RUNWAY EXTENSION FEASIBILITY STUDY

DETAILED ASSESSMENT OF EXTENDED RUNWAY REQUIREMENTS AND SUITABLE AIRCRAFT

Lord Howe Island Board | 20 April 2018

AECOM Imagine it. Delivered.

Detailed Assessment of Extended Runway Requirements and Suitable Aircraft

Client: Lord Howe Island Board

Co No.: N/A

Prepared by

AECOM Australia Pty Ltd
Level 21, 420 George Street, Sydney NSW 2000, PO Box Q410, QVB Post Office NSW 1230, Australia
T +61 2 8934 0000 F +61 2 8934 0001 www.aecom.com
ABN 20 093 846 925

In association with

Astral Aviation

20-Apr-2018

Job No.: 60559990

AECOM in Australia and New Zealand is certified to ISO9001, ISO14001 AS/NZS4801 and OHSAS18001.

© AECOM Australia Pty Ltd (AECOM). All rights reserved.

AECOM has prepared this document for the sole use of the Client and for a specific purpose, each as expressly stated in the document. No other party should rely on this document without the prior written consent of AECOM. AECOM undertakes no duty, nor accepts any responsibility, to any third party who may rely upon or use this document. This document has been prepared based on the Client's description of its requirements and AECOM's experience, having regard to assumptions that AECOM can reasonably be expected to make in accordance with sound professional principles. AECOM may also have relied upon information provided by the Client and other third parties to prepare this document, some of which may not have been verified. Subject to the above conditions, this document may be transmitted, reproduced or disseminated only in its entirety.

Quality Information

Document	Detailed Assessment of Extended Runway Requirements and Suitable Aircraft
Ref	60559990
Date	20-Apr-2018
Prepared by	Jed Mills
Reviewed by	Richard Murran

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	07-Mar-2018	For Client Comment	Jed Mills Project Manager	
B	20-Apr-2018	Final Issue	Jed Mills Project Manager	

Table of Contents

Executive summary

Being 590 km from the closest town on the Australian mainland and 790 km from Sydney, Lord Howe Island is one of the most remote communities in NSW and among the most remote of any Australian territory. With no marine passenger service to the mainland, the residents of Lord Howe Island are dependent on the regular airline services between Sydney and Brisbane to support not only the major economy on the island (tourism) but also their daily requirements including health education, mail and freight.

This report provides a detailed review of the runway requirements for operation of the existing DHC8-200 regular passenger transport (RPT) aircraft at Lord Howe Island Airport (LDH), and the requirements for alternative aircraft types such as the DHC8-300/400, ATR42/72 and Fokker 50.

In addition future aircraft design trends were investigated, including electric aircraft. It was concluded that electric aircraft of comparable size will be developed within the next 15-20 years but at this point no conclusions can be drawn on their runway requirements except that they are expected to be similar to current aircraft.

The predominant western-designed and in production turbo-prop aircraft in the 30-70 seat class is the ATR42 (48 seats), ATR72 (68 seats) and the Bombardier DHC-400 with 74 seats. These aircraft are the preferred choice of the “mainline” airlines such as Qantas and Virgin Australia. Older types no longer in production such as the DHC8-200/300, the Saab 340 and Fokker 50, while capable aircraft, are confined to the small regional airlines such as Rex and Skytrans.

The following runway options were investigated during this study:

- Option 1: Do Nothing;
- Option 2: 450m runway extension;
- Option 3: 570m runway extension;
- Alternative Option 1: Runway realignment; and
- Alternative Option 2: Leasing or purchasing of aircraft.

It is proposed the current runway orientation should be retained due to the likely considerable cost associated with a full realignment and is not recommended for further study.

A ‘Do’ Nothing’ approach could leave the island with no RPT service from March 2022 onwards once the current agreement with Qantas expires; this is not considered a viable solution.

Although a 450m extension option provides for the future operation of some candidate aircraft, it does not provide sufficient “future proofing” for efficient operation of the ATR72 and DHC8-400 and therefore the recommendation is to further investigate a 570m extension option.

Conclusion

The recommendation of the review is to further investigate the ‘570m runway extension’ option to the NW.

Pending the outcome of the ‘570m runway extension’ feasibility study, leasing or purchasing of aircraft could be investigated although the significant operational, logistical and legal aspects would need to be considered in further detail.

1.0 Introduction

AECOM has been engaged by the Lord Howe Island Board (LHIB) to undertake a runway extension Feasibility Study to investigate the viability of a runway extension and subject to LHIB approvals, progress technical studies, develop conceptual engineering plans and undertake community engagement.

Lord Howe Island is among Australia's premier tourist destinations, known nationally and internationally for its natural beauty and biodiversity, as recognised in the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Listing.

Consideration of a runway extension at Lord Howe Island needs to take into account the potential impacts that any development would have on the island and impact on the unique environment.

1.1 Scope of this report

This report is a summary of the desktop aviation assessment undertaken as part of the Lord Howe Island Airport Runway Extension Study Milestone 1 deliverable.

The scope of this report includes the following:

- Review of existing operations and physical conditions;
- Evaluation of suitable Regular Passenger Transport (RPT) aircraft;
- Determination of a suitable runway length, width and pavement strength;
- Assessment of runway extension options, including review of CASA compliance, obstacle and flight path impacts; and
- Outline of next steps and conclusion of the AECOM evaluation.

1.2 Reference documents

In developing this report, AECOM have considered the documentation in Table 1 in the analysis and generation of options.

Table 1 Reference documents

Document name	Version	Date
CASA Manual of Standard Part 139-Aerodromes	1.14	Jan 2017
Three Consulting -Lord Howe Island Air Services	Final draft	Jun 2017
Airport operational support Pte Ltd - Lord Howe Island Aerodrome Technical Inspection 2017		Aug 2017
Australian AIP	Current issue	
Australian Board of Meteorology Lord Howe island weather statistics, http://www.bom.gov.au/climate/averages/tables/cw_200839.shtml		1988-2018
CASA Lord Howe Island Aerodrome Audit Report	ARN:513956	Oct 2016
ICAO Annex 14 - Aerodromes	7th Ed	Jul 2016

1.3 Acronyms and descriptions

Table 2 Table of acronyms

Acronym	Definition
ACN	Aircraft Classification Number
AIP	Aeronautical Information Publication
ARFFS	Airport Rescue and Firefighting Service
ASA	Air Services Australia
ASDA	Accelerate-stop distance available
BNE	Brisbane Airport
CASA	Civil Aviation Safety Authority
DME	Distance Measure Equipment
EMS	Emergency Medical Services
GA	General Aviation
GNSS	Global Navigation Satellite System
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
IF	Instrument Flight
IFP	Instrument Flight Procedure
ISA	International Standard Atmosphere
LDA	Landing Distance Available
LDH	Lord Howe Island Airport
LHIB	Lord Howe Island Board
Load factor	The percentage of an aircraft's maximum payload load that can be carried over a specific route (e.g. due to take-off or landing restrictions)
MCTOW	Maximum Classified Take-Off Weight
Minima	The minimum visibility and cloud base weather conditions aircraft can take-off or land at an aerodrome
MLW	Maximum Landing Weight
MOS	Manual of Standards
MZFW	Maximum Zero Fuel Weight
NDB	Non Directional Beacon
Non-precision	An instrument approach with minima typically cloud base 300ft or more and visibility 1600m or better.
NSW	New South Wales
OEW	Operating Empty Weight
OLS	Obstacle Limitation Surface
PANS-OPS	Procedures for Air Navigation Services – Aircraft Operations.
PAPI	Precision Approach Path Indicator
Payload	The weight of commercial load that can be carried in an aircraft over a specific route.
PCN	Pavement Classification Number

Acronym	Definition
RAAF	Royal Australian Air Force
RESA	Runway End Safety Area
RFDS	Royal Flying Doctor Service
RLR	Runway Length Required
RNAV	Random Area Navigation
RPT	Regular Public Transport
STOD	Supplementary Take-off Distance
STODA	Supplementary Take-off Distance Available
STOL	Short Take-off and Landing
TBA	To Be Announced
TODA	Take-off Distance Available
TORA	Take-off Run Available
VASIS	visual approach slope indicator systems
VPA	Vertical Path Angle
VSS	Visual Segment Surface

2.0 Lord Howe Island Airport and operating environment

2.1 Location

Lord Howe Island is considered remote, located some 790km from Sydney, 740km from Brisbane, 900km from Norfolk Island and 1,570km from Auckland. The closest mainland town is Port Macquarie approximately 590km to the west. Figure 1 below shows the location of Lord Howe Island.

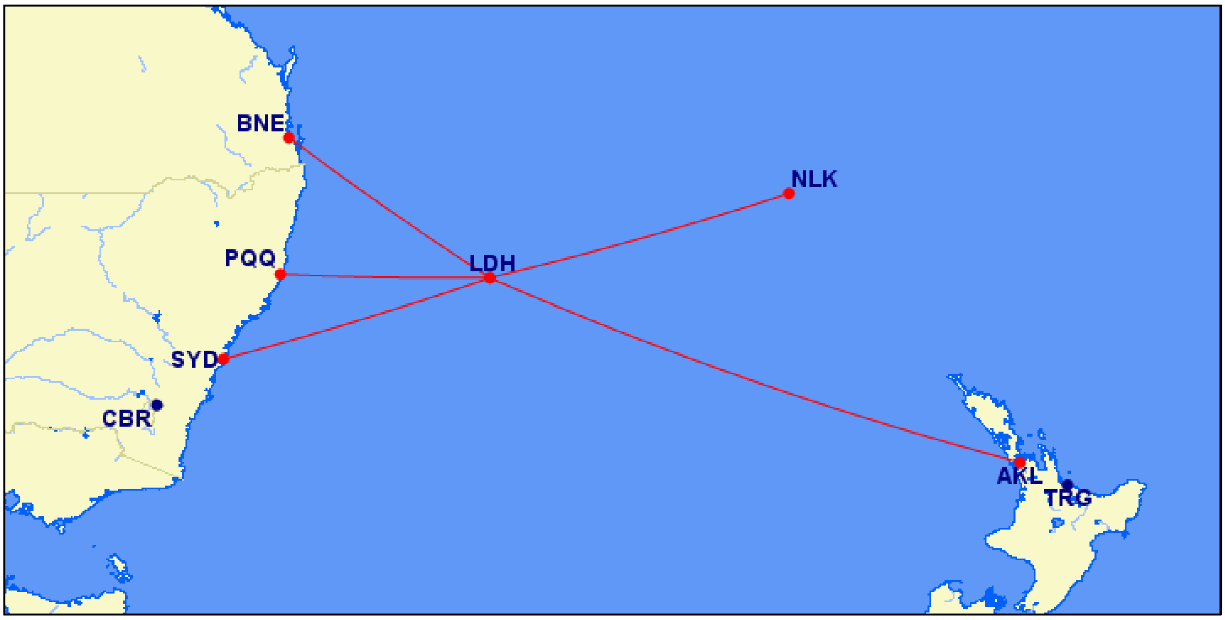
This remoteness requires aircraft operating into Lord Howe Island Airport (IATA code – LDH) to carry a substantial amount of reserve fuel, sufficient to divert to Port Macquarie airport should a landing at LDH not be possible. This combined with the relatively high operating minima (minimum weather conditions in which a landing can be made), the short runway and frequent turbulent winds on approach, make operations a challenge.

The types of propeller powered aircraft operating to LDH are generally at or near the limit of their range capability. This combined with the short runway which restricts take-off and landing weight, leaves very little operational flexibility to carry additional fuel or payload.

Rugged terrain adjacent to the airport and strong wind gusts generate turbulence which particularly affects the approach on runway 10.

Lord Howe Island Aerodrome is classified by CASA as a Restricted Use International Airport.

Figure 1 Location of Lord Howe Island



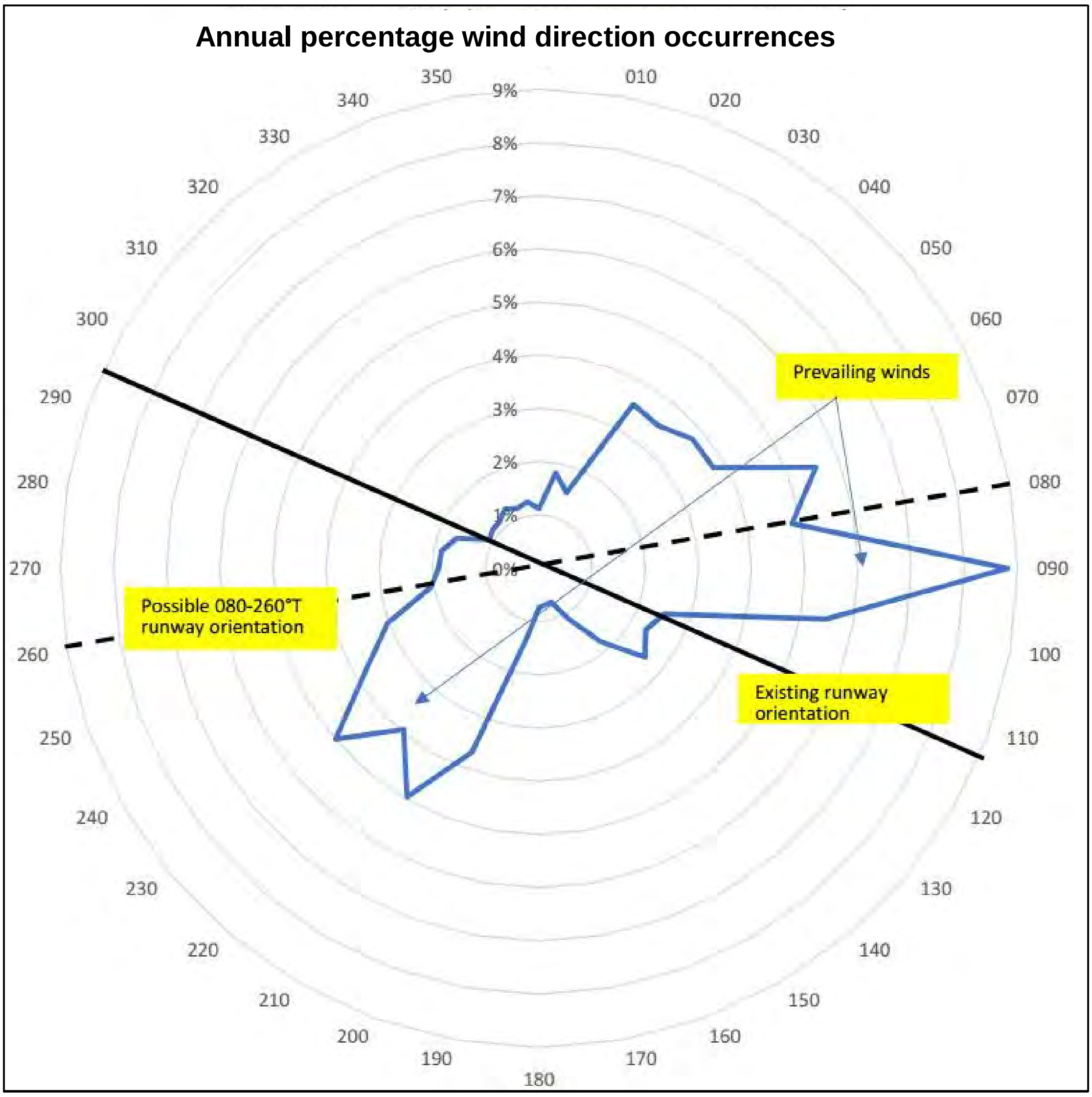
2.2 Weather patterns

Weather patterns have been based on statistics provided by the Australian Bureau of Meteorology between 1988 and 2018.

The Island's climate is temperate to sub-tropical with an annual mean daily temperature of 22°C and minimum 17°C. Annual rainfall is about 1,500mm with the wettest period between March to July.

A consistent average daily wind speed of 22km/hr (approximately 13knots) is recorded. The prevailing winds on an annual basis are south-west (SW) and west (W) but in the summer months through until April, east (E) and north-east (NE) winds prevail, these are depicted in a wind rose shown in Figure 2.

Figure 2 Lord Howe Island wind rose



The sky is predominantly cloudy with the annual average mean number of cloudy days (defined as more than 6/8ths cloud cover) being 106 compared to clear days (defined as 2/8th cloud cover or less) being much less at 68.

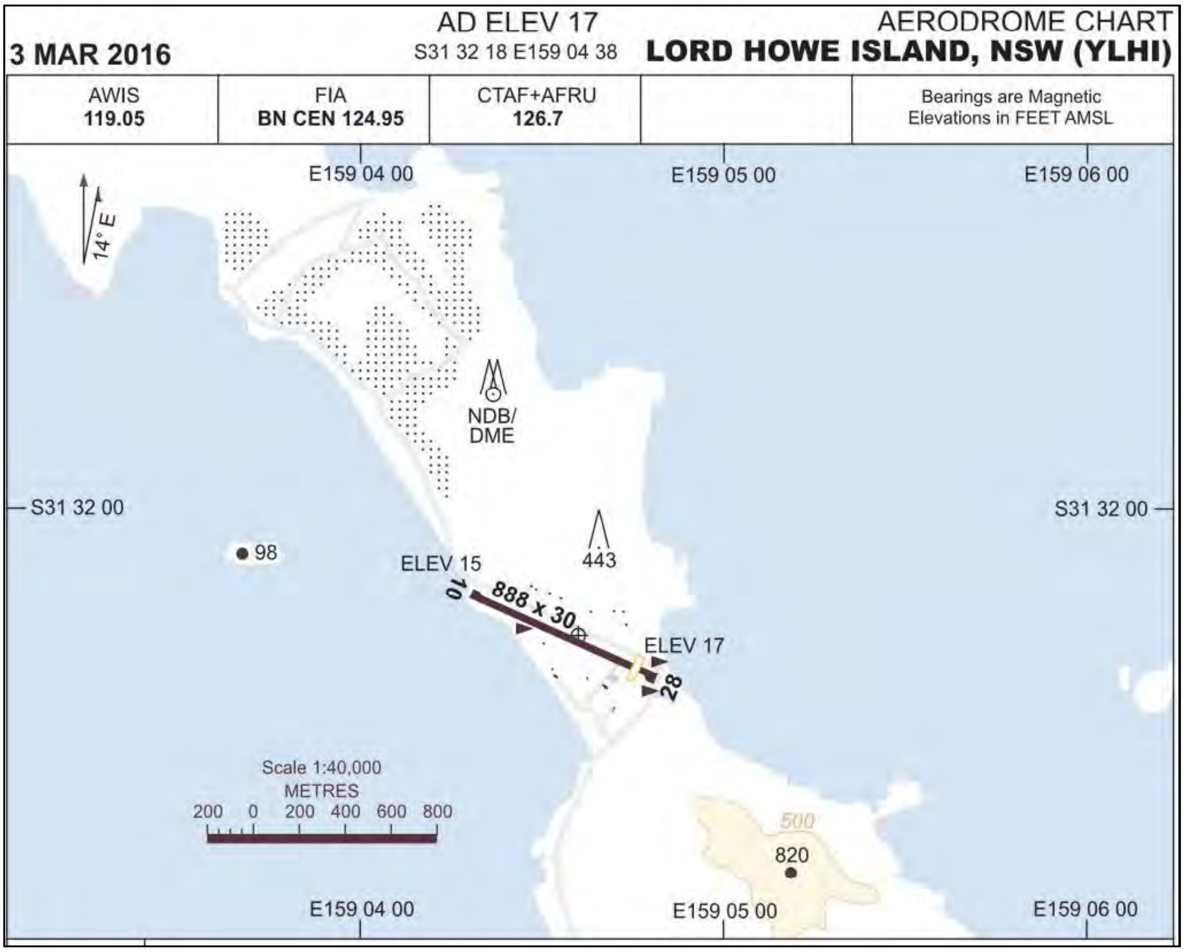
3.0 Existing operating conditions

3.1 Existing runway

3.1.1 Runway length and orientation

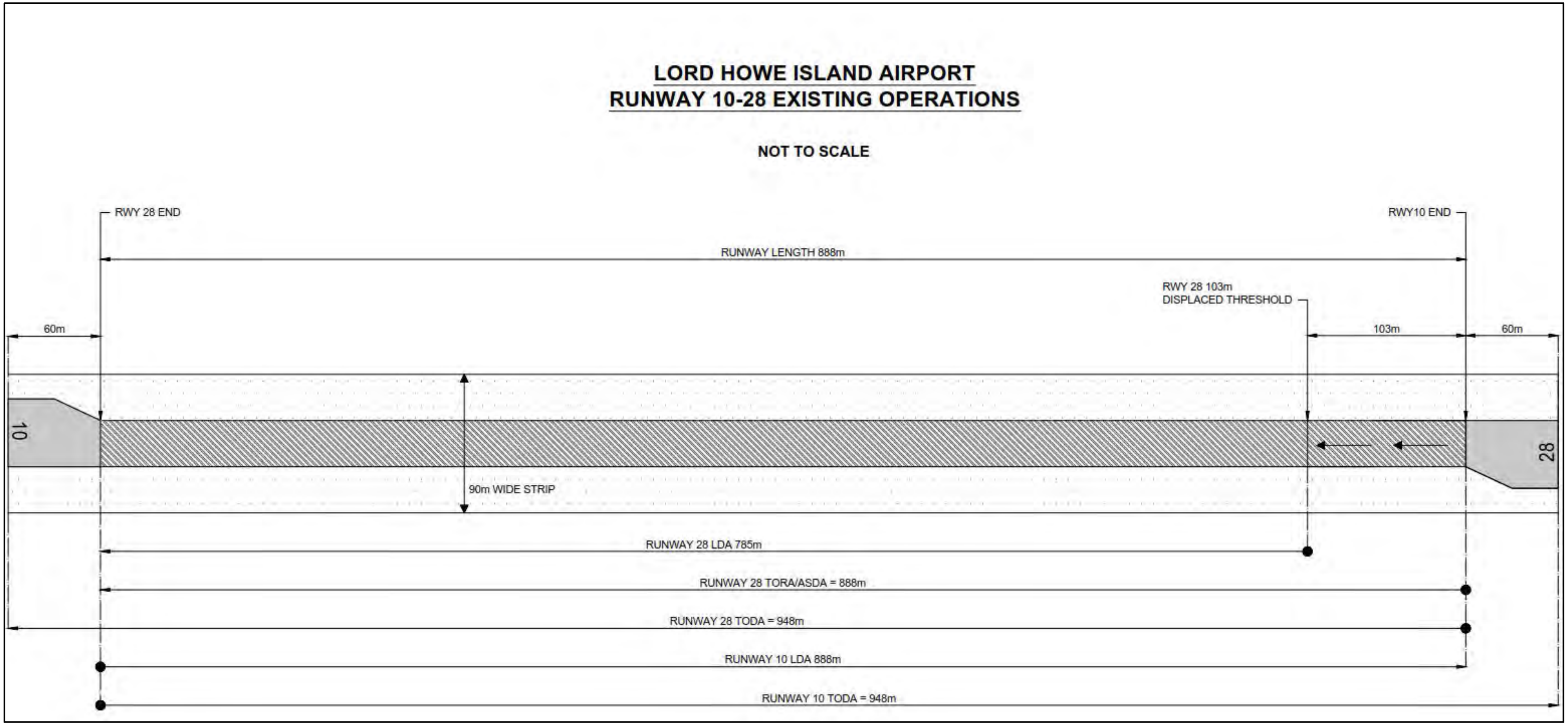
The existing runway layout is shown in Figure 3, taken from the Australian Aeronautical Information Publication (AIP). The runway runs north-west (NW) to south east (SE); take-off or landing towards the SE is on runway 10 and towards the NW is on runway 28.

Figure 3 Lord Howe Island Aerodrome Chart



The runway has a basic sealed length of 888m with additional sealed turn bays approximately 60m long at each end. The runway operational lengths are shown in Figure 4 on the following page.

Figure 4 Existing runway operational lengths



The Runway 28 threshold is inset 103m, reducing the landing distance in that direction to 785m, this is due to a 10ft high sand dune on the north side of the runway close to the threshold, and this also reduces the runway 10 take-off distance at 2.5% gradient by 82m to 803m. In addition to the engineering complexities of removing the sand dunes, the presence of an endangered sand spurge (Chemeaeyce psammogeton) has been recorded.

The runway is 30m wide and has a bearing strength of PCN10/F/A/550 (80psi)/U, there are no precision approach path indicators (PAPI) or visual approach slope indicator systems (VASIS) providing glide slope guidance.

The runway is classified as Code 2 in the AIP and therefore as shown in Table 3 it is suitable for aircraft with a reference take-off field length 800m but less than 1200m.

Table 3 Aerodrome Reference Code

Code Number	Aeroplane Reference Field Length	Document Reference
1	Less than 800m	*Civil Aviation Safety Authority, Manual of Standards Part 139 – Aerodromes, Version 1.14, Table 2.1-1*
2	800m up to but not including 1200m	
3	1200m up to but not including 1800m	
4	1800m and over	

3.1.2 AIP runway declared distance data

The Australian Aeronautical Information Publication (AIP) Runway Distance Supplement YLH-1 issued 9th November 2017 provides the declared distances for Lord Howe Island, this have been shown in Table 4

Table 4 Lord Howe Island Runway declared distances

Runway	TORA[1] (m)	TODA[2] (m)	ASDA[3] (m)	LDA[4] (m)
10	888	948 *(2%)*	888	888
28	888	948 *(1.6%)*	888	785

Notes

1. *TORA = Take-off run available*
2. *TODA = Take-off distance available*
3. *ASDA = Accelerate-stop distance available*
4. *LDA = Landing distance available*

In addition, Supplementary TODA (STODA) have been published for runway 10 that take account of the sand dunes at the SE runway end, these are provided for 2.5%, 3.3% and 5.0%. Advisory STOD for 1.6%, 1.9% and 2.2% have been calculated by based on data contained within the Australian AIP Runway Distance Supplement YLH-1. The distances are shown in Table 5 below.

Table 5 Lord Howe Island Runway 10 supplementary take-off distances

Gradient	1.6%	1.9%	2.2%	2.5%	3.3%	5.0%
STODA	593m	687m	755m	803m	877m	906m

3.1.3 Runway strip width

The runway strip width is currently 90m which meets the CASA requirements for a Code 2 runway, although recent CASA Audit reports have remarked on a narrowing of the strip at the runway ends effectively reducing the strip width to less than 90m in those areas. CASA have indicated in discussions that they require this to be rectified irrelevant of any runway extension works.

It is to be noted that infrastructure and vegetation on either side of the runway (road to the NE, apron and terminal building on the SW side) may make any strip width increases cost prohibitive.

3.1.4 Runway end safety area

The existing runway has no Runway End Safety Area (RESA), which is a “grandfather situation” arising as the airport was built prior to the RESA standard being adopted. Any runway extension work would need to include the provision of RESA’s.

3.1.5 Obstacle limitations surfaces

Obstacle limitation surfaces (OLS) are required to protect aircraft on taking off, landing and circling an aerodrome from objects infringing their flight paths. An indicative assessment of the current OLS surface penetrations has been shown in Figure 5, surface levels are based on Light Detection and Ranging (LiDAR) survey information available from the NSW government. It is to be noted the LiDAR survey information does not provide a level of detail great enough to accurately determine the penetrations, but merely to give an indication.

Sand dunes at the SE end of the runway penetrate the OLS and result in a significant reduction in STODA, as listed in Table 2, compared to the physical runway plus clearway length of 948m.

The transitional OLS is penetrated along the north runway strip edge; in addition the inner horizontal and conical surfaces are penetrated by Mount Lidgbird, Mount Gower, Mount Eliza and Malabar Hill.

Figure 5 Lord Howe Island Indicative Existing OLS Surface Penetrations

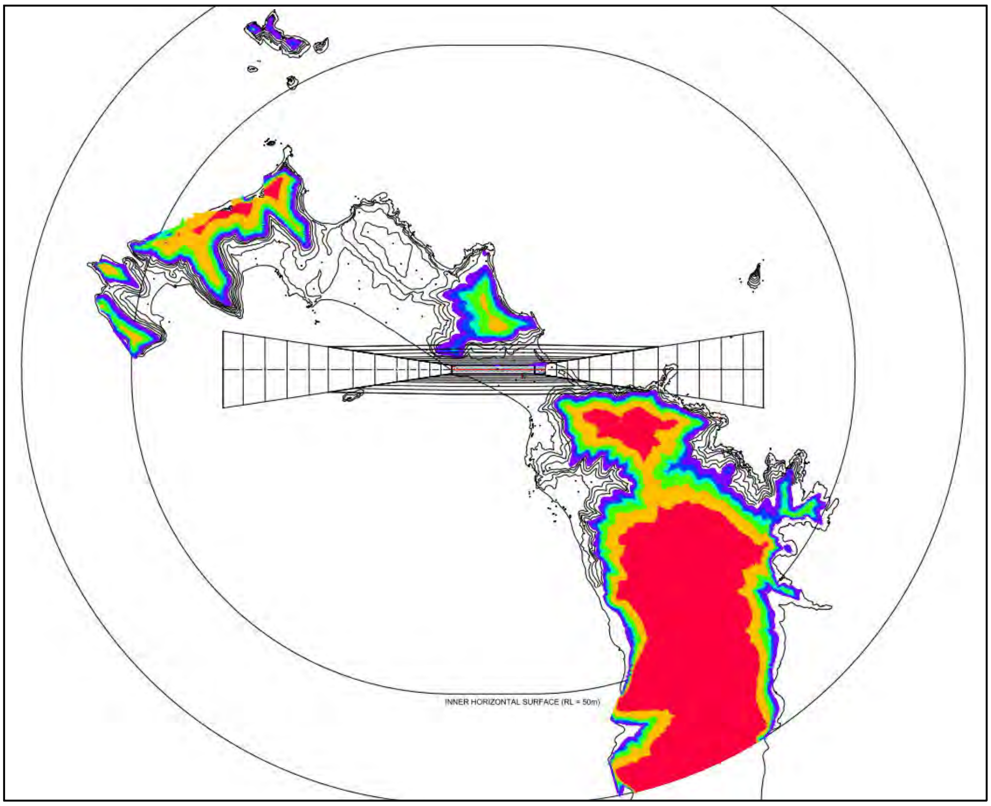
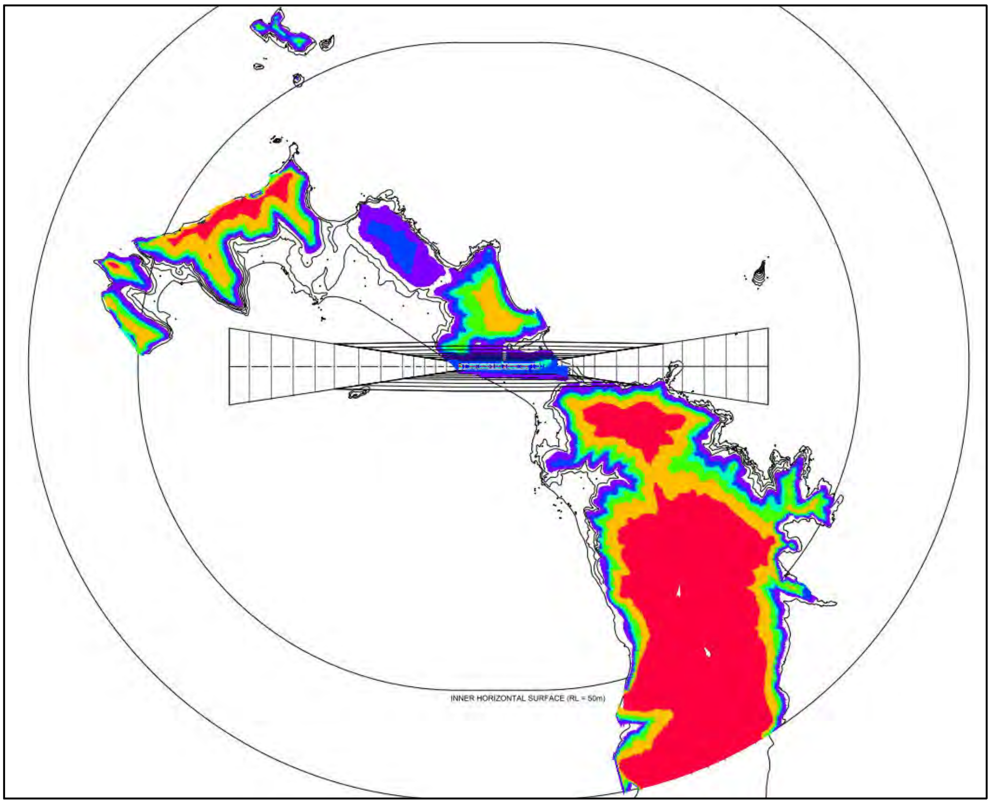


Figure 5 does not take into account the height of vegetation, as LiDAR scanning typically only picks up the ground surface. An indicative 20m has been added to the ground surface to account for vegetation, as shown in Figure 6 this significantly increases the OLS penetrations. Given the height of vegetation will vary across the island, the actual OLS penetrations will probably be a combination between Figure 5 and Figure 6.

Figure 6 Lord Howe Island Indicative Existing OLS Surface Penetrations including 20m vegetation



3.1.6 Visual segment surface

This surface, required for the protection of aircraft making instrument approaches, has a similar planform shape to the approach OLS; however it splays out at a larger angle and rises at a steeper gradient. Obstacles infringing the Visual Segment Surface (VSS) affect the operating minima and Vertical Path Angle (VPA) required for the approach. The dunes at the NE end do not affect the VSS; however terrain and vegetation on Intermediate Hill do affect the approach to runway 28.

North Head lies under the approach to Runway 10, however with the threshold in its current location there is no infringement.

3.1.7 Approach and lighting

The runway has Global Navigation Satellite System (GNSS) approaches available in each runway direction, supplemented by a Non Directional Beacon (NDB) and Distance Measure Equipment (DME) circling approach.

There is no runway lighting for RPT flights, but emergency lighting is available for medical evacuations and declared aircraft emergencies

3.1.8 Instrument flight procedures

Both runway directions have non-precision instrument approaches as below:

Runway 10: Random Area Navigation (RNAV)-Z (GNSS) straight in minima 1090ft-5km Codes A-C

Runway 28: RNAV-Z (GNSS) straight in minima 1340ft-5km Codes A-C

Either runway: NDB-A Circling minima 1580ft -2.5km (Codes A&B), 1680ft-4km (Code C)

3.1.9 Aerodrome rescue and firefighting service

No Airport Rescue and Firefighting Service (ARFFS) is provided. It is not required by CASA as the passenger numbers passing through the airport are below the CASA threshold at which ARFF is required. It is assumed LDH has an Aerodrome Emergency Plan and related emergency service procedures including firefighting and rescue services.

3.1.10 Runway strength

The runway strength is listed as pavement classification number (PCN) 10 /F /A /550 (80PSI) /U in the AIP. Table 6 below lists the corresponding aircraft classification numbers (ACN) for a range of aircraft typically operating at LDH.

Table 6 Lord Howe Island Current Operating Aircraft Loading

Aircraft	ACN	Tyre Pressure (kPa)
DHC8-200	9	900
King Air 350	3	730
C130J Hercules	29	670
C27J Spartan	8	440

Generally, it is acceptable to exceed a runway's published PCN by 10% without causing distress to the runway, therefore based on this the existing aircraft can comply with runway strength limits except for the C130J. The tyre pressure of the DHC8-200 exceeds the 550kPA allowed, although LDH issue a dispensation to Qantas for this.

It is to be noted that the PCN for LDH has not been recalculated following the runway resurfacing completed in 2015.

3.2 Current aircraft operations

3.2.1 RPT operations

Currently the only Regular Passenger Transport (RPT) service to the Island is provided by QantasLink using a Code 2B 36 seat Bombardier DHC8-200 aircraft.

This service which operates from Sydney (SYD) approximately 12 times per week, and from Brisbane (BNE) approximately twice a week, has payload limitation outbound from LDH, Qantas indicated this is typically 29 passengers in summer months.

Landing on Runway 28 when the runway is wet is also limiting due to the 103m displaced threshold resulting from the sand dunes. The estimated maximum landing weight in this condition is also around 29 passengers although conditions favouring the use of Runway 28 for landing are less common, based on an estimated wet runway landing limit weight of 15,000kg.

Operating an aircraft with a restriction in payload to about 80% of the aircraft's seating capacity can be inefficient and may significantly increase per seat operating costs.

3.2.2 Emergency medical operations

The Royal Flying Doctor Service (RFDS) (NSW) provide Emergency Medical Services (EMS) to LDH using Beechcraft King Air 250 and 350 aircraft. Occasionally, the RFDS are required to perform night operations but only if the weather is favourable and it's a "priority 1" emergency.

3.2.3 Military operations

On occasions the Royal Australian Airforce (RAAF) will also provide EMS using C130J Hercules or C27J Spartan aircraft on behalf of the RFDS for "priority 1" emergencies at night during bad weather. Other than for EMS we are informally advised by the RAAF that it has no operational need to use LDH.

3.2.4 General aviation

There are two general aviation (GA) aircraft based at LDH. Occasionally GA aircraft use LDH as a transit stop enroute to and from Australia and New Zealand or the Pacific islands.

These aircraft are generally Code 1 or 2 and can operate adequately on the existing runway. There are some 300-400 GA aircraft movements through LDH annually, ranging from small single engine piston powered aircraft, to business jets.

4.0 CASA requirements

Consultation with CASA has been undertaken to discuss the runway extension. CASA have raised the issues included within Section 4.0.

4.1 Applicable standards

CASA advised that the applicable Manual of Aerodrome Standards (MOS139) is currently undergoing detailed review. A final draft is currently out for industry consultation and is expected to be adopted by the end of 2018. This updated MOS139 has updated requirements for both the runway strip and also the Runway End Safety Area (RESA).

Should a runway extension be commissioned at LDH, it is highly likely the final design would be completed following approval of the draft MOS. Accordingly, this report has been based on the draft MOS139, although reference has been made to the current MOS139(Version 1.14 Jan 2017) for comparison.

4.2 Runway design code

An aerodrome is assessed by CASA based on the design code nominated by the aerodrome operator. The aerodrome must then meet all the standards applicable to that code or obtain a dispensation from CASA. This does not limit the airport to exceeding any Code criteria. For example, a runway can exceed the Code 2 length of 1200m, but if it doesn’t meet all design requirements for a Code 3 runway, it will remain designated as Code 2.

The design code is not intended to preclude the operation of a higher Code aircraft. For example, a Code 3 aircraft can be operated on a Code 2 runway, however the aircraft operator must obtain approval from CASA based on a risk assessment of any aspects of the runway that do not meet the aircraft code.

4.3 Runway length

MOS139 does not determine runway length required for operation of any specific aircraft type. It is quite common for example for a Code 4 aircraft to be operated on a Code 3 length runway. Safe operation of the aircraft on a shorter runway is achieved via restrictions on take-off and landing weight to ensure the aircraft performance matches the runway length.

Therefore, extension of the LDH runway to more than 1200m (the Code 3 threshold) would not automatically require the runway (or the whole aerodrome) to satisfy all Code 3 parameters.

4.4 Runway strip width

The draft version of MOS139 requires the runway strip width for a Code 2 instrument non-precision runway to be a minimum 90m; including 10m “fly over” which has a less stringent grading requirement. For a Code 3 runway this increases to 140m, although the additional 50m would be designated as “fly over” and be subject to less stringent grading requirements.

Widening the strip beyond the existing 90m at LDH could be cost prohibitive due to the removal of vegetation and relocation of infrastructure. If the strip remained at 90m, CASA would regard this as the limiting factor on the design code i.e. the runway will always be Code 2.

This does not preclude operations of Code 3 aircraft but the aircraft operator (and possibly the aerodrome operator as well) will need the appropriate dispensation from CASA. This makes the ability to accommodate larger aircraft less certain and potentially subject to ongoing review. At present Qantas operate Dash 8-400’s (a Code 3 aircraft) at Blackall Airport (Queensland) which has a strip width of 90m.

CASA will not stipulate the requirements for a dispensation (other than the need for the operator to provide an acceptable safety case) ahead of an operator actually applying. However, discussion between the potential operator (such as QantasLink) and CASA would provide a reasonable guide of what CASA's stance will be in the future.

At this point we believe restrictions could be placed on:

- Cross wind limits;
- Operating minima;
- Night operations (not applicable at LDH); and
- Pilot experience.

The current version of MOS139 requires a Code 3 runway strip width to be 150m (including 60m "flyover".

4.5 Runway End Safety Area (RESA)

Under MOS139 (both current and draft version), LDH is required to have a RESA at each runway end as it is a Code 2 instrument runway. Although it is not currently required as the RESA standard was introduced after the runway was built, i.e. the runway is "grandfathered" as non-RESA compliant.

CASA made it clear that any extension of the runway would trigger a requirement for RESA under MOS139 6.25 (draft version). The minimum RESA length for a Code 2 runway is 60m measured from the end of the runway strip, and a minimum width of 60m (being twice the runway width). The preferred length of a Code 2 runway RESA is 120m. For a Code 3 runway, CASA require a minimum 90m long RESA, although the preferred length is stated as 240m.

Should a RESA less than the preferred length be provided, then CASA may require a safety case be produced to justify this. Informal indication from CASA is that the minimum RESA length would be acceptable at LDH.

The current version of MOS139 only requires a 60m long RESA for Code 3 runways only being used by propeller aircraft, this relaxation has been removed from the draft MOS139.

4.6 Aerodrome rescue and fire fighting

ARFF requirements are related to the number of RPT passengers through the airport, not on the code of aircraft operated. LDH would continue to operate under the current Aerodrome Emergency Plan, although it is to be noted should international RPT services begin to operate then ARFF would be required.

4.7 Air Services Australia

Air Services Australia (ASA) are required by CASA to design Instrument Flight (IF) procedures in accordance with ICAO Standards. This requires ASA to apply appropriate IF protection surfaces to approach paths that are separate from the OLS specified in MOS139. These are typically more stringent than the OLS approach surface, therefore restricting the allowable height of objects beneath the approach path.

5.0 Existing runway limitations

5.1 Runway length

At 888m in physical length (plus 60m turn arounds at each end which act as the existing clearway), the runway is very short for 30+ seat RPT aircraft, being just above the Code 2 threshold of 800m. In addition, the dunes at the NE end reduce the effective runway length by up to 350m for the 1.6% take-off surface.

Often aircraft can operate efficiently (i.e. with a full or near full payload) from a shorter than normal runway length if the destination is relatively close, which allows for a reduced fuel load. However, the long flight distance from LDH to SYD or BNE means most take-offs from LDH are at or near the aircraft's maximum classified take-off weight (MCTOW).

Similarly, on landing at LDH, the high reserve fuel load carried to cover possible diversion to Port Macquarie, requires aircraft to be at or close to their maximum structural landing weight (MLW) on arrival at LDH, this requires a longer landing runway length.

Table 7 below lists the indicative take-off and landing weights required for full payload operation from SYD to LDH as a percentage of the aircraft's maximum. The figures for BNE –LDH are very similar.

Table 7 Required take-off and landing weights and runway lengths at LDH

Aircraft	MCTOW (kg)	MCTOW % required	RLR for MCTOW (m)[1]	MLW[2] (kg)	MLW % required	RLR for MLW (m)[3]
DHC8-200	16466	99%	1050	15649	99%	775
DHC8-300	19505	100%	1400	19051	97%	1025
DHC8-400	28998	100%	1450	28009	97%	1311
ATR42-500	18600	100%	1170	18300	95%	1109
ATR72-500	22500	100%	1350	22350	95%	1051
Fokker 50	20820	98%	1280	19730	100%	1288
Saab 340	12925	100%	-	12340	98%	-

<u>Notes</u>

1. *RLR for MCTOW = Take-off runway length required when taking off at ISA + 10°c (25°c)*
2. *MLW = Maximum landing weight*
3. *RLR for MLW = Landing runway length required when landing on a wet runway*

As the existing take-off runway length available on either runway is only 888m, the runway is shorter than any of the listed aircraft require for efficient operation. This also doesn't take into consideration any reduced operational length because of the sand dunes.

Similarly, apart from the DHC8-200, the landing runway length available is too short to allow the required landing weight for efficient operation for any of the listed aircraft.

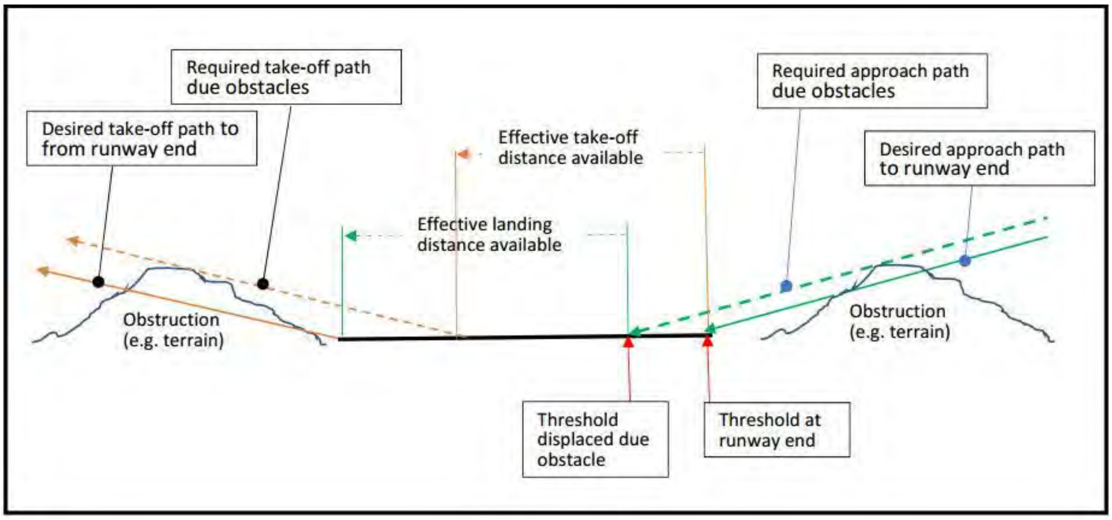
While the DHC8-200 can operate from 888m long runway, it does so at a much-reduced payload of 29 passengers i.e. 80% of a full load of 36. This means the operation is not efficient which drives up per seat operating costs and ticket prices.

5.2 Effect of flight path obstructions

5.2.1 General

Flight path obstructions reduce the effective runway length below the physical runway length available. This is because aircraft can only take-off and land at relatively fixed angles (referred to as gradients) of climb and descent and any obstacles penetrating a surface of this gradient from the ends of the runway will reduce the effective runway length. This is illustrated in Figure 7 below:

Figure 7 Effect of flight path obstacles



For landing an aircraft's descent angle (referred to as vertical path angle or VPA) is relatively fixed at 3° to 4°, depending on the size of the aircraft. For example, small aircraft can accommodate a much steeper VPA compared to a large jet aircraft. The approach OLS provides a protection surface below the VPA as a safety margin. Obstacles penetrating the approach OLS reduce the safety margin requiring the threshold to be displaced such that no penetration occurs on the displaced path.

The displacement reduces the effective landing distance available to less than the runway length, which can result in aircraft landing weight restrictions occurring.

The take-off gradient the aircraft (assuming a twin engined RPT aircraft) can achieve must cater for the possibility of one of the two engines failing during take-off.

The take-off OLS for Code 2 aircraft specified in MOS139 is 4.0%; this is too steep for twin engined RPT aircraft to achieve as CASA require the possibility of one engine failing during take-off to be accounted for. Therefore a take-off OLS gradient of 1.6% clear of obstacles is required to ensure twin engined aircraft are not restricted by flight path obstacles. Depending on the aerodynamic (flap setting) characteristics of individual aircraft, higher gradients may be acceptable under some situations, but rarely above 2.0%

This greatly reduces gradient capability. If obstacles are present the take-off weight of the aircraft must be reduced until the gradient at the lift off point is sufficient to clear the most limiting obstacle. The actual gradient required and therefore the limiting allowable take-of weight is determined by the aircraft's weight and the location of the take-off point along the runway, which is influenced by take-off flap setting, wind component along the runway, air temperature and air pressure.

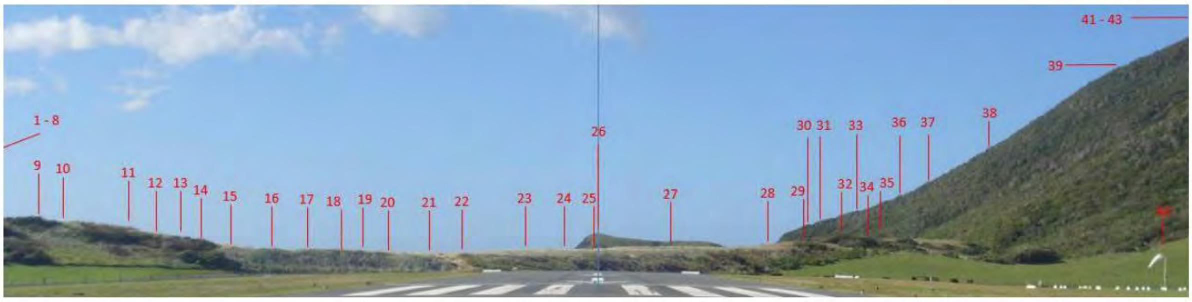
Therefore without in depth aircraft performance analysis being carried out, it is not possible to say whether an STOD of 1.9%, or 2.2% or any other figure above 1.6% will be adequate for an aircraft to take-off unrestricted. What is more certain is that if an STOD of 1.6% equal to the runway length plus any available clearway is available then it is unlikely the aircraft's take-off weight will be reduced due to flight path obstacle.

The objective therefore in any aerodrome siting is to be able to provide an approach OLS appropriate to the category of aircraft and a take-off OLS of 1.6% clear of obstacles. Difficulties arise at LDH because both approach and take-off OLS are penetrated by obstacles. Any runway extension, depending on its direction, can exacerbate or mitigate the difficulty.

5.2.2 South east runway end flight path obstructions

The SE runway end has a line of sand dunes close to the runway end which substantially penetrate both the 1:30 (3.3%) approach OLS and the 1.6% take-off OLS. Further out, Intermediate Hill penetrates the approach OLS. These are shown in Figure 8 below. Full details of the penetrations are contained in Section 10 of Appendix A.

Figure 8 South east runway end flight path obstructions



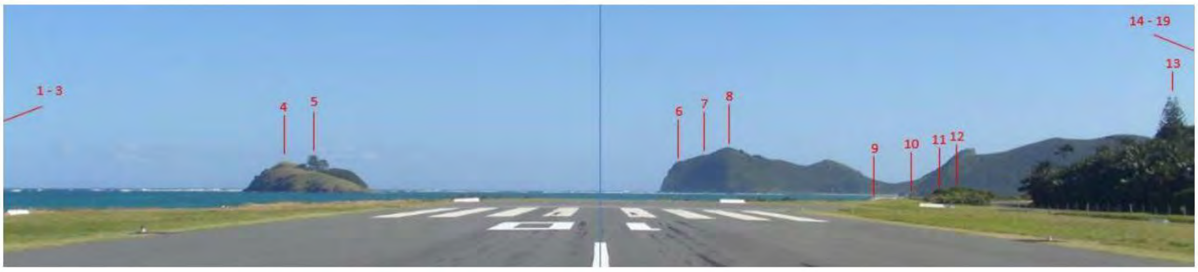
The dunes penetrating the take-off and approach OLS are numbers 16-35 (excluding 26 which is Mutton Bird Point and 30, 31 and 33 which are Intermediate Hill). The penetrations, along with Intermediate Hill, result in a displacement of 103m in the runway 28 landing threshold, reducing the effective landing distance to 785m in that direction.

Mutton Bird Point, which does not affect the approach OLS does impact the 1.6% take-off OLS however it would be possible to turn the take-off flight path immediately after take-off to avoid Mutton Bird Point. This also removes Intermediate Hill from the take-off OLS.

5.2.3 North west runway end flight path obstructions

The NW runway end take-off and approach OLS are clear of obstructions across the lagoon out to the end of the (Code 2) OLS at 2,500m from the end of the runway strip. Approximately 3,470m out, the runway extended centreline beyond the end of the approach OLS passes south of North Head (points 6,7 & 8 in Figure 9 below). The remaining obstacles 4 to 13 do not impact the take-off or approach OLS. Should the runway be upgraded to Code 3, then the approach OLS will extend to 15,000m which may cause North Head to become an obstruction.

Figure 9 North West runway end obstructions



The visual segment surface (VSS) however does currently extend out to North Head. We are advised by ASA that to avoid the VSS being infringed by North Head, a VPA of 3.3° must be used. While steeper than the normal 3°, this does not require any special flight procedures.

It does mean that any extension of the runway to the NW will require a steepening of the VPA, which may itself require agreement of the operating airlines and special Instrument Flight Procedure (IFP). Based on advice received from ASA, the maximum the NW (runway 10) threshold could be shifted with a runway extension over the lagoon is 400m. This is based on a VPA of 3.5°, increasing the steepness of the VSS approach will be in jeopardy of an airline not accepting operating it, making any additional extension redundant.

5.3 Runway design code

The Runway design code, a proxy for aircraft speed and size, determines the size of the protection areas provided to aircraft using the runway and the airspace surrounding it. In particular the number part of the design code determines strip width and dimensions of the OLS and IFP protection areas.

There is a very large step up between the smaller codes 1 and 2, essentially providing for small aircraft below approximately 40 seats to the larger codes 3 and 4 which accommodate bigger aircraft, up to 400+ seats. Notably under MOS139, when moving from a Code 2 instrument non-precision to Code 3 instrument non-precision design standard:

- The strip width required increases from 90m to 140m;
- The approach OLS base width increases from 90 to 140m and the length from 2500m to 15,000m;
- The transitional OLS moves outward by 25m each side (due to the strip width increase) and its upslope reduces from 1:5 to 1:7; and
- The geometry of the PANS-OPS IFP protection areas based on the runway strip width (such as the VSS) also changes substantially.

The change in OLS and VSS geometry greatly extend the protection areas within which obstacles infringing on flight paths must be considered.

Consequently, it can be extremely difficult for a Code 2 runway, such as LDH, that is constrained by terrain to be able to achieve compliance with Code 3 standards.

Figure 10 and Figure 11 shows the difference in 2d coverage of the OLS for Code 2 (red) and Code 3 (blue) runways

Figure 10 Full OLS 2d comparison

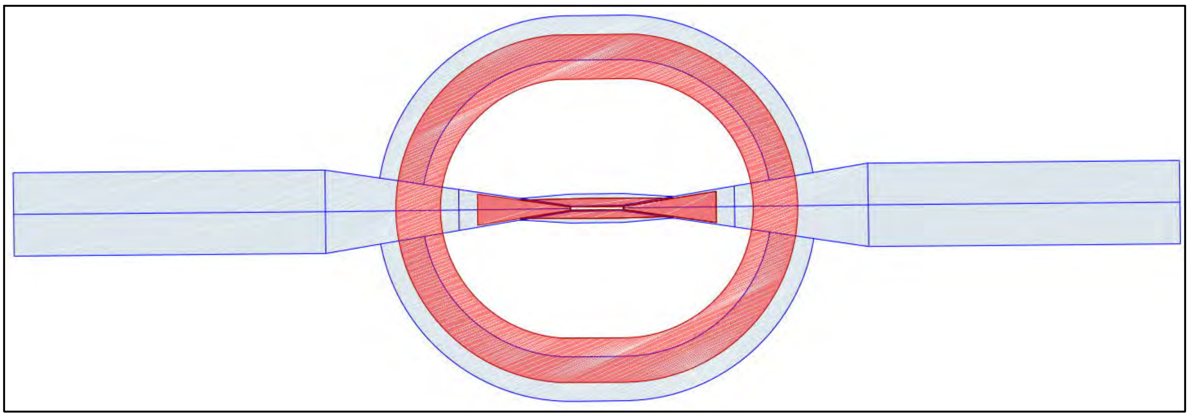
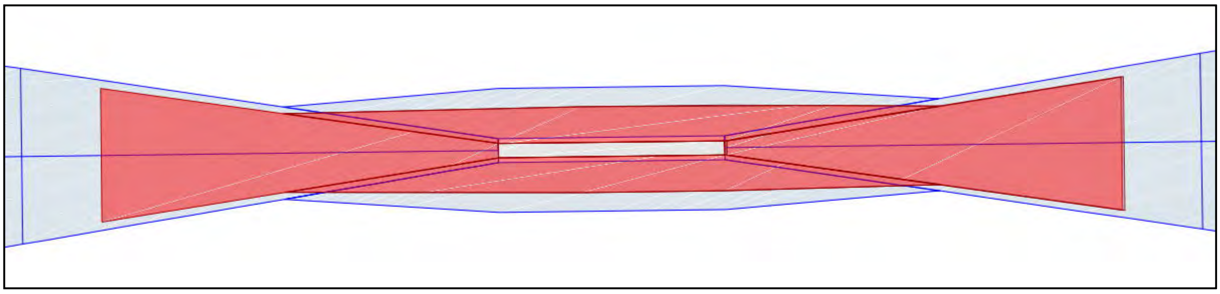


Figure 11 Runway strip, transitional surface and approach surface comparison



5.4 Runway strip width

The runway strip width is a fundamental design specification for a runway and an important safety consideration as it determines the amount of emergency run-off area available on either side of the runway. Clearly larger and faster aircraft require more safety area.

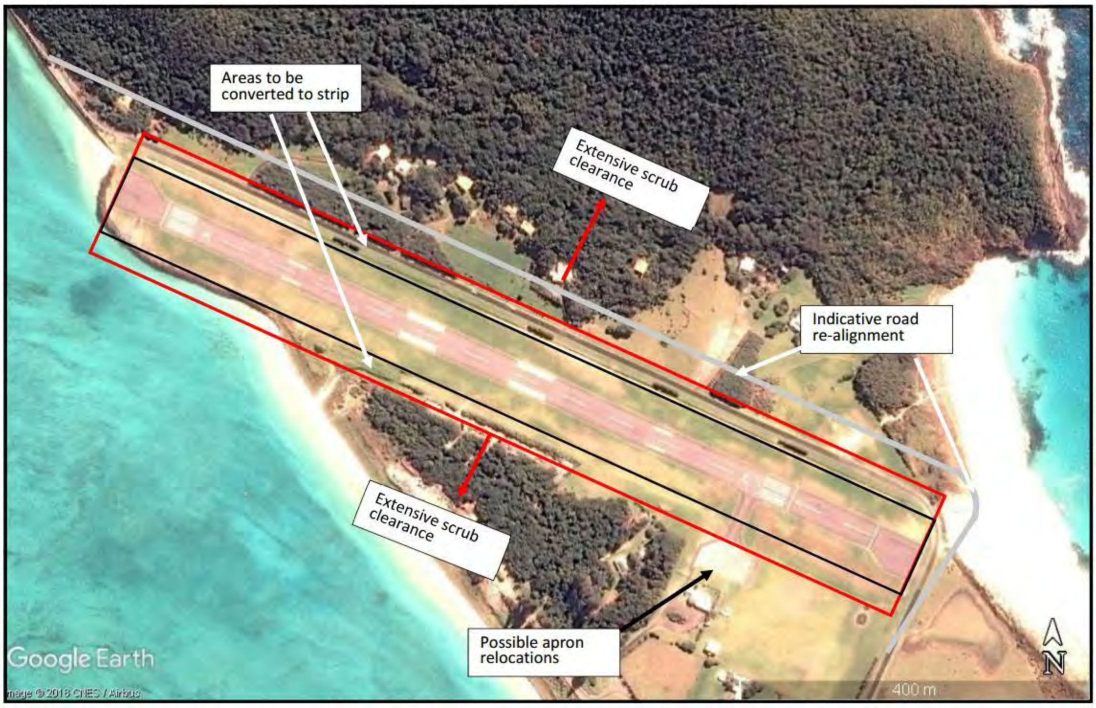
Under MOS139 standards the runway strip width of 90m is adequate for a Code 2 instrument non-precision runway. As the DHC8-200 is Code 2 its operation conforms to the runway Code.

If the replacement aircraft were to be Code 3, CASA requires an instrument non-precision runway to have a 140m wide strip. To accommodate Code 3 aircraft at LDH there are three options:

5.4.1 Widen the strip width to 140m.

Figure 12 shows the additional area that would be required by a Code 3 140m wide strip.

Figure 12 Potential effects of a 140m runway strip at LDH



Extending the runway strip width will require significant additional work such as vegetation removal and infrastructure relocation; there are two options with regards to the island road as discussed below

a) Retaining the existing road position

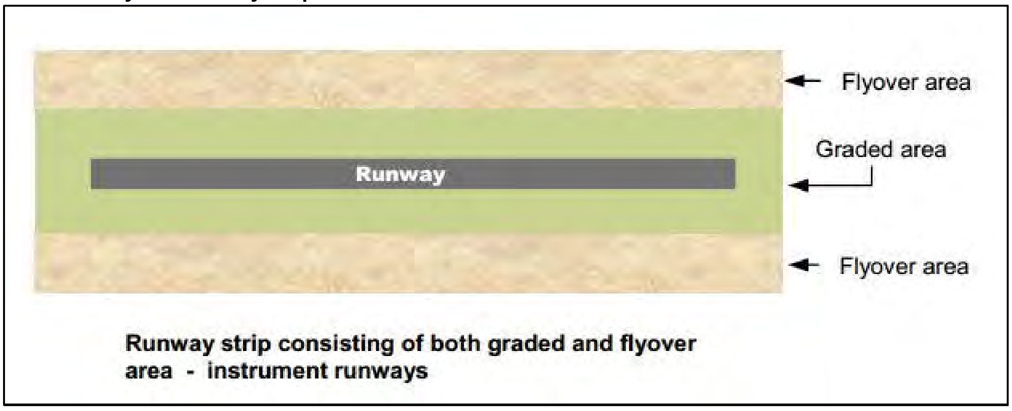
Subject to further discussions with CASA, the existing road alignment could be retained as it sits outside of the existing Code 2 strip and for any Code 2 aircraft manoeuvres it would not provide transient obstacle issues because cars would be beyond the edge of the strip. For all Code 3 aircraft manoeuvres physical controls would need to be installed in order to keep any pedestrians and vehicles outside of the runway strip.

b) Road realignment

If CASA do not accept the proposal above, the road running along the north side of the runway would need to be relocated approximately 45m further out from its existing location to remove it from within the expanded runway strip and to ensure any vehicles on it are kept under the 1:7 transitional surface. The alignment of the road as it passed the end of the runway would need to be reviewed for compliance with MOS139 7.1.6.4 which requires transient obstacles such as vehicles that may infringe an OLS to be referred to CASA for assessment. It is possible the road may still need to be controlled during RPT aircraft movements.

The additional Code 3 strip width of 50m (25m each side) would be treated as “flyover strip” under MOS139 6.2.18.2, as shown in Figure 13.

Figure 13 Graded and flyover runway strip areas



Flyover strip does not need to be graded to the same extent the central 90m of (existing) strip is. It can have ditches and depressions within it. However, MOS139 6.2.22.3 requires that no object within the graded area infringes a 1:5 slope outwards from the edge of the graded portion. This means the highest object or vegetation in the flyover strip could only be 1.5m high. This may provide limited relief but it is expected a substantial amount of scrub and possibly terrain clearance would be required along with side of the runway to accommodate the 140m strip and its associated 1:7 transitional surface.

As the size of the OLS and VSS obstacle protection surfaces is linked to strip width, substantially more obstacles could be bought into play if a 140m strip width was sought. This could adversely affect aircraft operations.

5.4.2 Airline seeks dispensation from CASA

The alternative to developing a 140m wide runway strip is for the runway to remain Code 2 and the operating airline to seek an appropriate dispensation from CASA for operation of its Code 3 aircraft on a Code 2 runway. There is at least one precedent for this; the QantasLink DHC8-400 operates to Blackall Airport (Queensland) which only has a 90m strip width.

In its Aerodrome Design Manual, ICAO makes it clear that the aerodrome design code is not intended to prevent operation of any aircraft on a runway:

“The aim of the specifications in [ICAO] Annex 14, Volume I is to give aerodrome planners a tool to design efficient aerodromes for safe aircraft operations. It is not intended, however, that the Annex be used to regulate aircraft operations. It may be permissible to operate at existing aerodromes with lower [specifications] than those specified in the Annex if an aeronautical study indicates that such lower [specifications] would not adversely affect the safety or significantly affect the regularity of operations of aircraft. The purpose of this material is to assist States in undertaking an aeronautical study by defining the criteria considered pertinent for the assessment of whether lesser [specifications] than those specified in Annex 14 Volume I, are adequate for the operation of new larger aeroplanes in the specific operational environment at an existing aerodrome. This may also result in operational restrictions or limitations. Notwithstanding the above, every effort must be made to conform with Annex 14, Volume I specifications at the earliest opportunity.”

ICAO makes this statement in the context of taxiway to runway separations; however the principle applies to other aerodrome design specifications. The key points are that:

i. An aeronautical study would be required to establish whether Code 3 operations can, with appropriate risk mitigations, be made safe on a Code 2 Runway; and

ii. Every effort should be made to bring the runway up to Code 3 specifications at the earliest opportunity i.e. it is only regarded as a temporary situation.

Relying on a dispensation therefore carries the risk that the conditions attached to Code 3 operations (for example a cross wind limit) will not be satisfactory and at some point compliance will be required by CASA at potentially high cost.

Our understanding is that the airline wishing to operate the Code 3 aircraft would have to apply for the dispensation, not the airport operator. However, it could be that the airport operator has to make runway/systems upgrades to support the operator's dispensation e.g. and improved crosswind monitoring system or placing controls on use of the public road parallel to the runway during aircraft operations.

5.4.3 Aerodrome seeks upgrade to Code 3 with dispensation from CASA for 90m wide strip

Much the same issues would apply as for the option discussed in Section 5.4.2, except the aerodrome operation would have to prepare the safety case.

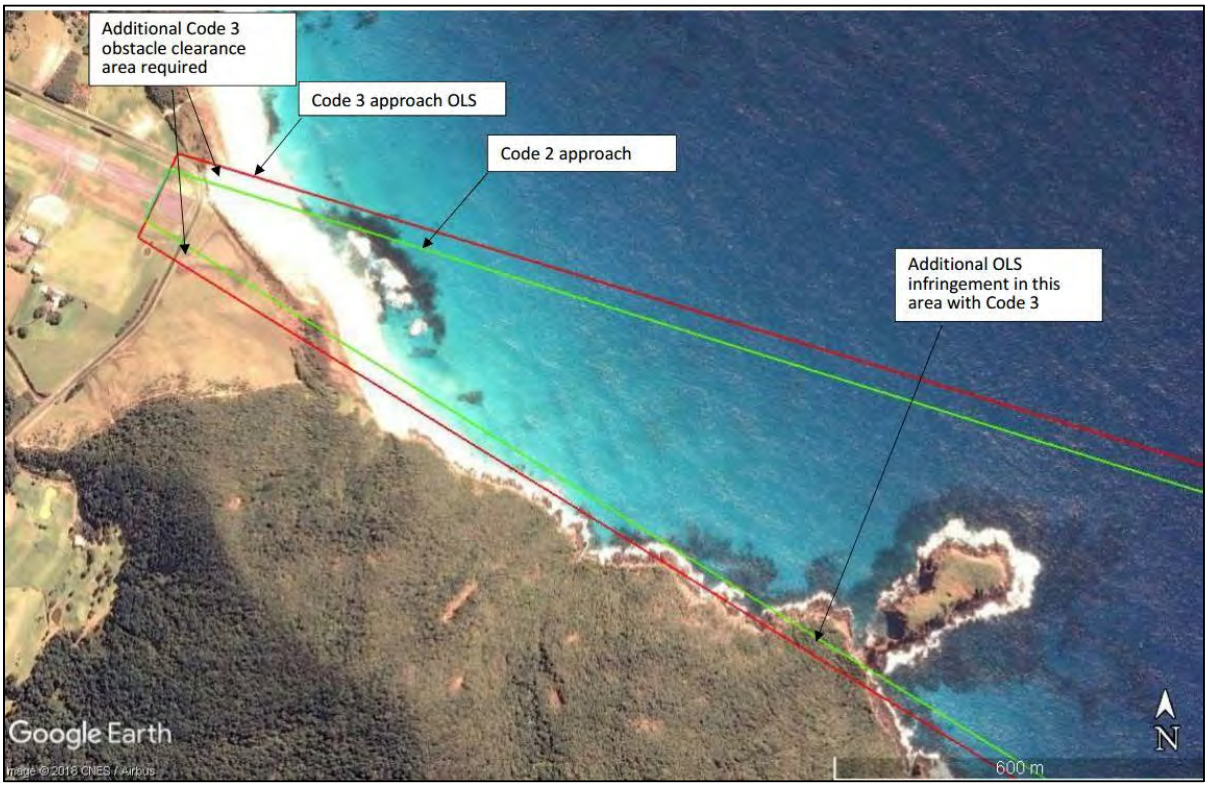
5.5 Obstacle limitation surfaces

As indicated previously, the OLS for the existing Code 2 runway are constrained. This affects not only the transitional OLS as discussed above, but also the take-off and approach OLS by virtue of their wider base ("inner edge") widths of 140m. The PANS OPS VSS is also affected as its base width is similarly increased.

Any additional OLS width brings more obstacles into the splay areas as illustrated in Figure 14.

At the SE end the wider approach splay will require more of the sand dune area to be cleared. The additional terrain on Intermediate Hill cannot be realistically cleared which would require CASA to approve the infringement. This situation already exists, albeit at a lower level, with the Code 2 OLS.

Figure 14 Additional Code 3 approach splay at SE end



5.6 Runway strength

Table 8 lists the ACN's of aircraft which may potentially operate at Lord Howe Island as part of the RPT services. These should not exceed the rated PCN for the pavement or a pavement concession will be required from CASA.

Table 8 Lord Howe Island Potential Operating Aircraft Loading

Aircraft	ACN	Tyre Pressure (kPa)
ATR42	9	720
ATR72	11	790
DHC8-200	9	900
DHC8-300	8	670
DHC8-400	14	670
Fokker 50	9	590
Saab 340B	6	820

While the rated pavement strength of PCN10/F/A/550 (80psi)/U is adequate for the current aircraft (DHC8-200) and the DHC8 -300, it is not adequate for the larger Code 3 aircraft (ATR72 and DHC8-400). A dispensation or structural pavement overlay may be required depending on the updated PCN results.

6.0 Candidate RPT aircraft types

6.1 Aircraft performance considerations

The existing runway is very short with sand dune obstacles at the SE end reducing the effective take-off distance on Runway 10 and the landing distance on Runway 28, without this obstacle the existing runway would be adequate for unrestricted landings of the DHC8-200.

It is beneficial to investigate removing the dunes because any obstructions infringing the 1.6% upslope take-off OLS can reduce aircraft take-off weight due to aircraft having to lift off further from the runway end to clear the obstacles in the emergency one engine inoperative take-off situation.

Assuming the sand dunes are retained, extending the runway would make operation of the DHC8-200 far more efficient enabling more fuel and payload to be carried resulting in a more cost effective and flexible operation.

Efficient operation of any Code 3 aircraft would require a runway extension and possibly the partial or complete removal of the dunes. Amendments to the sand dune heights may reduce the length of runway extension required.

Achievable emergency one engine take-off gradients vary between aircraft types, depending on propeller thrust and aircraft aerodynamic characteristics in the take-off configuration. Some aircraft may be able to achieve better than 1.6% climb gradient capability but rarely better than 1.9%. Based on the sand dunes being retained, an aircraft capable of 1.9% climb gradient would have an additional 94m take off distance available.

Given the unknown characteristics of future aircraft operating at LDH, it would be conservative to ensure a 1.6% clear OLS can be provided in both runway directions. This has the potential to result in an unrealistic length of runway extension, therefore we have sought a balance by assessing the extension requirements based on a 1.9% OLS with no dune changes, then studying the incremental effect of selective partial dune lowering or total removal. This has the potential to minimise the extension length required and reduce construction costs.

6.2 Relevant aircraft types- next 15 years

6.2.1 Aircraft types

The study assumes 30-80 seat turbo-prop aircraft types in use in Australia over the next 15 years with be the same as those in use today. There are no new turbo-prop designs being developed by the major Western aircraft manufacturers (including Embraer in Brazil) within this seating capacity range.

While new designs may be developed in Asia (including India and Indonesia), in the past these have not had widespread acceptance in Western countries for a variety of reasons including design, certification standards, reliability and customer support.

Table 9 lists the candidate aircraft types; expected to be relevant to LDH operations over the next 15 years, and their characteristics. These are based on representative weights but individual aircraft may vary. Table 10 provides comment on the various aircraft

Table 9 Candidate aircraft characteristics

Aircraft	Seats	MCTOW (kg)	MLW (kg)	MZFW[1] (kg)	OEW[2] (kg)	Fuel Capacity (kg)	Maximum payload[3] (kg)		Runway length required[4]	
							SYD-LDH	LDH-SYD	Landing (m)	Take-off (m)
Saab 340B	34	13155	12930	12020	8620	2580	2243	2500	1200	1395
DHC8-100	36	15650	15380	14061	10245	2576	3000	3100	900	960
DHC8-200	36	16466	15377	14515	10600	2576	3700	3850	775	1050
ATR42-500/600	48	18600	18300	16700	11700	4500	4950	5250	1109	1170
DHC8-300	50	19505	19050	17920	11630	2574	5600	5900	1025	1400
Fokker 50	50	20820	20030	18900	12800	4120	5800	5900	1288	1280
ATR72-500/600	68	22800	22350	20800	13500	5000	6800	7050	1051	1350
DHC8-400	74	28998	27442	25174	16700	5318	8300	8750	1311	1450

<u>Notes</u>

1. *MZFW = Maximum zero fuel weight*
2. *OEW = Operating empty weight*
3. *Indicative, assuming no runway length or obstacle restrictions*
4. *Indicative, assuming wet runway landing and 60m clearway on take off*

Table 10 Comment on candidate aircraft

Aircraft	In production?	Code	Comment
Saab 340B	✗	3	Marginal range for LDH operation
DHC8-100	✗	2	Being phased out by airlines
DHC8-200	✗	2	A very popular aircraft, ideal for LDH with a small runway extension.
ATR42-500/600	✓	2	None currently operating in Australia. Ideally suited to LDH with a small runway extension. A STOL version is under study by ATR.
DHC8-300	✗	2	Requires runway extension
Fokker 50	✗	3	Requires runway extension and strip widening, unless CASA dispensation is given on strip width
ATR72-500/600	✓	3	Requires runway extension and strip widening, unless CASA dispensation is given on strip width
DHC8-400	✓	3	Requires runway extension, dune lowering and strip widening, unless CASA dispensation is given on strip width

It would be a reasonable assumption that all the aircraft in Table 9, apart from the ATR42 which is not currently operated in Australia, will still be in operation in Australia in 15 years' time. Even though the DHC8-100/200 and 300 will be 30-40 years old some should still have residual airframe life and operators may import more recent versions than those currently operating. Operation beyond that time (2033) cannot be assured.

Nevertheless, unless an Australian operator acquires the ATR42, the supply of Code 2 aircraft will steadily reduce over time leaving only Code 3 aircraft available for LDH. In particular the ATR72-600 series and the DHC8-400, which are still in production and likely to be for some years yet, will become the predominant types in service.

6.2.2 Operators and fleets

Based on the aircraft identified in Section 6.2.1, there are only a few operators in Australia with the relevant aircraft and within a reasonable geographic area of operation to potentially undertake RPT services to LDH. These operators and currently available or anticipated aircraft are listed in Table 11:

Table 11 Candidate RPT operators for LDH services

Operator	Existing Fleet		Comment on fleet plan
	Code 2	Code 3	
QantasLink	DHC8-200 DHC8-300	DHC 8-400	Have stated DHC8-200 will depart their fleet in 2022. Silent on future of 300 fleet which has an average age about 20 years. Their preferred aircraft for LDH is the Code 3 DHC8-400.
Virgin	-	ATR72	Have just recently quit operation of older ATR72-500 and are standardising on -600. Opposed to having a mixed fleet so unlikely to introduce any Code 2 ATR42.
REX	-	Saab340B	State that the Code 3 Saab 340 is ideal for their operation and they have a large fleet (approx. 50). May eventually consider Code 2 ATR42
Skytrans	DHC8-100	-	Stated they will move to the Code 2 DHC8-200 from Oct 18
Alliance	-	Fokker 50	Moving to an all jet fleet and out of contention for LDH operations

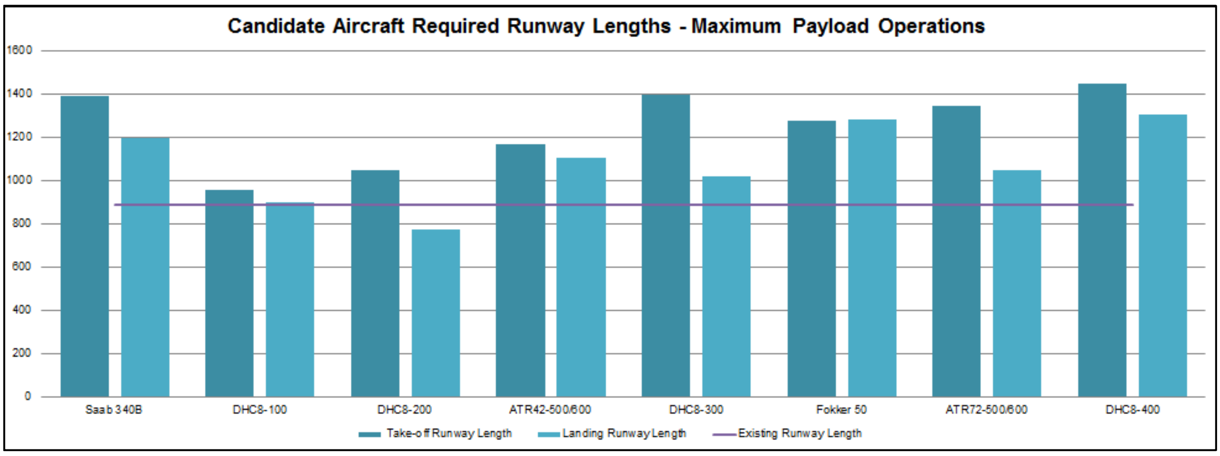
From the comments received it appears the only Code 2 aircraft available after the end of the current Qantas Regulated Route contract period will be the DHC8-200 of Skytrans. Skytrans, who have 8 DHC-100 in their fleet, have operated to LHD many times on charter. They are based in Cairns and currently operate RPT services to Northern Queensland, the Torres Strait Islands and Papua New Guinea.

6.2.3 Runway length requirements

The runway lengths are assessed assuming nil wind; 25°C ambient temperature and standard sea level air pressure (1013hPa), and assume a 60m clearway is available at the take-off end of the runway. No allowance is made for line-up distance at start of take-off as the turn pads currently provide this. Landing lengths are based on landing on wet runway.

All the candidate aircraft types require a runway extension and the dunes cleared for operation at maximum payload. Generally, the larger the aircraft (in terms of its MCTOW) the longer the runway length required is, although the Saab 340B is the exception to this. Figure 15 shows the respective runway length requirements.

Figure 15 Candidate aircraft required runway lengths – maximum payload operations



Some reductions in these lengths may be possible in discussion with the aircraft operators. However, that presents a risk as aircraft operators can change over time and a new operator may have more conservative policies than the existing. For this reason, the recommended runway lengths for preliminary design and costing purposes are those shown above.

6.2.4 Route payload capability

Currently the DHC8-200 is limited to 29 passengers; about 80% of its seating capacity which can restrict the ability to carry freight or even on occasion's passenger's bags. Ideally runway development for alternative aircraft should allow at least a full passenger load with baggage allowance, typically a combined "standard passenger weight" of 95kg per person. Any residual payload capacity over this provides operational flexibility including the ability to carry freight and mail which can be extremely beneficial to remote communities. However, operation at reduced payload may be the only viable option given the potential funding issues associated with any runway extension at LDH. Runway length requirements for operation at reduced payload have been included in Section 8.5.The runway lengths identified in Section 6.2.3 are based on MCTOW and therefore allow for maximum payload to be carried. This does not take into account the amount of reserve fuel required to divert back to the mainland in the event landing can't be made at LDH, therefore payload on inbound flights to LDH are generally limited by aircraft maximum landing weight.

For outbound flights from LDH, if the runway is long enough that MCTOW can be achieved, then the maximum structural payload capacity can be carried outbound because there is no "diversion" fuel load requirement.

Figure 16 and Figure 17below show the maximum passenger payload and residual for freight and mail available based on no runway restrictions for the candidate aircraft.

Figure 16 Inbound passenger and freight payloads (no runway restrictions)

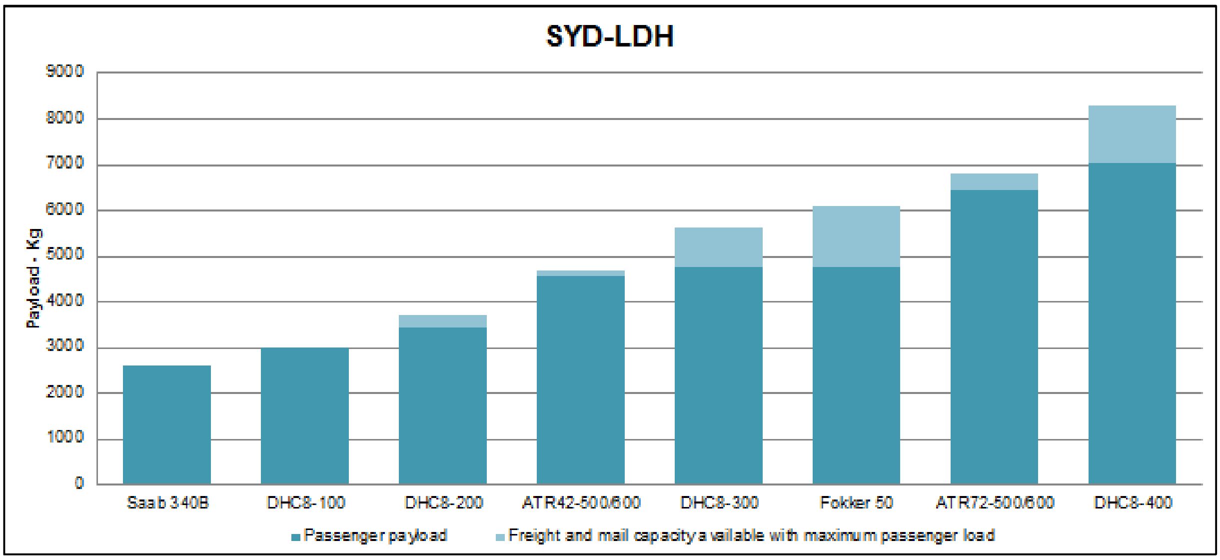
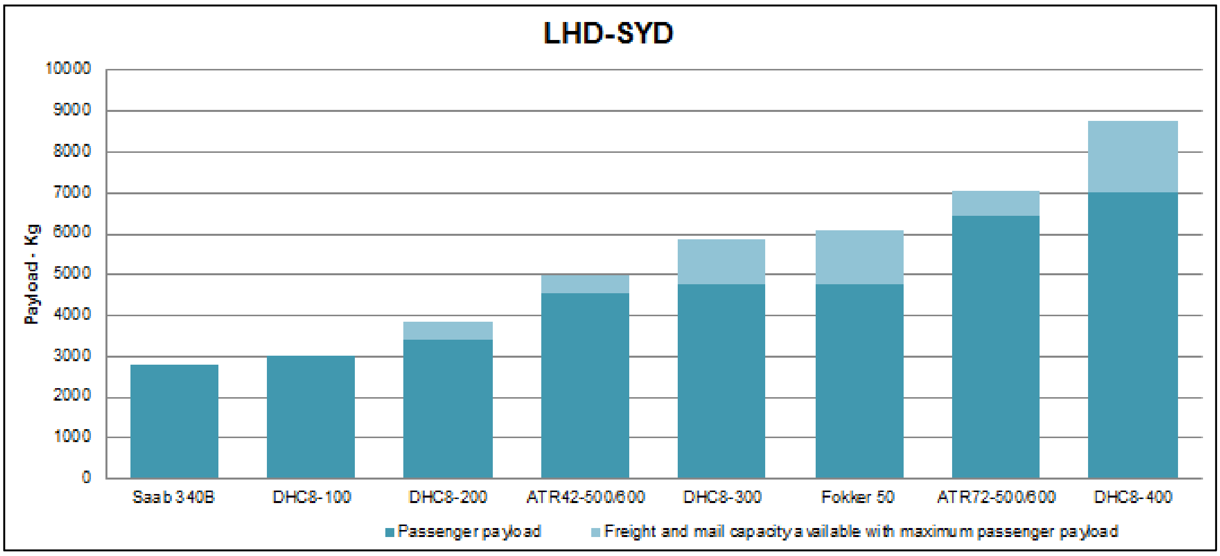


Figure 17 Outbound passenger and freight payloads (no runway restrictions)



Code 2 aircraft have very little capacity for freight and mail with a full passenger load. By contrast the Code 3 aircraft have significant capacity. Depending on how important reliable carriage of freight and mail is to the Island, there may be benefits in providing sufficient runway extension for the Code 3 aircraft. Although the 400 tourist bed limit on the island may limit passenger numbers for larger aircraft, which could reduce the frequency of flights and may have an adverse effect on freight and mail.

6.3 Relevant aircraft types beyond 15 years

6.3.1 Aircraft design trends

There are rapid technology changes occurring in aircraft design. Both Boeing and Airbus are heavily investing in electric powered aircraft concepts, both hybrid (gas turbine and electric motor) and pure electric designs are evolving. Airbus and Siemens are collaborating and test flying a British Aerospace 146 four-engined jet with one of the turbine engines replaced with an electrically driven fan providing the same level of thrust.

As battery storage technology advances it will become feasible to design small electric commuter aircraft (up to 10 seats), soon advancing to 30-40 seats. This has the potential to revolutionise airline operations given jet fuel typically accounts for 40% of an airlines operating cost and engine maintenance costs are also significant.

In addition to propulsion advances, aerodynamic improvements are providing fuel saving benefits which in turn reduces aircraft weight and runway length requirements.

It is unlikely electric aircraft of 30-60 seats will be in service prior to 2030 when existing Code 2 aircraft start to diminish in numbers, but they may be within 20 years.

It is too early to speculate what impact electric aircraft will have on runway length requirements, however it would be assumed they will not need more runway than existing equivalents, nor are they likely to be capable of vertical take-off and landing.

At this point we believe it is prudent to assume runways of around 1200m in length will be adequate for electric aircraft, and that the OLS obstacle clearance requirements will be unchanged.

7.0 Non-RPT operations

7.1 Emergency medical services

Currently emergency medical services (EMS) for LDH are provided by the Royal Flying Doctor Service (RFDS) NSW division who operate Beech King Air 200C and 350C aircraft.

In consultation RFDS advised that their preference is the King Air 350 as it allows a more flexible operation at LDH. The desired runway length at LDH for this aircraft is 1100-1200m, preferably 1200m. We were advised that, even though other RFDS divisions in Australia are acquiring the Pilatus PC24 jet, RFDS (NSW) would not be adopting this type. RFDS are confident a 1200m runway at LDH would meet all their foreseeable future requirements.

RFDS also requested the installation of PAPI visual glide slope guidance to facilitate night EMS operations; this would also be highly beneficial to day operations of larger RPT aircraft such as the ATR72 and DHC8-400.

7.2 RAAF

It is understood the RAAF occasionally operate EMS flights when RFDS cannot. Informal discussion with RAAF indicated the C130J Hercules and C27J Spartan are the only aircraft types used.

As the military do not need to observe CASA requirements both the C130J and C27J are able to operate off the existing runway length, the RAAF have confirmed that the present runway dimensions suit their projected operations. Although it was mentioned that removal or reduction of the sand dunes would be appreciated.

The RAAF informally advised us that its only use of LDH is for EMS operations. We have not ascertained if there are any other military or defence agencies that may have an interest in runway development.

7.3 Private operator requirements

We are advised by the LHIB that 300-400 private aircraft transit through LDH annually and that two privately owned aircraft (Cessna 172 single engine and a Cessna 310 twin light aircraft) are based on the Island.

Most of the transits are by light piston or turbine (Code 1) aircraft, requiring less than 800m runway length. Exceptions are Cessna Citation business jets, which can be code 2 or 3 depending on the model, and several RPT types such as the DHC8-100, -200 and -300, on non-scheduled operations.

Whilst a runway extension may benefit some of the Code 2 and 3 aircraft, most of private operations are not limited by the existing runway.

8.0 Runway extension options

8.1 General comments

It is apparent that runway improvements are required for operation of aircraft requiring longer runway lengths than the DHC8-100/200. The DHC-100 is not likely to be a candidate aircraft after March 2022 as the only likely operators, Skytrans, is re-equipping with -200 series within that timeframe. Even the -200 series cannot operate efficiently on the existing runway, being limited to 29 seats LDH-SYD, an 80% seat factor. Any larger aircraft will be even less economically efficient in terms of percentage of seats that can be sold as the payloads will be even more restricted.

For larger aircraft the issue is both take-off and landing runway length required, take-off on Runway 10 being significantly penalised by the dunes and landing on Runway 28 penalised by the 103m displaced landing threshold which is due in part to the dunes and in part to vegetation on “Intermediate Hill” some 1200m from the SE runway strip end infringing a 3.3% approach OLS.

The options to increase effective runway length, that is runway length available to the aircraft for take-off or landing after inclusion of obstacles in the take-off and approach OLS:

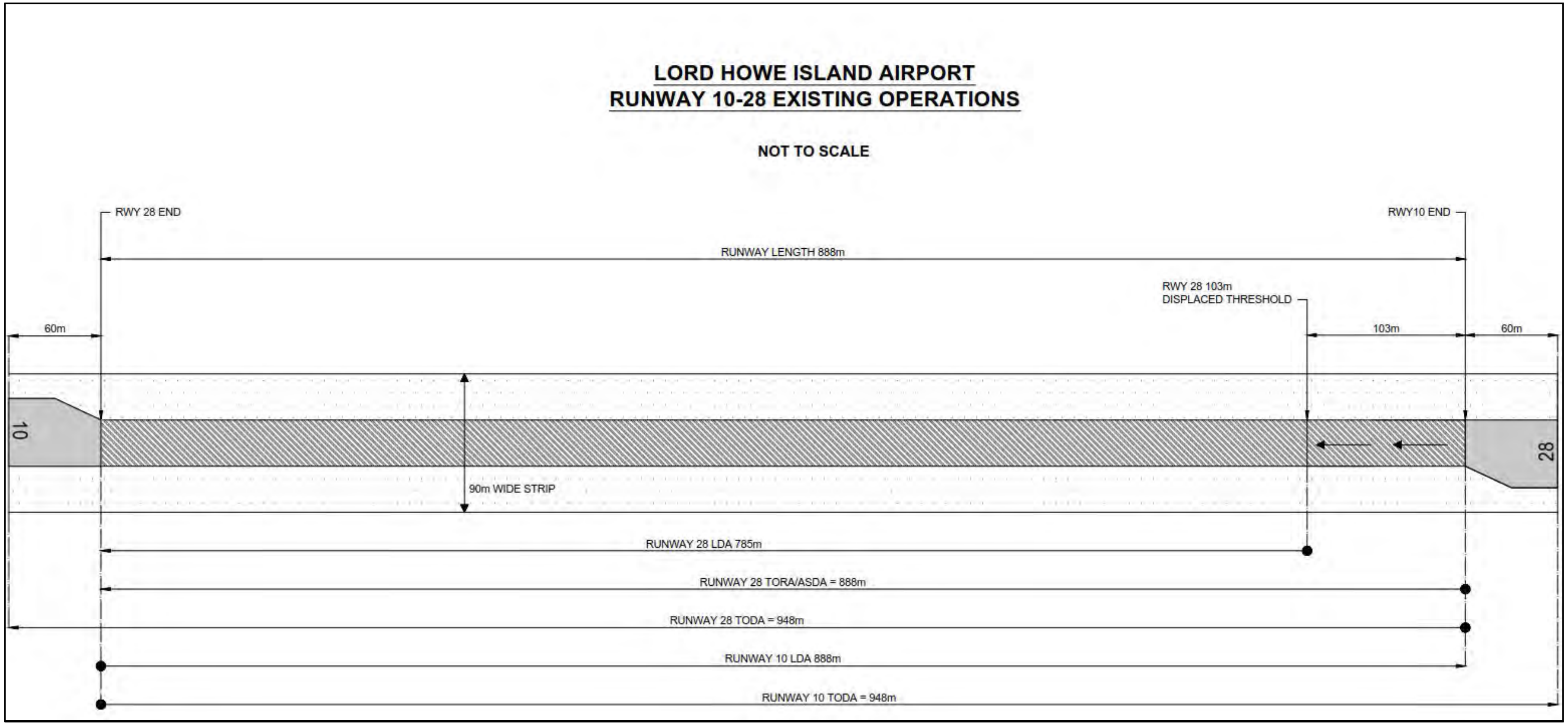
- Change in runway orientation to avoid infringing obstacles;
- Runway extension; and
- Removal of existing obstacles.

None of the options involve any extension to the SE, including for RESA or clearway. This is not only based on the issues with removing the sand dunes both from an engineering and environmental perspective but also significantly more coastal protection construction would be required given the lack of lagoon on the east of the island. In addition there are approach terrain limitations associated with Intermediate Hill.

Finally all options which allow for use of a Code 3 aircraft have initially been shown with a 140m Code 3 strip, this could potentially be reduced if CASA provide an exemption for the operation of Code 3 aircraft on a 90m Code 2 strip.

8.2 Option 1 – Do Nothing

Figure 18 Existing runway operational lengths



8.2.1 Operational Length

Figure 18 shows the existing runway operational length without any amendments being carried out on the sand dunes along Blinky Beach, Table 12 contains additional scenarios which estimate the additional operational length gained by reducing the height of the sand dunes.

Table 12 Effective operational lengths for existing runway options

Scenario	Runway 10					Runway 28				
	TORA ASDA	LDA	STOD			TORA ASDA	LDA	STOD		
			1.6%	1.9%	2.2%			1.6%	1.9%	2.2%
Do Nothing	888	888	593	687	755	888	785	948	948	948
Sand dune reduction 1[1]	888	888	718	768	812	888	875	948	948	948
Sand dune reduction 2[2]	888	888	767	800	824	888	875	948	948	948

Notes
1. *Dune 28 (**Figure 8**) reduced by 2.0m*
2. *Dune 28(**Figure 8**) reduced by 3.5m and Dune 24 & 25 reduced by 1.0m*
3. *Dune removal has not been included in landing length calculations as the terrain and vegetation on Intermediate Hill also influences the displace threshold.*

8.2.1.1 Take-off and landing runway length

Keeping the operational length unchanged would still allow the current QantasLink DHC8-200 to continue operating to LDH, but given that Qantas have indicated that they will no longer be operating the aircraft beyond the current route agreement end date in March 2022 this does not provide a long term solution. Although reducing the sand dune heights does provide additional operational lengths, it would still not allow any aircraft to take off or land without restrictions which limits the financial viability of the route for airline operators.

Table 13 Aircraft performance on the existing runway

Aircraft	Maximum payload available (%)				
	Take Off		Landing (Nil Wind)		Landing (5 knot tail wind)
	RWY 28	RWY 10	RWY 28	RWY 10	RWY 10
ATR42-600	< 50%		< 50%		< 50%
ATR72-600	< 50%		< 50%		< 50%
DHC8-200	60%		100%		100%
DHC8-300	< 50%		50%		< 50%
DHC8-400	< 50%		< 50%		< 50%
Fokker 50	< 50%		< 50%		< 50%

There have been rumours that ATR may investigate the option of a short take-off and landing (STOL) version of the ATR42 which may be ideally suited to the existing runway length at LDH, but no timeframes have been provided for if/when this will occur.

8.2.2 Operational considerations

8.2.2.1 RPT

QantasLink will continue to operate the route until March 2022 using their DHC8-200 with reduced payload, but are unlikely to continue this operation based on the significant upgrade costs required for the airframe.

Skytrans are the only other current airline which could operate the route, as they are upgrading their fleet from DHC8-100's to DHC8-200's. Their base in Cairns and the payload restrictions for DHC8-200 operations at LDH may make this a non-viable option.

Finally should an ATR 42 STOL version become available and be operated by an Australian airline, this may be ideally suited to the current runway extents at LDH

8.2.2.2 Non-RPT

The RAAF, RFDS and GA operators are able to currently operate on the existing runway, and therefore a "do nothing" option would be acceptable. Although this would not remove any of the operational restrictions they may have in place.

8.2.3 CASA compliance

Should the existing runway remain unchanged, then all "grandfathered" CASA exemptions would remain in place, although the "tapering" of the 90m runway strip at each end of the runway would need to be rectified.

8.2.4 Runway Strength

Based on the DHC8-200 (ACN = 9) currently operating at LDH, it is assumed that an ATR STOL version (ACN = 9) would have no operational restrictions applied with regards to runway pavement strength.

8.2.5 OLS and VSS

As mentioned in Section 8.2.3 any exemptions associated with OLS will remain in place given no upgrades will be carried out on the runway. The existing OLS surface has been modelled in 3D based on LiDAR for information. Figure 19 is based on the LiDAR surface level contours alone and Figure 20 has an indicative 20m vegetation height included. Obstacle penetrations can be seen in colour, more detailed versions of these figures can be found in Appendix B. The VSS will remain unchanged too.

Figure 19 Lord Howe Island Indicative Existing OLS Surface Penetrations

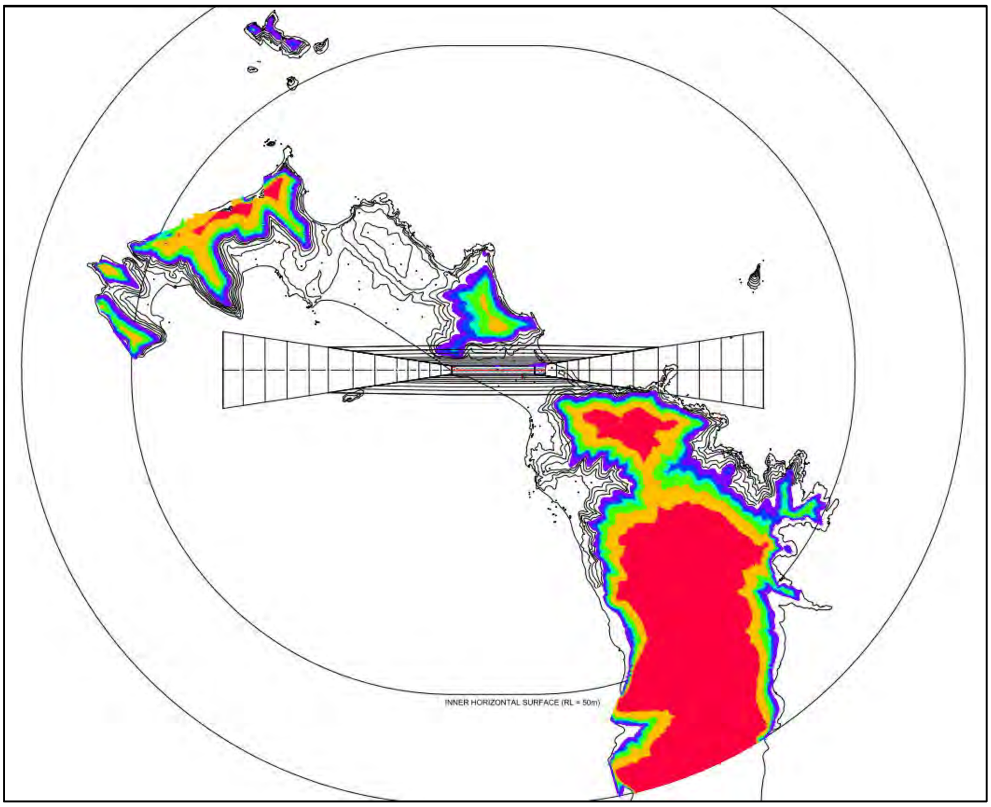
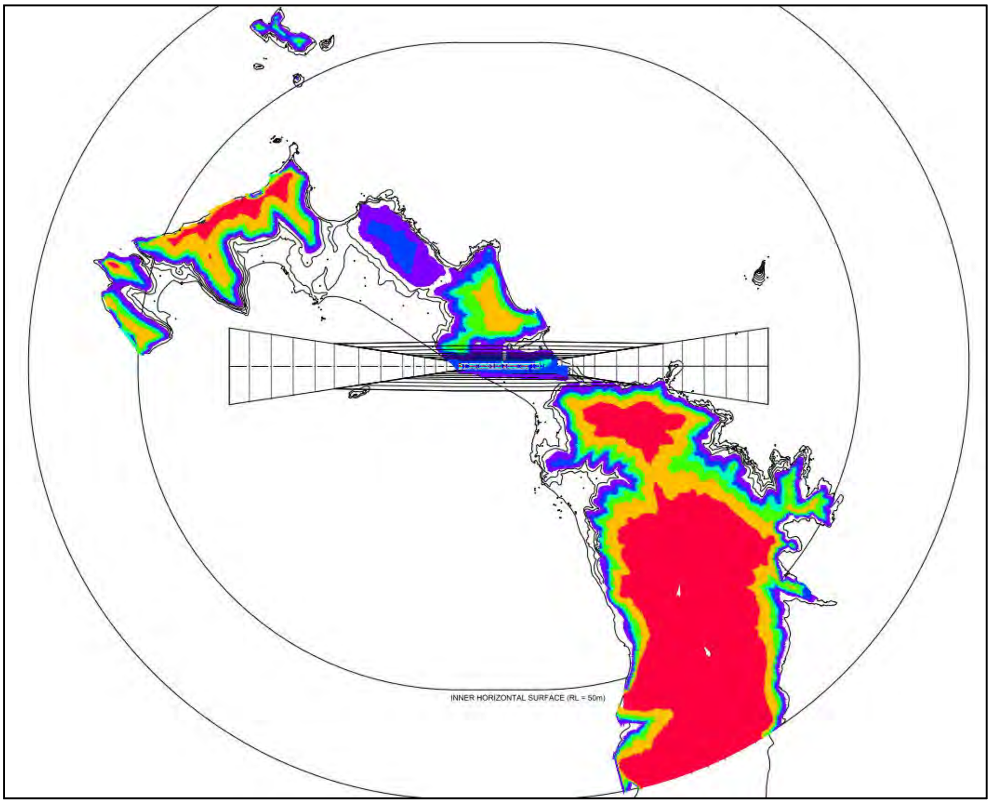


Figure 20 Lord Howe Island Indicative Existing OLS Surface Penetrations including 20m vegetation



8.3 Option 2 – 450m Runway Extension

Figure 21 450m runway extension layout

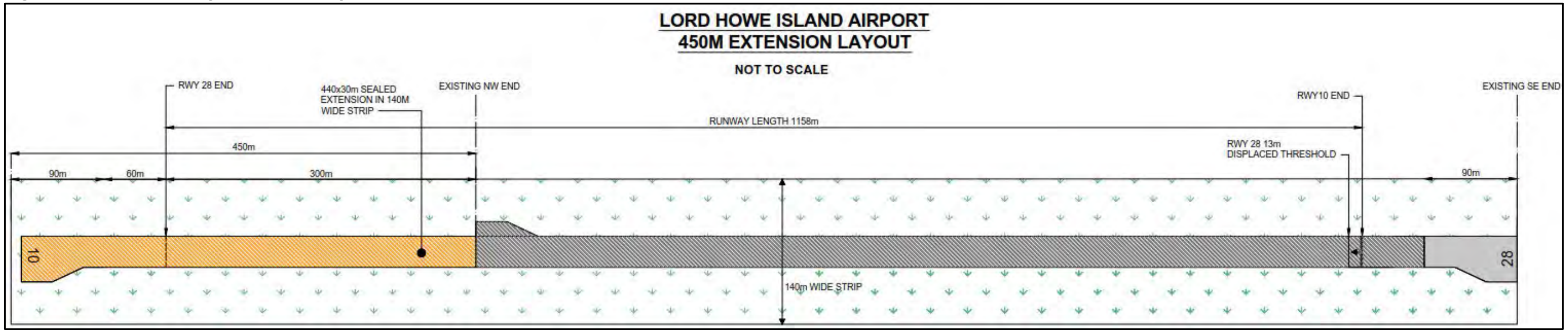


Figure 22 450m runway extension – Runway 10 declared distances

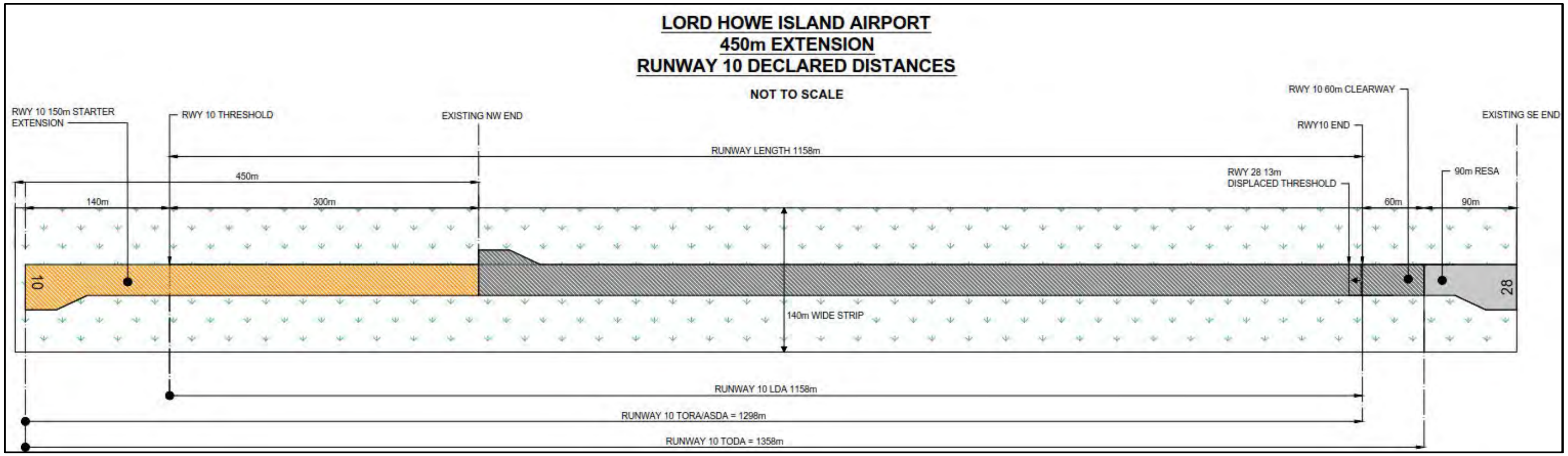
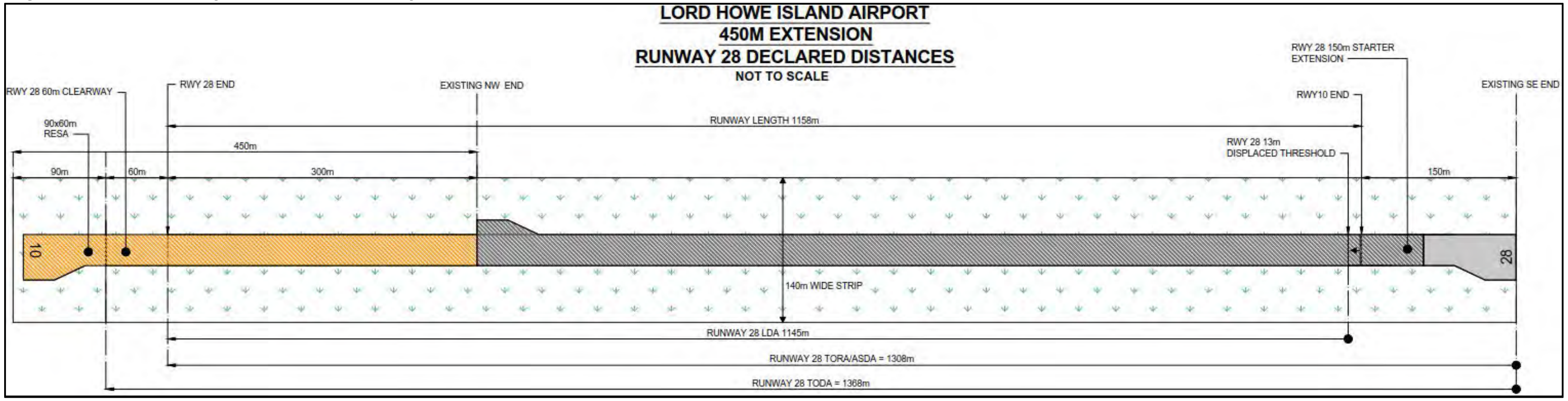


Figure 23 450m runway extension – Runway 28 declared distances



8.3.1 Operational length

Figure 21 shows the existing runway operational length with a 450m extension. Table 14 also contains additional scenarios which estimate the additional operational length gained by reducing the height of the sand dunes.

Table 14 Effective operational lengths for 450m runway extension options

Scenario	Runway 10					Runway 28				
	TORA ASDA	LDA	STOD 1.6%	STOD 1.9%	STOD 2.2%	TORA ASDA	LDA	STOD 1.6%	STOD 1.9%	STOD 2.2%
450m extension	1298	1158	863	957	1025	1308	1145	1368	1368	1368
Sand dune reduction 1	1298	1158	978	1038	1082	1308	1145	1368	1368	1368
Sand dune reduction 2	1298	1158	1038	1070	1094	1308	1145	1368	1368	1368

Notes

1. *Dune 28 (**Figure 8**) reduced by 2.0m*
2. *Dune 28(**Figure 8**) reduced by 3.5m and Dune 24 & 25 reduced by 1.0m*
3. *Dune removal has not been included in landing length calculations as the terrain and vegetation on Intermediate Hill also influences the displace threshold.*

8.3.1.1 Take-off and landing runway length

As discussed in Section 8.2, it is clear from the figures that the existing runway is constrained, even for the DHC8-200 in either runway direction, hence the existing payload limitation. A 450m extension would greatly improve the take-off weights available and hence outbound payloads, and enable unrestricted operation of DHC8-200. In addition the ATR72-600 and DHC8-300 could operate with minimal restrictions

Landing length has initially been assessed based on a wet runway with nil wind. In order to assess the most stringent landing conditions, they have also been assessed based on a wet Runway 10 with a 5 knot tail wind, this reflects the current QantasLink practice of landing with up to 5 knots tailwind on Runway 10 to avoid the more turbulent approach and currently shorter Runway 28. This severely restricts the ATR42-600, which in other conditions would be able to operate unrestricted.

Table 15 Aircraft performance on the 450m runway extension

Aircraft	Maximum payload available (%) Take Off		Landing (Nil Wind)		Landing (5 knot tail wind)
	RWY 28	RWY 10	RWY 28	RWY 10	RWY 10
ATR42-600	100%	100%	100%	100%	50%
ATR72-600	90%	80%	100%	100%	90%
DHC8-200	100%	100%	100%	100%	100%
DHC8-300	80%	70%	100%	100%	90%
DHC8-400	80%	75%	55%	60%	< 50%
Fokker 50	100%	100%	60%	60%	< 50%

8.3.2 Operational considerations

8.3.2.1 RPT

QantasLink would be able to operate both their DHC8-200 and DHC8-300 aircraft on this runway extension. They provided performance data for the DHC8-300 based on a range of runway extension both with the existing dunes and also with them totally removed; this Qantas data confirms our initial analysis of the DHC8-300.

Virgin Australia only provided performance analysis data for maximum payload requirements; the 450m extension would provide sufficient operational length for this other than landing on Runway 10. Although based on initial analysis, ATR 72's would be able to operate but it would be at a reduced payload.

Skytrans advised that their DHC8-100 aircraft ideally require a take-off distance of 1150m at LDH. The 450m extension provides a 1.9% STODA of 957m (with existing dunes) on Runway 10 and 1308m on Runway 28. On this basis we believe the 450m extension could meet Skytrans needs for the -100 aircraft. However as previously discussed, Skytrans advised they plan to move to DHC8-200's staring this year. They did not indicate what runway length they believe the -200 requires. While we are confident the 450m extension would be sufficient we recommend further discussions with Skytrans in the next phase of the project.

The Fokker 50's operated by Alliance would be able to operate on this extended runway with almost no restrictions for take-off but a significantly reduced payload for the most stringent landing, as previously discussed in Section 6.2.2 Alliance are phasing out the Fokker 50's and converting to an all jet aircraft fleet.

8.3.2.2 Non-RPT

RFDS (NSW) indicated their preference to use the King Air 350 for EMS operations to LDH. Their desired runway length at LDH for this aircraft is 1100-1200m, preferably 1200m. The 450m runway extension provides 957m at 1.9% STODA for Runway 10 and 1308m on Runway 28. We believe this could address RDFS's requirement.

The RAAF and GA operators would have reduced or no operational restrictions because of the extended runway length available.

8.3.3 CASA compliance

As indicated in Section 5.4 the strip width requirement for Code 3 aircraft on an instrument-non precision runway is 140m, which has been provided for. However, MOS139 at 6.2.18.4 states:

"If an aerodrome operator wishes to provide a lesser runway strip width to that specified in the standards, the aerodrome operator must provide CASA with a safety case justifying why it is impracticable to meet the standard. The safety case must include documentary evidence that all relevant stakeholders have been consulted."

Elsewhere in MOS139, CASA indicates an adjustment to landing minima would be required for Code 3 operation on an instrument runway with a 90m strip. This adjustment, contained in MOS173, is fairly minor. What is not known is what other limitations CASA may place on the aircraft operator at LDH, for example cross wind limits.

Clearly CASA does provide for situations where the full 140m cannot be provided. We therefore recommend detailed discussion with CASA on this requirement, and any conditions likely to arise out of the safety case requirement. It is noteworthy that under MOS 139, 6.2.18.1 the aerodrome operator, not the aircraft operators, must provide the safety case. However, we believe this only applies if the aerodrome operator wishes to upgrade the aerodrome to a higher Code. As mentioned earlier in the report we believe there is an option that the aerodrome remains at Code 2 (due to strip width) and the aircraft operator seeks a dispensation to operate on the narrower strip width.

Clearly in any event the aircraft operator has to be consulted and concur with the proposed operation and any risk mitigations envisaged.

8.3.4 Runway strength

The 450m extension would allow the opportunity for more aircraft to viably operate from LDH; the ATR72 would present the highest ACN (11) of these aircraft. As previously discussed, it is acceptable to exceed a runway's published PCN by 10% without causing distress to the runway therefore the runway strength would be sufficient

8.3.5 OLS and VSS

Given that Code 3 aircraft would be using the runway and it would be at CASA's discretion if they were allowed to operate on a Code 2 runway, OLS surfaces have been modelled in 3D for both a Code 2 runway (Figure 24 and Figure 25) and also a Code 3 runway (Figure 26 and Figure 27). Obstacle penetrations can be seen in colour, more detailed versions of these figures can be found in Appendix B.

Figure 24 Lord Howe Island Indicative Code 2 runway 450m extension OLS Surface Penetrations

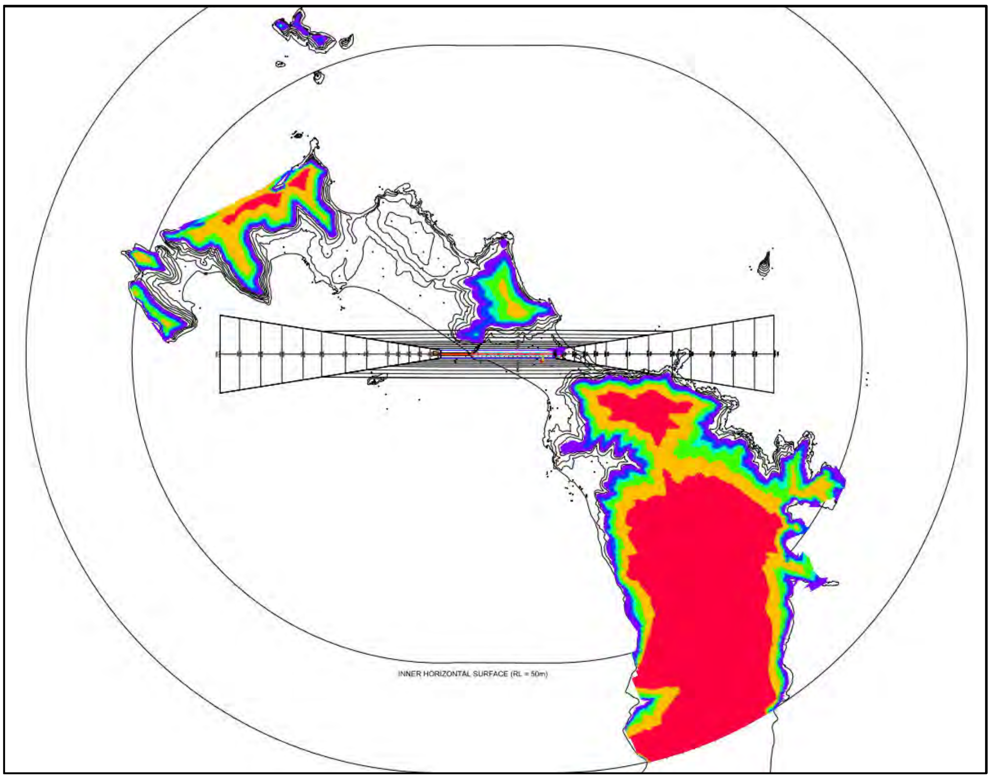


Figure 25 Lord Howe Island Indicative Code 2 runway 450m extension OLS Surface Penetrations with 20m vegetation

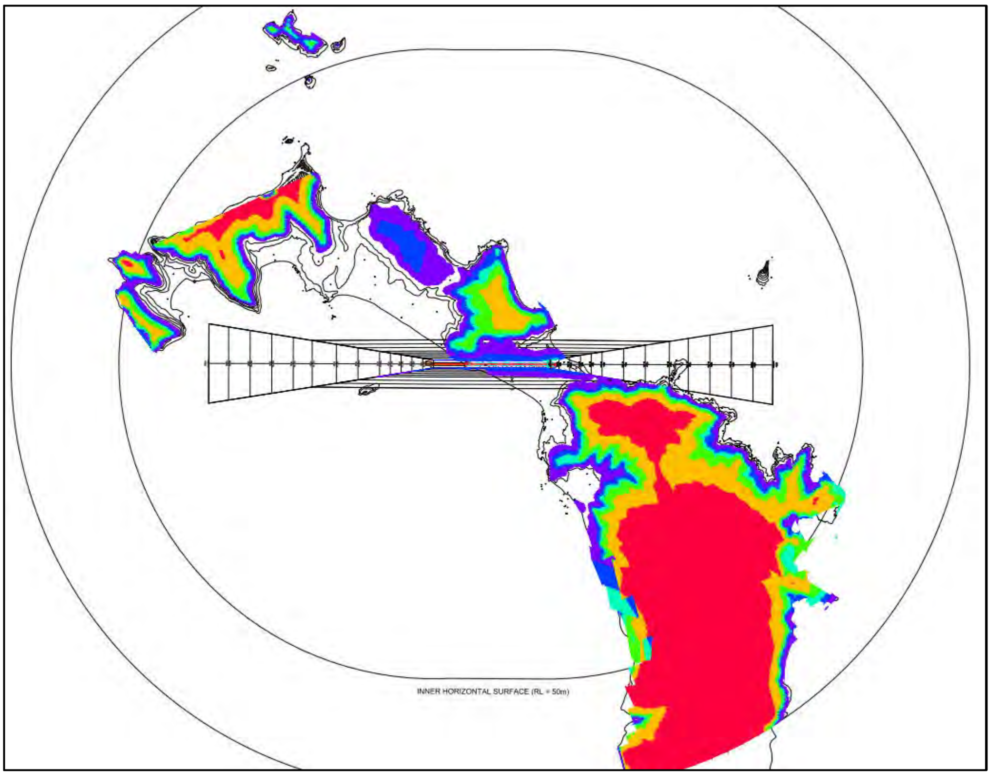


Figure 26 Lord Howe Island Indicative Code 3 runway 450m extension OLS Surface Penetrations

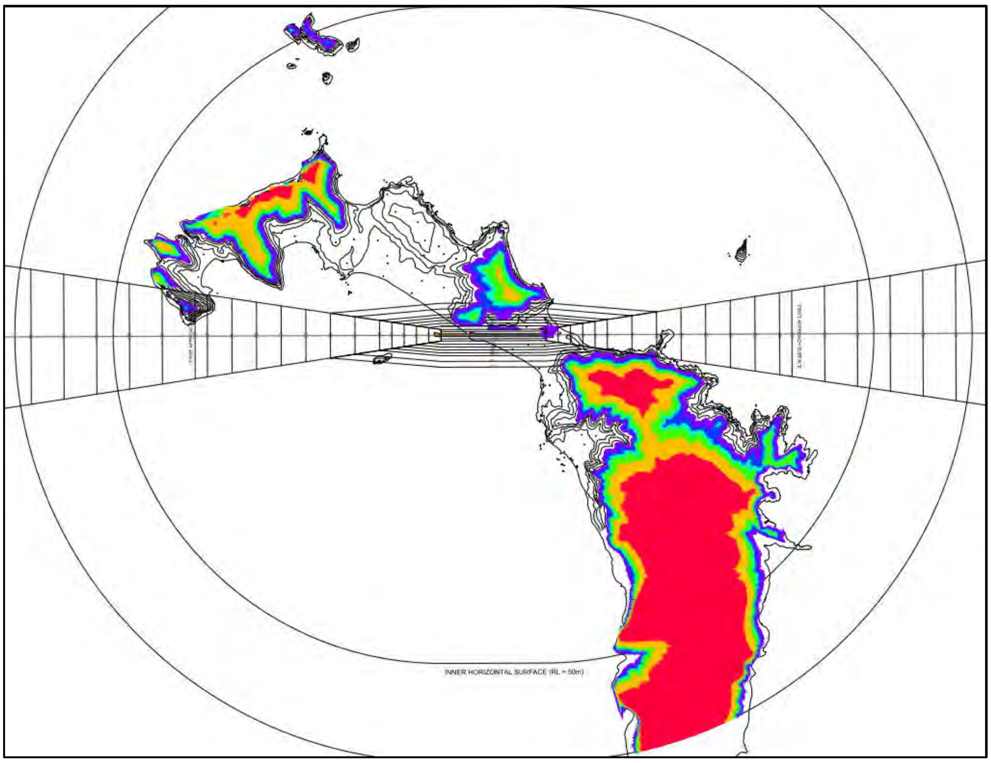
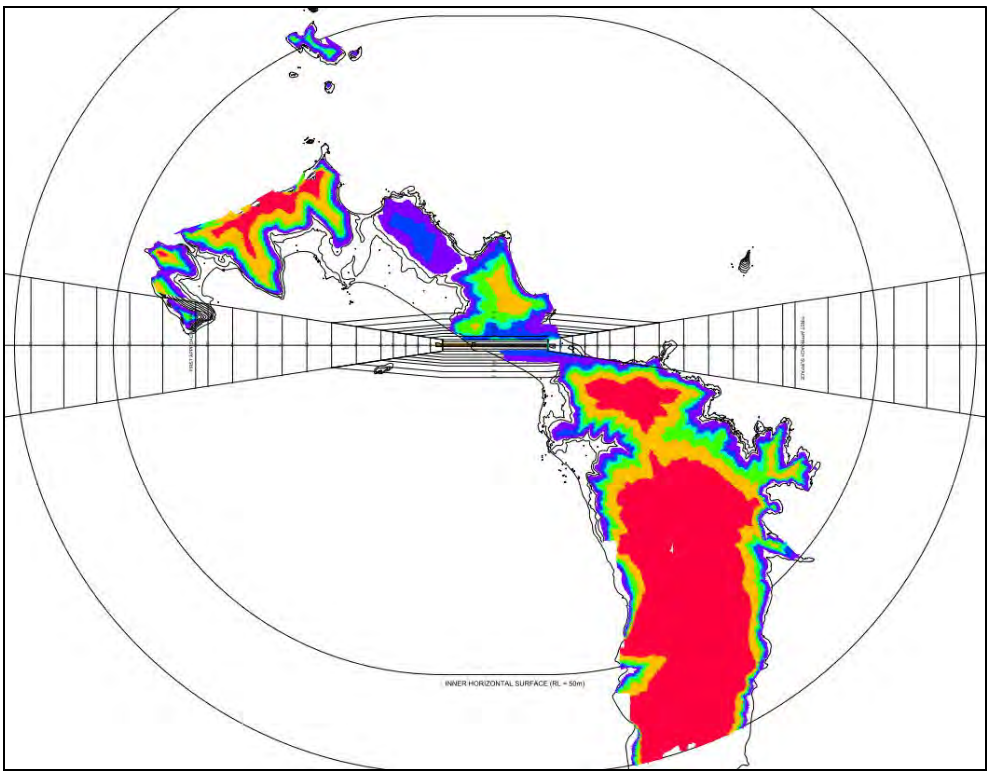


Figure 27 Lord Howe Island Indicative Code 3 runway 450m extension OLS Surface Penetrations with 20m vegetation



Although this runway extension option has a 450m extension, the Code 2 OLS approach surface for Runway 10 still does not extend over North Head. The VSS approach for Runway 10 will have to steepen to accommodate the extension and avoid North Head although this will still stay within industry accepted operational parameters.

The Code 3 OLS has significantly more obstructions; this is principally because of the extended approach surface length projecting over North Head and the widened runway strip (90m to 140m) with associated transitional surface. Should these potential obstructions be immovable, then dispensations would need to be sought from CASA.

8.4 Option 3 – 570m Runway Extension

Figure 28 570m runway extension layout

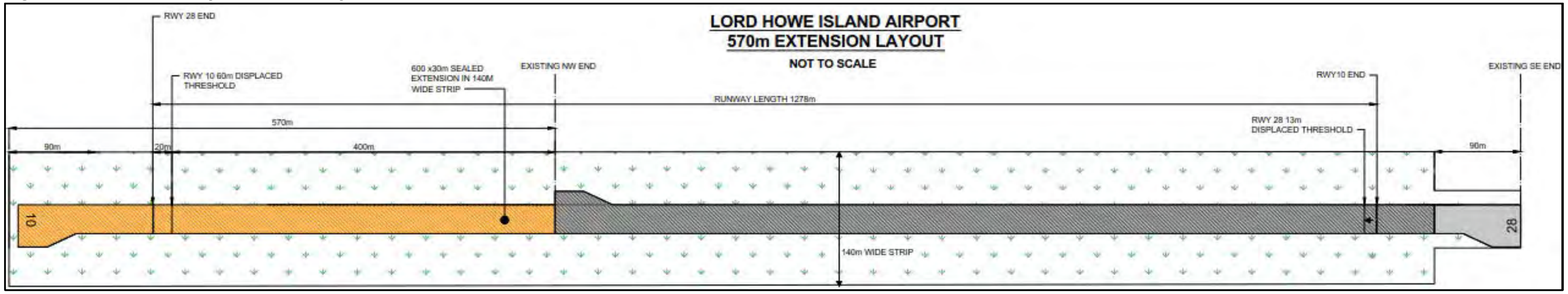


Figure 29 570m runway extension layout – Runway 10 declared distances

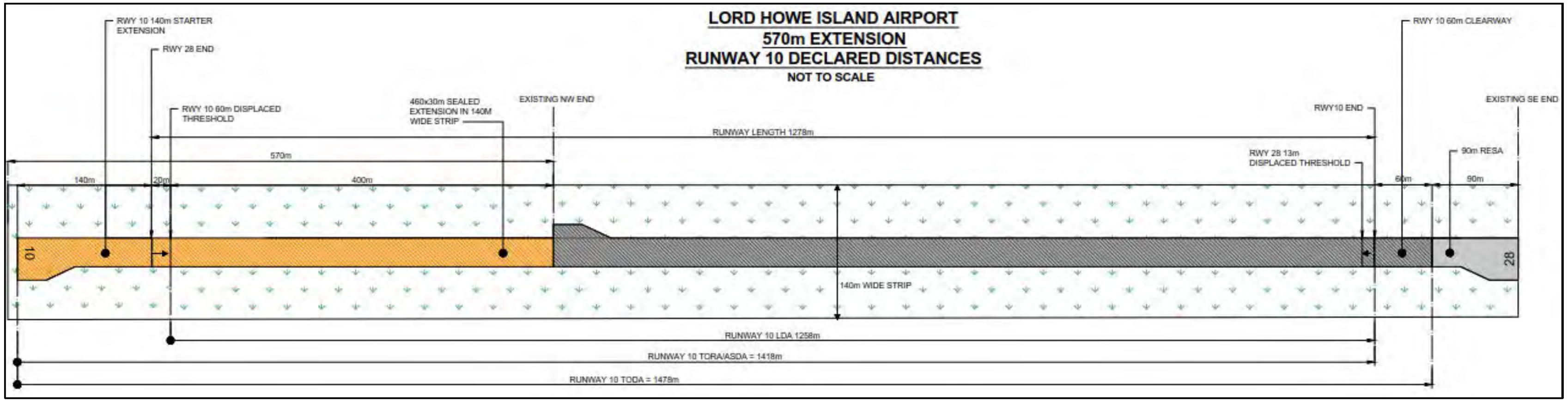
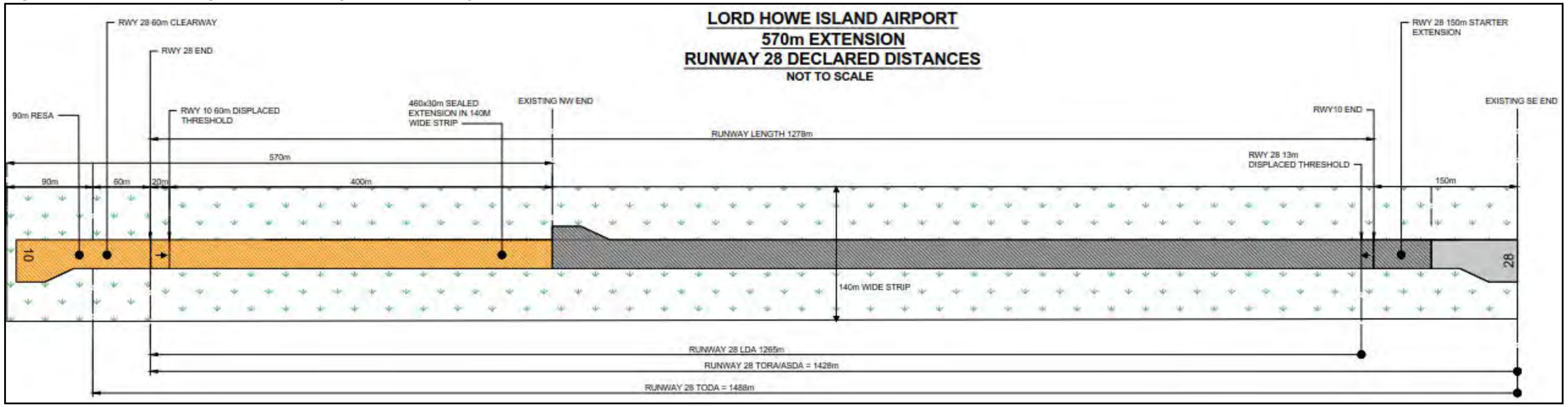


Figure 30 570m runway extension layout – Runway 28 declared distances



8.4.1 Operational length

Figure 28 shows the existing runway operational length with a 570m extension. Table 16 also contains additional scenarios which estimate the additional operational length gained by reducing the height of the sand dunes.

Table 16 Effective operational lengths for 570m runway extension options

Scenario	Runway 10					Runway 28				
	TORA ASDA	LDA	STOD			TORA ASDA	LDA	STOD		
			1.6%	1.9%	2.2%			1.6%	1.9%	2.2%
570m extension	1418	1258	1123	1217	1285	1428	1265	1488	1488	1488
Sand dune reduction 1[1]	1418	1258	1238	1298	1342	1402	1265	1488	1488	1488
Sand dune reduction 2[2]	1418	1258	1298	1330	1354	1428	1265	1488	1488	1488
Sand dune removal[3]	1418	1258	1478	1478	1478	1428	1265	1488	1488	1488

<u>*Notes*</u>

4. *Dune 28 (**Figure 8**) reduced by 2.0m*
5. *Dune 28(**Figure 8**) reduced by 3.5m and Dune 24 & 25 reduced by 1.0m*
6. *Total dune removal requires all dunes removed below 1.6% STOD, although more detailed analysis may enable removal to 1.9% STOD*
7. *Dune removal has not been included in landing length calculations as the terrain and vegetation on Intermediate Hill also influences the displace threshold.*

8.4.1.1 Take-off and landing runway length

A 570m extension would enable the DHC8-200 and ATR42 to operate unrestricted and the ATR72, DHC8-300, DHC8-400 and Fokker 50 with 75-90% payload varying penalties which could be improved by dune height reduction.

Operation of the DHC8-400 from Runway 10 could have more significant penalties and would most likely require dune removal to 1.9% STODA. This enhancement could be made after the aircraft is introduced if in-service experience indicates it is necessary.

The 570m extension would remove all landing restrictions on all aircraft types but the Fokker 50 and DHC8-400 which could only operate at 60% payload respectively in the most stringent landing conditions.

It should be noted that due to terrain in the approach path and the assumption that the east runway end cannot be extended, a 400m extension of the threshold (limited by the VSS approach) is the maximum that provides any benefit for landing on runway 10.

Table 17 Aircraft performance on the 570m runway extension

Aircraft	Maximum payload available (%) Take Off		Landing (Nil Wind)		Landing (5 knot tail wind)
	RWY 28	RWY 10	RWY 28	RWY 10	RWY 10
ATR42-600	100%	100%	100%	100%	100%
ATR72-600	100%	90%	100%	100%	100%
DHC8-200	100%	100%	100%	100%	100%
DHC8-300	90%	75%	100%	100%	100%
DHC8-400	95%	85%	95%	95%	60%
Fokker 50	100%	100%	85%	85%	60%

8.4.2 Operational considerations

8.4.2.1 RPT

As mentioned in Section 8.3.2.1, QantasLink performance data for the DHC8-200, 300 & 400 closely align with our assessment of aircraft performance capabilities.

Virgin’s figures for the ATR72 at maximum payload show close agreement for take-off Runway 28. For Runway 10 take-off, Virgin estimates a significantly longer extension than 570m is required if the dunes remain, which is consistent with our analysis, but suggests total removal of dunes would be required for the ATR72. Although Virgin noted that further analysis might mitigate this saying: *“The next stage would be to identify what flight sectors we intend to travel, then run a payload analysis to determine what MTOW would be required to allow for maximum PAX on board. We may find that we don't require the full 23,000kg MTOW for our operations, making the runway extension more feasible.”*

8.4.2.2 Non-RPT

It is likely that a 570m extension would remove all operational restrictions for RFDS, RAAF and GA users of LDH, subject to confirmation. It’s to be noted that these users have indicated any extension would be beneficial to operations though.

8.4.3 CASA compliance

As per Section 8.3.3, this option has been based on a Code 3 runway strip, but a dispensation from CASA could be sought for a Code 2 runway strip.

8.4.4 Runway strength

Depending on the results of the revised PCN calculations following the runway overlay in 2005, a CASA pavement concession may be required by the aircraft operator should the DHC8-400(ACN of

14) begin regular RPT operations to LDH. Should the revised PCN not increase or a concession not be granted, then a structural overlay of the runway may be required as part of the extension work.

8.4.5 OLS and VSS

The obstacle penetrations of the OLS for the 570m extension will be very similar to those shown for the 450m extension in Section 8.3.5, and can be seen in Figure 31 and Figure 32 for a Code 2 runway and in Figure 33 and Figure 34 for a Code 3 runway. The required runway strip and associated OLS would be at CASA's discretion. Obstacle penetrations can be seen in colour, more detailed versions of these figures can be found in Appendix B.

Figure 31 Lord Howe Island Indicative Code 2 runway 570m extension OLS Surface Penetrations

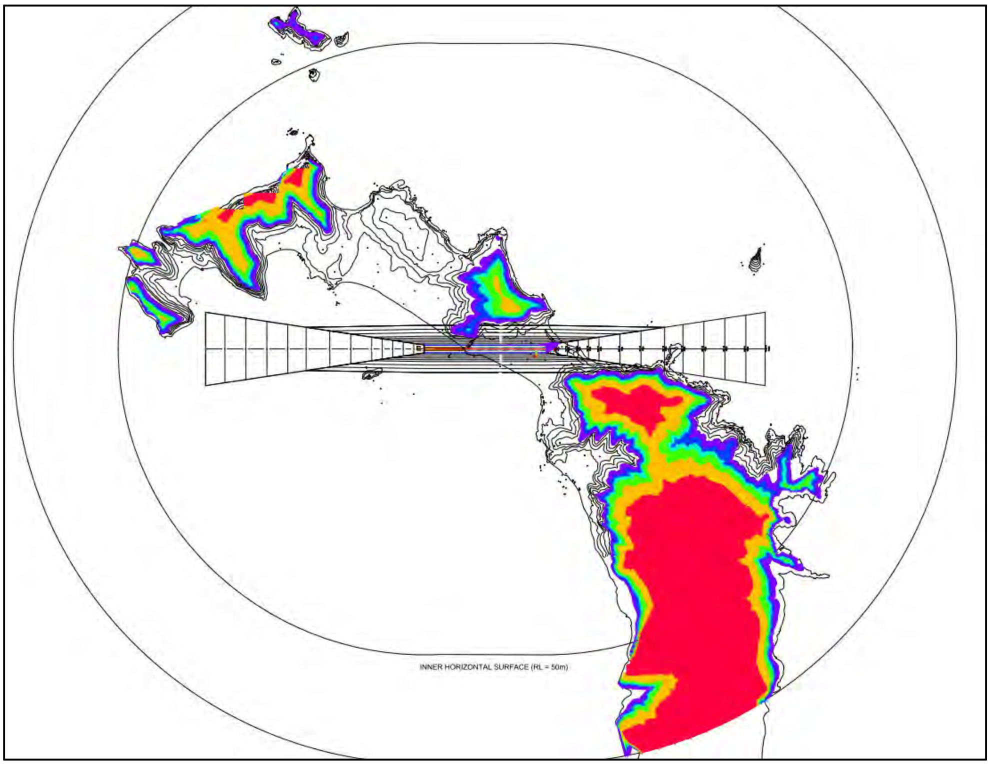


Figure 32 Lord Howe Island Indicative Code 2 runway 570m extension OLS Surface Penetrations with 20m vegetation

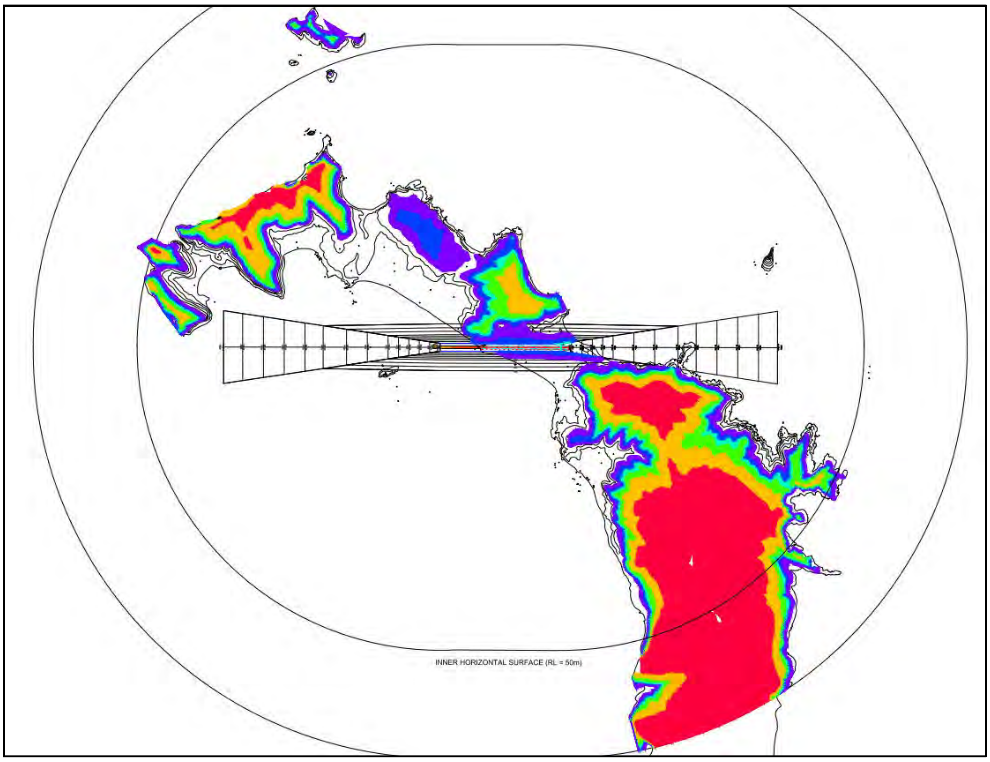


Figure 33 Lord Howe Island Indicative Code 3 runway 570m extension OLS Surface Penetrations

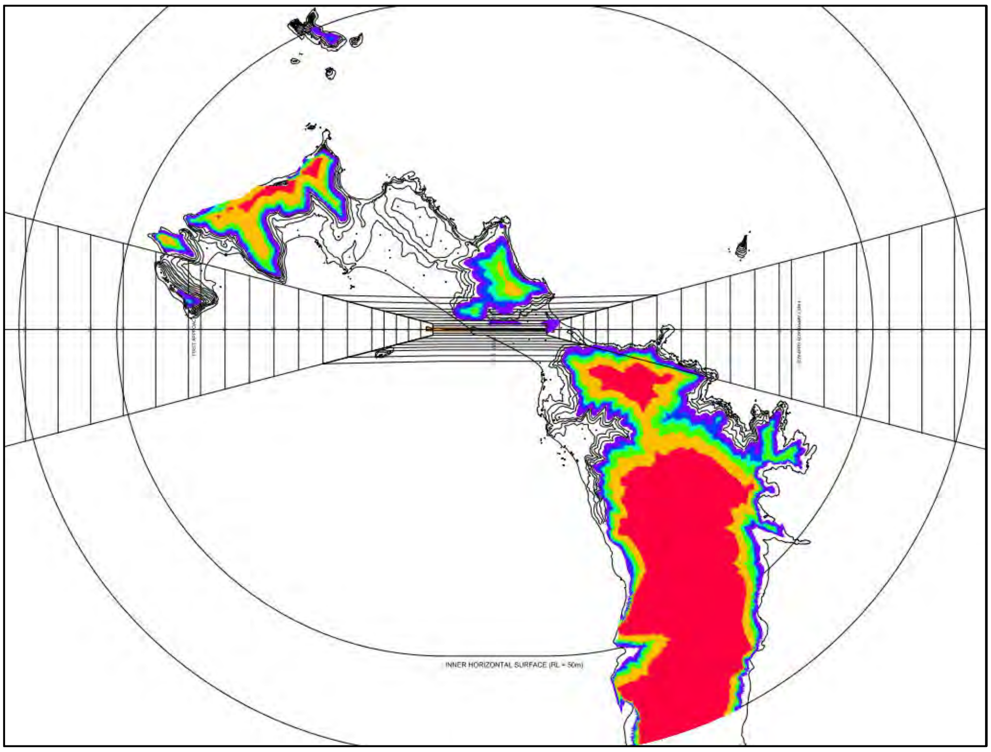
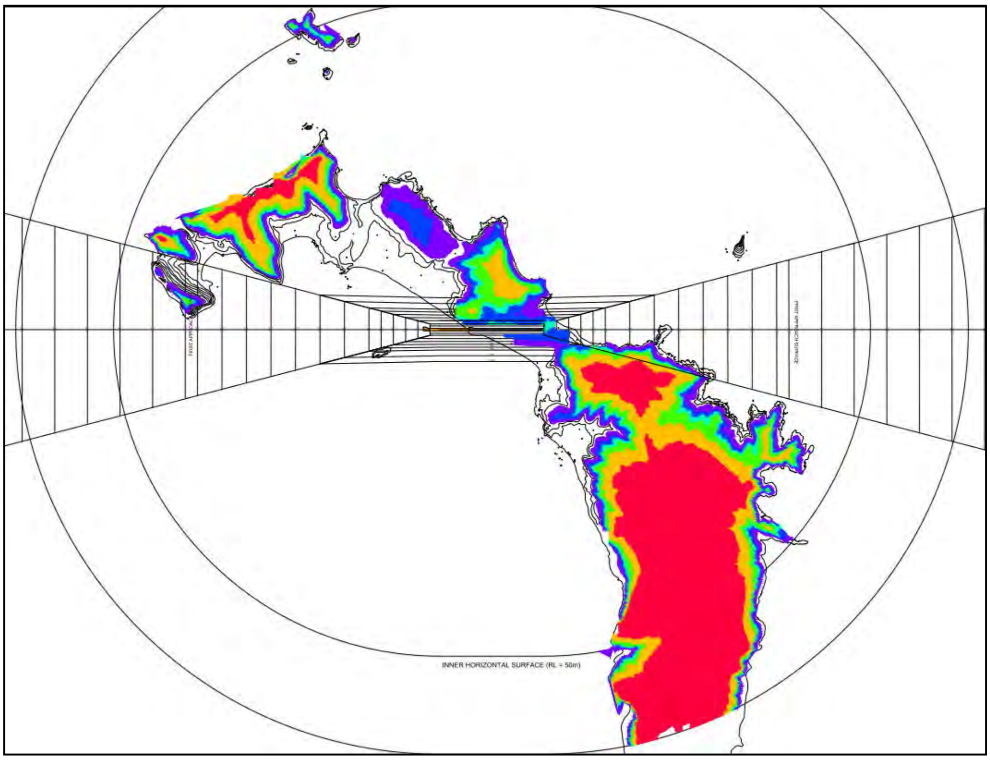


Figure 34 Lord Howe Island Indicative Code 3 runway 570m extension OLS Surface Penetrations with 20m vegetation



Based on the advice of both ASA and Qantas, the VPA which forms part of the VSS approach slope has been limited to a steepness of 4.5° this is because airlines may reject the risk of landing on runways with a VPA greater than this. In addition Airservices indicated that a steeper angle could preclude the use of vertical flight path guidance by future aircraft equipped for it meaning approach minima may not be able to be lowered from today's level.

In order to avoid the VSS approach slope being penetrated by North Head and retaining a maximum slope of 4.5° the runway 28 threshold can only be shifted 400m to the northwest. Therefore the VSS approach slope is the limiting factor for any runway extension to the northwest.

8.5 Extension Option Aircraft Performance

Figure 35 and Figure 36 depict the candidate aircraft take-off length requirements at varied payloads in comparison to the declared take-off run available for each runway option.

Figure 35 Runway 10 take-off distance required and available

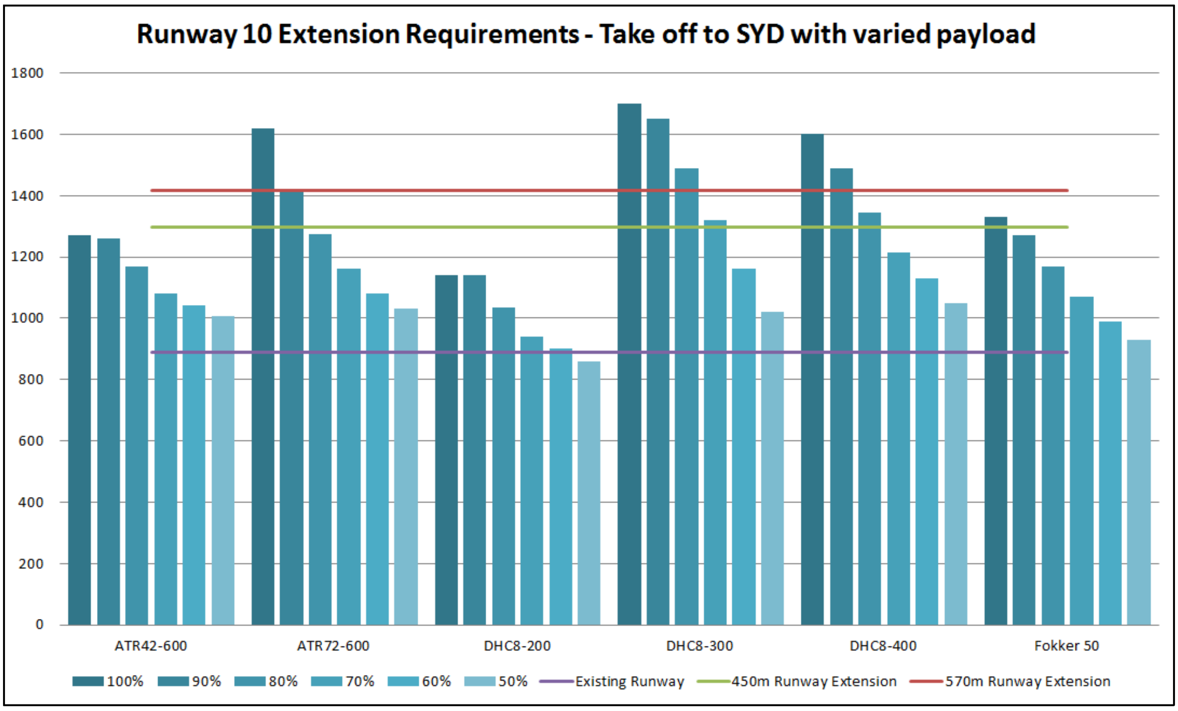


Figure 36 Runway 28 take-off distance required and available

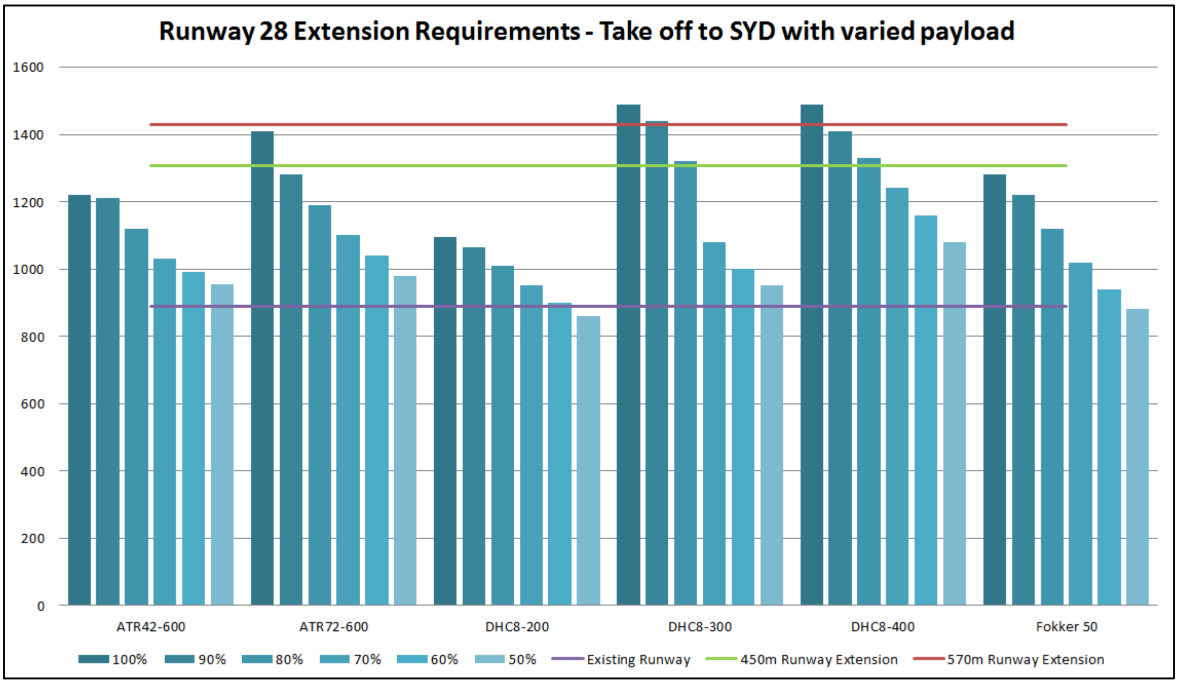


Figure 37 and Figure 38 depict the candidate aircraft landing length requirements for nil wind conditions at varied payloads in comparison to the declared landing distance available for each runway option. As previously discussed QantasLink currently land on Runway 10 with tailwinds of up to 5 knot in order to avoid the more turbulent approach on Runway 28. Figure 39 illustrates the additional aircraft landing length required for these operations.

Figure 37 Runways 10 landing distance required and available (nil wind)

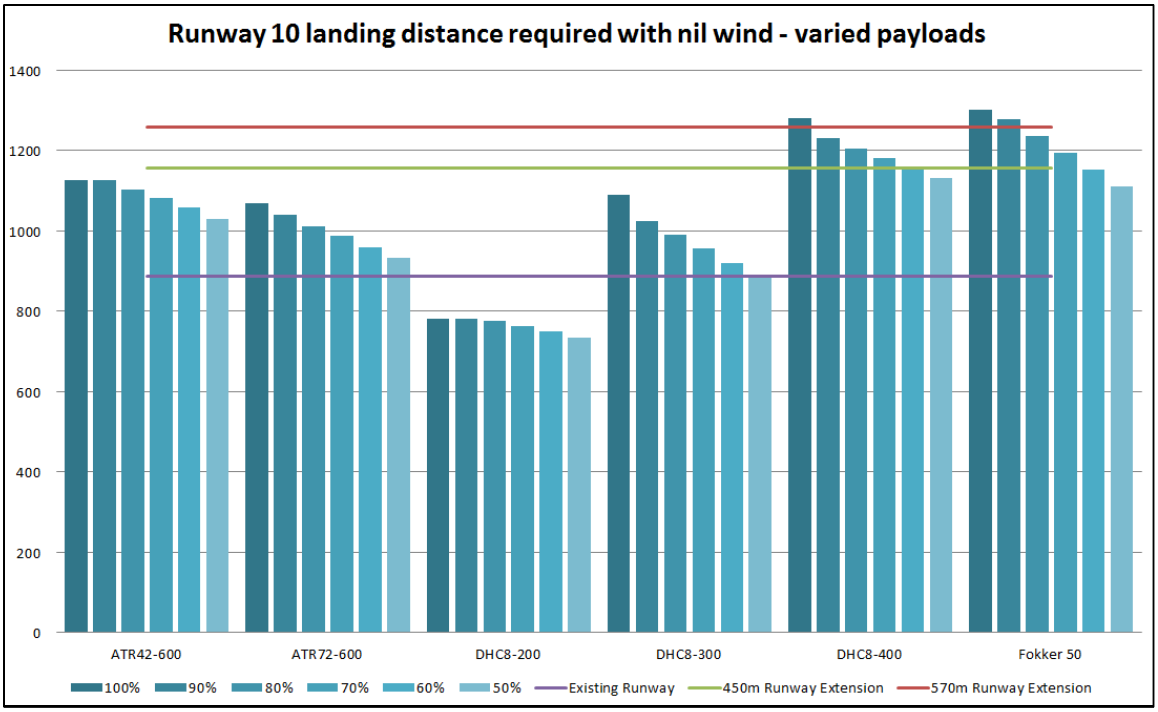


Figure 38 Runways 28 landing distance required and available (nil wind)

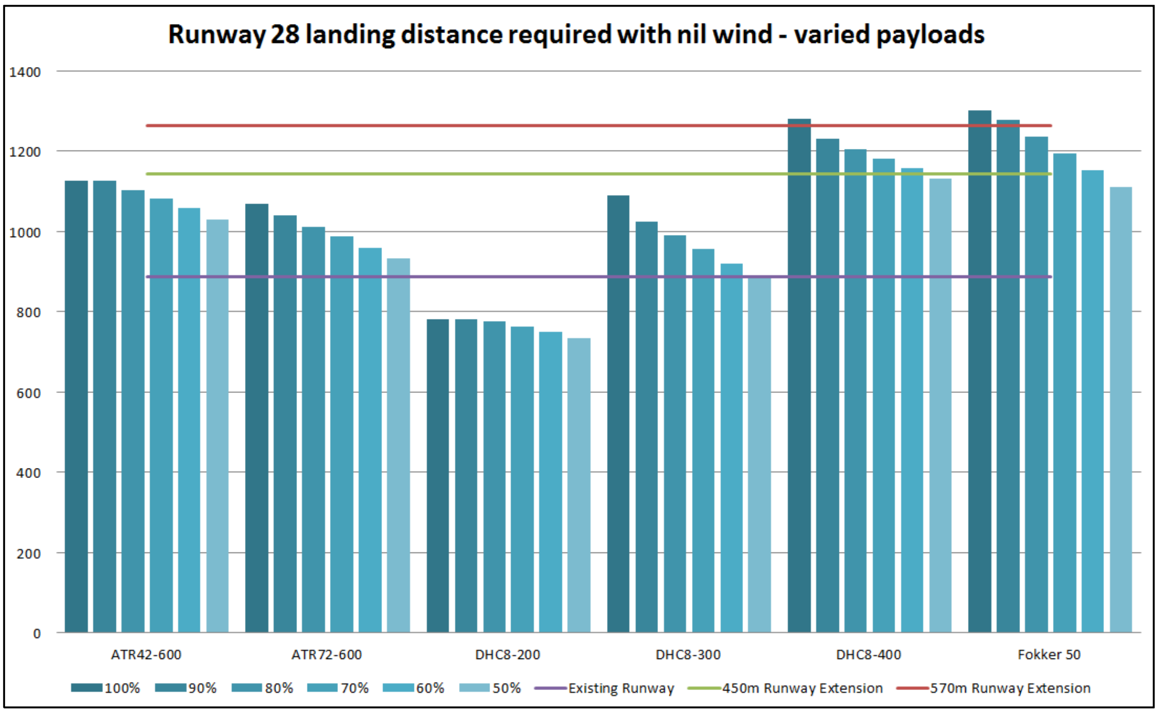
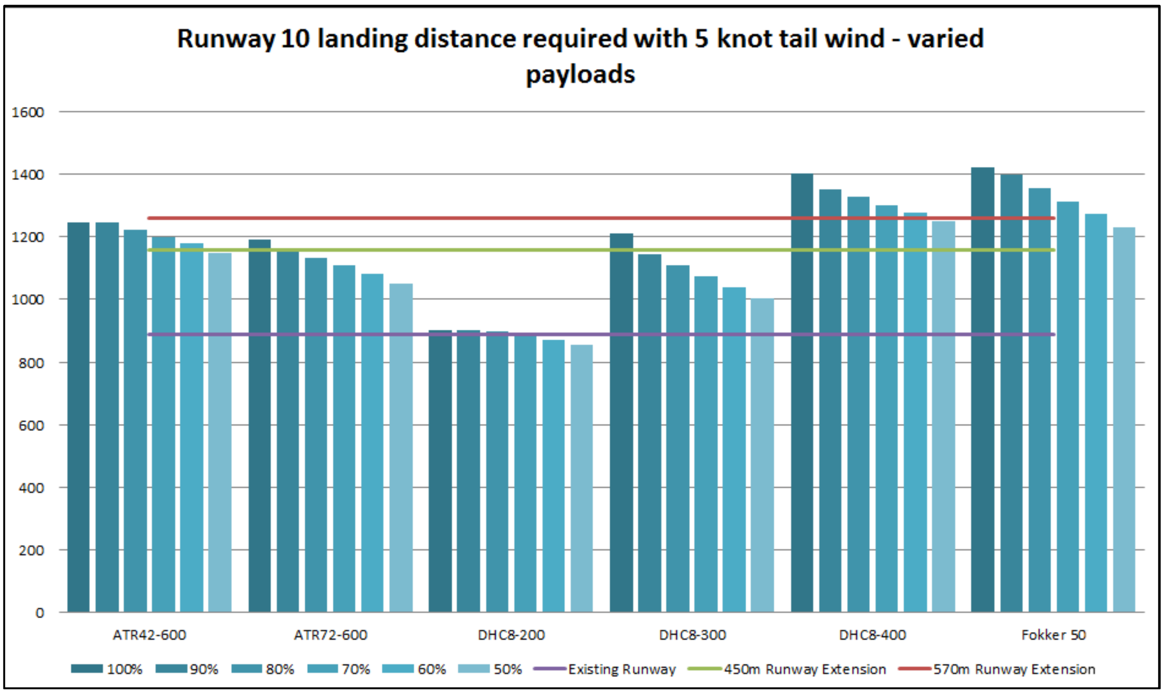


Figure 39 Runways 10 landing distance required and available (5 knot tail wind)

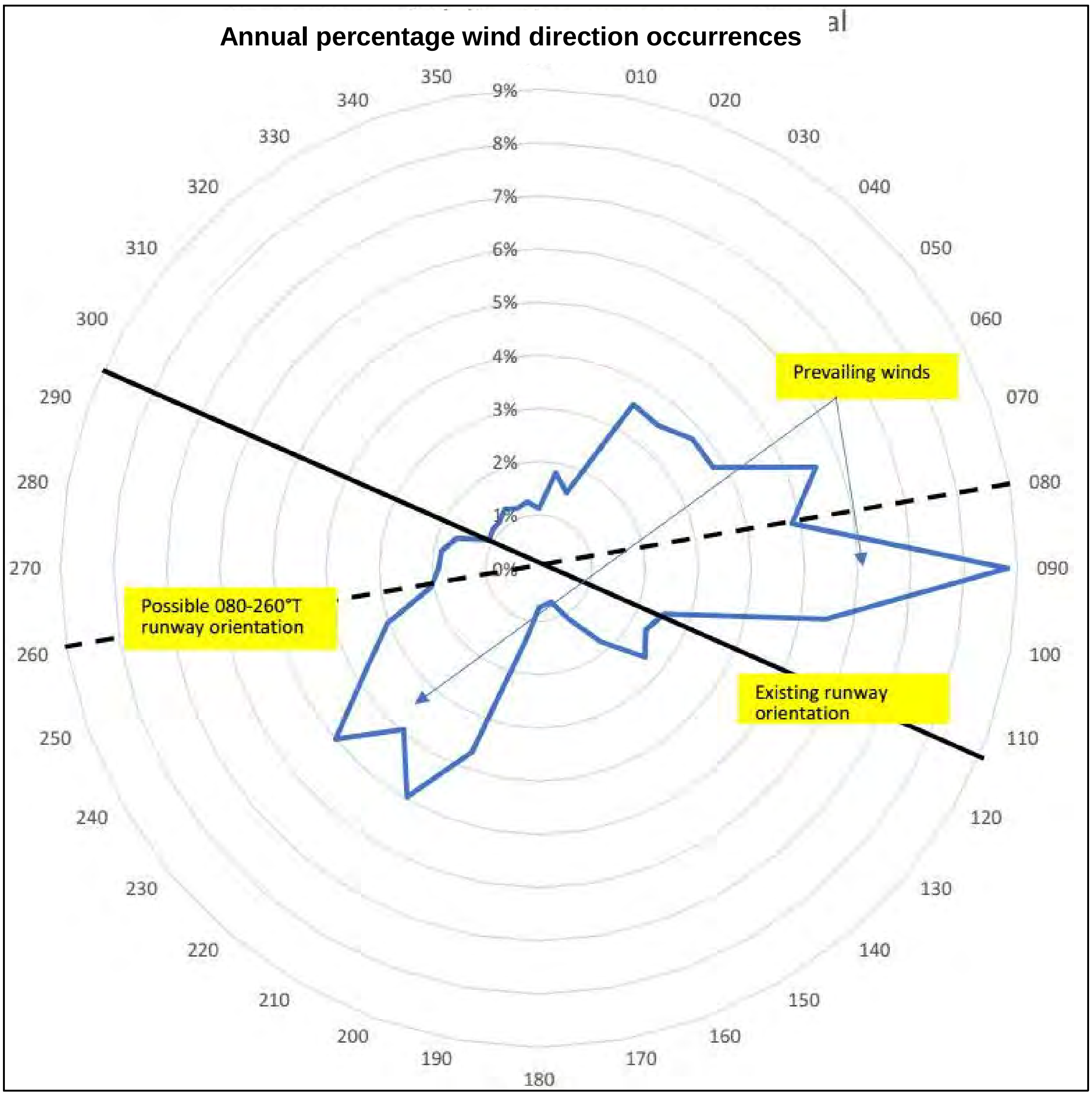


8.6 Alternate option 1 – Optimal runway reorientation

8.6.1 Runway usability - crosswinds

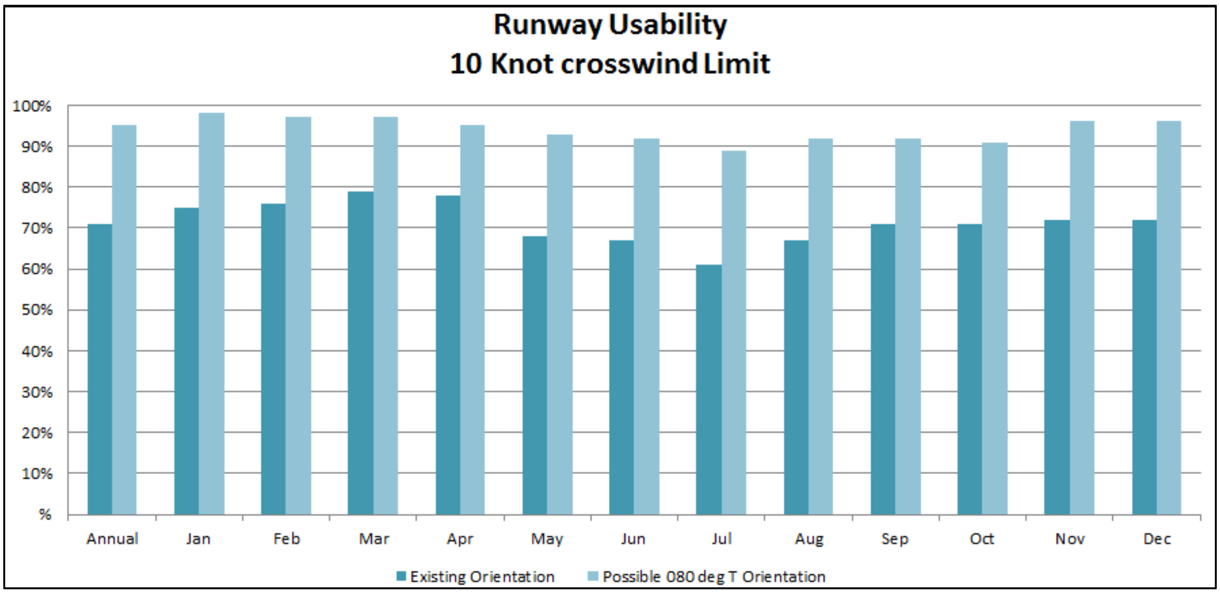
The existing runway orientation is not ideal for either prevailing winds or flight path obstructions. Figure 40 below shows the annual wind rose based on BOM data Jul 1994 – Jan 2013. Monthly wind rose data shows a strong prevalence of easterly winds Nov-Apr with south westerlies more prevalent May-Oct.

Figure 40 Lord Howe Island wind rose



A more east – west orientation (approximately 080-260° True) would be better aligned with the prevailing easterly and south westerly winds, lessening the prevalence of crosswinds. The runway usability factor, defined in ICAO Annex 14 as the percentage of time during which the use of a runway or system of runways is not restricted because of the crosswind component, would improve as shown in Figure 41 below.

Figure 41 Monthly runway usability factors

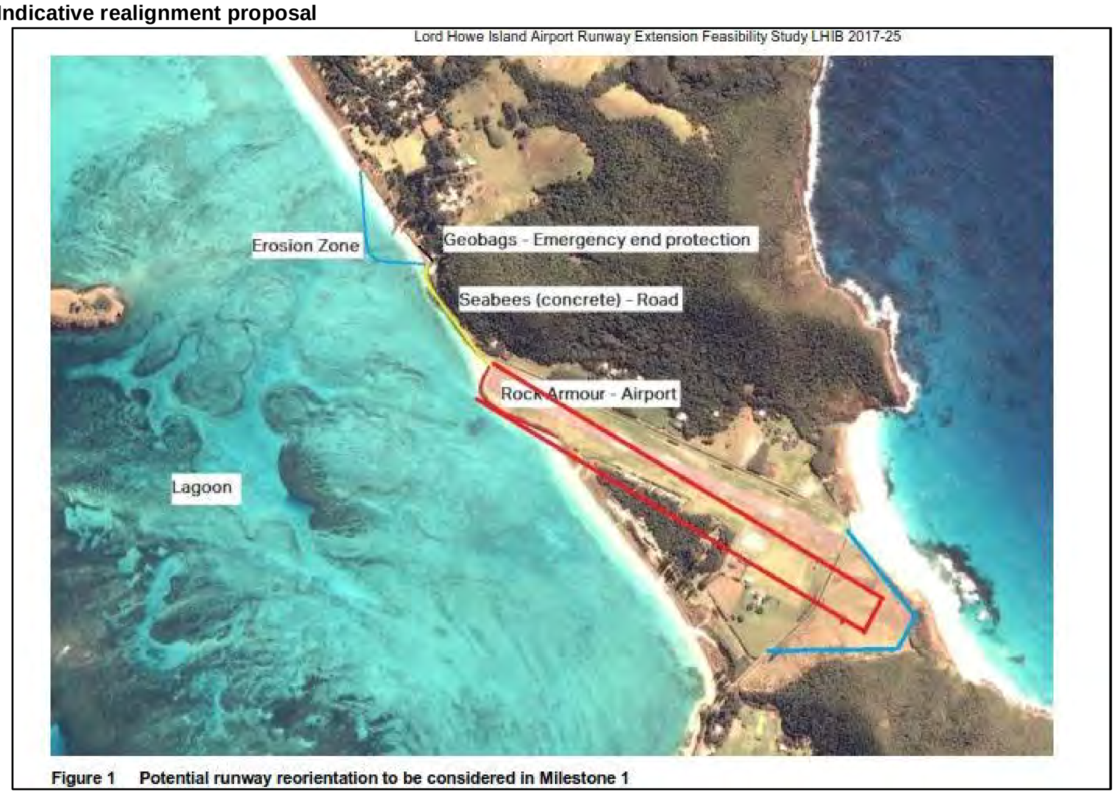


ICAO recommends that the number and orientation of runways at an aerodrome should be such that the usability factor of the aerodrome is not less than 95 per cent for the aeroplanes that the aerodrome is intended to serve based on a recommended crosswind limit of 10kts for aircraft with reference field length less than 1200m (Codes 1 and 2) and 13kts for reference field length 1200m up to 1500m. The 080-260 orientation would give an annual usability, with a 10kt crosswind limit, of 94%, increasing to 98% at 13kts. For the existing orientation the figures are 72% at 10kts and 89% at 13kts.

8.6.2 Indicative runway realignment

An indicative realignment was presented within the original proposal, as shown in Figure 42. Based on the wind data it would have a usability of 68% and in addition, the approaches at each end of the runway would be severely obstructed.

Figure 42 Indicative realignment proposal



8.6.3 Optimal operational runway realignment

The flight paths for an east-west orientation are clear of Intermediate Hill and North Head, both of which affect approaches to the existing orientation.

Figure 43 Optimal operational runway realignment

The dunes to the east of the existing runway may still need to be removed. This would have to be subject to further study.

There are number of issues to consider with a realignment, not the least being construction cost due to the additional reclamation required over the lagoon. Flight path turbulence is also another important factor for which pilot advice should be sought, and has not been accounted for at this stage.

8.7 Alternate option 2 – Aircraft leasing

As previously discussed the ATR42 and the potential ATR42 STOL aircraft could be ideal for RPT operations to Lord Howe Island, although based on current discussions with candidate airlines and ATR themselves there are no plans for ATR42 aircraft to be in operation in Australia in the near future. Airlines are typically guarded in discussions around future aircraft fleet plans, so it is difficult to predict their fleet make up in 2022 but it would be conservative to assume there will be no ATR42 aircraft in operation.

There would be significant operational, logistical and legal aspects to be considered for this alternative option, which may make it not a viable solution. One of the key concerns would be an airlines willingness to commit to training, operating and maintenance of two aircraft they don’t operate on any of their other routes.

8.7.1 Avation PLC Group

Initial discussions were held with Avation (a commercial aircraft leasing company) with regards to the feasibility of a leasing arrangement with a government agency, as there are precedents of non-airline entities leasing aircraft and contracting operators to fly them. The following information has been provided by Avation with regards to ATR aircraft, and has been based on the aircraft being provided in 2021. Indicative costs and financial commitments were provided, but these would be subject to more detailed discussions in the future.

1. Avation currently has the potential to obtain up to 20 aircraft from ATR for delivery in 2021, these can be either ATR42 or ATR72;
2. Two of these could be allocated to a government agency, for aircraft to be delivered late 2021;
3. ATR has very recently lifted activity on the proposed ATR42 short field. It is expected the option will be offered this year and would be available by 2021. However, its performance specifications are not yet known so it is not possible to say whether it would require a runway extension. This should become clear over the next 6-9 months;
4. Should a government agency proceed to lease the aircraft, the lease commitment period would be 10-12yrs.
5. The cost of this over 10 years could be offset by reimbursements from the operating airline as follows;
6. More than 50% lease payment may be able to be clawed back from the operating airline as the aircraft could be used on the operator’s other routes, not just LDH;
7. The risk is that no operator is found then worst case a government agency is stuck with the aircraft leasing costs;

9.0 Conclusion

It is clear a runway extension would be required to adequately accommodate projected future aircraft types and of great benefit for the DHC8-200 operation even if either QantasLink or Skytrans operate the route from 2022.

If operation was to remain with the DHC8-200 indefinitely we would suggest the 450m extension as being sufficient. However, it is expected that QantasLink will phase the -200 out, and Skytrans, being a smaller operator based in Cairns may not have the resources or the intent to set up a SYD or BNE based operations just for LDH.

We also suggest the 450m extension would be adequate if the ATR42 was a serious contender, and even more so should ATR develop the “Short Field” version of the aircraft currently under consideration. However, at this time no Australian operator has the ATR42 within its fleet, and in discussion, Virgin who currently operate the ATR72, indicated they have no appetite for a sub-fleet of ATR42’s even though the differences between the aircraft are not great.

Realignment of the runway shown in alternative option 1 would significantly increase the runways usability and also remove the obstruction issues associated with Intermediate Hill and North Head, but the significant cost of building a new runway in addition to the extension into the lagoon makes this option non-viable from a financial perspective.

Direct leasing or purchase of aircraft by LHIB has the potential to remove or reduce the required runway extension, although this would be subject to available aircraft and airline operator agreements at the time. This appears to be a viable solution should state funding not be available for a runway extensions. Although further understanding and investigation of the operational, logistical and legal aspects of this solution would be required, therefore this should continue to be seen as an alternate solution, pending the results of the full runway extension feasibility study for LDH.

For these reasons, we believe the 570m extension would open LDH to a much wider range of candidate aircraft and operators and recommend this option for further study. Any dune reduction and removal could be made depending on the aircraft operating to LDH and the subsequent airlines specific requirements.

For a less, remote aerodrome we would recommend staged extension construction in which the 450m extension could be built initially and the further 110m to make 570m later. However, given the difficulties of construction at LDH, we understand it may prove far more cost effective to build to 570m in one phase that two.

Further discussions will be required with airlines, CASA and Airservices at subsequent stages of the runway extension design to ensure the final design meets the relevant user and stakeholder requirements.