Chapter 6 Project development and alternatives

The introduction of WSI will require changes to the management of the existing airspace within the whole of the broader Sydney Basin (including new and amended flight paths). To ensure that new aircraft operations at WSI integrate into the operations of the broader Sydney Basin airspace as seamlessly as possible, an extensive flight path design development process has been undertaken. The intention of this process has been to optimise the currently proposed preliminary flight paths for WSI for introduction into the Sydney Basin. The development process to date has focused on 4 key criteria being safety, environment and noise, efficiency and capacity, while minimising changes to existing airspace arrangements in the Sydney Basin.

This chapter describes the processes that have been applied to the development of the preliminary airspace design and air traffic management system for WSI.

An overview of the requirements for its finalisation and implementation are also discussed in this chapter.

6.1 Background to flight path development

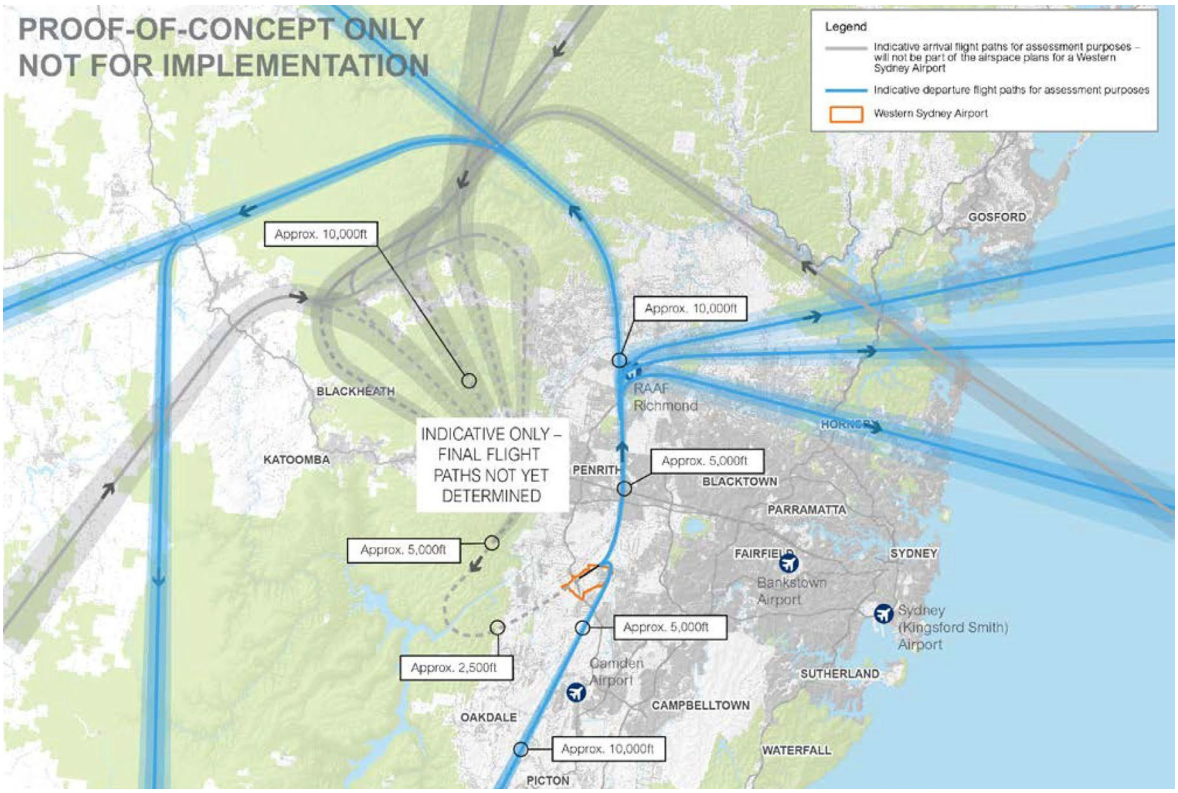
Proposals to develop a major airport at Badgerys Creek have been the subject of 3 earlier EISs – one in 1985, the next between 1997 and 1999, and most recently, in 2016. Similarities between the current *Western Sydney Airport – Airport Plan* (the Airport Plan) (DITRDC, 2021) and those described in the previous environmental assessments include a first stage single runway development, an ultimate parallel runway design and a largely south-west to north-east runway orientation. Utilising the most up to date information available at the time, each of the 3 EISs for WSI were based on different indicative flight path configurations, different ATC procedures, different operating fleet mixes and different passenger and air traffic demand forecasts.

As previously presented in Chapter 1, development approval was given to the Stage 1 Development for WSI as presented in the 2016 *Western Sydney Airport Environmental Impact Statement* (Department of Infrastructure and Regional Development, 2016) (2016 EIS). This approval confirmed the Stage 1 Development for WSI would be developed using a 05/23 runway alignment (approximately south-west to north-east). This fixed alignment allowed for the development of an initial airspace concept for flight paths for WSI. This initial concept was presented in the 2016 EIS.

6.1.1 The 2016 EIS airspace concept

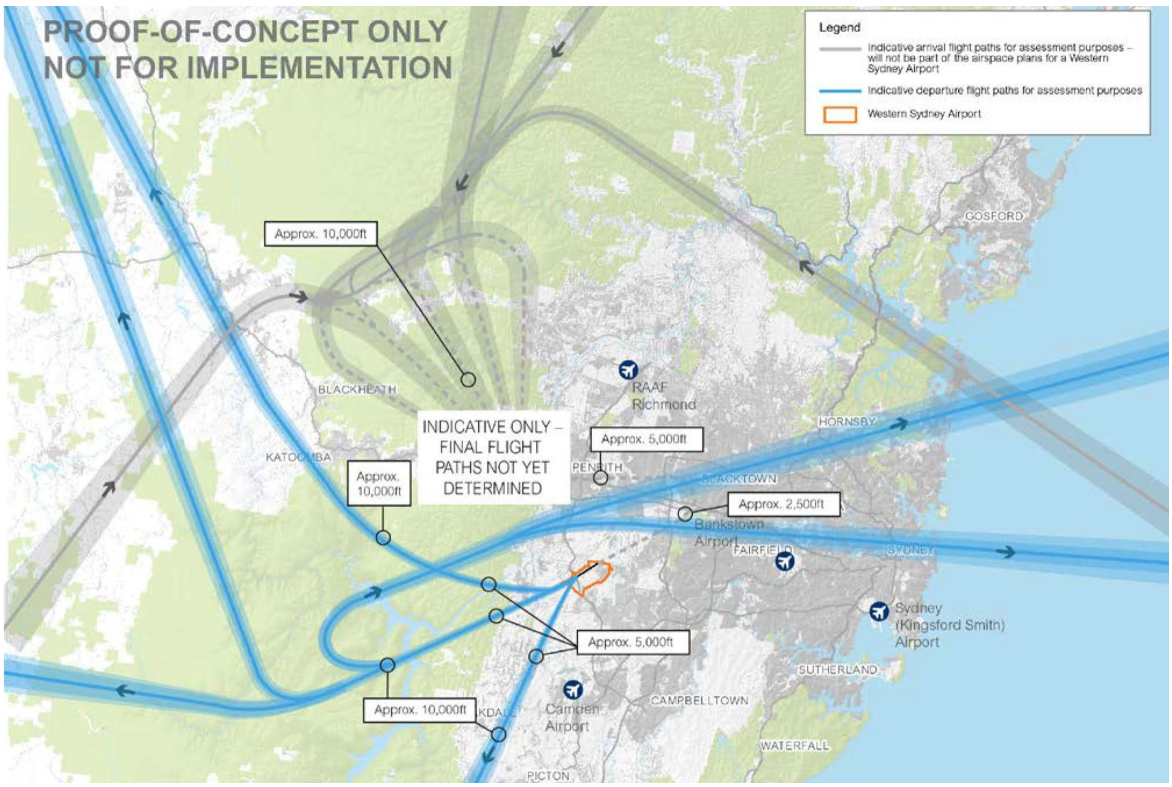
The 2016 EIS depicted an indicative airspace concept for the flight paths associated with single runway operations at WSI (see Figure 6.1 and Figure 6.2). In order to assess the viability of the proposed airport operation, indicative flight paths were developed. The flight paths identified and assessed in the 2016 EIS represented one possible airspace design (referred to as a 'proof-of-concept'), and included a preliminary assessment of key issues such as potential noise and air impacts for the 'proof-of-concept' for flight paths. The main consideration for the 2016 EIS in its depiction of the indicative flight paths for WSI was to demonstrate air traffic management feasibility, particularly whether WSI flight paths could interact and synchronise with aircraft operating to or from Sydney (Kingsford Smith) Airport and other Sydney Basin airports, aerodromes and Defence facilities. The indicative flight paths developed were designed to demonstrate that WSI could operate independently of these other airports and achieve its design capacity.

A feature of the 'proof-of-concept' flight path design depicted in the 2016 EIS was a conceptual model for 2 modes of operation for aircraft arrivals and departures, for the 05 and 23 runway operating modes respectively. The design presented at the time of the 2016 EIS included a single indicative merge point location for aircraft arrivals serving both runway operating modes (05 and 23) as this was identified as providing an efficient flight path design for approaching aircraft.



Source: Department of Infrastructure and Regional Development, 2016

Figure 6.1 Conceptual flight paths for the Runway 05 operating mode as presented in the 2016 EIS



Source: Department of Infrastructure and Regional Development, 2016

Figure 6.2 Conceptual flight paths for the Runway 23 operating mode as presented in the 2016 EIS

As a means of managing potential noise impacts at night, a third operating mode, referred to as a 'head-to-head' mode (also known as reciprocal runway operations – RRO) was also identified in the 2016 EIS (and Airport Plan) as an additional potential mode of operation that would be utilised for WSI. The 2016 EIS identified that this option should be evaluated as part of any future, detailed assessment for the operation of WSI. Under this mode, all aircraft arrivals and departures would effectively occur using only one end of WSI for a period of time when traffic levels and safety requirements permitted (typically at night) and therefore offer a period of respite to more densely populated areas when possible (noting the converse impact this would have on some communities beneath the reciprocal runway flight paths – refer to Section 6.3.2 for further discussion of reciprocal runway operations).

As part of the development of the 'proof-of-concept' flight paths for the 2016 EIS, a *Preliminary Airspace Management Analysis* was conducted by Airservices Australia (Airservices Australia, 2015). The principal objective of the preliminary assessment was to establish whether safe and efficient operations could be introduced at the proposed airport through the development of indicative air traffic management designs. The assessment considered the potential airspace implications and air traffic management arrangements for airspace in the Sydney Basin associated with the potential introduction of flights to and from the proposed airport. The analysis indicated there was sufficient airspace capacity and there were no apparent physical impediments that would prevent safe and efficient operations for aircraft arriving at or departing from WSI. Indicative approach and departure routes demonstrated that WSI and Sydney (Kingsford Smith) Airport could both operate independently as high-capacity airports following the commencement of operations at WSI.

Based on community and stakeholder feedback, in particular with respect to potential noise impacts, the Australian Government subsequently announced that the airspace design to be implemented for WSI should not converge arriving aircraft at a single point over any one single residential area. The Australian Government identified that the future scope to assess and determine the final flight paths for arrivals and departures would seek to minimise the overflight of residential areas and reduce the impact of aircraft noise on the communities of Western Sydney and the Blue Mountains. Consistent with the Government's announcement, the preliminary airspace and flight path design for the proposed airport has applied international best practice for managing airspace design and its associated environmental impacts (refer to the following sections in this chapter for details of this process). These guidelines formed part of the WSI Airport Plan which has guided the development of the current airspace design as presented in this chapter and following sections of this EIS.

6.1.2 Airport Plan

Alongside the development of the 2016 EIS, an Airport Plan (DITRDC, 2021) was prepared to outline the approach to the design and development of WSI as well as set out the intent for the operation of WSI. The Airport Plan also provides authorisation for the construction of the Stage 1 Development. Following finalisation of the 2016 EIS, the final Airport Plan was determined by the then Australian Minister for Urban Infrastructure, with conditions recommended by the then Australian Minister for the Environment.

Section 2.2.5 of the Airport Plan sets out the formal design process and establishes the key phases and activities – as discussed in Section 6.2 of this EIS. Part 3 of the Airport Plan also sets out several conditions that must be completed prior to or as part of the construction of the Stage 1 Development. The process for airspace design for WSI including the flight paths, proposed airspace changes, air traffic control and noise abatement procedures is addressed in Condition 16 of the Airport Plan which states:

Condition 16 – Airspace design process

(1) The ALC must not permit regular aircraft operations to commence at the Airport unless the requirements of this condition have been satisfied.

(2) The airspace and flight path design are to be developed by a steering group led by the Infrastructure Department and involving Airservices Australia and the Civil Aviation Safety Authority. After an Airport Lease is granted the ALC will also be invited to participate in the steering group. The Infrastructure Department must establish a community and stakeholder reference group (Forum on Western Sydney Airport) which will operate until the end of the detailed design stage identified in Table 10 in Part 2 of the Airport Plan.

(3) In developing the airspace and flight path design, the steering group must conduct public consultation with stakeholders who include the aviation industry, the community and state and local government authorities.

(4) The airspace and flight path design, once developed, is to be referred as a plan for aviation airspace management, to the Environment Minister under section 161 of the EPBC Act.

(5) The airspace and flight path design must take account of the following principles, in addition to the principles in section 2.2.5 of the Airport Plan:

(a) airspace and flight path design must explicitly consider the Aircraft Overflight Noise mitigation options presented in chapters 7 and 10 of the EIS;

(b) airspace and flight path design must have regard to the social and economic impacts on existing airspace users in the Sydney Basin;

(c) airspace and flight path design must explicitly consider whether arrangements are required for managing Aircraft Overflight Noise at night; and

(d) airspace and flight path design must minimise to the extent practicable the impact of Aircraft Overflight Noise on the following:

(i) residential areas;

(ii) Sensitive Receptors;

(iii) the Greater Blue Mountains World Heritage Area – particularly areas of scenic or tourism value; and

(iv) Wilderness Areas.

(6) The airspace and flight path design for the Airport, once developed, must include or be accompanied by noise modelling of a range of realistic airport capacity and meteorological scenarios.

(7) The Infrastructure Department must develop a noise insulation and property acquisition policy in relation to Aircraft Overflight Noise for buildings outside the Airport Site, having regard to the 24-hour nature of operations at the Airport.

(8) Any referral(s) of a plan for aviation airspace management, in accordance with section 161 of the EPBC Act, must explain how all matters in this condition 16 have been addressed in developing the plan.

A range of community and stakeholder engagement sessions as part of the Forum on Western Sydney Airport (FOWSA) have occurred throughout the planning and preliminary airspace design phases of the flight path design process. This engagement commenced following the determination of the Airport Plan in 2016 and included consideration of the community and stakeholder feedback received on the 2016 EIS. The FOWSA has to date provided a link between the community, the Australian Government and WSA Co (developer and operator of WSI) during planning and construction of WSI and provides a consultative forum for the exchange of information and ideas. In determining the final flight paths, the community, aerodrome operators and airspace users will continue to be consulted extensively. Further details regarding the community and stakeholder consultation undertaken to date, in addition to the proposed future consultation regarding the proposed flight paths, is discussed in Chapter 9 (Community and stakeholder engagement).

The planning and preliminary airspace design phases of the airspace design process for single runway operations are the key phases which have been completed as part of the development of the project to date. Further discussion regarding each of these phases is provided in the following sections.

6.1.2.1 Development of airspace design principles

As described above, the initial 'proof-of-concept' design presented in the 2016 EIS utilised an airspace design that incorporated a concept known as 'Point Merge'. Point Merge is a description of a type of flight path design. 'Point Merge' is a method for synchronising arriving aircraft into one or more merge points prior to aircraft landing. This concept, which has been deployed at several airports around the world, delivers efficient high-capacity aircraft operations. The Point Merge concept presented in the 2016 EIS drew considerable concern from the community, in particular regarding potential noise impacts. To address this concern, the Airport Plan set out 12 Airspace Design Principles that the design process is required to follow. The principles were informed by and reflect community and industry feedback on the 2016 EIS.

The principles seek to maximise safety, efficiency and capacity, while minimising impacts on the community and the environment. With respect to the concern raised regarding the Point Merge concept, Principle 6 of the Airport Plan stated that aircraft arrivals will not converge through a single merge point over any single residential area.

The 12 guiding airspace design principles identified in the Airport Plan which were applied to planning phase of the airspace design process and were used to assist in guiding developing the preliminary flight paths are summarised in Figure 6.3.

Figure 6.3 Future airspace design principles

6.1.3 'No action' consideration and infrastructure constraints

Given the approval and ongoing construction of WSI, not proceeding with the project was not considered to be an alternative given the proposed flight paths are a critical component of the operation of the approved airport. Condition 16 of the Airport Plan also required the Australian Government to undertake an airspace design process and as such it is considered that a 'take no action' (i.e. to consider a no-flight path option) would not represent a feasible alternative.

The airfield geometry and infrastructure for WSI is now fixed and currently under construction consistent with the approved elements of the 2016 EIS. Therefore, no alternatives were considered for project elements such as runway direction and length, or for location of runway taxiway entries and exits. The initial and final flight path segments connecting to the runway are fixed by aircraft configuration and performance requirements in safely making any turns from the immediate runway heading for take-off or stabilising on final approach to the runway for landing.

In accommodating departing aircraft, the flight path design has been limited to the consideration of alternatives once a departing aircraft commences its take-off roll, becomes airborne and is established in a stable configuration to safely execute turns to join the established higher level enroute airspace system. For arriving aircraft, the flight path must ensure that an aircraft is safely processed from the established higher level enroute airspace system to a landing onto the designated runway.

The need to process aircraft in an orderly sequence when arriving has limited the opportunity to develop multiple alternative approach paths for aircraft arriving at WSI. Similarly, airspace constraints within the Sydney Basin as a result existing flight paths, military areas etc also limit the opportunity for the development of multiple departure paths for WSI. One exception to this is that specific flight paths have been developed for non-jet aircraft which segregate these aircraft operations from jet aircraft operations.

6.2 Airspace and flight path design process

6.2.1 Overview

In addition to meeting Condition 16 of the Airport Plan requirements, the airspace design must meet civil aviation safety regulatory standards and other international rules and regulations. The design of the airspace and flight path design is required to balance the competing needs from the community, environment, industry and users of the Greater Sydney airspace, while maintaining safety. The airspace and flight path design must also efficiently integrate into existing and future air traffic management operations in the Sydney Basin. The design process has therefore considered (among other factors) the following key requirements:

- safety of air navigation including
  - the required air traffic controller workload to manage the airspace for aircraft
  - the connectivity to the flight network
  - the operations of aircraft accessing other airports
  - flying training areas
  - other military airspace constraints
- capacity to meet projected demand
- efficiency of operation for arriving and departing aircraft
- minimising adverse effects on the environment from WSI aircraft operations.

The flight path design has been carefully designed to be compatible with the operational performance of the current and anticipated future airline aircraft fleets that could be expected to use WSI. In designing the flight path options, it was necessary to account for the fact that airspace operations are influenced by a range of factors, including weather, the number of arriving and departing aircraft and the origin and destination of these aircraft.

The flight path design also sought to take into account longer-term factors such as future growth in total traffic volumes and new aircraft types and/or new technologies.

6.2.2 Airspace design process

A summary of the airspace and flight path design process is shown in Figure 6.4. Table 6.1 provides a more detailed discussion of the key activities and outputs of each of these process steps as outlined in the Airport Plan.

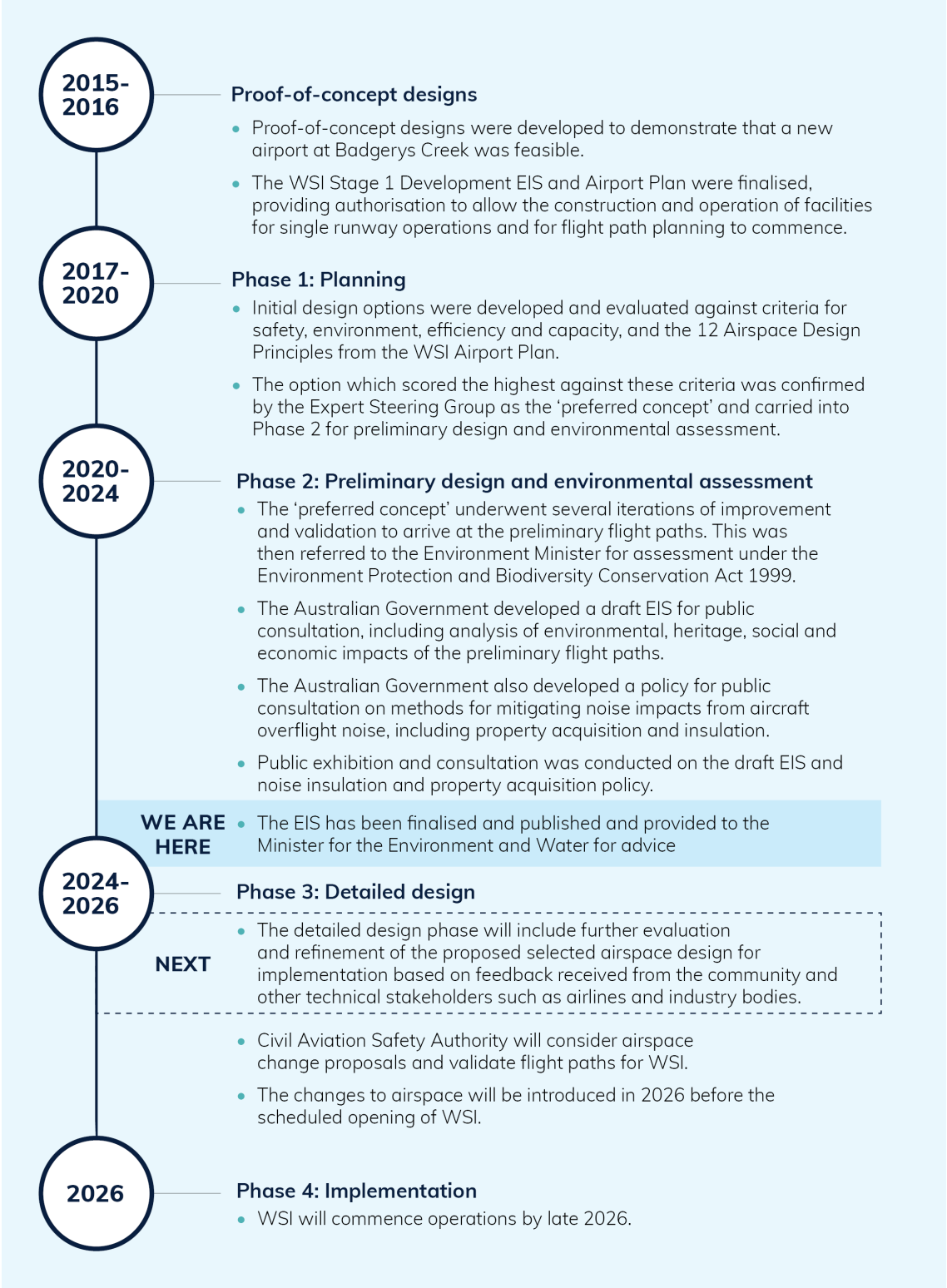


Figure 6.4 Flight path design pathway

Table 6.1 Airspace and flight path design process

Phase	Key activities	Key outcomes
Planning phase and indicative design	• Establish an Expert Steering Group • Collect stakeholder requirements including community and environmental inputs • Confirm Sydney basin airspace and air route requirements and constraints • Establish community and stakeholder reference group • Develop and undertake preliminary environmental assessment of airspace concept options (i.e. standard arrival and departure routes.	• Consultation conducted with interested parties, including regulatory authorities, government agencies, airlines, other Sydney Basin aerodrome operators and airspace users, and the community • Review of airspace concept options and potential noise abatement procedures including identification of a preferred high level airspace concept option.
Preliminary airspace design and environmental assessment	• Evaluate the preliminary airspace design through consideration of iterative flight path development, runway modes, identification of consequential impacts and changes to other airports and airspace users.	• Preferred airspace design concept.
	• Refer preferred airspace design to the Australian Minister for the Environment under the EPBC Act • Prepare and submit any formal environmental assessment documentation required by the Australian Minister for the Environment and Water • Public exhibition and community consultation • Policy on property acquisition and noise insulation announced.	• Draft and Final EIS documentation (and supporting technical papers) • Draft and final noise insulation and property acquisition (NIPA) policy
Detailed design	• Evaluate, validate and refine the detailed design taking account of the EPBC Act process.	• Final airspace design and noise abatement procedures for implementation • Commencement of the NIPA program
Implementation and post-implementation review	• Notify airspace and air route changes.	• Airspace change proposal approved by CASA • Commencement of air operations at WSI in accordance with specific noise abatement procedures identified in the airspace design process.

6.3 Development of the proposed airspace and flight paths for WSI

6.3.1 Planning phase

Flight path design in Australia, and more broadly at an international level, generally starts with developing 'proof-of-concept' designs. As discussed in Section 6.1.1, the initial 'proof-of-concept' flight path design developed for WSI was presented in the 2016 EIS and triggered the commencement of the planning phase. One of the key outcomes of the planning phase of the airspace and flight path design process was the identification and evaluation of a broad range of potential airspace flight path concepts (having regard to existing air route requirements and constraints), leading to selection of a preferred airspace concept.

The development of the preferred concept airspace design options was an iterative design and evaluation process. The concept airspace design options were developed and assessed based on existing Sydney Basin airspace and air route arrangements and future user and stakeholder requirements. Activities and outputs during this phase included:

- establishment of an Expert Steering Group to oversee the planning and design process. The Expert Steering Group oversees the technical design process and is led by the Department of Infrastructure, Transport, Regional Development, Communications and the Arts. It includes Airservices Australia, the Civil Aviation Safety Authority (CASA), the Department of Defence and the WSI Airport operator. The operator of Sydney (Kingsford Smith) Airport and the Chair of the FOWSA also attend the Expert Steering Group
- consideration of existing Sydney Basin airspace and air route arrangements and the conduct of consultations with regulatory authorities, Sydney Basin aerodromes, airspace managers and airspace users to consolidate future user requirements
- comprehensive and ongoing community and stakeholder engagement through creation of a community and stakeholder reference group, FOWSA, to ensure community views were taken into account in the airspace design process
- development of a range of conceptual air traffic management options (e.g. standard arrival and departure flight routes and procedures) and preliminary assessment of each option against key performance assessment criteria.

The key activities that were undertaken throughout the planning phase which led to the selection of the preferred airspace concept are outlined in Figure 6.5. Each of the activities are described in the following sections (noting the establishment of airspace concept design principles have been discussed previously in Section 6.1.2.1).

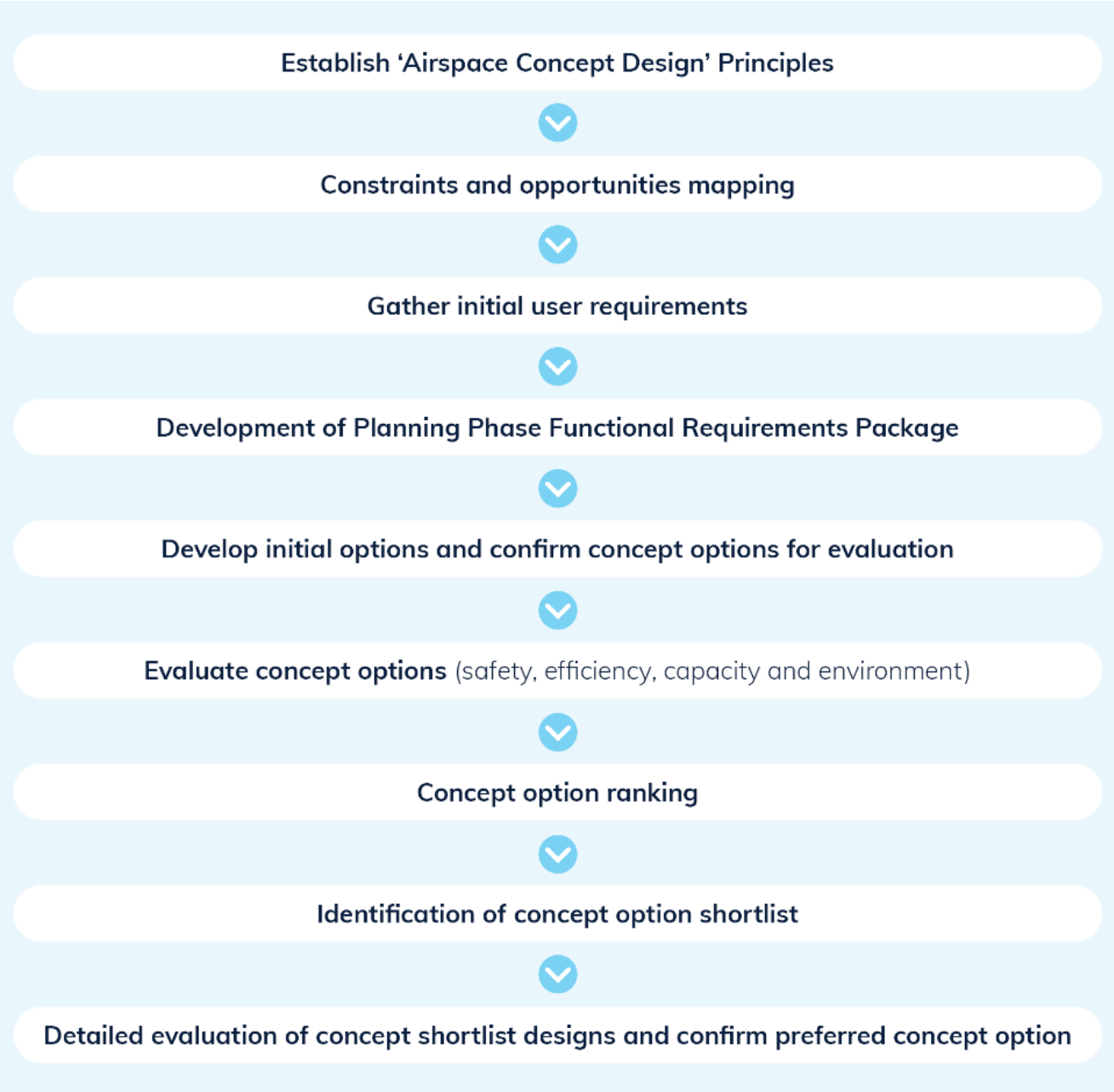


Figure 6.5 Overview of planning phase airspace development process

6.3.1.1 Constraints and opportunities mapping

As part of the initial stages of the planning phase, following establishment of the airspace concept design (refer to Section 6.1.2.1), the Department of Infrastructure, Transport, Regional Development, Communications and the Arts (DITRDCA) (and its technical service providers) identified key constraints and opportunities that were likely to impact on the development of the proposed flight paths. The key technical, airspace and environment constraints are summarised in the following sections.

Technical and flight constraints

In developing the preferred airspace concept flight paths, the development of the design was guided by a range of matters which determine what is technically feasible for the design. These included:

- *the need to maintain a safe airspace*: the need to comply with safety requirements and international rules of aviation was paramount for the development of the proposed flight paths
- *the fixed nature of the runway alignment*: there will be no changes to the north-east/south-west runway alignment, which was approved in the 2016 EIS and is currently under construction
- *the final approach and initial departure paths are fixed*: given the fixed runway alignment and the requirement for aircraft to approach and depart the WSI on a relatively straight trajectory (from a minimum distance of around 4 nautical miles (nm) (around 7 kilometres (km)) from the runway) was fixed for this portion of the flight paths. The need to safely manage the speed and altitude of aircraft in the final approach and departure faces of flight was also considered
- *the altitude of aircraft is constrained*: the height at which aircraft operate is determined by a number of factors, including the aircraft type, weather conditions, safety requirements and international rules of aviation. This also includes the height at which aircraft start their landing approach (e.g. maintaining a certain glide path towards the runway)
- *the presence of existing airports and other airspace requirements in Greater Sydney*: major changes cannot be made to the flight paths for Sydney (Kingsford Smith) Airport and considerations were needed to be made for operations at other airports, such as Camden, Bankstown, Richmond and Holsworthy (refer to detail below regarding Sydney Basin airspace).

Sydney Basin airspace

As described in Chapter 3 (Introduction to airspace) and Chapter 4 (Project setting), the Sydney Basin airspace is likely the most complex and busiest airspace within Australia. It comprises an extensive network of flight paths associated with:

- Sydney (Kingsford Smith) Airport
- Bankstown Airport and Camden Airport
- Defence airports – RAAF Base Richmond and Australian Army Holsworthy Airport
- Tasman Sea Military Flying Training restricted area
- Orchard Hills Defence Establishment (which includes restricted airspace over the facility when in use)
- recreational aviation activities (gliders, ballooning, parachuting)
- transiting flights.

The level of existing aircraft activity within the Sydney Basin airspace provided a substantial constraint with respect to identifying safe and feasible flight paths for WSI. As shown previously in Figure 6.6, the majority of the Sydney Basin is overflown by aircraft with flight tracks associated with the Sydney (Kingsford Smith) Airport being the dominant activity. In developing the WSI airspace and flight path design, minimising consequential changes to the established Sydney Basin airspace system to the extent practical has been a critical consideration. In particular, the preliminary airspace and flight path design has been developed through consultation with the Sydney (Kingsford Smith) Airport resulting in the evolution of the existing flight paths for WSI to minimise impacts to its future operations.

The necessary changes and associated impacts to the flight paths identified to accommodate aircraft operations from WSI have also been considered in terms of safety, national security (Defence), efficiency, equity of airspace access, existing aircraft operating standards as well as environmental impact.

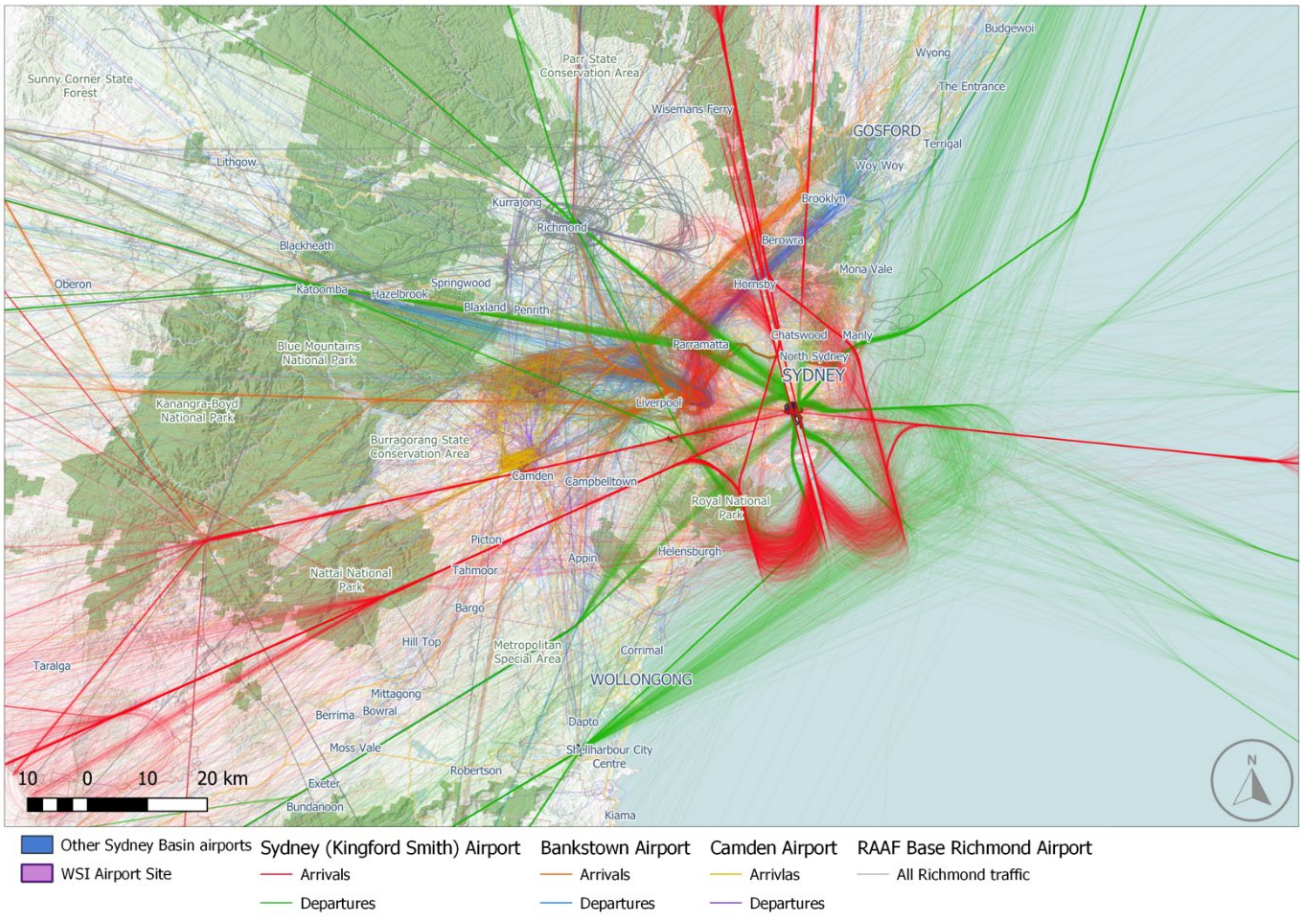


Figure 6.6 One week sample of flight track activity in 2019 in the Sydney Basin

Environmental and social considerations

In addition to the airspace design constraints, key environmental and social impacts were considered, in particular potential noise and visual amenity impacts as result of aircraft overflights. The key constraints considered in the flight path design process included:

- the Greater Blue Mountains Area (GBMA), which is listed as a World and National Heritage place
- residential built up areas within the Sydney Basin and Blue Mountains region
- sensitive tourist and recreation areas with the potential to receive impacts from aircraft overflights including:
  - Jamison Valley south of Echo Point lookout and the Scenic Cableway at Katoomba and Wentworth Falls lookout
  - Grose Valley east of Evans lookout and Govetts Leap lookout
  - the wilderness area between Deanes lookout and Crawfords lookout within Wollemi National Park
  - the wilderness area between Mt Yengo lookout and Finchley lookout within Yengo National Park
  - Nattai wilderness area
  - Kanangra Walls and wilderness area east of Kanangra-Boyd lookout
  - Baal Bone Gap within Gardens of Stone National Park.

Figure 6.7 and Figure 6.8 provide an overview of the key airspace and environmental constraints that were considered as part of the flight path design process. The identified constraints provided a key input for development of the functional requirements for used in developing the preferred airspace concept designs.

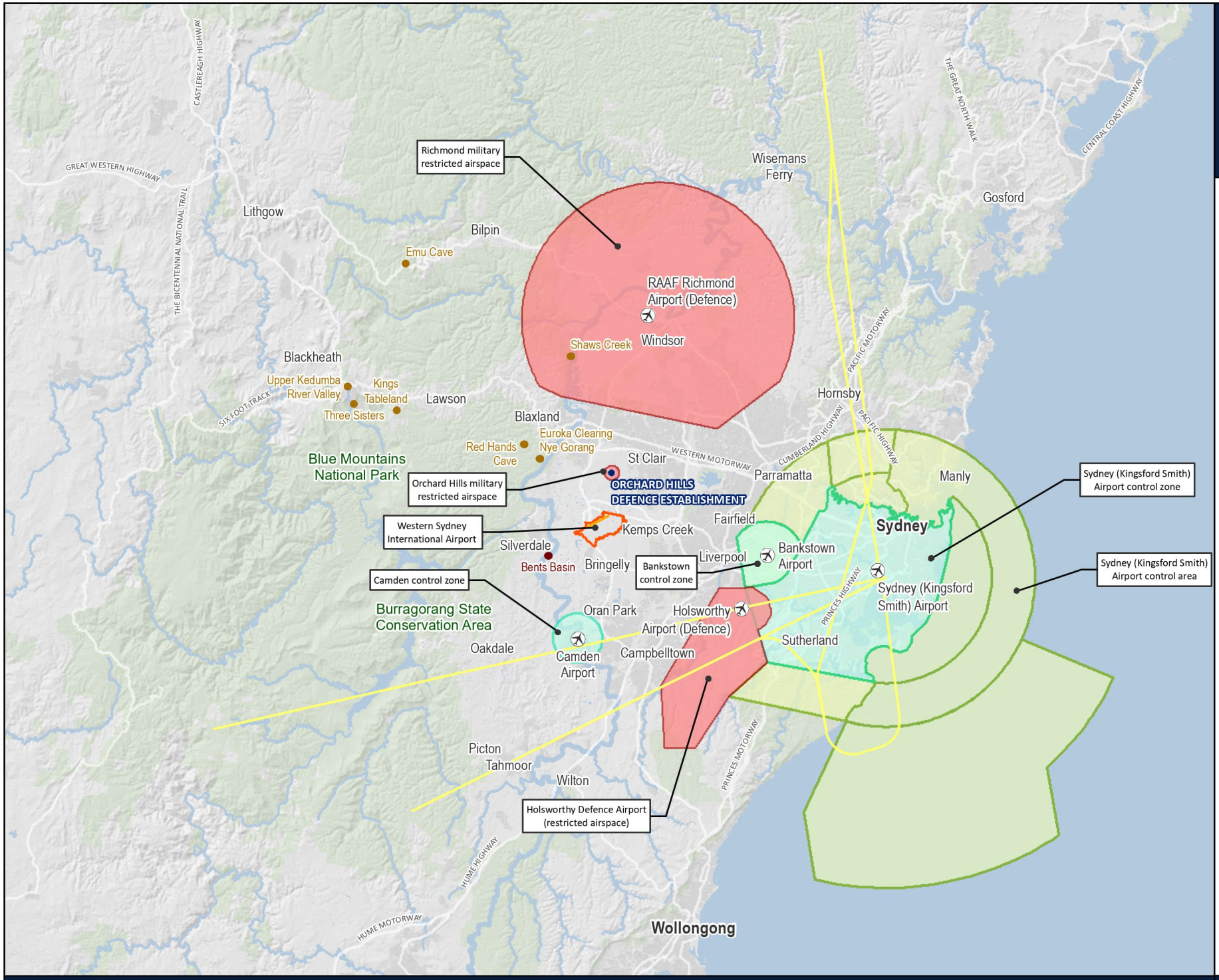


Figure 6.7

Key airspace constraints within the Sydney Basin

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Key runway approaches
- Restricted area
- Control zone
- Control area
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

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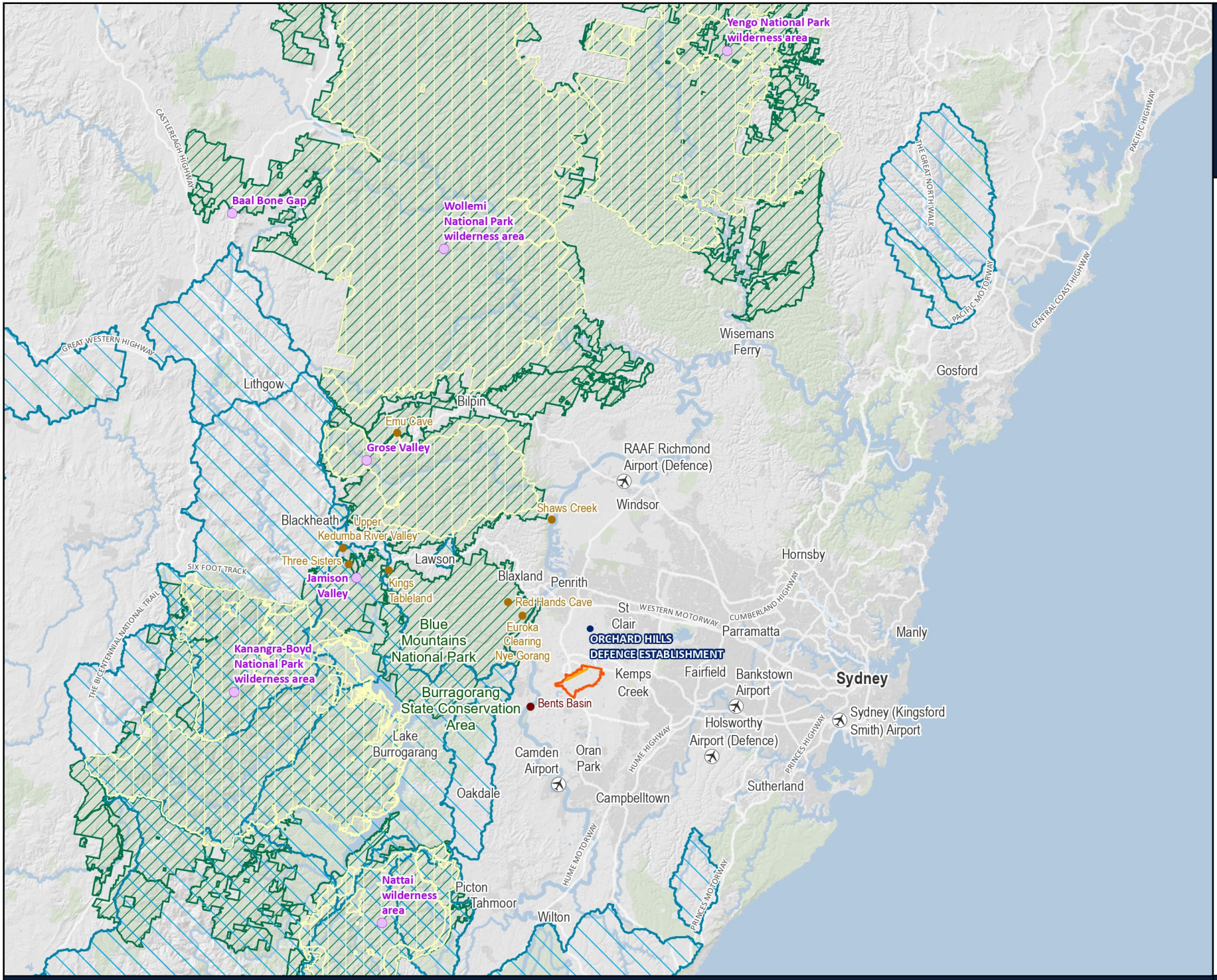

Figure 6.8

Key environmental and social constraints within the Sydney Basin

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Declared Wilderness
- Drinking water catchments
- Greater Blue Mountains World Heritage Area
- Tourist locations
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

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6.3.1.2 Gather initial user information requirements

Initial gathering of user requirements for the flight path designs was undertaken through a series of technical stakeholder meetings in early July 2018. Key user requirements identified during this phase were incorporated into the project functional requirements, as appropriate, during the subsequent phase of the options process.

6.3.1.3 Planning phase functional requirements

Development of the functional requirements

Following identification of the airspace concept design principles, constraints and opportunities, and initial user requirements, a series of functional requirements for the development of the flight path concept design options were identified in consultation with a broad series of stakeholders including:

- airlines – including Qantas and Virgin Group Australia
- airports – including representatives from Aeria Management Group (formerly Sydney Metro Airports who operate Bankstown and Camden airports) and Sydney Airport Corporation Ltd (SACL)
- other associations and agencies – including the Civil Aviation Safety Authority (CASA), Airservices Australia, the Department of Defence, the Board of Airline Representatives of Australia Inc and the Regional Aviation Association of Australia.

The user requirements and functional requirements were derived from the Airport Plan (and other reference documents including the Civil Aviation Safety Authority Manuals of Standards) and through initial stakeholder consultation and gathering of initial user requirements (refer to Section 6.3.1.2). Overall, 48 functional requirements were identified that were applied to the planning phase (and subsequent stages of the design development). The functional requirements essentially comprised a series of requirements that each of the concept design options needed to meet to allow for further consideration in the subsequent phases of testing and evaluation. These requirements (along with the associated performance assessment criteria) were documented as part of the Planning Phase Functional Requirements Package for WSI.

To facilitate prioritisation where the requirements might compete, the functional requirements were classified according to their criticality to the design using the following terminology:

- ‘must’ – design elements which were considered mandatory to the flight path design options. A solution may not be considered viable without this requirement being met
- ‘should’ – design requirements/elements which were identified as being preferential for inclusion within the design solution unless an identified/tangible benefit from their relaxation could be identified
- ‘consider’ – design elements which the design team were to take into account during development of the flight path design options and which were to be further examined during the Preliminary Design and Environmental Assessment Phase.

The technical design team jointly evaluated each Concept Mode (a concept design specifically aligned to operations in a specified runway direction at WSI – i.e. Runway 05 or Runway 23) for compliance with the Planning Phase Functional Requirements. The respective Concept Modes were evaluated qualitatively as having ‘met’, ‘not met’ or ‘not yet met’ each functional requirement. Based on this evaluation, the technical design team established a series of concept design options for progression to further performance assessment phases.

6.3.1.4 Identification of initial concept design options and qualitative assessment

Performance assessment criteria scoring methodology

Preliminary assessment work was then undertaken on each concept design option (both departure and approach options) using the 4 key performance areas (KPAs) of safety, environment, efficiency, and capacity. An overview of the KPAs, is summarised in Figure 6.9.

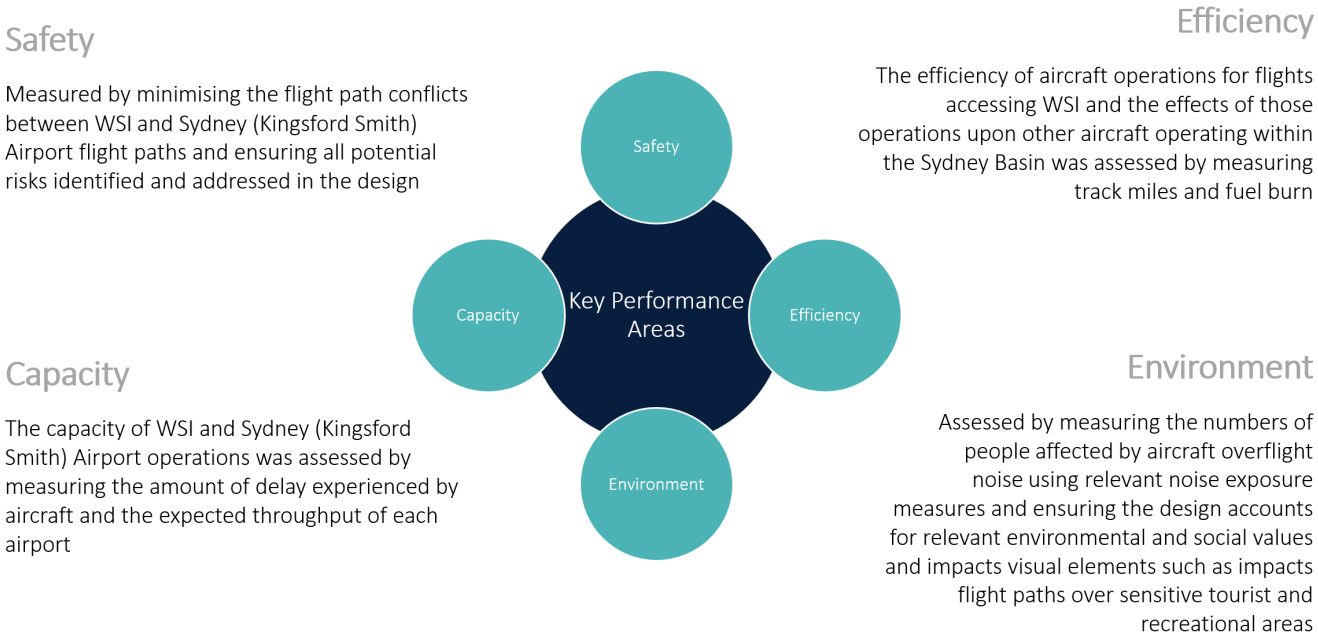

Figure 6.9 Key performance areas

Against each of the KPAs, a series of key performance assessment criteria were identified to assess the performance of each concept design option. These performance assessment criteria were developed to sit alongside the functional requirements and were used to assist in evaluating how certain functional requirements were determined as either met or not by each design concept.

Using this assessment criteria, the performance of each concept design option was assessed. The scores for each of the performance assessment criteria were tracked and combined into a single score for each of the 4 key performance areas. Using this method, it was possible to compare the performance of a concept against other concepts and to allow priority to be applied between the performance areas, the highest priority being given to safety.

Identification of initial concept design options

Twenty-two primary concept design options were initially identified and developed as potential WSI flight paths by the Joint Concept Option Evaluation Workshop (JCOEW) group comprising representatives from DITRCDA (formerly Department of Infrastructure) and Airservices Australia subject matter experts. It was considered that this high number of concept design options was needed to allow for consideration of a wide selection of ideas and solutions that could each be tested to inform the best possible design. A number of the concept design options required some form of change to flight paths currently utilised by Sydney (Kingsford Smith) Airport to accommodate the introduction of WSI into the Sydney Basin. Where changes were required, these were identified as either:

- tactical changes (changes that do not require publication of new flight paths or operating procedures)
- systemic changes (those that are published as flight paths or operating procedures with the aim of minimising air traffic control intervention).

This resulted in the 22 concept design options being grouped into 2 broad groups for consideration:

- standalone designs that did not include any change to Sydney (Kingsford Smith) Airport flight paths. These options were referenced using a series of alphabetical references (A, B, C, D, F, H, J, Q, R, S and Y)
- standalone designs with the same WSI flight paths as one of the above concept designs, but which would also require flight path changes for Sydney (Kingsford Smith) Airport. Concept designs which included changes to Sydney (Kingsford Smith) Airport flight paths were notated with the suffix 'v' to denote their potential impact (Av, Bv, Cv, Dv, Fv, Hv, Jv).

During the planning phase, the concept design options were depicted as single nominal flight paths for both the WSI and Sydney (Kingsford Smith) Airport operations. Once established into a viable concept design, the possible waypoints and flight path details for each concept were included to provide additional detail for each concept, to assist in the technical evaluation against the KPAs.

Qualitative assessment of the initial concept design options

Initial consideration of the 22 primary concept design options identified that 4 of the options failed to meet core safety requirements (in particular the ability to provide safe flight operations). As a result, these 4 concept design options were not progressed any further in the options evaluation process.

The remaining 18 concept design options were progressed and were considered using a more rigorous assessment involving a process known as Fast Time Simulation (FTS – a technical modelling approach used to compare the performance of different airspace design options – such as with or without changes to existing operating modes for Sydney (Kingsford Smith) Airport operations), as well as preliminary environmental modelling (i.e. high level noise and visual impacts). The FTS modelling was employed to allow a rapid, cost-effective assessment of each concept design option, and provided the ability to quantify the performance of each option against the key performance assessment criteria during the planning phase.

Overall, each of the 18 concept designs underwent this evaluation, and were ranked against the key assessment criteria. A summary of the combined, single ranking for each of the options against each of the performance assessment criteria is shown in Figure 6.10.

Based on the evaluation, the top 5 options (Hv, Fv, Jv, Cv and Dv) were identified for further consideration and refinement due to their overall acceptable safety scores (highlighted in Figure 6.10 by the orange line which shows a clear break in the safety performance).

Below this line, the air traffic controller workload required to manage the number of aircraft interactions was evaluated to be substantially greater and therefore would potentially reduce the safety aspect of that option. Therefore, the remaining concepts below the top 5 options were not progressed further from this point.

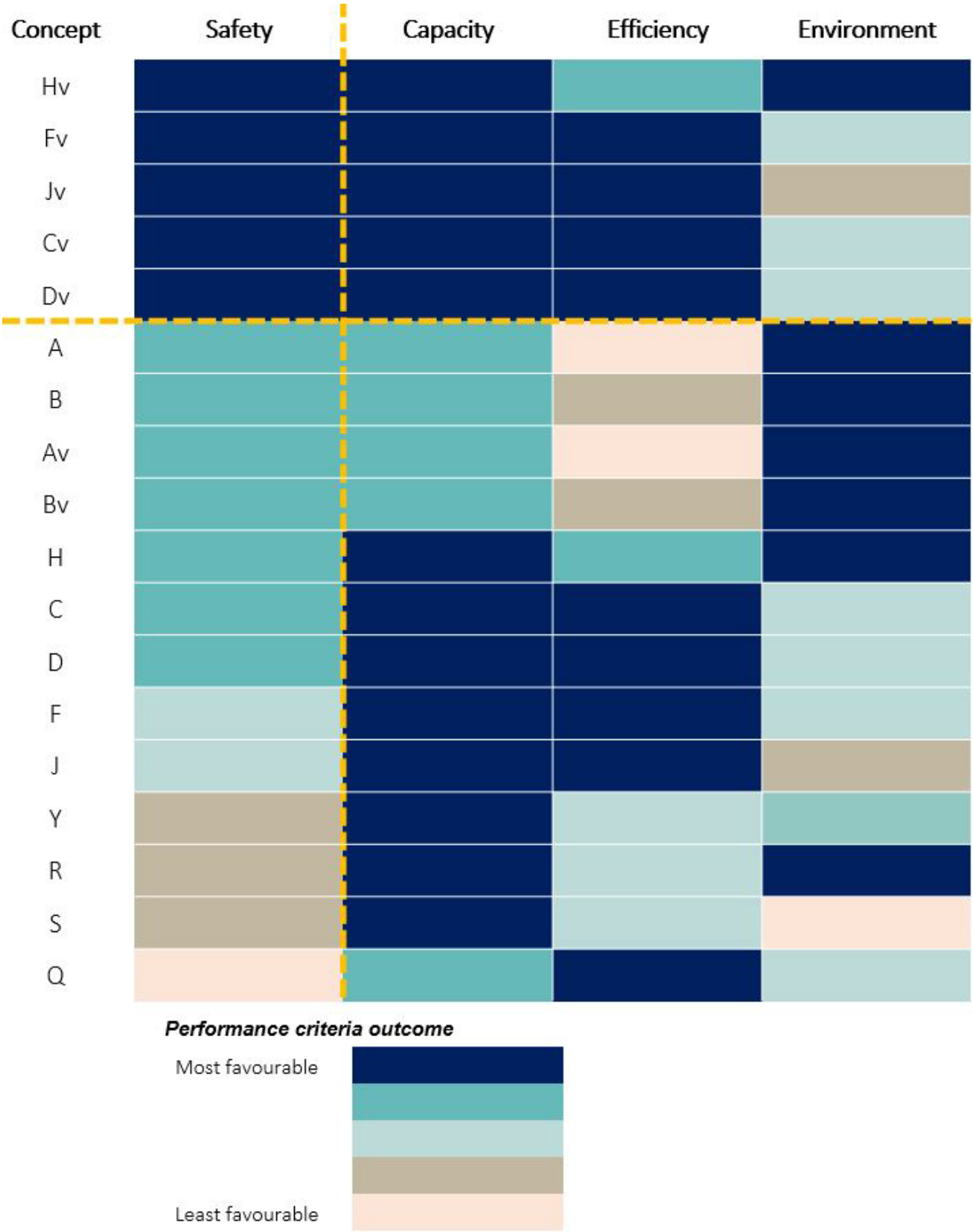

Figure 6.10 Long list ranking of initial concept design options

In summary:

- concept option Hv provided the most favourable outcome from a safety perspective and the most favourable environmental outcome. This option also required the least variation to existing flight paths at Sydney (Kingsford Smith) Airport (a key functional requirement) compared to other options
- concept option Fv provided an equally favourable outcome from a safety perspective and the most favourable outcomes from efficiency and capacity perspectives (in addition to a reasonably favourable score for environment).

6.3.1.5 Detailed evaluation of concept designs

The better performing elements of each of the 2 best performing concept design options (concepts Hv and Fv) were then integrated into a single 'preferred concept' design (designated as 'Concept W'). Baseline scoring of the concept design was also undertaken to identify the estimated noise footprint of the design (to further consider the environment criteria). This involved an approximate count of dwellings and population considered to be within the N60 to N70 noise contours (i.e. areas where noise impacts are predicted to be at or above 60 dB(A) and 70 dB(A) respectively).

The integration of the 2 concepts into one was conducted as an iterative design process through a series of technical workshops leading to the incremental evolution of the design across 3 primary versions.

These technical workshops resulted in the creation of the initial Concept W which provided significant improvements in the key performance criteria as follows:

- safety– in particular with respect to minimising air traffic control workload interactions
- efficiency – through improvements to the amount of level flight within the design and the reduction of the overall length of flight paths (referred to as track miles)
- environment – through minimising the number of dwellings overflown as far as possible
- capacity – minimal change.

The results of the Concept W refinement process were presented to the project Expert Steering Group in November 2019 and Concept W was confirmed by the Expert Steering Group as the 'preferred concept' design option for progression to the preliminary design phase. At this point the planning phase had achieved its primary goals of identifying the safest concept design option that met the identified functional requirements as best as possible, including the least impact on existing flight paths for Sydney (Kingsford Smith) Airport in the Sydney Basin.

At this point Concept W consisted exclusively of WSI and Sydney (Kingsford Smith) Airport flight paths. The next phase of the design process would introduce the additional elements required to operate WSI in day and night operations, and include the changes required to existing airspace elements for Bankstown, Camden and RAAF Base Richmond airports.

Proposed Concept W flight paths for the Runway 05 and Runway 23 operating modes (showing the development since the initial 2016 EIS concept flight paths) are shown in Figure 6.11 and Figure 6.12 respectively. Note the flight paths shown are indicative and represent the nominal centreline of the proposed flight path. As described in Chapter 3 (Introduction to airspace) due to dispersion, the actual path would progressively widen to notionally 2 km either side of the nominal centreline. If aircraft fly within the flight path corridor, they are considered to be 'on track'. For ease of comparison of the various options, only the nominal centreline has been shown.

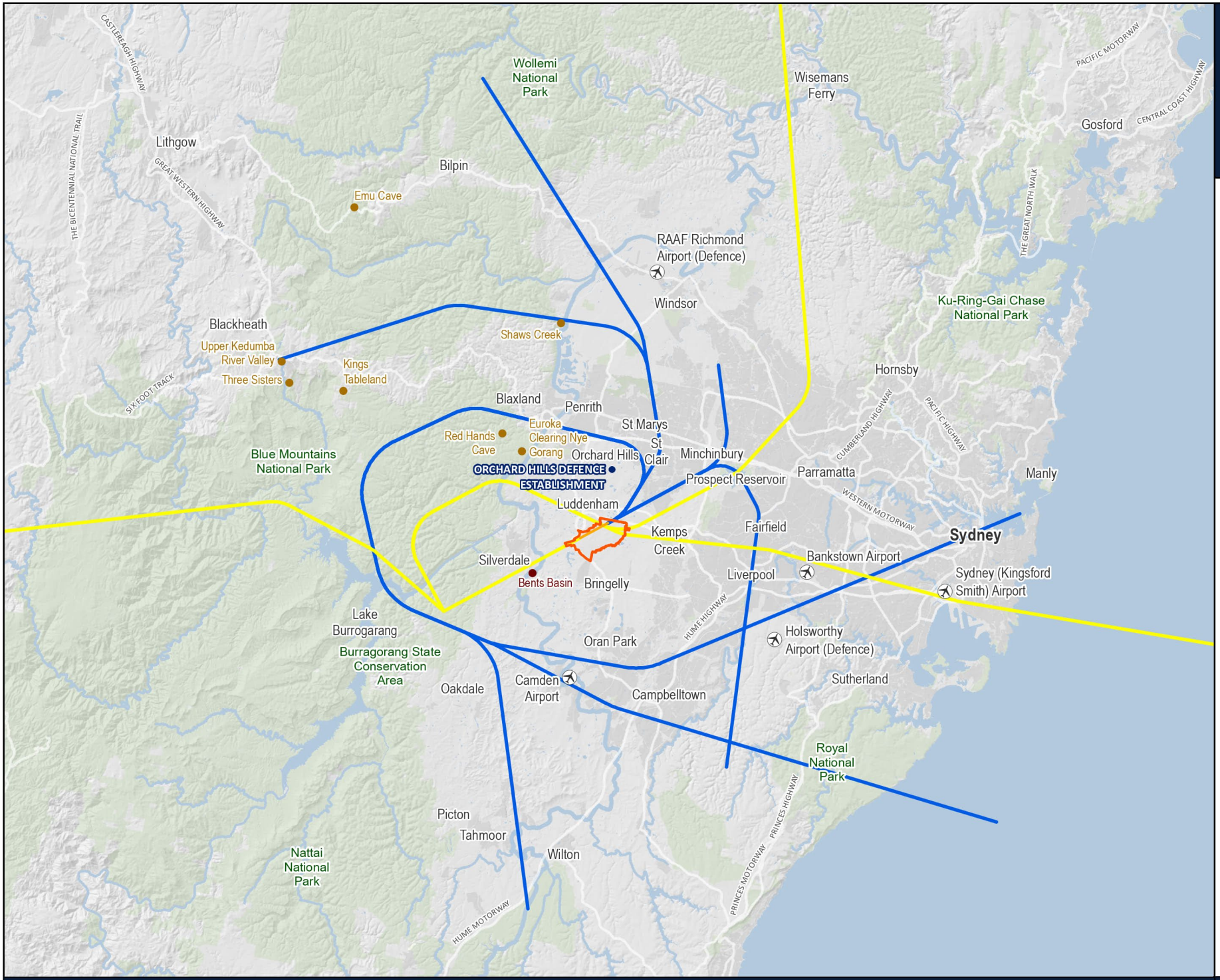

Figure 6.11

Proposed Concept W flight paths (Runway 05 operating mode)

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W arrivals flight path
- Indicative Concept W departures flight path

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 31/07/2023

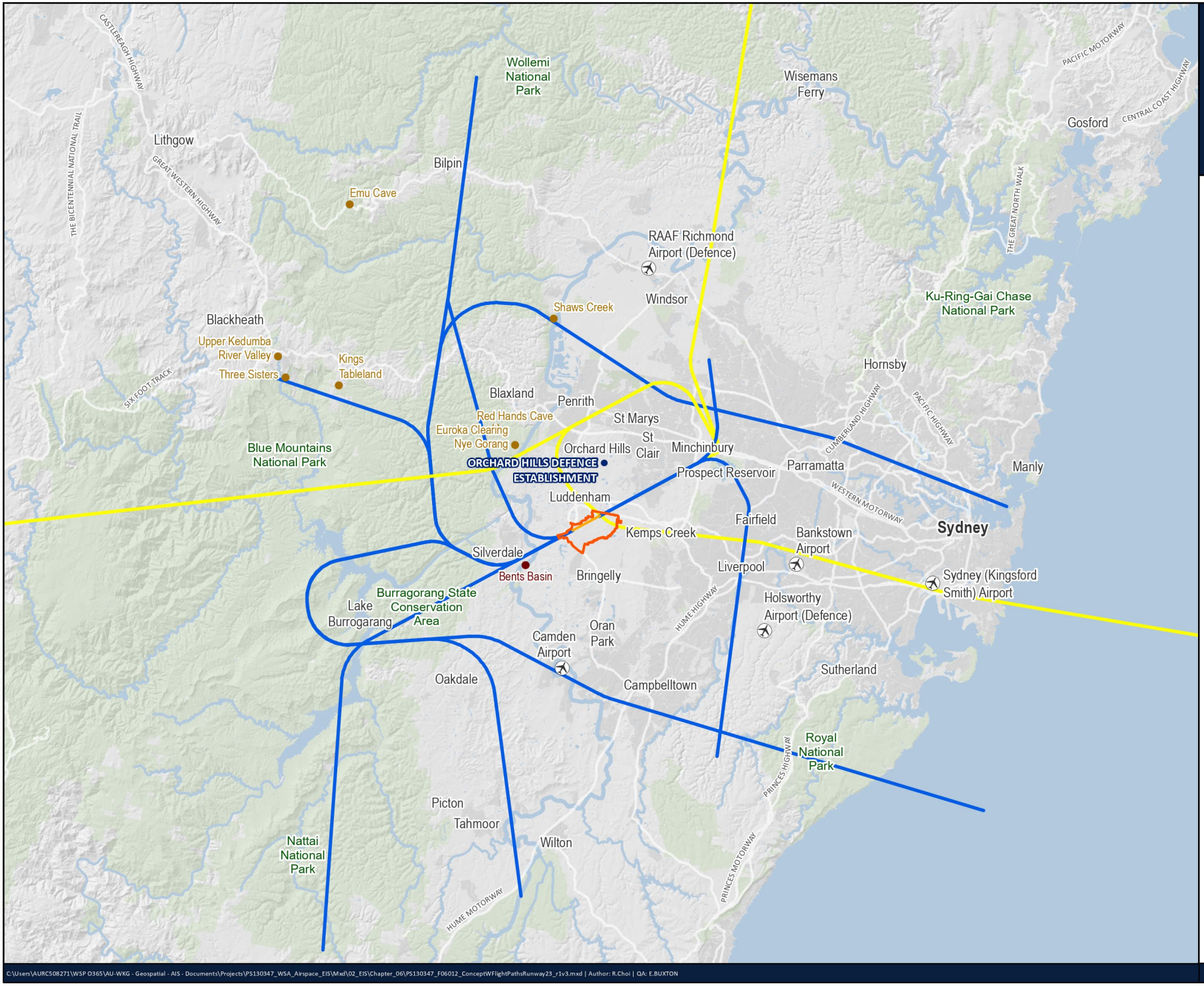

Figure 6.12

Proposed Concept W flight paths (Runway 23 operating mode)

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W arrivals flight path
- Indicative Concept W departures flight path

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 30/06/2023

6.3.2 Preliminary airspace design and environmental assessment

The purpose of this phase was to progress the preliminary airspace design using an iterative flight path development process to create a complete airspace design for WSI day and night operations, and include the changes required to existing airspace elements for Bankstown, Camden and RAAF Base Richmond airports.

6.3.2.1 Evolution of Concept W design

Following identification of the preferred airspace concept flight paths during the planning design phase, a technical working group was formed to conduct further design activities. The technical working group began with the Concept W design that had been endorsed at the end of the planning phase. The Concept W design required further refinement as the design presented was only based on a peak day time period of operation. At this stage of design, it did not take into account non-peak periods or night time operations. The concept design was also brought closer to a viable operational state with the introduction of additional airspace design elements such as:

- draft flight paths for all Instrument Flight Rules (IFR) capable airports within the Sydney Basin
- draft initial airspace containment volumes for the new WSI flight paths
- development of suggested flight paths that may be used by VFR aircraft to remain clear of the WSI flight paths
- draft air traffic control operating procedures for air traffic management including draft noise abatement procedures.

This approach resulted in an initial evolved flight path concept that was suitable for 24-hour operations in all weather conditions.

Confirmation of functional requirements and performance assessment criteria

As part of the initial preliminary airspace design process, a review was conducted of the functional requirements and performance assessment criteria. Where it was identified that the existing functional requirements and performance assessment criteria were still relevant and fit for purpose, they were transitioned into a subsequent functional requirements package for the Preliminary Design and Environmental Assessment Phase.

Requirements that were no longer relevant to the current state of the design were ‘retired’ and, where required, replaced with updated versions. This resulted in the clarification of some of the existing functional requirements (such as those relating to noise sharing arrangements with Sydney (Kingsford Smith) Airport or prioritisation of retaining existing flying training areas) based on how they had been applied in the previous planning phase of the flight path design.

A number of performance assessment criteria were also updated in order to reflect the requirements of the preliminary design stage.

6.3.2.2 Iterative development of the preliminary design flight paths

The refinement of the Concept W during the preliminary design phase included more detailed consideration of the factors that had previously been considered during the planning phase. As part of this consideration, the following fundamental parameters were applied to the flight path development during the preliminary design phase:

1. Safety – as with all of the design phases for the airspace development, the key performance assessment criteria of safety continued to be the paramount consideration in all flight path option development.
2. Environment – noise, and other environmental impacts including visual and social, were minimised to the extent practical while still achieving safe and efficient operations.
3. Air Traffic Management requirements – consistent with the efficiency and capacity requirements, flight path options were refined to ensure they were fit for purpose and based on sound air traffic management requirements to deliver the required capacity in an efficient manner.

Where these requirements conflict, resolution was typically based on the above order. For example, some environmental impacts were generally, within reasonable limits, taken to have precedence over efficiency requirements. Conversely, some environmentally friendly flight paths were withdrawn from the design where they proved too complex for airlines to fly in a safe manner.

Preliminary assessments

In addition to ongoing refinements (of the Concept W design) to improve the safety outcomes of the flight path development during the preliminary design phase, a series of preliminary environmental assessments were undertaken to identify more detailed constraints. These assessments considered each relevant runway operating mode and time period (i.e. night time periods). A summary of the key areas considered during the preliminary assessments is provided in the following sections.

Overflights of sensitive tourist, recreational and wilderness areas

The visual impacts on sensitive tourist and recreational areas by aircraft overflight was considered in each preliminary design refinement with the aim of minimising the potential visual impacts of aircraft flying over these areas. In particular, this included considering the impacts of flight paths over the GBMA and other wilderness areas as well as the identified sensitive tourist and recreation areas (as identified previously in Section 6.3.1.1).

Noise impacts

Aircraft noise modelling was used to undertake preliminary environmental assessment of the design. Noise assessments for each of the refinements included an estimate of the number of dwellings which would be likely to be subject to different levels of overflight noise events. These assessments were produced for each relevant runway operating mode and time period. A more typical representation of an expected annual average day of operations, taking into account potential noise abatement operating mode priorities, was also developed.

A range of overarching noise abatement procedures were considered during the design of each flight path refinement, some of which built on considerations identified in the planning phase, and some of which were newly introduced during the preliminary design phase. These considerations included:

- use of noise preferential runways to direct the initial and final flight paths of aircraft away from noise-sensitive areas
- the use of noise preferential routes to assist aircraft in avoiding noise-sensitive areas on departure and arrival, including the use of turns to direct aircraft away from noise-sensitive areas located under or adjacent to the usual take-off flight paths.

Flight path design refinements which were considered throughout the preliminary design phase included (noting some of these refinements built on previous planning phase considerations):

- Runway 05 day north jet departures flight path to reduce residential overflight noise north of WSI by tracking as far west of St Clair and St Marys as possible
- Runway 05 day north jet departures flight path to minimise aircraft overflight noise for residential areas in the Blue Mountains and residential areas along the Great Western Highway, in particular favouring flight paths to the north of the highway
- Runway 05 arrivals to join final approach and remain south of the Silverdale township to minimise the aircraft overflight noise for this residential area
- Runway 23 day north, north west and west jet departures flight path by delaying the turn to the west until past Silverdale to minimise overflight noise in that area
- Runway 23 day arrivals were positioned, wherever possible, over light industry and green spaces for the last 22 kilometres of flight
- where required, flight paths to cross the Great Western Highway over areas of low residential density to minimise aircraft overflight noise to Blue Mountains communities
- reciprocal runway operations for night-time periods when demand permits (refer to following section for details).

Socio-economic

While potential socio-economic impacts had been considered as part of the planning phase (such as impacts on sensitive community receivers such as major residential areas, schools, hospitals etc.), consideration of potential impacts was expanded as part of the preliminary design phase to include additional types of receivers such as tourist locations, sporting facilities and major outdoor recreation-type facilities. Potential economic impacts to the values associated with tourist locations and facilities, in particular important tourism-related economic activities based in and around the GBMA, were also considered.

Reciprocal runway operations

In order to ensure that WSI night modes result in noise impact to the fewest feasible number of dwellings, the flight paths in the night modes are different from those in the day modes. A third operating mode, known as reciprocal runway operations, was also considered in line with section 2.2.3 of the Airport Plan.

Reciprocal runway operations (RRO) is a term given to a specific mode where aircraft depart in the opposite direction of flight to arriving aircraft. In the Airport Plan this runway mode is referred to as 'head to head operations'. The RRO mode of operation would not be the only night time operational mode but could be used for WSI as an additional operating mode when it is safe to do so and specifically when:

- the number of arriving and departing aircraft is not more than around 20 air traffic movements per hour to permit the safe separation of aircraft
- the weather conditions (principally a dry runway and light downwind component) mean that it is safe to take off or land; and
- the Sydney (Kingsford Smith) Airport curfew period is in effect due to the complexity of operating the RRO and the large amount of airspace it requires (noting this would apply to all night modes of operation at WSI, not just RRO).

RRO was developed to minimise noise impacts over populated areas and was therefore restricted to operations which utilise a Runway 05 arrival and Runway 23 departure orientation. This arrangement confines low level flight paths over the less populated areas to the south and south-west of the Airport Site.

Design refinements which were applied throughout the preliminary design phase for RRO (as well as for day time operations) focused on seeking to minimise tracking of flight paths over high density inhabited/residential (and other noise sensitive) areas such as Camden, Silverdale, Wallacia and Warragamba. This also included consideration of balancing impacts to existing wilderness and other sensitive areas (noting that for some options this resulted in some flight paths maximising overflight of low or unpopulated areas to avoid maximising overflight of wilderness areas).

Further discussion regarding the proposed reciprocal runway operations and noise impacts and preferred noise abatement procedures associated with these operations is provided in Chapter 7 (The project).

Impacts to Defence sites

Defence operates a number of aircraft that regularly access the Sydney Basin. These include military transport, fast jet aircraft, and helicopter operations. Consultation has been conducted with the Department of Defence at regular intervals to confirm that the flight paths developed would support Defence operations and establish the suitability of the designs to provide a viable future access capability.

Interaction with RAAF Base Richmond

The way in which aircraft accessing WSI would interact with the RAAF Base Richmond operations has been developed through ongoing consultation with Defence through the creation of the Defence Airspace Technical Working Group (DATWG). The intention of the working group was to negotiate suitable solutions and broad procedures that would be used to operate WSI (including arrival and departure flight paths transiting overhead of the airbase), whilst maintaining continued RAAF operations.

Ongoing discussion within the DATWG led to the development of a solution which enabled arrival and departure flight paths that would cross towards the eastern and southern sides of the existing restricted airspace area.

Co-ordination will continue to occur with Defence into the detailed design phase of the project, in order to finalise the shape of the restricted airspace so that it meets Defence's future needs.

Interaction with Orchard Hills Defence Establishment

As described in Chapter 4 (Project setting) the Defence Establishment Orchard Hills is a RAAF operated facility. It is located approximately 4 nm (around 7 km) a north of WSI. It has a restricted airspace that is approximately 1.2 nm (around 2.2 km) in diameter and exists to prevent aircraft overflying an explosive risk area. As a result of the explosive risks associated with the facility, the airspace above the Defence Establishment Orchard Hills is not accessible to flying activity while the site is in use.

Consultation between the project team and the Department of Defence has been ongoing since 2017. In anticipation of the WSI airspace design process, the Department of Defence undertook a review of its airspace requirements at the Defence Establishment Orchard Hills and reduce the operating hours of this facility to generally between Monday to Friday 9 am to 4 pm. In addition, ongoing consultation between the Department of Defence and the design team led to an agreement to initiate a reduction in the lateral extent of the restricted area above the facility to accommodate the new flight paths. This allowed the design team to consider alternate options for flight paths within the vicinity of this facility.

Following confirmation of the area and time within which potential flight paths could occur, all of the preliminary design jet flight paths that depart from Runway 05 incorporated a left turn in close proximity to the Defence Establishment Orchard Hills. The design process considered various refinements to avoid this site while also considering the other key constraints in this area (such as existing Sydney (Kingsford Smith) Airport flight paths and the need to minimise impacts to the Bankstown Airport control zone).

Airspace structure

As described in Chapter 3 (Introduction to airspace), controlled airspace is an airspace of defined dimensions within which air traffic control services are provided to IFR flights and to VFR flights in accordance with the airspace classification. The airspace structure of flight paths for WSI is expected to be controlled airspace (which refers to the controlled airspace surrounding major airports). Within this airspace, both IFR and VFR flights are permitted and must communicate with air traffic control).

In designing the airspace structure for WSI, every effort was made (in line with the functional requirements), to minimise the impact on Bankstown Airport and Sydney (Kingsford Smith) Airport operations as well as existing flying training areas and VFR corridors granting equity of access to the Sydney Basin. To achieve this throughout the flight path design refinement, consultation was conducted with key industry bodies and operators from Camden and Bankstown airports to develop the proposed airspace structure presented in Chapter 7 (The project).

Of specific note during the refinement process with reference to the proposed airspace structure:

- the north-east control zone boundaries of the WSI control zone were optimised to align with expected VFR tracking
- the south-east control zone boundaries were optimised to reduce constraints between Bankstown Airport and WSI operations
- the control area lower levels were raised wherever possible to maximise opportunities for VFR flight over the GBMA.

Of necessity, some alignment and optimisation has been undertaken to ensure that the airspace being assigned to protect WSI aircraft operations, integrates safely and efficiently into the existing airspace model.

Equity of access – Interaction with Bankstown and Camden airports

The preliminary design phase functional requirements identified the need for the airspace design to provide equity of airspace access within the Sydney Basin, wherever possible. Notwithstanding this, the introduction of an airspace structure around WSI requires some reduction to the lateral extent of Flying Training Areas D552, D556A and D556B. These volumes of airspace are utilised by flights operating out of Bankstown and Camden airports.

As part of the preliminary design process, further consideration of the functional requirement to minimise the loss of airspace available for flying training was undertaken. This was considered through the development of a series of flight path refinements for arriving and departing aircraft which positioned the flight paths primarily to the west of WSI, in order to reduce the impact on VFR operations in the affected flying training areas for Bankstown and Camden airports. The resultant iterative process resulted in the identification of a generally north-east to south-west line of restriction across the existing flying training zones.

New flying training areas are expected to be introduced to the north and south of the Sydney Basin to replace those lost due to the WSI airspace structure. These are described in Chapter 8 (Facilitated changes) and are subject to a separate airspace change proposal, depending on the extent of the changes.

6.3.2.3 Identification of the preferred design for environmental assessment

Overall, the preliminary design phase considered 9 separate refinements/iterations of the flight paths to arrive at the preferred preliminary design. Figure 6.13 to Figure 6.16 provides a high level comparison between the proposed flight paths identified at the end of the planning phase (i.e. refined Concept W) and the preliminary design phase (i.e. the preliminary flight path designs). As with Figure 6.11 and Figure 6.12, for ease of comparison of the various options, only the nominal centreline flight paths have been shown.

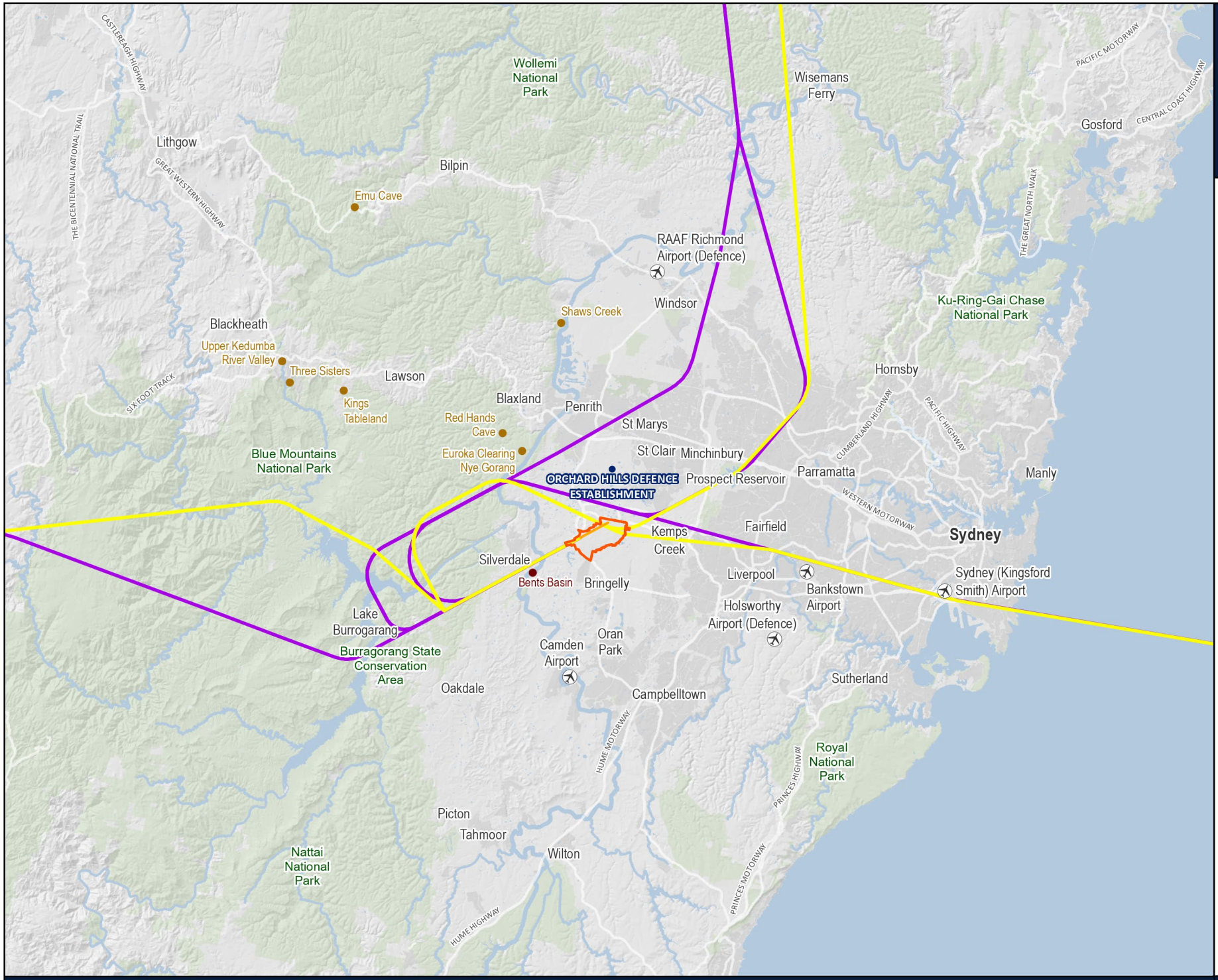

Figure 6.13

Comparison of Concept W and preliminary design flight paths
(05 arrivals operating mode)

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W arrivals flight path (05 arrivals)
- Indicative Preliminary design flight path (05 arrivals)

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 31/07/2023

Data sources: - DITRDC, DCS, Geoscience Australia
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community

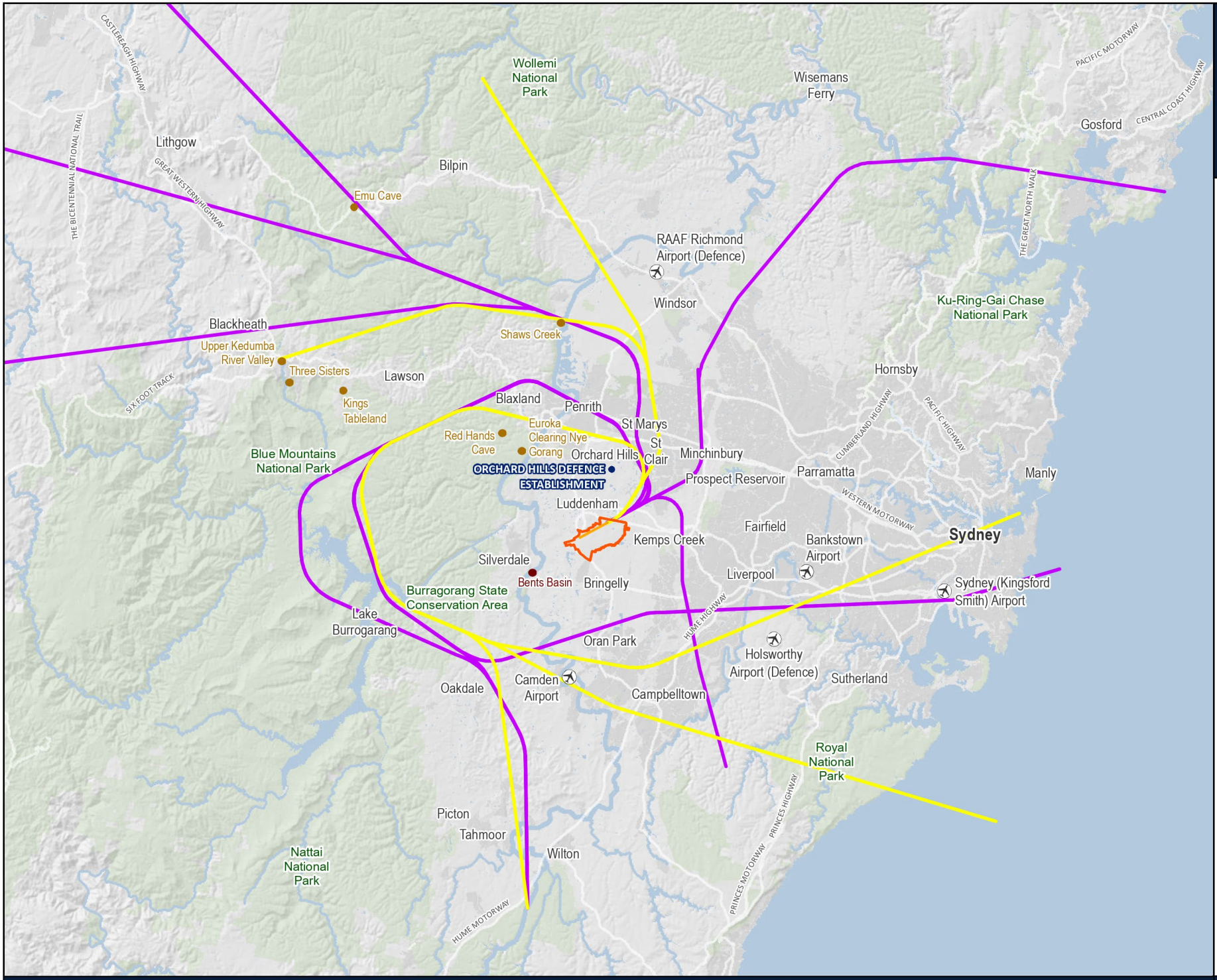

Figure 6.14

Comparison of Concept W and preliminary design flight paths
(05 departures operating mode)

Legend

- WSI Runway
- Daytime 05 departures
- Daytime 05 non-jet departures
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W departures flight path (05 departures)
- Indicative Preliminary design flight path (05 departures)

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 12/08/2024

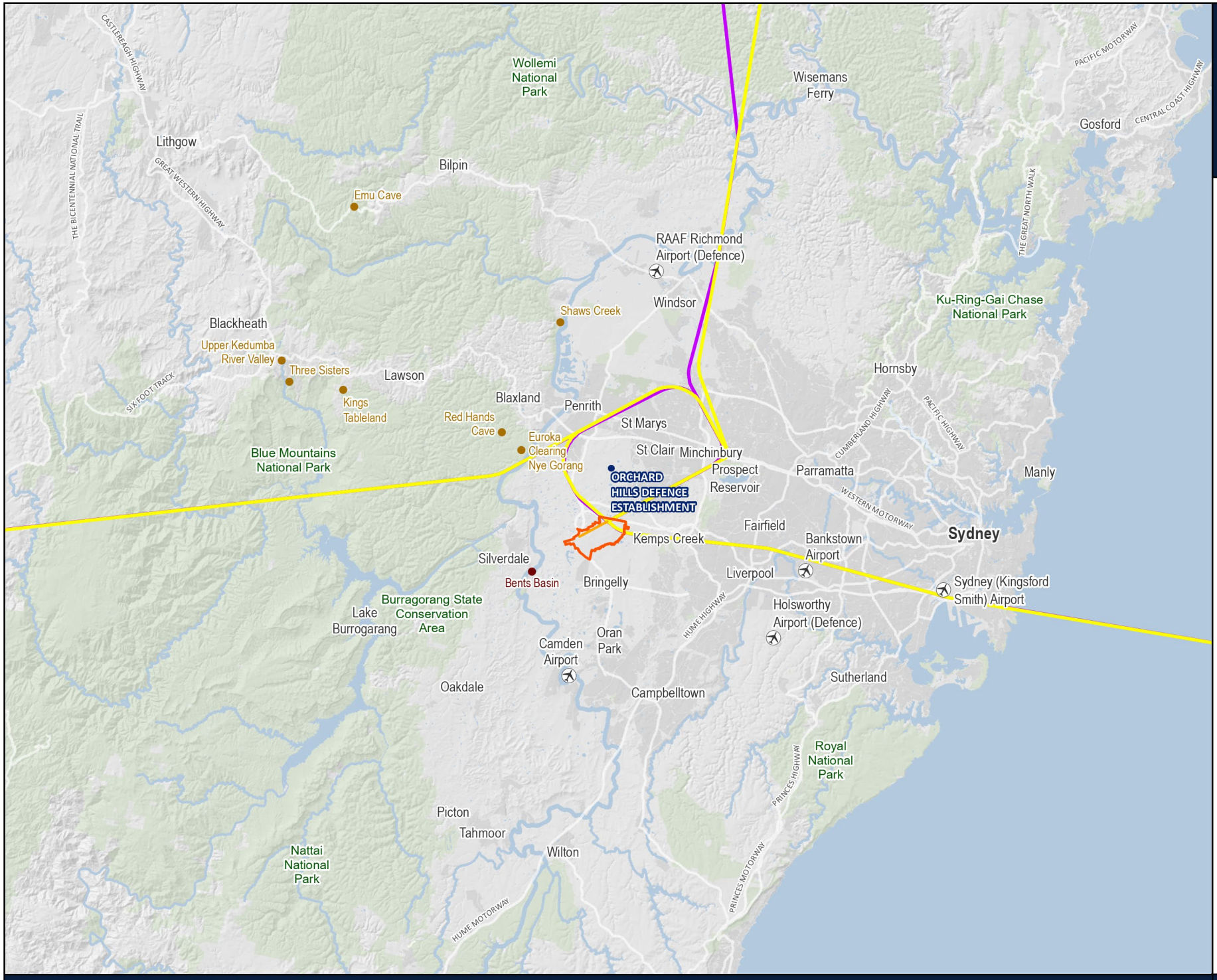

Figure 6.15

Comparison of Concept W and preliminary design flight paths (23 arrival operating mode)

Legend

- WSI Runway
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W arrivals flight path (23 arrivals)
- Indicative Preliminary design flight path (23 arrivals)

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 31/07/2023

Data sources: - DITRDC, DCS, Geoscience Australia
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
Airbus,USGS,NGA,NASA,CGIAR,NCEAS,NLS,OS,NMA,Geodatastyrelsen,GSA,GSI and the GIS User Community

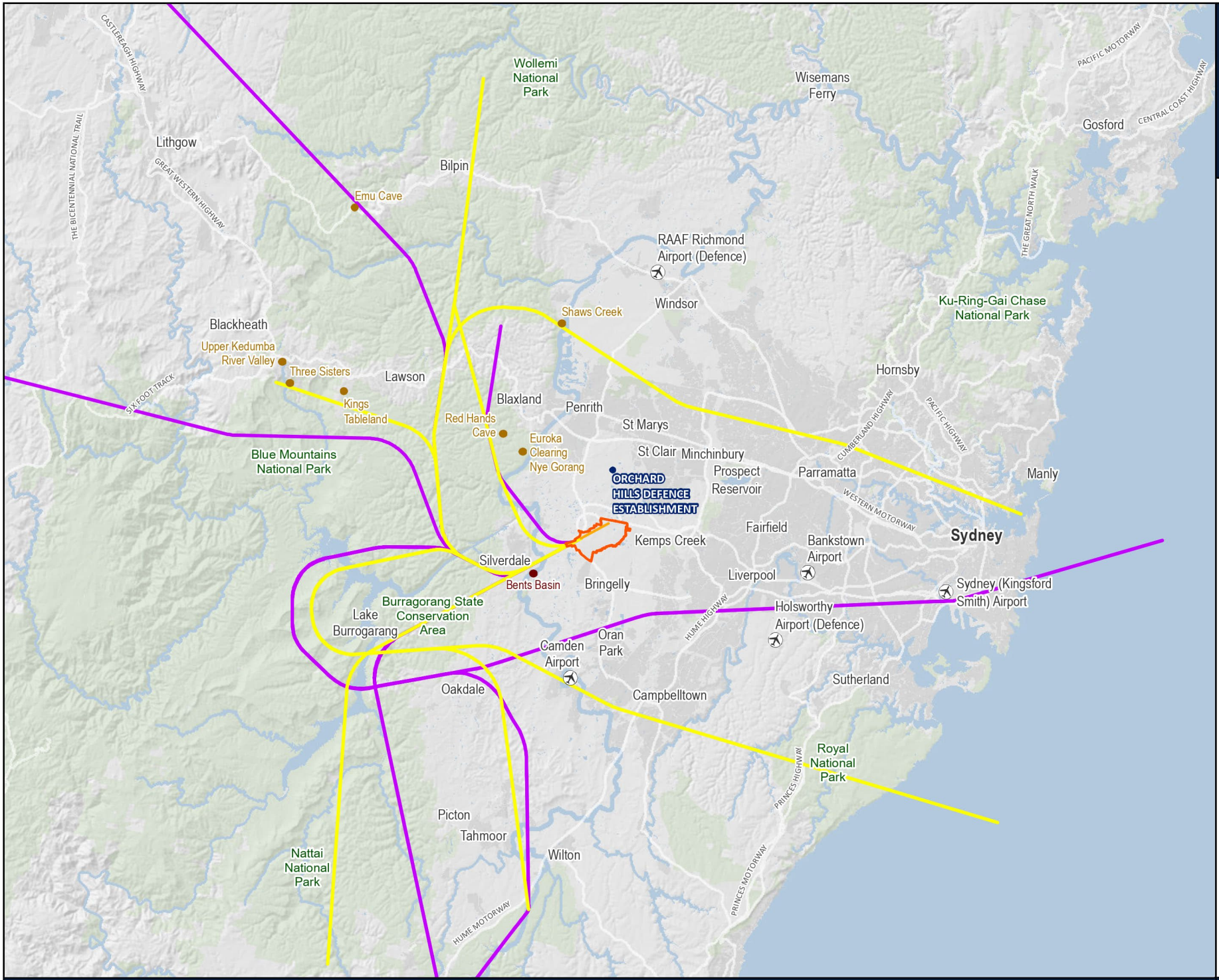

Figure 6.16

Comparison of Concept W and preliminary design flight paths (23 departures operating mode)

Legend

- WSI Runway
- Daytime 23 departures
- Daytime 23 non-jet departures
- Western Sydney International (Nancy-Bird Walton) Airport land boundary
- Aboriginal Places raised during consultation (NPW Act)
- Site of Aboriginal significance

Flight Paths

- Indicative Concept W departures flight path (23 departures)
- Indicative Preliminary design flight path (23 departures)

0 10 20 km

Coordinate system: GDA 1994 NSW Lambert

Scale ratio correct when printed at A4

1:600,000 Date: 12/08/2024

6.3.3 Consideration of alternative flight paths following community consultation

As part of the response to the exhibition of the Draft EIS, submissions requested a number of the flight paths be amended or reconsidered and that alternative options be identified. Submissions also requested that, where flight paths were identified above their property or above their suburb (including a range of suburbs across the Sydney Basin, Blue Mountains, and Central and South coasts), that they be moved away from their suburb to another area to reduce direct impacts (in particular noise). A number of submissions made requests for changes to specific preliminary flight paths. With respect to the specific flight path design changes identified in submissions, these suggested changes were considered as part of the submissions process following exhibition of the Draft EIS.

The suggested alternative flight paths were considered through a formal design change process. This process generally consisted of the following steps:

- all public submissions that provided suggestions for changes to flight path design, usage, airspace access, or runway use, including submissions for noise abatement procedures, were considered by the project design team responsible for developing the airspace design
- the design team undertook an initial review of each submission to determine if suggestions were technically feasible to enable accurate analysis (including review of each submission and any supporting diagrams or illustrations):
  - where the initial review considered that the suggestion(s) represented a viable alternative to consider, the suggestion was identified for further assessment. Typically, each of the viable changes were grouped geographically to ensure that all related suggestions were considered collectively for the greatest potential improvement and to address contradictory suggestions in a coordinated manner. The groupings selected were:
    - Western Sydney Airport North
    - Western Sydney Airport South
    - Western Sydney Airport West
    - Sydney (Kingsford Smith) Airport changes
    - Bankstown Airport VFR/IFR Changes and Airspace Access
    - noise abatement procedures.
  - where the initial review considered that the suggestion(s) did not represent a viable alternative to consider, the suggestion was not progressed and a reason recorded for this decision. Changes that did not progress were generally based on one or more of the following reasons:
    - they were not feasible for safety reasons
    - they provide no clear benefit to the community
    - the change would only transfer the identified impact from one community to another with no other benefit
    - they contravene a key design principle.

Using the above process, around 300 suggested alternatives were identified for further consideration. A technical analysis of each of these design suggestions was undertaken, and potential changes to the flight paths or procedures were developed based on the intent of the suggested change. This entailed turning public suggestions into technical solutions. Once technical solutions were identified, they were considered against the key performance criteria (safety; environment (including noise); efficiency; and capacity). Where a technical solution was assessed as safe and likely to provide a better community or environmental outcome, the submission was identified as a candidate for potential change. Each candidate was categorised according to the level of change and environmental assessment required, using the preliminary flight path design (as presented in the Draft EIS) as the baseline for assessing the change. Of the suggestions received, around 50 were considered to be suitable for further consideration.

These 50 design opportunities underwent further detailed analysis and examination by the WSI Technical Working Group. This process generally consisted of the following process:

- candidate design changes which were considered operationally feasible during consideration by the Technical Working Group were broadly categorised as follows:
  - Category A – no environmental assessment would be required to incorporate the change into the design (change is considered within EIS)
  - Category B – environmental assessment would be required to determine consultation requirements and need for Department of Climate Change, Energy, the Environment and Water referral before the change could be incorporated into the design.
  - Category C – likely to trigger EPBC Act significance and would require referral before the change could be incorporated into the design
- design changes were assessed as being suitable for inclusion in the revised flight path design where the change:
  - did not affect safety
  - provided a clear benefit to the community
  - did not transfer the impact from one community to another; and
  - did not contravene a key design principle
- the design changes that were not accepted as being suitable for inclusion in the revised flight path design were not progressed where they were identified as they:
  - were not feasible for safety reasons
  - provided no clear benefit to the community
  - transferred the impact from one community to another; or
  - contravened a key design principle.

Further detail regarding the updated description of each of the flight paths, based on the runway operating mode and time of day is provided in Chapter 7 (The project).

6.4 Future phases

Following completion of the preliminary design (and completion of the current environmental assessment – this EIS document), a series of future phases will still be required to be completed in order for the proposed changes to be implemented. These include:

- detailed design
- implementation, and
- a post-implementation review of the implementation of the flight paths.

A summary of each of these phases is provided in the following sections.

6.4.1 Detailed design phase

The detailed design phase will include further evaluation and refinement of the proposed selected airspace design for implementation based on feedback received from the community and other technical stakeholders such as airlines and industry bodies. This includes refinement of the preliminary design (as outlined in Chapter 7 (The project)) and further development of the design to a level appropriate to secure regulatory approvals.

The detailed design and implementation phase will involve continued consultation with communities and stakeholders in accordance with Airservices Australia's Community Engagement Standard. It will also be based on the advice or recommendations received from the Minister for the Environment and Water following the completion of the Environmental Assessment Phase.

This phase will also include:

- further development and simulation testing of the proposed airspace design and flight paths to ensure the operating procedures are fit for purpose and suitable for implementation
- further safety and hazard assessments to ensure that risks have been identified and managed to the lowest practicable level
- finalisation of noise abatement procedures.

6.4.2 Implementation of the flight path design

The implementation phase will include conducting all activities required to implement changes to existing Sydney Basin flight operations. This phase will also include the regulatory certification and authorisation of the proposed airspace design and its implementation. During the implementation phase, a series of operational readiness activities will take place. Activities during this phase will include:

- approval of the airspace classification by CASA (in the form of an airspace change proposal (ACP))
- validation of the final airspace design and flight paths
- identification of the appropriate operational readiness date and Aeronautical Information Regulation and Control date to ensure safe and efficient dissemination of aeronautical information
- flight path validation and runway aids/technology testing and training of air traffic controllers
- notifying airspace and flight path changes to aviation industry stakeholders and the community ahead of the commencement of air operations at the WSI. This would be achieved through publication of revised Aeronautical Information Management data and stakeholder and airspace user briefings regarding the changed airspace design
- commencement of noise abatement procedures and noise management measures through the airspace and flight path design process.

The facilitated changes to the Sydney Basin airspace would be introduced in 2026 on a scheduled Aeronautical Information Regulation and Control (AIRAC) date, prior to the official opening of WSI. Introduction of these changes ahead of WSI's opening will allow pilots and air traffic control to adjust their systems and become familiar with changes to current procedures before WSI traffic is introduced, and minimise the likelihood of conflicts or incidents in the airspace. These facilitated changes are described in Chapter 8 (Facilitated changes).

6.4.3 Post Implementation Review

Following ‘opening day’ there would continue to be ongoing monitoring of the operation of the design as part of standard business practices for new airspace and flight paths projects. Monitoring of the operation would be undertaken by key operational stakeholders, in particular Airservices Australia, the Department of Defence and CASA. It is standard practice for Airservices Australia to conduct a Post Implementation Review of significant airspace changes.