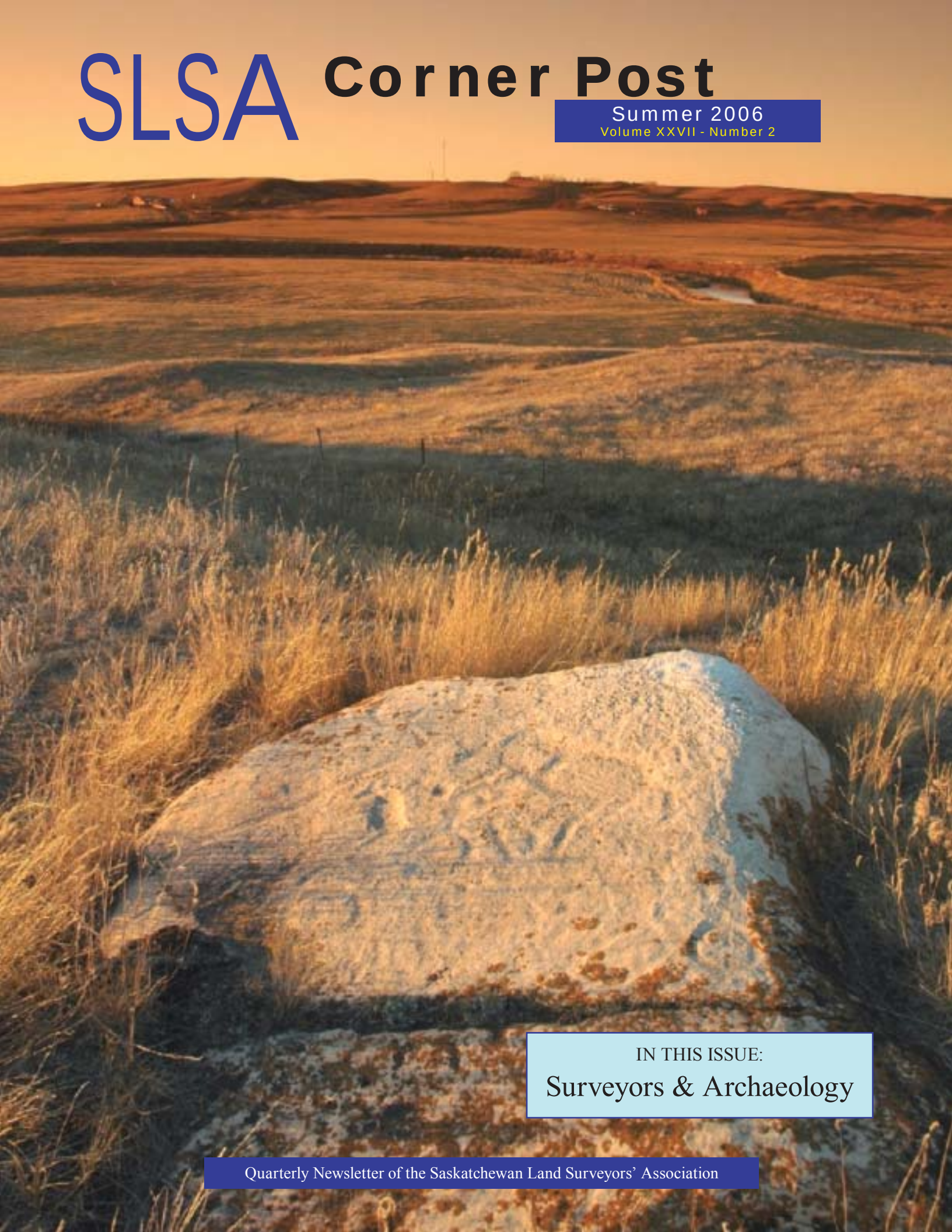
SLSA Corner Post

Summer 2006
Volume XXVII - Number 2

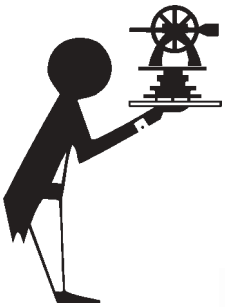


IN THIS ISSUE:

Surveyors & Archaeology

Quarterly Newsletter of the Saskatchewan Land Surveyors' Association

Providing Solutions | **Hardware** | **Software** | **Training** | **Rentals**



"Your Partner in the Field"

BUTLER SURVEY SUPPLIES LTD.

Calgary, AB
1-800-661-1129

Edmonton, AB
1-800-661-8816

Richmond, BC
1-800-667-5944

Leica Geosystems

Leica Geosystem's Premier Dealer to the Professional Survey Market in Western Canada for GPS, Total Stations & Accessories.

For demanding, high-end surveying jobs and users.

Leica GPS1200 Series

Leica SmartStation

Leica TPS1200 Series

Leica DNA Series Digital Level

Leica Geosystems
Authorized
DEALER & WARRANTY REPAIR CENTRE

Leica TPS800 Series

Leica TPS400 Series

Leica Sprinter Digital Level

Leica Disto Series

Call today for Sales and Rental Information!

A special thanks to all our customers for making Butler Survey Supplies Ltd.
one of the top Leica Dealers in North America

BUTLER SURVEY ALSO HAS THE LARGEST SELECTION AND THE MOST COMPETITIVE PRICING WITH THESE FOLLOWING BRANDS....

Can-Measure | DUTCH HILL | METROTECH | SCHONSTEDT

SECO | CRAIN Surveying Products | AERVOE | CST/berger

www. butlersurvey.com

SLSA Corner Post
Summer 2006
Volume XXVII, Number 2

SLSA Corner Post is published by the Saskatchewan Land Surveyors' Association for circulation to its members.

Deadlines for articles are the last Friday in December, March, June and September.

The opinions of the contributing writers may not be consistent with those of the Council of the Saskatchewan Land Surveyors' Association. Articles may be reprinted with appropriate credit given to the authors, unless it is under copyright.

Address all correspondence to:

Doug Bouck, SLS (Ret.) - Editor
408 Broad Street #230
Regina, Saskatchewan S4R 1X3
Phone: 306-352-8999
Fax: 306-352-8366
e-mail: slsa@sasktel.net
web site: www.slsa.sk.ca

2006/2007 Council

President	R. A. (Bob) Webster
Vice President	R. Dale Rosnes
Past President	Peter F. Unger
Public Member	Lloyd Gillies
Councillors	Ron J. Eichel
	Tom W. Sansom
	E. H. (Gene) Seis
	Ravi B. Shrivastava

Administration

Executive Director — A. Carl Shiels

Office Hours

Office hours are:

9:00 a.m. to 12:00 p.m.
1:00 p.m. to 4:00 p.m.

on all regular business days.

In this Issue

In This Issue

Regular Features

Cover Story

By both training and experience, land surveyors become well versed in the art of recognizing evidence of survey activity from many decades earlier. A faint discolouration in the soil, for example, might indicate an original wooden monument dating back to when the township system was first surveyed. It is not such a big leap then, for surveyors to recognizing evidence of human activity from several hundreds or even thousands of years ago.

The photo on the cover depicts a petroglyph, discovered in the Swift Current district, that is just one example of the thousands of archaeological artifacts that a survey crew could literally trip over while carrying out an otherwise routine survey. The article on page 217 by Nathan Friesen, an archaeologist and GIS specialist with the Heritage Resources Branch, Saskatchewan Culture, Youth and Recreation, reminds surveyors of their important roles in recognizing and reporting archaeological evidence that may be at risk from private or commercial development.

(The cover photo is subject to copyright and was provided through the courtesy of the Heritage Resources Branch, Government of Saskatchewan - Calvin Fehr, Photographer)

President's Message

Bob Webster,
SLS, P. Surv., P. Eng., CLS
President

Upcoming Events

Sep 14 - 15	AMLS AGM Brandon, MB
Oct 12 - 14	ANSLS AGM Wolfville, NS
Oct 15 - 16	CCLS AG- Wolfville, NS
Jan 18 - 19	ANBLS AGM (T.B.A.)
Jan 30	U. of C. "Beef on a Bun" Reception
Jan 31	MARLS/ LSAW AGM's
Jan 31 - Feb 2	ABCLS AGM Fort St. John
Feb 21 - 23	AOLS AGM Ottawa
Apr 26 - 28	ALSA AGM Lake Louise

If it was difficult to meet the deadlines for the President's Message the first time around, it has been doubly difficult to meet it, with fresh new thoughts, this second term. Here are a few ideas that occurred to me for this issue:

Who would have thought that one of our more forward thinking members knew what he was talking about when he said 25 years ago that, eventually, all Land Surveyors would be survey engineers. He was close. Eight years ago I was the first engineer elected as president since John Turnbull and now we have six engineering graduates on council including the executive director, and we are likely to have at least two presidents in a row who are engineers.

With fifteen SLSIT's or student Land Surveyors we seem well positioned for the future. No complaints: no discipline. With the approval of a fee increase at the last AGM, our finances continue to be stable. We seem to be in good times with clear sailing ahead. I suspect that there are always storm clouds on the horizon and we should identify any outside threats to the association. If we can't defend against them we should at least be aware of them.

It won't be too long until most land surveyors in this and other provinces hold two or more commissions. At what point will they begin to wonder why they are paying fees to more than one association, particularly if the level of fees become unbearable? With labour mobility and increased harmonization is it time to consider one national association that would govern all Land Surveyors? What about regional associations? Would we be better off than we are now? Would the pubic be better served? Would our political masters allow it? I suspect that the vast majority of land surveyors would prefer that type of integration than one involving mergers with provincial engineering associations if we ever reach the point where such options have to be given serious consideration in order to remain viable. ☼

Highlights from the 2006 SLSA AGM

The Presidential "Handoff"
Bob & Maureen Webster, Louise & Peter Unger

President Webster - slightly out of character during improv. theatre, President's Dinner

OLSA president Doug Culham gets a light wax and buff during improv. theatre at President's Dinner.

MobileMapper

BENEFITS

- More efficient asset/ resource management, emergency planning and environmental/ agriculture control
- Immediately increases your productivity in the field
- MobileMapper Office™ software makes it easy to transfer data to and from the field and your office
- Post-processing option provides sub-meter accuracy

Spending too much on GIS/GPS data collection?

MobileMapper: Industrial Strength Mapping Solutions
Now you can have an affordable, easy-to-use and rugged GPS solution for collecting and maintaining GIS data in the field. MobileMapper™ enables you to equip, train and deploy your field personnel for less than ever before. Our user-friendly software and easy-to-read full-color screen makes MobileMapper an indispensable tool for your company's mobile GIS workforce.

For more information about MobileMapper, contact your local Thales Navigation dealer or visit www.thalesnavigation.com

Gemini Positioning Systems Ltd.

611 71 Ave SE
Calgary, Alberta T2H 0S7
Phone: (800) 361-0978, (403) 252-5007
Email: sales@gps1.com
Web: www.gps1.com

www.thalesnavigation.com

© 2004 Thales Navigation, Inc. All rights reserved. MobileMapper and MobileMapper Office are trademarks of Thales Navigation.

THALES NAVIGATION

Council Highlights

Carl Shiels, M. Sc., P. Eng.
Executive Director

2005-06 Meeting #6 - APR. 28, 2006

- The president circulated reports from his attendance at the AGM's of the ANLS and ALSA.
- The president had received a favourable response to the "Surveyor's Crate" concept when presented at the President's Forum of the ANLS AGM. The ALSA appear to be having very good success with their "Made to Measure" kit and will be investing more money into additional kits in the near future. While the cost of developing and marketing a similar kit in Saskatchewan would amount to approximately $60,000, as much as half of that might come from federal and/or provincial government sources. Some of the cost might also be offset if other associations agree to participate in the development. Council agreed to put the proposal, including a description of the contents of the ALSA kit, ideas for marketing and distribution, and options for funding, before the members at the 2006 AGM.
- Council approved two resolutions to be placed before the membership at the 2006 AGM. One would increase the annual fees of licensed members to $1,550, the other would initiate a request to amend the LSPS Act making the admission requirements for Student Land Surveyors less restrictive.
- The chairmen of the PR and Finance Committees were asked to come up with ideas and costs for revamping of the SLSA Display for use at career fairs and trade shows, and also for the resources necessary to have a person travel to high-schools in the province promoting technical and professional careers in surveying. D.J. Clarke agreed to consult with other members about the idea of developing a broader base for project funding beyond the sale of survey monuments.
- The president, D.J. Clarke, W.L. Jamieson and the executive director were to meet to develop the details of presentations for the 2006 AGM which would describe various PR projects which could be undertaken and possible options for funding them.
- Council discussed the possible implications of the move by D. Williams from the Geomatics Technology program to the Civil Engineering technology program at SIAST. Concern was expressed that this could further jeopardize the viability of the geomatics program. It was agreed that G.D. Craig and P.F. Unger would again meet with the administration at SIAST to find out what the future holds for the Geomatics Technology Program and whether SLSA efforts to increase enrolment might be wasted because there is no commitment on the part of SIAST administration to continuing it.
- Planning was nearing completion for the 2006 AGM and registration packages had been sent out.
- R.A. Webster has appointed B.G. Clark as the convention chairman for 2007 and options for location are being considered.
- The Practice Committee was encouraged to bring forward an amendment to the bylaws related to survey offices since this was a topic of concern at the 2005 AGM.

CCLS Report

- An MOU on distance learning had been signed by most, but not all, member associations.
- A number of issues have arisen out of new Safety in the Work-place legislation, particularly as it relates to chain saw safety.

2005-06 Meeting #7 - JUNE 24, 2006

- Council reviewed the resolutions that would be voted on at the 2006 AGM and who would be speaking to them. It was noted that resolution #7, which had come from the Practice Committee, had been published late and may raise some concerns from the membership. It was also noted that there is nothing in the Act or bylaws that requires a motion to be published in advance of the annual meeting although that had been the practice in past years.
- A meeting had been held in Calgary on May 8 to finalize the transition between the Western Canadian Board of Examiners for Land Surveyors (WCBELS) and the newly formed Canadian Board of Examiners for Professional Surveyors (CBEPS). As a result, council passed a

motion approving both the Western Canadian Board of Examiners for Land Surveyors (WCBELS) and the Canadian Board of Examiners for Professional Surveyors (CBEPS) as "Boards of Examiners for Land Surveyors" under the provisions of Article XI, SECTION 1, subsection (1) of the bylaws made pursuant to the Land Surveyors and Professional Surveyors Act.

- Council was advised that, based on the results of the 2006 Professional Examinations, no new commissions would be issued in 2006.
- The president indicated that preparation for the 2006 AGM was complete and that the registration numbers were consistent with previous years.
- 2007 Convention Committee chairman B.G. Clark had been investigating Manitou Lake Resort near Watrous as the venue for the 2007 AGM. It appeared that the facilities were large enough to host the event.
- President Unger explained that he would continue to spear-head the Surveyor's Crate project but that Mr. Jamieson and his committee were prepared to take on the other P. R. projects after the AGM.
- The president had received written confirmation of support for the Surveyor's Crate project from the ACLS.

CCLS Report

- Hugh O'Donnell is the new CCLS director for the OAGQ.
- An information exchange feature has been developed on the CCLS web site as a pilot project. Each association is responsible for their own data that appears on the site.
- A template is being developed for preparation of news releases by individual associations.
- Accreditation of the Geomatics program at UNB has been extended to September 2007 and, pending receipt of additional information, could be extended to June of 2010.
- The Professional Liability Insurance Committee (PLIC) has developed a presentation which was first presented at the ACLS annual meeting and be presented again at the SLSA 2006 AGM.
- Chain saw safety certification is a growing issue in BC and Alberta and Victor Hut has been asked to be a CCLS observer in the discussions and report back on developments.
- Issues related to railway access have been identified across the country but most of the problems seemed to be in the Atlantic provinces.
- The next CCLS AGM will be October 15 & 16 in Wolfville, NS in conjunction with the ANSLS annual meeting

2006-07 Meeting #1 - MAY 27, 2006

- The president called the meeting to order at 10:01 a.m. and welcomed the new members of council. He explained that the meeting would be very brief and would only include those items that needed immediate attention. He also noted that, based on the decisions taken by the members at the Annual General Meeting, it appeared that there would probably be a Special General Meeting sometime in the fall - possibly in conjunction with the fall education seminars.
- It was agreed that liaison between Council and the standing committees would be provided by:
  - E.H. Seis (Education)
  - R.D. Rosnes (Public Relations)
  - R.J. Eichel (Practice)
- It was agreed that the CCLS would be encouraged to hold their 2010 annual meeting in conjunction with the SLSA Centennial Celebration.

2006-07 Meeting #2 - June 26, 2006 A Regina member had been in contact with the Controller of Surveys regarding the destruction of control monuments, by city workers, within the city of Regina. Council agreed with the suggestion of the Controller of Surveys that a letter, signed jointly by him and the SLSA president, be sent to the City of Regina reminding them of the costs that had been incurred by the City in establishing the control monuments and the potential implications of city workers tampering with them.

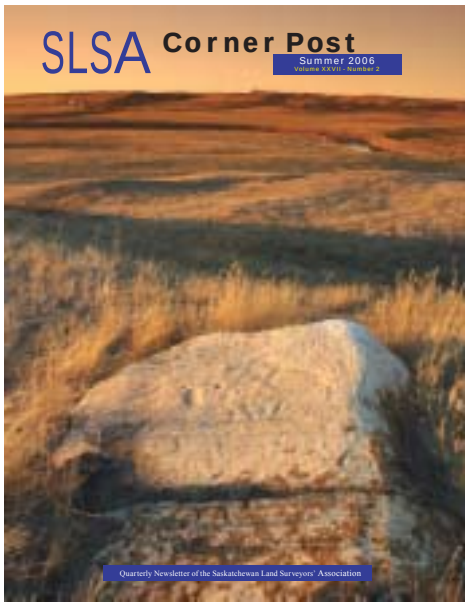
- Council approved Land Surveyor in Training agreements, signed between T.G. Wolfe and E.H. Seis, and between M.M. Vanstone and D.L. Gurnsey.

244

Wanted!!!

We need your photos for the front page of the

SLSA Corner Post



Councillor's Corner

Ravi Shrivastava
CLS, SLS, P. Surv., P. Eng.
Councillor, Year 2

"How to Attract and Retain Our Members"

The aging demographic of the Baby Boom, with its greying hair and growing baldness, is clearly evident in the land surveyors' community. In the absence of a regular inflow of new blood, the level of membership has begun to show a steady decline.

Thanks primarily to the "Mutual Recognition Agreement" (MRA) there has been an artificial inflation in the number of registered members in this association. Surveyors who exercise their options under the MRA obtain two or more commissions. While physically working in one province they maintain their membership in one or more others. These non-resident members continue to pay fees to the association but offer limited or no competition to their resident peers. Unless service to the public is considered an issue, this appears to be a win-win situation for the association and its practising members. Currently, 30% (19 out of 64) of our association's licensed members are practising in Alberta. If this trend continues, the real challenge could be maintaining the level of service to the public that we are obliged to provide as part of our responsibility as a self-regulated profession.

In an effort to mitigate a potential crisis and attract new and fresh blood to the survey industry and profession, we must pique the interest of young minds in pursuing careers as surveyors. Thanks Peter Unger for promoting this concept to our sister associations and soliciting their support. The idea - originally developed in Alberta - is simple; plant the seeds of surveying in fertile young minds by introducing it to teachers in the form of resource material that they can use to demonstrate various concepts that they must teach as part of the established school curriculum. Then follow it up with recurring visits to career fairs, where the seeds planted in these young minds can be fertilized and watered by way of reminders of our profession and of career options in the survey industry. The unanimous support of our members to revamp our dated display material was a welcome and appreciated step in that direction.

A concerted effort, aimed at public and high school students, could go a long way to increasing awareness of our profession and potentially influence young minds to consider careers in surveying.

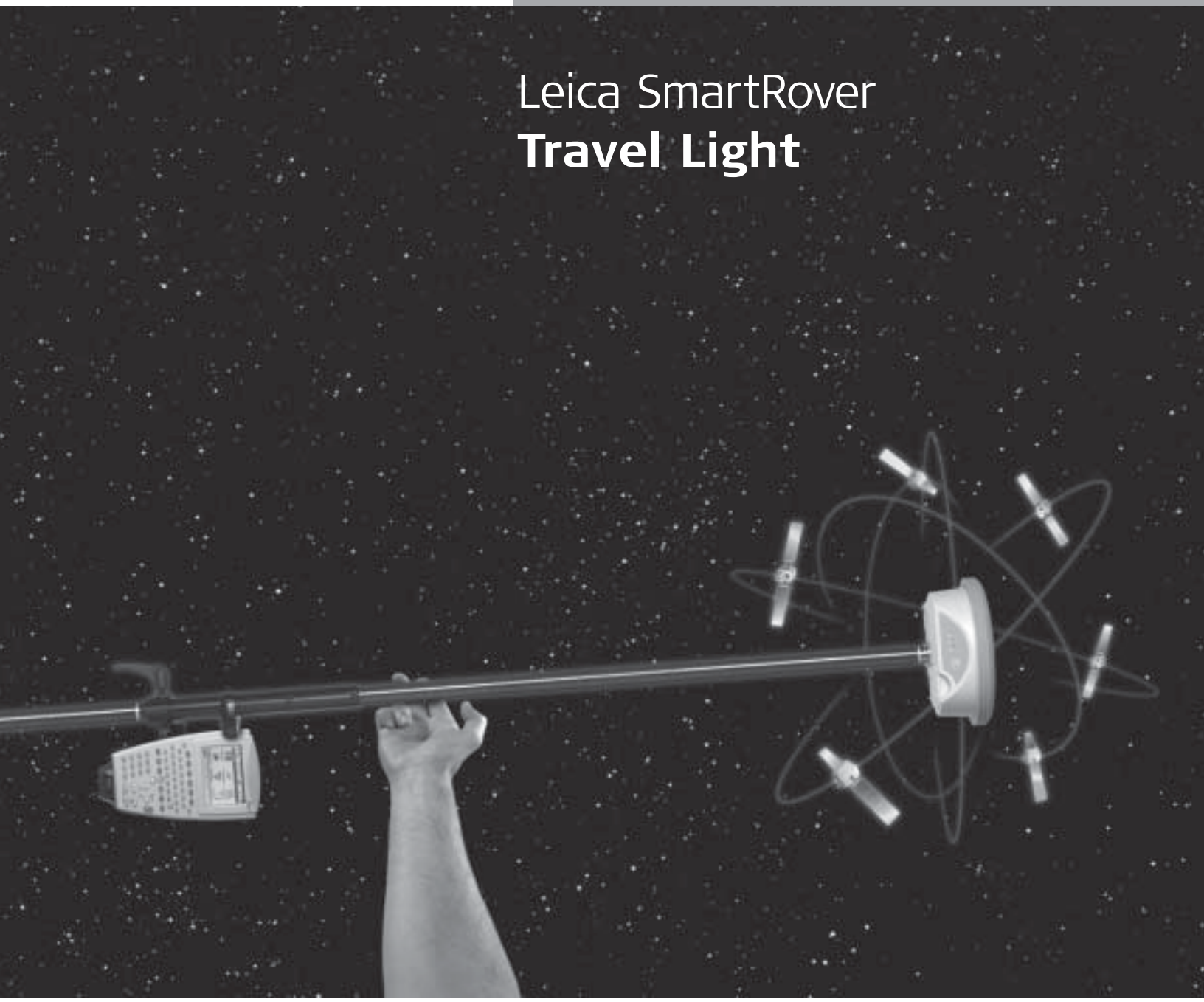
Upon graduation from high school students have a choice. They can enrol in either a recognized geomatics technology course or in a university degree program in Geomatics Engineering. For those who follow the survey technology route, there are significant challenges ahead if they later decide to obtain a commission as a land surveyor. Obtaining the Certificate of Completion (C of C) from the Canadian Board of Examiners for Professional Surveyors (CBEPS) - which is a prerequisite for becoming a land surveyor in training - can be a Herculean task for anyone who has not qualified for it while obtaining a degree in Geomatics Engineering.

It is unfortunate that the Canadian Board of Examiners for Professional Surveyors (CBEPS) is unable to automatically grant credits to our SIAST Geomatics graduates. We need to pro-actively work with SIAST and assist them in restructuring their course curriculum so that, while meeting industry requirements, their graduates are automatically granted CBEPS credits. I am aware of tech-diploma holders and university graduates from the non-geomatics disciplines who, while attempting to acquire a C of C become frustrated and give up on their dream of becoming a land surveyor.

If the legislature passes the amendment to our act, as requested by the resolution approved by the members at the 2006 AGM, we will be able to accept any CBEPS candidate as a Student Land Surveyor. Hopefully, their involvement with the SLSA will provide added support and encouragement in obtaining their C of C's. For example, we could acquire a few sets of recommended textbooks and course material that could be loaned out to students who are preparing for their exams; we could arrange for lectures and partially finance weekend workshops on subjects that are known to have posed constant difficulties to the candidates; we could facilitate organizing study groups with one of our land surveyors as their mentor and where candidates could interact with each other and remain motivated toward their goal - essentially, give them a sense of belonging and a warm welcome even before they join us as land surveyors in training and commissioned surveyors.

Two potential but overlooked sources for new candidates are immigrants and First Nations. Canada is a country of immigrants where

219



Introducing the Leica SmartRover: The world's lightest cable-free RTK GPS System.

Now the world's best-performing GPS system is also the world's lightest. Less weight reduces operator fatigue – and boosts productivity. Best of all, we've dropped weight without reducing performance. You still get the powerful SmartTrack measurement engine that out-performs every GPS system on the market. Count on heavyweight performance from this amazingly lightweight system. Only from Leica Geosystems.

Leica SmartRover

- SmartTrack and SmartCheck for best GPS results
- All-on-the-pole convenience
- WinCE and Bluetooth/MIL spec ruggedness
- Fully compatible with Leica TPS1200 and SmartStation
- To schedule a demo, contact your local Leica Geosystems rep or call 1-800-746-3607.

Grant Beach • Leica Geosystems Ltd. • 1-866-623-8206

- when it has to be **right**

Leica Geosystems

Biography

By J. H. Webb, SLS (Life Member), ALS, MLS, CLS

OSCAR WILLIAM MARTYN

(1889-1968)

Ba.Sc, DLS, SLS (#044)

Mr. Martyn was the Director of Surveys, Province of Saskatchewan from 1947 to 1957. Graduating from the University of Toronto with a Bachelor of Science in Civil Engineering with post-graduate work in Astronomy and Geodesy, he was commissioned as a Dominion Land Surveyor in 1909 and a Saskatchewan Land Surveyor in 1914. He entered private practice in Regina in 1912. He then moved to Swift Current, Saskatchewan and was in partnership with Mr. P.J. MacDonald, P.E.. He served in World War I with the 77th Battery, C.F.A. C.E.F and was discharged in 1918 as a sergeant.

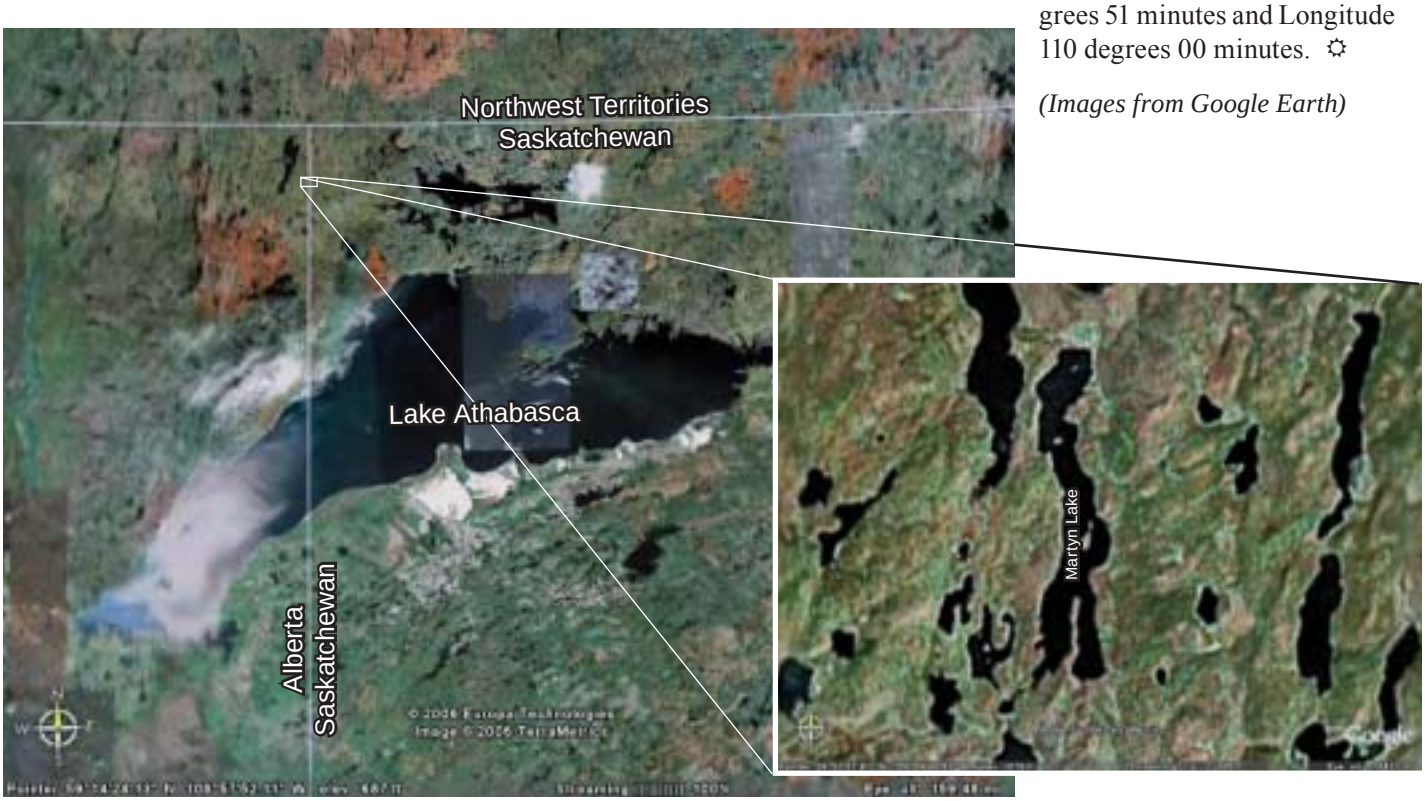
His life as a land surveyor and engineer took him all over Saskatchewan. From 1925 to 1934 he was with the Saskatchewan Department of Highways as a District Engineer and then with Underwood and McLellan, Saskatoon. His duties included many mineral claim surveys in the north around Lake Athabasca along with surveying the towns of Goldfields and Lodge Bay. He was engaged on the 4th Meridian Township surveys, airports and many subdivisions in the Province. From 1938 to 1947 he was with the Federal Government as a Hydraulic Engineer and Land Surveyor.

It was Mr. Martyn who tutored some of us young new students in Astronomy and Calculus prior to our SLS examinations in 1949.

Mr. Martyn was president of the Saskatchewan Land Surveyors Association in 1940 and became a Life Member of the Association in 1957. Mr. Martyn was married and they had two daughters. He was a Mason and a member of the Engineering Institute of Canada and Saskatchewan.

"Martyn Lake", shown on map 74N13 is a 3 mile long lake along the Saskatchewan-Alberta border at Latitude 59 degrees 51 minutes and Longitude 110 degrees 00 minutes. ☼

(Images from Google Earth)



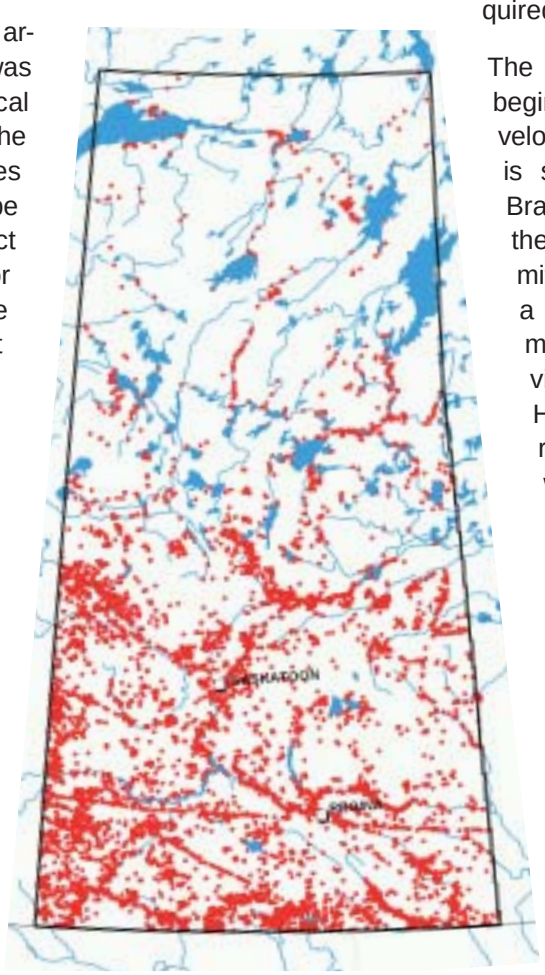
Archaeology and the Development Review Process in Saskatchewan

By Nathan P. Friesen, Archaeologist with the Heritage Resources Branch,
Department of Culture, Youth and Recreation, Province of Saskatchewan

Saskatchewan has a rich archaeological history – over 20,000 archaeological sites have been recorded in the provincial inventory. Many significant sites have been recorded in this province, ranging from ancient campsites as old as 8,400 years to medicine wheels to fur trade posts. Evidence of ancient human activity spans the entire length of the province, from Lake Athabasca to the Souris River.

In response to the richness of this archaeological heritage, legislation was passed to protect the archaeological and palaeontological sites within the province. The Heritage Properties Act provides for developments to be assessed for their potential to impact significant archaeological sites prior to construction. Once sites have been disturbed by development the information that can be learned about the past from these sites becomes very limited.

Currently, the Heritage Resources Branch of the Department of Culture, Youth and Recreation reviews development plans to determine if there are concerns that developments may impact archaeological sites. A wide range of developments are reviewed, including developments in the oil and gas industry, forestry, and mining. Subdivisions are also reviewed; however this is done in co-ordination with Community Planning, Department of Government Relations.



Distribution of Known Archaeological Sites Within Saskatchewan
(Image credit: Heritage Resources Branch, Department of Culture, Youth and Recreation)

Many surveyors will be aware of archaeological sites within the area of the development they are surveying. Indeed, it is not uncommon for surveyors, particularly in the oil and gas industry, to notice archaeological features (for example stone circles or tipi rings) while surveying, and to note theses features in the development plan. This can assist developers to avoid impacting archaeological sites. However, many archaeological sites consist of accumulations of artifacts that are buried underneath the ground surface. As well, the significance of many archaeological features and artifacts would not be immediately recognizable to the general public. For this reason, in cases where it is suspected that an archaeological site may be in conflict with a development, a qualified archaeological consultant is required to assess the development area.

The review process for a development begins when the description of a development, usually along with a plan, is submitted to Heritage Resources Branch for review. Most often, it is not the surveyors for a project who submit developments to the Branch, but a lands agent, or possibly a government agency like Saskatchewan Environment or Community Planning. However, surveyors often do play a role in project planning, and conflicts with archaeological sites can sometimes be addressed in the planning stage of a development.

The Heritage Resources Branch office will usually take at least seven days to review a project because of the large numbers of projects it sees every year. The Branch reviews developments to see if the development conflicts with a known site that is significant, or the development will be located within an area that has the potential to contain intact archaeological sites.

For the southern half of the province, areas that have a higher potential to contain sites are often along waterways or on lake margins, along valley edges or within flood plains, and are often within native prairie. Sand hills or areas with sandy soils can contain deeply buried and significant sites. Finally, areas with a lot of topographic relief

(including prominent hills, coulees, etc.) often have large numbers of archaeological sites.

The northern half of the province is similar, in terms of archaeological site potential. The main difference is that sites in the boreal forest and north tend to be found more closely along the margins of water ways, lake margins, and on prominent hills or ridges near to these areas.

Most developments the Heritage Resources Branch reviews do not require further archaeological investigation. This is particularly true of developments on cultivated land, although there are some known intact buried sites within these areas. If, however, it is determined that a development does indeed have the potential to impact an archaeological site, a study referred to as a "heritage resource impact assessment" or HRIA will be required. This will almost always require the developer to hire a consulting archaeologist to conduct this study prior to construction. The Branch maintains a list of qualified consultants who are available to do this type of work. The consultant will do a field inspection, and provide the Heritage Resources Branch with a report on the results of the investigation.

Stone Circle or "Tipi Ring" – the remains of the ring of stones used to hold down the hide cover or liner of a Tipi. (Image Credit: Nathan P. Friesen)

There are three scenarios that can results from an HRIA; the first is that there are no archaeological sites, and the development can proceed as planned. The second is that there are archaeological remains, but they are not considered to be significant and the development can proceed as planned. Thirdly, there are significant archaeological remains in conflict with the development.

Clovis Spear Point – Approximately 12 000 years old, used for hunting such animals as mammoth and ancient forms of bison

Prairie Side-Notch Arrow Point– dates from approximately 1,200 to 550 years ago, would have been used to hunt modern bison.

(Image Credits: by L.J. Amundson, Courtesy of Saskatchewan Association of Professional Archaeologists)

In this last case, development can proceed in two ways: the development can be re-designed to avoid the archaeological remains, or the archaeological site can be mitigated through an archaeological excavation. Avoiding a site in the context of an oil or gas pipeline, for example, may simply be done by shifting the pipeline route over to avoid archaeological features that have been identified by an archaeologist. In some cases, surveyors and archaeologists meet on site and the survey of the development is done in conjunction with the archaeologist. This avoids the cost and time delays associated with having to re-survey developments in order to avoid archaeological sites. In terms of residential or cottage subdivisions, municipal or environmental reserves are usually part of the development plan. In a number of cases, archaeological remains that have been identified within subdivisions have been included within these reserve areas and avoided the necessity to excavate them.

Where significant archaeological sites cannot be avoided by development, the excavation of a sample of the site that will be affected may become necessary. Through this

processes we ensure that the information contained in the site is not lost without an attempt to recover it. Sites excavated in the context of development have contributed greatly to our understanding of Saskatchewan's history, and have included sites that date to older than 8,000 years ago. Once a site has been excavated, the development proceeds and the remainder of the site that is in conflict with the development is allowed to be destroyed.

Certain archaeological sites, known as "Sites of a Special Nature" under the Heritage Properties Act, need special consideration in the development planning process. These sites, which generally have spiritual or ceremonial connections (examples include medicine wheels, pictographs and human burials), are afforded special protection by law and may require that development be limited in the areas in close proximity to them. Fortunately, conflicts with these types of sites are relatively rare.

Many archaeological concerns with developments can be dealt with at the planning stage. The Heritage Resources Branch is more than willing to provide advice on potential heritage requirements even before a project has been formally proposed or a survey has been conducted. To help ensure that archaeological sites are protected, the Heritage Resources Branch is welcomes all enquires, so that developers are aware of any regulatory requirements at an early stage and these requirements do not come as a surprise when development plans are already advanced.

Finally, surveyors are in an excellent position to find new archaeological sites in the course of their work. The Heritage Resources Branch welcomes new information on archaeological sites, as each site, in its way, expands our understanding of the history of the Province of Saskatchewan. ☼

The author can be contacted at nfriesen@cyr.gov.sk.ca or by telephone at (306) 787-5774.

The contact information for the Heritage Resources Branch is :

9th floor, 1919 Saskatchewan Drive

Regina, SK S4P 4H2

Fax: (306) 787-0069

2006 AGM Highlights

Congratulations to 25 Year Pin Recipients:

- D. J. (Dave) Quirk (#231)
- L.A. (Larry) Zimmerman (#232)
- S.I. (Stu) Hayward (#233)
- T.R. (Tom) Webb (#234)
- D.A. (Doug) Bouck (#235)
- E.H. (Gene) Seis (#236)

214 - " Councillor's Corner"

there is a constant inflow of quality graduates. With reasonable coaching and mentoring, selected graduates could easily be guided into our profession. Furthermore, under the "Provincial Nominee Program" we could pre-select the right talent from across the globe and fast-track them into our system.

Our aboriginal population, growing at twice the rate of their non-aboriginal counterparts, represent a huge potential resource for our industry and our profession. We need to get involved with the Saskatchewan Indian Institute of Technology and arrange for a flow of trained personnel to meet our future needs. With the national focus being on Immigrants and First Nations, there exist several provincial and federal programs and funding sources.

Despite all our efforts, we will not taste success unless we have a strategy to retain this talent with us. As we aim to attract more candidates, we will be competing with other disciplines and professions within the province, across Canada and internationally. We need to maintain a constant flow of members to match our retirement and migratory outflow, and to meet the growing need of industry and the public.

The fact of the matter is, we need to build our image, we need to sell ourselves and market our profession to new and up-coming students and immigrants. To attract and retain, we must first learn to value ourselves and the service we provide. How many of you would agree that we aren't charging enough to pay adequately and fairly for the services of our professionals and staff. Are practitioners making enough to reward them for the quality of the service they are providing vis-à-vis the liability they are accumulating? At the risk of sounding like I am promoting "price fixing" may I ask how many of you are charging according to the recommended schedule of fees?

In the June 2006 issue of "*Point of Beginning*" magazine, Ray Carlson P.L.S, a longtime land surveyor and business owner in the US, stated "I fear that the future of land surveying will be in danger if our profession cannot attract the best and brightest to fill our aging ranks." "How can owners find exceptional employees and retain them? First they must offer good salaries, good benefit packages and exceptional working conditions as well an exceptional work environment. Consider the salaries offered in other industries to see what you are up against for attracting employees into surveying and Geomatics."

I must reiterate that MRA arrangements will help financially in running our association but they may fall short in providing service to the public. Building our image and attracting new talent is a good start but it must be followed by a sound and successful retention strategy. In a competitive market like today, we must value and reward the services of our professionals and staff. Maybe, this is the time to take a fresh look at how we manage and nurture our profession. ☼

Random Errors in Measurements for Surveyors

By Rajendra Bajracharya, Ph.D, P.L.S., Geomatics Technology Program, Idaho State Univerity

Reprinted from "Gem State Surveyor" Volume XIX, Issue 1, Spring, 2006

Error is defined as observed value (X) minus true value ($\overline{X}$): E = X - $\overline{X}$; But True value is never known. Hence exact error is always unknown. In any measurement, we remove mistakes first and then systematic errors. Then we have acceptable measurement plus some remaining errors. These remaining errors after removing mistakes and systematic errors are call random errors. Random errors are sometimes positive and sometimes negative. Random errors cannot be eliminated but we can deal with them. We deal with random errors by computing Mean, Standard Deviation, Variance, and by Propagating Errors. In surveying, we take repeated measurements thus giving redundancy requiring computing mean, standard deviation, and propagated errors. Different terminologies Mean, Standard Deviation, Variance, Median, Mode, Propagation Errors, Degrees of Freedom, and Weights on measurements are explained by examples in the following sections.

1. Mean, Standard deviation, Variance, Median and Mode

Let a distance be measured with repetition, and after removing mistakes and systematic errors, we have 3 measurements.

Tape Readings feet	Residual(v) = Reading minus Mean	v^2 ft^2
537.96	537.96 – 537.973 = -0.013	0.000169
537.94	537.94 – 537.973 = -0.033	0.001089
538.02	538.02 – 537.973 = + 0.047	0.002209
Mean = 1613.92/3 = 537.973 (retain one more decimal than measured). The Mean is also called **Most Probable Value**	Sum of v's or Σ v = (-0.013)+(-0.033) +(+0.047) = 0.001 (this value should be zero but because of rounding error it is not zero)	Sum of $v^2 = \Sigma v^2$ = (0.000169 + 0.001089 + 0.002209) = 0.003467 This value is used in computing Standard deviation

Standard deviation or standard error is defined as: Sum of v^2 divided by degrees of freedom. Degrees of freedom is defined as the number of additional measurements made more than what is required. In the above measurements, we need only one measurement to determine the length but we took two more. Here the degrees of freedom is 2. The formula for degrees of freedom (d.f.) is as follows: d.f. = n-1; where n is the number of measurements. In our example, d.f. = 3-1 = 2.

Standard deviation is denoted by greek letter σ (sigma). The formula is: $\sigma = \pm\sqrt{\frac{\Sigma v^2}{n-1}} = \sqrt{\frac{0.003467}{3-1}} \pm 0.042$ ft.

We write the result of the taping of three measurements as: 537.973±0.042 ft.

Variance is defined as square of the standard deviation ;

$\sigma^2 = (\pm 0.042)^2 = 0.001764 = 0.002$ ft^2.

To get **Median**, first arrange the measurements in the descending order, and then the number in the middle is the median value. In the above example of tape measurements, after arranging the number in ascending order, 537.96, in the middle is the median value.

Mode is value which repeats highest number of times in the measurements. For example, take a set of numbers: 10, 12, 10, 15, 14, 12, 13, 12, 9, 12, 8, 12, 14. The number 12 occur 5 times, hence **12 is the mode** value.

2. Propagation of Errors

The following is the rule for propagating random errors:

"Rule: square individual items and then add; take square root of the sum."

2.1 Error propagation in Taping

A distance is measured in two sections AB and BC with their standard deviation. What is the standard deviation of total length AC?.

A----------B----------C

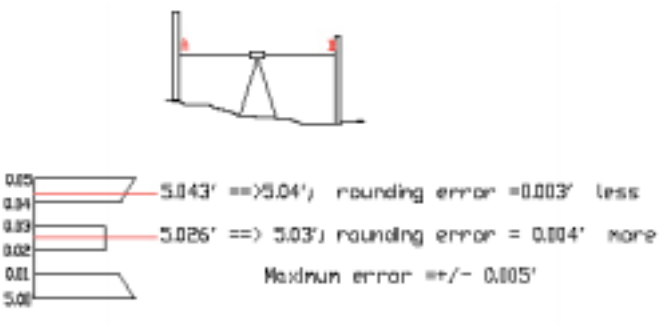
AB = 101.310±0.100 ft; BC = 87.200±0.008 ft

Here standard deviation for AB, σAB = 0.100'; standard deviation for BC, σBC = 0.008'.

We do not add the random errors. The treatment of random error is done by **"square and add, and take the square root of the sum"**.

Standard deviation of AC, $\sigma AC = \sqrt{\sigma_{AB}^2 + \sigma_{BC}^2} = \sqrt{0.100^2 + 0.008^2} = \pm 0.013$ ft

2.2 Error Propagation of reading errors in leveling



Standard deviation in reading A = ±0.005 ft; Standard deviation in reading B = ±0.005 ft; Standard Error in elevation difference = $\sqrt{(0.005)^2 + (0.005)^2}$ ±0.007 ft

2.3 Error Propagation in Sum of Identical Measurements

For identical measurements, with same standard deviation, such as

A----------B----------C----------D----------E
100±0.02' 100±0.02' 100±0.02' 100±0.02'

$$SE_{sum} = \sqrt{.02^2 + .02^2 + .02^2 + .02^2} = \sqrt{4(0.02^2)}$$
$$= 0.02\sqrt{4} = \pm 0.04 \text{ sq.ft.}$$

For identical measurement, the formula is $SE_{sum} = \sigma\sqrt{n}$ where n is the number of identical measurements.

2.4 Error Propagation in Product of Measurements

Area = length (A) x Width (B); A = 250.00±0.04'; B = 100.00±0.02'; Area = 25000 sq.ft.; here σA=±0.04'; and σB=±0.02'; here we want to find standard deviation of the product AB which is the area.

$$\sigma_{AB} = \sqrt{A^2\sigma_B^2 + B^2\sigma_A^2} = \sqrt{25.00^2(0.2^2) + (10.00^2(0.04^2)}$$

= ±6.4 sq. ft.

Hence we write for area with accuracy of measurement, Area = 25000±6.4 sq.ft.

2.5 Error Propagation in Traverse Angle

Permissible Misclosure C = $K\sqrt{n}$ Where K is a constant that depends on the level of accuracy specified for survey; n is the number of angles. For K, Federal Geodetic Control Subcommittee (FGCS) recommends standards for traverse angles as follows:

First Order → 1.7 seconds; Second Order Class I → 3 seconds; Second Order Class II → 4.5 seconds; Third Order Class I → 10 seconds; Third Order Class II → 12 seconds.

For a Traverse of 5 sides with 3rd Order Class I accuracy,

K = 10, n=5; then Misclosure = 12 √5 = 26.8 seconds allowable misclosure.

2.6 Error Propagation in Electronic Distance Measurement (EDM)

The random errors in EDM measurements are (1) instrument setup error (2) target setup error and (3) instrument manufacturer specified error expressed as, for example, (2mm+5ppm). Here 2 mm is called the constant part and 5 ppm is called the proportional part. The parts per million for a distance measured, say 823.329 meters, is expressed as follows:

$$5\,ppm = \frac{5\ parts}{million}\ of\ 823.329m = \frac{5}{1000000}(823.329m)\left(1000\frac{mm}{m}\right)$$

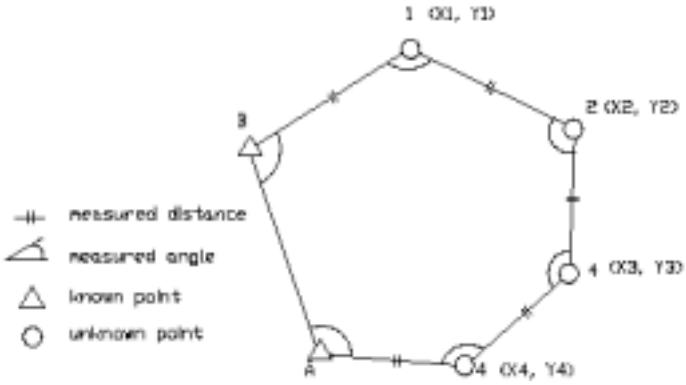
Now the error propagation in EDM is calculated as follows. Again we apply **"Rule: square individual items and then add; take square root of the sum."**

For estimating error in EDM, we square and add instrument centering error, target centering error, the constant part of manufacturer specified accuracy, and the proportional part of manufacturer specified accuracy. σEDM =

$$\sqrt{\left(3^2 + 5^2 + 2^2 + \left(\frac{5}{1,000,000}(823329)(1000)\right)^2\right)} = \pm 7.4mm$$

3. Degrees of Freedom

The definition of degrees of freedom is " difference between number of measurement minus number of unknown." For example, for a distance measured 5 times, the number of observation = 5; the number of unknowns = 1; hence the degrees of freedom = 5-1 = 4. Let us take an example on traverse.



Here the number of distances measured = 5; number of angles measured = 6; The total number of measurements = 11; the number of unknowns (X1, Y1), (X2,Y2) , (X3,Y3), (X4,Y4) are 8. Hence the degrees of freedom = 11 – 8 = 3.

4. Weights in measurements

Giving weights in the measurements means providing importance according to the reliability of measurements. The measurements might have been taken using different categories of instruments, different weather conditions, and different repeatability of the same measurement items. For example, an angle is measured on a sunny day; next day the same angle is measured but the weather is wet and windy. Now we can not throw away the second day angle because it costs money to pay survey crew to take that angle. But we can combine these observations by giving weights.

Day	Angle	Weight
1. (Sunny)	410 21' 03"	2
2. (Wet/Windy)	410 21' 12"	1

Considering only seconds, Weighted Mean ($\overline{W}$) =

$$\frac{M_1W_1 + M_2W_2}{W_1 + W_2} = \frac{(3)(2) + (12)(1)}{2+1} = 6";$$

Hence, weighted mean = 41^0 21' 06".

Weight for an observation is calculated by formula, weight $Q1/\sigma^2$; which means weight is inversely proportional to square of standard deviation; and taking constant of proportionality as 1, then weight = $1/\sigma^2$; where σ is standard deviation or error; For example, the following observations are taken on different days and mean and standard deviation of observations are as follows:

Day	Mean angle	Standard deviation	Weight
1	M_1 = 410 20' 56"	$\sigma_1 = \pm 5$"	$W_1 = (1/5^2)$
2	M_2 = 410 21' 10"	$\sigma_2 = \pm 12$"	$W_2 = (1/12^2)$

Considering only seconds for calculating Weighted mean ($\overline{W}$) =

$$41^0 21' + \frac{M_1W_1 + M_2W_2}{W_1 + W_2} = \frac{(-4)(\frac{1}{5^2}) + (10)(\frac{1}{12^2})}{\frac{1}{5^2} + \frac{1}{12^2}} = -2'$$

Weighted mean for the angles = 41^0 20' 58".

For Levelling, the weight is estimated as follows:

weight $\propto \frac{1}{D}$; where D is distance.

5. Summary and Conclusions

Different terminology Mean, Standard Deviation, Variance, Median, Mode, Propagating Errors, Degrees of freedom, and weights on Measurements have been presented by examples. Propagation of errors is computed by "square and add, and take the square root of the sum". The degrees of freedom is the difference between number of observations and number of unknowns. The weights for observations are computed by the inverse of square of standard deviations. ☼

References:

- *Wolf, P.R. and Ghilani, C.D. 2006. Elementary Surveying: An Introduction to Geomatics. Pearson, Prentice Hall.*
- *Wolf, P.R. and Ghilani, C.D.1997. Adjustment Computation: statistics and Least Squares in Surveying and GIS. John Wiley and Sons, Inc.*

The New Math New Conversion Table

1. Ratio of an igloo's circumference to its diameter = Eskimo Pi
2. 2000 pounds of Chinese soup = Won ton
3. 1 millionth of a mouthwash = 1 microscope
4. Time between slipping on a peel and smacking the pavement = 1 bananosecond
5. Weight an evangelist carries with God = 1 billigram
6. Time it takes to sail 220 yards at 1 nautical mile per hour = Knotfurlong
7. 16.5 feet in the Twilight Zone = 1 Rod Serling
8. Half of a large intestine = 1 semicolon
9. 1,000,000 aches = 1 megahertz
10. Basic unit of laryngitis = 1 hoarsepower
11. Shortest distance between two jokes = A straight line
12. 453.6 graham crackers = 1 pound cake
13. 1 million-million microphones = 1 megaphone
14. 1 million bicycles = 2 megacycles
15. 365.25 days = 1 unicycle
16. 2000 mockingbirds = 2 kilomockingbirds
17. 52 cards = 1 decacards
18. 1 kilogram of falling figs = 1 Fig Newton
19. 1000 milliliters of wet socks = 1 literhosen
20. 1 millionth of a fish = 1 microfiche
21. 1 trillion pins = 1 terrapin
22. 10 rations = 1 decoration
23. 100 rations = 1 C-ration
24. 2 monograms = I diagram
25. 4 nickels = 2 paradigms
26. 2.4 statute miles of intravenous surgical tubing at Cornell University Hospital = 1 IV League
27. 100 Senators = Not 1 decision

Google is at it again...

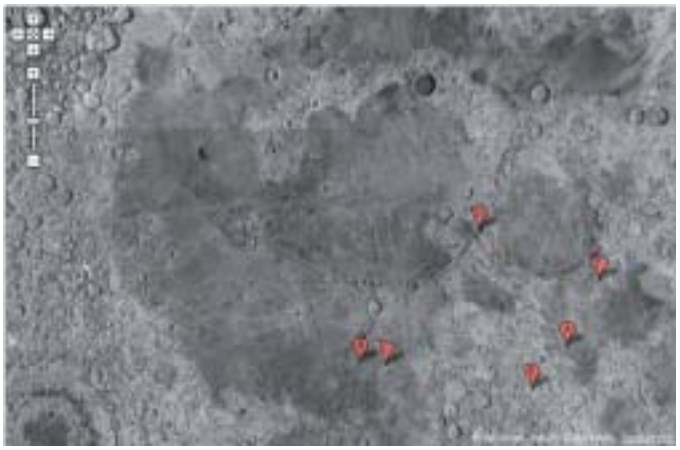
By Kelly Dean, Editor, Geomatica

As seen in "Geomatica" Vol. 60, No. 1, 2006

First came Google Maps and then came Google Earth. Now Google has launched two new extraterrestrial offerings with Google Moon and Google Mars.

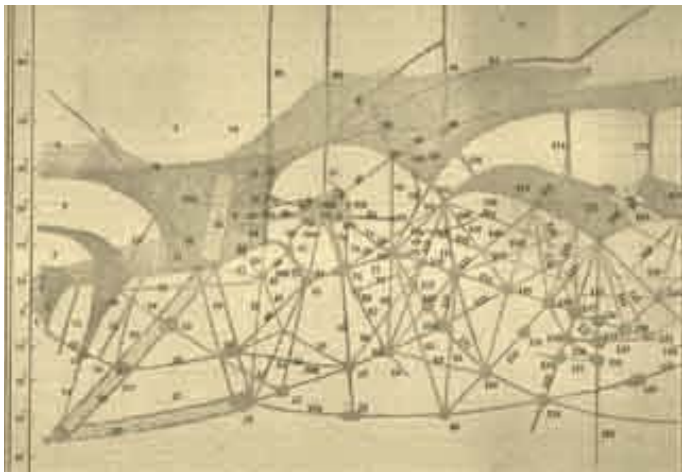
Google, who has emerged as a leader in the pack of Internet geospatial viewing tools, released Google Maps within the last year, providing a highly responsive, intuitive mapping interface with detailed street and aerial imagery for Canada and the US. Although Google Maps (http://Maps.google.com) doesn't provide anything we haven't already seen from traditional GIS vendors in terms of Web offerings, one could argue that they have certainly managed to capture the attention of the non-traditional geospatial world.

Google Earth (http://earthgooglecom) on the other hand adds a whole new dimension to the geospatial Internet industry in that it offers imagery and 3D data depicting the entire Earth, in high-resolution detail. As stated by Google, "It's a globe that sits inside of your PC." Using functionality that has become common-place, Google Earth allows you to point and zoom to anyplace on the planet that you want to explore. The Local Search allows you to search for restaurants, hotels, driving directions, and perhaps find your own home. The various layers show parks, schools, hospitals, airports, shopping, and more. Google Earth, which is free for personal use, offers several upgrades including Google Earth Plus and Google Earth Pro for the more sophisticated users, for modest fees, while Google Earth Enterprise, comprising three elements (Google Earth Fusion, Google Earth Server, and Google Earth Enterprise Client) is used more by commercial real estate developers, architecture and engineering companies, insurance companies, etc., again for an additional fee (conveniently not included on their Web site). Minimum system requirements for Google Earth (for a PC) include Windows 2000 or XP, 500MHz CPU, 400MB of available Hard Disk space, 128MB RAM, 16MB Video RAM, and a network speed of at least 128 kbits/sec.



Screen capture from Goolge Moon

More recently, Google Moon was launched to commemorate the first lunar landing on July 20, 1969. An extension of Google Maps and Google Earth, Google Moon uses NASA imagery allowing users to explore the Moon's surface and see exactly where Apollo astronauts made their landings. All six Apollo landings are marked from the 1969 landing of Apollo 11 to the December 11, 1972 landing of Apollo 17. Clicking on these markers displays the names of astronauts on each mission. Visit Google Moon (http://Moon.google.com) to explore the Moon's surface for yourself. Just be careful you don't zoom in too close!



Percival Lowell's map of the western hemisphere of Mars.

The newest addition to the Google family is Google Mars. It was recently launched on the occasion of the 151st birth of Percival Lowell, the astronomer who mapped Mars in the 19th Century (1895) after many years spent carefully studying the Red Planet through his telescope. With the launch of Google Mars (http://Mars.google.com), now you can do the same thing. In collaboration with NASA researchers at Arizona State University, they've created some of the most detailed scientific maps of Mars ever made.

Keep your eyes open for more upclose views of some planets within our solar system, as Google has obtained domain names for Google Mercury, Google Venus, and Google Jupiter too! ☼

(sources: Google Maps, Google Earth, Google Moon, and Google Mars)

Natural Boundary

By Alec McEwen

As see in "Geomatica" Vol. 60, No. 1, 2006

When interpreting deed descriptions, courts place natural boundary features at the top of the evidential hierarchy because their permanence and prominence renders them more reliable than artificial markers or theoretical measurements and they are considered less likely to be in error. A boundary that a deed clearly defines as a stream is not normally susceptible to challenge unless, for example, there is doubt as to which watercourse was actually intended to form the boundary or in situations where the stream, though correctly identified, has undergone avulsive lateral movement since the deed adopted it as the boundary. A surveyor who is called upon to determine the location of a parcel boundary that a deed describes as a stream should, in the absence of ambiguity, give preference to that natural feature over other apparent types of evidence.

In DeGruchy v Pettipas (2004), 227 N.S.R. (2d) 141, heard by the Nova Scotia Supreme Court, the plaintiff brought an action for trespass alleging that the defendants had entered her land at Antigonish and had unlawfully cut and removed timber. The defendants argued that since the land in dispute belonged to them, they did not commit a trespass.

The plaintiff, a widow, claimed ownership of a considerable amount of woodland that had been left to her by her husband, Alex DeGruchy. She submitted that the property on which the defendant cut the timber formed a portion of a lot purchased by DeGruchy in 1956 and described in a deed. The defendants contended that the disputed land lay outside the plaintiff's deed limits and was conveyed in 1970 by Arthur Pettipas to his wife Frances, who in 1997 transferred its ownership to the defendants. The 1997 description reads, in part, "Bounded on the west by Chisholm's Brook (so-called), and Bounded on the north by lands of Alex DeGruchy; containing twenty (20) acres, more or less."

Before cutting trees on the disputed land, the defendants retained M, a licensed surveyor, to determine the boundaries of their lot. Defendant Charles Pettipas showed M the locations where his father, Arthur Pettipas, had cut wood. In one of those locations, lying west of Chisholm's Brook, M testified that in 1980 he found a tree blazed on both sides, which blazes he estimated to be about 30 years old, and also a blazed stub, both of which artificial marks he accepted as indicating the west limit of the Pettipas property. By connecting the two sets of blazes and ignoring the deed reference to Chisholm's Brook, M ran the boundary northerly along a line that lay considerably to the west of the watercourse.

In reliance on M's survey plan, Charles Pettipas cut trees on the land lying east of the blazed line and west of Chisholm's Brook. Upon discovering the cutting, the plaintiff retained surveyor S to establish the defendants' western boundary.

S examined the 1970 deed and concluded that M should not have disregarded its description of Chisholm's Brook as the western limit of the Pettipas land. He found one of the two sets of blazes, without being able to say what it represented, but offered his emphatic opinion that "you need more than two blazes to establish a boundary."

S drew the boundary along Chisholm's Brook, in accordance with the description in the defendants' title deed. He also testified that he had searched the Pettipas title as far back as 1894 and found Chisholm's Brook referred to at that time and in subsequent conveyances as the western boundary of the defendants' property. Whereas the 1970 deed described that property as containing 20 acres, the land surveyed by M and shown on his plan contained 65.13 acres.

Chief Justice Kennedy found it "inexplicable" that M would have ignored the consistent reference to Chisholm's Brook as the western boundary of the Pettipas property. He concluded that S had correctly accepted that natural feature and had established the boundary in its true location. As a result of his survey, which also included the defendants' disputed northern boundary, S found the Pettipas land to contain 21 acres, which agreed closely with the deed description. The chief justice confirmed the western and northern boundaries, as established by S.

The court also found that the defendants had committed trespass in cutting the trees and that the plaintiff was entitled to general damages in the amount of $15,000. The chief justice declined to award the punitive or exemplary damages sought by the plaintiff. He declared the defendant Charles Pettipas to be an unsophisticated, illiterate person who had relied to his detriment on a professional surveyor's erroneous plan and did not display the degree of malice or wantonness that would justify such an award. ☼

A BRIEF HISTORY OF BOUNDARY LAW

BY PETER OLSON, PLS

As seen in "Treasure State Surveyor", April 2006 (Volume XXXV, Issue II)

Boundaries are closely tied to the progress of civilization. When land ownership or boundaries are disputed, progress is stifled, development slows and investment stagnates.

Records of individual tracts and parcels were introduced by the Egyptians. As an arid country, Egypt is dependent on the Nile River for its existence. Prior to the development of irrigation, the yearly flooding of the river was relied upon to sustain life. Since initial records of ownership were based on actual surveys and the annual flooding obliterated the landmarks and caused considerable conflict and confusion between neighbors, extensive retracements and resurveys were required. Because surveys were costly and time consuming, duplicate records were placed in the provincial archives where tax records were maintained, and in the royal treasury. The ancient Greeks worshipped the god Terminus, the Protector of Boundaries. Boundaries were stones or stumps with marks carved into their surface: the terminal or end point of a line.

Stamp Issued by Egypt - 1998
Honouring the Egyptian Survey Authority
(Image Credit: http://jeff560.tripod.com/)

Showing faith in Terminus was said to bring peace to communities and stability to its boundaries. In fact, the Greeks celebrated the central role of boundaries with the Festival of Terminalia on February 23. Landowners met at common boundary stones, placed a garland of flowers, feasted on cakes and honey and sacrificed a pig or a lamb.

Later, as the Roman Empire rose to prominence, the Romans appropriated the goddess and made her into a God. Rome's founding included the erection of a temple to Terminus on one of the seven hills. Rome spread a lasting influence over Europe and from Africa to the Middle East. As the strength and influence of the empire faded, breaks in its influence and control became evident. The British Isles was a remote province of a dying Roman Empire. Invaders from the north landed and brought death and destruction to a once prosperous land. By the fifth century, England was under control and domination of a mixed group of Anglos, Saxons, Jutes and Danes. Islands of control and conflict emerged, with each an entity unto itself.

Modern English development of boundaries probably started in 1066 when William of Normandy, a.k.a. William the Conqueror, gained the crown of a defeated England by right of conquest. William and his Normans brought England efficient administration, a sense of order, and legal minds and principles. One of his first acts was to establish a strong central government with himself as its king. William considered all lands his personal property and all individuals his possessions as tenants or subtenants of him. Land tenure became the foundation of his feudalism. He considered the natives as primitives who would not accept his changing their common ways.

Both the King and the tenants needed land for survival. For the tenant, it meant food; for the King, it assured his tenure on the throne. Land was power. Life was cheap. A transgressor would receive a more severe sentence for the destruction of property than for the destruction of life.

Each tenant owned only those rights that were granted by the King. Possession, tillage and water were but a few. In 1086, William had gained such power that he desired to have an accounting of his wealth. He directed that five justices from each shire (county) inventory all the real and personal property. In concept and execution, his inquest was nothing more than a revival of the old Roman institution of census taking. The results were collected in two volumes that became known as the Domesday Book. The names of landowners with their described lands, the value of the land and livestock, the number of servants, and details of property were all included. While William was in control, lesser possession or tenure was assured. It is from this time that the modern statements: "Possession is 9/10ths of the law" and "A man's home is his castle" find their meaning.

The early nomadic tribes of Europe and Asia and Native American tribes of the United States had no concept of individual land ownership. Land was held for common usage of all members of the tribe, and no specific form of ownership was recognized.

Well-defined and delineated boundaries are required to limit the extent of territorial claims between and within nations. Boundaries in and of themselves function as dividing lines, starting with property lines between contiguous neighbors or farms that are guarded by a simple fence separating them, and extending to national and international boundaries identified by legal treaties and guarded by armies. ☼

What's outside the Box?

By Doug Culham, OLS, CLS, OLIP

Reprinted from "Ontario Professional Surveyor" Volume 49, No. 2, Spring 2006

Sometimes the solutions to issues cannot always be found inside the normal box of tools that we, as geomatics professionals and land surveyors, share. It is important to periodically look beyond our business and regulatory roles. A case in point is the issue of advocacy.

Advocacy, what does it mean? What role should the AOLS have? It was clear from the straw vote taken at the last Annual General Meeting that the membership feels advocacy is a subject that should be investigated further. However, it can have many facets. For example, one function of advocacy could be to ensure that the voice of the Association is heard on those issues that might have an impact on the business activities of its membership. Or alternatively, it could facilitate the ability to track and intervene in the government legislative process when laws are proposed that will have an impact on the Association. Yet, by contrast advocacy can be as simple as a message describing the role of the profession and the contribution that the Association and its members make to the social and economic well being of the Province and the people of Ontario. At the very least, it is important that those officials in positions of responsibility are aware of how much of the wealth of the Province of Ontario is entrusted to some 693 geomatics professionals in both the public and private sectors.

Ongoing issues: Today's world of self-regulating associations is exceedingly complex. The government is in the process of examining the role of such associations and as a result, more effort will be required on the part of our Association to ensure that we have the opportunity to influence any future decisions. Other jurisdictions in Canada are moving towards a more e-government environment. For example, in British Columbia, the Office of the Surveyor General, in addition to its land registry functions, is now part of a special agency established to administer property rights. This is a trend that the AOLS should monitor and perhaps be prepared to recommend a course of action to the provincial government. The Underground Utilities Committee has presented a report that recommends significant changes concerning how information related to underground utilities should be maintained within the Province. This report could have far reaching effects well beyond the original intent of simply locating and managing information related to underground utilities. The members of this committee are to be commended for their well-considered report and its recommendations. Council has also received a report from the License Expansion Task Force that addresses the broadening scope of geomatics and the increasing reliance on spatially related information. Many changes are being proposed, the least of which are possible changes to our legislation.

Council hosts a dinner at the Ontario Legislature each spring that provides us with an opportunity to talk to those politicians who have an interest in geomatics. The themes for this year's presentation during the dinner will be: the value of property rights and the contribution of the geomatics community; underground utilities and the increasing need to manage the location of this infrastructure; digital plan submissions; and, lastly, the integration of surveys through adoption of common standards.

The AOLS must continue to provide improved services to its membership. Our Association is in direct competition with other organizations for potential members. For example, we need to show the reasons why a Geographic Information Manager would be better served through membership in the AOLS rather than one of the other discipline specific associations. How should the AOLS proceed to develop and improve upon its status as a premier professional organization in the Province of Ontario whose members are able to meet the needs of clients that require the use of integrated spatially related information technologies? How do we promote an environment where new ideas are shared and how do we provide an effective forum for peer review and feedback? Annual General Meetings and Regional Group meetings provide ideal opportunities to discuss innovative ideas and concepts and deal with regional matters of common interest.

The strength of this Association continues to be its membership. The degree of participation by volunteers is extraordinarily high, yet because we are also a small Association, much is demanded from relatively few individuals. Members' participation on Council, on Committees or at the Regional Group level is essential if we hope to be in a position to influence our future. It is important that we start focusing on some of the strategic concepts that have been tabled and begin implementation at the regional group and committee levels of our organization. Council will be providing presentations and further information regarding these proposals over the next several months. ☼

Improving field crew productivity

Always in stock!

Cansel's large inventory of surveying equipment and field supplies along with fast delivery times keep you and your crew working.

Call Cansel and reduce downtime!

SALES • SERVICE • RENTALS • TECHNICAL SUPPORT • TRAINING

1-888-222-6735 • www.cansel.ca

Cansel

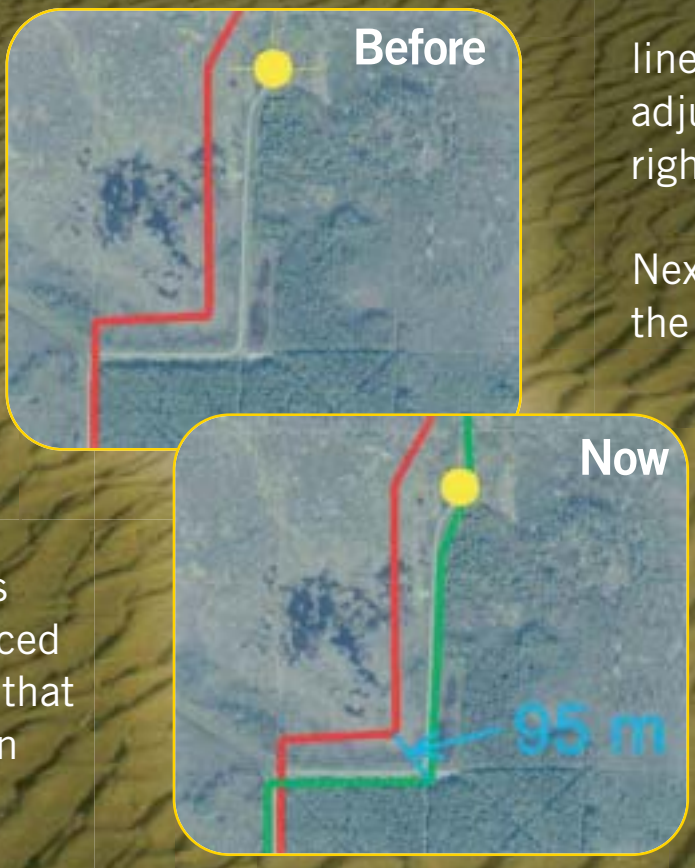
Vancouver • Edmonton • Calgary • Winnipeg • Toronto • Ottawa • Montreal • Quebec • Halifax

Consider the source

It's the difference between here and there

Get access to the premier pipeline database for Western Canada, exclusively from IHS Energy.

Our pipeline data partner, Geomatics Data Management Inc., has released a new enhanced AB pipeline database that contains over 1 million line segments spatially adjusted to surveyed right of way locations.



Next, GDM is integrating the trusted PipesWest™ database with their BC and SK pipeline databases, resulting in a new level of combined excellence for all our customers.

Now available in AccuMap®, PetroSurveys™, EGIS™ and GIS Reference Layers! Visit **www.ihsenergy.ca** to learn more about how to get the premier pipeline file on your desktop!

www.ihsenergy.ca

GDM

IHS ENERGY™

3900, 150 - 6 Avenue SW, Calgary, AB T2P 3Y7 Tel: 403.770.4646 Fax: 403.770.4647

LMS LAND MEASUREMENT SYSTEMS INC.

LAND MEASUREMENT SYSTEMS WINTER SALE!

LAND MEASUREMENT SYSTEMS IS THE LEADING SERVICE PROVIDER IN WESTERN CANADA FOR TOTAL STATIONS, LASERS, MACHINE CONTROL AND GPS

GTS-235 W
WIRELESS TOTAL STATION

- World's first wireless total station (no cable between instrument and data collector)
- Large, easy-to-read screen
- Expanded keyboard for increased functionality
- Compatible with 3rd Party Data Collectors!
- Also available in Reflectorless Models!

TOPCON

Get the best at incredible prices:

GTS-239 9" Instrument $6995
GTS-236 6" Instrument $7495
GTS 235 5" Instrument $7995

LMS Service Specials

At Land Measurements Systems, not only do we make sure you have what you need, we also help you keep your essential equipment running smoothly so you can get the job done. Our skilled technicians are more than happy to service your Topcon, Nikon, Pentax, Sokkia, TDS, and Schonstedt products.

- Instrument Clean & Calibrate $135
- Factory Authorized TDS, Topcon, Schonstedt.

Surveyors Vests

Cruiser vests from small to 3XL in cotton, $99 each!

HiPerLite +

- Cable Free Integrated RTK GPS + Receiver
- Dual Constellation GPS + Glonass
- 50% More Satellites
- **Lite on Price At $38,995**
- Why settle for less?

Head Office
Bay 1, 1435 40th Ave. NE Calgary, AB T2E 8N6
Tel (403) 291-9575 **Fax** (403) 291-9576

Winnipeg Office
118 Cunnington Ave. Winnipeg, MB R2M 0W8
Tel (204) 231-0613 **Fax** (204) 231-0618

Maple Ridge Office
203, 20285 Stewart Cres. Maple Ridge, BC V2X 8G1
Tel (604) 460-9575 **Fax** (604) 460-9576

or visit us online at www.lmssurvey.com

Trimble® R8 GNSS System

Upgraded. Advanced. Perfected. And still able to fit under that shiny white dome. Designed to maximize flexibility and minimize initialization time, the Trimble R8 GNSS System keeps you on top of signal innovations for improved accuracy and field productivity. Combining a tested and proven system design with advanced receiver technology, the Trimble R8 GNSS is a major step forward for the survey industry. In other words, the best just got better.

GNSS Support

Trimble R-Track technology lets you utilize both the modernized GPS L2C and L5 signals and GLONASS L1/L2 signals. More satellite tracking means increased productivity now and into the future.

Proven System Design

It's from Trimble, so you'll always have proven technology, lightweight, flexible communications and rugged construction. As a base or a rover, it offers simple, cable-free operation.

Get Connected

Create a complete Trimble I.S. Rover solution by adding a prism to your rover pole. And, like every Trimble product, the R8 GNSS System fits seamlessly into the Trimble Connected Survey Site.

To discover how far we've come, and how far you can go, visit **www.trimble.com/gnss**

Trimble

CONNECTED SURVEY SITE READY

TRIMBLE NAVIGATION LTD.
Tel: 1.800.563.7184 Fax: 1.416.252.8635
Email; info_trimble_canada@trimble.com
©2006, Trimble Navigation Limited. All rights reserved.
Trimble and the Globe & Triangle logo are trademarks of Trimble Navigation Limited registered in the United States Patent and Trademark Office. SUR-085

Trimble DIMENSIONS 2006

November 6 – 8, 2006
Mirage Hotel, Las Vegas
www.trimbleevents.com

SIZING SECTIONS

By Jeffery N. Lucas

Reprinted from "Gem State Surveyor" - Fall 2005 & Winter 2005 - 2006

Part II

Last month's installment brought us to the issue of intent. This month we will continue with intent and come to a conclusion. I doubt seriously, however, that this will be the end of the matter.

Indications of Intent

The most controversy and the most "theory" applied to corner location usually involve sectionalized descriptions (aliquot parts). Least we forget, sectionalized land is what I am talking about. I'm not talking about lot and block surveys. Several factors are looked at by the courts on the issue of intent. The survey texts notwithstanding, the first factor looked at by the courts when trying to decipher intent is what boundary is being occupied by the coterminous landowners at the present time or in the recent past. At the outset, the courts don't care about the history of sectionalized land or your resizing of it. They only care about the line that the coterminous landowners think is the boundary between their two parcels of land. This is only logical and makes perfect sense if you simply take your surveyor hat off and try to imagine being a judge. Pretend you don't know anything about land surveying, especially the theoretical sizing of sections. Two landowners come to you with a boundary dispute. What's the first question you want to have answered? I don't know about you, but the first question I would want to ask is what line are you holding to now? Lines of occupation can be witnessed by fences, cut lines, timber activities, or even lawn mowing. But generally, when there is a dispute the lines of occupation are not clear. That's why there's a dispute.

Absent lines of occupation, the courts will next look at the writings. Can the intent of the parties to the transaction be deciphered from the deed? With aliquot parts descriptions, the writings are no help. This, I think, is where theoretical surveyors believe that their special skills will come in to play. "Certainly my special skills as a theoretical surveyor, determining theoretical corners, will be needed when the judge wants to decipher an aliquot parts survey." Sorry to bust your bubble but you're wrong. The judge then goes back to those who might be able to testify as to the original location of the boundary. This is when the testimony of those who might know about the boundary line is considered, any available survey monuments are looked at, and experts who can testify as to the original location of the boundaries are listened to. Sizing of the section is a collateral issue to the possible expertise of the testifying land surveyor. In modern cases it rarely, if ever, is used to determine the location of the original boundary.

So this begs the question: Why do so many surveyors put their faith in the sizing of sections? The only other answer that I can come up with is that sizing the section gives the surveyor a feeling of: "I've covered all the bases and can show I've done my homework." This may be a valid point and might be absolutely critical to your testimony. Certainly, if two surveyors are in court you do not want to be the one who didn't size the section—the one who came in without his homework assignment. Nevertheless, the judge will almost never ask for the homework assignment. In most cases the decision about the boundary line will be reached well before sizing of the section will ever be considered.

The Law in Alabama

The law in Alabama is clear and has been stated over and over again. "The law requires that where a fence has existed as a boundary for a period in excess of ten years between two coterminous owners, the fence becomes the boundary, regardless of the actual deed or survey line. In the absence of such physical evidence of possession, the line as called for in the deed controls." Fallin v. Cornelius, 733 So.2d 409, 411 (Ala.Civ.App.1998). In other words, the judge will look first to possession and then to the deed. If you recall our pervious discussion about our adverse possession statute here in Alabama, you will remember that there is an exception to the ten year period having to do with minors and incompetents, which extends the period to 20 years. But I imagine that this exception arises so infrequently that Judge Austin, who presided over Fallin at the trial level, felt it unnecessary to even mention it.

"The court finds that based upon the remnants of the 'turkey' fence on the ground and embedded in the trees, that such fence existed for a period in excess of ten years, that the fence was intended as a boundary marker between the two adjoining property owners, and that the location of the fence coincides with the north boundary line as drawn on the Burgett survey." Id. Here we have a result reached by the court. If we back up through this result we see that the elements leading to it were: (1) the fence coincided with a line on a survey; (2) the fence represented the intent of the coterminous land owners; (3) the statutory ten year period had elapsed; and (4) there were remnants of a fence embedded in the trees. (1), (3), and (4) are easily determined by any land surveyor in the field at the time of the survey. And they are determined without sizing the section. Item (2) is the problem child. As we discussed earlier, who knows the intent to the coterminous landowners? And we're not talking about

the present landowners, because they were not in agreement about the boundary line, we are talking about their predecessors in title.

On that score, Judge Austin chimes in: "Were it not for rules of law which have been established by judges and lawmakers much wiser that this trial judge, that are steeped in a tradition of disputes by neighbors over land since the beginning of courts and the judicial system, this judge would fare no better in the resolution of the dispute than the parties, surveyors, or lawyers." Id. at 410, 411. In Bell v. Jackson, 530 So.2d 42, (Ala.1988), the Alabama Supreme Court tells us on the question of intent that "[if] one of [the coterminous landowners] proceeds to enclose his property and erects a fence intended as a line fence and holds actual and exclusive possession to it as such, his possession is adverse and if continued for ten years ripens into title. Citing Mardis v. Nichols, 393 So.2d 976, 978 (Ala.1981), quoting Salter v. Cobb, 264 Ala. 609, 88 So.2d 845 (1956). Adverse possession does not have to be established by the present landowners, as Fallin illustrates. It attaches to the land and, in essence, is inherited by subsequent landowners.

What if there are no signs of possession? Judge Austin addressed that issue as well. "The Court further finds, based upon the testimony and its inspection of the premises, no indicia of possession on the east boundary line; the quarter-quarter line as called for in the deeds is the boundary." Fallin at 411. It is only after no lines of possession can be found that the court even looked at the deed for direction. There were two surveys presented during the trial. And, of course, neither agreed with the other, for reasons already stated above.

"As to which survey to use in establishing the location of the east boundary line of the Cornelius property, the Court looks to three factors:

"1. The testimony of [surveyor] Frank Hollis, as to the prior existence of iron stobs or axles in the ground marking the corners of the east boundary line of the Cornelius property;

"2. The existence of the survey performed 30 years previously by Harvey Atkinson, and Frank Hollis's testimony that his 1996 survey confirmed the accuracy of the Atkinson survey and the points established thereby, and;

"3. The testimony that there had never been a dispute as to the property lines between the neighbors from anytime before the Atkinson survey or for the 30 years after, until the Fallins procured the Burgett survey." Id.

Noticeably absent was an examination of a sizing of the section. "In the present case, there was also a great deal of testimony regarding the existence of markers and monuments on the disputed property. Hollis testified that his staff ran lines from monuments that had been set by a prior survey. Burgett testified that he had actually sized the section." Id. at 412. Burgett's work relative to sizing the section appears to have been in vain. The trial judge didn't even consider the sizing of the section when he made his determination about the true boundary. Burgett's time would have been better spent looking for existing monuments and evidence of a line of possession as opposed to a theoretical sizing of the section, the resulting boundary line of which was thrown out by the trial judge.

It's Up To The Judge

As we have all heard from time infinitum, the final determination of a boundary line is left up to the judge. "It is the providence and duty of the court to locate the disputed boundary line by finding and locating the true line. If this cannot be done with absolute certainty, the court should consider all the physical indications, reputation, general treatment of the parties, monuments, if any, and courses and distances." McLaurine v. Knowles, 57 So.2d 543, 544 (Ala.1952). Notice that the only consideration that even resembles sizing a section is the last one mentioned: "courses and distances." However, this power is not unlimited. It is the judge's duty to fix the existing boundary line not create a new one. In Ramsey v. O'Neal, 812 So.2d 324 (Ala.2001), the trial judge attempted to do just that; create a new boundary line. In reversing the order of the trial judge, the Alabama Supreme Court said: "The role of the court in a boundary line dispute is to determine and fix the existing boundary line, not to create a new one." Id. at 328. "This court has held…that it is error for a trial court to establish a line not supported by the evidence presented by either landowner." Id.

"The Fallins argue that the trial court erred in basing its determination of the east-west boundary on the possession survey performed by Frank Hollis at the request of the Corneliuses." Id. at 411, 412. "In light of the fact that the trial court was in a superior position to weigh the evidence, we cannot say the judgment of the trial court was erroneous." Id. "When evidence is presented ore tenus in a boundary line dispute, the trial court's judgment establishing the boundary is presumed correct and need only be supported by credible evidence." Bell v. Jackson, 530 So.2d 42, 44 (Ala.1988); Hodge v. Snider, 495 So.2d 539, 540 (Ala.1986). "The ore tenus rule, which on appeal accords a presumption of correctness to a trial court's findings, is particularly strong in boundary line disputes and adverse possession cases, and the presumption is further enhanced if the trail court personally views the property in dispute." Bell v. Jackson, at 44; Wallace v. Putnam, 495 So.2d 1072, 1075 (Ala.1986).

What we can glean from these rulings is that in your typical boundary line dispute there will be two sides. Each side will present their evidence as to the true boundary line between them. The trial judge must choose between one or the other, he cannot create a new line. Now let's put a little meat on these bones, let's say the dispute is over the location of a

north-south 1/4-1/4 line. Two surveyors survey the line and, as is always the case, they disagree. One surveyor held existing monuments that coincide with a well occupied and defined line. The other surveyor sized the section and established a new 1/4-1/4 line 25 feet west of the monuments and occupied line. You be the judge. All other things being equal how would you decide this case?

Conclusion

Let's put all of this in perspective. It would be easy to walk away from this discussion thinking that I'm advocating possession surveys, only. So let me state flat out—I'm not. What I am saying is that unless you've done a proper job of retracing your section (and perhaps the better part of a township), your sizing of a section does nothing towards determining the correct location of boundary corners. All it can do is give you a good or bad feeling about the section you have today verses the section that was set by the GLO in 1850. So do not use the information you have gathered about the section to project new theoretical corners, especially theoretical corners that conflict with existing monuments and long held occupation. You haven't done enough work to make that determination. If you haven't determined the GLO section corners beyond a reasonable doubt, why are you throwing out the existing monument that you found at the 1/4 section? Or the existing monument that you found at any other breakdown corner within your section? You cannot build a house on a foundation of sand. You are better off tearing down this house, digging a new foundation based on existing monuments, established lines of occupation, testimony of locals, witnesses to the location of the boundary, and erect a new house supported by the columns of good judgment, reasonable research, thorough field investigation, and good mapping practices. This is what the judge is going to look at, why shouldn't you?

In the year 2004, I do not think that surveyors should be expected to recover GLO corner positions, prove them beyond a reasonable doubt, and run out entire sections in order to survey Ma Kettle's 5 acre plot in the NW 1/4 of the SE 1/4. First of all, Ma Kettle can't afford to hire you to do this. And what good is it to be a land surveyor if nobody can afford to hire you? Secondly, even if Ma Kettle could afford to hire you to do this, the court isn't going to tell Ma Kettle's neighbors that they need to move their fence 30 feet to the west to coincide with your survey. Our equitable principles of adverse possession, estoppel, reliance, and acquiescence will not allow such a result. As we all know, surveyors cannot determine boundaries, only the judge can. But we can stop making illogical decisions based on half-baked theories that cannot and will not be supported by the law. Let's stop the madness and recognize that some boundary solutions cannot be made with a calculator, on a drawing table, or in a computer program. They must be made in the field weighing the evidence in your hands. ☼

RED SKELTON'S RECIPE FOR THE PERFECT MARRIAGE

Two times a week, we go to a nice restaurant, have a little beverage, good food and companionship. She goes on Tuesdays, I go on Fridays.

We also sleep in separate beds. Hers is in California and mine is in Texas.

I take my wife everywhere ... but she keeps finding her way back.

I asked my wife where she wanted to go for our anniversary. "Somewhere I haven't been in a long time!" she said. So I suggested the kitchen.

We always hold hands. If I let go, she shops.

She has an electric blender, electric toaster and electric bread maker. She said "There are too many gadgets and no place to sit down! ..... So I bought her an electric chair.

My wife told me the car wasn't running well because there was water in the carburetor. I asked where the car was; she told me "In the lake."

She got a mud pack and looked great for two days. Then the mud fell off.

She ran after the garbage truck, yelling "Am I too late for the garbage?" The driver said "No, jump in!"

Remember: Marriage is the number one cause of divorce.

I married Miss Right. I just didn't know her first name was Always.

I haven't spoken to my wife in 18 months. I don't like to interrupt her.

The last fight was my fault though! My wife asked "What's on the TV?" - I said "Dust!"

Hidden Multimillion Dollar Infrastructure

by Richard E. Waltrip, PLS

As seen in "Evergreen State Surveyor" Volume 30, Number 1, Spring 2006

Our profession and organization has once again raised the issue of destruction of boundary and positional control monuments. These are sometimes referred to as "survey monuments" and the problem is often seen as a "survey problem:' Of course, this issue is of great importance to surveyors because it has a direct effect on our ability to effectively implement a survey project. This is true whether that project be a boundary survey or one requiring the establishment of an elevation or a reference to a horizontal system such as a state plane coordinate system. The effect of monument destruction generally translates to more project time and a higher cost for the survey project. My experience in other states has shown me that the problem is not limited to the state of Washington, but exists in other states as well. And though efforts have been made over the years to develop strategies to protect these monuments, these efforts have met with limited success.

The effect of monument destruction generally translates to more project time and a higher cost for the survey project.

We continue to struggle to develop effective strategies that will help to protect more monuments from destruction. I have joined in the struggle, both with LSAW and as an individual. Because a substantial part of the monument destruction occurs on street and utility projects, I've met with local agency groups and professional engineering organizations. I've spoken with my contacts with local utility companies and local contractors. From my conversations with these groups, as well as with members of our profession, my outlook has changed and I am approaching the situation a little differently. I have begun to frame the conversation by speaking of our system of monuments, property lines and right of way lines as an infrastructure, much like a street infrastructure system or a utility infrastructure system. What's struck me most about these conversations is the difficulty in having to build my case about the importance of our efforts and the benefits to all. I mention that monuments are protected by law and have the appropriate statutes available for handout. I get questions about what is stated in the law, when the laws apply, and what constitutes a survey monument. I get the distinct impression that my audience sees this as a problem only for surveyors. They seem to feel that these monuments belong to surveyors and though they are sympathetic, there is only so much they can do.

One could build a list of standard procedures that occur in the implementation of a street or utility project. Protection of utility features, fences, landscaping and other features would be on the list. With the possible exception of street monuments, a standard plan for the protection of monuments is typically not on that list. Though some public agencies and private engineering firms have taken steps to address the problem, in many cases they are inadequate. And of course, most have done nothing. I often hear that the contractor is ultimately responsible. This approach and attitude only serves to separate the agency, utility or private firm from the responsibility of protection of survey monuments. And it certainly doesn't convey the importance of monument protection to those involved in the construction of the project.

Can you imagine this attitude about a water valve or gas valve? How much effort is typically expended to make sure they get protected? Is there a standard procedure in place to ensure that proper protection occurs? The answer, of course, is yes. If we are doing a design topographic map, we will map each utility feature as part of our standard process. We'll research utility records and verify utility maps against what we find in the field. If something doesn't add up, we'll dig deeper, sometimes literally. The client, whether it be a public agency or private engineer, expects these utility features to be mapped. The field and record utility information is placed in the engineering design drawings. Each feature receives appropriate treatment to make sure it is "preserved and protected." If we ask the client whether or not to map utility features, we know they won't decide to pull that from the scope. Ask the same question about monuments and you may get a different answer.

Why don't survey monuments get the same treatment? Part of the reason is a general misunderstanding of surveying in general and how property or right of way corners are established. Can't you just calculate coordinates for these? Most non-survey types don't understand the nuances and application of boundary survey principles established from real estate law and case law. Monuments and property lines are not viewed as part of an interrelated system or network with interdependencies and relative relationships. "Can't we just use GPS and put them back?" Many assume that GPS has some sort of inherent knowledge about where things are. But surveyors know well that GPS is only a measurement tool and cannot make professional decisions to determine boundaries. Ultimately, the importance of these monuments is simply not recognized.

There are other reasons that utility features are protected so assertively. One is the immediate nature of the problem. Public health and safety concerns may be created and these need to be addressed right away. Another important reason is that the owner has clout. If a manhole or valve box is buried, the owner will not hesitate to require that you take appropriate measures. From what I've seen, most don't see a survey monument as having an owner. The property owners themselves may not even know that a monument was destroyed or even existed in the first place. Most of the time, they don't know their rights. Only in a few cases, does a property owner ask to have a monument replaced.

Our profession is very aware that monuments and property lines are a network with interdependencies and rule of construction, much like gas or water systems. This network exists like utility subnets, within regions or local networks. If you destroy or disturb a critical survey monument, a serious problem becomes present in the system. Often, the problem is not known for some time. No one on the block will be calling the agency right away to let them know about the problem. Surveyors will hear about it from the land owner who wants to know why the cost of the survey is so high. We'll explain that the controlling street monuments were destroyed in the street improvement project three years ago. Can't you get the city to put the monuments back in? But of course "it's not the city's responsibility because the contractor destroyed the monuments."

> We need to start thinking and talking about this system of property lines, right-of-way lines and monuments as an infrastructure.

We need to start thinking and talking about this system of property lines, right-of-way lines and monuments as an infrastructure. As a gas valve is an essential component in a network or interrelated system, a survey monument is an essential component in a network or interrelated system. Both need to be perpetuated in a useable condition to prevent damage to the system.

Monument destruction often occurs during a public project or during a private development or utility project approved by a public agency. I would suggest that all professionals associated with the project have some responsibility in preserving these monuments. The private design professionals and the participating agency or utility should put the same level of effort into the protection of the monument infrastructure as it would to the protection of any other infrastructure. Protection of monuments needs to become so routine that the equipment operators know to be as careful with the survey monument as they are with the lilac bush next to it, without being told.

For many projects, this will mean conducting a thorough research of survey records, subdivision plats and other record sources. In accordance with good professional practice, it may mean employing a surveyor to participate in the process. Monuments need to be searched for, shown on the design drawings, and labelled "preserve and protect." Their existence needs to be monitored throughout the project. If damage occurs, it needs to be corrected. Whatever actions are required to protect the monuments (and the public), they needs to be done.

> After all, public agencies, as well as all licensed professionals, are charged with the responsibility of protecting the public interest.

After all, public agencies, as well as all licensed professionals, are charged with the responsibility of protecting the public interest. Private utilities operate with a quasi-public status and also have a responsibility to protect the public interest. These agencies, utilities and individuals need to accept this responsibility and take proactive action. Survey monuments mark Public Land Survey System (PLSS) lines and private property corners. These monuments are essentially owned by our citizens. They need to be shown on design plans, along with provisions for their perpetuation. If a public agency, utility or private individual hires a contractor to do a project and property is damaged, is the responsibility solely with the contractor? Doesn't the entity initiating the project share some of the responsibility?

Our profession needs to stay involved with this issue. We need to help generate solutions. Do we need to keep placing controlling monuments in street intersections? Would a monument database be viable? Is there a way to get One-Call involved? Have we taken the time to explain the importance of monument preservation to the engineer or client we're working for?

We need to keep spreading the message. The problem is not a "survey problem". Attitudes about who is responsible need to change. Many share in the responsibility. The public interest regarding this issue needs to be understood.

The courts view monuments as paramount evidence of boundary lines and statutes have been enacted to protect them. Those involved with construction projects need to participate in their protection. It is just as important to protect a property corner as it is to protect a water valve or a landscape feature. I propose that we incorporate some new language about the property boundary infrastructure in our discussions with designers, contractors, public agencies and utility purveyors. And I propose we incorporate new language in construction standards and specifications to provide for the protection of this infrastructure. ☼

Rules for Investigation

By Donald A Wilson, LLS, PLS, RPF

Reprinted from Professional Surveyor Magazine, November 2005.
As seen in "The Nova Scotian Surveyor" Spring, 2006

PROFESSIONAL SURVEYOR Magazine
www.profsurv.com

Searching for boundary evidence is an investigation. It is an investigation into a scene, not a crime scene, but a scene nonetheless, where the investigator is searching for evidence, and for clues when evidence is absent, or not readily visible. Crime scene investigators are highly trained for their tasks, and sophisticated scientific techniques are usually employed. Other investigations, if taken to the same level, and applying appropriate techniques, can also be very successful in locating valuable evidence.

Many of the same techniques can be employed to both types of investigation, even if the evidence sought and the tools employed might be quite different. One thing doesn't change - the thought process and the scientific process of reasoning. Sherlock Holmes made a habit of explaining his reasoning throughout his stories. Today's sleuths have attained higher levels, and reference materials demonstrating and analyzing methods of reasoning are readily available. Learning this part of the investigative process is like learning the multiplication tables for the first time. There did not seem to be any immediate practical value to the fact that 2 times 2 is equal to 4, but it did make sense that it might be useful at some time in the future. Such it is with the science of reasoning, especially when translated into practical rules, and more so when illustrated with examples.

Statue of Sherlock Holmes
Edinburgh, Scotland
(Image Credit www.rampantscotland.com)

Good investigators know that lists of questions from officially issued procedure manuals have limited use. Reading the signs and asking questions at a site does not involve completing a form or responding to circumstances by following pre-established rules. Each site, perfectly preserved or irrevocably compromised, has unique elements that modify the questions and define the playing rules for that particular site. Asking the right questions, of oneself or of others, depends on identifying the rules of each new challenge.

Reasoning backward analytically at a scene involves discovering the rules while playing the game. Sherlock spoke of that in *A Study in Scarlet*: "In solving a problem of this sort, the grand thing is to be able to reason backwards. That is a very useful accomplishment, and a very easy one, but people do not practise it much. In the everyday affairs of life it is more useful to reason forward, and so the other comes to be neglected. There are fifty who can reason synthetically for one who can reason analytically." There is no place for guesswork in an investigation, it is much too serious for that. Thinking logically does not involve guessing. Guessing is blind and riddled with doubt. Guessing is merely desperate, and is not necessary where there are ordinary facts, as facts raise no doubts. Gil Grissom, the team leader of the popular TV show CSI, is quoted as saying, "concentrate on what doesn't lie: the evidence."

Yesterday, Sherlock Holmes, and today, scientific reasoners, employ the art of *Abductive Reasoning.* Abduction is the process of finding a best explanation for a set of observations and it leads to subtle implications for evidence evaluation. It is about certainty and the logico-computational foundations of knowledge. *Abduction* can be described as "inference to the best explanation", which includes the generation, criticism, and possible acceptance of explanatory hypotheses. What makes one explanatory hypothesis better than another are such considerations as explanatory power, plausibility, parsimony, and internal consistency. In general, a hypothesis should be accepted only if it surpasses other explanations for the same data by a distinct margin and only if a thorough search was conducted for other plausible explanations.

Ask any forensic investigator to name the biggest problem that they encounter on the job and you will consistently hear the same response - crime scene contamination by others. Surveyors encounter that on almost every scene, and the older the scene, the more likely the contamination or compromise. Developers won't even hire a surveyor until the soil testing is completed. Backhoes have an uncanny way of seeking out the corner evidence and running over it. Rule Number 1: Protect the scene. Once evidence is lost, opportunities are lost. And the investigator may never know what was lost when a scene is not controlled. State guides for police practice on crime scenes state, "once the scene has changed, you cannot change it back."

Most investigators will not visit a scene alone. It is always a good idea to take someone on an investigation with you. Another person, or preferably more than one, will most likely see something that you may not. It is always good to have independent corroboration of a scene.

A good investigator will keep his or her perceptions clear. If on the scene for awhile, bring something to eat and drink. Avoid anything that could impair the senses, like alcohol.

Most investigators will do their research first, trying to find out as much about the site as possible. Without research, you cannot know what you should be looking for, nor can you know what you have when you do find something.

Some investigators make it a practice to arrive at the scene with skepticism. While one should always maintain an open mind, remember that there just may not be anything out there. By doing the homework first, one gets an idea as to what to expect.

Beware of false readings. Measurements, mathematical closures, magnetic attraction, errors in reported information can all lead to false conclusions or provide false leads. Make sure that equipment is working properly, that the operator knows what he or she is doing, and that you are on the right parcel of land, not the neighbor's land or some place totally irrelevant.

Most investigators will take lots of photographs, digital or otherwise. Make certain you have plenty of film and you know how to take good pictures, with or without a flash. If you are not a good photographer, bring along someone who is. The next time you visit the site, the conditions may have changed - dramatically, or the evidence may have been totally obliterated.

The above rules, at the very least, should be second nature to any successful investigator. Sometimes it is easy to find and locate the evidence, but explaining procedures or a lack of success to a judge or jury may be entirely another matter. People watch television, and they watch shows like CSI, and have come to expect from the practitioner what they see and hear on television. The well-advised will make certain that good and careful work, successful or otherwise, is not compromised or discounted by those who have a different expectation. ☼

Don Wilson is president of Land & Boundary Consultants, Inc., a New Hampshire-based firm specializing in land records research and evidence investigation. He is the lead instructor in Surveyors Educational Seminars and a member of the Professional Surveyor / Red Vector Dream Team providing online courses for continuing education. He has also been a regular instructor in the University of New Hampshire Continuing Education System for 25 years.

LINE OF SIGHT, LINE TREES, AND ORIGINAL GOVERNMENT BEARING TREE - DO THEY STILL EXIST?

By Roger Brand, LS

Reprinted from "Minnesota Surveyor" Vol 13 No. 1 Spring 2006

I say "Yes" but knowing how we survey today it is very rare that we have the opportunity to even look for them. As an old timer, having 48 years as a field surveyor and having been County Surveyor for over 34 of those years, I have experienced the transition from the transit and steel tape to the EDM and theodolites to total stations, and now GPS.

Back in the good old days, 50 years ago, in transit and tape surveys (the wire link Gunter chains were already not used, even by me) we used to measure along or very near the Section or Quarter Section lines and we could observe those lines as we went.

These section lines were usually marked with fences or even roads and trails nearby, so if there were any trees still standing (or in some cases fallen over but still there) we could visually inspect them for any possibility of being one of these tree types, assuming of course that we had knowledge of the information in the original Government field notes.

Today how many of us even get close to the line between the corner markers? With GPS and total stations, you no longer observe or are interested in examining the line location itself. For those of you who are not familiar with line of sight trees or line trees look at the following copy of Figure 63, page 100 of the 1973 BLM Manual of Surveying Instructions.

Figure 63

Dodd's book of the Original Instructions governing Public Land Surveys 1815-1855 defines the sight trees and line trees as:

> *"those trees which may intercept your line must have two chops or notches cut on each side of them without any other marks whatever. These are called `sight trees, line trees or station trees".*

Dodd goes on to say:

> *"A sufficient number of other trees standing nearest to your line, on either side of it, are to be blazed on two sides diagonally, or quartering towards the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other the further the line passes from the blazed trees. Due care must ever be taken to have the lines so well marked as to be readily followed".*

Excerpts from pages 99 and 100 of the BLM 1973 Manual are as follows:

> *"A blaze is a smoothed surface cut upon a tree trunk at about breast height. The bark and a small amount of live wood tissue are removed with an axe or other cutting tool, leaving a flat surface which forever brands the tree. The size of the blaze depends somewhat upon the size of the tree, but should not be made larger than the surface of an axe blade. A blaze five or six inches in height and from two to four inches in width is usually ample."*

> *"A hack is a horizontal notch cut well into the wood, also made at about breast height. Two hacks are cut to distinguish them from other accidental marks. A vertical section of the finished hack marks resembles a double-V extending across a tree from two to six inches depending upon the diameter of the tree."*

> *"The blaze and hack mark are equally permanent but so different in character that one should never be mistaken for the other. The difference becomes important when the line is retraced in later years."*

"The lines should be so well marked as to be readily followed and blazes plain enough to leave recognizable scars as long as the trees stand."

"This can be accomplished by blazing just through the bark into the live wood tissue. The blazes should be narrow so that they will heal before decay begins, and special care should be taken not to loosen the cambium layer around the blaze since this will prevent overgrowth."

Figure 2

F. Hodgman in his 1913 Manual of Land Surveying mentions the `marking line' as the marking of trees and brush along lines was required by law as positively as the erection of monuments, by the act of 1796, which is still in force. The old rules are unchanged. All lines on which are to be established the legal corner boundaries will be marked after this method. Page 99 of the 1973 BLM Manual says:

"Those trees which may be intersected by the line will have two chops or notches cut on the sides facing the line, without any other marks whatever. These are called sight trees or line trees. A sufficient number of other trees standing within 50 links of the line, on either side of it, will be blazed on two sides diagonally or quartering toward the line, in order to render the line conspicuous, and readily to be traced in either direction, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other toward the line the farther the line passes from the blazed trees."

In early surveys, an opposite practice prevailed. Where trees two inches or more in diameter occur along a line, the required blazes will not be omitted. The practice of blazing a random line to a point some distance away from an objective corner, and leaving through timber a marked line which is not the true boundary, is unlawful, and no such surveys are acceptable. The decisions of some State courts make the marked trees valid evidence of the place of the legal boundary, even if such line is crooked, and has the quarter section corner far off the blazed line.

Recently while engaged to locate a section line for an adverse possession claim by my client's neighbor, I needed to place stakes along the actual Section line. In doing so, I observed an old blaze on a large oak tree standing within about 3 feet of this section line. Line of sight trees are NOT mentioned in the PLSS Government field notes, therefore, there would be no proof that this tree is an authentic line of sight tree. However, I am certain that it is.

Line Trees, those actually on the section line, are supposed to be measured to and be identified in the field notes. These would be extremely rare to find today due to the PLSS being done in the 1850s in this SE Minnesota area and I am not sure if those notches (hacks) would show up very good today. In all my years of surveying in this area, I believe I have found only one of these, it being in Olmsted County and that one found over 30 years ago. The blazed tree shown in Figure 2 is near the section line between Sections 29 and 30 in T104N, R10W in Fillmore County. Bearing trees to the PLSS corner monuments are not quite so rare to find in our area. Some of the local surveyors still find them and positively identify them. I have found and used a few in Dodge County where I am still County Surveyor. ☼

(Editor {of original article} asks: Is it better to mark the bearing tree with a sign or plaque so that the public and landowners can act to preserve it, or leave it unmarked so as not to draw the attention of vandals?)

Setting the Stage for Mandatory Geo-Referencing Legal Surveys in British Columbia and Across Canada

By Jim Sutherland, BCLS, Surveyor General, Victoria, BC

Reprinted from "The Link" - Volume 28, Number1, March 2006

National Geo-Referencing Initiative

The Canadian Council on Geomatics (CCOG) passed a resolution in March 2005 whereby each province/territory agreed to develop and implement a plan to require geo-referencing new legal surveys according to the principles and standards set out in the resolution. Michael O' Sullivan, former Surveyor General of Canada, initiated the resolution which took over five years of research, development, analysis and discussion before being passed.

The resolution sets out the responsibility to each province/territory to define three geo-referencing zones. The zones are to be defined as a function of parcel location and land use.

The resolution also sets out the required minimum relative accuracy standard, at the 95 % confidence level, for geo-referencing new legal surveys located within each zone as follows:

Survey location	Accuracy (95% Confidence Level)
Urban areas	5 cm
Rural areas	20 cm
Remote areas	1 metre

The referencing datum must be NAD83 (CSRS) and ties, where reasonable, shall be made to high quality officially published High Precision Networks (HPN), Canadian Base Net (CBN) or Active Control Points (ACP). Currently in BC there are HPN networks in the Capital Regional District and Greater Vancouver Regional District areas, approximately a dozen CBN pillars, and approximately eighteen BC-ACP GPS reference stations.

A fundamental principle of the resolution is that requirements (legislation, regulations, rules) for integration of new legal surveys, to the standards, should only be implemented when there is sufficient and easy access to the reference framework. This leaves the provinces and territories to develop and implement a plan to:

1. Assess their local geo-referencing infrastructure and enhance where necessary to ensure access is practical.
2. Communicate the migration strategy for mandatory geo-referencing to the survey community.
3. Solicit input from land surveyors for defining geo-referencing zones.
4. Assess land surveyors training requirements and bridge gaps where necessary.
5. Explore the opportunity for collaborating on the development of open source tools that will facilitate and support geo-referencing new legal surveys nationally.
6. Make necessary legislation, regulation or rule changes.

BC Geo-Referencing Requirements

The current General Survey Instruction Rules require all legal surveys outside of an integrated survey area, conducted all or in part by GPS methods to be geo-referenced to two (2) metres or better at the 95% confidence level. All legal surveys within integrated survey areas must be geo-referenced to 5 cm or better at the 95% confidence level. There is also a fairly recent rule change that requires Mineral Tenure Act surveys to be geo-referenced to 0.5 metres or better at 95% confidence level.

A working group, chaired by Mike Taylor, was created about a year and a half ago by the Government Liaison Committee (GLC) to investigate technical aspects of geo-referencing legal surveys and the practicality of accessing the positioning infrastructure within BC.

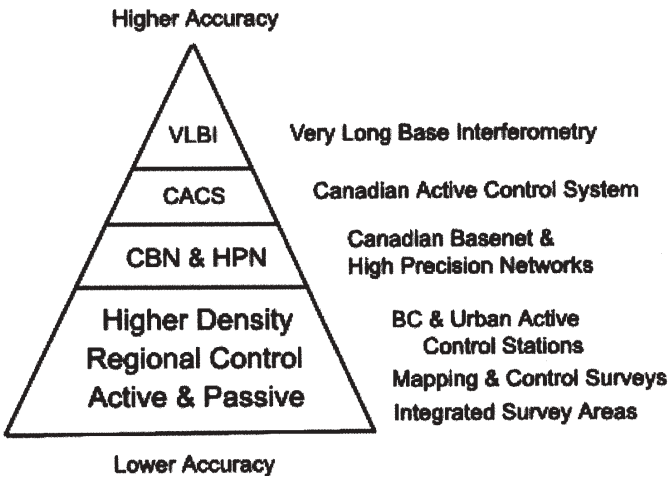
The summary report of the working group findings on geo-referencing legal surveys was presented to the members at the last annual general meeting. The report includes an excellent summary of available positioning methods and accuracies achievable.

In alignment with the CCOG resolution for integration of legal surveys passed in March 2005, the GLC has taken the follow-up initiative to develop draft rule changes to require mandatory geo-referencing of all legal surveys in BC. The rule change will be presented to the Survey Rules Committee (SRC) in the near future. In support of this proposed rule change, the GLC is sponsoring a workshop at the Annual General Meeting which is intended to provide a good overview of positioning technologies and specifically outline the practicality of geo-referencing legal surveys in BC.

Geo-Referencing Infrastructure

The provinces, territories and Natural Resources Canada (NRCan) have worked together to modernize the geo-referencing framework across Canada for many years. This collaborative effort has resulted in the re-adjustment of regional geodetic control networks and the official adoption of the NAD83 (CSRS) datum. The federal leadership and regional cooperation to enhance geo-spatial reference system has provided a much more homogenous network of geodetic control across Canada. Diagram 1 illustrates the hierarchy of the national geodetic control and regional control in British Columbia.

Diagram 1



The philosophies and resources available within the provincial and territorial areas to develop the regional geodetic referencing framework over the last many years resulted in quite a variance in the physical and active control infrastructure developed within each region.

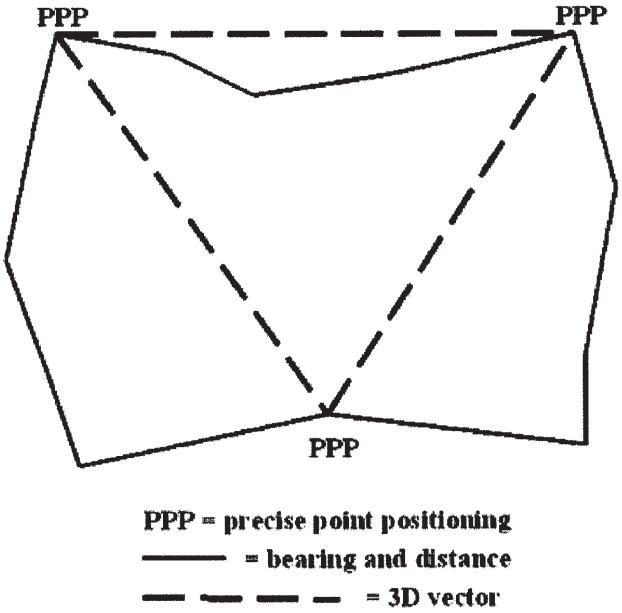
As Brad Hlasny, Manager of the Geo-Spatial Reference Section, Base Mapping and Geomatics Services Branch (BMGS) said in the March 2004 issue of The Link, "Truly, we are lucky to live in B. C. when it comes to accessing a modern and effective geo-spatial reference system (with its associated positioning services and tools) ". It is important to note that BMGS is actively pursuing cooperative partnerships with local, regional governments and educational institutes to further enhance the provincial active control infrastructure. New active control points are in the process of being set up in Castlegar and Prince George with other areas currently under discussion and consideration.

One recent advance in the geo-referencing environment is the online Precise Point Positioning (PPP) Service launched by NRCan (Federal Government). This service enables users with one receiver to derive reasonably accurate NAD83 (CSRS) positions relative to the Canadian Active Control System (CACS). The user collects GPS data at a point, exports a file in the RINEX file format, and then submits this file to the online PPP service. The online process is very fast and the user is e-mailed results and comprehensive processing reports. The processing can also be performed off-line as well by using GPS Pace software.

The improved accuracy of the positioning solution is derived from precise GPS orbit and clock information which is collaboratively collected and distributed by agencies participating in the International GPS Service. Single or dual frequency receivers may be used, however, Precise Point Positioning using dual frequency receivers takes advantage of using both the carrier phase and pseudo-range observations. The PPP processing for single frequency receiver's currently uses only the pseudo-range observations. As well, only dual frequency receivers can take advantage of direct measurement of atmospheric errors. Single frequency receivers must instead rely on modelling these errors with a result of reduced positional accuracy.

Base Mapping and Geomatics Services Branch is currently testing the PPP service using data collected with various receivers including low cost single frequency receivers. The tests are expected to include typical legal survey observation scenarios (see diagram 2) that include PPP derived coordinates, 3D vectors (derived from differential positioning using two receivers) and conventional direction/distance observations. I believe the PPP service will have a great impact in making it practical and relatively inexpensive for land surveyors to geo-reference new legal surveys in remote areas.

Diagram 2
Legal Survey Network



The availability of inexpensive new generation GPS receivers that are capable of collecting multi-channel car-

rier phase and pseudo-range data and able to convert to a RINEX file format will complement the PPP service to provide a powerful and practical positioning solution. New processing techniques and technologies also show promise for providing better positioning solutions using inexpensive GPS receivers, thereby, making high accuracy positioning more practical/accessible to the survey community.

Integrating Legal Surveys

The challenge facing the legal survey community is to determine whether the geodetic framework is adequate in each region to implement rules for mandatory geo-referencing of all new legal surveys, and if not, how to enhance it to be practical. The cost of ramping-up all legal survey firms to be capable of geo-referencing all new legal surveys could be considerable. One must look at not only the capital cost of survey equipment, but also the equipment validation, training, maintenance and processing resources.

Alternatively, many survey firms have already taken advantage of modernizing survey operations to include global positioning systems in order to gain efficiencies and to embark on new business opportunities. While the implementation of geo-referencing of all surveys will involve additional work not previously undertaken during legal surveys in many areas of the Province, the long term benefits to the cadastre and to surveyors can not be understated.

Development of Open Source Tools that Support the CCOG Resolution

The resolution passed by CCOG fosters the integration of legal surveys across Canada. However, this places an additional burden on land surveyors to find practical methods for geo-referencing and integrating their conventional legal surveys to meet the standards. It would be very beneficial to all stakeholders to collectively explore the development of an integrated set of open source tools for processing conventional survey and coordinate observations.

This would provide an effective alternative to commercial software that would benefit the national survey community. We are very fortunate to have a number of existing open source tools that provide valuable resources independently, however, when combined and enhanced would provide a very powerful and practical processing environment for land surveyors. A brief outline of some of pertinent existing open source programs follows:

Gama Least Square Adjustment: is a program for performing a least square adjustment of 1D, 2D and 3D survey observations. The project was initiated by Ales Cepek and Jan Pytel at the Department of Mapping and Cartography, Faculty of Civil Engineering, Czech Technical University in Prague in 1998. The program name Gama is derived as an acronym from Geodesy and Mapping. Gama has been presented at FIG conferences and received status of GNU license software in 2001. Gama adjusts observed coordinates (with variance-covariance matrix), distances, angles/directions, height differences and 3D vectors in a local coordinate system. The observation data is formatted as an XML (Extensible Markup Language) input file. This makes it easy to read and edit the data. Gama is run simply as a command line program or via the companion GUI Rocinante (written by Jan Pytel) which is very well structured and easy to use.

Rocinante Graphical User Interface for Gama: is fully object-oriented cross-platform GUI for creating/editing Gama XML input files and running Gama least square program.

Use-Friendly Desktop GIS (uDig): is an open-source spatial data viewer/editor based on OpenGIS standards and is licensed under Lesser Gnu Public License (LGPL) and includes a Web Map Server and Web Feature Server. uDig provides a common Java platform for building spatial applications with open source components.

GeoTools: is an open source Java GIS toolkit for developing programs compliant with Open Geospatial Consortium standards. GeoTools provides a computational process of converting a position given in one Coordinate Reference System into the corresponding position in another Coordinate Reference System.

Gama and Rocinante are very powerful survey data processing resources for land surveyors. They were originally intended for adjusting geodetic networks, however, Rocinante makes it easy to input legal survey type observations and quickly run the Gama least square adjustment. Land surveyors commonly use commercial coordinate geometry programs to process their conventional direction and distance survey observations. In recent years some firms have incorporated GPS base line processors and complimentary least square adjustment programs that may or may not include processing both conventional and GPS data together.

Many commercial tools enable land surveyors to export an AutoCAD TM DXF format file. This provides an opportunity to use this file format as an easy means of importing the direction and distance observations to the Gama XML input format. uDig provides an excellent framework for creating a plug-in extension to import the DXF file, convert to Gama XML input format and run the adjustment. UDig can also perform necessary coordinate transforms using the appropriate GeoTools code. Adding a plug-in extension to import coordinate observations (including the associated variance covariance matrix) from Precise Point Positioning files would create a powerful and practical integrated legal survey observations processing environment.

Diagram 3 illustrates a basic proposed legal survey data processing model integrating the aforementioned open source tools. The model enables a user to:

1. create observation input file using Rocinante;
2. input conventional observations using a vector file input (DXF / SHP) and extract to Gama (note: the vector

file would be coded by line-type or colour for discerning direction, distance or both type of observations);

3. input coordinate observations via PPP, text file or dialogue input;
4. input Land XML file format observations and convert to Gama XML input format;
5. perform coordinate transforms;
6. run Gama least square adjustment, review output, edit and re-run as necessary;
7. export final adjusted network in DXF, SHP, Land XML format or Gama output file.

Creating a robust and easy to use set of integrated legal survey open source processing tools will provide substantial support to land surveyors in all regions tasked with the requirement of geo-referencing legal surveys according to the new CCOG resolution. We are very fortunate to have all the main open source components already existing to create an integrated processing environment that will require minimal additional effort.

The March 2005 CCOG resolution set the stage for the migration towards mandatory geo-referencing of legal surveys across Canada. I strongly encourage the national survey community to seek support from CCOG and the Geo-Connections program in order to collectively explore, develop and implement a powerful integrated open source processing solution for integration of legal surveys. ☼

See Next Page for the Saskatchewan Perspective

References

http://www.gnu.org/software/gama/ **Gama Least Square Program**

http://roci.sourceforge.net/ **Rocinante GUI for Gama**

http://udig.refractions.net/confluence/display/UDIG/Home **uDig Home Page**

http://www.geotools.org/ **GeoTools Home Page**

http://www.geoconnections.org/CGDI.cfm/fuseaction/partners.ccog/gcs.cfm **GeoConnections**

http://www.cgdi.gc.ca/ccog/ccog.html **Canadian Council on Geomatics (CLOG)**

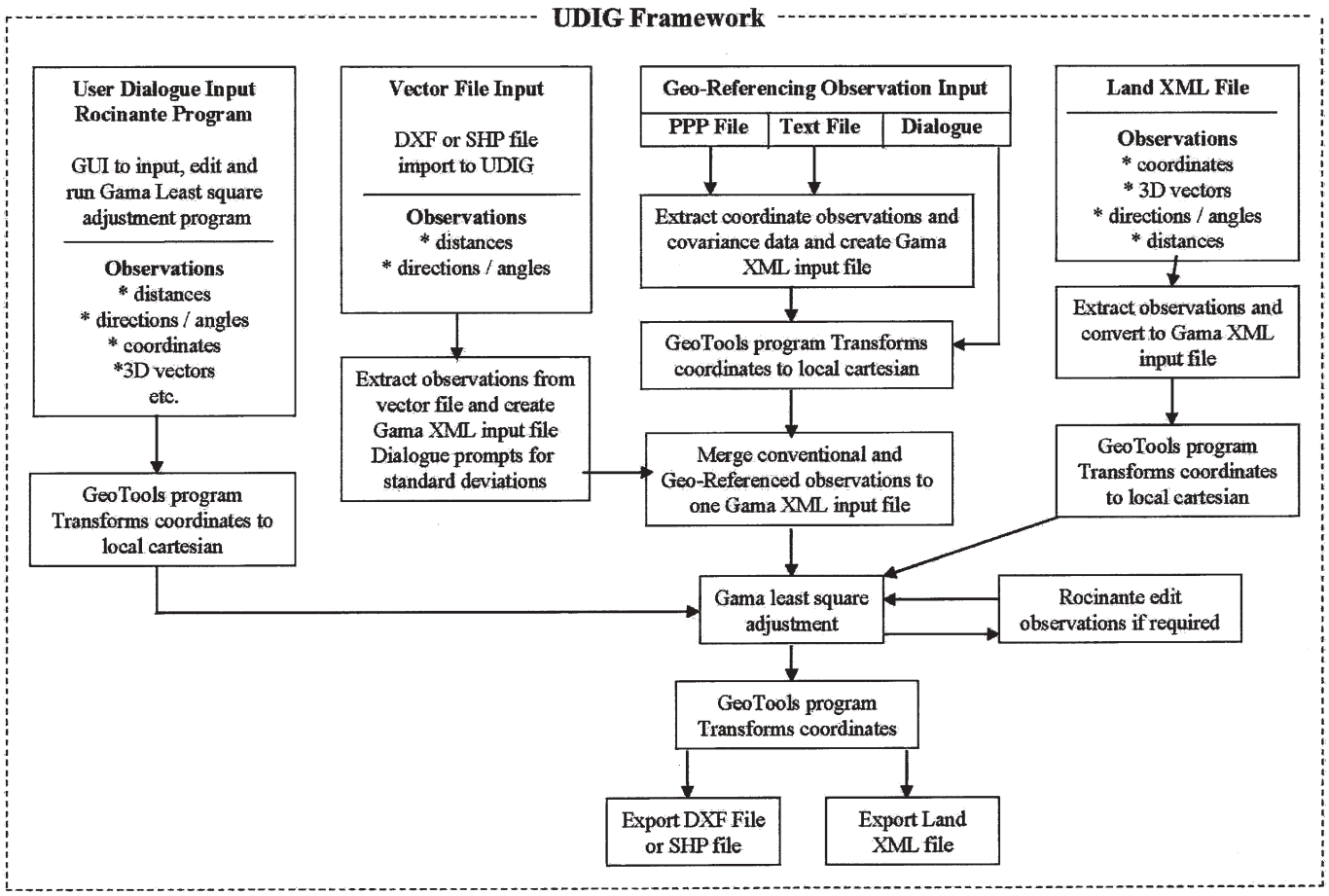
http://www.geod.nrcan.gc.ca/ppp_e.php **Precise Point Positioning Service**

http://www.geod.nrcan.gc.ca/network_p/index_e.php **Canadian Spatial Reference System**

http://ilmbwww.gov.bc.ca/bmgs/gsr/ **British Columbia Geo Spatial Reference System**

Diagram 3

Legal Survey Data Processing Model
Using Open Source Tools



Geo Referencing Legal Surveys - The Saskatchewan Perspective

By E.F. Desnoyers, Controller of Surveys

In Saskatchewan, The Land Surveys Act, 2000 came into effect in June 2001 and contains provisions for integrated and coordinate-based surveys. However these particular sections have not yet been proclaimed and no regulations have been prepared.

Currently, there does not seem to be any great demand for Integrated surveys in the province with cost likely to be the deciding factor. The accuracy standards adopted for both urban and rural areas could not easily be achieved in Saskatchewan. The control framework would have to be densified, or control brought in for individual projects, either of which would involve increased costs.

There is no specific government program in place for enhancing the control framework and promoting the integration of surveys. A detailed review would be required to determine what the benefits would be and who would benefit from requiring and implementing mandatory integrated surveys and high standards of accuracy.

There currently are policies in place in Saskatchewan requiring integration of surveys in certain situations. Requirements to integrate surveys in northern Saskatchewan or the unsurveyed portions of the province were implemented in January, 2004. Requirements to integrate road surveys if within certain distances of control monuments have been in place for years. Over time, this province may adopt additional requirements and standards that make sense for the Saskatchewan environment.

Mandatory implementation of the integration of all surveys comes down to accessibility. The reality is that it can be difficult and costly to impose additional requirements for all legal surveys. Unless the infrastructure is in place for quick and effective real-time positioning, and significant benefits are to be gained, it will be difficult to convince stakeholders to do more than they are doing now.

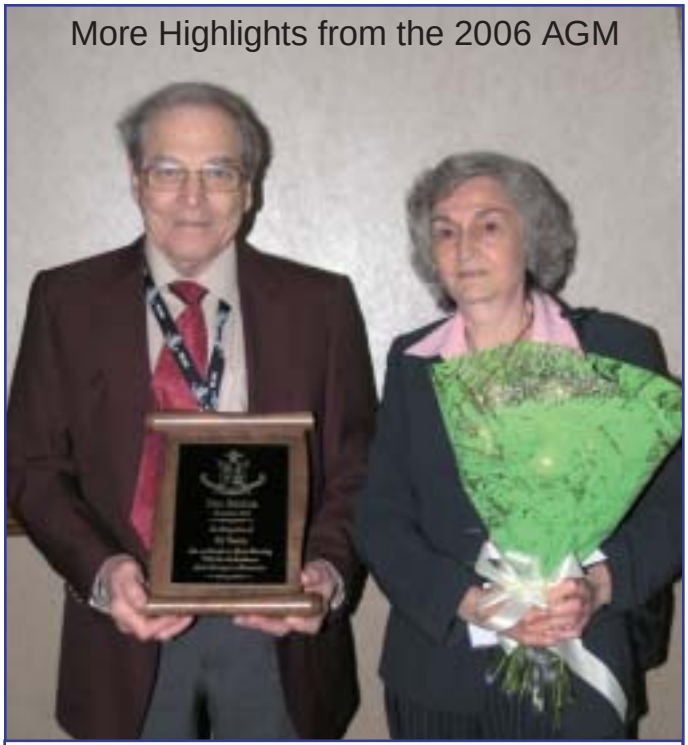
In order to move forward it would be in the best interest of the province to have the integrated surveys section of the Act proclaimed. Proclaiming the section would not mean that anything need change, until the province believes that conditions are right. Proclaiming the section would enable regulations to be prepared that would allow certain areas of the province (as needed) to be declared Integrated Survey Control Areas where all surveys would be required to tie into the provincial geodetic spatial reference system.

Stakeholder consultations and input will play a key role in moving this initiative forward. ☼

213 - " Council Highlights" ➡

- In response to an invitation from the Saskatchewan Construction Panel, it was agreed that R.A. Webster would attend at lease one of the SCP meetings to better gauge the value of participation on the panel. Preliminary indications are that the panel is dealing with many issues of concern to the survey industry.
- A recent magazine article emphasized the way in which one law firm in the province is increasing its level of service to its customers by, among other things, scanning property surveys ".. to save clients the time and costs of locating a survey copy or having a new one prepared." Council agreed that a letter should go to the Law Society of Saskatchewan pointing out the unethical behaviour of any of their members who violate copyright by distributing copies of Real Property Reports.
- Preliminary estimates from the 2006 AGM indicate a net loss of approximately $3,600. Past-president Unger noted that there had been two less exhibitors than originally anticipated which resulted in approximately $1,200 less revenue than expected. He also emphasized the need to provide better continuity between past, present and future Convention Committee chairmen to help address the very steep learning curve that a new convention chairman can face. It was agreed that he (2006), Barry Clark (2007) and Dale Rosnes (2008) would work together to initiate a better approach.
- A conditional letter of support had been received from the ABCLS for the Surveyor's Crate project. ☼

More Highlights from the 2006 AGM



Dan Babiuk, with his wife Dolcie, were honoured at the 2006 AGM for Dan's 50 years as a member of the SLSA

lewis instruments ltd.

1438 ERIN STREET, WINNIPEG, MB R3E 2S8
PH. (204) 772-0366 FAX. (204) 783-2049
1-800-883-9984

For over 50 years, proudly serving surveying & engineering communities

GPS SOLUTIONS FOR ALL ACCURACIES

REFLECTORLESS TOTAL STATIONS

LEICA GPS • OCE COPIERS • HEWLETT PACKARD PLOTTERS
SCANNERS • FILING SOLUTIONS • FIELD SUPPLIES • DRAFTING

REPRESENTING

- Océ
- Garmin
- CST
- Planhold
- Staedtler Mars
- Schonstedt
- Sokkia
- Lufkin
- Mayline
- Kohinoor
- Leica
- Rolatape
- Aervoe Pacific
- Eslon
- Hewlett Packard

Your complete survey repair facility

SURVEYING • GPS • ENGINEERING • LASERS • REPAIRS • RENTALS

VALUE IN VIRTUALITY

A virtual GPS concept garners tangible results for surveyors

By Mary Jo Wagner

Reprinted from "Ontario Professional Surveyor" Volume 49, No. 2, Spring, 2006

Ask any surveyor in southern Ontario who has adopted Cansel's Can-Net GPS Reference Station Network about what is its most significant selling point and the answer will undoubtedly be the ability to achieve real time kinematic (RTK) GPS accuracy without setting up their own base station.

To be sure, the advent of RTK GPS nearly a decade ago fundamentally changed the way surveyors could perform their positioning work; today it is still a mainstay for the majority of surveyors' activities. However, with increasing workloads, surveyors have begun searching for advanced technologies that can take them farther and faster without sacrificing precision.

Can-Net, created with Trimble VRSTM (Virtual Reference Station) technology, seems poised to answer surveyors' wishes.

"A significant benefit of Can-Net is that it works with no base station so there is no set up time or risk of theft," says Kim Husted, land surveyor and owner of Kim Husted Surveying Ltd. (KHS) in Tillsonburg, Ont. "Before, I could spend two days setting up control and shooting a site, and someone would have to stay with the base. With CanNet, you step out of the office and you're working at plus/minus a few millimeters. It's a great way to go."

A need for a network

Based in Vancouver, BC, Cansel is the largest distributor of land-based positioning systems in North America. As such the company has been only too aware of a rather predominant redundancy issue in the surveying industry. "With RTK GPS, we have a group of surveyors - particularly in densely populated regions - who all have their own high-end base station," explains Stephen Fletcher, OLS and Cansel's national survey sales manager who managed Can-Net's implementation. "It's like everyone with a cell phone bringing their own cell tower with them so they can use their phone. If surveyors could use the same base station, they'd save themselves a lot of money and time."

Cansel's solution was to implement Trimble's VRS technology in a permanent reference station network in the Ontario area. The network offers surveyors a solution to cost-effectively increase accuracy and productivity in the field while removing the ionospheric and tropospheric-induced errors that typically affect traditional RTK GPS. The Can-Net VRS Reference Station Network erases the base station out of the GPS baserover equation and displaces it with a densely populated, permanent network of reference stations, faster and more reliable communication links and Trimble's RTKNet™ software, which creates a VRS network able to eliminate or greatly reduce the PPM error.

Initially launched in September 2004 with nine Trimble NetRS© reference stations, Can-Net has expanded across Canada to now include 32 installations. Thirteen of those installations are in southern Ontario and make up the VRS network. To date Cansel has 40 Can-Net users, all of whom are either yearly subscribers or rent Can-Net units from Cansel.

Requiring only a Can-Net subscription, rover, data collector and Web-enabled cell phone, users need only activate their receiver, connect to Can-Net's IP address and the network begins streaming RTK GPS data over the Internet immediately - a set up time of less than "three minutes," says Fletcher.

Unlike traditional RTK, where surveyors are subject to degrading accuracies the farther they move from the base station, the Trimble VRS solution's RTKNet software utilizes a group of reference stations to factor in potential systematic errors and to model the local ionospheric activity. When users connect to the system, the software recognizes the users' field position and sends a specific correction for that specific position, enabling them to work as though they have a "virtual" reference station next to their rover. With such a fully modeled solution, the PPM error is eliminated or significantly reduced, giving surveyors the ability to gain RTK precision at much greater distances. According to Fletcher, users can expect to achieve 1 cm horizontally and 2 cm vertically anywhere within the southern Ontario Can-Net VRS network.

Each Can-Net reference station is tied into the Canadian Federal Datum (NAD83 CSRS) and independently checked using Canada's Geodetic Survey PPP processing. That quality control, coupled with the rigorous quality-control modules provided by Trimble's RTKNet software, assure surveyors that they can be "99.9 percent confident" that the accuracies offered by the Trimble VRS solution are correct, says Michael Wolfe, Cansel's GPS infrastructure engineer.

Improved accuracy is indeed a benefit of Can-Net, but Fletcher says its real attraction is increased productivity for less cost.

"With Can-Net, users can put two crews to work for the same level of investment in base stations," he explains. "Secondly, with traditional RTK GPS, you can waste the better part of the morning just setting up the base and control. Now, you get to the job site, connect to Can-Net and you're ready to work before you've finished putting sugar in your coffee. That is a significant productivity enhancement, particularly for crews who are doing many small jobs."

Small jobs, big headaches

The chance to reduce time in the often time-consuming smaller jobs such as laying out houses was a significant draw for Husted.

A full-service land survey firm, KHS is a 20-year veteran provider of legal land surveys for property boundaries, lot grading plans, house layouts and topographic surveys. An avid GPS and total station user, Husted says that while GPS enables his crews to work much faster at a higher degree of accuracy, base station setup time could slow them down. And that is particularly problematic for small job assignments.

"A base station is a big pain for small work," says Husted. "When you lay out a house, for example, you can spend two hours just setting up a base line."

Husted tested the Can-Net system for two-weeks last June to layout a 20-mile long utility corridor - a project that would typically pose control challenges with conventional instruments. The Can-Net VRS solution allowed crews to perform the assignment quicker and with even better accuracy - within 3-4 mm horizontally - than what Trimble specifications state for a VRS solution, says Husted. Although the RTKNet software behind the network is a complex workhorse, Husted says the system is very user-friendly yet sophisticated enough for surveyors to perform a multitude of calculations in the field.

Since becoming a Can-Net user, Husted is using the system for "everything" including large topographic surveys, farm surveys, property boundaries and house layouts.

"Can-Net works better than we expected," says Husted. "It has not only significantly increased our productivity and accuracy, it's provided sizable cost savings in operating costs."

Capital outlay

For Gord McGuire, senior project manager of survey services for the City of Hamilton, the move to Can-Net was all about dollars and sense. Common to municipal departments, McGuire faced daily budget reminders to produce more with less. That was compounded a few years ago when the City launched its capital revitalization program to rebuild its aging infrastructure, bringing a heavy workload to McGuire's department and heightening the awareness that his current RTK GPS equipment would make it difficult for his team to meet the City's goals.

Can-Net initially came to McGuire through the "back door" when he purchased the Trimble R8 GPS System; Cansel offered the Can-Net network as part of the hardware package. Since becoming a user in November 2005, however, McGuire says Can-Net has quickly moved to the front door of most of his department's surveying operations.

"The ability to just drive to a site and turn on a cell phone is huge," says McGuire.

One of the most notable rewards of the system came to McGuire's department during initial testing last fall. Using only the Trimble R8, a cell phone, and the VRS network, McGuire and colleagues located and tied in 120 control points to create a full calibration set for the entire 1,200-sq-km city in three weeks - a control fabric that took years to complete with their former RTK system.

"The maximum distance we could ever get with our RTK system was about five km," says McGuire. "Now we can go anywhere within city limits, hop out of the car, turn on the cell phone and receiver and we have positioning to engineering spec, which satisfies 99 percent of our positioning requirements. I've saved $30,000 in equipment and about $13,000 in annual operating costs."

A magic stick

Since Can-Net rids users of the traditional rover-base station radio link, they no longer have line-of-sight issues - a particularly important feature when working at busy construction sites where piles of dirt, materials and machinery can quickly interrupt total station surveying activities. Steve Conway, field services manager with civil engineering company Gamsby Mannerow Ltd. (G&M) in Guelph, Ont., has experienced this frustration many times.

"The guys would often set up the total station - even a robot - and lay out one side of the street when a truck would come and dump a pile of dirt in front of the station, forcing you to move it to the other side of the street," he recalls.

G&M is predominantly a total station outfit, of which surveying represents about five percent of its business. However, as infrequent as the need to rent GPS equipment has been, Conway says the downtime in dealing with base stations on those occasions pushed him to look for more efficient surveying methods.

After a two-week Can-Net trial last October, Conway signed on to the network, particularly because the Trimble GPS hardware and software is compatible with G&M's Trimble 5600 Robotic Total Station System. Since acquiring the technology, Can-Net and its "magic stick," as Conway calls it, have become standard equipment at construction sites.

"With Trimble's VRS technology, Can-Net is allowing us to be more productive because we don't have to set up a base and it eliminates our total station line-of-sight problems," says Conway. "Recently our guys did a day-and-a-half's-worth of work in two-thirds of a day because they didn't have to set up the total station in four different locations."

Sold on the tangible benefits of the system, Conway says they are looking into expanding its application to other work, such as topographic surveys - a task they have traditionally performed with a conventional total station and GPS.

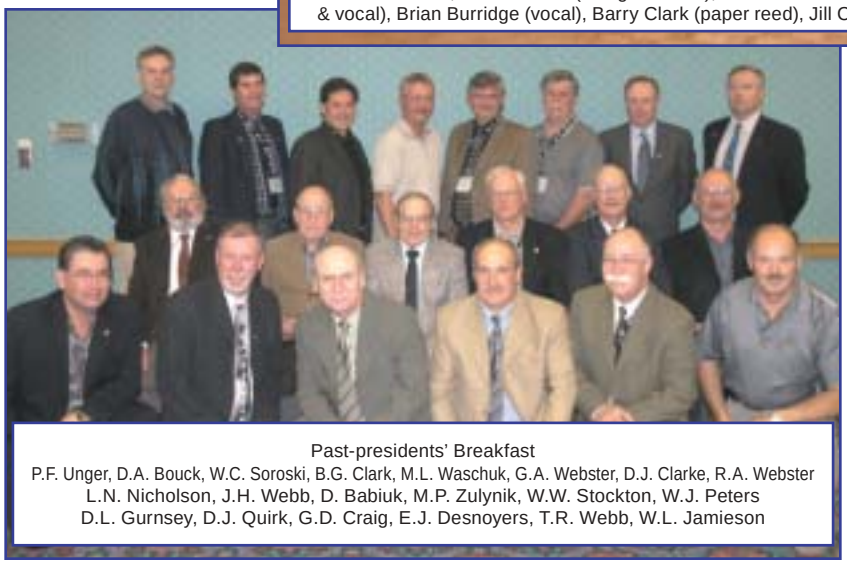
Quantifying costs

Based on the success garnered by surveyors in southern Ontario, Cansel is focused on bringing that same achievement to other regions in Canada. A Trimble VRS network installation went live in Edmonton in March and other installations are planned in Winnipeg, Calgary, Montreal and other sites in Ontario.

Should Can-Net become a reality for these areas as well, more Canadian surveyors stand to learn the value in virtuality. ☼

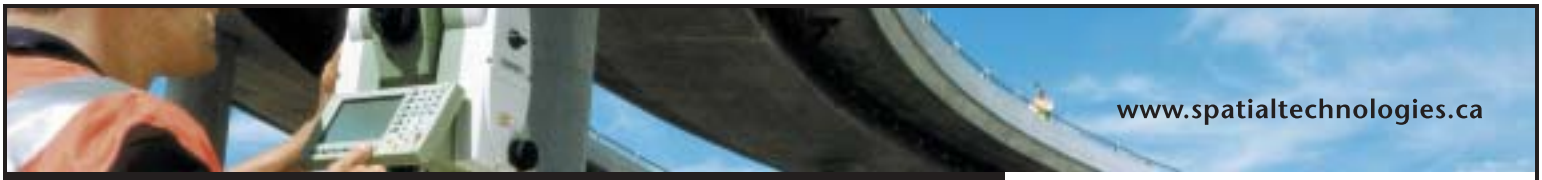
More Highlights from the 2006 AGM

The "East-West Fusion Band" at the Ice Breaker with:
ANBLS President, Fraser Smith (strings & vocal), Saskatoon Entertainer, Ray Richards (strings & vocal), Brian Burridge (vocal), Barry Clark (paper reed), Jill Cheverie (percussion & vocal)



Past-presidents' Breakfast
P.F. Unger, D.A. Bouck, W.C. Soroski, B.G. Clark, M.L. Waschuk, G.A. Webster, D.J. Clarke, R.A. Webster
L.N. Nicholson, J.H. Webb, D. Babiuk, M.P. Zulynik, W.W. Stockton, W.J. Peters
D.L. Gurnsey, D.J. Quirk, G.D. Craig, E.J. Desnoyers, T.R. Webb, W.L. Jamieson

Hoop-Dancer at Ice Breaker



www.spatialtechnologies.ca

SPATIAL TECHNOLOGIES' FEATURE PRODUCTS

* Ideal for Quad mounting *

GPSMAP 60CSX	GPSMAP 276C	EXPLORIST 210	ROADMATE 760

The **GPSMAP 60CSx**, by Garmin, provides detailed mapping memory and a waterproof, rugged housing. Acquires satellites faster, lets users track their location in very challenging conditions, provides highly accurate elevation data and displays an accurate heading while standing still.

Garmin's **GPSMAP 276C** is an all-in-one, versatile, color chartplotter and automobile navigator, perfect for land or water. Features an easy to read 256-color TFT display and a built-in basemap and auto routing to provide you with turn-by-turn directions.

Magellan's **eXplorist 210** is easy-to-use, with 22MB of available memory. An advance file memory system and vertical profiles allow for data to be easily accessed and for tough routes to be pre-navigate MapSend® maps can be added to the available memory.

GPS navigation is easier than ever with your Magellan **RoadMate 760**, with turn-by-turn voice guidance. QuickSpell™ allows you to find nearby gas stations, restaurants, ATMs and more by selecting from more than 7 million pre-programmed points of interest.

QUALITY. VALUE. SERVICE. For more information on our products and current pricing, give us a call or visit our website. Spatial Technologies is committed to being your full service, support and training specialist.

Professional Series Total Stations
Survey Grade GPS
GIS Mapping Grade
3D Laser Scanners & Software
Differential GPS Data
Sales, Rental & Service
Training

spatial TECHNOLOGIES INC.

Phone (403) 252-0070 Fax (403) 259-3992
Toll free (877) 252-0070
www.spatialtechnologies.ca

spatial TECHNOLOGIES INC.

New products to make your work life easier

LEICA SMARTROVER.

The ideal tool for modern surveying.

- > All-on-the-pole convenience
- > Weighs only 2.8 kg
- > Full compatibility with SmartStation
- > WinCE and Bluetooth™ wireless technology
- > Best GPS result with SmartTrack and SmartCheck
- > MIL spec ruggedness
- > Your perfect companion for demanding tasks

THE LEICA SMARTROVER is the lightest cable-free RTK GPS system in the world and is fully compatible with Leica SmartStation, the world's first total station with integrated GPS. Use SmartStation to position your total station and then transfer the SmartAntenna and continue RTK GPS surveying with the SmartRover. Enjoy outstanding performance at a fraction of the weight of current all-on-the-pole systems. Reduce operator fatigue and maximize productivity. Consisting of the Leica SmartAntenna ATX1230 and the Leica RX1250 Controller, the Leica SmartRover delivers complete cable free operation to provide maximum flexibility with fewer components.

Professional Series Total Stations
Survey Grade GPS
GIS Mapping Grade
3D Laser Scanners & Software
Differential GPS Data
Sales, Rental & Service
Training

spatial TECHNOLOGIES INC.

Phone (403) 252-0070 Fax (403) 259-3992
Toll free (877) 252-0070
www.spatialtechnologies.ca