MASTER PLAN

CHRISTCHURCH AIRPORT

INTRODUCTION

Airports form a critical component of the international and domestic supply chain, provide the opportunity for people and freight to be connected across continents and unlock the economic capabilities of cities, regions and countries. Airports over the past century have evolved to become multi-disciplinary organisations that generate economic activity, not only from aeronautical activity but also from activities supporting the large number of passengers, visitors, well-wishers and employees. They are now becoming business hubs and are fundamental determinants of urban growth and economic performance of the markets they serve.

Christchurch Airport is located 10 kilometres northwest of Christchurch city centre, on the western city development edge and is a critical piece of significant national and regional infrastructure. Christchurch International Airport Limited (CIAL) is responsible for the efficient and safe operation of Christchurch Airport and aims to provide the airport's diversity of users with modern, appropriate and competitive facilities and services.

Christchurch Airport is the major gateway to the South Island. We fully appreciate that international connectivity is crucial to fostering economic development, so are highly energetic and successful in international air services development for new and expanded routes to and from Christchurch. The Airport is home to the Antarctic research programmes of the United States of Americaand New Zealand, making it one of only 5 Antarctic Gateway Cities in the world.

The Airport's business has been significantly affected as a consequence of the destructive earthquakes of 2010 and 2011, which have disrupted normal traffic and visitation patterns to Christchurch and the South Island and influenced CIAL's business priorities for several years. CIAL has played a central part in the disaster response and recovery. Its business focus has returned to a future-oriented approach, where it plays a central role in the wider economic development of Christchurch, the South Island and New Zealand as a whole.

The Christchurch Airport Master Plan is a guide for future development, allowing the Airport to grow activity in a flexible, efficient, safe and sustainable manner that continues to support the community aspirations of Christchurch city, the Canterbury region and New Zealand as a whole. The Christchurch Airport Master Plan will also act as a significant marker in CIAL's on-going story of sound long-term land use planning.

The purpose of the Christchurch Airport Master Plan is to provide a long-term land use and infrastructure planning framework for delivery of our strategic objectives as well as painting a picture of the 2040 future, that:

1. Enhances long-term value of assets and thereby create value for our shareholders
2. Guides responsible development
3. Captures community expectations
4. Informs and supports the three year Business Plans and Real Growth 2025 strategy plans.

This document focuses on the major land use and infrastructure components required to provide the capacity and capability to cater for forecast demand and user requirements. The Christchurch Airport Master Plan Long Term layout is shown in Figure 1, on the next page.

This document is a summary of the more technically focussed Master Plan. The full Airport Master Plan is a technical internal planning document.

Figure 1; Christchurch Airport Master Plan Long Term Layout

CURRENT SITUATION

Christchurch Airport is the major gateway to the South Island. There are four airlines providing domestic services from the Airport and nine operating short and long-haul international services.

Christchurch Airport has celebrated many significant milestones since commercial flying began at the Airport in 1940. In 1950, Christchurch Airport became the first international airport operating in New Zealand and 1955 saw the beginning of United States Antarctic Operations. The main runway was extended in 1962 and again, to its current 3,287m length, in 1985. There have been numerous terminal developments over the 65 years, most recently the new terminal building opening in 2013.

The Airport's footprint falls entirely within the Christchurch City Council territorial area; however the extended centre line of the main runway and the areas impacted by the Airport's noise contours extend into the neighbouring districts north and south, namely Waimakariri and Selwyn districts. Ownership of CIAL is shared 75% by Christchurch City Holdings Limited and 25% by the New Zealand Government.

Airports have a strong multiplier effect on the economies they serve and are critical regional economic development and social infrastructure. For CIAL, this has been independently estimated at 50:1, or for every $1 CIAL earns, the wider South Island economy earns $50.

CIAL is a critical piece of strategic national and regional infrastructure and provides a significant contribution to both the Canterbury region and the South Island as a whole, with the total airport operation employing more than 6,500 employees across a diverse range of companies. An Economic Impact Assessment review in 2012 identified that Christchurch Airport contributed to the generation of $1.8 billion in regional GDP, representing 7.1% of the total GDP in the Canterbury region and created employment for 9.7% of the region's workforce.

CIAL is committed to Christchurch Airport being recognised as a good place to do business and through this create and grow the Airport as a strong economic base. To achieve this, CIAL will actively pursue development of infrastructure and provide a development environment, to support aeronautical and commercial investment on the wider airport campus by businesses which have synergies with the Airport campus and/or require ready access to air services. CIAL will also ensure it promotes Christchurch as a great place to live, work and do business.

EXISTING AIRPORT FACILITIES & CAPABILITIES

Christchurch Airport operates as a two runway system with a main runway and a cross wind runway that intersects the main runway. Both runways are able to be utilised together, with the appropriate restrictions required for a system with crossing runways:

- The main sealed runway 3,288m designated 02/20, and
- The cross wind sealed runway 1,741m designated 11/29.

Runway 02/20 is the main runway and, coupled with its taxiway system, represents the major item of investment of airport infrastructure. It is well established in the surrounding community that this runway accommodates the predominant traffic volume throughout the year, and operates on a 24-hour per day basis.

Runway 11/29 is currently utilised predominantly in northwest wind conditions by aircraft sized up to Code E, or during periods of maintenance on the main runway.

Overall, about 10% of annual movements use this runway, although much of the northwest condition occurs in spring and the approach path during this operation is over portions of suburban Christchurch.

In addition to the above sealed runways, a general aviation grass strip 515m long x 135m wide is provided parallel to and west of Runway 02/20.

CIAL has demonstrated a consistent and thorough approach to planning that gives confidence in the future development direction presented in this Christchurch Airport Master Plan. This approach can be seen in many studies including previous the Christchurch Airport Master Plans.

The overview of CIAL's current land use activities and aeronautical infrastructure is provided in Figure 2.

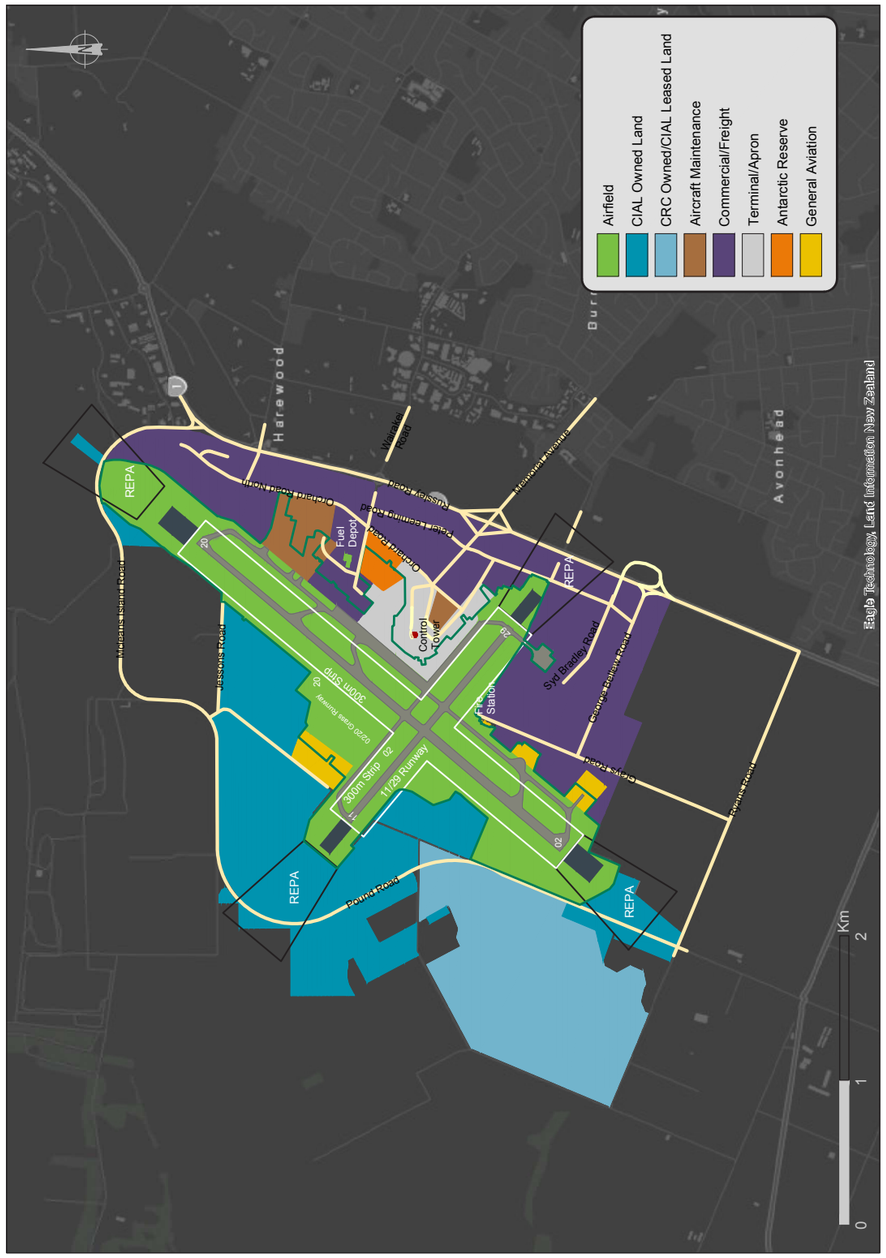

Figure 2; Overview of Current Airport Facilities

DEMAND FORECASTS

CIAL focuses on creating places and space for people to dwell, creating an opportunity to enhance the visitor experience. The Christchurch Airport Master Plan provides for landside and airside improvements in a coordinated manner which reflects forecasted demand including aircraft movements, accommodation and other commercial activities.

The demand forecasts detail the expected number of passengers, aircraft and visitors that CIAL facilities need to cater for. Underlying this forecast are assumptions in relation to the operation of the Airport itself, Christchurch as a city and the South Island as a whole. More specifically, the forecast is set at a state where by 2025:

- The rebuild is complete, including convention centre and stadium
- Christchurch has adopted a visitor strategy, which can be evidenced in the actions of key stakeholders
- The Airport has reclaimed its position as the preferred transit hub for the South Island
- The City has developed Iconic Attraction/s.

Table 1 below provides forecast passenger and aircraft movements across the short, medium and long term based on the assumptions above.

Table 1: CIAL forecast passenger and aircraft movements

It must be noted that the growth forecasts used are conservatively positive to make sure that long lead time infrastructure and land use changes are investigated in time for delivery.

Forecast growth is concentrated towards an increasing proportion of international travellers with strong domestic demand. The forecast total passenger movements are expected to grow faster than the forecast total aircraft movements, due to the general trend of increased aircraft size.

While the total number of passengers, whether they are domestic or international and the size of the aircraft are critical components for airport development, the requirements for terminal space is the number of passengers required to be handled during peak period – also known as the number of busy hour passengers.

Due to the location and size in relation to the international airports it serves, CIAL has limited ability to dictate the scheduled arrival and departure times. Instead, CIAL is required to react to and accept the times that best serve the airline schedules which are often dictated by availability at other international hubs.

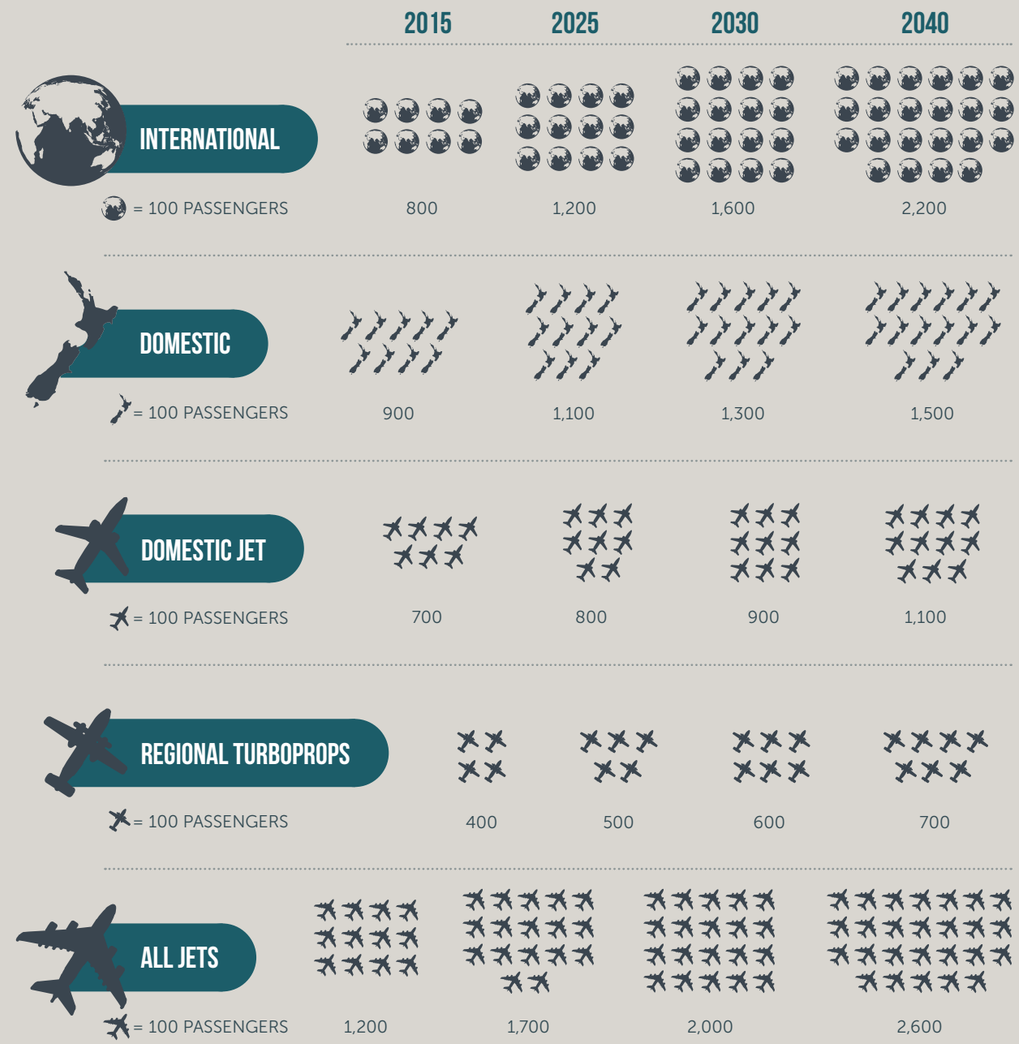

Table 2: Busy Hour passenger demand

Therefore the busy hour peak is a key determinant of capacity requirements. The number of passengers that CIAL's terminal facilities are required to cater for at busy hour is expected to increase significantly over the longer term – increasing 135% for Arriving passengers and 118% for Departing passengers between 2015 and 2040. This is significantly higher than the forecast increase in total annual passenger of 85% and total aircraft movements of 65% over the same period.

What this means is that there needs to be a concentration on the operational efficiency of the car parking, terminal facilities and apron facilities at the peak or busy hours in order to cater for the level of service requirements of passengers at the busiest hours while not over investing in infrastructure and having significant idle capacity outside busy or peak hours.

In terms of the current daily peaks, there is

- an early morning (0500 hour) peak in passenger movements due to trans-Tasman departures,
- a peak in passenger movements between 0700 and 0900 due to regional aircraft movements,
- a peak in passenger movements mid-afternoon due to wide body international movements and
- a late night (2300 hour) peak in passenger movements due to trans-tasman arrivals.

CIAL continues to evaluate the level of service provided to passengers, visitors workers and businesses to align infrastructure provision and land use to the strategic direction of the organisation.

AIRFIELD & AVIATION

The Christchurch Airport Master Plan takes a staged approach to the development of airside, landside and the terminal, and allows for the use of emerging technology where appropriate. CIAL ensures compliance with safety and security requirements, while providing airside improvements, supporting demand for aircraft movements by larger international aircraft and for increased freight.

Current facilities are high quality and can support the regular scheduled movements of the largest passenger aircraft on a regular basis. However, as detailed in the forecast passenger, aircraft movements, and busy hour forecasts, CIAL will be required to develop capacity and capability of airfield facilities - especially in the areas of operational resilience, flexibility and peak capacity.

The 2006 Airport Master Plan, in reference to a 2003 Airfield Study, determined that, in future, Runway 11/29 should have a wider level of use rather than just in northwest wind conditions, contributing to the overall airport runway capacity in conjunction with the main Runway 02/20, under Simultaneous Operations (SIMOPS). This approach would allow capacity enhancement and delay the massive cost and planning investment required for a second parallel runway.

Introducing independent Simultaneous Operations on the existing two runways, or at least reducing the inter-dependency of arrival and departure operations, can increase capacity of the existing airfield. This is achievable at Christchurch Airport by retaining a cross runway configuration and by extending the main runway, Runway 02/20, by approximately 300m to the north and extending the northwest runway, Runway 11/29, to the west to a length of around 2,200m as shown in Figure 3 below.

There are three prevailing runway modes of operation anticipated to be used under SIMOPS. In providing for additional capacity through airfield enhancements (taxiway and runway) and operational changes, these and other Runway Modes of Operation (RMOs) will have to be developed through detailed consultation with stakeholders, such as Airways New Zealand and airline operators, to determine their effectiveness and usage.

RUNWAY MODE OF OPERATION

	1	2	3
WIND DIRECTION	NE / E	SW	NW
USE PERCENTAGE	50-70%	20-40%	10%
OPERATION	• Intersection Departures Runway 02 • Arrivals Runway 11 • Large wide body aircraft to use the full length of Runway 02 for both arrival and departure	• Intersection Departures Runway 20 • Arrivals and Departures Runway 29 • Large wide body aircraft to use the full length of Runway 20 for both arrival and departure	• Departures Runway 29 • Arrivals Runway 29 • Large wide body aircraft to use the full length of Runway 02 for both arrival and departure

Table 3: Runway Mode of Operation

The extension to the main Runway 02/20, when that is required and justified, would be contained on land owned by CIAL and within the current airfield.

The extension to the cross wind Runway 11/29, when that is required and justified, would be contained on land owned by CIAL and within the current Airport Designation. The recently completed Pound Road realignment would allow for the extension to the cross wind runway that is shown in the Airport Master Plan.

Additional taxiway elements are also required to enhance existing aircraft movements, apron access and improve runway capacity through expediting runway egress and access. The approximate location of these are outlined in Figure 3.

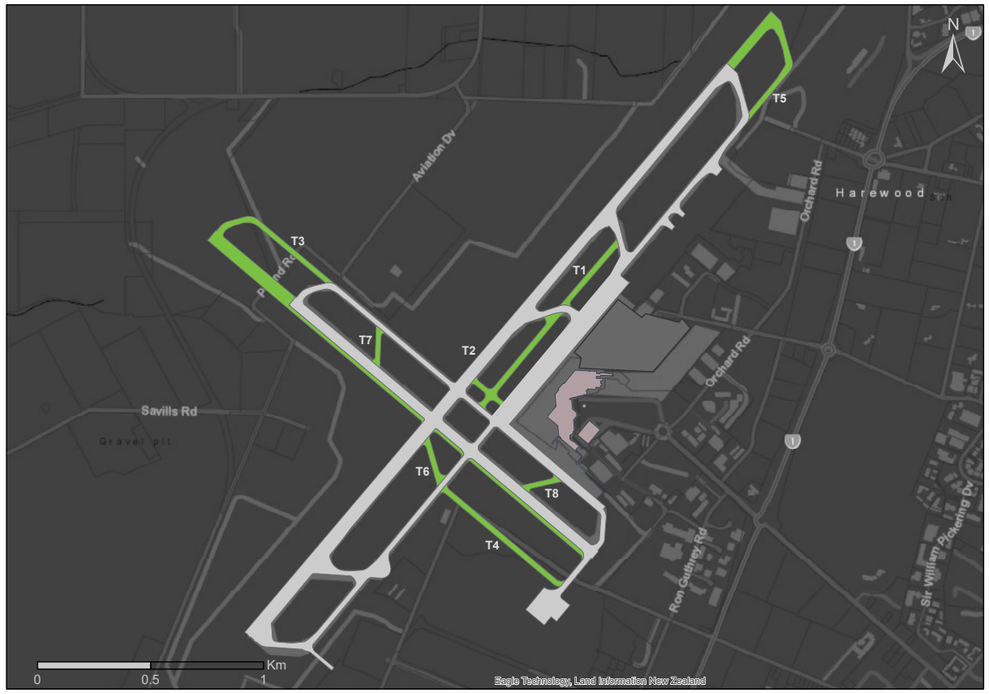

Figure 3; Airfield Development Requirements

The Airport Master Plan also allows for the realignment of Runway 11/29 in the form of a 15m move towards the south. This 15m move of the runway centreline would provide Code E taxiway separation between Runway 11/29 and Taxiway F.

The cross wind Runway 11/29 is an instrument non-precision runway with a 150m runway strip width. The Airport Master Plan provides for this runway strip width to expand to 300m which would align with the international standards that are contained in the International Civil Aviation Organisation (ICAO) document Annex 14 Volume 1 Aerodrome Design and Operation. ICAO and NZCAA Standards and Recommended Practices require that a precision approach runway shall be contained in a runway strip of 300m width. This 300m wide runway strip is centred on the Runway 11/29 centreline moved 15m towards the south.

The current width of 60m of the main Runway 02/20 and 45m of the cross wind runway 11/29 meets the requirements set out in NZCAA AC139-6 Rev 4. Any extension of either runway would continue at the 60m and 45m widths.

While the infrastructure requirements outlined above provide for the continued increase in capacity, CIAL continues to investigate opportunities to integrate new technology and to improve safety and passenger experience in collaboration with Airlines, Civil Aviation Authority, Ministry of Transport and Airways New Zealand.

The 2006 Airport Master Plan included reference to the need for a future parallel runway to be located at least 2,000 metres to the west of Runway 02/20 at a time beyond the planning period.

Additional factors in locating a runway include land availability, any obstructions to flight paths, aircraft taxiing times, environmental impacts (including noise exposure contours), etc. Therefore the future runway has been shown as an indicative band (1,800 – 2,100m) on the diagram, because the exact location, separation and length of such a runway would be subject to further detailed study at a more appropriate time. The taxiway links are also shown as indicative bands, because their exact location and composition will be determined by the location of both the parallel runway and any future terminal area between the runways.

While it is unlikely that the second parallel runway will be required before 2040, it is vital that a long term planning approach is undertaken. This will ensure irreversible land uses are not undertaken in the area of both the physical environment of the future runway and the surrounding noise sensitive area, which would result in the airport being operationally constrained in the long term future, limiting the economic and social development of Christchurch, Canterbury and the South Island.

In terms of land use immediately adjacent to the airfield facilities described, it is assumed:

- That the existing aircraft maintenance precinct location and size is retained but that a north western Aviation Support precinct that could include a relocated fuel storage facility and the opportunity for new aeronautical commercial developments such as addition aircraft maintenance is reserved to enable long term growth.
- That the existing Antarctic Area adjacent to the passenger terminal is retained, but only where it does not impact on the long term expansion of the terminal reserve. A land area in the south eastern precinct is reserved for possible relocated Antarctic operations or expanded freight facilities to allow terminal precinct growth.
- RESA and REPA areas to remain protected.

TERMINAL PRECINCT

The terminal precinct focuses on passenger footfall and dwell to increase operational efficiency, create an integrated journey from park to plane and provide an opportunity to enhance the visitor experience.

The terminal precinct, in this case, covers:

- Terminal apron
- Passenger terminal facilities, including the associated landside forecourt

Associated landside parking and approach roads are covered in the next chapter, land transport.

TERMINAL APRON

The aircraft stand demand on the terminal aprons is the minimum number of stands required on a common use apron to cover both:

- The highest number of aircraft on the ground at any one time; and
- The highest number of large, Code E and F, aircraft on the ground at one time.

In 2015 the demand for aircraft stands of 21 is below the existing apron's capacity of 31 stands. This has allowed the apron to operate in a largely segregated mode with parts of the apron dedicated to domestic turboprop, domestic jet and international jet aircraft. The forecast aircraft stand demand assumes a common use apron which has a lower total aircraft stand requirement than segregated operations.

The aircraft stand demand forecast has been prepared using the principle that additional stands are forecast to be for larger aircraft Codes as much as possible, i.e. no growth is forecast for turboprops stands and additional Code E and F stands are favoured over Code C stands. This means that growth in the turboprop stand demand is not reflected in a growth in dedicated Code C Turboprop stands in the demand forecast, rather it is reflected in the growth in Code C Jet stands as that would provide greater operational flexibility.

AIRCRAFT STAND DEMAND	EXISTING	2015	2025	2030	2040
CODE F	1	-	1	2	3
CODE E	4E + 2D	2	4	5	8
CODE C JET	12	12	14	15	16
CODE C TURBOPROP	10C + 2B	7	7	7	7
TOTAL	31	21	26	29	34

Table 4: Aircraft Stand Demand Forecast, 2015 – 2040

The demand forecasts in passengers, aircraft and busy hour demand compiled suggest that increases in plane and passenger movements busy hours will require a significant terminal expansion sometime around 2030. This expansion must be focused towards the up-gauging of aircraft and the greater concentration of international passengers outlined in the demand forecasts chapter above – capacity needs to be developed in the Code E and Code F stands (outlined by the **red** and **slate** planes in Figure 4.

The expanded terminal precinct provides the additional apron, terminal and landside capacity required for the expected passenger growth. The terminal apron expansion would be facilitated by removal of existing landside buildings and realignment of existing landside roads. The terminal expansion includes the option to satisfy the entire 2030 Jet stand demand with contact positions through a proposed pier development on the northern side of the terminal. In this concept, access to the existing Antarctic apron is maintained.

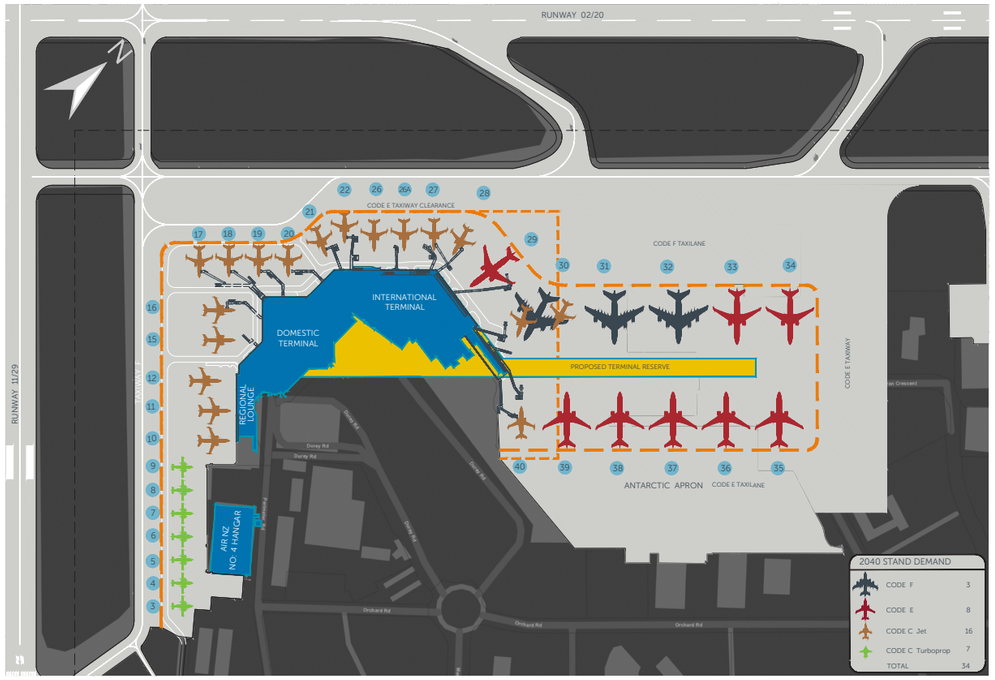

Figure 4; CIAL stand demand 2030

The lower cost alternative to this concept is remote aircraft parking stands with buses between the terminal and aircraft, with a reduction in level of service to passengers and a reduction in operational efficiency.

We are already in the process of relocating businesses to the north of the terminal – in particular large freight warehouses and a freight apron have been relocated as part of the Dakota Park freight facility.

Under the extended terminal plan large fuel reserves are close to the apron facilities - they are directly to the north or right of the picture outlined in figure 4.

Any further terminal expansions past 2040 may require relocation of the fuel reserves.

TERMINAL

Currently the CIAL terminal, while new is not operating at optimal efficiently, in particular:

- there are numerous routes through the facility, complicating way finding
- there is duplication of facilities (such as security)
- there is underutilisation in some areas with congestion in others
- there is limited remaining capacity in baggage make up and reclaim
- narrow throats in places which cause congestion

The proposed development of the terminal building is to create a flexible, scalable facility that creates an enhanced passenger experience, in particular:

- Enhanced passenger facilitation and experience on the journey through the terminal precinct, from park to plane that creates a strong sense of place at the Airport.
- Terminal precinct configured as a flexible solution, maximising potential for all flights to use any gates dependant on future demand.
- Landside integrated departure and arrival experience initially as the Forecourt Square, a central circulation and retail hub between the terminal and landside.
- Potential for future direct terminal connections from car park and hotel.

Figure 5 below outlines a concept for the development of this terminal solution between now and the year 2025.

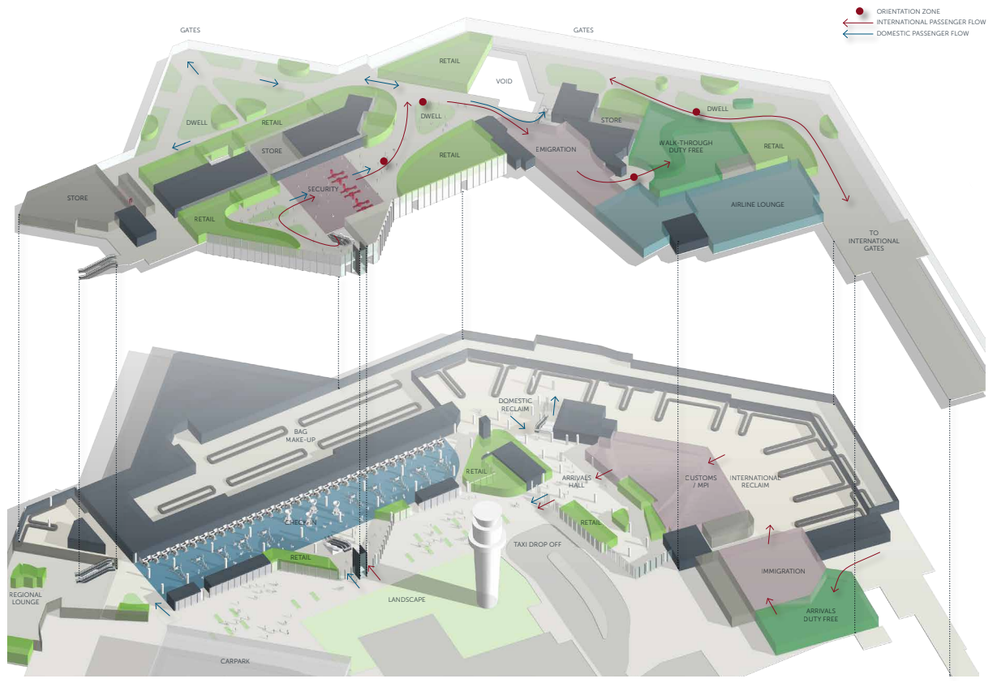

Figure 5; Terminal

The key concept here is a single route through the building – way finding is better, facilities are more aligned to the passenger at that part of the process and there is less congestion. Ultimately it is expected that this will lead to a more enjoyable, efficient trip for travellers, especially when coupled with digital technology solutions.

In the longer term these themes are replicated. In the future CIAL will carry out the investigation of a semi covered forecourt. The forecourt provides an orientation opportunity – it improves the operational performance of the terminal and carpark by concentrating and orientating footfall – almost like the centre of a train station. Before people check in and move towards their gates, there is a chance to gather information and orientate themselves rather than doing so just inside the building disrupting passenger movement and operational efficiency.

We also see this forecourt or plaza project creating a sense of place – through the use of local pop up stores and markets, art exhibitions, images, facilities and information on the history of the airport, city and region and a space to really showcase Canterbury and the South Island.

The forecourt also enables the hotel and multi modal transport facilities to be more integrated with the terminal experience.

The future plaza concept is outlined below in Figure 6.

OPTIONS TO IMPROVE REGIONAL PASSENGER MOVEMENTS

The current regional lounge experiences high volumes of passengers at peak periods. In contrast, there is relative capacity on level 1 landside domestic lounge, which represents opportunity for both operational efficiency and improved customer experience.

The opportunities explored seek to rearrange the regional passenger flows to address the following shortcomings without the need to expand the regional terminal:

- To better utilise existing assets, improve operational efficiency and to avoid expanding the terminal.
- To create capacity for additional regional services and to de-congest the existing regional departures lounge.
- To improved passenger experience for regional passengers by providing them with an improved retail experience, a larger departure lounge area and an easier journey to navigate.

Future legislation and/or regional passenger demand will drive the requirement for all regional passengers to be screened at the domestic security, and therefore follow the domestic passenger flow outlined in Figure 5. If regional passengers are not screened, it is expected that all passenger movements will be through level 1 in an optimised manner, improving way finding and journey experience.

It is noted that the walking distances from check in to gate will be greater than the current scenario, however the distances are comfortably within Level of Service standards and are still significantly less than the comparable New Zealand and Australian airports.

Figure 6; Future Plaza Concept

LAND
TRANSPORT ACCESS

CIAL places strong emphasis on relationships with the local community, region and country and seeks to enrich the passenger experience through enhancement of the urban environment, and to create an attractive compact urban form which is well connected, creates foot traffic and supports economic vitality.

The Christchurch Airport Master Plan provides for landside and airside improvements in a coordinated and integrated manner which reflects forecasted demand including aircraft movements, accommodation and other commercial activities.

Land transport access is divided, in this Master Plan, between terminal transport and wider campus transport, while noting that both elements must be integrated in terms of vehicle, public transport and walking and cycling facilities.

TERMINAL TRANSPORT

The themes of clear way finding and increased operational efficiency are further extended to our land transport access – to integrate the journey from park to plane or from home to abroad.

Table 6 compares the current terminal access and parking with a future concept alternative. In particular, the current challenges with the existing transport access are:

- it is congested
- it is difficult to find where you are going
- there is limited flexibility and/or scalability due to the roads dividing the space
- there is a safety concern on the Orchard Road Roundabout due to the 5 spurs and international drivers with limited experience with roundabouts

CURRENT TERMINAL ACCESS AND PARKING

FUTURE TERMINAL ACCESS AND PARKING

Table 6: Comparison of Current and Future Terminal Access and Parking

The future concept (detailed on the right) in Table 6 provides

- a single one way access loop
- complete flexibility in the parking space – the blue space can be aggregated up or broken down to cater for seasonal demands, or changes in consumer preferences or technology or be easily converted to other uses
- significantly increased capacity due to the increased kerb length along the front of the terminal
- most importantly, it provides a safer, easier journey for all users.

The key for the success of this concept will be the efficient integration and management of pedestrian and vehicle interfaces adjacent to the terminal. It must be noted that this concept is similar to most other international airports of large scale.

Cycling and walking facilities along the corridors serving the airport and the crossing of the State Highway are currently being improved through the upgrade of Russley Road, the grade separation of the Russley Road intersection with Memorial Avenue in what is known as the Gateway Bridge and the construction of a walking and cycling underpass at the Harewood Road Roundabout with Russley Road. The presence of new retail developments and tourist attractions has created more pedestrian movements between the terminal and the wider airport campus.

Three bus routes current serve the airport, connecting the central business district as well as key activity centres to the north and south. The bus services depart from the coach car park area adjacent to the international terminal.

In the short-term, the focus will be to increase awareness of the public transport options within the terminal and clearly mark the walking routes and times from within the terminal as part of the sense of place project. In the long-term, public transport will be accommodated using the one-way loop and integrated with the pedestrian and way finding throughout the park to plane journey. In this sense, the current multi-level parking building is likely to become a multi-modal transport interchange in the long term.

The design of the road network along Memorial Avenue and within the terminal precinct zone is flexible and could be adapted to accommodate changes to public transport including bus priority or light rail options.

CIAL will work alongside Environment Canterbury and Christchurch City Council to enhance the passenger experience for those passengers and workers using public transport, to promote public transport as an alternative and to provide safe and efficient infrastructure facilities.

AIRPORT CAMPUS TRANSPORT NETWORK

A road hierarchy has been developed for the broader airport campus. A properly designed and managed road hierarchy can help ensure that a few roads carry most motor vehicle traffic, and do so efficiently, while most roads carry less through traffic and provide opportunities for other uses of the street, especially access to property. To create a consistent road network in the airport zone, the hierarchy aligns with the Christchurch City Council District Plan. The adoption of a functional road hierarchy will protect the road function including provision for pedestrians and cyclists and provide an
on-going ability to review how new developments fit within the network.

TRANSPORT FUTURES

Smart technologies and their application, have transformed the way we live and how we travel will be the next aspect of our lives to be changed by the range of new technologies that are becoming more readily available. At the extreme, we may no longer even need to own or drive our own vehicles given the development of self-driving vehicles and ride share schemes like Uber.

The New Zealand Government's recently announced Transport Futures and Electric Vehicle Programme also contains a range of measures to help speed up the adoption of new technologies. Although how these technologies and public uptake of some of the initiatives will progress is not known, the Airport Master Plan framework is flexible and able to change to meet the future transport demands. This includes opportunities for CIAL to accommodate and encourage electric vehicle use by providing charging points in preferred locations. The transport loop could also be adapted to accommodate self-driving vehicles.

KEY PLANNED NETWORK IMPROVEMENTS

Given the reliance on City Council and NZTA roads and public funded public transport services to provide access to the airport, it is critical for on-going performance and development that planning, capital development and maintenance programmes are integrated with these stakeholders. Planned upgrades or investigations required are:

TERMINAL PRECINCT ZONE

- Orchard Road/Memorial Avenue
  Create a signalised three-arm roundabout or signalised T-intersection with a shared pedestrian and cycle crossing. This design will maintain east and west bound traffic flows along Orchard Road. The vision is to safely and efficiently manage traffic flows exiting the loop road.
- Perimeter Road/Orchard Road
  This intersection will be a give-way control in the short term and modified to cater for future demand as required.
- Design of long term traffic, pedestrian and parking requirements within the terminal.

AIRPORT CAMPUS

- Perimeter Road/Ron Guthrey Road
  In the short term, this section of Perimeter Road will serve as access for pedestrians, service vehicles and overflow traffic into the existing land use along Perimeter Road, and direct access onto the one-way loop via a give-way control onto Orchard Road. In the long term, there is potential for the section of Perimeter Road between Ron Guthrey Road and Orchard Road to form an integral part of the one-way loop.
- Orchard Road/Wairakei Road/Ivan Crescent
  To accommodate the closure of Wairakei Road and provide access to business the extension of Ivan Crescent and Peter Leeming Drive is likely will create a new intersection into Orchard Road east of the existing four-way intersection.
- Memorial Avenue/Ron Guthrey Road/Peter Leeming Drive
  This intersection is likely to have a poor level of service and require capacity improvements by 2041. Options for capacity improvements could include changes to priority, signal optimisation and additional queuing space and releasing traffic onto Ron Guthrey Road to use Perimeter Road as a secondary access into the terminal loop. This intersection is critical as an entrance to the airport and as a distributor across the airport campus. Therefore any changes to the campus transport network need to thoroughly access the impact on the performance of this intersection.
- Dakota Park Road extension
  The roads between Syd Bradley Road and George Bellew Road may be extended to provide access for new commercial opportunities.
- Robin Mann Place Office Development
  To accommodate the new office development, new pedestrian facilities will be provided and the road will be realigned to minimise impact on the existing intersections within the area. A new intersection may also be formed on Peter Leemin/Permitrer/Robin Mann

WIDER TRANSPORT ZONE IMPROVEMENTS

Although the increased capacity provided by the four-laning of the State Highway will assist to reduce travel times for through traffic and travel to the Airport, there are still likely to be significant demands on the intersections. The following measures are planned:

- Northern extension of Orchard Road
  This link will create a connection for traffic from the north to access the airport and other land uses within the Special Purpose Airport Zone.
- Sawyers Arms Road Intersection Upgrade
  To improve level of service for traffic along State Highway 1, the intersection will need to be upgraded to provide more capacity. The northern extension of Orchard Road will be integral to providing access to the airport once this upgrade has been completed.
- Memorial Avenue flyover
  Work with NZ Transport Agency to explore the opportunity to address congestion for the right turn into the airport from the north.
- Yaldhurst Road intersection
  Work with NZ Transport Agency to identify improvements to increase travel time reliability and capacity at this intersection.

COMMERCIAL LAND

In addition to providing aeronautical facilities and services, an important element of success for a modern airport is to maximise value through identifying and implementing compatible commercial and property developments, with a resultant diversification of revenue streams. The extent and diversity of business activities at and around CIAL will be major factors in the ability of CIAL to function as a successful economic enabler and champion the South Island.

The principal opportunities are those where commercial services are provided by CIAL or its concessionaires directly or indirectly to passengers and the Airport's resident workforce.

These opportunities are possible as a result of scale and degree of connectivity of air services available at the Airport and the volumes of people and goods moving on, off and through the Airport. The more flights, the more routes, the more people and the more goods, the better the prospects for service businesses to establish at the Airport, such as:

- Food and beverage, and retail;
- Ground transport (rental cars, taxis and coaches) and car hire;
- Hotels and motels;
- Recreation facilities for transit passengers;
- Light industrial and manufacturing; and
- Air freight forwarders and consolidators.

Christchurch Airport, through the aggregation of its own activities, airline customers and tenant businesses, is a substantial contributor to the Christchurch and regional economies, generating slightly more than 6,500 on-airport jobs.

Christchurch Airport is playing a major logistical and economic role in the recovery of Christchurch and South Island regions after the devastating earthquakes of 2010 and 2011. The airport has proven itself to be a resilient location for the continued development of economic infrastructure, being built on stable land, and providing ground sourced water independent of the city's water supply network, as well as other network services.

Christchurch Airport is a critical component of the transport and economic infrastructure of Christchurch and the South Island. The commercial development zones are integral parts of the airport and a major engine for economic activity for the airport, Christchurch city, Canterbury region and the South Island.

CIAL provides for reconfiguration of facilities within the airport to optimise the existing space and maximise productivity. The Christchurch Airport Master Plan provides for air freight alongside other uses with a similar type of infrastructure requirement such as logistics, distribution, light industrial and manufacturing to enable improved efficiency and reliability.

Across our land development we are implementing a precinct based approach, with activities being grouped and complementary businesses being clustered to generate positive economies of scale.

There are three commercial and freight zones on the eastern side of the airport that are expected to provide different types of commercial activities, as illustrated by Figure 7 below.

Figure 7; Airport Commercial Zones

The Northern Development Zone is a vehicle rental hub, focused on the tourism travel market and associated businesses. The Central Development Zone includes the Christchurch Airport's vibrant convenience retail and hospitality hub, known as Spitfire Square, offering convenient shopping and entertainment for both visitors and campus workers and a trade and service precinct currently in early stages of development. The Southern Development Zone is a freight and logistics park which offers direct air and land connection for the businesses within it.

The Airport Master Plan does not restrict activities in these zones just to the expected activities listed above. The grouping of complementary businesses allows traffic types to be separated, keeping heavy vehicles in south of the campus and tourists in the north of the campus. The co-location of rental vehicle facilities enables easier way finding and in future a shared bus connection to the terminal will increase operational efficiency of both the terminal and the rental car facilities.

CIAL land to the west of the main runway will be developed to cater for underlying activities in the area while being flexible for potential long term aeronautical uses. It is noted that there has been an increase in the traffic demand on Pound Road due to CIAL's construction of the Pound Road Realignment. This demand is expected to increase again with the increased quarrying activity to the west of the airport and the Barters and Broughs Road upgrades which now mean the Pound Road is a feasible Western Airport Bypass.

ENVIRONMENTAL MANAGEMENT

Preventing, minimising, mitigating and managing the environmental impacts of airport operations protects not only the environment surrounding Christchurch Airport but also protects CIAL's ability to operate 24 hours a day, 7 days a week which is essential for the continued economic well-being of both CIAL and the regional economy.

CIAL has developed a Sustainability Strategy aimed at protecting our environment, minimising the use of natural resources and improving the quality of life for our community. Compliance with regulatory and legal frameworks is important but is just the start for us – we want to enhance the lives of all our stakeholders and we'll do this by concentrating our efforts in five key areas of water, energy, waste, land and noise.

CIAL is committed to ensuring Christchurch Airport remains an important contributor to local and national economic development while maintaining the highest environmental standards. The sustainability elements outlined within this Airport Master Plan align with CIAL's Sustainability Strategy and are well integrated with other strategic documents throughout the organisation, including the infrastructure strategy, CIAL's business plan and the Statement of Corporate Intent.

WATER

As the Airport is located above the sensitive groundwater aquifer, CIAL considers that the prevention of stormwater pollution and contamination of soil and ground water is of utmost importance. All stormwater generated at the Airport is discharged directly to ground, authorised by the following global Stormwater discharge consents from Environment Canterbury.

- Airside: CRC981129.2 and CRC151333 expire 10/06/2033 & 10/06/2033
- Landside: CRC000013.3 and CRC130198 11/02/2035 & 11/02/2035
- Roof water: Christchurch City Council's Global Roof water Consent CRC000315 due to expire in 20 October 2034

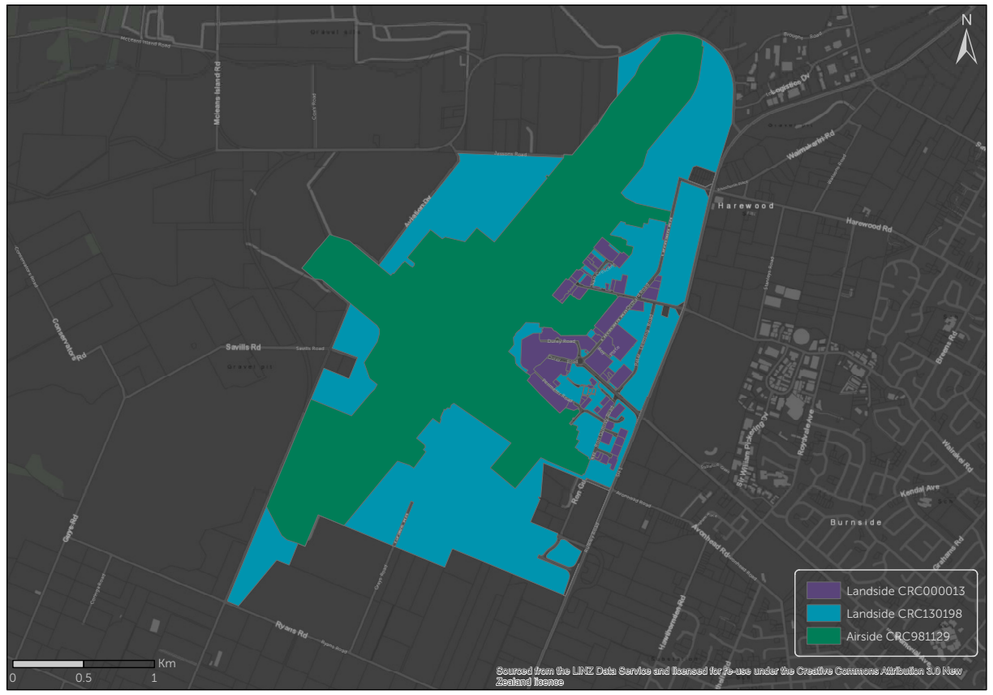

Figure 8; Stormwater Discharge Consents Held by CIAL

Alternative stormwater disposal options have been investigated since 2007, however discharge to a surface water body was concluded to be not environmentally viable. In addition to this, the Airport seeks to minimise any surface water presence on or around the Airport to avoid creating preferable habitat for birds that may pose a hazard to aviation. As a result of this, stormwater treatment at the Airport is in line with bird management processes.

The Canterbury Land and Water Plan dictates protection zones for Community Drinking Water Supplies. Development and activities within these zones can be limited and resource consents required. Current protection zones impacting on CIAL are shown on the next page in Figure 9.

Figure 9; Community Drinking water protection zones Source: Canterbury Maps

CIAL have established various methods to mitigate the potential risks of contaminants being leaked onto airport land and into the ground water system.

These include:

- Ground and stormwater monitoring
- Sediment sampling from stormwater soakpits
- The requirement for spill response training and kits at all sites
- The requirement of specific stormwater treatment systems depending on land use in the catchment. Ranging from catch pit filter inserts, oil interceptors and multi-media filters.
- Controlled clean-up procedures, including spill recording and reporting procedures as well as staff training programs.

Our future desire is to maintain the integrity of the water supply, avoid accidental contamination and minimise use of this precious resource as it passes under the airport. By doing so, we ensure water supply safety and security, protect the aquifer, reduce costs and protect the city, region and island.

Our priorities in this area are to:

- Set standards for new developments, including the design of stormwater infrastructure in new developments
- Monitor tenancy trade waste connections
- Highlight aquifer sensitivity to tenants and public
- Maintain compliance with stormwater consent
- Maintain and improve the quality of stormwater discharge
- Maximise efficiency from water takes
- Harness thermal energy potential of groundwater

CIAL's internal and external sustainability working continues to work hard to achieve gains across these priority areas.

ENERGY

Energy use at CIAL is an aspect under continual review. By minimising energy use, CIAL's reduces our carbon footprint, reduce costs to our businesses and reduce demand on the national grid. We strive for growth without impact, and for our business to protect our city region and island.

CIAL's priorities going forward include undertaking innovative methods to reduce energy consumption, providing infrastructure for emerging technologies, identifying and replacing aging or inefficient technology and including sustainable design and energy efficiency in new developments new builds.

With concentration on terminal building, several major energy reduction projects incorporated into the Integrated Terminal redevelopment and continued operations.

These include:

- Highly efficient artesian water heating and cooling energy centre in the new Integrated Terminal
- Replacement program underway within the terminal building upgrading older lighting technology to Light Emitting Diode technology (LED), also utilising LED technology in new builds where practicable
- Work closely with the Energy Efficiency and Conservation Authority on numerous energy initiatives
- Continuous monitoring and targeting of terminal building energy consumption.

CIAL continues to implement energy saving technology as part of new projects or facility refurbishment where possible or feasible. Long term projects such as district energy schemes will be considered and evaluated as part of new precincts to determine viability.

WASTE

Waste is a by-product of operating a diverse and large organisation but we can work with all our stakeholders to reduce, reuse and recycle so we minimise the impact on our environment. We are passionate about reducing costs and our storage footprint, managing less waste in our business and achieving growth without impact on the environment, so our business protects our city, region and island.

Our priorities are to divert waste from landfill by improved diversion rates from terminal tenants and CIAL operated spaces and by the efficient and effective waste management contract and to minimise waste by reducing the surplus stock stored onsite to reduce stock management, avoid disposal of spares and minimise packaging waste.

CIAL has set an objective to divert 60% of all airport waste away from landfill by July 2025. A key component to achieving this is the minimisation and management of solid waste such as food, plastics, paper etc.

CIAL is responsible for all waste generated directly from our own operations as well as any generated by visitors to the terminal. In addition, CIAL actively works alongside operators within the terminal, including airlines, to reduce the amount of waste going to landfill by providing education and training as well as recycling options for glass, food waste, cardboard, polystyrene and co-mingled recycling (plastics, cans and paper).

LAND

Our Place is an area of unique natural beauty. We have a responsibility to maintain it, improve it and remediate contaminated land. By doing so we help ensure the safety of our environment and our people, and enable growth without being limited by past activities. We also have a responsibility to ensure the safety of travellers and our airline partners, so understanding the hazards and addressing the risks of bird strike is a critical and ongoing activity.

Therefore, our priorities for sustainable land management are across three main areas; integrated wildlife management, remediation and management of contaminated land areas and managing remnant sites of ecological significance.

CONTAMINATED SITES

The Airport site contains a number of sites included on the Listed Land Use Register (LLUR) as it has been identified or assumed that hazardous activities have or may have occurred in those locations historically. Such activities include:

- Landfilling
- Waste disposal to land
- Spray use for pastoral weed and pest control
- Storage of agrichemicals
- Livestock dip or spray race operations
- Fuel storage – underground and above ground
- Woolsheds
- Service station
- Engineering workshops
- Vehicle workshop
- Transport depot
- Military emplacements

Given the activities which have been carried out at the Airport over time, several parts of the Airport campus and surrounds are likely to contain some contamination, CIAL commissioned a Preliminary Site Investigation (PSI) for the site involving reviews of historic and current land use information. This PSI established that a range of activities which occur, have occurred, or are likely to have occurred on site which could have led to ground contamination. This report was used to obtain a global Resource Consent to disturb soil, remove and replace fuel storage systems and occasionally change land use under the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011. This consent was issued in May 2016 – RMA92032983.

CIAL has already carried out a number of successful remediation projects in the process of developing contaminated sites. Remediating contaminated sites has the twin benefit of returning potentially contaminated land to a safely developable state, therefore delivering a net environmental improvement by removing the source of the contamination. This in turn prevents ongoing leaching into the aquifer an/or future exposure to people.

Examples of remediated LLUR sites include:

- Mustang Park – this area was historically known as Harewood Landfill/pit. Refuse was removed and replaced with clean engineered fill.
- Taxiway Alpha shoulder replacement – During the replacement of the taxiway shoulders, deep deposits of refuse associated with the former Harewood Landfill were encountered and removed.
- Dakota Park – A number of agricultural activities have occurred historically in this precinct resulting in its listing as a LLUR site.
- Spitfire Square – This site was formerly a petrol and maintenance station.
- Pound Road realignment and RESA extension – Rubbish piles and contaminated stockpiles were removed and the site was remediated to allow for these sites to be developed.

ECOLOGICAL HERITAGE

The dry plains grasslands in this area of Christchurch represent what is left of once extensive areas of former stony Waimakariri River bed and river terraces. The sheep-grazed semi-natural grasslands contain a range of significant communities supporting populations of indigenous plants and insects. The site is different from most of the other savannah grasslands in that the soils are deeper so it is more completely vegetated than other old river channels and terrace sites. This site of ecological significance extends eastward from the edge of the carriageway on Conservators Road (i.e. including the grass verge within the road reserve) and includes the entire CCC owned parcel of land, and extends into the Christchurch International Airport owned land as shown on the location map in Figure 10.

CIAL's priorities with respect to ecological heritage is to understand our biodiversity and to promote local species in our landscaping. This will be achieved by carrying out projects to identify site boundaries and improve the survival and protection of Dry Plains Grasslands.

WILDLIFE HAZARD MANAGEMENT

Wildlife hazard management is a major consideration in CIAL's planning and operational requirements and a major part our commitment to ensure safe aviation operations at the Airport.

Accomplishing this objective entails careful monitoring of all aspects of arriving and departing aircraft in the vicinity of the Airport, including potential wildlife hazards on and around the Airport.

As part of its on-going safety efforts, CIAL operates under a Wildlife Hazard Management Plan in line with CAA Rule Part 139.71 to address potential wildlife hazards at the Airport and surrounding areas, with a particular emphasis on hazards and wildlife attractants less than an 8 km radius from the airfield. The 8km radius can be seen in Figure 9. In addition to addressing general wildlife hazards, the Wildlife Hazard Management Plan discusses habitat modification, monitoring and responding to potential wildlife hazards associated with stormwater mitigation sites.

The Wildlife Hazard Management Plan provides CIAL with the discretion and capability to respond to these situations, while providing guidance for compliance with applicable CAA and municipal laws or regulations.

At a general level the following methods are employed to combat the threat posed by bird strike:

- Assessment of risk species and behaviours
- Monitor bird numbers by species on the Airport and in the Airport's general vicinity
- Make the Airport environment as unattractive to birds as possible
- Actively harass birds on the Airport
- Actively manage hazard species
- Actively removing rubbish sources and rubbish / food waste in general (involves liaison with CCC waste management staff also)
- Identify and remove / control food sources (insects, grass, seeds etc.)
- Obtaining consultancy services from ornithologists, entomologists and botanists
- Liaise with appropriate councils and environmental and game management groups.

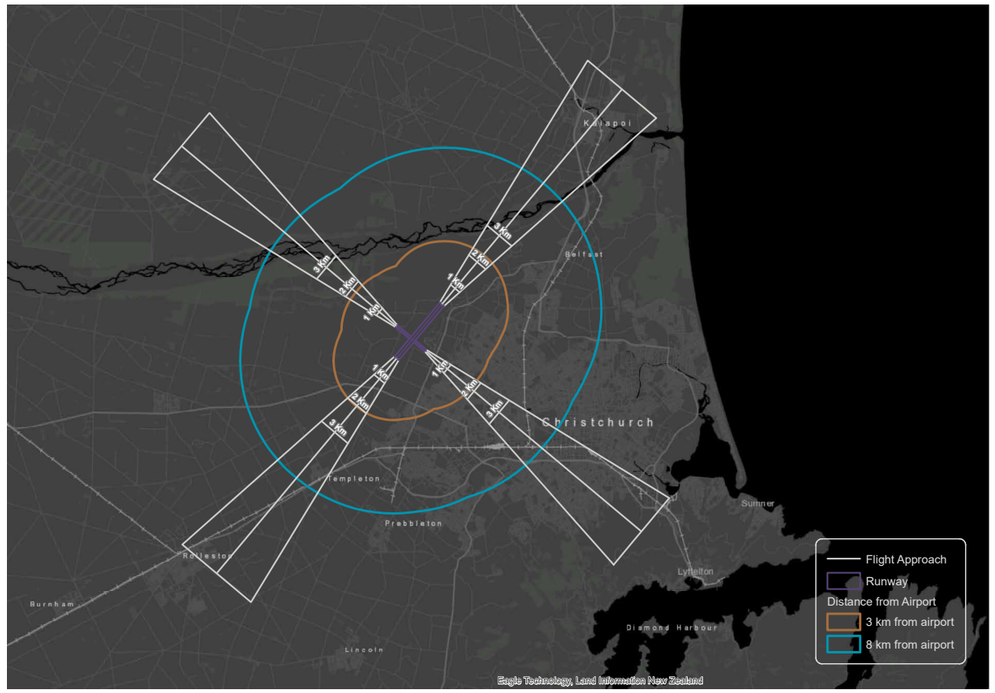

Figure 10; Off Airport Bird Hazard Management key features

Our priorities for integrated wildlife management are to minimise birdstrike risk through the management of land use activities within the 8km radius of the airport and by focusing management on key risk species.

Additional to the CAA Rule Part 139.71, the Christchurch City Council District Plan recognises incompatible activities including birdstrike to Airport operations. Specific provisions of the Christchurch City Council District Plan regulate the water bodies and storm water basins and place controls on fish processing or packing plants, abattoirs or freezing works within 3km from the airfield.

Christchurch Airport will continue to collaborate with Environment Canterbury and other regional wildlife stakeholders to minimise the interaction between wildlife and aircraft by discouraging the presence of wildlife that represent a potential hazard to aircraft on, or in the vicinity of, the airport as a means of protecting the safety of airline passengers. It is expected that this collaboration will provide for effective wildlife management planning to ensure that the interests of the airport are represented where any new off-airport developments are being proposed that may attract birds or flight lines across the airport, in line with International Civil Aviation Organisation (ICAO) recommendations. It is also expected that this collaboration will result in the continued monitoring and risk assessment of bird attracting sites within the ICAO defined 13km bird circle as recommended by The World Birdstrike Association (formerly the International Birdstrike Committee (IBSC)).

AIRPORT NOISE

CIAL operates a large and diverse business and in doing so generate activity and wide scale employment which can impact others. In prior decades, the airport was physically separated from Christchurch city and the broader Canterbury region, but city expansion and earthquake-driven relocations have resulted in us having more immediate neighbours. Our responsibility and intention is to engage and collaborate, where appropriate, with all stakeholders, especially residents and businesses close to the airport grounds. Promoting understanding helps our goal of growth without significant or unreasonable impact.

Airport noise occurs as a result of airline operations, ground support activities (engine maintenance, re-fuelling, baggage loading/unloading and re-provisioning of aircraft), airfield maintenance and site development activities.

The extent to which the community is affected by noise is determined by a wide range of factors including:

- Timing of operations
- Aircraft type
- Air space management
- Proximity of noise sensitive activities; and
- Prevailing weather conditions.

CIAL manages aircraft noise in order to:

- Reduce the effects of noise on local residents
- Maintain high standards of residential amenity
- Prevent imposition of a curfew which would restrict 24/7 operations.

At the Airport, the two principle sources of noise received by surrounding properties relates to aircraft operational noise from take-off and landing; and engine ground running noise. CIAL's priority is to measure, manage and mitigate airport noise from both aircraft operations and engine ground running.

OPERATIONAL NOISE

Noise rules relating to the Christchurch City Plan require CIAL to present annual calculated noise contours and associated monitoring results which assesses compliance with the City Plan noise standard for aircraft operations at the Airport. The City Plan also requires that CIAL manages noise from aircraft operations ensuring that noise does not exceed 65 dBA Ldn contours outside the Air Noise Compliance Contour shown in the City Plan.

Independent Acoustics specialists carry out noise monitoring at appropriate sites around the Airport. This monitoring work is then correlated with aircraft movement records to determine the noise produced for the busiest three months of each calendar year and for each runway. This is then modelled to generate the annual Aircraft Noise Contour and is compared with the Air Noise Compliance Contour in the City Plan to determine whether the Airport is complying with the noise limits.

Currently the Airport is operating well within the City Plan air noise contours, as these contours allow for the projected growth of the Airport out beyond 2025. In 2015 however, unusual use of the cross-wind runway due to maintenance works on the main runway meant that CIAL came close to maximising full capacity of the contours on the cross-wind runway.

MANAGE

Airport operational noise contours are important as they allow the Airport to continue to grow and operate efficiently on its present site and allow the Airport to function as a non-curfewed operation. There are numerous examples of cities and their airports that have not managed aircraft noise levels and are now either subject to curfew or have been forced to move to locations further removed from the city they serve.The noise contours only set an operational limit for the airport. They also prevent noise sensitive activities from establishing in close proximity to the airport.

Noise contours protect the future of the local economy:

- The location of the Airport relative to the city is a major benefit to the region
- South Islanders benefit from low fares and frequent Trans-Tasman services due to the Airport's current non-curfewed status
- The CIAL campus employs slightly more than 6,500 Full-time equivalent workers (FTEs)
- Many businesses rely on the fast and efficient delivery of mail, documents and products on overnight freight flights. Curfews on aircraft operations would put these services at risk.

Christchurch Airport's noise contours have been calculated to incorporate:

- The introduction of quieter aircraft
- Technological advances in aircraft control systems
- An anticipated increase in daily day and night aircraft movements; and
- The need to use both runways simultaneously (SIMOPS) during peak periods, due to the expected increase in demand.

The contours reflect version 7 of the US Federal Aviation Authority's Integrated Noise Model (INM) – a best practice industry standard.

The figure on the next page shows the location of the noise contours proposed under the Replacement Christchurch District Plan, expected to become operative late 2016.

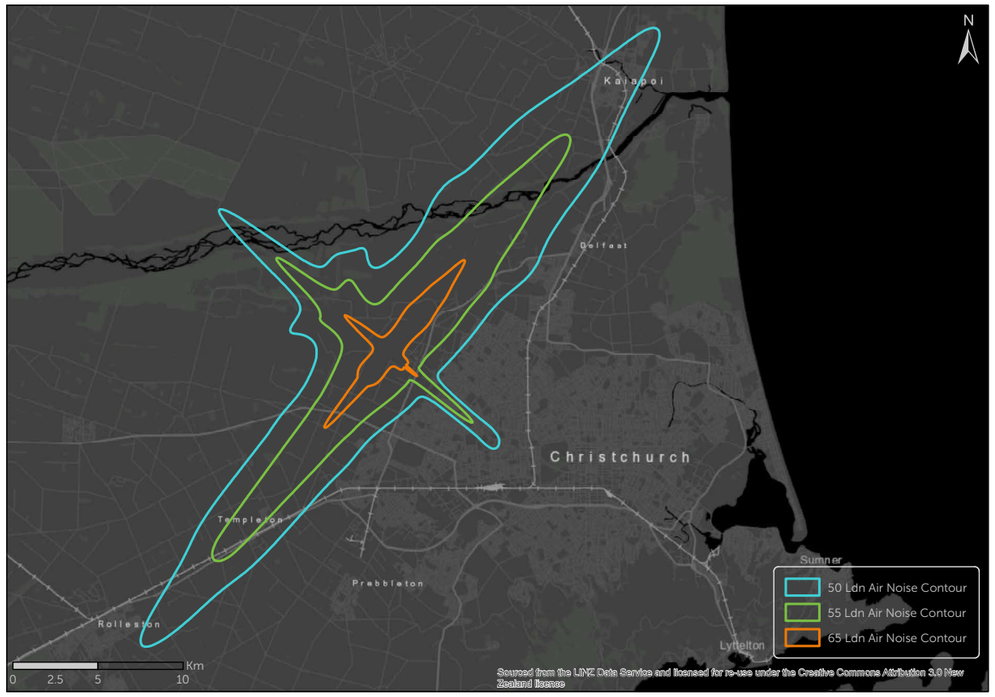

Figure 11; Christchurch International Airport Air Noise Contours

MITIGATE

CIAL undertakes noise mitigation practices in partnership with Airways with respect to noise mitigation and management.

These practices include:

- The revision of proposed flight paths to avoid townships
- The investigation of Required Navigation Performance with Authorisation Required (RNP AR) approaches which are designed to commence from higher altitudes and to enable low-power approach without the typical level-off that is associated with a visual approach.
- CIAL and Airways have agreed that the use of Runway 29 is limited to when Runway 29 is the runway in use – i.e. Runway 29 is to be used for its intended purposes of providing a cross wind alternative. Runway 29 is to be used when the weather requires. It cannot be used as an alternative to the main runway to reduce track miles when weather and operational conditions allow the use of the main runway.

ENGINE TESTING NOISE

The Airport provides employment for approximately 1500 staff involved in aircraft maintenance activities. Engine ground running is a critically important part of aircraft maintenance. Engine ground running is carried out either "on-wing" or "off-wing" in a purpose built facility. Both types of engine running are carried out at the Airport.

In 2005, Air New Zealand partnered with Pratt and Whitney, and developed the Christchurch Engine Centre. This facility has been designed for full overhaul and test of V2500-A1, -A5, -D5 engines. This work is carried out inside a building, and does not generate significant noise away from the Airport.

Airlines conduct "on-wing" tests following maintenance and prior to scheduled departures to ensure engines are fully functioning prior to take-off. These "on-wing" tests are carried out at different locations around the Airport, but many are conducted on the purpose built ground running pad outside Air New Zealand's Hangar 1.

As "on-wing" engine running is carried out while the engine is on the aircraft, this means that the aircraft is generally not within a building and is therefore the primary source of engine ground running noise at the Airport.

MEASURE

The recently released Replacement District Plan decision requires engine testing to comply with a set of engine testing noise contours, similar to the operational Air Noise Compliance Contour. CIAL is required to implement the necessary monitoring and reporting regime within 12 months of these rules becoming operational.

MANAGE

CIAL has worked with the airlines that carry out engine ground running at the Airport to reach agreement on the operational procedures for engine ground running, including where they will be carried out and the reporting requirements. This is important to ensure that engine ground running noise is adequately managed to avoid effects on the residential areas close to the Airport.

As part of implementing the new engine testing rules in the Replacement District Plan, these agreements will be revised to reflect the new requirements. CIAL will also develop new systems to capture engine test events, to ensure that airlines are complying with the Replacement District Plan provisions.

This image represents the location of the proposed engine ground running contours. The engine ground running contours sit wholly within the aircraft operational noise contours.

Figure 12; 2016 Replacement District Plan - Engine Testing Noise Contours

UTILITIES AND INFRASTRUCTURE MANAGEMENT

CIAL has a strong focus on the future development, operation and maintenance of infrastructure through an integrated and collaborative framework for asset management planning. CIAL is continuously investigating ways, methods and new technologies which minimise infrastructure and environmental impacts of their operations.

The Master Plan details, at the highest level, some of the large scale infrastructure and land use changes required over the next 25 years. CIAL are cognisant of the fact that these are long life, costly investments – in some cases we get one shot every 50 years to get the investment right. We are also cognisant of the extreme diversity in infrastructure and customer requirements. In supporting the master plan, CIAL has also moved towards a move strategic approach to how we deliver infrastructure. We are currently developing an integrated and collaborative framework for the planning, development and maintenance of infrastructure assets aligned with the organisation's strategic direction.

CIAL has become a large, diverse nationally strategic infrastructure resource, which now caters for a daily consumer population greater than that of many mid-sized New Zealand cities. The airport is required to provide a multitude of utilities and services to cater for the various aeronautical and non-aeronautical stakeholders of the Airport campus. CIAL aims to provide a reliable utility network that supports current aeronautical and non-aeronautical activities and fosters further economic and social growth of the city, region and South Island.

The utilities and roads currently operated at the Airport are a result of the process of airport development since the 1930s. The progression of development is from a central core, concentrating about the terminal facilities. Recent development has focused on the addition of facilities at the extremities of the Airport network – in particular at Dakota Park and Mustang Park – as well as in the terminal precinct. This has resulted in a hub and spoke network whereby there are significant differences in age and condition of infrastructure in the hub compared to the spokes.

Future developments need to be cognisant of this potential problem – aging infrastructure exists in our campus core with new utilities infrastructure towards the edges. Additional to the on-going replacement and maintenance programme based on age, condition and criticality, investigation needs to continue in line with new developments to make sure that the core network has sufficient capacity for new developments and to determine the best means by which to supply future developments.

CIAL utility networks consist of multiple ownership models. Given the reliance on City and regional networks and third party suppliers, it is critical for on-going performance and development that planning, capital development and maintenance programmes are integrated with these stakeholders.

The methods for interaction and integration of planning and strengthening strategic relationships between CIAL are external stakeholder include:

- Integration of land use and master planning
- Airport development rules included within City and Regional Statutory Planning documents
- Consultative community forums held regularly with elected representatives
- Joint infrastructure and safety research or analysis projects
- Joint infrastructure provision
- Mutual review and approval of design for infrastructure development works
- Integrated communication throughout construction of infrastructure
- Integration of planning for emergency events.

CIAL manages the water, wastewater, stormwater and roads on the airport campus.

For CIAL managed and owned utilities, the major areas of development are outlined for each utility type below, with the exception of roads, which is outlined in the Land Transport Access chapter above.

WATER

All water consumed across the CIAL campus is supplied by groundwater wells located on-the airport site. It is not, nor is it expected to be, connected to the Christchurch City Council water supply network.

A ring main supplies potable water to both terminals and other consumers around the campus. Potable water to is provided to aircraft via a dedicated tanker that uploads water from CIAL's supply at various points around the apron. The Primary and Secondary Fire Suppression Systems are serviced by the water tower, the potable water supply and multiple storage tanks, both above and below ground. The Air New Zealand maintenance facility also has a two million litre storage capacity in their deluge tanks, which is available for airfield fire fighting requirements.

Based on current demand for water, the system has unutilised cumulative capacity and could theoretically cope with increases in volume should future demand dictate. When demand increases to approach or reach capacity additional bore wells could be commissioned subject to obtaining resource consent(s).
The areas currently being investigated for network extensions and future capacity enhancements are:

- The area south of Avonhead Road to cater for new freight businesses.

  Long term growth in passenger activity could require new wells in the terminal area.

  A deep potable well with generator back up to support any long term development on the western side of the airport.
- Rapid rill hydrant extended from freight apron supply to provide fire fighting requirements for the new Dakota Park freight apron.
- The long term requirements and alternatives for water tower chamber, which is dated and is scheduled for significant maintenance outlay.

In identifying potential sites for new wells, due consideration will be given to both the localised and cumulative effects of additional draw down such as the localised interference between wells is where the abstraction from a well creates a cone-shaped depression in groundwater levels that can affect adjacent wells and hence attention will be given to:

- Separation distance between wells
- Abstraction rates
- Aquifer characteristics
- Regional water levels

An area of operations that places significant demand on both water and wastewater infrastructure is the vehicle wash pads for tourism and rental vehicle. CIAL continues to review the design, development and maintenance specifications for wash pads to minimise infrastructure and environmental impacts of operations.

WASTEWATER

CIAL campus owns and operates the wastewater collection network throughout the campus, with a single outflow to Christchurch City Council's collection and treatment network. The CIAL network provides capacity to CIAL operations and tenancies as well as other land owners within the Special Purpose Airport Zone.

The total monitored discharge flow into the Wairakei collector shall not exceed a flow rate of 35 litres/second measured and recorded at five minute intervals; except that this standard shall not apply to flows that result from a rainfall event with greater than a five year annual recurrence interval as assessed from data recorded on the Metservice Airport Rain Gauge.

This limit on CIAL's outflow is in place until such time as the Riccarton Interceptor sewer catchment network is upgraded by Christchurch City Council to a capacity able to accept an additional peak wet weather flow. At that stage CIAL will be able to complete a secondary outflow connection at Avonhead Road. CIAL infrastructure is in place awaiting the Council works. The capital works in the Riccarton wastewater interceptor catchment are planned for completion between 2016 and 2024, as outlined by CCC's Infrastructure Strategy 2020, however there is currently no confirmed date and the 2016 to 2024 period is subject to change.

Given the reliance on the single outflow, with limited capacity, this presents a major resilience and constraint on long term development. CIAL continues to investigate all alternatives to provide increased resilience risk and greater certainty of future capacity. CIAL also continues to collaborate with Christchurch City Council regarding the capacity of their network.

The areas of the CIAL currently being investigated for network extensions and future capacity enhancements are:

- The network crossing State Highway 1 (Russley Road) is currently being upgraded as part of NZTA's Russley Road upgrade project expected to be completed in 2018.
- Wairakei Road network - CIAL continues to review the maximum wastewater flows in the 150 mm diameter Orchard Road sewer pipe, north of Wairakei Road, as well as the anticipated flows from future developments upstream.
- Additional wastewater flows from the forecast developments within Mustang Park are expected to result in flows to the Orchard Road sewer, which will bring the pipeline close to or in excess of the capacity of the pipeline at peak flows. The highest of these predicted flows is forecast to cause some short term surcharging in the pipeline at peak times which, while not desirable, is unlikely to result in operational issues over a relatively short period of time.
- In order to carry out further developments which produce wastewater flows upstream of Wairakei Road on the Orchard Road pipeline, CIAL has developed concept design for a 300 mm diameter pipeline duplicating the Orchard Road pipeline.
- CIAL will continue to monitor wastewater flows in this area to determine the most appropriate timing for construction of this wastewater infrastructure upgrade.
- Development west of Runway 02/20 – sections of this Airport Master Plan outline the requirement for long term development to the west of the airport's main runway. CIAL continues to investigate the requirements and alternatives to cater for the airport's long term requirements.
- Avonhead sewer connection – as above, when the CCC network allows a connection from Dakota Park pump-station east down Avonhead Road via pressure line connecting with CCC network (approx 400 metres). A duct is already in place to facilitate this crossing of State Highway 1.
- Mustang Park – CIAL continues to monitor both the roading and wastewater network development to the northern periphery of the airport campus for the potential to connect the airport's wastewater network.
- Terminal Outfall – as outlined above, the central terminal network is, in some cases, aging infrastructure insufficient for large scale future development. CIAL is currently investigating the capacity requirements in the northern areas of the terminal precinct to cater for the addition of the CIAL hotel (Novotel Christchurch Airport) and future terminal expansions.

These developments will be investigated with a concentration on the entire life cycle infrastructure costs across both new developments and upgrades.

STORMWATER

All stormwater generated at the airport is discharged directly to ground, authorised by the global stormwater discharge consents from Environment Canterbury, outlined in the Environment section of this Airport Master Plan. Each of these consents outlines the infrastructure requirements for the maintenance of current facilities or operations and the infrastructure requirements of any new developments.

CIAL continues to review the consent conditions and allowances to ensure we are able to effectively deliver the long term operational and environmental requirements of airport stakeholders. CIAL also carries out regular communication and review with Environment Canterbury (which regulates and monitors compliance against our resource management consents).

SUMMARY

CIAL has a diverse range of utility networks to cater for the diverse range of aeronautical and non-aeronautical developments across the operational and commercial requirements.

CIAL has infrastructure development projects or investigations planned to align investment with demand and level of service requirements across the campus.

Development and maintenance programmes to cater for forecast demand and provide the required level of service will mean CIAL will be required to further integrate planning with external, but mutually dependent, infrastructure providers/stakeholders such as CCC, NZTA, Orion, ECan and Airways, as well as our surrounding communities and various other stakeholders.

The future development, operation and maintenance of utilities projects will be supported by a continuous improvement process in asset management planning, focused on an integrated and collaborative framework for the planning, development and maintenance of infrastructure assets which is aligned with the strategic direction of the organisation.