Document Information

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<th>Project</th>
<th>West Gate Tunnel Project</th>
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<tr>
<td>Client</td>
<td>Clayton Utz</td>
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<tr>
<td>Report title</td>
<td>Peer Review of Noise and Vibration (Surface) Assessment</td>
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<tr>
<td>Project Number</td>
<td>M17202</td>
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<tr>
<td>Author</td>
<td>Matthew Stead</td>
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<tr>
<td>Reviewed by</td>
<td>Tom Evans</td>
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Revision Table

<table>
<thead>
<tr>
<th>Report revision</th>
<th>Date</th>
<th>Comments</th>
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<tr>
<td>0</td>
<td>15 May 2017</td>
<td>First issue</td>
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1 Introduction

Matthew Stead has been instructed to carry out a technical peer review of the surface noise and vibration impact assessment carried out as part of the Western Distributor Environment Effects Statement (EES) on behalf of the Western Distributor Authority by Clayton Utz (refer letter of instruction dated 4th April 2017).

This review is of the following EES document ("Impact Assessment Report"):

1. West Gate Tunnel Project, Technical Report H, Surface noise and vibration impact assessment, for the Western Distributor Authority, prepared by AECOM Australia Pty Ltd, received 15-May-2017 (Final revision).

The report summarises Matthew Stead’s technical peer review. Matthew Stead’s review was supported by Tom Evans.

The technical peer review of the Impact Assessment Report is to ascertain whether the report:

(a) Adequately addresses the relevant requirements of the EES Scoping requirements and the "public works" declaration; and
(b) Is suitable to represent the noise and surface vibration related impacts of the project.

In the technical peer review Matthew Stead have been asked to:

(a) Assess the process, methodology and assessment undertaken in the Impact Assessment Report including any assessment criteria applied or assumptions relied upon;
(b) Identify and additional matters which should be considered in order to address the EES Scoping requirements, "public works" declaration or to otherwise adequately assess the likely impacts of the project;
(c) Assess the adequacy of the relevant Environmental Performance Requirements (EPRs) to manage potential adverse impacts arising from the project, and recommend any modifications you consider appropriate.

Additional documents which form the basis for the review are:


Additional documents provided with the letter of instruction are superseded by the version of the Impact Assessment Report identified above.
2 Technical peer review framework

Resonate Acoustics is a member firm of the Association of Australasian Acoustical Consultants (AAAC). The latest revision of the AAAC “Guideline for Report Writing, November 2016” in respect to peer reviews states that:

- All AAAC member firm peer reviews should adhere to the AAAC constitutional objectives.
- All Peer Review reports should identify opinions based on the following classifications:
  - Advice which is incorrect or inappropriate
  - Advice which requires clarification or additional information
  - Minor points which the peer reviewer’s may not view as the approach they would have taken however do not alter the outcome of the project.
- Use of a similar structure in Peer Review reports (to the three categories above) is recommended.
- Any Peer Review should take into account the nature of the commission which should be stated in the original consultant’s report.
- The Peer Reviewer should attempt to contact the author of the report where permitted by the client and where clarification would address questions the peer reviewer has.

These points have been taken into consideration in carrying out this technical peer review.

This technical peer review summarises the current status of the technical review, following discussions with the report authors, and is based on the document referenced in the introduction (West Gate Tunnel Project, Technical Report H, Surface noise and vibration impact assessment, for the Western Distributor Authority, prepared by AECOM Australia Pty Ltd, received 15-May-2017, Final revision).

2.1 Extent of review

The technical peer review has not included:

- Detailed review of acoustic models for construction and operational noise
- Detailed site inspections throughout the project boundary
- Calculation of construction or operational noise or vibration levels for comparison with those predicted in the Impact Assessment Report

It is the opinion of the author that the technical review has been carried out in sufficient detail to address the review requirements and the items listed above were not required.

2.2 Review of related documents (input and output)

Based on our briefing discussions, inputs to and outputs from the surface noise and vibration impact assessment is not within the scope of this technical peer review (e.g. human health, flora/fauna, etc). Inputs to and outputs from the assessment have therefore not been assessed. It is assumed that cross references and interpretation of documents (input and output) have been correctly interpreted.

2.3 Wording, formatting, grammar and minor points

Some minor points associated with wording, formatting or grammar errors in the Impact Assessment Report were noted during this review. These have not been documented in this report as they were not considered to influence the outcomes of the assessment but can be provided on request.
2.4 Discussions with authors of impact assessment

Discussions have been held with authors of the Noise and Vibration (Surface) Impact Assessment Report. A record of these discussions are:

- Phil West via phone on 6th April 2017
- Lee Evans via phone on 7th April 2017
- Lee Evans meeting / teleconference 4th May 2017
- Lee Evans via phone on 15th May 2017

The discussions were to clarify various technical points.

2.5 Modifications to the draft version of the Impact Assessment Report

This technical review report summarises the findings of the peer review process.

Two draft versions of the Impact Assessment Report have previously been reviewed prior to the reviewed version dated 15th May 2017. Where feedback is no longer relevant, as it has been adequately addressed in the current Impact Assessment Report, it is not included in this report. We note that any significant points raised in our previous review have been addressed in the revised Impact Assessment Report.
3 Summary of technical peer review

In the technical peer review Matthew Stead have been asked to:

(a) Assess the process, methodology and assessment undertaken in the Impact Assessment Report including any assessment criteria applied or assumptions relied upon;
(b) Identify and additional matters which should be considered in order to address the EES Scoping requirements, "public works" declaration or to otherwise adequately assess the likely impacts of the project;
(c) Assess the adequacy of the relevant Environmental Performance Requirements to manage potential adverse impacts arising from the project, and recommend any modifications you consider appropriate.

These requests are addressed in the following sections.

3.1 Process, methodology and assessment

The Impact Assessment Report process, methodology and assessment is considered to meet the EES Scoping Requirements. The fundamental assessment criteria and assumptions are considered to be sound, and in particular the definition of and use of Environmental Performance Requirements (EPR’s) is considered to be appropriate.

As with most impact assessments of this scale there is opportunity for ongoing refinement and clarification. This technical peer review has identified some areas of possible refinement and clarification. These refinements do not change the conclusion that the assessment meets the relevant EES Scoping Requirements.

Comments which are relevant to the technical peer review are provided in Attachment A: Summary of technical peer review comments.

3.2 Additional matters

In the author’s opinion there are no significant additional matters identified in this technical peer review which require additional assessment. Technical peer review comments are provided in Attachment A: Summary of technical peer review comments and outline some points which may improve the impact assessment.

3.3 Adequacy of EPR’s

The EPR’s are considered to be appropriate to the project and consistent with EPR’s for recent projects of similar scale. The Melbourne Metro Rail Authority released the approved EMF (Part 1) in February 2017 (Melbourne Metro, Environmental Management Framework (EMF), Version 0, 9/2/2017, Melbourne Metro Rail Authority, Approved EMF (Part 1). The EMF was approved following a comprehensive EES process. The EPR’s which are included in the Melbourne Metro EMF are the most recently approved conditions in Victoria and there is the opportunity for the West Gate Tunnel Project EPR’s consider those EPR’s.

Comments which are relevant to the EPR’s are provided in Attachment A: Summary of technical peer review comments.
4 Conclusion

This technical peer review is authored by Matthew Stead with support from Tom Evans and has responded to the request to:

- (d) Assess the process, methodology and assessment undertaken in the Impact Assessment Report including any assessment criteria applied or assumptions relied upon;

- (e) Identify and additional matters which should be considered in order to address the EES Scoping requirements, “public works” declaration or to otherwise adequately assess the likely impacts of the project;

- (f) Assess the adequacy of the relevant Environmental Performance Requirements to manage potential adverse impacts arising from the project, and recommend any modifications you consider appropriate.

The Impact Assessment Report process, methodology and assessment is considered to meet the EES Scoping Requirements. The fundamental assessment criteria and assumptions are considered to be sound and, in particular, the definition and use of EPR's is considered to be appropriate. The Impact Assessment Report demonstrates that construction and operational noise can be managed in accordance with EPR’s.

In the author’s opinion is there are no significant additional matters identified in this technical peer review which require additional assessment.

The EPR's are considered to be appropriate to the project.

As with most impact assessments of this scale there is opportunity for ongoing refinement and clarification. This technical peer review has identified some areas of possible refinement and clarification. These do not change the conclusion that the assessment meets the relevant EES Scoping Requirements.

It is the author’s opinion that the definition of, application of and ongoing compliance with the EPR’s are essential to ensure that impacts are managed both during construction and operation.
Attachment A: Summary of technical peer review comments

A summary of key peer review comments where there is clarification, minor comments or errors identified are outlined in Table 1 below.

Table 1 Summary of preliminary findings

<table>
<thead>
<tr>
<th>Section Reference</th>
<th>Comment / point</th>
<th>Potential implication for impact assessment</th>
<th>Classification (incorrect / clarification / minor)</th>
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<tbody>
<tr>
<td>Executive summary and within main report</td>
<td>It is noted any out-of-hours works proposed require specific noise management plans. This could be included in the EPRs.</td>
<td>Inclusion in an EPR would provide assurance that higher risk night time construction activities are addressed.</td>
<td>Minor</td>
</tr>
<tr>
<td>Executive summary and within main report</td>
<td>The night time ban on trucks is likely to lead to a significant improvement in acoustic amenity.</td>
<td>The noise-related benefits associated with this project requirement could be more clearly demonstrated.</td>
<td>Minor</td>
</tr>
<tr>
<td>Executive summary and within main report</td>
<td>Portal sheds are noted as a noise mitigation technique.</td>
<td>This requirement could be included in an EPR if it is considered to be necessary.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section 3.2.3 Site investigations</td>
<td>The noise and vibration monitoring conducted to establish the existing environment is considered extensive and appropriate.</td>
<td>The existing environment in the study area has been well established.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>Section 3.4.1.4</td>
<td>Sound power levels are provided for construction sources in Table 13. However, there are some inconsistencies with the sound power levels for the same sources in Appendix D. For example, the vibratory roller is stated as having a sound power of 97 dB(A) in Table 13 but 109 dB(A) in Appendix D.</td>
<td>The overall sound power levels for the different construction phases in Appendix D are considered reasonable and we understand that the construction noise assessment has been based on these values.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>Section Reference</td>
<td>Comment / point</td>
<td>Potential implication for impact assessment</td>
<td>Classification (incorrect / clarification / minor)</td>
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<td>Section 3.4.2.1 and Appendix D</td>
<td>It is stated how receptors were applied to multiple-storey buildings where the ground floor is not the lowest habitable level but not how these buildings were identified.</td>
<td>A description of the process for identifying multiple-storey buildings where the ground floor is not the lowest habitable level could assist in understanding for the reader.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section 3.4.2.1 and Appendix D</td>
<td>The assumed road surface corrections for DGA and OGA surfaces are appropriate and consistent with standard practice. It is noted that the OGA performance will degrade over time and an appropriate level of maintenance and/or resurfacing will be required to maintain it at -3 dB.</td>
<td>The requirement for appropriate maintenance of the OGA surface is acknowledged within the assessment.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>Section 3.4.2.1 and Appendix D</td>
<td>The ground surface in the study area has generally been assumed to be completely acoustically reflective, whereas our experience suggest areas such as this would be a mix of acoustically absorptive and reflective ground. This assumption may result in an overestimate of the future traffic noise levels at receptors.</td>
<td>The CoRTN algorithm assumes reflective ground behind any noise barriers regardless of the input ground conditions, therefore the impact on the assessment is negligible for areas where noise barriers exist.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>3.4.2.1 Modelling Assumptions and Appendix D Noise Modelling Inputs</td>
<td>Existing road surface acoustic corrections are not clearly defined within the report.</td>
<td>It is not clear what the state of the existing road surface is. This Impact Assessment Report informs the likely change in noise levels on project opening. This could be supplemented with additional assessment of existing surface corrections.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section Reference</td>
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<td>Potential implication for impact assessment</td>
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<tr>
<td>3.4.2.1 Modelling Assumptions and Appendix D Noise Modelling Inputs</td>
<td>Intersections can have higher local noise emissions. The use of OGA near intersections is also understood to not be suitable where there is higher levels of vehicles braking. The impact of these modelling inputs does not seem to be addressed.</td>
<td>Noise level impacts of these factors could be considered and reported. This is particularly critical for local roads where the target is no increase in noise level.</td>
<td>Clarification suggested</td>
</tr>
<tr>
<td>Section 3.4.2.2 and Appendix D</td>
<td>It is assumed that the $L_{10,18hr}$ level is equivalent to the $L_{10,12hr}$ level based on noise logging results shown in Appendix D. However, the results in Appendix D demonstrate that the $L_{10,12hr}$ can be marginally (1 dB) higher than the $L_{10,18hr}$ level at some locations.</td>
<td>The risk of this assumption is considered minor unless the predicted noise level at a Category B building is 63 dB(A). The inclusion of a decimal place in the comparison in Appendix D could assist in assessing any potential risk.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section 3.4.2.4 and 5.3.4.7</td>
<td>It is noted that sections of Hyde Street will have existing curfews removed.</td>
<td>There could be additional discussion on residences which may be impacted by this change.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section 4.3.4.1</td>
<td>Based on the statements above Table 27, the “Maximum Values” from Table 27 are to be used as the limit at which further construction vibration management procedures are required. The definition of “Preferred” and “Maximum” in the context of Table 27 is not provided.</td>
<td>BS6472 does not define “Preferred” and “Maximum” but these appear to be taken from the NSW DEC Assessing vibration: a technical guideline.</td>
<td>Minor</td>
</tr>
<tr>
<td>Section 4.6</td>
<td>The average daytime background $L_{90}$ level is used as the basis for daytime construction noise objectives, rather than the Rating Background Level recommended by the ICNG. The Rating Background Level is the typical lowest $L_{90}$ level rather than the average noise level.</td>
<td>The suggested objective will be less stringent than that which would typically be applied using the NSW ICNG. However, as this affects daytime works only, it is not considered to be a significant discrepancy.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>Section Reference</td>
<td>Comment / point</td>
<td>Potential implication for impact assessment</td>
<td>Classification (incorrect / clarification / minor)</td>
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<tr>
<td>Section 5.1.4</td>
<td>While the average existing PPV vibration level may be below the threshold for human annoyance, the maximum PPV levels were above in most instances. Average PPV is not a relevant metric for human annoyance from vibration. It is not clear from the report what caused these higher PPV levels.</td>
<td>Additional discussion could be provided on the existing vibration sources that led to levels above the threshold of annoyance. It is acknowledged this is unlikely to be traffic given the higher levels reported.</td>
<td>No action suggested</td>
</tr>
<tr>
<td>Section 4.6, Section 5.3.2.3 and Executive summary</td>
<td>In Table 1 the night time criteria is correctly noted as &quot;Noise inaudible within a habitable room of any residential premises&quot;. Below the table this interpreted as &quot;LA90 + 5 dB(A) is considered to be an acceptable external noise objective for determining compliance during the 10pm-7am time period&quot;. This definition is not consistent with the author’s opinion. The night time construction noise objectives are presented as background noise plus 5 dB(A) may be inconsistent with EPR NVP4 which requires night time construction noise to be inaudible within a habitable room.</td>
<td>The proposed EPR’s correctly state the requirement for night time noise. It is the author’s opinion that the Impact Noise Report could be updated accordingly to clarify that construction works are to meet the EPR’s requirements. A more stringent night time construction noise objective (than listed in the Impact Assessment Report) may be required to determine where management measures would start to be applied in order to comply with the EPR’s.</td>
<td>Clarification suggested</td>
</tr>
<tr>
<td>Appendix D Noise Modelling Inputs</td>
<td>Calibrated models are used for operational noise predictions in the assessment. These models are used to predict existing and future (without project) noise levels. In the calibration process, actual levels are typically +/- 2 dB relative to the predicted level. This means that calibrated models may under-predict at some locations by up to 2 dB. We understand that a conservative model has been used for calculating the required noise mitigation.</td>
<td>It is understood that limits apply to the allowable traffic noise (63 dB(A) L_{10,18hr}) that are not to be exceeded. The modelling accuracy, calibration and probability of exceedance could be more clearly identified for the design of noise walls to provide improved discussion on the conservative nature of the noise wall design. This would provide additional confidence to the reader that operational noise objectives will be met.</td>
<td>Minor</td>
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<tr>
<td>Appendix B</td>
<td>EPR NVP1 states that widening of some arterial road are not included in the EPR. It is not clear what roads this applies to. The applicable year at which the EPR should also be identified.</td>
<td>For clarity, this EPR could be refined to ensure the potential impact (if any) is clearer.</td>
<td>Minor</td>
</tr>
<tr>
<td>Appendix B</td>
<td>EPR NVP3, 4, 5 and other EPR’s could benefit from refinement in accordance with Melbourne Metro EPR’s. The EPR’s should be reviewed for consistency with the final Melbourne Metro EPR’s.</td>
<td>Community expectations around consistency of approach between major projects may not be met.</td>
<td>Clarification suggested</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Local road noise is required to be “no greater than the predicted traffic noise level under a ‘no project’ scenario”. Current VicRoads Policy requires a “2 dB” tolerance. The project requirement therefore provides an improved amenity.</td>
<td>This could be discussed further to determine the implications of achieving a 0 dB increase and to provide additional explanation of the benefit of this EPR.</td>
<td>Clarification suggested</td>
</tr>
<tr>
<td>Appendix B</td>
<td>SEPP N-1 requirements do not fully address impacts on all sensitive receptors (e.g. most non-residential land uses).</td>
<td>This EPR could be expanded to include other noise sensitive receptors as per Melbourne Metro EPR’s</td>
<td>Minor</td>
</tr>
<tr>
<td>Appendix B</td>
<td>It is not clear what methodology is used for “Off reservation noise attenuation treatments”. It could also be clarified that such treatment is applied in lieu of achieving external noise objectives.</td>
<td>For clarity, the EPR could be defined that any such treatment should be applied in accordance with VicRoads Road Design Note (RDN 06-01).</td>
<td>Clarification suggested</td>
</tr>
<tr>
<td>Section Reference</td>
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<tr>
<td>Appendix B</td>
<td>Given the magnitude of the project it is possible that unique situations subject to more stringent noise or vibration requirements may not have been identified through the EES process.</td>
<td>The project may benefit from a process within the EPR's to address unique sensitivities.</td>
<td>Minor</td>
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</tbody>
</table>
Attachment B: Matthew Stead and Tom Evans’ CVs.
Matthew Stead

Managing Director

Qualifications
Bachelor of Mechanical Engineering (First Class Honours)
Master of Engineering Science

Affiliations
Current Chairman Association of Australian Acoustical Consultants
Former Federal Councillor Australian Acoustical Society
ASHRAE Technical Committee member (TC2.6) Acoustics, International Voting Member
Member IOA, Member AIRAH, Member ASHRAE

Awards
2008 Australian Acoustical Society Excellence Award - MCEM
2009 Victorian Engineering Excellence Award for infrastructure projects up to $20M – MCEM

Career History
Matthew is the Director of Resonate Acoustics. He has over 24 years experience as a professional acoustic consultant in Adelaide, Melbourne and a year in the USA with an internationally recognised noise and vibration consultancy. Matthew has had roles, leading and establishing offices in Melbourne and across Australia. He specialises in acoustics with niche expertise in a variety of areas such as environmental acoustics, transportation noise and vibration.

Specialist Areas of Expertise
Environmental noise prediction and assessment (traffic noise, planning and noise control act).
Vibration isolation and transmission within buildings, particularly for specialist uses.
Noise assessment (environmental and occupational) identification of noise sources.

Contact details
m+61 408 805 293
matthew.stead@resonateacoustics.com
Publications and Technical Papers

Matthew Stead and Jason Turner, ‘Fan generated pressure disturbance; an example of its discovery, source and rectification’. AIRAH Conference (Adelaide, 1996).


Matthew Stead, What’s all the noise about? Sound Insulation Provisions of the Building Code of Australia, Australian Institute of Building Surveyors, 26th February 2005


Matthew Stead, Darren Jurevicius and Philip Agnew, ‘Correlation of rural highway road traffic noise with vehicle speed and commercial vehicle percentages for the day and night time periods’ 14th International Congress on Sound and Vibration (ICSV14), Cairns, Australia, 9-12 July, 2007.


Project Experience
Matthew has been involved in a wide range of projects as an acoustic consultant, some of which include:

Government, planning and policy
- Training and guidelines to support Adelaide City Council Development Plan
- Sound Insulation Guidelines for Building Code of Australia
- Scoping Study into Building Code of Australia External noise provisions
- Review of Building Code of Australia External noise provisions (as Chairman of AAAC)

Health Care
- Women’s and Children’s Hospital (SA) – Construction phase acoustics for the new birthing suite, wards and associated consulting suites.
- Glenside Mental Health (SA) – full acoustic consultancy services for new mental health campus.
- Flinders Medical Centre Mental Health Unit (SA) – full acoustic consultancy services for new mental health building.
- Cabrini Hospital (Vic) – assessment of environmental noise associated with hospital redevelopment.
- St John of God Hospital Geelong (Vic) – environmental noise assessment for new hospital development.

Educational
- RMIT University, City Campus, MicroNano Research Facility (MNRF) – Vibration and Acoustics
- Flinders Medical Centre / Flinders University, Margaret Tobin Mental Health – full acoustic consultancy services for new mental health campus.
- Central Queensland University, Appleton Institute – Acoustic Design
- University of Sydney, AIN-PHYSICS BUILDING – Adviser Vibration & Acoustics
- Regency Tafe - Education | Mining and Engineering Industry Training Centre – Acoustic Design
- Flinders University School Of Optometry And Vision Science - Acoustic Design
- Equine Health and Performance Centre (EH&PC) – Acoustic Design

Roads and traffic noise
- EastLink (Mitcham to Frankston Freeway, Vic) design work for ConnectEast consortium. This project involves a 45 km long Freeway which be a toll road. Bassett Acoustics is engaged by the successful team tendering for the construction and operation of the freeway. Traffic noise levels were predicted based on a comprehensive three dimensional noise model. Preliminary barrier heights have been designed for the length of the freeway.
- Northern Expressway – Project Director for the AECOM acoustic consultancy through the environmental impacts to project delivery stages
- South Road / ANZAC Highway underpass through the environmental impacts to project delivery stages
• South Road Tram overpass environmental impact assessment stage
• Marion Collector Road – Preliminary study of proposed road incorporating an assessment of noise from a proposed road extension.
• Eastern Freeway Extension, Springvale Road to Maroondah Highway and Ringwood Bypass (Vic) - Preliminary barrier heights design.
• Eastern Freeway Extension (Vic), Noise Monitoring, Bulleen Road to Elgar Road.
• South Gippsland Highway realignment, Koonwarra and Blackspur (Vic) – Traffic noise and barrier assessment.
• CityLink Grant Street Tunnel (Vic). Assessment of construction noise and noise reduction.

Railway noise and vibration
• Frankston Cinema (Vic) - Special acoustic isolation (noise and vibration) is incorporated into the proposed design of the cinema complex for the adjacent railway.
• Adelaide Noarlunga Railway Line (SA) – Assessment of proposed Grain Train Operation noise for AWB.

Vibration
• Seagate Research Facility, Pittsburgh USA (low vibration microelectronics facility): Rectification of excessive vibration from mechanical plant, structural stiffness and vibration level testing.
• Intel Phoenix, Albuquerque, San Jose USA: various assessments of low vibration levels in existing and new microelectronics facilities
• AMD, Austin Texas USA: Assessment of vibration levels in an existing facility and prediction of future vibration levels with the addition of new plant.
• National Institute of Standards and Technology, Boulder, USA: Assessment of vibration associated with proposed chiller replacement project.
• Numerous Projects Related to Ground Vibration from blasting, piling rock breaker and vibratory compactor operation vibration.

Grain handling and storage facilities
• Port Stanvac Grain Handling Facility
• AWB Grain Bulk Storage Facility - Monarto
• Grainco Terminal, Appleton Dock
• AusBulk - Apumurra Grain Storage

Mining, quarries, civil works, landfill and waste transfer stations
• McMillan Contracting – ground vibration assessments
• Southern Titanium NL - assessment of environmental noise issues associated with proposed new mineral processing plant near Mindarie.
• Angas Zinc Mine, environmental approvals for the new mine located near to Strathalbyn.
Wineries and breweries
- CUB Abbotsford Brewery – various assessments of environmental noise associated with existing brewery operations.
- Loxton Winery, Australian Vintage – environmental noise assessment of proposed tank farm.

Airport and aircraft related noise
- Residential Building Acoustic Design – Melbourne Airport - numerous assessments of aircraft noise for residential and commercial buildings around the Melbourne airport.
- RAAF Edinburgh residential land usage - Investigation into land use and advice on residential construction guidelines for areas south of RAAF Edinburgh.

Performing arts venues
- Frankston & Mandurah Reading Cinemas
- Queensland Cultural Centre Stage 5.
- Northern Territory University, Speech and Music Auditorium
- University of Central Queensland Theatre complex (QLD)
- Camberwell Grammar School Performing Arts Centre (VIC)

Court buildings
- Commonwealth Law Courts Project, Victoria. Full involvement from design to construction (Walter Construction) and commissioning.
- Perth CDB Courts Project, WA. Full involvement for design of courts building for PPP consortium.
- Victorian County Courts. Full involvement with privately funded and operated court complex developed by Multiplex and The Liberty Group.

Wind farms, gas supply, transformers / transmission lines and power generation facilities
- Myponga Wind Farm, revised design, community consultation and updated environmental reporting.
- Review and feedback to EPA on South Australian Wind Farm Guidelines.
- Assistance with research into windshield performance for input into South Australian Wind Farm Guidelines.
- ABB MurrayLink Converter Site - post construction environmental noise measurements.
- Adelaide - Moomba Gas Pipeline, natural gas compressor stations - on site noise reduction to local work areas and accommodation.

Ports and port facilities
- Victorian Channel Authority – Channel Deepening SEES and EES projects
- Grainco Terminal, Appleton Dock (Vic) - Grain processing/ handling terminal at Appleton dock.
• Victoria Dock - Noise assessment of environmental noise from the proposed redeveloped Victoria Dock (Vic).
• Outer Harbor, Grain handling facility – assessment of noise from proposed port and grain handling facility for AusBulk.

**Defence**

• DSTO Rationalisation Explosives Test Facility / Victoria and South Australia – DSTO Building 120: Measurement of test blast noise levels. Prediction of noise from explosive test facility being relocated from DSTO Maribyrnong to DSTO Edinburgh
• Lancelin Defence Training Area: This project involved the monitoring of noise and vibration from explosive demolition training at nominated sites including the boundaries of the surrounding buffer area and 2 at more distant areas of human settlement. The project involved the review of applicable noise, vibration and blast overpressure criteria. This included Australian Standards, Western Australia Environmental Protection (Noise) Regulations and state and federal occupational noise legislation.
• AAF Base Edinburgh: Control Tower: Demonstrates experience in assessment of operational and ground based aircraft noise. This includes run-up and ground based activities.
• Victoria Police Training Centre / Victoria: Acoustical design of training facility to ensure acceptable environmental gunshot noise levels.

**Water and water treatment facilities**

• Euston Water Supply Project – assessment of construction and operation noise.
• Lake Bellfield Causeway - assessment of construction noise.

**New and/or existing manufacturing / industrial facilities**

• Holden Ltd – Paint shop Environmental noise assessment at Elizabeth and various assessments at the Port Melbourne facility.
• Southern Food Group – environmental noise assessment of proposed food processing facility.
• Weyerhaeuser Australia Pty Ltd - environmental noise assessment of proposed Tumut planer mill upgrade.
• Penrice Soda Products Pty Ltd - environmental noise assessment of proposed solids recycling facility.
Professional History

- August 2011 to present – Director, Resonate Acoustics
- December 2009 to August 2011 – AECOM Global Practice Lead - Acoustics
- July 2007 to December 2009 - AECOM Specialist Groups Director – Buildings and National Manager of Acoustics, Bassett Acoustics (promotion to Director of Specialist Groups). Note Bassett changed its name to AECOM in October 2009.
- January 2005 to June 2007 - Principal of Bassett, National Manager of Acoustics, Bassett Acoustics (promotion to role of principal)
- July 2002 to January 2005 - Associate, National Manager of Acoustics, Bassett Acoustics (promotion to National Manager role)
- July 2001 to June 2002 - Secondment to Colin Gordon and Associates, San Francisco USA. My role involved working as a senior acoustic consultant on a range of projects.
- July 1998 to June 2001 - Associate, Manager Acoustics Victoria with Bassett Acoustics. (promotion to role of associate)
- 1 June 1995 to June 1998 - Senior Acoustical Engineer, Manager Bassett Acoustics Victoria (division of Bassett Consulting Engineers)
- 4 March 1992 to 31 May 1995 - Acoustical Engineer, Bassett Consulting Engineers – Adelaide
Tom Evans
Associate Director

Qualifications
Bachelor of Mechatronic Engineering (First Class Honours)
Bachelor of Economics

Affiliations
Member of the Australian Acoustical Society
Australian Acoustical Society Victorian Division Committee Member

Awards
2013 Australian Acoustical Society Award for Excellence in Acoustics:
Development of a method for Tonality assessment at a wind farm

Career History
Tom has 11 years of experience in the assessment of noise and vibration on a wide range of projects in the environmental, wind energy, transport and architectural sectors. His strengths are his ability to combine his strong technical understanding with excellent communication skills as well as to understand the different technical, social and environmental constraints on a project. Tom enjoys working on multidisciplinary projects, where specialty disciplines such as acoustics must work closely with the wider team to develop practical solutions.

Specialist Areas of Expertise
Transport infrastructure noise and vibration assessments
Wind farm noise measurement and prediction
Construction noise and vibration assessment
Environmental noise modelling and assessment

Contact details
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Publications and Technical Papers


‘Low frequency noise near wind farms and in other environments’, SA EPA and Resonate Acoustics, April 2013, T. Evans, J. Cooper and V. Lenchine.

‘Infrasound levels near windfarms and in other environments’, SA EPA and Resonate Acoustics, January 2013, T. Evans, J. Cooper and V. Lenchine.


Project Experience

Some examples of Tom’s wind farm project experience are included below:

**Transport – Rail**

- Melbourne Metro Rail Project – review of construction and operational noise and vibration impacts on University of Melbourne uses.
- EPA Draft Guidelines for the Assessment of Noise from Rail Operations – development of noise and vibration guidelines for rail operations on behalf of the SA EPA.
- Darlington Transport Study – monitoring, modelling and assessment of proposed duplication and conversion of the Tonsley Passenger Rail Line to a tram–train service.
- Seaford Rail Extension – DPTI’s noise and vibration advisor for the extension of passenger rail services to Seaford, including construction and operational phases.
- Northern Connector – modelling and assessment of rail traffic noise and vibration from the proposed Northern Connector project, a 12 km road/rail link west of Port Wakefield Road.
- Glenelg Tram Overpass – measurement, modelling and assessment of rail traffic noise from the tramline overpass of South Road. Monitoring of construction noise and vibration during the construction phase.
- Port River Expressway Stage 3 – noise monitoring, modelling and assessment of rail traffic from the rail bridge over the Port River.
- Northern Lefevre Peninsula Master Plan – modelling and assessment of rail traffic noise as part of the development of the master plan for PAMC.

**Transport – Road**

- EastLink – review of reverse sensitivity impacts of multiple proposed developments adjacent to the existing highway.
- RMS expert evidence – provision of expert evidence to RMS with regards to traffic noise impacts as part of partial property acquisitions on multiple projects.
- Foxground and Berry Bypass – road traffic noise and construction noise and vibration assessment for 11 km upgrade of Princes Highway.
- Grafton Bridge Upgrade – operational and construction phase noise modelling for proposed second crossing of Clarence River.
- Torrens Road to River Torrens Project – road and rail traffic noise modelling, construction noise and vibration assessments for 2.5 km upgrade of South Road through mainly residential areas.
- Darlington Upgrade Project – road traffic noise monitoring for upgrade of 3.3 km of Main South Road in South Australia.
- DPTI Road Network Noise Map – development of a model to predict road traffic noise from roads within the DPTI road network in metropolitan Adelaide. The process has been designed so that data can be input in GIS format from DPTI and output from the noise modelling software such that it can be used in GIS software packages.
- Adelaide Road Traffic Noise Map – modelling of road traffic noise over the Adelaide City Council area, involved coordinating inputs from the Council, DPTI and the EPA.
- South Road Superway – development of construction noise and vibration management frameworks for DPTI addressing road construction activities and operations at the casting yard and concrete batching plants as part of the $900m Superway project.
- Northern Expressway – monitoring, modelling and assessment of road traffic noise for the largest road project in SA for 40 years linking Port Wakefield Road with the Gawler Bypass.
Involved in house inspections, consultation with residents and the development of noise treatments for over 100 properties affected by the project.

- Gallipoli Underpass project – modelling and assessment of road traffic noise and vibration. This project also involved the inspection of affected residences and housing treatments.

Construction

- Port of Melbourne Port Capacity Upgrade—Noise and vibration advice for operational phases of $600m port upgrade.
- Al Raha Beach Redevelopment (Middle East) – operated two noise monitors and four vibration monitors adjacent to the Al Raha Beach Redevelopment for a period of three years. Prepared monthly monitoring reports and liaised with site-based staff to arrange the swap out of equipment for calibration and maintenance as required.
- Goodwood Rail Junction Grade Separation – currently involved in undertaking noise and vibration monitoring as part of the construction phase of the project. The project is occurring in a residential area with particularly sensitive community issues.
- Adelaide Oval Western Grandstand Redevelopment – installed, operated and maintained seven remote vibration monitors on the heritage-listed walls of the George Giffen Stand during the Western Grandstand Redevelopment. The monitors were located on site continuously for a period of 11 months and provided email notifications when trigger levels were exceeded. Preparation of a monitoring plan and monthly reports.
- Queen’s Theatre Vibration Monitoring – installed, operated and maintained three remote vibration monitors on the heritage-listed Queen’s Theatre during construction of the neighbouring UNO Apartments. The monitors were located on site for seven months and provided email notifications when trigger levels were exceeded.
- Intersection Upgrade, Nuriootpa – installed a remote, continuous vibration monitor at the heritage-listed chimney in Nuriootpa during an intersection upgrade approximately 20 metres away. The monitor operated for three months, provided email notifications when a pre-determined trigger level was exceeded.
- Gawler Rail Revitalisation Project – set up a remote, continuous vibration monitor that the Contractor could move with them as the rail line upgrade progressed through residential areas and pass heritage-listed structures (including train stations). The monitor provided email notification when a pre-determined trigger level was exceeded.
- Glenelg Tram Overpass project – developed a simple unattended noise logging option for the Contractor to implement during weekend night time construction works. This allowed them to demonstrate compliance with their regulatory requirements.
- Developed Construction/Demolition Noise and Vibration Management Plans/Frameworks for key infrastructure/building projects including:
  - Goodwood Rail Junction Grade Separation
  - Northern Expressway
  - South Road Superway
  - Seaford Rail Extension tender phase
  - Glenelg Tram Extension
  - Adelaide Oval Western Grandstand Redevelopment (demolition phase)
  - Rail Revitalisation Projects
  - Bakewell Underpass
  - University of Adelaide New Engineering Building
Environmental

- Noise SEPPs Impact Analysis (VIC) – managed an impact analysis of the Noise SEPPs administered by the EPA and their impact on business, regulators and the community.
- Port of Melbourne Port Capacity Upgrade—Noise and vibration advice for operational phases of $600m port upgrade.
- Angas Zinc Mine, Strathalbyn – Environmental noise modelling for the site during the project approval stage and during subsequent changes to the site during operation. Assistance with noise monitoring at the site, including training for site staff on the use of noise monitoring equipment.
- Holden manufacturing facility, Elizabeth – Assessment of environmental noise emissions from the southern half of the Holden site. The project involved the measurement of key noise sources on site and development of practical noise mitigation measures that could be implemented.
- Lyons Residential Subdivision (Northern Territory) – modelling of environmental noise from Royal Darwin Hospital affecting a proposed residential subdivision.
- Sheridan Site Residential Development, Woodville – modelling and assessment of environmental noise from a neighbouring industrial site, road noise and rail noise affecting a proposed residential subdivision adjacent Torrens Road.
- Northern LeFevre Peninsula Master Plan – Environmental noise modelling from existing and proposed future industry as part of the development of a master plan for PAMC to utilise the available land on the peninsula. Areas were designated for specific types of industry and mitigation options including noise mounds and noise walls were assessed.
- Noise modelling of wind farm sites – environmental noise modelling for over 30 wind farm sites in Australia and South East Asia, assisting a tendering turbine supplier design achieve compliance with the relevant noise criteria.
- SA EPA Wind Farm Infrasound Study – Conducted a study into infrasound levels around wind farms and in other environments with the SA EPA. The study demonstrated that infrasound levels near wind farms were no higher than in other environments where people live, work and sleep, and was published on the EPA website.

Wind Farms

- Macarthur Wind Farm (Vic) – noise modelling of proposed turbine layouts for the Macarthur Wind Farm as part of Vestas Australia’s submission. The Wind Farm will comprise 140 3 MW turbines and noise represented a key constraint on the site layout, with the modelling allowing Vestas to optimise their tender design. Vestas were awarded the contract for the wind farm in August 2010 and Tom was also involved in conducting background noise monitoring at 27 properties to establish appropriate noise criteria.
- Oaklands Hill Wind Farm (Vic) – undertook a compliance assessment of the Oaklands Hill Wind Farm once operational. In addition to the standard compliance assessment, we undertook a special audible characteristics assessment, involving measurement and assessment of infrasound, low frequency noise, tonality and amplitude modulation at two locations adjacent to the wind farm. Also determined appropriate assessment criteria for the special audible characteristics in consultation with the Vic EPA.
- Hallett Hill Wind Farm (Hallett 2) (SA) – Measurement of sound power levels and tonality from turbines using IEC 61400-11 to check compliance with guaranteed levels, compliance noise measurements at the residences using the 2009 Wind Farms Noise Guidelines, and detailed assessment of tonality at residences.
• Due diligence reviews – engaged to undertake due diligence reviews for the purchase of two wind farms, identifying acoustic issues that may alter the future value of the site.

• North Brown Hill Wind Farm (SA) – analysis of background noise measurements to determine existing noise levels at nearby residences, and regression analysis to determine environmental noise criteria. Involved in compliance monitoring once the wind farm was operational to assess compliance with the criteria.

• The Bluff Wind Farm (SA) – prediction of environmental noise levels at residential locations surrounding the proposed wind farm site. Conducted a compliance assessment and tonality analysis once the wind farm was operational against the environmental noise criteria.

• Starfish Hill Wind Farm (SA) – provided technical assistance for research being undertaken by the SA EPA, which included the measurement of turbine sound power levels and modelling of resultant environmental noise emissions from the Starfish Hill wind farm using various calculation algorithms, to allow comparison with measured noise levels.

• Wind Farms Noise Guidelines testing (SA) – undertook testing of the compliance measurement section in the last draft (May 2009) of the Wind Farms Noise Guidelines for the SA EPA. This testing involved the analysis of measurement results obtained using alternative compliance measurement methods.