



# IMAGE

## & INFORMATION

### **UKMap is Launched**

UK's latest large scale mapping unveiled

### **How Accurate is UKMap?**

Tackling issues of data quality

### **From Air Photo to Map**

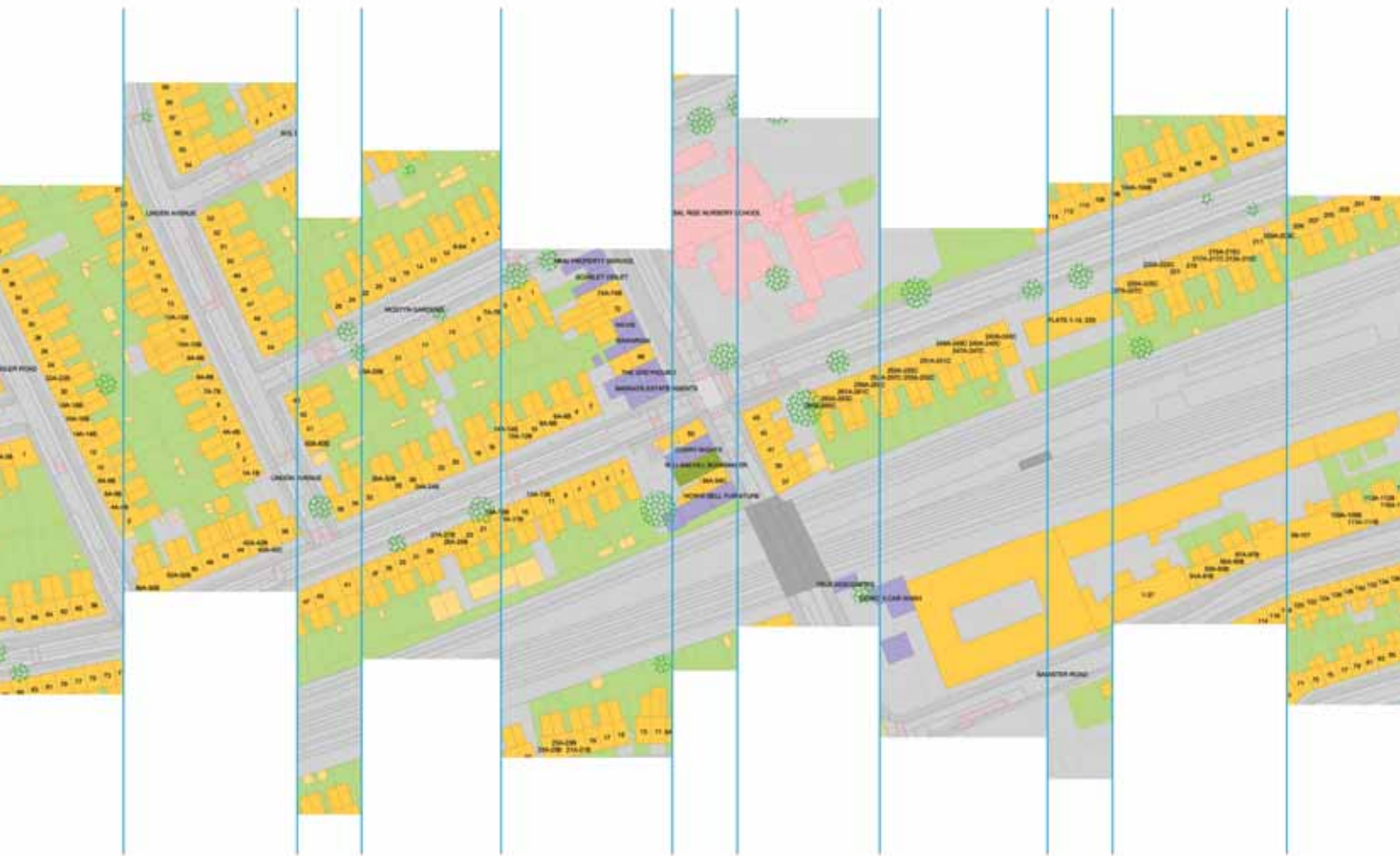
A behind the scenes look at UKMap's creation

### **Life as a Field Worker**

The highs and lows of data gathering

## **UKMap Launch Edition**

New mapping for the UK



# UKMap<sup>®</sup>

## Mapping your way

UKMap is a modern, highly detailed and feature rich mapping database. Its innovative design offers users a flexible choice of integrated map layers within a single product. Based on 1:1,000 scale topographic mapping, UKMap accurately locates buildings, garages, property boundaries, roads, trees and a multitude of other features.

It comprises addresses, a retail database including above ground usage, building heights, a wide range of points of interest as well as aerial photography and digital terrain model. All this, plus the added benefit of freedom from Ordnance Survey<sup>®</sup> copyright makes UKMap the map of choice for a wide range of organisations and business applications.

To discover more and to request a sample go to [www.theukmap.co.uk](http://www.theukmap.co.uk) or call **01223 880077**.



The Geoinformation Group

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# Why UKMap?



It is always difficult to make claims of being the first or of being unique; someone can always contradict you. However, those of us who have been working on the UKMap Project over the last couple of years believe that it is the first commercially-created, large scale mapping database of the UK that brings together topographic mapping, imagery, three dimensional data, address information and points of interest.

There will no doubt be small project areas that have been completed, but we are fairly certain no one has ever attempted this for areas the size and complexity of UK's cities.

The UKMap Topo Base layer for London alone is some 14 million polygons, with a possible 38 attribute fields per polygon, generating a database of over 140 million pieces of information.

So why do it? There is after all an existing product suite that does this already.

The answer is partly because we can. Technology allows us to create such data more cost effectively than ever before and therefore not only can we do it but we can also do it at a cost that makes it commercially viable.

It is also more that that. We passionately believe everyone should have a choice, be that the type of car you buy, the supermarket you shop in or the colour you paint your house. Until now there has been no choice for large scale mapping.

There is more than one way to generate and maintain such a map base and there is no reason why users should not be able to use the mapping that best suits their needs. Choice, and therefore competition, brings benefits to everyone – different options for licensing, publishing and maintaining data or different ways of combining commercially-sourced base mapping with your own data.

And London is only the start. At the time of going to press funding is in place for the next cities, which, subject to flying, will be the West Midlands and Liverpool/Manchester, closely followed by West and South Yorkshire, Tyneside and Bristol.

Our plan is to complete some 24,000 square kilometres of England, Scotland and Wales covering all the urban populations of

over 10,000 and their urban/rural fringe out to the local authority extents, by 2014. That is about 45% of the population.

We believe that UKMap is revolutionary. The amount of information together with the quality of the mapping provided in the single product – UKMap Topo – is unrivalled. As a consequence, what you can do with it is truly amazing. Combining the various attribute fields in new and creative ways to answer ever more complex questions will make you rethink the way you have worked in the past.

Finally, we should thank all those who have contributed so much to the development of the UKMap specification and production processes with their advice, comments and critique. This includes all those who were on the UKMap Forum that, for nearly two years, provided invaluable input into the planning and pilot data gathering exercises. It also includes key commercial partners who have supported us and challenged us, helping to create a much better product.

Please read through this issue of Image & Information, specially written for the launch of UKMap. Hopefully it will answer many of your initial questions, but I'm sure it will raise others. Some of the answers may be found on the website [www.theukmap.co.uk](http://www.theukmap.co.uk) or alternatively call us and we will be more than pleased to talk through the issues and provide you with sample data to test.



If you are not going to be at our launch in June, come along to one of our GeoDATA seminars that are happening around the UK this summer or see us at the AGI event and other shows throughout the autumn.

Seppe Cassettari  
CEO  
June 2009

## UKMap Launches UKMap Training

To support the investment made by users in UKMap, The GeoInformation Group's training division, Training4GIS, has launched its UKMap training programme. The new programme has been designed by Fiona Cocks, who has created geospatial training courses for the past 15 years for government departments and commercial companies throughout the world. Fiona is a Chartered Geographer and Accredited Ordnance Survey® Data consultant and brings a wealth of experience to the new programme.

The UKMap programme is a must for all those serious about realising their investment in UKMap. With so much new and exciting geospatial data inside UKMap this training course will bring immediate benefits to users. Priced at £250 per person per day the course will be packed with information on how to get the most out of the many layers of UKMap. Users will also have the chance to meet the team and learn about future development for UKMap.

Further information about the UKMap training programme and its content can be found on page 18

## A Starring Role

STAR-APIC®, one of the world's best-known GIS and cartographic database companies has signed up as the UKMap's Primary Technology Partner. The agreement will see STAR-APIC provide strategic and operational support for the hosting of UKMap data in Oracle®.

The agreement includes the commitment by STAR-APIC to offer a WMS and WFS service from the core Oracle version of the UKMap database. The service will also include the delivery of all maintenance updates of the UKMap database in a range of formats, including Oracle®, Autodesk®, MapInfo® and ESRI®.

Dr Seppe Cassettari, CEO, commented "We are delighted to be working with STAR-APIC, a company that brings so much expertise and commitment to the UKMap project."

Tom Timms, UK Director of STAR-APIC, remarked, "We are very pleased to be working with The GeoInformation Group and to be chosen as the strategic technology partner to host and distribute UKMap data. Their expertise and reputation for data production and ours in data management, publication and distribution complement each other perfectly. I believe that UKMap will bring significant benefits to both the GI community and to the general public."

## Mapping Brent

London Borough of Brent has become the first public authority in the UK to implement UKMap. The London Borough of Brent has signed up to a corporate licence for a three year term and chose UKMap to provide key location and base map data for a number of its core applications including planning, environment and transportation.

Savings have already been identified in the first year making the purchase of UKMap cost neutral. The Council has invested in UKMap in addition to their existing Ordnance Survey® mapping, and

provides a number of new features, such as road markings, residential outbuildings, 3D buildings, trees and retail information.

London Borough of Brent plans to incorporate the location information from UKMap with their Local Land and Property Gazetteer to further enhance their public services through web-based applications.

Alisdair Maclean, GIS Manager for the Council, said, "This product represents a revolution in mapping and brings the provision of large scale mapping in the UK into the 21st Century".

## Autodesk Xplores with UKMap



built in 3D component, giving a basic 3D structure to the ground and all the buildings.

A simple enhancement by The GeoInformation Group has now added additional roof detail and tree heights using stereo aerial photography. This demonstrates the power and speed offered by UKMap for architects, planners and software developers looking to create 3D applications.

Lynda Sharkey, Autodesk, commented, "It was a huge benefit to the LandXplorer launch knowing that we had a comprehensive, sample map base we could rely on, and distribute to our customers and partners. We look forward to future developments using UKMap".

Autodesk has also based its "Getting Started Guide" for Autodesk LandXplorer Studio Professional exercises on the UKMap Base data which is available for download from their website.

Autodesk has chosen UKMap to support the worldwide launch of its very latest 3D mapping product, LandXplorer Studio™. Designed to create and manage 3D city models, Autodesk LandXplorer required a highly accurate and realistic 3D city model to incorporate in their latest product.

UKMap with its accurate and detailed 2D building footprints, trees, road outlines and general land use provided the perfect base. An added bonus for Autodesk was the

## Going 3D with Lattico

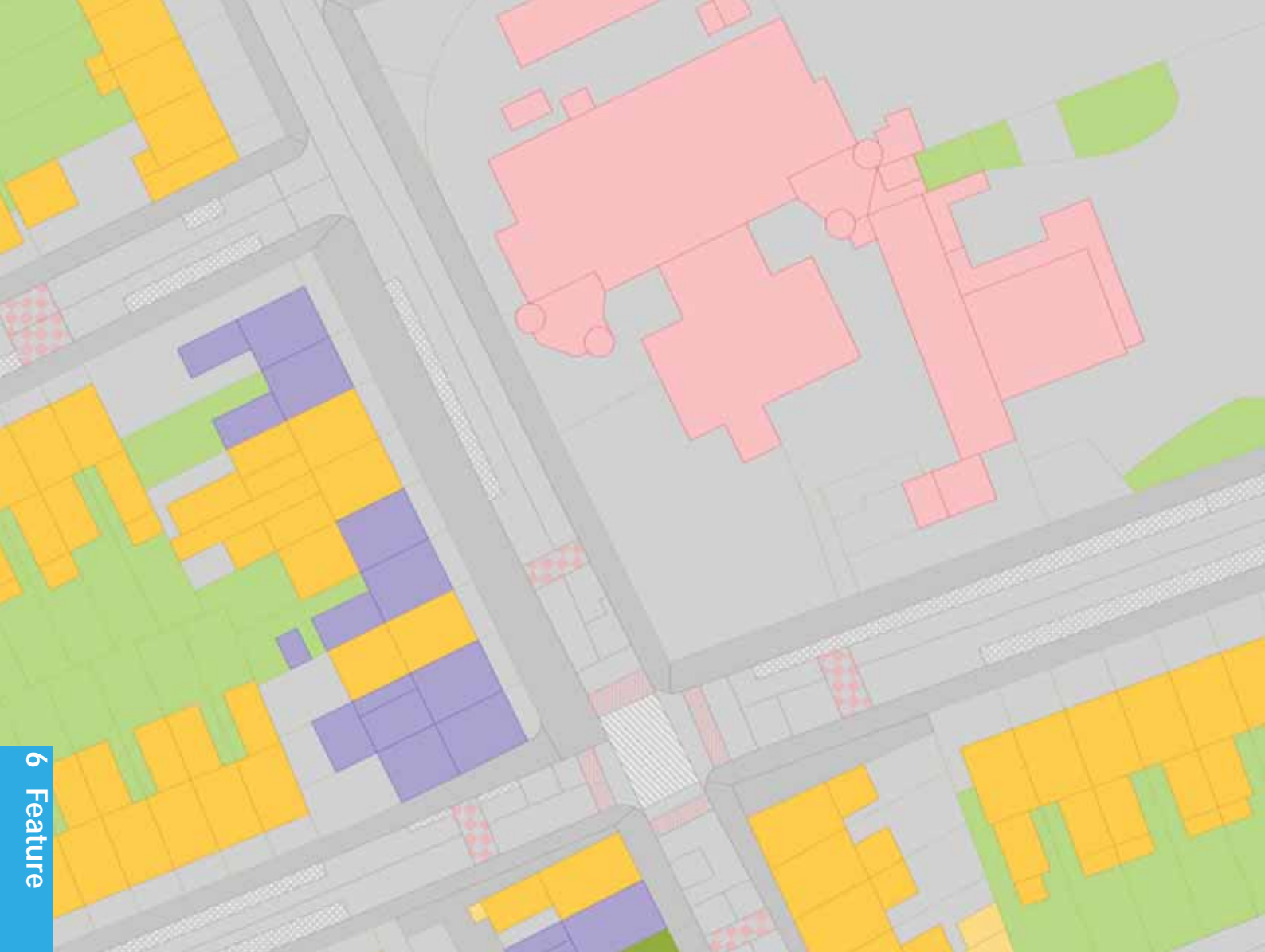
Lattico, an internationally recognised 3D modelling company, is the first to



experience the benefits of UKMap. Lattico produces high quality, detailed 3D models for the architectural community. However, they recognise the difficulties faced by many of their clients when it comes to getting an accurate mapping base on which they can create their 3D models.

Using UKMap and its aerial photography Lattico is able to offer their clients accurate 3D products and a new fully referenced mapping base complete with addresses, points of interest and street names.

All this makes for a much-improved product and mapping experience not only for Lattico but also for their customers.



# What is UKMap?

UKMap is a modern, highly detailed and feature rich mapping database. Its convenient design offers users a flexible choice of integrated map layers within a single geographic information source. Based on 1:1,000 scale topographic mapping, UKMap accurately locates buildings, garages, property boundaries, roads, trees and a multitude of other features. What's more, it comprises addresses, a retail database including above ground usage, building heights, a wide range of places of interest as well as aerial photography and digital terrain model layers. All this, plus its straightforward licensing options make UKMap the map of choice across a wide range of business applications and organisations.

## The conception of UKMap

It was one of those coincidences that it would be difficult to plan for.

The idea of creating a new, large scale mapping database had been a point of discussion between Alun, co-founder of The GeoInformation Group, and myself for a number of years and we had made a commitment to put the concept into practice when the time was right.

The idea of a commercially funded, large scale mapping database seemed the logical next step after the development of the Image to Information products (land use, building class, building heights and more recently the ground sealing and pluvial flood modelling). These products were derived, in large part at least, by photo interpretation from our GPS controlled Cities Revealed™ imagery base, and this source would be the basis of any new mapping

product. But it needed something to kick-start the programme.

## Kick starting the programme

That something came in the form of two very different expressions of interest in new large-scale mapping. The first was from a local authority, not in the UK but in France. One of the new towns around Paris wished to create their own mapping base at a scale greater than the standard 1:4,000 BDTopo created by the national mapping agency, IGN, which would contain additional information such as land use, and which would be more current than was then available.

In 2005, the first large scale database for an area of 120 square kilometres was specified and created. It incorporated all the ground features you might expect, including buildings, road detail and rural features as well as a land use classification. The dataset was hugely innovative, and probably knowing what we do now, it needed more time in the design stage so that everyone involved could weigh up the benefits and the implementation problems which come from creating a brand new mapping specification. What it did do was teach us all a great deal about what was possible.

Not long after this project was started, a UK utility tendered for a new mapping product, with the idea of replacing their existing map base within their asset management system. This was for a large area - tens of thousands of square kilometres of urban and rural England. The level of mapping detail required was consistent with what they already had for their urban areas but included more detail



UKMap Base

in the countryside. They also wanted a range of features not available on the standard products.

In the end the project did not proceed, due in no small part to the business risk the utility would be facing if they embarked on creating a new mapping base from scratch. But the decision not to proceed was only taken after an extensive period of creating a specification and undertaking a pilot. This proved to be a very valuable testing ground for our ideas.

These two initiatives lit the fuse of the UKMap project. They identified a clear need for alternative products and allowed us to develop and test a basic product and to evaluate some of the problems a full production process would encounter.

#### Committing to the programme

From these early beginnings we committed ourselves to developing a full mapping specification. The first draft was circulated internally in June 2007 and its development was accompanied by small scale pilots in areas such as Bexleyheath and High Barnet in London. This process raised many questions, which were resolved into the first full version of the UKMap Specification in November 2007.

#### The UKMap forum

We established a group of experienced map professionals from local government and emergency services, known as the UKMap Forum 2007. Their advice, comment and thoughts have been invaluable in helping steer the development of UKMap. Based on their responses we felt confident we were on the right path and decided to embark on a full pilot programme.

During the last quarter of 2007, a commercial partner became involved in the development of UKMap. Their experience in handling large data volumes and assessing accuracy and quality within a variety of datasets was brought to bear on making pilot processes as robust and consistent as possible.

#### Completing the pilots

By February 2008 the first full pilots for three areas within London were completed - a largely residential area and a commercial centre within the London Borough of Brent and the nearest example of a rural area we could find - RAF Northolt. These pilots covered some 30 square kilometres and threw up a series of production problems that had to be resolved.

Early in 2008 we sat down to make the biggest decision in the company's history. The funds were in place and we were convinced the product was right. The UKMap project got the approval we all wanted to go ahead. We established and trained two production teams; one in India and one in South Africa; we recruited a fieldwork team.....then it was down to the hard work of creating the first city, London. And so UKMap was born.

It will be for others, with the advantage of hindsight, to judge the importance of UKMap to the geospatial community, but we certainly believe now is the time for the commercial sector to play a role in creating large scale mapping databases that meet the ever-changing, and ever more demanding, needs of the twenty first century.



Pilot data for a UK utility

# The UKMap Product Suite

## The UKMap Product Suite

The UKMap was conceived as a feature-rich database that can be the basis for the widest possible range of geographic information applications. The structure is intended to provide the flexibility necessary for today's GIS user as well as being a mapping solution for the future.

The UKMap product suite divides into two groups:

- UKMap Topo: the large scale mapping base with associated attribution and raster data;
- UKMap Thematic: the smaller scale products derived in part from UKMap Topo.

The launch of UKMap is accompanied by the first UKMap Topo product that covers London and is supported by one of the derived smaller scales from the UKMap Thematic suite of products.

## UKMap Topo

The UKMap Topo suite of products consists of vector layers, attribute tables, ortho imagery and a digital terrain model (DTM). The components of UKMap Topo are as follows:

- UKMap Topo Base
- UKMap Topo Overlay
- UKMap Topo Points
- UKMap Topo Address
- UKMap Topo POI (Points of Interest)
- UKMap Topo Heights
- UKMap Topo Ortho
- UKMap Topo Terrain

All these components are supplied as part of a standard package when you purchase UKMap Topo.

## UKMap Topo Base

This is a vector map layer consisting only of polygons. It is designed to be a continuous map layer with no overlaps and no gaps and is best displayed at a scale of 1:1,000, (although it looks very good at much larger scales).



Building with different height elements

Base contains detail of buildings, including sub divisions based on different height elements, and sub divisions, based on inferred ownership or usage.

It also contains a large amount of detail for the road network, including pavements, individual lanes where marked and features such as speed humps, traffic islands, roundabouts, no parking areas, bus stops and Keep Clear Zones.



Road detail

Base includes the railway network, rivers and canals, bridges, vegetated areas, paths, playgrounds, woodlands and monuments. In residential areas it includes garages, sheds and swimming pools and differentiates between front and back gardens. In fact, it contains a wealth of detail, some of it not previously mapped.

The Base layer contains its own unique attribution that can be used to interrogate the richness of the mapping. This attribution is termed the Unique Classification Code (UCC) and is a 30 digit reference number that contains the following information:

- Unique feature reference number
- Feature Type Classification
- Land use classification
- Source of the information
- Date of collection or update

The Feature Type Classification (FTC) is a simple classification of each polygon into buildings, man-made surfaces, other man-made structures, vegetation, or water.

The land use classification is more complex. Called the Feature Classification Code (FCC), it is a four level hierarchy of land use codes based on the National Land Use Database (NLUD) Specification 4.4, trimmed to fit mapping of this scale but with extra codes to reflect the detail in the Base layer.

For example, the NLUD code for roads is '22 01 05', to which we have added a fourth level to represent the bus stops, speed humps or other features. This means it is possible to interrogate the Base layer

and define all the areas related to Transport (Code 22), or down to all the areas classed as Roads (Code 22 01 05) or to select all the speed humps (Code 22 01 05 17).

The power of a four level hierarchy is that the user can be as generalised or as specific as they wish in their feature definition and subsequent mapping.

However, the real power of the UKMap specification comes when the land use (FCC) is combined with the feature type (FTC). This means it is possible to define residential areas (FCC code 19 01 02 00), highlight sheds that have their own FCC codes (19 01 02 09), and also distinguish between vegetated back gardens and paved over front gardens based on the FTC.



Residential detail

There are about 270 land use codes that are used in UKMap, but when combined with the feature type code there are over 1250 possible classification combinations.

The Base layer is supplied in the form of 'hairy chunks', which means we do not cut polygons, so we can maintain the integrity of the of the UCC.

What we try to do is minimise the length of polygons or prevent the creation of large doughnut-shaped polygons. We do this in particular for pavements by splitting them at street corners. This is one of three types of line within the Base layer that does not represent a feature on the ground. The others are lines marking the extent of white lines along roads and the other is splitting front and back gardens where no fence exists.

### UKMap Topo Overlay

So much for the richness of the Base layer, but there are features that are difficult to show on the Base layer and still maintain the concept of a continuous layer with no overlaps or gaps. These are termed as 'overlapping' and are defined as features that do not touch the ground but overlap features on the ground. Examples include a polygon that represents the canopy of a tree or a polygon that represents the extent of a power line.

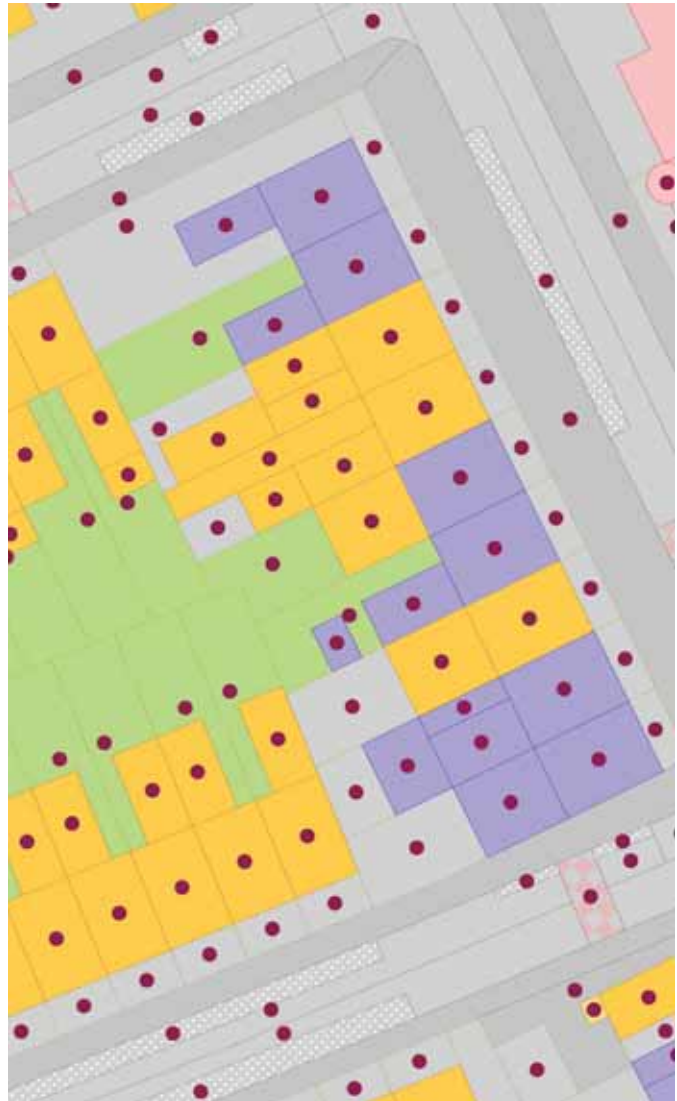
So, UKMap Topo contains a second vector layer that is also only made up of polygons – UKMap Topo Overlay. This layer is not continuous but includes features that cannot be well represented on the Base layer. Single trees, power lines, raised walkways and the floors above ground level of retail centres are the most common examples. Bridges are always shown on the Base layer.

### UKMap Topo Points

To compliment the two polygon layers there is a Points layer. This contains a point for every polygon in the Base and Overlay layers as well as a few points for features that do not have a geographic entity that can be mapped, for example, a location for a place name.

It can be used as the key reference layer, linking polygons to the various attribute tables, as we shall see below.

Each point that links to a polygon has the same Unique Classification Code (UCC), except for a single number, which indicates it is a point rather than a polygon. This means it is easy to use as a cross-reference source.



Point data

However, you do not have to go through the points layer. Attributes can be linked directly to the polygons through the UCC; a short cut designed to help those who wish to combine the attributes with the polygons.

### Attributes

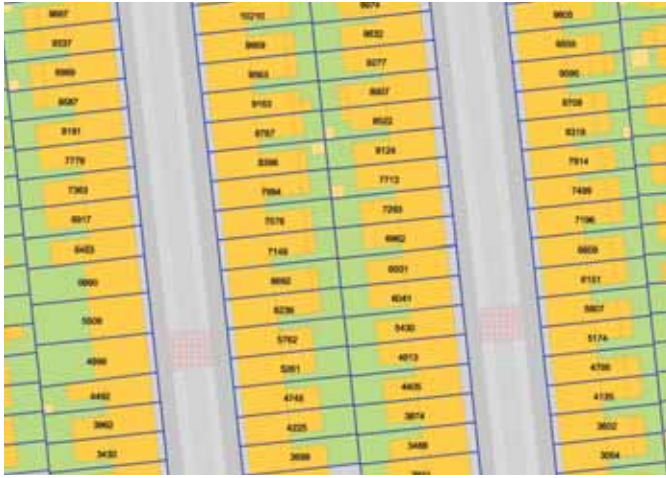
There are three groups of attributes in addition to those built into the UCC. These are address information, points of interest and building heights.

### UKMap Topo Address

The address information divides into two tables. The first is a table that links an address reference number to one or more polygons that form the feature to which the address relates using the UCC.

This means that it is possible to link all the components of a house, the front and back gardens, garage and shed to a single address reference. This is an inferred Basic Land and Property Unit (BLPU) reference, but has no legal basis and is not related to any other records.

Each address can be linked to several polygons and because there can be several addresses to a group of polygons that make up a building (such as several flats in a building), this can be a many-to-many relationship. This means that each polygon that has an address associated with it (and not all do, such as roads or railways) has a BPLU reference number. Several polygons may have the same BPLU number.



UKMap BPLU reference numbers

The BPLU reference numbers used in UKMap are simple unique numbers, and do not relate to any existing BPLU classifications.

The second table links the BPLU reference to an address, so that the address information can be attached to all the relevant polygons.

The address information that has been collected is broadly compatible with the BS6667 standard. It contains; address ranges (including numbers and letter suffixes) building names where no number exists, and in the event there is neither number nor building name then an occupier's name. This last case is common in some industrial or commercial areas. The address also contains a primary road name, a secondary road name (where this is appropriate), area name and postcode.

The postcode is from the Post Office, but all the other address information has been collected for the UKMap database.

The address list contains three types of address record. The first is the simple type, where groups of polygons have a single address. The second is the range, where a group of polygons have a range of addresses, such as 36A – 36D or Flats 1 – 10. This is retained so it can be used for cartographic display of just the range, avoiding the problem of overlapping address records.

The third type is the expanded address where each address in a range is converted into an individual address record, thereby creating a full address listing or gazetteer. So in the range example of 36A – 36D, it means there would be four expanded address records for 36A, 36B, 36C and 36D.

The combination of the inferred BPLU reference number and the three types of addresses means there is great flexibility in handling the address data provided with UKMap. The address data clearly enhances the richness of the Base and Overlay layers.

### UKMap Topo POI

In addition to the address data, UKMap contains a lot of information about features that might be of interest to users. These are held as attributes in the Points of Interest (POI) Table. Unlike addresses, POIs are linked to a single reference point that can be used as the location for a label, or related to the corresponding polygon in the Base layer. The only exceptions to this are names that have a point but no corresponding polygon.

POIs include various names, especially road names, places of interest including tourist, cultural, governmental, educational and religious sites, recreational areas and retail areas.

Each POI is classified based on the general type. For example, the retail POI is class 18.

Each POI has a name and where this does not make it clear what the POI is, it also includes a short description.

In the case of retail POIs, there is some additional information. The name is the shop name and instead of there being a description there is a retail classification code, which breaks down into two layers. For example, a shop called Dewhursts would be classified as a Food shop and then a Butcher's shop (Code 01 06).

In addition to the retail classification there is also information held on the use of the building above the retail ground floor. This is recorded for up to five floors and will classify use into retail (R), office (O), residential (H), or vacant (V). So a shop with an office and two floors of flats above will have the code R O H H.



Retail area with POI labels

The retail POIs are revisited every 12 months in order to keep them up to date.

The other piece of additional information is related to road names that have a cartographic angle field, which indicates the angle at which the road name should be displayed in order to be parallel to the road. This is an aid to improve cartographic display.

### UKMap Topo Heights

The final attribute table is information about the height of buildings above the ground. The ground height above datum is derived from the terrain data and is given as a value for each building element. Added to this is a value for the height of the top of the building above datum and also the calculated height of the building above the ground.

The building elements are intended to give a reasonable three-dimensional representation of the structure and so a building is divided if the height difference between two parts is more than a storey or about three metres.

There is a minimum size for such areas of five metres by five metres, but features such as conservatories (which are smaller than this) may be differentiated. In very complex buildings the height elements are generalised to give an overall impression of a structure.



Building classified by height

#### UKMap Topo Ortho

The UKMap Topo product is enhanced with a mosaiced version of the ortho imagery used as the principle source for the mapping.

The imagery is generally 10 to 12.5cm resolution, and has been collected using a digital aerial survey camera. It is processed using the terrain data to have a target accuracy of +/-1 metre.

All the imagery used in the ortho layer is flown in the summer, to give a strong, bright colour. In some areas winter imagery is also collected to aid the data collection.

The imagery is usually supplied as MrSID compressed files or JPEG square kilometre tiles.



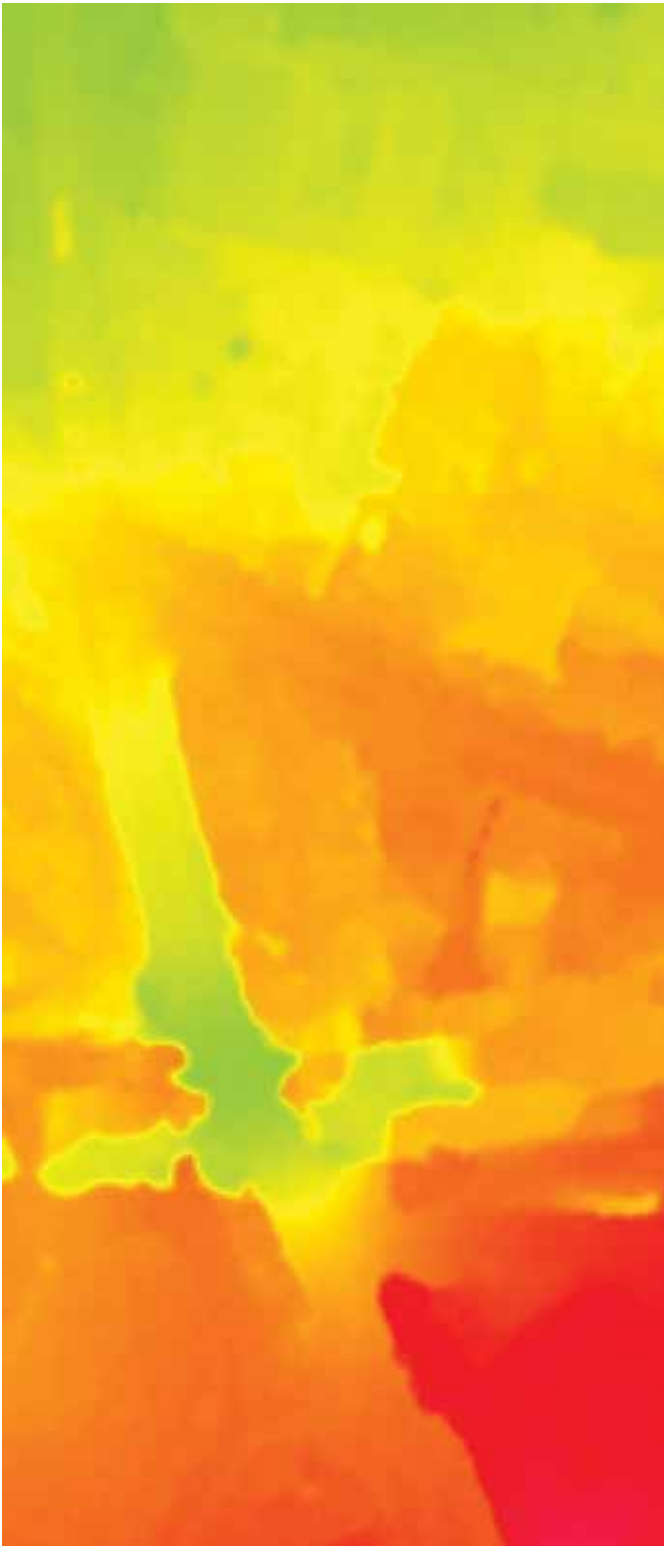
Ortho photo

#### UKMap Topo Terrain

The last component of the Topo suite is the Terrain layer. This is derived from a one metre LiDAR survey. The surface model from the survey is processed to generate a Digital Terrain Model (DTM).

The Terrain layer is supplied as a five metre postings layer with a target height accuracy of +/-1 metre. The data is usually supplied in IMG format.

The Terrain layer can be added to the building polygons and their height attributes to create high quality, three dimensional models of large areas, effectively and accurately.



Terrain data

### UKMap Thematic

The UKMap programme envisages a number of map layers that are derived from the Topo components. These include smaller scale map products at 1:5,000, 1:25,000 and 1:100,000, together with a transport network layer and possibly a boundary layer.

For the launch of UKMap only one of these derived products has been specified and created - the 1:5,000 map layer, called Thematic 5k. This is created simply by dissolving some of the features in the Topo Base layer to give a simpler definition of features. For example, building splits and garden splits are removed and much of the road detail is also taken out. Selected annotations from the POI table are added to the map to provide context, including the road names.

The Thematic 5k layer is intended to be used as the default web-mapping layer for those who wish to put their own information on the web but have a UKMap backdrop to give context.

Due to this, Thematic 5k is supplied as a polygonised vector dataset and also as a raster layer to which the annotations can be added as required.

Thematic 5k comes as a standard component when you purchase the UKMap Topo product.



1:5,000 scale Thematic layer

### Future Developments

The UKMap product suite is designed to be a dynamic product that can be enhanced and developed as users identify different requirements.

There have already been discussions about two further products for the UKMap Topo suite. The first has been dubbed the 'underlay' layer and as the name suggests would be the underground equivalent of the Overlay layer. It would show features such as rail tunnels, underground rivers, basement retail areas and the location of utilities. This is still very much at the drawing board stage but the idea is to include depth information so that it can be used to create underground three-dimensional data.

The second idea is a little further advanced and is the development of an annotations layer with details about feature layout, font styling and orientation. This is being developed with one of our partners and we are hoping to release it towards the end of 2009.

The richness of the information within UKMap is bound to spark new ideas for adding further information. It is one of the strengths of UKMap that it can be adapted and developed as the geospatial market place changes.



# Updates and Maintenance

The UKMap programme is planned to keep on going. We know that maintaining and updating the database is an essential part of the commercial success.

In order to do this, there are two problems we have to address. The first is finding out about a change and the second is collecting the information to update the mapping or tables.

We also know that no matter how careful we are in the compilation process there will be mistakes and errors. In a database of some 14 million polygons and nearly 120 million different attributes, even a 0.1% error rate would mean one in a 1000 errors.

What we want to do is find out about them and correct them as quickly as we can.

## Change Partners

To do this we have set up a process whereby users can sign up to be 'Change Partners', and get a discount on their licence fees at the same time. As a Change Partner you agree to inform us of either errors that exist in the database or changes that you have come across.

You do this through a security protected website, so once you have logged in you can annotate a map or aerial image, or change an attribute field and then submit this to our Maintenance Manager.



They will respond to you giving information about how we intend to deal with your information, including a planned timeframe for the change. You can continue to monitor all the errors and changes you have reported to see we are making progress with keeping UKMap up to date.

## Tri Monthly Updates

We will be sending a fully revised database to clients who have purchased on-(going licences every three months; no change-only updates, just a full resupply.

Each resupply will be accompanied by a reference table detailing which features have been edited or changed (either the linework or the attributes) and which are the new ones.

Whenever a point or polygon is altered it is replaced. If the line

work is changed, then any adjacent polygons are also replaced. If only an attribute is changed then just that point or polygon will change.

All polygons or points that are changed will be issued with a new Geographic Type Number (GTN), the unique number for every map feature.

Whenever a change takes place the source of the change is updated and the date of the change is also recorded. These are part of the Unique Classification Code (UCC).

This means you will always be able to recreate prior versions of your map base. And if you don't keep the earlier versions, we most certainly will, so recreating the historical sequence will always be possible.

## Change Process

For errors or mistakes that are reported we will check back with our field sheets. If the error is a compilation error, we will make the change and resupply the corrected information in the next update.

If the field sheet is wrong we will check the reported error when we next pass through the area. As we intend to check all retail areas every 12 months we will be passing through each area within that timeframe.

We will not just update the information based on a Change Partner report without verifying it in the field.

If the error is a digitising error we will check against the imagery and correct if we can for the next update.

Where the reported error is really a change because the imagery source was out of date or there has been a recent alteration, we will have to decide how significant the change is. We could undertake a small field survey, we may fly a one off survey to capture an image of the area or we may just wait until the next full aerial survey.

We plan to re-fly the whole area at least once every three years. In the case of London the plan is once every two years, probably with half of the city each year, but this will be subject to weather and air traffic restrictions.

When a full re-fly has been completed we will undertake a full review of the database looking for change, so we can update recent conservatories or extensions, new garden sheds, cycle lanes or roundabouts, etc.

As part of our planning process we will publish the planned update schedule for each production block, so you can keep informed about progress and let us know if you think we need to do something else. We'll do our best to respond!



# Mapping, Mapping Everywhere. So why UKMap?

*Alun Jones reveals the secrets behind the early development of UKMap and how GIS professionals from a range of market sectors have been instrumental in helping shape UKMap.*

13 September 2007 marked a significant day in the development of UKMap. It was the first meeting of the UKMap Forum; this event was significant as it started the process of professional user involvement in the product design.

From the outset, The GeoInformation Group decided it wanted user input into the very key decisions it was taking about the creation of UKMap. From data formats, features to be collected even to the licence conditions for users, the UKMap User Forum was consulted and their feedback became very important to the UKMap team.

The Forum comprised of GIS professionals (primarily from the public sector) and members were chosen for their experience in using a range of geographic mapping data in a wide range of application areas. The Forum consisted of; Gareth Baker, Greater



Alun Jones,  
Managing Director

London Authority, Brian Higgs, Dudley MDC, James Rutter, Surrey Heath DC, Paul Grainger, South Cambridgeshire DC, Roger Monk FRICS, previously Birmingham City Council and now retired, Alisdair Maclean, London Borough of Brent, Nigel Cross, Lancaster City Council, Steve Holt, Blackburn and Darwen Council, and Ray Hooper, London Fire LFEP. The UKMap Forum members were not paid for any advice or services given, only general subsistence and travel expenses were given.

Each of the Forum members provided feedback through attending meetings that were held twice a year and each provided additional feedback via email to particular issues that arose in between. For the UKMap team it was exciting to have their ideas and views challenged and also to be able to engage in conversations about the use of mapping with such professionals.

The Forum members would often question the team to ask why it had developed the mapping in such a way and how it could be improved to make it more flexible and easier to use in the professional market place.

Here are just some of the features that are now in UKMap that came about from advice provided by the Forum members:

### 1. Contractor licence management

Through a web portal, The GeoInformation Group will manage contractors. This removes the burden from the GIS Officers and saves them a considerable amount of time and pressure.

### 2. Simple licensing

We have created a simple, no-fuss licence to enable users to accomplish more with UKMap.

### 3. Derived data and data sharing

Following input from the UKMap Forum, UKMap is provided with a derived data licence making it possible for professionals to collect and keep their own data from UKMap and then share that data with their partners. This improves partnership working and enables teams to create their own location databases.

### 4. Update frequency and data formats

The Forum felt that too much time was spent on managing updates and spending money on conversion software. So we have simplified the process by ensuring we deliver updates on a quarterly basis (as a complete database refresh or change updates only) and in common GIS formats. Some users have estimated this will save them over £10,000 per year.

### 5. Online service

A number of members said an online service would help, as they are more frequently being asked to deliver mapping in this way. As a consequence, The GeoInformation Group has partnered with a leader in this field, STAR-APIC, to deliver UKMap via a hosted service and offer data in Oracle formats.

### Active in Advice

The UKMap Forum members have not only been active in advice but have also provided a good and early test bed for our data.

We supplied early datasets to a number of users providing very positive results. These included:

1. Automatic creation of land parcels is possible using a dissolve on the address fields.



Early example of automatic land parcel generation using UKMap

2. This is an excellent and much more accurate alternative to other software solutions that attempt to solely use geometry to build land parcels.
3. Automatic creation of cartographic text from address fields using simple SQL.

4. This includes the generation of text for buildings with ranges of numbers.



Example of generation of text for buildings with ranges of numbers

5. Very flexible feature classification system.
6. The feature and land use codes are hierarchical so you can strip features out at the Macro level, for example, all roads or buildings but which will also let you combine classifications, such as isolate all residential gardens.
7. The numerical classification system is much simpler than other textual 'descriptions' for building themes to display with.
8. Because of the flexibility of the feature classification it is very easy to build different themes to display the data differently.
9. Any GIS capable of talking to a DBMS will be able to use UKMap without additional software.

### So where next for the UKMap Forum?

Well, it has run its course in being a sounding board for the development of the specification for UKMap and in testing early pilot data, so with the programme announcement on 1 June 2009 the Forum is now disbanded.

However, the role of an independent group of GIS professionals to provide input, advice and even criticism of how we develop UKMap is still a very key part of the future strategy. So a new panel is to be formed as UKMap now moves from formation into delivery and further development. If you think you have something to contribute and would like to be part of that panel please contact us.

Our sincere thanks go to all the UKMap Forum members for giving up their time to help in the development of the UK's first commercial large scale mapping product created independently of Ordnance Survey® that they undertook both professionally and enthusiastically.

This article is dedicated to the memory of Nigel Cross, Lancaster City Council who sadly passed away in April 2009.

### Base

A 1:1,000 scale topographic map with road markings, buildings, garages and sheds, property boundaries, aggregated into basic land and property units, vegetation, industrial complexes and man made structures.

All features have a land use classification for improved map display and analysis.

### Overlay

A 1:1,000 scale vector map of overlapping topographic features, such as tree canopies, walkways, and power lines.

The first level of all multi level retail centres are stored in this overlay layer.

### Points

The points layer provides the linkage between the attribute tables of UKMap (addresses, heights and points of interest) and the polygons of the Base and Overlay layers.

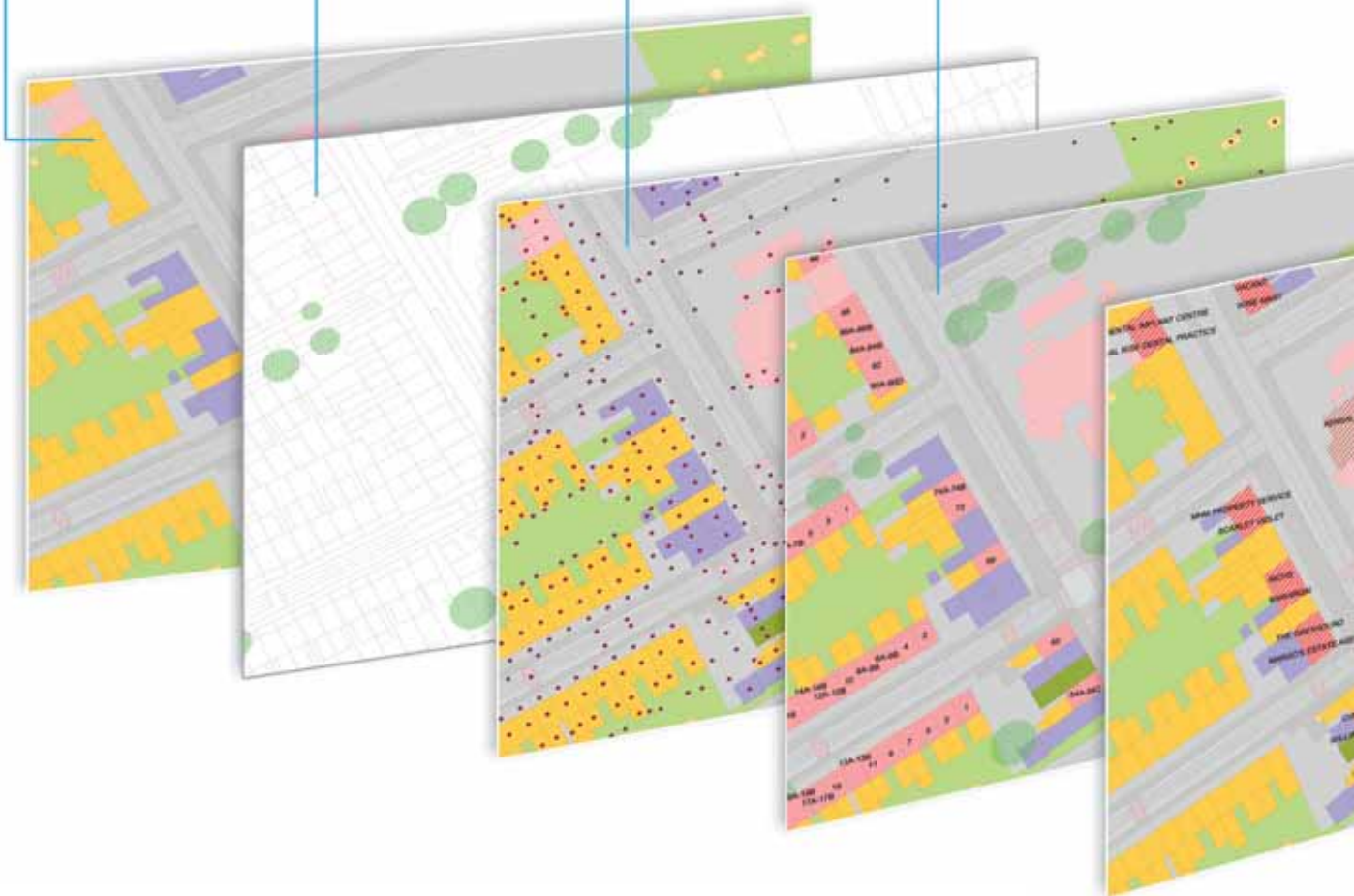
The points layer also contains a location for other features such as the location of roads and feature names.

### Addresses

The address data follows the principles of BS7666 and contains two related tables: UCC to Basic Land and Property Unit (BLPU) and BLPU to Address.

The address database holds recordable addresses for every publicly accessible building with road name, secondary road name and area included.

Address ranges are included for improved cartographic display.



## The multi-layered intelligent map base.

UKMap is made up of two product suites: Topo, comprising 8 map layers; and Thematic, a 1:5,000 scale map layer with annotations for web use.

### Points of Interest (POI)

Provides attributes for geographic and non geographic features. Each feature is classified into one of 18 categories, for example transport facilities, Central & Local Government, community, sports & leisure, retail, and regional, local and street names. Each POI is supplemented where necessary with additional information such as name and description of feature or location.

Retail POIs have additional information to describe the type of retail activity.

### Heights

Three height values are provided for every building element, with a height difference of  $\pm 3m$ . This is the height of the base and the top of the building above sea level and the difference to give the height above local ground.

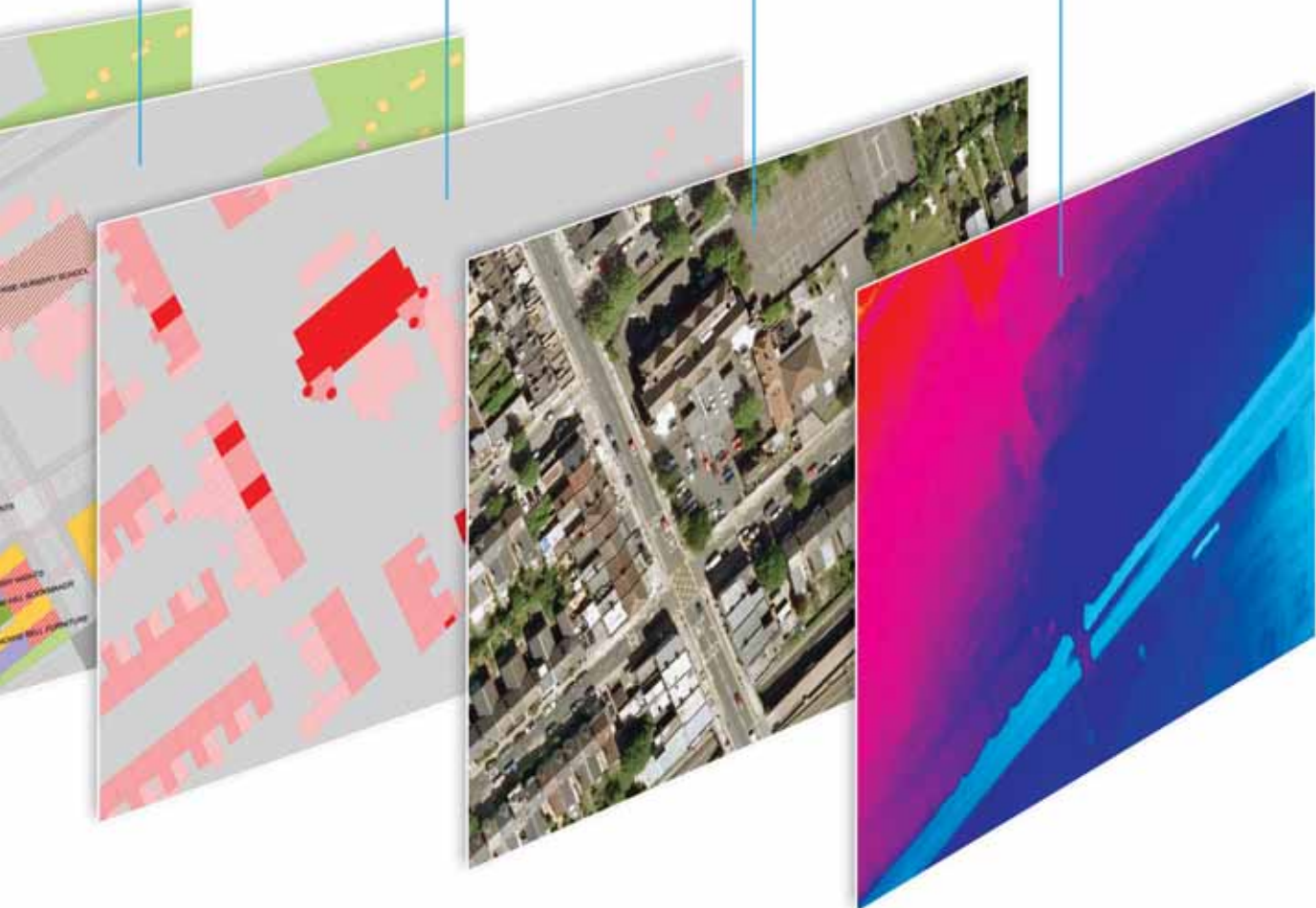
Height data are derived by extracting values from LiDAR or aerial photography.

### Ortho

UKMap comes complete with a 12.5cm high resolution, full colour, ortho rectified aerial photography layer.

### Terrain

To complement the ortho photography layer a 5m resolution digital terrain model (DTM) is provided as part of UKMap. The DTM is derived from either high resolution aerial photography or LiDAR.



## The GeoInformation Group

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# UKMap Training

Training4GIS is the training and consultancy division of The GeoInformation Group. It has over 25 years of training expertise within the field of geographical information and an enviable portfolio of clients that extend from Communities and Local Government through to Fire and Rescue Services throughout the UK and abroad. Training4GIS has always been committed to developing flexible and practical training solutions to ensure that clients get the most from their data investment. Now, more than ever, it is essential that we continue to provide this service in support of UKMap.

It is the feature rich database of UKMap that necessitates a comprehensive training programme. Not only is the UKMap Topo product suite made up of eight components but each of these have their own complexities that when used individually or together allow you to pull out a staggering amount of information. In the Topo Base of London alone there are 14 million polygons (each averaging 10 attributes), there are approximately 270 land use codes (FCC) and when combined with the Feature Type Codes (FTC) over 1250 classification combinations. Just these two simple facts alone may leave a new client reeling and wondering how and where to start in using these data.

The answer is our two-day UKMap training programme. We have developed this training as we want you to take full advantage of the information that UKMap offers. Delegates may either attend off-site training or we will bring our portal PC lab to you to train a group of staff in-house.

As with all our training courses, the UKMap training programme is accredited by the AGI Continuing Professional Development Scheme. Delegates attending the training programme are eligible to receive Continuing Professional Development points that can be used towards securing or retaining Chartered Geographer (GIS) status.

## The UKMap Training Programme



### Aim:

- To provide theoretical and practical training in the UKMap product suite.

### Objectives:

- To explain the structure and components of the UKMap database.
- To provide practical training in using UKMap.
- To describe applications and uses of UKMap within an organisation.
- To outline the update and maintenance policy.



## Day 1

|                                     |   |
|-------------------------------------|---|
| <b>UKMap Product Suite Overview</b> | Synopsis of the product suite and database structure.   |
| <b>Data Compilation</b>             | Explanation of fieldwork compilation, digitisation and attribution process and field checking.                      |
| <b>UKMap Topo Base</b>              | Detailed explanation of this base vector data layer; including Unique Classification Code structure.                |
| <b>UKMap Topo Overlay</b>           | Detailed explanation of this vector data layer that shows above ground features known as 'overlapping' features.    |
| <b>UKMap Topo Points</b>            | Description of the points data layer and their association to the polygon data layers.                              |
| <b>UKMap Topo Address</b>           | Detailed explanation of how addresses are structured within the database and the different types of address record. |
| <b>UKMap Topo POI</b>               | Detailed explanation of the Points of Interest classification and the types of feature that these relate.           |
| <b>UKMap Topo Heights</b>           | Methodological review of the creation of building heights from LiDAR data.  |

## Day 2

|  |   |
|--|---|
| <b>UKMap Topo Ortho</b>                      | Specification outline of the principle mapping source for UKMap.  |
| <b>UKMap Topo Terrain</b>                    | Technological explanation of the data capture and processing techniques undertaken to create the Digital Terrain Model. |
| <b>UKMap Topo Thematic</b>                   | Description of the map layers derived from UKMap Topo components.   |
| <b>UKMap Accuracy, Quality and Revisions</b> | Clarification of positional and attribute accuracy, update procedures and maintenance of UKMap.                         |
| <b>UKMap Applications</b>                    | Showcase of current and potential UKMap case studies.   |
| <b>Copyright, Usage &amp; Licensing</b>      | Explanation of the copyright and licensing regulations for using UKMap.   |
| <b>UKMap New Developments</b>                | Future developments highlighted.  |

Find out more at [www.theukmap.co.uk](http://www.theukmap.co.uk) or call Training4GIS on 01223 880077

# Accuracy and Quality

So, how accurate is the UKMap Topo data?

That is the question everyone wants an answer to and, of course, to which there is no simple reply.

Accuracy is just one element in judging the overall quality of the data. Completeness and currency are also factors in assessing the quality. There are several accuracy measures, including both positional accuracy and attribution accuracy.

## Positional Accuracy

The positional accuracy of the UKMap Topo Base and Overlay layers is determined by two main factors:

The first is the quality of the ortho rectification of the aerial imagery, (and that will depend on the quality of the Inertial Navigation System (INS) in the aircraft at the time of the aerial survey) and the quality of the Digital Terrain Model (DTM).

The second is the accuracy with which the detail has been digitised relative to the imagery. In some cases it is easy to be very precise in assessing the accuracy of a digitised point against a feature on the image, but in many cases it is not quite so clear-cut. This is because the map is both an interpretation of the features in the image and a generalisation of those features, and subsequently the level of detail is consistent with the nominal display scale at which the mapping is intended to be viewed. In the case of UKMap Topo Base the nominal viewing scale is 1:1,000.

Some features are captured to a higher order of accuracy, partly

because they can and partly because they form the framework against which other features are plotted. In the case of UKMap Topo Base the primary features are the road network against which buildings are plotted. The soft features, such as vegetation boundaries, are considered to be the lowest priority in terms of achievable accuracy.

The overall accuracy of the final digitised data is measured against independent GPS ground control points. For consistency these are similar features and are collected at regular intervals across the data. The feature used is the corner of the white line at a road junction, as shown in the diagram.

The stated target accuracy for the mapping in the UKMap Topo product suite is one metre RMS (Root Mean Square Error) at two standard deviations. This is a statistical measure which indicates the range of measured values in the database against the independent GPS points which will on average vary by no more than one metre in any direction in 96% of cases. This means there may be examples where the difference is greater than 1 metre but overall the average is one metre or better.

An independent check of data in the area of Brent in London came up with an RMS of 0.7 of a metre, which verified our methodology and gives confidence in the data we are generating.

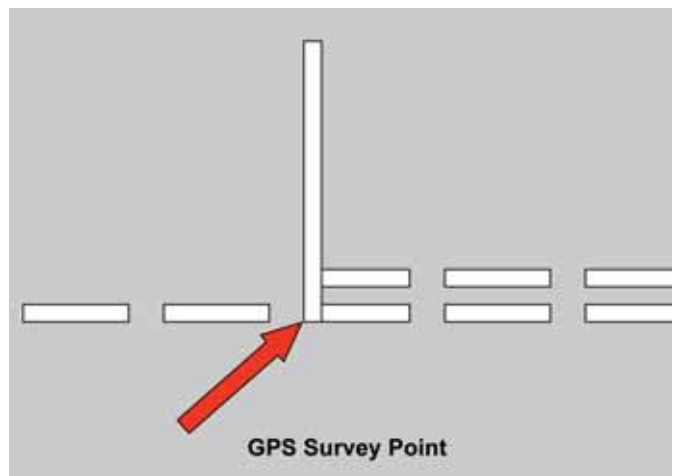
The most difficult areas to digitise are those with tall buildings and narrow streets so the amount of ground level information can be restricted. These areas have been carefully checked to ensure we achieve the best results possible.



### Other Accuracies

There are other types of accuracy that can be measured. The accuracy of the mosaiced ortho image relates to the original rectified images and of the terrain layer relates back to the original LiDAR survey. More detail can be provided for those who want to understand more from the technical support staff.

It is the intention of the UKMap Production Team to ensure the data is as accurate as it can be, but there will be mistakes. However, our commitment is to put these errors right as quickly and efficiently as possible. That is why we have set up the 'Change Partner' programme (see page 13).



Typical point for GPS accuracy check

### Attribution Accuracy

The second type of accuracy is that of attribution. We want to make sure that we collect accurate information and that we add the correct information into the right fields in the database.

In a database the size of London with over 14 million polygons and an average of 10 attributes per polygon it is essential we do everything we can to ensure we achieve a high level of accuracy.

There are several approaches employed in the process. Some involve logic checks, so that mutually exclusive options are not included. For example, a land use code that is part of a road cannot have a feature type code that is a building.

We have also undertaken spelling checks on the text fields, looking for consistency and accuracy. There are many rules applied for things such as abbreviations, use of apostrophes and how handle to words with 'Mc' or 'Mac' in.

There is also a visual check based on graphic representations of each field to look for completeness and consistency.

Different fields have different accuracy standards, depending on how they are collected or calculated. So the height values for buildings have a very different accuracy standard to the land use codes or retail points of interest.

The overall target accuracy for the attribution fields is a 0.5% error rate; that is one error in every 200 populated fields.



# Frequently Asked Questions and Answers

*Alun Jones looks behind the technical details of UKMap and answers some of the more common questions put forward about the UK's latest mapping product.*

It could be said that the UK is perhaps one of the world's most mapped countries, so why is there a need for a new map and what does it contain to make it so different that it makes people want to buy it?

## **Why do we need another map?**

The UK is well covered with street level and smaller scale mapping. In fact, there seems to be a growth particularly with the advent of user or crowd-sourced material. However, at the large scale (the more professional end such as at the property level) there is only one provider: Ordnance Survey. We looked at the modern mapping

market and felt that there is a demand for a second provider of large scale mapping at this level, and one that is not simply a copy of the existing provider but one that offers what the modern market needs.

## **How does UKMap meet the demands of the modern market?**

Our research has shown that the modern user wants to do more with their mapping. They want to own what they create, want more from the information (particularly at the local level) and they want simplicity, i.e. simplicity in obtaining data, using it and licensing it. UKMap offers the following to support these needs:

- **Simple licensing and purchasing options.** For example, data sharing with partners, archive licences built into licensing fees, support for managing sub-contractors, and a simple pricing scheme.

- **Derived data license.** UKMap comes with a derived data license so users may digitise or collect information using UKMap as a base and own that data.
- **Multi layered.** UKMap comes with a number of map layers that will save users having to purchase these additional layers from other third parties, such as addresses, BLPUs, land use, building heights, points of interest, aerial photography, and terrain data, hence immediately delivering costs savings for UKMap users.
- **Simple delivery.** UKMap is priced competitively and supplied in standard, recognisable areas, for example, one square kilometre blocks and formats that are commonly used saving on time and costs that may otherwise be required in integrating mapping into existing systems.

#### So how was UKMap created?

The first step required the use of Cities Revealed high-resolution aerial photography. This was all captured using a very advanced digital camera at 10 or 12.5cm resolution.

The aerial photos were orthorectified using GPS and a very detailed terrain model from Cities Revealed LiDAR database. This gave a very accurate stereo aerial photo database from which we could digitise; the accuracies of our air photo database and the subsequent features we digitised have been tested and show absolute positional accuracies compared to independent GPS points of 0.7m RMSE.

We then digitised, using stereo pairs, all features we can see in the photo, such as fences, buildings, road markings, trees, bridges, etc. These were all digitised with some new digitising tools to ensure we created parallel lines, right angled corners and splines for curves. This all makes for a much neater, more accurate and cartographically improved map base.

The digitised maps were then printed and sent out to our field survey teams who walked every street, park, office complex, in fact anywhere where there is public access to collect all the information we needed and added that to our map. This included house numbers, street names, shop names, locality information, office names, etc.

All these data were then compiled into the UKMap database.

#### Were any additional map or third party databases used?

All the buildings, roads and line work were digitised from Cities Revealed aerial photography, and all the information collected in the field by The GeoInformation Group survey team. These data were recorded by writing down names, etc on our digitised maps. The only piece of third party data used within the UKMap database, and is optional, is the Postcode from the Post Office.

#### Is UKMap a copy of Ordnance Survey?

UKMap is created from non Ordnance Survey copyright material. Whilst we map the same features as Ordnance Survey and to a similar degree of accuracy the database structure, the additional features mapped, the multiple layers provided and the pricing and licensing make using UKMap a very different experience to that of Ordnance Survey.

#### Having up to date information is important. How is UKMap maintained?

Firstly, UKMap licensees will receive an update every three months for the term of their licence; they can choose to have either just the changes supplied or a complete re-supply.

To achieve this The GeoInformation Group operates a multi level maintenance programme for UKMap, namely updates from aerial photography, updates from The GeoInformation Group's field survey team and update information through the Change Partner

Programme. Our Change Partner Programme is unique for this type of mapping as it offers users the chance to provide details of errors that they see in UKMap via the website.

The UKMap team then reviews the Change Partners' edits and then informs them of the status of the edits. The inputs from our partners help all users, including the partners themselves. All those who sign up to this programme also receive a discount on their licence fee.

#### How much does UKMap cost and will I be able to make a return on my investment in UKMap?

UKMap is a commercial product and as such is competitively priced to be affordable in today's market. Pricing varies according to the area chosen and what use the mapping will be put to. However, one thing all users can count on is that our pricing is simple.

We do not differentiate for different layers, so the price you pay is the price for all layers of UKMap. Therefore, not only will you get a competitively priced product but you will get multiple map layers as well. This makes UKMap a worthwhile investment. One local authority user has seen a return on investment within one year of purchasing UKMap.

#### Can I use UKMap on the web?

With the drive to increase service efficiency and innovation through the Internet we have created a 1:5,000 thematic layer, derived directly from the 1:1,000 Topo Base for use on the web. The 1:1,000 base is not licenced for web applications, but the 1:5,000 scale Thematic layer and the other layers (for example points of interest, addresses and aerial photography) provide significant web mapping resources for users to create effective web applications.

#### So what can I use UKMap for?

UKMap is rich in its information content and is a very accurate and up to date mapping product. As a consequence it is a product that can be relied upon for a range of applications. These include, local planning, utility asset management, emergency support services, flood modelling, address and retail location planning and service delivery. Page 28 focuses on UKMap in Real World Applications.

#### So what do others think of UKMap?

Here are just a very few early comments we have received from existing users of UKMap:

*"The GeoInformation Group has done it again. They've brought to the market another exciting new product that the market didn't even know it wanted. This product represents a revolution in mapping and brings the provision of large scale mapping in the UK into the 21st Century. For the first time users of large scale maps will not only have an accurate and feature rich layered solution but also have it in a format of their choice. The goal posts haven't just been moved, this is a whole new ball game!"*

Alisdair Maclean, GIS Manager, London Borough of Brent.

*"...a product that has been designed from first principles with our specific requirements in mind. I am in no doubt that the positive characteristics within this portfolio of data products will result in it being seen as a "must have" for all Local Government GIS Managers."*

Brian Higgs, Dudley MBC

More information on UKMap in the form of frequently asked questions and answers can be found on our web site at [www.theukmap.co.uk](http://www.theukmap.co.uk)



Field sheet example

# Life as a Field Worker

## by Tony Beasley



I started with the UKMap field team as one of the first recruits. Having worked as a gas metre reader in the past I was used to being out and about in all weathers and having to search for metres to read. You wouldn't believe where some metres are hidden – in one case I had to read a metre hidden in a bush in the middle of a field!

Like most of us I applied for the job through the local job centre. It sounded intriguing but crazy at the same time. The interview confirmed my first impressions – these guys were trying to achieve the near impossible.

But once we had met up with the UKMap team and had the training I was hooked. I love being out, your own boss, hunting down the information needed for the mapping.

I like to start early in the morning. I have two young kids, so putting the hours in is important to earn the money. It's not all fun though. Some of the large residential areas can be tedious, but actually the most challenging are long Victorian high streets, with loads of small shops. In some areas the range of shops and their names are just incredible.

This type of job certainly keeps you fit. One of the team who was a regular visitor to the Doctor's was told he had substantially lowered his cholesterol level due to all the walking. The surprised Doctor's advice was 'don't give up the job'.

I've been working in the field work team for over 14 months now and when we get together we exchange stories and there are lots to tell.

Members of the team have been stopped a number of times by

the police who want to know what we are up to – around Heathrow was, not surprisingly, particularly sensitive. The local station commander has always had contact from the Cambridge team before we start on an area but not every PC finds out what we are up to. Not that they've ever been a problem – I suppose it's good they're on the lookout for trouble.

One of the team, Peter, recently claims he had a Mexican stand-off with a 'really huge' dog. Whilst collecting details about a farm the dog came and stood in front of him. Not liking dogs he started to back away. The dog followed. Peter backed away faster... again, the dog followed. In the end he just turned tale and ran. The dog chased him for a quarter of mile. Or so he claims....

People often stop us to ask what we are doing. The common thought is we are re-calculating the Council tax bands. Someone was accused of being a spy and one of the team was stopped by a senior manager from Ordnance Survey.

It is amazing how interested people are in what we are doing. Jeff told us about the time he was collecting information along a high street and while standing outside a laundrette he was asked by the lady in charge what he was writing. She invited him in, offered him tea and when he accepted went across the road to the bakers to buy the cakes!

We also come across the most amazing things, like the rifle factory in Hammersmith or the architectural model company that just happened to have a model of the houses in Chelsea that Roman Abramovitch is having altered, including a new basement swimming pool.

I enjoy the work so much I got my brother involved. Apparently we are affectionately known as the 'Beasley Boys' back in Cambridge!

I'm now looking forward to seeing the map published. I think we are all proud of what we have achieved.

# Delivering UKMap

*STAR-APIC has built the system to maintain the UKMap database and deliver UKMap data to customers. Tom Timms, Director of STAR-APIC UK describes working with and managing UKMap data, the delivery system itself, and the opportunities that this rich new dataset offers GI professionals.*

STAR-APIC has a longstanding relationship with The GeoInformation Group having participated in the popular GeoDATA events for several years and worked with Cities Revealed data with a number of customers. The STAR-APIC group has more than 25 years experience of supplying systems to Government, utility and commercial organisations who manage and publish spatial data. Major customers include the Coal Authority who maintain a three-dimensional database of historic coal mining for the whole of the United Kingdom, Northumbrian Water whose GIS is a key element of Corporate Information Systems relied on by hundreds of members of staff daily, and the Highways Agency who are increasing the efficiency of high quality map publication using STAR-APIC software.



Fig 1 UKMap data by land-use

STAR-APIC have particular expertise in managing large, complex datasets within a database environment and with products that have always been closely linked to database technology. As many organisations are finding, storing spatial data within a database offers a number of benefits. Databases are designed for multiple users to access and share a common dataset. Typically, databases can handle large volumes of data easily and data management is simplified by centralised storage. It is also possible to build and maintain rules within the database to ensure quality and completeness. Audit trails of changes can be maintained so that it can be possible to view changes to data through time. With the increasing importance of spatial data to organisations and processes, the reliability and resilience that are possible with database technology is also vital to a successful deployment.

The STAR-APIC UKMap database and delivery system uses market-leading ORACLE™ technology to store data and a range of additional tools to process and distribute the end product. The system takes data supplied by The GeoInformation Group and performs additional checks for quality and completeness. The data is loaded into ORACLE and then published according to each customer's own delivery and format requirements. The current system can deliver data in ORACLE dump, ESRI Shape, AutoCad DXF and MapInfo Mif/Mid formats. For file-based formats, data is supplied in 5 Kilometre square tiles with additional metadata also

supplied so that customers can optionally validate the completeness of each delivery. Data is delivered quarterly with a complete re-supply. The system that has been developed also offers the capability of delivering UKMap data via the Internet conforming to Open Geospatial Consortium (OGC) web mapping WMS and WFS standards. The system is designed to offer traditional file based data delivery with the requirement for on-line delivery expected to increase through time.

Having worked with UKMap data, STAR-APIC staff have been impressed both by the quality of the data, and the built in, overall 'richness'. The integration of land-use (see Fig 1), mapping, height and address data is particularly impressive while the inclusion of BLPU data (see Fig 2) increases its value to any organisation that deals with property. It is clear that the data can be displayed in a number of ways; for example highlighting land-use or building height. The example seen in Fig 3 illustrates retail premises labelled with their trade name. UKMap has proven to be manageable and easy to work with. It has been designed 'bottom up' to provide a logical structure and should integrate easily into any GIS or mapping system.

Tom added, "We see UKMap as a very valuable UK data resource that adds significantly to information available to GI professionals. I am convinced that it offers the possibility to improve efficiency and quality of services for many organisations."

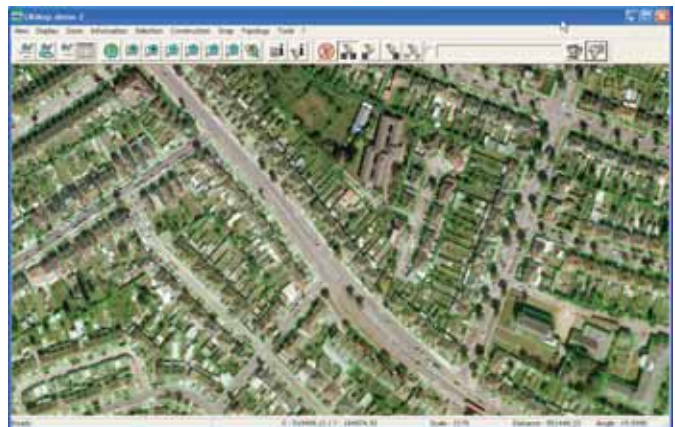


Fig 2 Air photo with BLPU extents overlaid



Fig 3 Retail premises labelled.



Image courtesy Aerodata

# How UKMap was Created

Once the specification for the UKMap product had been written and the various pilot projects completed it was time to start full-scale production. It was clear that this would take a considerable amount of time and resources, so a number of dedicated teams were created and trained.

In Fulbourn, Cambridge, at the office of The GeoInformation Group, the UKMap Project Management team was established. This team included a Project Manager, a Field Work Manager, a Quality Assurance Manager and support staff. The whole project was managed through the UKMap Project Board, which met every month, or more often as required, to set the goals and measure progress towards completing the London database.

The UKMap team sourced imagery through one of our flying partners, which for London was Aerodata in Belgium. This was processed in the UK by the Cities Revealed team that undertakes production of the standard ortho products. The result was an imagery database of some 1,000 ortho photographs, rectified to a very high level of accuracy but not mosaiced.

The UKMap team also collected independent GPS ground control points to check the accuracy of the imagery and subsequent digitising. A reference base of some 2,000 points will eventually be completed for the Greater London area.

The UKMap team became responsible for three production teams.

## India production centre

The first was the digitising centre at our long-term partners in India, SGS Infotech pty Ltd. Here, a team of about 35 staff became responsible for digitising the Base layer from the ortho rectified images and adding the feature type codes.

The digitising is done in AutoCad with their own software enhancements to ensure the right quality is achieved. In particular, the introduction of tools to ensure 90 degree angles are created at building corners, parallel lines are achieved for railway lines and road/pavement splits, and splines are used for drawing curves. In the instance that buildings and gardens are split for the inferred BLPUs then a special tool is used to ensure its accuracy.

Working on production blocks of five kilometres by five kilometres, each digitiser would take up to two weeks to complete one square kilometre. On average there are about 10,000 polygons per square kilometre in the UKMap Topo Base layer.

The resulting information was carefully checked both in India and then by the UK QA staff, so that a high level of accuracy and consistency could be achieved.



A happy field worker

### UK production centre

Once the digitising was complete the raw vector files were returned to the UK. Here, a field work team was established. Over 30 people were involved in collecting fieldwork data in London during the 15 months it took to complete a street-by-street survey.

The field workers took the digitised information out for one square kilometre at a time, and collected every address and every bit of information required for the POI table by walking every street and publicly accessible area, looking and recording as they went.

The data was hand annotated onto a paper base. Several experiments were conducted with handheld computers and loggers but in the end it was just as quick to capture the data on paper. This had one very important result – we had an archive of all the fieldwork data that could be used to verify the independence of the data that had been collected.

Once returned to the Fulbourn office, the field sheets were checked for completeness and archived. Random checks were made by the Field Work Manager and the QA staff to ensure the field data was as correct and complete as could be managed.

Field work took place through the year in all types of weather, only being curtailed by rain. A single square kilometre could take anything from one day to 10 days to complete, depending on the density of the housing and the number of retail premises to be collected.

The field work archive consists of some 60,000 pieces of paper.

### South Africa production centre

Once the fieldwork is complete copies of the sheets go to a third team in South Africa who compile the address information, create the inferred BLPUs and add the POI detail.

### The final compilation

This is returned to the UK, checked by the QA team using a number of logic processes and passed to a couple of specialists with editorial skills who look for spelling mistakes, grammatical errors and typology consistency. The POI table for 60 square kilometres of the London Borough of Brent contains about 9,500 POI name records and a further 3,000 descriptive records, as well as having about 176,000 individual addresses.

Lastly, the database is returned to a small team in India who add the land use codes using the POI references from the field work.

The UKMap team are responsible for completing a full topology check on the Base layer, making sure it conforms to the condition that there are no overlaps or gaps. This is all done using ESRI tools. The team completes the accuracy checks, QA logic checks, compiles the various tables, creates the Ortho, Terrain and Thematic 5k layers and presents each production block to the Project Board for approval.

Only once approved by the Project Board are the data ready to be published, at which point it will go to STAR-APIC, our partners who are creating an Oracle-based version of UKMap, ready to be published and supplied to clients.

It is as simple as that...



UKMap archive shelf

# Meeting Real World Challenges



*Climate change, global pandemics, security, efficiency savings, shared services, improved communications are all major challenges that have behind them significant political and social pressure. Geographic information can support our efforts to meet these challenges but to do so it has to deliver much more than a simple map. Alun Jones looks at how UKMap has been designed to underpin these key areas with effective geographic information.*

"One showing is better than one hundred sayings," is the ancient Chinese proverb that we commonly misquote as 'a picture paints a thousand words'. Rightly or wrongly quoted the essence of this proverb (or quote) is a good mantra to follow for those involved in geographic information and in frontline service delivery, whether that is fire fighting, flood management, energy reduction or security. Information is required in an effective manner. Information must be relevant, up to date and accurate. Frontline users do not want to sieve through hundreds of databases to get answers or to re-read maps or databases many times over to extract the information they require. The geographic information they seek must be at their fingertips and it must be delivered effectively and efficiently.

UKMap now offers users a significant amount of new geographic information all in one place, from one source and in a format that is easy to use; one showing, one database, so to speak.

The following looks at real world applications where UKMap is already making a real difference to those in the frontline and at some, as yet, unexploited areas of application.

## Local Planning

UKMap with its detailed and accurate buildings, traffic data, boundary information and address data along with tree size and location information and land use offers the perfect mapping base for displaying, communicating and solving local planning issues.

### 1. Traffic Management

Local authorities have started to use UKMap to improve mapping

and communication of Traffic Management Orders. In the London Borough of Brent, the authority engineers rely on the built-in road markings and key reference points and the accurate road lengths to measure and record new works and orders.

### 2. Property Management

Those involved in property services are also benefiting from having the Basic Land and Property Units already mapped out within UKMap. This has saved significant costs and time on locating properties and now offers improved service delivery. Recent examples have been the identification of small garden buildings that double up as illegal dwellings. UKMap provides a rare source for these buildings and through the BLPUs it is easy to link these illegal dwellings to formal addresses.

### 3. Urban Design

Whilst looking at planning applications or wider area master plans, 3D modelling is becoming an increasing requirement. UKMap comes equipped with 3D information for both the ground and all the buildings. Coupled with tree information and land use it is now possible for planners, urban designers and architects to create basic form 3D models directly out of UKMap. This significantly reduces project implementation time, reduces data costs and improves communication; quick and accurate 3D models can be drafted up for consultation within a matter of hours.

### Emergency Services

Accurate mapping provides a solid base on which services can communicate between each other on an incident. Therefore, the wealth of location information built into UKMap, such as street names, retail, commercial and government building names and residential addresses, makes it the perfect database for which services can operate. As many retail, office and other location names change on a regular basis, address matching is always a complex task.

UKMap offers emergency services a new database from which the emergency services can update and improve their own address gazetteers. With additional layers (such as aerial photography and road markings) the scope to not only locate but also convey solutions to situations has never been easier.

#### Flood Risk Modelling

UKMap offers a wealth of information to enable a more informed and accurate flood risk assessment to be undertaken. The terrain data within UKMap provides the base on which the flood models can be run and the buildings, bridges, trees and other obstructions can be accurately located and modelled. Once the extent of the flooding is known the addresses and points of interest data can readily help planners identify those residents who most urgently require help and those services and infrastructure that will be affected by the flooding.

Combined with the aerial imagery and 1:5,000 scale mapping highly visual and communicative maps can be drawn up for public consultation and emergency scenario planning.

#### Retail Location Analysis

UKMap provides an abundance of location data on high streets, shopping centres, corner shops and mixed development sites to aid retail analysis. All retail, commercial and industrial units are given

along with their name and address, geographic location, building height, building area, type of industry, and usage of the building. This, along with other road information (such as parking bays, zebra crossings, car parks and other land use information) makes for a very comprehensive retail location database. All of these data are updated on an annual basis.

#### Property Development

Choosing the right site is critical to the success of any development. UKMap can help ease this task. The land use and feature codes combine to identify suitable land parcels available for development and with its precise digitising, developers are able to accurately calculate the area of land for development.

The 3D data offers the scope to look at roof top development and prepare for planning applications and rights of light restrictions. UKMap provides land and property developers a powerful tool to help save considerable time, effort and money so that they can make the most out of their investments.

UKMap is rich in its information and is a very accurate and up to date mapping product. As a consequence it is a product that can be relied upon for a myriad of applications. So perhaps in the case of UKMap the Chinese proverb should now read "one UKMap database is better than one hundred databases."



# A Wealth of Information...

A pilot area for the UKMap Project was the London Borough of Brent. The 60 square kilometres that make up the borough extended to a full square kilometre tile contains a fascinating snap shot of London in the early 21st century.

30,395 trees in the overlay layer  
 9689 points of interest  
 263 land use codes used  
 3 scout groups  
 2,007 traffic islands  
 59 buildings over 40 metres tall  
 1 Portugal and Brazil deli  
 262,017 building polygons  
 541,267 polygons in the Base layer  
 131,415 individual addresses  
 1,103 road name labels  
 23,085 addresses with letter suffixes  
 144 schools or nurseries  
 245 electricity substations  
 24 Post Offices  
 4 Tesco superstores  
 1 Wembley stadium  
 91.4 maximum height of the ground above sea level in metres  
 5,186 retail premises recorded  
 274 polygons classified as water  
 23 allotment sites  
 25 stations

UKMap London is 1,720 square kilometres, so 30 times larger than just Brent. Imagine what the numbers are for the whole city!

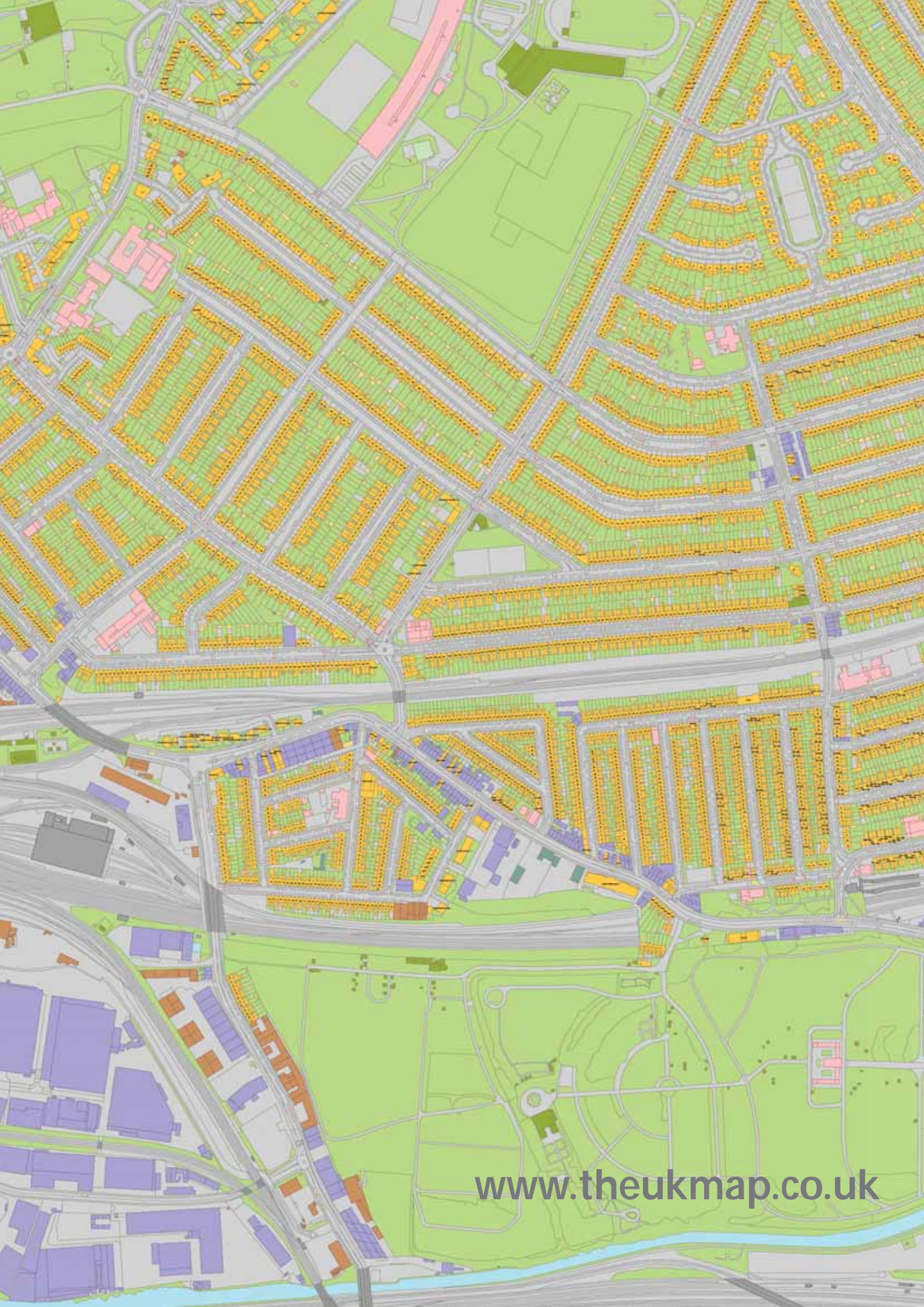


To discover more and to request a sample go to [www.theukmap.co.uk](http://www.theukmap.co.uk) or call **01223 880077**.



The Geoinformation Group

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