ATKINS ACOUSTICS
Postal Address
P.O. Box 432
Gladesville
N.S.W. 1675
AUSTRALIA
A.C.N. 068 727 195
A.B.N. 19 068 727 195
Telephone: 02 9879 4544
Fax: 02 9879 4810
Email: AtkinsAcoustics@bigpond.com.au

Atkins Acoustics and Associates Pty Ltd.
Consulting Acoustical & Vibration Engineers

WILTON JUNCTION MASTER PLAN
REZONING STUDY
NOISE AND VIBRATION MANAGEMENT ASSESSMENT

44.6827.R1:GA/DT/2014

Rev 08

Prepared for: Wilton Junction Landowners Group
C/- Elton Consulting
PO Box 1488
BONDI JUNCTION NSW 1355

Prepared by: Atkins Acoustics and Associates
8-10 Wharf Road
GLADESVILLE NSW 2111

May 2014

WILTON JUNCTION MASTER PLAN
REZONING STUDY
NOISE AND VIBRATION MANAGEMENT ASSESSMENT

Prepared by:

Atkins Acoustics and Associates
8-10 Wharf Road
GLADESVILLE NSW 2111

CONTENTS

TABLES

FIGURES

ATTACHMENTS

1.0 Introduction

In November 2011, the NSW Government initiated the Potential Housing Opportunities Program and invited landowners with suitably located substantial landholdings to nominate sites which might be able to deliver additional housing to address Sydney's housing supply shortfall. Walker Corporation, Governors Hill, Bradcorp and Lend Lease responded to the Program and nominated landholdings of more than 100ha in Wollondilly Shire, surrounding the Hume Highway-Picton Road intersection for consideration. This area has subsequently become known as Wilton Junction, and is the subject of this application.

Following a Wollondilly Shire Council resolution in May 2012, the four major landowners (collectively known as the Wilton Junction Landowners' Group) signed an agreement to work cooperatively with Council to prepare a high level Master Plan for Wilton Junction to deliver high quality new housing, jobs close to homes, supporting social and utilities infrastructure and services, and a range of complementary land uses. A high level Master Plan and a Preliminary Infrastructure Requirements Report were considered by the Council on 17 December 2012, with Council resolving to give in-principle support to the proposal. Council also resolved to request that the rezoning be a state-driven process.

Subsequently, the NSW Government decided to coordinate the statutory planning process, led by the Department of Planning and Infrastructure (now the Department of Planning and Environment, DP&E). The Minister for Planning and Infrastructure (now the Minister for Planning and Environment) proposed to prepare a State Environmental Planning Policy (SEPP), as per Section 24 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), which identifies that a SEPP is an Environmental Planning Instrument, and Section 37 of the EP&A Act, which relates to the making of a SEPP for State or regional significant development. This was done with a view to rezone the land through an amendment to the Wollondilly Local Environmental Plan 2011 (LEP) to facilitate the early delivery of housing and infrastructure, linked to an agreed Infrastructure, Servicing and Staging Plan.

The NSW Department of Planning & Infrastructure has issued Director-General's Requirements (DGRs) to guide planning investigations for a new town at Wilton Junction. The DGRs set the criteria for carrying out environmental investigations across the site. The investigations examine the potential for the site at Wilton Junction to be rezoned under a state environmental planning policy (SEPP). The DGRs identified a number of key issues to be considered and assessed as part of the assessment required for the potential rezoning including noise and vibration. A summary of the relevant sections of the DGR Study Requirements addressed in this report is presented in *Attachment A*.

This Noise and Vibration Management Assessment *(NVMA)* has been prepared to address the *DPI* requirements in collaboration with Elton Consulting *(Elton)* and on-behalf of the Wilton Junction Landowners' Group *(The 'Landowners' Group'). The 'Landowners' Group* comprises the following landowners:

- Bradcorp
- Governors Hill
- Lend Lease
- Walker Corporation.

The Lend Lease land known as Bingara is located on the eastern side of the Hume Highway and has been rezoned for redevelopment and in the process of being developed to accommodate dwellings, a town centre, school, parkland, a golf course and support infrastructure.

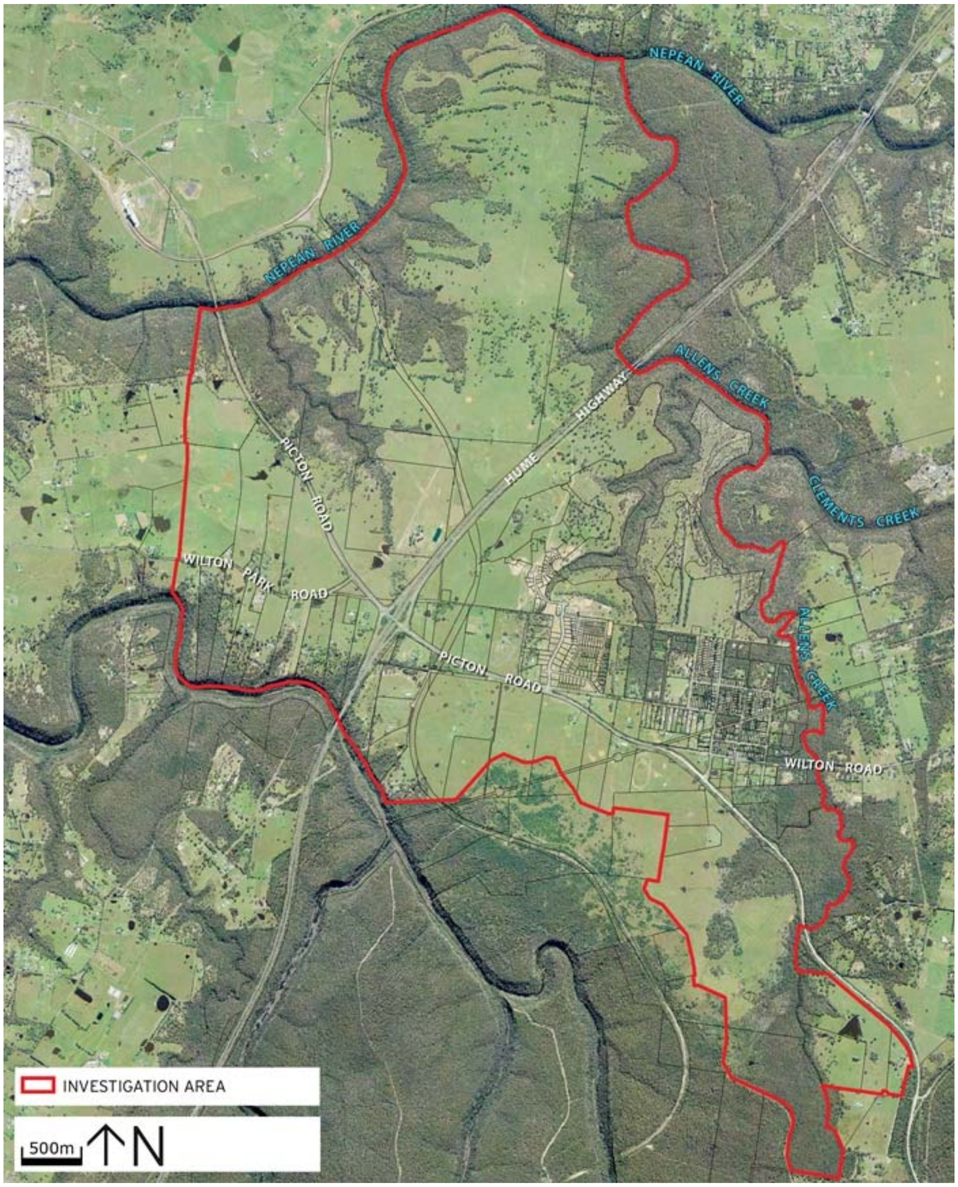
The *NVMA* report addresses potential noise and vibration impacts from existing road and rail infrastructure and potential impacts from possible future development of railway corridors in the study area.

The results, findings and recommendations presented in the *NVMA* include:

- site inspections to identify likely noise and vibration sensitive areas;
- measurement of existing ambient background noise levels;
- review of noise and vibration assessment criteria referenced to the *Department of Planning - Development near rail corridors and busy roads - Interim Guideline (December 2008);* the *Department of Environment, Climate Change and Water (DECCW) NSW Road Noise Policy (March 2011); and the Environmental Protection Authority, Rail Infrastructure Noise Guideline (May 2013);*
- assessment of predicted noise and vibration exposure for the study area; and,
- consideration of possible noise and vibration mitigation planning options.

The report has been prepared for the particular noise and vibration investigation described. No part of the report should be used in any other context or for any other purpose without written approval from *The 'Landowners' Group'* and *Atkins Acoustics.*

Figure 1: Study Area



2.0 Study Guidelines

Director -Generals requirements (DGR) for the rezoning investigations and assessment were issued 27 March 2013. Section 15 of the DGR's relate to noise and states the following:

15. Noise Assessment

Undertake high level noise assessment analysis to ensure potential noise conflicts are managed appropriately. In particular:

- Consideration should be given to road traffic noise in relation to the Hume Highway and Picton Road (Note: RMS will not accept any noise walls or other structures within the Hume Highway or Picton Road reserves).
- Consideration should also be given to potential future rail noise in relation to the Maldon Dombarton Railway alignment.
- Consideration should also be given to potential future rail noise in relation to the Commonwealth proposed high speed rail alignment.

For the purpose of assessing noise and vibration from state infrastructure the following assessment procedures and guidelines have been considered:

- *NSW Government State Environment Planning Policy (Infrastructure) 2007;*
- *Department of Planning - Development near rail corridors and busy roads - Interim Guideline (December 2008);*
- *Department of Environment, Climate Change and Water (DECCW) NSW Road Noise Policy (March 2011);*
- *Environment Protection Authority, Rail Infrastructure Noise Guideline (May 2013);*
- *Rail Infrastructure Corporation - State Rail Authority - Interim Guidelines for Councils- Consideration of Rail Noise and Vibration in the Planning Process (November 2003; and*
- *Rail Infrastructure Corporation - State Rail Authority - Interim Guidelines for Applicants- Consideration of Rail Noise and Vibration in the Planning Process (November 2003).*

The EPA in an earlier submission on the High Level Master Plan (HLMP) set out a view that aircraft noise from Wilton Airport should be considered in the noise assessment. The HLMP proposes that this activity ceases. Hence noise impacts from the Airport associated activities have not been considered any further in the report.

3.0 Site Description

The study area is located within the Wollondilly Local Government Area (LGA) approximately 80km from Sydney CBD and 30km west of Wollongong. The area is strategically located along the Hume Highway, and represents the next potential major town focal point along this transport corridor south of Campbelltown – Macarthur. Wilton Junction has been identified as being capable of providing resources to expedite housing delivery, roll out enabling infrastructure, deliver social services and provide local employment.

3.1 Project Description

A Draft Wilton Junction Master Plan was prepared by Connor Holmes in September 2012. The vision for the study area is for the creation of a high quality township that delivers housing diversity and choice and a high level of employment. The key principles were identified to inform the development of the HLMP, include:

- Employment and commercial drivers, including integrating and co-locating employment activities with the proposed town centre;
- Housing, including a range of housing types and choice to facilitate affordability;
- Community facilities in central and accessible locations;
- Environment including conservation, creating vegetation protection zones;
- Placemaking and creating a sense of community;
- Activity centres to create focal points of neighbourhoods;
- Traffic and transport, including encouraging car-free travel, promoting public transport opportunities and services; and
- Infrastructure including environmental and social measures.

3.2 Study Objectives

The main objectives of the *NVMA* are to:

- Identify potential off-site noise and vibration sources associated with transport infrastructure;
- Assess potential noise and vibration exposure for the study area from the transport infrastructure;
- Address potential noise and vibration impacts in accordance with the DGR's
- Review possible planning options to reduce noise and vibration exposure for the study area referenced to Department of Planning – Development near Rail Corridors and Busy Roads – Interim Guideline; and
- Access building set-backs from infrastructure corridors through the use of planning, acoustic shielding, building orientation, mounding/barriers, and architectural design features

3.3 Transport Infrastructure Corridors

The DG's report identified that the rezoning assessment should consider road traffic noise in relation to the Hume Highway and Picton Road and potential future rail noise in relation to the Maldon Dombarton Railway and the Commonwealth proposed high speed rail project.

3.3.1 Existing Road Infrastructure

The existing north-south aligned Hume Highway (HW2) is intersected at Wilton Junction by Picton Road (MR95). The intersection is configured with on and off road ramps for both north and south bound highway traffic *(Figure 1).*

3.3.1(a) Hume Highway

The Hume Highway is a divided four lane road, two north and two south. Projected traffic volumes reported by Parsons Brinkerhoff (August 2013) presents data for existing conditions and projected volumes for 2023, with traffic generated by the Wilton Junction project. Table 1 presents a summary of the existing and 2023 projected traffic data.

Table 1. Projected Traffic Volumes (Hume Highway)

Description	2013 Traffic Volumes		2023 Traffic Volumes	
	15 hour (Day)	9 hour (Night)	15 hour (Day)	9 hour (Night)
North Picton Road	34004	6261	51687	9517
South Picton Road	25607	4715	34613	6373

The reported daily (24 hour) Highway heavy vehicle content north of Picton Road was 18%. The reported 15 hour (day) and 9 hour (night) Highway heavy vehicle content north of Picton Road was 16% and 34% respectively. The posted traffic speed for the Highway is 110kph.

3.3.1(b) Picton Road

Picton Road is generally a two-lane undivided road. Projected traffic volumes reported by Parsons Brinkerhoff (August 2013) presents data for existing and projected volumes for 2023, with traffic generated by the Wilton Junction project. Table 2 presents a summary of the existing and 2023 projected traffic data.

Table 2. Projected Traffic Volumes (Picton Road)

Description	2013 Traffic Volumes		2023 Traffic Volumes	
	15 hour (Day)	9 hour (Night)	15 hour (Day)	9 hour (Night)
Picton Road (West)	12526	1948	19450	3581
Picton Road (East- Highway to Pembroke)-	21045	3272	27234	5014
Picton Road (East-Pembroke to Almond)	19839	3085	28286	5208

The reported 15 hour (day) and 9 hour (night) heavy vehicle content for Picton Road west was 13% and 27% respectively. For Picton Road east between the highway and Pembroke Road the reported heavy vehicle content was 16% (day) and 34% (night), east of Pembroke the reported heavy vehicle content was 14% (day) and 30% (night).

3.3.2 Existing Rail Infrastructure

The Main Southern Railway Line between Sydney and Goulburn is located to the west of the study area *(Figure 2).* Rail traffic on the line comprises freight and commuter (Cityrail and Countrylink) trains. Reported commuter daily train movements (AECOM Traffic Impact Assessment – Maldron Rail Terminal August 2010) range between 40 and 45. Freight train movements are reported to be up to 20 per day. It is understood that an EIS for the Maldon-Dombarton Rail Corridor has been commissioned and *due for completion by June 2014.*

3.3.3 Maldon -Dombarton Rail Corridor

The Maldon - Dombarton Rail Link Feasibility Study (September 2011) proposed a single track rail line with two 1500m passing loops, and scope for a third to be added later if required. It is reported in the Study that this would enable the line to allow 25 trains per day, increasing to 60 trains per day with construction of the third loop. The reported minimum freight train transit time was 55 minutes, maximum loaded operating speed 80 km/hour, and a maximum axle load of 30 tonnes. The September Study provides no detail for noise mitigation, however concluded that it was technically feasible to complete the building of the line and that the environmental consequences of completing construction and operating the line are not major and can be mitigated against, for example with appropriate drainage and sound barriers.

With respect to freight train noise ARTC and Rail Corporation of NSW are licensed by the NSW, EPA. An objective of EPA Licenses is to progressively reduce noise from freight trains with the implementation of Pollution Reduction Programs. As part of the Environmental Protection Licenses noise limits are set for various operating conditions. One Condition requires the maximum noise level for all service conditions referenced to AS2377-2002 (Acoustics- Methods for the measurement of rail bound vehicle noise) not to exceed 87dBA (Max) referenced to 15 metres from the centre of the track. Other Conditions relate to stationary noise compliance testing.

3.3.4 Fast Train

The Department of Infrastructure released the High Speed Rail Study, Phase 2 Report in April 2013 *(HSRS).* The *HSRS* assumed that trains would typically operate 18 hours per day, 365 days per year. It is reported that a noise assessment was undertaken using projected train frequencies between Sydney and Canberra.

Predicted train noise levels are presented in the *HSRS* against distance from the centre of the railway with and without noise mitigation. The results reproduced in *Table 3* below, show typical offset distances from the centreline of the railway at which compliance with the adopted standard was predicted.

Table 3. Predicted Noise Level vs Off-set Distances

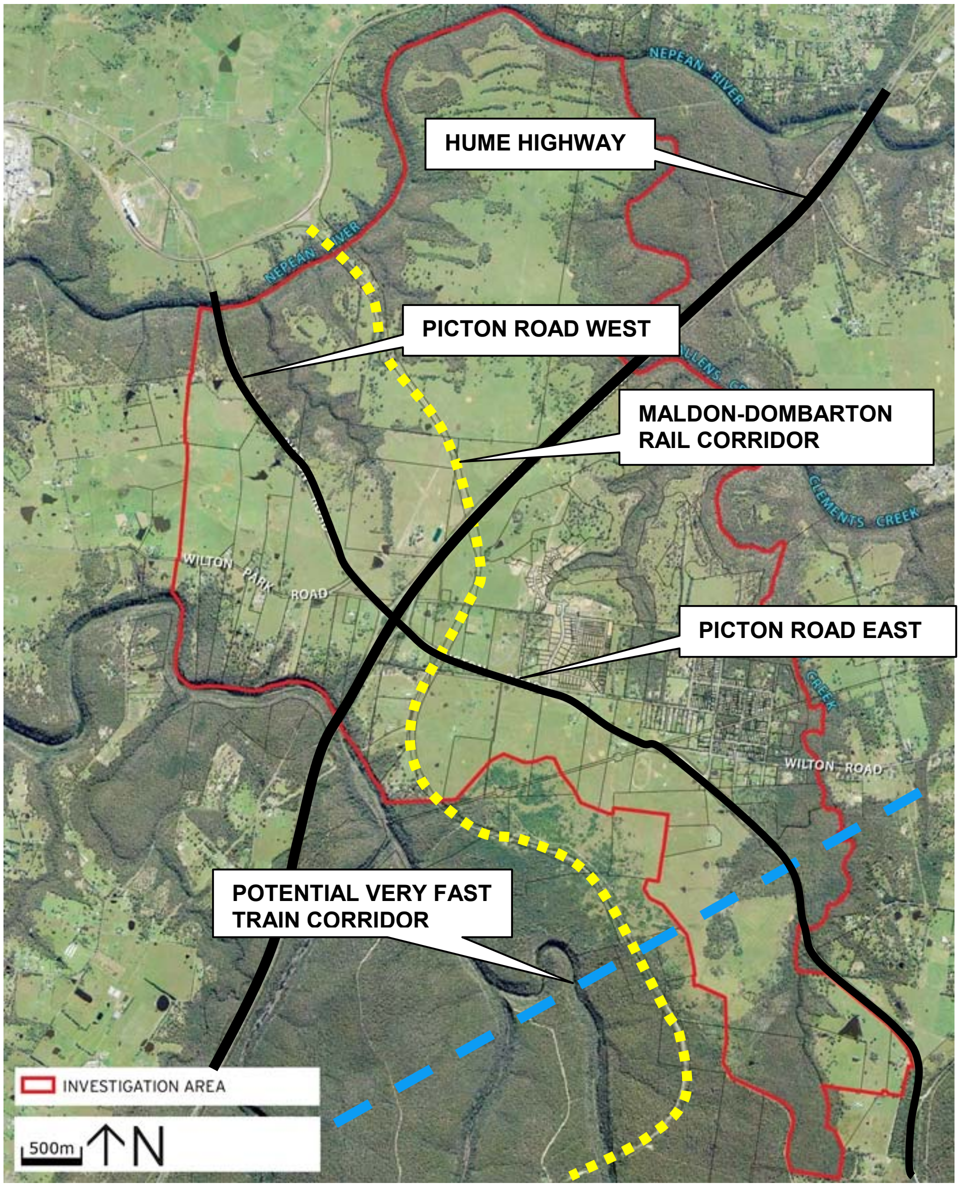
Scenario	Predicted offset distance (m)
Rural area	230
Rural Transition area with 2 m mounding	70
Rural Transition area with 3 m mounding	51
Urban area with 2 m noise wall, 7 m from track centreline	25
Urban area with 2 m noise wall, 4 m from track centreline	21
Urban area on viaduct with 2 m noise barrier	21

Note 1: Rural areas assumed to comprise predominantly single storey receivers (e.g. dwelling, office, school).
Note 2: Urban areas assumed to comprise predominantly two storey receivers.
Note 3: Viaduct assumed to be predominantly elevated, resulting in a similar height as a second storey receiver.

The predicted levels in *Table 3* show offset distances at which receptors would be noise affected range from 21 metres to 230 metres. The *HSRS* considered that mitigation for noise receptors in sparsely populated areas would generally comprise architectural treatments such as mechanical ventilation, upgraded doors and window seals. *HSRS* recommended that further investigation of specific measures would be required at a later stage if an *HSR* were progressed. The *HSRS* assessment reported that appropriate noise mitigation could be included in the design to ensure that impacts comply with adopted standards.

Figure 2 identifies the preferred route option for the HSR east of the Wilton Township

Figure 2: Infrastructure Corridors



4.0 Assessment Noise Levels

The NSW Government State Environment Planning Policy (Infrastructure) 2007 (the SEPP) was introduced to facilitate the delivery of sustainable higher density living along major transport routes. One of the aims of the SEPP is to identify matters to be considered in the assessment of development adjacent to rail and road infrastructure. The SEPP refers to guidelines which must be taken into account where development is proposed in, or adjacent to, specific railway and road corridors under Clauses 85, 86, 87, 102 and 103.

SEPP Clauses 87 (Rail) and 102 (Road) refer to development of buildings for residential use. The SEPP states that the consent authority must be satisfied that appropriate measures will be taken to ensure that the following internal L_{Aeq} sound pressure levels can be achieved:

- 35dBA at any time 10.00pm–7.00am in any bedroom in the building; and
- 40dBA at any time anywhere else in the building (other than a garage, kitchen, bathroom or hallway.

4.1 NSW Department of Planning - Development near Rail Corridors and Busy Road - Interim Guideline

Referring to the SEPP, the NSW Department of Planning - Development near Rail Corridors and Busy Road - Interim Guideline (December 2008) *(DPIG)* provides noise criteria for the assessment of rail and road noise for residential and non-residential buildings. *DPIG* provides no reference or criteria for assessing of rail or road traffic noise exposure at commercial or industrial premises. A summary of the Department of Planning *(DP)* criteria is provided in *Table 4.* The trigger point for the application of the SEPP with respect to sensitive land use development adjacent to roads is greater than 40000 vehicles per day. For sensitive development adjacent to a road with an average daily traffic volume of 20000 -40000 vehicles, *DPIG* refers to the Guideline as providing best practical advice.

Table 4. Internal Noise Criteria for Rail and Road Traffic

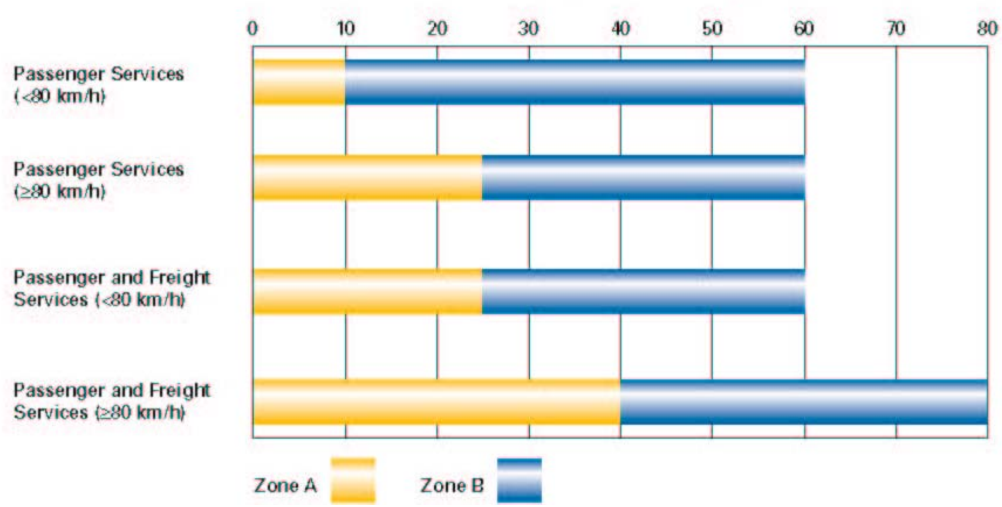
<table>
<tr><th colspan="4">Residential Buildings</th></tr>
<tr><td colspan="2">Type of Occupancy</td><td>Noise Level dBA</td><td>Applicable time period</td></tr>
<tr><td colspan="2">Sleeping Areas (bedrooms)</td><td>35</td><td>Night 10.00pm to 7.00am</td></tr>
<tr><td colspan="2">Other habitable rooms (excl. garages, kitchens, bathrooms and hallways</td><td>40</td><td>Anytime</td></tr>
<tr><th colspan="4">Non-Residential Buildings</th></tr>
<tr><td colspan="2">Type of Occupancy</td><td colspan="2">Recommended Max Noise Levels dBA</td></tr>
<tr><td colspan="3">Educational Institutions including child care centre</td><td>40</td></tr>
<tr><td colspan="3">Place of Worship</td><td>40</td></tr>
<tr><td rowspan="2">Hospitals</td><td colspan="2">Ward</td><td>35</td></tr>
<tr><td colspan="2">Other noise sensitive areas</td><td>45</td></tr>
</table>

If internal noise levels from rail or road infrastructure with windows/doors open exceed the criteria *(Table 2)* by more than 10dBA, the *DPIG* recommends that the design of ventilation for the exposed rooms should be such that occupants can leave the windows/doors closed, if they desire, and also meet the ventilation requirements of the Building Code of Australia. With windows/doors open for natural ventilation, typical noise attenuation across exposed building facades would be in the order of 10dBA. Standard window/door configurations with standard weight per size glazing typically attenuate external noise by 20dBA with the windows/doors closed.

4.1.1 Rail Noise

DPIG provides a guide as to the level of assessment required when noise sensitive development is located in the vicinity of existing rail and road infrastructure.
Where there is no noise mapping available based on actual operating conditions, *DPIG* refers to assessment zones based on offset distances from the operational track (not corridor). For passenger and freight rail lines with an operating speed of less than 80kph the Figure below refers to Zones A and B. The zones are indicative acoustic assessment zones where sensitive land-uses are likely to be adversely affected. The Guideline does not require acoustic assessment for sensitive land-use development greater than 60m from a rail line with speed limit less than 80kph. In locations where train noise levels are high (freight lines) *DPIG* recommends that it may be advisable to seek specialist advise.

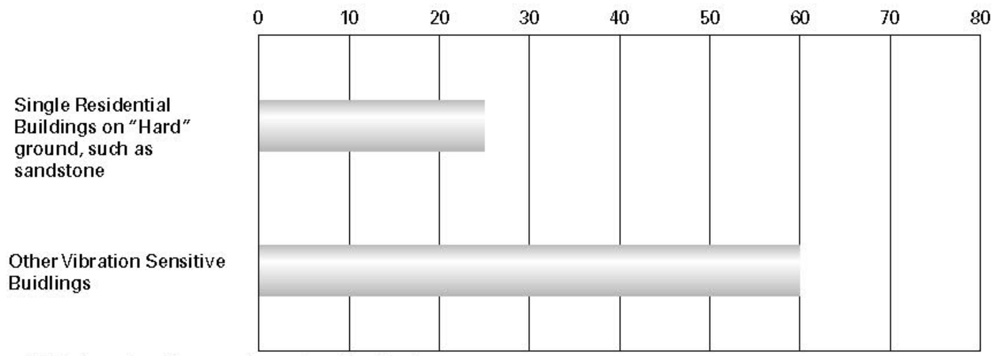
Figure 3. Acoustic Assessment Zones (DPIG)



4.1.2 Rail Vibration

Referenced to ground vibration the *DPIG* assessment zones for typical development sites adjacent to rail corridors is reproduced in *Figure 4.* Accordingly, for residential development within the 25 metres of the railway *DPIG* recommends that a more detailed vibration assessment will be needed.

Figure 4 Ground Vibration Assessment Zones (DPIG)



4.1.3 Road Traffic Noise

Screening assessment procedures referenced in the *DPIG* provide deemed to satisfy constructions for various categories of noise control treatments. The category types *(Figure 5)* are referenced to traffic volumes and offset distances for single dwellings and dual occupancies. With respect to the Hume Highway frontage at approximately (30) metres from the site boundary the area could be classified as either Category 5 or Category 6.

Acoustic treatments for residential dwellings in Categories 5 and 6 would typically include masonry wall construction, double glazed windows and doors, upgraded roof/ceilings and provision for borrowed or mechanical ventilation to habitable rooms exposed to traffic noise. It is also considered feasible to implement a combination of external controls (barriers/mounds) with acoustic building treatments. Final combinations of noise controls would need to be evaluated and assessed for each subdivision.

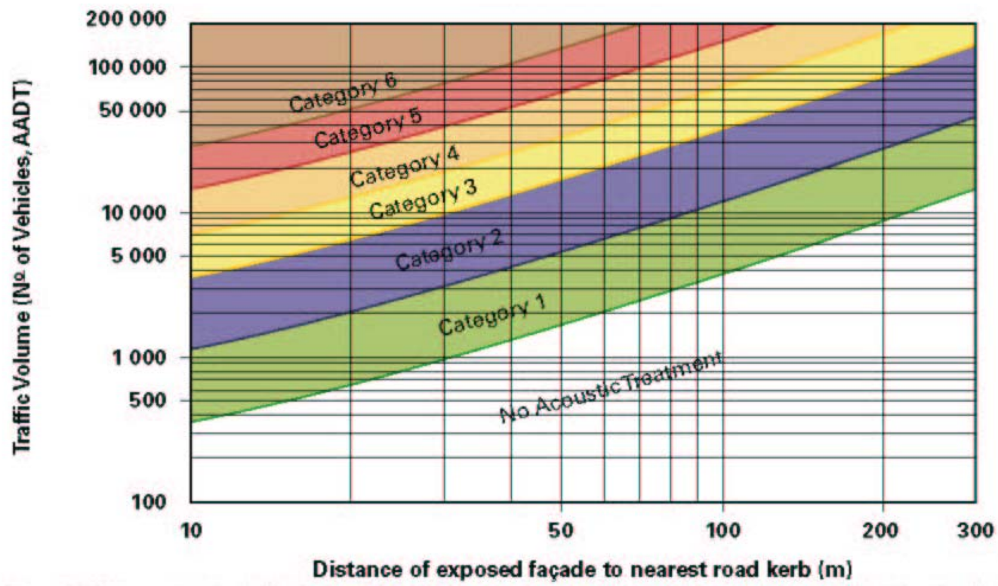
With respect to the Picton Road frontage at approximately (30) metres from the site boundary the area could be classified as either Category 4 (Picton Road east) or Category 2 (Picton Road west).

Acoustic treatments for residential dwellings in Category 4 buildings would typically include masonry wall construction, 10.38mm laminated glazed windows and doors, upgraded roof/ceilings with provision for borrowed or mechanical ventilation to habitable rooms exposed to traffic noise. Category 2 buildings typically include masonry wall construction, 6mm monolithic glazed windows and doors, upgraded roof/ceilings and provision for borrowed or mechanical ventilation to habitable rooms exposed to traffic noise.

It is also considered feasible to implement a combination of external controls (barriers/mounds) with acoustic treatments to the buildings. Final combinations of controls would need to be evaluated and assessed for each subdivision.

It is noted that with acoustic treatment to residential dwellings alone the internal noise amenity would be controlled with windows and doors closed. Building treatments alone provide no acoustic benefit for external noise amenity.

Figure 5. Screening Test for Road Traffic Noise



4.2 NSW Government's *Road Noise Policy* (RNP)

The NSW Government's *Road Noise Policy (RNP)* (March 2011) was developed for assessing noise from new roads or road redevelopment and when there is a land use development with the potential to generate additional traffic on local, sub-arterial or arterial roads. The *RNP* provides external target noise levels for assessing road traffic noise. *Tables 5 and 6* set out target levels recommended in the *RNP*.

Table 5. Road Traffic Target Noise Levels - residential land uses

Road Category	Type of Project/land use	Target Noise Levels dBA	
		Day 7.00am - 10.00pm	Night 10.00pm - 7.00am
Freeway/arterial/ sub-arterial roads	Residences affected by noise from freeways/arterial/sub-arterial roads	LAeq, (15 hour) 60 (external)	LAeq, (9 hour) 55 (external)

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads.

Considering the *RNP* external target noise levels $L_{Aeq, (15\ hour)}$ 60 and $L_{Aeq, (9\ hour)}$ 55 and 20dBA noise reduction with windows/doors closed, the equivalent *DPIG* internal levels $L_{Aeq, (15\ hour)}$ 40 and $L_{Aeq, (9\ hour)}$ 35 are satisfied.

Table 6. Road Traffic Noise Assessment Criteria - non - residential land uses

Existing sensitive land uses	Assessment Period		Additional consideration
	Day 7.00am - 10.00pm	Night 10.00pm - 7.00am	
1. School classrooms	LAeq, 1 hour 40 (internal) when in use		In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard
2. Hospital Wards	LAeq, 1 hour 35 (internal)	LAeq, 1 hour 35 (internal)	
3. Place of Worship	LAeq, 1 hour 40 (internal)	LAeq, 1 hour 40 (internal)	The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what in these areas may be affected by road traffic noise. For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, there are areas between the church and the road where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see point 5) may be applied.
4. Open Space (active use)	LAeq, 1 hour 60 (internal) when in use		Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion. Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading. In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.
5. Open Space (passive use)	LAeq, 1 hour 55 (internal) when in use		

Note: Land use developers must meet internal noise goals in the Infrastructure SEPP (Department of Planning NSW 2007) for sensitive developments near busy roads.

4.3 NSW Government's *Rail Infrastructure Noise Guideline*

The purpose of the *Rail Infrastructure Noise Guideline (RING)* is to ensure noise and vibration impacts associated with particular rail development projects are evaluated in a consistent and transparent manner.

4.3.1 Airborne Heavy Rail Noise Trigger Levels

The *RING* specifies trigger levels for assessing rail infrastructure projects to protect the community from the effects of noise from rail infrastructure projects. Trigger levels referenced for heavy and light rail projects are summarised in *Table 7* and *Table 8.* The *RING* defines a new rail line development as one where a rail infrastructure project is to be developed on land that is not currently an operational rail corridor. Typically this involves a rail line being developed on land that has not previously had a rail line or on land where an existing rail line is to be substantially realigned outside the existing rail corridor. *(RING pages 3 and 4)*

Table 7. Airborne heavy rail noise trigger levels for residential land use

Type of development	Noise trigger level (External)' dBA	
	Day 7.00am - 10.00pm	Night 10.00pm - 7.00am
New rail line development	$L_{Aeq\ (15\ hour)}$ 60 or L_{AFmax} 80	$L_{Aeq,\ (9\ hour)}$ 55 or L_{AFmax} 80
Redevelopment of existing rail line	Development increases existing LAeq, period rail noise levels by 2dB or more, or existing LAmax rail noise levels by 3dB or more and predicted rail noise levels exceed	
	$L_{Aeq\ (15\ hour)}$ 65 or L_{AFmax} 85	$L_{Aeq,\ (9\ hour)}$ 60 or L_{AFmax} 85

Table 8. Airborne rail noise trigger levels applicable to heavy and light rail developments for sensitive land uses other than residential

Other sensitive land uses	**Noise trigger level** (When in use) **’dBA**	
	New rail line development	**Redevelopment of existing rail line**
	Resulting rail noise levels exceed	Development increases existing rail noise levels by 2dBA or more in LAeq for that period and resulting rail noise levels exceed
Schools, educational institutions and childcare centres	LAeq, 1 hour 40 (internal)	LAeq, 1 hour 45 (internal)
Places of worship	LAeq, 1 hour 40 (internal)	LAeq, 1 hour 45 (internal)
Hospital wards	LAeq, 1 hour 35 (internal)	LAeq, 1 hour 40 (internal)
Hospitals other uses	LAeq, 1 hour 60 (external)	LAeq, 1 hour 65 (external)
Open space – passive use (e.g. park land, bush reserves)	LAeq, 15 hour 60 (external)	LAeq, 15 hour 65 (external)
Open space – active use (e.g. sports field, golf course)	LAeq, 15 hour 65 (external)	LAeq, 15 hour 65 (external)

4.3.2 Ground-borne NoiseTrigger Levels

The *RING* specifies trigger levels for assessing ground-borne noise from the pass-by of a vehicle on rail. Ground-borne noise excludes direct airborne noise. Trigger levels referenced in the *RING* for heavy rail and light projects are summarised in *Table 9.*

Table 9. Ground-borne noise trigger levels for heavy or light rail

Sensitive land use	**Time of day**	**Internal noise trigger level** dBA
Residential	Day 7.00am -10.00pm	$L_{As\ max}$ 40
	Night 10.00pm -7.00am	$L_{As\ max}$ 35
Schools, educational institution, places of worships	When in use	$L_{As\ max}$ 40-45

4.3.3 Vibration Trigger Levels

The *RING* specifies trigger levels in order to evaluate vibration associated with rail activities. *RING* refers to the NSW Government’s *Assessing Vibration – a Technical Guideline (AVTG). AVTG* provides a methodology to assess vibration exposure in terms of the Vibration Dose Value (VDV). The assessment procedure takes into account the overall vibration level, duration of the vibration and the number of occurrences in each assessment period (day and night). The acceptable VDV criteria taken from the above guideline are detailed in *Table 10.*

Table 10. Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Daytime (7.00am – 10.00pm)		Nighttime (10.00pm – 7.00am)	
	Preferred Value	Maximum Value	Preferred Value	Maximum Value
Residence	0.2	0.4	0.13	0.26
Offices, schools. Educational institutions and places of worship	0.4	0.8	0.4	0.8

5.0 Overview of Land Use Planning Strategies

Planning strategies for greenfield development sites usually offer more opportunity to minimise noise exposure. Land use planning can be used to reduce conflicts between noise-sensitive development and noise producing sources such as roads and rail infrastructure. When development near road and rail corridors is planned, subdivision design and house/building design can reduce noise exposure and impacts. Areas within the *WJP* study area are exposed to existing road traffic noise from the Hume Highway and Picton Road and will be exposed to future rail traffic noise if the Maldon-Dombarton Rail Corridor and the Commonwealth High Speed Rail Corridor are developed.

With respect to the *WJP* study area the Infrastructure SEPP requires property developers to investigate and recommend preferred options and strategies for controlling internal noise levels generated from road and rail infrastructure. In addition consideration should be given for the control of site generated noise and vibration impacts.

Generally it is recognised for subdivision planning that the control of noise exposure requires a balanced design approach. In real terms the control of noise exposure is dependent on a combination of noise control strategies rather than just one strategy.

Responsible for noise and vibration control for sensitive land uses is not always the responsibility of the developer of sensitive land use:

- The proponent of a new or upgraded infrastructure road or rail project that gives rise to impacts over a certain trigger level is normally responsible for providing noise mitigation.
- If it is the proponent that is undertaking the road or rail infrastructure project, mitigation should be assessed and it is likely that mitigation would need to be on the proponents land.
- If the government is the proponent of the infrastructure project, then the onus is on them to assess and control impacts, if required.
- If a developer or land owner is introducing sensitive receiver land uses adjacent to road or rail infrastructure the onus is on them to assess and control impacts, if required.

5.1 Road Traffic Noise

With respect to the *WJP* land ownership on both sides of the road corridors (Hume Highway and Picton Road) has been identified for rezoning to accommodate future residential development. To assist with managing traffic noise exposure, the *WJP* Master Plan has been developed with non noise-sensitive development around the intersection of the road corridors *(Figure 6)*. As a result of planning the requirement to consider noise attenuation/mitigation has been reduced. For the residual land along the Hume Highway and Picton Road frontages where sensitive noise receivers are being introduced noise attenuation/mitigation needs to be provided.

5.2 Rail Traffic Noise

With respect to land set aside as rail corridors and possible future rail use, two corridors identified include the Maldon-Dombaton Rail Corridor and the Commonwealth High Speed Rail Corridor. For the purpose of assessing possible noise and vibration exposure and mitigation options, acoustic planning strategies are provided in the Department of Planning document *Development near Rail Corridors and Busy Roads – Interim Guideline* and the High Speed Rail Study Phase 2 Report (Chapter 3) released April 2013 *(HSR).* The *HSR* study (Section 3. Service and Operations) presents possible noise and vibration (regenerated noise) outcomes for the *HSR* system.

5.3 Noise Control Options

The SEPP internal noise goals are $L_{Aeq\ 9\ hours}$ 35dBA for bedrooms during nighttime hours and $L_{Aeq\ 15\ hours}$ 40dBA for other habitable rooms (day and night). Assuming windows/doors are closed and alternative ventilation is provided, a normal building construction can provide a 20dBA noise reduction, with windows/doors open a noise reduction of 10dBA is expected. On the basis that windows/doors are closed the equivalent external traffic noise levels are $L_{Aeq\ 9\ hours}$ 55dBA for bedrooms and $L_{Aeq\ 15\ hour}$ 60 for other habitable rooms.

RNP external target noise levels for existing residences affected by road traffic noise are $L_{Aeq\ 15\ hours}$ 60 (external) and $L_{Aeq\ 9\ hours}$ 55 (external).

For open space (active use) the RNP recommends a daytime criterion of $L_{Aeq\ 15\ hour}$ 60. For passive use open space the RNP daytime criterion is $L_{Aeq\ 15\ hour}$ 55.

Noise control options available for residential sub-division projects need to be evaluated in terms of aesthetics, cost-effectiveness and effectiveness and subject to consultation with approving Authorities including the Local Council. Options normally considered include sub-division layout, building set-backs, noise barriers and architectural treatments.

5.3.1 Acoustic Barriers

Depending on the final sub-division layout and locations of residential dwellings, typical set-backs are considered and the location and heights of noise barriers can be considered to assess effectiveness. In some areas existing road cuttings can provide a degree of noise attenuation.

The final barrier locations and heights will be dependent on finished site topography and building floor levels. Barrier heights and locations could alter during the detail sub-division planning or design development and/or construction. The final details for barriers should be reviewed during the detailed design development and construction phase of each subdivision.

5.3.2 Building Treatments

For buildings exposed to traffic noise levels exceeding the relevant external criteria by more than 10dBA, the building mitigation measures would require upgrading to achieve recommended internal levels. For buildings exposed to external noise levels exceeding the criteria by less than 10dBA, building treatments would be limited to provision of a form of alternative building ventilation.

With windows and doors closed acoustic treatment to residential buildings will control the internal noise amenity. Albeit. the acoustic benefits gained with the windows/doors closed will reduce when they are opened. Building treatments alone provide no acoustic benefit for external noise amenity.

Typical additional glazing acoustic performances referenced to 4mm glass with windows/doors closed include:

- 6.28mm laminated plus 4dB
- 10.28mm laminate plus 7dB
- 6mm - 30mm airgap -4mm plus 9dB
- 6mm – 50mm air gap -7mm plus 13dB

5.4 On-site Noise Control Planning Management

It is recognised that on-site noise sources generated by internal road traffic, mechanical plant, commercial/retail development, sporting fields, schools, child care centres, hospitals, etc have potential to impact on noise amenity within each site. Guidelines for assessing noise from typical sources are discussed in the NSW, ECCW, NSW Road Noise Policy, the NSW, EPA Industrial Noise Policy, and NSW, ECCW, Noise Guide for Local Government. At the present planning stage for the Wilton Junction Master Plan the final type, source and location of onsite noise sources have not been confirmed. On this understanding during the DA phase of individual subdivisions details and acoustic planning requirements for identified noise sources would be subject to detailed acoustic investigations, assessment and recommendations.

6.0 Existing Ambient Noise Levels

For the purpose of assessing noise exposure the existing ambient background noise levels were measured at eleven (11) reference locations within study area during Aril/May 2013. The locations were selected to acquire ambient noise levels that are representative of those likely to be experienced by future residential development. The locations are identified in *Table 11* and shown in *Figure 6.*

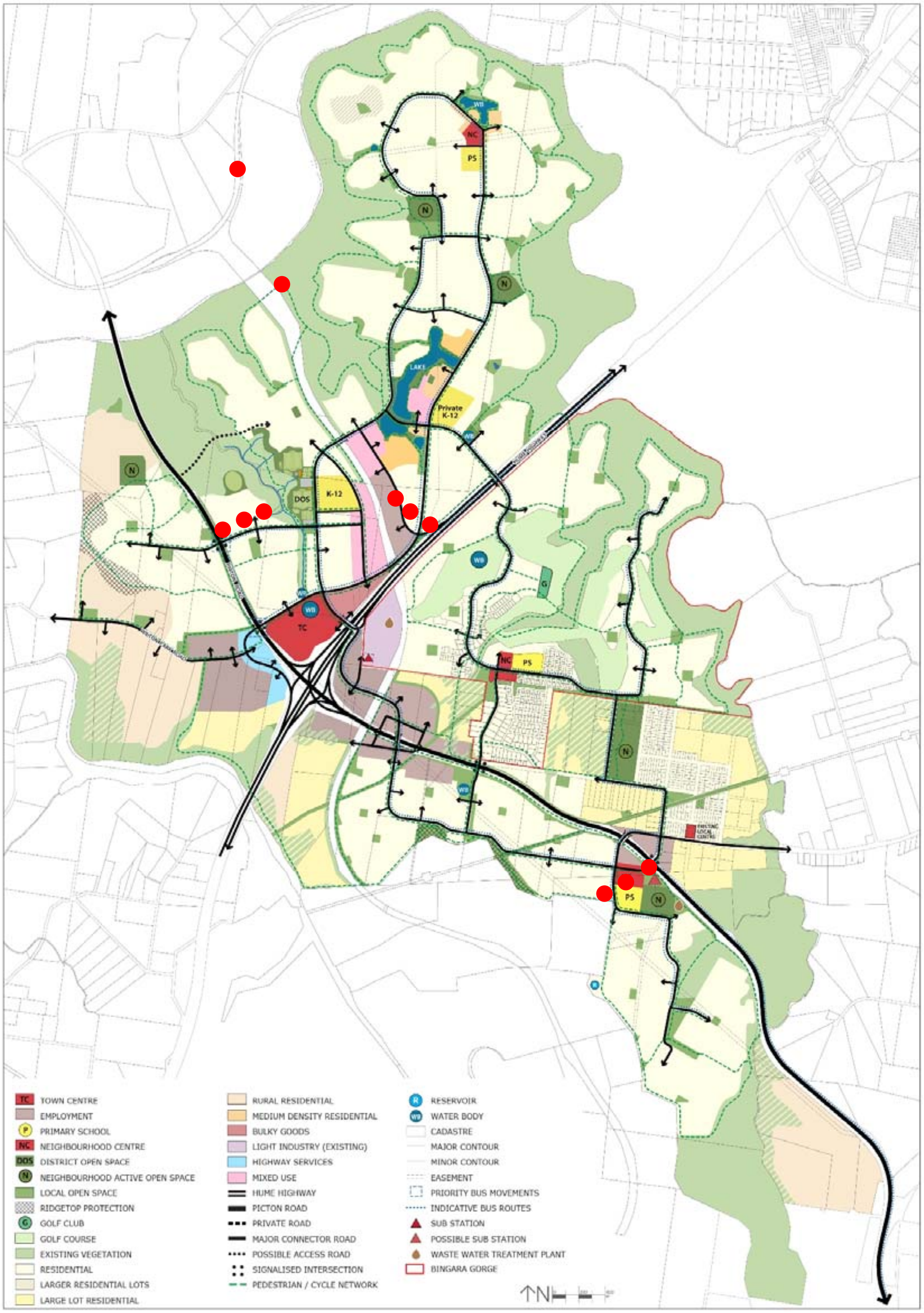
Table 11 Description of Measurement Locations

Measurement Location	Site Description
R1	North South Rail Line 10m offset from rail corridor.
R2	Picton Road West 200m set back from nearside road alignment
R3	Picton Road West 100m from set back from nearside road alignment.
R4	Picton Road West (Site Boundary approx 20m from nearside road alignment
R5	Western site boundary adjacent Maldon-Dombarton rail via duct.
R6	Hume Highway 200m set back from nearside road alignment.
R7	Hume Highway 100m set back from nearside road alignment.
R8	Hume Highway approx 25m set back from nearside road alignment.
R9	Picton Road East 200m set back from nearside road alignment
R10	Picton Road East 100m set back from nearside road alignment
R11	Picton Road East approx 20m set back from nearside road alignment

Other than R1 and R5 the ambient noise was primarily controlled by road traffic on the Hume Highway or Picton Road. The noise monitoring locations along the Highway and Picton Road frontages were located in exposed positions without acoustic shielding from road cuttings, structures, etc. and considered to represent a worst case scenario for assessing road traffic noise exposure. Observations during the site inspections confirmed that the proportion of heavy vehicles on the Hume Highway and Picton Road was high. The daytime noise environment at reference locations R6, R7 and R8 was influenced by light aircraft associated with Wilton Airport.

Instrumentation used for the noise measurements was comprised of RTA Technology Environmental Noise Loggers and SVAN949 Sound and Vibration Meters. The instruments were set to A-weighting and 15-minute sampling periods. The reference level of each instrument was checked prior to and after the measurements with a NATA calibrated (Certificate No. 3630) Bruel & Kjaer Sound Level Calibrator Type 4230 (Serial No. 623590), and no significant drift recorded.

Figure 6. Referenced Noise Measurement Locations



● REFERENCE NOISE MONITORING LOCATIONS

The ambient noise levels were measured and assessed as percentile A-weighted sound levels. The parameters regarded as being the most important among these are the:

- "L_{A1}" or the A-weighted sound level exceeded for 1% of the sampling period and referenced as the "maximum noise level";
- "L_{A90}" or the A-weighted sound level exceeded for 90% of the sampling period and referenced as the "background or average minimum noise level"; and
- "L_{Aeq}" which is the average A-weighted energy equivalent continuous sound level.

The $L_{Aeq,\ 15\ hour}$ and $L_{Aeq,\ 9\ hour}$ noise levels were established from the measurement results. These levels represent the energy averaged noise levels during the daytime and night-time respectively, and used to assess road and rail traffic noise.

Attachment 1 provides the results of the measurement showing common statistical 15 minute levels. *Table 12* presents a summary of the rating background noise levels during daytime, evening and night-time, the daytime $L_{Aeq,\ 15\ hour}$ and night-time $L_{Aeq,\ 9\ hour}$ levels.

Table 12 Measured RBL and L_{Aeq} Noise Levels

dBA re 20 × 10^{-6} Pa

Measurement Location	Rating Background Level RBL			Equivalent Continuous Level $L_{Aeq,\ Time}$	
	Day	Evening	Night	$L_{Aeq,\ 15\ hour}$	$L_{Aeq,\ 9\ hour}$
R1	34	41	38	58	57
R2	44	45	39	58	55
R3	44	48	43	58	54
R4	46	48	40	65	62
R5	34	34	32	49	43
R6	45	50	41	57	55
R7	50	52	42	62	58
R8	52	53	42	65	62
R9	42	40	32	54	52
R10	43	41	33	59	54
R11	48	43	33	65	62

Notes:
1. Daytime is defined as between 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sunday; Evening 6:00pm to 10:00pm, and Night-time 10:00pm to 7:00am, Monday to Saturday and 10:00am to 8:00am Sunday.
2. Daytime ($L_{Aeq,\ 15\ hour}$) is from 7:00am to 10:00pm and night-time ($L_{Aeq,\ 9hr}$) from 10:00pm to 7:00am.

6.1 Discussion.

The unattended noise measurements summarised in *Table 12* when adjusted for facade reflection (+2.5dBA) exceed the equivalent external night time $L_{Aeq,\ (9\ hour)}$ 55 target levels at up to 200m from the site boundaries; R2 - Picton Road west $L_{Aeq,\ (9\ hour)}$ 58dBA; R6 – Hume Highway $L_{Aeq,\ (9\ hour)}$ 58dBA; and, R9 (Picton Road east $L_{Aeq,\ (9\ hour)}$ 55dBA.

7.0 Baseline Modelling and Assessment

7.1 Road Traffic Noise

Preliminary road traffic noise modelling for the Hume Highway and Picton Road has been conducted using the UK Department of Environment's "Calculation of Traffic Noise" (CORTN) procedures.

Noise control options for the *WJP* could include provision of block buildings (town centre, strip development, etc), acoustic barriers, earth mounds, building treatments, set-backs and/or a combination of these options. *Figure 7* provides a conceptual layout for noise barrier locations along the road frontages. Possible noise exposure levels and control options for consideration of future sub-division planning are outlined below.

Tables 13-22 present a summary of predicted traffic noise levels for assumed building set-backs and noise barrier heights. Further noise reductions referenced to the SEPP internal noise goals limits are possible with the upgrading of the acoustic performance of building facades. Compared to 4mm glazed standard windows/doors, Section 5.3.2 provides a range of typical noise reduction for various glazing configurations, including single and doubling glazed windows/doors in acoustic frames,

7.1.1 Hume Highway Conceptual Noise Control Options

Preliminary road traffic noise modelling for day and night hours is summarised below with the barrier heights referenced to finished road level and receptors 6.5m above road level. Areas in the Tables marked yellow indicate where the calculated noise level at a typical building glazed with standard weight/area glass exceed the designated equivalent external (60dBA day/55dBA night) target levels, assuming windows/doors are closed.

Hume Highway (North of Picton Road)

Noise modelling for the Hume Highway (north of Picton Road) assumed the following;

- 2023 traffic volumes (51687 (day 15 hours), 9517 (night 9 hours))
- 110kph traffic speed
- 16% heavy vehicles day
- 34% heavy vehicle night
- 180° angle of view
- No screening from intervening structures or topography
- Receptor source height 6.5m above road surface
- +2.5dB façade correction
- Offset distances for dwellings 20m, 50m, 100m, 200m, 400m, 600m and 800m

Figure 7. Conceptual Sound Barrier Locations (Road Noise)

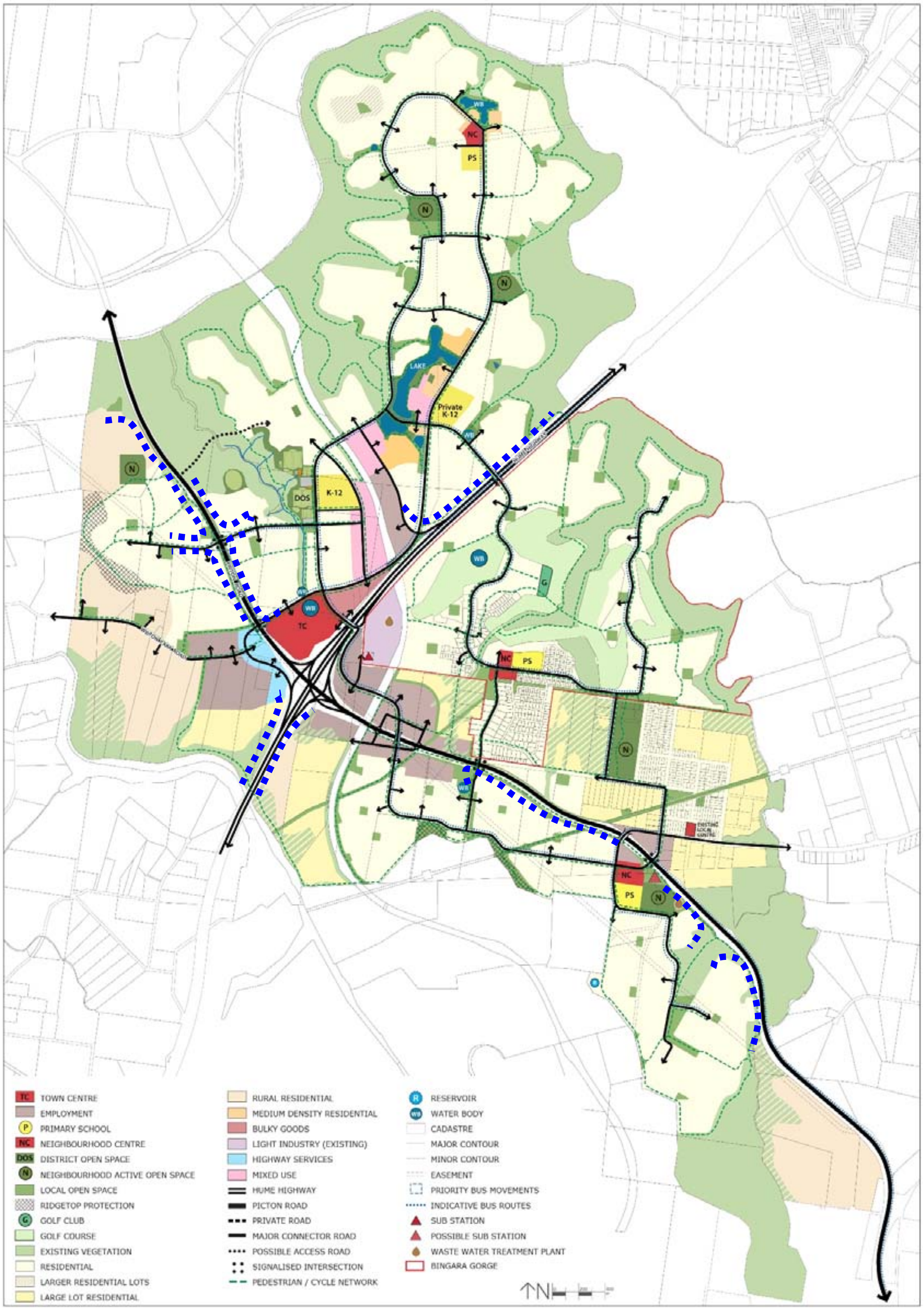


Table 13. Daytime Hours (Hume Highway North Picton Road)

Distance from boundary	Sound Pressure Level LAeq 15 hour					
m	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	73 (13)	69 (9)	66 (6)	64 (6)	61 (1)	59
50	70 (10)	64 (4)	62 (2)	60 (2)	59	57)
100	69 (9)	61 (1)	59	58	56	55
200	67 (7)	58	57	55	54	53
400	65 (5)	56	54	53	52	51
600	63 (3)	54	52	51	50	50
800	61 (1)	52	50	49	48	48

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 14. Night Hours (Hume Highway North Picton Road)

Distance from boundary	Sound Pressure Level LAeq 9 hour					
m	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	72 (17)	68 (13)	65 (10)	63 (8)	61 (6)	59 (4)
50	70 (15)	63 (8)	61 (6)	59 (4)	58 (3)	56 (1)
100	68 (13)	60 (5)	59 (4)	57 (2)	56 (1)	55
200	66 (11)	57 (2)	56 (1)	55	54	53
400	64 (9)	55	53	52	51	50
600	63 (8)	53	52	51	50	49
800	61 (6)	51	50	49	48	47

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Hume Highway (South of Picton Road)

Noise modelling for the Hume Highway (south Picton Road) assumed the following;

- 2023 traffic volumes (34613 (day 15 hours), 6373 (night 9 hours))
- 110kph traffic speed
- 17% heavy vehicles day
- 37% heavy vehicle night (to be confirmed by others)
- 180° angle of view
- No screening from intervening structures or topography
- Receptor source height 6.5m above road surface
- +2.5dB façade correction
- Offset distances for dwellings 20m, 50m, 100m, 200m, 400m, 600m and 800m

Table 15. Daytime Hours (Hume Highway South Picton Road)

Distance from boundary	Sound Pressure Level LAeq 15 hour					
m	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	73 (13)	69 (9)	66 (6)	64 (4)	62 (2)	60
50	72 (12)	65 (5)	63 (3)	61 (1)	60	58
100	70 (10)	62 (2)	61 (1)	59	58	57
200	68 (8)	59	58	57	56	55
400	65 (5)	56	55	53	52	52
600	64 (4)	54	53	52	51	51
800	63 (3)	53	52	51	50	49

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 16. Night Hours (Hume Highway South Picton Road)

Distance from boundary	Sound Pressure Level LAeq 9 hour					
m	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	70 (15)	67 (12)	64 (9)	62 (7)	59 (4)	57 (2)
50	68 (13)	62 (7)	60 (5)	58 (3)	57 (2)	55
100	67 (12)	59 (4)	57 (2)	56 (1)	54	53
200	64 (9)	55	54	53	52	51
400	62 (7)	53	51	50	49	48
600	60 (5)	51	49	48	47	47
800	59 (4)	49	48	47	46	46

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

7.1.2 Picton Road Conceptual Noise Control Options

Picton Road (West)

The daily traffic projection for Picton Road (West) of 23031vpd is less than the SEPP trigger level of 40000. Noise modelling for the Picton Road (West) assumed the following;

- 2023 traffic volumes (19450 (day 15 hours), 3581 (night 9 hours))
- 80kph traffic speed
- 13% heavy vehicles day, 27% heavy vehicles night
- 180° angle of view
- No screening from intervening structures or topography
- Receptor source height 6.5m above road surface
- +2.5dB façade correction
- Offset distances for dwellings 20m, 50m, 100m, 200m, 400m, 600m and 800m

Table 17. Daytime Hours (Picton Road West)

Distance from boundary m	Sound Pressure Level LAeq 15 hour					
	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	73 (13)	66 (6)	63 (3)	61 (1)	59	57
50	70 (10)	60	58	56	55	53
100	68 (8)	57	55	54	52	51
200	65 (5)	54	52	51	49	48
400	62 (2)	51	49	48	46	45
600	61 (1)	50	48	46	45	44
800	60	48	47	45	44	43

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 18. Night Hours (Picton Road West)

Distance from boundary m	Sound Pressure Level LAeq 9 hour					
	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	68 (13)	61 (6)	58 (3)	56 (1)	54	52
50	65 (10)	55 (5)	53	51	50	48
100	63 (8)	52 (2)	50	49	47	46
200	60 (5)	49	47	46	44	43
400	57 (2)	46	44	43	41	40
600	56 (1)	45	43	41	40	39
800	54	42	41	39	38	37

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Picton Road (East – Highway to Pembroke)

The daily traffic projection for Picton Road (East) between Pembroke and the Highway of 32248vpd is less than the SEPP trigger level of 40000. Noise modelling for the Picton Road (East) assumed the following;

- 2023 traffic volumes (27234 (day 15 hours), 5014 (night 9 hours))
- 80kph traffic speed
- 16% heavy vehicles day, 34% heavy vehicles night
- 180° angle of view
- No screening from intervening structures or topography
- Receptor source height 6.5m above road surface
- +2.5dB façade correction
- Offset distances for dwellings 20m, 50m, 100m, 200m, 400m, 600m and 800m

Table 19. Daytime Hours (Picton Road East – Highway to Pembroke)

Distance from boundary m	Sound Pressure Level LAeq 15 hour					
	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	76 (16)	69 (9)	66 (6)	64 (4)	62 (2)	60
50	73 (13)	63 (3)	61 (1)	59	58	56
100	71 (11)	60	58	57	55	54
200	68 (8)	57	55	54	52	51
400	65 (5)	54	52	51	49	48
600	63 (3)	52	50	48	47	46
800	62 (2)	50	49	47	46	45

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 20. Night Hours (Picton Road East – Highway to Pembroke)

Distance from boundary m	Sound Pressure Level LAeq 9 hour					
	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	71 (16)	64 (9)	61 (6)	59 (4)	57 (2)	55
50	68 (13)	58 (3)	56 (1)	54	53	51
100	65 (10)	54	52	51	49	48
200	63 (8)	52	50	49	47	46
400	60 (5)	49	47	46	44	43
600	58 (3)	47	45	43	42	41
800	57 (2)	45	44	42	41	40

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Picton Road (East – East of Pembroke)

The daily traffic projection for Picton Road (East) east of Pembroke of 33494vpd is less than the SEPP trigger level of 40000. Noise modelling for the Picton Road (East) east of Pembroke assumed the following;

- 2023 traffic volumes (28286 (day 15 hours), 5208 (night 9 hours))
- 80kph traffic speed
- 14% heavy vehicles day, 30% heavy vehicles night
- 180° angle of view
- No screening from intervening structures or topography
- Receptor source height 6.5m above road surface
- +2.5dB façade correction
- Offset distances for dwellings 20m, 50m, 100m, 200m, 400m, 600m and 800m

Table 21. Daytime Hours (Picton Road East – East of Pembroke)

Distance from boundary m	Sound Pressure Level LAeq 15 hour					
	No Barrier	4m Barrier	5m Barrier	6m Barrier	7m Barrier	8m Barrier
20	76 (16)	69 (9)	66 (6)	64 (4)	62 (2)	60
50	73 (13)	63 (3)	61 (1)	59	58	56
100	71 (11)	60	58	57	55	54
200	68 (8)	57	55	54	52	51
400	65 (5)	54	52	51	49	48
600	63 (3)	52	50	48	47	46
800	62 (2)	50	49	47	49	45

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 22. Night Hours (Picton Road East – East of Pembroke)

Distance from boundary m	Sound Pressure Level LAeq 9 hour					
	No Barrier	4m Barrier	5m barrier	6m barrier	7m barrier	8m barrier
20	71 (16)	64 (9)	61 (6)	59 (4)	57 (3)	55
50	68 (13)	58 (3)	56 (1)	54	53	51
100	66 (11)	55	53	52	50	49
200	63 (8)	52	50	49	47	46
400	60 (5)	49	47	46	44	43
600	58 (3)	47	45	43	42	41
800	57 (2)	45	44	42	41	40

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

7.2 Rail Traffic Noise and Vibration

Both the Maldon-Dombarton Rail and the Fast Train Corridors are in preliminary study phases with limited noise and vibration information available and no time commitments for producing information or commencement of construction/operation. On this basis this assessment has considered the *RING* with respect to new rail lines. By definition *RING states that 'A new heavy rail line development is one where a rail infrastructure project is to be developed on land that is not currently and operational rail corridor. Typically this will involve a rail line being developed on land that has not previously had a rail line or on land where existing rail line is to be substantially realigned outside the existing rail corridor'* Further *RING* states. '*Where planned rail infrastructure projects (and/or corridors have been approved, it is reasonable for a developer and consent authority to consider such approved projects in accordance with the requirements of the Infrastructure SEPP'*

7.2.1 Maldon-Dombarton Rail Corridor

The Maldon - Dombarton Rail Link Feasibility Study (September 2011) proposes a single track rail line with two 1500m passing loops with scope for a third loop to be added later if required. The Study reports that this would enable the line to allow 25 trains per day, increasing to 60 trains per day with construction of the third loop. The Study provides no detail for noise mitigation, however concludes that it is technically feasible to complete the building of the line and that the environmental consequences of completing construction and operating the line are not major and can be mitigated against, for example with appropriate drainage and sound barriers. No reference is provided in the Study with regards to the extent or location of the envisaged sound barriers.

Reference to the Hyder rail alignment drawings (C031, C032) the Wilton passing loop extends from the Hume Highway underpass (Chainage 129km 700m) to the Nepean River via duct (Chainage 131km 500m) a distance of approx 1800m. The conceptual design provides for an elevated concrete via duct over the Nepean River, a track at natural ground level and under passes at the Hume Highway and Picton Road. Over the length of the track from the Nepean River via duct to the Picton Road underpass the track alignment rises some 65m.

7.2.1(a) Rail Noise

Noise sources likely to be associated with passing loop include idling locomotives, accelerating locomotives, wheel squeal, wagon creak and coupling take-up. Typical source noise levels could range between 100-116dBA. If train horn sounding was required sound power levels of upto 125dBA would be expected.

It is envisaged that the freight trains could be of multiple lengths with multiple locomotives. Intermodal trains could be upto 1500m in length with 3 locomotives. Bulk carriers could vary in length from 800-1500m with 3-4 locomotives. Freight train noise is modeled and assessed using predicted energy average L_{Aeq} levels, SEL noise levels and L_{Amax} (95%) levels. Source noise levels for train systems are dependent on many factors including locomotive types and numbers, rolling stock types and numbers, track gradient, track and track support structures, train speed and locomotive notch settlings. Factors affecting noise propagation include building facade reflections, ground cover, cuttings, angle of view and screening. With respect to near-field noise controls, for barriers to be acoustically effective they would need to 3-5m from the rail line and greater than 4m above the top of rail. *Figure 8* provides a conceptual layout for noise barrier locations along the rail corridor.

At the time of preparing this paper the information provided with respect to the Maldon - Dombarton Rail Corridor is insufficient for detailed noise modelling. Hence, the following assumptions have been made to undertake preliminary noise modelling.

- 60 train movements split over 24 hours (30 up - 30 down)
- 38 train movements split over 15 hours (19 up - 19 down)
- 22 train movements split over 9 hours (11 up - 11 down)
- 60-80kph train speed,
- SEL 131dBA Sound Power Level (1)

- L_{Amax} 130dBA Sound Power Level [(1)]
- 180° angle of view
- No screening from intervening structures or topography
- Train noise source height 4m above top of rail
- Dwelling ground level equivalent to top of rail
- Receptor source height 4.5m above top of rail
- +2.5dB façade correction
- Offset distances from rail (not corridor) from 20m, 50m, 100m, 200m, 400m, 600m and 800m
- Controlling criteria night LAeq 9 hour (external 55dBA, internal 35dBA)
- L_{Amax} external criteria 80dBA
- Windows/doors closed

- Referenced Source Data Southern Sydney Freight Line EA, Northern Sydney Freight Corridor Program EA, ARTC noise data bank

The following *Tables 23 and 24* present the results of the preliminary noise modelling. The findings identified that the nighttime noise exposure controls the extent of noise control requirements. Modelling has shown that if the nighttime levels are satisfied, the daytime levels would be satisfied. The predicted levels the Tables are based on offset distances and barrier attenuation. Areas in the Tables marked yellow indicate where the calculated noise level at a typical building glazed with standard weight/area glass exceed the designated equivalent external (55dBA night) design goals, assuming windows/doors are closed.

Table 23. Predicted Night-Hours (LAeq 9 hours) Rail Noise Levels

Distance from boundary m	Sound Pressure Level LAeq 9 hour					
	No Barrier	4m Barrier	5m barrier	6m barrier	7m barrier	8m barrier
20	81(26)	77(22)	72(17)	72(17)	72(17)	72(17)
40	78(23)	73(18)	69(14)	65(10)	63(8)	61(6)
60	76(21)	71(16)	67(12)	63(8)	61(6)	59(4)
100	74(19)	69(14)	65(10)	61(6)	59(4)	56(2)
200	69(14)	64(9)	60(5)	57(2)	54	52
400	66(11)	61(6)	57(2)	54	51	49
600	64(9)	59(4)	55	52	49	47
800	63(8)	58(3)	54	51	48	46

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

Table 24. Predicted Day and Night Hours (LAmax) Rail Noise Levels

Distance from boundary m	Sound Pressure Level LAmax					
	No Barrier	4m Barrier	5m barrier	6m barrier	7m barrier	8m barrier
20	98(18)	94(14)	89(9)	89(9)	89(9)	89(9)
40	92(12)	87(7)	83(3)	79	77	75
60	89(9)	84(4)	80	75	74	72
100	85(5)	79	75	71	69	67
200	78	73	69	66	63	61
400	72	67	63	60	58	55
600	69	64	60	57	55	52
800	66	61	57	54	52	49

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

With respect to projected train movements on the Maldon - Dombarton Rail Corridor *Table 23* presents predicted noise exposure levels for 22 train movements over 9 hours (11 up - 11 down). If the projected movements were to reduce the resultant noise exposure would reduce. *Table 25* presents preliminary noise modelling results conducted assuming 40 train movements per day split over 24 hours (20 up -20 down). With respect to night-time hours this would equate to 15 movements over 9 hours. The predicted train noise levels in predicted levels in *Table 25* are based on offset distances and barrier attenuation. Areas marked yellow indicate where the calculated noise level at a typical building glazed with standard weight/area glass exceed the designated equivalent external (55dBA night) design goals, assuming windows/doors are closed.

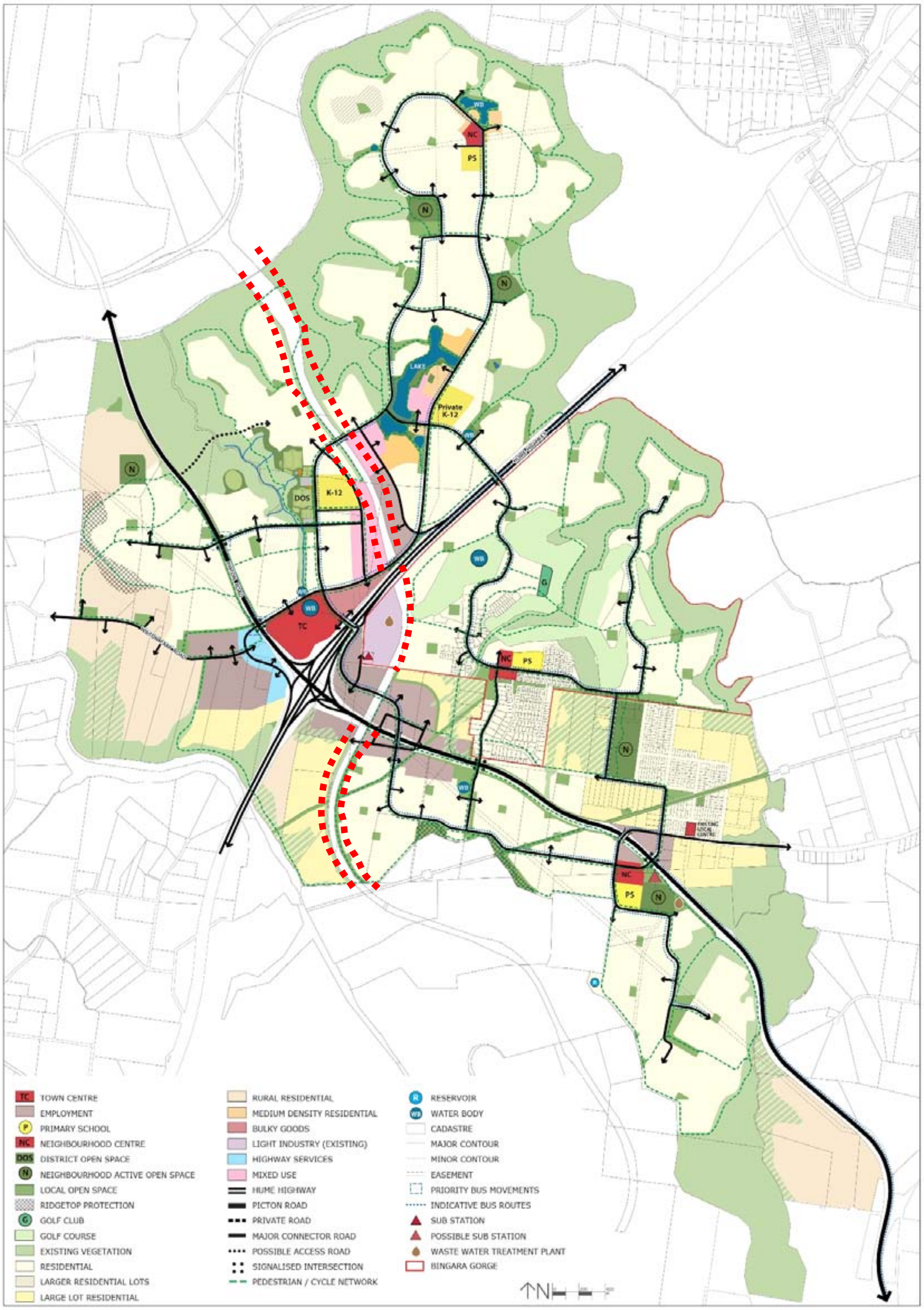
Table 25. Predicted Night-Hours (LAeq 9 hours) Rail Noise Levels

Distance from boundary m	Sound Pressure Level LAeq 9 hour					
	No Barrier	4m Barrier	5m barrier	6m barrier	7m barrier	8m barrier
20	79(24)	75(20)	70(15)	70(15)	70(15)	70(15)
40	76(21)	71(16)	67(12)	63(8)	61(6)	59(4)
60	74(19)	69(14)	65(10)	61(6)	59(4)	57(2)
100	72(17)	67(12)	63(8)	59(4)	57(2)	54
200	67(12)	62(7)	58(3)	55	52	50
400	64(9)	59(4)	55	52	49	47
600	62(7)	57(2)	53	50	47	45
800	61(6)	56(1)	52	49	46	44

- *Numbers in brackets ( ) indicate addition noise reduction required compared to standard glazing*
- *Areas shaded green assume acoustic rated single glazed windows/doors*
- *Areas shaded yellow assume acoustic rated double glazed windows/doors*
- *Areas shaded orange would require specific architectural and acoustic detailing*

With respect to freight train noise ARTC and Rail Corporation of NSW are licensed by the NSW, EPA. An objective of EPA Licenses is to progressively reduce noise from freight trains with the implementation of Pollution Reduction Programs (PRP). With the implementation of the PRP's together with appropriate track design operational noise impacts from the MDRC could reduce.

Figure 8. Conceptual Sound Barrier Locations (Rail Noise)



7.2.1(b) Rail Vibration

Rail induced ground vibration is dependent on many factors including rolling stock, rail/wheel condition, ground type, offset distances, track installation, etc. and normally g noise induced vibration for windows.

With respect to assessing human exposure to vibration RING refers the DEC 'Assessing Vibration: a technical guideline'. From the guideline the preferred nighttime Vibration Dose Value (VDV) is 0.13 m/sec$^{1.75}$ with a maximum value of 0.20 m/sec$^{1.75}$. For offices, schools educational institution and places of worship the guideline recommends a level of 0.40 m/sec$^{1.75}$.

Where no site specific vibration data is available Department of Planning -Development near Rail Corridors and Busy Roads - Interim Guideline (DNRCBR) refers to offset distances of 25m for residential buildings on 'hard ground'.

Assuming an average VDV 0.014 m/sec$^{1.75}$ at 25m for a single freight train passby, a train length of 800m at 50kph the calculated train passby time is 64 seconds. For 22 train movements (nighttime period) the calculated VDV of 0.08 m/sec$^{1.75}$ is below the vibration trigger level of 0.13 m/sec$^{1.75}$. At 50m the estimated nighttime VDV is expected to be less than 0.05 m/sec$^{1.75}$ From the guideline it is noted that there is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Further it is anticipated that for some train passbys vibration levels would be perceptible at buildings located within approximately 25m from the closest track.

7.2.2 Fast Train Corridor

Similar to the Maldon- Dombarton Corridor limited information is available to assess likely train noise and vibration impacts.

7.2.2(a) Rail Noise

The results reproduced in *Table 1* show typical offset distances from the centreline of the railway at which compliance with the *NRG* daytime criteria $L_{Aeq,\ 15\ hour}$ 60 was predicted.

The results in *Table 1* show indicative offset distances at which receivers would be affected by noise range from 21 metres to 230 metres, depending on location and the noise mitigation provided.

The HSR Report considered that mitigation for receivers in sparsely populated areas would generally comprise architectural treatments such as mechanical ventilation, upgraded doors and window seals. HSR recommends that further investigation of specific measures would be required at a later stage, if an HSR were progressed and that appropriate noise mitigation could be included in the design to ensure that impacts comply with adopted standards $L_{Aeq,\ 15\ hour}$ 60dBA). For Rural Transition Areas HSR reported that with 2 m high mounding/barrier appropriate noise standard could be satisfied at 70 metres from the track, with a 3m high mound/barrier the off-set distance reduces to 51 metres from the track.

7.2.2(b) Rail Vibration

HSR reports that a variety of track fasteners could be employed dependent on the specific location to control ground vibration and that the same measures are predicted to provide sufficient mitigation potentially arising from ground-borne vibration as well as regenerated noise.

8.0 Conclusion

A Noise and Vibration Management Assessment has been conducted to address the *DPI* requirements in collaboration with Elton Consulting and on-behalf of the Wilton Junction Landowners' Group.

The report addresses potential noise and vibration impacts from existing road and rail infrastructure and potential impacts from future development of railway corridors in the study area. The main potential sources of noise that identified that could impact on the study area include road and rail traffic noise.

The findings of site investigations and preliminary modelling show that without consideration of secondary controls noise and potential vibration levels across the *WJP* study area exceed the assessment criteria.

SEPP Clauses 87 (Rail) and 102 (Road) refer to development of buildings for residential use. The SEPP states that the consent authority must be satisfied that appropriate measures shall be taken to ensure that the following internal L_{Aeq} sound pressure levels are not exceeded:

- 35dBA at any time 10.00pm–7.00am in any bedroom in the building; and
- 40dBA at any time anywhere else in the building (other than a garage, kitchen, bathroom or hallway.

The proponent of the land use development is responsible for demonstrating that the internal noise levels can be satisfied.

The NSW Government's *Road Noise Policy (RNP)* (March 2011) and Rail Infrastructure Noise Guideline *(RING)* were developed for assessing noise from road and rail projects. The *RNP* and *RING* provide external criteria for assessing impacts from road and rail traffic noise. Assuming closed windows/doors with a 20dBA noise reduction, the external criteria generally equates to the SEPP internal criteria. *It is noted that RING describes a new heavy rail line development as one where a rail infrastructure project is to be developed on land that is not currently and operational rail corridor. Typically this will involve a rail line being developed on land that has not previously had a rail line or land where an existing rail line is to be substantially realigned outside the existing corridor.*

Responsible for noise and vibration control for sensitive land uses is not always the responsibility of the developer of sensitive land use:

- The proponent of a new or upgraded infrastructure road or rail project that gives rise to impacts over a certain trigger level is responsible for providing noise mitigation.
- If it is the proponent that is undertaking the road or rail infrastructure project, mitigation will need to be assessed and it is likely that mitigation would need to be on the proponents land.
- If the government is the proponent of the infrastructure project, then the onus is on them to assess and control impacts, if required.

- If a developer or land owner is introducing sensitive receiver land uses adjacent to road or rail infrastructure the onus is on them to assess and control impacts, if required.

The study findings identified that a number of noise and vibration mitigation strategies will be required to be incorporated into the Master Plan to control acoustic amenity for new development in the study area. These include but are not limited to:

- Negotiations with proponents of the rail infrastructure developments;
- Sub-division planning including building orientations, layouts, set-backs, use of less-sensitive development including retail/commercial/industrial development to provide buffers and acoustic shielding to more sensitive receptors; and
- buffer zones along infrastructure corridors.

The final locations and heights of noise barriers would be dependent on requirements of individual land owners/developers, noise exposure, the site location, site topography, location and finished floor levels of dwellings. The final detailing would dependent on individual requirements and negotiations and should be reviewed during the detailed design development of each subdivision.

The recommendations presented in this report are conceptual and have been developed to assist the land owners with the development of the Wilton Junction Master Plan. It is noted that with acoustic treatment to residential dwellings the internal noise amenity can be controlled when the windows and doors closed. Building treatments alone will provide no acoustic benefit for external noise amenity.

ATTACHMENT A: AMBIENT SOUND PRESSURE LEVELS

THIS ATTACHMENT IS BLANK

DATA AVAILABLE ON REQUEST

ATTACHMENT B: DIRECTOR GENERAL REQUIREMENTS

Referenc e	Description	Section of Report
15.	Consideration should be given to road traffic noise in relation to the Hume Highway and Picton Road (Note: RMS will not accept any noise walls or other structures within the Hume Highway or Picton Road reserves).	5.3.1, 7.1.1 7.1.2
	Consideration should also be given to potential future rail noise in relation to the Maldon Dombarton Railway alignment.	3.3.3 4.1.1 5.2 7.2.1
	Consideration should also be given to potential future rail noise in relation to the Commonwealth proposed high speed rail alignment.	3.3.4 7.2.2