NSW GOVERNMENT PLANNING AND ENVIRONMENT

DECEMBER 2021

CONFIDENTIAL

CAMELLIA - ROSEHILL PLACE STRATEGY

NOISE AND VIBRATION IMPLEMENTATION REPORT

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Camellia - Rosehill place strategy
Noise and Vibration Implementation Report

NSW Government Planning and Environment

Image Source: *Draft Camelia Town Centre Master Plan: Planning report (NSW Government, Planning and Environment, 2018)*

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GLOSSARY

TERM	DESCRIPTION
Noise Terms	
Acoustic barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc used to reduce noise, without eliminating it.
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.
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise environment, 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 L_{90} noise level (see below).
Decibels (dB)	The human ear responds to minute pressure variations in the air. These pressure variations can be likened to the ripples on the surface of water but of course cannot be seen. The pressure variations in the air cause the eardrum to vibrate and this is heard as sound in the brain. The stronger the pressure variations, the louder the sound is heard. The range of pressure variations associated with everyday living may span over a range of a million to one. On the top range may be the sound of a jet engine and on the bottom of the range may be the sound of a pin dropping. Instead of expressing pressure in units ranging from a million to one, it is found convenient to condense this range to a scale 0 to 120 and give it the units of decibels. The following are examples of the decibel readings of every day steady or quasi-steady sounds. *0db the faintest sound we can hear under perfect conditions* *20db quiet bedroom at night or recording studio* *30db quiet library or quiet location in the country* *40db living room* *50db typical office space or ambience in the city at night* *60db normal conversational speech* *70db a car passing by* *80db kerbside of a busy road* *90db truck passing by* *100db nightclub* *110db rock band or 2m from a jackhammer* *120db 70m from a jet aircraft* *130db threshold of pain* *140db 25m from a jet aircraft*

TERM	DESCRIPTION
dB(A); A-weighted decibels	The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same sound pressure level are not heard as loud as high frequency sounds. The sound level meter attempts to replicate 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 in is denoted as dB(A). Most environmental noise is measured using the A filter.
Diffraction	The bending of sound waves around solid obstacles.
Frequency	Of a periodic quantity: the time rate of repetition. The reciprocal of the period. Frequency is measured in hertz (Hz).
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}	Equivalent sound pressure level – the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. The sound weighting of the noise measurement is commonly added, for example L_{Aeq} or L_{Ceq}.
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 one 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 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 sound pressure, 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.
Structure-borne noise	Vibration propagating through solid structures in the form of compression or bending waves, heard as sound.

EXECUTIVE SUMMARY

DISCLAIMER

This publication was prepared for the NSW Department of Planning, Industry and Environment for the purpose of the Camellia-Rosehill Place Strategy. No representation is made about the accuracy, completeness, suitability of the information in this document for any particular purpose nor should be assumed that the content of the document represents the views of the NSW Government. The NSW Government, its agents, consultants or employees shall not be liable for any damage which may occur to any person or organisation taking action or not on the basis of this publication. Readers should seek appropriate advice when applying the information to their specific needs. This document may be subject to revision without notice

OVERVIEW OF THE PROJECT

The Department of Planning, Industry and Environment (DPIE) is leading the development of the Camellia – Rosehill Place Strategy (the Place Strategy), in collaboration with Council, industry, the community and State agencies.

The precinct plays a significant strategic role in Greater Parramatta and Olympic Peninsula (GPOP) through its contribution towards the GPOP Economic Corridor by accommodating city building industries. Through the development of the Place Strategy, there is also potential for activation of the Parramatta River and Duck Creek foreshore and capitalising on investment in Parramatta Light Rail and synergies with Rosehill racecourse, leading to opportunities for amenity led mixed-use development and a variety of additional development outcomes including urban services, innovation industries, a Town Centre and residential development.

The NSW Government has commissioned the preparation of a Place Strategy for the whole Camellia-Rosehill precinct. The Place Strategy is underpinned by a Master Plan and several technical studies. This document forms part of the Environmental (Package C) component of this strategy.

PURPOSE OF THIS REPORT

This Noise and Vibration Implementation Report has been prepared to ensure that all new development encourages a diversity of landuses whilst minimising the risk of noise and vibration impacts or potential land use conflicts for future development.

SUMMARY OF KEY FINDINGS OF THE REPORT

Existing background noise levels have been sourced from a combination of attended noise monitoring and reference to recent environmental assessments in the area. Indicative, recommended noise levels have been based on the NSW *Noise Policy for Industry* Amenity noise levels and used for the assessment.

Noise levels at existing residential properties surrounding the precinct are generally considered acceptable during daytime hours, however night-time noise levels exceed the relevant amenity levels for an urban environment within the NPfI at many locations. It is noted that several noise complaints have been received by the EPA and Parramatta City Council concerning noise from the existing Camellia precinct.

Existing noise sources in the area include industrial developments within the precinct, as well as within the surrounding areas of Silverwater, Rydalmere and Parramatta. Road noise sources include the M4 motorway, James Ruse Drive and heavy vehicles on the local road network.

Land use planning processes provide the first and most effective and efficient mechanism to avoid noise-related land-use conflicts. The brownfield nature of large parts of the precinct provides a rare opportunity to create a built environment

that reduces future land use conflicts and allows the passive management of noise impacts, reducing environmental noise effects and the need for retrofitting noise controls at the receiver.

The report concludes that as development proceeds in the precinct, noise and vibration impacts associated with these sources in addition to potential new sources will need to be considered during land use planning in order to minimise future land use conflicts and costly noise mitigation.

This acoustic assessment has considered potential acoustic impacts within and outside of the precinct under the proposed masterplan scenario.

The assessment has considered indicative noise criteria and landuses proposed for the scenario. Noise modelling has included forecast road traffic numbers, typical noise emissions for each industry type and a representative site layout. Predictions assumed worst case meteorological influences and moderate to high noise emissions from each industry type. The assessment is therefore a conservative prediction of likely noise impacts.

This assessment has identified the following features of the acoustic environment under the proposed future development:

- Noise levels from future and existing heavy industrial sources are predicted to result in low to moderate noise impacts throughout the proposed new residential areas of the precinct during daytime hours. However, during the night, industrial noise may affect new and existing residential areas along the banks of the Parramatta River at both Camellia and Rydalmere.
- Noise from the proposed Sydney West Metro is not expected to impact properties within the precinct.
- Noise from the proposed PLR maintenance facility may impact residential properties at the eastern end of the proposed residential area, particularly during night-time hours.
- Road noise from James Ruse Drive is predicted to impact new residential areas, particularly at properties directly facing the corridor.
- Although heavy vehicle numbers along Grand Avenue will be reduced with the introduction of new heavy vehicle routes, the road corridor is likely to generate low noise impacts during night-time hours at residential properties facing the corridor.
- Noise from the existing Sydney Water pumping station appears to be minimal. If impacts were identified in the future, these would be relatively simple to mitigate through the installation of insulation or other architectural building treatments to the pump house building.
- Due to the infrequent nature of racing events, and the intention of this study to present high level noise impacts, noise from the racecourse has not been considered in this study.
- Overall, the risk of long-term ground vibration impacts is considered low, however impacts have been predicted where vibration sensitive properties (such as precision laboratories) are located in close proximity to the Parramatta Light Rail or Sydney Metro alignments. Potential noise and vibration risks associated with these sites at existing landuses will be subject to their own approval processes.
- Ground vibration impacts are considered likely for receivers located close to high impact demolition and earthworks during remediation and construction phases of the development.

CONCLUSION / RECOMMENDATIONS

These impacts are able to be managed through the consideration of noise and vibration at all stages of the planning process. Substantial benefits to amenity and cost reductions can be realised where good acoustic design is incorporated during early stages of planning, the following opportunities and risks are noted:

- All future developments within the site would be subject to the normal NSW planning approval processes. This would include assessment of potential noise or vibration impacts.
- Site design should consider potential noise screening benefits from the front building rows for succeeding properties.
- Although the proposed heavy vehicle routes will reduce the level of traffic noise within the new residential areas of the precinct, it is recommended that gaps between buildings along Grand Avenue and northern areas of James Ruse Drive are minimised to effectively act as noise screens for any proposed residential areas (reducing transmission of both industrial noise and road traffic noise).
- Noise treatment is likely to be required for most residential buildings and any other sensitive landuses. In particular the western facades of properties along James Ruse Drive and southern facades of residences on Grand Avenue.
- Any proposed residential buildings would be required to include a consideration of acoustic treatment to ensure that internal noise levels are in accordance with recommended levels outlined in AS/NZS2017.
- Noise impacts associated with any future industrial development would be assessed in accordance with the NPfI and suitable noise management measures would be implanted to control any predicted noise impacts.
- Consider construction noise impacts during planning stages of demolition, remediation and construction.
- Avoid positioning vibration sensitive landuse above the Sydney Metro West or adjacent to the Parramatta Light Rail.
- Vibration impacts on residential landuses in the vicinity of the current alignment of these projects is unlikely.
- Consider potential ground vibration impacts during planning stages of demolition, remediation and construction.

1 PROJECT BACKGROUND

1.1 INTRODUCTION

The Department of Planning, Industry and Environment (DPIE) is leading the development of the Camellia – Rosehill Place Strategy (the Place Strategy), in collaboration with Council, industry, the community and State agencies.

The precinct plays a significant strategic role in Greater Parramatta and Olympic Peninsula (GPOP) through its contribution towards the GPOP Economic Corridor by accommodating city building industries. Through the development of the Place Strategy, there is also potential for activation of the Parramatta River and Duck Creek foreshore and capitalising on investment in Parramatta Light Rail and synergies with Rosehill racecourse, leading to opportunities for amenity led mixed-use development and a variety of additional development outcomes including urban services, innovation industries, a Town Centre and residential development.

1.2 PROJECT DESCRIPTION

The Camellia Rosehill Precinct (~321ha) was identified by the NSW Government as a priority growth area in 2014, resulting in precinct wide Land Use and Infrastructure Strategy in 2015 and subsequently development of a Town Centre Master Plan in 2018. Work on the Town Centre was paused pending outcomes of Greater Sydney's 2019 Draft Place-based Infrastructure Compact (PIC) Pilot which aimed to ensure infrastructure delivery was matched with growth across the 26 precincts in the GPOP corridor. The PIC recommended that Camellia be retained for urban service and industrial land, however, should the Government seek to progress a town centre (in the form of the 2018 plan or a modified form), before any rezoning a number of issues had to be been resolved. It was determined that a coordinated and strategic approach was required, and a place strategy be prepared for the whole Precinct, drawing on previous work and including ongoing collaboration with industry, the community and state agencies.

The DPIE has engaged a range of technical services to determine opportunities and challenges at the site. These technical studies have informed the development of the Place Strategy and Master Plan for the precinct. This Noise and Vibration Implementation Report has been prepared as a part of the Environmental package.

An Enquiry by Design (EbD) process was undertaken to inform the preparation of the Place Strategy. The EbD was an interactive process which explored a number of master plan options for Camellia-Rosehill which could deliver the vision for the precinct, and resulted in a draft master plan which was the subject of public consultation as part of the Camellia-Rosehill Directions Paper. The draft master plan was further refined following exhibition of the Directions Paper and consideration of the submission received.

1.3 VISION STATEMENT

Camellia-Rosehill has an important strategic role as an industry and employment hub within the Greater Parramatta and Olympic Peninsula (GPOP) Economic Corridor. By 2041, the precinct will be enhanced with service and circular economy industries and new recreational and entertainment facilities, all enabled by better transport access via light rail, active transport and road connections. A well-designed town centre next to the light rail stop will be the focus of community activity. New homes will be close to public transport supported by walking and cycling paths and new public spaces, including the Parramatta River foreshore.

Key environmental features such as Parramatta River, Duck River and their wetlands will be protected and enhanced. Camellia's rich heritage will be interpreted, celebrated and promoted.

Country and culture will be valued and respected with the renewal guided by Aboriginal people.

The precinct will set a new standard for environmental sustainability with embedded renewable energy networks, integrated remediation and water management strategies, circular economy industries and a commitment to achieve net zero by 2050.

Recycled water will be connected to all residences, businesses and public spaces and will support the integrated network of green infrastructure.

Camellia will be a showcase of recovery and restoration – a place of economic prosperity but also a place where people love to live, work and enjoy.

1.4 THE CAMELLIA - ROSEHILL DRAFT MASTER PLAN

The draft master plan is shown in Figure 1.1 and forms the basis of the Place Strategy.

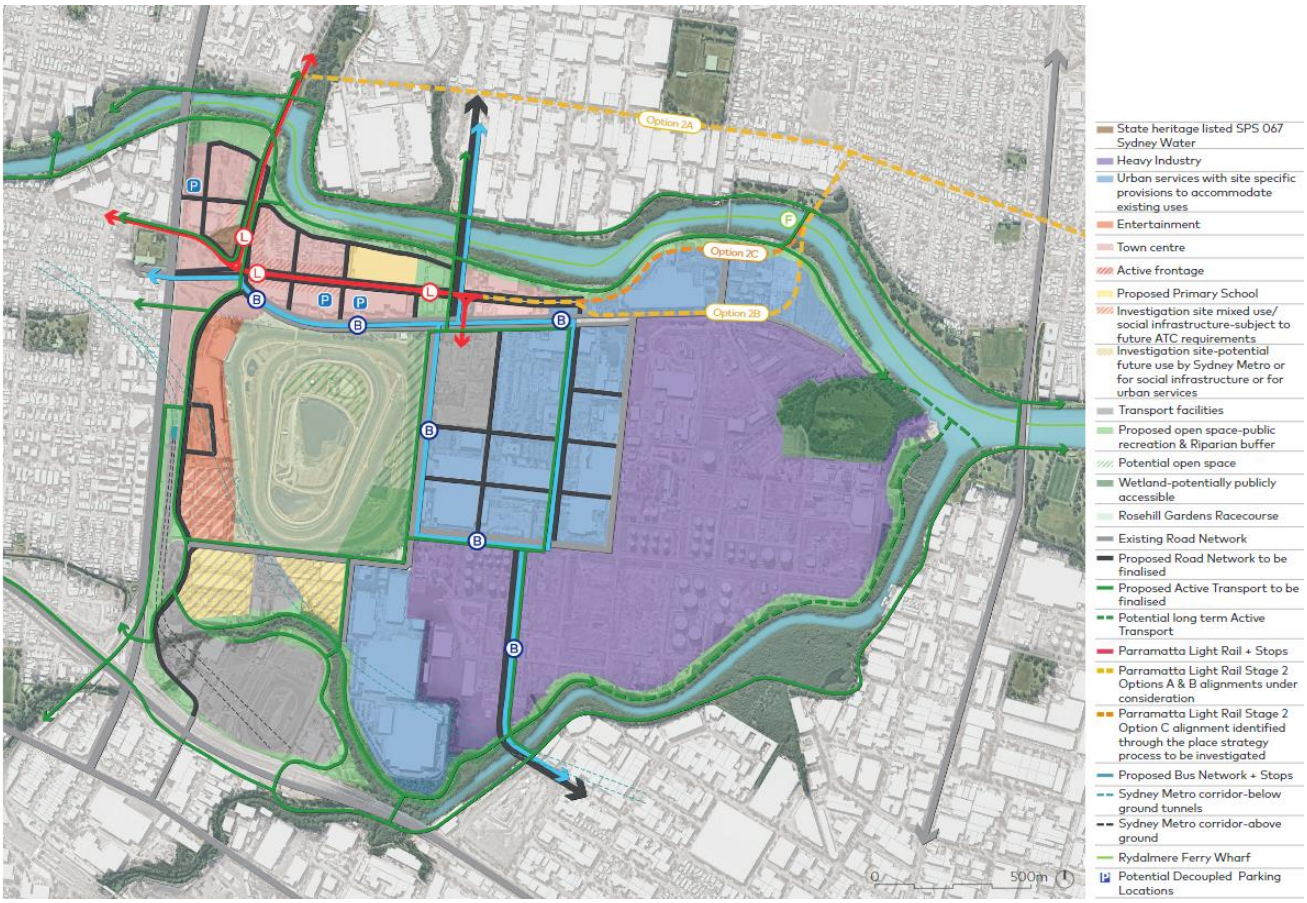


Figure 1.1 Proposed site layout

Key features of the master plan include:

- Provision for approximately 10,000 dwellings within a Town Centre serviced by light rail
- Provision for approximately 14,500 jobs
- A new primary school and primary and secondary high school
- District and regional open space facilities
- Introduction of a new entertainment precinct and an urban services area
- Initiatives to Care for Country and continued protection of heritage listed sites
- Retention of the existing state heritage sewerage pumping station (SPS) 067 within the town centre

- Measures to mitigate land use conflicts and risks including buffers and setbacks from existing fuel pipelines and between the existing sewerage pumping station and future surrounding residential uses
- Access to the Parramatta River, Duck River and Duck Creek foreshores and potentially the wetland
- New transport infrastructure including a local road network, potential bus services, additional connections into and out of the precinct, and opportunities to integrate with Parramatta Light Rail Stage 2
- An extensive active transport network
- A comprehensive remediation strategy
- A sustainability strategy and integrated water cycle management strategy.

1.5 ACOUSTICS IN LAND-USE PLANNING

Exposure to noise can have negative impacts on a community's physical and mental health.

Effective, early stage planning is a key strategy to achieving acceptable environmental noise levels in communities. Land use planning processes provide the first and most effective and efficient mechanism to avoid noise-related land-use conflicts.

Best practice engineering noise management techniques generally consider noise mitigation based upon application in the following order of priority:

1. Appropriate land use planning
2. Consideration of noise transmission in design of site layouts
3. At the noise source, by reducing the level of noise emissions

1.6 PURPOSE OF THIS REPORT

This Acoustics report will:

- Identify the existing and future noise sensitive receivers, both within the precinct and in affected adjacent areas
- Identify relevant legislation and indicative noise and vibration goals for areas within, and outside of, the precinct
- Identify and describe likely noise sources affecting the identified receivers, including their impact, and potential cumulative impacts under the proposed scenario
- Identify possible requirements for noise control, in order to protect the future amenity of users.

This Noise and vibration report has been prepared to align with the CRPS Vision Statement (DPIE, 2021), which provides important planning and policy context for the site. Specifically, this strategy aims to ensure that all new development encourages a diversity of landuses whilst minimising the risk of noise and vibration impacts or potential land use conflicts for future development.

1.7 RELEVANT LEGISLATION

A variety of noise and vibration legislation, standards and guidelines exist to ensure that noise is kept to acceptable levels, and in-balance with the social and economic value of industry to NSW. The following legislation, standards and guidelines are the primary documents applicable to this site to assess and manage noise and vibration in NSW:

Table 1.1 Relevant noise and vibration legislation

DOCUMENT	APPLICATION
Noise Policy for Industry (NSW Environmental Protection Authority, 2017) (NPfI)	The NPfI is applicable to noise emissions from new or redeveloped industrial noise sources
Road Noise Policy (NSW Department of Climate Change and Water, 2011) (RNP)	The RNP is applicable to noise from new or upgraded roads
Rail Infrastructure Noise Guideline (NSW Environmental Protection Authority, 2013) (RING)	The RING is applicable to noise from new or redeveloped rail lines (including light rail)
Australian / New Zealand Standard – Acoustics – Recommended design sound levels and reverberation times for building interiors (AS/NZS 2107, 2016)	AS/NZS 2017, 2016 details acceptable internal noise levels for a range of building types
*Apartment Design Guide, Tools for improving the design of residential apartment development (*NSW Department of Planning and Environment, 2015)	The *Apartment Design Guide* (ADG) contains principles for residential building design at potentially noise affected apartments
Interim Construction Noise Guideline (NSW Department of Environment and Climate Change, 2009) (ICNG)	The ICNG is applicable to noise from construction activities (it is noted that this document will soon be superceded by the Draft Construction Noise Guideline)
State Environmental Planning Policy (Infrastructure) (NSW State Legislation, 2007) (ISEPP) *Development Near Rail Corridors and Busy Roads – Interim Guideline* (NSW Department of Planning, 2008) (DNRCBR)	The ISEPP is applicable to new noise sensitive development near existing road and rail corridors. The DNRCBR provides methods and examples for appropriate management of noise and vibration at properties affected by road or rail noise.
Assessing Vibration: A Technical Guideline (NSW Department of Environment and Conservation, 2006) (AVaTG)	AVaTG is applicable to (ground) vibration impacts affecting human comfort
British Standard BS 7358-2: Evaluation and measurement for vibration in buildings. Part 2: Guide to damage levels from ground-borne vibration (BS7358-2, 1993)	BS7358-2:1993 is applicable to (ground) vibration impacts affecting buildings and infrastructure

2 EXISTING SITUATION

This section outlines the existing noise and vibration environment in the vicinity of the proposal. It also details noise and vibration sensitive receivers located outside the precinct.

2.1 EXISTING STUDIES

Several recent, local environmental studies are relevant to this study and have been referenced in the preparation of this baseline report. These documents include:

- *Parramatta Light Rail Stage 1, Environmental Impact Statement, Technical paper 13: Noise and vibration impact assessment* (SLR, 2017)
- *Sydney Metro West, Environmental Impact Statement, Concept and Stage 1, Technical Paper 2: Noise and vibration* (SLR, 2020)
- *Viva Energy Clyde Western Area Remediation Project, Environmental Impact Statement, Appendix G Technical report: Noise and vibration assessment* (Wilkinson Murray, 2018)
- *Camellia Recycling Centre, Environmental Impact Statement* (Veolia Environmental Services, 2013)
- *Camellia Precinct Land Use and Infrastructure Strategy* (Department of Planning and Environment, 2015)
- *Draft Camellia Town Centre Paster Plan* (Department of Planning and Environment, 2018).

In addition, current and historic submissions from stakeholders have been considered.

2.2 LOCAL NOISE SENSITIVE RECEIVERS

2.2.1 EXISTING RESIDENTIAL RECEIVERS

There are numerous residential properties that may be impacted by noise generated within the precinct. In general, these are located within three main residential areas. These locations and the main existing noise source affecting each area are presented in Table 2.1.

Table 2.1 Identified receiver areas

RECEIVER	EXISTING NOISE SOURCES
Vicinity of John Street, Rydalmere	Road traffic (Silverwater Road and local), industrial noise (Camellia), Parramatta River sources (e.g. Ferry traffic)
James Ruse Drive	Road traffic (James Ruse Drive), M4
Asquith Street Silverwater	Road traffic (M4), Industrial noise (Silverwater)

2.2.2 NON-RESIDENTIAL RECEIVERS

The nearest non-residential existing receivers to the proposal area are outlined in Table 2.2.

Table 2.2 Identified noise sensitive receiver areas

RECEIVER	MAIN RECEIVER TYPE(S)
Eric Primrose Reserve / Newington Soccer Club Rydalmere	Active recreation
Rydalmere industrial area	Industrial
Rydalmere bike path	Active recreation
Western Sydney University	Educational / passive recreation
James Ruse Drive (north), Parramatta	Commercial / industrial
Rosehill Community Preschool	Educational
Silverwater Park	Passive recreation
Rosehill Bowling Club	Active recreation

2.3 EXISTING NOISE ENVIRONMENT

The Camellia - Rosehill precinct is located within a busy urban environment and is impacted by road noise and industrial noise sources located both inside and outside the proposal area.

The major existing noise sources likely to influence land use planning within the precinct are listed in Table 2.3.

Table 2.3 Existing regional noise sources

NOISE SOURCE TYPE	LOCATIONS / NOISE SOURCES
Commercial, warehouse and industrial facilities	Within the precinct and outside the precinct (Silverwater, Parramatta, Clyde, Auburn). The noisiest sites within the precinct include Concrete Recyclers, Hymix, SAMI Bitumen Technologies, USG Boral and James Hardie.
Road traffic on arterial roads	James Ruse Drive, M4 Motorway, Silverwater Road
Road traffic on local roads	Grand Avenue, Rosehill and South Street, Rydalmere
Entertainment noise	Rosehill Racecourse during events
Future noise sources	The Parramatta Light Rail and Sydney Metro West stabling and maintenance facilities are in currently undergoing planning approvals / construction

2.4 EXISTING VIBRATION ENVIRONMENT

Ground vibration impacts are generally limited to a small area surrounding the vibration source and rarely extend beyond approximately 100m. Existing ground vibration sources within the precinct include industrial activities and heavy vehicle movements on local roads, in addition to construction activities at development sites.

Ground vibration associated with road traffic is generally low, and large separation distances between industrial sites and residential receivers mean that the risk of existing vibration impacts at sensitive receivers is considered low.

Vibration sensitive developments, such as micro-electronics, medical and imaging laboratories have not been identified within the proposal area.

Other major, critical infrastructure exists within the site, such as a fuel and gas pipeline. These items are not considered to be highly vibration sensitive, however will need to be closely considered during future construction work.

2.5 NOISE MONITORING

In order to describe the existing noise environment in the vicinity of the proposal, levels of background noise have been measured at a range of locations.

For existing noise sensitive receivers, noise monitoring results were sourced from existing, publicly accessible acoustic reports. Operator attended noise surveys were carried out at other locations to characterise the noise environment within the proposal area.

Based on the attended and unattended monitoring results, the background noise environments at all monitoring locations can be categorised as a mix of urban and industrial environments, with industrial and road traffic noise being audible throughout the day and night-time periods. Heavy vehicles are the main contributor to most noise monitoring sites, particularly during night-time hours. The Concrete Recycling plant on Thackeray Street was the loudest site identified in the precinct. Access to many areas within the precinct was limited due to construction of the Parramatta Light Rail.

The results of the referenced and attended ambient noise surveys and observations are presented in Table 2.5.

In addition, spot measurements were undertaken throughout the Camelia area to determine noise levels at the boundary of individual industrial sites. In general, these measurements were dominated by heavy vehicle traffic on the local road network, however the following observations were able to be made:

Table 2.4 Industrial spot noise measurements

LOCATION	DOMINANT NOISE SOURCE AND LEVEL	NOTES
USG Boral, Grand Avenue	Ventilation fans 57dBA	Noise environment dominated by heavy vehicles on local roads
Concrete Recyclers, Pedestrian bridge	Crushing and loading trucks 65dBA	-
SAMI bitumen technologies, Grand Avenue	Batch plant 59dBA	Noise environment dominated by heavy vehicles on local roads
Viola, Grand Avenue	Ventilation / cooling fans 50dBA	Noise environment dominated by heavy vehicles on local roads
Recycled water plant, Durham Street	Pumps 54dBA	Noise environment dominated by heavy vehicles on local roads
Viva energy, Durham Street	Inaudible	Noise environment dominated by heavy vehicles on local roads and James Hardy
James Hardy, Durham Street	Ventilation 56dBA Regular audible alarm 58dBA (operating approximately 30% of the time)	Noise environment dominated by heavy vehicles on local roads

2.6 NOISE CATCHMENT AREAS

Noise catchment Areas (NCAs) have been defined to classify areas that are likely to have a similar existing noise environment and experience similar noise impacts from the proposal. These NCAs are presented visually in Figure 2.1 and discussed in more detail in Table 2.5.

Table 2.5 Noise monitoring results

ID	LOCATION	MONITORED NOISE LEVEL dBA						COMMENTS
		RBL / L_{A90} (BACKGROUND)			L_{Aeq} (AMBIENT)			
		DAY[3]	EVENING[3]	NIGHT[3]	DAY[3]	EVENING[3]	NIGHT[3]	
NCA 1	23 John Street, Rydalmere[1]	44	43	42	59	55	52	Industrial and road traffic noise from Camellia
NCA 2	Rydalmere industrial area	N/A[4]						-
NCA 3	Western Sydney University	N/A[4]						-
NCA 4	5 Hope Street, Rosehill[1]	51	48	41	61	58	57	Noise environment dominated by road traffic noise from James Ruse Drive
NCA 5	Silverwater industrial area	N/A[4]						-
NCA 6	Camelia Station, Grand Avenue North, Rosehill	56	-	45	69	-	64	Frequent to constant heavy vehicles (70-80dBA), James Ruse Dr not generally audible, PLR construction / batch plant (44dBA), Camellia southern industrial noise (42dBA), aeroplane 60dBA
NCA 7 / 8	Corner of Unwin Street and Shirley Street, Rosehill	54	-	-	71	-	-	Frequent heavy vehicles, constant blower type noise from Hytec
NCA 9	Camellia industrial area	N/A[4]						-
NCA 10	101 Asquith Street, Silverwater[2]	42	41	38	55	51	48	Not provided

(1) *Parramatta Light Rail Stage 1, Environmental Impact Statement, Technical paper 13: Noise and vibration impact assessment* (SLR, 2017)

(2) *Camellia Recycling Centre, Environmental Impact Statement* (Veolia Environmental Services, 2013)

(3) *In accordance with NPfI time periods: Day time (7am to 6pm), Evening (6pm to 10pm), Night (10pm to 7am)*

(4) *Not monitored due to low risk of noise impacts*

NCA 3
NCA 2
NCA 6
NM_6
NM_4
NCA 1
NM_1
NM_7
NCA 4
NCA 7
NCA 9
NM_3
NM_8
NM_5
NCA 8
NM_2
NCA 5
NCA10

Map: Noise Monitoring Locations, NCAs and Existing Land uses	Author: SH
Date: 06/05/2021	Approved by: BI

To be read in conjunction with WSP document: PS124746_Camellia_Acoustics Baseline Report_RevA

Map Source: Google Satellite

0 100 200 300 400 500 m

1:12,750 at A4

Legend

- Monitoring locations
- Residential
- Educational Institutions
- Place of Worship
- Active Recreation
- Passive Recreation
- Commercial
- Industrial
- Education/Passive Recreation
- Commercial/Industrial
- Disused
- Endangered Ecological Reserve

PS124746 - Camellia-Rosehill Place Strategy Planning Project

Noise Monitoring Locations & Existing Land uses

2.7 METEOROLOGICAL INFLUENCES

Meteorological conditions can influence or reduce the transmission of noise. In particular, weather conditions, including atmospheric temperature inversions and wind conditions can have a substantial impact on noise levels. These impacts are most noticeable at distances of more than 500m.

Typical meteorological conditions in the area have been discussed in detail in the Air Quality and Odour Baseline Study for this proposal and are summarised below. Seasonal and time based wind-roses are presented in the *Acoustics Baseline Report* for this project.

2.7.1 LOCAL METEOROLOGICAL CONDITIONS

Inversion conditions are unlikely to form a part of the meteorological environment at this site. Wind directions are predominately from the northwest and southeast quadrant. Seasonal wind patterns are described in Table 2.6. This data is presented as wind-roses in the *Acoustics Baseline Report* for this project.

Table 2.6 Local wind patterns

TIME PERIOD	DESCRIPTION OF WIND CONDITIONS
Summer	Wind from the east to the south-southeast
Autumn	Wind from the northwest and southeast
Winter	Winds from the northwest
Spring	Wind from the southeast
Annual	Winds from the northwest and southeast
Mornings	Wind from the northwest and west-northwest
Daytime	Wind speeds generally increase and shift towards the east
Night time	Reduced to low level

2.7.2 METEOROLOGICAL NOISE IMPACTS

The most sensitive existing receiver areas potentially impacted by noise from the heavy industrial areas within Camellia-Rosehill are located in Rydalmere to the north east. Wind influencing noise transmission to this area would come from the south west (enhancing conditions) or the north east (reducing conditions). As these wind conditions are rare in this area, meteorological conditions are not considered to be a major influence on noise transmission to existing receivers.

It is noted that the proposed town centre is located in the north western corner of the precinct and as such noise transmission would likely be increased from the heavy industrial areas into the town centre during afternoon and evening periods.

2.8 NOISE COMPLAINTS

Noise complaints have been received by the EPA and Parramatta City Council concerning noise from the Camellia precinct, although it is noted that the majority of these concern the operation of the Parramatta Speedway which is no longer operating.

Additional complaints concern daytime noise from the Rosehill Racecourse, in addition to two complaints concerning two industrial sites on the north eastern area of the Camelia peninsula, opposite the Rydalmere residential area.

3 NOISE LEGISLATION

3.1 OPERATIONAL NOISE

The *NSW Noise Policy for Industry* (NPfI) provides the framework and process for deriving the noise limits for industrial developments under the *Protection of the Environment Operations Act, 1997.*

This section outlines potential, indicative noise trigger levels. These do not form any type of project criteria and are only included to identify the likely acceptability of predicted noise levels.

3.1.1 OVERVIEW

The NPfI outlines a procedure to assess industrial noise impacts utilizing two assessment criteria for environmental noise. The first relates to the intrusiveness of a noise source, allowing for the noise under assessment to marginally above the background, whilst the other procedure relates to the acceptability of the resulting noise, in relation to the use of the surrounding landscape. Generally, the more stringent of the intrusive or amenity criteria is adopted as the project-specific noise criterion.

In assessing the noise impact of industrial sources, both components must be considered for residential receivers. In most cases, only one will become the limiting criterion and thereby determine the project-specific noise levels applied to noise from the Proposal's industrial sources. As the proposal will include a significant rezoning and redesign of the area, existing background noise levels at the site are not considered to be representative of the redesigned Camellia – Rosehill Precinct.

Therefore, for the purposes of this assessment, only the amenity criteria have been used to provide a general indication of the acceptability of predicted noise. Potential impacts of specific projects will be assessed during the planning process, in accordance with the NPfI.

3.1.2 ASSESSMENT PERIODS

The assessment time periods defined by the NPfI are presented in Table 3.1.

Table 3.1 NPfI Time Periods

ASSESSMENT PERIOD	TIME
Day	7:00 am to 6:00 pm Monday to Saturday 8:00 am to 6:00 pm Sundays and public holidays
Evening	6:00 pm to 10:00 pm all days
Night	10:00 pm – 7:00 am

3.1.3 AMENITY CRITERIA

Existing and potential future residential receivers would likely be categorised as a mix of "suburban" and "urban" residential" as defined in the NPfI. A variety of non-residential receivers are proposed under each scenario. The relevant NPfI amenity criteria for these landuses are presented in Table 3.2. It is noted that the Amenity Noise Levels relate to the maximum permissible noise levels *onto* the development, not the maximum permissible noise emissions *from* the development.

The recommended Amenity Noise Levels (ANLs) represent the objective for total industrial noise at a receiver location. The amenity noise level emissions for any individual proposed development would be 5 dBA below these levels.

Table 3.2 Amenity criteria

TYPE OF RECEIVER	INDICATIVE NOISE AMENITY AREA	ASSESSMENT PERIOD	RECOMMENDED ANL, dBA $L_{eq,period}$
Residential	Urban	Day	60
		Evening	50
		Night	45
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
School classroom	All	Noisiest 1-hr period when in use	35 (internal) 45 (external)
Active recreation	All	When in use	55
Passive recreation	All	When in use	50

3.2 ROAD TRAFFIC NOISE

3.2.1 ROAD NOISE POLICY

The proposed scenario involves the construction of several new roads, in addition to work in the vicinity of Grand Avenue and Hassall Street. In NSW, any changes to road traffic noise are assessed in accordance with the *NSW Road Noise Policy* (RNP), (DECC, 2011).

The RNP can be used by individuals and agencies to assess and mitigate the impacts of traffic noise from new and redeveloped road projects, and traffic-generating developments on residential and other sensitive lands.

The policy links with other NSW Government policies and plans to ensure that where road traffic exists, its noise impacts are appropriately identified and addressed.

As relevant to the potential road changes associated with this project, the following noise criteria would be considered at residential properties.

Table 3.3 Road traffic noise criteria

ROAD CATEGORY	TYPE OF PROJECT	ASSESSMENT CRITERIA dBA (EXTERNAL)	
		DAY (7AM TO 10PM)	NIGHT (10PM TO 7AM)
Arterial / sub arterial roads	Existing residences affected by noise from NEW roads	$L_{Aeq\ (15\ hour)}$ 55	$L_{Aeq\ (9\ hour)}$ 50
	Existing residences affected by noise from REDEVELOPED roads	$L_{Aeq\ (15\ hour)}$ 60	$L_{Aeq\ (9\ hour)}$ 55
Local roads	Existing residences affected by noise from NEW roads	$L_{Aeq\ (1\ hour)}$ 55	$L_{Aeq\ (1\ hour)}$ 50
	Existing residences affected by noise from REDEVELOPED roads		

3.2.2 DEVELOPMENT NEAR RAIL CORRIDORS AND BUSY ROADS – INTERIM GUIDELINE

Development near rail corridors and busy roads – Interim guideline (DNRCBR) has been developed by Department of Planning for use by authorities and proponents to consider road and rail noise at new residential and other developments alongside railway corridors and busy roads. The guideline details the requirements and implementation of the relevant provisions in the *State Environmental Planning Policy (Infrastructure) 2007* (ISEPP).

The Guideline applies to development adjacent to rail corridors and busy roads. While consideration of the Guideline is a requirement for development specified under the Infrastructure SEPP it can also provide a useful guide for all development that may be impacted by, or may impact on, road and/or rail corridors

It aims to protect the safety and integrity of key transport infrastructure from adjacent development, and ensure these developments maintain appropriate acoustic amenity by meeting internal criteria specified in the ISEPP.

The guideline provides internal noise criteria for noise from road and rail traffic at residential and non-residential landuses. These have been replicated in Table 3.4.

Table 3.4 Exterior noise criteria for proposed road and rail for residential land-use developments

RESIDENTIAL BUILDINGS		
Type of occupancy	**Noise level dBA**	**Applicable time period**
Sleeping areas (bedroom)	35	Night 10 pm to 7 am
Other habitable rooms (excl. garages, kitchens, bathrooms & hallways)	40	At any time
NON-RESIDENTIAL BUILDINGS		
Type of occupancy	**Recommended max level dBA**	
Educational Institutions including child care centres	40	

Source: Department of Planning: Interim Guideline – Development Near Rail Corridors and Busy Roads

3.2.2.1 ROAD NOISE

The DNRCBR provides screening tests for any noise sensitive receivers as per Table 3.4 which define relevant categories of noise control treatments required, depending on distance to the road and traffic volumes.

It is assumed that future and existing streets within Camellia would be generally signposted at 50 / 60 km/h. The nearest screening test provided is for 60/70 km/h zones, and is presented in Figure 3.1.

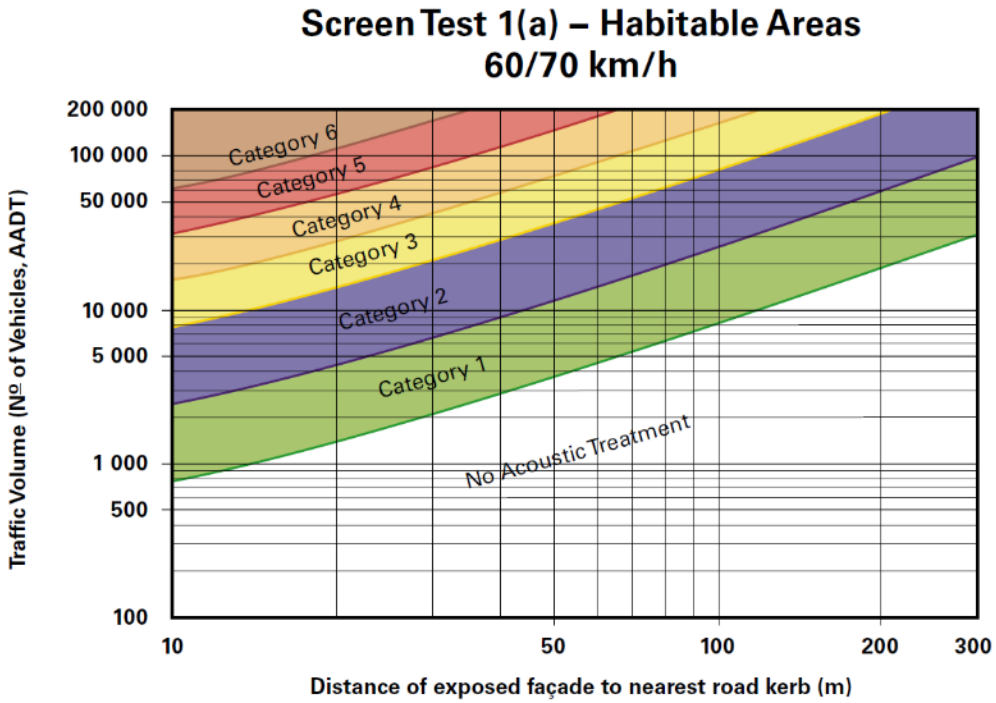


Figure 3.1 DNRCBR Screening test for habitable areas (if any exposed façade is direct line-of-sight)

Source: NSW Government's Development Near Rail Corridors and Busy Roads – Interim Guideline 2008

For the purposes of the assessments in Section 5, these categories broadly align with the following noise risk levels:

— Category 1	No noise risk	Dark green
— Category 2	Low noise risk	Light green
— Category 3	Low – medium noise risk	Yellow
— Category 4	Medium noise risk	Orange
— Category 5	Medium – high noise risk	Dark orange
— Category 6	High noise risk	Red

3.3 RAIL NOISE

Potential rail noise impacts within the precinct may arise from operation of the Sydney Metro West or Parramatta Light Rail (Stages 1 and 2). This assessment has adopted the identified noise and vibration impacts identified within the planning studies for each of these assessments. These have been assessed in accordance with the relevant noise and vibration criteria as outlined in the Rail Infrastructure Noise Guideline (RING) Further background on the guideline is provided in each of the following reports:

- *Parramatta Light Rail Stage 1, Environmental Impact Statement, Technical paper 13: Noise and vibration impact assessment* (SLR, 2017)
- *Sydney Metro West, Environmental Impact Statement, Concept and Stage 1, Technical Paper 2: Noise and vibration* (SLR, 2020).

3.4 VIBRATION CRITERIA

Vibration may be generated within the site during the operation of industrial facilities and rail lines or during construction, demolition and remediation activities. These impacts may result in adverse impacts on human comfort or the damage of physical structures such as dwellings. These two impacts are assessed against different criteria, with the effects of vibration on human comfort having a lower threshold.

3.4.1 COSMETIC BUILDING DAMAGE AND STRUCTURAL INTEGRITY

There are no vibration limits for buildings and structures in *Assessing Vibration: A Technical Guideline* (AVaTG). Therefore, limits have been adopted from the British Standard *BS 7358-2: Evaluation and measurement for vibration in buildings guide to damage levels from ground-borne vibration*.

Importantly, cosmetic damage is regarded as minor in nature; it is readily repairable and does not affect a building's structural integrity. If there is no significant risk of cosmetic damage, then structural damage is not considered a risk.

A summary of the relevant limits from BS7358-2 is presented in Table 3.5. These peak vibration limits are set so that the risk of cosmetic damage is minimal. They have been set at the lowest level above which damage has been credibly demonstrated. The limits assume that the equipment causing the vibration is used intermittently.

Table 3.5 BS 7385-2 Guideline vibration limits for cosmetic damage

GROUP	TYPE OF STRUCTURE	PEAK COMPONENT PARTICLE VELOCITY, mm/s (1)		
		4–15 Hz	15–40 Hz	> 40 Hz
1	Reinforced or framed structures Industrial and heavy commercial buildings	50		
2	Un-reinforced or light framed structures Residential or light commercial buildings	15 – 202	20 – 50	50

(1) Values referred to are at the base of the building, on the side of the building facing the source of vibration (where feasible).

At frequencies below 4Hz, a maximum displacement of 0.6mm (zero to peak) should not be exceeded.

3.4.2 HUMAN COMFORT (AMENITY)

Table 3.6 presents the limits (vibration dose values or VDV) above which there is considered to be a risk to the amenity and comfort of people occupying buildings from intermittent vibration. These limits are sourced from the *Assessing Vibration: A Technical Guideline* (AVaTG).

Table 3.6 Human comfort (amenity) guideline vibration limits (intermittent work)

LOCATION	ASSESSMENT PERIOD	VIBRATION DOSE VALUE, $m/s^{1.75}$	
		PREFERRED VALUES	MAXIMUM VALUES
Critical areas	Anytime	0.1	0.2
Residences	Daytime	0.20	0.40
	Night time	0.13	0.26
Offices, schools, educational institutions, and places of worship	Anytime	0.4	0.8
Workshops	Anytime	0.8	1.6

3.4.3 HERITAGE STRUCTURES

Building structures classified as being of heritage significance are to be considered on a case by case basis, as a heritage listed structure may not be assumed to be more sensitive to vibration unless it is structurally unsound which is unlikely for a regularly maintained structure. Where a historic structure is deemed to be sensitive to damage from vibration following inspection by qualified structural and / or civil engineers, more conservative superficial cosmetic damage criterion based on Peak Component Particle Velocity (PPV) should be considered.

Where a historic building is deemed to be sensitive to damage from vibration (structurally unsound), a conservative superficial cosmetic damage criterion of PPV 3 mm/s peak component particle velocity (based on DIN4150) may be applicable.

With the exception of construction induced ground vibration from sources such as piling or demolition, it has been assumed that the operation of the Sydney Metro West and Parramatta Light Rail would be the only sources of ground borne noise or vibration at this site.

4 ASSESSMENT METHODOLOGY

4.1 NOISE ASSESSMENT METHODOLOGY

Noise generated under the proposal has generally been modelled using spatial information supplied by DPIE and includes typical noise emissions for each landuse type. Given the lower noise criteria for night-time hours at sensitive receiver locations, noise levels have been modelled for night-time periods only. Where compliance during night-time is shown, the risk of daytime noise impacts is considered low.

A 3D noise model was created using SoundPLAN software and included terrain, buildings and ground absorption. Where relevant, existing building were retained within the model, otherwise typically representative structures were assumed for each proposed landuse type.

Table 4.1 summarises the modelling conditions.

Table 4.1 Industrial noise modelling parameters

ITEM	ASSUMPTIONS
Calculation method	CONCAWE noise prediction algorithm within SoundPLAN v8.2
Assessment period	Night-time only (10pm to 7am)
Ground topography	From a combination of supplied 3D drawings and survey data and existing topographical maps provided by NSW Lands and Property Information.
Existing buildings and receivers	Provided by Geoscape and developed from a combination of satellite and aerial imagery.
Proposed buildings and receivers	Typical building types, heights and footprints are indicative only and have been based on recommendations within the proposed scenario planning report.
Ground absorption	— Set at 60% soft ground for lawn, natural areas and park land — Set at 50% soft ground for residential land use — Set at 25% hard ground for commercial landuses — Set at 0% for water
Source and receiver locations	Sources and noise predictions have been set at 1.5m height above ground
Meteorological conditions	As described in Section 2.7.2 (low to moderate breeze from source to receiver, Pasquil stability category F (worst case))

4.2 INDUSTRIAL NOISE ASSESSMENT METHODOLOGY

Industrial noise assessed in this study includes all known human generated noise sources, such as heavy industrial, entertainment or other commercial landuses, in addition to noise from the Sydney Metro West and Parramatta Light Rail stabling and maintenance facilities. It does not include road or rail noise sources, which are discussed in the following sections.

Industry noise source emissions for each scenario have been adapted from a combination of existing reports, government databases, on site monitoring and the NSW NPfI and are detailed in Table 4.3. Where possible, noise levels have been validated against monitored noise data or predictions within publicly available noise reports.

4.3 ROAD NOISE ASSESSMENT METHODOLOGY

Road noise impacts have been based on the Screening Test 1(a) and corresponding noise levels outlined in the DNRCBR / ISEPP (refer Section 3.2.2). Modelled traffic numbers for existing roads are outlined in Table 4.2.

Table 4.2 Road traffic numbers – Existing roads

ROAD	DIRECTION	AADT	SOURCE
James Ruse Drive (north of Grand Avenue)	North bound	23,360	Traffic counts (Matrix, 21/11/2019)
	South bound	28,205	
James Ruse Drive (south of Grand Avenue)	North bound	26,365	Traffic counts (Matrix, 21/11/2019)
	South bound	29,835	

Traffic numbers on unchanged off-site roads have been assumed to remain the same under this model. Although numbers are likely to change somewhat, changes are not likely to be acoustically significant on these major road corridors. It is noted that a doubling of road traffic numbers would lead to an increase in road traffic noise of approximately 3dB, and as such actual impacts on road noise levels are likely to be marginal.

Modelled road traffic numbers for new or upgraded roads have been presented in Table 4.3.

4.4 RAIL NOISE AND VIBRATION ASSESSMENT

This section addresses noise from the Parramatta Light Rail and Sydney West Metro train operations. It does not include potential impacts associated with the stabling or maintenance facilities for either project. The assessment methodology for these developments is considered in Section 4.1.

4.4.1 PARRAMATTA LIGHT RAIL - NOISE

Potential rail noise and vibration impacts from the Parramatta Light Rail Stage 1 have been referenced from the *Parramatta Light Rail Stage 1 Westmead to Carlingford via Parramatta CBD and Camellia Environmental Impacts Statement (NSW Government, 2017).*

This document states that for the Camellia / Rosehill area, operational rail noise impacts are predicted to exceed RING residential criteria within 15m of the alignment. Outside this distance, noise levels are predicted to comply with these guidelines.

Operational rail noise as a result of Stage 2 operations have been assumed to be similar to those predicted under Stage 1.

4.4.2 PARRAMATTA LIGHT RAIL – GROUND VIBRATION

Potential ground vibration impacts associated with the Parramatta Light rail (Stage 1) was been assessed in the Noise and Vibration Impacts Assessment for the project (SLR, 2017). This assessment found that predicted vibration levels comply with the human comfort VDV criteria at all locations. However, where vibration sensitive laboratories are located within 150m of the alignment, a detailed review of their sensitivity to vibration should be carried out. This would consider the nature of work and equipment at the site and assess potential impacts of ground vibration on the proposed activities.

Where the site is found to be vibration sensitive, more detailed investigations would be conducted including measurement of existing ambient vibration levels at the facade and at the equipment location, and measurement of the vibration transmitting characteristics of the ground at that specific location.

Under the existing scenario, no vibration sensitive landuses have been identified within the affected zone of Camellia. It is therefore recommended that no vibration sensitive landuses are considered for construction within 150m of the proposed Parramatta Light Rail alignment.

It is assumed that vibration impacts under Parramatta Light Rail Stage 2 would be largely similar to those assessed for Stage 1.

4.4.3 SYDNEY METRO WEST – NOISE

Given that the Sydney Metro West main line will be an underground alignment, noise impacts are not predicted to occur during operation of main line of the proposal. However, in addition to the main line operations, trains will access the maintenance facility via a tunnel entrance (dive site), located between James Ruse Drive and the Rosehill Racecourse. This area will also include a test track for Metro trains.

Potential operational noise impacts associated with the Sydney West Metro main line had not been assessed at the time this report was prepared. In the absence of publicly available data, noise levels per train were assumed to be similar to *Sydney Metro City and South West Sydenham to Bankstown Technical paper 2 – Noise and vibration Assessment* (610.15897-R02) (SLR, 2017). The number of trains using the test track or accessing the maintenance facility is not currently known and assumptions have been presented in Table 4.3.

4.4.4 SYDNEY METRO WEST – GROUND VIBRATION

An assessment of areas potentially affected by ground-borne vibration has been based on the methodology detailed in ISEPP. The results of this calculation show that vibration impacts at typical residential properties are unlikely outside of an approximate 25m buffer distance and at vibration sensitive landuses (for example laboratories, medical facilities, electronic workshops, photographic studios, etc) outside of a 60m buffer zone.

In order to minimise the effect of these potential impacts it is recommended that no vibration sensitive landuses are positioned within 25m of the West Sydney Metro corridor.

4.5 NOISE ASSESSMENT INPUTS

Table 4.3 presents the noise sources modelled for this assessment. These have been determined with reference to the amenity noise levels in Section 3.1.3, monitoring results in Section 2.5 and details in Section 4.1 to Section 4.4. These levels are indicative of typical maximum noise emissions for each land use.

Table 4.3 Proposed scenario – Noise assessment inputs

NOISE SOURCE	MODELLED SOUND POWER LEVEL dBA /m^2
Pumping station	50[2]
Heavy industrial (excluding Viva Energy)	65
Viva Energy	45[3]

NOISE SOURCE	MODELLED SOUND POWER LEVEL dBA /m²			
Innovation and light industry	60[1]			
Urban services	55[1]			
Entertainment and hospitality	55			
PLR Stabling yard	60[4]			
Sydney Metro West stabling yard	60[5]			
Parramatta Light Rail (operations)	73 daytime / 63 night-time[4, 7]			
Sydney Metro West dive site	64 daytime / 64 night-time[6, 7]			
ROAD	**TRAFFIC NUMBERS (AADT)[7]**			
	LV Day	**HV Day**	**LV Night**	**HV Night**
Grand Avenue	3,167	282	293	168
New south western access (M4 ramps)	-	1,738	-	260
Carnarvon Road	3,006	267	278	160
New south western access (Wentworth Street)	-	8,444	-	1,262
Clyde Street	2,903	258	269	154

(1) It has been assumed that this noise source would not be operational during night-time hours

(2) Assumed external noise level. Due to construction activities associated with PLR Stage 1, monitoring was not able to be carried out for this site.

(3) Based on attended noise monitoring (refer Table 2.4) this is considered a conservative assumption

(4) Calculated from levels presented in *Parramatta Light Rail Stage 1, NVIA* (610.16769.R02), August 2017

(5) Potential operational noise impacts associated with the Sydney West Metro will be assessed under Stage 2, which has not yet commenced. In the absence of publicly available data, noise levels were assumed to be similar to PLR

(6) Noise levels per train were assumed to be similar to *Sydney Metro City and South West Sydenham to Bankstown Technical paper 2 – Noise and vibration Assessment* (610.15897-R02) (SLR, 2017). Train numbers were not available and assumed to be 10 per day and 6 per night per direction.

(7) Approximate calculations based on forecasts within the traffic assessment, this project. LV=Light vehicles, HV=Heavy vehicles, Day = 7am to 10pm, Night=10pm to 7am

In addition, the following assumptions have been made:

- Noise sensitive receivers such as residential, recreation and educational landuses have not been included as a noise source.
- Potential operational noise impacts associated with the Sydney West Metro maintenance facility had not been assessed at the time this report was prepared. In the absence of publicly available data, noise levels were assumed to be similar to the PLR maintenance facility. The number of trains using the test track or accessing the maintenance facility is not currently known and assumptions have been presented in Section 4.5.
- Landuse at the Viva energy site will remain unchanged.
- As the racetrack is scheduled to only operate one day each fortnight, noise from this event has not been included in the modelling.
- Train movements on the Sydney Metro West test track would be erratic and infrequent and have not been included in the model.

5 PROPOSED MASTER PLAN NOISE AND VIBRATION ASSESSMENT

5.1 INTRODUCTION

This section outlines the noise environment likely to be encountered under the proposed scenario. The region is proposed to be formed of the following 3 separate sub-precincts:

- Active town centre
- Transition zone: including entertainment, recreation and urban services
- Innovation and industry

Opportunities for new residential areas and continued employment growth in the precinct have been identified. More specifically, the following features have been proposed:

- Redevelopment will be focused around a new town centre located close to transport connections and will be an attractive place for people to live, work, study and visit.
- The new community, and surrounding areas, will enjoy enhanced public access to the Parramatta River through new waterfront parks connecting the precinct to Parramatta CBD and Sydney Olympic Park.
- A primary school is planned to support the new residential population and collocated with open space on the Parramatta River.
- The Urban Services Zone will act as a transition area and is proposed to facilitate an intensification of employment uses within the urban services, light industry and manufacturing sectors.
- New urban services businesses are attracted to Camellia-Rosehill by improved public transport and amenity from a new Town Centre, enhanced pedestrian and cyclist environment and access to the Parramatta River.
- The eastern part of the peninsula is focussed on maintaining the employment focus of the Camellia-Rosehill Precinct, whilst ensuring a greater diversity of uses and users within it.
- The industrial uses will achieve a greater density and diversity of jobs with businesses attracted by improved public transport, road upgrades and amenity and access to the Parramatta River.
- New high tech/eco-industries such as prefabrication, 3D prototyping, robotics, recycling and industrial design businesses, new industrial uses with a larger office component, city-building services, warehousing, logistics, distribution centres and energy generation are located within these zones.

5.2 PROPOSED SITE LAYOUT

The proposed layout and transport corridors for the proposal are presented in Figure 1.1.

5.3 NOISE AND VIBRATION RISK MAPS

Noise sources from each landuse type, including industrial, road and rail have been modelled and assessed and the relative risk of each source upon sensitive landuse within the precinct has been assessed. Maps showing the overall noise level are presented in Figure 5.1 (daytime) and Figure 5.2 (night-time) and detailed maps showing the influence of each landuse type are presented in Figure 5.3 to Figure 5.8. Generally, these risk levels broadly align to the following predicted noise levels:

Table 5.1 Risk noise levels

COLOUR	DAYTIME NOISE LEVEL $L_{Aeq\ (15\ minute)}$	NIGHT TIME NOISE LEVEL $L_{Aeq\ (15\ minute)}$
Dark green	55 to 60 dB	40 to 45 dB
Green	60 to 65 dB	45 to 50 dB
Yellow	65 to 70 dB	50 to 55 dB
Orange	70 to 75 dB	55 to 60 dB
Red	> 75dB	> 60dB

Potential vibration risk zones are presented in Figure 5.9.

The categories broadly align to the following ground vibration risks:

Table 5.2 Risk vibration levels

COLOUR	RISK	DESCRIPTION
Green	Low risk	Potential impacts to vibration sensitive industry
Yellow	Medium risk	Potential impacts to human comfort
Orange	High risk	Potential building damage impacts

Figure 5.1 Proposed scenario - Noise risk map (All sources) – Day time

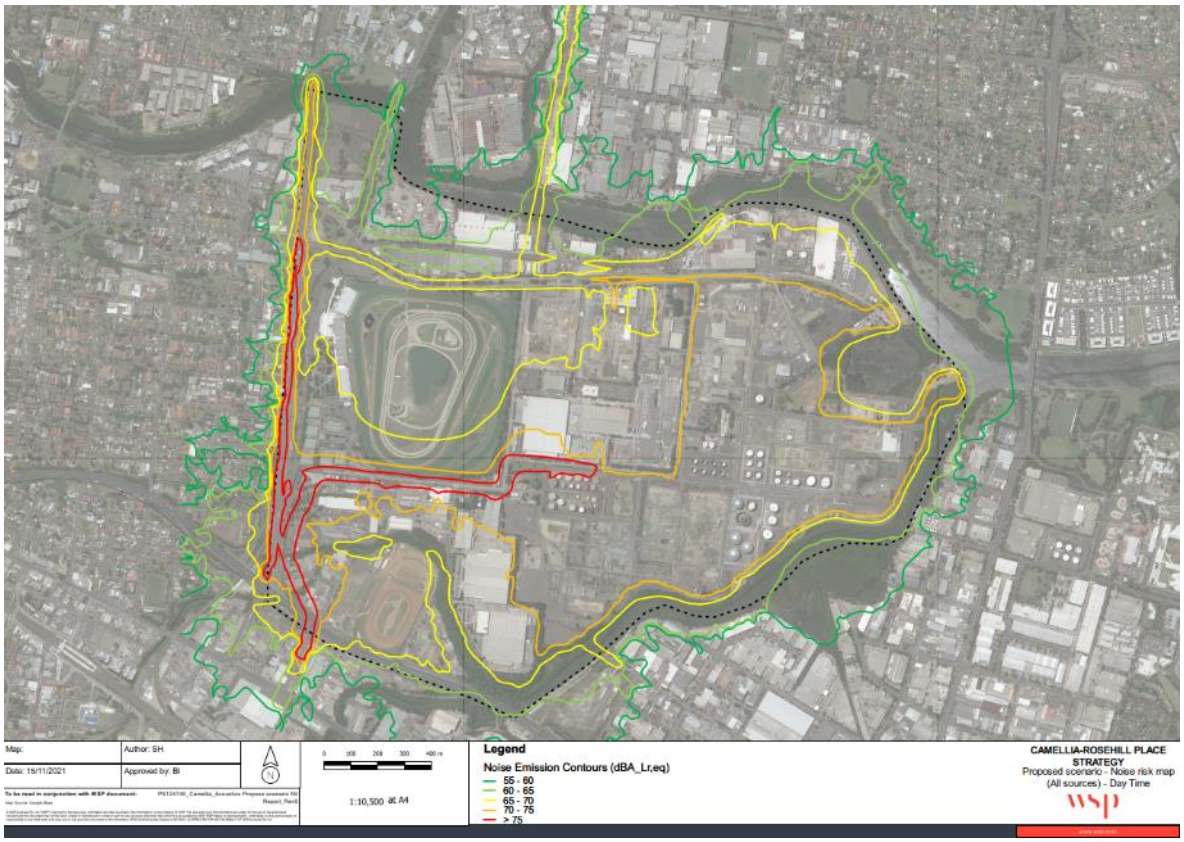


Figure 5.2 Proposed scenario - Noise risk map (All sources) – Night time

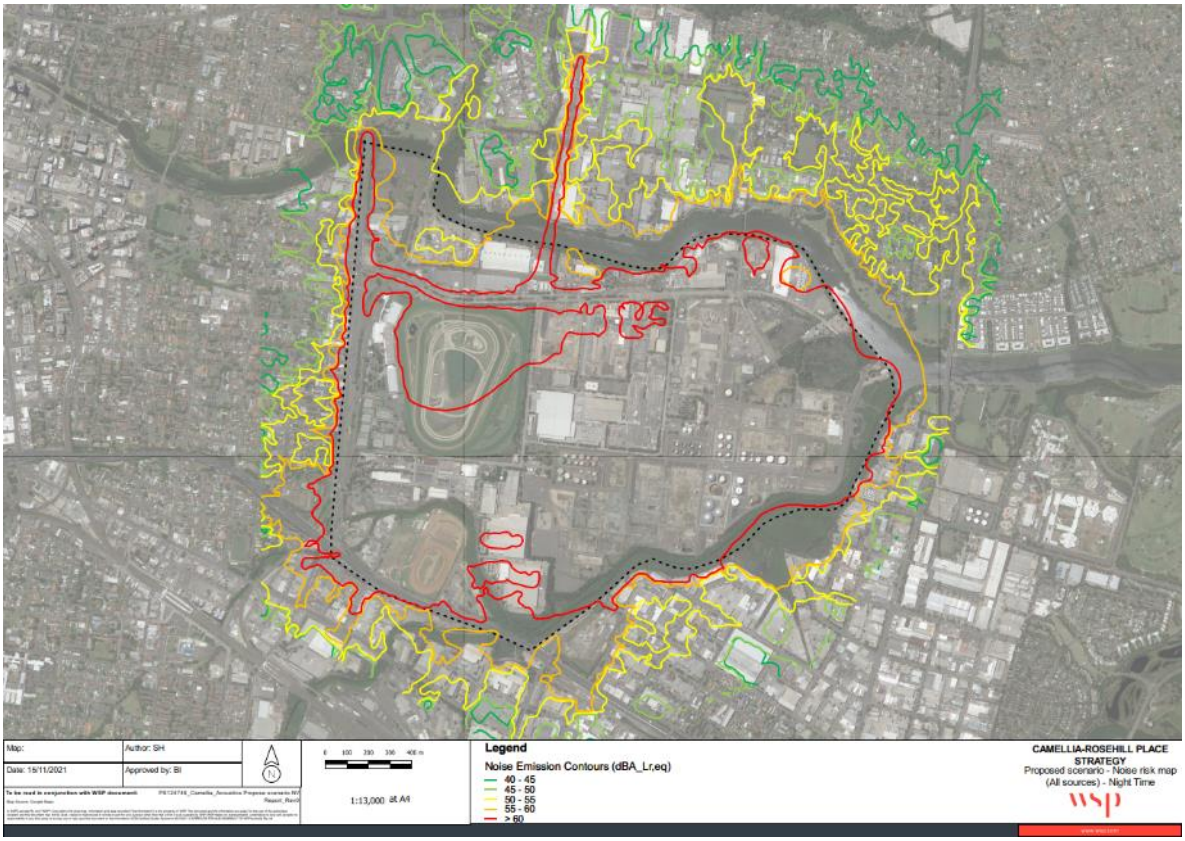


Figure 5.3 Proposed scenario - Noise risk map (Heavy industry only) – Day and night-time

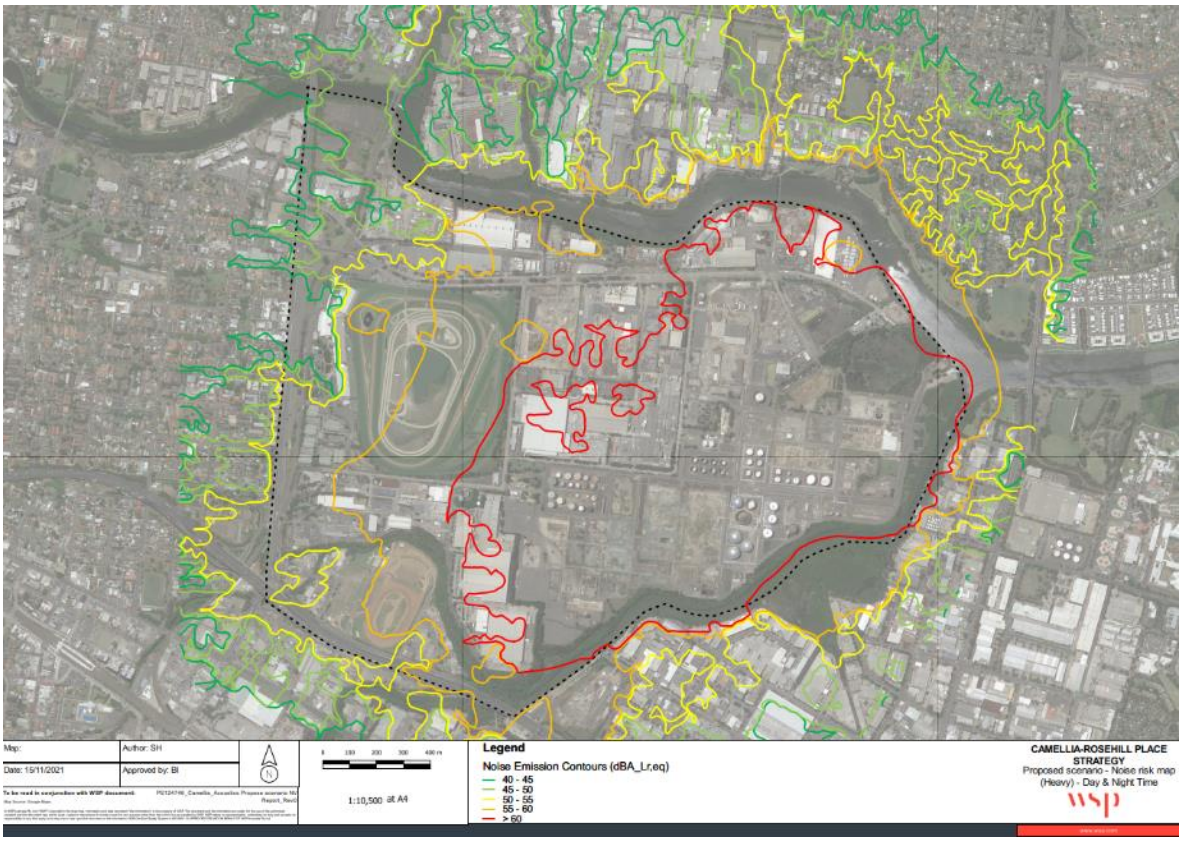


Figure 5.4 Proposed scenario - Noise risk map (Entertainment only) – Day and night-time

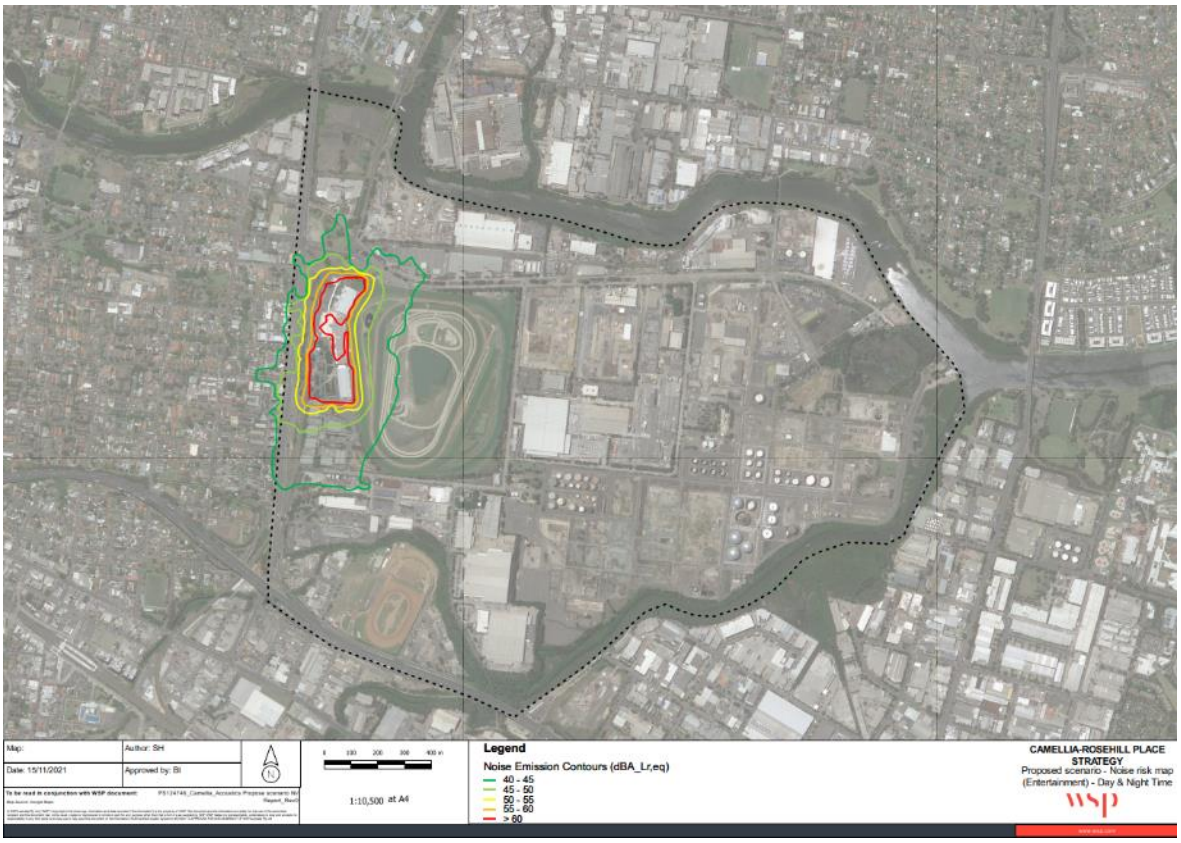


Figure 5.5 Proposed scenario - Noise risk map (Transport only) – Day time

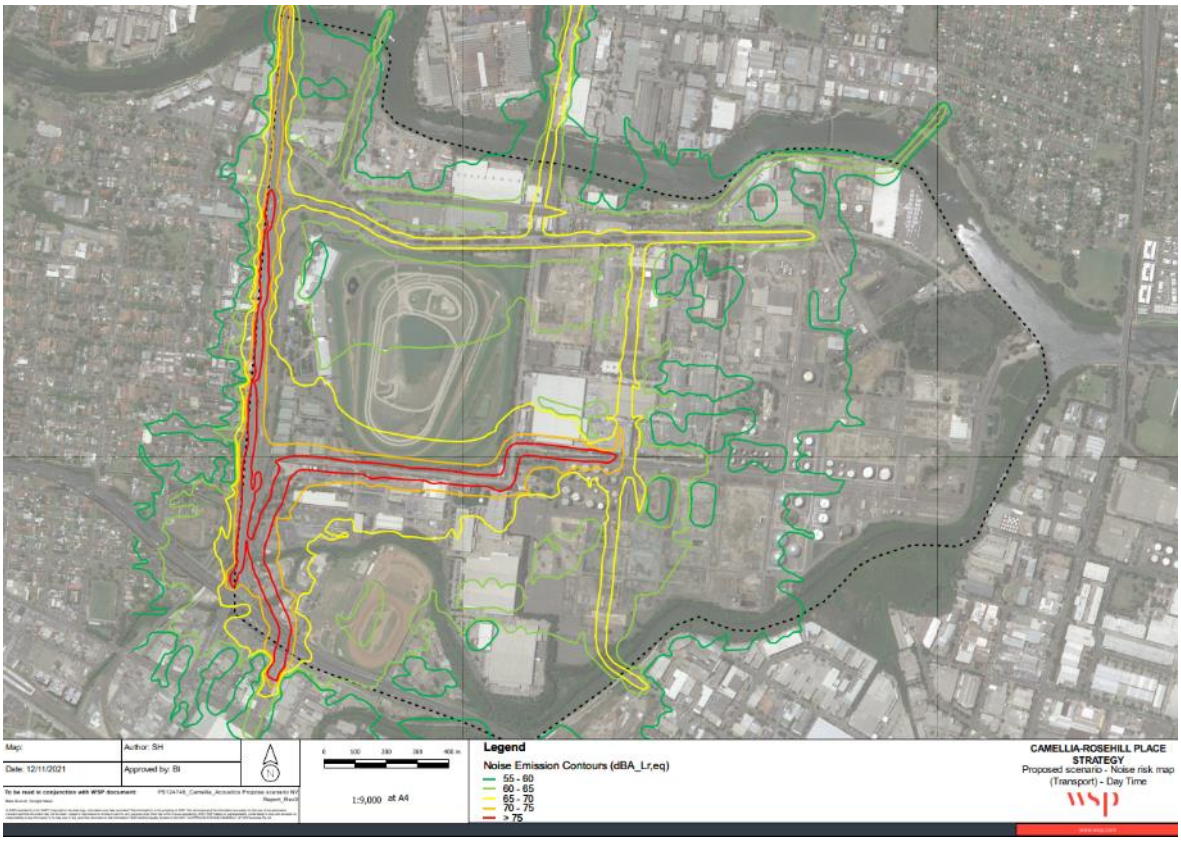


Figure 5.6 Proposed scenario - Noise risk map (Transport only) – Night time

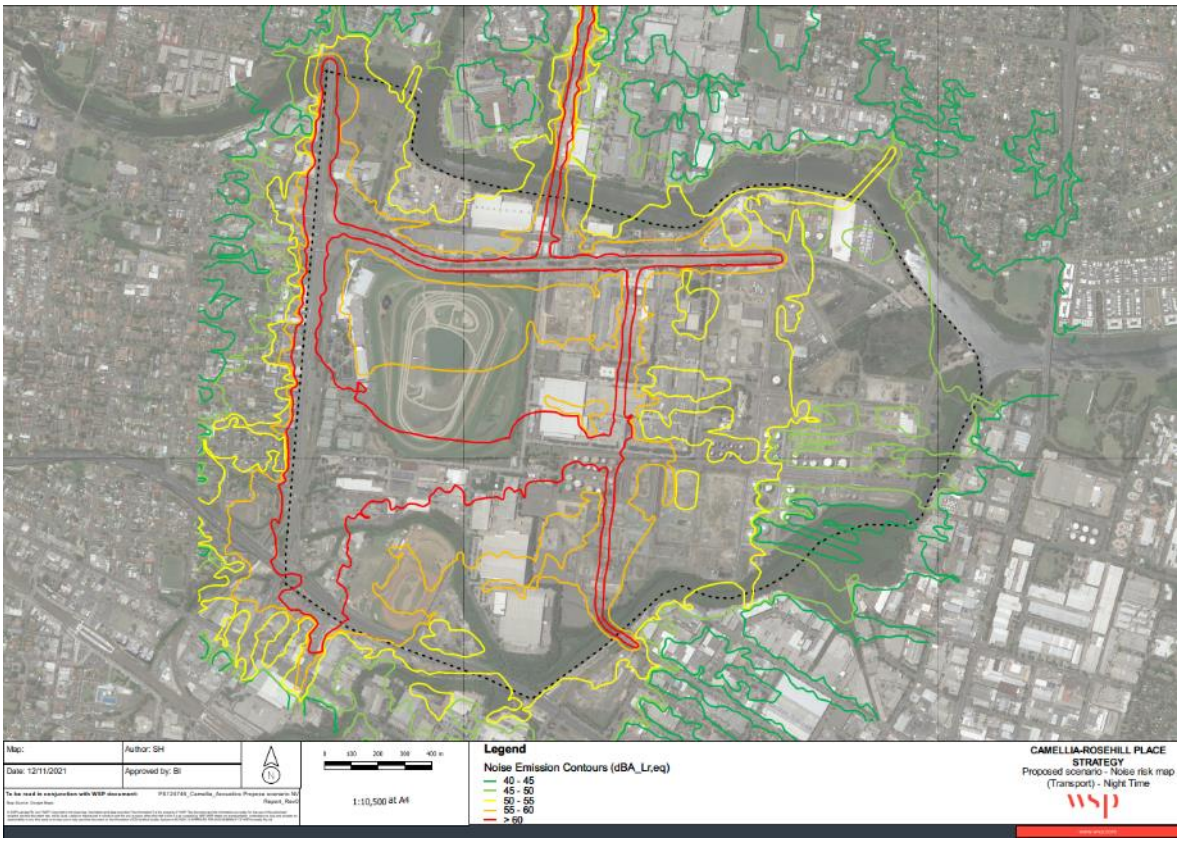


Figure 5.7 Proposed scenario - Noise risk map (Innovation only) – Day time

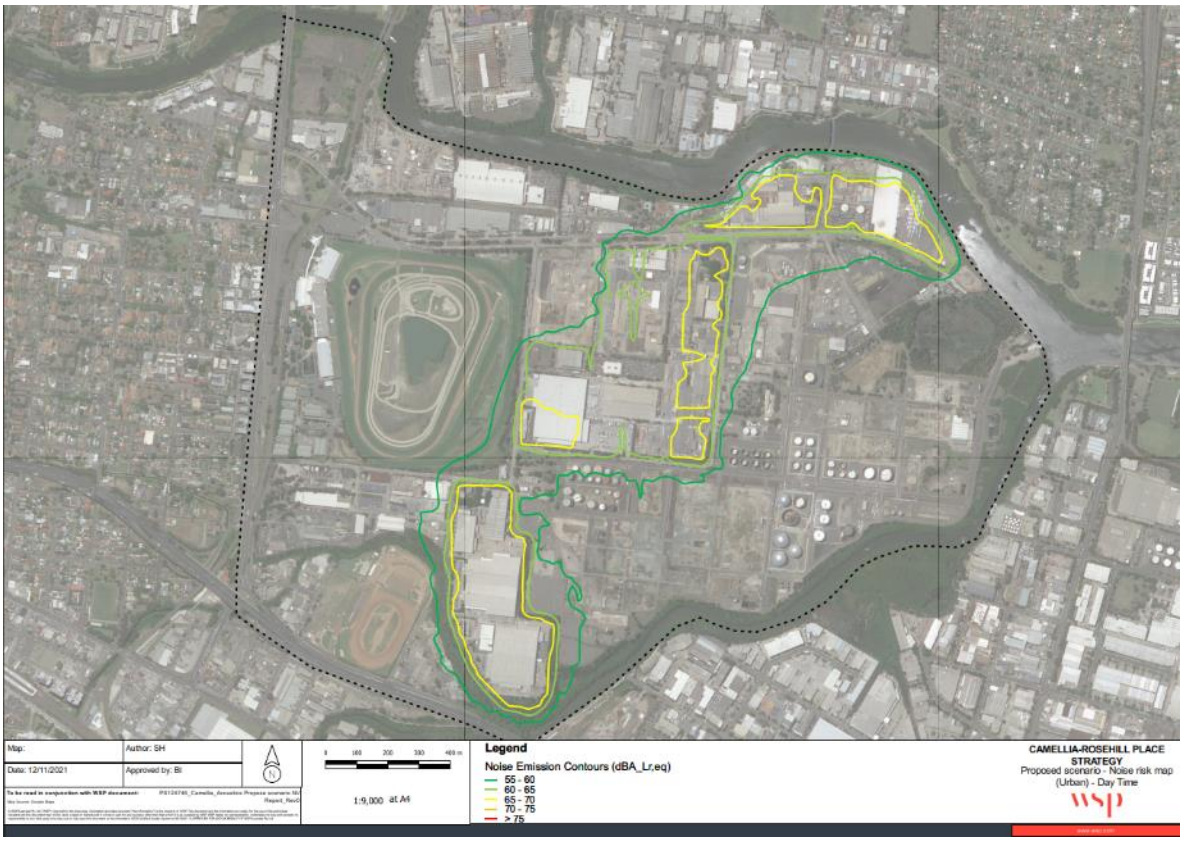


Figure 5.8 Proposed scenario - Noise risk map (PLR and Metro maintenance facilities only) – Day and night time

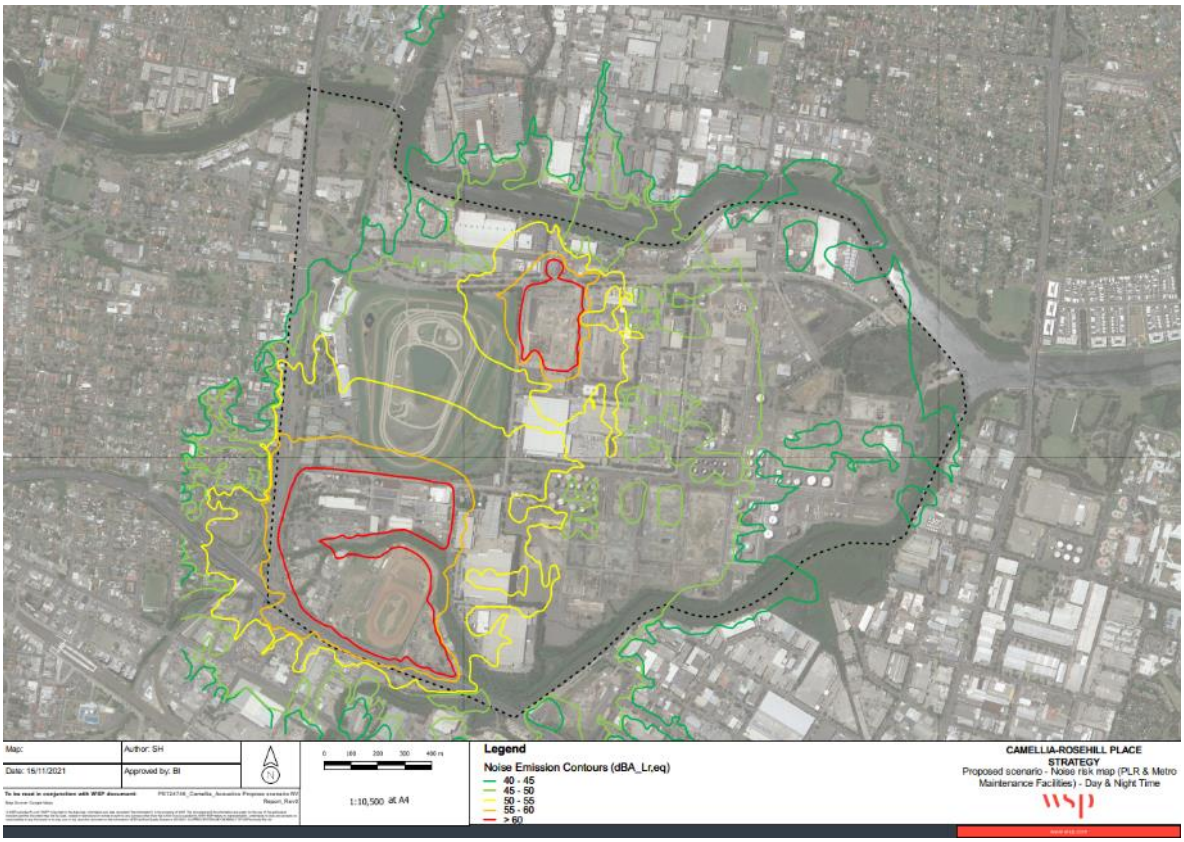
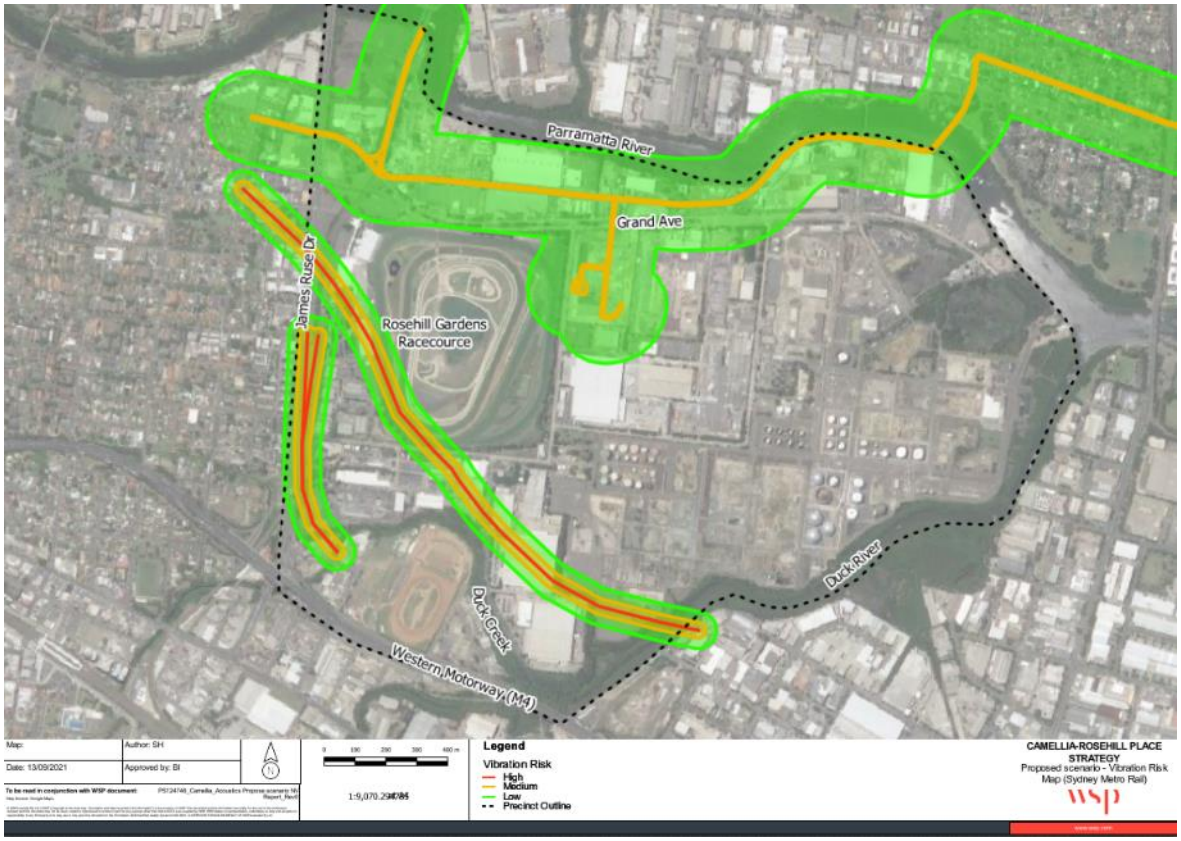


Figure 5.9 Proposed Scenario - Vibration risk map



5.4 DISCUSSION

Potential worst case noise levels have been predicted for the proposed Master Plan. These predictions assess the impact of the likely maximum noise emissions from each site under worst case meteorological conditions. As such they represent a highly conservative prediction of potential impacts.

The noise and vibration maps presented in Figure 5.1 to Figure 5.9 indicate that the most intensive noise source affecting the peninsula would continue to be road traffic noise and heavy industrial landuses in the east of the precinct. Table 5.3 presents a summary of the findings:

Table 5.3 Findings of noise modelling

NOISE SOURCE	FINDINGS
Heavy industry	Noise from heavy industry is already a feature of the environment within the precinct. Under the proposed Master Plan, daytime noise impacts would not be expected to extend far from these industrial areas themselves, with the daytime amenity noise level being met at all residential areas. Where these industries operate during night-time hours, existing residential areas on James Ruse Drive and in southern areas of Rydalmere may be impacted by noise levels greater than the recommended night-time amenity levels. It is expected that these impacts would be further assessed and managed through normal planning approval processes. The proposed heavy vehicle routes will reduce road traffic noise impacts for the new residential landuses in the north and east of the precinct. The removal of heavy industry in the northern areas of the precinct is expected to reduce existing noise impacts for existing residential areas of Rydalmere. Noise levels from heavy industry at the proposed new residential areas are likely to marginally exceed the night-time amenity levels at the eastern facades of buildings, with the most eastern residential properties on Grand Avenue likely to be most affected. Impacts at new residences are likely to be easily mitigated through the incorporation of normal acoustic building treatments in their design.
Urban services	The Urban Services Zone will act as a transition area / buffer from the heavy industrial landuses in the south towards the proposed residential areas in the north of the precinct, screening noise and providing a distance buffer to reduce industrial noise. Operation of the proposed urban services precinct is unlikely to affect noise levels in the proposed new residential zones or at existing residential areas. This assessment has assumed that operation of these services can be restricted to Standard working hours. Where night-time operation of any urban services is required, any predicted impacts could be further reduced through landuse planning and the placement of night-time operations to the southern areas of the precinct.

NOISE SOURCE	FINDINGS
Entertainment and hospitality	Noise from the proposed entertainment and cultural areas are not expected to affect most residential properties outside of the precinct itself. Noise levels marginally higher than the night-time amenity levels have been predicted to potential impact 2 buildings directly opposite the entertainment precinct on James Ruse Drive. Residential buildings within the entertainment and cultural precinct may be affected by noise from within the precinct, however these impacts are likely to be easily mitigated through the incorporation of normal acoustic building treatments in their design. The infrequent nature of racing events means that the risk of noise impacts from the racecourse are considered to be low.
PLR / Metro stabling and maintenance facilities	The operation of these maintenance facilities will be subject to assessment and management through the planning approval process for each project. Ambient noise levels at eastern residential areas within the precinct are predicted to be 5 to 10 dB higher than the recommended residential amenity levels during night-time hours as a result of the operation of the PLR maintenance facility. It is noted that the Noise and Vibration Impact Assessment for the PLR Stage 1 states that '…*the area surrounding the facility has been identified for potential rezoning as Camelia Town Centre which would consist of mixed-use land, including residential, open spaces and various commercial usages. Whilst limited details are available regarding the redevelopment of the site, it is acknowledged that the stabling facility has the potential to impact on future receivers that are built in proximity to the boundary of the site.'*. These residential properties are likely to be impacted by other noise sources, in particular, from road traffic and as such these impacts are likely to be mitigated through the incorporation of normal acoustic treatments in the building design. The Sydney West Metro facility is not expected to impact landuse within the proposal area, however it may generate noise levels marginally higher than the recommended night-time amenity levels at residences on the southern extent of James Ruse Drive. These properties are already highly impacted by road traffic noise and these impacts may not be discernible.

NOISE SOURCE	FINDINGS
Transport	Transport is currently the largest noise impacts at all areas within the proposal area. Noise from heavy vehicles within Camelia and road traffic on James Ruse Drive and the M4 impacts all areas of the site. Impacts from the M4 and James Ruse Drive are not expected to substantially change under the proposal. Train noise from PLR operations is considered unlikely to result in noise levels greater than the day or night-time amenity levels at any proposed residential properties. Minor impacts may arise at existing residences within Rydalmere, however this would be assessed in detail as part of the planning for future stages of the PLR project. Both surface and underground train movements of the Sydney West Metro are considered unlikely to generate noise impacts. A moderate risk of noise impacts has been predicted for all proposed new road corridors. However, route selection has ensured that the assessed corridors do not directly impact residential properties and therefore the risk of road noise impacts is substantially reduced. In particular, moving heavy vehicles south, onto the Unwin Street route is likely to substantially reduce traffic noise levels in northern areas of the site and reduce impacts for existing residences in Rydalmere. The removal of the Grand Avenue rail bridge will reduce the transmission of noise, in particular to existing residential properties west of James Ruse Drive. Impacts from James Ruse Drive will continue to be high, but will be marginally reduced. Road traffic noise levels of more than 60dBA have been predicted for both day and night-time periods at residential properties facing the road corridor. These impacts will require substantial noise mitigation through the incorporation of a high level of acoustic treatments in the building design.

NOISE SOURCE	FINDINGS
Overall noise levels	Night-time periods are expected to be the most sensitive in consideration of residential noise impacts. Although road traffic on internal roads is reduced and several industry types, including innovation and urban zoning are assumed to not be operating at full capacity between 10pm to 7am, potential night-time noise impacts have been predicted at eastern residential areas of the peninsula. Impacts are predicted from heavy industry at residences along the northern side of Parramatta River within Rydalmere. It is noted that this is an existing noise source, and that these residences have been the source of historic noise complaints. However, the removal of heavy industry in the northern areas of the precinct is expected to reduce existing noise impacts for existing residential areas of Rydalmere. Noise levels at the proposed school location are expected to exceed recommended levels on the eastern and southern building facades of buildings as a result of noise from within the precinct. Noise levels on the western facades may exceed the recommended levels as a result of road traffic on James Ruse Drive. These impacts will require mitigation through the incorporation of normal acoustic treatments in the building design and the consideration of site layout during planning. Noise levels at northern areas of the proposed school site are considered acceptable. In the west, road traffic noise may generate noise levels in the order of 20dB above the amenity levels for residences facing James Ruse Drive and Grand Avenue. These impacts will require substantial mitigation through acoustic building design, however they are expected to be manageable. The proposed heavy vehicle routes will reduce road traffic noise impacts for the new residential landuses in the north and east of the precinct. More information on these acoustic treatments is outlined in Appendix A.
Vibration	Ground vibration will be associated with operation of the Parramatta Light Rail and Sydney Metro West, in addition to heavy vehicles on local roads and potential future industrial sources. The risk of impacts for most landuses is very low, however there is some risk associated with the operation of vibration sensitive industries such as laboratories, microscopic imaging or scientific instrument calibration in the immediate area of these routes. Any proposed residential buildings or vibration sensitive landuses would be required to include a consideration of ground vibration to ensure that internal ground borne noise and vibration levels are in accordance with the requirements outlined in the ISEPP. It is noted that the likely highest ground vibration impacts are likely to occur during demolition, remediation and construction works within the precinct. This will be required to be controlled via individual Noise and Vibration Management Plans.

5.4.1 RECOMMENDATIONS

Night-time periods are the most sensitive in the consideration of residential noise impacts and noise impacts have been predicted throughout all residential areas of the peninsula. Noise will need to be considered during the planning stages of all elements of the proposal and in residential building design.

Base noise levels during the daytime periods are expected to be largely similar to those predicted during the night. However, as the amenity level during this time is higher than that recommended for night-time periods, noise impacts during the day are likely to be minor and easily manageable at most locations.

Any proposed residential buildings would be required to include appropriate acoustic treatment to ensure that internal noise levels are in accordance with recommended levels outlined in AS/NZS2017. Compliance with this Standard will be required to be included into any specific Development Control Plan (DCP). In addition, less sensitive landuses should be placed on facades facing high noise sources and the screening benefit of buildings be considered during site layout planning.

Likely future noise emissions would be assessed, during the planning stages of future industrial developments in accordance with the NPfI. Suitable noise management measures would be implanted to control any predicted noise impacts.

6 CONCLUSION

This report has provided a high-level assessment of potential noise and vibration opportunities associated with the proposed development scenario for the Camellia – Rosehill precinct.

The assessment has considered indicative noise criteria and landuses proposed for each scenario. Noise modelling has included forecast road traffic numbers, typical noise emissions for each industry type and a representative site layout. Predictions assumed worst case meteorological influences and moderate to high noise emissions from each industry type. The assessment is therefore a conservative prediction of likely noise impacts.

A detailed discussion of the noise outcomes is provided in Section 5, however in summary, this assessment has identified the following features, opportunities and risks to optimise the acoustic environment under future development.

The Camellia - Rosehill precinct is located within a busy urban environment and is impacted by existing road noise and industrial noise sources located both inside and outside the proposal area. The Master Plan has considered both existing and potential future noise impacts and has incorporated the following design features to reduce these impacts:

- the removal of heavy industry in the northern areas of the precinct to reduce existing noise impacts for existing residential areas of Rydalmere
- The removal of the Grand Avenue rail bridge to reduce the transmission of noise, in particular to existing residential properties west of James Ruse Drive
- The use of the Urban Services Zone a transition area / buffer from the heavy industrial landuses in the south towards the proposed residential areas in the north of the precinct, screening noise and providing a distance buffer to reduce industrial noise.

Noise levels from industrial sources predicted low to moderate industrial noise impacts throughout the Camellia - Rosehill precinct during daytime hours. However, during the night, noise from the Parramatta Light Rail maintenance facility is predicted to extend into the proposed residential areas along the Parramatta River.

Road noise from James Ruse Drive and Grand Avenue is predicted to impact the residential areas during night-time hours. Moderate to high noise impacts are predicted for any residential properties facing these corridors.

Offsite industrial noise impacts are predicted to generally remain unchanged under this scenario. Minor impacts are predicted in residential areas of Rydalmere and Parramatta, largely in line with the current situation.

Overall, the risk of long term ground vibration impacts is considered low, however impacts have been predicted where vibration sensitive properties (such as precision laboratories) are located in close proximity to the Parramatta Light Rail or Sydney Metro alignments.

Ground vibration impacts are considered likely for receivers located close to high impact demolition and earthworks during remediation and construction phases of the development.

The following opportunities and risks are noted:

- Noise treatment is likely to be required for most residential buildings or sensitive landuses. In particular the western facades of properties along James Ruse Drive and southern facades of residences on Grand Avenue.
- Any proposed residential buildings would be required to include a consideration of acoustic treatment to ensure that internal noise levels are in accordance with recommended levels outlined in AS/NZS2017.
- Noise impacts associated with any future industrial development would be assessed in accordance with the NPfI and suitable noise management measures would be implanted to control any predicted noise impacts.
- It is recommended that gaps between buildings along Grand Avenue and northern areas of James Ruse Drive are minimised to effectively act as noise screens for any proposed residential areas (reducing transmission of both industrial noise and road traffic noise).

- Consider construction noise impacts during planning stages of demolition, remediation and construction.
- Avoid positioning vibration sensitive landuse above the Sydney Metro West (main line) or adjacent to the Parramatta Light Rail (main line).
- Vibration impacts on residential landuses in the vicinity off these projects is unlikely.
- Consider potential ground vibration impacts during planning stages of demolition, remediation and construction.
- The infrequent nature of racing events means that the risk of noise impacts from the racecourse are considered to be low.

7 REFERENCES

- *Acoustic Assessment Report, Penshurst Public School (6320-01.R Rev E, Day Design, 2018)*
- *Assessing Vibration: A Technical Guideline* (Department of Environment and Conservation, 2006)
- *Australian Standard – Acoustics – Description and measurement of environmental noise, Part 1: General Procedures* (AS 1055.1, 2018)
- *Australian Standard – Acoustics – Description and measurement of environmental noise, Part 3: Acquisition of data pertinent to land use* (AS 1055.3, 1997)
- *Australian Standard – Acoustics – Recommended design sound levels and reverberation times for building interiors (AS/NZS 2107, 2016)*
- *British Standard BS 7358-2: Evaluation and measurement for vibration in buildings. Part 2: Guide to damage levels from ground-borne vibration* (BS7358-2, 1993)
- *Camellia Recycling Centre, Environmental Impact Statement* (Veolia Environmental Services, 2013)
- *Development Near Rail Corridors and Busy Roads – Interim Guideline* (Department of Planning, 2008)
- *Environmental Protection Licence – Concrete Recyclers Group Pty Ltd* (EPL6664, 2015)
- *German Standard DIN 4150-3 Structural Vibration – Part 3: Effects of vibration on structures* (DIN4150-3, 1999)
- *Noise Policy for Industry* (NSW Environmental Protection Authority, 2017)
- *Parramatta Light Rail Stage 1, Environmental Impact Statement, Technical paper 13: Noise and vibration impact assessment* (SLR, 2017)
- *Road Noise Policy* (Department of Climate Change and Water, 2011)
- *Rail Infrastructure Noise Guideline* (NSW Environmental Protection Authority, 2013)
- *State Environment Planning Policy (Infrastructure) (NSW Government, 2007)*
- *Sydney Metro West, Environmental Impact Statement, Concept and Stage 1, Technical Paper 2: Noise and vibration* (SLR, 2020)
- *Viva Energy Clyde Western Area Remediation Project, Environmental Impact Statement, Appendix G Technical report: Noise and vibration assessment* (Wilkinson Murray, 2018)

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APPENDIX A

ACOUSTIC TREATMENT OF RESIDENCES

The following section is extracted from appendix c of 'development near rail corridors and busy roads – interim guideline. It presents the type of architectural treatment that would typically be required to meet the acceptable noise levels for interior spaces of residential buildings as required under as/nzs 2107 acoustics – recommended design sound levels and reverberation times for building interiors.

The risk levels presented on the noise risk maps for each scenario broadly align with the following categories:

Low risk	*categories 1 and 2*
Medium risk	*categories 2 and 4*
High risk	*categories 5 and 6*

Appendix C – Acoustic Treatment of Residences

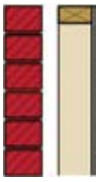
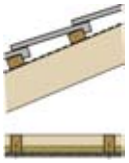
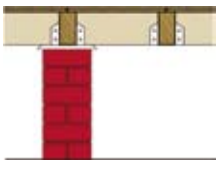
The following table sets out standard (or deemed-to-satisfy) constructions for each category of noise control treatment for the sleeping areas and other habitable areas of single / dual occupancy residential developments only. The assumptions made in the noise modelling are as follows:

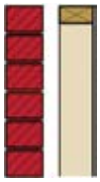
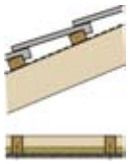
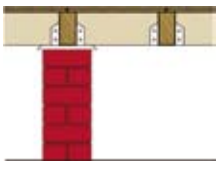
- Typical layout of a modern dwelling taken from a recent large residential development in an outer Sydney suburb
- Bedrooms and other habitable rooms are exposed to road noise

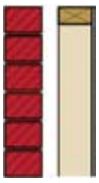
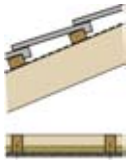
ACOUSTIC PERFORMANCE OF BUILDING ELEMENTS

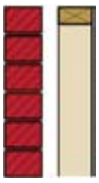
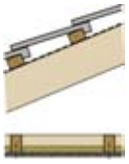
The acoustic performances assumed of each building element in deriving the Standard Constructions for each category of noise control treatment presented in the preceding Table, are presented below in terms of Weighted Sound Reduction Index (Rw) values, which can be used to find alternatives to the standard constructions presented in this Appendix:

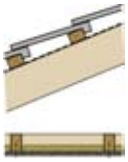
Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Category No.	Building Element	Standard Constructions	sample
1	**Windows/Sliding Doors**	Openable with minimum 4mm monolithic glass and standard weather seals	
	Frontage Facade	**Timber Frame or Cladding:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally	
		Brick Veneer: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
		Double Brick Cavity: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R1.5 insulation batts in roof cavity.	
	Entry Door	35mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
2	**Windows/Sliding Doors**	Openable with minimum 6mm monolithic glass and full perimeter acoustic seals	
	Frontage Facade	**Timber Frame or Cladding Construction:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally with R2 insulation in wall cavity.	
		Brick Veneer Construction: 110mm brick, 90mm timber stud frame or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	40mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
3	**Windows/Sliding Doors**	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
4	**Windows/Sliding Doors**	Openable with minimum 10.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, R2 insulation batts in wall cavity, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Category No.	Building Element	Standard Constructions	sample
5	**Windows/Sliding Doors**	Openable Double Glazing with separate panes: 5mm monolithic glass, 100mm air gap, 5mm monolithic glass with full perimeter acoustic seals.	
	Frontage Facade	**Double Brick Cavity Construction:** 2 leaves of 110mm brickwork separated by 50mm gap with cement render to the external face of the wall and cement render or 13mm plasterboard direct fixed to internal faces of the wall.	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 2 layers of 10mm sound-rated plasterboard fixed to ceiling joist using resilient mounts, R2 insulation batts in roof cavity	
	Entry Door	Special high performance acoustic door required - Consult an Acoustic Engineer	*Door to acoustic consultant's specifications*
	Floor	Concrete slab floor on ground	
6	**All**	Consult an Acoustic Engineer	

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