

## Union Railways Property Manages the UK's Largest Compulsory Purchase with GIS-Based Land Information Management System

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Compiling and submitting the myriad of legal documents required to finalise a land conveyance in the United Kingdom (UK) is complicated enough when one property is involved, but can you imagine managing the transactions for over 6,500 land parcels into a series of individual titles including tunnels? That's the daunting task facing Union Railways Property (URP) as it oversees the acquisition of land for the permanent way for a 113-km-long rail link between London and the Channel Tunnel.

To make its job feasible, the Information and Standards team within URP has created a land information management system called the Land Terrier. Union Railways partnered with Intergraph UK to develop the multi-functional system by customising standard information systems and spatial database products. In addition to organising land data and automating the production of documents supporting the property registration process, the map-based system is designed to handle a range of functionality relating to the ongoing operation and maintenance of the Channel Tunnel Rail Link (CTRL).



### The Channel Tunnel

By any standards, the Channel Tunnel is a marvel of engineering innovation and international cooperation. Officially opened to shuttle and high-speed passenger trains in 1994, the tunnel lies some 50 metres below the bed of the English Channel and forms a 49-kilometre-long link between England and France. A trip that once took hours by ferry has now been reduced to just 20 minutes on a fast rail train.

On the continental side of the channel, both France and Belgium have built high-speed lines linking their respective capitals directly to the Tunnel entrance. In Great Britain, however, passengers boarding a train in London bound for Paris or Brussels must first travel at relatively low speed before reaching the Tunnel where the specially designed rail line accommodates speeds up to 300 km per hour.



The objective of the CTRL is to match the speed of the continental track by building an entirely new link between the Tunnel and St Pancras in central London. Starting in September 2003, the hour and a half UK leg will initially be cut to 55 minutes and then a mere 35 minutes by phase 2 in 2007. Once completed, the rail link will reduce the journey time to Paris to 2 hours 20 minutes and Brussels will take two hours, making rail a much faster and more comfortable alternative to flying.

Construction Work behind the CTRL terminus at St Pancras, central London

## The Land Terrier

Union Railways is a London-based subsidiary of London & Continental Railways, the private consortium that won the bid to design, finance, build and operate the new link. The planning and approval process has taken several years to make the new railway a reality. Threading a high speed railway line through one of the most densely populated and congested areas of the UK required the most comprehensive environmental impact assessment seen in the UK together with the largest Compulsory Purchase Order for over 150 years.

Maintaining a database of affected owners and notifying them of the compulsory purchase is the responsibility of the Information and Standards team. Timely access to land for construction purposes is essential to avoid costly downtime for Civil Engineering contractors. Union Railways uses powers conferred by an Act of Parliament to achieve this and can seek referral to the Lands Tribunal if conflicts arise. Ultimately, they must deliver two leases for the entire rail corridor to the Secretary of State having ensured that no gaps exist.



Pond environment created by CTRL

URP recognised the need for an information system to support the complex processes involved in land registration; securing rights over thousands of titles and interests, separating the required portions into a new 'super lease' and disposing of surpluses. This task was further complicated by the advent of the 2002 Land Registration Act.

Coming into force on 13<sup>th</sup> October 2003, the Act will see the largest overhaul of land registration procedures in England and Wales since 1925. Until recently, land registration in the UK has been voluntary resulting in an incomplete record of land interests with as much as 20% of land remaining unregistered; all that is about to change. With the advent of the Act, the Land Registry aims to complete a record of all interests with 100% registration by 2012 providing the framework for electronic conveyancing.

URP undertook a review to see whether modifying their existing systems or buying an off-the-shelf solution could meet these requirements. After careful investigation they concluded that both commercial land management systems and their existing corporate GIS could store the required information, but crucially, neither had the ability to manage the business processes. URP needed to develop their own solution and in 2000 retained Terraquest to undertake the production of the Logical Requirements specification and process model. This would enable carefully selected information system solution providers to prepare proposals for satisfying those needs.



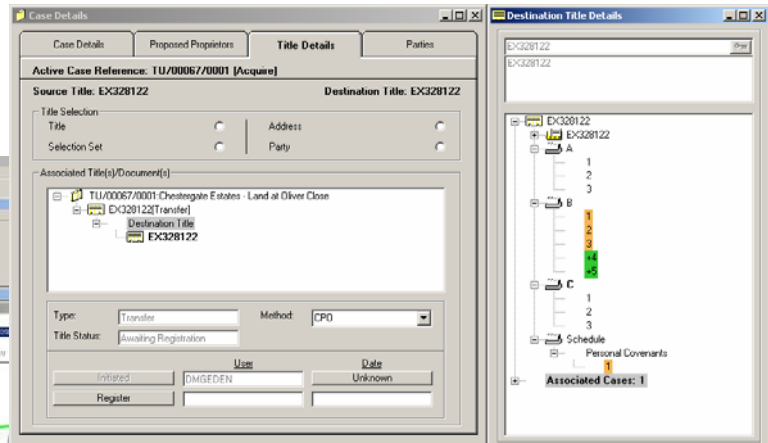
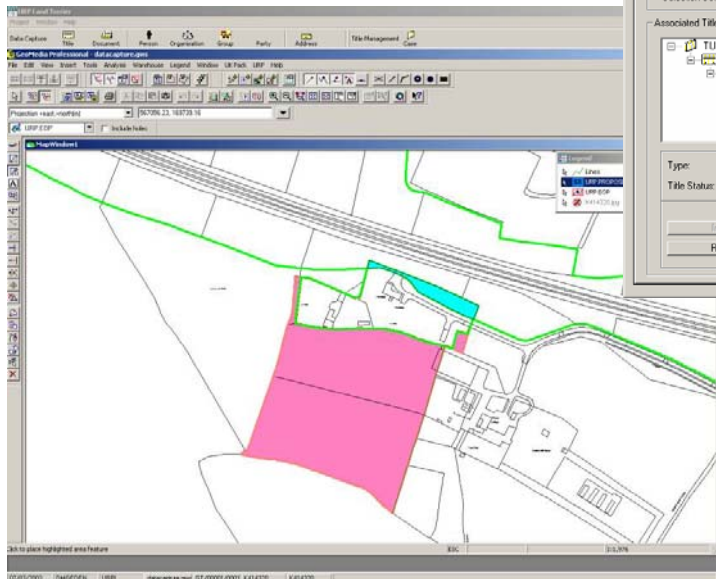
One of the main objectives was to bring map production to the desktops of its personnel. An evaluation of available software packages put Intergraph on the shortlist of potential suppliers, which led to URP visiting Deutsche Bahn in Frankfurt to assess a system developed by Intergraph for the recently privatised German Railways. The decision to build the Land Terrier on top of the Intergraph GeoMedia Professional product can be credited to the open architecture of the software that enables it to handle multiple data types. The CTRL project uses MicroStation as the computer aided design (CAD) standard and GeoMedia could provide URP direct access to large volumes of data in DGN format. In addition, Union Railways would need to share datasets with numerous other parties known and unknown and it knew Intergraph's non-proprietary architecture would accommodate this.

Information and Standards is a small team, making outsourcing of some project development work a necessity. As a result, Union Railways and Intergraph UK established a team that included Terraquest of Birmingham and GeoAid

of Swindon to assist with creation of the land information system. Terraquest provided the logical system specifications and GeoAid designed much of the system functionality.

URP and its partners sought to build a system that would take advantage of the Land Registration Act 2002 changes while automating the production of land transfer documents and plans. This was achieved by basing the development on a set of generic property principles that would allow any sequence of events to be accommodated.

Long and complex processes of land and property acquisition and management could be captured and a secure record of actions stored in a database where they could be easily interrogated.



### Land Terrier Data Layers

The central repository for the system is an Oracle spatial database. This business data is supplemented by base mapping from Ordnance Survey, primarily 1:1250 and 1:2500 scale, in two warehouses representing different time views; one prior to construction and the other the latest available. The other major data source is the ownership and feature information found in title

documents that Union Railways obtains from the Land Registry both in hardcopy and digital formats. Each title document contains a complex series of related data including one or more: extents, details (rights and burdens, additions and subtractions), parties and addresses. The Land Terrier captures and relates the various extents and records providing dynamic links between the map and any aspect of a title as well as address and title-based gazetteers.

To complete the picture, the Terrier stores other key features that are not directly involved in land and property acquisition, including:

- Administrative features such as parish and borough boundaries;
- Contract boundaries pertaining to special agreements, such as maintenance contracts, made between the railway and land owners;
- Environmental constraints relating to areas of natural beauty and SSSIs;
- Heritage constraints on listed buildings;
- Highways;
- Planning applications;
- Proposed Scheme Title, used as an operator in spatial reports and management;
- Services, existing utilities on site;
- Site investigation, areas where the utility may perform geological studies;
- Property valuations.

This list is not exhaustive and can easily be expanded. Some of these data sources are used in the automated processes of allocating land in a particular title to a specific land use.

### Land Information Applications

Implementation of the Land Terrier took about 18 months followed by an extended period of data capture as registry information was received and processed. The data capture element was made available early so that the database could be established and data captured allowing users to contribute valuable input into the development process.

One tangible benefit is that users with a minimum of training can generate the documents and plans necessary for a transfer of land. In the past, these functions could only be performed by individuals with CAD skills or by paper-based methods and by the appointed conveyance solicitors. Users can quickly query the Terrier to learn if a specific property falls into an environmental or heritage constraint area. A graphical answer can be returned to the desktop in seconds. In the past, the interested party would have to shuffle through a file of map sheets to find and consult the paper documents.

Another significant advantage provided by GeoMedia's functionality is the ability to share data with other organisations. For instance, Network Rail, the national operator of the UK railway network can send URP digital data of its land holdings from a file-based GIS. Users can integrate this data with Land Terrier and output new maps incorporating the additional feature layers – all from the desktop. This also assists with resolving conflicting data between the two databases.

Mapping functions aside, the case management tool developed as part of the application controls the business processes. This picks up where most other land information systems stop; it controls the processes of addition and subtraction of land to and from the portfolio, together with the granting of leases and rights. This tool automates the document management and production processes necessary to achieve the end result, registration of the new railway with no gaps.

As soon as URP agrees to terms with a claimant, Land Terrier records the details of the title. Supporting documents are then generated and a record of the distribution is recorded allowing the conveyance solicitors and property agents to comment on the documents prior to their engrossment and forwarding to the Land Registry.

Many land information systems can provide a static record of land holdings and related information, but the beauty of the URP Land Terrier is that it manages the entire business process in a dynamic way. The database automatically adds and subtracts leases and ownership information as the conveyance is approved and registered. URP has control of the business process

### The Future

The land registration part of URP's task will be completed once all the land needed to build the rail link has been purchased and registered with the Land Registry and the two operational leases granted. After the link is constructed, actual operation will be turned over to another company. At that time, Union Railways will provide the data contained in Land Terrier to the UK Department of Transport as a permanent digital record of all land transactions relating to the CTRL project. The data can also be provided to the operator of the railway as a working tool that provides information on access rights, easements and liabilities.

**About the Author** – Doug Geden is the Referencing Manager in the Information and Standards team of Union Railways Property in London.

**Acknowledgements** – The Land Terrier Team at URP consisted of the author, Edwin Kemp, Data Manager, Mike Tucker, Land Plans Manager, and Andy Wilkinson, Information and Standards Manager. In addition to the team the author would like to thank the URP Management in providing the full support necessary to fulfil our objectives together with the coalition of the willing at Intergraph, Terraquest and Geo-Aid.

