

Annexure Q:

Acoustic Report

SYDNEY OLYMPIC PARK

MASTER PLAN 2050

ACOUSTIC REPORT

RWDI # 2303761

3 September 2024

SUBMITTED TO

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GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

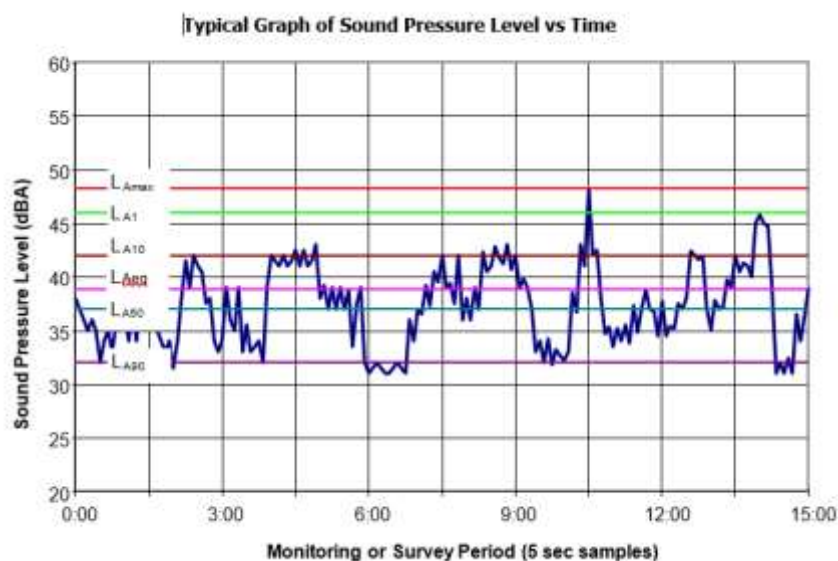




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1 INTRODUCTION

The Sydney Olympic Park Master Plan 2050 (Master Plan 2050) provides guidance for proposed development within Sydney Olympic Park. Under the *Sydney Olympic Park Authority Act 2001 (SOPA Act)*, Sydney Olympic Park Authority (SOPA) is required to maintain and update the Master Plan. SOPA will update their Noise Management Plan within 5 years of this report.

RWDI Australia have been engaged to provide the acoustic provisions within the Master Plan 2050. This update addresses the amendments to the Sydney Olympic Park layout, land use and building massing to facilitate the delivery of a Sydney Metro West station and its integration with this precinct.

The primary focus of these guidelines is to minimise potential acoustic impacts of sporting and entertainment venues on other land uses within and around Sydney Olympic Park. Our review includes the updated built form and the following noise sources:

- Noise sources associated with Stadium Australia, including both sports and concert events;
- Noise produced by Sydney Showground events;
- Noise produced by traffic associated with events and day-to-day operation of the park;
- The Royal Easter Show outdoor carnival;
- Plant noise produced by commercial developments within the park; and
- Noise produced by the rail link.

A high-level review of the noise implications associated with the Food and Beverage (F&B) and public domain events within the Central / Metro precinct as well as crowds moving toward the Metro Station following an event is provided in Section 7.

Table 1-1 details the sections in this report where the Study Requirements for the Master Plan 2050 provided by the Department of Planning, Housing and Infrastructure (DPHI) in December 2022 and amended in June 2023 are addressed.

Table 1-1: Sections where the report addresses DPHI's Study Requirements relating to noise.

DPE Study Requirement Section	Noise Requirements to be addressed	Where it is addressed in the report
5. Sustainability, Water and Waste Management and Resilience	<p>The Sustainability Report is to address whether the proposed changes to the master plan require:</p> <ul style="list-style-type: none">• A review of the existing acoustic controls and any further assessment to ensure that noise controls are adequate	Section 4

DPE Study Requirement Section	Noise Requirements to be addressed	Where it is addressed in the report
	<ul style="list-style-type: none"> Consider cumulative noise and vibration impacts on receivers, including from noise generating activities being carried out (or to be carried out) both inside and outside the proposed project area; 	Section 3, Section 4, Section 5, Section 6.
	<ul style="list-style-type: none"> consider noise impacts from entertainment activities and events at Sydney Olympic Park, including a review of the maximum permissible noise levels for events under Sydney Olympic Park Act 2001 and SOPA's current Noise Management Plan, to determine if locating housing closer to venues would be appropriate and whether there will be a need to impose lower noise levels for venues; 	Section 3 and Section 4.
	<ul style="list-style-type: none"> consider noise impacts from other noise producing activities including mixed use activities, late night entertainment/commercial activities, marshalling of people during events, and noise from new and proposed transport links such as the Sydney Metro and the light rail; 	Section 3, Section 4, Section 5, Section 6.



1.1 Master Plan 2050

Sydney Olympic Park is transforming into a thriving suburb strategically located in the centre of Greater Sydney. It is a suburb that benefits from diverse land uses, proximity to Sydney and Parramatta central business districts, and is of national significance, all of which have played an important role in its evolution since hosting the Sydney 2000 Olympic and Paralympic Games. As the 640-hectare site continues to evolve into vibrant neighbourhoods, it will reconnect with its Wangal roots and extensive natural assets to provide a meaningful connection to Country.

The Sydney Olympic Park 2050 Vision & Strategy (the Vision) was released in June 2022 and serves as a roadmap to inform decision-making for the next three decades. Master Plan 2050 is the next stage of strategic planning for Sydney Olympic Park. Master Plan 2050 will ensure a coordinated, long-term development plan is prepared for the whole precinct.

The most recent iterations of a master plan for Sydney Olympic Park were completed in 2018 and 2021, to support the delivery of Sydney Metro West. Building upon the Vision, Master Plan 2050 considers Sydney Olympic Park holistically, seeking opportunities to integrate thinking about the parklands and urban core together, enhancing its role in Greater Sydney.

The Vision articulates an aspiration to position Sydney Olympic Park as Sydney's Green Beating Heart: a place energised with everyday life, Country-first, nature positive and where Sydney comes to play.

In 2050, Sydney Olympic Park will be a complex, layered suburb offering a rich and varied range of experiences. Many will live and work here, and others will visit for events, diverse attractions, or everyday retail and entertainment. Master Plan 2050 aims to balance certainty with flexibility enabling Sydney Olympic Park's future to be resilient, dynamic and able to leverage future opportunities and technologies not yet known.

1.2 Planning Context

Sydney Olympic Park, while located within the City of Parramatta local government area, is managed by SOPA in accordance with the SOPA Act. The SOPA Act requires that a master plan be prepared to guide the planning, management, protection and development of Sydney Olympic Park.

The Master Plan is given statutory effect by *State Environmental Planning Policy (Precincts - Central River City) 2021* (Central River City SEPP), Appendix 4 - Sydney Olympic Park, which establishes land use zoning and key development planning controls for Sydney Olympic Park. The Master Plan contains detailed principles and controls to supplement the provisions of the SEPP.

This review of the Master Plan will culminate in Master Plan 2050, which will supersede the following Master Plans that currently apply to Sydney Olympic Park:

- Sydney Olympic Park Master Plan 2030 (2018 Review)
- Sydney Olympic Park Master Plan (Interim Metro Review)

Master Plan 2050 will be implemented through consequential amendments to the Central River City SEPP, as well as amendments to other policies and plans as required.



It will also be informed by previous studies and analysis, updated studies and will align with NSW Government strategic and design policies.

1.3 Regulatory Context

The Sydney Olympic Park Authority Regulation 2018 under the Sydney Olympic Park Authority Act 2001 governs the noise limits at Sydney Olympic Park. It makes provisions for the regulation of activities at Sydney Olympic Park generally, the regulation of activities at the sportsgrounds within Sydney Olympic Park (such as the Stadium Australia and the Sydney Olympic Park Aquatic Centre), and the functions of a local government council that the SOPA may exercise in relation to Sydney Olympic Park.

1.4 Site Description

The land covered by the Sydney Olympic Park is shown in Figure 1-1.

Since Master Plan 2030 first came into effect, Sydney Olympic Park has grown considerably with the addition of residential and commercial developments.

The proposed updates to the central precinct include a new Metro Station and the redevelopment of much of the land into a mixed used residential, commercial and entertainment precinct. presents an illustration of the proposed Central precinct with the location of the Metro Station highlighted in pink.

Figure 1-1 Lands covered by the Sydney Olympic Park Master Plan 2050





2 NOISE MONITORING

Noise monitoring was conducted to ensure that assumptions made with regards to environmental noise and detailed in Master Plan 2030 (Interim Metro Review) remain valid for this assessment. This is discussed in the following sections.

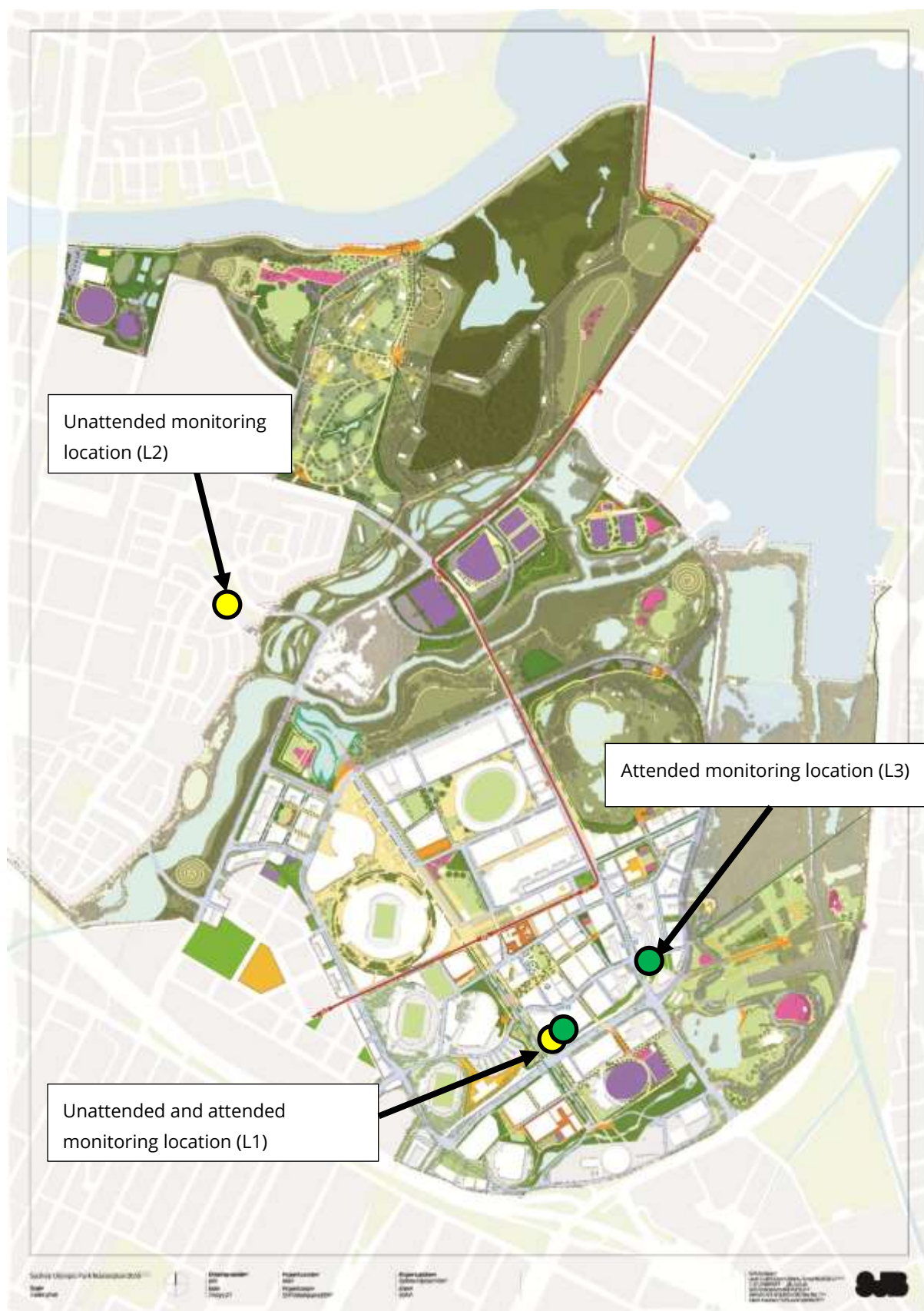
2.1 Unattended Noise Monitoring

Two unattended noise monitors were installed at the following locations to measure the ambient and background noise levels (refer also to):

- Location 1 (L1): corner of Olympic Boulevard and Sarah Durack Avenue, Sydney Olympic Park. The purpose of this was to determine the background noise level (which affects residential noise criteria in this area) and noise levels from passing rail traffic on the Sydney Olympic Park loop line.
- Location 2 (L2): The logger was deployed at 3 Wenden Avenue, Newington. The purpose of this was to determine the background noise level which affects residential noise criteria in this area. The background noise environment at this location was dominated by distant traffic noise from surrounding roadways, and noise from birds and insects.

A map of the noise monitoring locations is shown in Figure 2-1 below.

Figure 2-1 Master Plan 2050 monitoring locations



The unattended noise measurements were conducted using noise monitors which were programmed to measure A-weighted, statistical noise levels stored at 15-minute intervals on fast response mode. The noise monitors were calibrated at the beginning and end of the monitoring period, with no significant drift being observed.

The measured noise levels at the unattended noise monitoring locations are presented in Table 2-1 and Table 2-2. Refer to Appendix A for a graph of the unattended noise monitoring data.

The unattended noise monitoring data has been analysed in conjunction with weather data obtained from the nearest weather station. Any noise measurement data that has been adversely affected by inclement weather as defined by the EPA Noise Policy for Industry (i.e., periods where average wind speeds exceed 5 m/s and periods that are rain affected) have been excluded in determining the existing noise levels on site.

Table 2-1: Unattended Noise Measurements – Ambient (L_{eq}) Noise Levels

Noise Monitor Location	Monitoring Period	Time of Day	Measured Ambient Noise Levels
Location 1	24/07/2023 - 31/07/2023	Day (7 am – 10 pm)	55 dBA L_{eq} , 15-hr
		Night (10 pm – 7 am)	50 dBA L_{eq} , 9-hr
Location 2	1/12/2023 – 8/12/2023	Day (7 am – 10 pm)	53 dBA L_{eq} , 15-hr
		Night (10 pm – 7 am)	48 dBA L_{eq} , 9-hr

Table 2-2: Unattended Noise Measurements – Background (L_{90}) Noise Levels

Noise Monitor Location	Monitoring Period	Time of Day	Rating Background Noise Level ^[1]
Location 1	24/07/2023 - 31/07/2023	Day (7 am – 6 pm)	40 dBA $L_{90}(\text{period})$
		Evening (6pm – 10 pm)	43 dBA $L_{90}(\text{period})$
		Night (10 pm – 7 am)	41 dBA $L_{90}(\text{period})$
Location 2	1/12/2023 – 8/12/2023	Day (7 am – 6 pm)	37 dBA $L_{90}(\text{period})$
		Evening (6pm – 10 pm)	37 dBA $L_{90}(\text{period})$
		Night (10 pm – 7 am)	30 dBA $L_{90}(\text{period})$

Note [1] The rating background noise level has been calculated in accordance with the requirements of section B1.3 of the EPA Noise Policy for Industry 2017.



2.2 Short-Term Train Noise Measurements

RWDI personnel also conducted short-term attended noise measurements at L1 and L3 locations to supplement the long-term unattended noise monitoring. The measurements were conducted on 24 July and 31 July 2023 using a Class 1 NTi Audio XL2 Sound Level Meter. The sound level meter was calibrated at the beginning and end of the measurement periods and no significant drift was observed.

The weather conditions during the attended noise measurements were clear with little to no wind.

The short-term noise measurement results are summarised in Table 2-3 below.

Table 2-3 Short-Term Noise Measurement Results (Conducted on 24 July and 31 July, 2023)

Measurement Location (Refer to)	Measurement Time	Measured Ambient Noise Level dBA L _{eq} (15min)	Noted Noise Source(s)
L1: 8m from railway	5:20pm	59	15-min measurement of rail traffic. 1 train every 10 minutes. Main noise contributions were rail noise and distant traffic.
L3: 20m from railway	2:30pm	67	15-min measurement of rail traffic. 1 train passby during the measurement period. Noise contribution from trains passby was not measurable due to surrounding noise sources. The measured train passby generated a sound pressure level of 75dBA L _{eq} over 40 s.

3 MODELLED SCENARIOS

Modelled scenarios are consistent with previous versions of the Master Plan 2030 with the exception of the updated precinct built form and the location of the Sydney Royal Easter Show activities. These scenarios include:

- Sporting event in Stadium Australia;
- Concert in Stadium Australia;
- Carnival noise (Royal Easter Show);
- Late night party noise;
- Football (Sydney Showground);
- Traffic Noise; and
- Rail Noise.

Whilst there are other noise generating activities held in Sydney Olympic Park, these are considered the most critical.

The indicative building locations and heights have been provided by the SOPA.

Site-related noise emissions were modelled with the “CadnaA” noise prediction program, using the Concawe noise prediction algorithms. Factors that are addressed in the noise modelling are:

- Sound level emissions and location;
- Screening effects from buildings;
- Ground topography;
- Noise attenuation due to geometric spreading;
- Ground absorption; and
- Atmospheric absorption.

The impact of different scenario noise sources was considered individually and cumulatively on the acoustic suitability for residential development of different areas of Sydney Olympic Park. Each source has been modelled at heights of 20m, 40m and 80m above ground, to reflect the impact of the least screened portions of mid-rise buildings, high-rise buildings, and towers respectively.

The noise contour plots are derived from the individual modelled scenarios. However, they are not discussed in detail in this report as the long-term strategy for the development is best informed by the combined effects, as illustrated by the plots identifying the acoustic suitability for residential development of the different areas of Sydney Olympic Park. These have been derived from all of the most critical scenarios identified above on the basis that they would generally occur at different times of the day and would therefore not act cumulatively.

3.1 Source Noise Levels

The sound power levels for Park events used in this assessment are drawn from our previous assessments and more recent event monitoring data. These are summarised in Table 3-1.

The location of these venues is shown in Figure 3-1 below.

Table 3-1 Sound Power Levels used in noise modelling of Park Events

Event, Location & Plan Label	Sound Power Level (dBA L _{Aeq})
Stadium Australia Events (3)	
Stadium Australia Sport Events (80,000 people) Crowd & PA Noise	136
Stadium Australia Rock Concert + Crowd Noise	145
Sydney Showground Events (1)	
Showground Rock Concert On-axis power level for single speaker stack	142
Showground Rock Concert Crowd Noise	128
Showground AFL / Cricket (25,000 people in Main Arena) Crowd & PA Noise	131
Royal Easter Show – Main Arena event, Crowd & PA	125
Royal Easter Show – Carnival rides external to Main Arena	118
Athletics Centre (4)	
Athletics Event Crowd & PA Noise	129
Qudos Bank Arena (2)	
(Indoor) Rock Concert	120 (external to arena)

Figure 3-1 Major Venues Located in the Town Centre



Major Venues referenced in Figure 3-1	Venues
1	Showground Stadium
2	Sydney SuperDome
3	Stadium Australia
4	Athletics Stadium
5	Sydney Olympic Park Aquatic Centre
6	Warm up Arena
7	Sydney Olympic Park Hockey Centre
8	Sydney Olympic Park Sports Centre



Major Venues referenced in Figure 3-1	Venues
9	Ken Rosewall Arena
10	Tom Wills Oval

4 ACOUSTIC SUITABILITY FOR RESIDENTIAL DEVELOPMENT

Each scenario / noise type was modelled separately, and noise contours were derived based on the external criteria. Contours with respect to the corresponding criteria were then summed graphically to form contours of 'Acoustic Suitability for Residential Development' (ASRD), covering all noise types.

For the individual scenarios there are differing noise criteria that determine the suitability of a site, these criteria are set out in Figure 4-1. The table also identifies the levels that correspond to the contours for 'Some Mitigation Required', 'Maximum Mitigation Required', and 'Not Suitable for Residential Development' conditions shown on the plots. These criteria are similar to those in Master Plan 2030.

Table 4-1 Residential noise criteria for each noise type and contour levels

Noise Type	Source of Criterion	Noise Measure	External Criterion ⁵	Some Mitigation Required	Substantial Mitigation Required	Maximum Mitigation Required	Not Suitable for Residential Development
Sports & Concerts	SOP Guidelines ¹	L _{AMax}	60dBA	>60dBA	>70dBA	>80dBA	>85dBA
Late Night Parties	SOP Guidelines ¹	L _{eq,125Hz,15min}	50dB	>50dB	>60dB	>70dB	>75dB
Industrial	Noise Policy for Industry ²	L _{Aeq,15min}	45dBA	>45dBA	>55dBA	>65dBA	>70dBA
Carnival Area	Development Consent	L _{A10,15min}	45dBA	>45dBA	>55dBA	>65dBA	>70dBA
Road Traffic	Road Noise Policy ³	L _{Aeq,9hr} (10pm to 7am)	50dBA	>50dBA	>60dBA	>70dBA	>75dBA
Rail Traffic	Department of Planning ⁴	L _{Aeq,9hr} (10pm to 7am)	45dBA	>45dBA	>55dBA	>65dBA	>70dBA

- Notes:
- 1) Sydney Olympic Park Noise Management Guidelines, Report No. 99053, July 2002.
 - 2) Night time amenity criterion for 'Urban' areas, NSW Noise Policy for Industry, EPA.
 - 3) NSW Road Noise Policy, EPA (formerly the ECRTN).
 - 4) Development Near Rail Corridors and Busy Roads – Interim Guideline, NSW Department of Planning.
 - 5) The equivalent internal noise criterion is 10dBA below the external criterion, 10dBA being the typical attenuation of an open window.

The following three figures present the Acoustic Suitability for Residential Development (ASRD). Figure 4-1 shows these areas at a 20m receiver height, representing mid-rise buildings, and valid when assessing buildings <25m height. Figure 4-2 shows this at a 40m receiver height representing mid-rise buildings between 25m and 50m height. Figure 4-3 shows this at an 80m receiver height representing high-rise buildings over 50m height. There is minimal difference in the contours above this height due to lack of shielding, therefore Figure 4-3 can be used for buildings 100m tall and above.

Figure 4-1 Acoustic suitability for residential development, under 25m building height

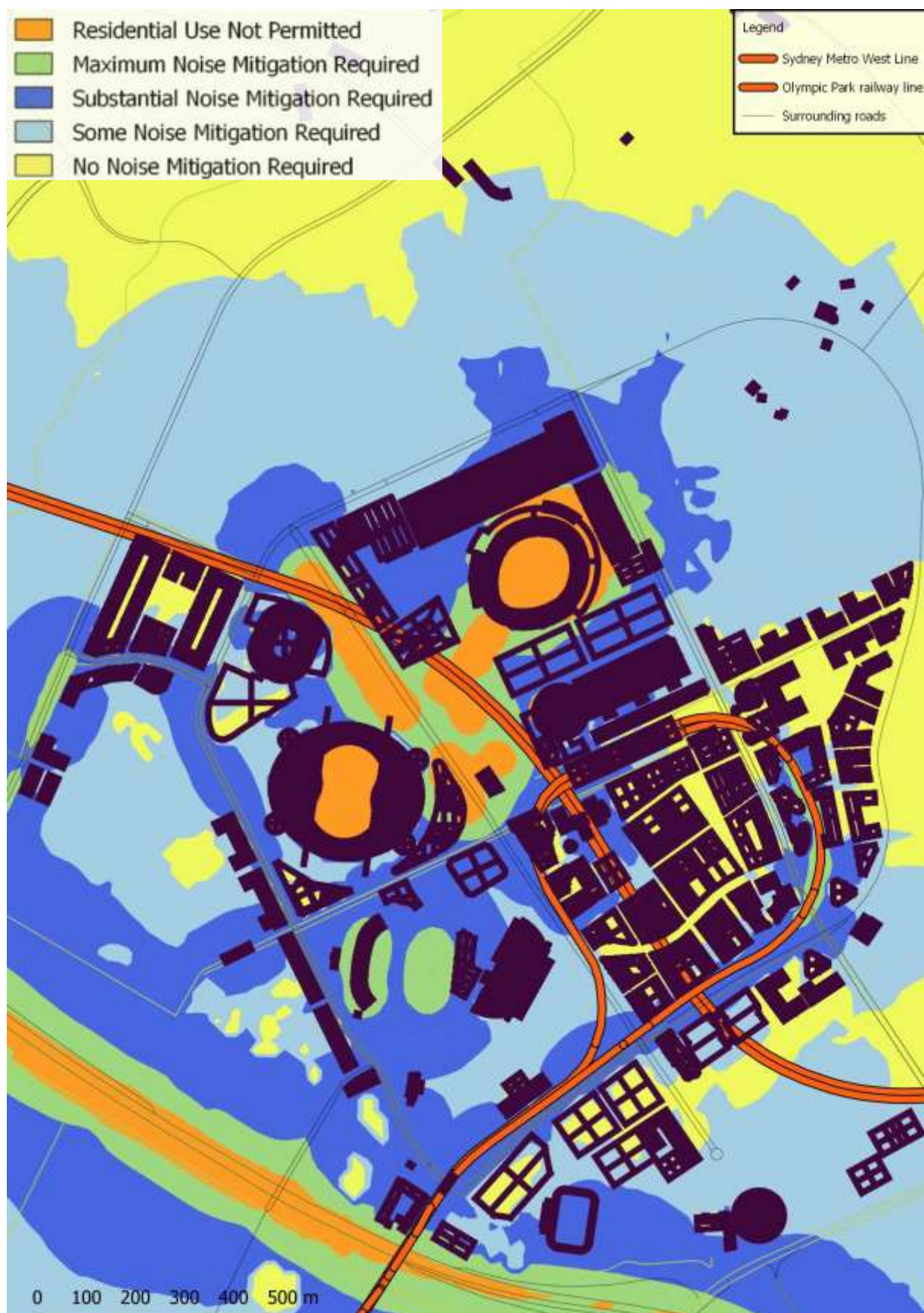
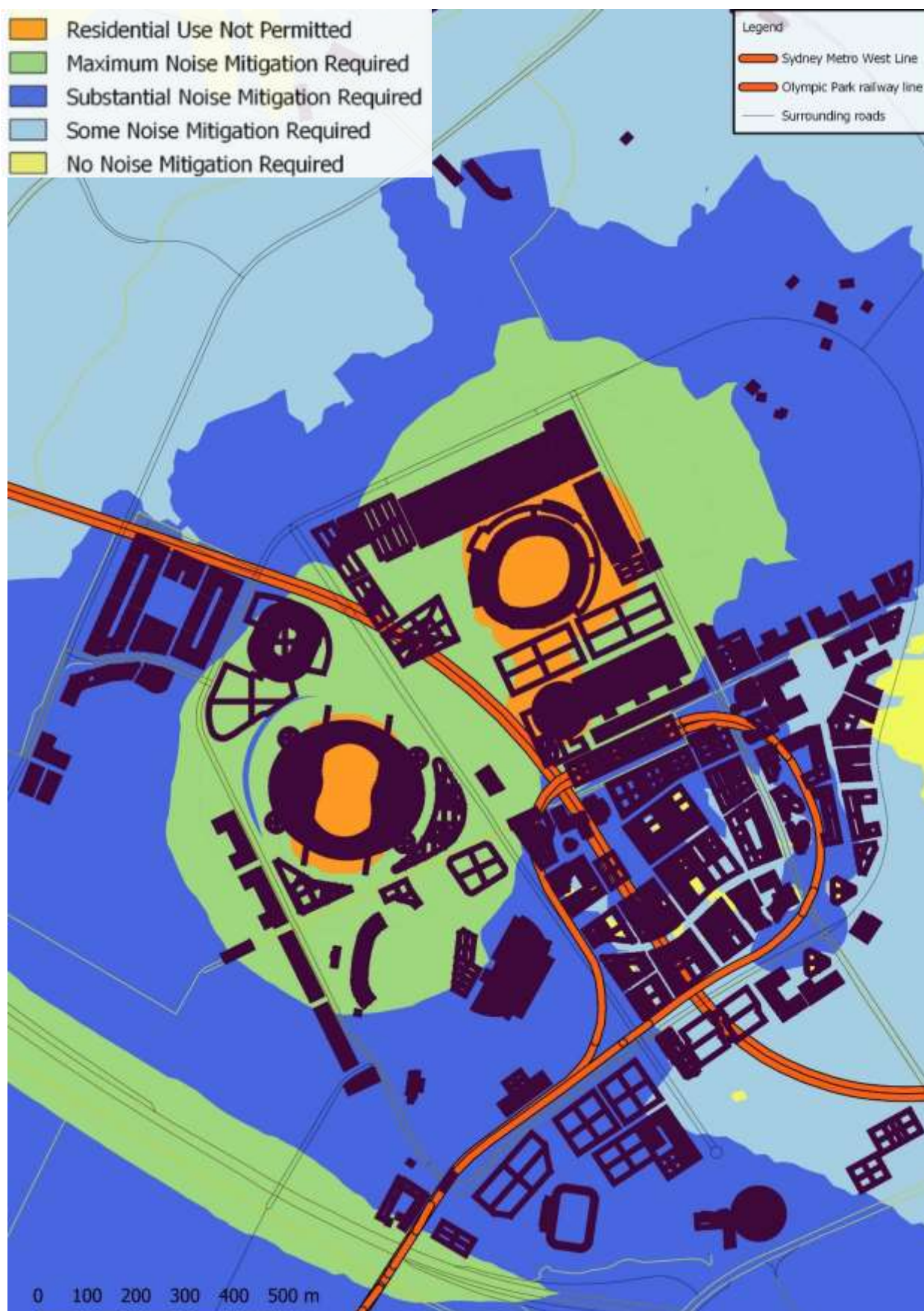


Figure 4-2 Acoustic suitability for residential development, 25m to 50m building height



Figure 4-3 Acoustic suitability for residential development, over 50m building height



In-Principle Acoustic Façade Design

The acoustic design of a building façade – particularly where full-width and/or full-height glazing is preferred - is dictated by the acoustic performance of its glazing.

The design of any acoustically-rated facade can only be confirmed at the detailed design stage once building parameters, such as building orientation, glazing dimensions, room furnishings and decisions on including additional acoustic building elements, such as soffit absorption, blade wall or baffles are known. The in-principle facade treatments below are based on generic design details of habitable rooms located on exposed facades. The identification of such generic treatments is for the purpose of establishing the feasibility of siting residential buildings in the chosen locations. Each proposed development should be subject to a detailed acoustic assessment to be submitted with the development application.

Table 4-2 outlines typical in-principle glazing treatments that will provide the level of noise reduction required for each building facade.

Table 4-2 In-Principle Façade Treatments for Project Buildings

Glazing Option	Description	Noise Reduction dBA for Relevant Sources	Comments ¹ on Acoustic Suitability Zoning
Option 1	Openable sliding door - 6.38mm glass + acoustic seals	< 26	This level of treatment would be appropriate for façades in “Some Noise Mitigation Required” zones
Option 2	Openable sliding door - 10.38mm glass + acoustic seals	26 – 30	This level of treatment would be appropriate for façades in “Some Noise Mitigation Required” or “Substantial Noise Mitigation Required” zones
Option 3	Single-Leaf, double- glazed sliding door – 12.38mm laminated glass + 7.52 laminated glass + 22mm air gap + acoustic seals	30 – 32	This level of treatment would be appropriate for façades in “Substantial Noise Mitigation Required” and “Maximum Noise Mitigation Required” zones
Option 4	Acoustically-enclosed balcony	> 32	This level of treatment would be appropriate for façades in “Maximum Noise Mitigation Required” zones

Note 1: Comments regarding façade treatments are indicative only. Final treatments need to be determined following a detailed noise study for each building application.

5 METRO STATION EVENT CROWD

The Sydney Olympic Park Pedestrian Assessment has developed scenarios for crowds leaving events at Sydney Olympic Park and accessing various forms of transport away from the site. This assessment found that following a large event at the stadium approximately 26,000 people could be accessing the Metro Station late in the evening. These pedestrians would be marshalled along Olympic Boulevard before entering the Urban Centre and passing by residential receivers before entering the Metro Station, as shown in Figure 5-1.

Figure 5-2 presents the proposed land uses for the Urban Centre, where the Metro Station marshalling area shown shaded in yellow.

Figure 5-1 Sydney Olympic Park Pedestrian Assessment – Metro Access

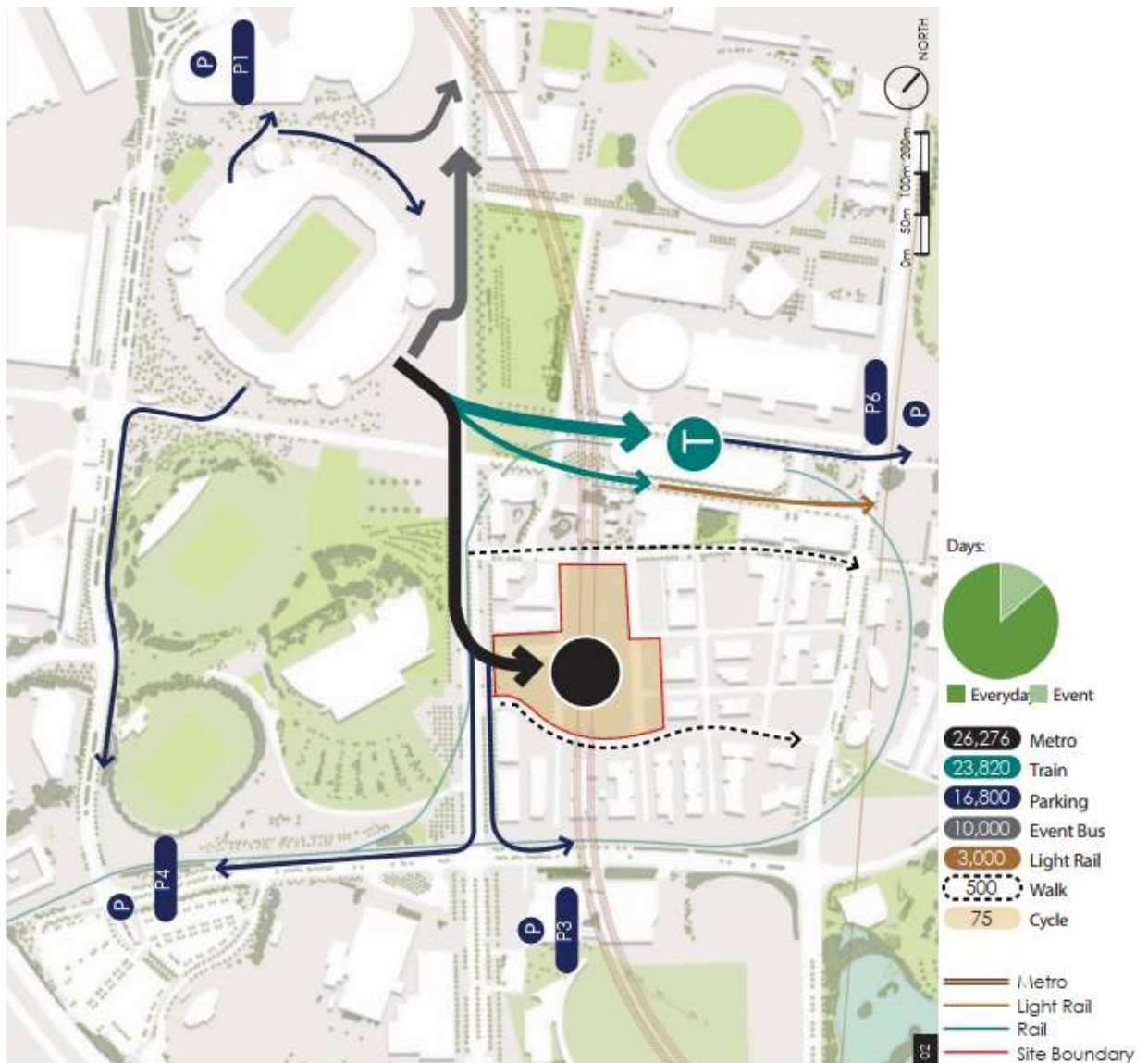
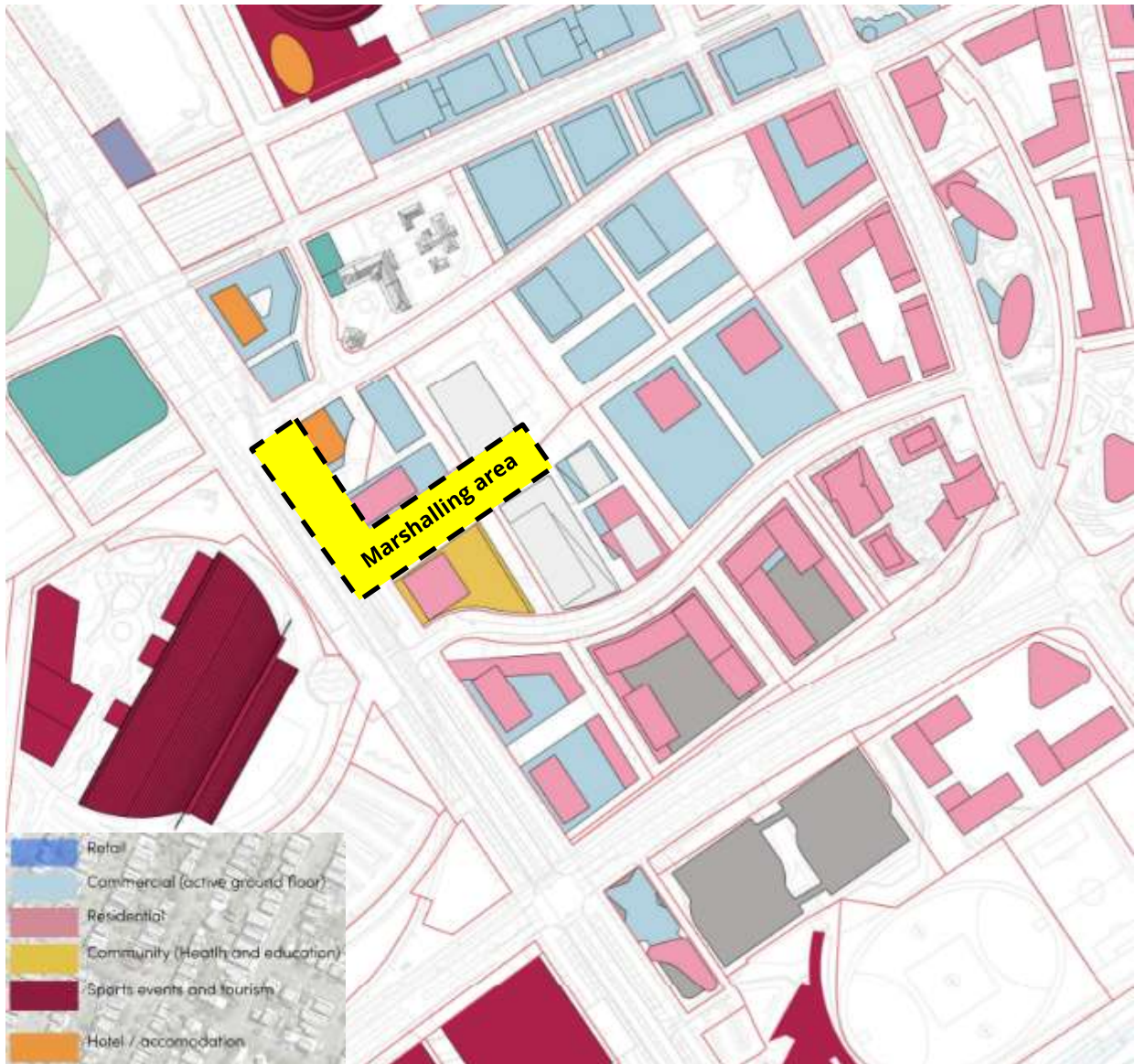


Figure 5-2 Master Plan 2050 land uses and Metro Station Marshalling Area



To determine the potential impacts at these proposed residential buildings along the marshalling corridor a Building Evaluation has been undertaken using the CadnaA noise model. This modelling assumes a crowd of 26,000 people within the marshalling area and 50% of people speaking with a raised voice.

Figure 5-3 and Figure 5-4 present the Building Evaluation results for buildings along the marshalling area. The results indicate these buildings could experience external free field $L_{Aeq,15\text{ min}}$ levels in the range of 70-75 dBA along much of their lower floors. The middle floors of the towers overlooking the marshalling area could experience external noise levels of 60-70 dBA and the higher floors levels where residential uses are located will be exposed to levels below 60dBA.

The residential noise criteria for sports and concert noise uses the L_{Amax} noise descriptor. For a large crowd over a large area a typical L_{Amax} is assumed to be 3dB above the $L_{Aeq, 15\text{ min}}$ level. It is expected those marshalling fans will be able to remind them they are in a residential area, although there will be occasional higher levels from fans celebrating by singing and individual shouts directly below residences. With residences set back as close

as 10m this would result in L_{Amax} noise levels of 75-80dBA. It is noted that these buildings are to be mixed-use, and non-residential uses are proposed for the lower floors.

These large-scale events would occur on an intermittent basis and residents would be aware of their proximity to the Stadia and the Metro station. Nevertheless, building façade shall be designed taking into account short term high noise levels. Residential development that falls into this category requires mechanical ventilation to allow windows and doors to be closed. Controls such as heavy glazing, balcony design and location of habitable rooms within the building should be considered.

Figure 5-3 3D-View of the Precinct from the North-Western end of Olympic Boulevard



Figure 5-4 3D-View of the Precinct from the South-Western end of Olympic Boulevard



6 ADDITIONAL ACOUSTIC ITEMS

6.1 Impacts Caused by the Relocation of the Royal Easter Show Carnival

RWDI has been advised that the Royal Easter Show carnival rides will be relocated from the current location at the corner of Australia Avenue and Olympic Boulevard. The proposed location is shown below in Figure 6-1.

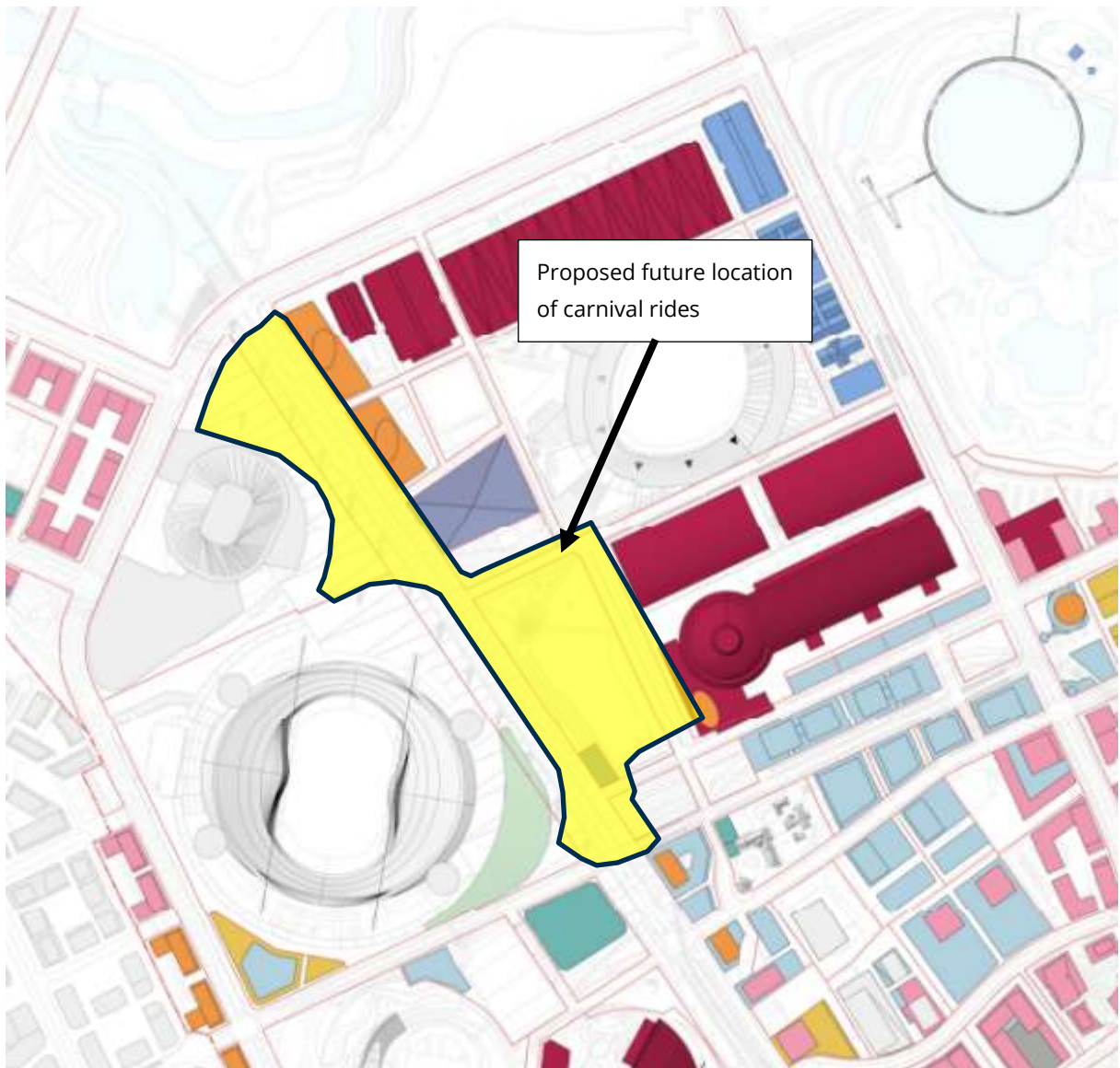


Figure 6-1 Proposed future location of carnival rides

Assuming noise levels generated by carnival rides remain constant (see section 3.1), noise levels at sensitive residences outside Sydney Olympic Park are set to increase for Newington residences to the northwest of the site. The most impacted residence is expected to be the multistorey apartment buildings on and near Nurmi Avenue. Unattended measured noise levels in 3 Wenden Avenue, Newington indicate that ambient levels in Newington are in the 50 to 55 dBA L_{eq} (daytime, 15hr) range. These receivers are expected to experience noise levels of up to 45dBA $L_{eq}(15min)$ generated by carnival rides. This means that these noise impacts would likely be audible (especially people shouting/screaming), but would not be intrusive or unreasonable.

Future noise impacts from the Royal Easter Show at surrounding residences are expected to remain below the respective noise limits for residential locations of 60 dBA L_{Aeq} / 65 dBA L_{Amax} for Special Events and 55dBA L_{Aeq} / 65 dBA L_{Amax} for Standard Events, and are not expected to cause significant noise disturbances to residential receivers located to the north.

6.2 Noise Impact from Proposed Event Bus Hub

An event bus hub is proposed to be located on Pondage Link. It will be directly facing residential façades shown in the Master Plan 2050.

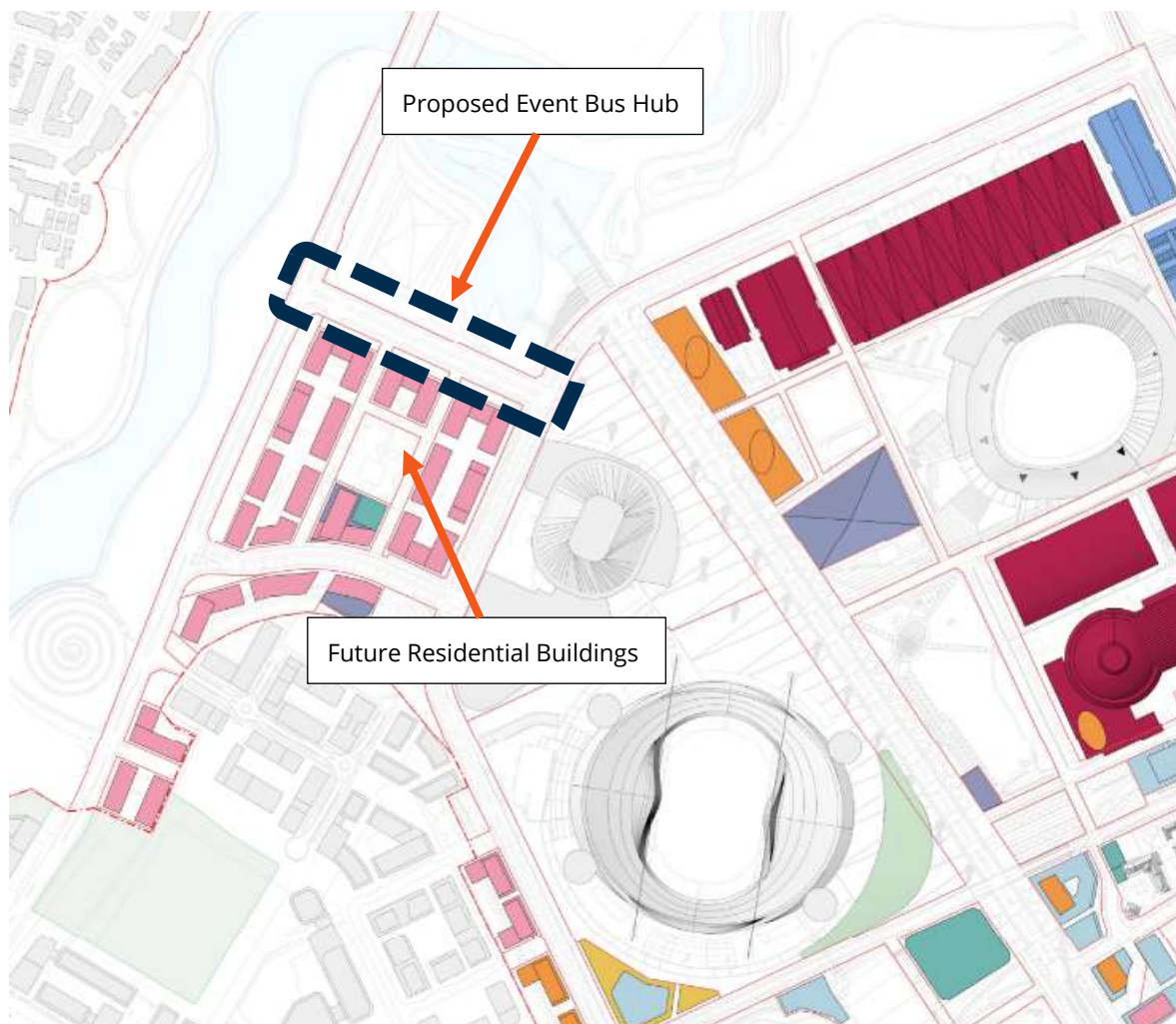


Figure 6-2 Proposed Event Bus Hub



Future impacts from bus on the future residential building façades were analysed considering the following assumptions:

- Up to 20 buses simultaneously idling on the Event Bus Hub, each generating a sound power level of 90dBA.
- Up to 5 buses simultaneously moving under 40 kph with in the Event Bus Hub, each generating a sound power level of 105dBA.
- All 30 buses are expected to be distributed evenly in the Event Bus Hub.

Noise levels of up to 70dBA are expected to be experienced on apartment buildings directly facing the Event Bus Hub during events generating bus traffic. Façades will require a level of mitigation treatments similar to properties classified as “Substantial Mitigation Required” to reduce noise impacts to acceptable levels inside habitable areas.

A separate Noise and Vibration assessment should be conducted at DA Stage to confirm the specific levels of treatments.

6.3 Proposed New Residential Buildings with Maximum Noise Mitigation Required

Eight new buildings are proposed along Edwin Flack Avenue in close proximity to Stadium Australia and the Athletics Centre. These buildings are between 40 and 50 metres in height. These buildings are shown in the Acoustic suitability for residential development map for buildings between 25m to 50m height, shown in Figure 6-3.

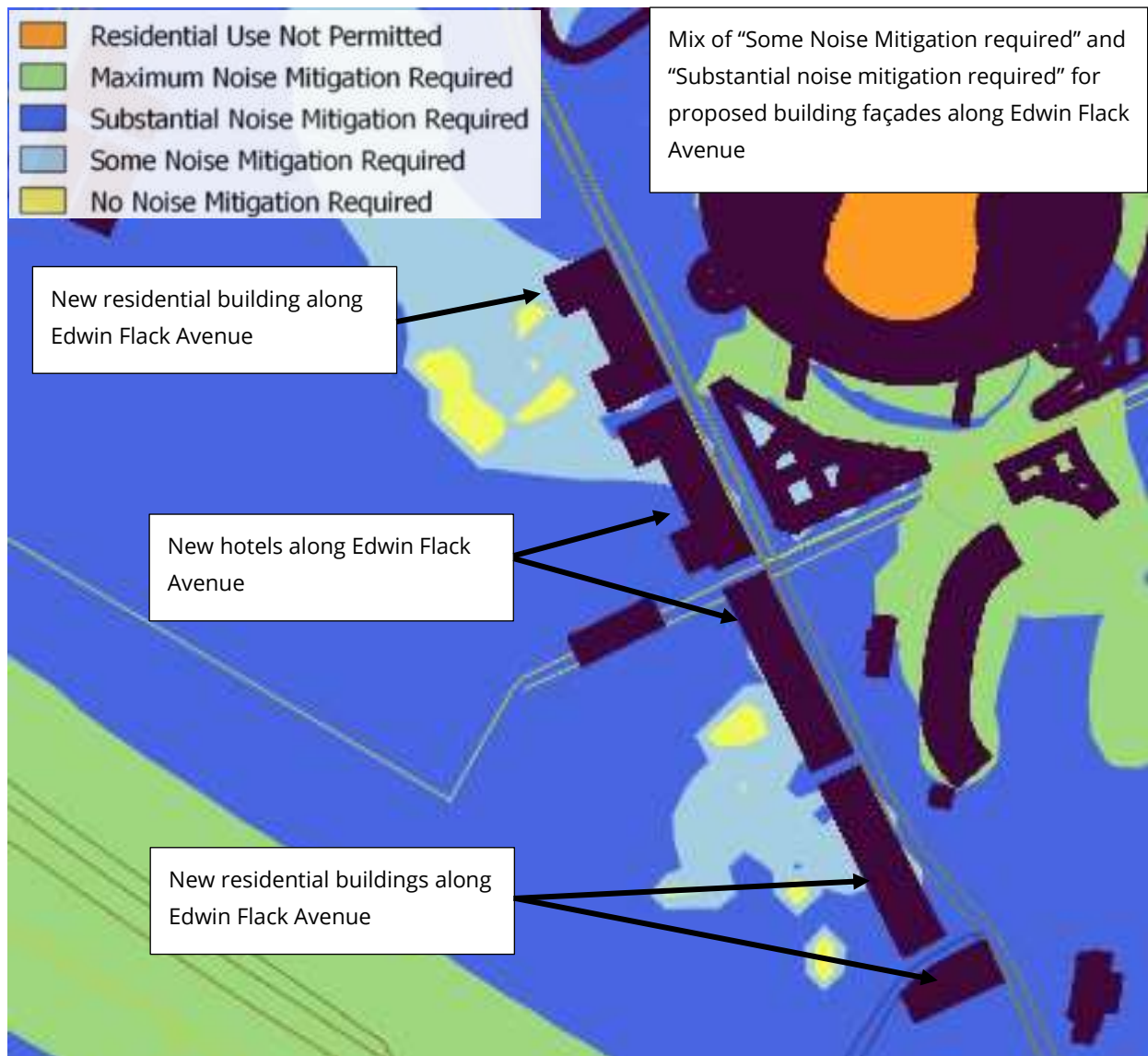


Figure 6-3 Acoustic suitability for residential development, 25m to 50m building height – Buildings along Edwin Flack Avenue

As indicated in the above map, all buildings along Edwin Flack Avenue can be mitigated and their façades will require "Some Noise Mitigation" or "Substantial Noise Mitigation" to achieve acoustic requirements.

Similarly, new buildings located near the corner of Australia Avenue and Murray Rose Avenue are predicted to require a mix of "Substantial Noise Mitigation" and "Maximum Noise Mitigation" due to their proximity to events at Sydney Showground and Exhibition halls.

The exact type of mitigation required will be determined at a later stage, in a separate Development Application.

6.4 Residential Buildings Surrounding Tom Wills Oval

The Master Plan drawing dated 20 November 2023 shows a number of residential buildings overlooking the existing sport field located at 1 Olympic Blvd, Sydney Olympic Park, as shown in Figure 6-4.

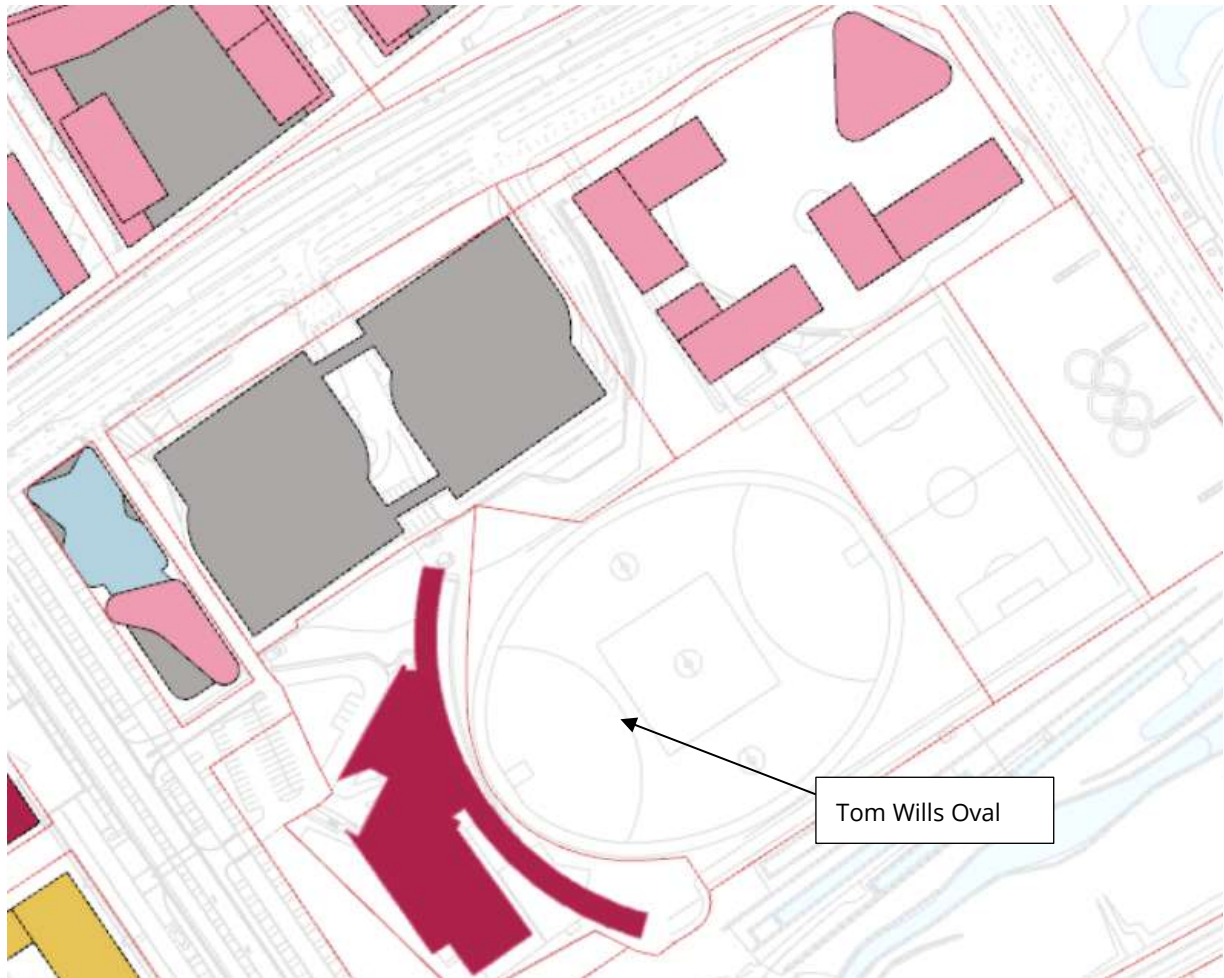


Figure 6-4 Residential buildings in the Southern Neighbourhood

In the Acoustic suitability for residential development maps shown in Figure 4-1, Figure 4-2 and Figure 4-3, these buildings are currently classified as "Some Noise Mitigation Required" and "Substantial Noise Mitigation Required". While noise treatments to these buildings are not expected to be prohibitive, the impacts of the combination of traffic noise (from surrounding roads) and use of the sports field should be considered. Treatments should be assessed at a later stage, in separate Development Application(s).

6.5 Metro Line

A number of proposed buildings will be located above the Sydney Metro West underground line, as shown in Figure 6-5.



Figure 6-5 Map showing the proposed new buildings and the Sydney Metro West underground line

RWDI has reviewed the ground-borne mitigation treatments detailed in the Sydney Metro West Environmental Impact Statement (Technical Paper: Operational Noise and Vibration) prepared by Mott MacDonald Australia Pty Ltd and dated 8 March 2022.

Required mitigation treatments have been considered and described in that report, which indicates that no further ground-borne noise mitigation treatments will be required for any type of buildings located above the Sydney Metro West Line.



7 PRECINCT ENTERTAINMENT AND HOSPITALITY

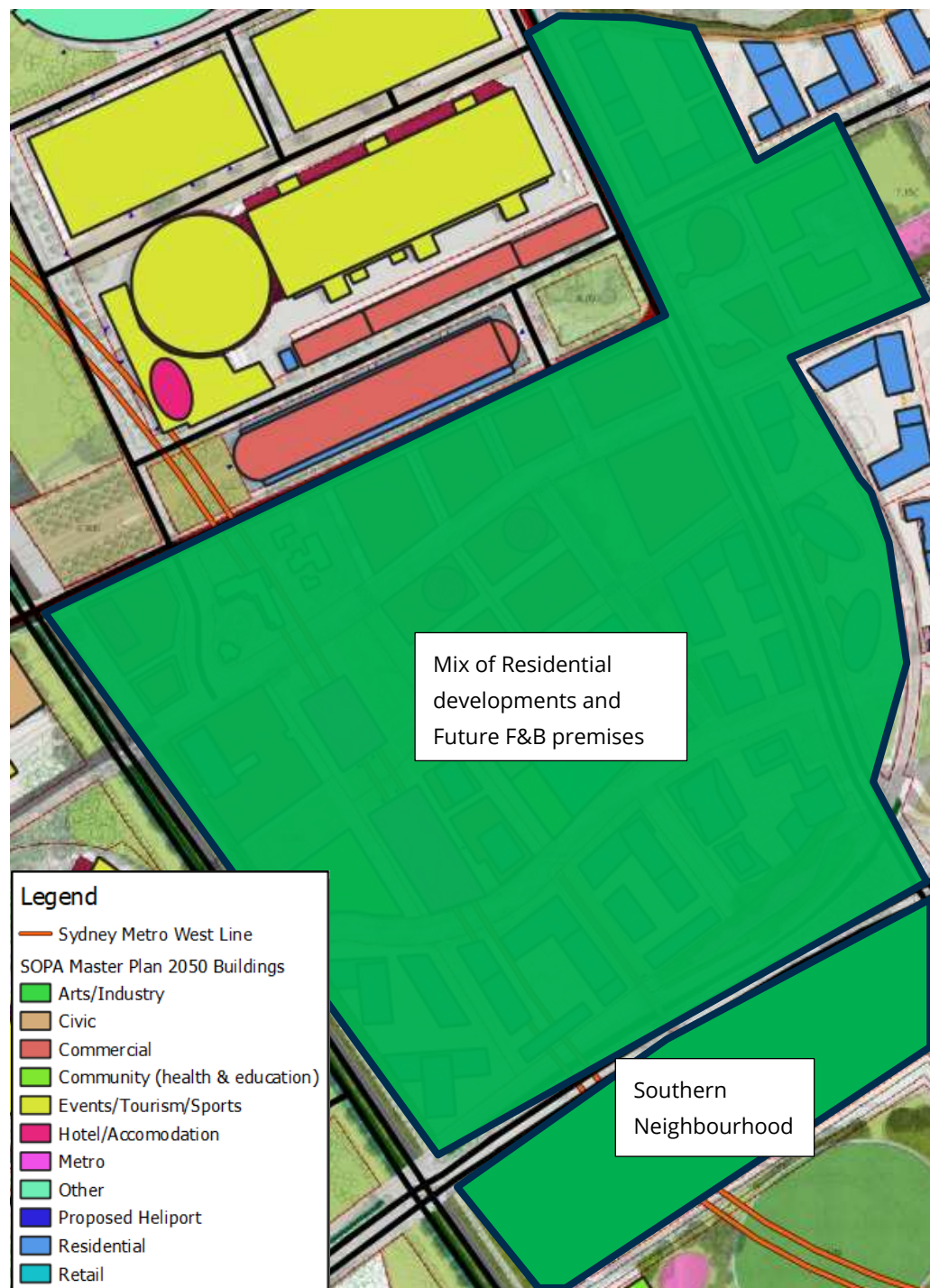
This section provides a high-level review of the noise implications associated with the Food and Beverage (F&B) premises and public domain events within the Sydney Olympic Park. The Precinct, including the Metro development will have a mix of retail, commercial and residential components including ancillary community facilities.

Residential towers vary from 20 to 50 storeys. Typically, 4 to 6 storeys of podium block edge with the towers above, set back within the podium structure on some façades.

7.1 Review of Noise Issues

This review focusses on the Urban Centre, Eastern Neighbourhood, and Southern Neighbourhood where commercial buildings and premises are potentially overlooked by residential receivers and likely to include several F&B offerings likely with outdoor dining and drinking such that cumulative impacts from multiple venues need to be considered.

Figure 7-1 SOPA precinct retail areas



In addition, there are several public spaces which are likely to be overlooked by a mix of either commercial or residential buildings. These spaces are capable of supporting community events which may include live music and large gatherings.

7.2 Noise Mitigation and Management Measures

The purpose of this section is to provide some general guidance to the design of the mixed-use areas of the future precinct to providing the best possible environment for residential integration into a lively entertainment area.

It is noted from the current plans that the intention is to have podium structures along much of the main retail precincts with the residential components at higher elevation and set back from the podium to provide additional distance and some shielding. It should be noted that reflections of noise from side to side between the podiums can reduce the benefit of shielding therefore building articulation will assist in reducing these reflections.

Where residences are located on the floor directly above Food and Beverage (F&B) premises the use of solid awnings to shield noise from below or combination of solid and operable awning which can be closed based on a combination of time of day, patron numbers and behaviour. Temporary umbrellas and fabrics do not offer sufficient noise reduction.

Consideration of greater slab thicknesses (300mm) and resiliently mounted ceiling treatment for mixed use buildings where residential is located directly above a F&B premise.

There should be limits on outdoor noise emissions and only minor noise spill from internal systems which are limited. Use of outdoor speakers will be addressed on a site-by-site basis during the assessment of development applications.

For the public domain areas, ideally a site provided PA system can be used by performers, which has been designed and set up to minimise music propagating to residences. This is preferable to each performer bringing their own PA with no control over outcomes.

It is also critical to manage expectations for those moving to the area and those who are operating businesses within this precinct. This should make it clear they are living in an apartment that overlooks active areas that have approved outdoor trading until 11pm/12 midnight as well as public domains which have special events. Similarly, future business operators need to understand they are surrounded by residences and to expect strict time and noise limits.

Section 3.6.7 of Master Plan 2050 outlines the 'Public Positive Covenants' and requires a Section 88 to acknowledge potential noise impacts from major sports and entertainment events. It is recommended to update this for the central precinct and other residential areas to include noise from F&B, retail and outdoor active zones that will occur more frequently.

Whilst commercial receivers are expected to have sealed façades, noise impacts from events still require consideration at Development Application Stage.

In the future, it is recommended that an Acoustic Master Plan specifically addressing F&B premises and outdoor dining be prepared to address the following specific aspects:

- Strict time limits for various Food & Beverage uses (weekdays, weeknight, weekend days/nights, special events). This allows more relaxed noise limits within approved hours with no noise outside so residents know when noisy activities stop.



- Manage people noise from outdoor dining/drinking differently to music and establish strict limits for music.
- Strict time limits for events.
- Mixed use buildings – No residential uses in podiums, so private residential uses are more distant from noise source and potentially set back so shielding also provided.
- Residential buildings - Use of podiums with non-residential uses (communal spaces such as gyms, pools) so private residential more distant from noise source and potentially set back so shielding also provided.
- Apartment layout – Keeping bedrooms away for areas which overlook active zones.
- Establish internal noise criteria to suit the precinct such that the façade design (windows and doors) reduces external noise to acceptable levels. The use of winter gardens is also critical in reducing noise and residents can choose to keep these close at times when required. Stricter limits than currently outlined in the Master Plan 2050 may be necessary for noise from F&B, retail and outdoor active zones as noise impacts could occur more frequently than current event noise.
- Address cumulative noise where limits on hours and patron numbers are attached to individual tenancies, but with some flexibility to allow small changes where impacts can be managed. This will ensure the internal noise limits can be achieved from cumulative noise emissions.



8 CONCLUSIONS AND RECOMMENDATIONS

RWDI Australia have conducted a review of the acoustic provisions for the Sydney Olympic Park Master Plan 2050. The work conducted in our assessment is based on the original study for Master Plan 2030 and subsequent reviews and considers the changes in design provided for Master Plan 2050.

It addresses the impact of proposed changes to the built form and Sydney Metro West Station. Criteria for this assessment have been taken from the Sydney Olympic Park Noise Management Guidelines (original Report: 99053, July 2002) with updated references from the latest government guidelines.

Noise modelling was based on the proposed new built form for the Master Plan 2050, events and activities from previous measurements and new contours of 'Acoustic Suitability for Residential Development' have been developed.

Additional modelling of crowds waiting to access the Metro Station following a large event at the stadium has been undertaken. External noise levels along the façade of the buildings overlooking the marshalling area have been presented and will require consideration in residential façade design.

A high-level review of potential noise issues within the precinct due to Food & Beverage premises, including retail and public events has been undertaken. The review has provided guidance for the design of these areas, to allow for better integration of residential premises into this precinct.

It is expected that control measures such as upgraded glazing, wintergardens and floorplan design to limit noise to habitable rooms will be required to meet the internal noise criteria for residences within the Master Plan 2050.



9 STATEMENT OF LIMITATIONS

This report entitled *Sydney Olympic Park - Master Plan 2050 – Noise Management Guidelines* was prepared by RWDI Australia Pty Ltd (“RWDI”) for SJB (“Client”). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein (“Project”). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.