PACIFIC HIGHWAY UPGRADE
OXLEY HIGHWAY TO KEMPSEY
NOISE & VIBRATION WORKING PAPER

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6 ASSESSMENT OF 2026 PREDICTED NOISE LEVELS & REVIEW OF NOISE MANAGEMENT MEASURES

6.1 General assessment methodology

Noise level predictions for year 2016 and year 2026 have been calculated at all potentially affected residential locations. In addition, night time and day time noise contours have been produced for year 2026 and are included in the figures shown in Appendix D and E respectively. Note that the figures only show the areas where residential receivers are located.

Detail of existing and predicted future noise levels at individual residences is shown in Appendix C.

It should be noted that a number of residences (262, 314, 376, 396, 397, 398 and 841) are located within the footprint of the Proposal and would be demolished during construction. These properties would be subject to acquisition in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* as discussed in Chapter 10 of the of the *Oxley Highway to Kempsey Upgrading the Pacific Highway Environmental Assessment* (GHD 2010).

While these residences have been considered in this noise assessment and are listed in Appendix C, they have not been identified as requiring noise mitigation in Table 6-1.

Based on the field measurements and outputs for each model, exceedances of *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999) criteria at residences were generally highest at night and accordingly, management measures designed to meet relevant criteria at night would generally also meet them during the day time. However, a small number of receivers found to have higher noise exceedances during the day also need to be addressed. For this reason, when considering management of noise impacts at residences in the discussion below, a combination of both day time and night time noise levels is considered.

Preliminary modelling of the upgraded highway indicated that for most of the Proposal, residences have existing exposure to traffic noise and the Proposal would generally be considered a redevelopment of an existing freeway or arterial road as defined in the ECRTN. Residences located near the proposed bypass of Telegraph Point and along the smaller deviation near Hastings River generally have little existing exposure to traffic noise, and the ECRTN criteria for new freeways or arterial roads would apply. It should be noted that a number of residences, even though affected by traffic noise from the existing highway, would be exposed to traffic noise from another direction as a result of the Proposal, and therefore the ECRTN criteria for new freeways or arterial roads would apply to these residences.

6.2 Feasible and reasonable noise management measures

Where the 'base' criteria in Table 3-1 are already exceeded, Practice Note (iv) of the *Environmental Noise Management Manual* (ENMM) (RTA 2001) provides further discussion of situations where provision of additional controls would be considered 'feasible and reasonable'. It should be acknowledged that these considerations apply only if it can be demonstrated that all 'feasible and reasonable' traffic management and other road design opportunities for reducing traffic noise have been exhausted.

For 'new freeways or arterial roads' it is generally not considered reasonable to take action to reduce noise levels to the base noise levels if the noise levels with the proposal, ten years after Proposal opening, are predicted to be:

- Within 2 dB(A) of 'future existing' noise levels.
- No more than 2 dB(A) above the base noise criteria set out in the Table 3-1.

For road 'redevelopments' where existing noise levels already exceed the base noise criteria (Table 3-1), it is generally not considered reasonable to apply additional treatments (after opportunities for noise control have been incorporated into the road design) if predicted noise levels:

- Do not exceed the ECRTN allowance of 2 dB(A) over 'future existing' noise levels.
- Will not be 'acute' (i.e. do not exceed 65 dB(A) $L_{Aeq,15h}$ and 60 dB(A) $L_{Aeq,9h}$).

The ECRTN indicates (technical note ix) that if the existing noise level is below the criterion but within 2 dB of the criterion, then the 2 dB allowance may also be applied. Hence, the exclusion above is also taken to apply to cases where an existing noise level below the 'base' criterion is predicted to increase by 2 dB(A) or less.

6.3 Operational noise management measures

For all locations where noise mitigation would be required, guidance is taken from the RTA's *Environmental Noise Management Manual* (ENMM) (RTA 2001), which was published to assist in interpretation of the *Environmental Criteria for Road Traffic Noise* (ECRTN) (EPA 1999) and in particular, provides guidance on the selection of appropriate management measures. It should be noted that this document states that community views should be fully taken into account in following the processes for evaluating and selecting noise mitigation treatments.

6.3.1 Noise barriers

Where the barrier height required to meet ECRTN base criteria would have unacceptable visual impacts, a procedure is outlined to undertake a cost-benefit analysis of various barrier configurations. Where noise modelling has indicated that a height of greater than 4 metres would be required to meet criteria, a cost benefit exercise is carried out to determine a suitable 'assessed' barrier height.

For the purposes of this assessment, a noise barrier of a minimum of 4 metres above pavement level was considered for the Wilson River's southern floodplain. Visual impacts, urban design considerations and the hydrological nature of the area (subject to flooding) would combine to prove a noise wall in this area unfeasible. Therefore based on the ENMM and Proposal specific considerations surrounding the Wilson River's southern floodplain, no noise barriers have been recommended for the Proposal.

6.3.2 Architectural treatments

Table 6-1 outlines the noise modelling results and indicates the number of residences that could require architectural treatments to meet ECRTN criteria for each noise catchment area.

A total of 352 residences in 22 noise catchment areas have been identified and noise levels predicted at each location 10 years after the adopted opening date (2026) for the Proposal in accordance with guidelines set out in the *Environmental Noise Management Manual* (ENMM) (RTA 2001). A total of 92 residences would be considered for architectural treatments.

Although not considered feasible it is noted that with low-noise pavement (e.g. stone-mastic asphalt) over the Wilson River bridge, residences 632 and 259 would no longer be acute. Similarly, if dense-graded asphalt was replaced by low-noise pavement over the Hastings River bridge and extending approximately 200 metres south of the bridge, residence 82 would no longer be acute.

For existing buildings these treatments are generally limited to acoustic treatment of the building elements and the installation of acoustic screens walls close to dwellings.

Architectural treatments should aim to achieve internal noise levels in habitable rooms 10 dB(A) below the external noise targets (i.e. ECRTN base criteria). 10 dB(A) is equivalent to the traffic noise reduction that can be achieved for most building structures with the windows sufficiently open to satisfy minimum fresh air requirements.

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 they would be less effective in these cases. The acoustic treatments provided by the RTA is typically 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 facades of masonry structures only (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, eaves, roofs.
- The installation of external courtyard screen walls.

Table 6-1 Summary of predicted noise levels (combined day and night) and noise mitigation design

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA01	This noise catchment area is subject to both 'redevelopment' and 'new freeway' criteria. With the exception of one residence that would experience a fall of 1-2 dB(A), noise levels are generally predicted to increase by 0-2 dB(A). Seven residences would require consideration of mitigation, five of which with acute noise levels. Because of the isolated nature of the three residences, a noise barrier would not be considered feasible. In addition, the residences are elevated in relation to the upgraded highway and the existing highway is already in cutting up to 7 metres deep which makes this section inappropriate for noise barriers. Architectural treatments would be considered at the seven residences.	503, 814, 921, 922 and 923	493, 503, 814, 920, 921, 922 and 923 (7 residences)
NCA02	This noise catchment area is subject to both 'redevelopment' and 'new freeway' criteria. Noise levels are predicted to increase by 2-3 dB(A). Two residences would require consideration of noise mitigation. Architectural treatment would be considered.	N/A	498 and 500 (2 residences)
NCA03	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 3-5 dB(A). Acute levels are found at five residences located within 200 metres of the upgraded highway and would require consideration of mitigation. One residence at the north end of the noise catchment area would also need to be considered for mitigation. All six residences are deemed too isolated for mitigation at the upgraded highway and architectural treatment would be considered instead.	466, 467, 475, 746 and 821	466, 467, 475, 488, 746 and 821 (6 residences)
NCA04	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 4-5 dB(A). All five residences located within 200 metres of the upgraded highway would be subject to acute noise levels and would require consideration of noise mitigation. Noise barriers would not be feasible for the five residences since they are too scattered along the upgraded highway and architectural treatment would be considered instead.	471, 478, 480, 484 and 486	471, 478, 480, 484 and 486 (5 residences)

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA05	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 4-5 dB(A). Most residences would comply with the criteria. Two residences are expected to exceed the criteria and would require consideration for mitigation. These residences are not numerous and grouped enough to consider mitigation at the upgraded highway and would instead be investigated for architectural treatment.	N/A	448 and 459 (2 residences)
NCA06	This noise catchment area is subject to 'redevelopment' criteria. With the exception of two residences that would experience an increase of 2-4 dB(A), noise levels are generally predicted to increase by 4-5 dB(A). Four residences are predicted to have exposure to noise levels that exceed the criteria. This includes one residence where noise levels are predicted to be acute. Architectural treatment would be considered over noise barriers since all residences are deemed too isolated for mitigation at the upgraded highway.	409	409, 436, 712 and 729 (4 residences)
NCA07	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 4-5 dB(A). Two residences would exceed the criteria and would accordingly require further consideration for mitigation. Since they are isolated, architectural treatment would be considered.	N/A	438 and 439 (2 residences)
NCA08	This noise catchment area is subject to 'redevelopment' criteria. With the exception of two residences that would experience an increase of 3-4 dB(A), noise levels are generally predicted to increase by 4-5 dB(A). Three residences in total are predicted to have exposure to noise levels that exceed the criteria. One of those residences would show acute noise levels. Due to the scattered nature of the residences, noise barriers would not be feasible and consideration would be given to architectural treatment.	399	399, 683 and 695 (3 residences)
NCA09	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 4-5 dB(A). Only one residence is predicted to have exposure to noise levels that exceed the criteria. It is too isolated for mitigation at the upgraded highway and would be considered for architectural treatment.	N/A	405 (1 residence)
NCA10	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 4-5 dB(A). One residence is expected to be exposed to noise levels exceeding the criteria. This residence is too isolated for mitigation at the upgraded highway and architectural treatment would be considered.	N/A	688 (1 residence)

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA11	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by 1-5 dB(A) with higher increases at the residences closer to the upgraded highway. Three residences within 250 metres of the upgraded highway would be exposed to levels exceeding the criteria and would need further consideration. Two of those would also be exposed to an acute noise environment. These residences are scattered too far apart along the upgraded highway for noise barriers to be feasible and would be considered for architectural treatment instead. It should be noted that a number of structures located further back from the upgraded highway and complying with the criteria could also benefit from mitigation at the upgraded highway.	361 and 373	361, 373 and 377 (3 residences)
NCA12	This noise catchment area is subject to 'redevelopment' criteria. Noise levels are predicted to increase by up to 4 dB(A). Six residences would exceed the criteria, four of which would be exposed to acute noise levels. These residences are too isolated from one another for noise barriers to be feasible and consideration would be given to architectural treatment.	363, 364, 374 and 375	363, 364, 365, 367, 374 and 375 (6 residences)
NCA13	This noise catchment area is subject to both 'redevelopment' and 'new freeway' criteria. Even though almost all residences in this noise catchment area would benefit from a noise reduction of up to 7 dB(A) due to the upgraded highway moving further east, four residences would exceed the criteria. In addition, one of the four residences has exposure to noise from a different direction (i.e. from the east rather than the west) resulting in an increase of 13 dB(A) at a newly exposed façade. This residence is predicted to be subject to acute noise levels. Noise barriers are considered not feasible due to local topography and existing cutting. Accordingly, consideration would be given to architectural treatment.	315	315, 322, 323 and 840 (4 residences)
NCA14	This noise catchment area is subject to both 'redevelopment' and 'new freeway' criteria. Noise levels are generally predicted to increase by 4-10 dB(A). One residence located in the south of the noise catchment area would experience an increase of 20 dB(A). Three residences are expected to exceed the criteria including one with acute levels. Most of those three residences are located near a section of existing highway which is already in cutting up to 5 metres deep and where noise barriers would not be beneficial. Accordingly, consideration would be given to architectural treatment. The residence located in the south of the noise catchment area and exposed to acute levels is too isolated for mitigation at the road and would also be considered for architectural treatment.	259	259 , 341 and 647 (3 residences)

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA15	This noise catchment area is subject to 'new freeway' criteria. All but one residence would have exposure to noise from a different direction (i.e. from the east rather than the west) and would experience an increase ranging up to 28 dB(A) in the worst case scenario. All of these residences would require further consideration of noise mitigation. The residences located further back near the existing highway are expected to exceed 'new freeway' criteria and would still experience increases in noise levels since the newly exposed eastern façade of those residences are shielded from traffic noise from the existing alignment. One residence is predicted to have acute noise levels. Those residences are too isolated for mitigation at the upgraded highway. In addition, although irrelevant to the assessment in relation to noise mitigation, it should be noted that most of the residences located further back from the highway still experience an overall reduction in noise levels regardless of which façade noise impinges on. Therefore noise barriers are considered not feasible. Accordingly, consideration would be given to architectural treatment.	632	204, 205, 209, 266, 270, 271, 311 and 632 (8 residences)
NCA16	This noise catchment area is subject to 'new freeway' criteria. Noise levels are predicted to decrease by up to 15 dB(A) at the residences located along existing highway and exposed from the same façade. However, the residences located between the existing highway and upgraded highway would experience an increase of up to 7 dB(A) at their newly exposed façade. Two residences located between the existing highway and the upgraded highway are expected to exceed 'new freeway' criteria and would experience increases in noise levels since the newly exposed eastern façades of those residences are shielded from traffic noise from the existing alignment. In addition, three residences located immediately adjacent to the existing highway would exceed the 'new freeway' criteria. Those five residences are too isolated for mitigation at the road. In addition, similarly to NCA15, the five residences would experience an overall reduction in noise levels regardless of which façade noise impinges on. Therefore, architectural treatment would be considered.	N/A	230, 231, 234, 256 and 610 (5 residences)

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA17	This noise catchment area is subject to 'new freeway' criteria. Noise levels are predicted to decrease by up to 15 dB(A) at the residences located along existing highway and exposed from the same façade. However, the residences located between the existing highway and upgraded highway would experience an increase of up to 17 dB(A) at their newly exposed façades. Thirteen residences are expected to exceed the criteria but would not have acute levels, as they are located further away from the upgraded highway. Most of those residences are located relatively close to each other and investigation into mitigation at the upgraded highway would normally be considered. However, due to engineering complications associated with constructing a barrier across a floodplain, visual impacts and urban design issues, architectural treatment would be considered instead.	N/A	116, 119, 123, 125, 126, 128, 129, 130, 131, 133, 135, 583 and 846 (13 residences)
NCA18	This noise catchment area is subject to 'new freeway' criteria. One residence located in the south of the noise catchment area would exceed the criteria and would require further consideration. It is too isolated for mitigation at the road and would be considered for architectural treatment. The other residences in this noise catchment area are located over 1 kilometre away from the upgraded highway and would all comply with the criteria.	N/A	850 (1 residence)
NCA19	This noise catchment area is subject to both 'redevelopment' and 'new freeway' criteria. Noise levels are predicted to increase by 2-9 dB(A). Six residences would exceed the criteria including one with acute noise levels. All six residences are too isolated for noise barriers and architectural treatment would be considered instead.	76	74, 75, 76, 77, 80 and 855 (6 residences)
NCA20	This noise catchment area is mostly subject to 'new freeway' criteria. However, some residences are subject to 'redevelopment' criteria in the southern and northern ends of the noise catchment area. Six residences would be exposed to noise from another direction (i.e. from the west rather than the east), three of which with acute levels. These residences would experience an increase of 8-15 dB(A). Four residences located to the east of the Proposal would also exceed the criteria and would require noise mitigation to be considered even though they would benefit from a noise reduction of up to 4 dB(A) due to the upgraded highway moving further away. All ten residences requiring mitigation are considered too far apart to justify mitigation at the road, especially since traffic noise from the existing highway also contributes to the residences located further east. Architectural treatments would be considered for all ten residences.	82, 83 and 96	82, 83, 84, 85, 93, 96, 103, 106, 107 and 860 (10 residences)

Noise catchment area	Discussion	Residences exposed to acute noise levels	Residences to be considered for architectural treatment
NCA21	This noise catchment area is subject to 'redevelopment' criteria. Noise levels do not vary much from the existing situation, increasing only 1-2 dB(A). Residences already have considerable traffic noise exposure and are not expected to have acute levels and accordingly, no noise mitigation is recommended.	N/A	N/A
NCA22	This noise catchment area is subject to 'redevelopment' criteria. Similarly to NCA21, noise levels do not vary much from the existing situation, increasing only 1-2 dB(A). Residences in this noise catchment area are not expected to have acute noise levels and accordingly, no noise mitigation is recommended.	N/A	N/A