Aeronautical Assessment — Adina Central,

2 Lee Street, Haymarket (Sydney) NSW

Version 1.0.2 FINAL

9-Sep-2020

strategic airspace

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Document Title: **Aeronautical Assessment — Adina Central, 2 Lee Street, Haymarket (Sydney) NSW**

Purpose / Abstract: *This aeronautical study has been prepared for TOGA Group, which has proposed a new mixed-use (hotel and commercial) tower above the existing Adina Hotel site at 2 Lee St, Haymarket (the site), under the project name Adina Central.*

This report assesses the Prescribed Airspace height constraints over the site. in view of existing operations and forecasted changes as included in the Sydney Airport Master Plan 2039 and the current airspace constraints related to Sydney Airport as defined in the Airports (Protection of Airspace) Regulations 1996 (APAR).

Following a Design Review Panel process completed in June 2020 the NSW Government Architect provided a written recommendation on 1 July 2020 that the maximum height of the planning envelope for the site could extend to the Prince Alfred Park Sun Access Plane as defined by the City of Sydney. At the highest point of the envelope this is equivalent to RL 213.203. Based on this proposed development height, the findings are as follows:

- *The development would infringe Sydney Airport's Obstacle Limitation Surfaces (OLS) — triggering a requirement under the APAR to seek approval of the development as a Controlled Activity (prior to construction) from the Commonwealth Department of Infrastructure, Transport, Cities and Regional Development (DITCRD).*
  Note that this kind of airspace-related height approval is not normally required for approval of rezoning planning applications.
- *Because the top heights of the development would be clear of (below) the most constraining of the prescribed airspace surfaces, in this case that associated with the Radar Terrain Clearance Chart (which is lower than PANS-OPS surfaces at the same location), such an application is technical approvable under the Regulations.*
- *The potential future impact of cranes required for construction would be considered as a factor by DITCRD when evaluating the feasibility of constructing the proposed building prior to making a determination. Given the substantial clearance margin between the top of the proposed development and the limiting RTCC height there is a substantial margin for crane operations, so this factor would not prove a burden on gaining approval under APAR for the building envelope.*

Given the above, we anticipate that a development based on the proposal herein would not adversely affect the safety, regularity or efficiency of current and future air transport operations to and from Sydney Airport, and thus a future APAR application would be approved.

Contract: - *StratAir Ref:* 20.019 (19.014)

Change History

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1.0.2 FINAL	09-Sep-2020	C. Pak-Poy	J. McCarthy	Minor amendment due TfNSW feedback

Distribution Control

Legend:				
	Uncont	Uncontrolled Document	*StratAir*	Strategic Airspace
	Client	TOGA Group	*AsA*	Airservices Australia
	APT,	Sydney Airport	*DITRDC*	Department of Infrastructure, Transport, Regional Development & Communications (formerly DIRDC)
	SACL	Sydney Airport Corporation Ltd		
	CASA	Civil Aviation Safety Authority		

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1.0.2 FINAL	09-Sep-2020	Amended final submission to client	Uncont	StratAir Intranet, Client

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1. Executive Summary

Strategic Airspace (StratAir) has been engaged by the TOGA Group to conduct a preliminary aeronautical assessment for the proposed Adina Central development at 2 Lee Street, Haymarket NSW (the site), a site which encompasses Lot 30 in DP 877478 and Lot 13 in DP 1062447. Based on a letter of advice and recommendations provided by the NSW Government Architect's office on 1 July 2020, the maximum height of the proposed rezoning envelope is to be defined by the Sun Access Plane. This equates to a height of 213.203m Australian Height Datum (AHD) at the highest point.

Located at the southern end of the Sydney CBD, the site is affected only by the prescribed airspace of Sydney Airport; other airports are too remote to have any impact. As such, the report has been prepared having regard to the Prescribed Airspace of Sydney Airport. The report examines the current airspace height constraints overhead the site as defined by the Airports (Protection of Airspace) Regulations 1996 (APAR) and which would:

a) Trigger the requirement to apply for an airspace height approval; and
b) Constrain the maximum permissible building envelope height(s).

The site is located approximately 7.3 km (3.95 Nautical Miles (NM)) north-north-east of the Aerodrome Reference Point (ARP) of Sydney Airport, as shown in Figure 1 below.

For the purposes of the assessment, key reference points on the site were determined, as well as possible maximum development heights — the latter only for the purpose of indicating the amount of OLS infringement and clearances below higher airspace height constraints.

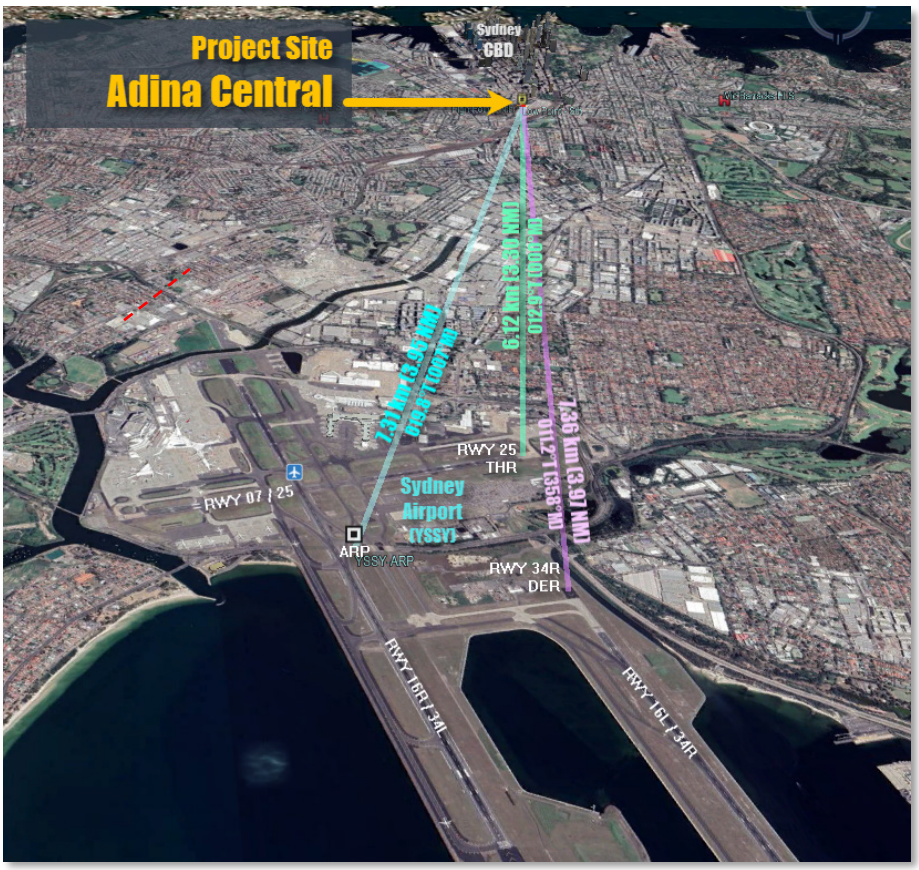


Figure 1 — Site Location in relation to Sydney Airport (Small Format)

The critical airspace constraints overhead the site are summarised in the table below.

Table 1 — Summary — Airspace Height Constraints

Height Limits (AHD)	*Height Limit Detail*	*Comment*
From 192.424 to max **213.203**	**Max Envelope Height**	The top of the envelope slopes up across the site. For the purposes of this assessment, two key points (the lowest and the highest) have been used for the evaluation of the OLS and PANS-OPS surfaces on the proposed development. See Figure 2 (p3), Table 2 and Figure 5 (p6) for more detail.
~143.8 to ~146.0	**OLS CONICAL Surface**	The site is under the OLS CONICAL Approach Surface, which slopes up at 5% across the site from the south-south-west to the north-north-east. The height limits of this surface vary across the site and the tower envelope. See Figure 6 (p10) and Table 5 (p11). As **the proposed envelope** would infringe the OLS, it **would require a height application under the Airports (Protection of Airspace) Regulations 1996 (APAR) to be approved by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) prior to construction**. Infringement of the OLS in this case is not considered a barrier to approval of an application under the APAR.
243.84	**Radar Terrain Clearance Chart (RTCC)** / Minimum Vector Altitude (MVA) 1800 Sector	**The site lies within the lateral limits of an RTCC surface which has an effective limit 243.84m AHD** — although this is published as 244m AHD on Sydney Airport's RTCC chart as part of their Declared Airspace. See Table 10 (p15) for details. At 800ft altitude, this surface protects the 1800ft MVA sector which is used by Air Traffic Controllers (ATCs) to vector aircraft. This surface typically cannot be breached by any obstacle, permanent or temporary, at night or during times of low visibility. For this reason, **this is considered the most limiting height for the proposed development at the project site.**
~279+	PANS-OPS Surfaces	Height constraints across the envelope relate to the precision approach to RWY34R (a missed approach surface) and the Omnidirectional Departure from RWY34R. All other PANS-OPS surfaces which overlay the site are higher.
Higher or N/A	Other surfaces	This site is outside the extent of other protection surfaces or the height limits are higher, and so considered Not Applicable.

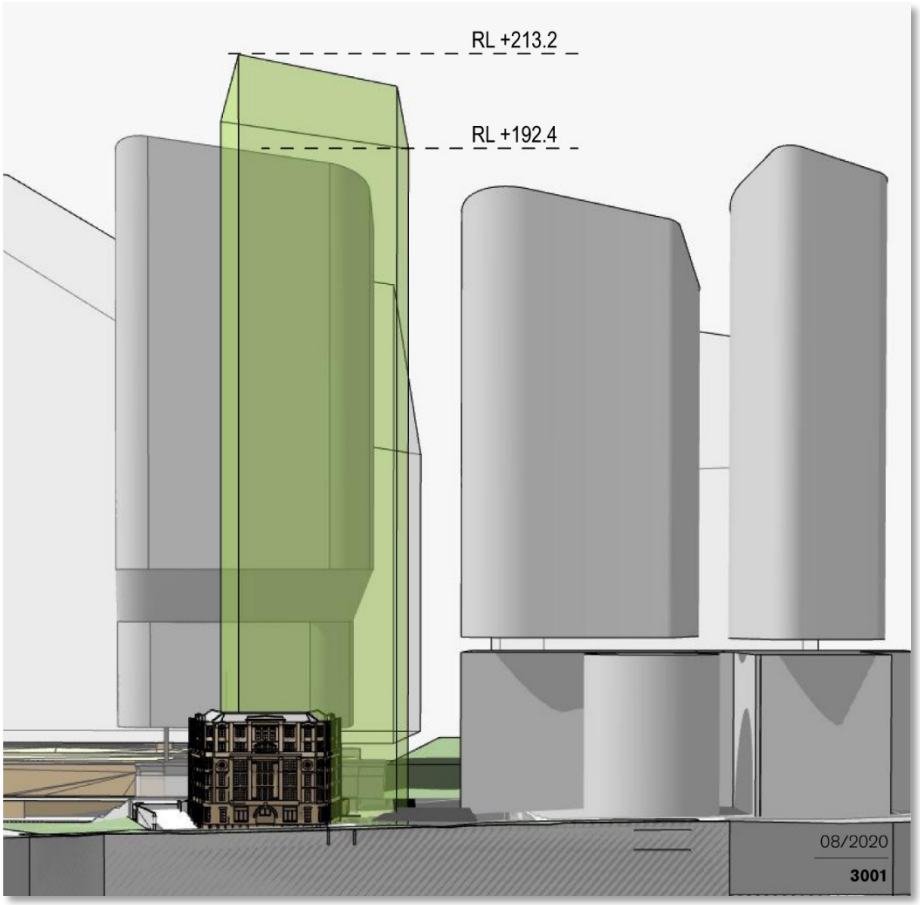
The conclusion of the report is that:

- Because the proposed envelope would exceed the OLS, an "*airspace application*" for the approval of the development as a *Controlled Activity* under the Airports (Protection of Airspace) Regulations 1996 would need to be submitted to the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC).
  Such applications are usually submitted via Sydney Airport. Under APAR approval is required prior to construction, but under most local planning regulations approval may be required prior to (or as a consent condition of) approval of a Development Application.
- As the maximum development height would not infringe — and would in fact be substantially clear of (below) — the constraining surface height (in this case, the RTCC surface), the application is technically approvable under the APAR.

In summary, we anticipate no barrier to approval under the APAR of an application for proposed building envelope at the maximum planned height.

2. Introduction

Strategic Airspace (StratAir) has been engaged by the TOGA Group to conduct a preliminary aeronautical assessment for the proposed Adina Central development at 2 Lee Street, Haymarket NSW (the site), a site which encompasses Lot 30 in DP 877478 and Lot 13 in DP 1062447. The proposed development would include a tower, part of which would sit over the existing Adina Hotel complex at that site. Following extensive engagement with the NSW Government Architect and other key stakeholders, support for a maximum height for the proposed development based on the Sun Access Plane has been provided in July 2020. This planning height constraint is designed to protect shadowing of the nearby Prince Alfred Park.



Source: FJMT

Figure 2 — Proposed Envelope: Model of West Elevation

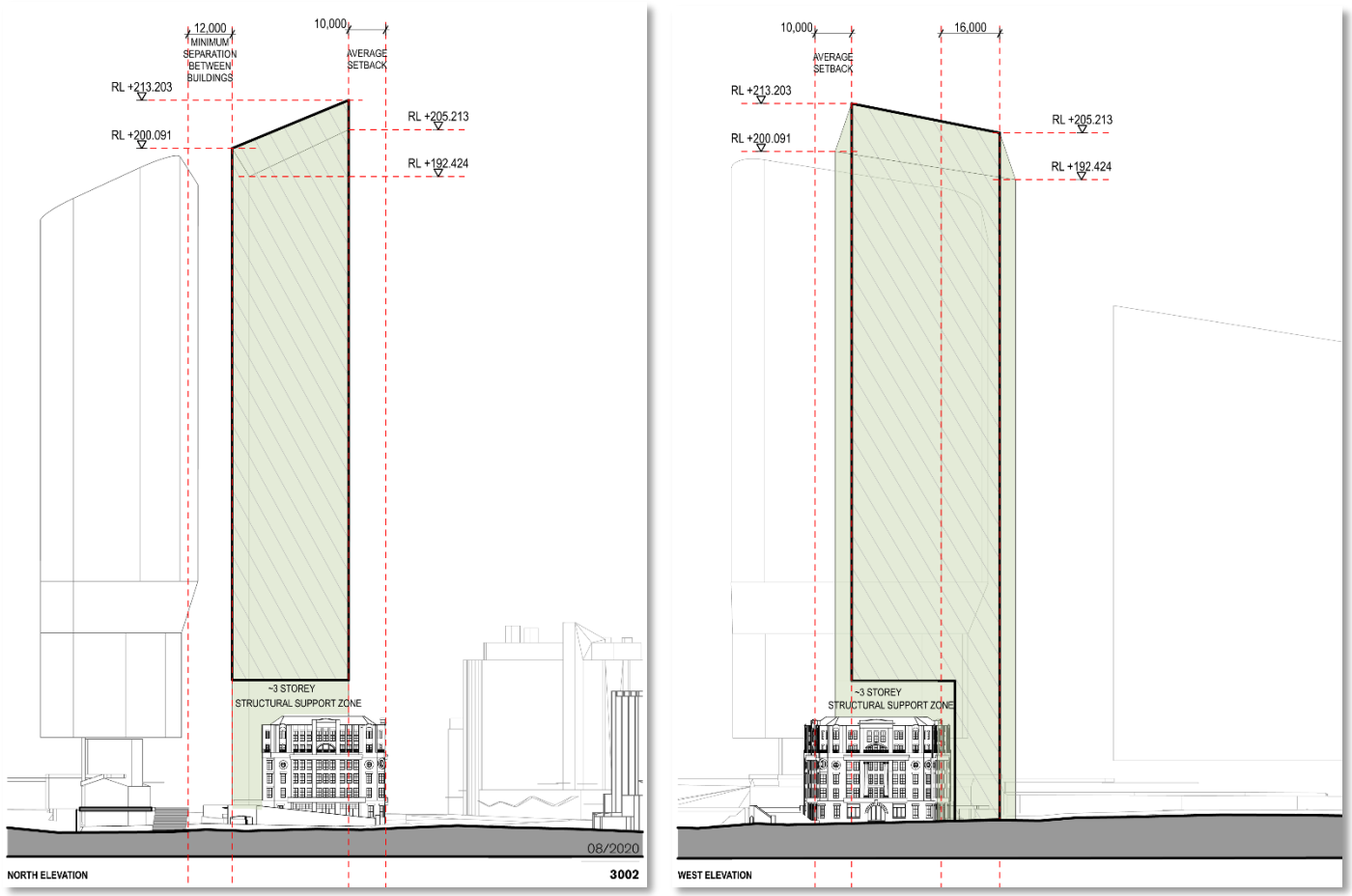
Located at the southern end of the Sydney CBD, the site is only affected by the prescribed airspace of Sydney Airport. This report examines the current and forecast regulated airspace height limits constraints overhead the site that are related to aviation airspace protection requirements under the Airports (Protection of Airspace) Regulations 1996 (APAR) and which would:

a) Trigger the requirement to apply for an airspace height approval; and
b) Constrain the maximum permissible building envelope heights.

3. Aeronautical Impact Context

3.1 The Proposed Development

The proposed mixed-use (hotel and commercial) tower, under the current plan, intends to comply with the gross floor area (GFA) constraints and feedback by key stakeholders regarding the conceptual design and maximum heights, whilst still respecting aviation-related airspace limits. The top of the proposed envelope slopes down in accordance with the constraints of the Prince Alfred Park solar access plane. This is depicted in the figures above and immediately below, and detailed in Table 2 below (p6).



Source: FJMT

Figure 3 — Proposed Envelope: North & West Elevations

3.2 Location of the Proposed Development

The site is located approximately 7.3 km (3.95 Nautical Miles (NM)) north-north-east of the Aerodrome Reference Point (ARP) of Sydney Airport, as shown in Figure 4 below.

It is approximately 7.4 km (3.97 NM) north of the Departure End of Runway (DER) of Runway (RWY) 34R, and 6.1km (3.3 NM) north of the landing threshold of RWY 25. Procedures to/from the western parallel runway, RWY 16R/34L, are considered irrelevant

because those procedures must stay safely to the west of those for the eastern parallel runway — and therefore remain clear of the project site.

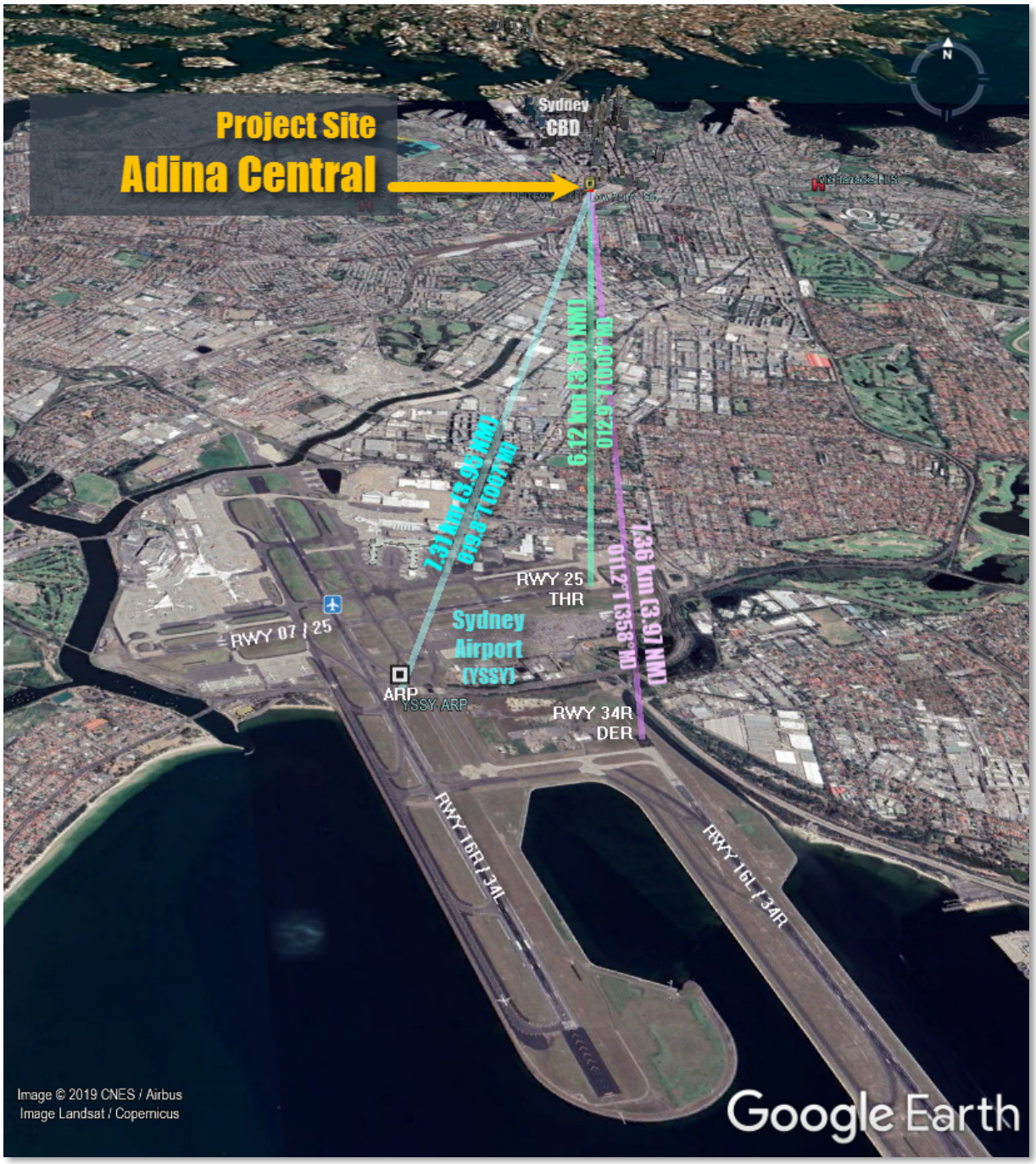


Figure 4 — Proposed Development Site in relation to Sydney Airport (Large Format)

3.3 Reference Points used for Analysis

Based on the envelope design elevation and the site orientation in relation to the airport, two key reference points were selected for assessment of the PANS-OPS procedure surfaces. The reference point coordinates were determined from the preliminary envelope floor plans geo-referenced against CAD-based cadastral data. These reference points are shown in Table 2 and illustrated in Figure 5 below. For height assessment of this rezoning proposal, only the lowest and highest points of the proposed envelope are considered.

Table 2 — Assessment Reference Locations & Coordinates

Point	*Preliminary Assessment Heights (m AHD*)*	*Location*	*WGS84 Geographic Coordinates*	*GDA94 Coordinates (Zone 56)*
Pt0-Site	—	**General Site Reference Point** SW Point of Site on Lee Street frontage *7308m (3.95 NM) 019.8°T (007°M) from the Aerodrome Reference Point (ARP)*	33° 53’ 02.47” S 151° 12’ 13.29” E	333879.304 E 6249251.492 N
Pt1-L SE Corner	**192.424**	Lowest point of the top of the tower envelope. Southern-most corner of the envelope & closest to the airport. *7369m (3.98 NM) 011.6°T (359°M) from RWY34R Departure End of Runway (DER)*	33° 53’ 02.42” S 151° 12’ 14.95” E	333922.001 E 6249253.666 N
SW Corner	205.213	South-western corner of the tower envelope	33° 53’ 01.90” S 151° 12’ 14.10” E	333899.772 E 6249269.596 N
Pt2-H NW Corner	**213.203**	Highest point of the top of the tower envelope. Northern-most corner of the envelope & furthest from the airport. *7419m (4.01 NM) 011.5°T (359°M) from RWY34R DER*	33° 53’ 00.74” S 151° 12’ 14.83” E	333917.986 E 6249305.648 N
NE Corner	200.091	North-eastern corner of the tower envelope	33° 53’ 01.09” S 151° 12’ 16.00” E	333948.244 E 6249295.396 N

* *Assessment Heights — Indicative Max RLs for of the Proposed Tower Envelope*
m AHD = RL Heights expressed in Metres Australian Height Datum (AHD)

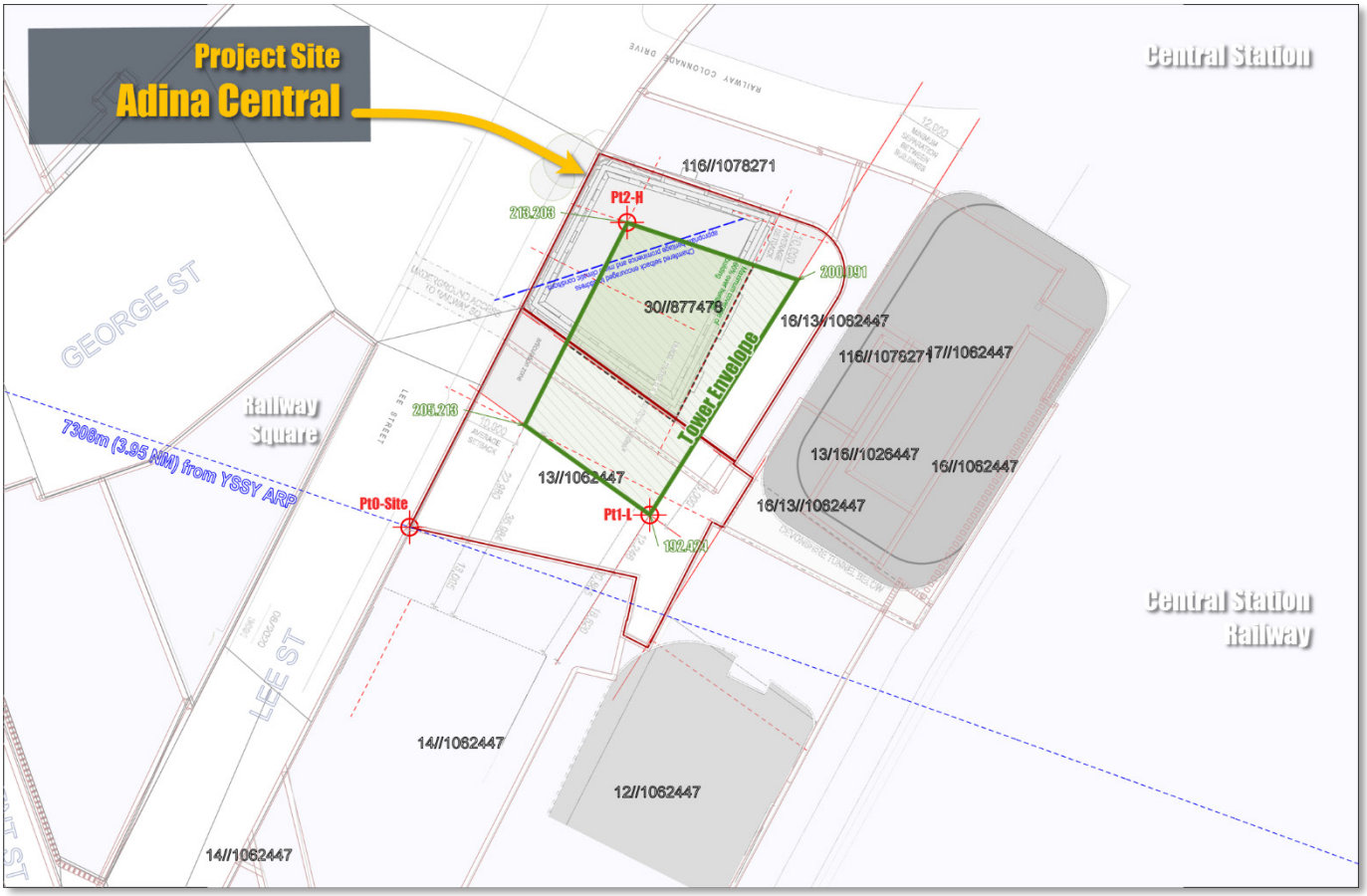


Figure 5 — Site Location Plan & Key Reference Points for the Aeronautical Assessment

3.4 Methodology

The report considers the airspace of the closest major airport, Sydney International Airport.

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

The proposed development site is subject to the Airports (Protection of Airspace) Regulations (APAR), under the Commonwealth's Airports Act, 1996), because of its proximity to Sydney Airport and because of its proposed height. These regulations define both: how building height limitations due to airspace safety can be determined; and the process for gaining approval of the proposed development under the regulations.

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

Where a proposed development would infringe the Prescribed Airspace, a height approval must be obtained from 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*.

Applications are usually submitted via the nearest relevant airport (in this case, Sydney Airport), which then contacts relevant stakeholders and ultimately forwards the application to DITRDC for the final determination.

Height approvals under APAR are not required for rezoning applications. They are however usually required by local planning authorities prior to, or as consent conditions of, approval of Development Applications (DAs).

3.4.2 Prescribed Airspace

Prescribed airspace, under these regulations, includes at minimum:

- **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.
- **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 Surface Plan published by an airport may not reflect the current situation — which is why we not only reference the airport's plans but also review the published charts for current (or pending) instrument flight procedures and evaluate the associated PANS-OPS height limits. The regulations also make a provision for any factor which may be deemed to adversely affect the safety, regularity or efficiency of aircraft operations at an airport. In light of this, it is necessary to consider the following factors.

- **Other Considerations**
  - **Sydney Airport's Declared Airspace Plans** additionally include:
    - Radar Terrain Clearance Charts (RTCC), which depict the areas and height limits related to the Minimum Vector 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.
  - **Sydney Airport's 2039 Master Plan**
  - **Other Factors**
    - Airline Engine-Out (Contingency) Take-Off Splays
      (as per Civil Aviation Order 20.7 1b)
      These are generally assessed independently by the airlines as part of their own evaluations of any given airspace height application, but it is prudent to evaluate any potential impact in advance.
    - 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.
  - Note: Airspace that is approved by DITRDC as Declared Airspace is considered part of an airport's Prescribed Airspace.

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, antennae, etc).

4. Analysis

4.1 Summary

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

Table 3 — Analysis Summary — Airspace Height Constraints

Height Limits (m AHD)	*Height Limit Detail*	*Comment*
From 192.424 to max **213.203**	**Max Envelope Height**	The top of the envelope slopes up across the site. For the purposes of this assessment, two key points (the lowest and the highest) have been used for the evaluation of the OLS and PANS-OPS surfaces on the proposed development. See also Table 2 (p6) for more detail.
~143.8 to ~146.0	**OLS CONICAL Surface**	The site is under the OLS CONICAL Approach Surface, which slopes up at 5% across the site from the south-south-west to the north-north-east. The height limits of this surface vary across the site and the tower envelope. See Figure 6 (p10) and Table 5 (p11). As **the proposed envelope** would infringe the OLS, it **would require a height application under the Airports (Protection of Airspace) Regulations 1996 (APAR) to be approved by the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC) prior to construction**. Infringement of the OLS in this case is not considered a barrier to approval of an application under the APAR.
243.84	**Radar Terrain Clearance Chart (RTCC)** / Minimum Vector Altitude (MVA) 1800 Sector	**The site lies within the lateral limits of an RTCC surface which has an effective limit 243.84m AHD** — although this is published as 244m AHD on Sydney Airport's RTCC chart as part of their Declared Airspace. See Table 10 (p15) for details. At 800ft altitude, this surface protects the 1800ft MVA sector which is used by Air Traffic Controllers (ATCs) to vector aircraft. This surface typically cannot be breached by any obstacle, permanent or temporary, at night or during times of low visibility. For this reason, **this is considered the most limiting height for the proposed development at the project site.**
Pt1-L: ~279 Pt2-H: ~281	PANS-OPS Surfaces (Approach & Departures)	The departure from RWY34R is the most constraining above P1-L (the SE corner) of the envelope, and the surface related to the 3.6% missed approach climb gradient of the ILS approach to RWY34R is the most constraining above Pt2-H (the NW corner) of the envelope. See Table 4 (p10) for details. Normally the PANS-OPS procedure surfaces are the most constraining on development heights, but since in this case the RTCC surface height is lower, the RTCC is considered the maximum permissible development height at the project site. The relevant PANS-OPS surface heights would most likely be considered the absolute maximum height for crane operations used for construction of the building, subject to approval of Sydney Airport, the aviation stakeholders and DITRDC. Separate applications under APAR for crane operations would need to be

Height Limits (m AHD)	*Height Limit Detail*	*Comment*
		submitted and approved prior to operations of cranes but are not be required to secure an approval under APAR for a proposed building development itself.
N/A or Higher	Other Surfaces	The site is outside the extent of other protection surfaces or the height limits are higher, and so considered Not Applicable.

Table 4 — Summary of Limiting PANS-OPS Surface Heights (Approach & Departure) over Key Envelope Reference Points

		Limiting PANS-OPS Surfaces		
Location	*Assessment Height (m AHD)*	*Surface Type / Detail*	*Surface Height*	*Clearance / Infringement*
Pt1-L	192.424	RWY 34R Omni Dep	279.12	86.70
Pt2-H	213.203	RWY 34R ILS (MA 3.6%)	281.37	68.17

4.2 OLS Analysis

The location of the proposed re-development, with respect to the OLS of Sydney Airport, is shown in Figure 6 below.

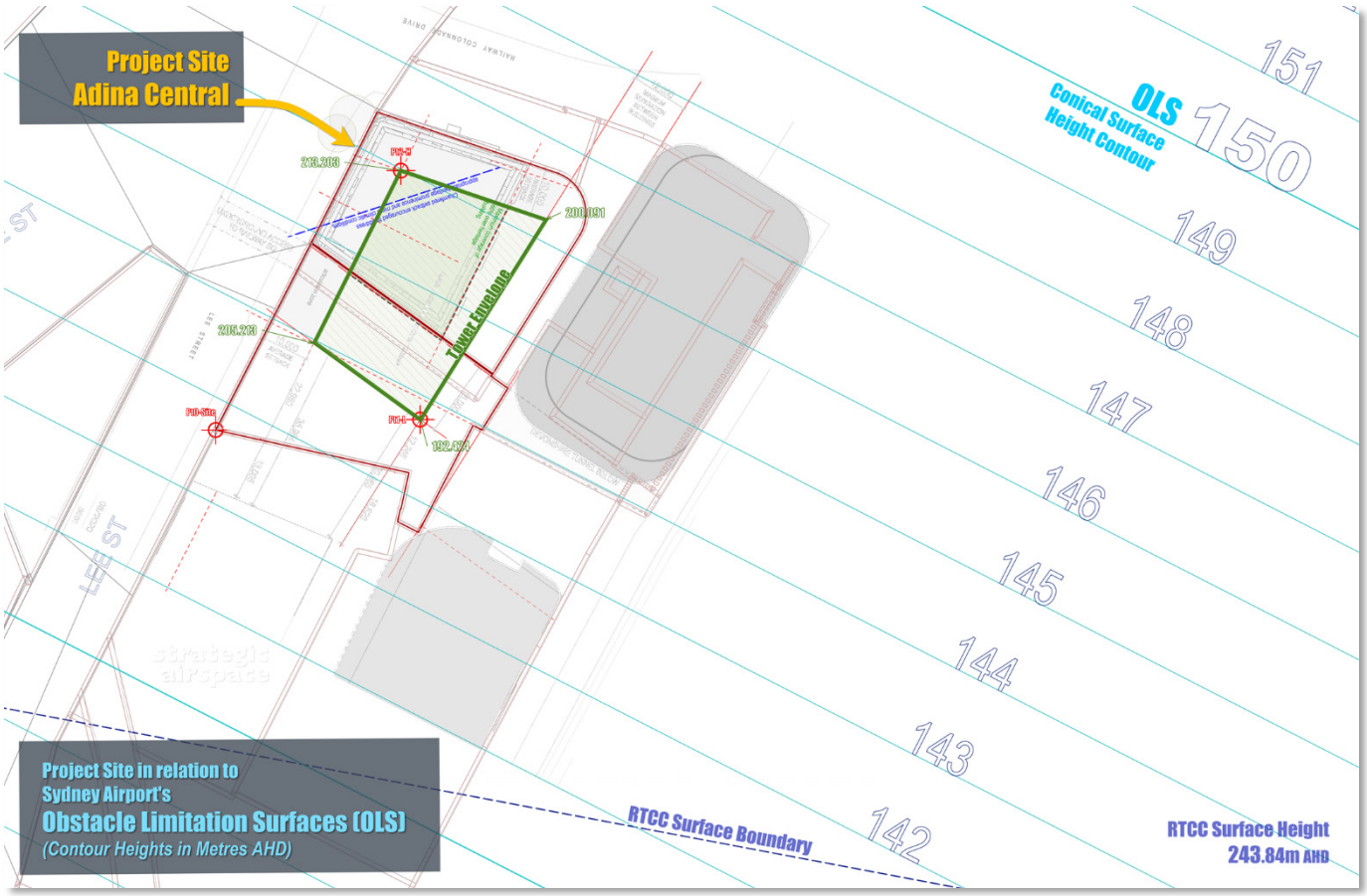


Figure 6 — Site in relation to Sydney Airport's OLS

Table 5 — OLS Height Impact & APAR Application Implications

		OLS Height		
Location	*Assessment Height (m AHD)*	*Surface Height*	*Clearance / Infringement*	*Approvability Comment*
Pt1-L	192.424	143.8	- 46.42	The Tower building requires prior approval under APAR; approval being subject to the maximum height being below the most limiting PANS-OPS or RTCC surface height.
Pt2-H	213.203	146.0	**- 67.20**	

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 164 (effective 13-Aug-2020 to 04-Nov-2020).

- The Circling Minima and Minimum Sector Altitudes (MSAs) for existing PANS-OPS procedures
- The discrete minima for the Instrument Approach Procedures.
- Missed Approaches — as part of the evaluation of Approach Procedures
- The existing Standard Instrument Departure Procedures (SIDs)
- Minimum Sector Altitude — 10 NM Sector

The site in relation to the PANS-OPS surfaces shown on Sydney Airport's 2017 chart is shown for information. The limiting surface, at the time the chart was drawn, was that related to the parallel runway obstacle assessment surfaces (PAOAS) in the missed approach of the precision approach (ILS/GLS) approach procedures to RWY34R.

Due to the coarseness of the street boundary data shown on the chart, it is not possible to determine the height limit according to that chart precisely — but it indicates that the constraining height at the lowest point of the proposed envelope (Pt1-L) would be approximately 292m± AHD.

The StratAir analysis of current flight procedures determined that the site is laterally outside the protection surfaces related to the northern approaches to the right parallel runway (ie, to RWY16L), to all procedures related to the left parallel runway (RWY 16R/34L) and those of the short cross runway (RWY 07/25). It is below the protection surfaces for the departure procedure from RWY34R. Below is an overview of the restrictions based on the assessment of the site in relation to the PANS-OPS Instrument Flight Procedures (IFPs) currently published by Airservices Australia (refer also to Appendix 2 — PANS-OPS Procedures).

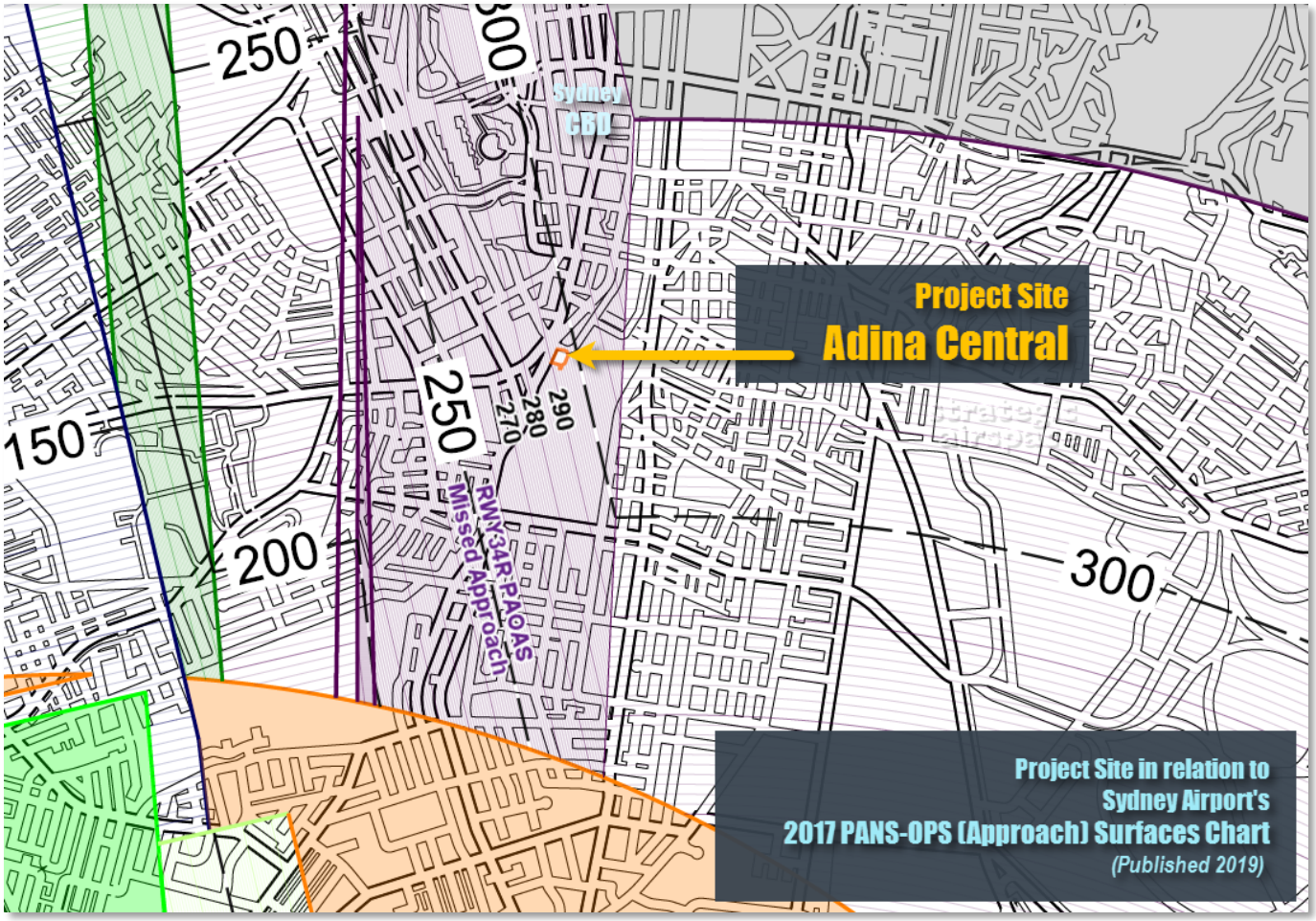


Figure 7 — Site in relation to Sydney Airport's PANS-OPS (Approach) Surfaces

Table 6 — Sydney (YSSY) PANS-OPS Height Limit Summary

Procedure	*Height Limit (m AHD)*	*Description*
Approaches and Missed Approaches to all Runways	≥ 279.50	Outside the lateral protection areas of many procedures. Where protection surfaces overlay the site, StratAir analysis indicates that the lowest limit is related to the Missed Approach of the RWY34R ILS procedure (based on the lowest published minima with the 3.6% minimum climb gradient) — which is lower than that indicated in Sydney Airport's PANS-OPS critical surfaces chart. This constraint is applicable at Pt2-H (the NW corner of the envelope).
Circling Area	N/A	Outside the extent of the circling procedures.
Departures	≥ 279.12	Analysis indicates that most limiting surface constraint for the Omnidirectional Radar departure from RWY3R is applicable at Pt1-L (the SE corner of the envelope).
Minimum Sector Altitude (MSA)	335.28	The 10 NM Minimum Sector Altitude of 2100 ft imposes this surface height constraint across the entire site.
STARs	>335.28	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 2,100ft minimum flight altitude.

Procedure	*Feature and / or Restriction*	*Description*
10NM MSA	Horizontal Surface: • **335.28m**	Covers the entire site. This surface height is based on a conservative minimum obstacle clearance of 1000ft instead of the ICAO value of 300m.

B Circling Minima

Not applicable: the site is outside the extent of the circling procedures.

C STARs

The minimum segment altitude on any of the STARs surrounding Sydney Airport is 2,100ft, which would have a protection surface of 335.28m 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.

A Approach Procedures to RWY 16L & RWY 25

The site is laterally clear of the protection surfaces of all approaches.

B Missed Approaches

The missed approaches related to the RWY 07 and RWY 34R approach procedures were analysed. The most limiting of the missed approach surfaces overhead the site is associated with the Baro-VNAV approach to RWY 34R. The limiting heights and the impact in relation to the Tower are summarised in Table 7 below.

Note that there is a substantial clearance between the limiting heights and the proposed development height of 152m AHD.

Table 7 — Summary of Limiting PANS-OPS Approach & Missed Approach Heights and Envelope Height Clearances

		Limiting PANS-OPS Approach & Missed Approach Procedure Surfaces					
Location	*Assessment Height (m AHD)*	*RWY 34R Baro-VNAV (MA)*	*Clearance / Infringe-ment*	*RWY 34R ILS MA 2.5%*	*Clearance / Infringe-ment*	*RWY 34R ILS MA 3.6%*	*Clearance / Infringe-ment*
Pt1-L	192.424	N/A	—	292.64	100.22	279.50	87.08
Pt2-H	213.203	N/A	—	293.93	80.73	281.37	68.17

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 all PANS-OPS procedures. The limiting

heights and the impact in relation to the Tower and the cranes are summarised in Table 8 below.

Note that there is a substantial clearance between the limiting heights and the maximum probable development heights at each end of the building envelope.

Table 8 — Summary of Limiting PANS-OPS Departure Surface Heights & Envelope Height Clearances

		PANS-OPS Departure Surfaces	
Location	*Assessment Height (m AHD)*	*RWY 34R Omnidirectional Radar Departure*	*Clearance / Infringement*
Pt1-L	192.424	279.12	86.70
Pt2-H	213.203	281.50	68.30

4.4 Other Assessment Considerations

The following table provides a brief assessment of other considerations.

Table 9 — Other Assessable Height Limitations — including the RTCC MVA Limit

Procedure	*Height Limit (m AHD)*	*Description*
Radar Terrain Clearance Chart (RTCC) / Minimum Vector Altitude (MVA)	**243.84**	This height constraint is applicable over the entire site. This is the limit related to the 1800ft Minimum Vectoring Altitude (MVA) sector, which is used by air traffic controllers. This information is sourced from the RTCC published as part of Sydney Airport's Prescribed Airspace Plans.
Navigation Infrastructure Surfaces	N/A	The proposed development is too far from the airport to affect any ground-based navigation infrastructure.
Approach Lighting & VGSI Surfaces	N/A	The site is outside the lateral extent of published approach lighting surfaces.
Airlines Engine Out Procedures	N/A	The Engine Out 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 the relevant regulations. All such procedures necessarily take into account Sydney Tower Eye in the Sydney CBD, which given its relevant proximity and taller height, will take precedence. As such this proposal will not adversely affect any contingency procedures.
Helicopter Procedures related to the Nearest Strategic Helicopter Landing Site (SHLS)	N/A	There are no nearby SHLS that would be adversely affected by the development. Any other helicopter traffic that traverses the CBD must maintain visual clearance from any obstacles, including existing tall buildings. It is also noted that the HARBOUR 5 visual helicopter route has a transition point above Central Railway. The minimum flight altitude of this route at that point is 1000 ft (304.8m AHD), which is >91m above the tallest point of the proposed envelope.

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) overhead the site protects the airspace used by air traffic controllers as the lowest Minimum Vector Altitude (MVA) they can use for vectoring aircraft. The RTCC surface height limit overhead the entire study area is 243.84m AHD — but on Sydney Airport's RTCC chart they use the value rounded up to the nearest metre, 244m AHD.

Table 10 — Proposed Envelope in relation to the RTCC Surface Height

		RTCC (1800ft MVA Sector)		
Location	*Assessment Height (m AHD)*	*Surface Height (800 ft)*	*Clearance / Infringement*	*Comment*
Pt1-L	192.424	243.84	51.42	Substantial clearance above the envelope heights.
Pt2-H	213.203	243.84	30.64	

Note that because the RTCC surface constraint is lower than the lowest PANS-OPS surface, it becomes relevant as a cap on the building height. The clearance margin above envelope is also considered sufficient space for cranes that would ultimately be required for construction.

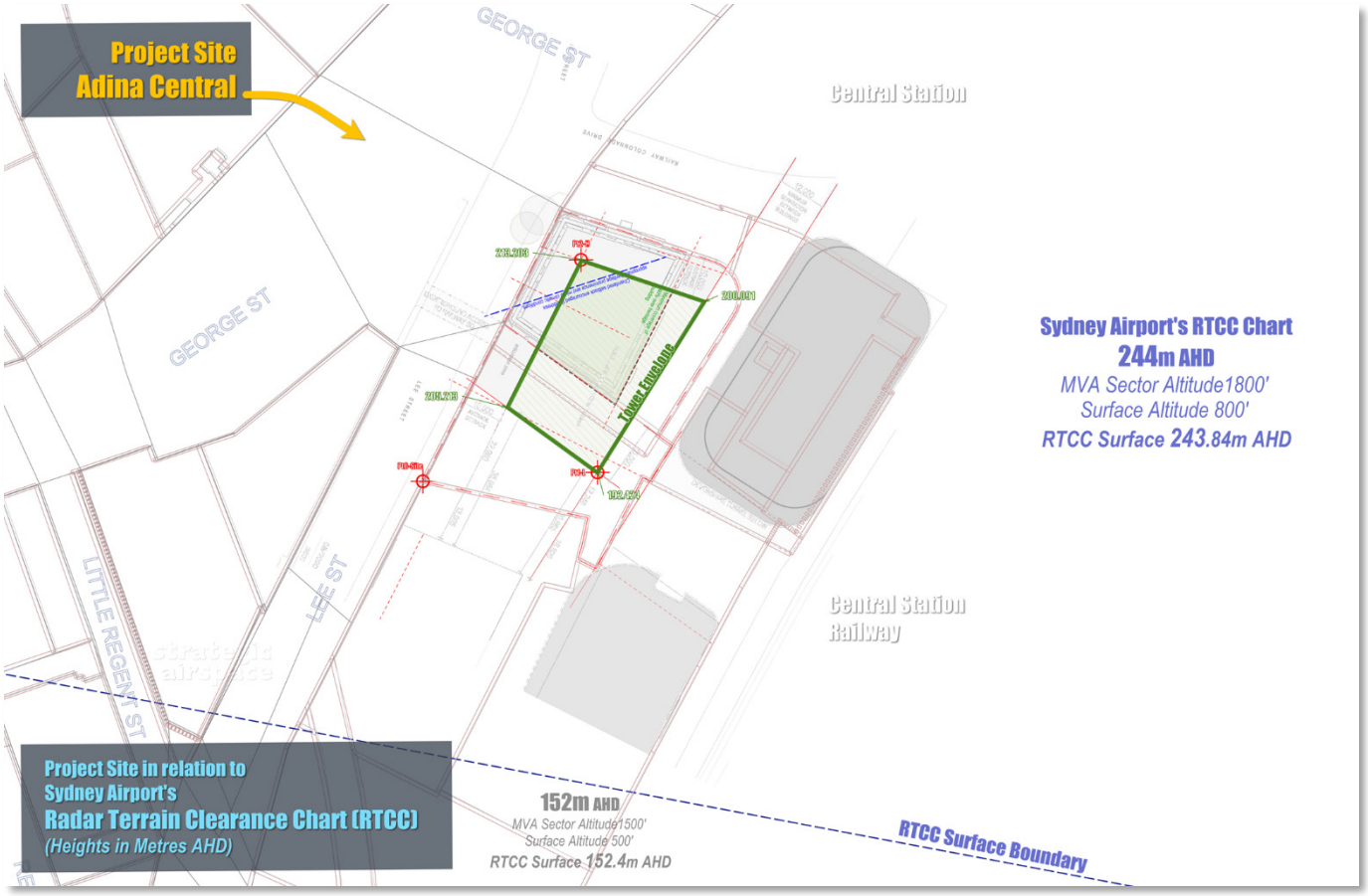


Figure 8 — Radar Terrain Clearance Chart (RTCC) Height Constraint

5. Crane Considerations

This section is provided for advance information only.

As noted above, the primary purpose of this report is to demonstrate that the proposed building will not infringe PANS-OPS airspace and is beneath the overhead RTCC surface, and therefore it satisfies the requirements to be granted a height approval under the APAR.

When evaluating a height application for most tall buildings and those where the maximum proposed building height is close to the limiting height, it is now common practice by DITRDC to also evaluate the feasibility of construction by assessing whether or not the cranes needed for construction could also (in the future, at the time of separate application(s) for cranes) be considered approvable under the APAR.

Under the APAR, cranes which would exceed the PANS-OPS surface limits could only be considered approvable as Short-Term Controlled Activities (ie, temporary obstacles), and in such cases the approval would contain a number of specific conditions. The key regulatory implications are that applications for cranes must be acceptable to Sydney Airport, and the operating period during which a crane height may exceed the PANS-OPS height limit would be limited to a period not exceeding 3 months.

In addition to standard requirements such as hazard warning lights, other approval conditions that could be reasonably anticipated would include operating procedures and requirements such as:

- A defined communications system between the Site Manager or Crane Supervisor and the Sydney Air Traffic Management (ATM) Unit at Sydney Airport; and
- The need to lower cranes during periods of low visibility (and that this may need to be put into place at short notice) and at night.

The case is slightly more complex where the RTCC surface height is lower than the PANS-OPS surface height limits. In such cases it is possible that cranes may be permitted to exceed the RTCC surface height, as long as it does not infringe the PANS-OPS height, noting that in such circumstances it is also probable that the cranes would be required to be lowered below the RTCC surface height at night and during times of low visibility.

Cranes which would not exceed the RTCC surface height (where it is lower than the limiting PANS-OPS surface height) may be permitted to operate longer than the 3-month period, subject to the agreement of Sydney Airport.

Analysis of the planning proposal shows that the clearance margin above the top of the proposed envelope that is more than sufficient for cranes to operate at heights which would not infringe the RTCC surface height. In this case, this means that:

- Approval under the APAR of height applications for cranes required for construction could be reasonably anticipated; and
- It is likely that such approvals would not be subject to the 3-month operating time limit conditions, subject to the agreement of Sydney Airport.

Any future height applications for cranes will require a detailed airspace assessment, current at the time of the application, inclusion of the then current Construction Management Plan (CMP), crane plans and operations programme and, subject to the final height impact, demonstration that the cranes could be operated within the anticipated time and operational constraints without any adverse impact on the safety, regularity or efficiency to air transport operations.

6. Conclusion

The OLS Conical Surface, a surface which slopes up across the site, is lower than (ie, infringed by) the planned maximum top elevations of the planning envelope. As such, the building would require approval as a Controlled Activity under the APAR from DITRDC prior to construction. However, as the maximum height of the proposed envelope is well below the most limiting of the PANS-OPS and Radar Terrain Clearance Chart surface heights, the planning proposal can be regarded as technically approvable under the APAR. Use of this report (or a future updated version) as an attachment to such an application for height approval would help to fulfil application requirements.

Given the location of the tower in the Sydney CBD, its proximity to the existing tower buildings in the CBD which are taller than that now proposed for this development, and the fact that the maximum height of the planning envelope is well clear of the constraining RTCC surface height, there is no technical reason why an airspace approval for the proposed building, under the Airports (Protection of Airspace) Regulations, would not be granted. An approval for the development is likely to contain condition for installation of obstacle lights.

At the latest, an approval under APAR is required prior to intrusion into the prescribed airspace (ie, before the development infringes the OLS). However, most local councils now require such an approval prior to (or as a consent condition of) approval of a Development Application. It is typically not required for approval of a rezoning application.

Separate applications for cranes that would infringe the OLS would also be required in the future. The advantage of doing separate applications at a time closer to construction is that more final information on the actual crane requirements (including maximum heights, locations and staging) will be available as a result of more resolved construction planning.

In summary, based on this preliminary assessment, we anticipate that a height application under APAR for the building envelope as proposed would be successful.

A P P E N D I C E S

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
AGL	Above Ground Level (Height)
AHD	Australian Height Datum
AHT	Aircraft Height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Services
ALARP	As Low As Reasonably Practicable
ALC	Airport Lease Company
Alt	Altitude
AMAC	Australian Mayoral Aviation Council
AMSL	Above Minimum Sea Level
ANEF	Australian Noise Exposure Forecast
ANSP	Airspace and Navigation Service Provider
APACL	Australia Pacific Airports Corporation Limited, owner of Melbourne and Launceston Airports
APCH	Approach
APARs, or A(PofA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ASDA	Accelerated Stop Distance Available
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BA (Planning)	Building Application or Building Approval (Planning)
BAC	Brisbane Airport Corporation
BCC	Brisbane City Council
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)
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

Abbreviation	*Meaning*
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
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
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
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

Abbreviation	*Meaning*
OAR	Office of Airspace Regulation
OCA	Obstacle Clearance Altitude (in this case, in AMSL)
OCH	Obstacle Clearance Height
ODPROPS	Opposite Direction Parallel Runway OPerations
OHS	Outer Horizontal Surface, an Obstacle Limitation Surface
OLS	Obstacle Limitation Surface, defined by ICAO Annex 14; refer also CASA MOS Part 139
PANS-OPS	Procedures for Air Navigation – Operations, ICAO Doc 8168; refer also CASA MOS Part 173
PAPI	Precision Approach Path Indicator (a form of VGSI)
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
RAAF	Royal Australian Air Force
RAPAC	Regional AirsPace users Advisory Committee
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RNP AR	Required Navigation Performance – Authorisation Required
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
THR	THReshold (of Runway)
TMA	TerMinal Area
TNA	Turn Altitude
TODA	Take-off Distance Available
TORA	Take-Off Runway Available
VFR	Visual Flight Rules
VIS	Visual
VMC	Visual Meteorological Conditions
V_n	Aircraft critical velocity reference
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
WSA	Western Sydney Airport

APPENDIX 2 — PANS-OPS PROCEDURES

The versions of the IFPs consulted were from the AIP Amendment 164, effective from 13-Aug-2020 to 04-Nov-2020, current as of the date of this report — as indicated in Table 11 below.

Table 11 — Appendix: PANS OPS Instrument Flight Procedure Charts for Sydney Airport (AIP Amendment 164 – Effective 13-Aug-2020 to 04-Nov-2020)

SYDNEY (YSSY)

Name of Chart	*Effective Date*	*(Amdt No)*
AERODROME CHART PAGE 1	7-Nov-2019	(Am 161)
AERODROME CHART PAGE 2	13-Aug-2020	(Am 164)
APRON CHART - INTERNATIONAL PAGE 1	21-May-2020	(Am 163)
APRON CHART - INTERNATIONAL PAGE 2	13-Aug-2020	(Am 164)
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	7-Nov-2019	(Am 161)
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	21-May-2020	(Am 163)
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 TWO A ARRIVAL (RNAV)	21-May-2020	(Am 163)
STAR BOREE TWO P ARRIVAL (RNAV)	21-May-2020	(Am 163)
STAR MEPIL THREE ARRIVAL (RNAV)	21-May-2020	(Am 163)
STAR MARLN FIVE ARRIVAL (RNAV)	21-May-2020	(Am 163)
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	7-Nov-2019	(Am 161)

Name of Chart	*Effective Date*	*(Amdt No)*
ILS RWY 16L PAGE 2	7-Nov-2019	(Am 161)
ILS OR LOC RWY 16R PAGE 1	7-Nov-2019	(Am 161)
ILS RWY 16R PAGE 2	7-Nov-2019	(Am 161)
ILS OR LOC RWY 25	7-Nov-2019	(Am 161)
ILS OR LOC RWY 34L PAGE 1	7-Nov-2019	(Am 161)
ILS RWY 34L PAGE 2	7-Nov-2019	(Am 161)
ILS OR LOC RWY 34R PAGE 1	7-Nov-2019	(Am 161)
ILS RWY 34R PAGE 2	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 07	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 16L	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 16R	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 25	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 34L	7-Nov-2019	(Am 161)
RNAV-Z (GNSS) RWY 34R	7-Nov-2019	(Am 161)
GLS RWY 07	7-Nov-2019	(Am 161)
GLS RWY 16L	21-May-2020	(Am 163)
GLS RWY 16R	21-May-2020	(Am 163)
GLS RWY 25	7-Nov-2019	(Am 161)
GLS RWY 34L	21-May-2020	(Am 163)
GLS RWY 34R	21-May-2020	(Am 163)

Source: AIP Book (13-Aug-2020 to 04-Nov-2020) via http://www.airservicesaustralia.com/aip/aip.asp?pg=10