

11 AMENITY (NOISE AND VIBRATION)

11.1 EPA Objective

The EPA's objective relating to amenity (EPA, 2015a) is to ensure that impacts from noise and vibration are reduced to as low as reasonably practicable.

11.2 Existing Environment

Noise monitoring was conducted in accordance with the Australian Standard 2702:1984 Acoustics – Methods for the Measurement of Road Traffic Noise and occurred during the period of September to December 2014 (Lloyd George Acoustics, 2015a).

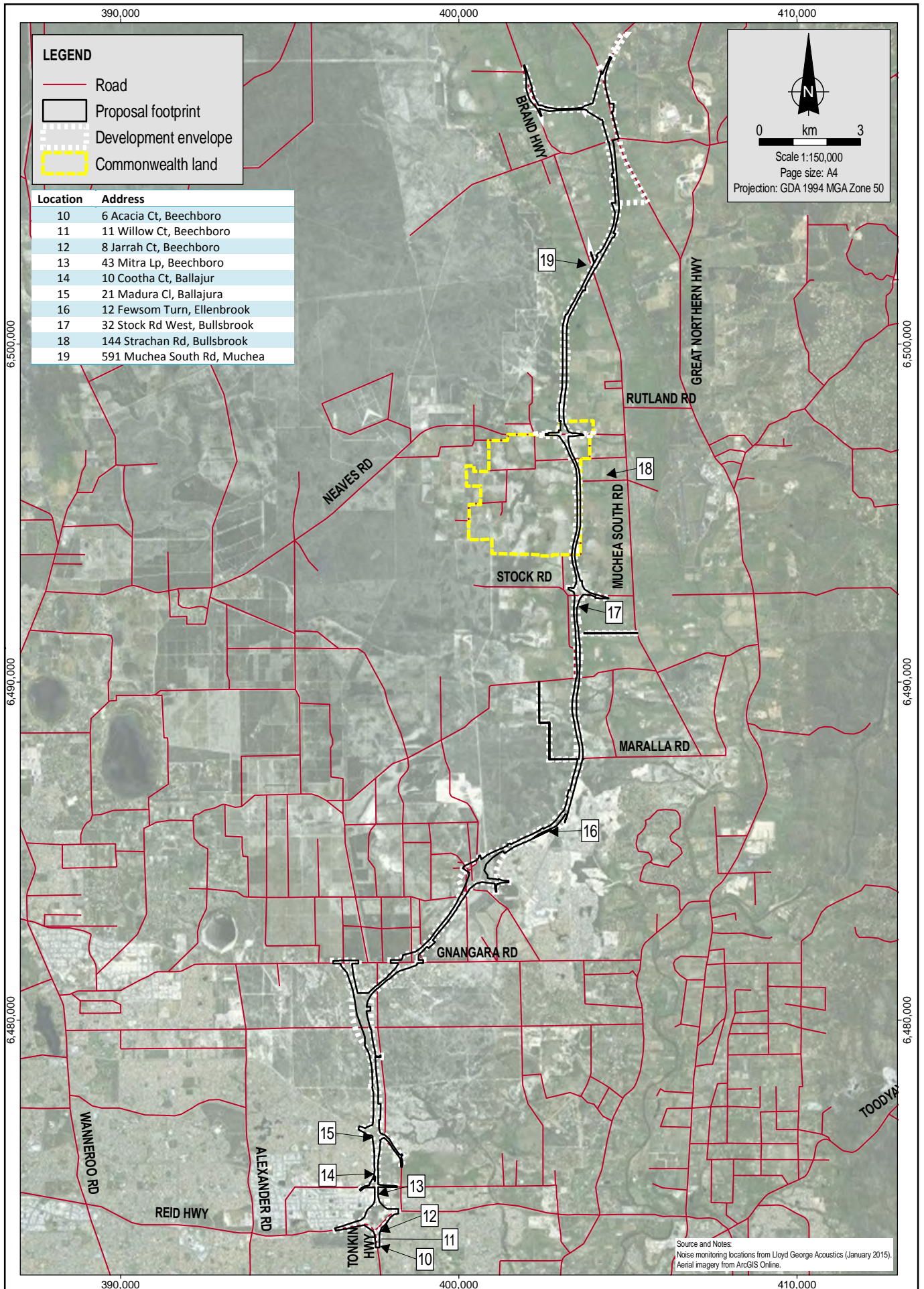
Noise monitoring was undertaken at nine locations from just south of Reid Highway to Muchea (Figure 11.1) and results are detailed in Table 11.1.

Table 11.1 Noise monitoring locations

Site No.	Address	Average weekday noise level (dB)		
		LA _{10,18 hour}	LA _{eq (Day)}	LA _{eq (Night)}
10	6 Acacia Court, Beechboro	57.1	54.9	50.9
11	11 Willow Ct, Beechboro	53.9	52.2	48
12	8 Jarrah Court, Beechboro	51.6	50.6	45.5
13	43 Mitra Loop, Beechboro	50.9	50.1	52.8
14	10 Cootha Court, Ballajura	47.8	47.4	43.2
15	21 Madura Close, Ballajura	50.3	49.4	47.0
16	12 Fewson Turn, Ellenbrook	45.6	49.1	44.1
17	32 Stock Road West, Bullsbrook	51.1	54.2	48.2
18	144 Strachan Road, Bullsbrook	45.6	47.7	43.2
19	591 Muchea South Road, Muchea	52.1	50.7	49.3

Noise measurements were used to determine the differences between the L_{A10,18 hour} and L_{Aeq (Day)} or L_{Aeq (Night)} noise descriptors, as well as to determine if the day or night period traffic noise is dominant when compared to SPP 5.4 criteria.

The difference between the L_{Aeq (Day)} and L_{Aeq (Night)} results was shown to be between 4 dB and 7 dB. The daytime noise levels were found to increase more than the night levels, correlating with an increase in traffic volumes. It is assumed for this proposal that daytime traffic noise levels will be more than 5 dB above the night-time traffic noise levels. Therefore, the day time noise levels have been compared against SPP 5.4 noise criteria.



11.3 Noise Level and Vibration Criteria

11.3.1 Construction Noise Criteria

Noise from construction sites is managed under Regulation 13 of the Environmental Protection (Noise) Regulations 1997 (Noise Regulations). Any construction noise made between 7.00 a.m. to 7.00 p.m. Monday to Saturday (excluding public holidays) is exempt from assigned noise limits, provided the works are being carried out in accordance with AS 2436:2010 – Guide to Noise and Vibration Control on Construction, Demolition and Maintenance sites. If work is to be conducted outside of these times a noise management plan will be prepared in accordance with Regulation 13 of the Noise Regulations.

11.3.2 Traffic Noise Criteria

State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (SPP 5.4) defines the traffic noise criteria relevant to the operation of the proposal (Government of Western Australia, 2009). Note that the Noise Regulations do not apply to traffic noise. SPP 5.4 outdoor noise criteria are shown in Table 11.2. SPP 5.4 is relevant to this proposal, as this proposal involves a:

- Proposed new major road project in the vicinity of existing or future noise-sensitive land uses.
- Proposed major redevelopment of existing road infrastructure in the vicinity of existing or future noise-sensitive land uses.

Where the proposal is being constructed in an area where there is no existing traffic noise (i.e. greenfield site), there is an expectation that the SPP 5.4 "target" should be achieved where reasonable and practical. For other sites, efforts should be made to achieve the "limit". Where the "target" can be met, no further mitigation measures under SPP 5.4 are required.

Where it is not possible to achieve the "limit", best practicable noise mitigation measures should be implemented. These measures should balance noise benefit, cost, feasibility, community preferences, amenity, safety, security and conflict with other policies. This may include measures to achieve the required indoor noise criteria, if the limit can't be achieved outside a noise sensitive premise.

Table 11.2 SPP 5.4 outdoor noise criteria

Period	Target	Limit
Day (6am to 10pm)	55 dB L _{Aeq} (Day)	60 dB L _{Aeq} (Day)
Night (10pm to 6am)	50 dB L _{Aeq} (Night)	55 dB L _{Aeq} (Night)

Source: State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning (Government of Western Australia, 2009).

11.3.3 Construction Vibration Criteria

In Western Australia there are no vibration criteria that are applicable to construction vibration.

11.4 Potential Impacts

During the construction and operation phases of the proposal, potential impacts from excessive noise and vibration include:

- Sleep disturbance.
- Hearing impairment.
- Community annoyance.

- Reduced amenity.
- Reduced learning capacity.
- Changed behaviour in the use of public areas.
- Hearing protection requirement.
- Vibration, leading to structural damage (only expected during construction).

11.5 Assessment of Potential Impacts

11.5.1 Construction Noise and Vibration

Due to its temporary and variable nature, noise and vibration impacts from the construction activities are difficult to assess or model. Impacts during this phase are of a temporary nature and are likely to be more prevalent where construction activities occur in close proximity to residential areas. A list of construction activities likely to generate noise and vibration include, but are not limited to:

- Clearing of vegetation and topsoil.
- Earthworks.
- Operating machinery and generators.
- Construction of structures.
- Drilling and pile driving.
- Transporting of cut, fill and materials.

Increases in noise may impact the rest and recreational activities of the surrounding community especially if construction activities are undertaken at night. The noise and vibration associated with construction activities can cause particular annoyance to the community due to its tonality, modulation and impulsiveness.

Noise sensitive premises along the proposal footprint that are likely to be impacted most as a result of construction activities are:

- Between Tonkin/Reid Highway interchange and Hepburn Avenue, including the suburbs of Noranda, Beechboro, Malaga and Ballajura.
- Cullacabardee.
- Cyrenian House.
- Ellenbrook.
- Rural residential properties north of Ellenbrook.

11.5.2 Operation Noise and Vibration

A noise assessment was undertaken in accordance with the SPP 5.4.

The noise impact assessment (Lloyd George Acoustics, 2015b) (Appendix O) considered the likely traffic noise emissions resulting from the proposal on sensitive receivers. Modelled impacts took into account:

- Types of vehicles using the road infrastructure. Vehicles were classed as either heavy or non-heavy and each was allocated different source heights above road levels to represent the engine and exhaust height.

- Topographical data was considered in the modelling and integrated into the existing proposal site characteristics (i.e. existing property fences). Buildings were incorporated into the model as they can provide barrier attenuation when located between a source and receiver.

Modelled noise was compared to the policy criteria outlined in Table 11.2. The results of the noise modelling (both with and without proposed noise walls) are depicted in Figures 11.2 and 11.3 as follows:

- Properties where noise levels are predicted to be above the noise target of 55 dB L_{Aeq} , but below the noise limit of 60 dB L_{Aeq} .
- Properties where the noise level will be above the 60 dB L_{Aeq} noise limit.

The noise modelling depicted in Figure 11.3 includes:

- Proposed noise walls between Reid Highway and Hepburn Avenue to ensure, where practicable, that all noise sensitive premises have resultant noise levels below the day limit criterion of 60 dB L_{Aeq} , as this area is not considered a greenfields area.
- Proposed noise walls between Hepburn Avenue and Ellenbrook to ensure, set at a maximum of 5 m where practicable, that all noise sensitive premises have traffic noise levels below the day target criterion of 55 dB L_{Aeq} .
- A maximum noise wall height of 5 m.

With a 5 m high limit on noise walls, all properties between Hepburn Avenue and Ellenbrook will have traffic noise levels below the limit and the majority will be below the target.

Rural residential properties north of Ellenbrook where noise levels are likely to exceed the day target criteria of 55 dB L_{Aeq} are presented in Figure 11.4. At these locations, it is not practicable or reasonable to construct noise walls. Noise sensitive receivers north of Ellenbrook will receive facade treatments and screen walls to minimise visual and acoustic impacts. It is estimated that eight receivers may require facade protection. During operations vibration from traffic is unlikely to be detectable and will not result in vibration impacts to humans or damage buildings and structures.

11.6 Management Measures

To reduce the noise and vibration impacts resulting from the proposal, the mitigation hierarchy (i.e. avoid, minimise, rehabilitate/restore and offset) discussed in Chapter 7 has been applied during proposal design and in the development of appropriate mitigation and management strategies and offsets.

While various management measures are proposed in this PER to achieve these desired outcomes, alternative management strategies may arise with further design, investigations and proposal planning. MRWA is committed to achieving environmental outcomes through appropriate management measures that are relevant to specific conditions on site, and which may vary from those described in this document.

This approach is consistent with the Environmental Assessment Guideline for Recommending Environmental Conditions (EPA, 2013a).

Traffic Noise level

$L_{Aeq, (Day)}$ dB

- ≤ 55 Noise Target
- ≤ 60 Above Noise Target - Below Noise Limit
- > 60 Above Noise Limit

