

PART SIX

OPTIONS TO BETTER UTILISE SYDNEY (KINGSFORD-SMITH) AIRPORT TO GAIN CAPACITY TO MEET FORECAST DEMAND

A repeating pattern of various travel-related icons in a lighter blue shade, including airplanes, globes, people, suitcases, and airport equipment, set against a darker blue background.

P6

Key points

- Sydney Airport Corporation Limited (SACL), Airservices Australia and airline operators are continuing to work on ways to improve efficiencies in operations at the airport. Efficiencies available include airside infrastructure works to add new gates, terminals, taxiway and apron capacity, improved Air Traffic Management procedures, better coordination of arrivals and departures traffic and improved airport ground movements coordination.
 - These are important to help manage congestion and contain delays to some extent but will not address the capacity shortfall in the medium and longer term. This includes the proposed new infrastructure concept outlined by SACL in December 2011.
- There is no real option to increase the capacity of Sydney (Kingsford-Smith) Airport significantly, as:
 - There is no scope to build new runways or to substantially reconfigure or upgrade runways in the existing airport footprint.
 - Options to expand the airport into surrounding suburbs would be prohibitively expensive and would not add any significant new capacity to the airport.
- Options have been raised in the past for an additional runway or new airport at Kurnell, but this would have major environmental impacts and would be prohibitively expensive.
 - Furthermore, airspace interactions with Sydney (Kingsford-Smith) Airport would reduce the level of additional capacity attained.
- Options for changing the legislated operational requirements at Sydney (Kingsford-Smith) Airport could provide some additional capacity but would not meet the medium- to long-term capacity gap, particularly in the peak periods.
- Increasing the movement cap and slot allocations to allow 85 movements per hour in the weekday morning and evening peaks (a one per cent increase in total slots per day) would postpone the impacts of capacity pressures by only one year; however this would be targeted to provide additional capacity at times with the greatest constraint (that is, six per cent increase in total peak slots).
 - Increasing the movement cap to 85 movements per hour for all non-curfew hours would provide a six per cent increase in total slots available to be allocated. This would be expected to result in approximately a three-year postponement of the impacts.
- Increasing the permitted movements during the curfew shoulder periods would have minimal impact on capacity pressures.
 - Allowing movements in the morning shoulder period (5.00am to 6.00am) to the maximum limit permitted under the curfew legislation would only add 0.1 per cent in available slots, although it would assist in clearing the morning international peak arrivals.
 - Allowing movements in the evening shoulder period would have even less impact on the capacity gap, as there are less slots available under the *Sydney Airport Curfew Act 1995* as compared to the morning shoulder.

- Limiting access to Sydney (Kingsford-Smith) Airport by smaller aircraft would potentially open up a small amount of additional capacity for international and domestic services using larger aircraft.
 - A large proportion of regional services are operated with small aircraft. NSW intrastate aircraft movements comprise approximately 20 per cent of all slot allocations and Regular Public Transport (RPT) activity at the airport yet only carry about six per cent of total airport passengers. While the current arrangements support access by regional passengers to Sydney and connecting services, they do not promote efficient economic use of the airport's constrained capacity.
 - Achieving a 30 per cent reduction in the number of movements by aircraft up to 40 seats could free up to two per cent of total airport slots depending on the level of services merged or withdrawn, providing for growth of larger aircraft movements for approximately one year.
- A reduction in the protection of access to Sydney (Kingsford-Smith) Airport by intrastate services would raise broader issues for government consideration, including the impacts on:
 - regional centres which rely on convenient aviation links to the state capital for a range of social and economic activity;
 - viability of regional aviation operators; and
 - regional passengers, a high proportion of whom transfer onto domestic and international flights at Sydney (Kingsford-Smith) Airport.
- There is a need to address the growth of congestion in the road network serving Sydney (Kingsford-Smith) Airport.
 - A key element is to increase the use of public transport – in particular, the train services operating to stations at the Domestic and International Terminals but also bus services.
 - Investment in upgrading roads and intersections around the airport will also be essential.

With continued population growth expected, the Sydney region faces significant RPT capacity shortfalls to meet the forecast demand. On conservative forecasts of just under three per cent per year, RPT traffic growth is expected to double in less than 25 years to nearly 88 million passenger movements and to nearly quadruple to 165 million passenger movements by 2060; with approximately 800,800 RPT aircraft movements forecast in 2060.

As the busiest airport in the region, in terms of passenger movements, the focus will be on Sydney (Kingsford-Smith) Airport to meet that demand.

- Notwithstanding the continued upgauging of aircraft and extension of terminal and gate facilities, demand at Sydney (Kingsford-Smith) Airport will begin to exceed its capacity in the peak and shoulder periods in the near future.
 - It is estimated, by 2015, there will be a shortfall of 25 aircraft stands compared to projected demand based on the infrastructure shown in the *Sydney Airport Master Plan 2009* (the Master Plan). This shortfall could be reduced if terminal and apron work proposed in the Master Plan is brought forward.

- By 2020, there will be an estimated shortfall of 18 stands, even if works proposed in the Master Plan for 2014 to 2019 have been completed.
- In addition, by 2020, all slots on weekday mornings between 6.00am and 12noon and between 4.00pm and 7.00pm will be fully allocated, so growth of passenger capacity at these times will be dependent on aircraft upgauging.
- By 2035, unconstrained forecast demand at Sydney (Kingsford-Smith) Airport will be approximately 77 million RPT passenger movements and approximately 460,000 aircraft movements (including 428,900 RPT aircraft movements) above its current practical capacity.

The Steering Committee has explored a range of policy and infrastructure options to better utilise Sydney (Kingsford-Smith) Airport both on and off airport to cater for the forecast demand.

6.1 Options for better use of Sydney (Kingsford-Smith) Airport

Expansion of physical capacity

Given Sydney (Kingsford-Smith) Airport has little scope to expand within its current land footprint, a range of options has been proposed in the past to expand the airport beyond its boundaries. Possible options included:

- expansion to the area near Kurnell or the adjacent Botany Bay;
- development of an offshore airport; and
- additional or modified infrastructure, such as extending the Sydney (Kingsford-Smith) Airport shorter north-south runway (16L/34R) or constructing a second east-west cross-runway.

The findings and recommendations of previous analyses were considered by the Steering Committee to determine whether the findings remain relevant in today's context. More information can be found in Technical Paper C1.

Expansion to Kurnell / Towra Point area of Botany Bay

There have been a number of proposals considered previously for expansion of Sydney (Kingsford-Smith) Airport into the Towra Point / Kurnell area of Botany Bay area.

In particular, a 1999–2000 proposal by IAC Aviation Technical Services Pty Ltd involved the development of two new parallel runways in Kurnell, south of the airport. This was designed to enable relocation of international and domestic traffic to the new site while retaining Sydney (Kingsford-Smith) Airport for intrastate and General Aviation (GA) traffic. However, the proposal, as suggested, would require closing runway 16L/34R and would effectively displace the existing airport without enabling a significant change in capacity in the region.

Other options included developing:

- a full-service international airport at Kurnell with runways parallel to the existing 16/34 runways at Sydney (Kingsford-Smith) Airport; and
- an RPT airport at Kurnell, near parallel with the existing 07/25 cross-runway at Sydney (Kingsford-Smith) Airport. However, services operated there would be limited to certain aircraft sizes, as the runway length would be limited by Botany Bay National Park to the east and Woollooware Bay to the west.

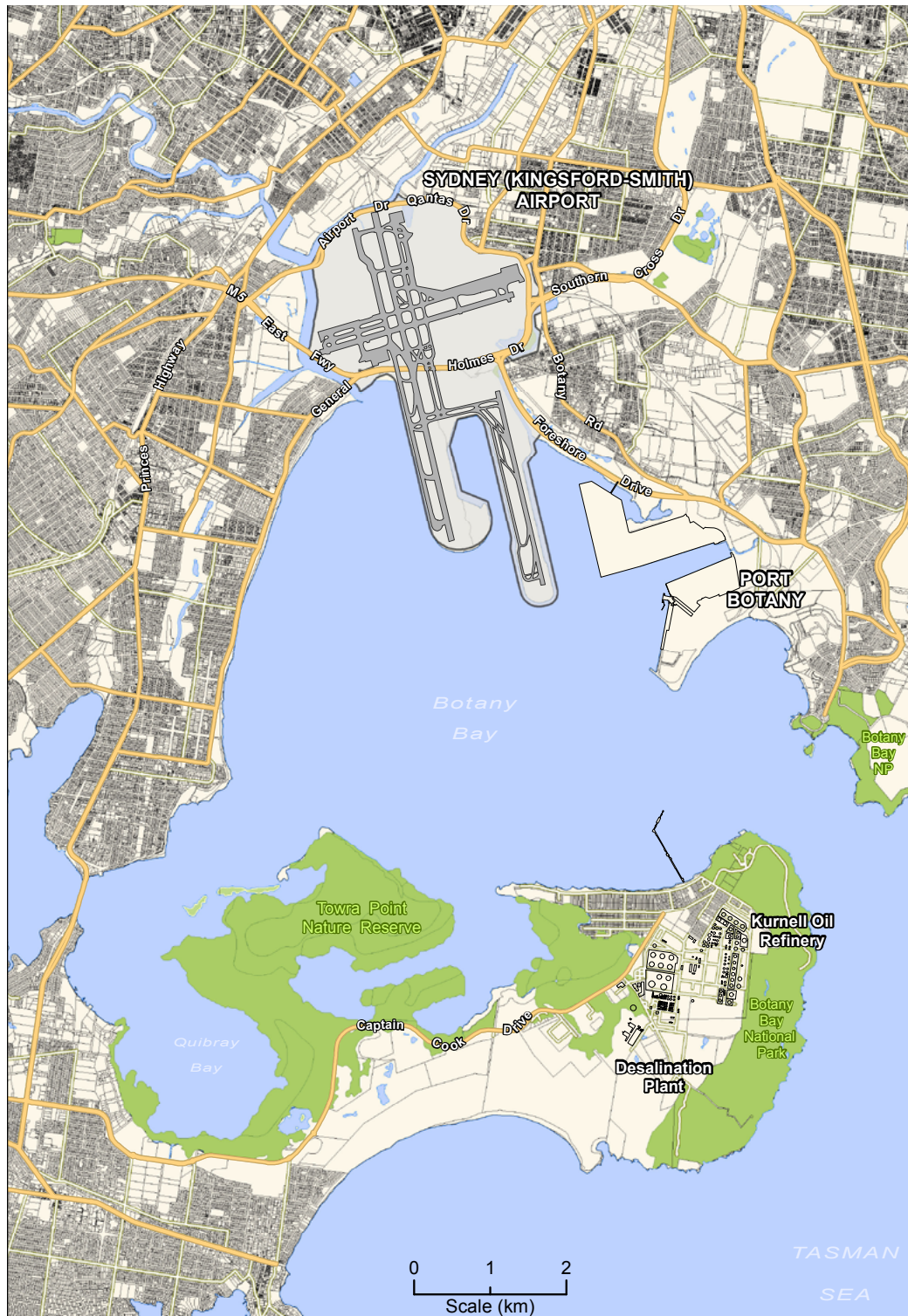
These options are not considered practical on cost and operational grounds. All present airspace management challenges, as they would impact on the existing operations at Sydney (Kingsford-Smith) Airport. This could potentially limit capacity of the existing runways, reducing the capacity gains and cost-effectiveness of any expansion.

In addition, extensive development in the Kurnell/Port Botany area since such initiatives were initially put forward restricts the land available for development for airport facilities. While an oil refinery has been located at Kurnell since 1952, recent developments in the region include the Sydney Water desalination plant south-west of the refinery and the third container terminal at Port Botany (which itself is capacity constrained by its proximity to the airport).

Given the urban development close to the Kurnell site and the implications for Sydney (Kingsford-Smith) Airport flight paths, an airport development could also increase, not decrease, the number of people exposed to aircraft noise. Given the population density and proximity to the airport, the noise impacts would be greater than possible capacity expansions in other parts of the region. Land acquisition around the airport would be extremely costly and there would be other significant community impacts, such as the number of businesses around the airport, which support airport activity, would find it very difficult to relocate to suitable locations.

Options to develop new runways in the Kurnell area would also have significant environmental impacts on lands and ecosystems. For example, reclamation of land and sand dunes protruding into Botany Bay could have implications for wave energy, beach profiles, water quality and sedimentation, aquatic flora and fauna in the area, and sea level rises. Any option would also affect international commitments entered into by the Commonwealth and efforts by the NSW Government to protect these areas.

The close proximity of the existing airport site to other developments in the region is presented in Figure 118.

Figure 118 Proximity of Sydney (Kingsford-Smith) Airport to other land use

Source: Australian Department of Infrastructure and Transport.

Offshore options

A number of offshore areas have been previously examined by the Australian Government. Offshore airports in the vicinity of Sydney (Kingsford-Smith) Airport have been proposed to ensure close proximity to the existing site while limiting noise impacts on surrounding urban areas. Previous analysis has ruled out offshore airport options, as the expense and potential environmental impact would exceed those of the Kurnell options. Passenger access would be

expensive to establish and operate, with difficult and costly linkages to the existing networks. Security of infrastructure would now also be a key consideration for such a development.

Modified infrastructure at Sydney (Kingsford-Smith) Airport

A range of potential development options has been proposed relating to additional or modified infrastructure at Sydney (Kingsford-Smith) Airport, such as extending the shorter north-south runway (16L/34R) and constructing a second east-west cross-runway. Such modifications cannot be undertaken within the current airport footprint and would require expansion of the airport boundary further into Botany Bay or into land to the east of the airport.

The extent of further expansion into Botany Bay is limited by the location of Port Botany and the port access needs of container vessels. It may provide for better balancing of the runways and greater efficiency, as larger planes would be able to use it. However, the port capacity would be severely reduced. The lengthening of the shorter runway would also not give any greater capacity than what has previously been estimated by Airservices Australia, as the runway capacity for the parallel configuration would remain the same.

Any extension east of the airport involves significant land acquisition and relocation of roads. Furthermore, while these developments may provide Sydney (Kingsford-Smith) Airport with greater flexibility or options for air traffic management, it is unlikely any of these options would provide the additional capacity required.

For example, an additional cross-runway could allow greater movement levels to be achieved during poor weather conditions, which Airservices Australia states reduces capacity by approximately 10 per cent per year. However, an additional cross-runway would not affect the upper physical parallel runway limit, estimated by Airservices Australia at 85 movements per hour. In addition, such a move would expand the noise footprint over densely-populated areas to the east and west of the airport.

Any new runway infrastructure would also require upgrades to taxiways, aprons and terminal gates, which is unlikely to be able to be undertaken within the limited airport footprint and therefore would require even more land acquisition, again with very little or no improvement to overall capacity.

The size of the land parcel, its location and its surrounds mean that there is little scope to rebuild or extend the site substantially to ensure a more efficient layout to meet the projected long-term demand. In addition, the significant costs and environmental impacts of each of these options are prohibitive to any serious consideration as possible solutions to providing additional capacity at the existing airport.

New SACL concept

In December 2011, SACL announced its intention to work with stakeholders on a new proposal for making use of the airport terminals. At present, the International Terminal precinct (T1) is used by all airlines offering international services, with all major domestic services operating from the Domestic Terminal precinct T2 and T3. Passengers transferring between domestic and international flights need to travel between the two terminal precincts – in some cases, through the Qantas airside transfer bus system; in other cases, by the public road and rail networks. The new concept involves reconfiguring the terminals so that the current Domestic Terminal precinct will accommodate the Qantas Group and its alliance partners for both domestic and international services. The current International Terminal precinct would accommodate Virgin Australia and its partners for both domestic and international services.

The concept also includes the construction of a new Qantas Engineering complex.

The proposal was announced at a concept level and broader consultations are underway to develop the proposal in more detail before any formal decisions can be made to proceed.

SACL's objectives for the proposal are to improve the passenger experience through faster connection times and more efficient airline and airport operations and to minimise operating disruptions, with positive flow-on benefits to the rest of Australia's aviation network. From an airport operations perspective, SACL believes the proposal could reduce aircraft turnaround times and the requirement for crossings of the main runway by aircraft under tow.

The further development of the proposal requires detailed analysis and design, commercial negotiations with a range of parties and a range of regulatory approvals. SACL has announced the intention to finalise the proposal in time for its endorsement in the 2014 Master Plan.

The concept includes the use of common use facilities and swing gates to create flexibility. It is also intended to provide for additional gates and is aimed at delivering eight gates more than anticipated in the Master Plan, with provision for a further 12 gates beyond that.

The two airline terminal concept will not improve runway movement capacity or affect the legislated cap of 80 movements per hour. Nor will it enhance movement capability when under a single runway operation (i.e. Runway 07/25 in adverse wind conditions).

Airservices Australia is working with SACL on the implications of the new proposal, but advises that full consideration has not been given at this stage to operational issues impacting on movement areas and associated air traffic management issues for airborne traffic that may act to inhibit or limit the capacity outcomes being planned.

A range of airside operational and air traffic management concerns may limit the potential of the concept:

- crossing flight paths - for example westbound flights that currently utilise the western parallel runway may shift to the eastern parallel runway causing an airborne cross-over conflict rather than a ground based cross-over. This is a critical safety issue and could limit the realisation of efficiencies;
- new or amended flight paths - the two airline terminal concept may cause a need for amended flight paths or new flight paths to be promulgated which in turn would have environmental implications and the need for associated public consultation;
- relocation of the air traffic tower, VOR, Radar and Aviation Rescue and Firefighting facilities. A major capital project would be required to relocate essential Airservices facilities early on the critical time path for the progression of the concept. Project delivery capacity could oblige Airservices to re-prioritise and defer other capital projects across Australia which currently underpin the five-year pricing and investment agreement; and
- runway balancing issues - a review of runway demand balancing is required particularly with regard to expected upgauging of the fleet. The air traffic management and operational implications of the two airline terminal concept on how the parallel runways are proposed to be used is likely to be a major issue in commercial negotiations with the airlines.

A range of other issues will need to be addressed:

- road works around the airport – notwithstanding the perceived benefits of spreading the peak periods for road traffic at the two terminal precincts, the implications of the new concept for congestion on key roads and intersections on and around the airport will need to be studied, with appropriate strategies developed in consultation with the NSW Government;
- location of hangar and maintenance facilities – the location under consideration for the Virgin maintenance hangar creates an additional issue as aircraft will need to cross the

main runway (if in smaller numbers than is currently required for the Qantas maintenance operations for international aircraft); and

- transitional strategy – a major challenge would be to maintain operational capacity and safety at the airport through the construction and operational changes required.

The Steering Committee welcomes work by SACL with its stakeholders to maximise the efficiency of operations at the airport and to improve the passenger experience. For the purposes of this Joint Study, the Committee notes that, while the proposal may help ensure the airport is operated efficiently and help to make maximum use of the infrastructure, it does not address underlying capacity limitations. In particular, it does not change the maximum capacity of the runway system or address the immediate shortage of gates. Further, it does not provide the additional capacity required to address the growth of demand into the medium and long term.

The Committee is also concerned that essential work on infrastructure upgrades, including additional gates and taxiway enhancements as set out in SACL's *Sydney Airport Master Plan 2009* (the Master Plan), should not be deferred as work proceeds on the new concept.

Air traffic management and other efficiency measures

There are a range of measures and options in development to increase the efficiency of operations at Sydney (Kingsford-Smith) Airport.

New Performance Based Navigation technologies offer advantages over sensor-based navigation, including reduced environmental impact through more efficient use of airspace route placement, fuel efficiency and noise abatement.

The Advanced Surface Movement Guidance and Control System (A-SMGCS) being introduced by Airservices Australia at four of Australia's busiest airports is an air traffic surveillance system enabling aircraft and vehicles on the airport surface to be accurately identified and tracked by air traffic control in all visibility conditions. Commissioned at Sydney (Kingsford-Smith) Airport in 2010, this technology was introduced to improve airport operations, particularly during reduced visibility conditions and at night, and where distances from the control tower make visual contact difficult; and to mitigate congestion experienced, for example, during certain inclement weather conditions.

Airservices Australia is also pursuing the introduction of new collaborative decision-making capabilities to improve air traffic management and realise efficiencies. Three capabilities are being established or improved – namely, Air Traffic Flow Management, Airport Collaborative Decision Making and Integrated Arrival and Departure Management.

While these air traffic management technologies provide a range of benefits in relation to safety, efficiency and managing environmental impacts, they are not expected to provide overall capacity gains to meet forecast demand levels. Instead, they will assist in creating greater efficiency by ensuring the airport can operate as close as practicable to its capacity, with reduced effects from weather and operational impacts, and that, where such impacts do occur, the airport can more quickly recover to full operations.

Review of policy settings

The Steering Committee noted there are three operational policy settings that affect the airport's ability to operate at its full capacity. These are the:

1. demand management system, which imposes a maximum movement limit per regulated hour on the runway and a limit on the slot allocations;
2. curfew, which limits take-offs and landings between 11.00pm and 6.00am; and
3. regional ring fence that protects the number of intrastate NSW movements in and out of the airport.

The demand management system, curfew and regional ring fence provisions were introduced with legislative backing to support specific policy objectives. The movement cap and curfew protect communities from undue impacts of aircraft noise. The regional ring fence ensures appropriate access to Sydney and the CBD for NSW regional communities.

The Steering Committee acknowledges that these provisions have had bipartisan political support for a number of years.

Movement cap and slot allocation

The movement cap and slot allocation system are intrinsically linked. The *Sydney Airport Demand Management Act 1997* sets a cap of 80 movements per hour on the runway and requires that the slot management scheme is consistent with the runway movement cap. In effect, this means that 80 is the maximum for both the runway movements and slot allocation.

As discussed in Part Four of this Report, analysis by Airservices Australia indicates that, in practice, operations of up to 85 movements per hour might be achieved on the parallel runway system in favourable conditions. The Steering Committee has assessed the implications of allowing up to 85 movements per hour, either in peak periods or more generally at the airport.

It should be noted that such a move would involve changes to both the movement cap and the slot allocation arrangements.

- Increasing slot allocations without increasing the movement cap would just add to delays.
- Increasing the movement cap without increasing slot allocation would not change overall capacity but would provide an increase in efficiency by allowing greater ability to recover from delay.

A complete removal of the cap on movements has not been explored. As outlined in Part Four, the physical and operational constraints at the airport will not realistically allow sustained operation over 85 movements per hour for more than short periods.

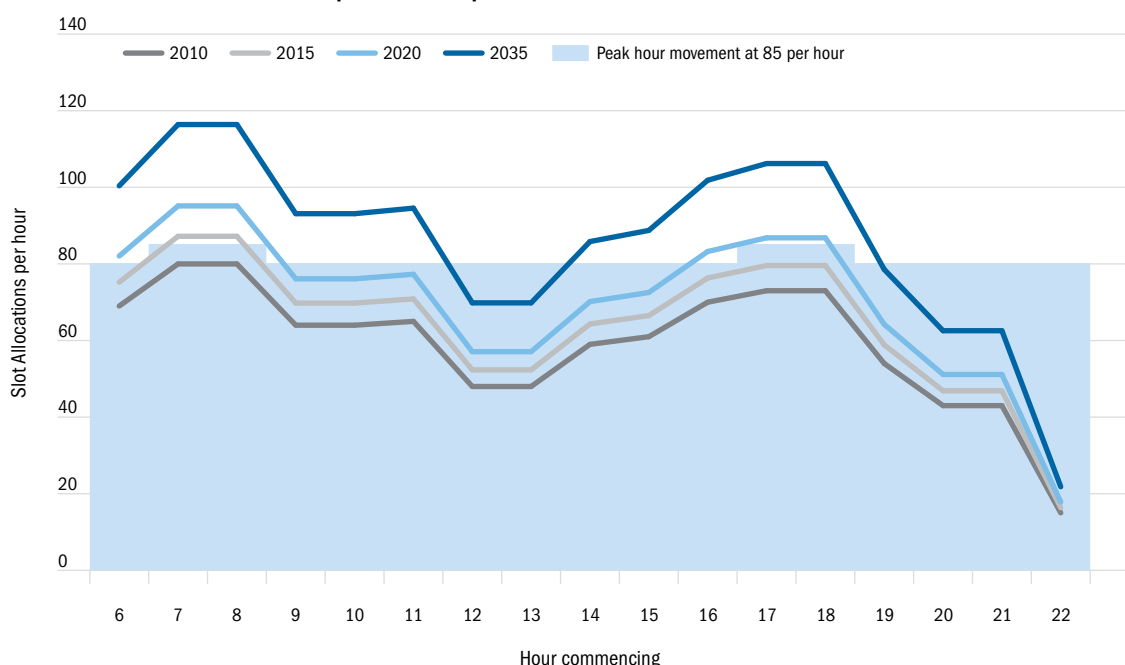
Allowing up to 85 movements per hour in peak hours

Allowing up to 85 movements per hour to be scheduled during peak hours (in the busiest weekday hours of 7.00am to 9.00am and 5.00pm to 7.00pm) would provide for some additional capacity at key times. It would make available 20 additional slots per day or 7,300 additional peak slots per year (six per cent increase in peak slots and one per cent increase in total slots). This could delay the timing of capacity issues for aircraft movements accessing Sydney (Kingsford-Smith) Airport by approximately one year.

While this option would provide peak capacity in the short term, any new release of peak slots would be taken up rapidly.

As shown in Figure 119, the peak hours would very quickly reach the new capacity limit, with forecast slot demand in 2015 already exceeding the 85 slot allocations per hour for most of the morning peak. The unconstrained forecast for 2035 greatly exceeds that made available by the 85 movement per hour peak.

Figure 119 Comparison between unconstrained forecast slot demand and proposed cap of 85 movements per hour at peak times



Source: Forecast slot allocations are based on Booz & Company analysis of Airport Coordination Australia data.

With the additional capacity in peak periods, this will in effect delay peak spreading for a short period. As demand growth continues, peak spreading will resume to levels otherwise experienced earlier under the 80 slot movement per hour arrangements.

Any increase in peak movements would place additional strain on limited airside infrastructure and surface transport linkages. For example:

- There would be a requirement for more gates, as well as greater apron and parking space within the limited airport site. This will require some airside infrastructure restructure and capital expenditure.
- Depending on the aircraft fleet mix attracted to the new peak slots (that is, if there is an increase in larger aircraft), this could increase the use of runway 34L/16R, resulting in greater runway imbalance. The terminal changes proposed by SACL are not expected to substantially mitigate this issue.
- Increased passenger numbers accommodated through the airport in peak periods would also bring forward and exacerbate capacity constraints for surface transport access. Peak hours for air travel at the airport currently coincide with peak commuter peak hours on the road and rail network.
- The system would be even more susceptible to delay and less able to recover from these delays.

An increase in slot allocations in peak hours would not impact on current ring fence arrangements for NSW intrastate services or slots with historical precedence. However, unless there was a change to the slot allocation process, new slots will likely follow the general process for allocation and priority is likely to be allocated initially to new entrants. This could assist in

freeing up some capacity for new international services or Low Cost Carrier (LCC) operators during the peak period for at least two seasons. If not taken up by new entrants, the slots will likely be taken up by incumbent operators quickly.

The increase in peak capacity is unlikely to help in the application of the Long Term Operating Plan (LTOP), as the surrounding hours are already above the 55 movements per hour in which LTOP can operate. In addition, noise will increase during the peak periods, as there would be more movements.

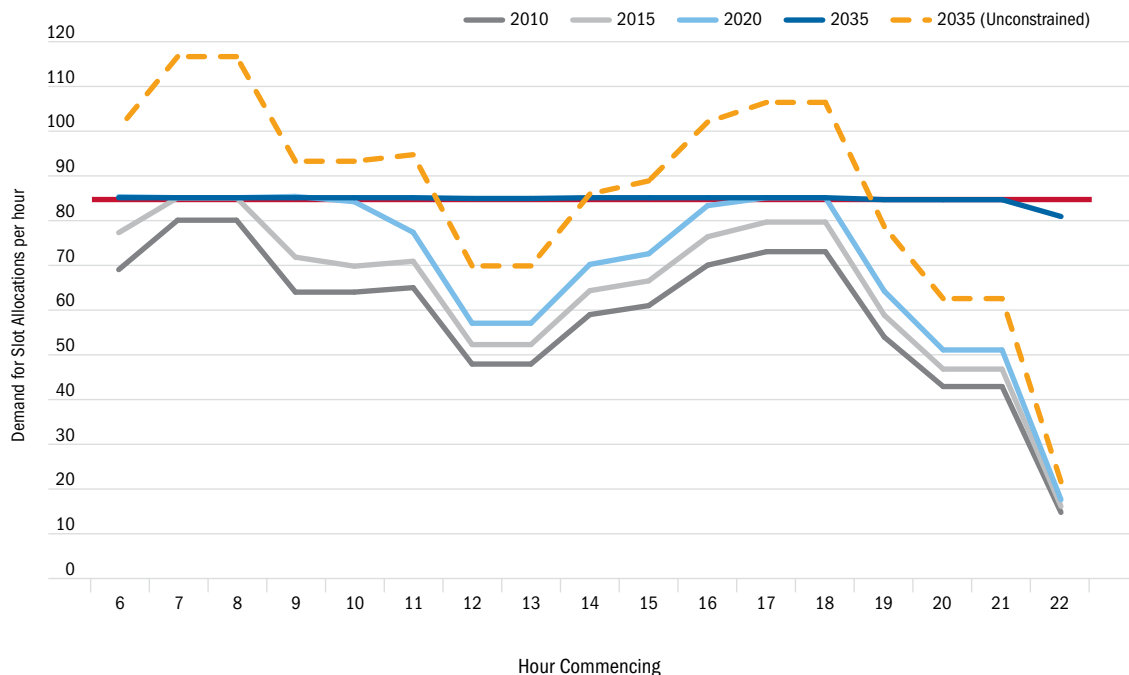
A potential alternative to this option would be to allow a slot increase in peak hours but balance it with a decrease in slots in some non-peak hours so the overall level of slots at the airport remains the same. This would provide for some additional capacity at key times while possibly delaying the loss of noise respite arrangements.

Increasing slot allocations to 85 per hour for all non-curfew hours

This option would allow an increase in slot allocations to 85 per hour across all hours of the Sydney (Kingsford-Smith) Airport non-curfew period (6.00am to 11.00pm) in order to allow greater movements across the airport's operating hours. This would make available an increase of some six per cent in slots available at the airport – an additional 85 slots per day or a total 31,000 per year, of which 20 per day (or 7,300 per year) would be in peak periods.

However, as shown in Figure 120, these allocations would be filled rapidly such that, by the 2035 dark blue line, for a majority of hours in the day (that is, except after 9.00pm) the 85 movement cap per hour will have been exceeded.

Figure 120 Expected hourly profile with 85 slot allocations at Sydney (Kingsford-Smith) Airport, 2010, 2015, 2020 and 2035

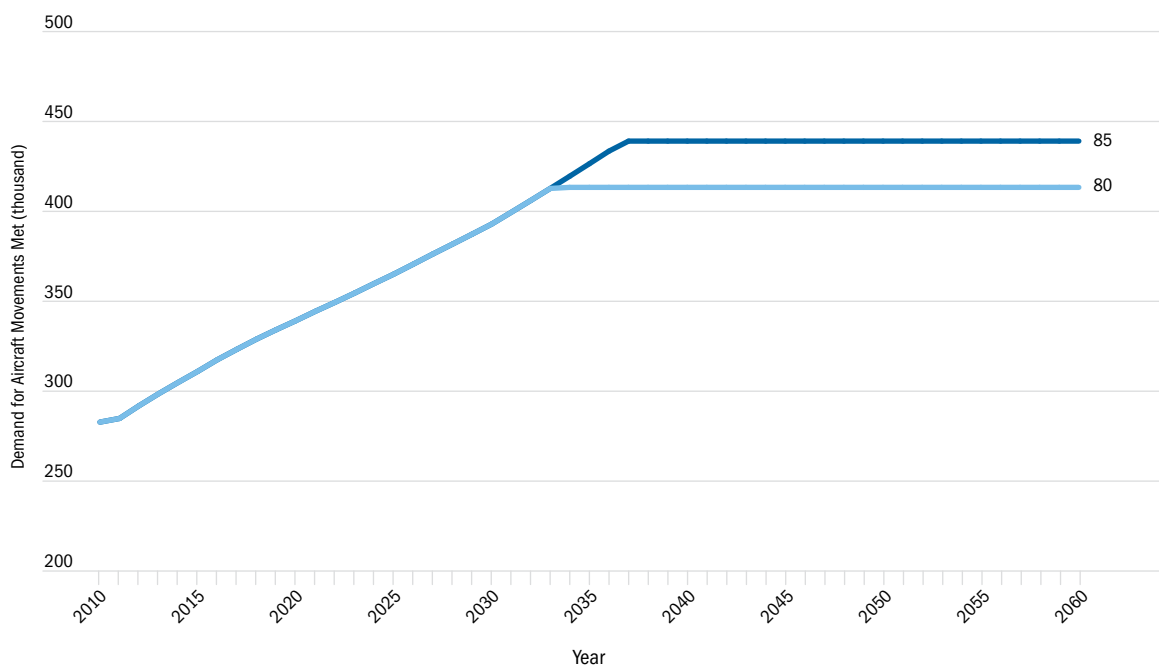


Notes: Excludes Military and GA movements. Red line represents a possible 85 movement per hour cap. The 2035 (unconstrained) case shows forecast growth in slot allocations, based on 2010 allocation in Part Four of this Report. 2010, 2015, 2020 and 2035 constrained cases assume that, when more than 85 slots are demanded in an hour, some will be 'peak spread' and be redistributed to other hours of the day, while others will be suppressed and not allocated. This figure shows a 'medium' peak spreading scenario. Outcomes of other scenarios are identified in Technical Paper B3.

Source: Booz & Company analysis.

On the basis of total annual movements, Booz & Company estimated that increasing the slot allocations and the movement cap from 80 to 85 per hour would delay capacity issues by three years, as depicted in Figure 121.

Figure 121 Sydney (Kingsford-Smith) Airport expected RPT aircraft movements per year under higher slot allocation levels, 2010 to 2060



Note: Excludes Military and GA movements. Assumes 80 or 85 aircraft movements can be achieved in every non-curfew hour of every day for 365 days. Assumes gap between allocated and actual slots (as identified in Part Four of this Report) declines as capacity constraints increase. A 'medium' peak spreading, including aircraft upgauging and load factor changes, applies.

Source: Booz & Company analysis.

The increase in movements could also place strain on airside infrastructure. Surface transport congestion will be exacerbated in the medium term, as there will be more passengers needing access to and from the airport.

Summary of implications from revisions to slot allocations

Table 25 summarises the range of impacts that may occur as a result of the two options presented.

Table 25 Possible revisions to Sydney (Kingsford-Smith) Airport slot allocation: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing the slot allocation to 85 per hour in peak hours, retaining the 80 per hour for off-peak hours	<p>Noise: increase movements in peak. Limited effect on LTOP as surrounding hours already above 55 movements per hour.</p> <p>Peak slot availability: six per cent increase in peak slots.</p> <p>Slot availability: one per cent increase in total slots, delaying constraints by at least one year.</p> <p>Airside infrastructure: some airside infrastructure restructure and capital expenditure is likely to be required.</p> <p>Surface transport: increased peak road congestion.</p> <p>Delay impacts: increased delays due to higher peak movements when capacity is reduced.</p>	●		
Increasing the slot allocation to 85 per hour for all non-curfew hours	<p>Noise: increase movements initially in peak, then non-peak over medium term. Short-term ability to effectively apply the LTOP improved, but difficult again in medium term.</p> <p>Peak slot availability: six per cent increase in peak slots.</p> <p>Slot availability: six per cent increase in total slots, delaying constraints by around three years.</p> <p>Airside infrastructure: some airside infrastructure restructure and capital expenditure expected, but no more than required for the preceding option.</p> <p>Surface transport: increased peak road congestion, expanding to off-peak in medium term.</p> <p>Delay impacts: increased delays when capacity is reduced.</p>	●		

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, while the greater capacity increase from the two options would be achieved from a change in the slot allocation to 85 movements per hour for all non-curfew hours, this would not be as well targeted and would reduce delay recovery, compared with an increase only in peak hours. Neither option addresses the real pressure on availability of peak period slots beyond the short term.

Curfew shoulder settings

A curfew has been in place at Sydney (Kingsford-Smith) Airport since 1963 as an essential protection to the communities close to the airport and flight paths. Any substantial reduction in the protection provided by the curfew is likely to be unacceptable to governments and the community and has not been assessed further.

Possible refinements to the curfew shoulder period have, however, been considered below.

Increasing permitted movements in both morning and evening curfew shoulders to the maximum level allowed under the Sydney Airport Curfew Act 1995

As a result of Sydney's geographic position, international demand is currently characterised by early morning arrival peaks from Europe, Asia and the US. International flights cannot be spread evenly throughout the day because of:

- curfews in Asia and Europe;
- connections at hub airports;
- aircraft and crew rotations; and
- the number of sectors per day required to commercially operate trans-Tasman routes.

The *Sydney Airport Curfew Act 1995* allows a small number of movements in the shoulder periods – to a maximum of 35 weekly arrivals between 5.00am and 6.00am and 14 movements between 11.00pm and midnight or to such lower levels as set out in the regulations.

The regulations currently set the limit at no more than 24 movements per week between 5.00am and 6.00am and zero movements between 11.00pm and midnight. In total, this means that the regulated level for curfew shoulder movements is currently 1,248 movements per year, but the absolute maximum curfew shoulder levels allowed under the Act is equivalent to 2,548 movements per year.

If the movement level prescribed in the regulations was increased to the maximum allowed under the Act, this would provide for 1,300 additional curfew shoulder slots per year (or 3.5 slots per day).

The effectiveness of this option to provide capacity would be driven by the level of demand for movements in the curfew shoulder hours. Considering current demand for international landings in the morning peak, it is likely the 5.00am to 6.00am shoulder would attract interest from international airlines. Such a measure would reduce pressure on International Terminal and airport infrastructure in the following 6.00am to 7.00am hour, where the passenger facilitation processing currently experiences peak pressures. However, as current demand for international landings during the 5.00am to 6.00am shoulder period is principally during the northern hemisphere summer scheduling period, any increased slot capacity in the curfew shoulder, if utilised, may only be taken up during those six months.

In the 11.00pm to midnight shoulder period, there is likely to be limited demand for movements (in comparison, there are currently only 15 slot allocated in the final 10.00pm to 11.00pm period). However, a potential benefit of increasing permitted movements in the evening curfew shoulder is that it could reduce pressure on long-haul departure slots between 10.00pm and 11.00pm. At present there is pressure on those slots, as long-haul airlines need to allow for a buffer period in their movements during this period to avoid breaches of the curfew.

This proposed change to the curfew shoulder movements would likely delay capacity issues for aircraft accessing Sydney (Kingsford-Smith) Airport by less than one year.

There are two variations on the above options.

- Increasing the permitted movements only in the morning curfew shoulder period to the maximum level allowed under the Act. This would provide for an additional 11 weekly slots for international landings in the 5.00am to 6.00am curfew shoulder, resulting in an additional 572 slots per year, or an increase of 0.1 per cent in total slots.
- Increasing the permitted movements only in the midnight curfew shoulder period to the maximum level allowed under the Act. This would provide for an additional 14 weekly slots (728 per year or a 0.15 per cent increase in total slots).

Given the curfew shoulder periods are outside of the peak hours for air travel and peak commuter hours on the road and rail network, the potential impact on airside infrastructure and surface transport congestion would be minor.

The Steering Committee is conscious that these options would involve increased movements at very early morning and very late evening periods, when sensitivity to aircraft overflight and noise is greater than at other times of the day.

Summary of implications from revisions to the curfew shoulder settings

Table 26 summarises the range of impacts that may occur as a result of the shoulder curfew options.

Table 26 Possible revisions to Sydney (Kingsford-Smith) Airport curfew shoulder: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing permitted movements in the curfew shoulder to the maximum level allowed in the <i>Sydney Airport Curfew Act 1995</i>	<p>Noise sharing: minimal impact on the LTOP. However, increased aircraft noise during more sensitive times of day.</p> <p>Peak slot availability: may free up some peak morning slots if current users can move to more operationally effective time. Otherwise, no impact.</p> <p>Slot availability: direct 0.25 per cent increase in total slots, delaying constraints by less than one year. Indirectly, could increase airline take-up of slots between 10.00pm to 11.00pm by providing greater buffer period.</p> <p>Airside infrastructure: minor impact, as curfew shoulder would still have less movements than peak periods.</p> <p>Surface transport: limited impact, as the curfew shoulder is outside of land transport peak hours.</p> <p>Delay impacts: minor impact if shoulder movements are delayed. Greater impact at night, as likely to force recovery next day, though low relative to total movements.</p>			
Increasing permitted movements in the 5.00am to 6.00am curfew shoulder to the maximum level allowed under the <i>Sydney Airport Curfew Act 1995</i>	<p>Noise sharing: minimal impact on the LTOP. However, increased aircraft noise during more sensitive times of day.</p> <p>Peak slot availability: may free up some peak morning slots if current users can move to more operationally effective time. Otherwise, no impact.</p> <p>Slot availability: 0.1 per cent increase in total slots, delaying constraints by less than one year. Slot take-up may only occur during the northern hemisphere summer.</p> <p>Airside infrastructure: minor impact, as curfew shoulder would have less movements than peak periods. Could assist clearing the 6.00am to 7.00am peak demand for international arrivals.</p> <p>Surface transport: limited impact, as the morning curfew shoulder is outside of land transport peak hours.</p> <p>Delay impacts: minor impact if shoulder movements are delayed, though low relative to total movements.</p>			

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Increasing permitted movements in the 11.00pm to midnight curfew shoulder to the maximum level allowed in the <i>Sydney Airport Curfew Act 1995</i>	<p>Noise sharing: would result in noise during evening curfew shoulder (compared to now, with no movements allowed). Minimal impact on the LTOP.</p> <p>Peak slot availability: no capacity impact.</p> <p>Slot availability: direct 0.15 per cent increase in total slots, delaying constraints by less than one year. Indirectly, could increase airline take-up of slots between 10.00pm and 11.00pm by providing a greater buffer period.</p> <p>Airside infrastructure: minor impact, as curfew shoulder would still have less movements than peak periods.</p> <p>Surface transport: limited impact, as the evening curfew shoulder is outside of land transport peak hours.</p>			

Source: PwC and Australian Department of Infrastructure and Transport.

In summary, the shoulder curfew options are likely to have a minor effect on overall capacity at Sydney (Kingsford-Smith) Airport and may not warrant further consideration.

NSW intrastate ring fence and minimum aircraft size

The Slot Management Scheme includes specific provisions to protect slots for intrastate NSW air services and ensure they are not squeezed out by international or major domestic services. The so-called ‘regional ring fence’ provisions are aimed to preserve equitable access by regional communities in NSW to Sydney (Kingsford-Smith) Airport so as to help with access to the range of services and facilities in Sydney, and to allow convenient connections with domestic and international services.¹⁴³

The regional ring fence provisions limit the scope for the holder of a protected regional slot to swap an intrastate service for an interstate domestic or international service. Further, the provisions limit the right of a new operator to take up a currently unused protected regional slot and use it for ongoing interstate or international services. Without these provisions, the operators of interstate or international services could progressively obtain access to more and more slots, to the gradual exclusion of NSW intrastate services.

For the northern winter 2010 scheduling season (30 October 2010 to 26 March 2011), the total slots allocated to NSW intrastate services represented about 16 per cent of total slots allocated at Sydney (Kingsford-Smith) Airport, and for the northern summer 2011 scheduling season (27 March 2011 to 29 October 2011) about 17.5 per cent, as shown in Table 27.

Table 27 Slots for the northern winter 2010 and northern summer 2011 scheduling seasons, October 2010 to October 2011

	Winter 2010 (30 October 2010 to 26 March 2011)	Summer 2011 (27 March 2011 to 29 October 2011)
Total NSW Intrastate Regional Slots Allocated	24,667	39,650
Allocated Sydney (Kingsford-Smith) Airport Slots	151,141	225,320

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data.

In 2010, there was an average of 30 passengers per movement for regional flights, compared to around 140 passengers per movement for domestic flights and 185 passengers per movement

143 Existing regional services would still be retained.

for international flights. Consequently, notwithstanding the proportion of allocated slots, regional flights accounted for only about six per cent of total Sydney (Kingsford-Smith) Airport passengers.¹⁴⁴

Table 28 provides an indication of the size of aircraft serving NSW intrastate routes from Sydney (Kingsford-Smith) Airport for the northern summer 2011 scheduling season. As this Table indicates, around 18 of the 26 intrastate routes were catered for by aircraft with fewer than 40 seats between March and October 2011.

Table 28 **Seat capacity supported on aircraft types serving NSW intrastate routes from Sydney (Kingsford-Smith) Airport for the period March 2011 to October 2011**

Intrastate Location	Current range of aircraft seat capacity
Albury	33–72
Armidale	50
Broken Hill	33
Bathurst	33
Ballina	33–180
Cobar	18
Coffs Harbour	78–106
Dubbo	33–78
Mudgee	19
Griffith	33
Grafton	33
Lord Howe	36
Lismore	33
Merimbula	33
Moree	36
Moruya	33
Narrabri	19
Narrandera	33
Newcastle	19
Orange	33
Cooma	19
Parkes	33
Port Macquarie	72–78
Tamworth	78
Taree	33
Wagga Wagga	33–78

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data.

While the protection of regional access is an important policy objective, a large number of operations by small aircraft does not represent an efficient use of limited airport capacity. This was recognised in amendments to the scheme in 2001, which set a cap for the maximum

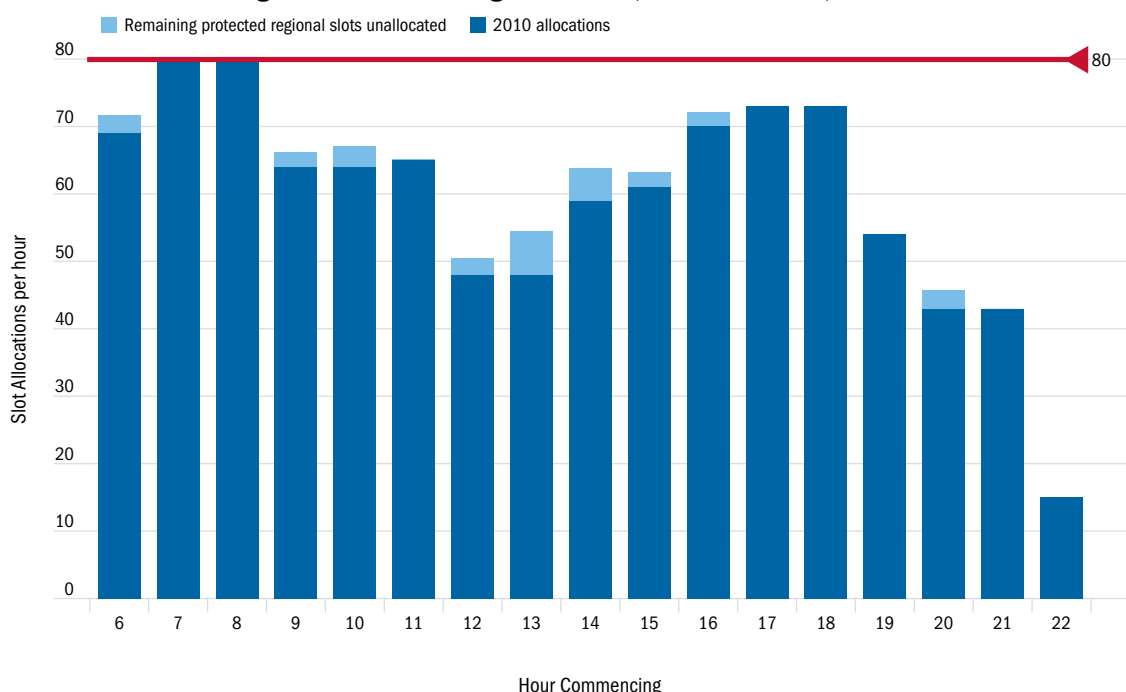
144 Booz & Company.

number of NSW intrastate slots allocated in peak periods (defined for this purpose as from 6.00am to 11.00am and from 3.00pm to 8.00pm on weekdays). The cap was set to reflect the level of intrastate operations scheduled at that time; this in effect reserved the remaining unallocated slots in those periods for international and interstate services.

The Slot Management Scheme also specifies that passenger aircraft seeking a slot series for a new service must have a minimum of 18 seats.

The number of slots set aside for NSW intrastate movements has already been heavily taken up in the morning and afternoon peaks. The cap means that no additional slots can be made available in those periods. As Figure 122 shows, the busy morning and evening hours between 7.00am to 9.00am and 5.00pm to 8.00pm have no remaining protected slots. There are limited numbers of protected slots available in other periods. Taking into account that any new service would require two slots close together – one for arrival and one for departure – it is clear there is limited scope for growth in intrastate movements in the busy periods of the day.

Figure 122 Comparison of all Sydney (Kingsford-Smith) Airport slots allocated relative to remaining NSW intrastate ring fence slots, northern winter, 2010



Note: 2010 allocations are based on slot allocations corresponding to the planning day Friday, 12 November 2010. Protected regional slots reflect an average of the remaining slots per hour during the week.

Source: Australian Department of Infrastructure and Transport analysis of Airport Coordination Australia data.

The protections in the Slot Management Scheme for intrastate NSW services are supported by controls on increases in aeronautical charges at Sydney (Kingsford-Smith) Airport for intrastate airlines. These controls essentially limit potential increases to consumer price index adjustments. SACL's charges for the provision of terminal, check-in, passenger security and bag screening, runways and apron parking services to NSW intrastate air services at Sydney (Kingsford-Smith) Airport have not been increased since May 2001.

Options for reducing the use of small aircraft

The Steering Committee is conscious that the price cap and the regional ring fence protect the continued operation of regional services, including services operated with small aircraft. In the absence of such provisions, commercial pressures would tend to favour interstate or international services using large capacity jet aircraft operations.

The Committee considered whether changes to the regulatory arrangements could create greater incentive for airlines to use larger aircraft, in the interests of more efficient use of the airport's capacity, without prejudicing continued access for regional communities. The options outlined in the following paragraphs were examined.

Removal of regional ring fence

Removing the regional ring fence would allow immediate use of unallocated regional slots to any operators (including domestic and international airlines) seeking to operate new services. Existing regional operators would retain historical precedence for allocated slots they continue to operate. Such options may have implications, however, for the infrastructure requirements at both Sydney (Kingsford-Smith) and the airport at the other end of the route.

Removal of the price cap

Removing the price cap on intrastate services would allow SACL to negotiate with regional airlines on commercial terms, subject to the provisions of the *Australian Competition and Consumer Act 2010*. Notwithstanding those provisions, regional airlines have expressed strong concerns over the years about their ability to negotiate with SACL on an equal basis. An alternative could be to change the price controls to add increased incentive for regional airlines to use larger aircraft. For example, the scheme might allow a minimum charge to be imposed for peak period movements, with the minimum charge set at a level which would discourage use of very small aircraft. The operator at Perth Airport has recently introduced charging for peak times, to ensure efficient use of limited capacity.

Increase the minimum number of seats

The restriction on allocation of a slot series for new services with aircraft with less than 18 seats could be extended to apply to larger aircraft on a staged basis. Estimates indicate that, in 2010, approximately 60 per cent of intrastate aircraft movements at Sydney (Kingsford-Smith) Airport were by aircraft with less than 40 seats.¹⁴⁵ This is equivalent to around 39,000 aircraft movements. If, for example, through the upgauging of aircraft, a 30 per cent reduction could be achieved in the number of movements by aircraft with fewer than 40 seats, this would be equivalent to approximately two per cent of total airport slots. The impacts of capacity pressures at Sydney (Kingsford-Smith) Airport could be therefore delayed by approximately one year. The greater the reduction in aircraft of this size, the more capacity created.

Progressive increases in aircraft size and therefore passengers per movement have been a trend to date and normal market forces are likely to continue driving aircraft upgauging to the extent it is economically viable for airlines. For example, recent trends for the number of passengers per intrastate aircraft movement at Sydney (Kingsford-Smith) Airport have shown an increase from an average of 19 seats per movement to an average of approximately 31 seats over the period 2001 to 2010 – an increase of 4.9 per cent year on year.¹⁴⁶ However, the high pace of upgauging is likely to be more viable in markets where there is sufficient volume of demand to support the larger capacity aircraft.

¹⁴⁵ BITRE data.

¹⁴⁶ Booz & Company analysis of BITRE data.

If, however, the threshold was increased, to 40 or 50 seats initially, with a view to increasing it to 70 seats in the future, this would assist in providing a more balanced approach to upgauging while still creating capacity. The restriction could initially be limited to peak periods and/or existing services with small aircraft being allowed to continue for a limited period.

Impacts

Any of the above options have some potential to affect the level and pattern of services to centres in regional NSW. To the extent that they create incentives to use larger aircraft for intrastate services, they may encourage a reduction in the number of services if not in seat numbers.

Potential implications may include:

- a need for regional airports to be upgraded to cater for larger aircraft;
- reduction in service frequency, but potentially higher capacity in seat numbers;
- increased hub and spoke activity, with consolidation of smaller flights in regional hubs and larger aircraft operating to Sydney (Kingsford-Smith) Airport;
- operation of smaller aircraft into another airport in the region, such as Bankstown Airport, if available; and
- withdrawal of some services to markets with low demand, where only small aircraft are viable and services through a regional hub are not a realistic option.

A hub and spoke system would result in increased travel times and higher costs for many regional passengers. In addition, for interlining passengers connecting to other flights through Sydney (Kingsford-Smith) Airport, it would involve multiple flights and airport transfers. Given the analysis of capacity pressures at Sydney (Kingsford-Smith) Airport and their impacts, the Committee considers it important that a strategy is put in place to support a progressive upgauging of small aircraft operations in the medium term, drawing on these options. This would need to be combined with an approach to infrastructure investment to ensure gates and aprons will be adequate to support the move to larger aircraft.

Summary of implications from removing the regional ring fence, the price cap and increasing the minimum aircraft size

Table 29 summarises the range of impacts that the option of removing the regional ring fence, the price cap or introducing a requirement for the minimum aircraft size.

Table 29 Possible revisions to Sydney (Kingsford-Smith) Airport intrastate pricing and aircraft size: potential range of impacts

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Removal of regional ring fence	<p>Noise sharing: minimal impact on noise and the LTOP due to low and likely gradual affect on slot and movement availability.</p> <p>Peak slot availability: minimal increase of peak slot availability.</p> <p>Slot availability: if 20 per cent of the affected intrastate movements were upgauged or rationalised (one per cent of total airport slots), capacity issues could be delayed by less than one year.</p> <p>Airside infrastructure: minor impact due to low potential change in total movements, though may require upgrades/investment to accommodate larger average aircraft size over time.</p> <p>Surface transport: limited impact due to low potential change in total movements.</p> <p>Delay impacts: minor impact due to low potential change in total movements.</p>			
Removal of the price cap	<p>Noise sharing: minimal impact on the LTOP</p> <p>Peak slot availability: minor increase in peak slot availability.</p> <p>Slot availability: if 30 per cent of affected intrastate movements were upgauged or rationalised (two per cent of total airport slots) then capacity issues could be delayed by approximately one year.</p> <p>Airside infrastructure: airside infrastructure at Sydney (Kingsford-Smith) Airport would require capital expenditure to accommodate larger aircraft. Airports at other end of the route may also require investment.</p> <p>Surface transport: limited impact due to low potential change in total movements.</p> <p>Delay impacts: minor impact due to low potential change in total movements.</p>			
Increasing the minimum size of aircraft for RPT aircraft accessing Sydney (Kingsford-Smith) Airport to at least 40 seats per movement	<p>Noise sharing: minimal impact on the LTOP</p> <p>Peak slot availability: possible minor increase in peak slot availability.</p> <p>Slot availability: if 30 per cent of affected intrastate movements were upgauged or rationalised (two per cent of total airport slots) then capacity issues could be delayed by approximately one year.</p> <p>Airside infrastructure: airside infrastructure at Sydney (Kingsford-Smith) Airport would require capital expenditure to accommodate larger aircraft. Airports at other end of the route may also require investment.</p> <p>Surface transport: limited impact due to low potential change in total movements.</p> <p>Delay impacts: minor impact due to low potential change in total movements.</p>			

Source: PwC and Australian Department of Infrastructure and Transport.

6.2 Options to improve Sydney (Kingsford-Smith) Airport surface transport access

The road and rail networks connecting Sydney with Sydney (Kingsford-Smith) Airport are already experiencing capacity pressures. There are currently around 130,000 land transport trips to and from the airport each weekday, which is a rise of over 40 per cent from 90,000 per weekday in 2006. These trips will continue to increase with airport passenger growth, contributing to congestion problems for airport users and others.

A range of options exist to improve Sydney (Kingsford-Smith) Airport land transport connections to create capacity and enable more reliable and less congested journeys.

A preliminary assessment was conducted of more than 20 options (including cycle ways, park 'n' ride facilities, bus enhancement and rail upgrades. Transport for NSW and PwC then selected a set of options to principally serve Sydney (Kingsford-Smith) Airport users, and one set that has the potential to improve land transport performance for airport and other transport network users more broadly. More detail can be found in Technical Paper C2.

Surface transport options principally benefiting airport users

Airports are complex surface transport trip generators, where access planning is more complicated than simply dealing with peak commuter demand. Given the complex nature of surface transport needs for airport users, a set of surface transport options principally improving connections for airport users to Sydney (Kingsford-Smith) Airport were identified for consideration.

The options that were assessed are presented below.

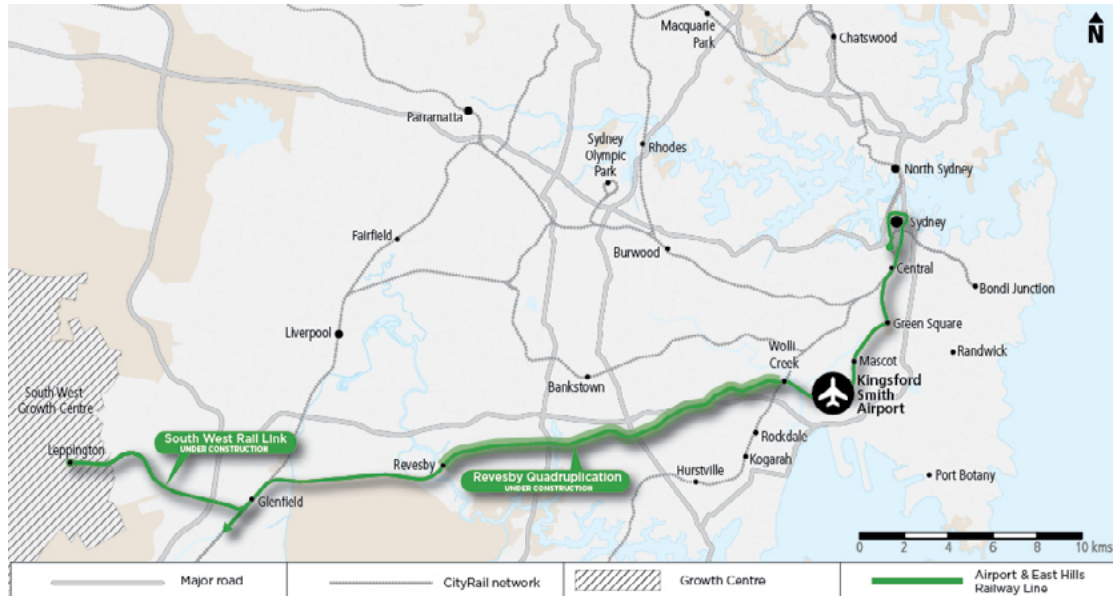
Rail

Upgrades to airport train services and possible long-term rail scenarios

The airport rail line operates within the broader CityRail network and cannot be considered in isolation. Sydney's future rail challenges are likely to require provision of additional capacity for the broader rail network to meet demand growth for rail and public transport. As such, any significant development of capacity on the airport rail link is likely to involve extensive capital works across the network.

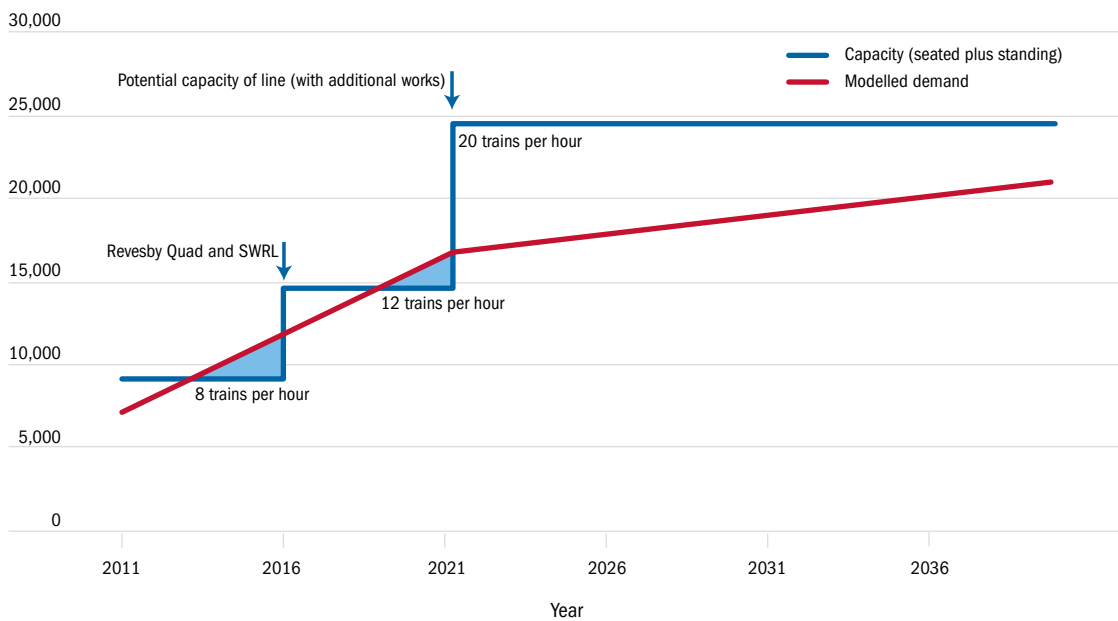
Currently the airport rail line has eight trains per hour and this is increasing to potentially 12 per hour in 2016 (post opening of the South West Rail Line, the Kingsgrove to Revesby Quadruplication and the Revesby turnback; and if additional rollingstock is allocated to the line). To achieve 20 trains per hour or to meet demand growth for rail on the rail lines serving the airport would, however, require an expansion of capacity.

Figure 123 shows the rail capacity on the airport rail line and works under construction.

Figure 123 Rail capacity and works under construction

Source: Transport for NSW.

Figure 124 illustrates the timing of the increases in rail frequency compared to forecast demand growth in the morning peak for city-bound services. Assuming implementation of additional network capacity, the airport rail line has the potential to provide important medium- and long-term capacity on the airport station line. However, additional works would be needed to achieve the maximum of 20 services per hour under current operating conditions.

Figure 124 Expected capacity of the airport rail line to accommodate demand growth (with long-term rail network capacity increases), 2010 to 2036

Source: Transport for NSW.

However, if additional rolling stock and train paths are not allocated to the Airport Link, or long-term rail investments do not facilitate a higher number of trains per hour, there will be significant ongoing issues, especially city-bound during peak hour.

At other times of day for CBD-bound services, adequate spare capacity exists as well as across the whole day for services to the south-west (for example, Wolli Creek and Campbelltown).

Potential options to assist in creating more mode shift and greater capacity include:

- converting Wolli Creek to an express stop for Illawarra and South Coast trains (for all services or to coincide with work shifts);
- improved interchange facilities, lifts and signage at Central Station for passengers with luggage;
- extending night ride services into the airport to assist airport workers (if trains are not viable for night use then a night ride bus could be investigated).

A number of options for improving rail mode share access to Sydney (Kingsford-Smith) Airport were examined.

Removal of the station access fee at the International and Domestic Terminals railway stations

In 2006, an assessment by SACL suggested rail had an estimated 11 per cent mode share of all surface transport trips to and from Sydney (Kingsford-Smith).¹⁴⁷ There are estimates this could now be closer to 17 per cent.¹⁴⁸

Travellers are currently charged a station access fee to access the International and Domestic airport rail stations. The high cost relative to other rail ticket prices in the network may be deterring some users from accessing Sydney (Kingsford-Smith) Airport by rail, putting more pressure on the congested road network.

This option assumes removal of the station access fee from the Domestic and International Terminal railway stations for all commuters, with the price paid for all tickets aligned to CityRail system-wide fares.

Funding the station access fee could deliver a range of benefits in order to assist with performance of surface transport in the short term. Transport for NSW estimated that, combined with a public transport information campaign, removal of the station access fee could delay capacity issues on the roads serving the airport (in particular, the problematic Domestic Terminals entrance) by between one and four years.

Removal of the fee is expected to encourage a mode shift to rail among all market segments due to the demand response caused by the relative price reduction of rail. A rapid cost benefit analysis (CBA) undertaken by PwC suggests that this will result in a positive benefit cost ratio (BCR), principally due to travel time benefits for users switching to a more time-efficient mode of transport, as well as the decongestion benefits generated for road users. The significant reduction in the cost of rail travel for airport users will not only provide existing rail users with cost savings but also attract new rail travel.

Average fares are estimated to fall from over \$11 to \$3 per trip, which could result in more than 3,500 new users per weekday diverting from road to rail in the first year of operation alone (equivalent increase of 26 per cent of existing airport rail users). In the long term, this could increase the diversion of almost 8,400 users from car to rail (equivalent to 34 per cent of existing airport rail users). The Productivity Commission's August 2011 draft report Economic Regulation of Airport Services supports these results and suggests that the patronage increase

¹⁴⁷ SACL, *Airport Ground Travel Plan*, 2006.

¹⁴⁸ BITRE analysis of *Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data*; PwC and High Range Analytics analysis based on Sydney Strategic Travel Model (STM) RCZ modelling mode shares adjusted with other travel demand information, 2011.

may be even greater than expected in light of the effect seen when the station access fee was removed at Green Square and Mascot stations in March 2011.

Reduced road congestion as a result of the mode shift will be a further benefit. Diversion of trips from road to rail will result in reduced travel times for remaining road users to and around Sydney (Kingsford-Smith) Airport. This will in turn reduce vehicle operating costs for car drivers, as fuel, tyre and vehicle maintenance can be reduced and greater average speeds can be achieved, with less stops and starts in congested traffic.

There will be some environmental benefits for third parties as a result of the station access fee removal. The Australian Transport Council externality values suggest that rail has lower environmental impact than road travel in relation to costs including air pollution, greenhouse/ climate change, noise, water, nature and landscape, and urban separation.¹⁴⁹

Public transport information campaign to promote rail access to or from Sydney (Kingsford-Smith) Airport

The implementation of a NSW Government customer information campaign for public transport serving the airport could provide greater information on rail services in order to encourage an increase in rail mode share to assist relieving road congestion. The main focus of the campaign could be customer information about Airport Link services to the airport, with the possibility to extend information about public bus services and private minibuses in later years.

Measures include:

- signage and street prompts to direct people to St James Station from Martin Place to reduce congestion from taxi trips;
- communicating the airport rail line operating pattern to give passengers the choice to stay on through the City Circle line rather than interchange at Central Station when this option is available; and
- improved signage for the Airport Link at the International Terminal.

An information campaign would increase awareness among all market segments of the availability and operation of public transport services to and from the airport, and act primarily to create a mode shift towards rail. While the possible mode shift is not estimated to be as significant as removing the station access fee, an information campaign would require relatively low investment and cost outlay in order to encourage behaviour change and mode shift from road to rail when accessing Sydney (Kingsford-Smith) Airport. It is also low risk given the low level of investment required and also considering that if, after implementation, it does not result in the level of benefits predicted, resources could be readily directed elsewhere.

As opposed to the station access fee removal, which reduces generalised trip costs for existing and new rail users, this public information campaign would principally benefit new users who are encouraged to use rail and are able to experience savings in the trip cost. A public transport information campaign could also be viewed as a facilitator that could be combined with the station access fee removal option. The packaging of these two options was estimated in rapid cost benefit analysis to offer synergies and increase overall economic benefits. A pedestrian link from Martin Place to St James of up to 300 metres could also facilitate easier access to airport link train services from across the CBD.

¹⁴⁹ Australian Transport Council, *National Guidelines for Transport System Management in Australia*, 2006.

Road

Upgrades to Sydney (Kingsford-Smith) Airport arterial roads

Potential upgrades to Sydney (Kingsford-Smith) Airport arterial roads were considered as an option to reduce road congestion in the airport precinct. These upgrades were not assessed in the rapid CBA, as the specifics of the projects would be highly dependent upon other projects. In particular, in the event that the M5 East Expansion and/or M4 Extension proceed, some of these projects will be required to ensure that the motorways connect smoothly with the airport precinct, while others may no longer be required.

There are a range of arterial road upgrades and projects that could assist to ease congestion in the short to medium term. The following projects are defined in SACL's Master Plan:

- widening of Joyce Drive and General Holmes Drive between Mill Pond Road and O'Riordan Street by one lane in each direction;¹⁵⁰
- widening of Airport Drive / Qantas Drive by one lane in each direction;
- improving capacity at the Mill Pond Road right turn into General Holmes Drive;
- improvements proposed for the International Terminal precinct's road access, egress and internal road networks; and
- domestic precinct road system upgrade by development of multiple entry/exit points with segregation of the main traffic flows including taxis, passenger drop-off and pick-up and parking.¹⁵¹

The NSW Government has also identified additional upgrades for consideration:

- realignment of Wickham Street to connect Forest Road to Marsh Street to address traffic queueing extending through and beyond the intersections of Wickham, Marsh and West Botany Streets;
- widening of O'Riordan Street to three lanes in each direction from Botany rail bridge to north of Bourke Road; and
- widening Marsh Street to three lanes each direction to provide continuity for traffic flow from Airport Drive.

The majority of these projects are likely to be relatively expensive to construct due to the requirement to amend current infrastructure in relatively constrained areas of land. While many are defined as "minor works" they still have an estimated cost of between \$700 million and \$1 billion. Furthermore, with the current levels of forecast demand growth around the airport, these projects will be unlikely to provide enough additional capacity in the future to solve forecast capacity issues. They would, however, play an important role in helping to manage existing congestion problems.

Public buses running from selected locations to and from Sydney (Kingsford-Smith) Airport

Currently, there are two public buses that directly service Sydney (Kingsford-Smith) Airport; only the 400 Burwood to Bondi bus route (as shown in Figure 125) operates to the airport terminals.

As a comparison, North Sydney, which has 50,000 people employed in the area, is served by 62 bus routes (the airport averages 130,000 users per day).¹⁵²

¹⁵⁰ The introduction of high occupancy vehicle lanes in the airport precinct could be considered within the bounds of this project.

¹⁵¹ SACL, *Landside Access – Master Plan Concept*, 2009.

¹⁵² Productivity Commission, *Economic Regulation of Airport Services, Draft Report*, August 2011.

The 400 bus is a medium- to high-frequency trunk daily cross-regional service and calls at both the International and Domestic Terminals. There may be potential to implement new bus services to target two potential pools of bus patronage where there are clusters of commuters and airport passengers. As discussed in Part Four of this Report, a significant portion of airport users are from Sydney's Lower North, with a concentration of commuter/staff trips to Sydney (Kingsford-Smith) Airport from the Sutherland Shire – both areas which are not currently well served by public transport to the airport.

Figure 125 400 bus route passing Sydney (Kingsford-Smith) Airport



Source: Transport for NSW.

The introduction of the following two bus services to and from Sydney (Kingsford-Smith) Airport could assist to encourage these two demand segments to access the airport by bus to reduce road congestion:

- **St George/Sutherland bus service:** this service would connect airport staff in South West Sydney with Sydney (Kingsford-Smith) Airport. An extension of a current route could be possible so that the airport employees in the St George / Sutherland area are connected to the International Terminal, Airport Drive bus stops and the Domestic Terminals. Such a service could also potentially connect some largely residential land to the rail system at Miranda, Rockdale and the airport.
- **Lower North Shore bus service:** This service could serve airport users from the Lower North Shore. While the pool of commuter patronage from the Lower North Shore is relatively small to warrant a direct service, a metrobus service could provide a direct bus link from the Lower North Shore to the airport, also connecting other areas in between.

The introduction of these services would provide new options for road users to divert from car to bus. For users attracted to shift to the bus, benefits may include reduced travel time as well as reduced costs associated with parking at Sydney (Kingsford-Smith) Airport. As a result of increased bus use, road congestion would improve, resulting in faster travel times for other remaining road users to and around Sydney (Kingsford-Smith) Airport. This would in turn result in reduced car operating costs as well as a reduction in environmental externalities, as one bus trip can replace a number of car trips.

The option also has relatively low up-front costs and, along with the public transport information campaign, represents a relatively low-risk solution. If, after implementation, the buses do not provide the level of benefits predicted, the additional buses operated to and from the airport could be redirected to other services in the metropolitan area.

Taxis, minibuses and hire cars

Taxis, minibuses and hire car services play major roles in providing almost 40 per cent of movements to and from the airport.¹⁵³ They consequently also account for a major component of road congestion around this precinct.

Taxi trips in particular have a high impact on the local road network due to additional circulation brought about by the queuing system, restrictions on where passengers can be picked up, unbalanced unloading and backloading and low passenger loads per vehicle. As congestion around the airport has increased and with queues for taxis in peak periods approaching 30 minutes on occasions, there has been a shift from taxi trips to the train service. Given the congestion around the airport, there are limited opportunities to grow taxi usage compared to other public transport modes. Taxi pick-up and drop-off points are highly controlled at Sydney (Kingsford-Smith) Airport to ensure pedestrian safety is not compromised by the very high movement of taxi movements.

Additionally, the collection of a taxi entry fee at pick-up points and the complex system of taxi vehicle queuing at the airport can also contribute to congestion and reduce the customer experience for passengers. SACL is continuing to focus on facilitating the efficient movement and backfilling of taxis with longer ranks and more intensive supervision of the taxi loading area. However, unless there is a mode shift to rail or bus (including minibus), any congestion at and around the airport will only continue to grow.

Minibuses are becoming increasingly popular and account for more than 10 per cent of all trips to Sydney (Kingsford-Smith) Airport.¹⁵⁴ They are more popular for suburbs of Sydney more distant from the airport which are not on the rail line, such as those in Northern Beaches. Over 100 minibus companies provide a door-to-door airport service at a lower price than a taxi, albeit with a longer transit time due to multiple pick-ups or set-downs. There is scope for improving the marketing and accessibility of the minibus services and, because loads per vehicle are better than taxis, this could achieve a reduction in congestion.

The NSW Government is considering reforms to better support the minibus market (particularly where they complement the rail market) and improve customer experience (such as mobile phone apps). There may also be merit in locating minibuses, together with other higher occupancy vehicles such as buses and taxis, in a better centralised space or a transit mall to improve vehicle flows out the front of Domestic and International Terminals.

¹⁵³ BITRE analysis of Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data.

¹⁵⁴ BITRE analysis of Tourism Research Australia 2005–2009 NVS, IVS and independently commissioned survey data.

For airport users who do not access trains to travel from the airport to their final destination, a transit mall could provide capacity for higher-occupancy vehicles to reduce traffic congestion at the airport. This space could be combined with improvements in passenger information about travel options, costs and approximate travel times – for example:

- real-time information boards for customers on departure time, destinations served and price;
- applications for smart phones to provide on-demand shuttle bus services; and
- customer service booths to assist passengers with various forms of transport.

There also appears to be merit in developing new minibus services catering specifically to airport shift workers (who commence in the early hours of the morning prior to public transport services starting) with potentially some industry funding to reduce fares for workers.

Hire car (or limousine) services make up a small proportion of trips, but they have a much higher congestion impact on the local airport road network, as many of them have long dwell times close to the exit points to the Domestic Terminals. Hire cars are often double-parked as they meet their customers, which slows road circulation and reduces parking availability as these drivers wait for their customers. There is limited opportunity for this market to grow unless alternative new waiting arrangements are developed (such as a dedicated valet-style facility within the car park).

Broader network options for surface transport

Given the interconnected nature of surface transport and the challenge of isolating one part of the network that does not have an impact on other parts of the network, the Steering Committee has examined broader network-wide options to provide surface transport capacity in the medium term. These all provide benefits to the surface transport access of Sydney (Kingsford-Smith) Airport as well as provide benefits more broadly in Sydney.

M5 East expansion

The M5 motorway is part of Sydney's Orbital Road Network and is a key link to Sydney (Kingsford-Smith) Airport and Port Botany. It is the main road freight, commercial and passenger route between Sydney (Kingsford-Smith) Airport and South West Sydney and comprises two sections:

- the M5 South West motorway from Prestons to Beverley Hills; and
- the M5 East Freeway, which is the focus of this option.

The NSW Government's proposed M5 East Expansion aims to:

- duplicate the capacity of the existing M5 East Freeway (including tunnels) to a total of eight lanes between Beverly Hills and Kyeemagh; and
- provide enhancements to the road network and improve access to the airport and commercial and industrial areas north of the airport.

Improved travel times

The M5 East Expansion has been estimated by the NSW Government to be economically viable in terms of its BCR. This is primarily driven by travel time savings given that the increased capacity on the motorway will improve traffic flows.¹⁵⁵ This will in turn result in reduced road vehicle operating costs and will also result in reduced environmental externalities.

155 RTA (2009) *M5 Expansion – Preliminary Economic Evaluation*, cited by Transport for NSW (Technical Paper C2)

Analysis of travel time changes with and without the M5 East Expansion was undertaken in order to gauge the impact of the project on airport users. The motorway project was found to reduce travel times to the airport from a selection of town centres in comparison to a 2036 base case. The travel time savings resulting from the project will be captured by airport users living along the motorway corridors. Those living in less proximate locations will derive improved accessibility as a result of the expansion, although to a lesser extent.

M4 Extension

The M4 Extension project arose out of a NSW Government commitment to examine the needs of the wider network between the eastern end of the M4 at North Strathfield, the CBD, and the Sydney (Kingsford-Smith) Airport / Port Botany precinct. This was intended to improve connectivity between the western part of Sydney, Parramatta and the Sydney CBD and airport / Port Botany area and reduce traffic intrusion into local residential areas in Sydney's Inner West.

The proposal for the M4 connection to the airport has not yet been finalised and detailed designs have yet to be developed. Broad route options have been examined which could include components such as:

1. widening/upgrading of the M4 motorway from west of Church Street (near Pitt Street at Merrylands) to Concord Road at North Strathfield;
2. a tunnel from North Strathfield to just south of Campbell Road at St Peters with ramp connections to the City West Link at Lilyfield/Rozelle and Parramatta Road / Broadway at Glebe/Chippendale. A bus-only connection at Parramatta Road, Haberfield, is also possible;
3. a surface motorway link from just south of Campbell Road to the road network around Sydney (Kingsford-Smith) Airport, most likely connecting to Canal Road and Qantas Drive (the latter subject to M5 East Expansion planning and SACL agreement), with a potential link to the M5 at Arncliffe; and
4. northern motorway tunnel connecting Victoria Road near Gladesville Bridge to the main tunnel in the Leichhardt area.

The M4 Extension is estimated by the NSW Government to deliver substantial economic benefits to metropolitan Sydney by addressing key areas of network congestion and future travel demands from the port and airport. The toll on the existing M4 was also covered by cashback, but this toll was totally removed when the concession period ended in 2010.

The principal benefit of the M4 Extension is travel time savings, given that the increased capacity will improve traffic flows.¹⁵⁶ The M4 Extension project would provide a more direct link to the airport than existing arterial roads. This would be captured by airport users living along the motorway corridors. Those living in less proximate locations would derive improved accessibility if these projects are built, although to a lesser extent.

Freight

This Joint Study has also considered the impact of rapidly growing freight movements from Port Botany on land transport capacity, and the need to pursue measures to separate the freight task from the land transport needs of Sydney (Kingsford-Smith) Airport within the Global Economic Corridor. Although the air freight task at Sydney (Kingsford-Smith) Airport is relatively small compared to the container freight task for Port Botany, the colocation within one precinct creates land transport capacity issues. As discussed in Part Two of this Report, Port Botany is Australia's second-largest container terminal, handling two million containers in 2010–11 (one-third of national volume), with this trade worth more than \$40 billion per year. Freight activity has been growing by seven per cent per year. Strong growth (albeit at slightly lower levels) is expected

156 RTA (2008) *M4 Extension – Preliminary Economic Evaluation*, cited by Transport for NSW (Technical Paper C2)

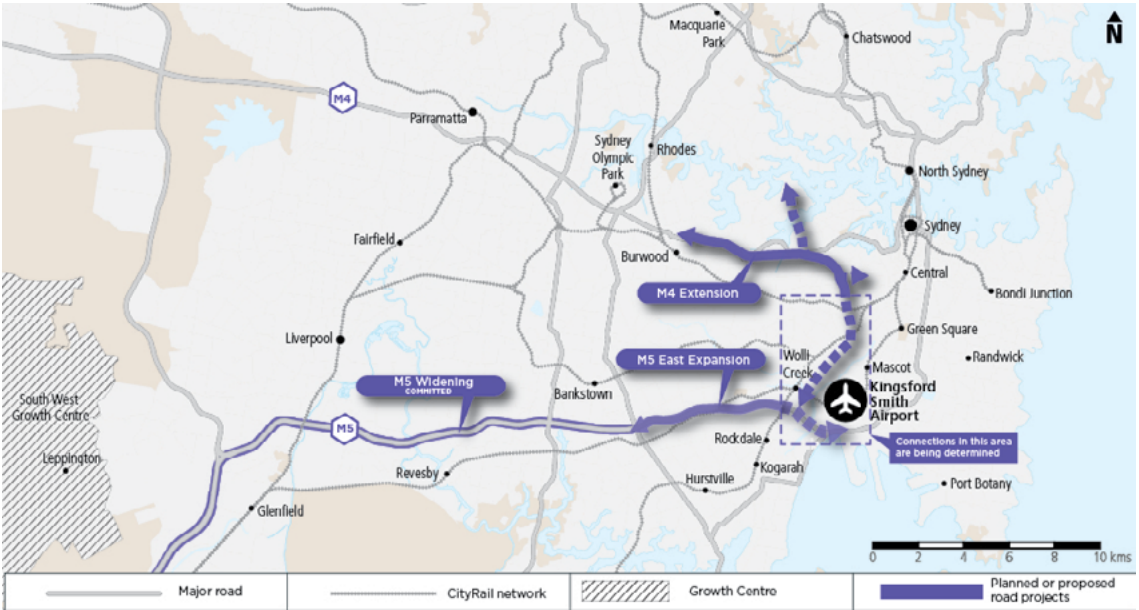
to continue, with container volumes rising to reach the 3.2 million per year container volume planning limit (set by the NSW Government) by 2018.

Port Botany operates 24-hours a day, seven days a week. This means that often a significant proportion of truck trips to the precinct are scheduled to avoid the commuter peaks on the road network. Nevertheless, truck movements to and from Port Botany total 3,900 to 4,400 per day, or one million to 1.5 million movements per year.¹⁵⁷ The NSW Government's Container Freight Strategy aims to reduce the impact of freight truck trips on the road network by increasing the rail network's mode share of containers to and from the Port.

The NSW State Plan has set a target for reducing the impact of truck trips and doubling the mode share of rail from 16 per cent to 32 per cent by 2020. The upgrades to the Southern Sydney Freight Line, which are underway, as well as extra intermodal capacity at sites such as Enfield and Moorebank, are key to achieving this target. However, there is a requirement to consider some of the surface transport linkages between the port and airport together to ensure a whole-of-precinct response. Transport for NSW is currently developing a proposal for Port/Airport Transport Improvement Plan, designed to alleviate congestion and increase productivity.

The routes for the proposed M5 East Expansion and the M4 Extension are illustrated in Figure 126.

Figure 126 Proposed improved motorway connections to Sydney (Kingsford-Smith) Airport



Source: Transport for NSW.

Summary of implications for options to improve surface transport for airport users and broader network

Table 30 summarises the range of impacts that may occur as a result of the surface transport options to access Sydney (Kingsford-Smith) Airport.

157 Sydney Ports Corporation, *Port Freight Logistics Plan: A framework to improve road and rail performance at Port Botany*, 2008.

Table 30 Implications of surface transport options to access Sydney (Kingsford-Smith) Airport

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Long-term rail network capacity increases	<p>Generalised trip cost: savings in travel costs for users across the CityRail network due to improvements to the rail system.</p> <p>Road decongestion: as a result of mode shift from road to rail, road decongestion will be experienced across the region, with lower travel time and reduced vehicle operating costs.</p> <p>Environmental externalities: improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.</p>			
Removal of the station access fee at the International and Domestic Terminals railway stations	<p>Generalised trip cost: relatively high savings in travel costs for airport users accessing the airport by rail due to lower rail fares.</p> <p>Road decongestion: as a result of mode shift from road to rail (potential increase of 26 per cent of existing users in first year), resulting in reduced road congestion to access the airport, with lower travel time and reduced vehicle operating costs.</p> <p>Environmental externalities: improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.</p>			
Public transport information campaign to promote rail access to Sydney (Kingsford-Smith) Airport	<p>Generalised trip cost: increased awareness of rail could result in some new users switching from car to rail and benefiting from lower travel costs.</p> <p>Road decongestion: slight increase in rail mode share will lead to less road congestion.</p> <p>Environmental externalities: slight increase in the number of users travelling on rail as opposed to road will result in a reduction in environmental externalities.</p>			
M5 East Expansion	<p>Generalised trip cost: significant travel time savings for motorway users, primarily benefiting airport users travelling to and from destinations along the motorway corridor. Considering the current trip distribution of airport users, the M5 East Expansion is likely to benefit a higher number of airport users than the M4 Extension, given the volume of trips to and from the west and north-west of the airport relative to the south and south-west.</p> <p>Road decongestion: improved traffic flows affecting a number of users in the network will reduce road congestion and result in reduced vehicle operating costs.</p> <p>Environmental externalities: significant improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.</p>			

continued...

Option	Potential Impacts	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
M4 Extension	<p>Generalised trip cost: significant travel time savings for motorway users, primarily benefiting airport users travelling to and from destinations along the motorway corridor.</p> <p>Road decongestion: improved traffic flows affecting a number of users in the network will reduce road congestion and result in reduced vehicle operating costs.</p> <p>Environmental externalities: significant improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.</p>	●	●	
Public buses running from selected locations to or from Sydney (Kingsford-Smith) Airport	<p>Generalised trip cost: will provide new public transport options for staff in the St George / Sutherland area and passengers from the Lower North Shore to divert from car to bus if their travel cost is less. They will avoid the inconvenience and financial costs of parking at the airport.</p> <p>Road decongestion: with increased number of bus users, road congestion will decrease and provide reduced travel times for road users to and around Sydney (Kingsford-Smith) Airport, which will result in reduced vehicle operating costs.</p> <p>Environmental externalities: improvements to road congestion and more users travelling on rail will result in a reduction in environmental externalities.</p>	●		
Minor improvements to taxis, hire cars and minibuses	A range of minor improvements to improve the short-term parking, loading, unloading and terminal road circulation arrangements.	●		

Source: PwC and Australian Department of Infrastructure and Transport.

Summary of economic analysis of land transport capacity options

PwC completed a preliminary economic CBA of key options, which were compared to a reference or base case. This was defined as the road, rail and bus plans currently planned by the NSW Government to 2016. The key options were:

- removal of the station access fee at airport stations, with a complementary public transport information campaign to promote rail including improved affordability;
- establishment of a transit mall at each terminal to coordinate and promote high occupancy vehicles, such as mini buses;
- provision of additional public bus routes serving the airport from St George/Sutherland and the lower North Shore;
- M5 East motorway expansion; and
- M4 motorway extension.¹⁵⁸

¹⁵⁸ Potential upgrades to Sydney (Kingsford-Smith) Airport arterial roads were also considered as an option to reduce road congestion in the airport precinct but were not evaluated in a CBA separately due to them being highly dependent upon the final airport connections determined for the large-scale motorway projects.

Table 31 provides a summary of the economic results for these key land transport improvement options and illustrates the substantial diversity in capital cost between the options. All projects show BCRs above one, indicating they each deliver positive net economic benefits, with M4 Extension and removal of the station access fee having the highest BCR. The NPV result provides a quantification of the size of the net benefit stream..

Table 31 Summary of economic results for key land transport options

Option	Remove Station Access Fee, with a Public Transport Information Campaign	New Public Buses (North Shore and St George / Sutherland) along with a Transit Mall	M5 East (untolled)	M4 Extension
BCR	1.5	1.2	1.5	3.3
NPV (\$m)	268	17	2,000	17,700

Note: BCR represents benefit cost ratio; NPV represents net present value.

Source: PwC and Australian Department of Infrastructure and Transport.

6.3 Summary of existing infrastructure options

Table 32 summarises those policy and infrastructure options considered to have some impact on providing greater capacity at Sydney (Kingsford-Smith) Airport. As can be seen, the policy options will assist more with short-term capacity shortfalls, and the land transport infrastructure options will assist with medium- and long-term capacity issues. There are no aviation infrastructure options for the airport that are viable or will provide significant increased capacity; and no option meets the expected gap in demand forecasts.

Table 32 Possible existing infrastructure options: potential range of impacts

Option	Potential Delay in Capacity Shortfall (years)	Potential Timing		
		Short Term (0–10 years)	Medium Term (10–25 years)	Long Term (25–50+ years)
Options for Better Use of Sydney (Kingsford-Smith) Airport	Increasing the movement cap to 85 movements per hour in peak hours	Around one year	●	
	Increasing the movement cap to 85 movements per hour for all non curfew hours	Around two years	●	
	Increasing permitted movements in the curfew shoulder to the maximum level allowed in the Act (both 5.00am to 6.00am and 11.00pm to midnight)	Less than one year	●	
	Increasing permitted movements in the 5.00am to 6.00am curfew shoulder only	Less than one year	●	
	Increasing permitted movements in the 11.00pm to midnight curfew shoulder only	Less than one year	●	
	Redefining the NSW intrastate services affected by price regulation	Less than one year	●	
	Increasing the minimum size of aircraft for RPT aircraft accessing Sydney (Kingsford-Smith) Airport to 40 seats per movement	Around one year	●	
Options to improve Sydney (Kingsford-Smith) Airport surface transport access	Improved rail connections to the airport	Medium- and long-term solution		●
	Removal of the station access fee at the International and Domestic Terminal railway stations	One to four years	●	
	Public transport information campaign to promote rail access to Sydney (Kingsford-Smith) Airport	Short-term solution	●	
	M5 East Expansion	Medium-term solution	●	
	M4 Extension	Medium-term solution	●	
	Public buses running from selected locations to or from Sydney (Kingsford-Smith) Airport	Short-term solution	●	
	Minor improvements to taxis, hire cars and minibuses	Short-term solution	●	

Source: PwC and Australian Department of Infrastructure and Transport.