

## ROAD DESIGN NOTE

# Interpretation and application of VicRoads Traffic Noise Reduction Policy 2005

## 1. General

The VicRoads Traffic Noise Reduction Policy is attached as Appendix A.

For the purposes of this Design Note, the shortened noise descriptor dB(A), will mean dB(A)  $L_{10}$  (18 hour).

## 2. Limiting noise next to new or improved roads

The policy applies to:

- Freeways and arterial roads built on new alignments; and
- Existing freeways and arterial roads widened by two or more lanes that result in noise sensitive buildings previously protected from traffic noise being exposed by removal of buildings or other significant structures required for the road upgrade works.

### 2.1 What is the definition of a “new alignment” covered by the Policy?

A new freeway or arterial road is constructed in a new or an existing reservation (i.e. a greenfield site where no road has previously existed).

### 2.2 What is not a “new alignment”?

A widening or duplication of an existing freeway or arterial road is not a “new alignment”.

### 2.3 When does the policy apply to road upgrade projects?

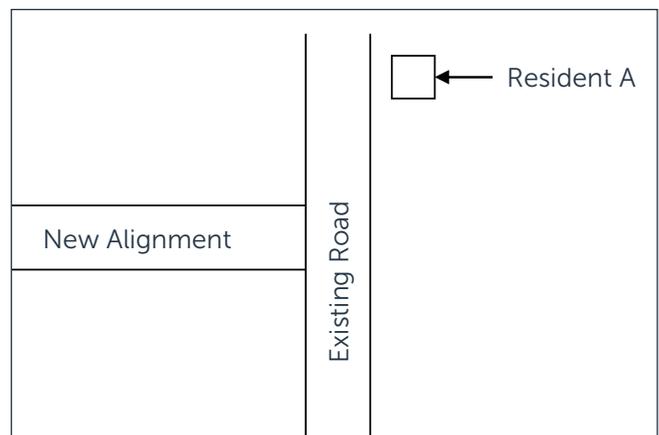
The policy applies to road upgrade projects only when each of the criteria below is met:

- Two or more lanes are added to a freeway or arterial road; and
- Buildings previously protected from traffic noise are exposed to increased road traffic noise by the removal of buildings or other significant structures required for the road upgrade works.

In cases where a road upgrade project has not triggered noise attenuation (i.e. does not meet all the requirements specified above) but has existing noise levels >68 dB and therefore meets the criteria for retrofit, then consideration

should be given to incorporating the retrofit works into the upgrade works to take advantage of economies of scale.

A flowchart to assist in interpreting if the Policy is applicable to a road upgrade project is provided in Appendix B.



### 2.4 How should the interface between new alignments and the existing network be dealt with?

The interface between a new alignment and the existing road should be dealt with as described in this section. The “new alignment” should be identified with reference to the point at which the new section of pavement joins the existing pavement.

Edge effects occur at the transition between new alignments and the existing road network. A local resident adjacent to a road project but just outside of the new alignment section that triggers the noise policy (Resident A above) should not be subject to noise levels above those set in this policy due to the new alignment. To achieve this outcome acoustic modeling should determine the noise level contribution from the new alignment section of road on all properties, whether adjacent to the new alignment or not, and attenuate in accordance with the policy. For example if the additional noise level from the new alignment section of the road in the diagram above pushes Resident A above 63 dB(A) or the level that would have prevailed if the new alignment had not been built, then noise attenuation should be considered for this property.

## 2.5 What noise level objectives apply?

The primary noise objectives are:

- Category A: - For residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature, the external noise level objective will be 63 dB(A)  $L_{10}$  (18hr) measured between 6 am and midnight;
- Category B: - For schools, kindergartens, libraries and other noise-sensitive community buildings, the external noise level objective will be 63 dB(A)  $L_{10}$  (12hr) measured between 6 am and 6 pm; and
- Where the noise level adjacent to Category A or B buildings prior to a new or improved road is less than 50 dB(A)  $L_{10}$  (18hr), consideration will be given to limiting the external noise level increase to 12 dB(A).

or

- The level that would have prevailed if the road upgrades had not occurred, whichever is the greater.

The Project Objective Noise Level (PONL) is the noise level objective for a specific road project to be achieved for at least ten years after completion of the project.

To determine the PONL, it is necessary to measure the existing noise level at noise sensitive buildings adjacent to the new alignment or qualifying road upgrade project. Where there are numerous noise sensitive buildings near the new alignment or qualifying road upgrade project, it is reasonable to apply the measurements to other locations which have a similar exposure to existing noise sources. Noise measurement guidelines for Acoustic Consultants are attached as Appendix C.

**It should be noted that where the existing noise levels are less than 50 dB(A)  $L_{10}$  (18hr), an assessment of the noise barrier requirements to limit the future noise level increase to 12 dB(A) must be undertaken. An assessment of the practicability of the measures will then be made (refer to Section 2.7.3), and valid reasons for adopting or not-adopting the lower noise objective, are to be documented.**

As a guide:

### New alignments and upgrades

- If the existing noise level is < 50 dB(A), consideration is given to the objective to limit the noise increase to 12 dB(A);
- If the existing noise level is between 50 and 63 dB(A), then the objective is to limit the noise level to 63 dB(A); or the level that would have prevailed if the road upgrades had not occurred, whichever is the greater;
- If the existing noise level is > 63 dB(A), then the objective is to limit noise level increase to 0 dB(A), which in practice is very difficult to achieve. The accepted practice when existing noise level is > 63 dB(A) is to limit the increase in noise levels by no more than 2 dB(A), or the level that would have prevailed if the road upgrades had not occurred, whichever is the greater.

A diagram to assist in determining what noise level objective is applicable under the Policy is provided in Appendix D.

## 2.6 When should noise monitoring be undertaken?

Noise monitoring should be undertaken only once it has been determined that a new road or existing road upgrade project is covered by the VicRoads Traffic Noise Reduction Policy. Once this has been determined noise monitoring should be undertaken to establish baseline noise levels as part of preconstruction activities for the project. Noise monitoring may also be required as part of a noise modelling exercise. A shell brief for engaging an acoustic consultant for noise monitoring and a guideline detailing requirements of acoustic consultants engaged by VicRoads are available from Environmental Services.

**Post construction monitoring should also be undertaken 6 months following opening of the new or upgraded road to verify that Project Objective Noise Level (PONL) targets have been met.**

## 2.7 Achieving the Policy objectives

Applying the policy is mandatory. However, the noise level objective established and the techniques used to limit the noise from a road project are subject to the techniques in Section 2.3.1 of the Policy.

### 2.7.1 Whole-of-life considerations

This requirement ensures that attenuation measures perform acoustically and physically for a reasonable period of time. For example, the acoustic and physical life of a noise barrier should finish at about the same time. The situation where the physical condition of a barrier has deteriorated considerably to the extent that it needs replacing, whilst the acoustic properties are performing according to the Policy requirements, is not desirable. Similarly, it is a waste of resources, if the barrier requires replacement, because the Policy retrofitting level has been exceeded years prior to the end of the structural life of a barrier.

For a new or upgraded road, the “whole-of-life” considerations in determining acoustic performance of attenuation solutions should take into account the requirements to achieve the PONL for a reasonable period after opening of a project. Where noise barriers are used they should be designed to achieve the PONL or less for ten years after opening, taking into account predicted traffic growth.

Consideration of the expected life of noise barrier materials and the predicted acoustic life of the barrier should be undertaken during the design stages of a new road project. If it is anticipated that the acoustic life of a barrier will be significantly shorter than the physical life, then it may be necessary to ensure that the initial barrier can be retained, whilst future noise reduction treatments such as increased barrier height, quieter road surfaces, architectural treatments, etc, are available to reduce the noise level below the retrofit trigger level.

Similarly, for a retrofitted barrier, the target level after retrofitting should allow for the “whole-of-life” performance. The target retrofitting noise levels should be set at a level below the retrofitting trigger level that will allow for traffic growth considerations.

#### Example of “whole-of-life” considerations for retrofitting of noise barriers

If a noise barrier material has a life time of 25-40 years then this will determine the acoustic life of the barrier treatment. If the annual average traffic volume growth for the road is about 2%, then for a barrier lifetime of 25-40 years, the compound traffic growth will be theoretically a 65% to 120% increase on the current traffic volumes. The growth capacity of the road would need to be tested when determining the acoustic life of the barriers.

A 65% to 120% increase on the current traffic volumes equates to an increase in traffic noise levels of 2 to 3.5 dB(A). Therefore the target level at the start of the retrofitting project, should be 66 to 64.5 dB(A), i.e. 2 to 3.5 dB(A) less than 68 dB(A). This will mean that at the end of the barriers physical life, the retrofitting objective will be mostly met and occasionally exceeded.

The underlying principle in retrofitting of noise barriers is that it is undesirable to have to retrofit noise barriers before the end of their physical life due to a miscalculated acoustic outcome.

### 2.7.2 Practicability

The practicability of a noise attenuation treatment is dependent upon the feasibility and reasonableness of the proposed solutions to the noise impact issues. The feasibility and reasonableness issues covered below are relevant to noise barriers and off-reservation treatments.

**Feasibility** relates to engineering considerations and includes, but is not limited to:

- Cost of abatement - The total cost of construction needs to be established for each project. Cost-effectiveness for non-residential properties (such as schools and industrial buildings) will be handled on a case by case basis. A benefit/cost analysis should be undertaken for on and off reservation options
- Access - Continued accessibility to roads and driveways must be provided for motorists and residents. Access to noise barriers for maintenance purposes also needs to be considered and should be discussed with the VicRoads maintenance team that will become responsible for maintenance of the noise barrier and surrounding landscape.
- Safety - The safety of motorists, construction workers and residential safety and personal security must be assured;

- Topography - The geometry, soil types, floodway and stormwater flow obstruction and the presence of other structures (bridges, culverts) on-site, need to be assessed;
- Structural - Noise abatement measures that require construction must be able to be constructed and existing structures must be able to withstand the additional weight or wind load imposed by the measures. The worksite needs to be assessed for underground utility services and any relocation requirements which may impact the construction of noise abatement measures;
- Heritage listing of properties - Determine whether properties are heritage listed as this could prevent the implementation of architectural noise abatement measures; and
- Maintenance - Maintenance of noise abatement measures needs to be cost effective. An indication of the ongoing cost and resources required to maintain abatement measures in terms of the replacement of materials, cleaning, painting, etc., needs to be obtained.

If any of the risks associated with the feasibility factors cannot be mitigated then the site treatment should be considered infeasible. A reasonableness analysis will only be undertaken if the site and treatment measures are considered feasible.

**Reasonableness** of an attenuation proposal relates to the application of wider issues and should consider:

- Noise abatement benefits - For each feasible measure determine the amount of noise protection provided (both internal and external);
- Project approval - The date of public knowledge of the approval of the project is a major part of the site history of the project (this is the date against which all site history will be judged).
- Change in noise levels - Determine the change in noise levels to assess the severity of noise impacts on residences. The measurements to be used are the difference between existing noise levels and the predicted future traffic noise levels as a result of the project. VicRoads Traffic Noise Measurement Guidelines for Acoustic Consultants, and shell briefs for noise modelling and noise monitoring, are available from Environmental Services.
- Opinions of the impacted residents – The opinions of directly impacted residents should be sought and considered when selecting noise abatement measures. The visual perception of noise abatement (colour, shape, materials, height) and the setting of abatement measures (urban, open suburban or rural areas) should be taken into account when considering the reasonableness of noise abatement measures.
- Urban design objectives – Consideration should be given to the existing surrounding environment, including materials, forms and spaces.

- Environmental impacts of noise abatement construction - The effects on the natural environment such as wildlife, ecology, disruption to water bodies and drainage patterns should be considered in the design of noise abatement measures. Noise generated during the implementation of noise abatement measures should be minimized.

If any of the risks associated with the reasonableness factors cannot be adequately mitigated then the site should not be considered for external noise abatement (noise barriers) only. It then follows that a combination of architectural (internal) and noise barriers (external) noise abatement measures should be considered at the impacted buildings, refer to Section 2.8.5.

**Practicability analysis of the noise attenuation options will assist VicRoads to determine most appropriate treatment for a Project (new, upgraded or retrofitting). VicRoads maintains the right to apply the Policy in a fair and appropriate manner and determine the most suitable noise attenuation solution. Appendix E contains a template for documenting the outcomes of practicability assessments.**

### 2.7.3 Combination of noise attenuation measures

A combination of noise barriers and other measures, such as open-graded asphalt, barriers on bridge parapets and safety barriers, etc., needs to take into consideration the “whole-of-life” aspects as well as the practicality of the measure. For example, on the Monash Freeway in East Malvern, it was decided that a noise barrier installed on a concrete safety barrier was a cheaper and more practical solution compared with a free-standing noise barrier behind a safety barrier.

When low noise surfacing, such as Open Graded Asphalt (OGA) or Stone Mastic Asphalt (SMA), is to be used as part of the attenuation solution for reducing noise, then the life of the asphalt must be taken into consideration. The “whole-of-life” aspect of open-graded asphalt is relatively short compared with other attenuation techniques such as concrete noise barriers. The use of open-graded asphalt to reduce noise should only be considered if there is a commitment to maintain the noise reduction performance.

### 2.7.4 Off-Reservation Attenuation Treatments (ORTs)

The provision of acoustic treatments to individual dwellings may be a viable road traffic noise treatment option for new and upgraded roads, depending on factors such as cost-effectiveness, aesthetics and community and resident preferences. For existing buildings, these treatments are generally limited to acoustic treatment of the building elements and the installation of acoustic screen walls close to the dwelling.

A flowchart to assist with the application of off-reservation treatments is included in Appendix F.

**Barriers and other road treatments that reduce external noise are normally preferred over architectural treatments that only reduce noise levels within the building.**

**Off-reservation attenuation measures will only be considered after on-reservation attenuation techniques have been assessed and subjected to practicability testing. Where there is a shortfall in obtaining the PONL for practical reasons, then consideration should be given to making up the difference with off-reservation treatments to achieve an equivalent indoor noise level. If off-reservation treatments are being considered, then a combination of reduced barrier height and architectural treatment should be the preferred initial approach.**

Ideally the decision to use off-reservation attenuation will be made early in the planning process as a result of noise investigations, preliminary design, and consultation with affected residents. However a VicRoads Region or Project may make the decision to use off-reservation treatments at any stage in the project at which on-reservation treatments become an impracticable option.

Consultation with all affected property owners must be undertaken in the assessment of the practicability of off-reservation options. It is important to manage expectations during this process by carefully and clearly explaining the process from a resident’s perspective at an early stage. Property owners should understand the rationale for VicRoads decision making. It is important to convey that VicRoads are not offering individuals a choice of noise attenuation, but carrying out consultation with affected residents to determine overall community preferences. Clearly articulating budget limitations may also assist in managing expectations.

If the “architectural treatment in lieu of noise barrier” option is not largely supported by the community, and/or if architectural treatment of individual dwellings will cost more than a noise barrier, the optimal combination of road treatment and architectural treatment options should be applied.

The acoustic treatments provided by VicRoads include (but are not limited to):

- Fresh air ventilation systems that meet Building Code of Australia requirements with the windows and doors shut;
- Upgraded windows and glazing and solid core doors on the exposed façades of masonry structures only (Upgraded windows and doors must have a Rw rating of 30 dB(A)). These techniques would be unlikely to produce any noticeable benefit for light frame structures with no acoustic insulation in the walls;
- Upgrading window and door seals;
- The sealing of wall vents; and
- The installation of external screen walls.

Building element treatments are more effective when they are applied to masonry structures than light timber frame structures. Caution should be exercised before providing treatments for buildings in a poor state of repair, as treatments will be less effective in these cases.

Architectural acoustic treatments should aim to achieve internal noise levels in habitable rooms significantly below the external noise level targets. A target indoor noise level in habitable rooms of 10 dB(A) below the external noise level targets is thought to be reasonable and should be aimed for. However, VicRoads makes no guarantee that this target level will be achieved as the state of housing can be difficult to determine.

It is important to remember, that whilst the internal noise levels in buildings may be acceptable, the external acoustic environment may need consideration and protection to ensure on-going or restored use of the external environment.

VicRoads funding of off-reservation treatments is subject to the execution of an Agreement to Noise Attenuation Works. A standard form of this agreement is available from Environmental Services. While due care must be taken in the design and selection of acoustic treatments for which funding is provided, VicRoads makes no representations that any particular internal noise level will be achieved. There is therefore no need to verify that a particular internal noise level has been achieved, and post-treatment noise monitoring is not required.

Under the Agreement to Noise Attenuation Works, VicRoads accepts no legal responsibility to building owners for the quality of the treatments carried out, their maintenance, the cost of operating and maintaining treatments, or future noise treatments. However, VicRoads must be satisfied with the treatment works carried out before it releases payment to the contractor.

In the event that a decision is made that off-reservation noise attenuation measures is the optimal solution and one or more householders declines the Agreement to Noise Attenuation Works they should be presented with a Deed Acknowledging Refusal of Noise Attenuation Works. A standard form of this agreement is available from Environmental Services. The intention of the Deed Acknowledging Refusal of Noise Attenuation Works is to record the offer of noise attenuation works to the house owner and indemnify VicRoads against future claims and requests for noise attenuation at the premises. Should the house owner refuse to sign the Deed Acknowledging Refusal of Noise Attenuation Works then details of the offer and subsequent refusal should be recorded on the Project file and provided to VicRoads Environmental Services.

**Under no circumstances should VicRoads offer monetary compensation as opposed to ORTs to affected land owners.**

### 2.7.5 Multi-function noise barriers

In some circumstance it may be beneficial to incorporate multiple functions into a noise barrier design. Possibilities include the following:

- incorporating solar panels into noise barriers such as in the Tullamarine Calder Interchange Project example;
- incorporating noise attenuation into a wall of a development (i.e. joint noise barrier / outer wall);
- incorporating unique elements that provide a way-finding (or landmark) benefit; and

- integrating aesthetic design with the surrounding landscape to provide an aesthetic improvement to the road corridor.

## 3. Retrofitting projects

Refer to Section 2.4 of the Traffic Noise Reduction Policy in Appendix A.

### 3.1 Which roads qualify for consideration of retrofitting of noise attenuation?

VicRoads has been providing noise attenuation along new freeways and arterial roads since 1979 and retrofitting noise attenuation to freeways built prior to 1979 since 1985. The latest revision of the Policy released in 2005 changed retrofit criteria to include all freeways and arterial roads that have previously been eligible for noise attenuation works. In effect this adds eligibility to new and significantly upgraded arterial roads that when constructed met the eligibility requirements detailed in the 'Limiting noise next to new or improved roads' section of the Policy.

Roads qualifying for consideration of retrofitting of noise attenuation include:

- Freeways built prior to 1979 with noise levels at adjacent to receptors exceeding 68 dB(A).
- Freeways and arterial roads built after 1979 that were eligible under the Policy section "Limiting noise next to new or improved roads" and changes in traffic volumes or other conditions has meant that the noise levels at adjacent to properties exceed 68 dB(A).

In all cases the exceptions detailed in Section 3.2 below apply to retrofit projects.

It is important to note that even though a section of freeway or arterial road may be eligible for retrofit this is not a guarantee that a noise attenuation project will be funded. Funding is dependent upon consideration of the cost – benefit relationship of the project in comparison with other road improvement projects such as road safety and traffic management improvements.

### 3.2 Which roads are ineligible from consideration of retrofitting of noise attenuation?

There are a limited number of situations where expenditure of public monies on noise attenuation is not considered to be justified. These situations are detailed in Section 6 of this report.

In addition the following exemptions apply to retrofit projects:

- Arterial roads built prior to 1979.
- Local roads becoming part of the declared road network are exempt from consideration under the policy;
- Retrofitting of noise attenuation along freeways and arterial roads will not be undertaken where the impacted development was required by VicRoads, as a referral authority, or by the planning authority, to install noise attenuation treatments (noise barriers, architectural treatments, etc).

### 3.3 What noise level objectives apply?

The target level for retrofitting projects is a level of less than 68 dB(A). However, the principles of “whole of life” and practicability apply to retrofitting projects.

### 3.4 When should noise monitoring be undertaken?

Noise monitoring should be undertaken by VicRoads Regions on an ongoing basis. The monitoring program should seek to measure noise levels at representative receptors that are known to be near the retrofit trigger level and have not been measured for at least five years, or where there has been a significant change in traffic volumes or composition. Sites for inclusion in the noise monitoring program may also be determined in response to complaints from the community.

Post construction monitoring should be undertaken one month following the construction of any noise barriers constructed under the retrofit program to verify that Project Objective Noise Level targets have been met.

All noise monitoring results should be entered into the VicRoads Traffic Noise Database. Contact VicRoads Environmental Services for a link to the database and/or assistance with entering data.

### 3.5 What noise attenuation treatments should be considered?

The noise reduction measures to be considered for retrofitting projects are identical to those for new and upgraded roads. Noise attenuation measures such as noise barriers, off-reservation treatments, low noise surfacing, and combinations of these treatments, all apply to retrofitting projects.

### 3.6 Managing expectations

It is important that expectations of stakeholders seeking noise attenuation through retrofit works are managed. Whilst areas adjacent to freeways/arterial roads may be identified as qualifying for consideration of retrofitting, this does not automatically mean that noise attenuation will be provided in the near future. It should be explained to stakeholders that the works will be prioritised against other road upgrade projects and only be undertaken when funds are made available.

## 4. Documenting decision making

In any case where consideration of provision for noise attenuation is triggered under the Policy, the decision making process needs to be documented and recorded. A template for recording the decision making process, including practicability assessment, is provided in Appendix E.

## 5. Additional policy interpretations

### 5.1 Traffic growth

For “Limiting noise next to new or improved roads”, the noise level objective will take into account predicted traffic volumes 10 years after opening of the project. This criterion has applied to all new projects for the past 20+ years. It allows for small errors in estimating the predicted traffic using the new or upgraded road, errors in noise modelling, or other unforeseen local effects, and ensures that project/noise attenuation techniques will conform to

the objective for a reasonable period of time after opening of the project.

### 5.2 Location of receptor point

The receptor point, where modelling for noise barriers and measurements are undertaken at a noise sensitive building, is the centre of the window of the most exposed external façade facing the traffic noise. The receptor point will be at the lowest habitable level of the building. This is due to ease of measurement, and because noise is generally louder at the lower level. Also the 63 dB(A) level is aimed at achieving acceptable outdoor levels, which generally occurs at ground level.

### 5.3 Noise modelling

The model that is used to determine traffic noise levels is the Calculation of Road Traffic Noise (CoRTN) 1988. CoRTN's outcome is a noise level expressed as dB(A) L<sub>10</sub> (18hr) and is the preferred model used by VicRoads. The CoRTN model can be imbedded in software packages such as SoundPlan, which have the capacity to perform large numbers of calculations in complicated terrain areas, optimise the noise barrier heights to achieve a noise site objective and present the noise levels in a map of noise contours.

### 5.4 Noise performance of various pavement surfacings

The typical values of relative surface noise level for new surfacings are tabulated below (Source: Guide to the selection of road surfacings, Austroads, 2000). It should be noted that these are average noise level reductions and that noise level reductions from low noise pavements will reduce over time as the pavement deteriorates.

Surface type	Relative noise level, dB(A)
Spray seals, 10 mm or larger	+4
Spray seals, 7 mm	+2
Dense graded asphalt (DGA)	0
Open graded asphalt (OGA)	-3
Stone mastic asphalt (SMA)	-1
Slurry surfacing	+0
Tyned concrete only	+1 to +4
Broomed Concrete	+1 to +4
Hessian dragged concrete (with or without tyning)	+2 to +4
Exposed aggregate concrete	-1 to +1

Notes:

1. These relative noise levels are given relative to typical dense graded asphalt. They may also depend on environmental circumstances and tyre type.
2. Because of the nature of noise measurements and the variable levels of noise produced by the spectrum of vehicle types, it is not possible to quote absolute values.
3. For speeds below 80 km/h tyre/road noise is less of a problem than at high speeds.
4. It is important to ensure that there is adequate texture depth to minimise the risk of aquaplaning.

## 6. Exceptions to the policy

There are a limited number of situations where expenditure of public monies on noise attenuation is not considered to be justified. These situations are detailed in Section 3 of the Traffic Noise Reduction Policy.

Examples are provided to illustrate scenarios where properties may be exempt from consideration of noise attenuation under VicRoads Policy.

**Exception 1 - Category A or Category B** buildings where such land use is defined as a non-conforming use in the relevant planning scheme.

An example of this exception is a property being used for residential purposes within an industrial zone under the local planning scheme. Planning scheme information, including maps of land use zoning, are available on the Department of Sustainability and Environment website .

**Exception 2** - new buildings or subdivisions abutting any existing road under the control of VicRoads.

An example of this exception is a residential sub-division being constructed adjacent to the Monash Freeway. As the sub-division is being carried out next to an existing road it would not be eligible for consideration for noise attenuation under the Policy.

Whilst VicRoads has no obligation to residents in new buildings or subdivisions abutting an existing freeway or road, there are numerous situations where new residents will seek to have VicRoads ameliorate noise impacts. To alleviate this situation, when a development proposal adjacent to a highly trafficked road is referred to VicRoads as a referral authority, it must be recommended to Councils that conditions limiting the potential traffic noise impacts on the development be included as conditions on the planning permit. A set of standard conditions that can be included in the planning permit can be obtained from Environmental Services.

In limited circumstances VicRoads may allow a developer use of the road reserve for locating noise attenuation infrastructure. For further information refer to VicRoads Policy on Third Party Use of Road Reserves for Noise Attenuation Infrastructure (under development at the time of writing).

**Exception 3** - new buildings or subdivisions abutting any road zone shown on any planning scheme for a new road or a road widening.

A variation on Exception 2, an example of this exception is a nursing home constructed in 1990 abutting a road reserve set aside for the Scoresby Freeway in the 1970's. This property would be exempt from consideration for noise attenuation under the Policy as the property owners could have been reasonably expected to be aware of the potential for future traffic noise impacts at the time of making the decision to build the nursing home.

**Exception 4** - buildings or subdivisions abutting any proposed road zone where the planning approval for the subdivision, was obtained after the commencement of the

exhibition period to set aside land for a future road in the relevant planning scheme.

An example of this exception is a residential subdivision where planning approval for the subdivision was approved in June 2004 and the exhibition period to set aside land for a future road in the relevant planning scheme commenced in March 2004.

**In any case where a decision is made that a property is exempt from consideration of noise attenuation under the Policy the rationale for making this decision must be clearly documented and recorded (refer Section 4).**

## 7. Useful information and references

The following relevant references are available from Environmental Services:

- Traffic Noise Modelling Shell Brief
- Traffic Noise Monitoring Shell Brief
- A Guide to the Reduction of Road Traffic Noise
- Bridge Technical Note: Design Criteria for Noise Barriers
- Noise Guidelines – Construction and Maintenance Works
- Traffic Noise Attenuation Barriers Policy
- Traffic Noise Measurement Requirements for Acoustic Consultants
- Traffic Noise Reduction Policy

Additional resources include:

- VicRoads Traffic Noise Lotus Notes Database (contact Environmental Services for a database link)

## References

Supersedes RDN 06-01b (Dec 2007) 06-01a and 06-04

## Approved by



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*Road Design Notes are subject to periodic review and may be superseded.*

## Appendix A

### VICROADS TRAFFIC NOISE REDUCTION POLICY (2005)

#### 1 Statement of Policy:

Road traffic noise is a significant environmental problem, particularly in residential areas. VicRoads is committed to taking whatever steps it can to reduce the overall level of traffic noise, and to limit the effect of traffic noise on nearby residents when new or improved roads are opened to traffic. It will achieve this by:

- seeking to reduce noise emitted by vehicles and road surfaces;
- encouraging compatible land use next to major roads;
- limiting traffic noise from new arterial roads and roads upgraded to carry significantly more traffic;
- retrofitting noise barriers on older freeways.

#### 2. Detailed Requirements and Performance Standards:

##### 2.1 Reducing noise emissions at source:

VicRoads will seek to reduce noise emitted by vehicles and road surfaces by:

- supporting more stringent noise standards in Australian Design Rules for motor vehicles;
- using quieter pavement surfaces, where practicable on freeways and major arterial roads through residential areas;
- promoting and supporting measures that reduce engine brake noise.

##### 2.2 Encouraging compatible land use:

VicRoads will encourage compatible land use next to major roads by:

- working with Planning Authorities to ensure that wherever possible, permitted land use beside busy roads is relatively insensitive to noise;
- encouraging the development of building regulations which will take into account both the noise level outside and the type of activity proposed inside the building.

##### 2.3 Limiting noise next to new or improved roads:

Where arterial roads and freeways are built on new alignments, or where existing arterial roads or freeways are widened by two or more lanes and buildings previously protected from traffic noise are exposed by removal of buildings required for widening, the traffic noise level will be limited to the objectives set out below or the level that would have prevailed if the road upgrades had not occurred, whichever is the greater.

- Category A: - For residential dwellings, aged persons homes, hospitals, motels, caravan parks and other buildings of a residential nature, the noise level objective will be 63 dB(A)  $L_{10}$  (18hr) measured between 6 am and midnight,

- Category B: - For schools, kindergartens, libraries and other noise-sensitive community buildings the noise level objective will be 63 dB(A)  $L_{10}$  (12hr) measured between 6 am and 6 pm,

- Where the noise level adjacent to Category A or B buildings prior to road upgrades is less than 50 dB(A)  $L_{10}$  (18hr), consideration will be given to limiting the noise level increase to 12 dB(A).

##### 2.3.1 Achieving Policy objectives

VicRoads will endeavour to comply with these noise level objectives using the most cost effective technology. The approach taken to controlling noise will include but not be limited to:

- the "whole of life" attenuation performance and the practicability of the measures,
- a combination of noise barriers and other measures such as open graded asphalt, barriers on bridge parapets and crash barriers, etc.,
- off-reservation attenuation measures to be undertaken, subject to practicability testing, and agreement with key stakeholders.

In addition, VicRoads will:

- consult with Councils and affected local communities on the need for and type of protection (if necessary) for small areas of passive open space;
- implement appropriate traffic management measures, if necessary, to ensure that night time noise levels are not excessively high.

##### 2.4 Noise abatement program - Retrofitting

The principle of this part of the Policy is that all eligible projects under the policy are to be included within the noise retrofitting program and acceptable treatment methods are to ensure that the most cost effective approach over the life cycle of the project is considered.

The following key elements to the Noise Abatement Program – Retrofitting apply:

- VicRoads will continue to retrofit barriers to freeways and arterial roads that have previously been eligible for noise attenuation works,
- The retrofitting program will apply through out Victoria,
- The trigger for considering retrofitting will be when the traffic noise levels exceed 68 dB(A)  $L_{10}$  (18hr),
- A target noise level of less than 68 dB(A)  $L_{10}$  (18hr) should be maintained after the attenuation works,
- When determining what measures can be employed to achieve the retrofitting target noise objective, consideration should be given to the "whole of life" attenuation performance and the practicability of the measures,
- The noise reduction may be achieved by a combination of noise barriers and other measures such as open graded asphalt, barriers on bridge parapets and crash barriers, etc.,

- Off-reservation attenuation measures may be undertaken, subject to practicability testing, and agreement with key stakeholders,
- Noise retrofitting works will be undertaken as funds permit, and will only apply to Category A and B buildings.

### 3 Exceptions to this Policy

There are a limited number of situations where expenditure of public monies on noise attenuation is not considered to be justified. Accordingly, VicRoads will not take action to protect existing or future development in the following circumstances:

- Category A or Category B buildings, as defined above, where such land use is defined as a non-conforming use in the relevant planning scheme.
- new buildings or subdivisions abutting any existing road under the control of VicRoads.
- new buildings or subdivisions abutting any road zone shown on any planning scheme for a new road or a road widening.
- buildings or subdivisions abutting any proposed road zone where the planning approval for the subdivision, was obtained after the commencement of the exhibition period to set aside land for a future road in the relevant planning scheme.

### 4 Definitions of terms used to describe traffic noise

Due to its nature traffic noise varies from instant to instant. Statistical terms have evolved to describe its level using a single number value.

**dB:** This is the abbreviation used for decibel which is the measure of sound pressure level.

**dB(A):** The (A) denotes that the sound pressure level has been "A" weighted so that the scale approximates the response of the human ear. The ear is less sensitive to high and low frequency sounds than it is to sounds in the midrange. Most community noise is measured in "A" weighted decibels.

**L<sub>10</sub>dB(A):** This is the noise level in dB(A) exceeded for 10% of a specified time period. For a one hour period the level would be exceeded for 6 minutes but would be less for the remaining 54 minutes.

**L<sub>10</sub> (18hr)dB(A):** This is the standard traffic noise descriptor used in Australia. It is the arithmetic average of the hourly L<sub>10</sub> levels between 6 am and 12 midnight.

### 5 Key Responsibilities:

#### Director – Environmental Sustainability:

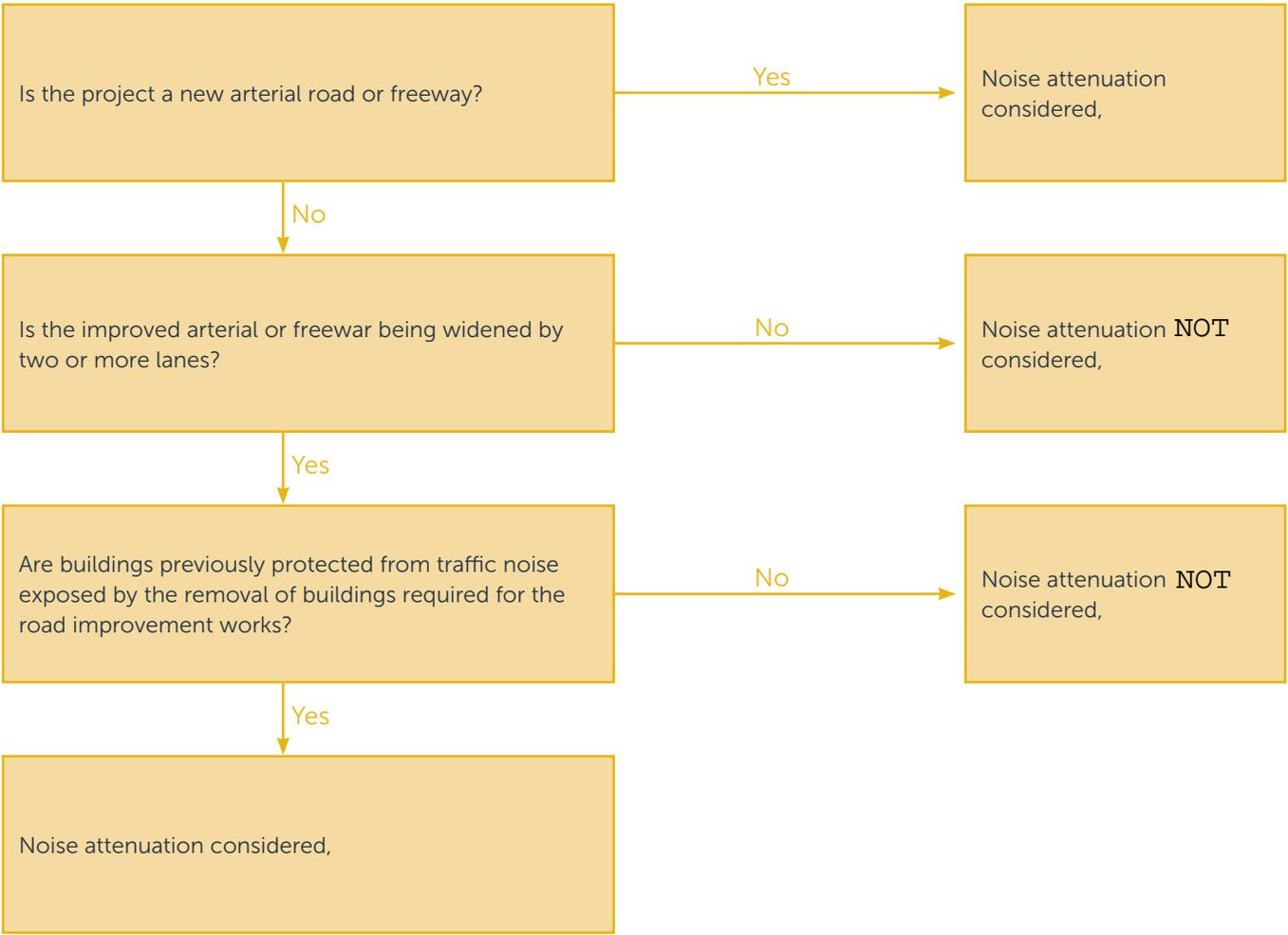
- Preparation of information to advise the public of VicRoads practices with respect to traffic noise.
- Ensure that VicRoads standard specifications and design practices are consistent with these guidelines.

#### Regional Directors and Project Directors:

- Implementation of this policy

### Appendix B

#### Flowchart for determining applicability of the policy



**Note:** In all cases where consideration of noise attenuation is triggered under the Policy due consideration shall be given to the practicability of noise attenuation options as outlined in Section 2.8.3

## Appendix C

### VicRoads traffic noise measurement requirements

#### 1. Introduction

To ensure that all measurements are of high quality and are consistent over time, the following requirements have been developed and shall be observed by acoustic consultants whether engaged directly by VicRoads, or some other party engaged by VicRoads.

#### 2. Instrumentation

Sound level meters, tape recorders and data loggers shall comply with paragraphs 5.1.2 to 5.1.5 of AS 2702-1984: Acoustics-Methods for the Measurement of Road Traffic Noise.

Field checks of instruments shall be carried out with a piston phone, portable calibrator or other portable checking device prior to and on completion of the measurements. Full system calibration shall be carried out at intervals of not more than two years.

#### 3. Certification

A person holding a degree or diploma in electrical or mechanical engineering, a degree or diploma in science with a major in physics or such other qualifications and experience as approved by the Superintendent, shall be responsible for:

- overseeing the calibration of the instruments;
- supervising the instrument operator; and
- certifying that the results presented are a true record and all relevant
- paragraphs of these guidelines have been complied with.

Instrument operators shall be adequately trained and then supervised by the person responsible for certification.

#### 4. Microphone position

The microphone shall be substantially unobstructed (approx 135o) and shall be located one metre from the centre of the most exposed window of a habitable room on the lowest habitable level of the building under consideration. Where the prescribed position is inaccessible for some reason, a site which is considered to be equivalent shall be used, but subject to approval by the Superintendent. A note of this shall be included in the final report.

Where free-field measurements are to be taken, the microphone shall be located approximately 1.2 metres above ground level. The desirable area free of vertical reflecting surfaces shall be a circle of 5.0 metres radius centred on the microphone.

#### 5. Measuring locations

All locations where noise is to be measured are subject to the approval of the Superintendent. At the construction and post-construction phases of a project, these locations will generally be where noise levels have previously been measured or calculated. Direct comparisons can then be made of the acoustic environment in the before and after situation. However, the Superintendent at his discretion may approve alternate or additional locations.

It is essential that a clear photographic record of each microphone position, with respect to the exposed facade, will be presented in the report. A map of the measurement location with respect to the noise source, (e.g. a Melways Map) will be included in the report.

#### 6. Measuring periods

Where there are between one and five stations at which the noise levels are to be measured, then at one of the stations, the measuring period shall extend over forty eight hours. Where there are more than five stations at which noise is to be measured, then for two of them, the measurement period shall extend over forty eight hours.

#### 7. Weather conditions

The ideal weather conditions for measuring traffic noise is fine with little or no wind. However, these conditions are not always available and so the instrument operator shall ensure that environmental conditions that may significantly affect the noise levels are controlled within appropriate limits.

The Consultant must report the weather conditions throughout the measurement period. As a minimum, the morning and afternoon wind speed and direction as well as rain events must be reported. The location of the weather station must also be reported.

**Wind:** The effect of wind noise on the microphone shall be at least 10dB(A) below the received noise levels. To ensure the above condition applies, appropriate windshields shall be fitted to the microphone for the duration of the measurement period.

The component of the wind speed from the road to the measuring station and vice versa shall not exceed 3.0 metres/sec for any significant period/s during the conduct of the measurements.

The wind speed at the microphone in any direction should not exceed 10 m/s.

**Rain:** Occasional light showers during the measuring periods are acceptable. However, when there are periods of heavy rain or continuous light rain measuring shall be abandoned.

**Note:** It may be requested that wind speed and direction be checked with a hand held anemometer at the beginning and end of each measurement period. However the Consultant should be aware of the weather patterns in the intervening periods and be prepared to report those conditions if requested to do so.

## 8. Traffic conditions

The level of traffic noise is dependent to a large extent on the volume, speed and mix of vehicle types. To ensure that average traffic conditions are encountered, measurements shall only be carried out between Mondays and Fridays unless otherwise directed. Measurements shall not be carried out during the period 23 December to 31st January or on public holidays due to the changed traffic conditions during these periods.

## 9. Information to be recorded

- The hourly  $L_{10}$  dB(A) levels for a continuous 24 hour period.
- The hourly  $L_{eq}$  dB(A) levels for a continuous 24 hour period.
- The hourly  $L_{10}$  dB(A) and  $L_{eq}$  dB(A) levels over the continuous 48 hour period (where required).

It may be requested of the Consultant to measure hourly  $L_{max}$  dB(A) and  $L_{90}$  dB(A) for specific projects.

## 10. Information to be presented

- Hourly  $L_{10}$  and  $L_{eq}$  levels in dB(A)  
Hourly  $L_{max}$  dB(A) and  $L_{90}$  dB(A) when requested
- The  $L_{10}$  (18hr), (arithmetic average) 6.00 am to midnight in dB(A), for a single day,
- The  $L_{eq}$  (15hr), (logarithmic average) 7.00 am to 10.00 pm in dB(A), for a single day,
- The  $L_{eq}$  (9hr), 10.00 pm to 7.00 am in dB(A) for a continuous period.

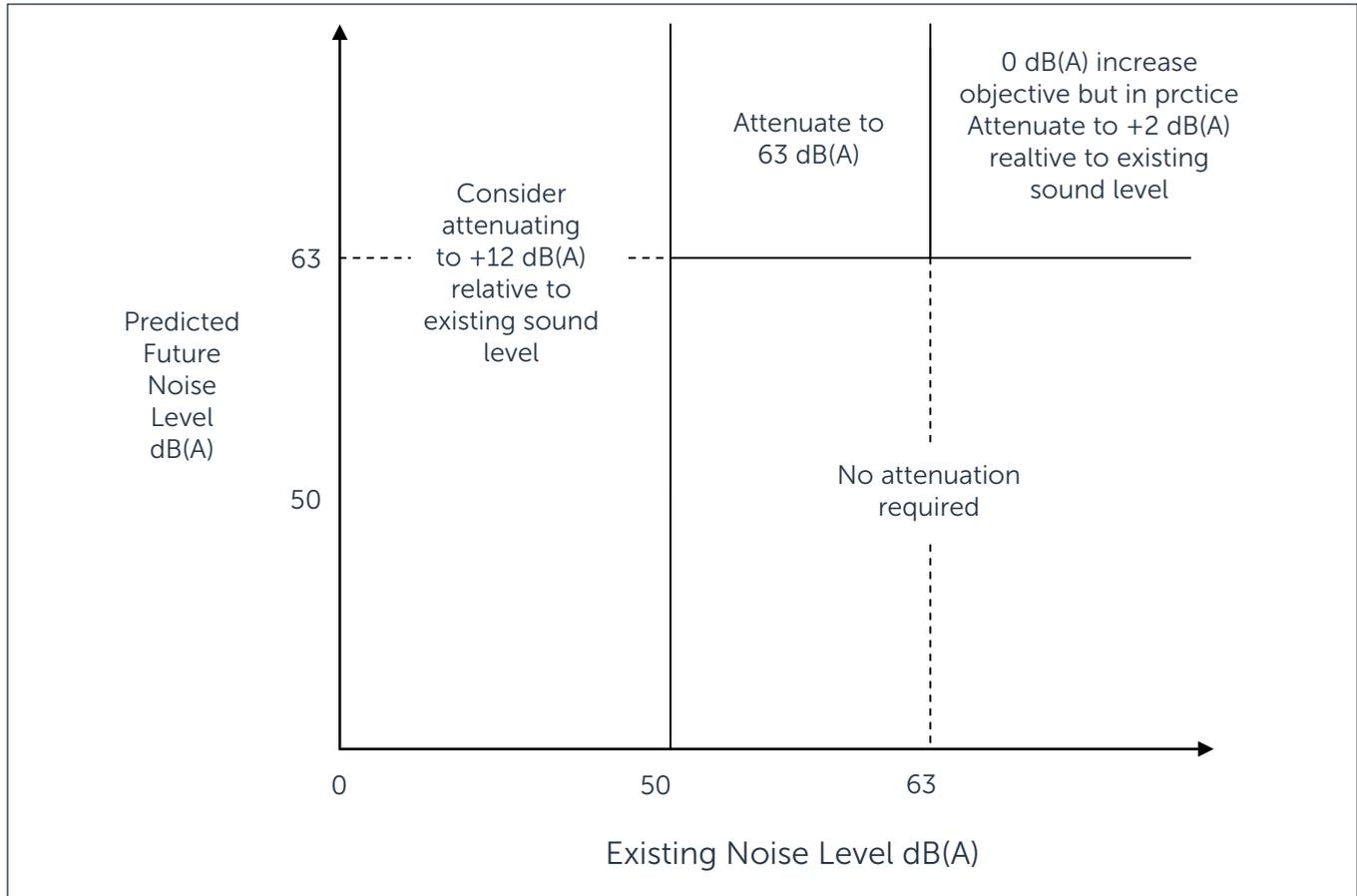
## 11. Adjusted and rejected measurements

Where noise levels change as a result of an extraneous uncontrolled source, then measurements for the period (24 hour or 48 hour) shall be rejected if the extraneous noise lasts for more than 3 hours.

Where the extraneous source lasts for 3 hours or less, then the affected hourly measurements are to be rejected and derived descriptors presented. These shall be referred to, for example as  $L_{10}$  (18hr) adj or  $L_{eq}$  (15hr) adj. Reasons for rejection of any measurements shall be given.

## Appendix D

### Project noise level objective diagram



#### Instructions:

1. Determine existing noise level at sensitive receptors through monitoring;
2. Determine predicted future noise level at sensitive receptors through modelling;
3. Plot a point on the graph using existing and predicted future noise levels;
4. The Project Objective Noise Level will be the value obtained from the chart or the level that would have prevailed if the road upgrades had not occurred, whichever is the greater.

#### Notes:

1. For existing roads noise attenuation retrofitting projects have a Project Objective Noise Level of <68 dB(A) – refer to Section 3.
2. For Category A receptors the noise level descriptor is  $\text{dB(A)}_{L_{10}(18\text{hr})}$  measured between 6am and midnight, for Category B receptors the noise level descriptor is  $\text{dB(A)}_{L_{10}(12\text{hr})}$  measured between 6am and 6pm – refer to Section 2.5.

#### Examples:

1. Existing noise level is 57 dB(A), predicted future noise level is 66 dB(A), level that would have prevailed is 59 dB(A). Outcome is Attenuate to 63 dB(A).
2. Existing noise level is 57 dB(A), predicted future noise level is 66 dB(A), level that would have prevailed is 65 dB(A). Outcome is Attenuate to 65 dB(A).

## Appendix E

### Template for recording rationale for selection of noise attenuation treatments

#### Project background

<Include a description of the project background including existing noise levels.>

#### VicRoads Noise Policy

<Include relevant extracts from the VicRoads Traffic Noise Reduction Policy>

#### Practicability test

The Practicability Test requires an assessment against the Feasibility and Reasonableness of noise attenuation treatment methods. Feasibility relates to engineering constraints whereas reasonableness considers wider project issues. The Practicability Test is provided below, outlining the benefits and constraints of the noise attenuation works taken into consideration.

**## Note:** Noise attenuation works taken into consideration should generally include noise barriers, low noise surfacing treatments, and off reservation acoustic treatments to sensitive receptors.

Where applicable the impact on each of the feasibility and reasonableness issues should be rated using the following scheme:

- Rating 1 : Very poor
- Rating 2 : Poor
- Rating 3 : No impact
- Rating 4 : Good
- Rating 5 : Very good

Feasibility		
Feasibility Issue	Consider	Rating
Cost of abatement	<insert costs associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Access	<insert text demonstrating consideration of access issues associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Safety	<insert text demonstrating consideration of safety issues associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Topography	<insert text demonstrating consideration of topography considerations associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Structural	<insert text demonstrating consideration of structural issues associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>

Heritage listing	<insert text demonstrating consideration of heritage (indigenous and non indigenous) issues associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Maintenance	<insert text demonstrating consideration of maintenance issues associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>

Reasonableness		
Reasonableness Issue	Consider	Rating
Noise abatement benefits	<insert benefits associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Project approval	<insert date the project was announced to the public and any implications this has on the provision of noise attenuation>	<add a rating between 1 – 5>
Change in noise levels	<insert predicted change in noise levels associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>
Opinions of the impacted residents	<insert outcomes of consultation with impacted residents>	<add a rating between 1 – 5>
Urban design objectives	<insert urban design objectives of the corridor and details of how each noise attenuation option addresses them>	<add a rating between 1 – 5>
Environmental impacts of noise abatement during construction.	<insert environmental impacts associated with each of the noise attenuation options under consideration>	<add a rating between 1 – 5>

#### Assessment outcome

<Insert the outcome of the practicability test, including a description of the noise attenuation measures adopted and how the practicability assessment above relates to selection of the adopted measures>

.....  
Signature of Project Engineer

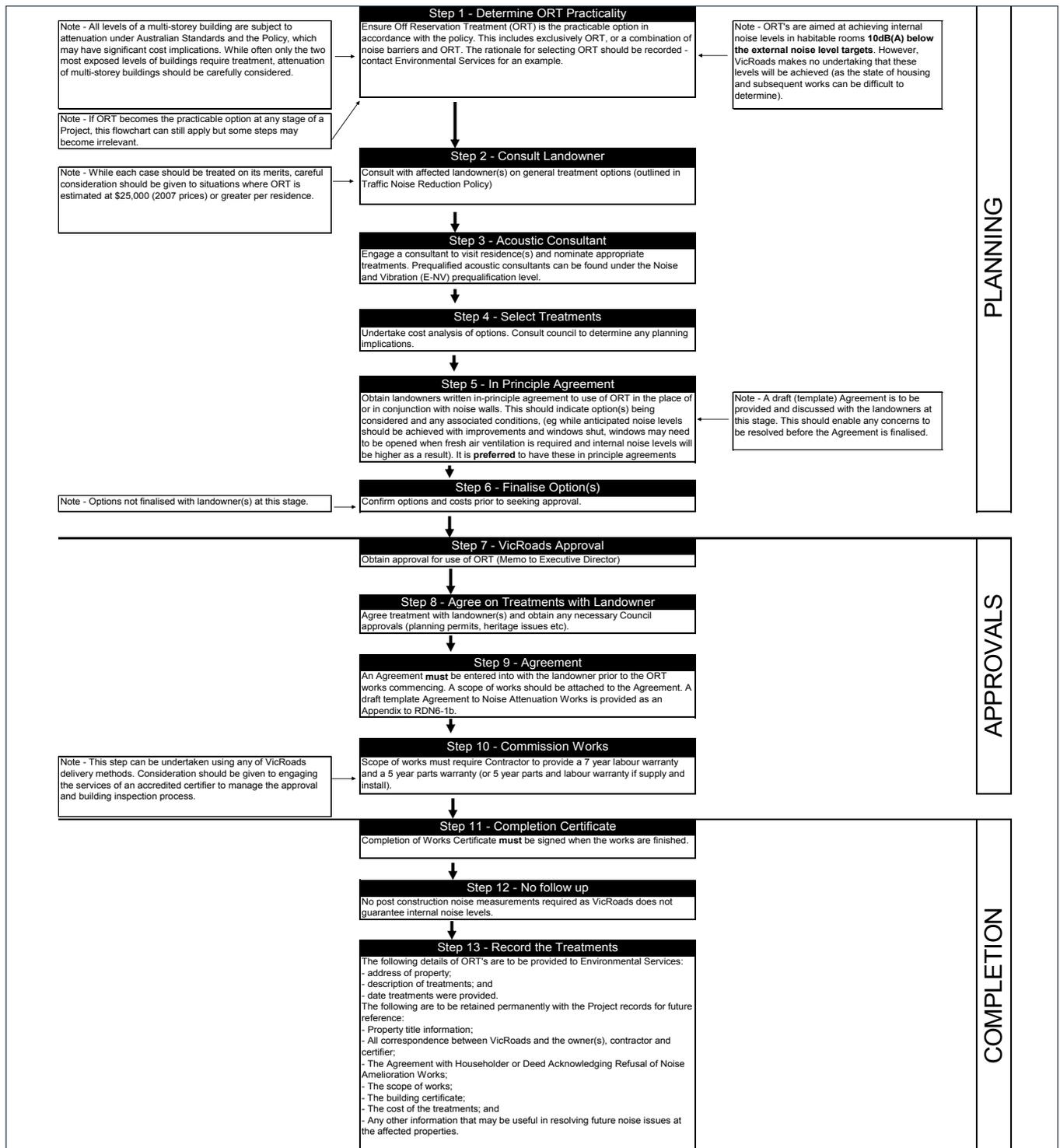
.....  
Date

.....  
Signature of Project Manager

.....  
Date

## Appendix F

### Flowchart for off reservation noise attenuation treatments



For further information please phone **13 11 71**  
or visit [vicroads.vic.gov.au](http://vicroads.vic.gov.au)

