Environmental Assessment of Proposed Changes to SIDs and STARs at Hobart Airport

CIRRIS EA-0001407

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Reviewed:

Change summary

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1.0	23 October 2018	Final draft prepared for review
1.1	23 October 2018	Final draft version for further review
1.2	26 October 2018	Final version for release
1.3	8 November 2018	Final version. Figures for existing SIDS and STARs updated

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1 Executive Summary

Following implementation of new Standard Instrument Departures (SIDs) and Standard Instrument Arrivals (STARs) by Airservices at Hobart Airport on 14th September 2017, aircraft noise concerns were raised by members of the community. Airservices made a commitment to conduct a complete review of the design of the Hobart airspace, including the SIDs and STARs for Runway 12 and Runway 30 (the 'Hobart Airspace Design Review').

A multitude of design considerations were initially considered for the Hobart Airspace Design Review. Following community and aviation industry consultation, and an internal preliminary review, two feasible design alternatives were identified. Analysis of the design alternatives took into account air traffic control (ATC) and aircraft operator safety and efficiency considerations, as well as potential environmental and community issues.

This targeted Environmental Assessment (EA) aims to evaluate the two design alternatives, known as the Hobart – Melbourne Arrivals East alternative (HB-ML Arr East), and the Hobart – Melbourne Arrivals West alternative (HB-ML Arr West), against each other and against the existing SIDs and STARs (referred to as 'the baseline'). Each alternative was assessed against the other to identify a preferred design solution, based on environmental considerations including noise and visual impacts on communities, ecological and heritage issues, as well as fuel burn and carbon dioxide emissions.

Noise modelling for this environmental assessment was performed using the United States Federal Aviation Administration's (US FAA's) Aviation Environmental Design Tool (AEDT). A 'whole of airport' methodology has been used, where each SID and STAR alternative (ie. the baseline and the two alternatives) has been modelled using a 'busy day' operational schedule, and taking into account seasonal variations. Matters of National Environmental Significance (MNES) were identified below the areas of the proposed changes using the Commonwealth Department of Environment and Energy (DoEE) Protected Matters Search Tool.

This EA has found that neither of the proposed HB-ML Arr West and HB-ML Arr East design alternatives is likely to result in any significant environmental impact within the meaning of the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act, 1999. Both alternatives would have some noticeable noise and visual impacts that may affect different communities in different geographical areas around Hobart. There are small differences between the numbers of populations identified as potentially exposed to these noise and visual impacts for each of the proposed alternatives, however these differences are minimal. There are also no material differences between the two design alternatives in terms of noise impacts, ecological and heritage impacts, and effects on aircraft emissions and fuel burn. **As such, this EA has found that, from an environmental perspective, there are no material differences between the HB-ML Arr West alternative, the HB-ML Arr East alternative, and the existing SIDs and STARs at Hobart Airport.**

Both proposed design alternatives have been assessed as a Class C environmental risk.

2 Background

Airservices introduced changes to arrival and departure flight paths at Hobart Airport on 14th September 2017. The changes were designed to organise aircraft departing from, or arriving at Hobart Airport onto standard routes through the implementation of a system of Standard Instrument Departures (SIDs) and Standard Instrument Arrivals (STARs). Following implementation, aircraft noise concerns were raised by the community, and Airservices subsequently undertook to engage with the communities affected to provide feedback on a number of flight path alternatives which may result in an improved noise outcome.

Based on the feedback received, Airservices implemented a change to the Runway 30 STAR flight path in March 2018, and also committed to a further ‘green field’ assessment of the overall SID/STAR design for Hobart Airport. As a result, and within the operational requirements and constraints at Hobart Airport, Airservices has conducted a complete review of the design of the SIDs and STARs for Runway 12 and Runway 30 (the ‘Hobart Airspace Design Review’).

The Hobart Airspace Design Review has been undertaken with the safety of air navigation as the primary consideration, and will include recommendations for changes that would enhance the safety of the flight path design, balanced with minimising the effects of aircraft on the environment, utilising satellite-based navigation technology.

3 Purpose

The purpose of this document is to conduct an environmental assessment (EA) of two proposed alternatives by Airservices to introduce new, re-designed SIDs and STARs at Hobart Airport, as part of the Hobart Airspace Design Review. This includes analysis and assessment of the significance of any potential environmental impacts of the proposed alternatives, including noise and visual impacts on communities, ecological and heritage impacts, and effects on aircraft emissions.

This document also aims to evaluate the two alternatives and current situation (baseline) against each other to identify a preferred solution, based on environmental considerations. Operational and safety considerations are not evaluated in this document.

This assessment is required to meet Airservices obligations under sections 28 and 160 of the Commonwealth *Environmental Protection and Biodiversity Conservation (EPBC) Act, 1999*. As a Commonwealth agency, Airservices is required (by the EPBC Act) to assess the potential environmental significance of any ‘actions’ it takes, including changes to on-ground operations and changes to air traffic management (ATM) practices.

This EA also includes a summary of social analysis data from the area of the proposed change, to provide Airservices Group and Community Engagement (G&CE) Team with information to prepare a social impact assessment as part of their Stakeholder Engagement Plan (SEP).

4 Airport description

Hobart International Airport (ICAO code: YMHB) is located at Cambridge, 17 km east of Hobart, Tasmania. It is the major passenger airport in Tasmania. Information from the Hobart Airport Master Plan (2015) shows that the airport is served by Australia's four main passenger airlines: Qantas and Qantas Link, Jetstar, Virgin Australia and Tiger Airways. These airlines carried 2.1 million passengers in the 2014 calendar year to and from Hobart Airport (Hobart Airport Master Plan, 2015). Qantas Freight and Toll operate dedicated freight operations from the airport, and it also serves as a port for the Royal Flying Doctor Service (RFDS), with more than 365 flights a year.

Hobart Airport is situated on a narrow peninsula with take-offs and landings directed over bodies of water, regardless of approach or departure direction.

The airport has one runway, RWY 12/30, which is 2,251 metres long and 45 metres wide. Hobart Airport is equipped with approach, runway and taxiway lighting for day and night time operations. The airport is able to cater for aircraft types up to Boeing 767 size, with capability for handling weight-restricted Boeing 747 operations. The Hobart Air Traffic Control Tower's opening hours are between 6am and 10:30pm local time.

Hobart Airport's published instrument flight procedures include an instrument landing system (ILS) for RWY 12, VHF Omni-Directional Radio Range (VOR) for RWY 12/30 and Distance Measuring Equipment (DME) or Global Navigation Satellite System (GNSS) arrival instrument procedures for RWY 12/30. Figure 1 below shows a satellite image of Hobart Airport.

Figure 1: Satellite image of Hobart Airport (showing Runway 12 and Runway 30).

5 Proposed alternatives

Airservices ANS Group is proposing to redesign the SIDs and STARs at Hobart Airport, as part of the Hobart Airspace Design Review. Specifically, the proposal includes:

- Amending the existing SIDs and STARs
- Introduction of new STARs
- Introduction of new SIDs
- Introduction of new holding patterns
- Introduction of a new RWY 30 Area Navigation (RNAV) approach
- Introduction of an RNP-AR (Required Navigation Performance – Authorisation Required) approach for both RWY 30 and RWY 12.

Airservices has conducted a 'green field' review of the design of the SIDs and STARs for RWY 12 and RWY 30 at Hobart Airport (the Hobart Airspace Design Review), which may result in an improved noise outcome.

A multitude of design considerations were initially considered for the Hobart Airspace Design Review. Following community and industry consultation and a preliminary review internally, two design alternatives were identified for further environmental assessment. Analysis of the design alternatives took into account air traffic control (ATC) and aircraft operator safety and efficiency considerations, as well as environmental and community issues.

5.1 Existing SIDs and STARs (baseline)

The current design is an airspace and air route solution which was necessitated by the introduction of new technologies such as Performance Based Navigation (PBN) and new aircraft avionics systems, to provide air traffic management (ATM) efficiencies and benefits to the aviation industry.

The existing design was based on the need to develop an integrated SID/STAR package for Hobart Airport, designed using advancements in PBN technology to provide separation assurance between arriving and departing traffic. The current design consists of a 'racetrack' pattern between Hobart and other Tasmanian airports, providing better integration of traffic from airports in Tasmania to Hobart, than the previous design. A satellite image with the current published SIDs and STARs is shown in Figure 2, over.

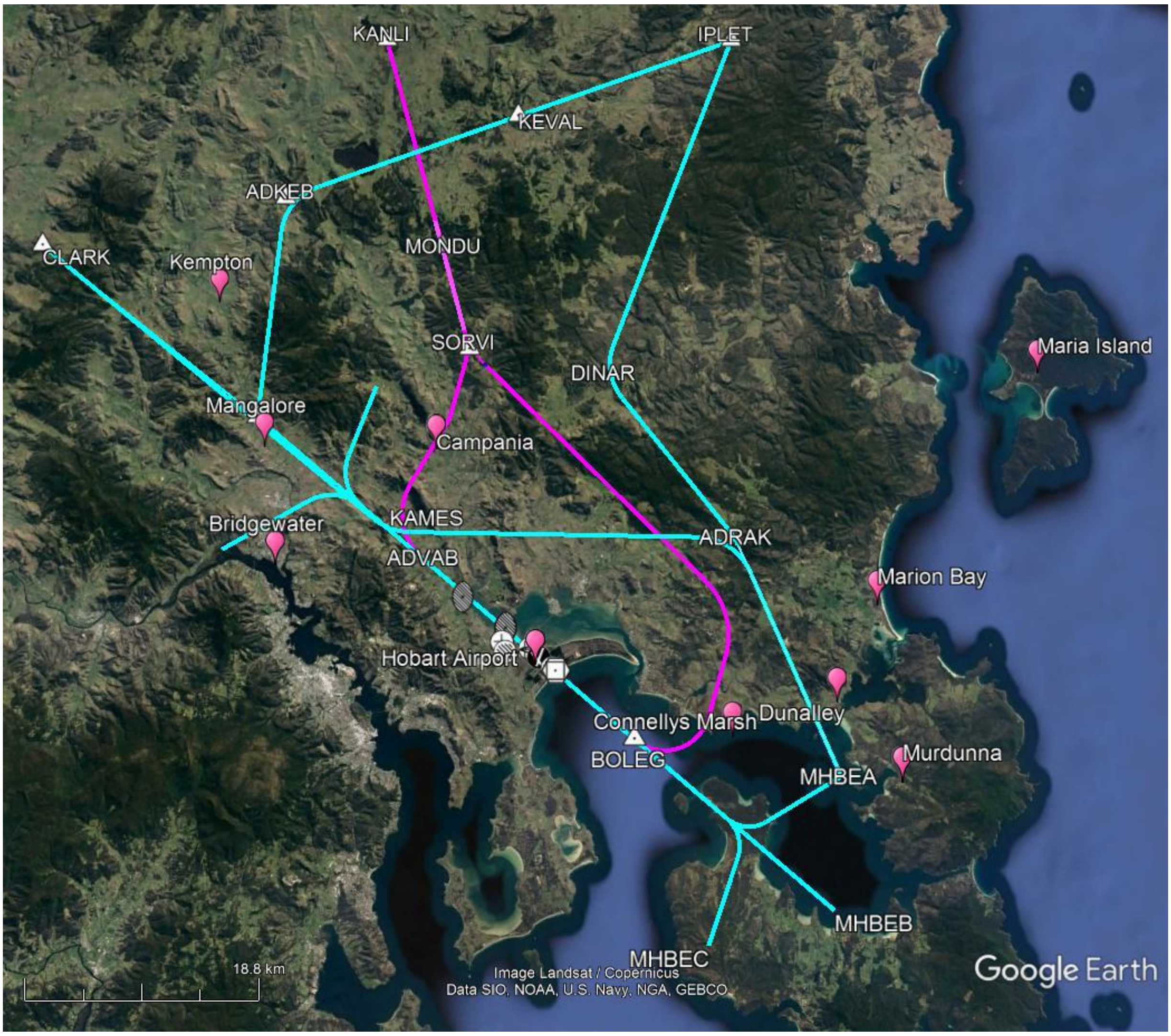


Figure 2: Satellite image with the existing SIDs (magenta) and STARs (light blue) at Hobart Airport.

5.2 Hobart – Melbourne Arrivals West design alternative

The Hobart – Melbourne Arrivals West (HB-ML Arr West) design alternative is a proposed airspace and air route design solution where the arrivals from Perth, Adelaide and Melbourne will all arrive via a STAR that tracks west of Mt Wellington to join a new Area Navigation (RNAV) instrument approach, which is completely over water (see Figure 3, over). This STAR, to the west of Hobart, will require additional controlled airspace and will overfly new areas, although at high altitude and low noise levels.

In the HB-ML Arr West design, the inbound STAR for all traffic arriving from the east coast of Australia tracks completely over water and crosses land only when necessary to join the new RNAV approach at a location which attempts to minimise noise impacts (approximately equidistant between Dunalley and Murdunna, crossing a total of only 7NM of land). Arrival traffic from the east is split between the RNAV approach (south of Maria Island) and the RNP-AR/Visual approach (north of Maria Island). Although the RNP-AR/Visual approach path passes over more land, it is shorter than the RNAV approach path (which passes over more water), and is therefore likely to be more fuel efficient.

Both runway configurations include a jet SID and a non-jet SID for departures. Both SIDs are unrestricted for RWY 30, and both SIDs have at or above altitude requirements for RWY 12. The RWY 12 configuration is similar to the current situation (baseline), only presenting new changes in tracks where necessary for separation.

There is a STAR from the IPLET waypoint, however this is only used for low numbers of low altitude turbo-prop and piston aircraft, and priority traffic that cannot track over water (eg. single-engine piston aircraft), or where the track miles are too inefficient to go that far east after departing Launceston (YMLT) or St Helens (YSTH).

The HB-ML Arr West design is centred around de-conflicting traffic inbound from Melbourne with the main jet departure route in the RWY 30 configuration, by preventing a crossover, including a 'racetrack' pattern between Melbourne and Hobart (taking into account that RWY 27 and RWY 30 are the most predominant runway modes at each airport, respectively).

Designing the STAR to track to the southwest of Hobart allows every aircraft (jet and non-jet) departing to the north, to depart Hobart Airport unrestricted, providing a safety benefit. The STAR has been designed to keep track miles similar to the current situation while also remaining to the west of Mt Wellington to avoid turbulence and ‘mountain waves’ (disturbances in air flow on the down-wind side of high ground). The HB-ML Arr West design alternative presents ATC and aircraft operators with no regular crossover points on SIDs and STARs used by Regular Passenger Transport (RPT) operators (airlines) in the RWY 30 configuration. However, this STAR is inflexible with regards to options for a visual approach or an RNP-AR termination to the runway threshold, mainly due to the presence of the D316 airspace (a general aviation flying training area) being in such a position that prevents it.

Both design alternatives have two STARs for RWY 30 for traffic from Sydney and Brisbane. The shorter STAR connects the ATS route with the RNP-AR/Visual approach (tracking north of Maria Island) and the longer STAR connects the ATS route with the new RNAV approach (tracking south of Maria Island). For a Sydney to Hobart flight, the RNP-AR STAR provides a track mile saving of 10NM, compared to current day operations (IPLET 4 ARRIVAL), while the RNAV STAR provides a 4NM track mile saving compared to current operations.

The proposed RWY 12 configuration is similar to the current situation, with the only difference being that the departure requirements are slightly steeper (more aligned to natural climb profiles in Hobart than currently), with a non-jet SID included to prevent complexity issues with faster following traffic.

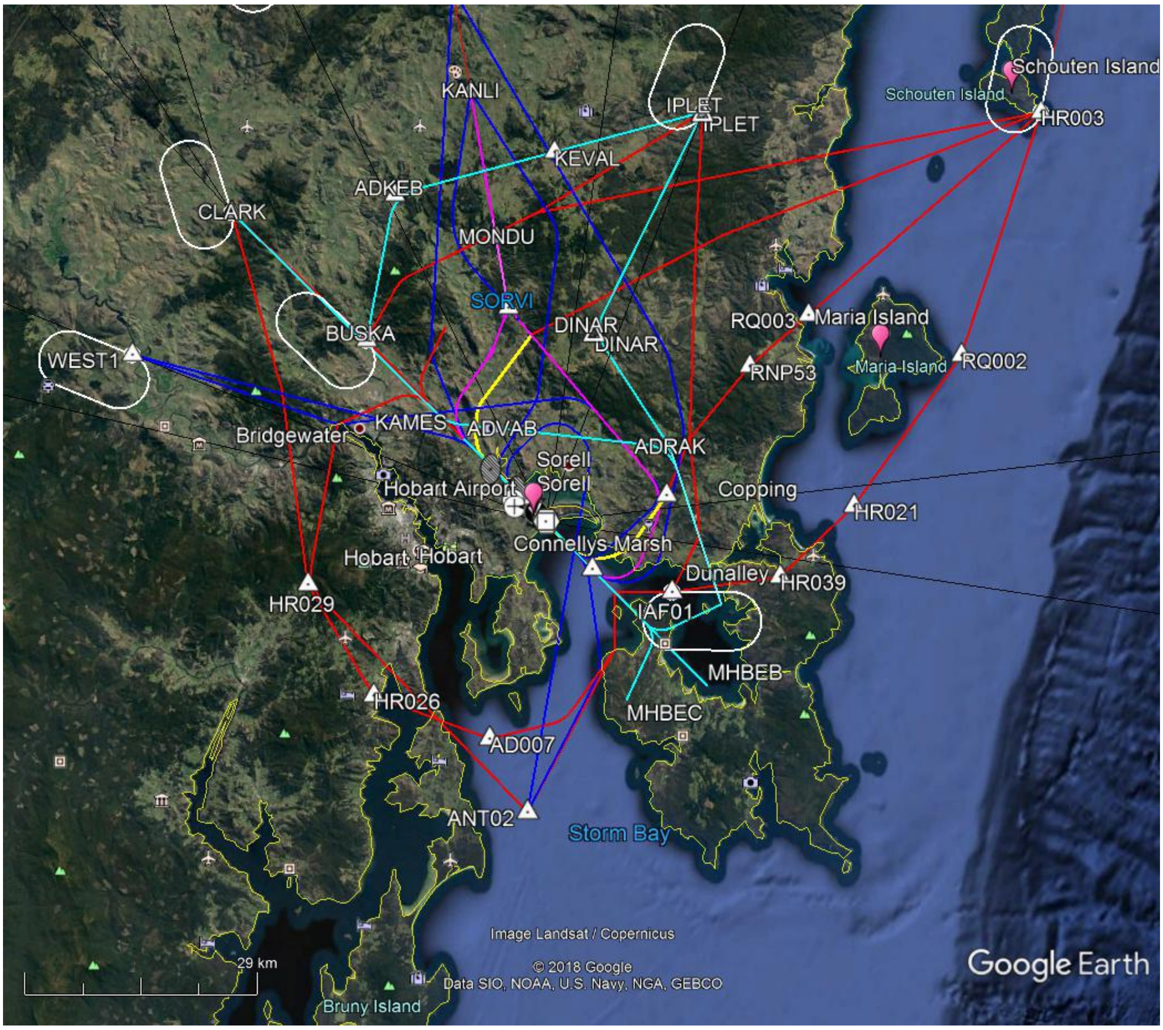


Figure 3: Satellite image showing the proposed HB-ML Arr West design alternative (departures in blue, arrivals in red and yellow for RNP-AR and visual approaches), overlaid with the current published procedures (existing SIDS in magenta and existing STARs in light blue). Proposed new holding patterns are shown in white.

5.3 Hobart – Melbourne Arrivals East design alternative

The Hobart – Melbourne Arrivals East (HB-ML Arr East) design alternative is a proposed airspace and air route design solution that will require less additional controlled airspace for implementation. The STAR for arrival traffic from Melbourne, Perth and Adelaide will track to the east of Hobart, with a requirement to be at or below FL130 (Flight Level 130, ie. 13,000ft altitude) by a waypoint to 'get under' the jet SID (for departure traffic) in the RWY 30 configuration. This STAR also has an RNP-AR, visual approach or RNAV termination to the RWY 30 threshold, with arrivals from Sydney and Brisbane also tracking over the east coast, as in the HB-ML Arr West alternative above. The Hobart – Melbourne Arrivals East (HB-ML Arr East) design alternative is shown in Figure 4, over.

The HB-ML Arr East design alternative also has a runway track (runway aligned) SID for traffic departing to the northwest or traffic that cannot meet the FL140 (14,000ft altitude) requirement (for the SID).

As with the other alternative, additional controlled airspace will be required to the east to contain the STAR off the east coast of Tasmania and the non-jet, low level STAR from the IPLET waypoint.

There are also jet and non-jet SIDs for departures from both runways, as with the HB-ML Arr West alternative. Only the non-jet SID on the RWY 30 configuration requires departing traffic to hold at a level that keeps aircraft below the inbound STAR with arrivals from Melbourne, Adelaide and Perth. The proposed RWY 12 configuration is similar to the other alternative.

Both design alternatives include new SIDs for departures to Strahan (on the west coast of Tasmania) and to Antarctica, and both include a new RNAV design for RWY 30 that keeps aircraft tracking over water.

The HB-ML Arr East design alternative is centred around providing a flexible approach (including RNP-AR, visual approach and RNAV termination capabilities) for traffic arriving from Melbourne (which represents approximately 50-60% of Hobart's arrival traffic), so that it is de-conflicted from departing traffic at a point in flight which is away from airspace, frequency and surveillance boundaries. Bringing the STAR from Melbourne to the east allows departing jet traffic enough track miles to reach a height requirement to be above this STAR (AT or ABV FL140 requirement), while also leaving the runway track clear for departures that cannot meet the height requirement, and for missed approaches (which can be unrestricted). The STAR for arrivals from Sydney and Brisbane off the east coast remains flexible, exactly as with the other alternative.

In the HB-ML Arr East design, the STAR from IPLET is exactly the same as the HB-ML Arr West design alternative. This IPLET STAR aims to provide an alternative route for priority traffic (usually Royal Flying Doctor Service Beechcraft Super King Air BE20 aircraft and medical helicopters), and single engine IFR (Instrument Flight Rule) traffic that cannot overfly water.

The HB-ML Arr East design alternative also reduces the impact on general aviation (GA), which predominantly operates to the south-west of Hobart. By keeping the STAR from Melbourne to the east of Hobart, GA operators will retain all the existing Class G airspace and flexibility for training and other operations. This has safety benefits in that ATC can concentrate on managing RPT traffic and runway operations at Hobart Airport, rather than issuing clearances for GA aircraft to operate in areas where they already do today. In the other alternative, these areas would be in controlled airspace.

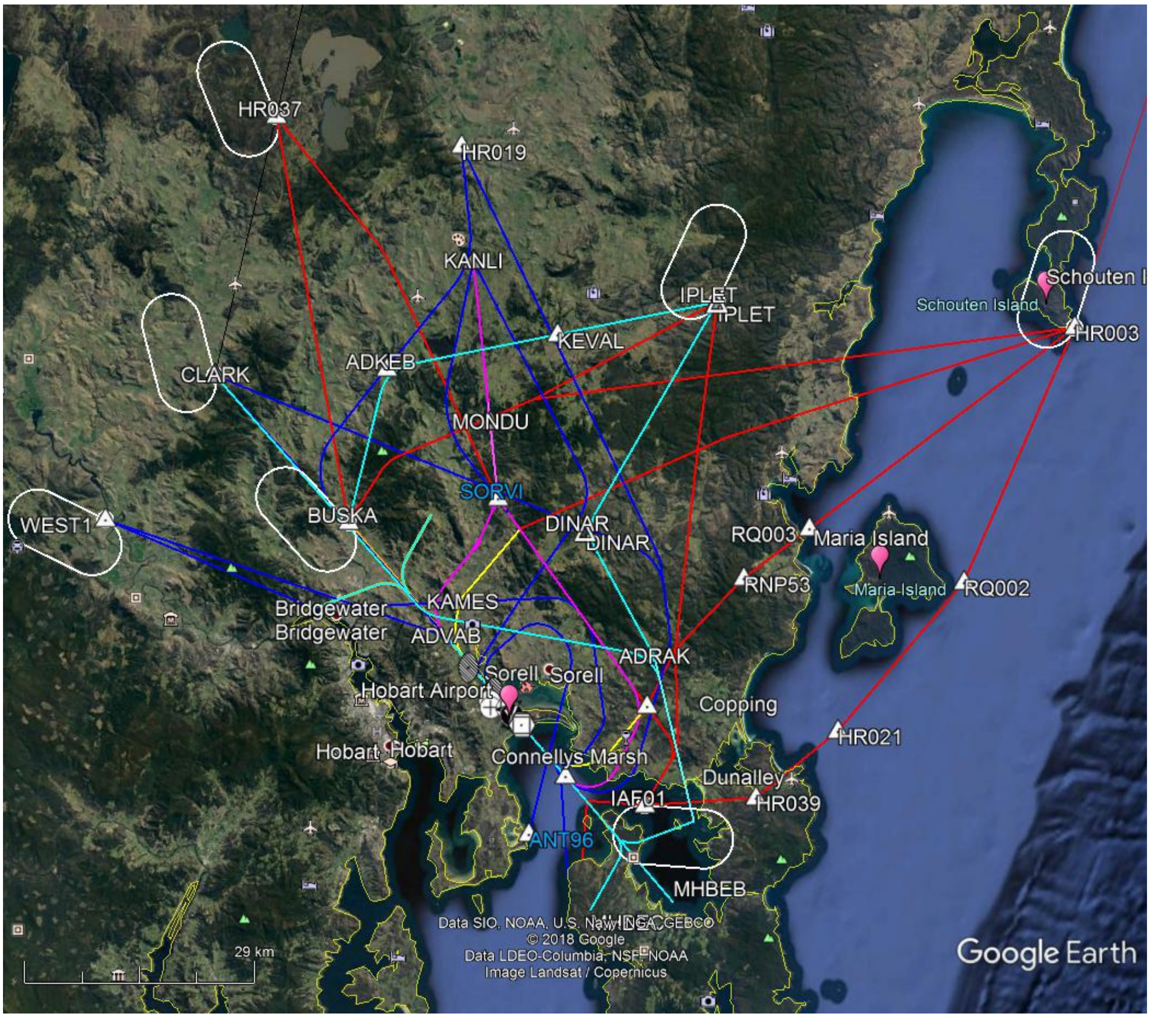


Figure 4: Satellite image showing the proposed HB-ML Arr East design alternative (departures in blue, arrivals in red and yellow for RNP-AR and visual approaches), overlaid with current published procedures at Hobart Airport (existing SIDS in magenta and existing STARs in light blue). Proposed new holding patterns are shown in white.

5.4 Holding patterns

This EA also assesses the noise levels in areas under proposed new holding patterns that have been included for each design alternative as part of the Hobart Airspace Design Review. Holding patterns are mainly flown by arrival aircraft awaiting clearance to land. The locations of the holding patterns are shown in Figures 3 and 4 above.

Table 1 over, shows the altitude levels for the different holding patterns for the two design alternatives at Hobart Airport. Only the holding patterns associated with the selected alternative would be implemented (noting that the majority are common to both alternatives). It should also be noted that, although there are 7 separate holding pattern locations, 3 of them (HR003, CLARK and HR037) have holding patterns at two different altitudes, as shown in Table 1, over.

Table 1 – Altitudes for proposed new holding patterns at Hobart Airport.

Holding Point	Alternative	Runway	Altitude (ft)
HR003	HB-ML Arr West, and HB-ML Arr East	RWY 30	14,000-16,000
HR003	HB-ML Arr West, and HB-ML Arr East	RWY 12	15,000-20,000
CLARK	HB-ML Arr West	RWY 30	20,000
CLARK	HB-ML Arr West	RWY 12	9,000-10,000
IPLET	HB-ML Arr West, and HB-ML Arr East	RWY 12 & 30	4,000-11,000
HR037	HB-ML Arr East	RWY 30	14,000-17,000
HR037	HB-ML Arr East	RWY 12	11,000-12,000
IAF01	HB-ML Arr West, and HB-ML Arr East	RWY 30	4,000
*BUSKA	HB-ML Arr West, and HB-ML Arr East	RWY 12	4,500-5,500
WEST 1	HB-ML Arr West, and HB-ML Arr East	RWY 12	10,000

** Note: The BUSKA holding pattern is located near the waypoint KILOS in the imagery above.*

5.5 Environmental assessment scope

Multiple designs were initially considered for the Hobart Airspace Design Review. Following industry and community consultation and a preliminary review internally, two design alternatives were considered for further environmental assessment.

6 Operational data analysis

The methodology used to conduct this analysis, including details on the environmental assessment criteria, are found in Appendix C.

6.1 Aircraft operations

As can be seen in Table 2, the Boeing 737-800 (B738) jet is the most common civilian aircraft operating at Hobart Airport. The following analysis used a 'whole of airport' modelling method where individual aircraft types were used in the noise model with a representative 'busy day' schedule. The table below is presented for information only.

Table 2 - Ten most common passenger jet aircraft operating at Hobart Airport, from January to July 2018 (from Airservices NFPMS).

Aircraft Type	Number of Movements
B738	4,218
A320	3,149
A321	1,061
B712	945
B733	167
B737	60
B73Y	45
GLF5	36
CL60	28
A319	20

Published data on Airservices website indicates that Hobart Airport had 28,084 total aircraft movements in 2017 (http://www.airservicesaustralia.com/publications/reports-and-statistics/movements-at-australian-airports/, accessed 28/9/2018).

6.2 Forecast growth in aircraft operations

Forecast growth data is only considered as a reliable prediction for the next 12 months, due to many unforeseen variables that may impact traffic growth (eg. economic, operational or political factors). Growth beyond 12 months has therefore not been considered. In this assessment, the 90th percentile busy day traffic numbers have been used as shown in Table 3. These values have been used as a 'worst case scenario' (ie. highest traffic numbers) for assessment of the proposed changes.

Hobart Airport received approval for a Master Plan in December 2015. The Master Plan includes an endorsed Australian Noise Exposure Forecast (ANEF) noise contour map. Flight movements forecast in the Master Plan for the year 2020 were around 20,020 movements. This level has already been exceeded by the 2017 total movement numbers shown above (28,084). The Master Plan also projects a strong growth in freight aircraft for the region. Forecast numbers are included here for information purposes.

6.3 Seasonal modes

The operational pattern at Hobart Airport is highly seasonal, due to prevailing winds. In winter months the airport tends to operate in a north-westerly flow direction (ie. arrivals to RWY 30 and departures from RWY 30, in a north-westerly direction), whereas during summer months, airport operations are move evenly distributed between both runway ends. For this assessment, winter and summer scenarios have been developed for the current situation (baseline) and each alternative, in order to evaluate potentially significant environmental impacts of the proposed changes, while taking into account seasonal variations.

6.4 Busy day operations

The movement numbers obtained from Airservices Noise and Flight Path Monitoring System (NFPMS) were used to calculate a 'busy day' number of operations for this assessment, using a 90th percentile figure for daily movements. The range of (minimum and maximum) movements per day and 90th percentile busy day movement numbers are shown in Table 3 below.

Table 3 – Daily aircraft movement numbers at Hobart Airport, January to July (from Airservices NFPMS).

Daily aircraft movement numbers at Hobart Airport			
Minimum	**Maximum**	**Average**	**Busy day (90th percentile)**
41	90	62	75

Considering the above 'busy day' daily aircraft movement number of 75 operations per day, an appropriate representative winter and summer baseline has been chosen from NFPMS data, as shown below in Table 4.

Table 4 – Current (baseline) operations using the existing SIDs and STARs at Hobart Airport (from Airservices NFPMS).

Current Operations (baseline)			
Scenario	**Day**	**Number of operations per day**	**Runway distribution**
Summer	18 January 2018	77	42% south east flow (arrive RWY 12 / depart RWY 12) 56% north west flow (arrive RWY 30 / depart RWY 30)
Winter	22 June 2018	70	100% north west flow (arrive RWY30 / depart RWY30)

Helicopters account for around 18% of traffic at Hobart Airport, based on published data on Airservices website (http://www.airservicesaustralia.com/publications/reports-and-statistics/movements-at-australian-airports/, accessed 28/9/2018). Helicopters have been excluded from this analysis, as they are not currently assigned to the existing SID and STAR flight paths, nor will they be under the proposed changes. The pattern of helicopter movements near Hobart Airport is highly diverse, covering a large area. Helicopter flights include rescue, medical and police operations, contributing to the overall noise scape of the area. In addition to helicopters, general aviation aircraft movements from the closely located Cambridge Airport also contribute to the overall noise scape of the area, with most suburbs on the north shore of Frederick Henry Bay already overflown.

6.5 Night movements

An average of around 5 night movements per day (11pm to 6am) operated at Hobart Airport during the months of January to July 2018 (based on Airservices NFPMS data).

The chosen representative busy day baseline defined above had 3 night operations in the summer scenario and 7 night operations in the winter scenario. These night operations have been incorporated into the ‘whole of airport’ models used for this assessment. Specific analysis of night time operations is provided in Section 7.2.4.

7 Aircraft noise

7.1 Noise modelling methodology

Noise modelling for this environmental assessment was performed using the US FAA's Aviation Environmental Design Tool (AEDT), version 2d. A 'whole of airport' methodology has been used, where each SID and STAR alternative (ie. the existing situation and the two alternatives) has been modelled with a busy day operational schedule, taking into account summer and winter scenarios. The number of noise events above 60dB(A) and 70dB(A) (ie. N60 and N70 values) was generated directly from AEDT, using receptor grids for direct evaluation against Airservices' criteria for potential environmental significance (as shown in Appendix A).

Each modelling run was completed using AEDT's inbuilt airport meteorological data and terrain information, based on Shuttle Radar Topography Mission (SRTM) global data (source https://www.usgs.gov/, accessed 4th September 2018). **Table 5**Table 5 below describes each noise model generated for this assessment.

Table 5 – Description of AEDT models used in this environmental assessment, with summer and winter scenarios.

Model	Scenario	Flight Paths	Total Number of Daily Operations
Current situation with existing SIDs and STARs (baseline)	Summer	Radar data used from NFPMS	77
	Winter	Radar data used from NFPMS	70
HB-ML Arr West	Summer	Generated from KML files supplied by FPD*	77
	Winter	Generated from KML files supplied by FPD	70
HB-ML Arr East	Summer	Generated from KML files supplied by FPD	77
	Winter	Generated from KML files supplied by FPD	70

** FPD = Airservices Flight Procedures Design team.*

An example of the flight paths modelled in AEDT can be seen in Figure 5 and Figure 6. The baseline models (for the existing SIDs and STARs) used actual radar data, whereas the proposed alternatives are based on data supplied by Airservices Flight Procedures Design (FPD) team. Standard flight profiles were used in the noise model, with departure profiles assigned by the destination airport.

Aircraft traffic from the busy day schedules was assigned to the proposed SIDs and STARs by their flight planned origin or destination, according to the ruleset provided by the FPD team. This ruleset is included in Appendix F and the busy day traffic schedule (used as an input into the model) can be found in Appendix G.

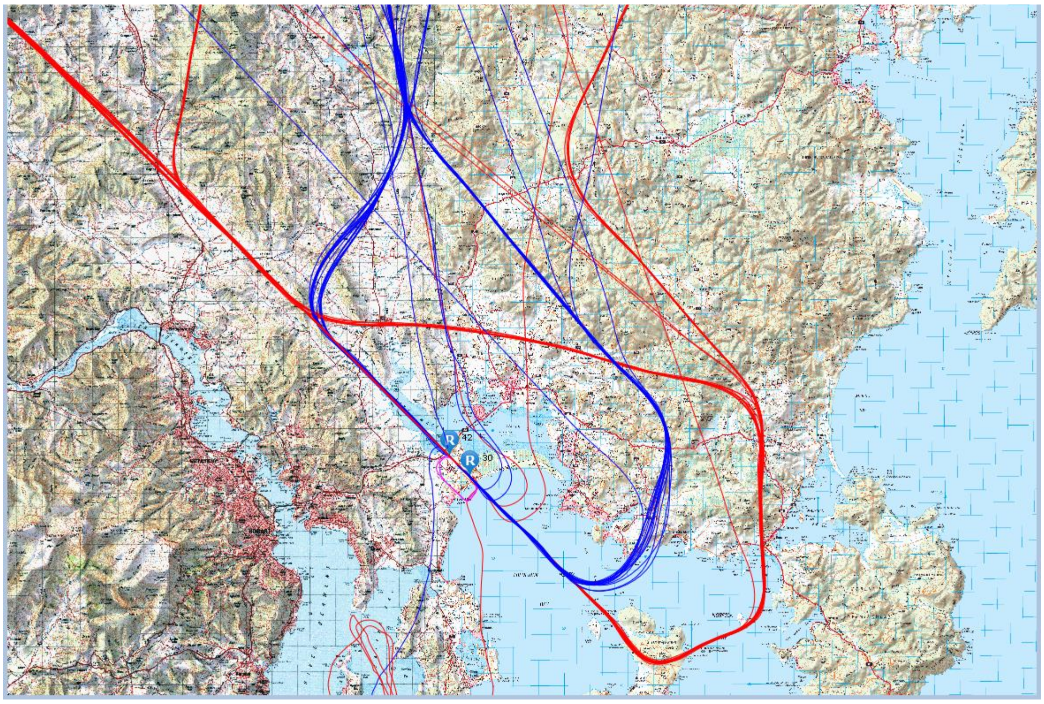


Figure 5: AEDT model tracks (developed from radar data) for the existing SIDs and STARs (baseline) at Hobart Airport for 18 January 2018 (summer), showing departures in blue and arrivals in red.

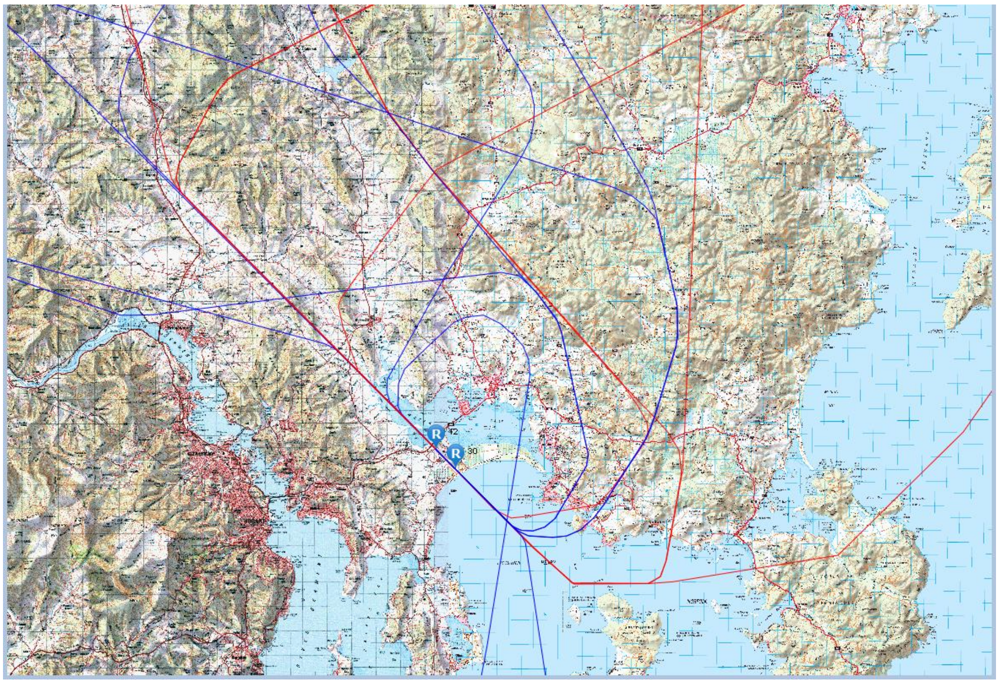


Figure 6: AEDT model tracks (developed from FPD data) for the HB–ML Arr East scenario at Hobart Airport, showing departures in blue and arrivals in red.

Figure 7: AEDT model tracks (developed from FPD data) for the HB–ML Arr West scenario at Hobart Airport, showing departures in blue and arrivals in red.

As described in Section 6.4, noise modelling performed for this assessment has not included helicopters, Cambridge Airport operations or the occasional (infrequent) Antarctic flight at Hobart Airport. Each of these sources would provide some contribution to the noise scape around the general Hobart area. However, these flights have not been modelled in this assessment, as they either do not use the existing SIDs and STARs (or do so very infrequently), nor will they use either of the proposed new SIDs and STARs (or would do so very infrequently). This allows this assessment to provide a clear evaluation of each proposed SID/STAR alternative against the current situation (baseline).

Tactical vectoring is present in the baseline modelling due to the actual radar tracks being used to create the noise model. Examples of this can be seen in Figure 5, where some flight tracks appear to deviate off the assigned SID or STAR. In the models for each alternative, tactical vectoring is not accounted for, due to its variable nature and the difficulty in establishing an accurate representation.

7.2 Noise modelling results

The following section presents noise modelling results evaluated against Airservices' criteria for potentially significant environmental impacts (as shown in Appendix A). Results are provided for the baseline (current situation) and each proposed alternative. The results of each winter and summer scenario were combined when evaluating potentially significant impacts. For assessment purposes, the residential areas around Hobart Airport are considered to be 'rural residential' and due to relatively low traffic volumes at the airport, the criteria representing a ‘low number’ of existing flights is considered appropriate. The relevant Airservices significance criteria for aviation noise are provided in Table 6 below (the full set of criteria are presented in Appendix A).

Table 6 – Airservices aviation noise EPBC Act significance criteria for locations which experience a low number of existing flights or are newly overflown (source: Airservices AA-NOS-ENV-2.100, Environmental Management of Changes to Aircraft Operations, v12, 1 May 2018).

<table>
<tr><th>Location Type</th><th>Noise Metric</th><th>Day (6am-11pm)</th><th>Night (11pm – 6am)</th></tr>
<tr><td rowspan="3">Rural residential</td><td>N70</td><td>> 7 flights</td><td rowspan="2">> 1 flight</td></tr>
<tr><td>N65</td><td>> 17 flights</td></tr>
<tr><td>N60</td><td>> 33 flights</td><td>> 2 flights</td></tr>
<tr><td rowspan="3">Newly overflown</td><td>N70</td><td rowspan="2" colspan="2">> 0 flights</td></tr>
<tr><td>N65</td></tr>
<tr><td>N60</td><td>> 10 flights</td><td>> 0 flights</td></tr>
</table>

The N70 and N60 results were used for this evaluation, as the N65 threshold above is expected to fall between the two other criteria and has therefore not been shown. In the section below, the N70 and N60 grid results (‘receptor points’) generated by the AEDT model have been geographically overlaid with Google Earth images to identify potentially affected residential areas (see Figures 9-18 to follow).

Appendix E provides the full noise modelling results from AEDT for the baseline (current situation) and each alternative, for both summer and winter scenarios. The graphical images in Appendix E provide context for the ‘whole of airport’ noise impacts, showing the number of flights above 60dB(A) for each receptor point (N60) for winter and summer. **The full modelling results help describe impacts that, whilst not considered significant regarding the EPBC Act, may cause annoyance in noise-sensitive residential communities.**

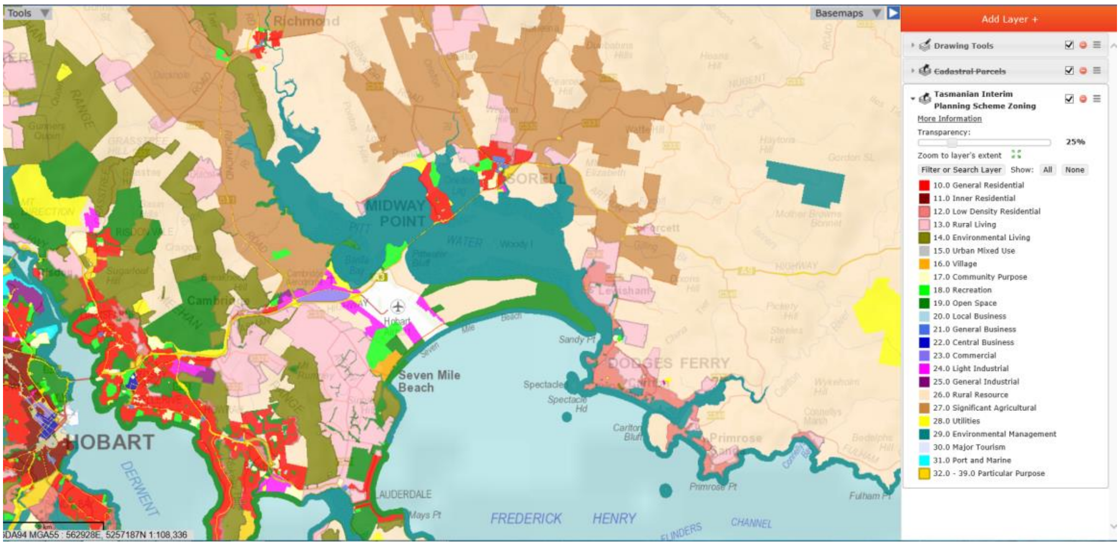


Figure 8: Hobart land-use planning map from the Tasmanian Planning Commission (https://maps.thelist.tas.gov.au/listmap/app/list/map?bookmarkId=137005, accessed 8/10/2018).

The land-use planning map above indicates that some of the residential areas around Hobart Airport are a combination of ‘environmental’, ‘rural and ‘low density residential’ land-use zones. As described above, Airservices EPBC Act significance criteria for ‘rural residential areas’ have been used in this assessment as a conservative approach.

7.2.1 Analysis of noise impacts in rural residential areas

The sections below provide direct evaluation against Airservices aviation noise EPBC Act criteria for potential significant environmental impacts in rural residential areas, in accordance with Airservices AA-NOS-ENV-2.100 (v12), as shown in Table 6 above.

Note that the summer and winter scenarios have been combined when creating the images below to ensure the runway mode usage effects (due to seasonal variations) have been taken into account.

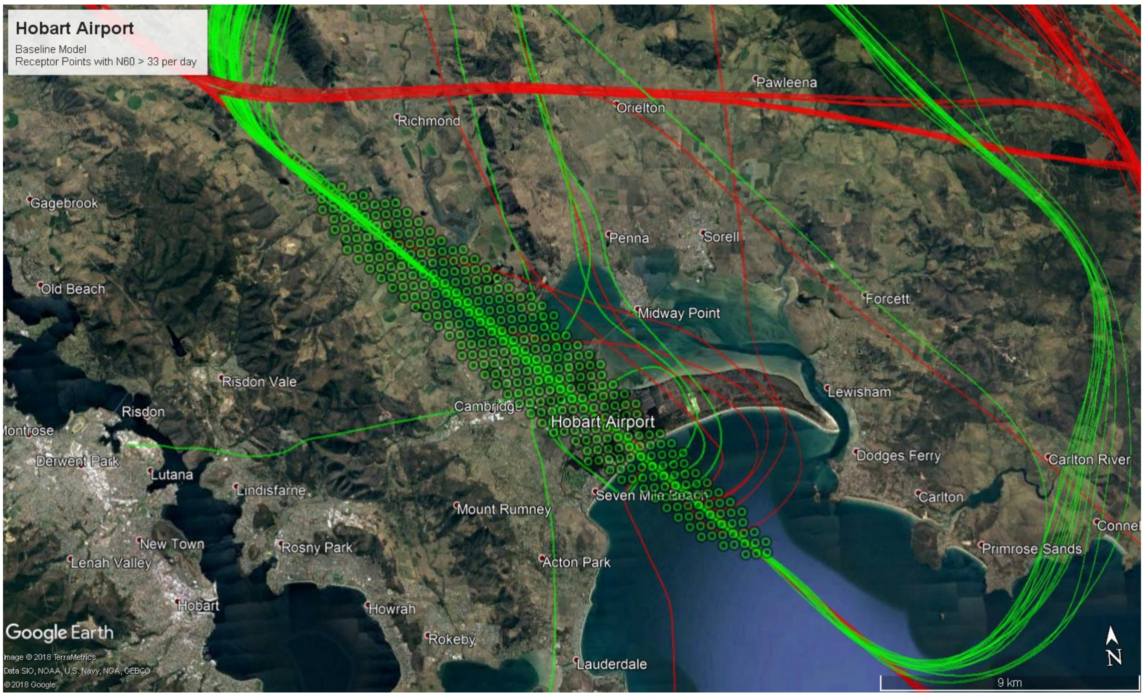


Figure 9: AEDT noise modelling results for existing SIDs and STARs (baseline) at Hobart Airport, showing receptor points (green dots) with more than 33 flights with noise levels of 60dB(A) or above (ie. N60 >33). Existing modelled baseline arrivals are shown in red and departures in green.

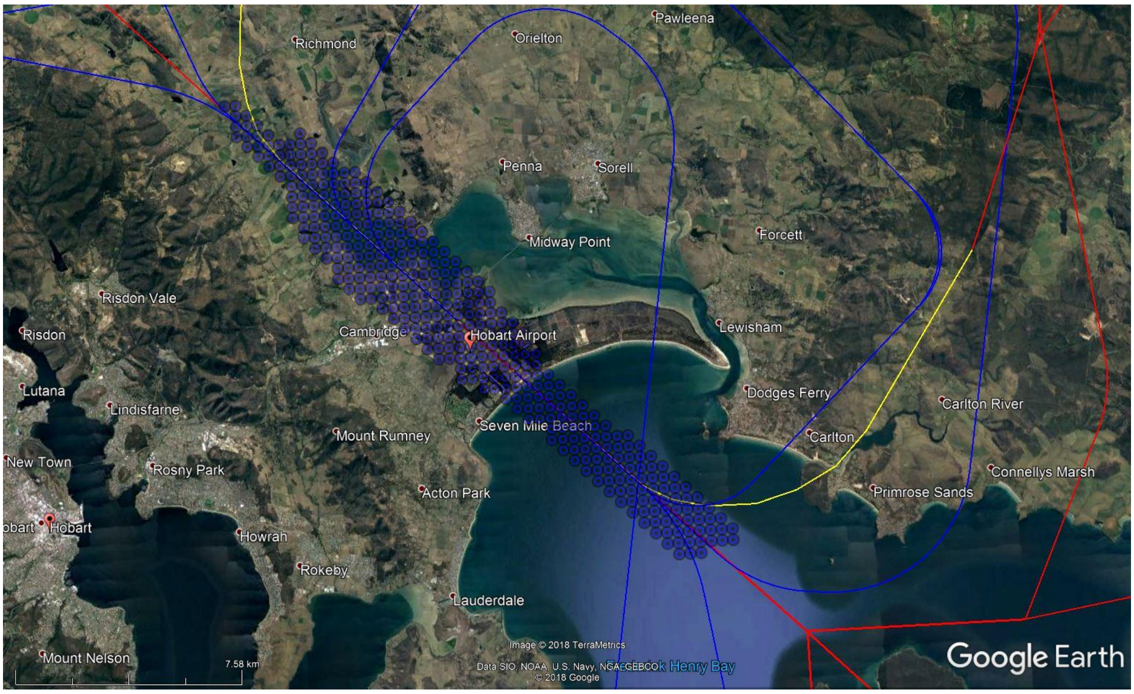


Figure 10: AEDT noise modelling results for HB-ML Arr West alternative at Hobart Airport, showing receptor points (blue dots) with more than 33 flights with noise levels of 60dB(A) or above (ie. N60 >33). Proposed nominal departures paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

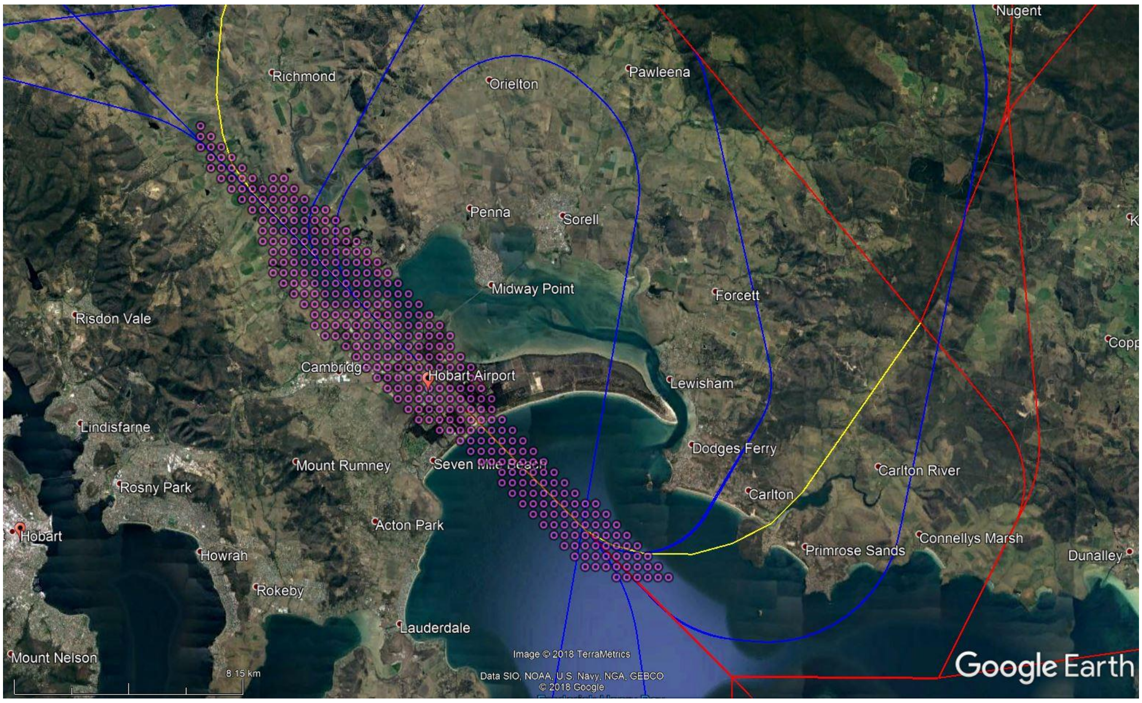


Figure 11: AEDT noise modelling results for HB-ML Arr East alternative at Hobart Airport, showing receptor points (pink dots) with more than 33 flights with noise levels of 60dB(A) or above (ie. N60 >33). Proposed nominal departure paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

The above figures indicate that there are isolated rural residential properties to the north west of Hobart Airport that can expect more than 33 flights on a busy day with noise levels at 60dB(A) or above. This is at Airservices threshold levels of potential environmental significance for noise. However, comparison against the baseline (current situation), indicates that both proposed alternatives are not discernibly different from the current noise levels in this area, as shown below in Figure 12.

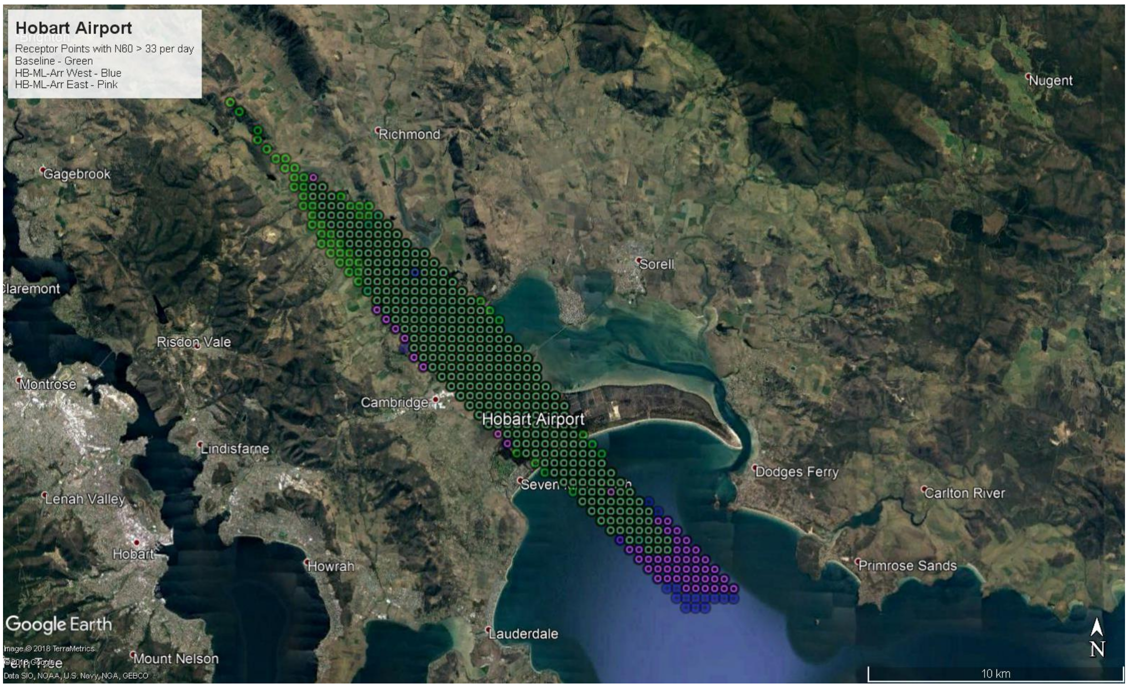


Figure 12: Combined AEDT noise modelling results for existing SIDs and STARs (baseline) in green, HB-ML Arr East in pink and HB-ML Arr West in blue, showing receptor points with more than 33 flights with noise levels of 60dB(A) or above (ie. N60 >33).

Mapping of the N70 >7criteria for the current situation (baseline) and each alternative is shown in Figure 13 to Figure 15 below (ie. areas with seven or more flights with noise levels of 70bB(A) or more). Figure 16 shows the N70 >7 contours for the baseline and each alternative overlaid on top of each other.

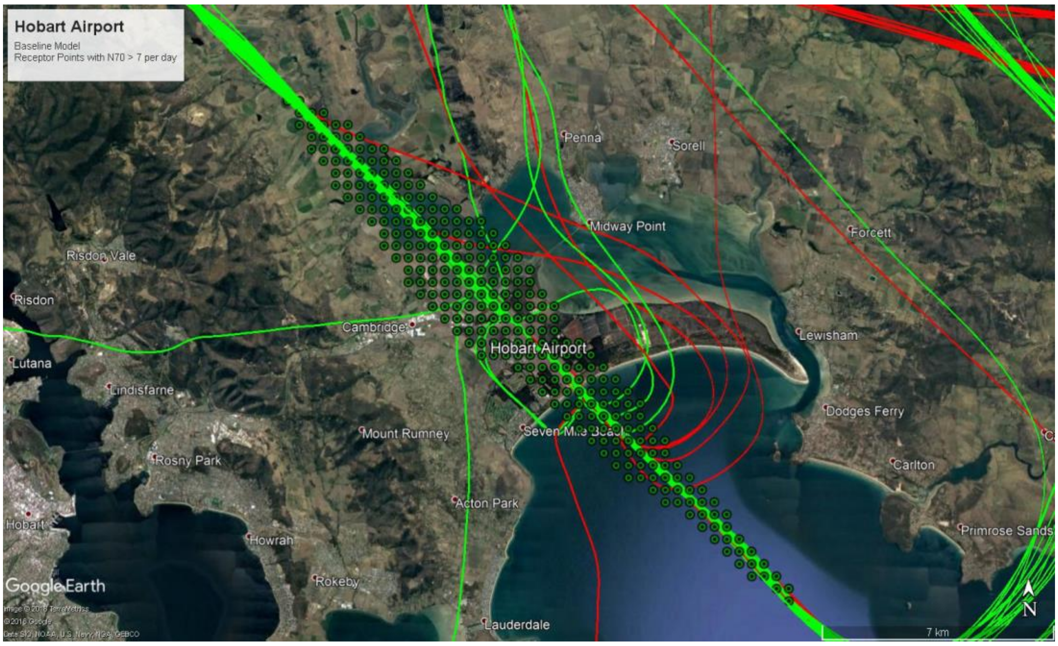


Figure 13: AEDT noise modelling results for existing SIDs and STARs (baseline) at Hobart Airport, showing receptor points (green dots) with more than 7 flights with noise levels of 70dB(A) or above (ie. N70 >7). The existing modelled baseline arrivals are shown in red and departures in green.

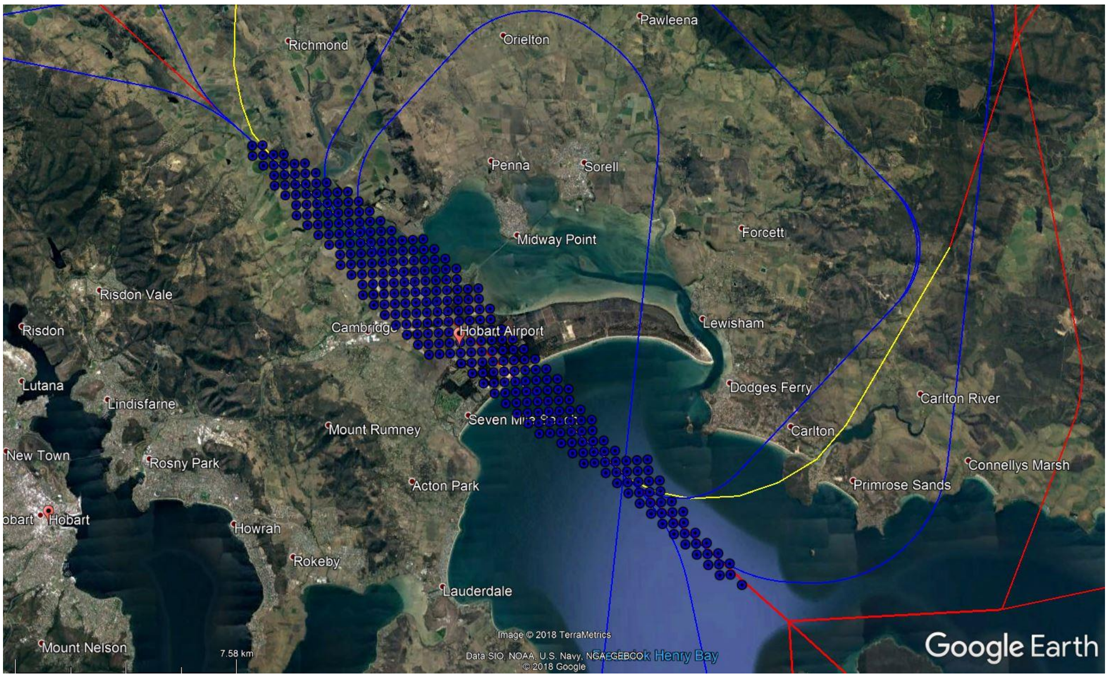


Figure 14: AEDT noise modelling results for HB-ML Arr West alternative at Hobart Airport, showing receptor points (blue dots) with more than 7 flights with noise levels of 70dB(A) or above (ie. N70 >7). Proposed nominal departures paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

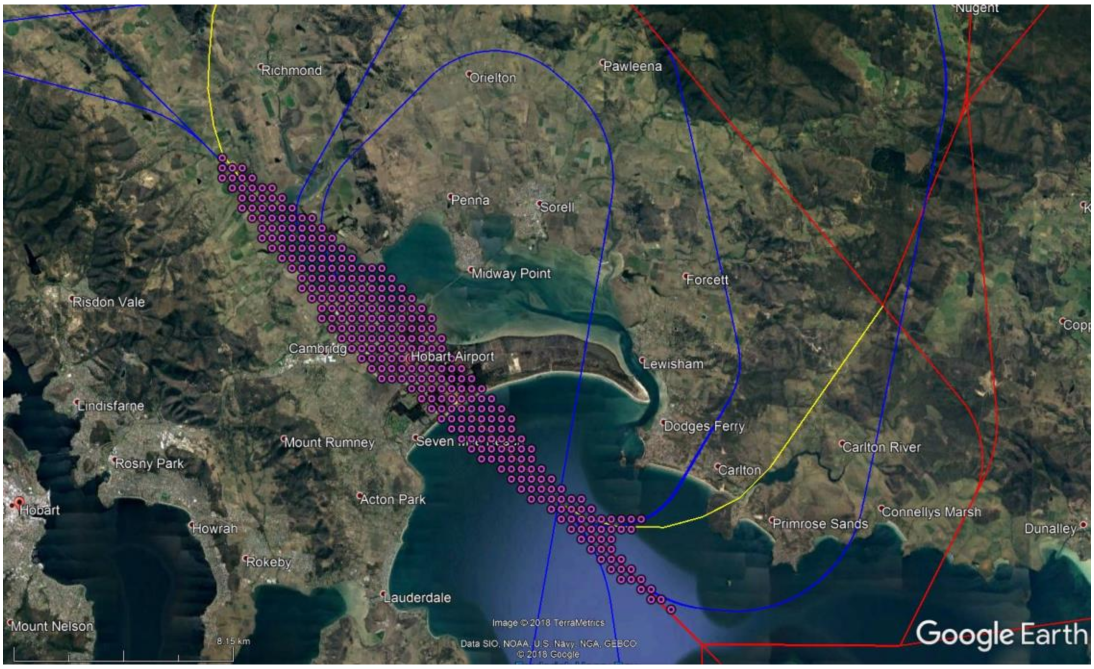


Figure 15: AEDT noise modelling results for HB-ML Arr East alternative at Hobart Airport, showing receptor points (pink dots) with more than 7 flights with noise levels of 70dB(A) or above (ie. N70 >7). Proposed nominal departure paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

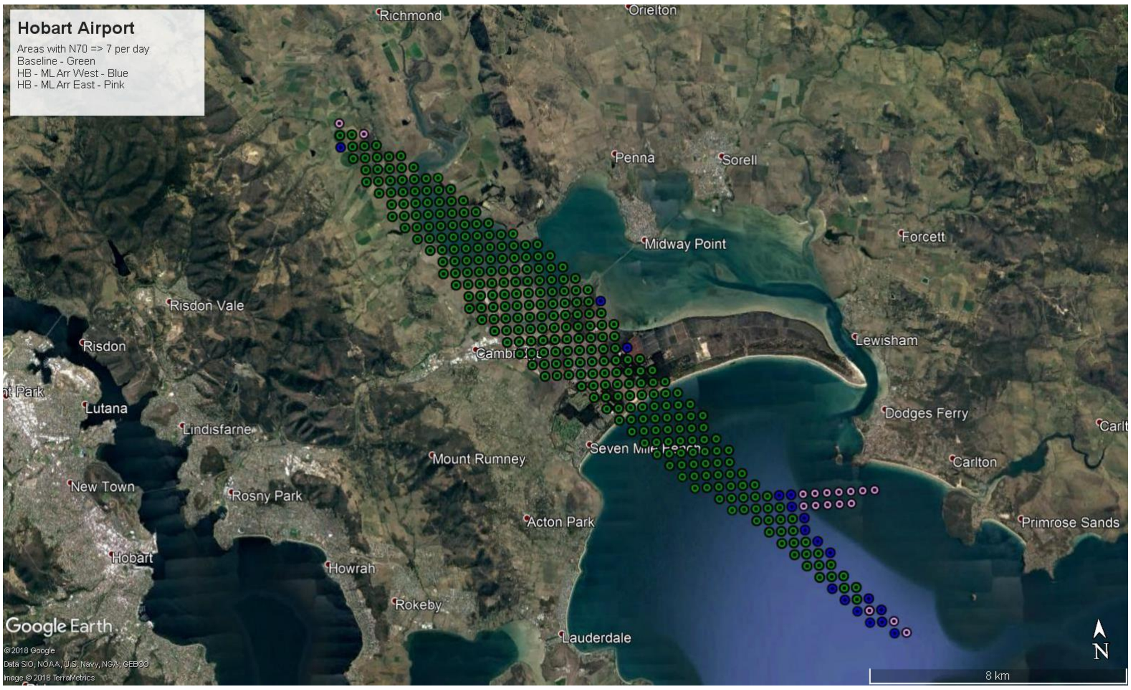


Figure 16: AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots) at Hobart Airport, showing receptor points with more than 7 flights with noise levels of 70dB(A) or above (ie. N70 >7).

As with the N60 analysis above, there are isolated rural residential properties to the north west of Hobart Airport that are shown to be at the level of Airservices threshold levels of potential significance for aircraft noise impacts. However, comparison against the baseline (current situation) indicates that both proposed alternatives are not discernibly different from the current noise levels in this area (as shown in Figure 16 above).

7.2.2 Analysis of newly overflown areas

To further identify any areas of potentially significant environmental impact and to identify any newly overflown residential areas (during day time hours), the N60 >10 criteria has been used, for ‘day time’ operations (ie. 6am to 11pm, as shown in Table 6 above). The N60 >10 contour for the current situation (baseline) extends further than the N60 >33 baseline contour shown in Figure 9 above, and reaches into areas where the noise levels from the proposed alternatives start to differ from the noise levels associated with the existing (baseline) flight paths.

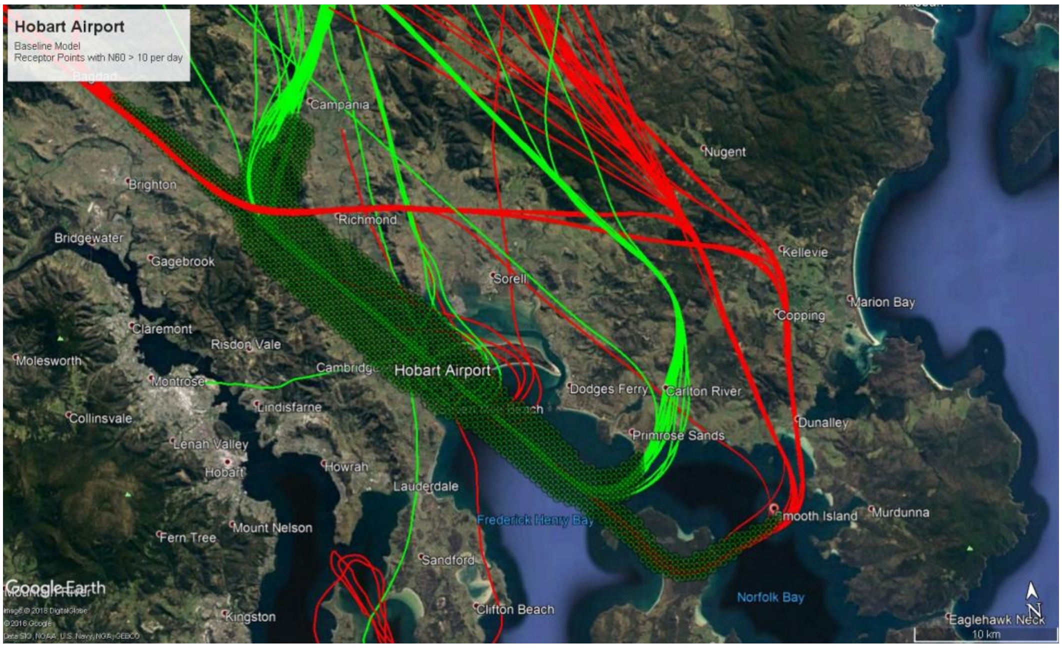


Figure 17: AEDT noise modelling results for existing SIDs and STARs (baseline) at Hobart Airport, showing receptor points (green dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). The existing modelled baseline arrivals are shown in red and departures in green.

Figure 18: Close up of AEDT noise modelling results for existing SIDs and STARs (baseline) at Hobart Airport, showing receptor points (green dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). The existing modelled baseline arrivals are shown in red and departures in green.

Figure 19: AEDT noise modelling results for HB-ML Arr West alternative at Hobart Airport, showing receptor points (blue dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). Proposed nominal departures paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

Figure 20: Close up of AEDT noise modelling results for HB-ML Arr West alternative at Hobart Airport, showing receptor points (blue dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). Proposed nominal departures paths are shown in blue and proposed nominal arrival paths in red and yellow (RNP-AR and visual approaches).

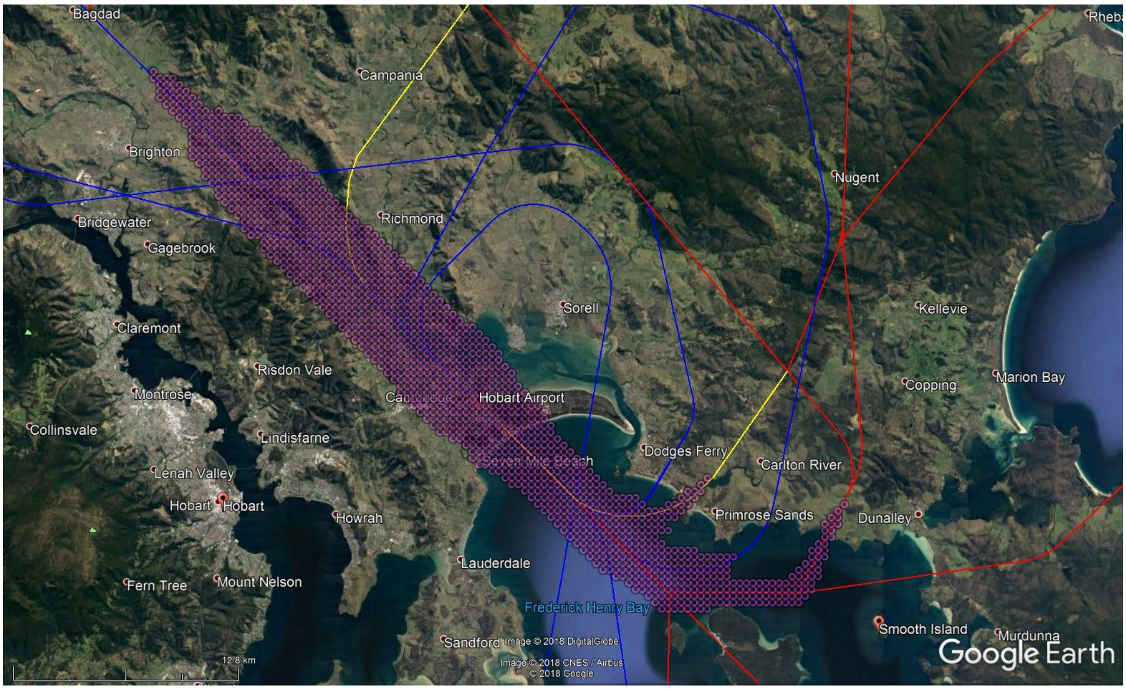


Figure 21: AEDT noise modelling results for HB-ML Arr East alternative at Hobart Airport, showing receptor points (pink dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). Proposed nominal departure paths are shown in blue and proposed nominal arrival paths are shown in red and yellow (RNP-AR and visual approaches).

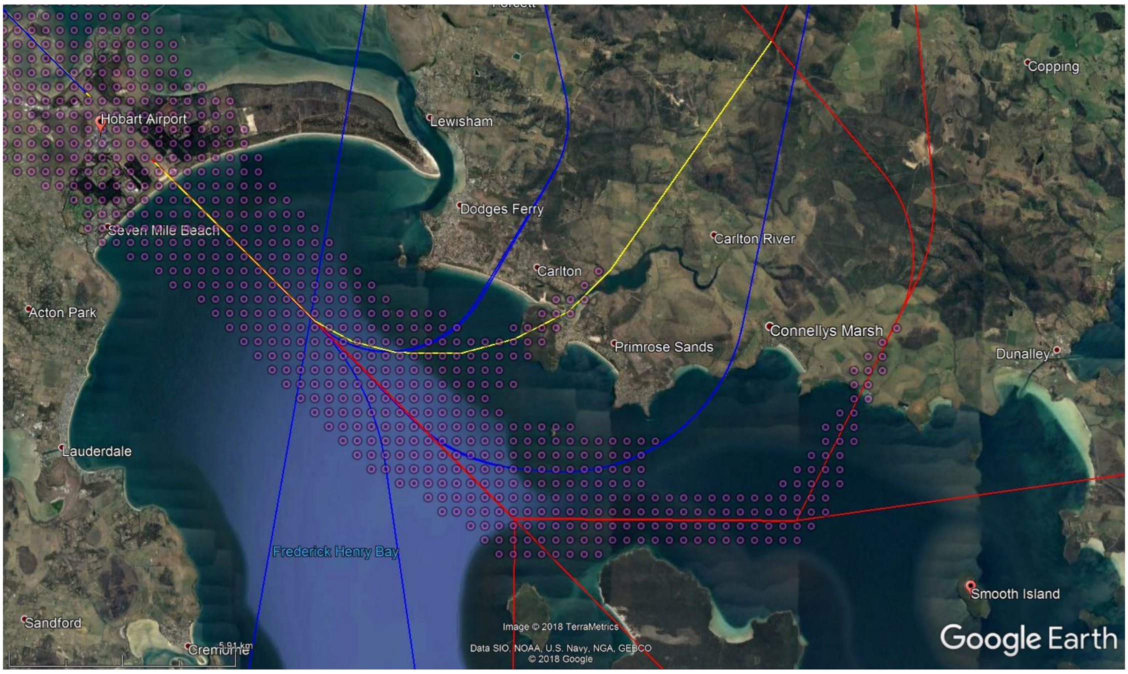


Figure 22: Close up of AEDT noise modelling results for HB-ML Arr East alternative at Hobart Airport, showing receptor points (pink dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10). Proposed nominal departure paths are shown in blue and proposed nominal arrival paths are shown in red and yellow (RNP-AR and visual approaches).

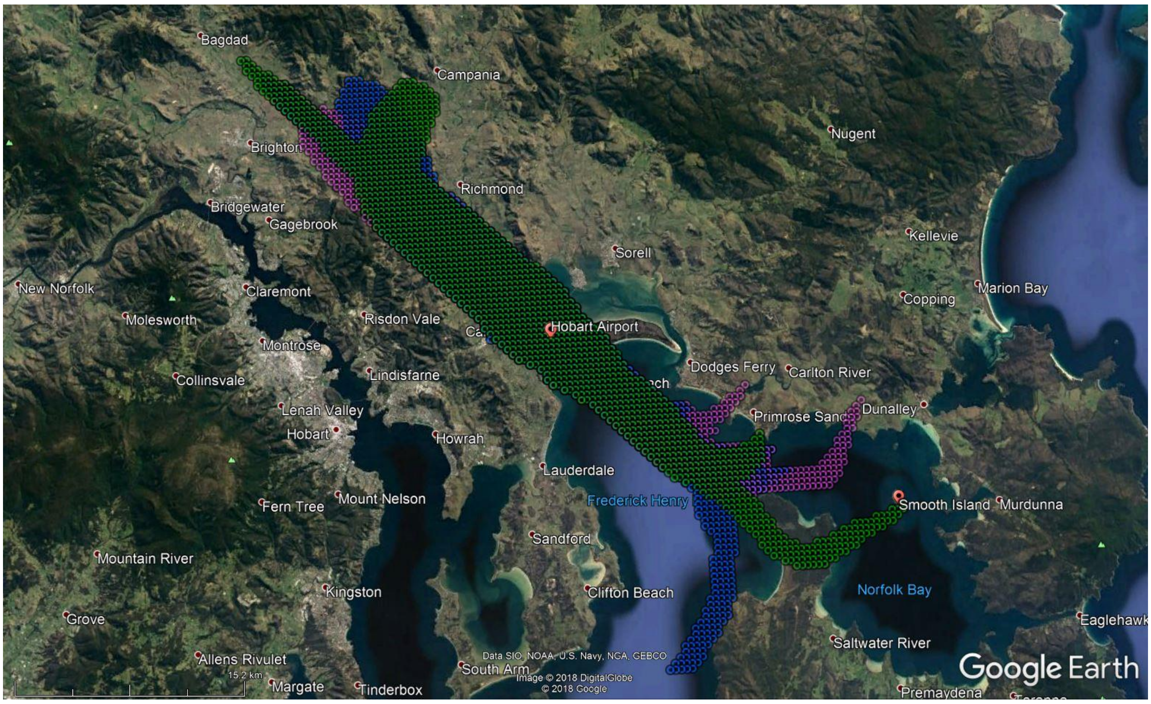


Figure 23: AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots) at Hobart Airport, showing receptor points with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10).

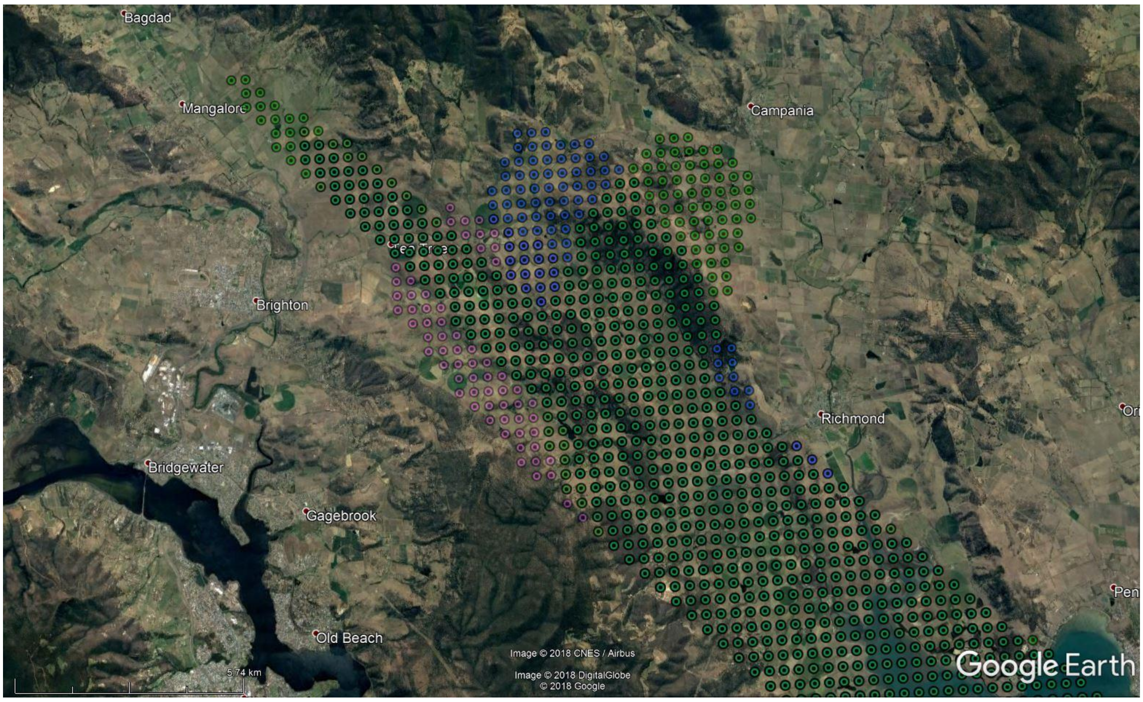


Figure 24: Close up (north) of AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots) at Hobart Airport, showing receptor points with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10).

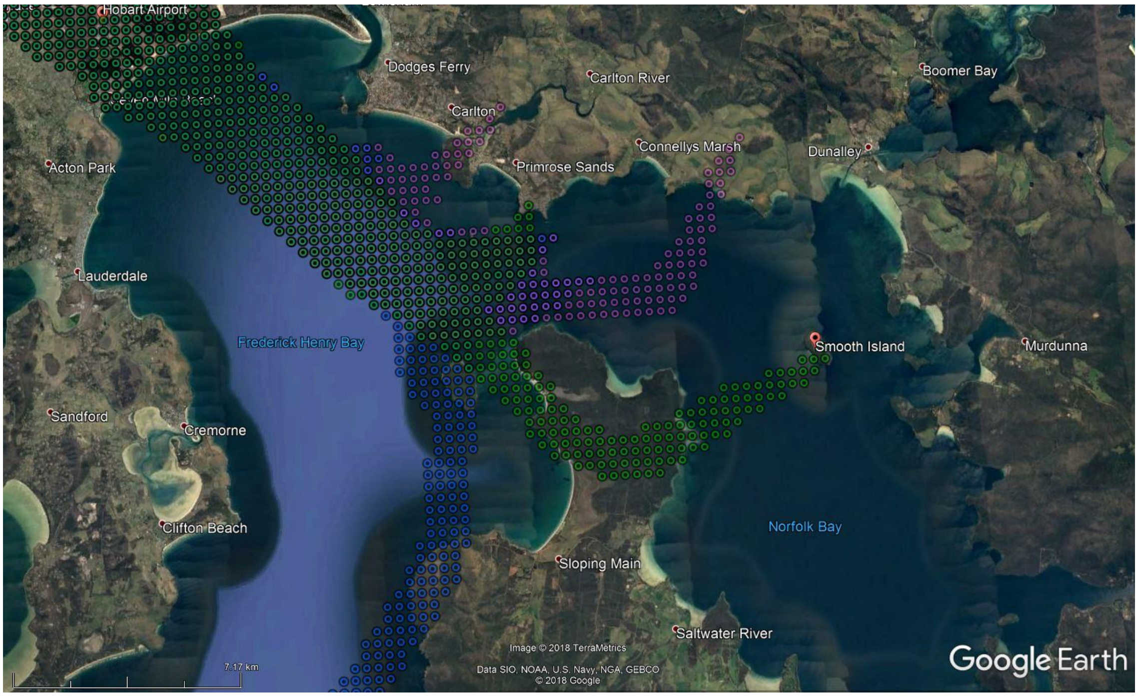


Figure 25: Close up (south) of AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots) at Hobart Airport, showing receptor points with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10).

Analysis of HB-ML Arr West design alternative

The above figures show that in the HB-ML Arr West design alternative, there are some areas to the north-west of the airport with isolated residences (near Tea Tree Road) that can expect more than 10 flights with noise levels of 60dB(A) or above (blue dots). This is due to RWY 30 departures using the proposed HR019 SID. This area has a relatively high level of existing traffic from RWY30 departures and is not considered to be newly overflown. As such, this proposed alternative does not trigger Airservices significance criteria (in Table 6 and Appendix A), in relation to potentially newly overflown communities.

Analysis of HB-ML Arr East design alternative

The above figures show that in the HB-ML Arr East design alternative, some residential areas near Primrose Sands, Carlton and Carlton River can expect more than 10 flights with noise levels of 60dB(A) or above (pink dots). This is due to a proportion of arrival traffic from Melbourne using the proposed HR037 STAR on the shorter RNP/Visual Approach flight path.

To the north west of the airport, the HB-ML Arr East design alternative has aircraft departing from RWY 30 ‘runway aligned’ until 35 km from the runway. This results in receptor points with 10 or more flights at 60dB(A) or above, moving closer to the residential areas of Honeywood and Brighton, compared to the current situation.

To evaluate for newly overflown impacts on Primrose Sands, Carlton and Carlton River, additional data from Airservices NFPMS was extracted for a 3 month period to show all traffic in this area, including Cambridge Aerodrome operations and Hobart

Airport helicopter operations. Figure 26 below shows all operations captured within a 2.5km radius of a nominal point at the mouth of the Carlton River, overlaid with the N60 >10 areas (in pink), presented above.

All of these residential areas (Primrose Sands, Carlton, Carlton River, Honeywood and Brighton) have some level of existing traffic (see Figure 26 below), and are not considered to be newly overflown. As such, this proposed alternative does not trigger Airservices significance criteria (in Table 6 and Appendix A), in relation to potentially newly overflown communities. This is due to a proportion of arrival traffic on the HR037 STAR from Melbourne and the HR003 STAR from Sydney and Brisbane using the RNP-AR or visual termination that tracks via a shorter final approach.

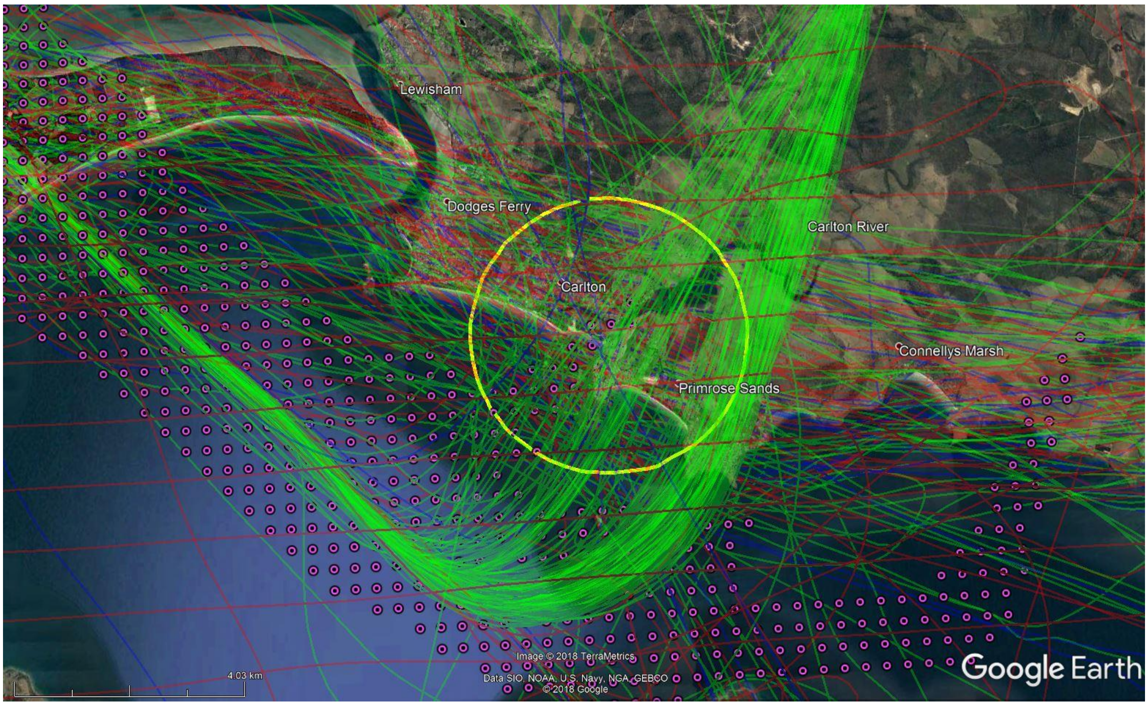


Figure 26: Radar flight tracks from Airservices NFPMS for a 3 month period (January to March 2018), within a 2.5km radius of the Carlton River mouth (shown as the yellow circle), with departures shown in green, arrivals in red and overflights in blue (data extracted on 5/10/2018). Also shown are the AEDT noise modelling results for the HB-ML Arr East alternative at Hobart Airport, showing receptor points (pink dots) with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10).

7.2.3 Noise at sensitive sites

The following section evaluates noise sensitive sites (ie. schools and hospitals) identified using a Google search in the Hobart area, in relation to the proposed design alternatives and the existing SIDs and STARs. The sites are presented in the figure below with the N60 >10 noise contours overlaid for the existing SIDs and STARs, and for each proposed alternative.

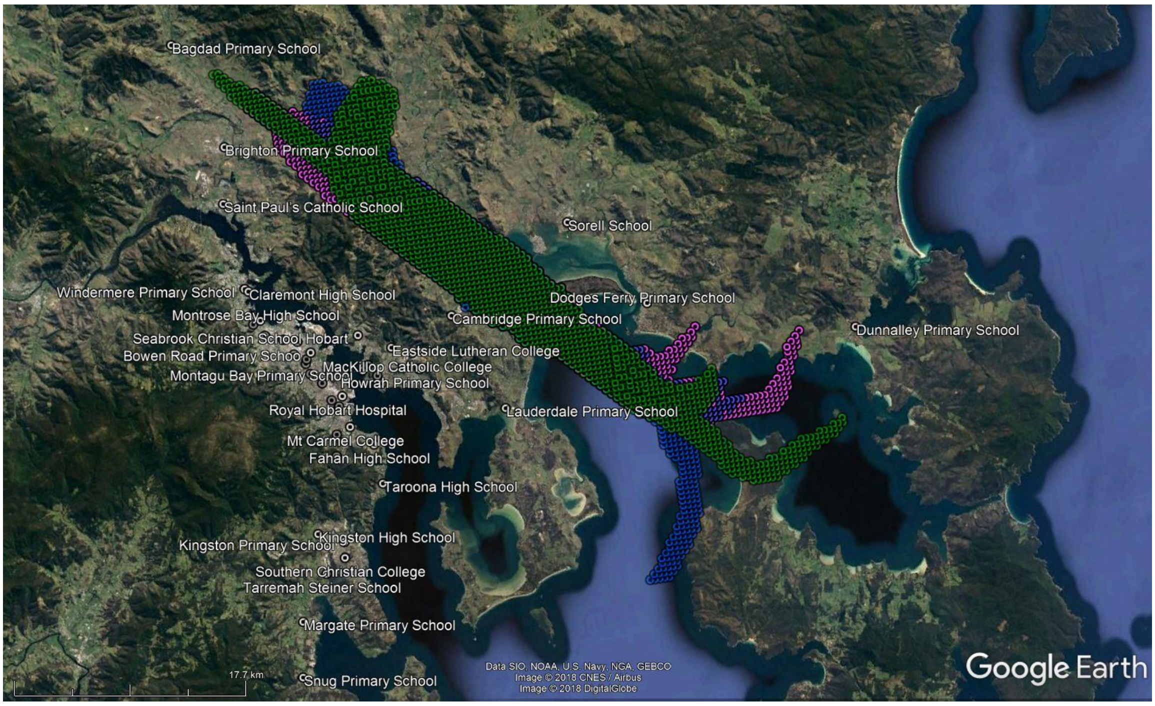


Figure 27: Noise sensitive sites identified around Hobart Airport overlaid with AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots), showing receptor points with more than 10 flights with noise levels of 60dB(A) or above (ie. N60 >10).

Figure 27 above shows that all of the noise sensitive receivers identified around Hobart Airport are outside the N60 >10 contours for the existing SIDs and STARs, and for each proposed alternative. This therefore does not trigger Airservices criteria for potentially significant environmental impact (in Appendix A).

7.2.4 Night time noise evaluation

As described in Section 6.5 above, Hobart Airport generally has a low number of existing night time operations, with the baseline modelling having 3 summer and 7 winter operations per night, during 'night time' hours (defined as 11pm to 6am local time, as per Airservices significance criteria in Appendix A).

Airservices night time criterion for potentially significant environmental impacts in rural residential areas (with a low number of existing overflights) is N60 >2 (ie. 2 or more additional flights with a noise level of 60dB(A) or greater), as shown in Table 6 above and in Appendix A. Figure 28 below presents the N60 >2 (for 11pm to 6am) noise receptor points for the existing SIDs and STARs, and for each proposed alternative – as generated by the AEDT model.

To the north and west of the airport, the night time noise contours for each alternative cover a very similar area as the existing situation (baseline), as shown in Figure 28 below. Therefore, neither alternative is expected to result in any major changes from the existing situation (in relation to night time movements), nor cause any potentially significant environmental impact.

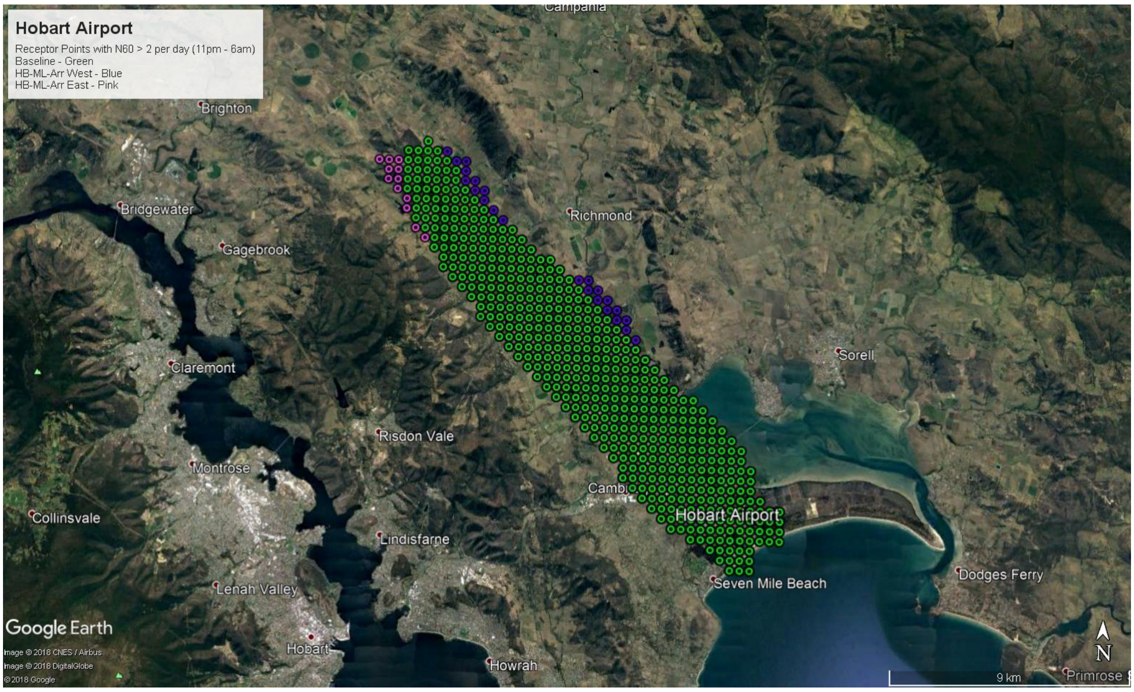


Figure 28: AEDT noise modelling results for current situation (green dots), the HB-ML Arr West alternative (blue dots), and the HB-ML Arr East alternative (pink dots) at Hobart Airport, showing receptor points with more than 2 flights with noise levels of 60dB(A) or above (ie. N60 >2) during night time hours (11pm to 6am).

7.2.5 Noise under holding patterns

Noise-power-distance (NPD) data from the US FAA's Integrated Noise Model (INM), v7.0d has been used in this assessment to estimate noise levels associated with proposed new holding patterns at different altitudes.

As described in the INM v7.0d User's Guide (US FAA 2007, p.285), '*the noise-power-distance (NPD) data (…) in INM were developed according to a rigid set of field measurement and data reduction criteria*', which is deemed by Airservices to have sufficient rigour to be used for the purpose of estimating noise levels at different altitude levels. Where multiple NPD entries exist for different thrust settings, the mid-range or higher level thrust settings have been used, as they represent the worst-case scenario.

Table 7 – Estimation of noise levels from two representative aircraft type for proposed new holding patterns at Hobart Airport (source: US FAA's INM, v7.0d).

	Airbus A320-232	**Boeing B737-800**
NPD data	**Arrival thrust setting 6,000 pounds**	**Arrival thrust setting 7,000 pounds**
Altitude ft	**Noise Level dB(A)**	**Noise Level dB(A)**
4,000	58	61.5
6,300	51.9	55.2
10,000	45	48.7
16,000	37.2	41.8
25,000	29.1	34.5

The altitudes for the proposed new holding patterns shown in Table 1 range from 4,000-20,000ft. As shown in Table 7, the noise levels at similar altitudes (except where the altitude is 4,000 ft for the B737-800 aircraft) are all less than 60dB(A), Airservices threshold for potentially significant environmental impact.

At two holding patterns, BUSKA and IAF01, where the altitude levels range between 4,000- 5,500 ft, noise levels could potentially be above 60dB(A) for B738 aircraft types, assuming aircraft are flying at maximum thrust (to maintain altitude on a continuous level segment).

The IAF01 holding pattern is mostly over water but overflies Smooth Island while for BUKSA, nearby communities include Elderslie, Broadmarsh and Mangalore. However, operational data sources indicate that these holding patterns would only be used highly infrequently at Hobart Airport, approximately only once in six months (source: Hobart ATC, 15 Oct 2018). As such, the highly infrequent number of movements on these proposed new holding patterns does not trigger the Airservices threshold for potential significance (Appendix A).

8 Further environmental assessment

8.1 Matters of National Environmental Significance (MNES)

Matters of National Environmental Significance (MNES) were identified below the areas of the proposed changes using the Commonwealth Department of Environment and Energy (DoEE) Protected Matters Search Tool. The MNES search was divided into areas within and outside a 25km radius of Hobart Airport.

The arbitrary 25km radius was chosen on the basis that it would be unlikely any impacts would be experienced beyond that distance, based on the altitude (and associated noise levels) of both departing aircraft (estimated at above 6,000 ft) and arriving aircraft (estimated at 3,000ft or more).

Closer to the final approach, and at lower altitudes, aircraft will generally be flying the same path for arrivals and are not likely to fly over new areas. As such, it is unlikely that there will be any newly exposed areas for arrivals within the 25km radius.

For departures, aircraft outside the 25km radius are well above 6,000ft altitude, and up to 10,000ft, depending on the length of the flight segment. As such, departing aircraft are unlikely to cause any potentially significant impacts on wildlife, for either proposed alternative.

The STAR segment over the east coast via Schouten Island (part of both the two alternatives) and the STAR segment over the western side of Mt Wellington, west of Hobart City (part of the ML-HB Arr West alternative only) are not currently under the existing SIDs and STARs. The MNES search also concentrates on these areas that were not previously under any existing SID or STAR but potentially overflown by GA aircraft. Figure 29 below shows the existing SIDs and STARs, the proposed HB-ML Arr West design alternative and the proposed HB-ML Arr East alternative, as well as the 25km radius MNES search area.

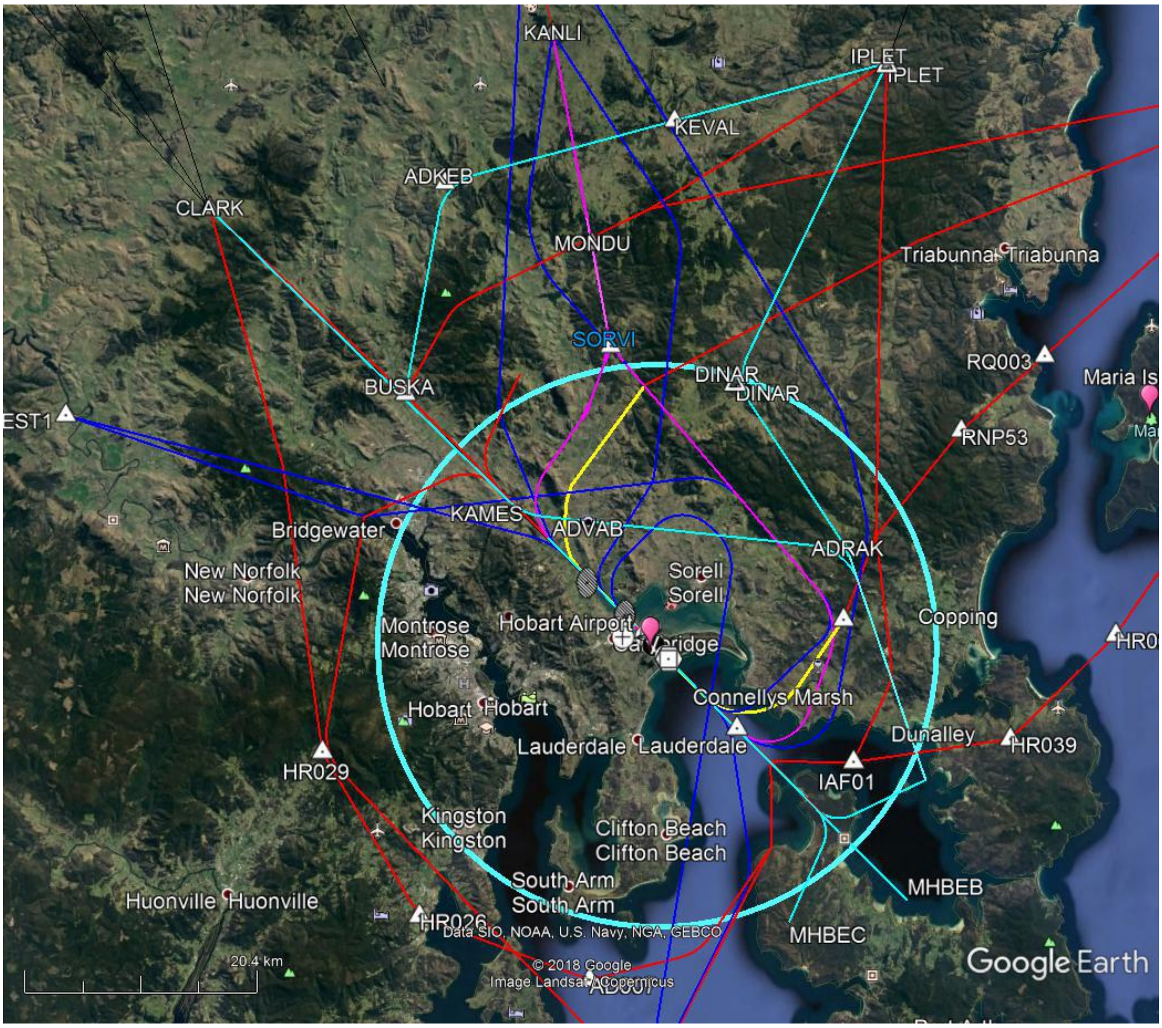


Figure 29: Existing SIDs and STARs at Hobart Airport, the proposed HB-ML Arr West alternative, the proposed HB-ML Arr East alternative, and the 25km radius MNES search area.

The MNES assessment also identified areas that are currently exposed to existing aircraft overflights. Figure 30 below shows the current aircraft overflights for two randomly selected two week periods in March and July 2018. As shown in Figure 30, there are no areas within the 25km radius MNES search area that can be considered to be newly overflown, for the purpose of this MNES analysis.

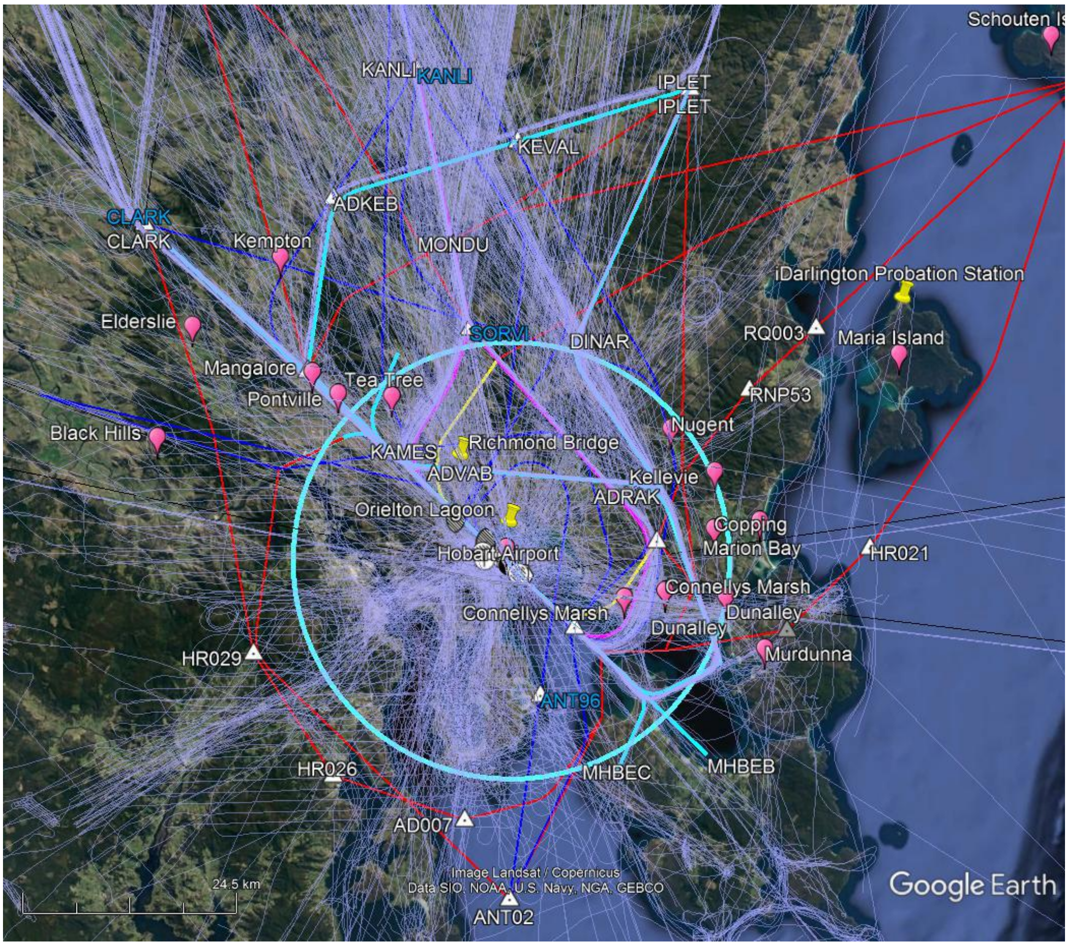
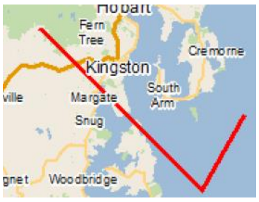
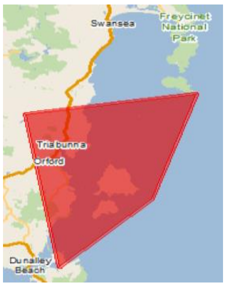


Figure 30: Existing SIDs and STARs at Hobart Airport, the proposed HB-ML Arr West alternative, the proposed HB-ML Arr East alternative, and the 25km radius MNES search area, together with radar tracks over two randomly selected periods, 1-15 March and 1-15 July 2018 (source: Airservices NFPMS 9/10/2018).

In total, areas below four segments (related to both alternatives) were identified for a more detailed MNES search. These areas are shown as A, B, C and D in Table 8, below. The search results are also summarised in the table below, with an extract of the search results included in Appendix D.

Table 8 - Summary of MNES in the areas below the proposed changes to the SIDs and STARs at Hobart Airport.

	Number of MNES that may occur in area of proposed flightpath change Area A	Number of MNES that may occur in area of proposed flightpath change (Mt Wellington) Area B	Number of MNES that may occur in area of proposed flightpath change Area C	Number of MNES that may occur in area of proposed flightpath change (East Coast) Area D
Map of area		 (Area B, which appears as a red line above, is 3km wide)		
Proposed design alternatives	HB-ML Arr West and HB-ML Arr East	HB-ML Arr West	HB-ML Arr West and HB-ML Arr East	HB-ML Arr West and HB-ML Arr East
Wetlands of International Importance	1 (Pitt Water - Orielton Lagoon)	0	1 (Pitt Water - Orielton Lagoon)	0
Great Barrier Reef Marine Park	0	0	0	0
Commonwealth Marine Area	0	0	0	0
Listed Threatened Ecological Communities	1	4	3	4
Listed Threatened Species	59	59	67	71
Listed Migratory Species	47	33	48	40
Critically Endangered Species	7 (Curlew Sandpiper, Great Knot, Swift Parrot, Bar-tailed Godwit, Eastern Curlew, Spotted Handfish, Red Handfish)	7 (Curlew Sandpiper, Swift Parrot, Bar-tailed Godwit, Eastern Curlew, Spotted Handfish, Red Handfish, Ammonite Snail)	8 (Curlew Sandpiper, Great Knot, Swift Parrot, Bar-tailed Godwit, Eastern Curlew, Spotted Handfish, Red Handfish, Ammonite Snail)	5 (Curlew Sandpiper, Swift Parrot, Bar-tailed Godwit, Eastern Curlew, Red Handfish)
Critical Habitats	0	0	0	0

	Number of MNES that may occur in area of proposed flightpath change Area A	Number of MNES that may occur in area of proposed flightpath change (Mt Wellington) Area B	Number of MNES that may occur in area of proposed flightpath change Area C	Number of MNES that may occur in area of proposed flightpath change (East Coast) Area D
	Summary of heritage locations identified in the areas below the proposed changes to the SIDs and STARs at Hobart Airport, as identified in the MNES search			
World Heritage Properties	0	0	0	2 (Darlington Probation Station and Darlington Probation Station Buffer Zone) on Maria Island
National Heritage Places	0	0	1 (Richmond Bridge)	1 (Darlington Probation Station)
Commonwealth Heritage Places	0	0	0	0

In the MNES search performed above, of note are the Wetlands of International Importance relating to the Pitt Water-Orielton Lagoon (shown as yellow pin in Figure 30), which is also a 'Ramsar site' (ie. a wetland site designated to be of international importance under the Ramsar Convention). However, this wetland is already exposed to overflights (as shown in Figure 30), and is therefore not expected to be significantly impacted by either of the proposed alternatives.

As identified in Table 8 above, there were up to 71 listed threatened species identified in Area D, including a number of critically endangered fauna. A list of all the threatened species is shown in the MNES results uploaded into Airservices CIRRIS incident reporting and change management system. No critical habitats were identified within the areas of the MNES search. The Species Profile and Threats Database (http://www.environment.gov.au/cgi-bin/sprat/) was used to consider any potential impacts upon these species.

Of the critically endangered specifies listed in Table 8, none were identified in the Recovery Plans as being particularly sensitive to noise disturbance, including aircraft noise (Commonwealth Department of Environment, Land, Water and Planning, 2016). As the Recovery Plans do not determine noise levels which may induce stress (or include any associated actions), it is not possible to make any further assessment of the potential impacts of the proposed changes on the listed species. However, it is unlikely that the proposed flight path changes will have a potentially significant impact on any of the critically endangered species, as the areas under the proposed changes are already exposed to existing overflights, as shown in Figure 30.

8.2 Matters of indigenous heritage and cultural significance

The Mouheneenner people are acknowledged as the traditional owners of the areas below the proposed changes. As indicated above in Table 8, there were two National

Heritage Places and one World Heritage Property identified in the MNES searches conducted. However, no sites of particular importance to the Mouheneenner people that could be potentially impacted by the proposed changes, were identified in the MNES search.

8.2.1 Potential impacts of aircraft noise on wildlife

This EA draws on literature from both Australia and overseas to further understand the potential impacts of aircraft noise on fauna, particularly bird species. The impact of aircraft noise has been studied in several bird species on the UK Priority Species (PS) and Species of Principal Importance (SPI) lists (Burger 1981; Ellis & Ellis 1991).

The biggest constraint to studies on impacts of aircraft on wildlife has been how to eliminate confounding factors without experimental manipulation of the noise source. It is particularly difficult to isolate noise as a single testable variable responsible for any observed impacts on the test species. A lot of studies, being field-based and generally observational, therefore do not provide great weight when drawing conclusions about the impact of aircraft noise on UK wildlife.

Most research addressing the effects of anthropogenic noise has focused on avian communication and, and less on impact of chronic noise exposure on non-vocal behaviour such as anti-predator behaviour (Meillère, A *et al*., 2015)

A study by Ellis and Ellis (1991) estimated the effects of low-level military jet aircraft and mid- to high-altitude sonic booms (actual and simulated) on nesting peregrine falcons and found no conclusive evidence on impacts on the reproductive performance of the species.

Similar studies that have been conducted on noise intrusion on avian behaviour do not necessarily support that aircraft noise negatively impacts the breeding success and fitness of bird populations. The results of the research reviewed in previous studies indicates no difference in breeding success between noise affected birds and non-noise affected birds. Other studies have suggested that, when subject to noise, behavioural plasticity (adaption to environment) contributes to breeding resilience. A review by Ortega (2012), has shown that for vehicular transport, some birds can compensate for the masking effect of noise through shifts in vocal amplitude, song and call frequency, and song component redundancies, as well as temporal shifts to avoid noisy rush-hour traffic.

One experiment exposed free-living house sparrows (*Passer domesticus*) breeding in nest-boxes to either a playback of vehicular traffic noise (disturbed birds) or the rural background noise of the study site (no playback: control birds), during their first breeding attempt (Meillère, A *et a*l., 2015). The study tested whether one of the female's anti-predator behaviours (ie. flushing distance) was affected by exposure to chronic noise and investigated the impact of chronic noise on reproductive performances. Disturbed females flushed more rapidly than controls, suggesting that birds may compensate for reduced ability to detect predators with increased vigilance. However, the study found no significant effect of exposure to chronic vehicular noise on reproductive performance. The findings of this study did show that chronic noise exposure can affect the anti-predator behaviour of a breeding bird.

Studies on UK PS and SPI, however, provide an overwhelming lack of strong evidence for, or against noise impacts.

A report commissioned by Airservices in 2013 included a field study of avian fauna in the Gold Coast area, with a particular focus on how birds respond to noise disturbance from aircraft overflights (Sandpiper Ecological Surveys, 2013). Key conclusions from this study included:

- Jet aircraft overflights are unlikely to have a negative effect on birds at Fingal Head, as there is enough time between overflights to enable auditory communication.
- Wildlife populations, in particular birds, can habituate to noise, including aircraft noise.

8.3 Emissions analysis

The AEDT models used to carry out noise modelling for this assessment were also used to carry out an emissions analysis of the existing SIDs and STARs at Hobart Airport, and each proposed alternative. The total emissions for the current situation (baseline) and each alternative were calculated (using ‘busy day’ traffic numbers) for the arrival phase of flight (descent below 10,000ft), departure phase of flight (climb up to 10,000 ft) and the overall totals.

AEDT uses the following publically available and internationally recognised methods for aircraft emissions modelling (AEDT Technical Manual, Version 2d September 2017).

- The Boeing Fuel Flow Method 2 (BFFM2) 33 is used to compute oxides of nitrogen (NOx), hydrocarbons (HC), and carbon monoxide (CO);
- A first order approximation (FOA) of 3.034 is used to compute particulate matter (PM) below the mixing height;
- Fuel composition-based factors are used to compute sulphur oxides (SOx), carbon dioxide (CO_2), and water vapour (H_2O), in addition to PM above the mixing height; and
- Derivative factors are used to compute non-methane hydrocarbons (NMHCs), volatile organic compounds (VOCs) and Total Organic Gases (TOGs).

Table 9 – AEDT fuel burn, distance and emissions calculations for 'busy day' arrivals (descent below 10,000 ft) for the existing SIDs and STARs at Hobart Airport, and each of the proposed alternative designs (HB–ML Arr West and HB–ML Arr East) – during winter and summer seasons.

Alternative	Existing SIDs and STARs	HB-ML Arr West	HB-ML Arr East	Existing SIDs and STARs	HB-ML Arr West	HB-ML Arr East
Season	Winter	Winter	Winter	Summer	Summer	Summer
Fuel (kg)	8,641	8,626	8,635	9,760	9,831	9,935
Distance (km)	1,365	1,365	1,365	1,508	1,508	1,543
CO (kg)	221	222	221	252	245	246
HC (kg)	28	28	28	32	32	32
TOG (kg)	32	32	32	37	37	37
VOC (kg)	32	32	32	36	37	37
NMHC (kg)	32	32	32	37	37	37
NOx (kg)	62	61	61	68	69	69
CO_2 (kg)	27,263	27,216	27,242	30,794	3,1017	31,344
H_2O (kg)	10,689	10,671	10,681	12,073	12,161	12,289
SOx (kg)	10	10	10	11	12	12

Table 10 – AEDT fuel burn, distance and emissions calculations for 'busy day' departures (climb below 10,000 ft) for the existing SIDs and STARs at Hobart Airport, and each of the proposed alternative designs (HB–ML Arr West and HB–ML Arr East) – during winter and summer seasons.

Alternative	Existing SIDs and STARs	HB-ML Arr West	HB-ML Arr East	Existing SIDs and STARs	HB-ML Arr West	HB-ML Arr East
Season	Winter	Winter	Winter	Summer	Summer	Summer
Fuel (kg)	19,824	19,823	19,813	21,936	22,009	22,011
Distance (km)	854	889	854	936	903	903
CO (kg)	271	280	271	270	254	254
HC (kg)	25	25	25	21	22	22
TOG (kg)	29	29	29	25	25	25
VOC (kg)	29	29	29	25	25	25
NMHC (kg)	29	29	29	25	25	25
NOx (kg)	270	270	270	327	327	327
CO_2 (kg)	62,545	62,541	62,512	69,208	69,437	69,443
H_2O (kg)	24,522	24,521	24,509	27,135	27,225	27,227
SOx (kg)	23	23	23	26	26	26

In the above emissions calculations, some differences can be seen in the quantity of fuel burn and emissions estimated between the winter and summer seasons – this is largely due to different traffic numbers and different aircraft operating conditions. As expected, there are significant differences in fuel burn and emissions calculated for the arrival and departure phases of flight – this is largely due to higher thrust settings and much larger quantities of fuel required during the departure phase of aircraft operations. However, as shown in the summary totals in Table 11 below, there is no distinct difference between fuel burn and emissions on the existing SIDs and STARs (baseline), and either proposed alternative.

Table 11 – Summary table for total 'busy day' fuel burn and CO_2 emissions below 10,000 ft for the existing SIDs and STARs at Hobart Airport, and each of the proposed alternative designs (HB–ML Arr West and HB–ML Arr East).

Total * (winter + summer busy days)	Existing SIDs and STARs (baseline)	HB-ML Arr West	HB-ML Arr East
Total fuel burn (tonnes)	60.2	60.3	60.4
Total CO_2 (tonnes)	189.8	190.2	190.5
% increase from baseline	0%	+0.21%	+0.39%

**Note: the totals in Table 11 are based on a summer and winter busy day, summing climb and descent to/from 10,000ft.The data is for comparative purposes only*

9 Social data analysis

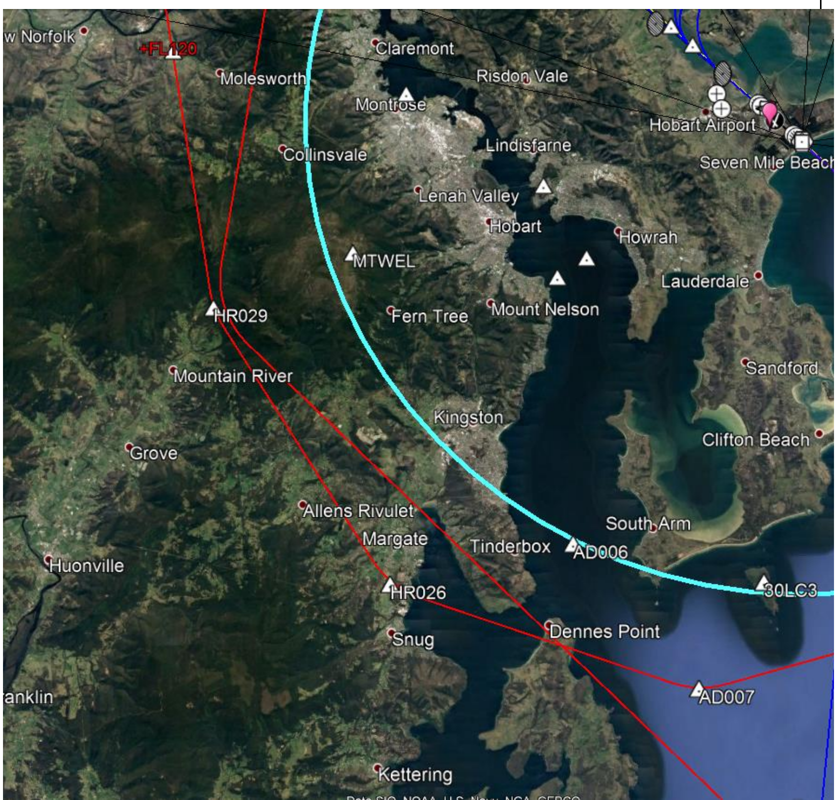
9.1 Initial review

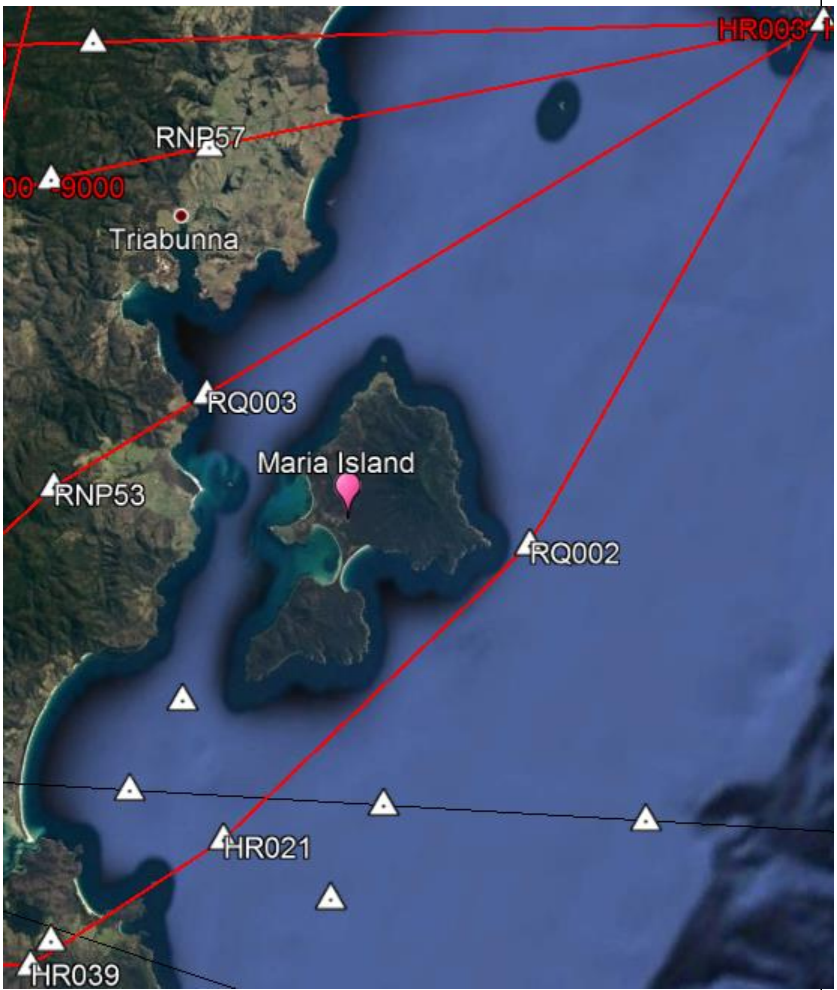
A multitude of design alternatives were identified as part of the initial review of the proposed new SID and STAR designs for Hobart Airport. Following a number of iterations, two alternatives, HB-ML Arr West and HB-ML Arr East, were progressed for detailed environmental assessment.

9.2 Potential visual impacts of proposed SID and STAR design alternatives

Table 12 summarises the communities that may notice a visual change in aircraft tracking and/or noise levels associated with the two proposed design alternatives at Hobart Airport.

Table 12 – Summary of communities potentially affected by visual impacts associated with the two proposed design alternatives at Hobart Airport (HB-ML Arr West and HB-ML Arr East).

Description of proposed change and potential visual and noise impacts	Google Earth image of proposed change
HB-ML Arr West CLARK STAR In this design alternative, it is proposed to shift the CLARK STAR to track over the western side of Mt Wellington, following the waypoints HR029, HR026, and AD007. This would potentially overfly new areas such as New Norfolk, Molesworth, Mountain River, Allens Rivulet, Tinderbox, and Dennes Point. At New Norfolk, aircraft would be above 12,000ft in altitude, to as low as 8,000 ft at Dennes Point. The expected number of daily movements could be up to 20 per day in winter and 14 per day in summer, as this is the main STAR utilised by traffic arriving from Melbourne (approximately 60% of arrivals to Hobart). The expected altitude of aircraft on the proposed new flight path would not result in noise levels above 60dB(A), the threshold that would trigger potential significance under the Airservices criteria in Appendix A. However, due to low ambient noise levels in these rural residential communities, aircraft noise levels are likely to be audible. The communities under this flight path are not expected to be significantly impacted by any increase in aviation noise, however, they may notice a visual difference in the way aircraft are tracking and this could be a source of annoyance to the affected communities.	

Description of proposed change and potential visual and noise impacts	**Google Earth image of proposed change**
HB-ML Arr West and HB-ML Arr East HR003 STAR This alternative has Sydney and Brisbane arrivals tracking off the east coast of Tasmania. This would potentially overfly new areas, such as the Schouten Islands, Maria Island, Rheban, and Triabunna. Areas such as Dunalley, Copping, Marion Bay and Boomer Bay, while not directly under any of the proposed flight path, would likely notice aircraft newly tracking along the east coast at distances up to 10km away. The expected number of daily movements at HR003 would be 6 movements per day in summer and 11 per day in winter, on a busy day. In both design alternatives, arrivals from Sydney and Brisbane would be split north (approximately 30%) and south (approximately 70%) of Maria Island on the RNP-AR and RNAV approaches respectively). This would result in 4 arrivals in summer and 8 arrivals in winter tracking south of Maria Island, and 2 arrivals in summer and 3 arrivals in winter, tracking north of Maria Island. At Triabunna and Maria Island, aircraft would be above 12,000 ft in altitude, but as low as 7,000 ft at RNP53 and 5,800 ft at HR039 waypoint. The expected altitude of aircraft on the proposed new flight paths would not result in noise levels above 60dB(A), the threshold that would trigger potential significance under the Airservices criteria in Appendix A. However, due to low ambient noise levels in these communities, the aircraft noise is likely to be audible. The communities under these flight paths are not expected to be significantly impacted by any increase in aviation noise, however, they may notice a visual difference in the way aircraft are tracking and this could be a source of annoyance to the affected communities.	

<table>
<tr><th>Description of proposed change and potential visual and noise impacts</th><th>Google Earth image of proposed change</th></tr>
<tr><td>

HB-ML Arr East

HR037 STAR HB-ML Arr East

This area is between south of HR044 and IAF01 on the adjoining image.

The expected number of daily movements could be up to 20 per day in winter and 14 per day in summer, as this would be the main STAR for arrivals from Melbourne.

The expected altitude of aircraft on the proposed flight path near Connellys Marsh and Dunalley would be below 5,000ft and likely to result in noise levels above 60dB(A). This noise level does not trigger Airservices significance criteria (due to the number of movements being below the threshold), but would be noticeable to residents in this area, who would also notice a visual difference in the way aircraft are tracking. This is likely to be a source of annoyance to the affected residents.

This area, midway between Dunalley and Connellys Marsh, already experiences arrival overflights related to the existing STARs.

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HB-ML Arr West and HB-ML Arr East

HR003 STAR

A segment of the HR003 STAR would track between Murdunna and Dunalley, between IAF01 and HR039 waypoints, as shown in the adjoining figure.

Over the area midway between Dunalley and Murdunna, aircraft would be expected to be between 5,000ft and 6,000 in altitude (over the west coast of Norfolk Bay).

The expected altitude of aircraft on the proposed new flight path would not result in noise levels above 60dB(A), the threshold that would trigger potential significance under the Airservices criteria in Appendix A. However, due to low ambient noise levels in these communities, the aircraft noise is likely to be audible. The communities under this flight path are not expected to be significantly impacted by any increase in aviation noise, however, they would notice a visual difference in the way aircraft are tracking and this could be a source of annoyance to the affected communities.

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Dunalley and Murdunna are mid-way (approximately 4 km from the flight path) between the nominal track from the east.

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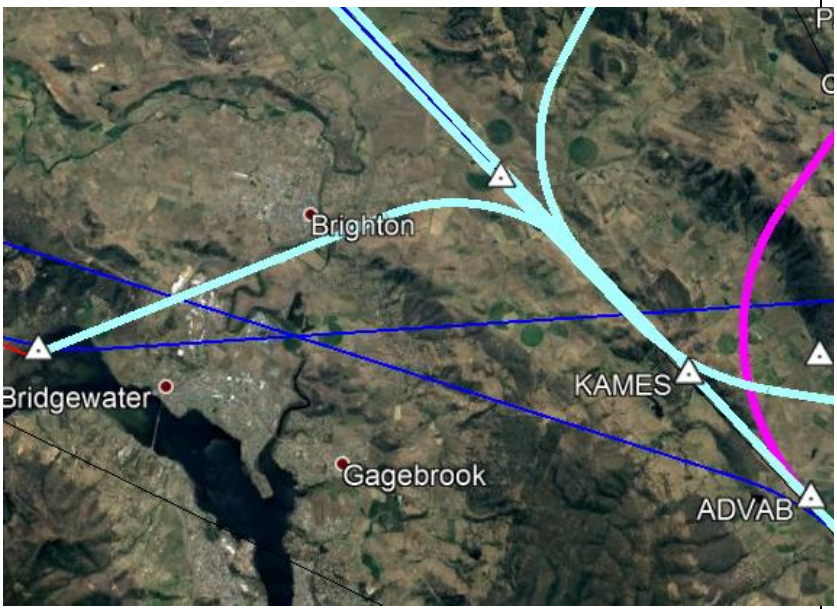
Description of proposed change and potential visual and noise impacts	Google Earth image of proposed change
HB-ML Arr West and HB-ML Arr East The area of the proposed change includes all RWY 12 SIDs (jets on the wider turn, and turbo-props on the tighter turn) for both design alternatives and the RNP-AR/Visual approach for both design alternatives. The expected altitude of aircraft on the proposed new flight paths in this area would be below 5,000ft and is likely to result in noise levels above 60dB(A). This noise level does not trigger Airservices significance criteria (as the number of movements is below the threshold for potential significance), but would be noticeable to the communities in this area, who would also notice a visual difference in the way aircraft are tracking. This is likely to be a source of annoyance to the affected communities. This area, including Lewisham, Forcett, Dodges Ferry, Carlton, Carlton River and Primrose Sands already experience, or have experienced, both departure and arrival overflights. However, these communities would notice a substantial change in the way aircraft track to and from Hobart Airport, as a result of either of the proposed alternatives.	
HB-ML Arr West and HB-ML Arr East WEST1 SID The communities of Bridgewater and Gagebrook would audibly notice departures on the WEST1 SID. The altitude of aircraft over this area would be above 6,000ft and would only include some occasional flights of less than 5 per week. However, due to the low number of movements, noise levels in this area do not trigger Airservices significance criteria. These communities are not expected to be significantly impacted by any increase in aviation noise, however, they may notice an audible and visual difference in the way aircraft are tracking.	

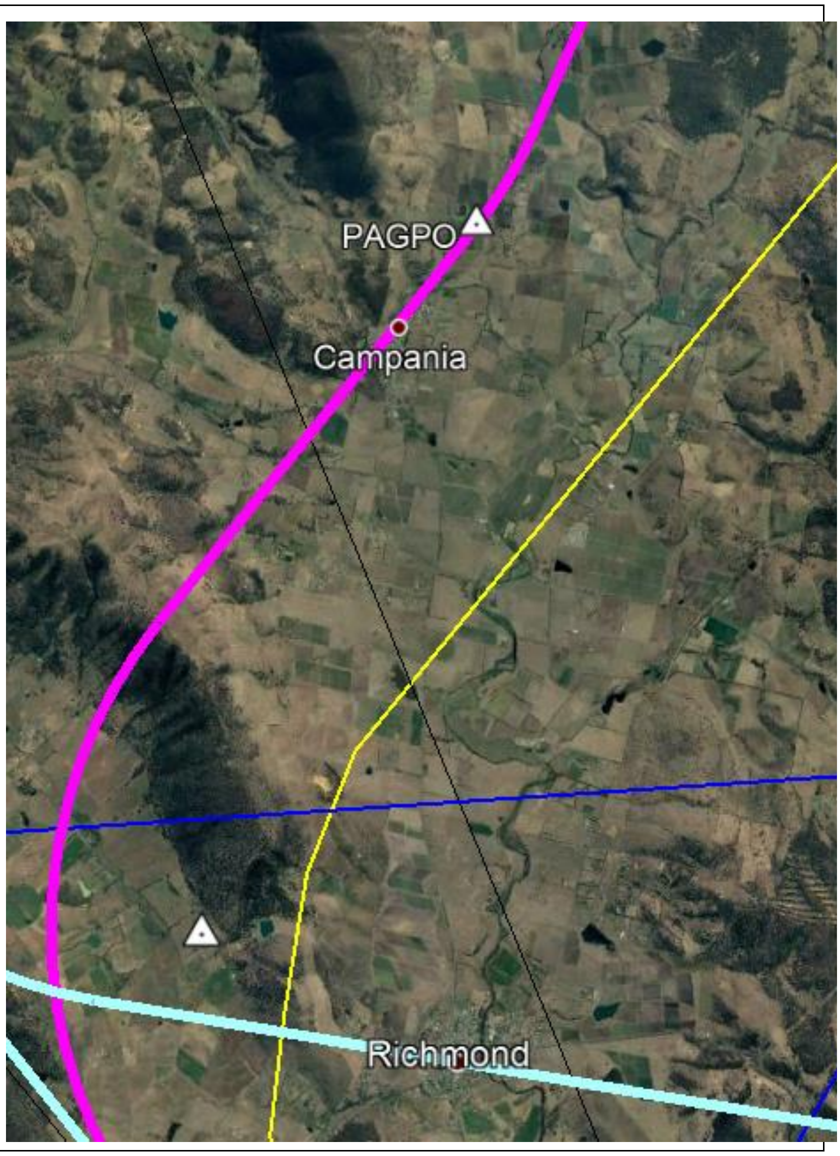
HB-ML Arr West and HB-ML Arr East

HR003 RWY12 RNP/Visual Approach Arrivals

Richmond and the communities east of Campania are currently overflown by departures on the existing SID (magenta line) and would be newly exposed to arrivals, as part of the HB-ML Arr West design alternative.

The altitude of aircraft over the area would be approximately 5,000 ft around Campania.

These communities are not expected to be significantly impacted by any increase in aviation noise (as per Airservices significance criteria), however, they may notice an audible and visual difference in the way aircraft are tracking.



9.3 Visual impact assessment of proposed new holding patterns

This EA has also assessed the potential visual impacts in areas under the proposed new holding patterns at Hobart Airport. The locations of the proposed new holding patterns are shown in Figure 31.

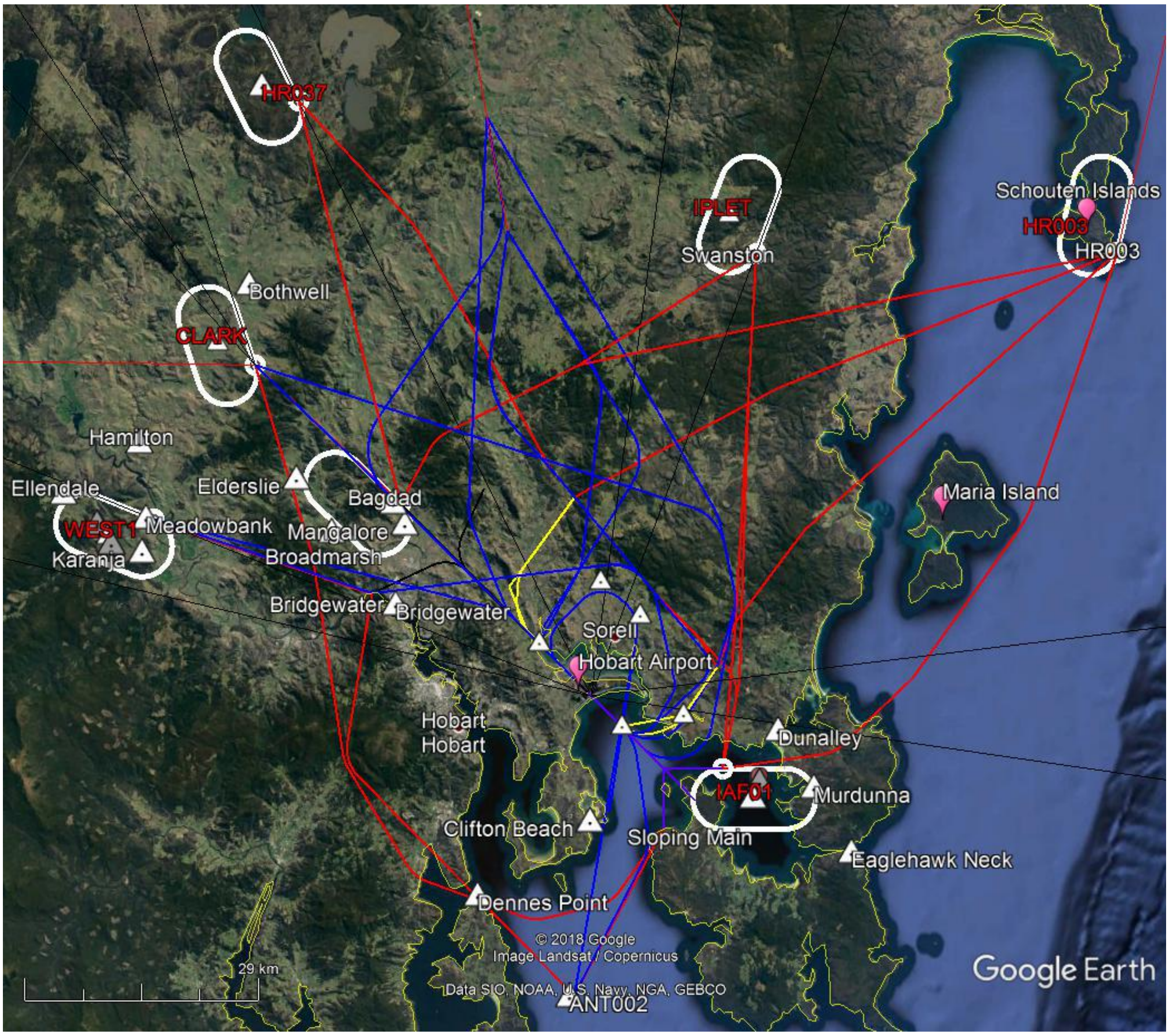


Figure 31: Location of proposed new holding patterns (white) at Hobart Airport.

Table 13, over shows a list of the proposed new holding patterns at Hobart Airport, their altitude, the communities that would be overflown and the likely visual impacts. These proposed new holding patterns are likely to be used infrequently, in some cases as little as once every six months. Due to the low number of movements and high altitude of aircraft for most of the holding patterns, this change does not trigger the Airservices threshold for potential significance (Appendix A).

Table 13 – List of proposed new holding patterns at Hobart Airport, the relevant design alternative/s, altitudes, communities overflown and potential visual impacts.

Holding Point	Design alternative/s	Runway	Altitude (ft)	Communities Overflown and potential visual impacts
HR003	HB-ML Arr West, and HB-ML Arr East	RWY 30	14,000-16,000	High altitude over Schouten Island. No residential communities but a popular tourist destination. Very low potential visual impacts (due to altitude and infrequency of use).
	HB-ML Arr West, and HB-ML Arr East	RWY 12	15,000-20,000	
CLARK	HB-ML Arr West	RWY 30	20,000	High altitude, mostly over non-residential areas. Bothwell is the nearest community that may notice a change in aircraft tracking. Very low potential visual impacts (due to altitude and infrequency of use).
	HB-ML Arr West	RWY 12	9,000-10,000	
IPLET	HB-ML Arr West, and HB-ML Arr East	RWY 12 & 30	4,000-11,000	Small aircraft types including pistons. Mostly over non-residential areas with the nearest community being Swanston. Very low potential visual impacts (due to infrequency of use).
HR037	HB-ML Arr East	RWY 30	14,000-17,000	High altitude. Mostly over non-residential areas. Very low potential visual impacts (due to altitude and infrequency of use).
	HB-ML Arr East	RWY 12	11,000-12,000	
IAF01	HB-ML Arr West, and HB-ML Arr East	RWY 30	4,000	Tracks over Smooth Island at low altitude. Noticeable to the communities of Murdunna, Sloping Main and possibly Dunalley. The noise level could reach above 60dB(A) for B738 aircraft types. Very low potential visual impacts (due to infrequency of use).
BUSKA	HB-ML Arr West, and HB-ML Arr East	RWY 12	4,500-5,500	Nearby communities include Elderslie , Bagdad, Broadmarsh and Mangalore. The noise level can reach above 60dB(A) for B738 aircraft types. Very low potential visual impacts (due to infrequency of use).
WEST 1	HB-ML Arr West, and HB-ML Arr East	RWY 12	10,000	High altitude. Communities likely to notice include Westerway, Karanja, Fentonbury, Meadowbank, and Ellendale. Very low potential visual impacts (due to altitude and infrequency of use).

9.4 Population analysis

To compare the population and dwelling numbers between each proposed alternative and the existing SIDs and STARs (baseline), the N60 >10 contour was used, as this contour extends into residential areas affected by the proposed changes. Calculations were made using 2016 Australian Bureau of Statistics Census data, as shown in Table 14 below. This information has been provided to assist Airservices G&CE Team to conduct a social impact analysis as part of their Stakeholder Engagement Plan (SEP).

Table 14 – Population and dwelling counts within the N60 >10 contours for the existing SIDs and STARs at Hobart Airport, and each proposed alternative (HB–ML Arr West and HB–ML Arr East).

Alternative	Contour	Dwelling numbers	Population numbers
Existing SIDs and STARs	N60 >10	870	2,310
HB-ML Arr West	N60 >10	800	2,120
HB-ML Arr East	N60 >10	1031	2,672

Note that the numbers in the above table have been calculated using a proportional sum of each intersecting Census area. Therefore the counts are less accurate in areas where the actual population is not evenly distributed through the Census area.

9.5 Population density

A population density chart can be useful to identify areas of dense population in relation to the proposed changes.

Figure 32 below shows population density overlaid with the N60 >10 contours for the existing SIDs and STARs (baseline) at Hobart Airport, and each of the proposed alternatives (ML-HB Arr West and ML-HB Arr East).

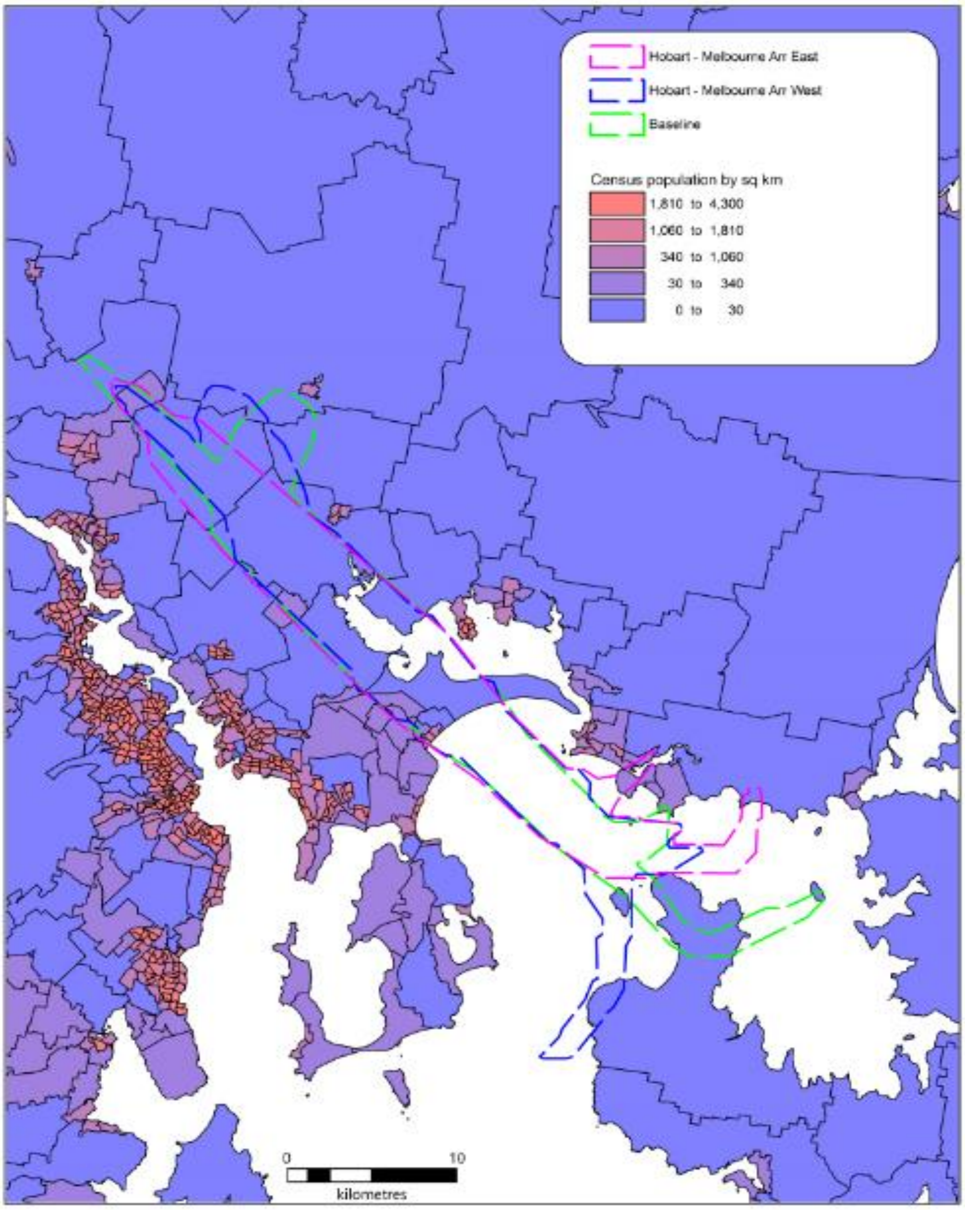


Figure 32: Population density map overlaid with N60 >10 contours for the existing SIDs and STARs (baseline) at Hobart Airport, and each of the proposed alternatives (ML-HB Arr West and ML-HB Arr East).

The density map shows that the N60 >10 contour for the HB-ML Arr East alternative extends further into populated areas to the south-east of the airport, as shown in Figures 25 and 27.

10 Findings

10.1 Noise impacts

In order to determine potential environmental significance in this assessment, the noise levels have been considered together with the proposed number of movements for the relevant SID or STAR in each alternative.

Noise modelling conducted as part of this EA has shown that there are isolated rural residential properties to the north-west of Hobart Airport that could expect more than 33 aircraft noise events at or above 60dB(A) on a busy day, as a result of implementing either design alternative. This is at Airservices threshold levels of potential environmental significance for noise (as shown in Table 6 and in Appendix A). However, comparison against the existing SIDs and STARs (the baseline), indicates that both proposed alternatives are not discernibly different from the current noise levels in this area.

Noise modelling has also shown that all of the noise sensitive receivers (hospitals and schools) identified around Hobart Airport are outside the N60 >10 contours for the existing SIDs and STARs, and for each proposed alternative. This also does not trigger Airservices criteria for potentially significant environmental impact.

Hobart Airport generally has a low number of existing night time operations, with the operational 'busy day' data showing 3 summer and 7 winter operations per night. Based on the noise modelling carried out as part of this EA, neither alternative is expected to result in any major changes from the existing situation (in relation to night time movements), nor cause any potentially significant environmental impact.

The altitude of aircraft on some of the proposed new SIDs and STARs may result in noise levels just above and below 60dB(A) in some rural residential areas. Whilst this is not considered significant in relation to the EPBC Act (and Airservices significance criteria in Appendix A), it may cause annoyance in noise-sensitive communities in these areas. In particular, due to low ambient levels in some of these rural residential areas, these predicted noise levels would be highly noticeable, even if below 60dB(A). For both the HB-ML Arr West and HB-ML Arr East design alternatives, such areas include Primrose Sands, Carlton, Carlton River, Connellys Marsh, Dunalley, Murdunna, Nugent, Bagdad, Mangalore, Tea Tree, Brighton, Dodges Ferry, Richmond, Lewisham, Forcett, and Campania. For the HB-ML Arr West design alternative only, such areas include Snug, Margate, Allens Rivulet, Sandfly, Lower Longley, Dennes Point, Killora, Howden, Kingston, Tinderbox, Leslie Vale and Mountain River.

The noise levels under 5 of the 7 of the proposed new holding areas for each design alternative are estimated to be less than 60dB(A), the threshold for potential significance under Airservices criteria. However, two of the holding patterns (BUSKA and IAF01), could produce noise levels above 60dB(A) for B738s and larger jet aircraft types. However, due to the highly infrequent use of these holding patterns (approximately once every 6 months), this does not trigger Airservices thresholds for potential environmental significance.

10.2 Visual impacts

Some individuals or communities below or within proximity of the two proposed design alternatives would visually notice the changes in tracking of aircraft, at both low and high altitudes.

Based on Airservices criteria to determine potential significance under the EPBC Act, these communities are not expected to be significantly impacted by any increase in aviation noise. However, they would notice an audible and visual difference in the way aircraft are tracking. These communities are identified in Section 9.2. For both the HB-ML Arr West and HB-ML Arr East design alternatives, areas that would experience a potential visual impact include Rheban, Triabunna, Primrose Sands, Carlton, Carlton River, Connellys Marsh, Dunalley, Dodges Ferry, Richmond, Lewisham, Forcett, Murdunna, Smooth Island and Campania. Areas such as Copping, Marion Bay and Boomer Bay, while not directly under any of the proposed flight path, would likely notice aircraft newly tracking along the east coast at distances 5 to 10km away. These proposed changes would also be visible from Schouten and Maria Islands.

For the HB-ML Arr West design alternative, the main visual impacts would be as a result of arrivals tracking west of Mt. Wellington for a left base turn to RWY 30, overflying new areas (although at high altitude and low noise levels). The communities that would experience potential visual (and audible) impacts from these arrivals include Snug, Margate, Allens Rivulet, Sandfly, Lower Longley, Dennes Point, Killora, Howden, Kingston, Tinderbox, Leslie Vale and Mountain River.

10.3 Natural environment impacts

This assessment has found that there are no likely impacts to the natural environment as a direct result of implementing either of the proposed new design alternatives. In general, both proposed design alternatives are in areas that are already overflown by aircraft. In areas that are newly overflown, the altitude of aircraft is such that the impacts on wildlife are highly unlikely.

A total of four MNES searches were performed as part of this assessment. A sample front page of these searches is included in Appendix D below. The detailed reports have been included in Airservices CIRRIS entry for this proposed change (EA-0001407).

10.4 Cultural and heritage value impacts

The Mouheneenner people are acknowledged as the traditional owners of the Hobart region. There is no likely environmental impact on areas of indigenous heritage and cultural significance as a direct result of implementing either of the proposed design alternatives, due to the areas already being exposed to existing overflights. In the areas where new SIDs or STARs are proposed, no sites of cultural significance were identified.

10.5 Emissions impacts

AEDT modelling has shown that there is no material differences in fuel burn or carbon dioxide emissions between the existing SIDs and STARs (baseline) or either of the proposed design alternatives.

10.6 Summary of findings

Table 15 shows a summary of the potential environmental impacts of each proposed design alternative (HB-ML Arr West and HB-ML Arr East), compared to each other and to the existing SIDs and STARs at Hobart Airport (the baseline). The green colour indicates no potential impacts, the orange colour indicates some potential impacts, while the red colour shows that there is likely to be a major impact for that particular issue.

As can be seen in Table 15, there is no material difference between the alternatives in terms of noise impacts, fuel burn, carbon emissions, ecological impacts, or cultural and heritage impacts. The main difference between the alternatives is mainly related to visual impacts and the number of people potentially affected. Neither of the alternatives has been determined to result in any significant environmental impact within the meaning of the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act, 1999.

Table 15 – Summary of the potential environmental impacts of each design alternative (HB-ML Arr West and HB-ML Arr East), compared to each other and the existing SIDs and STARs at Hobart Airport (the baseline).

Issue	Existing SIDs and STARs (baseline)	HB-ML -ARR WEST	HB-ML -ARR EAST
Potential Environmental Significance (overall)	**Not likely**	**Not likely**	**Not likely**
Potentially significant noise impacts	Not likely	Not likely	Not likely
Visual impacts	Status quo	Likely, west of Hobart City and on the east coast	Likely, on the east coast
Population numbers within N60 >10	2,310	2,120	2,672
Fuel Burn (tonnes) winter + summer busy days	60.2	60.3	60.4
Carbon dioxide (tonnes) winter + summer busy days	189.8	190.2	190.5
Ecological Impacts Potential significance	Not likely	Not likely	Not likely
Cultural and Heritage impacts Potential significance	Not likely	Not likely	Not likely

11 Risk classification

11.1 ML-HB Arr West design alternative

Based on the analysis and findings in this EA, the environmental impact of the proposed ML-HB Arr West alternative has been assessed using Airservices Risk Management Framework (ARMF), as defined in Airservices *Risk Management Standard (AA-NOS-RISK-0001).*

The proposed ML-HB Arr West alternative has been determined to be a **Class C environmental risk** (shown in large font in Table 16, below).

Table 16 – Outcome of environmental risk assessment of the proposed ML-HB Arr West and ML-HB Arr West design alternatives, as per Airservices Risk Classification Table (*AA-NOS-RISK-0001* - Table 5, p14).

Likelihood Criteria	Consequence Criteria				
Consequence is expected to occur:	Insignificant	Minor	Moderate	Major	Catastrophic
More frequently than hourly	C	A	A	A	A
Between hourly and daily	D	B	A	A	A
Between daily and yearly	D	**C**	B	A	A
Between yearly and 5 yearly	D	C	C	B	A
Between 5 and 50 years	D	D	C	B	A
Less frequently than once every 50 years	D	D	D	C	B

11.2 ML-HB Arr East design alternative

Based on the analysis and findings in this EA, the environmental impact of the proposed ML-HB Arr East alternative has been assessed using Airservices Risk Management Framework (ARMF), as defined in Airservices Risk Management Standard (AA-NOS-RISK-0001).

The proposed ML-HB Arr East alternative has also been determined to be a **Class C environmental risk** (shown in large font in Table 17, above).

12 Conclusion

This EA finds that neither of the proposed HB-ML Arr West and HB-ML Arr East design alternatives is likely to result in any significant environmental impact within the meaning of the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act, 1999.

Both alternatives would have noise and visual impacts that may affect different communities in different geographical areas, but no significant differences between the two alternatives in terms of noise impacts, ecological and heritage impacts, and effects on aircraft emissions and fuel burn.

Both proposed alternatives would result in a visible and audible changes to the pattern of how aircraft arrive and depart from Hobart Airport, which would be noticeably different to communities in different areas.

This assessment concludes that there is no material difference between the two proposed design alternatives in terms of noise impacts. The main difference between the two alternatives is the visual impacts associated with the differences in the flight paths.

There are no impacts expected on Matters of National Environmental Significance (MNES), or on sites of cultural and heritage value as a direct result of implementing either of the proposed alternatives.

As this assessment has identified community areas that would potentially notice changes to aircraft tracking in both alternatives, and potentially newly overflown areas, it is strongly recommended that a Stakeholder Engagement Plan (SEP) be prepared by Airservices G&CE Team so that the change proponent may consider the benefits of the proposed change against the risks of implementation.

Both alternatives have been assessed as a Class C environmental risk.

13 References

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14 Appendices

Appendix A - Airservices aircraft noise significance criteria

Appendix B - Data sources for current and proposed design

Appendix C - Methodology

Appendix D - Excerpts from MNES search

Appendix E - N60 Noise Modelling Results

Appendix F - Flight Path Allocation Ruleset

Appendix G - Busy day schedule

Appendix A Airservices aircraft noise significance criteria

Appendix B Airservices Aviation Noise EPBC Act Referral Criteria for Environmental Assessment of Changes to Aircraft operations

Table 1: Determining high or low number of existing flights[1]

	N70		N65		N60	
Receptor	High	Low	High	Low	High	Low
Urban residential: day (6am to 11pm)	≥10	<10	≥25	<25	≥50	<50
Rural Residential: day (6am to 11pm)	≥7	<7	≥16	<16	≥35	<35
Urban or Rural Residential: night (11pm to 6am)	≥6	<6	≥6	<6	≥6	<6

1. Refer to Referral Criteria Definitions and Explanatory Notes (below) for clarification of what constitutes 'existing flights'
2. Flight numbers in Tables 1-4 are considered to be 'busy day' (90th percentile) movements. Note that, on occasion, when the number of existing flights are low and not well distributed throughout the year, it may be appropriate to use an average number, rather than the 'busy day' 90th percentile number.

Table 2: Aviation noise EPBC Act referral thresholds for locations which already experience a high number of existing flights

Location type	Noise Metric	Day (6am-11pm)[1]	Night (11pm – 6am)[1]
Residential (urban and rural)	N70; N65; N60	>25% increase	>10% increase

1. The usage of the terms 'day' (6:00am to 11:00pm) and 'night' (11:00pm to 6:00am) is as per the definition of night (11:00pm to 6:00am) used at Australian curfew airports (see Commonwealth Sydney Airport Curfew Act 1995). This definition is applied consistently for all Airservices environmental assessments, whether or not a curfew is in place at the specific airport.

Table 3: Aviation noise EPBC Act referral thresholds for locations which experience a low number of existing flights or are newly overflown

Location type	Noise Metric	Day (6am-11pm)	Night (11pm – 6am)
Urban residential	N70	> 10 flights	> 1 flight
	N65	> 25 flights	> 2 flights
	N60	> 50 flights	> 3 flights
Rural residential	N70	> 7 flights	> 1 flight
	N65	> 17 flights	
	N60	> 33 flights	> 2 flights
Newly overflown	N70	> 0 flights	
	N65		
	N60	> 10 flights	> 0 flights

Table 4: Aviation noise EPBC Act referral thresholds for specific noise receptor categories

Noise Receptor	Noise Metric	Day (6am-11pm)	Night (11pm – 6am)
Hospitals	N70; N65; N60	Apply values from Tables 2 or 3 as applicable	Apply values from Tables 2 or 3 as applicable
Schools	N70	> 10 flights	NA
	N65	> 25 flights	
	N60	> 50 flights	
NES sites	N70; N65; N60	Assessed on a case by case basis based on identified receptors and associated sensitivities	
Industrial /open spaces/parks	N70	> 20 flights	NA
	N65	> 50 flights	
	N60	> 100 flights	

1. Newly overflown hospitals and schools are assessed at Table 3.

Applying the EPBC Act Referral Criteria for Environmental Assessment of Changes to Aircraft Operations

1. Tables 1 - 4:

   a. Tables 1 - 4 above are used to determine whether a proposed new or amended flight path should be referred to the Commonwealth Environment Minister for advice regarding whether it constitutes ‘significant impact’, within the meaning of the *Environmental Protection and Biodiversity Conservation Act 1999* (f the EPBC Act). Note, however, that the EPBC Act has no guidance on aviation noise significance criteria for environmental assessment of changes to aircraft operations.

   b. Table 1 is used initially to determine whether there are a high or low number of existing flights in the area of the proposed change, and therefore whether Table 2 or Table 3 is then used to assess aviation noise impacts.

   c. Table 2 shows Airservices aviation noise referral thresholds for locations which experience a high number of existing flights prior to the change. If Table 2 is used, impact is measured as a percentage increase in flight numbers over a particular ‘noise above’ metric (N70, N65 and N60).

   d. Table 3 shows Airservices aviation noise referral thresholds for locations which experience a low number of existing flights prior to the change. It lists thresholds in number of flights, per noise contour band, per day or night, for urban or rural locations and receptors. If Table 3 is used, impact is measured in total number of flight events over a particular ‘noise above’ metric (N70, N65 and N60), such that the level of flights is still low.

   e. Table 4 defines aviation noise referral thresholds for specific receptor categories (hospitals, schools etc).

2. Steps in Applying Tables 1 - 4:

   - Step 1 Using Table 1, identify whether the existing number of flights is “high” or “low”. For a high number of existing flights (day or night criteria), Table 2 must be used to determine the potential significance of any aviation noise impacts, while a low number of existing flights must use Table 3.
   - Step 2 Identify the relevant aviation noise receptors for the proposed change (urban residential, sensitive – school, etc).
   - Step 3 From available data, identify the number of flights currently using the existing flight path for the applicable noise metric (N70 and/or N65 and/or N60), for day and/or night times, as per the operating times of the existing flights.
   - Step 4 Identify how many flights will use the flight path as a result of the proposed change for the applicable noise metric (N70 and/or N65 and/or N60) for day and/or night, as per the operating times of the flights associated with the proposed change.
   - Step 5 Using either Table 2 or Table 3, as determined at Step 1, read across to determine whether the increased number or noise metric of flights in the change proposal, in any contour, triggers stated thresholds for the relevant receptor.

- Step 6 Consider the additional criteria in Table 4 to determine if noise thresholds for noise receptor categories are triggered.
- Step 7 If any criteria are triggered, and the change is planned to proceed in its current form, then the change should be referred to the Commonwealth Environment Minister for advice and a determination of whether it constitutes 'significant impact' (as per the requirements of the EPBC Act).

Context and Considerations

1. The Airservices Aviation Noise EPBC Act Referral Criteria for Environmental Assessment of Changes to Aircraft Operations (the Referral Criteria) establish a range of threshold levels for key noise metrics, below which aircraft noise arising from a proposed change is considered highly unlikely to represent 'significant impact', as defined under the EPBC Act.
2. Where assessments indicate that a proposed change may result in noise levels exceeding these thresholds, and the change is planned to proceed in its current form, the proposal shall be referred to the Commonwealth Environment Minister for advice (known as an 'EPBC Act Referral') and a determination on whether it constitutes significant impact.
3. The Referral Criteria were developed giving consideration to relevant published literature including AS2021:2015 (Acoustics – Aircraft noise intrusion – Building siting and construction), the National Safeguarding Airports Guidelines (NASAG), and the (then) Commonwealth Department of Transport and Regional Services (DOTARS) discussion paper entitled 'Expanding ways to describe and assess aircraft noise' (March 2000).
4. The rationale behind Airservices key noise metrics and the Referral Criteria thresholds is provided below:

   a. Noise Metrics

      i. 'Number Above' metrics (N70, N65 and N60).

      - 'Number Above' metrics (also known as 'N Contours') are an aircraft noise characterisation mechanism used to map noise 'zones' around an aerodrome. Number above metrics show the number of noise events above a given noise level (for example, N70 contours would show the number of aircraft noise events greater than 70dB(A)).
      - Application of the Referral Criteria to a particular change, entails a comparison of existing N contour events around a given airport, with those represented by the change. The change in events can either be expressed as a percentage increase over the current state, or up to a total numbers of flights (refer to 'b' below for further details).

        Why N70, N65 and N60?

        In March 2000, the (then) Commonwealth Department of Transport and Regional Services (DOTARS) released a discussion paper entitled 'Expanding ways to describe and assess aircraft noise'.

        70 dB (A) and N60 dB(A) were identified as suitable levels for describing noise impacts given that:

        - 70dB (A) is considered to be the external sound level below which no difficulty with reliable communication from radio, television or conversational speech is expected in a typical room with windows open.

- 60 dB(A) equates to the indoor design guide level of 50 dB(A) specified in AS2021:2015 Acoustics – Aircraft noise intrusion – Building siting and construction.

In addition to N70 and N60, Airservices uses N65 when required to improve granularity of change characterisation (as an intermediate threshold between N70 and N60).

ii. LAmax.

- In addition to N contours, LAmax is used on occasion to further characterise the potential noise increase (expressed in dB(A)) represented by the proposed change.

  LAmax increases may be considered in the evaluation of potential significant impact for areas where a proposed change represents a likely increase of +5 LAmax dBA during the day and +3 LAmax dBA during the night.

b. Referral thresholds (percentage noise increase, total flight numbers, and noise levels in dB(A))

i. Percentage noise increase, and increase in total flight numbers.

- These thresholds were devised by Airservices aviation noise and environmental specialists and acoustics engineers, based on qualitative estimates of levels of noise below which there is minimal risk of a change resulting in significant impact under the EPBC Act (in the absence of published, defined criteria for these metrics). The thresholds are above what would be expected to be experienced through normal growth in aviation traffic in Australia.

ii. LAmax.

- Thresholds for these metrics are based on published literature[1] regarding how perceptible noise changes (expressed in dB(A)) are to the human ear, as follows:
  - Changes of up to 3dB(A) – not likely to be perceptible.
  - Changes between 3dB(A) and 5dB(A) – may be perceptible.
  - Changes between 5dB(A) and 10dB(A) – likely to be perceptible.

1. Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise, Queensland Department of Transport and Main Roads 2013.

5. Validation of the Referral Criteria

The noise metrics and thresholds described in the Referral Criteria have been used by Airservices in aviation noise impact assessments from 2013 to the present, over which time their appropriateness for identifying potential 'significant impact' has been validated through:

a. Discussion of changes being implemented at Community Aviation Consultation Group (CACG) meetings at airports around Australia;

b. Ongoing analysis of aviation noise complaint data, and associated flight path changes, from Airservices' Noise Complaints Information Service (NCIS);

c. Consultation with stakeholders (including the Aviation Noise Ombudsman and the Commonwealth Department of Infrastructure and Regional Development) regarding noise complaints and noise impact assessments;

d. A referral to the Commonwealth Department of Environment, under the EPBC Act, for Airservices Gold Coast Airport Instrument Landing System (ILS) Project (which included discussion of the Referral Criteria and associated methodology to assess potential significance of aviation noise impacts).

Over 200 airspace changes have been successfully assessed for potential aviation noise impacts and implemented by Airservices since inception of the Referral Criteria in 2013, without later being found to represent 'significant impact' under the EPBC Act. Given this result, and the significant traffic growth experienced in Australia since 2013, the current Referral Criteria threshold levels are considered by Airservices to be appropriate and relatively conservative.

6. Continuous Improvement of the Referral Criteria

Notwithstanding the above, as part of Airservices continuous improvement efforts, the referral criteria will undergo external review and revision in 2018, to ensure they provide improved clarity and reflect industry best practice. As part of this process Airservices will seek review and feedback from the Department of Environment and Energy; and Department of Infrastructure, and Regional Development and Cities, regarding the appropriateness and rigor of the Referral Criteria.

Referral Criteria Definitions and Explanatory Notes

- Existing Flights refers to any flight path which is either formalised or regularly used.
  - Formalised paths could include:
    - Noise Abatement Procedures, or flight paths prescribed in LoAs with locals operators
    - Terminal Instrument Flight Procedures (SID, STAR and approach procedures) published in AIP Departure and Approach Procedures (DAP)
    - Regional Routes and Domestic Routes published in Designated Airspace Handbook (DAH)
  - Non-formalised paths could include a regularly used vectoring path or track shortening. Regular usage is subjective to each individual airport and can include seasonal variations, for example a path which is only used during certain meteorological conditions but used consistently in those situations, would be considered an existing track.
- LAmax: A maximum A-weighted sound pressure level in a given stated interval (see AS2021:2015). LAmax represents the loudest noise level of a single flight by a specific type of aircraft.
- 'Number Above' metrics (i.e. N70, N65 and N60) – Noise characterisation mechanisms used to map noise 'zones' around an aerodrome, showing the number of noise events above a given noise level (i.e. 70dB(A), 65dB(A) and 60dB(A)). For example, N70 contours would show the number of aircraft noise events greater than 70dB(A).

(For further information refer to: https://infrastructure.gov.au/aviation/environmental/transparent_noise/expanding/4.aspx)

- Commonwealth Matters of National Environmental Significance (MNES) sites: sites which represent Matters of National Environmental Significance – as listed in the EPBC Protected Matters Search Tool.
- Sensitive sites are considered by Airservices to be schools, hospitals and churches, due to increased vulnerability of occupants to the negative effects of aviation noise.
- Urban residential and rural residential areas are determined based on searches of relevant State or Territory Land-Use and Planning Tools.

Appendix B Data sources for current and proposed design

Information sources

This assessment is based on the following sources of information:

- *AS2021:2015 Acoustics—Aircraft noise intrusion—Building siting and construction*
- Integrated Noise Model (INM) modelling
- Aviation Environmental Design Tool (AEDT) version 2d
- Airservices Departure and Arrival Plates (DAPs) for current and proposed procedure changes
- Satellite images (and associated information) from Google Earth Pro, MapInfo and NearMaps
- Published movement data from Airservices Operational Data Warehouse (ODW)
- *Expanding ways to describe and assess aircraft noise*, March 2000, former Commonwealth Department of Transport and Regional Services (DOTARS)
- *Transport Noise Management Code of Practice – Volume 1 Road Traffic Noise,* Queensland Department of Transport and Main Roads 2013.
- Commonwealth Matters of National Environmental Significance (MNES) search tool
- 2016 Australian Census data

Appendix C Methodology

This EA examines the potential environmental impact of Airservices proposed airspace redesign at Hobart Airport through examination of air traffic movements on the existing and proposed procedures. It includes an assessment of potential environmental impacts such as increased aircraft noise on communities, visual changes in aircraft movements, increased aircraft emissions, heritage sites and potential impacts on Commonwealth Matters of National Environmental Significance (MNES) and heritage sites.

This EA also includes a summary of social data from the area of the proposed change to provide Airservices G&CE Team with information to prepare a social impact assessment as part of their SEP.

Aircraft noise modelling

Aviation Environmental Design Tool (AEDT) version 2d was used to model noise impacts of the proposed change. The AEDT is a software tool developed by the United States of America Federal Aviation Administration (FAA) for the purpose of modelling aircraft noise. The AEDT is an average noise model, designed to determine aircraft noise based upon an entire airport's operations, with movement information averaged over time. AEDT modelling only considers noise from aircraft movements. Noise modelling requires input of assumptions in order to reflect the variability in conditions. These assumptions include:

- Weather conditions – a single set of standard weather conditions based on Australian Bureau of Meteorology (BoM) average data have been modelled. In reality, weather conditions will vary throughout the year.
- Standard aircraft operations – an assumption has been made that each aircraft type will be operated according to a standard Noise, Power, Distance (NPD) curve. In reality, each airline and pilot may operate the aircraft differently, such as using different engine power settings, or retracting landing gear at different times.
- Standard arrival and departure profile – an assumption is made that every aircraft will operate according to a standard approach and departure profile; essentially operating at the same rate of climb or descent. In reality, arrival and departure profiles may vary on an individual basis for a number of reasons, including:
    - Traffic
    - Weather and cloud conditions
    - Pilot requirements
    - Separation and sequencing requirements for Air Traffic Control (ATC).

Environmental assessment criteria

A number of criteria were considered as part of this environmental assessment, including:

- potential aircraft noise and visual impacts on communities, including any newly overflown communities
- potential impact on MNES
- potential impact on heritage and cultural matters, including indigenous heritage

- potential impacts on aircraft emissions.

The assessment criteria adopted by Airservices to determine potential environmental impacts of proposed flight path changes with respect to aircraft noise can be found in Appendix A. These aircraft noise assessment criteria were developed giving consideration to *AS2021:2015 Acoustics—Aircraft noise intrusion—Building siting and construction*, World Health Organisation (WHO) guidance, and the *National Safeguarding Airports Guidelines (NASAG),* 2016.

The section below describes the metrics that have been applied in this environmental assessment, focusing on those metrics that provide analytical insight to best represent the potential impacts of the proposed flight path changes.

Note: Although this assessment does include a summary of social analysis data collected for the areas potentially affected by the proposed ATM changes (see Section 0), it does not include a social impact assessment. The social impact assessment is prepared by Airservices G&CE Team as part of their SEP, as described above.

Noise metrics

The following noise metrics were used in this assessment.

LAmax – indicative noise levels

LAmax is a noise metric that shows the maximum noise level of a single noise event associated with a particular flight path. The LAmax noise metric is useful for determining the potential noise change associated with geographical movement of a flight path.

‘Number Above’ metrics (N70, N65 and N60)

‘Number Above’ metrics (also known as ‘N Contours’) are an aircraft noise characterisation mechanism used to map noise ‘zones’ around an airport. Number above metrics show the number of noise events above a given noise level. For example, N70 contours would show the number of aircraft noise events greater than 70dB(A).

The former Commonwealth Department of Transport (DOTARS) identified 70dB (A) and 60dB(A) as suitable levels for describing noise impacts given that:

- 70dB (A) is considered to be the external sound level below which no difficulty with reliable communication from radio, television or conversational speech is expected in a typical room with windows open.
- 60dB(A) equates to the indoor design guide level of 50 dB(A) specified in *AS2021:2015 Acoustics – Aircraft noise intrusion – Building siting and construction*, when building attenuation is taken into consideration.

In addition to N70 and N60, Airservices uses N65 when required to improve granularity of change characterisation (as an intermediate threshold between N70 and N60).

Night and day criteria

The usage of the terms ‘day’ (6:00am to 11:00pm) and ‘night’ (11:00pm to 6:00am) is as per the definition of ‘night’ (11:00pm to 6:00am) used by Australian curfew airports, as defined in the relevant Commonwealth curfew legislation (*Commonwealth Sydney Airport Curfew Act 1995*). This definition is applied consistently for all Airservices environmental assessments, whether or not a curfew is in place at the specific airport, and applies to the Airservices aircraft noise significance criteria provided in Appendix A.

Matters of National Environmental Significance (MNES)

The Commonwealth Department of Environment and Energy (DoEE) Protected Matters Search Tool was used to determine the presence of MNES in the areas below the proposed change. Where MNES were identified using the search tool, the potential impact of aircraft overflights was assessed on an individual basis (for each MNES).

Appendix D Excerpts from MNES search

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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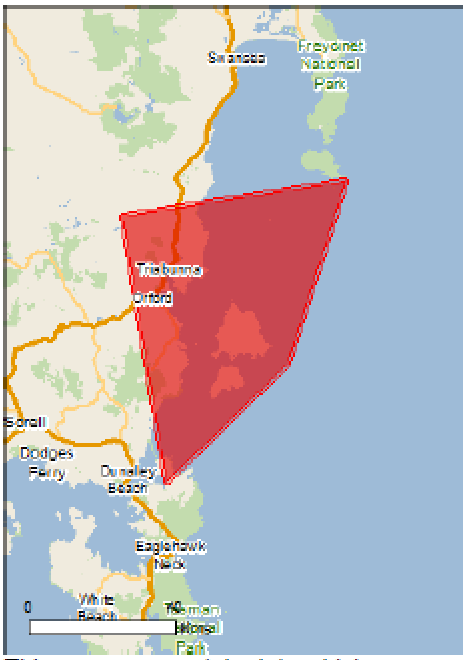

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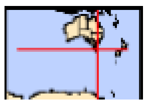

Australian Government

Department of the Environment and Energy

EPBC Act Protected Matters Report

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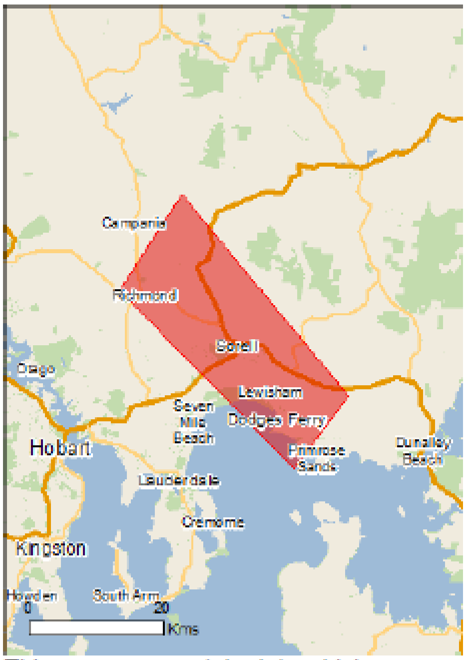

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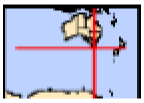

Australian Government
Department of the Environment and Energy

EPBC Act Protected Matters Report

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Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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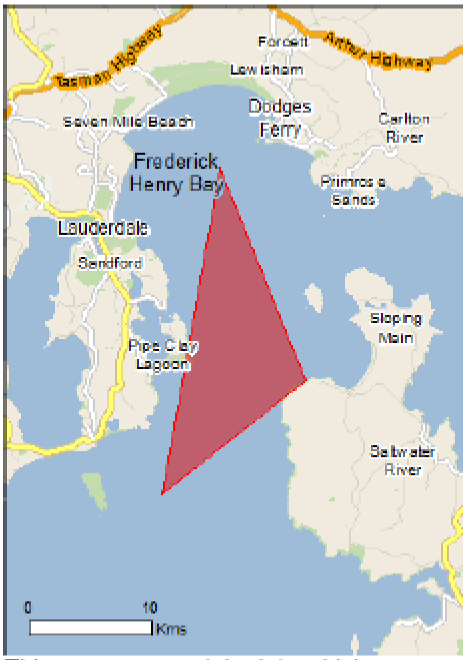

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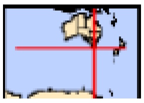

EPBC Act Protected Matters Report

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Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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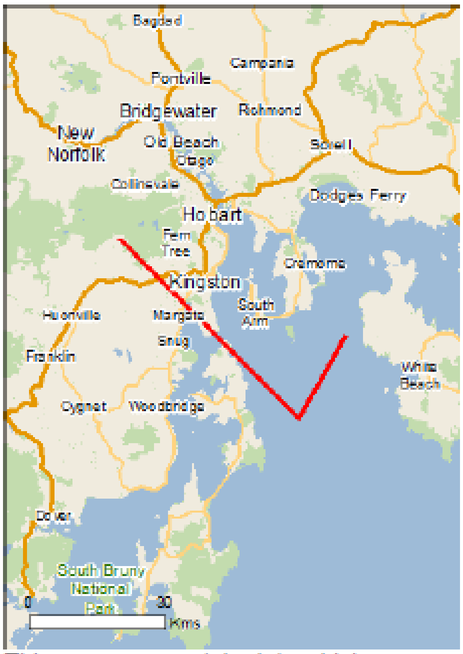

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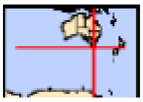
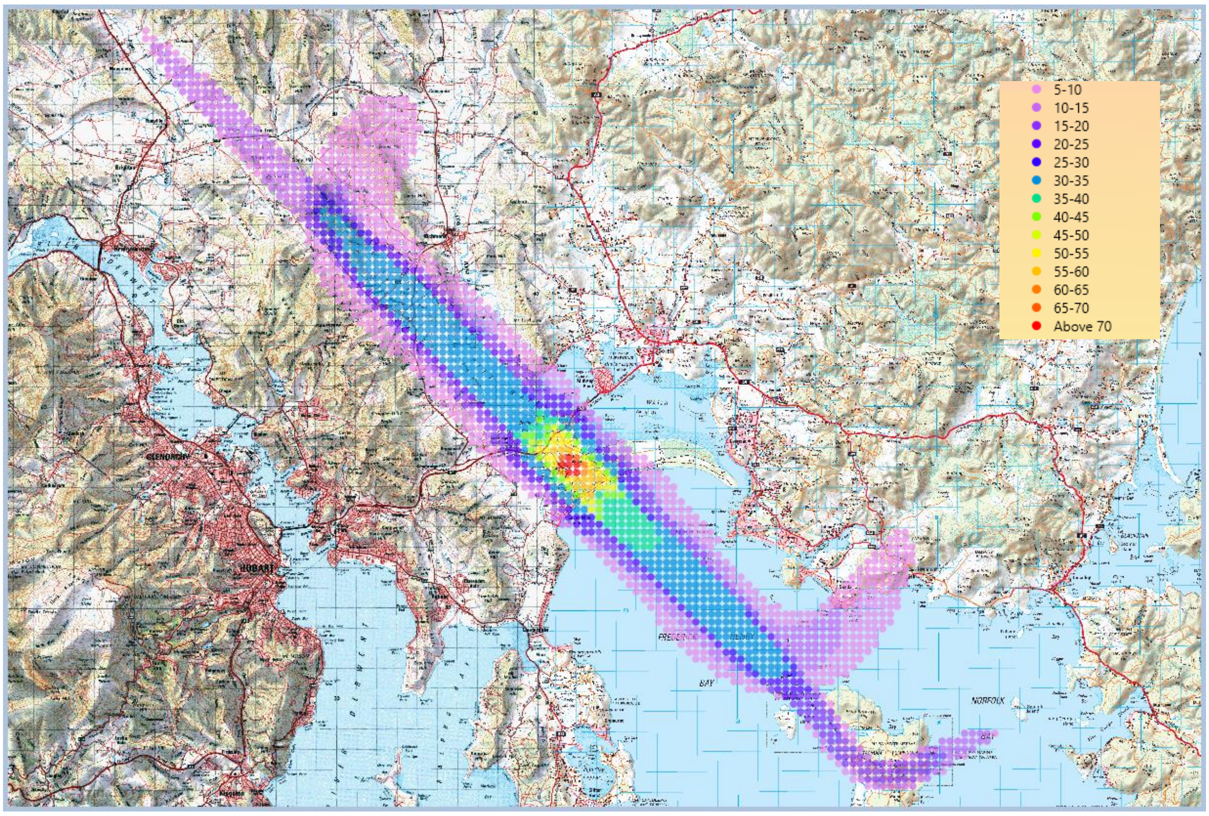
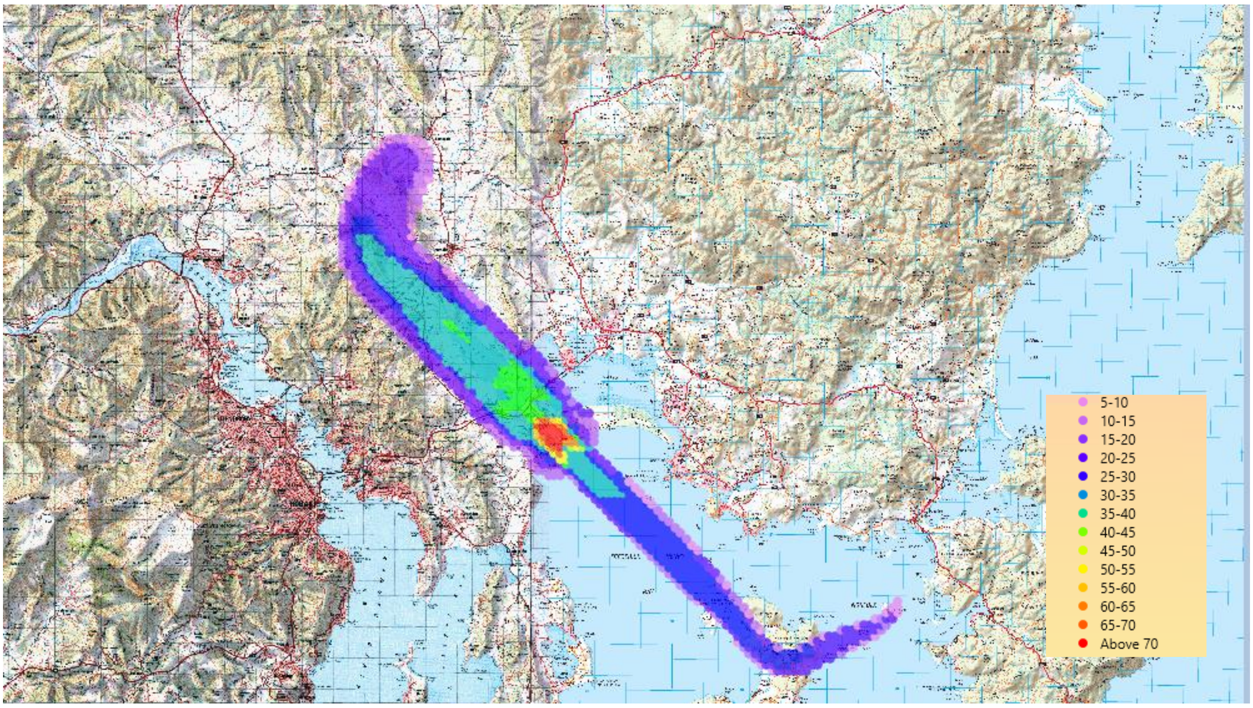


Appendix E N60 Noise Modelling Results

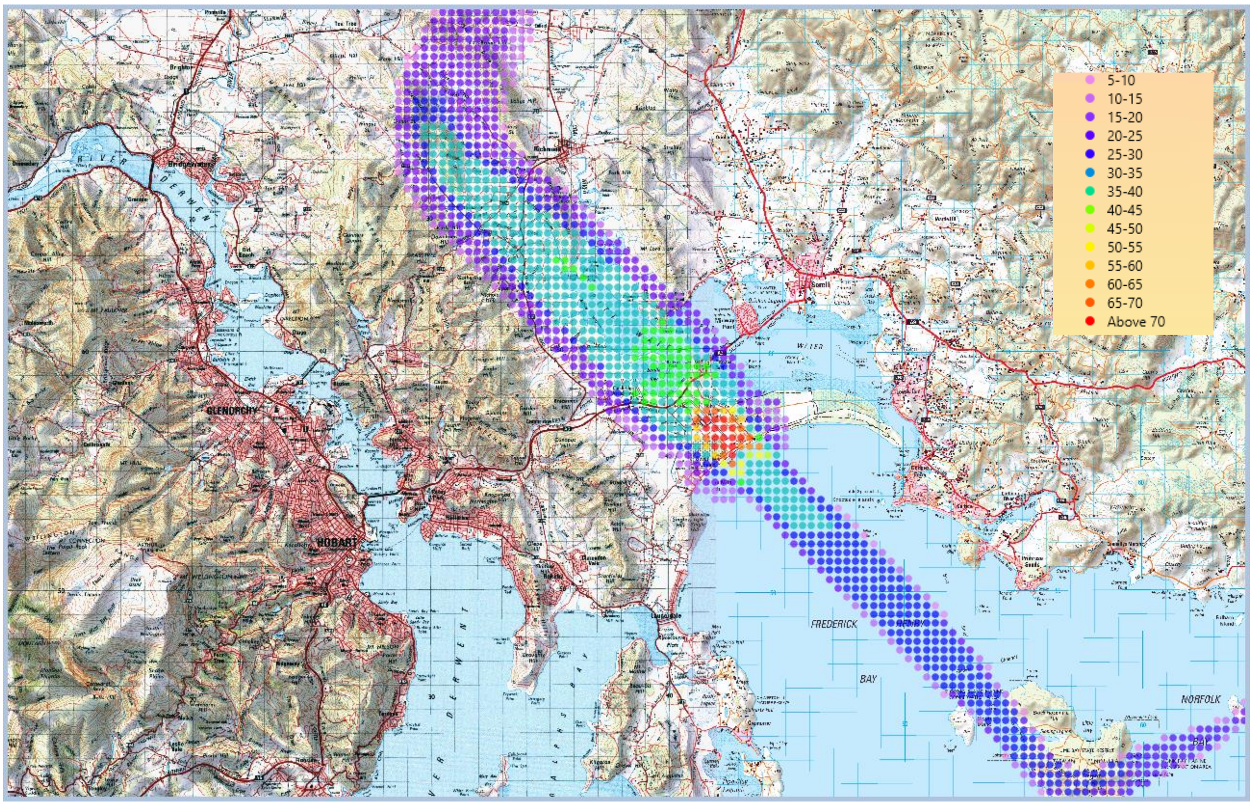
Baseline Modelling



Summer baseline N60 results

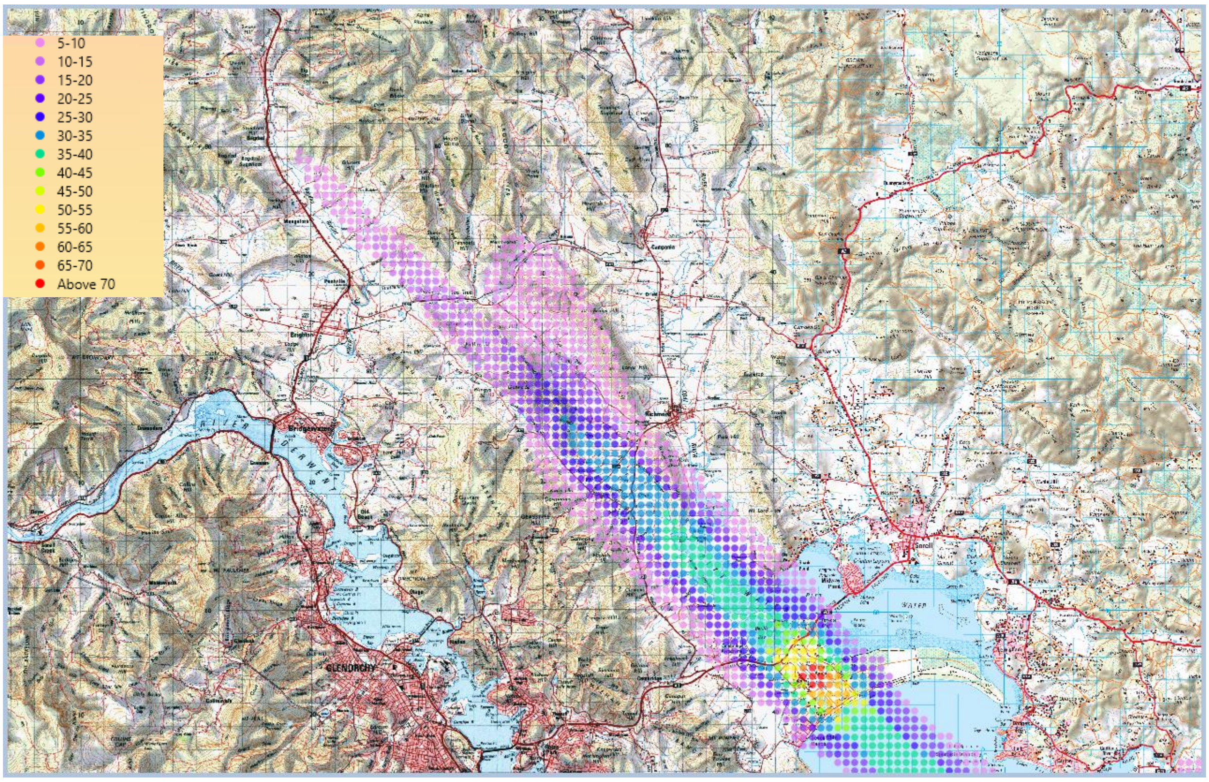


Winter baseline N60 results – 1

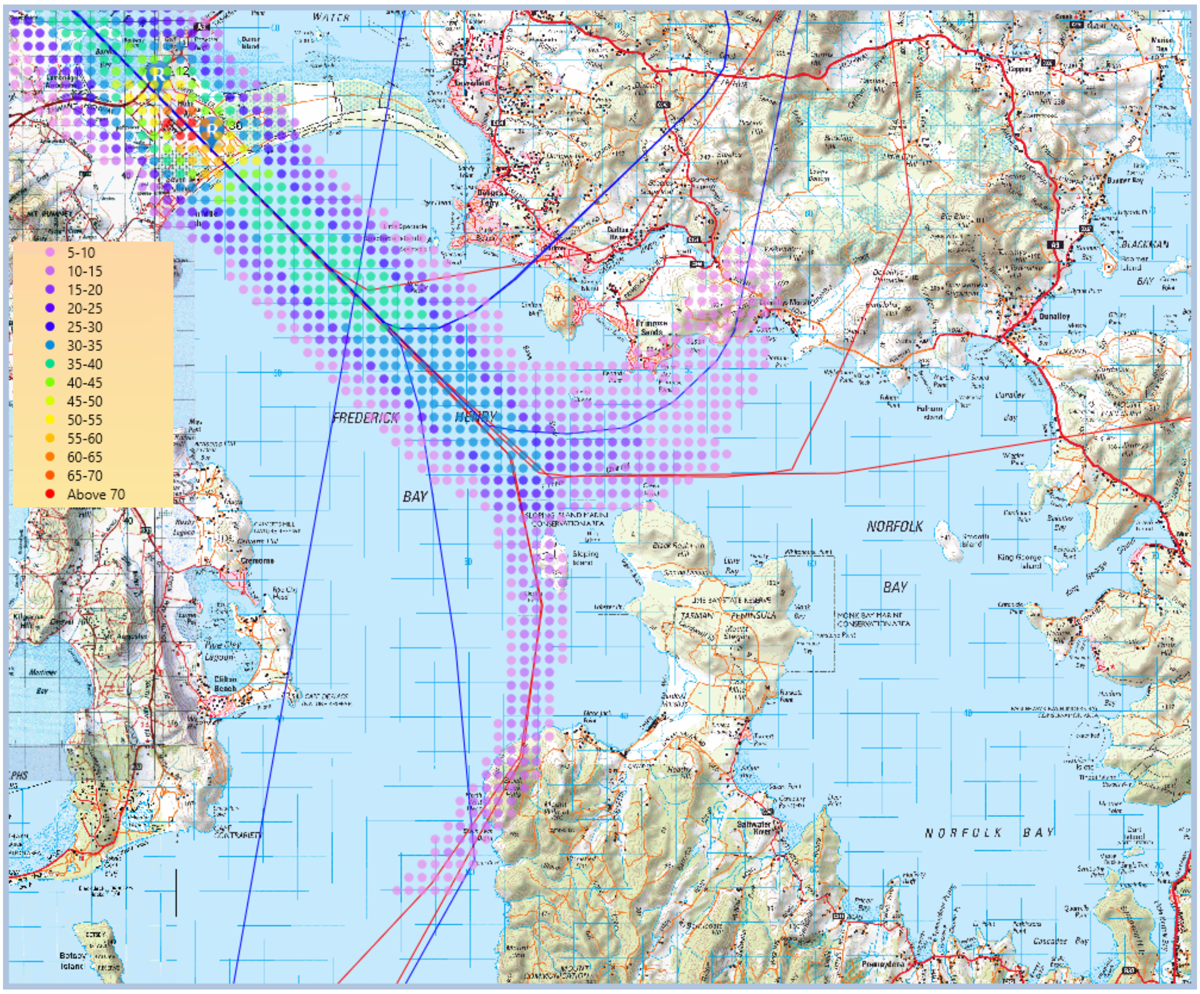


Winter baseline N60 results – 2

HB-ML Arr West



Summer – HB-ML Arr West – 1



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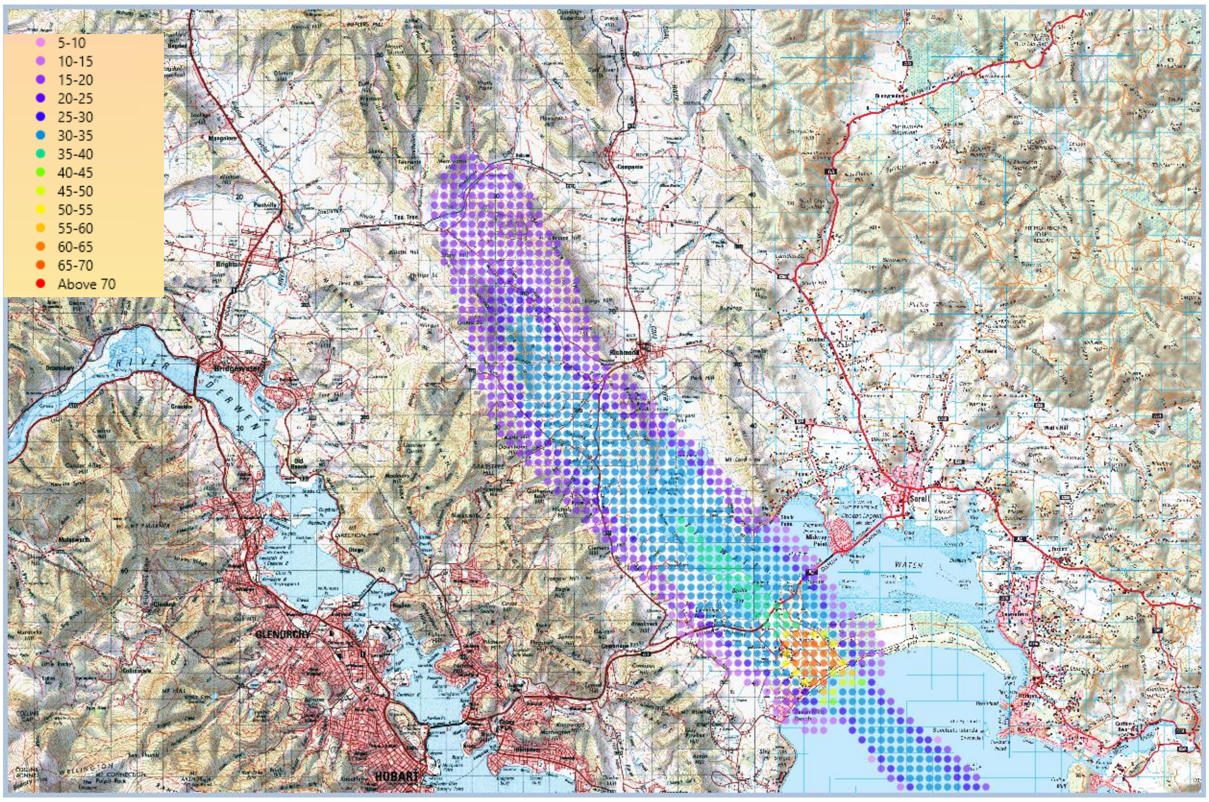

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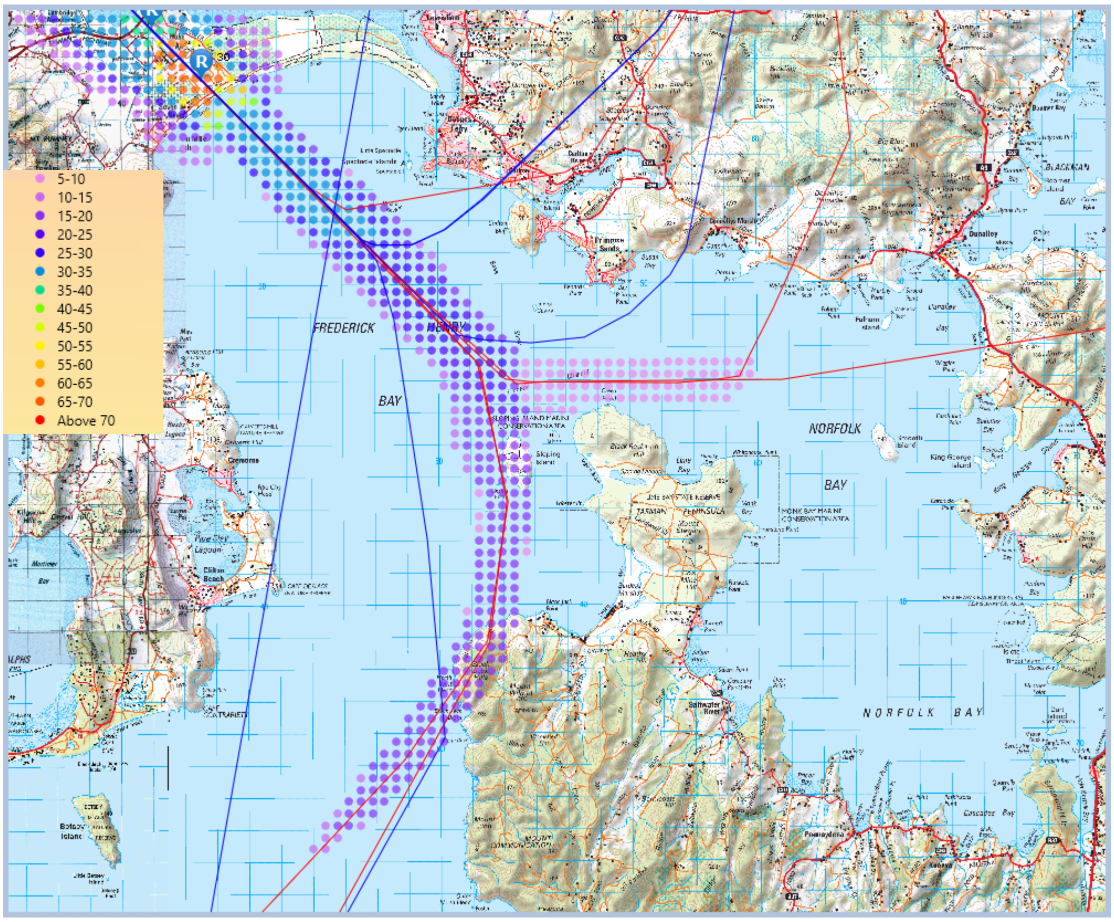

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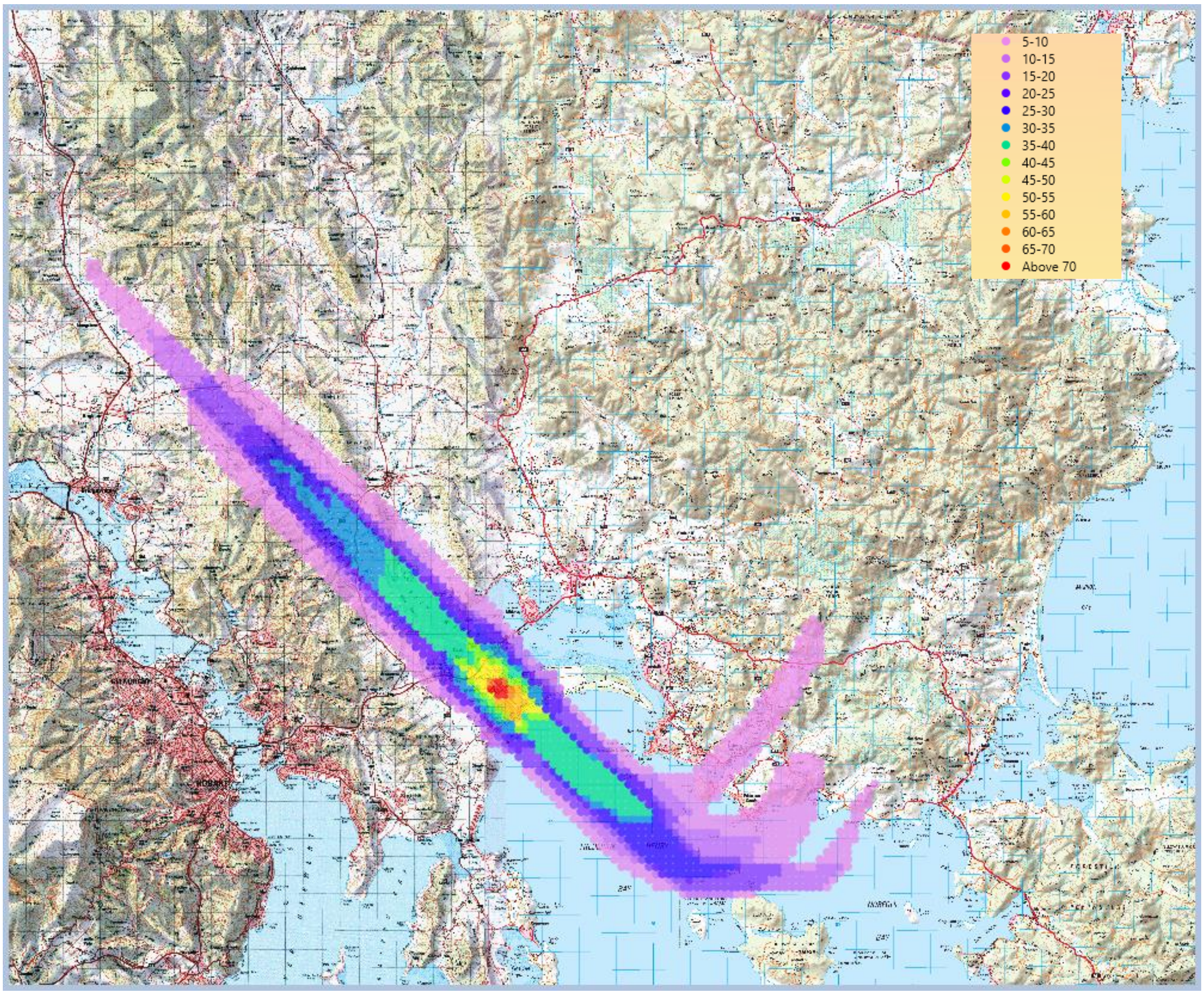
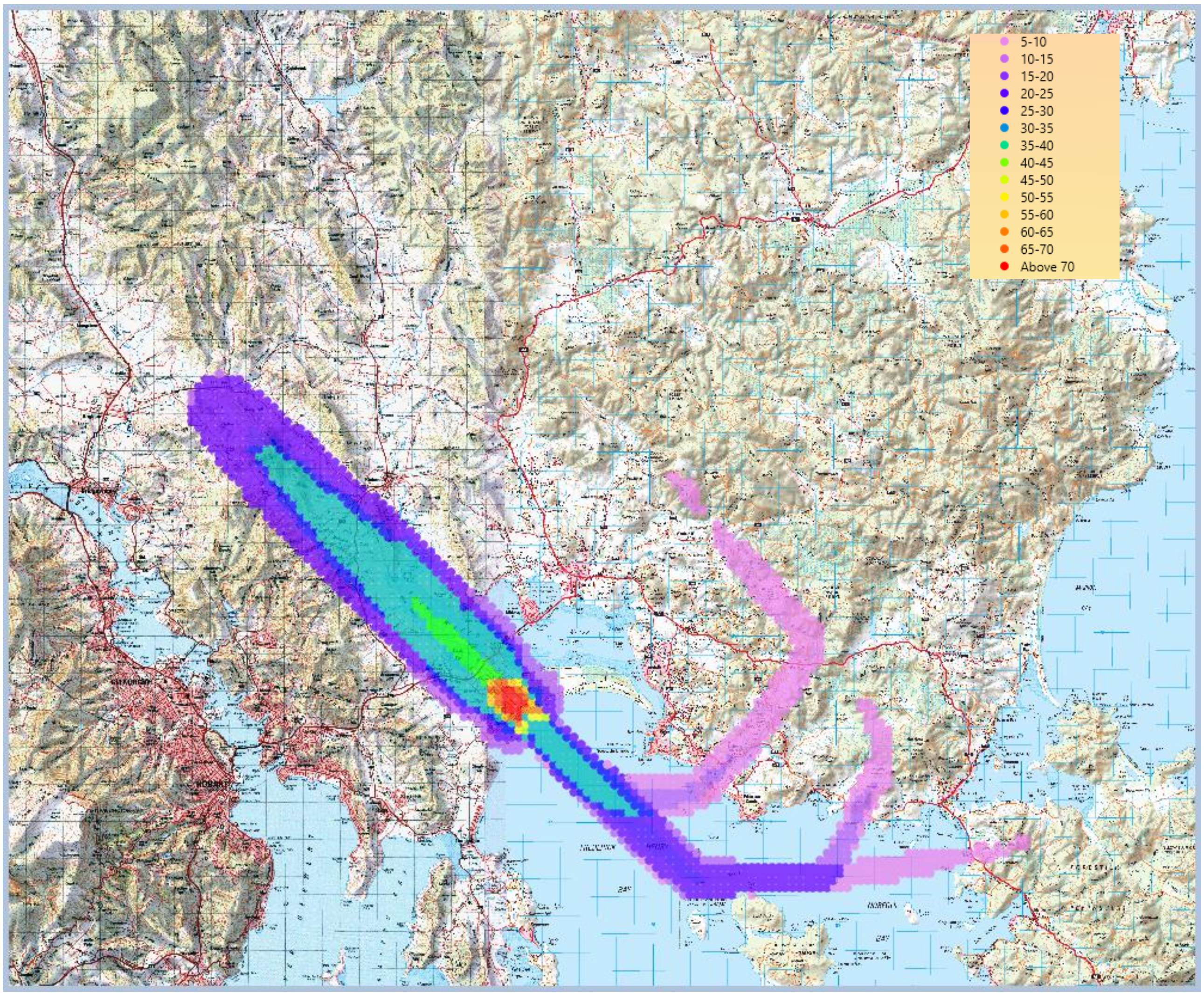
HB-ML Arr East



Summer – HB-ML Arr East



Winter – HB-ML Arr East

Appendix F Flight Path Allocation Ruleset

HB-ML Arr West

30 STARs

HR003 STAR RNAV

Approximately 30% of inbound traffic will be using this STAR – jets from Sydney, Brisbane and any other itinerants from east coast Australia;

HR003 STAR RNP-AR or Visual Termination
This STAR would be available to CASA approved operators and would share the load regarding 30% of the traffic from HR003;

CLARK STAR (west of Mt. Wellington) RNAV

Approximately 60% of inbound traffic will fly this STAR – jets from Melbourne, Adelaide, Perth and also turbo-prop aircraft from Launceston;

ANT02 STAR RNAV

only used by A319 and C17 traffic (20 flights in 2017) however it could be used for training IFR aircraft to the southwest

IPLET STAR RNAV (only single engine, <5700kg MTOW or priority)
flown a few times a week at most by RFDS BE20s and itinerant single engine IFR traffic from St Helens

SIDs

WEST1 SID

RPT services to YSRN. Only flown a few times per week to various destinations in Tasmania west of Hobart; and

HR019 (JET) SID
Approximately 85% of Hobart departures will fly this SID (MEL/SYD/ADL/BNE/CBR)

KANLI (PROP) SID
Approximately 10-12% of traffic will use this SID. Light aircraft to the north including RFDS and Sharp to Launceston;

ANT02 SID

only a few flights per year; and

HB-ML Arr West

12 STARs

HR003 RNAV STAR

Approximately, 30% of arrivals will fly via HR003

HR003 RNP-AR STAR

A share of 30% of traffic from HR003, issued according to sequence and operator authorisation; and

CLARK RNAV STAR – as per current operations, no change.

ANT02 RNAV STAR
only a few flights per year

IPLET RNAV STAR (only single engine, <5700kg MTOW or priority)

only a few flights per week would track via this STAR

WEST1 RNAV STAR
a few flights per week (PA31 etc)

12 SIDs

WEST1 SID
RPT services to YSRN and other destinations in Tasmania west of Hobart. Only a few flights per week

ANT02 SID

Only 20 or so flights per year

KANLI (PROP) SID
approximately 10-12% of HB departures would use this SID

HR019 (JET) SID

all jet departures to the north will use this SID, sometimes the Sharp and RFDS flights when there are no jets behind due to even slower preceding traffic. Approximately 85% of departures

<u>HB-ML Arr East</u>

STARs

<u>HR003 STAR RNAV</u>

Approximately 30% of inbound traffic will be using this STAR – jets from Sydney, Brisbane and any other itinerants from east coast Australia

<u>HR003 STAR RNP-AR or Visual Termination</u>
This STAR would be available to CASA approved operators and would share the load regarding 30% of the traffic from HR003

<u>HR037 STAR RNAV</u>

Approximately 60% of inbound traffic will fly this STAR – jets from Melbourne, Adelaide, Perth and also turbo-prop aircraft from Launceston;

<u>HR037 RNP-AR STAR or Visual Termination</u>

This STAR would be available to CASA approved operators and would share the load regarding 60% of the traffic from HR0037

<u>IPLET STAR RNAV (only single engine, <5700kg MTOW or priority)</u>

Flown a few times a week at most by RFDS BE20s and itinerant single engine IFR traffic from St Helens

SIDs

<u>WEST1 SID</u>

Would only be flown a few times per week to various destinations in Tasmania west of Hobart

<u>HR019 (JET) SID</u>
Approximately 85% of Hobart departures will fly this SID (MEL/SYD/ADL/BNE/CBR)

<u>KANLI (PROP) SID</u>

Approximately 5-10% of traffic will use this SID. Light aircraft to the north including RFDS and Sharp to Launceston;

<u>ANT02 SID</u>
only a few flights per year

<u>CLARK SID (RWY TRACK)</u>

less than 10% of departures will use this SID;

<u>HB-ML Arr East</u>

STARs

HR003 RNAV STAR

Approximately 30% of inbound traffic will be using this STAR – jets from Sydney, Brisbane and any other itinerants from east coast Australia

HR003 RNP-AR STAR

This STAR would be available to CASA approved operators and would share the load regarding 30% of the traffic from HR003

HR037 RNAV STAR

Approximately 60% of all arrivals would be processed through HR037;

IPLET RNAV STAR

Flown a few times a week at most by RFDS BE20s and itinerant single engine IFR traffic from St Helens

WEST1 RNAV STAR

Flown a few flights per week (PA31 etc)

SIDs

WEST1 SID
RPT services to YSRN and other destinations in Tasmania west of Hobart. Only a few flights per week

ANT02 SID

Flown only 20 or so flights per year

KANLI (PROP) SID

Approximately 10-12% of HB departures would use this SID.

HR019 (JET) SID

All jet departures to the north will use this SID, sometimes the Sharp and RFDS flights when there are no jets behind due to even slower preceding traffic. Approximately 85% of departures

CLARK (JET) SID

Approximately only 7-14 flights per week (YPAD and YPPH deps);

Appendix G Busy day schedule

Example busy day schedule - summer

Local time	Operation Type	Origin/destination	Flight No	Tail No	Airline	Aircraft Type	Runway Name	AC Categ.	Beacon
4:32:32 AM	A	YMLT	QFA7367	VHXMR	QFA	B733	30	J	4372
5:45:25 AM	A	YMLT	SH189	VHOZV	SH	SW4	30	T	4223
6:01:23 AM	D	YMML	VOZ1313	VHYVD	VOZ	B738	30	J	4336
6:06:59 AM	D	YMML	QJE1500	VHNXQ	QJE	B712	30	J	4217
7:15:36 AM	A	YMML	JST701	VHVWT	JST	A321	30	J	4262
7:41:28 AM	A	YSSY	JST719	VHVQJ	JST	A320	30	J	4075
8:27:44 AM	A	YMML	TGG501	VHVNB	TGW	A320	30	J	4011
6:56:07 AM	D	YSSY	QFA1022	VHVZE	QFA	B738	30	J	7244
8:44:23 AM	A	YMLT	AM769	VHMVW	AM	BE20	30	T	4045
8:13:19 AM	D	YMML	JST700	VHVWT	JST	A321	30	J	4271
9:28:48 AM	A	YMML	QJE1501	VHNXQ	QJE	B712	30	J	3642
9:22:18 AM	A	YSSY	VOZ1528	VHYFH	VOZ	B738	30	J	4352
9:46:15 AM	A	YMML	JST703	VHVQQ	JST	A320	30	J	4210
9:38:19 AM	D						30	U	3000
9:55:00 AM	A	YMML	VOZ1316	VHVUK	VOZ	B738	30	J	3741
8:37:27 AM	D	YSSY	JST718	VHVQJ	JST	A320	30	J	4235
9:44:51 AM	D						30	U	3000
10:13:28 AM	A						30	U	3000
10:18:32 AM	A	YBBN	JST759	VHVFI	JST	A320	30	J	1031
9:19:35 AM	D	YMEN	AM769	VHMVW	AM	BE20	30	T	4042
11:12:02 AM	T	YMHB	UHV				30	U	3000
11:17:57 AM	A	YMML	JST705	VHVWU	JST	A321	30	J	7202
10:22:11 AM	D	YMML	QJE1502	VHNXQ	QJE	B712	30	J	4052
11:23:51 AM	T	YMHB	UHV				30	U	3000
11:29:21 AM	A	YSSY	QFA1019	VHVZE	QFA	B738	30	J	3634
10:06:23 AM	D	YSSY	VOZ1531	VHYFH	VOZ	B738	30	J	3704
9:16:33 AM	D	YBCG	TGG852	VHVNB	TGW	A320	30	J	1376
10:40:35 AM	D	YMML	VOZ1321	VHVUK	VOZ	B738	30	J	3626
12:19:42 PM	A	YMAV	JST627	VHVFK	JST	A320	30	J	4313
12:24:36 PM	A	YBBN	VOZ702	VHYVA	VOZ	B738	30	J	1057
12:29:11 PM	A	YMML	JST707	VHVFU	JST	A320	30	J	3755
12:34:40 PM	A	YSSY	JST721	VHVWY	JST	A321	30	J	7247
11:48:20 AM	D	YMML	JST702	VHVQQ	JST	A320	30	J	4202
12:42:29 PM	A	YMML	VOZ1320	VHVUH	VOZ	B738	30	J	4067
12:23:15 PM	D	YMML	JST706	VHVWU	JST	A321	30	J	3630
11:03:11 AM	D	YBBN	JST758	VHVFI	JST	A320	30	J	1534
12:38:23 PM	D	YMML	QFA1010	VHVZE	QFA	B738	30	J	3654
1:54:58 PM	A	YMML	QFA1011	VHVXE	QFA	B738	30	J	4377
1:05:37 PM	D	YMAV	JST626	VHVFK	JST	A320	30	J	4376

1:19:27 PM	D	YMML	JST708	VHVFU	JST	A320	30	J	4247
2:28:00 PM	A	YWYY	AM769	VHMVW	AM	BE20	12	T	7244
2:43:08 PM	A	YMML	JST713	VHVQW	JST	A320	12	J	4311
2:49:23 PM	A	YBCG	TGG851	VHVNB	TGW	A320	12	J	1102
2:10:03 PM	D	YMML	VOZ1325	VHVUH	VOZ	B738	12	J	3607
1:40:35 PM	D	YSSY	JST720	VHVWY	JST	A321	30	J	7245
3:11:00 PM	D	YMLT	AM769	VHMVW	AM	BE20	12	T	4245
3:38:13 PM	A	YSSY	JST723	VHVQG	JST	A320	12	J	4074
3:47:22 PM	A	YMML	QFA1009	VHVZU	QFA	B738	12	J	3643
3:42:58 PM	A	YSSY	VOZ1534	VHVUE	VOZ	B738	12	J	4321
1:30:03 PM	D	YBBN	VOZ705	VHYVA	VOZ	B738	30	J	1433
2:53:23 PM	D	YMML	QFA1012	VHVXE	QFA	B738	12	J	3271
4:21:14 PM	A	YMML	QJE1507	VHNXE	QJE	B712	12	J	4207
3:36:31 PM	D	YMML	TGG502	VHVNB	TGW	A320	12	J	3732
3:32:43 PM	D	YMML	JST714	VHVQW	JST	A320	12	J	4324
5:02:30 PM	A	YMML	JST709	VHVQU	JST	A320	12	J	4017
5:11:19 PM	A	YMML	VOZ1328	VHVON	VOZ	B738	12	J	4224
5:20:48 PM	A	YMML	JST711	VHJQG	JST	A320	12	J	3757
5:56:10 PM	A	YBBN	JST757	VHVFI	JST	A320	12	J	1106
4:36:47 PM	D	YSSY	VOZ1535	VHVUE	VOZ	B738	12	J	4203
4:27:43 PM	D	YSSY	JST722	VHVQG	JST	A320	12	J	3630
4:43:39 PM	D	YSSY	QFA1020	VHVZU	QFA	B738	12	J	3605
5:23:39 PM	D	YMML	QJE1508	VHNXE	QJE	B712	12	J	4303
5:59:07 PM	D	YMML	VOZ1333	VHVON	VOZ	B738	12	J	4353
6:44:47 PM	D	YMLT	SH188	VHOZV	SH	SW4	12	T	4020
6:18:39 PM	D	YMML	JST710	VHVQU	JST	A320	12	J	7222
7:01:08 PM	D	YBBN	JST756	VHVFI	JST	A320	12	J	1252
7:38:40 PM	A	YSSY	JST725	VHVGQ	JST	A320	12	J	4021
6:23:59 PM	D	YPAD	JST680	VHJQG	JST	A320	12	J	4245
7:56:27 PM	D	YMLT	QFA7376	VHXMR	QFA	B733	12	J	4060
8:30:00 PM	A	YMML	JST715	VHVGJ	JST	A320	12	J	7246
8:22:56 PM	A	YMML	QJE1509	VHNXE	QJE	B712	12	J	3755
8:43:09 PM	A	YSSY	QFA1021	VHVXC	QFA	B738	12	J	3263
9:25:20 PM	A	YMML	VOZ1334	VHYIA	VOZ	B738	12	J	3702
8:25:59 PM	D	YSSY	JST724	VHVGQ	JST	A320	12	J	7213
9:29:27 PM	D	YMML	JST716	VHVGJ	JST	A320	12	J	4014
10:37:43 PM	A	YPAD	JST681	VHJQG	JST	A320	30	J	7255
11:34:11 PM	D	YMML	JST712	VHJQG	JST	A320	30	J	3607