5. Stage 1 Western Sydney Airport

5.1 Introduction

5.1.1 Overview

The proposed Western Sydney Airport would be developed in stages in response to demand. Stage 1 would comprise a single runway, a terminal and other relevant facilities to accommodate up to 10 million annual passengers as well as freight traffic.

Over time, as demand grows, the proposed airport is expected to include an expanded terminal, further support and commercial facilities and ultimately a second runway (to be developed around 2050). The expansion of the proposed airport similarly would occur in a number of stages in response to demand for aviation services. The long term development would be capable of handling approximately 82 million annual passengers.

The draft Airport Plan provides an indicative concept design and land use plan for the proposed airport. The location and orientation of main elements such as runways and the area reserved for terminal development (for both Stage 1 and the long term) optimise the use of the site in light of the size, shape and orientation of the available land. In general the preferred runway orientation and the amount of separation required between two runways defines the parameters for other aspects of the concept design. Consideration has also been given to previous airport design concepts, in particular with regards to runway orientation, to minimise the changes in potential impacts identified by previous environmental impact statements which were subject to public consultation.

This chapter provides an overview of the major functional elements of Stage 1 as described in the Airport Plan.

5.1.2 Stage 1 development

The majority of the construction of Stage 1 is expected to occur between 2016 and 2025. During this period, major site preparation would be undertaken, including bulk earthworks commencing in mid-2016 the earthworks are required to create a level surface for the Stage 1 development which covers approximately 60 per cent of the airport site. Airport operations are proposed to begin around 2025 and provide capacity to service the predicted 2030 demand of up to 10 million annual passengers, equating to approximately 63,000 annual traffic movements.

Stage 1 would include the construction of a 3,700 metre runway positioned in the northern portion of the airport site on an approximate north-east/south-west or 50/230 degree orientation (referred to as runway 05L/23R). Stage 1 includes a single full length parallel taxiway and a range of aviation support facilities such as passenger terminals, cargo and maintenance areas, car parks and navigational instrumentation.

These facilities would be developed before operations begin in 2025 and would be capable of handling both domestic and international regular public transport services.

An indicative layout for Stage 1 is provided in Figure 5–1.

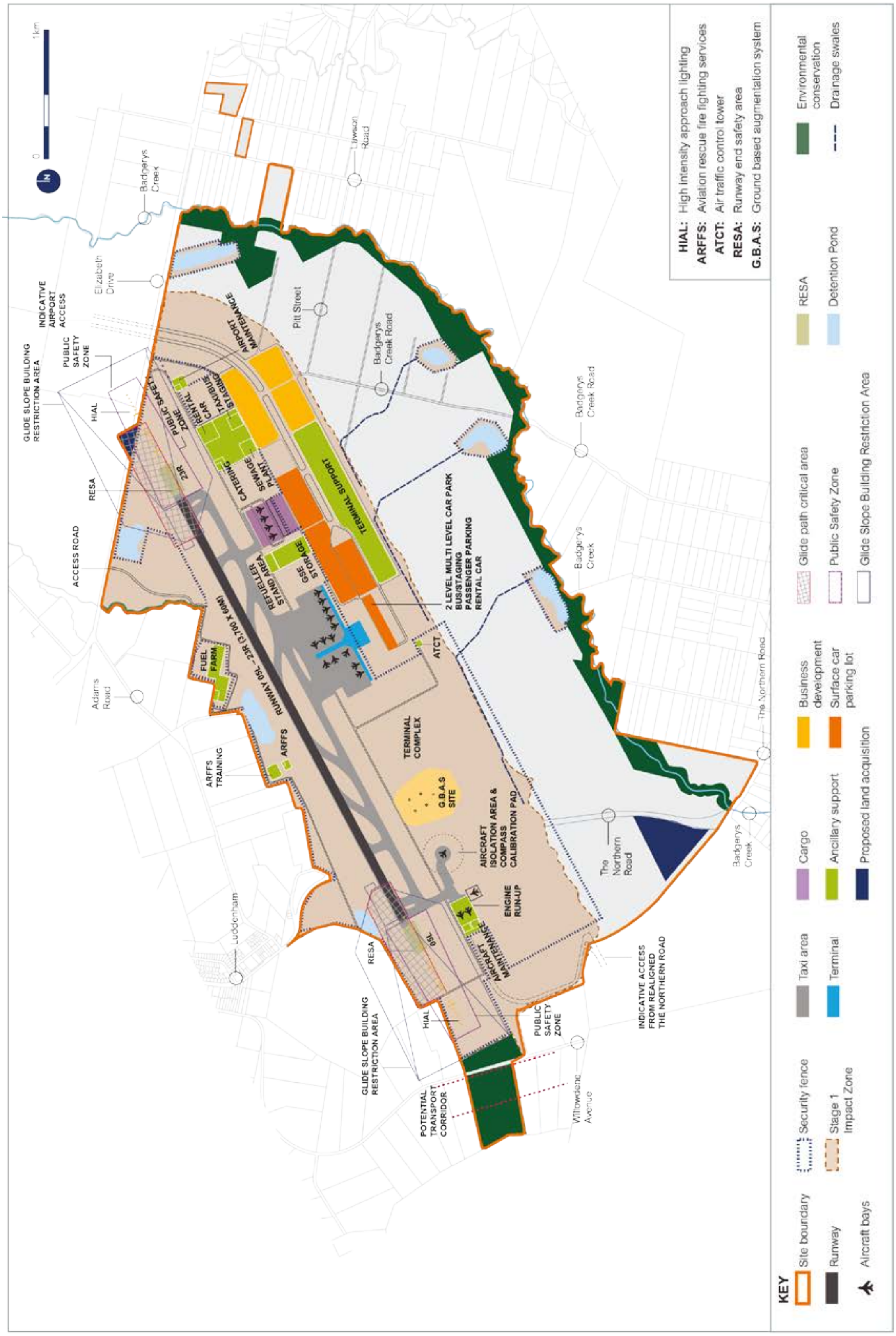

Figure 5–1 – Indicative airport site layout – Stage 1 development

The scale of the Stage 1 development has been designed to match demand. However, the precise layout of Stage 1 would be the responsibility of the ALC and may differ from the indicative layout shown in Figure 5–1. Some other examples of terminal layouts that could meet the Stage 1 capacity requirements as set out in the draft Airport Plan are presented in Figure 5–2.

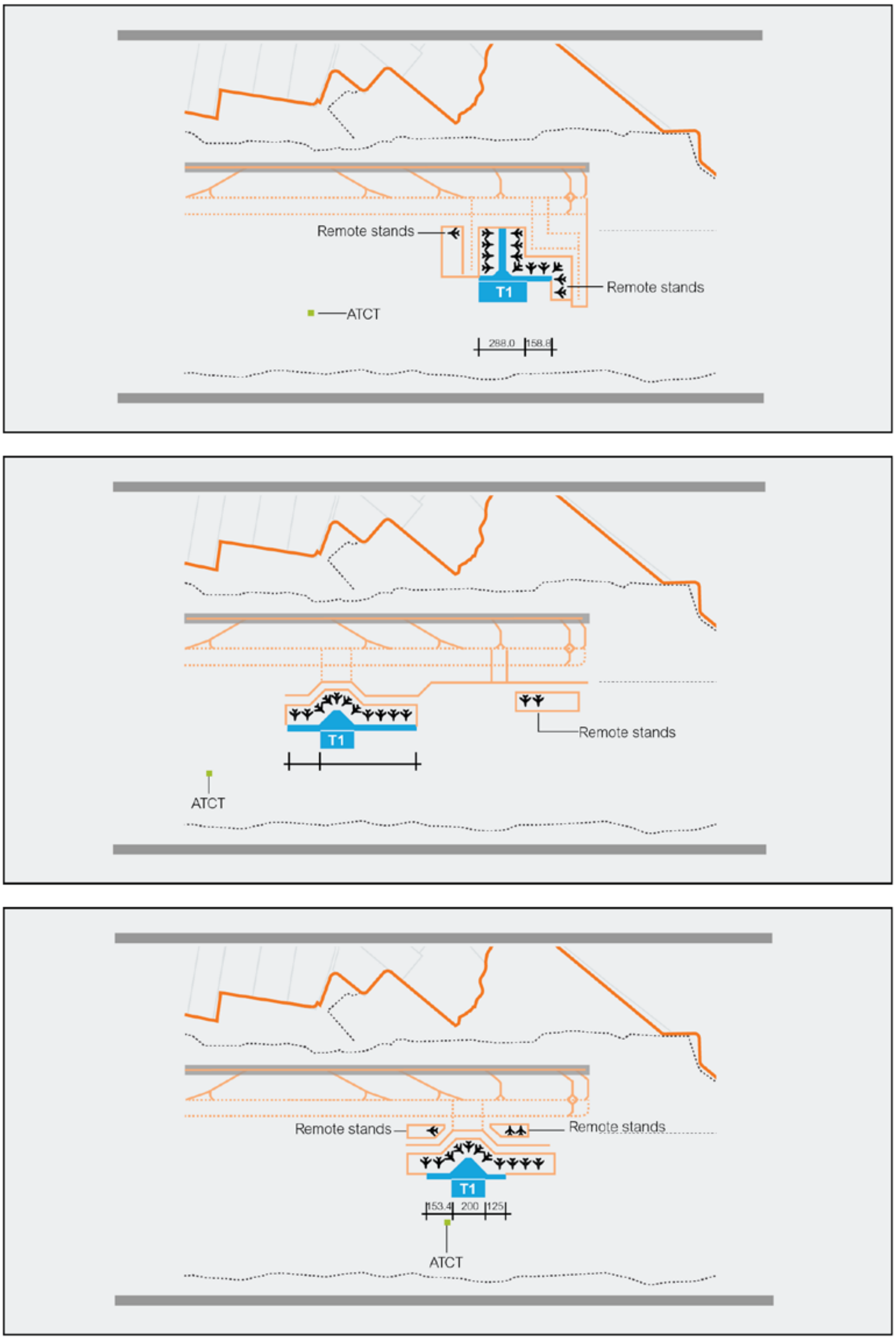

Figure 5–2 – Alternative Stage 1 terminal layouts

5.1.3 Long term airport development

Incremental development of the proposed airport would be required at various stages as passenger demand approaches and exceeds 10 million annual passengers including:

- expansion of the terminal precinct;
- continued growth of the airport support facilities and business development activities;
- improvements in transportation infrastructure on and into the site such as the development of a railway station; and
- development of a second runway.

The functional elements of Stage 1 would be designed so as not to preclude future expansion and to provide the required capacity for aircraft, passengers, cargo, and vehicle movements expected for the future. Flexibility and expandability have been considered in the geometry of the proposed airport and indicative facility layout to allow for the proposed staged development over the long term in line with increasing demand.

The Stage 1 runway is expected to reach capacity when passenger demand approaches 37 million annual passengers, around 2050. This is equivalent to approximately 185,000 annual traffic movements. By around 2063, the total annual traffic movements for the proposed airport is expected to be 370,000, serving approximately 82 million annual passengers.

To meet expected growth and additional demand beyond 37 million annual passengers, a second parallel runway 3,700 metres in length would be required. This is expected to be around 2050. The Land Use Plan, as outlined in the draft Airport Plan, has identified an area as aviation reservation to provide for future development of a second runway positioned in the southern portion of the airport site. The second runway would be on a similar 05/23 orientation and is anticipated to require a minimum of 1,900 metres separation from the first runway.

These future stages beyond Stage 1 would be subject to further regulatory approval in accordance with the Airports Act (see Section 3.2.2), including any required environmental assessment, and are not assessed as part of this draft EIS. However, as Stage 1 clearly facilitiates the development of these future stages, it is appropriate for this draft EIS to refer to the potential impacts associated with the long term development. In this context, a strategic environmental assessment is provided in Volume 3.

An indicative layout of the long term development is provided in Figure 5–3.

Figure 5–3 – Indicative airport site layout – Long term development

Figure 5–3 represents only one indicative layout for the long term development. Alternative long term terminal layouts may be developed by the ALC. Some other examples of long term terminal layouts are presented in Figure 5–4.

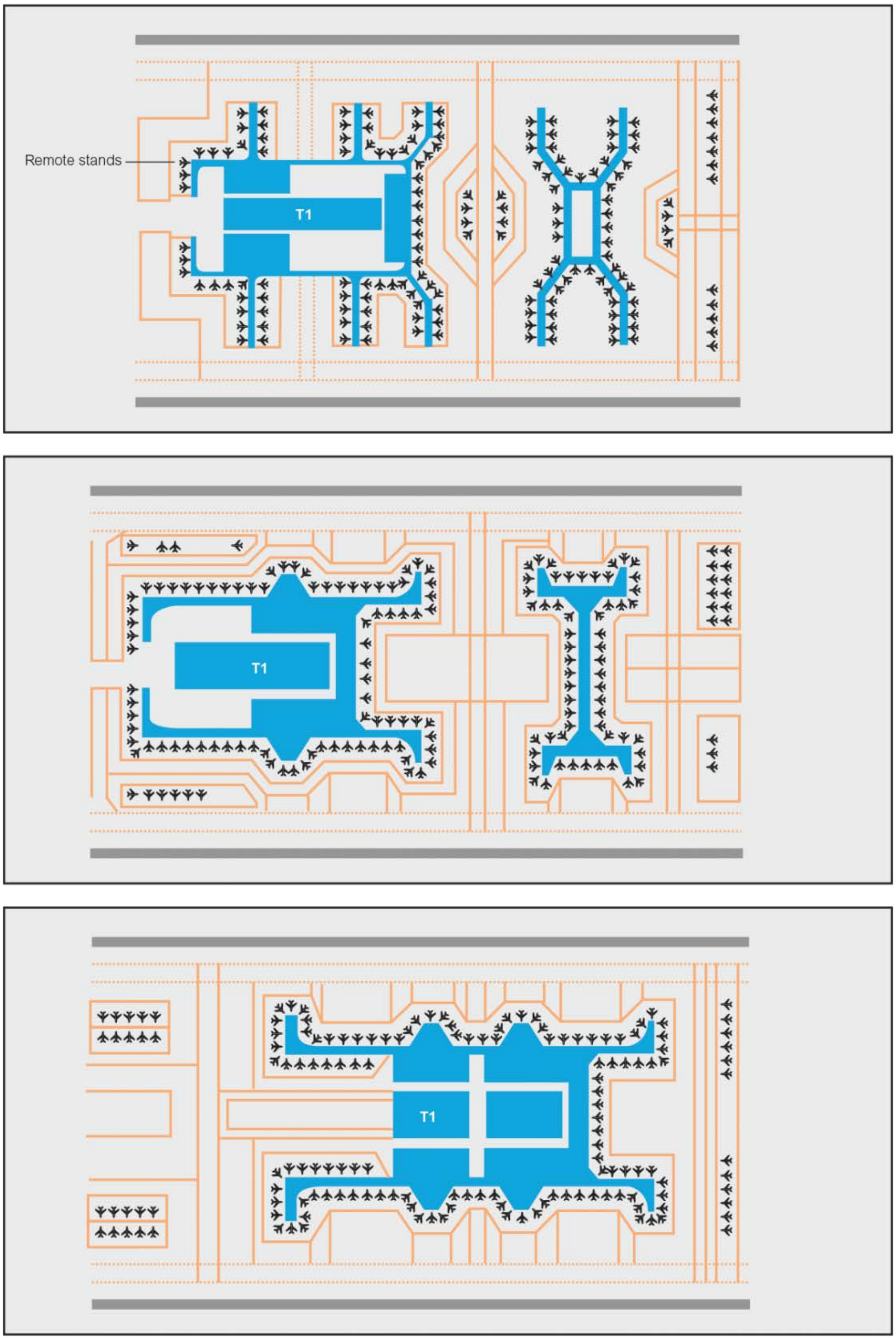

Figure 5–4 – Alternative long term terminal layouts

5.2 Airport precincts

Airports are generally divided into two main areas, or 'precincts', that reflect the level of public access to the main functional elements within each area. These are known as the airside and landside precincts.

The airside precinct includes all areas that are accessible to aircraft, as well as the restricted access areas within the airport site that support passenger and freight aircraft operations, including runways, taxiways, aprons, baggage handling, air traffic control, fuel facilities, and firefighting and rescue services. Parts of the terminal buildings and cargo handling facilities also form part of the airside precinct. These include boarding gates, lounges and other areas that are only accessible following security screening.

The landside precinct includes areas that are open to general public access such as parking lots, access roads and kerbside drop-off areas, bus stations and train stations. Those parts of the terminal buildings and cargo handling facilities not subject to security and screening, such as check-in and baggage drop-off and freight delivery docks, also form part of the landside precinct.

5.3 Summary of key features

The key features and performance criteria for Stage 1 at 2030 are provided in Table 5-1.

Table 5-1 – Summary of key Stage 1 features

Feature	Performance criteria
General	
Airport site	Total area 1,780 hectares
Ownership	Commonwealth
Land use	Commercial aviation
Predicted 2030 demand	
Annual aircraft movements – passenger	Approximately 56,000 international and domestic
Annual Aircraft movements – freight	Approximately 7,000 international and domestic
Domestic aircraft movements – passenger	~48,300 annual traffic movements
Domestic aircraft movements – freight	~3,100 annual traffic movements
International aircraft movements – passenger	~7,700 annual traffic movements
International aircraft movements – freight	~3,900 annual traffic movements
Nominal passenger movements	Approximately 10 million per year international and domestic
Domestic nominal passenger movements	7.8 million per year
International nominal passenger movements	2.1 million per year

Feature	Performance criteria
Runway and lighting	
Length	3,700 metres
Width	60 metres
Aerodrome reference aircraft	Code F
Orientation	Approximately north-east/south-west (50/230)
On-site/ off-site lighting	900 metre high intensity approach lighting (HIAL) off end of each threshold requires offsite easements.
Aviation fuel supply	
Fuel delivery method	Road tanker
Storage	Onsite fuel farm providing at least 3 days' storage of 8.1 mega litres
Terminal	
Configuration/ type	Integrated domestic and international
Size/ floor space	74,000 to 90,000 square metres of floor space
Ground transport links and access	
Access	Road access only
Public entrance	M12 link at Elizabeth Drive (100 metre wide corridor comprising up to six traffic lanes, two bus lanes and a 40 metre rail reserve corridor)
Freight and maintenance	The Northern Road (50 metre wide corridor comprising a minimum of two traffic lanes)
Car parking and drop-off	
Car parking spaces	11,500 (minimum) to 12,500 (maximum authorised)
Kerbside drop-off – Arrivals	180 to 250 metres
Kerbside drop-off – Departures	180 to 250 metres
Major utility requirements	
Water	1.6 mega litres of potable water per day and 1.8 mega litres of non-potable water per day
Sewage and wastewater	2.5 mega litres of wastewater treated onsite and 0.11 mega litres of surplus sludge
Electricity	16.7 megavolt amperes at peak demand
Gas	57,000 gigajoules per year

A holistic approach to the planning of the proposed airport has been applied to provide the initial required capacity for aircraft, passengers, cargo, and vehicle movements. Flexibility and expandability have been considered in the airport geometry and facility layout to allow for the proposed staged development in line with increasing demand. The capacity of each facility has been planned with regard to the overall airport operating efficiency and ability to accommodate future growth and cost.

The development of the Airport Plan has taken into account various forecasts and assumptions around expected air traffic movements and required capacity for the proposed airport to operate during Stage 1 and in the long term.

In order to provide the most efficient and safe operation of the proposed airport, the following codes and regulations were taken into account in developing the Stage 1 indicative concept design, as outlined in the draft Airport Plan:

- International Civil Aviation Organization (ICAO) standards and manuals;
- *Civil Aviation Act 1988*, the Civil Aviation Regulations and the Civil Aviation Safety Authority's (CASA) Manual of Standards;
- *Aviation Transport Security Act 2004* and Regulations;
- *Air Navigation Act 1920* and Regulations;
- *Customs Act 1901* and Regulations;
- *Crimes (Aviation) Act 1991* and Regulations;
- *Quarantine Act 1908* and Regulations, which will be replaced by the *Biosecurity Act 2015* when it commences in June 2015*;*
- *Airspace Act 2007*; and
- *Air Services Act 1995*.

5.3.1 Aircraft fleet mix and aerodrome reference codes

The draft Airport Plan has been developed to provide flexibility to accommodate any aircraft fleet mix anticipated to use the proposed airport. ICAO aerodrome reference codes (A, B, C, D, E, and F) were used in the planning of the functional elements of the airport site. Using the ICAO system provides flexibility to accommodate a variety of aircraft fleet types at the proposed airport during Stage 1 and long-term development. Table 5-2 outlines the fleet mix categories and provides examples of applicable aircraft.

Table 5-2 – Aerodrome and aircraft reference codes and examples

Aerodrome and aircraft reference code	Most common routes	Aircraft examples
Code A	General aviation	General aviation aircraft
Code B	Regional	SAAB 340 Dash 8-300
Code C	Domestic	Airbus A320 Boeing 737

Aerodrome and aircraft reference code	Most common routes	Aircraft examples
Code D	Domestic	Boeing 767
Code E	International	Airbus A330/ A350 Boeing 747-400 Boeing 777 Boeing 787
Code F	International	Airbus A380 Boeing 747-800

During Stage 1 Code C aircraft are expected to account for the majority of domestic operations at the proposed airport, representing approximately 90 per cent of the domestic fleet mix at the time. The international fleet mix during Stage 1 is expected to comprise about 59 per cent Code E aircraft and about 40 per cent Code C aircraft.

The fleet mix of freight aircraft assumes the majority of domestic dedicated freight activity is served by Code C aircraft and international freight activity served by larger Code E aircraft.

The remaining fleet mix would consist of Code A, B and F aircraft. No Code D aircraft are expected to operate at the proposed airport, since most Code D aircraft (e.g. B767, A310, B757) are being phased out of operations.

5.3.2 Critical design aircraft

The largest aircraft expected to use an airport determines the airfield planning dimensions and is considered the 'critical design aircraft'. The critical design aircraft also determines the critical separation and design geometry dimensions for safe operations on runways, taxiways and aprons.

Code F is the largest type of aircraft expected to use the proposed airport, and has therefore been adopted as the critical design aircraft. This means that from the start of operations, the airport would be able to service the largest aircraft in operation today (e.g. the Airbus A380). Designing to meet Code F standards means that the functional elements would be able to meet Code F activity as operations develop without disrupting existing airport operations. This would be particularly important in advance of the potential second runway and terminal expansion.

Although Code F has been adopted as the critical design aircraft, it is expected that only a small number of Code F aircraft are likely to use the proposed airport, equating to about 0.5 per cent of movements in 2030 and up to one per cent of the expected fleet mix in the long term.

5.3.3 Airfield capacity and activity forecasts

Airfield capacity

Airservices Australia has assessed airspace implications and air traffic management approaches for the Sydney region airspace associated with the development of the proposed airport. It is important for long-term planning that the configuration of the airport site in Stage 1 does not preclude future development in the long term and therefore airfield capacity analysis is based on the long term, parallel runway scenario.

This analysis indicates that an airport development at Badgerys Creek could potentially achieve the following capacity (per hour) with parallel runway operations in the long term:

- 45 landing operations;
- 58 departure operations; and
- 103 total aircraft movements (landing and departing).

Activity forecasts

Indicative activity forecasts based on the expected fleet mix have been developed for the purpose of planning the capacity, layout and functionality of the proposed airport. The key indicative forecast parameters considered during the design and planning of the airport site include:

- The annual passenger demand in terms of million annual passengers;
- Forecast air traffic movements (annual traffic movements), either landing or departing; and
- Peak hour passenger and annual traffic movements demand at the airport.

The major functional areas of the airport such as terminal facilities, runways, taxiways and roadways are would be designed to accommodate the peak hour passenger or peak hour aircraft demand. The peak hour activity represents the greatest level of demand being placed on facilities required to accommodate passenger and aircraft movements. Consideration of the peak hour activities during planning allows facilities to be sized appropriately so that they are neither underutilised nor overcrowded too often, and ensures that users consistently receive a satisfactory level of service and are not subject to significant congestion.

In 2030, the proposed airport is expected to accommodate approximately 63,000 passenger and freight annual traffic movements, including approximately 21 annual traffic movements per hour during peak times. This could increase to 370,000 annual traffic movements in 2063, including 85 annual traffic movements per hour during peak times.

The Stage 1 and long term capacity requirements for the proposed airport based on the indicative activity forecasts and the expected peak hour activity are summarised in Table 5-3. The Stage 1 airport layout would be designed so as not to preclude future development to accommodate expected long term capacity requirements.

Table 5-3 – Summary of activity forecasts

	Stage 1 (c. 2030)	First runway at capacity (c. 2050)	Long term (c 2063)
Annual passengers (arrivals and departures)	10 MAP	37 MAP	82 MAP
Peak hour passengers (international and domestic)	3,400	9,500	18,700
Total annual annual traffic movements (passenger and freight)	63,000	185,000	370,000
Total peak hour annual traffic movements	21	49	85

The volume and profile of passengers using the proposed airport is expected to evolve over time in response to growing demand and relative market position. It is expected that in the early years around 80 per cent of passenger demand at the proposed airport would involve regional and domestic travel. Domestic demand is likely to be focussed on travel between capital cities, including Melbourne, Brisbane and Perth, as well as Gold Coast Airport.

Over time, it is expected that demand could grow, particularly in international regular public transport, as residual capacity at Sydney Airport is used. It is expected that the proposed airport could serve approximately 2 million international passengers annually by 2030, growing to approximately 19.5 million international passengers annually by 2050. By this time, the domestic/international split could be approximately 43 per cent domestic and 57 per cent international. In the long term, the proposed airport is expected to serve all types of aviation traffic including low cost carriers, full service carriers, international, domestic, connecting and regional traffic.

Freight aircraft are also expected to operate at the proposed airport, with the site able to accommodate approximately 7,000 dedicated freight annual traffic movements in 2030, increasing to 30,000 annual traffic movements in 2063.

5.4 Airside precinct

The airside precinct includes all areas that are accessible to aircraft, as well as the restricted access areas within the airport site that support passenger and freight aircraft operations, including runways, taxiways, aprons, baggage handling, air traffic control, fuel facilities, and firefighting and rescue services. Parts of the terminal buildings and cargo handling facilities also form part of the airside precinct. These include boarding gates, lounges and other areas that are only accessible following security screening.

5.4.1 Runways

Orientation

Design principles

Runway orientation is determined largely by the shape and size of the available land and the prevailing wind conditions at the site. The amount and shape of land available at the airport site is relatively constrained, and design development is limited in terms of options for runway orientation.

The site is oriented generally north-east/south-west. To provide for future development to two parallel runways, the design has been developed around an optimal orientation of 50/230 degree (magnetic) heading (referred to as 05/23). This is illustrated in Figure 5–5.

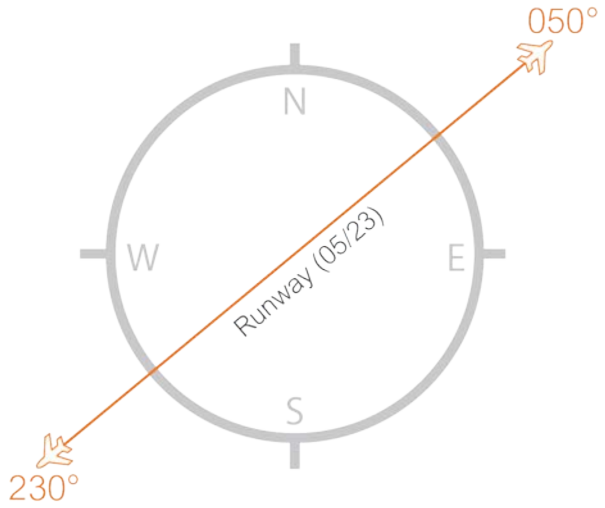

Figure 5–5 – Runway orientation

ICAO aerodrome design standards dictate that the number and orientation of runways at an aerodrome should ensure that the aerodrome is useable for not less than 95 per cent of the time for the aircraft it is intended to serve (ICAO 2006).

In developing and assessing the usability factor for various runway orientation options it is assumed that landing or take-off operations are precluded when the crosswind component exceeds the following:

- 20 knots (37 kilometres per hour) in the case of aircraft that require a minimum field length of 1,500 metres for take-off;
- 13 knots (24 kilometres per hour) in the case of aircraft that require a minimum field length of 1,200 metres for take-off; and
- 10 knots (19 kilometres per hour) in the case of aircraft that require a minimum field length required of less than 1,200 metres for take-off.

The Bureau of Meteorology assessed the usability of the airport site based on a 05/23 runway orientation by analysing, historical wind speed and direction data over the last 18 years. The *Western Sydney Airport Usability Report* is provided in Appendix D. This data was obtained from weather stations at and around Badgerys Creek. Analysis indicates that the proposed airport would be able to be used approximately 99.5 per cent of the time based solely on a prevailing crosswind of less than 20 knots.

The assessment undertaken by the Bureau of Meteorology found that a runway orientation of 05/23 would provide a high level of usability at the airport site and would likely exceed the 95 per cent usability target recommended by ICAO aerodrome design standards.

Given the constraints presented by the size and shape of the airport site, this orientation is considered the optimal parameter for the development of the airport layout.

Number of runways

To meet the anticipated passenger and freight demand at the proposed airport, two parallel runways are proposed in the long term. This provision limits the options available for locating the first runway for Stage 1.

By 2030, the Stage 1 runway is expected to accommodate approximately 63,000 passenger and freight annual traffic movements, including approximately 21 annual traffic movements per hour during peak times. This is equivalent to about 10 million annual passengers. At full capacity (in about 2050) the first runway could accommodate 185,000 annual traffic movements per year, including 49 annual traffic movements per hour during peak times – equivalent to about 37 million annual passengers.

Once the first runway reaches capacity around 2050 a second runway could be required.

In the long term, two runways would be expected to service about 85 annual traffic movements per hour during the peak hour, or up to 370,000 annual traffic movements per year, equivalent to around 82 million annual passengers.

The Stage 1 layout consists of a single runway in the northern portion of the site, close to the boundary, referred to as the 'northern runway'. Using standard naming conventions for runways to indicate their relationship to the left and right of each other in relation to the direction of travel, the northern runway would be 05L-23R and the future 'southern runway' would be 05R–23L. The layout of the Stage 1 05L–23R runway is provided in Figure 5–6.

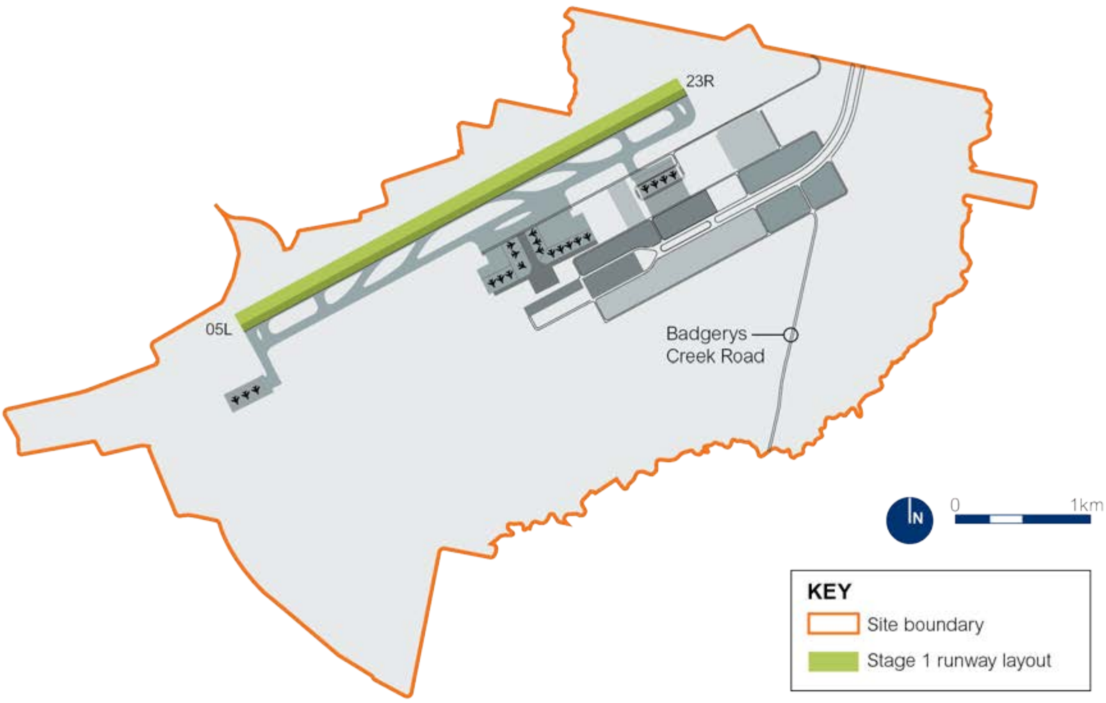

Figure 5–6 – Stage 1 'northern runway' (05L–23R) layout

Runway length requirements

Safe aircraft operating conditions require a runway length that is sufficient to ensure that, after beginning a take-off, an aircraft can either be brought safely to a stop or safely complete the take-off.

ICAO Annex 14 – Aerodromes Volume 1[2] identifies the minimum specification requirements for currently operating aircraft and for similar aircraft planned for introduction that are likely to have similar characteristics to those currently operating. Runway length analysis was conducted using the ICAO Aerodrome Design Manual[3] with consideration given to the following information:

- mean maximum temperature;
- aerodrome elevation;
- equivalent temperature in standard atmosphere;
- runway slope; and
- maximum take-off weight for the critical aircraft likely to use the proposed airport.

The maximum take-off weights for a range of aircraft expected to use the proposed airport, including the design critical Code F aircraft are shown in Table 5-4. These weights were used to analyse the runway length required to allow the aircraft to reach its furthest possible destination, based on payload and fuel weight. Analysis included the domestic and international operations expected at the proposed airport.

Table 5-4 – Maximum take-off weights for critical aircraft expected to use the proposed airport

Aircraft	Code	Maximum take-off weight (kg)	Runway length requirements (m)
B737-500	C	60,550	2,960
B747-400	E	396,894	3,790
B747-800	F	447,696	3,670
B767-300ER	D	186880	3,790
B777-200	E	286,900	3,320
B777-300ER	E	351,535	3,640
A321-200	C	93,500	3,000
A330-300	E	242,000	3,650
A340-600	E	380,000	3,400
A380-800	F	575,000	2,900

Source: Aircraft Manufacturer's Manuals

[2] *ICAO Annex 14 – Aerodromes Volume 1, Aerodrome Design and Operations, 6th Edition* (ICAO2013)

[3] *Doc. 9157 Aerodrome Design Manual, Part 1, Runways, 3rd Edition* (ICAO 2006)

Based on the analysis undertaken, the maximum runway length requirement is 3,790 metres for the B747-400 and B767-300ER aircraft. However, these two aircraft are currently being phased out of the Boeing fleet.

The heaviest Code F aircraft, the A380-800, only requires a runway length of 2,900 metres and is therefore not a significant design constraint in considering the most appropriate runway length. A runway length of 3,700 metres will cater for the requirements of the A330-300, the B777-300ER (both Code E) and the B747-800 (Code F) aircraft and is considered the most appropriate length for the Stage 1 development and long-term planning of the airport.

A runway length of 3,700 metres would be constructed for Stage 1 and would enable the airport to serve all domestic and international destinations within a radius of 8,000 nautical miles. Figure 5–7 shows that, for the B777-300ER aircraft at maximum take-off weight, the proposed airport could serve international destinations including Dubai and mid-west USA.

Figure 5–7 – B777-300ER range with 100 per cent passenger load

Runway separation

Airport developments with two or more parallel runways require adequate separation to accommodate independent (but parallel) approach and departure operations during peak hour operations. Runway separation requirements are based on ICAO Standards as prescribed in the *Manual on Simultaneous Operations on Parallel or Near-Parallel Instrument Runways*[4]. These standards require a minimum separation of 1,525 metres to enable runways to operate independently of each other in poor weather.

[4] ICAO Doc. 9643

The separation criteria for the Stage 1 and the long term runways have been developed in accordance with the requirements set out in the ICAO Standards and in such a way as to maximise the land between the two runways for terminal buildings, aprons and taxiways.

The Stage 1 northern runway would be positioned in the northern portion of the site, allowing for a separation of 1,900 metres between the Stage 1 runway and the second runway in the southern portion of the airport site.

A separation of 1,900 metres would be required to allow the second runway to operate completely independent, parallel arrival and departure operations. This separation would also ensure adequate midfield separation to accommodate the airfield taxiway system, terminal buildings, aircraft stands and maintenance facilities; as well as ground transport access infrastructure required for operations to meet the long-term demand capacity of up to 82 million annual passengers expected to be achieved around 2063.

5.4.2 Taxiway and apron system

Taxiways and taxi lanes

Taxiways and taxi lanes allow the safe and efficient movement of aircraft between runways and the terminal. Landing aircraft cannot touch down until any preceding aircraft has moved completely clear of the runway. Rapid exit taxiways are required to facilitate this movement and need to be optimally positioned and configured to support the aircraft fleet mix expected to use an airport, so that the time an aircraft spends on a runway is minimised.

It is expected that the taxiway system for the proposed airport constructed as part of Stage 1 would include a full length parallel field taxiway, with linking taxiways and taxi lanes providing safe and efficient access and circulation between the runway/parallel taxiway and the apron areas, including rapid exit taxiways. Stage 1 would be designed to preserve the ability to expand the proposed airport in the long term.

An indicative layout of the Stage 1 taxiways is provided in Figure 5–8.

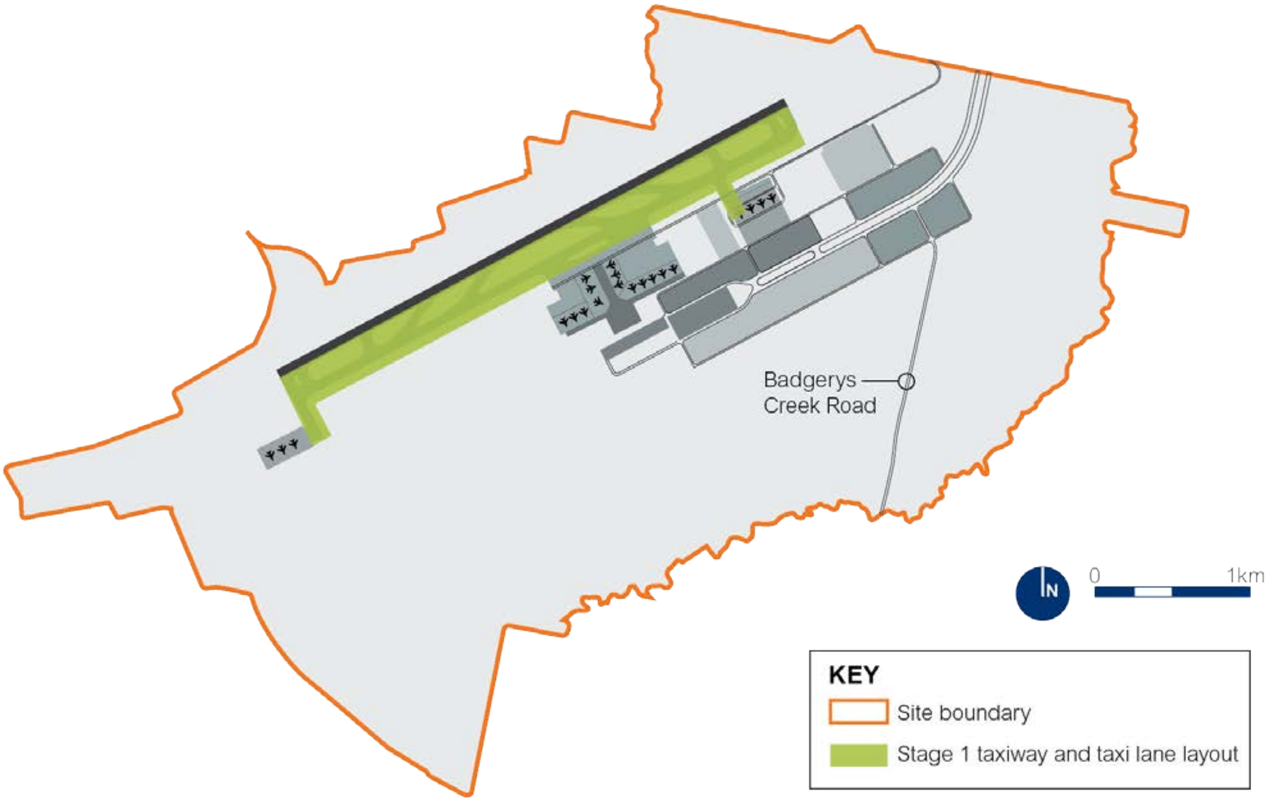

Figure 5–8 – Taxiway and taxi lane layout

Lighting, marking and signage

The proposed airport would require a range of airfield ground lighting including low visibility lighting, as well as movement control and guidance system interface, pavement marking and signage for the taxiway and taxi lane systems. These would be developed in accordance with CASA Manual of Standards (MOS) – Part 139 Aerodromes and ICAO Standards.

5.4.3 Apron and aircraft stands

The main public transport apron and aircraft stands would be developed to operate as an integrated terminal. This is discussed in more detail in Section 5.4.9 and Section 5.5.1. An integrated terminal design would provide efficiencies in operation due to the ability to 'swing' certain airport facilities, allowing the airport operator to switch the use of airport facilities such as check-in, security and baggage claim between domestic and international passengers.

Swinging certain facilities would provide benefits including increased flexibility to accommodate the up-gauging of domestic aircraft, sharing of passenger processing facilities by international and domestic passengers and increased efficiency in transfers and the usage of stands and gates.

All aircraft stands on the regular public transport apron and the permanent freight apron area (if constructed in Stage 1) would be provided with an aircraft (reticulated) hydrant refuelling system.

A freight apron may be located at the western end of the airport site or, as a temporary provision, near to the passenger terminal area. If the temporary location is utilised, fuelling of aircraft may be undertaken by fuel truck instead of hydrant fuelling.

It is likely that some Code F stands would be developed as Multiple Aircraft Ramp Systems, which provide maximum flexibility in stand capability and airline allocation within the terminal by allowing one stand to handle either two Code C aircraft or one Code F aircraft.

A mix of contact (aerobridge served) stands and non-contact (walk-on/walk-off) stands would be required according to the nature of traffic, (e.g. full service carriers versus low cost carriers).
The layout of the Stage 1 aprons and aircraft stands would be designed such that they are able accommodate the capacity requirements of both the Stage 1 and the long term developments and the requirements of the critical Code F aircraft. This would include consideration of the following functional elements:

- aircraft servicing;
- taxi lane support;
- push back zones;
- jet blast considerations;
- hydrant fuelling;
- safety zones;
- aerobridge manoeuvring zones;
- Ground Service Equipment staging and storage areas;
- safe walk out or bussing stand provisions;
- airside road layout with preservation for long-term design capacity and circulation of ground service equipment and airside vehicles; and
- other provisions typically associated with compliant stand design.

An indicative example of an apron and stand layout sufficient to accommodate a Code F aircraft is provided in Figure 5–9.

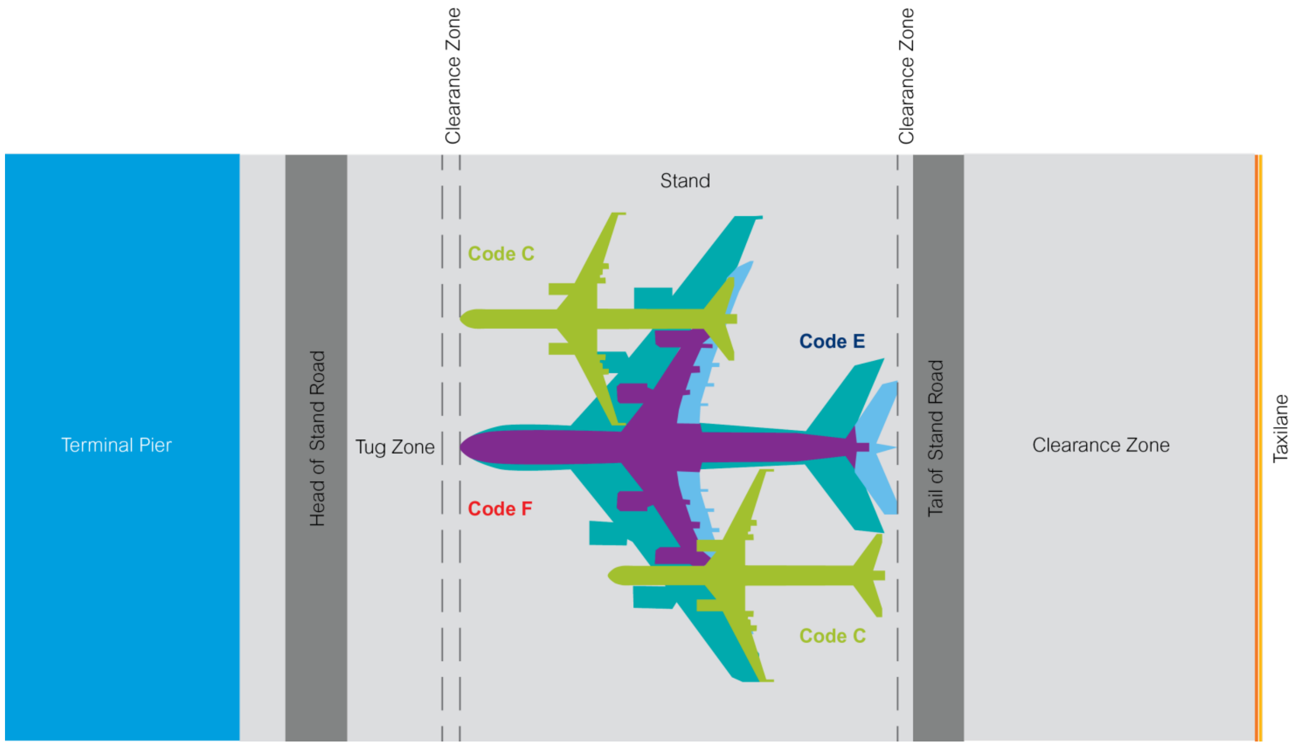

Figure 5–9 – Indicative apron and stand layout for a Code F aircraft

5.4.4 Air traffic control

An air traffic control tower (ATCT) needs to be located so that the time taken by the air traffic controller to detect the start of an aircraft's movement at take-off is minimised. This is referred to as the Response Time.

The CASA *Draft Advisory Circular 172-003 (Control Tower Advisory Principles)* (CASA 2005) require that the response time be kept below four seconds, with an upper limit of five seconds for exceptional circumstances.

Based on the design grading of the airport site, estimated runway locations and elevation plans, the controller eye level elevation would need to be a minimum of 115 metres Australian Height Datum (AHD) to provide the required four second response time. For the airport site, this means that the ATCT would need to be approximately 35 metres high.

In order to provide air traffic control coverage of both runways within the required response time the ATCT would be located within the area shown in Figure 5–10.

The facility would be a stand-alone installation approximately 35 metres high and would be segregated in a secure ATCT precinct.

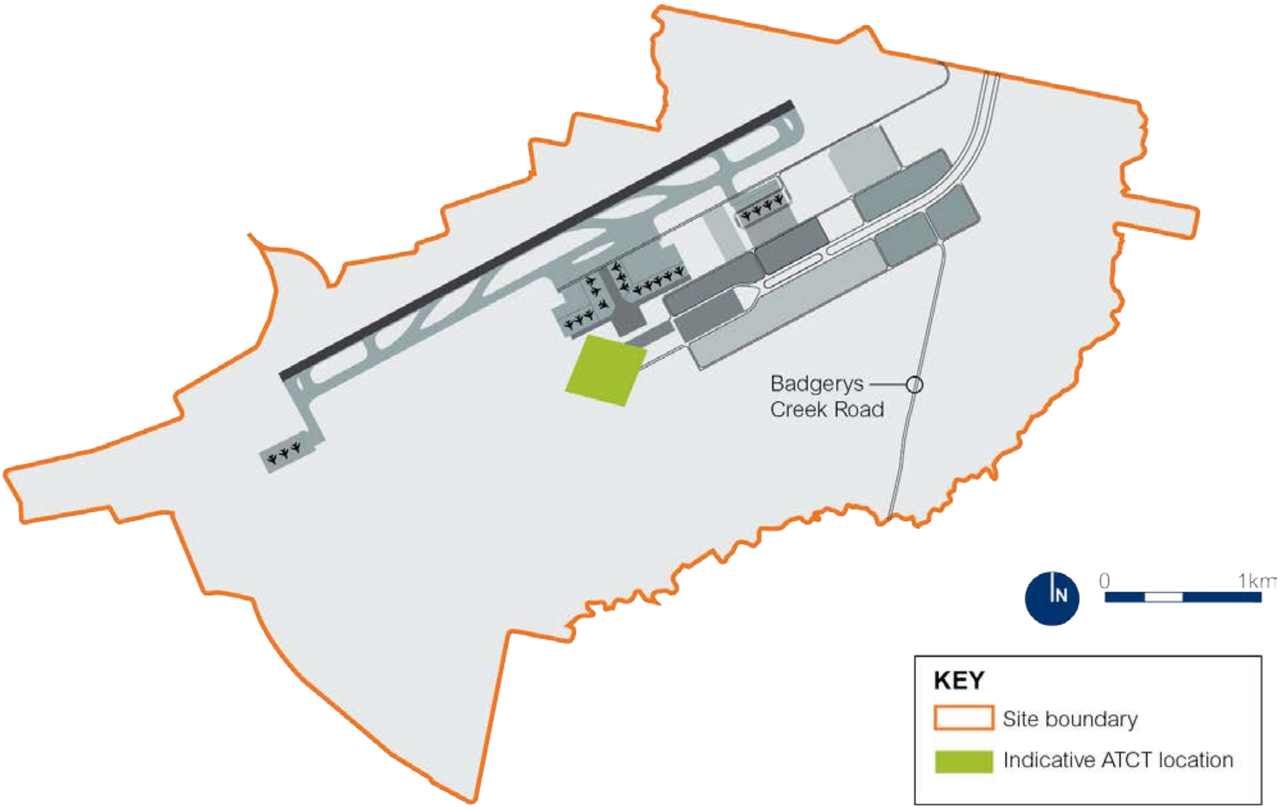

Figure 5–10 – Location of the air traffic control tower

5.4.5 Navigational aids

The Stage 1 runway is expected to be equipped to accommodate instrument approach procedures at both ends, which provide navigational guidance to approaching aircraft enabling them to land safely during periods of poor visibility.

Protection zones would need to be included to assure the continuous operation of the navigational aids. Easements or land acquisition may be required to facilitate these protection zones, within which restrictions would be placed on building types, building heights and certain activities in order to avoid interference with navigational aid equipment.

Navigational equipment

Stage 1 would include a number of navigational aids, located in accordance with the relevant equipment siting guidelines. The following equipment would typically be required:

- Precision Approach Path Indicator (PAPI);
- Instrument Landing System (ILS) – Category III;
- Glide Path (GP);
- Localiser (LOC);

- High Intensity Approach Lighting (HIAL) – where HIAL protrudes beyond the airport site boundary, these facilities would be protected either with an easement or through land acquisition. Indicative locations for the required HIAL are shown in Figure 5–11;
- Marker Beacons (Inner, Middle, and Outer Markers);
- Far Field Monitor (FFM);
- Distance Measuring Equipment (DME);
- Advanced-Surface Movement Guidance and Control System (A-SMGCS); and
- Ground Based Augmentation System.

A Ground Based Augmentation System (GBAS) is a critical component of the navigational aids required for safe airport operations. The system improves the accuracy and reliability of an aircraft's navigational system by transmitting location data between one or more accurately surveyed ground stations and an approaching aircraft's navigation system.

The GBAS facility comprises two components including a VHF Data Broadcast antenna and four Remote Satellite Measurement Unit antennas. The GBAS is required to be located at least 200 metres from operating aircraft, 150 metres from major roads and railway lines and requires clear unobstructed coverage to the entire runway length. The location of the GBAS would be confirmed during detailed airport design.

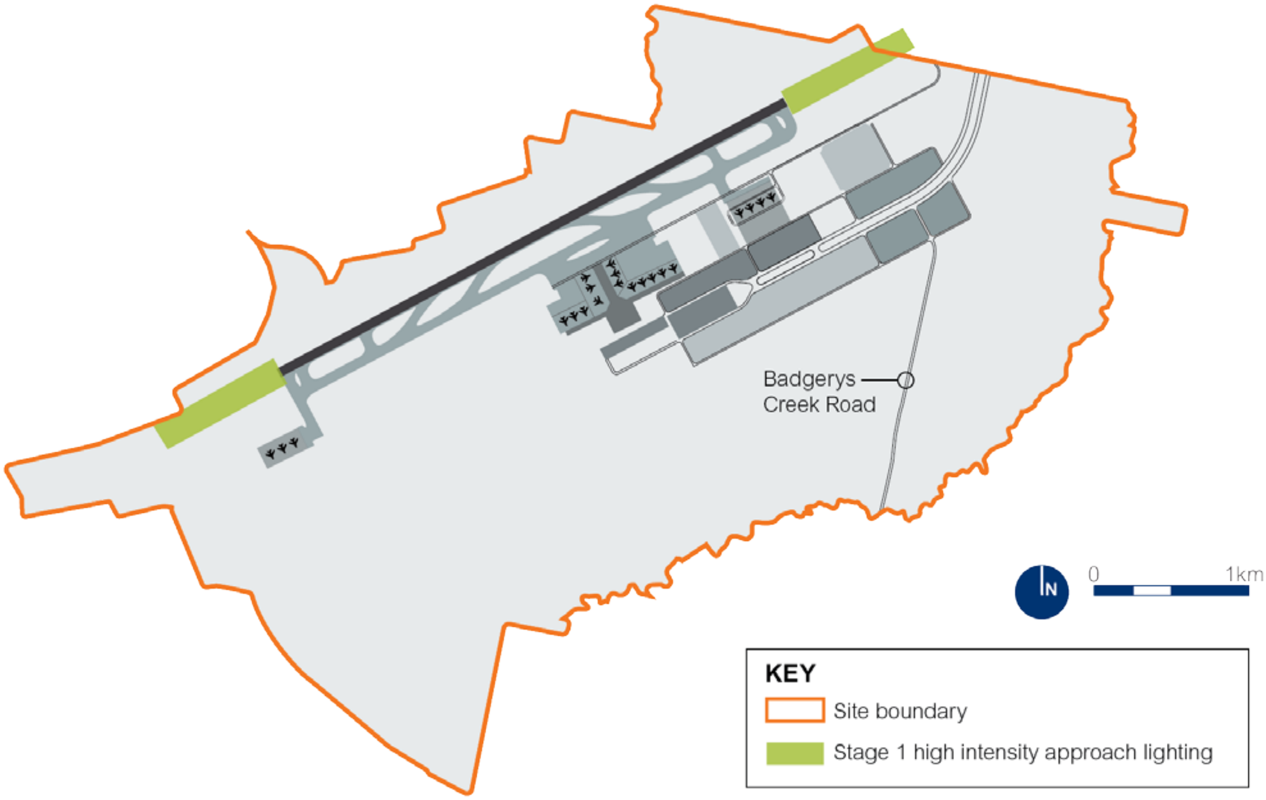

Figure 5–11 – Indicative location of the required high intensity approach lighting

Runway lighting

Runway lighting would comprise the following typical elements:

- High Intensity Runway Lights (HIRL);
- Airfield Lighting Equipment Room (ALER) Facility, which will house all control systems and Constant Current Regulators (CCR) of the Airfield Ground Lighting (AGL) system;
- Runway Centreline Lights;
- High Intensity Approach Lighting;
- Touchdown Zone Lights (TDZ);
- Runway Threshold Lights;
- Runway Wing Bar Lights;
- Runway End Lights; and
- Runway Guard Lights.

Taxiway lighting

Taxiway lighting would comprise the following typical elements:

- Rapid exit taxiway indicator lights;
- Stop bars;
- Taxiway edge lights;
- Taxiway centreline lights; and
- Movement area guidance signs.

Meteorological equipment

Meteorological equipment would comprise the following typical elements:

- Runway visual range – touchdown;
- Runway visual range – roll-out;
- Runway Visual Range – mid-point; and
- Illuminated wind direction indicator.

5.4.6 Security and safety

The proposed airport is expected to be designated as a 'Category 1' airport for the purposes of the Aviation Transport Security Act 2004 and related regulations. This designation dictates minimum security requirements for the proposed airport.

A perimeter security fence and pass controlled secure airside access points would be required to restrict public access to all airport operations areas and supporting facilities.

Inside the security fencing, a perimeter road would provide access to all perimeter support infrastructure, including all navigational aids, as well as detention basins and water quality structures. This roadway may also be used to monitor airport perimeter security and provide access for maintenance of the security fencing, perimeter lighting, and closed circuit television (CCTV).

Safety measures at the airport site would be put in place in accordance with all relevant laws including requirements in relation to:

- emergency safety response facilities and reserves;
- fuel and other toxic spill containment infrastructure;
- fire training area;
- public safety areas; and
- airside emergency safety assembly areas.

5.4.7 Aviation Rescue and Firefighting Services (ARFFS)

An ARFFS station would be required to service the Stage 1 runway. In the long term, a second ARFFS station would be required to service the southern runway.

During Stage 1 the ARFFS station is expected to be located on the outboard side (to the west) of the northern runway and as close to the centre of the runway alignment as possible in order to optimise response time to each end of the runway. An indicative location for the ARFFS is shown in Figure 5–12.

The ARFFS station would accommodate vehicle fuel storage and delivery systems and firefighting foam storage facilities and standard fire and rescue station operating requirements such as a control centre, accommodation and services and vehicle maintenance facilities.

An ARFFS training area would be provided adjacent to the ARFFS station and is likely to be positioned to the west, between the ARFFS station and the airport site boundary.

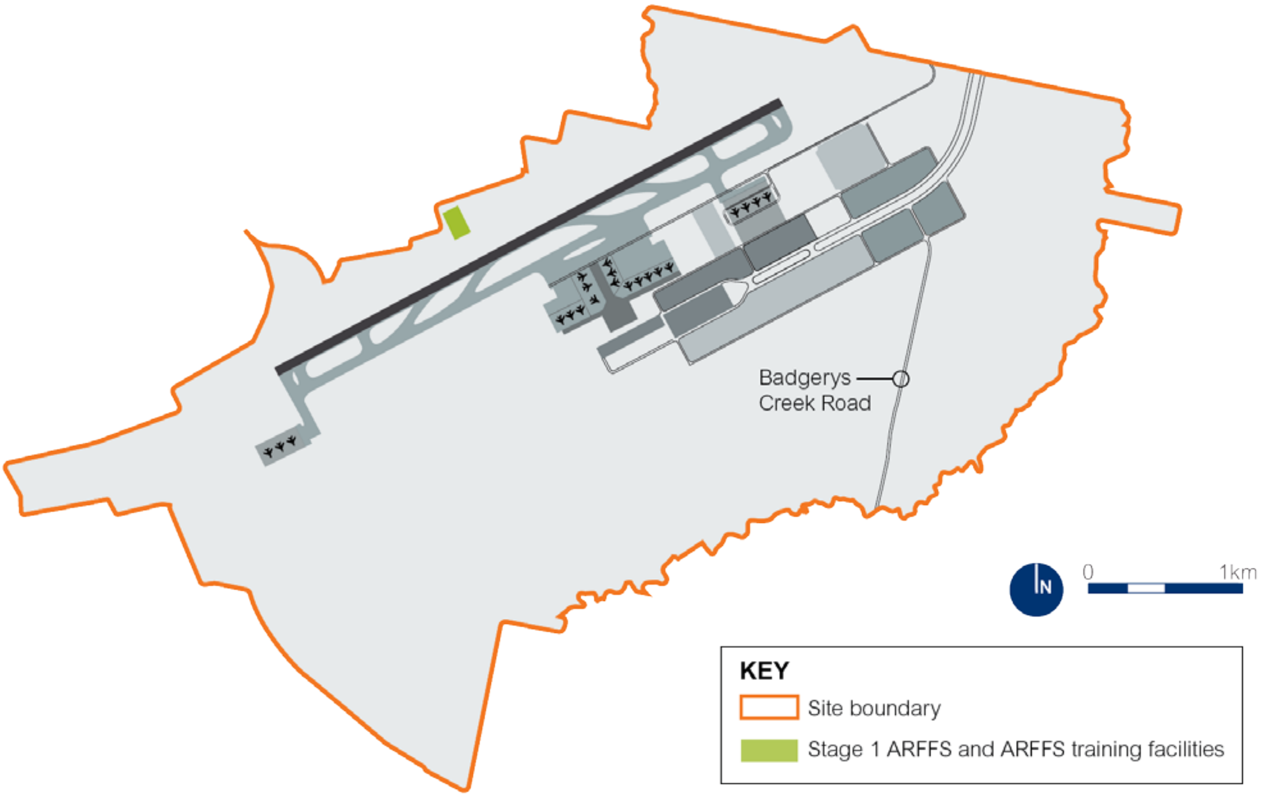

Figure 5–12 – Indicative location of the ARFFS station and training facility

5.4.8 Aviation support

The proposed airport would require the provision of fully serviced support facilities, internal road infrastructure, drainage and all necessary utilities to provide optimal support to aviation activities. The type and scale of the support services required would change and develop over time in line with increased demand.

Stage 1 may include maintenance facilities for aircraft and ground vehicles and equipment, fuel services for aircraft and ground vehicles, freight and cargo handling and processing facilities, general and corporate aviation facilities, flight catering facilities and other support facilities such as storage areas, policing operations and waste disposal.

Aircraft maintenance facilities

Stage 1 would include an aircraft maintenance precinct and associated aprons, taxiways and landside access. Facilities may include:

- general maintenance facilities including an engine run up area;
- hangars;
- aircraft wash;
- staff car park; and
- fuel provision facilities for ground vehicles.

A major element of the aircraft maintenance facility is the aircraft engine run up area, where aircraft engines are run at full throttle to check that they capable of producing take-off thrust. A dedicated bunded location is provided to ensure that air blast from the engines does not damage other aircraft or structures, and to assist in the reduction of ground based noise associated with airport operations.

Fuel

Appropriate facilities for the handling of aircraft fuel and lubricants would be provided. These facilities would include fuel storage for JET A-1 aviation fuel and fuels for ground vehicles (diesel and petrol), provision for electric vehicles and/or gas driven vehicles, and fuel transfer and aircraft defueling facilities.

The requirements for the storage and transfer of fuel are discussed in more detail in Sections 5.6.11 and 5.6.12.

Freight and cargo

Stage 1 is expected to include a freight precinct, to which aprons, taxiways and landside access would be provided in order to meet the expected capacity requirements for freight. As for all functional elements in Stage 1, they would be developed so as not to preclude future growth in the long term.

Stage 1 may include a multi-tenant cargo terminal complex and provision for support activities such as truck docking, staging, cargo agents, storage equipment repair and associated quarantine, customs and immigration activities.

The indicative locations of the main functional elements providing aviation support are shown in Figure 5–13.

General and corporate aviation

The proposed airport would be developed to address aviation passenger demand and does not make specific provisions for general aviation facilities, which may include helicopter flight support and tourist flight facilities. Should such provisions be required in the future, they would be subject to separate environment and planning processes under the Airports Act.

Flight catering

Stage 1 may include a flight catering facility, depending on demand. This would include appropriate airside and landside access for flight catering providers. Provision would also be made for supporting activities, such as a truck manoeuvring area for loading docks within the complex, truck parking and a fuel facility for ground vehicles.

Other support facilities

Other support facilities that may be developed as part of Stage 1 include:

- facilities to support policing operations;
- facilities as required by various Government agencies;

- crash gates;
- vehicle maintenance for ground service equipment;
- long term storage areas for various airlines;
- an airfield lighting equipment room;
- an aircraft waste disposal facility;
- a recycled water treatment plant; and
- a building and ground maintenance facility.

The main airport support facilities are shown in indicative locations in Figure 5–13.

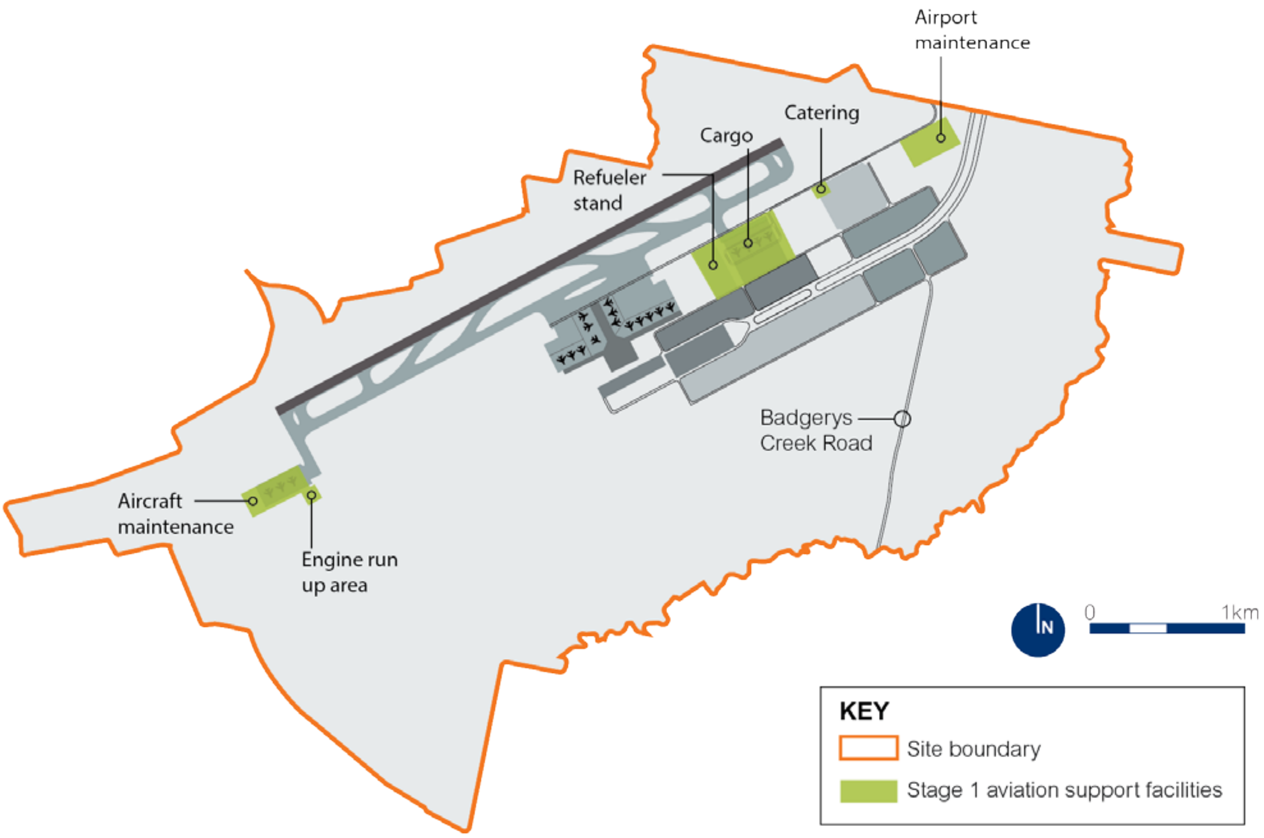

Figure 5–13 – Indicative locations of the main aviation support facilities

5.4.9 Airside roads

Airside roads would be provided for efficient movement of vehicles around the airport site between the terminal area and support facilities without disruption to aircraft operations. These roads would be internal access roads and subject to security clearance and restricted access. A Ground Transport Plan would be prepared as part of the detailed design of the proposed airport.

Perimeter road

A perimeter road would provide access to perimeter support infrastructure and navigational aids. This road would also be used to monitor the perimeter security and perform any maintenance of the security fencing, perimeter lighting, and CCTV system.

The perimeter road pavement (surface) would be designed to accommodate all expected vehicles, including specialised and emergency response vehicles. Where the perimeter road would be used for emergency response vehicles, it would be a sealed two-lane road. Where the perimeter road would be remote from airside activities, and used for maintenance and inspection of support facilities only, it may be an all-weather (unsealed) road.

Internal road layout

Airside roadways would be provided to ensure efficient movement of required vehicles without disruption to aircraft operations between the terminal area and support facilities.

Where not part of the apron areas, the airside roadways would generally be sealed, have two trafficable lanes and have a design speed of 60 kilometres per hour.

Airside access to airport support facilities

Airside secure access is likely to be provided via Anton Road and Adams Road, the connecting road to the realigned The Northern Road, and may also be provided from internal public roads as required.

Emergency access points

Emergency access would be available to both the airside and landside precincts via entry points at Badgerys Creek Road, Anton Road and Adams Roads and The Northern Road connection, as well as via the primary public entrance off Elizabeth Drive and the future M12 Motorway.

An Emergency Access Plan addressing infrastructure required for all Emergency Services would be prepared in consultation with ARFFS.

5.5 Landside precinct

The landside precinct includes areas that are open to general public access such as parking lots, access roads and kerbside drop-off areas, bus stations and train stations. Those parts of the terminal buildings and cargo handling facilities not subject to security and screening, such as check-in and baggage drop-off and freight delivery docks, also form part of the landside precinct.

5.5.1 Terminal

An integrated terminal precinct, serving both international and domestic passengers and located in the midfield area between the Stage 1 northern runway and the long-term southern runway, is considered the most effective design solution for the layout of the airport site. In the long term, a midfield terminal would most appropriately utilise the available space and facilitate the best integration of landside, terminal and airfield operational requirements.

An integrated terminal would provide the greatest flexibility and allow the terminal precinct to evolve to meet changing passenger demand over time. In an integrated terminal precinct, performance criteria for the common use elements such as check-in, security and baggage claim facilities would be developed to meet the overall peak hour demand, rather than individual domestic and international peak hour demands.

The Stage 1 terminal would be designed for incremental expansion to meet the expected long-term demand cost effectively and on commercial terms, without significant disruption to operations and applying the same level of service and performance standards as Stage 1.

The terminal precinct would be the primary public focus of the proposed airport, serving arriving and departing international, domestic and regional (intrastate) passengers. It would incorporate features to optimise the functional and aesthetic appeal of a significant airport, while being efficient and cost effective for passengers, airlines, government agencies and related aviation service providers.

All elements of the terminal design would be developed in accordance with the requirements of relevant laws, including the Airports (Building Control) Regulations and the *Aviation Transport Security Act 2004* and Regulations; ICAO Standards, IATA and MOS guidelines; instruments governing the provision of disabled access; provisions for heritage and other memorial areas; and industry benchmarks for support and retail areas.

5.5.2 Terminal building

Service requirements

The Stage 1 terminal would include:

- facilities for departing passengers (check-in and departure concourse) and for arriving passengers (baggage claim and arrivals concourse areas);
- outbound and inbound inspection services (passport control, security screening, and immigration/emigration, quarantine and custom checks);
- passenger facilitation areas such as departure and gate lounges/areas; and
- areas for the provision of food and beverage and retail for passengers, visitors and staff.

General Design Considerations – Built Form

Western Sydney Airport would be a key gateway for people arriving from other national and international destinations and a gateway to Western Sydney and therefore must present a positive image for the city, state and nation.

The airport site would achieve a cohesive identity through built form integration, both within the site and also within the surrounding environment. The design would consider:

- specific factors relating to climate and geography;
- the urban or local planning context, in particular limitations and constraints;
- the size of individual developments so that structures do not dominate the landscape unless important to the overall design (e.g. airport terminals and control towers);

- morphology and elevation;
- design for cultural expression;
- access to natural light;
- transport corridors, including active transport considerations, supporting efficient movement within and between the airport site and its surrounding environment;
- universal access for the public including disability access standards;
- external spaces, circulation and services;
- any particular requirements to address evidence based design;
- specific design requirements for efficient movement of passengers and operations of the facility;
- human scale environments and inviting building frontages;
- clear way-finding with recognisable entrances, directions of movement and definition between arrivals and departures;
- safety and security considerations;
- visual and acoustic separation of the public and operational zones of the facility;
- expansion and future proofing requirements;
- lifespan and life cycles of materials;
- operational, maintenance and environmental services efficiency;
- integrated design approach through landscaping and public art; and
- applicable elements of environmentally sustainable design including consideration of climate and water sensitive principles in design and in selection of materials and colour.

Location

The terminal as part of Stage 1 would be constructed in the northern portion of the airport site, within the airport midfield (the Terminal and Support Services Zone in the Land Use Plan). The terminal would provide direct access to the Stage 1 northern runway and its associated taxiway system.

Ground transport access to the terminal would be provided via the north-eastern side of the site at Elizabeth Drive and as a high capacity connection to the future M12 Motorway, which is expected to be located north of Elizabeth Drive. An indicative location for the terminal precinct is shown in Figure 5–14.

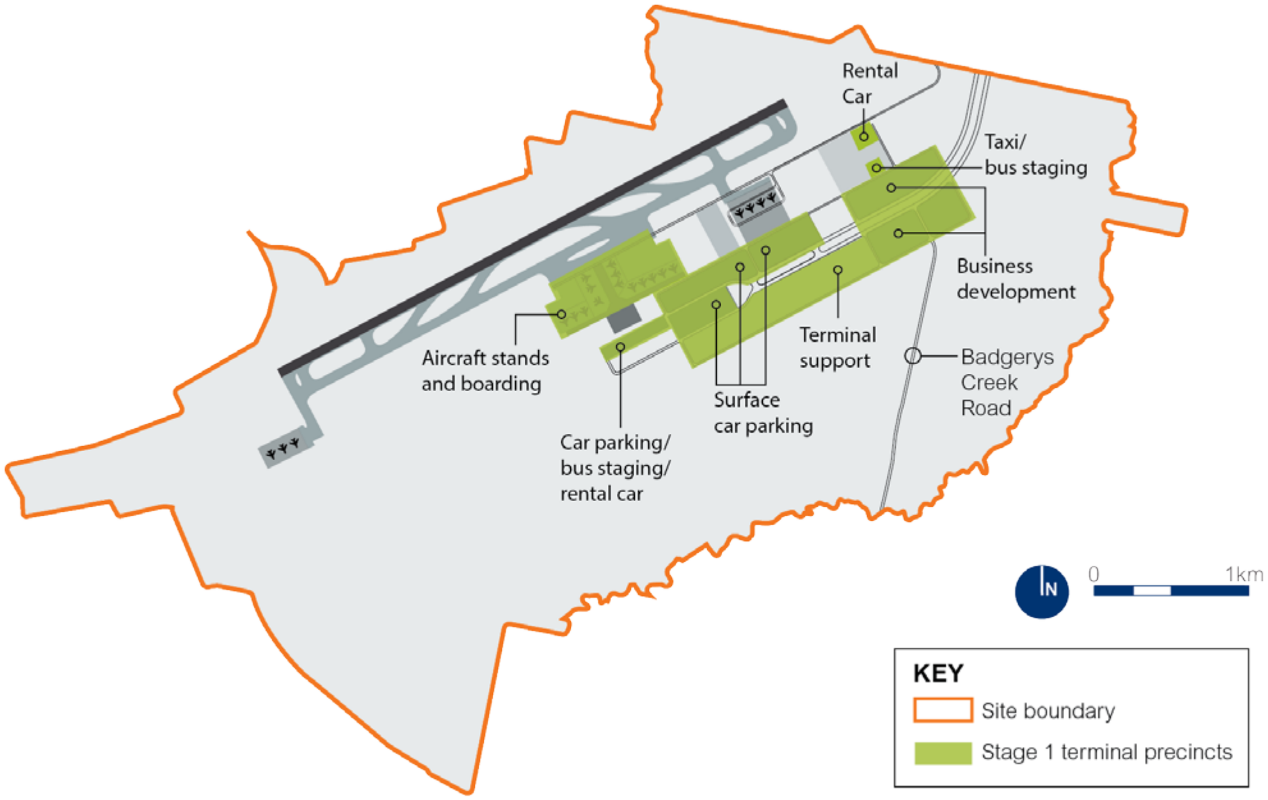

Figure 5–14 – Location of the terminal precinct

Size

The size of the Stage 1 terminal would be determined in the detailed design process based on capacity requirements, but is expected to be in the order of 74,000 to 90,000 square metres of floor area.

Terminal – public areas

The terminal will include a range of public areas that would be developed as demand dictates. The main passenger and baggage sub-components would include the following key elements:

Check-in and bag drop off

Passengers and their checked luggage would be processed using a combination of self-service and staffed counters for check-in and baggage drop-off.

Check-in facilities may include common use and airline-specific branding. The specific layout would be developed as part of the design process informed by demand, technology advancements and general market trends.

A baggage system with screening and sorting capabilities would be provided to facilitate efficient and secure processing of all baggage in accordance with Commonwealth security requirements and taking into account IATA guidelines regarding functionality, throughput and hardware requirements.

Immigration and emigration, customs and quarantine

Inbound and outbound border control processing facilities would be provided to satisfy the relevant demand and level of service standard. Adequate flexibility would be provided in Stage 1 to accommodate changes in policy, threat levels and legislation, and to integrate current and future screening technologies.

Passengers would be processed using a combination of automated processes and staffed positions.

The terminal design would take into account IATA recommendations for queuing and circulation within these passenger processing facilities.

Office facilities and amenity areas for government and border agencies, including detention areas would be provided.

Security processing

Passengers and their carry-on baggage would be screened before entering the boarding gate area of the terminal and. The facilities provided in the Stage 1 terminal would provide sufficient flexibility to accommodate changes in screening requirements and protocols, and would provide for future growth in line with increasing demand.

Additional screening points may be located in aircraft boarding lounges. Separate screening facilities may also be provided for processing of goods and other items.

Baggage claim

Baggage claim facilities, presentation areas for inbound baggage reconciliation and delivery gates, and associated circulation belts would be provided. In addition, inbound baggage offload belts would be provided with convenient access for tugs and carts.

Departure gates and aircraft boarding areas

The layout of contact and remote aircraft parking positions would be provided to meet the forecast aircraft fleet mix, taking account of aircraft types, schedules, and gate occupancy and turn-around times.

Flexible aircraft parking positions would accommodate a variety of aircraft types and sizes, including domestic and international traffic, thus optimising the overall gate utilisation.

When gates are used for international arrivals, segregation would be provided to direct arriving passengers to immigration and customs facilities.

Retail and food and beverage offering

The retail and terminal operations would be integrated to provide a high quality airport customer experience, and would be designed into the overall operation of the passenger terminal.

A range of food and beverage outlets and retail shops and services would be provided to meet the needs of customers, which are expected to be similar to those available at other comparable Australian airports. The necessary storage, back-up facilities, goods delivery access, logistics, and security screening for these activities would be built into the overall airport and terminal design.

Other terminal provisions

The proposed airport would be designed to meet the growing demand from passengers and other stakeholders for a high level of automation, more convenience, more self-service and the use of technology for a more efficient airport experience. Consistent with other comparable Australian airports, the terminal may include other operational and commercial facilities.

5.6 Utilities

Stage 1 would include the provision of utility (service) connections to external suppliers of power, water, gas and telecommunications. The connections would have sufficient capacity for Stage 1 and would be capable of expansion without significant disruption to operations as demand grows.

A Services Master Plan would be developed and all design and construction would be consistent with this plan. The Services Master Plan would include provisions, routes, easements and reservations for all services, including provision for expansion as appropriate.

Coordination with utilities (service providers) would be required during detailed design to determine supply points. All agencies and stakeholders associated with the proposed airport would be consulted in relation to their service requirements.

5.6.1 Services supply

Services would be connected to the site boundary by the relevant utility provider. Offsite works associated with connecting the services to the boundary would be the subject of separate approval processes initiated by the relevant utility provider. Stage 1 would include reticulation of services on the airport site.

5.6.2 Corridor identification and preservation (onsite and offsite)

Services entering the site would, where possible, be appropriately integrated and co-located within the access transport reserves and using common trenching. Supply corridors would be located within the airport site, and could be accessed with minimal disruption to the airport operations. Consultation with NSW authorities and utility providers would be conducted to determine and provide infrastructure to connect transport infrastructure and services to networks.

The utilities would where practicable, be designed to allow for future expansion to provide adequate supply to meet the demands of the long term development.

5.6.3 Relocation and removal of existing utilities

Where offsite services rely on existing on-site infrastructure that would need to be removed for the development of the proposed airport, connections would be relocated as needed by or in consultation with the relevant utility provider in accordance with established processes. Where relocations are required to off-site locations, they would be the subject of separate approval processes in accordance with the relevant utilities provider’s established processes.

There is currently no gas, wastewater or recycled water infrastructure on the airport site that would require relocation or removal. Services expected to be relocated or removed are discussed below.

5.6.4 Water

There is existing Sydney Water infrastructure along The Northern Road, which connects to a private easement that runs through the site to properties on Mersey Road. Properties on Badgerys Creek Road are serviced by a water main from Elizabeth Drive. Existing customers on the southern side of the airport site are also serviced through connections that cross the airport site.

Water main extensions and augmentations would be required in order to maintain service delivery to these customers, and the process for removal and relocation of existing assets would be discussed with Sydney Water.

5.6.5 Electricity

Elizabeth Drive contains a 33kV sub transmission feeder as well as an 11kV feeder that forms part of the Endeavour Energy network in the area. These feeders are currently overhead and due to their proximity to the end of the northern runway would need to be relocated or buried.

Endeavour Energy has advised that some of 11kV lines traversing the site provide important cross feeder/zone connections in the network and as such would need to be relocated.

The 11 kilovolt feeder along the existing The Northern Road is expected to be relocated into a realigned The Northern Road.

The 11 kilovolt feeder in Badgerys Creek Road would need to be re-routed to the east of Badgerys Creek. This may require an easement to be established through private property if suitable road routes cannot be found.

An existing TransGrid 330 kilovolt above ground transmission line currently runs across the south west area of the airport site. TransGrid is investigating potential options to relocate the line, which would require a separate environmental assessment. Consultation would need to occur with Air Services Australia to ensure the relocation of the 330 kilovolt line does not have impact on operations at the proposed airport.

5.6.6 Telecommunications

Telstra has an aerial cable along the existing alignment of The Northern Road, which would need to be relocated off the airport site. A new copper cable is expected to be installed as part of the works for the new fibre cable route in the The Northern Road once realigned.

Consultation would need to occur with Telstra regarding the possible removal of the conduit/cable route along Badgerys Creek Road, which connects the Elizabeth Drive conduit/cable network to the Bringelly Exchange.

If Elizabeth Drive requires realignment (separate to the development of the M12) to cater for the Stage 1 northern runway, it is expected that part of the main fibre cable route in Elizabeth Drive would also need to be relocated. The timing for removal would be co-ordinated with any Elizabeth Drive diversion.

Depending on road realignments and closures, works may need to be undertaken to move existing customers to the north of Elizabeth Drive from the Bringelly exchange to the Luddenham exchange, when Badgerys Creek Road is no longer available. A new fibre would need to be run from the Luddenham exchange along Elizabeth Drive and a new conduit route along Lawson Road.

5.6.7 Water

Potable water requirements

Initial consultation with Sydney Water has indicated that the nearby water reticulation system has capacity to meet the Stage 1 potable water requirements of an estimated 1.6 mega litres per day. It is expected that there is currently sufficient capacity at the anticipated connection point on Elizabeth Drive. Additional connection locations would be determined in consultation with the relevant utility provider.

All water mains on the airport site would be designed and constructed with regard to all relevant standards and codes.

Non-potable and recycled water

Maximum use will be made of non-potable water sources (on site stormwater storage and recycled water), for permissible uses within the airport site, subject to meeting appropriate health and safety requirements.

An estimated 1.8 mega litres of recycled water per day is expected to be generated at an onsite recycled water plant.

Redundancy

It is expected that the detailed design would accommodate redundancy requirements, currently estimated at a minimum of two days' redundancy of the maximum day demand for both potable and non-potable water stored on site.

5.6.8 Sewage and wastewater

System requirements

An estimated 2.5 mega litres of wastewater per day would be generated at peak operating capacity of Stage 1. This would be reticulated, treated and recycled (as grey water) or irrigated on site. An approximate surplus of 0.11 mega litres of generation sludge each day would be stored and removed by tanker.

The treatment process would be determined in detailed design but is expected to require an onsite wastewater treatment facility using a Membrane Biological Reactor. Effluent quality would be in accordance with *National Guidelines on Water Recycling*. Redundancy requirements and reliability in the event of failure would also be addressed in the detailed design.

The processes, technologies, footprint and location of the sewage treatment plant, (if required), would be determined as part of the detailed design process. This would include odour management requirements, chemical handling processes and sludge disposal procedures.

It is expected that a trade waste contract may need to be established for offsite waste disposal including trade waste metering requirements.

Aircraft waste disposal

An appropriate facility would be provided for the management of aircraft waste. Quarantine waste collection and disposal (incineration) would be provided for all international operations.

5.6.9 Electricity

System capacity requirements

The proposed airport would be a high voltage customer that would be responsible for electrical reticulation within the airport site from a boundary connection. The supply voltage would be 132 kilovolts. Stage 1 would have an estimated maximum electricity demand of 16 megavolt amperes during operation. Consultation with electricity suppliers has indicated that there is sufficient capacity in the current system to meet this demand.

Connection points to the local network and the location of high voltage substations will be consistent with the Land Use Plan and would be determined in consultation with electricity suppliers.

Redundancy and backup supply capacity requirements

N-1 reliability would be required for the power supply. 'N-1' means that the electricity system would continue to supply the loads connected to the system even if any one element were to fail. N-1 reliability would apply to the external connection, which would require the electricity network supply provider to use diverse routes and connect to zone substations that also have N-1 reliability to support the operations of the proposed airport.

Onsite delivery and distribution

The electrical connections would be at the boundary of the site, one at Elizabeth Drive and one from The Northern Road. These are expected to be supplied from the north and south by new infrastructure from West Hoxton and Bringelly.

The high voltage power system within the airport site would be run between the Stage 1 northern runway and the future southern runway, forming a ring supply for reliability.

5.6.10 Gas

System requirements

The Stage 1 airport is expected to require approximately 57,000 gigajoules of gas each year. This estimated demand is based on supplying commercial catering facilities with gas as the preferred fuel.

The gas requirements are expected to be provided via connection to the Jemena network. There is currently sufficient capacity at the anticipated connection point on Elizabeth Drive to supply the airport site. A single gas pipeline connection is considered to be adequate to provide a high reliability supply.

Onsite delivery and distribution

At the connection point to the airport site, a pressure reducing station is required to change the secondary mains pressure to 210 kilopascals for reticulation. The location for the pressure reduction station would be determined in consultation with the supplier, Jemena.

All gas works would be designed and constructed in accordance with all relevant standards and codes and the gas supplier's network operation rules.

Redundancy

It is assumed that there will be no redundancy of the gas pipeline or supply points; this is considered normal industry practice.

5.6.11 Aviation fuel

Fuel storage requirements and location

Stage 1 would include a fuel farm with fuel storage capacity equivalent to at least three days' requirements. It would be capable of incremental expansion to meet the anticipated long-term development capacity of 82 million annual passengers.

The fuel farm for Stage 1 would be located near the northern boundary of the proposed airport. An underground fuel piping system would connect it to a network of hydrants to be located at aircraft stands and designated hydrants to refuel ground based trucks.

The fuel farm is expected to require four fuel tanks, each with a capacity of three mega litres. Each tank would be contained in a bunded area 65 metres square and 1.5 metres high. The location, configuration, design and construction of this area would be compliant with AS1940 and other standards referenced therein and will include provisions for up to five B-Double tankers to be unloaded at any one time. An indicative location of the fuel farm is provided in Figure 5–15.

An access road approximately 20 metres wide would be required for maintenance and inspection (and any ongoing delivery of fuel by road tanker). This road would be located off Anton Road and a small office structure for security and administration would be located adjacent to the entry gate off Anton Road.

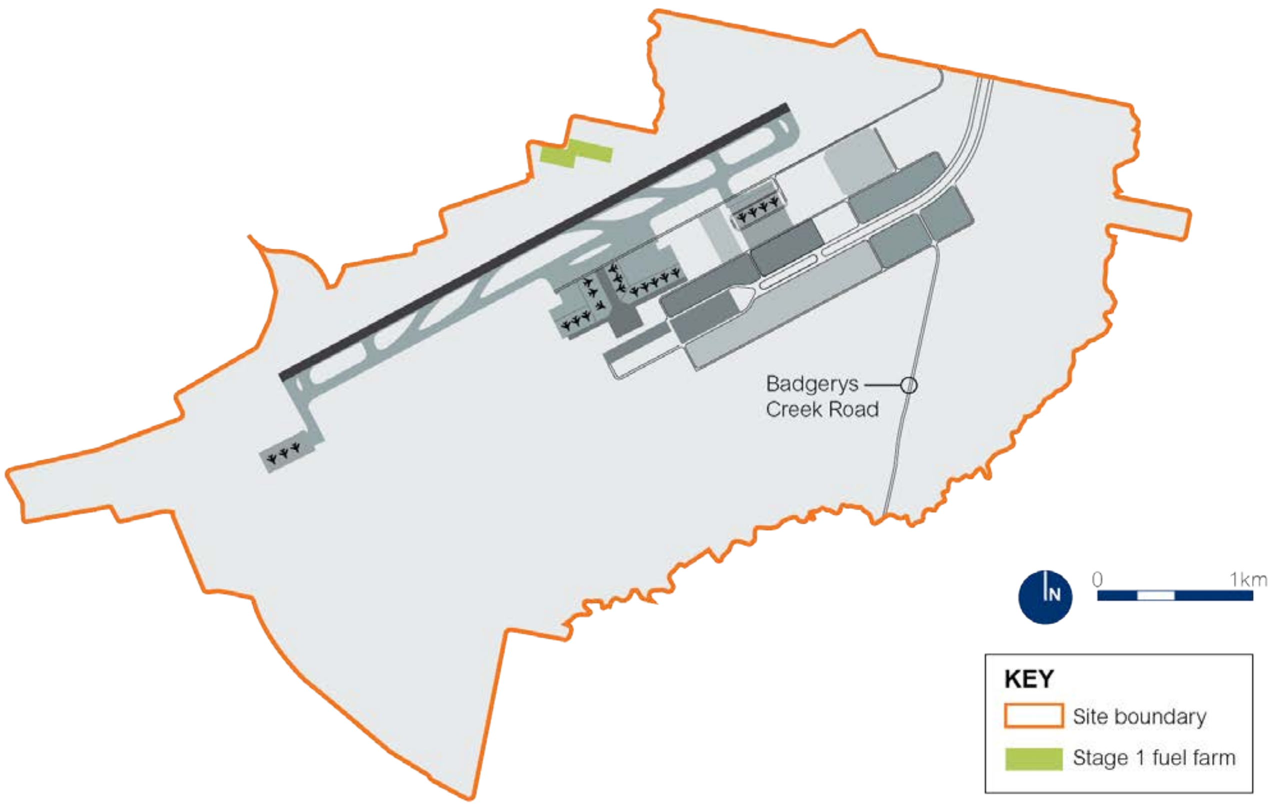

Figure 5–15 – Indicative location of the fuel farm

An airside refueller stand area of 900 square metres (60 x 150 metres) in the vicinity of the terminal would provide adequate space for tankers, support activities and a filling stand to be serviced via the fuel piping system.

Fuel distribution (onsite)

Fuel would be distributed onsite via a purpose built underground pipeline grid served from the on-site fuel tank farm. Runway, taxiway and apron designs would provide for expansion of the grid as staged expansion of the airport occurs, and allow for the expected range of climatic conditions at the site.

There would also be a requirement for some above ground fuel delivery (refuelling trucks) for general aviation aircraft and in specific circumstances. In these instances, the refuelling trucks would be filled via the filling stand.

Fuel delivery (offsite)

Fuel delivery for Stage 1 would be initially supplied by road tanker and anticipated to be sourced from either the Clyde of Banksmeadow fuel terminals. Site access will be via either the M4 or M5 motorways to access the M7 motorway, Elizabeth Drive, Anton Road and Adams Road. Local roads including Anton Road and Adams Road would need to be upgraded to cater for B-double traffic for final access to the site. An estimated fuel delivery of 2.7 mega litre per day would be required for Stage 1. This would result in two road tankers per hour entering and exiting the airport site.

As the proposed airport grows in response to demand beyond Stage 1, future delivery may be via a dedicated pipeline. A secure, landside delivery point immediately adjacent to the fuel tank farm would be provided. Any off-site pipeline would be subject to separate approval.

Redundancy and bypass capability

The fuel tank farm would allow for the decanting of fuel by tankers. Sufficient decanting points would be provided to enable delivery of at least one day's demand within one day.

The filler point would be located within the fuel tank farm compound, but is expected to be connected to Anton Road via entry and exit gates.

The offtake pipeline grid within the fuel tank farm and servicing the airport would provide bypass capability and redundancy. Redundancy would be considered as part of detailed design, but is expected to be achieved by providing tank storage for at least three days' demand (approximately 8.1 mega litres).

5.6.12 Petrol and diesel

Small holdings of petrol and diesel would be maintained in the vicinity of the airport maintenance depot to service ground vehicles and aviation support activities.

5.6.13 Telecommunications

Stage 1 would include the provision of communications facilities within the airport site and necessary connections with off-site communications infrastructure. To ensure continuity of communications, two separate fibre optic cable connection points would be required to the airport site. These would be determined in consultation with the telecommunications providers but are expected to connect from Elizabeth Drive, with the second connection point likely to be in the re-aligned route of The Northern Road.

Within each major terminal building a communications room would be required. This would become the interface point for the airport's communication network.

Airport operations

Communications requirements for airport operations would be determined during detailed design.

Passenger services

Communication services for passengers would be provided in consultation with telecommunications providers.

Reliability

A high level of reliable telecommunications coverage would be required across the airport site. The telecommunications system would be designed to continue to provide communication to the connected systems, even if any one element were to fail. The same reliability would apply to the external system connection, which would require the telecommunication network provider to use diverse routes and connect to exchanges that have similarly high levels of reliability.

5.6.14 Meteorology instrumentation

The proposed airport would require meteorological instrumentation which would be determined and designed in consultation with the Bureau of Meteorology and CASA to meet the requirements of the airport operator and other potential users including airlines.

An automatic weather station and an anemometer are expected to be required to provide relevant data to support aviation operations in accordance with international standards and recommended practices.

5.6.15 General waste disposal

Based on assumptions from other currently operating airports around the world, during Stage 1 operation the proposed airport is expected to generate up to about 11,210 tonnes of general waste per year.

There would be locations for onsite waste collection, with disposal to occur off-site. Landside waste collection would allow for sorting and separate disposal of recyclable, non-recyclable and hazardous materials.

Infrastructure required within the airport site to manage waste is expected to include:

- distributed vacuum systems within the airport terminals with a process plant to separate the waste streams; this would need to be scalable to allow expansion as new terminal floor space is brought on line;
- a waste management transfer depot for collection and dispatch off site to landfill or other disposal facilities;
- facilities for recycling; and
- facilities on or close to the proposed airport site that could convert the waste stream to energy.

5.7 Stormwater

5.7.1 Stormwater management

The development of the proposed airport would create a large impervious area and appropriate management, treatment and storage of stormwater runoff would be required. In identifying the required infrastructure for managing stormwater runoff across the site, consideration has been given to the mitigation of ponding and standing water areas that could not only impact on the movement of aircraft and airport vehicles, but also attract birds to the area, increasing the risk of bird strikes.

The location and alignment of the stormwater infrastructure would be determined based on the requirements of the *Manual of Standards Part 139—Aerodromes*[5].

[5] Version 1.12: November 2014, Australian Government Civil Aviation Safety Authority

5.7.2 Water quality

The design considerations for the management of surface water quality across the airport site need to mitigate any change to the quality of water being discharged from the site. In analysing the water quality treatment requirements, consideration was given to the required reduction of all pollutants specified in the Upper Parramatta River Catchment Trust (2004) *Water Sensitive Urban Design (WSUD) Technical Guidelines for Western Sydney* (total suspended solids of 80 per cent, total phosphorous of 45 per cent and total nitrogen of 45 per cent). Water quality is discussed further in Chapter 18 Water Quality.

5.7.3 Apron drainage

A pit and pipe stormwater system would provide drainage of the apron and aircraft parking areas and feed into a branch pipeline. The pit and pipe system would be sized to cater for the 10 year average recurrence interval (ARI) storm event. Overland flows in excess of the 10 year ARI storm event would be captured by the taxiway drainage.

The branch pipelines would discharge into trunk pipelines that run parallel to the taxiways and runways. These trunk lines would then convey flows beneath the runway and taxiway area and discharge at specific locations into a series of detention basins at the airport site boundary. The arrangement of the pipelines and discharge points would be developed to reflect the existing catchment areas and discharge locations where possible.

5.7.4 Runway and taxiway drainage

The predominant surface water management for the runway and taxiway areas would be provided through parallel grassed swales, which would also provide the initial treatment of runoff from the paved areas.

The swales would be sized according to the management of flows from the runway and taxiway areas under the 50 year ARI storm event and would discharge into pipelines then ultimately discharge into the detention basins.

Overland flows from the apron area and taxiway closest to the terminal buildings would be designed to cater for the management of flows to prevent ponding on the taxiway or within 30 metres of the buildings, for up to the 50 year ARI storm event. The management of these flows would be achieved by providing slot drains at the low point between these features.

5.7.5 Detention basins

A series of eight detention basins would be provided around the edges of the airport site to provide detention and final treatment of stormwater runoff prior to discharge into the major watercourses of Badgerys Creek, Cosgroves Creek and Oaky Creek. The basins have been sited to allow discharge points that are consistent with natural drainage lines and watercourses wherever possible to minimise potential impacts on existing hydrology and watercourse downstream of the airport site.

In addition to these basins, consideration during detailed design would be given to providing a basin or other form of detention on a tributary of Duncans Creek before discharge from the airport site.

The detention basins would be planted with vegetation that has effective nutrient removal properties. These basins are expected to perform a similar function to bio-retention basins. A forebay would be provided in each of the basins to capture any gross pollutants before they reach the main basin area.

The detention basins would operate as dry basins in order to minimise bird attraction to the site and reduce the risk of bird strike. Indicative locations of the detention basins are shown in Figure 5–16.

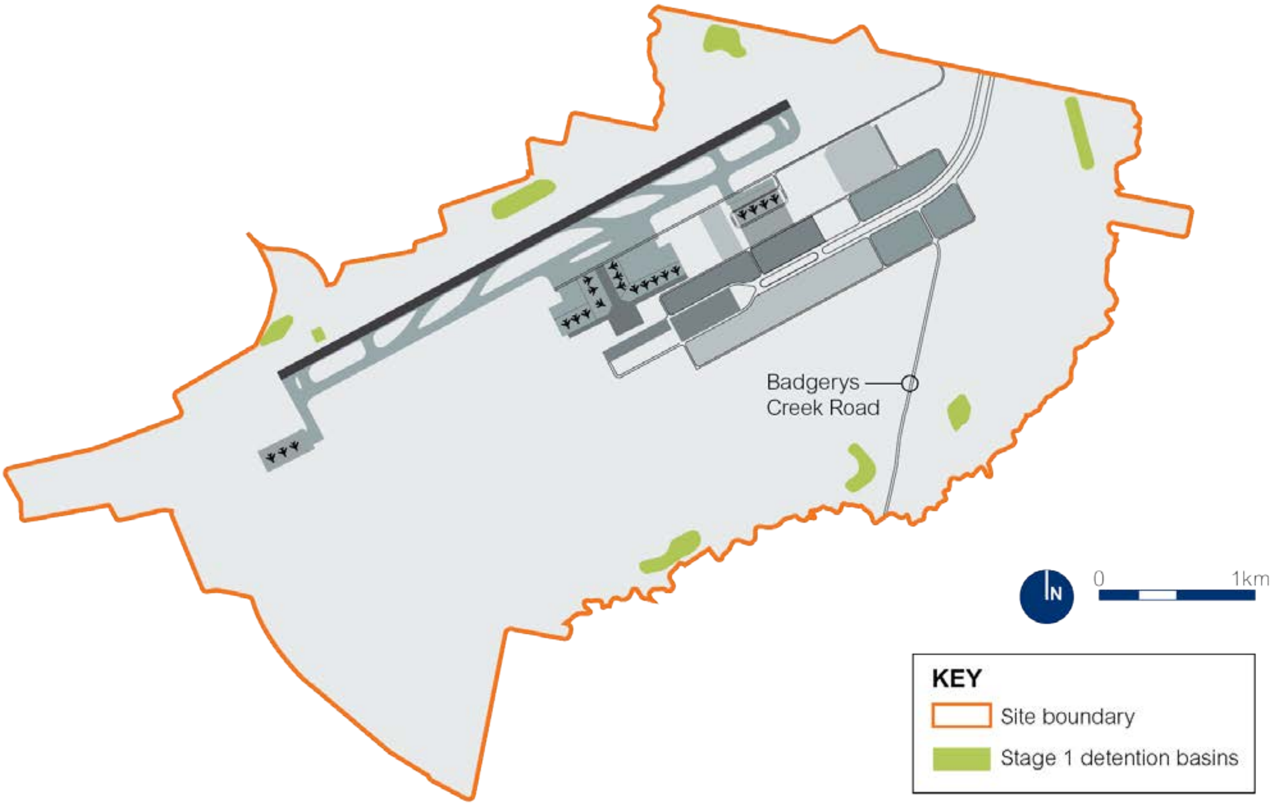

Figure 5–16 – Indicative location of the detention basins

5.7.6 Airside stormwater quality management

Stormwater quality of the airside surface water runoff would be managed through the following key elements:

- flame traps proposed on the aprons and aircraft parking areas to collect small and accidental spills; and
- swales to manage and provide initial treatment and conveyance for stormwater runoff from the runway and taxiway areas. Bio-retention systems would be included in the downstream end of each of these swales and would provide secondary treatment prior to discharge into a detention basin via a gross pollutant trap.

5.7.7 Flame traps

In accordance with clause 6.5.3.5 of the *Manual of Standards Part 139—Aerodromes*, flame traps would be provided where stormwater drains could also serve to collect spilt fuel from the apron area. These pits would be installed in the aprons at the junction where each catchpit connects to a branch pipeline. The flame traps provide a means to collect small spills such as oil or aviation fuel, and isolate and prevent the spread of fuel into other areas.

5.8 Ground transport

The proposed airport is located in the growing areas of Western Sydney. It is immediately adjacent to the Broader Western Sydney Employment Area to the north-east and South West Growth Centre to the south-east. This area is anticipated to grow significantly over the next 30 years and will place its own demands on the transport system.

The NSW Long Term Transport Masterplan, Western Sydney Roads Infrastructure Package and South West Rail Link Extension Corridor Preservation set the road and public transport network requirements for the region. In the long term, the proposed airport is expected to generate 82 million passenger movements per year. This is the equivalent of 224,000 passengers per day entering and leaving the airport site.

5.8.1 Ground Transport Plan

A Ground Transport Plan would be prepared as part of the detailed design of Stage 1 and before the proposed airport begins operating. The plan would address:

- road design speeds;
- security issues;
- traffic loads from the proposed airport and other developments on site;
- connections with off-site/external roads, including matching capacity, speeds and road geometry;
- forecast traffic flows, including public transport requirements;
- car parking;
- commercial and operational vehicles and storage;
- terminal interface;
- passenger pick-up and drop-off by private and commercial vehicles;
- pedestrian linkages between terminals and all transport drop-off and pick-up areas;
- pedestrian, cycle or road networks for workers moving around the airport site;
- use of dedicated busways;
- ability to continue to provide access to and from the airport site when key intersections are unavailable; and
- the ability to expand, with minimal disruption, to meet future airport and business development requirements.

5.8.2 External roads crossing the site

The Northern Road

The Northern Road is a state road under the care and control of Roads and Maritime Services (Roads and Maritime). It currently traverses the airport site. It would be realigned outside the airport site by Roads and Maritime before the start of construction. Concurrently, services in easements along The Northern Road alignment would also be relocated.

A connection to The Northern Road would be constructed to the airport site boundary by Roads and Maritime as part of the construction of The Northern Road on its new alignment.

The offsite realignment would be subject to separate approval processes to be conducted by Roads and Maritime.

Other existing internal roads

Existing internal roads on the airport site outside the Stage 1 construction impact zone, such as Badgerys Creek Road, may remain in place for interim uses. This would be determined in consultation with the ALC and in accordance with the Land Use Plan.

Other external roads

Other roads that would be upgraded to meet the requirements of Stage 1 include:

- Elizabeth Drive, which may be deviated to the northeast and upgraded (separate to the M12), approximately between its current intersection with Badgerys Creek and Adams Road to accommodate the northern runway;
- Adams Road, which is expected to be upgraded from Elizabeth Road at least to Anton Road to meet the needs of support traffic for the proposed airport, including B-double tanker traffic; and
- Anton Road, which would be upgraded from Adams Road to meet the need for secondary access to non-public airport facilities located along the northern site boundary, including B-double tanker traffic.

All road upgrades outside the airport site boundary would be subject to a separate approvals process.

5.8.3 Landside roads

Public access

Road access would provide for private car, public transport, commercial traffic, pedestrians and cyclists. The primary public access road to the proposed airport would be from the future M12. Roads and Maritime would construct the M12 connection to the airport site boundary, subject to separate approval.

The design of the main public access road (from Elizabeth Drive connection with the future M12) would take account of the connecting road developed by Roads and Maritime from the M12. The current expectation is that this main public access road would include:

- a minimum design speed of 90 kilometres per hour and minimum posted speed of 80 kilometres per hour for the main carriageways including the connections to the M12 Motorway, decreasing to safe speeds in the vicinity of the terminal forecourt and Ground Transportation Centre (minimum design speed of 40 kilometres per hour);
- a minimum of two (and up to three) trafficable lanes for each carriageway on the main carriageways;
- two bus lanes; and
- a 40 metre rail reserve.

The main public access road would allow efficient and safe vehicle movement around the ground transport hub within the terminal forecourt, including access to the commercial precinct, support areas and airport parking.

Secondary public access points from Elizabeth Drive may also be provided to improve traffic circulation to commercial areas on either side of the main entrance road.

Pedestrian and cycle access would be included in the Terminal and Ground Transport precincts and parking areas, and pedestrian and cycle routes would likely be provided within the airport site including:

- pedestrian graded ramps between terminal levels for passengers arriving and departing with baggage; and
- grade separated, safe undercover pedestrian access between parking, pick-up and drop-off areas and the terminal.

All ground transport connections would comply with the *Disability Discrimination Act 1992*.

Road layout

The road layout within the airport site would provide for the safe and efficient movement of traffic under all expected traffic conditions. The location of the road network would be generally as shown on the Land Use Plan and may include additional secondary roads. Existing local roads on the airport site that are outside the proposed Stage 1 earthworks footprint are expected to remain open.

Commercial access road (from The Northern Road realigned)

The design of the access road to and from The Northern Road as realigned to freight and maintenance precincts would take into account the connecting road to be constructed by Roads and Maritime. Current expectations are that this road would include a minimum of two trafficable lanes for each of the main carriageways, and have a minimum design speed of 90 kilometres per hour and minimum posted speed of 80 kilometres per hour for the main carriageways connected to The Northern Road, decreasing to safe speeds in the vicinity of these facilities.

Emergency access points

Emergency access would be available to both the airside and the landside precincts via the entry points which would include Badgerys Creek Road, Anton Road and Adams Road, and The Northern Road connection, as well as via the primary public entrance off Elizabeth Drive and the future M12.

An Emergency Access Plan addressing infrastructure required for all emergency services would be prepared in consultation with ARFFS.

5.8.4 Rail access

For the proposed airport to reach its long term capacity, rail services would be required at the airport site at an appropriate point in its development. Stage 1 does not currently include a rail service because the recently approved road network upgrades have been assessed as adequate to support anticipated airport demand for at least a decade after operations commence. The timing of investment in a rail connection to the proposed airport will take into account the cumulative demand from a growing airport and surrounding urban growth and development.

Initial rail services are expected to be provided to the airport site through the extension of the existing Sydney metropolitan rail network. In the longer term, the proposed airport is expected to also be serviced by a dedicated airport express rail service from a key transport hub in the Sydney basin.

Planning for rail connections to the airport site have been undertaken in close consultation with Transport for NSW. The indicative airport layout is aligned with Transport for NSW's current planning for the extension of the South West Rail Link. It preserves flexibility for two possible rail routes across the airport site: one along a corridor under the terminal at right angles to the runways, and one along the airport ground transport access corridor parallel to and between the runways. The rail line would be predominantly underground through the airport site to avoid critical infrastructure, and to preserve flexibility for one or more stations in the terminal precinct.

Figure 5–17 broadly indicates how the proposed corridors for the South West Rail Link Extension would approach the airport site. A final rail alignment would be determined in consultation with the NSW Government. Depending on the alignment and preferred timing to develop rail services, some enabling work may be required during the Stage 1 development to future-proof the corridor. Any such work is expected to be subject to a separate approval process.

Figure 5–17 – Indicative rail alignments connecting to the airport site

5.8.5 Parking

Stage 1 would include dedicated car parking facilities to meet the expected demand. These car parking facilities are expected to include:

- parking for a minimum of 11,500 up to 12,500 vehicles;
- short and long stay parking;
- employee and operational parking;
- commercial vehicle parking and storage;
- parking for rental cars; and
- emergency services vehicle parking.

The majority of passenger car parking for Stage 1 is expected to be surface level parking although some multi-level parking may be provided.

5.8.6 Terminal kerbside

The design for the terminal kerbside would be developed as part of detailed design. It is estimated that a kerbside of 180 to 200 metres would be likely for both departures and arrivals for Stage 1.

5.8.7 Ground transport hub

A ground transport hub would include facilities to provide for connections to the terminal, including:

- set down and drop off zones;
- pick-up, including waiting zones;
- loading zones;
- commercial and operational vehicle parking and storage;
- buses;
- taxis;
- hire cars; and
- rental cars.

The road and pedestrian systems servicing the ground transportation hub and terminal kerbside would also provide for safe and equitable vehicular and pedestrian access to and from these facilities.