Mordialloc Bypass Project

Report of Rodney van der Ree

1 Introduction

My firm Ecology and Infrastructure International Pty Ltd contributed to the impact assessment report that WSP prepared entitled Mordialloc Bypass – Flora and Fauna Impact Assessment (**Report**) which is included as Appendix C to the Environment Effects Statement (**EES**) for the Mordialloc Bypass Project (**Project**). Since that time, I have accepted a position as a Technical Executive - Ecology at WSP, which at the time of writing this report, I intend to commence on the 25th February 2019.

The role that I had in preparing the Report was to provide technical expertise to assess the potential direct and indirect impacts of roads and traffic on wildlife and develop strategies to mitigate those impacts. I did this by reviewing the species records of flora and fauna, vegetation and habitat mapping, conducted a site visit, reviewed plans and designs for the Project and had numerous meetings with WSP staff. I made specific recommendations about the number, type and location of measures to mitigate the impacts of the Project on the movement of wildlife and wildlife mortality through collision with vehicles.

I adopt the Report, in combination with this document, as my written expert evidence for the purposes of the Mordialloc Bypass Project Inquiry and Advisory Committee's consideration and reporting in respect of the Project. I restrict my responses contained in this document to matters that relate to road impact mitigation including connectivity for wildlife and reducing the rates of wildlife-vehicle collision (WVC).

2 Qualifications and experience

Appendix A contains a statement setting out my qualifications and experience, and the other matters in accordance with Planning Panels Victoria's 'Guide to Expert Evidence'.

A copy of my curriculum vitae is provided in Appendix B.

3 Further work since preparation of the Report

I have reviewed the alternative design proposed for Woodlands Drive and have concluded that it is unlikely to affect rates of WVC or movement of wildlife across the Project.

4 Written Submissions

4.1 Submissions Received

I have read the public submissions in respect of the EES and draft Planning Scheme Amendment for the Project and identified those that are relevant to the Report and my area of expertise in mitigation measures to reduce WVC and maintain movement of wildlife across the Project. These include the following submissions:

40, 54, 55, 58, 60, 62, 71, 76, 80, 84, 86, 87, 88, 90, 92, 97, 102, 104, 109, 110, 111

4.2 Summary of Issues Raised

The submissions have raised the following issues relevant to my area of expertise:

1. **Increased rate of mortality of wildlife due to wildlife-vehicle collision**
2. **Negative impacts of lighting and air pollution on wildlife**
3. **Reduction in levels of landscape connectivity / movement of wildlife across the bypass**
4. **Wildlife underpasses are a prey trap, allowing introduced predators to efficiently and consistently catch native wildlife.**
5. **Mitigation measures are not a guarantee of success**

4.3 Response to Issues Raised

Set out below are my comments and response to the issues raised by the written submissions relevant to my area of expertise.

4.3.1. Increased rate of injury and mortality of wildlife due to wildlife-vehicle collision (WVC)

The most effective approach to reducing WVC is to install barriers that prevent wildlife from accessing the road, most typically in the form of fencing (van der Ree et al. 2015a). Recent literature reviews and meta-analyses of published data have shown that such fencing can reduce the rates of WVC of some species groups by almost 90% (Huijser et al. 2016; Rytwinski et al. 2016). The design of such barriers is species-specific, with effective techniques for mammals, reptiles and amphibians being deployed globally. Strategies to reduce rates of WVC of birds and bats are less well-developed, principally because birds and bats can fly and thus get above the fencing (Abbott et al. 2015; Kociolek et al. 2015).

According to the 'Mordialloc Freeway – Noise Walls and Fencing Plan' prepared by the VicRoads Landscape and Urban Design team (28 June 2018), the Project has a combination of noise walls, two different styles of right-of way fencing, and two types of fauna-fencing proposed for different sections along the Project. The noise walls vary in height up to 6 m, depending on the need to reduce sound levels. I understand based on the standard VicRoads drawings that the two types of right-of-way fencing are 1.8 m tall chain mesh fencing with three strands of barbed wire (Type K) and farm-style wire fencing to a height of 1150 mm (Type A), with the upper strand barbed. The fauna exclusion fencing is either a 'low fauna barrier' for terrestrial wildlife or a 2 m tall multi-function fauna barrier for terrestrial fauna and birds.

I do not support the use of barbed wire fencing anywhere along the alignment, especially in areas of high quality habitat because many species of birds (including wetland birds) and Sugar Gliders and Flying-foxes can become entangled with the barbs and die (van der Ree 1999). EPR B1 specifies that 'wildlife friendly fencing' is required around Braeside Park, and in my opinion, barbed wire fencing does not satisfy this requirement and I recommend that EPR B1 be modified to specify that all fencing is to be wildlife-friendly and avoid the use of barbed wire.

The height and location of noise walls and fauna barriers between Braeside Park and the Woodlands Wetlands and through the Waterways Wetlands fulfil the requirements of EPR B1 by reducing rates of WVC for terrestrial mammals, reptiles and amphibians, and will likely be effective for most groups of birds if they maintain the height of the barrier as they fly across the road. The low-height fauna fencing to the north of the Parks Victoria Office is appropriate because birds are unlikely to attempt to cross the road here because the factories on the western side of the project are not attractive to most birds. The 3m wall that is proposed for around the Parks Victoria office, along with the multi-purpose fauna barriers proposed for south of the Parks Victoria Office will force birds to fly up to get over them.

The absence of a vegetated median and relatively narrow verges with 'appropriate ecologically sensitive plantings' (EPR LV1) will minimise the attraction for birds to land or feed in the centre median and verges, thereby further reducing the likelihood of bird mortality.

The plans show that where noise walls and fauna-fencing is proposed, they provide a continuous barrier to wildlife movement along the relevant sections of the alignment, which is appropriate and necessary to ensure that wildlife are unable to move between gaps in different styles of fencing. It is important during the detailed design stage to also ensure the that there are no gaps under any of the noise walls and fauna

fencing, and that they be constructed of opaque/solid materials to discourage animals from attempting to push through.

Monitoring is required to evaluate the effectiveness of this approach for different groups of birds as the amount of study of the road-crossing behaviour of birds is comparatively much smaller than for other groups, such as large mammals. EPR B6 highlights the need to monitor the effectiveness of measures to improve habitat connectivity, but the need to monitor effectiveness of measures to reduce WVC is not specified in this EPR. I recommend that EPR B6 be modified to also include the evaluation of measures to reduce WVC and wildlife mortality (i.e. fencing and barriers).

Fencing along the verges of the Project that effectively reduces the rate of wildlife mortality through collision with vehicles necessarily increases the barrier effect of the road. In response to this, the project has included the installation of wildlife crossing structures to facilitate the movement of wildlife across the road (see section 4.3.5 of Appendix C of the EES). Further discussion of wildlife crossing structures is given in Section 4.3.3 of my expert witness statement.

A number of submissions expressed concern about the risk of secondary mortality which occurs when scavengers attempt to eat the already-dead animals on the road or on the verges. This often occurs when the rate of primary mortality due to WVC is high, and there are enough carcasses to justify the risk of mortality to the scavenging species. The incidence of this occurring along the Project has been reduced by recommending the installation of fencing/barriers to prevent the access of animals to the road in the first place (i.e. EPR B1). The rate of mortality of wildlife is expected to be significantly lower because of the barriers that will be installed and the lack of a vegetated median. Furthermore, most animals near the Mordialloc Bypass are relatively small in size, and thus are not particularly rewarding for scavengers looking for a meal, as compared to the reward for scavenging on a kangaroo or wallaby. In addition, the scavenging species along the Mordialloc Bypass tend not to be endangered or migratory species, and thus are of reduced conservation significance. Therefore, the impact of secondary mortality along the Project is expected to be small and the proposed EPR B1 sufficiently addresses the risks.

In addition, regular inspection and maintenance of the roadsides, including collection of rubbish and any roadkill, would further reduce the rate of secondary mortality by removing resources that may attract wildlife to the roadside.

4.3.2. Impacts of lighting and air pollution on wildlife

The lighting associated with the proposed project will contribute to increased night-time lighting levels through street lighting and lighting from vehicles. However, the combination of restricting lighting to locations where it is essential, careful design/shielding of light fixtures, minimum lux levels, minimising the height of fixtures (as detailed in EPR B2), plus the installation of the impermeable multi-function barriers and noise walls (EPR B1), and the dense landscape plantings along the road edge, will significantly reduce the penetration and brightness of the lighting into adjacent habitats.

There is extensive data and understanding of the impacts of air pollution from traffic on people. In contrast, knowledge of the consequences of air-borne chemicals and particulates from roads and vehicles on ecological systems, and wildlife in particular, is scant. Some examples in the scientific literature include changes to nutrient levels in wetlands, with resultant changes to vegetation and the wildlife that reside in them. It is possible that wildlife permanently resident in areas adjacent or in close proximity to the road may be similarly affected to humans through the emission of oxides of nitrogen and sulfur, carbon monoxide and hydrocarbons, however I am not aware of any research on this topic. The multi-function fauna barriers (EPR B1) and dense plantings adjacent to the road will assist in intercepting and trapping air-borne pollution, reducing the levels impacting wildlife adjacent to the road. Therefore, it is my opinion that air-borne pollution from the Project presents a low risk to wildlife because (i) many species have relatively short lifespans within which chemical levels must accumulate and cause significant impacts; (ii) migratory birds will spend large amounts of time vast distances away from the Project area; and (iii) even resident birds can move hundreds of metres from the road within their territory, thereby reducing exposure levels.

4.3.3. Landscape connectivity / movement of wildlife across the bypass

Roads and other linear infrastructure often form barriers or filters to the movement of some species of wildlife. As we explained in Figure 6.1 and Section 6.1.2 of Appendix C of the EES, roads can present complete barriers to the movement of some species, and have no impact on the movement of other species, depending on their behaviour and movement ability (Kociolek et al. 2015).

Some submissions expressed concern that the Project will be a barrier to the movement of birds. I believe this is highly unlikely because many of the bird species at Braeside Park and the nearby wetlands either fly thousands of km annually as part of their migration or are species that survive in patchy habitats and can traverse treeless gaps more than 50 m in size. However, it is likely that the Mordialloc Bypass will reduce the rate of crossing of some species of birds, particularly small-sized woodland birds (Kociolek et al. 2015) in locations away from the bridges over Mordialloc Creek, which are large enough for birds to fly under the bridges.

EPR B1 requires a minimum of three culverts that are specifically designed for fauna movement between the wetlands in Braeside Park and the wetlands in Woodlands Industrial Estate and two such culverts between the wetlands in the Waterways estate. It is my opinion that this number of dedicated culverts for fauna is enough in these two areas to maintain the movement of reptiles, frogs, and terrestrial mammals.

There are numerous culverts along the project whose primary function is drainage of surface water. Where possible, these culverts should be improved to facilitate the incidental or occasional movement of wildlife by potentially including (where it does not impede the flow of water, which is their primary purpose) furniture inside them, funnel fencing and/or strategic revegetation at their entrances, ensuring right of way fencing and/or noise walls do not impede animal movement, and facilitating dry passage through a raised cell or ledge, etc.

Without the provision of crossing structures, the Mordialloc Bypass with its noise walls and multi-function barriers that reduce wildlife mortality, will likely be a barrier to the movement of most amphibians, reptiles and terrestrial and arboreal mammals. Both design elements (fencing/barriers and wildlife crossing structures) must be integrated to (1) prevent wildlife from accessing the road and thus reducing roadkill; (2) provide regular opportunities for crossing and (3) funnel the wildlife to the crossing structures. EPR B1 has recognised the importance of integrating the culverts with the barriers and noise walls to 'encourage' use by fauna, and this is critical to the success of this EPR.

There is ample evidence from around the world and locally that the combination of crossing structures and fencing can successfully and effectively reduce roadkill and increase connectivity across the road (see references and examples in van der Ree et al. 2015b).

One submission recommended that overpasses (presumably vegetated land-bridges) for wildlife not be built, unless they double as pedestrian overpasses as well. Land-bridges are not proposed for this project, only underpasses (i.e. various-sized culverts and open-span bridges) and we recommended some canopy rope bridges for arboreal species (Figure 7.3 and Table 7.7 in Appendix C of the EES). The canopy rope bridges are recommended for installation at a later date (e.g. in 10 years time) when revegetation of trees is sufficiently mature to connect existing woodlands to the rope bridges. Submission 92 recommended the use of glider poles to allow Sugar Gliders to traverse the freeway. I do not support this suggestion, but instead recommended rope bridges (for installation in approximately 10 years time) because rope bridges have been shown to provide connectivity for Sugar Gliders, Common Ringtail Possums, Common Brushtail Possums and Antechinus species while poles only cater for gliding species (Soanes & van der Ree 2015). In addition, the poles also require the gliders to glide across the road, potentially in front of vehicles and be at risk of WVC, while rope bridges keep them above the height of vehicles at all times.

4.3.4. Wildlife underpasses are a prey trap, allowing introduced predators to efficiently and consistently catch native wildlife.

It is an often cited and commonly presented argument that introduced and/or native predators learn to use crossing structures to regularly and systematically catch prey and therefore crossing structures are not effective (Little et al. 2002; Mata et al. 2015). There is no question that crossing structures may increase

the risk of predation because prey and predator species can both use the crossing structure and if they use them at the same time, they are forced to pass each other in relatively close proximity, potentially resulting in capture. However, an extensive literature review of numerous international studies conducted in 2002 (Little et al.) found no evidence of systematic predation. Furthermore, while predation may occur, it is my opinion, based on experience and the empirical evidence, that wildlife crossing structures are beneficial and significantly reduce the barrier effect of roads, and that these benefits outweigh the potential negative impact of low rates of predation.

The risk of predation can be significantly reduced by designing, building and managing the crossing structures to include features that assist in providing protection to potential prey and providing maximum space possible to allow prey to escape. These include:

- ensuring the crossing structures are sufficiently large
- the entrances are revegetated
- 'furniture' (i.e. hollow logs, branches, rocks, etc) is included inside the culverts and around the entrances to provide shelter and escape from predators
- inclusion of co-ordinated, systematic predator control around the road and crossing structures if the rate of predation by introduced predators is found to be problematic.

I recommend that the 2nd landscaping requirement of EPR B1 be amended (with the italicised text below) to read 'creating or revegetating habitat that maximises connectivity *and minimises predation risk* at fauna crossing points...'

Ultimately, predation in crossing structures is only a problem if the rate of predation exceeds the rate of mortality due to WVC that would occur in their absence. If the steps outlined above are included in the design, construction and ongoing management of the structures, the benefits of crossing structures at reducing mortality and maintaining animal movement exceeds the risk of predation.

4.3.5. Mitigation measures are not a guarantee of success

It is my opinion that if correctly installed and adequately maintained, the various mitigation measures proposed for this project will significantly reduce the impacts of the road on wildlife. Where there remains some uncertainty about the effectiveness of specific strategies, such as the use of multi-function barriers to force birds to fly up and over the road, we clearly stated the evidence-base behind the proposed strategy and expect it to be successful.

Importantly, the mitigation strategies we proposed have been widely used internationally and in Australia and there is clear evidence as to their ability to reduce the negative impacts of the road and traffic, such as noise walls to reduce noise and light impact, culverts and bridges for the movement of terrestrial animals and fencing to keep animals off the road and funnel them towards the crossing structures (van der Ree et al. 2015b).

References

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van der Ree R, Smith DJ, Grilo C, editors. 2015b. Handbook of Road Ecology. John Wiley & Sons Ltd, Oxford, UK.

Declaration

I have made all the inquiries that I believe are desirable and appropriate and no matters of significance which I regard as relevant have to my knowledge been withheld from the Inquiry and Advisory Committee.

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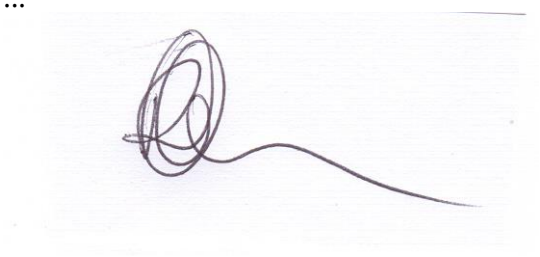

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Signed

Date: [13 February 2019]

Appendix A Matters Raised by PPV's Guide to Expert Evidence

(a) The name and address of the expert

Rodney van der Ree

32 St David's Drive, Wantirna, 3152, Victoria, Australia

(b) The expert's qualifications and experience

I obtained my PhD in Wildlife and Landscape Ecology from Deakin University in 2000. After graduating, I conducted research on the impacts of roads and traffic and urbanisation on wildlife at the Australian Research Centre for Urban Ecology, a division of the Royal Botanic Gardens Victoria and the University of Melbourne. This included numerous research projects on the barrier effects of roads on a range of wildlife. In 2015 I published the international-award winning Handbook of Road Ecology, with > 100 authors from 23 countries. I was the lead editor of this book, and I wrote or co-wrote 18 of the chapters. I have worked on the impact assessment and design of mitigation on dozens of road projects in Victoria, NSW and Queensland, and have provided strategic road ecology advice on numerous road project and research groups internationally.

For more details, see Appendix B

(c) A statement identifying the expert's area of expertise to make the report

I am internationally recognised for my expertise in road ecology and urban ecology, with expertise in both researching the impacts of roads and traffic and assessing use and effectiveness of mitigation techniques and advising road agencies across Australia and internationally on practical and effective impact assessments and mitigation techniques.

For more details, see Appendix B

(d) A statement identifying any other significant contributors to the report and where necessary outlining their expertise

None

(e) All instructions that define the scope of the report (original and supplementary and whether in writing or oral)

The instructions I received via email on 2 Nov 2017 were to undertake:

— **Site visit (if required): short visit to the sections of the proposed bypass adjacent to Woodlands Industrial Estate wetlands, Braeside Park wetlands, and the Waterways.**

— **Literature review relating to potential road impacts and mitigation options specific to Mordialloc Bypass. Anticipated form likely to be a short letter-form report with literature cited for incorporation into the Flora and Fauna Assessment as required.**

— **Review of reporting and mitigation recommendations to date. Feedback provided as a marked up document or in a meeting.**

— **Attendance at meetings with WSP ecologists and/or landscape architects from ASPECT Studios to contribute to design of mitigation measures.**

(f) The identity of the person who carried out any tests or experiments upon which the expert has relied on and the qualifications of that person

None

(g) A statement setting out any questions falling outside the expert's expertise

None

(h) A statement setting out any key assumptions made in preparing the report

None

(i) A statement indicating whether the report is incomplete or inaccurate in any respect

The report is complete and accurate to the best of my knowledge. Any uncertainties are acknowledged in the text of my report.

Appendix B CV

DR RODNEY VAN DER REE

Technical Executive, Ecology

1 year with WSP

25 years of experience

Areas of expertise

International expertise in road and rail ecology and urban ecology

Project management and design, execution and analysis of ecological research and monitoring

Science communication, community engagement, workshop facilitation and consultation

Expert review of infrastructure planning documents, EIAs and construction environmental management plans

Targeted and general flora and fauna surveys, especially of arboreal mammals and bats

Preparation and implementation of endangered species management plans

LANGUAGES

English

PROFILE

Dr Rodney van der Ree is an ecologist with international recognition for his expertise in urban ecology and road ecology. He has conducted high quality scientific research and monitoring on the impacts of human activities on wildlife and the effectiveness of mitigation strategies on a range of species, including insectivorous bats, flying-foxes, arboreal mammals and introduced predators. He has developed biodiversity monitoring programs for urban and urbanising landscapes, including for The City of Melbourne, the eastern suburbs of Melbourne and Thurgoona on the fringes of Albury. He has also addressed important issues such as habitat connectivity for wildlife in urban areas and human-wildlife conflict.

Rodney is also an Associate Professor at The University of Melbourne and continues to undertake research, collaborate and supervise postgraduate students in Australia and internationally, including Africa, Asia, Europe and the Americas. He published the international award-winning "Handbook of Road Ecology" (Wiley, 2015), with 63 chapters by more than 100 authors from 25 countries. He has advised the European Union on habitat fragmentation issues due to urbanisation and infrastructure development and currently sits on expert advisory committees for the Swedish Transport Administration and VicRoads. He has supported the development and growth of road ecology research and mitigation programs in South Africa, Singapore, India, Taiwan, China, Japan and South America.

He has published extensively, with over 70 refereed scientific publications, 120 conference and community presentations, 100 reports and popular articles and dozens of media presentations. He has excellent communication and community engagement skills, and often leads workshops and consultation exercises on a range of complex issues.

EDUCATION

Bachelor of Science (1st class Hons), Deakin University	1994
Doctor of Philosophy, Deakin University	2000

PROFESSIONAL ASSOCIATIONS

Member, International Union for the Conservation of Nature, World Commission on Protected Areas	IUCN WCPA
Co Chair, Transport Working Group of the IUCN Connectivity Conservation Specialist Group	TWG CCSG
Chair, VicRoads Roadside Environmental Advisory Committee	VREC
Chair, Australasian Network for Ecology and Transportation	ANET
Member, Infra-Eco Network of Europe	IENE

PROFESSIONAL EXPERIENCE

- **Mordialloc Bypass EES, Melbourne, Victoria, Australia (2018 - 2019): Major Road Projects Victoria, Wildlife Impacts and Mitigation Specialist**

  I provided specialist advice on the potential impacts of the project on wildlife and develop a suite of comprehensive mitigation strategies addressing noise, light, barrier and wildlife-vehicle collisions for the flora and fauna impact assessment technical report accompanying the EES

Previous experience

- **Echuca 2nd Bridge crossing of the Murray River, Echuca-Moama, Victoria/NSW, Australia (2015 - 2019): VicRoads, NSW Roads and Maritime Services and Major Road Projects Victoria, Wildlife Impacts and Mitigation Specialist**

  Undertook targeted surveys for Squirrel Gliders during the planning stages of the project and provided expert advice on potential impacts to wildlife and mitigation strategies, including maintaining connectivity for Squirrel Gliders and other arboreal species, replacement strategy for unavoidable loss of large trees with hollows and developing a proposal for a large research project on the efficacy of different hollow-creation techniques.

- **Yan Yean Road Stage 1 widening, Yan Yean, Victoria, Australia (2017 – 2019): VicRoads and MRPA, Biodiversity Specialist**

  Undertook targeted surveys for Brush-tailed Phascogale and Sugar Glider using infra-red camera traps; assessed all trees within project boundary for hollows and identified those suitable for highest and best use after removal; reviewed construction tree removal protocols and provided concept and detailed design advice for wildlife crossing structures, fencing and other mitigation strategies.

- **Potential Impact of Grey-headed Flying-foxes on Aircraft at Melbourne Airport, Tullamarine, Victoria, Australia (2017 – 2018): Melbourne Airport, Species Expert**

  Undertook targeted surveys for Grey-headed Flying-foxes (GHFF) at Melbourne Airport using thermal cameras to identify flight paths and feeding areas in order to assess the risk of collision between the species and aircraft. Provided specialist advice on diet and ecology of GHFF to inform the review of landscape planting guidelines across the site.

- **Shepparton Bypass, Shepparton, Victoria, Australia (2017 – 2019): VicRoads, Biodiversity Specialist**

  In collaboration with Ecology Australia, I undertook targeted surveys for Squirrel Gliders and wrote the Squirrel Glider Management Plan, which included concept design advice for wildlife crossing structures, fencing and other mitigation strategies.

- **Henderson Road Bridge, Rowville, Victoria, Australia (2017 – 2018): Knox City Council, Ecologist**

  Undertook targeted flora and fauna surveys, vegetation mapping, tree assessments and provided concept and detailed designs and revegetation plan to minimise environmental impacts, including consideration of lighting, noise, wildlife-vehicle collisions and fauna connectivity. Project included extensive consultation with council and design contractor.

- **Western Highway Duplication Project, Sages 1, 2 and 3, western Victoria, Australia (2014 – 2019): VicRoads and Major Roads Project Authority, Biodiversity Specialist**

  Provided strategic impact assessment and concept/detailed design advice and consultation on the potential impacts of the duplication of the Western Highway on wildlife, including habitat fragmentation / barrier-to-movement impacts, wildlife vehicle collisions and avoidance and mitigation strategies including fencing, underpasses, land-bridges and canopy rope bridges.

- **Western Highway Duplication, Stage 3, western Victoria, Australia (2018 – current): VicRoads and Major Roads Project Authority, Fauna-sensitive Road Design Specialist**

  In collaboration with Loci Environment and Place, I provided expert impact and mitigation advice during the planning of Stage 3, including extensive liaison with stakeholders. This project is adopting an innovative ‘best-practise’ approach to designing and implementing novel strategies to reduce the environmental impacts of the

project, support community-led initiatives and deliver the community a safe and efficient transport link.

- **Various Projects, Victoria, Australia (Ongoing): VicRoads and Major Roads Project Authority, Biodiversity Specialist**

  Projects include the Ravenswood Interchange on the Calder Freeway; the Eltham-Yarra Glen Rd and Kangaroo Ground-St Andrews Rd safety works, Chandler Highway Bridge duplication, Warrandyte Bridge widening. These projects included site visits, targeted surveys of a range of fauna, inspections of plans and designs, and meetings with engineers to scope out and define feasible and reasonable measures to lessen the ecological impacts of the projects.

- **Peninsula Link, Frankston, Victoria, Australia (2009 – 2012): Linking Melbourne Authority. Wildlife Ecologist and Mitigation Specialist**

  Provided specialist impact assessment and mitigation design advice to Linking Melbourne Authority and the Department of Environment, Land, Water and Planning. Undertook pre- and post-construction targeted surveys and monitoring of Southern Brown Bandicoots and Red Foxes in the Pines Flora and Fauna Reserve and nearby. Reviewed construction tenders and assessed the quality of their proposed treatment of wildlife underpasses, noise and light walls and barrier fencing. Developed the Southern Brown Bandicoot Management Plan for the project and undertook extensive liaison and consultation with a wide range of stakeholders.

- **Green Infrastructure Network Project Stages 1 and 2, Brisbane, Queensland, Australia (2015 – 2018): Moreton Bay Regional Council (MBRC), Fauna and Mitigation**

  In collaboration with AECOM Brisbane, I assessed the overlap between green infrastructure (e.g. corridors, habitat patches), linear infrastructure (e.g. road and rail) and patterns in wildlife-vehicle collisions (WVC) and identified and prioritized mitigation options to build a functional green infrastructure network and reduce WVC. I then worked with engineers, designers and Council to develop and cost concept designs for the top 20 priority sites, which MBRC are now constructing.

- **Develop and Implement the Nature in the City Strategy, Melbourne, Victoria, Australia (2016 - 2019): City of Melbourne, Lead Urban Ecologist**

  Produced the City of Melbourne 'Nature in the City' Strategy and delivered key urban ecology and biodiversity actions across the municipality. Included extensive liaison amongst City of Melbourne branches and teams, running community events, setting strategic direction and leading key urban ecology research projects with partners at universities, consultancies and not for profits.

- **Opportunities for WWF and Partners to Develop Sustainable and Climate Resilient Linear Infrastructure, Washington, USA (2016 – present). World Wide Fund for Nature, Technical Specialist.**

  Wrote an options paper for WWF that identified strategic options and opportunities for them to maximally influence the planning, design, construction and operation of roads and other linear infrastructure in developing countries. Includes extensive liaison with partners in Singapore, Malaysia, Myanmar, Asian Development Bank and the USA.

- **Impact of urbanisation on microbats, Melbourne, Victoria, Australia (2009 - Present): Australian Research Council and The University of Melbourne, Principal Investigator and Lead Researcher**

  Research project investigating the impact of urbanisation on insectivorous bats in Melbourne. This ARC-funded Linkage project brought together 5 local councils and 3 government agencies to investigate the ecology of insectivorous bats across Melbourne,

including their distribution and abundance, roosting and dietary requirements, long-term use of habitats and the community perceptions of them.

- **Hume Freeway Upgrade, Southern New South Wales, Australia (2007 – Present): NSW RMS, Wildlife Ecologist and Technical Expert**

  Assessed impacts of upgrade on arboreal marsupials and provided strategic mitigation advice to RMS. Initially engaged to provide ecological advice during the planning and design stage, the project developed into a comprehensive monitoring program, including one of the first Before-After-Control-Impact studies on road projects internationally.

- **Grey-Headed Flying-fox Relocation and Population Monitoring, Melbourne, Victoria, Australia (2004- Present): Royal Botanic Gardens Victoria, DELWP, Parks Victoria, Melbourne Water and numerous Local Governments. Species Expert and Lead Ecologist**

  Designed and implemented research and monitoring of Grey-headed Flying-fox (GHFF) camps at the Royal Botanic Gardens Melbourne, Yarra Bend Park and Doveton. Undertook various research and monitoring of the GHFF, including co-ordinating and running monthly citizen science fly-out counts. Extensive and frequent provision of expert advice to state and federal government, including NSW OEH, DELWP, and local councils (e.g. East Gippsland, Toowoomba, Albury, Adelaide, Coffs Harbour, Bendigo, Shepparton, Sydney, Cairns).

- **Development of a Biodiversity Monitoring Strategy, Victoria, Australia (2014-2015): Eastern Alliance for Greenhouse Action (EAGA), Ecologist and Project Lead**

  Developed a strategy to monitor the health of biodiversity for an alliance of local councils in eastern Melbourne, extending from Boroondara to Yarra Ranges. This project was awarded first prize in the local government section of the United Nations Association of Australia World Environment Day Award in June 2016 and first prize for the 2016 Victorian Premiers Award and was nominated for the 2016 Banksia Foundation Awards.

- **Managing Grey-headed Flying-foxes at HMAS Cerberus, Victoria, Australia (2014): Department of Defence, Project Manager and Species Expert**

  Developed an options paper with management recommendations for the Department of Defence to manage Grey-headed Flying-foxes at the base, should the species return.

- **Realignment of Olympic Highway at Kapooka, New South Wales, Australia (2013): NSW RMS, Technical Wildlife Specialist**

  Undertook targeted Squirrel glider surveys to inform the impact assessment and develop concept and detailed design and mitigation advice.

- **Pacific Highway Upgrade, Woologoolga to Ballina, New South Wales, Australia (2013): NSW RMS, Technical Specialist Adviser**

  Specialist expert advice on ecological impacts of the highway upgrade on wildlife and review of Threatened Gliders Management Plan.

- **Relocation of Grey-headed Flying-foxes from the Royal Botanic Gardens, Sydney, New South Wales, Australia (2009 – 2013): Royal Botanic Gardens Trust, Project Lead and Species Expert**

  Provided expert advice to the Royal Botanic Gardens Trust on dispersal methods; wrote the Public Environment Report to obtain Federal Government approval; assisted with

research and monitoring, including trapping and radio/satellite tracking; and sat on Expert Panel to monitor and advise the Trust.

PROFESSIONAL HISTORY

Technical Executive, Ecology, WSP	2019 – Present
Adjunct Associate Professor, School of BioSciences, University of Melbourne	2014 – Present
Director and Principal Ecologist, Ecology and Infrastructure International Pty Ltd	2016 – Present
Senior Urban Ecologist, The City of Melbourne	2016 – 2019
Deputy Director, Australian Research Centre for Urban Ecology, Royal Botanic Gardens Victoria and The University of Melbourne	2013 – 2016
Post-Doctoral Research Fellow, Ecologist, and Senior Ecologist, Australian Research Centre for Urban Ecology, Royal Botanic Gardens Victoria and The University of Melbourne	2000 – 2013

AWARDS

Graeme Caughley Travel Fellowship, Australian Academy of Sciences *Travel award to promote the adoption of ecologically-friendly roads in developing countries in Africa, Asia and South America.*	2015
Infra-Eco Network of Europe Project Award *Recognition for the contributions to road ecology research and practice in Europe and globally through writing, co-ordinating and editing The Handbook of Road Ecology*	2016
The Wildlife Society 'Edited Book of the Year' Award for The Handbook of Road Ecology	2016
United Nations Association of Australia World Environment Day Award for Local Government; First prize for the Victorian Premiers Award, Local Government; Nominated for the Banksia Awards. *Awards for the development of a Biodiversity Monitoring Strategy for the Eastern Alliance for Greenhouse Action.*	2016

PUBLICATIONS AND PRESENTATIONS

Selected Publications

- Soanes, K., Taylor, A.C., Sunnucks, P., Vesk, P.A., Cesarini, S., van der Ree, R., 2018. Evaluating the success of wildlife crossing structures using genetic approaches and an experimental design: lessons from a gliding mammal. Journal of Applied Ecology 55, 129 - 138.
- Bhardwaj, M., Soanes, K., Lahoz-Monfort, J.J., Lumsden, L.F., van der Ree, R., 2018. Little evidence of a road-effect zone for nocturnal, flying insects. Ecology and Evolution 00, 1-8.
- Currey, K., Kendal, D., van der Ree, R., Lentini, P.E., 2018. Land Manager Perspectives on Conflict Mitigation Strategies for Urban Flying-Fox Camps. Diversity 10, 39.

- Visintin, C., Golding, N., van der Ree, R., McCarthy, M.A., 2018. Managing the timing and speed of vehicles reduces wildlife-transport collision risk. Transportation Research Part D: Transport and Environment 59, 86-95.
- Krull, C.R., McMillan, L.F., Fewster, R.M., van der Ree, R., Pech, R., Dennis, T., Stanley, M.C., 2018. Testing the feasibility of wireless sensor networks and the use of radio signal strength indicator to track the movements of wild animals. Wildlife Research 45, 659-667.
- Visintin, C., van der Ree, R., McCarthy, M.A., 2017. Consistent patterns of vehicle collision risk for six mammal species. Journal of Environmental Management 201, 397-406.
- Bhardwaj, M., Soanes, K., Straka, T.M., Lahoz-Monfort, J.J., Lumsden, L.F., van der Ree, R., 2017. Differential use of highway underpasses by bats. Biological Conservation 212, 22 - 28.
- Watson, D.M., Doerr, V.A.J., Banks, S.C., Driscoll, D.A., van der Ree, R., Doerr, E.D., Sunnucks, P., 2017. Monitoring ecological consequences of efforts to restore landscape-scale connectivity. Biological Conservation 206, 201 - 209.
- Visintin, C., van der Ree, R., McCarthy, M.A., 2016. A simple framework for a complex problem? Predicting wildlife–vehicle collisions. Ecology and Evolution 6, 6409-6421.
- Rytwinski, T., Soanes, K., Jaeger, J.A.G., Fahrig, L., Findlay, C.S., Houlahan, J., van der Ree, R., van der Grift, E.A., 2016. How Effective Is Road Mitigation at Reducing Road-Kill? A Meta-Analysis. PLoS One 11, e0166941.
- Soanes, K., Mitchell, B., van der Ree, R., 2017. Quantifying predation attempts on arboreal marsupials using wildlife crossing structures above a major road. Australian Mammalogy 39, 254-257.
- Soanes, K., Lobo, M.C., van der Ree, R., 2016. Radio-collared squirrel glider (*Petaurus norfolcensis*) struck by vehicle and transported 500 km along freeway. Australian Mammalogy 38, 127-129.
- Straka, T.M., Kendal, D., van der Ree, R., 2016. When ecological information meets high wildlife value orientations: Influencing preferences of nearby residents for urban wetlands. Human Dimensions of Wildlife, June 2016.
- Straka, T.M., Lentini, P.E., Lumsden, L.F., Wintle, B.A., van der Ree, R., 2016. Urban bat communities are affected by wetland size, quality, and pollution levels. Ecology and Evolution 6(4).
- Soanes, K., P. A. Vesk, and R. van der Ree. (2015). Monitoring the use of road-crossing structures by arboreal marsupials: insights gained from motion-triggered cameras and passive integrated transponder (PIT) tags. Wildlife Research **42**:241 - 256.
- LaPoint, S., N. Balkenhol, J. Hale, J. Sadler, and R. van der Ree. (2015). Ecological connectivity research in urban areas. Functional Ecology 29:868-878.
- Rytwinski, T., R. van der Ree, G. M. Cunnington, L. Fahrig, C. S. Findlay, J. Houlahan, J. A. G. Jaeger, K. Soanes, and E. A. Van der Grift. 2015. Experimental study designs to improve the evaluation of road mitigation measures for wildlife. Journal of Environmental Management 154:48 - 64.
- van der Ree, R., D. J. Smith, C. Grilo, Eds. (2015). Handbook of Road Ecology. London, Wiley.
- Laurance, W. F., G. R. Clements, S. Sloan, C. O'Connell, N. D. Mueller, M. Goosem, O. Venter, D. P. Edwards, B. Phalan, A. Balmford, R. van der Ree, and I. B. Arrea. (2014). A global strategy for road building. Nature **513**:229 - 232.

- Ascensao, F., S. LaPoint, van der Ree R. (2015). Roads and traffic: big problems for small mammals. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- D'Angelo, G. J. and R. van der Ree (2015). Use of wildlife reflectors and whistles to prevent wildlife-vehicle collisions. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Jones, D., H. Bekker, van der Ree R (2015). Road ecology in an urbanising world. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Milton, S. J., R. Dean, van der Ree R et al. (2015). The function and management of roadside vegetation. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Reck, H. and R. van der Ree (2015). Insects, snails and spiders: the role of invertebrates in road ecology. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Soanes, K. and R. van der Ree (2015). Arboreal animals and roads Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Van der Grift, E. A., J. A. G. Jaeger, van der Ree R (2015). Study designs to measure effectiveness of road mitigation measures. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- van der Ree, R. and S. Tonjes (2015). How to maintain safe and effective mitigation measures. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- van der Ree, R., S. Tonjes, et al. (2015). Ensuring the completed road project is designed, built and operates as intended. Handbook of Road Ecology. R. van der Ree, D. J. Smith and C. Grilo. London, Wiley.
- Hamer, A. J., R. van der Ree, M. J. Mahony, and T. Langton. 2014. Usage rates of an under-road tunnel by three Australian frog species: implications for road mitigation. Animal Conservation 17:379-387.
- Soanes K, Carmody Lobo M, Vesk PA, McCarthy MA, Moore JL, van der Ree R. (2013). Movement re-established but not restored: inferring the effectiveness of crossing mitigation by monitoring use. Biological Conservation **159**, 434 - 441.
- Van der Grift EA, van der Ree R, Fahrig L, Findlay S, Houlahan J, Jaeger JAG, et al. (2012). Evaluating the effectiveness of road mitigation measures. Biodiversity and Conservation **22**, 425 - 428.
- van der Ree, R., J. A. G. Jaeger, et al. (2011). "Effects of Roads and Traffic on Wildlife Populations and Landscape Function: Road Ecology is Moving Toward Larger Scales." Ecology & Society **16**(1): 1 - 9.
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