

Metropolitan Planning Authority
Melton Rail Corridor
Potential Acoustic Impact
Assessment

Report01

Issue | 15 March 2016

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Job number 247942-00

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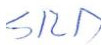




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Document Verification

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Job title		Melton Rail Corridor		Job number	
				247942-00	
Document title		Potential Acoustic Impact Assessment		File reference	
Document ref		Report01			
Revision	Date	Filename	Report01 draft- acoustic impact assessment.docx		
Draft	16 Feb 2016	Description	Draft for client comment		
			Prepared by	Checked by	Approved by
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Issue	15 Mar 2016	Filename	Report01 Issue- acoustic impact assessment.docx		
		Description	Issue version		
			Prepared by	Checked by	Approved by
		Name	Simon de Lisle	Kym Burgemeister	Kym Burgemeister
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
		Filename			
		Description			
			Prepared by	Checked by	Approved by
		Name			
		Signature			
<div> Issue Document Verification with Document <input checked="" type="checkbox"/> </div>					

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Executive Summary

The Melton Line Upgrade Project includes providing dual tracks between Deer Park West and Melton and, at a later stage, adding electrification for tracks from Sunshine to Melton. Tracks would be quadrupled from Sunshine to Deer Park West. The project also includes provision of stabling facilities, initially for diesel trains and following electrification, for electric trains.

The proposed Melton Line Upgrade Project is adjacent to several areas where Precinct Structure Plans (PSPs) - which include proposed noise-sensitive land uses- are in development. Therefore, the Metropolitan Planning Authority (MPA) has engaged Arup to:

- Assess potential acoustic impacts of the Melton Line Upgrade Project to future residential developments.
- Determine the land area expected to exceed the *investigation thresholds*, so that a planning control can be created for this area.

The applicable legislation regarding rail noise is the *Transport Integration Act 2010* and the *Transport (Compliance and Miscellaneous) Act 1983*. Operational noise has been assessed according to the *Victorian Passenger Rail Infrastructure Noise Policy April 2013* ('The Policy'). Noise from the proposed railway upgrade has been modelled according to the Kilde methodology using detailed 3D acoustic modelling software.

Potential future developments are expected to exceed the *investigation thresholds* in several areas. A "rail noise amenity area" has been determined and it is recommended that a planning control be applied to this area. The proposed application requirement and permit requirement for the *rail noise amenity area* are:

Railway noise attenuation application requirement

An application for use or development within the 'railway noise attenuation area' on the Public Transport and Path Network of the *Precinct Structure Plan* must be accompanied by an acoustic assessment report prepared by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority and Public Transport Victoria.

- The acoustic assessment report must demonstrate compliance with the 'Railway Street Interface' cross-section in the PSP. The acoustic assessment report must also include (as appropriate to the particular use or development):
- An assessment of noise levels on the land taking into account the existing and likely future noise levels associated with the ongoing operation of the Melbourne-Ballarat rail line.
- Recommendations for noise attenuation measures to provide appropriate indoor amenity (see "Indoor Noise Amenity" below)
- Recommendations for limiting the impact of railway noise on future buildings within the proposed subdivision.

- A design response that addresses the recommendations of the acoustic assessment including all necessary architectural noise attenuation treatments.

All to the satisfaction of the responsible authority and Public Transport Victoria.

Railway noise attenuation area permit requirement

Any permit for the use or development of land, within the 'railway noise attenuation area' on the Public Transport and Path Network of the *Precinct Structure Plan* must implement any recommendations of the acoustic assessment and include any conditions necessary, in the opinion of the responsible authority and Public Transport Victoria, to implement railway noise attenuation measures.

All to the satisfaction of the responsible authority and Public Transport Victoria.

Indoor Noise Amenity

The Victorian PRINP does not provide any guidance on internal noise limits.

VCAT judgements for noise-sensitive developments near railway lines- such as *Richmond Icon Pty v Yarra CC*, *Lazzcorp Brunswick Pty Ltd v Stonnington CC*, and *Kilker v Stonnington CC*- have resulted in noise criteria of 55 dBL_{Amax} (or lower) for bedrooms and 60 dBL_{Amax} for living areas.

For Section 2 of Regional Rail Link, the Minister For Planning's directions to local councils specified internal noise limits of 65 dBL_{Amax} and 40 dBL_{Aeq}.

In Arup's experience, 65 dBL_{Amax} is not likely to provide acceptable amenity for sleeping areas. Also, it is reasonable to provide amenity limits for living areas. Therefore, Arup recommends indoor noise limits of 55 dBL_{Amax} for bedrooms and 60 dBL_{Amax} for living areas, as per VCAT precedence.

1 Introduction

The Ballarat rail line is a regional line to the west of Melbourne. It is used for passenger and broad-gauge regional (or intra-state) freight services. The section between Deer Park West and Melton is shown in Figure 1 and currently consists of un-electrified single-track, with several passing loops.

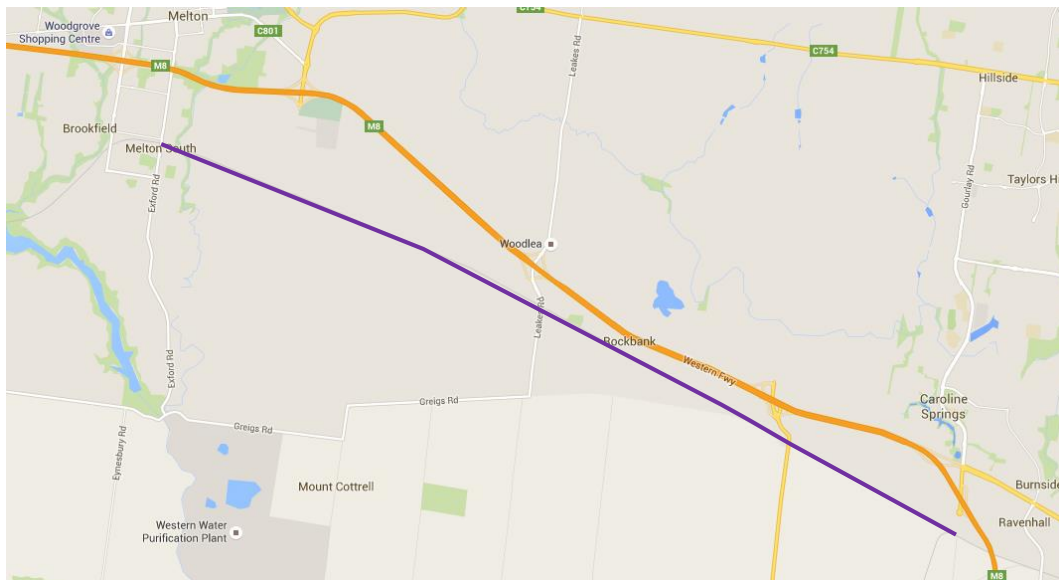


Figure 1: Ballarat rail line between Deer Park West and Melton (shown in purple)

The Melton Line Upgrade Project includes providing dual tracks between Deer Park West and Melton and, at a later stage, adding electrification for these tracks. It also includes provision of stabling facilities, initially for DMUs and subsequently, following electrification, for EMUs.

In 2015, PTV commissioned an acoustic assessment of the proposed rail upgrades, including the identification of areas exceeding the *investigation thresholds*. These areas require investigation according to the Victorian Passenger Rail Infrastructure Noise Policy (PRINP). This assessment identified potential mitigation measures for existing residences.

The PRINP also provides principles for cases of a “change in land use near an existing passenger rail corridor”. The proposed Melton Line Upgrade Project is adjacent to several areas where Precinct Structure Plans (PSPs) - which include proposed noise-sensitive land uses- are in development. Therefore, the Metropolitan Planning Authority (MPA) has engaged Arup to:

- Assess potential acoustic impacts of the Melton Line Upgrade Project to future residential developments.
- Determine the land area expected to exceed the *investigation thresholds*, so that a planning control can be created for this area.

2 Railway Noise and Vibration

Operation of railway services can create noise and vibration emissions to the environment. This includes airborne noise from the railway operations (explained in more detail in Section 2.1 below), as well as vibration transmitted through the ground into building structures, and groundborne noise (also called re-radiated or structure-borne noise) caused by vibration of building structures. For the operation of an at-grade railway such as the Melton Line Upgrade Project, the vibration or groundborne noise impacts are significantly lower than the airborne noise impact and typically not a significant issue. Therefore the focus of the assessment is airborne noise impacts.

2.1 Railway noise sources

Noise from operation of railway vehicles generally comes from the following sources:

- Engine noise (sometimes called ‘traction noise’), which varies between engine type. The diesel locomotives have a higher level of engine noise than the newer VLocity and Sprinter diesel (‘DMU’) trains. Electric (‘EMU’) trains have significantly lower levels of engine noise.
- Aerodynamic noise; which is proportional to speeds. Aerodynamic noise is typically not significant below speeds of 170 km/h.
- Rolling noise from the wheel–rail interface, which is dependent on the combined wheel–rail roughness amplitude and speed of the rail vehicle. Rolling noise is likely to be the dominant source of noise applicable to the Melton Line Upgrade Project, particularly for DMU and EMU trains.
- Horns, whistles, warning and crossing bells. Noise from these safety devices is not covered by the Victorian Passenger Rail Infrastructure Noise Policy or SEPP N-1.

2.2 Acoustic treatments

Where railway noise levels are predicted to exceed the investigation thresholds then options for avoiding, minimising and mitigating railway noise should be considered. This could include consideration of the horizontal or vertical alignment, imposing planning controls on nearby developments, providing noise barriers or earth berms, or undertaking architectural treatment of individual dwellings.

3 Policy and Criteria

3.1 Legislative and Policy Framework

The Victorian integrated and sustainable transport policy is outlined in *Towards an integrated and sustainable transport future: A new legislative framework for transport in Victoria*¹ and in the *Transport Integration Act 2010*.

The Transport Integration Act provides the overarching policy framework for transport legislation, and provides guidance and direction for decisions in key areas that impact on transport, including planning and local government. The policy statement notes that the challenges facing the transport system and the community's expectations for transport are very different from those of a generation ago.

While the policy statement and the Transport Integration Act do not provide any specific guidance in relation to noise impacts from railways, the vision statement (Part 2.6) does note the 'aspiration of Victorians for an integrated and sustainable transport system that contributes to ... an environmentally responsible State', and Part 2.10(c), that '[the] transport system should actively contribute to environmental sustainability by avoiding, minimising and offsetting harm to the local and global environment, including through transport related emissions and pollutants'.

Section 251B of the *Transport (Compliance and Miscellaneous) Act 1983* specifically excludes noise from passenger rail operations from consideration as an 'offensive noise' under the *Environmental Protection Act 1970*.

Nevertheless, in April 2013, the Victorian Department of Transport released a *Passenger Rail Infrastructure Noise Policy*² (PRINP). This new policy noted that Section 251B of the *Transport Act*, while providing an exemption for passenger rail operations from liability and prosecution for nuisance in relation to noise under the *Environmental Protection Act 1970*, does not mean that noise impacts should be ignored during the approval process or when planning changes in land use near existing and future rail corridors. The PRINP provides specific requirements for the consideration of the impacts of railway noise from passenger rail infrastructure and from changes to land use near rail corridors. The objective of the policy is to require consideration of noise impacts as early as possible in the development of transport projects in order to achieve good urban, transport and social outcomes.

The policy is only triggered where there is a statutory approval or planning scheme amendment required to undertake the railway infrastructure works or relating to land uses near an existing or planned corridor. As it is likely that the full delivery of the Melton Line Upgrade Project will require statutory approvals, potential railway noise impacts due to the project must be considered in the context of the PRINP.

In particular, this report provides an assessment of the potential airborne noise impacts in relation to the investigation thresholds provided in the PRINP, to assist

¹ *Towards an integrated and sustainable transport future: A new legislative framework for transport in Victoria*, Policy Statement July 2009, State of Victoria.

² Victorian Government *Passenger Rail Infrastructure Noise Policy*, April 2013

with the consideration of options for avoiding, minimising and mitigating rail noise.

At the point where construction is proposed, a further assessment in accordance with the policy will be undertaken including development of any necessary detailed noise mitigation measures.

3.2 West Growth Corridor Plan

The Melton Line Upgrade Project lies within the area covered by the West Growth Corridor Plan. The West Growth Corridor Plan sets the planning framework for the development of Precinct Structure Plans in Melbourne's western sub region. The Metropolitan Planning Authority is the planning authority responsible for the development of Precinct Structure Plans for land which is in, or planned to be included in, or is appropriate to be included in the Urban Growth Zone.

3.3 Future land use changes near the rail corridor

The PRINP applies where adjoining land is proposed to be rezoned for sensitive land uses. In particular, principles such as the integrated early consideration of noise from the railway, balancing of objectives and the provision of best-fit solutions should be applied, and are set out in Attachment 4 of the *Passenger Rail Infrastructure Noise Policy*.

Due to the PSPs currently in development, land areas adjacent to the Melton Line Upgrade Project will experience a change in land use to include residential areas. This assessment therefore defines a 'Noise Amenity Zone' that can be the basis of planning controls where the PRINP *investigation thresholds* are likely to be exceeded in future. Planning controls for this Noise Amenity Zone can be used by MPA to ensure that the PRINP objectives are met for future developments adjacent to the Melton Line Upgrade Project.

3.4 PRINP Investigation Thresholds

3.4.1 Existing dwellings

Existing dwellings along the Melton rail line are subject to the *redevelopment of existing rail* section of the PRINP. Therefore, the applicable *investigation thresholds* are those shown in Table 1 below.

Time	Type of receiver	Investigation threshold
Day (6 am – 10 pm) dB(A) External	- Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks - Noise sensitive community buildings including schools, kindergartens, libraries	65 L_{Aeq} and change in L_{Aeq} of 3 dB(A) or more or 85 L_{Amax} and change in L_{Amax} of 3 dB(A) or more
Night (10 pm – 6 am) dB(A) External	- Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks	60 L_{Aeq} and change in L_{Aeq} of 3 dB(A) or more or 85 L_{Amax} and change in L_{Amax} of 3 dB(A) or more

Table 1: Investigation thresholds for redevelopment of existing passenger rail infrastructure

It should be noted that the investigation thresholds above comprise two elements:

- The ‘absolute’ railway noise level (eg 65/60/85 dB(A)), and
- A 3dB(A) relative increase in railway noise, compared to if the project did not go ahead

Where railway noise levels are predicted to exceed the investigation thresholds then ‘*noise impacts should be considered a primary matter*’, and options for avoiding, minimising and mitigating railway noise should be considered.

3.4.2 Future dwellings

Dwellings constructed in future along the Melton rail line would be subject to the *change in land use near an existing rail corridor* section of the PRINP. Therefore, the applicable *investigation thresholds* are those shown in Table 1 below.

Time	Type of receiver	Investigation threshold
Day (6 am – 10 pm) dB(A) External	- Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks - Noise sensitive community buildings including schools, kindergartens, libraries	65 L_{Aeq} or 85 L_{Amax}
Night (10 pm – 6 am) dB(A) External	- Residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks	60 L_{Aeq} or 85 L_{Amax}

Table 2: Investigation thresholds for change in land use near an existing passenger rail corridor

It should be noted that assessment of future dwellings is based on the ‘absolute’ railway noise levels only (eg there is no requirement for a 3 dB(A) increase).

Where railway noise levels are predicted to exceed the investigation thresholds then ‘*noise impacts should be considered a primary matter*’, and options for avoiding, minimising and mitigating railway noise should be considered.

3.5 Consideration of Noise from Fixed Infrastructure and Stabling

Noise from fixed infrastructure and stabling is covered in the planning scheme by SEPP N-1³. It is therefore not included in this assessment. .

³ Victoria Government Gazette, *State Environment Protection Policy (Control of noise from commerce, industry and trade) No. N-1*, June 1989

4 Assessment Methodology

4.1 Scenarios Assessed

The following scenarios have been assessed:

- Duplication
- Electrification
- *Do Nothing* – the future scenario expected in the absence of the project. *Do Nothing* is used in Table 1 as the baseline for assessing the increase in rail noise.

4.2 Prediction Methodology

The Nordic Rail Prediction Method⁴, developed by Kilde, has been used to predict airborne railway noise levels adjacent to the proposed alignments. The Nordic method is commonly used for railway noise prediction in Australia since it provides both average and maximum noise level predictions. Predictions of the daytime average ($dBL_{Aeq,16hr}$), night-time average ($dBL_{Aeq,8hr}$) and maximum noise level ($dBL_{A,max}$) were conducted using the acoustic model.

4.3 Software Implementation

The Nordic methodology was implemented in SoundPLAN version 7.3, a well-established environmental noise prediction software package.

4.4 Source Noise Levels

4.4.1 Reference Source Noise Levels

Reference source noise levels are based on measurements of rail pass-bys undertaken by Arup on the Lilydale, Geelong, Ballarat and Bendigo lines. The reference source noise levels are provided in Table 3 below. The Kilde reference distances for source levels are 100 metres for dBL_{Aeq} and 10 metres for $dBL_{A,max}$.

Train Type	$L_{A,SEL} / L_{Aeq}^{\dagger}$ (dB)	$L_{A,max}$ (dB)	K speed SEL/ $L_{A,eq}$	K speed $L_{A,max}$
VLocity	84	88	16	26
EMU (Metro)	83	88	24	31
Freight locomotive	88	96	6	26
Freight wagon	79 [†]	- *	28	- *

[†] L_{Aeq} per second of pass-by

* Since wagons are always hauled by an accompanying locomotive, the maximum noise level is determined by the locomotive.

Table 3: Reference source noise levels of vehicles used for acoustic modelling

⁴ Nordic Council of Ministers, *Railway Traffic Noise- The Nordic Prediction Method*, TemaNord 1996:524

The Kilde methodology uses a reference speed of 80 km/h. Where the train speed is higher or lower than the reference speed, the source noise levels are calculated based on the following formulae:

- $L_{A,SEL}(S) = L_{A,SEL}(ref) + K_{SEL} \times \log(S/80)$
- $L_{Amax}(S) = L_{Amax}(ref) + K_{Lmax} \times \log(S/80)$

Where S is the train speed. These source noise levels are consistent with other rail upgrade projects in Victoria.

4.4.2 Train speeds

Arup is advised that the line speed between Deer Park and Melton is 160 km/h, for all scenarios. Therefore, based on the maximum speed for each train type, the train speeds used for the acoustic modelling are:

- 115 km/h for Metro (EMU) services
- 115 km/h for freight services
- 160 km/h for VLocity services

4.4.3 $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ Source Noise Levels

The $L_{Aeq,16hr}$ (daytime average) and $L_{Aeq,8hr}$ (night-time average) measures specified in the PRINP are dependent on the number of services during each period. The calculation of these average noise levels are determined using the following formula:

- $L_{Aeq,16hr} = L_{A,SEL} + 10 \times \log(N / 57\,600)$
- $L_{Aeq,8hr} = L_{A,SEL} + 10 \times \log(N / 28\,800)$

Where N is the number of services during the time period.

The $L_{Aeq,16hr}$ and $L_{Aeq,8hr}$ source levels have been determined based on service estimations provided by PTV. These source levels (at the train speeds in Section 4.4.2) are provided in Table 4 below.

Train type	To Melbourne		From Melbourne	
	dBL _{Aeq,16hr}	dBL _{Aeq,8hr}	dBL _{Aeq,16hr}	dBL _{Aeq,8hr}
‘DO NOTHING’ SCENARIO				
VLocity	53	49	53	49
Metro	-	-	-	-
Freight	-	53	50	-
DUPLICATION SCENARIO				
VLocity	54	51	54	51
Metro	-	-	-	-
Freight	-	51	50	-
ELECTRIFICATION SCENARIO				
VLocity	51	46	51	46
Metro	59	56	59	56
Freight	-	56	52	-

Table 4: L_{Aeq,16hr} and L_{Aeq,8hr} source levels

4.5 Topography and shielding

Existing terrain features have been modelled using 1 m terrain survey contours. Shielding from buildings are included in the modelling. The vertical alignment of the new tracks is currently not available, therefore the tracks have been placed at ground level. The ground absorption factors have been applied in accordance with the existing conditions. Therefore the majority of the model uses a factor of 1.0 for undeveloped land.

Details of the input files, which are used to construct the acoustic model, are provided in Appendix B.

4.6 Buildings

Existing buildings have been traced from aerial photography.

Locations of potential “future buildings” have been determined based on cadastral boundaries and Precinct Structure Plans.

Buildings have been modelled using a height of 3 metres, with the receiver placed at 1.5 metres above ground level for noise-sensitive buildings.

5 Results and Discussion

Assessment according to the PRINP is based on both the absolute railway noise level and the relative increase in railway noise level.

A summary of the predicted railway noise level at each individual (existing) property relative to its distance along the alignment are shown in Figure 2 to Figure 7. Each dot on the graphs represents an existing dwelling. The absolute noise level at each dwelling is shown on the Y-axis, and the relative noise level is shown by the colour of the dot. A red line indicates the *investigation threshold* for the absolute noise level.

Therefore dwellings that would exceed both the absolute and relative investigation thresholds of the PRINP, and therefore areas where noise impacts are required to be considered are shown by red dots above the red line.

Detailed noise level contours for each of the prediction scenarios are provided in Appendix C.

5.1 Duplication

Predicted daytime, night-time and L_{Amax} noise levels are shown below in Figure 2, Figure 3 and Figure 4 respectively. Each dot represents the noise level at an existing residence.

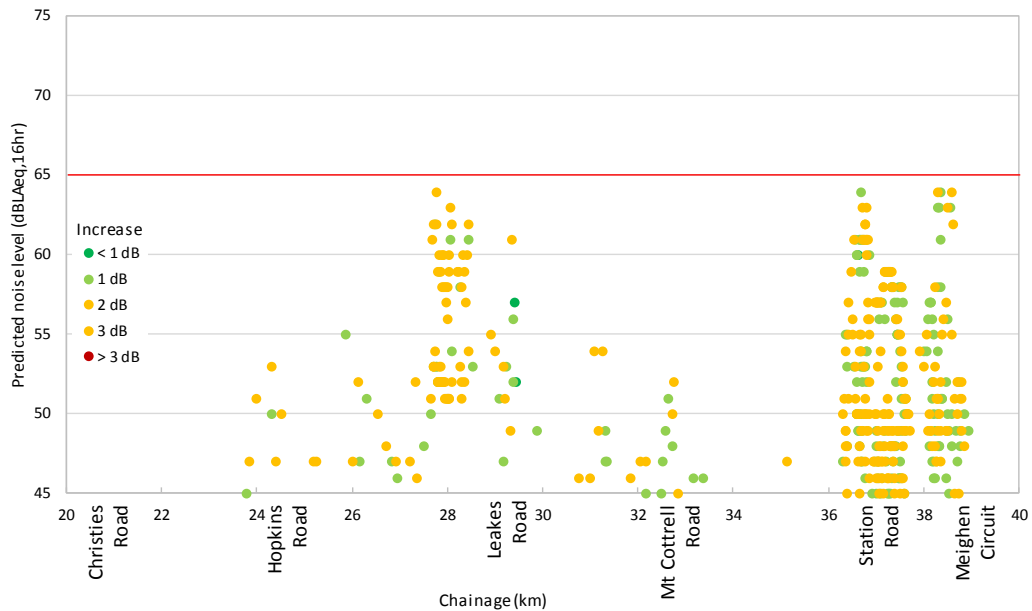


Figure 2: Duplication- predicted daytime average noise levels at existing dwellings

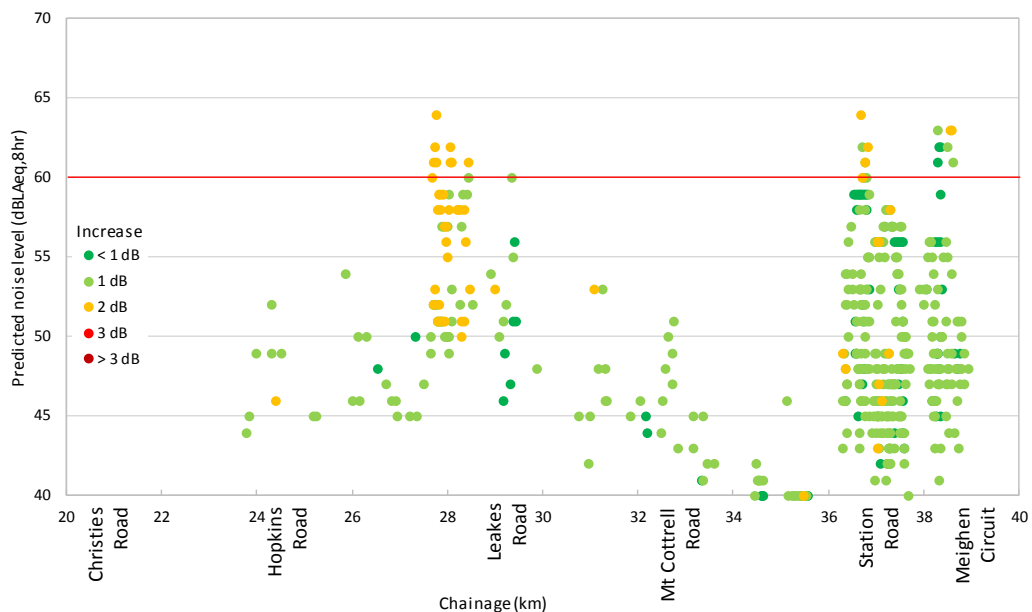


Figure 3: Duplication- predicted night-time average noise levels at existing dwellings

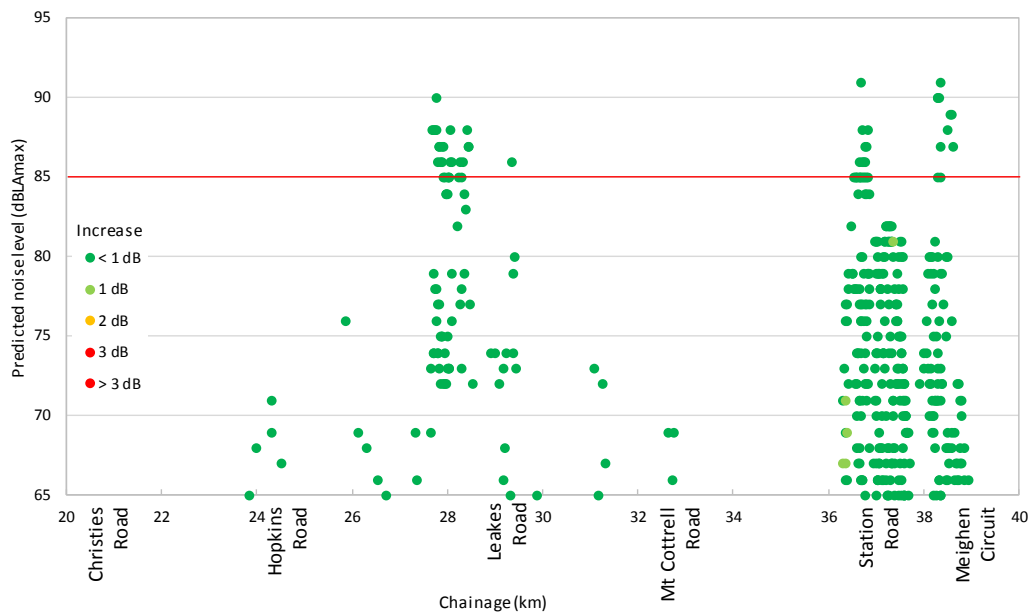


Figure 4: Duplication- predicted L_{Amax} noise levels at existing dwellings

5.2 Electrification

Predicted daytime, night-time and L_{Amax} noise levels are shown below in Figure 2, Figure 3 respectively. Each dot represents the noise level at an existing residence.

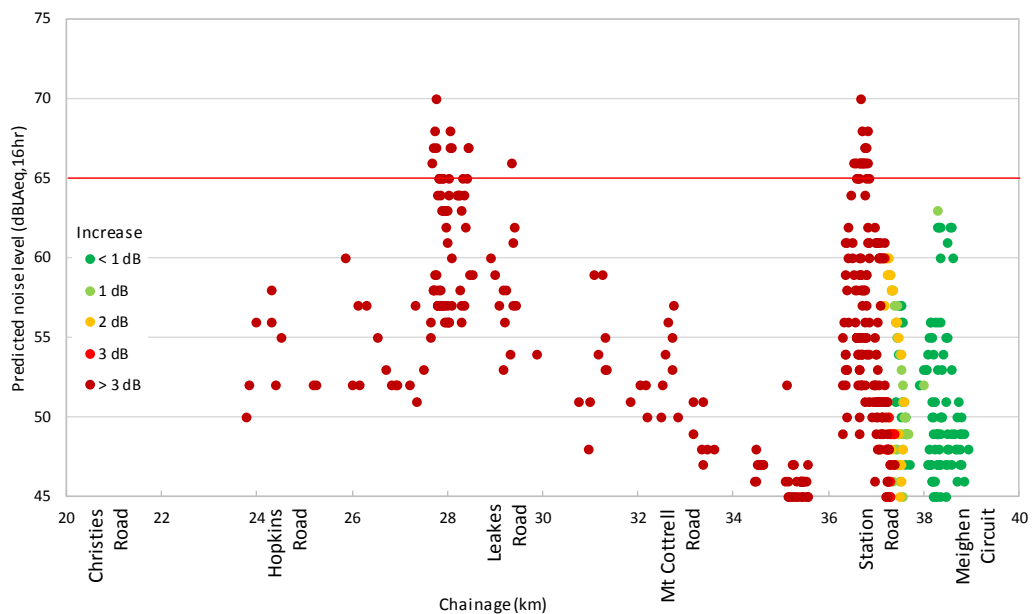


Figure 5: Electrification- predicted daytime average noise levels at existing dwellings

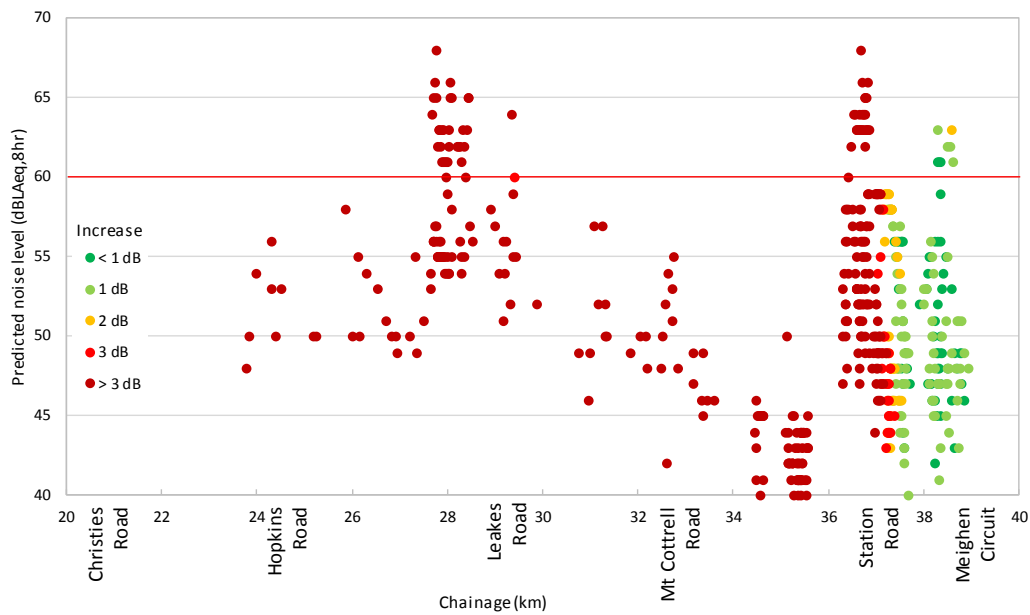
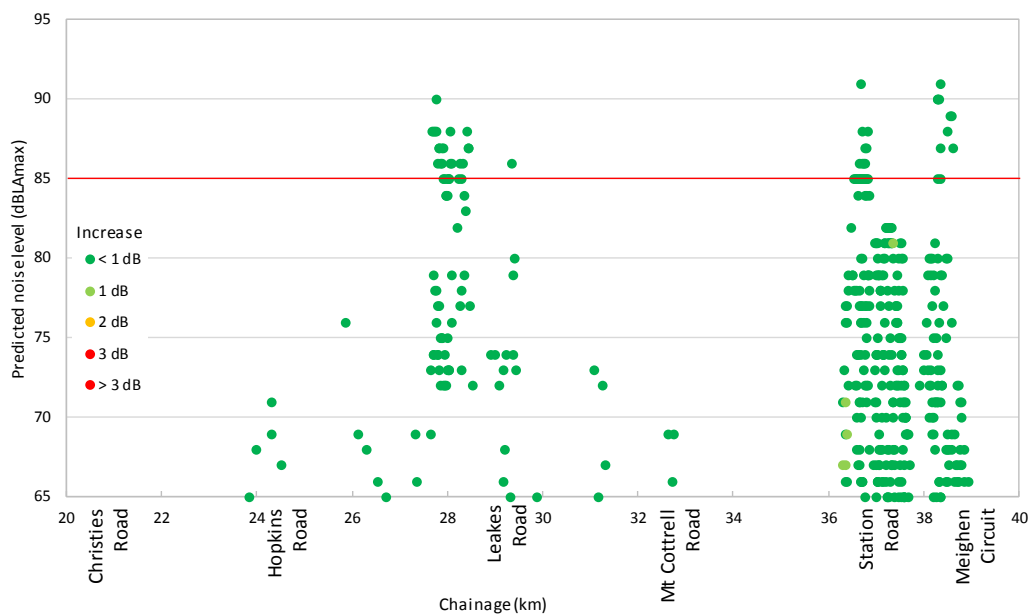


Figure 6: Electrification- predicted night-time average noise levels at existing dwellings

Figure 7: Electrification- predicted L_{Amax} noise levels at existing dwellings

5.3 Discussion of results- existing dwellings

For the duplication scenario, none of the existing dwellings are expected to exceed the *investigation thresholds*. Some dwellings are exceeding the absolute railway noise level for the night-time average and L_{Amax} (some of these dwellings are also exceeding for the 'Do Nothing' scenario), however the relative increase in railway noise is less than 3 dB(A).

For the electrification scenario, several existing dwellings near Leakes Road and Station Road are expected to exceed the daytime and night-time average *investigation thresholds*.

Although electric train are quieter than diesel trains, the large increase in the number of services results in the *investigation thresholds* being exceeded.

5.4 Discussion of results- future developments

Noise contours for indicative future developments are shown in Appendix C. Note that housing developments are subject to change, therefore the results are indicative of noise levels based on a potential worst-case development scenario.

The PRINP trigger requiring a relative increase of “3dB(A) or more” does not apply to a “change in land use near an existing rail corridor” (eg dwellings built after the railway is upgraded). Therefore all future buildings constructed within the red and orange contours are expected to exceed the Investigation Threshold.

The front row of dwellings generally shields the houses behind from rail noise, as shown in the noise contours. However, construction timelines should be considered, as they may result in some dwellings being exposed to rail noise until the front row of houses is completed.

These examples indicate that, unless developers apply buffer zones, a large number of properties will be in excess of the PRINP thresholds. Acoustic treatment, such as noise barriers or architectural treatments, would need to be investigated for these properties.

A proportion of the land where PRINP thresholds will be exceeded in future is expected to be already affected by noise. However, the proposed duplication and electrification would increase the scale of the impact and the area affected.

6 Potential acoustic treatment

For dwellings exceeding the *investigation thresholds*, indicative noise barriers have been designed. The PRINP does not provide any advice regarding the noise levels that acoustic treatment should be designed to achieve.

The following approach adopted has been based on previous projects such as Regional Rail Link and is as follows:

- Noise level reduced back to the absolute noise level of the *investigation threshold* (ie 65 dBL_{Aeq,16hr}, 60 dBL_{Aeq,8hr} or 85 dBL_{Amax}).
- Noise barriers designed only for the time period (daytime average, night-time average or L_{Amax}) in which the *investigation threshold* is exceeded.

6.1 Noise barriers for duplication scenario

Since the predicted noise levels are below the *investigation thresholds* at all locations, investigation of acoustic treatment is not required for the rail duplication scenario.

6.2 Noise barriers for electrification scenario

The railway noise levels for the electrification scenario are expected to exceed the investigation thresholds at locations in Melton and Rockbank. A preliminary design of noise barriers has been conducted for these locations, with the barriers located on the VicTrack boundary. Changes in barrier heights may occur as the project progresses, due to refinements such as the final location of the barriers and the earthworks design of the railway.

Noise barriers are shown in Figure 9 to Figure 11 below.

According to this preliminary assessment, approximately 1,100 metres of noise barriers would be required for existing buildings.

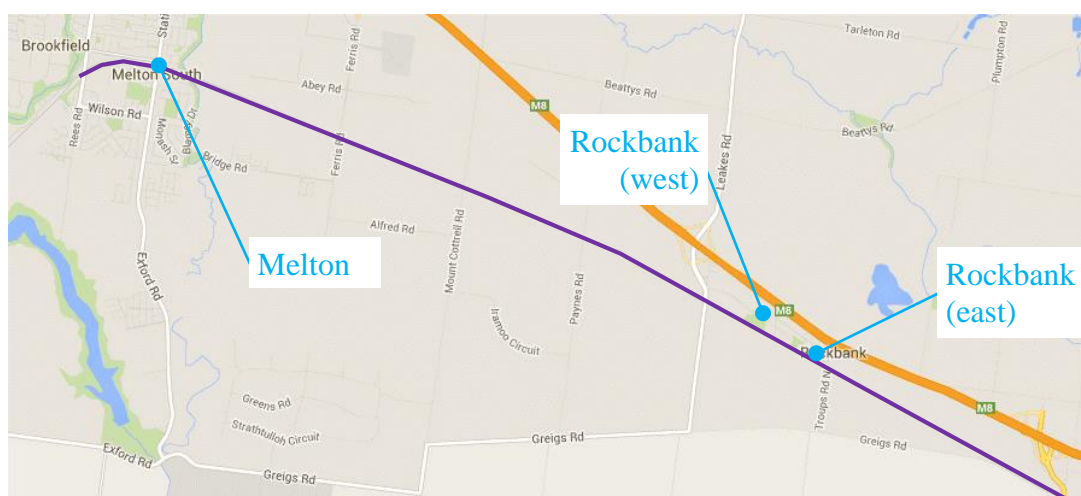


Figure 8: Overview map for noise barriers- electrification scenario

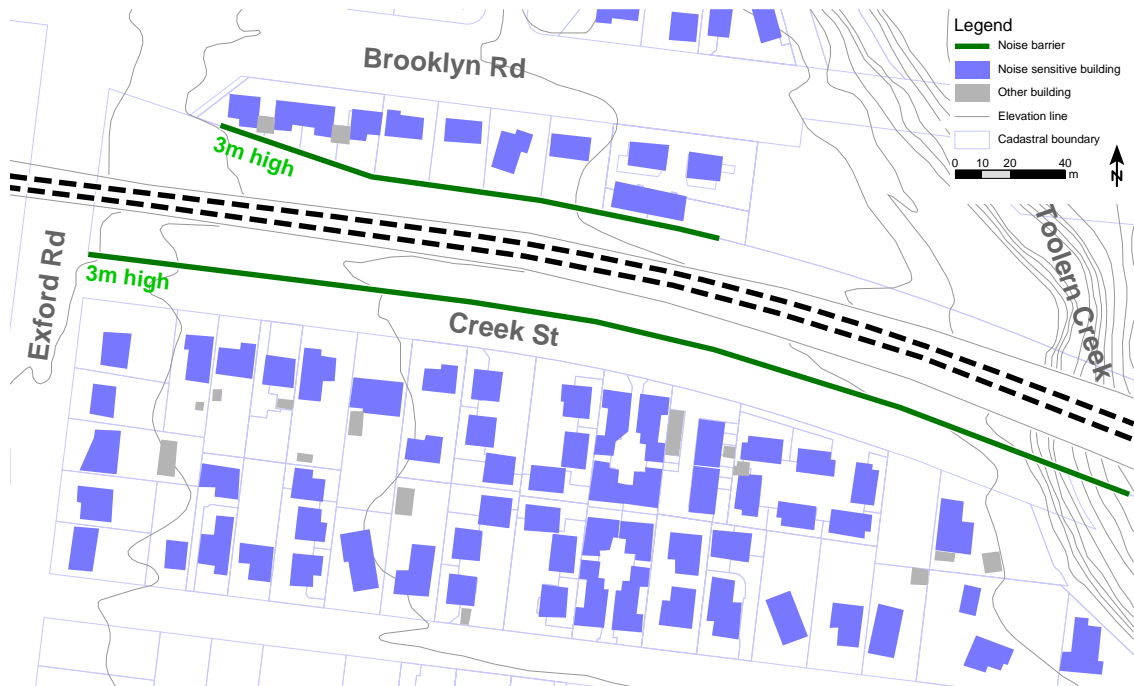


Figure 9: Indicative noise barriers for electrification scenario- Melton

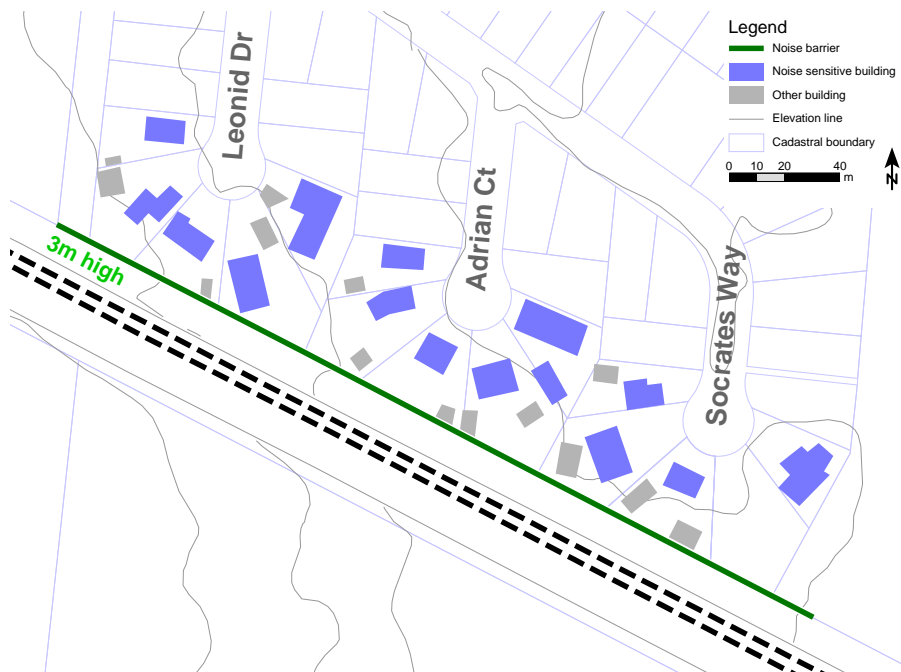


Figure 10: Indicative noise barriers for electrification scenario- Rockbank (west)



Figure 11: Indicative noise barriers for electrification scenario- Rockbank (east). Note: different scale to previous figures.

6.3 Noise Mounds

Noise mounds or earth bunds could be constructed as an alternative to noise walls. The height of the mound required is the same as the noise barrier, therefore the locations and height of noise mounds are shown in Figure 9 to Figure 11 above.

While a mound provides a natural aesthetic and can be constructed from excess spoil, the greater area of land required by a mound should be considered. Arup's experience is that a practical batter slope is between 1:2 and 1:3. For the 3 metre high noise barriers shown above, this would result in a mound width of around 20 metres (including a 1 metre wide flat area on the top of the mound for maintenance).

6.4 Railway Street Interface Cross Section

The MPA have developed a street cross section to be used at the interface of the rail corridor, as shown below. The developer's acoustic assessment report must demonstrate general compliance with the railway interface cross section in the PSP. The design of the cross section will ensure that there is minimal impact on development within the rail noise amenity area.

6.5 Planning controls for future developments

6.5.1 Rail noise amenity area

As shown in Appendix C, potential future developments are expected to exceed the *investigation thresholds* in several areas, especially for the electrification scenario. The area exceeding the *investigation thresholds* for the electrification scenario is shown as the "rail noise amenity area" in Map 13 below. It is recommended that a planning control be applied to the *rail noise amenity area*. The proposed condition for this area is provided in Section 6.5.2 below.

Rail Noise Amenity Area.
Based on external night-time
(10pm - 6am) noise level.



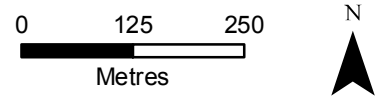
Rail Noise Amenity Area.
Based on external night-time
(10pm - 6am) noise level.








Rail Noise Amenity Area.
Based on external night-time
(10pm - 6am) noise level.



ARUP



Legend






-  Rail Noise Amenity Area
-  Noise sensitive building
-  Non-residential building
-  VicTrack boundary
-  Railway

Title
Melton Electrification
Noise Contours

Rail Noise Amenity Area.
Based on external night-time
(10pm - 6am) noise level.



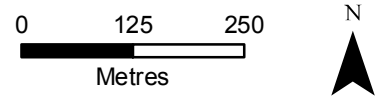
Legend

-  Rail Noise Amenity Area
-  Noise sensitive building
-  Non-residential building
-  VicTrack boundary
-  Railway






Rail Noise Amenity Area.
Based on external night-time
(10pm - 6am) noise level.



ARUP



Legend

- | | |
|--|---|
|  Rail Noise Amenity Area |  VicTrack boundary |
|  Noise sensitive building |  Railway |
|  Non-residential building | |

Title **Melton Electrification**
Noise Contours

An example of this approach in Victoria is DDO-10 in the Melton and Wyndham planning schemes, which was implemented for Section 2 of Regional Rail Link (RRL2). DDO-10 imposes an indoor noise limit in bedrooms, and the boundary of DDO-10 corresponds to the area exceeding the *investigation thresholds* for RRL2.

6.5.2 Planning application and permit requirements

Railway noise attenuation application requirement

An application for use or development within the ‘railway noise attenuation area’ on the Public Transport and Path Network of the *Precinct Structure Plan* must be accompanied by an acoustic assessment report prepared by a qualified acoustic engineer or other suitably skilled person to the satisfaction of the responsible authority and Public Transport Victoria.

- The acoustic assessment report must demonstrate compliance with the ‘Railway Street Interface’ cross-section in the PSP. The acoustic assessment report must also include (as appropriate to the particular use or development):
- An assessment of noise levels on the land taking into account the existing and likely future noise levels associated with the ongoing operation of the Melbourne-Ballarat rail line.
- Recommendations for noise attenuation measures to provide appropriate indoor amenity (see “Indoor Noise Amenity” below)
- Recommendations for limiting the impact of railway noise on future buildings within the proposed subdivision.
- A design response that addresses the recommendations of the acoustic assessment including all necessary architectural noise attenuation treatments.

All to the satisfaction of the responsible authority and Public Transport Victoria.

Railway noise attenuation area permit requirement

Any permit for the use or development of land, within the ‘railway noise attenuation area’ on the Public Transport and Path Network of the *Precinct Structure Plan* must implement any recommendations of the acoustic assessment and include any conditions necessary, in the opinion of the responsible authority and Public Transport Victoria, to implement railway noise attenuation measures.

All to the satisfaction of the responsible authority and Public Transport Victoria.

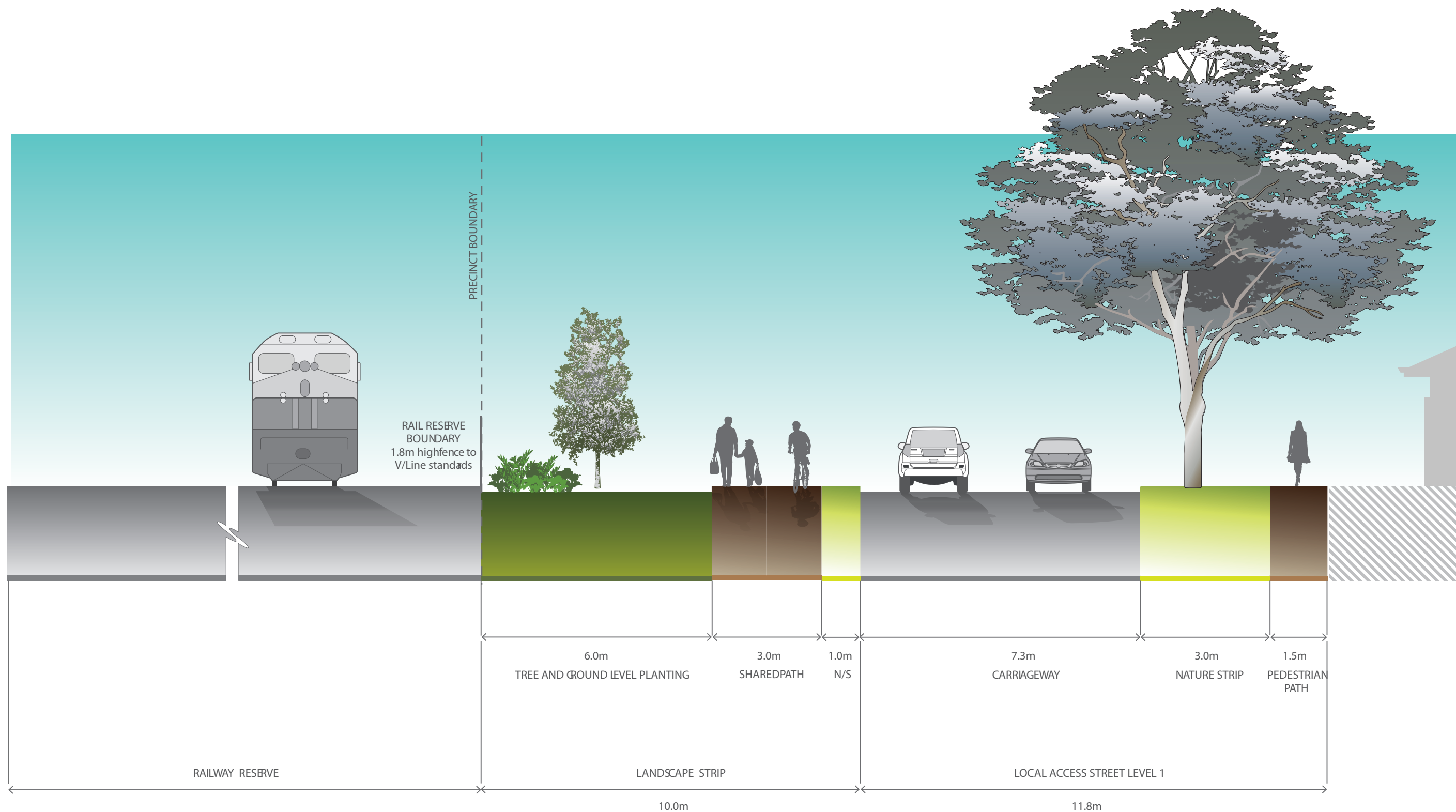
Indoor Noise Amenity

The Victorian PRINP does not provide any guidance on internal noise limits.

VCAT judgements for noise-sensitive developments near railway lines- such as *Richmond Icon Pty v Yarra CC*, *Lazzcorp Brunswick Pty Ltd v Stonnington CC*, and *Kilker v Stonnington CC*- have resulted in noise criteria of 55 dBL_{Amax} (or lower) for bedrooms and 60 dBL_{Amax} for living areas.

For Section 2 of Regional Rail Link, the Minister For Planning's directions to local councils specified internal noise limits of 65 dBL_{Amax} and 40 dBL_{Aeq} .

In Arup's experience, 65 dBL_{Amax} is not likely to provide acceptable amenity for sleeping areas. Also, it is reasonable to provide amenity limits for living areas. Therefore, Arup recommends indoor noise limits of 55 dBL_{Amax} for bedrooms and 60 dBL_{Amax} for living areas, as per VCAT precedence.



NOTES:

- A shared path is to be provided along the rail corridor reserve where shown on Plan 8
- The shared path is to be located outside of the rail reserve, unless a proposal to locate the path within the rail reserve is approved in writing by VicTrack
- Fencing to the rail reserve boundary is to be visually transparent.

Railway Interface Street (21.8m)
Residential / Commercial Frontage

Appendix A

Acoustic Terminology

dB(A)

The unit generally used for the measurement of environmental, transportation or industrial noise is the A-weighted sound pressure level in decibels, denoted dB(A). The A-weighting is based on the frequency response of human hearing (for a given sound pressure level, low frequency sounds do not seem as loud as mid or high frequency sounds) and has been found to correlate well with human subjective reaction to various sounds.

An A-weighting network is built into sound level measuring instrumentation such that sound levels can be read directly from the meter in dB(A). An increase or decrease in sound level of approximately 10 dB(A) corresponds to a subjective doubling or halving in loudness. A change in sound level of 2 to 3 dB(A) is subjectively barely noticeable.

Investigation thresholds

The Victorian Passenger Rail Infrastructure Noise Policy states that *‘If an assessment shows that the investigation thresholds will be exceeded, noise impacts should be considered a primary matter’*. Investigation thresholds are provided for the daytime average ($L_{Aeq,16hr}$), night-time average ($L_{Aeq,8hr}$) and maximum pass-by (L_{Amax}) noise levels.

L_{Aeq}

A common assessment for overall noise exposure is the “equivalent continuous sound level”, L_{Aeq} . This is the (energy-based) average noise level for a given period of time. Hence fluctuating levels can be described in terms of a single figure level.

$L_{Aeq,16hr}$

The L_{Aeq} noise level for the period 6:00 hours to 22:00 hours. It is the average daytime noise level over a 16 hour period.

$L_{Aeq,8hr}$

The L_{Aeq} noise level for the period 22:00 hours to 06:00 hours. It is the average night time noise level over an 8 hour period.

$L_{A,max}$

The maximum instantaneous noise level during the measurement period. The $L_{A,max}$ level for electric trains most influenced by the traction system and the wheel-rail interface. The $L_{A,max}$ level diesel trains is most influenced by the exhaust.

Noise Sensitive buildings

The Victorian Passenger Rail Infrastructure Noise Policy specifies investigation thresholds for ‘residential dwellings and other buildings where people sleep including aged person homes, hospitals, motels and caravan parks’. During the daytime, investigation thresholds are also defined for ‘noise sensitive community buildings including schools, kindergartens and libraries.

Structureborne Noise

The transmission of noise energy as vibration of building elements. The energy may then be re-radiated as airborne noise. Structureborne noise is controlled by structural discontinuities, ie expansion joints and floating floors.

Typical Noise Levels

Some typical noise levels are given below:

Noise Level dB(A)	Example
130	Threshold of pain
120	Jet aircraft take-off at 100 m
110	Chain saw at 1 m
100	Inside disco
90	Heavy lorries at 5 m
80	Kerbside of busy street
70	Loud radio (in typical domestic room)
60	Office or restaurant
50	Domestic fan heater at 1m
40	Living room
30	Theatre
20	Remote countryside on still night
10	Sound insulated test chamber
0	Threshold of hearing

Appendix B

Data Inputs For Acoustic Model

The input files shown in Table 5 were used for the acoustic model

Filename	Description	Date received
el_contour_1to5m.shp	Existing terrain contours	19/09/2014
West-Growth-Corridor-Plan.pdf	Land usage information	25/09/2014
Toolern MTC UDF adopted Aug 2012 overall concept layout.pdf	Toolern masterplan	25/09/2014
x-2177729A-civ-mel-track_stabling-rbk-opt3 20140923.dgn	Rockbank potential stabling location	15/10/2014
x-2177729A-civ-mel-track_stabling-mel-optc 20141015.dgn	Melton potential stabling location	15/10/2014
x-2177729A-civ-mel-track_20141009	Rail design	10/11/2014
PSP-1099-Rockbank-PSP-Informal-Consultation-November-2014-Final.pdf	Rockbank precinct structure plan	03/12/2014
melton_2014mar14_air_vis_10cm_mga55.ecw	Aerial photography	04/12/2014
Melton_V_PROPERTY_MP_ADDRESS_1_region.shp	Cadastral boundaries	04/12/2014

Table 5: Input files used for the acoustic model