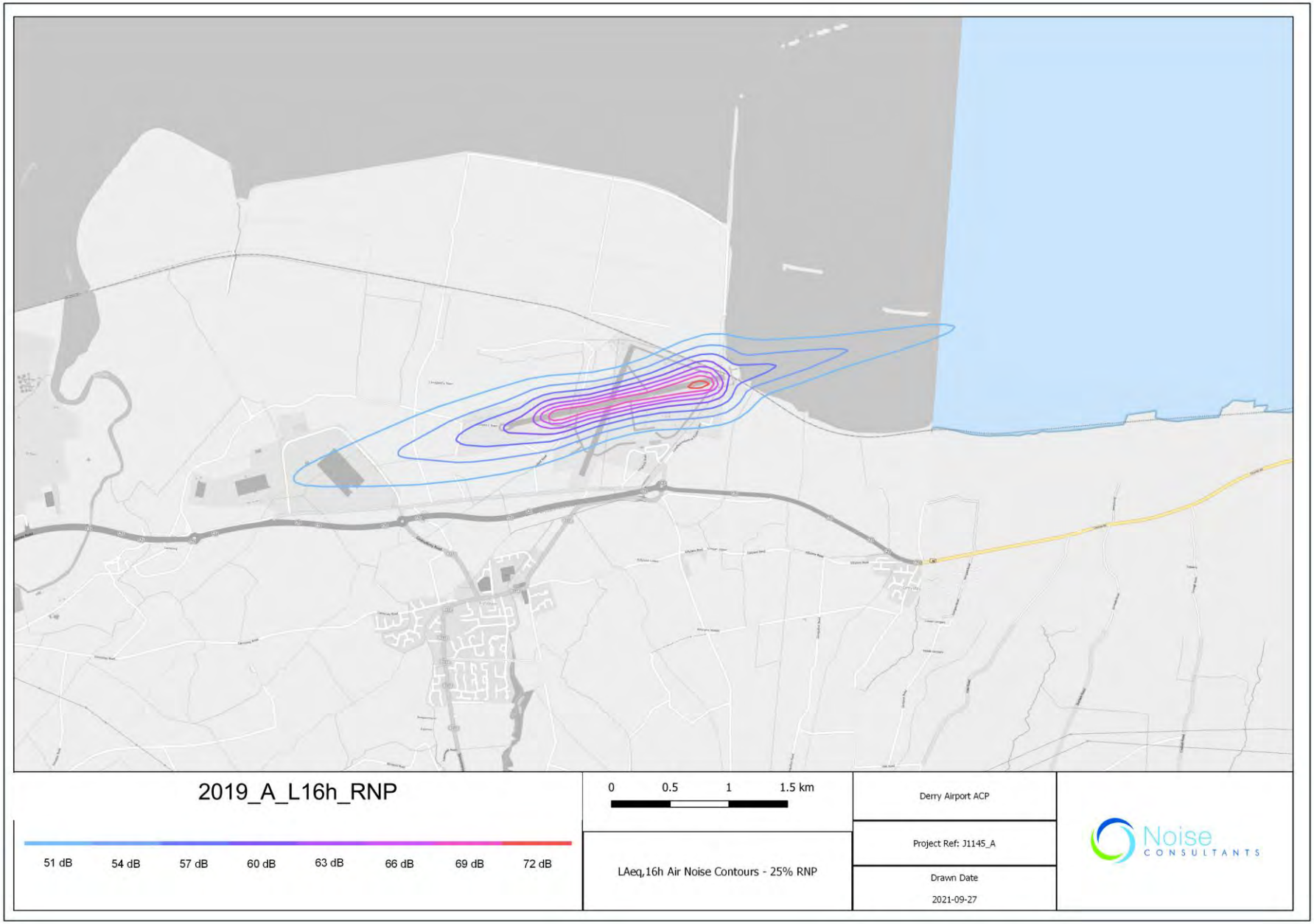
Due to the nature of the CoDA ACP where the aim is to replicate current day and there will be no increase in capacity as a result of the ACP, the changes to the noise metrics are very small, if any. Therefore please note that there may only be very small visible differences between the baseline and Airspace Option 2 in the noise contours shown on the following pages.

Please also note that N60 (night) contours are not included as our noise modelling showed a result of less that 1 movement per night over the 60dB LAmax.

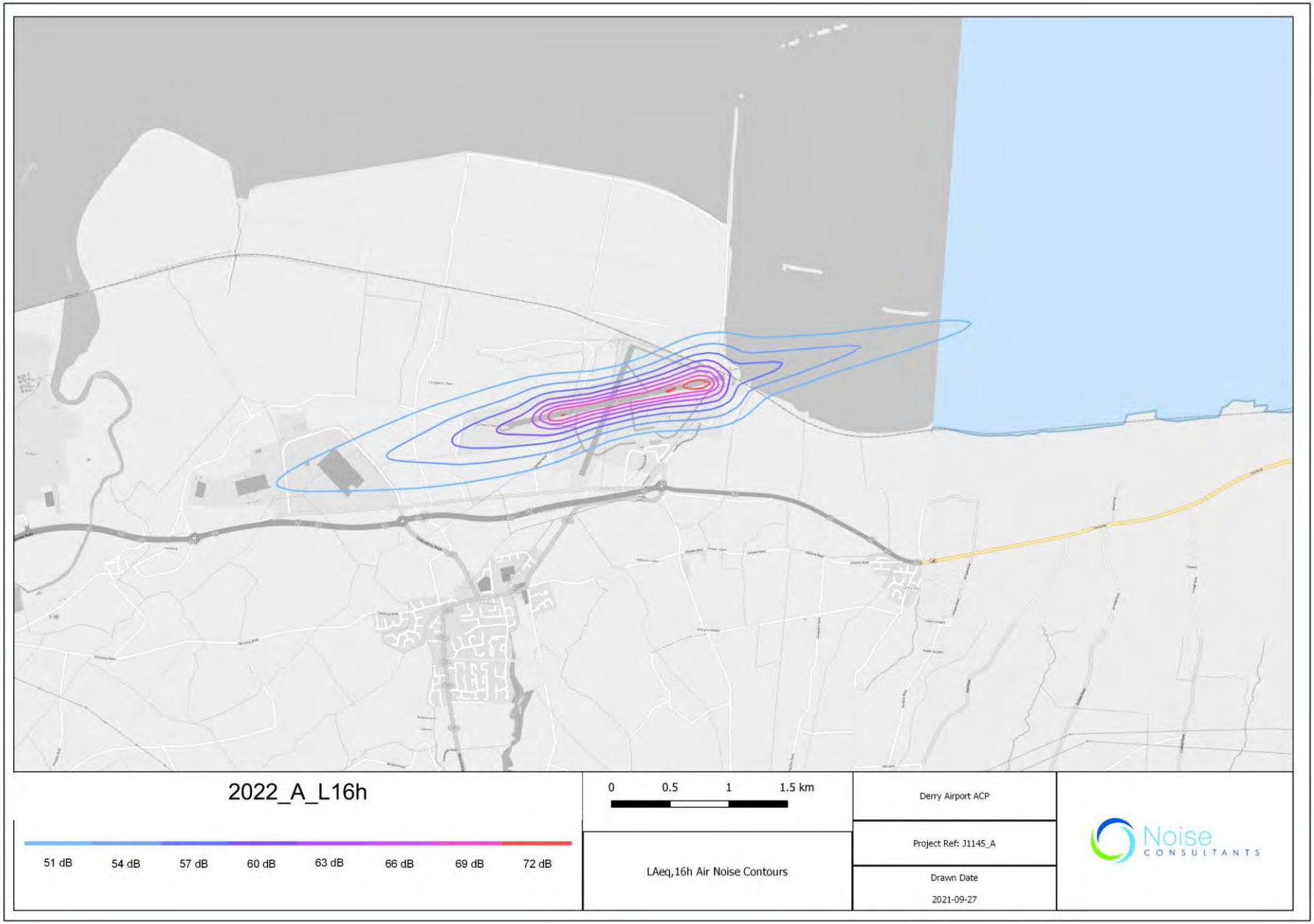
LAeq 16hr (Day) Baseline 2019



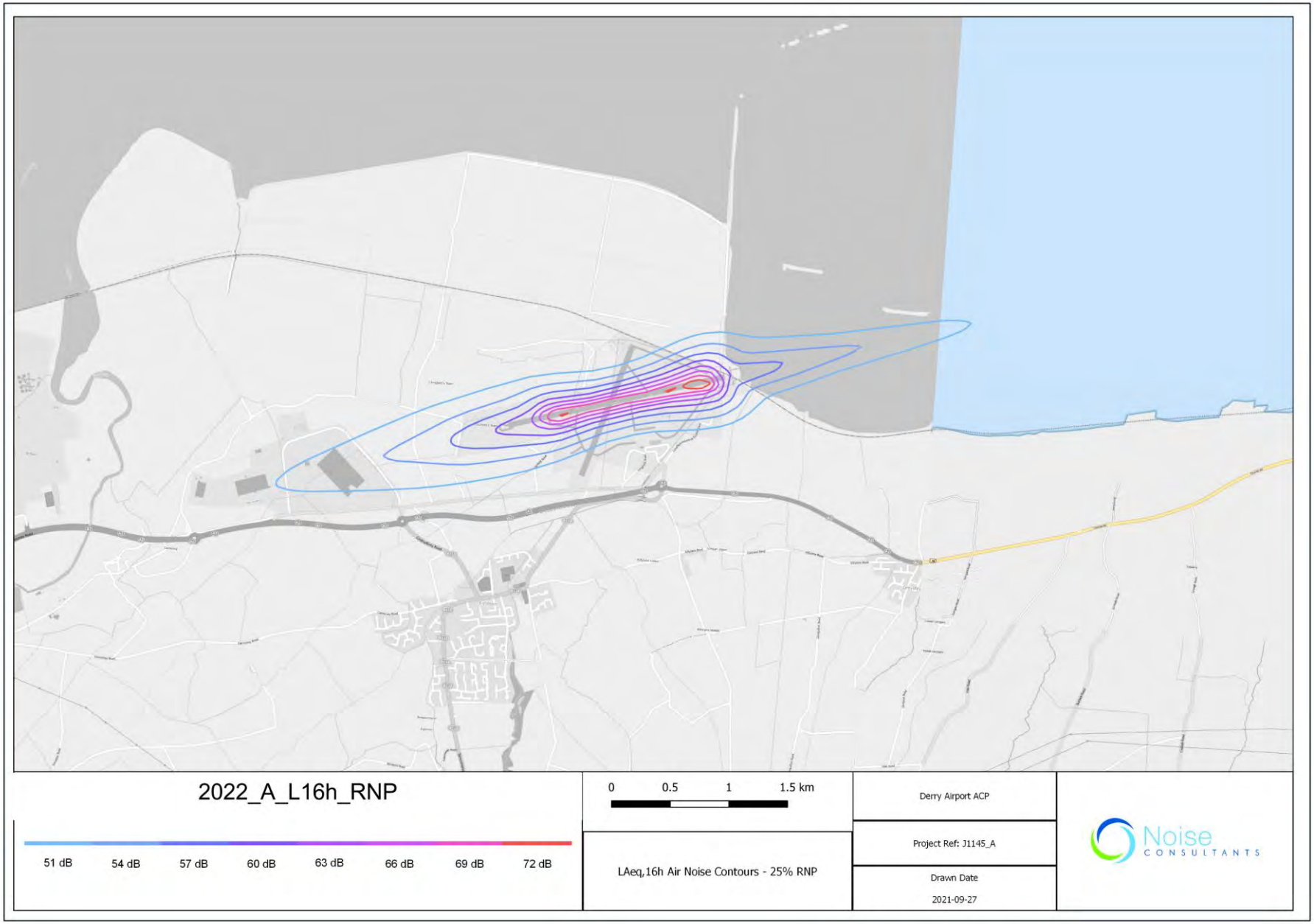
LAeq 16hr (Day) Airspace Option 2 2019



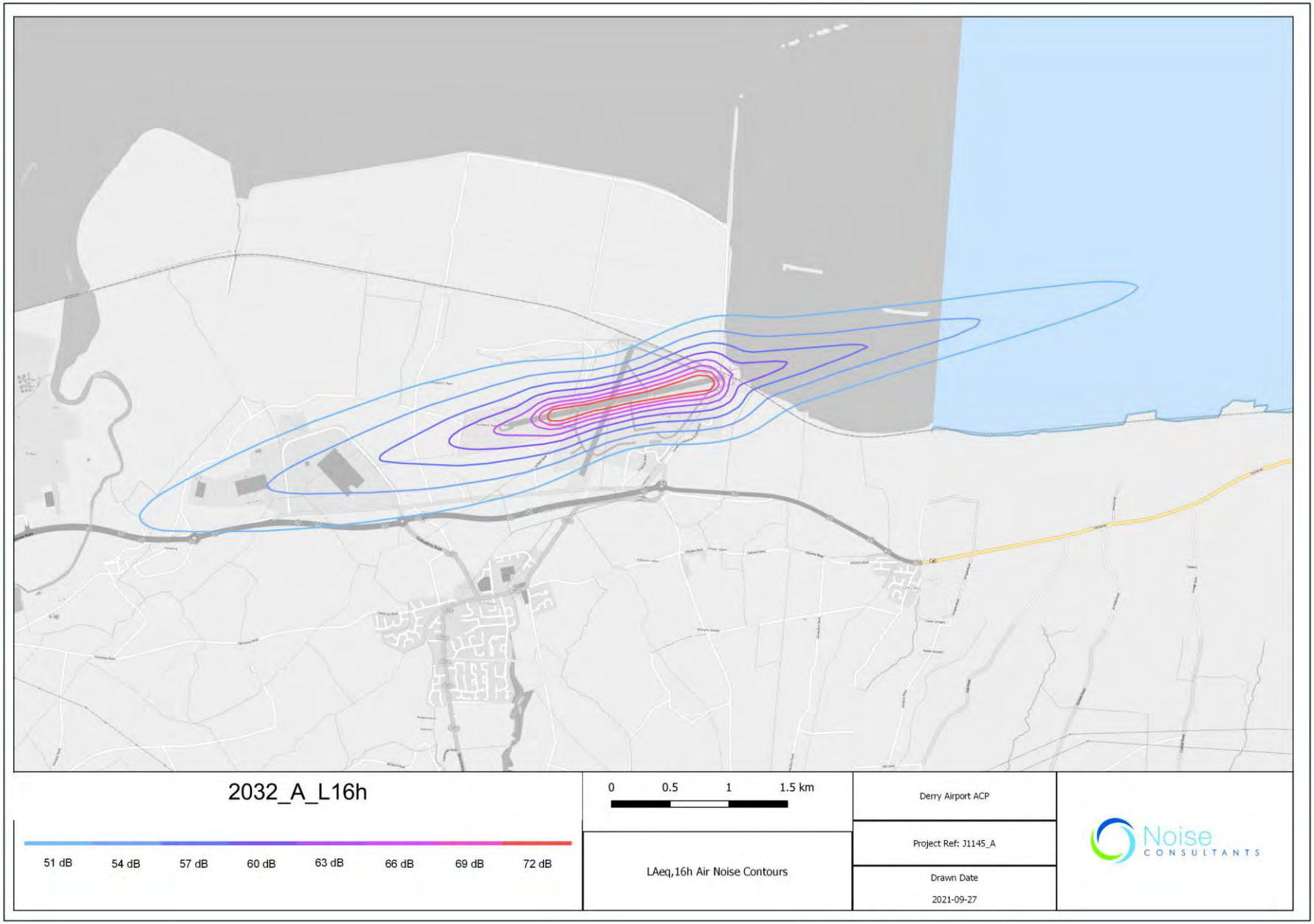
LAeq 16hr (Day) Baseline 2022



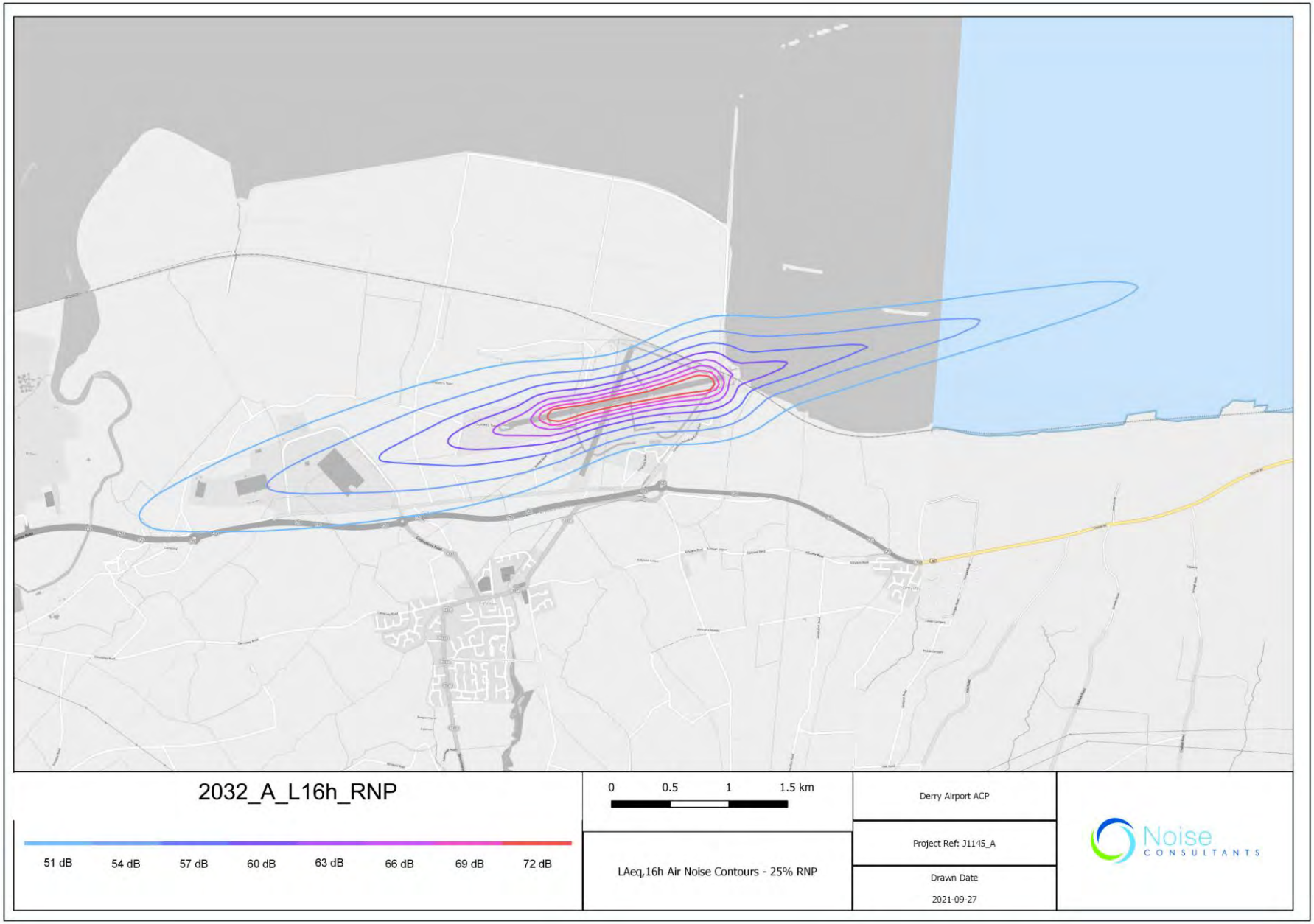
LAeq 16hr (Day) Airspace Option 2 2022



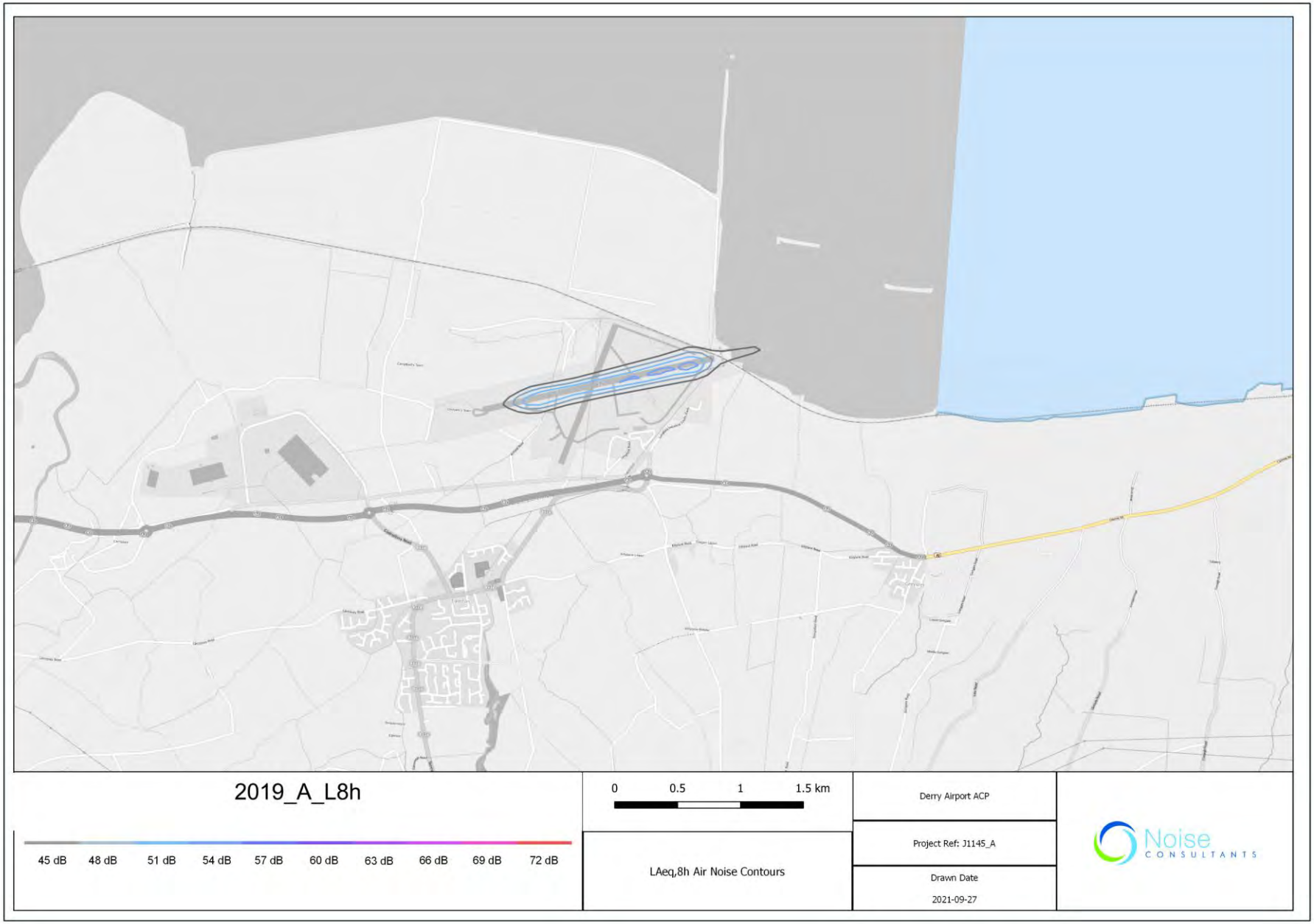
LAeq 16hr (Day) Baseline 2032



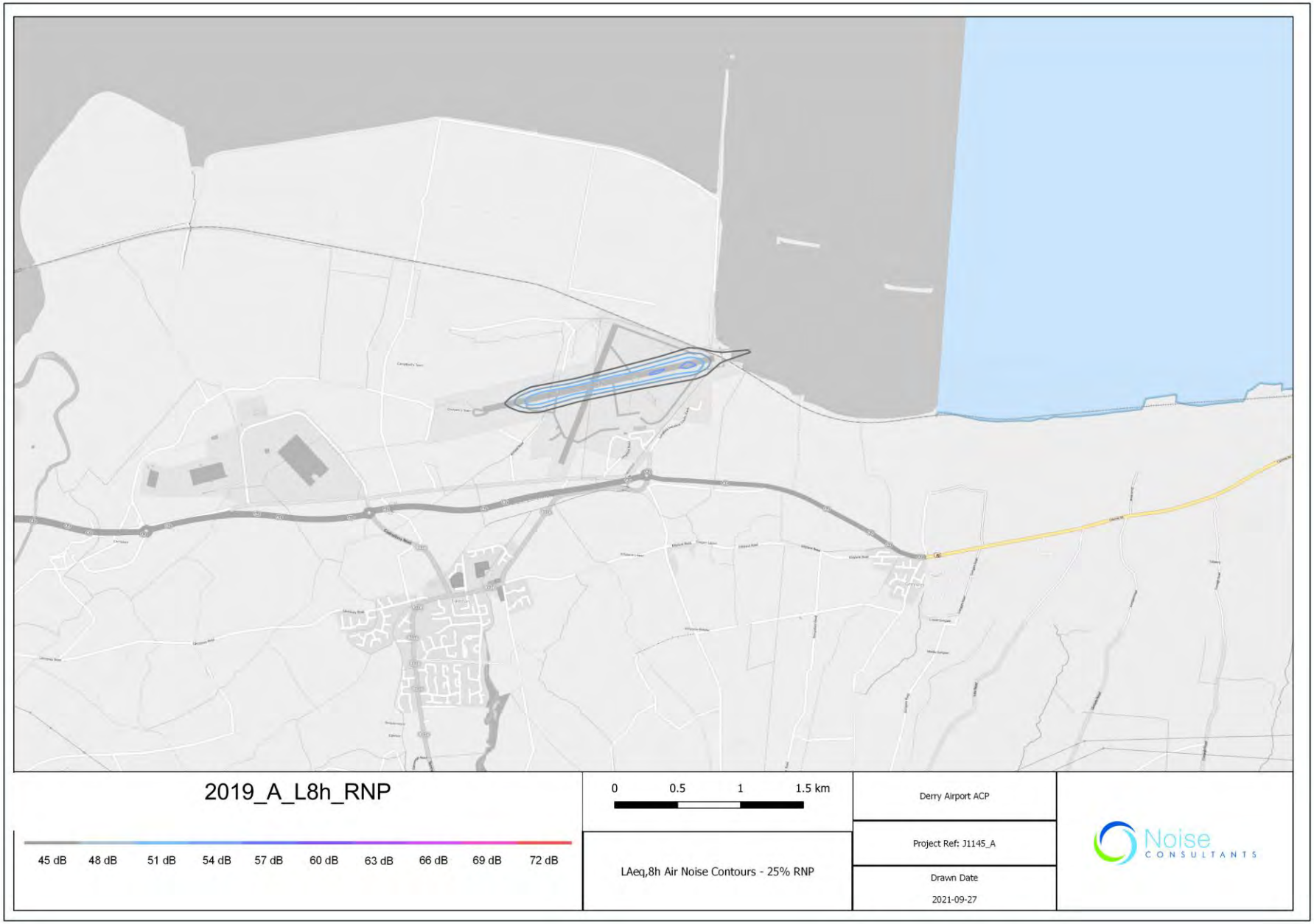
LAeq 16hr (Day) Airspace Option 2 2032



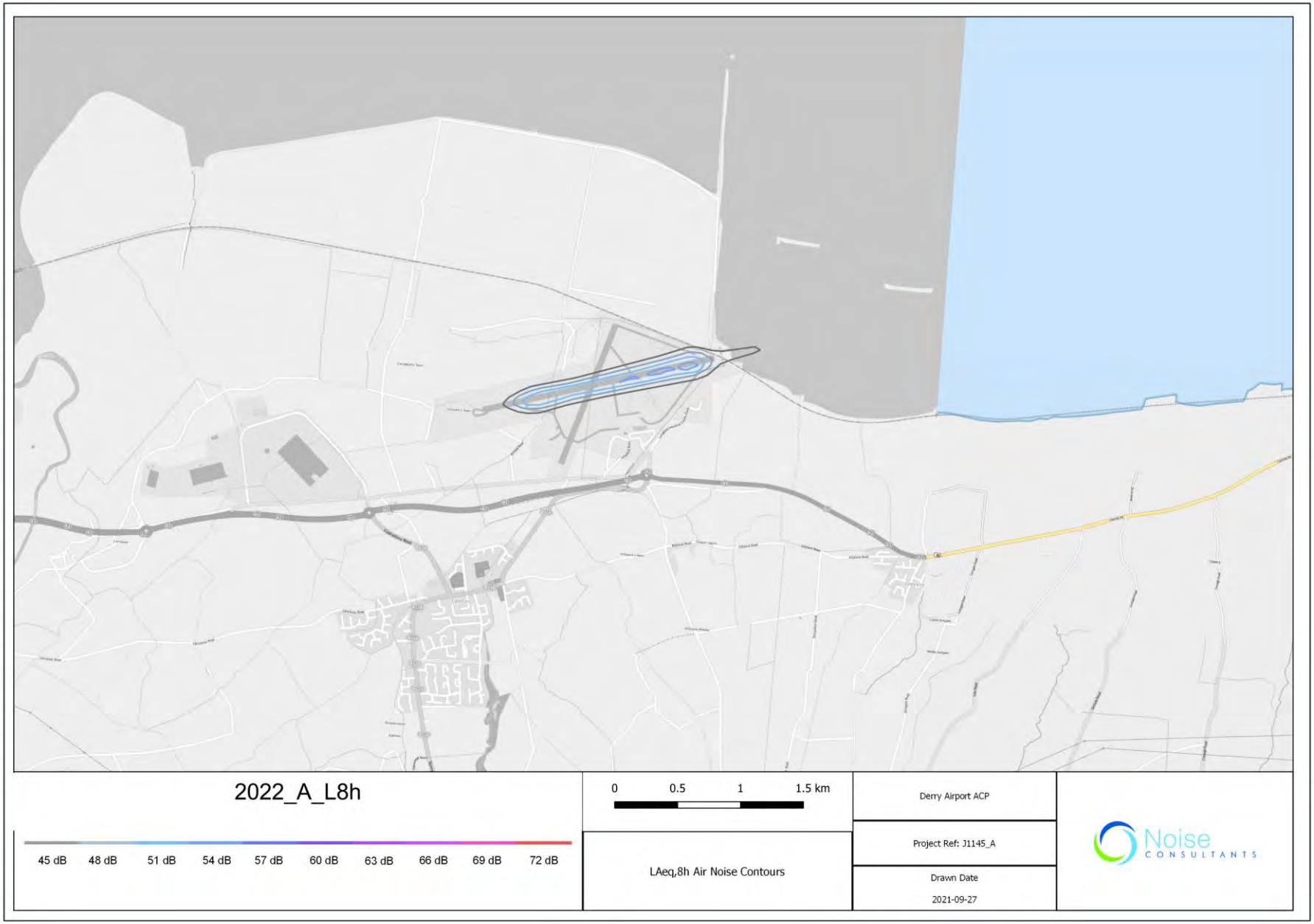
LAeq 8hr (Night) Baseline 2019



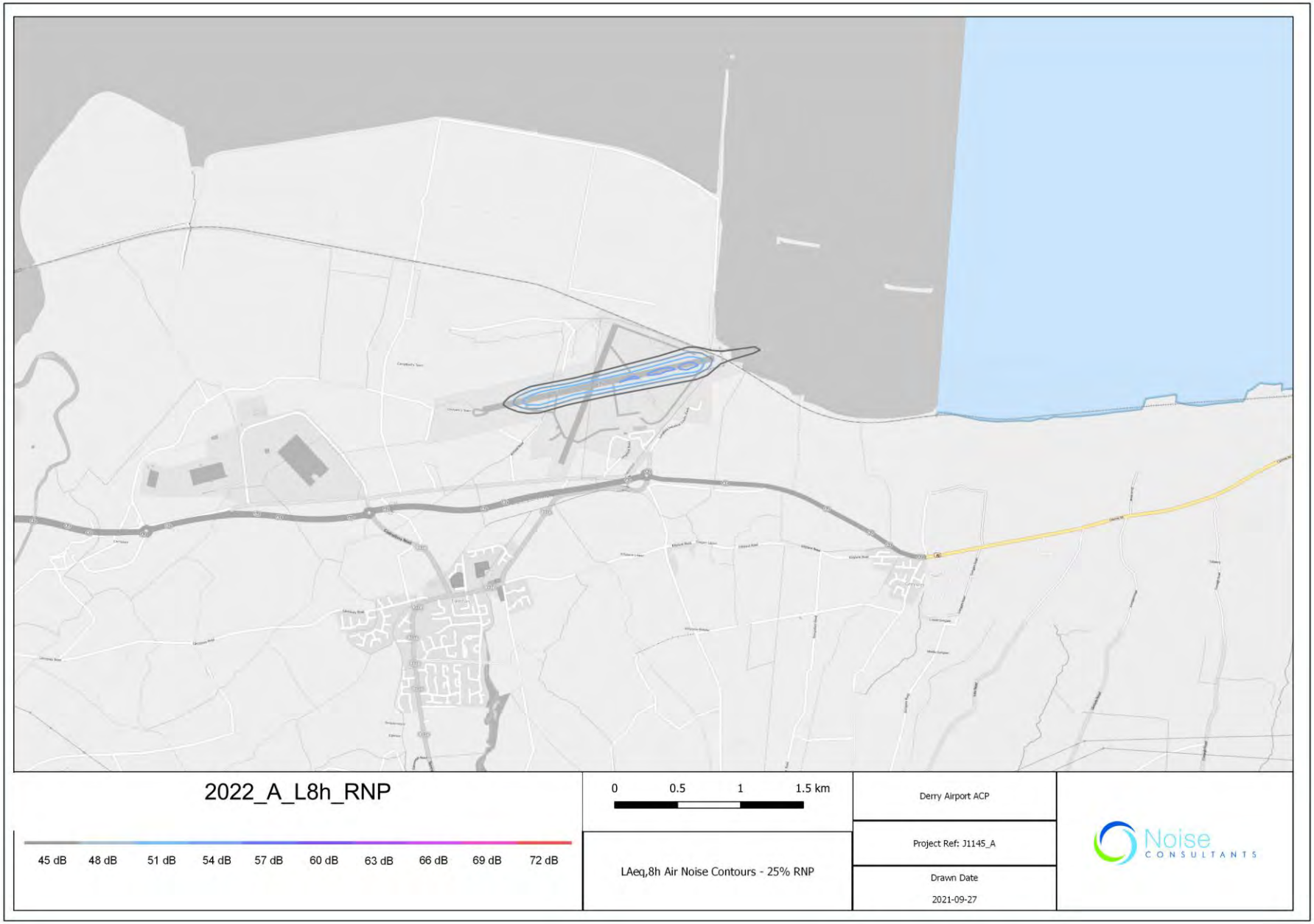
LAeq 8hr (Night) Airspace Option 2 2019



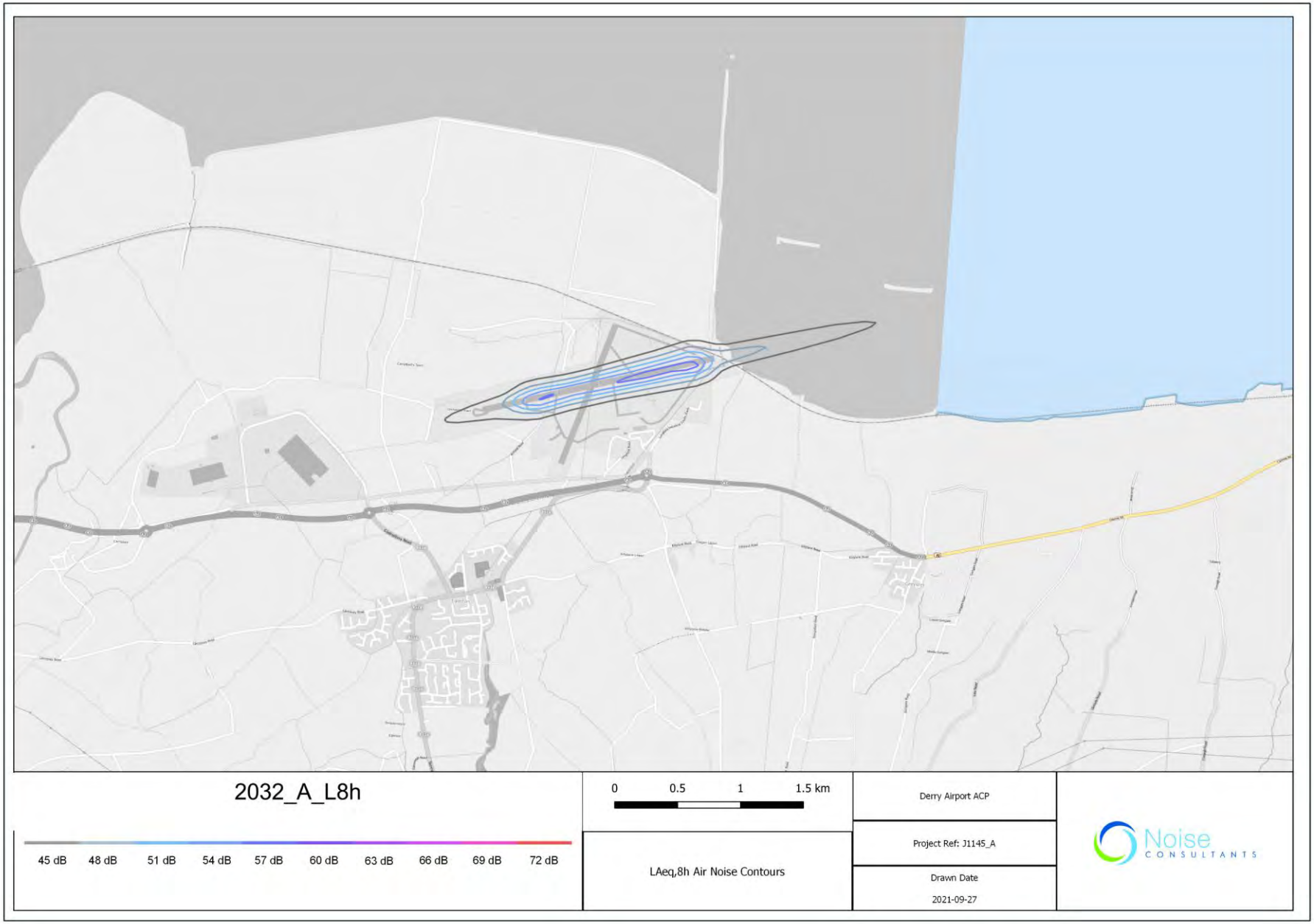
LAeq 8hr (Night) Baseline 2022



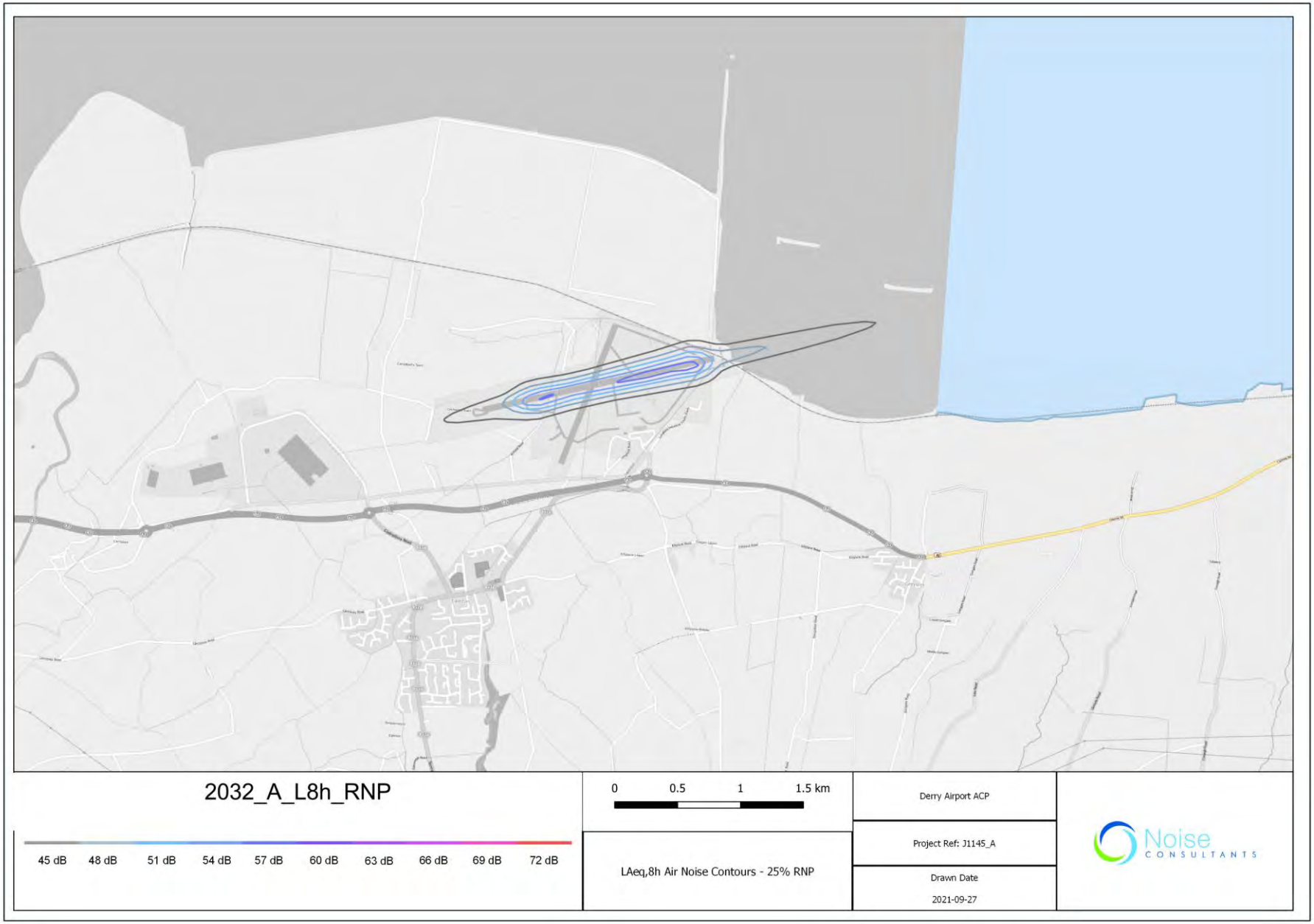
LAeq 8hr (Night) Airspace Option 2 2022



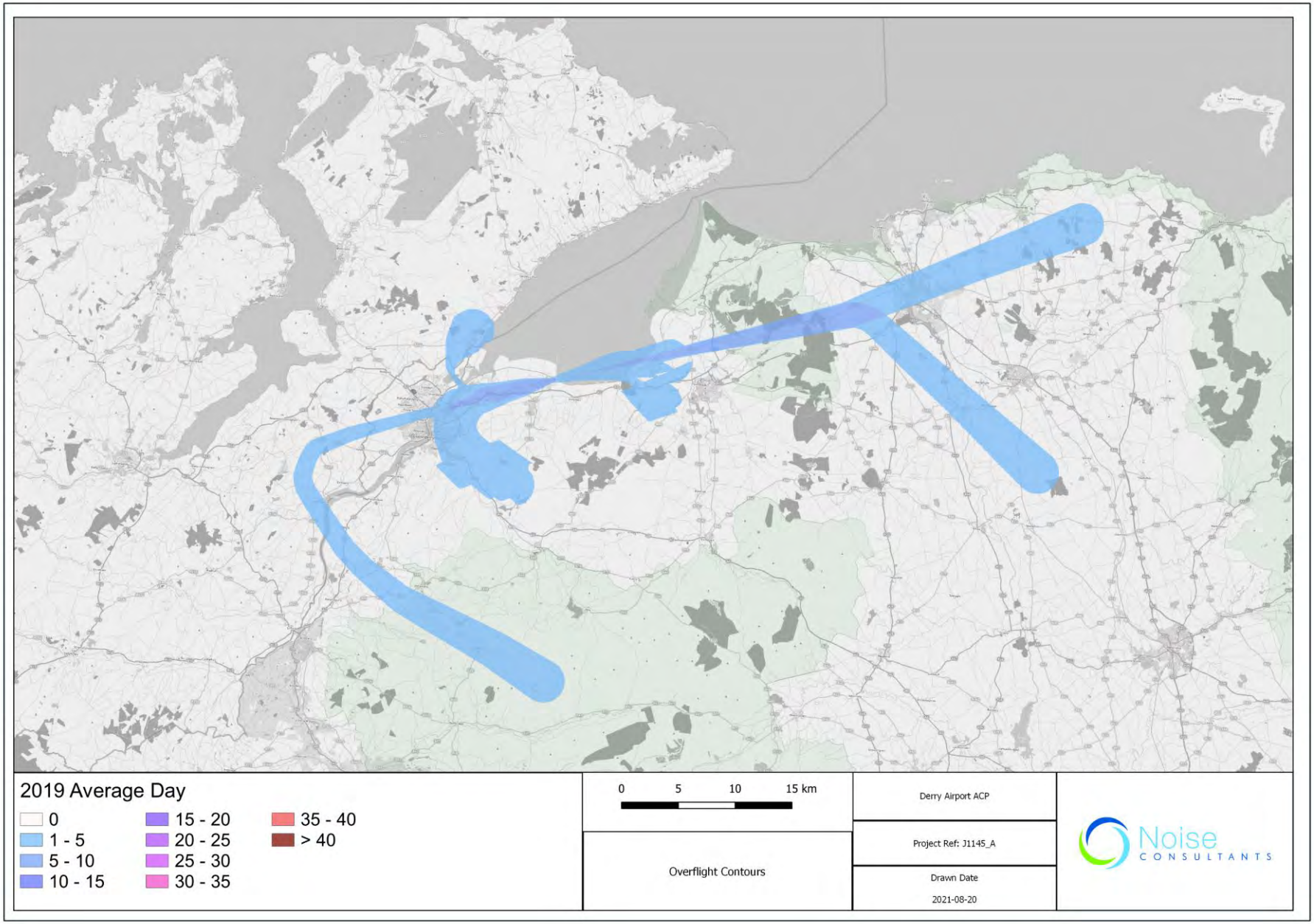
LAeq 8hr (Night) Baseline 2032



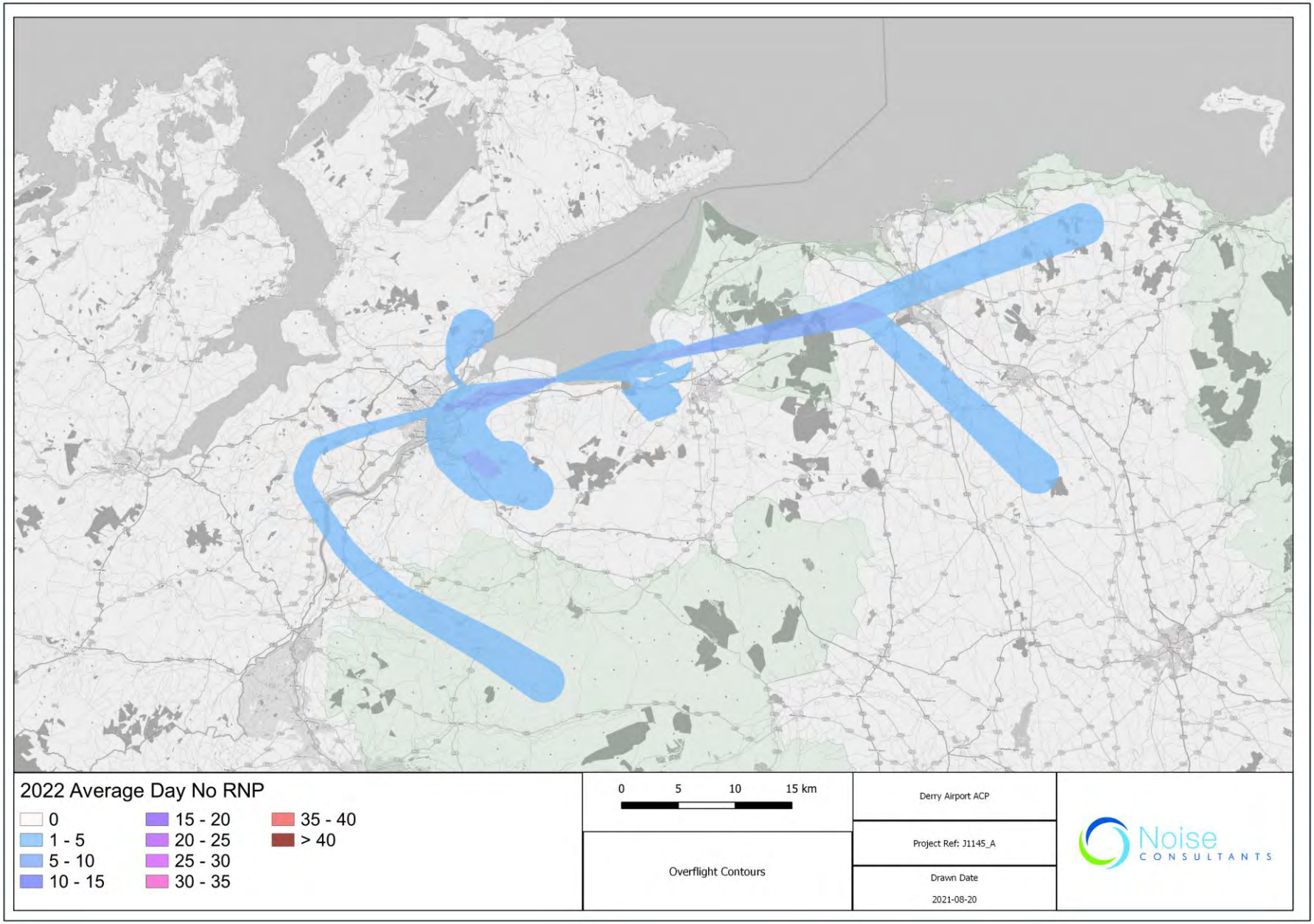
LAeq 8hr (Night) Airspace Option 2 2032



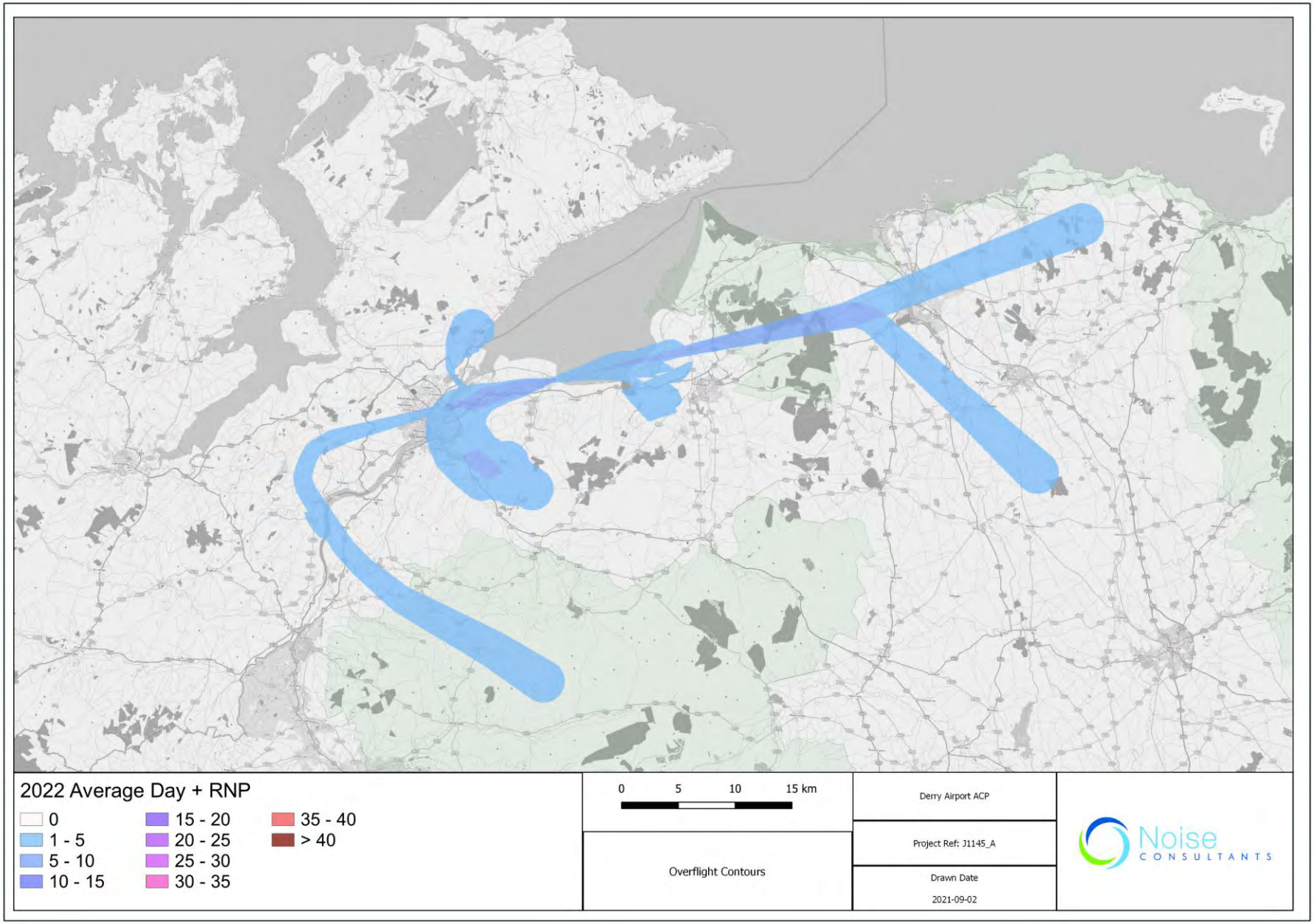
Overflight Baseline **2019**



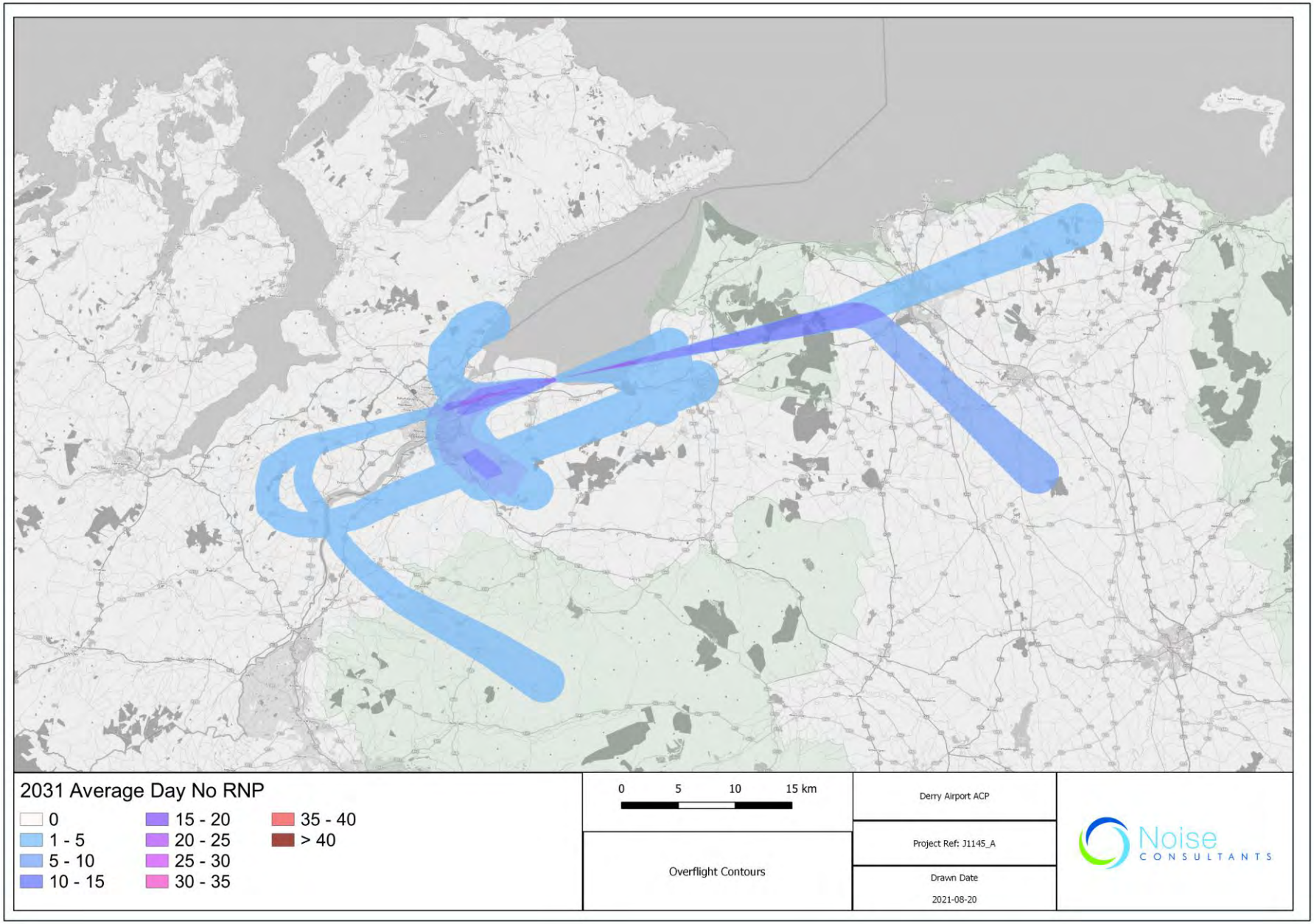
Overflight Baseline **2022**



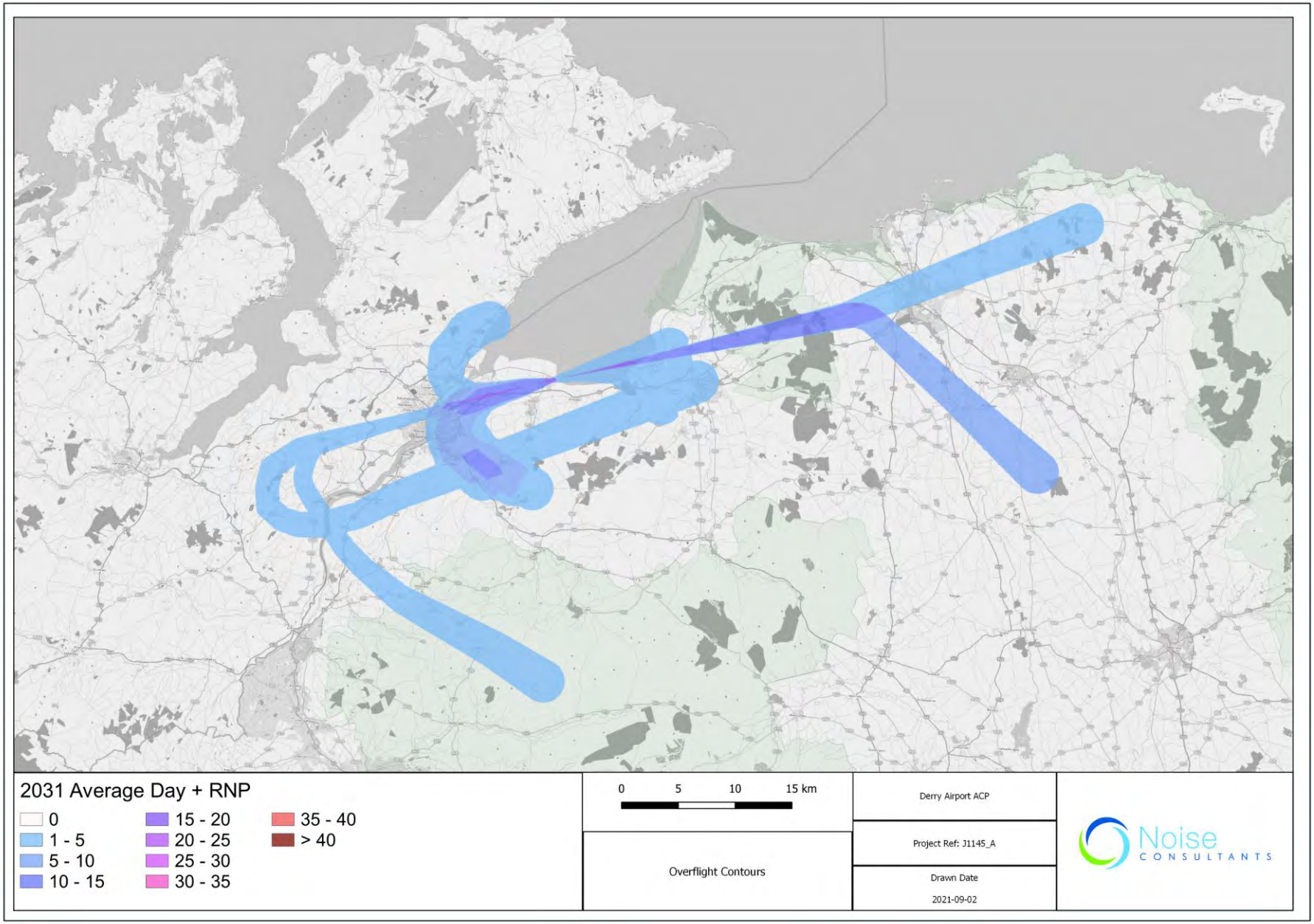
Overflight Airspace Option 2 2022



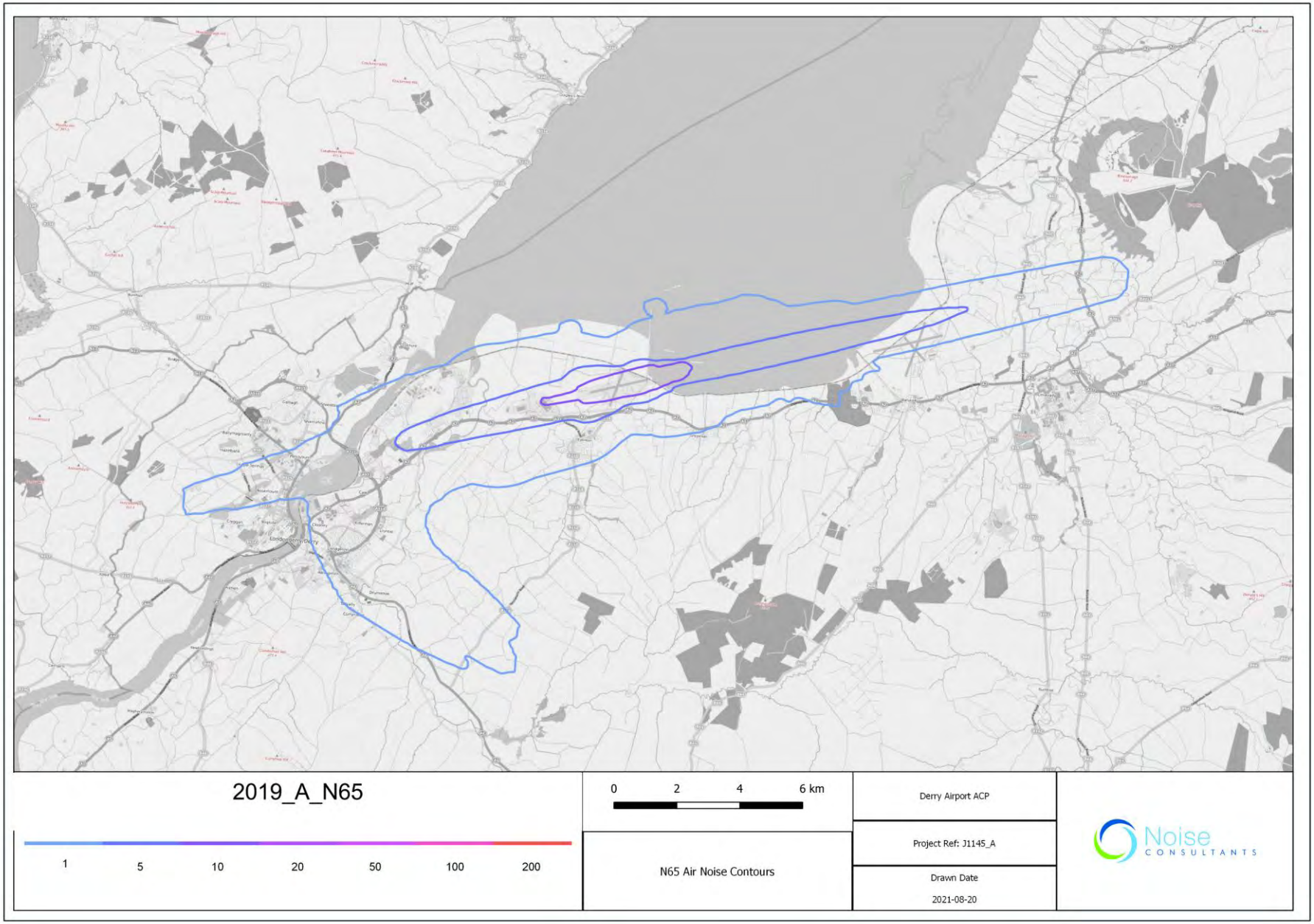
Overflight Baseline 2032



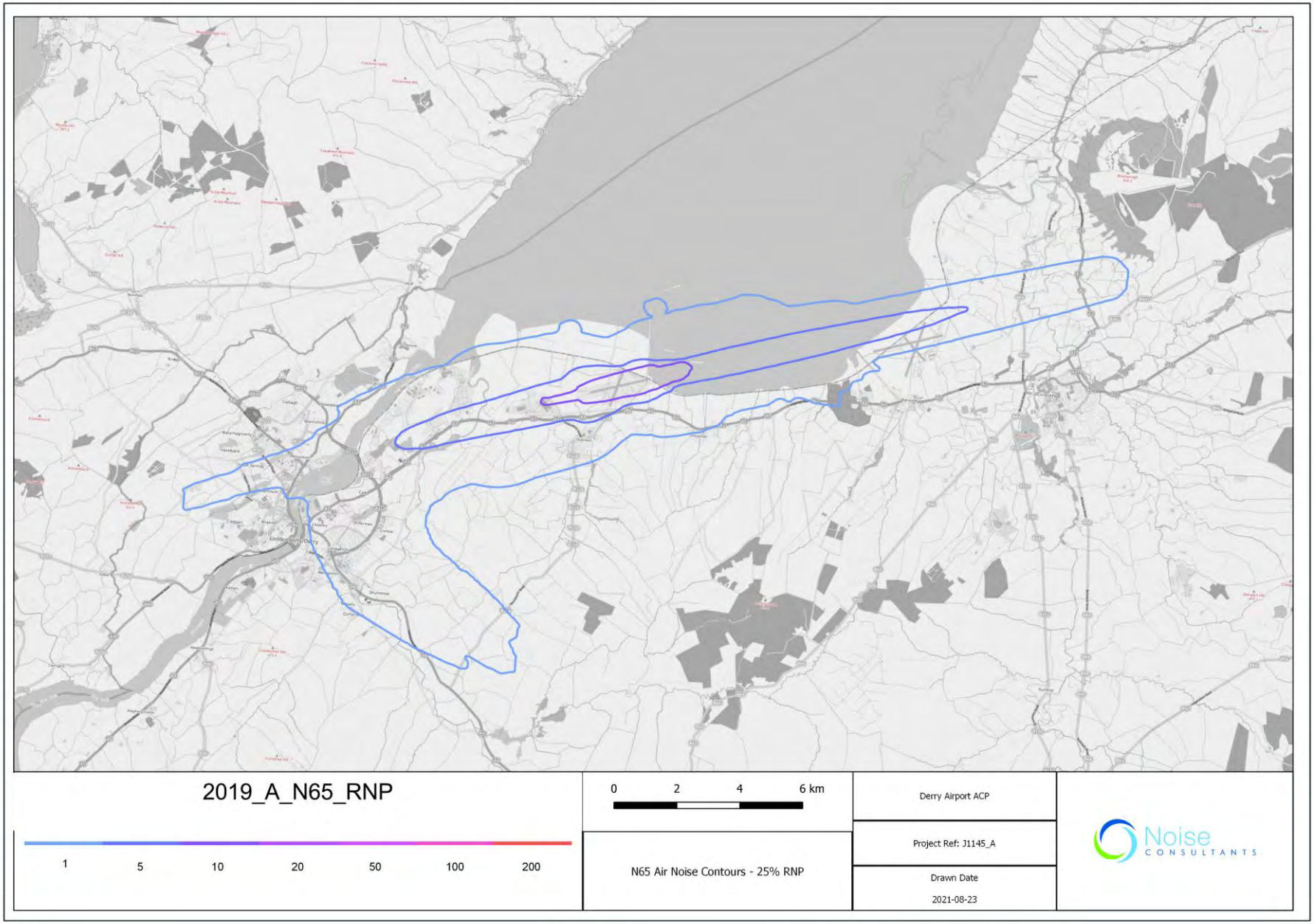
Overflight Airspace Option 2 2032



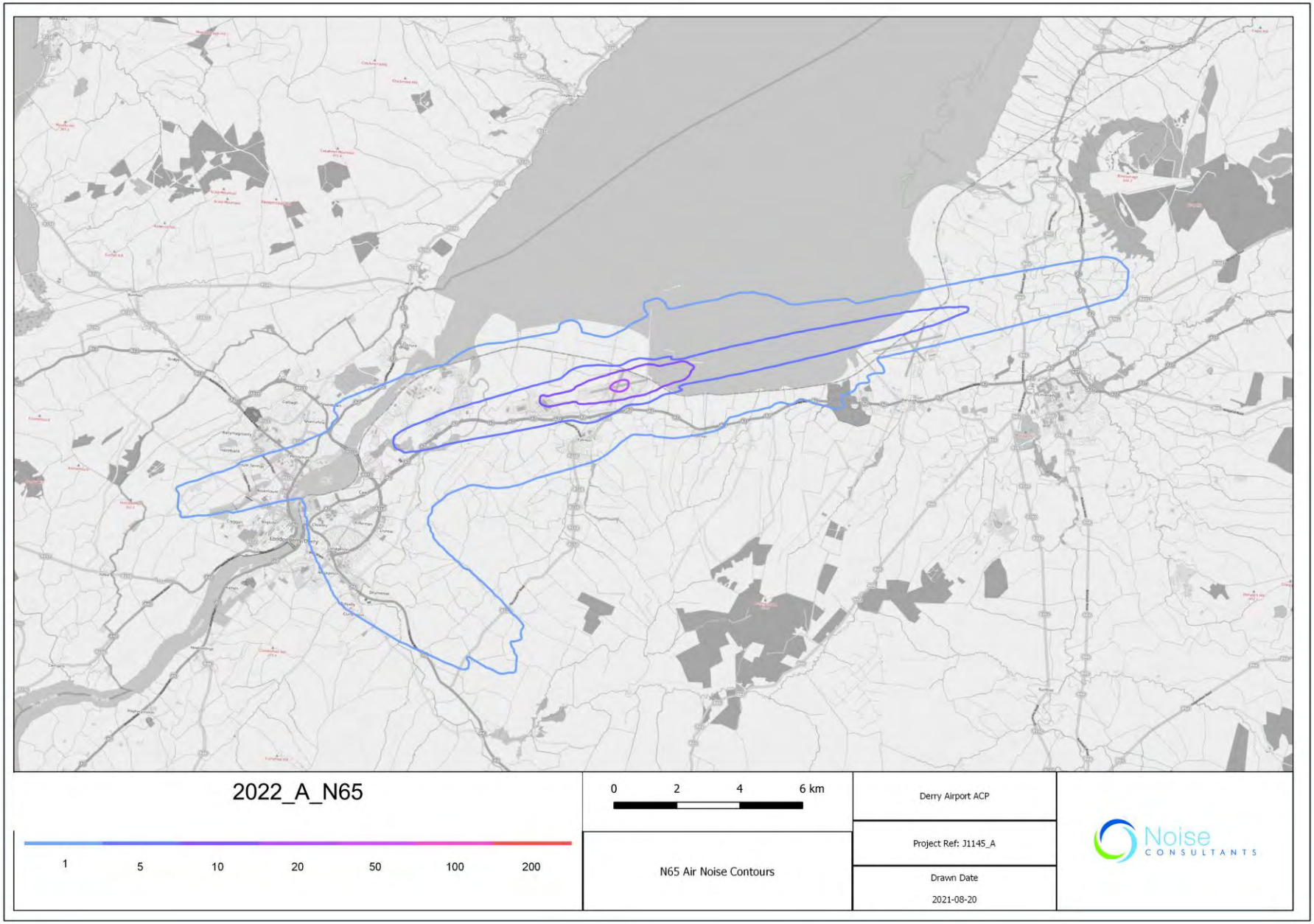
N65 (Day) Baseline 2019



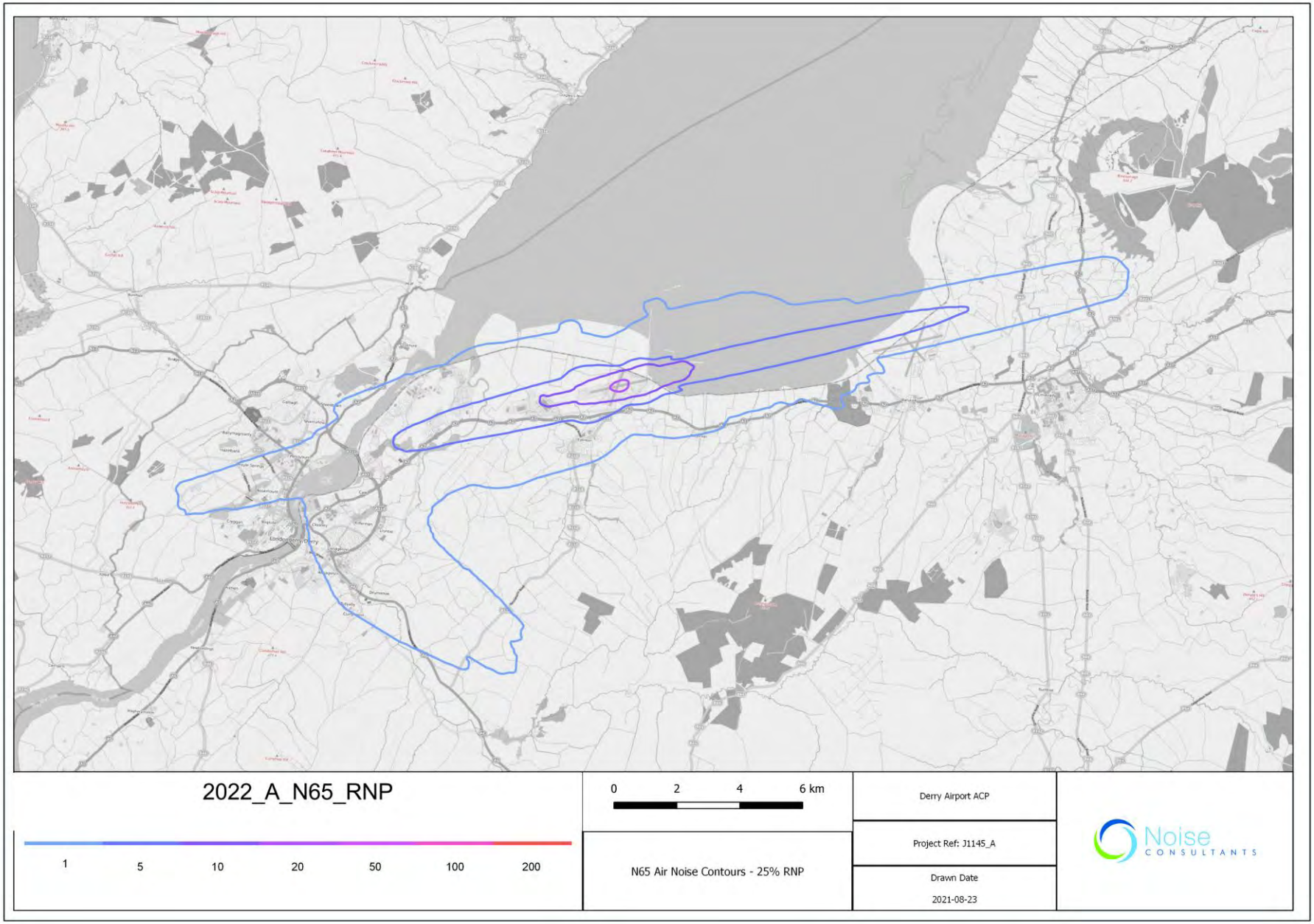
N65 (Day) Airspace Option 2 2019



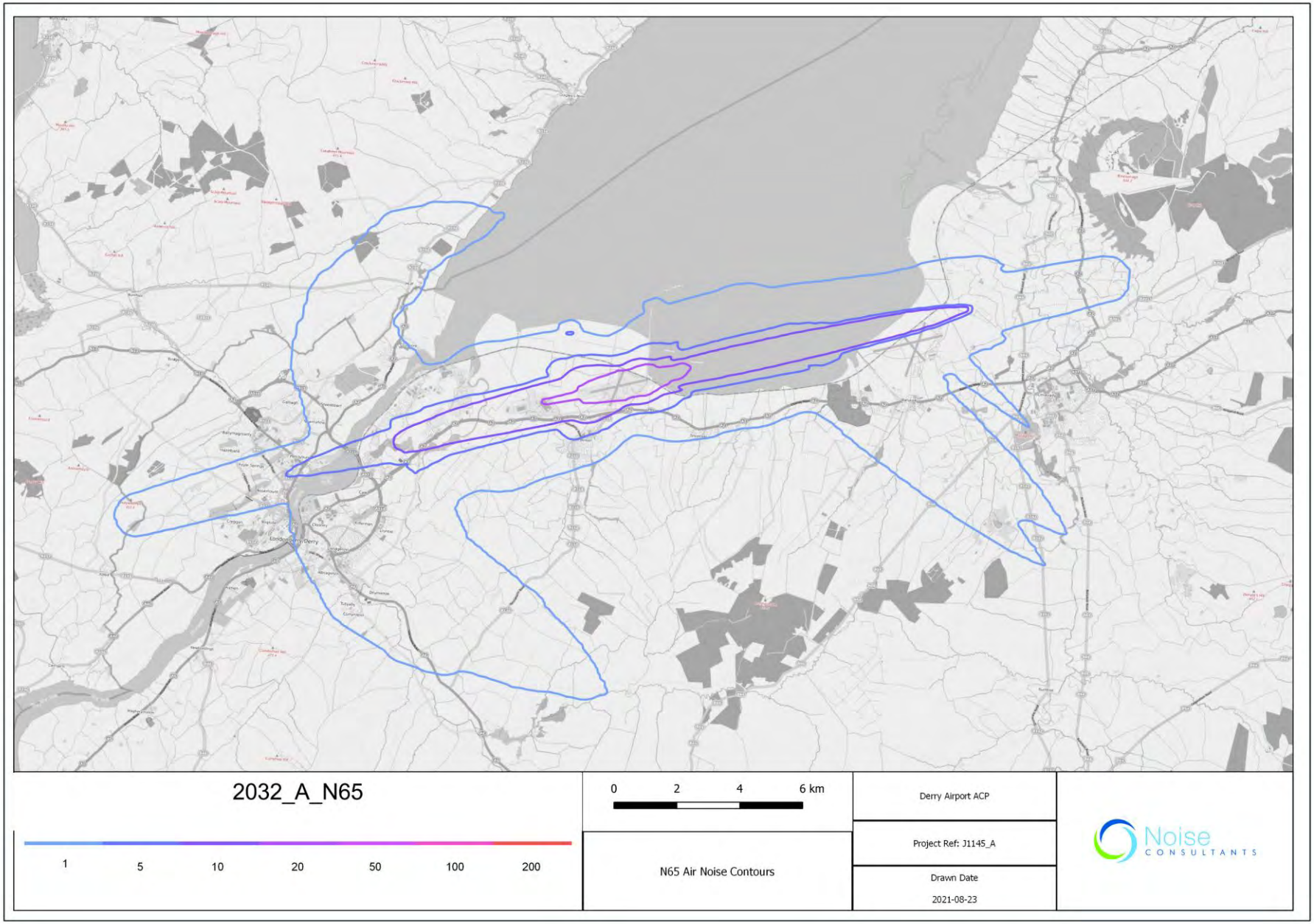
N65 (Day) Baseline 2022



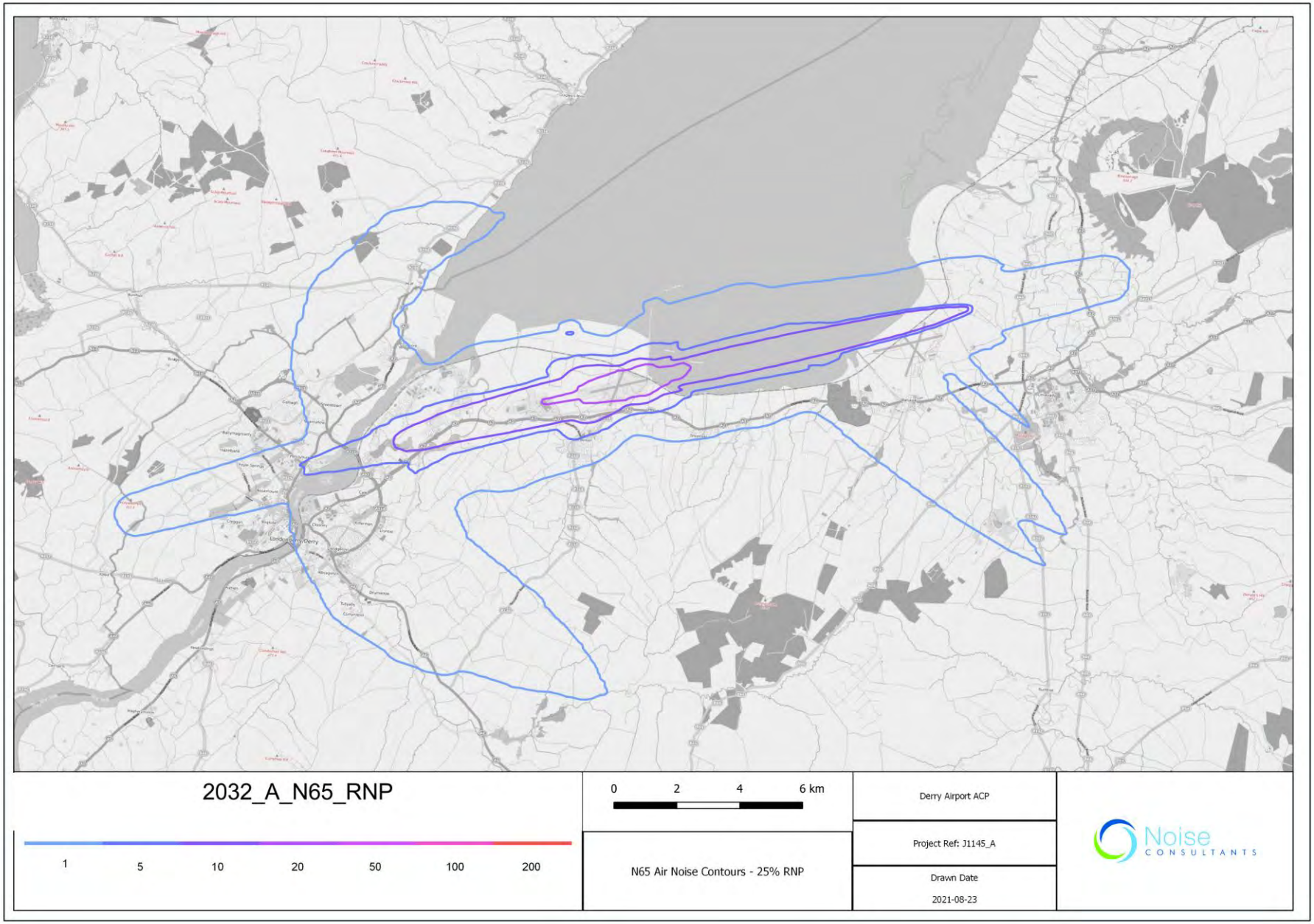
N65 (Day) Airspace Option 2 2022



N65 (Day) Baseline 2032



N65 (Day) Airspace Option 2 2032



Population	2019		2022		2032	
Contour LAeq, 16hr (dB)	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
51	31	31	106	106	151	151
54	12	12	12	12	106	106
57	12	12	12	12	12	12
60	0	0	0	0	12	12
63	0	0	0	0	0	0
66	0	0	0	0	0	0
69	0	0	0	0	0	0
72	0	0	0	0	0	0

Dwellings Contour LAeq, 16hr (dB)	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
51	10	10	34	34	57	57
54	4	4	4	4	34	34
57	4	4	4	4	4	4
60	0	0	0	0	4	4
63	0	0	0	0	0	0
66	0	0	0	0	0	0
69	0	0	0	0	0	0
72	0	0	0	0	0	0

Contours Area (km^2) Contour LAeq, 16hr (dB)	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
51	2.85	2.85	3.13	3.13	6.36	6.37
54	1.49	1.50	1.63	1.63	3.27	3.28
57	0.85	0.85	0.91	0.92	1.70	1.70
60	0.49	0.49	0.53	0.53	0.95	0.95
63	0.31	0.31	0.33	0.33	0.54	0.54
66	0.20	0.20	0.21	0.21	0.34	0.34
69	0.10	0.11	0.12	0.12	0.22	0.22
72	0.01	0.01	0.01	0.01	0.13	0.13

Population Contour N65	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	44587	44587	46514	47324	69964	70083
5	989	989	1003	1003	3112	1964
10	12	12	12	12	1003	1003
20	0	0	0	0	12	12
50	0	0	0	0	0	0
100	0	0	0	0	0	0
200	0	0	0	0	0	0

Dwellings Contour N65	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	17488	17488	18131	18402	26648	26693
5	334	334	339	339	1007	747
10	4	4	4	4	339	339
20	0	0	0	0	4	4
50	0	0	0	0	0	0
100	0	0	0	0	0	0
200	0	0	0	0	0	0

Contours Area (km^2) Contour N65	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	107.08	106.17	110.80	110.76	184.96	185.08
5	17.61	17.59	18.55	18.54	31.24	31.22
10	2.83	2.83	3.24	3.24	18.45	18.44
20	0.00	0.00	0.16	0.16	2.88	2.89
50	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00
200	0.00	0.00	0.00	0.00	0.00	0.00

Population and Dwellings Contour LAeq, 8hr (dB)	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
45	0	0	0	0	0	0
48	0	0	0	0	0	0
51	0	0	0	0	0	0
54	0	0	0	0	0	0
57	0	0	0	0	0	0
60	0	0	0	0	0	0
63	0	0	0	0	0	0
66	0	0	0	0	0	0
69	0	0	0	0	0	0
72	0	0	0	0	0	0

Noise Sensitive Buildings Contour LAeq, 8hr (dB)	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
45	0	0	0	0	0	0
48	0	0	0	0	0	0
51	0	0	0	0	0	0
54	0	0	0	0	0	0
57	0	0	0	0	0	0
60	0	0	0	0	0	0
63	0	0	0	0	0	0
66	0	0	0	0	0	0
69	0	0	0	0	0	0
72	0	0	0	0	0	0

Contours Area Contour LAeq, 8hr (dB)	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
45	0.36	0.36	0.38	0.38	0.76	0.77
48	0.22	0.22	0.24	0.24	0.40	0.40
51	0.12	0.12	0.14	0.14	0.24	0.24
54	0.01	0.01	0.01	0.01	0.14	0.14
57	0.00	0.00	0.00	0.00	0.03	0.03
60	0.00	0.00	0.00	0.00	0.00	0.00
63	0.00	0.00	0.00	0.00	0.00	0.00
66	0.00	0.00	0.00	0.00	0.00	0.00
69	0.00	0.00	0.00	0.00	0.00	0.00
72	0.00	0.00	0.00	0.00	0.00	0.00

Population and Dwellings Contour N60	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	0	0	0	0	0	0
5	0	0	0	0	0	0
10	0	0	0	0	0	0
20	0	0	0	0	0	0
50	0	0	0	0	0	0
100	0	0	0	0	0	0
200	0	0	0	0	0	0

Contours Area (km^2) Contour N60	2019		2022		2032	
	Baseline	Airspace Option 2	Baseline	Airspace Option 2	Baseline	Airspace Option 2
1	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	0.00
50	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00
200	0.00	0.00	0.00	0.00	0.00	0.00

Noise Sensitive Buildings

As part of the CAP1616 noise appraisal requirements, Airspace Change Sponsors are required to undertaken analysis of noise sensitive buildings. Examples of noise sensitive buildings include hospitals, places of worship, and schools. In the case of the CoDA ACP, where the outcomes of the noise assessment have shown that there are only very small marginal changes in noise metrics associated with this ACP, it was not considered proportionate to apply a quantitative approach. As per paragraph B26 of CAP1616 we have therefore provided qualitative analysis to demonstrate that there will be no difference in the outcomes of our noise assessment:

Our noise analysis shows, in terms of the $L_{Aeq\ 16hr}$ day contours, that there are very small, almost immeasurable differences in contour shapes and location between the baseline 'do nothing' scenario and airspace change option 2. This is supported by the data tables that show there are no changes in numbers of dwelling or population. The contour area data table shows that for the majority of scenarios, there is no difference in contour area other than on some occasions where there is a difference of $0.1km^2$ (rounded to the nearest 1 decimal place) between the baseline and Airspace Change Option 2. We can therefore conclude that there is no expected difference in counts of noise sensitive buildings, or significant impact to noise sensitive buildings, within the L_{Aeq} contours, between the baseline and Airspace Change Option 2.

L_{Aeq} metrics are the primary measure of noise impact for ACPs (Paragraph B47, page 164 CAP1616) however as part of our noise analysis we have also reviewed secondary metrics in the form of N65 contours. Secondary metrics are those that are not being used to determine significant impacts but which are still able to convey noise effects.

Similar to the L_{Aeq} contours, there are only very small differences between the shapes and location of the N65 contours. The data tables show that for most contours in most scenarios there are no changes between the two options when considering population and number of dwellings. We can therefore conclude that in these scenarios there will also be no change in noise sensitive building counts.

There is however an increase in population experiencing up to one noise event greater than 65dB L_{Amax} in the 2022 and 2032 scenarios. This is due to the small change in the runway 08 final approach track which expands the N65 (1) contour to the north and therefore captures more population. It is also this change that leads to a positive impact of decreasing the number of population experiencing up to five 65 dB L_{Amax} noise in the 2032 scenario. Although this does reflect a change in the N65 (1) contour within the 2022 and 2032 forecast which could result in capturing new noise sensitive buildings, it also benefits the N65 (5) contour within the 2032 scenario whereby any buildings within the contour may experience reduced noise. Should any school, hospital or healthcare building be located in any of these contours, an N65 of 1 and 5 are highly unlikely to result in any impacts to have an influence on decision making.

10. Appendix C: AONB Map

Source: https://landscapesforlife.org.uk/about-aonbs/aonbs/overview