

APPENDIX C: WIND ASSESSMENT PREPARED BY CPP

18 December 2014

CPP Project 8241

SJB

Level 2, 490 Crown Street
Surry Hills
NSW 2010

Attn: Mr. Francisco Layson

Project: 296-298 Botany Road

Dear Francisco,

Please find herein an initial assessment of the wind conditions in and around the proposed mixed-use development at 296-298 Botany Road. The assessment is based on the drawings provided on 16 December 2014, Figure 1. It is understood that the plan-form shape of the residential towers may change, but the general massing and orientation are fixed. The site is located to the north-west of the Green Square development, Figure 2.

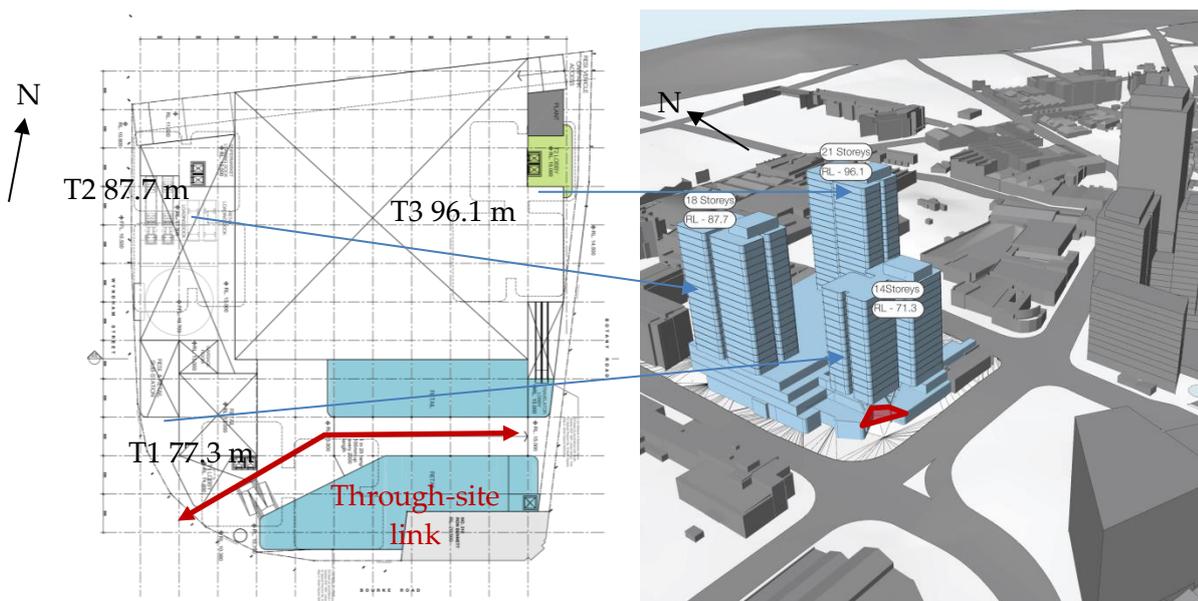


Figure 1: Ground floor plan (L), schematic looking north-west (R)

The site, blue shade buildings in Figure 1 (R), is generally surrounded by low to medium-rise buildings with the proposed Green Square development to the south-east. From a wind engineering perspective, topography surrounding the site is relatively flat dropping slightly to the south.

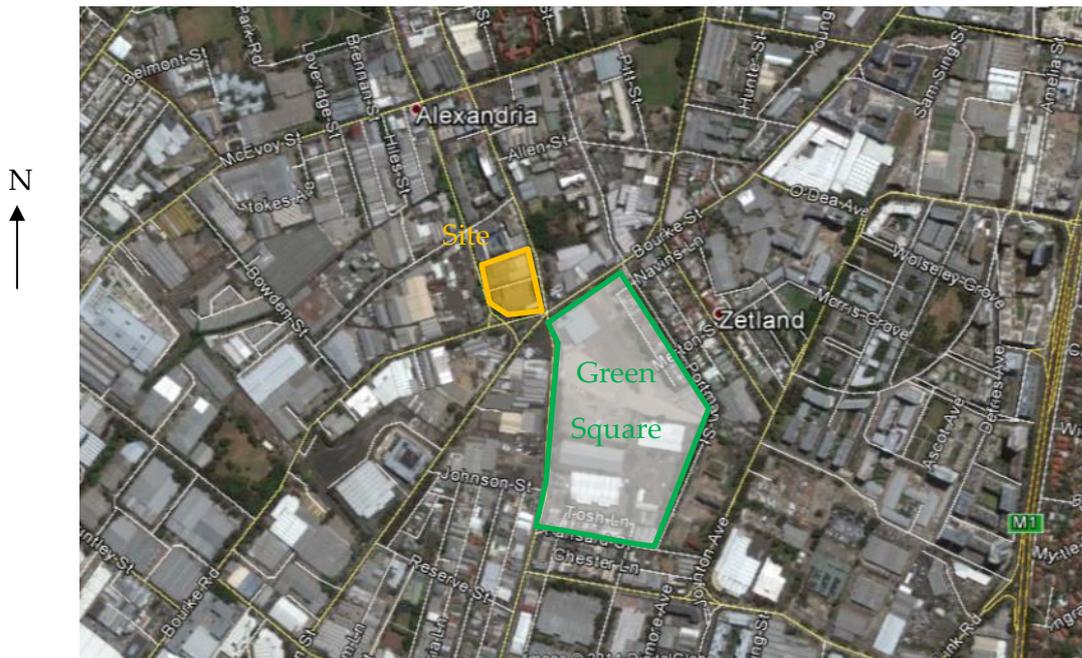


Figure 2: Aerial view

Wind Climate

The wind rose for Sydney airport is shown in Figure 3 and is considered to be representative of prevailing winds at the site. It is evident that the prevailing winds come from the north-east, south, and west. Winds from the north-east tend to be summer sea breezes and bring welcome relief on summer days. Winds from the south occur throughout the year and tend to be cold, generally associated with frontal systems that can last several days. Winds from the west are the strongest of the year and are associated with large weather patterns and thunderstorm activity. These winds occur throughout the year and can be cold or warm depending on the inland conditions. This wind assessment is focused on these prevailing wind directions.

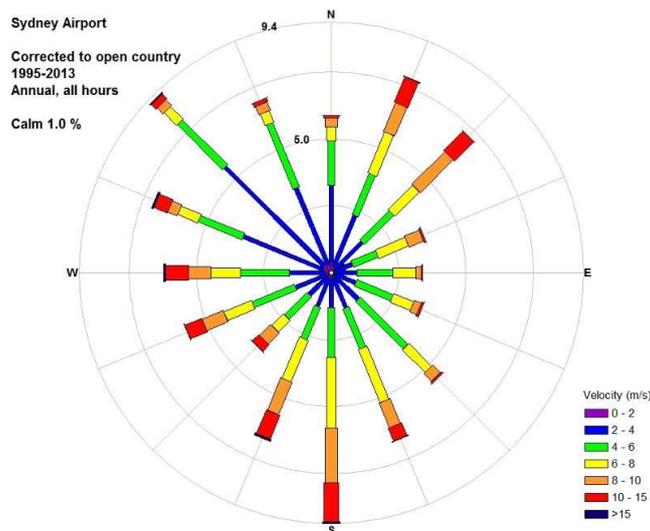


Figure 3: Wind rose for Sydney Airport

Wind Flow Mechanisms

When the wind hits an isolated building, the wind is accelerated down and around the windward corners, Figure 4; this flow mechanism is called downwash and causes the windiest conditions at ground level on the windward and sides of the building. In Figure 4 smoke is being released into the wind flow to allow the wind speed, turbulence, and direction to be visualised. The image on the left shows smoke being released across the windward face, and the image on the right shows smoke being released into the flow at about third height in the centre of the face.

Techniques to mitigate the effects of downwash winds on pedestrians include the provision of horizontal elements, the most effective being a podium to divert the flow away from pavements and building entrances. Awnings along street frontages perform a similar function and generally, the larger the horizontal element the more effective it will be in diverting the flow.

Channelling occurs when the wind is accelerated between two buildings or along straight streets with buildings on either side.

Figure 4 shows wind is accelerated substantially around the corners of the building. When balconies are located on these corners they are likely to be breezy, and will be used less by the owner due to the regularity of stronger winds. Owners quickly become familiar with when and how to use their balconies. If the corner balconies are deep enough, articulated, or have regular partition privacy fins then local calmer conditions can exist.

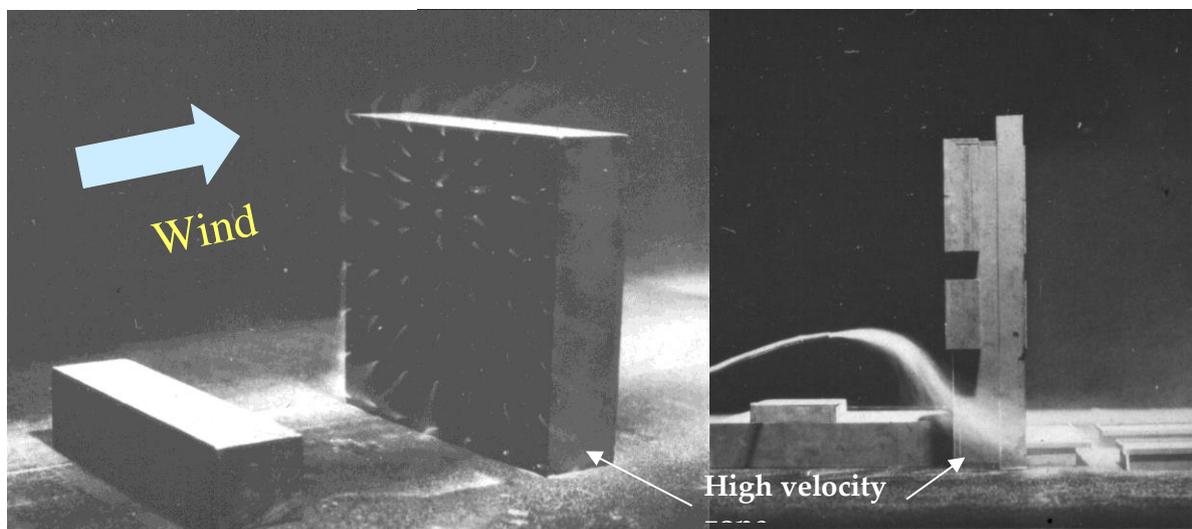


Figure 4: Flow visualisation around a tall building

Pedestrian Level Environmental Wind Conditions

In general terms this site is located in a relatively windy location and once the Green Square development is constructed the prevailing winds will be accelerated around the large development, impacting on the proposed development. The design of the towers with little podium setback will induce downwash impinging on ground level.

Wind conditions in the through-site link are expected to be relatively windy. It is

understood the laneway is only open at either end, being closed at roof level along its entire length. This is considered good from an internal flow wind perspective, as the internal flow is driven by the pressure differential between the two main entrances. With the south exit being located directly underneath the tallest tower, the pressure differential between the entrances is expected to be large for the majority of wind directions, hence drive the flow through the laneway. To mitigate this pressure driven flow, one of the entrances should be considerably smaller in open cross-sectional area than the passageway thereby focusing the windy area. If the passageway is expected to be used for outdoor café-style activities, it would be recommended that one of the entrances is effectively closed. Similarly the gap between the roof and the podium should be as small as possible to prevent wind and wind-driven rain ingress to the space. Pedestrians generally have a higher expectation of environmental conditions in semi-outdoor spaces, and with a roof over the main section of the laneway this would be almost perceived as indoor space therefore any adverse environmental conditions would be noticed.

Winds from the north-east will impact on the broad face of Tower 3. With the low height and position on the podium, the downwash flow will be discharged along the laneway to the north and across the podium. Wind conditions at ground level are expected to be satisfactory for accessways. Unless one of the two openings to the through-site is reduced in size the wind conditions in the through-site link are expected to be unsuitable for their intended retail purpose. As these prevailing winds occur on hot summer afternoons when people generally like to be outdoors, relatively calm and windy area have been marked on Figure 5 for the podium roof to assist with landscaping design.



Figure 5: Winds from the north-east

For winds from the south quadrant, wind conditions at ground level will be governed by the proposed large triangular building to the immediate south of the site. This would provide significant wind protection to the site. If this building is not constructed, windier conditions would be expected to be generated along Wyndham Street, due to the lack of podium setback at the base of the façade, Figure 6. The south-west corner of Tower 1 extending over the entrance to the through-site link is expected to generate windy conditions under this exposed corner. It would be recommended to include an awning at podium roof level to ameliorate the wind conditions at the entry as annotated in Figure 1.

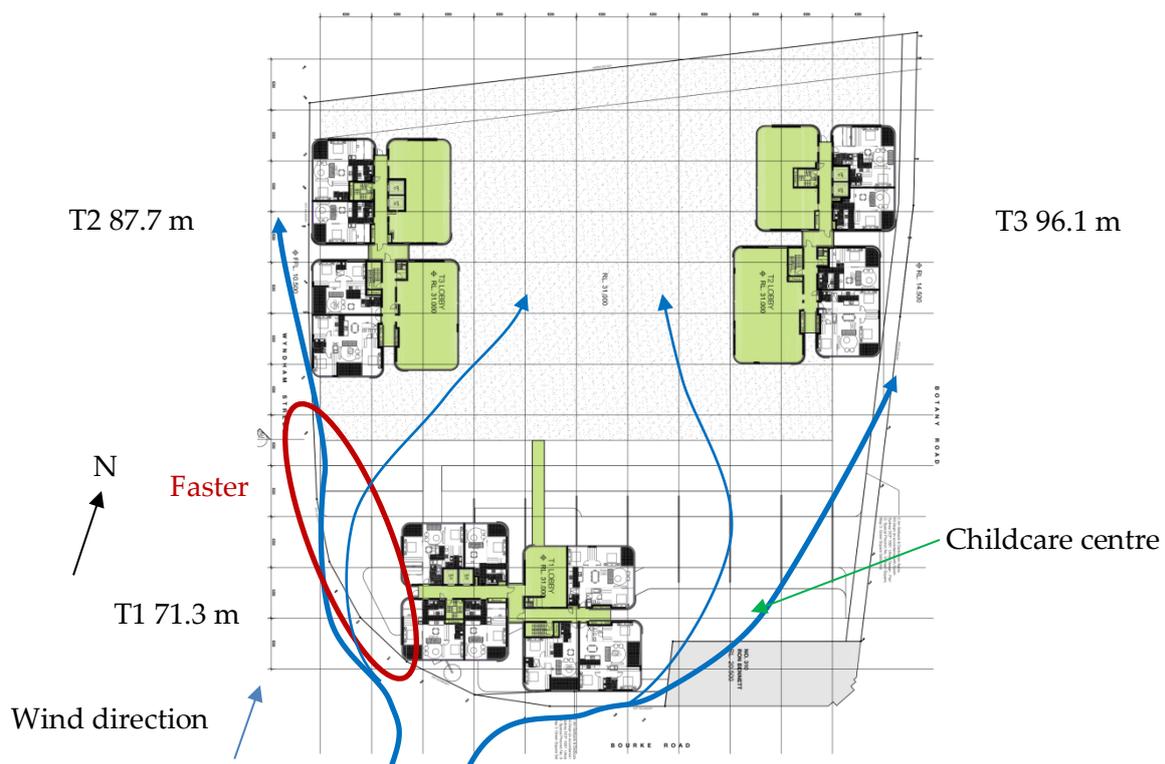


Figure 6: Winds from the south without proposed building to the immediate south

Winds from the west would be relatively undisturbed on reaching the site. Downwash would be expected from the broad face of Tower 2 and the narrow face of Tower 1. The spacing between the towers would be expected to divert the majority of the flow across the podium protecting the ground level from impinging downwash. However, this flow has the potential to cause uncomfortable wind issues along the open laneway for the intended use of the space.

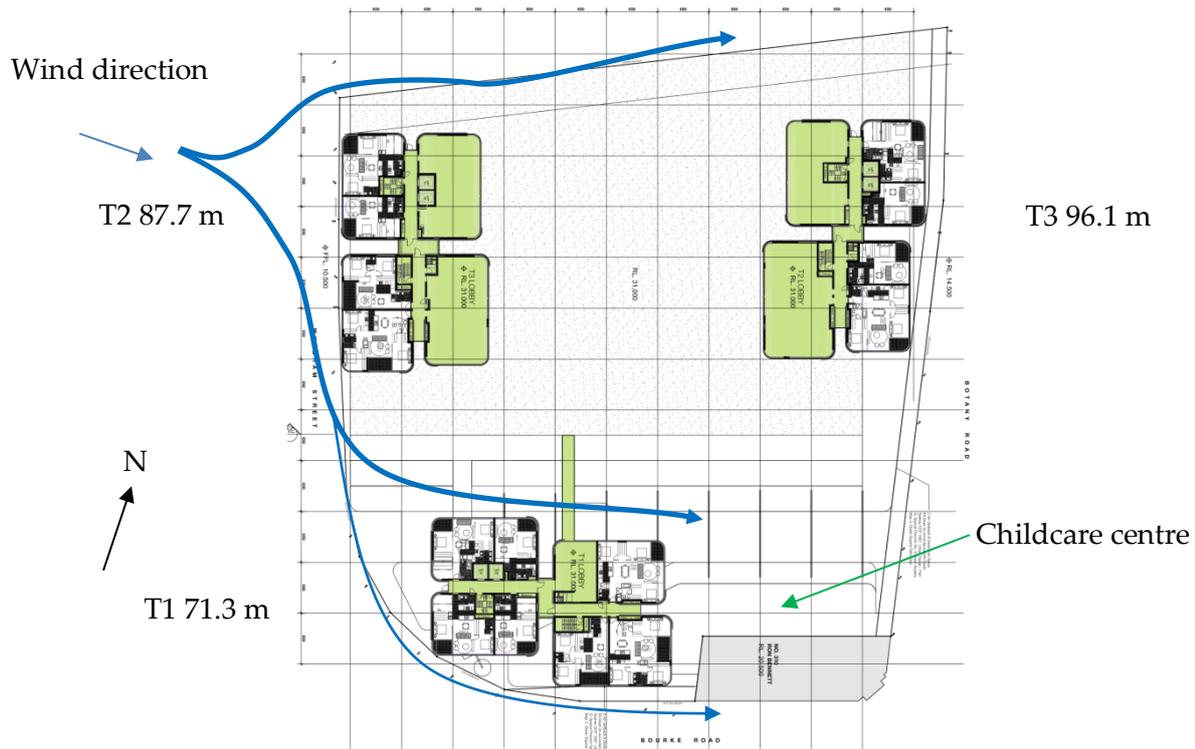


Figure 7: Winds from the west

In summary, the impact of the proposed development on the surrounding wind conditions is highly dependent on the completion of other proposed neighbouring buildings, particularly the triangular building to the immediate south. If this building is not constructed, then it would be recommended to include an awning at podium level across the laneway entry.

For a development of this size, it is strongly recommended to quantify the wind conditions and loading on the structure through a detailed wind tunnel testing programme.

I hope this is of assistance, please do not hesitate to contact me if you have any questions regarding any aspect of this report.

Yours sincerely,

Graeme Wood
Director

01 April 2015

CPP Project 8241

SJB

Level 2, 490 Crown Street
Surry Hills
NSW 2010

Attn: Mr. Francisco Layson

Project: 296-298 Botany Road

Dear Mr. Layson,

Please find herein a brief review of impact of the proposed massing changes on the pedestrian level wind environment around the proposed development at 296-298 Botany Road. The change in geometry is to address Council concerns regarding the wind along Wyndham Street for winds from the south quadrant. This report follows on from a review of the proposed drawings with respect to the previous configuration, Figure 1.

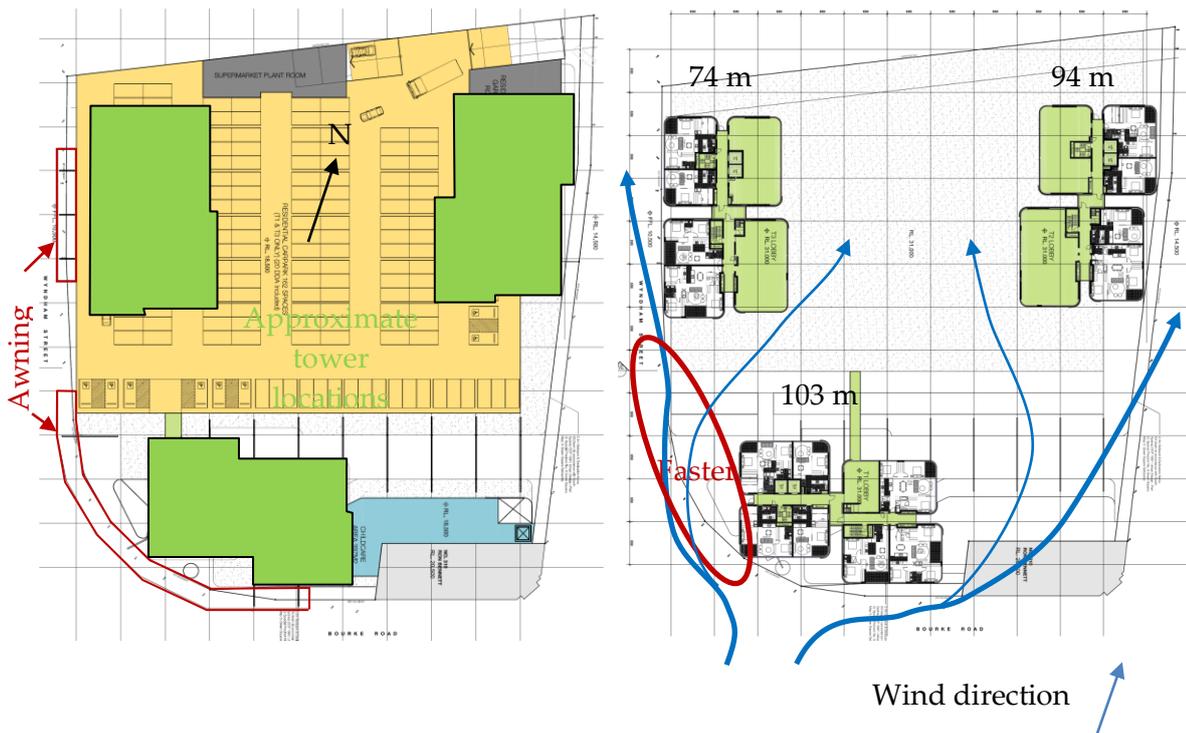


Figure 1: Plan view of the proposed development: revised (L), and previous showing wind flow patterns for winds from the south (R)

The overall flow pattern around the revised geometry will be similar to the previous development. From a wind perspective, the largest changes are the relocation of the north-west tower to the east to create a 4 m podium along Wyndham Street, and the rounding of the tower corners for the Masterplan scheme. The relocation of the tower will have a beneficial impact to the wind environment along Wyndham Street and the greater the distance the better the wind conditions. The squaring of the tower corners will induce more

downwash for winds from the south, slightly worsening the wind conditions along Wyndham Street; this is particularly the case for Tower 1. To mitigate this impact awnings have been included around the corner and along Wyndham Street at critical locations to protect pedestrians from both wind and wind-driven rain.

To quantify the wind conditions discussed in this and previous report, physical modelling would be required.

I hope this is of assistance, please do not hesitate to contact me if you have any questions regarding any aspect of this report.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'G. Wood'.

Graeme Wood
Director

22 June 2016

CPP Project 8241

Gazcorp Pty. Ltd.

Level 10, 60 Park Street
Sydney
NSW 2000

Attn: Mr. Nicholas Gazal

Project: 296-298 Botany Road

Dear Mr. Gazal,

Please find herein a brief review of impact of the proposed massing changes on the pedestrian level wind environment around the proposed development at 296-298 Botany Road. The change in geometry is to address Council concerns regarding the wind conditions in and around the site is similar to the previous reporting. This report follows on from a review of the proposed drawings with respect to the previous configuration, Figure 1.



Figure 1: Plan view of the proposed development: revised (L), and previous scheme of April 2015 showing wind flow patterns for winds from the south (R)

The overall flow pattern around the revised geometry will be similar to the previous scheme. From a wind perspective, the largest changes are the change in shape of and position of the south tower relative to the edge of the podium. The increased setback of the south tower from the podium edge is a benefit from a wind perspective and removes the recommendation to include an awning wrapping around the corner of Wyndham and Bourke Streets. The setback of the north-west tower from Wyndham Street remains the

same, and therefore it would be recommended to include an awning as noted in Figure 1(L) to offer protection to pedestrians from downwash flow from the north-west tower for winds from the south quadrant wind, and wind-driven rain.

With the proposed setbacks, the increase in width of the south tower is not expected to have a significant impact on the pedestrian level wind conditions at ground level, but would improve the wind conditions on the podium roof. The information in the previous wind reports remains valid with the minor updates with the revised geometry discussed herein.

To quantify the wind conditions discussed in this and previous report, physical modelling would be required.

I hope this is of assistance, please do not hesitate to contact me if you have any questions regarding any aspect of this report.

Yours sincerely,



Graeme Wood
Director

**APPENDIX D: ROAD TRAFFIC NOISE ASSESSMENT PREPARED BY RENZO
TONIN**

296-298 BOTANY RD & 284 WYNDHAM ST

Road Traffic Noise Assessment

1 December 2015

City of Sydney Council

TH772-01F02 (r2) 296-298 Botany Rd

Document details

Detail	Reference
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Prepared for:	City of Sydney Council
Address:	456 Kent St Sydney, NSW, 2000
Attention:	Tim Aldham

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
19.11.2015	Draft	0		AB	GW	
25.11.2015	Issued draft		1	AB	GW	GW
01.12.2015	Issued		2	AB	GW	GW

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

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In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

Contents

1	Introduction	1
2	Project description	2
2.1	Site location	2
2.2	Development proposal	3
3	Road traffic noise criteria	4
3.1	State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)	4
3.2	Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline'	4
3.3	Clarification of ISEPP noise limits	5
4	Road traffic noise assessment	6
4.1	Road design and traffic flow	6
4.2	Prediction methodology	7
4.3	Road traffic noise results	8
5	Conclusion	9
APPENDIX A	Glossary of terminology	10
APPENDIX B	RMS Strategic Model Traffic Data	12
APPENDIX C	Road traffic noise impact results	13

List of tables

Table 1:	ISEPP noise criteria for new residential development	5
Table 2:	2036 future road traffic volumes	6
Table 3:	Summary of modelling inputs	8

List of figures

Figure 1:	Aerial photograph of subject site	2
Figure 2:	Modelled roads	7

1 Introduction

Renzo Tonin & Associates was engaged to conduct a road traffic noise impact assessment for a proposed residential development site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria. The assessment is required to determine the impact of future road traffic noise (year 2036) on two built form scenarios under consideration by the City of Sydney Council.

The assessment will be used to establish which areas of the future buildings, if any, are unable to comply with the ADG requirement for all habitable rooms to be naturally ventilated, while also satisfying the provisions of the SEPP (Infrastructure) 2007.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project description

2.1 Site location

The subject site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria, contains three road frontages, with Wyndham St to the west, Bourke St to the south and Botany Rd to the east. These roads currently carry high vehicle volumes and as redevelopment in Alexandria and Green Square continues, it is anticipated that these vehicle volumes and the resultant noise impact on the site will increase significantly.

Figure 1 presents an aerial photograph of the subject site and surrounding area.

Figure 1: Aerial photograph of subject site



2.2 Development proposal

The City of Sydney Council is currently considering two built form scenarios at the site. Both of the scenarios contain various multi story commercial tenancies and residential apartment buildings. The scenarios under consideration have been developed by:

- Option 1 - City of Sydney Council, and
- Option 2 - SJB.

3 Road traffic noise criteria

3.1 State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)

The NSW State Environmental Planning Policy (Infrastructure) 2007 (known as 'ISEPP') came into force in NSW on 1 January 2008 to facilitate the effective delivery of infrastructure across the State. The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and services development fall and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Pertinent to noise assessment, the ISEPP includes the following clauses:

102 Impact of road noise or vibration on non-road development

1. *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
 - a. *a building for residential use,*
 - b. *a place of public worship,*
 - c. *a hospital,*
 - d. *an educational establishment or child care centre.*
2. *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
3. *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
 - a. *in any bedroom in the building - 35 dB(A) at any time between 10 pm and 7am,*
 - b. *anywhere else in the building (other than a garage, kitchen, bathroom or hallway) - 40 dB(A) at any time.*
4. *In this clause, "freeway", "tollway" and "transitway" have the same meanings as they have in the Roads Act 1993*

3.2 Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline'

To support the Infrastructure SEPP, the NSW Department of Planning released the *Development in Rail Corridors and Busy Roads – Interim Guideline* (December 2008). The Guideline assists in the planning,

design and assessment of developments in, or adjacent to, major transport corridors in terms of noise, vibration and air quality.

3.3 Clarification of ISEPP noise limits

The Guideline clarifies the time period of measurement and assessment. Section 3.4 *'What Noise and Vibration Concepts are Relevant'* and Table 3.1 of Section 3.6.1 confirms that noise assessment is based over the following time periods:

- Daytime 7:00am - 10:00pm $L_{Aeq(15hr)}$
- Night-time 10:00pm - 7:00am $L_{Aeq(9hr)}$

The noise criteria nominated in the ISEPP apply to internal noise levels with windows and doors closed. However as the preliminary noise assessment is based on predictions at external locations, equivalent external noise criteria has been established. The equivalent external noise criterion is used to determine which areas of the development may require acoustic treatment in order to meet the internal noise requirements of the ISEPP. The equivalent external goals have been determined on the following basis:

- *The ISEPP states: "If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia." The internal criteria with windows open is therefore 10dB(A) above the criteria explicitly outlined in the ISEPP.*
- The generally accepted noise reduction through an open window from a free-field external position is 10dB(A). Windows/doors are assumed to be open no more than 5% of room floor area, in accordance with the Building Code of Australia (BCA) ventilation requirements.

Table 1 presents the ISEPP internal noise criteria along with the equivalent external noise criteria for residential premises.

Table 1: ISEPP noise criteria for new residential development

Room	Location	$L_{Aeq, 15hr}$ Day 7am – 10pm	$L_{Aeq, 9hr}$ Night 10pm – 7am
Living rooms*	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)^	60	60
Bedrooms*	Internal, windows closed	40	35
	Internal, windows open	50	45
	External free-field (allowing windows to remain open)^	60	55

Notes: * Requisite for 40,000AADT Roads only under ISEPP 2007.

^ ISEPP Guideline states that where internal noise criteria are exceeded by more than 10dB(A) with windows open mechanical ventilation is required. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the BCA 2011 requirements.

4 Road traffic noise assessment

4.1 Road design and traffic flow

Roads and Maritime Services (RMS) Strategic Model traffic data (2 hour peak hour traffic volumes) for the year 2036 have been obtained and have been utilised for the assessment. The Strategic Model traffic data is presented in Appendix B. The following calculations and assumptions were used for the road traffic noise modelling:

- The AADT is 6.5 times the average of the 2 hour peaks,
- The 15hr daytime volume is 85% of the 24hr volume,
- The 9hr night time volume is 15% of the 24hr volume, and
- The heavy vehicle percentage has been based on existing traffic counts.

The traffic volumes used for the assessment are presented in Table 2.

Table 2: 2036 future road traffic volumes

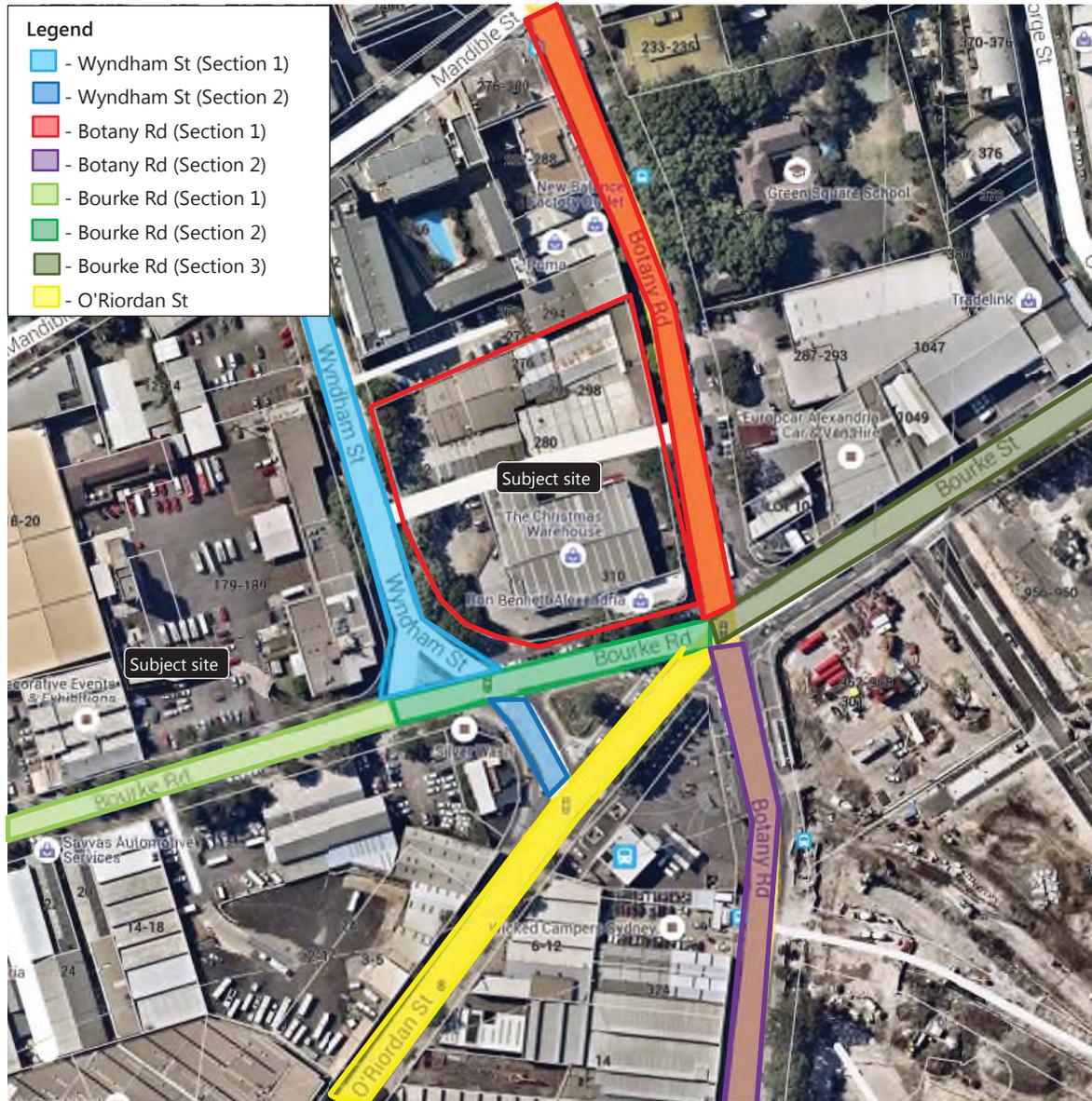
Road	Approach	2hr Predicted Traffic Volume		Calculated Traffic Volumes			% Heavy Vehicles
		AM Peak	PM Peak	AADT	15hr Day	9hr Night	
Wyndham St (Section 1)	North bound	1818	1742	11570	9835	1736	11
	South bound	1076	1161	7270	6180	1091	11
Wyndham St (Section 2)	North bound	837	951	5811	4939	872	11
	South bound	927	804	5626	4782	844	11
Botany Rd (Section 1)	North bound	1723	1446	10299	8754	1545	11
	South bound	1548	1479	9838	8362	1476	11
Botany Rd (Section 2)	North bound	2289	2046	14089	11975	2113	11
	South bound	2080	1856	12792	10873	1919	11
Bourke Rd (Section 1)	North bound	1186	1058	7293	6199	1094	8
	South bound	861	964	5931	5042	890	8
Bourke Rd (Section 2)	North bound	1294	1399	8752	7439	1313	8
	South bound	1801	1479	10660	9061	1599	8
Bourke Rd (Section 3)	North bound	3441	3273	21821	18547	3273	8
	South bound	3381	3240	21518	18291	3228	8
O'Riordan St	North bound	2643	2234	15850	13473	2378	10
	South bound	2200	2027	13738	11677	2061	7

Note is made that the modelled roads all contain an AADT lower than 40,000 vehicles. While the ISEPP applies only to roads with an AADT greater than 40,000 vehicles, the guideline is also recommended for other road traffic noise affected sites.

Although there are both 'day' and 'night' traffic noise goals to be satisfied, based on the difference in traffic volumes between day and night, daytime was established as the worst case period for road traffic noise impacts.

The roads modelled in the assessment are indicated in Figure 2.

Figure 2: Modelled roads



4.2 Prediction methodology

Noise predictions are based on CoRTN, having been adapted to Australian conditions and extensively tested by the Australian Road Research Board. As a result it is recognised and accepted by the NSW Environmental Protection Authority (EPA). The model predicts noise levels for steady flowing traffic and noise from high truck exhausts is taken into account. The CoRTN algorithms are contained within the 'CadnaA' noise modelling software which has been used to calculate road traffic noise levels.

The noise prediction software takes into account the following:

Table 3: Summary of modelling inputs

Input Parameters	Input used
Traffic volumes and mix	As described in Section 4.1
Vehicle speed	50km/h
Gradient of roadways	Topographic data provided by RMS
Source height	0.5m for car exhaust, 1.5m for car and truck engines and 3.6m for truck exhaust.
Ground topography at receiver and road	2m Ground Contours obtained from the NSW Land & Property Information (LPI)
Angles of view from receiver	Calculated within CoRTN
Reflections from existing barriers, structures and cuttings on opposite side of road	Calculated within CoRTN
Air and ground absorption - Values vary between 0 (hard surface) to 1 (100% absorptive)	0 has been used in this study It is noted that where screening is calculated CoRTN uses hard surface correction.
Receiver Heights	1.5m above floor level of the identified floor
Free Field Noise Levels	Free Field noise levels were used in this assessment as it is directly relevant to assessment against ISEPP criteria
Australian conditions correction	-1.7dB(A)
Acoustic properties of road surfaces	Assumed dense graded asphalt (DGA) (+0dB)
Roadside mounds / barriers	None were considered in this assessment

4.3 Road traffic noise results

The results of the road traffic noise impact assessment are presented graphically in Appendix C.

5 Conclusion

Renzo Tonin & Associates as completed a road traffic noise assessment for a proposed residential development site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria.

The assessment was required to determine the impact of future road traffic noise (year 2036) on two built form scenarios under consideration by the City of Sydney Council, and to establish which areas of the future buildings, if any, are unable to comply with the ADG requirement for all habitable rooms to be naturally ventilated, while also satisfying the provisions of the Infrastructure SEPP 2007 for maximum repeatable noise levels.

The results of the road traffic noise impact assessment are presented graphically in Appendix C.

APPENDIX A Glossary of terminology

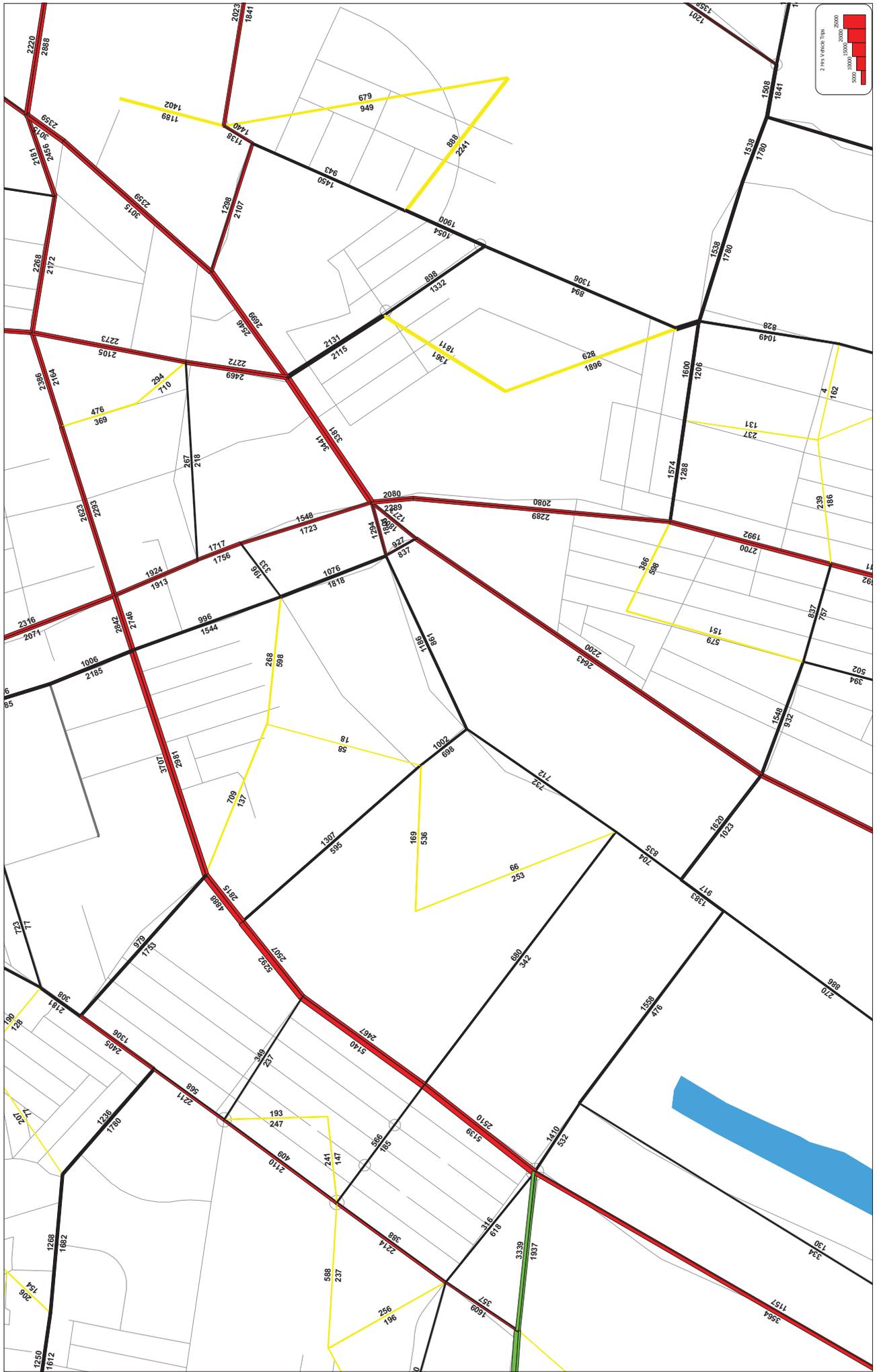
The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B RMS Strategic Model Traffic Data

TRAFFIC VOLUMES_

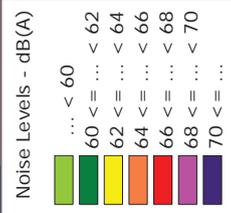
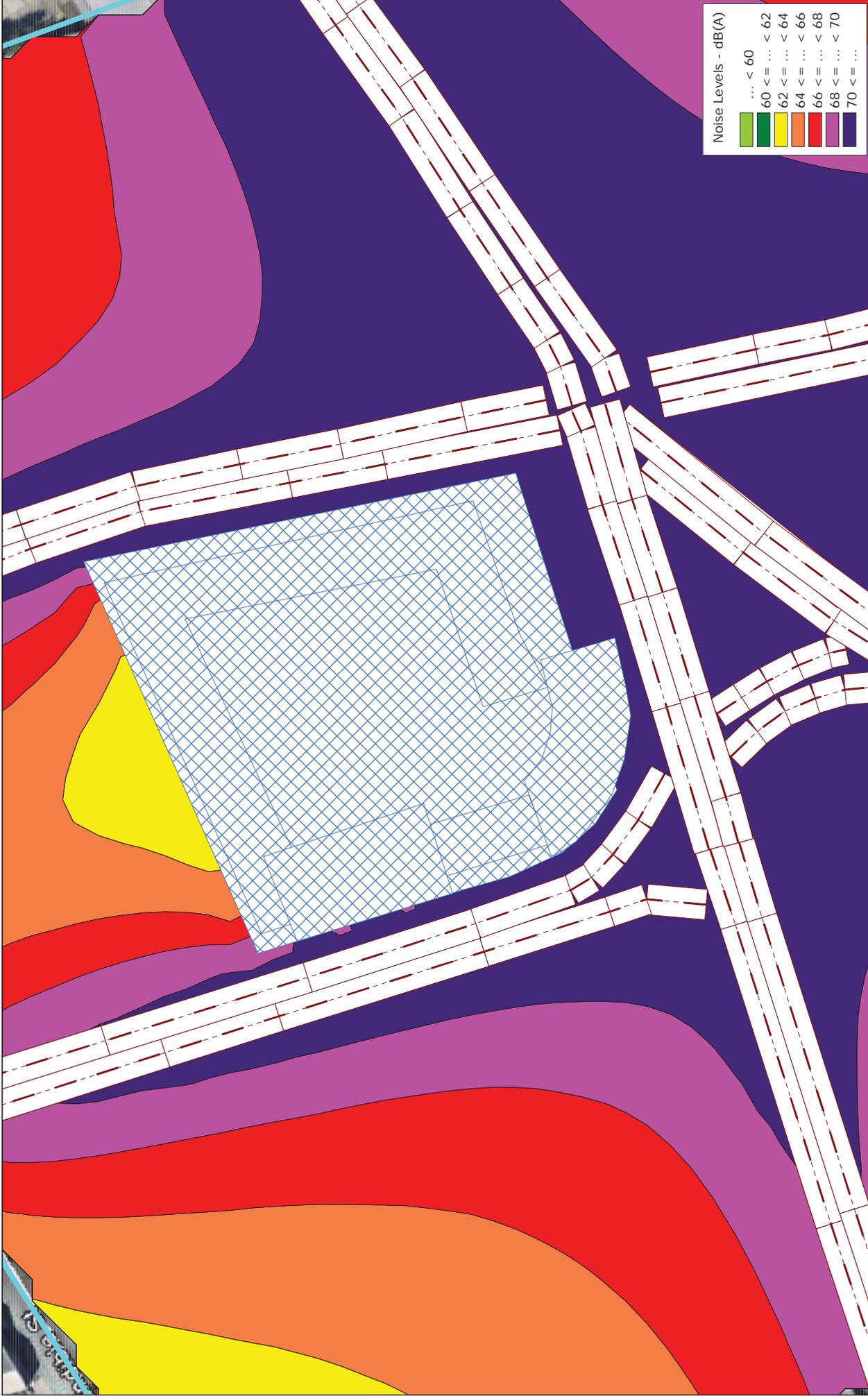


TRAFFIC VOLUMES_



APPENDIX C Road traffic noise impact results

Façade noise levels indicated in vertical contours are approximate only. Reference should be made to horizontal contours for precise noise levels.



Legend:

- Road
- Building
- Contour Line
- Receiver
- Calculation Area

North Arrow

Scale: 1: 1200 A3

Description:
 LAeq (15hr) Daytime at 13m (AGL) height
 Design Year - 2036
 Option 1

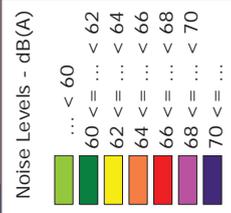
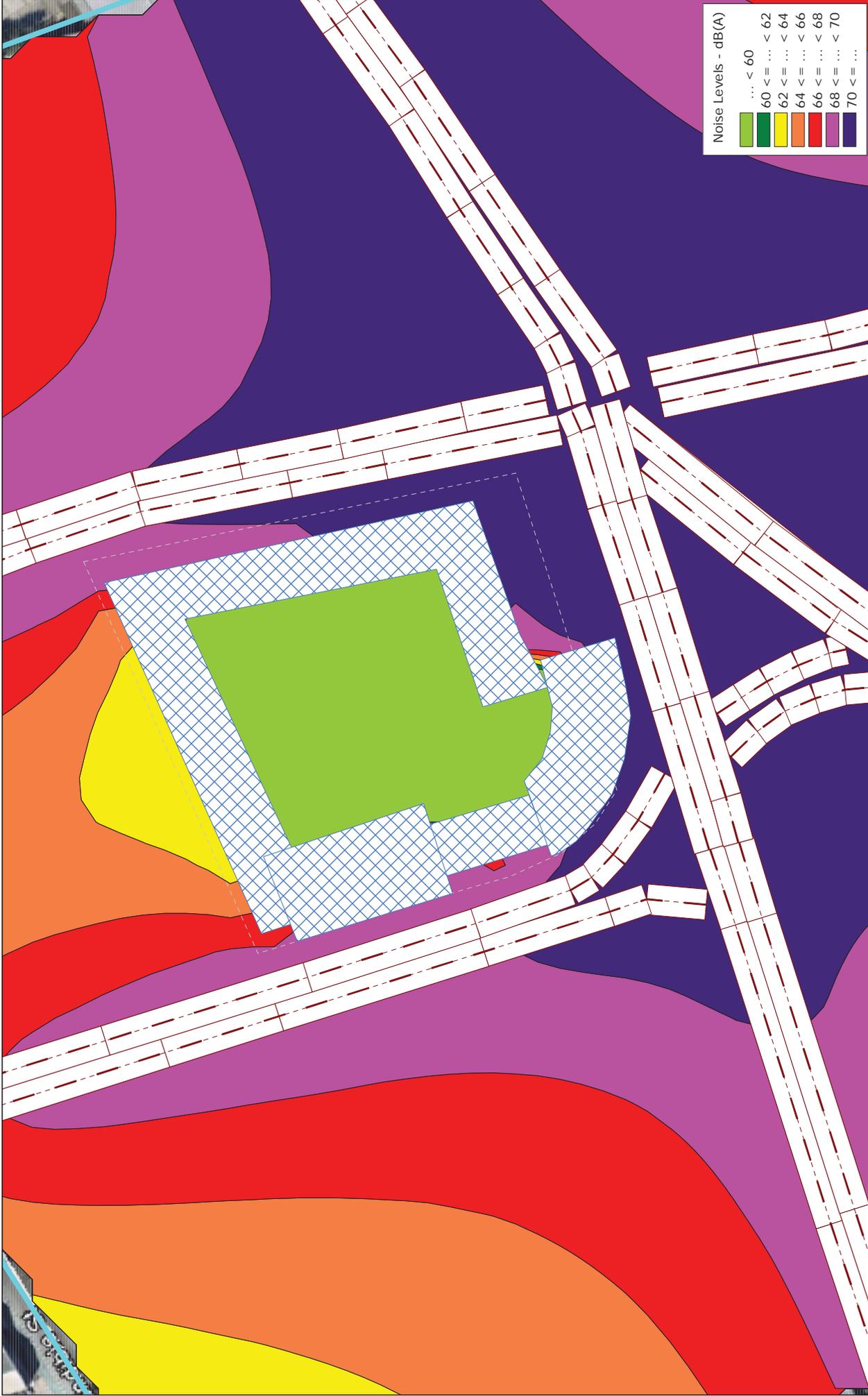
Date: 25/11/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

**RENZO TONIN
 & ASSOCIATES**
inspired to achieve

Reference: TH772-01 (rev 0) Option 1 - COS



Legend:

- Road
- Building
- Contour Line
- Receiver
- Calculation Area

North Arrow

Scale: 1: 1200 A3

Description:
 LAeq (15hr) Daytime at 20m (AGL) height
 Design Year - 2036
 Option 1

Date: 25/11/2015

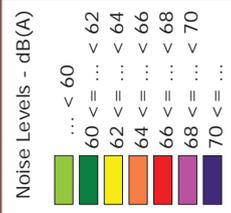
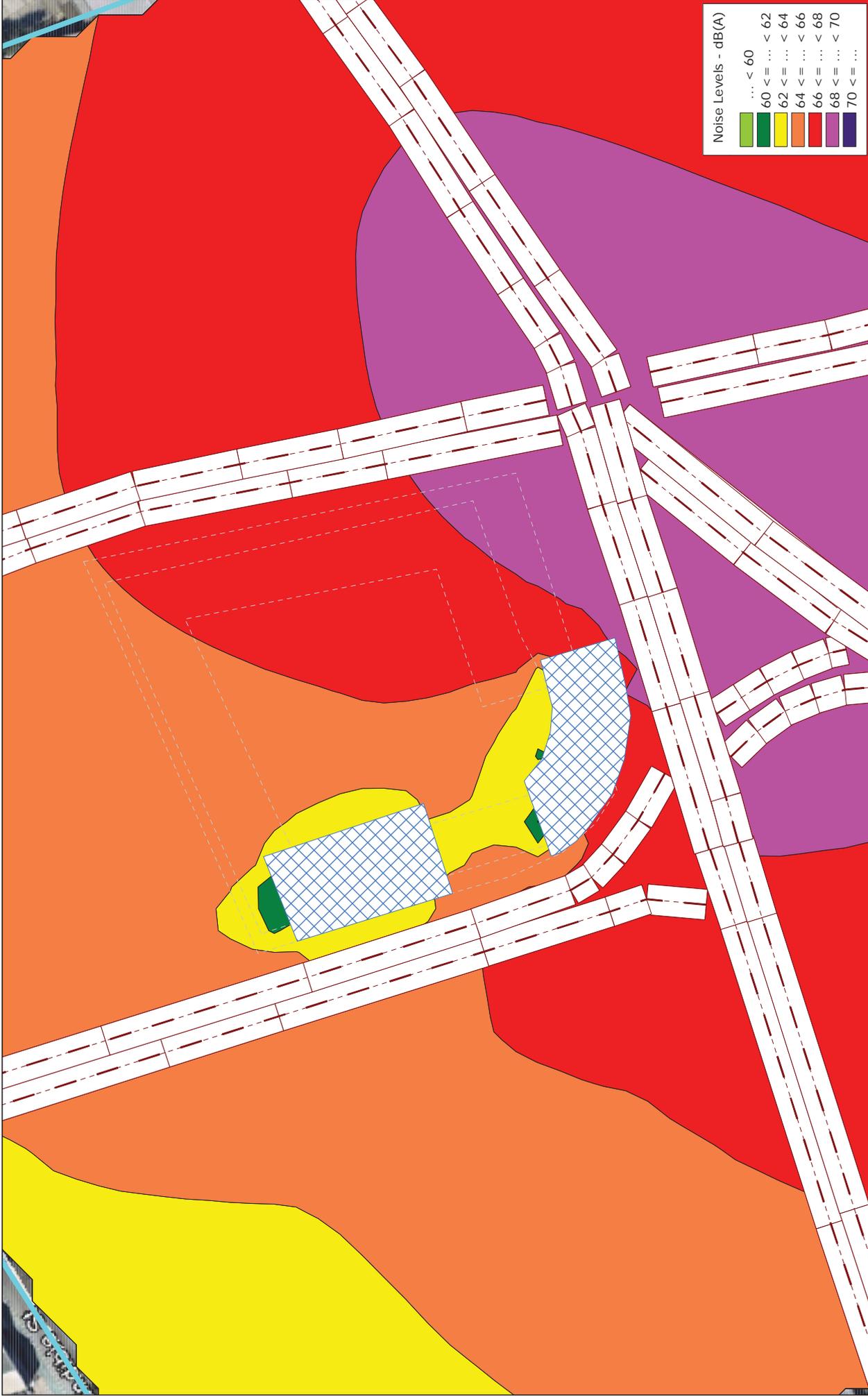
Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council



**RENZO TONIN
 & ASSOCIATES**
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Reference: TH772-01 (rev 0) Option 1 - COS



Legend:

- Road
- Building
- Contour Line
- Receiver
- Calculation Area

North Arrow

Scale: 1: 1200 A3

Description:
 LAeq (15hr) Daytime at 70m (AGL) height
 Design Year - 2036
 Option 1

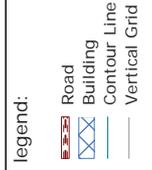
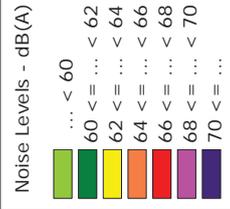
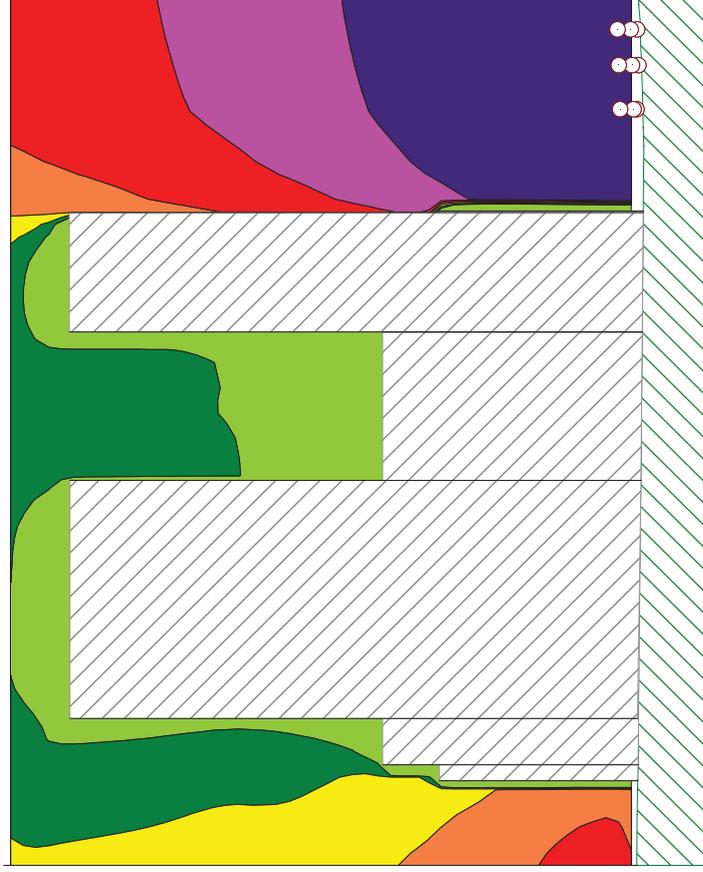
Date: 25/11/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

**RENZO TONIN
 & ASSOCIATES**
inspired to achieve

Reference: TH772-01 (rev 0) Option 1 - COS



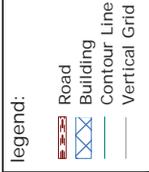
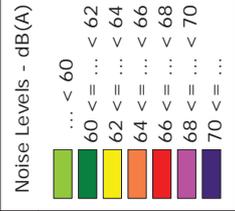
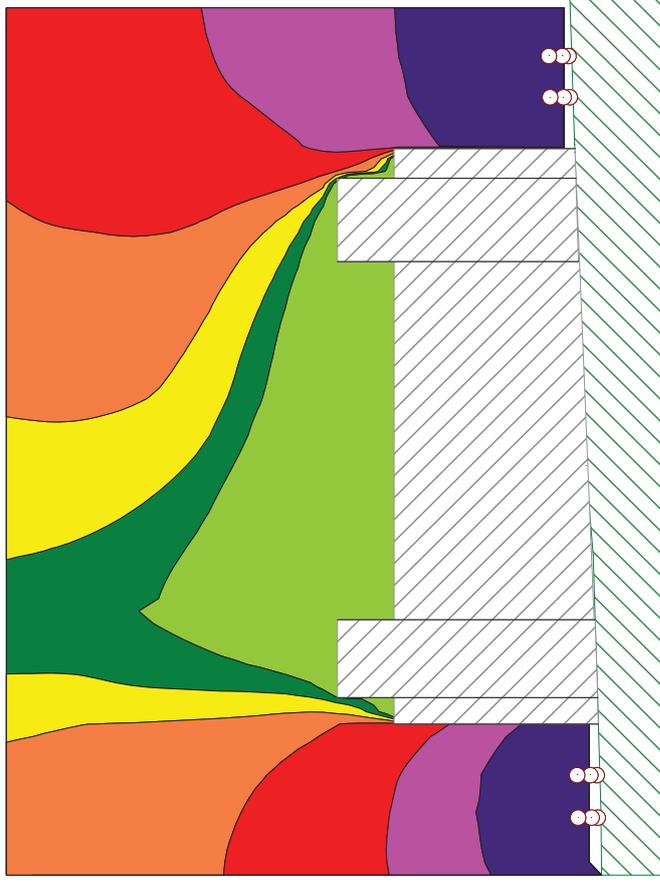
Description:
 LAeq (15hr) Daytime
 Design Year - 2036
 Option 1 - Easten side looking west

Date: 01/12/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 1 - COS



Scale: 1: 1200 A3

Description:
 LAeq (15hr) Daytime
 Design Year - 2036
 Option 1 - Southern side looking north

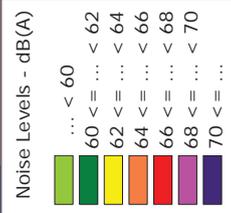
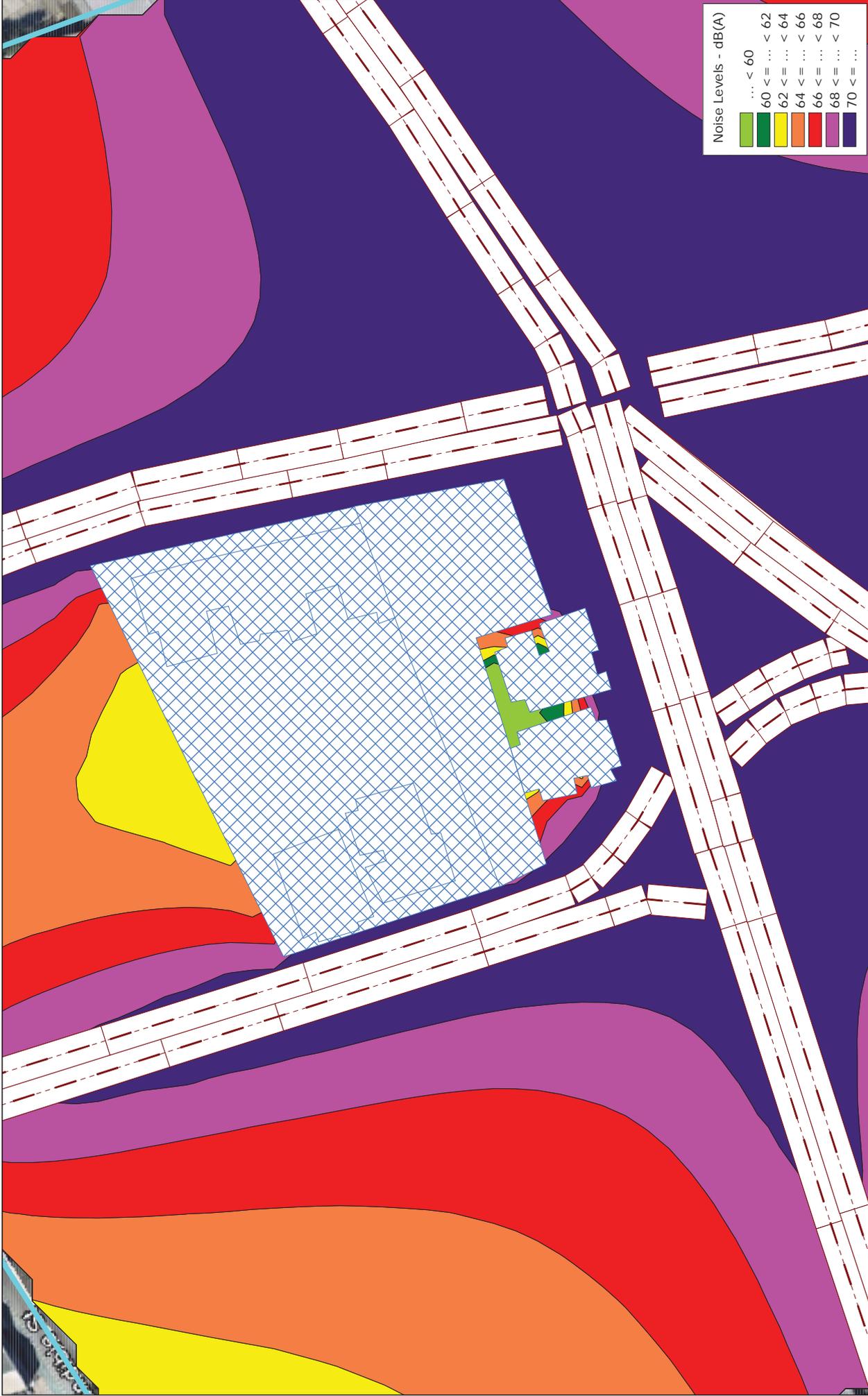
Date: 01/12/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 1 - COS





Legend:

- Road
- Building
- Contour Line
- Calculation Area

North Arrow

Scale: 1: 1200 A3

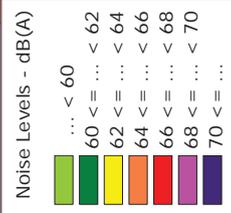
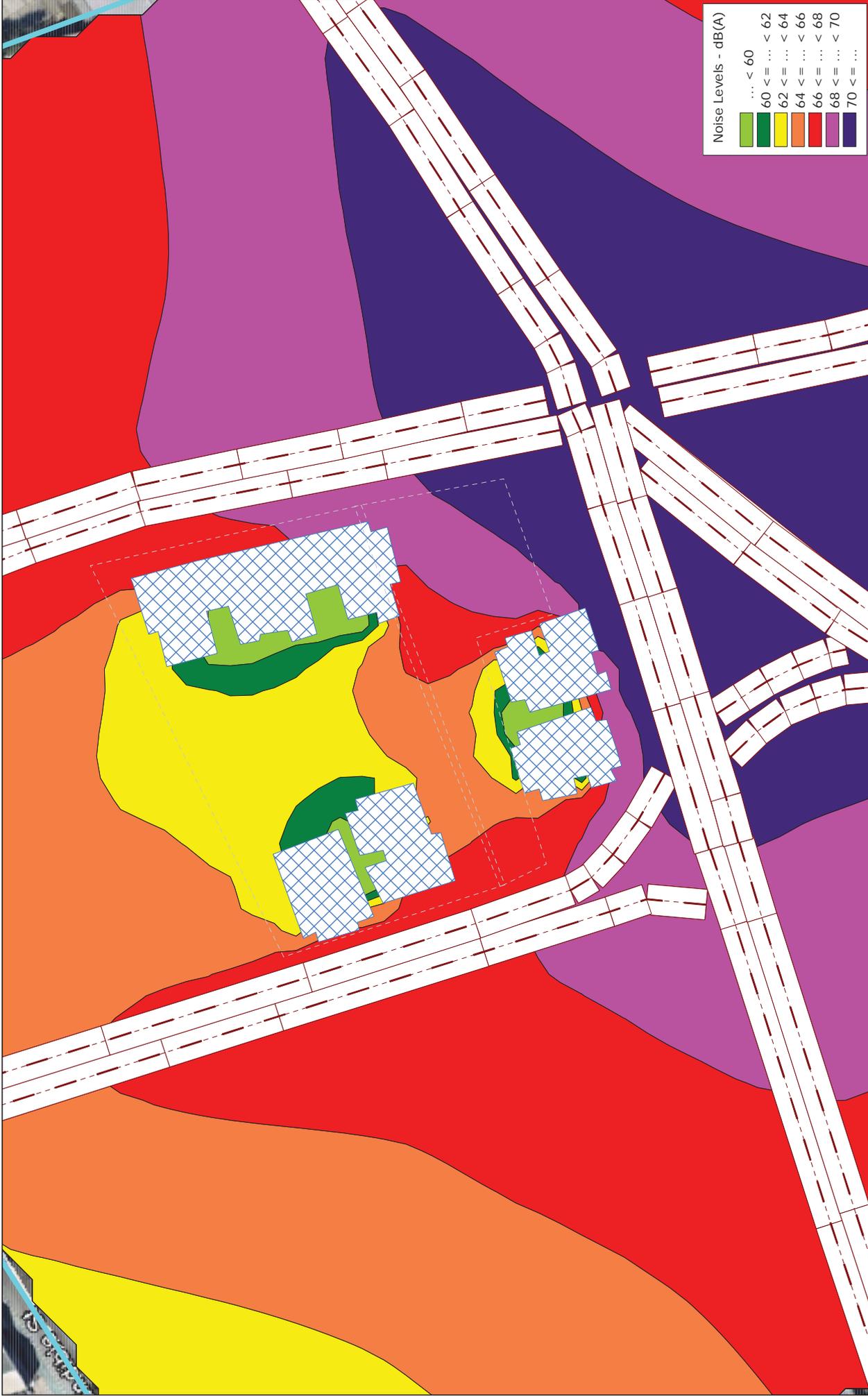
Description:
 LAeq (15hr) Daytime at 13m (AGL) height
 Design Year - 2036
 Option 2

Date: 25/11/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 2 - SJB



Legend:

- Road
- Building
- Contour Line
- Calculation Area

North Arrow

Scale: 1: 1200 A3

Description:
 LAeq (15hr) Daytime at 40m (AGL) height
 Design Year - 2036
 Option 2

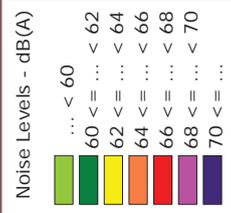
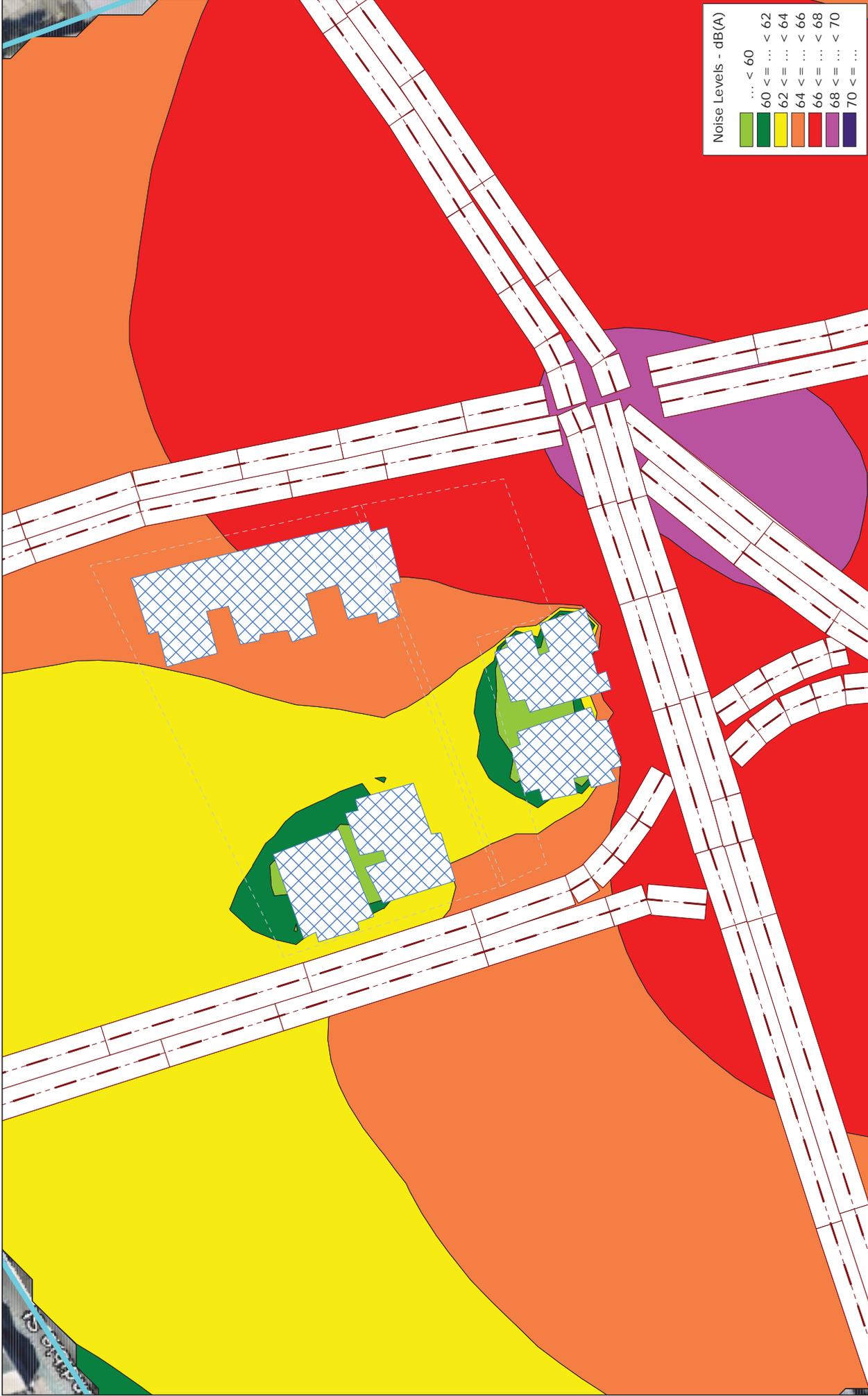
Date: 25/11/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

**RENZO TONIN
 & ASSOCIATES**
inspired to achieve

Reference: TH772-01 (rev 0) Option 2 - SJB



Legend:

- Road
- Building
- Contour Line
- Calculation Area

North Arrow

Scale: 1: 1200 A3

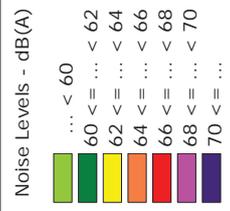
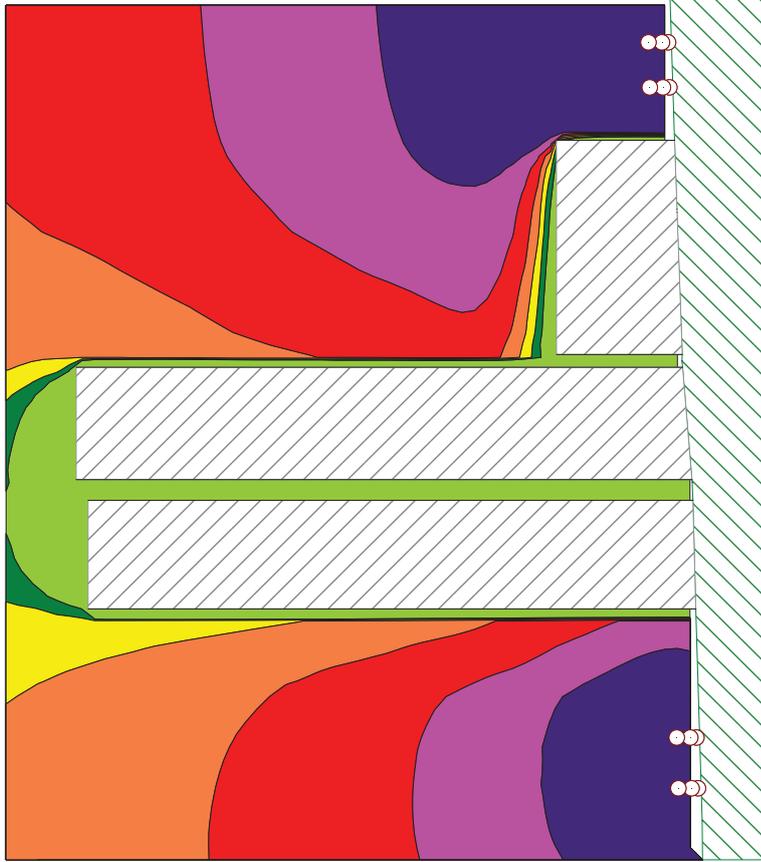
Description:
 LAeq (15hr) Daytime at 83m (AGL) height
 Design Year - 2036
 Option 2

Date: 25/11/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 2 - SJB



Legend:



North Arrow

Scale: 1: 1200 A3

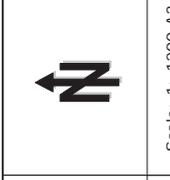
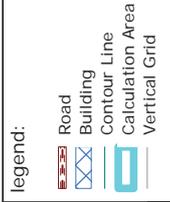
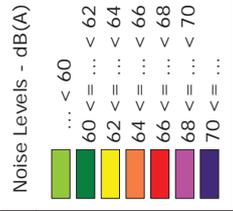
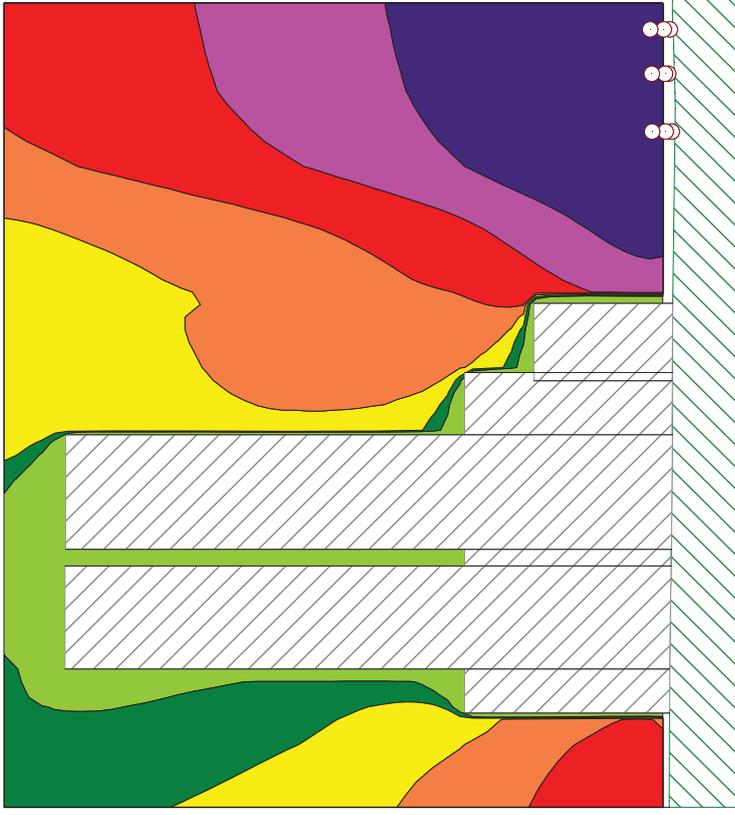
Description:
 LAeq (15hr) Daytime
 Design Year - 2036
 Option 2 - Southern side looking north

Date: 01/12/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 2 - SJB



Description:
 LAeq (15hr) Daytime
 Design Year - 2036
 Option 2 - Western side looking east

Date: 01/12/2015

Project:
**296-298 Botany Rd &
 284 Wyndham St**

Client: City of Sydney Council

Reference: TH772-01 (rev 0) Option 2 - SJB

296-298 BOTANY RD & 284 WYNDHAM ST

Road Traffic Noise Assessment

8 March 2016

SJB Architects

TH772-02F02 (r3) 296-298 Botany Rd

Document details

Detail	Reference
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Prepared for:	SJB Architects
Address:	SJB Architects Level 2, 490 Crown Street Surry Hills NSW 2010
Attention:	Adam Haddow

Document control

Date	Revision history	Non-issued revision	Issued revision	Prepared	Instructed	Authorised
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17.02.2016	Revised	2		AB	GW	
08.03.2016	Approved		3	AB	GW	GW

Important Disclaimer:

The work presented in this document was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001.

This document is issued subject to review and authorisation by the Team Leader noted by the initials printed in the last column above. If no initials appear, this document shall be considered as preliminary or draft only and no reliance shall be placed upon it other than for information to be verified later.

This document is prepared for the particular requirements of our Client referred to above in the 'Document details' which are based on a specific brief with limitations as agreed to with the Client. It is not intended for and should not be relied upon by a third party and no responsibility is undertaken to any third party without prior consent provided by Renzo Tonin & Associates. The information herein should not be reproduced, presented or reviewed except in full. Prior to passing on to a third party, the Client is to fully inform the third party of the specific brief and limitations associated with the commission.

In preparing this report, we have relied upon, and presumed accurate, any information (or confirmation of the absence thereof) provided by the Client and/or from other sources. Except as otherwise stated in the report, we have not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

We have derived data in this report from information sourced from the Client (if any) and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination and re-evaluation of the data, findings, observations and conclusions expressed in this report.

We have prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

The information contained herein is for the purpose of acoustics only. No claims are made and no liability is accepted in respect of design and construction issues falling outside of the specialist field of acoustics engineering including and not limited to structural integrity, fire rating, architectural buildability and fit-for-purpose, waterproofing and the like. Supplementary professional advice should be sought in respect of these issues.

Contents

1	Introduction	1
2	Project description	2
2.1	Site location	2
2.2	Development proposal	3
3	Road traffic noise criteria	4
3.1	State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)	4
3.2	Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline'	4
3.3	Clarification of ISEPP noise limits	5
4	Road traffic noise assessment	6
4.1	Road design and traffic flow	6
4.2	Prediction methodology	7
4.3	Road traffic noise results	10
5	Conclusion	12
APPENDIX A	Glossary of terminology	13
APPENDIX B	RMS Strategic Model Traffic Data	15

List of tables

Table 1:	ISEPP noise criteria for new residential development	5
Table 2:	2036 future road traffic volumes	6
Table 3:	Summary of modelling inputs	8
Table 4:	Barrier wing calculation points	8
Table 5:	Road traffic noise level predictions (barrier wings), dB	10
Table 6:	Road traffic noise level predictions (balconies), dB	11

List of figures

Figure 1:	Aerial photograph of subject site	2
Figure 2:	Barrier wings and enclosed balcony areas	3
Figure 3:	Modelled roads	7
Figure 4:	Barrier wing calculation points	10

1 Introduction

Renzo Tonin & Associates was engaged to conduct a road traffic noise impact assessment for a proposed residential development site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria. The assessment is required to determine the impact of future road traffic noise (year 2036) on a built form scenario under consideration by SJB Architects.

The assessment will be used to establish which areas of the future buildings, if any, are unable to comply with the ADG requirement for all habitable rooms to be naturally ventilated, while also satisfying the provisions of the SEPP (Infrastructure) 2007.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project description

2.1 Site location

The subject site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria, contains three road frontages, with Wyndham St to the west, Bourke St to the south and Botany Rd to the east. These roads currently carry high vehicle volumes and as redevelopment in Alexandria and Green Square continues, it is anticipated that these vehicle volumes and the resultant noise impact on the site will increase significantly.

Figure 1 presents an aerial photograph of the subject site and surrounding area.

Figure 1: Aerial photograph of subject site



2.2 Development proposal

SJB Architects is currently considering a built form scenario at the site which contains various multi story commercial tenancies and residential apartment buildings.

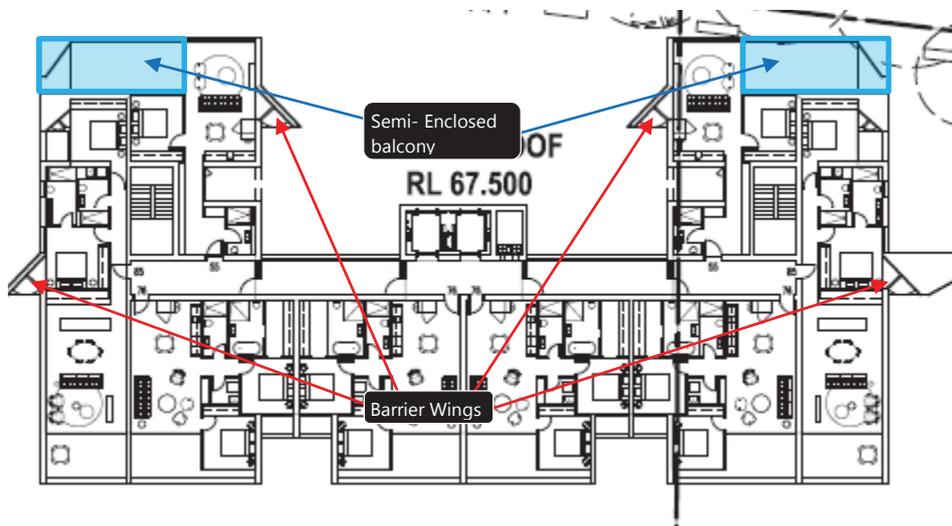
The design features various barrier wings along the external facades of the building as well various balcony areas which are largely enclosed, with small openings on the short side. The intent of the barrier wings and enclosed balconies is to allow habitable rooms to be naturally ventilated with windows open, while also satisfying the provisions of the SEPP (Infrastructure) 2007.

The barrier wings are understood to be of durable material with a minimum mass of 10kg/m^3 and are to extend from ground level to the top of roof level. Windows associated with the habitable rooms are located behind the barrier wings, along the external façades of the building and within the balcony areas. The acoustic assessment specifically seeks to determine the effectiveness in noise reduction provided by the barrier wings and the enclosed balconies.

A podium is also included into the design which extends to the edge of the site and is approximately 15m above ground level towards the Wyndham St side of the site and 11m above ground level towards the Botany Rd side of the site.

Figure 2 presents an example of some of the barrier wings and enclosed balcony areas.

Figure 2: Barrier wings and enclosed balcony areas



3 Road traffic noise criteria

3.1 State Environmental Planning Policy (Infrastructure) 2007 (ISEPP)

The NSW State Environmental Planning Policy (Infrastructure) 2007 (known as 'ISEPP') came into force in NSW on 1 January 2008 to facilitate the effective delivery of infrastructure across the State. The aim of the policy includes identifying the environmental assessment category into which different types of infrastructure and services development fall and identifying matters to be considered in the assessment of development adjacent to particular types of infrastructure.

Pertinent to noise assessment, the ISEPP includes the following clauses:

102 Impact of road noise or vibration on non-road development

1. *This clause applies to development for any of the following purposes that is on land in or adjacent to the road corridor for a freeway, a tollway or a transitway or any other road with an annual average daily traffic volume of more than 40,000 vehicles (based on the traffic volume data published on the website of the RTA) and that the consent authority considers is likely to be adversely affected by road noise or vibration:*
 - a. *a building for residential use,*
 - b. *a place of public worship,*
 - c. *a hospital,*
 - d. *an educational establishment or child care centre.*
2. *Before determining a development application for development to which this clause applies, the consent authority must take into consideration any guidelines that are issued by the Director-General for the purposes of this clause and published in the Gazette.*
3. *If the development is for the purposes of a building for residential use, the consent authority must not grant consent to the development unless it is satisfied that appropriate measures will be taken to ensure that the following LAeq levels are not exceeded:*
 - a. *in any bedroom in the building - 35 dB(A) at any time between 10 pm and 7am,*
 - b. *anywhere else in the building (other than a garage, kitchen, bathroom or hallway) - 40 dB(A) at any time.*
4. *In this clause, "freeway", "tollway" and "transitway" have the same meanings as they have in the Roads Act 1993*

3.2 Department of Planning publication 'Development near rail corridors and busy roads – Interim guideline'

To support the Infrastructure SEPP, the NSW Department of Planning released the *Development in Rail Corridors and Busy Roads – Interim Guideline* (December 2008). The Guideline assists in the planning,

design and assessment of developments in, or adjacent to, major transport corridors in terms of noise, vibration and air quality.

3.3 Clarification of ISEPP noise limits

The Guideline clarifies the time period of measurement and assessment. Section 3.4 '*What Noise and Vibration Concepts are Relevant*' and Table 3.1 of Section 3.6.1 confirms that noise assessment is based over the following time periods:

- Daytime 7:00am - 10:00pm $L_{Aeq(15hr)}$
- Night-time 10:00pm - 7:00am $L_{Aeq(9hr)}$

The noise criteria nominated in the ISEPP apply to internal noise levels with windows and doors closed. However as the preliminary noise assessment is based on predictions at external locations, equivalent external noise criteria has been established. The equivalent external noise criterion is used to determine which areas of the development may require acoustic treatment in order to meet the internal noise requirements of the ISEPP. The equivalent external goals have been determined on the following basis:

- *The ISEPP states: "If internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia." The internal criteria with windows open is therefore 10dB(A) above the criteria explicitly outlined in the ISEPP.*
- The generally accepted noise reduction through an open window from a free-field external position is 10dB(A). Windows/doors are assumed to be open no more than 5% of room floor area, in accordance with the Building Code of Australia (BCA) ventilation requirements.

Table 1 presents the ISEPP internal noise criteria along with the equivalent external noise criteria for residential premises.

Table 1: ISEPP noise criteria for new residential development

Room	Location	$L_{Aeq, 15hr}$ Day 7am – 10pm	$L_{Aeq 9hr}$ Night 10pm – 7am
Living rooms*	Internal, windows closed	40	40
	Internal, windows open	50	50
	External free-field (allowing windows to remain open)^	60	60
Bedrooms*	Internal, windows closed	40	35
	Internal, windows open	50	45
	External free-field (allowing windows to remain open)^	60	55

Notes: * Requisite for 40,000AADT Roads only under ISEPP 2007.

^ ISEPP Guideline states that where internal noise criteria are exceeded by more than 10dB(A) with windows open mechanical ventilation is required. External goals have been calculated on the basis of nominal 10dB(A) reduction through an open window to a free-field position. Windows open to 5% of floor area in accordance with the BCA 2011 requirements.

4 Road traffic noise assessment

4.1 Road design and traffic flow

Roads and Maritime Services (RMS) Strategic Model traffic data (2 hour peak hour traffic volumes) for the year 2036 have been obtained and have been utilised for the assessment. The Strategic Model traffic data is presented in Appendix B. The following calculations and assumptions were used for the road traffic noise modelling:

- The AADT is 6.5 times the average of the 2 hour peaks,
- The 15hr daytime volume is 85% of the 24hr volume,
- The 9hr night time volume is 15% of the 24hr volume, and
- The heavy vehicle percentage has been based on existing traffic counts.

The traffic volumes used for the assessment are presented in Table 2.

Table 2: 2036 future road traffic volumes

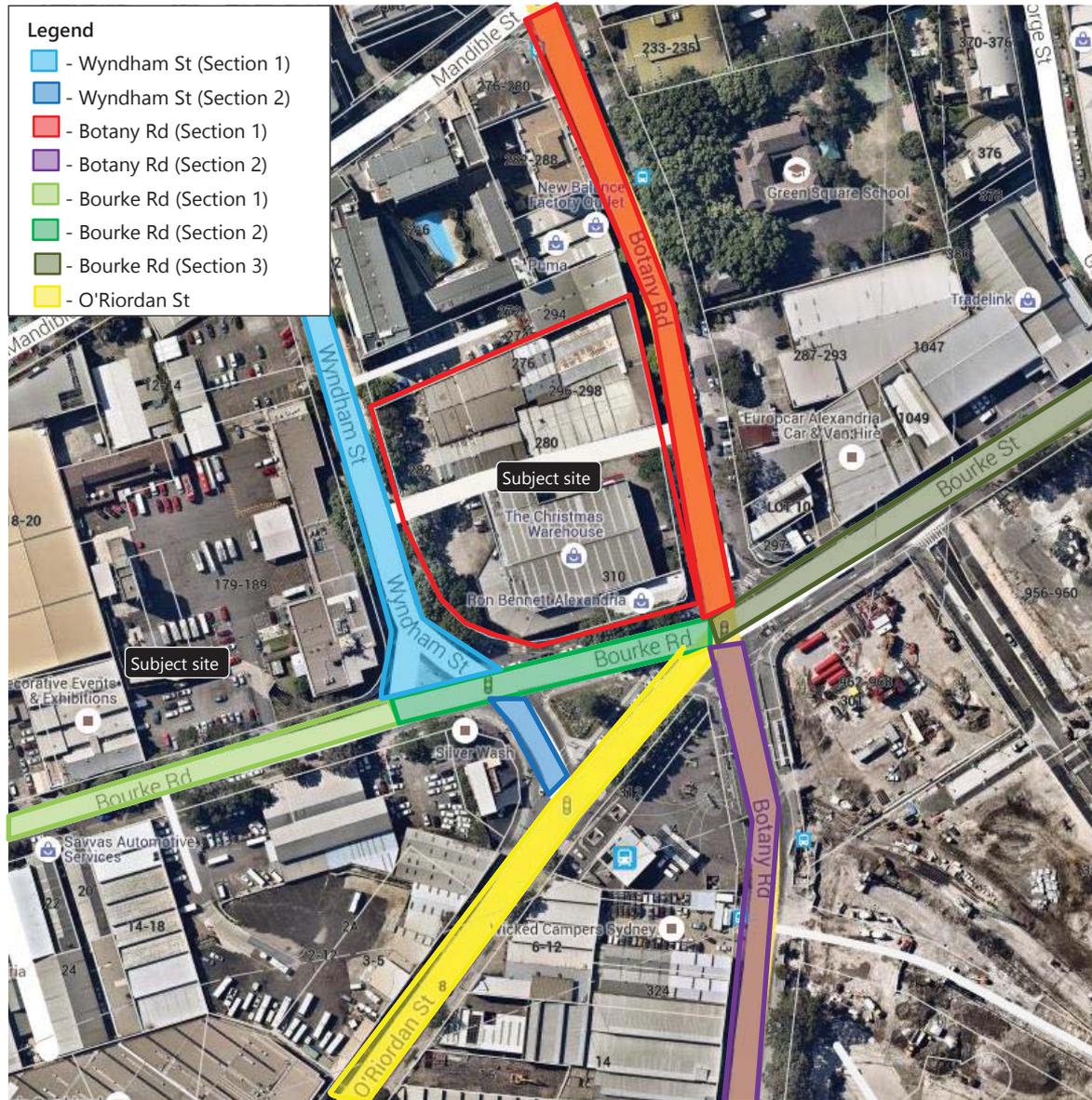
Road	Approach	2hr Predicted Traffic Volume		Calculated Traffic Volumes			% Heavy Vehicles
		AM Peak	PM Peak	AADT	15hr Day	9hr Night	
Wyndham St (Section 1)	North bound	1818	1742	11570	9835	1736	11
	South bound	1076	1161	7270	6180	1091	11
Wyndham St (Section 2)	North bound	837	951	5811	4939	872	11
	South bound	927	804	5626	4782	844	11
Botany Rd (Section 1)	North bound	1723	1446	10299	8754	1545	11
	South bound	1548	1479	9838	8362	1476	11
Botany Rd (Section 2)	North bound	2289	2046	14089	11975	2113	11
	South bound	2080	1856	12792	10873	1919	11
Bourke Rd (Section 1)	North bound	1186	1058	7293	6199	1094	8
	South bound	861	964	5931	5042	890	8
Bourke Rd (Section 2)	North bound	1294	1399	8752	7439	1313	8
	South bound	1801	1479	10660	9061	1599	8
Bourke Rd (Section 3)	North bound	3441	3273	21821	18547	3273	8
	South bound	3381	3240	21518	18291	3228	8
O'Riordan St	North bound	2643	2234	15850	13473	2378	10
	South bound	2200	2027	13738	11677	2061	7

Note is made that the modelled roads all contain an AADT lower than 40,000 vehicles. While the ISEPP applies only to roads with an AADT greater than 40,000 vehicles, the guideline is also recommended for other road traffic noise affected sites.

Although there are both 'day' and 'night' traffic noise goals to be satisfied, based on the difference in traffic volumes between day and night, daytime was established as the worst case period for road traffic noise impacts.

The roads modelled in the assessment are indicated in Figure 3.

Figure 3: Modelled roads



4.2 Prediction methodology

Noise predictions are based on CoRTN, having been adapted to Australian conditions and extensively tested by the Australian Road Research Board. Additionally, barrier noise improvement calculations are based on ISO9613. As a result it is recognised and accepted by the NSW Environmental Protection Authority (EPA). The model predicts noise levels for steady flowing traffic and noise from high truck

exhausts is taken into account. The CoRTN algorithms are contained within the 'CadnaA' noise modelling software which has been used to calculate road traffic noise levels.

The noise prediction software takes into account the following:

Table 3: Summary of modelling inputs

Input Parameters	Input used
Traffic volumes and mix	As described in Section 4.1
Vehicle speed	50km/h
Gradient of roadways	Topographic data provided by RMS
Source height	0.5m for car exhaust, 1.5m for car and truck engines and 3.6m for truck exhaust.
Ground topography at receiver and road	2m Ground Contours obtained from the NSW Land & Property Information (LPI)
Angles of view from receiver	Calculated within CoRTN
Reflections from existing barriers, structures and cuttings on opposite side of road	Calculated within CoRTN
Air and ground absorption - Values vary between 0 (hard surface) to 1 (100% absorptive)	0 has been used in this study It is noted that where screening is calculated CoRTN uses hard surface correction.
Receiver Heights	1.5m above floor level of the identified floor
Free Field Noise Levels	Free Field noise levels were used in this assessment as it is directly relevant to assessment against ISEPP criteria
Australian conditions correction	-1.7dB(A)
Acoustic properties of road surfaces	Assumed dense graded asphalt (DGA) (+0dB)
Roadside mounds / barriers	None were considered in this assessment

The predicted road traffic noise levels have been calculated to specific points behind the barrier wings, along the external façade of the building. Additionally, desktop calculations have been undertaken to determine the effectiveness in noise reduction provided by the enclosed balconies.

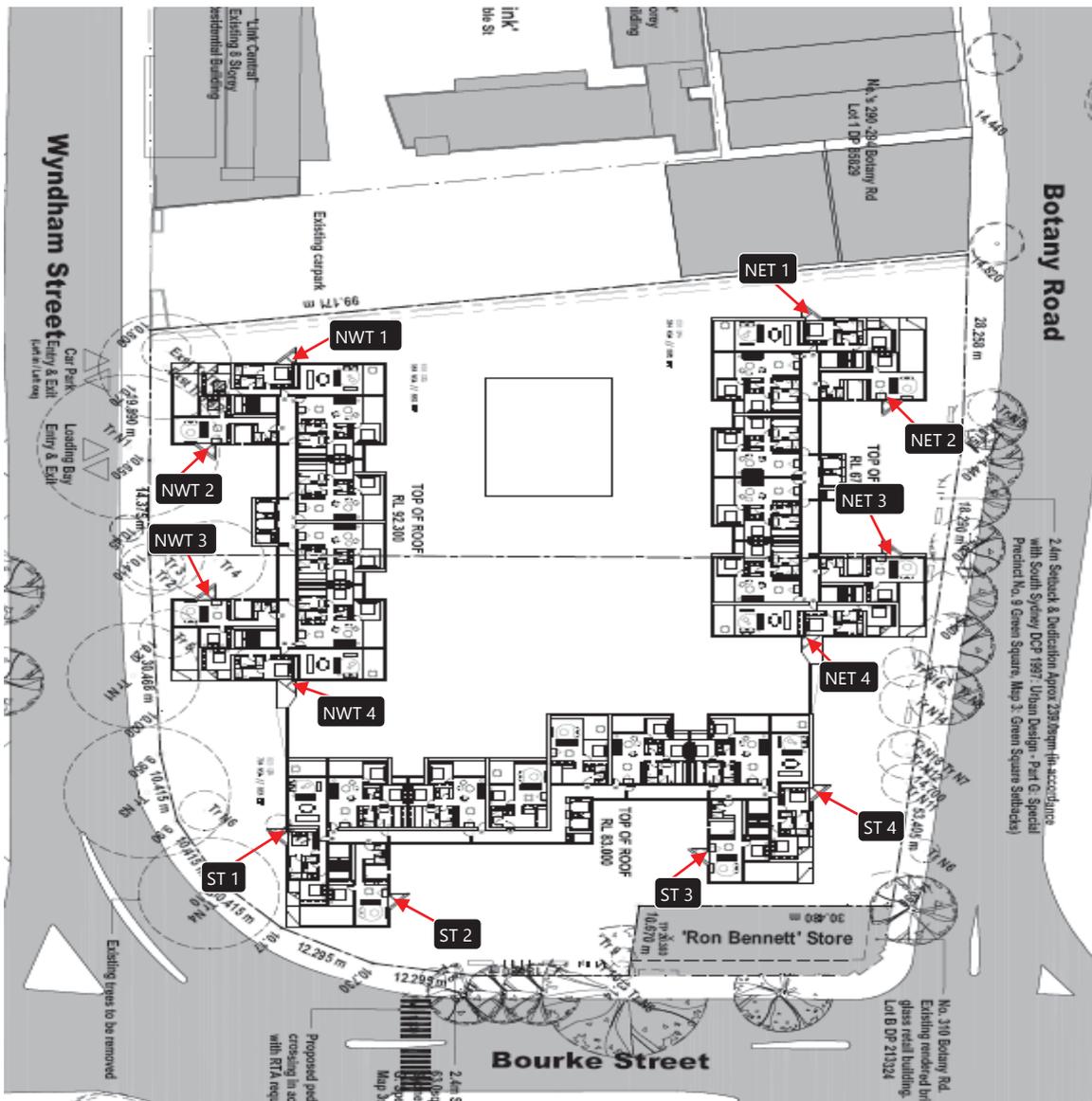
The specific points behind the barrier wings are presented in Table 4 and Figure 4.

Table 4: Barrier wing calculation points

ID	Name	Description	Calculation heights
NWT 1	North-West Tower - Point 1	Calculation point located along the northern façade of the north-western tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NWT 2	North-West Tower - Point 2	Calculation point located along the north-western façade of the north-western tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NWT 3	North-West Tower - Point 3	Calculation point located along the south-western façade of the north-western tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NWT4	North-West Tower - Point 4	Calculation point located along the southern façade of the north-western tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m

ID	Name	Description	Calculation heights
NET 1	North-East Tower - Point 1	Calculation point located along the northern façade of the north-eastern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NET 2	North-East Tower - Point 2	Calculation point located along the north-eastern façade of the north-eastern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NET 3	North-East Tower - Point 3	Calculation point located along the south-eastern façade of the north-eastern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
NET4	North-East Tower - Point 4	Calculation point located along the southern façade of the north-eastern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
ST 1	South Tower - Point 1	Calculation point located along the western façade of the southern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
ST 2	South Tower - Point 2	Calculation point located along the south-western façade of the southern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
ST 3	South Tower - Point 2	Calculation point located along the south-eastern façade of the southern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m
ST 4	South Tower - Point 4	Calculation point located along the eastern façade of the southern tower, positioned in between the façade and angled barrier wing.	16m, 45m and 60m

Figure 4: Barrier wing calculation points



4.3 Road traffic noise results

The results of the road traffic noise calculations at barrier wing locations, including indicative internal noise levels and assessment criteria, are presented in Table 5. The noise reduction provided by the barriers varied between 1-17dB(A). The locations with the greatest reduction were determined to be within the enclosed courtyard, which were all found to satisfy the external and internal noise criteria.

Table 5: Road traffic noise level predictions (barrier wings), dB

ID	L _{Aeq} 15 hr external noise levels			L _{Aeq} 15 hr internal noise levels			L _{Aeq} 15 hr noise criteria	
	16m	45m	60m	16m	45m	60m	External	Internal
NET 1	58	58	58	48	49	48	60	50
NET 2	57	59	58	47	49	48	60	50

ID	L _{Aeq} 15 hr external noise levels			L _{Aeq} 15 hr internal noise levels			L _{Aeq} 15 hr noise criteria	
	16m	45m	60m	16m	45m	60m	External	Internal
NET 3	47	57	56	37	47	46	60	50
NET 4	59	56	56	49	46	46	60	50
NWT 1	54	58	58	44	48	48	60	50
NWT 2	54	55	56	44	45	46	60	50
NWT 3	48	53	54	38	43	44	60	50
NWT 4	52	54	53	42	44	43	60	50
ST 1	57	50	50	47	40	40	60	50
ST 2	59	64	64	49	54	54	60	50
ST 3	58	59	61	48	49	41	60	50
ST 4	61	50	50	51	40	40	60	50

Notes: Red indicates exceedance of external and internal noise criteria

Calculations were also undertaken to determine the effectiveness in noise reduction provided by the semi-enclosed balconies. Following analysis of the noise model results, it was determined that the balconies on the lower levels of the southern tower, fronting Bourke St were the most exposed to road traffic noise. Typical noise reduction provided through short side balcony openings would be in the range of 5-8dB. For the purposes of the assessment, 5dB has conservatively been assumed.

The results of the road traffic noise calculations at balcony locations, including indicative internal noise levels and assessment criteria, are presented in Table 6. For the assessment it has been assumed that hard reflective surfaces are throughout the balcony space. However, if absorptive finishes were applied to the soffit and walls, further noise reductions up to approximately 5dB(A) could be achieved dependent on the extent and type of treatment.

Table 6: Road traffic noise level predictions (balconies), dB

Location	L _{Aeq} 15 hr external façade noise levels	L _{Aeq} 15 hr internal balcony noise levels	L _{Aeq} 15 hr internal apartment noise levels	L _{Aeq} 15 hr noise criteria	
				External	Internal
ST balconies	72	70	57	60	50

Notes: Red indicates exceedance of external and internal noise criteria

Windows open 5% of floor area

5 Conclusion

Renzo Tonin & Associates as completed a road traffic noise assessment for a proposed residential development site located at 296-298 Botany Rd and 284 Wyndham St, Alexandria.

The assessment was required to determine the impact of future road traffic noise (year 2036) a built form scenario under consideration by SJB Architects and to establish which areas of the future buildings, if any, are unable to comply with the ADG requirement for all habitable rooms to be naturally ventilated, while also satisfying the provisions of the Infrastructure SEPP 2007 for maximum repeatable noise levels.

APPENDIX A Glossary of terminology

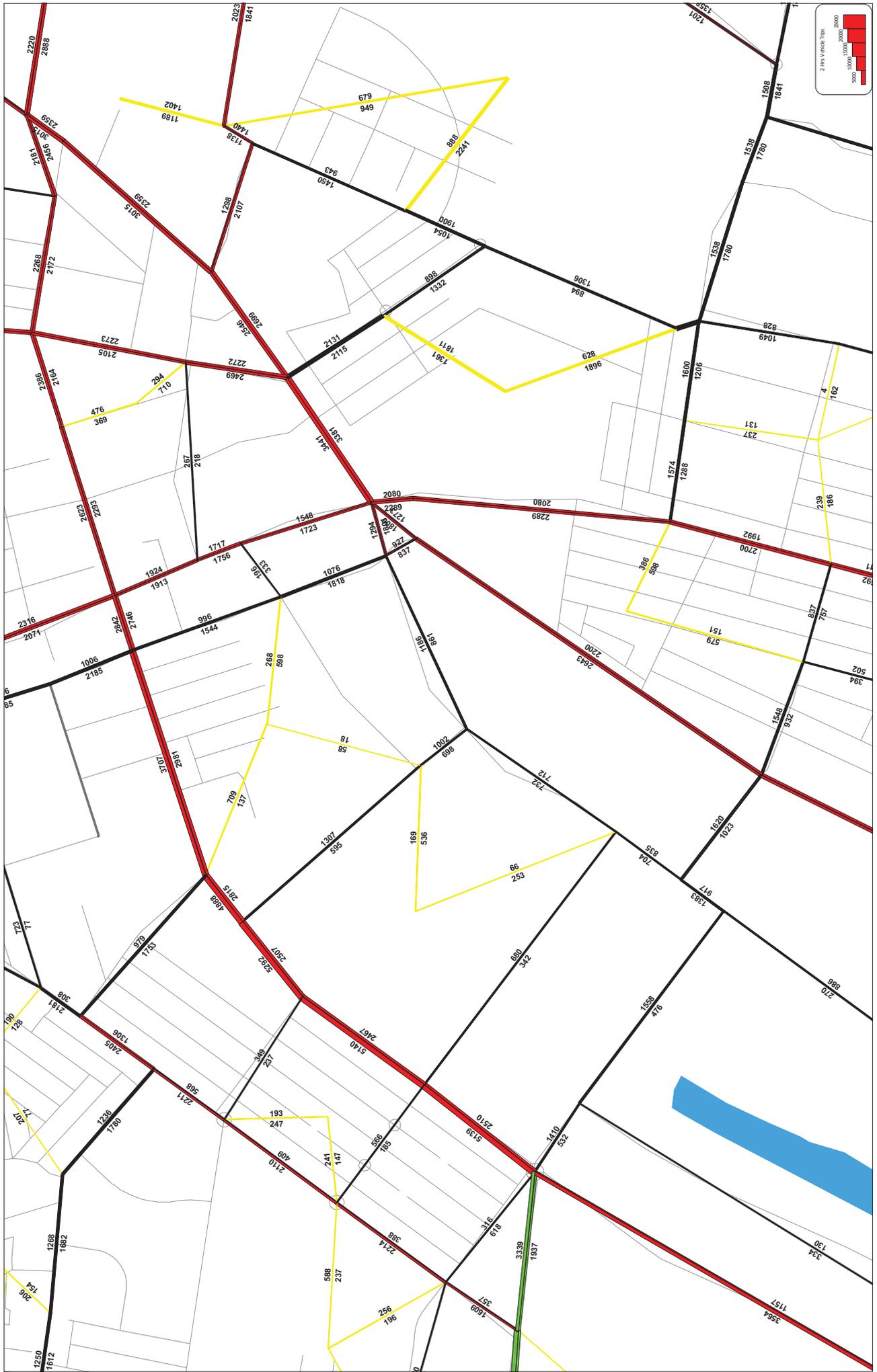
The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.
Assessment period	The period in a day over which assessments are made.
Assessment point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).
Decibel [dB]	The units that sound is measured in. The following are examples of the decibel readings of every day sounds: 0dB The faintest sound we can hear 30dB A quiet library or in a quiet location in the country 45dB Typical office space. Ambience in the city at night 60dB CBD mall at lunch time 70dB The sound of a car passing on the street 80dB Loud music played at home 90dB The sound of a truck passing on the street 100dB The sound of a rock band 115dB Limit of sound permitted in industry 120dB Deafening
dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.
Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.

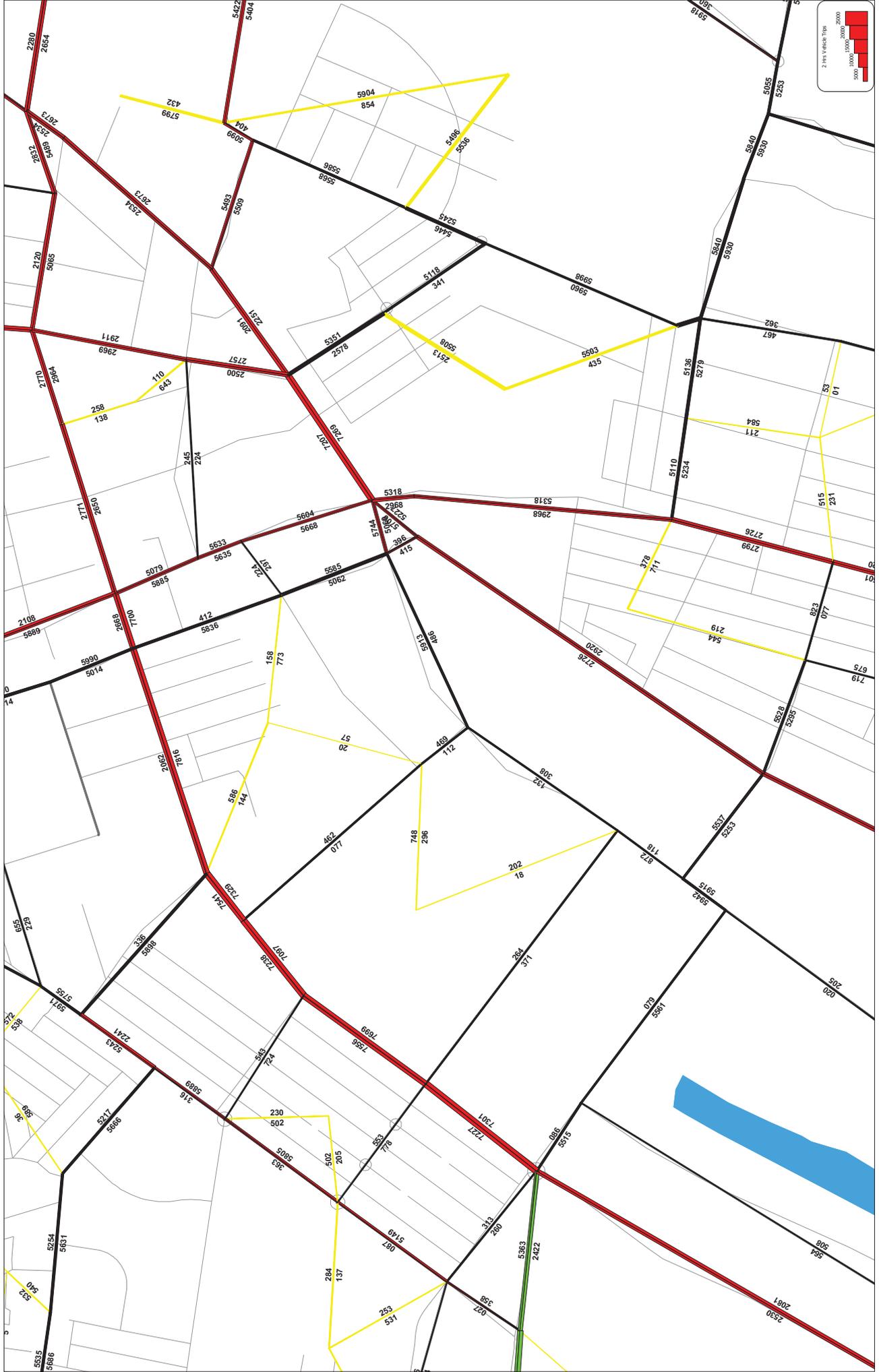
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.

APPENDIX B RMS Strategic Model Traffic Data

TRAFFIC VOLUMES_



TRAFFIC VOLUMES_



**APPENDIX E: PRELIMINARY AERONAUTICAL IMPACT ASSESSMENT
PREPARED BY STRATEGIC AIRSPACE**

Preliminary Aeronautical Impact Assessment to Support Planning Approval Application

**Airports
(Protection
of Airspace)
Regulations**

for

**296-298 Botany Rd, Alexandria:
Preliminary Aeronautical
Assessment for Planning**

Doc v1.0 FINAL

09 Feb 2015

by



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Document Control

Document Number: **15.003-01-001**

Version: **Doc v1.0 FINAL**

Document Title: **296-298 Botany Rd, Alexandria: Preliminary Aeronautical Assessment for Planning**

Purpose / Abstract: *This brief report assesses the potential aeronautical impact of the proposed development at 296-298 Botany Rd, the site also being bounded by Bourke Rd and Wyndham Street. The purpose of this assessment to support the application for Planning Approval*

Contract: -

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	Client Gazcorp	StratAir Strategic Airspace
	APT -	AsA Airservices (formerly Airservices Australia)
	CASA Civil Aviation Safety Authority	Infrastruc Department of Infrastructure ture

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Contents

Change History.....	iii
Distribution Control.....	iii
1. Introduction & Executive Summary	1
2. Methodology	2
2.1 Methodology as Basis of Study	2
2.2 Location of the Proposed Development	3
3. Analysis of Obstacle Limitation Surfaces (OLS) & Shielding by Existing Obstacles	4
3.1 OLS Analysis	4
3.2 Shielding	4
4. Analysis of PANS-OPS Surfaces	5
4.1 Minimum Sector Altitudes (MSAs).....	5
4.2 Circling Minima	6
4.3 Instrument Approaches, Missed Approaches & Arrivals	6
4.4 Departures	6
5. Other Assessment Factors.....	6
6. Conclusion	7

APPENDICES

Appendix 1 — Abbreviations

Appendix 2 — PANS-OPS Analysis

I. Introduction & Executive Summary

Gazcorp has engaged Strategic Airspace to prepare a preliminary aeronautical assessment in relation to proposed development at **296-298 Botany Rd, Alexandria NSW**, adjacent to the Green Square precinct of southern Sydney.

The proposed development is approximately 5.1km (2.77NM) at 027°T from the Aerodrome Reference Point (ARP) at Sydney Airport. Thus, due to proximity to the airport and the proposed maximum building height of the development, the proposal is subject to the Airports (Protection of Airspace) Regulations 1996. The two fundamental factors of the Airports Regulations that are used for assessment of development heights are the Obstacle Limitation Surfaces (OLS) and the PANS-OPS Surfaces. Various other factors that come under the catch-all of “assuring the safety, efficiency or regularity of existing or future air transport operations into or out of airports” are also considered.

The development site comprises three tower complexes, of **proposed maximum heights of 66.2m, 91.0m and the tallest at 100.3m AHD**.

All of the proposed towers would penetrate Sydney Airport’s OLS. Specifically, it will penetrate the **OLS Inner Horizontal Surface (IHS)**, which has an elevation of **51m AHD** above the site; **the tallest tower would penetrate the OLS IHS by 49.2m**. However there are precedents for approved penetrations of such extents in the area adjacent to the development — namely the Green Square Town Centre (GSTC) site — and this may help support the case for approval of the development (subject to timing of the construction of buildings in the GSTC and the likely requirement for a safety case).

In addition to the OLS, the other critical aspect of the Airports Regulations is the absolutely restrictive height of the PANS-OPS “surfaces”. These surfaces are complex in nature and protect aircraft operations in all weather. The limiting height of the **lowest PANS-OPS surface** (based on this preliminary analysis of PANS-OPS procedures currently published) is **126.4m AHD** above the site. Note also that this height would most likely be stipulated as the height restriction for cranes to be used for construction as part of any airspace height approval for the development itself.

Other factors that would be assessed as part of the overall safety and operational efficiency and regularity evaluation have also been considered as part of this preliminary assessment. A key factor in this regard is the ability of airlines to perform their contingency procedures in the event of an engine-out instance on or after take-off. Based on similar assessment for the nearby and already approved GSTC site, this is not anticipated to be problematic for this development.

In conclusion, based on the preliminary assessment, we believe that there is no technical impediment to approval of the development as proposed and described herein under the Regulations, and that an application supported by a full aeronautical assessment and safety case would be approved by the Department of Infrastructure.

This preliminary report is for the purpose of supporting further planning and exploring a maximum development height at the site that may be considered as technically and probably approvable under the Airports (Protection of Airspace) Regulations 1996 (APARs). The results and opinions are based on preliminary data only and would be subject to confirmation in a complete aeronautical impact study.

2. Methodology

The preliminary version of this report includes only the technical analysis of PANS-OPS and OLS surfaces. More complete assessment of the potential impact upon operations at Sydney Airport would need to be included in the report presented for the application for approval by the aviation authorities.

2.1 Methodology as Basis of Study

The report considers the existing Sydney International Airport facilities only.

In respect to the influence on the proposed development, the prescribed airspace surrounding the Airport comprises two components:

- the Obstacle Limitation Surfaces (OLS); and
- the Procedures for Air Navigation Services - Aircraft Operations (PANS-OPS) surfaces.

In this instance the OLS plans produced by Sydney Airport were referenced. In addition to Airservices Australia Departure & Approach Plates (charts) effective at 6-March-2014 as published on the Airservices AIP (Aeronautical Information Publication) website.

The aeronautical assessment was undertaken in phases, as described below:

Table 2-1 Methodology

#	Phase	Description
1	Obstacle Limitation Surfaces	The extent of penetration of the Obstacle Limitation Surfaces by the proposed developments was determined accurately based on the siting (building zone footprint) and height data provided by the client. See section 3 below.
2	Instrument Approach Procedures	The relevant instrument approach procedures were examined to determine whether the development would impose any restriction on those procedures. Based on the requirement of the Airports (Protection of Airspace) Regulations any restriction on the instrument approach procedures would preclude further consideration of the application. See section 4 below.
3	Other Assessment Factors	Comments regarding other factors that would be assessed in a future detailed aeronautical impact study, the results of which will impact on the opinion concerning future approvability of the development. Some preliminary opinions are offered for guidance. See section 5 below.
4	Summary & Conclusions	A concise summary of findings and conclusion as to the likely approvability of the proposal. See section 6 below.

2.2 Location of the Proposed Development

For the purpose of the analysis, the site plan was geo-referenced against data in GoogleEarth™, and the most conservative coordinates for each tower were digitised. (as shown by the 'grid cursor' style marks depicted in the image below.

Figure 2-1: Site Plan in Local Context



3. Analysis of Obstacle Limitation Surfaces (OLS) & Shielding by Existing Obstacles

The analysis of the proposed building envelope in relation to the Obstacle Limitation Surfaces (OLS) and any relief that may be provided by shielding of the development by existing obstacles has been done with reference to the CASA Standards for Obstacle Restriction and Limitation¹ — known as MOS Part 139.

3.1 OLS Analysis

The prevailing OLS restriction on building heights over the development site is the OLS Inner Horizontal Surface (IHS). The site is some 250-350m inside the outer edge of the Inner Horizontal Surface.

The proposed heights penetrate the restrictive surface, as shown in the table below.

Table 3-1 Proposed Building Elevations & Penetrations of OLS Surfaces

<i>Proposed Site / Feature</i>	<i>Max Development Elevation Metres AHD</i>	<i>OLS Surface Height at Location Metres AHD</i>	<i>Penetration * Metres</i>	<i>Clearance** Metres</i>
Tower 1 (SW corner of site, southern-most tower)	66.2	51.0	15.2	—
Tower 2 (North-East corner)	100.3	51.0	49.2	—
Tower 3 (North-West corner)	91.0	51.0	40.0	—

* **Penetration:** rounded up to nearest 0.1m

** **Clearance:** rounded down to nearest 0.1m

3.2 Shielding

Preliminary analysis indicates that at least one of the taller GSTC buildings (Site 5A) that is closest to this proposed development may offer “shielding” of Tower 2 (at 100.3m AHD, the tallest in this proposal). Shielding is a provision permitted under the regulations, but requires that the structure providing the shielding actually exists. Hence the possibility of using this particular option as an easier and faster path to assessment and approval of the proposed development is dependent on the relative timing of the airspace height application for this development and the construction status (and confirmed maximum height plans) of the GSTC building.

If this particular possibility is not available at the time of the application to the Department, the application will have to be supported by a safety case to demonstrate that the development would not adversely impact the safety, efficiency or regularity of existing or future air transport operations into and out of Sydney Airport.

1 CASA RPA, and Manual of Standards Part 139 — Aerodromes, Chapter 7 Obstacle Restriction and Limitation, <http://www.casa.gov.au/rules/1998casr/139/139m07.pdf>

4. Analysis of PANS-OPS Surfaces

Assessment of impact by the proposed building envelope was undertaken with respect to:-

- The Circling Minima for existing PANS-OPS procedures
- The discrete minima for the Instrument Approach Procedures for Sydney International Airport, as published in the Departure and Approach Procedures (DAP), up to Amendment 141 (effective 13-Nov-2014 to 04-Mar-2015).
- Missed Approaches — as part of the evaluation of Approach Procedures
- The existing Standard Instrument Departure Procedures (SIDs)

The proposal was assessed as being laterally outside the protected airspace for all other procedures.

The aeronautical assessment was undertaken in phases with the results summarised as follows:

Table 4-1 Impact Summary

<i>Procedure</i>	<i>NO Impact</i>	<i>Impact</i>	<i>Issues & Comments</i>
MSA	✓	Nil	Below protection surface
Circling Minima (Cat A,B,C&D)	✓	Nil Most limiting	Below the restrictive height of 126.4m AHD (applicable to Cat A & B aircraft). This is the most restrictive of the PANS-OPS surfaces above the development site.
Approach Procedures & Missed Approaches			
All Approaches, Missed Approaches & Arrival Procedures	✓	Nil	The most restrictive surface related to approaches and arrival procedures is higher than the limit imposed by the Cat A&B Circling. The most restrictive of these procedures relates to the missed approach of the RNAV-Z (GNSS) approach to RWY 34L.
Departures			
➤ Radar Departure	✓	Nil	The most restrictive radar departure surface height above the proposed development is higher than the limit imposed by the Cat A&B Circling. The most restrictive is the RWY34R departure.
➤ Other SIDS	✓	Nil	As for the radar SIDs above, or outside protection area surfaces.

4.1 Minimum Sector Altitudes (MSAs)

In the location of the proposed development, the circling minimum is more restrictive than the MSA: thus, there is no impact on the MSA.

4.2 Circling Minima

The proposed development lies inside the permitted circling area to the north of the airport, and is most restricted by the minima applicable to the Category A and B aircraft.

The restrictive height due to Circling is 126.4m AHD — and the assessment has determined that this is the most restrictive PANS-OPS surface height overhead the development site.

4.3 Instrument Approaches, Missed Approaches & Arrivals

All instrument approach procedures were considered. The detailed results of these considerations are shown in Appendix 2.

The proposed development was assessed as being outside the tolerance areas for, or below the restrictive heights imposed by, all approach segments of the procedures.

In addition, the missed approaches were considered for all approach procedures, as well as the arrival procedures. In all cases the development was either outside the protection areas or below the critical heights.

The most restrictive height of the approach procedures relates to the RWY34L RNAV-Z (GNSS) procedure, where the development site is below the secondary protection area of the missed approach. The height limitation is greater than 102.4m — which means that the highest of the proposed towers will be below the limiting PANS-OPS surface height.

4.4 Departures

All published Standard Instrument Departures (SID) are based on the Radar SID. The proposed development is beneath the obstacle clearance surfaces for all Radar SIDs. The most limiting height of the departure procedures, based on the preliminary analysis calculations, is 152.4m AHD.

5. Other Assessment Factors

At the site location, other factors that would require assessment as part of any full aeronautical impact analysis may include:

- Navaid impact — no adverse impact anticipated
- Surveillance (eg, radar) — no adverse impact anticipated
- Airline contingency procedures (eg, engine out performance) — no adverse impact anticipated due to location and heights, especially in consideration of previously approved building elevations for the adjacent Green Square Town Centre (GSTC) development.

The opinions in this section are preliminary in nature only and are subject to confirmation by detailed analysis.

6. Conclusion

This preliminary study concludes that:

- **All of the three proposed towers on the 296-298 Botany Rd Alexandria development site penetrate the OLS** (the Inner Horizontal Surface, by amounts ranging from 15.2 to 49.2 metres).
 - This means that an “airspace height application” pursuant to the Airports (Protection of Airspace) Regulations will need to be submitted to the Department of Infrastructure (via Sydney Airport) for approval prior to development.
 - Penetration of the OLS also means that an approval of the airspace height application would most likely include conditions requiring obstacle lighting.
- **The three towers, at proposed elevations 66.2m, 91.0m and 100.3m AHD, would NOT infringe any PANS-OPS surface**, and thus the development may be considered approvable under the Airports (Protection of Airspace) Regulations.
 - The **most restrictive height of all PANS-OPS surfaces** overhead the development site is **126.4m AHD**.
 - It is highly likely that **this (or a slightly lower height) will be the maximum height cap stipulated for cranes** that would be required for construction of the development.
- As part of the safety, efficiency and regularity factors to be assessed when evaluating an airspace height application, aircraft contingency procedures are also considered. As these have already been demonstrated to be clear of the buildings already approved for the GSTC developments, it is also anticipated that the proposed development will not adversely affect the aircraft contingency procedures — and thus not prevent approval on this basis.
- Further, preliminary analysis indicates that **at least one of the taller GSTC buildings** (Site 5A) closest to this development **would offer shielding (and therefore an easier path to airspace height approval) to the 100.3m Tower 2 building** of the proposed development. This will be dependent on the relative timing of the airspace height application for this development and the construction status of the GSTC building.
Nevertheless, despite the proximity to the already approved Green Square Town Centre (GSTC) site, which already has buildings approved at higher elevations, it is highly probable that a safety case, as part of the Airspace Height application in order to support the case for approval, will be required by CASA. The safety case would also include any benefits from shielding by the nearby GSTC.

This preliminary report is for the purpose of supporting further planning and exploring a maximum development height at the site that may be considered as technically and probably approvable under the Airports (Protection of Airspace) Regulations 1996 (APARs). The results and opinions are based on preliminary data only and would be subject to confirmation in a complete aeronautical impact study.

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
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
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
CNS/ATM	Communications, Navigation, Surveillance / Air Traffic Management
CPA	Cairns Port Authority, Operators Of Cairns Airport
DAP	Departure and Approach Procedures (published by AsA)
DER	Departure End (of the) Runway
DEVELMT	Development
DME	Distance Measuring Equipment
Doc nn	ICAO Document Number nn
DoD	Department of Defence
DODPROPS	Dependent Opposite Direction Parallel Runway Operations
DOI&T	Department of Infrastructure and Transport (sometimes also abbreviated as Infrastructure)
EIS	Environmental Impact Study
ELEV	Elevation (above mean sea level)
ENE	East North East
ERSA	EnRoute Supplement Australia

Abbreviation	Meaning
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
GLS	GNSS Landing System
GNSS	Global Navigation Satellite System
GP	Glide Path
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organisation
IHS	Inner Horizontal Surface, an Obstacle Limitation Surface
ILS	Instrument Landing System
IAS	Indicated Air Speed
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
LLZ	Localizer
LONG	Longitude
LSALT	Lowest Safe ALTitude
M	Metres
MAPt	Missed Approach Point
MDA	Minimum Descent Altitude
MDP	Major Development Plan
MGA94	Map Grid Australia 1994
MOC	Minimum Obstacle Clearance
MOS	Manual Of Standards, published by CASA
MP	Master Plan
MVA	Minimum Vector Altitude
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
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
PANS-OPS	Procedures for Air Navigation – Operations, ICAO Doc 8168
RAAF	Royal Australian Air Force
PRM	Precision Runway Monitor
RAPAC	Regional AirSpace users Advisory Committee
REF	Reference
RL	Relative Level

Abbreviation	Meaning
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
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)
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
V _n	Aircraft critical velocity reference
VOR	Very high frequency Omni-directional Range
WAC	Westralia Airports Corporation, operators of Perth Airport
WAM	Wide-Area Multilateration

APPENDIX 2 — PANS-OPS ANALYSIS

Calculations for the procedures are shown in the table below.

Procedures are as per Airservices Australia AIP DAP 141 (effective 13-Nov-2014 to 04-Mar-2015).

CIRCLING

Table 6-1 Circling Procedures, including Calculations

Procedure	Impact	Max Permissible Obstacle Elev (mAHD)	Comment
Cat A & B	None – below limiting height	126.4	Inside permitted circling area north of the airport between RWY 16R/34L and RWY 07/25. Circling elevation = 710ft = 216.4m – 90m MOC = 126.4m

APPROACHES & ARRIVALS

Table 6-2 Approach Procedure Obstacle Clearance, including Calculations

Procedure	Impact	Max Permissible Obstacle Elev (mAHD)	Comment
STARs			
All	None – outside protection areas or too high over development precinct to affect building heights	N/A	BOREE 6, CALGA 1, MARLN 1, ODALE 5, RIVET 2
Approaches			
ILS Approaches			
RWY 07 ILS-Y OR LOC-Y ILS-Z OR LOC-Z GLS	Nil – outside extent of surfaces	N/A	The whole of the development is outside the extent of the Basic ILS surfaces, OAS surfaces and Localizer Only protection areas.
RWY 25 ILS OR LOC GLS	Nil – outside extent of surfaces	N/A	The whole of the development is outside the extent of the Basic ILS surfaces, OAS surfaces and Localizer Only protection areas.
RWY 16R ILS-Y OR LOC-Y ILS-Y PRM ILS-Z OR LOC-Z ILS-Z PRM ILS-Z (CAT I & II) OR LOC-Z ILS-Z (CAT I & II) PRM GLS	Nil – outside extent of surfaces	N/A	The whole of the development is outside the extent of the Basic ILS surfaces, OAS surfaces and Localizer Only protection areas.

<i>Procedure</i>	<i>Impact</i>	<i>Max Permissible Obstacle Elev (mAHD)</i>	<i>Comment</i>
RWY 34L ILS-Y OR LOC-Y ILS-Y PRM ILS-Z OR LOC-Z ILS-Z PRM ILS-Z (CAT I & II) OR LOC-Z ILS-Z (CAT I & II) PRM GLS	Nil – outside extent of surfaces	N/A	The whole of the development is outside the extent of the Basic ILS surfaces, OAS surfaces and Localizer Only protection areas.
RWY 16L ILS-Y OR LOC-Y ILS-Y PRM ILS-Z OR LOC-Z ILS-Z PRM GLS	Nil – Outside the extent of the Basic ILS, OAS and Localizer Only surfaces	N/A	The whole of the development is outside the extent of the Basic ILS surfaces, standard OAS surfaces and Localizer Only protection areas.
RWY 34R ILS-Y OR LOC-Y ILS-Y PRM ILS-Z OR LOC-Z ILS-Z PRM GLS	Nil - beneath the outer edge of the Basic ILS surfaces	> 132.9m	Development is in the turn area of missed approach with both 2.5% and 3.3% climb gradients. Turn is required when aircraft achieves altitude of 600ft = 182.9m. 50m clearance is required in the turn area, therefore maximum building height > 182.9 – 50m = 132.9m. Additional height margin due to location in secondary area not calculated.
RNAV (GNSS) Approaches			
RNAV-Z (GNSS) RWY 07	Nil – outside extent of protection surfaces	N/A	
RNAV-Z (GNSS) RWY 16L	Nil – outside extent of protection surfaces	N/A	
RNAV-Z (GNSS) RWY 16R	Nil – outside extent of protection surfaces	N/A	
RNAV-Z (GNSS) RWY 25	Nil – Clear of protection areas	N/A	
RNAV-Z (GNSS) RWY 34L	Nil – Beneath the outer portion of the secondary protection area of the missed approach	~ 139m	Development near outer edge of secondary area of missed approach turn area. Turn altitude = 500ft = 152.4m, therefore altitude of primary at turning point = 152.4m – 50m = 102.4m. Approximately 25% in from the outer edge of protection area, thus limiting height approximately 139m AHD. Additional height margin due to location in secondary area not calculated in detail.

<i>Procedure</i>	<i>Impact</i>	<i>Max Permissible Obstacle Elev (mAHD)</i>	<i>Comment</i>
RNAV-Z (GNSS) RWY 34R	Nil – In primary area of missed approach (after turn at altitude)	> 132.9m	Development near outer edge of secondary area of missed approach turn area. Turn altitude = 600ft = 182.9m, therefore altitude of primary at turning point = 182.9m – 50m = 132.9m. Additional height margin due to location in secondary area not calculated.

DEPARTURES

Table 6-3 Departure Procedure Obstacle Clearance, including Calculations

<i>Procedure</i>	<i>Impact</i>	<i>Max Permissible Obstacle Elev (mAHD)</i>	<i>Comment</i>
SIDS			
SYDNEY SIX DEPARTURE (RADAR)			
➤ RWY 07	Nil – beneath protection area	Approx 200.9m	Turn Alt = 182.9m Approx Dist from Turn Init Area to Site = 2297m Max Obst Height = 182.9m + 2297m*0.047 – 90m = 182.9m + 108m - 90m = 200.9m
➤ RWY 16R	Nil	N/A	Aircraft prohibited from turning towards development on take-off.
➤ RWY 16L	Nil – beneath protection area	323.9m	Turn Alt = 152.4m Approx Dist from Turn Init Area to Site = 5563m Max Obst Height = 152.4m + 5563m*0.047 – 90m = 152.4m + 261.5m - 90m = 323.9m
➤ RWY 25	Nil – beneath protection area	>153.4m	Turn Alt = 243.8m Turn Alt – 90m = 153.8m So aircraft must have adequate clearance when they start the turn.
➤ RWY 34R	Nil – beneath protection area	152.5m	Turn Alt = 152.4m Approx Dist from Turn Init Area to Site = 1893m Max Obst Height = 152.4m + 1893m*0.048 – 90m = 152.4m + 90.1m - 90m = 152.5m
➤ RWY 34L	Nil	N/A	Aircraft prohibited from turning towards development on take-off.

<i>Procedure</i>	<i>Impact</i>	<i>Max Permissible Obst Elev (mAHD)</i>	<i>Comment</i>
Other SIDs			
All	Nil	N/A	All other SIDs are based upon the Radar SIDs so none should have any greater effect upon the proposed development



21st June 2016

Gazcorp

PO Box A2577
Sydney South NSW 1235

Email: Nicholas@gazcorp.com

Attn: Nicholas Gazal

Dear Nicholas,

Re: Preliminary Aeronautical Impact Statement for Planning Application, for Development at 296-298 Botany Rd, Alexandria NSW — 2016/06 SUPPLEMENT to Feb-2015 Report

Regarding the **proposed change of layout of the proposed development (Feb-2016) at 296-298 Botany Rd, Alexandria NSW**, we have been requested to assess the changes and provided an updated opinion on the likely “building airspace height” approvability of the amended proposal should an application for the development be submitted under the Airports (Protection of Airspace) regulations.

Having evaluated the amended proposal against the Preliminary Aeronautical Impact Assessment report of Feb-2015, and our knowledge of the current and planned airspace and flight procedures for Sydney Airport, we confirm that:

- ❑ All three towers would penetrate Sydney Airport’s OLS, and thus a building airspace height application would need to be submitted to the Department of Infrastructure, via Sydney Airport, prior to construction.
- ❑ The proposed development is lower than (and would not infringe) the maximum permissible heights of Sydney Airport’s prescribed airspace.
- ❑ The maximum height of the development overall is 3.7m lower than that previously proposed — which means that **the amended development provides 3.7m more clearance** from the maximum permissible height limit than was available in the original proposal (as per the Feb-2015 report), **and an additional safety margin**.
- ❑ In our opinion, based on the applicable height restrictions, the heights of existing and approved nearby developments, and the location of this and other developments in relation to Sydney Airport, **the development as currently proposed would gain airspace height approval**.

KEY POINTS OF EVALUATION

The basis of the evaluation was the amended plan in the Botany Rd Response to Council report of Feb-2016¹.

The overall extent of site has not changed. The footprints of the various towers have changed and the maximum height of each of the three towers has changed, as indicated in Table 1 below. The maximum height of the development overall is 3.7m lower than that previously proposed.

¹ *SJB Architects, Council Response: 296-298 Botany Road, 294-300 Wyndham Street, Alexandria. February 2016 Version 01*

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design &
information
solutions

strategic
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OLS ANALYSIS

The tallest of the towers in the amended proposal is 3.7m lower than in the original proposal, and so the maximum penetration of the limiting OLS surface is 3.7m less than before.

Table 1: Proposed (Original & Amended) Building Elevations & Penetrations of OLS Surfaces

OLS Surface Height at Location: 51.0 m AHD

<i>Proposed Site / Feature</i>	<i>ORIGINAL Max Development Elevation Metres AHD</i>	<i>Penetration * Metres</i>	<i>AMENDED Max Development Elevation Metres AHD</i>	<i>Penetration * Metres</i>
Tower 1	66.2	15.2	96.5	45.5
Tower 2	100.3	49.2	77.9	26.9
Tower 3	91.0	40.0	96.5	45.5

* **Penetration:** rounded up to nearest 0.1m
 ** **Clearance:** rounded down to nearest 0.1m

PANS-OPS ANALYSIS

The current amendment provides 3.7m more clearance than was available in the original proposal. The total clearance from the most limiting surface — that related to the Cat A&B Circling procedure — is now almost 30m (almost 100 ft).

Table 2: Proposed (Original & Amended) Maximum Building Elevation in relation to Most Limiting PANS-OPS Surfaces

Cat A&B Circling Procedure Surface Height at Location: 126.4 m AHD

<i>Proposed Site / Feature</i>	<i>ORIGINAL Max Development Elevation Metres AHD</i>	<i>Clearance ** Metres</i>	<i>AMENDED Max Development Elevation Metres AHD</i>	<i>Clearance ** Metres</i>
Tallest of Towers	100.3	26.1	96.5	29.9

* **Penetration:** rounded up to nearest 0.1m
 ** **Clearance:** rounded down to nearest 0.1m

OTHER FACTORS

No adverse change in relation to the Feb-2015 report.

Should you require clarification on any aspects of our evaluation or wish to discuss our final opinion, please do not hesitate to contact me directly via phone (M: 0411 389 317) or email (Cathy.PakPoy@StrategicAirspace.com).

Yours sincerely,

STRATEGIC AIRSPACE


Cathy Pak-Poy
Joint CEO



**APPENDIX F – SUMMARY OF SUBMISSIONS AND
CITY OF SYDNEY RESPONSE**

Summary of submissions and City of Sydney response

GAZCORP SITE - 296 - 298 BOTANY ROAD AND 284 WYNDHAM STREET, ALEXANDRIA
 – PLANNING PROPOSAL AND DRAFT AMENDMENT TO SYDNEY DEVELOPMENT
 CONTROL PLAN 2012

Glossary of terms

ADG – Apartment Design Guide
 FSR – Floor Space Ratio
 RMS - Roads and Maritime Services
 SEPP – State Environmental Planning Policy
 Sydney LEP 2012 – Sydney Local Environmental Plan 2012
 Sydney DCP 2012 – Development Control Plan 2012

Submitter	Summary of matter raised in submission	Officer's response
Local residents submissions		
<p>1. Local resident</p>	<p><u>Height</u></p> <p>Considers that it would be incongruous to add height to this site only - it would detrimentally impact upon the adjoining site to the north.</p>	<p>The planning proposal has been prepared in response to a request by the developer to amend the maximum building height on this particular site.</p> <p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. The site occupies a prominent position and is opposite Green Square town centre where there are higher maximum building heights. In response to the maximum building heights on surrounding sites, taller elements (maximum RL 96.5) are proposed on the western side of the site to respond to the taller maximum permissible heights on the western side of Wyndham Street and on the Bourke Road/O’Riordan Street corner. Lower elements (maximum RL 87.5 and 79) are proposed on the eastern side of the site to respond to the lower permissible heights on the eastern side of Botany Road and the medium rise development to the north.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p>

Submitter	Summary of matter raised in submission	Officer's response
		<p>The detailed design of a development within the building envelope will involve consideration of impacts on neighbouring properties, and will be subject to assessment at the development application stage.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
<p>2. Local resident</p>	<p><u>Height; Town centre expansion</u></p> <p>The development expands the Green Square town centre into the existing area, exceeds existing height limits and lacks setback from the road.</p>	<p>The site is located immediately to the north of the Green Square town centre, and centrally within the Green Square Urban Renewal area. The proposal has been supported by a detailed Urban Design Study which has considered the site in the context of surrounding development and the neighbouring Green Square town centre. This study finds that the site can support a development of greater height than the existing planning controls allow.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building envelope allows for a commercial/retail podium with high rise towers above. The podium levels largely adopt no setback from the property boundaries to allow for a strong street wall effect. Along the Bourke Road and Botany Road site boundaries, the development will adopt a setback of 2.4m for footpath widening. Furthermore, the building envelope is required to adopt setbacks for the taller residential towers to reduce impacts on the public domain and adjoining properties.</p> <p>No change to the exhibited height and setback controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
	<p><u>Infrastructure; Traffic and transport</u></p> <p>Concerns are raised regarding impacts on existing</p>	<p>The planning proposal does not involve any change to the maximum floor space ratio permitted on the site. This means that the proposal will not increase density</p>

Submitter	Summary of matter raised in submission	Officer's response
	<p>infrastructure and parking. Improvements are needed to roads and public transport.</p>	<p>on the site, only the way in which the density is physically expressed. Therefore the planning proposal and draft DCP changes will not, in themselves, result in an increase in pressure on existing infrastructure in the locality.</p> <p>The proponent offered for a restriction relating to car parking to be included in the planning proposal. This restriction would be that no on-site parking can be provided for any residential apartments within the development which have been created as a result of floor space awarded as a design excellence incentive through a competitive design process. This restriction has been incorporated into the site specific provisions of Sydney LEP 2012.</p> <p>It is acknowledged that there are concerns about infrastructure investment not keeping pace with the rapid redevelopment and population growth in the Green Square Urban Renewal Area. In response to this, the City prepared the <i>Green Square Infrastructure Strategy and Plan</i> (the plan). The plan details the strategies, plans and studies that support and guide the growth of Green Square and seeks to ensure that the necessary physical and social infrastructure required to support development is clearly identified so that it can be delivered as development occurs. The plan recognises that some services such as public transport provision are not the responsibility of the City and provides a framework to work with relevant agencies to achieve more timely infrastructure provision by the NSW Government. The plan is available on the City's website here – http://www.cityofsydney.nsw.gov.au/council/about-council/meetings/calendar-and-business-papers-2015/2015/march/planning-and-development-committee</p> <p>An additional restriction limiting on-site car parking has been incorporated into the site specific provisions of Sydney LEP 2012.</p>
	<p><u>Traffic and transport</u></p> <p>Parts of the Botany Road corridor should be preserved for future expansion (road widening, light rail etc).</p>	<p>Botany Road is a classified road which is controlled by RMS. Parts of Botany Road have already been identified for future road widening, and they have been zoned accordingly under Sydney LEP 2012. There are no parts of the site which have been zoned "Special Purposes 2 – Classified Road" to enable road widening at a future date. Refer also to response to Transport for NSW comments (#17).</p> <p>Botany Road is a significant bus corridor. Light rail is planned along Gadigal / Defries Avenues to connect the Green Square town centre with Central. The City</p>

Submitter	Summary of matter raised in submission	Officer's response
		<p>is securing the land for the light rail corridor through development and advocating the NSW Government for its early delivery.</p> <p>No change to the exhibited controls is recommended.</p>
	<p><u>Visual impact; Heritage item</u></p> <p>The development will change the aesthetics of the area and there is a heritage item nearby at Green Square School.</p>	<p>Given the proposed scale of development and the prominence of the site, the development will be highly visible in the Green Square area. A competitive design process will be required for the detailed design. The City requires all new buildings and external alterations to existing buildings to exhibit design excellence, and this includes achieving a high standard of architectural design, materials and detailing appropriate to the building type and location.</p> <p>Green Square School is located in close proximity to the site, on the eastern side of Botany Road. The school contains buildings, landscaping and a retaining wall which are identified as a heritage item under Sydney LEP 2012. Botany Road serves as a significant barrier between the site and the school, and the school buildings are well setback within the site. As part of the Urban Design Study prepared to support the planning proposal, a view analysis was undertaken and illustrates that the impacts of increased building heights on the setting of the heritage item is minor and acceptable. The potential for any proposed development on the site to adversely impact on the heritage item is relatively low. The assessment of a future development application, will provide further opportunity for the impacts on the heritage listed school to be considered.</p> <p>No change to the exhibited controls is recommended.</p>
	<p><u>Construction impacts</u></p> <p>Prolonged construction work will be undertaken at a busy intersection, with increased truck movements and noise.</p>	<p>The development of the site will result in construction traffic at a street intersection which is already very busy. The development will also result in construction related impacts, including noise impacts.</p> <p>These impacts can be mitigated through appropriate management at the development application stage, through a requirement for a Construction Traffic Management Plan and a Noise and Vibration Management Plan.</p> <p>No change to the exhibited controls is recommended.</p>

Submitter	Summary of matter raised in submission	Officer's response
<p>3. Local resident</p>	<p><u>Height</u></p> <p>Prior to purchasing a nearby residential property, due diligence was carried out in relation to the height limits in the area. Objection is raised to the proposed increase in height - 85 metres is excessive and will directly impact upon neighbouring residential properties.</p>	<p>The review of the height limit for the site was initiated by the landowner. In December 2014, the land owner submitted a request to the City to amend certain planning controls on the site. This request was supported by a full planning justification for the change and technical studies. NSW legislation allows for this type of review of planning controls to take place.</p> <p>The City assessed the merits of this request. City staff worked collaboratively with the land owner and their consultant team to refine the proposal. The result of this work is a planning proposal and draft DCP amendment to allow for a mixed use development on the site comprised of a retail/commercial podium and taller residential towers above.</p> <p>The site occupies a prominent position and is opposite Green Square town centre where there are higher maximum building heights. In response to the maximum building heights on surrounding sites, a range of heights are proposed across the site.</p> <p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. This has included testing of shadow impacts, wind impacts, traffic and transport impacts and impacts upon the nearby heritage listed school.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>The detailed design of a scheme for the site, along with the assessment of a future development application, will provide further opportunity for the impacts on neighbouring properties to be considered.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>

Submitter	Summary of matter raised in submission	Officer's response
	<p><u>Traffic and transport</u></p> <p>Concerned that the area is already gridlocked, and there are problems with public transport access with trains and buses being overcrowded.</p>	<p>The planning proposal does not involve any change to the maximum floor space ratio permitted on the site. This means that the proposal will not increase density on the site, only the way in which the density is physically expressed. Therefore the planning proposal and draft DCP changes will not, in themselves, result in an increase in pressure existing infrastructure in the locality.</p> <p>The site is immediately adjacent to Green Square train station which has direct services to Central Sydney and Sydney Airport. The site is also well serviced by a number of bus routes which travel to a variety of destinations.</p> <p>Since early 2000, long term planning for the Green Square Urban Renewable Area has included transport studies and management plans examining road capacity, traffic management and transport infrastructure required to support the redevelopment of Green Square. These studies identified measures to improve transport in the area as development occurs. The City is pursuing actions to improve transport in the Green Square Urban Renewal Area, including continued advocacy for improved public transport in Green Square and continued work between the City and Transport for NSW to improve capacity and reliability of public transport services.</p> <p>No change to the exhibited controls is recommended.</p>
<p>4. Local resident</p>	<p><u>Height</u></p> <p>Opposed to the increase in height limit – we have height limits already which keep being raised.</p>	<p>The review of the height limit for the site was initiated by the landowner. In December 2014, the land owner submitted a request to the City to amend certain planning controls on the site. This request was supported by a full planning justification for the change and technical studies. NSW legislation allows for this type of review of planning controls to take place.</p> <p>The City assessed the merits of this request. City staff worked collaboratively with the land owner and their consultant team to refine the proposal. The result of this work is a planning proposal and draft DCP amendment to allow for a mixed use development on the site comprised of a retail/commercial podium and taller residential towers above.</p> <p>The site occupies a prominent position and is opposite Green Square town centre where there are</p>

Submitter	Summary of matter raised in submission	Officer's response
		<p>higher maximum building heights. In response to the maximum building heights on surrounding sites, a range of heights are proposed across the site.</p> <p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. This has included testing of shadow impacts, wind, impacts, traffic and transport impacts and impacts upon the nearby heritage listed school.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
	<p><u>Infrastructure</u></p> <p>Concerns that infrastructure will struggle to cope with what is already planned.</p>	<p>The <i>Green Square Infrastructure Strategy and Plan</i> was approved by Council in March 2015. It was prepared by the City in response to concerns that investment by NSW Government agencies has not kept pace with rapid redevelopment and population growth in the Green Square Urban Renewal Area, which includes the Gazcorp site. The plan details the strategies, plans and studies that support and guide the growth of Green Square and seeks to ensure that the necessary social and physical infrastructure required to support development is clearly identified and understood so that it can be delivered as development occurs. Importantly, the plan recognises that some services such as public transport, education and health care provision are not the responsibility of the City and provides a framework to work with relevant agencies to achieve more timely infrastructure provision by the NSW Government. The plan is available on the City's website here – http://www.cityofsydney.nsw.gov.au/council/about-council/meetings/calendar-and-business-papers-2015/2015/march/planning-and-development-committee</p>

Submitter	Summary of matter raised in submission	Officer's response
		<p>No change to the exhibited controls is recommended.</p>
	<p><u>Open space; Trees</u></p> <p>Open space and trees should not be replaced with concrete jungle.</p>	<p>The City recognises that the provision of high quality open spaces is essential to ensure a healthy, vibrant and sustainable community.</p> <p>The City's <i>Open Space, Sports and Recreation Needs Study 2016</i> was adopted by Council on 14 November 2016 and provides a series of directions and recommendations for the future planning, provision, development and management of public open space and recreation facilities located within the City. This Study makes reference to a number of projects which are already underway in the Green Square Urban Renewal area which will contribute to the provision of open space and recreational facilities in the locality including Gunyama Park, Drying Green Park, and Matron Ruby Grant Park (on the former South Sydney Hospital Site).</p> <p>Furthermore, the <i>Green Square Infrastructure Strategy and Plan 2015</i> also recognises the importance of delivering open space and recreational facilities for Green Square's growing population. This Plan details the existing and planned public open space areas in Green Square and discusses delivery options for securing new open space in the area.</p> <p>Sydney LEP 2012 and Sydney DCP 2012 contain controls to ensure the protection of trees within development sites and maximise the quality and quantity of healthy tree canopy coverage. The City has numerous other policies which are aimed at maintaining and increasing canopy cover, including <i>Sustainable Sydney 2030</i>, the <i>Greening Sydney Plan 2012</i>, the <i>Urban Forest Strategy 2013</i> and the <i>Tree Management Policy 2013</i>.</p> <p>There are a number of mature street trees located on the footpaths surrounding the site, and the protection of these trees will be a matter for consideration during the assessment of a future detailed development application for the site. Any such development application will also need to be supported by a landscape plan which details how the proposed development will contribute to the greening of the area.</p> <p>No change to the exhibited height controls is recommended.</p>

Submitter	Summary of matter raised in submission	Officer's response
<p>5. Local resident</p>	<p><u>Height</u></p> <p>Opposed to the increase in height. Notes the development will tower over neighbouring properties. Considers an increase in height limit with the same floor space ratio will make the whole site uneven and little justification is provided as to how the height increase gives a better built form.</p> <p>The proposal itself states that approval of a development application contravening the height standard to this degree would set an undesirable precedent and undermine the Sydney LEP 2012 height controls.</p>	<p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. The site occupies a prominent position and is opposite Green Square town centre where there are higher maximum building heights. In response to the maximum building heights on surrounding sites, taller elements (maximum RL 96.5) are proposed on the western side of the site to respond to the taller maximum permissible heights on the western side of Wyndham Street and on the Bourke Road/O'Riordan Street corner. Lower elements (maximum RL 87.5 and 79) are proposed on the eastern side of the site to respond to the lower permissible heights on the eastern side of Botany Road and the medium rise development to the north.</p> <p>While no change is proposed to the FSR control, the proposed increase in height limit will allow greater flexibility around built form, more opportunity for creative architectural expression and the high rise residential towers are likely to achieve good solar access and ventilation.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The planning proposal acknowledges that the proposed height increase would be a significant departure from the current height control on the site. It argues that a development application would not be appropriate for the consideration of such a significant change to the height control. Rather, the most appropriate means of considering such a significant change to the height control is through the planning proposal process, where extensive testing and analysis can be undertaken. The planning proposal process also permits the broader strategic considerations of allowing additional height on the site to be taken into account.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>

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6. Local resident	<p><u>Height and density</u></p> <p>A building height of 85 metres is far too high.</p> <p>480 new dwellings is too much in an already overcrowded area and will impact upon living standards.</p>	<p>The site occupies a prominent position and is opposite Green Square town centre where there are higher maximum building heights. In response to the maximum building heights on surrounding sites, a range of heights are proposed across the site.</p> <p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. This has included testing of shadow impacts, wind impacts, traffic and transport impacts and impacts upon the nearby heritage listed school.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>The planning proposal does not involve any change to the maximum floor space ratio permitted on the site. This means that the proposal will not increase density on the site, only the way in which the density is physically expressed. Therefore the planning proposal and draft DCP changes will not, in themselves, result in an increase in pressure existing infrastructure in the locality.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
	<p><u>Traffic and transport</u></p> <p>The massive increase in the residential population of the area means that buses are already overcrowded, car parking in the neighbourhood is impossible.</p>	<p>The site is well serviced by existing infrastructure and services being immediately adjacent to the Green Square Train Station which has direct services to Central Sydney and Sydney Airport. It is also well serviced by a number of bus routes which travel to a variety of destinations.</p> <p>A number of transport studies and management plans which examine road capacity, traffic management and transport infrastructure have been conducted since early 2000. These studies have identified that</p>

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		<p>measures to improve transport must be implemented as development occurs. Some key actions which the City is pursuing include:</p> <ul style="list-style-type: none"> • Continuing advocacy by the City for improved public transport in Green Square • Working with NSW Government and landowners to secure land to allow delivery of the future Eastern Transit Corridor which will connect the Green Square town centre with Central. • Continuing work between the City and Transport for NSW to develop measures to improve transport in the area including improving reliability and capacity of public transport services. <p>With regard to car parking, the planning proposal makes provision for some on-site parking for both the commercial and residential uses.</p> <p>The proponent offered for a restriction relating to car parking to be included in the planning proposal. This restriction would be that no on-site parking can be provided for any residential apartments within the development which have been created as a result of floor space awarded as a design excellence incentive through a competitive design process. This restriction has been incorporated into the site specific provisions of Sydney LEP 2012.</p> <p>The <i>City's Neighbourhood Parking Policy</i> states that new developments will be subject to street parking restrictions through ineligibility for residential parking permits. This restriction is usually implemented through development consent conditions.</p> <p>An additional restriction limiting on-site parking has been incorporated into the site specific provisions of Sydney LEP 2012.</p>
	<p><u>Construction impacts</u></p> <p>Construction work since 2000 has already resulted in noise and dust pollution.</p>	<p>Construction work to facilitate new development will result in noise impacts. These impacts can be mitigated through appropriate management at the development application stage, through a requirement for a Noise and Vibration Management Plan.</p> <p>With regard to dust, construction site operators are required by law to minimise dust emissions from sites. Council's Environmental Health Officers can take action in instances where construction dust is causing nuisance to neighbouring properties.</p> <p>No change to the exhibited controls is recommended.</p>

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7. "Sydney Your Say" respondent	<p><u>Height</u></p> <p>The building height should be limited. 8 - 10 floors is enough.</p>	<p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site. This has included testing of shadow impacts, wind impacts, traffic and transport impacts and impacts upon the nearby heritage listed school.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>It is noted that the existing controls would permit a building of greater than 15 storeys at 284 Wyndham Street.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
8. "Sydney Your Say" respondent	<p><u>Height</u></p> <p>An 85m building height is too high – we already have a Central Business District only 3km away.</p>	<p>While it is acknowledged that the Sydney CBD is a short distance away, Green Square has been identified as an area for considerable growth, infrastructure improvements and redevelopment over the next 20 years and beyond. By 2030, Green Square is expected to provide 22,000 jobs and house 61,000 residents. Much of the new development in the Green Square area will be provided through high density and medium density developments, supported by social and physical infrastructure including open spaces and parks.</p> <p>Extensive analysis has been undertaken in support of the planning proposal to raise the maximum building height on the site.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p>

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		<p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
<p>9. "Sydney Your Say" respondent</p>	<p><u>Height</u></p> <p>The City of Sydney should stop approving high rise apartment buildings over 8 floors. High rise apartment buildings in the area are casting shadows and blocking blue sky, and residents need access to sunshine and blue sky for welfare.</p>	<p>The height limits for high rise developments in the City are determined after extensive analysis and testing, including in relation to overshadowing, wind impacts and view analysis. Different building heights across the City supports development of different intensities, and allows for variety in urban form and visual interest.</p> <p>The planning proposal has been subject to extensive testing, including consideration of overshadowing impacts generally and in relation to the Green Square Plaza which is located to the south-west of the site.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>The detailed design of a development within the building envelope will involve consideration of impacts on neighbouring properties, including in relation to overshadowing impacts, and this will be subject to assessment at the development application stage.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>
	<p><u>Infrastructure</u></p> <p>Council continues to fail to address the roads and the</p>	<p>The <i>Green Square Infrastructure Strategy and Plan</i> details the strategies, plans and studies that support and guide the growth of Green Square. The plan</p>

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	<p>lack of infrastructure needed to meet the needs of the massive population increase.</p>	<p>seeks to ensure that the necessary social and physical infrastructure required to support development is clearly identified and understood so that it can be delivered as development occurs. Importantly, the plan recognises that some services such as public transport, education and health services are not the responsibility of the City and provides a framework to work with relevant agencies to achieve more timely infrastructure provision by the NSW Government. The plan is available on the City's website here – http://www.cityofsydney.nsw.gov.au/council/about-council/meetings/calendar-and-business-papers-2015/2015/march/planning-and-development-committee</p> <p>No change to the exhibited controls is recommended.</p>
<p>10. "Sydney Your Say" respondent</p>	<p><u>Height</u></p> <p>The proposed building heights are too high and are likely to be out of balance with the heights of buildings within the immediate surrounds. The existing height limits should be retained to maintain balance.</p>	<p>The site occupies a prominent position and is opposite Green Square town centre where there are higher maximum building heights. In response to the maximum building heights on surrounding sites, taller elements (maximum RL 96.5) are proposed on the western side of the site to respond to the taller maximum permissible heights on the western side of Wyndham Street and on the Bourke Road/O'Riordan Street corner. Lower elements (maximum RL 87.5 and 79) are proposed on the eastern side of the site to respond to the lower permissible heights on the eastern side of Botany Road and the medium rise development to the north.</p> <p>The planning proposal heights are considered to be the maximum heights achievable on the site without resulting in unacceptable overshadowing impacts. Two post-exhibition amendments have been incorporated which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights.</p> <p>The proposed building heights and building envelope can result in a scheme that is able to satisfy key objectives and provisions of relevant SEPPs, Sydney LEP 2012 and Sydney DCP 2012.</p> <p>No change to the exhibited height controls is recommended. Two amendments which remove the possibility of additional building height being achieved on the site beyond the planning proposal heights have been incorporated.</p>

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<p>11. "Sydney Your Say" respondent</p>	<p><u>Bicycle facilities</u></p> <p>The development should provide at least 100 secure bike parking cages for residents with 24 hour access.</p> <p>End of trip facilities should be provided for the commercial uses in the site, to provide cyclists with showers, lockers and change rooms.</p>	<p>Sydney DCP 2012 sets out on site bicycle parking rates according to the proposed land use, for example, residential, commercial etc. Any future development application for the site would be expected to provide bicycle parking and end-of-trip facilities in accordance with the rates set out in Sydney DCP 2012.</p> <p>Development consent D/2012/1021/B relates to the site and grants approval for the construction of a part 2 / part 3 retail and commercial development. There are conditions attached to this consent which require the provision of on-site bicycle parking and associated facilities. If this consent is implemented, bicycle parking and facilities are to be provided in accordance with the consent.</p> <p>No change to the exhibited controls is recommended.</p>
<p>12. "Sydney Your Say" respondent</p>	<p><u>Bicycle facilities</u></p> <p>The Traffic Transport Assessment has inadequately dealt with cycling access. A more rigorous assessment of cycling provision is needed, and should include: cycling access to/from the development; internal bike parking and end-of-trip facilities; the option of underground cycling links through this dangerous intersection.</p> <p>The Traffic and Transport assessment unduly focusses on car parking provision. Westconnex will reduce traffic flows for all roads and intersections in this area to level F –</p>	<p>The City is supportive of cycling as an active mode of transport, and is committed to creating and maintaining a comfortable and bicycle friendly environment in Sydney. The City is building a network of cycle paths across the local government area, including extensive cycling infrastructure within the Green Square Urban Renewal Area.</p> <p>The City is supportive of improving cycling accessibility and safety on the busy roads and intersections in Green Square, including those around the Gazcorp site. However, some of the actions required to achieve this are the responsibility of other NSW Government agencies. The City is committed to working with relevant agencies to ensure the delivery of the necessary cycling infrastructure within the Green Square area.</p> <p>With regard to bicycle parking and end-of-trip facilities on site, any future development would be expected to provide such in accordance with the rates set out in Sydney DCP 2012. If the existing development consent (D/2012/1021/B) for a retail and commercial development on the site is implemented, bicycle parking and facilities will need be provided in accordance with the conditions of this consent.</p> <p>The City continues to oppose Westconnex and is working with community and business groups opposing Westconnex. The project will have significant negative impacts in the city as it will funnel traffic into areas such as Alexandria, Waterloo and Green Square.</p>

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	the traffic assessment should account for this.	No change to the exhibited controls is recommended.
13. "Sydney Your Say" respondent	<p><u>Location</u></p> <p>Proposal is an excellent idea given the site's proximity to the Green Square town centre & Green Square Railway Station.</p> <p>Proposal will provide a visual transition between the taller buildings in Green Square town centre and apartment buildings along Botany Road.</p> <p>Proposal will provide more homes for Sydney's growing population in a central and convenient position.</p>	<p>Noted.</p> <p>No change to the exhibited controls is recommended.</p>
	<p><u>Apartment sizes</u></p> <p>Apartment sizes should be more generous, rather than the small sizes that have become common.</p>	<p>The Apartment Design Guide (ADG) sets out minimum internal areas for apartments based on the apartment type (studio, 1 bedroom, 3 bedroom etc). The apartments within any future development would be expected to comply with the minimum apartment sizes set out in the ADG. This will be a matter for consideration in the assessment of a development application involving the proposed residential towers.</p>
Public authority submissions		
14. Sydney Water	<p><u>Infrastructure</u></p> <p>No objections raised.</p> <p>The trunk water and trunk wastewater systems have adequate capacity to service this development area.</p>	<p>Noted.</p> <p>No change to the exhibited controls is recommended.</p>

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15. Ausgrid	<p><u>Infrastructure</u></p> <p>No objections raised.</p> <p>Due consideration is to be given to the compatibility of the proposed development with existing Ausgrid infrastructure.</p> <p>Ausgrid have provided detailed conditions in relation to the redevelopment of the site.</p>	<p>The conditions provided by Ausgrid are matters to be taken into account at the design stage of a future development.</p> <p>No change to the exhibited controls is recommended.</p>
16. Department of Education	<p><u>Green Square School - Heritage item</u></p> <p>The school site is listed as a heritage item under Sydney LEP 2010. The school buildings and plantings are landmarks in the locality which allow an interpretation of development on Botany Road.</p>	<p>Botany Road serves as a significant barrier between the site and Green Square School, and the school buildings are setback within the site. As part of the Urban Design Study prepared to support the planning proposal, a view analysis was undertaken and illustrates that the impacts of increased building heights on the setting of the heritage item is minor and acceptable. The potential for any proposed development on the site to adversely impact on the heritage item is relatively low. The assessment of a future development application will provide further opportunity for impacts on the heritage listed school to be considered.</p> <p>No change to the exhibited controls is recommended.</p>
	<p><u>Development impacts</u></p> <p>The redevelopment of the Gazcorp site, together with potential further development in and around the Green Square precinct, will have a cumulative impact in the locality in relation to traffic generation, overshadowing, overlooking and</p>	<p>The Gazcorp site, as well as Green Square School, are located within the Green Square Urban Renewal Area. Green Square has been identified as an area for considerable renewal and redevelopment over the next 20 years and beyond.</p> <p>The planning proposal has been supported by extensive analysis of potential impacts, including a Traffic and Transport Impact Assessment and shadow testing.</p> <p>The Traffic and Transport Impact Assessment concludes that given the site's location next to Green Square Train Station, the majority of residents will</p>

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	<p>noise impacts. The successful operation of the school relies on safe pedestrian and vehicular access, minimal noise interference and avoidance of overshadowing and overlooking of internal and external spaces.</p> <p>Council should include an assessment of these impacts to ensure the school can continue without significant environmental impacts from the development of nearby properties.</p>	<p>utilise rail services rather than private cars for the majority of trips, and that the net vehicular impacts of the proposed development are minimal.</p> <p>The shadow testing shows that a high rise development on the site would not result in any overshadowing of Green Square School between 9am and 3pm at winter solstice (given the school's location to the north-east of the site).</p> <p>The detailed design of a scheme for the redevelopment of the site will need to consider how to mitigate against overlooking impacts. It will also need to consider the potential noise impacts of uses on the site and how to protect the amenity of nearby properties.</p> <p>The assessment of any future development application for the redevelopment of the site will consider whether potential impacts upon neighbouring properties, including Green Square School.</p> <p>No change to the exhibited controls is recommended.</p>
<p>17. Transport for NSW</p>	<p><u>Botany Road access</u></p> <p>Botany Road is a classified road, and therefore the proposed access arrangements for the development off Botany Road should be approved by RMS.</p> <p>Proposed driveway access off Botany Road and median treatment (to restrict right turning movements into the site from Botany Road) have the potential to impact on bus services. If access is approved by RMS, Transport for NSW request further consultation to minimise the impacts on existing and future bus services along Botany Road.</p>	<p>RMS was consulted regarding the planning proposal. RMS has not raised objection to the proposed access arrangements to the site from Botany Road.</p> <p>RMS has not raised objection to the proposed left in/left out driveway access or the construction of a median strip on Botany Road.</p> <p>RMS advised that the residential car park access point should be located in the farthest north-easterly point of the building (at least 100m) from the Bourke Road / Botany Road intersection. This advice is incorporated into the draft DCP controls which show the residential vehicular entry to be located at the most northerly point of the Botany Road frontage, as far away from the Bourke Road/Botany Road intersection as possible.</p> <p>No change to the exhibited controls is recommended.</p>

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	<p>They also request that the proponent demonstrate that the proposed left in / left out arrangement for accessing the residential car park would not cause queuing on Botany Road.</p>	
	<p><u>Active Transport</u></p> <p>Inclusion of bicycle facilities and wayfinding strategies to assist with increasing the mode share of walking and cycling.</p>	<p>These are matters to be taken into account in the detailed design of a redevelopment scheme for the site.</p> <p>No change to the exhibited controls is recommended.</p>
<p>18. Roads and Maritime Services</p>	<p><u>Traffic and Transport</u></p> <p>No objections raised, noting that previous advice in relation to the following matters has been considered:</p> <ul style="list-style-type: none"> • left in / left out access on Botany Road; • construction of a median on Botany Road to restrict right turning movements to the residential development; • location of the residential car park entrance at the farthest north easterly point of the building (at least 100m) from the Bourke Road/Botany Road intersection. 	<p>Noted.</p> <p>No change to the exhibited controls is recommended.</p>

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19. Sydney Trains	<p><u>Infrastructure</u></p> <p>Given the proximity of the site to the Airport Line Tunnel, any proposed development will need to comply with the <i>Airport Line Tunnel Protection Guidelines</i>.</p>	<p>The <i>Airport Line Tunnel Protection Guidelines</i> will need to be taken into account at the detailed design stage of a development for the site.</p> <p>No change to the exhibited controls is recommended.</p>
20. Sydney Airport Corporation	<p>The proposed height controls will allow a development which will penetrate the Obstacle Limitations Surfaces (OLS) which set the height limits for structures around an aerodrome for the purposes of protecting aviation airspace.</p> <p>They do not support the development of any structure which intrudes into the OLS.</p> <p>The proposal has been referred to the Department of Infrastructure and Regional Development for determination, as the Commonwealth body with ultimate responsibility for airspace operations. Submissions have also been invited from the Civil Aviation Safety Authority, Airservices and Airlines.</p>	<p>A preliminary aeronautical assessment was submitted in support of the planning proposal. This concluded that based on a preliminary assessment, an application supported by a full aeronautical assessment and safety case would be approved by the Department of Infrastructure and Regional Development.</p> <p>A post exhibition amendment has been incorporated which specifies that the maximum building heights as shown on Height of Building Maps 17 and 18 are subject to the written approval of the relevant Commonwealth body with regard to airspace operations. Any future development application which penetrates the Obstacle Limitations Surfaces would require the concurrence of Sydney Airport Corporation.</p> <p>An amendment has been incorporated which states that the maximum building heights (as specified through the planning proposal) are subject to the written approval of the relevant Commonwealth body with regard to airspace operations.</p>