

# SURVEYING +

September 2017  
Issue 91

# SPATIAL



**Memorial Markers  
of the Landscape  
– the process of  
place naming in NZ**

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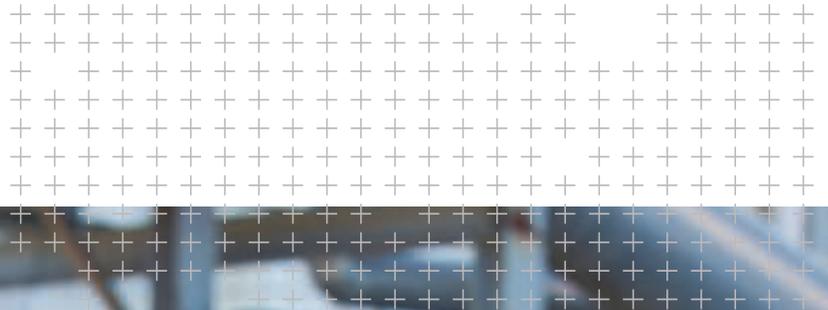
**Geospatial  
Information –  
Ten Benefits for  
New Zealand**

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**Boundary  
disputes – defining  
problematic  
easements**

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## • EDITORIAL



# A newcomer's perspective

Rachel Harris

Spring is slowly making its presence felt here in the South Island and this September edition marks my first editorial for *Surveying + Spatial*.

After recently taking over the helm from Diane Moriarty, I had the great pleasure of meeting many of our regular contributors, readers, advertisers and professionals across the industry at the NZIS conference in Napier this June.

The conference provided a diverse range of presentations and excellent discussions, as well as a memorable and inspiring take on innovation from closing keynote speaker, Sir Ray Avery.

Sir Ray reminded us how a fresh look at our everyday encounters and work experiences can lead to major new advancements and developments in the field.

As a newcomer to *Surveying + Spatial*, the conference was a wonderful opportunity to meet the individuals that make this industry innovative and I look forward to meeting many more at future events and corresponding in the course of publishing articles.

This edition features a diverse range of content from the benefits of geospatial information, to boundary disputes, the complexities and uncertainties in fee simple title for iwi Lake trusts, to a variety of technological advancements across the industry.

Jill Remnant of LINZ has provided an informative article on the work of the NZ Geographic Board and the responsibility the organisation has for place naming with regards to culture, history, language and traditions for New Zealand communities. The article outlines the organisation's responsibilities and processes for naming places and geographic features in New Zealand.

From the Hydrographic Stream, University of Otago Hydrographic Surveying Lecturer Emily Tidey and her students have compiled an account of the Australasian Hydrographic Society's annual seminar held in Dunedin at Te Kura Kairūri, The School of Surveying last month. The day's event included presentations covering the World Hydrography Day theme "Mapping our seas, oceans and waterways – more important than ever."

Maurice Perwick, Director of Eliot Sinclair, discusses the firm's experience of using drone photogrammetry in an engineering surveying business from CAA 102 certification, field data capture, processing, exporting and making the systems more affordable and profitable.

The effectiveness of Auckland's Unitary Plan and the issue of subdivision consents is examined by Auckland-based cadastral surveyor David Crerar in our perspective column this edition. Auckland currently experiences different formats for subdivision applications with no common, set conditions for the area. David discusses how changes could be made to the current processing of subdivisions to allow consents to be issued more efficiently.



# The Surveyor's Role in Representative Government

Mark G. Dyer

We are now in the midst of the 2017 election campaign, and housing affordability, urban growth, and the provision of infrastructure are among the most hotly debated issues.

All these issues involve surveyors. Whatever the outcome of the election, they will have a fundamental role to play in how our communities, and local and central government address them.

And, of course, individually you will be thinking about making your vote count and considering how to best get your views represented in Parliament. What some of you may not know is just how fundamental the role of surveying is in enabling our system of representative democracy.

Following the census next year, one of my statutory functions will be to prepare provisional electorates and then convening the Representation Commission. Joining me on that Commission will be the Government Statistician, the Chief Electoral Officer, representatives of the Government and Opposition (usually two ex-MPs), and a judge who will chair the Commission. We will set about dividing the population of the South Island/Te Wai Pounamu into 16 electorates. The number of people in a South Island electorate will determine the number of electorates to be defined in the North Island and for Maori electorates.

Meshblock scale demographic data from Statistics NZ, based on the cadastre, is a key data input to the determination. This helps ensure that properties are clearly aligned with electorates and illustrates well the value of the cadastre beyond an individual's property rights. Of course, these determinations are enabled by spatial analytics.

As every land development surveyor will know, the allocation of addresses by territorial authorities is critical to the accuracy and integrity of this system. This again is supported by statutory functions of the Surveyor-General to ensure that people can be identified as being within an electorate by reference to where they live. To this end there is an element of control over the allocation of addresses, and aspects of road naming.

Addresses can be complicated things, which is why we put some effort into keeping them simple. They are abstract in that they are not physical as a piece of land or a building or an apartment within a building is. Christchurch demonstrated difficulties with the earthquake response and recovery prompting the Surveyor-General, LINZ and others to consider how addressing may be improved.

In a broader context of opportunities to better link property data generally, work is being undertaken to progress initiatives in this space. LINZ is kicking it off. They have been talking to users of New Zealand's property data – that's property owners, utilities companies, insurance companies, banks and real estate agents – to find out more about how they would like it presented.

Early indications are that they want it better connected, more accessible and of better quality. Once this phase is complete, a decision will be made as to how to take this work forward.

And so the processes of land development, subdivision, building communities and representative democracy are linked – demonstrating that value is often created in systems beyond those immediately obvious to those commissioning work.

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## Cadastral

The Cadastral Stream are looking forward to the Review of the Cadastral Survey Rules which will have been announced by the Surveyor-General by the time this is published.

We are looking forward to working with LINZ to ensure that the review of the Rules will result in something which both LINZ and the surveyors using them are proud of and enjoy using. The Stream encourages members to attend the upcoming workshops to be held by LINZ on this topic.

Once this process of the review is a little further along we will be calling for members to help with a working group. Please consider if you would like to be involved with this.

The group also understands that LINZ are advancing on their ASaTS workflow and are in regular contact with LINZ on its progress. The group is also planning a GNSS for Cadastral Surveying seminar for later this year so keep an eye out for dates. If you would like to contact the group, this can be done through National Office.

*Matt Ryder, Cadastral Stream Chair*

## Engineering Surveying

May 26 saw the first day seminar run by the Positioning and Measurement and Engineering Surveying streams held at the Novotel, Auckland Airport. The location allowed for simple day access to those travelling from outside the Auckland area.

This event saw 130 delegates and speakers, and exhibitions from seven stands. We had a mix of speakers, ranging from the diamond sponsors, to university lecturers, to survey professionals. There was a strong emphasis on survey technology, but there was also some interesting discussion on the survey basics, which is important not to forget.

There was also interesting talk about the non-surveying side, such as recruitment and insurance. Feedback from the day was resoundingly positive, and we will endeavour to do it all again next year. The Engineering Stream made the audience aware of the organisational structure of the NZIS, and the upcoming developments, especially the anticipated reshaping of the RPSurv.

The Engineering Stream would once again like to thank the exhibitors, the speakers and the diamond sponsors for their contribution to make the first event a very successful one.

*Michael Cutfield, Engineering Surveying Stream Chair*

## Hydrography

HPS members Maurice Perwick and Emily Tidey both presented at the NZIS conference this year. While in Napier, an HPS meeting was held in which two members were added to the HPS leadership stream which now comprises: Bruce Wallen, Maurice Perwick, Emily Tidey, Stuart Caie and Rhys Davies. Minutes from this meeting and subsequent teleconferences are being sent out to members of the stream.

The HPS is very concerned and would like to remind NZIS members that while some modern sounding equipment seems very black-box it is important to undertake appropriate calibration and have the sound velocity set correctly to provide confidence in your results and ensure your surveys maintain a high professional standard.

By association this affects all of us, including the professional hydrographers who make up the HPS, so if in doubt please ask! If there is demand for more information on this we may consider instigating CPD training, so please get in touch.

The NZR AHS recently held a very successful annual seminar and AGM in Dunedin. Four students have written



about this for *Surveying + Spatial*. The NZR AHS will host a webinar later this year.

The National Hydrographer, Adam Greenland was recently awarded the 2017 Alexander Dalrymple Award by the UK Hydrographic Office, for his substantial contribution and commitment to International Capacity Building.

CMDR David Crossman was recently awarded the Australasian Hydrographic Society's Order of Merit Award for his long service to the organisation. The HPS would like to acknowledge and congratulate these hydrographic achievements.

*Emily Tidey, Hydrography Stream Representative*

## Land Development and Urban Design

Land development in cities and regions continues to be buoyant with most members indicating busy workloads across the board.

The recent NZIS conference in Napier was a success and the new three-day format excluding the AGM appeared to appeal to the majority of members and exhibitors. Although there was not a large land development/urban design content, there were some very interesting speakers with topics including smart cities and integrated technologies, sustainable communities and planning for an uncertain future.

Moving forward to future conferences, it would be good for our stream to have a particular theme focused around land development and urban design to provide more beneficial content to the stream and attract more of our members to conference. This will be an item to be discussed by the National Technical Committee reviewing the Napier Conference and planning the theme and content for the Nelson Conference next year.

The LDUD Committee completed a submission on behalf of NZIS on the forming of Urban Development Authorities in response to the discussion document put out by the Ministry for Business, Innovation and Employment mentioned in our previous news item.

On a local note, the Waikato Region is still seeing major growth and a recent initiative of the Local Authorities Shared Services Group is the roll out of a Regional Infrastructure Technical Specification (RITS) document that will eventually supersede local Development Manuals and establish a common document for engineering specifications for Hamilton City, Waikato, Waipa, Matamata-Piako, South Waikato and Otorohanga District Councils. This has been ratified by Waikato Regional Council and a large emphasis is on stormwater management, which is arguably one of the most important components in large scale development projects.

Our next Council meeting is in November followed by the Stakeholders Forum and AGM and I look forward to good participation from our members in these events.

This will be my last term as Chairman and Council representative and I have enjoyed the experience and being part of the NZIS governance team.

*Phil Cogswell,*

*Land Development and Urban Design Stream Chair*

## Positioning and Measurement

The NZIS conference in Napier marked the end of the 2016-17 stream theme: "Network RTK with the publication of a comprehensive document covering all aspects of Network RTK technology".

Download a PDF copy from: [www.surveyors.org.nz/Article?Action=View&Article\\_id=65](http://www.surveyors.org.nz/Article?Action=View&Article_id=65). A shorter article on the same topic appeared in the June 2017 issue of NZIS's *Surveying + Spatial* magazine.

For 2017-18, the theme for the stream is: "Datums and Projections". Keep an eye out in Newslink and the stream LinkedIn pages for references, documents and events which should encourage some discussion about how datums and projections are being used by professionals and non-professionals alike.

*Rachelle Winefield,*

*Positioning and Measurement Stream Chair*

## Spatial

The NZIS conference had plenty of good spatial content this year; with speakers including Rob Deakin from LINZ on New Zealand's Spatial Data Infrastructure, Mike Lee from Eagle Technology on the increasing demand for Spatial Information, and a presentation by Aubrey Miller of the University of Otago which generated a lot of discussion on adapting the geospatial professional to an evolving geospatial world.

The conference had more spatial content than previous years, feedback from this has generally been positive and shows that the spatial stream is making more of an impact on the wider industry.

The NZSEA award nominations are now open; this is New Zealand's premier geospatial awards event held on Wednesday, 15 November 2017, at Te Papa Tongarewa, Wellington. Please do submit a nomination for this event if you can!

At the time of writing the NZ ESRI Users Conference is coming up, at which people are welcome to come and talk to NZIS and ask any questions you may have on the wider Spatial industry in NZ.

*Greg Byrom, Spatial Stream Representative*





# MEMORIAL MARKERS of the LANDSCAPE

## The New Zealand Geographic Board Ngā Pou Taunaha o Aotearoa

*Jill Remnant, Advisor,  
New Zealand Geographic Board Ngā Pou Taunaha o Aotearoa*

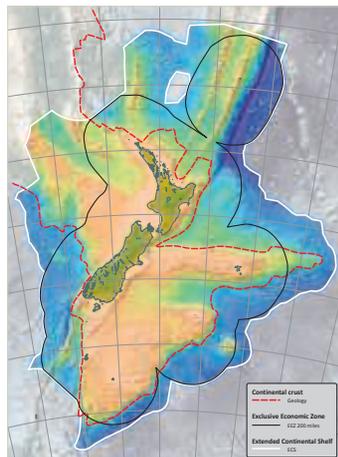


### Introduction

The New Zealand Geographic Board Ngā Pou Taunaha o Aotearoa (NZGB), a statutory board of government, is the national authority responsible for making place names official in New Zealand, its offshore islands, its continental shelf, and the Ross Dependency of Antarctica.

The New Zealand Geographic Board (Ngā Pou Taunaha o Aotearoa) Act 2008 provides the framework for the NZGB's powers, functions, and duties. Two of the NZGB's high level outcomes are location identification and preservation of culture and heritage.

Place names play a significant role in New Zealand's





historical, cultural, social, economic, administrative and language matters. They identify where we are as we go about our everyday business, are a component of our infrastructure, and most importantly they matter in emergency responses.

Place names also add to our sense of identity and belonging – helping us better connect with our identity: who we are, where we’re from, and the importance of those who came before us.

From a technical perspective, place names form one of the fundamental data themes for location identification and are becoming more extensively used in electronic mapping tools and databases – including many web based applications of government, businesses and communities.

### Who is the NZGB?

The Surveyor-General, Mark Dyer, is the NZGB’s Chairperson. This recognises the long term association of the Surveyor-General’s connection with the land, its spatial representation in survey records, and the historic role the Surveyor-General has had in preserving place names under various former legislative directions.

Land Information New Zealand (LINZ)’s National Hydrographer is also an ex-officio appointment to the NZGB. A further eight members are appointed under the NZGB Act 2008:

- two people nominated by the Minister of Māori

Development to represent Māori,

- two people nominated by the Minister for Land Information,
- one person nominated by Te Rūnanga o Ngāi Tahu,
- one person nominated by the New Zealand Geographical Society,
- one person nominated by the Federated Mountain Clubs of New Zealand, and
- one person nominated by Local Government New Zealand.

These eight members serve three year terms and may be reappointed for further terms. The NZGB meets two or three times a year.

The NZGB’s Antarctic Names Committee, Māori Names Committee, and Undersea Feature Names Committee meet once a year to advise and make recommendations to the NZGB. These committees must have at least two NZGB members. The NZGB appoints other committee members who are experts in the particular field of the committee they serve on.

The NZGB’s Secretariat, which is located within LINZ, provides the NZGB and its committees with administrative and policy support, research assistance, and expert advice. The Secretariat also maintains the NZGB’s Gazetteer and responds to public enquiries.





## What are the NZGB’s responsibilities?

The NZGB is responsible for safeguarding the place naming traditions, culture, and heritage that various communities have brought to New Zealand.

Its decision making is independent of government and based on robust processes. It follows policies, principles, and practices that have evolved from decisions, investigations, precedent, international trends, liaison, and co-operation. The NZGB also cooperates with a range of international naming organisations on Antarctic, undersea, regional and global place naming conventions.

The principal functions of the NZGB set out in the NZGB Act 2008 include:

- considering proposals for new or altered place names, including spelling alterations;
- approving and adopting recorded place names as official place names;
- determining the position or extent of named features;
- collecting and encouraging the use of original Māori names, with correct orthography, for recording on official charts and maps;
- making recommendations on place names included in Treaty of Waitangi settlements;
- Antarctic place names;
- undersea feature names;
- validating Crown protected area names, and,
- maintaining a publicly available Gazetteer of place names.

The NZGB doesn’t name streets, highways, tracks, buildings, homesteads, monuments or businesses, and it cannot change the name of New Zealand. Nor is the NZGB concerned with the pronunciation of place names.

The NZGB’s informed, robust and enduring place name decisions:

- provide practical and fundamental location identification and navigation;

- recognise heritage and culture;
- are reliable and authoritative; and
- uphold standardised, consistent and accurate place naming practices.

## The historic role of the surveyors in place naming

Although formal place naming is a relatively recent activity in New Zealand, Major Palmer’s 1875 report, *The State of Surveys in New Zealand*, to the Colonial Secretary recommended that ‘Special attention should be given to the subject of nomenclature, and care to be taken to adhere in all possible cases to accurate Native names: this is a matter of great philological and antiquarian importance.’<sup>1</sup> These instructions were hugely important to the collection, on going use and preservation of original Māori place names.

The subsequent Survey Regulations made under the Land Act 1885 required that in the survey of native lands the surveyor must ascertain ‘the Native names of all boundaries or natural features within or pertaining to a block, together with the names and position of adjacent lands, and shown on the map.’

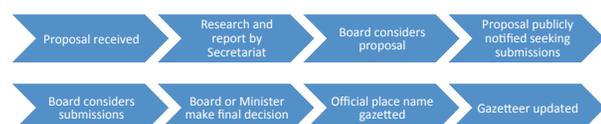
The 1908 *Regulations for Conducting the Survey of Land in New Zealand* also record: ‘The original Maori names of places are to be preserved as far as possible. To this end the Chief Surveyor should see that these are added from time to time to his maps, and when the 80-chain maps are to be published by the Department the Head Office should be notified. The names should be verified by Natives or by Native experts whenever an opportunity occurs. Names of places given by original explorers or otherwise are not to be altered without the consent of the Surveyor-General.’

## What is the process for naming a place or geographic feature?

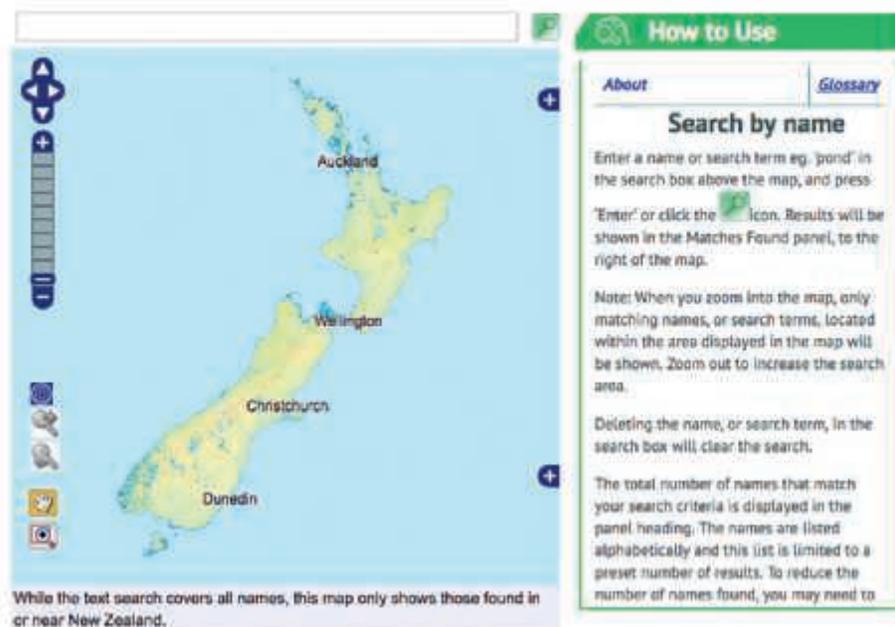
Anyone can make a place name proposal to the NZGB, but proposals must meet a *Minimum Requirements* benchmark before they will be processed. The NZGB also has a rigorous consultation process, as understanding the views of New Zealand communities is essential when making informed, robust and enduring decisions on place name proposals.

### Standard process

Overview of the NZGB’s standard process for considering a place name proposal:



## New Zealand Gazetteer: Search for Place Names



### **Treaty process**

An important part of the NZGB's work is its contribution to place names as part of the Treaty of Waitangi settlement process. The NZGB supports and actively contributes to this cultural redress component of the Treaty, to give effect to partnership principles.

### **Fast track process**

Because the government wants certainty about the name for a place, another important role of the NZGB is to convert recorded place names into official place names. By making a place name official, it can be consistently applied across official published material, avoiding confusion and giving recognition to the official name for that place.

### **The New Zealand Gazetteer of Place Names**

The NZGB Act 2008 requires that the NZGB maintains a publicly available *New Zealand Gazetteer of Official Geographic Names*. The Gazetteer lists all official place names within the NZGB's jurisdiction, along with contextual information such as position, extent and description of a feature, and if known, the history, origin and meaning of a place name. A large number of recorded place names are also listed. The Gazetteer can be downloaded for reuse

in a CSV file, or from the free-to-use LINZ Data Service in various formats for the three available layers.

### **The NZGB's long term strategy**

The NZGB's strategic goals are that:

- people have easy access to trusted and useful information about geographic names so that they can understand the history and culture of the names;
- it has good relationships with people at local, national and international levels to make it easier to get the right information;
- it names features so people can find where they are;
- it encourages people to use official names in everyday life, and
- it continually improves its capability to make consistent and rigorous decisions.

### **Further reading**

To find out more about the NZGB see: <http://www.linz.govt.nz/regulatory/place-names>

#### FOOTNOTE

1. *The State of Surveys in New Zealand – correspondence relative to, and report by Major Palmer ON*. January 1875. Accessed from the National Library of NZ on 25 July 2017.

# Glenn Stone Insurance

## Our story with the NZIS – So Far

Glenn Stone Insurance have partnered with the NZIS over the last 3 years and service over 50 land surveying and multi-disciplinary firms. We were the first diamond sponsor and this has enabled the NZIS to better support its members and the land surveying profession in general.

We work with the NZIS on insurance related topics or legislative changes that might impact the profession. Most recent examples include our advice on health and safety changes, construction contracts legislation and individual cadastral survey cover.

## Some of our key achievements over the last few years:

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- › Scholarship introduced for School of Surveying.
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## “Mapping Our Seas, Oceans and Waterways – More Important than Ever”

*Rhiannon Evans, Mecaela Fraser, Samuel Josephs, Ross Nicholls and Emily Tidey –  
Te Kura Kairūri, Te Whare Wānanga o Otāgo / School of Surveying, University of Otago*

ON JULY 6, THE ANNUAL NEW ZEALAND REGION OF THE AUSTRALASIAN HYDROGRAPHIC SOCIETY (NZR AHS) SEMINAR AND AGM WAS HELD AT TE KURA KAIRŪRI, THE UNIVERSITY OF OTAGO’S NATIONAL SCHOOL OF SURVEYING IN DUNEDIN. THE AHS IS THE SOUTH WEST PACIFIC AND SOUTH EAST ASIAN REGIONAL FOCUS FOR THOSE INTERESTED IN HYDROGRAPHY AND RELATED SCIENCES.

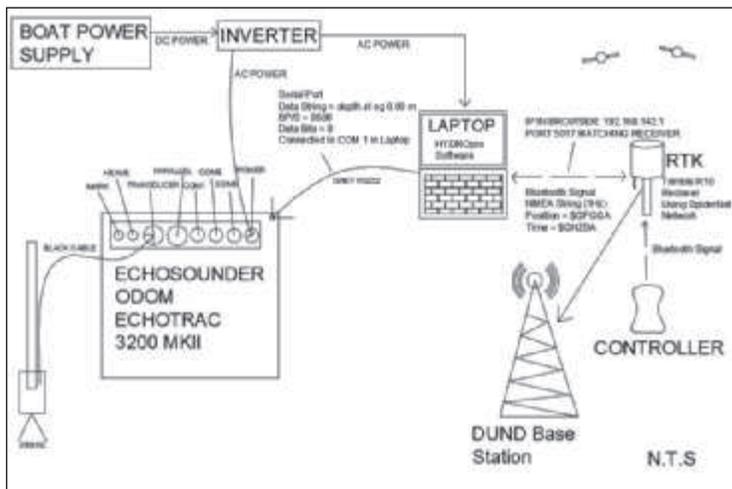
Forty members from a range of organisations were in attendance, along with nine Otago Surveying students who were sponsored for the event by Discovery Marine Ltd (DML), Eliot Sinclair, iX survey, Land Information New Zealand (LINZ), National Institute of Water and Atmospheric Research (NIWA), NZ Ocean Technology Ltd (NZOT), and Trimble.

After morning registrations and mingling, we visited the Port Chalmers Maritime Museum. Members thoroughly enjoyed themselves; some were even found fondly recalling the ‘good old days’ with some of the equipment on display. A Port Otago representative then joined our bus back to town and told us about the current dredging programme. After lunch, formal presentations began. Here are some of the highlights from the day’s events.

### Student Presentations

The first presentations of the day were from School of Surveying students. Rian Mayhead presented his involvement in surveying Hawkes Bay waterways and coastal areas over the past two years as part of his summer work experience. This work was in aid of the Hawkes Bay Regional Council, who used set cross sections to observe change in these areas and deliver beach nourishment where applicable.

Sam Cox, Antoine Logez and Alex Moss then presented a summary of first semester hydrographic surveying paper ‘SURV322’ which they had just completed. The paper included a range of theory as well as practical and lab work which built up to a comprehensive harbour survey and report using a single beam echosounder.



Examples of student work (Cox, Logez, Moss)

Final year student, Matt Barber, shared some experiences from his seven years in the New Zealand Navy. This included surveys in Tonga and Samoa, emergency charting of Lyttelton Harbour in Christchurch immediately following the February 2011 earthquake and even hunting pirates off the coast of Somalia! Matt then described his professional project, involving hydrographic mapping with the Yellow Eyed Penguin Trust, which he is undertaking in the second semester.



Presentations at Surveying

### Jimmy Van der Pauw, Discovery Marine Ltd (DML): Developments in Survey Technology and Its Application to Freshwater Environments

Jimmy presented on behalf of DML showing us some freshwater surveying and data products they have collected.

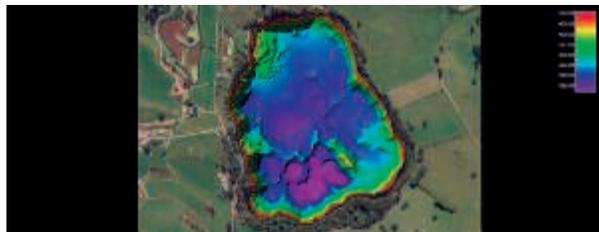
The current trend for multibeam echo sounder (MBES) systems is a reduction in size to enable use on smaller vessels which are suitable for these environments. DML has been able to utilise these advancements to carry out two large survey projects:

The Te Arawa project was an MBES first in New Zealand with five lakes surveyed. Van der Pauw commented that the main difficulties faced were to collect adequate detail of the steep slopes found around the lake edges and accounting for inversion layers in the water column. Mul-

iple data products were produced for the client, utilising a combination of bathymetry and backscatter to enable the detection underwater features such as landslides and debris.

The second project involved surveying the Auckland dam reservoirs for Watercare Services. The significant access challenges highlighted the benefits of using a compact MBES system, and once again using backscatter data allowed a much more complete dataset to be provided for the client.

Looking to the future, comments were made about the trend toward seamless data deliverables above and below the surface, combined with fast data capture. In the future, we could see real-time scanning and plotting of structures, combined with traditional bathymetry.



Lake Okaro

### Justin Harrison – University of Canterbury: Choosing a Bathymetric System

Due to weather conditions Justin was unable to be present and Gary Chisholm presented in his place. This talk detailed the decision-making process before acquiring a new piece of equipment for research projects. Initially three goals were defined:

- Locations – They were surveying Lake Tasman: deep, cold, with very steep sides.
- Level of Detail – Mapping was the first priority they were not chasing centimetres, they also needed a 300m swath for safety from the glacier.
- Range, Accuracy, and Price – Range was their primary concern, they had small budget.

Their options came down to a Multibeam or an Interferometer (Bathyswath). So, they broke down the two options into pros and cons considering factors such as precision, geomorphic mapping, width to depth ratios, patch data in nadir, pricing and power requirements.

They decided on the Interferometer, and during initial mapping they demonstrated they could gain 10 million data points in 15 minutes so the mapping product was deemed a success. The main issue experienced was due to the Inertial Measurement Unit, which they admitted requires a larger monetary input than their budget allows.

## Liam Jagvik – Eliot Sinclair: Kaikoura Recovery

Eliot Sinclair are part of the North Canterbury Transport Infrastructure Recovery (NCTIR) team. They started work in early December 2016 with the aim of re-establishing Chart Datum (CD).

To establish CD, they first needed to re-level to Lyttelton 1937 Datum beyond the zone of influence; beyond the effects of the earthquake. They then used a 2-minute grid to determine the relationship between this and Geodetic Datum 2016, from which they determined that the fundamental relationship remains.

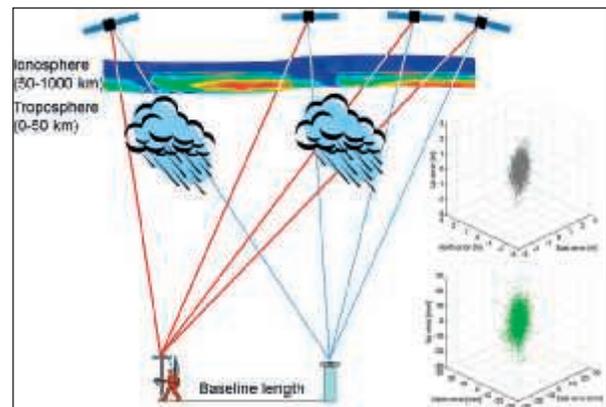
Jagvik and Eliot Sinclair also worked on the South Bay Marina Construction in Kaikoura with Downer. Due to the risk of slips, machine control and laser scanning was used. From this data point clouds were created and combined with the NCTIR GIS platform. This was a totally combined space allowing the engineers and surveyors to work with the same data over the entire 50km.

Jagvik also talked about the future of the industry looking at 3D, 4D, 5D GIS, combining UAV's with Point Clouds, and Point Clouds versus Mesh Modelling to give the client what they actually want. He also discussed the issue of creating UAV targets on the ocean, and how to georeference a moving target.

## Dr Robert Odolinski – School of Surveying: Low-cost Multi-GNSS Receiver Precise Positioning

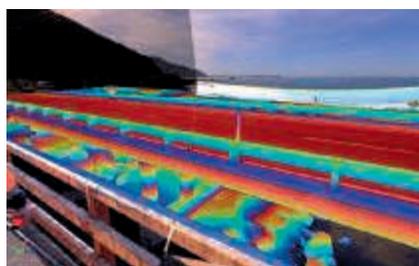
Dr Odolinski presented his ground-breaking research into the use of low-cost, multi-constellation GNSS receivers for

survey accurate positioning. Currently there are 31 GPS satellites available, however considering the future there is a projected increase in numerous other satellite constellations including Galileo and BeiDou (BDS). Robert predicts there will be around 110 satellites available by 2024.

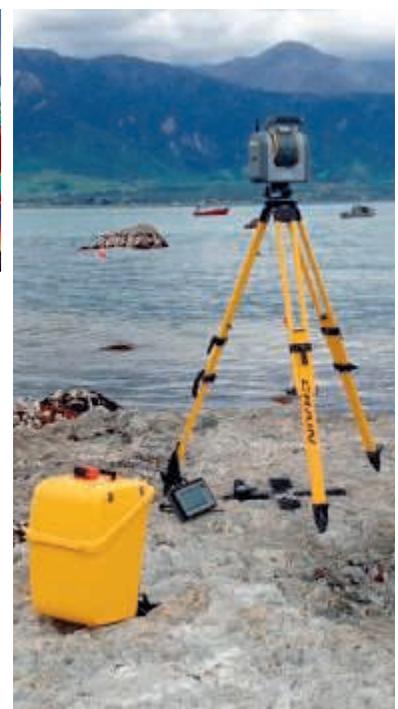


Single-baseline RTK, where low-cost single-frequency receivers can be used if the baseline length is a few kilometres (left) and multi-GNSS observations are available. The positioning scatters (right) are in local North, East and Up for (top) code-only and (bottom) code+phase observations (RTK). Note the two order of magnitude of positioning precision improvement when going from code-only (metre-level) to including phase observations (millimetre-centimetre-level). (Odolinski).

Practical tests utilising both GPS and BDS constellations, and a low-cost single frequency receiver, have shown comparable results to a dual frequency survey-grade device. The cost difference between receivers is more than ten-fold. A four-system test gave even better results with ability to use larger satellite cut-off angles. Looking forward, mobile phones are beginning to introduce open source



Left: Control set up in Kaikoura  
Above: Laser scan of bridge  
Right: Laser scanner and vessels working in Kaikoura. (Eliot Sinclair)



positioning information which Robert predicts will create a large area of potential growth for cheap and accessible high-accuracy positioning.

For more information on the technical details of Robert's research, his research paper "Single-frequency, dual-GNSS versus dual-frequency, single-GNSS: a low-cost and high-grade receivers GPS-BDS RTK analysis" can be found in the Journal of Geodesy.

### Jennifer Coppola – LINZ: Joining Land and Sea (JLAS) Project Update

Several representatives of Land Information New Zealand (LINZ) attended the seminar with Jennifer Coppola presenting a progress update on the Joining Land and Sea (JLAS) project.

This ongoing project was initiated after a recognised need to be able to better combine data from land and sea, which are currently based off different vertical datums. This would enable bathymetry datasets to be joined together, place a lower reliance on tide gauges, and allow better modelling of flooding and sea level rise. Examples from around the world were highlighted.

Currently LINZ are working with NIWA to confirm the accuracy of the existing New Zealand tide model developed by NIWA from tide gauge and satellite altimetry data, and to tie this model into the land. The final aim of this phase of the project is to develop a new tide model for New Zealand, as well as improved mapping on land and sea to better monitor the relationship between the two and any changes over time.

### David Rycroft – Fugro BTW Ltd: MH370 presentation

This presentation outlined Fugro's involvement in the search for missing Malaysian Airlines flight MH370 in the Indian Ocean. David was part of the survey team onboard one of three vessels covering a vast survey area.



LINZ presentation (photo: Fraser)

Rycroft outlined the large search area and the technical considerations and challenges faced when working in such an isolated environment – with a week transit each way! He outlined the equipment and procedures used and presented imagery showing the improvement in seabed mapping detail resulting from the survey. We were then shown some impressive statistics of the number of vessel days, personnel involved, distances travelled and data gathered.



Fugro Discovery (www.fugro.com)

### Gary Chisholm – Trimble: What's New in GNSS for Marine and a Brief Update on Trimble Marine

Gary talked about the advancements of Satellite Based Augmentation System (SBAS), which is being subsidised by the Australian and NZ governments. SBAS provides a single correction for single antenna without paying for a subscription. The horizontal precision is sitting at roughly  $\pm 1m$ .

The system works by using nine satellites and permanent base stations on land: the corrections are determined for these base stations and sent to the SBAS satellites. In New Zealand we would mainly be using #129. The



Trimble presentation. (Photo: Fraser).

corrections provided are: Clock Error, Ephemeris, and Ionosphere. Currently the troposphere cannot be modelled for due to the ever-changing conditions and the area that these changes are occurring over.

Chisholm followed this with updates on Trimble Marine, stating that HydroPro is now being increasingly used for seawalls and dredging and with Machine Control for dredging and cranes.

### Denis Vukovac – Seismic Asia Pacific Pty Ltd: New Waves of Innovation Transforming Hydrography

The final presentation of the day was by Seismic Asia Pacific, covering new waves of innovation in the industry. The focus was on the benefits of utilising integrated systems of MBES to decrease size and cost for a greater ease of use. When quick solutions are needed – as in the case of emergency – the result is often messy and confusing. An integrated system provides a solution that is smaller with lower power requirements, allowing easy deployment that can also meet high accuracy standards.

Vukovac also identified that industry trend is toward ease of use. With innovation, we are heading to multi-use systems that include more than just bathymetry.

Some of the presentations from the day have been uploaded to the AHS website: <http://ahs.wildapricot.org/news>

The day concluded with the award of the Australasian Hydrographic Society's Order of Merit Award to CMDR David Crossman for his long service to the organisation and

the NZR AHS AGM, followed by drinks and an excellent meal at Emerson's Brewery (thank you to Fugro for the generous tab!).

Thank you once again to the student sponsors DML, Elliot Sinclair, iXsurvey, LINZ, NIWA, NZOT and Trimble, and the School of Surveying for hosting the day.



Pip Davies accepts CMDR Dave Crossman's award on his behalf from NZR Chair Kevin Smith (photo: Fraser)

Participants mingle at the School of Surveying (photos: Fraser)





Attendees of the recent FIG Working Week in Helsinki

## FIG Working Week in Helsinki

*Robert Mears, Chair NZIS Young Professionals*

*Email: [Robert.mears@woods.co.nz](mailto:Robert.mears@woods.co.nz)*

**“ONCE YOU STOP LEARNING, YOU START DYING” – ALBERT EINSTEIN.**

The above quote can be closely related to where we are currently as a profession. With technologies such as machine learning and artificial intelligence (AI) creeping into our workplace, if we don't keep on investing into our learning we will quickly find ourselves out of jobs.

In May I was given the opportunity to attend the FIG Working Week in Helsinki, Finland. The experience left me with great personal and professional satisfaction. I presented at the FIG Young Surveyors European Meeting about the changing face of the surveying profession, and through attending plenary and technical sessions, I had the privilege to hear from world leaders from the likes of Google, Bentley Systems, and many of the world's top surveying and spatial universities.

Being geographically isolated from many of the world's technological and business centres, I think it can be easy to become complacent about global trends, new technologies and different ways of thinking.

With recent advancements and the rise of social media we are exposed to random blasts of articles and videos, but rarely do these promote discussion and proper involvement.

Since entering the profession, I have been fortunate enough to attend several different professional develop-

ment events locally, nationally and internationally. It is widely accepted that the young people within our profession are the way forward. I think it is equally accepted that to progress our profession and the businesses within it, we need our young people to be well rounded and up to date with the latest ideas, technologies and methods.

The following outlines a few of my opinions and experiences on the massive positives that come from attending such events, with a focus on young professionals' involvement.

### **1. Sharing our Experiences and Learnings**

The obvious experience during a conference is attending our peer's presentations on their recent work or research. With many of today's events featuring multiple short, information-packed presentations within each session, it is easy to take in a wide variety of ideas on one general topic. During all of the events I have attended, the presentations have acted as a segue into deeper conversations on the topics discussed. They allow you to become familiar with experts on topics, and I have always found that I get immense benefit from follow-up discussions with presenters. I have never met anyone at a conference who is not generous with his or her time or knowledge.

Lessons learnt can then be brought back and shared with our peers and our company, expanding to the wider profession.

This is a two-way street, and young professionals should be pushed to present at events. It serves multiple purposes, including improving their public speaking skills, finding clear ways to best communicate their ideas or findings,

and it raises their profile, and the profile of the company they represent amongst our profession. Personally, I have never been a particularly strong public speaker. Through speaking at events such as FIG Working Week, and presenting on behalf of the NZIS Young Professionals at the Otago University School of Surveying I have learnt skills that would not have been accessible in my workplace.

(continued p18)

## PERSONAL EXPERIENCES



Rebecca Strang

*NZIS Vice President, Digital Practice Leader, Aurecon NZ*

I joined Connell Wagner as a summer student, then was lucky enough to be taken on as in a full-time permanent position when I graduated. My career has followed a fairly typical route in my opinion. I was involved in a variety of work in my early days (land development, photo control for mapping, geodetic surveys, construction set out, etc), got my cadastral license and obtained RPSurv status some years later after getting married and having two children. The last three or four years I have managed the Auckland and Wellington survey teams.

For about a year I had been wondering what the next step might be, when I saw a newly created role (Digital Practice Leader) advertised at work. I applied for the role and thankfully was successful.

This role is a step away from day-to-day management of surveying and requires me to implement our global digital strategy at a local level. My role is to connect people across our organisation so that clever solutions and ways of working are leveraged across our NZ business.

I get to work with all of the different groups (transport, buildings, land and government) to help define the way we deliver our projects so as to ensure a consistent and efficient approach. It's almost change management in a way, as the end game is to transform the way we think

and work, so that we can spend less time doing repetitive tasks and more time actually talking to our clients.

I've been on the NZIS Board for just over a year and on the Council for a few years. Prior to that, I had been involved at local branch level and with the Young Surveyors (now Young Professionals) Group.

I was thrilled to help the YP's celebrate their ten year-plus existence at the recent Napier Conference! I've really enjoyed meeting a diverse range of individuals at branch meetings, conferences and training workshops.

A number of the people I've met I'd count as informal mentors too. I'm quite certain that some of the strategic thinking skills I've learned through my time on the Board helped me get my new role at work. Interacting with organisations such as LINZ and other professional bodies has also grown my confidence.

I would love to see more people putting their hand up to become involved at branch, Council and Board level. It really is an honour to help shape where our profession is heading and to advocate for our members.

I feel that I've grown a lot at a personal level through my NZIS experiences over the last few years. There are elections coming up, so I'd encourage people to consider putting themselves forward.



## 2. Technology and Attending Exhibitions

Seldom are we graced within our own workplaces with all of the latest hardware and software, or experts who themselves have helped to develop these tools. More often than not we are sheltered within our workplaces to one brand of equipment, or one piece of software, while every day our tasks vary and adapt. Speaking to different providers about their latest methods or tools allows us to stay aware of changes that are on their way and maybe ask better informed questions of our own suppliers about advancements or industry shifts.

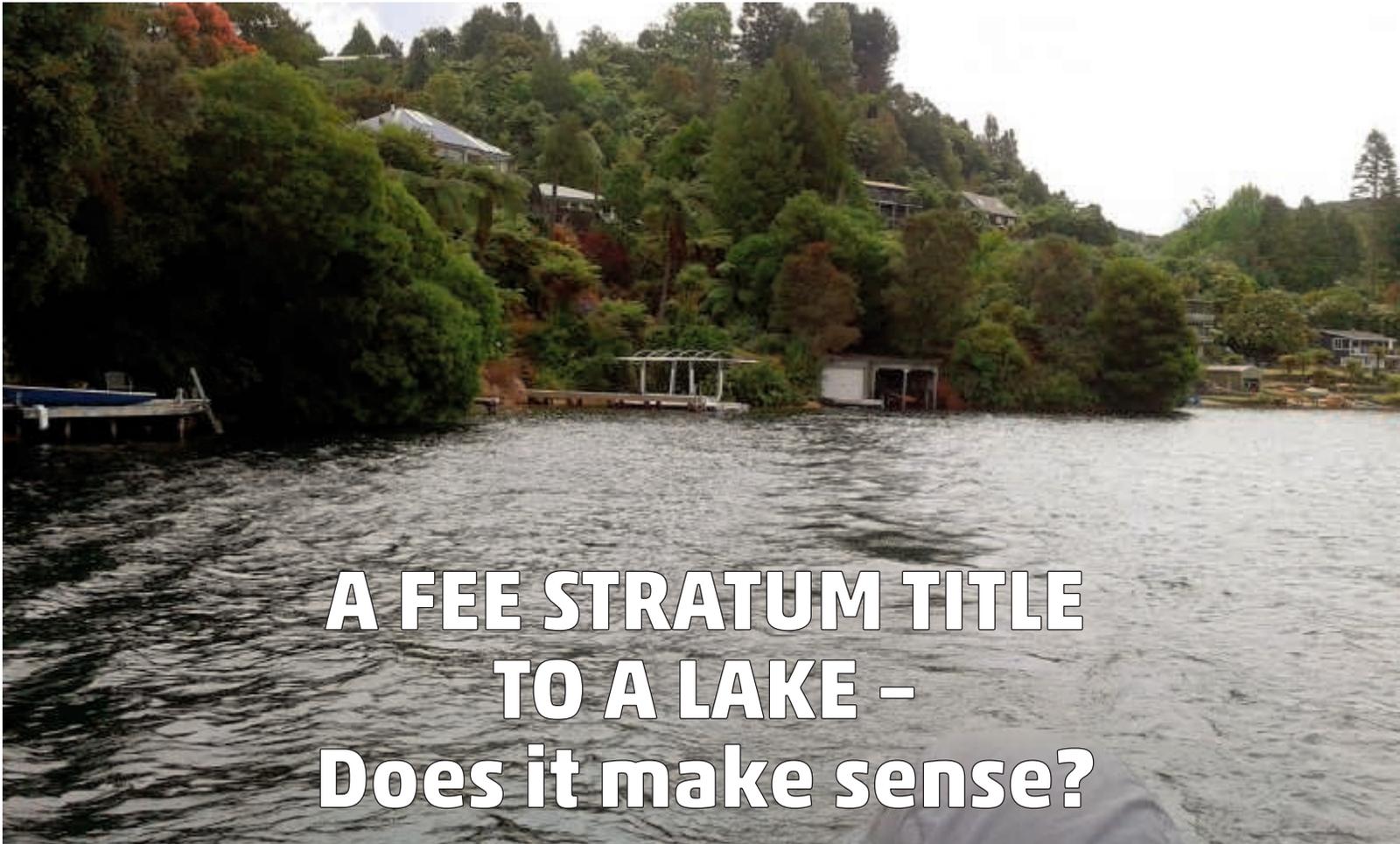
This is not to say we should all go out and buy the latest gadgets because they are new. More that the people most often using these tools, the young professionals, know where efficiencies could be made and can ask the right questions to potentially progress our businesses. I found it fascinating how fluent my European peers were in the underlying coding of our day-to-day software. Their understanding of the internal processes and methodology used behind the scenes blew me away. The ability to re-write or manipulate programs to better suit their needs was something that I think most young and experienced professionals in this country lack.

## 3. Building Networks

You can't talk about professional development and not highlight the relationships that are created. The FIG Working Week in Christchurch last year was an amazing example this, highlighted by Taryn Martin's input into our last article, "Giving Back and Making Connections". Ideas and experiences are shared just as frequently after events as they are during it. While topics might not always come up during an event, with social media having the presence it does today I often find myself discussing potential solutions to problems or generally hunting for advice from people I know that have likely faced similar challenges and are based on the other side of the world.

The experiences and friendships made are things that will stay with me a lot longer than many of the event topics remain relevant.

I would like to thank NZIS and their Diamond Partner Eighty4 Recruitment for giving me the opportunity to attend the Working Week, and to my employer Woods for their generous support with this and countless other professional development endeavors.



# A FEE STRATUM TITLE TO A LAKE – Does it make sense?

*Mick Strack and Nick Davies*

**Photos:** Cheal Consultants.

**IN THE SETTLEMENT OF TREATY CLAIMS, SEVERAL IWI HAVE HAD THE FEE SIMPLE TITLE TO THEIR LAKE BEDS VESTED IN THEIR IWI TRUST, INCORPORATION OR RUNANGA.**

Te Arawa Lakes Settlement Act 2006 followed the Deed of Settlement of the Te Arawa Lakes Historical Claims in the Rotorua region. The Act provides for Crown land under water to be vested in fee simple title to Te Arawa Lakes Trust. This sounds relatively straightforward, but a deeper investigation reveals a wide range of complexities and uncertainties.

To understand these complexities some historical perspective is required. We will use Lake Okareka (about 340Ha) as an example to put our discussion in context. Our purpose here is not to determine what iwi should accept from the government but, from a property rights perspective, to discuss what is being offered by the Crown and what is being withheld.

In 1840, Maori were confirmed and guaranteed the full exclusive and undisturbed possession of their lands. It is relatively uncontentious therefore, that Lake Okareka was Maori customary land, possession of which could only be extinguished by the free consent of Maori (in other words

by Maori selling their lands to the Crown) or by clear and plain statutory acquisition (in other words, an act of parliament explicitly extinguishing customary title). When customary title is extinguished the interests in that land are transformed; the Crown asserts its radical title to the land and may then further alienate the land as a fee simple estate into private title; a completely different set of rights, restrictions and responsibilities is created.

It may be that as ALL of the land surrounding Lake Okareka had at some point been alienated by Maori and therefore acquired by the Crown as one parcel (part of Run77 SO18076 – 1914), the lake within that parcel became Crown property by the assumption of the Crown being the adjoining upland owner.

However, it is likely that the Native Land Court would have confirmed the lake to be Maori customary title when it was finally allowed to investigate title to the lakes in 1918. The Crown intervened before such a determination was completed and asserted Crown ownership and extin-

guished customary title by statutory intervention (the Native Land Amendment and Native Land Claims Adjustment Act 1922 s27(1)).

Later, the land surrounding the lake was alienated from the Crown by several surveys of subdivision. These plans showed a marginal reserve set aside on the lake shore – approximately one chain (20 metres) wide. The shore boundary of this Crown reserve is a natural boundary defined by the water's edge (at the time) and the upland boundary is a series of right-lined boundaries of the adjoining subdivided parcels (DP27864 – 1938 and DP31482 – 1943).

The lake was not defined as a separate parcel nor did it have any appellation apart from Lake Okareka. It was later designated a Scenic Reserve by Gazette notices of 1984 and 1985.

The lake has no natural outlet (at least not on the land surface) and the evidence suggests that subsequent to the subdivision surveys the lake level was rising significantly, flooding much of the adjoining marginal strip and upland parcels. In 1964, the catchment authority intervened and reduced the lake level by piping lake water to an adjoining stream. The current controlled level remains significantly higher than it was in 1940 and much of the marginal strip and some adjoining parcels remain under water.

In 2004, SO338992 was prepared to illustrate the lake boundaries in anticipation of the fee simple title to the bed of the lake being vested in Te Arawa. The boundaries were largely adopted from previous plans, notably SO18076. This new plan shows Sec 1 as a stratum estate "The upper limit of Section 1 is the bed of Lake Okareka".

The upper stratum which is retained by the Crown as Crown Stratum ("*Crown stratum* means the space occupied by water and the space occupied by air above each Te Arawa lakebed"), remains undefined except in the sense that it is a balance parcel of Crown land left over from the vertical subdivision of the lake. Note: the plan panel records that this subdivision is not subject to s11 and Part X of RMA (the subdivision rules). It is interesting to note that in 2012 a similar settlement with Ngati Pahauwera in Hawkes Bay provided a plan of Lake Rotoroa strata which explicitly showed the upper stratum as a defined section of Crown Stratum (Sec2 SO430206). Perhaps it has since been recognised that the Crown Stratum needs a spatial and descriptor definition.

The plan panel also notes that "Natural boundaries are subject to the normal common law rules of accretion and erosion." The enabling legislation also records this (s40). We are unsure why this note is required; the common law applies by default to all natural boundaries without statutory clarification. However, now that the lake level is controlled it is unlikely that there will be any natural,

slow, gradual and imperceptible changes to the shoreline boundary. Also, the statement merely adds confusion because the common law on accretion and erosion is irrelevant when what the Crown is offering the iwi is title to all the (Crown-owned) lake bed that is submerged no matter how it became submerged.

The plan panel also records that Section 1 (the stratum whose upper boundary is the lake bed) is comprised in the Scenic Reserve and the Crown land reserved from sale (the marginal strip). In fact it is only the part of the Scenic Reserve that is under the lake bed which is incorporated in Section 1 (and we are uncertain how the subsurface can be described as a Scenic Reserve. Furthermore, Scenic Reserve is a designation not a parcel appellation). The Scenic Reserve above the lake bed is unaffected by Section 1. However, the legislation confirms that any part of the lakebed or Crown stratum that is a conservation area ceases to be a conservation area (s21), so the scenic reserve status is extinguished by statute.

Another definitional difficulty includes the determination about what remains of the marginal strip. It would appear that the raised level of the lake automatically extinguished (or moved the boundary of) the marginal strip as it was flooded (s24G Conservation Act 1987 provides for a new strip to be created on each change of the riparian boundary). So Section 1 isn't actually comprised in the marginal strip either.

The right-lined (fixed) boundaries of the adjoining parcels are not riparian, and will not move. However, the fact that now the lake water has encroached over some of those boundaries means that parts of those allotments are submerged, and those parts of the lake are private, and therefore not part of the fee simple estate vested in Te Arawa. Of course, it is no longer practical to re-establish those submerged boundaries, so there is jurisdictional uncertainty about where they are.

A fee simple title is the standard grant from the Crown for what we commonly understand as full ownership of the land. It is characterised not as the ownership of a thing, but as a bundle of rights; the rights to possess and occupy, to use and enjoy, to alienate, to exclude, to make a profit from and to lay to waste. Perhaps at the core is transferability. The point about a fee simple title is that it is the highest form of title granted by the Crown and it is assumed to represent 'ownership' of the land. A fee simple title is also required to be unambiguously defined so that there is security of title, certainty about its extent and subject to the protections of the Land Transfer Act.

As it turns out, the titles vested in Te Arawa include none of these rights. The lakebed includes; "the subsoil beneath that land and plants attached to that land" but the title is inalienable (s24) and it explicitly excludes the





water and aquatic life (s25), existing structures (s33), and all Crown minerals (s27) below the bed. The common law rights of navigation are protected (s31), all public recreational (s32) and commercial activities (s36) are protected, all existing structures (s33) and utilities (s38) are unaffected, although new ones need consent of the Trustees which is not to be unreasonably withheld (s41). About the only upside of this arrangement is that the lakebed is non-rateable (s44). The Crown obviously intends that an iwi title to a lake bed is something different from a normal fee simple title that has a well recognised bundle of rights attaching to it.

It is not at all clear whether anything of value has been granted to Te Arawa in this settlement, other than a symbolic grant of a fee simple title to a surface and the subsoil under a lake, with no rights of occupation, possession, exclusion or use. It sounds, at first, like a significant concession from the Crown providing redress for historical breaches of the Treaty resulting in loss of possession of the iwi's lands and taonga. Closer examination demonstrates that having a fee simple title to the bed of a lake amounts to little more than words on paper. It is disingenuous of the Crown to suggest that there is something of substance in the vesting, when there is little. The Crown retains the substance, Maori hold just the shadow.

On the one hand, the Crown addresses the loss of Maori customary title and returns land to Maori. On the other hand, the Crown avoids granting any of the rights attaching to a fee simple title. This settlement is merely a shadow of what could have been. The Crown could have prescribed a different form of Maori title that could more explicitly restore customary relationships? A unique form of title; sui generis; a waterways title; an aboriginal title. A chance for innovation; a chance to restore Maori mana, tikanga, kaitiakitanga and rangatiratanga. An opportunity missed.

*Nick Davies (BSurv RPSurv & LCS - Cheal Rotorua) provides a high level of technical expertise in the areas of greenfield development, subdivision, engineering and cadastral survey. Nick also specialises in water boundaries, the preparation and presentation of expert evidence for Maori Land Court and the application of Te Ture Whenua Maori Act 1993.*

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*Mick Strack (PhD MNZIS) teaches land law, property rights and statutory planning at the School of Surveying, while his research interests include understanding natural boundaries and property in rivers, lakes and the sea, environmental responsibilities, and property law. Email: [mick.strack@otago.ac.nz](mailto:mick.strack@otago.ac.nz)*

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# BETTER, STRONGER, FASTER

## *More geospatial benefits than ever before*

*Duane Wilkins, Spatial Data Infrastructure Leader, LINZ*

UNLESS YOU'RE OSCAR GOLDMAN WITH A SPARE SIX MILLION DOLLARS, GAINING SUPPORT FOR GEOSPATIAL PROJECTS CAN BE DIFFICULT. LINZ IS TRYING TO MAKE IT A LITTLE EASIER BY COLLATING STORIES, EXAMPLES AND RE-USABLE RESOURCES LIKE CASE STUDIES AND DIAGRAMS TO HELP EXPLAIN TO NON-SPECIALISTS HOW USING GEOSPATIAL TECHNOLOGY CAN BENEFIT ORGANISATIONS.

Geospatial practitioners understand the potential of spatially enabling a process, but often struggle to describe or quantify business benefits or process improvements to non-geospatial executives. Geospatial practitioners often underestimate the level of effort required to demonstrate a quantitative benefit for decision makers, it's not often that a task can be completed in a single afternoon, as much as we'd like!

With the support of organisations that have implemented successful systems or projects, LINZ have been gathering New Zealand examples of how geospatial data, technology and services are creating clear benefits.

We hope this collaborative project will make it easier for all of us to share, describe and raise awareness of the many different ways geospatial information and systems can make a difference.

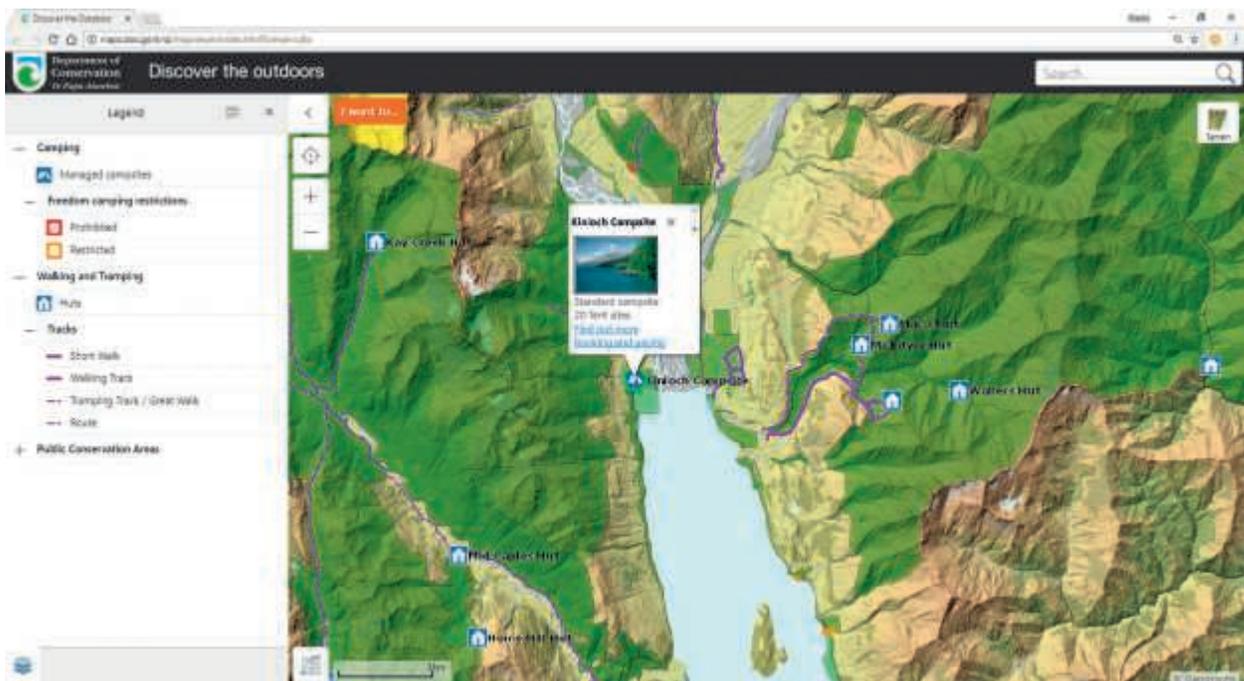
By providing local, home grown examples for use in business cases and project proposals we hope that this will drive greater investment and increase the use and value generated from geospatial information in New Zealand.

### **What is a Benefit?**

A benefit is a positive change or desirable result or effect from an action, investment or project. A disbenefit is the disadvantage or loss resulting from some activity or some action. Generally, these are described as an increase, a decrease, an improvement, a reduction, bigger, better, faster or stronger.

For example, good address and road network data (navigation) means that we are less likely to get lost, save time and fuel finding a delivery location, resulting in improved customer satisfaction, and an increased cash flow through more parcels delivered, and in less time.

The use of geospatial information leads to a variety of efficiencies, or capacity if the same resources are still devoted to the same work. The application of geospatial data and technologies creates efficiencies, or at least enables the re-use of the same data. Efficiencies result from the use of spatially-enabled tools, by making data easier and faster to read on a map than in spreadsheets and reports.



Savings from the use of geospatial data and capabilities are the difference between a baseline cost (which may be an estimate) for a process that makes no use of geospatial data, and the cost of doing that work using geospatial tools, data and techniques.

## The Ten Benefits of Geospatial Information for New Zealand

We tried a number of ways to 'slice and dice' the data, but after much 'paralysis of analysis', we opted for a 'click bait heading' approach based on ten different general types based on their aspects of similarity.

Here are the ten "categories" we've used to group the examples so far:

- Increased efficiency and reduced costs
- Enhanced effectiveness and accuracy
- Increased transparency and improved perception
- Increased interoperability and data exchange
- Greater satisfaction and better understanding of customers and stakeholder needs.
- Improved quality of products and services
- Improved knowledge management and retention
- Accelerated innovation
- Strengthen resilience and reduced risk
- An empowered Māori culture

We've also added a section on Benefits Realisation and will be developing further the Return on Investment (ROI) approaches to quantifying these benefits to support business case development for example. We welcome further feedback and there is no reason we cannot add, merge, remove or change these categories either!

An example (pictured above) is the Department of Conservation's (DOC) "Discover the Outdoors" web mapping application.

This application supports increased public access to DOC land, with millions of views per year. It also enables anyone to provide quality assurance feedback on the features mapped and entirely removed the need for DOC's geospatial team and other staff throughout New Zealand providing simple maps to the public. The app also reduces demand on local DOC Rangers for basic track or hut location information, enabling more of a focused and informed discussion, and links users directly to DOC Hut and Track booking systems. The benefits of this work include: increased public use of DOC land, improved data and information access and management, and reduced overheads. <https://maps.doc.govt.nz>

Google Maps is a great example of how geographic information is used by millions of people daily, reducing travel time, and offer alternative routes depending on usual traffic at different times of the day, as well as real time updates on traffic information based on anonymised information from smartphone users where a traffic jam or other significant event may have occurred just moments ago. <https://google.com/maps>

Geospatial data and technologies have the potential to deliver an extraordinary amount of value to New Zealand businesses, local government, central government, Iwi, NGOs and New Zealanders. The effort required to implement a benefits realisation assessment can be small in comparison to the economic, social, cultural and environmental benefits that will result from even a relatively modest geospatial project.

## Geospatial means business

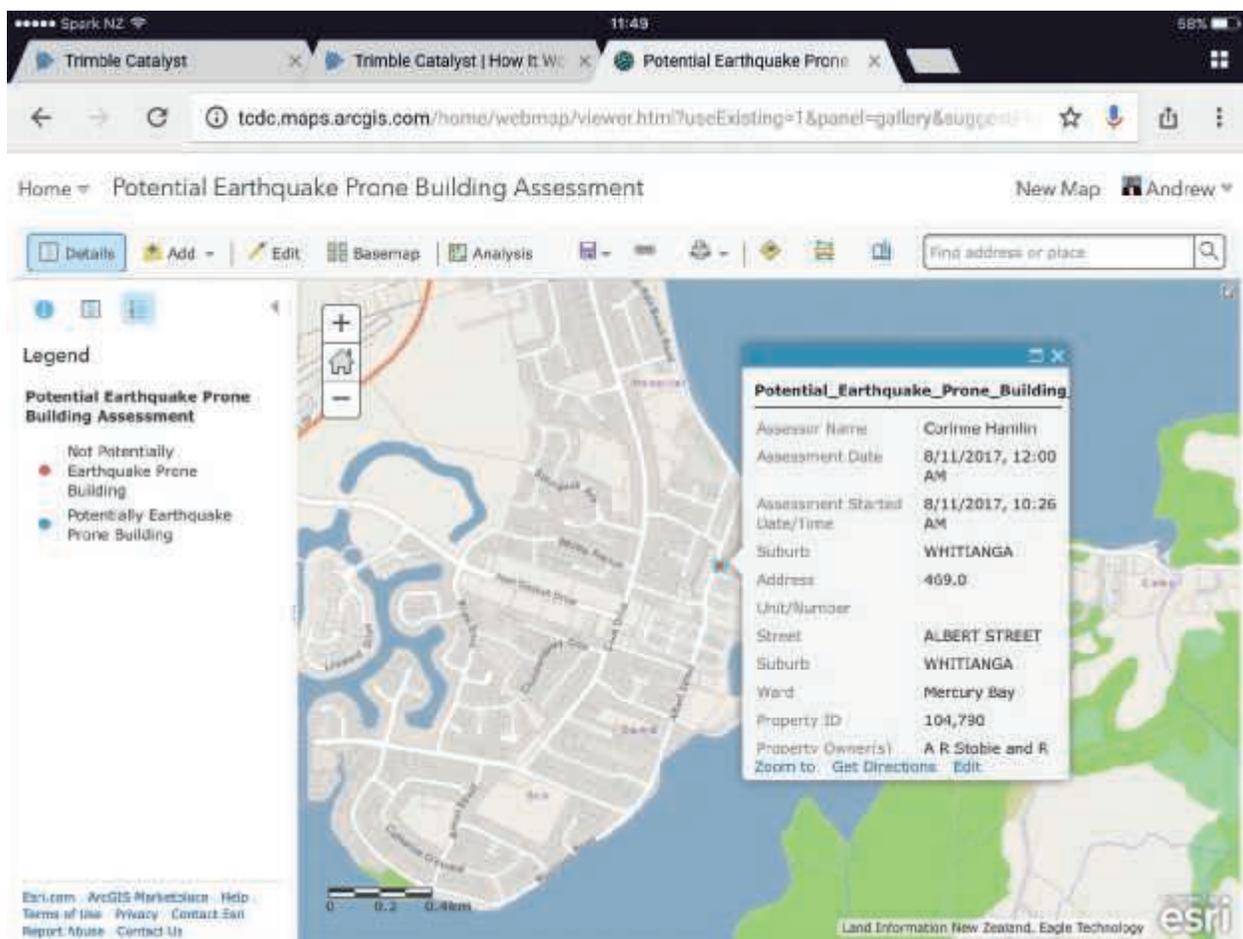
Removing key barriers to connecting this information could add a further \$500 million a year in productivity benefits and generate an extra \$100 million in government revenue. Geospatial information and related technologies form a part of New Zealand's knowledge infrastructure and enables innovation and better decision-making. Geospatial capability may enhance virtually any aspect of business, including decision-making, asset management, service delivery, new product development, resource allocation, process improvement, and overall cost structure. Both public-sector and private-sector businesses may benefit from the addition of geospatial capabilities.

formed decisions, yet-more-streamlined business processes, and even new capabilities, products and services.

The intent of this work is to raise decision-makers awareness of the possible benefits and the business benefits to be had by their organisations. For practitioners—project managers, programme managers, change managers, and programme management offices (PMOs)—this resource is intended to support benefits realisation planning.

Another example of geospatial technology reducing duplication is the “Potential Earthquake Prone Building Assessment Form” recently shared by the Thames Coromandel District Council on LinkedIn.

This provides Geospatial Analysts in other local government offices with a running start to use as is, or build on



Almost every transaction today is time-stamped, which has provided an added dimension for business analysis. Timestamps have enabled superior forensic investigation (e.g. by exposing the sequence of events), streamlined business processes (e.g. by exposing delays and downtime), and improved decision-making (e.g. by providing richer evidence).

Location-stamping these transactions (and assets, and events etc.) allows for further types of analysis (spatial analysis), which could be combined with time analysis and other forms of business analysis to enable yet-better-in-

the work already done by Senior Geospatial Analyst, Andrew Hansford. Download the form template for use with Esri ArcGIS Online from: <https://tcdc.maps.arcgis.com>

## Download a copy of *The Ten Benefits of Geospatial Information* today

We've collated examples of the benefits of using geospatial information and grouped them by themes for ease of reference and you can access and use materials from our ongoing collaboration at [linz.govt.nz/benefits](http://linz.govt.nz/benefits)

# Resource Management Act – Version 22

*Stephanie Harris, Glaister Ennor Solicitors*

Recent correspondence to me around some of my articles has given me pause to reflect on just how varied a surveyor's work is, how wide ranging a surveyor's knowledge is of many aspects of land law in New Zealand and how significant the legislation is that relates to and guides a surveyor's professional duties and practice.

To that end, I firstly want to clarify a portion of my last article relating to professional conduct and secondly want to ensure a focus and reporting on some of the wider legislation that surveyors will have a professional interest in. In this latter regard, see my overview below of the Resource Management Amendment Act that came into force in April of this year. There are further changes to come with the next effective date October 2017 and I will report on these closer to that time.

Firstly, my recent article on surveyors' professional duties provoked some great commentary from some members, many of whom had faced disputes or unwelcome complaints. I welcome the feedback, and as a result of the most recent feedback, think that it is incumbent on me to clarify a matter that two surveyors separately raised with me. That is; the wording of my article implied (although it was not intended to) that a surveyor could dictate where a boundary lies dependent on their client's wishes. My intent was to highlight the need to be impartial, and how easily we can all be caught in conflict and difficult situations – particularly where acting for multiple parties.

The feedback I received showed me it is a real issue for many surveyors who have found themselves under pressure from clients (and sometimes other surveyors by way of complaints) over (for example) boundary definitions. My intent was to highlight the issue, and by way of clarification I note that of course, all surveyors will be clear on their fundamental obligation to be able to justify their boundary definitions by reference to the Rules for Cadastral Survey.

This issue of professional duties and increasing compliance obligations is one that is more and more to the fore in our daily work, and I have chosen to comment on the recent RMA changes in this article following the theme of professional duty, as part of the RMA Amendment legislation is to introduce into the legislation procedural principles for decision making.



To my mind, this represents a significant shift from the underlying RMA principle of wide public participation to end customer focused decision making. As these changes are adopted, we will keep a watching brief on their effect and impact on how we undertake our work and continue to meet our professional obligations. In the meantime, see the article below, this is substantively based on an article written by my Resource Management specialist partner, Vicki Toan.

The Resource Legislation Amendment Act 2017 came into force on 18 April, 2017. It introduces further changes to the Resource Management Act 1991 ("RMA") and makes amendments to the Reserves Act 1977, the Public Works Act 1981, the Conservation Act 1987, and the Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012. Many changes came into effect on 19 April, 2017, other changes will have effect from October 2017 and from 18 April, 2022.

## The key changes to the RMA relate to:

- National (central government) direction
- Plan-making
- Consenting

## Other changes to the RMA relate to:

- Courts
- Process changes
- Minor/technical amendments

One process change introduces procedural principles for decision-making, which means these principles require customer-focused decision-making. Therefore, anyone exercising a power or function under the RMA must take all practicable steps to use processes that are timely, efficient, consistent, cost-effective, and proportionate.

And whether the changes will have an effect on the cost and time of consenting in New Zealand will largely depend on how councils implement the changes. The reduc-

tion in public participation through reduced notification and appeal rights will negatively affect would-be submitters and applicants to differing degrees. But, it represents a significant shift away from the concept of open public participation, which has previously underwritten the RMA.

## **Here is a summary of other key changes:**

### ***National direction***

In addition to national policy statements, New Zealand coastal policy statements, and national environmental standards, the RMA now makes provision for national planning standards ("NPS"). NPS are intended to form a standardised national framework for district and regional plans and policy statements. It is expected the first set of NPS will be developed and approved by 2019.

Further, the new powers to make regulations are intended to reduce duplication between Acts by removing or prohibiting rules that needlessly duplicate or overlap with the provisions of another Act (excluding provisions dealing with genetically modified organisms). These regulations may, for example, relate to matters covered by the Building Act 2004. These changes have immediate effect.

### ***Plan-making***

Two new plan-making processes have been introduced: "streamlined" and "collaborative". Limited notification of plan changes may be used when full public notification would be disproportionate to and inefficient in the circumstances. One of the effects of these changes is to reduce the scope of public participation and associated appeal rights. These changes have immediate effect.

From 18 April, 2022, councils will no longer be able to require financial contributions. This means that the costs of servicing new growth should be met through development contributions under the Local Government Act 2002. Alternatively, consent conditions may require the construction of infrastructure directly related to the proposed development.

### ***Consenting***

Most of the changes to consenting will not have effect until 18 October, 2017. They introduce a series of new concepts that are relevant to residential subdivision and development. One of the effects of these changes is to reduce the scope of public participation and associated appeal rights.

Councils must except "boundary activities" from needing resource consent if the relevant neighbour provides written approval. Boundary activities will include things like yard setbacks, height in relation to boundaries and fences. Although, it will not include site coverage or maximum height.

Resource consent may not be required for marginal or temporary rule breaches where the effect of the breach cannot be discerned from those of permitted activities. An applicant may apply for an exemption, and if the council grants an exemption, the applicant will receive a written notice deeming the proposed activity is permitted. That written notice, though, will lapse if the applicant does not give effect to it within five years.

A new "fast track" process for controlled activities will apply to district consents. Fast track applications must be processed within ten working days if non-notified. An application will cease to be fast track if it is notified, a hearing is necessary, or the applicant opts out.

New four-step processes for determining public and limited notification have been introduced. These processes remove a council's general discretion to publicly notify applications and to preclude notification of some applications for subdivision and residential activities. One desired outcome from removing some of these applications from the usual notification tests is to speed up the delivery of housing.

Subdivision consents may be refused or have conditions imposed to manage risks from natural hazards. While this has always been the case, the definition of natural hazards has been widened and now includes, but is not limited to, earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire, or flooding. Otherwise, the scope for imposing conditions has been reduced.

### ***Courts***

Unless the activities and consents include non-complying activities, neither submitters nor applicants will be able to appeal decisions relating to boundary activities, subdivision consents, or residential activities. Submitters will be limited to appealing on points raised in their submissions. The effect of these changes is to make the council's decision the final decision on certain types of application (subject to judicial review). These changes will have effect from 18 October 2017.

*Stephanie Harris is the joint managing partner of Glaister Ennor Solicitors. She has extensive experience in property and commercial law. She acts for SMEs, larger corporates, investors and developers on many large and complex property transactions and developments, ownership structures, leases, security interests and general structuring and finance.*

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# The Problematic Easement

***Guo v Bourke* [2016] NZHC 2240; [2016] NZHC 2932; (2017) 17 BCB 391.**

*Mick Strack, National School of Surveying, (mick.strack@otago.ac.nz)*

**BOUNDARY DISPUTES GET WAY OUT OF HAND WHEN NEIGHBOURS START BICKERING. PROPERTY RIGHTS ARE ESPECIALLY PROBLEMATIC WHEN THEY ARE SHARED.**

A recent Epsom dispute that went to court – ultimately both parties bringing claims against the other – shows how perverse judgments can be. I do not mean to criticise the judges for that but just that the litigants would have been much better to have resolved the conflicts themselves with good advice; ideally from a surveyor experienced in land law, rather than a lawyer whose interest may tend towards drawing out legal point-scoring in court.

The details of the situation are not difficult to explain nor are they unique; in other words, they are quite common and are recognisable to any land development surveyor.

In brief, there is a reciprocal right of way with a front lot and a back lot sharing rights over two strips of land adjoining the side boundary of the front lot, each lot holding one strip.

The formed driveway only covers part of each strip, with the parts to the sides of the formation landscaped in garden plots. The front lot has two access points, one directly off the road and one about halfway along the RoW where it turns off the shared driveway into a garage and car port. The front lot's use to the end of the RoW allows access to the very back of the lot although access that way is difficult and inconvenient.

At some point the original owner/subdivider of the two parcels living in the back lot built a dividing wall and gate that intruded over the boundary onto the front lot and the right of way. Several changes of ownership later and the current owners of the back lot, the Bourkes, wish to replace the old wooden gate with an electric steel gate.

Apparently, they obtained consent from the front lot owner, Ms Guo, although that is denied in court by Guo. They built the new gate in place of the old, apparently



unobserved by Guo. Ms Guo was described by the judge as obdurate and of taking an untenable position with her evidence. In this respect the court observed that she did not help herself, and the court found against her in nearly every respect.

Legal arguments revolved around s313 Property Law Act 2007 allowing the court to enforce easements, and s323 PLA 2007 allowing the court to provide relief for misplaced structures, except when the dispute may better be dealt with by s24 Fencing Act 1978 allowing the court to make an order about the fence and determine matters of compensation.

The court decided that there had been knowledge and consent to build the new gates in place of the old, but that Guo had not been informed about not being able to open the electrically operated gates. The gates were allowed to remain encroaching over the Right of Way, but Guo would be able to operate them to access her strip of land to the end.

It is hard to imagine what benefit she may obtain by doing this, as the end of the strips is effectively in the occupation of the Bourkes. Clearly the Bourkes are receiving a benefit from such exclusive occupation but not apparently at any significant detriment to Guo (other than the indignity of having a neighbour in exclusive occupation of what should be shared), and nothing is different than when the property was purchased (except a newer gate). It may be pointed out that Guo is also in exclusive occupation of the shared part of the strip on which she has her side garden.

Perhaps out of spite, the Bourkes lodged a counter claim that was heard at the same time although reported

(continued page 44)

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Stephen Donaldson of GeoLocarta.com

# What just happened when I was looking at the ground

*Patrick O'Connor, Australia-Pacific Regional Sales Director, Carlson Software*

THE TRANSITION FROM TRADITIONAL DATA COLLECTION METHODS TO THE 'BIG DATA' METHODS HAS AND WILL CONTINUE TO CHANGE THE BUSINESS PROCESSES FOR SURVEY COMPANIES. THIS CHANGE WILL ALSO AFFECT HOW COMPANIES PURCHASE EQUIPMENT. THE USE OF SOFTWARE IS COMING INTO ITS ASCENDANCY AS THE MAJOR COST FOR THE DELIVERY OF SURVEY AND MAPPING PRODUCTS.

We are transitioning through to the age of mass data. Less point and shoot, more machine-gun-the-hell-out-of-it in a controlled way. We are extending the traditional ways of presenting survey and spatial information as well as creating platforms to deliver complex information in a way that can be better understood by non-professionals.

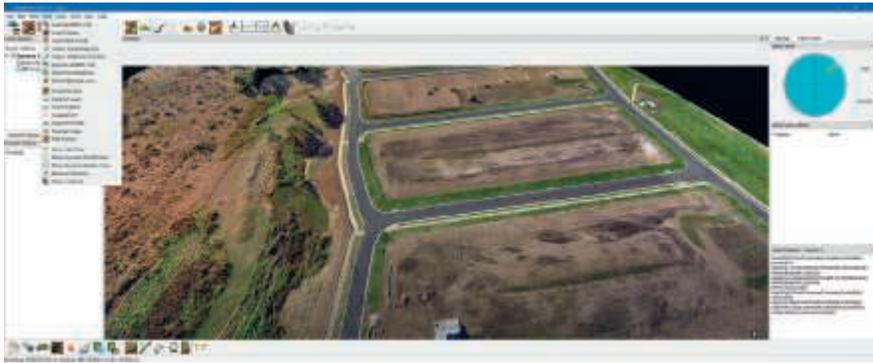
I work for a geospatial software company. For us, every piece of measurement hardware is a sensor from which we can acquire data. Essentially, software is usually designed to reduce, demystify and present data in a form that is easily understood by other professionals and the public. Since the start of my spatial career we have used tripod based systems to acquire XYZ values for localised data collection.

In the last few years the data acquisition platforms have left the ground. Now, through our ever-increasing use of UAV technology we can look forward to more profound data processing change. However, what has not changed for me since 1981 is the need for clever work flows built around efficient methods and reliable software.

Software is a key component of most business ventures these days. Take a problem, scratch below the surface and you will discover some form of software (or firmware) providing a speedier solution than that what was proposed three years before. To be competitive, software publishers update their software to add new functionality or extend current functions to make them more relevant. Add data to the mix and we have solvable problems.

One of the most prominent changes for end users of geospatial data is the accessibility to high resolution images. The relative quality of images provided by Google back in the early parts of this century certainly provided all spatial professionals with a great resource. However, more importantly the average person was given access to the same resource. This provided a level of education to the public that no government at the time could ever match. Now that geospatial images are commonplace, we are diving deeper into providing more and more resolution.

The use of UAV data can feed an increasing appetite for the presentation of higher levels of reality. Instead of just



Carlson P3D Topo 2017 showing 150 million points on 22ha site.

providing a snapshot, a moment in time, we are heading very quickly to geospatial information in a temporal reference frame. The incremental change in a site is now a key observable that businesses want to see. It is no longer sufficient to know the volumes at key moments. There is now a need to identify all aspects of the site, that include the differential of volumes, assets and even safety aspects. Having entered the period of mass data in the geospatial world we must look at how we control the vast quantities of information we will acquire, process and present.

The business process for surveying usually involves an expensive sensor coupled to a relatively inexpensive computing device. Then add the cost of training, either on the job or in a formal setting. By comparison the software is usually the poor cousin.

On top of the tools, the fieldwork takes much longer than the processing. My argument is not that survey equipment is overpriced for what it achieves, the business models of traditional surveys and UAV surveys do differ. With UAV surveys, the equipment is relatively cheap, the software is relatively expensive and the processing costs are high.

My first experience was a 22-hectare site of a newly constructed subdivision. The control took an hour to record, the flight took one hour and the processing, to extract 150 million points, took 14 hours. Add another hour to produce a CAD ready surface and volumes.

The beauty of this form of data collection is the ability to extract extra information at any time. Does the client want detail on assets identified in the images? Add some GIS classification with some data entry and you have a complete detail survey from the same data. The downside is the quantity of processing required to extract new and valuable information.

To be honest I never got the flying gene. I fly all the time, but I like that there is someone else driving while I am quietly eating my dinner. While the world has become fascinated with "drones" I have been busy assisting in the development of software. Subconsciously, I knew that my interests and the interests of the avionics loving people would someday cross. This occurred about three weeks

after attending my first New Zealand survey conference. Fate tends to surprise us even while we are watching it.

From what I have experienced, software takes control and flies the sensor around in a planned flight path without any need for intervention from the operator.

The processing of the individual images is done in software that can be on your desk or 10,000 km

away. The processed data is an orthophoto plus millions of points. This data is further reduced in applications such as Carlson P3D. The output from the entire process is traditional plans and reports. Add some easily obtained 3D objects such as human figures, vehicles, building and vegetation and now we have representative 3D models and fly-throughs. The results no longer require an experienced eye to understand. The final product must be clear, concise and full of meaning to the observer.

To progress through this new paradigm in survey data collection we should select a cost-effective tool to process, present and transfer final information.

My journey has been with Carlson Precision 3D Topo (P3D). P3D is developed on a gaming engine. P3D Topo is a data processing toolbox. P3D provides tools to import traditional reduced survey data, point clouds and images. Whether we need to process line work from our field codes, create a surface or drape an image, P3D provides an ever-increasing range of functions to visualise, measure or embellish any 3D scene.

Output is in multiple formats from PDF to machine control files. Having created a wonderful 3D model becomes difficult when you need to email it to your client. This is where LandXML.org becomes critical. Just download the free viewer from the site, import your P3D model in all its glory. If you are using some other CAD, just export your data in LandXML format for points, lines, surface models, pipe networks, etc and let non-CAD users marvel at the high-precision 3D world.

With mass data becoming an everyday part of the surveying and spatial professions arsenal, we need to consider new business methods of reducing, value-adding and presenting geospatial data.

As data volumes increase and data collection methods become more efficient the average user must also increase their efficiency. We are also extending the traditional ways of presenting survey and spatial information as well as creating platforms to deliver complex information in a way that can be better understood by non-professionals.

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- **Kevin Birch, Director of Birch Surveyors**



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# IT'S PHOTGRAMMETRY 101

## Introducing Drone Technology to an Engineering Firm

*Maurice Perwick, Eliot Sinclair*

### Introduction

At a recent NZIS National Conference we were all encouraged to embrace the technology of drones by Professor John Hannah.

We initially went low budget and purchased a DJI Phantom 3 from Ferntech for under \$2000. Quentin Doig, Graduate Surveyor, who has been a UAV pilot forever, was tasked to make it fly and capture images for processing and making 3D models.



Sylvia Butters, Photogrammetrist circa 1990s

### Historical Experience

Sylvia Butters and Jerry Schutte were our photogrammetrists back in the day with a 70mm format film camera, Adams and SDR Mapping Software, light plane or helicopter. We flew the plane without GPS corrections at low altitude, with good results. Jobs were small but terrain was often difficult.

### Back to Now

#### *The Big Question*

Upon receiving a topo job, a decision is made as to how to capture the data. It might be using one technique or multiple techniques where the datasets are merged, compared and trimmed to create the deliverables. The two simplest methods for topographical survey are RTK-GPS and Total Station surveys using feature codes and right-lines.

However, if LiDAR, 3D scanning or photogrammetry is used, then processes become more complicated! Underpinning all of these techniques is the need for good Geodetic control, and choice of a height datum on which to build the dataset.

Photogrammetry can deliver a geo-referenced orthophoto, a 2D & 3D mesh, a LAS File, obj files and more.

## **Eyes Wide Open**

New technologies and their use is at the creative edge. It takes a lot of work, planning, data capture, processing, cleaning, exporting, learning and quality analysis to perfect the use of the systems and their outcomes.

## **Expectation**

We wanted to work in 3D and achieve better than 5cm accuracy. We tried and tested many scenarios before we got close to being able to achieve this.

## **Testing Location**

We initially started close to home (20 Troup Drive) by placing targets around the carpark and on a post. The ground targets were detected but not the elevated targets. We weren't getting enough hits, (same image in six photos), so that idea of placing photo control targets on fence posts went 'out the window'. We also wanted to survey rooflines as one could not always scan these from the ground with our scanner. This again, turned out to be problematic but it was high on our priority list and we were determined to solve it and develop a technique to do this.

## **Oblique Photography**

The great news about flying quadcopters is that they can fly really slow and close to the ground. They can also orientate their cameras in any direction. We augmented our nadir photogrammetry with images captured by flying parallel to buildings, varying the flying height and oblique angles to ensure that the eaves featured in many of the images. This sharpened up the roof lines and encouraged us to develop the technique further. We found different software to fly the drones which supported oblique capture.

## **Photo Scale & Bridging**

As we started to push the envelope on the type of terrain, (natural and manmade), we chose to use the UAV on, and we discovered there were limits on how much a change in flying height could be tolerated to optimise the processing and accuracy.

We also found where we were restricted to fly below a height of 80m, that the location of rock outcrops at sea



Rough Terrain along the Roadside

were too variable to allow bridging of photo images. We had marked these at low tide. This caused some of the orthophoto mapping to fail. But we couldn't change the flying height due to civil aviation regulations and local agreements as the town was recovering from being isolated with a lot of aerial traffic.

However, we were able to use a Trimble SX10 to scan at low tide to good effect to rocks 500m offshore.

## **Too Much Data**

Rough and variable terrain does demand extra flight lines, obliques and cross lines to get the necessary overlap and views of that surface. This can double or triple the amount of imagery which needs to be collected, and this is where expenses start to increase. It extends flying times and UAV requirements, aircraft choice and battery resources.

## **Processing Platform & Software**

Our initial photogrammetry processing was carried out on our fastest and best speed PC dedicated to the terrestrial scanning team. We had embraced PIX4D as it has great tutorials and is straight forward to use, even though we have tried a few others. There are various leasing options from free trials, monthly or annual subscriptions to purchase and support. We found it was necessary recently to buy a new PC, sub \$20,000, and after fine-tuning by our IT staff it has proved very cost and time effective for the three stages of data processing.



LIPO Battery Storage

## **Squadron**

We have three UAV DJI multi-rotors to carry out work. We have not considered fixed wing aircraft as the size of our projects are small, less than 1.5km, and cannot do obliques as easy as a Quad.

Our Phantom 4 has collision avoidance capability.

Our basic Phantom 3 flew into a mountainside but was recovered and repaired and is now our trainer!

Our Matrice 600 is a beast that has a large payload and wind-loading capability but also has a hunger for higher battery usage. We have three sets of six 4500mAh Lithium Polymer (LIPO) batteries to maintain it in the air for approximately 45 minutes to one hour. We have battery charging facilities in the field if the flying is extensive or if wind conditions create excess demand of the aircraft. Each of our aircraft has different quality cameras or can support a range of cameras, e.g. video with zoom lens for inspections. We have a LIPO fireproof cabinet for charging and storage of our LIPO batteries.



Campus Mapping

## **Flight Operations & Planning**

We then decide what number of personnel are required to fly the aircraft as this can vary from one to three people. One pilot for simple jobs or two pilots, one flying the aircraft and one observer, if in a restricted location with designated, coned-off landing sites or whether we use two controllers, one to fly and the other to control the camera especially during inspections. We will need to check that the image quality being captured on the controller is acceptable and whether adjustments to the exposure or the flying 'speed over ground' is appropriate to eliminate blur or under exposure.

We often have a third man if a site has two launch locations where he manages the landing zones again with cones and barriers. Hand-held radios are a must when flying high-risk sites.

The flight can be planned to some extent before leaving the office but may need to be reviewed when on-site, before flying the mission. On-site access to the internet may need to be considered if re-planning the operation. Lighting conditions, wind, tide, vegetation cover, bright sunlight, overcast, shadows, ground terrain, and steep slopes must all be considered during pre-flight planning. The memory card must be fast and have sufficient memory available. It is necessary to keep visual track of the aircraft

(under the CAA rules) while it is flying. Low tide is the preferred time to fly along a shoreline but this may be at a time when sun angles are low, increasing the amount of shadow.

The UAV may require a pit stop for a battery change at some point. Some flight control software may store where the photo capture stopped earlier, when it resumes flying. When the UAV flights have been completed, it may be necessary to advise 'the agencies' that you are 'back on the ground'. The CAA Airshare procedures for flight logging while in restricted airspace ensures that all flights

are taking place within the rules and regulations set for that particular area to eliminate conflict and ensure safety for all.

## **CAA Part 101 & 102**

We currently operate under the Part 101 rules but have applied for Part 102 certification, which is very demanding both in the flying standard and competency required in the field and to the generation of our own dedicated flying manual with all the procedural and protocols that entails. We had written a procedures manual with quick-check task lists to ensure successful deployment and capture, but this has now been expanded somewhat, after Part 102 training, education and flying tests. Our less experienced pilots regularly take our aircraft home to practise the very simple but demanding flight patterns by setting the GPS aiding to off. The benefits of Part 102 certification are many as some professional freedoms can be sought and taken advantage of.

Seeking permissions from local authorities, land owners, CAA Airshare (restricted flight zones) can be more easily obtained. It has been pointed out by legal advisers that the onus of obtaining permissions could be 'on the client' and part of the conditions of engagement especially if a drone survey was agreed as the methodology of choice

with the client (still pays to check if permission to overfly has been granted).

### **The Data Processing Procedure**

The SD card is downloaded to the computer on return, so as to begin an unconstrained adjustment of the raw dataset, usually overnight. The number of images processed can easily exceed 2000 or 4000 especially when adding oblique and terrestrial images. We examine the processing reports and look for outliers. Following step one, we add ground control coordinates to the system and then identify them in the imagery, much as you do in any calibration or adjustment sequence.

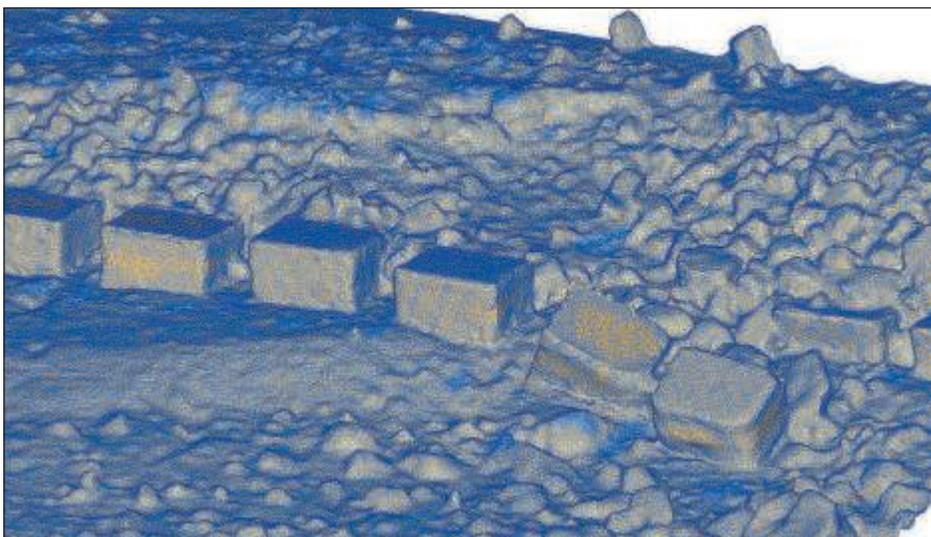
As you add more control to the image selection, the refinement becomes easier as it geo-locates to the targets. We again reprocess and check the quality of the constrained adjustment. Any misidentification of control needs to be corrected and the processing re-run and checked for outliers.

We may look to install PPK logging on our aircraft as this will reduce the processing demands and the amount of ground control, as well as any need for radio correction systems. A GPS logging 1Hz on site would suit.

We then finish the processing and begin to clean the imagery and mesh of unwanted artefacts, if required. For this, we use dedicated software such as 3D Reshaper which repairs the surface where trees, vehicles and other noise is removed. We can also remove imagery from adjoining properties, not part of the survey, to respect privacy. Vegetative cover will always remain an issue when seeking ground levels, even with Lidar, although some processing systems can knit the lowest points together.

### **Further Refinement**

Objects generation, right-lining.  
Ortho photos image draping.



Concrete Blocks Sea Wall

### **Optimising File Sizes for Export**

When working with large point cloud datasets there is usually a correlation between project size, portability and accuracy. We use software to seriously reduce the size of our geo-referenced JPEG files and to coarsen our DTM meshes without loss of accuracy. This can be done by specifying tolerances when generating objects or LAS files which then become more manageable in other CAD and design software suites and when merging datasets from other techniques, e.g. Topo, scanning and LiDAR.

### **Summary**

It all looks easy when done well, but it is 'hard won' and continues to be so as we strive to better our techniques, ease of capture, processing and make the systems more affordable and profitable.

The aircraft systems continue to be developed with increased capability, capacity and affordability especially as LiDAR is developed for Drones. Spectral capture is still very much in the realm of the specialist users and outside the experience and expertise of the average surveyor. The software systems are chasing hard to optimise the surface creation and right-line generation and feature coding capability to optimise portability and merging and enhancing of the deliverables.

Photo and video capture can enhance a presentation in a special way that traditional surveys cannot compete with.

AUV are becoming more affordable and capable and well supported by specialised software to make the adoption of photogrammetric techniques part of our professional mainstream again.

Surveyors understand the 3D world and can take advantage of the technology.



# The Archaic Process of Subdivision Consents – Auckland Council

## *A brief history and likelihood of going forward positively*

*David Crerar, Licensed Cadastral Surveyor, Spacelink Surveyors, Auckland*

### Introduction

I will be discussing the relevance of the subdivision consent in Auckland, in terms of its conjunction with the New Unitary Plan, with some of the following headings:

1. Subdivision conditions should be affordable, and should match the intent of the Unitary Plan, with standardisation across the whole Auckland region.
2. Why are there so many council applications and processes in the subdivision process, from the initial subdivision consent, to the issue new certificates of title?
3. Who should be the professional body responsible for the formatting of the subdivision consent conditions? and who should be the professionals responsible for the on-site supervision and its certification of the Section 224c. Should this be Auckland Council and its staff?

### A Short History

From a surveyor's perspective, the relationship of the subdivision department has eroded in Auckland City, since the departure of Liz Stewart and before that Ross Millar.

Not forgetting Ron Jackson from Waitakere and Roger Low from Manukau, being key members of the various council subdivision's teams.

In their day, they created a workable subdivisions team, and the liaison with subdividing agents, such as surveyors, was very good. Communication lines were well and truly open, and consistently the same subdivision officers issued consent.

Nowadays, many outside planning consultants can act to process a subdivision consent, and there ends up being no continuity from one consent to the next, and the relationship and communications portal for Registered Surveyors has become non-existent.

There are not enough surveyors on council staff, and as a result the consent is processed by planners and engineers. The teams that were set up by Liz Stewart and Ross Millar are largely non-existent.

It seems that the planners and the engineers have all

the power at council, and the subdivision department is now seen as a poor cousin. I speak at this point primarily about Auckland City Council staff. (now Auckland Central)

However, given my summary of events, in our office we were looking forward to the unification of the Auckland Unitary Plan, as in my mind it meant that consents would become uniform through the entire Auckland region.

I presumed that because we were getting a Unitary Plan, that all the teams involved in subdivisions, would bring their processes together across the regions. Surely this was a logical thought looking from the outside?

This topic is vital to Auckland's growth, and I believe that overall council staff and the archaic subdivision process is lagging behind the Unitary Plan.

It is all very well to have new planning rules, but the implementations need to be updated also with the same standard across the whole of Auckland. This is not happening, unfortunately.

Currently in Auckland we are still operating districts that relate to engineering departments that issue consents based upon the old systems from the various old councils.

The application format is quite different, and there is no common set of conditions across the whole geographic Auckland area.

The areas were quite adamant their individual system was the best, and have been unwilling to let go of their own structure, in search of commonality and a solution for the Unitary Plan.

### Auckland Unitary Plan Comes of Age

In 2010, Auckland Council was formed when the eight previous councils in the region were amalgamated.

Auckland Council was required to develop a unitary plan, with special legislation passed by the government requiring Auckland Council to develop a consistent set of planning rules for the whole region.

I truly believed back in 2010 that we would finally get one set of council staff to deal with. The regionalism and parochialism of the staff processing subdivisions, from the various councils made for subdivision applications across the regions that were vastly different. The Unitary Plan is



the biggest planning transformation in New Zealand as they have said.

However, council staff seem to have conveniently kept their own interpretation of subdivision conditions, and their own format for applications. This anomaly has largely been kept quiet to the public and the politicians; the mechanism of the implementation of the Unitary Plan somehow not matching its formation.

From recent communications with Auckland Council, *Consenting Made Easy (CME)* will be released shortly. This at my request for information. What is promised is a review of the engineering standard conditions across all regions.

This may be a solution to this little-know anomaly, but to some extent there has been no transparency (that I know of) to this solution, whereas with the Draft Unitary Plan this was public knowledge.

However, I am at a loss to understand why this was not thought about seven years ago, when to all of us in the industry/profession it was obvious.

I also think that generic subdivision conditions will most likely be more restrictive and require more expensive site works because the trend is to increase the level of engineering over time, rather than look more realistically at each site, and the impact of the development.

Engineering by gradation and not by rule, based upon the size and complexity of a subdivision.

For example, the concreting of Rights of Way is a typical example of how engineering standards and subdivision conditions have become more and more restrictive.

In 1972 in our street in Mount Albert, a simple 2-lot subdivision of a rear lot did not have conditions to form extensive concrete driveways, so a strip driveway was formed. There have been no adverse effects from this strip drive in 45 years.

In days gone by, having money for concreting of long driveways was looked at differently.



Strip driveway

The consequence is that the concrete does not dominate the entrance, and the drive is framed on either side and in the middle with a grass strip. There is also a stone wall with a rambling rose over the wall, on one boundary. There is no issue with drainage during heavy rainfall as the rich Mt Albert volcanic soil drains very well.

Therefore, in amenity terms and the neighbourhood, having a strip driveway that is shared by two or three properties is a better use of the landscape than a 3.0m wide concrete Right of Way. This also becomes affordable, and also means this does not need to be a subdivision condition. It will happen naturally as the owners see fit.

That is where the environmental conditions and soakage is adequate for this driveway treatment. A wide concrete driveway is not a panacea to the good management of stormwater and amenity.

In contrast, two properties over the driveway were required by Auckland City Council (Development Engineering) in 2000 to form and drain this driveway.



Wide concrete driveway

We have just moved from the minimum carriageway width from 2.40m wide to 3.0m wide under the Unitary Plan. As time goes on, in comparison to the subdivision from 1972, the area of concrete is forever increasing, and as a consequence, the amount of stormwater run-off is dramatically increasing.

I believe that in some cases, these strip drives are more than adequate.

I am also in the belief, that Auckland Council should not "condition" the formation of Rights of Way for simple subdivisions. Whoever, and whenever a concrete drive is constructed, should be up to the land owner to decide and not the council engineers.

## Who Should Write Up the Subdivision Consents?

Registered professional surveyors are the only trained professionals with the broadness of qualification and ex-

perience in terms of planning, development engineering, and land tenure, to prepare applications for subdivision consent.

Therefore, many clients come to us as Registered Professional Surveyors, as we have had this experience over a number of years, and the client can use the surveyor as the lead consultant.

At the council end, there is insufficient surveying staff, and what happens is applications get examined by a planner from council or from an outsourced firm. Plus, the council engineer makes his submission to the planner.

If the engineer is at all unsure about the application, then he puts the application on hold, and this wait can be for some considerable time. Council engineers are often stuck on minor interpretation of the Code of Practice and we go searching for unattainable solutions that do not exist in the real world, but are written into their engineering book of rules.

It can be a slow process dealing with council engineers, because they are busy, but their communication skills are also not up to scratch.

At the end of an application, we find a solution with the council engineer, that sometimes makes no sense at all.

The subdivision consent conditions 75 per cent of the time, can be written up in 30 minutes by a qualified surveyor. And 25 per cent of the time, we have to work through complex engineering, that as I said is usually unworkable in terms of construction or reality.

So, the question is obviously, why do we go through this experience and extremely time consuming process?

We have just won the America's Cup, with Kiwi ingenuity, innovation and courage. Yet we are stuck with this archaic subdivision process that is extremely inefficient, takes a long time to complete and is unaffordable in terms of meeting our current housing needs.

We have the Unitary Plan, but we do not have a suitable mechanism to put it into practice.

My suggestion is that registered professional surveyors prepare the subdivision consent conditions in advance of the application to council. We can make our report in the usual way, but the qualified surveyor makes some assurance as to the relevance of the consent conditions.

Auckland Council accepts these conditions, and the consent is processed quickly and efficiently. Council should be accepting the recommendations of the qualified consultant. A more rigorous level of commitment and understanding may be required by us to make an impartial and professional call as to these conditions, but we have the experience to do just what I suggest. The RP surveyors would have to comply with a level of competence with Auckland Council and applications would need to be reviewed from time to time by a council adjudicator.

This system is no different to council using Building Certifiers in the building consent application stage, and to a large extent the RPSurv is best qualified to make assessments as to the subdivision consent conditions.

Auckland Council still believe they are responsible totally for the processing and issue of subdivision consents. This model does not work fast enough to process consents in a timely manner. To some extent this is historical because people don't like to change the system, and to some extent this is driven by political motivations within council to maintain the level of control of this work.

## Section 224c processing

Up to this point, where the subdivision is located determines the complexity of getting the S224c issued. To this day, Waitakere City and now the Western Area, are difficult to deal with and their process has been painfully slow in the long number of steps required.

Usually we have engineering work, as part of the subdivision consents, that requires a building consent inspection. At the end of the process, our firm applies for the S224c and council sends out an engineering representative to check the conditions. This is at the end of the process.

Would it not be better for the RPSurv to check the drainage work and other engineering, while the work is in process? And to certify compliance to the S224c, and have this consent available within a matter of days, not weeks and months, as it is under the current system.

## Summary

We have been stuck with this archaic system of processing subdivision consent for too long. We have the Unitary Plan, but we do not have a suitable mechanism to put it into practice.

My suggestion is that Auckland Council look at the whole process and find ways to make this much more efficient. One of those ways is to work together with the NZIS and the consulting surveyors to facilitate a process that makes better use of the professionals at the core of the subdivision process.

**Graeme Evans** BSc (Comp Sci)  
Managing Director

**Administration and Accounts Software**

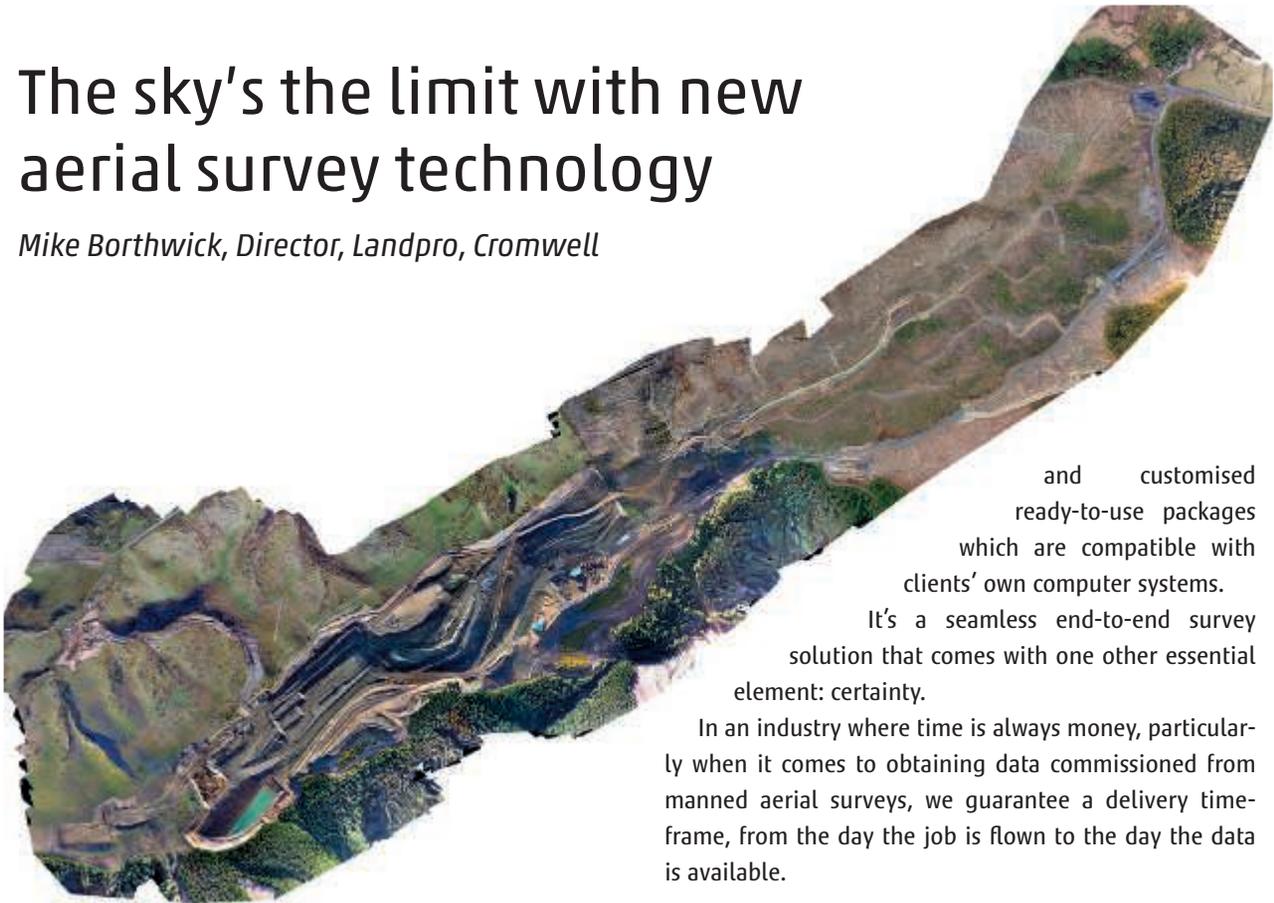
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# The sky's the limit with new aerial survey technology

*Mike Borthwick, Director, Landpro, Cromwell*



Last month, after 12 months of planning and preparation, we flew our first aerial survey in a Cessna 337 twin engine aircraft purchased specifically for this purpose.

The job itself only took a matter of minutes. But it represented a significant increase in high resolution aerial capability for New Zealand's geospatial sector, filling a gap between low level, fixed wing UAV and existing large-scale aerial surveying.

The new plane has been fitted with New Zealand's first Leica airborne system to provide a unique combination of high resolution 4 band aerial photography and LiDAR. Both aerial imagery and LiDAR data can be captured simultaneously in one flight, rather than entailing two missions as is otherwise often the case.

This is an important technological advance, not only for us at Landpro and our clients, but also for any business in need of fast, accurate and competitive aerial surveying services to keep pace with the demand for increasingly sophisticated spatial datasets.

Combined with our existing fixed wing and multi blade UAVs, the Cessna and its payload mean we can now fly sites which range from a few square metres to thousands of hectares.

This hardware is supported by comprehensive software and data processing power, providing terabytes of capacity as well as the ability to deliver both full-size datasets

and customised ready-to-use packages which are compatible with clients' own computer systems.

It's a seamless end-to-end survey solution that comes with one other essential element: certainty.

In an industry where time is always money, particularly when it comes to obtaining data commissioned from manned aerial surveys, we guarantee a delivery time-frame, from the day the job is flown to the day the data is available.

## Getting off the ground

Three years ago, if you'd told me and my fellow directors Kate Scott and Kathryn Hooper we'd soon be this involved in aerial surveying, on behalf of both our clients and fellow surveyors, we would have probably looked at you sideways.

Likewise, if you'd suggested it wouldn't be long before we invested seven figures in a small plane kitted out with some very specialised airborne technology, eyebrows would have been raised even further.

At that stage, in 2014, we had had only just purchased a fixed wing UAV to better serve and expand our own surveying business, which then comprised mainly mining and agricultural interests as well as some utility operators.

That drone was among the first to be deployed for commercial surveying in NZ, but our decision to invest in it – and subsequently a rapid succession of new computers and software – was pragmatic rather than strategic.

What we wanted to do was provide photogrammetry over larger rural areas and mining sites than we were able to do with our existing resources.

That first UAV – a TopDrone 100 with a two metre wingspan and a flight range of 40 minutes – brought scale, speed, precision and efficiency to our business, providing high resolution RGB imagery and GPS data collection

over areas ranging from 70 ha to 2500 ha.

Flying 70 kph at just 400 feet, every pixel captured by the TopDrone's high resolution on-board camera represents 2.5 cm of ground coverage, creating very tight, accurate data with exactly the depth of detail clients need for everything from designing rural irrigation systems to determining contractor movement volumes.

Within 12 months, the TopDrone was complemented by a multi blade UAV so our surveyors could also collect fast, economic aerial imagery from small sites where access is difficult or impractical for conventional aircraft or fixed wing UAVs.

The quad copter came equipped with a medium resolution camera providing photogrammetry data for mapping areas of up to 70 ha. It quickly met demand from land developers, local authorities, farmers and miners for similar applications to the fixed wing UAV plus development site surveys, inspections and infrastructure modelling.

Both the fixed wing and multi blade drones allowed us to provide a range of new geospatial services in keeping with the increasingly complex technical requirements of our clients, who own reliance on timely, accurate, high quality data intensifies every year.

It wasn't long however before it became apparent that UAVs in themselves could only meet part of the demand. This is what motivated us to start looking for a plane last year.

## Burgeoning demand for aerial data

Moore's Law has been a driving global force of technological and social change, productivity and economic growth for decades, and surveying is no more immune to the sweeping effects of this transformation than any other land-based sector in New Zealand.

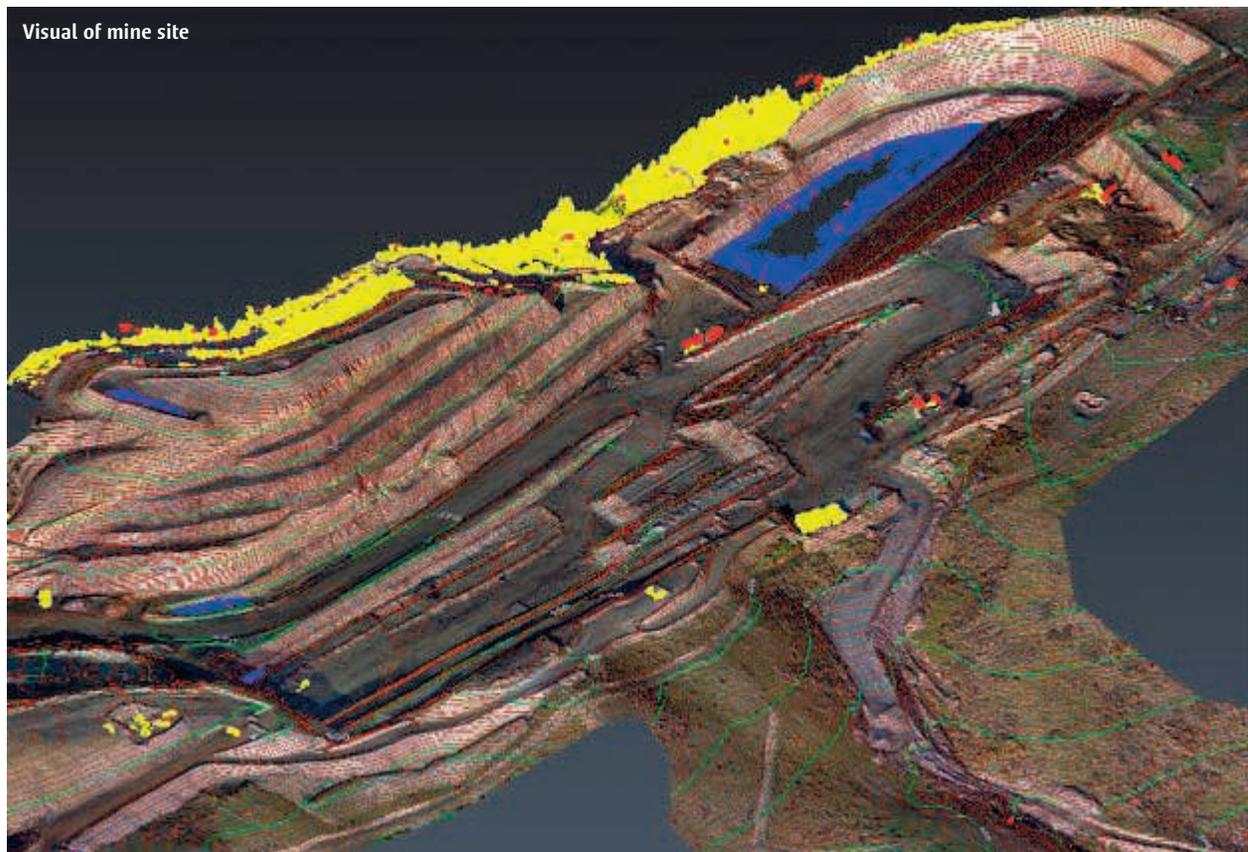
The more technology is applied to any situation, the more it is expected and required. Nonetheless, at the time we started using this particular technology, there's no way we expected to outgrow the fixed wing UAV in 24 months. Even if we did, we just assumed we would use a bigger drone.

However, what actually happened is that a number of our projects started getting too big for the fixed wing UAV, to the point where the economics stacked up similarly to using an actual aircraft. But then obviously availability became an issue.

The advantage of a UAV for us as an end user as well as being the team actually capturing the data is speed and efficiency.

We're like any surveyors – once we've been given a job by a client, we just want to get it done as fast and as accurately as we can. Sending ten guys out on foot and on motorbikes sounds labour-intensive, but then you know you've got the data in two weeks. Most projects are hugely time sensitive; we can't afford to wait months for aerial data.

(continued bottom p38)





*Christina Hulbe, Dean, National School of Surveying*

A recent study of 30,000 US university graduates (the 2014 Gallup-Purdue Index) found that positive connections with professors and other university mentors have a strong positive influence on long-term graduate outcomes such as workplace engagement.

The same study identified six key university experiences linked to graduate well-being: a professor who made you excited about learning; a professor who cared about you as a person; a mentor who encouraged you to pursue your goals and dreams; a project that took more than a semester to complete; an internship or job that allowed you to apply classroom lessons; and participation with extra-curricular activities and organisations.

Reflecting on my own university pathway, I would suggest that these experiences are even more important than the study suggests. Like most first year students, I was

shockingly young when I went away to university. I was 18 years old, my prefrontal cortex was still developing, and I had a stubbornly clear idea of what I wanted to do: move away from home, live in the mountains, and study geology with some physics.

If anybody asked what it would take to achieve my university goals, I would have responded with the usual clichés about working hard, managing my time, and having some fun too. If anybody had pushed a little harder, perhaps asking if I knew what any of those responses meant, I wouldn't have had a clue.

University was a big step up from high school. I went from a system of set pieces for which practice guaranteed success, to a system in which fixed routines were just the foundation on which success might be built.

Like many university students, I sometimes struggled to

(continued from p37)

We knew from our fixed wing UAV work there was a big market that needed servicing – jobs that were regarded as too small to be worth taking a plane to, but too big for the technology currently available here.

All of a sudden, buying a plane, cutting a big hole in the bottom of it and fitting it out with airborne imaging equipment for these very defined niche aerial surveys made a lot of sense. The business case for this move identified another opportunity for surveyors New Zealand wide.

Even though New Zealand uptake of LiDAR technology is still much slower than the rest of the world (by a factor of 10), and we are four to five years behind Australia, recognition of the value of LiDAR data is beginning to spread fast, to the point where big Australian spatial providers now see value in competing for New Zealand tenders.

If there was ever a right time for a relatively small provincial survey firm to take the plunge on an airborne

laser/camera package and start partnering with other providers on big jobs, we believed this was it.

### **Unique technical capability**

Packed (very securely) inside the new Landpro Cessna are two pieces of equipment sourced from Global Survey in Christchurch. The Leica Geosystems RCD30 is the first medium format single head camera which collects perfectly co-registered 80 megapixel RGBI multispectral imagery. It's paired with a Leica Geosystems ALS60 laser scanner featuring a 200 kHz 'at the ground' pulse rate which translates to a point cloud as high as 150 points per square metre and generates an accuracy of 3 cm or less.

In real terms, all the fancy spec's boil down to two key deliverables: more detailed data, processed faster, for the type of work that was not serviced previously, either because it was seen as too expensive or too time consuming.

Faster processing is a critical part of being able to benefit from aerial data. While availability is usually the main

keep everything balanced but I kept at it, enjoyed some successes, and had some fun too. Like many university students, I made some poor choices and paid various prices for those.

The academic calendar kept rolling along, with its regular pace of lectures, field trips, exams, and social activities. On the outside everything was fine, but on the inside I felt a lot of dread about things that seemed out of my control and about the ways in which I would never measure up. If anybody had noticed this and thought to ask what was wrong, I would not have known how to answer.

Looking back, I wish somebody *had* asked what was happening on the inside. It might have saved me the worst of the prices I had to pay. Instead, I took senseless risks and eventually put myself in a situation that was completely out of my own control.

The irony of the story is that the muddy, confusing experience of complete lack of control was what provoked me toward some clarity. Contrary to what I thought, letting go was neither making a choice nor exerting control. It was the opposite. Looking back, I wish somebody *had* asked what was happening on the inside. I could have learned that lesson another way.

There are more pathways for students now than there were in the 1980s, when I was an undergraduate. Pastoral care is a priority and students can find mentors and councillors who will listen and who will help frame the questions that need asking and answering. But somebody

still has to ask the first question, to turn a signpost toward one of those paths.

I never learned how to talk about what ailed me. But I learned how to take each day for what it was and to see just as much beauty in what went wrong as what went right.

I made friends who checked in to see if I was okay, just because they wanted to know and I started talking with the curmudgeonly geology professor who asked more questions than he ever answered. He insisted that it was up to me to figure out if my answers were correct and showed through this insistence that he thought I could meet the challenge. Over time, it became clear that I had some things to prove and some people to not let down. I still feel that way today.

A few weeks ago, the School of Surveying lost a valued member of its community too soon. We miss him, just as other New Zealand families miss loved ones who have taken their own lives. What we must do now is acknowledge our grief while moving forward as a community, committed to talking about the things that matter and paying attention to the people around us.

If you or someone you know is struggling with depression or another mental wellbeing issue, there are a number of pathways for help, including Healthline 0800 611 116, Lifeline Aotearoa 0800 543 354, Suicide Crisis Helpline 0508 828 865 (0508 TAUTOKO), Samaritans 0800 726 666, and, The Depression Helpline 0800 111 757.

challenge with manned aerial surveys, processing itself can take weeks or even months depending on the scale of the job, the people doing it and the gear they use.

The ability to manage this data is a really big hurdle for surveyors. We found that ourselves when we started in the drone market. Our software suppliers said we'd need a 32GB computer – we lasted less than three months with that before replacing it with a 128GB machine, and within 12 months we had to buy yet another machine but with 256GB this time. We're now to the stage where we measure our capacity in terrabytes.

All well and good, until the client tries to open the source data file and can't, because it's too big.

We felt the frustration of the size of the source data; you'd get it, and it would be so big you'd struggle for a couple of weeks just getting it down to a usable size. We faced the same situation when we first started producing these fantastic aerial images from the drone and the irrigation designers who actually needed to work with them couldn't even open the files.

This has led to further expansion of our software, including tools which allows our technical team to manipulate and filter source data so it reaches the client in a size and format that can be easily used, without compromising on quality. The full data set is always provided too, so it can be revisited (or taken to another surveyor) as and when necessary.

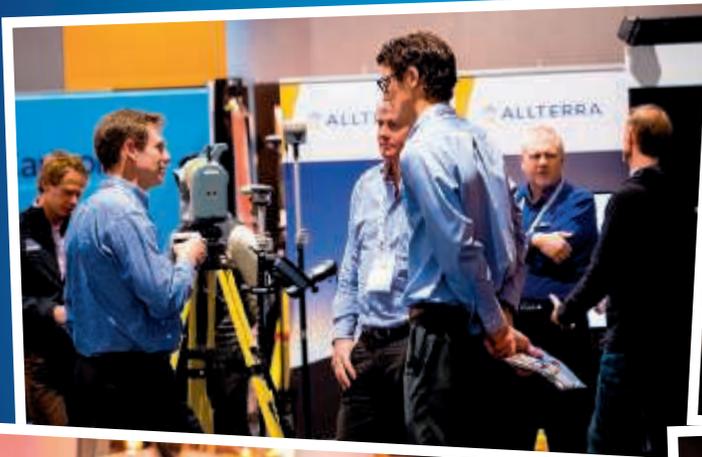
The Cessna may be the most recent in a rapid series of aerial developments for Landpro, but is unlikely to be the last. Such is the pace of technological change, I'm only partially joking when I say a satellite is probably next on the list.

At the end of the day, technology means we will do twice as much work with half as many staff, and the client will get a far better outcome. Our view is that it's not necessarily about owning all that equipment yourself, but forming those partnerships with others who do so you can get the information you need, when you need it.





Scenes from the recent NZIS conference in Napier



(continued from p28)

separately. Their claim was that if they had been ordered to remove the gates, they would need more manoeuvring space to turn into their lot so that the landscaped parts of the RoW would have to make way for their use.

The Bourkes were successful in convincing the judge that the planted parts of the strip were an unreasonable intrusion into the RoW. The judge ordered that all impediments on the RoW, including rock walls and vegetation, be removed. Furthermore, the part of a common boundary wall that was only fractionally encroaching on the back section had to be removed or relocated as well. This seems outrageously unfair on Guo given that much of the rest of that wall was encroaching over her boundary but was not subject to a removal order.

The situation where rights of way are created that are significantly wider than the driveway formation is very common, and the surplus land is then landscaped in some way. Clients must be warned that the whole of any strip is encumbered by the rights of way and any intrusion into the right of way is subject to removal or clearance.

Of course the other lesson is to make sure you are honest with the court. The details of the remedy in this case seem unfairly biased in favour of the Bourkes. Maybe that is mostly because Ms Guo was considered an unreliable witness.

The lesson for surveyors is to try to set up easements clearly and simply, providing just the minimum space required for the use. Ensure that there is minimum conflict about what is what, whose is whose, and that the 'where' and 'why' of any easement are clearly defined.

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