



# Cadastral Reform in NSW

(Professor John Fryer – The University of Newcastle – June 2001)

## *The case for building a Numerical Cadastral Data Base*

Land ownership is a fundamental layer in the Geographic Information Systems (GIS) used by governments, agencies, utilities and councils. Many infrastructure assets, such as pipes, power-lines and street furniture are located with respect to land boundaries and their accuracy depends on the accuracy of the land ownership layer. If any changes are made to the position of boundaries on the land ownership layer, then these changes have to be reflected on all of the dependent layers.

The former NSW Land Titles Office (LTO) is responsible for managing boundary data (survey plans and land descriptions) and surveyors use this information to define boundaries to a high degree of accuracy. Because it is in the form of dimensions written on plans and documents, this data cannot be readily used in a GIS system.

Our “dimension based” boundary data has evolved over the last 200 years during a time when it was easier to measure dimensions (bearings and distances) than it was to fix the location of a point on the surface of the earth.

***With the introduction of the Global Positioning Satellites (GPS), it is now easier to measure position than it is to measure a dimension.***

The emphasis has shifted to the use of “position based” GPS systems for all GIS needs. The challenge is therefore to capture and convert the historic dimensional boundary data to a complete, correct and precise position based network of parcel coordinates.

We now have the technology, systems and software to use the current boundary data to generate coordinates for all property corners. This could provide the basis for moving to a coordinate based cadastral system and at the same time producing an accurate and complete base layer for all GIS systems.

An approximation of the boundary data set is available in digital form from the former NSW Land Information Centre (LIC) and is referred to as the Digital Cadastral Data Base (DCDB). The DCDB was produced about twelve years ago by digitising boundaries shown on the available mapping at the time. It served a useful role as a ‘stop-gap’ data set for a decade, but lacked the connectivity and accuracy necessary to become a fundamental data set for NSW.

The DCDB is expensive and complicated to keep up to date because of the need to continually fit precise new data into an incomplete and inaccurate parcel framework. In addition, the continual changes in position of property boundaries with subdivision and other land developments requires the subsequent updating of all the dependent GIS layers.



About one third of all local government councils and some service utilities have purchased the DCDB, but few of them rely on the LIC update service. Consequently, every government agency, utility and council has a different version of this cadastral dataset making it difficult to combine data from different organisations. The duplication of effort and duplication of update is very costly to the State as a whole. However, because updating costs are absorbed within each organisation, the total cost is largely hidden.

The traditional function of the former NSW Land Titles Office has been the management of land titles and distribution of this data. Before any reform can take place, this role must be expanded to include the maintenance and distribution of a new “survey accurate” Numerical Cadastral Data Base (NCDB) as an essential component of the overall management of land titles.

***The NCDB for NSW can only be built from existing LTO boundary data using techniques and software, which have been specially developed for this purpose.***

Ideally, the LTO would have a “survey accurate” dataset of their cadastre, maintain it through the normal checking and charting process for new plans of subdivision, and make it available to all users. In this way it will always be accurate and up-to-date and will be available as the sole cadastral dataset for any user in the state of NSW.

An important by-product of the NCDB will be the automation of many of the checking procedures for new plans and this will reduce the time for registration of new subdivisions. This will assist State development.

## **The Current Position**

The cadastral surveying industry in each state is made up of three main groups with interlaced responsibilities:

- 1) The LTO manages the cadastral record and provides quality checks on data submitted to change the cadastre,
- 2) Registered Surveyors provide the data for the cadastral record and for changes to the cadastre, and
- 3) The Government sets the survey standards and the regulations and has overall control of Registered Surveyors.

The current system is effective in protecting land titles. The level of litigation is low, the cost for remarking a boundary is not excessive and the public in general are not worried by boundary disputes.

***For change to occur Government must recognise that a titling system has to serve a wider purpose than simply protecting individual owners.***

The Torrens system was adopted in the 1860's to provide a guarantee of title. The new GPS measuring equipment means that in the future the NCDB can provide a guarantee of the land itself. In other words, the land parcel will be defined by its coordinates and not its dimensions. Therefore the concept of, “be it a little more or a little less”, for the parcel corner is now unambiguously defined as an absolute position on the earth's surface.



## **Building the new NCDB**

As mentioned previously there is technology, systems and software to use the current boundary data to generate coordinates for all property corners.

The existing record system of cadastral plans held by the former LTO contains a complete data set of all the dimensions for all land parcels past and present in the state of NSW. The surveys have been to set standards and are of a known accuracy and reliability.

Methods for utilising the NSW data to directly create a “survey accurate” coordinated cadastre were investigated in 1991 by a research project (known as the Gresford Study) run by the University of Newcastle and supported by the former NSW Land Information Centre (LIC) and the Consulting Surveyors Association.

As a consequence of the investigation a complete system to effect the transition to a coordinated cadastre was developed and tested. It is a unique three-stage process comprising the entry of all dimensional data, the building of topology (linking of common points, points on lines and inclusion of control) and then adjustment of the data to create a seamless parcel network.

Computer programs and operational procedures were developed by Mimaka Pty Ltd to facilitate and manage the total system. The software and procedures have been progressively refined and patented since then and have been used in projects in most states in Australia as well as the Philippines, New Zealand and the USA. The former LTO has extensively tested the system for NSW and it has been modified to reflect their requirements.

The Northern Territory has been building an NCDB using the Mimaka system and the work has been carried out within budget and is nearing completion. The key to success in the Northern Territory has been the decision to use the existing cadastral workforce to build a completely new system from all of the existing dimensional data.

***There are no short cuts, for if a coordinated cadastre is to have the reliability and security of the existing cadastre, it must be based on the original boundary data.***

It is important to note that the existing DCDB and derived products are of little use in this process, being comprised of data scanned from a variety of maps.

There is no doubt that a coordinated cadastre is the way of the future. It is inevitable that it will replace the current system. There will be benefit-cost savings and improvements to the timeliness of data. The question for NSW is really how long should we delay and waste resources on maintaining the current outmoded system.