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REPORT No. 001 R04 2010242

PROJECT: M2 UPGRADE
INDEPENDENT NOISE REVIEW

CLIENT: Pacific Highway Assessment Team
Major Project Assessments
Department of Planning
GPO Box 39
Sydney NSW 2001

ATTENTION: Kylie Seretis

DATE: 21 October 2010

MARSHALL DAY ACOUSTICS

Neil Huybregts
Associate

EXECUTIVE SUMMARY

Marshall Day Acoustics Pty Ltd has reviewed the noise and vibration impact assessment for the M2 Upgrade project using a 'general overview and reasonable checking' approach. The review addressed the relevant sections of the *M2 Upgrade Environmental Assessment* and the *Submissions and Preferred Project Report*, as well as related documents and the computer noise model used by the proponent. The review was undertaken with regard to the Director General's Requirements.

A range of issues were identified relating to the adequacy of the assessment method and compliance with the assessment method. Many of these issues were addressed adequately in the original documents. Those requiring clarification or action were passed on to Heggies, the RTA and Leighton Contractors. In all cases, the responses by Heggies or the RTA adequately clarified the situation. However, the following comments should be considered:

- The individual Construction Noise and Vibration Impact Statements (CNIS) should address the following:
  - Noise from the hydroblasting spray itself should be measured to determine its significance
  - The 5dBA penalty for particular noise sources should be explicitly applied
- The RTA responses regarding solar access and visual impacts of noise barriers fall outside MDA's areas of expertise.

The assessment undertaken by Heggies and the advice provided by the RTA in the Submissions Report adequately address the Director General's requirements regarding noise and vibration impacts. If their recommendations are implemented, noise and vibration impacts will be adequately mitigated.

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DOCUMENT STATUS

Revision	Purpose	Date delivered	Reviewed by
-	Internal draft issued to client for review	17 September 2010	-
R01	Draft issued to client for review	29 September 2010	Justin Adcock
R02	Revised draft issued to client for final review	18 October 2010	-
R03	Additional explanation added to some items	21 October 2010	-

1.0 INTRODUCTION

The Department of Planning (DoP) is considering a Major Project Application for the upgrade (widening) of the M2 Motorway. The Roads and Traffic Authority (RTA), acting as the proponent, has prepared an Environment Assessment of the project. The DoP has publically exhibited the proposal and received submissions from the public and other stakeholders.

Marshall Day Acoustics Pty Ltd (MDA) has been commissioned by the DoP to undertake an independent review of noise-related matters, with particular attention to the M2 Upgrade noise impact assessment and the RTA response to the submissions.

Not every detail of the noise and vibration assessment has been reviewed. This review has been undertaken using a 'general overview and reasonable checking' approach, focussing on the underlying assumptions and the methodology, combined with random checks of a number of aspects of the computer noise model.

A glossary of acoustic terms and symbols is provided in Appendix A.

2.0 SCOPE OF WORK

The scope of work for this project was prepared by the Department of Planning and is attached as Appendix B. Briefly, the tasks include:

- Meet with the Department to discuss the scope and receive the relevant documents. Of central importance is the *M2 Upgrade Environmental Assessment*, particularly:
  - Section 9.3 – Operational noise and vibration
  - Section 9.4 – Construction noise and vibration
  - Technical Paper 2 – *Noise and vibration assessment* (Heggies Pty Ltd) ('the Heggies report')
  - The *Submissions and Preferred Project Report* ('the Submissions Report')
- Review the documents, focusing on the aspects of the project identified in the scope of work, including:
  - Technical adequacy
  - Changes due to the M7 Motorway
  - Public submissions and the RTA's response
  - The reasonableness and feasibility of the mitigation and management measures
- Provide a report detailing our findings.

Additional tasks undertaken by MDA are:

- Travel to the site to inspect the existing M2 Motorway and adjacent areas
- Meet with the team who undertook the noise modelling and investigate:
  - How model inputs were obtained
  - Whether traffic and pavement assumptions have been properly entered
  - Whether road and terrain geometry data have been properly entered

  - What assumptions were made regarding other input parameters
  - How the model calibration was undertaken
  - How the calculation runs were performed.

3.0 REVIEW METHODOLOGY

The methodology used for this review is:

- Identification of key issues through:
  - An initial overview of the noise impact assessment and related documents
  - Discussions with the Department
  - Discussions with the RTA or other stakeholders, as appropriate
- Review of the documents in sufficient detail to resolve the key issues, identifying any further key issues as the work progresses
- Communicate with the DoP and Heggies regarding any issues requiring clarification
- Provide a report that:
  - Briefly outlines the methodology
  - Provides an overview of the issues
  - Lists the issues in detail, identifying any that require clarification from Heggies
  - Relates how the issues requiring clarification were resolved
  - Identifies any outstanding issues that may require further resolution.

The documents reviewed or referred to were:

- *M2 Upgrade Environmental Assessment:*
  - Detailed review of Appendix B, Director-General's Requirements; Section 9.3, Operational noise and vibration; Section 9.4, Construction noise and vibration; and Technical Paper 2, Noise and vibration assessment (Heggies Pty Ltd) ('the Heggies report')
  - Reading or scanning of sections relating to the project description and other matters that may inform this review
  - Scan of all occurrences of the words 'noise' and 'vibration'
  - Scan of all occurrences of words associated with related matters such as determination of criteria, determination of eligibility to mitigation, community liaison, solar access, etc
- *Submissions and Preferred Project Report* ('the Submissions Report'):
  - Reading of Sections 1 and 2
  - Scan of all occurrences of the words 'noise' and 'vibration'
  - Detailed review of the noise-related submissions in Sections 3.1 and 3.2
  - Detailed review of sections 3.3.6 and 3.3.7
  - Detailed review of the noise-related sections of the Revised Statement of Commitments
- Reference to other documents to look up aspects relevant to this review:
  - *Environmental Criteria for Road Traffic Noise* (ECRTN)
  - *Environmental Noise Management Manual* (ENMM)

- *Calculation of Road Traffic Noise* (CRTN)
- *Interim Construction Noise Guideline* (ICNG)
- *Community involvement and communications resource manual.*

4.0 DIRECTOR-GENERAL'S REQUIREMENTS

Appendix B of Volume 1 of the Environmental Assessment details the Director-General's requirements (DGRs) for the M2 Upgrade project. Noise and vibration impacts are of relevance to almost every section of the DGRs. Sections of high relevance to the noise and vibration assessment are:

An assessment of the key issues, *with the following aspects addressed for each key issue (where relevant):*

- *description of the existing environment*
- *assessment of potential impacts (direct and indirect) of the project for both construction and operation stages, in accordance with relevant policies and guidelines*
- *identification of how relevant planning, land use and development matters (including relevant strategic and statutory matters), have been considered in the impact assessment and/or in developing management/mitigation measures; and*
- *description of measures to be implemented to avoid, minimise, manage, mitigate, offset and/or monitor the impacts of the project; and*
- *any residual impacts.*

A ***draft Statement of Commitments*** *- incorporating or otherwise capturing measures to avoid, minimise, manage, mitigate, offset and/or monitor impacts identified in the impact assessment Chapters of the environmental assessment.*

Operational Noise Impacts *– the environmental assessment must include an assessment of the noise impacts of the project during operation, consistent with the* Environmental Criteria for Road Traffic Noise *(EPA, 1999). The assessment must include specific consideration of impacts to sensitive receivers (schools, hospitals, aged care facilities), as relevant.*

General construction impacts *– the environmental assessment must consider the potential impacts associated with the construction of the project, and present a management framework for construction works to ensure that impacts are mitigated, monitored and managed. The environmental assessment must include consideration of, and a management framework for:*

- *construction noise and vibration, including a considered approach to scheduling construction works having regard to the nature of construction activities (including transport, blasting and tonal or impulsive noise-generating works, as relevant), the intensity and duration of noise and vibration impacts, the nature, sensitivity and impact to potentially-affected human receivers and structures, the need to balance timely conclusion of noise and vibration-generating works with periods of receiver respite, and other factors that may influence the timing and duration of construction activities (such as traffic management). The environmental assessment must also present a strategy for monitoring and mitigating construction noise and vibration, with a particular focus placed on those activities identified as having the greatest potential for adverse noise or vibration impacts, and a broader, more generic approach developed for lower-risk activities;*

Environmental risk analysis – notwithstanding the above key assessment requirements, the environmental assessment must include an environmental risk analysis to identify potential environmental impacts associated with the project (construction and operation), proposed mitigation measures and potentially significant residual environmental impacts after the application of the proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of this additional key environmental impact must be included in the Environmental Assessment.

5.0 KEY ISSUES

Key issues have been identified. In broad terms, the issues are:

- Adequacy of the assessment method, including:
  - Adequacy of the *Environmental Criteria for Road Traffic Noise* (ECRTN)
  - Adequacy of the Roads and Traffic Authority's *Environmental Noise Management Manual* (ENMM)
- Compliance with the assessment method. Having determined the adequacy of the assessment method, the question addressed next is whether the method has been properly followed. Aspects of the assessment to be addressed include:
  - Competency of Heggies to undertake the assessment
  - Noise monitoring
  - Determination of criteria
  - Noise modelling
  - Feasibility and reasonableness determination
  - Construction noise and vibration
  - Response to community submissions.

Issues have been identified because:

- The reports reviewed did not adequately address the issue
- The issue is important, either because it relates to severity of impacts or technical accuracy.

In many cases, issues were identified that were adequately addressed by the Heggies report or by our inspection of the noise model. Although no action was required in response to these issues, they were included in the review for completeness.

6.0 ADEQUACY OF THE ASSESSMENT METHOD

6.1 Adequacy of the ECRTN

The ECRTN was published in 1999 by the then Environment Protection Authority (EPA), now the Department of Environment, Climate Change and Water (DECCW). It is currently under review pending release of a revised version. It is our understanding that the changes under consideration would not significantly affect the assessment of noise impacts for this project.

The Director-General has determined that the assessment of noise impacts will be undertaken in accordance with the ECRTN. Thus, it is clear that the Department of Planning consider the ECRTN to be adequate for this project.

Subject to the comments in the table below, the ECRTN is adequate for this project.

6.2 Adequacy of the ENMM

The ENMM was published in 2001 following extensive consultation with stakeholders, including the EPA. It is accepted as the document to refer to when seeking guidance on interpreting the ECRTN.

Subject to the comments in the table below, the ENMM is adequate for this project.

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Neither the ECRTN or the ENMM sets criteria for pre-schools, kindergartens, or child-care centres	Pre-schools, kindergartens and child-care centres are noise-sensitive. Criteria should be established for these land uses and noise impacts assessed against those criteria	Heggies to determine whether such land uses are considered to be noise-sensitive in NSW, and if so, whether there are any impacted by the M2 Upgrade project and how to mitigate the impacts	*In a general sense, child care centres and the like can be considered to be "noise sensitive". So, for example, many NSW Councils provide guidance documents governing the approvals process for new developments of this type. Guidance is also provided by the Association of Australian Acoustical Consultants (AAAC), once again in the context of the approval of a new development. Currently, there is no formal requirement to assess these receiver types in either the ECRTN or the ENMM. Accordingly, child care centres were not formally identified for noise investigation in the EA. It is noted also that notifications were sent to all properties within 250 m of the M2 Motorway during the development and public exhibition of the environmental assessment. No responses were received from any pre-schools, kindergartens or child-care centres.*	Issue closed
Neither the ECRTN or the ENMM sets criteria for potentially noise-sensitive community resources such as scout halls or community centres	Depending on the level of use, such community resources may be sensitive to environmental noise	Heggies to determine whether such land uses are considered to be noise-sensitive in NSW, and if so, whether there are any impacted by the M2 Upgrade project and how to mitigate the impacts	*Currently, there is no formal requirement to assess non-continuous or intermittent usage spaces (eg Scout Halls, Community Halls) in either the ECRTN or the ENMM. Accordingly, such facilities were not formally identified for specific noise investigation in the EA.*	Issue closed

* See Appendix E

7.0 COMPLIANCE WITH THE ASSESSMENT METHOD

7.1 Competency of Heggies to undertake the assessment

Heggies is a member company of the Australian Association of Acoustical Consultants (AAAC) and a well-respected consultancy with a good reputation amongst peers. Subject to provision of the documents requested below, it is my opinion that they have the knowledge, resources and expertise to undertake the work adequately.

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Pre-qualification to undertake road traffic noise assessments	It is not stated in the Heggies report whether Heggies is pre-qualified with the RTA to undertake this type of work	Heggies to provide evidence of pre-qualification	*There is currently no formal "qualification" process for undertaking road traffic noise assessments for the RTA in New South Wales, unlike some other specialist areas where Panels have been established, eg the RTA Structural Dynamics Panel (to which Heggies belongs). The RTA accepts road traffic assessments from consultants like Heggies (Wilkinson Murray, Renzo Tonin, etc) where the consultants concerned have established a long track record (in some cases decades) of carrying out such studies to an acceptable standard.*	Issue closed
Quality system certification	The Heggies report states that their Quality System is certified under ISO9001:2000 (p.2). This standard has been superseded	Heggies to provide evidence of certification under ISO9001:2008	*The EA report made use of text from an outdated template which referred to the incorrect ISO9001 standard. Heggies' current certification is attached.*	Issue closed

* See Appendix E

7.2 Noise monitoring

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Coverage across study area	It appears from Appendix B of the Heggies report that noise monitoring locations were selected in a manner that provided good coverage of the study area, apart from chainages 5600-6700, 9000-9500 and 10300-11300, where there appear to be gaps. However, given that the computer noise model demonstrated good agreement with the measured noise levels, it is likely that the modelled noise levels are reliable across the whole of the study area	Heggies to indicate what the reasons were (if any) for not measuring in the areas identified	*The monitoring undertaken for the study took place in two parts. 1 The initial 24 locations were chosen by Hills Motorway – they had been the subject of previous (regular) M2 noise surveys, thereby enabling historical trends to be observed. 2 The second set of noise monitoring locations were selected by Heggies after the initial round of noise modelling for the motorway. The noise modelling identified areas exposed to potentially higher road traffic noise (in either "existing" and "future" scenarios). Any remaining areas were observed to be either (a) locations not exposed to as high level of road traffic noise as areas covered by the monitoring, or (b) locations whose exposure (road alignment, terrain, presence of noise barrier, proximity of houses, etc) was very similar to areas already covered by the monitoring.*	Issue closed
Noise monitor position	Located at building facade with the microphone at a height of 1.5m. This is in accordance with the ECRTN and ENMM.	None required	-	-
Weather conditions	The Heggies report states that 'potentially adverse weather' was 'identified', but it is not clear whether days with adverse conditions were excluded from the analysis	Heggies to provide clarification	*All monitoring periods were excluded from the analysis where rain was apparent (≥5 mm) and/or wind speeds were in excess of 5 m/sec.*	Issue closed

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Number of days of monitoring at each site	Not stated	Heggies to provide clarification	*The total number of days at each site varies, primarily due to access reasons at the property for collection of the logger at the conclusion of the monitoring period. Noise logging was however completed for a minimum of seven days at each monitoring location. Please be aware of a "pdf-macro" date entry error which occurred for the pdf summary graphs in Appendix C for locations S1-6, S1-7, S2-2, S2-7 and S2-8, where the end date quoted in the graph title should have been one week later, ie a Tuesday start date to the Wednesday or Thursday of the following week.*	Issue closed
Number of days with acceptable weather conditions	Not stated	Heggies to provide clarification	*The analysis used a duration of a full week of monitoring, taking into account any weather-affected data being rejected. Data impacted by adverse weather was excluded on a 15-minute period basis. For isolated instances of adverse weather (refer standard RTA recommendations) 15-hour daytime or 9-hour night-time period L_{Aeq}'s were retained for the analysis. On days in which significant periods of rain and/or wind occurred, the entire 15-hour daytime or 9-hour nighttime period data record of that day was excluded from the analysis.*	Issue closed
Removal of spurious (non-road traffic noise) data	The graphs in Appendix C of the Heggies report show some spurious data. The Heggies report states that 'data was processed' (p. 39)	Heggies to provide clarification	*The graphs in Appendix C contain the raw logger data before filtering, as their title suggests. Following filtering of wind/rain data (adverse weather), some (modest) additional filtering, involving rejection of isolated 15-minute readings, was made where isolated "spikes", clearly not related to road traffic noise, were excluded from the analysis of the associated 15-hour and 9-hour LAeq average periods.*	Issue closed

* See Appendix E

7.3 Determination of criteria

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Construction noise criteria	Criteria are taken from the *Interim Construction Noise Guideline* (ICNG) (DECCW 2009) . The criteria used are adequate	None required	-	-
Construction noise criteria for passive recreational spaces	The ICNG sets criteria for passive outdoor recreation spaces, of which there are a number affected by noise from the M2 Upgrade project. While it is likely that the low levels of use of such areas may lead to a determination that noise mitigation is not reasonable, it is not clear why the assessment process has not been applied to these areas	Heggies to provide clarification regarding why such areas were excluded and, if necessary, assess impacts on passive recreation spaces	*Passive recreation areas along the route occur in places where construction noise impacts have been examined in relation to other categories of noise sensitive receivers, eg residential, schools, etc. In these instances, the management noise levels arising from the application of ICNG criteria for the other land use categories are generally the same or more stringent than the 15-minute 60 dBA external noise level recommended in the ICNG's Table 3 for passive recreation areas. Noise mitigation in such areas has therefore already been covered by the construction noise assessment for other noise-sensitive spaces.*	Issue closed
Construction vibration criteria	Criteria are taken from *Assessing vibration: a technical guideline* (DEC (now DECCW) 2006) and British Standard BS7385.2-1993. The criteria used are adequate	None required	-	-
The ECRTN does not define 'acute' noise impacts except with regard to existing roads where no road works are planned	The ENMM defines 'acute' impacts as those that are 5dBA or more above the operational noise criteria and requires that priority be given to noise mitigation when impacts are acute. This approach is consistent with the comment in the ECRTN acknowledging that *"Resources are generally limited for noise control on existing roads, and strategies need to take into account what is reasonable and feasible."* The 'acute' criteria (65dBA during the day and 60dBA at night) are	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
	consistent with practice in other states			
Choice of criteria	Criteria selected in accordance with the ECRTN	None required	-	-
Application of criteria	Operational criteria applied to residences, schools, hospitals, places of worship and active outdoor recreation spaces, in accordance with the ECRTN. Eligibility for noise mitigation determined in accordance with the ENMM using 'acute' criteria	None required	-	-
Operational noise criteria for passive recreation spaces	The ECRTN sets operational criteria for passive outdoor recreation spaces, of which there are a number affected by noise from the M2 Upgrade project. While it is likely that the low levels of use of such areas may lead to a determination that noise mitigation is not reasonable, it is not clear why the assessment process has not been applied to these areas	Heggies to provide clarification regarding why such areas were excluded and, if necessary, assess impacts on passive recreation spaces	*In relation to passive recreation areas, the ECRTN recommends that, in the situation where existing levels of traffic noise exceed the criteria (in this case a 15-hour L_{Aeq} of 55 dBA), all feasible and reasonable noise control measures should be evaluated and applied. Where this has been done and the internal or external criteria (as appropriate) cannot be achieved, the proposed road or land use development should be designed so as not to increase existing road traffic noise levels by more than 0.5 dBA for new roads and 2 dBA for redeveloped roads or land use development with potential to create additional traffic. In the present instance, the following is noted: 1 Feasible and reasonable noise control measures have been evaluated and applied along the entire route, including many of the areas along the route where noise barriers mitigate noise emissions. 2 Some passive recreation areas along the route are associated with other sensitive land uses, eg schools, who have more stringent ECRTN noise criteria which have been investigated and addressed. 3 There are no areas along the route where passive recreation areas are located where a >2 dBA increase is predicted to occur as a result of the project. Accordingly, no specific noise mitigation for such spaces arises for the upgrade project.*	Issue closed
Impacts adjacent to sections of the M2	Impacts adjacent to sections of the M2 not being upgraded have been assessed in	Heggies to provide	*With reference to areas outside of the M2 Upgrade Project area,*	The finding that noise levels will

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
not being upgraded	terms of the +2dBA criterion only. It is not clear from a brief review of the ECRTN and the ENMM what the basis is for using only the +2dBA criterion	clarification	*reference is made to pp15-16 of the ECRTN where the following is noted: 1 Resources are generally limited for noise control on existing roads, and strategies need to take into account what is reasonable and feasible. Retrofitting of engineering-type noise controls is generally not recommended as a suitable strategy for addressing existing undesirable levels of road traffic noise impact where no upgrading or redevelopment is occurring. The benefits from retrofitting noise controls are usually limited to relatively small areas, whereas, to be effective, any strategy needs to be able to address the widespread nature of the impacts. It is also noted that there are often high costs and practical difficulties associated with retrofitting noise controls. 2 The retrofitting of engineering-type noise controls to existing roads where no upgrading or redevelopment is occurring should be limited to situations where there are acute noise impacts that require prompt attention. The Noise Abatement Strategy that has been developed and implemented by the RTA on a priority basis for State-owned roads is an appropriate response for addressing acute existing traffic noise impacts. This strategy directs resources to receivers experiencing the highest road traffic noise impacts. The environmental assessment was able to identify acute houses outside the areas that would be directly affected by the upgrade in both the "existing" and "future" scenarios. Based on point 1 above, however, it is not considered reasonable or feasible for the project to specifically address those acute properties outside the project area. The environmental assessment could be used, where appropriate, for further investigation of noise issues outside of the current upgrade project as part of the RTA's ongoing Noise Abatement Program. Given the "Redevelopment" nature of the project, the related 2 dBA allowance goal was used as an additional source of information regarding project impacts. This was determined in conjunction with the RTA.*	not increase by more than 2dBA indicates that impacts attributable to this project are not significant. The section of the ECRTN quoted by Heggies shows that the ECRTN supports this conclusion. Issue closed

* See Appendix E

7.4 Noise modelling

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Noise modelling software	Noise modelling undertaken using SoundPLAN v6.5	None required	-	-
Calculation method	The noise calculation method was the UK *Calculation of Road Traffic Noise* (CoRTN) method	None required	-	-
Traffic volumes	The traffic volumes in the Heggies report are consistent with traffic volumes forecast in the Transurban (Hills M2) traffic report	None required	-	-
Determination of 18-hour volumes	The 18-hour traffic volumes in the Heggies report are generally 94-97% of the daily traffic volumes forecast in the Transurban traffic report. This is consistent with the usual relationship between 18-hour and daily volumes	None required	-	-
2008 traffic speeds	The traffic speeds used in the 2008 calibration of the noise model are those measured during the traffic counts	None required	-	-
Traffic speed for 2021 Design Scenario same as the measured 2008 speeds	Widening of the M2 Motorway is likely to improve traffic flow and hence increase average traffic speeds	Heggies to provide a determination of the likely (if any) increase in speed and what effect this would have on noise levels	*The 2021 model makes use of the same speeds as the 2008 model except where a speed increase is proposed as part of the project, eg westbound traffic from Lane Cove Road to Beecroft Road. Changes in average speeds on the motorway in 2021 are not anticipated, given that in the existing situation the motorway is generally free flowing at all times outside of the peak hours.*	Issue closed

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Traffic speed on cross roads	The noise impact assessment assumes an average traffic speed of 50km/h. This is adequate	None required	-	-
Some traffic speeds in model not consistent with report	The traffic speeds in the noise model at chainages 11800 and 17300 were not consistent with the traffic speeds at the closest point in Table 32 of the Heggies report	Heggies to provide clarification regarding how the speeds in the model were obtained	*Traffic volumes and speeds were monitored by traffic consultants at discrete points along the length of the motorway during the Environmental Assessment phase of the project. The difference in the speeds as highlighted in* [Appendix C] *are as a result of the measured speeds (which were in this instance to the west of the Toll Gates where no noise sensitive receivers are present) being conservatively adjusted to better reflect the average speeds along this section of the motorway where the residential receivers are actually located (at a distance of 1 km to 2 km from the measurement site). This was based on site observations and measurements.*	Issue closed
Traffic composition	The 18-hour truck traffic volume in the noise model was consistent with the figures in Tables 34 and 35 of the Heggies report	None required	-	-
Noise source height	Traffic was modelled as four noise sources – one for cars and one each for truck tyres, truck engines and truck exhaust stacks. The heights stated in the Heggies report are appropriate	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Noise source contributions	Although not stated in the Heggies report, the relative contribution of the various truck noise sources has been provided by Heggies. The contributions are: • Truck tyres - 5.4dBA • Truck engines - 2.4dBA • Truck exhausts - 8.5dBA	None required	-	-
Road surface	A correction of 0dBA has been applied for the proposed open-graded asphalt surface. This is conservative	None required	-	-
Poor condition of road surface during noise measurements	A correction of 0dBA was applied for the existing surface, which is likely to under-estimate the effect of the existing surface. Despite this, the noise model over-estimated noise levels by 1dBA on average. This means that the model is conservative	None required	-	-
Receiver heights	Reasonable receiver heights have been entered into the model for both the ground floor and first floor of all affected buildings	None required	-	-
Facade effect	A facade correction of +2.5dBA has been applied. This is consistent with the requirements of the ECRTN and the ENMM	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Construction of the noise model	An inspection was undertaken of the noise model set-up at a random selection of locations. Details of the model inspection are provided in Appendix C herein	None required, other than the clarification regarding the speeds in the model requested above	See above	-
Source of geometric data	Data corresponding to existing and proposed road alignment, noise barriers, roadside terrain, nearby terrain, property boundaries, building shapes and heights has been acquired from a number of sources. The quality of data is likely to be as good as or better than that used for most planning-stage noise models	None required	-	-
Model calibration	The noise model estimated noise levels that were 1dBA higher than the measured noise levels on average. This is a very good level of accuracy, with a good degree of conservativeness	None required	-	-
Model outputs	The set-up of the calculation run files and the graphics generated from the results was demonstrated during the model inspection. All the set-up parameters seemed to be set correctly and the sample results displayed were identical to those shown in Appendix E of the Heggies report	None required	-	-
Special adjustments	In some cases, consultants will apply their own correction factors to the predicted noise levels. There was no evidence of this	None required	-	-

* See Appendix E

7.5 Operational noise and vibration assessment

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Assessment scenarios are for different years	Comparison of the 2011 Future Existing scenario with the 2021 Future Design scenario means that any differences would be associated with 10 years' traffic growth as well as changes due to the M2 Upgrade project. This is a conservative approach	None required	-	-
Noise from cross-roads	Noise mitigation for premises affected by noise from cross-roads has been considered when there are road works on the cross-road. This is in accordance with the ENMM, which requires that the noise assessment *"identify all road traffic noise impacts for the predicted noise environment (including any part of the surrounding road network affected by a proposal)"*	None required	-	-
Noise from cross-roads calculated even when there are no road works proposed on the relevant cross road	It is likely that noise from cross roads was included in the noise modelling to ensure that noise impacts associated with the M2 upgrade were not falsely identified at locations where noise from cross roads was dominant	None required	-	-
Identification of all noise-sensitive premises	A brief comparison of the noise model outputs with the aerial photographs found no dwellings that had been omitted	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Impacts adjacent to sections of the M2 not being upgraded	The conclusion that no noise-sensitive premises near the non-upgraded sections of the M2 will have a noise level increase of 2dBA or more is reasonable	None required	-	-
Identification of affected schools, hospitals, places of worship and outdoor recreation spaces	All affected schools, hospitals, places of worship and outdoor recreation spaces appear to have been identified and impacts assessed	None required	-	-
No change in height of noise barriers even where impacts are acute	Increasing the height of noise walls not affected by the widening was found to be not cost-effective in accordance with the ENMM. Given that the costs associated with replacing existing walls are likely to be high relative to the benefits, this seems to be a reasonable conclusion	None required	-	-
Decrease in height of some noise barriers	The Heggies report recommends that some sections of barriers NW-E-1001 and NW-W-1001 be reduced in height. However, the report states that *"all of the noise wall designs presented within this Report reflect the RTA procedures as contained within the ENMM"*. Thus it is clear that the height decreases have not been found to affect compliance with the ECRTN.	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Overshadowing by noise barriers	Table 91 in the EA identifies several locations where solar access may be affected by noise barriers and the issue is acknowledged in general terms in the Heggies report. The submissions report addresses overshadowing at two specific locations (pp.190, 242). Note that there may be a conflict with managing light spill impacts (Submissions Report, p.226)	RTA to review the need for a study of potential loss of solar access. If necessary, a study should be undertaken	*The environemntal assessment has adequately considered the potential for solar access impacts from new or relocated noise walls in the Urban Design and Visual Impact Assessment section. The potential for soalar access imapcts from new or relocated noise walls is considered minimal and as such, further consideration is not considered considered necessary. As mentioned in the submissions report it is not proposed to include transparent noise wall panels in the M2 Upgrade at this point in time.*	Issue closed
Maximum noise level assessment only undertaken at one location	The residence at 3 Horwood Avenue, Baulkham Hills was selected for an assessment in terms of maximum noise levels (p.112-113). The assertion that this location has the potential to be significantly affected is reasonable, and is a reasonable basis for selecting this site. However, many of the changes discussed in the dot points on p.113 would only apply at this location	Heggies to perform an additional maximum noise level assessment at a more typical location, or indicate why such an additional assessment is not warranted	*Maximum noise level assessments are generally undertaken on the basis of a potential change in vehicle usage likely to create an increase in the occurrence of maximum noise level events. For the M2 upgrade project, the following factors were taken into account: 1 Is there a significant increase in Heavy Vehicle (HV) numbers or HV percentage? 2 Is there a "new" or "changed" source of HV noise? 3 Is there a road or traffic condition, eg new toll booth causing slowdown and acceleration of traffic flow, and hence likely to generate new maximum noise level events? The analysis of the project resulted in only one such instance – the new on/off ramps at Windsor Road – where the maximum noise level assessment took place. Maximum noise levels events are noted by the community as a significant issue along the existing M2 Motorway. Available mitigation measures, however, have limited ability to reduce the number or magnitude of such events. Undertaking an additional maximum noise level assessment would not provide any additional information to better manage the issue or potential impacts of the upgrade.*	It is a reasonable conclusion that the only proposed change that could affect exposure to noisy events is the ramps at Windsor Road. Elsewhere, exposure to noisy events will not change significantly. Issue closed

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Signage to reduce engine brake use	Heggies only recommend signage to discourage engine brake use on the west-facing Windsor Road ramps. It is recommended that such signs be installed at all locations were truck engine brake use is indicated, such as exit ramps, downhill sections and toll booth approaches	Heggies to review whether such a recommendation has merit	*The RTA has developed a Sydney-wide strategy for the installation of signs on all major truck routes at strategic locations advising truck drivers to limit the use of compression brakes in the vicinity of residential areas. There are already two signs on the M2 motorway located prior to Windsor Road eastbound and west of Lane Cove Road westbound. Therefore, under the current strategy, it is not proposed to put additional signs along this motorway. Previous research on the effects of the use of signage on heavy vehicle driver behaviour has shown that a proliferation of signs only serves to reduce their overall effectiveness rather than provide additional noise relief for affected residences. The RTA has successfully trialled noise camera technology as a measure to reduce compression braking in urban environments. Model laws have been proposed to address engine brake noise. The proposed laws however have not been adopted in any Australian state to date and therefore there is currently no regulation limiting engine brake noise. Should a suitable regulation be made, the inclusion of noise cameras on the M2 motorway would be considered.*	Issue closed. See also Section 8.0 below.

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Manual toll-booths	On one occasion during our site inspection, noise from trucks deceleration and accelerating was evident from the nearest side-street. The resident we spoke to informed us this was due to the tollbooth. It is recommended that the option of installing electronic tolling only be investigated	Heggies to review whether such a recommendation has merit	*As described in section 3.1.4 of the Environmental Assessment, Full Electronic Toll Collection (FETC) is not proposed as part of the M2 Upgrade. The recommendation to include FETC could not be made on the grounds of noise mitigation only, and there are many factors that would need to be considered. Currently the toll collection points on the M2 Motorway at Pennant Hills Road and the main toll plaza at North Ryde accept electronic payment (tag) or cash. Although there are new toll roads in Australia that have been constructed in recent years that utilise FETC, it was decided that a move to electronic only payment would not be included as part of the M2 Upgrade. There are still a large number of existing users that do not use the motorway regularly and prefer to pay the toll with cash rather than electronic payment. The M2 Motorway operator would only consider removing the cash option of payment for these customers when the number of cash users dropped to such a level that retention of this payment method could not be justified. The M2 Upgrade does not preclude FETC, however this would be the subject of further consideration including costs of implementation and impacts on the traffic network in the M2 corridor.*	Issue closed
Vibration	No impacts expected	None required	-	-

* See Appendix E

7.6 Construction noise and vibration assessment

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Some sound power levels in Table 12 may be low	Appendix D herein provides a comparison of a small sample of sound power levels in Table 12 and sound power levels given in Annexe C of British Standard BS5228. Some of the Table 12 sound power levels are lower than the BS5228 sound power levels, suggesting that Heggies' noise level predictions may be too low	Heggies to provide a comparison between the Table 12 sound power levels and those of an accepted standard	*The Sound Power Levels as used in the EA are taken from Heggies' in-house noise database and reflect values as measured in the field on numerous recent projects (eg Westlink M7) under Australian conditions. Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.*	Issue closed. See also Section 8.0 below.
Noise sources associated with hydroblasting seem incomplete	The list of noise sources associated with hydroblasting shown in Table 12 of the Heggies report does not include the spray itself. Noise from the spray can be significant, particularly if the spray is being used to break up concrete	Heggies to provide clarification	*The construction noise assessment as contained within the EA represents an assessment completed using preliminary information at an early stage of the project's timeline. Heggies were provided with equipment lists for the assessed scenarios based upon the most up-to-date information available. These equipment lists are now being updated with detailed specific machinery information. Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.*	Issue closed. See also Section 8.0 below.
Sound power levels for tunnelling equipment not given	Sound power levels for the roadheader, rock drill and shotcrete rig not given in Table 12 or anywhere else	Heggies to provide sound power levels	*A combined total Sound Power Level of 120 dBA was used for the assessment of Tunnelling activities, based on recent Heggies' Brisbane-based tunnelling projects. Confirmation of construction noise levels will be part of the noise management process for tunnelling work.*	Issue closed

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Compliance with noise criteria	The Heggies report shows general compliance with noise criteria during the day, but significant exceedances during the evening and, in particular, the night. Exceedences of the sleep disturbance screening criteria are also indicated. The noise mitigation strategies discussed and recommended are sufficient to address these impacts	None required	-	-
Operational noise impact management when noise walls are relocated	While construction noise impacts may be worse in cases where new noise walls cannot be built before demolition of existing walls, relocating noise walls opens the opportunity to raise the height of a wall if acute impacts are identified	Consideration should be given to potential operational noise benefits when assessing options for noise wall relocation	*The EA has considered the heightening of relocated noise walls where three or more acute properties are apparent in the 2021 Future Design scenario in accordance with the ENMM.*	The response by Heggies indicates that the benefits of increasing wall heights in all cases where barriers are being relocated have been found to be insufficient to justify a height increase. Issue closed
Community liaison	Proposed community liaison measures include a dedicated telephone number, direct communication with residents, information sessions, leafleting and other measures. There is reference to the RTA guideline *Community Involvement and Communications* in the Revised Statement of Commitments	None required	-	-

Issue	Discussion	Recommended action	Heggies/RTA response*	MDA response
Night-time noise impacts	The assessment of night-time noise impacts, the discussion of mitigation options and recommendations for noise management are adequate	None required	-	-
Assessment of maximum noise levels from construction activity may be incomplete	Maximum noise levels are assessed against the screening criteria but not against the 60-65dBA criteria, even though the *Application Notes – NSW Industrial Noise Policy* makes reference to the ECRTN (p.19 of the Heggies report). It is not clear why an assessment against the 60-65dBA criteria has not been undertaken	Heggies to provide clarification	*Assessment of maximum noise levels was made against the screening criterion contained in the ECRTN, namely an examination of maximum noise levels against the ambient background noise level (without further filtering with respect to the absolute noise level). This is considered sufficient for evaluating the potential impacts at the EA stage of a project and in line with ECRTN guidance. We are unsure as to the reference above to … "60-65dBA criteria" … in relation to construction noise and vibration. The potential for sleep disturbance will be further assessed in comprehensive Construction Noise Impact Statements that will be prepared for works that would be undertaken outside of standard construction hours.*	Issue closed
Options for mitigating ground-borne noise and vibration during tunnel widening works	The Heggies report acknowledges that mitigation measures are limited and recommends consideration of temporarily relocating residents who are disturbed by the noise or vibration	None required	-	-
Vibration due to construction activity	The Heggies report shows compliance with the vibration criteria. The recommendations for management of vibration impacts is adequate	None required	-	-

* See Appendix E

7.7 Response to community submissions

The *Roads and Traffic Authority – M2 Upgrade Project – Submissions and Preferred Project Report* dated 23 August 2010 prepared by AECOM Australia Pty Ltd has also been reviewed. Issues not identified previously in this report are listed below.

Page*	Issue	RTA response	MDA response	Recommended action	Heggies/RTA response**	MDA response
22	Omission of 5dBA penalty for high noise impact construction work	A 5dBA penalty is not warranted as worst-case sound power levels have been used	Sound power levels may not be worst-case. See Section 7.6 above	Heggies to provide a comparison between the Table 12 sound power levels and those of an accepted standard	*The Sound Power Levels as used in the EA are taken from Heggies' in-house noise database and reflect values as measured in the field on numerous recent projects (eg Westlink M7) under Australian conditions. Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.*	Issue closed. See also Section 8.0 below.
26	"DECCW allows three hours of high noise impact activity followed by a minimum of one hour respite."	"Noted."	It is our understanding that the DECCW can seek to impose such restrictions. However, respite periods, like all mitigation measures, should be subject to a test of feasibility and reasonableness before being imposed	None required	-	None required. See also Section 8.0 below.

Page*	Issue	RTA response	MDA response	Recommended action	Heggies/RTA response**	MDA response
178	Requests for increases in heights of noise walls	A height increase of 1.2m resulted in reductions in noise levels of 0.4-2.8dBA. Construction of new 3.6m high walls resulted in reductions in noise levels of 0.4-3.4dBA	It is not clear from the Submissions Report why these additional mitigation measures were not considered feasible or reasonable. However, it is our understanding that a reduction of 5dBA is necessary before a noise barrier is considered reasonable	Heggies to provide clarification	*This additional assessment was completed for information purposes to determine the effect of increasing the height of already high existing walls in response to submissions. As indicated above, the noise benefit in increasing the height of existing noise barriers was marginal and did not satisfy the cost-effectiveness, practical and feasible criteria contained within the ECRTN or ENMM.*	The height increases discussed in the RTA response were consistent with the findings of the Heggies report that such increases were not reasonable. Issue closed
182	Use of signage to discourage compression braking in residential areas	"...the use of such signage is not considered to be an effective mitigation measure."	According to the Heggies report, *"some success has been achieved on certain major arterial routes via the use of signage to promote awareness of their use in residential areas."* Some success with signage has been reported in Victoria, but none of the work assessing the efficacy of signage in Victoria has been done with much rigour	RTA to provide evidence that signage is not effective. If none is available, trials should be undertaken and the effectiveness of the signs evaluated. If the results are positive and are available in a timely manner, signs should be used in appropriate locations as part of the M2 Upgrade project	*A paper presented at the November 2004 Acoustics Conference in Queensland titled "A Vehicle Maximum Noise Study" examined the effects of the installation of fixed speed cameras on changes in the application of audible engine brakes. A conclusion being audible engine brakes were applied on 25% of all heavy vehicle passbys where the preexisting road geometry was conducive to even the slightest driver hesitation and that the installation of engine brake advisory signs had little effect in reducing audible engine brake use in heavy vehicles.*	Issue closed. See also Section 8.0 below.

Page*	Issue	RTA response	MDA response	Recommended action	Heggies/RTA response**	MDA response
204	Impacts on visual amenity	"Noise walls would be designed in a manner to avoid the ad-hoc stepping in wall height seen on the existing M2 Motorway."	According to Appendix H of the Heggies report, the two new noise barriers will be of constant height (including wall NW-W-3001 which, according to the submissions report, is now likely to be 3.6m high). However, many of the relocated walls (including the one wall increased in height) will be built with varying wall heights	RTA to review visual impacts associated with stepping of wall heights	*The Urban Design and Visual Impact section of the Environmental Assessment makes the observation that the noise walls are visually dominating components of the motorway corridor, Currerntly there are random changes in the height of noise walls and this does not necessarily complement the visual context of the surrounding environment or align with a preferred urban design outcome. As part of the M2 Upgrade Urban Design concept (as described in technical paper 4) a detailed noise wall strategy was developed in accordance with the RTA's Noise Wall Design Guidelines (2006). The primary aim in the design of noise walls is to ensure that noise impacts on the motorways's neighbours are minimised as far as reasonably possible. However, the strategy notes that there are opportunities to make noise walls visually unobtrusive and includes a number of design principles. The design principles note that random height changes and abrupt noise wall terminations will be avoided by tapering noise walls and having stepped noise wall sections consistent with the urban design pattern and treatment and colour. This does not mean that all relocated or new noise walls would be the same height along their length. New and relocated noise walls may change in height in accordance with the urban design principles of the noise wall*	Issue closed. See also Section 8.0 below.

* Many issues have been raised by several submitters and are addressed at multiple locations. The page number shown is the first occurrence or the page on which the issue is addressed in the greatest detail.
** See Appendix

8.0 RESPONSE TO ISSUES

The issues requiring action were forwarded to Heggies, the RTA and Leighton Contractors. Their responses to the issues are provided in Appendix E.

The responses are all adequate, subject to the following comments:

- The use of in-house noise data and preliminary equipment schedules for estimating construction noise is sufficient for estimating community noise exposure. The assertion that the noise estimates will be more detailed in the Construction Environmental Management Plan (CEMP), the individual Construction Noise and Vibration Impact Statements (CNIS) is accepted, noting the following:
  - Noise from the hydroblasting spray itself should be measured to determine its significance (p.9)
  - The 5dBA penalty for particular noise sources should be explicitly applied (p.12)
- We have been advised that the DECCW requirement concerning respite periods during noisy construction work is a standard DECCW requirement and would be subject to the same feasibility and reasonableness tests as all other mitigation measures
- The RTA response regarding the effectiveness of engine brake advisory signs relies on only one study in which there was only one site that had an advisory sign. It is clear that there is no strong evidence either way at this stage
- The RTA responses regarding solar access and visual impacts of noise barriers fall outside MDA's areas of expertise. The assertion that the matters have been adequately addressed is accepted.

Note that some of the explanations provided by Heggies and the RTA provide detail regarding the noise and vibration assessment additional to that in the documents reviewed, including:

- The basis for using the 2dBA allowance to evaluate impacts on sections of the M2 Motorway not being upgraded (p.4)
- How impacts on passive recreation areas were implicitly considered in the assessment (p.7)
- The basis for selecting 3 Horwood Avenue for the maximum noise level assessment (p.8)
- Further details of the maximum noise level assessment (p.8)
- The evidence regarding the lack of effectiveness of signage to reduce engine brake usage (RTA response, first page).

This list is provided to draw the reader's attention to the fact that this new material is now available.

9.0 REQUIREMENTS OF THE BRIEF

The scope of work prepared by the DoP (as shown in Appendix B) requires this report to:

- Address the adequacy of the noise and vibration assessment
- Review compliance with relevant criteria
- Identify any additional information that is required to address potential shortcomings
- Review the adequacy of the management and mitigation measures identified for the project considering reasonable and feasible criteria
- Recommend conditions of approval that may be applied to the project to minimise, mitigate and/or manage noise amenity impacts to achieve regulatory and best practice standards.

Requirement	Major points to note	Conclusions
To address the adequacy of the noise and vibration assessment	• The noise and vibration assessment has been undertaken in accordance with the ECRTN as required by the Director General • The ECRTN has been interpreted in accordance with the ENMM • Operational and construction noise impacts have been assessed at all noise-sensitive premises covered by the DGRs	The noise and vibration assessment is adequate
To review compliance with relevant criteria	• ENMM criteria adopted for identifying 'acute' impacts • Operational and construction noise criteria exceeded in some cases. In all cases where excesses are indicated, noise mitigation has been considered and, where feasible and reasonable, recommended for implementation • Compliance with vibration criteria appears certain	Compliance with the relevant criteria has been demonstrated
To identify any additional information that is required	• Issues requiring additional information were identified • Response to the issues requiring clarification were adequate	No further additional information is required
To review the adequacy of the management and mitigation measures	• Where necessary, feasible and reasonable noise and vibration mitigation measures have been recommended • In all cases, the mitigation measures either achieve compliance with the operational or construction criteria, or provide reasonable noise reductions	The noise and vibration management and mitigation measures appear adequate
To recommend conditions of approval that may be applied to the project	• Compliance with the ECRTN for operational noise and the ICNG for construction noise has been demonstrated	No additional conditions of approval have been identified

10.0 CONCLUSIONS

The noise and vibration impact assessment for the M2 Upgrade project has been reviewed using a 'general overview and reasonable checking' approach. The review addressed the relevant sections of the *M2 Upgrade Environmental Assessment* and the *Submissions and Preferred Project Report*, as well as related documents.

A range of issues were identified. Many of these issues were addressed adequately in the original documents. Those requiring clarification or action were passed on to Heggies, the RTA and Leighton Contractors. In all cases, the responses by Heggies or the RTA adequately clarified the situation.

Provided the comments in Section 8.0 above are considered, there are no outstanding issues at this time.

The assessment undertaken by Heggies and the advice provided by the RTA in the Submissions Report adequately address the Director General's requirements regarding noise and vibration impacts. If their recommendations are implemented, noise and vibration impacts will be adequately mitigated.

APPENDIX A

ACOUSTIC TERMINOLOGY

dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.

Noise is often not steady. Traffic noise, music noise and the barking of dogs are all examples of noises that vary over time. When such noises are measured, the noise level can be expressed as an average level, or as a statistical measure, such as the level exceeded for 90% of the time.

L_{10}	The noise level exceeded for 10% of the measurement period. This is commonly referred to as the average maximum noise level.
L_{10}18hr	The arithmetic average of the 18 one-hour L_{10} measurements (or predictions) between 0600-0000hrs.
L_{Aeq}	The equivalent continuous sound level. This is commonly referred to as the average noise level and is measured in dBA.
$L_{Aeq,15h}$	The L_{Aeq} noise level measured over a 15-hour period, in dBA. For road traffic noise measurements, the 15-hour period is usually 7am-10pm (0700-2200hrs).
$L_{Aeq,9h}$	The L_{Aeq} noise level measured over a 9-hour period, in dBA. For road traffic noise measurements, the 9-hour period is usually 10pm-7am (2200-0700hrs).
L_w (or SWL)	Sound Power Level. The level of total sound power radiated by a sound source.

APPENDIX B

INVITATION TO TENDER

NSW GOVERNMENT | Planning

Contact: Kylie Seretis
Phone: (02) 9860 1518
Fax: (02) 9895 7670
Email: slrmail@planning.nsw.gov.au

Mr Neil Huybregts
Marshall Day Acoustics
6 Gipps St
Collingwood Victoria 3066

File: 10/15261

22 JUL 2010

Dear Mr Huybregts

DoP2010/174 Invitation to Tender: M2 Upgrade: Independent review of the noise assessment.

The Department invites your organisation to tender for the above project. Essentially, the services of a suitably qualified and experienced service provider are required to provide a brief overview report to the Department on the noise impact assessment of the M2 Upgrade.

The Department has received a Major Project Application for the upgrade (widening) of the existing M2 Motorway in Sydney, New South Wales. The project comprises:

- widening and/or provision of a third lane along sections of the eastbound and westbound carriageways between Windsor Road and Lane Cove Road;
- provision of new on and off-ramps at Windsor Road, a new on-ramp at Christie Road and a new off-ramp at Herring Road;
- widening and provision of a third lane eastbound and westbound in the Norfolk Tunnel;
- restoration of the westbound breakdown lane and provision of 3.5 metre wide traffic lanes between Lane Cove Road and Beecroft Road;
- removal of the Beecroft Road bus on and off-ramp;
- upgrade to the intersection of the M2 Motorway/Windsor Road, and the Christie Road/Talavera Road and Herring Road/Talavera Road intersections; and
- upgrade to the M2 Motorway Intelligent Transport System.

The project is classified as a Major Project by order declared by the Minister for Planning on the 24 February 2009 and therefore will be subject to assessment under Part 3A of the *Environmental Planning and Assessment Act 1979* (the Act) and the Minister for Planning is the approval authority. The project also meets the definition of 'critical infrastructure' pursuant to section 75C of the Act by virtue of the declaration by the Minister for Planning on 24 February 2009, with respect to the project being essential to the State for economic, social and environmental reasons.

Director-General's requirements were issued for the project on 6 April 2009, identifying noise as a key environmental assessment requirement. The Environmental Assessment for the project was completed in May 2010 and was available for public exhibition between 19 May and 21 June 2010. Proponent's response to submissions is expected to be completed and available in late July 2010

Scope of Work

The Department requires an independent peer review of the noise impact assessment undertaken for the project as part of its Environmental Assessment.

The project will entail a review and comment on:

1. the technical adequacy and completeness of the noise assessment including both the methodology, modelling assumptions and/or approach undertaken;
2. review the changing noise environment since the opening and operation of the M7 Motorway;
3. the RTA's response to the noise issues raised in submissions received for the project (the Submissions Report),
4. the adequacy of management and mitigation measures identified for the project considering reasonable and feasible criteria;
5. prepare a brief report for the Department on the findings of the review, including:
    - adequacy of the noise assessment;
    - compliance with relevant criteria;
    - identify any additional information that is required to address potential shortcomings;
    - adequacy of the management and mitigation measures identified for the project considering reasonable and feasible criteria; and
    - recommended conditions of approval that may be applied to the projects to minimise, mitigate and/ or manage noise amenity impacts to achieve regulatory and best practice standards.

Available Information

Key documents include:

- Director-General's Requirements;
- M2 Upgrade Environmental Assessment;
- RTA's Submissions Report and Preferred Project Report;
- a copy of the original EIS and detail design assessment; and
- compliance noise monitoring conducted by Hills Motorway and RTA.

Reporting and Timing

It is expected that an inception meeting will be held in the week commencing 26 July 2010 between the service provider and Department representatives to discuss the scope of the works and to distribute copies of the Environmental Assessment, the subject of the review.

The service provider will be required to present a draft report outlining its findings by no later than **18 August 2010** and a final report incorporating any comments made by the Department (as relevant) by no later than **25 August 2010**, unless a later date is agreed to by the Department in writing.

Response to this brief

The response to this brief should include:

1. a short discussion on the work involved to meet the requirements of this brief;
2. details of all persons who will be involved with the work, including their qualifications and experience; and
3. a commitment to meeting the timeframe.

Tender Requirements

Your organisation is invited to provide a written tender (an email response with attachment is acceptable) to perform the above scope of works. The tender should include a completed *Value of Financial Offer form* (template attached) summarising your tender price.

Would you please ensure the tender is provided on company letterhead (with ABN identified), is dated and contains the following:

1. a signature from an authorised representative from your organisation
2. the timeline or program for deliverables
3. a completed *Value of Financial Offer Form* which provides the following details:
   - an upper limiting fee (inc GST) for the project
   - the number and type of meetings costed in the tender
   - a breakdown of hourly rates per task
   - the hourly rates payable to the person/people proposing to undertake the work
   - the cost per person per task
   - the position/role of the person/people proposing to undertake the work; and
   - details of any disbursements sought.

This work will require Professional Indemnity Insurance coverage of a minimum of $1M. If successful, your organisation will be engaged under the Department's *Professional Services Contractor Agreement* (template attached).

Please forward your tender to slrmail@planning.nsw.gov.au by **10am on Wednesday 28 July 2010**.

If you require clarification of any of the above information, please contact the Contracts team on slrmail@planning.nsw.gov.au or on (02) 9860 1518.

Yours sincerely

Giovanni Cirrilo
Executive Director, Urban Renewal & Major Sites

Attachments

- ***Value of Financial Offer Form*** **template**
- ***Professional Services Contractor Agreement*** **template**

APPENDIX C

NOISE MODEL INSPECTION

Chainage	Object inspected	Side of road	Aspect inspected	Details	Comments
4100	Residence	Eastbound	Ground height	Base of building at RL 86.62 Nearest point on terrain at RL 86.74	Consistent
4300	Noise source	Eastbound	Cars – 18-hour volume (2008)	In model: 22,079 vehicles In report: 22,079 vehicles (14,5897 from the M7 + 7,482 from Old Windsor Road)	Consistent
			Cars – traffic speed (2008)	In model: 94km/h In report: 94km/h (M7)	Consistent
			Cars – noise source height	Noise source at RL 71.79 Road elevation: RL 71.79	Consistent
			Cars – 18-hour volume	In model: 27,668 vehicles In report: 27,539 vehicles (48,360 x 0.86 – 14,790 x 0.95)	Consistent (difference is due to rounding)
			Cars – traffic speed	In model: 94km/h In report: 94km/h (M7)	Consistent
7800	Noise barrier	Eastbound	Base and top height (near chainage 7800)	Base height: RL 85.94 Top height: RL 89.32 (equivalent to a wall height of 3.4m	Visual appearance of wall consistent with height of 3-4m
			Base and top height (just beyond chainage 7800)	Base height: RL 85.46 Top height: RL 89.71 (equivalent to a wall height of 4.3m	
8700	Noise source	Westbound	Cars – 18-hour volume	In model: 31,924 vehicles In report: 32,143 vehicles (50,430 x 0.87 – 15,040 x 0.78)	Consistent (difference is due to rounding)
			Cars – traffic speed	In model: 84km/h In report: 84km/h	Consistent

Chainage	Object inspected	Side of road	Aspect inspected	Details	Comments
			Truck exhausts – 18-hour volume	In model: 3,466 vehicles In report: 3,247 vehicles (50,430 x 0.13 - 15,040 x 0.22)	Consistent (difference is due to rounding)
			Truck exhausts – traffic speed	In model: 84km/h In report: 84km/h	Consistent
9800	Noise barrier	Westbound	Base of barrier	Barrier: RL 106.5 Nearest point on road: RL 106.7	Consistent
			Barrier height	In model: 3.6m Google Street View: 3.4m	Consistent
11100	Residence	Westbound	Building height	In model: 4m	Reasonable height for a single-storey dwelling
			Base of building	Building: RL 100.1 Nearest ground elevation line: RL 100	Consistent
11800	Noise source	Westbound	Cars – 18-hour volume	In model: 42,578 vehicles In report: 42,488 vehicles (46,690 x 0.91)	Consistent (difference is due to rounding)
			Cars – traffic speed	In model: 84km/h In report: 80km/h (difference is not significant)	Not consistent
			Truck tyres – 18-hour volume	In model: 4,112 vehicles In report: 4,202 vehicles (46,690 x 0.09)	Consistent (difference is due to rounding)
			Truck tyres – traffic speed	In model: 84km/h In report: 80km/h (difference is not significant)	Not consistent
12700	Noise barrier	Eastbound	Base of barrier	Barrier: RL 61.63 Nearest point on road: RL 61.64	Consistent

Chainage	Object inspected	Side of road	Aspect inspected	Details	Comments
			Barrier height	In model: 3.2m transitioning up to 4.8m Google Street View: A height transition is apparent over several lengths of noise barrier panel from approximately 3.2m to 5.0m	Consistent
17300	Noise source	Eastbound	Cars – 18-hour volume	In model: 32,720 vehicles In report: 32,726 vehicles (45,300 x 0.92 - 10,170 x 0.88)	Consistent (difference is due to rounding)
			Cars – traffic speed	In model: 87km/h In report: 84km/h (difference is not significant)	Not consistent
			Truck engines – 18-hour volume	In model: 2,410 vehicles In report: 2,404 vehicles (45,300 x 0.08 - 10,170 x 0.12)	Consistent (difference is due to rounding)
			Truck engines – traffic speed	In model: 87km/h In report: 84km/h (difference is not significant)	Not consistent

APPENDIX D

SPOT COMPARISON OF CONSTRUCTION EQUIPMENT SOUND POWER LEVELS

Annex C of British Standard BS5228-1:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* contains a comprehensive list of construction equipment with typical sound power levels. The table below compares the sound power levels given in Table 12 of the Heggies report with those given in BS5228 for a random sample of equipment items.

Item		Sound power levels (dBA)	
Heggies	BS5228	Heggies	BS5228
Excavator 30t	Tracked excavator 14t	109	111
Vibratory roller	Vibratory roller 4t	106	105
Jack hammer	Breaker mounted on wheeled backhoe	115	120
Drilling rig	Tracked drilling rig with hydraulic drifter	104	110
Piling rig (bored)	Large rotary bored piling rig	107	111

According to BS5228, the values in Annex C *"will apply in the majority of cases, but can be lower or higher due to the make and maintenance of the machines, their operation and the procedures adopted when work is carried out."*

In some cases, the values used by Heggies appear to be under-estimates.

APPENDIX E

RESPONSE TO ISSUES REQUIRING CLARIFICATION

16 September 2010

10-7434 DoP Review Responses 20100916

Leighton Contractors
Level 4, Tower A
799 Pacific Highway
CHATSWOOD NSW 2067

Attention: Mr Andrew Marsonet

Dear Andrew

M2 Upgrade DoP Review - Marshall Day Acoustics
Response to Submissions

We enclose our responses to the queries raised by Marshall Day as part of the NSW Department of Planning's review of the noise studies supporting the Environmental Assessment and Submissions Report for the M2 Upgrade Project.

Please do not hesitate to call if you have any queries regarding the enclosed.

Yours sincerely

PETER GEORGIOU
Director
(call at any time on 0421 915 597)

Table 1 Marshall Day Queries - Part 1

General		
Issue	**Discussion**	**Recommended action**
Pre-qualification to undertake road traffic noise assessments	It is not stated in the Heggies report whether Heggies is pre-qualified with the RTA to undertake this type of work	Request evidence of pre-qualification from Heggies
Heggies Response There is currently no formal "qualification" process for undertaking road traffic noise assessments for the RTA in New South Wales, unlike some other specialist areas where Panels have been established, eg the RTA Structural Dynamics Panel (to which Heggies belongs). The RTA accepts road traffic assessments from consultants like Heggies (Wilkinson Murray, Renzo Tonin, etc) where the consultants concerned have established a long track record (in some cases decades) of carrying out such studies to an acceptable standard.		
Quality system certification	The Heggies report states that their Quality System is certified under ISO9001:2000 (p.2). This standard has been superseded	Request evidence of certification under ISO9001:2008 from Heggies
Heggies Response The EA report made use of text from an outdated template which referred to the incorrect ISO9001 standard. Heggies' current certification is attached. It may be noted that in 2009 SLR received the SAI Global Quality Assurance Award for Enterprises with 50-500 staff (refer below).  Winner of the 2009 National SAI Global Quality Assurance Excellence Award for companies with 50 to 500 staff		
Noise monitoring		
Issue	**Discussion**	**Recommended action**
Coverage across study area	It appears from Appendix B of the Heggies report that noise monitoring locations were selected in a manner that provided good coverage of the study area, apart from chainages 5600-6700, 9000-9500 and 10300-11300, where there appear to be gaps. However, given that the computer noise model demonstrated good agreement with the measured noise levels, it is likely that the modelled noise levels are reliable across the whole of the study area	Inquire with Heggies regarding the reasons (if any) for not measuring in the areas identified

Heggies Response

The monitoring undertaken for the study took place in two parts.

1 The initial 24 locations were chosen by Hills Motorway – they had been the subject of previous (regular) M2 noise surveys, thereby enabling historical trends to be observed.

2 The second set of noise monitoring locations were selected by Heggies after the initial round of noise modelling for the motorway. The noise modelling identified areas exposed to potentially higher road traffic noise (in either "existing" and "future" scenarios).

Any remaining areas were observed to be either (a) locations not exposed to as high level of road traffic noise as areas covered by the monitoring, or (b) locations whose exposure (road alignment, terrain, presence of noise barrier, proximity of houses, etc) was very similar to areas already covered by the monitoring.

Weather conditions	The Heggies report states that 'potentially adverse weather' was 'identified', but it is not clear whether days with adverse conditions were excluded from the analysis	Request clarification from Heggies

Heggies Response

All monitoring periods were excluded from the analysis where rain was apparent (≥5 mm) and/or wind speeds were in excess of 5 m/sec.

Number of days of monitoring at each site	Not stated	Request clarification from Heggies

Heggies Response

The total number of days at each site varies, primarily due to access reasons at the property for collection of the logger at the conclusion of the monitoring period. Noise logging was however completed for a minimum of seven days at each monitoring location. Please be aware of a "pdf-macro" date entry error which occurred for the pdf summary graphs in Appendix C for locations S1-6, S1-7, S2-2, S2-7 and S2-8, where the end date quoted in the graph title should have been one week later, ie a Tuesday start date to the Wednesday or Thursday of the following week.

Number of days with acceptable weather conditions	Not stated	Request clarification from Heggies

Heggies Response

The analysis used a duration of a full week of monitoring, taking into account any weather-affected data being rejected. Data impacted by adverse weather was excluded on a 15-minute period basis. For isolated instances of adverse weather (refer standard RTA recommendations) 15-hour daytime or 9-hour night-time period L_{Aeq}'s were retained for the analysis. On days in which significant periods of rain and/or wind occurred, the entire 15-hour daytime or 9-hour night-time period data record of that day was excluded from the analysis.

Removal of spurious (non-road traffic noise) data	The graphs in Appendix C of the Heggies report show some spurious data. The Heggies report states that 'data was processed' (p. 39)	Request clarification from Heggies

Heggies Response

The graphs in Appendix C contain the raw logger data before filtering, as their title suggests. Following filtering of wind/rain data (adverse weather), some (modest) additional filtering, involving rejection of isolated 15-minute readings, was made where isolated "spikes", clearly not related to road traffic noise, were excluded from the analysis of the associated 15-hour and 9-hour L_{Aeq} average periods.

Criteria		
Issue	**Discussion**	**Recommended action**
Impacts adjacent to sections of the M2 not being upgraded	Impacts adjacent to sections of the M2 not being upgraded have been assessed in terms of the +2dBA criterion only. It is not clear from a brief review of the ECRTN and the ENMM what the basis for using only the +2dBA criterion is.	Request clarification from Heggies

Heggies Response

With reference to areas outside of the M2 Upgrade Project area, reference is made to pp15-16 of the ECRTN where the following is noted:

1 Resources are generally limited for noise control on existing roads, and strategies need to take into account what is reasonable and feasible. Retrofitting of engineering-type noise controls is generally not recommended as a suitable strategy for addressing existing undesirable levels of road traffic noise impact where no upgrading or redevelopment is occurring. The benefits from retrofitting noise controls are usually limited to relatively small areas, whereas, to be effective, any strategy needs to be able to address the widespread nature of the impacts. It is also noted that there are often high costs and practical difficulties associated with retrofitting noise controls.

2 The retrofitting of engineering-type noise controls to existing roads where no upgrading or redevelopment is occurring should be limited to situations where there are acute noise impacts that require prompt attention. The Noise Abatement Strategy that has been developed and implemented by the RTA on a priority basis for State-owned roads is an appropriate response for addressing acute existing traffic noise impacts. This strategy directs resources to receivers experiencing the highest road traffic noise impacts.

The environmental assessment was able to identify acute houses outside the areas that would be directly affected by the upgrade in both the “existing” and “future” scenarios. Based on point 1 above, however, it is not considered reasonable or feasible for the project to specifically address those acute properties outside the project area. The environmental assessment could be used, where appropriate, for further investigation of noise issues outside of the current upgrade project as part of the RTA’s ongoing Noise Abatement Program.

Given the “Redevelopment” nature of the project, the related 2 dBA allowance goal was used as an additional source of information regarding project impacts. This was determined in conjunction with the RTA.

Noise Modelling		
Issue	**Discussion**	**Recommended action**
Traffic speed for 2021 Design Scenario same as the measured 2008 speeds	Widening of the M2 Motorway is likely to improve traffic flow and hence increase average traffic speeds	Request a determination of the likely (if any) increase in speed and what effect this would have on noise levels

Heggies Response

The 2021 model makes use of the same speeds as the 2008 model - except where a speed increase is proposed as part of the project, eg westbound traffic from Lane Cove Road to Beecroft Road.

Changes in average speeds on the motorway in 2021 are not anticipated, given that in the existing situation the motorway is generally free flowing at all times outside of the peak hours.

Some traffic speeds in model not consistent with report	The traffic speeds in the noise model at chainages 11800 and 17300 were not consistent with the traffic speeds at the closest point in Table 32 of the Heggies report (see below - **Table 2**)	Request clarification from Heggies regarding how the speeds in the model were obtained

Heggies Response

Traffic volumes and speeds were monitored by traffic consultants at discrete points along the length of the motorway during the Environmental Assessment phase of the project.

The difference in the speeds as highlighted in **Table 2** are as a result of the measured speeds (which were in this instance to the west of the Toll Gates where no noise sensitive receivers are present) being conservatively adjusted to better reflect the average speeds along this section of the motorway where the residential receivers are actually located (at a distance of 1 km to 2 km from the measurement site). This was based on site observations and measurements.

Table 2 Marshall Day – SoundPLAN Model Investigation

Chainage	Object inspected	Side of road	Aspect inspected	Details	Comments	Heggies Response
11800	Noise Source	Westbound	Cars – 18-hour volume	In model: 42,578 vehicles In report: 42,488 vehicles (46,690 x 0.91)	Consistent (difference is due to rounding)	-
			Cars – traffic speed	In model: 84km/h In report: 80km/h (difference is not significant)	Not consistent	The measured speed to the west of the Toll Gates was adjusted conservatively to better reflect the average speed of the motorway at the residential receiver locations.
			Truck tyres – 18-hour volume	In model: 4,112 vehicles In report: 4,202 vehicles (46,690 x 0.09)	Consistent (difference is due to rounding)	-
			Truck tyres – traffic speed	In model: 84km/h In report: 80km/h (difference is not significant)	Not consistent	The measured speed to the west of the Toll Gates was adjusted conservatively to better reflect the average speed of the motorway at the residential receiver locations.
17300	Noise Source	Eastbound	Cars – traffic speed	In model: 87km/h In report: 84km/h (difference is not significant)	Not consistent	The measured speed to the west of the Toll Gates was adjusted conservatively to better reflect the average speed of the motorway at the residential receiver locations.

			Truck engines – traffic speed	In model: 87km/h In report: 84km/h (difference is not significant)	Not consistent	-

Table 3 Marshall Day Queries - Part 2

General		
Issue	**Discussion**	**Recommended action**
Neither the ECRTN or the ENMM sets criteria for pre-schools, kindergartens, or child-care centres	Pre-schools, kindergartens and child-care centres are noise-sensitive. Criteria should be established for these land uses and noise impacts assessed against those criteria	Heggies to determine whether such land uses are considered to be noise-sensitive in NSW, and if so, whether there are any impacted by the M2 Upgrade project and how to mitigate the impacts.
Heggies Response In a general sense, child care centres and the like can be considered to be "noise sensitive". So, for example, many NSW Councils provide guidance documents governing the approvals process for new developments of this type. Guidance is also provided by the Association of Australian Acoustical Consultants (AAAC), once again in the context of the approval of a new development. Currently, there is no formal requirement to assess these receiver types in either the ECRTN or the ENMM. Accordingly, child care centres were not formally identified for noise investigation in the EA. It is noted also that notifications were sent to all properties within 250 m of the M2 Motorway during the development and public exhibition of the environmental assessment. No responses were received from any pre-schools, kindergartens or child-care centres.		
Neither the ECRTN or the ENMM sets criteria for potentially noise-sensitive community resources such as scout halls or community centres	Depending on the level of use, such community resources may be sensitive to environmental noise	Heggies to determine whether such land uses are considered to be noise-sensitive in NSW, and if so, whether there are any impacted by the M2 Upgrade project and how to mitigate the impacts
Heggies Response Currently, there is no formal requirement to assess non-continuous or intermittent usage spaces (eg Scout Halls, Community Halls) in either the ECRTN or the ENMM. Accordingly, such facilities were not formally identified for specific noise investigation in the EA.		
Criteria		
Issue	**Discussion**	**Recommended action**
Construction noise criteria for passive recreational spaces	The ICNG sets criteria for passive outdoor recreation spaces, of which there are a number affected by noise from the M2 Upgrade project. While it is likely that the low levels of use of such areas may lead to a determination that noise mitigation is not reasonable, it is not clear why the assessment process has not been applied to these areas	Heggies to provide clarification regarding why such areas were excluded and, if necessary, assess impacts on passive recreation spaces

Heggies Response

Passive recreation areas along the route occur in places where construction noise impacts have been examined in relation to other categories of noise sensitive receivers, eg residential, schools, etc. In these instances, the management noise levels arising from the application of ICNG criteria for the other land use categories are generally the same or more stringent than the 15-minute 60 dBA external noise level recommended in the ICNG's Table 3 for passive recreation areas. Noise mitigation in such areas has therefore already been covered by the construction noise assessment for other noise-sensitive spaces.

Operational noise criteria for passive recreation spaces	The ECRTN sets operational criteria for passive outdoor recreation spaces, of which there are a number affected by noise from the M2 Upgrade project. While it is likely that the low levels of use of such areas may lead to a determination that noise mitigation is not reasonable, it is not clear why the assessment process has not been applied to these areas	Heggies to provide clarification regarding why such areas were excluded and, if necessary, assess impacts on passive recreation spaces

Heggies Response

In relation to passive recreation areas, the ECRTN recommends that, in the situation where existing levels of traffic noise exceed the criteria (in this case a 15-hour L_{Aeq} of 55 dBA), all feasible and reasonable noise control measures should be evaluated and applied. Where this has been done and the internal or external criteria (as appropriate) cannot be achieved, the proposed road or land use development should be designed so as not to increase existing road traffic noise levels by more than 0.5 dBA for new roads and 2 dBA for redeveloped roads or land use development with potential to create additional traffic. In the present instance, the following is noted:

1 Feasible and reasonable noise control measures have been evaluated and applied along the entire route, including many of the areas along the route where noise barriers mitigate noise emissions.

2 Some passive recreation areas along the route are associated with other sensitive land uses, eg schools, who have more stringent ECRTN noise criteria which have been investigated and addressed.

3 There are no areas along the route where passive recreation areas are located where a >2 dBA increase is predicted to occur as a result of the project.

Accordingly, no specific noise mitigation for such spaces arises for the upgrade project.

Operational noise assessment

Issue	Discussion	Recommended action
Maximum noise level assessment only undertaken at one location	The residence at 3 Horwood Avenue, Baulkham Hills was selected for an assessment in terms of maximum noise levels (p.112-113). The assertion that this location has the potential to be significantly affected is reasonable, and a reasonable basis for selecting this site. However, many of the changes discussed in the dot points on p.113 would only apply at this location	Heggies to perform an additional maximum noise level assessment at a more typical location, or indicate why such an additional assessment is not warranted

Heggies Response

Maximum noise level assessments are generally undertaken on the basis of a potential change in vehicle usage likely to create an increase in the occurrence of maximum noise level events. For the M2 upgrade project, the following factors were taken into account:

1 Is there a significant increase in Heavy Vehicle (HV) numbers or HV percentage ?

2 Is there a "new" or "changed" source of HV noise?

3 Is there a road or traffic condition, eg new toll booth causing slowdown and acceleration of traffic flow, and hence likely to generate new maximum noise level events?

The analysis of the project resulted in only one such instance – the new on/off ramps at Windsor Road – where the maximum noise level assessment took place.

Maximum noise levels events are noted by the community as a significant issue along the existing M2 Motorway. Available mitigation measures, however, have limited ability to reduce the number or magnitude of such events. Undertaking an additional maximum noise level assessment would not provide any additional information to better manage the issue or potential impacts of the upgrade.

Signage to reduce engine brake use	Heggies only recommend signage to discourage engine brake use on the west-facing Windsor Road ramps. It is recommended that such signs be installed at all locations were truck engine brake use is indicated, such as exit ramps, downhill sections and toll booth approaches	Heggies to review whether such a recommendation has merit

Heggies Response

The RTA has developed a Sydney-wide strategy for the installation of signs on all major truck routes at strategic locations advising truck drivers to limit the use of compression brakes in the vicinity of residential areas.

There are already two signs on the M2 motorway located prior to Windsor Road eastbound and west of Lane Cove Road westbound. Therefore, under the current strategy, it is not proposed to put additional signs along this motorway.

Previous research on the effects of the use of signage on heavy vehicle driver behaviour has shown that a proliferation of signs only serves to reduce their overall effectiveness rather than provide additional noise relief for affected residences.

The RTA has successfully trialled noise camera technology as a measure to reduce compression braking in urban environments. Model laws have been proposed to address engine brake noise. The proposed laws however have not been adopted in any Australian state to date and therefore there is currently no regulation limiting engine brake noise. Should a suitable regulation be made, the inclusion of noise cameras on the M2 motorway would be considered.

Manual toll-booths	On one occasion during our site inspection, noise from trucks deceleration and accelerating was evident from the nearest side-street. The resident we spoke to informed us this was due to the tollbooth. It is recommended that the option of installing electronic tolling only be investigated.	Heggies to review whether such a recommendation has merit

Heggies Response

As described in section 3.1.4 of the Environmental Assessment, Full Electronic Toll Collection (FETC) is not proposed as part of the M2 Upgrade. The recommendation to include FETC could not be made on the grounds of noise mitigation only, and there are many factors that would need to be considered.

Currently the toll collection points on the M2 Motorway at Pennant Hills Road and the main toll plaza at North Ryde accept electronic payment (tag) or cash. Although there are new toll roads in Australia that have been constructed in recent years that utilise FETC, it was decided that a move to electronic only payment would not be included as part of the M2 Upgrade.

There are still a large number of existing users that do not use the motorway regularly and prefer to pay the toll with cash rather than electronic payment. The M2 Motorway operator would only consider removing the cash option of payment for these customers when the number of cash users dropped to such a level that retention of this payment method could not be justified. The M2 Upgrade does not preclude FETC, however this would be the subject of further consideration including costs of implementation and impacts on the traffic network in the M2 corridor.

Construction noise and vibration assessment

Issue	Discussion	Recommended action
Some sound power levels in Table 12 may be low	Appendix @ provides a comparison of a small sample of sound power levels in Table 12 and sound power levels given in Annexe C of British Standard BS5228. Some of the Table 12 sound power levels are lower than the BS5228 sound power levels, suggesting that Heggies' noise level predictions may be too low *(see below - **Table 4**)*	Heggies to provide a comparison between the Table 12 sound power levels and those of an accepted standard

Heggies Response

The Sound Power Levels as used in the EA are taken from Heggies' in-house noise database and reflect values as measured in the field on numerous recent projects (eg Westlink M7) under Australian conditions.

Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.

Noise sources associated with hydroblasting seem incomplete	The list of noise sources associated with hydroblasting shown in Table 12 of the Heggies report does not include the spray itself. Noise from the spray can be significant, particularly if the spray is being used to break up concrete	Heggies to provide clarification

Heggies Response

The construction noise assessment as contained within the EA represents an assessment completed using preliminary information at an early stage of the project's timeline.

Heggies were provided with equipment lists for the assessed scenarios based upon the most up-to-date information available. These equipment lists are now being updated with detailed specific machinery information.

Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.

Sound power levels for tunnelling equipment not given	Sound power levels for the roadheader, rock drill and shotcrete rig not given in Table 12 or anywhere else	Heggies to provide sound power levels

Heggies Response

A combined total Sound Power Level of 120 dBA was used for the assessment of Tunnelling activities, based on recent Heggies' Brisbane-based tunnelling projects. Confirmation of construction noise levels will be part of the noise management process for tunnelling work.

Maximum noise levels assessment may be incomplete	Maximum noise levels are assessed against the screening criteria but not against the 60-65dBA criteria, even though the *Application Notes – NSW Industrial Noise Policy* makes reference to the ECRTN (p.19 of the Heggies report). It is not clear why an assessment against the 60-65dBA criteria has not been undertaken	Heggies to provide clarification

Heggies Response

Assessment of maximum noise levels was made against the screening criterion contained in the ECRTN, namely an examination of maximum noise levels against the ambient background noise level (without further filtering with respect to the absolute noise level). This is considered sufficient for evaluating the potential impacts at the EA stage of a project and in line with ECRTN guidance. We are unsure as to the reference above to … "60-65dBA criteria" … in relation to construction noise and vibration.

The potential for sleep disturbance will be further assessed in comprehensive Construction Noise Impact Statements that will be prepared for works that would be undertaken outside of standard construction hours.

SPOT COMPARISON OF CONSTRUCTION EQUIPMENT SOUND POWER LEVELS

Annexe C of British Standard BS5228-1:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise* contains a comprehensive list of construction equipment with typical sound power levels. The table below compares the sound power levels given in Table 12 of the Heggies report with those given in BS5228 for a random sample of equipment items.

Table 4 Sound Power Levels

Item		Sound power levels (dBA)	
Heggies	**BS5228**	**Heggies**	**BS5228**
Excavator 30t	Tracked excavator 14t	109	111
Vibratory roller	Vibratory roller 4t	106	105
Jack hammer	Breaker mounted on wheeled backhoe	115	120
Drilling rig	Tracked drilling rig with hydraulic drifter	104	110

According to BS5228, the values in Annexe C *"will apply in the majority of cases, but can be lower or higher due to the make and maintenance of the machines, their operation and the procedures adopted when work is carried out.*

The Sound Power Levels as used in the EA are taken from Heggies' in-house noise database and reflect values as measured in the field on numerous recent projects (eg Westlink M7) under Australian conditions.

Note once again that confirmation of construction noise levels – especially for the more noise-intensive machinery – will be part of the noise management process for the project.

FINAL COMMENT ON CONSTURCTION-RELATED "RESPITE PERIODS"

1-hour respite for 3 hours of continuous noise intensive activities is a standard condition that DECCW write into environmental protection licences for road construction projects.

In the DECCW submission regarding the EA, it was indicated that this licence condition would be also imposed on the M2 Upgrade project.

Table 5 Marshall Day Queries - Part 3

Operational noise and vibration assessment		
Issue	**Discussion**	**Recommended action**
Overshadowing by noise barriers	Table 91 in the EA identifies several locations where solar access may be affected by noise barriers and the issue is acknowledged in general terms in the Heggies report. The submissions report addresses overshadowing at two specific locations (pp.190, 242). Note that there may be a conflict with managing light spill impacts (Submissions Report, p.226)	RTA to review the need for a study of potential loss of solar access. If necessary, a study should be undertaken

Heggies Response

RESPONSE ARE PROVIDED IN A SEPARATE REPORT

Construction noise and vibration assessment		
Issue	**Discussion**	**Recommended action**
Operational noise impact management when noise walls are relocated	While construction noise impacts may be worse in cases where new noise walls cannot be built before demolition of existing walls, relocating noise walls opens the opportunity to raise the height of a wall if acute impacts are identified	Consideration should be given to potential operational noise benefits when assessing options for noise wall relocation

Heggies Response

The EA has considered the heightening of relocated noise walls where three or more acute properties are apparent in the 2021 Future Design scenario in accordance with the ENMM.

Submissions Report				
Page	**Issue**	**RTA response**	**MDA response**	**Recommended action**
22	Omission of 5dBA penalty for high noise impact construction work	A 5dBA penalty is not warranted as worst-case sound power levels have been used	Sound power levels may not be worst-case. See lists of issues in previous emails	Depends on response to issue as raised in previous emails

Heggies Response

The Sound Power Levels as used in the EA are taken from Heggies' in-house noise database and reflect values as measured in the field on numerous recent projects (eg Westlink M7) under Australian conditions.

Comprehensive Construction Noise Impact Statements will be produced for certain noise intensive activities, particularly those required outside of standard construction hours. Confirmation of noise levels from certain construction scenarios – particularly for the more noise-intensive machinery – will be part of the noise management recommendations for these assessments.

178	Requests for increases in heights of noise walls	A height increase of 1.2m resulted in reductions in noise levels of 0.4-2.8dBA. Construction of new 3.6m high walls resulted in reductions in noise levels of 0.4-3.4dBA	It is not clear from the Submissions Report why these additional mitigation measures were not considered feasible or reasonable. However, it is our understanding that a reduction of 5dBA is necessary before a noise barrier is considered reasonable	Heggies to provide clarification

Heggies Response

This additional assessment was completed for information purposes to determine the effect of increasing the height of already high existing walls in response to submissions. As indicated above, the noise benefit in increasing the height of existing noise barriers was marginal and did not satisfy the cost-effectiveness, practical and feasible criteria contained within the ECRTN or ENMM.

182	Use of signage to discourage compression braking in residential areas	"...the use of such signage is not considered to be an effective mitigation measure."	According to the Heggies report, *"some success has been achieved on certain major arterial routes via the use of signage to promote awareness of their use in residential areas."* Some success with signage has been reported in Victoria, but none of the work assessing the efficacy of signage in Victoria has been done with much rigour	RTA to provide evidence that signage is not effective. If none is available, trials should be undertaken and the effectiveness of the signs evaluated. If the results are positive and are available in a timely manner, signs should be used in appropriate locations as part of the M2 Upgrade project

Heggies Response

RESPONSE ARE PROVIDED IN A SEPARATE REPORT

204	Impacts on visual amenity	"Noise walls would be designed in a manner to avoid the ad-hoc stepping in wall height seen on the existing M2 Motorway."	According to Appendix H of the Heggies report, the two new noise barriers will be of constant height (including wall NW-W-3001 which, according to the submissions report, is now likely to be 3.6m high). However, many of the relocated walls (including the one wall increased in height) will be built with varying wall heights	RTA to review visual impacts associated with stepping of wall heights

Heggies Response

RESPONSE ARE PROVIDED IN A SEPARATE REPORT

M2 Upgrade DoP Review - Marshall Day Acoustics
RTA Responses to issues raised by Marshall Day

Operational noise and vibration assessment		
Issue	**Discussion**	**Recommended action**
Overshadowing by noise barriers	Table 91 in the EA identifies several locations where solar access may be affected by noise barriers and the issue is acknowledged in general terms in the Heggies report. The submissions report addresses overshadowing at two specific locations (pp.190, 242). Note that there may be a conflict with managing light spill impacts (Submissions Report, p.226)	RTA to review the need for a study of potential loss of solar access. If necessary, a study should be undertaken

RTA Response

The environemntal assessment has adequately considered the potential for solar access impacts from new or relocated noise walls in the Urban Design and Visual Impact Assessment section. The potential for soalar access imapcts from new or relocated noise walls is considered minimal and as such, further consideration is not considered considered necessary. As mentioned in the submissions report it is not proposed to include transparent noise wall panels in the M2 Upgrade at this point in time.

182	Use of signage to discourage compression braking in residential areas	"...the use of such signage is not considered to be an effective mitigation measure."	According to the Heggies report, *"some success has been achieved on certain major arterial routes via the use of signage to promote awareness of their use in residential areas."* Some success with signage has been reported in Victoria, but none of the work assessing the efficacy of signage in Victoria has been done with much rigour	RTA to provide evidence that signage is not effective. If none is available, trials should be undertaken and the effectiveness of the signs evaluated. If the results are positive and are available in a timely manner, signs should be used in appropriate locations as part of the M2 Upgrade project

RTA Response

A paper presented at the November 2004 Acoustics Conference in Queensland titled "A Vehicle Maximum Noise Study" examined the effects of the installation of fixed speed cameras on changes in the application of audible engine brakes. A conclusion being audible engine brakes were applied on 25% of all heavy vehicle passbys where the pre-existing road geometry was conducive to even the slightest driver hesitation and that the installation of engine brake advisory signs had little effect in reducing audible engine brake use in heavy vehicles.

204	Impacts on visual amenity	"Noise walls would be designed in a manner to avoid the ad-hoc stepping in wall height seen on the existing M2 Motorway."	According to Appendix H of the Heggies report, the two new noise barriers will be of constant height (including wall NW-W-3001 which, according to the submissions report, is now likely to be 3.6m high). However, many of the relocated walls (including the one wall increased in height) will be built with varying wall heights	RTA to review visual impacts associated with stepping of wall heights

RTA Response

The Urban Design and Visual Impact section of the Environmental Assessment makes the observation that the noise walls are visually dominating components of the motorway corridor, Currerntly there are random changes in the height of noise walls and this does not necessarily complement the visual context of the surrounding environment or align with a preferred urban design outcome.

As part of the M2 Upgrade Urban Design concept (as described in technical paper 4) a detailed noise wall strategy was developed in accordance with the RTA's *Noise Wall Design Guidelines* (2006). The primary aim in the design of noise walls is to ensure that noise impacts on the motorways's neighbours are minimised as far as reasonably possible. However, the strategy notes that there are opportunities to make noise walls visually unobtrusive and includes a number of design principles.

The design principles note that random height changes and abrupt noise wall terminations will be avoided by tapering noise walls and having stepped noise wall sections consistent with the urban design pattern and treatment and colour. This does not mean that all relocated or new noise walls would be the same height along their length. New and relocated noise walls may change in height in accordance with the urban design principles of the noise wall