



Sydney Metro City & Southwest: Crows Nest Over Station Development

Aviation Report

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Executive Summary

This report supports a concept *State Significant Development* application (concept SSD Application) submitted to the *Department of Planning and Environment* (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) by the *Sydney Metro Authority* (Sydney Metro) who are seeking to secure concept approval for a mixed-use development comprising four buildings above the Crows Nest Station, otherwise known as the over station development (OSD).

This airspace assessment report has been prepared to respond to the *Secretary's Environmental Assessment Requirements* (SEARs) issued for the SSD Application on 26th September 2018, with the specific focus being on the potential impacts on the Prescribed Airspace for Sydney Airport.

As such, this report addresses the potential aeronautical impact of the building envelopes and the approvability of the building envelopes under the *Airports (Protection of Airspace) Regulations* (APAR), pursuant to the *Airports Act 1996*. Under the APAR, the approving authority is the Commonwealth *Department of Infrastructure, Regional Development and Cities* (DIRDC).

Key stakeholders consulted by DIRDC prior to making a determination (approval or refusal) or an APAR application include Sydney Airport (other airports in the Sydney Basin are not relevant to this concept proposal), the *Civil Aviation Safety Authority* (CASA) and Airservices Australia.

Under the APAR and pursuant to the SEARs, the principal assessment threshold is the Prescribed Airspace of Sydney Airport. In that regard, this report examines the current and forecast regulated airspace height limits overhead the site that would:

- a) Trigger the requirement to apply for an airspace height approval under the APAR — typically the airport's Obstacle Limitation Surfaces (OLS); and
- b) Constrain the maximum permissible building envelope heights, including the proposed 'services zone' above the roof slabs — typically the PANS-OPS surfaces associated with published instrument flight procedures to and from the airport.

The feasibility of constructing future buildings within the building envelopes is also considered by stakeholders and DIRDC, necessitating evaluation of the likely impact of cranes even if they are not formally part of an APAR application for the building envelopes. To this extent the potential impact and likely approvability of cranes that may be required in the future has also been examined in this study.

Another factor evaluated was the location of the site in relation to the nearby Royal North Shore Hospital and the standard helicopter flight paths to and from the hospital's helipad, a facility classified as a *Strategic Helicopter Landing Site* (SHLS) under the 2018 update to the Commonwealth's *National Airports Safeguarding Framework* (NASF) and designated as requiring protection from proposed developments. The Crows Nest OSD site was assessed as having no negative impact on those flight paths.

The APAR also makes provision for refusing an application if a proposed development such as the concept proposal, based on other non-specified factors, would adversely impact the safety, regularity or efficiency of current or future air traffic into or out of Sydney Airport. Relevant 'other' factors have been identified and evaluated as not contributing any adverse effects.

Based on the building envelope plans in this concept proposal, Building A North and Building A South would infringe the OLS height by 32 metres and Building B would infringe the OLS height by 2 metres and would consequently require approval under the APAR. Approval is unlikely to be considered problematic given the combination of the location of the site in relation to the airport, the relatively small degree of infringement of the OLS and the large clearance from the limiting PANS-OPS surfaces (the latter also being sufficiently large as to afford ample space for cranes that would be required to support future construction within the building envelopes). Being below the OLS threshold height, the building envelope height for Building C would not require approval under APAR.

Thus, we consider that an application under the APAR for the building envelopes which infringe the OLS — that is, Buildings A North and South and Building B — supported by a full aeronautical assessment and safety case would be approved by DIRDC.

In conclusion, the SEARs issued for the SSD Application on 26th September 2018 are satisfied, and we anticipate no barrier to approval of the concept SSD Application for the Sydney Metro Crows Nest OSD from the aviation perspective.

1.0 Introduction

1.1 Purpose of this report

This report supports a concept State Significant Development application (concept SSD Application) submitted to the Department of Planning and Environment (DPE) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The concept SSD Application is made under Section 4.22 of the EP&A Act.

Sydney Metro is seeking to secure concept approval for a mixed use development comprising four buildings above the Crows Nest Station, otherwise known as the over station development (OSD). The concept SSD Application seeks consent for building envelopes and land uses, maximum building heights, maximum gross floor areas, pedestrian and vehicular access, circulation arrangements and associated car parking and the strategies and design parameters for the future detailed design of the development.

Sydney Metro proposes to procure the construction of the OSD as part of an Integrated Station Development package, which would result in the combined delivery of the station, OSD and public domain improvements. The station and public domain elements form part of a separate planning approval for Critical State Significant Infrastructure (CSSI) approved by DPE on 9 January 2017.

As the development is within a rail corridor, is associated with railway infrastructure and is for commercial premises and residential accommodation with a Capital Investment Value of more than \$30 million, the project is identified as State Significant Development (SSD) pursuant to Schedule 1, 19(2)(a) of the *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). The development is therefore, State significant development for the purposes of Section 4.36 of the EP&A Act.

This report has been prepared to specifically respond to the Secretary's Environmental Assessment Requirements (SEARs) issued for the concept SSD Application on 26 September 2018 which states that the Environmental Impact Statement (EIS) is to address the following requirements:

Reference	SEARs Requirement	Where Addressed in Report
SSD 9579 Key Issue	7. Prescribed airspace for Sydney Airport The EIS shall: <ul style="list-style-type: none"> identify any impacts of the proposal on the prescribed airspace for Sydney Airport 	Sections 2 to 6

Reference	SEARs Requirement	Where Addressed in Report
SSD 9579 Consultation	During the preparation of the EIS, you must consult with relevant local, State or Commonwealth Government authorities, service providers, community groups and affected landowners.	Section 5.4

1.2 Overview of the Sydney Metro in its context

Sydney Metro is Australia's biggest public transport project. A new standalone metro railway system, this 21st century network will deliver 31 metro stations and 66km of new metro rail for Australia's biggest city — revolutionising the way Sydney travels. Services start in the first half of 2019 on Australia's first fully-automated railway.

Sydney Metro was identified in *Sydney's Rail Future*, as an integral component of the *NSW Long Term Transport Master Plan*, a plan to transform and modernise Sydney's rail network so it can grow with the city's population and meet the future needs of customers. In early 2018, *the Future Transport Strategy 2056* was released as an update to *the NSW Long Term Transport Master Plan* and *Sydney's Rail Future*. Sydney Metro City & Southwest is identified as a committed initiative in the *Future Transport Strategy 2056*.

Sydney Metro is comprised of three projects, as illustrated in **Figure 1**:

- **Sydney Metro Northwest** — formerly the 36km North West Rail Link. This \$8.3 billion project is now under construction and will open in the first half of 2019 with a metro train every four minutes in the peak.
- **Sydney Metro City & Southwest** — a new 30km metro line extending the new metro network from the end of Sydney Metro Northwest at Chatswood, under Sydney Harbour, through the CBD and south west to Bankstown. It is due to open in 2024 with an ultimate capacity to run a metro train every two minutes each way through the centre of Sydney.
- **Sydney Metro West** — a new underground railway connecting the Parramatta and Sydney central business districts. This once-in-a-century infrastructure investment will double the rail capacity of the Parramatta to Sydney CBD corridor and will establish future capacity for Sydney's fast growing west. Sydney Metro West will serve five key precincts at Westmead, Parramatta, Sydney Olympic Park, The Bays and the Sydney CBD. The project will also provide an interchange with the T1 Northern Line to allow faster connections for customers from the Central Coast and Sydney's north to Parramatta and the Sydney CBD.

Sydney's new metro, together with signalling and infrastructure upgrades across the existing Sydney suburban rail network, will increase the capacity of train services entering the Sydney CBD – from about 120 an hour currently to up to 200 services beyond 2024. That's an increase of up to 60 per cent capacity across the network to meet demand.

Sydney Metro City & Southwest includes the construction and operation of a new metro rail line from Chatswood, under Sydney Harbour through Sydney's CBD to Sydenham and on to Bankstown through the conversion of the existing line to metro standards.

The project also involves the delivery of six (6) new metro stations, including at Crows Nest, together with new underground platforms at Central. Once completed, Sydney Metro will have the ultimate capacity for a train every two minutes through the CBD in each direction - a level of service never seen before in Sydney.



Figure 1: Sydney Metro alignment map

On 9 January 2017, the Minister for Planning (the Minister) approved the Sydney Metro City & Southwest - Chatswood to Sydenham application lodged by TfNSW as a Critical State Significant Infrastructure project (reference SSI 15_7400), hereafter referred to as the CSSI Approval.

The CSSI Approval includes all physical work required to construct the CSSI, including the demolition of existing buildings and structures on each site. Importantly, the CSSI Approval

also includes provision for the construction of below and above ground structures and other components of the future OSD (including building infrastructure and space for future lift cores, plant rooms, access, parking and building services, as relevant to each site). The rationale for this delivery approach, as identified within the CSSI application is to enable the OSD to be more efficiently built and appropriately integrated into the metro station structure.

The EIS for the Chatswood to Sydenham alignment of the City & Southwest project identified that the OSD would be subject to a separate assessment process.

Since the CSSI Approval was issued, Sydney Metro has lodged five modification applications to amend the CSSI Approval as outlined below:

- **Modification 1** - Victoria Cross and Artarmon Substation which involves the relocation of the Victoria Cross northern services building from 194-196A Miller Street to 50 McLaren Street together with the inclusion of a new station entrance at this location referred to as Victoria Cross North. The modification also involves the relocation of the substation at Artarmon from Butchers Lane to 98 – 104 Reserve Road. This modification application was approved on 18 October 2017.
- **Modification 2** - Central Walk which involves additional works at Central Railway Station including construction of a new eastern concourse, a new eastern entry, and upgrades to suburban platforms. This modification application was approved on 21 December 2017.
- **Modification 3** - Martin Place Station which involves changes to the Sydney Metro Martin Place Station to align with the Unsolicited Proposal by Macquarie Group Limited (Macquarie) for the development of the station precinct. The proposed modification involves a larger reconfigured station layout, provision of a new unpaid concourse link and retention of the existing MLC pedestrian link and works to connect into the Sydney Metro Martin Place Station. It is noted that if the Macquarie proposal does not proceed, the original station design remains approved. This modification application was approved on 22 March 2018.
- **Modification 4** - Sydenham Station and Sydney Metro Trains Facility South which incorporated Sydenham Station and precinct works, the Sydney Metro Trains Facility South, works to Sydney Water's Sydenham Pit and Drainage Pumping Station and ancillary infrastructure and track and signalling works into the approved project. This modification application was approved on 13 December 2017.
- **Modification 5** - Blues Point acoustic shed modification which involves the installation of a temporary acoustic shed at Blues Point construction site and retrieval of all parts of the tunnel boring machines driven from the Chatswood dive site and Barangaroo through the shaft at the Blues Point temporary site. This modification application was approved on 2 November 2018.

The CSSI Approval as modified allows for all works to deliver Sydney Metro between Chatswood and Sydenham Stations and also includes upgrade of Sydenham Station.

The remainder of the City & Southwest alignment (Sydenham to Bankstown) proposes the conversion of the existing heavy rail line from west of Sydenham Station to Bankstown to metro standards. This part of the project, referred to as the Sydenham to Bankstown upgrade, is the subject of a separate CSSI Application (Application No. SSI 17_8256) for which an EIS was exhibited between September and November 2017, and a Submissions and Preferred Infrastructure Report was exhibited in June and July 2018. This application is currently being assessed by DPE.

1.3 Planning relationship between Crows Nest Station and the OSD

While Crows Nest Station and the OSD will form an Integrated Station Development, the planning pathways defined under the *Environmental Planning & Assessment Act 1979* require separate approval for each component of the development. In this regard, the approved station works (CSSI Approval) are subject to the provisions of Part 5.1 of the EP&A Act (now referred to as Division 5.2) and the OSD component is subject to the provisions of Part 4 of the EP&A Act.

For clarity, the approved station works under the CSSI Approval included the construction of below and above ground structures necessary for delivering the station and also enabling construction of the integrated OSD. This includes but is not limited to:

- demolition of existing development
- excavation
- integrated station and OSD structure (including concourse and platforms)
- lobbies
- retail spaces within the station building
- public domain improvements
- pedestrian through-site link
- access arrangements including vertical transport such as escalators and lifts
- space provisioning and service elements necessary to enable the future development of the OSD, such as lift cores, plant rooms, access, parking, retail, utilities connections and building services.

The vertical extent of the approved station works above ground level is defined by the 'transfer level' level, above which would sit the OSD. This delineation is illustrated in **Figure 2**.

The CSSI Approval also establishes the general concept for the ground plane of Crows Nest Station including access strategies for commuters, pedestrians, workers, visitors and residents.

Since the issue of the CSSI Approval, Sydney Metro has undertaken sufficient design work to determine the space planning and general layout for the station and identification of those

spaces within the station area that would be available for the OSD. In addition, design work has been undertaken to determine the technical requirements for the structural integration of the OSD with the station. This level of design work has informed the concept proposal for the Crows Nest OSD. It is noted that ongoing design development of the works to be delivered under the CSSI Approval would continue with a view to developing an Interchange Access Plan (IAP) and Station Design Precinct Plan (SDPP) for Crows Nest Station to satisfy Conditions E92 and E101 of the CSSI Approval.

All public domain improvement works around the site would be delivered as part of the CSSI Approval.

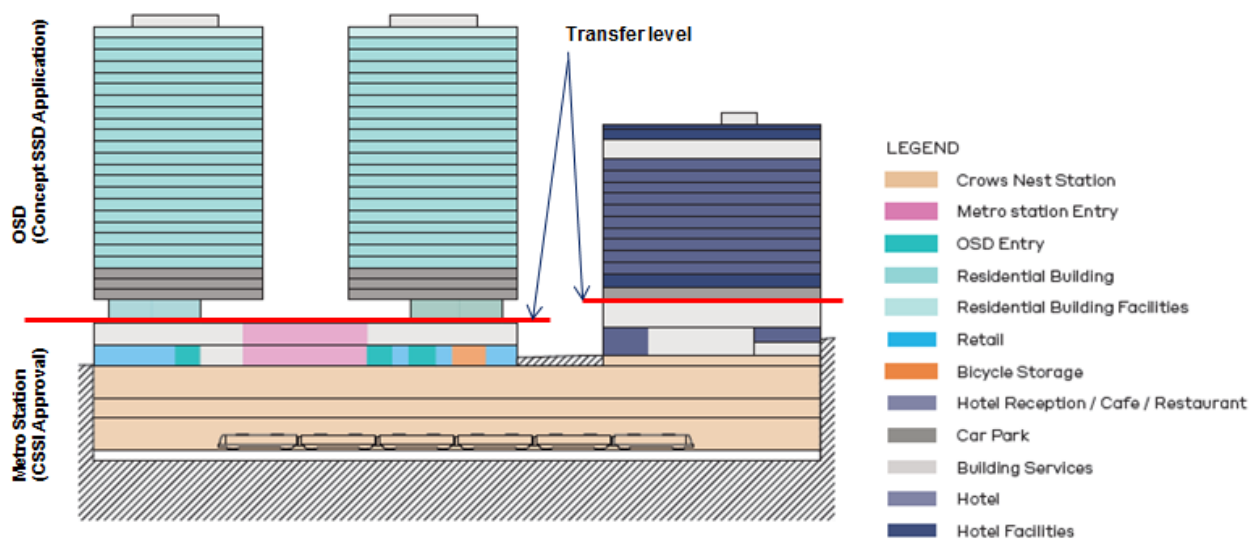


Figure 2: Delineation between the Metro station and OSD (based on indicative OSD design)

1.4 The strategic planning context

DPE is currently undertaking strategic planning investigations into revitalising the area surrounding St Leonards railway station and the metro station at Crows Nest. In August 2017, DPE released the *St Leonards and Crows Nest Station Precinct Interim Statement* and in October 2018 DPE released the *St Leonards and Crows Nest 2036 Draft Plan* (2036 Draft Plan) and supporting documents which detail recommended changes to land use controls in the precinct. These documents recommend new developments be centred around the Pacific Highway corridor and the Crows Nest Station while protecting the amenity of Willoughby Road.

In October 2018, DPE also placed on public exhibition the *Crows Nest Sydney Metro Site Rezoning Proposal* (Planning Proposal). The Planning Proposal outlines the State led rezoning of the subject site, on the basis that the current planning controls in the *North*

Sydney Local Environmental Plan 2013 do not reflect the opportunities for improved accessibility associated with the new metro station enabling people to live, work and spend time close to public transport. This concept SSD Application is aligned with the planning controls proposed in the Planning Proposal.

1.5 The site

Crows Nest Station precinct is located between the Pacific Highway and Clarke Street (eastern side of the Pacific Highway) and Oxley Street and south of Hume Street, Crows Nest (**Figure 3**).

The site is located within the North Sydney Local Government Area.

The Crows Nest Station precinct is divided into three separate sites as illustrated in **Figure 4** and described below:

- **Site A:** Six lots in the block bound by the Pacific Highway, Hume Street, Oxley Street and Clarke Lane (497-521 Pacific Highway, Crows Nest)
- **Site B:** Three lots on the southern corner of Hume Street and Pacific Highway (477-495 Pacific Highway, Crows Nest)
- **Site C:** One lot on the north-western corner of Hume Street and Clarke Street (14 Clarke Street, Crows Nest).

Sites A, B and C have a combined site area of 6,356 square metres.

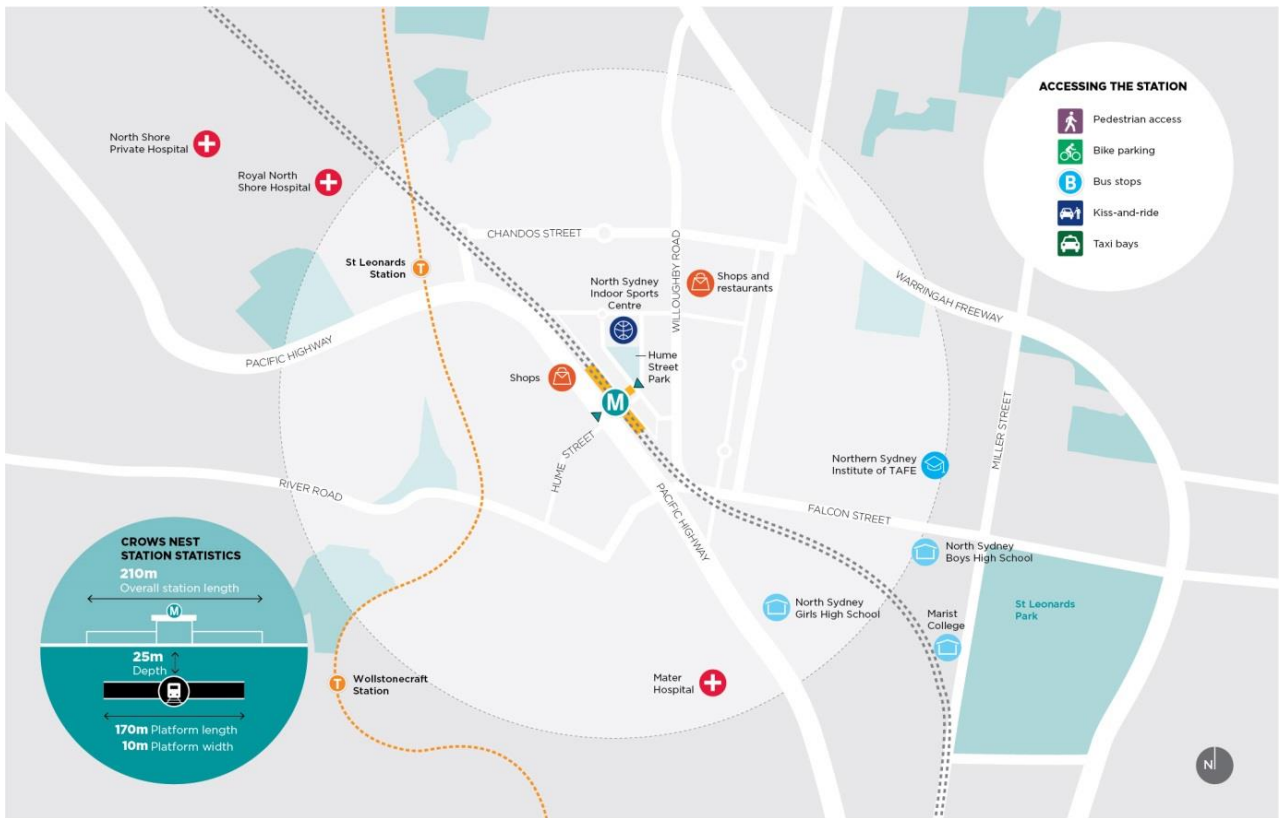


Figure 3: Crows Nest Station location plan



Figure 4: The subject site

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The site comprises the following properties:

- **Site A:**
 - 497 Pacific Highway (Lot 2 in DP 575046)
 - 501 Pacific Highway (Lot 1 in DP 575046)
 - 503-505 Pacific Highway (Lot 3 in DP 655677)
 - 507-509 Pacific Highway (Lot 4 in DP 1096359)
 - 511-519 Pacific Highway (SP 71539)
 - 521-543 Pacific Highway (Lot A and Lot B in DP 374468)
- **Site B:**
 - 477 Pacific Highway (Lot 100 in DP 747672)
 - 479 Pacific Highway (Lot 101 in DP 747672)
 - 491-495 Pacific Highway (Lot 100 in DP 442804)
- **Site C:**
 - 14 Clarke Street (Lot 1 in SP 52547)

1.6 Overview of the proposed development

This concept SSD Application comprises the first stage in the Crows Nest OSD project. It will be followed by a detailed SSD Application for the design and construction of the OSD to be lodged by the successful contractor who is awarded the contract to deliver the Integrated Station Development.

This concept SSD Application seeks approval for the planning and development framework and strategies to inform the future detailed design of the Crows Nest OSD.

The concept SSD Application specifically seeks approval for the following:

- maximum building envelopes for Sites A, B and C, including street wall heights and setbacks as illustrated in the plans prepared by Foster + Partners for Sydney Metro
- maximum building heights:
 - **Site A:** RL 183 metres or equivalent of 27 storeys (includes two station levels and conceptual OSD space in the podium approved under the CSSI Approval)
 - **Site B:** RL 155 metres or equivalent of 17 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval)
 - **Site C:** RL 127 metres or 8 storeys (includes two station levels and conceptual OSD space approved under the CSSI Approval)

Note 1: the maximum building heights defined above are measured to the top of the roof slab and exclude building parapets which will be resolved as part of future detailed SSD Application(s)

 - maximum height for a building services zone on top of each building to accommodate lift overruns, rooftop plant and services:
 - **Site A:** RL 188 or 5 metres
 - **Site B:** RL 158 or 3 metres
 - **Site C:** RL 132 or 5 metres

Note 1: the use of the space within the building services zone is restricted to non-habitable floor space.

Note 2: for the purposes of the concept SSD Application, the maximum height of the building envelope does not make provision for the following items, which will be resolved as part of the future detailed SSD Application(s):

- communication devices, antennae, satellite dishes, masts, flagpoles, chimneys, flues and the like, which are excluded from the calculation of building height pursuant to the standard definition in NSLEP 2013
- architectural roof features, which are subject to compliance with the provisions in Clause 5.6 of NSLEP 2013, and may exceed the maximum building height, subject to development consent.
- maximum gross floor area (GFA) of 55,400sqm for the OSD comprising the following based on the proposed land uses:
 - **Site A:** Residential accommodation - maximum 37,500 square metres (approximately 350 apartments)
 - **Site B:** Hotel / tourist accommodation and associated conference facilities or commercial office premises GFA - maximum of 15,200 square metres (approximately 250 hotel rooms)
 - **Site C:** Commercial office premises GFA - maximum of 2,700 square metres
 - **Site A or C:** social infrastructure GFA inclusive of the GFA figures nominated above for each site, with provision optional as follows:
 - Site A: podium rooftop (approximately 2,700 square metres)
 - Site C: three floors and rooftop (approximately 1,400 square metres)

Note 1: GFA figures exclude GFA attributed to the station and station retail space approved under the CSSI Approval

- a minimum non-residential floor space ratio (FSR) for the OSD across combined Sites A, B and C of 2.81:1 or the equivalent of 17,900 square metres
- the use of approximate conceptual areas associated with the OSD which have been provisioned for in the Crows Nest station box (CSSI Approval) including areas above ground level (i.e. OSD lobbies and associated spaces)
- a maximum of 150 car parking spaces on Sites A and B associated with the proposed commercial, hotel and residential uses
- loading, vehicular and pedestrian access arrangements
- strategies for utilities and services provision
- strategies for managing stormwater and drainage
- a strategy for the achievement of ecological sustainable development
- a public art strategy
- indicative signage zones
- a design excellence framework

- the future subdivision of parts of the OSD footprint, if required.

As this is a staged development pursuant to section 4.22 of the EP&A Act, future approval would be sought for the detailed design and construction of the OSD.

The proposed location of the buildings on the site is illustrated in the location plan provided at **Figure 5**.

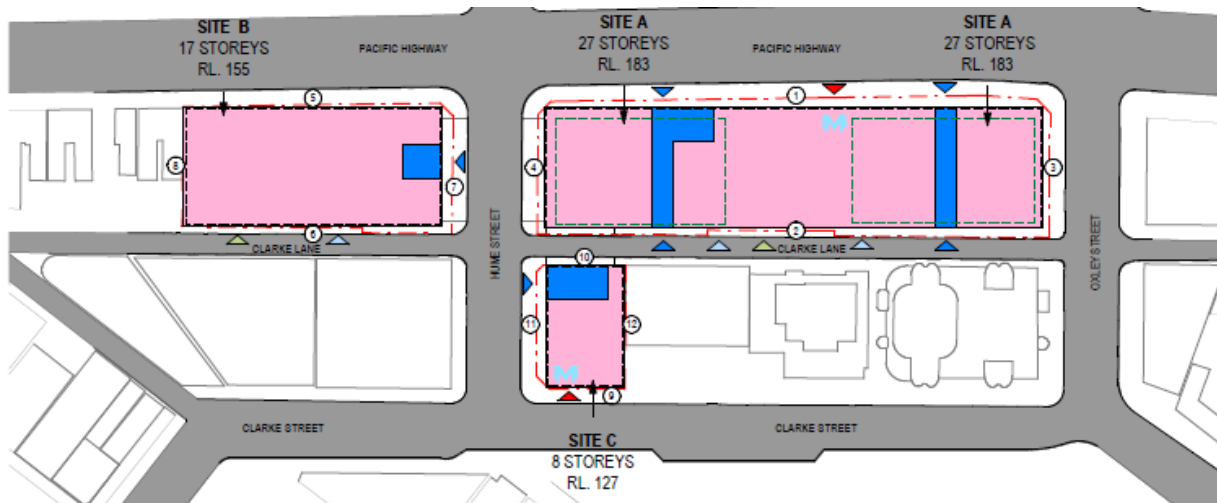


Figure 5 – Proposed location of buildings on the

The total GFA for the integrated station development, including the station GFA (i.e. retail, station circulation and associated facilities) and the OSD GFA is 60,400 square metres, equivalent to a floor space ratio (FSR) of 9.5:1.

The concept proposal includes opportunities for community uses in the development on either Site A or Site C. This space has the potential to be used for a range of uses including community facilities, child care centre, recreational area/s, library, co-working space, which can take advantage of the sites accessibility above the metro station.

Through design development post the CSSI Approval, pedestrian access to the metro station is proposed from the Pacific Highway and from Clarke Street, opposite the Hume Street Park. Vehicular access to the site including separate access to the loading docks and parking is proposed from Clarke Lane.

Public domain works around the site would be delivered as part of the CSSI Approval. Notwithstanding, the OSD will be appropriately designed to complement the station and activate the public domain. Provision for retail tenancies to activate the public domain are included in the ground floor of Sites A, B and C, as part of the CSSI Approval. Future detailed development applications will seek approval for the fitout and specific use of this retail space.

Drawings illustrating the proposed building envelopes are provided in Figures 6A and 6B. The concept SSD Application includes an indicative design for the OSD to demonstrate one potential design solution within the proposed building envelope (refer to Figure 7).

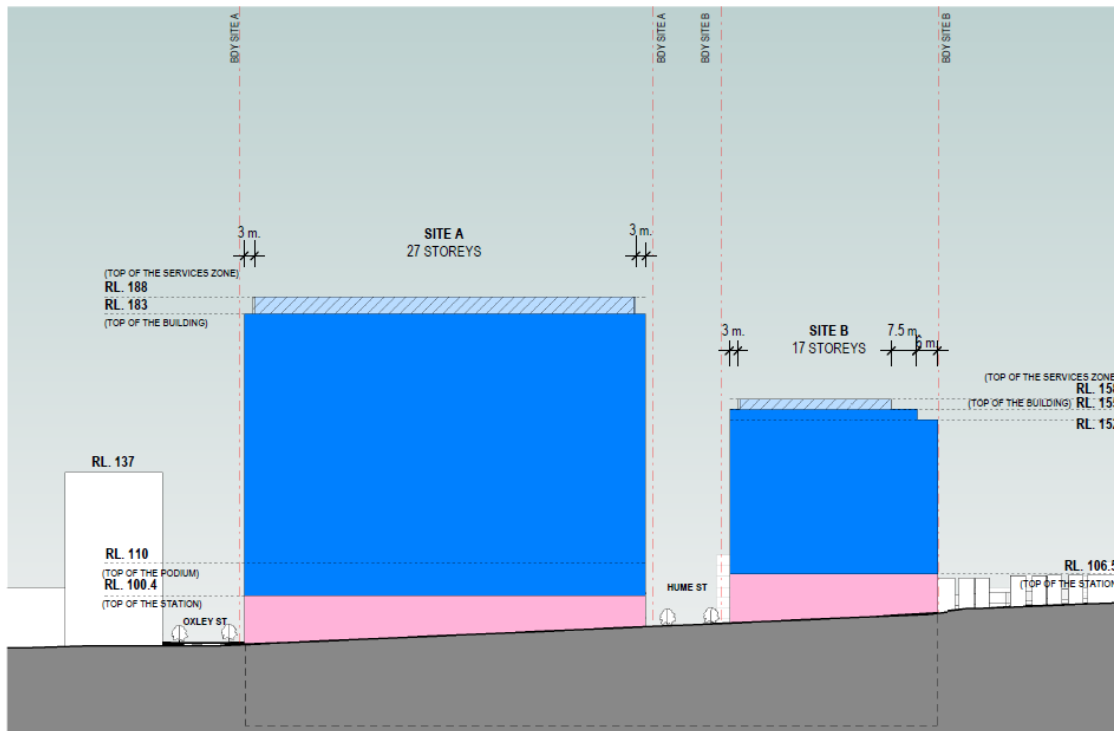


Figure 6A: Proposed Crows Nest OSD building envelopes – west elevation (Pacific Highway)

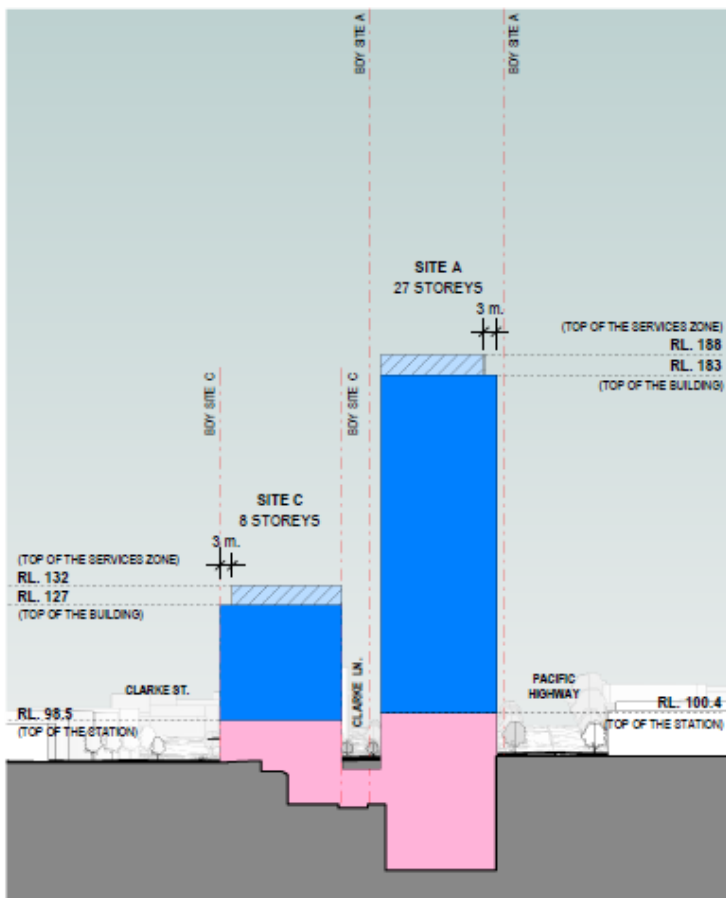


Figure 6B: Proposed Crows Nest OSD building envelopes – cross section through the site (east-west)



Figure 7: Crows Nest OSD indicative design

2.0 Scope of assessment

2.1 Introduction

This report documents an aeronautical impact assessment that has been undertaken for the OSD concept (concept proposal) prepared by Sydney Metro above Crows Nest Station. The assessment considers the potential approvability of the concept proposal under the *Airports (Protection of Airspace) Regulations* (APAR), which is administered by the Commonwealth Department of Infrastructure, Regional Development and Cities (DIRDC).

The primary factors relevant to the assessment are the location of the proposed development in relation to Sydney Airport and the maximum heights of proposed building envelopes in relation to the Prescribed Airspace of the airport. The proximity of the site in relation to the helipad atop the nearby Royal North Shore Hospital, which is defined as a Strategic Helicopter Landing Site (SHLS) under the *National Airports Safeguarding Framework* (NASF), also necessitates assessment of the potential impact of the concept proposal on helicopter flight paths to and from this facility.

The airspace constraints are examined in relation to the maximum building envelopes proposed, as illustrated in **Figure 6** and **Figure 8**.

Further, in order to demonstrate at this stage of planning that future development of the concept proposal is feasible within the scope of the APAR, the airspace that would ultimately be required for cranes necessary to enable the development is also evaluated.

This report has been prepared having regard to Prescribed Airspace for Sydney Airport. It examines the current and forecast regulated airspace height limits constraints overhead the site that are related to aviation airspace protection requirements and which would:

- c) trigger the requirement to apply for an airspace height approval
- d) constrain the maximum permissible building envelope heights
- e) constrain the maximum permissible heights for cranes, information which would be used by the aviation stakeholders and DIRDC in their own evaluations of the potential approvability of any future application for an airspace height approval of the building envelopes.

2.2 The Proposed Development from the Aviation Perspective

From the aviation perspective, the key elements of the proposed development that are relevant at this stage of assessment are the three taller building envelopes. The rooftop elevations of the building envelopes, as depicted in **Figure 8** below, are:

- 188m AHD — Building A North (residential), between Oxley & Hume Sts
- 188m AHD — Building A South (residential), between Oxley & Hume Sts
- 158m AHD — Building B (commercial or hotel), south of Hume St

The Clark Street building on Site C, proposed to be 8 storeys (132m AHD), does not need to be considered further because:

- its maximum height would be well below the *Obstacle Limitation Surface* (OLS) height threshold and so would not need prior airspace approval
- it would be shielded by the taller towers between it and Sydney Airport in the event of approval of the three principal buildings.

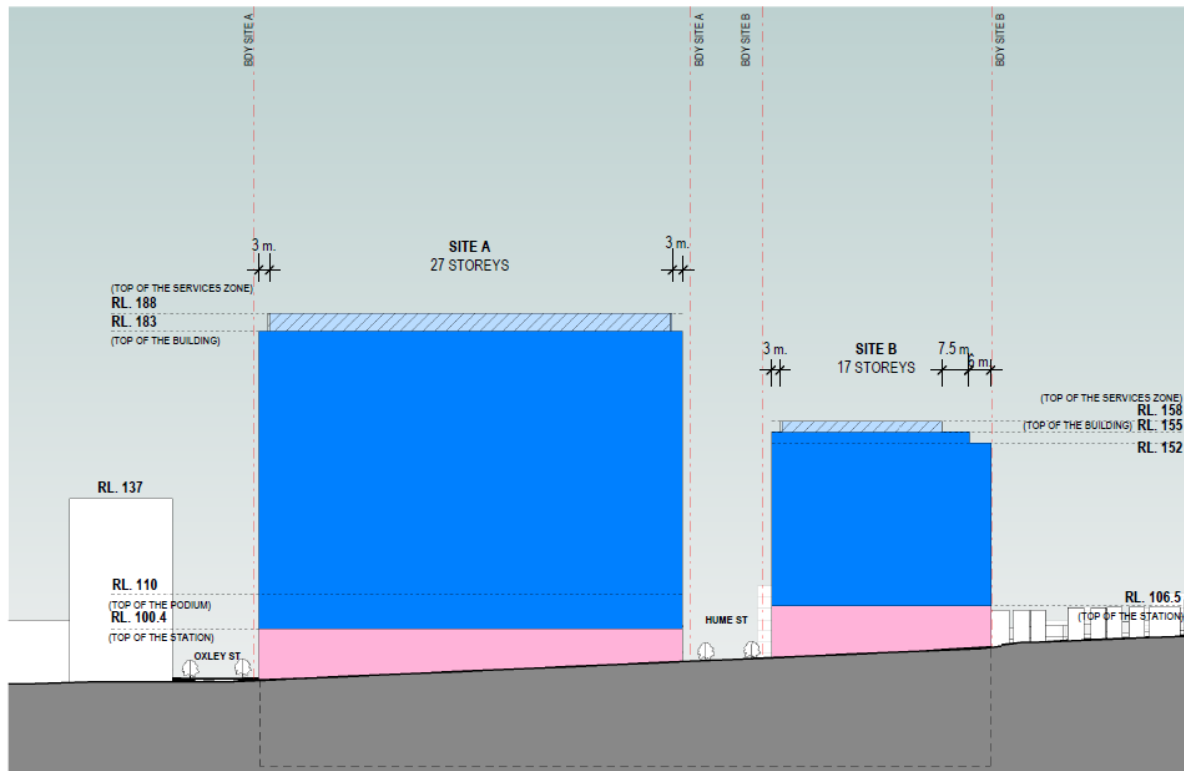


Figure 8 — Proposed Crows Nest OSD building envelopes- west elevation (Pacific Highway)

3.0 Relevant Standards, Guidelines & Assessment Criteria

The following standards and guidelines are considered applicable to this project and have been utilised or referenced where appropriate.

3.1 Airspace Regulations

The proposed development site is subject to the *Airports (Protection of Airspace) Regulations* (APAR), under the *Commonwealth's Airports Act, 1996*, because of its proximity to Sydney Airport and because of its proposed height. These regulations define both: how building height limitations due to airspace safety can be determined; the different evaluation thresholds and conditions for approval of permanent buildings and structures (controlled activities) and temporary structures such as cranes (*short-term controlled activities*); and the process for gaining approval of the proposed development under the regulations.

The Prescribed Airspace Regulations and their impact upon building height limitations are described below.

3.2 Prescribed Airspace

Prescribed airspace under these regulations, includes:

■ Obstacle Limitation Surfaces (OLS)

- The OLS surfaces are used to identify buildings and other structures that may have an impact upon the safety or regularity of aircraft operations at an airport. This impact depends upon both the type of operations at the aerodrome and which OLS surfaces are penetrated by a (proposed) building or structure.
- The OLS are flat and rising (invisible) surfaces around the airport. They are based on the geometry of the airport and its runways and therefore they rarely change.
- If a permanent building development (or temporary crane) that is proposed at a height that will penetrate (exceed) the height limit of an OLS surface, then an application must be made to the Commonwealth DIRDC — via the closest airport, and with copies to any other potentially affected airport — for an airspace height approval prior to construction of the permanent development &/or erection of the temporary crane obstacle. Such applications should demonstrate the proposed building height does not penetrate or adversely affect surfaces protecting: instrument flight procedures (PANS-OPS surfaces); radar vectoring; navigation infrastructure; or anything else that might affect the safety or regularity of operations at the airport.

■ PANS-OPS Surfaces

- PANS-OPS surfaces represent the protection surfaces for published instrument flight procedures to and from the airport. These surfaces comprise flat, sloping and complex surface components.

- PANS-OPS surfaces must not be penetrated by permanent buildings or structures, nor temporary structures of things for a period of longer than 3 months (the latter only via prior approval and the support of the airport). However, for a variety of reasons, PANS-OPS surfaces can and do change over time.
- As flight procedures change from time to time (pursuant to safety and/or operational requirements identified by Airservices Australia), the PANS-OPS Surface Plan published by an airport may not reflect the current situation — which is why we not only reference the airport's plans but also review the published charts for current (or pending) instrument flight procedures and evaluate the associated PANS-OPS height limits. The regulations also make a provision for any factor which may be deemed to adversely affect the safety, regularity or efficiency of aircraft operations at an airport. In light of this, it is necessary to consider the following factors detailed below.

■ Other Considerations

- **Sydney Airport's Declared Airspace Plans*** additionally include:
 - Radar Terrain Clearance Charts (RTCC), which depict the areas and height limits related to the Minimum Vector Altitudes (MVAs) used by Air Traffic Controllers when vectoring aircraft;
 - Lighting and visual guidance protection plans — used for approach guidance by aircraft, especially at night and in times of poor visibility; and
 - Navaid and radar evaluation / protection surface plans.

* Note: Airspace that is approved by DIRDC as Declared Airspace and is considered part of an airport's Prescribed Airspace.

➤ Other Factors

- Protection for other Instrument Flight Procedure surfaces, where the procedures are not classified as PANS-OPS and/or have been omitted from Sydney Airport's declared PANS-OPS surfaces charts. These may include a variety of Required Navigation Procedures (RNP).
- Airline Engine-Out (Contingency) Take-Off Splays
(as per Civil Aviation Order 20.7 1b)
These are generally assessed independently by the airlines as part of their own evaluations of any given airspace height application, but it is prudent to evaluate any potential impact in advance.
- Other miscellaneous factors that may be considered as potential safety issues by any of the key stakeholders and the *Civil Aviation Safety Authority* (CASA). This may also include protection of critical airspace for visual flight procedures used for emergency service helicopter landing sites.

3.3 Note about Heights: Australian Height Datum (AHD) vs Above Ground Level (AGL)

All “heights” provided in this document are elevations expressed in metres in Australian Height Datum (AHD) — and thus they are true elevations, and NOT heights above ground level (AGL).

For estimating maximum development heights AGL, the ground elevation AHD should be subtracted from the airspace height limits also expressed in AHD.

It should be noted that for aviation-related airspace height limits, any building height approval under the APAR is regarded as inclusive of the building itself, plus all rooftop furniture and overruns (plant buildings, lift risers, antennae, etc).

3.4 Making an Application for an Aviation-related Airspace Height Approval

All applications under APAR must be submitted to DIRDC at the appropriate time through the closest relevant airport — in this case, Sydney Airport. Applications should include aeronautical impact assessment report(s) — such as this, but which are based on the most current plans for the proposed development available at the time. For major developments, such reports should include consideration of cranes that will be required for construction. This information will be used for assessment of the feasibility of constructing the buildings if approved at the maximum heights sought. Safety impact assessments and mitigation strategies may need to be included in the aeronautical study, depending on the nature and location of the development in relation to the airspace restrictions and other aeronautical impact factors. A successful application for the concept proposal would be given approval under Regulation 14 of the APAR as a controlled activity.

Applications for cranes themselves are not required for the concept SSD application. If cranes are required for construction in the future, separate applications would be required for cranes as temporary controlled activities under Regulation 14(5) of the APAR.

4.0 Existing Environment

4.1 Location in relation to Sydney Airport

The site, located on the eastern side of the Pacific Highway at Crows Nest, south of Oxley Street, as indicated in **Figure 5**. The majority of the development is located in the blocks between Pacific Highway and Clark Lane to the east.

The study area is located approximately 13.4 km (7.25 Nautical Miles, NM) north-north-east of the aerodrome reference point of Sydney Airport, as indicated in **Figure 10**.

The measurement point used for this preliminary aeronautical assessment is at the southern-eastern corner of Building B, the approximate coordinates* being:

Latitude:	33° 49' 35.08" S	Longitude:	151° 11' 58.94" E	
Easting:	333,398.785	Northing:	6,255,633.607	Zone 56

* NB: These are not survey coordinates. They have been digitised from GoogleEarth™, having registered the roof plan in situ.



Figure 9 — Location of Aeronautical Assessment Coordinate

The other airports in the Sydney Basin are too distant from the study area to have any impact on the airspace overhead it.

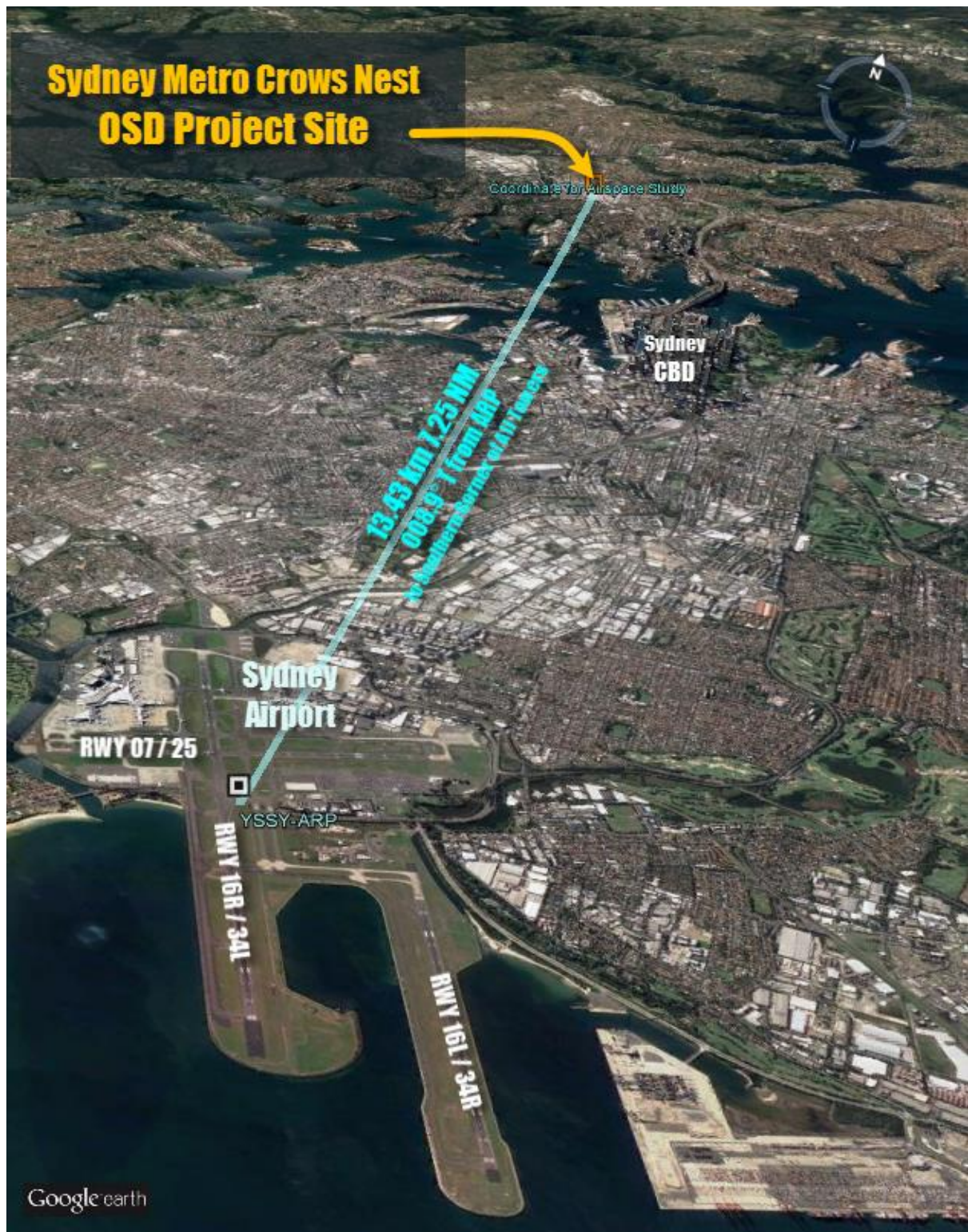


Figure 10 — Project site in relation to Sydney Airport (Large Format)

4.2 Proximity to nearby Royal North Shore Hospital Helipad

The *National Airports Safeguarding Framework* (NASF) was updated in 2018 to include a new guideline — Guideline H — to provide guidance on protecting strategically important *Helicopter Landing Sites* (HLS). Helipads associated with hospitals are generally considered to be *Strategic Helicopter Landing Sites* (SHLS). Recommendations of Guideline H, whilst not supported by any specific commonwealth legislations, place a strong onus on Commonwealth, State and local planning authorities to consider planning proposals within the potential sphere of influence of such facilities to help assure that they can continue to be accessed and used safely.

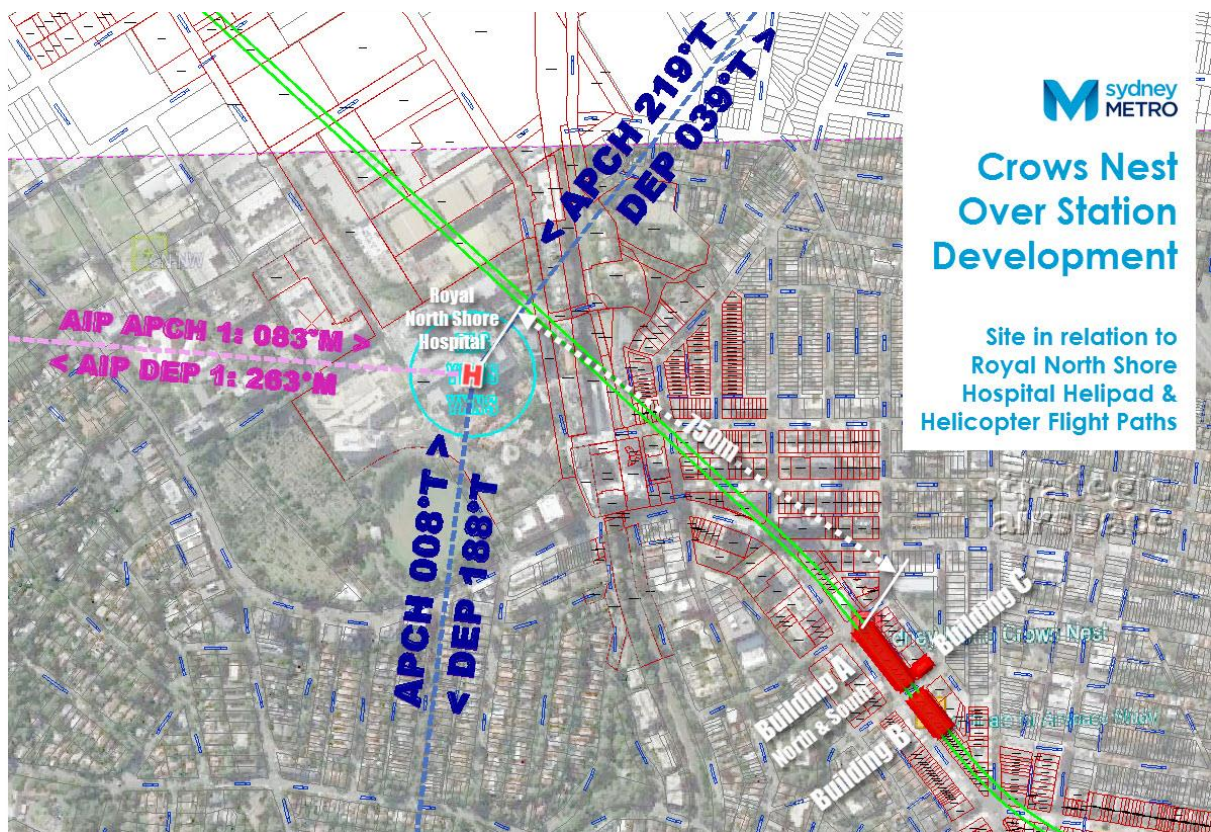


Figure 11 — Project site in relation to the Royal North Shore Hospital Helipad and Flight Paths

The concept SSD, at the closest point of the site, is approximately 750m from the SHLS of the Royal North Shore Hospital helipad, a major trauma treatment hospital. The *helicopter emergency management services* (HEMS) to this facility are provided by the NSW Ambulance helicopter service.

5.0 Assessment

The impact of the various building height limitations, from lowest to highest, is summarised in the following table.

Table 1: Summary — Airspace Height Constraints

Height Limits (AHD)	Height Limit Detail	Comment
156m	OLS Outer Horizontal Surface (OHS)	<p>THRESHOLD HEIGHT limits (depicted in Figure 12)</p> <p>Any development that would exceed the relevant limiting heights across the site would require a prior 'airspace height' approval from DIRDC under the APAR.</p> <p>An application can be made for each building separately, or a single application can be made for the all buildings within the development that would exceed this height.</p>
335.2m	PANS-OPS 10NM MSA	<p>This constraint is the maximum permissible building height (including crane heights) at the site that would be approved by the aviation authorities in the relevant areas (see Figure 13)</p> <p>The vertical space available between the top of the building envelopes and this PANS-OPS height constraint leaves ample room for cranes.</p>
335.2m	Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)	<p>This constraint is the maximum permissible building height (including crane heights) that would be approved by the aviation authorities in the relevant areas (see Figure 14)</p> <p>The vertical space available between the likely maximum proposed building envelope heights and the applicable airspace height constraint leaves ample room for cranes.</p>
N/A or >340m	PANS-OPS Approaches & Departures Surfaces	<p>The study area is outside the extent of the protection areas of PANS-OPS Approach Surfaces for Sydney Airport. Where PANS-OPS Missed Approach and Departure Procedure Surfaces do overlay the study area, the limiting heights are higher than that of the PANS-OPS 10NM MSA and RTCC MVA constraints.</p> <p>The height limits related to the departure procedures would be higher than ~540m AHD.</p>
NA	Other Surfaces	<p>The study area is outside any airspace protection requirements related to Sydney Airport's Navigation and Airport Lighting and Visual Guidance facilities, as well as those related to Airline Engine Inoperative contingency take-off procedures.</p>

5.1 OLS Analysis

The height limit of Sydney Airport's OLS overhead the precinct is defined by the Outer Horizontal Surface, which is 156m AHD, as depicted in **Figure 12**.



Figure 12 — Project site in relation to Sydney Airport (Large Format)

Buildings and cranes may exceed the OLS height limits, but if planned as such an application for the aviation-related airspace approval for the proposed development must be submitted to DIRDC, via Sydney Airport. Failure to obtain such approval before construction commences can result in significant penalties under the *Airports Act, 1996*.

Conversely, airspace height approvals are not required for any buildings or cranes that would not exceed the OLS height limits. This means that approval is not required for the building envelope on Site C, which has a proposed maximum of height of 132m AHD inclusive of the building services zone.

The *Sydney Airport Master Plan 2033* does not forecast any changes to the aerodrome that would occasion a change to the OLS. This remains true for the draft *Sydney Airport Master Plan 2039* released in September 2018 for preliminary comment. Thus, the current OLS is anticipated to remain in force for the planning horizon of the project.

Table 2: OLS Height Impact & APAR Approval Implications

Height Limits (AHD)	Max Building Envelope Height including building services zone (m AHD)	Penetration of OLS 156m AHD	Comment
Building A North	188	32 metres	Requires prior APAR Approval
Building A South	188	32 metres	Requires prior APAR Approval
Building B	158	2 metres	Requires prior APAR Approval
Building C	132	-24 metres CLEAR	Prior APAR approval not required

Under the Civil Aviation Safety Regulations Manual of Standards (CASR MOS) Part 139, any building that penetrates an OLS is subject to obstacle lighting conditions. The recommendations as to the conditions that should be imposed as part of an approval would be made by the Civil Aviation Safety Authority (CASA) to the DIRDC. It is highly likely that Building A North and Building B would be required to have obstacle lights installed and operational. Building A South may or may not require obstacle lights, subject to CASA's assessment of the relative height and location of this building in relation to the other two buildings on the development site.

5.2 PANS-OPS Analysis

In addition to reviewing the PANS-OPS Surfaces chart of Sydney Airport's Prescribed Airspace (as declared and approved by DIRDC in 2015), assessment was conducted of the following instrument (non-visual) procedure types for Sydney Airport, as published by Airservices Australia in the Australian Aeronautical Information Publication (AIP) *Departure and Approach Procedures* (DAP), up to the pending Amendment 156 (effective 16-Aug-2018 to 07-Nov-2018):

- The Circling Minima and Minimum Sector Altitudes (MSAs) for existing PANS-OPS procedures
"Area" procedures, which provide protection for aircraft manoeuvring or circling within defined areas above the airport and surrounds
- The discrete minima for the Instrument Approach Procedures
- Missed Approaches — as part of the evaluation of Approach Procedures
- The existing Standard Instrument Departure Procedures (SIDs)
- Minimum Sector Altitude – 10 NM Sector.

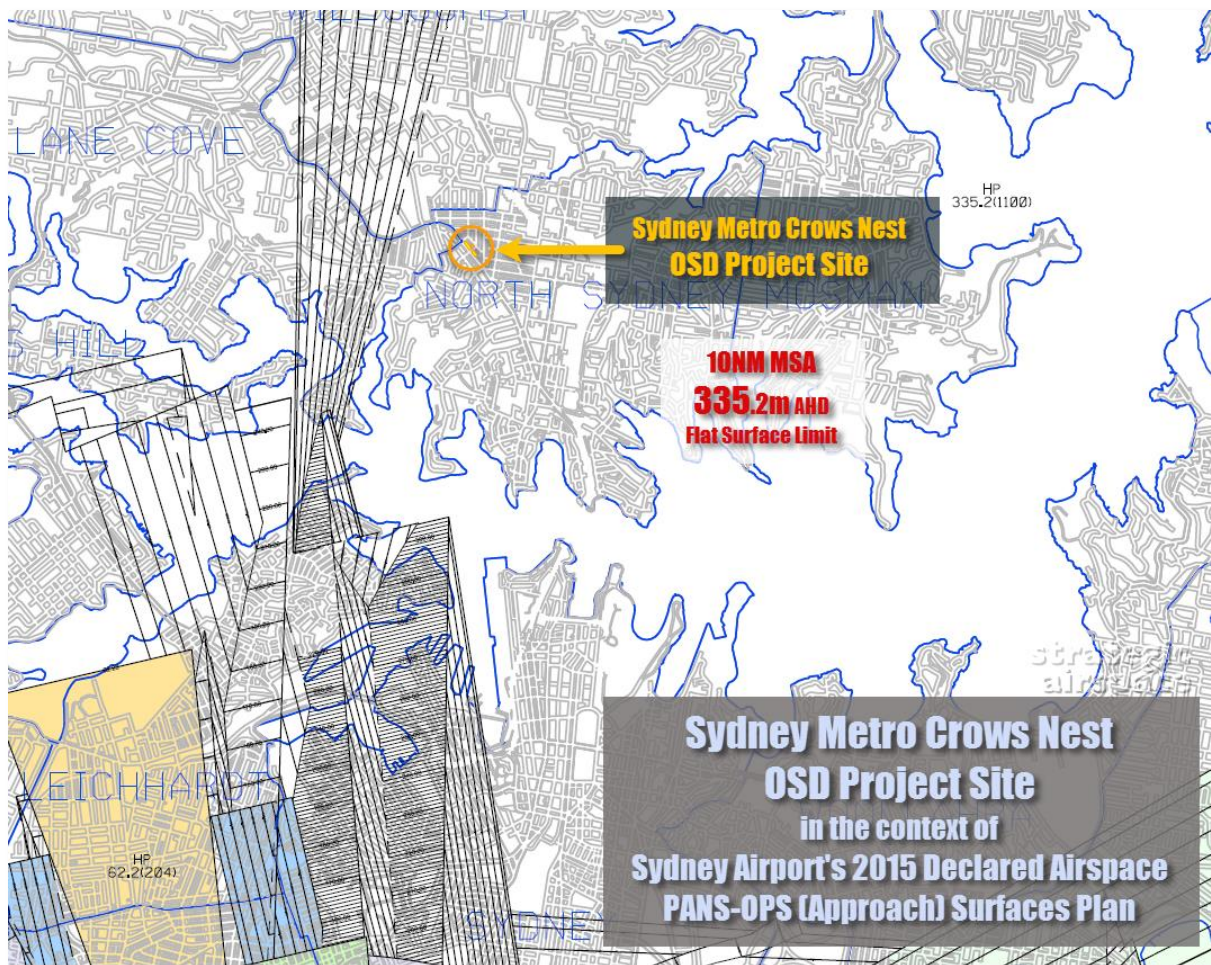


Figure 13 — PANS-OPS Approach Procedure Height Constraints across the Site (SACL Plan)

Of the approach and departure procedures, only procedures that might be relevant to the project site are included in this report. Principally these are procedures for the eastern North-South runway, RWY 16L/34R, departures from RWY 07, and “area” procedures.

The current approved *Sydney Airport Master Plan 2033* and the draft *Sydney Airport Master Plan 2039* were also reviewed for potential future impact. Neither of the Master Plan versions forecast changes to procedures that would, to our best knowledge, make the airspace above the project site any more constraining than that resulting from analysis of the current PANS-OPS procedures.

Analysis determined that the precinct is not constrained by protection surfaces related to approach flight procedures to runways at Sydney Airport, and although the precinct is under the protection surfaces for some missed approach and departure procedures, the effective height limit imposed on the site is by the surface related to the 10 NM Minimum Sector Altitude (MSA). See sections 5.2.1, 5.2.2 and 5.2.3 for further details.

Table 3: PANS-OPS Height Impact & APAR Approval Implications

Procedure	Height Limit (m AHD)	Comment
Minimum Sector Altitude (MSA)	335.2	The 10 NM Minimum Sector Altitude of 2100 ft results in this surface height constraint. This limit applies across the entire site area.
Circling Areas	N/A	This site is outside the extent of the Circling Areas.
Approaches and Missed Approaches to all Runways	N/A or >340	Outside the lateral protection areas of many procedures. Where protection surfaces overlay the study area, the lowest limit is higher than that of the maximum permissible obstacle constraint imposed by the 10NM MSA (refer 5.2.2).
Departures	N/A or >~540	Where protection surfaces overlay the study area, the lowest limit is higher than that of the maximum permissible obstacle constraint imposed by the 10NM MSA (refer 5.2.3).

Table 4: PANS-OPS Height Impact & APAR Approval Implications

Height Limits (AHD)	Max Building Envelope Height including building services zone (m AHD)	CLEAR of PANS-OPS 335m AHD	Comment
Building A North	188	147	Approvable under APAR
Building A South	188	147	Approvable under APAR
Building B	158	177	Approvable under APAR
Building C	132	203	Prior APAR approval not required because it does not infringe the OLS

Further details are provided in the following sections.

5.2.1 “Area” Procedures

5.2.1.1 Minimum Sector Altitudes (MSAs)

The MSA protects area manoeuvring by aircraft within defined sectors. The relevant sector is a circular area of 10 NM in radius (plus a 5NM buffer) around the airport. The height restriction imposed by 10NM MSA is lower than the limits imposed by other procedures (eg, departure procedures) which also overlay the site.

Table 5: Minimum Sector Altitude (MSA)

Procedure	Height Limit (m AHD)	Comment
10NM MSA	Horizontal Surface 335.2m	See Figure 13 above. Covers the entire site.

5.2.1.2 Circling Minima

The site is outside the extent of the circling procedures.

5.2.2 Instrument Approaches & Missed Approaches

The impact of each of the relevant PANS-OPS protection surfaces for current approach and departure procedures for Sydney Airport are summarised below. The lateral extent of restrictions is shown in the diagrams (where appropriate).

5.2.2.1 Approach Procedures to RWY 16L and RWY 25

The site is laterally clear of the protection surfaces of the following procedures:

- RWY 25 RNAV(GNSS) Approach
- RWY 25 ILS and GLS Approaches
- RWY 16L RNAV(GNSS) Approach
- RWY 16L ILS and GLS Approaches

5.2.2.2 Missed Approach Segments of Approach Procedures for RWY 07 and RWY 34R

The precinct is unconstrained by the following procedures, either because the limiting heights are so high (higher than other more restrictive surfaces) or the site is laterally outside the protection surfaces.

- RWY 07 RNAV(GNSS) Missed Approach
- RWY 07 ILS and GLS Approaches
- RWY 34R RNAV(GNSS) Missed Approach
- RWY 34R ILS and GLS Missed Approaches

5.2.3 Departures

Height limitations may be imposed by departure procedures from both RWY34R and RWY07, but the limiting heights overhead the project site are significantly higher than the limit imposed by the 10NM MSA. For example, the most restrictive of the height limits from any departure, as shown on Sydney Airport's 2015 Declared Airspace chart for Omnidirectional Radar Departures is above 400m AHD. However, this particular chart is not entirely correct and is also obsolete due to change of procedures since the time it was drafted and approved, and also because of a change in the PANS-OPS departure criteria at the end of 2016. The independent calculations of the PANS-OPS omnidirectional departure procedures made by Strategic Airspace indicate that the height constraints from the current procedures (from RWY34R and RWY07) are of the order of ~540m AHD.

5.2.4 Other Assessment Considerations

The following table provides a brief assessment of other considerations.

Table 6: PANS-OPS Height Impact & APAR Approval Implications

Procedure	Height Limit (m AHD)	Comment
Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)	335.2	This height constraint is applicable over the entire site. This is the limit related to the Minimum Vectoring Altitude (MVA), which is used by air traffic controllers. This information is sourced from the RTCC published as part of Sydney Airport's Prescribed Airspace Plans.
Navigation Infrastructure	N/A	The proposed development is too far from the airport to affect any navigation infrastructure.
Airlines Engine Out Procedures	N/A	Engine Out procedures (from RWY 34R, the most relevant take-off runway end for these procedures) are designed and maintained by each of the passenger transport aircraft operators in accordance with the relevant regulations. All such procedures necessarily take into account Sydney Tower Eye, which is closer to the airport and taller than the proposed development. As such this proposal will not adversely affect any contingency procedures.
HEMS* Flights to/from Royal North Shore (RNS) Hospital Helipad	N/A	* Helicopter Emergency Medical Service (HEMS) The proposed development is laterally clear of the published Fly Neighbourly flight paths used by the HEMS operator.

There are no other considerations that might limit the building height at the project site.

5.2.5 Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA) Surface

The surface depicted in Sydney Airport's Radar Terrain Clearance Chart (RTCC) overhead the site protects the airspace used by air traffic controllers as the lowest Minimum Vector Altitude (MVA) they can use for vectoring aircraft.

The RTCC / MVA height limit overhead the entire study area is 335.2m AHD. This surface constraint becomes the effective limit where it is lower than surface heights related to PANS-OPS approach and departure procedures. In this case, the height constraint is the same as that for the PANS-OPS limit which stems from the 10NM MSA. The relevant RTCC surface boundary is depicted in relation to the site in **Figure 14**.

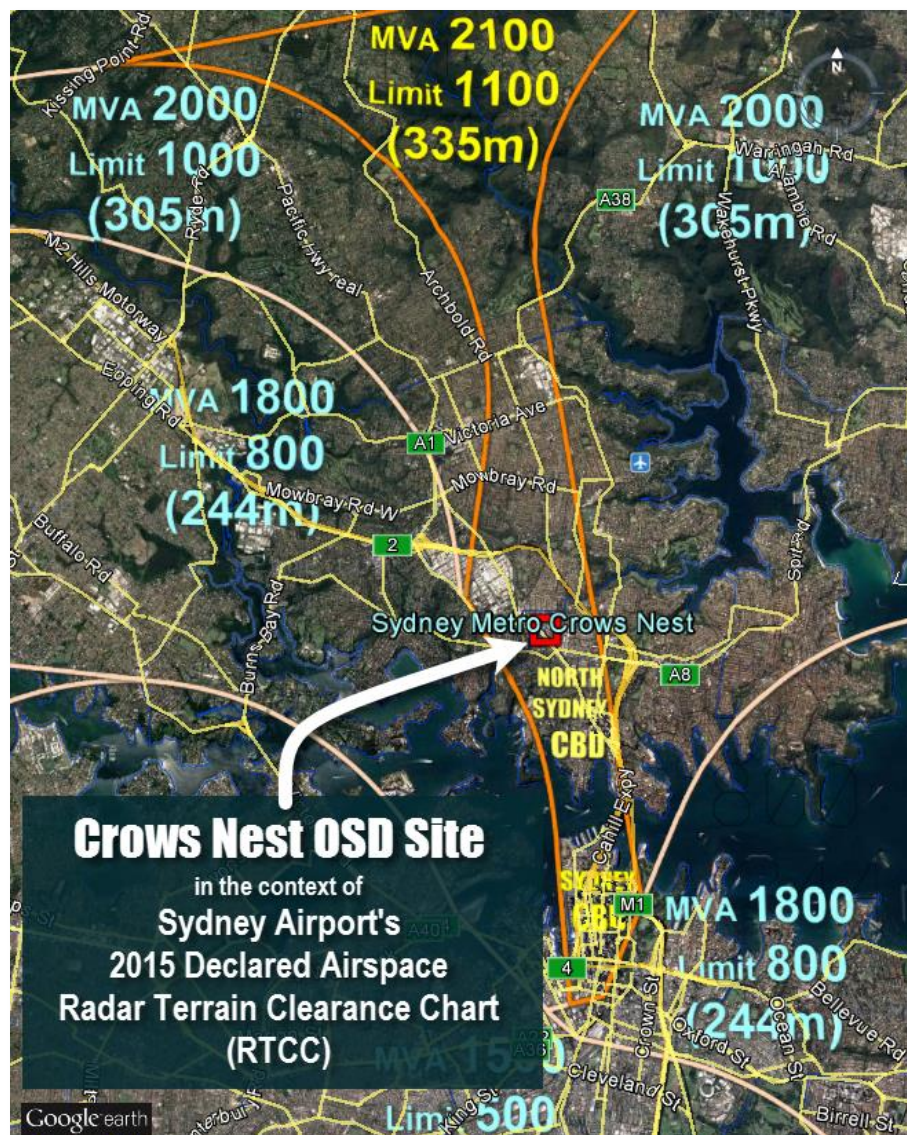


Figure 14 — Radar Terrain Clearance Chart (RTCC) Height Constraints across the Site (SACL Plan over GoogleEarth Image)

5.2.6 Helicopter Emergency Management Services (HEMS) Flights

Whilst not part of the Prescribed Airspace of Sydney Airport, the close proximity of the *strategic helicopter landing site* (SHLS) at the Royal North Shore hospital and the requirement to not measurably interfere with access to the helipad, nor have an adverse impact on the safety of helicopter emergency management service (HEMS) flights to/from the hospital, would be considered by CASA when commenting on any future height application under APAR for the proposed development.

The site (at the closest corner, the north-west corner) is approximately 0.75km (0.4NM) at a bearing of 112°M (125°T) from the Royal North Shore (RNS) Hospital helipad which is used by Helicopter Emergency Management Service helicopters operated by NSW Ambulance.

The key operational data and standard ‘Fly Neighbourly’ and Preferred flight paths for this SHLS are published both on the OzRunways.com.au website (used by the helicopter operators) and in the Facility entry in the *En-Route Supplement Australia* (ERSA) published by Airservices Australia. There are two primary flight paths for this SHLS are associated with approaches from and departures to the north-east and south-west sectors, as depicted in dark blue in **Figure 11**. The AIP Preferred Flight Path 1 published in ERSA (which is understood to be not commonly used) is the Gore Hill Cemetery path (illustrated as the AIP APCH 1 and AIP DEP 1 path in **Figure 11**). The concept OSD is laterally clear of the assessment areas that would be associated with any of these flight paths.

Note also that the Preferred Flight 2 published in ERSA appears to be in conflict with flight paths actually flown and is currently subject to clarification and confirmation by the HEMS operator and Airservices Australia. Hence this flight path has not been considered in this report.

Regardless of the preferred, published procedure paths, a HEMS flight could in fact approach the HLS from any location, but must at present fly using Visual Flight Rules (VFR) and they generally follow paths that avoid tall obstacles, especially as they near the landing site. In this regard, it is worth noting that the existing St Leonards Station building lies directly between the Crows Nest OSD site and the RNS helipad. Further, the direction of the Crows Nest OSD site to/from the RNS HLS does not align with any of the potentially tertiary flight paths that could conceivably be considered optimal for landing on the helipad. Additionally, there are other areas within the same radial distance from the HLS which would provide more clear flight paths, with lower existing terrain and buildings.

Evaluation of these factors taken together leads to the conclusion that the building envelopes proposed for the Crows Nest OSD (Building A North being closest) would not contribute any adverse impact to the accessibility of the SHLS to HEMS flights or the safety of such operations to the RNS SHLS.

5.3 Provisional Assessment of Cranes to Support Feasibility of APAR Height Approvals for Proposed Buildings

It is likely that cranes required for construction of Buildings A North and South and Building B would infringe the OLS and would therefore be subject to assessment and prior approval under the *Airports (Protection of Airspace) Regulations*.

Given the PANS-OPS height constraint overhead the site, there is ample space vertically for cranes to operate without infringing the PANS-OPS surface height limit. As such, the potential impact of cranes would not be considered problematic when assessing any height applications under the APAR for the future buildings within the building envelopes proposed in this SSD Application. As detailed in section 1.5, future approval would be sought for the detailed design of the Crows Nest OSD. If necessary, future approvals would be sought under the APAR.

5.4 Consultations

The feedback from the key stakeholders and DIRDC supported and confirmed the methodology and key elements of the assessment undertaken and documented in this report. CASA also indicated that in their opinion the assessment of this proposal, based on the maximum heights of the tallest building envelopes, would be routine (ie, they would not anticipate any complexity or difficulty when the time comes to assess an application for an APAR approval for this concept proposal).

The feedback from each organisation consulted is summarised in the sections below.

5.4.1 Response from Sydney Airport

The letter by Sydney Airport (6th September 2018, their reference Registration No 18/0699) in response to the Request for SEARs reinforced the assessments and conclusions of this study — namely that:

- The 156m AHD OLS height applicable overhead the site;
- Proposed developments which would exceed that height would be subject to assessment by aviation stakeholders prior to an APAR determination by DIRDC; and
- Cranes required to develop within the building envelopes may be required to operate at heights substantially higher than the proposed developments, and thus APAR approvals for such should be assured (or secured) prior to any commitment to construct.

A subsequent telephone discussion with the respondent, the Airfield Design Manager, confirmed no change from that written position.

5.4.2 Response from CASA

The 13th September 2018 reply to the Request for SEARs confirms that the taller buildings, which would infringe the OLS height of 156m AHD, would require a prior APAR approval. They also comment that it will be a routine obstacle assessment, noting that CASA has assessed several buildings in the area of over 200m AHD.

In a separate telephone discussion with the respondent, the Aerodrome Engineer, he did not foresee any obstructions to an APAR approval of the concept proposal, on the basis that the site was confirmed clear of the helicopter paths associated with the nearby Royal North Shore hospital.

5.4.3 Response from Airservices Australia

The Airport Developments section of Airservices Australia, in their 5th September 2018 response to the Request for SEARs for the Crows Nest OSD SSD 9579, recommended that an aviation consultant is engaged to assess the potential impacts to aviation. They did not perform a technical of review the information provided.

5.4.4 Consultation regarding Potential Impact on HEMS Flights to/from Royal North Shore Hospital SHLS

As noted in section 5.2.6, the Senior Contract Pilot for Toll Helicopters who provide the HEMS flights under contract for NSW Ambulance to the Royal North Shore Hospital SHLS has confirmed the details of the flight paths actually used in day-to-day operations to and from the helipad. During these discussions he also confirmed that, in his opinion, the concept proposal would have no negative effect on those flight paths.

He advised that more detailed consultation, if and when required in future, should be undertaken directly with the asset owner, the Royal North Shore Hospital. This level of consultation was not deemed necessary for the purposes of this study.

5.4.5 Consultation with DIRDC

The Crows Nest OSD project was discussed (along with other related projects) with DIRDC via telephone in late August 2018. The Director, Airspace Protection, was aware of the project, as one of the six major Sydney Metro OSD projects. Based on a relatively recent approval for the Victoria Cross site in North Sydney, and his general knowledge of the general Crows Nest location, he did not foresee any complications in the assessment process for an APAR application for the Crows Nest OSD.

6.0 Mitigation Measures

6.1 Potential Obstacle Lighting Conditions for Proposed Buildings

As noted in section 5.1, the CASR MOS Part 139 provides guidance on various safety mitigations for buildings which infringe the OLS, including conditions for obstacle lighting. Following their assessment of an APAR application, CASA would make recommendations concerning such mitigations to DIRDC and these would generally be accepted and included as conditions of an APAR approval. At this stage of planning, and without further consultation with CASA, it is not possible to forecast whether or not such lighting conditions would be recommended for an APAR application for the proposed building envelopes.

6.2 Risk Reduction of Cranes to be Used during Construction

This information in relation to risk mitigation for cranes is provided purely to inform future stages of planning. As the assessment has already indicated that there are ample height clearances available for cranes to be used during construction, and that the site is laterally clear of the normal flight paths to/from the RNS SHLS, it is anticipated that no special mitigations would be required in future construction other than the standard provisions for marking and lighting, as per MOS Part 139. Such conditions would be stipulated at the time of specific approvals for cranes which may be required during subsequent stages of detailed development planning.

7.0 Conclusion

This report presents the results of an aeronautical impact assessment of the concept proposal for the OSD above Crows Nest Station.

This report has been prepared to outline the impacts of the proposed building envelopes on the prescribed airspace of Sydney Airport and in doing so fully responds to the relevant issues raised in the SEARs issued for the concept SSD Application on 26th September 2018.

From an aeronautical perspective, the Crows Nest OSD site benefits from its location in relation to the airport and the two nearest runways — RWY 07/25 and RWY 16L/34R — which means that in practice, it is unaffected by height constraints related to the approach, missed approach and departure procedures to/from those runways.

The OLS height overhead the site is related to the Outer Horizontal Surface, which at 156m AHD means that only the three taller buildings on the site (Building A North, Building A South and Building B) are considered relevant to the Prescribed Airspace of Sydney Airport.

The overall degree of penetration of the OLS and the amount of clearance between the maximum proposed building heights and the constraining PANS-OPS surface height are summarised in **Table 7**. Approval is required for the building envelopes for Building A North, Building A South and Building B under the APAR. This is unlikely to be problematic given the combination of the location of the site in relation to the airport, the relatively small degree of infringement of the OLS and the large clearance from the limiting PANS-OPS surfaces.

Table 7: Summary — Buildings, Airspace Impact & Approvability Implications

Height Limits (AHD)	Max Building Envelope Height including building services zone (m AHD)	Penetration of OLS 156m AHD	CLEAR of PANS-OPS 335m AHD	Comment
Building A North	188	32 metres	147	Approvable under APAR, optionally with obstacle lighting conditions
Building A South	188	32 metres	147	Approvable under APAR, optionally with obstacle lighting conditions
Building B	158	2 metres	177	Approvable under APAR, optionally with obstacle lighting conditions
Building C	132	-24 metres CLEAR	203	Prior APAR approval not required

Assessment of the site in relation to the nearby helipad at the Royal North Shore hospital has also determined that the proposed Crows Nest OSD building envelopes will not adversely impact the HEMS flight operations to and from the hospital.

Further, given the location of the site in relation to Sydney Airport, and the amount of clearance between the maximum heights proposed for the building envelopes and the constraining ‘maximum permissible heights’ defined by the PANS-OPS and RTCC/MVA surfaces, there is ample room for cranes of all types to be used for construction — and so the development can also be considered feasible because its construction would not cause any adverse impacts on the protected airspace. Thus, Sydney Airport and other aviation stakeholders would not have cause to object to the approval of the towers on this basis.

Taking these factors into consideration, as well as the location of the site in relation to the airport, there is no technical impediment to approval of the concept SSD Application for the Sydney Metro Crows Nest OSD providing the maximum heights of buildings (and estimated crane heights) proposed in the future detailed SSD Applications do not exceed the PANS-OPS and RTCC/MVA Height Constraints documented herein. On this basis we consider that an application under the *Airports (Protection of Airspace) Regulations*, supported by a full aeronautical assessment and safety case would be approved by DIRDC.

In conclusion, we anticipate no barrier to approval of the concept SSD Application of the Sydney Metro Crows Nest OSD from an aviation perspective.

Appendix A

Airspace & Aviation Abbreviations

Abbreviations used in this report and/or associated reference documents, and the meanings assigned to them for the purposes of this report are detailed in the following table.

Abbreviation	Meaning
AC	Advisory Circular (document supporting CAR 1998)
ACFT	Aircraft
AD	Aerodrome
AGL	Above Ground Level (Height)
AHD	Australian Height Datum
AHT	Aircraft Height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Services
ALARP	As Low As Reasonably Practicable
ALC	Airport Lease Company
Alt	Altitude
AMAC	Australian Mayoral Aviation Council
AMSL	Above Minimum Sea Level
ANEF	Australian Noise Exposure Forecast
ANSP	Airspace and Navigation Service Provider
APACL	Australia Pacific Airports Corporation Limited, owner of Melbourne and Launceston Airports
APCH	Approach
APARs, or A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ASDA	Accelerated Stop Distance Available
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BA (Planning)	Building Application or Building Approval (Planning)
BAC	Brisbane Airport Corporation
BCC	Brisbane City Council
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
CBD	Central Business District
CG	Climb Gradient
CNS/ATM	Communications, Navigation, Surveillance / Air Traffic Management
CPA	Cairns Port Authority, Operators Of Cairns Airport

Abbreviation	Meaning
DA (Aviation)	Decision Altitude (Aviation)
DA (Planning)	Development Application or Development Approval (Planning)
DAH	Designated Airspace Handbook
DAP	Departure and Approach Procedures (published by AsA)
DEP	Departure
DER	Departure End (of the) Runway
DEVELMT	Development
DH	Decision Height
DIRDC	Department of Infrastructure, Regional Development & Cities (sometimes also abbreviated as Infrastructure)
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoD	Department of Defence
DODPROPS	Dependent Opposite Direction Parallel Runway Operations
EIS	Environmental Impact Study
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	EnRoute Supplement Australia
ESE	East South East
FAF	Final Approach Fix
FAP	Final Approach Point
Ft	Feet
GBAS	Ground-Based Augmentation System, a GNSS augmentation system to provide vertical guidance and additional precision to non-precision approaches — permits GLS Approaches
GLS	GNSS Landing System – a precision landing system like ILS but based on augmented GNSS using ground and satellite systems.
GNSS	Global Navigation Satellite System
GP	Glide Path
HEMS	Helicopter Emergency Management Services
HIAL	High Intensity Approach Light
HLS	Helicopter Landing Site
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System, a precision approach landing system
IMC	Instrument Meteorological Conditions
IPA	Integrated Planning Act 1997, Queensland State Government
ISA	International Standard Atmosphere
IVA	Independent Visual Approach
Km	Kilometres
Kt	Knot (one nautical mile per hour)
LAT	Latitude

Abbreviation	Meaning
LDA	Landing Distance Available
LEP	Local Environment Plan (Planning
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe ALTitude
M	Metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MDH	Minimum Descent Height
MDP	Major Development Plan
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOCA	Minimum Obstacle Clearance Altitude
MOS	Manual Of Standards, published by CASA
MP	Master Plan
MSA	Minimum Sector Altitude
MVA	Minimum Vector Altitude
NASF	National Airports Safeguarding Framework
NDB	Non-Directional Beacon
NE	North East
NM	Nautical Mile (= 1.852 km)
nnDME	Distance from the DME (in Nautical Miles)
NNE	North North East
NNW	North North West
NOTAM	NOTice to AirMen
NPR	New Parallel Runway (Project, Brisbane Airport)
OAR	Office of Airspace Regulation
OCA	Obstacle Clearance Altitude (in this case, in AMSL)
OCH	Obstacle Clearance Height
ODPROPS	Opposite Direction Parallel Runway Operations
OHS	Outer Horizontal Surface, an Obstacle Limitation Surface
OLS	Obstacle Limitation Surface, defined by ICAO Annex 14; refer also CASA MOS Part 139
PANS-OPS	Procedures for Air Navigation – Operations, ICAO Doc 8168; refer also CASA MOS Part 173
PAPI	Precision Approach Path Indicator (a form of VGSI)
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
RAAF	Royal Australian Air Force
RAPAC	Regional AirSpace users Advisory Committee
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation

Abbreviation	Meaning
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RTCC	Radar Terrain Clearance Chart (refer also MVA)
RWY	Runway
SACL	Sydney Airport Corporation Limited
SHLS	Strategic Helicopter Landing Site
SID	Standard Instrument Departure
SODPROPS	(Independent) Simultaneous Opposite Direction Parallel Runway Operations
SPP	State Planning Policy, Queensland (specifically SPP 1/02: Development in the Vicinity of Certain Airports and Aviation Facilities)
SSDA	State Significant Development Application
SSP	State Significant Precinct
SSR	Secondary Surveillance Radar
STAR	STandard Arrival
TAR	Terminal Approach Radar
TAS	True Airspeed
THR	THReshold (of Runway)
TMA	TerMinal Area
TNA	Turn Altitude
TODA	Take-off Distance Available
TORA	Take-Off Runway Available
VFR	Visual Flight Rules
VIS	Visual
VMC	Visual Meteorological Conditions
V _n	Aircraft critical velocity reference
VOR	Very high frequency Omni-directional Range
VSS	Visual Segment Surface
WAC	Westralia Airports Corporation, operators of Perth Airport
WAM	Wide-Area Multilateralation
WNW	West North West
WSW	West South West
WGS84	World Geodetic System 1984
WSA	Western Sydney Airport – the proposed second international airport for the Sydney Basin

Appendix B

PANS-OPS Procedures

The latest versions of the IFPs consulted were from the current AIP Amendment 156, effective from 16-Aug-2018 to 07-Nov-2018 — as indicated below.

SYDNEY (YSSY)

Name of Chart	Effective Date (Amendment No)
AERODROME CHART PAGE 1	2-Mar-2017 (Am 150)
AERODROME CHART PAGE 2	10-Nov-2016 (Am 149)
APRON CHART - INTERNATIONAL PAGE 1	13-Nov-2014 (Am 141)
APRON CHART - INTERNATIONAL PAGE 2	16-Aug-2018 (Am 156)
APRON CHART - DOMESTIC PAGE 1	26-May-2016 (Am 147)
APRON CHART - DOMESTIC PAGE 2	16-Aug-2018 (Am 156)
APRON CHART - DOMESTIC PAGE 3	16-Aug-2018 (Am 156)
STANDARD DOMESTIC TAXI ROUTES - ARRIVALS	21-Aug-2014 (Am 140)
STANDARD DOMESTIC TAXI ROUTES - DEPARTURES	6-Mar-2014 (Am 138)
NOISE ABATEMENT PROCEDURE PAGE 1	17-Nov-2011 (Am 129)
NOISE ABATEMENT PROCEDURE PAGE 2	17-Aug-2017 (Am 152)
NOISE ABATEMENT PROCEDURE PAGE 3	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 4	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 5	2-Mar-2017 (Am 150)
NOISE ABATEMENT PROCEDURE PAGE 6	24-May-2018 (Am 155)
NOISE ABATEMENT PROCEDURE PAGE 7	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 8	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 9	3-Mar-2016 (Am 146)
NOISE ABATEMENT PROCEDURE PAGE 10	3-Mar-2016 (Am 146)
AIRPORT EFFICIENCY PROCEDURES	1-Mar-2018 (Am 154)
IVA USER GUIDE PAGE 1	1-Mar-2018 (Am 154)
IVA USER GUIDE PAGE 2	1-Mar-2018 (Am 154)
SID SYDNEY ONE DEP (RADAR) - ALL RWYS	17-Aug-2017 (Am 152)
SID RWY 34L SOUTH WEST DEP (JET)	10-Nov-2016 (Am 149)
SID RWY 16R & 34L SOUTH DEP (NON-JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 16R DEENA SEVEN (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 34R ENTRA FIVE (JET) (RNAV)	10-Nov-2016 (Am 149)
SID RWY 07 FISHA EIGHT (JET) (RNAV)	17-Aug-2017 (Am 152)
SID KAMBA DEP RWYS 07 & 16L (NON-JET) (RNAV)	1-Mar-2018 (Am 154)
SID RWY 16R KAMPI FIVE (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 16L KEVIN SIX (JET) (RNAV)	9-Nov-2017 (Am 153)
SID RWY 16L ABBEY THREE (JET) (RNAV)	24-May-2018 (Am 155)
SID RWY 34R MARUB SIX (JET) (RNAV)	24-May-2018 (Am 155)

Name of Chart	Effective Date (Amendment No)
SID RWY 34L RICHMOND FIVE DEP (JET)	17-Aug-2017 (Am 152)
STAR BOREE EIGHT A ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR BOREE EIGHT P ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR MEPIL THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR MARLN THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR ODALE SEVEN ARRIVAL (RNAV)	24-May-2018 (Am 155)
STAR RIVET THREE ARRIVAL (RNAV)	24-May-2018 (Am 155)
ILS OR LOC RWY 07	9-Nov-2017 (Am 153)
ILS OR LOC RWY 16L PAGE 1	24-May-2018 (Am 155)
ILS RWY 16L PAGE 2	24-May-2018 (Am 155)
ILS OR LOC RWY 16R PAGE 1	24-May-2018 (Am 155)
ILS RWY 16R PAGE 2	24-May-2018 (Am 155)
ILS OR LOC RWY 25	9-Nov-2017 (Am 153)
ILS OR LOC RWY 34L PAGE 1	24-May-2018 (Am 155)
ILS RWY 34L PAGE 2	24-May-2018 (Am 155)
ILS OR LOC RWY 34R PAGE 1	16-Aug-2018 (Am 156)
ILS RWY 34R PAGE 2	16-Aug-2018 (Am 156)
RNAV-Z (GNSS) RWY 07	17-Aug-2017 (Am 152)
RNAV-Z (GNSS) RWY 16L	9-Nov-2017 (Am 153)
RNAV-Z (GNSS) RWY 16R	9-Nov-2017 (Am 153)
RNAV-Z (GNSS) RWY 25	17-Aug-2017 (Am 152)
RNAV-Z (GNSS) RWY 34L	9-Nov-2017 (Am 153)
RNAV-Z (GNSS) RWY 34R	9-Nov-2017 (Am 153)
GLS RWY 07	9-Nov-2017 (Am 153)
GLS RWY 16L	9-Nov-2017 (Am 153)
GLS RWY 16R	9-Nov-2017 (Am 153)
GLS RWY 25	9-Nov-2017 (Am 153)
GLS RWY 34L	9-Nov-2017 (Am 153)
GLS RWY 34R	9-Nov-2017 (Am 153)
ILS PRM USER INSTRUCTIONS PAGE 1	16-Aug-2018 (Am 156)
ILS PRM USER INSTRUCTIONS PAGE 2	20-Aug-2015 (Am 144)
ILS PRM RWY 16L	9-Nov-2017 (Am 153)
ILS PRM RWY 16R	24-May-2018 (Am 155)
ILS PRM RWY 34L	24-May-2018 (Am 155)
ILS PRM RWY 34R	24-May-2018 (Am 155)

Source: AIP Book (16-Aug-2018) via <http://www.airservicesaustralia.com/aip/aip.asp?pg=10>