Transport for NSW

Redfern North Eveleigh Renewal Project

Paint Shop Sub-precinct

State Significant Precinct Study - Aeronautical Report

NSW GOVERNMENT

June 2022 | Version: 2.0.5 FINAL

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1. Executive Summary

The NSW Government is investing in the renewal of the Redfern North Eveleigh (RNE) Precinct to create a unique mixed-use development, located within the important heritage fabric of North Eveleigh. The strategic underpinning of this proposal arises from the Greater Sydney Region Plan and Eastern City District Plan. These plans focus on the integration of transport and land use planning, supporting the creation of jobs, housing and services to grow a strong and competitive Sydney.

Located towards the south-west of the Sydney CBD near Redfern train station, the site is located approximately 6 km (3.3 Nautical Miles (NM)) north of Sydney Airport and therefore located within the extent of the prescribed airspace of the airport.

This report addresses Study Requirement Item 14.1: Aeronautical. Further to the key objective of ensuring that the precinct does not have an adverse impact on the operations of Sydney Airport, this report examines the current and forecast regulated airspace height limits above the site as well as other non-height related assessment criteria that are related to aviation airspace protection requirements under the APAR, and which would:

a) trigger the requirement to apply for an airspace height approval,
b) constrain the maximum building envelope height,
c) for advance information, limit the maximum heights for the cranes that will be required for construction.

Mitigation measures to reduce the risk of any potential impact on the safety of aircraft operations are also considered.

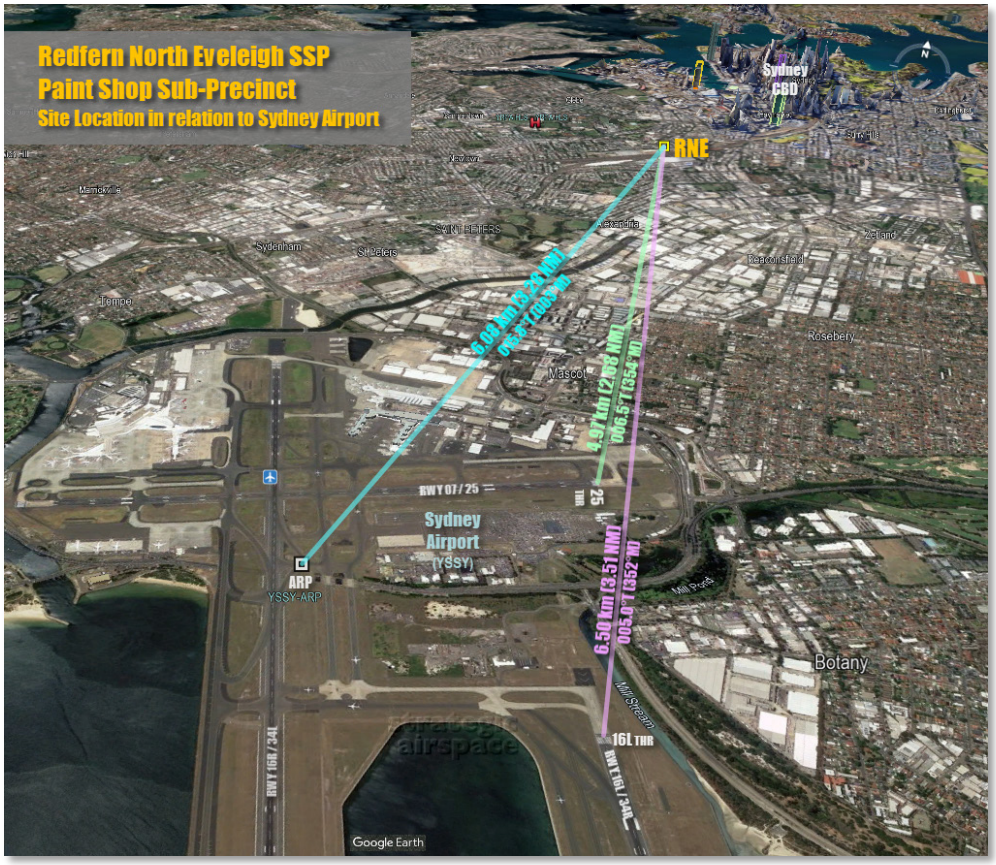


Figure 1-1 — The RNE Paint Shop sub-precinct in relation to Sydney Airport (Small Format)

The critical airspace constraints over the site are summarised in Table 1-1 and illustrated in Figure 1-2 below.

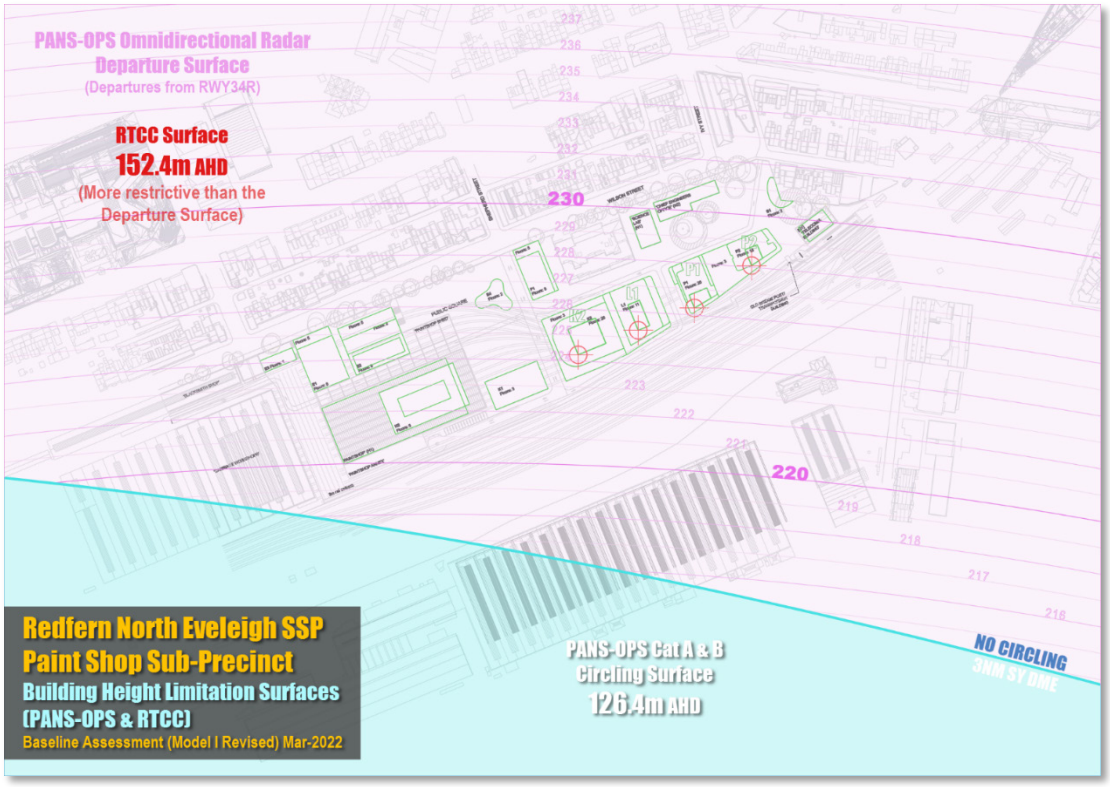


Figure 1-2 — Building Height Limitation Surfaces (Small Format)

Table 1-1 — Summary — Airspace Height Constraints

Height Limits (m AHD)	Height Limit Detail	Comment
128.2	**Max Tower Building Height**	The is the top height of the tallest of the tower buildings in the Paint Shop precinct in the masterplan proposal. Refer Section 3.2 (p1212) and Table 3-1 (p13)
69 – 89	**Obstacle Limitation Surface (OLS) — Conical Surface**	**APAR THRESHOLD HEIGHT** The OLS is the surface is the airspace assessment surface which is used for determining if a building (or crane) requires a height approval under the Airports (Protection of Airspace) Regulations (APAR). The conical surface generally slopes upwards from the south-west to north-east over the site with heights over the Paint Shop sub-precinct ranging from approximately 69m AHD in the south to approximately 89m AHD in the north. Refer Section 4.2 (p19) and Figure 4-1 (p20). As the proposed tower buildings would infringe the OLS, they would require a height application under the APAR to be approved by the Commonwealth Department of Infrastructure, Transport, Regional Development & Communications (DITRDC). Infringement of the OLS in this case is not considered a barrier to approval of an application under the APAR. The low and mid-rise buildings are below the OLS and therefore would not require prior approval under the APAR.

Height Limits (m AHD)	Height Limit Detail	Comment
152.4	**Radar Terrain Clearance Chart (RTCC) Surface**	**MAXIMUM EFFECTIVE BUILDING HEIGHT CONSTRAINT** The site lies within the lateral limits of an RTCC surface which protects a sector used by Air Traffic Controllers (ATCs) to vector (ie, direct) aircraft. As this surface is lower than the PANS-OPS surface over the site, **the RTCC is the most constraining height limit for building developments.** Typically, this surface cannot be breached by any permanent obstacle, or any temporary at night or during times of low visibility — hence any approval for temporary obstacles are subject to conditions to minimise impact on operational airspace. Cranes operating above this height, if approved, would be subject to various operational constraints, including a maximum duration of 3 contiguous months.
≥ 224	PANS-OPS Departure Surface RWY 34R	MAXIMUM EFFECTIVE CRANE HEIGHT CONSTRAINT Whilst PANS-OPS surfaces normally define the maximum permissible building height, in this case the lowest of the PANS-OPS surfaces (that related to the Radar Departure for RWY34R) is higher than the RTCC and therefore less restrictive. Given this, the PANS-OPS surface heights should be considered as the maximum permissible crane heights.

There are no other prescribed airspace surfaces or other operational factors that would be adversely affected by the masterplan proposal. The potential options for the addition of new buildings, the highest of which would be 12-storeys, would not change the overall assessment.

All low and mid-rise buildings in the masterplan proposal will be below the OLS, and therefore will not require prior height approvals under the APAR.

Whilst all tower buildings would infringe the OLS, and would therefore require airspace approvals, they are considered approvable under the APAR because their maximum design heights are below the constraining RTCC surface. Note however that approval of the two tallest towers may be subject to assessment of construction feasibility when height applications are evaluated, primarily because cranes for these buildings are likely to infringe the RTCC surface and would most likely be limited to 3-months when operating above the RTCC surface height.

Table 1-2 — Concept Design Heights, Airspace Impact & Approvability Overview

		OLS Surface Impact	**Maximum Permissible Building Heights**	
Location	*Airspace Height (m AHD)*	*Clearance / Infringement*	***RTCC** Clearance / Infringement*	**APAR Status**
The 2 Tallest Towers				
K2	128.2	- 49.6	24.2	Approvable
P1	123.5	- 41.2	28.9	Approvable
Low/Mid-Rise Buildings				
Non-Tower Buildings	≤ 63.6	All below OLS Height Clearances vary	≥ 88.8	APAR Approval NOT Required

Based on the maximum heights of the building envelopes in the masterplan proposal, and subject to the potential requirement for obstacle lights to be installed and operated on some of the taller of the tower buildings (subject to CASA recommendations at the time of any applications for height approval under the APAR), we certify that the masterplan proposal will not have an adverse impact on the current and known future operations of Sydney Airport.

2. Introduction

The NSW Government is investing in the renewal of the Redfern North Eveleigh Precinct to create a unique mixed-use development, located within the important heritage fabric of North Eveleigh. The strategic underpinning of this proposal arises from the Greater Sydney Region Plan and District Plan. These Plans focus on the integration of transport and land use planning, supporting the creation of jobs, housing and services to grow a strong and competitive Sydney.

The Redfern North Eveleigh Precinct is one of the most connected areas in Sydney, and will be a key location for Tech Central, planned to be Australia's biggest technology and innovation hub. Following the upgrading of Redfern station currently underway, the Precinct's renewal is aimed at creating a connected destination for living and working, and an inclusive, active and sustainable place around the clock.

The Redfern North Eveleigh Precinct comprises three sub-precincts, each with its own distinct character:

- The Paint Shop Sub-Precinct which is the subject of this rezoning proposal;
- The Carriageworks Sub-Precinct, reflecting the cultural heart of the Precinct where current uses will be retained; and
- The Clothing Store Sub-Precinct which is not subject to this rezoning proposal.

This State Significant Precinct (SSP) Study proposes amendments to the planning controls applicable to the Paint Shop Sub-Precinct to reflect changes in the strategic direction for the Sub-Precinct. The amendment is being undertaken as a State-led rezoning process, reflecting its status as part of a State Significant Precinct located within the *State Environmental Planning Policy (Precincts - Eastern Harbour City) 2021*.

The amended development controls will be located within the City of Sydney Local Environmental Plan. Study Requirements were issued by NSW Department of Planning and Environment (DPE) in December 2020 to guide the investigations to support the proposed new planning controls.

2.1 Purpose of this Report

The purpose of this report is to provide a detailed aeronautical impact assessment of the proposed changes and consider any potential impacts that may result within and surrounding the Paint Shop Sub-precinct.

This report addresses Study Requirement Item 14.1: Aeronautical. The relevant study requirements, considerations and consultation requirements, and where within this report these have been responded to is outlined in Table 2-1 below.

Further to the key objective of ensuring that the precinct does not have an adverse impact on the operations of Sydney Airport, this report examines the current and forecast regulated airspace height limits above the site as well as other non-height related assessment criteria that are related to aviation airspace protection requirements under the APAR, and which would:

a) trigger the requirement to apply for an airspace height approval for the proposed building development,
b) constrain the maximum permissible building envelope height, and
c) for advance information, limit the maximum heights for the cranes that will be required for construction.

Mitigation measures to reduce the risk of any potential impact on the safety of aircraft operations are also considered.

2.2 Aeronautical Study Requirements

Table 2-1 — Study Requirements Cross-Reference Index

Ref 14.1	Requirement	Section Reference (This Report)
Scope and Requirement	Prepare an Aeronautical Study that:	
	• Identifies any constraints associated with the operations of Sydney Airport.	Section 4.1 Sydney Airport's Prescribed Airspace & the Master Plan 2039 (p19) Section 3 Aeronautical Impact Context (p12) Section 4 Analysis (p19) & 4.5 Height Analysis Summary (p28) Section 5 Crane Considerations (p30) Section 8 Conclusion (p36)
	• Advises on measures, if necessary, to ensure the precinct does not have an adverse impact on the operations of Sydney Airport.	Section 5 Crane Considerations (p30) Section 6 Obstacle Lighting Considerations (p32) Section 8 Conclusion (p36)
	• Certifies that, subject to any recommended measures, the proposal will not have an adverse impact on the operations of Sydney Airport.	Section 8 Conclusion (p36)
Considerations	The Study is to demonstrate consideration of:	
	• Appropriate mapping to demonstrate the OLS, PANS OPS and other relevant Sydney Airport height limitation layers.	Section 4 Analysis (p19). Section 4.1.1 Sydney Airport's Prescribed Airspace Charts (p19) Figure 4-1 — Site in relation to the OLS (p20) Figure 4-3 — Site in relation to the PANS-OPS Procedure Surfaces (p22) Figure 4-5 — Site in relation to Sydney Airport's Radar Terrain Clearance Chart (RTCC) (p26)
	• Whether proposed heights will impact the OLS Conical surface over the precinct which varies in height from 51 – 80m AHD.	Section 4.2 OLS Analysis (p19) Table 4-1 — OLS Height Impact & APAR Application Implications (p20)
	• Preliminary views of CASA and Airservices should the proposed heights exceed the OLS Conical surface.	Section 3.4 Methodology (p14) Section 7 Consultation (p33)
	• Pathways required to secure approval from relevant bodies as part of subsequent development applications processes.	Section 3.4.1A Pathways to Approval under the APAR (p15) Section 8 Conclusion (p36)
Consultation	The study is to demonstrate that it has been informed by consultation with the Sydney Airport to ensure the precinct will not have an adverse impact on the operations of Sydney Airport and demonstrate that consultation informs the preparation of the proposed planning.	Section 7 Consultation (p33)

Ref 14.1	Requirement	Section Reference (This Report)
Guidance Documents	The following documents provide guidance for this Study: • Airports Act 1996 • Airports (Protection of Airspace) Regulations 1996 (APAR)	Section 3.4.1 Airspace Regulations (p15)
	• Sydney Airport Master Plan 2033	This report refers to the more recent Sydney Airport Master Plan 2039 Section 3.4.2 Prescribed Airspace (p17) Section 4.1 Sydney Airport's Prescribed Airspace & the Master Plan 2039 (p19)
	Additional to specified requirements: • The National Airports Safeguarding Framework (NASF), Guideline H	Section 3.4 Methodology (p14) — under Other Considerations ⇨ Other Factors Section 4.4.4 Flight Paths to/from Strategic Helicopter Landing Sites (SHLS) (p27)

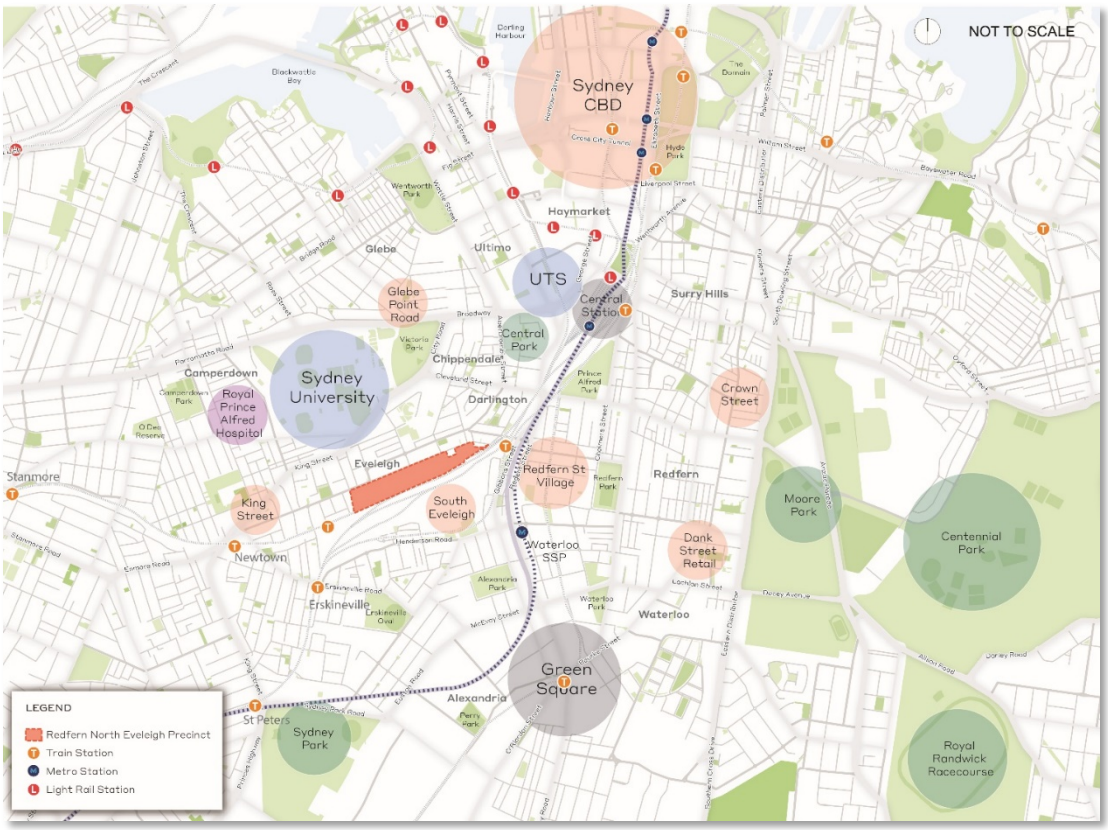
2.3 About RNE & The Project

2.3.1 Redfern North Eveleigh Precinct

The Redfern North Eveleigh Precinct is located approximately 3km south-west of the Sydney CBD in the suburb of Eveleigh (refer to Figure 1). It is located entirely within the City of Sydney local government area (LGA) on government-owned land. The Precinct has an approximate gross site area of 10.95 hectares and comprises land bounded by Wilson Street and residential uses to the north, an active railway corridor to the south, residential uses and Macdonaldtown station to the west, and Redfern station located immediately to the east of the Precinct. The Precinct is also centrally located close to well-known destinations including Sydney University, Victoria Park, Royal Prince Alfred Hospital, the University of Technology Sydney, and South Eveleigh, forming part of the broader Tech Central District.

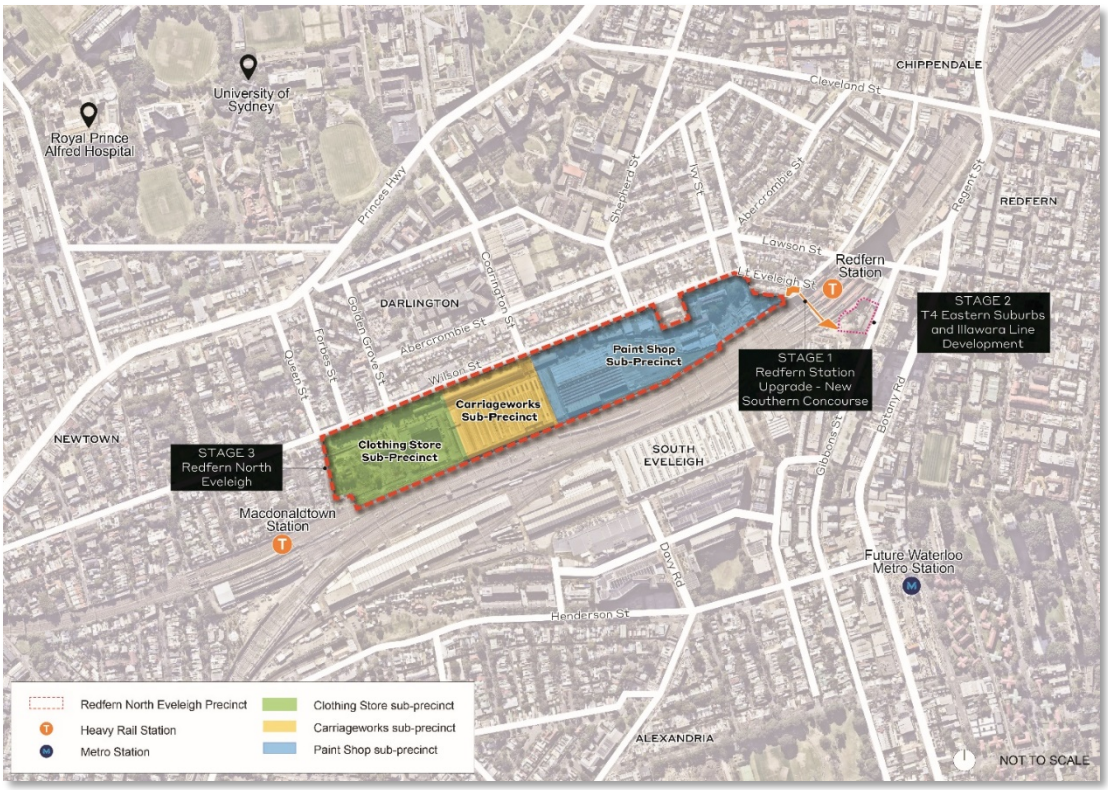
The Precinct is located within the State Heritage-listed curtilage of Eveleigh Railway Workshops and currently comprises the Platform Apartments with 88 private dwellings, Sydney Trains infrastructure and key state heritage buildings including the Paint Shop, Chief Mechanical Engineer's Building, and the Carriageworks and Blacksmith Shop which provide shared community spaces for events including the Carriageworks Farmers Markets.

A map of the precinct and relevant boundaries is illustrated in Figure 2-1.



Source: Ethos Urban

Figure 2-1 — Location plan of Redfern North Eveleigh Precinct



Source: Ethos Urban

Figure 2-2 — Redfern North Eveleigh and sub-precincts

2.3.2 Redfern North Eveleigh Paint Shop Sub-Precinct

The Redfern North Eveleigh Paint Shop Sub-Precinct is approximately 5.15 hectares and is bounded by Wilson Street to the north, residential terraces and Redfern station to the east, the Western Line rail corridor to the south and the Carriageworks Sub-Precinct to the west. The Sub-Precinct has a significant level change from a Reduced Level (RL) height of RL25 metres to RL29 metres on Wilson Street.

The Paint Shop Sub-Precinct currently hosts a number of items of heritage significance, including the Paint Shop Building, Fan of Tracks, Science Lab Building, Telecommunications Building, and Chief Mechanical Engineer's Building. The Sub-Precinct has a number of disused spaces adjacent to the rail corridor as well as functioning Sydney Trains' infrastructure, offices and operational space. Vehicle and pedestrian access to this area is used by Sydney Trains. The site has a clear visual relationship to South Eveleigh and the Eveleigh Locomotive Workshops across the active rail corridor.

A map of the Paint Shop sub-precinct and relevant boundaries is illustrated in Figure 2-2.

2.3.3 Renewal Vision

The Redfern North Eveleigh Paint Shop Sub-Precinct will be a connected centre for living, creativity and employment opportunities that support the jobs of the future, as well as providing an inclusive, active and sustainable place for everyone, where communities gather.

Next to one of the busiest train stations in NSW, the Sub-Precinct will comprise a dynamic mix of uses including housing, creative and office spaces, retail, local business, social enterprise and open space. Renewal will draw on the past, adaptively re-using heritage buildings in the Sub-Precinct and will acknowledge Redfern's existing character and particular significance to Aboriginal peoples, culture and communities across Australia. The Sub-Precinct will evolve as a local place contributing to a global context.

2.3.4 Project Description

An Urban Design and Public Domain Study has been prepared to establish the urban design framework for the Redfern North Eveleigh Paint Shop Sub-Precinct. The Urban Design and Public Domain Study provides a comprehensive urban design vision and strategy to guide future development of the Sub-Precinct and has informed the proposed planning framework of the SSP Study.

The urban design framework for the Paint Shop sub-precinct comprises:

- Approximately 1.4 hectares of publicly accessible open space, comprising:
  - A public square – a 7,900 square metre public square fronting Wilson Street.
  - An eastern park – a 3,871 square metre park located adjacent to the Chief Mechanical Engineer's Building and the new eastern entry from Platform 1 of the Redfern station; and
  - Traverser No1 - a 2,525 square metre public square edged by Carriageworks and the Paint Shop.
- Retention of over 90% of existing high value trees.
- An overall greening coverage of 40% of the sub-precinct.
- A maximum of 142,650 square metre gross floor area (GFA), comprising:
  - Between 103,700 - 109,550 square metres of gross floor area (GFA) for employment and community facility floor space (minimum 2,500 square metres). This will support approximately 6,200 direct jobs on the site across numerous industries including the innovation, commercial and creative sectors.

- Between 33,100 - 38,950 square metres of GFA for residential accommodation, providing for between 381 and 449 new homes (including 15% for the purposes of affordable housing).

- New active transport infrastructure and routes to better connect the Paint Shop Sub-Precinct with other parts of Tech Central and the surrounding localities.
- Direct pedestrian connections to the new Southern Concourse at Redfern station.
- Residential parking rates comprising:
  - Studio at 0.1 per dwelling
  - 1 Bed at 0.3 per dwelling
  - 2 Bed at 0.7 per dwelling
  - 3 Bed at 1.0 per dwelling
- Non-residential car parking spaces (including disabled and car share) are to be provided at a rate of 1 space per 700 square metres of GFA.
- 66 car spaces are designated for Sydney Trains maintenance and operational use.

The key features of the urban design framework, include:

- The creation of a new public square with direct pedestrian access from Wilson Street to provide a new social and urban hub to promote outdoor gatherings that will accommodate break out spaces and a pavilion structure.
- An eastern park with direct access from Redfern station and Little Eveleigh Street, which will provide a high amenity public space with good sunlight access, comfortable wind conditions and community character.
- Upgraded spatial quality of the Traverser No1 yard, retaining the heritage setting, and incorporating complementary uses and good access along Wilson Street to serve as a cultural linkage between Carriageworks and the Paint Shop Building.
- The establishment of an east-west pedestrian thoroughfare with new public domain and pedestrian links.
- A range of Water Sensitive Urban Design (WSUD) features.
- Active ground level frontages with commercial, retail, food and beverage and community and cultural uses.
- Adaptive reuse of heritage buildings for employment, cultural and community uses.
- New buildings for the Sub-Precinct, including:
  - Commercial buildings along the rail corridor that range between 3 and 26 occupied storeys;
  - Mixed use buildings along the rail corridor, comprising a three-storey non-residential podium with residential towers ranging between 18 to 28 occupied storeys;
  - Mixed use buildings (commercial and residential uses) along Wilson Street with a four-storey street wall fronting Wilson Street and upper levels at a maximum of 9 occupied storeys that are set back from the street wall alignment;
  - A commercial building on the corner of Wilson Street and Traverser No.1 with a four-storey street wall fronting Wilson Street and upper levels at a maximum of 8 occupied storeys that are set back from the street wall alignment. There is flexibility to allow this building to transition to a mixed-use building with active uses at ground level and residential uses above; and
  - Potential options for an addition to the Paint Shop Building comprising of commercial uses. These options (all providing for the same GFA) include:
    - A 5-storey commercial addition to the Paint Shop Building with a 3m vertical clearance, with the adjacent development site to the east comprising a standalone 3-storey commercial building (represented in Figure 2-3);

- A 3-storey commercial addition to the Paint Shop Building with a 3m vertical clearance which extends and connects to the commercial building on the adjacent development site to the east; and
- No addition to the Paint Shop Building, with the adjacent development site to the east comprising a standalone 12-storey commercial building.

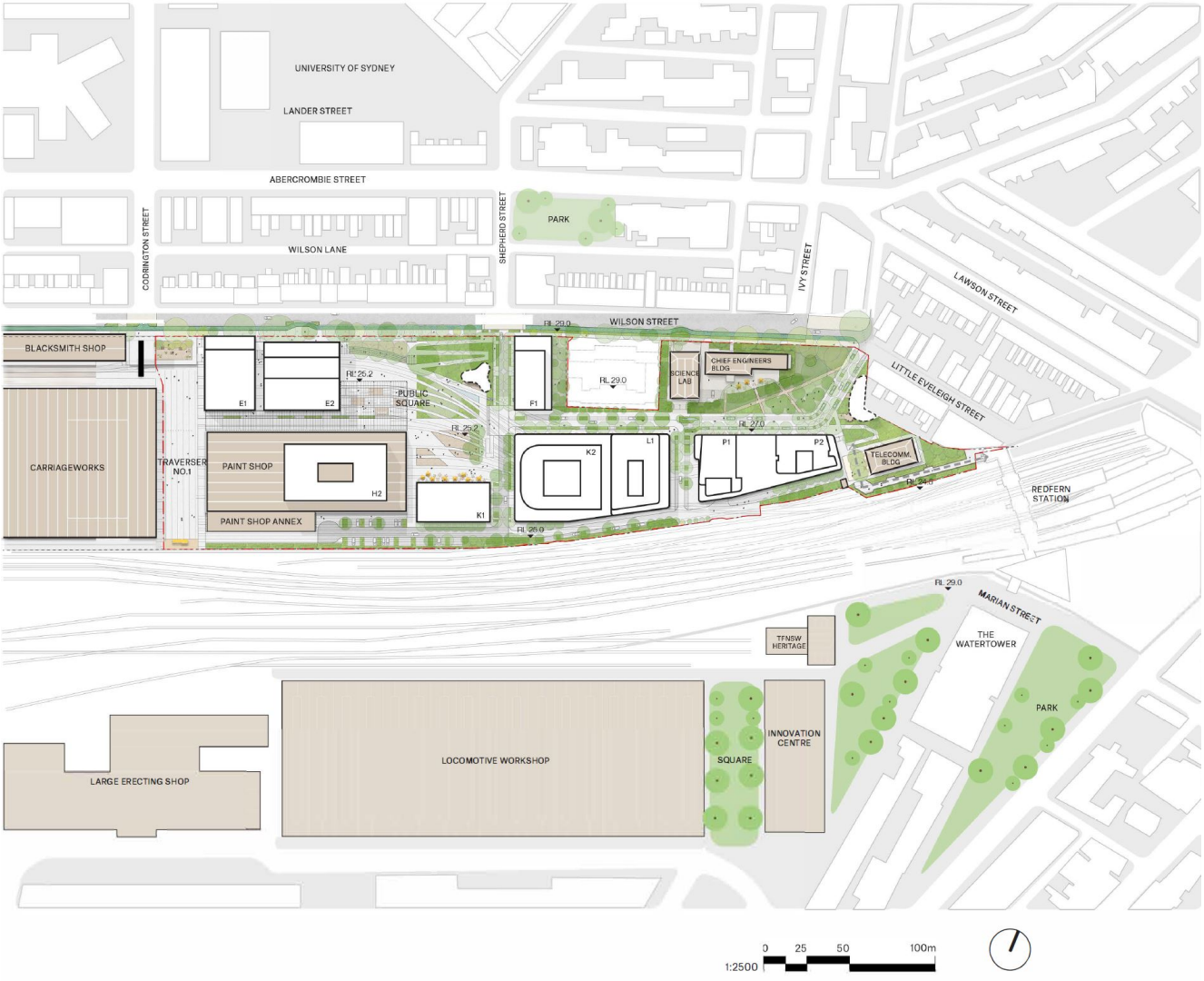
- Commitment to a 5 Star Green Star Communities rating, with minimum 5 Star Green Star Buildings rating.
- All proposed buildings are below the Procedures for Air Navigation Services – Aircraft Operations (PANS-OPS) to ensure Sydney Airport operations remain unaffected.

The proposed land allocation for the Paint Shop sub-precinct is described in Table 2-2 below.

Table 2-2 — Breakdown of allocation of land within the Paint Shop sub-precinct

Land allocation	Existing	Proposed*
Developed area	15,723 sqm / 30% of total site area	20,824 sqm / 40% of total site area
Public open space	Area not publicly accessible	14,306 sqm / 28% of total site area
Other public domain areas (Including streets, shared zones, pedestrian paths and vehicular zones)	Area not publicly accessible	15,149 sqm / 29% of total site area (Excludes privately accessible public links and private spaces ~ 3% of total site area)

The Indicative Concept Proposal for the Paint Shop Sub-Precinct is illustrated in Figure 2-3 below.



Source: Bates Smart and Turf

Figure 2-3 — Indicative Concept Proposal

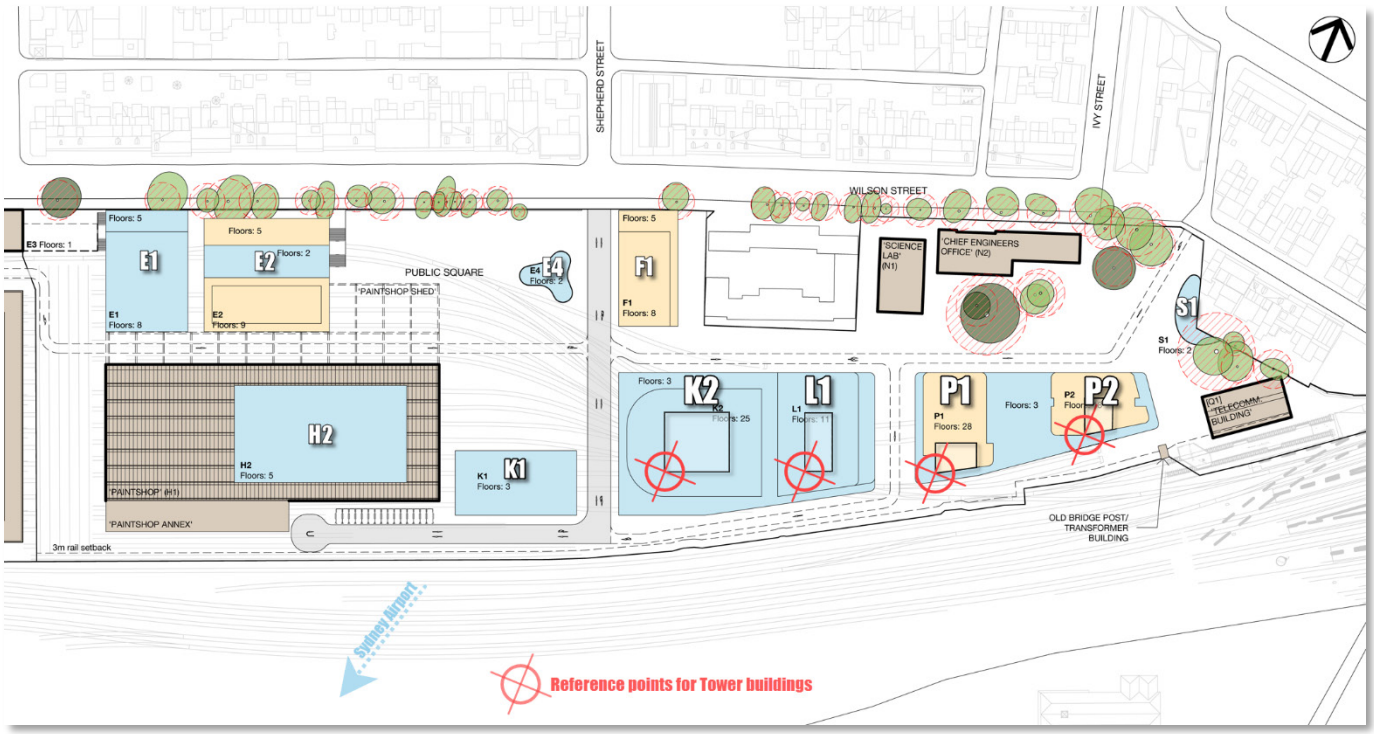
3. Aeronautical Impact Context

3.1 Scope & Extent of Aeronautical Assessment

The extent of the site covered by this aeronautical assessment is the Paint Shop sub-precinct (the Project Site), as highlighted in Figure 2-2 above (p7).

In terms of potential impact on development of the site, the focus of the aeronautical impact is on the taller buildings — ie, the tower buildings with more than 10 storeys — because these are the buildings identified as most likely to infringe the OLS. These tower buildings, named as K2, L1, P1 and P2, are depicted in the masterplan proposal in Figure 3-1 below[1].

The low and mid-rise buildings, identified as E1, E2, E4, F1, H2, K1 and S1, range from single-storey buildings to 9-storeys high.



Source: Bates Smart and Strategic Airspace

Figure 3-1 — Key Reference Points Used for Assessment

3.2 Key Reference Points used for Analysis

For the purposes of assessment, reference points for each of the tower buildings have been set at the closest point to Sydney Airport of the roof overrun of each building footprint. These reference points are illustrated in Figure 3-1 above and detailed, together with top heights of the building envelopes presented in the masterplan proposal. in Table 3-1 below.

As the closest of the tower buildings to the airport, the reference point for building K2 is also used as the general reference point for the site.

1 Note also that Table 3-1 (p13), Figure 3-1 (p12), Figure 4-2 (p21), Figure 4-3 (p22) and Figure 4-6 (p27) and do not include reference to potential options for new buildings, such as an addition to or adjacent to the Paint Shop building, the highest of which could be 12-storeys (refer end of Section 2.3.4, p9). The tallest of the proposed options would be of a similar height range, or lower than, buildings L1 and P2, and so would not prejudice the overall findings of this report.

Reference points have not been assigned to the low and mid-rise buildings. However, these buildings and their estimated top heights are documented for use during assessment in Table 3-2 below.

Table 3-1 — Assessment Reference Points, Coordinates & Heights (Tower Buildings)

Key Reference Points	Point	No of Floors	Assessment Heights (m AHD)*	WGS84 Geographic Coordinates	GDA94 Coordinates (Zone 56)
SW Corner of K2 *Site Reference Pt*	**K2**	**25**	**128.2**	33° 53' 35.76" S 151° 11' 42.05" E	333094.744 E 6248211.945 S
SW Corner of L1	L1	11	90.2	33° 53' 35.15" S 151° 11' 43.94" E	333142.878 S 6248231.620 E
SW Corner of P1	P1	28	123.5	33° 53' 34.59" S 151° 11' 45.70" E	333187.958 S 6248249.517 E
SW Corner of P2	P2	18	91.1	33° 53' 33.52" S 151° 11' 47.51" E	333233.777 S 6248283.577 E

* *Assessment Heights — Indicative Max RLs of the Proposed Tower Envelopes*

- *It is assumed that the top heights of the masterplan proposal are top of building envelope heights, inclusive of all lift and plant overruns, rooftop furniture and vegetation, signage and antennae.*
- *Heights expressed in Metres Australian Height Datum (AHD)*
- *This table does not include potential options for new buildings, such as an addition to or adjacent to the Paint Shop building, the highest of which could be 12-storeys (refer end of Section 2.3.4, p9).*

Table 3-2 — Low & Mid-Rise Buildings

Building	Point	No of Floors	Assessment Heights (m AHD)*	WGS84 Geographic Coordinates	GDA94 Coordinates (Zone 56)
E1		8	53.6	N/A	N/A
E2		9	57.7	N/A	N/A
F1		8	52.6	N/A	N/A
H2		5	63.6	N/A	N/A
K1		3	44.6	N/A	N/A
S1		2	38.0	N/A	N/A

3.3 Site Location relative to Sydney Airport

The closest point of the tower buildings (point K2, taken to be the Site Reference Pont in this report) is located approximately 6.1 km (3.3 Nautical Miles (NM)) north-north-east of the Aerodrome Reference Point (ARP) of Sydney Airport, as shown in Figure 3-2 below.

The distance and bearing from the ARP and the northern ends of Runways 07/25 and 16L/34R to the site reference point K2 are detailed in Table 3-3 below. Procedures to/from the western parallel runway, RWY 16R/34L, are not relevant because aircraft using those procedures must stay safely to the west of the eastern parallel runway at low altitudes — and therefore are clear of the precinct. Hence, a distance bearing for this runway is not provided.

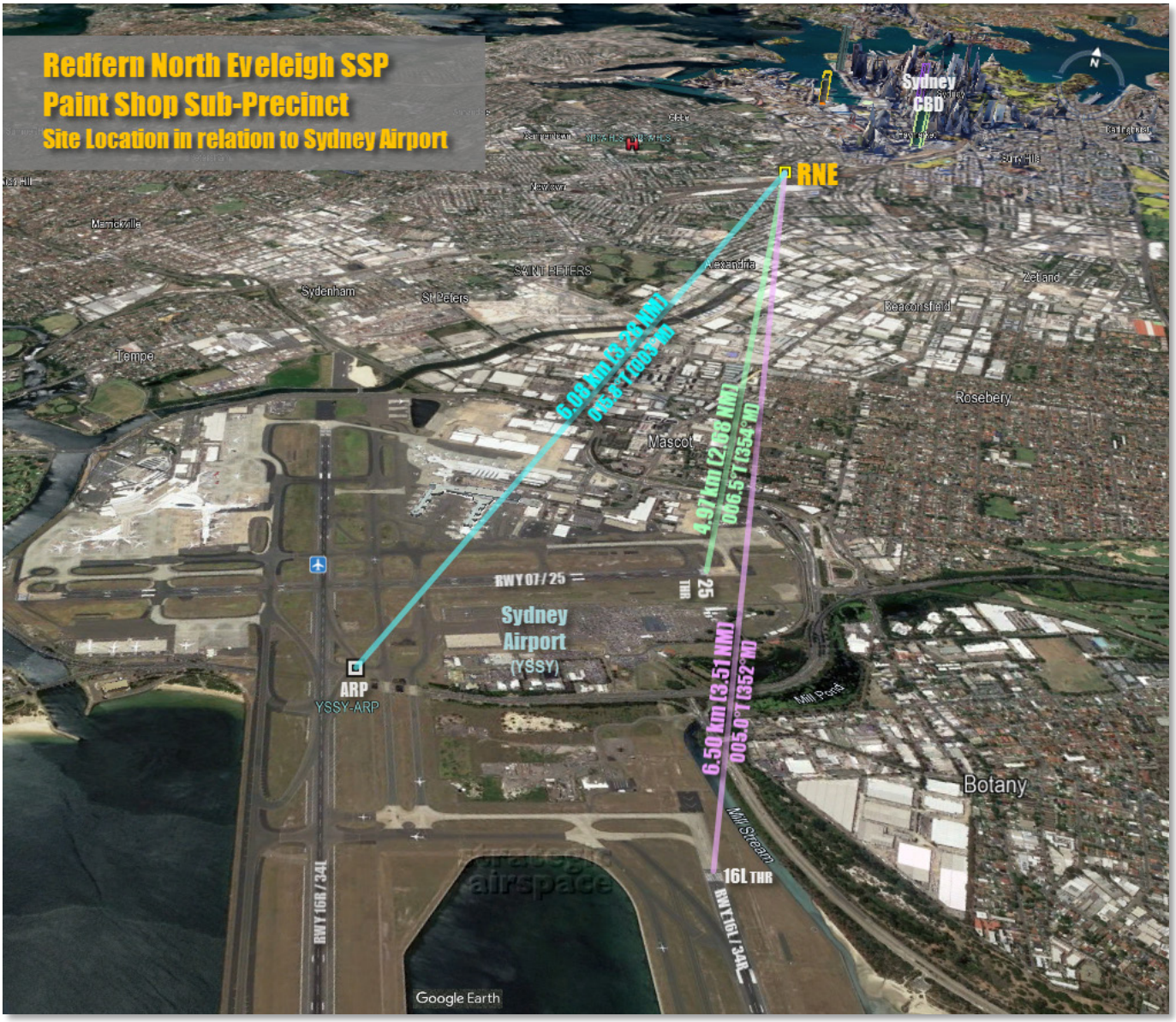


Figure 3-2 — The RNE Paint Shop sub-precinct in relation to Sydney Airport (Large Format)

Table 3-3 — Site Reference Point (K2) — Location in Relation to Sydney Airport

Airport Feature	Distance (Km)	Dist (NM)	Bearing (°T)	Bearing (°M)
Aerodrome Reference Point (ARP)	**6.08**	**3.3**	**015.8**	**003**
RWY16L Threshold	6.50	3.5	005.0	352
RWY25 Threshold	4.97	2.7	006.5	357

3.4 Methodology

This report considers only the airspace of the closest major airport, Sydney International Airport and the airspace required for helicopter routes near the RNE Precinct.

With regard to the influence on the proposed development, the following elements of the airport's prescribed airspace have been considered.

3.4.1 Airspace Regulations & Pathways to Approval

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 maximum height. These regulations define both: how building height limitations due to airspace safety can be determined; and the process for gaining approval of the proposed development under the regulations.

Regulation 2 of the APAR refers to Prescribed Airspace, and their impact upon building height limitations, are described below.

Further, Regulation 4 "*Ascertainment of OLS and PANS-OPS surfaces*" of the APAR refers to the source standards published by the International Civil Aviation Organisation (ICAO) that are fundamental standards used for determining OLS (ICAO Annex 14) and PANS-OPS (ICAO Doc 8168) protection surfaces. In Australia, reference to these standards should also include reference to any relevant Australian modifications or specifications made in the Civil Aviation Safety Regulations (CASR) Manual of Standards (MOS) Part 173.

Where a proposed development would infringe the Prescribed Airspace, a height approval must be obtained from the Commonwealth Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) prior to the intrusion into the airspace. A permanent intrusion, such as a building, is termed a *controlled activity*, and temporary intrusions that are not expected to continue longer than 3 months, such as cranes, are termed *short-term controlled activities*.

Height approvals under the APAR are not required for rezoning applications. They are required for buildings which would infringe the OLS and are required by local planning authorities prior to, or as consent conditions of, approval of Development Applications (DAs). Height approvals are usually not required prior to the time a crane would infringe the OLS, except where stipulated otherwise as a condition of a Stage 1 DA.

A Pathways to Approval under the APAR

Applications for height approval of a proposed development — for the entire sub-precinct or for individual tower buildings — under the APAR may be lodged at any time prior to the commencement of construction or, if necessary, prior to determination of a DA.

Earlier-than-required applications (eg, even during evaluation of the SSP planning proposal) can be lodged — for the entire Paint Shop sub-precinct, or by individual tower building — to gain the certainty of attainable building heights in advance of proceeding to DA planning and submission stages. An early approval essential secures the heights for future use.

This approach has been adopted for some urban redevelopment projects (eg, the Waterloo Metro Quarter Over Station Development) — with the advantage that the APAR approvals help to increase the marketing value of proposed development projects for sale to or in partnership with commercial developers.

Approval for a crane must be granted prior to the erection of the crane. Applications for approval under the APAR can be made at any time during the normal planning and approval processes.

An approval can be amended and re-submitted to obtain a new approval.

The usual steps for obtaining an approval are as follows:

1. Lodge an application with the nearest airport — in this case, Sydney Airport.
    a. Attach an Aeronautical Impact Statement (AIA) which has been prepared based on the proposal and then current airspace.
    b. Attach summary application form(s)

2. The evaluation process by Sydney Airport and stakeholders.
    a. *The Airport*:
    Makes its own evaluation and may make comments on a building application and/or request further information.
    Forwards applications to CASA, Airservices Australia and, if considered relevant to key airline stakeholders, for evaluation and formal responses — which are ultimately forwarded to DITRDC for their assessment of the application.
    With crane applications the airport has the authority to approve or disallow an application, but in practice it will forward applications to the Department and the aviation agencies that have specialist expertise to evaluate such applications.
    b. *CASA*:
    Assesses the OLS impact and safety implications.
    If CASA responds that the proposal would in their opinion adversely affect the safety of air transport operation then DITRDC must refuse the application.
    c. *Airservices*:
    Evaluations the proposal in relation to PANS-OPS procedures maintained by them, potential impact on communication, navigation and surveillance facilities as well as on air traffic control operations.
    d. *Key Airline Operators*:
    Assess the proposal for potential impact on their One-Engine Inoperative (OEI) contingency procedures.
3. The airport must refer the application to DITRDC no later than 21 calendar days after receipt.
4. DITRDC:
    Assesses the responses from the Sydney Airport, the referral agencies and stakeholder airlines.
    Under the APAR, they must make a determination on the application no later than 28 calendar days after referral from Sydney Airport (49 days from date of application), with the exception that the determination date may be pushed back if they have requested further information from the Proponent of the application
    If a response from Airservices has not been received by the regulated determination date, DITRDC must refused the application. However, that application can be reopened for a revised determination upon request of the Proponent once the Airservices response has been received by DITRDC.

Strategic Airspace is frequently engaged by Proponents to prepare and submit the application, and to manage the process for and on their behalf — including facilitating responses to technical queries, and handling liaison between the airport, CASA, Airservices, DITRDC and the Proponent — during the application process until a final determination is received.

B Sunsetting of the Airports (Protection of Airspace) Regulations

The APAR are one of the set of regulations pursuant to the Airports Act 1996 that are due to sunset on 1st April 2024[2]. There is no clear information available at this time that describes the process that will replace the APAR, however DITRDC has provided an overview of the legislative review process — see section 7.4 (p34).

2 https://www.infrastructure.gov.au/infrastructure-transport-vehicles/aviation/aviation-legislation-regulation-policy/sunsetting-aviation-legislation

3.4.2 Prescribed Airspace

Prescribed airspace, under these regulations, includes at minimum the following.

A 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 Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) — 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 does not penetrate or adversely affect surfaces protecting the 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.

B 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. However, for a variety of reasons, PANS-OPS surfaces can and do change over time. Approval may be granted, under certain conditions, for temporary obstacles (such as cranes) which at their maximum height would infringe the limiting PANS-OPS surface, and in such cases operation at such heights would most likely be capped by the RTCC surface constraint (see below) and limited to 3 months duration.
- As flight procedures are changed from time to time (usually by Airservices), the PANS-OPS Surfaces Chart 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. In this case analysis of the most recently published or known planned PANS-OPS instrument procedures is conducted using the PANS-OPS criteria published by ICAO and, where relevant, as modified or specified otherwise under the Australian MOS Part 173.

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 also necessary to consider the other factors.

C Other Considerations

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 also necessary to consider the other factors.

- **Sydney Airport's Declared Airspace Plans**
  Once approved as Declared Airspace by DITRDC, become part of their Prescribed Airspace (refer also Section 4.1.1, p19).
  In addition to the OLS and PANS-OPS charts, these additionally include:
  - Radar Terrain Clearance Charts (RTCC), which depict the areas and height limits related to the Minimum Vector Altitude (MVA) sectors 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.
  - Navaid and radar evaluation / protection surface plans.

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

- **Sydney Airport's 2039 Master Plan**
  As the most recent Master Plan, this is evaluated for changes to the airport and/or airspace infrastructure which are included in the approved Master Plan, and which may potentially supersede the published Declared Airspace plans.
  See also Section 4.1.2 (p19).
- **Other Factors**
  - Airline One-Engine Inoperative (OEI) (Contingency) Take-Off Splays
    (as per Civil Aviation Order (CAO) 20.7 1b)
    These are generally assessed independently by the airlines as part of their own evaluations of any given airspace height application, but in certain cases it may be prudent to evaluate any potential impact in advance.
  - As per the National Airports Safeguarding Framework (NASF) – Guideline H: Proximity to the critical parts of flight paths to/from Strategic Helicopter Landing Sites (SHLS), which are usually limited to the helipads used by Helicopter Emergency Management Services (HEMS) at major trauma hospitals.
  - Other miscellaneous factors that may be considered as potential safety issues by any of the key stakeholders, and the Civil Aviation Safety Authority (CASA) in particular.

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

All "heights" provided in this document are elevations expressed in metres in the 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^{AHD}.

Note also for aviation-related airspace height limits, any building height approval under the Airports (Protection of Airspace) Regulations is regarded as inclusive of the building itself, plus all rooftop furniture and overruns (plant buildings, lift risers, building management units, rooftop furniture and vegetation, antennae, signage, etc).

4. Analysis

4.1 Sydney Airport's Prescribed Airspace & the Master Plan 2039

4.1.1 Sydney Airport's Prescribed Airspace Charts

Other than Sydney Airport's OLS Chart (Feb-2021), the airport's other declared airspace charts are outdated.

The PANS-OPS Protection Surfaces (Combined Current IALs and STARs) chart (effective Mar-2017, published by the airport in 2019) no longer fully reflects the PANS-OPS instrument flight procedures in use and planned for Sydney Airport. The PAN-OPS Omnidirectional Departure Critical Assessment Surfaces chart (Mar-2015) is obsolete because the underlying standards for height clearances for departure procedures has since changed, and the operational PANS-OPS departure procedures have also changed. Thus, the assessment of PANS-OPS surfaces herein is based on the latest PANS-OPS Instrument Flight Procedures (IFPs) published by Airservices. See also Section 4.3 (p21) and Appendix 2 — PANS-OPS Procedures.

All other published charts are dated Feb-2015. The navaid chart is obsolete by virtue of changes to the navigational aids and radar since publication. The Radar Terrain Clearance Chart (RTCC) should also be superseded because RTCC surface areas have since changed — but the sector overhead the site remains the same (refer Figure 4-5, p26).

4.1.2 Master Plan 2039

Sydney Airport's current approved Master Plan has a planning horizon to 2039. This supersedes the 2033 Master Plan that was referenced in the Study Requirements.

The 2039 Master Plan does not forecast any changes that would result in changes to the OLS or more constraining airspace over the site.

4.2 OLS Analysis

The location of the proposed re-development, with respect to the OLS[3] of Sydney Airport, is shown in Figure 4-1 below. The image shows that the site is located under the Conical Surface, which slopes upwards (from the direction of the airport) across the Paint Shop sub-precinct. The OLS Conical Surface heights range from approximately 69 to 89m AHD, from south to north as indicated by the 1m contours shown in Figure 4-1.

All towers in the final design are likely to infringe the OLS — Table 4-1 below provides an indication of the extent of infringement of the OLS (the numbers being based on the proposed heights of the towers in the Masterplan proposal).

Because the towers would infringe the OLS, they would require height approval under the APAR prior to construction. In fact, under planning regulations height approval would be required prior to determination of a Development Application (DA) for the buildings (singularly or as a group). Infringement of the OLS in the general vicinity of the Paint Shop precinct is not unusual — existing developments such as at the Green Square Town Centre and the Waterloo Metro Quarter also infringe the OLS.

The low and mid-rise buildings will not infringe the OLS and therefore would not require approval under the APAR.

3 *Technical Note*: The OLS Conical Surface starts from the edge of the OLS Inner Horizontal Surface. The Inner Horizontal Surface has been generated by Strategic Airspace using the ICAO Annex 14 parameters, with distances from the Runway Ends (as specified in ICAO Doc 9137 Airport Services Manual, Part 6 Control of Obstacles.

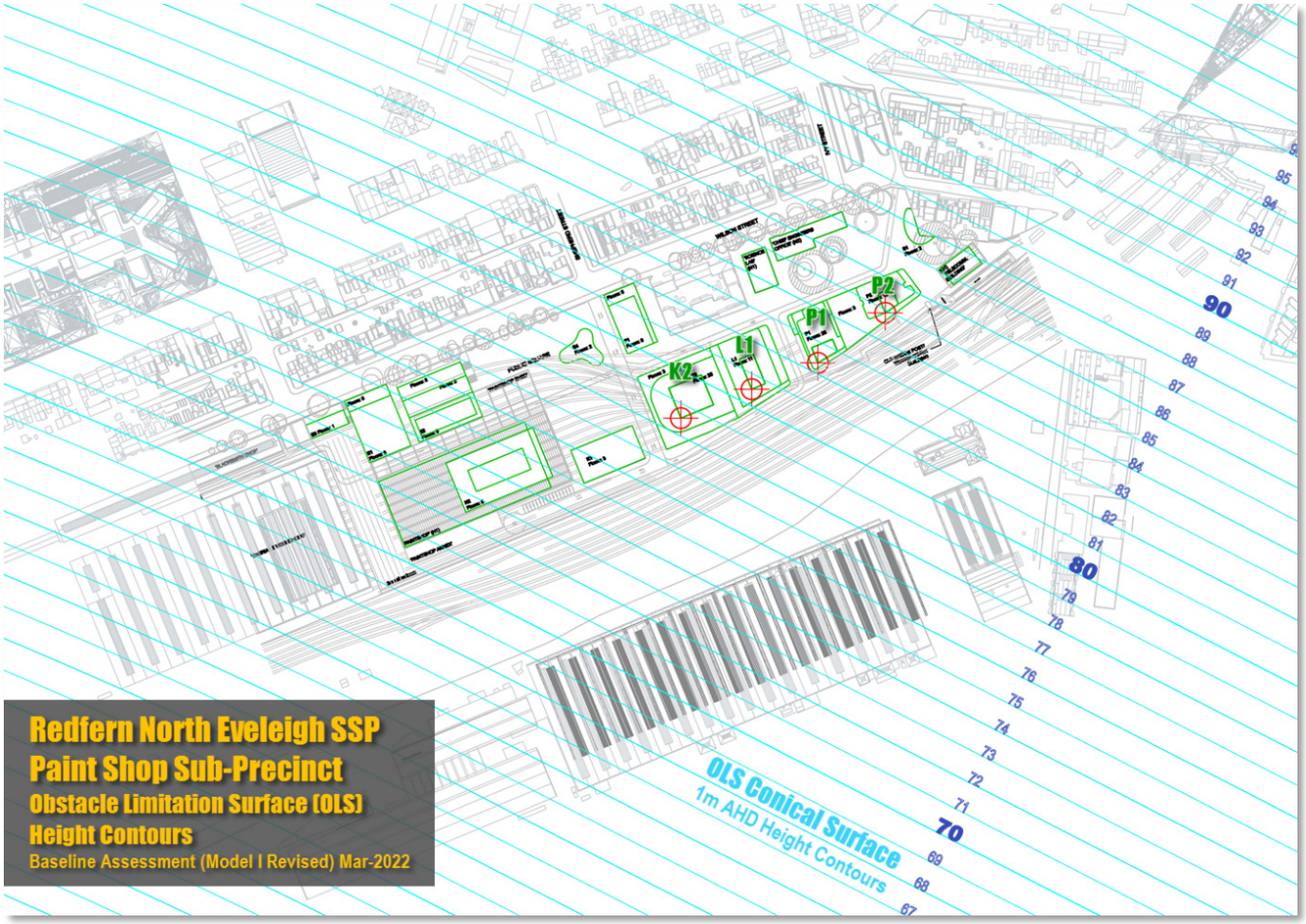
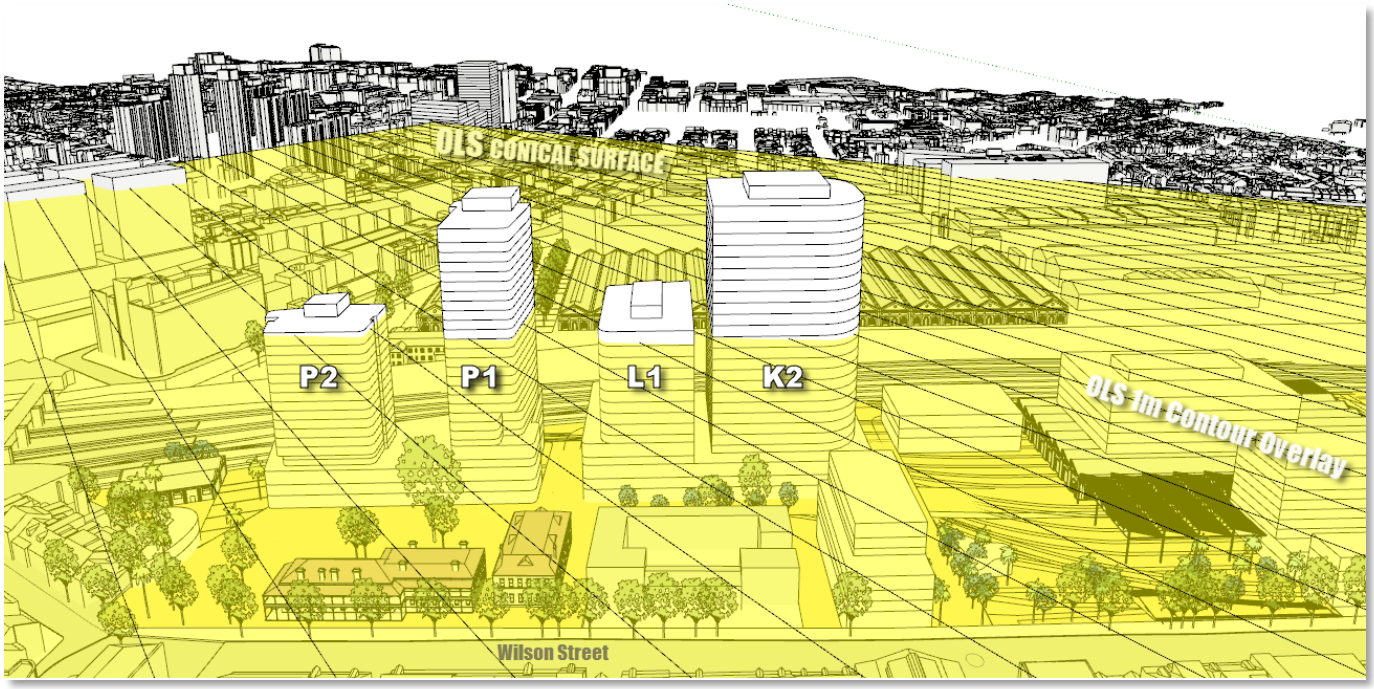


Figure 4-1 — Site in relation to the OLS for Sydney Airport

Table 4-1 — OLS Height Impact & APAR Application Implications

		OLS Height		
Location	*Assessment Height (m AHD)*	*Surface Height (m AHD)*	*Clearance / Infringement*	*Approvability Comment*
Paint Shop Sub-Precinct		Range 69 – 89	- 49.6 or lesser infringement	The towers require prior approval under APAR because they infringe the OLS; approval being subject to the maximum height being below the most limiting PANS-OPS or RTCC surface height.
The 2 Tallest Towers				
K2	128.2	78.55	- 49.65	Infringement by lower towers is less
P1	123.5	82.35	- 41.15	
Low/Mid-Rise Buildings				
Non-Tower Buildings	≤ 63.6	69 – 89	Clearances vary	All low & mid-rise buildings will be below the OLS.



Source: Bates Smart & Strategic Airspace

Figure 4-2 — Masterplan Proposal in 3D and the OLS Overlay (Viewed from the West)[4]

4.3 PANS-OPS Analysis

In addition to reviewing the PANS-OPS (Approach) Surfaces chart of Sydney Airport's Prescribed Airspace (current at 2017, but published by the airport in 2019), assessment was conducted of the following instrument procedure types for Sydney Airport, as published in the Australian Aeronautical Information Publication (AIP) Departure and Approach Procedures (DAP), up to Amendment 169 (effective 02-Dec-2021 to 21-Mar-2022). Following items were checked against applicable criteria in ICAO PANS-OPS Doc 8168 Vol II (Construction of Visual and Instrument Flight Procedures):

- The Circling Minima and Minimum Sector Altitudes (MSAs) for existing PANS-OPS procedures
- The discrete minima for the Instrument Approach and Missed Approach Procedures.
- Standard Instrument Departure Procedures (SIDs)

Due to the changes in PANS-OPS procedures since the publication of Sydney Airport's PANS-OPS (Approach) Surfaces chart, and the fact that their Departure Surfaces chart is totally obsolete, imagery of the site location within the context of these charts is not shown.

It should also be noted that Airservices and CASA have decided that Omnidirectional Departure surfaces will, in Australia, be based on criteria that is different to the current ICAO standard. While there are Australian and ICAO processes to document and promulgate such 'local' variations, Airservices and CASA have not yet used these processes to promulgate their intention to use a 'local' standard for these surfaces. The surface contours for departure protection surfaces shown in Figure 1-2 — Building Height Limitation Surfaces (Small Format) and Figure 4-3 — Site in relation to the PANS-OPS Procedure Surfaces below are based upon the ICAO standard. The ICAO standard is more restrictive than the proposed new 'local' Australian standard, so this diagram shows the 'worst case' in terms of PANS-OPS restrictions on building heights.

4 Refer also Footnote 1 (p12)

Table 4-2 contains an overview of the key PANS-OPS surface heights over the site, and the details of assessment of the various PANS-OPS surfaces is contained in the following sub-sections. Figure 4-3 below depicts the height contours of the limiting PANS-OPS surfaces over the site.

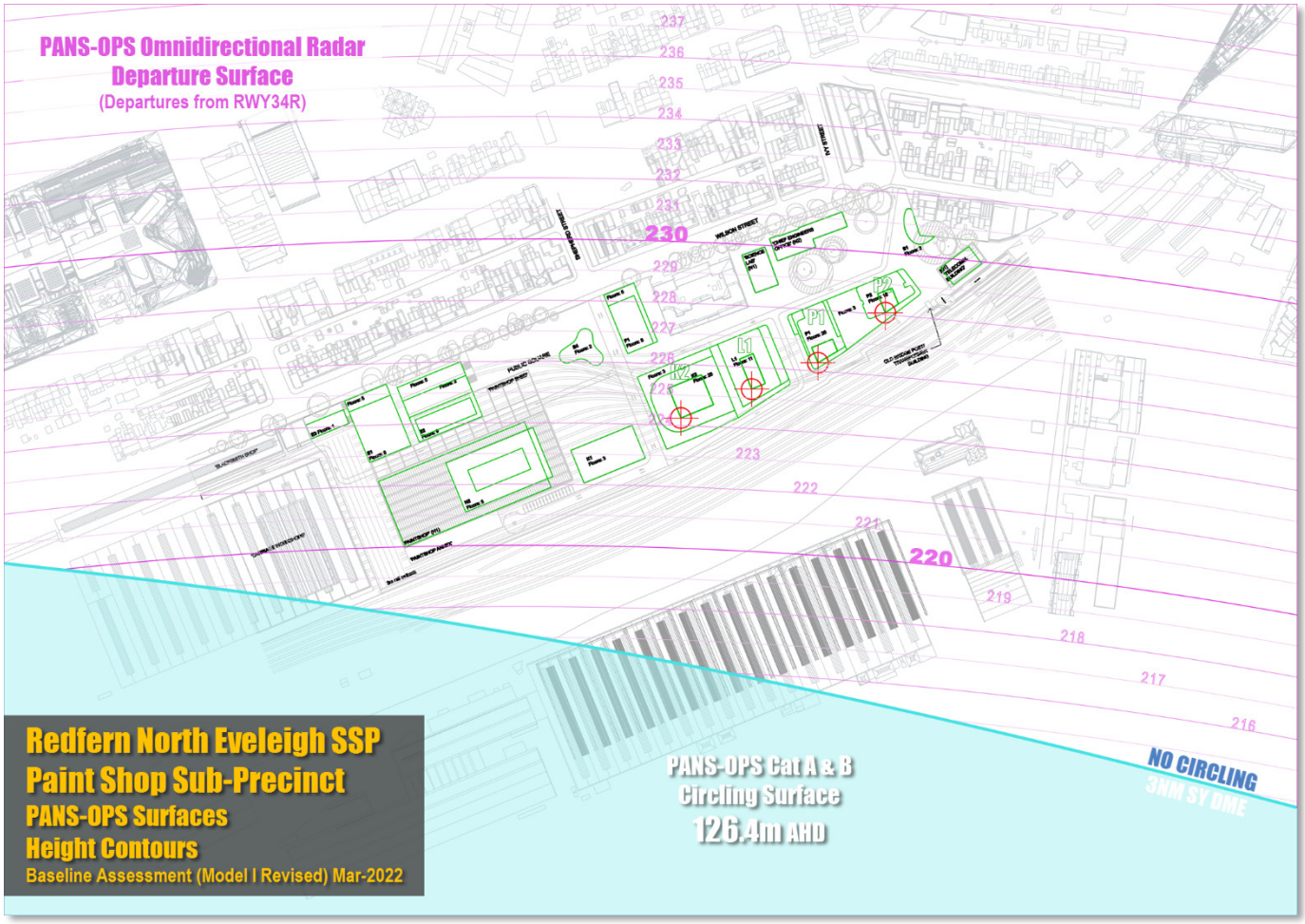


Figure 4-3 — Site in relation to the PANS-OPS Procedure Surfaces[5]

Table 4-2 — Sydney (YSSY) PANS-OPS Height Limit Summary

Procedure	Height Limit (m AHD) at K2	Description
Departures	≥ 224.1	Under the protection surfaces for the Omnidirectional Radar Departure from RWY07 and RWY34R — the latter being the most restrictive.

5 Refer also Footnote 1 (p12)

Procedure	Height Limit (m AHD) at K2	Description
Approaches and Missed Approaches to all Runways	≥ 240.8	Under the protection area for the turn in the missed approach procedures coming off the approach procedures for RWY 34R[6]. The most restrictive of these is the RWY34R ILS CAT I SA missed approach.
Circling Area	N/A	The Paint Shop Sub-Precinct is in an area where the circling procedure is explicitly forbidden.
Minimum Sector Altitude (MSA)	340	The 10 NM Minimum Sector Altitude of 2100 ft imposes this surface height constraint across the entire site.
STARs	≥ 340	Outside the lateral protection areas or too high overhead to have any impact on the proposed development.

4.3.1 "Area" Procedures

A Minimum Sector Altitudes (MSAs)

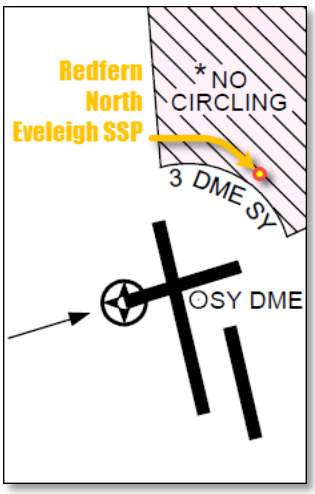
The relevant sector is the inner 10 NM sector around the airport which has a 2100ft (~640m) minimum flight altitude.

Table 4-3 — Summary of MSA Surface Heights over the Key Reference Points

Procedure	Height Limit (m AHD)	Description
10NM MSA	Horizontal Surface: **340**m	Covers the entire site. This surface height is based on the ICAO minimum obstacle clearance of 300m, giving a calculated value of 340.08m AHD. The value published in Sydney Airport's PANS-OPS chart is 340m AHD.

B Circling Minima

Not applicable: the site is in an area where circling procedure is explicitly forbidden (the north-eastern sector outside 3NM from SY DME).



Source: Airservices Australia, Australian AIP DAP Amdt 169

Figure 4-4 — Site in relation to the No Circling Area

6 *Technical Note:* The RWY34R missed approach Basic ILS, ILS OAS and PAOAS surfaces, as shown in the Sydney Airport's 2017 PANS-OPS chart, are considered irrelevant now as the missed approaches now rely on GNSS navigation. This is because of the requirement (effective from AIP DAP Amdt 169) for all RWY34R missed approaches to use a turning waypoint SSYST before continuing to waypoint SSYSH to the north-east.

C STARs

The minimum segment altitude on any of the STARs surrounding Sydney Airport is 2,100ft, which would have a protection surface of 340m AHD or higher. A detailed study of the extent of impact by STARs is not included.

4.3.2 Instrument Approaches & Missed Approaches

The impact of each of the relevant PANS-OPS protection surfaces for current approach and departure procedures for Sydney Airport were evaluated.

The site is laterally clear of the protection surfaces of all approach procedures, except for the missed approaches for the RWY34R approach procedures. It is under the protection area for the right-hand turn in the missed approach.

Analysis has shown that lowest protection surfaces overhead building K2 are those associated with missed approach procedures. The altitude of the lowest surface for the ILS SA CAT I procedure, above building K2, is 240.8m AHD. The limiting heights and the heights of the tallest buildings are summarised in Table 4-4 below.

Table 4-4 — Summary of Limiting PANS-OPS APPROACH Surface Heights & Height Clearances

		PANS-OPS Approach Surfaces		
Reference Point	*Assessment Height (m AHD)*	*Procedure*	*Surface Height*	*Clearance / Infringement*
K2	128.2	RWY 34R ILS MA	240.8	112.6
P1	123.5	RWY 34R ILS MA	241.4	117.9
Other Tower Buildings		RWY 34R ILS MA		> 117.9

4.3.3 Departures

The departure procedures from RWY 07 and RWY 34R were evaluated for potential impact. Based on the data published in the Omnidirectional Radar Departures All Runways chart, the RWY 34R departure procedure was determined to be the most limiting of the PANS-OPS departure procedures, and indeed the overall most restrictive PANS-OPS surface. The limiting departure surface heights and the impact in relation to the proposed development are depicted in Table 4-5 below. A contoured depiction of this surface over the whole site is shown in Figure 4-3 above.

Table 4-5 — Summary of Limiting PANS-OPS DEPARTURE Surface Heights & Height Clearances

		PANS-OPS Departure Surfaces		
Location	*Assessment Height (m AHD)*	*Procedure*	*Surface Height*	*Clearance / Infringement*
K2	128.2	Radar Dep RWY34R	224.1	95.9
P1	123.5	Radar Dep RWY34R	226.1	102.6
Other Tower Buildings		Radar Dep RWY34R		> 102.6

4.4 Other Assessment Considerations

The following table provides a brief assessment of other considerations.

Table 4-6 — Other Assessable Height Limitations — including the RTCC MVA Limit

Procedure	Height Limit (m AHD)	Description
Radar Terrain Clearance Chart (RTCC)	**152.4**	This height constraint is applicable over the entire site. Refer Section 4.4.1and Figure 4-5 below.
Communications & Navigation Infrastructure Surfaces	N/A	The proposed development is too far from the airport to affect any ground-based navigation or communications infrastructure. Refer Section 4.4.2 below.
Approach Lighting & VGSI Surfaces	N/A	The site is outside the lateral extent of published approach lighting surfaces.
Airline One-Engine Inoperative Procedures	N/A	The OEI contingency procedures from RWY 34R (the most relevant take-off runway end), are designed and maintained by each of the passenger transport aircraft operators in accordance with CAO 20.7 1b, and other relevant regulations and operational approvals. These procedures are not part of the Prescribed Airspace. Airlines must ensure that their company procedures (which are specific to the performance of aircraft type, configuration, take-off weights, and so forth) have predetermined paths to follow in the event of engine-out incidents on and after take-off which will remain appropriately clear (vertically and laterally) from obstacles. The site is outside the straight splay area that is defined by the regulations for obstacle assessment. Further, there are taller buildings within the general vicinity of RNE but closer to the airport (eg, Green Square) which are likely to be more demanding on the EOI procedures than the masterplan proposal for the RNE Paint Shop sub-precinct. Consequently, this proposal will not adversely affect any contingency procedures.
External Lighting & Façade Reflectivity	N/A	The Paint Shop sub-precinct is outside the defined vicinity from the airport where restrictions on external lighting are imposed. Further, reflectivity of the external façade of the tower buildings is not a concern because of the distance of the site from the airport.
Wind Shear & Turbulence	N/A	The masterplan proposal will not have any adverse turbulence and windshear impact on aircraft operations due to the distance of the site from the airport.
Helicopter Procedures related to the Nearest Strategic Helicopter Landing Site (SHLS)	N/A	The Royal Prince Alfred Hospital helipad (YRPA) is located approximately 1.1km west-north-west of the Paint Shop sub-precinct. As it serves Helicopter Emergency Management Services (HEMS) flights, this landing site is considered to be an SHLS under the National Airports Safety Framework (NASF). The published routes for YRPA are not affected in any way by the proposed development. The nearby Harbour Bridge Five helicopter transit route to/from Sydney Airport is to be flown at an altitude high enough to not be affected by the proposed Paint Shop sub-precinct development. Refer Section 4.4.4 (p27)

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

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

The Radar Terrain Clearance Chart (RTCC) surfaces overhead the site protect the lowest Minimum Vector Altitude (MVA) sectors used by air traffic controllers, where each MVA sector defines the lowest altitude that can be used for vectoring aircraft in that sector. With an MVA of 1500ft over the entire site, the RTCC surface height limit is 152.4m AHD as shown on Sydney Airport's RTCC chart (depicted below in Figure 4-5).

Table 4-7 — RTCC Surface Height & Tower Building Height Clearances

Location	Assessment Height (m AHD)	RTCC Surface	
		Surface Height	Clearance / Infringement
K2	128.2	152.4	24.2
P1	123.5		28.9
Other Tower Buildings			> 28.9

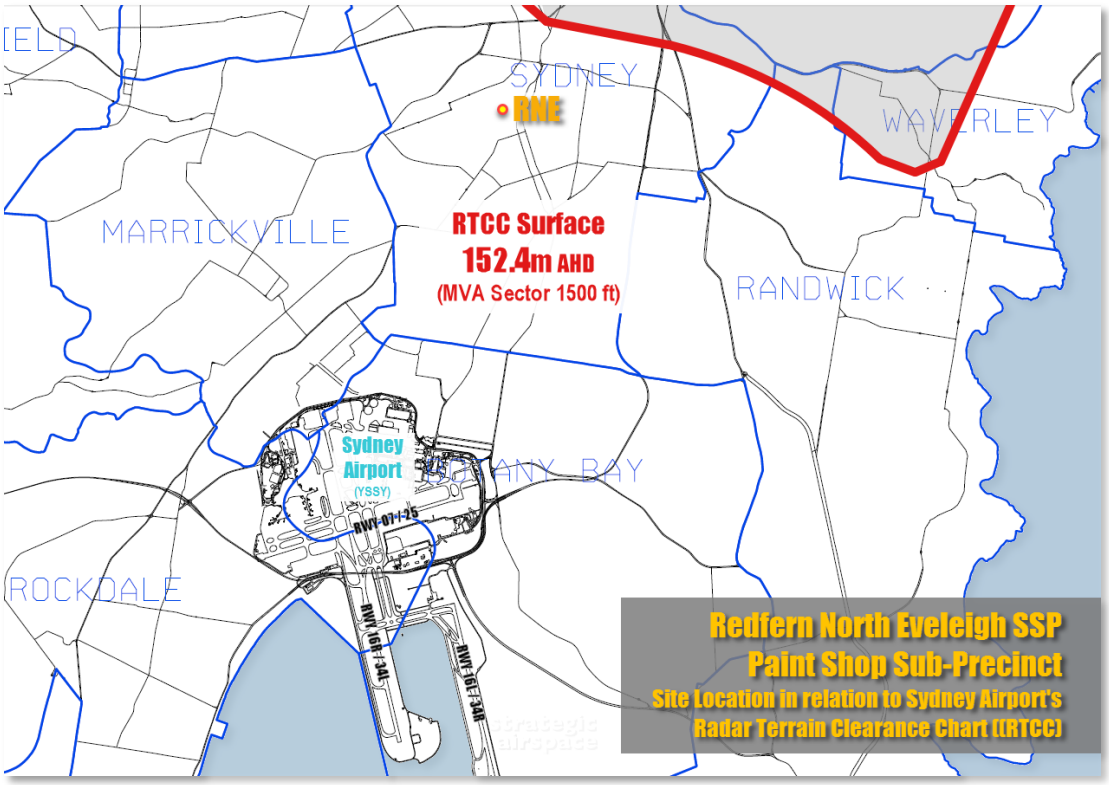


Figure 4-5 — Site in relation to Sydney Airport's Radar Terrain Clearance Chart (RTCC)

4.4.2 Communication/Navigation/Surveillance (CNS) Facilities

Based on the location and maximum planned heights of the planning proposal, it is considered that there will be no adverse impact on the performance of any Airservices Australia's Precision and Non-Precision Navigation Aids, Anemometers, HF/VHF/UHF Communications, A-SMGCS, Radar, PRM, ADS-B, WAM or Satellite links required for safe and efficient operations at Sydney Airport.

4.4.3 Shielding

There are no taller developments in a location that would provide shielding to the masterplan proposal.

4.4.4 Flight Paths to/from Strategic Helicopter Landing Sites (SHLS)

The Royal Prince Alfred Hospital's helipad (identifier code: YRPA) is classified as a Strategic Helicopter Landing Site and is located at just over 1km west-north-west of the Paint Shop precinct. Though helicopters flying in and out of this helipad are technically allowed to depart to, or approach from, any direction in accordance with prevailing conditions and operational needs, there are paths published in the official Aeronautical Information Publication (AIP) that must be maintained free of obstacles. The YRPA's published southern path (as per AIP Amendment 169, effective from 02-Dec-2021 to 21-Mar-2022) passes west and south of the Paint Shop sub-precinct and remains clear and unimpacted by the planning proposal, as illustrated in Figure 4-6 below.

The default approach and take-off southern flight paths used by the primary operator to the helipad — the TOLL Group helicopters as the contracted helicopter emergency management services (HEMS) operator for NSW Ambulance — which differ from those published in the AIP, were also assessed (see also section 7.5.1, p35).

Figure 4-6 — Site in relation to nearby SHLS (RPA Hospital Helipad) & Coded Helicopter Route (Harbour Bridge Five)[7]

7 Refer also Footnote 1 (p12)

The flight paths in and out of YRPA were assessed by analysis of the most conservative protection surfaces that might be associated with the paths: the surface for night operations at the lowest applicable slope, with a protection area as wide as 10 rotor diameters of the largest helicopter to operate in and out of the helipad. The surfaces protecting the flight paths to the south (as per the AIP and as used by TOLL) remains well clear of the Paint Shop sub-precinct.

Also shown in Figure 4-6 is the Harbour Bridge Five helicopter route which passes nearby the project site on the leg between Redfern train station and Erskineville Oval. The Harbour Bridge Five helicopter route is a transit route published for Sydney Airport to allow helicopter traffic to transit through controlled airspace between Sydney Airport and Sydney Harbour — using Central Station, Redfern Station and Erskineville Oval as key turning points. The surface area either side of the nominal flight path shown in the figure above represents a reasonable variation for helicopters traversing the route. This route is to be flown at an altitude no lower than 1000ft AGL (ie, ~305m above the ground) on the leg past the Paint Shop sub-precinct and is not impacted by the towers in the masterplan proposal.

4.5 Height Analysis Summary

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

Table 4-8 — Analysis Summary — Airspace Height Constraints

Height Limits (m AHD)	Height Limit Detail	Comment
69 – 89	**Obstacle Limitation Surface (OLS) — Conical Surface**	**The tower buildings of the masterplan proposal would infringe the OLS**, and thus would **require height approval under the APAR to be approved by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC)**. Infringement of the OLS in this case is not considered a barrier to approval of an application under the APAR.
152.4	**Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA) 1500 Sector**	**MAXIMUM EFFECTIVE BUILDING HEIGHT CONSTRAINT** As the RTCC is lower than the PANS-OPS surfaces over the site, **the RTCC is the most constraining height limit for building developments**. Cranes operating above this height, if approved, would also be subject to various operational constraints, including a maximum duration of 3 contiguous months.
≥ 224.1	PANS-OPS Departure Surface — Radar Departure RWY 34R	MAXIMUM EFFECTIVE CRANE HEIGHT CONSTRAINT Whilst PANS-OPS surfaces normally define the maximum permissible building height, in this case the lowest of the PANS-OPS surfaces (that related to the Radar Departure for RWY34R) is higher than the RTCC and therefore less restrictive. Given this, the PANS-OPS surface heights would also define the maximum permissible crane heights.
≥ 240.8	PANS-OPS Approach Surface — ILS RW34R Missed Approach	The missed approach of the RWY 34R ILS procedure is the lowest PANS-OPS approach surface over the site. See Table 4-4 (p24) for details. This surface is higher than the departure surface across the entire site and doesn't impose any additional restrictions on the site.
N/A or Higher	Other Surfaces	The site is outside the extent of other protection surfaces or the height limits are higher, and so are considered Not Applicable.

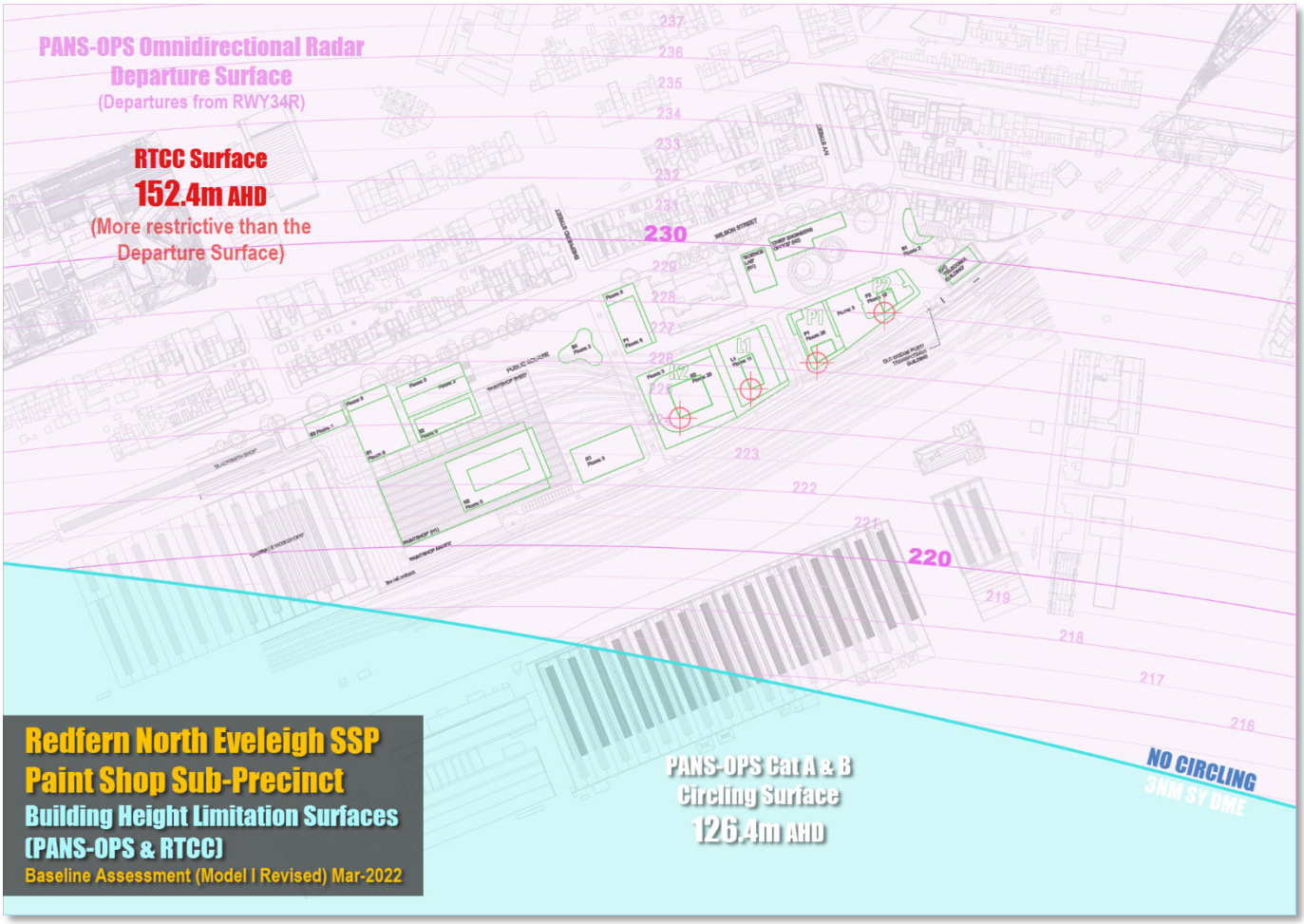


Figure 4-7 — Building Height Limitation Surfaces

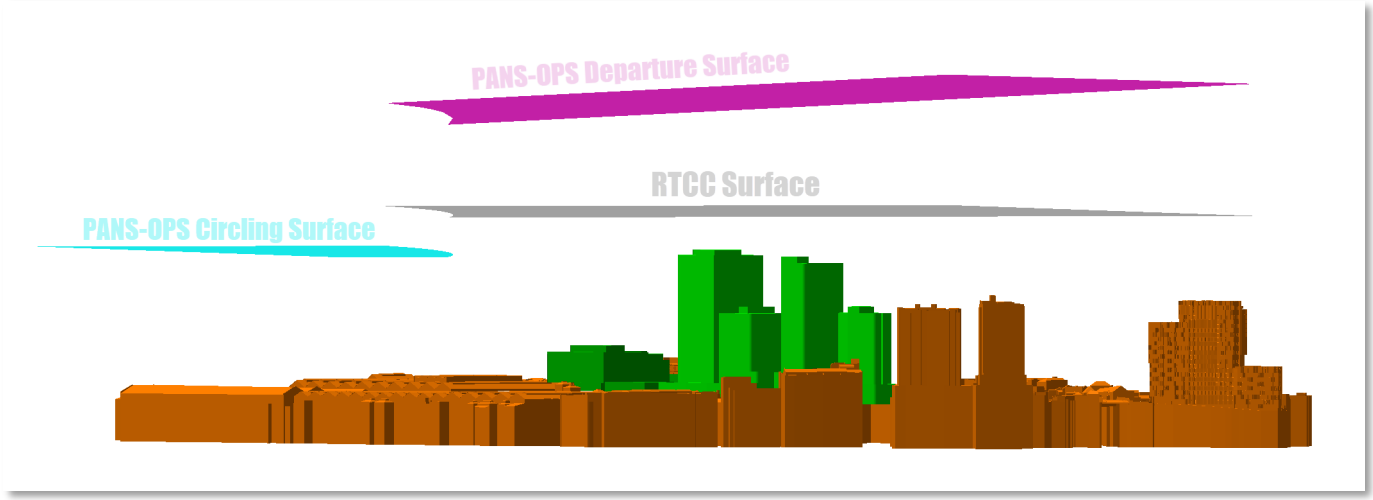


Figure 4-8 — 3D View of the PANS-OPS & RTCC Surfaces

5. Crane Considerations

Crane types, the maximum height of cranes and crane operation duration limits (which may be imposed as part of crane height approvals) are likely to influence the length of the construction program and therefore cost and economic feasibility of constructing the tower buildings.

In this regard, the determining factor will be the heights at which cranes would be permitted to operate without an operation duration limit, and the height at which cranes may be permitted to operate but with a range of operational conditions (refer section 5.2).

As with buildings, any crane that would infringe the OLS would require a prior height approval under the APAR.

5.1 Building, Crane & Airspace Height Clearance Overview

Table 5-1 — Surface Heights & Crane Implications

		Crane Height Clearance & Impact			
Reference Point	*Assessment Height (m AHD)*	*Surface*	*Surface Height*	*Clearance / Infringement*	*Implications*
Site	**≤128.2**	RTCC	152.4	≥ 24.2	Cranes for the taller towers may infringe this surface.
		Radar Dep RWY34R	≥224.1	≥ 95.9	Cranes higher than the RTCC surface but below this limiting height may be approved but with operational & maximum duration conditions.

The RTCC surface will be the maximum height at which cranes would be approved without any special operational conditions or operating duration limit.

With regard to the maximum heights of the tower buildings and the RTCC surface:

- Clearances of 24m and 29m between the RTCC surface and the two tallest buildings (K2 and P1 respectively) is insufficient for luffing tower cranes that would be required for their complete construction — and is also most likely insufficient for hammerhead cranes. Thus, it is likely that cranes would need to be staged, with the initial stage using cranes operating up to heights no higher than the RTCC surface.
- The clearance between the RTCC and the top of L1 and P2, in the order of 62m, may be sufficient for a hammerhead crane but is unlikely to be sufficient for a luffing crane for construction of the upper levels of the building. Thus, it is likely that cranes would need to be staged, with the initial stage using cranes operating up to heights no higher than the RTCC surface.
- In the above two cases, approval for a subsequent stage where the crane exceeds the RTCC surface height would most likely be subject to the additional operational and time limits.
- For the low to mid-rise buildings, with clearances 89m or more between the top of the buildings and the RTCC surface, luffing cranes could approved without special operating conditions (apart from obstacle lighting).

Other items to consider:

- Hammerhead cranes require less space overhead the roof of buildings, but they have less lifting power than luffing cranes and therefore may be required for longer. Thus, for

construction efficiency, the use of luffing cranes may be preferred, which means higher maximum heights.

- The use of climbing cranes can be used to minimise the time that a crane would exceed the RTCC surface (if ultimately an approval for infringement of the RTCC surface is accepted by Airservices Australia).

5.2 Crane Approvals & Approval Conditions Implications

Airspace height approvals for cranes are not required for DA consent — they are only required prior to the time the crane would infringe the relevant OLS limit. However, for the two taller tower buildings that have maximum elevations near the maximum permitted building height (eg, K2 and P1) it is advisable that any Aeronautical Impact Assessment reports which support height application for buildings demonstrate that their construction is feasible by including pre-assessment of likely crane implications.

As noted above, the RTCC surface height is most likely to be considered a critical height by aviation authorities in terms of assessment of applications for crane height approvals, and it is also highly likely to be used as a trigger for special operational conditions.

Because the RTCC surface protects the Minimum Vector Areas which are used by air traffic control (ATC) for manually vectoring (ie, directing) air traffic, a crane which infringes the RTCC surface is in the vertical safety zone of that MVA for which ATC has legal liability. It is for this reason that Airservices Australia seeks to minimise the duration of such infringements, where considered acceptable by them.

Thus, cranes which infringe the RTCC surface may be approved as *short-term controlled activities*, wherein the approved duration would be limited to no more than three (3) contiguous months.

Airservices Australia may also consider multiple tower cranes on the site (even if for different tower buildings) as closely located cranes, in which case they may regard all cranes which have planned overlapping durations as a single instance of an infringement of the RTCC surface — which means that they would request the approving authority to limit all such cranes to the same 3-month contiguous period. Whilst not a key issue during the SSP planning process, it is a factor to consider in relation to the consideration of timing and staging of cranes during construction planning.

Further, where a crane infringes the RTCC surface, an approval would contain a range of special operational conditions, including:

- The site supervisor being responsible for contact with Airservices Australia's designated ATC contact by radio and/or telephone.
- Lowering the crane at night and at times of low visibility (eg, low fog). In the case of low visibility occurring during the date, the operator would be required to lower the crane within 30 minutes of instruction from ATC).

Note also, given the proximity of the site to Sydney Airport and the fact that ATCs rely heavily on vectoring aircraft to/from the airport, Airservices may regard any infringement of the RTCC surface as an impingement on their ability to efficiently manage air traffic, in which case DITRDC would not permit such an infringement for cranes, even for a limited duration — with the exception of 1-day permits for infringements during erection and dismantling of cranes which have separate approvals.

In the case where infringements of the RTCC surface may not be approved, development plans for the tower buildings would have to take into account building and materials technologies, and craneage plans (range, type and staging of cranes), to be employed for construction of the upper levels of the taller buildings.

Cranes for all low and mid-rise buildings are anticipated to be unconstrained by the maximum airspace limits. However, it is probable that cranes for the buildings of 5-9 storeys would infringe the OLS and so would require approval prior to the time they exceed the OLS limit applicable at the building.

Approval for cranes to operate above the OLS are likely to include a requirement for obstacle lighting of the cranes.

6. Obstacle Lighting Considerations

The installation of obstacle lights on tall structures are a means of hazard reduction because they serve to provide warning to aircraft (including helicopters).

Any building which infringes the OLS may be subject to an approval condition that requires the installation and operation of obstacle warning lights on the building as a safety mitigation.

Obstacle lights would most likely be required for the two tallest tower buildings, K2 and P1. This assessment concurs with the separate advice received from CASA during consultation (refer section 7.2, p33).

The requirement for obstacle lighting will be determined by CASA in accordance with MOS Part 139, section 9.4 (Obstacle Lighting) when an application for a height approval under the APAR is assessed.

7. Consultation

7.1 Sydney Airport

Consultation was undertaken with Sydney Airport Corporation Limited (SACL) on 26th October 2021. The airport representatives included the Head of Government and Community Relations, the Manager Airfield Spatial & Technical Planning, and the Senior Airspace Protection Officer. A briefing presentation was provided to them before the consultation meeting.

Sydney Airport's policy is to not support the development of a permanent structure that infringes the airport's OLS. They also wish to protect against increasing encroachment of their airspace to maintain safety of current and future aircraft operations and also to preserve sufficient airspace to allow flexibility for potential future aircraft operations.

In the context of increasing encroachment, other developments that already infringed the OLS were mentioned, including Green Square Town Centre (GSTC) buildings (the tallest being 121m AHD), Waterloo Metro Quarter over-station development buildings, and the tallest tower in Redfern village (102m AHD).

Their final comment was that ultimately the acceptability of the tower buildings in the masterplan proposal would be subject to a determination by DITRDC of a height application — for the sub-precinct as a whole, or per tower building.

Sydney Airport defers to the advice of CASA (regarding safety impact and obstacle lighting conditions) and Airservices Australia (regarding safety and maximum heights). It is this advice, together with feedback from stakeholder airlines, which is relied upon by DITRDC when making their determinations on height applications under APAR.

7.2 CASA

Consultation was undertaken with representative of the Air Navigation, Airspace and Aerodromes Branch of the Civil Aviation Safety Authority on 26th October 2021, the representative being an Aerodrome Engineer who is responsible for assessment of height applications. A briefing presentation was provided before the consultation meeting.

Being familiar with the local region around the RNE precinct and the height of significant buildings in that region, including the tower buildings in the Green Square Town Centre, the Waterloo Metro Quarter and Redfern Village, the CASA representative was of the opinion that an infringement of the OLS would be considered approvable under the APAR, and anticipated that the main focus when assessing a height application for one or more of the tower buildings in the planning proposal would be to determine which building(s) would require obstacle warning lights as part of a condition of approval of an application under the APAR.

The requirement to ensure that the flight paths to/from the Royal Prince Alfred Helipad, an SHLS, would not be adversely impacted was also discussed.

7.3 Airservices Australia

Consultation was undertaken with the Senior Advisor, Customer Engagement on 27th October 2021. A briefing presentation was provided before the consultation meeting.

Based on the briefing information provided, it was agreed that the maximum permissible airspace height limit for the planning proposal would be the RTCC surface over the site.

It was also considered likely that the RTCC surface height may be the limiting factor for cranes (it was noted that a recent application for a crane on Eveleigh St, Redfern, to a top height of ~168m AHD, was not considered acceptable by Airservices). However, if a future application for cranes for the site was considered acceptable by Airservices, they would be subject to a

maximum operational period of 3 contiguous months (without extension) and other operational conditions.

It was suggested that the planning proposal could be forwarded to Sydney Airport, CASA and Airservices for formal review and feedback — which would result in non-binding opinions. The alternative option suggested was to lodge a height application under the APAR for the tower buildings in Paint Shop sub-precinct masterplan — in which case a positive determination would provide certainty on the maximum development heights for the tower buildings (the approved heights and locations would in fact be reserved for future use within the conditions of the approval).

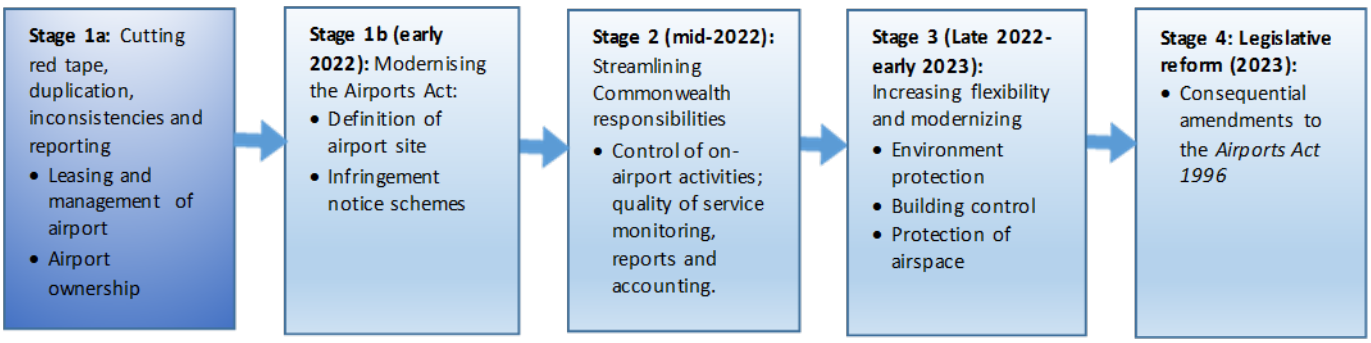
7.4 Department of Infrastructure (re APAR Sunsetting)

In response to a query regarding the sunsetting process for the Airports (Protection of Airspace) Regulations and the underlying Airports Act 1996, what superseding regulations may look like, and how they might affect planning and application processes for developments requiring airspace height approvals beyond the sunset date, DITRDC provided the following information[8].

The Australian Government is reviewing six legislative instruments under the *Airports Act 1996* due to sunset on 1 April 2024. The review presents an opportunity to examine the regulations thematically and streamline and modernise the current framework to reduce regulatory burden on the airports and their tenants, particularly as the sector emerges from, and adapts to, the impacts of COVID 19.

The regulations under review are: The Airports (Building Control) Regulations 1996, Airports (Control of On-Airport Activities) Regulations 1997, Airports (Environment Protection) Regulations 1997, Airports (Ownership—Interests in Shares) Regulations 1996, Airports (Protection of Airspace) Regulations 1996, and Airports Regulations 1997. Legislative changes to the *Airports Act 1996* will be considered in due course.

The review will be staged as follows and each stage will have an associated period of consultation:



For all stages of legislative review, we will notify key stakeholders when the department releases a discussion paper with further detail on proposed amendments and how to respond.

It is anticipated the consultation process on airspace protection issues will commence from mid-2022.

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8 Email 29th October 2021

Previous conversations with the Department have indicated that the objective is to have a revised scheme which is able to better cater for major long-term projects (such as RNE), provides more flexibility, and overall is more holistic — ie, considers environmental and other aspects which are currently included as considerations in the National Airports Safety Framework (noted as an ancillary consideration in section 3.4.2C, p17) but which are not encoded in the current legislative and regulatory framework. Height approvals already granted under the APAR prior to the implementation of any superseding regulations will remain active.

[Consultant's Note: Given the verbally stated objective, the location of the RNE site in relation to Sydney Airport and its airspace and flight procedures (and the technical basis upon which they are designed), it is considered that the risk of airspace-related height restrictions being made more constraining after the sunsetting process is extremely low. However, gaining a height approval under APAR for the entire scheme based on the current master plan, before the sunset date, would however obviate any such risk.]

7.5 Helicopter Operators to Royal Prince Alfred Hospital Helipad

7.5.1 TOLL Group (NSW Ambulance Contractor for Helicopter Services)

The Senior Contract Pilot – Helicopters (Government / Defence) for the Global Logistics division of the Toll Group, which has the contract for providing helicopter flight operations for NSW Ambulance was consulted for an opinion on the potential impact of the masterplan proposal on the helicopter flight paths to/from the Royal Prince Alfred hospital helipad (an SHLS, refer section 4.4.4, p27).

It was noted that the default southern approach and departure tracks used by Toll, under their Standard Operating Procedures (SOP), vary by 15° to the east from those published in the AIP (as depicted in Figure 4-6, p27).

The Toll representative stated that in his opinion that the masterplan proposal was well clear of the flight paths to/from the helipad.

It was also noted that from time to time other HEMS operators, such as the Westpac Rescue Helicopter Service (from their Newcastle base), also use the YRPA helipad.

7.5.2 Westpac Rescue Helicopter Service

Feedback from Chief Pilot and Operations Manager of the Newcastle-based Westpac Rescue Helicopter Service, which occasionally lands at Sydney hospitals including the Royal Prince Alfred hospital helipad, was sought in writing. No response has been received.

8. Conclusion

The limiting OLS across the Paint Shop sub-precinct is the Conical Surface which has a height sloping up from 69m AHD in the south-west to 89m AHD in the north-east. The taller of the proposed tower buildings and any cranes required during construction would infringe the OLS. Consequently, prior airspace-related height approvals under the APAR are required for the building and any associated cranes that would penetrate that OLS.

All low and mid-rise buildings in the masterplan proposal will be below the OLS, and therefore will not require prior height approvals under the APAR.

Based on the top heights of buildings in the masterplan proposal, all tower buildings would infringe the OLS.

The most restrictive surface for building heights is the RTCC Surface. At a height of 152.4m AHD, this surface is lower than the PANS-OPS surfaces over the Paint Shop sub-precinct. None of the buildings in the masterplan proposal would infringe this constraining surface — and so would be considered approvable under the APAR.

Table 8-1 — Summary of Constraining Surface Heights over the Paint Shop Sub-Precinct

		OLS Surface Impact		Maximum Permissible Building Heights	
Location	*Assessment Height (m AHD)*	*Conical Surface Height (m AHD)*	*Clearance / Infringement*	*RTCC Surface Height (m AHD)*	*Clearance / Infringement*
The 2 Tallest Towers					
K2	128.2	78.55	- 49.65	152.4	24.2
P1	123.5	82.35	- 41.15	152.4	28.9
Low/Mid-Rise Buildings					
Non-Tower Buildings	≤ 63.6	69 – 89	All clear. Clearances vary	152.4	≥ 88.8

There are no other prescribed airspace surfaces or other operational factors that would be adversely affected by the masterplan proposal. Further, the potential options for the addition of new buildings, as canvassed in at the end of Section 2.3.4 (p9) would not change the overall assessment — all proposed buildings would be below the limiting airspace heights to ensure Sydney Airport operations remain unaffected.

Based on the maximum heights of the building envelopes in the masterplan proposal, and subject to the potential requirement for obstacle lights to be installed and operated on some of the taller of the tower buildings (subject to CASA recommendations at the time of any applications for height approval under the APAR), we certify[9] that the masterplan proposal will not have an adverse impact on the current and known future operations of Sydney Airport.

9 The Certifying Author of this report, Cathy Pak-Poy, has 30 years' experience as a specialist airspace consultant, including 9 years' experience as a Technical Advisor for Australia to the International Civil Aviation Organisation's Instrument Flight Procedures Panel, which was responsible for the international OLS, PANS-OPS and PBN standards. She has also consulted to Airservices, CASA and the RAAF, and consulted to and trained civil and military aviation agencies and airlines overseas. She held a Delegation for the Civil Aviation Safety Authority of PNG for two years and is the designated Chief Procedure Designer for the Part 173 design and validation approvals held by Strategic Airspace in South Africa.

APPENDICES

APPENDIX 1 — 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
ADS-B	Automatic Dependent Surveillance-Broadcast
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
APAR / APARs	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA / Airservices	Airservices Australia
ASDA	Accelerated Stop Distance Available
A-SMGCS	Advanced Surface Movement Guidance and Control System
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
CAAP	Civil Aviation Advisory Publication
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
CBCiy	City of Canterbury-Bankstown (Council)
CBD	Central Business District
CG	Climb Gradient
CMP	Construction Management Plan
CNS/ATM	Communications, Navigation, Surveillance / Air Traffic Management
CoM	City of Melbourne (Council)
CoS	City of Sydney (Council)

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 Runway
DEVELMT	Development
DH	Decision Height
DITRDC	Department of Infrastructure, Transport, Regional Development & Communications (Commonwealth) (former abbreviations include DIRD, DIRDC, DITCRD)
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoD	Department of Defence
DODPROPS	Dependent Opposite Direction Parallel Runway OPerations
DPIE	Department of Planning, Industry & Environment (NSW)
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
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
HF	High Frequency
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
LDA	Landing Distance Available
LEP	Local Environment Plan (Planning

Abbreviation	Meaning
LLZ	Localizer
LNAV	Lateral Navigation
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
MGA2020	Map Grid Australia 2020
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
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
PAOAS	Parallel Approach Obstacle Assessment Surfaces
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
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance – Authorisation Required

Abbreviation	Meaning
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
TfNSW	Transport for NSW (see also Transport)
THR	THReshold (of Runway)
TMA	TerMinal Area
TNA	Turn Altitude
TODA	Take-off Distance Available
TORA	Take-Off Runway Available
Transport	Transport for NSW (see also TfNSW)
UHF	Ultra-High Frequency
UTM	Universal Transverse Mercator (Map Coordinates – eg, in MGA94 or MGA2020)
VFR	Visual Flight Rules
VHF	Very High Frequency
VIS	Visual
VMC	Visual Meteorological Conditions
V_n	Aircraft critical velocity reference
VNAV	Vertical Navigation
VNC	Visual Navigation Chart
VOR	Very high frequency Omni-directional Range
VSS	Visual Segment Surface
VTC	Visual Terminal Chart
WAC	Westralia Airports Corporation, operators of Perth Airport
WAM	Wide-Area Multilateration
WNW	West North West
WSW	West South West
WGS84	World Geodetic System 1984 (Geographic Coordinates in Latitude & Longitude)
WSA	Western Sydney Airport

APPENDIX 2 — PANS-OPS PROCEDURES

The versions of the IFPs consulted were from the AIP Amendment 169, effective from 02-Dec-2021 to 21-Mar-2022, current as of the date of this report — as indicated in Table 8-2 below. The charts shaded in light grey are not applicable to, or have been determined to be inconsequential, to the project site.

Table 8-2 — Appendix: PANS-OPS Instrument Flight Procedure Charts for Sydney Airport (AIP Amendment 169 – Effective 02-Dec-2021 to 21-Mar-2022)

SYDNEY (YSSY)

Chart	Effective Date	(Amdt No)
AERODROME CHART PAGE 1	2-Dec-2021	(Am 169)
AERODROME CHART PAGE 2	2-Dec-2021	(Am 169)
APRON CHART - INTERNATIONAL PAGE 1	2-Dec-2021	(Am 169)
APRON CHART - INTERNATIONAL PAGE 2	2-Dec-2021	(Am 169)
APRON CHART - DOMESTIC PAGE 1	7-Nov-2019	(Am 161)
APRON CHART - DOMESTIC PAGE 2	13-Aug-2020	(Am 164)
APRON CHART - DOMESTIC PAGE 3	13-Aug-2020	(Am 164)
STANDARD DOMESTIC TAXI ROUTES - ARRIVALS	7-Nov-2019	(Am 161)
STANDARD DOMESTIC TAXI ROUTES - DEPARTURES	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 1	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 2	2-Dec-2021	(Am 169)
NOISE ABATEMENT PROCEDURE PAGE 3	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 4	21-May-2020	(Am 163)
NOISE ABATEMENT PROCEDURE PAGE 5	21-May-2020	(Am 163)
NOISE ABATEMENT PROCEDURE PAGE 6	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 7	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 8	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 9	7-Nov-2019	(Am 161)
NOISE ABATEMENT PROCEDURE PAGE 10	7-Nov-2019	(Am 161)
AIRPORT EFFICIENCY PROCEDURES	7-Nov-2019	(Am 161)
IVA USER GUIDE PAGE 1	7-Nov-2019	(Am 161)
IVA USER GUIDE PAGE 2	7-Nov-2019	(Am 161)
PRM USER INSTRUCTIONS	17-Jun-2021	(Am 167)
SID SYDNEY TWO DEPARTURE (RADAR)	21-May-2020	(Am 163)
SID RWY 34L SOUTH WEST DEP (JET)	7-Nov-2019	(Am 161)
SID RWY 16R DEENA SEVEN (JET) (RNAV)	7-Nov-2019	(Am 161)
SID RWY 34R ENTRA FIVE (JET) (RNAV)	7-Nov-2019	(Am 161)
SID RWY 07 FISHA EIGHT (JET) (RNAV)	7-Nov-2019	(Am 161)
SID RWY 16R KAMPI FIVE (RNAV)	7-Nov-2019	(Am 161)
SID RWY 16L KEVIN SIX (RNAV)	21-May-2020	(Am 163)
SID RWY 16L ABBEY THREE (JET) (RNAV)	7-Nov-2019	(Am 161)
SID RWY 34R MARUB SIX (JET) (RNAV)	7-Nov-2019	(Am 161)
SID RWY 34L RICHMOND FIVE DEP (JET)	7-Nov-2019	(Am 161)
STAR BOREE THREE A ARRIVAL (RNAV)	5-Nov-2020	(Am 165)

Chart	Effective Date	(Amdt No)
STAR BOREE THREE P ARRIVAL (RNAV)	5-Nov-2020	(Am 165)
STAR MEPIL THREE ARRIVAL (RNAV)	21-May-2020	(Am 163)
STAR MARLN FIVE ARRIVAL (RNAV)	9-Sep-2021	(Am 168)
STAR ODALE SEVEN ARRIVAL (RNAV)	21-May-2020	(Am 163)
STAR RIVET THREE ARRIVAL (RNAV)	21-May-2020	(Am 163)
ILS OR LOC RWY 07	7-Nov-2019	(Am 161)
ILS OR LOC RWY 16L PAGE 1	9-Sep-2021	(Am 168)
ILS RWY 16L PAGE 2	9-Sep-2021	(Am 168)
ILS OR LOC RWY 16R PAGE 1	9-Sep-2021	(Am 168)
ILS RWY 16R PAGE 2	9-Sep-2021	(Am 168)
ILS OR LOC RWY 25	17-Jun-2021	(Am 167)
ILS OR LOC RWY 34L PAGE 1	9-Sep-2021	(Am 168)
ILS RWY 34L PAGE 2	9-Sep-2021	(Am 168)
ILS OR LOC RWY 34R PAGE 1	2-Dec-2021	(Am 169)
ILS RWY 34R PAGE 2	2-Dec-2021	(Am 169)
RNP RWY 07	9-Sep-2021	(Am 168)
RNP RWY 16L	9-Sep-2021	(Am 168)
RNP RWY 16R	9-Sep-2021	(Am 168)
RNP RWY 25	9-Sep-2021	(Am 168)
RNP RWY 34L	9-Sep-2021	(Am 168)
RNP RWY 34R	2-Dec-2021	(Am 169)
GLS RWY 07	7-Nov-2019	(Am 161)
GLS RWY 16L	9-Sep-2021	(Am 168)
GLS RWY 16R	9-Sep-2021	(Am 168)
GLS RWY 25	17-Jun-2021	(Am 167)
GLS RWY 34L	9-Sep-2021	(Am 168)
GLS RWY 34R	2-Dec-2021	(Am 169)

Last Modified: 2021-09-10

Source: AIP Book (02-Dec-2021 to 21-Mar-2022) via http://www.airservicesaustralia.com/aip/aip.asp

APPENDIX 3 — HELICOPTER ROUTES

The versions of the relevant helicopter routes consulted were from the AIP Amendment 169, effective from 02-Dec-2021 to 21-Mar-2022, current as of the date of this report.

The Royal Prince Alfred Hospital's preferred helicopter routes are published in the YRPA FAC:

ROYAL PRINCE ALFRED HOSPITAL **ELEV 96**

FULL NOTAM SERVICE NOT AVBL

NSW UTC +10 YRPA
335322S 1511102E VAR 13 DEG E UNCR
AD OPR Royal Prince Alfred Hospital, Missenden Road, Camperdown, NSW, 2050.

REMARKS

1. Location: UBD City Link Map 14D3
2. 1:25K Map 9130 grid 319485

PHYSICAL CHARACTERISTICS

1. 26M Rooftop Helipad atop new wing (Level 11).
2. Maximum design weight 5,400KG.
3. 19M Dashed white circle.
4. Standard Hospital HLS Symbol.
5. 12 x white omnidirectional perimeter lights.
6. 2 x white, illuminated flight path arrows.
7. Manually-activated flood light on request.
8. Lighted windsock with beacon.

ATS COMMUNICATIONS FACILITIES

FIA SYDNEY CENTRE 124.55
Sydney Terminal 135.1

LOCAL TRAFFIC REGULATIONS

1. Lee-side turbulence in west wind due to building alongside.
2. Possible turbulence due low velocity air discharge from plant rooms immediately below northern flight path.
3. Magnetic Resonance Imaging Unit (MRI) bearing 290DEG 70M.

FLIGHT PROCEDURES

1. **PREFERRED FLIGHT PATHS:**
   a. 165DEG M in/345DEG M out.
   b. 330DEG M in/320DEG M out.
2. Minimise ground running.

CTAF 126.7

ADDITIONAL INFORMATION

1. Buildings below 8:1 flight path gradient about 600M South.
2. Emergency equipment stored adjacent to HLS.
3. CO2 & Dry Chemical Fire Extinguishers.
4. Fire Hose Reel with "chrome foam".
5. Chem-spill Bucket.
6. Fire Blanket.
7. "Hot Line" to NSWFB.
8. Video Surveillance.
9. Push-button to open access doors & prioritise lifts.

CHARTS RELATED TO THE AERODROME

WAC 3456.

The Helicopter Harbour Bridge Five route is published in the YSSY FAC:

HARBOUR BRIDGE 5 - INBOUND (for arrival from R405B)

TR South Pylon of the Harbour Bridge to Darling Harbour thence Central Railway thence via the railway line to Redfern Railway Station, thence via Erskineville Oval; ALT 1,000FT; thence DCT to The Stamford on descent to 500FT.
Clearance Limit: The Stamford.
Contact TWR 124.7 at Erskineville Oval.

HARBOUR BRIDGE 5 - OUTBOUND (for entry to R405B)

TR via The Stamford to Erskineville Oval thence via Redfern Railway Station and the railway line to Central Railway thence DCT to Darling Harbour thence over water to South Pylon of the Harbour Bridge to enter R405B; ALT 1,000FT. FREQ change at Central Railway approved, control service terminated at Central Railway.