Unlocking potential: Central Otago's runway to a future-focussed airport

August 2023

CHRISTCHURCH AIRPORT

Contents

Kia ora koutou

Looking back to the future

In 1935, the Christchurch City Council surveyor A.R Galbraith was tasked with exploring from where commercial aviation might establish in Ōtautahi Christchurch. This forward-looking view was taken at a time when commercial aviation did not exist. While A.R Galbraith didn't have all the answers about the future of aviation and travel 90 years ago, both he and the City Councillors understood that identifying and setting sufficient land aside for the purpose of an airport would be incredibly important to future generations. Ninety years later Christchurch Airport is still proud to call that place our home.

That sense of duty to the future is what drives us at Christchurch Airport to think ahead, to challenge the status quo and to ask 'could this work better'.

The opportunity

New Zealand faces a significant infrastructure deficit. Te Waihanga – the Infrastructure Commission assesses that New Zealand has a public infrastructure deficit of approximately $104 billion. We simply haven't built the transport networks, public utilities or housing that is required. Aviation is not immune to this or the effects of a changing climate.

The wider aviation sector is currently planning for the future. Central and local government, airlines and airports alike, are projecting growth, both of resident and visitor travel and freight in Central Otago. This demand is likely to outstrip capacity within a decade. The region is in high demand as a place to live and visit, and thus faces significant future infrastructure deficits. This was recognised by airlines in 2017 expressing their concern that without change and significant investment, Central Otago would not be able to benefit from the growth heading its way.

This is where our interest began. With championing Te Waipounamu the South Island as a key part of our mission, we could embrace the challenge with a fresh perspective and a broader lens, a southern approach.

It's not hard to look at a map of Central Otago today and conclude there are very few sites suitable for resilient and sustainable aeronautical activity with the space required now and in the future. In 2020 we bought 750 hectares at the intersection of three valleys near Tarras to enable us to fully explore the option. Our land has grown, and we now own around 800 hectares.

Some views may differ on this strategy. Some may say we put the cart before the horse in purchasing land before a firm decision has been made to build an airport. In our view, we understood the case for a new approach well enough that we were confident making the financial investment in land. Land does not go away. Our project is focussed on building a strong base of quality information on which future decisions can be made. Our intention is to get the planning right so that the end result is the right infrastructure, in the right place, able to support the opportunities that give rise to a positive future – safe, sustainable, resilient and economically beneficial for its communities.

Instead of waiting for a problem to materialise, we are looking at the needs of a region well beyond the current decade and considering the best solution before it becomes an irreversible problem. We are not saying that ours is the perfect solution – no solution will be. At this stage, we are simply saying this solution is worth exploring.

Sustainability and connection

We are uniquely reliant on aviation in New Zealand to connect to each other and to the world. It's the only way we can easily explore the world and the only way to get critical, time sensitive goods to and from our country. There's no doubt that this reliance comes with a challenge. There is real commitment within the aviation industry to decarbonise, to reduce waste and increase efficiency. Christchurch Airport has become a globally recognised world leader in carbon management and reduction at airports – and we're incredibly proud of that.

All airports need to be committed to a low carbon aviation future and aligned with the national carbon emissions reduction pathway out to 2050 and beyond. But any airport is likely to struggle to do so on outdated infrastructure. A greenfield airport development could provide a once-in-a-generation opportunity to design, build and operate the very best future-focussed airport positioned to adapt to the risks posed by a changing climate.

When we think about how people move around the country, attention needs to be given to the impact of their whole journey. If people cannot fly directly to where they are going, they will find another way to get there. The impact of this may be worse than the impact of efficient, well positioned air travel. Our research tells us that travel demand unmet by direct air services could result in an extra 500,000km travelled every day on South Island roads by 2050.

This is an opportunity for Central Otago to address the air capacity constraint it will shortly face – and open up a world of possibilities their children and grandchildren can make the most of.

Our approach to sustainability is best captured by the Māori concept of kaitiakitanga. This refers to guardianship, conservation, and the connection humans have with the natural world. It is our responsibility to protect, preserve and foster the environment that nurtures us in return. We take that responsibility seriously.

Good kaitiakitanga is also about not forgoing opportunities for future generations. Even when, like A.R Galbraith 90 years ago, we don't know what all those opportunities are.

Exploring a new airport in Central Otago may seem slow. We don't apologise for that – but we do acknowledge the uncertainty it creates for the community. We're laying the groundwork for good decision-making – whatever the decision – by fully understanding the case for and impact of a new airport in Central Otago, and how it compares to the alternative consequences of living with constraints.

Next steps – weather and climate change impacts, runways, flight paths, noise

In September 2021 we released a Preliminary Aeronautical Assessment for a possible new airport that showed:

- two options for a single runway on the proposed site,
- weather conditions are likely to be within normal operating parameters,
- an early understanding of noise impacts.

Since then, our efforts have been focussed on:

- a more detailed aeronautical analysis, including flight paths and a preferred runway alignment,
- growing our understanding of the proposed site environment – including weather, water, landscape, land transport, and ecology,
- understanding climate impacts – including the impact of living with constraints.

People have asked us a wide range of questions. We hope that this document goes some way to answering those questions. We have also updated the centralotagoairport.co.nz website with more information and videos to animate what a conceptual airport might look like in the local surroundings, and how noise might be experienced with aircraft using the airport.

This report is a summary of those findings. It is not a business case or a decision document. Work is continuing. This is a long-term project, and we will continue to share the analysis and information as and when it is ready.

Justin Watson
Chief Executive

Michael Singleton
Chief Strategy and Stakeholder Officer

Introduction

The work shared in this information release builds on the work released in September 2021 in the Preliminary Aeronautical Assessment. It draws together the work of external experts to explore the need for, and needs of, aeronautical infrastructure and the environment in Central Otago.

A summary of the findings released in 2021 are outlined below.

- The site is suitable for compliant and safe aeronautical operations by typical scheduled aircraft types operating in New Zealand.
- Flight tracks can be designed to and from the site and the initial assessment indicates that efficient aircraft operating gradients can be designed.
- Preliminary weather data for the site indicates local conditions are suitable for scheduled aircraft operations with northerly wind conditions. Visibility data indicates generally good operating conditions.
- Integration of new flight tracks into the existing airspace environment will need to be carefully planned but is achievable.
- Considering topographical and wind conditions, there are two potential alignment options for a single runway on the site.
- Both runway alignment options perform comparably in terms of carbon emissions.
- A runway length in the order of 2,200m is achievable and possibly a longer runway length between 2,500m and 3,000m.
- More work needs to be done to refine the runway options and airspace planning to ensure aircraft can operate in the most environmentally and operationally efficient way possible.
- The site is suitable for the key aircraft types expected to operate scheduled aviation services within New Zealand and on likely international routes now and in the future.

Project objectives are guiding our work

The objectives of the project are to:

Provide for additional airport capacity to meet the needs of Central Otago and the lower South Island with associated facilities and infrastructure that;

a. Meets medium and long-term future demands for convenient and affordable domestic and international air connectivity;

b. Improves the accessibility of aviation services to meet Central Otago's future population growth and distribution patterns;

c. Enhances the vitality of the region's economy which relies on the safe and efficient movement of people and products to and from the region;

d. Is located, developed and operated to:

   i. enable the long-term provision of safe and efficient aviation services to the region while minimising the risk of operational constraint;

   ii. mitigate adverse effects on natural and physical resources, people and communities;

   iii. integrate with the existing state highway network and be readily provided with infrastructure services;

   iv. be resilient to the adverse effects of climate change and natural hazards; and

   v. adhere to national and international aviation safety standards and protocols;

e. Enables the transition to low emissions aviation including opportunities for future energy sources; and

f. Is developed and operated to provide a positive user experience.

Detailed aeronautical analysis has led to a preferred runway alignment

Christchurch Airport and external advisors have completed detailed technical investigations and assessments of aeronautical and environmental feasibility. The primary objective has been to identify a preferred runway alignment and flight tracks for aircraft, building on the preliminary information provided in the Preliminary Aeronautical Assessment. This work is ongoing and will see continued refinement, including a peer review process until a runway alignment is finally confirmed.

Christchurch Airport has continued to be assisted in these investigations by specialist aviation consultants Airbiz Aviation Strategies Ltd. Airbiz has also coordinated specialist investigations by Aeropath Ltd in flight track design.

The preferred runway alignment is the Lindis Valley-Lake Dunstan alignment, or 04/22 by its magnetic reference. While both runway 04/22 and the Hāwea Valley-Lake Dunstan (Runway 01/19) are feasible, flight paths for runway 04/22 are better suited to the terrain of the region meaning aircraft movements can be safer and more efficient.

A runway length between 2,200 – 2,600m is likely to be feasible. Runway lengths up to 3,000m were considered however the surrounding terrain means anything beyond 2,600m in length is less likely to meet aircraft safety and operational requirements.

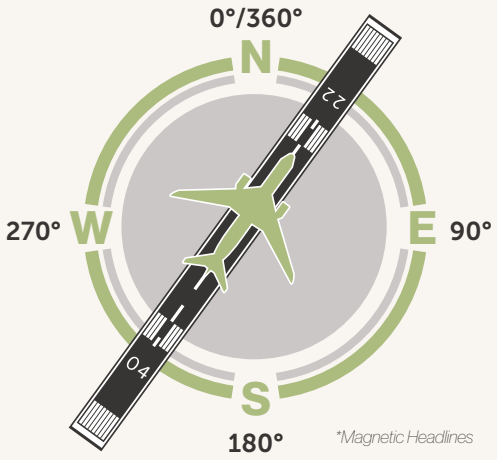
Runway alignment references

Runway numbers refer to the closest magnetic heading of the runway, rounded to the nearest 10 degrees and only the first two digits. Each runway has two numbers – one for each direction. For the preferred alignment these are:

04 – facing 040° on a compass

22– facing 220° on a compass

RWY 04/22



Climate impacts are an important part of the puzzle

Airports and the aviation industry have an important role to play in supporting the shift to a low emission economy. In October 2021, The International Civil Aviation Organization (ICAO) made a formal commitment to achieve net-zero carbon emissions by 2050, bringing international air transport in line with the objectives of the Paris Agreement to limit global warming to 1.5°C. Two thousand airports and 290 airlines have signed the commitment.

Christchurch Airport is committed to being part of this shift. By October 2022, Christchurch Airport had already reduced its Scope 1 emissions by 88% and Scope 2 emissions by 16% compared with 2015 levels. The airport continues to be a global leader in decarbonising aviation and considering the full sustainability picture. This means Christchurch Airport works to fully understand the environmental impact of decisions broader than just carbon.

Analysis shows the difference in carbon emissions from aircraft operations between the two runway options was negligible. But the investigation doesn't stop there. Understanding the impact doing nothing would have on emissions is a key consideration. Research tells us unmet demand for air travel will result in people finding other ways to travel – that may include overflying and/or driving long distances in a private vehicle.

Estimated total journey emissions, including both air and land transport travel, for a range of different scenarios have been mapped – you can see these on page 68-69.

Focus is sharpening and deepening

As the project approaches the point where a decision about proceeding to approvals will be made, the project focus will sharpen and deepen. The project will be focussed on fully understanding the impact of an airport, and how it could be developed to mitigate any impacts it might have.

This is a considered process with decision gateways

This is a long term project which will take some time to work through. The validation and planning stage is focussed on discovery, exploring the proposed site and its feasibility. This current phase is expected to continue through 2023 and into 2024. Decision gateways exist between phases 1 and 2, and 2 and 3. Each decision gateway is an opportunity to consider whether the project should continue to the next phase. Passing through one decision gateway does not commit the project further than the next phase.

More information is at centralotagoairport.co.nz

The centralotagoairport.co.nz website has been updated with tools to help people visualise the airport and its impact. These tools include:

- flyover concept video to show how a modern airport would integrate into the local landscape,
- arrival and departure videos to show where aircraft noise is likely to impact,
- fact sheets about noise, avifauna, climate, land transport, landscape, and tourism.

Aviation in New Zealand and around the world

How aviation works

Aviation allows people and products to travel long distances quickly and cost effectively

Demand for aviation is created by people who want to transport themselves or their products by air. Airlines satisfy that demand by carrying them to their destinations. Airports provide the infrastructure required for aircraft to land and take off at these destinations.

Air connectivity is a critical driver of social and economic prosperity. Ensuring the right level of airport capacity is available in the right places to support Central Otago's aspirations is important strategically for the region. Equally, transport infrastructure that operates as an integrated network is able to support social and economic prosperity.

Airports are long-lived infrastructure assets that connect regions into national and global aviation and transport networks. Airports fund their aeronautical costs through charges on airlines that use their facilities, and these costs are passed on to customers by airlines through airfares and freight charges.

This is an efficient and sustainable funding model that allows the airport network to scale as required to meet demand.

The fundamentals of aviation

Airports enable significant economic activity

Airports facilitate a significant amount of economic activity in the regions they serve by enabling the movement of people and products. This is certainly true in Central Otago* where most airline passengers are relatively high spending inbound visitors.

Christchurch Airport adds over $2 billion to the Canterbury region's economy and creates employment for more than 20,000 full time equivalent workers. The number is much higher across the South Island where it has been estimated that for every $1 Christchurch Airport earns, the wider South Island economy earns $50.

Analysis suggests that a similar airport multiplier exists for passengers connecting to Central Otago.

*For the purpose of this project, Central Otago refers to the area comprising Queenstown Lakes District and Central Otago District.

Central Otago – a thriving region in a mountainous landscape

Central Otago as a catchment for a new regional airport

Central Otago is a sub region of Otago. For the purpose of the project, we have stepped back and asked ourselves what the catchment area for an airport would be now and in the future, taking into account how people live, work and play not just today, but in the future. Infrastructure is a long-term investment so it's important that thinking and decisions consider long term regional needs.

We recognise these do not neatly fall into often arbitrary criteria and have for that reason combined both the districts comprising Central Otago District Council and Queenstown Lakes District Council.

This creates an initial catchment of 18,650km^2 and 73,000 people today. This number will likely grow. It connects beyond to the Waitaki, Mackenzie, West Coast, Dunedin metropolitan and Southland districts. That means an airport on our site can serve residents from a large swathe of the South Island. It also means that visitors who fly to our site can disperse more widely.

By locating at the centre of the region benefits will be distributed more evenly and all populations will have the ability to connect to resilient and accessible travel.

Central Otago is growing fast

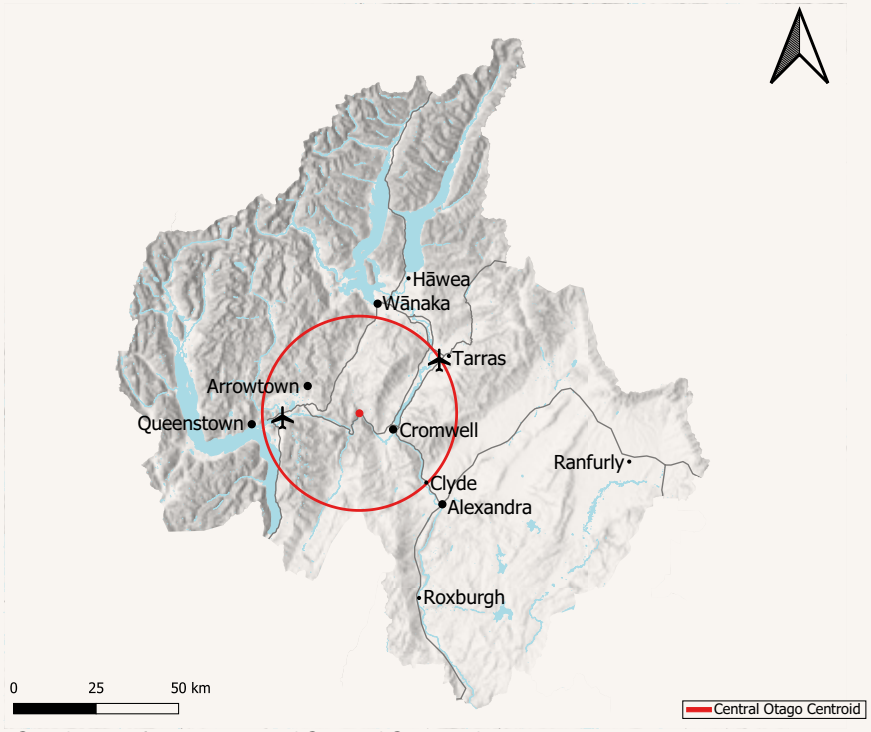
Central Otago is one of the fastest growing regions in New Zealand.

The Central Otago region grew by an average of 3.6% per annum over the last 25 years (adding around 43,000 residents), making it the second fastest growing region in the country. It is forecast to continue to grow by 1.3% – 1.8% per annum over the next 25 years which could see an extra 40,000 people living in the region (a higher population means a lower rate of growth results in similar nominal growth to the previous 25 years).

Forty percent of Central Otago residents have moved to the region in the last five years, which is twice the national average. New residents often maintain strong connections with their friends and family, and their previous region or country, driving demand for travel.

	New Residents	Domestic Travel	International Travel
Central Otago	40% of Central Otago's residents moved to the region in the last five years **(twice the NZ average)**	Central Otago residents spend an average of **24 nights** outside the region each year **(45% more than NZ average)**	Central Otago residents take an average of 3.75 international trips every five years **(20% more than NZ average)**
New Zealand			

These attributes, together with the region's geographic remoteness, mean that demand for air connectivity among Central Otago residents is high and growing at a significant rate. The average Central Otago resident takes around 45% more domestic trips and 20% more international trips each year than the average New Zealander.



Catchment for a proposed Central Otago airport.

Central Otago's population is centred midway between Queenstown and Tarras

A 'population centroid' is the geographic location that represents a region's 'population centre of gravity' or the point around which the region's population is evenly balanced – to the north, south, east and west. Central Otago's population centroid is located near the Roaring Meg power station in the Kawarau Gorge. This is approximately halfway – or 30km – between Queenstown and Tarras.

A regional airport located at Tarras would be about the same distance from the geographic centre of Central Otago's population as Queenstown Airport is currently.

The Central Otago Economy

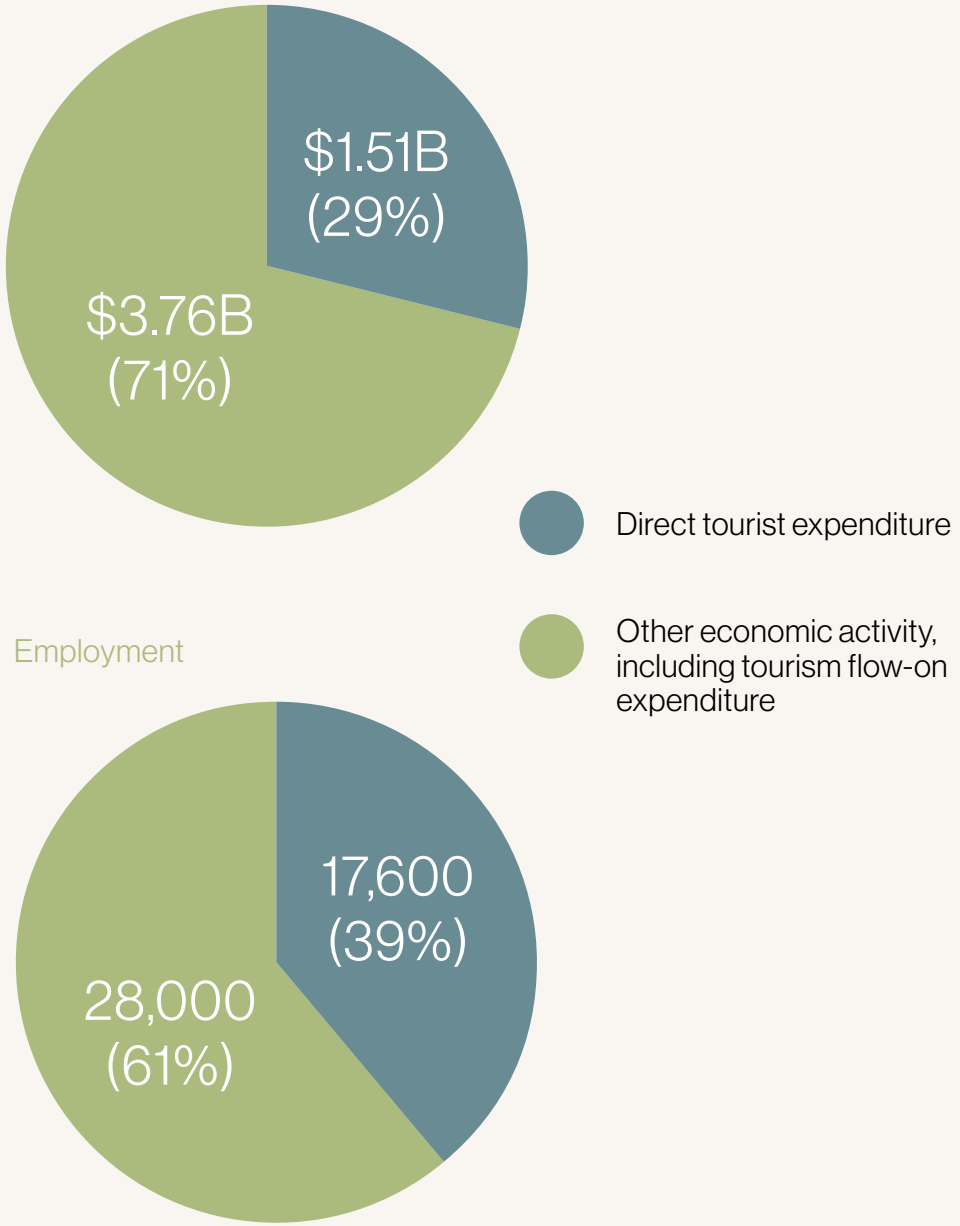
Central Otago's $5.27 billion economy provides 45,600 jobs

According to Infometrics, Central Otago's economy was worth $5.27 billion in the year ending March 2020. This level of economic activity sustained 45,600 jobs.

The 'accommodation and food services' sector was the largest contributor to both GDP (15%) and employment (21%), followed by 'construction' (12% and 15%) and 'rental, hiring and real estate services' (10% for both).

The Central Otago economy is relatively diversified when viewed as a single economic system due to the CODC area's rural/industrial focus and the Queenstown Lakes District Council area's urban/service focus.

Regional GDP

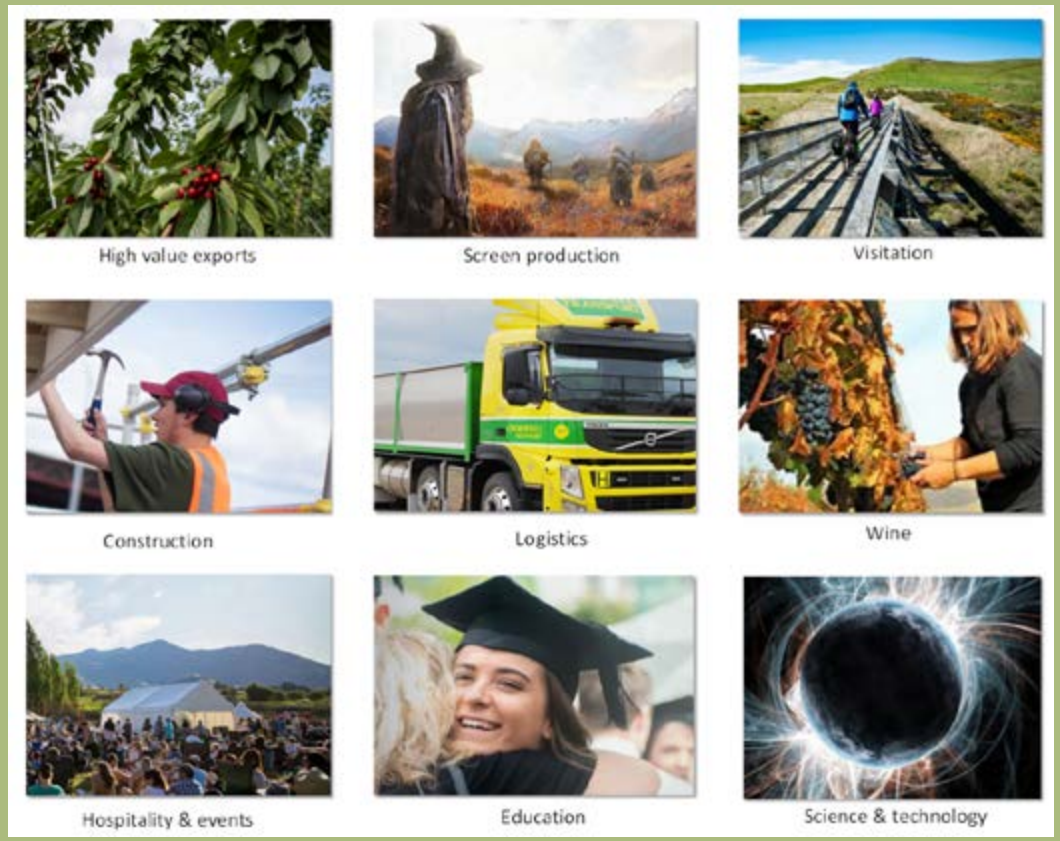


Central Otago's economy depends on the efficient movement of people and products

Many of Central Otago's key sectors of employment require high-quality transport connections to operate successfully. Some examples include:

- Exporters of premium fresh foods, like stone fruit and seafood, rely on airfreight to get their products to overseas markets in a timely manner.
- Wine producers and fruit and vegetable growers rely on travellers (e.g. backpackers) for their seasonal workforce. The wine industry also relies on visitors as customers, with around 22% of international visitors going to a winery.
- Growing sectors like screen production, technology, and education rely on the efficient movement of people and equipment in and out of the region.

Efficient air connectivity helps enable these and other sectors of the Central Otago economy to grow and thrive, providing employment opportunities for current and future generations.

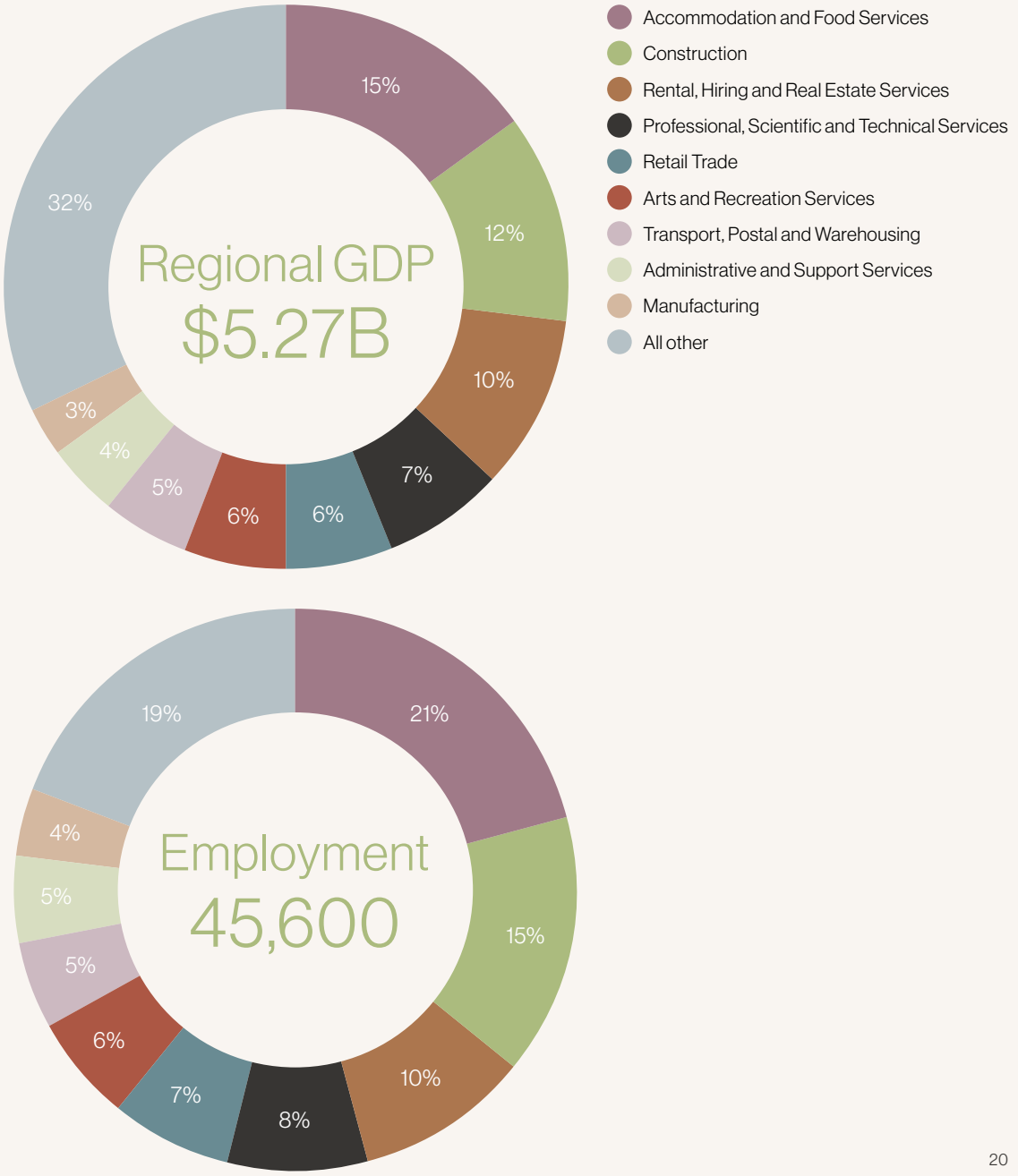


Visitors are a major contributor to the Central Otago economy

Domestic and international visitors spent around $3.8 billion in the Central Otago economy in the year ending March 2020. This expenditure generated $1.51 billion (29%) of regional GDP and supported 17,600 jobs in the region (39% of employment).

Direct visitor expenditure is then re-spent in the local economy through purchases by tourism businesses and their employees, stimulating further economic activity.

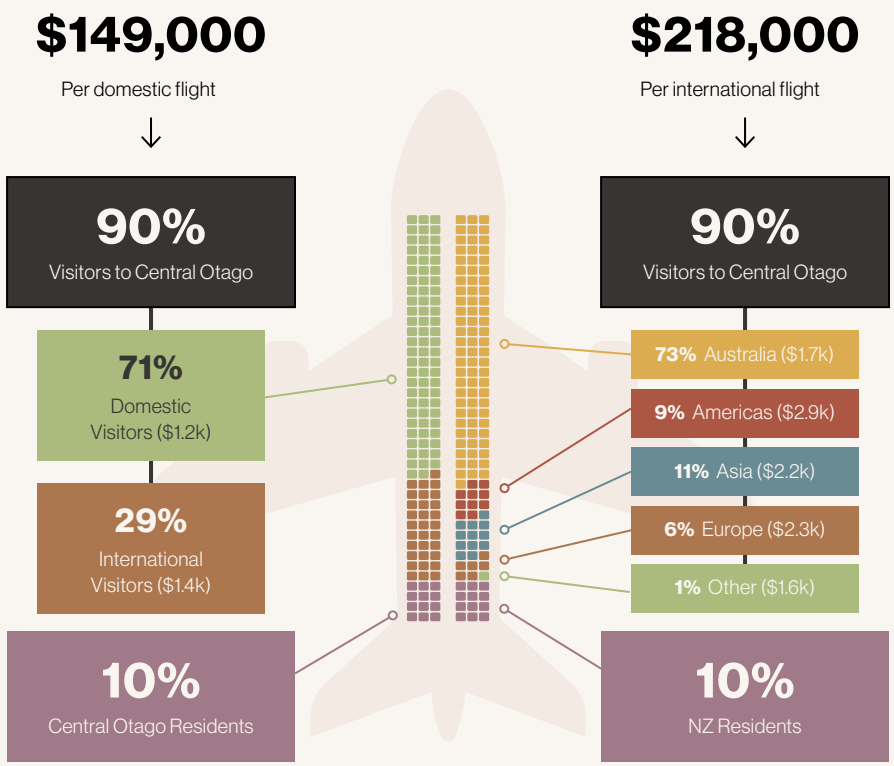
Previous studies indicate that the indirect (flow on) impacts of direct tourism expenditure could be at least as large as the direct impacts. This suggests that around 60% of Central Otago's GDP and 80% of its employment could depend directly or indirectly on the visitor economy.



The ability to connect by air is a critical driver of the Central Otago visitor economy

Around 40% of this expenditure ($1.51 billion) was by visitors who arrived in Central Otago by air. On average, an international flight results in $218,000 of visitor spending in Central Otago in 2019 compared with $149,000 for a domestic flight.

Average visitor spend in Central Otago per aircraft landing at ZQN
(Figures in brackets are average spend in Central Otago per visitor in 2019)



Visitors who arrive by air are more aligned with a high-quality visitor strategy than those arriving by road

On average, visitors who arrive in Central Otago by air will stay around 20% longer and spend 60% more money in the region than those arriving by road.

A visitor arriving in Central Otago by air will stay an average of 4.7 nights and spend $1,475 in the region, compared with 3.9 nights and $940 for a visitor arriving by road.

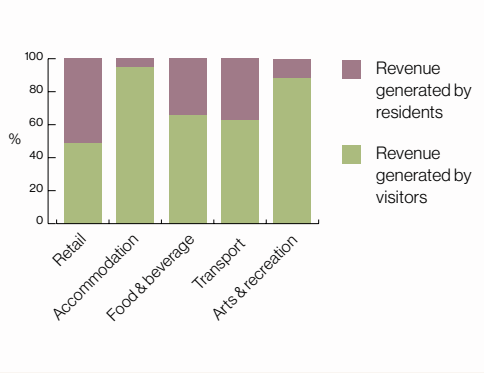
Mode of arrival	Nights per visitor	Spend per visitor
	3.9	$940
	4.7	$1,475
	1.2x	1.6x

In a 2020 report, MartinJenkins found that if airport capacity is constrained at current limits, when compared with a new international airport, Queenstown Lakes district will forego an estimated $350 million in annual GDP on average between 2030 and 2050, which represents about 13% of the district's current annual GDP. This corresponds to foregoing about $7.4 billion in total GDP over the 20 years between 2030 and 2050. The impact on the wider Central Otago district's GDP was not calculated as part of that report.

In addition to significant economic benefits, visitors help sustain things in Central Otago that residents value

The number of destinations Central Otago residents can fly directly to, and the frequency of flights, far exceeds what the resident population could sustain.

This high level of connectivity is due to the demand for direct air services created by domestic and international visitors.



Many businesses in Central Otago sell their goods and services to Central Otago residents as well as visitors and may need to close or reduce their hours in the absence of visitor spending (as seen during the COVID-19 pandemic).

Visitor spending therefore sustains many businesses that Central Otago residents enjoy having access to.

Visitor spending sustains a wide range of recreation activities that residents use such as ski fields, world class golf courses, cycle trails, and a range of indoor and outdoor activities for children.

Visitors make major events in Central Otago viable. These events bring excitement and vibrancy to Central Otago and provide opportunities for residents to participate.

Central Otago landscape

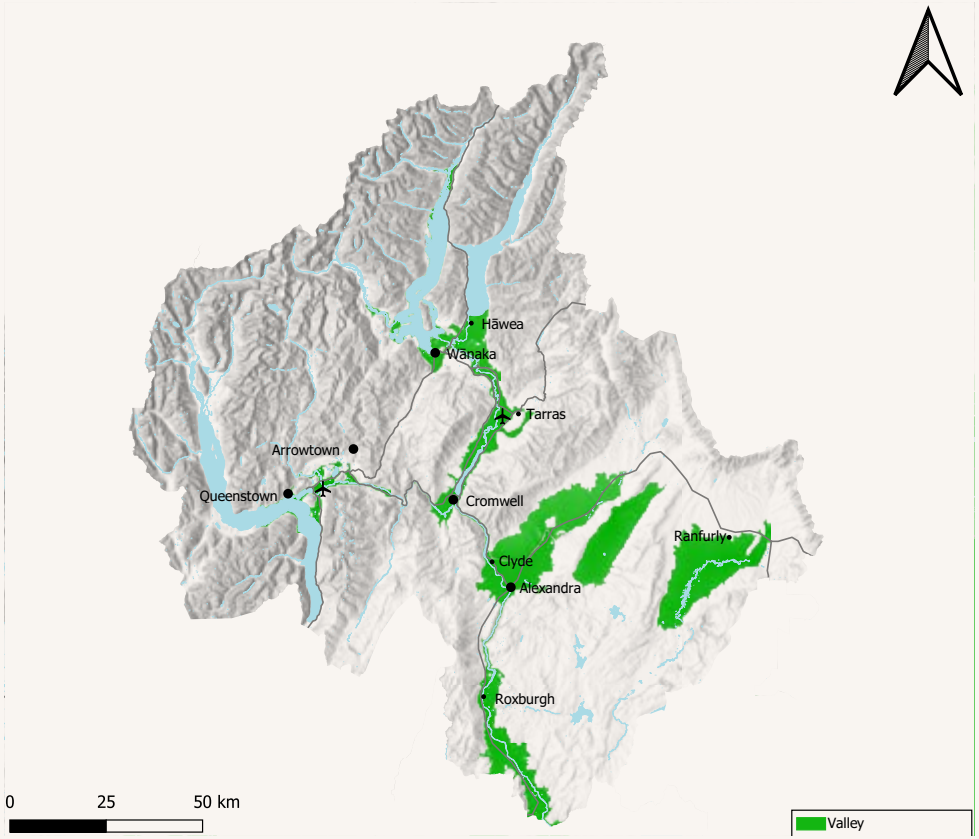
Central Otago is a region of valleys

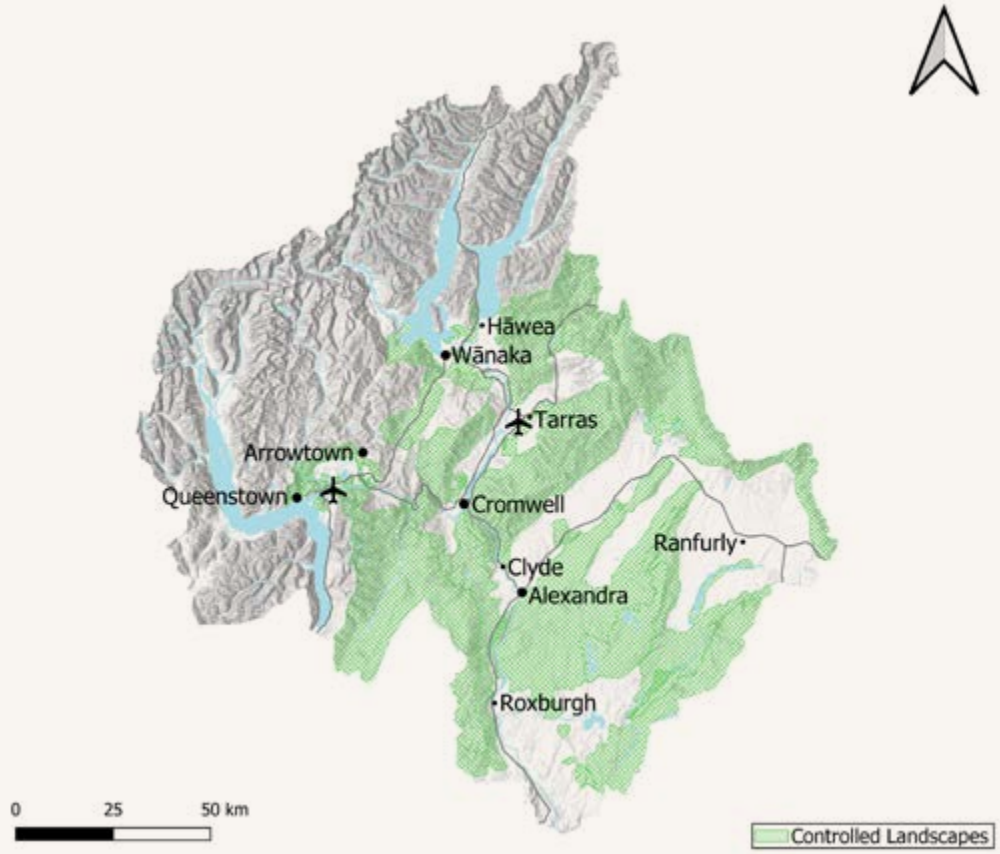
Distinguished by a backdrop of predominantly north east trending mountain ranges, Central Otago's valleys have helped shape the social and economic wellbeing of its communities. Valleys enable towns, farming and transport infrastructure – both at the regional and national level. The terrain also shapes the land use that can be accommodated in each of the valleys. This also imposes restrictions on activities such as aviation.

Land use competition is high for the limited remaining space within the valley floors of mountainous backdrop of the Wakatipu. Aside from the plateau of the Maniototo the remaining valley is that created by the Clutha (Mata-au) River.

Central Otago's populations are also located well above sea level:

- Alexandra 150m
- Cromwell 200m
- Wānaka 292m
- Queenstown 310m
- Clyde 165m
- Ranfurly 430m
- Arrowtown 410m





The Central Otago region is full of protected landscapes

Central Otago is home to a number of outstanding and highly valued natural features and landscapes. These range from environments associated with the high country of the Lindis Pass and surrounding mountain areas through to lowland ecosystems such as the Lindis (Ōmako) River, Clutha (Mata-Au) River and the wetlands at the head of Lake Dunstan.

The map to the left shows the extent of protected natural features through existing planning classifications, including Outstanding Natural landscape (ONL), Outstanding Natural Features of Landscapes (ONF), or Significant Amenity Landscape (SAL).

In Central Otago, areas identified as ONL, ONF or SAL include the faces and crest of part of the Bendigo Terrace (which is south-west of the proposed airport site), the Pisa Range, Dunstan Mountains, the top of the Bendigo Terrace, and the foothills north of Bells Lane (SH8A). Large parts of rural land within Queenstown Lakes District are also designated as ONF or ONL.

You can read more information in the Landscape Information Sheet at centralotagoairport.co.nz

Central Otago contains Wāhi Tūpuna | Sites and areas of significance to Māori

We recognise mana whenua have a strong cultural, spiritual, and traditional relationship with the region.

The broader region was part of an ara tawhito (trail). It linked permanent coastal settlements through Te Manuhuna (Mackenzie Basin) and the lakes of Central Otago. This traditional route was fundamental to the operation of the Kai Tahu mahika kai system, where seasonal migration covered vast distances to collect food and resources.

Mata-Au (Clutha River) and Ōmako (Lindis) river were both part of the mahika kai sites, supporting weka, papaī (speargrass), tuna, āruhe and kokopu populations. It was known for weka hunting and plentiful plant resources.

Wāhi tūpuna are interconnected ancestral places, landscapes and taoka that reflect the history and traditions associated with the long settlement of Kāi Tahu whānui in Otago. These have been preliminarily mapped across both Queenstown Lakes District and Central Otago districts and are reflected on the map below.

A NEW CENTRAL OTAGO AIRPORT

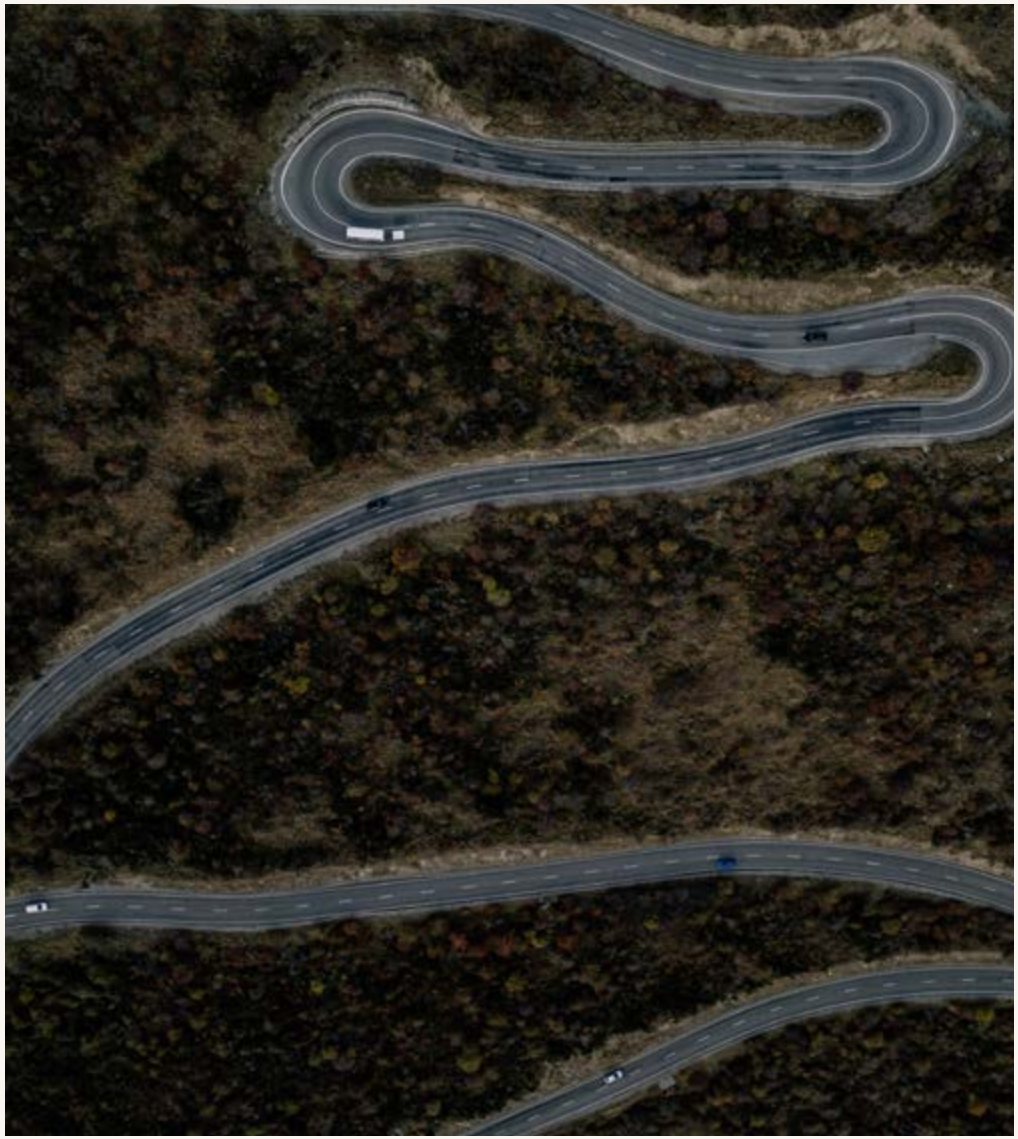
Central Otago - a region on the move

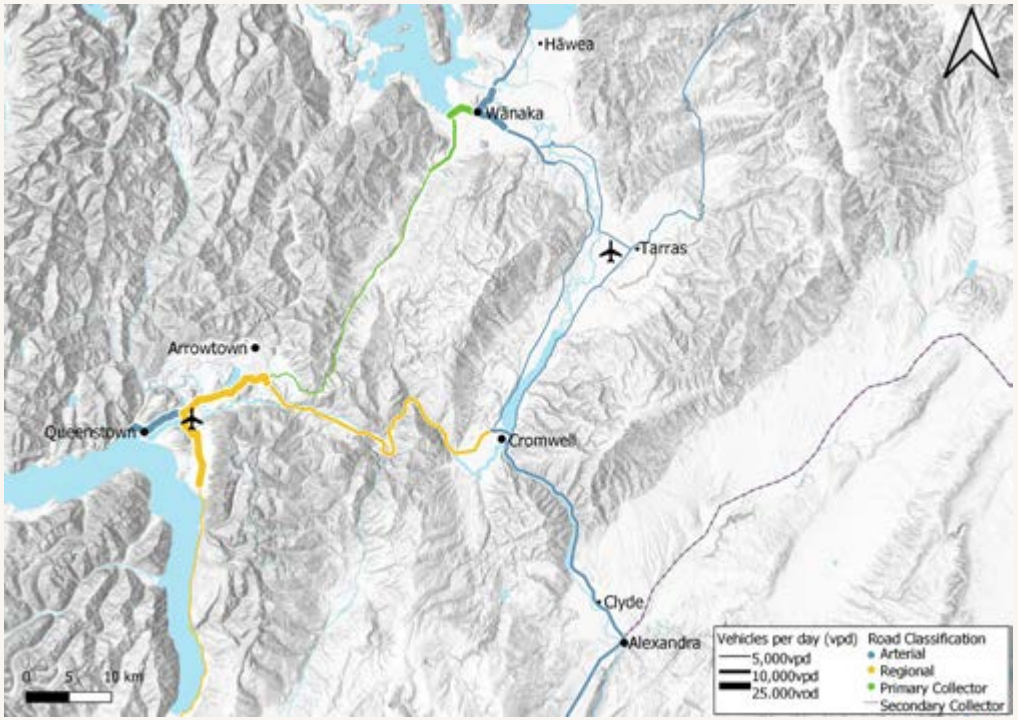
Central Otago has a well-established network of low risk highways

A review of Central Otago's land transport network shows the majority of the highways are low volume and low risk. As you can see from the maps on page 27, there are areas of high volume and high risk, particularly in the Wakatipu Basin, including areas of 'extreme risk' of natural hazard disruption.

More than half the region live and travel on high quality state highways with relatively low traffic levels. Although congestion is a regular feature at the Shotover Bridge and Ladies Mile/Frankton roundabouts and traffic volumes are forecast to continue growing. Growth forecasts suggest that the Central Otago population will continue to be distributed in similar proportions in the future and investment is likely to be required in the area's land transport infrastructure network regardless of whether a new airport is built.

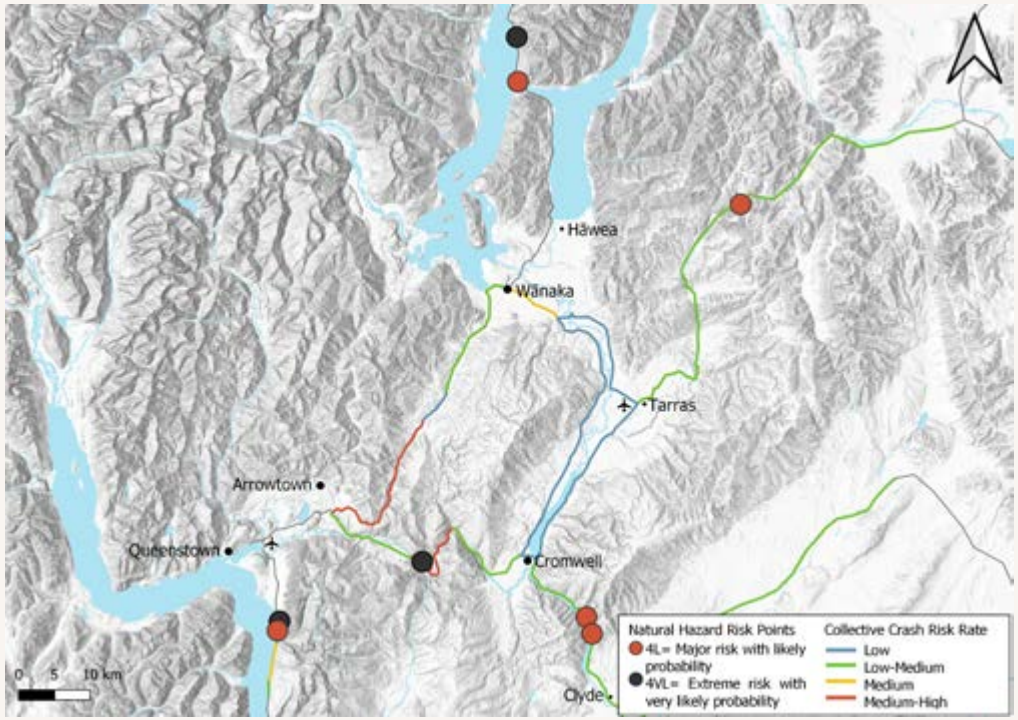
Most of those who live in Central Otago are able to connect to the wider region and beyond by low-risk, high-capacity highways.





Road Classifications and usage

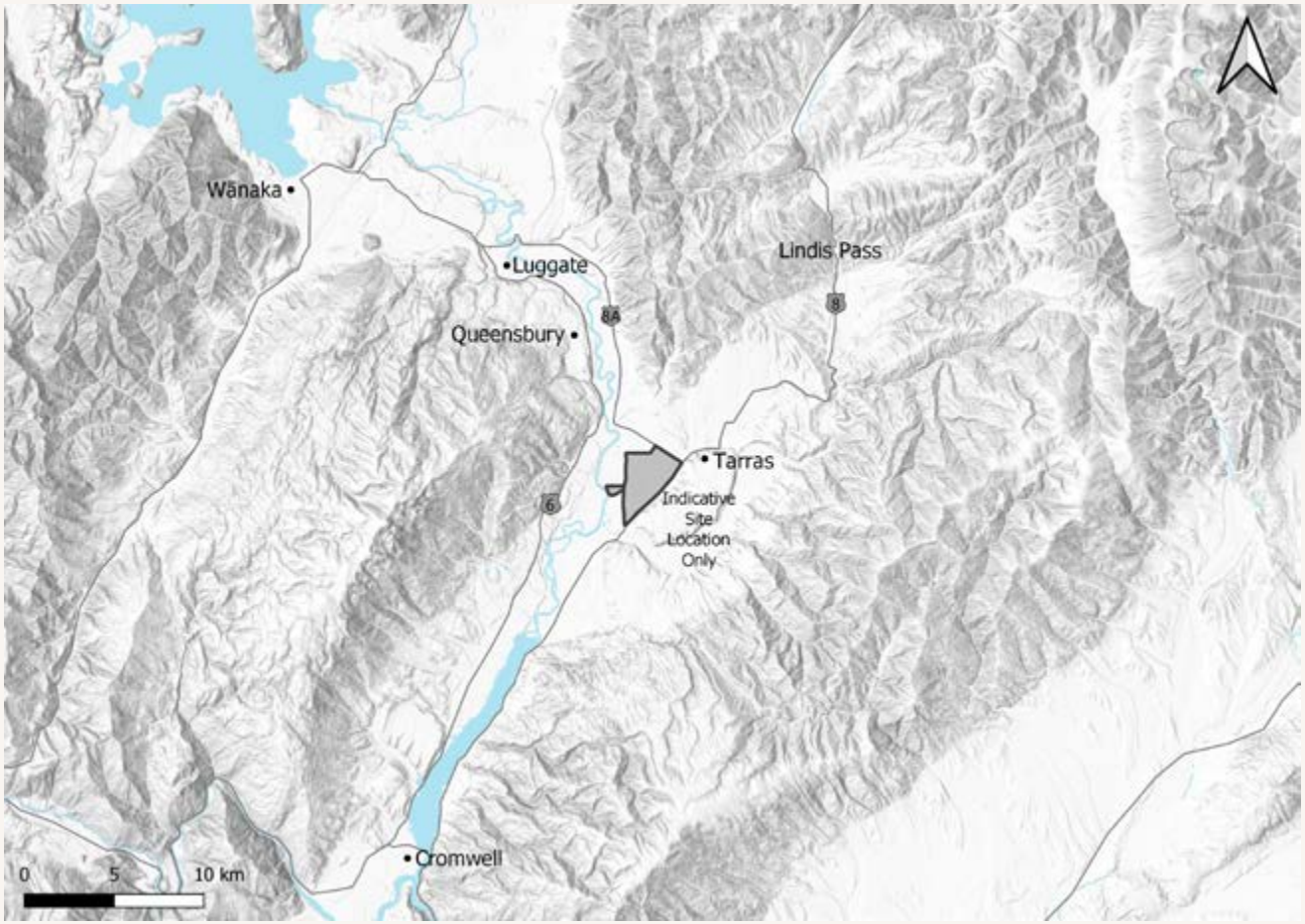
Initial land transport analysis tells us that the region is well served by New Zealand's state highway network. Currently, the majority of the roads are relatively low volume, however this is expected to increase. The Wakatipu Basin experiences significant traffic volume pressure compared to elsewhere in the region. Growth in traffic is likely to require some land transport infrastructure to be upgraded.



Natural hazards and crash risk rating

Parts of the region's road network are at risk of natural hazards, including some areas of 'extreme' risk. Damage to land transport networks is immensely disruptive, time-consuming and expensive to repair. The disruption also impacts residents' economic and social wellbeing. For more information, see the Land Transport Information Sheets at centralotagoairport.co.nz

Proposed airport site



The proposed airport site comprises approximately 800 hectares of land near Tarras, Central Otago. The proposed site lies to the east of the Clutha River/Mata-Au, between State Highways 6 and 8. The northern side of the proposed site is flanked by SH8A which provides a linkage between SH6 and SH8.

The proposed site sits at a strategic location in the state highway network which provides good connectivity to the surrounding regions, including:

- Cromwell (22km)
- Wānaka (25km)
- Hāwea (30km)
- Alexandra (58km)
- Queenstown (70km)
- Twizel (108km).

Located 243m (800ft) above sea level the proposed site is situated at the confluence of three valleys; the Hāwea Valley aligned generally north to south, the Lindis Valley aligned generally north-east to south-west and the Cromwell Valley aligned generally north-east to south-west along Lake Dunstan and the Clutha River/Mata-Au.

Constrained aviation capacity in a thriving region – a new regional airport

Passenger demand growth is predicted for Central Otago over next two-three decades

The region has experienced significant growth in passenger numbers

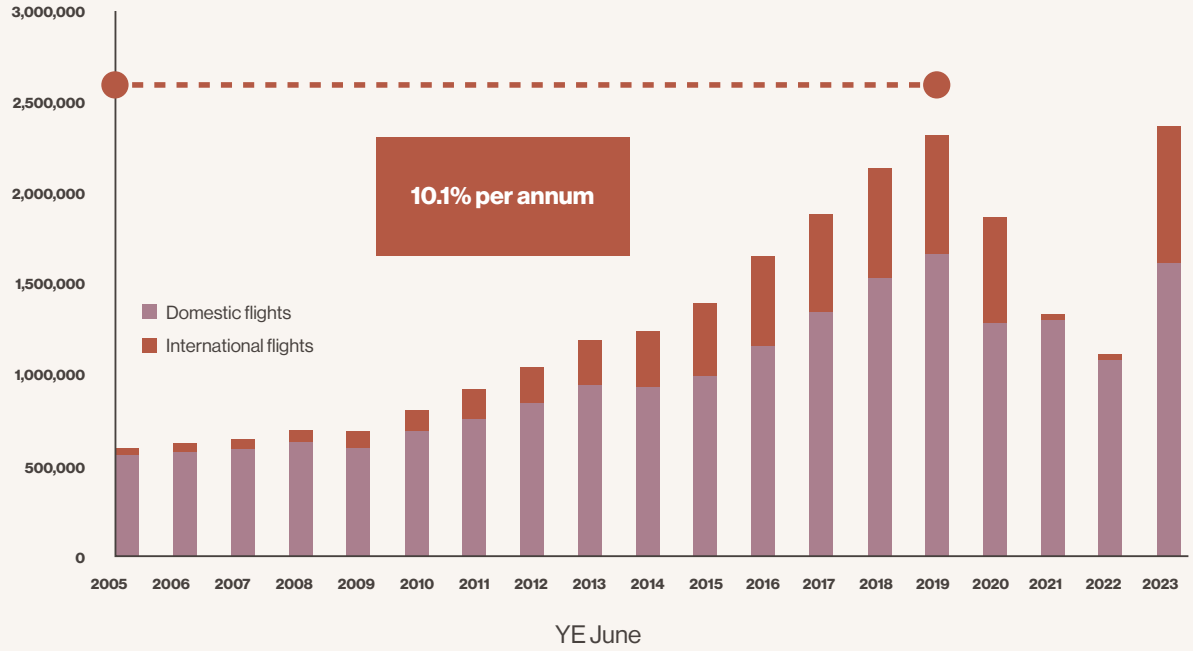
Between 2005 and 2019, passenger movements at Queenstown Airport grew on average by 10.1% per annum and have already recovered to exceed pre-Covid levels.

Domestic flights have been the dominant source of passenger movements, accounting for around 70% of all air passenger movements. Auckland services have driven most of the growth in recent years, much of which is to or from destinations beyond Auckland.

In their 2020 report, MartinJenkins identified that almost 90% of passenger movements to and from the region are on jet aircraft and the remaining 10% are on turboprop aircraft. The turboprop services are limited to the relatively short Christchurch and Wellington routes, with jets being strongly favoured or required for the longer Auckland and trans-Tasman routes.

This domestic and international inbound visitor demand provides Central Otago residents with access to direct flights to more destinations at a greater frequency than what the resident population alone could sustain.

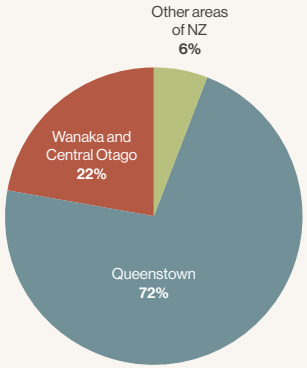
Passenger movements at Queenstown Airport



Queenstown Airport is the gateway to the entire Central Otago region

Analysis shows that around 22% of passengers at Queenstown airport in 2019 were travelling to or from destinations in Wānaka and the Central Otago District, and a further 6% were travelling to or from destinations outside the Central Otago region. The ability to manage future passenger demand through Queenstown Airport is therefore an issue that affects the entire Central Otago region.

Current arrivals at Queenstown Airport by main destination



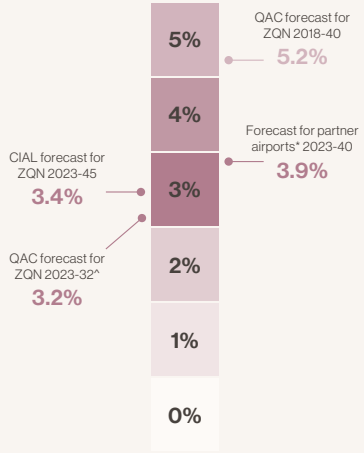
Predicting future passenger demand

There are reference points to take guidance from when considering what future demand may look like.

In 2018 QAC predicted growth in passenger demand of 5.2% per annum to 2040. Their latest forecast of 3.2% per annum to 2032 is a throughput projection (what the facility can manage within its constraints) rather than a traditional demand projection.

Christchurch Airport's medium scenario predicts demand growth of 3.4% per annum between 2023 and 2045, and the airports Queenstown Airport exchanges passengers with (Auckland, Wellington, Christchurch, Brisbane, Sydney, Melbourne, Gold Coast) have a combined average growth forecast of 3.9% per annum between 2023 and 2040.

Predicting future passenger demand at Queenstown Airport



** Auckland, Wellington, Christchurch, Brisbane, Sydney, Melbourne, Gold Coast.*

Although it is difficult to predict with certainty, based on these reference points it would be prudent to plan for long-term growth in demand for travel to and from Central Otago of 3-4% per annum. At the lower end of the band, this translates to 4.5 million passengers in 2040 and 5.8 million passengers in 2050.

Demand forecasting

Forecasts are predictions of future volumes of passengers and aircraft movements at a given point in time conditional on information known today. If forecasts are too low the volumes and effects will be underestimated, and inadequate provisions made. If forecasts are too high the opposite is the case.

Uncertainty is inevitable and forecasts need to be constantly fine-tuned particularly as part of investment cases.

Forecasts used in this report will continue to be refined as the project progresses towards any future decision to proceed with construction.

Passenger demand growth scenarios

Year	2%	3%	3.5%
2005	0.6M	0.6M	0.6M
2023	2.4M	2.4M	2.4M
2030	2.9M	3.3M	3.5M
2040	3.5M	4.5M	5.2M
2050	4.2M	5.8M	6.8M

It is important to note these forecasts are based on expected growth in domestic and trans-Tasman routes only, mainly driven by Brisbane, Auckland, Sydney, and Melbourne. These markets can only be served with jet aircraft.

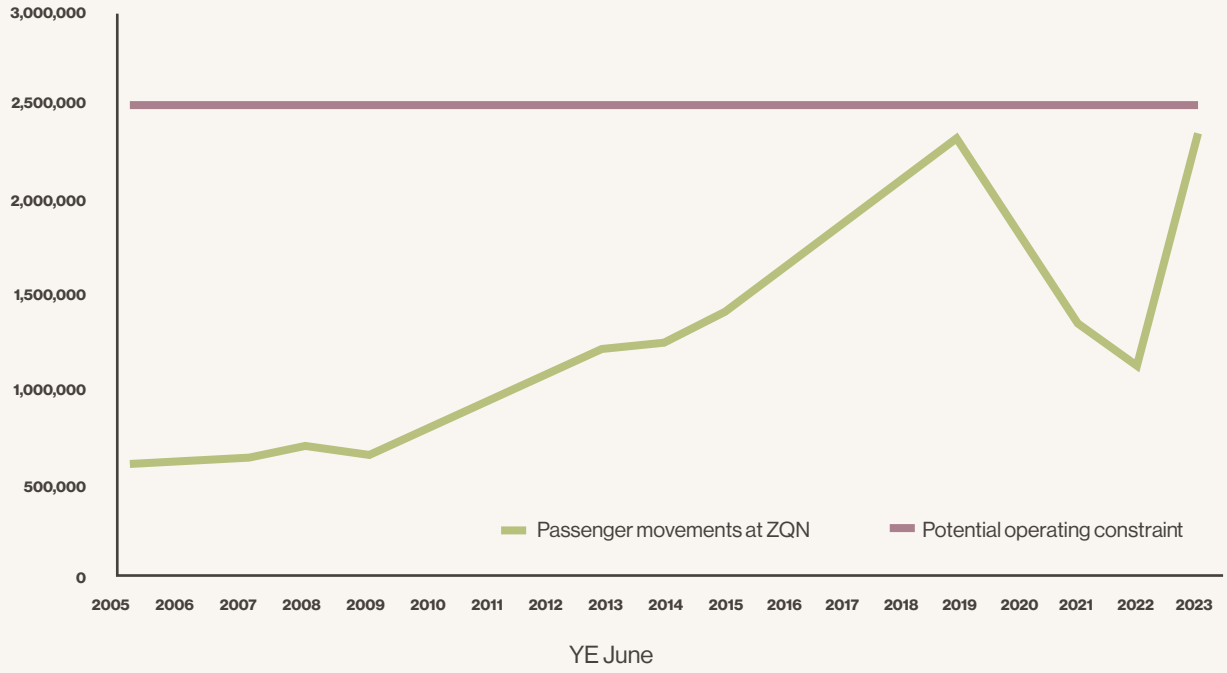
The region's primary airport is approaching its operational capacity

Queenstown Airport has served the region's air travel needs well for decades, but faces two key constraints that prevent it from scaling to accommodate long-term demand:

- Infrastructure constraints: Queenstown Airport does not currently have enough space within its current airfield and terminal infrastructure to accommodate expected long-term passenger demand.
- Noise constraints: Queenstown Airport is subject to noise restrictions that limit the number of scheduled aircraft movements it is allowed to operate each year. In its 2017 30-year Master Plan Options Document, QAC predicted that this limit would be reached by around 2022.

In its 2022 10-year Strategic Plan, QAC acknowledged that Queenstown Airport is rapidly approaching its current operational constraint of around 2.5 million passenger movements per annum.

Passenger movements at Queenstown Airport



Capacity constraint will result in significant unmet demand for Central Otago

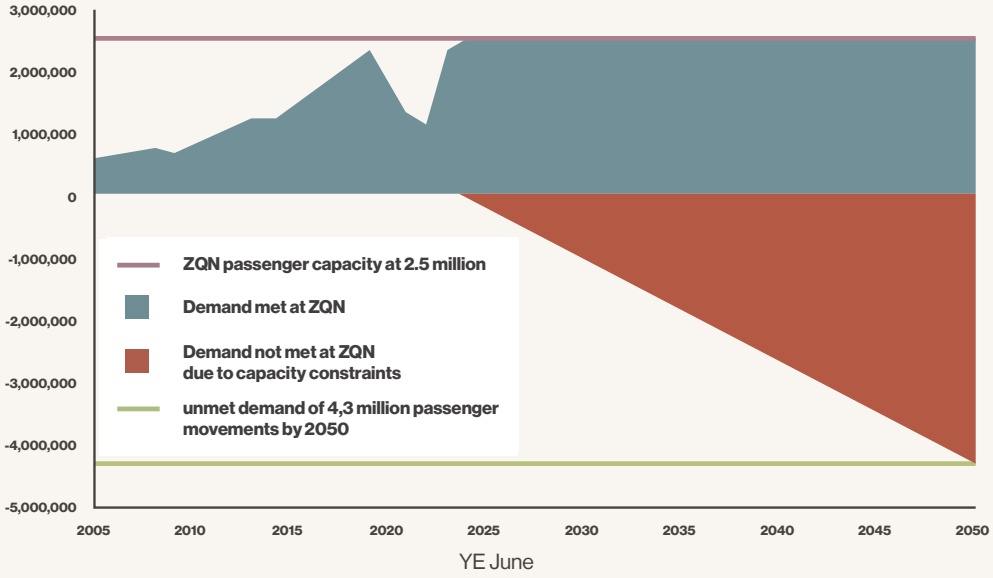
With its current configuration Queenstown Airport could start experiencing operational constraints as early as 2024. This means that Queenstown Airport will not be able to efficiently satisfy 100% of passenger demand from this point onwards.

Based on long-term growth in passenger demand of 3.5% per annum, Queenstown Airport's capacity constraints are expected to result in unmet demand of around:

- 1 million passenger movements by 2030,
- 2.7 million passenger movements by 2040,
- 4.3 million passenger movements by 2050.

This suggests that by 2040 Queenstown Airport will be spilling more demand than it is able to satisfy. Passengers that are unable to fly directly to or from Central Otago will need to find alternative (and less efficient) ways to travel, or not travel to and from Central Otago at all. This has significant implications for the entire Central Otago region.

Demand for pax movements to/from Central Otago



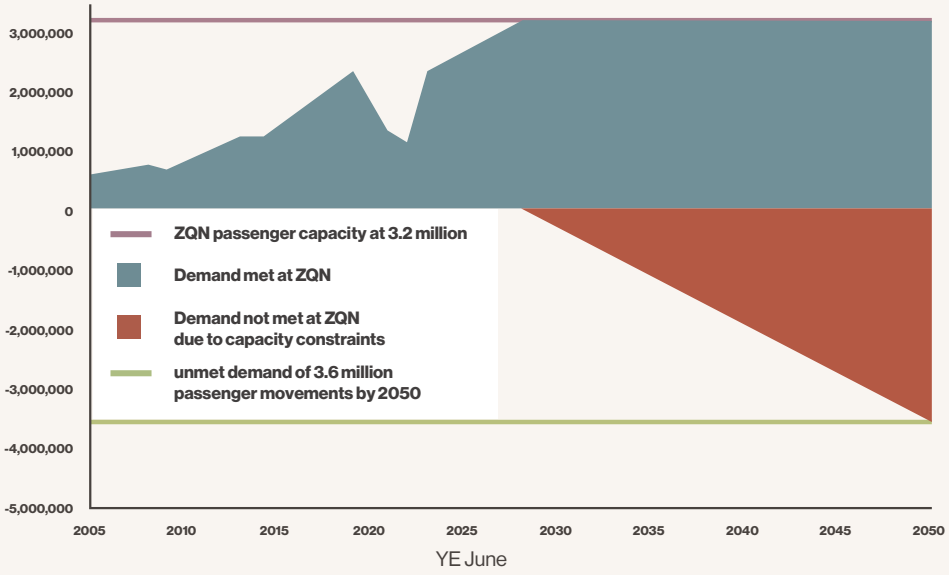
Increasing capacity through existing infrastructure only moves the problem for Central Otago out a few years

Queenstown Airport has outlined a plan to increase its capacity to 3.2 million passenger movements per year. Once in place, QAC projects that it will reach its new operational capacity limitations of around 3.2 million annual passengers by 2032. The proposed expansion would only defer the capacity problem for a few years. QAC have not released plans in their QAC 2023 10-year Master Plan Consultation Document for what happens beyond 2032.

QAC's plan to expand Queenstown Airport would still result in unmet demand of around 2 million passenger movements per annum by 2040 and 3.6 million passenger movements by 2050 based on long term growth in passenger demand of 3.5% per annum.

This scenario suggests that by 2050 Queenstown Airport will be spilling more demand than it is able to satisfy, creating implications for the entire Central Otago region.

Demand for pax movements to/from Central Otago*



**Based on a $300M expansion of Queenstown Airport's current facility and long-term growth in passenger demand of 3.5% per annum.*

As Central Otago's population increases, constraints will compound residents' ability to travel by air

Capacity constraints at Queenstown Airport will have two main consequences for Central Otago residents who want to travel by air:

1. The number of available aircraft seats per Central Otago resident will fall as capacity is reached at Queenstown Airport and population continues to grow.
2. The competition for each seat will intensify once capacity is reached at Queenstown Airport and passenger demand continues to grow.

The first table below shows a drop in seats per Central Otago resident under all scenarios in 2050, while the second table shows that demand for seats could be more than three times higher than the number of available seats.

The combined impact of reduced seats per capita and greater competition for each seat will make it more difficult and expensive for Central Otago residents to travel by air.

Seats per Central Otago resident in 2050 relative to 2023

	ZQN with 2.5M pax capacity in 2050	ZQN with 3.2M pax capacity in 2050
Central Otago population of 105,000 in 2050	-28%	-7%
Central Otago population of 120,000 in 2050	-37%	-19%

Passenger demand per seat at Queenstown Airport in 2050

	ZQN with 2.5M pax capacity in 2050	ZQN with 3.2M pax capacity in 2050
Passenger demand grows by 3% per annum	2.3	1.8
Passenger demand grows by 4% per annum	3.2	2.5

Dunedin and Invercargill Airports are not good substitutes for a Central Otago airport

Both Dunedin and Invercargill Airports serve their populations well and are sometimes cited as alternatives to building a new airport for Central Otago. Into the future, the area of high population growth and visitor demand is forecast to be Central Otago, 2-3 hours' drive from those airports. Those distances will impact the desirability and ease of use for both residents and visitors whose origin and departure is Central Otago. Greater utilisation of those airports would result in increased driving and over-flying by Central Otago residents and visitors.

Over-flying occurs when air passengers fly over their point of origin or destination. For example, a Central Otago resident who takes a flight from Dunedin Airport to Australia will fly back over Central Otago, covering some of the same ground twice.

The Reserve Bank of New Zealand has also identified Dunedin and Invercargill Airports as among those that are vulnerable to inundation from climate change.

The impact of air capacity constraints on Central Otago residents will be wide-reaching

The limitations described above mean that existing airports are unable to meet Central Otago's future air connectivity needs. If nothing is done in the region, air capacity constraints will make it harder for Central Otago to move people and products. This is likely to be strongly felt by individuals in Central Otago, particularly those with a high propensity, or requirement, for travel.

A shortage of air capacity is likely to result in:

- **Reduced choice**
  It will become harder to secure seats and freight slots at the times and days people want.
- **Longer journey times**
  Increasing numbers of people will need to drive or send freight to other airports to access flights.
- **Increased cost**
  Prices will rise as competition for seats and freight capacity increases. Central Otago residents are more likely to be disadvantaged by seat shortages than visitors who often book earlier and have a higher willingness to pay for travel.
- **Disconnection**
  Travelling to and from Central Otago will become increasingly hard and expensive for some Central Otago residents, resulting in disconnection.
- **Economic loss**
  Air capacity constraints will reduce economic opportunities for industries that depend directly or indirectly on air travel.
- **Higher emissions**
  Carbon emissions are likely to grow as a result of increased driving and over-flying.

Can air capacity constraints be used to manage demand?

Travel demand for Central Otago will continue to grow even if air capacity is constrained, due to its strong visitor offerings. In a 2020 report, MartinJenkins stated that only a third of visitors to Queenstown Lakes District arrive via Queenstown Airport.

Doing nothing about air capacity constraints is not an effective demand management strategy – it will cause congestion and inefficient travel patterns – with consequential economic loss and higher carbon emissions. These problems can be avoided by taking a proactive approach to managing growth that ensures the right infrastructure is in place to support it.

A new jet-capable airport in Central Otago appears to be the strongest solution

A new jet-capable airport in Central Otago would provide:

Capacity

- Existing infrastructure can't meet the long-term passenger task by itself.
- A new airport in Central Otago could scale as required to meet demand for the next 50+ years.

Efficiency

- A new airport in Central Otago would prevent the need for overflying and long road trips to/from Christchurch, Invercargill, and Dunedin when Queenstown Airport reaches its capacity.

Resilience

- The proposed site for the new airport is geographically distinct from Queenstown Airport as well as being climate and energy resilient.

Opportunity

- Air connectivity will give Central Otago the opportunity to proactively pursue its long-term aspirations.

This is not new thinking

Queenstown Airport's capacity constraints have been identified by its owner, QAC, for some time. Studies on new airports have been undertaken by QAC in the late 1980s and again in 1995. In preparation for its 30-year Master Plan Options consultation process in 2018 QAC undertook a significant amount of work at that time and concluded that Queenstown Airport alone could not accommodate forecast growth on its existing infrastructure.

Christchurch Airport's conclusion is the same as QAC reached when taking a 30-year view regarding the need for additional direct air capacity to serve Central Otago's future aviation needs.

The only difference is that QAC proposed an expansion of Wānaka Airport as part of a "dual airport strategy". Christchurch Airport's solution is for a second and new jet capable airport that can serve the region for the next 50+ years.

Planning for a new regional airport

Planning a new airport

Airport planning aims to meet the future needs of communities and regions

Airports are intergenerational assets and exploring the creation of a new airport is a detailed and complex task.

Successful airport planning provides a framework for airports to develop in response to changing needs over a long period of time. The success of that long-term thinking can be measured by how well the airport meets its immediate needs, while also adapting to changing trends, developing in stages to meet evolving demand.

> *"[Airport master planning] is essentially about gaining an understanding of how the airport is likely to change over the planning period (as long as possible, and usually at least 20 years)."*
>
> **New Zealand Airports Association, Airport Master Planning Good Practice Guide, 2017**

Airport planning is future focussed, providing a balance between reliance on known technological advances in areas such as air traffic control, avionics and security, the possibility of innovations enabling new ways of operating an airport, as well as the transition of New Zealand's aviation network to a low carbon future.

Airport planning also takes into account the regulatory context for airport operations. For the assessment undertaken the key regulatory reference was the Civil Aviation Act 1990, and its replacement the Civil Aviation Act 2023 which will come into force during the life of this project. These Acts set out requirements to enable the certification of an aerodrome, as well as the Civil Aviation Rules and the International Civil Aviation Organization (ICAO) standards and recommended practices.

There will also be numerous land use planning and environmental regulations to consider as the project moves closer to a gateway decision on whether to seek approvals.

A modern airport secures high quality air connectivity for 50+ years

The key features of a safe and efficient airport at the proposed site are considered to be:

Airport is relatively free of infrastructure constraints

- a single runway of at least 2,200m and up to 3,000m,
- associated taxiways and aircraft parking aprons,
- fully compliant 240m runway end safety areas,
- resilience to natural hazards including those associated with climate change.

Airlines have the ability to match best aircraft to route

- maximum flexibility to enable airlines to use the wide range of aircraft anticipated to be in operation at the airport over its lifetime.

Airport infrastructure enables greener aviation

- ability to use the latest generation of aviation technology to maximise safety and efficiency, and to mitigate the effects of operations on communities and the environment.

Airport infrastructure enables operational efficiencies

- ability to incorporate smart technology and innovation to enhance the user experience and improve the reliability of flight schedules by enabling safe operations to continue during low visibility conditions.

Runway length and location really does matter

Runway length and location is a vital part of aeronautical safety and efficiency

Sufficient runway length is required to ensure aircraft can, after starting take-off, either complete the take-off safely or safely stop on the runway. A RESA or Runway End Safety Area is a symmetrical area adjacent to the end of the runway to reduce the risk of damage to an aircraft over or under shooting the runway. In New Zealand, RESA must extend at least 240m unless the Director of Civil Aviation decides it's not practicable.

Runway length will determine the aircraft types that can be used, as well as the number of passengers, and weight of freight and fuel (payload) that can safely be carried. A longer runway means airlines have more choice in the types of aircraft they use to fly their customers, and can use the most efficient option safely.

The location of a runway considers prevailing wind patterns, topography, and surrounding airspace. An optimal runway location enables safer aircraft operations and enhances aircraft performance. The right location within the airport layout ensures efficient operation by reducing taxiing times and minimising congestion.

Building a resilient future-focussed runway reduces disruption to communities

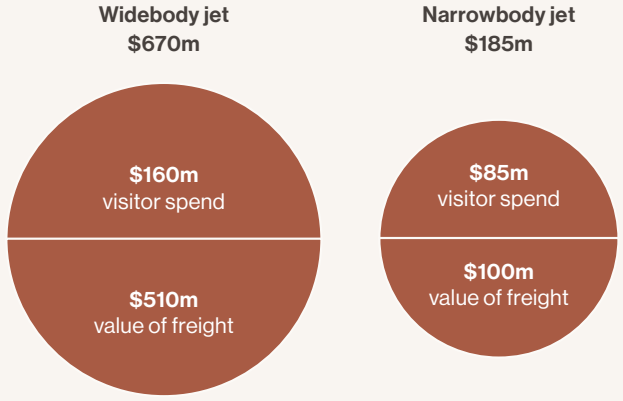
When planning a new airport, it is essential to consider the maximum runway achievable. The right length can support a region's growth, connectivity, resilience and prosperity over the long term. The right length will allow regional opportunities to be fully realised and for the investment to deliver for years to come. Site geography and boundaries, surrounding terrain and weather are all factors in determining the runway length for a particular site.

Runway length (alongside runway location) is a significant factor in an airport's resilience and adaptability.

Runway length and location determines the types of aircraft that can use an airport

In general, longer runways, in the right location, enable larger aircraft to take off and land at an airport. However, the surrounding terrain, payload, fuel requirements and the destination also play a role. Widebody jets can enable 3.5x higher value compared to narrowbody jets, bringing significant economic benefits.

Airports can enable lifesaving services during emergencies and can be key to establishing alternative supply routes in the event of land transport (road and rail) disruptions. A longer runway provides more options for how those services are delivered. Larger planes can also clear passenger backlogs faster, removing pressure on local facilities.



*Based on daily service over 12 months

A runway between 2,200m and 2,600m is feasible on the proposed site

For this project, runway lengths of 2,200m and 3,000m have been considered as the most realistic shortest and longest options available on the proposed site. Early analysis suggests that while a 3,000m runway would fit on the proposed site, it would be unlikely to accommodate additional aircraft types due to the surrounding terrain.

A runway of between 2,200m and 2,600m is feasible for the proposed site and surrounding terrain, and provides a more realistic range of runway length options. At this length, the runway would enable a broad range of aircraft types, and is expected to be suitable for the next generation of sustainably-powered aircraft. The proposed site can accommodate a 240m x 150m RESA at each end of the runway, and a parallel taxiway that fully complies with the safety requirements laid down by ICAO and CAA.

Key Representative Aircraft	Type	Typical Runway Length (m) for Select Destinations	Typical Range (km)	Typical Seat Range (no.)	Typical Freight Capacity (tonnes)
 ATR72-600	Turboprop (Code C)	<2,200	1,400	68	0.2-0.5
 A320neo	Narrowbody Jet (Code C)	<2,200 East Coast Australia	6,570	162-178	2-3
 A321neo	Narrowbody Jet (Code C)	<2,200 East Coast Australia	6,300	160-180	2-3
 B737-800	Narrowbody Jet (Code C)	<2,200 East Coast Australia	7,400	180-220	2-3
 A350-900	Widebody Jet (Code E)	2,300-3,000+	13,950	290-310	8-11
 B787-9	Widebody Jet (Code E)	2,300-3,000+	15,000	300-350	13-17

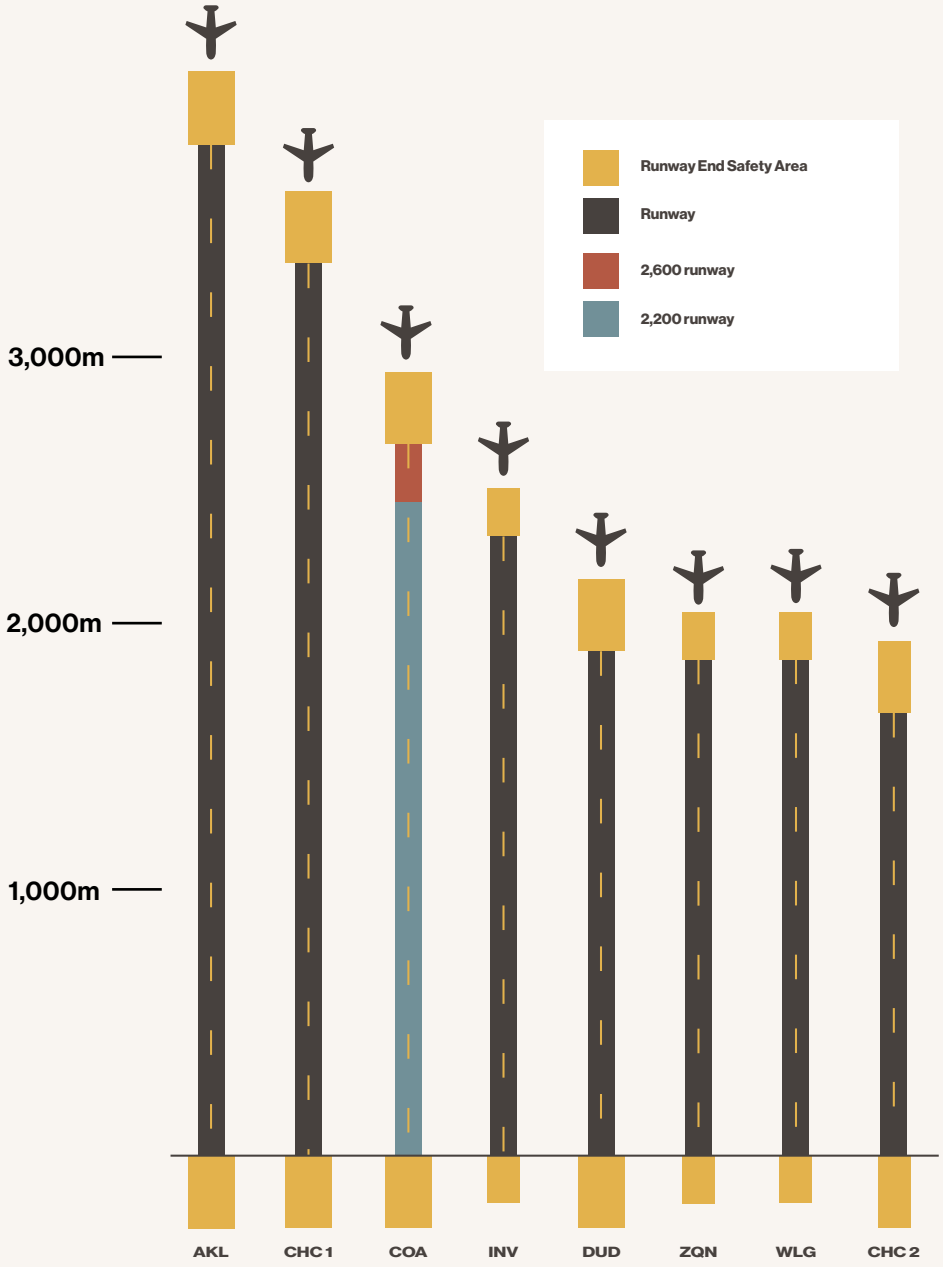
A 2,200m runway would be suitable for:

- domestic operations for jets of all sizes and turboprops
- international trans-Tasman operations for narrowbody (Code C) and widebody (Code E) jets
- international operations to parts of the South Pacific for widebody jets.

A 2,600m runway would be suitable for

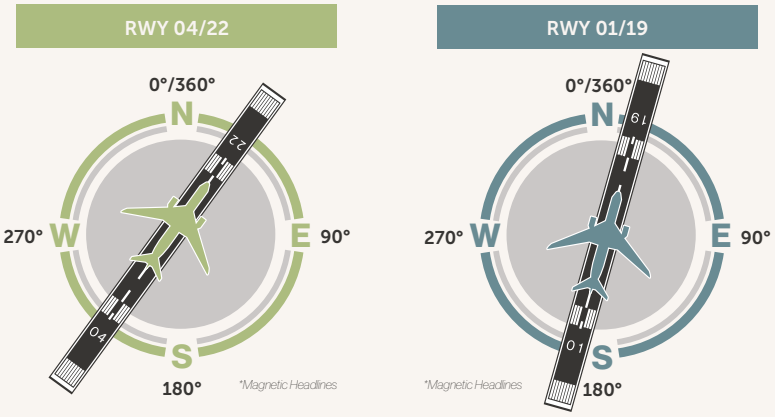
- domestic operations for jets of all sizes and turboprops
- international trans-Tasman operations for narrowbody (Code C) and widebody (Code E) jets
- international operations to parts of Asia and the South Pacific for widebody jets.

The diagram to the right shows how a 2,200-2,600m runway would compare to existing runways in New Zealand.



Choosing favourites

In 2021, our Preliminary Aeronautical Assessment report identified two runway alignment options - Hāwea Valley-Lake Dunstan (Runway 01/19) and Lindis Valley-Lake Dunstan alignment (Runway 04/22).



Flight path options and flight procedures need to be designed to identify a preferred runway alignment

The process of identifying the preferred runway alignment requires the design of feasible flight path options and flight procedures suitable for the main types of aircraft expected to serve the proposed airport. These options were then evaluated, considering the requirements, effects and suitability against four lenses, outlined on page 46.

Six design principles guided flight path options and flight procedures

The following principles were applied to flight path options and flight procedure design work:

- Keep design as simple as possible.
- Place safety as the primary consideration.
- Be compliant with relevant international and New Zealand Civil Aviation Standards.
- Be suitable for a range of aircraft types and potential airlines, for operations to and from likely destinations, in New Zealand and internationally, based on selected proxies.
- Mitigate impact on areas which might have levels of potential social sensitivity to having aircraft flight paths overflying, such as potential noise effects and impacts on visual amenity, i.e. over communities and sensitive heritage and ecological areas.
- Be efficient in terms of flight track distance and connections to the established New Zealand domestic and international enroute air navigation structure, which affects carbon emissions.

The flight tracks resulting from this comprehensive process are depicted on pages 54-57 showing the main tracks for arrivals and departures for routes that may reasonably be expected. These optimised flight tracks are the result of work to develop and refine flight tracks that perform best.

Flight tracks are designed to connect to an existing network

A Standard Terminal Arrival (STAR) would be developed which connects from the established enroute network to the start of the landing approach. As the approach begins well above the terrain, no significant design issues are anticipated for the future design of the STARs.

Two specification types for aircraft navigation were considered in the initial design process

The design considered two specification types for aircraft navigation (NAVSPEC) to test feasibility and determine the preferred runway alignment. These were:

Required Navigation Performance (RNP)

- precise flight paths with a high level of accuracy,
- ability to determine aircraft position with both accuracy and integrity,
- commonly used in New Zealand and Australia,
- allows for a wide range of aircraft and operational conditions.

Required Navigation Performance Authorisation Required (RNP-AR)

- higher standards of accuracy and integrity,
- requires authorisation by the Civil Aviation Authority of each airline's procedures,
- allows a wider range of aircraft and operational conditions.

A process guides this assessment

Flight path design and runway alignment evaluation process

Key steps in determining a preferred runway alignment involved detailed assessments of flight paths, airspace integration, aircraft performance, environmental performance and noise impacts. This work helped establish which runway alignment option is best suited to the types of aeronautical operations that could be expected.

Safety is the priority amongst four assessment criteria

Four lenses were selected as key criteria against which to assess the flight paths and runway alignment options. Assessment of each lens cannot be done in isolation. The process is interdependent, starting and ending with safety. This means, when a change is proposed to the original concept, the new design must then be reassessed against all lenses.

The four lenses are:

Safety

Safety is the most important consideration. Flight paths must be feasible, safe and compliant with relevant International and New Zealand Civil Aviation Standards.

Efficiency

Efficiency predicts a measure of individual aircraft and overall airspace system performance.

Environment

Environment measures noise impacts, visual effects from aircraft overflight (for both communities and sensitive heritage and ecological areas) and carbon emissions.

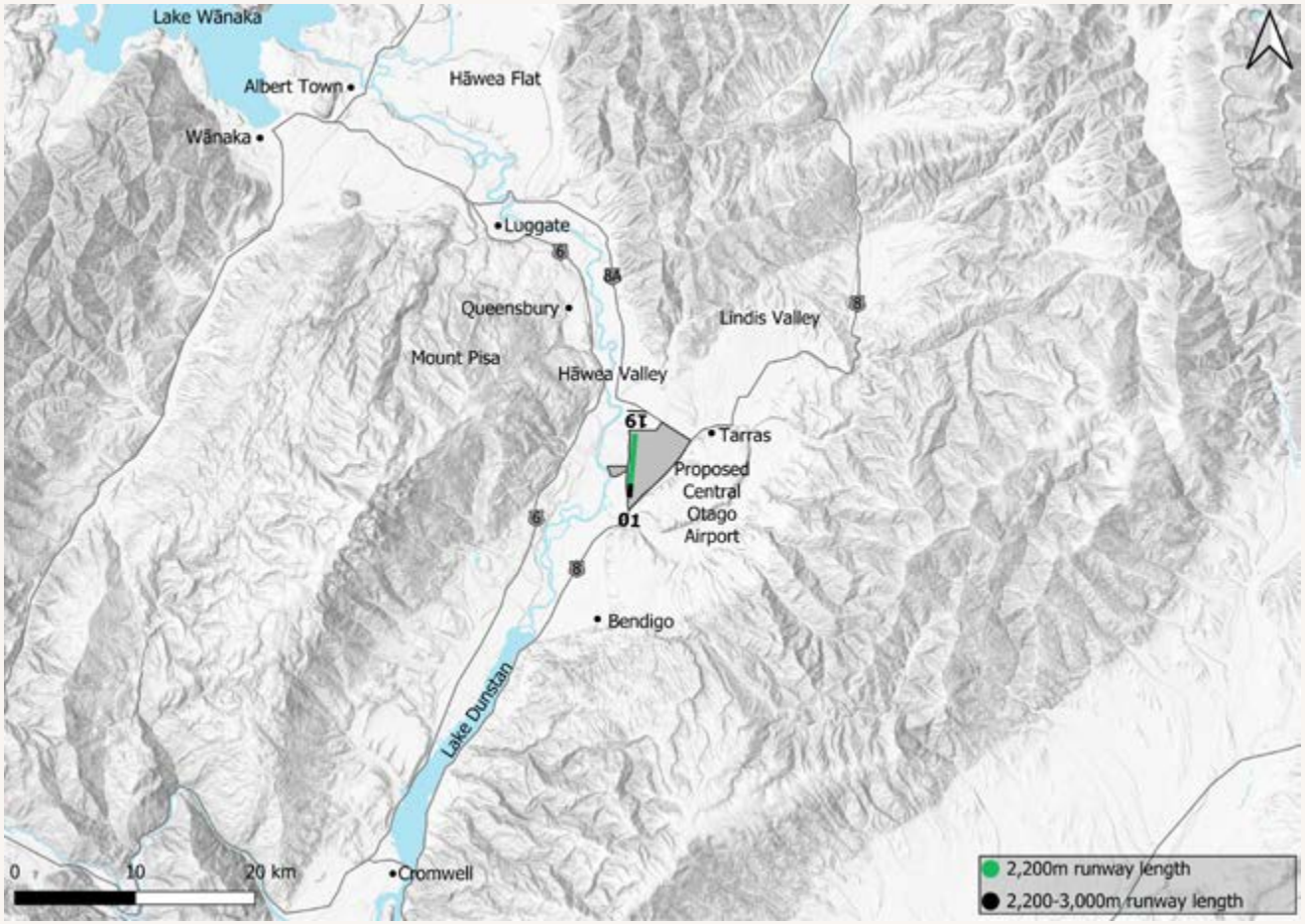
Capacity

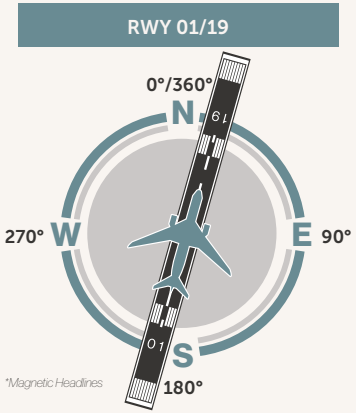
Capacity assesses the ability of the airspace system and air traffic management procedures to minimise inter-dependenices to achieve a consistent processing rate of aircraft arrivals and departures at the airport.

Runway alignment

Hāwea Valley – Lake Dunstan 01/19 Alignment option

The 01/19 alignment is generally aligned north / south with the Hāwea and Dunstan Valleys.





Flight tracks

- Able to connect to and from the existing flight paths in the area and beyond.
- Avoids overflying main residential areas of Cromwell, Ardgour Valley, Arrowtown, Queenstown and Lakes Wānaka, Hāwea and Wakatipu. Flight paths track close to Wānaka and Hāwea.

Runway navigation technology

- Aircraft navigation systems RNP-AR 0.1, and 0.2 NAVSPEC are achievable for this alignment option with limitations. The more accurate RNP 0.3 NAVSPEC is not possible on Runway 19.

Safety considerations

- Substantial breach of the Obstacle Control Surface (OCS).
- Weather is within normal operating parameters.
- EOSID - Engine Out Standard Instrument Departure (a process for safely clearing take off with one engine) is achievable on Runways 01 unrestricted for domestic, Tasman and long haul routes. Runway 19 would require payload restrictions of below 80% for domestic and Tasman routes, and likely unworkable restrictions for long haul operations.

Efficient operations

- Able to support full or near full payloads for all expected aircraft types across domestic and trans-Tasman routes.
- Efficient for short routes (Wellington and Christchurch). Similar performance for Auckland and international routes compared to 04/22.
- Restrictions would be required for turboprop operations to Wellington.

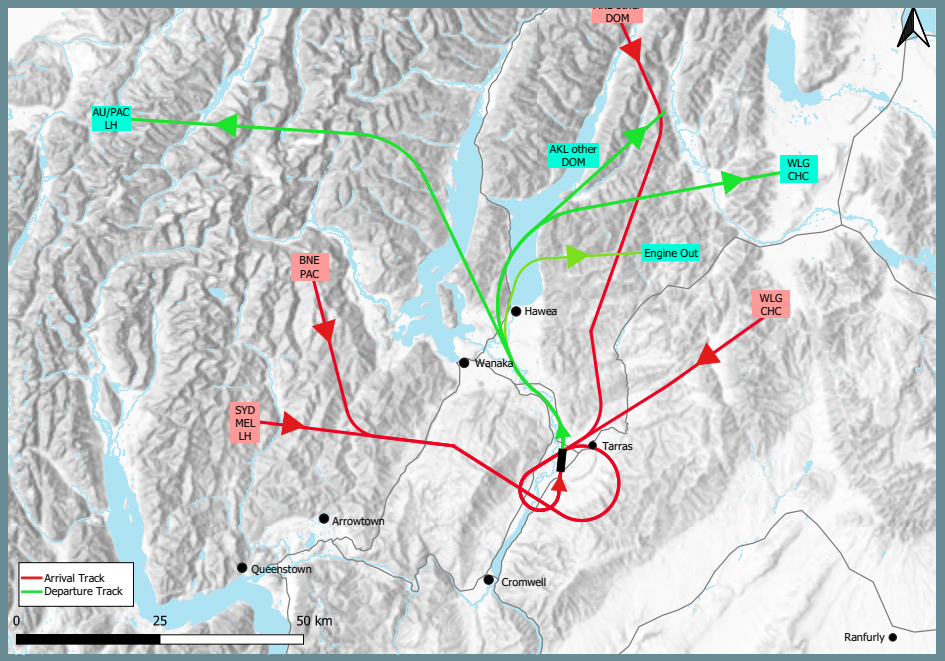
Considering our environment

- Exposes more households to noise compared to 04/22 option.
- Comparable emissions output with 04/22.

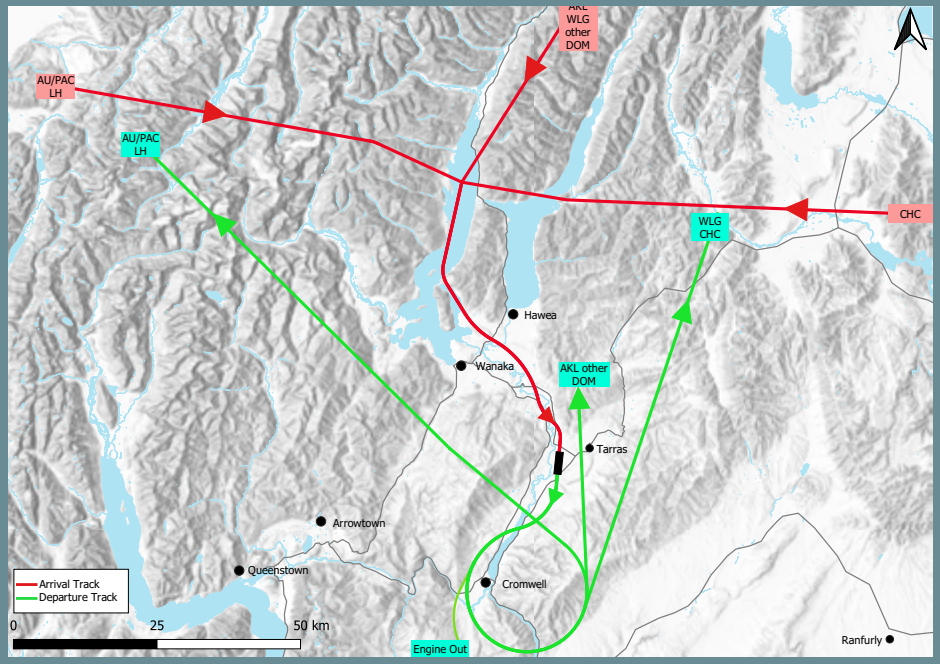
Capacity and air traffic management

- The design process has not proceeded sufficiently for capacity to be a differentiator.

Runway 01 Arrival and Departure

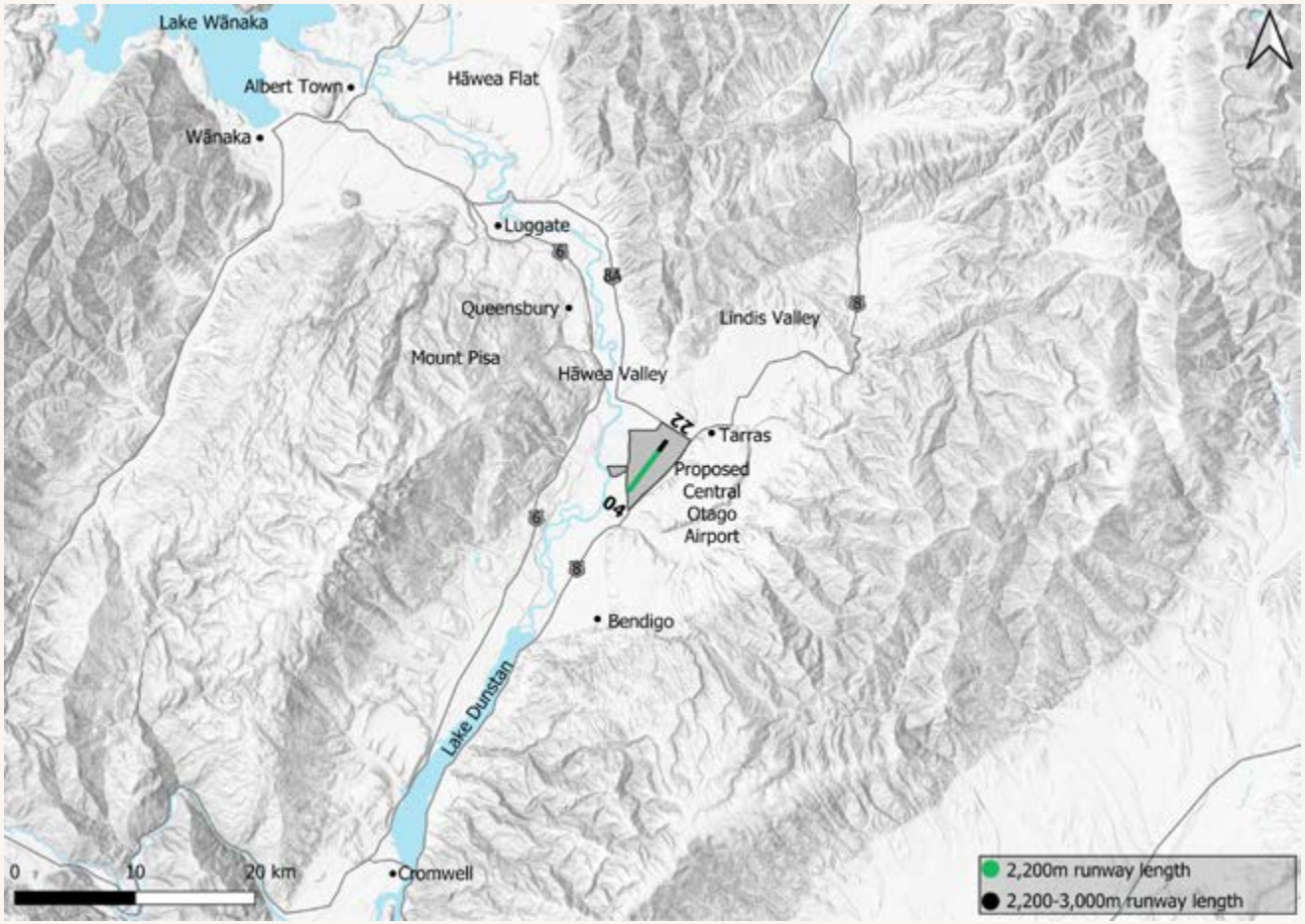


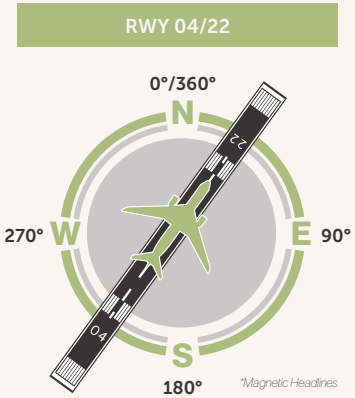
Runway 19 Arrival and Departure



Lindis Valley – Lake Dunstan 04/22 Alignment option

The 04/22 alignment is generally aligned northeast / southwest with the Lindis and Dunstan Valleys.





Flight tracks

- Able to connect to and from the existing flight paths in the area and beyond.
- Avoids overflying main residential areas of Wānaka, Hāwea, Cromwell, Arrowtown, Queenstown and Lakes Wānaka, Hāwea and Wakatipu. Flight paths track close to Ardgour Valley.

Runway navigation technology

- Aircraft navigation systems RNP-AR 0.1, 0.2 and 0.3 are achievable for this alignment option.

Safety considerations

- Weather is within normal operating parameters.
- EOSID - Engine Out Standard Instrument Departure (a process for safely clearing take off with one engine) achievable on Runways 04 and 22 unrestricted for domestic and Tasman routes, with possible payload restrictions for some long haul operations.

Efficient operations

- Able to support full or near full payloads for all expected aircraft types across domestic and trans-Tasman routes.
- Some payload limitations would be expected for some long haul routes.
- Efficient for short routes (Wellington and Christchurch). Similar performance for Auckland and international routes compared to 01/19.

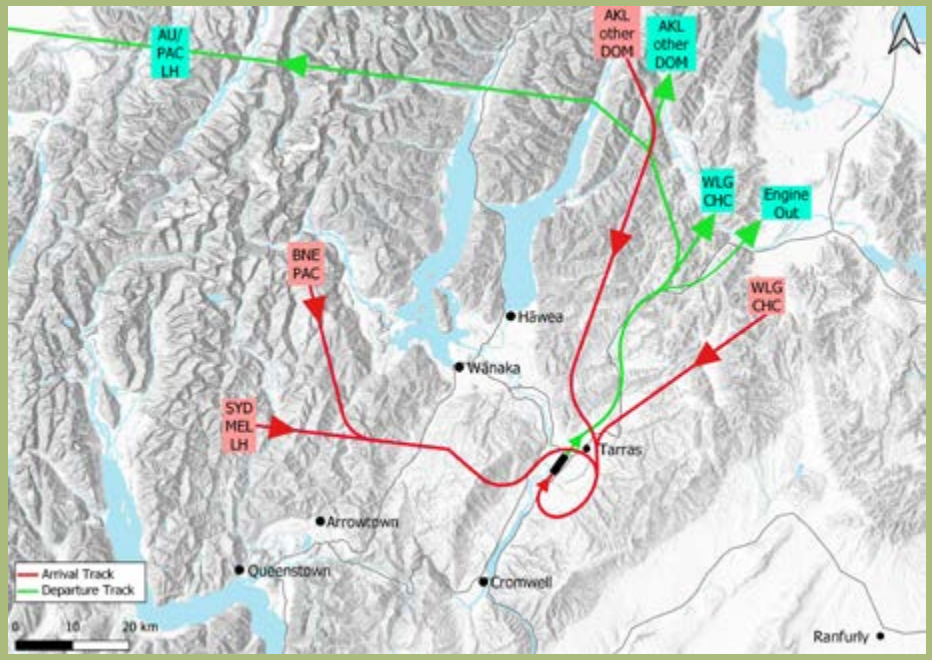
Considering our environment

- Exposes fewer households to noise compared to 01/19 option.
- Comparable emissions output to 01/19 option.

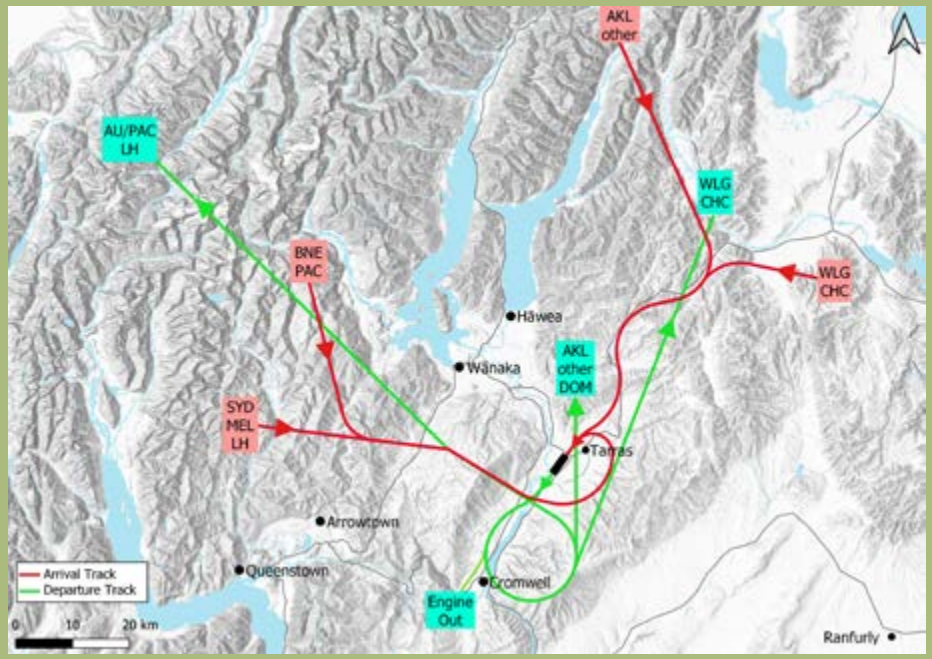
Capacity

- The design process has not proceeded sufficiently for capacity to be a differentiator.

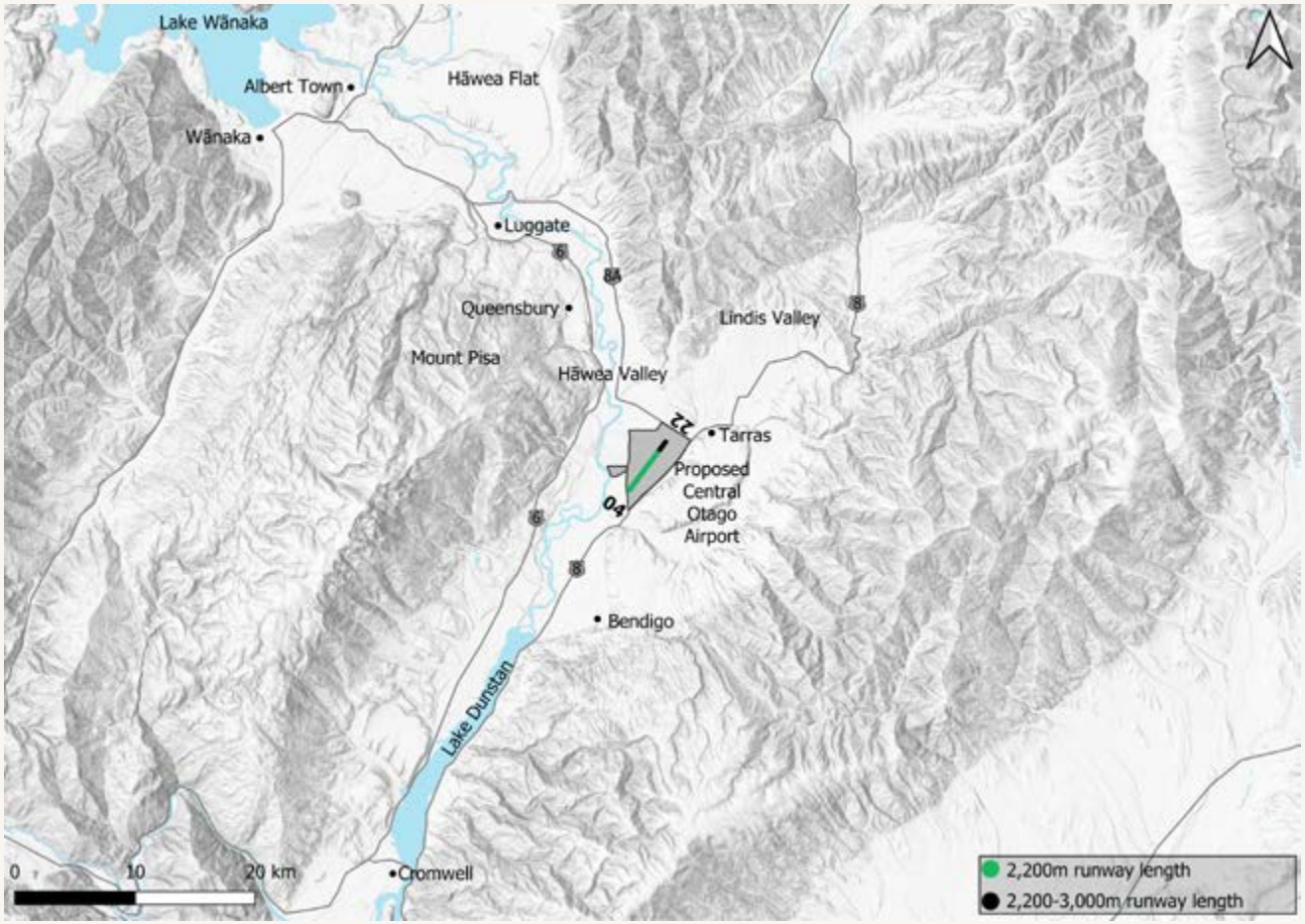
Runway 04 Arrival and Departure



Runway 22 Arrival and Departure



Runway 04/22 is the preferred runway alignment



Across most criteria, the two runway options perform comparably. However, 01/19 would not enable the airport to operate efficiently and would also have a greater impact on more households as a result of aircraft noise. That meant the 04/22 alignment emerged as the preferred option.

Benefits of this alignment are:

- greatest flexibility for aircraft types and operating parameters, an important factor for long-term resilience, especially with unknown performance capabilities of next generation aircraft,
- enhanced reliability for low visibility conditions due to lower decision heights,
- greater payload capacity than 01/19,
- reduced community noise impact.

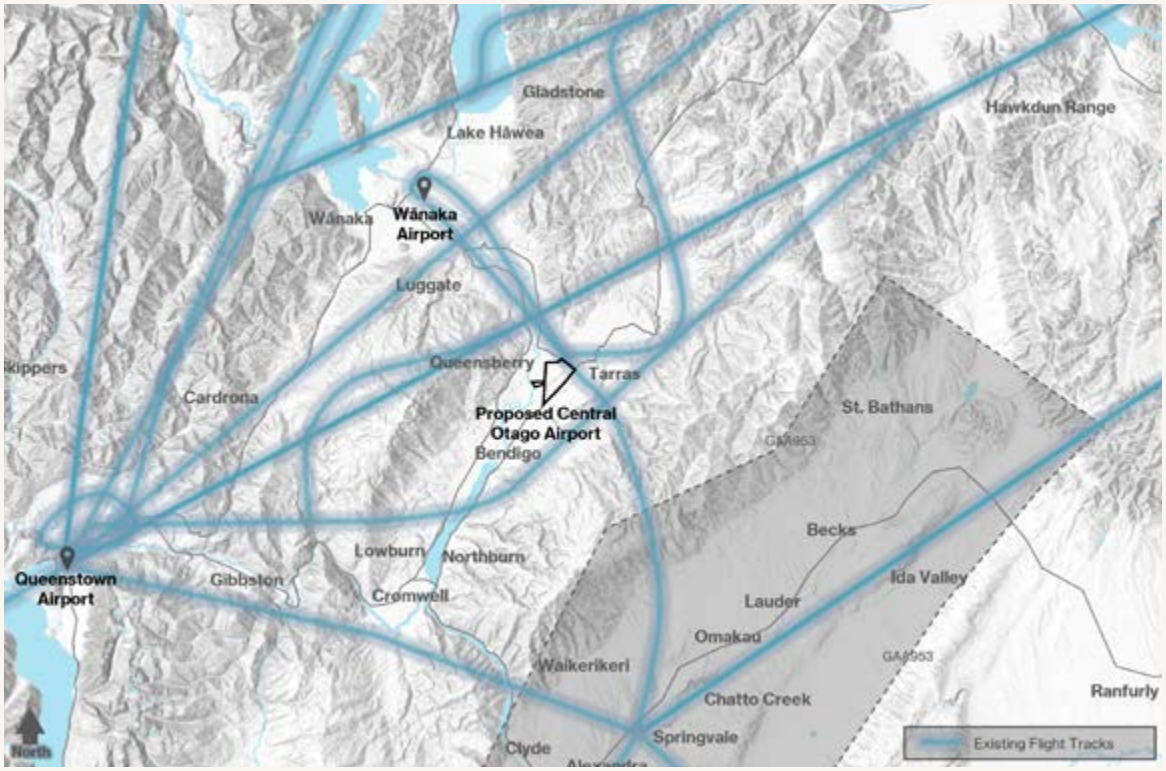
Runway 01/19 is not preferred due to:

- payload restrictions,
- the inability to achieve RNP 0.3 NAVSPEC,
- a substantial breach of the OCS.

Flight tracks are on-ramps linking to existing flight paths

The airspace around the proposed airport site is already used by scheduled aircraft accessing other airports in the region or enroute to other destinations, as shown to the right.

The flight tracks shown on pages 54-57 depict the approach and departure tracks which would link into these existing flight paths.



Notes:

- *This graphic is illustrative.*
- *GAA953 is an area of controlled airspace released by air traffic control for glider activity.*
- *Flight tracks are a general representation of some of the key scheduled aircraft flight tracks in the area.*
- *Preliminary new flight tracks are not illustrated.*

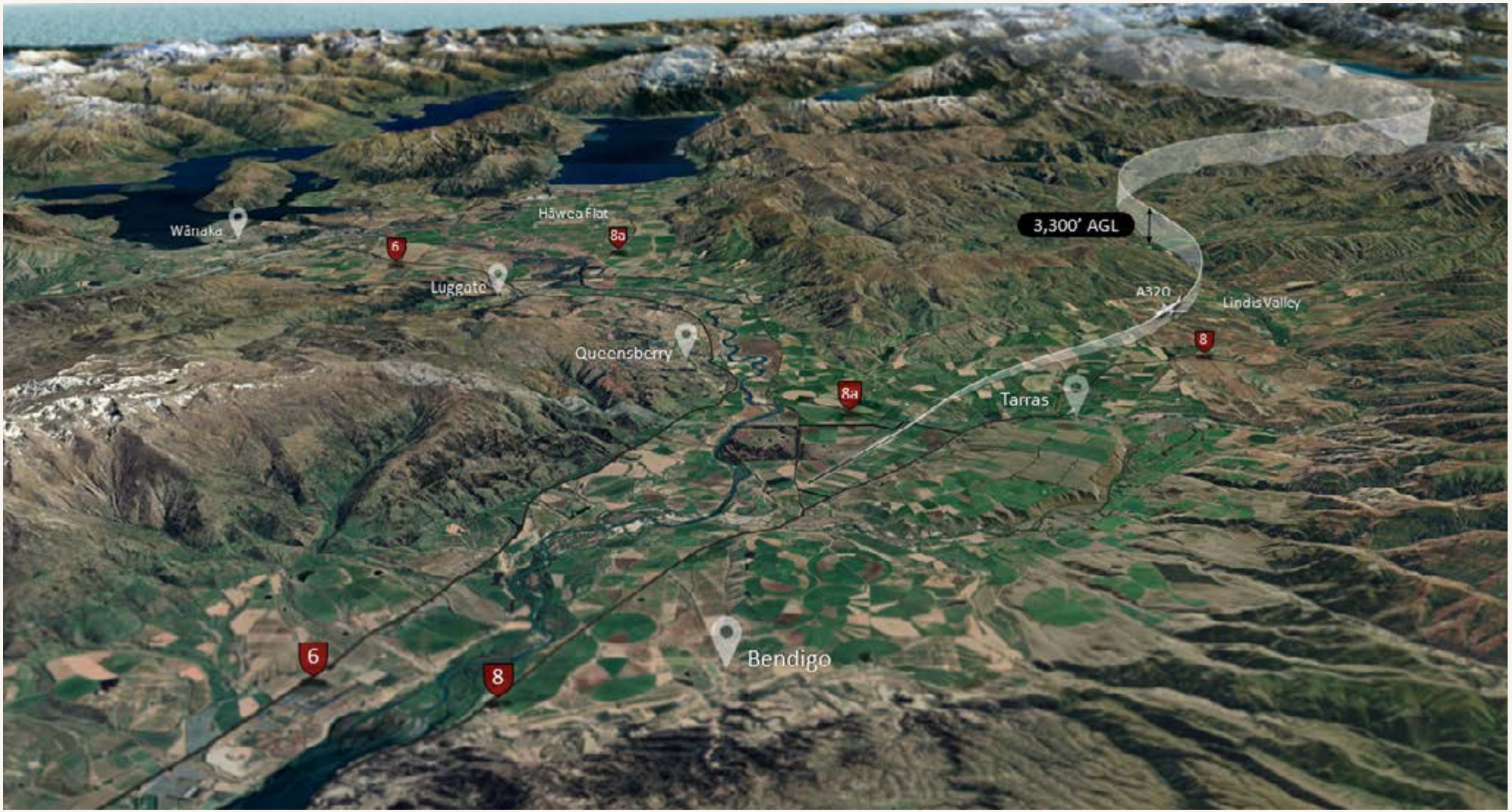
Runway 04 Arrivals

The aircraft shown on this page has been enlarged for readability.

Runway 04 Departures

The aircraft shown on this page has been enlarged for readability.

Runway 22 Arrivals



The aircraft shown on this page has been enlarged for readability.

Runway 22 Departure

The aircraft shown on this page has been enlarged for readability.

Understanding aircraft noise

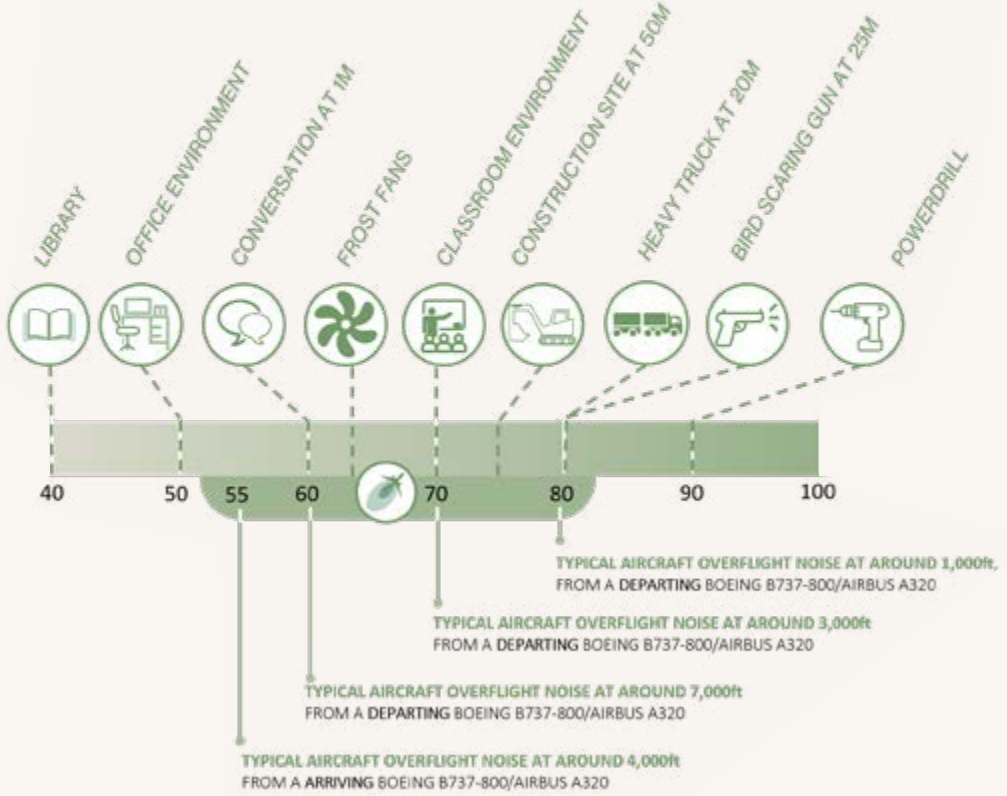
Aircraft noise is produced in all phases of flight. It is the sound caused by a moving aircraft which compresses the air around, creating noise waves. The three main components of aircraft noise are:

1. The engine components.
2. The aerodynamic drag or resistance of airflow around the aircraft's fuselage or wings.
3. The deployment of nose and main wheel landing gear from the undercarriage and aircraft control surfaces (i.e. flaps, slats, ailerons and elevators).

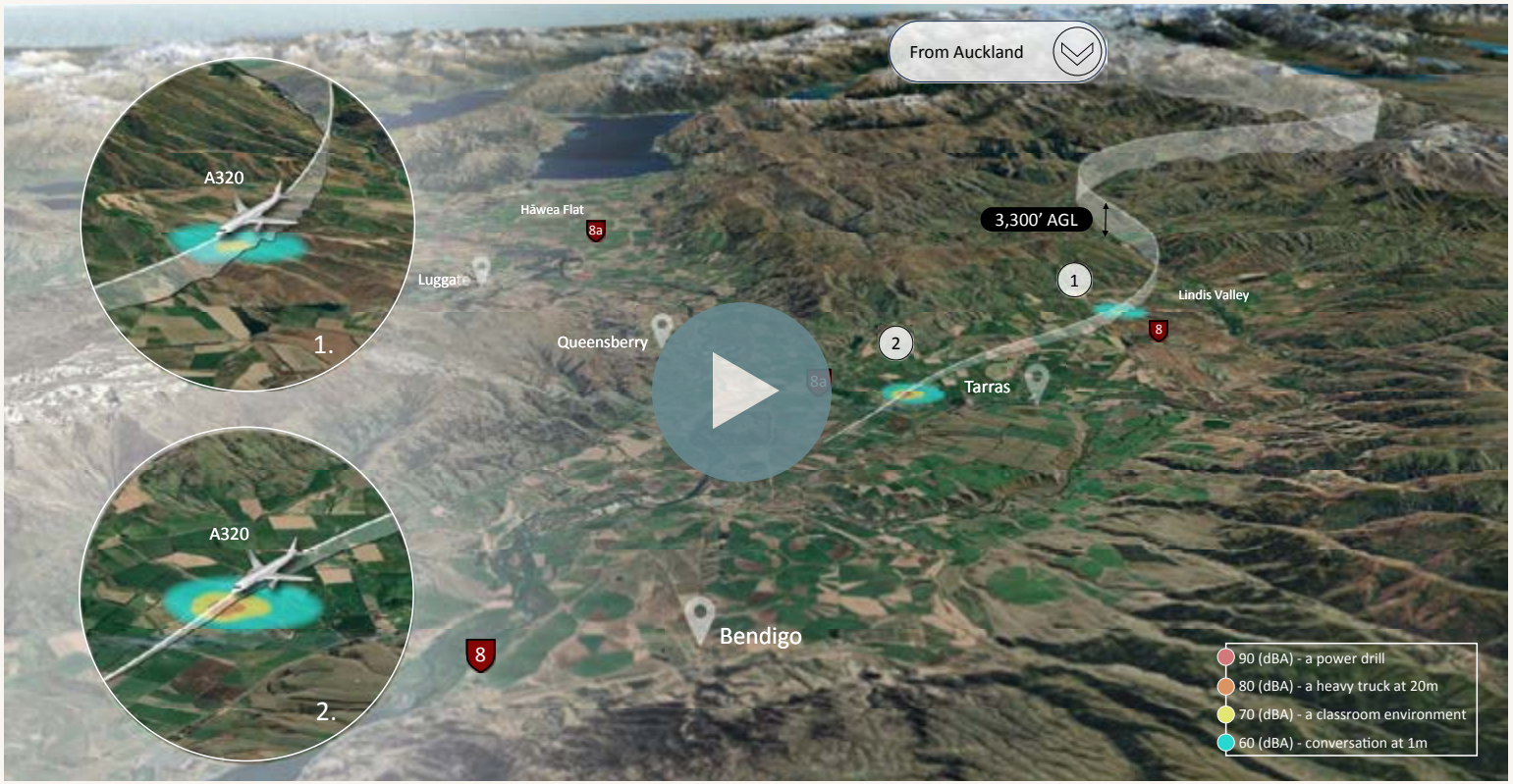
Aircraft noise is most noticeable in the immediate vicinity of a runway and on the extended centrelines when aircraft approach to land at the airport or climb on take-off. Areas under flight paths immediately adjacent to the proposed site, when aircraft are operating closest to the ground, will be subject to higher levels of aircraft noise than those further from the proposed site where aircraft are at higher altitudes.

In general:

- aircraft noise and sound waves 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,
- this is dependent on a range of factors, such as wave divergence, atmospheric absorption and ground attenuation.



Expected aircraft noise



Noise profile videos are also available at centralotagoairport.co.nz/information-resources/videos. The profiles show expected noise on the ground for an approach and a departure for each runway (04 and 22).

Other origins and destinations, and other aircraft types may produce variations to the profiles shown in the videos.

Environment around the proposed site

Local landscape around the proposed site

There are a variety of landscapes around the proposed site.

The proposed site can be approached from three different directions, each of which reveal quite different landscape experiences, including:

- pastoral,
- river valleys with hills and mountains climbing away from State Highway 8,
- sedimentary terraces,
- farmlands, vineyards and orchards.

The proposed airport site sits at the eastern edge of a river plain or terrace created by historic changes in the course and flow of the Clutha (Mata-Au) River, as well as alluvial deposits. The proposed airport site is framed by the 'working' nature of most of the landscape enclosing it.

The visible effects on landscape will depend on vantage point

The airport itself – including its terminal, control tower, hangars, runway and ancillary buildings – is likely to have quite a low profile. The area's topography means the proposed airport site is viewed at a flat angle from most surrounding areas of public activity (including the state highways) and most of the residential occupation areas near the proposed site.

Those physically close to the proposed site are more likely to be directly exposed to both the airport's visual effects and aircraft movements which will require assessment. Good design practices and a mitigation strategy will help reduce the magnitude of effects on environments in closer proximity to the proposed airport site.

Tarras is a small rural settlement and good design will help to maintain its character

This might include locating buildings to capitalise on a 'natural advantage' that the proposed site currently has. A mounding / earth-working and planting strategy could be developed for the entire airport so that future development is integrated with a buffering and enhancement strategy for the entire site.

For more information, see the Landscape Information Sheet at centralotagoairport.co.nz.

A video concept has been created to demonstrate what an airport and terminal might look like its scale, and how it might integrate with the landscape.

View the video at **centralotagoairport.co.nz/information-resources/videos**

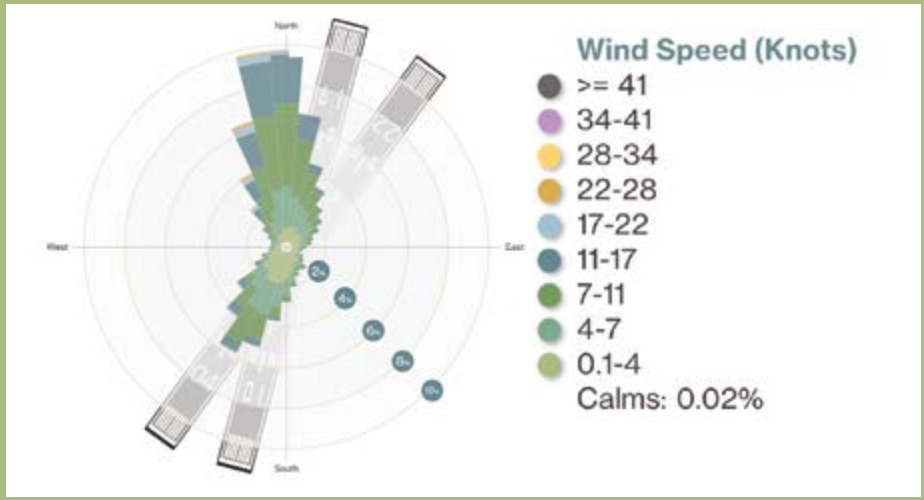
Ongoing weather analysis supports initial modelling

The preliminary analysis of the modelled NIWA data undertaken in 2021 indicated that wind and temperature conditions were within normal operating parameters; and that appropriate aircraft and airport infrastructure and crew training could be deployed to enable aircraft to operate even in very low cloud conditions.

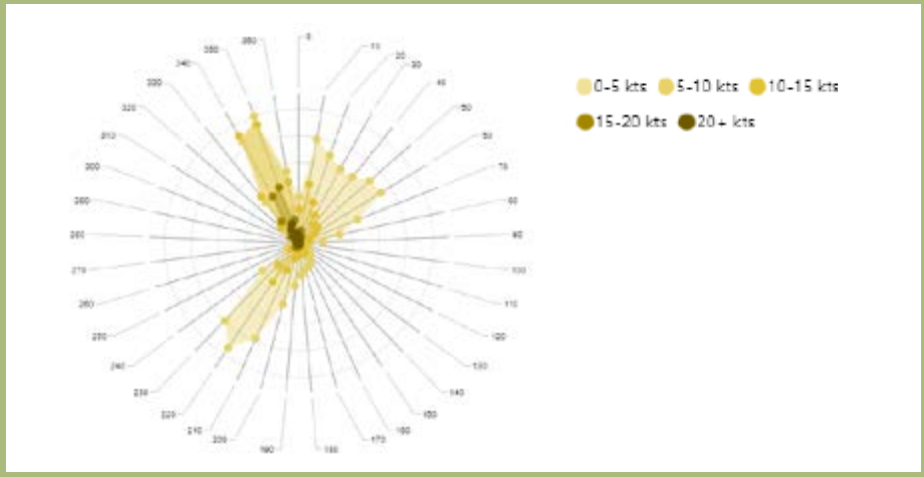
A MetService weather station has now been operating on the proposed airport site for a year. An initial comparison of the NIWA data and new MetService data shows virtually no differences from the preliminary assessment.

The prevailing wind is from the north and north-west

- The prevailing wind conditions at the proposed site are north and north / north-west.
- The on-site weather station has shown some light wind from the north-east, mainly under 10 knots.
- Aircraft operations are likely to favour northerly operations on Runway 04 with departures using the Lindis Valleys and arrivals using the Dunstan Valley.
- Predominant wind speeds are less than 15 knots. Windspeeds above 15 knots occur less than 5% of the time and tend to come from a northerly direction.
- Crosswinds do not appear to be a limiting factor for the 04/22 runway alignment and a preliminary assessment of runway usability meets International Civil Aviation Organization (ICAO) and Civil Aviation Authority (CAA) recommendations for most aircraft categories.



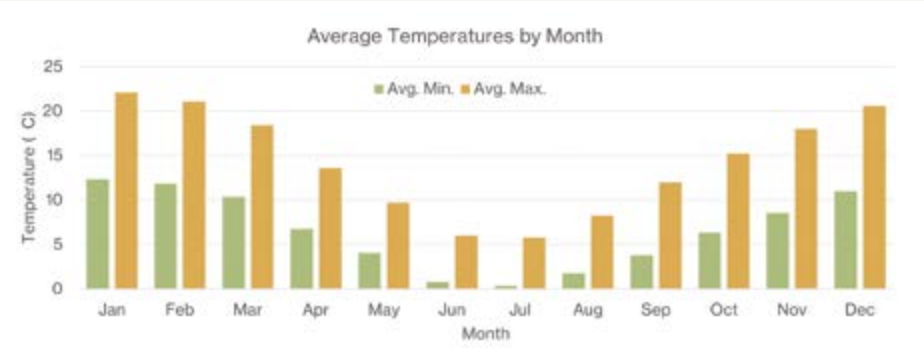
Based on Airbiz analysis of NIWA modelled data for 10 year period.



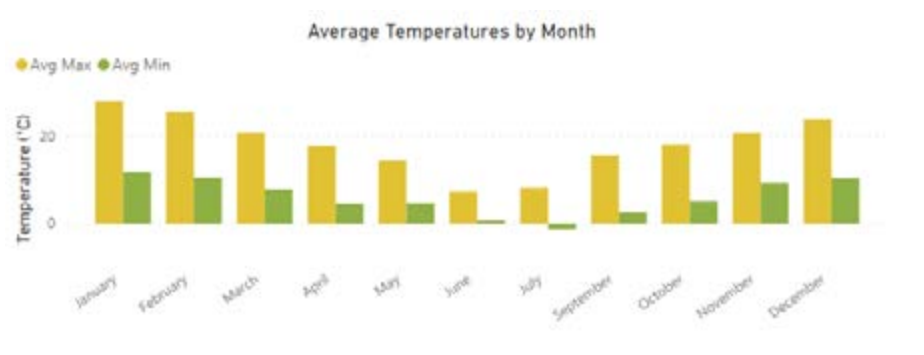
On-site weather station data collected for 9 months

Temperatures are within normal operational conditions

- The average of the daily maximum temperatures for each month range from 6°C in July to 22°C in January.
- Temperatures above 30°C only occur occasionally.
- The on-site weather station is showing daily average minimum temperatures are warmer, and daily average maximum temperatures are cooler compared to the modelled data. Both minimum and maximum average temperatures are within normal operating parameters.
- On-site data has not been analysed for June-September 2023.



Based on NIWA modelled data for 10 year period.



On-site weather station data collected for 11 months

Visibility

- Visibility data indicates generally good conditions with winter being the season with some fog/low cloud (visibility below 1000m at ground level).
- Analysis of fog/low cloud in winter indicates that fog/low cloud typically occurs overnight from midnight to 10am and for these hours fog/low cloud was present approximately 6-10% of the time.
- On-site data has not been analysed for June-September. With winter generally being the worst season for fog and low cloud analysis will be completed after a full set of seasonal data is available.
- While decisions have not yet been made, technology is available to mitigate the impacts of any low visibility. This technology is significantly easier to install in a greenfield development.

Ecology at the proposed site

Birds

- 49 bird species have been found in surrounding landscape.
- Most species are classified as 'Not Threatened' or 'Introduced'. Some 'At Risk' river bird species have been recorded south of the proposed site.
- Initial indications are any habitat disruption would not have a significant adverse effect on Threatened or 'At Risk' species.

Water

- Site sits between Clutha River / Mata-Au and Lindis River. Water quality of both classified as A (good).
- Conventional airport activity is likely to use less water than agricultural activity.

Plants

- There is a mix of introduced and native species.
- An area of dryland vegetation is present.

Archaeology and Wāhi Tūpuna

- Records provide some limited evidence of early Māori presence and early domestic occupation within the Site but provide no details on whether any archaeological features or taonga remain.

Insects and lizards

- The species and number of insects found on the proposed site are as expected.
- Some species of lizards identified as present.
- One species of grasshopper was identified and is categorised 'At Risk'.

Fish

- Freshwater fish are present in nearby rivers.
- Some small fish identified in the waterways on site.

The proposed site is well connected to existing transport networks

Early analysis has been conducted to consider how an airport would impact existing transport infrastructure. Themes that have emerged from this early land transport analysis are:

- The proposed site is well-connected to New Zealand's state highway network.
- For most Central Otago residents, the new regional airport would be their closest airport.
- Central Otago's traffic volumes will increase regardless of whether the new regional airport is built.
- Ongoing growth in traffic will require some land transport infrastructure to be upgraded, regardless of whether a new airport is built.
- Not addressing the existing airport capacity constraint in Central Otago will not remove demand. Instead, people will travel long distances by road to reach the region. This will result in inefficient travel patterns and increased emissions.
- Parts of Central Otago's roading network are at risk of natural hazards. Points considered to be at 'extreme' risk exist on the network, for example Kingston to Queenstown and Nevis Bluff.
- A new regional airport in Central Otago would have minimal impact on traffic volumes in the Wakatipu Basin – the area under the greatest pressure at present.
- Having a new regional airport could strengthen the case for an sub-regional public transport network by providing consistent daytime demand.

More information on land transport is available on the Land Transport Information Sheets at centralotagoairport.co.nz

Aviation can be part of a low emissions future

The aviation industry has a strategy to reduce its emissions impact

The International Civil Aviation Organization (ICAO) is funded and directed by 193 governments, including New Zealand. To address climate change, ICAO introduced two primary goals in 2010:

1. To improve fuel efficiency annually by 2% from 2010 onwards,

2. To achieve carbon neutral growth from 2020.

To achieve this, the ICAO has developed a four pillar strategy to focus efforts to decarbonise aviation:

Operational Improvements	Aircraft Technology	Sustainable Aviation Fuels (SAFs) Travel	Carbon Offsetting
Zero carbon airports Efficient ground operations Low carbon ground technology	Improving current aircraft design Fuel-efficient flying New low and zero carbon aircraft (electric and hydrogen)	SAFs can deliver an **80% reduction** in emissions	The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) will require airlines to offset CO_2 emissions from international flights.

Christchurch Airport has demonstrated how to remove emissions from airport operations

Christchurch Airport is globally recognised for its sector-leading initiatives to reduce the emissions from airport operations. This has led to an 88% reduction in Scope 1 emissions – or those emissions directly in the airport's control – from operations at Christchurch Airport.

The Airport also works with key aviation stakeholders to help identify and deliver the infrastructure that will be necessary to support aviation's transition to low emissions.

	Scope 1	Scope 2	Scope 3
What they are ...	Direct emissions	Indirect emissions from energy purchases	Indirect emissions from a company's value chain
For airports that might include ...	Fuels burnt on-site (boilers, generators, operational vehicles) Refrigerant gas loses Runway de-icer	Purchased electricity	Commercial tenants Land transport travel to/from the airport Waste disposal Aircraft emissions Contractor vehicles and activities
	Control		**Influence**

Reducing the emissions impact

A new airport in Central Otago can help reduce New Zealand's carbon emissions footprint in three ways

By making considered decisions in three key areas, a new airport could help to reduce New Zealand's carbon emissions footprint. These are:

1. All of journey emissions

2. Airport operations

3. Embodied emissions

1. Journey emissions are made up of each major transport component of a journey

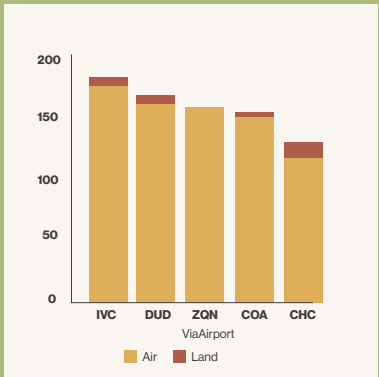
There are emissions outcomes for any decision to travel irrespective of the mode. Scenarios have been created to understand the impact of travel to and from Central Otago, including using both the proposed airport and existing airport infrastructure, and accepting the capacity constraints of Queenstown Airport.

Allowing air transport demand to be unmet by suitable capacity will cause people and freight to endure emissions-inefficient, time-consuming, and costly alternative journeys.

Early estimates suggest an additional 500,000 vehicle kilometres per day could be added to the land transport network as a result of passengers needing to drive to and from the alternative existing airports of Christchurch, Dunedin and Invercargill when sufficient flights and seats are not available at Queenstown due to its constraints.

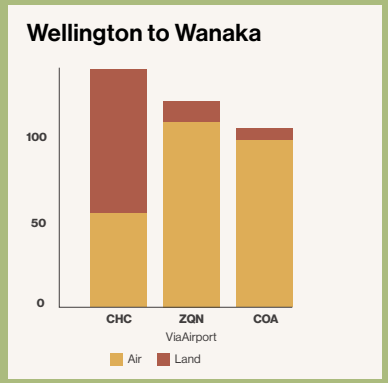
A series of personas and situations have been developed to show the total journey emissions for passengers as well as the emissions for moving freight to and from major freight ports.

Total journey emissions for travel to and from Central Otago



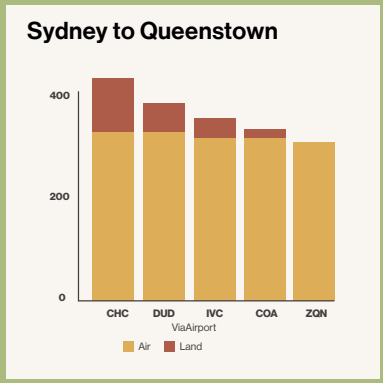
James is aware of the emissions produced because of his decisions. He's also a big music fan. James is travelling from Queenstown to Auckland for a concert and wants to make the least impact with his travel.

He flies home from Auckland via Christchurch and gets a bus to Queenstown.



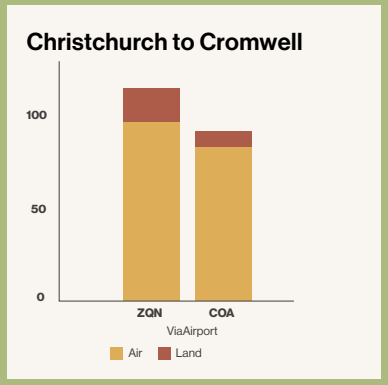
Ani is a Wānaka-based artist who enjoys a weekend in Wellington visiting galleries, friends and other artists. During Covid-19 restrictions, Ani's wellbeing suffered due to a lack of face-to-face contact with her artistic community.

Ani travels via Central Otago Airport and has left her medium sized petrol car at the airport so she can drive home.



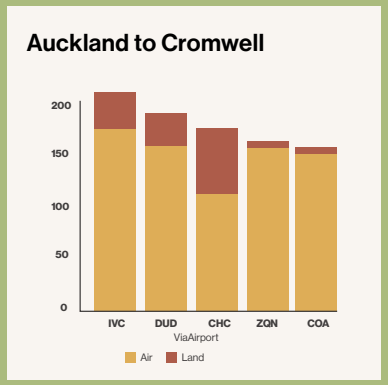
Charlie lives in Sydney and is meeting friends in Queenstown for a ski holiday. Due to higher demand, it may be difficult and expensive for Charlie to get a flight directly to Queenstown.

Without a Central Otago Airport, they would need to fly to Christchurch, Dunedin, or Invercargill and drive a rental car to Queenstown. The data in this example assumes a medium sized petrol car.



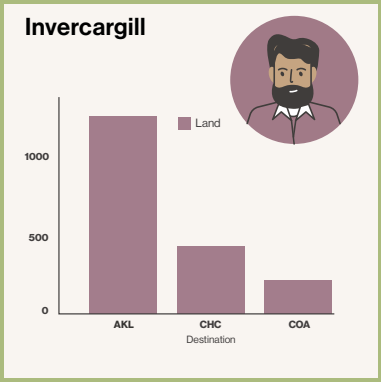
Dave is a regional manager based in Christchurch and looking after most of the South Island. He needs to visit clients in Cromwell efficiently so he can be home for his mum's birthday dinner that evening.

Dave flies to Central Otago Airport and uses a hybrid rental car to travel to Cromwell.



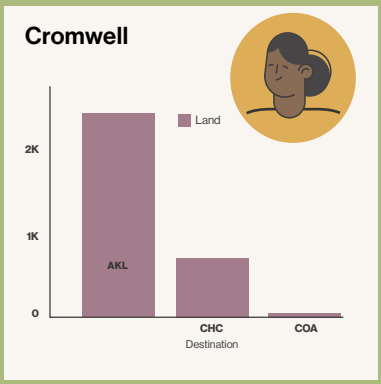
Margaret lives in Cromwell and her daughter lives in Auckland. Margaret's daughter has recently given birth to her second child. Margaret lives in Cromwell and wants to visit her daughter but has struggled to get reasonably priced flights since her first grandchild was born.

The Central Otago Airport would mean Margaret can visit her whānau. The data in this example assumes a hybrid vehicle to drive to Cromwell.



Ray owns a rock lobster fishing business operating in Foveaux Strait. Most of Ray's catch is exported offshore as live catch and can last up to 5 days in specialist packaging. Speed and efficiency are important to Ray – but his customers want to know the company takes steps to reduce their carbon footprint.

Ray needs to get his catch to a major freight port so it can be exported. His options are Christchurch, Auckland, Central Otago.



Tracy is the logistics manager for a cherry orchid in Cromwell. Her job is to oversee the supply chain from packhouse to international port.

Tracy needs to ensure 10 tonnes of cherries get to Singapore in time for Chinese New Year celebrations.

Tracy looks into the emissions for getting the product to a freight hub - Auckland, Christchurch and Central Otago.

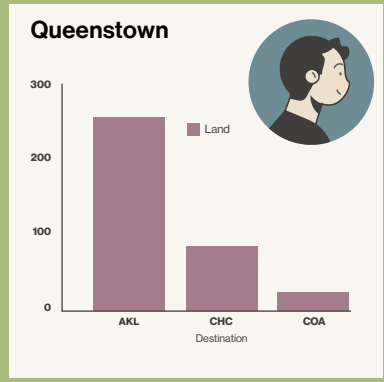
Notes

Meaningful quantities of air freight can only be transported through wide-body enabled airports. For this reason, we have used Auckland and Christchurch Airports as the only wide-body capable airports in New Zealand currently.

**all calcs assume 0.164kgCO2e/tonne/km*

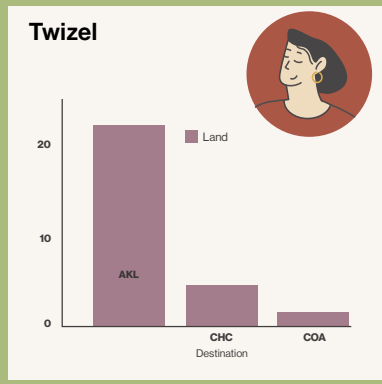
***emissions for ferry crossing (for AKL freight) unknown at this stage*

**** this analysis provides no emissions factors for air freight component because they are all roughly equal to one another (e.g. air distance CHC to Singapore ≈ AKL to Singapore, CHC to Sydney ≈ AKL to Sydney).*



Gus is a mechanic for a large vineyard near Queenstown. He needs to urgently replace a part in harvesting machinery. The crop needs to be picked within the next two weeks so Gus is under a lot of pressure.

The part for the machine comes from Germany and is quite large (1 tonne). The company says they can get it on a plane the following day but it will need to be trucked to Queenstown from Christchurch, Auckland or Central Otago due to its size.



Lynn works for a produce exporter near Twizel. Her manager has asked her to look into the carbon footprint of getting 100kg of produce from Twizel to the major freight ports they use: Christchurch, Auckland and the potential airport in Central Otago.

Currently the produce is trucked to Christchurch before being exported, but sometimes Lynn can't get space from Christchurch and has to send it via truck to Auckland – adding significant time delays and carbon emissions.

2. Efficient airport operations will help aviation reach its net zero goal

The way airports operate impact on the ongoing operational emissions produced. To reduce operational emissions, airports need to:

- develop airfield infrastructure (runways and taxiways) that allow new and next-generation aircraft types to operate efficiently,
- be ready to support cleaner aircraft technologies, including battery electric, green hydrogen or Sustainable Aviation Fuel (SAF) powered aircraft types,
- ensure airlines have access to resilient supplies of renewable energy sources,
- ensure airline ground operations are designed, delivered and maintained in ways that continue to remove emissions.

A greenfield airport could reduce carbon emissions

By using sustainable design principles, utilising renewable energy sources, implementing efficient transportation systems, and adopting environmentally friendly practices a new, well-positioned airport could be part of New Zealand's low emissions future.

Christchurch Airport has gained significant expertise and is a global leader in emissions reductions which can be applied to the design and development of a new airport.

airport carbon accredited
TRANSFORMATION

3. Planning and design can reduce embodied emissions associated with construction

Embodied emissions refer to emissions created through the construction and maintenance of infrastructure. Within an airport, this could include the construction and maintenance of facilities and supporting airport infrastructure, such as road, parking areas, fuel storage facilities, and utility systems.

Embodied emissions can be mitigated through:

- Sustainable Construction: Adopting sustainable building practices during airport construction can minimise embodied emissions by using eco-friendly materials, optimising energy-efficient designs, and considering the entire life cycle of the infrastructure.
- Waste Management and Recycling: Implementing effective waste management and recycling programs can minimise the environmental impact associated with the disposal of construction materials, equipment, and other waste generated at airports.

The graphic on the right provides high-level estimates of the embodied emissions associated with infrastructure. These estimates have been sourced from a variety of sources including Waka Kotahi, AECOM and Thinkstep. The information is intended to provide a general indication of embodied emissions resulting from the development of infrastructure and is not a detailed analysis or forecast.

Embodied emissions from construction and maintenance of infrastructure

Average standalone house
63 tCO2e

20 average standalone houses
1,260 tCO2e

An airport, including terminal and runway
70,000 tCO2e

New highway of 25km
162,800 tCO2e

New rail line of 25km
234,700 tCO2e

Summary

1

Demand for air connectivity to Central Otago is likely to far exceed the region's current airport capacity over the next 30 years, resulting in the region spilling more demand than it meets by 2050.

Increasing the capacity of existing airport infrastructure only moves the problem for Central Otago out a few years.

2

A shortage of air capacity is likely to have a greater impact on residents through reduced choice, longer journey times, increased cost, disconnection, economic loss and higher emissions. A new jet-capable airport would provide capacity, efficiency, resilience and opportunity.

3

A modern airport secures high quality air connectivity for at least 50 years, securing economic activity for the region and future generations.

4

Runway 04/22 is the preferred runway alignment and meets all safety requirements, including the incorporation of a fully compliant RESA.

Runway 04/22 is likely to have less noise impacts, and perform better on a number of efficiency measures, giving airlines greater flexibility for aircraft types and operating parameters.

5

A runway length between 2,200m and 2,600m is the most realistic range of runway lengths for the site and surrounding terrain.

6

Ongoing weather analysis using on-site data supports the modelled data, showing local conditions are within operating parameters. Collection and assessment of data will continue.

7

Some land transport infrastructure may need to be upgraded regardless of whether an airport is built. Not addressing existing airport capacity constraint in Central Otago will encourage inefficient travel patterns and increase emissions

8

Internationally, the aviation industry is actively working to decarbonise.

A greenfield airport could reduce carbon emissions through good planning, design and operations.

A well placed airport can reduce total journey emissions.

Glossary

Terminology	Description
Approach gradient	The steepness of descent during landing phase.
CHC	Christchurch International Airport (an airport) operated by Christchurch International Airport Limited (a company).
Civil Aviation Act	The Civil Aviation Act 1990 governs New Zealand's civil aviation system and sets the overall framework for aviation safety, security and economic regulation. The Civil Aviation Act 2023 will come into force on 5 April 2025, replacing the Civil Aviation Act 1990.
Civil Aviation Authority	A Crown entity responsible for the safety, security and supporting an integrated, safe, responsive and sustainable transport system.
Crosswinds	A wind blowing across one's direction of travel.
Decision height	A specified altitude or height in an approach with vertical guidance at which a Missed Approach must be initiated if the required visual reference to continue the approach has not been established.
Departure gradient	The steepness of the climb from take-off to cruising altitude.
Domestic	Travel within New Zealand.
DUD	Dunedin Airport.
Emissions	The production and discharge of pollutants.
Engine Out Standard Instrument Departure (EOSID)	The procedure followed where engine failure has occurred and where the flight crew are committed to a continued takeoff with one engine out.
Flight procedures	A set of pre-determined manoeuvres with specified protection from obstacles design to achieve safe flight operations and orderly flow of air traffic.
Flight tracks	The pathway that an aircraft will follow within an Instrument Flight Procedure.
Horizontal Flight Efficiency	A measure of the relativity between the actual flight path length and a hypothetical direct distance.
Instrument Flight Procedure	A procedure used to fly aircraft safely.
International	Travel outside of New Zealand.
International Civil Aviation Organisation (ICAO)	An international organisation funded by governments in order to foster co-operation in air transport.
IVC	Invercargill Airport.
MartinJenkins Airport Impact Assessment Report 2020	A report prepared for Queenstown Lakes District Council dated 15 June 2020 by Martin, Jenkins and Associates Limited.
MetService	New Zealand's national weather service.
Missed approach	A procedure to be followed if an approach to land cannot be continued.

National Institute of Water and Atmospheric Research (NIWA)	A Crown Research Institute established to conduct environmental science
Navigation Specification (NAVSPEC)	A set of aircraft and aircrew requirements needed to support navigation application within a defined airspace concept.
Obstacle Control Surface (OCS)	Sits within the Visual Segment Surface (VSS). When obstacles breach the OCS, aircraft cannot approach.
Obstacle Limitation Surfaces (OLS)	Area ideally kept free of obstacles to minimise the danger to aircraft.
Pax	Aircraft passengers.
Payload	The carrying capacity of an aircraft from which revenue is derived; passengers and cargo.
Population centroid	The geographic location that represents a region's 'population centre of gravity' or the point around which the region's population is evenly balanced.
QAC	Queenstown Airport Corporation Limited.
QAC 2018 Master Plan Options Document	QAC consultation document outlining three main options to manage demand – expansion, new airport or dual airport.
QAC 2022 10-Year Strategic Plan	Document outlining the direction QAC intends to take over the next 10 years.
QAC 2023 10-Year Master Plan Consultation Document	A long-term planning document prepared by Queenstown Airport Company.
Required Navigation Performance (RNP)	A type of performance-based navigation that allows an aircraft to fly a specific path between two 3D-defined points in space.
Runway End Safety Areas (RESA)	A symmetrical area adjacent to the end of the runway to reduce the risk of damage to an aircraft over or under shooting the runway.
Required Navigation Performance Authorisation Required (RNP-AR)	RNP-AR requires air operations to have authorisation from a civil aviation regulator to operate below standard RNP 0.3 nautical mile values.
RNP 0.3 NAVSPEC	An RNP of 0.3 means the aircraft navigation system must be able to calculate its position to within a circle with a radius of one tenth of a nautical mile.
Total journey emissions	The emissions created from all major components of a journey, including air travel and land transport.
Visual Segment Surface (VSS)	An area that needs to be kept clear of obstacles to support safe landing of aircraft.
ZQN	Queenstown Airport.

You are always welcome to contact us and provide feedback at central@christchurchairport.co.nz

CHRISTCHURCH AIRPORT