

# Plan Updating Process Innovations

By Stephen Lougheed January 2001

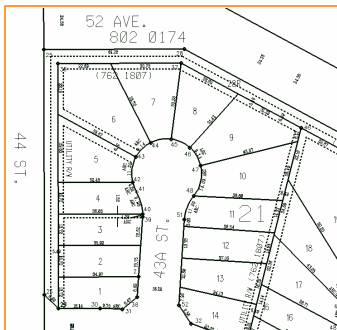
Most cities, counties and provinces are facing the task of either building or, even more challenging, maintaining a digital land base that is affordable, usable and accessible by a variety of user groups. After spending millions of dollars in the 1980's building a digital land base the **Province of Alberta** and the **City of Calgary** both faced challenges in delivering on the initial promises offered by the creation of a digital land base.

In Alberta, the provincial government has responsibility for the management and maintenance of the land registry system and, in general for a provincial wide digital mapping database. In 1995 the City of Calgary entered into an agreement with the Province to assume control of digital map maintenance for its area to, in large part, improve the update turnaround process while maintaining common provincial standards.

This article highlights the innovation and lessons learned in Calgary and Alberta. It also follows the evolution of **Martin Newby Consulting Ltd. (MNC)** as an emerging leader in the development of efficient accurate and affordable land base updating processes.

## REQUIREMENTS

- **Timeliness**
- **Lower Cost – taxpayer**
- **Lower Cost – all stakeholders**
- **Usability**
- **Exchange – multiple users**
- **Accuracy**
- **Sustainable business model**



In the mid 1990's The City of Calgary implemented a digital plan submission process to meet internal mapping and information access requirements.

## HIGHLIGHTS

The **City of Calgary** is the second ranked business and financial center in Canada and continues to be one most rapidly growing cities in the country. In 1994 the City of Calgary embarked on a successful effort to significantly reduce the time and effort required to update its land database. The effort to improve the parcel updating process was driven by a desire to manage rising costs and to free municipal resources consumed in maintaining data to be redeployed to analyzing and using the data. The effort to develop a new process was initiated and lead by Bill Martin, the City Land Surveyor at the time.

A review of the plan creation and registration process employed by surveyors, indicated the majority were creating their plans of survey in digital format (primarily Autocad); however, paper plans were required to be submitted and registered at the Provincial Land Registry Offices (LTO), and were used as part of the City's subdivision approval and engineering processes. In turn, these paper plans were reconverted back to digital format by both the City and the Province. The analysis of this process revealed that optimum benefits (accuracy, time saving and process cost) could be realized if the digital CAD files of the surveyors could be utilized.

Stakeholders including developers, surveyors and city departments were consulted. Lessons learned from earlier attempts to initiate similar process were reviewed and the new process was designed and tested using the latest techniques and tools.

In 1995 the City of Calgary started accepting digital plans from developers. Plans of survey conforming to City's digital filing standards were required prior to approval of subdivision / development applications. After the initial phase-in period all surveyors operating in the City were required to comply with the new requirements.

In 1997 the **Province of Alberta** launched a major initiative in conjunction with five major utility companies, later to be supported by the Alberta Municipal Association (AMA) and the Alberta Association of Municipal Districts and Counties (AAMD&C). The **Spatial Data Warehouse (SDW)** initiative was aimed at effecting a major improvement in the way in which spatial data was collected, maintained, distributed and used within the Province.



## Parcel Updating Accomplishments

### Update cycle reduced

- From several months
- To Less than a week on avg.

### Update cost reduced

- Significantly by over two-thirds
- To under \$ 100 Canadian / plan
- 1 to hundreds of parcels / plan

### Database created

- Tracks every change
- GIS ready data

### New efficient process

- Uses digital filing
- Tools provided to surveyors
- Achieved municipal, surveyor and developer support
- Most functions automated
- Improves accuracy of base using least squares integration engine
- Improves functionality to all users
- Tentative plan capability added



Spatial Data Warehouse Ltd. is the agent of the Government of Alberta and operates under an innovative public / private sector business model. It is responsible for the updating, maintenance, management, marketing and distribution of the Provinces digital mapping data including the parcel mapping data.

The most critical and immediate requirement of the SDW initiative was to improve the process for updating cadastral/parcel data. While there was full provincial digital mapping coverage, the data was maintained in CAD drawing files with no related database or intelligence and the data was not GIS “ready”. Individual clients were obliged to expend extensive resources to import and maintain data in GIS systems while potential clients were dissuaded from adopting new technologies. Changes to the cadastral fabric, triggered by plans of survey, were not available for several months and there were no records of what changes had been made nor were there any tracking of items affecting the accuracy of the base map. Further, many titles recorded by “*meets and bounds*” descriptions were not entered and displayed in the land base. Finally, it was hoped that the cost of maintenance could be significantly reduced based on the experience of the deployments in the City of Calgary.

While the City of Calgary’s experience was used as a guide, the newly formed agency, Spatial Data Warehouse Ltd., set out on an extensive international search to find private sector partner(s) to take on the operations of the SDW initiative under an innovative business model (*see a related paper on the SDW initiative by the same author*). SDW Ltd was looking for a “best of breed” team to become their business partner in the initiative.

In the meantime Bill Martin had left the City of Calgary and formed a new Company with the owner of Newby Engineering Ltd., the key contractor on the City of Calgary initiative, to exploit their combined expertise in data and process technology; especially relating to land related information and infrastructure management (info-structure). **MNC** formed a strategic joint venture (AltaLIS Ltd.) with QC Data Ltd. to pursue the SDW partnership. QC Data Ltd. had a large data distribution infrastructure and was the dominant company marketing and distributing data, analytical tools and related services to the resource industry in western Canada. QC Data was also involved in the business of providing conversion and data management services to utility companies in the region and internationally.

After an extensive selection process, AltaLIS Ltd. was chosen by SDW Ltd. to become the long-term private sector partner for the SDW initiative. **MNC** immediately set out to restructure and preserve the legacy data, meet with stakeholders and started design and implementation work for a new updating process for cadastral mapping. Many business, political and technical obstacles had to be overcome. As highlighted in the adjacent panel, Alberta, arguably now has the most sophisticated and efficient land base updating in the world.

### BUSINESS ISSUES

A number of business, process and stakeholder issues needed to be addressed. Analysis of other attempts at introducing digital submission standards showed that success would be dependant on, or would be limited by, business, process or political factors equally as much as technical factors. The new Provincial system would have to be seamlessly linked to the land registry system, mandated province-wide (including Calgary) with full compliance by the surveyors, implemented with a minimum of disruption or resistance and it would have to meet the needs of multiple user groups.

Input and involvement was solicited from the Provincial Director of Surveys, the Provincial Land Titles Office (LTO), the survey community and their association (ALS), the UDI, municipalities, municipal districts and counties and other key user groups.

At the same time the Government decided that since the level of service was to be improved, the cost of updating was to be significantly reduced and the true costs were now able to be tracked (fixed by agreement), a \$100 CDN. cost per plan was to be charged as part of the registration fee collected at the LTO. In many stakeholder meetings the “increase” in the filing fee became a distracting issue, especially as a number of stakeholders had issues with the declining levels of service offered by the Government prior to the introduction of the new process. Nonetheless a number of business and process issues were identified and resolved, and significant progress was made in clarifying details and educating stakeholder on the benefits of the proposed new process as part of the series of stakeholder meeting that were held.

Openly addressing issues and the benefits that each stakeholder would obtain under the new system was critical in gaining the support and cooperation of the key stakeholders and opinion leaders. The surveyor community in particular was concerned with issues of accuracy, the potential cost impact and the amount of effort required to implement the new standard.

The new updating process and system implemented by MNC was able to accept submissions from all of the mapping/CAD platforms commonly used by surveyors. MNC also provided surveyors with software tools, training and telephone support to assist in adopting the new submission standard with minimal disruption. Most survey companies did not even need to change their internal drawing, naming or layering conventions as the software tools provided by MNC allowed surveyors to move data into and out of the new system using their own conventions so long as the data segregation met the specification.

In the end surveyors were able to benefit from a single provincial standard (versus the number of municipal and utility standards plus a provincial Paper/Mylar registration system), improved on-line access to mapping and registry data and from the ability to access and directly input accurate digital surround data for inclusion into survey plans rather than having to redraw this information.

## TECHNICAL ISSUES

Building and implementing a new digital submission and plan updating process that was able to meet the various user requirements including operating costs and accuracy was not an insignificant technical challenge. As of this time the authors are not aware of any other system or process capable of meeting the levels of efficiency and accuracy as is being delivered by SDW and MNC in Alberta.

The core components of the updating system are the capability of pulling data from layered drawing/CAD files and interactively integrating the data into mapping base at a substantially lower cost but with improved relative and absolute accuracy. The ability to pull layered data from digital submissions into a standardized process, combined with the sophistication of the integration engine, set the SDW system apart.

Great effort was expended in the development of the integration engine and related process to improve accuracy and eliminate issues of benching and breaks and to maintain the relative accuracy and integrity of the survey. Integration of the process with LTO was critical as the Government was using this initiative to move to an entirely digital filing process and to provide enhanced on-line access to digital title records plus all historic records, which were scanned for on-line retrieval.

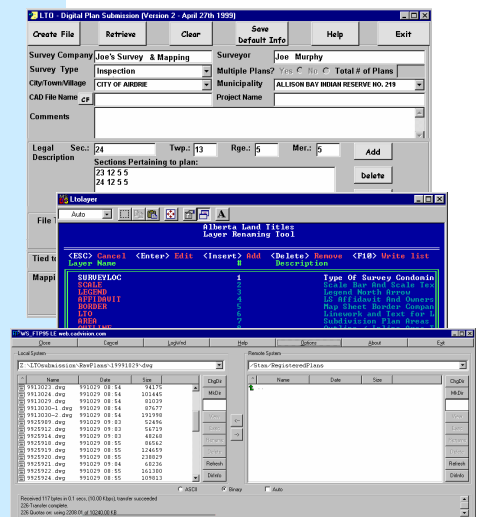
Alberta has more than one Land Title Office, these offices being the official point of receipt and approval of plans. To meet the requirement for a rapid

## Sophisticated integration engine



delivers improved relative and absolute accuracy while at the same time reducing input labor and costs significantly and automating integration to improve turn-around time by several orders of magnitude.

## Easy to use tools for Surveyors



Tools provided to surveyors to assist in plan submission process, data segmentation & to provide quality checks for surveyors & LTO

Plan No.	Plan Date	Plan Type	Plan Status	Plan Description	Plan Area	Plan Value	Plan Fee	Plan Tax	Plan Other
9121001	1992-08-14	Map	Final	Survey of Lot 1, Block 1, Plan 1	1.2	10000	100	1000	1000
9121002	1992-08-14	Map	Final	Survey of Lot 2, Block 1, Plan 1	1.2	10000	100	1000	1000
9121003	1992-08-14	Map	Final	Survey of Lot 3, Block 1, Plan 1	1.2	10000	100	1000	1000
9121004	1992-08-14	Map	Final	Survey of Lot 4, Block 1, Plan 1	1.2	10000	100	1000	1000
9121005	1992-08-14	Map	Final	Survey of Lot 5, Block 1, Plan 1	1.2	10000	100	1000	1000
9121006	1992-08-14	Map	Final	Survey of Lot 6, Block 1, Plan 1	1.2	10000	100	1000	1000
9121007	1992-08-14	Map	Final	Survey of Lot 7, Block 1, Plan 1	1.2	10000	100	1000	1000
9121008	1992-08-14	Map	Final	Survey of Lot 8, Block 1, Plan 1	1.2	10000	100	1000	1000
9121009	1992-08-14	Map	Final	Survey of Lot 9, Block 1, Plan 1	1.2	10000	100	1000	1000
9121010	1992-08-14	Map	Final	Survey of Lot 10, Block 1, Plan 1	1.2	10000	100	1000	1000
9121011	1992-08-14	Map	Final	Survey of Lot 11, Block 1, Plan 1	1.2	10000	100	1000	1000
9121012	1992-08-14	Map	Final	Survey of Lot 12, Block 1, Plan 1	1.2	10000	100	1000	1000
9121013	1992-08-14	Map	Final	Survey of Lot 13, Block 1, Plan 1	1.2	10000	100	1000	1000
9121014	1992-08-14	Map	Final	Survey of Lot 14, Block 1, Plan 1	1.2	10000	100	1000	1000
9121015	1992-08-14	Map	Final	Survey of Lot 15, Block 1, Plan 1	1.2	10000	100	1000	1000
9121016	1992-08-14	Map	Final	Survey of Lot 16, Block 1, Plan 1	1.2	10000	100	1000	1000
9121017	1992-08-14	Map	Final	Survey of Lot 17, Block 1, Plan 1	1.2	10000	100	1000	1000
9121018	1992-08-14	Map	Final	Survey of Lot 18, Block 1, Plan 1	1.2	10000	100	1000	1000
9121019	1992-08-14	Map	Final	Survey of Lot 19, Block 1, Plan 1	1.2	10000	100	1000	1000
9121020	1992-08-14	Map	Final	Survey of Lot 20, Block 1, Plan 1	1.2	10000	100	1000	1000
9121021	1992-08-14	Map	Final	Survey of Lot 21, Block 1, Plan 1	1.2	10000	100	1000	1000
9121022	1992-08-14	Map	Final	Survey of Lot 22, Block 1, Plan 1	1.2	10000	100	1000	1000
9121023	1992-08-14	Map	Final	Survey of Lot 23, Block 1, Plan 1	1.2	10000	100	1000	1000
9121024	1992-08-14	Map	Final	Survey of Lot 24, Block 1, Plan 1	1.2	10000	100	1000	1000
9121025	1992-08-14	Map	Final	Survey of Lot 25, Block 1, Plan 1	1.2	10000	100	1000	1000
9121026	1992-08-14	Map	Final	Survey of Lot 26, Block 1, Plan 1	1.2	10000	100	1000	1000
9121027	1992-08-14	Map	Final	Survey of Lot 27, Block 1, Plan 1	1.2	10000	100	1000	1000
9121028	1992-08-14	Map	Final	Survey of Lot 28, Block 1, Plan 1	1.2	10000	100	1000	1000
9121029	1992-08-14	Map	Final	Survey of Lot 29, Block 1, Plan 1	1.2	10000	100	1000	1000
9121030	1992-08-14	Map	Final	Survey of Lot 30, Block 1, Plan 1	1.2	10000	100	1000	1000

update cycle, a process was required to move plans on-line from the Land Title Offices to **MNC**, so that **MNC** could immediately start the updating and integrations process (acting as Agent to the Government). Additionally, the ability to accept tentative plans on-line from, or on behalf of, municipalities and counties was a requirement of the SDW initiative to support utility and municipal planning and engineering activities. This is especially important in one of the most diverse, active and rapidly growing economies in Canada.

The challenge of building the new system was also compounded by the condition of the legacy data. The data was originally converted in the mid 1980's by a number of contractors to two file format standards in three projections and maintained in non-integrated tiled files. While a high degree of spatial accuracy was maintained, the files essentially contained only line drawings.

**MNC's** first step was to clean and restructure all of the data, and create an accurate seamless integrated digital land-base in a single projection across the 255,000 square miles of provincial territory. An Oracle database was created that contains the historical and current information on each cadastral station and on each plan of survey. Custom cleaning tools were developed to automate most cleaning processes. Many of the technical and business issues addressed including the cleaning process and the tools that were used and developed could, on their own, be the subject of an extensive paper.

The new system is operated by **MNC** acting as agent to SDW and the Government. This system now operates with fewer people, at one third or less previous costs, provides exceptional turnaround time (under a week), frees-up government resources, and provides data products that are significantly more useful and appealing to historic and a growing lineup of new users. The system has also been designed to be able to accept tentative plans for municipalities and utilities that utilize and conform the standardized process used for registration. This allows municipalities and utilities to improve their planning and engineering activities using GIS data at a fraction of the cost

### SUITABILITY IN OTHER JURISDICTIONS

It is the opinion of the author that the updating systems and processes developed by **MNC** and AltaLIS for the SDW initiative are in whole or part transferable to other jurisdictions. Significant efficiencies have been gained, and timeliness, accuracy and quality have been improved to the benefit of all existing and potential users of parcel data in Alberta.

This paper only touches on some highlights of the many valuable lessons learned and innovations in technology and process that were pioneered. It is possible that municipalities and utilities may wish to apply some components of this experience to improving the tentative plan process now being used. Jurisdictions responsible for title registration and mapping may benefit from a more thorough review of the SDW system. Clearly many jurisdictions will be able to benefit from the experience gained and the technologies developed as part of this groundbreaking initiative.

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A critical factor in the success of the SDW initiative was coordination with Provincial Government agencies and departments and a variety of stakeholder groups including: municipalities; counties; surveyors; developers; utilities; and a number of other users including software developers; data resellers; resource industry companies; forestry companies; agriculture interests, real estate etc.).



MNC is a consulting engineering firm providing *practical and innovative data collection, mapping and GIS solutions* to private and public sector clients.

#### Services include:

- Consulting;
- Data management and updating;
- Design development & implementation of spatial and related information management solutions;
- Design development and implementation of data collection & maintenance processes;
- Data conversion and digital Mapping.

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