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## **DIGITAL LODGEMENT OF CADASTRAL SURVEY DATA IN VICTORIA**

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### **Abstract**

The current system of land registration has been in place for over 130 years and in that time very few changes have been made to it, despite substantial changes in society. Whilst this system does still fulfil its purpose of providing guarantee to title, an upgrade is necessary for several reasons. These include reducing the cost of the system; extending the applications and marketable uses of registered cadastral survey information; improving overall efficiencies of lodgement, registration, examination and use of cadastral survey information; and ensuring that the system can take full advantage of developing technology.

The development of a digital environment to manage land information, in particular, cadastral data, seems to be the most logical solution. The digital concept has already been embraced by many areas of the land information industry, however the lodgement of cadastral survey data is still basically a manual process. In the future it is possible that surveyors may lodge all plans to the local municipality, the Land Titles Office or even directly into a digital cadastral database in a digital format. This concept is known as digital lodgement and forms the basis of the paper.

This paper presents the results of a questionnaire sent to all consulting surveyors in Victoria regarding their views on digital lodgement of cadastral survey data. It also reviews responses from various Australian states on current initiatives towards the digital lodgement of cadastral data, and briefly outlines the main issues to be considered.

## **INTRODUCTION**

The primary purpose of survey document lodgement in Australian jurisdictions is principally to support the Government's guarantee of title. Originally, cadastral systems in Australia were designed specifically to support the operation of the land market and the individual owner, rather than being part of a wider land administration system. However, the need for complete and accurate spatial information has meant that plan lodgement now facilitates not only title creation, but also further subdivisional activity, updating of record systems and updating of the State Digital Cadastral Map Base.

Current lodgement in Victoria is still primarily paper based with most processes such as registration largely manual, being designed to support guaranteed title. While the current system still serves this purpose, it should be realised that an upgrade is needed to meet the following requirements:

- reduce the cost of the system to all participants;
- extend the applications and marketable uses of registered cadastral survey information;
- improve overall efficiencies of lodgement, registration, examination and use of cadastral survey information;
- provide 'absolute', authoritative and accurate spatial definition of cadastral data to support links to other systems; and
- ensure that the system can take full advantage of developing technology (Pearce et al., 1997).

Some of the processes in the lodgement of cadastral data have already been converted into a digital environment, such as the automation of titles. However, as Pearce states, "the degree of automation and integration possible for an inherently manual system is limited". In a true digital environment, it is not a simple matter of using a computer to enhance current paper based systems, but rather to efficiently manage and utilise the data. It is also more than simply computerising titles.

A vital step in the conversion of these processes into a digital environment is the actual lodgement of the cadastral data by consulting surveyors, which may be lodged in a digital format in the future. The term that is used to describe this process is digital lodgement, which is a proposed method of submission for registration and management of cadastral survey information in an electronic environment (Pearce et al., 1997).

Digital lodgement does not imply a paperless system, but physical representations of the data will be regarded as outputs, rather than the legal source of the data. What is important, is that in a digital environment, cadastral data is no longer produced primarily for the limited purpose of registration of title. This is due to changing community needs, as demands are made increasingly to integrate and improve access to key public information databases and resources.

This paper discusses the developments that have been made in the area of digital lodgement. It adopts a bottom-up approach, whereby the needs of the data suppliers (the surveyors) are

considered before the needs of the data users. This was achieved through a questionnaire sent to all consulting surveyors in Victoria concerning their current lodgement methods and attitudes towards digital lodgement. The paper focusses on the results of this questionnaire. The paper will also briefly discuss developments in other jurisdictions concerning digital lodgement, including Queensland, New South Wales and Western Australia; as well as reviewing the main issues involved in the implementation of digital lodgement.

## **DIGITAL LODGEMENT QUESTIONNAIRE**

Surveyors play a very important role in generating cadastral data, being key players in the plan preparation and lodgement processes. It is likely that when digital lodgement is eventually implemented, it will have a profound effect on all parties involved in the lodgement processes, and so it is of utmost importance to obtain input from these parties.

It was decided that the best way to determine the views of the surveyors was to send a questionnaire to each consulting surveyor in Victoria. The objective of the questionnaire was to determine the technical capabilities of surveyors, their current lodgement processes and their attitudes towards digital lodgement, in order to provide valuable information for developing a vision for an electronic plan lodgement system.

The questionnaire was sent to 104 private surveyors in Victoria, all of who are members of the Association of Consulting Surveyors. It was sent in early January 1998 with a closing date for responses in mid-February 1998. However, due to lack of responses, some follow up was required and the last responses were accepted in late April. The companies surveyed have remained confidential throughout the results.

The questionnaire consisted of both multiple-choice questions and short answer questions. The first two sections contained questions regarding current technology, and current survey and data lodgement practices, whilst the third section concentrated on the surveyors' attitudes towards digital lodgement. Appendix One contains a transcript of the entire questionnaire.

The questionnaire was designed using a similar questionnaire done in New South Wales as a basis (NSW Land Titles Office, 1997), with some overlap of questions. It was also based on a questionnaire carried out in South Australia in 1994 by the Department of Environment and Natural Resources (Land Services Group, 1994).

## **RESULTS OF QUESTIONNAIRE**

A satisfactory return rate of 42% (44 out of 104) was achieved which indicated quite a high interest in the general concept of digital lodgement. A higher response was anticipated in order to provide a more accurate range of answers, however these responses yielded some very important information nonetheless. This section will provide a summary of the results of the questionnaire. Some of the results will be shown in terms of percentage, whilst others will be shown as numbers out of 44.

### **Nature of company**

The results indicated that 86% of responses were from private organisations, with the remaining 14% from sole practitioners. This is not necessarily representative of the number of sole practitioners in the industry however because it was not known how many sole practitioners were actually on the mailing list to begin with. Not surprisingly, all sole practitioners had less than 5 people working for them. The number of employees was fairly consistent within all companies, with 27% of companies having less than 5 employees, 37% having between 5 and 10 employees, and 36% having more than 10 employees.

### **Current Technology**

The number of surveyors with access to a personal computer (PC) was 93%, with the remaining 7% using workstations. In the questionnaire, a PC was defined as a personal computer which is IBM compatible (as opposed to a Macintosh), which may be stand alone or networked. A workstation was defined as a computer, usually connected to a network, possibly running UNIX. In most cases, the firms using workstations had more than 10 employees.

The section regarding software was divided into three parts – geometry, which has been defined by the questionnaire as software which is capable of calculating parcel bearings and distances and coordinates for all parcel corners and connections; drawing software, which is that used to present data, rather than to perform complicated surveying routines; and word processing software, which is that used for the preparation of textual documents.

Initial results showed that the most popular geometry software was Liscad, with 22 users, closely followed by Autocad, with 21 users. For both packages, the majority of firms were using either the most recent version or the previous version. Geocomp appeared to be the next most popular geometry software with 13 users. The combined total of the other packages (Civilcad, Landmark, Wescom and others) amounted to 17, with only four firms using Microstation. The total number of software packages used amounted to more than 44 because many firms used more than one type.

After the majority of the responses of the questionnaire were received, it was suggested that the results of the questionnaire did not accurately reflect the true status of the profession, as no allowance was made for the multiple software licences used within the major companies. It was pointed out that some 80% of the majority of subdivisional work within Victoria is done by a handful of companies, which needed to be heavily weighted to obtain creditable results. Using this information, a second list of companies was surveyed again by telephone, and from this it was determined that the most commonly used software for large subdivisions was Microstation.

The most popular drawing software was Autocad, with 25 users, closely followed by Liscad, with 14 users. Microstation only had 8 users, half of whom also used it as their geometry software. Again, most firms used the latest version or the preceding versions.

Microsoft Word was by far the most popular word processing package, with 36 users. Six of these used the latest versions, with the rest varying between the next few versions down. Word Perfect had six users. The range in versions was most probably due to easy to use conversion functions in most word processing packages.

The questionnaire indicated that 58% of surveyors updated their software when the latest version was released (within 1 year usually), whilst 18% updated within the last year, but not necessarily with the newest versions. 24% updated between 1 and 5 years ago. By correlating this data with the software data, it would appear that this updating generally referred to geometry software.

There is currently quite a high usage of computer communications, as shown in Figure 1. For instance, the graph shows that the percentage of surveyors who used modems to transmit information digitally was 70%. Approximately half of those surveyed also had access to the Internet and email.

Figure 1. Usage of remote computer communications within the surveying industry.

### Current Lodgement Practices

The first question in this section regarded subdivisional work. The question was divided into five classes (number of lots) and the respondents were asked to state what percentage of each type of subdivision they would perform. For example, one company may be more inclined to carry out 2 lot subdivisions, say 70% of all the work they performed, whilst another 10% may be used for subdivisions for more than 20 lots. Figure 2 shows the setout of the question.

	Percentage
2 lots	.....
3-5 lots	.....
6-10 lots	.....
10-20 lots	.....
More than 20	.....

Figure 2. Question on subdivisional work.

In order to present the most useful results for this question, the results were correlated with the size of the company (number of employees) and relations were calculated between these two categories. Figures 3a, 3b and 3c show the results of this.



Figure 3a. Less than 5 employees.



Figure 3b. Between 5 and 10 employees.



Figure 3c. More than 10 employees.

The most evident finding from this correlation is that as the company size increased, so did the number of multiple lot subdivisions (more than 20 lots). For instance, the majority of the companies with less than 5 employees submitted mostly plans of only 5 or less lots, whereas the companies with more than 10 employees submitted many plans of 20 or more lots.

A significant finding was that there were 10 companies whose plans of 10 or more lots made up more than 50% of their plans lodged. This is important because current guidelines require that subdivisions containing more than 10 lots have to be accompanied by a digital plan.

Another notable finding was that 14 companies submitted more than 50% of plans that were 2 lot subdivisions. This is important to know because it is easier to manually update files for 2 lot subdivision, rather than trying to enter a plan in digital form.

The survey showed more than half of the plans submitted by 83% of the surveyors were carried out in urban areas. However, there seems to have been a misunderstanding in the question. Urban areas technically refer to the Melbourne Metropolitan area, not smaller country towns such as Geelong and Warnambool. Unfortunately, this was not specified in the survey and thus it appears that the question has been misconstrued. It would be safe to assume that the only companies who perform surveys in urban areas are Melbourne companies, and possibly those close by, such as Geelong. It is important to make this differentiation between urban and rural plans as there are two separate databases for the information, both of which have different requirements, such as the methods for updating the information, and the accuracies of each map base.

50% of the surveyors submitted more than 50 plans to the Land Titles Office (LTO) each year, and another 38% submitted between 21 and 50 plans. So overall, 88% of surveyors lodged more than 20 plans a year to the LTO, which is quite high, hence the introduction of digital lodgement would be extremely beneficial to those surveyors, especially if it is expected to reduce time and costs.



Figure 4. Preparation of plans.

Figure 4 shows the methods by which surveyors prepared plans, whether this was digitally, manually or using combinations. 31% used computers to prepare all their plans, and also of interest was the fact that 76% prepared more plans on computer than manually. 27% of surveyors used a combination of computer and manual techniques to prepare more than 10% of their plans. These results show a generally high usage of computers in the area of plan preparation, which is extremely encouraging for the purposes of introducing digital lodgement.

The results from this question were correlated with the size of the company, and it is surprising to find that there was no direct relationship between those companies who prepared all their plans digitally and the size of the company. Therefore it cannot be assumed that simply because a company is quite small that they generally prepare their plans manually, because this is not necessarily true.

80% of surveyors submitted some plans in digital format, whether this was to the water authorities, or councils. 30% stated that they would submit plans digitally if needed to, although some of these included those that already do submit digitally. Only 3 companies (7%) stated that they would not submit plans digitally.

### **Attitudes towards digital lodgement**

This section contained four short answer questions regarding the surveyors' exposure to digital lodgement, benefits and problems they foresee, and their recommendations for implementation.

22% of surveyors stated that they understood the purpose of digital lodgement but not the procedures. A few had a general knowledge of digital lodgement though using email. 18% stated that they regularly provided clients with digital data, with 3 stating that this was a result of a Melbourne Water scheme several years ago requesting that selective surveyors submit all plans of 10 lots or more in digital format. 9% had heard of the concept through seminars and conferences and only 4% had been exposed to it through articles in technical magazines.

The most important benefit perceived by surveyors resulting from digital lodgement was that of time efficiency, with 54% having this response. The concept of time efficiency included time saved for downloading data, faster approval times, and processing all the data in the same place. The other three main benefits perceived were less paper usage, cost savings, and easier data retrieval, all with responses of about 18%. Other benefits that were mentioned included ease of plan amendment, increased data accuracy, more control over the data from the surveyor's point of view, less file space required for hard copy plans, and less duplication of subdivision plans.

One main concern about the implementation of digital lodgement was the integrity of the data after it left the surveyor's control, such as the possibility of the data being manipulated, the consequences being possible professional indemnity claims resulting from manipulated data. Another major concern was that of intellectual property, and also compatibility of software. Each of these three problems was mentioned on 25% of the responses. Another 18% thought that there would be financial losses, and 13% were concerned about staff retraining.

The most significant methods suggested for implementing digital lodgement was that of using standards, such as a common DXF (digital exchange file) format, with 20% of responses suggesting this. The two other main ideas were that a dual system should be used at first, with digital lodgement being introduced in tandem with existing procedures for a period of time; and that it should only be implemented after considerable input by and from organisations, professionals and individuals who are actively involved in the industry on a day to day basis.

## **Summary**

This questionnaire has revealed that the majority of surveyors in Victoria are already proficient in computer usage, with an average of 84% of plans currently being fully or partly prepared digitally. 80% of surveyors already submit plans in digital format to some type of authority, whether this is to the local municipality or to Melbourne Water. Also of significance was that 66% of surveyors currently use or own a modem. These facts, together with the rest of the results from the survey indicate that there is a high willingness to move towards the digital lodgement of survey data, providing it does not impose high setup costs on the surveyors.

## **DEVELOPMENTS IN DIGITAL LODGEMENT AUSTRALIA WIDE**

Digital lodgement has progressed in some of the other Australian states. Even though each state has a different system of title registration, it is still worthwhile comparing what each state has achieved in this area, in order to determine the best practices to adopt for Victoria. Only major developments and initiatives have been discussed.

### **New South Wales**

In New South Wales, there is currently no digital lodgement of cadastral data as such, however an Electronic Plan Lodgement (EPL) program is being carried out, with the main aim at replacing the existing paper lodgement system with an electronic system. It is intended that the project develop a detailed understanding of the issues and mechanisms involved in the electronic transmission and receipt of digital data.

In conjunction with the work being done on the Electronic Plan Lodgement (EPL) project, a Cadastral Spatial Referencing System (CSRS) is also being developed. The CSRS is intended to be a spatially accurate layer in the statewide Land Information System (LIS), and it is being derived directly from data submitted to the Land Titles Office by the surveying profession in the normal course of the registration process. The CSRS will grow to give a spatially accurate cadastral fabric for the state of NSW and will be both topologically sound and legally correct .

### **Queensland**

The main work that has been done on digital lodgement in Queensland has been by John Hayes, who has recently completed his PhD, entitled "A Prototype System for the Digital Lodgement of Spatial Data". The thesis was concerned with developing a prototype for the digital lodgement of spatial data and was developed to take advantage of the growing amount of digital spatial data being generated by surveying organisations.

The prototype takes into account such aspects as spatial data collection, manipulation and presentation procedures, transfer and retrieval processes, format and content standards, and best practice and quality assurance. It provides for immediate delivery of accurate, digital land



boundary data, ensuring that all data is entered into the database at source accuracy, rather than the current procedures where it often passes through a series of processes whereby the accuracy of the data is often reduced (Hayes, 1997).

## **Western Australia**

Digital lodgement was introduced in Western Australia in 1995, with plans now being lodged in a Cadastral Survey Data (CSD) format. The CSD was designed to provide for data to be extracted from various existing formats currently in the market place as well as provide the opportunity for new applications to be developed by the private sector (Pearce et al., 1997). The development of the CSD has enabled faster updating of the map base and streamlined the plan registration process. 85% of survey plan lodgements currently received contain CSD files and the standard of these files is improving (Houghton, 1996).

Another significant reform has been that of plan examination. Traditionally, responsibility for survey plan examination has been that of the public sector, who formerly checked 100% of all plans lodged by licensed surveyors. However, it is now compulsory for licensed surveyors to fully examine their plans, with the Government performing a 10% random audit of the mathematical and legal aspects of surveyors' plans (Cribb and Higham, 1995).

## **ISSUES**

A number of issues have been highlighted through studies of digital lodgement in the other states, and also through the digital lodgement questionnaire. Three key issues include data standards, digital signatures, and intellectual property, all of which shall be briefly discussed.

### **Data standards**

Currently, the number of different software packages used by consulting surveyors in Victoria is around six or seven, as indicated by the questionnaire results discussed earlier. This may present problems when trying to implement digital lodgement, as there would need to be a common file format or at least a translator for the most common packages. It would be quite unfair to expect the majority of the survey companies to change their software packages simply to facilitate digital lodgement. The cost to change over and the amount of training needed for staff could negate the benefits of digital lodgement. Currently the only possible option for most states is to convert files to a DXF format, however the data in these files is not intelligent, therefore also counteracting the effects of digital lodgement. Western Australia has taken a step forward in this area by introducing a common file format, however this is still a significant issue that needs further work.

### **Digital signatures**

The importance of a signature on a lodged plan is stated in the Subdivision (Procedures) Regulations 1989, whereby each sheet of a plan must be signed and dated by a licensed surveyor. Currently, signatures are represented in a handwritten form, however in a digital environment, this cannot happen. In order to cope with this problem in many areas, digital signatures have been developed, and are already being used in many other digital environments, such as banking and tax returns. A digital signature is a reliable electronic means of signing electronic documents that provide high levels of security, sender authentication and message integrity (Division of Corporations and Commercial Code, 1997). Their use for digital lodgement of cadastral data appears logical.

### **Intellectual Property**

The information that a surveyor represents on a plan may be classed as intellectual property, which McNamara defines as "those distinctive elements of innovation and/or reputation within a person's business. It includes the elements of copyright, patents, designs, trademarks, trade

secrets and goodwill." (McNamara, 1997). Copyright, which is one form of intellectual property, contains a number of different categories, however those of relevance to this topic are artistic and literary works. It appears that a surveyor's plan may fall under the category of artistic work, which includes diagrams, maps, charts and plans. However of a more controversial nature is the information on the plan itself, which some argue, should fall under the category literary works, which is defined by the Act as a table or compilation expressed in words, figures or symbols. This opinion is supported by McNamara who states that "the expression of bearings and distances in Surveyors' plans form the basis of a literary work".

Conversely, another opinion is put forward by Siebrasse & McLaughlin, who believe that if full copyright is given to both the plan and the information on the plan, then surveyors "will not be able to increase their total revenue by charging a licensing fee for the information in plans of survey, because an increase in revenues from licensing the copyright would be accompanied by a fall in fees charged to the land-owner client as competition among surveyors lowered the surveyors' total revenue to average cost" (Siebrasse and McLaughlin, 1997). This is obviously an important issue that needs resolution.

## **CONCLUSION**

This paper has discussed the concept of implementing digital lodgement in Victoria, by focussing on the results of a questionnaire forwarded to all consulting surveyors in Victoria regarding their opinions on digital lodgement. Through analysis of this questionnaire, it has been shown that most surveyors are already quite proficient in the various skills that would be needed if digital lodgement were implemented. It has also highlighted some of the important issues that must be contended with if digital lodgement is to be considered. The paper has investigated the status of digital lodgement in a number of Australian states which are quite advanced in this area, namely New South Wales, Queensland and Western Australia.

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## **APPENDIX ONE - DIGITAL LODGEMENT QUESTIONNAIRE FOR CONSULTING SURVEYORS**

If necessary, please tick more than one box.

### **1. What is the nature of your company?**

- Sole practitioner
- Private company
- Part of a larger organisation

### **2. How many people does your organisation employ?**

- Less than 5
  - 5-10
  - More than 10
- 

## **Section 1. Your current technology**

### **3. Do you use computers for data collection and/or drawing of plans?**

- Yes       PC
- No       Macintosh
- Workstation

If **No**, please proceed to Section 2.

### **4. What is the latest version of software you use to prepare plans and related information?**

#### **Geometry files**

##### **Version**

- Autocad      .....

- Civilcad .....
- Geocomp .....
- Landmark .....
- Liscad .....
- Wescom .....
- Other .....

*Drawing files*

*Word Processing*

**Version**

**Version**

- Autocad .....
- Microstation .....
- Other .....

- Microsoft Word .....
- Word Perfect .....
- AmiPro/WordPro .....
- Other .....

5. When did you last update your hardware/software?

- Release of last version
- Less than 1 year ago
- Between 1 and 5 years ago
- More than 5 years ago

6. What type of remote computer communications do you use?

- Modem
- Internet
- E-Mail
- Floppy disk
- Other

**Section 2. Your current survey and data lodgement practices**

7. What are the main types of surveys you carry out?

		Percentage
Subdivisions	2 lots	.....

- |                          |                     |                          |                    |
|--------------------------|---------------------|--------------------------|--------------------|
| <input type="checkbox"/> |                     | <input type="checkbox"/> |                    |
| <input type="checkbox"/> | Re-establishments   | <input type="checkbox"/> | 3-5 lots .....     |
| <input type="checkbox"/> | Feature surveys     | <input type="checkbox"/> | 6-10 lots .....    |
| <input type="checkbox"/> | Engineering surveys | <input type="checkbox"/> | 10-20 lots .....   |
| <input type="checkbox"/> | Other.....          | <input type="checkbox"/> | More than 20 ..... |

8. Estimate the percentages of surveys you perform in urban and rural areas.

Urban ..... %

Rural ..... %

9. Estimate how many plans you would lodge each year at the Land Titles Office.

- Less than 10
- 10-20
- 21-50
- More than 50

10. Estimate percentages of files prepared by computer/hand/combination of the two.

Computer ..... %

Manual ..... %

Combination ..... %

**11. Do you currently supply any companies (such as the water retailers) with plans in digital form?**

- Yes
- No

12. If not, would you be willing to submit plans electronically?

- Yes       Drawing files
- No         Geometry files
- Reports

**Section 3. Attitudes towards digital lodgement**

13. Have you been exposed to the concept of digital lodgement through peers, seminars, conferences, etc, and as such, what knowledge do you have about it?

.....

14. What do you perceive to be the benefits of digital lodgement?

.....

15. What problems do you envisage by moving into a digital environment, for your organisation and/or the spatial information industry as a whole?

.....

16. Would you like to comment on your views about how digital lodgement could be effectively introduced?

.....

THANKYOU FOR YOUR TIME



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