

# GIS

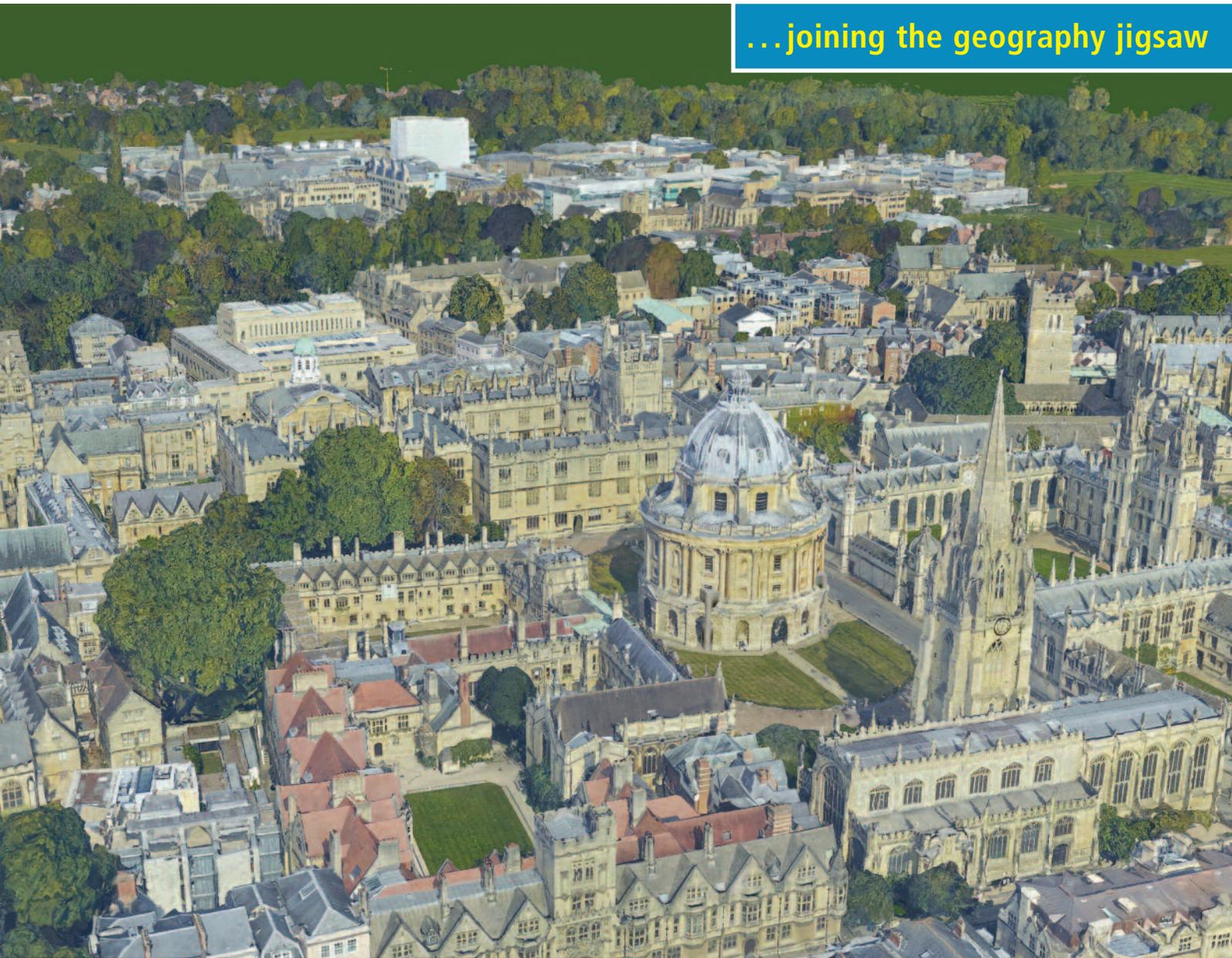
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issue 71 : August 2016

... joining the geography jigsaw



**Web viewing of 3D GIS comes of age**

**New technologies and historic environments**

**New transformations for mapping and GIS**

**Cooperation is key at AGI Northern Ireland**

**Bringing BIM alive with Cadline and Autodesk**

**Return on investment in addressing**

**Spatio-temporal geography and health data**

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## Return on Investment from Addressing

GISPro has had unique access to the recent report by ConsultingWhere to GeoPlace on the benefits of addressing. Just look at the savings!



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## New Geoid Transformations

It may seem a tad complicated but this is an important topic in GIS. The earth moves while our sensors get better at recording positions.



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## Big Map feature: Brexit's islands

The nation has spoken and Brexit is already beginning to take effect. But what about the geography? This is one way of looking at it.



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## Technology and the historic environment in Scotland

The rise of geospatial technologies is having a profound affect on data collection in the heritage and historic environment. **Diana Murray** explains.



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## Cadline's Autodesk conference

BIM is now a reality in construction and environment. **Richard Groom** reports from a conference that raised awareness across the board.



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## AGI Northern Ireland

From how the map will look in the future to digital realities, there was something for everyone at the AGI conference for Northern Ireland.



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## Geography adds value for analysis of medical data

Dr **David Green** and colleagues present their findings through several examples of how spatio-temporal geography can plan medical resources.

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**Next Issue: October 2016**

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**COVER:** A 3D textured mesh model of Oxford automatically generated by Skyline PhotoMesh. PhotoMesh produces photorealistic models that can be loaded in Skyline TerraExplorer for viewing and analysis in applications such as city planning and security. The images used to make the model are from a camera system that has five cameras, one nadir and four oblique. ©Shanghai Hangyao. **To read more, turn to p.30.**

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welcome. . .  
to the August 2016 issue of *GIS Professional*. . .

## Watch out for the IoT and the return of vinyl

Writing in *The Observer* newspaper **John Naughton** sounded a prophetic warning about the Internet of Things, the latest technology buzz to assail us. He cites one of those security systems that enables you to control all sorts of sensors in your home remotely from your smartphone. With a control centre in China, it was about as secure as a chicken coop with a dodgy door and a pack of foxes on the prowl.

Naughton is one of my techy heroes. I've followed his regular *Sunday New Yorker* columns for years. They always offer concise informative insight into some topical aspect of technology and the world of the silicone geeks. He is also the author of a couple of outstanding books on digital communications: *A Brief History of the Future: the origins of the Internet* and *From Gutenberg to Zuckerberg: What You Really Need to Know About the Internet*. They're both an easy and engaging read.

As we rush headlong into the IoT and other over-hyped techy things more of us need to pause and take stock. I was reminded of this with a story on *Wired* recently where the writer was singing the praises of the sound quality from music CDs. Remember those handy little disks before Apple and a billion downloads? The Apple iPod is a brilliant little piece of technology (launched unbelievably almost 15 years ago!). But I've never gone for music downloads. Instead I rip/copy my CDs via Apple's awful iTunes software (if you doubt my criticism talk to a classical music enthusiast) so I can enjoy music on the move. The key point is that Apple encourages a canapé approach to music instead of a fulfilling meal. Songs versus a body of work. In vinyl times: 45s versus LPs (ask your Mum or Dad!)

I'm also not so sure about the fidelity of CDs as there's been a revival of their predecessor, the vinyl long-player disk, which some aficionados including me believe offers even better sound reproduction, provided the disk is in pristine condition and free of scratches that replicate as those annoying pops and crackles so reminiscent of the pre-digital era. We call it noise today and rightly.

Hopefully there are no pops in this issue of *GISPro* although I hope there are one or two items that will set ideas crackling. I must thank GeoPlace for allowing us to see the full version of ConsultingWhere's report on the value and cost savings local authorities gain from having up-to-date addressing. It deserves wider circulation and appreciation.

GIS has brought order where previously there was often chaos from undocumented files without meta data. But that is only the beginning. GIS allows analysis to reveal the best routes, the ideal location, where efficiencies and savings can be made and importantly, the tracking of assets. I commend the first of two articles from Dr **David Green** and colleagues about how GIS has provided useful insight for the medical professionals. Disease and infections can be tracked, treatment facilities best located and the impact of inappropriate positioning of schools identified.

Another area where GIS is helping to widen interests for the general public is the heritage sector. **Diana Murray** reflects on the changes during her career in Scotland's heritage sector.

Finally, I must draw readers attention to our article on the new geoid transformations that affect mapping in the UK and Ireland. This is a complex topic but one which GIS professionals should understand, even if their current job is unlikely to be affected. While height differences of a few millimetres are unlikely to affect many applications, changes in 2D mapping do need recording.

Enjoy the summer; we shall return in October.

Stephen Booth, Editor



**GIS has brought order where previously there was often chaos from undocumented files without meta data. But that is only the beginning.**



## Up-to-date imagery helps council



English local authority South Tyneside Council is using the latest digital aerial survey data from Bluesky to update essential council records and inform decision making. By comparing new photography with older imagery, officers are able to identify potential breaches of planning permission and land encroachment.

Flown in 2015, the latest photography is being deployed in planning and highways through the council's desktop GIS using standard web browser technology and across the organisation via an intranet. Plans are also in place to update the council's community website, giving residents and businesses access to the imagery.

Different ages of imagery help identify and resolve boundary disputes where residents or businesses may have encroached on council land, while other applications include identifying and recording features not referenced on traditional map layers, such as street furniture, road markings, street lights, trees and other council assets.

### 'Raw' laser data for better city models

The Britain's Environment Agency (EA) has released 175,000 square kilometres of 'raw' lidar data to help and encourage start-ups, engineers and planners to build more realistic models of cities. The release of lidar point cloud data began in March 2016 and by the end of June EA had made all 725 gigabytes of its point cloud archive available on the website: <https://data.gov.uk>

The benefit from this has seen start-up Emu Analytics use the data in an interactive map enabling people to easily see heights of buildings across

London: <http://www.emu-analytics.com/buildingheights/> and at the end of June they released a similar map showing building heights across the majority of England: <http://buildingheights.emu-analytics.net/>

Emu Analytics' **Jonathan Smith** said: "Point cloud data is a step up in terms of the level of detail we can achieve in modelling infrastructure and the natural environment. We are able to define the shapes of buildings and vegetation and even discover temporary infrastructure, such as cranes. With the detail that point cloud provides we will be able to

open up new use cases and offerings such as providing clutter data for line-of-site broadband companies or calculating the shadows nearby buildings would cast on a proposed array of solar panels."

Since the agency began releasing its lidar surveys as open data in September 2015 there have been many surprising uses including helping archaeologists to discover 'lost' Roman roads and Minecraft enthusiasts to build virtual worlds. With point cloud data users can create their own customised elevation models incorporating additional information about the type of ground feature (vegetation or hard surface) being surveyed, or the time the survey was conducted.

### Mongol Post adopts w3w

Mongol Post, Mongolia's national postal delivery service, has adopted the addressing platform what3words for the entire country – an area nearly the size of the European Union. The partnership gives Mongolia an instant addressing system to help underpin the country's economic development. Despite almost a third of its population living as nomads, and a vast sparsely populated landscape, Mongolians now have an address.

The company has also completed an \$8.5 million (US\$) Series B funding round, led by global logistics giant Aramex. As part of the deal, Aramex, which operates in 60 countries, will roll out 3 word addresses in its e-commerce fulfilment operations across the Middle East, Asia, and Africa.

### Web mapping helps fire & rescue service

Web mapping from British software developer Cadcorp provides location intelligence

to firefighters and analysts in fire and rescue services in the UK. Tyne and Wear Fire and Rescue Service (TWFRS) has selected Cadcorp's Web Map Layers 8.0 to help them better understand the geographic distribution of incidents in their service area, and in doing so, help both prevent and respond to them.

TWFRS's **Ross Hall** explains: "All fire and rescue services are under pressure to do more with less, and TWFRS is no exception. Our analysts... have been working successfully with Cadcorp's Workload Modeller for a number of years. This software has been invaluable in helping us work smarter by optimising the way in which we deploy our resources."

Hall is keen to stress that Web Map Layers is not a replacement for existing systems that handle location, but rather an enhancement. "We already have an incident recording system in place. Amongst other things, it records the location of each incident. Web Map Layers will provide a cartographic front end to this SQL Server database. It will display the recorded location of the incident against a map background, and it will give the user the ability to amend the location interactively."

It is intended that Web Map Layers will become a generic resource in TWFRS... to support a range of strategic and tactical operations. Ross provides the following examples: "We will be able to combine our own risk data with other data sources such as flood maps provided by Environment Agency or anti-social behaviour provided by Northumbria Police and display the results as hot spot maps. Web mapping will be

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invaluable in confirming the location, building footprint, and size of premises before our inspectors carry out fire safety visits. The system will also provide a map-based front for displaying premises records in the Community Fire Risk Management Information System (CFRMIS)."

### Aerial certification for Leica

Leica Geosystems has completed all aspects required to fly and operate UAVs commercially. The Civil Aviation Authority (CAA) has awarded the company a PFAW certificate (Permission for Aerial Work). To operate commercially in the UK, a company must achieve all qualifications and standards set out by the CAA relating to the weight class of the system. Leica's Aibotix X6 V2 system falls into the sub 7kg weight class, meaning the completion of a theory course with an NQE (national qualified entity) was needed. This was followed by compiling an operations manual and finally completing a flight assessment. On successful completion of all three elements the company received its PFAW certificate.

"The CAA approval for the UK is a very important step for both, Leica Geosystems/Aibotix and our customers", explains **Robert Heaver**, technical specialist UAS at Leica. "The CAA approval offers many opportunities for surveying engineers, professional inspection companies and potential users in the field of agriculture and forestry", adds **Ben Federmann**, director of marketing and communications at Aibotix.

Leica will be holding monthly demonstration days to showcase the Aibotix system's abilities at Hawk in Shropshire to include site specific data so customers can relate to the

data they are viewing. The demonstrations will be half-day sessions including inspection, volume control, 3-D modelling and information on multi spectral and thermographic sensors. CAA rules and regulations and how to achieve a PFAW through a NQE will also be covered. To register your interest in the demonstration days, please go to: [http://facts.leica-geosystems.com/UK\\_Aibotixdemodates](http://facts.leica-geosystems.com/UK_Aibotixdemodates)

### Partners in the skies

Drone developers Skyward and senseFly are partnering to deliver a custom operations management software and consulting service package for senseFly's aircraft. The package, available for customers in North America through the senseFly distribution network or Skyward, gives operators a preconfigured Skyward account with senseFly flight log import, senseFly manuals, customized pre-flight checklists, and other information specific to senseFly operations. These features are part of the Skyward drone operations management platform that includes up-to-date airspace information and tools to plan and log flights, manage personnel and equipment, flight hours, and meet regulatory reporting requirements.

Customers will also have access to a team of regulatory and drone operations experts and benefit from Skyward expertise in order to define their flight operations procedures and write related operating manuals.

### EC launches Copernicus Accelerator

The first of what must surely be many initiatives from which the UK will not be benefiting was announced recently. To speed up the user uptake of

## Canal clean up job for Esri



Ten employees from Aylesbury based Esri UK have been working with the charity, the Canal & River Trust, as part of a project to spruce up the Grand Union Canal. More than 40 Esri staff were involved with various tasks to help improve the Aylesbury Arm of the Canal. In their latest outing, the team has been busy repainting a footbridge which crosses the canal and filling sandbags which, once in place, will be used to help protect the canal bank from water erosion.

Richard Parry, Canal & River Trust chief executive, said: "The volunteers have been doing a fantastic job in helping us to look at this stretch and they should be proud of their efforts. We've been working with Esri for a number of years and it's great to give the team the opportunity to get out of the office, enjoy some fresh air and help out on the canal. Already I can see that they have made a big difference."

Esri UK MD Stuart Bonthron adds: "Our office is located right next to the canal basin in Aylesbury and often my team pop out during their lunch hour to get some fresh air and take a break beside the water. We've all really enjoyed the opportunity to get away from our desks, get a bit mucky and help the Trust look after our local canal."

the European Union's Earth observation programme Copernicus, the EC's Copernicus Accelerator will foster the development of commercial space applications and products.

There is a tremendous amount of data from space - especially the kind produced by Copernicus - that presents countless opportunities. Such data are becoming an increasingly common component of commercial products and applications in numerous sectors of the economy. Fascinated by the possibilities in intelligent data analysis, young start-ups and scientists in particular are

developing a growing interest in Earth observation and the big data it generates from space. If you're interested, maybe a move across La Manche or the Irish Sea is the answer.

## BRIEFS

Route optimisation software is helping to reduce mileage, manage costs and minimise the environmental impact of bed-maker Warren Evans. The firm is always keen to burnish its green credentials having won green and ethical awards from the Sunday Times and The Observer newspapers. They have now adopted Maxoptra, an advanced

## Shady deal from EU helps Santorini's coffers



Planning to take your summer holiday in Santorini? Now, due to a study carried out by TotalView and the Municipality of Santorini based on using very high-resolution satellite imagery, you can be assured that you are sitting under the shade of a legally placed umbrella!

European Space Imaging has published a case study showing how very high-resolution satellite imagery has aided Santorini to claim back its public space from illegally placed umbrellas. In Greece the beaches belong to the community and are public spaces requiring free access. Imagery from WorldView-2 satellite has assisted in mapping the beaches and in ongoing monitoring of umbrella locations to help ensure businesses pay fees for their location on public beaches.

route scheduling optimisation software for delivery fleets that incorporates job despatching, telematics integration, mobile messaging, with live ETA and POD reporting.

Europa Technologies has been appointed as an official Eircode provider for Ireland's postcode system. The company is now able to supply either of the two data Eircode products: ECAF (Eircode Address File), the base reference data containing all 2.2 million address points with their Eircode and USP Postal Address and ECAD (Eircode Address Database) which incorporates ECAF with additional data for each address such as alias address information, geo-coordinates and other data including but not limited to boundary and building information.

Iceland has committed to contribute data to a gateway of pan-European maps, geographic and land information from official sources. Following agreements

with EuroGeographics, National Land Survey Iceland and Registers, the country will provide a range of information, including topographic and cadastral data, administrative units, addresses, geographical names, land cover and transport networks to the European Location Framework.

Cartography.co.uk is using the latest aerial photography from Bluesky to produce bespoke maps of rural farms and estates. The largest producer of customised mapping for private landowners in the UK, Cartography.co.uk's maps are used for a variety of applications, including a growing concern for rural safety. Detailed maps are increasingly being produced for landowners concerned about employees working in remote locations in the event of an accident or other incident requiring support from the emergency services.

The Open Geospatial Consortium (OGC) has released version 3.0 of its Catalogue

Services standard to support publishing and searching geospatial data and services. Information (metadata) provided by catalogues supports evaluation and further processing by both humans and software. The OGC Catalogue interface standards specify the interfaces, bindings, and a framework for defining application profiles required to discover and access digital catalogues of metadata for geospatial data, services and related resource information.

The theme for this year's Intergeo conference in Hamburg will be Smart Cities. As the host city for INTERGEO 2016 (11-13 October), Hamburg is leading the way in Germany when it comes to the Smart City and has been quick to position itself with "Hamburg's Strategy for the Digital City", which aims to develop a standardised smart city strategy that aims to make cities places which offer a good standard of living and that can fully harness their economic potential. Key areas include mobility, energy, business and work, accommodation and city life.

1Spatial is to distribute Geocom's GIS "Geonis" suite for utilities and industrial plants in the USA. The move extends 1Spatial's partnership with Geocom to the US and builds on the recent UK & Ireland distribution agreement. Both companies are Esri worldwide partners.

## PEOPLE

Bluesky expands  
Investing in internal support, Bluesky has appointed Andrew Kociolek to the role of IT Engineer, while Suzanna Baynard joins as management

accountant. Charlotte Ballard, previously a key member of the Bluesky production team, joins the sales team, and Marco De Stavola joins the company on an EU ERASMUS scholarship as GIS Intern.

"We have recently been involved in a number of large, high profile contracts both in the UK and abroad," commented Rachel Tidmarsh, MD of Bluesky, "and it was crucial to our continued success that we underpin our frontline sales and production teams with the support they, the company and our expanding client based require. These appointments will allow us to build on recent success and will provide the foundation for future growth."

## New MD for OSI



Ordnance Survey International has appointed Peter Hedlund as MD. He has previously held senior director positions, and has over 15 years' experience in developing and delivering international business strategies to support business objectives of both start-ups and global corporations. Hedlund joins from Trimble where he was regional director of Middle East and Africa. During his time with Trimble, Peter produced and implemented growth strategies for international markets that grew the company's business across several regions.



Adena Schutzberg has worked in geospatial technologies for more than 25 years. She is a member of the Esri Education Team.

THE TOPIC OF THIS ISSUE'S COLUMN comes from an e-mail exchange with *GISPro* Publisher, and my longtime friend, **Stephen Booth**. I shared news with him about my new position on the education team at Esri and I noted that I'd be working on MOOCs and with universities. He replied that he was unfamiliar with MOOCs until he looked up the acronym.

I suspect a reasonable number of readers are in the same boat. Further, I'll guess that those who could quickly expand MOOC to "massive open online course" haven't reconsidered this form of teaching and learning for a few years, since the hype has waned. I want to address both groups to highlight why MOOCs matter to GIS professionals in 2016 and beyond.

First, let's get back to the acronym itself. Conversations using the term MOOC have become less and less aligned with the original meaning. "Massive" might be thought of as "optional." Is a MOOC with 300 students just an OOC? Is one with 3000? 30,000? These days, the term seems to apply to all of those. "Open" is widely variable

*No pocket money?* - "Real" MOOCs are free, and those with a fee often also have a "free option" that has fewer bells and whistles. Coursera now has fees for the vast majority of its courses, but it also offers free versions.

*Limited time commitment?* - How long are MOOCs? Google early GIS MOOCs (2013) Mapping with Google, covered the material in just two weeks. Another one, from Pace University, GIS Basics, which tackles ArcGIS for Desktop, runs 16 weeks. Most other courses fall somewhere in between.

*Wide variety* - There are now companies, universities, non-profits and others offering MOOCs that include GIS. A well rounded professional needs more than technical ability. Are you considering starting up a GIS consulting business? How about a business MOOC?

*Credentials* - While a number of organizations are working on ways to turn MOOCs into credit bearing college courses, companies and non-profits are

# Why GIS users (still) need to know about MOOCs

Need to update your skills? Want to learn a new GIS? Adena Schutzberg has sound advice for those turning to the online world to learn new skills.

in meaning, as many of us in GIS know. In the context of MOOCs it tends to refer to "accessible to all," "without a fee" and "with open access content." In these times I'll suggest it too can be considered optional for some providers. I'm pleased to report that "online" and "course" have straightforward meanings.

**Why MOOCs matter** *Things change* - new GIS (and related) products are being released all the time. MOOCs can be a great way to get your hands on them and see how they can be used. Want to play with ArcGIS Pro within a class? It'll be front and centre in the upcoming Earth Imagery at Work MOOC.

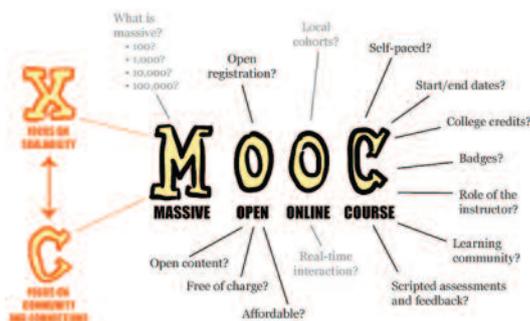
offering other credentials such as certificates of completion and badges. Do these matter? I think they do; I note the three MOOCs I've completed on my résumé.

**Advice for today's MOOC students** *Search widely and vet* - EdX and Udemy are less well-known than Coursera, but all three and others of which you have not heard, host MOOCs. Don't be put off by organizations that are new to you, just vet them. Read course reviews; CourseTalk is a good place to start.

*Law of "Two Feet" applies* - Go into MOOCs expecting a good to great experience, but don't feel bad if it doesn't work out. Remember that only 7% or so of students complete most MOOCs, so it's no big deal to drop out.

*Document your learning* - Document your work on a publicly accessible blog or portfolio, especially if you want to use MOOCs to enhance career options.

*Commit* - Like most learning opportunities, what you get out of it depends on what you put into it. Decide what your goal for the class is and set aside the time to reach it.



MOOC diagram By Mathieu Plourde, creative commons, wikimedia.org

# ROI from addressing

ConsultingWhere  
 Making the most of your location

Cost Benefit Analysis of Address and Street Data for Local Authorities and Emergency Services in England and Wales  
 Final Report

Prepared by: Andrew Carter  
 Director  
 ConsultingWhere Ltd  
 Version: 1.0  
 Date: 20/08/2016

*"Government investment in the Local Land and Property Gazetteers (LLPG) and Local Street Gazetteers (LSG) over the period 2010-5 has yielded a net benefit of approximately £86m in savings from reduced data duplication and integration, improved tax revenues, channel shift and route optimisation in waste management."*

The statement above comes from a report prepared by ConsultingWhere for GeoPlace. It adds, "Future net benefits from the same applications are likely to be in the region of £200m over the next 5 years. Based on the current rates of adoption, this represents a Return on Investment (RoI) or cost benefit ratio after discounting of 4:1."

The report goes on to argue that the "return could be significantly higher if barriers to adoption, particularly access to funds, staff retention and

looked more widely and included comparable studies from countries as diverse as Australia and Denmark.

**Treasury approved technique** The technique used to analyse ROI in this study is one based on cost-benefit analysis, a method where results are often expressed as return on investment, i.e. "for each £1 invested the return is £xx over a period of xx years", a method approved by the Treasury as the most robust approach for projects where results are as real and tangible. Such a cost benefit analysis (CBA) attempts to collate all of the costs and the quantifiable benefits, adjusted for the time value of money, i.e. returns achieved at some future date are discounted to take into account the opportunity cost of having made an alternative investment. However, ConsultingWhere note that associated qualitative benefits discovered during the study while reported are often difficult to express in financial terms.

The environment in which GeoPlace operates was also subject to analysis. A framework analysis tool, PESTLE works through six key indicators: Political,

## Multi-million pound savings bring ROI from right addressing

Earlier this year a report commissioned by GeoPlace found that the return on investment (ROI) to local councils and emergency services from accurate addressing had delivered multi-million pound savings. *GiSPro* reported briefly on this in the last issue of *GiSPro* (June 2016, page 16–17). We have now had unique access to the full report.

improved national collaboration are addressed. We estimate this could be worth additional benefits of £20m over the next 5 years."

Accurate geo-referenced address data from a single authoritative source is vital and can deliver substantial socio-economic benefits. As ConsultingWhere point out, "Inaccurate and unreliable addresses that are inconsistently geo-referenced carry a high financial cost and, in the despatching of emergency services, a human cost." (A recent example in London was a patient in cardiac arrest had to wait half an hour for an ambulance dispatched to the wrong address despite the location being a well known sports venue.)

In Great Britain that "single authoritative source" is GeoPlace, a partnership between the Local Government Association and Ordnance Survey. Through its links with local authority address and street gazetteer custodians, GeoPlace creates and maintain the National Address Gazetteer and the National Street Gazetteer for England and Wales to provide definitive geo-referenced address and street data from Ordnance Survey, which makes it available to the wider public and private sectors.

The study looked in detail at ROI from address and street data for local councils in England and Wales including the emergency services. It also

Economic, Social, Technology, Legislative and Environment, hence PESTLE. Under Political, for example, the observation was made that there is a general lack of political awareness of the potential of address and street gazetteer data to inform and enhance decision making in the public sector. The potential benefits from the integration of health and social care are poorly understood by decision makers. Let's hope that the bold declaration of Cabinet Office Minister **Matthew Hancock** at this GeoPlace Awards day, "I will be your champion!" bear fruit (see June *GiSPro*).

Since GeoPlace was founded in 2010, the Public Sector Mapping Agreement (PSMA) of 2011 has had significant impact to the public sector through access to Ordnance Survey digital mapping and OS's AddressBase product. Nevertheless, since 2010 severe reductions in local authority budgets have meant cuts to staff engaged in gazetteer maintenance with loss of expertise. On the plus side, there has been an increasing integration of the Address ID (UPRN) into core local authority systems resulting, for example, in the identification of benefit fraud, more efficient recording of new houses and street names and more shared services including address and street gazetteer maintenance.

**Case studies and survey** ConsultingWhere's study

“

**... ROI in this study is one based on "for each £1 invested the return is £xx"**

”

relied primarily on GeoPlace's own database of case studies and its international involvement in similar exercises. This was backed by training for potential respondents to an online Survey Monkey questionnaire, of which 178 out of 800 responded. As the report's author **Andy Coote**, comments: "if you have a good story to tell you may respond but otherwise not." Over 30 of the respondents were followed up with interviews. Analysis of the responses ranked local authority department users of address data: Planning and development (54%), Highways and transport (17%) and customer Services (14%) were significant users. The least important current uses of LLPG and LSG in local organisations – those ranked 11-15% by importance – were public health, public safety and interaction with emergency services.

This has led ConsultingWhere to conclude that the functions with opportunities for greater realisation of value include:

- **Corporate services** (reflecting little understanding at senior management level of the value of address and street data);
- **Social Services**, where there is probably a mutual lack of understanding of how data in general and addresses in particular can provide insights in

**Unitary authorities (including Metropolitan Districts, London Boroughs and Welsh Counties) represented 40% of the responses and districts 44% of responses. There were relatively few county respondents (9%). The remainder were predominantly shared services.**



social care provision;

- **Public Safety**, a sector surprisingly low in importance ranking given recent floods;
- **Education**, best practice indicates significant savings in school placement applications;
- **Emergency Services**, (there is generally less interaction between local authorities and emergency services in relation to data sharing than in the last decade); and
- **Public health**.

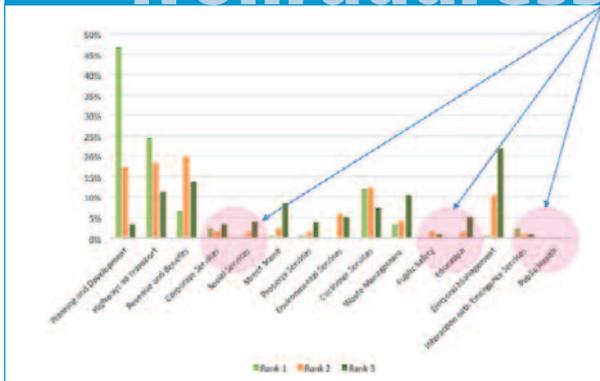
So plenty of evangelising ahead for both local and national custodians of addressing. In the meantime let's look at some of the successful users.

## £4 return on every £1 spent on council address and street information

- A GeoPlace commissioned study projects net benefits of up to £202 million by 2020 for the local government sector from better use of the address and street data that councils create and maintain
- Based on the current rates of adoption within councils, this represents a Return on Investment after discounting of 4:1



# ROI from addressing



**Ranking of current users. Planning and development (54%), Highways and transport (17%) customer Services (14%) scored most highly.**

larger Digital Transformation projects and the specific benefits of the LLPG and LSG are difficult to separate out for quantification.

**Social services** A growing number of uses relate to social services, these include neighbourhood analysis and the identification of troubled families, support for vulnerable people, loneliness studies and special needs transport. Currently, the numbers of implemented systems are small so there is significant potential to recognise these successes, create case studies and promote them as exemplars of best practice.

**Street scene** The most easily quantified use case for this type of council function is the use of tablets or smartphones to allow council officers to spend more time in the field and react more rapidly to incidents. This technology opens up new possibilities for reporting problems such as graffiti as well as work order management and management reporting. There are however few examples where the benefits have been captured.

**Planning and development** Well developed uses of the LLPG and UPRN (unique property reference number) include integration into planning and building control processes in the majority of all types of local authorities. Local Land Charges have seen a significant impact too, with the UPRN being the key identifier used to bring diverse data together. Other examples include systems that facilitate notification of neighbours of planning applicants, local plan revision and planning consultations. Plans to move responsibility for Local Land Charges to the Land Registry is delaying investment in this functional area.

**Highways and transport** The use of the Local Street Gazetteer (LSG) in the planning and issuing of permits for streetworks both by local authorities and by utility companies is well established. The LLPG can also play a role in notifying those affected while the LSG can be optimised for inspection routes for highway maintenance; more effective gritting and salting routes and reducing service interruptions for streetworks.

**Property services** The address gazetteer (LLPG) has long been used to assist property departments in locating, managing and rationalising their assets. The usage is a small part of a much more complex process and few examples of quantification exist. The availability of the land registry index map as open data under INSPIRE provides opportunities for further work by local authorities on vacant land. The Public Rights of Way (PROW) maintained by councils can also be hosted within the LSG data.

**Revenue and benefits** The LLPG is being used to pinpoint missing council tax or non-domestic rates collection. The use of address data as part of a matching process to detect council tax and benefit fraud is included in the cost benefits quantification. This is increasingly being undertaken as part of what is referred to as a data warehouse application or more recently big data analytics. An example of this process is the detection of potentially fraudulent claiming of single person occupancy by cross-referencing against other local authority address data such as parking fines where several people using the same address (claimed to be in single occupancy) for parking fines indicates the need to investigate the claim. Matching with central government data through the National Fraud Initiative (NFI) also has substantial potential to highlight fraud.

**Environmental services** Address data is fundamental to the licensing and monitoring of commercial premises. However, apportioning the benefits is often problematic. Environmental issues such as illegal tipping can also be monitored and tackled more effectively with address data. The LSG can be used as a base to record detailed environmental information, allowing streetworks activities to be carried out with consideration and awareness of roadside nature reserves and sites and artefacts in the sites and monuments record.

**Corporate services** The creation of executive and member dashboards that allow decision makers to be able to see what is happening across their organisation in relation to a small area (defined by a group of addresses) or individual address is an important and as yet underused. The use cases in Corporate Services are often "bundled up" into

**Customer services** Customer Relationship Management (CRM) systems are one of the largest consumers of address data for identifying location during calls and face-to-face meetings. GeoPlace data from 2015 suggests that 72% of councils' CRMs are reliant on the UPRN. Address data can also assist with service interruption notices and opinion surveys. The associated benefits of channel shift are quantified as part of the study.

ConsultingWhere's analysis found that whilst effort in local authorities is spent maintaining and improving the quality of data, additional resources would have potentially significant impact on the rate of integration

“

**... address data as part of a matching process to detect council tax and benefit fraud...**

”

and thereby accelerate the flow of benefits. They also found that too often it was observed that anything concerning gazetteers was passed unseen from CEOs to custodians, defeating the object of targeting them. Closer work to find partners across government and the public sector; identifying examples where individuals have been successful with short-term impact and limited resource; and collaborating with DCLG's digital local success on waste management as a national model for other use cases. The experience of the London Borough of Harrow is an exemplar here.

**Recommendations** The report concludes with a series of recommendations to GeoPlace and calls for: "a sustained, multi-faceted, marketing campaign based on the results of this study. The core messages to communicate to local authorities should be:

- The substantial benefits that have been realised from past investment.
- The need for current staffing levels and product quality to be maintained in order to realise greater benefits in the future.
- The multiple opportunities for enhanced benefits tied to national efficiency initiatives, such as the successful Troubled Families scheme."

The barriers preventing wider use of address data identified by the study include lack of funds, insufficient management awareness and software limitations. Coote, who is an evangelist for the benefits of addressing, says that danger lurks in not maintaining a good database. GeoPlace is therefore recommended to:

- (i) Enhance collaboration with bodies working at a national level such as the Audit Commission (NFI), Socitm, CIO Council, DCLG and Nesta.
- (ii) Further promote examples of best practice across a wider range of business functions such as education and social services. The value of data sharing with emergency services should also be re-emphasised.
- (iii) Work more closely with the Ordnance Survey to promote the use of AddressBase for local authority functions where out-of-area coverage is required.
- (iv) Advocate and work towards replicating DCLG schemes such as the DCLG Local Digital Project for Local Waste Service Standards for other use cases.
- (v) Establish key performance indicators that allow realised benefits to be regularly (annually) quantified.

Watch this space for more news of how addressing can deliver worthwhile savings to the public sector.

**A study in 2015 suggested that 72% of councils' CRMs are reliant on the UPRN.**

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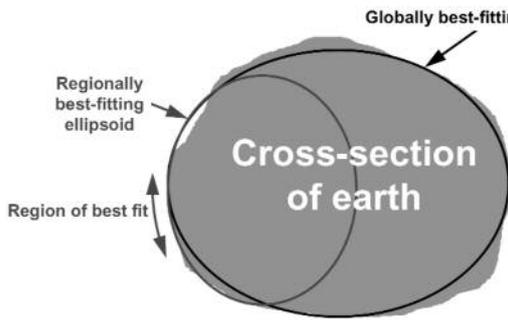
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# transformations for GIS & mapping



*A greatly exaggerated representation of a cross-section through the Earth showing cross-sections of a globally best-fitting ellipsoid (black) and a regionally best-fitting ellipsoid (grey). The regional ellipsoid is only intended for use in the region of best fit and does not fit the Earth in other areas. Note that the ellipsoids differ in centre position and orientation as well as in size and shape.*

• read more about the UK's co-ordinate systems at <https://www.ordnancesurvey.co.uk/docs/support/guide-coordinate-systems-great-britain.pdf>

THE ORDNANCE SURVEYS of Great Britain (OS), Ireland (OSi) and Northern Ireland (now known as Land & Property Services (LPS)) have announced new transformations to convert coordinates generated by

The realisation of ETRS89 has now been improved and updated so there is a need to update OSTN02, resulting in OSTN15. Table 1 shows the expected final impact on user-generated OSGB36 coordinates. For most GIS applications the changes will be insignificant.

**Table 1. Differences (in m) old ETRS89 + OSTN02 and new ETRS89 + OSTN15.**

	East	North
Min	-0.037	-0.015
Max	0.019	0.018
RMS	0.009	0.007

OSTN02 was only valid offshore within 10km of the coast and the transformation file was zero populated outside that buffer, but OSTN15 extends to the edge of the UK's Exclusive Economic Zone (EEZ) and extrapolates the correction from shore, so that the accuracy degrades

## Updated transformations for UK and Ireland's GIS and mapping

OSTN and OSGM are the transformations that link 3D positions measured using GNSS with the national coordinate and height reference systems of Great Britain, Ireland and Northern Ireland. This article presents the latest transformations incorporating new gravity data. They also iron-out discrepancies, mostly at the outer edges.

• This article is an abridged version of a longer one which was published in *Geomatics World*, July/August 2016 issue.

GNSS equipment to their respective national grids and height datums.

**Plan positions** GNSS positions are in a "Global" reference frame, but in many countries national mapping is still on a "classical" datum with an ellipsoid defined to fit the shape of the Earth as closely as possible just within the individual country. As a result there are many national datums and ellipsoids of slightly different size and each positioned slightly differently.

There still remains the problem however of fitting GNSS based observations to the national mapping on the "classical" datum. National grid coordinates derived from GNSS (and in ETRS89) need to fit as closely as possible to the coordinates derived from the Re-triangulation which resulted in the OSGB36 datum\*. When the triangulation stations were surveyed using GPS there were inevitably differences. So, in the early 1990s a transformation which would 'rubber-sheet' the observed GPS coordinates onto OSGB36 was created so that the GPS coordinates of any triangulation station would, on average, be within 0.1m of the published value. When GPS came into popular use, in the early 2000s, OSGB published OSTN02, which applied the transformation from ETRF89 to OSGB36. To obtain correct national grid coordinates using any GPS receiver, the user had to apply OSTN02. It is always worth checking, particularly on navigation grade receivers, in case another transformation has been used, which could result in errors of ten or more metres.

from 0.1m onshore to the 3m level at the edge of the EEZ as the process of extrapolation increases errors.

**What about height?** GNSS observations produce latitude, longitude and height above the GRS80 ellipsoid, the standard ellipsoid used by ETRS89. To be useful, these have to be transformed to the heights above the national height datum and for this we need a geoid model of the separation between the ellipsoid and the irregularly shaped geoid. It's irregular because it is affected by the micro gravitational effects of topography and geology. In 2002 the OS produced OSGM02. The new model (OSGM15) incorporates new gravity data from the GRACE (Gravity Recovery And Climate Experiment) satellite mission and additional ground-based observations to improve the fitting to local datums.

\*OSGB36 National Grid (Ordnance Survey Great Britain 1936) is our national coordinate system for topographic mapping. It is used for OS mapping at all scales, and for many private topographic surveys. The OSGB36 part of the name refers to the geodetic datum (system of latitude and longitude) used, and the National Grid part refers to the map projection and grid referencing convention for eastings and northings. Established in 1936, could it be the first instance of metrication in the UK?

“

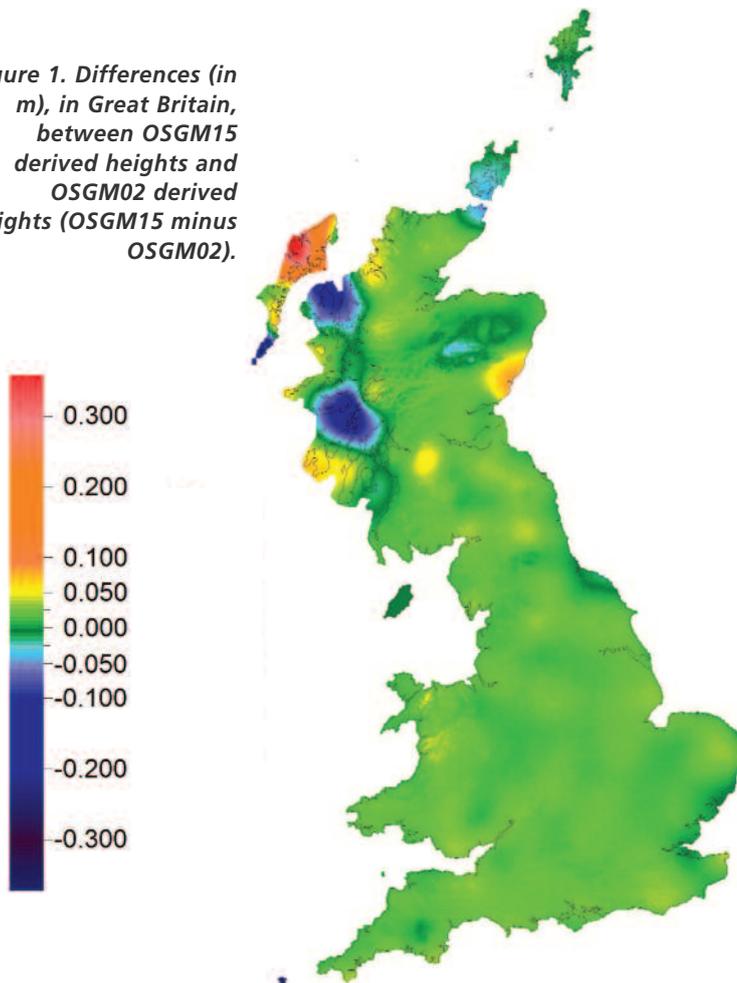
**... there are many national datums and ellipsoids of slightly different size and each positioned slightly differently.**

”

**Table 2. Differences (in m) between OSGM02 and OSGM15 in GB and also accuracy values of OSGM15.**

Datum:	Newlyn	St Marys	Douglas02	Stornoway15	Lerwick	Newlyn (Orkney)
RMS difference:	0.026	0.365	0.000	0.175	0.013	0.021
Accuracy:	0.008	N/A single offset		0.030	0.011	0.018 0.017

**Figure 1. Differences (in m), in Great Britain, between OSGM15 derived heights and OSGM02 derived heights (OSGM15 minus OSGM02).**



**OSGM02 in Great Britain** In GB, OSGM02 was not a true geoid model because there was a requirement for heights observed with GNSS to be compatible with legacy OS benchmarks, quoted in metres above Ordnance Datum Newlyn (ODN). To do this, GNSS observations were made at the network of high precision OS geodetic benchmarks, the network of highly accurate benchmarks maintained by OSGB, and OSGM02 was adjusted to fit.

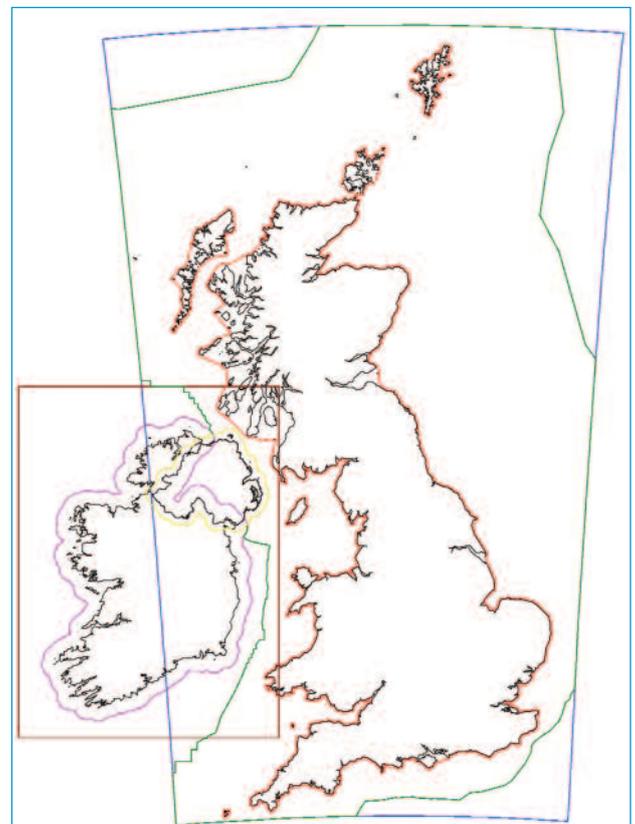
OSGM15 is affected by the new realisation of ETRS89 which has the effect of changing levels across Great Britain by an average 25mm. The new geoid model improves the fit to ODN in north-west Scotland and the local height datums of the islands.

Table 2 shows the expected differences between OSGM02 and OSGM15 and also the accuracies of the OSGM15 datum realisations. The differences are

shown spatially in Figure 1.

**Changes** It is clear from Table 2 that the greatest changes are for the Isles of Scilly and the Outer Hebrides. For details, see the longer full article in *Geomatics World*, July/August 2016.

In OSGM02 the Newlyn (ODN) datum extended up to the 10km offshore boundary imposed in the file. In OSGM15 ODN extends to 2km offshore. Since the gravimetric geoid is computed for the whole 700km x 1250km OSTN15/OSGM15 area, but is of course just fitted to Newlyn on the GB mainland – anything offshore is considered an extrapolation of ODN. So, beyond the 2km line this datum is now



**Figure 2: Map of transformation extents.**

- = Extent of Irish OSGM15 files
- = Extent (10km buffer) of Belfast OSGM15 datum built into OSGM software
- = Extent (20km buffer) of Malin OSGM15 datum built into OSGM software
- = Extent of OSTN15/OSGM15 file
- = Extent of OSGM15 "Newlyn Offshore" datum (flag15)
- = Extents (2km buffer) of Great Britain OSGM15 land based datums: Newlyn, St Marys, Douglas02, Stornoway15, Lerwick, Newlyn (Orkney)

flagged as "Ordnance Datum Newlyn (Offshore)" to indicate the extrapolated Newlyn datum. Figure 2 shows the transformation extents.

**OSGM15 in Ireland and Northern Ireland** Table 3 shows the differences between OSGM02 and OSGM15 in Ireland and Northern Ireland.

**Table 3. Differences (in m) between OSGM02 and OSGM15 in Ireland and also accuracy values of OSGM15.**

Datum:	Malin Head	Belfast
RMS difference:	0.093	0.018
Accuracy:	0.023	0.014

The differences between OSGM02 and OSGM15 on the Malin datum can be largely attributed to improved gravity data in the extreme West of Ireland. The difference between the OSGM02 model and the OSGM15 model in Ireland is, on average, at the less than the 2cm level. However, the new model in some places contains significant variations. An area around Leitrim/Cavan/Monaghan contains differences around the 20cm level, while the most pronounced differences occur in the most Westerly parts of Galway and Mayo. These differences are higher than expected given the accuracy of the models and to give further assurance of the validity of these changes OSi observed some further test points targeted specifically in these areas.

The raw OSGM15 data for Ireland is released as two files: one for Belfast datum and the other for Malin datum. Within the updated transformation software limits have been placed on the extents of the datums. Belfast extends 10km offshore and into Ireland and Malin extends 20km offshore and into Northern Ireland. See Figure 2.

**Availability of new models** All the transformations have been coded into the software application "Grid InQuest II" which allows for individual coordinate input and output via a GUI and also batch input/output via text files. A command line interface and dll, along with examples of their use in a variety of programming languages, are also included. Users wishing to incorporate the prepared .dll into other applications should refer to the Grid InQuest II user guide. Grid InQuest II download packages for Windows (32 bit and 64 bit), Linux (32 bit and 64 bit) and OSX are available from <https://bitbucket.org/PaulFMitchell/gridinquestii>

The raw data files have been released to software and equipment vendors. Any developer wishing to request the raw data files should contact one of the following:

Ordnance Survey (GB): [GeodeticEnquiries@os.uk](mailto:GeodeticEnquiries@os.uk)  
 LPS: [peter.downie@finance-ni.gov.uk](mailto:peter.downie@finance-ni.gov.uk)  
 OSi: [control@osi.ie](mailto:control@osi.ie)

The new models will be available by August 26th 2016 and website transformation tools will also be updated at this time. A tool will also be available to allow coordinates and heights from the OSTN02/OSGM02 models to be converted to OSTN15/OSGM15 values by first back transforming to ETRS89, via OSTN02/OSGM02, and then forward transform through OSTN15/OSGM15.

The EPSG Geodetic Parameter Dataset maintained by the International Association of Oil & Gas Producers (IOGP) has been updated to give new EPSG codes to the OSTN15 and OSGM15 models. EPSG codes are commonly used to uniquely identify datums, projections, transformations etc especially within GIS systems. E.g. OSGB36 datum can be referenced as EPSG:27700.

## The authors

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**Peter Downie**, geodetic manager, geodetic survey, Land & Property Services, Northern Ireland.

**Katy Fitzpatrick**, operations manager, geodetic survey, Ordnance Survey Ireland. Additional material by **Richard Groom**.

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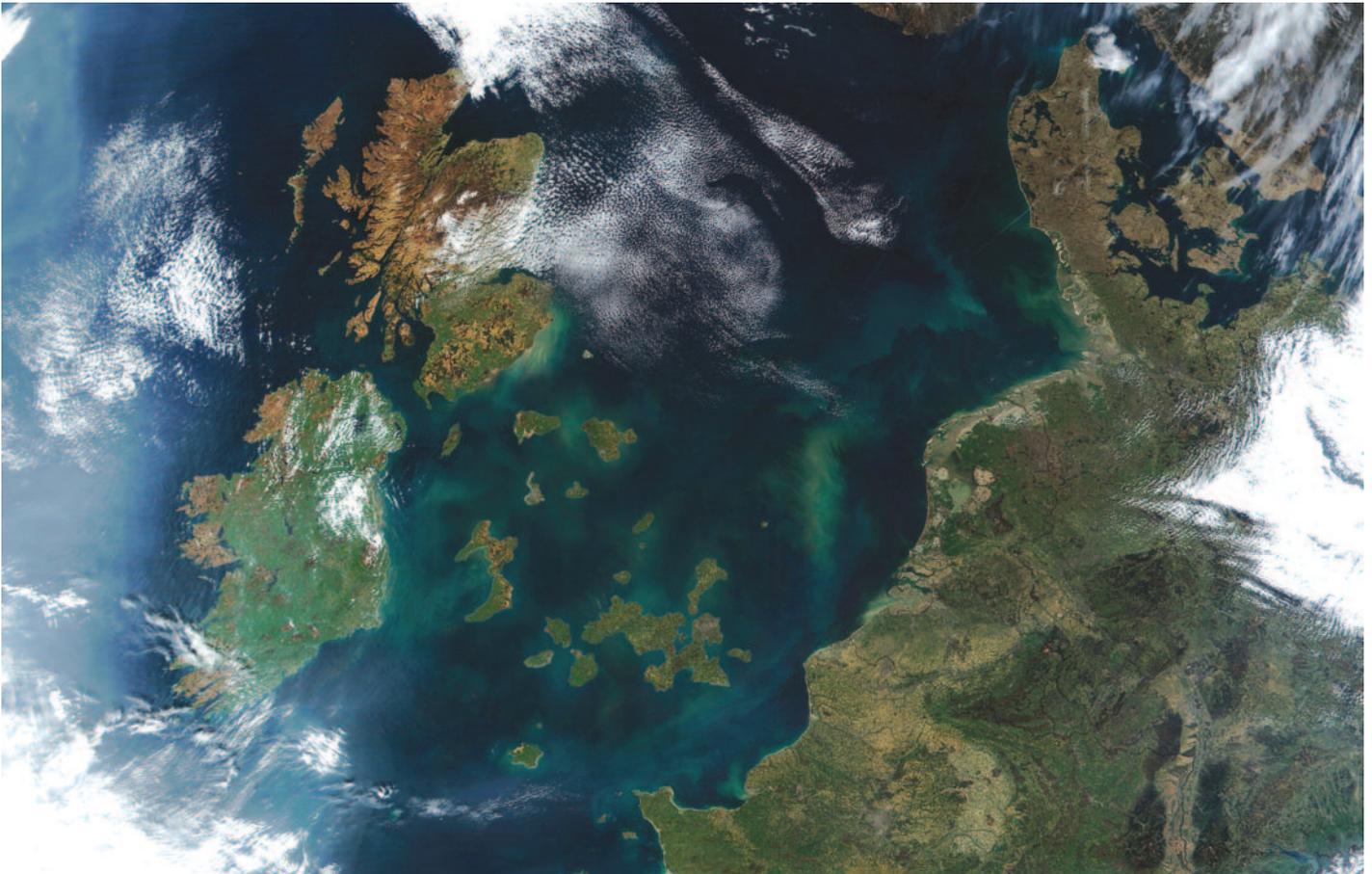
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## Islands of Remain in the Brexit Sea

– the geography of the counties and countries of the UK after the Referendum on 23rd June 2016



“

***... a qualified graphic designer with a trigger-happy attitude for any and all fan-art sundry.***

”

THE MAP above shows the counties of Great Britain (not including Northern Ireland) that voted to remain in the EU following the UK's referendum on 23 June 2016 as physical islands; islands of remain in the Brexit Sea.

The new post-Brexit Isles would include the island of London (minus Hillingdon, Sutton, Bexley, Barking and Dagenham, and Havering) but which would also include Oxford, Cambridge, Reading and Brighton, the island of Cardiff & Bristol, Isles of Scilly, island of Leicester, island of Manchester, island of Liverpool, island of Leeds & York, Newcastle-on-the-Sea and of course the largest island of all, Scotland.

- The map is the work of MATAYO MOSHI, aqualified graphic designer with a trigger-

happy attitude for any and all fan-art sundry. He says: I'm a passionately proud nerd/dork/geek (plus any and all other related synonyms). It is my nerdiness which is my biggest source of inspiration for most of my favourite projects. Design is my favorite hobby and my only profession.

I love creating, and make sure to play around with something new everyday. Popular culture of the science-fiction and fantasy persuasion is my design muse, and has been the inspiration for much of my most enjoyable work. However, I am a designer, and enjoy a creative challenge no matter the project.

My favourite toys are Photoshop, Illustrator, InDesign, and Cinema 4D.

- More at <http://stagyika.deviantart.com/>

# technology: historic environment

The Impact of new technologies in the  
Historic Environment Sector



**Detailed recording methodology by RCAHMS surveyors and research and interpretation has led to a recent book on the remote island of St Kilda.**

NEARLY 20 YEARS AGO I organised a seminar that looked at new techniques and new knowledge in archaeology. 'The purpose of the session', I wrote, 'was to take a glimpse of the future, exploring new technologies which could help the effective management and sharing of data which would lead to a better understanding of the past.' In this vision, I

concept. Information about the historic environment (antiquities as it was termed) has been part of the OS field survey specification for nearly 200 years until the end of the 20th century. It was brought together with accurate topographic mapping on published maps used universally by those engaged in any form of work relating to planning, land use or land management. Today powerful databases, digital mapping and GI technologies, internet and web developments enable heritage managers to hold and manipulate their own data interactively with spatial geographies; which in turn has opened up unimaginable opportunities and raised user expectations.

Alongside the opportunities that this brings, is the recognition that there needs to be a co-ordinated national approach if we are to serve our stakeholders well. Encouraging this collaboration and demonstrating the benefits of mutual co-operation has resulted in the National Mapping of the Historic Environment for Scotland. This provides the bedrock on which decision

## New technologies and historic environment data

Former CEO of the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) **Diana Murray** reviews the impact of new technology on archaeology since she joined the heritage sector 35 years ago.

• This article is based on a presentation the author gave at the AGI Scotland annual conference on 16 March 2016 in Edinburgh.

imagined a time when, from the comfort of your own home, you could make an enquiry online that would call on information from any available source, with location maps, distribution analysis, images and associated data to answer an almost limitless set of questions about the historic environment (it was the very early days of the internet). Well of course this vision is now very much a reality and we can even do this on mobile technology, which was way outside our thinking back then.

Historic Environment professionals are always keen to harness available and emerging technologies, not least in the recording and curation of information and in the democratisation of access that makes people more engaged with the Historic Environment, and the job of the professionals better understood. Today, we are looking at new methodologies, such as machine-readable techniques and new thinking such as linked data, which will speed up data collection and open up new avenues of analytics.

**Linking data** An example of such potential is to link Historic Environment data across sectoral boundaries in order to demonstrate the relevance of the Historic Environment to a wider agenda. For example, that a sense of place and identity, interest in cultural heritage, and associated volunteering effort can have a significant impact on self worth, and physical and mental well-being. The technology exists and the data is there and is only waiting for the standards to be set and the links to be made.

The power of integrating information is not a new

making can be made about how to deal with change. It helps establish the criteria that are used relating to significance of monument and landscape types and the consequent approach to conservation or recording, as well as providing access for interested public users.

**The long-term view** Providing authentic national coverage is achieved firstly by taking the long-term view: incorporating work that has been accumulated over many years of research and survey by RCAHMS and others and which form the National Record of the Historic Environment, now in Historic Environment Scotland (HES). This includes field surveys, aerial and remotely sensed data, desk-based recording and research programmes, and excavation plans which can themselves be spatially and chronologically fitted into landscape mapping. In order to establish a truly national picture, it also depends on collaboration across the Historic Environment Sector with all those who are involved in data capture and who have a requirement or desire to make that public.

The recent survey of St Kilda provides an example of data capture involving over 15 years of research and interpretation. Such detailed ground surveys have been a typical method of archaeological survey for over 100 years, but this survey illustrates the way different modern techniques combine to produce accurate mapping of the historic landscape using rectified aerial photography, and GPS survey methods, together with detailed on-site recording. The results have been published as a popular book\*, and the

“

**The technology exists and the data is there and is only waiting for the standards to be set and the links to be made.**

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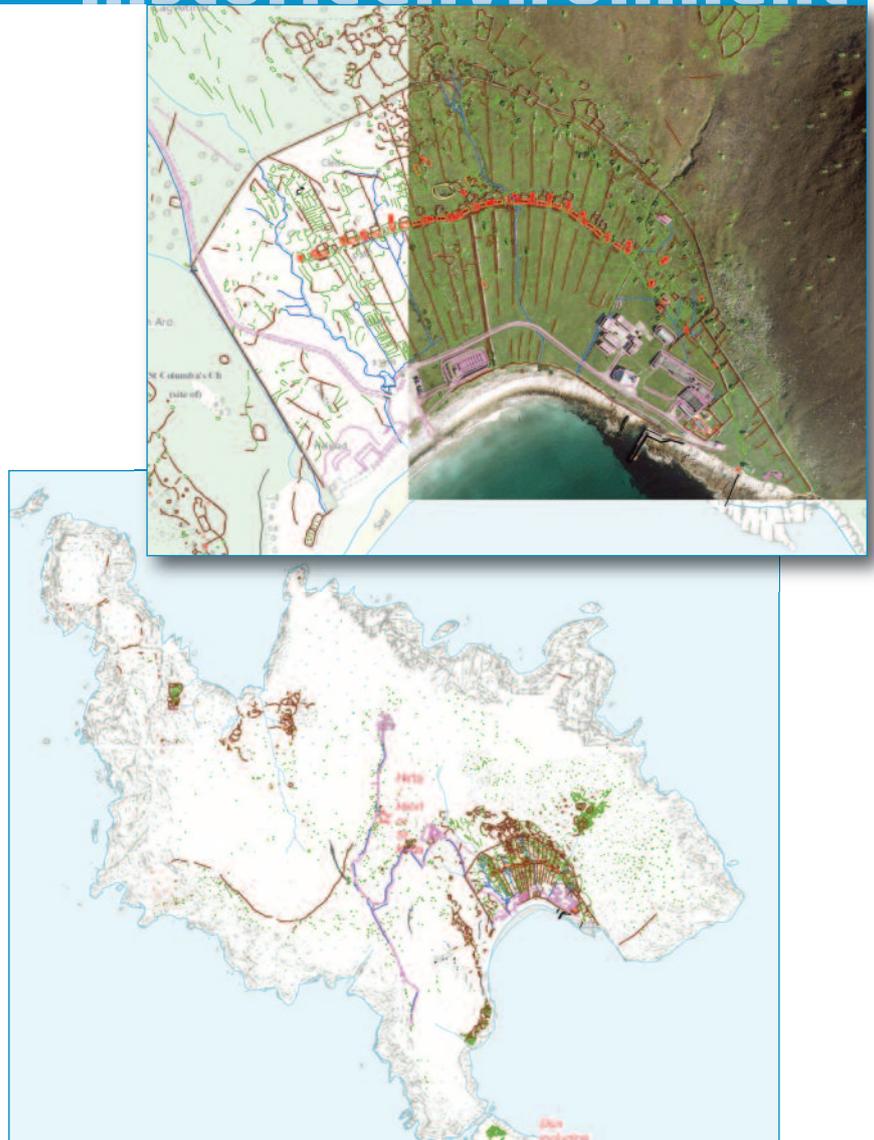
detailed information, survey drawings, images and the mapping of this fascinating archipelago are incorporated into the National Record of the Historic Environment and are available online.

**Crop-mark capture** Another important data capture methodology is low-level aerial survey (flown at 1-2000 feet). Targeted in optimum conditions at specific historic environment sites and at a rate of capture of 2-3000 per year, it has resulted in a wide coverage of the Scottish landscape. This technique includes low-light photography of low relief sites; and crop-mark survey which typically reveals archaeology as the conditions beneath the ground cause stresses in the crop at specific times of year. This creates the distinctive marks that can be photographed from the air and interpreted as particular types of monument. Farming methodologies with precision farming is now beginning to remove this effect from observation and new techniques are being explored including spectral imaging, lidar and low-level drone surveys. These provide innovative ways for not only capturing, but also analysing information which can be manipulated digitally to enhance features.

The National Record of the Historic Environment at HES houses over 20 million photographs from all over the world including blanket coverage of Scotland from 1940s to the end of the 20th century. This collection provided the source material for a 20-year desk-based data collection programme in which the combination of maps and photographs old and new has been used to analyse the historic land use of Scotland. This collaborative project was developed to help the understanding of the landscape and to enable the evaluation of areas of relicts of historical interest vulnerable to change.

**Defining boundaries** One of the programmes of data enrichment currently underway, is to define the extent of sites to replace single centre point locations. Defining the boundaries of historical sites for mapping purposes is not as straight forward as you might imagine. The statutory boundary for monument protection does not coincide necessarily with the known spread of a site; while defining the extent of a site known only through remote sensing can be quite subjective. So the journey to determining how to show site extents has been a long one and has involved developing and agreeing a defined set of standards of polygonisation across the sector so that the data is exchangeable between partners. Based on these standards however, it has been possible in collaboration with a number of participating organisations to build another layer of the National

\*"St Kilda: the Last and Outmost Isle" by Angela Gannon and George Geddes, published by HES November 2015.



Map the Historic Environment of Scotland.

Making this richly layered information widely available is a core responsibility of public sector organisations. Searches to the online services provided by HES have escalated to a staggering 16.5 million worldwide and some 20,000 images are fulfilled annually through direct online services.

**Single hub** Key to the success of the online delivery of a national dataset is that the source data is maintained in a single data hub, which can be accessed by a number of tailored services including WFS and WMS. Also key to success is the collaborative partnerships across the Historic Environment sector in Scotland that provides users with access to a 'one-stop-shop' for data drawn from a number of reliable sources.

The basic principles that have been adopted are:

- **Metadata that links data internally and externally which is key to user discovery across different datasets.**
- **The application or if not available, the joint**

**Above, top: the survey of St Kilda used rectified aerial photography and GPS survey to produce an accurate map of the historic landscapes on the island.**

**Above: over 1400 structures were mapped on St Kilda and linked to a GIS.**

# technology: historic environment

The Impact of new technologies in the  
Historic Environment Sector



*The archaeological landscape is dense with sites in this part of North Berwick. The underlying OS map is enhanced with aerial photographic survey.*

development of industry standards and controlled terminologies,

- Introducing controlled gazetteers linking historic to modern data allowing past and present geographies to be linked, which is key to historic archive discovery
- Historic Environment data is spatially enabled to underpin the operation of the user services and the integration of data. This allows users to make their own associations and links.

The development across the sector of a shifting relationship with users, specifically the introduction of a two-way dialogue, and a presumption that users will be able to make their own understanding and meaning without specialist intervention or expert advice. The focus therefore moves to enriching the data content including public contributions. These principles underpin many of the online services available. Examples include:

**Canmore** – the main online service for users which combines access to location maps, survey reports, photographs and digital images of archives including historical material and modern surveys. A new mapping application is about to be launched as part of this service combining a number of spatial datasets, including site extents, which have not previously been available online. <https://canmore.org.uk/> Related to this is:

**My Canmore** – which gives access for the public to upload information and images and contribute to the national endeavour of creating a National Record of the Historic Environment.

**Scotland's Places** – is a partnership site aimed at the family history sector, giving access to the digitised records of three National collections delivered in real time, using controlled gazetteers that link historic to modern places. This opens a non-spatial archive to spatial searches and the site includes opportunities for volunteers to transcribe hand-written manuscripts to make them searchable by people or place. [www.scotlandsplaces.gov.uk/](http://www.scotlandsplaces.gov.uk/)

**Britain from Above** – is a partnership site which is

specifically designed as an online crowd sourcing project. Over 1 million users last year helped to identify and plot the content of the Aerofilms collection. [www.britainfromabove.org.uk/](http://www.britainfromabove.org.uk/)

There are also online services primarily designed for the professional or specialist user, but open to all. Here data standards, metadata links and spatially-enabled data are key to their operation.

**Pastmap** – is a shared site for heritage information that combines data from a number of different datasets managed by a range of professional bodies, locally and nationally but which provides a 'one stop shop' for land managers and planners.

<http://pastmap.org.uk/>

**HLAmap** – is a Scotland-wide view of land use in modern and past times designed to show how the landscape has changed over time.

<http://hلامap.org.uk/>

**Buildings at Risk Register** – lists vulnerable listed buildings at risk of decay or demolition and allows the public to nominate buildings for the register

[www.buildingsatrisk.org.uk/](http://www.buildingsatrisk.org.uk/)

**NCAP** - is the online site for examining and purchasing aerial photography cover of the UK and countries across the world where Britain has had an interest (generally military). The collection consists of over 20 million photographs that are steadily being digitised and geo-located. <http://ncap.org.uk/>

Spatial and data technologies have become increasingly interactive, web services are providing more powerful delivery tools and an ever more sophisticated range of techniques is available for data capture. The technology is no longer a barrier to what we can now achieve. More important is ensuring that the data is enriched in a way that can provide answers to the questions we need answering, and those depend not just on systems and collaborations, but on a clear vision of what we need and what our stakeholders require.

## About the author

Diana Murray MA (Cantab), FRSE, FRSGS, FSA, FSA Scot, MCIfA, MloD was the Chief Executive of the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) for 11 years and recently was also joint CEO of Historic Scotland (HS) until the functions of both organisations combined in October 2015 to form Historic Environment Scotland (HES). She studied archaeology at Cambridge University and having joined RCAHMS in 1976, has devoted her career to Scottish cultural heritage. She was responsible for leading the application of database, GIS and online technologies to develop the innovative methodologies and online services delivered today by HES and its collaborative partners.

- RCAHMS was set up by Royal Warrant in 1908 to make a record of the Historic Environment which it developed for over 100 years. In 2014, its functions were made statutory in the Historic Environment (Scotland) Act and in October 2015, it became part of a new organisation, Historic Environment Scotland.

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With the deadline passed for central government contracts worth over £50 million to be using BIM

on a three-month or one, two or three year basis. This reduces the upfront cost. There are various options to migrate from perpetual licences to the new licence rental system.

Woolven also introduced users to Cadline's 'Journey plan'. This is intended to help users in particular disciplines to implement BIM. As an aside, he also said that Cadline has noticed a trend towards more work being done in-house with less out-sourcing.

**BIM in 90 mins** PAS1192 is the document that defines the BIM process in Britain. It gives structure by specifying key documents, roles and responsibilities. Early on in the evolution of BIM, the Royal Institute of British Architects (RIBA) drafted a BIM 'Plan of Works', which has been adopted by the AEC industry as a de facto standard for implementing BIM. The Cadline team took us through all the six stages of the Plan of Works.

## Conference brings BIM alive

Cadline's Autodesk user conference took place in the heart of the City of London in June.

**Richard Groom** reports that BIM was the hot topic this year.

level 2, this year's conference concentrated on helping delegates to get to grips with the nuts and bolts of BIM.

**BIM for newbies** For early birds there was a pre-conference session on 'BIM leadership', which was aimed at anyone 'new to BIM or confused about what they should be doing next'. There were a lot of us! **James Philip** put 3D modelling in the centre of BIM and explained how federated modelling is the means by which different disciplines contribute their expertise and retain ownership, whilst enabling collaboration. This integrated approach means design can proceed concurrently, with plenty of tools to detect and resolve design difficulties before construction commences.

**Licensing** Following the pre-conference session, **Scott Woolven** welcomed delegates and gave an update on the situation regarding Autodesk licences. He began with a warning from Autodesk that renewals have to be received by Autodesk before the current licence expires or users will have to buy a new licence. Licences can be renewed up to 90 days before expiry of the old licence so the advice is to order with plenty of time to process the orders.

From 31st July 2016 Autodesk will remove all remaining perpetual licences and all 'suites' will be withdrawn from sale. From 1st August, three software 'collections' will be introduced – architecture engineering & construction; product design; media & entertainment. These can be rented

The task was a hotel development at Glastonbury. Stage One: preparation involved downloading OS Model Builder data for Infraworks 360. For stage two a building was sketched using Autodesk's answer to SketchUp – Formit360 and then transferred to Infraworks360, a conceptual design tool that enables outline design work for the site and for road access on a DTM with map or imagery background. It is a quick way to work up options, which can be used as the basis for consultation. When the outline design is ready it can be exported as an IMX format file and then read into Autodesk Civil3D. At this point the file might be saved to a Common Data Environment on Autodesk's Vault. From here on, audit tracing is automatic.

At that point everyone took a breather. When we returned from coffee the project was at RIBA stage 3, the developed design phase. The IMX file was read into Civil 3D and then the site grid set up by clicking on two points to define the origin and orientation. No discussion about scale in this section but the coordinates appeared and were expressed in metres in the Civil 3D software. When the model was transferred to Revit, the coordinates maintain their intelligence and were automatically shown in Revit as millimetres to align the building model.

Swiftly on to step 4: technical design, where we were shown how to combine the federated models using BIM360 GLUE, which enables any partner in the project to view any model and make mark-ups. It can also detect clashes between different models to



**... the coordinates appeared as the national grid expressed in millimetres.**



# Autodesk user conference



*Delegates learning all things BIM.*

see if, for example, elements in the structural model clash with those in the MEP model. It is at this point that component manufacturers can get involved. The example we were given was a fanlight window. The idea is that the manufacturer can see the fanlight as depicted in REVIT, then use Autodesk Inventor to design the window and then export to Autodesk360 as a new component. The interface between BIM as used for design and for shop drawings used by trades is at last, it seems, being addressed.

And so on to stage 5 – construction. Here, the team used Navisworks tools to produce contract

documents and then simulate construction and produce animations for site project meetings. BIM360 is then used to allocate construction tasks and track them by monitoring in real time.

Stage 6 is project handover and close out, including hand-over of as-built models and commissioning documentation. Another neglected area has been building operations but Autodesk now has software to do that too. A mobile phone app can be used to set maintenance tasks, create job cards and monitor the work.

**Bringing it together** In short, Cadline were able to demonstrate how a project is handled throughout its lifecycle. It was certainly a brave live demo but gave delegates a valuable overview of the whole BIM process.

The afternoon was taken up with workshop master classes in three streams: Building, Infrastructure and General Design.

Overall, like last year's, this event was time very well spent and free of charge, to boot.

Cadline invited delegates to participate in a free Discovery review to see how, as an Autodesk Platinum Partner with offices across the UK and Holland, they can help guide individual clients on to a successful road to BIM adoption.

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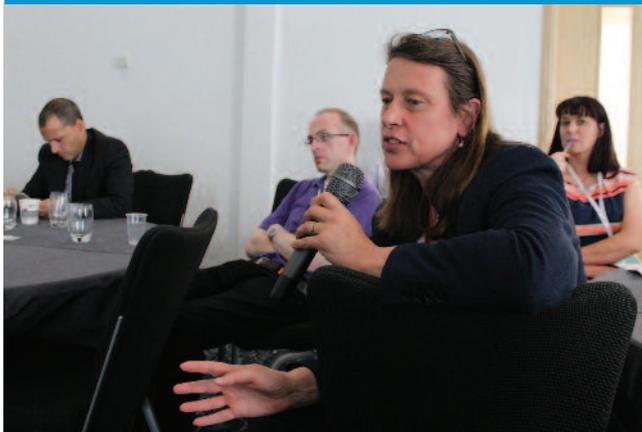
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*Dr Anne Kemp: "challenges we face globally with ageing infrastructure, shrinking natural resources and urbanisation"*

AFTER TWO REALLY SUCCESSFUL GeoBig 5 conferences, we felt the time was right to broaden the theme again. We had a good mix of public and private sector attending, and we were also heartened to have representation from 7 of our 11

applications. To round up the session before coffee we were pleased to welcome **Andy Murdock** to speak about the highly successful Early Careers Network (ECN) initiative, which he has led for the past 18 months. The network has held some interesting webinars, and he was able to connect with student members and new professionals in NI during the day.

Following coffee and networking, we looked at some more local examples of GI use from Northern Ireland and Ireland. **Brad Fisher** of Sopra Steria, **Ciaran Kirk** of IMGs, **Sean O'Boyle** of NI Water and **Brian Galloway** of Land & Property Services (LPS) reported on user stories from some of the bigger projects currently underway. Brad spoke about the importance and success of the user experience for farmers when managing their single farm payment claims for the Department of Agriculture, whilst Ciaran spoke on the major integration of SAP and GI

## AGI NI annual conference: cooperation is key

A good mix of attendees and some interesting topics for the speakers, AGI Northern Ireland's annual conference was set for a successful day, reports **Diane Sandeman**.

new local councils, signs of the renewed importance being placed on location within this area. We were also very grateful to our four Gold sponsors: IMGs, Esri-Ireland, Sopra Steria and Leica Geosystems, who enabled us to follow AGI Scotland's new cost model to make the conference accessible to more delegates in these financially difficult times.

The event was kicked off by AGI NI chair **Simon Wheeler** who reminded everyone that AGI in Northern Ireland is alive and kicking. To set the scene he introduced **Joao Fernandes** of Hexagon, **Dr Anne Kemp** of Atkins Global and **Tim Williams** of What3Words who looked at Future landscapes within the Location world. Joao looked at a world where the map of the future would be a dynamic platform telling users what has been, what is and what will be.

within the ESB – a major utilities provider in Ireland for asset, work and customer management.

**Improving your positions** Positional Improvement of data will be one of the big challenges for Northern Ireland incoming years, and Sean O'Boyle and his team gave an excellent account of the challenges they faced when looking at a shift for NI Water's assets. Whilst PI would normally be seen as a dry subject, the team gave an excellent delivery which proved of interest to all delegates. Finally before lunch, Brian Galloway of Land and Property Services spoke about the new LPS data model currently in release and how customers would benefit from the shift in how large scale base data is modelled. The new data model is simpler than its counterparts in GB and Ireland, while still providing a feature rich dataset giving many benefits to both LPS and customers.

Following lunch, the conference split into parallel sessions. In the technical session we heard from **Colin Murphy** of Natural Resources Wales, **Dr Suzanne McLaughlin** of Open Data NI and **Steve Campbell** of Ordnance Survey. Meanwhile in the customer experience session, we heard from **Iain McKay** of the Improvement Service Scotland, **Colm Daly** of the Education Authority and **Maira Grimley** of the Health & Social Care Board. Colin spoke about the challenges of moving several organisations with a variety of requirements to a cloud solution, whilst Suzanne updated delegates on the NI Open Data journey, and how everyone could assist. Steve rounded up this session with a novel look at the



**... it is important that we do so as it is perceived by our customers and stakeholders – not value as it is defined by vendors."**



**75% will live in cities by 2060** Dr Anne Kemp reviewed the AGI Foresight 2020 report and why it is important to everyone. She outlined the challenges we face globally with ageing infrastructure, shrinking natural resources and urbanisation – with 75% of the world's population expected to live in cities by 2060. These challenges will drive the need for smarter solutions that can support Big Data, and an increasingly data-driven world, where we will need to switch from being data providers to data services.

Last but not least, **Tim spoke** about an alternative method for addressing: breaking the world down into 3x3m squares with a unique 3-word address. Not only is everywhere on the globe included, but words are easier to remember than numbers and opens up a myriad of opportunities on a wide range of

# AGI Northern Ireland



*Delegates were keen to hear from speakers on a raft of topics.*

question of how 'Out is Out' when looking at data accuracy for addressing in GB.

**Joined up delivers for school transport** In the parallel session, Iain spoke about efficiencies in Scotland, from a joined up approach by local government there, whilst Colm explained how their pilot approach to school transport assessment was progressing, and the benefits in both time and resources from using a web-based GI approach. Moira spoke about the use of Spatial NI from LPS to help staff assess eligibility for access to early years services through SureStart, a job made much easier through use of location services.

The final session of the day was for the full conference. This session was kicked off by **Nathan Ward** of Leica Geosystems who presented on digital realities. Nathan outlined the rapid developments in

measurement technologies from wearable laser scanning to UAVs to mobile mapping of underground utilities. Quote of the day from Nathan was "you can't plan what you can't measure".

The final presentation from the day was from **Paul Synnott** of Esri Ireland who spoke on 'Reshaping our mindset- A Customer Value Perspective.' Paul explained that to understand value, it is important that we do so as it is perceived by our customers and stakeholders – not value as it is defined by vendors.

The day was rounded off with a panel session of the AGI NI Gold sponsors – Ciaran Kirk, Paul Synnott, Nathan Ward and Brad Fisher. Paul's view was discussed and the future was generally agreed to be bright for the industry with Ciaran Kirk predicting that "Geo will be a success when the technology is taken for granted and not seen as complex".

To round off a successful conference delegates were invited to indulge in a few GeoDrinks to enjoy the last of the day's sunshine. All in all a very successful conference and as one of the delegates said "The conference made me realise the need for joined-up thinking and sharing of information and ideas, between all the industry professionals, both in terms of enabling us to meet our own objectives and those of our customers going into the future. Cooperation would seem to be key," - **John Corry**, Omagh and Fermanagh District Council.



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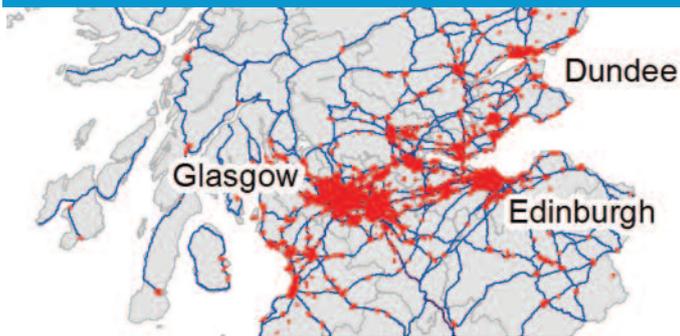
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**T: +44 (0)28 7012 4401 E: s.cook@ulster.ac.uk W: <http://www.ulster.ac.uk/es/pgdipmscgis>**



*Inset of central belt area of Scotland from Figure 1 page 26.*

THE ANALYSIS OF SPATIAL DATA often relies on the use of Geographical Information Systems, with maps being the usual output. However, increasingly, GIS functionality provides more than just a digital mapping toolbox: it can include spatial and network analysis, 3D visualisation, and modelling. GIS can also handle data from many disparate sources,

the form of smart watches, GPS trackers, and fit-bit devices. Subsequently this information can all be integrated into a GIS with other spatial datasets that may help in an explanatory capacity. Spatio-temporal relationships can also be studied using visualisation tools for data exploration and the generation of map animations that visually alert the viewer to any hotspots of change over time.

Whilst the mapping and visualisation of datasets remains the most common and obvious visual (both hard- and softcopy) output from a GIS and the related geospatial technologies, the real power of GIS lies with the potential to generate new datasets, explore spatio-temporal data, utilise techniques and tools for spatial analysis, and to interface with modelling and simulation tools. This is already being significantly enhanced by the addition of further utilities, specialised functionality, spatial statistics,

## Spatio-temporal geography and medical data

Authors **David R. Green** and **Jan O. Jansen** demonstrate through examples how GIS can add explanatory value to the analysis of medical data.

including remote sensing and GPS or GNSS. The latter provide for the accurate capture of spatial locations and an array of attributes including ground-based photographic records, text descriptions, and environmental sensor data. Recent developments in this technology have also led to decision-support systems (DSS), online Internet mapping capability, mash-ups, and real-time environmental monitoring, providing powerful and flexible ways to manage resources, access information, and to engage with the public.

Many GIS-based medical and health applications have been reported including mapping applications, for exploratory data analysis; studies analysing the distribution and spread of disease; studies of exposure to pollution sources, such as factories, roads and airports; cluster analysis and to identify the significance and sources of disease outbreaks, and the links between health and pollution; and the use of spatial techniques such as Kriging to generate surfaces.

Remotely sensed data has also been used as a source of environmental information to correlate with health data. Terrain data provides the means to consider the influence of both natural and man-made surface topography on local climate such as temperature, wind direction and speed, and on observed air and noise pollution patterns. Spatial data can also be used in GIS-based pollution models.

Personal and environmental data can now also be gathered using small GPS based sensors to track an individual and their health condition over both space and time. Witness also the rapid growth in wearable technologies such as monitoring devices in

and modelling tools.

**In the first of a two-part series of case studies, the following two examples outline, with illustrations, just how spatio-temporal data can be analysed and modelled to provide decision makers and budget holders with the key information they need.**

In the next issue we will look at examples in Geographical Mapping of Hepatitis C infection in North East Scotland using GIS; Proximity of high-density truck traffic near schools but not homes is associated with childhood wheezing; and, An exploratory analysis of the geospatial distribution of the incidence of injury requiring ambulance service attendance in Scotland.

### EXAMPLES

**Feasibility and utility of population-level geospatial injury profiling: Prospective, National Cohort Study** (see Figures 1-3 page 26)

Geospatial analysis is increasingly being used to evaluate the design and effectiveness of trauma systems, but there are no metrics to describe the geographic distribution of incidents. The aim of this study, therefore, was to evaluate the feasibility and utility of using spatial analysis to characterize, at scale, the geospatial profile of an injured population.

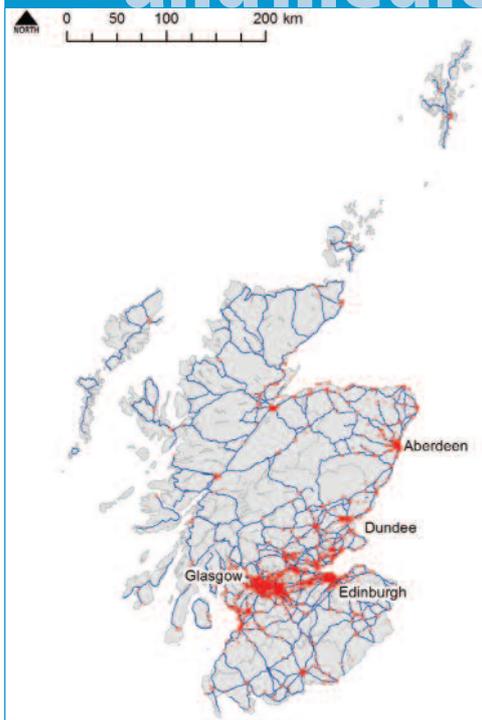
This was a prospective national cohort study of all trauma patients attended to by the Scottish Ambulance Service in a complete year (between July 1, 2013 and



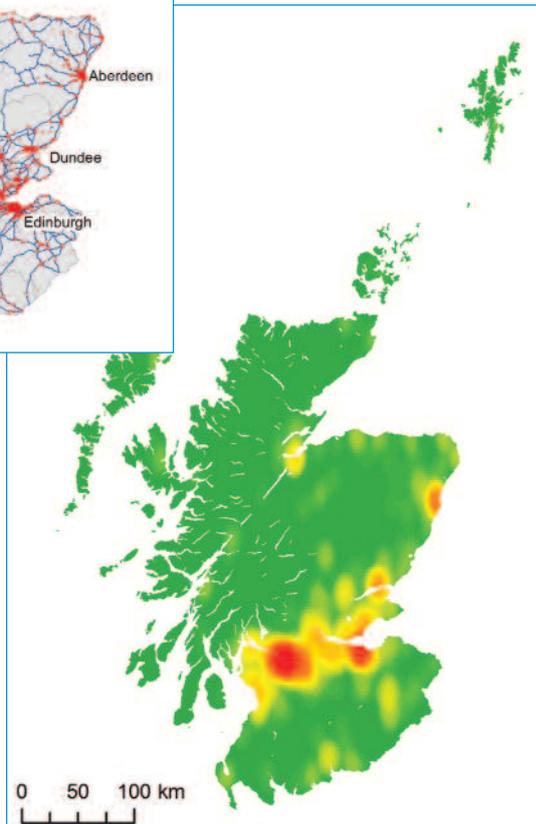
**Geospatial analysis is increasingly being used to evaluate the design and effectiveness of trauma systems...**



# GIS and medical data

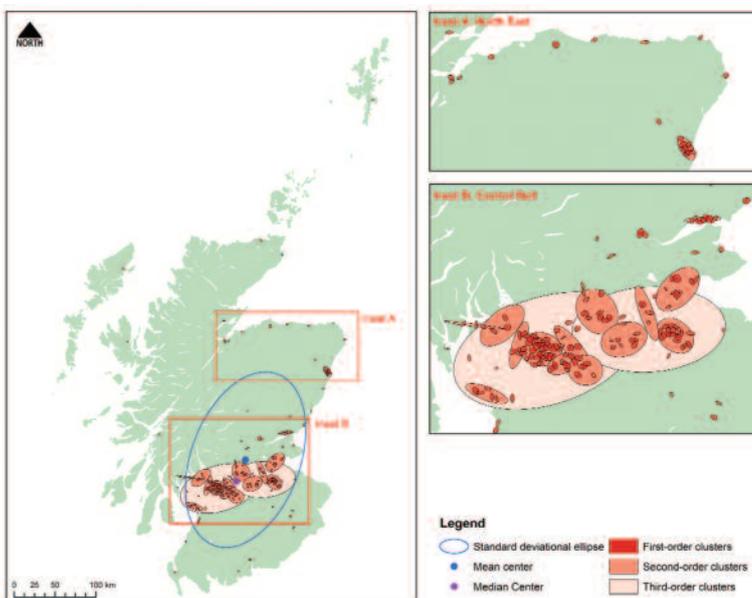


**Left: Figure 1, Map of study area, showing major cities, road network, and the "central belt" area.**



**Right: Figure 2, Distribution of incidents triaged to MTC care, as Kernel density estimates**

**Below: Figure 3, Cluster map of patients triaged to MTC care.**



June 30, 2014). Incident location and severity were collected at source. Incident distribution was evaluated using geo-statistical techniques.

There were 80,391 recorded incidents involving traumatic injury. Incident density was highest in the central Southern part of the country and along the East coast, broadly following the population distribution and road network. The overall distribution was highly clustered, and centred on the central Southern and Eastern parts of the country. When analyzed by triage category, the distribution of incidents triaged to major trauma centre care was slightly less clustered than that of incidents triaged to trauma unit or local emergency hospital care, but the spread was similar. When analyzed by type of injury, assaults and falls were more clustered than incidents relating to traffic and transportation.

This study demonstrates the feasibility and power of describing the geographic distribution of a group of injured patients. The methodology described has potential application for injury surveillance and trauma system design and evaluation, as shown by two subsequent analyses of the dataset.

**Paper Authors: Jan O. Jansen, Jonathan J. Morrison, Handing Wang, Shan He, Robin Lawrenson, Marion K. Campbell, & David R. Green.**

## Access to Specialist Care: Optimising the Geographical Configuration of Trauma Systems

A trauma system is a network of specialist hospitals, supported by emergency medical services (utilising both ambulances and helicopters). The geographic configuration of emergency care systems is key to maximising accessibility, while also promoting the efficient use of resources.

This study, drawing on the data collected as part of the GEOS study (see above), reports the use of a novel approach to inform the optimal configuration of a national trauma system. The project used a novel combination of network analysis and multi-objective optimisation, trading off characteristics such as travel time, under-triage, helicopter use, and hospital case volume.

The analysis demonstrated that Scotland's trauma network could be optimised with one or two major trauma centres, while requiring an enhancement of aero-medical retrieval capacity.

**Paper Authors: Jan O. Jansen, Jonathan J. Morrison, Handing Wang, Shan He, Robin Lawrenson, James D. Hutchison, Marion K. Campbell**

**An exploratory analysis of the geospatial distribution of incidence of injury requiring ambulance service attendance in Scotland (see Figures 1 & 2 opposite)**

Geographical variation in the risk of suffering injury is recognised anecdotally, but poorly characterised. The aim of this study was to explore the feasibility of using prehospital data and small-area geography to conduct a population-based analysis of geographical variation in the risk of injury in Scotland.

This was a secondary geospatial analysis of data from the GEOS study, described above. Data regarding incident location and injury severity were linked to small area ("datazone") administrative data, and analysed using geostatistical techniques.

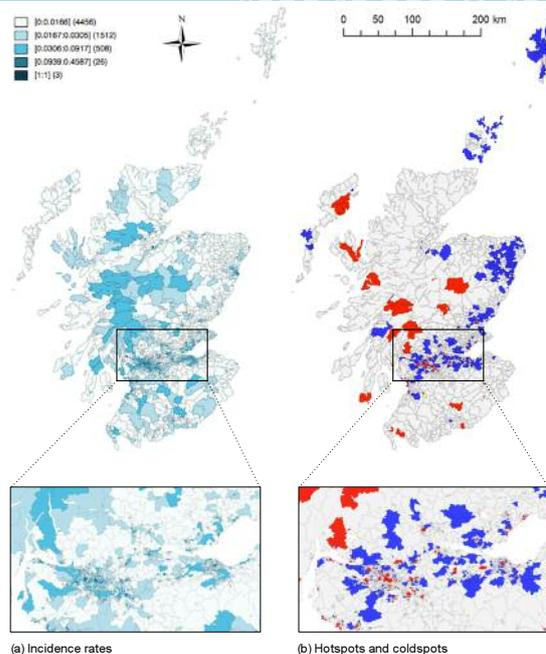
"Hotspots" and "coldspots" of risk were determined using the Getis-Ord\* statistic. 80,394 incidents requiring Scottish Ambulance Service attendance were documented, as previously reported. Overall, the risk of injury, of any severity, was low, in most of the datazones, but there were identifiable "hotspots" in the Scottish Highlands and some inner-city areas. "Coldspots" were situated within the central belt, the east coast of Scotland, and the islands of Orkney and Shetland. The results and statistical techniques were found to be susceptible to "zero inflation".

This study confirms the feasibility of combining prehospital data, collected by the ambulance service, with small geography administrative data to conduct population-based spatial analyses of incidence rates. Risk appears to be concentrated in identifiable locations. Risk differs from volume – trauma system configuration is determined by the latter, whereas identification of high-risk areas (which may not always be the same as high-volume areas) may help to address the causes of excess incidents.

**Summary and Conclusions** These examples demonstrate that there are many different ways in which spatial data can be used to develop an understanding of the geographical dimensions of medical datasets.

Although nearly all output from a GIS or GIS-based analysis results in a map, GIS also provides many geospatial tools and techniques to help spatially analyse medical datasets, e.g. to produce a surface using Kriging, or the use of cluster analysis to produce a map of hotspots. Furthermore, spatial data can be analysed using techniques from other disciplines. Network analysis often requires conflicting objectives to be considered, but conventional techniques frequently do not address this problem well. Multi-objective optimisation, pioneered in engineering and financial risk analysis, permits new insights.

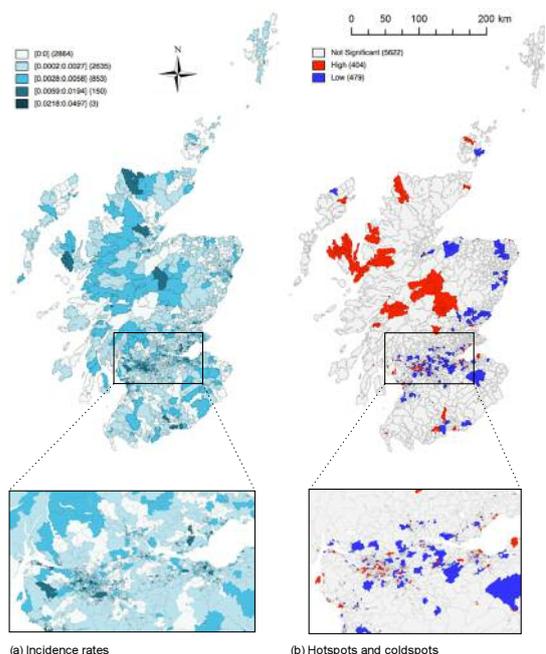
As desktop GIS, WebGIS, and mobile GIS technology continue to evolve there will be many new opportunities for individuals to capture environmental data using wearable technologies including miniaturised sensors, smart technologies and even phone apps, as well as being able to share information and to access publicly available information through the Internet.



(a) Incidence rates

(b) Hotspots and coldspots

**Above, Figure 1: Map of Scotland and detail maps (inset) of central belt areas, showing distribution of incidence rates per population (panel a), and hotspots (in red) and coldspots (in blue) (panel b), of patients requiring attendance by Scottish Ambulance Service between 1 July 2013 and 30 June 2014.**



(a) Incidence rates

(b) Hotspots and coldspots

**Above, Figure 2: Map of Scotland and detail maps (inset) of central belt areas, showing distribution of incidence rates per population (panel a), and hotspots (in red) and coldspots (in blue) (panel b), of patients requiring attendance by Scottish Ambulance Service between 1 July 2013 and 30 June 2014, that were notionally triaged to major trauma centre care.**

### About the principal authors

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**• In the next issue of GiSPro there will be examples of geographical mapping of Hepatitis C infection and the effects of proximity of high-density truck traffic near schools.**

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## 3D GIS viewer for hi-res realistic content



*A 3D textured Mesh model of Orlando automatically generated by Skyline PhotoMesh. PhotoMesh produces a photorealistic models that can be loaded in Skyline TerraExplorer for viewing and analysis in applications such as city planning and security. The images used to make the model are from a Dat'Air Octoblisque Midas camera system which has nine cameras, one nadir and eight oblique.*

TerraExplorer for Web is a "plug-in free" 3D GIS viewer that enables viewing high-resolution, stunningly realistic SkylineGlobe 3D content in a web browser. This latest addition to the TerraExplorer product line serves as a perfect complement to Skyline's powerful 3D GIS desktop and mobile applications, offering a simple, no-download, no-installation solution for online viewing and analysis of 3D environments.

Based on the Cesium open source 3D platform, TerraExplorer for Web has the capability to view imagery, elevation and KML layers. Spatial databases including 3D city layers and feature layers can be displayed and inspected using spatial analysis tools. The viewer integrates directly with the entire Skyline product line for easy access to all types of data – from photo-realistic, geographically accurate terrain databases created in Skyline TerraBuilder to high-resolution textured 3D mesh models created with Skyline PhotoMesh.

The viewer can seamlessly access online data from SkylineGlobe servers as well as OGC-compliant servers and can load online projects published with TerraExplorer Pro. Based on HTML5/WebGL standards, TerraExplorer for Web works on multiple platforms and browsers (Windows, Mac, Linux, select mobile devices, Chrome, Edge, Firefox, and more).

Based in the US with regional offices in the UK and Australia, Skyline Software Systems, Inc. is a leading provider of 3D earth visualization software and services. The SkylineGlobe software suite sets the standard for 3D desktop and web-based applications, enabling an enterprise to build, edit, navigate, query, and analyse realistic 3D environments, and rapidly and efficiently distribute them to users. 3D Datasets that cover entire countries can be served efficiently and swiftly to many hundreds of users using TerraGate Server. Applications include: Urban planning, Utility Network Management, such as vegetation management for power networks, Defence, mission planning and rehearsal and Facilities Management and Security. For more information about Skyline and TerraExplorer for Web, visit [www.skylinesoft.com](http://www.skylinesoft.com)

## IoT security scanner

An internet security vendor is claiming a world first with the launch of BullGuard IoT Scanner – a free tool for consumers which reveals connected devices that could be vulnerable to hackers. The scanner allows anyone to scan quickly to see if their smart devices or network are accessible to hackers. If a user's smart device is flagged as being vulnerable, details about the specific security issues are provided.

## Workload modelling with GIS

A new version of Cadcorp's SIS Workload Modeller, a resource planning and performance reporting tool, offers more realistic simulation modelling. Workload Modeller uses historic data about when and where incidents have occurred in a fire service, and relates this to the constraints under which the service has to operate. It enables exploration of the likely impact of making changes to resourcing strategies such as closing, relocating and merging stations, and changing the mix and location of vehicles.

Because simulation modelling is carried out against real historic performance data, analysts can be confident in the realism of outcomes: they are based on a service's own track records of performance. With the new release Cadcorp has endeavoured to build upon this realism, by incorporating new features and capabilities suggested by its users.

Workload Modeller uses GIS technology and algorithms not only in simulating outcomes but also in providing business intelligence tools to help analyse and investigate outcomes. To this end the new version includes more logging capabilities and more visual aids, such as Gantt-style charts

depicting the utilisation of appliances throughout the course of day.

## MobileMapper driven by DigiTerra

Spectra Precision's MobileMapper 300 smart antenna and the GIS software DigiTerra Explorer v7 now interface seamlessly, enabling the software to drive MobileMapper's GNSS receiver with advanced accuracy options which are scalable from mapping grade to full RTK accuracy. The antenna is designed for use in combination with a wide variety of mobile devices, including smart phones, tablets, and notebook computers. DigiTerra Explorer software offers mobile mapping, GIS data collection and maintenance as well as field-to-office workflows.

## Quick drone to map

As reported in the last issue ("Esri lights up the enterprise", page 18 *GiSPro* June 2016) Esri has now released Drone2Map for ArcGIS. This is a desktop app that allows people to process images from drones and to create imagery products quickly for mapping, analysis, and sharing across the ArcGIS platform.

## Automated data validity in the field

1Spatial has extended its offering with Esri to ArcGIS Collector. 1Integrate for ArcGIS, as part of Collector for ArcGIS, adds mobile capability for automated data validation and management for the ArcGIS platform, allowing organisations to assess the quality of data to ensure it meets defined specifications and is fit for purpose. It also performs rules-based data re-engineering tasks, such as cleaning data, transforming data or creating new data from existing data assets.

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May's GEO Business event in London saw the launch of a range of new technology solutions aimed at the geospatial sector. Of particular interest to *GiSPro* readers will be mass spatial data collectors for mapping and GIS applications.

### City mapping and point clouds

Leica Geosystems announced the world's first fused airborne sensor. The Leica CityMapper is part of the RealCity 3D reality capture solution, enabling capture and processing of imaging and LiDAR data in a single sensor. Leica also released TruView Global 2.0, a software integrating point cloud, 3D model and panoramic imagery to support multiple communities of users from a single installation.

### Sub-metre GNSS

A real-time sub-metre GNSS receiver from Juniper Systems was launched at May's GEO Business show. The Geode provides precise GNSS data and combines versatility with one-button simplicity and can be used with Juniper Systems' rugged handhelds or any

Windows, Windows Mobile, or Android device.

### OS and Cadline link for Infracworks

Cadline and the Ordnance Survey launched OS Model Builder at a workshop at the GEO Business event in May. Over 30 attendees heard about an application that will allow them to build 3D Models for Infracworks using Ordnance Survey data. OS Model Builder is a visualisation tool that can support projects, including Level 2 BIM activities, and could save the construction industry and its clients' time and money when planning future projects. The tool is the result of a collaboration between Cadline and OS to provide Autodesk Infracworks 360 customers with a single source of Great Britain's most accurate and up-to-date collection of geographic data.

### Robin bobs in below 10 kgs

3D Laser Mapping launched its Robin mobile mapping system at GeoBusiness. Weighing less than 10kg for the Walk/Drive set up and less than 6kg for the Fly set up, the Robin mobile mapping system can also be transported easily in one portable flight case.

*Below: a GEOBusiness visitor carefully inspects Riegl's new Robin mobile mapping system.*



## Leica's Georadar Portfolio



Leica Geosystems has established a georadar portfolio with three releases to provide applications in utility mapping, asset detection and mapping, and monitoring.

The Leica DS2000 utility detection radar identifies all potential underground threats, including plastic, all non-conductive pipes and fibre optics. Data is collected with dual-frequency antennae that locate deep and shallow targets simultaneously. With or without GPS, utility location can be accomplished onsite without post processing.

The new radar technology has also been added to Leica's GeoMoS monitoring software. By combining GeoMoS with IDS Guardian software, the gaps between prisms on monitoring projects of landslides, mines or infrastructure are now also detected for fast movement. Risk managers can carry out their tasks with complete confidence, knowing all movement of surfaces is monitored by the two technologies.

The Leica Pegasus:Stream combines laser scanning and images above with ground penetrating radar below to accurately capture the complete view of a targeted area. This mass digitisation of infrastructure assets, such as telephone cabinets above and cable conduits below, are collected in less time without needing to stop traffic, increasing the safety of users. The Pegasus:Stream has the potential to collect up to 100 km per day at 15 km/hr, providing digital documentation for GIS and CAD modelling.



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## | seminars | conferences | exhibitions | courses | events | workshops | symposiums |

We welcome advance details of conferences, seminars, exhibitions and other events which are likely to be of interest to the GIS community. Please mention the name of the event, venue, date and point of contact for further information and send to Jason Poole *GISPro*, 2B North Road, Stevenage, Herts SG1 4AT or e-mail: [jason@pvpubs.demon.co.uk](mailto:jason@pvpubs.demon.co.uk).

## SEPTEMBER 2016

**RSPSoc 2016****5-8th September 2016, Nottingham, UK**[www.rspsoc.org.uk/index.php/rspsoc-events/rspsoc2016.html](http://www.rspsoc.org.uk/index.php/rspsoc-events/rspsoc2016.html)**BCS - SoC Conference 2016****6-8th September 2016, Cheltenham, UK**[www.cartography.org.uk/default.asp?contentID=581](http://www.cartography.org.uk/default.asp?contentID=581)**InterDrone****7-9th September 2016, Paris Hotel, Las Vegas, USA**[www.interdrone.com](http://www.interdrone.com)**Inspire Conference 2016****26-30th September 2016, Barcelona, Spain**[http://inspire.ec.europa.eu/events/conferences/inspire\\_2016](http://inspire.ec.europa.eu/events/conferences/inspire_2016)

## OCTOBER 2016

**Intergeo 2016****11-13th October 2016, Hamburg, Germany**[www.intergeo.de/intergeo-en/index.php](http://www.intergeo.de/intergeo-en/index.php)**GeoDATA 2016 Brussels****19th October 2016, Brussels, Belgium**[www.geoaware.info/#!geodata-seminars/c23xn](http://www.geoaware.info/#!geodata-seminars/c23xn)**The Commercial UAV Show 2016****19-20th October 2016, London, UK**[www.terrapinn.com/exhibition/the-commercial-uav-show/index.stm](http://www.terrapinn.com/exhibition/the-commercial-uav-show/index.stm)**GIS-Pro 2016: URISA's 54th Annual Conference****31 October-3rd November 2016, Toronto, Canada**[www.urisa.org/education-events/gis-pro-2016-urisa-s-54th-annual-conference/](http://www.urisa.org/education-events/gis-pro-2016-urisa-s-54th-annual-conference/)

## OCTOBER 2016

**GeoDATA Showcase 2016 Scotland****6th October 2016, Assembly Rooms, Edinburgh, Scotland**[www.geoaware.info/#!geodata-seminars/c23xn](http://www.geoaware.info/#!geodata-seminars/c23xn)

## NOVEMBER 2016

**Trimble Dimensions 2016 User Conference****7-9th November 2016, The Venetian, Las Vegas, USA**[www.trimbledimensions.com/](http://www.trimbledimensions.com/)

# AGI Foresight Report 2020



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The AGI Foresight Report 2020 gives insight into the issues we believe will have a significant impact on our economy, environment and society over the next five years. The purpose of the Report is to both observe and challenge the current role of Geographic Information (GI) in relation to these issues.

The Report highlights five key themes that are of relevance, not only to the GI industry, but to anyone with a vested interest in how technology and information will change our world and businesses in the next five years. These five themes - Open, Big Data, BIM and Future Cities, Innovative Technologies and Policy - form the backbone of our Report, bringing together papers from experts across industries and disciplines.

They show that the GI community can, and must, play a big part in helping us to understand and maximise benefits from these areas, and meet head on the challenges and opportunities the next five years will bring.

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