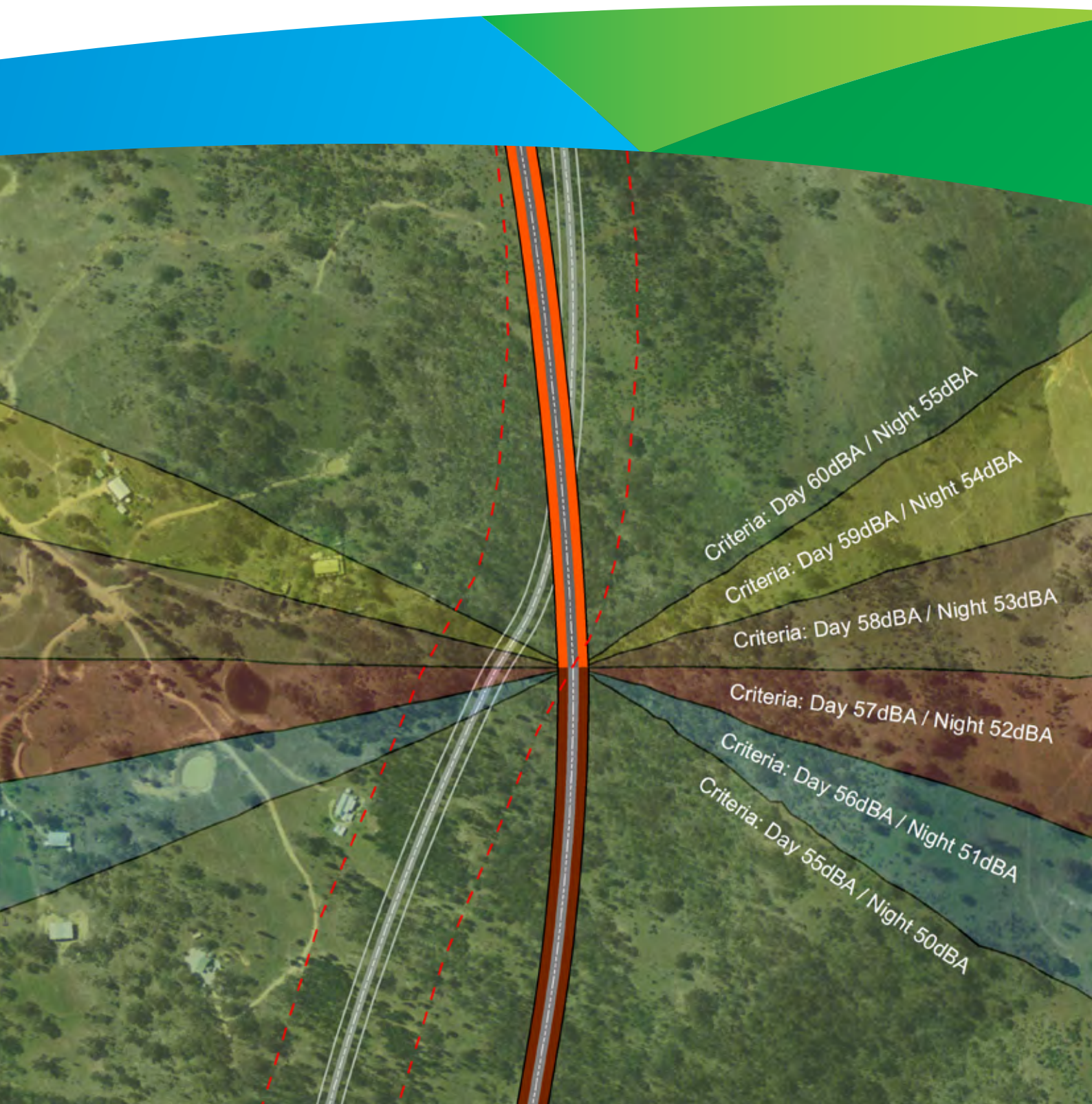


Noise Criteria Guideline



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Section 1

Overview

1.1 Why is this guideline required?

This guideline has been developed to provide a consistent approach to identifying road noise criteria for Roads and Maritime Services projects. This guideline establishes criteria for the following project types:

- New
- Redeveloped
- Minor works.

Criteria for road projects comprising of new and redeveloped road segments are assigned with reference to the NSW Road Noise Policy (RNP, 2011). This Noise Criteria Guideline provides a practical approach in applying the RNP and addresses specific situations relevant to Roads and Maritime Services' road projects. These approaches meet the intention of the RNP.

Read this guideline in conjunction with the:

- NSW Road Noise Policy, 2011
- Project Pack
- Network and Corridor Planning Practice Notes (RTA, 2008).

1.2 Policy Statement

Roads and Maritime is committed to effectively managing impacts from its activities in an environmentally responsible manner. For roads and traffic systems under its control Roads and Maritime is committed to delivering projects in a manner that minimises, to the extent feasible and reasonable, environmental noise impacts. Determining the appropriate type of road project and its associated noise assessment criteria is essential to delivering such an outcome.

1.3 Context

This guideline supersedes Practice Note I of Roads and Maritime's Environmental Noise Management Manual (2001). It differs from the previous method in that road criteria are now based on the road project near a receiver rather than the existing noise exposure.

For new roads the total noise level from all roads is assessed against the new road criteria. This differs from the 2011 edition of the Road Noise Policy where consideration is only given to the noise levels contributed by the new road. This ensures that noise mitigation provides a benefit by reducing noise levels at a receiver rather than just noise levels coming from the new road. It also ensures that the noise from the new road can not unreasonably increase noise levels at a receiver without the receiver qualifying for noise mitigation.

1.4 Scope

This guideline is most relevant for project development managers, environmental staff, project implementation managers, acoustical consultants and regulatory agencies involved in planning, approving and delivering road projects.

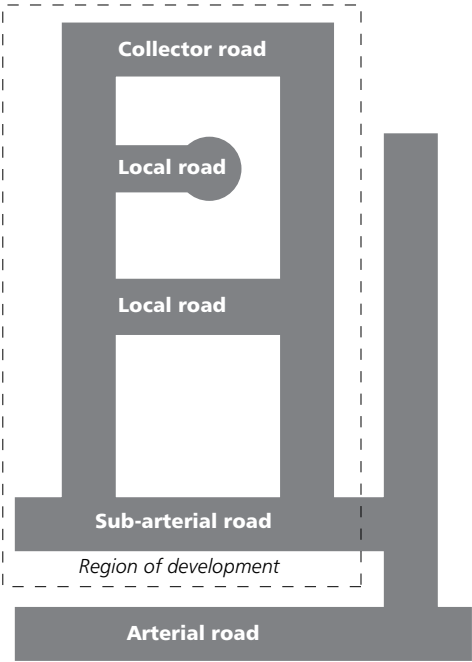
This guideline will generally apply:

- In the final stages of project concept design
- In the *environmental impact assessment phase*
- During the project's detailed design
- To all public roads and classified roads.

Section 2

Definitions

Word	Definition
Adjacent to	To determine the type of road that a residence is 'adjacent to' draw a straight line between the residence and closest point on the project road alignment.
Administrative class	Administrative class defines the responsibility for operating and maintaining a road (e.g. between Roads and Maritime or a local council). The administrative class is not used to determine noise criteria.
Existing road corridor	A corridor of land that is zoned for road purposes in relevant environmental planning instruments such as LEPs and contains an existing formed and dedicated public or classified road within the road reserve. Note that lots subsequently purchased and owned by Roads and Maritime that are adjacent to the existing road reserve do not form part of the existing corridor.
New road	See Section 5.2 of this guideline.
Receiver	A noise sensitive receiver includes the following: residences, schools, child care centres, places of worship, health care institutions.
Redeveloped road	See Section 5.3 of this guideline.
Road reserve	Property cadastral for the road.
Road segment	A continuous extent of road that is all either new or redeveloped and is the same functional class. A road project may have multiple alternating new and redeveloped segments along the road corridor. Some segments that meet the project may also be existing roads.
Substantially realigned	A road will be substantially realigned when the new carriageway in the road project is more than approximately six times the total existing lane width from the edge of the existing road corridor (See Appendix A). For example with an existing two lane road this would be 42 metres from the existing road corridor. And for a four lane road this would be 84 metres from the existing road corridor. Consideration can be given to whether a road has been substantially realigned for distances less than six times the existing lane width using local context for guidance.
Total existing lane width	3.5 metres per formed traffic lane excluding cycle and pedestrian lanes.
Transition zone	The 'transition zone' is the area either side of the physical transition point between road functional classes (e.g. arterial versus local) or road development types (e.g. new versus redeveloped road project). See Section 5.4 of this guideline.
Undeveloped road corridor	A corridor of land that is zoned for road purposes in relevant environmental planning instruments or draft environmental planning instruments such as LEPs and does not have an existing dedicated public or classified road.

Word	Definition
Functional class	<p>Austroroads and Roads and Maritime categorise roads based on how they function in the road network. The EPA uses the term 'road category' in the Road Noise Policy (RNP) which is analogous to 'functional class' in the context of the RNP.</p> <p>Functional class is based on usage and provides a basis for policy related to noise impacts. For the purpose of evaluating noise impacts only the functional class is relevant. See <i>Network and corridor planning practice notes</i> (RTA 2008), and below definitions of functional classes.</p> 
Arterial	Supports major regional and inter-regional traffic movement and carry traffic directly from one region to another. For noise assessment this term also includes freeways and motorways.
Classified road	Classified under the Roads Act 1993 and includes private toll roads.
Collector road	<p>Connects the sub-arterial roads to the local road system in developed areas.</p> <p>May support sub-arterial roads during peak periods.</p> <p>May have been designed as local streets but can serve major traffic-generating developments or support non-local traffic.</p> <p>Note not all networks are large enough to have both collector and sub-arterial roads.</p> <p>The Road Noise Policy does not provide separate noise criteria for collector roads. Roads and Maritime applies sub-arterial noise criteria to collector roads and still considers collector roads and sub-arterial roads to be different functional classes.</p>
Local road	<p>Provide vehicular access to abutting property and surrounding streets.</p> <p>They are the subdivisional roads within a particular developed area.</p>
Sub-arterial road	<p>Connects arterials to regions of development and carry traffic from one part of a region to another.</p> <p>Provide connection between arterial roads and local roads. May support arterial roads during peak periods.</p> <p>A road that collects local traffic leaving a locality and connects to another local road, sub-arterial or arterial.</p> <p>Note not all networks are large enough to have both sub-arterial and collector roads.</p>

Section 3

Policy

This guideline describes the principles to be applied when assigning new and redeveloped road types and transition zones. It also describes procedures to assist in assigning them.

The Road Noise Policy (RNP) sets more stringent criteria for new roads compared to redeveloped roads at-residences. The basis given for this in the RNP is that there are generally more opportunities to minimise noise impacts from new roads and road corridors, especially those in greenfield locations, through judicious road design and land use planning. The scope to reduce noise impacts from existing roads and corridors is generally more limited.

The intention of the approach in this guideline is that new or redeveloped noise criteria may be established by assessing the location of the residence relative to the road.

The intention in all situations is to meet the following principles. The use of the procedures in this guideline does not guarantee that the principles will always be met and in cases where there is doubt then it is the principles rather than the procedures that are paramount. Where the principles are not met the procedures may be varied through consultation with Roads and Maritime noise specialists.

The principles are:

1. Criteria are based on the road development type a residence is affected by due to the road project
2. Adjacent and nearby residences should not have significantly different criteria for the same road
3. Criteria for the surrounding road network are assessed where a road project generates an increase in traffic noise greater than 2dBA on the surrounding road network
4. Protect existing quiet areas from excessive changes in amenity due to traffic noise.

Section 4

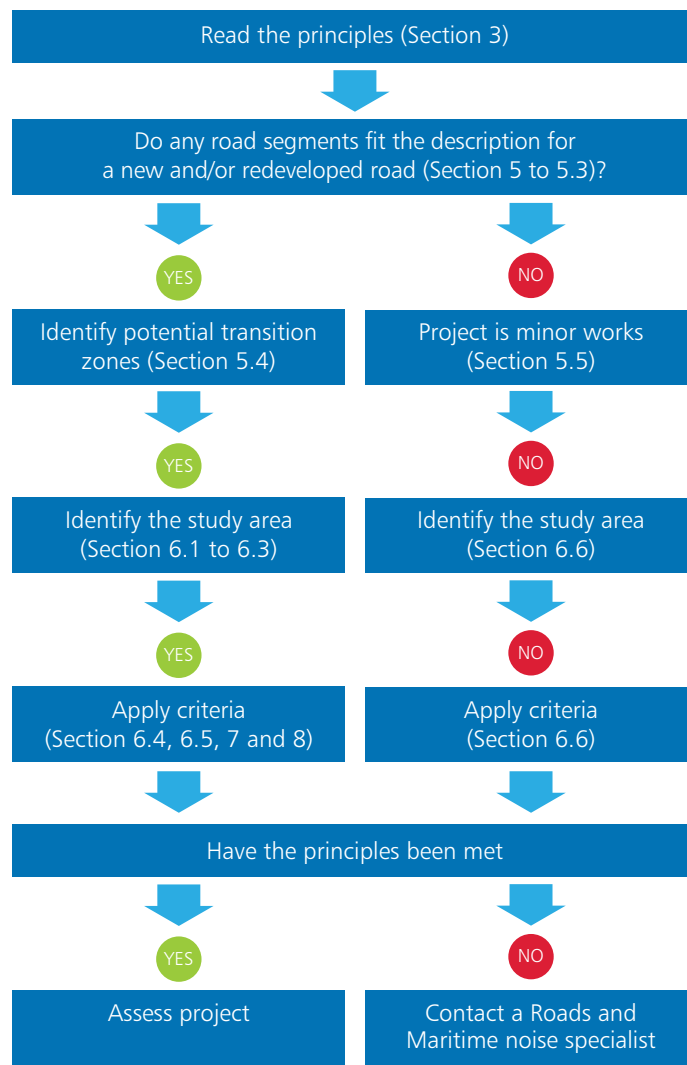
How do I use this guideline?

When considering noise on a road project the first question that should be asked is whether the project is new, redeveloped or minor works?

The second question should be how to apply criteria at sensitive receivers?

The diagram below shows an overview of how these questions may be answered in most situations. Please always ensure that the overall principles are met (Section 3).

Q4: How do I use this guideline?



Section 5

Identifying road types

The RNP describes a number of different types of receivers that are sensitive to noise. Most receiver types have the same criteria for all road types. Criteria for residences however require consideration of the road's functional class and also whether the road project is redeveloped or a new road.

Note a 'new road' for the application of this guideline may be a new public, classified road or a new off-road transitway as defined in the RNP.

5.1 Determining the road's functional class

The RNP defines assessment criteria based on the road's function in the road network. Detailed descriptions of function are provided in Roads and Maritime's *Network and Corridor Planning Practice Note* and the definitions section of this document. Functional classes include:

- Freeway / Arterial
- Sub-arterial
- Collector
- Local road.

The RNP provides two sets of criteria for each functional class, one for new roads and the other for redeveloped roads. Within each functional class the new road criteria are 5dBA lower than redeveloped criteria.

Roads and Maritime retains the distinction between collector and sub-arterial roads even though the RNP assigns them both the same criteria. This means that if collector becomes a sub-arterial road the change in functional class is considered when setting criteria.

Some projects will consist of both new and redeveloped roads. There may also be a transition zone between these roads. This procedure provides a process to consistently assign criteria to each dwelling based on the road the residence is most exposed to.

The following process should be used to determine whether the road development is assessed as a new or a redeveloped road and the applicable criteria at each residence. An example road project is shown in Appendix A with road development types assigned.

5.2 New road

A road is new for any of the following cases:

- A project proposes road construction in an undeveloped corridor
- A road project changes the functional class of the road
- A widening, curve straightening or adjustment of the corridor where the upgrade road pavement has been substantially realigned
- A duplication where the new lanes have been substantially realigned from the existing corridor in which case the existing lanes are also assessed as a new road development type
- A bypass where the upgraded road extends beyond the existing road corridor.

Figure 1: Bypass with road construction in an undeveloped corridor

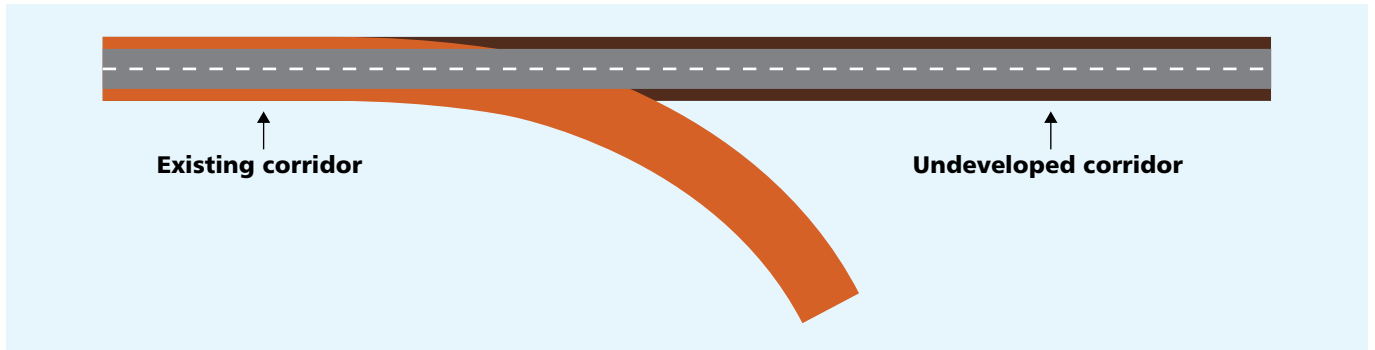
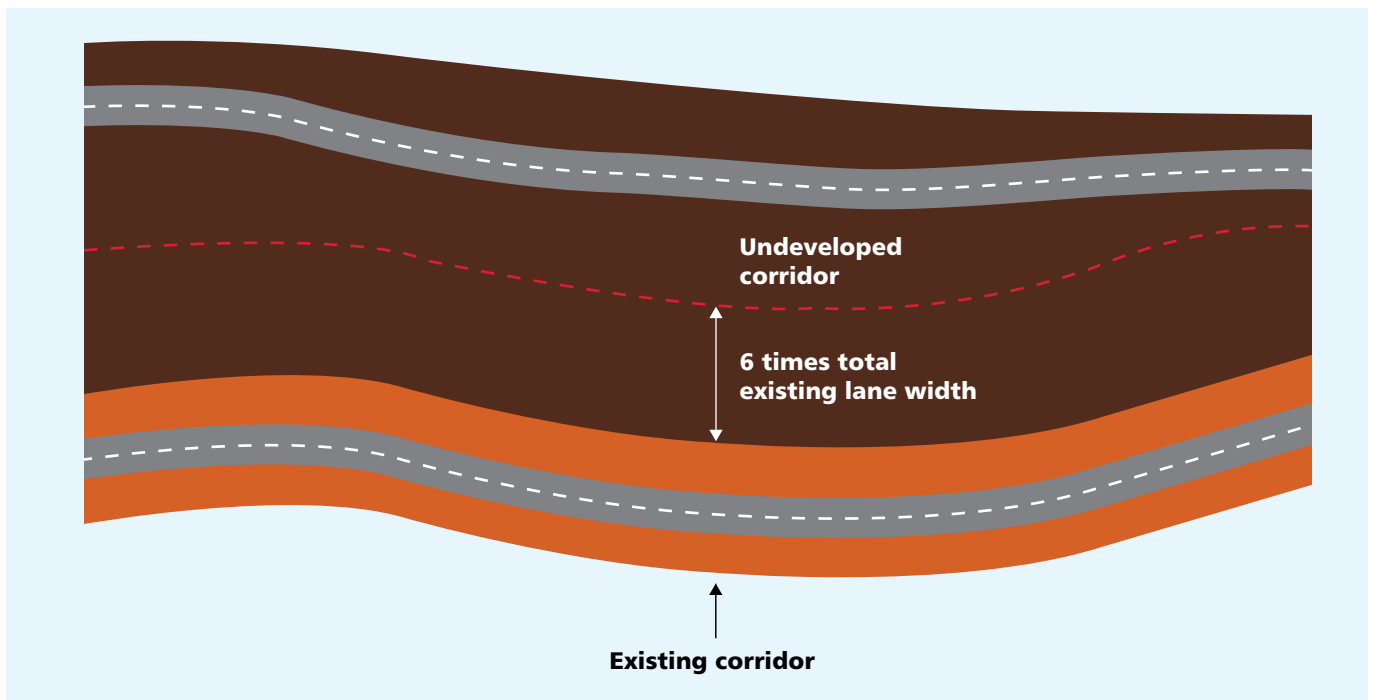


Figure 2: Substantially realigned duplication or upgraded road



5.3 Redeveloped road

A road is redeveloped if the purpose or outcome of the upgrade will result in one or more of the following:

- Increases in the traffic-carrying capacity
- Increases in the number of heavy vehicles by 50 per cent or more on the road where the physical works are located.

For a road to be considered redeveloped rather than new, the pavement should not be substantially realigned.

Typical examples of upgrades designed to increase traffic carrying capacity include:

- Widening/adjustment of the corridor where the road segment (including duplicated carriageway) has not been substantially realigned
- Duplication of a carriageway adjacent and parallel with the existing road corridor where the widened road has not been substantially realigned
- Duplication of a carriageway wholly within an existing corridor
- Introduction of on or off ramps to provide access through an intersection that was previously inaccessible for that direction.

Figure 3: Duplicated carriageway, road widening or curve straightening without substantial realignment of the existing road

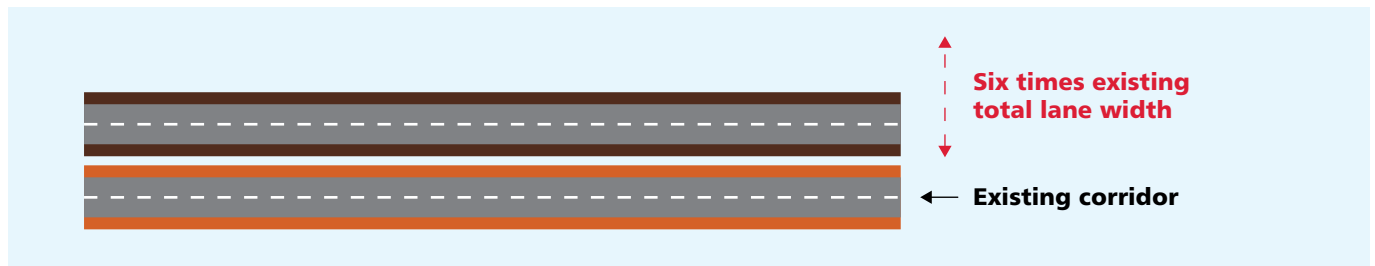
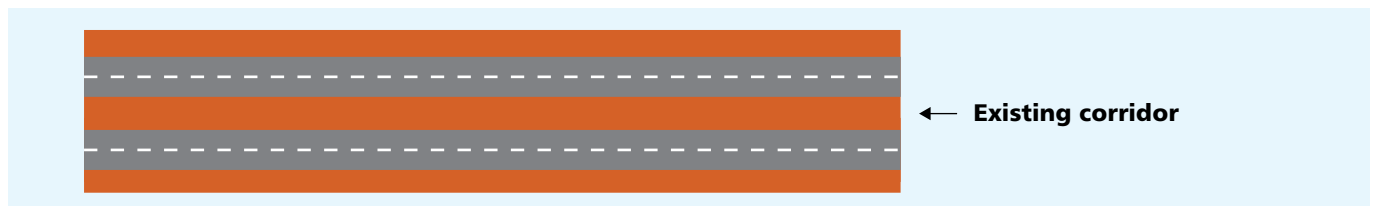


Figure 4: Upgraded road alignment or carriageway duplicated within existing road corridor



5.4 Transition zone

A transition zone is the junction between new and redeveloped roads or different functional classes. The transition zone extends a distance into each road type and provides a smooth change in noise criteria between adjacent residences. Illustrative examples are shown below. The extent and width of transition zones are to be calculated using the approaches in Section 7 of this guideline.

Figure 5: Transition zone between new and redeveloped road segments in a bypass

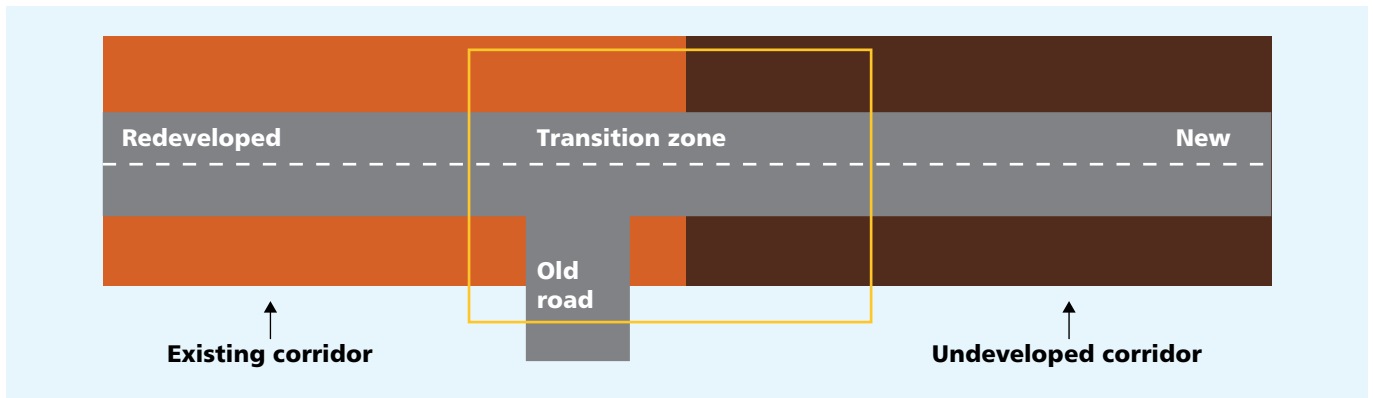
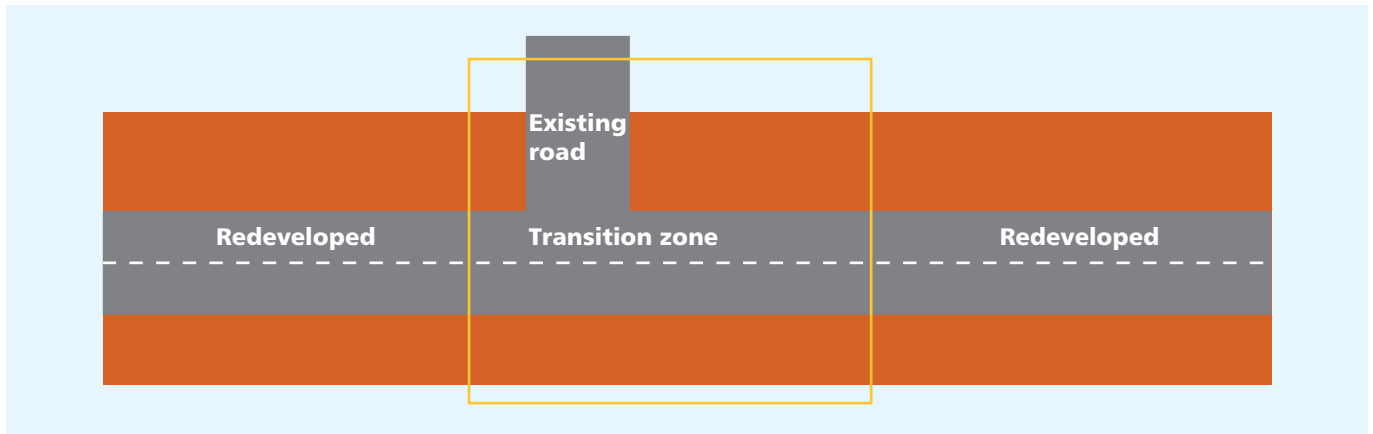


Figure 6: Transition zone between a redeveloped project and an existing road



5.5 Minor works

Some works may be primarily to improve safety. This may include minor straightening of curves, installing traffic control devices, intersection widening and turning bay extensions or making minor road realignments.

These works are not considered redeveloped or new as they are not intended to increase the traffic carrying capacity of the overall road or accommodate a significant increase in heavy vehicle traffic.

Section 6

Study area and criteria

6.1 General

The applicable noise assessment criteria need to be determined for each sensitive receiver within the study area. The RNP defines the study area width as '600 metres from the centre line of the outermost traffic lane on each side of the subject road'. This distance is based on the limit of accuracy of currently approved road traffic noise models.

6.2 Rural areas

Under some circumstances, such as in rural areas, criteria may still be exceeded at 600 metres. Where it can be demonstrated that criteria may be exceeded beyond 600 metres then each residence will be need to be assessed on a case by case basis. This should be done in consultation with Roads and Maritime noise specialists.

6.3 Highly urban areas

In highly urban situations a boundary width either side of the project of 600 metres may include other significant roads with noise levels that dominate at nearby receivers. As a guide the boundary width of the study may be reduced to where the noise levels from the project contribute slightly less than half of the total noise level. This is where the project adds no more than 2.0dBA (less than 2.1dBA) to the total noise level. The boundary should then be expanded to include any receivers where the project contribution exceeds $65\text{dBA } L_{\text{Aeq}, 15 \text{ hr}}$ and $60\text{dBA } L_{\text{Aeq}, 9 \text{ hr}}$ and to meet close-by landmarks to provide a logical boundary.

The extent of the study area is the chainage in which physical works associated with the road project occur and may be extended to close-by landmarks to provide a logical endpoint.

Landmarks defining the project area logical boundary may include items such as blocks of receivers, roads, parks and reserves, power utility corridors and breaks in landscape (For advice and guidance please consult with a Roads and Maritime noise specialist).

When defining the catchment local roads should be excluded from the modelling. Only collector roads, sub-arterial and arterial roads should be modelled.

Note the intention is that any noise mitigation applied to a road project under the Noise Mitigation Guideline in a highly urbanised area using this modified approach will be the same as when using the 1.2km wide study area. In practice the study area using this approach for redeveloped and most new roads will be bigger than the region where noise levels, due to the project, increase by more than 2dBA. In some situations where

there is a new road in a highly urban area with low existing noise levels and it creates more than a 2dBA noise increase, then the study area will be the same as the area eligible for noise mitigation.

6.4 Receiver types

For most types of receivers the RNP assigns criteria based on the receiver type. For residences it depends on the road.

Under most situations the criteria at a residence may be confirmed by identifying the road type for the upgraded road segment that is 'adjacent to' the sensitive residences location. Where a residence is exposed to more than one road type calculations may need to be completed to assess the contribution from each road.

Under most situations the same criteria are applied at each facade of a residence. The exception may be where the project increases noise contribution by more than 2.0dB (2.1dBA) on an existing road that is not part of the road project.

6.5 How to determine if new or redeveloped criteria apply

Redeveloped and new criteria are assigned by identifying which upgraded road in the project the residence is most exposed to (Principle 1). This can be identified by the residences location or through calculation.

In most instances this may be identified by drawing a line between the residence and the closest point of the road project alignment and identifying the type of the road at that point. Where the sensitive residence location is 'adjacent to' a 'new' or 'redeveloped' road segment, the criteria can be derived from the RNP, Tables 3, 4, 5, 6 and 8 (reproduced in Appendix B of this guideline).

Under more complex situations near multiple road types calculations should be conducted as the residence may be in a transition zone.

6.6 Minor works

Roads and Maritime applies existing road criteria (RNP Table 8, see Appendix B of this guideline) where the minor works increase noise levels by more than 2.0dBA relative to the existing noise levels at the worst affected receiver (Principle 1, 2, and 3, page 4).

The noise catchment area should include all receivers where noise levels increase. A 600 metre noise catchment may not be required.

Transition zones are not applicable to minor works.

Section 7

Transition zones

There are two types of transition zones that are most relevant to Roads and Maritime road projects. These are:

1. A junction between a new road and a redeveloped road
2. An intersection between the road project and an existing road.

Examples of these transition zones are shown in Appendix C:

- Example 1 shows a bypass or substantially realigned road upgrade with a new road segment that extends and continues beyond the existing road corridor
- Example 2 shows curve straightening that has resulted in substantial realignment of the road
- Example 3A to 3D show a road project that abuts an existing road and how this is assessed at each facade
- Example 4A and 4B show a wholly new road project that meets an existing major road
- Example 5 shows a situation where there are two types of transition zones at the one location. A redeveloped and new road transition zone is at the crossing point of an existing local road.

7.1 Transition zones between new and redeveloped roads

In a transition zone between a new and redeveloped road a residence is exposed to noise from the two road types. Transition zone criteria reflect the degree to which the residence is exposed to each road type. The aim of the transition zone is to ensure noise criteria change smoothly along the road between the two road types. The same criteria are applied at each facade of a residence.

The transition zone criteria are identified from the contribution difference in noise from each road type at the residences location using Table 1 below. Where the transition zone criteria change across the location of a residence the most stringent of the criteria apply.

Table 1: Assignment of new and redeveloped transition zone criteria

Contribution difference, (dBA) New minus redeveloped segments	Total noise levels, (dBA)	
	Daytime criteria	Night time criteria
Contribution difference $\geq +3.0$	55	50
$+3.0 >$ Contribution difference $\geq +1.5$	56	51
$+1.5 >$ Contribution difference ≥ 0	57	52
$0 >$ Contribution difference ≥ -1.5	58	53
$-1.5 >$ Contribution difference ≥ -3.0	59	54
$-3.0 >$ Contribution difference	60	55

Note where traffic volumes on the new road differ by more than 40% relative to the redeveloped road please consult with Roads and Maritime noise specialists.

Calculation of contribution difference

This should be used where the new and redeveloped segments of the road carry the main traffic flows within the project (Example 1 and 2) (Principles 1 and 2, page 4).

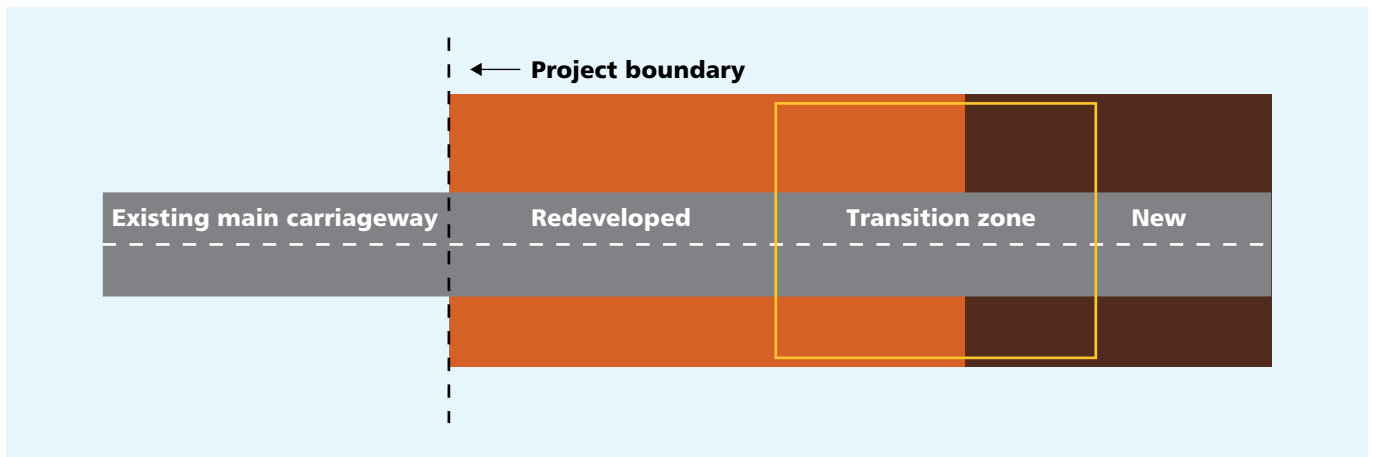
In this transition zone a residence is exposed to noise from a new road and a redeveloped road. The contribution difference is defined as the difference between the new road contribution and the redeveloped road contribution. For example if the level of noise at the receiver coming from the new road is 63dBA and that coming from the redeveloped road is 60dBA then the contribution difference is 3dBA.

New Road Contribution – Redeveloped Road Contribution = Contribution Difference

$$63 - 60 = 3 \text{ dBA}$$

The contribution from the redeveloped road should include any existing segments that remain part of the main carriageway alignment beyond the project boundary (see Figure 7).

Figure 7: Existing main carriageway segment included as redeveloped for calculating contribution difference



Modelling contribution difference

The purpose of transition zones is to provide a smooth change in noise criteria when moving from one road type to a different road type. When modelling contribution difference in the transition zone (as distinct from modelling the actual levels of noise impact) the following applies:

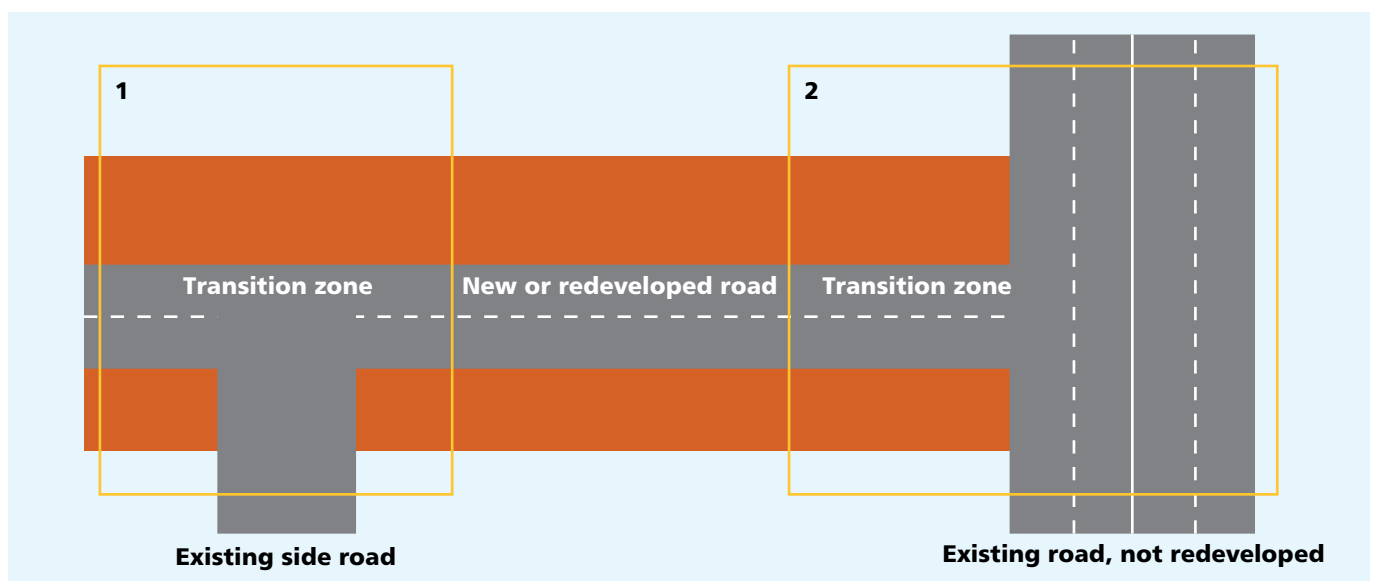
- Noise emission from the road surface must be equivalent to the unmitigated noise in the design year. Propagation modelling should only include road geometry, air and ground absorption and topography
- Noise emission should only be considered from the road project including any existing segments beyond the project boundary that are part of the road alignment being upgraded. Existing segments are counted as redeveloped for the purpose of identifying transition zone criteria. For example a Pacific Highway upgrade would include the existing parts of the highway beyond the northern and southern project boundaries. Exceptions which should be excluded are existing segments being retained for example as service roads or connectors
- Buildings and noise mitigation measures such as barriers and low noise pavement should not be modelled when setting transition zone criteria as their presence in the modelling can prevent the noise criteria being properly calculated
- All pavement types should use the same base level noise emission for new, redeveloped and existing roads. For example all surfaces could be modelled as DGA or concrete.

7.2 Transition zones at junctions between a project road and existing road

This approach should be applied at side road junctions between a project's new or redeveloped road and an existing road. There are two situations where this may occur (See Figure 8):

1. The project crosses or abuts an existing side road
2. The project ends at an existing road and the existing road is not redeveloped.

Figure 8: Locations where a road project should consider side road transition zones



For transition zones with existing roads the road projects noise criteria are applied at all residences and facades. Where certain conditions are met existing road criteria may also be applied at some facades.

Existing road criteria (RNP Table 8 and reproduced in Appendix B of this guideline) are only applied at a facade where both of the following conditions are met:

- The project increases the noise level contribution from the existing road by more than 2dBA (e.g. 2.1dBA or more) following the upgrade and relative to the existing 'no-build' situation
- The contribution from the existing road is greater than the contribution from the road project (Principles 1, 2 and 3, page 4).

Figure 9 shows a residence may have a noise contribution increase more than 2dBA from the existing road at the northern facade but negligible noise contribution increase from the existing road at the other facades. This receiver would have new road criteria applied at all facades and may also have the existing road criteria applied at the northern facade. See Example 3 and 4 in Appendix B for more detail. Table 2 shows an example of the process.

Figure 9: Residence exposed to project noise on opposite sides of the building

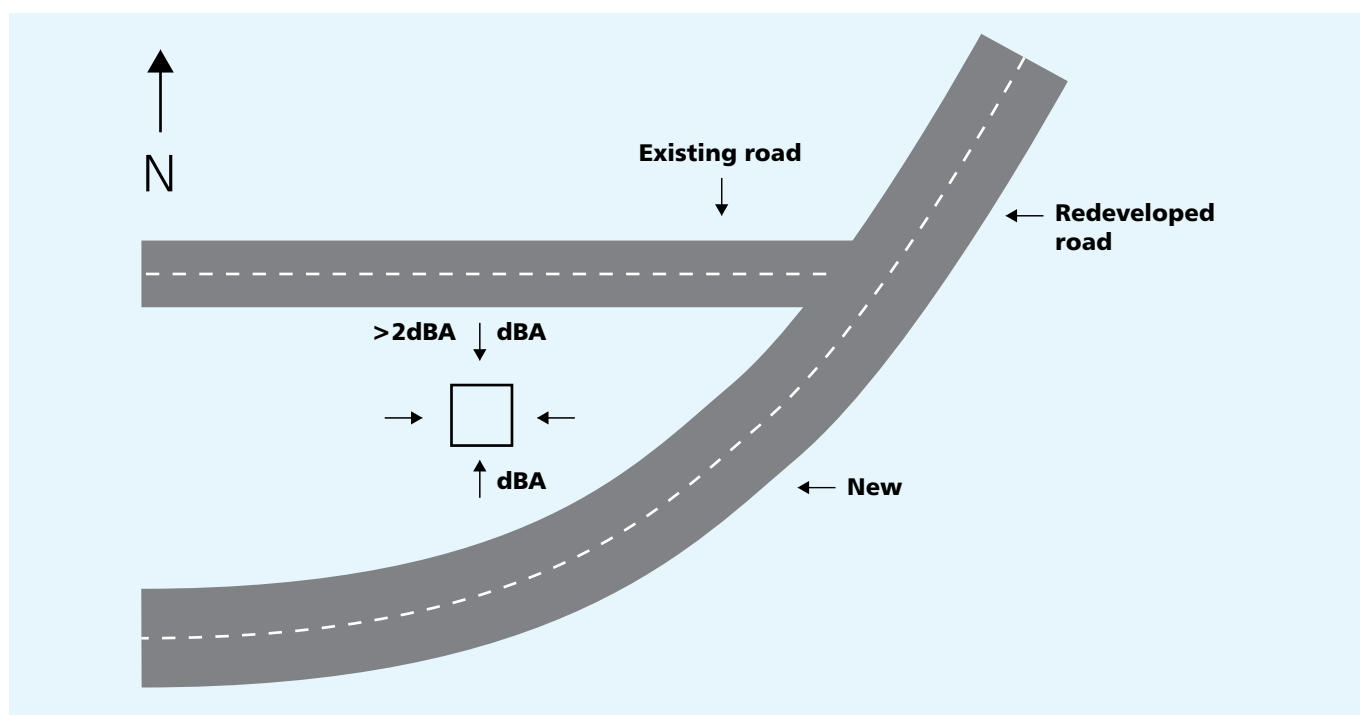


Table 2: Assignment of project and existing road transition zone criteria

Increase test		Existing road criteria	Project road criteria
Does the project cause a <i>greater than 2.0dBA</i> increase in contribution from the existing road relative to the 'no build' situation?	No	–	Applicable
	Yes	Applicable where the existing road contribution is <i>greater than</i> the project road contribution ¹	Applicable

The criteria time periods will be the same for all roads in the transition zone except where the existing road is a local road. Note where the existing road is a local road and the project has increased the local road noise contribution by more than 2.0dBA (2.1dBA or more) then consideration should be given to whether the existing local road is now a new collector or sub-arterial road.

Use the 'no-build and 'build' traffic flows and conditions when assessing contributions at intersections with existing roads. Buildings should be included in the noise model.

7.3 Multiple transition zones

At some road junctions there may be more than one type of transition zone at the same location (Example 5). This may occur where a road development has both new and redeveloped road segments and also increases noise level contribution by more than 2.0dBA (2.1dBA) on the surrounding road network.

The first step is to identify the relevant road project transition zone criteria at each residence using the contribution difference approach for junctions between new and redeveloped roads. This is followed by assessing if the existing road transition zone criteria also apply. This meets principles 1, 2 and 3.

7.4 Notes on implementation

Junctions between new and redeveloped roads

The aim for junctions with new roads is to create a smooth transition zone that relates to road geometry and unmitigated exposure to noise.

The intention is that criteria for redeveloped, new and transition zones may be established using the same noise model. This can be achieved by setting up the new and redeveloped road segments on different layers and calculating their noise contributions separately. The results for the redeveloped layer may then be subtracted from the results obtained with the new layer.

The sound power level assigned per metre of road chainage should reflect noise emission in the design year without noise mitigation. The results showing the transition zone could be presented as contribution difference noise contours or the assigned criteria.

Note noise level contributions from algorithms such as CoRTN that use an angle of view correction to adjust between an infinite line source and a finite length line source may be inaccurate where receivers are end on to road segments. Adjustments or alternative approaches may be required.

Please review the modelling parameters in the modelling contribution difference section (Page 12).

Junctions with existing roads

It is intended that the requirement for transitions with existing roads may first be checked using desktop methods to evaluate the difference in traffic flows between the 'no-build' and 'build' scenarios. Where an increase of more than 2dBA (2.1dBA or more) on an existing road is identified then the existing roads could be modelled on different layers to assist in identifying facades that are also eligible for existing road criteria.

Please also review the modelling parameters in the Section 7.2 for junctions with existing roads.

Section 8

Relative increase criterion

A large increase in the existing level of noise can cause a major change in the acoustic environment of a location. Under the RNP this is assessed using the Relative Increase Criterion (RIC). The purpose of the RIC is to recognise the potential for such a change and provide a means to assess and mitigate for this type of noise impact (Principles 1, 2, 3 and 4, page 5).

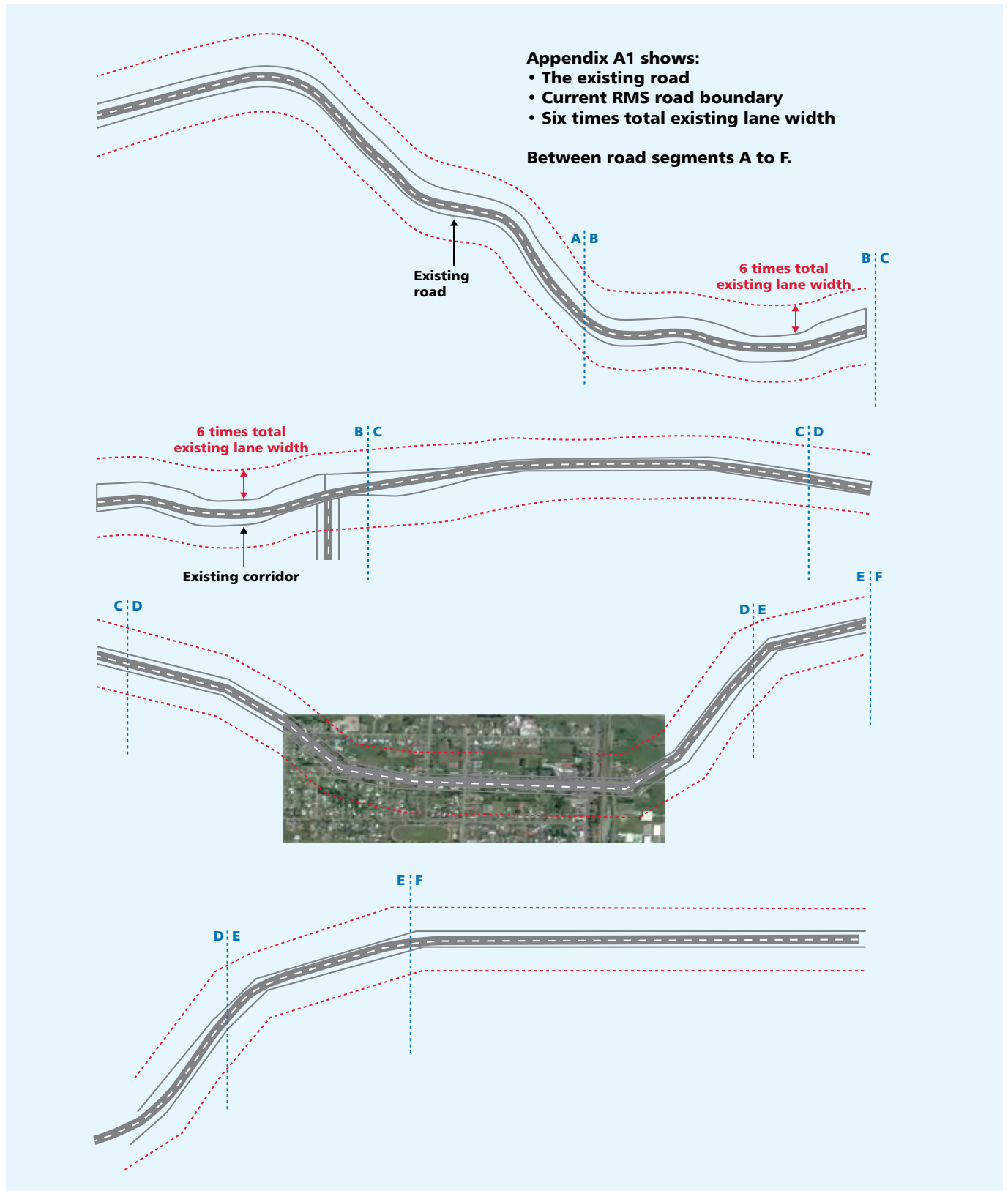
The RIC also functions as a transition zone between areas with low existing traffic noise and higher traffic noise. The RIC criteria become less stringent at receivers that are closer to existing sources of traffic noise.

Where applicable the RIC should be assessed at each facade.

When determining the RIC criterion at each residence, limit the existing traffic noise to exclude contributions from local roads. The basis for this is that a freeway, sub-arterial or collector road represents a significantly different noise source than a local road with low intermittent traffic flows.

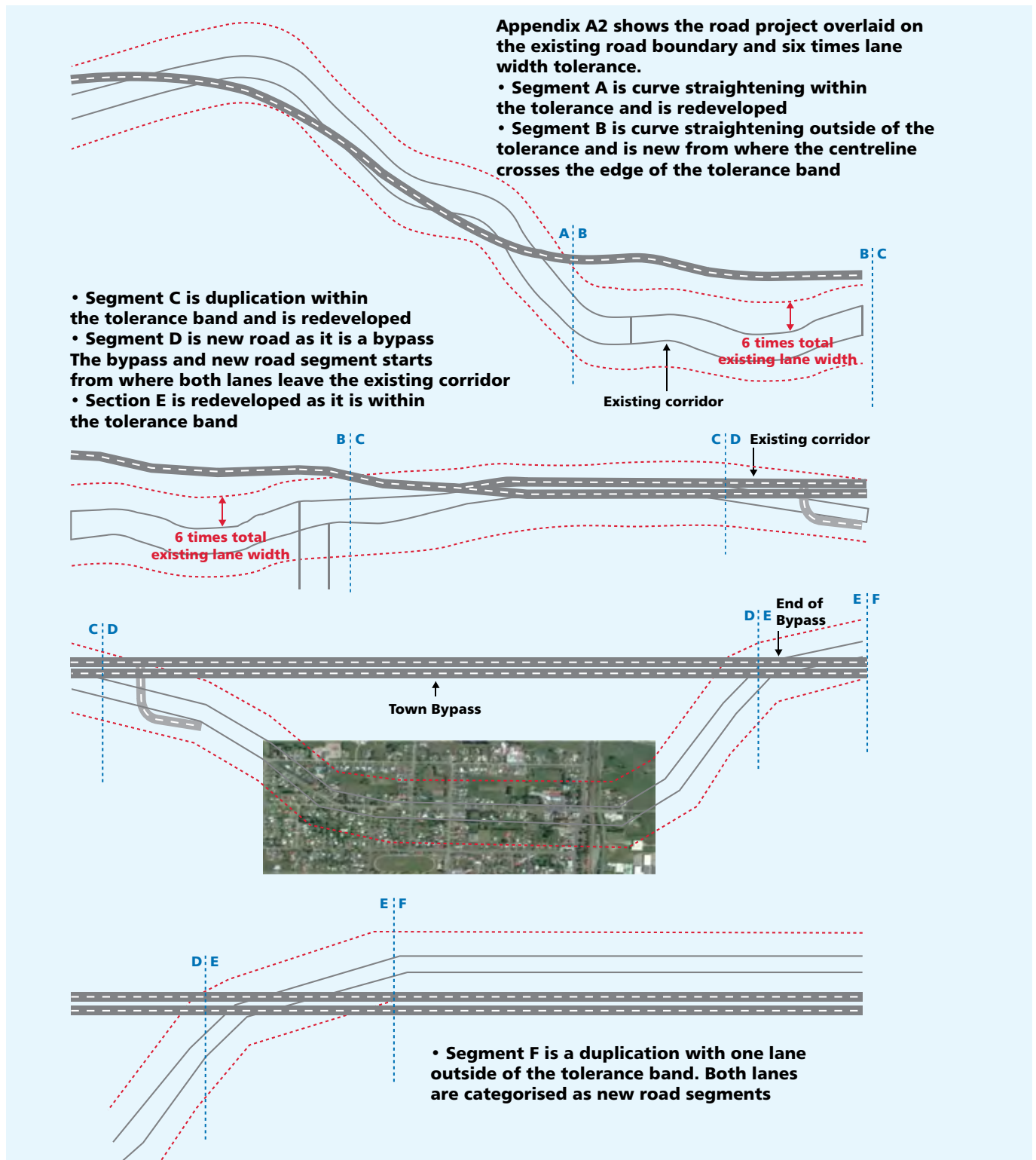
The Relative Increase Criterion (RIC) should be applied to receivers where it is more stringent than the new or redeveloped criteria. In this instance only the RIC needs to be applied to the receiver. Which criteria are most stringent should be checked for both the daytime and night time periods.

Appendix A1: New and redeveloped zones – Existing roads and boundaries



Appendix A2:

New and redeveloped zones – Road project overlaid on existing boundaries



Appendix B:

Road noise policy criteria

The following tables have been reproduced from the Environmental Protection Authority's Road Noise Policy (March 2011).

Note that:

- Roads and Maritime assesses collector roads using sub-arterial criteria
- Austroad and Roads and Maritime documentation uses the term functional class rather than road category. For the purposes of noise assessment in NSW the two terms are interchangeable.

RNP Table 3: Road traffic noise assessment criteria for residential land uses

Road category	Type of project/land use	Assessment criteria – dB(A)	
		Day (7am–10pm)	Night (10pm–7am)
Freeway/arterial/sub-arterial roads	1. Existing residences affected by noise from new freeway/arterial/sub-arterial road corridors	$L_{Aeq, (15 \text{ hour})}$ (external) 55	$L_{Aeq, (9 \text{ hour})}$ (external) 50
	2. Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial roads	$L_{Aeq, (15 \text{ hour})}$ (external) 60	$L_{Aeq, (9 \text{ hour})}$ (external) 55
	3. Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments		
Local roads	4. Existing residences affected by noise from new local road corridors	$L_{Aeq, (1 \text{ hour})}$ (external) 55	$L_{Aeq, (1 \text{ hour})}$ (external) 50
	5. Existing residences affected by noise from redevelopment of existing local roads		
	6. Existing residences affected by additional traffic on existing local roads generated by land use developments		

RNP Table 4: Road traffic noise assessment criteria for non-residential land uses affected by proposed road projects and traffic generating developments

Existing sensitive land use	Assessment criteria – dB(A)		Additional considerations
	Day (7am–10pm)	Night (10pm–7am)	
1. School classrooms	$L_{Aeq, (1 \text{ hour})}$ 40 (internal)	–	In the case of buildings used for education or health care, noise level criteria for spaces other than classrooms and wards may be obtained by interpolation from the 'maximum' levels shown in Australian Standard 2107:2000 (Standards Australia 2000).
2. Hospital wards	$L_{Aeq, (1 \text{ hour})}$ 35 (internal)	$L_{Aeq, (1 \text{ hour})}$ 35 (internal)	
3. Places of worship	$L_{Aeq, (1 \text{ hour})}$ 40 (internal)	$L_{Aeq, (1 \text{ hour})}$ 40 (internal)	<p>The criteria are internal, i.e. the inside of a church. Areas outside the place of worship, such as a churchyard or cemetery, may also be a place of worship. Therefore, in determining appropriate criteria for such external areas, it should be established what is in these areas that may be affected by road traffic noise.</p> <p>For example, if there is a church car park between a church and the road, compliance with the internal criteria inside the church may be sufficient. If, however, between the church and the road are areas where outdoor services may take place such as weddings and funerals, external criteria for these areas are appropriate. As issues such as speech intelligibility may be a consideration in these cases, the passive recreation criteria (see point 5) may be applied.</p>
4. Open space (active use)	$L_{Aeq, (15 \text{ hour})}$ 60 (external) when in use	–	<p>Active recreation is characterised by sporting activities and activities which generate their own noise or focus for participants, making them less sensitive to external noise intrusion.</p> <p>Passive recreation is characterised by contemplative activities that generate little noise and where benefits are compromised by external noise intrusion, e.g. playing chess, reading.</p>
5. Open space (passive use)	$L_{Aeq, (15 \text{ hour})}$ 55 (external) when in use	–	<p>In determining whether areas are used for active or passive recreation, the type of activity that occurs in that area and its sensitivity to noise intrusion should be established. For areas where there may be a mix of passive and active recreation, e.g. school playgrounds, the more stringent criteria apply. Open space may also be used as a buffer zone for more sensitive land uses.</p>

Existing sensitive land use	Assessment criteria – dB(A)		Additional considerations
	Day (7am–10pm)	Night (10pm–7am)	
6. Isolated residences in commercial or industrial zones	–	–	For isolated residences in industrial or commercial zones, the external ambient noise levels can be higher than those in residential areas. Internal noise levels in such residences are likely to be more appropriate in assessing any road traffic noise impacts, and the proponent should determine suitable internal noise level targets, taking guidance from Australian Standard 2107:2000 (Standards Australia 2000).
7. Mixed use development	–	–	Each component of use in a mixed use development should be considered separately. For example, in a mixed use development containing residences and a child care facility, the residential component should be assessed against the appropriate criteria for residences and the child care component should be assessed against the appropriate criteria for child care facilities.
8. Child care facilities	<p>Sleeping rooms $L_{Aeq, (1 \text{ hour})}$ 35 (internal)</p> <p>Indoor play areas $L_{Aeq, (1 \text{ hour})}$ 40 (internal)</p> <p>Outdoor play areas $L_{Aeq, (1 \text{ hour})}$ 55 (external)</p>	–	<p>Multipurpose spaces, e.g. Shared indoor play/sleeping rooms should meet the lower of the respective criteria.</p> <p>Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.</p>
9. Aged care facilities	–	–	Residential land use noise assessment criteria should be applied to these facilities, see Table 3 .

Note: Land use developers must meet internal noise goals set for sensitive developments alongside busy roads in the Infrastructure SEPP.

RNP Table 5: Transitway noise assessment criteria for existing residential land uses

Transitway type	Assessment criteria – dB(A)		Additional considerations
	Day (7am–10pm)	Night (10pm–7am)	
Off-road transitway	$L_{Aeq, (15 \text{ hour})}$ 60 (external)	$L_{Aeq, (9 \text{ hour})}$ 50 (external)	The total noise level from the transitway is to be assessed against the criteria.
On-road transitway	The noise assessment criteria in Table 3 apply as appropriate to the existing road classification, e.g. freeway/arterial/sub-arterial or local road classification.		The total combined noise level from the road, including the transitway and other traffic, is to be assessed against the criteria.

RNP Table 6: Relative increase criteria for residential land uses

Road category	Type of project/development	Total traffic noise level increase – dB(A)	
		Day (7am–10pm)	Night (10pm–7am)
Freeway/arterial/sub-arterial roads and transitways	New road corridor/ redevelopment of existing road/land use development with the potential to generate additional traffic on existing road.	Existing traffic $L_{Aeq, (15 \text{ hour})}$ + 12 dB (external)	Existing traffic $L_{Aeq, (9 \text{ hour})}$ + 12 dB (external)

RNP Table 8: Target noise abatement levels for existing roads not subject to redevelopment

Existing road category	Target noise level – dB(A)	
	Day (7am–10pm)	Night (10pm–7am)
Freeway/arterial/sub-arterial road	$L_{Aeq, (15 \text{ hour})}$ 60 (external)	$L_{Aeq, (9 \text{ hour})}$ 55 (external)
Local road	$L_{Aeq, (1 \text{ hour})}$ 55 (external)	$L_{Aeq, (1 \text{ hour})}$ 50 (external)

Appendix C:

Transition zone examples

The following examples show how the approaches in Section 7 may be applied for a number of junctions between road types and functional classes.

Example 1 shows a bypass or substantially realigned road upgrade with a new road segment that extends and continues beyond the existing road corridor.

Example 2 shows curve straightening that has resulted in substantial realignment of the road.

Example 3A to 3D show a road project that abuts an existing local road and how this is assessed at each facade.

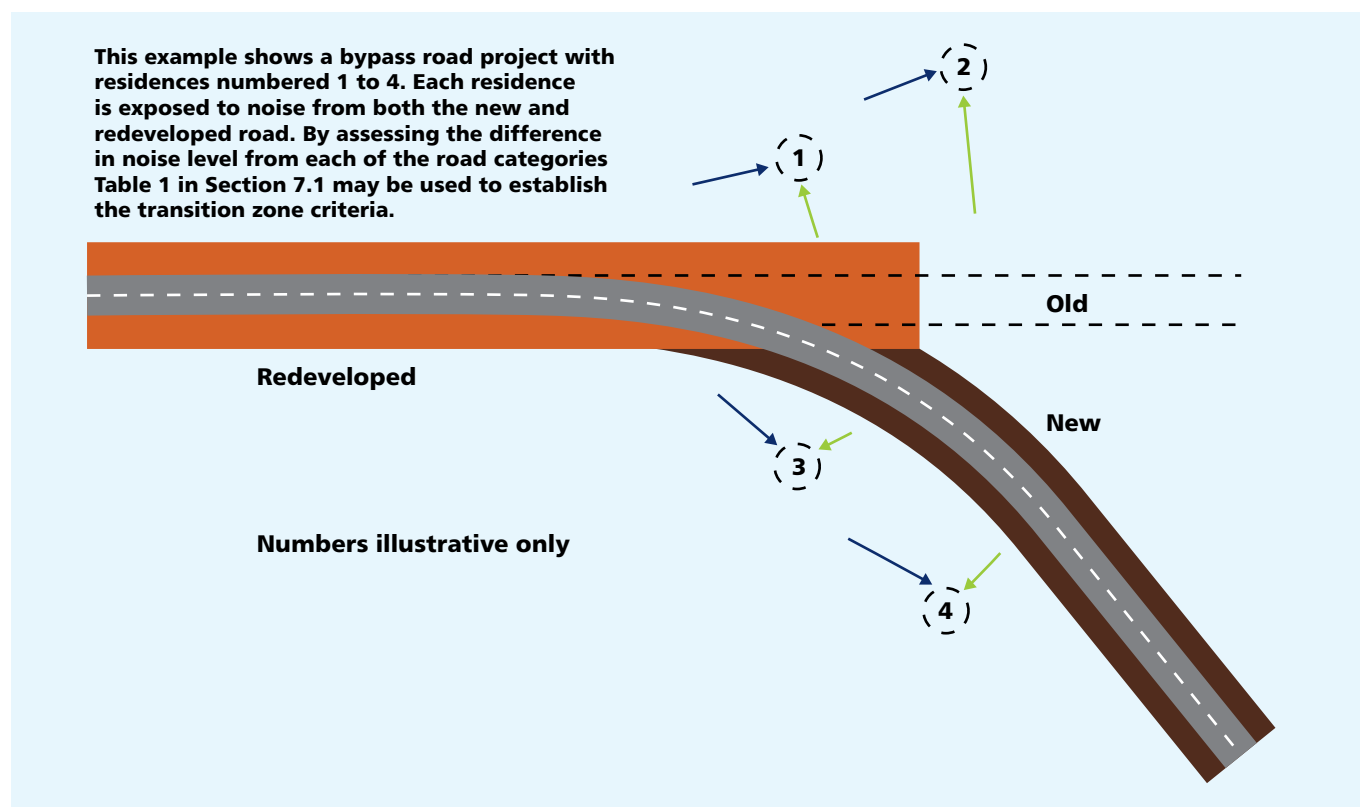
Example 4A and 4B show a wholly new road project that meets an existing major road.

Example 5 shows a situation where there are two types of transition zones at the one location. A redeveloped and new road transition zone is at the crossing point of an existing local road.

Example 1: Transition zone between redeveloped and new road (contribution difference)

Residence no.	New road contribution	Redeveloped contribution	Contribution Difference	Daytime criteria
1	61	65	-4	60
2	59	61	-2	59
3	63	63	0	57
4	65	56	9	55

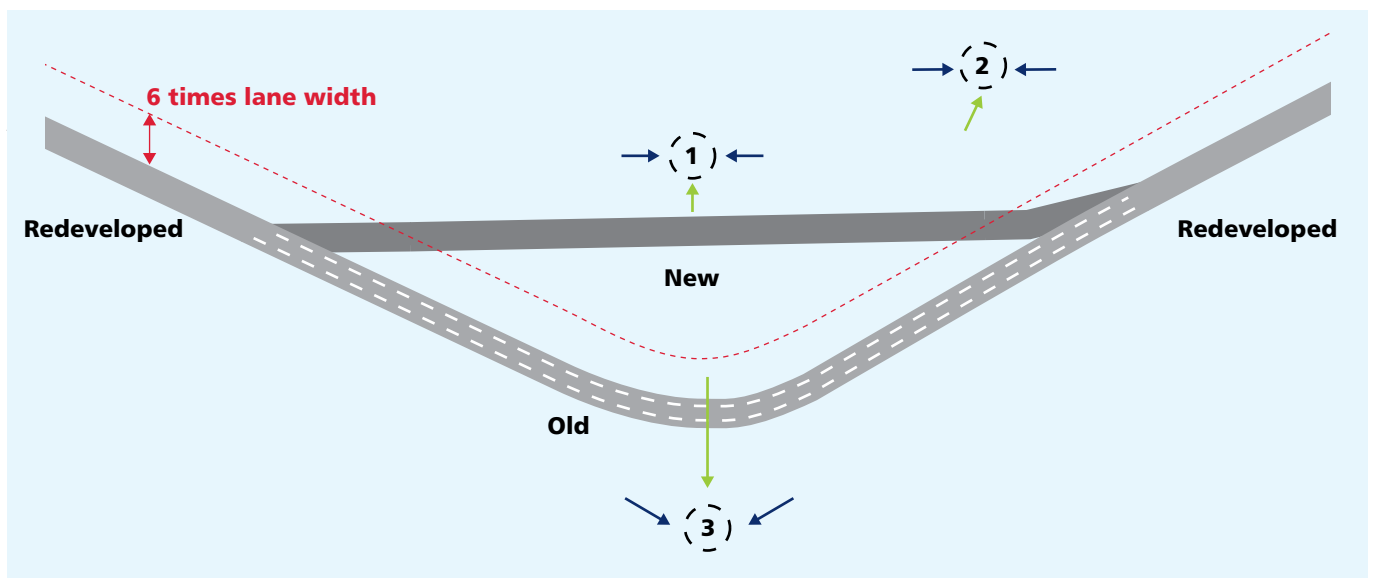
Example 1: Transition Zone between redeveloped and new road (contribution difference)



Example 2: Substantial realignment of road, transition zone between redeveloped and new road segments (contribution difference)

Residence no.	New road contribution	Redeveloped contribution	Contribution difference	Daytime criteria
1	70	59	11	55
2	64	64	0	57
3	63	61	2	56

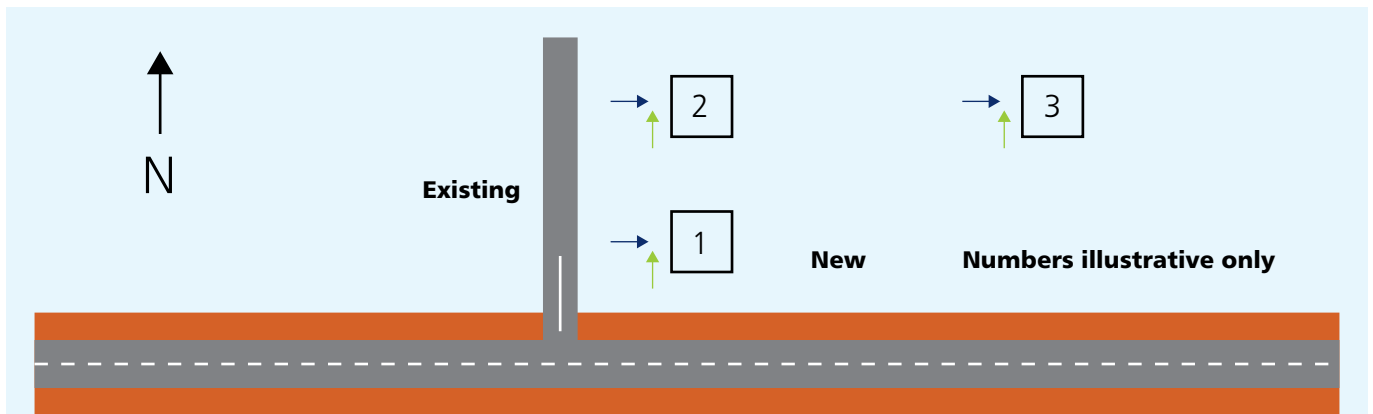
Example 2: Substantial realignment of road, transition zone between redeveloped and new road segments (contribution difference)



Example 3A: Transition zone between a new road and an existing local road – Western facade (road traffic noise levels)

Residence no.	Facade	Project daytime criteria	“Build” existing side road contribution	“No build” existing side road contribution	>2dB change?	“Build” project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	West	55 15hr	62 1hr	59 1hr	Y	63 15 hr	N	NA
2	West	55 15hr	62 1hr	59 1hr	Y	57 15 hr	Y	55 1hr
3	West	55 15hr	56 1hr	53 1hr	Y	57 15 hr	N	NA

Example 3A: Transition zone between a new road and an existing local road – Western facade (road traffic noise levels)

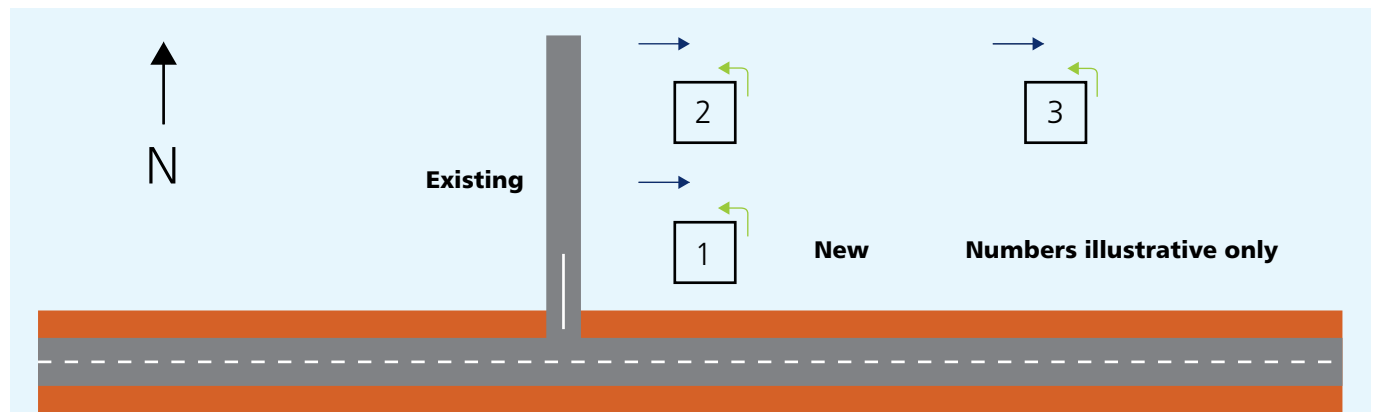


This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road, both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

**Example 3B: Transition zone between a new major road and an existing local road
– Northern facade (road traffic noise levels)**

Residence no.	Facade	Project daytime criteria	“Build” existing side road contribution	“No build” existing side road contribution	>2dB change?	“Build” project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	North	55 15hr	59 1hr	56 1hr	Y	55 15 hr	Y	55 1hr
2	North	55 15hr	59 1hr	56 1hr	Y	54 15 hr	Y	55 1hr
3	North	55 15hr	53 1hr	50 1hr	Y	54 15 hr	N	NA

*Example 3B: Transition zone between a new major road and an existing local road
– Northern facade (road traffic noise levels)*

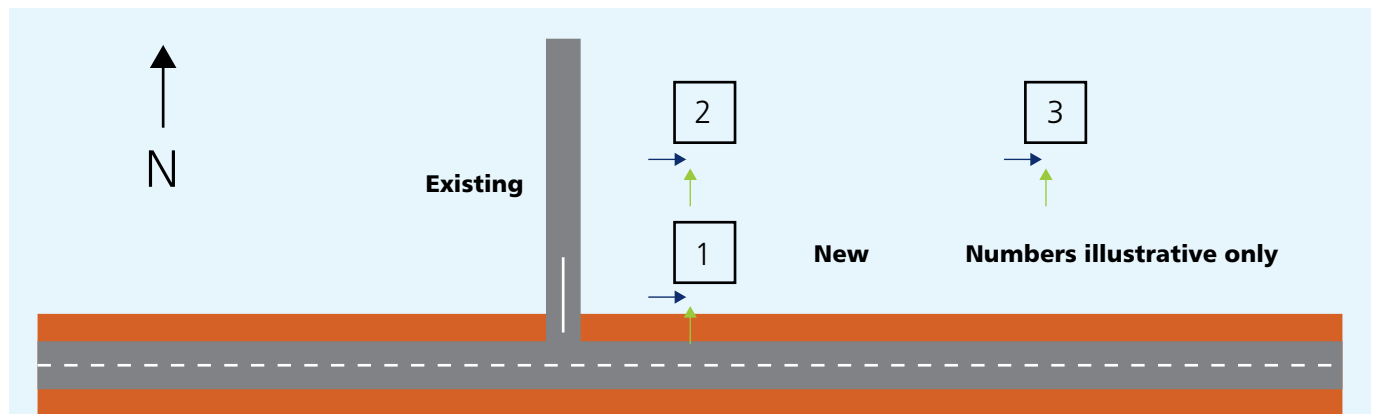


This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 3C: Transition zone between a new major road and an existing local road – Southern facade (road traffic noise levels)

Residence no.	Facade	Project daytime criteria	“Build” existing side road contribution	“No build” existing side road contribution	>2dB change?	“Build” project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	South	55 15hr	59 1hr	56 1hr	Y	63 15 hr	N	NA
2	South	55 15hr	59 1hr	56 1hr	Y	57 15 hr	Y	55 1hr
3	South	55 15hr	54 1hr	51 1hr	Y	57 15 hr	N	NA

Example 3C: Transition zone between a new major road and an existing local road – Southern facade (road traffic noise levels)

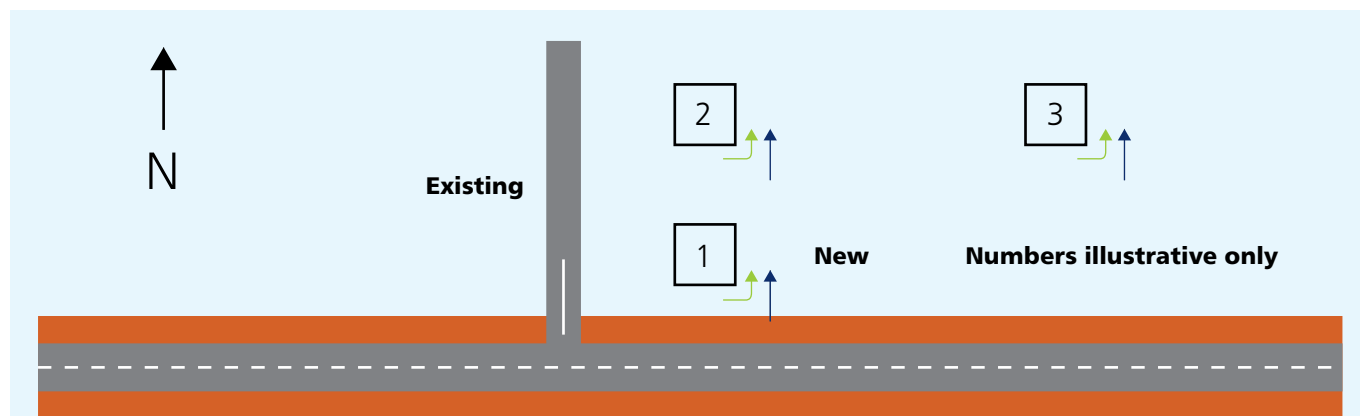


This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

**Example 3D: Transition zone between a new road and an existing local road
– Eastern facade (road traffic noise levels)**

Residence no.	Facade	Project daytime criteria	“Build” existing side road contribution	“No build” existing side road contribution	>2dB change?	“Build” project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	East	55 15hr	54 1hr	51 1hr	Y	63 15 hr	N	NA
2	East	55 15hr	54 1hr	51 1hr	Y	57 15 hr	N	NA
3	East	55 15hr	48 1hr	45 1hr	Y	57 15 hr	N	NA

*Example 3D: Transition zone between a new road and an existing local road
– Eastern facade (road traffic noise levels)*

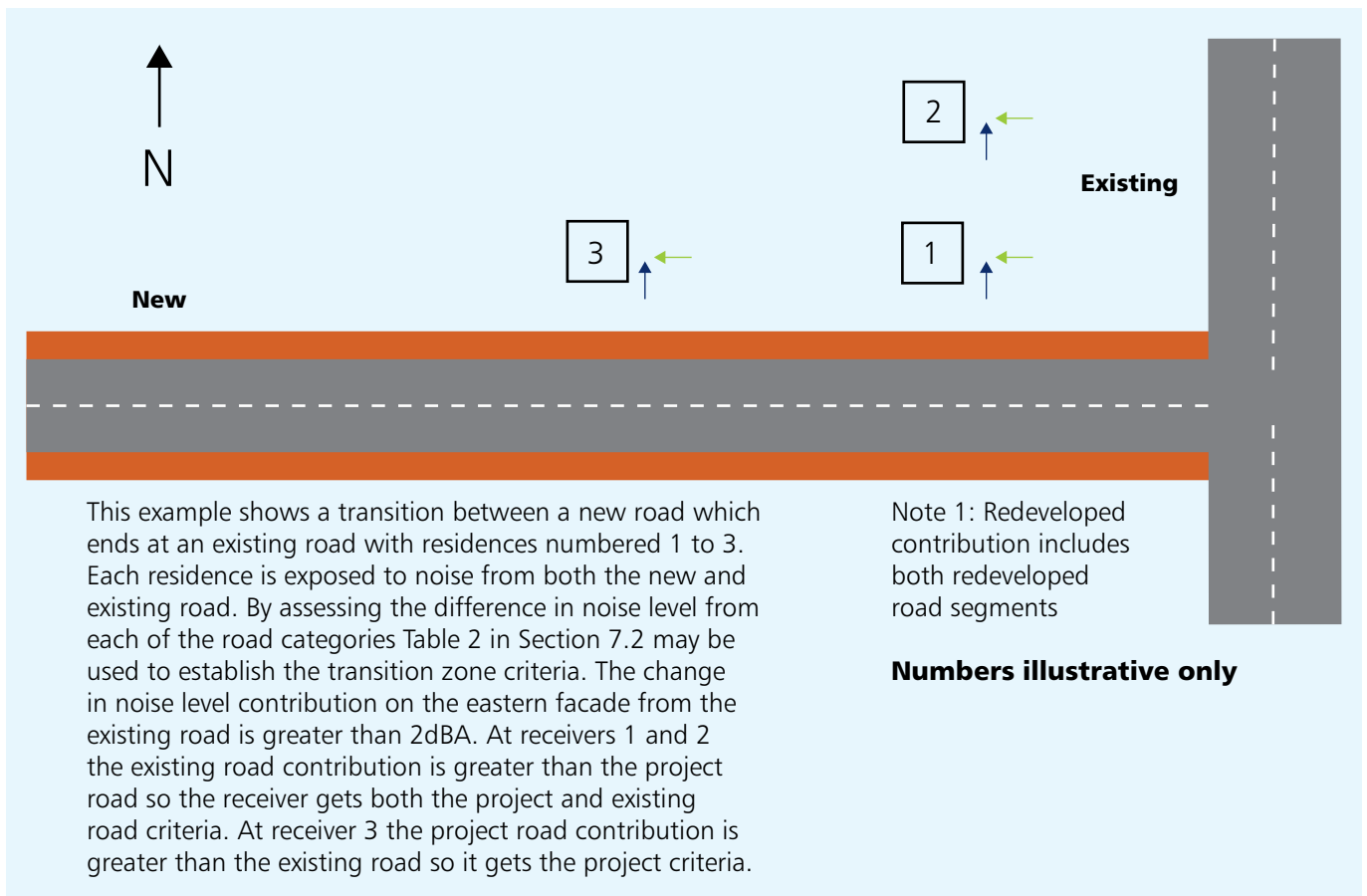


This example shows a new road which abuts an existing local road with residences numbered 1 to 3. Each residence is exposed to noise from both roads and is assessed at each facade. At each residence the change in noise level from the existing road is assessed to see if a transition zone needs to be considered. Where the change in noise level from the existing road is greater than 2dBA and the noise from the existing local road is greater than the new road both the existing local and new road criteria apply. Table 2 from Section 7.2 is completed for each residence.

Example 4A: Transition zone between new road and existing road, the existing road has a 3dBA increase in noise contribution – Eastern facades

Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	East	55 15hr	58 15hr	55 15hr	Y	57 15 hr	Y	60 15hr
2	East	55 15hr	58 15hr	55 15hr	Y	51 15 hr	Y	60 15hr
3	East	55 15hr	55 15hr	52 15hr	Y	57 15 hr	N	NA

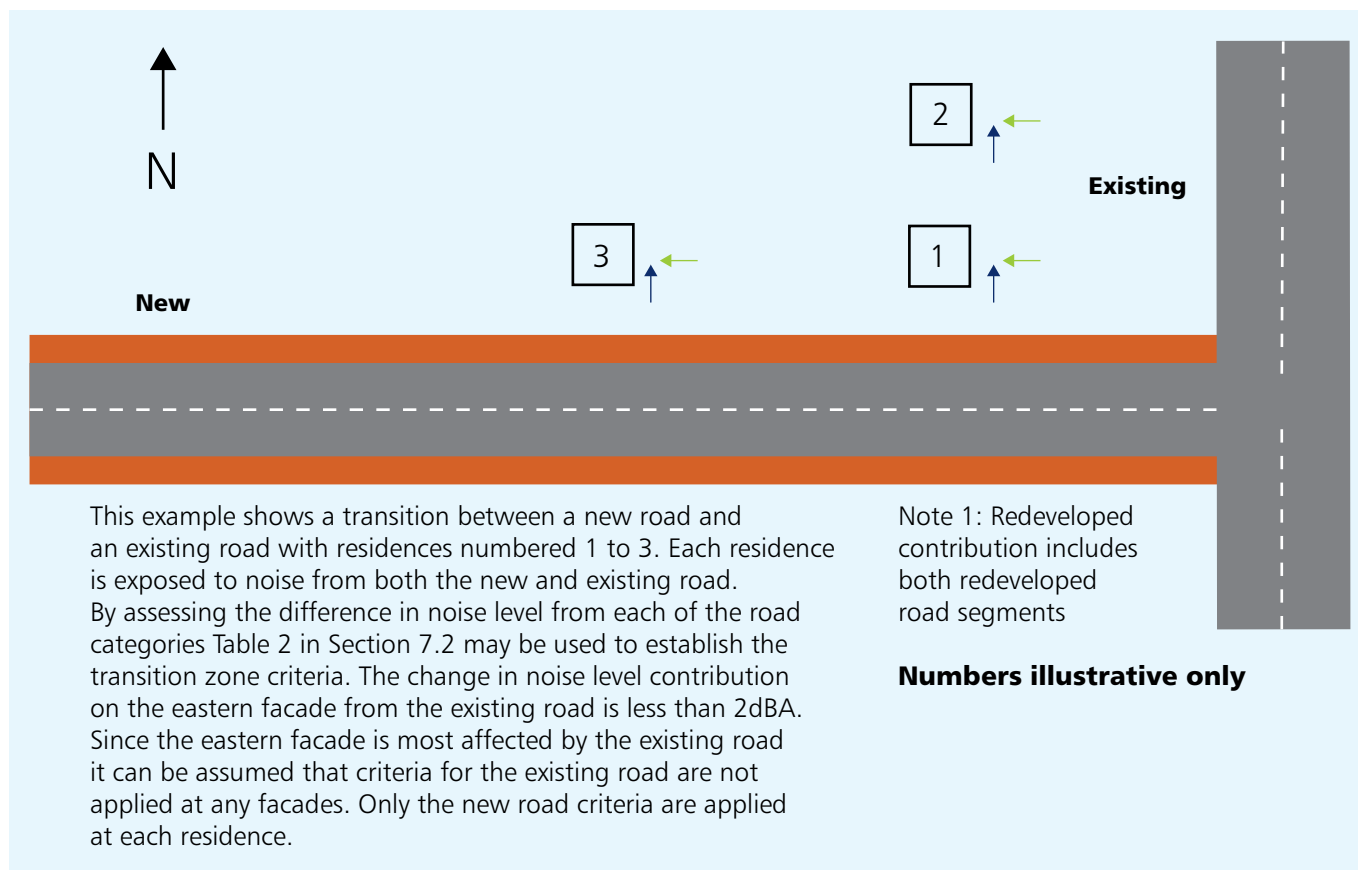
Example 4A: Transition zone between new road and existing road, the existing road has a 3dBA increase in noise contribution – Eastern facades



Example 4B: Transition zone between new road and existing road, the existing road has 1dBA increase in noise contribution – Eastern facades

Residence no.	Facade	Project daytime criteria	"Build" existing side road contribution	"No build" existing side road contribution	>2dB change?	"Build" project road contribution	Existing side road contribution greater than Project road contribution	Existing road daytime criteria
1	East	55 15hr	55 15hr	54 15hr	N	58 15 hr	N	NA
2	East	55 15hr	55 15hr	54 15hr	N	52 15 hr	Y	NA
3	East	55 15hr	52 15hr	51 15hr	N	58 15 hr	N	NA

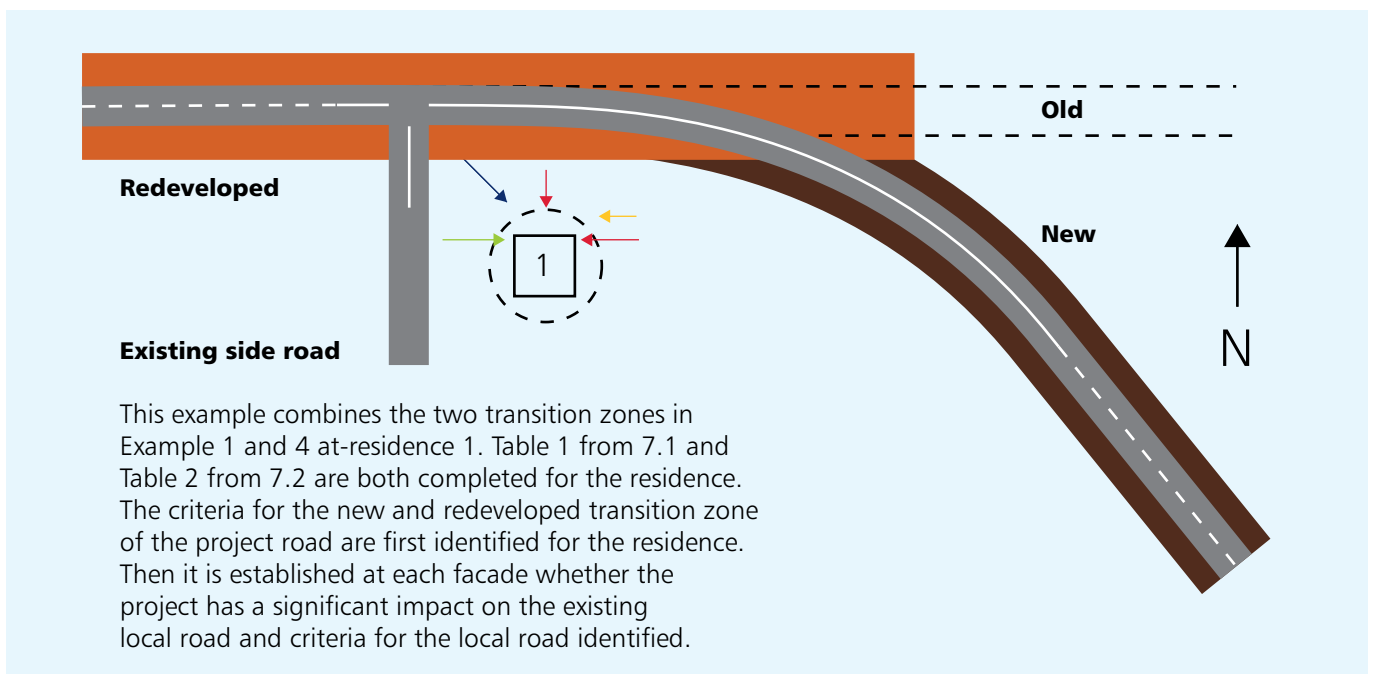
Example 4B: Transition zone between new road and existing road, the existing road has 1dBA increase in noise contribution – Eastern facades



Example 5: Transition zones between new and redeveloped roads and an existing local road (both contribution difference and road traffic noise levels)

Residence no.	New road contri.	Redeveloped road contri.	Contri. difference	Project road daytime criteria	Facade	"Build" existing side road contri.	"No build" existing side road contri.	>2dB?	"Build" project road contri.	Existing road contri. greater than project road contri.	Existing road daytime criteria
1	62	62	0	57 15hr	North	60 1hr	56 1hr	Y	65 15hr	N	NA
					South	60 1hr	56 1hr	Y	59 15hr	Y	55 1hr
					East	52 1hr	48 1hr	Y	65 15hr	N	NA
					West	63 1hr	59 1hr	Y	59 15hr	Y	55 1hr

Example 5: Transition zones between new and redeveloped roads and an existing local road (both contribution difference and road traffic noise levels)





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