ABSTRACT

Ten years ago cadastral reform was not an issue in Australia. In fact, the term 'cadastre' was not even thought applicable in Common Law jurisdictions; today this view has changed. What is 'cadastral reform' and why has it become a key issue in Australasia over the last few years, are key elements of this paper.

This chapter recognises that present Australian cadastral systems had their genesis in the 19th Century and, as a consequence, many of our practices, laws and regulations and institutional arrangements are not applicable in today's society. In reforming our cadastral systems, the paper looks at the major pressures which are instigating change. In particular, the chapter emphasises that an holistic approach is necessary in reforming cadastral systems while recognising that cadastral systems are fast becoming spatial information systems, in parallel with the community as it moves into the era of an information society.

As an example of the growing interest in cadastral reform, the recent conference 'Cadastral Reform 1990', the first of its type in Australia, is reviewed.
cadastral related activities have from virtually First Settlement comprised the major activity for the professional surveyor in Australia. On the other hand virtually every national surveying conference has regularly had at least a couple of papers concerned with cadastral matters.

Over the last decade there have been numerous suggestions in many surveying forums that cadastral activities are becoming less important in the spectrum of activities of the surveyor. To some extent this is true of the technical aspects of cadastral surveying considering the impact of EDM and the advances in computerised theodolites and data processing. However the importance of cadastral issues to society in the broadest sense appears to be as important as ever, and in some jurisdictions is increasing.

For example the number of papers which could be considered to be concerned with cadastral reform at the recent XIX Congress of the International Federation of Surveyors at Helsinki, Finland (10-19 June, 1990) numbered over 40. This was arguably the largest group of papers with a common theme out of about the 300 papers presented at the congress. The two major topics in the Congress which were concerned with cadastral reform were computerisation of land parcel records and equally the creation and maintenance of digital cadastral data bases. Papers included a discussion of *institutional, administrative, technical, legal, conceptual and modelling* issues. Discussion also included issues concerned with *data integration, the role of the private sector, uses of cadastral systems, access and delivery of cadastral data, developed and developing countries, government systems, linkages to other systems, socio-economic aspects and strategies for reform*. The Congress was attended by over 3,000 participants from 78 countries with technical and scientific papers in nine commissions ranging from Professional Practice, Survey Instrumentation, to Planning and Valuation.

As was seen at Helsinki, cadastral issues are alive and well. Australia is no different with the interest in cadastral issues increasing significantly over the last decade. A cursory review of the papers in the journal *The Australian Surveyor* will confirm this view.

In reviewing cadastral reform, this chapter examines the concept of cadastral reform, reviews briefly the historical interest in cadastral issues, considers some of the current issues and pressures on the cadastre, highlights evidence of a desire or need for cadastral reform, reviews the recent Cadastral Reform '90 conference and discusses the need to take a broader view of cadastral systems than many governments are doing at present.

**WHAT IS CADAstral reform?**

Cadastral reform is concerned with improving the operation, efficiency, effectiveness and performance of the cadastral system in a state or jurisdiction. In simple terms cadastral systems are the foundation of and an integral component of parcel based land information systems (LIS) which are in turn a central component of the land administration and land management systems in a state or jurisdiction. A parcel based land information system is also referred to as a multi-purpose cadastre in many jurisdictions. The term "cadastre" however can have a different interpretation in different countries and states. In the Australian context it generally refers to the land registration system and the corresponding cadastral surveying and mapping system, together with the related computerised indexes. Cadastral systems are not local government LIS or utility information systems even though these systems often rely heavily on a cadastral base and are usually considered to be a part of a multi-purpose cadastre.

In both the Australian and European contexts, cadastral systems are also closely linked with land valuation systems. In the European context, cadastral systems were originally concerned with land valuation for taxation purposes and later were linked to land registration systems. In Australia, the reverse was usually the case although the end result, which is a close relationship between land registration and land valuation, is very similar.

Some of the major cadastral reforms being introduced or being considered for introduction into Australia include:
- the development of complete computerised indexes of land parcels at a state level updated by the
title registration system
- the development of automated and fully computerised land title systems
- the development of statewide digital cadastral data bases updated by digital subdivision data
- the reform of the institutional arrangements for the management of the cadastre
- reforms to conveyancing and title registration procedures often instigated by Law Reform
Commissions
- reforms to the registration of surveyors and the statutes and regulations concerned with the
performance of cadastral surveys
- the introduction of coordinated cadastral surveys
- the introduction of coordinated cadastral survey systems where the mathematical coordinates have
"legal" significance in that the mathematical coordinate over-rides monumentation on the ground
- the move from a cadastral surveying system, to a cadastral mapping system supported by cadastral
surveys
- the incorporation of the core computerised cadastral system as part of a broader LIS or multi-
purpose cadastre
- systems to improve the delivery of cadastral information whether this information is textual or
graphical. This includes imaging systems and the use of remote terminals and FAX machines.

What is certain is that Australian cadastral systems are rapidly moving to systems much more akin
to their European counterparts.

The principles of a modern cadastre are clear and simple (Williamson, 1983) and have been recognised in
most countries for over a century but it is only during the last decade that they are being accepted in
Australasia.

HISTORICAL REVIEW

Cadastral issues have always been of major importance to the development of Australia. During the last
century administrators and Surveyors General had to develop new cadastral surveying and mapping, and
land registration systems to cope with a large harsh country. They attempted to use many fundamental
cadastral principles however they did not have the technology and resources available today. They did
however develop the Torrens System of title registration, introduce very sophisticated and accurate large
scale mapping systems in the larger cities, attempted various methods of controlling azimuth in cadastral
surveys (such as the systems in Queensland and WA) and introduced the use of coordinates based on a
local origin (as in New Zealand). Cadastral issues were of such importance, that based on the platform of
reforming the conveyancing system, Robert Torrens made his way to Premier of South Australia. In
addition there were two major Royal Commissions, one in Victoria and one in NSW, concerned with land
and cadastral issues, as well as many other investigations and reports. In a traditional sense Surveyors
General and cadastral issues were at their peak during the latter half of the 19th Century. This level of
activity to a significant extent continued up to the beginning of the First World War.

The low point in cadastral developments was between the end of the First World War and the end of the
1970s. There were some major initiatives in most states during this period such as the introduction of
Survey Coordination in the 1950s and 1960s and in the latter part, Survey Integration in NSW, but for the
most part the initiatives during this period did not have a major impact on the profession or society.

The view around Australia in the 1970s was that the country had one of the best cadastral systems in the
world. The general view was that there was nothing wrong with the systems and nothing worth
researching. The one significant exception was George Kennedy, the then Surveyor General of South
Australia, who was endeavouring to introduce a cadastral system derived from a photogrammetric map
base (see references to his work in Williamson, 1983).
One of the reasons for this low point in cadastral activities was the emphasis during the period on extending the geodetic network across the country and completing the topographic mapping of Australia. Due to these major activities, the emphasis in the tertiary institutions which set up surveying schools across Australia in the 1950s and 1960s, was on geodesy, photogrammetry and measurement surveying. Emphasis on land related issues and in particular cadastral matters was sometimes non existent or at best tolerated by the measurement scientists as a "necessary evil" in the courses. The 1970s however saw an increasing emphasis on land studies and cadastral issues in surveying degrees in such institutions as the University of New South Wales.

The impact of computerisation and the adoption of some fundamental cadastral principles in the 1970s saw a move to change the institutional structures surrounding the administration of our state cadastral systems. In this regard the institutional changes in South Australia were a model and led the way in Australia. These moves in the 1970s were in some states as a result of the recognition that the cadastral surveying and mapping activities had to be integrated into one function and closely linked to the land registration and to some extent the land valuation functions. These moves have resulted in the breaking down of some inefficient and anachronistic institutional arrangements in many Australian states, albeit there is still a long way to go in others.

The 1970s and 1980s have seen the move for our cadastral systems to be part of the development of state-wide parcel based LIS. Australia's cadastral systems however are still grappling with much institutional, legal and technical "baggage" from a past era. As Australia rapidly becomes an information society in the 1990s, the profession will be forced to come to terms with many, if not all, of these issues.

The present economic recession in Australia, is having a major effect on the structure and operation of Australian cadastral systems resulting in some positive and negative effects. Certainly cadastral activities in the State of Victoria have been dramatically scaled down, particularly in the surveying and mapping government sector. The author estimates that this sector is significantly less than half the manpower of ten years ago. In addition, the excellent institutional relationship which was established in Victoria over the last decade by bringing title registration, cadastral surveying and mapping and land information management (LIM) into the one government department has recently been disbanded. Title registration/conveyancing has been transferred to the Attorney General's Department while surveying, mapping and LIM having been transferred to the Department of Finance. The reasons for these changes are neither understood nor generally supported.

In support of the system developed over the last century, it must be stated that it has served its purpose. Australian cadastral systems have an enviable record of very few ownership and boundary disputes as evidenced by the lack of court cases despite being one of the most urbanised countries in the world. This is a credit to the professionalism and technical expertise of both government and private sector surveying and legal professionals, and government administrators. This is in sharp contrast to many developing countries where there is often a ten year backlog in the courts to hear boundary and ownership disputes. The difficulty at the present in Australia is that much of the present system was not designed for the needs of today's society. It has difficulty coping with the technological, economic, political and social pressures of today. This results in many aspects of the present system being expensive and inefficient, albeit it remains a very accurate system.

**EVIDENCE OF A TREND TO CADASTRAL REFORM**

Cadastral reform has existed since First Settlement. It is not a 'one off' administrative change. However cadastral reforms have increased significantly over the last decade with an expectation of that momentum and level of change being maintained for at least another decade. There is certainly no lessening of interest internationally in cadastral issues as evidenced by the proceedings of the recent FIG conference mentioned above. Many Surveyors General and land administrators around Australia are presently committed to a high level of cadastral reform.
The importance of cadastral and related issues is evidenced in the appointment of professors and heads of academic surveying departments around Australia and in other English speaking countries with expertise in this area. This would have been unheard of ten years ago when it was virtually mandatory to have a geodesy, photogrammetry or measurement science background for such appointments. This trend for people with such backgrounds to be appointed to senior positions is also being seen in international organisations and other forums.

There has certainly been an increase in interest in cadastral and LIS in developing countries over the last decade. For example it is only in the last 15 years that the Australian International Development Assistance Bureau (AIDAB) has taken an active interest in cadastral and LIS projects. The increase in interest in this area has been mirrored in other donor countries world wide with the major aid organisations such as the World Bank becoming very interested in the last decade.

One of the major issues pushing cadastral reform is the trend for cadastral systems to become information systems and not systems designed to just serve the traditional conveyancing/land ownership user base. The cadastral system has already become the basis of a much broader LIS in most states and jurisdictions in Australia however its future in some jurisdictions may be in question as evidenced by the recent developments in the State of Victoria. There is an increasing recognition, especially in such organisations as the World Bank, that cadastral data has a very important role to play in effective and efficient land management, especially in urban areas. Reference should be made to the two excellent papers by Lynn Holstein (1990a and 1990b) from the perspective of the World Bank. Another increasing pressure over the next decade, will be the need to link parcel based LIS with environmental and natural resource data.

More apparent issues in Australasia today, which are having a major effect on cadastral systems, are government policies for cost recovery, accountability, efficiency, effectiveness, deregulation, elimination of protectionism (both of systems and professions), quality control and the transfer of government activities to the private sector.

NEED FOR A HOLISTIC VIEW OF CADASTRAL SYSTEMS

Unfortunately there is not a large body of knowledge in the English speaking world concerned with the cadastre and related land administration and land management issues. This void has been filled to some degree over the last two decades however there has still not developed a cohesive body of knowledge for the area as is found in most accepted disciplines. Cadastral issues are however different from the more mathematical and scientific disciplines in surveying. A lot has been achieved over the past two decades albeit a lot more has to be done. Simply the acceptance of cadastral concepts in the English speaking world has only come about during the past decade. Achievements and reforms must therefore take this into account.

Interestingly there is some similarity between the establishment of the credibility of cadastral and LIS studies a decade ago in the surveying profession in Australia and the development of the geographic information system (GIS) discipline today world wide.

The key to understanding cadastral systems is in taking a global view of a system. This means in the Australian context looking at conveyancing, land registration, cadastral surveying and cadastral mapping as one system which is intimately linked. It means looking at the social, economic and institutional environment in which the system operates. Cadastral systems must be viewed in the broad sense as part of an information system which is central to the land administration and land management processes in any state or jurisdiction.

Further work must be undertaken to better understand the unique nature of cadastral data as compared with other spatial data in a land or geographic information system. Also a better understanding must be gained as to the role that the cadastre plays in the administration of land in both rural and particularly urban areas. These issues are particularly important in developing and improving systems in Third World
Cadastral Reform'90 - The Conference

Nothing epitomises the increased interest in cadastral reform in Australia more than the recent Cadastral Reform '90 conference. The Conference was directed at the immediate concerns of those involved in managing the cadastral systems in Australasia. These pressing issues are of such importance that the Conference attracted all Surveyors General in Australia and the Surveyor General of New Zealand, together with many other senior bureaucrats, private practitioners and academics. Surveying practices and related laws and regulations across Australia are changing under the pressure of deregulation: cadastral systems are moving to full cost recovery; total quality management (TQM) concepts are impacting on all facets of the cadastral system; digital cadastral databases are being completed yet their role in the cadastral community is not clearly determined; coordinated cadastres are becoming a reality with pressures to give legal status to boundary coordinates; the impact of the Global Positioning System (GPS) is forcing cadastral administrators and practitioners to re-think fundamental cadastral principles; these were the issues which the participants came to discuss. The Conference's objective of creating a forum for discussion of cadastral reform was achieved. Several participants considered the Conference was too narrow and was dominated too heavily by technology. Some felt that the role of cadastre in land management and the broad requirement of users should have been explored to a greater degree. These concerns will be addressed in the next Conference on Cadastral Reform which will be run next year as requested by all attendees. A summary of the discussions at the conference are set out below, being an extract from the conference proceedings (Hunter and Jeyanandan, 1990).

The first day of the conference saw nine papers presented on a wide range of topics which included the reasons for cadastral reform, a keynote address that reviewed international trends in this area, technologies and methodologies for reform, cadastral education and public perceptions of cadastral boundaries.

At the beginning of the first discussion session, the following major issues were raised:

- The high priority of land resource management in government agendas,
- The need for an holistic review of cadastral reform,
- That security of tenure is not necessarily the major issue associated with cadastral reform in developing countries,
- What do users really want from cadastral systems?
- How can the surveying profession best use new technologies?
- How does the profession model and test alternative system proposals before implementation? and,
- The need to enhance cadastral education with economic and political studies.

Although these issues were not discussed in any given order or priority, the following is a collected summary of the major discussion relating to these topics.

Firstly, in questioning whether society really needs cadastral reform at all, the general view of the conference was that reform is here to stay whether the profession likes it or not. It was recognised that in Australia at least, the development of statewide computerised Land Information Systems presents an ideal time to undertake change in order to provide better systems and to achieve greater benefits from them.

There was a feeling, however, that such reform should not take place in professional isolation and that this task is not the sole responsibility of the surveying profession. Indeed, the credibility of future conferences on this subject will rely upon greater involvement from the legal and valuation fraternities, and stronger private sector participation.

There was not a lot of discussion on the role of cadastral reform in resource management, but it was interesting to note that in NSW the government has already acknowledged the importance that management of data has to play in this issue.
Some delegates took the view that because one of the key issues facing governments is better management of natural resources, the profession should realise that cadastral reform per se is only part of a much greater process required to manage these resources, and that it should be seen in a far wider context than just relating to ownership registers and plans.

Indeed, cadastral reform is often only viewed as a means to an end (in developing countries for instance, where solving the rural and urban growth problems are far more important), and that in some countries resource management programmes proceed without cadastral reform at all.

This raised the issue of the importance of security of tenure, and it was made quite clear that while developed countries stressed the significance of secure tenure for property development purposes, in many developing countries secure tenure means not that landowners can borrow more money, but rather that they now know the boundaries to which they can plant their crops! Already, there is evidence to suggest that the productivity of some developing countries has been improved because of this measure.

A major discussion point arising from this session related to determining just what it is that users want from our cadastral systems. While there is no doubt that cadastral reform must be linked to cost-efficient and effective services, there remains to be answered the fundamental question of how far the profession can relax data quality and yet still give users the security that they require. In other words, what accuracy are users prepared to pay for in their cadastre and do accuracy requirements change with different scales of property development (and hence different risk factors associated with possible litigation over boundaries)?

Linked with this problem is the question of public perceptions of cadastral boundaries. The surveying profession may be ignoring user needs and (as a profession) becoming too technology driven.

This led to arguments for and against coordinated cadastres. It is apparent that there are jurisdictions in Australia operating these systems which work well. The problem here is determining why both systems are capable of operating successfully. It is obvious that the profession still lacks a thorough understanding of the inter-relationships between society, the economy and government which go towards making a successful cadastre.

This led to a discussion on cadastral education and it was acknowledged to be an essential part of the reform process. Over the past few years, there have been very few Australian post-graduate students in this subject and if the profession is to understand the subject, this science must have a higher profile and greater recognition. Students will also need to study a broader range of subjects, and this is already occurring in Queensland where politics, social and economic studies are considered part of cadastral science.

The second day began with a review of the relationship between technology and progress, the consensus being that the profession is not technology driven - indeed there was a criticism that all too often the profession has used the technology to reproduce old ways rather than to break into new fields. Even DCDBs are seen as simple digital mapping tools, to be used to assist in graphical indexing rather than as semi-intelligent tools. It was pointed out that the range of technologies is so wide that many options are available. The profession needs to look at all processes, not just technological advances to see whether they are in need of reform.

There was some discussion on the conservative nature of surveyors and the need for them to look to the year 2025 A.D. It was recognised that there is a lack of vision and insufficient funding of research and development. Until the cadastral problems of the 21st century are more clearly defined there will be a tendency to stick to well worn approaches, modified by the technology that is currently available.

Those attending the conference were almost all surveyors and regret was expressed that there were so few representatives of the legal community and none from the private sector - indeed the private survey sector
CADASTRAL REFORM - AN AUSTRALIAN VISION FOR THE 1990s

was represented by only three members. Geographic Information Systems (GIS) (or, possibly SIS, Spatial Information Systems) are multi-disciplinary and there needs to be greater dialogue with other user communities.

Discussion then moved to the impact of legal coordinates, some taking the view that it was in principle something that exists already and therefore not a big issue while others thought that it will be the death of the old surveyors. There was some debate on monuments versus measurements and questions of cost were raised, especially in the light of the evidence of user perceptions from New Zealand. The accuracy of coordinates in areas where control is of lower standard than modern survey measurements was raised. While techniques exist to manipulate some of the data - for instance using the software called MAGIC (Multiple Adjustment of Geometry with Implicit Constraints) that is being developed at The University of Melbourne - major problems were seen to exist. The overlay of topographic (graphical scanned) data with cadastral and other field survey measured data could possibly be solved by holding the data in different layers - for instance items such as water features and utility data could be held in vector layers while some background data could be held as a raster layer that could be overlaid when needed.

It was felt that the responsible authorities should still store the raw cadastral survey data and hope that in time the profession can use it to better advantage when adjoining areas have also been upgraded. As one speaker put it, the profession should not be in too much of a hurry as time will solve a number of the problems. Probably one of the biggest difficulties at present, however, is the handling of historical data and the profession must therefore make sure that any archive of raw data that it builds can meet future needs. It was recognised that the problems of integrating data from different sources poses many problems, not all of which are technological.

There was a lively discussion on the costs and benefits of survey examination. It was reported that in Victoria there was a 35-40% fail rate though often for relatively trivial reasons. It was suggested that some use the checking system as a protection against their own negligence - so that the State rather than the individual ultimately has to take the responsibility for errors. One solution offered was an exponential scale of charges for checking, so that each time a survey is referred, there is a dramatic increase in the checking fee. Such costs are already high in New Zealand where in the early 1970s they were $2 per lot and are now $600. A converse point of view was expressed that the Registrar of Titles or the Surveyor General should actually pay the private sector for their surveys since they incorporate the results in their archives for the long term benefit of the community at large.

A final thought was expressed about customary tenure and the issue of customary rights in land, especially in the Northern Territory. This was recognised as a major problem and one in which surveyors should cooperate with anthropologists before coming up with a solution. One wonders what anthropologists (or the Aboriginal peoples of Australia for that matter) would make of surveyors in such a dialogue!

Twelve papers were presented, in three sessions, on the third and final day of the conference. The papers identified visions for the future, dwelling on objectives of reform, corresponding barriers and strategies to overcome them. Most of the speakers were managers of, or closely associated with, ongoing cadastral reform processes in Australasia. Their vision and pragmatism reflected an apparent diversity which contributed greatly to the discussions.

The discussions were lively and thought-provoking, involving the active participation of the majority of the four score participants. Discussions followed each paper and session, and during the entirety of the fourth session. In the fourth session however, major issues identified during the day were tabled and discussed. These issues included the role of the DCDBs, significance of monuments in a coordinated cadastre or legal coordinate environment, the relevance and future role of Surveyors Boards, the need for practicing certificates in the context of quality assurance regimes, national strategies for reform, relative importance and nature of organisational, institutional and managerial barriers to change and the role of educational institutions in supporting reform.
It was clear that cadastral reform in Australasia is focussed on reducing uncertainties and costs associated with the hierarchy of evidence required to re-establish cadastral boundaries. As well, visions for reducing costs, time and complexity in land registration processes and modalities for improving access to such services from remote stations are emerging. These visions are supported by considerations inherent in questioning present activities, processes and functions. The quantum of 'value added', at every stage of the cadastral processes, is being questioned in the light of opportunities offered by automated systems and demands for cost effective and timely services.

The role of DCDBs, the efficiencies that may be gained by upgrading their accuracies from the 'graphical' to the 'survey' and their relevance to the concept of 'legal coordinate based cadastre' received considerable attention. The impetus for such changes was seen to come from land development and engineering activities. However, the very large costs involved in such changes was emphasised (however the excessive costs may well be perceived rather than real). As well, the dynamic nature of coordinates in a DCDB was recognised and connected problems in redefinition of boundaries was raised. The effects of 'legal coordinates' on classical concepts of hierarchy of evidence, cadastral surveying and the profession were seen to be far reaching. It was apparent that initiatives taken already in South Australia, in their Designated Survey Areas, and in West Australia, in their Bridgetown pilot project, will be followed very closely by other jurisdictions.

The significance of monumentation, in a coordinate based cadastre and GPS technology environment, evoked lively discussion. Concern regarding the control of GPS technology was raised. The discussion however focussed on the need to understand community perceptions of monuments and cadastral boundaries.

The relevance and role of Surveyors Boards and practicing certificates in a deregulated environment was questioned. While some saw these functions as necessary and in the domain of professional bodies, others argue that they may be redundant in the context of evolving quality assurance concepts. However there was general agreement that Surveyors Boards should be entrusted the control and custody of DCDBs.

Australasia, with nine distinct cadastral jurisdictions, is at different stages of cadastral reform (see Hesse and Williamson, 1990). It is apparent that these reforms are driven by economic imperatives. State agencies are required to be effective, efficient and self supporting. Professionals, both in the private and government sectors, are required to be increasingly accountable. It was evident that global changes and heightened public expectations are placing greater demands on cadastral systems as well. The participants were conscious of the need to be pro-active in their approach and work in teams instead of continuing with the 'culture of working in isolation', promoted by existing practices and systems.

The need for national strategies and communication links to share information, research efforts and project outcomes was also emphasised. While particular advantages of consistency in a uniform and national cadastral systems were mentioned, the strengths in managing, developing and reforming similar systems from nine different, competing perspectives (countries, states and territories) was recognised.

An outcome of the conference was a resolution (Appendix 1) which highlighted the major issues and recommendations resulting from the discussions. The recommendations are all the more important considering that they were supported enthusiastically by the attendees and importantly all the Australian Surveyors General. Appendix 2 provides an interesting and unbiased view of the conference by Professor Peter Dale, an internationally recognised cadastral authority.

**CONCLUSION**

Cadastral issues are real. The importance of an efficient and effective cadastral system is particularly evident in developing countries. Simply, appropriate cadastral systems are necessary for the operation of both the private and government sectors, and economic development, in all countries.
In developing, reviewing or improving cadastral systems, the cadastral system in question must be viewed as a whole, not as disparate parts. In both developed and developing countries it is essential to create a vision or model for the future. This is an area where the surveying profession and land administrators have performed poorly in the past. **It is very important for each country, state or jurisdiction to clearly state it's cadastral vision for the future.**

The key question however will always be - have we got the vision right? This is the most important issue presently facing the surveying profession and influencing the impact of our profession on society.

**REFERENCES**


**APPENDICES**

**Appendix 1**

**RESOLUTION FROM THE NATIONAL CONFERENCE ON CADASTRAL REFORM**

Recognising that cadastral systems in Australasia have remained essentially unchanged for over a century, this conference believes there are presently major social, political, economic and environmental pressures which are demanding a fundamental reappraisal and redefinition of the aims and objectives of cadastral systems.

These pressures come from:

- government policies for cost recovery, accountability, efficiency, deregulation, both of systems and professions, quality control and privatisation
- advances in information management technology and measurement technology
- demands from society (free market, elimination of protectionism and value for taxpayer funds)
- an increased need for the management of the environment
- challenges from other disciplines and professions
- improved service delivery (effective land ownership and property boundary system; land information to meet society's requirements)

Developments in information and measurement technology have created opportunities for meeting these demands. All jurisdictions in Australasia are currently addressing the needs for reform to different degrees in the following areas:

- the development of a digitised digital cadastral data base to provide a spatial reference for
comprehensive state wide land information systems
- the development of complete computerised indexes of land parcels at a state level updated by the title registration system
- the development of automated and fully computerised land title systems
- the reform of the institutional arrangements for the management of cadastral systems
- reforms to conveyancing and title registration procedures
- reforms to the registration of surveyors, the role and operation of Boards of Surveyors and the statutes and regulations concerned with the performance of cadastral surveys
- the introduction of coordinated cadastral surveys
- the incorporation of the spatial and textual components of the cadastral system in digital form as an essential and core component of a broader LIS or multi-purpose cadastre
- systems to improve the delivery of cadastral information whether this information is textual or graphical. This includes imaging systems and the use of remote terminals and FAX machines.

In addition many states and jurisdictions are

- considering the introduction of coordinated cadastral survey systems where the mathematical coordinates have 'legal' significance in that the mathematical coordinate over-rides monumentation on the ground
- introducing Total Quality Management as a means of ensuring all processes are 'value added' and to assist in improving the overall efficiency and effectiveness of the cadastral systems
- moving to increase the focus of cadastral systems on land management and information systems
- with regard to cadastral surveying, move from a traditional land title focus to a land information focus with emphasis on the maintenance of the spatial data base
- upgrade digital cadastral data bases having graphical map accuracy to DCDBs with survey accuracy primarily through the use of the land development and lot creation process

This conference however recognises that significant economic benefits may derive from a fundamental re-appraisal of these systems, and recommends

1. that a functional review be built into all cadastral systems in Australia to determine an appropriate, efficient and effective strategy for the future,
1. a national network be provided within an appropriate national structure to facilitate a shared national view of cadastral reform,
1. the Intergovernmental Advisory Committee on Surveying and Mapping be requested to complete its review of cadastral reform in Australasia as a matter of urgency,
1. that there should be a major increase in funding for coordinated research on cadastral reform, and
1. The University of Melbourne be invited to conduct a further National Conference on Cadastral Reform in 24 months, such conference to be extended to involve other shareholders in cadastral systems.

Appendix 2

Observations on Cadastral Reform '90 by Professor Peter Dale.

The observations by Professor Peter Dale (a keynote speaker at the conference) give an interesting and unbiased view of the conference.

"Cadastral Reform is the flavour of the decade - both nationally in Australia, and internationally. This conference was timely and important, so much so that not only was it a sell out, it was attended personally by all Surveyors-General, plus the Surveyor-General of New Zealand. It was well organized by Ian Williamson and his team from the Department of Surveying and Land Information who created a relaxed but stimulating atmosphere. Nitty gritty matters were discussed as well as major philosophical issues and very many of those attending contributed to the debates. The first day was dedicated to an
overview of trends, the second to detailed explanations of progress in each of the States and jurisdictions and the third to strategies for reform.

So why this interest in reform? There are a number of answers. The fact is that cadastral systems around the world are under significant pressure to deliver their services more cheaply, more quickly and more responsively to modern day needs. Society has changed dramatically over the last few decades - look at the pace of change in eastern Europe - but what is done in the cadastral field is still rooted in the 19th Century. On the one side, technology has created opportunities for change in the methods for solving old problems. On the other, new problems are emerging with the changing needs of society and the environment. It is a sign of health rather than weakness to question whether one is on the right path.

To an outsider, the message from this conference was threefold. Firstly, there are voices in Australia that are now questioning the unthinkable such as the licensing of surveyors, while one Surveyor-General went so far as to say that Australia has one of the most expensive cadastral system in the world. The critics are however in a minority, the straightjacket of traditional thinking being the binding force within the land surveying profession. Secondly, the loudest voices are those emphasising the use of modern technology to reproduce what has always been done - subject to the use of co-ordinates rather than bearings and distances as the basis for the records. And thirdly there are those predicting that properties will no longer be defined by marks on the ground but rather by a set of abstract numbers - a major philosophical change in which the landowner has had little or no say.

The conference showed little enthusiasm to address the fundamental problems that relate to the role of the cadastre in society as a pro-active tool of land management, as an information base for monitoring the land and as a basis for environmental impact assessments, as a property management tool or as a vehicle for land value and land use studies. Geometry rather than geography is still the dominant theme. The cadastre remains producer driven rather than user driven. Where were the lawyers, the economists, the planners, the ecologists and environmentalists, the valuers, and the property managers? Why did we hear so little from the representatives of the public utilities? The answer was that the conference was dominated by governmental and quasi-governmental land surveyors - even the private surveying sector was thinly represented.

But, as they say, oak trees from acorns grow. This was a start and a good start at that - and like all good conferences it was agreed that there should be another in two years time. There is new thinking afoot and although some see this as a threat, to others it is an opportunity."