5.0
Aircraft Noise

Gold Coast Airport works collectively with government agencies and community representatives.

5.1 INTRODUCTION

GCAPL works collectively with government agencies and community representatives on a range of initiatives to manage the noise impacts from aircraft and operations.

GCAPL works to address and respond to aircraft noise concerns through the Airport Noise Abatement Consultative Committee (ANACC). This forum has been in place for more than 20 years and examines both technical and community concerns. GCAPL also has a well-established Community Aviation Consultation Group (CACG), which acts as the primary community forum to discuss airport activities. The ANACC is a technical subcommittee of the CACG. Local, State and Federal government representatives and airline representatives are invited to both the CACG and ANACC to meet with the community to understand their concerns and to provide information and an ongoing dialogue. CASA is also notified of the community forums. The role and structure of the ANACC and CACG are further described in Chapter 3.0.

The ANACC has proposed several noise management initiatives designed to reduce noise exposure to built-up areas:

- A trial of amended flight paths for southern departures to maximise flights over Banora Point Golf Course
- Departures to the north turn and head over water as soon as practical in compliance with Airservices Australia procedures
- Investigated climb procedures to the south provide relief for the most densely populated area surrounding the Airport
- Arrivals on Runway 14 from the north track east of the coastline over water for as long as possible
- A "Fly Neighbourly" policy developed by the General Aviation Consultative Committee and supported by the ANACC has been in place since 2006. The policy aims to have the industry self-regulate to reduce the impact of General Aviation aircraft noise on surrounding areas.

Gold Coast Airport Noise Management

A cornerstone of the Gold Coast Airport noise management is providing relevant information to the community. Comprehensive information is available on the Gold Coast Airport website (www.goldcoastairport.com.au) and the ANACC website (http://anacc.goldcoastairport.com.au) including:

- Key flight tracks used by aircraft arriving at and departing from the Airport
- ANEF contours
- ANACC members, the areas they represent and their contact details
- Information on aircraft noise complaints procedures
- Links to the Airservices Australia online WebTrak system and other useful links.

GCAPL and its aviation partners are committed to ensuring the community and other stakeholders are provided with the most relevant and contemporary information on aircraft noise issues and management. GCAPL continues to work closely with Airservices Australia, the entity responsible for monitoring aircraft noise and responding to noise complaints. GCAPL will continue to take a proactive approach to communicating

with the local community and business groups and local, state and Federal government representatives. It will continue to use the CACG as the primary community consultation forum on these issues. The ANACC will continue to act as a technical support group to the CACG.

The Aircraft Noise Ombudsman was established on 11 September 2010 as an independent administrative office to:

» Review the handling of complaints or enquiries made to Airservices Australia or Defence about aircraft noise and in particular the operation of the Noise Enquiry Unit
» Monitor and report on the effectiveness of community consultation processes relating to aircraft noise undertaken by Airservices Australia
» Monitor and report on the effectiveness of the presentation and distribution of aircraft noise-related information.

The Aircraft Noise Ombudsman may also make recommendations to the Airservices Australia Board for improvements relating to these matters where necessary.

The full Aircraft Noise Ombudsman Charter is available from the website: http://ano.gov.au/

5.2 AIRCRAFT NOISE

Aircraft noise is complex and varies according to a range of factors. These include the size and type of aircraft, number of engines, thrust settings and speed, altitude, airline standard operating procedures, pilot performance and weight and load factor, which will be influenced by destination/origin.

Aircraft noise is produced during all phases of flight but aircraft noise is generally closest to the ground during take-off because weight and thrust settings are high and during landing because thrust settings are varied and the landing gear and other control surfaces are extended. The dominant sources of aircraft noise are depicted in Figure 5.1

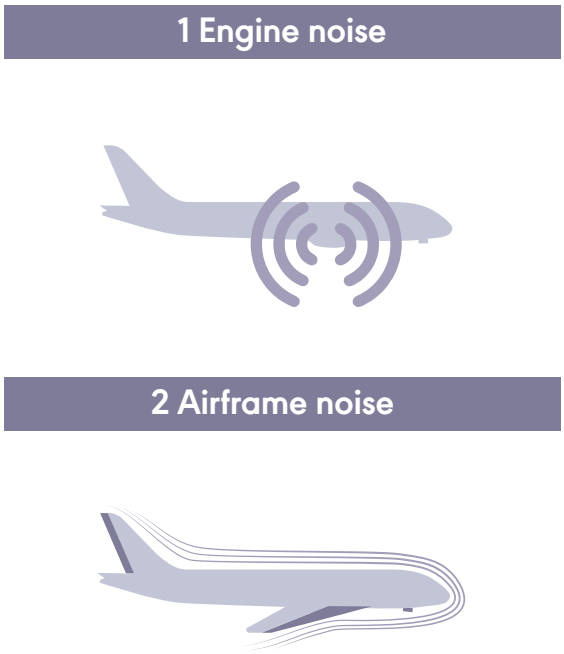


Figure 5.1 Aircraft Noise Sources

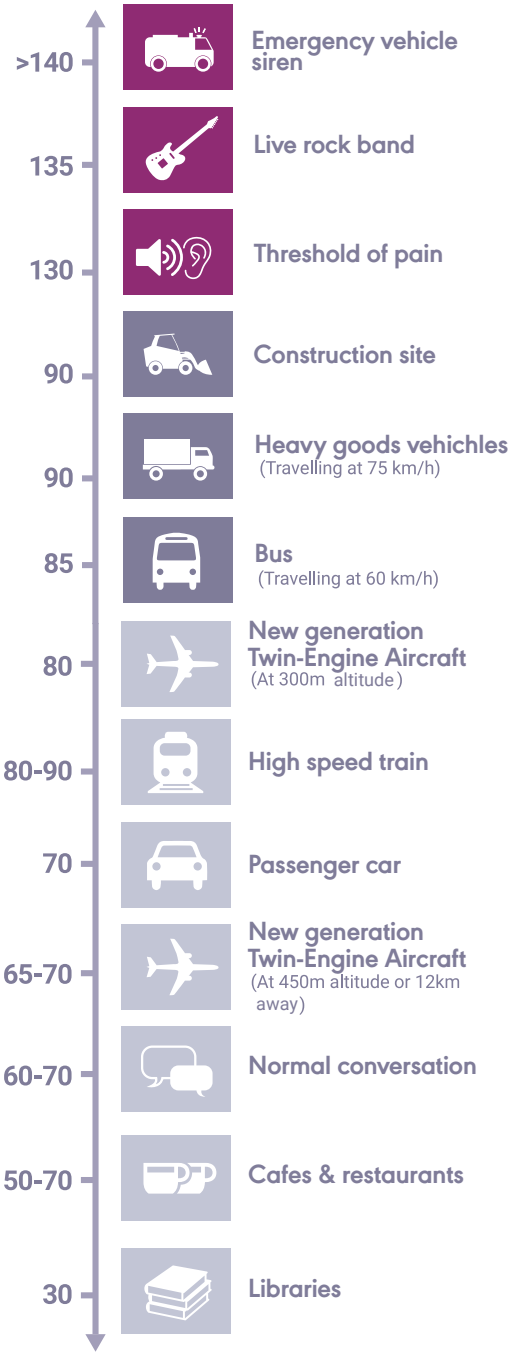


Figure 5.2 Typical Sound Level Thresholds

The sound of an aircraft taking off is dominated by engine noise which is generated by the mixing of high velocity exhaust gases with ambient air, combustion of fuel and compressor fans. Airframe noise is attributed to deploying landing gear and control surfaces, such as slats and flaps. For communities around airports, aircraft noise can be a source of great annoyance which is exacerbated during night-time hours. At Gold Coast Airport this annoyance is limited during the hours of 11:00pm to 6:00am due to the night-time curfew.

The propagation of aircraft noise and resulting sound waves will travel equally in all directions. As sound waves travel away from a source, the sound intensity decreases as the energy is dispersed over a greater area reducing the power of the sound wave. This depends on several factors, such as wave divergence, atmospheric absorption and ground attenuation.

Sound is measured in units called decibels (dB). The A-weighted sound level, expressed in dB(A) indicates the relative loudness of sound in the air as perceived by the human ear. In a normal environment with background and ambient noise, a three decibel change represents the threshold of detectability. Noise level changes less than three decibels are not likely to be noticeable.

A selection of typical sound levels that most people would experience regularly are illustrated in Figure 5.2.

For safety and efficiency reasons aircraft land and take-off into the wind, or with a minimal tailwind. The prevailing wind direction determines the mode of runway operation in use and flight path designation. At Gold Coast Airport, Airservices Australia assigns the runway direction and flight routings depending on the wind direction and speed, runway conditions and visibility as well as the preferred runway noise abatement procedures.

Atmospheric conditions heavily influence the spread of aircraft noise and intensity of sound levels on an hourly, daily and seasonal basis. The principal influences are attributed to temperature, atmospheric pressure, humidity, average headwind, elevation and terrain.

The absorption of aircraft noise by the atmosphere varies according to the frequency of the sound, humidity and temperature of the air. For example, atmospheric absorption is lowest (i.e. sound travels furthest) at high humidity and high temperatures. Wind direction and speed also affect noise propagation pathways due to refraction and turbulence.

The schematic in Figure 5.3 illustrates the influence of atmospheric conditions on the propagation of noise.

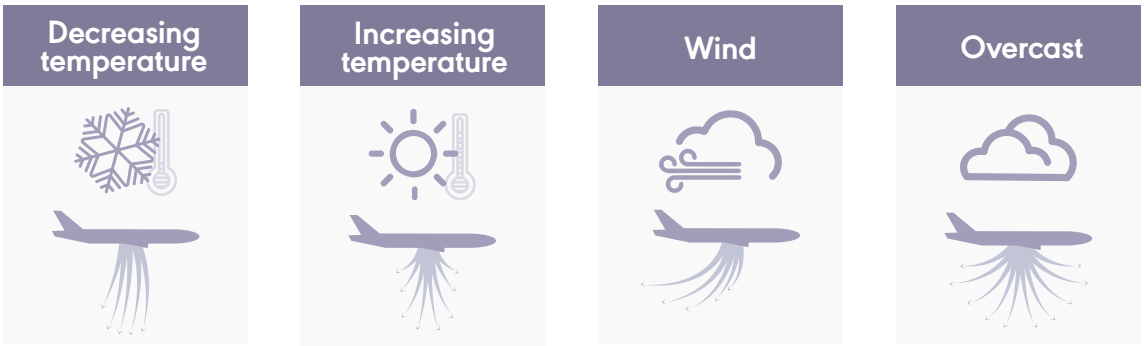


Figure 5.3 Influence of Atmospheric Conditions on the Propagation of Noise

5.3 AIRCRAFT NOISE EXPOSURE

5.3.1 International Civil Aviation Organization Balanced Approach

In 2001, the International Civil Aviation Organization (ICAO) endorsed the concept of a 'balanced approach to aircraft noise management'. This consists of identifying the noise problem at an airport and analysing the various measures available to reduce the noise in the most cost effective manner through exploring four principal elements:

- Reduction of noise at source (e.g. quieter aircraft)
- Land-use planning and management
- Noise abatement operational procedures
- Operating restrictions.

Australia is a member of ICAO and supports implementing the balanced approach to aircraft noise management. As one of 24 members of ICAO's Committee on Aviation Environmental Protection, Australia actively participates in 'think-tanks' to shape future policy direction and new approaches to manage aircraft noise. Managing aircraft noise involves a range of parties, including the relevant regulators and agencies (including Airservices Australia), local government authorities, aircraft operators (principally the airlines), and GCAPL.

Gold Coast Airport has adopted the balanced approach principles set out by ICAO.

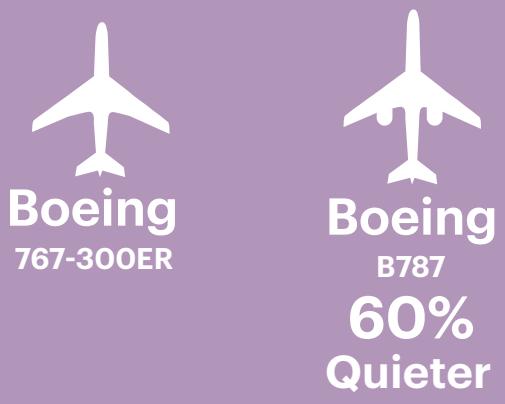
Reduction of Noise at Source

Much of ICAO's effort to address aircraft noise over the past 45 years has been aimed at reducing noise at source. Aircraft and helicopters built today are required to meet the noise certification standards adopted by ICAO. The ICAO has set progressively tighter certification standards for noise emissions from civilian aircraft. DIRD is responsible under the Air Navigation (Aircraft Noise) Regulations 1984 for ensuring compliance with aircraft noise regulations in Australia.

New aircraft types applying for certification (from 1 January 2006 onwards) must be "Chapter 4 compliant". Chapter 4 compliant aircraft are at least 10 decibels quieter than Chapter 3 compliant aircraft. This is based on a cumulative measurement over the three phases of flight (approach, take-off under full power, and overflight), which is tested at certification. Accepted acoustic standards assert that a 10 decibel reduction is perceived as an approximately 50 per cent decrease in the noise volume. Many certified Chapter 3 aircraft already comply with the Chapter 4 aircraft noise standard. The entry into service of new aircraft, such as the Airbus A320neo, Boeing B737 MAX and Boeing B787 Dreamliner, will continue to further reduce the footprints of aircraft noise at airports.

Over time, airframe and engine manufacturers have achieved significant progress in the reduction at source of aircraft noise levels. Improvements in aircraft and engine technology have resulted in quieter, more efficient aircraft engines and airframes, dramatically reducing aircraft noise. According to Boeing, the noise footprint of the new Boeing B787 Dreamliner is 60 per cent smaller than those of similar sized aircraft (Figure 5.4). This trend is expected to continue. Two airlines fly Boeing B787 Dreamliner to Gold Coast Airport: Scoot from Singapore and Jetstar from China.

Please note, although technological advancements have resulted in quieter aircraft, the noise exposure received by these new quieter aircraft is offset by increase in aircraft movements.



The Boeing 787 Dreamliner produces 60% less noise than aircraft of comparable size such as the Boeing 767.

Figure 5.4 Boeing B787 Dreamliner Noise Performance

5.3.2 Land Use Planning and Management

The most effective way of managing aircraft noise impacts on properties near the Airport is through adopting and implementing appropriate land use policies, development controls and acoustic standards. To achieve this accurate identification and mapping of localities potentially affected by aircraft noise is important. Proposals for development in the affected localities should be assessed for potential annoyance and disturbance from aircraft movements.

The traditional system of aircraft noise assessment has been based around the ANEF metric, which is a modification of the United States Noise Exposure Forecast system.

The ANEF is the only metric approved and promoted by the Federal Government for assessing the suitability of land use against aircraft noise. The ANEF is provided for a minimum twenty-year time-frame and is updated regularly. There can be only one approved set of ANEF contours at a time.

As required under the Airports Act, a 2047 ANEF has been produced for the Master Plan. The Gold Coast Airport 2047 ANEF has been assessed for technical accuracy and has been endorsed by Airservices Australia in the manner approved by the Minister.

A 2015 Australian Noise Exposure Index (ANEI) has been produced that shows the actual noise exposure experienced in that year. The long-range 2047 ANEF and 2015 ANEI are shown and described in this chapter.

The ANEF system is described in the Australian Standard AS2021:2015 (Acoustics—Aircraft noise intrusion—Building siting and construction) and is the only approved method of controlling land use planning. It is not used to regulate aircraft operations, but rather to capture, assess and quantify the effects of those activities. This system takes into account the frequency, intensity, time and duration of aircraft activities and calculates the total sound energy generated at any location. While ANEF contour charts are often misunderstood by the public, expert committees considering the regulation of aircraft noise around Australia conclude they are the most appropriate measure available. In the last few years there have been supplementary indices developed to help better describe aircraft noise in terms that are more readily understood by the public. These indices include N70 contours, which have been prepared and described in the Appendix of AS2021:2015.

The usual method of calculating ANEF contours is using the Integrated Noise Model (INM) developed by the US Federal Aviation Administration. It cannot be directly measured. The INM calculates the aircraft noise exposure for an average day (averaged over a year) activity at an airport.

For regional and local authorities and others associated with urban and regional planning and building construction, the AS2021:2015 provides guidance on the acceptable location of new buildings in relation to aircraft noise. Zones that are described as “conditionally acceptable” may be approved as building sites provided that new construction incorporates sound-proofing measures. Section 2 of the standard gives guidelines for determining the acoustic acceptability of a particular site.

AS2021:2015 provides recommended land use compatibility as reproduced in Table 5-2. For land designated conditionally acceptable land use authorities might consider that the incorporation of noise control features in the construction of residences or schools is appropriate.

Individual land uses shown in Table 5-1 are defined as:

Acceptable

There is usually no need for building construction to provide protection specifically against aircraft noise. Aircraft noise may still be noticeable and some people may find it undesirable.

Conditional

The maximum aircraft noise levels for the relevant aircraft and the required noise reduction should be determined from the procedures set out in AS2021:2015. Expected aircraft noise attenuation in the proposed construction should be determined in accordance with the outcomes set out in AS2021:2015.

Unacceptable

Construction of the proposed building should not normally be considered. In the event that development for a particular purpose was to take place despite classification as unacceptable, the AS2021:2015 indoor design sound levels should be achieved.

Table 5-1 AS2021: 2015 Building Site Acceptability Based on ANEF Zones

Building Type	ANEF Zone of Site		
	Acceptable	Conditionally Acceptable	Unacceptable
House, home unit, flat, caravan park	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hotel, motel, hostel	Less than 25 ANEF	25 to 30 ANEF	Greater than 30 ANEF
School, university	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF (Note 2 of AS2021)	Greater than 25 ANEF
Hospital, nursing home	Less than 20 ANEF (Note 1 of AS2021)	20 to 25 ANEF	Greater than 25 ANEF
Public building	Less than 20 ANEF (Note 1 of AS2021)	20 to 30 ANEF	Greater than 30 ANEF
Commercial building	Less than 25 ANEF	25 to 35 ANEF	Greater than 35 ANEF
Light industrial	Less than 30 ANEF	30 to 40 ANEF	Greater than 40 ANEF
Other industrial	Acceptable in all ANEF zones		

Source: AS2021:2015 (To be read in conjunction with guidance notes)

Table 5-2 Indoor Design Sound Levels for Determination of Aircraft Noise Reduction

Building Type and Activity	Indoor Design Sound Level (dB(A))
Houses, home units, flats, caravan parks	
Sleeping areas, dedicated lounges	50
Other habitable spaces	55
Bathrooms, toilets, laundries	60
Hotels, motels, hostels	
Relaxing, sleeping	50
Social activities	55
Service activities	75
Schools, universities	
Libraries, study areas	50
Teaching areas, assembly areas (Note 5 of AS2021:2015)	55
Workshop, gymnasia	75
Hospitals, nursing homes	
Wards, theatres, treatment and consulting rooms	50
Laboratories	65
Service areas	75
Public buildings	
Churches, religious activities	50
Theatres, cinemas, recording studios (Note 4 of AS2021:2015)	40
Courthouses, libraries, galleries	50
Commercial buildings, offices and shops	
Private offices, conference rooms	55
Drafting, open offices	65
Typing, data processing	70
Shops, supermarkets, showrooms	75
Industrial	
Inspection, analysis, precision work	75
Light machinery, assembly, bench work	80

Source: AS2021:2015

Recreational and commercial developments within the boundaries of an airport provide a transitional land use buffer around the core aviation activities, which helps to safeguard the surrounding areas from the noise impacts of airport operations.

Gold Coast Airport straddles the state border and lies partly in Queensland and partly in New South Wales. Due to its location, land use matters and development control around Gold Coast Airport are regulated by the state and local planning instruments of both jurisdictions.

In Queensland, at the northern end of the Airport, the Gold Coast City Plan 2015 (City Plan) is the planning instrument that regulates land use matters including aircraft noise. The City Plan includes an Airport Environs Overlay Code to deal with issues related to development near Gold Coast Airport and aviation facilities. The code requires that new development within the 20 ANEF contour is acoustically treated against intruding aircraft noise pursuant to AS2021:2015. Existing or planned noise-sensitive uses surrounding the Airport manage aircraft noise through appropriate design and the location of new development. Contours in the code will be upgraded to the new 2047 ANEF shown in Figure 5.6. Relatively low intensity residential development applies near the Airport to avoid significant increases in population of the areas most affected by aircraft noise.

In New South Wales, at the southern end of the Airport, the relevant planning instrument is the Tweed Local Environmental Plan (LEP) 2014, which reflects the state government objectives prescribed under the *Environmental Planning and Assessment Act 1979*. The Tweed LEP provisions relating to aircraft noise are set out under Part 7. They require the council to consider AS2021:2015 when dealing with applications for residential and other aircraft noise-sensitive developments. The provisions include a requirement for compliance with AS2021:2015 for dwelling houses in a 20 or higher ANEF.

The local authority must be satisfied that the noise reduction requirements of AS2021:2015 will be met for affected proposals for residential and other noise-sensitive developments.

5.3.3 Aircraft Noise Abatement Operational Procedures

The number one and overriding priority at Gold Coast Airport is the safe, reliable and efficient operation of aircraft. Managing aircraft noise impacts on surrounding communities from arriving and departing aircraft is fundamentally important to operating the Airport.

Under Ministerial Direction M37/99 issued pursuant to subsection 16(1) of the *Air Services Act 1995*, Item (V) Airservices Australia are directed, *"To develop and implement effective aircraft noise abatement procedures and monitor and report to the Secretary on compliance with those procedures at Australian airports."*

Airservices Australia implements several noise abatement procedures (NAPs) to provide noise respite for adjoining local communities. At Gold Coast Airport the NAPs in use are:

- Gold Coast Airport is subject to the Air Navigation (Coolangatta Airport Curfew) Regulations 1999 that restrict aircraft movements at the Airport between 2300 - 0600 hours
- Runway 14 is preferred for both landing and take-off (all hours), weather permitting
- Restrictions apply to intersection departures
- For arriving aircraft, maximum use of over-water tracking is used until aircraft are established on their final approach course to minimise the overflying of noise sensitive areas
- Aircraft fly above 5,000 feet above mean sea level (AMSL) until east of the coastline for Runway 14 approaches
- For departing aircraft, jet noise abatement climb procedures apply to Runway 14 and Runway 32. The procedures seek to make use of power and flap settings to satisfy the noise abatement objectives
- On final approach pilots of jet aircraft are encouraged to delay deploying flaps until as late as possible
- Circuit training is not permitted between 2200–0600 hours
- Where possible, circuits are distributed equally left and right of the runway in use
- Outside of control tower operating hours, pilots are requested to use the same runway for take-off and landing, if operationally acceptable
- Helicopter circuits from the western grassed area are conducted with upwind legs inside the Airport boundary fence and base turns made within the Runway 14/32 threshold markers
- Noise abatement procedures will also be employed for operations using the proposed instrument landing system when it commences.

5.3.4 Gold Coast Airport Noise Abatement Procedures Review

In 2012 Airservices Australia reviewed the effectiveness of current NAPs at Gold Coast Airport. This review evaluated the level of compliance with NAPs. It also explored options to reduce the impact of aircraft noise and where possible to move aircraft noise away from residential areas around Gold Coast Airport. The main findings of the review concluded:

» There is a high level of compliance with curfew restrictions
» The preferred runway system has high levels of compliance for all aircraft types and is effective in reducing the impact of aircraft operations on nearby residential areas
» Overall, adherence to flight paths that are specified in the NAPs is high, with over 90 per cent of flight tracks (which show where an aircraft has flown) aligned with the flight paths.

5.3.5 Operating Restrictions

Gold Coast Airport is subject to the Air Navigation (Coolangatta Airport Curfew) Regulations 1999, as administered by DIRD. The regulations restrict aircraft movements at the Airport between 2300–0600 hours (Queensland local time). Aircraft that can operate during the curfew period are:

» Propeller-driven aircraft with a maximum take-off weight of 34,000 kilograms
» Jet aircraft with a maximum take-off weight of 34,000 kilograms, which meet special low noise standards specified in the regulations
» Passenger and freight jet aircraft that have been permitted to operate under specific quota provisions in the regulations. Twenty-four movements per annum for jet passenger operations are permitted between 2300 and 2345 hours depending on the time in use in New South Wales. Four jet freight movements per week are also permitted. Aircraft types are restricted to the BAe 146, or aircraft of a similar weight and noise levels to the BAe 146.

The regulations also contain provisions for air service diversions (both international and domestic), dispensations and emergencies.

5.4 RESPONSIBILITIES

5.4.1 Commonwealth Government

Aircraft noise policy and mitigation is present at the different levels of government responsible for control of aircraft use, air navigation, airspace operations and land use planning in Australia. In each case the Federal Government is directly or indirectly involved through devolution of regulatory powers to other levels of government or by driving a coordinated national approach.

However, the varying and dispersed powers and responsibilities of different levels of government mean that various noise mitigation measures require input from multiple agencies, in a coordinated fashion. For example, DIRD administers the curfew at Gold Coast Airport and individual airports cannot determine licensing standards for noise-compliant aircraft.

5.4.2 Airservices Australia

Airservices Australia has a significant regulatory and decision-making role in efforts to reduce impacts of aircraft noise in Australian airspace. This is aligned to a wider focus on environmentally responsible air traffic management and related services to the aviation industry.

Airservices Australia is responsible for assessing aircraft and issuing Noise Certificates (discussed above) unless already certificated in the country of origin to the same standards.

Airservices Australia publicises flight paths and procedures once they have been determined by all stakeholders. They also carry out air traffic control. Both these functions are major determinants of timing, frequency, scale and locations of aircraft noise effects.

The Noise and Flight Path Monitoring System (NFPMS), consisting of permanent equipment in strategic positions near Gold Coast Airport, monitors flight tracks and aircraft noise events. The data is published monthly on the Airservices Australia website (www.airservicesaustralia.com). The collected data shows levels and duration of noise events, elevation and speed of individual aircraft movements. This allows for analysis of adherence to allocated flight tracks and is a base developing the ANEF.

GCAPL prepares ANEF mapping which is used for land use planning within the airport's vicinity. The review and endorsement of the mapping for technical accuracy, in the manner approved by the Minister, has been delegated to Airservices Australia.

As an operating restriction the night-time curfew at Gold Coast Airport has a beneficial limiting effect on the extent of aircraft noise on surrounding communities.

Airservices Australia has published its Airservices Environment Strategy 2014–2019. This strategy sets out the Airservices Australia vision and commitment to reducing the environmental impact of aircraft operations in Australia while removing, as much as reasonably possible, constraints on air navigation. In pursuit of this vision, while maintaining the primacy of safety, Airservices Australia aims to look beyond the obligations of compliance and to work collaboratively with government, industry and the community to reduce the impact of aircraft noise.

The long-term goal for Airservices Australia is to achieve world best practice in aircraft noise management. To help achieve this, five key areas have been identified:

- Proactive stakeholder engagement, consultation and information
- Collaborative stakeholder engagement with the aviation industry on aircraft noise
- Alignment of actions and processes to the ICAO balanced approach to aircraft noise management
- Innovation and technology development within Airservices Australia and across the industry to reduce the impact of noise
- Independent validation and international benchmarking of processes and actions.

The 2014 – 2015 Environment Action Plan highlights the major environmental initiatives undertaken by Airservices Australia to deliver the key outcomes set out in the Airservices Environment Strategy 2014 – 2019, including aircraft noise. These initiatives, as they relate to aircraft noise, include:

» Deliver commitments to aircraft noise management
» Develop a suite of information and data tools that meet the needs of stakeholders
» Identify, investigate and, where feasible, implement changes to aircraft flight procedures that reduce the impact of aircraft noise.

Airservices Australia handles airborne aircraft noise enquiries and complaints through a national noise complaint service. Complaints can be lodged online, by phone or by mail:

Hotline: Noise Complaints and Information Service on 1800 802 584 (free call) or
1300 302 240 (local call)
Online: Noise Complaint, Enquiry and Feedback
Form at: http://www.airservicesaustralia.com/aircraftnoise/about-making-a-complaint/how-to-make-a-complaint/
Mail: Noise Complaints and Information Service
PO Box 211
Mascot, New South Wales, 1460
WebTrak: http://www.airservicesaustralia.com/aircraftnoise/webtrak/

Airservices Australia publishes monthly Noise Information Reports (NIRs) for Gold Coast Airport, which are available on its website at: http://www.airservicesaustralia.com.

An interpreter service is also available on 131 450.

WebTrak

WebTrak is an innovative system providing the community with information on where and how high aircraft fly and the noise levels of these operations. It allows members of the public access to detailed information on actual aircraft operations around major airports and is generated from the NFPMS.

WebTrak uses information from air traffic control secondary surveillance radars to monitor aircraft within the wider vicinity of the Airport and up to a height of 10,000 metres (approximately 32,810 feet) above mean sea level (AMSL).

Aircraft noise data is downloaded daily from noise monitors strategically located about the communities close to the Airport. The information is displayed on a detailed map (road or aerial) that enables the user to zoom down to their street level. In "Current Flights" mode, current operations can be viewed (delayed for aviation security reasons) around the Airport. In "Replay Mode" flight information and noise data for the previous two weeks can be accessed.

The displayed weather information is updated every 30 minutes by the Bureau of Meteorology weather station at the Airport.

Aircraft Noise Monitoring at Gold Coast Airport

The Airservices Australia NFPMS captures and stores radar, flight plan and noise data. The NFPMS covers eight city regions around Australia. For the Gold Coast region, noise data is captured by two permanent noise monitors, also referred to as Environmental Monitoring Units (EMUs). These are at Tugun to the north of the Airport and at Banora Point to the south. Each EMU is positioned in line with Runway 14/32 to record noise from arriving and departing aircraft. A third EMU is to be reinstated at a suitable location in Tweed Heads West.

Data from these monitors is available in near real-time on WebTrak and published in the Airservices Australia monthly NIRs.

5.4.3 Airports

GCAPL has direct control only over the management of ground-based noise complaints including those about aircraft. Complaints or enquiries in relation to these issues should be directed to (07) 5589 1100.

GCAPL consults extensively with the community through the CACG and the ANACC and seeks to work closely with Airservices, airlines, Commonwealth, State and local governments to manage the impacts of aircraft noise on the community.

5.4.4 State and Local Government

The Gold Coast Airport lease area and runway straddle the state border of New South Wales and Queensland. This results in two state and two local governments, with dissimilar systems, having land use and development control of the areas surrounding the Airport.

In each case, the state governments manage adoption and administration of policies applicable on a state-wide basis and have oversight for the standardisation of zoning and land use systems, which are implemented by the respective local governments.

The state and local government planning regimes in relation to land use planning policies and land use compatibility are discussed in greater detail in Chapter 8.0.

In Queensland, State Planning Policy (SPP) contains regulations and guidance as to protect airports' airspace. The SPP also includes aircraft noise attenuation standards based on AS2021:2015 and reproducing its land use compatibility and indoor design sound level tables.

The SPP provides direction and advice to take into account aircraft noise issues in preparing planning instruments and development assessment. Under the *Sustainable Planning Act 2009* (Qld), referral to the state government as a concurrence agency may be required for applications for residential and other noise-sensitive development where ANEF levels exceed AS2021:2015.

In Queensland, the City of Gold Coast Council City Plan addresses aircraft noise in two ways. First, the extent of land where the ANEF contour exceeds 30 is limited. For the parts that are zoned residential, permissible densities are severely curtailed allowing in most instances merely for replacement or infill of single dwellings, or at most duplexes. Incompatible development surrounding the Airport that could impact on the public safety zone or operations will not be permitted.

Second, the City Plan includes a code related to airport matters, including aircraft noise. The code requires acoustic insulation complying with the standards set out in AS2021:2015 for residential development and other noise-sensitive uses inside the 20 ANEF contour.

In New South Wales, enhanced airspace controls, including those concerning the subject of aircraft noise, are in place.

The Tweed Shire Council LEP 2014 sets out requirements for noise-sensitive development to meet the standards set out in AS2021:2015 (discussed further in Chapter 8.0). This provision has been accompanied by amendments to the State Environmental Planning Policy (Exempt and Complying Development Codes) (SEPP). This SEPP requires that any proposed dwelling house in the 20 and 25 ANEF contours must be constructed in accordance with AS2021:2015.

The SEPP also provides for expedited approval processes for new dwelling houses as complying development; however, land in the 25 or higher ANEF contour is excluded from the category of complying development. Therefore, development requires approval from the local authority, requiring assessment of the proposal against the standard aircraft noise clause in each new LEP, potentially including aircraft noise assessment.

5.5 FLIGHT PATHS

The existing and proposed flight paths used in producing the 2015 ANEI and 2047 ANEF have been included in Figures 5.10 - 5.16.

The positioning and spread of the existing flight paths used in preparing the 2015 ANEI were derived from NFPMS data supplied by Airservices Australia and represent the tracks generally used during the year.

The flight paths used for preparing the 2047 ANEF had several significant assumptions:

- Provision of an ILS for Runway 14. This will result in flight tracks aligned with the runway centreline and extending about 12 nautical miles north of the Airport (subject to the specific arrival route the aircraft is transitioning from). This would allow aircraft to intercept the ILS between approximately 2,500–3,000 feet (762–915 metres) AMSL to establish on the three-degree glideslope on approach to Runway 14. To the north this is a new track, partly over land and partly over water, from the northern runway end to the northern extent of the ILS approach. It has been assumed that on fine weather days around ten per cent of arrivals on Runway 14 will use the ILS, with the majority of these originating from northern international airports
- The Required Navigation Performance (RNP) flight tracks that were permanently introduced in 2014 would be retained and expanded to include an increased number of arrivals from the south, north and east (New Zealand)

- By 2047 most RPT jet aircraft would be RNP equipped and approved, ensuring that those tracks would be extensively used
- Recent changes to the Runway 14 RNAV-Z, NDB/VOR and the Runway 32 NDB/VOR approaches consist of the final approach paths being straightened to align with the runway rather than being off-set
- The minimum descent altitude of the existing approach for the Runway 32 RNAV-Z approach has been reduced by 80 feet
- Use of the NDB/VOR is expected to decrease significantly due to increased use of RNP procedures and the ILS. It is assumed that approximately five per cent of jet arrivals will use the NDB/VOR, a reduction of 12 per cent from the 2015 ANEI.

The RPT flight paths have been arranged according to destination and direction of the active runway (Figures 5.10 - 5.16). The arrival paths included in the figures are:

Existing flight paths:

- Visual — Visual approach
- Instrument — Runway 14 NDB/VOR and RNAV-Z, and Runway 32 NDB/VOR
- Smart Tracking — RNP approaches to Runways 14 and 32 (from south, north and east).

Proposed flight paths:

- Instrument — ILS approach for Runway 14 (from north), MDP approved in 2016.

The departure paths position and spread (Figures 5.10 - 5.16) consists of:

- Turning off the centreline close to runway
- Turning off the centreline further away from runway.

The prepared flight paths have been confirmed against Airservices Australia's NFPMS data and in consultation with local air traffic control. They represent the tracks generally flown during 2015.

The flight paths for the local area movements (General Aviation, fixed-wing and helicopter) have been arranged according to type and direction of the active runway (Figure 5.11). The position and spread of the local area tracks were generally determined from NFPMS data provided by Airservices Australia and in consultation with local air traffic control.

5.5.1 Smart Tracking

Smart Tracking, also known as RNP procedures, are being progressively introduced at several Australian airports by Airservices Australia. RNP is based on RNAV, which combines on-board and global navigation satellite system technology rather than the traditional ground-based radio navigation aids. This allows aircraft to operate on the optimal flight path, curved or straight-in, with a greater level of track accuracy (i.e. +/– 0.3 nautical miles). RNP approaches enable aircraft to follow precise three-dimensional curved flight paths through congested airspace, around noise sensitive areas, or through difficult terrain.

The result is greater predictability and operational capability in the terminal airspace from more flexible, direct and shorter routing. Some of the other potential benefits of RNP include:

- Cost effective, avoiding the need to install expensive ground- based equipment
- RNP procedures are already in place and being used by certain airlines
- RNP procedures are runway aligned at a much shorter distance than an ILS procedure and potentially impact fewer people
  - Fewer track miles
  - Fuel burn savings and lower CO^2 emissions

Some limitations include:

- Some aircraft are not equipped to fly RNP procedures
- Pilots require training to fly the procedures, which requires investment by the airline
- Concentration of aircraft flight movements on more precise tracks
- Less geographic spread of aircraft noise reducing the opportunity for noise sharing and respite.

5.5.2 RNP at Gold Coast Airport

RNP procedures have been trialled at Gold Coast Airport since 2008. Since November 2014, RNP procedures for CASA approved RPT operators have been permanently in use. In 2015, approximately 45 per cent of RPT movements used RNP procedures, in 2016, this is up to 65 per cent. Over time, it is expected this technology will be more widely used as it offers significant benefits in several areas. This includes noise mitigation, as it achieves much higher navigation accuracy in relation to flight paths and potential avoidance of sensitive areas. The 2047 ANEF shown in Figure 5.6 is based on the most recently available information on RNP operations at Gold Coast Airport.

In 2047, it is assumed that all jet aircraft (RPT and General Aviation) would implement RNP procedures on the basis that the technology will be more readily available.

RNP-Authorisation Required (RNP-AR) approach procedures were incorporated into the 2047 ANEF 20 contours. RNP-AR procedures are based on RNP using RNAV avionics systems, where authorisation is required. RNP-AR extends beyond the procedure design for aircraft operations to ensure that other dependencies, related airworthiness and operational procedure approvals are complete for implementation.

The Gold Coast Airport RNP-AR approaches are depicted in Figures 5.10 - 5.16.

5.5.3 Runway 14 Instrument Landing System (ILS)

Airservices Australia will install an ILS on Runway 14 to improve the reliability of landings in adverse weather. The ILS Major Development Plan (MDP) was approved by the Minister in January 2016. The ILS is scheduled to be operational in 2018.

An ILS is a ground- based equipment system that provides high precision lateral and vertical guidance to aircraft conducting an approach to land on a specific runway. It is particularly useful in non-visual flight conditions or periods of reduced visibility such as night-time or inclement weather. The installation of the ILS on Runway 14 will reduce the need to divert aircraft from Gold Coast Airport to other airports, such as Brisbane, during adverse weather. Installation of the ILS requires the design and implementation of new flight paths and air traffic control procedures to enable aircraft to access the ILS. These are included in the long-range ANEF.

The south east Queensland/northern New South Wales region experiences adverse weather, such as tropical storms and intense rainfall, during the summer months. This period coincides with the region's peak travel season. This can mean that aircraft cannot land at Gold Coast Airport in adverse weather and must divert to another airport. It has been estimated that this results in an average of 50 diversions per year or around ten days per year based on data collected since October 2010. An ILS would provide increased certainty to pilots regarding the ability to land safely in adverse weather, while reducing the likelihood and number of diversions.

It has been assumed that on fine weather days around ten per cent of arrivals on Runway 14 will use the ILS, with the majority of these originating from northern international airports.

Aircraft departing Gold Coast Airport would not use the ILS.

5.5.4 More Information on Aircraft Noise

Additional information on aircraft noise can be found at the sources listed in Table 5-3.

Table 5-3 Additional Information Sources on Aircraft Noise

Source	Internet Address
Gold Coast Airport	www.goldcoastairport.com.au
International Civil Aviation Organization	www.icao.int
Airservices Australia	www.airservicesaustralia.com
WebTrak	www.webtrak.bksv.com
Noise Information Reports	www.airservicesaustralia.com
Federal Department of Infrastructure and Regional Development	www.infrastructure.gov.au
National Airport Safeguarding Framework	www.infrastructure.gov.au
Aircraft Noise Ombudsman	www.ano.gov.au
Federal Aircraft Noise Regulations	www.infrastructure.gov.au

An ANEF will assist for land use planning and future development decisions.

5.6 AUSTRALIAN NOISE EXPOSURE FORECAST (ANEF) CATEGORIES

Over the past three decades the ANEF system has been the primary measure of aircraft noise exposure near Australian aerodromes. An ANEF is a mandatory requirement of the Airport Master Plan process as prescribed under the Airports Act. It is based on average daily sound pressure levels, which are measured in decibels. Noise exposure levels are calculated in ANEF units, which take into account the following factors of aircraft noise:

- The intensity, duration, tonal content and spectrum of audible frequencies of the noise of aircraft take-offs, approaches to landing, and reverse thrust after landing
- The forecast frequency of aircraft types and movements on the various flight paths, including flight paths used for circuit training
- The average daily distribution of aircraft arrivals and departures in both daytime and night- time (daytime defined as 0700–1900 hours and night-time defined as 1900—0700 hours). Night-time movements are represented with a six decibel adjustment in the ANEF calculation.

There are three categories of ANEF that can be used in an Airport Master Plan under the Airports Act:

Standard ANEF (up to 20 years)

This is a forecast of expected aviation noise exposure levels during a specified period of five to 20 years. A standard ANEF includes a forecast of aircraft movement numbers and operating times, aircraft types, flight paths and anticipated use of runways at the aerodrome.

Long-range ANEF (20-plus years)

This is a forecast of expected aviation noise exposure levels for a specified period greater than 20 years. Forecasts account for present and anticipated trends, predicted future aircraft types, movement numbers, flight paths and changes to runway configurations expected to occur within the projected period.

Ultimate Practical Capacity ANEF

This is a forecast of aviation noise exposure levels expected to exist when the Airport is developed to its ultimate practical capacity. An estimated date of when the Airport is expected to reach its ultimate practical capacity must be stated. Forecasts account for present and anticipated trends, predicted future

aircraft types, movement numbers, flight paths and runway configurations expected to occur at the point of the Airport's ultimate practical capacity.

A long range ANEF has been included in this Master Plan, as per the preference stated in the National Airports Safeguarding Framework issued by the National Airports Safeguarding Advisory Group (NASAG). The long-range ANEF takes into account:

- Current and future aircraft types and mixes
- Forecast numbers of aircraft movements
- Runway layout and operational modes
- Current and future concept flight paths, including Smart Tracking
- Aircraft destinations or origins, which determine the weight of an aircraft and its noise profile
- Split of daytime and night-time operations
- Terrain elevation
- Weather, particularly wind and air temperature information.

An ANEF for Gold Coast Airport will primarily assist the City of Gold Coast Council in Queensland, Tweed Shire Council in New South Wales and the state planning agencies in land use planning and future development decisions that could be impacted by noise from current or forecast aircraft operations at Gold Coast Airport.

5.7 AUSTRALIAN NOISE EXPOSURE FORECAST (ANEF)

The ANEF system, as described in Section 5.6, is based on forecasts of aircraft traffic movements on an average day. Allocations of the forecast movements to runways and flight paths are on an average basis and take into account the existing and anticipated air traffic control procedures at the Airport.

At the time of preparing the ANEI, GCAPL used the most recent whole year data available, the 2015 financial year aircraft statistics provided by Airservices Australia. In 2015 there was an increase in passenger RPT movements with no discernible change in General Aviation or helicopter movements. The 2015 ANEI and 2047 ANEF contours indicate areas of City of Gold Coast Council and Tweed Shire affected by aircraft noise. The AS2021:2015 states that within the 20 contour, land is marginally acceptable for residential purposes. Building authorities may specify that sound insulation measures are required for new construction. Within the 25 contour residential land use is not acceptable although other uses (mainly commercial and industrial) are. These provisions can apply to new development applications but they do not affect existing land uses.

5.7.1 2015 ANEI

The 2015 ANEI 20 contour (Figure 5.5) is modelled on 2015 data. The ANEI 20 contour extends approximately 3.5 kilometres to the north and 3.4 kilometres to the south from the respective runway ends. Aircraft departing to the north turned to the east by Currumbin. Flight procedures were amended during 2010 to require nearly all aircraft to undertake instrument approaches at night, increasing the aircraft over flights to the north. To the south, the ANEI 20 contour extends further. Nearly all arriving aircraft undertake 'straight-in' approaches whether instrument or visual. Departing aircraft to the south remain on the runway centreline alignment until south of Tweed Heads.

Gold Coast Airport averaged 258 flights per day during 2015. These flights were a mixture of RPT, General Aviation (both travel flights and training) and helicopters. During 2015, each day there were approximately 106 RPT (arrivals and departures) jet aircraft movements, approximately 113 General Aviation aircraft movements, by a wide range of aircraft types, and 39 helicopter flight movements.

5.7.2 2047 ANEF

By 2047 there is forecast to be an average of 372 RPT flights per day and approximately the same number of General Aviation flights and helicopter movements. Many of the RPT flights will be by new generation aircraft, such as the Boeing B787 Dreamliner. While the new generation RPT aircraft are expected to be significantly quieter than those operating, this reduction in operating noise will be off-set by the increase in the number of flights.

By 2047 the ANEF 20 contour will be consistent with the shape and extent of the 2031 ANEF 20 contour presented in the 2011 Master Plan. The 2047 ANEF 20 contour is shown in Figure 5.6.

In line with the growth forecast for RPT flights at Gold Coast Airport over the next 30 years, the 2047 ANEF 20 contour is calculated to straighten to the north and marginally contract to both the north and south to be closer to the Runway 32 end. The reshaping of the 2047 ANEF 20 contour is largely attributed to:

- The forecast RPT jet aircraft movements increasing by approximately 96,000 movements from 2015
- More aircraft undertaking instrument approaches on realigned tracks
- Changes to decision height altitudes for pilots and timings on NDB/VOR (non-directional beacon / VHF omni directional radio range) procedures
- Increased usage of Required Navigation Performance (RNP) procedures for Runway 14 arrivals
- Reduction in the use of offset NDB/VOR procedures.

5.7.3 Relocation of Runway 32 Landing Threshold

Within the first five-years of this Master Plan the Runway 32 landing threshold is proposed to be relocated by 300 metres to the south. The threshold relocation is within the existing runway length and is required to improve reliability and safety during adverse weather for wide-body aircraft. This will cause a displaced landing threshold of 150 metres. This is further described in Chapter 6.0.

A 300 metre relocation of the Runway 32 landing threshold will cause the 2047 ANEF 20 contour to extend a similar distance to the south, along the existing runway length (when compared to the same 2031 ANEF 20 contour that included a relocated threshold).

Arrivals and departures from Runway 14/32 will be the only aircraft flights that affect the southern extent of the 2047 ANEF 20 contour.

An aircraft on a standard approach at any position along the flight path will be approximately 50 feet (15 metres) lower because of the proposed threshold relocation. At the southern extent of the 20 ANEF contour, arriving aircraft could be expected to overfly at an altitude of approximately 930 feet (280 metres) on descent.

To provide an indication of the likely changes to aircraft noise exposure resulting from this proposed landing threshold relocation, LAmax values were determined from three points along the straight-in approach flight track from the south inserted into the INM. This metric indicates the difference in maximum sound level created by an aircraft overflight though it provides no indication of either the duration or frequency of those flights. Table 5-4 shows the differences in LAmax values at a nominated location. The changes in sound pressure at specific locations, due to aircraft altitude, are relatively small (between 0.3 dB(A) and 0.6 dB(A)) and are generally not noticeable.

Table 5-4 Difference in LAmax Sound Levels Created by an Aircraft (generic)

Location	Distance	Existing Height	Relocated Threshold Height	Difference in dB(A) with a Relocated Threshold
Tweed Heads (Wyuna Road)	1.9 km	486 feet	433 feet	0.4 dB(A)
Banora Point	5 km	1168 feet	1115 feet	0.6 dB(A)
Chinderah	8 km	1962 feet	1909 feet	0.3 dB(A)

5.7.4 Comparison of 2031 ANEF with the 2047 ANEF

A comparison of the 2031 ANEF with the 2047 ANEF (Figure 5.7) indicates little change to the extent and shape of the ANEF 20 contours. To the north of the Airport, the ANEF 20 contour contracts marginally over water to the east of the coastline, while to the south this contour also contracts slightly. Both to the north and south, the lateral extent of the 2047 ANEF contour is slightly narrower than the 2031 ANEF, due to realigned approach flight paths (Figure 5.6).

The reasons for minor change between the two sets of contours are:

- The new version of the INM (7.0d) has changes to the algorithms used to calculate aircraft noise contours, in particular the modelling of helicopter noise. INM (7.0d) includes new aircraft types that were not previously available, such as the Boeing B787 Dreamliner. It also contains noise data updates for several existing Airbus aircraft types

- A greater proportion of new generation aircraft types operating in the fleet mix due to airline fleet renewal and modernisation programs and long-term aircraft technological advancements. Notably, the Boeing B787 Dreamliner is significantly quieter than some of the wide-body aircraft included in the 2031 ANEF, such as the Boeing B747

- For the 2031 ANEF, the bulk of the wide-body movements comprised quiet, modern Boeing B787 Dreamliner and Airbus A350 aircraft. However, due to no INM data being available, they were modelled as the significantly noisier Boeing B777-300 and Airbus A330-343 aircraft, respectively. For the 2047 ANEF, all wide-body movements are forecast to be Boeing B787 Dreamliners, for which data is now available in INM. Therefore, all wide-body movements in the 2047 ANEF were modelled as significantly quieter aircraft than in the 2031 ANEF. However, higher forecast number of wide-body movements in 2047 means that the impact of wide-body aircraft on the contours is similar for both the 2031 and 2047 ANEF

- For the 2031 ANEF, it was assumed that there would be an ILS. For the 2047 ANEF it has been assumed that there will be an ILS

- Increased usage of RNP procedures and realigning other instrument approaches has resulted in the 2047 ANEF contours straightening up to the north

- Continued strong growth in RPT aircraft activity at Gold Coast Airport. This includes a growth in international flights. The gradual increase in RPT aircraft flights will be off-set by replacing older, noisier aircraft with newer, quieter aircraft and implementing quieter operating procedures

- The 2031 ANEF has assumed a similar number of General Aviation aircraft undertaking repetitive circuit training as in 2015. The 2047 ANEF forecasts that repetitive circuit training and helicopter circuits will not significantly change from 2015 levels.

5.7.5 Areas above Significant ANEF Levels

The Airports Act requires airport lessees, such as GCAPL, consult with operators and local government bodies in vicinity of the Airport and develop plans for managing aircraft noise intrusion in areas above 30 ANEF.

GCAPL works closely with the airline industry, community, business groups and Airservices Australia in this regard.

This chapter outlines the noise management arrangements in place with the local planning authorities and airlines servicing the Airport for managing the impact of aircraft noise.

5.8 OTHER NOISE DESCRIPTORS

GCAPL is committed to providing the public and other stakeholders with the most relevant, accurate and easily understood information on aircraft noise impacts. Therefore, although it is not a statutory requirement, N70 contours have been prepared for this Master Plan.

5.8.1 N70 Contours

Contours that indicate the number of aircraft overflight events (average per day) for the areas surrounding the Airport that are louder than 70 dB(A), known as N70 contours. An external single noise event will be attenuated by approximately 15 dB(A) by the fabric of a house with the doors and windows closed. The resulting internal noise level of 55 dB(A) is the sound pressure level of a noise event likely to interfere with conversation or listening to radio or television. The 70 dB(A) level is chosen as it is equivalent to the single event level of 55 dB(A) as the indoor sound level for normal domestic areas in a dwelling, as specified in AS2021:2015.

5.8.2 2015 ANEI N70

The 2015 N70 (Figure 5.8) closely follows the outline of the 2015 ANEI in both extent and shape. The outer contours reflect the flight patterns of arriving aircraft more than departing aircraft as:

- Arriving aircraft generally descend at 300 feet (approximately 92 metres) per nautical mile, departing aircraft climb much more steeply
- Arriving aircraft extend undercarriage and control surfaces (flaps/slats) at an appropriate distance from touchdown (usually once the aircraft is on final approach), which generates airflow noises. Departing aircraft retract those devices as soon as practical
- Modern jet aircraft engines, even at high take-off power, have significantly reduced noise footprints compared to older generation engines and will start to reduce power once positive rates of climb are achieved.

5.8.3 2047 ANEF N70

The 2047 N70 contours (Figure 5.9) have been developed using the same assumptions used in the 2047 ANEF including the INM dataset, flight paths and forecast aircraft movements. Key factors influencing the extent and shape of the 2047 N70 contours are:

- The forecast indicates an increase in the numbers of aircraft operating to the east (New Zealand), and north (Japan and South East Asia). These latter aircraft are generally wide-body types. These aircraft on departure off Runway 14 will turn to the east
- The increase in the number of instrument approaches can be seen to the north of the Airport where the contours extend slightly further out from the Airport. The straightening of the Runway 14 RNAV-Z (area navigation) and the NDB/VOR approaches, the increased use of the RNP procedures, and the commissioning of the ILS on Runway 14 in 2018 will result in the shift of the northern extent of the contours slightly to the west, more in line with the runway centreline. This effect is less to the south, as the Airport operates predominantly in the Runway 14 direction and the visual approach from the south is on a similar alignment as the proposed ILS system. The current assumption is that ten per cent of arriving aircraft on Runway 14 would undertake ILS approaches infrequently and not usually on consecutive days
- The western extent of the contours are similar to the 2031 ANEI N70 indicating the limited side-line noise generated by modern aircraft; however, close in to the west the contours are a little more extensive due to the changes to the helicopter noise algorithms.

The RNP flight tracks described in Section 5.5 and used for preparing the 2047 ANEF are similar to the existing flight tracks, determined from NFPMS data and consultations with local air traffic control. The changes in contours are more attributable to the increases in flights and the concentration of those flights to specific routes.

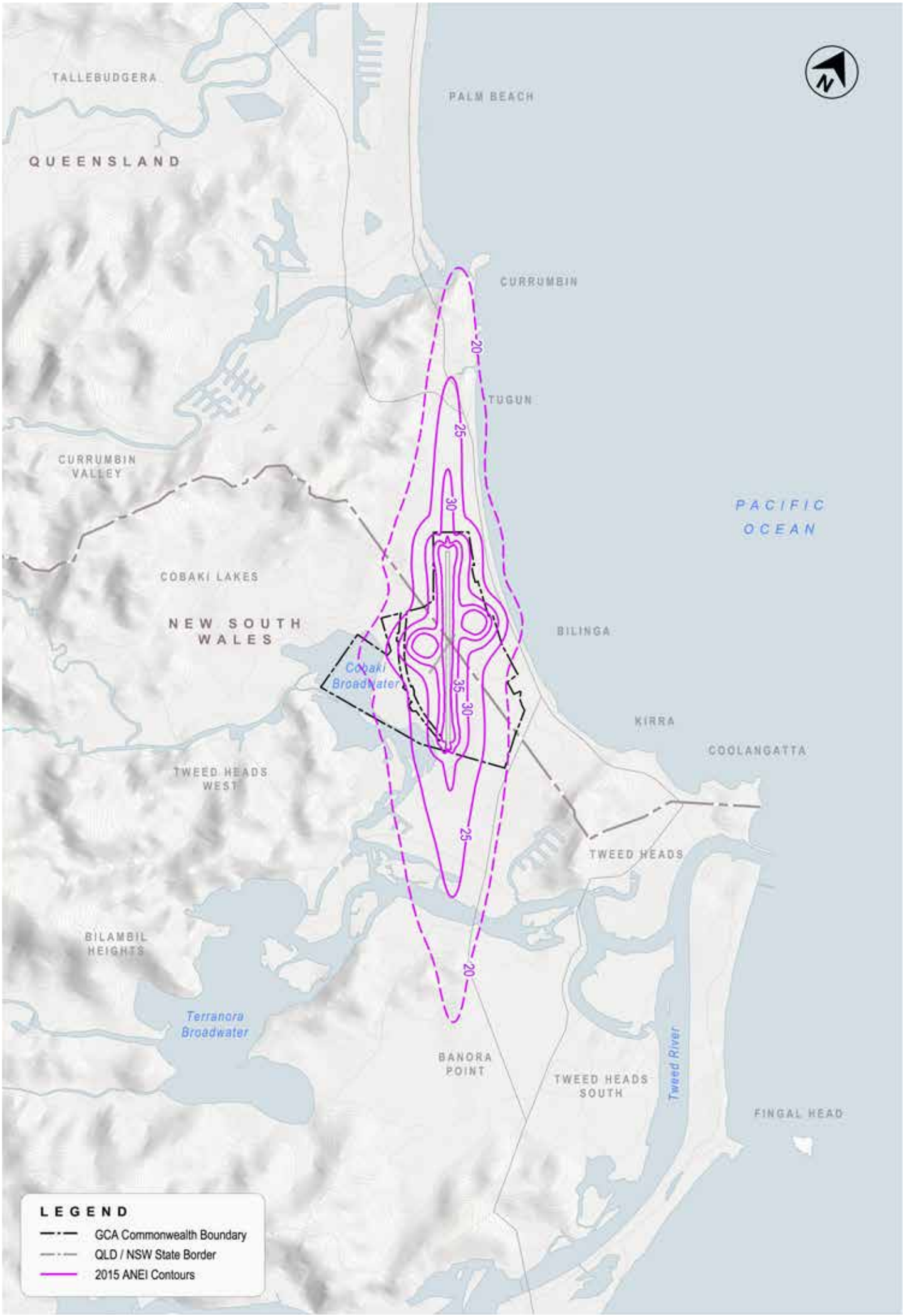


Figure 5.5 2015 Australian Noise Exposure Index (ANEI)

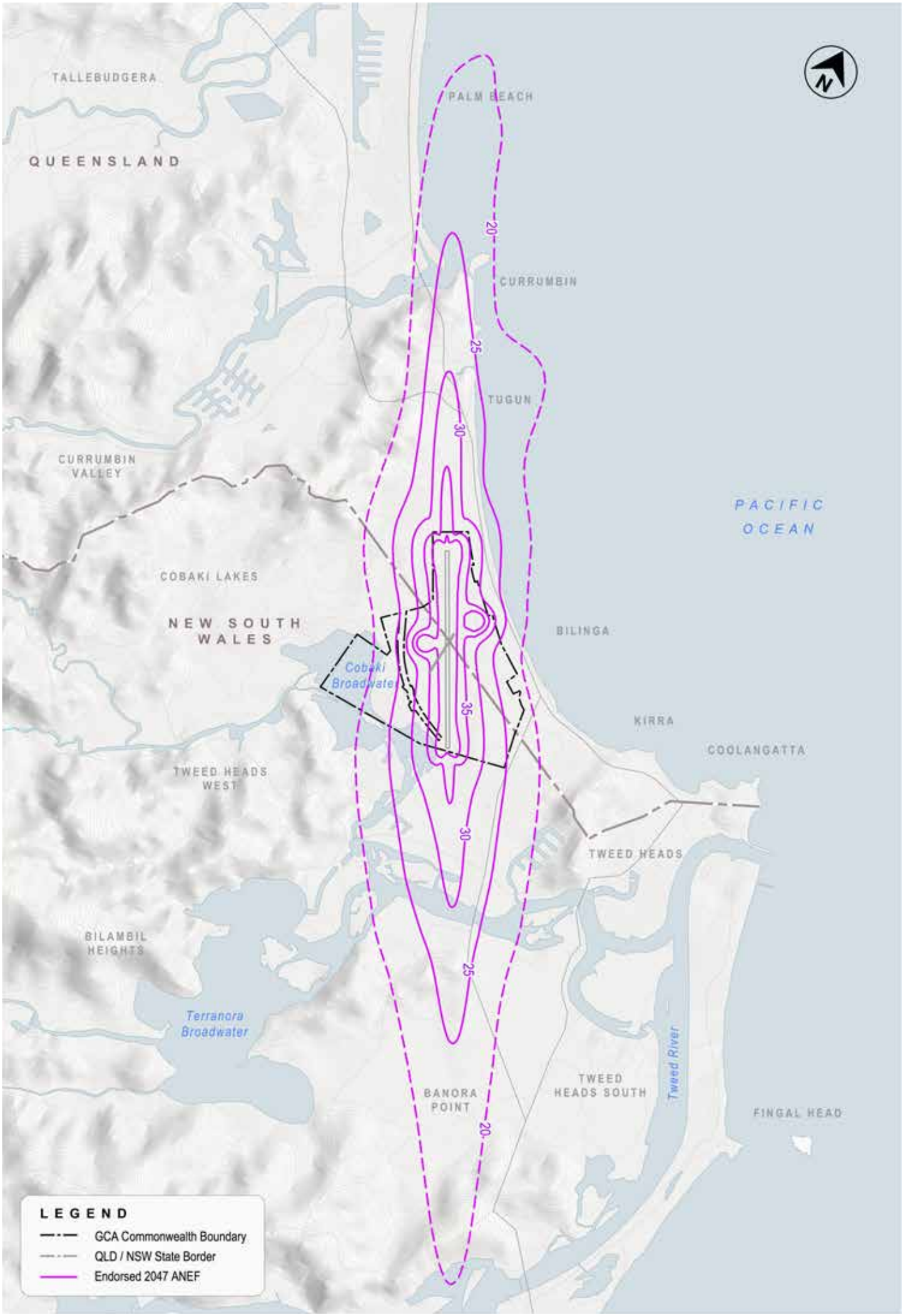


Figure 5.6 2047 Australian Noise Exposure Forecast (ANEF)

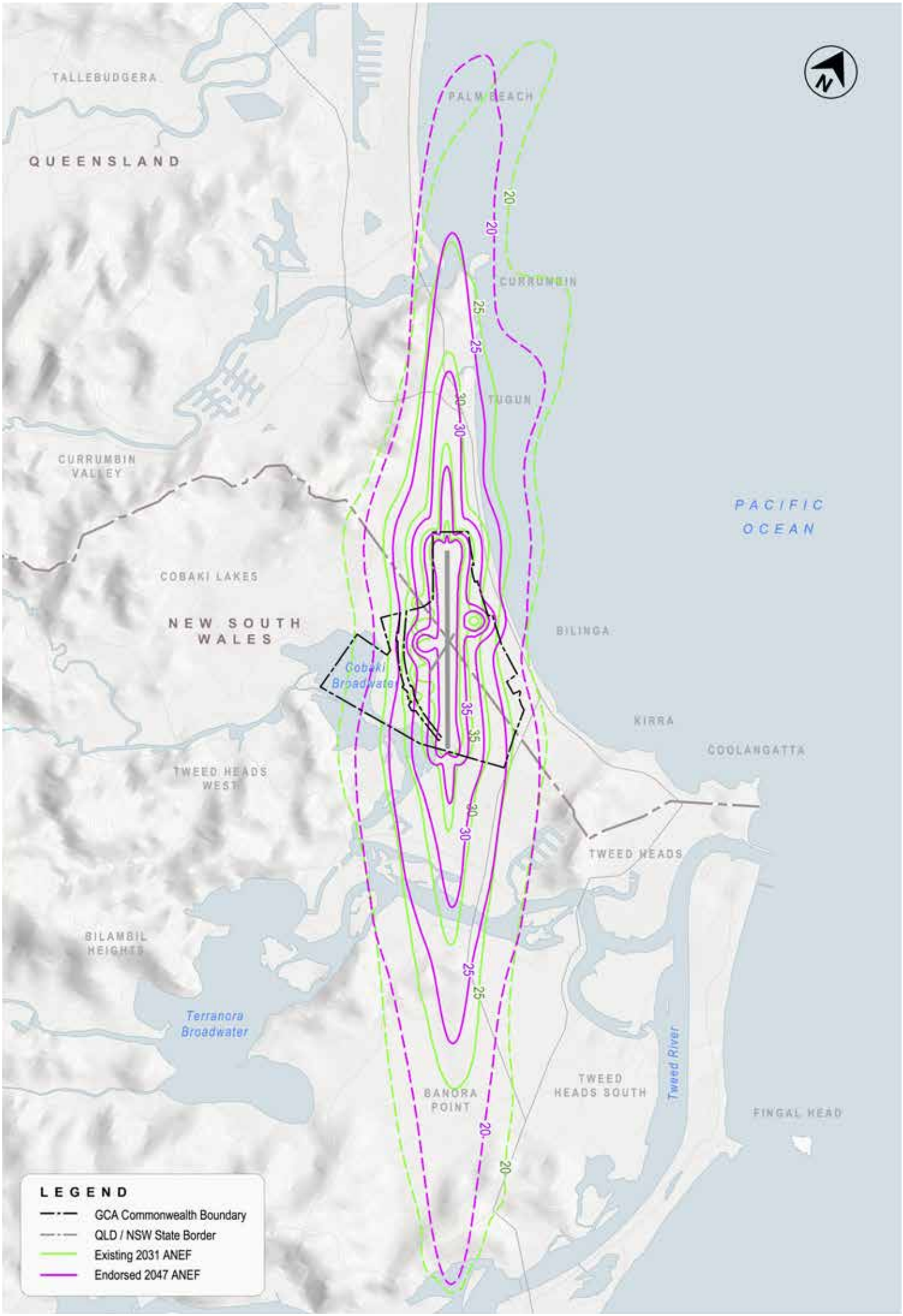


Figure 5.7 Comparison between 2011 Master Plan 2031 ANEF and 2047 ANEF

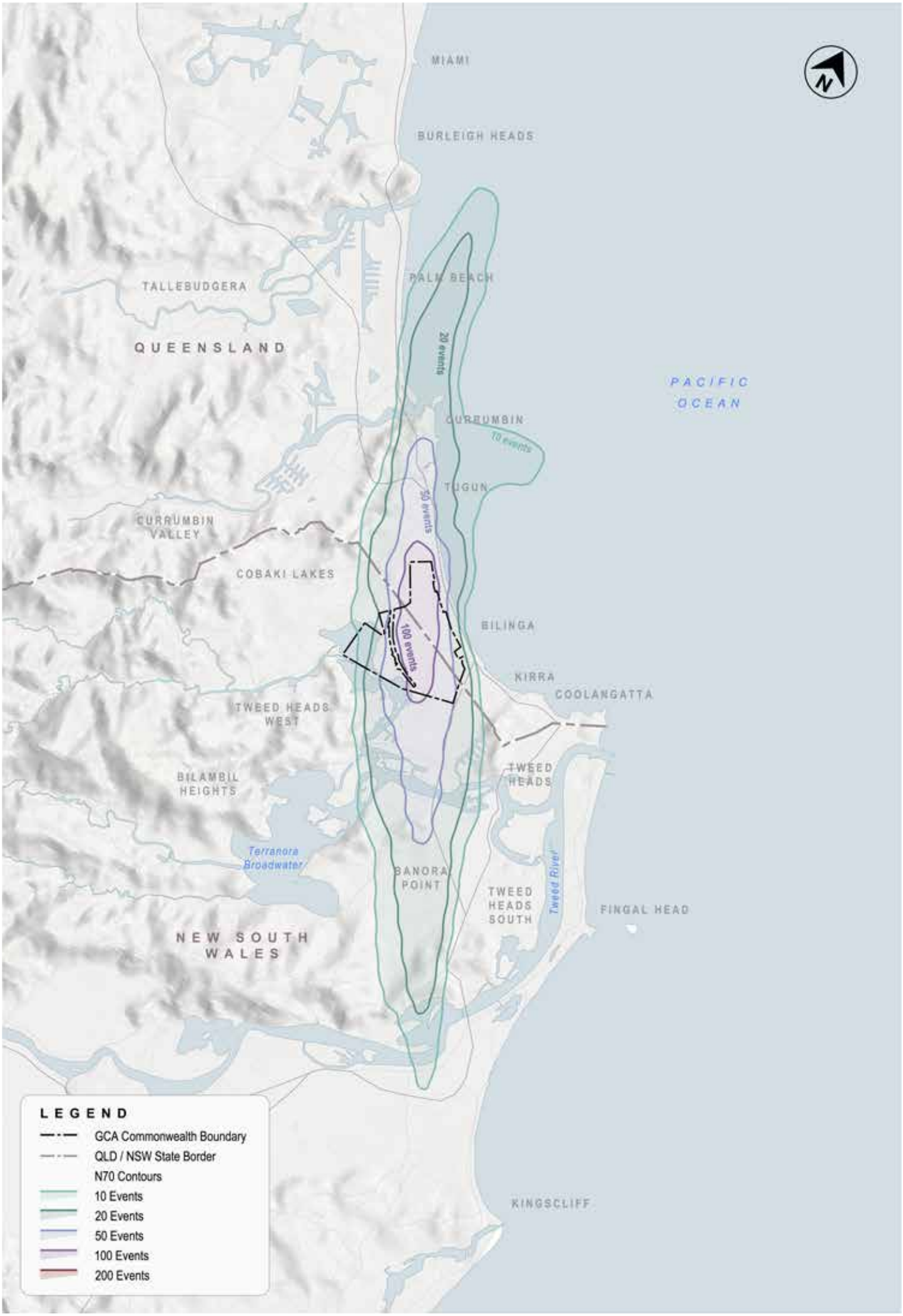


Figure 5.8 2015 N70 Contours

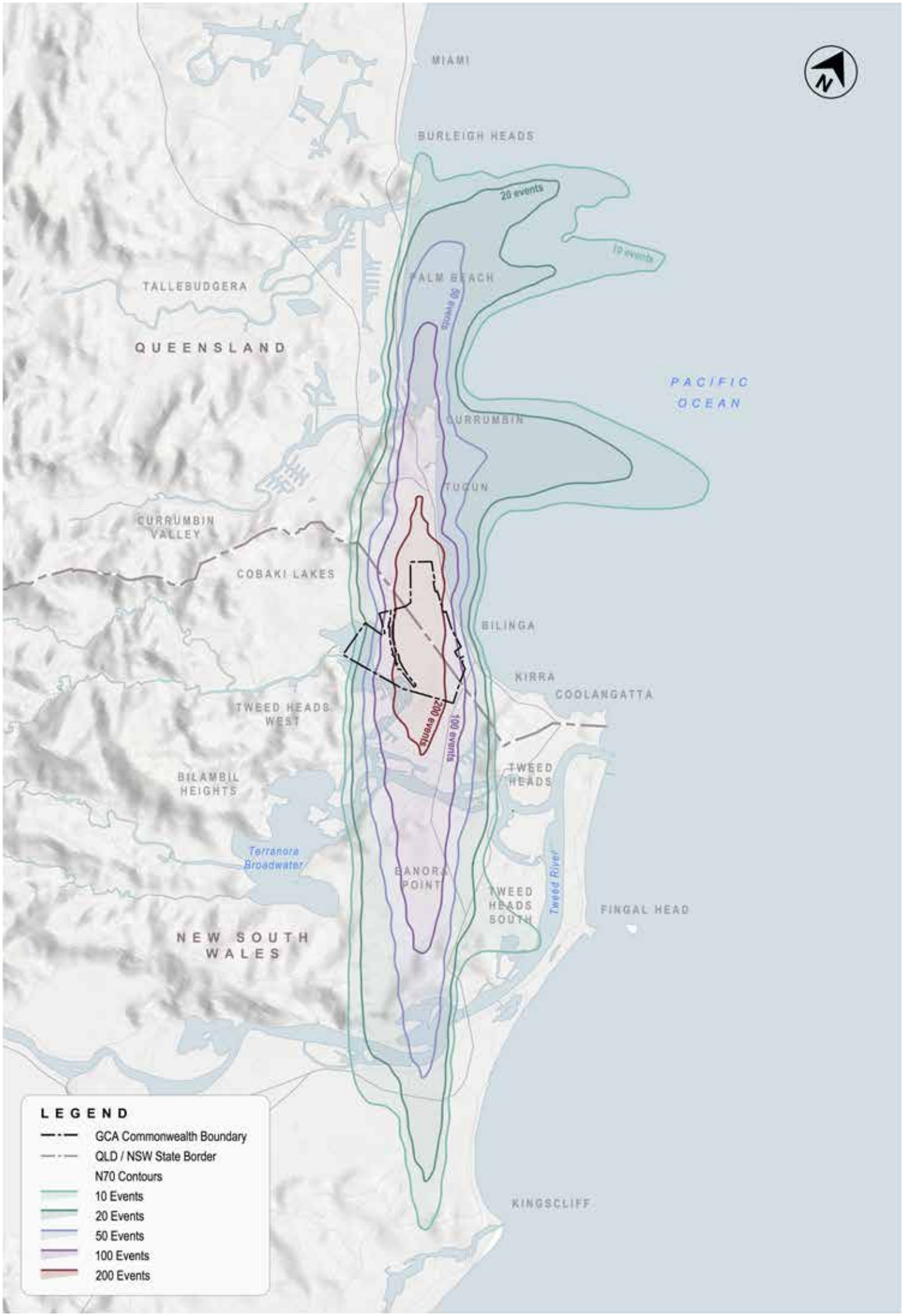


Figure 5.9 2047 N70 Contours

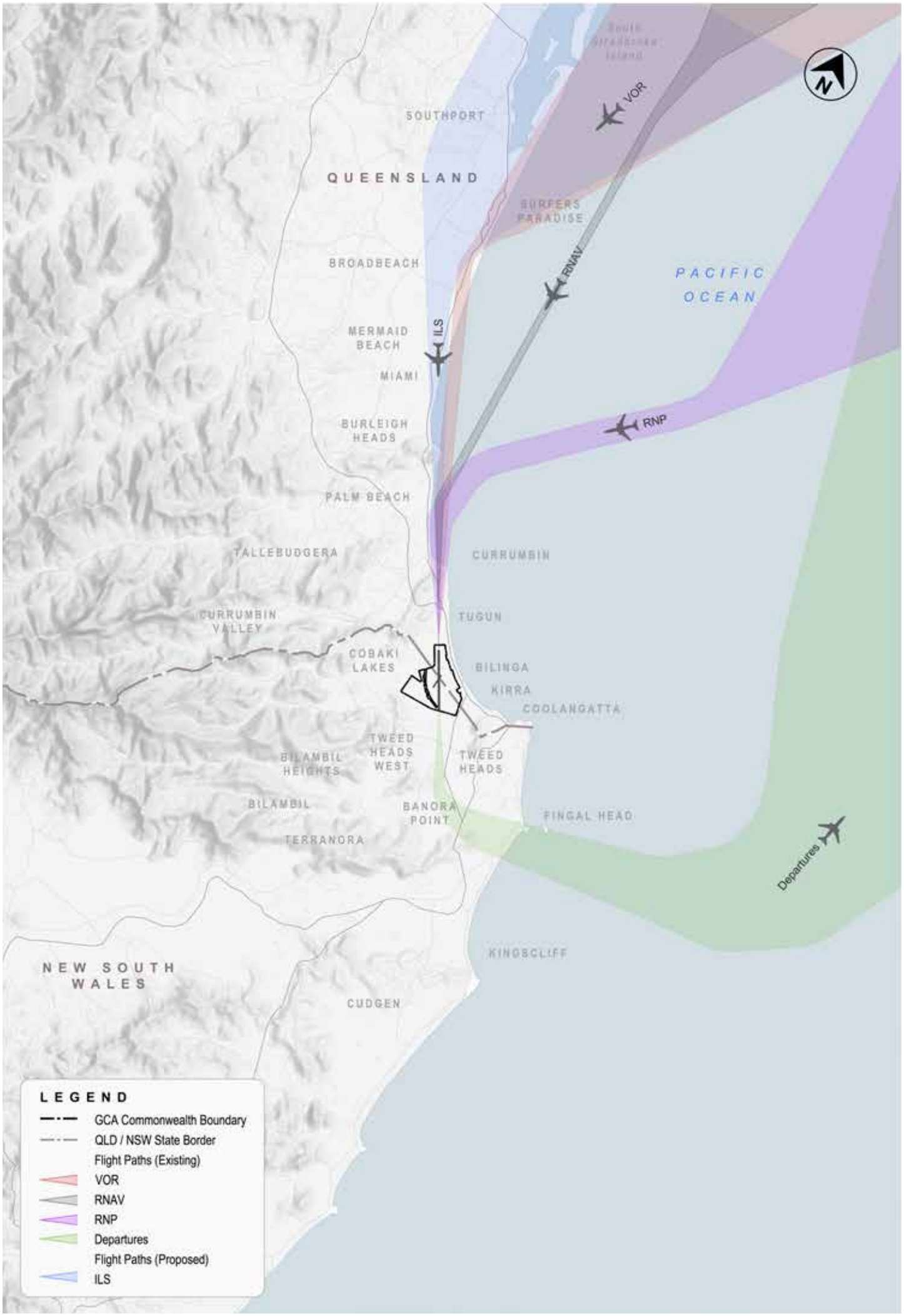


Figure 5.10 Runway 14 - (North) Departures and Arrivals

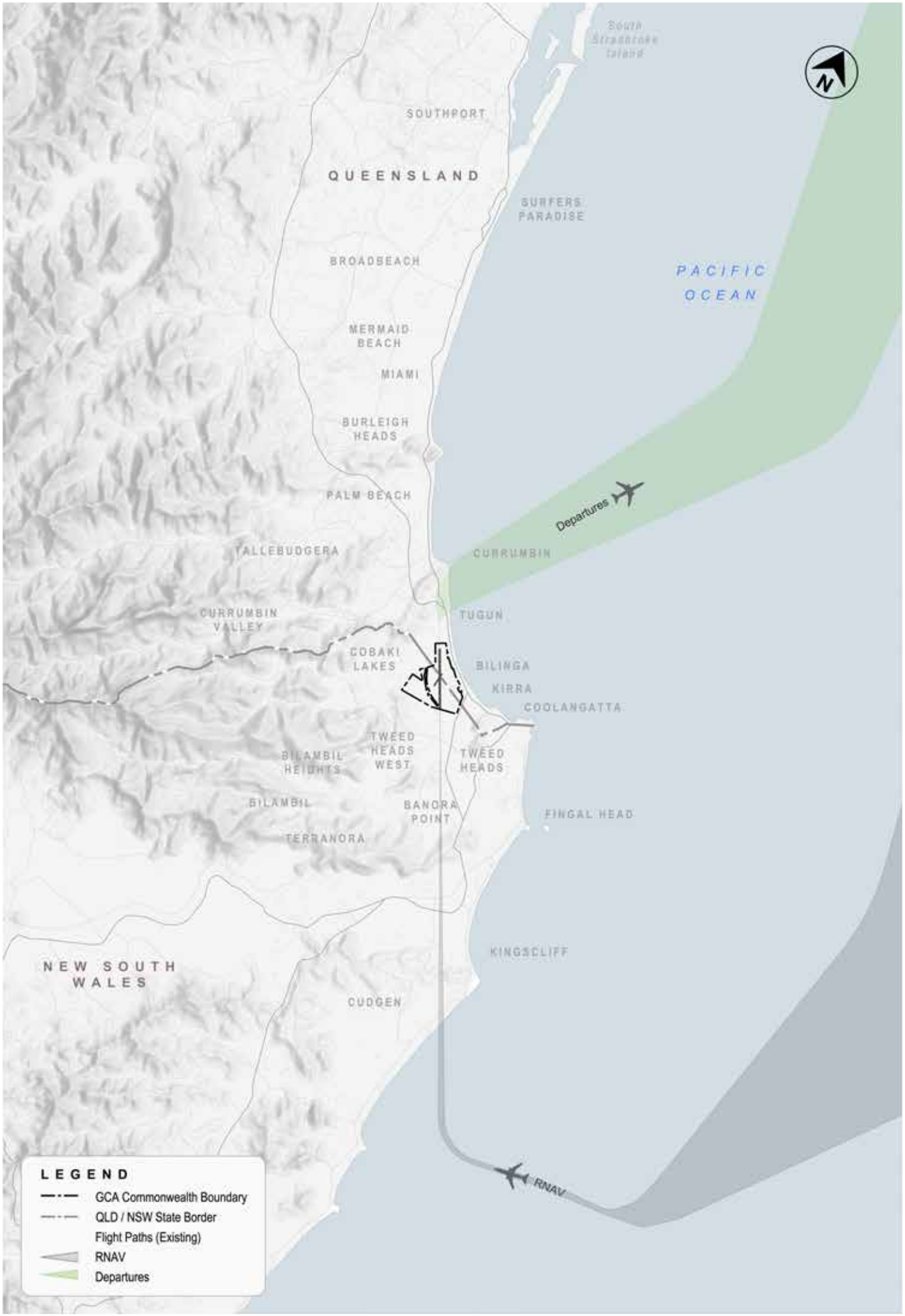


Figure 5.11 Runway 32 - (North) Departures and Arrivals

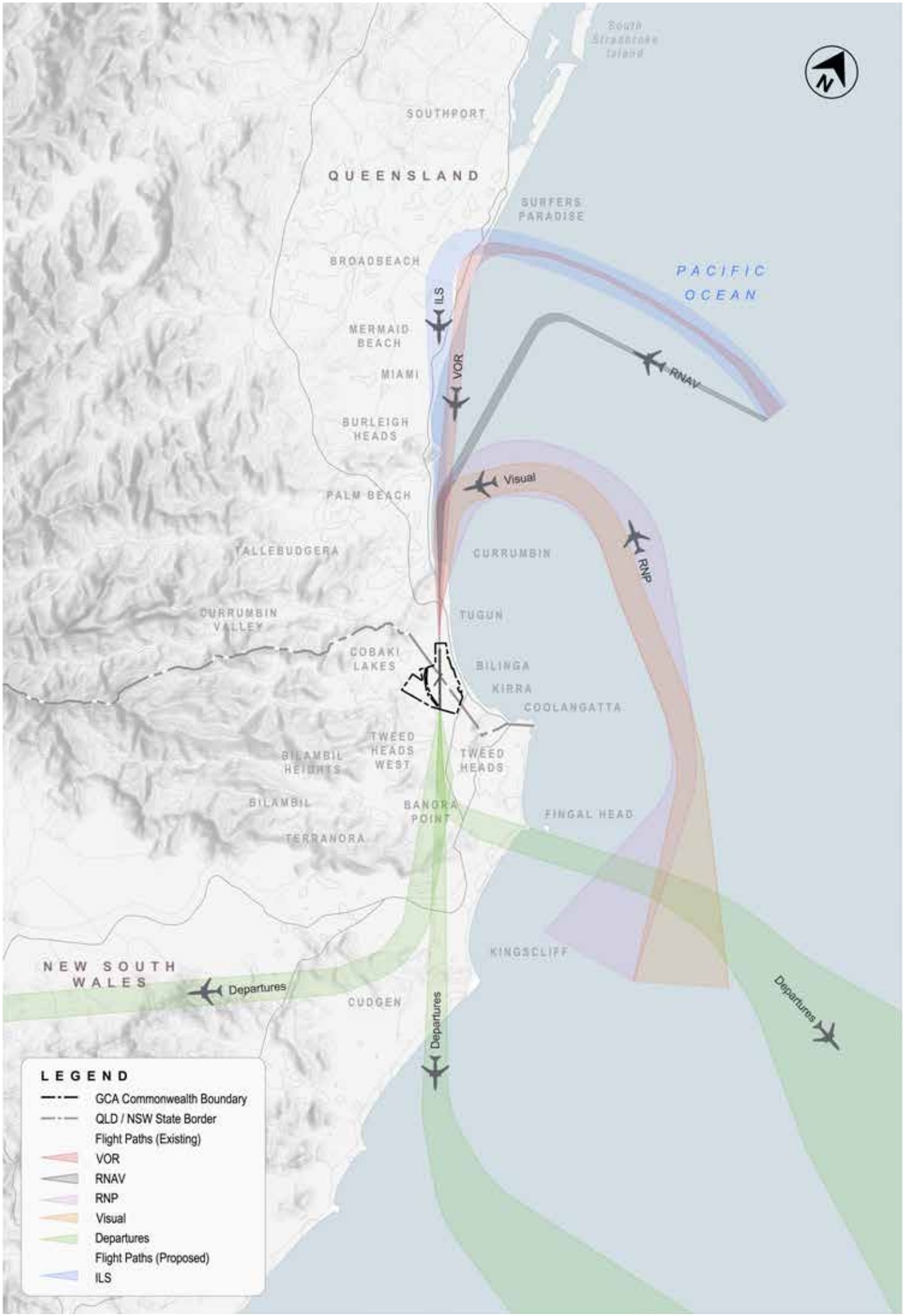


Figure 5.12 Runway 14 - (South) Departures and Arrivals

Figure 5.13 Runway 32 - (South) Departures and Arrivals

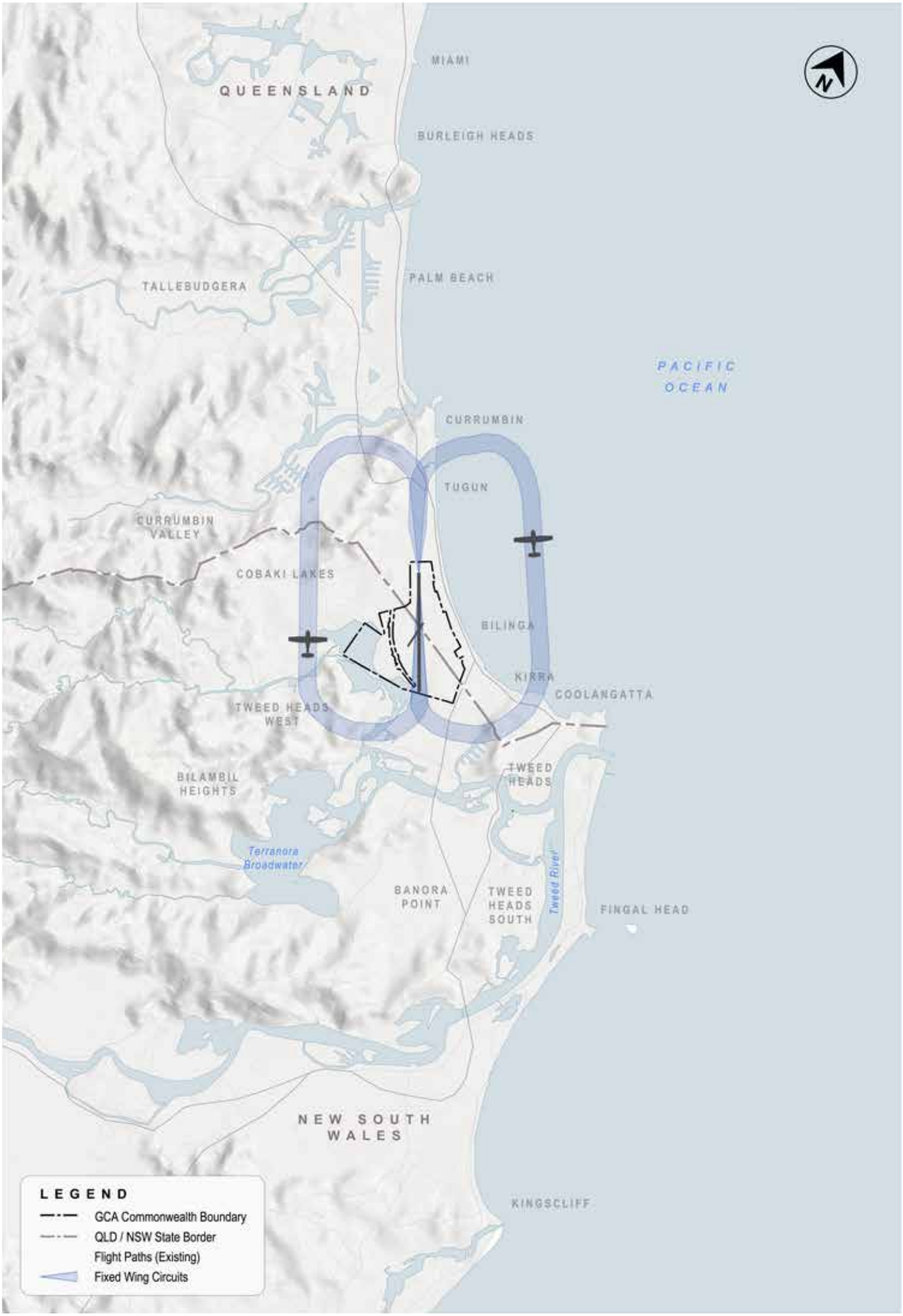


Figure 5.14 Runway 14 - Fixed Wing Circuit Training - General Aviation

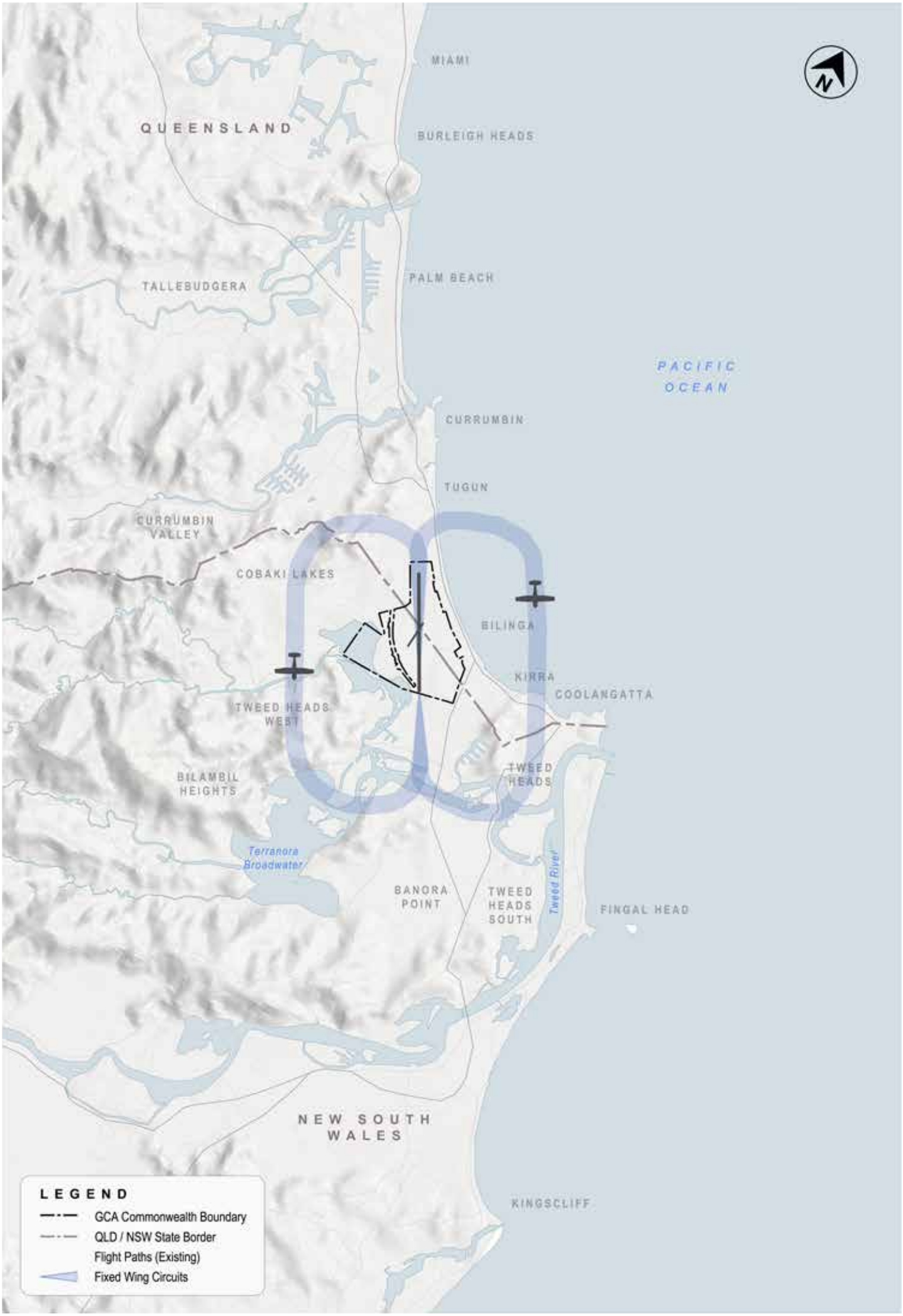


Figure 5.15 Runway 32 - Fixed Wing Circuit Training - General Aviation

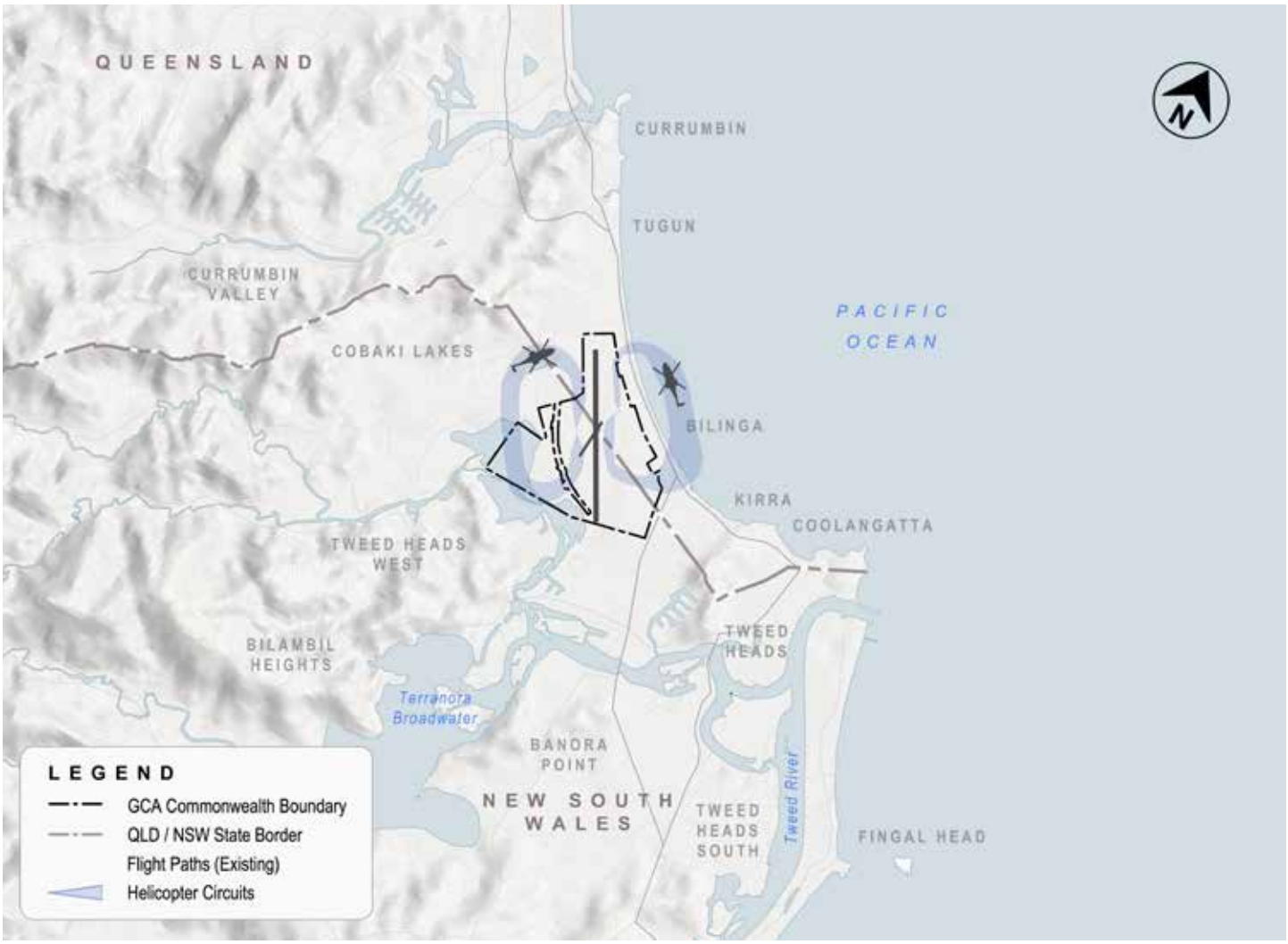


Figure 5.16 Helicopter Circuit Training