



In October 2013, strong winds in central Wellington caused scaffolding to collapse.

THIS ISSUE OF IN-TOUCH FEATURES SOME OF OUR ENVIRONMENTAL RESEARCH AND ASSESSMENT SERVICES.

This year there has been plenty of evidence of the hazardous nature of strong winds. Assessing buildings for the likely effects of wind is one of a wide range of environmental assessment services we provide at Opus Research to ensure that sustainability aspects are considered effectively in the design and implementation of projects and policies. Whilst we frequently undertake this work as one-off commissions for clients, often these services are part of an integrated response in which we work closely with others in Opus, including colleagues offering social and economic assessments.

The expertise of the technical specialists who conduct these assessments enables them to also recommend to clients the most appropriate mitigation measures when necessary.

Also profiled in this newsletter are some of the conferences at which Opus Research staff recently presented their research findings. Two of the team were part of a group of New Zealand researchers who participated in the Natural Hazards Workshop

held in Colorado, USA. This was a great opportunity as researchers and practitioners from across the world gather at this annual workshop for discussions on how society deals with hazards and disasters.

Plans are progressing well for our move to modern premises in Petone, Lower Hutt. Construction work on our new purpose built laboratories is well underway. I look forward to being able to tell you more about these facilities in our next newsletter to be published in early 2014.

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LIVING WITH ROAD TRAFFIC NOISE

Noise barriers alongside Wellington Inner City Bypass.

A paradox of New Zealand life is that while there is almost a car for every adult member of the population, we appear to be averse to the noise of other people using cars. Road traffic noise is one of the most frequently raised concerns about roading projects, and the management of road traffic noise is now a consideration in the development of all major roads.

At Opus Research, we regularly undertake noise assessments for roading projects, applying the guidelines and standards relating to the acceptable level of noise as determined by stakeholders.

In addition to noise assessments, we also undertake research into topics relating to road traffic noise. In one research project for the New Zealand Transport Agency, we investigated how communities live with road traffic noise, and in particular what the community regards as acceptable road traffic noise.

In this project, four roading projects from across New Zealand were studied and residents from over 130 properties surveyed. Two of these projects were major roads constructed with noise mitigation to achieve the lowest practicable noise level, with the other

two projects being on major roads constructed to achieve medium noise levels. The survey asked respondents to rate their satisfaction, neutrality or dissatisfaction with twelve attributes of their neighbourhood including condition of roads and footpaths; rubbish collection; neighbourhood crime; parks; trees in the area; noise from neighbours and animals; and vehicle noise.

As people tend to like where they live, it was no surprise that responses were very highly and positively skewed for nearly all of the neighbourhood attributes. The exceptions were road traffic noise and vehicle speeds. It was significant to observe that even in the same noise “environment”, there were many residents who were satisfied or very satisfied with road traffic noise levels as well as there being many residents who were dissatisfied or highly dissatisfied. Unsurprisingly, in the medium noise environment, there were more overall residents who were dissatisfied or highly dissatisfied than in the lowest noise environment.

To get a benchmark for “reasonable” noise, we also looked at residents’ reactions to noise such as increasing the volume on their television or shutting their windows. This

quantification approach is found to provide a more objective measure of “noise disturbance” rather than more subjective responses to noise such as the degree of annoyance. The survey found that residents who took action to reduce noise disturbance did so most often when the traffic was busiest or during the night.

Overall these findings highlight three important aspects of road traffic noise management. First, the community response is broad even within the same noise environment. Second, road traffic noise should be managed according to the typical response of the community, and not the individual. And lastly, that it is usually not possible to achieve noise levels that will satisfy everyone. Nevertheless where practicable, steps can be taken in road design to decrease road traffic noise, and as a result community satisfaction with their noise environment should improve.

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ODOUR OF BUSINESS

Unpleasant smells never go unnoticed. Rural towns are usually the location of businesses such as saleyards and abattoirs from which certain odours are expected, but can become intolerable if the smell reaches local homes.

The Shire of Katanning Saleyard Complex (SKSC), one of the largest sheep selling complexes in Western Australia, was relocating its premises so they could expand their trade. To get the required construction and development permits, the SKSC needed to prove the odour of the 24,000-30,000 sheep coming through every week would not impinge on the people of Katanning.

The Shire of Katanning commissioned the Albany office of Opus to assist with the approval process to proceed with the relocation, with Opus Research conducting the odour assessment required by the consenting process. Our assessment had to take into consideration the possible increase in throughput of up to 1.5 million sheep per year to allow for the potential growth of the business. With no air quality data existing for Katanning, this information would have to be determined before the potential effects of the smell of the SKSC on the community could be measured.

We first assessed the existing ambient air quality by taking into account

the meteorological conditions and topography of the area. A literature review was then undertaken to determine anticipated odour emission rates which would most likely be produced from saleyard activities. These results were used to assess the effect the SKSC's odour contaminants would have on residential properties and other sensitive sites, determining odour concentrations in ambient air. This came together in an air dispersion model so the predicted odour concentrations could be checked against relevant Western Australia Department of Environment and Conservation regulatory criteria.

One of the key factors of this project was how different teams in Opus worked effectively together so that we could best serve the SKSC and the Katanning community. This meant that we could successfully respond to the community's requirements, which were at the heart of the issue for the client.

The odour assessment undertaken by Opus Research assisted SKSC to gain the approval they needed to make their relocation. Furthermore using all available data, the air pollution dispersal model took into account the future growth projections of the business.

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STUDENTS IN ACTION

Opus Research is a member of the Natural Hazards Research Platform, which is dedicated to increasing New Zealand's resilience to natural hazards through high quality collaborative research. Part of our funding from the Platform is used to sponsor postgraduate students whose studies complement our work programme. We are currently working with Nicola Hancock who is studying towards her Masters in Applied Psychology at the University of Canterbury.

Nicola's academic background is in Human Factors Psychology. This is where human behaviour, perception and cognition are researched and then applied at the design stage to create more usable buildings and environments. Her current research is applicable to natural disaster recovery and is particularly relevant to the Christchurch rebuild process. Through a crowd sourcing process, Christchurch residents will supply photos of spaces and places that elicit positive and negative responses. Nicola hopes that her research will provide a more effective rebuild for Christchurch.

Natural disaster recovery and community resilience is a key research area for the Platform. This research, including Nicola's, can provide decision makers and planners with information that will help prioritise post-disaster landscaping and rebuilding.

Nicola Hancock

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NEW TO THE TEAM



Guillaume Roux joined Opus Research in September to lead our structural testing and analysis activities. These involve specialist investigation, testing, and research relating to the structural performance of a wide variety of materials and products. Guillaume has a background in mechanical engineering, having previously worked in the automotive industry and the security printing industry.

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ASSESSING VIBRATIONS

VIBRATIONS FROM CONSTRUCTION ARE DISRUPTIVE, BUT ARE A COMMON SIDE EFFECT OF BOTH CONSTRUCTION AND DEMOLITION PROCESSES.

Although the adverse effects from vibrations are experienced by fewer people than with noise, harsh vibrations can pose a risk to people's health, like broken sleep and hand-arm vibrations syndrome, or can result in building damage due to cracking.

As awareness for the potential harm of vibrations grows, so does the demand to have it monitored and controlled. Opus Research is a leading provider of specialist vibration services and has extensive capabilities for monitoring and analysis of vibrations. We even have the capability to undertake trial blastings to help inform prospective tunnelling and quarrying operations.

Examples of the types of assessment include:

- Ground motion due to vehicle traffic, construction vehicles, pile driving, or blasting.
- Building motion resulting from vehicle traffic, wind effects, activities in buildings, machinery, earthquakes.
- In-vehicle ride quality.
- Floor and bridge deck responses caused by walking, dancing and other activities.

The measured vibrations are assessed against recognised criteria for the

perception of people living or working nearby, or the potential for cosmetic damage to buildings e.g. cracking in wallboards. Assessments ensure that the measured vibrations are within acceptable limits, and to inform the choice of measures to reduce or eliminate the vibrations if required.

The New Zealand Transport Agency (NZTA) commissioned Opus Research to develop a reliable and user-friendly method of gauging the potential impact of ground vibrations caused by road construction activity, all from the comfort of a desk. The associated report can be downloaded from <http://www.nzta.govt.nz/resources/research/reports/485/docs/485.pdf>

As research into the impacts of vibration is relatively new to New Zealand and our road building, Opus Research additionally recommended that NZTA create a vibration-risk map. Vibration readings are now taken on roading projects all over New Zealand and incorporated with existing NZTA data. By creating this map, NZTA will have a much clearer idea of what they need to plan for in future road construction before they even take a step on site.

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INTO THE WIND

BUILDINGS CAN HAVE A SIGNIFICANT IMPACT ON WIND CONDITIONS FOR PEDESTRIANS AND VEHICLES. MANY CITIES IN NEW ZEALAND AND AROUND THE WORLD HAVE WIND RULES FOR NEW LARGE BUILDINGS AS THESE CAN MAKE WIND CONDITIONS FOR PEOPLE WORSE, OR EVEN DANGEROUS.

Wind engineers at Opus Research regularly undertake testing and assessment of proposed buildings to try and meet these wind rules. We can also provide early design advice, advise on mitigation measures if problems occur, and test different options in our wind tunnel.

One design aspect that is often neglected, until problems occur, are building entrances. Strong gusty winds around a building entrance can make the transition from a calm interior space to a very windy exterior space unpleasant. In strong winds, entrances may even be unusable. Wind flows can also penetrate into the building, making conditions cold or unpleasant for those in the building.

In Wellington's famously windy conditions, these problems became apparent around several of Wellington Hospital's main entrances. Having already been built, the positioning of the entrances could not be changed, and any redesign would have to also work with the existing look, feel and

accessibility of the buildings. On the basis of our many years of experience, we recommended some design options intended to make people safer and more comfortable, and that were also in keeping with the aesthetics of the buildings.

On a larger scale, Opus Research is currently assessing the impact on vehicles of potential changes to building height regulations near the Newmarket Viaduct in Auckland. This is because the effects of buildings can potentially make wind conditions dangerous, even overturning trucks in extreme winds.

Early involvement in the wind design of buildings and structures can help provide a safe and comfortable wind environment for people, communities and vehicles.

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Wind screens at the entrance to Wellington Hospital Emergency Department.





CONFERENCE UPDATE

38TH ANNUAL NATURAL HAZARDS RESEARCH AND APPLICATIONS WORKSHOP, BOULDER, COLORADO

Abi Beatson presented her PhD research titled 'Social Media, Information Flows and Crisis Mapping: Information Sharing Practices in Response to the Christchurch Earthquakes' at the pre-conference workshop organised by the US-New Zealand Joint Committee Meeting on Science and Technology Cooperation. The workshop was well attended and generated positive feedback, particularly from US researchers and practitioners.

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2013 INTERNATIONAL MEDICAL GEOGRAPHY SYMPOSIUM, EAST LANSING, MICHIGAN

Vivienne Ivory presented recent research on Christchurch's rebuild and recovery at this symposium. These findings were also presented to other audiences at the University

of Pittsburgh, and the Boulder Natural Hazards Research workshop. Delegates were surprised at the extent of damage and the on-going impact on everyday living. Useful links were made with other research groups based in the US.

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125TH NEW ZEALAND INSTITUTE OF SURVEYORS ANNUAL CONFERENCE, DUNEDIN

Felicity Powell co-authored a presentation on 'The Importance of New Zealand Digital Parcel Fabric'. This presentation described research undertaken for Land Information New Zealand by Opus in collaboration with BERL. Issues for end-users arising from variable accuracy of digital boundaries were identified, and the resulting \$ impact on NZ's economy estimated.

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2013 NEW ZEALAND PORTS AND SHIPPING CONFERENCE, AUCKLAND

Peter Cenek was an invited speaker to this conference, which focused on the pressing issues affecting New Zealand's ports and shipping industries. Peter's presentation, entitled 'A Comparative Study of Container Haulage by Coastal Shipping, Rail and Road', was well received by delegates who included senior policy staff from the NZTA and the Ministry of Transport, and a number of CEOs. This presentation covered findings from a research project undertaken by Opus Research on behalf of the NZTA that was featured in the September 2013 issue (Issue 21) of their quarterly publication NZTA Research, downloadable from <http://www.nzta.govt.nz/resources/nzta-research/>

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