



**Sydney Metro Martin Place
integrated station development —
South Site OSD: Assessment of
Airspace Approvability in Support of
Stage 2 SSD Development
Application**

CSWSMP-MAC-SMA-UD-REP-000300

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Document Title: **Sydney Metro Martin Place integrated station development — South Site OSD: Assessment of Airspace Approvability in Support of Stage 2 SSD Development Application**

Purpose / Abstract: *This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).*

Macquarie Corporate Holdings Pty Ltd (Macquarie) is seeking to create a World Class Transport and Employment Precinct at Martin Place, Sydney.

The SSD DA seeks approval for the detailed design and construction of the South Site Over Station Development (OSD), located above and integrated with the Martin Place Metro Station (part of the NSW Government's approved Sydney Metro project). The southern entrance and South Site OSD above is located at 39-49 Martin Place, Sydney.

This application follows the approval granted by the Minister for a Concept Proposal (otherwise known as a Stage 1 DA) for two OSD commercial towers above the northern and southern entrances of Martin Place Metro Station (SSD 17_8351). Although lodged concurrently with a Stage 1 Amending DA, the determination of this application will follow the determination of the Amending DA.

The Department of Planning and Environment have provided Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an Environmental Impact Statement for the proposed development.

The report assesses the current and forecast regulated airspace height constraints over the South Site OSD as per the Stage 2 SSD DA plans.

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Appendix 1 — Abbreviations

1. Executive Summary

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Macquarie Corporate Holdings Pty Ltd (Macquarie) is seeking to create a World Class Transport and Employment Precinct at Martin Place, Sydney.

The SSD DA seeks approval for the detailed design and construction of the **South Site Over Station Development (OSD)**, located above and integrated with the Martin Place Metro Station (part of the NSW Government's approved Sydney Metro project). The southern entrance and South Site OSD above is located at 39-49 Martin Place, Sydney.

This application follows the approval granted by the Minister for a Concept Proposal (otherwise known as a Stage 1 DA) for two OSD commercial towers above the northern and southern entrances of Martin Place Metro Station (SSD 17_8351). It also follows Gazettal of site specific amendments to the Sydney Local Environmental Plan 2012 (Planning Proposal reference: PP_2017_SYDNE_007_00) permitting greater building height (over a portion of the South Site) and additional floor space (over both the North and South Sites).

This application is also lodged concurrently with a Stage 1 Amending DA, which seeks approval for an amended concept for the precinct, including a change to the setback of the tower building on the South Site. To ensure consistency, the Stage 1 Amending DA must be determined prior to the determination of the subject Stage 2 DA for the South Site.

This report refers to a precedent study report which was prepared to assess the airspace implications of the Stage 1 SSD DA for the Over Station Development building envelopes for both the North and South Sites and the Stage 1 Amending DA. The maximum height sought for building envelope of the South Site OSD in the Stage 1 Amending DA is higher than the South Tower's maximum design height of 152.440m AHD. This lower height is what is relevant to this report and the Stage 2 DA for the South Site.

The findings of this study are:

- The 152.44m **maximum height of the South Tower building design** is 3.56m **below the OLS height limit**
- **No impact on the Prescribed Airspace of Sydney Airport;**
- The existing height and location of taller surrounding buildings, and the 2017 airspace approval for the North Site OSD, support the argument that future applications for cranes for construction of the South Tower would be granted airspace height approvals under APAR.

Approval of this Stage 2 SSD DA application can proceed without necessitating any aviation-related airspace application for the development of the South Site OSD (with the exception of cranes which are subject to separate applications at the appropriate time in the future).

2. Introduction

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning (Minister) pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on behalf of Macquarie Corporate Holdings Pty Limited (Macquarie), who is seeking to create a world class transport and employment precinct at Martin Place, Sydney.

The SSD DA seeks approval for the detailed design and construction of the **South Site** Over Station Development (OSD), located above and integrated with the Martin Place Metro Station (part of the NSW Government's approved Sydney Metro project). The southern entrance and South Site OSD above is located at 39-49 Martin Place, Sydney.

This application follows:

- Approval granted by the Minister for a Concept Proposal for two OSD commercial towers above the northern (North Site) and southern (South Site) entrances of Martin Place Metro Station (SSD 17_8351), which approved building envelopes, land uses, Gross Floor Areas (GFA) and Design Guidelines with which the detailed design (otherwise known as a Stage 2 DA) must be consistent.
- Gazettal of site specific amendments to the Sydney Local Environmental Plan 2012 (Planning Proposal reference: PP_2017_SYDNE_007_00) permitting greater building height (over a portion of the South Site) and additional floor space (over both the North and South Sites).

Lodged concurrently with this DA, is an amending DA to the Concept Proposal (Stage 1 Amending DA), which seeks approval for an amended concept for the precinct, aligning the approved South Site building envelope with the new planning controls secured for the precinct.

To ensure consistency, the Stage 1 Amending DA must be determined prior to the determination of the subject Stage 2 DA for the South Site.

This application does not seek approval for elements of the Martin Place Station Precinct which relate to Stage 2 of the Sydney Metro infrastructure project, which is subject to a separate Critical State Significant Infrastructure (CSSI) approval. These include:

- Demolition of buildings on the North Site and South Site;
- Construction of rail infrastructure, including station platforms and concourses;
- Ground level public domain works; and
- Station related elements in the podium of the South Site building.

However, this application does seek approval for OSD areas in the approved Martin Place Station Structure, above and below ground level, which are classified as SSD as they relate principally to the OSD. These components are within the Metro CSSI approved station envelope that will contain some OSD elements not approved in the CSSI consent. Those elements include the end of trip facilities, office entries, office space and retail areas, along with other office/retail plant and back of house requirements that are associated with the proposed OSD and not the rail infrastructure.

For: Macquarie

This report is based upon a precedent study report¹ which was prepared to assess the airspace implications, specifically in relation to the Prescribed Airspace of Sydney Airport, in support of the Stage 1 SSD DA for the Over Station Development building envelopes for both the North and South Sites. It also refers to a separate Aeronautical Assessment report prepared in support of the Stage 1 Amending DA² with the focus on the implications for the South Site.

2.1 Context

The New South Wales (NSW) Government is implementing Sydney's Rail Future (Transport for NSW, 2012), a plan to transform and modernise Sydney's rail network so that it can grow with the city's population and meet the needs of customers in the future.

Sydney Metro is a new standalone rail network identified in Sydney's Rail Future. The Sydney Metro network consists of Sydney Metro Northwest (Stage 1) and Sydney Metro City & Southwest (Stage 2).

Stage 2 of the Metro entails the construction and operation of a new Metro rail line from Chatswood, under Sydney Harbour through Sydney's CBD to Sydenham and onto Bankstown through the conversion of the existing line to Metro standards. The project also involves the delivery of seven (7) new Metro stations, including Martin Place.

This step-change piece of public transport infrastructure once complete will have the capacity for 30 trains an hour (one every two minutes) through the CBD in each direction catering for an extra 100,000 customers per hour across the Sydney CBD rail lines.

On 9 January 2017 the Minister approved the Stage 2 (Chatswood to Sydenham) Metro application lodged by Transport for NSW (TfNSW) as a Critical State Significant Infrastructure (CSSI) project (reference SSI 15_7400). Work is well underway under this approval, including demolition of buildings at Martin Place.

The OSD development is subject to separate applications to be lodged under the relevant provisions of the EP&A Act. One application is being sought for the North Site, via a separate application, and another for the South Site – this application.

2.2 Site Description

The Sydney Metro Martin Place Station Precinct (the Precinct) project relates to the following properties (refer to **Figure 2-1**):

- 50 Martin Place, 9 – 19 Elizabeth Street, 8 – 12 Castlereagh Street, 5 Elizabeth Street, 7 Elizabeth Street, and 55 Hunter Street (North Site);
- 39 – 49 Martin Place (South Site); and
- Martin Place (that part bound by Elizabeth Street and Castlereagh Street).

This application relates only to the South Site, being the land at 39-49 Martin Place, Sydney (refer to **Figure 2-1**).

1 Strategic Airspace, Doc No 16.026-01-002 Sydney Metro Martin Place: Assessment of Airspace Approvability in Support of a SSD Development Application, v1.2, May 2017
2 Strategic Airspace, Doc No 18.016-01-001 Sydney Metro Martin Place: Stage 1 Amending DA — Assessment of Airspace Approvability, v1.1.1, July 2018

The North Site is the subject of a separate detailed/Stage 2 SSD DA.

Figure 2-1: Aerial Photo of the North and South Site of the Martin Place Metro Station Precinct



2.3 Background

2.3.1 Sydney Metro Stage 2 Approval (SSI 15_7400)

On 9 January 2017, the Minister approved Stage 2 of the Sydney Metro project, involving the construction and operation of a metro rail line between Chatswood and Sydenham, including the construction of a tunnel under Sydney Harbour, links with the existing rail network, seven metro stations (including a station at Martin Place), and associated ancillary infrastructure. The project approves the demolition of existing buildings at Martin Place, excavation and construction of the new station (above and below ground) along with construction of below and above ground structural and other components of the future OSD, although the fit-out and use of such areas are the subject of separate development approval processes.

Modification 3 to the Sydney Metro consent, approved 22 March 2018, enabled the inclusion of Macquarie-owned land at 50 Martin Place and 9-19 Elizabeth Street within the Martin Place Station footprint, and other associated changes (including retention of existing MLC pedestrian link).

2.3.2 Concept Proposal (SSD 17_8351) and Amending Stage 1 DA

On 22 March 2018, the Minister approved a Concept Proposal (SSD 17_8351), relating to the Sydney Metro Martin Place Station Precinct. This Concept Proposal established the planning and development framework through which to assess the detailed Stage 2 applications.

Specifically, the Concept Proposal encompassed:

- Building envelopes for OSD towers on the North Site and South Site (see **Figure 2-2**) comprising:
 - 40+ storey building on the North Site
 - 28+ storey building on the South Site
 - Concept details to integrate the North Site with the existing and retained 50 Martin Place building (the former Government Savings Bank of NSW)
- Predominantly commercial land uses on both sites, comprising office, business and retail premises
- A maximum total GFA of 125,437m² across both sites
- Consolidated Design Guidelines to guide the built form and design of the future development
- A framework for achieving design excellence
- Strategies for utilities and services provision, managing drainage and flooding, and achieving ecological sustainable development
- Conceptual OSD areas in the approved Martin Place Metro Station structure, above and below ground level³

³ Refers to those components within the Metro CSSI approved station envelope that will contain some OSD elements not approved in the CSSI consent. Those elements include the end of trip facilities, office entries, office space and retail areas, along with other office/retail plant and back of house requirements that are associated with the proposed OSD and not the rail infrastructure.

Figure 2-2: North Site and South Site Approved OSD Building Envelopes

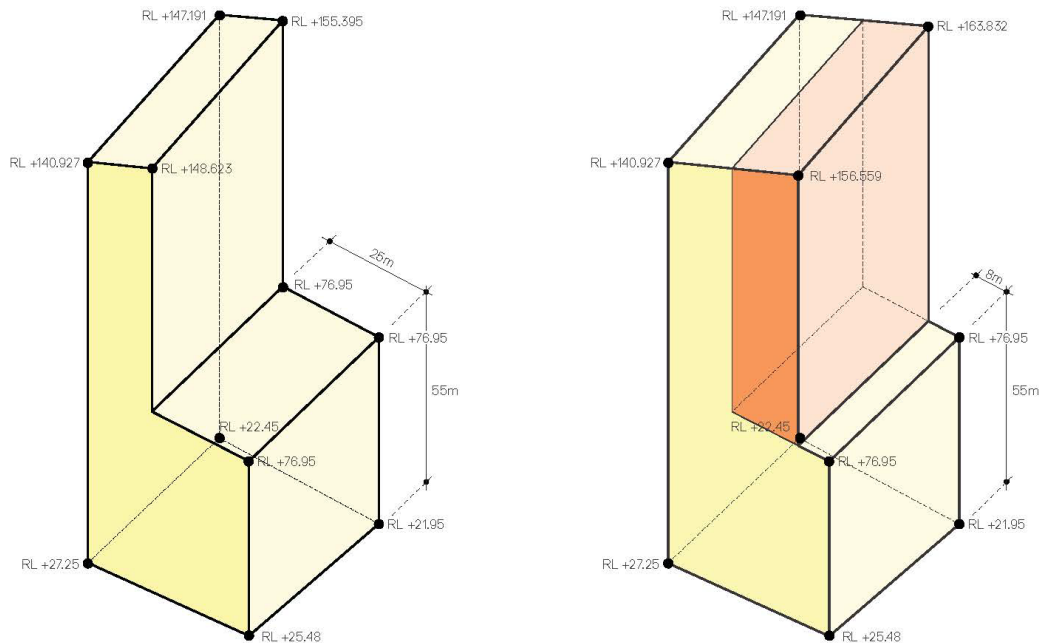


*The North Site is to the left;
the **South Site Approved OSD Building Envelope** is shown on the right.*

The Concept Proposal was prepared and determined prior to the site specific Sydney LEP 2012 amendment (Planning Proposal reference: PP_2017_SYDNE_007_00) being gazetted and was developed based on the height development standards that applied to the South Site at the time. As a result, the Concept Proposal allows for a tower on the South Site that is now inconsistent with the building envelope envisaged through the Sydney LEP 2012. The new site specific provision that applies to the precinct under Sydney LEP 2012 reduces the portion of the South Site which is subject to a 55 metre height limit from 25 metres to 8 metres from the boundary to Martin Place, and applies the Hyde Park North Sun Access Plane to the remainder of the South Site, and also permits an FSR of 22:1 on the South Site (and an FSR of 18.5:1 on the North Site).

Accordingly, an amending DA to the Concept Proposal (Stage 1 Amending DA) has been lodged concurrently with this subject Stage 2 DA, which seeks to align the approved Concept Proposal building envelope for the South Site with the revised site specific development standards applying under the Sydney LEP 2012, being increased FSR and building height. This Stage 1 Amending DA seeks to amend the planning and development framework established under the approved Concept Proposal that is used to assess this Stage 2 DA. The Stage 1 Amending DA is to be assessed concurrently with, and determined prior to the subject Stage 2 DA, with the amended South Site building envelope setting the broad development parameters for the South Site (see **Figure 2-3** below).

Figure 2-3: Relationship between the Approved and Proposed Amended South Site Building Envelope



Approved South Site OSD Envelope

*Proposed Amended South Site OSD Envelope
 (aligning with site specific amendment to
 Sydney LEP 2012)*

2.4 Overview of the Proposed Development

The subject application seeks approval for the detailed design, construction and operation of the South Site OSD commercial tower. The proposal has been designed as a fully integrated Station and OSD project that intends to be built and delivered as one development, in-time for the opening of the Sydney Metro line in 2024. The application seeks consent for the following:

- The design, construction and operation of a new 28 storey commercial OSD tower within the approved building envelope for the South Site, including office space and retail tenancies.
- Vehicle loading and parking areas.
- Extension and augmentation of physical infrastructure / utilities as required.
- Detailed design and delivery of 'interface areas' within both the approved station and Concept Proposal envelope that contain OSD-exclusive elements, office entries, office space and retail areas not associated with the rail infrastructure.

2.5 Planning Approvals Strategy

The *State Environmental Planning Policy (State and Regional Development) 2011* (SEPP SRD) identifies development which is declared to be State Significant. Under Schedule 1 and Clause 19(2) of SEPP SRD, development within a railway corridor or associated with railway infrastructure that has a capital investment value of more than \$30 million and

involves commercial premises is declared to be State Significant Development (SSD) for the purposes of the EP&A Act.

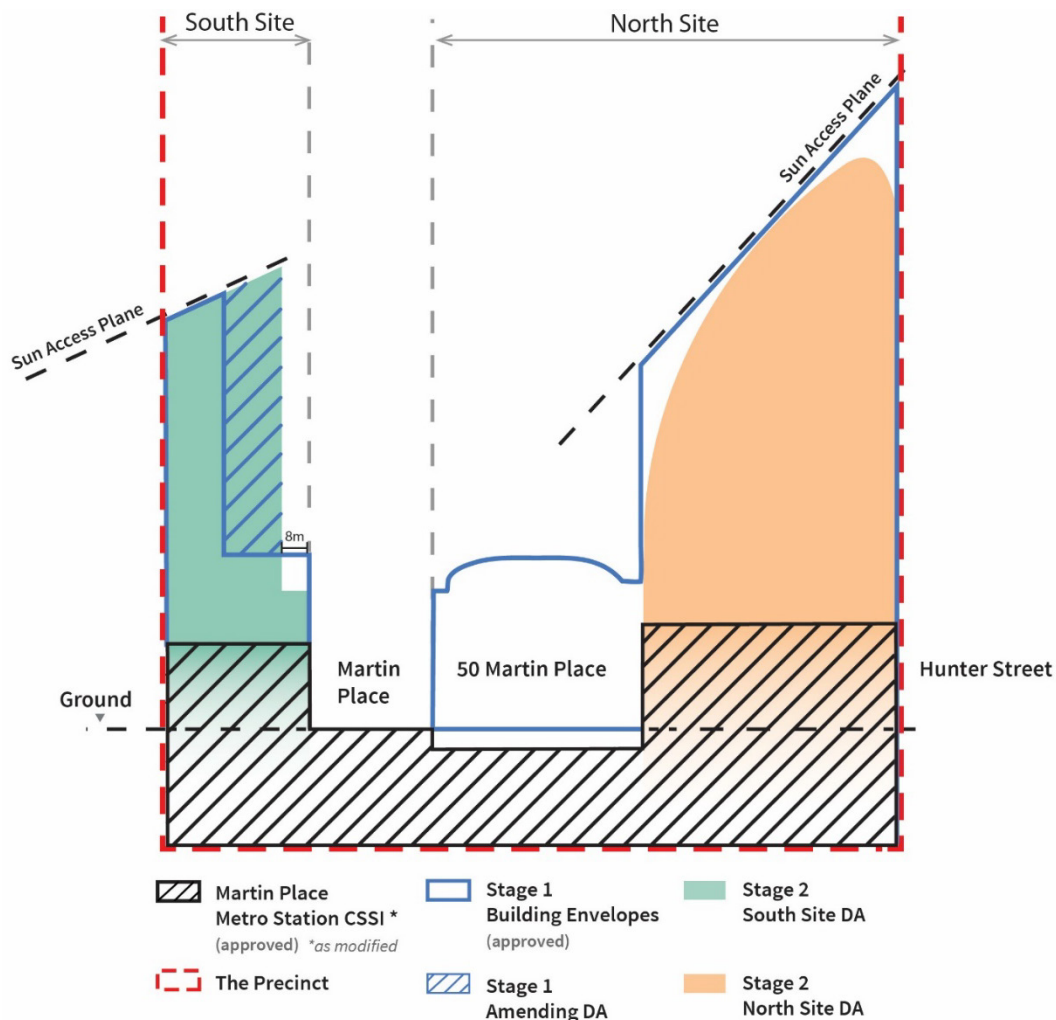
The proposed development (involving commercial development that is both located within a rail corridor and associated with rail infrastructure) is therefore SSD.

Pursuant to Section 4.22 of the EP&A Act a Concept DA may be made setting out concept proposals for the development of a site (including setting out detailed proposals for the first stage of development), and for which detailed proposals for the site are to be the subject of subsequent DAs. This SSD DA represents a detailed proposal and follows the approval of a Concept Proposal on the site under Section 4.22 of the EP&A Act.

Submitted separately to this SSD DA is a detailed proposal/SSD DA for the North Site (Stage 2 North Site DA), together with an amending DA to the Concept Proposal (Stage 1 Amending DA) that has the effect of aligning the approved South Site building envelope with the new planning controls established for the South Site (achieved through the site-specific amendment to the Sydney LEP 2012).

Figure 2-4 below is a diagrammatic representation of the suite of key planning applications undertaken or proposed by Macquarie and their relationship to the subject application (the subject of this report).

Figure 2-4: Relationship of key planning applications to the Stage 2 South Site DA (this application)



The Department of Planning and Environment have provided Secretary's Environmental Assessment Requirements (SEARs) to the applicant for the preparation of an

For: Macquarie

Environmental Impact Statement for the proposed development. However, there are no SEARs Key Issues relevant to this report for the Stage 2 DA.

This report examines the height limits overhead the site that are related to aviation airspace protection requirements and which would:

- a) Trigger the requirement to apply for an airspace height approval;
- b) Constrain the maximum permissible building envelope heights; and
- c) Constrain the maximum permissible heights for cranes that would be required to enable construction of the proposed development.

3. Aeronautical Impact Context

3.1 Location of the Proposed Development

The location of the site in the middle of the CBD means that it is surrounded by tall buildings, a substantial number of which are taller than the maximum proposed heights of the towers on both the North and South sites.

Figure 3-1: Site in Relation to Sydney Airport



The South Site lies to the north-north-east of Sydney Airport, approximately 9.15km (4.9 Nautical Miles, NM) from the aerodrome reference point (ARP) at a bearing of 019° True (T) — as indicated in Figure 3-1 above.

For: Macquarie

The measurement point used for this analysis is located at the centre of the southern boundary of the Sydney Metro Martin Place Precinct⁴, the WGS84 coordinate of which is approximately 33° 52.1' S 151° 12.6' E.

Other key measurement references are:

- In relation to Runway (RWY) 16L/34R, the eastern parallel runway
 - ~9.46km (5.1 NM) at 012°T from the threshold of Runway (RWY)16L
 - ~3.89km (2.1NM) from the extended runway centreline
- In relation to RWY 07/25, the short cross-runway
 - ~7.96km (4.3NM) at 014°T from the threshold of RWY 25
 - ~6.89km (3.7NM) from the extended runway centreline

In relation to tall buildings in the immediate vicinity:

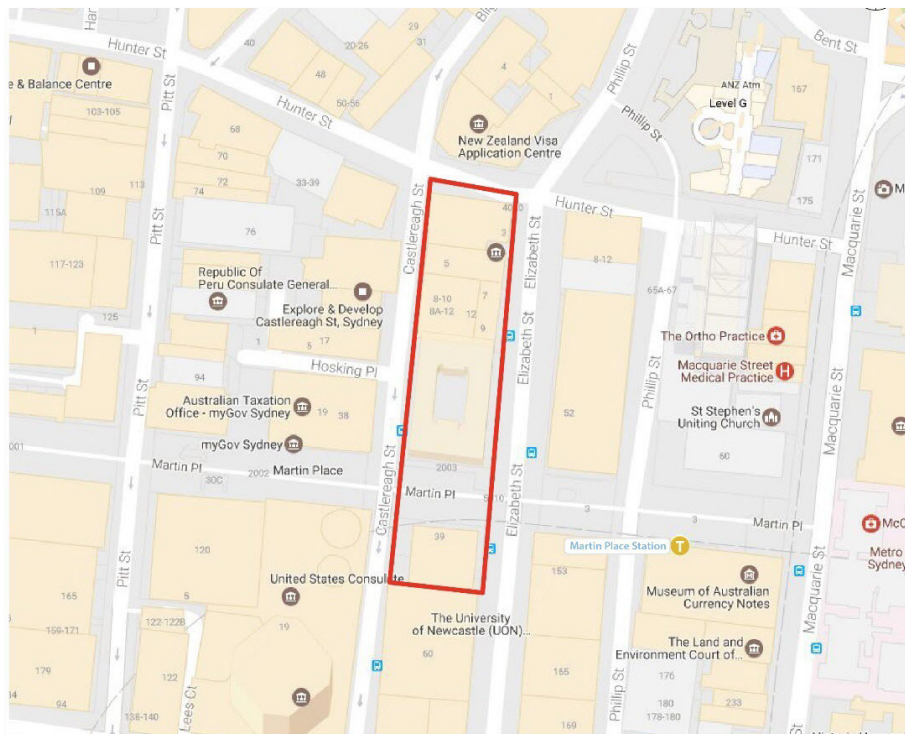
- The South Site is:
 - ~285m north-north-east (NNE) of Sydney Tower Eye (commonly known as “Centrepont Tower”)
 - ~50m NNE from the MLC Centre Tower (located at the King and Castlereagh Streets corner of the centre development)

The towers noted above (as well as others in the CBD) are taller than the maximum building height proposed, and their relative locations would effectively shield the proposed development in relation to any flight procedures to and from Sydney Airport.

The other airports in the Sydney Basin are too distant from the South Site to have any impact on the airspace surrounding it.

⁴ This coordinate is a conservative point if used for analysing airspace for the tower on the North Site. However, this was the coordinate used for the precedent study for the Stage 1 SSD DA and has thus been retained for consistency.

Figure 3-2: Location Map of the Precinct encompassing the South Site (this application) and the North Site



3.2 Proposed Maximum Building Height

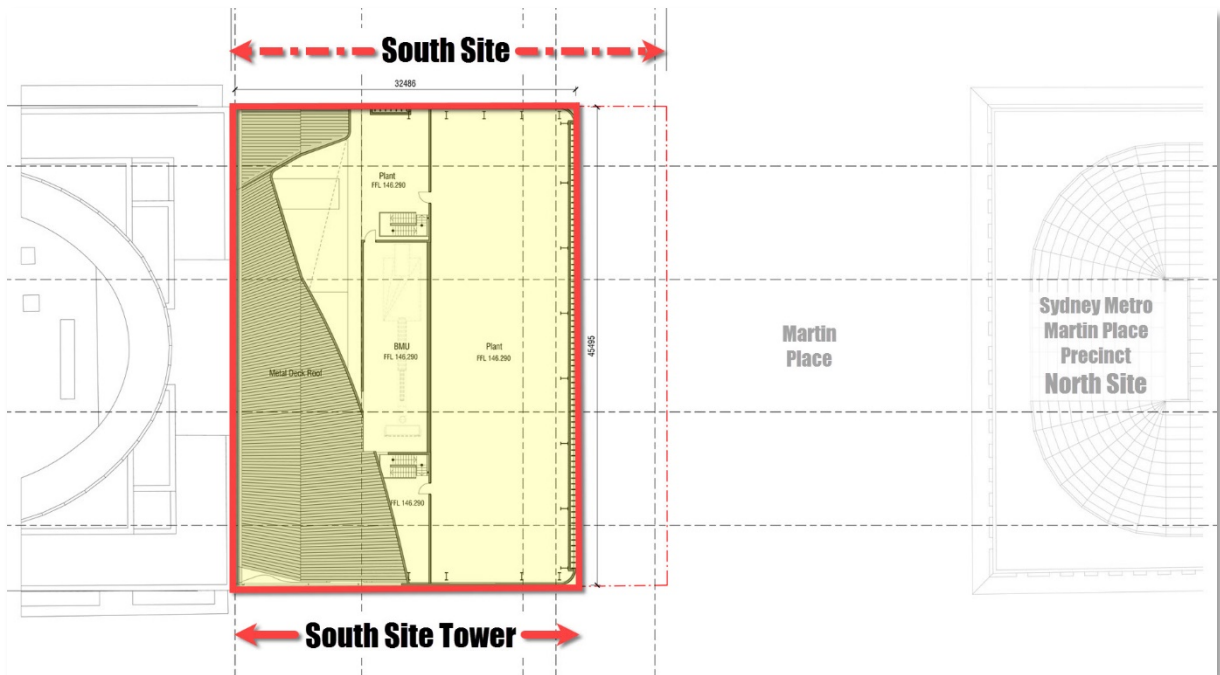
The building design relevant to this aeronautical assessment is that of the tower on the South Site, as illustrated in Figure 3-3 South Site Level 29 Plan with South Tower highlighted below and the East Elevation and Section figures also below.

As indicated in Figure 3-4 South Site Tower — East Section View (Top Floors & Height RLs) below, the peak height of the tower proposed for the South Site is **152.440m AHD**. Design plans indicate that all lift, plan rooms, rooftop signage and so forth will be below this maximum height.

This is 12.56m lower than the 165m AHD maximum height for the South Site OSD Building Envelope of the Stage 1 OSD Concept Plans already submitted for approval.

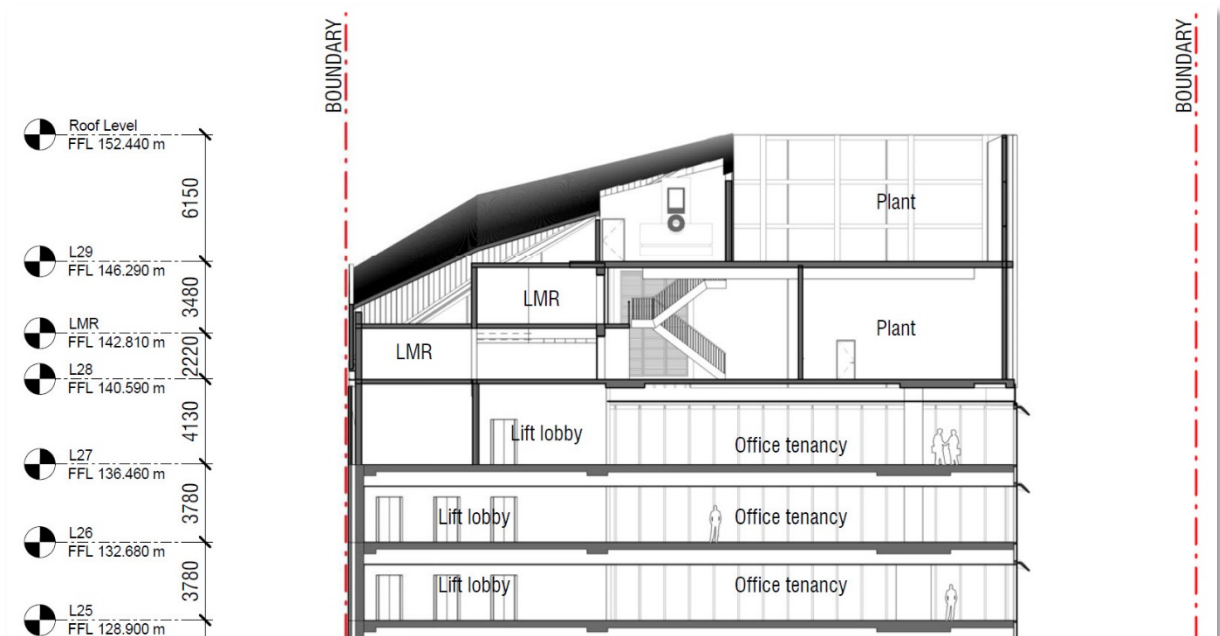
For: Macquarie

Figure 3-3: South Site Level 29 Plan with South Tower highlighted



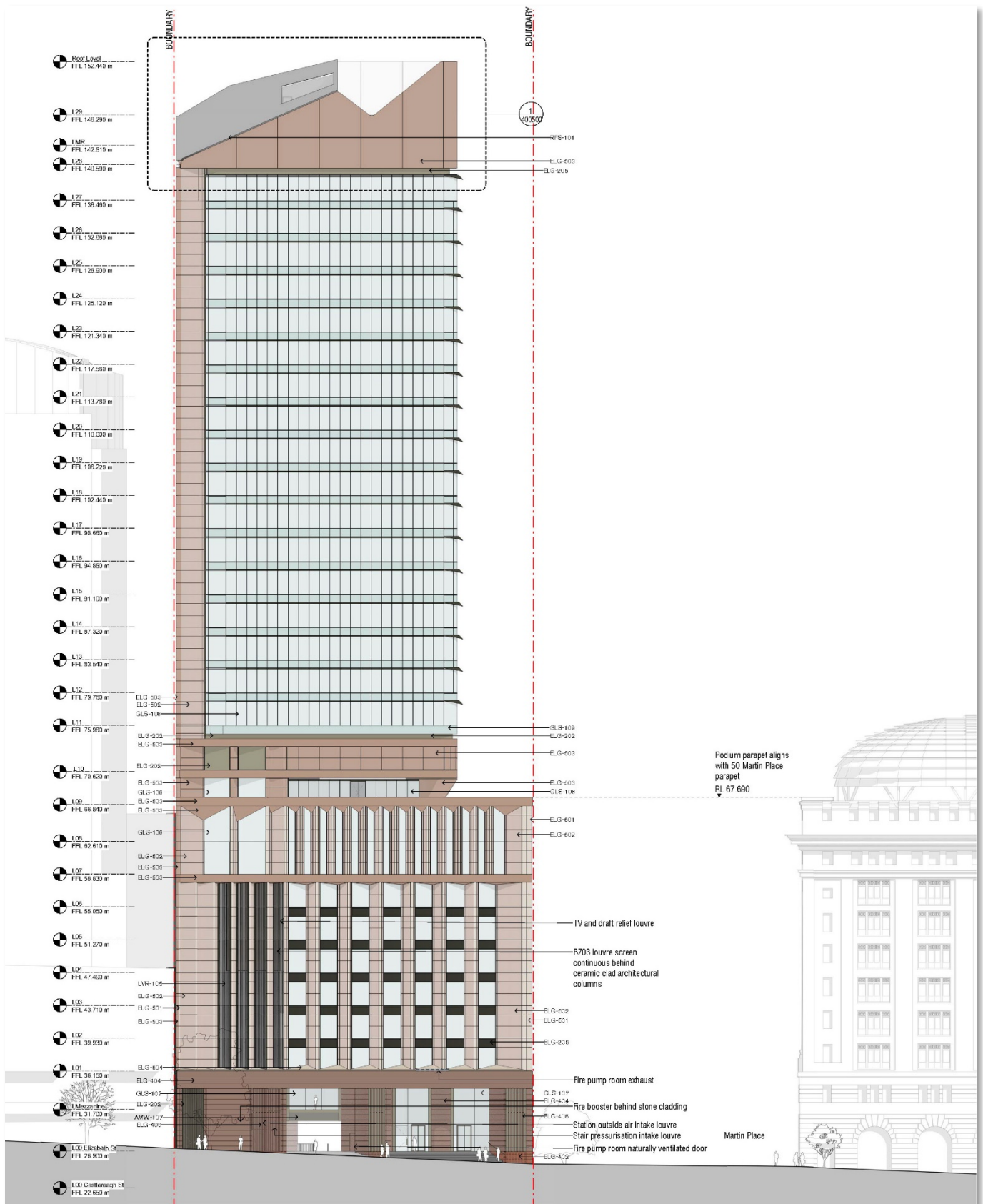
Source: DA Drawing: CSWSMP-MAC-SMS-AT-DRG-DA-302900 Rev F — Extract from Level 29 Plan

Figure 3-4: South Site Tower — East Section View (Top Floors & Height RLs)



Source: DA Drawing: CSWSMP-MAC-SMS-AT-DRG-DA-500100 Rev F — Extract from Top of Section Plan

Figure 3-5: South Site Tower — East Elevation



Source: DA Drawing: East Elevation – CSWSMP-MAC-SMS-AT-DRG-DA-400100 Rev G

3.3 Methodology

The methodology used to determine the maximum building height (or minimum airspace height limitation) above the development site takes into consideration each of the following.

3.3.1 Airspace Regulations

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

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

3.3.2 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 and Regional Development (DIRD) — 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 development does not penetrate or adversely affect surfaces protecting: instrument flight procedures (PANS-OPS surfaces); radar vectoring; navigation infrastructure; or anything else that might affect the safety or regularity of operations at the airport.

■ PANS-OPS Surfaces

- PANS-OPS surfaces represent the protection surfaces for published instrument flight procedures to and from the airport. These surfaces comprise flat, sloping and complex surface components.
- PANS-OPS surfaces must not be penetrated by either permanent or temporary buildings or structures. However, for a variety of reasons, PANS-OPS surfaces can and do change over time.
- 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 Altitudes (MVAs) used by Air Traffic Controllers when vectoring aircraft;
 - Lighting and visual guidance protection plans — used for approach guidance by aircraft, especially at night and in times of poor visibility; and
 - Navaid and radar evaluation / protection surface plans.
- **Other Factors**
 - Protection for other Instrument Flight Procedure surfaces, where the procedures are not classified as PANS-OPS and/or have been omitted from Sydney Airport's declared PANS-OPS surfaces charts. These may include a variety of Required Navigation Performance procedures (RNP).
 - Airline Engine-Out (Contingency) Take-Off Splays (as per Civil Aviation Order 20.7 1b)
These are generally assessed independently by the airlines as part of their own evaluations of any given airspace height application, but it is prudent to evaluate any potential impact in advance.
 - Other miscellaneous factors that may be considered as potential safety issues by any of the key stakeholders, and the Civil Aviation Safety Authority (CASA) in particular.
- **Note:** Airspace that is approved by the Department of Infrastructure and Regional Development as Declared Airspace is considered part of an airport's Prescribed Airspace.

3.3.3 Applications for Airspace Height Approvals

All applications under APAR must be submitted to DIRD, at the appropriate time, through the closest relevant airport. Applications should include aeronautical impact assessment reports that are based on the most current plans for the proposed development available at the time. For major developments, such reports should include consideration of cranes that will be required for construction.

In this particular case, however, there is already an approval for the construction of a building on the North Site, as explained in the following section.

For reference information in relation to the approvability of the South Site (this application), it is also noted that there is already an existing airspace approval for the North Site, up to a maximum height of 214.2m AHD⁵.

4. Analysis

This study is based on the maximum design height proposed for the South Tower building in this Stage 2 SSD DA South Site. The impact of the airspace height limits, from lowest to highest, is summarised in the following table.

⁵ DIRD Approval — reference F17/2779-10, dated 28th September 2017 — grants consent for the construction of a building up to a maximum of 214.2m AHD on the Martin Place Precinct North Site.

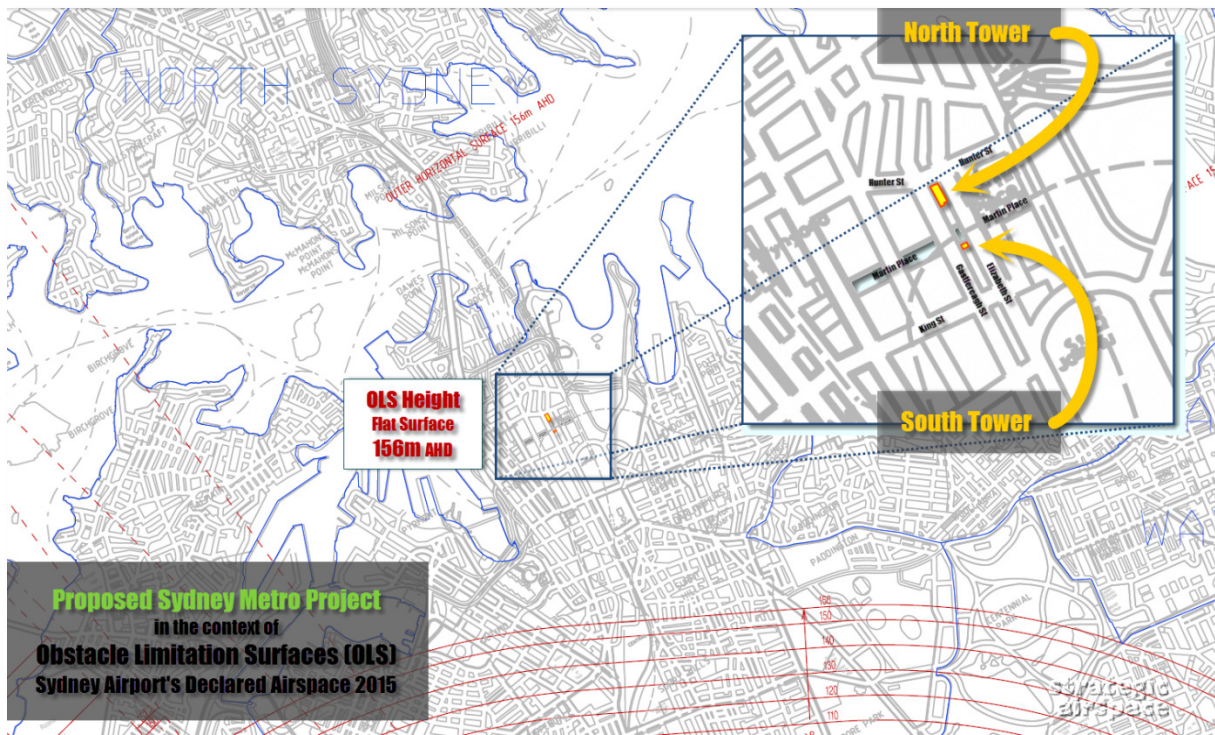
**Table 4-1: Airspace Height Constraints & Clearance (or Infringement) of
Airspace Protection Surfaces**

Height Limits (AHD)	Height Limit Detail	Clearance (AHD)	Comment
North: 152.440 m	Proposed Maximum Building Height		Current proposed maximum building height (refer section 3.2, p12)
156m	OLS Outer Horizontal Surface	South: 3.56m	THRESHOLD HEIGHT limit: Any development that would exceed this height requires a prior 'airspace height' approval from the Department of Infrastructure and Regional Development under the Airports (Protection of Airspace) Regulations (or APAR). Proposed max building height BELOW the OLS and therefore NO IMPACT on PRESCRIBED AIRSPACE.
335.2m	Minimum Sector Altitude (MSA), and RTCC Minimum Vector Altitude (MVA) — both 2100ft above the site	South: 182.76m	The 335m constraint is the maximum building height (including crane height) that would be approved by the aviation authorities. The vertical space available between the top of the proposed building and the applicable airspace height constraint leaves ample room for cranes above the top of the tower.
Other PANS-OPS Surface Height Constraints <i>The constraints listed in this section are higher than the MSA and RTCC MVA height limits — and so, in the particular location, most likely not considered relevant by the aviation authorities.</i>			
~335+m	PANS-OPS Departure Surfaces	South: 182+m	The Departure Surfaces must clear the Sydney Tower Eye (~330.7m). Based on the current Omnidirectional Departures for RWY07 and RWY34R, the protection surfaces over the southern-most point of the site will be at least 5m higher, resulting in a minimum surface limit of ~335m AHD. This excludes the additional 15m now available due to changes in the PANS-OPS Departure design criteria, which would mean a limit of at least 350m AHD.

N/A or >335	PANS-OPS Approaches & Other Surfaces	N/A	The site is outside the protection areas of PANS-OPS Approach Surfaces. The limits of the PANS-OPS Missed Approach surfaces for the RWY34R are higher at that point than that of other surfaces. Other surface types (eg, nav aids, lighting) are not applicable over the site.
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4.1 OLS Analysis

Figure 4-1: SACL Obstacle Limitation Surfaces (OLS) Context



Source: SACL Declared Airspace Chart 2015 and StratAir

The height limit of Sydney Airport's OLS at the proposed development site is **156m AHD**. The OLS surface directly above the South Site is called the Outer Horizontal Surface (OHS).

As the maximum height of the South Tower is **below the OLS**, the building would have **no impact on the Prescribed Airspace of Sydney Airport** — and so an **airspace height approval for the tower building prior to construction is not required**.

However, cranes required for construction of the tower would most likely penetrate the OLS. Applications under APAR would need to be made for any cranes that would penetrate the OLS at the appropriate time, and approval granted, prior to construction.

4.2 PANS-OPS Analysis

Although the analysis of impact against the PANS-OPS surfaces is not necessary in relation to the proposed tower building on the South Site — because at its maximum height it will have no impact on the prescribed airspace — it has been conducted to

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ascertain the potential impact of PANS-OPS height limits that would be applicable to cranes that would be required for construction of the tower building (and therefore ultimately the feasibility of constructing the building to the planned maximum height).

The site is not constrained by protection surfaces related to flight procedures to/from runways at Sydney Airport. The effective limit imposed by PANS-OPS procedure is that pertaining to the Minimum Sector Altitude (MSA).

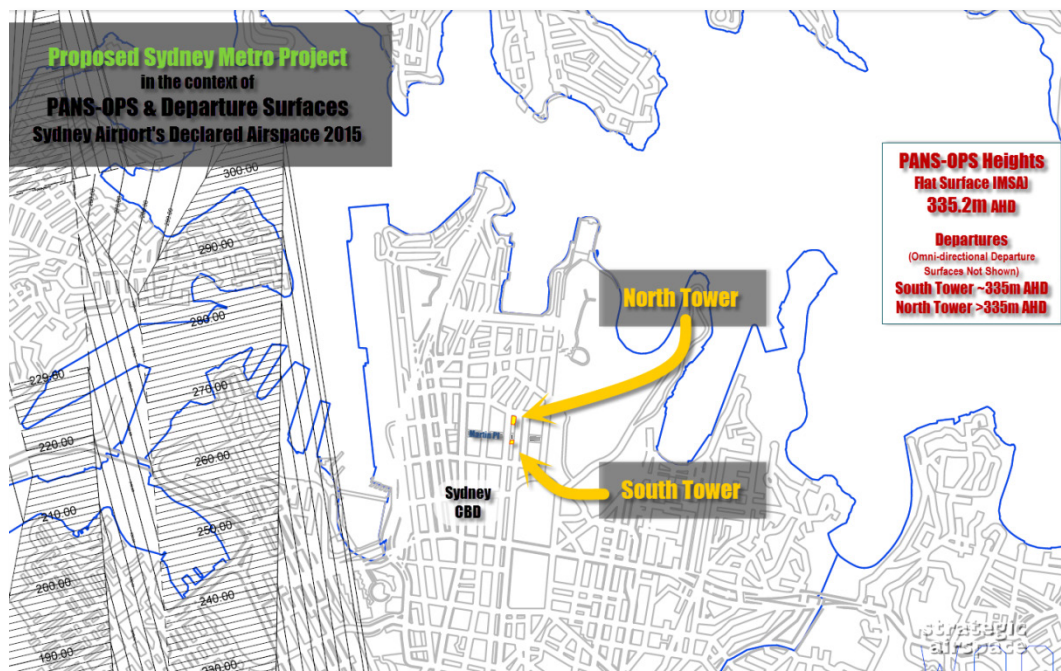
The analysis was based initially on the PANS-OPS Approach and Omnidirectional Radar Departure Surfaces charts published by Sydney Airport Corporation Limited (SACL) as part of their 2015 Declared Airspace charts (the latest available). In addition, due to the currency issue, the Instrument Flight Procedures (IFPs) published in the Australian Aeronautical Information Publication (AIP) on Airservices Australia website were also consulted to check if any changes to PANS-OPS procedures since the publication of the SACL charts would affect the height limits.

The versions of the IFPs consulted during the Stage 1 DA assessment for the precinct were from the AIP Amendment 150, effective from 02-Mar-2017 to 24-May-2017. A check review of the changes since that time (with reference to AIP Amendment 155, effective from 24-May-2018 to 15-Aug-2018) indicated that no changes that would affect the results of the analysis presented herein.

Table 4-2: PANS-OPS Height Limitations

<i>Procedure</i>	<i>Height Limit (m AHD)</i>	<i>Description</i>
Circling	N/A	Outside the Circling area protection surface.
Approaches and Missed Approaches to all Runways	N/A or >335	Outside the protection areas for Approach surfaces. The limits for the missed approach surfaces related to the RWY34R RNAV(GNSS) and ILS approaches are not shown on Sydney Airport's PANS-OPS Surfaces chart. However, the protection areas for these missed approaches must clear Sydney Tower Eye (~330.7m), and thus are therefore higher than that clearance height overhead the northern edges (peak heights) of both the North and South Towers.
Departures	~335+	Sydney Airport's (PANS-OPS) Omnidirectional Departure Surfaces chart shows height limits across the site that are too low and cannot be correct (they are indicative only). The PANS-OPS Departure Surfaces must clear the Sydney Tower Eye (~330.7m). Based on the current Omnidirectional Departures Procedures for RWY07 and RWY34R that are published in the Australian Aeronautical Information Publication (AIP) on the Airservices Australia website, the protection surfaces over the southern-most point of the site will be at least 5m higher, resulting in a minimum surface limit of ~335m AHD over the south-eastern corner of the South Tower. The height constraint overhead the South Tower is higher still. This excludes the additional 15m now available due to changes in the PANS-OPS Departure design criteria, which would mean a limit of at least 350m AHD overhead the south-eastern corner of the development site, rising in a north-westerly direction across the site.
Minimum Sector Altitude (MSA)	335.2	10NM Inner MSA of 2100ft.

Figure 4-2: SACL PANS-OPS Surfaces (excluding Departures) Context



Source: SACL Declared Airspace Chart 2015 and StratAir

4.3 Other Assessment Factors

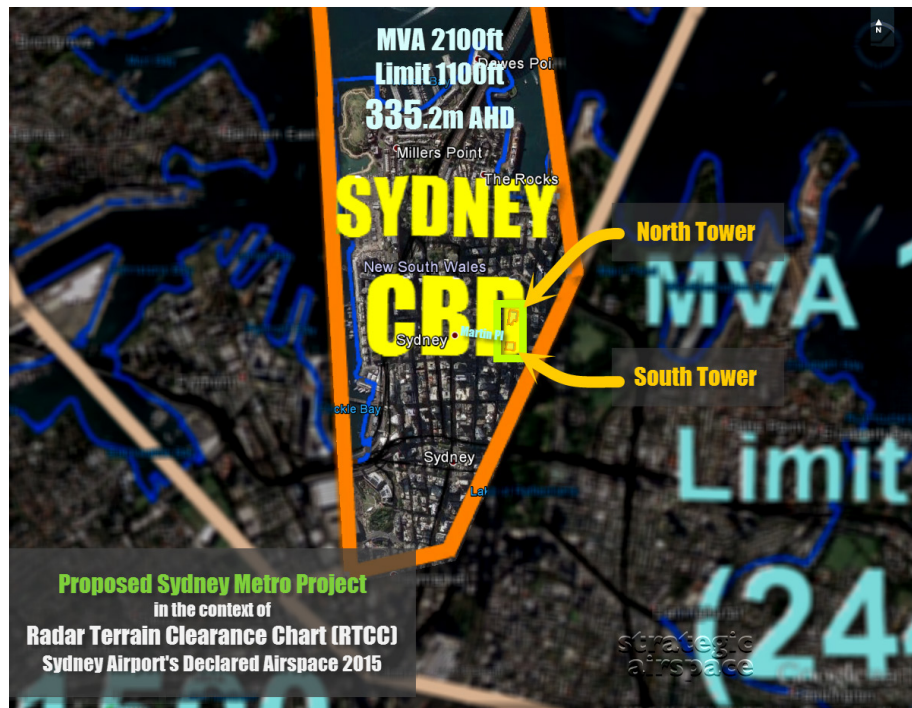
4.3.1 Airspace & Other Operational Considerations

The following table provides a brief assessment of other considerations.

Table 4-3: Other Assessable Height Limitations

Procedure	Height Limit (m AHD)	Description
Radar Terrain Clearance Chart (RTCC)	335.2	This is the limit related to the Minimum Vectoring Altitude (MVA), which is used by air traffic controllers. This information is sourced from the RTCC published as part of Sydney Airport's Prescribed Airspace Plans. See also Figure 4-3 below. Note that this is the same height limit as that of the MSA.
Navigation Infrastructure	N/A	The proposed development is too far from the airport to affect any navigation infrastructure.
Airlines Engine Out Procedures	N/A	Engine Out procedures (from RWY 34R, the most relevant take-off runway end) are designed and maintained by each of the passenger transport aircraft operators in accordance with the relevant regulations. All such procedures necessarily take into account Sydney Tower Eye, which is closer to the airport and taller than the proposed development. As such this proposal will not adversely affect any contingency procedures.

Figure 4-3: Height Limit related to RTCC/MVA for Air Traffic Control



Source: SACL Declared Airspace Chart 2015, Google Earth and StratAir

4.3.2 Other Considerations

Given the location of the development in the CBD, noise and reflectivity are not considered as issues that would preclude airspace approval. There are no other considerations that might limit the building height at the South Site.

4.3.3 Cranes to be used for Construction

As noted above, there is more than ample vertical clearance for cranes to be used for construction, as documented in Table 4-1 Airspace Height Constraints & Clearance (or Infringement) of Airspace Protection Surfaces (p17). The height limits applicable are so high that they would not impinge on maximum heights that would be realistically required for crane operations to support construction of the tower planned for the South Site.

In addition, it is noted that the existing airspace approval for the North Site⁶ extends up to a maximum height of 214.2m AHD, which is almost 62m higher than the maximum design height of the South Tower. This margin in itself provides sufficient vertical clearance for cranes operations overhead the designed top of the South Tower. The fact of that existing approval and the location of the South Site being shielded by existing nearby taller buildings (especially the Sydney Tower Eye), means that an airspace approval of cranes for development of the South Site can be assumed.

Thus, applications will need to be made for any cranes that would penetrate the OLS — but based on the location and the substantial height clearances, there is no technical impediment to the future approval of cranes under the Airports (Protection of Airspace) Regulations.

6 *ibid*

5. Conclusion

Under the Stage 2 SSD DA application for the South Site, the **maximum design height of the South Tower is 152.440m AHD**. As this is **below the OLS height** of 156m AHD, the Tower Building on the South Site has **no impact on the Prescribed Airspace of Sydney Airport**.

Thus, approval of this Stage 2 SSD DA application for the South Site can proceed without necessitating any aviation-related airspace application for the development of the South Site tower (with the exception of cranes which are subject to separate applications at the appropriate time in the future). Further, analysis conducted as part of this study also demonstrates that airspace approvals for future crane operations for the construction of the South Site tower building would also be granted as required.

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:

<i>Abbreviation</i>	<i>Meaning</i>
AC	Advisory Circular (document supporting CAR 1998)
ACFT	Aircraft
AD	Aerodrome
AGL	Above Ground Level (Height)
AHD	Australian Height Datum
AHT	Aircraft Height
AIP	Aeronautical Information Publication
Airports Act	Airports Act 1996, as amended
AIS	Aeronautical Information Services
ALARP	As Low As Reasonably Practicable
ALC	Airport Lease Company
Alt	Altitude
AMAC	Australian Mayoral Aviation Council
AMSL	Above Minimum Sea Level
ANEF	Australian Noise Exposure Forecast
ANSP	Airspace and Navigation Service Provider
APACL	Australia Pacific Airports Corporation Limited, owner of Melbourne and Launceston Airports
APCH	Approach
APARs, or A(PoFA)R	Airports (Protection of Airspace) Regulations, 1996 as amended
ARP	Aerodrome Reference Point
AsA	Airservices Australia
ASDA	Accelerated Stop Distance Available
ATC	Air Traffic Control(ler)
ATM	Air Traffic Management
BA (Planning)	Building Application or Building Approval (Planning)
BAC	Brisbane Airport Corporation
BCC	Brisbane City Council
CAO	Civil Aviation Order
CAR	Civil Aviation Regulation
CASA	Civil Aviation Safety Authority
CASR	Civil Aviation Safety Regulation
Cat	Category
CBD	Central Business District
CG	Climb Gradient
CNS/ATM	Communications, Navigation, Surveillance / Air Traffic Management
CPA	Cairns Port Authority, Operators of Cairns Airport
DA (Aviation)	Decision Altitude (Aviation)
DA (Planning)	Development Application or Development Approval (Planning)
DAH	Designated Airspace Handbook
DAP	Departure and Approach Procedures (published by AsA)
DEP	Departure
DER	Departure End (of the) Runway
DEVELMT	Development
DH	Decision Height
DIRD	Department of Infrastructure and Regional Development (sometimes also abbreviated as Infrastructure)
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoD	Department of Defence

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<i>Abbreviation</i>	<i>Meaning</i>
DODPROPS	Dependent Opposite Direction Parallel Runway OPERations
EIS	Environmental Impact Study
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	EnRoute Supplement Australia
ESE	East South East
FAF	Final Approach Fix
FAP	Final Approach Point
Ft	Feet
GBAS	Ground-Based Augmentation System, a GNSS augmentation system to provide vertical guidance and additional precision to non-precision approaches — permits GLS Approaches
GLS	GNSS Landing System – a precision landing system like ILS but based on augmented GNSS using ground and satellite systems.
GNSS	Global Navigation Satellite System
GP	Glide Path
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
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

Abbreviation	Meaning
NNW	North North West
NOTAM	NOTice to AirMen
NPR	New Parallel Runway (Project, Brisbane Airport)
OAR	Office of Airspace Regulation
OCA	Obstacle Clearance Altitude (in this case, in AMSL)
OCH	Obstacle Clearance Height
ODPROPS	Opposite Direction Parallel Runway OPERations
OHS	Outer Horizontal Surface, an Obstacle Limitation Surface
OLS	Obstacle Limitation Surface, defined by ICAO Annex 14; refer also CASA MOS Part 139
PANS-OPS	Procedures for Air Navigation – Operations, ICAO Doc 8168; refer also CASA MOS Part 173
PAPI	Precision Approach Path Indicator (a form of VGSI)
PBN	Performance Based Navigation
PRM	Precision Runway Monitor
RAAF	Royal Australian Air Force
RAPAC	Regional Airspace users Advisory Committee
REF	Reference
RL	Relative Level
RNAV	aRea NAVigation
RNP	Required Navigation Performance
RPA	Rules and Practices for Aerodromes — replaced by the MOS Part 139 — Aerodromes
RPT	Regular Public Transport
RTCC	Radar Terrain Clearance Chart (refer also MVA)
RWY	Runway
SACL	Sydney Airport Corporation Limited
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
SSR	Secondary Surveillance Radar
STAR	STandard Arrival
TAR	Terminal Approach Radar
TAS	True Airspeed
THR	THReshold (of Runway)
TMA	TerMinal Area
TNA	Turn Altitude
TODA	Take-off Distance Available
TORA	Take-Off Runway Available
VFR	Visual Flight Rules
VIS	Visual
VMC	Visual Meteorological Conditions
V _n	Aircraft critical velocity reference
VOR	Very high frequency Omni-directional Range
VSS	Visual Segment Surface
WAC	Westralia Airports Corporation, operators of Perth Airport
WAM	Wide-Area Multilateralisation
WNW	West North West
WSW	West South West
WGS84	World Geodetic System 1984
WSA	Western Sydney Airport –second international airport for the Sydney Basin