Geomatics World

JULY | AUGUST 2010

Issue No 5 : Volume 18

Surveying for geographical and spatial information in the 21st century

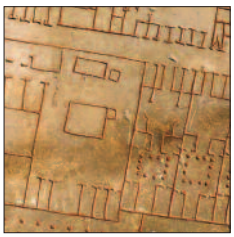
Versatile scanner cuts its teeth for Loy Surveys

Map Action helps in Niger flooding emergency

Looking for a new geoid model in Bermuda

Three Peaks challenge helps heroes

Is this the world's earliest large scale mapping?



RICS

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COVER STORY
The image shows Edinburgh's busy Princes Street and a scanned elevation of 80m taken with the Leica Scanstation C10 by Loy Surveys, who argue that the scanner is well ahead of the game. To find out more, read the article on page 22.

Contents

Regulars

Next issue

The next issue of *GW* will be that for September/October 2010.
Copy dates are: Editorial: 09 August Advertising: 20 August

The election is over but will it have brought change? For us in geomatics, we have to adapt and respond to it constantly.

Volcanic wisdom and hindsight

With this issue of *GW* you will find a readership survey form printed on the back of your postal carrier sheet. Please do take a moment or two to fill it in. You can fax it back to us or you can go online and complete it there. The survey will help us to survive in these tough economic times but more importantly to thrive by providing a better understanding of what readers like and dislike.

A significant move for overseas readers will be the option to receive a digital edition. This will mean that they will be able to access a new edition much more quickly than in the past. Once the journal has gone to press you will receive an e-mail with a link to the new publication instead of having to wait sometimes weeks for the printed copy to arrive. I should mention that Overseas readers will still be able to opt for the printed copy as we recognise that for some the Internet and broadband is not so easily available.

The new digital edition will be freely available to all readers but will only be available during the currency of an issue – after that you will have to log in to our searchable archive to access past issues. This is a valuable resource and a significant membership or subscriber benefit; it can only be accessed via a log-in procedure. We should be able to launch this at the beginning of September but in the meantime you can go to www.pvpubs.com/archives to get a feel of how the new digital edition works. Make sure that you are using an up-to-date browser. It works well in MS Explorer 7.0, Firefox and Google Chrome. iPhone fans may have to wait a little longer.

A new technology?

This is the first issue of *GW* to feature an advert in 3D. You should find a viewer glued to page 3 to help you gain the full effect of Leica's advert on page 2. If you haven't got one please call 01438 352617 and we'll send you one. Although this is a first, it got me thinking on how long 3D viewing has been around. New technology this isn't. I recall an uncle who used to proudly show me his collection of monochrome stereoscopic slides when I was very young. More recently, rambling through the bookshelves, I pulled out a copy of *Air Photography Applied to Surveying* by C.A. Hart and published in 1948 (with a foreword by no less than Sir Alexander Gibb, past president of the ICE and eponymous founder of the consulting engineers). There, tucked inside the back cover, was a cardboard red & blue viewer for a small set of prints (these were the days before cmyk). The 3D effect was a bit shaky for my eyesight but it demonstrated the principles.

A really good read

If you're looking for something to read during the summer break I cannot recommend too highly *Map Addict* by Mike Parker. Subtitled "a tale of obsession, fudge & the Ordnance Survey", this is an at times irreverent history of maps, the people who make them and their impact on the world. Parker began his obsession by buying his first OS 1-inch map as a seven-year old. Thereafter such was the obsession and his pocket money limited, that he admits to resorting to stealing them.

He traces the history of not just the OS but our friends over the Channel in France. He looks at those fascinating places at boundaries and in enclaves. I was unaware that until the Victorians really got going in sorting out the administration of UK counties, they often had little outlying enclaves scattered within their neighbours boundaries. The worst was probably Cromartyshire with 22 outliers scattered across the rest of Scotland! He also deals with the power and politics of maps and map projections and includes a teasing chapter he titles *Carto Erotica*. I will leave you to discover what that's all about but don't leave the book near the young or your maiden aunt.

Enjoy the summer and, if you can, call in at the British Library (a very few steps from King's Cross or St Pancras stations) to view the fabulous *Magnificent Maps* exhibition.

Stephen Booth, Editor

Ten years ago

It seems hard to believe but it has been a decade since **President Clinton** announced the removal of selective availability of GPS signals, thus at a stroke improving the accuracy and usefulness of satellite navigation. One of many consequences was the announcement by OS that they would no longer be maintaining their beloved trig pillars. To ease the pain, *GW* featured a CD on the front cover from the OS of the lamented trig points, now with GPS coordinates.

Unrelated to the demise of trig pillars but nonetheless significant, our *People* column announced that **Vanessa Lawrence** had just been appointed to head up the OS. Not only was she the first woman to lead the organisation but at 37 the youngest director general.

At RICS, **Mike Curtis** had just become the new president of the Geomatics Division while **James Kavanagh** had just joined as "Geomatics Executive".

Another surprise move was the acquisition by **Trimble Navigation** of **Spectra Precision**. The latter had been the holding company of the **Geotronics** and **Carl Zeiss Oberkochen** brands. Now Trimble was set to become a serious player in all aspects of survey data capture.

The editor welcomes your comments and editorial contributions by e-mail: *editor@pvpubs.demon.co.uk* or by post:
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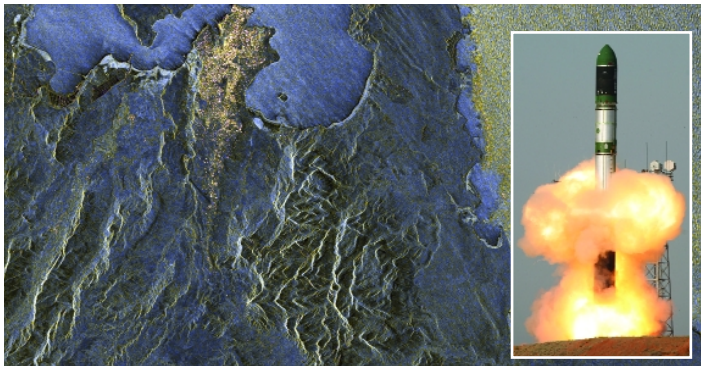
TanDEM-X launches successfully



The German radar satellite, TanDEM-X, was successfully launched from Baikonur, Kazachstan, at 04.14 hours CET on Monday 21 June, 2010. The satellite joins its "twin", TerraSAR-X, which has been in operation since mid 2007. Together, the two satellites will spend three years collecting stereo radar data for a global digital elevation model of the Earth's entire landmass. This DEM will feature a relative accuracy of better than 2 metres (10m absolute) on a 12-metre grid. Infoterra will be responsible for the commercial marketing of the elevation model, which will involve customising the DEM to users' needs. Also, TanDEM-X delivered its first images (of Madagascar, Ukraine and Moscow) three-and-a-half days after launch. For further details of the mission, see GW Nov/Dec 2008. *Main Image © DLR; inset image courtesy of Tenski.*

Common concerns for global community

Quality specialists from Europe and Canada are closer to establishing an international network focusing on geospatial quality issues after meeting recently in Brussels. Discussions between EuroGeographics' Quality Knowledge Exchange Network and Canada's GEOIDE Network's researchers, who are working on legal, ethical and data quality issues related to geospatial data, revealed many common concerns.

Speaking of the plenary meeting, EuroGeographics' network leader, **Carol Agius**, says: 'not only did it provide the opportunity to exchange information and experiences, it is also a significant step forward in forging a wider network for future collaboration in the creation of continental spatial data infrastructures, which help to address social, economic and environmental challenges. Collaborations like these also help us to support EuroGeographics' focus on delivering the definitive location framework for Europe using the reference data available from its members'.

Competition for surveying students!

Trimble is currently holding its 2010 surveying student paper competition, which will give the winning author the opportunity to present their survey application paper at Dimensions 2010 in Las Vegas, Nevada. The winner will receive a trip to take part in the conference plus three nights' accommodation. In addition, the winning student's school will receive a Trimble R8 GNSS system. The deadline for entries is 15 August and judging will occur from 16 August to 21 September. The winner will be announced on 22 September. For more information about the competition and how to submit a paper, visit **www.Trimble.com/StudentPaper**.

UCL Geomatics @ 60

University College London is celebrating 60 years as a centre for geomatics education this autumn. The event will also mark the 100th anniversary of the birth of Professor EH Thompson, who established the department of photogrammetry and surveying. This year also sees the 20th anniversary of the MSc programme in GIS. On Friday 17 September, a half-day event will include a special seminar to celebrate Thompson's work, followed by a celebration and evening reception. Full details of the programme are available at **http://www.cege.ucl.ac.uk/events/uclgeo60**.

CONTRACTS & PROJECTS

Mapping on the move

The LANDINS inertial navigation system (INS) has been selected to provide the position and orientation data required for ABA Surveying Ltd's kinematic mapping system (see GW, Jan/Feb 2010). The mobile scanning system is contained in a "scan-van" and principally comprises three Leica 6000 scanners, GNSS geodetic quality receivers, Ixsea's LANDINS unit, an advanced data logger and a rack-mounted computer based on an i7 processor for systems control and monitoring. 'Our aim was to develop a scanning system with an absolute accuracy of better than 10 mm when being used at highway speeds,' says **Alan Barrow**, founder of ABA Surveying. 'There are only a handful of suppliers offering high-end systems that are capable of achieving the results we were looking for. . . and it's [Ixsea's] LANDINS system ticked all the right boxes'.

Australia modernises GNSS networks

Three Australian state government organisations are to modernise their respective GNSS infrastructure networks for high accuracy positioning. The Department of Sustainability and Environment in Victoria will use 57 of Trimble's GNSS continuously operating reference station (CORS) receivers, plus VRS3Net software, for its Positioning Regional Victoria project. The company will also provide the software to the Land and Property Management Authority in New South Wales for its CORSnet-NSW network, which provides positioning infrastructure for the state to support various applications. The Department of Environment and Resource Management in Queensland has also purchased the VRS3Net software to manage its 20-station network along with three additional reference receivers for network expansion. In addition, a private network in Perth, RTKnetwest, also chose Trimble's hardware and software to modernise and expand its network.

Boosting mine safety

Anglo Platinum is deploying laser-scanning technology in South Africa to further improve safety and increase production of its mining operations. The latest system supplied by 3D Laser Mapping is being used in the Mogalakwena central open pit for continuous monitoring of the western highwall. The Riegl LPM-321 laser scanner measures at a rate of up to 1,000 points per second with a 360-degree field of view and combines laser measurements with imagery from a mounted high-resolution digital SLR (single lens reflex) camera. 'Laser scanning is an essential tool for our surveying operations,' says **Frans Benadé**, section surveyor. 'It enables us to remotely identify,

New lidar data portal

A new web-based portal launched by the Environment Agency's Geomatics Group allows customers to access and purchase elevation data from the group's archive of lidar data. The collection of lidar data for England and Wales includes many major urban areas, as well as rural flood plains and coastal zones. Currently, with over 65% (98,225 sq km) already mapped, at spatial resolutions ranging from 25cm to 2m, the archive is constantly updated, with new areas surveyed and existing areas re-flown to gather higher resolution data. To access this service, users can register at www.geomatics-group.co.uk/ GeoCMS/Order.aspx.

Laser scanning on the moon?

Software from Pointools is being used to create 3D walk-through models to explore the viability of laser scanning on the moon and mars. Researchers from Navajo Technical College, together with representatives from NASA and New Mexico Tech, laser scanned a volcanic formation in New Mexico, gathering 240 million individual measurements. The data was processed to create an immersive and interactive 3D computer model from which NASA scientists can assess the potential of laser scanning for future missions, such as sending a rover vehicle, equipped with a laser scanner, into a lava tube or cave. The survey party scanned the lava tubes in the El Malpais National Park using a Faro LS 120 laser scanner and collected eight individual scans, each composed of 30 million points.

measure and monitor inaccessible pit and dump slopes together with stockpiles, blast profiles and geological features. It is also used for the measuring of as-built construction'.

New waters for coastal mapping

A collaboration signed between Blom and UK marine vessel-based survey contractor, Gardline Geosurvey, aims to bring together a new shore to ocean seabed mapping capability for marine and coastal surveys. Blom operates the Hawk Eye II system, with the ability to capture both land and seabed data, while Gardline has a fleet of both deep water and coastal multi-role survey vessels. The agreement between the companies will enable a more comprehensive, efficient and flexible service in sectors like the seismic industry, oceanography and marine biology.

Veripos has been awarded a three-year contract by the survey department of Petroléo Brasileiro (Petrobras) for provision of high-accuracy GNSS positioning services in support of rig moves as well as operation aboard 16 support vessels engaged in pipelay, anchor-handling and flowline installation operations.

A number of new companies have joined RapidEye's network of distributors. The company's products will be distributed by Geosys, S.A in France, Geoserve BV in the Netherlands, the Panaxx Corporation in Japan and the Dniprocosmos State Company, belonging to the Ukrainian Space Agency, in the Ukraine.

Marine mapping from SeaZone is helping Forewind Ltd, a joint venture consortium comprising four energy companies, plan and deliver its offshore wind energy project in the North Sea. Using the HydroSpatial digital marine map, the company will undertake a comprehensive assessment of the maritime area to help identify potential sites for offshore wind development.

Survey data is assisting the European Marine Energy Centre (EMEC) in expanding its services. The centre provides developers with the opportunity to test full-scale grid connected prototype devices in wave and tidal conditions. EMEC purchased SeaZone's survey and bathymetry data tiles as part of their information-gathering exercise in extending facilities at the grid-connected sites and developing new scale test facilities.

SONY Pictures Imageworks, the visual effects and animation company, has invested in three SpheroCam HDR (high dynamic range) units. Manufactured by Spheron-VR, the camera can record a full spherical HDR image in a single scan and is expected to be a useful tool in Imageworks' production of visual effects work on films.

Four aerial imagery providers – Midwest Aerial Photography in the US, Kyodo Surveying in Japan, Beijing Guodian Jingwei Engineering Technology in China and Geoplana Ingenieure in Germany – have all recently acquired the new Intergraph Z/I Imaging DMC II camera.

3D Scantech Ltd has recently purchased multiple measuring systems from Faro, including three FaroArm Platinum, one Laser Line Probe, one Laser Tracker and two sets of the company's measurement software, CAM2 Q.

BRIEFS

Topcon Positioning Systems has acquired InlandGEO, headquartered in Madrid, Spain. In addition to continuing to distribute Topcon and Sokkia positioning products to the construction and survey markets in Spain and Portugal, the company will become the headquarters for distribution and support for Topcon precision agriculture products in Europe, the Middle East and Africa.

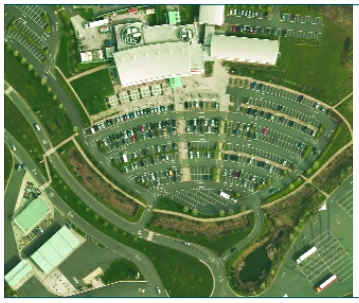
Trimble has acquired Germany-based Definiens' earth sciences business assets and licensing of its software technology platform, including the eCognition image analysis software suite, in an all-cash transaction.

At the recent Be Together Conference in Philadelphia, Bentley Software and Pointools presented a product vision for the adoption of the Pointools Vortex engine for referencing point clouds inside Bentley's applications. 'For the conference attendees that don't already use our software products, we were able to demonstrate our capabilities for point cloud editing and clean up, and for producing animation, in the interactive "LIVE" Zone for modelling and analysis. . .' says **Tony Rogers**, co-founder and director of Pointools.

Optech has acquired the operations and assets of DiMAC sprl, providers of large and medium-format airborne camera systems using a patented true forward-motion compensation technology.

The success of a transatlantic partnership between Northrup Grumman and Blom ASA has been recognised with the Lt Cdr Peter Johnson best practice award, presented at the recent Joint Airborne LiDAR Bathymetry Technical Center of Expertise (JALBTCX) 11th annual airborne coastal mapping and charting workshop. The award acknowledges the two companies collaboration to deliver an airborne LiDAR survey for the current Gulf of Mexico coastal mapping and charting project.

The inaugural StreetMapper International User Conference



Getmapping has started the 2010 aerial imagery flying season by capturing over 25,000 sq km using both its fleet of Vexel digital cameras and a new VisionMap A3 large format camera. The A3 camera module consists of two lenses, a motor unit and a mounting frame. The lenses sweep simultaneously on the camera axis across the flight direction, creating a 100-degree field of view. By the end of May, the company had completed an aerial survey of Wales (begun in 2009), the whole of Dorset and Staffordshire, 90% of Devon, most of Lincolnshire and parts of Yorkshire and Scotland.

will take place on the 2nd December 2010 in The Hague, Netherlands. The conference will feature a range of technical presentations detailing the latest developments in laser scanning and mobile data capture together with end user case studies. For further information, email info@3dlasermapping.com.

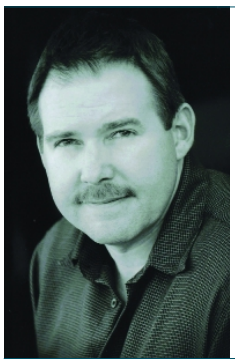
Richard Burt, sales and marketing director of Chelsea Technologies Group, recently addressed the fifth Intergovernmental Oceanographic Commission global conference on oceans, coasts and islands on the future requirements for oceanographic instrumentation. He argued that long term observing systems are becoming widely established and the diverse range of oceanographic environments requires careful selection of appropriate sensor technologies. It is becoming increasingly important, he continued, to identify where technology gaps exist and to ensure that clear guidance is provided to scientists and industry to enable these to be addressed.

FARO Europe has announced the launch of its European corporate blog (http://blog.faro-europe.com), plus its presence on social network sites. Twitter users can follow the company at http://twitter.com/faroeurope while Facebook users can visit www.facebook.com/FAROeu and YouTube users can go to www.youtube.com/FAROGB.

PEOPLE

New consultant in Scotland

Brian Core has been appointed as the machine control sales consultant for Scotland and the North of England area at KOREC. He will be responsible for the sales and hire of the company's full portfolio of Trimble 3D machine control, 2D grade control and construction site positioning systems. Based in Glasgow, Core has spent the last four years working as a site engineer in Scotland.



Director and successor

Leica Geosystems has appointed Steven Vesterdal as managing director of machine control mining for North and South America to succeed Sergio Blacutt, who leaves the company to pursue a new business in the mining sector. Vesterdal has almost 12 years experience working for Modular Mining Systems where he was project engineering manager. He was involved in customer implementations, developing key subsystems and modules, and also participated in sales, product development and customer account management. He was vice president of hardware engineering at Jigsaw Technologies before Leica acquired the company in 2007 and, after the acquisition, accepted the role of director of operations within Jigsaw.

Mining manager appointed

3D Laser Mapping has appointed a new global mining product manager to be based in South Africa. **Francois Stroh**, an engineering surveyor with over ten years experience of laser scanning sales, installation, training and support, will oversee the growth of the company's laser scanning hardware and software. Stroh holds a national diploma in civil surveying from the Pretoria University of Technology as well as a bachelor of technology degree. He started his professional surveying career with the South African Navy before working for commercial surveying companies including Murray and Roberts, Underwater Surveys and Tritan Survey. He was most recently the HDS product specialist for Hexagon, parent company of Leica Geosystems.

New manager at Faro

James Needham is the new regional manager responsible for the laser scanning and laser tracking product lines at Faro. Needham joined the company in 2002 in an internal sales support role for Faro UK. Following the acquisition of iQvolution, Needham was the product manager for the laser scanner division based in Stuttgart, Germany. He then moved to Singapore to be the marketing director for the Asia Pacific region before moving on to the company's global headquarters in Florida, USA as the vice president of marketing. In 2007, Needham returned to Asia as regional manager for sales in the Chinese operation based in Guangzhou.

New CEO for MDA

MDA Information Systems has hired **Herb Satterlee** as chief executive officer of its geospatial division. Previously, Satterlee has been president and CEO of Novariant and Resource 21 as well as chairman and CEO of DigitalGlobe. He currently serves as a board member for the United States Geospatial Intelligence Foundation. Satterlee also holds a BA in business administration from Washington State University and an executive MBA from the University of Washington.

New iXSea president

Philippe Debaillon Vesque has joined the iXCore group as chief operating officer and is responsible for the group's marine division. He will be based in Marly-le-Roi, France and is also iXSea's CEO. With an engineering degree from Télécom-Paris, Vesque has spent most of his career in the Thalès group. He worked for many years in Spain, then in Australia, and became MD of Thalès-SAFARE for several years.

Harry Glennie

We are saddened to report the death of Harry Glennie, past president of CICES and a well known engineering surveyor. We hope to bring you a full obituary in a future issue.

Awarding achievement

Dr Allan Carswell, founder and chairman of Optech Incorporated, has been awarded the 2010 Canadian Aeronautics and Space Institute (CASI) C.D. Howe Award. The award recognises outstanding achievements in the fields of planning and policy making, and overall leadership in Canadian aeronautics and space activities. Dr Carswell is a leader in lidar applications; a field in which he has been working since its inception in the early 1960s. He founded Optech in 1974 to develop commercial systems based on lidar technology. Dr Carswell, who has been appointed to the Order of Canada, was also recently inducted into the University of Toronto engineering alumni hall of distinction and was awarded the 2009 Ernst & Young Ontario entrepreneur of the year award.

The shortest distance between two points is not a trip back to the tripod.

TRIMBLE S8 TOTAL STATION

"Back and forth." Easily two of the most hated words for any surveyor. Except perhaps, "again".

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SEMINARS CONFERENCES EXHIBITIONS COURSES EVENTS

We welcome advance details of conferences, seminars, exhibitions and other events which are likely to be of interest to the Geomatics community. Please mention the name of the event, venue, date and point of contact for further information by readers. Please send to:

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2010

Magnificent Maps: Power, Propaganda and Art Finishes 19 September, PACCAR Gallery, British Library.
Contact: www.bl.uk/whatson/exhibitions/magnificentmaps/index.html

Leica Geosystems HDS User Symposium – UK & Ireland
20 July, MK Dons Football Stadium, Milton Keynes, UK.
Contact: Email, rekha.voralia@leica-geosystems.com

Expand your Horizons – Leica High Definition Surveying Seminar
21 July, MK Dons Football Stadium, Milton Keynes, UK.
Contact: Email, rekha.voralia@leica-geosystems.com

World Engineering Congress 2010 (WEC2010)
2-5 August, Sarawak, Malaysia.
Contact: Email, feiic.wec2010@gmail.com or www.mset.org.my/wec2010/

International Society for Photogrammetry and Remote Sensing (ISPRS) Technical Commission VIII Symposium
9-12 August, Kyoto, Japan.
Contact: www.isprscom8.org

International Federation of Surveyors Workshop – Trends in Surveying Education and Training
26-28 August, University of East London, UK.
Contact: Email, Sharon Brown s.g.brown@uel.ac.uk or www.uel.ac.uk/fig

RSPSoc 2010 – The Remote Sensing and Photogrammetry Society annual conference with Irish Earth Observation Symposium
1–3 September, University College Cork, Ireland.
Contact: Email, Dr. Fiona Cawkwell rspsoc2010@ucc.ie or www.rspsoc2010.org

COBRA 2010 – RICS Research Conference
2-3 September, Paris, France.
Contact: www.cobra2010.com

E. H. Thompson Centenary Seminar and A Celebration of 60 years of Geomatics at UCL
17 September, University College London, UK.
Contact: Email, liz.jones@cege.ucl.ac.uk or www.cege.ucl.ac.uk/events/uclgeo60

XIV International Congress for Mine Surveying
20-24 September, Sun City, South Africa.
Contact: Email, ism2010@globalconf.co.za or www.ism2010.co.za

AGI GeoCommunity'10 – Opportunities in a Changing World
28-30 September, Stratford-Upon-Avon, UK.
Contact: www.agigeocommunity.com

Geospatial Defence & Intelligence APAC 2010
28-30 September, Millennium Hotel, Kuala Lumpur, Malaysia.
Contact: www.geospatialdefenceasia.com

Intergeo 2010
5-7 October, Cologne, Germany.
Contact: www.intergeo.de

Leica Geosystems & McCarthy Taylor Systems LSS Training
18 October, Southern England.
Contact: www.leica-geosystems.co.uk

ENC GNSS – The European Navigation Conference on Global Navigation Satellite Systems
19-21 October, Braunschweig, Germany.
Contact: www.enc-gnss2010.org

Leica Geosystems & Applications in CADD Training
20 October, Southern England.
Contact: www.leica-geosystems.co.uk

Geomatics Atlantic 2010 Conference
28-29 October, Delta Hotel, Fredericton, New Brunswick, Canada.
Contact: www.geomaticsatlantic.com

Hydro2010
2-5 November, Rostock, Warnemünde, Germany.
Contact: www.hydro2010.com

Trimble Dimensions 2010 – Converge. Connect. Collaborate
8-10 November, The Mirage, Las Vegas, USA.
Contact: Email, 2010dimensions@trimble-events.com or www.trimbledimensions.com

GeoDATA 2010 Seminar
10 November, Trades Hall, Glasgow.
Contact: www.training4gis.com

Leica Geosystems & Applications in CADD Training
10 November, Northern England.
Contact: www.leica-geosystems.co.uk

Leica Geosystems & McCarthy Taylor Systems LSS Training
11 November, Northern England.
Contact: www.leica-geosystems.co.uk

Joint FIG Commission 3 and Commission 7 Workshop – "Information and Land Management. A Decade after the Millennium" and Commission 3 Annual Meeting
14-17 November, Sofia, Bulgaria.
Contact: www.conference.kig-bg.org

GeoDATA 2010 Seminar
16 November, Hastings Stormont Hotel, Belfast.
Contact: www.training4gis.com

StreetMapper 2010 International User Conference
2 December, The Hague, Netherlands.
Contact: Email, info@3dlasermapping.com or www.3dlasermapping.com/uk/index.htm

SPAR Europe 2010 – Conference on 3D Imaging for Engineering, Design, Construction, Manufacturing, Security
7-8 December, Amsterdam RAI Convention Centre, The Netherlands.
Contact: www.sparllc.com

Geomatics is the Cornerstone – of course!

It is only by engaging with the rest of the RICS, such as the Education Trust, that we discover just how significant Geomatics is. Group chair **Ruth Adams** was delighted to discover topics close to her heart backed by the Trust and the words of the incoming president confirmed our status.

In May I attended the RICS Education Trust 2009 Annual Review meeting. This is a charitable body set up and funded by the RICS since 1955 to support education and research into the theory and practice of surveying. In 2009 it made 21 awards totalling £117,185. The trustees ensure that projects selected are of the highest academic standards and address real-life problems. The review meeting saw presentations from a wide variety of Education Trust awardees on subjects such as: *The effects of energy performance on commercial real estate's values*; *Impact of bus rapid transit on land development in China*; *Development of instrumentation for gyrotheodolites* and *GIS in Africa*.

I note that the latest (December 2009) award is on *Hydro acoustic surveying, quantitative seabed characterisation and habitat mapping of Maltese territorial waters*, which is music to my ears. You can read more about the fascinating work of the Trust at http://www.rics.org/educationtrust.

Magnificent Maps

Whilst in London recently I managed to carve out a few free hours to visit the British Library for their Magnificent Maps exhibition (http://www.bl.uk/magnificentmaps/). It was an interesting enough exhibition but I think sometimes I overdose on old maps. My favourites were certainly the contemporary pieces which were a reflection of modern life in cartography. My absolute favourite was called 'The Island' which is a satirical view of London and the way it sometimes views itself as an island, detached from the rest of the UK. You can view it in all its gory detail on the magnificent maps link. For more on Magnificent Maps, see page 14 – Ed.

At the Newcastle-upon-Tyne meeting with ISPRS. From left to right: Dr Stuart Edwards, Ruth Adams, Prof Ian Dowman (President of ISPRS), Jan Dowman and Ken Hall (President of CICES).

Newcastle in my sights (close range of course)

Our next board meeting, in June, is in Newcastle-upon-Tyne. It will coincide with the ISPRS (International Society for Photogrammetry and Remote Sensing) Commission V Close Range Image Measurement Techniques meeting http://www.isprs-newcastle2010.org/. Not that we will be terribly involved but a few of us will have the chance to meet up with the eminent ISPRS-ers in the evening to maintain the strong links we have between us and this society.

Geomatics punches high

Some may be aware of the QS disengagement within the RICS. I admit to not being close enough to this one to understand the reasons for their discontent but I know that, at approx 40% of the membership, the QS's pack a punch. On the other side of the ship, we Geomatics members number only a few thousand but I know that we, similarly, sometimes don't feel our voice is heard. Geomatics surveyors are an odd bunch (and I include myself in here) as you could say we don't have a single institution that meets all our needs. Some of us are more aligned to civil engineering, some to hydrography, some to marine engineering, some to environmental causes etc. However, I truly believe that staying in the RICS benefits our institution. Geomatics won the Professional Group of the Year award last year so I know that despite our small numbers we have a significant voice in the RICS.

At the RICS Education Trust Annual Review the incoming RICS President, **Robert Peto**, stood up and stated:

> *'Without a tenure system and base mapping it's really hard to move forward… you can't value land if you don't know where it is… mapping is the cornerstone of development of a country's infrastructure'.*
>
> *'We take it for granted that we have good base mapping and land tenure… Geomatics takes a pole position in development…'*

Geomatics is the cornerstone. We know that. The incoming RICS President knows that. We have a duty to let the rest of the RICS know how much we contribute. Geomatics members – don't let me stop you!

No pay but plenty of play!

By Malcolm Draper

There's plenty to do in London if you're not busy, reports our columnist. But just how is it out there in the survey business?

How's business been? This always seems to be the anxious question nowadays when talking to friends and acquaintances. I spoke to one surveyor, who runs a small survey company. He said, 'It's like the night of the living dead!' People still seem to be getting a few enquiries but prices are fearsomely competitive and often ludicrously uneconomic with well established firms charging rates more appropriate to those working in back bedrooms or sheds.

But we all still have to eat so I was interested to read that the RICS building located opposite Parliament Square is now host to a new restaurant run by **Michel Roux**. A less than complimentary review in a Sunday paper described the décor as an "orgy of beige" with a bar decorated in "golf club chic". However, with prices starting at £55 a head for lunch and our parliamentarians now supposedly living a hair-shirt existence less the media get digging again on their expenses, I can't help thinking they may have got going a tad too late on this one. Too be fair to RICS I must stress that this venture is nothing to do with them; the proprietors are merely renting the space.

Don't miss this

With the dire economic times we're going through at least there are plenty of interesting events on in London. You must not miss the *Magnificent Maps* exhibition at the British Library. There's much to see in this display, which concentrates on maps as "Power, Propaganda and Art". Reflecting at each of these aspects, you don't get a much more powerful example of a map than when it's literally carved in stone! A slab of marble from what is believed to be the equivalent of ancient Rome's planning department is a large-scale map (1:500?) of part of the city. It shows individual streets, homes, gardens and public areas in great detail.

Propaganda is shown through several maps from the second world war. Typical are a rather jolly and colourful map showing the history and role of tea in the old empire by **McDonald Gill**. Another shows a bloodthirsty portrayal of **Churchill** by the French Vichy Government grabbing French possessions. As for the art, well I was absolutely bowled over by an incredibly detailed hand-drawn map of London by the artist **Stephen Walter**. The work is enormous and treats London as an island surrounded by various seas (Essex, Sea of Herts, etc) and towns on the outer edge becoming, for instance, Havering-on-Sea, Bay of Rickmansworth and the double entendre, Bushey Haven. You need to drill down, preferably with a magnifying glass, to reveal much more fantastic and often hilarious detail included by Walter. The cartouche has a list of pictograms for various activities – cricket, golf and. . . alfresco bonking! Don't miss it, it's on until September (*more details on page 14 – Ed*).

Open day's treasures

I also went to an Open Day at the RGS. This was an opportunity to see some of the fabulous maps the Society holds (over two million) as well as some of the more unusual relics – like **David Livingstone**'s and **Morton Stanley**'s trademark hats and boots. We also learnt about two of the Society's early luminaries. **Richard Lander** who received the Society's first annual gift of fifty guineas, "for important services in determining the course and termination of the Niger" river. Lander had not led the expedition yet he completed the work of his master, the Scottish explorer Commander **Hugh Clapperton** who died of dysentery at Sokoto on the river. A reminder that none of us are indispensable and there are always giants waiting in the shadows to fill shoes when they become empty.

The second was the remarkable Sir **Samuel Baker** who

MacDonald Gill's brilliantly jolly poster must have kept a few spirits going back in 1940 with his homage to what was then the national beverage. Image courtesy of the British Library Board.

was strongly opposed to slavery. Attending a slave auction in Bulgaria, he bid for the woman who was to become his wife but was outbid. He kidnapped her anyway and escaped with her. They married and **Florence**, a Hungarian officer's daughter, accompanied Sir Samuel on his expeditions in search of the source of the Nile.

This was a totally excellent afternoon where we also ran into many old friends including **Roy Wood**, **David Rhind** and **Mike Curtis**. But alas, the RGS couldn't get the bar open early enough so our little party adjourned to the neighbouring and splendidly modern surroundings of Imperial College where we discovered a pleasant student bar and an extraordinary vehicle on display. This might be described as a propeller-driven car designed to run on snow and ice in the Antarctic. I can tell you little more about it but the picture reveals a very clever device on skis that might just have one flaw for the driver: an open cockpit doesn't look much fun at 50° below zero!

Another interesting lecture was that given by Professor **George Saleba** of Columbia University under the theme "1001 Inventions – the Muslim heritage of science and technology". The lecture was extremely well attended in the Directors Suite at the Science Museum and was accompanied by an extensive exhibition in the main museum. After an introduction by the Astronomer Royal for Scotland (I'll bet few of you knew about that post!) Professor **John C. Brown**, Professor Saleba explained the enormous influence early Muslim scholars and scientists, who had built on the work of the Greeks and Egyptians before them, had on the Renaissance giants Copernicus and Galileo. Interestingly, Muslims were forbidden to patent or copyright their discoveries and so they were always available for the benefit of the people. Remarkable and a counter to the image too many have of automatically associating Muslims only with suicide bombers.

Designed for arctic work but an open cab? Who can tell us more about this odd vehicle we spotted in the foyer of Imperial College.

Professor George Saleba and Astronomer Royal for Scotland, Professor John C. Brown.

Harry Glennie

I was really saddened to hear of Harry Glennie's death in May. Harry was a really great engineering surveyor and all round thoroughly good bloke. I can't say that I knew him well but in the contacts we had I always found him to be a first class surveyor who really knew his stuff. I recall talking to Harry about music and he mentioned that he was part of a small vocal group that did Everly Brothers numbers; they were called The Elderly Brothers! As somebody said, 'He was one of life's gentlemen; charming, genuine and absolutely on the level'.

Miscellany

We've not had too much sent us since the last issue so here's a few pearls you may have missed. First of all, if you're struggling to make a crust just remember that. . . a lot of money is tainted – Taint yours and taint mine.

And if you're off to France for your hols like our editor, those who jump off a bridge in Paris are in Seine. While if you don't like their over-hyped cuisine, it could be another case of *Dijon vu* – it's just the same mustard again.

Now here are a few of those immutable laws of nature:

The Law of the Result – When you try to prove to someone that a machine won't work, upon demonstration it does.

The Variation Law – If you change traffic lanes, the one you were in will always begin to move faster than the one you are now in.

The Law of Tools – you need only two tools: WD40 and duct tape. If it doesn't move and it should, use the WD40. If it moves and it shouldn't, use the duct tape.

And here's a few useful insults to remember:

'He is a self-made man and he worships his creator' – *John Bright*

'He is not only dull, he is the cause of dullness in others' – *Samuel Johnson*

'He uses statistics as a drunken man uses lampposts; for support rather than illumination' – *Andrew Lang*

And finally, have a really great summer and don't forget that. . . time flies like an arrow. Fruit flies like a banana. Whereas reading whilst sunbathing makes you well red!

Got a tale to tell?

Please send letters for publication by e-mail to the Editor: editor@pvpubs.demon.co.uk or contact Undercurrents, in strictest confidence if you wish (we promise to change names, places, etc to protect the guilty!), via e-mail: rentamalc@aol.com

Magnificent Maps in London – Power, Propaganda and Art

Left: Fred W. Rose's Serio-Comic War Map for the year 1877. © British Library Board

Readers in London this summer, whether resident or visiting, should not miss the Magnificent Maps exhibition and associated events at the British Library in Euston Road.

On until 19 September at the British Library, this exhibition brings together some of the world's rarest and most unusual maps around the themes of Power, Propaganda and Art.

These themes are a reminder that maps are not just scaled plans to help travellers and planners. Prior to the 19th century, as the exhibition reveals, they were often more about demonstrating a ruler's power, even if they depicted princedoms and empires long since submerged by modern nation states. Whither Pomerania or Bohemia? Many were exquisite works of art designed to decorate state and formal rooms for their owners to impress guests and visitors.

There are two rather striking aspects of the display. As mapping emerged from the mystical and often impenetrable schematic depictions of the medieval world, the bird's-eye view perspective with exquisitely drawn houses and buildings emerged as the popular form. A giant 3m wide woodcut map of Venice is typical, showing the Serenissima's imposing state and authority in very great detail and drafted from somewhere 500ft or so in the sky above the Adriatic! By the late 17th century things were changing (or perhaps we should say reverting) to plan mapping similar to that of today. Yet almost half a millennia later we are back with those bird's-eye views via Google.

The second aspect, only touched on briefly by the exhibition, is from Roman times. Three small pieces of engraved marble are all that remains of what was once a vast marble slab map of Rome some 43ft high by 60ft long. It shows in plan and in great detail (1:500?) every street and building and may probably have been used by the equivalent of the city's planning department. Carved around 200 AD and almost certainly the work of Greek mapmakers schooled in Euclidean geometry, similar plans would not return for almost one and a half millennia.

Readers may already have seen the series of four preview programmes to the exhibition on BBC4. They included Hereford Cathedral's Mappa Mundi, an insight into the medieval world and mindset; the massive 17th-century Klencke Atlas, which stands taller than a man; and maps as propaganda like the 19th century mapmaker Fred Rose and his iconic depiction of Russia as a grabbing octopus.

Fragment of a once vast Roman map carved in marble and resembling modern large scale mapping. On loan from the Capitoline Museums, Rome.

Lectures too

An accompanying series of lectures and presentations began on 24 May with Professor Richard Talbert talking about the Peutinger map, a tantalising copy made in the 13th century of a Roman map. The map has an odd history with little known of what it was copied from or why. Various owners faltered along the way and although it was engraved in 1598 it had to await publication until 1753. The original copy was only colour photographed in the 1970s.

The copied map is 23ft long by just 1ft deep, more like a scroll than a map. Talbert believes it would have been even longer

and estimates some 6ft is missing. It takes some unravelling but you can just about work out, amidst the squeezed land masses and seas, that Britain and Gaul are on the far left and Persia on the right. In between the Mediterranean is squeezed in with Cyprus. The whole package is an elongated schematic road map of place names with distances marked in whatever units of measurement – Roman miles, leagues or Persian units – were deemed appropriate (or more likely reported to the draughtsman).

Peter Barber, map curator at the British Library, has put together not only a brilliant selection of maps covering some two thousand years of mapping but has also backed it up with an array of fascinating talks and lectures. They include topics as diverse as Changing perspectives: mapping global injustice by changing the view? by **Danny Dorling**. The Maps in Palace - **David Starkey** and Peter Barber discuss the importance of maps in medieval and early modern palaces. Power, Propaganda and Art: Maps in modern times. Great Cities of the World with historian **John Julius Norwich**. To Geopolitics: Power and Space and The New Mapping Revolution with a chance to hear Google's **Ed Parsons** and **Steve Chilton** from OpenStreetMap.

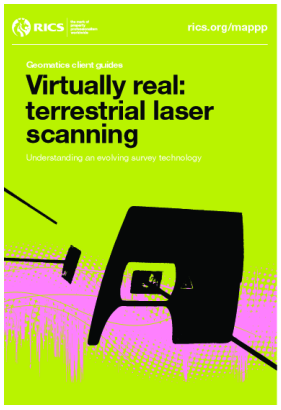
• *More details at:*
http://www.bl.uk/magnificentmaps/events1.html

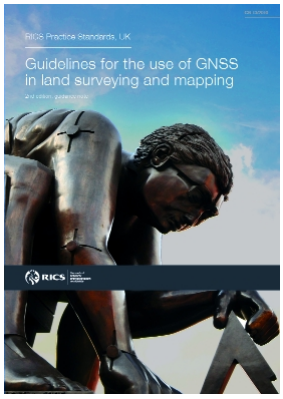
Peter Barber and a colleague steady the magnificent Klenke Atlas. The largest book in the world at almost six feet tall, it was presented by the Amsterdam merchant Johannes Klencke to Charles II of England on his restoration to the throne in 1660. It was certainly a gift fit for a king, with forty-one large wall maps in an ornate binding which bears symbols of the kingdoms of Great Britain, and that of France which the English monarch still claimed. The maps are either unique, or known in only a handful of copies. Together they were adjudged to encapsulate all knowledge.

RICS Update and Policy Watch

By James Kavanagh, Director of RICS Land Group

A raft of new and updated client guides and guidance notes for members plus recent initiatives reflect a busy time by RICS Geomatics on behalf of members, explains **James Kavanagh**.





Above: new editions of essential guides and a prize to be won for identifying that statue.

Summer time in a scorching central London and the new coalition government has mainly steered a path aimed squarely at reducing the enormous UK budget deficit. For the moment geo-related activities seem to have been spared the attentions of Chancellor Osborne. However, several issues have arisen in the UK and overseas with direct impact on the geo sectors and RICS as always has been at the forefront of the influencing agenda. Geo members with a political interest can keep up to date with developments @ www.rics.org/policyandinfluencing

Members can, as always, keep up to date on RICS related news with the Land e-brief and through the website www.rics.org/geomatics and www.rics.org/land

RICS Geomatics releases new Laser Scanning client guide

This 3rd edition geo client guide has been fully updated from the 2003 original and explains some of the survey issues behind laser scanning and what a client can really expect from this now ubiquitous survey data capture technology. The guide was distributed to over 250 delegates at the recent ISPRS Laser Scanning event held in Newcastle, UK. I cannot commend the guide more highly. It is perfect for students, surveyors and lay professionals and has been endorsed by RSPSoc, TSA and ISPRS. The guide is the seventh in the series and members are encouraged to distribute these guides as widely as possible. All of the current series can be downloaded from www.rics.org/geomatics and hard copies can be supplied on request from cmallett@rics.org

RICS Geomatics releases new guidance note 'Use of GNSS in surveying and mapping' 2nd ed 2010

This guidance note sets out best practice guidelines for surveyors and clients on the use of Global Navigation Satellite Systems (GNSS) in land surveying and mapping. It provides the surveyor with a set of practical operational guidelines, which can be used when undertaking any survey that includes GNSS techniques. It also provides clients and purchasers of geospatial information generated from a GNSS survey with sufficient information to write a task-specific specification for a GNSS survey. The guide sets out the accuracy requirements, final potential products and scope of work, from which the surveyor can produce an agreed specification and bid for a survey.

This 2nd edition also deals with recent advances in GNSS capabilities such as commercially available RTK systems, SBAS and other augmentation systems, satellite constellations and their effects on precision and the effects of factors such as the troposphere and tidal loading. The publication is international in context and can be used globally (with of course consideration given to local GNSS and RTK factors). The document is divided into two parts: Part 1 summarises the important criteria to be considered in GNSS surveying, and includes guidelines for best practice; Part 2 is a technical explanation that develops the themes of Part 1 in a more formal context. This is primarily intended for surveyors and clients who wish to understand some GNSS theory and the technical rationale behind the best practice guidelines. The document as a whole is a "must read" for all chartered surveyors who are interested or who are already using GNSS/GPS technologies.

The following topics are covered:

- *The role of GNSS in surveying*
- *The role of RTK and commercially available networks*
- *Survey documentation*
- *Survey operations*
- *Survey methods*
- *Operational considerations*
- *Co-ordinate reference frames*
- *Quality issues*

The guidance note is available to download from www.rics.org/geomatics and is another industry standard professional knowledge output from RICS.

Prize to be won

There is a free high quality Waterman RICS silver pen to the member who can correctly locate the statue on the front cover of the new edition of the guide. All answers to jkavanagh@rics.org by 30th Sept 2010.

Ordnance Survey and the UK Location users group

Ordnance Survey's 'OpenData' initiative http://opendata.ordnancesurvey.co.uk/ seems to be gaining ground as the UK government makes even more government held information available to the public http://data.gov.uk/dataset/coins

RICS has also recently taken a permanent seat on the UK Location Users Group as

chaired by **Mick Cory** FRICS. This politically powerful user group comprises senior civil servants, geo specialists, local authorities and professional bodies such as AGI and RICS. RICS recently distributed the new information paper *Geospatial Information and the surveying profession*, 1st Edn 2010 to the full user group. This new information paper sheds some light on the fast moving world of geospatial information and its myriad uses within the property industry. Designed as an update for property surveyors, it is also a useful touchstone for geomatics members and GIS practitioners. The new IP is available to download from www.rics.org/geomatics

Marine – RICS response to the Pre-consultation on the draft UK Marine Policy Statement (MPS)

RICS recently responded to the latest Marine consultation and again reiterated our policy stance on a number of issues. The UK marine policy statement will eventually become the primary policy driver behind the implementation of the new marine planning regime. RICS underlined the need for consistency across the marine policy framework with regards to training, marine and land based data capture, planning evidence and the links between the terrestrial and marine based planning frameworks. The full response can be found at www.rics.org/land. Interested members can also join an online marine virtual community of like-minded RICS members from the geomatics, planning, construction and environment areas of practice. Contact jkavanagh@rics.org for more information. All issues related to the MPS can be found @ http://www.defra.gov.uk/environment/marine/

Oceania reciprocity agreement between RICS and CRSBANZ

RICS and CRSBANZ (the combined licensed surveyor boards of Australia and New Zealand) recently signed a historic declaration agreeing on terms allowing licensed surveyors to join RICS and RICS members to gain their cadastral survey licence. Depending on the territory, RICS chartered land surveyors may find that a short six-month legal conversion course will suffice in helping them gain a cadastral license. The full agreement can be found @ www.rics.org/geomatics

RICS Oceania has also recently published advice on how RICS members can emigrate to Australia and New Zealand. The web resources contains advice on visas, education and family matters, to name but a few, and is split into separate advice for different areas of RICS practice. More @ www.rics.org/oceania

Ireland and new careers animation

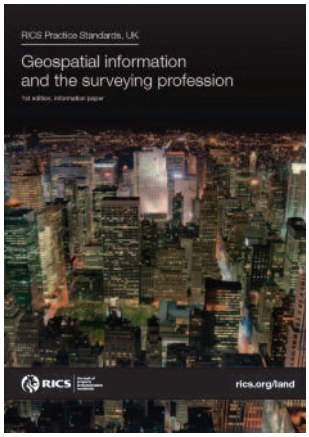
Eagle-eyed members will be aware of the wonderful new DIT Dublin careers animation www.surveying-360.com/about/land/geomatics/ This new animation is a real breath of fresh air and I would advise all members to give it a view (with sound enabled). More information on DIT Dublin geomatics can be found @ www.dit.ie/geomatics/

And finally some latest releases

Vertical Aerial Photography and Derived Digital Imagery – 5th Edn 2010, RICS Guidance Note. This new edition has been completely redesigned, formatted and updated to take account of the digital aerial camera revolution. The 5th Edn now comes with a completely separate client specification section and updated guidance section.

The extensive RICS geomatics portfolio also includes such industry standards as *Boundaries – procedures for boundary identification, demarcation and dispute resolution in England and Wales* 2nd Edn 2009 and *Terms and Conditions of Contract for Land Surveying Services* 3rd Edn 2009. This edition features a new quick specification, an updating of intellectual property issues and a fully edited and revamped format.

All of the above are or will be available free of charge from www.rics.org/guidance and www.rics.org/geomatics



Geospatial Information and the surveying profession *is a new information paper recently distributed to members of the UK Location Users Group.*

> *"This new information paper sheds some light on the fast moving world of geospatial information and its myriad uses within the property industry."*

Making a new Geoid Model for Bermuda – Part I

By Peter Hopkin and Jonathan Iliffe

It is not possible to realise orthometric levels on the ground using GNSS if you don't have a geoid model. But producing an accurate one is no simple matter. In the first of this two-part article, the authors explain how they developed a model for the fish-hook shaped island of Bermuda.

Over the last two decades a key feature of the survey industry has been the widespread adoption of GPS. This has revolutionised our work, but in some countries this has been delayed by a number of factors.

The goal: RTK GPS

The Bermuda Government's national Survey Section purchased GPS in the late 1990s, but an incomplete knowledge of the vertical datum separation was a significant hindrance to the full use of GPS in everyday production work. With the recent completion of a project to model Bermuda's vertical datum separation, this has now changed, and the island is starting to reap the benefits of RTK GPS. This article describes how it was possible to overcome the shortage of resources typical of a small island to achieve this goal.

Bermuda is a self-governing British Overseas Territory, situated in the north-west Atlantic, approximately 1,000km east of the easternmost point of the United States. The main island is 37km long, 3km wide at maximum and roughly shaped like a fish hook. The surface geology is a light, sandy limestone, which rests on the granite and basalt foundation of a relict volcano. This isolated mass generates steep gradients in the local gravity and so, in order to obtain accurate GPS corrections, a high density of control points is required to accurately model the vertical separation of orthometric and ellipsoidal heights.

Earlier geoid models

The first geoid-ellipsoid separation model was defined by Peter Hopkin's predecessor, **Sean Johnson** in 1988, and used nine control points and a graphically interpolated solution. This was refined by **Mark Griffin** in 1999 as part of a project to create a more accurate national grid and geodetic framework. However, project funding was curtailed at the last minute, with the result that only half the required geodetic levelling was actually observed, and significant sections of the island were not covered. Frustratingly, this project discovered a levelling glitch of approximately 100mm in the east end of the island. The GPS work went ahead however, and resulted in the modern Bermuda National Grid 2000 (BNG2000) being adopted.

Bermuda has no mandated national mapping body, although the Survey Section of the Ministry of Works and Engineering has de-facto assumed that responsibility. Resources are split between the duties of a national survey and mapping organisation, and those of an in-house surveying and GIS team for ministry infrastructure work such as road improvements and capital projects. These projects always take priority in short-term resource planning, and it was clear that any attempt to tidy-up and upgrade the geodetic framework would thus have to be low-key, self-sufficient, and performed incrementally over a long period as resources allowed. An additional objective was to reduce the island's reliance on overseas personnel by building local knowledge and skill capacity among Bermudian surveyors.

Two factors provided the stimulus for renewed work on Bermuda's geodetic framework. Firstly, in 2003 an aerial survey project by BKS of Northern Ireland highlighted the uncomfortable fact that there were significant weaknesses in the country's geodetic framework. Although the errors were acceptable for 1:2500 scale mapping, the framework would not fit requirements for mapping at larger scales. Secondly, a project to introduce registration of title created the need to enhance the use of GPS by the construction of a GPS base station, for which these errors were deemed beyond adjustment. So, in 2005, the "Bermuda Geodetic Project" was born.

Using historical data

The starting point was a review of the existing resources, together with consultation with the US National Geodetic Survey and geodetic consultant Geodetic Solutions in California. It was found that a number of key areas could be addressed with minimal impact on resources, provided that a specific deadline was not required. Bermuda had, over the years, collected a significant volume of geodetic observations, but the data was fragmented and a number of loose ends needed further investigation before an accurate, high resolution geoid model could be computed that covered the island's complex shape.

Achieving the requisite control point density for an accurate geoid model was always going to be difficult with such a steep gravity gradient. Options for pure gravity observations were explored but deemed too expensive for the resolution required, and a hybrid solution was thus adopted.

Global base model

It was decided that a globally available geoid model would be used as an underlying base

"This isolated mass generates steep gradients in the local gravity."

Right: Lost and found. Figures 1a and 1b show the search for the Fundamental Benchmark, eventually uncovered at the Dockyard.

model for the geoid, and the values implied by comparisons between ellipsoidal heights determined from GPS and orthometric heights found from levelling, would be interpolated with respect to this. EGM2008 – fortuitously released shortly before the actual computation commenced – is in principle capable of picking up geoid effects with a wavelength as small as 10km or less, and there was therefore some possibility of it managing to represent the main structure of the geoid across the island, but not of itself being able to describe the more detailed features that would be necessary for an accurate representation.

The geoid values implied by a comparison of GPS and levelling would disagree with the model for a couple of reasons. Firstly, they are based on a local realisation of mean sea level at a Bermudian tide gauge, rather than representing a global mean sea level. Secondly, they do not really represent the geoid itself as they also include any systematic levelling trends (and to a lesser, and generally negligible extent, GPS errors). However, direct interpolation between the benchmark values is somewhat unstable, particularly in parts of the island with sparser observations, or where the geoid surface has to be extrapolated to the coast and the seas immediately beyond. Using EGM2008 as a base would (with the proviso that it was a reasonably good fit overall) be a method of carrying the interpolation over longer distances.

The actual method of interpolation would be least squares collocation, using software that has been developed for this purpose at University College London. An essential element of this process is that it involves the derivation of a spatial covariance function as a preliminary step, and therefore gives a means of assessing the quality and characteristics of the data to be used.

Historical surveys re-used

Having decided on the project strategy, the next stage was to review the island's vertical network. The first major surveying in Bermuda was performed in the late 1890s by **Lt. Savage**, who conducted an extensive survey and mapping exercise. In his report, he noted that the levelling "included 92 lineal miles along the main roads throughout the colony… and benchmarks… have been cut on the walls of buildings etc so as to be fairly permanent". A few of these benchmarks remain today, and Survey Section stills sells the original map series (a bargain at $5).

Savage's work was superseded in the 1960s by a comprehensive survey and mapping project conducted by the Department of Overseas Survey (DOS). This combined aerial photography, a trigonometric survey, and a geodetic levelling project that included the construction of two Fundamental Benchmarks (FBMs) at each end of the island. The work culminated with the publication of a new 1:2500 map series in 1966. Survey Section is fortunate in holding the original fieldwork records from this survey, although the archives comprise only the original field-books and not the adjustment report. A decision was made to re-extract and re-compute this network, in the hope that, if enough surviving benchmarks could be found and proved to be stable, it might be possible to hang a modern vertical network on the existing benchmark values and thus retain the 1966 datum.

Benchmark search

The next job was to locate which geodetic benchmarks had survived and check their quality. An island-wide search on rock-cuts, buildings and parish boundary stones uncovered twenty, less than half the original number. One thorny problem was that while one fundamental benchmark, at the extreme east end of Bermuda, was known to exist, previous searches had failed to locate the second one at the west end. As Bermuda is long and thin, a linear network, fixed only at one end, would not be satisfactory. As for the integrity of the 1962 levelling, knowledge about the procedures and standards used was limited to inferences drawn from the field-books.

For example, while it is not recorded if an invar staff was used, it could be deduced from the booking methods that the work had been of a very high standard. Similarly, the tolerance for repeat levelling could not be found, but as the field-books showed that

"After some digging, the FBM chamber was uncovered and opened… perfectly preserved under 0.3m of tarmac, concrete and rubbish."

35% of the network was re-levelled, the tolerance must have been tight. Wry comments in the books' margins about the windiness of Bermuda showed that surveyors then, as now, struggled against the island's climate. Luckily for us, the field-books were complete and intact. Extraction of the entire levelling project took several weeks, and the observations were converted to metric and computed by least squares. The results were impressive; 72km of work with a standard error of better than 3mm √k (where k is the distance levelled in kilometres), which matched the published values perfectly. The basic 1962 network could be adopted and the datum used for the modern scheme.

One unexpected result of this data extraction project was the rediscovery of the presumed lost western FBM. The 1962 field-book was found to contain the original sketch description of the monument, and renewed efforts were made to uncover it. The events of that afternoon were momentous for the project.

After some digging, the FBM chamber was uncovered and opened (Figure 1), perfectly preserved under 0.3m of tarmac, concrete and rubbish. Inside the chamber, the brass benchmark had been protected with an upturned, sawn-off gas tank. The design was identical to the chamber at the east end of the island, and it was then realised that what had, in 1999 been identified as the FBM, was just the protective cover, and the actual FBM was buried underneath. This sudden realisation resulted in an immediate visit to the east end of Bermuda, and an hour's excavation of the earth-filled benchmark chamber. A brass ball FBM was indeed uncovered from underneath an identical gas tank, and a level check showed that it was 95mm lower than the top of the protective cover. At a stroke, the 100mm misclosure that had dogged the 1999 levelling project had been reduced to a mere 5mm error. The confirmation of both FBMs in perfect condition, connected by levelling of geodetic quality, provided the perfect conclusion to the decision to adopt the 1966 datum as the basis for the new scheme.

"The fish-hooked shape of Bermuda conspires against the creation of neat levelling loops and closed traverses..."

Filling the gaps

The next objective was to extend the 'spinal' network of vertical control to the extremities of the island and infill some major gaps. Initially it seemed that the volume of geodetic levelling required was beyond the Section's skill-set and resources. However the Bermuda Government's decision to proceed with Land Title Registration opened up new capital funding opportunities, some of which could justifiably be used to develop the new geodetic framework. This funding allowed the employment of an overseas contractor to complete the levelling from 1999 and to densify and extend the network of control points. When combined with the historical work, these control points would create sufficient raw material to compute a high resolution geoid model.

The work swiftly went to tender, and in March 2008 two staff from **Atlantic Geomatics UK Ltd** (based at Penrith, Cumbria). arrived in Bermuda for six weeks worth of observations. Mindful of previous struggles with the windy climate, considerable Section resources were diverted to support their work by measuring and nailing all change-points in advance along the entire 59km route. This ensured a fast pace of levelling, and included the involvement of two Bermudian survey companies, **Compu-Cad Training and Services Ltd**, and **Q-ship Enterprises Ltd**. This produced a positive team ethos and helped to generate local capacity for geodetic surveying. In addition, two survey technicians were exposed to high precision levelling techniques, so that once the geodetic network had been completed, it was decided to attempt significant amounts of 'secondary' digital levelling at the Section's own pace. This allowed additional infill work in the centre of the island and allowed us to push the network coverage out to a few key headlands.

Calibration work of the Section's Leica Sprinter electronic level against the recent geodetic levelling showed that with care, particularly with the selection of optimum weather conditions and the use of measured and nailed change points, the instrument could deliver results to better than 5mm √k. More than 25km of levelling was observed this way, ensuring that the vertical

Figure 2. Final Vertical Control Network

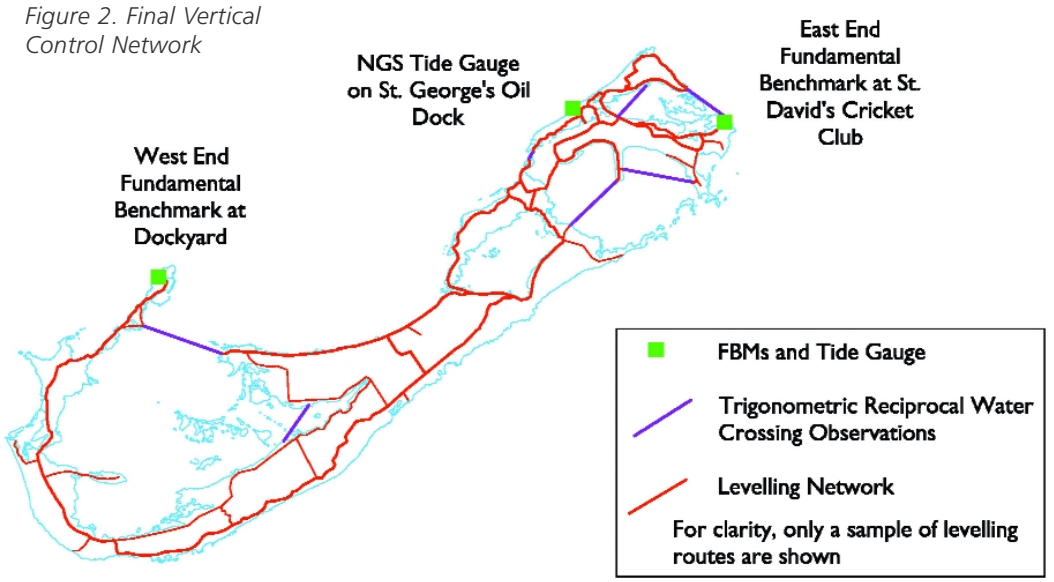


Figure 3a and Figure 3b record the simultaneous trigonometrical reciprocal observations. The St George's Town Crier came along to celebrate the tight network closure!

network was much denser than had originally been envisaged. (Figure 2)

Reciprocal vertical angles

The fish-hooked shape of Bermuda conspires against the creation of neat levelling loops and closed traverses, and it was clear that the network could be greatly strengthened by a number of cross-water reciprocal trigonometrical observations. Despite the author's experience of the method in Hong Kong, gained during engineering survey work on the Lantau Link and the New Airport Project, there was widespread scepticism amongst Section staff that good results could be obtained in a sub-tropical climate. A former colleague **Dr Alan Johnston**, who had performed the majority of the Hong Kong observations and has since written a doctorate thesis on refraction, was consulted for the best methods.

Alan made several key recommendations, chiefly the importance of ensuring that environmental conditions at the instruments at both ends of the line are equal. Refraction may not be avoidable, but asymmetric refraction is. Fortunately, Bermuda's rugged coastline did allow the selection of observation sites on small headlands that allowed instrument set-ups to be on the edge of small bluffs, with a line of sight that launched immediately into air remote from ground heating. In addition, observations were performed only when there was a gentle crosswind to mix the air over the sea / land interface to ensure that environmental conditions around each instrument were as similar as possible.

As for equipment, the targets we could build ourselves from metal plates, but finding two high-specification instruments occupied a considerable time. Following a personal recommendation, **Sirgit Singh Marway**, an instrument hire and repair company in Kent, came to our rescue. Sirgit had two mature **Leica TC2000** instruments in good repair and available for long-term hire. This allowed us the flexibility to observe only in optimum weather conditions and not be constrained by a tight hire window.

Having built the targets, the next step was a pilot study. Our first trial observation, conducted in daylight across 2.2km of the sheltered waters of Harrington Sound, closed to within 7mm of the known geodetic heights, and demonstrated to the entire field staff that, given care and a few improvements to technique, we could achieve at least second order levelling accuracy over considerable distances. Over time, we improved the method with a larger number of observations over a longer period, with repeat observations at night. Eventually, seven water crossings were observed (Figure 2 and 3) up to a maximum range of 2.6km. In an era of high tech instruments and GPS, it gave the Section staff a great deal of job satisfaction to achieve a tight tolerance with traditional methods which, when combined with the second order levelling, made a significant difference to the density of control points and completeness of the whole network.

Computations

Once the final water crossing observation had been made in the summer of 2009, the next stage was to compute the geodetic model. Once again this required access to technical resources beyond the expertise of Bermuda, but communications with the Cayman Islands resulted in a recommendation for the services of Dr Jonathan Iliffe, of University College London. This part of the story will appear in the next issue of *Geomatics World*.

"Refraction may not be avoidable, but asymmetric refraction is."

About the authors

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Rapid 3D Surveys – Loy Surveys embrace point clouds

By Scott Macleod

Loy Surveys were the first in the UK to buy the new Leica Geosystems Scanstation C10. Since October 2009 they have deployed the laser scanner on a variety of projects to good effect, as **Scott Macleod** recounts.

As a company, Loy Surveys had been aware for a number of years that laser scanning was going to be the next big thing in surveying and would eventually become a mainstream technology. We knew we would have to master it in order to stay at the leading edge of surveying. The only question was, when? With the technology changing at a rapid pace and becoming increasingly more affordable, it was a case of finding the right balance.

The pacesetter

Fortunately we had the opportunity to purchase the first commercially available Leica Scanstation C10. This is a bit of kit that appealed to us and our style of workflow in a big way. Not only was it a significant step ahead of previous scanners, it provided us with an excellent entry point into scanning. Being both faster and lighter it was ahead of the game and looked as though it would be the pacesetter for the next few years. The fact that everything came in a single manageable package and did not need cables, external batteries and laptops to operate it, meant it fitted perfectly into our flexible working system.

Once in possession of the Scanstation C10 we were able to put it straight to work and have been using it wherever and whenever possible since. Some of the projects we have carried out include major industrial sites, urban areas and historic buildings.

Monitoring cooling towers

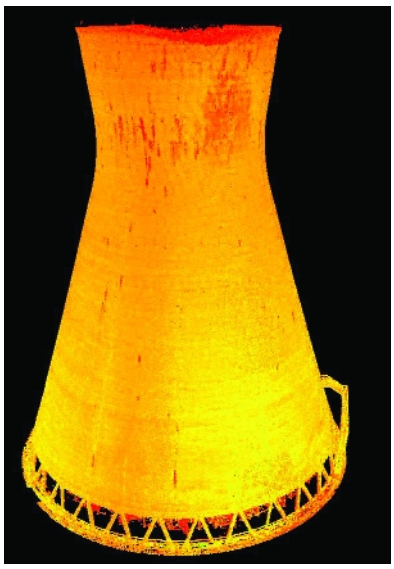
With a job in the pipeline we were able to get an early delivery of the Scanstation C10. The job was to carry out a survey of three cooling towers at the Grangemouth Oil refinery on Scotland's Firth of Forth. The C10 was delivered to us on the first morning of the job by Steven Ramsey from Leica Geosystems. Steven was there for more than just delivery. He had been involved in the testing and development phase of the C10 and, as we were going to be the first company to use it on commercial work, he joined us so that he could demonstrate its capabilities and observe the scanner in a commercial environment.

The purpose of the job was to survey the cooling towers with a view to identifying any movement and changes of shape or deformations in the tower structures. Previous surveys had involved observing points at set heights along a number of vertical lines around the tower. Although these surveys had not been carried out by Loy Surveys, we believed that this method of setting out and surveying fixed points around the tower could take two or possibly more days per tower. By using the Scanstation we were able to survey the three towers over two days, with the survey time for each individual tower of approximately 2½ hours. Not only was this a massive saving in site time, we were also able to record infinitely more data on the cooling towers.

Each tower was scanned by placing the C10 over known control points. A total of five overlapping positions were used on each tower and they were scanned at a 30mm grid. Importing and registering the individual scans proved straightforward with the Leica Cyclone 7 software and in less than an hour's office time we had a 3D model of the tower.

Unfortunately the next step of the process was not so straightforward. As previous surveys of the tower had all been observed with total stations their results had been represented as 2D drawings. This led to the slow process of picking off individual points from the scanned model in order to be able to show them in a similar format for comparison with the previous surveys. It proved time-consuming to compare points observed by scanning with those observed by total station, but future comparisons between 3D scanned models will not be so cumbersome and will take a fraction of the time.

The C10 cut its teeth on scanning cooling towers at the Grangemouth Oil refinery.



An early morning in Princes Street

Not long after taking delivery of the C10 we were commissioned to carry out a building survey of several adjacent properties on Edinburgh's Princes Street, including street-facing elevations. Although the client did not request the elevations to be scanned, we took the opportunity to use the scanner both to develop our own skills with it and as a comparison to the methods we had been using to date.

The job involved scanning 80 metres of building elevations up to five floors high. The fieldwork was accomplished in a day; an incredible timesaving when compared to a total station survey, which would have taken close to two weeks to complete. As with the cooling towers at Grangemouth, we were able to collect a level of detail that previously was not within our capabilities. Being able to carry out the work so quickly had great advantages. As one of Edinburgh's main thoroughfares, Princes Street is busy at the best of times, but with

Above: Edinburgh's busy Princes Street.

The scanned elevation of 80m of Princes Street.

work for the new tram network turning much of it into a construction site, the areas from which we could work felt rather confined. But the scanner and an early morning allowed us to collect the information with minimal risk of disturbance from the tram works and pedestrians, something that would have been tiresome and difficult to avoid had we needed to be on site for a couple of weeks.

At present this time saved on site is offset by the time required in the office to produce the 2D drawings required by the client. Being new to working with scanners we are still in the learning stages and continually developing our experience at creating drawings from the point-cloud data. So, while we get up to speed we have begun a relationship with a couple of design houses that we can call upon to assist and create drawings for us. This approach also frees up more time for us to carry out 3D survey fieldwork.

Dounreay Castle

One of our most recent jobs has been to carry out a 3D scan of Dounreay Castle on Scotland's north coast. The castle, a scheduled monument, is unique in this area of Scotland, as it has an L-shaped footprint that is more commonly found in the Scottish Lowlands. This makes it an important part of the history and heritage of the area. As the castle is in a poor state of repair, Historic Scotland are keen to see something done in order to maintain and preserve the castle. It is currently owned by the Dounreay nuclear facility and is trapped by the coast on one side and the nuclear facility on all others. The nuclear plant is currently being decommissioned and the security and monitoring controls in place during this process mean that it is not viable or affordable to carry out a physical restoration of the castle at present. With this in mind we were approached by Dounreay Site Restoration Ltd and asked to carry out a 3D scan of the castle as a means of preservation by record.

Only an exterior survey of the castle was possible. Its dilapidated condition meant that for health and safety reasons we were not allowed within 10m of the structure. The ability to scan the castle was ideal as it meant we could record it quickly and efficiently at relatively low cost (compared to physical restoration), and at the same time remain at a safe distance from the structure. The survey itself was carried out over two days with a total of eleven overlapping scan positions. At a different site, without the security protocols, we could potentially have completed the survey in a day. The castle was surveyed with an overlapping grid of 8-10mm or less so that we had enough information to see and record the individual stones within the coursework.

The end product for the client was the full point cloud data, which they could present to Historic Scotland as a record of the castle in its

> *"... future comparisons between 3D scanned models will not be so cumbersome..."*

The C10 has a simple screen interface from which the user controls all function.

The C10 Scanner

Announced by Leica Geosystems last autmn, the scanner was unveiled in the UK for the first time at Leica's GeoWorld event at the Emirates last October. The ScanStation C10 is a fully integrated, cableless system that can carry out a full dome scan up to ten times faster than its predecessor. The scanner has a surveyor-friendly onboard interface with high-resolution, colour touch-screen and integrated, high-resolution zoom camera/video. It is also equipped with a dual-axis compensator, laser plummet and tribrach mount for quick set-up and it interfaces to Leica's standard survey accessories such as TPS batteries, total station prisms, and even the Leica GPS SmartAntenna.

Right: South East Facing Elevation.

Below: The final rendered image of Dounreay Castle.

current state for future use and reference. We also produced 2D elevation drawings.

> *"...we have made the right move at the right time."*

Convincing clients

Looking at the long term, we see scanning as becoming the norm in the survey world, and are aiming to reach an ideal position where we will carry out the scanning, register the data and then pass the raw point cloud straight to the client so that they can use the data as they see best. This has huge benefits for both us and our clients. For us it means less office time and accordingly more survey time, which boosts our productivity. For our clients, they are able to get full 3D surveys in a fraction of the time and at an affordable price.

At present however, only a small number of our clients are in a position to accept and deal with full point cloud data, but this is something we are keen to rectify. We have run a number of roadshows and invited our current and potential clients to come along to see and hear about the technology we are investing in. The roadshows give us the opportunity to demonstrate the direction in which we are moving. They also provide clients with a clear picture of the types and amounts of data that are available and encourage them to towards incorporating our Rapid 3D surveys into future work. Architecture and design software packages, such as the latest versions of Autocad and Bentley Microstation, are now able to import and work with point clouds, so the number of clients who can take full advantage of this data is increasing. We are also looking to these clients for new areas and ideas to which we can apply this technology.

With the purchase of the Scanstation C10, Loy Surveys has taken a major step into the world of 3D scanning. In doing so we are expanding our capabilities as a survey company and keeping ourselves at the leading edge in a competitive industry. Having put the C10 to use, it is easy for us to see the huge advantages to be gained through highly detailed rapid 3D surveys, produced in record time. Although new to scanning and still with much to learn, we have no doubt that we have made the right move at the right time.

About the author

Scott Macleod originally worked as an archaeologist where he often carried out site surveys. He developed an interest in land and building surveying and joined Loy Surveys four years ago. He is currently a senior surveyor and played a key role in the introduction of the C10 to the company.

PhoToPlan goes 3D (and gets a lot smarter!)

Developed by Kubit Software in Germany, PhoToPlan 3D builds on its 2D predecessor as a low cost alternative to high-end photogrammetry. So how good is it? Richard Groom recently met with UK distributors **Latimer CAD** for a detailed look.

There are an increasing number of low cost, entry level software products aimed at capturing rectified 3D data from imagery. One of them, PhoToPlan, has already established a strong user group for its 2D version who use it for capturing building façades and similar single plane scenes.

PhoToPlan 2D is photograph rectification software that works within AutoCAD. The user has to identify the rectification plane within the image and coordinate at least four control points within the plane – typically using a total station.

Within the software, the operator has to identify the control points, relate them to the points in the image and the software calculates a least squares fit along with residuals on each point and a standard deviation for the computation. Of course, features that are in front of or behind the rectification plane remain distorted.

PhoToPlan 3D is a lot smarter because the control points do not have to be in a rectification plane. Control points can be anywhere in the image, but evenly spread over the photo. However instead of the minimum four points required by PhoToPlan 2D, at least nine control points are required. These enable the software to calculate the photo exposure position, camera tilts and camera calibration data.

When used with only one image, PhoToPlan 3D can be used to define and work in more than one rectification plane or curved surface so that it operates as a souped-up PhoToPlan 2D, but if you have two images covering the same object there is effectively a stereo pair and the software can be used to observe 3D lines by following features in the image. The line tracing process involves viewing the stereo images in two AutoCAD windows and toggling between the windows, picking equivalent points in each image in turn. It is quite straight-forward if a little time-consuming.

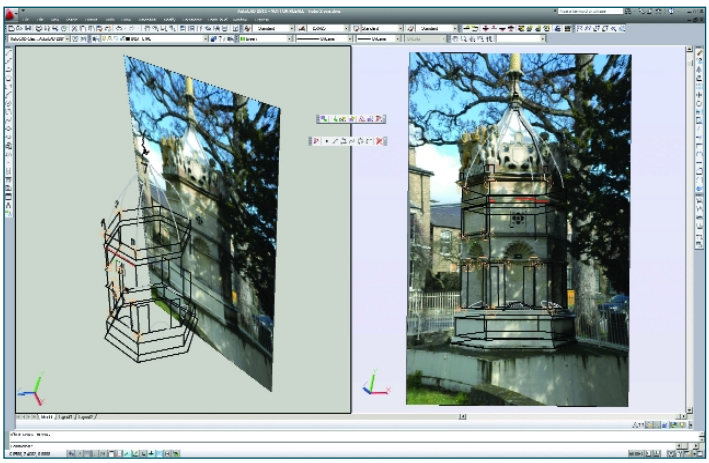
Understanding principles is important

The accuracy of the result depends upon the base to height ratio between the images in the stereo pair, so it is important for operators to understand the principles of stereo modelling. The images do not have to be the same scale and the system allows considerable flexibility in angle between the views that are used make up the model.

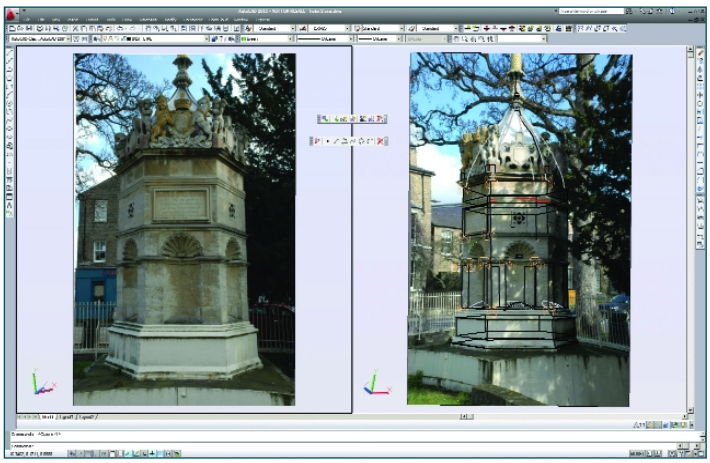
Julie Edwards of Latimer CAD stresses that PhoToPlan is not a be-all and end-all. However it is a low-cost alternative to high-end photogrammetry and particularly useful for surveying parts of objects that may be hidden from a laser scan or total station survey. PhoToPlan 3D has potential uses outside architecture and heritage and could for example be used in some circumstances to take measurements from CCTV imagery or indeed any imagery that has detail that can be identified on the two images.

Typically, digital SLR cameras are used to take the photography and, although it is possible to field calibrate the camera and save the results, the system can also accept data from a lab calibration. If known camera calibration values are entered, the number of control points can be reduced from nine to a minimum of four.

• *The one-off cost of PhoToPlan 3D is £2000 and it can also be purchased for £1000 as an upgrade from PhoToPlan 2D. Maintenance is 15% of the one-off cost. The software operates within AutoCAD 2007 or later. For more information contact Julie Edwards, Latimer CAD, email Julie@latimer-cad.com.*



Above: A 3D wireframe model within AutoCAD with an orientated image shown behind and from the camera's viewpoint.



Above: Two Images configured for "dual image drawing" in 3D, with the resultant lines shown only in the right image.

Cadastral Surveying in Europe: Nine countries compared

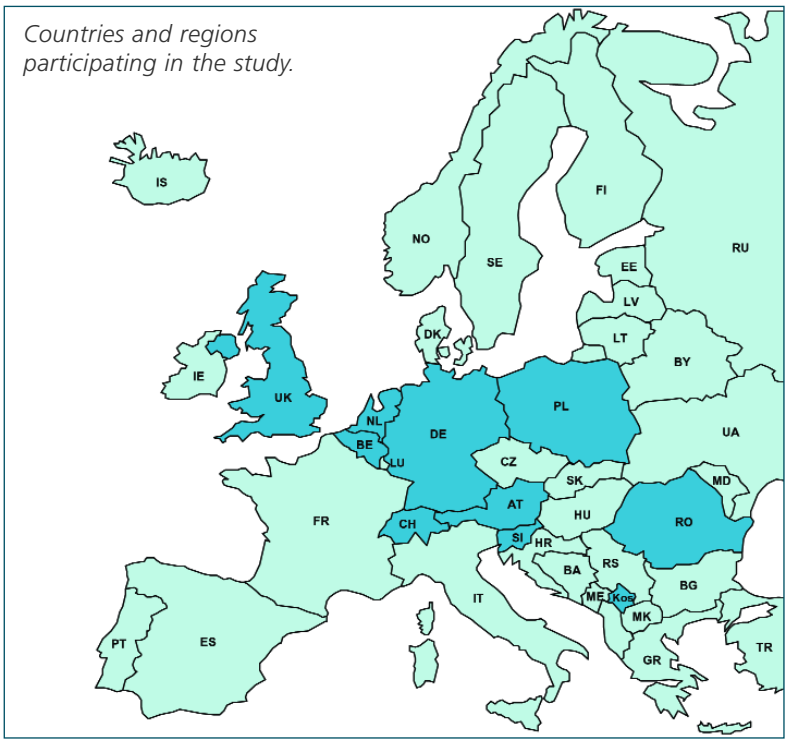
Looking for new opportunities abroad? **Richard Groom** and **David Powell** comment on this detailed report that will tell you all you need to know about the cadastral regimes in nine EU countries.

The background for this study arises from the ratification of the Treaty of Lisbon in December 2009, which aims for a more transparent and democratic Europe. Several initiatives and legislation have followed focusing on interoperable data and the exchange of information such as INSPIRE, e-governance, GMES and activities concerning Public Sector Information. These are all seen as examples of achieving greater transparency and have an impact on Europe as a whole and on professions in particular.

In reality, for many professional surveyors in Europe, national borders represent few restrictions. However, in specific situations, there can be issues where detailed knowledge of the legal framework is essential, especially when carrying out work related to a cadastral system.

EuroGeographics, Comité de Liaison des Géomètres Européens (CLGE) and Geometer Europas (GE) have produced a report entitled Impact of EU Legislation on Cadastral Surveying. Their objective was to look at the underlying principles of the Lisbon Treaty and the potential impact on surveying professionals and activities in the cadastral domain in Member States. For the nine EU countries that participated in the study, the report maps eight cadastral surveying activities against four relevant EU treaty articles.

The eight cadastral surveying activities defined are:



Countries and regions participating in the study.

1. *Cadastral (technical) field measurements*
2. *Marking of parcel corners*
3. *Advice / consultancy for the landowner*
4. *Validation, getting approval on cadastral plans from relevant authorities*
5. *Land price valuation*
6. *Registration of updated cadastral data to cadastral database*
7. *Defining restrictions on land use*
8. *Preparation (correction) of territorial planning documents*

The four relevant EU treaty articles are:

Art. 39: Freedom of movement, but not for employment in public sector, i.e. activity is in state monopoly – activity mainly carried out by civil servants (such as national mapping agencies).

Art. 45: Freedom of establishment, but not for activities connected to official authority – activity is carried out by publicly appointed professionals.

Art. 43: Freedom of establishment regulated by professional agreements incl. mutual recognitions – activity can be exercised by private sector professionals acting on behalf of state authorities.

Art. 49: Freedom to provide services – activity is not regulated, employment regulated by free market.

The bulk of the document contains a profile of each country and a tick-box table analyzing cadastral activities within the context of the EU articles. For the UK, the entry acknowledges the different land law structures between England & Wales, Scotland and Northern Ireland plus the odd offshore jurisdictions (Channel Islands, Isle of Man etc).

Richard Groom comments, "A look at the UK table reveals a line of ticks under article 43, but I thought that cadastral surveying work in England and Wales was unregulated. A check with the Land Registry website reveals that, in connection with determined boundaries, it is "good practice for plans prepared by a chartered land surveyor or other suitably qualified professional to be endorsed with a certificate as to its accuracy. . ." – a statement that permits plenty of interpretation and not much regulation!

David Powell, an acknowledged expert in boundary issues and Britain's own "cadastre" adds: "Having read the report, I was impressed

by the volume of information contained and the useful reference points provided."

Committed supporter

As a committed supporter of the "general boundaries rule" in England & Wales David Powell continues:

"I was heartened to see the way in which the future of the cadastre in Europe is being monitored, discussed and possibly strengthened. It should always be remembered that the general boundaries rule itself is a form of cadastral record keeping and is, in my view, when combined with the RICS Neighbour Dispute Service, the 21st century way of dealing with boundary demarcation and record keeping. It is a model that can be rolled out cheaply across the developing world and will naturally replace the over-pedantic 20th century "precise" cadastre as previously promoted by certain northern European countries.

I applaud the work put into this document by all those involved and am pleased that, within Europe, it is, once again, the RICS that is at the forefront of debate and development."

Perhaps inevitably and rather obviously, the report recommends that each country examines for itself the relevant EU treaty articles from their own national perspective. Depending on the national context, the impact of the EU legislation may differ, which can only be evaluated with a detailed "internal" know-how of the local legislation and structures.

	Art. 39	Art. 45	Art. 43	Art. 49
1. Cadastral (technical) field measurements	√		√	
2. Marking of parcel corners			√	
3. Advice / consultancy for the landowner			√	
4. Validation, getting approval on cadastral plans from relevant authorities	√		√	
5. Land price valuation	√		√	
6. Registration of updated cadastral data to cadastral database	√		√	
7. Defining restrictions on land use	√			
8. Preparation (correction) of territorial planning documents	√			

How most of the UK shapes up against the relevant Lisbon Treaty articles. But are we really regulated?

More information

The report can be downloaded from: http://www.eurogeographics.org/sites/default/files/ImpactEULegislationOnCadastralSurveying2010.pdf

A helpful guide, *Stepping into the EU*, is available from the RICS, which can serve as a guide to the successful recognition of your professional qualifications (RICS, 2009).

> *"It is a model that can be rolled out cheaply across the developing world and will naturally replace the over-pedantic 20th century "precise" cadastre..."*

MapAction in Niger

By Chris Ewing

When flooding hit Niger in 2009 MapAction were called upon to assist. Volunteer, Chris Ewing reports on his deployment for the charity that helps provide emergency mapping for humanitarian disasters.

Large-scale flooding hit the Agadez region of Niger in September 2009. This affected more than 80,000 people and left thousands without shelter as homes were destroyed by the rapidly flowing water. Oxfam GB, based in Niger, worked with local partners to create temporary settlement camps for affected families. In the following December I was asked to travel to Niger to assist Oxfam and their local partners.

Working for MapAction

Following the flooding, MapAction were requested by Oxfam GB to help train local aid agencies to map areas damaged by the floods. MapAction put the call out to its volunteers. I responded and was selected to travel. I was joined on the trip by another MapAction volunteer, Nick McWilliam, and an Oxfam GB water resource advisor, St John Day. The work we were sent to do forms part of a bigger Oxfam GB / Water Aid project which is looking to use Integrated Water Resource Management to help local communities across West Africa.

Combining volunteering for MapAction with a full-time job is a juggling act – last year I volunteered about 20 days of my time, which included weekends, days off, and evenings. We also have to be able to deploy to a disaster area at very short notice, sometimes in as little as 24 hours. My employers, Halcrow, have been very understanding and supportive of my voluntary work.

Niger

We arrived in Niger by plane into Niamey International Airport in the early hours of the morning to be met by a local Oxfam worker who took us to the guesthouse, where we would be staying. Early the next day we travelled through the dusty streets of the capital to the Oxfam GB headquarters. The first few days consisted of training local staff in the use of handheld GPS and low-cost GIS tools. These technologies are used to map points of interest on the ground. They will be especially useful to Oxfam GB in their projects around the capital to help staff locate projects and share information about where something is. We also met with local organisations AGRHYMET and ACMAD and a number of government departments to talk about sharing borehole and hydro-geological information about the area.

Agadez Fieldwork

After the first week we travelled to Agadez, part of the Sahel region of Niger. The local people are a mix of pastoralists and agro-pastoralists. The area was once a tourist hub but has become unpopular due to fear of kidnap from rebel Touaregs. On arriving we were struck by how desolate the area was from the air. The land is basically desert with water being found in wadi systems, which are filled in the rainy season. Our training sessions lasted three days with the local staff and included GPS training and an introduction to Google Earth.

Around Agadez we travelled to a local village, which had been affected by the flooding. The local team split into three groups and used their newly learnt GPS skills to map and locate wells and boreholes, which

Right: Large-scale flooding hit the Agadez region of Niger affecting over 80,000 people. Picture source: IRIN

Far right: Mud walled houses damaged by the flooding in Agadez Picture source: Oxfam

had been damaged by the flooding. Drinking water is drawn up from wells and they are extremely important in a region where water is scarce. The position of damaged wells and other infrastructure were recorded by the teams using GPS. Agadez lies downstream of a mountain range and the flooding inundated wells, flooded farmland and destroyed mud walled homes.

Back in the office the teams downloaded their GPS data to Google Earth. For the staff it was extremely interesting for them to see satellite imagery of their local area; and to put into context the results which they had captured in the field. This was the first time any of the staff had used such software and it was a real eye-opener for them. The first thing many of our trainees did was to search for their house!

Community mapping in the field in Agadez, Niger Source: MapAction

Training with the team from AIP Takkeyt (Oxfam GB local partners) in Agadez, Niger (Chris Ewing on the right). Source: MapAction.

Knowledge transfer

The GPS skills, which are now with AIP Takkeyt, will enable them to collect geographic information in the work they do. This work will feed into the work Oxfam GB conduct on a national level and help to distribute aid to those in need more effectively. In all, the mission to Niger was successful for all concerned. We imparted our knowledge of GIS and GPS to keen people and made some friends along the way. For the local staff the sessions were very interesting. The staff will apply their new geographical skills on a day-to-day basis to help map the needs of local communities and those most in need.

Why do it?

Our work in Niger has two distinct benefits:

1. To enable Oxfam and its partner staff to produce community and local level maps. These maps are fundamental in planning and responding to disasters because they enable multiple levels of detail to be assessed quickly.
2. On a broader scale, our trip also engaged with research organisations to produce regional (macro) scale maps that can improve planning and collaboration between humanitarian and development agencies. Mapping remains an important tool and MapAction enables field programmes to capture important local level data.

In the future, Oxfam and Water Aid plan to take forward this initiative to other countries across West Africa and use water resource management at a local level to help communities in need of water and sanitation. Through the initiative (and the training in GPS and GIS by MapAction) communities will be able to better plan and map their available water resources.

About the author

Chris Ewing is an enthusiastic geospatial professional who volunteers for MapAction.

With the charity, Chris has attended natural disasters in Bolivia and Jamaica and travelled on training missions to Niger and Lesotho. He works for Halcrow Group Ltd and is involved in a number of key geospatial projects.

> *"This was the first time any of the staff had used such software. . ."*

About MapAction, the disaster mapping charity

MapAction provides situation mapping and information management support in disaster zones. As well as responding to natural disasters, MapAction also supports local and international non-government organisations in developing countries.

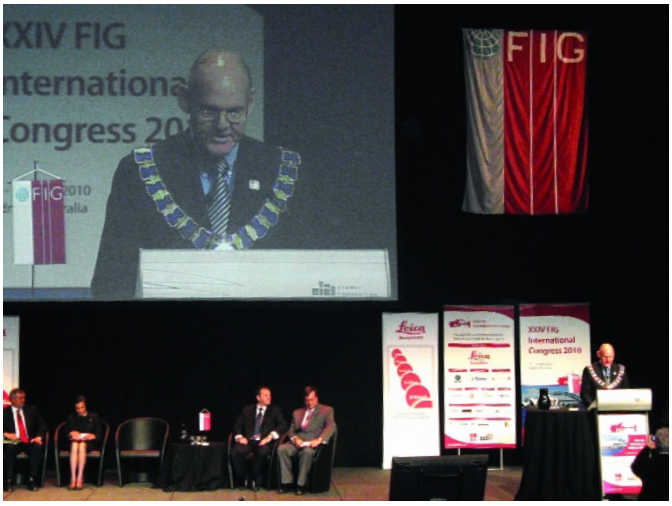
In a humanitarian crisis, relief agencies need rapid answers to questions about "where". MapAction helps to answer these questions:

- Where has the disaster impacted?
- Where are the greatest needs?
- Where are the affected people?
- Where are the gaps that need to be filled?
- Where are other relief teams working?

Source: MapAction.

Impressions of FIG Sydney: "Malaysia does the double"

By Alan Haugh



President Stig Enemark opens proceedings.

Apart from institutional delegations, few from the UK could afford the long and expensive trip. **Alan Haugh**, who combined the visit with holiday, wonders whether it was all worthwhile.

The 2010 quadrennial gathering of surveyors from world wide took place during early April in the Conference Centre on Darling Harbour in Sydney. Sunny autumnal weather prevailed throughout and when the air conditioning got too chilly it was pleasant to escape outside into the touristy area surrounding the harbour.

The Congress was jointly hosted by FIG and the Australian Surveying and Spatial Sciences Institute (SSSI), the renamed Australian professional body for Survey and Geographical Information. It was claimed to be the biggest ever with 2000 registered attendees, though it has to be said that some 40% were Australian. Numbers from New Zealand, Morocco, Germany and the USA were well to the fore in the 94 countries represented and there was a huge contingent of over 100 from Nigeria.

A valiant handful of 28 from the UK had made the long trip, with both RICS and ICES represented and voting in the General Assembly but otherwise having a very low-key presence. No Institution reception, as was enjoyed at the top of Melbourne's tallest building at the FIG Congress 16 years ago, and if ICES laid anything on they failed to invite all its attending members.

No papers, no disc

Registration produced the usual Leica bag, a Congress programme book, the technical programme book and a well-presented souvenir commemorative history of Crown Plans. But no papers, printed or on disc (not even extracts) – only advice at the desk that papers would be published on the web after the Congress. Some may have been available then but without computer and web access were not accessible.

So, apart from the four plenary sessions – one each day – one had to make one's choice of what technical sessions to attend from titles and authors only. And with 10-12 parallel or simultaneous sessions over three days, some commissions even having parallel sessions, and with technical tours being run each afternoon at the same time, the choice was problematical. Add the fact that some one-hour sessions could have 7 papers yet other one and a half hour sessions might have only three or four, and this part of the conference participation became for your reviewer somewhat of a largely pot-luck exercise.

By this time one did not wish to think of the cost of attendance, particularly in the light of our slumped pound, but for this attendee it was clearly not worth the expense or the effort in getting there had it not been to spend a holiday in Australia and Singapore or other stop off point, and treat the conference as a casual though costly diversionary interlude.

The exhibition was housed in one of the five vast exhibition halls adjacent to the Conference centre and was also the venue for morning coffee, afternoon tea and an included daily buffet lunch with hot dish for the four days of the exhibition, though not on the fifth after the exhibition had closed.

Though the big four – Leica, ESRI, Topcon and Trimble were well to the fore with prominent stands – perhaps the size of the hall made the total exhibition appear smaller than in previous congresses and mostly Australian oriented. It was certainly a good deal smaller than the Munich

display though of course that included the Intergeo.

Instrumental emphasis was, as usual, on assorted GPS, total stations and laser scanning devices, two or three units of the latter now often vehicle mounted along with GPS so that every detail is now surveyed to high accuracy with one pass along the road. It was noteworthy that one of the most patronised stands was one displaying and selling opal stones!

The Welcome reception on the Sunday evening was held in Sydney's historic Town Hall on George Street with a brief but impressive recital on the magnificent organ. The opening ceremony the following morning, which took place in the huge semi-circular auditorium of the Conference centre, was opened by an ash-painted aborigine blowing his didgeridoo and making a gracious introductory speech. It was followed by a series of formal speeches, welcomes by the SSSI President, the Australian Minister of Lands, and FIG President **Stig Enemark**, and then the Governor of New South Wales, Professor **Marie Bashir**. She spoke about one **James Meehan**, an Irish political prisoner deported to Australia in 1800 aged 26, who made good as a pioneering surveyor in NSW and Tasmania, who was to be honoured at last by having a new statue, on display in the exhibition, placed in the Department of Lands.

The Keynote address, which followed was by Professor **Tim Flannery** who spoke in a humorous but telling vein about the effects that climate change would have on Australia and elsewhere. For your reviewer this was one of the highlights of the Congress, others being Google's **Ed Parson**'s down-to-earth talk on Google's objectives and methods at one of the plenary sessions, and the hugely popular standing-room only single session on the History of Surveying in Australia. (There had been a two-day pre Congress workshop on the History of Surveying but only one session was available in the Congress proper – *see GW May/June 2010 for a fuller report. Ed*). Of course there may well have been other bright spots but with such an overfull programme one hadn't a hope of taking them all in. Most of the papers are now available in .pdf format at www.fig.net/pub/fig2010/techprog.htm though some are not and others are only in abstract.

At the final General Assembly Malaysia did indeed do the double. Council Member **Teo Chee Hai** defeated the UK's **Iain Greenway**, eliminated on the first ballot, and favourite **Matt Higgins** of Australia by one vote to become the new President. Then Kuala Lumpur was chosen as the next 2014 Congress venue over Istanbul, Malaysia's holiday oriented publicity material proving more successful than the Istanbul's stand's active PR.

Too much, too expensive

In summary this was a very enjoyable but hugely expensive conference in an excellent venue, but far too much was packed into the five days. Perhaps future organisers need to be much more selective in the choice of papers to be presented and if commission specialisations are to continue and mean anything, there needs to be a clearer division between their programmes, rather than, as at this Congress, grouping papers according to topic and then attaching to each set the Commission numbers which were relevant.

• *GW is indebted to editorial board member for this report. We were unable to attend FIG Sydney this time due to cost implications.*

> *"Perhaps future organisers need to be much more selective in the choice of papers to be presented..."*

CRC could boost demand for measured building surveyors

By Richard Groom

It is always interesting to hear where Autodesk sees the CAD and GI market going and this year's press day was no disappointment, reports **Richard Groom**.

Autodesk dominates the market for a range of software from its core AutoCAD product, CAD for architecture and civil engineering, GI, games and movies. With its 2011 series of products they aim to promote interoperability and synergy across the applications. In particular, the technology from the games and movies applications has been filtering down to the design products.

Infrastructure meets AEC

In the past year Autodesk has merged its infrastructure business centre, the home of its AutoCAD Map product, with AEC (Architecture, Engineering and Construction). It is the market leader in AEC and Map is seen as a valuable support to this core business that includes the information management package Revit and Civil3D packages.

Building Information Modelling (BIM) is, Autodesk believes, at the point in the software development cycle where it is now widely recognised as practical and starting to be adopted enthusiastically by the market. The company has recognised that building modelling includes the area around the building and so the term now has a wider meaning than implied.

Integrated Project Delivery

This year Autodesk introduced a new term – Integrated Project Delivery (IPD). IPD is intended to get all the people working on a project to work together. It sounds like partnering but takes the concept further because each organisation involved in the project takes a financial stake, so it is more like a project consortium. Autodesk has produced a white paper on setting up an IPD contract that can be downloaded from their website. Indeed they even used the concept for the redevelopment of their AEC headquarters building.

BIM is the focal point of activities. All project design information is developed within the BIM, stored once and used by all partners in the project. The advantages of using a single model are clear. Every partner uses the same data, changes ripple through the whole design and there is a high level of consistency. The BIM can be as detailed as necessary but there comes a point where the benefits of additional detail are outweighed by the costs. More of the analysis that goes with the modelling is now within the Autodesk modules and there is less need to export to other packages.

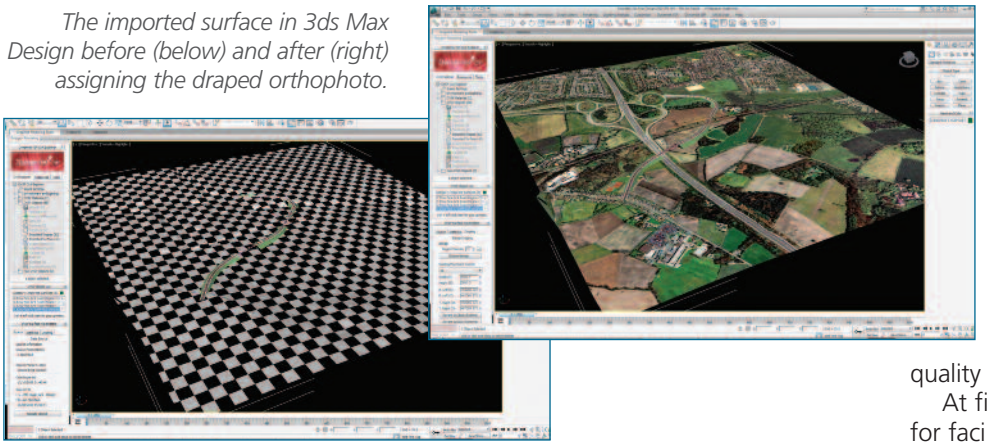
In the 2011 software there is more capability to run simulations. BIM can be seen as a phased development of CAD: initially models, objects and collaborations and, in its ultimate form, as integrated interoperable data. Autodesk emphasise that visualisation is now a lot more than just visual impact. What-if scenarios can be tested and designs can be optimised by the software using preset parameters. Indeed the behaviour of a building can be simulated for its lifetime including demolition.

Carbon Reduction Commitment

The UK has an ambitious programme to reduce carbon dioxide emissions. Buildings are serious CO2 emitters and there is now a concerted effort to improve energy efficiency under the Carbon Reduction Commitment (CRC). By 2019 it will be a requirement for all public buildings to produce more energy than they consume. If this is to be achieved, there will have to be massive activity to improve insulation and energy efficiency and to install renewable energy on the existing building stock. These buildings will of course require survey.

It was heartening to hear speakers from Scott Wilson make the point that quality surveying is the basis for a BIM. However they also bemoaned the difficulty they have in getting clients to pay for survey. They are not alone. Scott Wilson is also developing a dual-grid facility so that the building model can be related to the national grid and the building grid. Scott Wilson has found that there is a reluctance on the part of clients to own the BIM so there is clearly a need to educate them in the value of developing and maintaining quality as-built data for managing facilities.

At first sight it might appear that using BIMs for facilities management would lock the client



The imported surface in 3ds Max Design before (below) and after (right) assigning the draped orthophoto.

into buying the same system as that used to create the BIM. However, this is not the case. AutoCAD Revit, and other packages support Industry Foundation Classes (IFCs), which enable interoperability of BIMs between the various construction and facilities managers that need access to the data via software designed for their particular purposes. IFC is an object-orientated data model. It is a neutral and open specification (ISO/PAS 16739) that was developed by the International Alliance for Interoperability (IAI) and promoted under the banner of buildingSMART.

What's new

The four Autodesk products most likely to be used by surveyors are AutoCAD, AutoCAD LT, Map and Civil3D. All support Windows 7.0. Both the 32-bit and 64-bit versions of LT are compatible with and supported on Windows 7, Vista and XP.

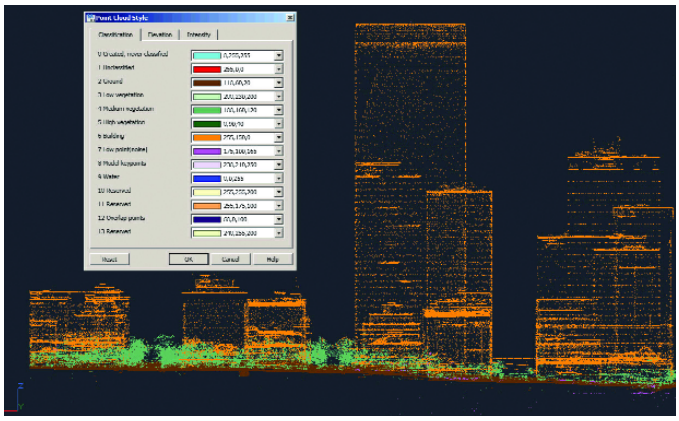
AutoCAD is at the core of both the Map and Civil 3D products so improvements to AutoCAD are reflected in the other two products. In AutoCAD 2011 and the LT version, improved functionality of enhanced grips make polylines significantly easier to edit. New secondary grips provide quick access to multiple functions. Grips can be used to add or remove vertices and to convert straight-line segments to arcs.

Both packages also access the Hatch command more easily through a contextual tab, similar to the tabs for Tables and Multiline Text. Expanded object grip functionality enables direct editing of a hatch's scale, rotation, and origin. Additional options for controlling the appearance of hatches include transparency, background colours, and gradient fills. A single command sets hatches to appear behind all other objects.

Transparency is a new variable in AutoCAD 2011 and LT for layers and objects that gives users new options for managing the appearance of drawings. Use the new "Hide Objects" and "Isolate Objects" tools to control the visibility of objects regardless of layer, so focus remains on the objects' designer's need. While wipeouts or solid fills obscure information, and underlays can show too prominently, transparency options allow users to easily highlight areas to make important information stand out.

There are two new commands to save steps and time, speeding the process of creating or selecting objects based on the properties of existing objects. You can quickly create new objects based on the properties of an existing object with the new "Add Selected" tool. The "Select Similar" tool enables quick selection of objects that include the same type and properties in the selection set.

AutoCAD LT has a new web-based help facility that gives access to regularly updated online Help content as well as the ability to link from a Help topic directly to related information in the online AutoCAD Knowledge base, discussion groups and the AutoCAD Exchange.



Point clouds of up to two billion points can now be visualised in AutoCAD2011.

Visualising large point clouds

With AutoCAD2011 (but not LT) it is possible to visualise large point clouds with up to two billion points in model space. Point clouds were first supported in AutoCAD Map 3D 2010 version as a 'Subscription Advantage Pack'. Now large sets of 3D laser scanned or lidar data of several million points can be imported and visualised within Map 3D. Point clouds can be displayed using LAS classification, spatial extents, elevation or intensity and can be used to create digital surface models or new 3D features using standard AutoCAD draughting tools. Similar point cloud functions are available in Civil 3D.

With AutoCAD Map 3D 2011 users can now work with a wider variety of data. The package includes support for ESRI ArcSDE 9.3.1 (32- and 64-bit), Oracle 11gR2, Microsoft SQL Server 2008 SP1, PostGIS 1.3.6, PostgreSQL 8.3.7-1, and SQLite 3.6.14. Map 3D 2011 also makes it even easier to automate repetitive tasks. New Workflow tasks allow you to connect to any vector data source; change and save feature layer styles; and execute AutoCAD, AutoCAD Map 3D, and AutoCAD Raster Design commands.

Autodesk have introduced videos and text instruction to help users walk through tasks such as importing data, changing symbology, annotating data, and using new features such as the point cloud tools. In addition, graphic tooltips provide quick overviews of functionality without having to search the help files. This could be useful for experienced or completely new users to the software.

AutoCAD Civil 3D is the home of their survey processing package. In the 2011 version it is possible to import DGN files into current drawing and copy from a DGN Underlay. There is a cross section wizard for display, enhanced formatting and plotting of multiple sections. For DTMs it is possible to crop a surface and export.

These developments are all real improvements to the productivity and versatility of Autodesk's software portfolio and will be welcomed by many users. Together, they should sustain and even grow the company's already dominant share of the market in design software.

"... by 2019, it will be a requirement for all public buildings to produce more energy than they consume."

Lunches and dinners but no cockatoo

By John Brock

GW's down under correspondent has been marking Australia's early governors and enjoying a celebratory dinner with a menu from 1788. But, why was there no cockatoo on there this time?

Since my last column I have been on Topp Tours to the old Pyrmont Bridge and State Parliament House in Sydney, Glen Davis Oil Shale Refinery ruins in Capertee Valley (four hours drive from Sydney) and Tomago House near Newcastle to the north. At the Australian Centre for Egyptology annual dinner Professor **Naguib Kanawati** gave a most interesting illustrated presentation about Filial Relationships in Old Kingdom Egypt.

Literary lunch

At a luncheon in the old Sydney Mint building (1818) we were treated to the book launch of *Red Coat Dreaming* by **Craig Wilcox**, which is an intriguing account of the soldiers who represented Australia in the earlier years of the colony in the times when they wore red coats, a very British accoutrement. We then walked across the road to St James Church (1824) where the walls are emblazoned with memorials to a significant number of these first Australian military veterans.

Walking in the footsteps of Phillip

When it was announced that there was to be a preliminary walk though Parramatta Park right along the same route as that followed by our first Governor **Phillip** in 1788, it was an opportunity too rare to resist.

Accompanied by representatives of all of the interested authorities including the Parramatta Park Trust, Local, State and Federal Government along with Health Department officials the select group of participants were treated to an Aboriginal cleansing ceremony complemented by indigenous music and dancing. We were provided with the similar menu enjoyed by Governor Phillip and his party, which included the Surveyor-General **Augustus Alt**, that camped on the side of Parramatta River at its head near the junction of Darling Mills and Toongabbie Creeks on the evening of 24th April 1788. On 24 April 2010 the fare consisted of eel, duck, rum and wine but white cockatoo was not considered appropriate due to its protected classification. That was a shame as I could have gone a bit of cocky stew. They must have sensed my ravenous intent as the flocks of white birds beat a hasty retreat, squawking in terror en route! Everyone really enjoyed being led by Governor Phillip himself played by **Brian Powyer**.

Below: with Erica Davies and Mike Whitney.

Breakfast with the Whit and Erica

Filling in for Kerima-Gae at the breakfast at Rosehill Racecourse for the launch of the 2010 NSW Tourism Awards was a "sacrifice" I had to make. It is great to see that our state government has finally realised that it needs to promote our state in order to reinvigorate the flagging popularity of its undoubted attractions. Television stars of the holiday show "Sydney Weekender" former Australian and NSW cricketer **Mike Whitney** and the vivacious **Erica Davis** are to be the co-hosts of a prize giving ceremony later in the year.

Big Macca's Big 200!

By the end of this year we will all be "Macquaried" out because there are so many events in commemoration of the Bicentenary of the Scotsman **Lachlan Macquarie** assuming the Governorship of New South Wales on 1 January 1810. We are going into overload! In the last two months we have heard about varying aspects of Macquarie's life from two very different viewpoints. Macquarie University expert **Robin Walsh** told a large audience at the Annual James Jervis Lecture put on by the Parramatta and District Historical Society about Lachlan's extensive world travels before being placed in charge of the southern colony.

Macquarie went to North America, West Indies, India, Ceylon, Egypt, Iraq, Iran, Russia and Denmark. With such a vast corpus of first hand experiences amongst the world's bastions of architectural grandeur, he and his wife Elizabeth engaged the services of the emancipated convict **Francis Greenway** to execute their vision of making Sydney and the Macquarie Towns impressive world class edifices.

On the other side of the ledger we attended a National Trust of Australia lecture by University of Sydney Professor **Brian Fletcher** mounting the case that Commissioner **John T. Bigge** was justified in his systematic criticisms of Macquarie's governorship when he was sent out to NSW to do a hatchet job on the great Scottish overlord of his southern clan of reformed convicts. I hastened to point out to our learned academic that "Biggey" Rat will be remembered for what he did not do while Lachlan Macquarie will be immortalised for what he did do! You may not be surprised that I also have a Scottish ancestor among all of my Irish kin. On his grave memorial on the Isle of Mull Macquarie is called "The Father of Australia"; such description is said to be the first inscription of this name for the Great South Land.

Equality – is the same by any word

By Carl Calvert

Ticking away on the new UK Government's backburner is a new act, which if it comes into force will have far reaching effects on the way businesses recruit and manage their employees.

Two of the four definitions of "Equality" given in the *Shorter Oxford English Dictionary* are:

1. *The condition of being equal in quantity, magnitude, value, intensity, etc.*
2. *The condition of having equal rank, power, excellence etc., with others.*

The Equality Act 2010 takes rather longer to get to the point and the preamble to that act is given below.

An Act to make provision to require Ministers of the Crown and others when making strategic decisions about the exercise of their functions to have regard to the desirability of reducing socio-economic inequalities; to reform and harmonise equality law and restate the greater part of the enactments relating to discrimination and harassment related to certain personal characteristics; to enable certain employers to be required to publish information about the differences in pay between male and female employees; to prohibit victimisation in certain circumstances; to require the exercise of certain functions to be with regard to the need to eliminate discrimination and other prohibited conduct; to enable duties to be imposed in relation to the exercise of public procurement functions; to increase equality of opportunity; to amend the law relating to rights and responsibilities in family relationships; and for connected purposes. [8th April 2010]

There are currently three public sector duties: those relating to race, disability and gender. Under **s149** of the new act there is a single duty regarding "protected characteristics" (see below) and **s19** lists those public sectors.

All very well; when does it come into force and what does it mean?

The Labour government had intended part of it to come into force in October 2010 with the remainder in April 2011. How the new government will treat the timetable is unknown as yet. However, there was a period of consultation on both Draft Codes of Practice and non statutory guidance (closed in April 2010 but still available to view) http://www.equalityhumanrights.com/legislative-framework/equality-bill/equality-bill-codes-of-practice-consultation/ .

The purpose of the act seems to be to consolidate various previous acts and simplify various parts of "equality". The list below is not exhaustive but in essence includes:

An extension to the discrimination law: Forbidding direct or indirect discrimination "because of a protected characteristic" (defined in Schedule 22 as Age, Disability, Gender Reassignment, Marriage and Civil Partnership, Race, Religion or Belief, Sex, Sexual orientation.)

Health questionnaires, pre-employment: s60 prohibits questioning a person about their health before offering that person a job.

Discrimination by association or based on perception: The Equality Act 2010's wording intended to cover discrimination by association or perception is actually set out in much more general terms – it talks of discrimination or harassment "because of" or "related to" disability. Perception is mighty difficult to determine but the Solicitor General declined to amend or extend those sections [http://www.publications.parliament.uk/pa/cm200809/cmpublic/equality/090616/pm/90616s04.htm]

Equal pay: the Equal Pay Act 1970 is repealed and **s71** deals with contractual pay, whilst other sections incorporate provisions to cover existing equal pay and sex discrimination law, with the aim of reflecting key decisions in equal pay case law and avoiding any gap or overlap between provisions.

Dual discrimination: A clause, section 14, allows for claims to be made for discrimination on the basis of up to and including two (and only two) protected characteristics. Therefore, for example, someone who claims they have been specifically discriminated against because they are an African man, rather than just because of their race or gender, will be able to claim for this combination of characteristics.

Recommendations by tribunals: The Act at section 120 widens tribunals' powers, which now allows for wide-ranging recommendations to be made applying across the workplace, such as re-training staff.

Positive action in recruitment and promotion: Section 158 deals with "Positive action" and;
(1) This section applies if a person (P) reasonably thinks that—
(a) persons who share a protected characteristic suffer a disadvantage connected to the characteristic,

cont'd on page 38

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Ca-li-forn-ia here we come!

By Nick Day

Our North America correspondent delivers a paean for his home state and gives us a history and geography lesson. Pay attention at the back there!

As Jim Davis' comic strip cat, Garfield, put it, "It's not a pretty life but somebody has to live it." I could have said likewise during my early days as a surveyor with Pacific Gas & Electric, based in San Francisco. Taking four-wheel drive vehicles, horseback rides, or helicopters into some of the most beautiful and rugged scenery on earth in the Sierra Nevada, to survey dams or transmission lines, might strike you as something tourists or city weekenders would do, and pay big bucks for the privilege. And, you'd be right. But, I was being paid to do it, and on company time! How good was that? I'm sure many of you have felt likewise at some time during your working lives, and have tales to tell.

Old Caltrans friend and colleague, **CJ Vandegrift**, brought back those memories when she gave me a guided tour recently of the Presidio Parkway project (aka Doyle Drive replacement) in San Francisco. As we drove and walked around, exhilarating views in all directions – the historic Presidio buildings, San Francisco skyline, magnificent cypress trees, Alcatraz Island, and Golden Gate Bridge – she told how she'd had to run levels with all these as a backdrop in her early career days. She had to pinch herself to ensure she wasn't dreaming. CJ is responsible for surveys on this project, as she was on the Carquinez Bridge, and new East Span of the San Francisco-Oakland Bay Bridge.

Doyle Drive is a critical section of Route 101 that connects San Francisco to the Golden Gate Bridge along the Presidio's northern waterfront. More than 91,000 vehicles use it every weekday. Originally constructed in 1936, the roadway is in dire need of a seismic and structural makeover. Every five years, ASCE grades the condition of the USA's infrastructure (roads, bridges, dams, schools, etc) from 1-100 – one being the worst. They rated Doyle Drive a four!

In the Jan/Feb 2005 issue of *GW*, I reported on a fascinating tour I made with other RICS members, given by Joe Perrelli of the Presidio Park Trust. The Trust is a cooperating agency on this project, and was an active participant in the planning process that identified the Parkway as the preferred alternative. The new roadway system reduces impacts to biological, cultural and natural resources; this includes respecting the project setting within a national park, the National Historic Landmark District, and meeting the needs of the surrounding neighbourhoods. Needless to say, this entire area is a major draw for visitors from all over the world, so they have to get it right.

Like the High Speed Rail, this project will be partly funded by the American Recovery and Reinvestment Act (ARRA) to the tune of $168 million. Governor **Arnold Schwarzenegger**, commented that ". . . apart from being a solid investment in the future of the Bay Area's transportation infrastructure, this project will reduce traffic congestion while creating thousands of jobs for California and improving our economy."

The project comprises cut-and-cover tunnels, viaducts, new access roads, and improved views. This last one has required the removal of numerous Monterey Cypresses, a protected species in California. Two cemeteries have had to be avoided, including a rather rinky-dink one for pets! Much of the work must be done within the

Below: Some of the Presidio buildings, with Golden Gate Bridge in background. Inset right: Construction powers ahead but not in the Pets Cemetery

existing right-of-way, and the current road cannot be taken out of use. Naturally, these make the work trickier and more expensive, but ARRA money should help expedite delivery by one year.

Broken into eight individual contracts, project bids were opened in February. Thanks to the lingering recession, they came in considerably lower than expected from construction companies hungry for work. However, to ensure that low bids met all contract requirements, they were thoroughly reviewed by Caltrans and the FHA.

The first major construction contract, a $48 million project already underway since Dec 2009, is for a new southbound viaduct bridge. The second calls for the addition of the southbound Battery Tunnel, one of two short tunnels that will enhance the connection between the Presidio and Crissy Field. The top of the tunnel will function as a parkway corridor with new pedestrian and bicycle trails. A temporary bypass will be built allowing traffic to flow unimpeded during construction. Ultimately, the drive from San Francisco to the Golden Gate Bridge will be one of the most scenic anywhere.

One added note is that my old survey department has been using their new ScanStation 2 on those historic Presidio buildings adjacent to the construction area for archiving, and monitoring of any settlement or cracking.

Facts and figures

Rodney Dangerfield, master of the one-liner genre of self-deprecating humour, was best known for his catchphrase "I don't get no respect." This could be applied to California. A congressional legislative analyst friend in Washington, DC, tells me the sad fact that those in the corridors of power have nothing good to say about California, throwing derogatory epithets around like confetti. So, this may be a good time to remind the rest of the USA, the world, and the survey community, just how much we contribute in products and innovation. But first, a little geography lesson.

California is the third-largest US state by land area, after Alaska and Texas – 70% larger than the British Isles and Ireland. If California were a country, it would rank 8th in the world, with a GDP similar to Italy, and at 38 million would be the 35th most populous.

It spans the Pacific coast in the west to the Sierra Nevada in the east, to Mojave desert-areas in the southeast and Redwood/Douglas fir forests of the northwest. The Sierra Nevada (Spanish for "snowy range") embraces Yosemite Valley, famous for its glacially carved domes, and Sequoia National Park, home to giant sequoia trees, the largest living organisms on Earth, and the deep freshwater lake, Lake Tahoe. Some of the highest annual snowfalls on earth are in the Sierras.

Above: start of the old viaduct to be replaced, with Alcatraz Island in background.

High and low points

The most geographically diverse state, it contains the highest (Mt Whitney, 14,505ft) and lowest (Death Valley, -282ft) points in the contiguous United States, both less than 200 miles apart. The highest temperature in the Western Hemisphere, 134°F, was recorded in Death Valley on July 10, 1913; only Libya is higher at 136°F. About 40% of California is forested – a high amount for a relatively arid state. Many trees in the California White Mountains are the oldest in the world, one Bristlecone pine being 4,700 years old. Deserts make up about 25% of the total surface area. California is the USA's number one tourist destination.

The centre of the state is dominated by the Central Valley, one of the most productive agricultural areas in the world, providing one-third of our nation's food. California has been the number one food and agricultural producer in the USA for more than 50 consecutive years. We grow more than half the nation's fruit, nuts, and vegetables, and are, perhaps surprisingly, the number one dairy state. The leading commodity is milk and cream, followed by grapes. Nationally, products exclusively grown (99% or more) here include almonds (the leading export crop), artichokes, dates, figs, kiwifruit, olives (70 to 80% of all ripe olives are grown in California), persimmons, pistachios, prunes, raisins, clovers, and walnuts. By 2006, California produced the 2nd largest rice crop in the US, after Arkansas, and 4th largest cotton crop.

In addition to its prosperous agricultural industry, other important contributors to the economy include: aerospace, petroleum, biotechnology, and IT. Hollywood alone brings in about $18 billion in revenues a year, Pixar is just a stone's throw from where I live, and George Lucas Films (*Star Wars* and *Indiana Jones*, etc) has set up new studios in the Presidio.

Where environmental movement began

The global environmental movement started in

> *"California has been the number one food and agricultural producer in the USA for more than 50 consecutive years."*

> *". . . home to the largest concentration of Nobel Laureates in the world. . ."*

California when we invoked CEQA (California Environmental and Quality Act) and the EIR (Environmental Impact Report) process. Some of the great writers, **Jack London**, **Jack Kerouac**, **Henry Miller**, **John Steinbeck**, and **Robert Louis Stephenson** spent years here. Street gaslights were a first, erected in San Francisco by a predecessor of my old company, PG&E. Seven of the ten largest civil/construction engineering companies in the USA are headquartered here.

Software caused the USA to leapfrog the rest of world. From the 1950s to 1980s they were behind the developed world, and certainly not a force in survey. Companies that contributed early on to that, all from California and mostly the SF Bay Area, were: Intel, Cisco Systems, Hewlett Packard (the revolutionary HP-35), Oracle, and Autodesk. Later arrivals, and mainstays of the surveyors' arsenal for GPS, GIS and laser scanning, were: Garmin and Trimble, ESRI, and Cyrax. Then, of course, for online research and communication we have: Google (80% of world browser market), Facebook, Twitter, YouTube, E-Bay, and Craigslist. And, let's not forget Apple (aided in no small way by London boy, **Johnny Ive**, who designed the iMac and iPod, etc).

We are home to the largest concentration of Nobel Laureates in the world, (over 100) in a variety of fields. Biotech, genome, DNA, and nanotechnology are major forces, as are nuclear and physics research at the Lawrence Livermore and Berkeley National Laboratories. The University of California system, encompassing the two laboratories, ten public campuses, and five medical centres, is unrivalled anywhere. And, Henry Kaiser (so critical in building hundreds of warships for the second world war), just down the road from me in Richmond, set up the first non-profit Kaiser Foundation hospitals in Northern California. These are now sweeping the country as models for what health care should be.

The latest major venture, announced mid-May, is for Tesla Motors to take over the recently closed GM/Toyota NUMMI plant in the Bay Area (Fremont) to build electric cars. And the Chinese have just chosen Southern California to build their electric cars. Too bad that the rust belt ignored the writing on the wall for so long and continued building inefficient and unreliable cars.

California is referred to as a donor state, meaning we give the Federal Government more taxes than we get back—about 81¢ for every $1. In effect, we subsidise many of those states that criticize us for being weirdo, liberal, fruit-and-nut cases. So, cut us some slack all ye naysayer states, lest we secede from the Union, and you'll finally have to work for a new kind of living!

Nick Day, FRICS, FRGS, PLS, is retired from the California Department of Transportation (Caltrans). He can be reached at feasibility.nick@gmail.com

Legal Notes – *continued from page 35*

(b) persons who share a protected characteristic have needs that are different from the needs of persons who do not share it, or
(c) participation in an activity by persons who share a protected characteristic is disproportionately low.

What is entailed will depend on regulations, which are not due yet but will be applicable to the private sector as well as the public, see The Solicitor-General's account given below:

'I will now address the point that employment might be singled out as a function that should not be subject to the duty. It seems to us that employment is part and parcel of the way in which public functions are delivered, because it is difficult to deliver that if one cannot consider the technical abilities of the people one employs to do it. How could a private contractor be required to make arrangements for advancing equality in all the aspects of running a prison but not in relation to the people it employs or how it employs them? Employment functions have not been excluded from the current duties.'

[col 550, HC Public Bill Cttee, 30th June 2009: http://www.publications.parliament.uk/pa/cm200809/cmpublic/equality/090630/am/90630s07.htm]

The change in government and the current foci of the new coalition on financial and military concerns will probably mean a slippage. So how, when and what parts of the Act come into force are still unknown, but it will, no doubt, affect us all, one way or another.

SCCS Three Peaks Challenge helps heroes

A team from SCCS has been testing out the latest Viva GNSS kit by taking it to Great Britain's highest points while raising money for a very worthy cause, reports **Bruce Ford** of SCCS.

Over 24 hours in June, a four-man team from SCCS completed the gruelling Three Peaks Challenge, conquering Ben Nevis, Scafell and Snowdon. The main objective of the exercise was to raise money for the charity Help for Heroes but the team couldn't resist putting the latest Leica Geosystems Viva kit through its paces.

The SCCS team conducted a trial set of static observations atop the mountains using the Viva GNSS equipment. Outside populated areas, where real-time corrections, whether with GPRS, GSM or PDL-radio, are not available a post-processed kinematic (PPK) technique can be employed to maintain low occupation periods (5 seconds) whilst ensuring <30mm absolute accuracy.

To achieve this the antenna has to be kept static for a minimum of 8 minutes whilst tracking five or more GPS satellites; data is logged immediately upon entering the survey program. This phase, the Initialisation period, allows Leica's Geo Office software to calculate an initial position. Once complete, there has to be a continuous stream of data in order to successfully calculate static survey positions. The team placed the GNSS receiver on the trig pillars at the summits, waited for initialisation and then collected 300 seconds of static data that was stored on a Viva CS15 field controller.

The raw observations were processed against Smart RINEX data as supplied by Leica Geosystems' online portal, in which a virtual reference station (VRS) is placed on site to identify the receiver's location and therefore the cell within which corrections are sort. When compared to the known coordinates of the trig pillars (legacy control from OS triangulation and levelling), the PPK points differed by only 73mm Easting, 211mm Northing and 102mm in Height.

To achieve greater levels of accuracy, comparable to an RTK solution, the Leica manual recommends that you must remain within a "Static & kinematic" survey configuration set for several hours after the initialisation period, so that continuous observations can be "regressed" to enhance the first reference point. For it to be valid, there must be no loss of lock or cycle slips during this period.

Alternatively, a receiver could be established to log raw observations at a rate of 2min/km from an Active Network receiver. For this example, Snowdon summit is 44 kms from the OS-Net station at Holyhead, therefore a minimum occupation period of 90 minutes would be necessary. From this, a Base & Rover combination could be employed, positioning the base to the known coordinate measured earlier. Furthermore, with the release of the Leica Zeno handheld GNSS controller, which utilizes Satellite Based Augmentation Systems (SBAS) such as WAAS and EGNOS, a position accurate to 1.2m is achievable without the need for a terrestrial correction technique.

The SCCS team successfully raised vital funds for Help for Heroes as well as testing the components required to conduct a PPK survey campaign. It should be emphasised however that this technique remains a last-resort if network or radio differential corrections are unavailable, or if the required accuracy is greater than that which can be achieved using an SBAS-enabled receiver type.

• *For those who want to find out more about network PPK, turn to page 6 of Geomatics World, November/December 2009 (". . . and don't forget network PPK").*

Above: *A cheery wave from Jim Douglas from atop Mount Snowdon.*

Right: *Bruce Ford affixes the Leica Viva GNSS receiver to the OS trig point at the top of Ben Nevis.*

Help for Heroes

The SCCS's team's trip was timed to coincide with the opening of the Help for Heroes Rehabilitation Complex at Headley Court, which opened a week previously. Funds raised will go towards the operation of the complex, which houses a superb swimming pool, gym and research centre.

Subsequent funds are to be invested in Personnel Recovery Centres, which will be regionally based for tri-service personnel. Bruce Ford of SCCS adds, "May we take this opportunity to thank all those who kindly made a donation to this good cause".

HiRes ortho processing

The latest version of Leica's XPro line sensor workflow allows users to take advantage of the company's HiRes orthophoto processing. Version 4.3 includes high-resolution orthophoto processing of RGB imagery by combining the HiRes data acquisition mode implemented in the ADS product line with post-processing algorithms. Orthophotos and orthomaps can be produced from imagery captured at up to two times higher flying altitude. In addition, a new drawing tool added to the XPro Image Viewer allows the operator, during the quality control process, to highlight areas that require a reflight. These marked-up areas can be used in the Leica FPES flight planning software to initiate re-flights immediately.

Enhancements for C10 scanner

New system enhancements for Leica's ScanStation C10 laser scanner aim to provide users with increased versatility and productivity for as-built and topographic surveys. These features are based on new versions of scanner firmware (v1.2) and Cyclone software (v7.0.3) including wireless LAN connectivity for remote operation; new imaging options for the embedded, parallax-free digital/video camera; expanded data management options for scan data and non-scan data; support for a range of local languages on the onboard user interface; and a new software tool for fast data transfer to any connected computer.

MobileMatriX supports Viva

MobileMatriX version 4.0 software provides full integration of Leica Geosystems' Viva GNSS, including full sensor configuration. The software also offers the ability to post-process GNSS raw data directly in the field with this version supporting L1 and L1/L2 post-processing. Raw GNSS data can be logged in the field, downloaded and post-processed in the same application. In addition, this version of the software and the ArcGIS edition support Windows 7 (32-bit only).

Receivers updated

Leica Geosystems has updated its GMX902 series of GNSS monitoring and reference station receivers. The GMX902 GNSS features 50Hz data rate, triple frequency and Galileo tracking. Additionally, the existing GMX902 GG has been updated with high-speed serial ports and lower power consumption. The GNSS receiver is ideal for monitoring vibrations and movements of structures like bridges, high-rise buildings, dams and landslides. With a low power consumption of 1.7W, the receiver integrates with the company's Spider GNSS processing software, GeoMoS and GNSS QC monitoring softwares.

20cm focus for levels

The new AT-B series of auto levels for surveying, engineering and construction applications have been released in the European market. The series from Topcon Europe Positioning can focus on objects as close as 20cm, facilitating work in confined spaces. With the IPx6 rating, the instrument is protected against water jets from all directions. The series includes three models: AT-B2 with 32× magnification (40× optional), 0.7mm accuracy (0.5mm with an optional micrometer); AT-B3 with 28×, 1.5mm accuracy; and AT-B4 with 24×, 2.0mm accuracy (accuracy specifications are based on 1km double-run levelling).

Support for mapping operations

Applanix has introduced version 3.0 software for its POSTrack direct georeferencing and flight management system. For accurate mapping over changing terrain, especially mountainous and coastline areas, the software incorporates a worldwide ASTER digital elevation model (DEM) product for flight planning. The DEM automatically determines the optimal flight path for the acquisition requirements of photo scale, ground sample distance and image overlap. The software also automates the manual tasks of an aerial survey mission to include: maintaining forward overlap and ensuring that stereoscopic coverage is sufficient in the direction of flight; ensuring there is enough lateral overlap and that there are no gaps due to terrain or pilot errors; and controlling the camera forward motion compensation system. Additional enhancements include the ability to import background maps from Google Earth, and to export flight plans and actual coverage flown as KML files.

Faster processing

The latest version of Pointools Edit software utilises the 64-bit for faster editing and processing of point cloud data. Pointools' software builds on the features of View Pro, the company's visualisation software, with point cloud layer based editing and

Geocasting: non-intrusive lone working – and more

Geocasting is a web-based system for collection and real-time presentation of position and video data from mobile phones. Its major strength is that it uses off the shelf GPS-enabled phones to transmit data back to a command and control centre that can itself be mobile.

It is already being used by Pelican Racing, a company that runs training courses for yachtsmen on the Isle of Wight as well as chartering boats for racing and leisure, and the US military are also showing an active interest. In the former case there is a clear health and safety benefit. The mobile phones keep a track of the sailors' movements in a non-intrusive way. In the latter case, the military have used the system on a training exercise by sewing phones into soldiers' uniforms. Video from each soldier can be streamed back to base along with his position so that command and control can see what is happening in real time.

• For further information visit: www.incax.co.uk, www.pelican-racing.co.uk, www.silverlight.net and www.bing.com/maps.

Extended scanning range

Designed for aircraft and helicopter operation, the Harrier 68i aerial imaging and laser scanning system is ideal for long-range corridor, project and wide-area mapping. Trimble's system extends the laser scanner's typical operating altitude to 1,600 metres above ground level. The system incorporates a wide-angle laser scanner with a 266 kHz effective measurement rate to collect high point density from the ground. Features include: LMS-Q680i airborne laser scanner; a 60 megapixel metric camera; Applanix POSTrack system providing GNSS-aided inertial direct georeferencing and flight management; operator and pilot displays with real-time monitoring of system status, imagery and laser scanner data; computer; data storage and backup system; and optional pilot-only operation.

segmentation. The software also enables RGB re-colouring together with noise and obstruction cleaning. Layers can be used to segment, clean and re-colour the data files from laser scanning instruments.

New aerial cameras

Intergraph has added four new large format digital aerial cameras to its Z/I Imaging line. The new cameras – RMK DX, DMC II 140, DMC II 230 and DMC II 250 – include a single monolithic panchromatic camera head to produce wide-ground coverage for capturing large-scale, high-resolution imagery. Having a single camera head for large ground coverage can eliminate potential issues with geometric accuracy and radiometric quality and the need for image mosaicking in the post-processing stage.

Flexible guidance

The PowerDigger 3D guidance system for excavating construction machines expands on Leica's PowerSnap concept. The concept allows users of the company's system to swap panels between laser, slope and 3D machine control as the job demands and also provides a cable-free system: data communication via infrared and induction for power supply. PowerDigger 3D software offers direct support for 3D design models (CAD) as well as full GNSS (GPS & GLONASS) coverage as standard. In addition, the system can be upgraded and is fully scalable from basic 2D to full 3D capability in the same control panel – if the machine loses GNSS coverage, the digger drivers can continue in 2D mode with full functionality.

Range up for FX scanner

The FX 3D laser scanner for industrial plant applications now features an extended range to capture high resolution position information at up to 80 metres. The increased range allows more data to be captured from each set-up, reducing field time. Improvements to Trimble's laser scanner also include a new compact design and durable housing to increase portability and flexibility.

BRIEFS

GeoAcoustics has released the GeoSwath Plus Compact for wide swath bathymetry. The shallow water multibeam and side-scan system offers simultaneous swath bathymetry and side-scan seabed mapping. Available in three frequency versions – 125, 250 and 500 kHz – the system has a depth performance of 200, 100 and 50m respectively.

The latest version of Leica's flight planning and evaluation software (FPES) allows automatic loading of worldwide DTM data covering the area of the flight plan. Version 10.1 also supports Windows OS including Windows 7 (32 bit and 64 bit) and flexible data import and export in different formats including Google Earth.

Kubit and Latimer CAD have announced PointCloud release 6 including a new free version that can be used to load point clouds into AutoCAD 2011. The main features of this release are its compatibility with this AutoCAD version and the new PCG PointCloud format supported natively within 2011.

Trimble has released new standard storage format (SSF) and data dictionary file (DDF) data format extensions for the FME spatial ETL (extract, transform, and load) product from Safe Software. These extensions enable users to move GNSS field data collected on the company's handhelds and processed through its GPS Pathfinder Office software to over 225 formats supported by the FME software platform.

Bricscad V10 Pro is available from KeyTERRA-FIRMA Ltd at under £500 per licence including year 1 maintenance. Developed by Bricsys in Belgium, Bricscad is easy to use and existing AutoCAD users can quickly convert to it thanks to Bricscad's familiar interface and "working in .dwg" (just like AutoCAD). 'Bricscad is a real alternative to AutoCAD and AutoCAD LT' says Roger Wilcox founder of KTF, 'most importantly Bricscad is a platform that KTF and KeyGML support'.

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