

SASKATCHEWAN LAND SURVEYORS' ASSOCIATION

Newsletter

President's Message to the Membership

By R. J. Pominville, SLS, P. Surv, President

Spring has sprung on the prairies and if that was winter I'll take a few more. This past winter has been the warmest that I can remember. This has been a particular blessing for those working in the field over the past six months.

Spring is generally the start of our busy season and this year seems to be the same. The mood at our recent seminars was one of optimism and I trust that it will carry into the summer months.

Since my last report Joanne and I have attended the 108th AGM of the Association of Ontario Land Surveyors in Ottawa. The meetings were held during Winterlude and a very good time was had by all who attended although the "Flu Bug" attempted to dampen many spirits. I also attended the AGM of the C.C.L.S. which was held immediately following the A.O.L.S. Meetings. The NAFTA delegations from the U.S.A. and Mexico were in attendance and made for an interesting meeting. The Amalgamation 2000 Group gave their presentations at these meetings however since that time CIG has passed a resolution to discontinue their involvement in the Amalgamation process.

I attended a meeting at the U.of C. on March 3 to discuss the changes regarding the Cadastral Chair and representation on the Geomatics Engineering Advisory Committee.

The Geomatics Department has changed the terms of reference of GEAC to no longer include repre-



sentation from the four Western Provinces. Instead, two Land Surveyors will be appointed to the committee by Dr. Lachapelle. A separate committee made of representatives of the four Western Provinces is proposed. (Geomatics Engineering Liaison Committee) I have expressed our concerns regarding the lack of representation on GEAC. This was somewhat alleviated by the allowance of a member of the Liaison Committee to be appointed to the Advisory Committee, However, Dr. Lachapelle will pick the said representative.

The meeting also discussed the Cadastral Chair and the Cadastral content of the Geomatics Engineering Degree. The

continued on page 4

Inside This Issue

Council Highlights	2
What's Happening?	4
Councillor's Report	5
Open Forum	6
Nomination Report	8
Book Review	9

Advertisers

CFE Technologies	19
Gemini Positioning Systems Ltd.	35
J. P. Morasse	15
Leica Geosystems Ltd.	38
Lewis Instruments	23

Council Highlights

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



Meeting #6 February 14, 2000

All members were present when the president called the meeting to order at 9:30 a.m. He reported on his attendance at the BCLS annual meeting in Prince George, highlights of which included a panel discussion on the obligations associated with the surveyors oath and an amazing social program.

Consequential Amendments to SLSA, APEGS and SAA Acts in SASTT Act.

Council was advised that the provincial government had notified the Association of Professional Engineers and Geoscientists that the consequential amendments to their Act would be proclaimed notwithstanding any opposition they

might have. In the face of those developments, it was agreed that the Executive Director should contact all other 'scope of practices' professions in the province regarding the precedent being set by the government in their unilateral encroachment into the SLSA Act, the APEGS Act and the SAA Act.

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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.

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1998/99 Council

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Newsletter Editor	

Association of Professional Community Planners of Saskatchewan (APCPS) - Proposed Elimination of Exemptions from SLSA Act.

APCPS president (Ralph Leibel) and past-president (John Wolfenburg) joined Council to discuss the potential implications of eliminating the exemption for Community Planners in the SLSA Act.

The representatives of APCPS agreed to raise the matter at their next council meeting and to review the history of their exemption in the SLSA Act.

Proposed Amendment to Bylaw Article XIII, Section 2 - Submission of Forms 'S'

Council approved a draft amendment to Article XII Section 2 which would replace the words "Chief Surveyor's Office" with the words "Executive Director". This amendment will be placed before the members at the next annual meeting.

Reciprocity in Registration Requirements in the Four Western Provinces

Council received a written report from D. L.

Gurnsey that outlined discussions with the other three western provinces regarding reciprocity in admission requirements. It was apparent that there would be very few changes for Saskatchewan as the other provinces move toward a standard that is similar to the current requirements in Saskatchewan.

CCLS - Appointment of New SLSA Representative

Council received a report from T. R. Webb reminding them that his term as CCLS representative was coming to an end and that a new representative must be appointed. The report also recommended that the new appointment be the current president in order to maintain a strong link between the official business of the association and the CCLS. Although Council was in agreement with the recommendation of Mr. Webb, it was agreed that input from the membership should be sought before making a final decision. This matter was tabled until the next meeting.

U of C Advisory Committee - Changes in Structure and Establishment of a New Geomatics Engineering Liaison Committee

Council reviewed a letter Dr. G. Lachapelle, Head of the Geomatics Engineering program at the U. of C. indicating that the land survey associations would no longer be represented on the Geomatics Engineering Advisory Committee but that representation would be allowed on a new Geomatics Engineering Liaison Committee which would have no advisory role. It was agreed that, considering the financial and other support given to the Geomatics Engineering Program from the outset, the SLSA should express its disappointment with this change. It was further agreed that the President should be authorized to work with the presidents of the other three western provinces in preparing a common response to these changes.

Arthur Mark Miller/John Holmlund - Form 'O' Agreement

Council approved a Form 'O' Land Surveyor in Training Agreement signed by A. M. Miller and J. H. Holmlund.

Professionalism in the Federal Government

Council reviewed a letter from Dr. Robert Baird

inviting the SLSA to express its opposition to the move by the Federal Government to group land surveyors, engineers and architects into a common category with other technical and non professional occupations for employment purposes. It was noted that this development seemed to have a great deal of similarity with the position being taken by the provincial government in breaking down the distinction between the land survey, engineering geoscience and architecture professionals, and the technical occupations associated with those professions. It was agreed that the president would send a letter condemning the actions of the Federal Government.

Multiple Forms 'O'

Council considered whether there was any reason why a Land Surveyor in Training could not have more than one supervisor at any given time. It was noted that there had been a few cases in the past where there had been multiple consecutive supervisors and there was no apparent reason why there could not be multiple concurrent supervisors if that was what was required for a Land Surveyor in Training to gain the appropriate breadth of practical experience, particularly with regard to legal survey work.

It was agreed that multiple concurrent Form 'O' Agreements would be allowed provided that a Form 'O' agreement is signed and approved for each supervisor, a separate Form 'P' is prepared by each supervisor at the completion of the practical experience period; and each supervisor is made aware of the agreements signed with each of the other supervisors.

Public Relations Committee

Council approved a request for five hundred dollars 'seed money' for each of the two daily newspapers in the province to promote the SLSA's 90th Anniversary. Additional advertising money would then be solicited from individual land survey companies, suppliers and related organizations to produce large-spread ads to be run around the time of the annual meeting.

LAND Project Committee - Letter to Justice Minister Chris Axworthy

Council approved a letter to be sent to the Hon. Chris Axworthy which would explain and empha-

size the SLSA's position regarding the need to eliminate metes and bounds descriptions and any graphical reincarnation of them in the new Land Surveys Act 2000.

Professional Conduct Committee

Council appointed B. G. Clark chairman for the

three member Professional Conduct Committee. Other members are D. V. Franko and G. H. Seis.

Next Meetings

The next meetings were tentatively scheduled for Monday, April 3, in Saskatoon and Tuesday, May 30, at Prince Albert National Park. ▀

President's Message

Continued from page 1

Department will be combining the Cadastral Professorship to make a new tenure track position for GIS/Land Tenure. Although we have been assured that the course content will not be changed, the Department will not be adding any Cadastral electives. It is now proposed that the GELC prepare a course and provide lecturers and offer a Cadastral elective at the U. of C. I will be presenting this proposal at the next council meeting.

In light of this and the number of members that have expressed their concern to me, I will suggest that we review our current and future educational

requirements for candidates. This review should also include a review of the W.C.B.E. and the various educational institutions across Canada. Currently we have trouble attracting graduates from the U. of C. to Saskatchewan and although they have an internationally recognized program that is second to none it does not seem to be fulfilling our needs. Please take sometime to discuss these matters with others, as I am sure that we will be asking for input as we move forward.

I wish you a busy spring and hope to see everyone at the AGM in Waskesiu. ▀

What's Happening?

Next Council Meeting: Tuesday, May 30, at Waskesiu in Prince Albert National Park.

2000 Annual Meeting Update: The 2000 Annual General Meeting will be held on Wednesday, May 31, Thursday, June 1, and Friday June 2, 2000. Accomodation is at a premium in downtown Waskesiu. We encourage you to **book your accommodation as early as possible** to assure yourself the accommodation of your preference. See the Sept. '99 issue for a listing of hotels and phone numbers, or watch your fax or mail box for a more detailed notice.

Annual Meeting Highlights:

Wednesday, May 31, 2000

Annual Golf Tournament	Elk Ridge Golf and Country Club
Opening Social	Elk Ridge Golf and Country Club

Thursday, June 1, 2000

Opening/Annual Meeting	Assembly Hall
Education Seminars	
President's Ball	

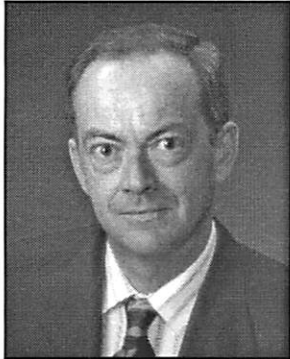
Friday, June 2, 2000

Annual Meeting/Closing	Assembly Hall
Elective Activities	Lobstick Golf?, Paddle Wheeler?, Fly-in fishing?

U of R and U of S Syllabus: For anyone who would like to view the U of R or U of S Syllabus, SLSA office has one copy of each in the Association Library. Please contact the office if you are interested. ▀

Councillor's Report

By R. J. Morrison, SLS, P. Surv.



Once again I have left the writing of this report to the absolute last hour. If nothing else, serving as Councillor has given me a new perspective on the amount of work that the executive puts forth and how difficult it is to resolve some issues that arise.

Two issues that council are still dealing with are the SASTT Act with the consequented amendments and the WCBE Certification process through the University of Calgary. I really thought these issues would have been resolved during my term as Councillor but there appears to be no easy solution to either problem.

If the last meeting President Pominville had with the University Of Calgary is any indication, it appears that they are not interested in setting up courses of study directed more specifically to Cadastral Surveys. Maybe this is an indication that we should review the whole WCBE process and see if there are courses offered at other universities or technical schools that would serve a candidate's needs for becoming a Saskatchewan Land Surveyor.

On another subject, the Practice Committee is currently looking into the feasibility of providing a system of marked iron posts. These monuments would be marked with the provincial emblem and a

number to identify the surveyor or firm that planted the monument.

This would in my opinion be a good idea, it would eliminate some problems in identifying the person responsible for planting a monument where no record has been placed on file.

Last year in my report my main problem was dealing with the problems encountered in completing Field Surveys in winter conditions. This year it seems that there were not as many such problems in the field.

This year it seems I am dealing with many situations in registering Plans of Survey that involve transfers of land, amendments, and Master of Titles Orders for various reasons. As the whole procedure seems to be time consuming, I wonder how these procedures will be dealt with under the new LAND Project. Some method of streamlining the process will have to be developed.

In closing I would like to thank you, the members of the Association for the opportunity of serving as Councillor and wish you "Happy Surveying" in the year 2000. □

OPEN FORUM

The "Newsletter" encourages provocative thoughts and rebuttal from the membership. This issue's contribution was submitted by D. Babiuk, BA (Geog), CLS, SLS, P. Surv.

A Letter to the Editor

With reference to Wayne Stockton's comments in the December '99 issue of the SLS Newsletter I find it perplexing that members of the Association who express concern with "our declining membership" have not seriously considered a solution provided for in our Act. For a number of years our membership has been fully aware that the Surveying Engineering programs have not alleviated the problem of only a few graduates entering the land surveying profession in Saskatchewan.

As the former chairperson of the SLS Act Committee may I state that this situation was fully comprehended by the committee. Explicit provisions in The Land Surveyors and Professional Surveyors Act, assented to April 29, 1995, were made so that the Association could address the problem of attracting suitable candidates for a commission. Subsection 19(3) of the Act states:

"(3) In the case of an applicant for admission as a land surveyor in training, the person has successfully completed:

(a) a Baccalaureate degree in Surveying Engineering, Survey Science, Geomatics or an equivalent degree from a university or college approved in the bylaws; or

(b) a course of study in surveying approved in the bylaws."

The provision for an "equivalent degree from a university or college" leaves considerable latitude for the Association to evaluate other university degrees where the course content has classes closely interrelated with Geographic Information Systems, Geomatics and/or professional land surveying and professional surveying as these disciplines are currently practiced. This latitude to evaluate other degree courses was presented to the membership at a number of meetings during the development of the new Act - it was voted upon and accepted. However, to date, we have not made any movement what-so-ever exploring the possibilities for attracting graduates from university programs that have courses related to the expanding disciplines of our profession as they develop in society.

For example, our Saskatchewan universities have Baccalaureate degrees, majoring in Geography, with course contents interrelated to activities practiced currently in professional land surveying and professional surveying. Classes offering the study of geographic information systems, urban and rural land use planning, map and air photo interpretation, computer cartography and remote sensing are but a few that could be considered for evaluation in relation to our profession. Perhaps a computer science program providing classes interrelated to Geographic Information Systems, or geomatics, could provide suitable candidates.

Continued on the next page

While graduates of this nature would need to supplement their degrees with acceptable courses in surveying they should not be overlooked. Likewise, if there are graduates from a two or three year "course of study in Surveying and Mapping at a technical school approved in the bylaws [Subsection 19(2)], and that person then attends university and also graduates from a program with inter-related classes as aforementioned surely that person would be an excellent candidate as a land surveyor in training.

Who would be so naive as to suggest candidates of this quality would not become worthy professional land surveyors, There are many currently practicing members who do not have the academic education that the above mentioned candidates would have. The present criterion that a member should have the educational standard of a Baccalaureate degree would be met.

Furthermore, what would be the reaction if a person approached the Minister, who is assigned the administration of our Act and requested that the Minister compel the Association to initiate the provisions of Subsection 19(3).

If the Association is serious about "our declining membership" then they should take that bold step of looking beyond the horizon and explore the possibilities that the Act allows. In our rapidly changing technological society of interrelated disciplines old attitudes and regressive positions will not survive—it is time to thoroughly examine our current requirements regarding suitable candidates for a commission as a Saskatchewan Land Surveyor.

D. Babiuk, BA (Geog). CLS, SLS, P.Surv. ©

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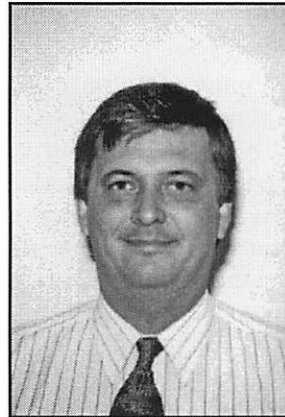
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Nomination Report

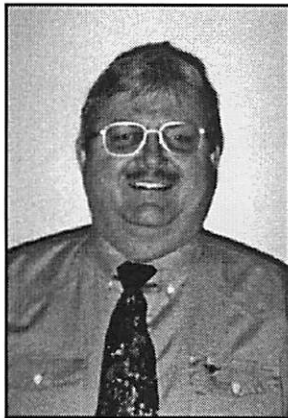
We nominate the following candidates for election at the 90th Annual Meeting of the Saskatchewan Land Surveyors' Association.



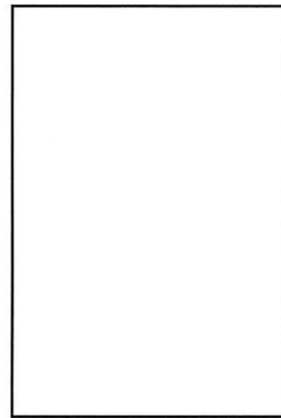
W. C. (Bill) Soroski
for President



M. L. (Mike) Waschuk
for Vice President



C. B. (Conrad) Swenson
for Councillor, two year term



Councillor, two year term, to be
announced

As always, nominations from the floor will be recieved.

Respectfully submitted,

R. A. (Bob) Webster, SLS, P. Surv.,
Past President e

Book Review

By John H. Webb, SLS (LM)

**Mapping a Northern Land:
The Survey of Canada, 1947-1994.**
Edited by Gerald McGrath and
Louis Sebert.

Purchase from "Chapter Book Stores"
Website – www.Chapter.com for \$56.00 or
McGill-Queen's University Press,
3430 McTavish St., Montreal, P.Q.
for \$75.00 ISBN 0-7735-1689-1, 668 pages

The above book is the latest edition about surveying and mapping following Don Thomson's three volumes of "Men and Meridians".

The book is a must for anyone interested in Geomatics Canada. There are 19 chapters devoted to all aspects of surveying between 1947 and 1994, and each chapter is independent of the others.

Saskatchewan projects in surveying and mapping are described in various areas of the book and makes it valuable to Saskatchewan and other Provinces and Territories.

Chapter 4, Provincial Topographic Mapping, by Louis M. Sebert, is an insight into the various mapping techniques in each Province and Territory across Canada including material on Saskatchewan.

It makes reference to the Mid-Canada Radar line under Chapter 5 which brings back memories to me when I surveyed many of the sites across northern Manitoba in 1955.

Chapter 7, Cadastral Surveys in Canada, by Alec McEwen deals with many forms of organizations that affect the Cadastral surveying profession in Canada.

Chapter 16, Engineering and Mining Surveys, is

certainly of interest to surveyors, describing many Canadian projects. "Geomatics" magazine, volume 55 number 2, 1999, has an excellent in depth review, by James Doig, of all the chapters in the book.

Quoting from the back cover jacket:

Canada was a difficult land to map. Planning, effort, and overall cost were comparable to other national efforts such as building the Canadian Pacific Railway or the St. Lawrence Seaway. "Mapping a Northern Land" recounts the immense human effort necessary to define this vast territory.

Twenty three specialists, many of whom were key players in the events they recount, describe developments in the fields of geodesy, topographic mapping, remote sensing, navigational charting and geographic information systems during a period of tremendous technological change

The many authors who submitted their knowledge towards the publishing of well timed articles about the industry must be congratulated for their efforts. The editors, Gerald McGrath and Louis Sebert, must also be thanked immensely for putting forth their efforts and time in gathering the various documentations and then placed in book form. e

Natural and Artificial Boundaries

By Alec McEwen, LL.M., Ph.D., CLS, Professor Emeritus of Geomatics Engineering, University of Calgary, reprinted as seen in *ALS News*, March 2000.

Introduction

A natural boundary is a legal boundary formed by a natural feature such as a river or lake. A fixed boundary, as generally understood by surveyors in Alberta, is a mathematical line, either rectilinear or curvilinear, the location of which is fixed by monuments, by its position relative to some other boundary line or point, or by horizontal coordinates. For the purpose of this discussion, an artificial boundary is the graphical representation of a boundary, whether natural or fixed, on a surveyor's plan.

Accretion and erosion

The doctrine of accretion and erosion is fundamental in English jurisprudence, and it forms a part of the law in Alberta. Where a parcel of land is bounded by a river or lake, the natural, gradual and imperceptible movement of the water's edge causes a corresponding shift in the boundary, and thereby results in a gain or loss in the extent of the riparian title.

Accretion cannot benefit a parcel unless it is truly riparian. The presence of an intervening strip of land between the parcel boundary and the water's edge means that the parcel cannot gain by accretion. This was clearly demonstrated by the Alberta Court of Appeal in *Nastajus v. North Alta. Land Registration Dist.* (1989), 64 Alta.L.R.(2d) 300. On the other hand, a surveyor's traverse line close to the bank or shore, which is intended solely to locate the sinuosities of the water feature by offset measurements and to facilitate the calculation of the irregular area of that part of a parcel lying between the traverse and the water, is not a boundary and does not deny the parcel its riparian character.

The application of accretion or erosion can be excluded by intention, but only if that intention is clearly expressed either by the terms of the conveyance or by special statutory provisions. In the Privy Council appeal case of *Southern Centre Of Theosophy v South Australia*, [1982] A.C. 706, Lord Wilberforce, on behalf of the court, explained the doctrine in plain language, at page 716:

When land is conveyed, it is conveyed subject to and with the benefit of such subtractions and additions (within the limits of the doctrine) as may take place over the years. It may of course be excluded in any particular case, if such is the intention of the parties. But if a rule so firmly founded in justice and convenience is to be excluded, it is to be expected that the intention to do so should be plainly shown. The authorities have given recognition to this principle. They have firmly laid down that where land is granted with a water boundary, the title of the grantee extends to that land as added to or detracted from by accretion, or diluvion, and that this is so whether or not the grant is accompanied by a map showing the boundary or contains a parcels clause stating the area of the land, and whether or not the original boundary can be identified.

Although decisions of the Privy Council are no longer binding on Canadian courts, they remain highly persuasive. It is submitted that Lord Wilberforce's quoted remarks are consistent with the law in Alberta.

Yet there are many situations in Alberta where the gradual, natural and imperceptible movement of a watercourse means that its banks have shifted significantly from their location as shown on the original township plan. The question then arises: does an originally riparian boundary continue to coincide with the bank, wherever it may be, or is it possible for the boundary to remain fixed in its location as plotted on the township plan?

Plan referred to in description

When a written boundary description in a deed of conveyance refers to a plan, the plan must be looked at together with the description, because it forms a part of the deed.

As stated by the Supreme Court of Canada:

When lands are described...by a reference, either expressly, or by implication, to a plan, the plan is considered as incorporated with the deed, and the contents and boundaries of the land conveyed as
continued on page 19

Nickel-Cadmium & Nickel-Metal Hydride Cells

Can You Upgrade an Existing Battery?

By Doug Crook, President, Ingenuity Inc., reprinted with permission of the author.

What is a battery?

A battery is a number of individual electrochemical storage cells that are arranged in a "battery" of cells. The cells may be combined in series to multiply voltage or in parallel to multiply current. Batteries themselves may also be combined to produce higher voltages or currents.

Electricity (electron flow or current flow) is produced by a difference in electron potential between the cell electrodes (positive and negative terminals). The electron exchange is made possible by a chemical solution called an electrolyte. There are hundreds of different cell chemistries or electrode-electrolyte combinations. Each cell chemistry is developed for a particular use from consumer goods to commercial and aerospace applications. As a cell technology matures its applications can multiply.

Cell chemistry dictates whether a battery or cell will be classed as *primary* (non-rechargeable - example: manganese dioxide or alkaline) or *secondary* (rechargeable - example: nickel-cadmium). Primary cells have an irreversible chemical reaction. Once the stored energy is depleted (chemical reaction has taken place) it can't be renewed. Secondary cells on the other hand can have their chemical reactions reversed by "recharging" the cell, usually by running an electrical current back into the cell. As with all chemical reactions, environmental conditions can influence or affect the discharge and recharge characteristics.

With the emphasis in the computer and wireless communications industries on smaller and more powerful hand held devices, there is need for smaller, lighter and yet more powerful battery systems. There are old standbys (alkaline, sealed lead-acid and nickel-cadmium) and emerging chemistries (nickel-metal hydride, lithium-ion and zinc-air). Economics, ease of battery replacement and run time also put pressure on the device design team in choosing a battery technology.

Nickel-Cadmium

The nickel-cadmium cell was originally developed for use in the aerospace industry. At the time it provided the most power per unit of weight in a manageable battery system. Subsequent development has brought this cell technology to a mature state. There are many nickel-cadmium cell types that can provide power in a wide range of environmental conditions ranging from extremes in temperature to extremes in charge and discharge capabilities. Several factors have put pressure on the continued use of the nickel-cadmium cell. Among these are environmental concerns in disposing of the toxic heavy metal cadmium and the higher power to weight ratio demanded by newer hand held devices. The nickel-cadmium battery will probably be relegated to high current power tools and devices where weight is not a factor, similar to the role played by the sealed lead-acid battery - good cheap power.

Nickel-Metal Hydride

A variant of the nickel-cadmium cell is the nickel-metal hydride cell. Both cells use a nickel hydroxide positive electrode and potassium hydroxide for the electrolyte. While the nickel-cadmium cell uses cadmium for the negative electrode, the nickel-metal hydride cell uses a metallic form of hydrogen for the negative electrode. The change in the negative electrode material allows for a greater energy density in the same size cell. Better battery? Maybe, but different. The change in chemistry also changes operational characteristics. The nickel-metal hydride cell has different charge and discharge parameters than the nickel-cadmium cell. At present, this cell chemistry does not have the maturity of the nickel-cadmium cell, therefore it exhibits a narrow operational and charge temperature range, lower charge-discharge current rate capabilities and needs to have better charge control. As this cell chemistry matures, it is possible that some of the objectionable characteristics will disappear.

Let's chart the some of the advantages, disadvantages and differences between the nickel-cadmium and nickel-metal hydride cells while comparing them to lead-acid cells.

Nickel-Cadmium

Advantages over lead-acid

- Higher energy density (light yet powerful)
- Sealed
- Wide operating and charging temperature range
- Long cycle life
- Long shelf life - any charge state
- Rapid recharging

Disadvantages compared to lead-acid

- Voltage depression with partial discharge
- Higher cost than lead-acid
- Poor charge retention
- Poorer float charge capabilities
- Cadmium toxicity and disposal concerns
- Releases oxygen gas when venting
- More expensive than lead-acid

Charge characteristics

- Endothermic (absorbs heat) at less than 75% charge
- Exothermic (generates heat) last 25% of charge
- Internal resistance increases, voltage decreases at end of charge
- Temperature levels off in < .5C overcharge
- Maintenance charge .05C to .1C
- Charge termination - AV, TCO, Timer

Capacity retention - months at temperature

32° F	1 - 88%	2 - 82%	3 - 80%
68° F	1 - 75%	2 - 65%	3 - 60%
86° F	1 - 65%	2 - 45%	3 - 35%
104° F	1 - 40%	2 - 0%	

Nickel-Metal Hydride

Advantages over nickel-cadmium or lead-acid

- Higher energy density
- Cadmium free
- Sealed
- Long cycle life
- Long shelf life - any charge state
- Rapid recharging

Disadvantages compared to nickel-cadmium & lead-acid

- Voltage depression with partial discharge
- Higher cost than nickel-cadmium
- Poor charge retention
- Poorer float charge capabilities
- Lower charge and discharge rates than Ni-Cd
- Releases hydrogen gas when venting
- More expensive than Ni-Cd (1.5 to 2 times)

Charge characteristics

- Exothermic (generates heat) throughout charge
- Internal resistance increases with cold or heat
- Internal pressure increases with high current charge lower than 50° F and above 104° F
- Temperature increases in > .05C overcharge
- Maintenance charge .03C to .05C pulsed
- Charge termination 0aV, TCO, Timer w/TCO, aT/At

Capacity retention - months at temperature

32° F	1 - 88%	2 - 82%	3 - 80%
68° F	1 - 80%	2 - 75%	3 - 70%
86° F	1 - 65%	2 - 45%	3 - 35%
104° F	1 - 40%	2 - 0%	

The question at this point is whether existing nickel-cadmium cells can or should be replaced with nickel-metal hydride cells. There are several potential problem areas that will have to be addressed when contemplating a change to nickel-metal hydride cells in a battery designed for nickel-cadmium cells. The information in the chart above shows that there are several differences between the two cell chemistries.

The one lone positive attribute is that energy density, or capacity for size and weight, is increased in nickel-metal hydride cells. At this time not all cell sizes available in nickel-cadmium are available in nickel-metal hydride cells, therefore some batteries may not be able to be retrofitted with higher capacity cells. As mentioned above, nickel-metal hydride cells are not available in as many different types (low/high temperature, high discharge/charge rate for example) so it may not be advantageous to change cell chemistries at this time.

One of the most important reasons to resist changing from nickel-cadmium to nickel-metal hydride in an existing battery is proper charging and charge control. Most of the basic or simple chargers developed for nickel-cadmium batteries may not adequately monitor and control the charging of a nickel-metal hydride battery. It is critical to the continued good health of a nickel-metal hydride cell that low/high temperature, voltage, bulk or fast charge current and maintenance or trickle current be able to be monitored and controlled in different or changing ambient conditions. While a charger designed for nickel-cadmium cells might properly charge and maintain a nickel-metal hydride battery under certain conditions (moderate temperature, low bulk and maintenance current) it may not provide proper control under adverse conditions.

One common type of charger available is the constant current type or what we call a "wall wart", that small transformer assembly that plugs into the wall. This type of charger is designed for a particular capacity battery and generally takes 12 to 16 hours to charge a battery. The charge current is generally one tenth the rated capacity of the battery it is designed for. The main drawback of using this type of charger for either a nickel-cadmium or nickel-metal hydride battery is that if the battery is left on charge for a long period of time, say a week, the battery can be overcharged and suffer loss of capacity known as voltage depression. Longer is

better, right? Wrong! If you've charged a battery for a week and it doesn't seem to run as long as it should doesn't it make sense to charge it even longer next time? Nope, wrong again. The constant current charger doesn't know how much charge is left in the battery. If you charge for the specified time you may be overcharging the battery. Nickel-cadmium cells will tolerate mild overcharge at a one tenth capacity rate while nickel-metal hydride will not. Nickel-metal hydride cells need a maintenance charge of only .03 to .05 capacity(3800 mAh = 114 to 190 mA not 380mA). The higher maintenance current will cause the nickel-metal hydride cell to overcharge generating an unacceptable temperature rise. If there is no internal thermal circuit breaker the cells can get hot enough to melt a plastic housing and possibly vent hydrogen gas.

There are many sophisticated chargers that will charge properly under most conditions, but it is best to use a charger that has been specifically designed for use with nickel-metal hydride cells. The bulk charge termination for nickel-cadmium cells is different than that for nickel-metal hydride cells. Bulk charge for nickel-cadmium batteries can be terminated by a drop in voltage or a rise in temperature. Bulk charge for nickel-metal hydride batteries is generally terminated by a rise in temperature. Virtually all nickel-metal hydride batteries and some nickel-cadmium batteries contain a temperature sensitive element called a thermistor. The charging system uses the thermistor to monitor the temperature of the cell pack. When the temperature rises at a rate of one degree per minute the bulk charge phase is terminated. If your existing battery doesn't contain this element, then it is probably not a good idea to make the change. It is mandatory that the nickel-metal hydride cell temperature be monitored when charging. There is sometimes an additional safety device in a battery called a thermal circuit breaker. The thermal circuit breaker is primarily used to prevent extreme over temperature conditions, not bulk charge termination. Check the charger labeling, instruction manual or consult the manufacturer to verify proper operation with nickel-metal hydride cells.

The bottom line in this discussion is that it may not be wise to attempt changing cell chemistries in existing batteries without checking that the charging system is compatible with the new cells and can provide proper monitoring and charge control.

continued on page 37

Under My Personal Delegation

by Doug MacAulay, A.L.S., reprinted as seen in the *ALS News*, December 1999 issue, with permission of the author.

Two of the primary objectives of the SPR program are to assess the professional competence of practitioners and to evaluate the operations of these practitioners to ensure that the interests of the public and the profession are maintained at the highest possible level. SPR conducts this assessment through a two part process consisting of an internal and external audit of each particular practice.

The external audit consists of a detailed examination of specific products authored by the practitioner in an effort to determine the level of compliance with the various statutes, regulations and standards of good practice adopted by the ALSA. The internal audit examines the technical and administrative operations of the organization in an effort to evaluate the general competency of the firm.

As one would suspect, there is a very definite correlation between the quality of products examined in the external audit and the quality and effectiveness of the internal operational processes that lead up to the preparation of that particular product. Further analysis suggests that there is also a direct relationship between the end quality of survey products and the amount of personal involvement exercised by the professional in their preparation.

I find it interesting, that, of all the topics addressed in the internal audit portion of each review, there is very little discussion of the professional practitioner's personal contribution to the final returns of survey. Perhaps SPR is sending a poor message to our membership. By not exploring a practitioner's personal involvement in the preparation of his products, is SPR implying that a land surveyor can discharge his professional obligations merely by establishing an elaborate system within which technicians and technologists conduct the business of boundary determination? Hopefully this is not the case.

Whether driven by economic pressures or rapidly evolving technological advances, delegation of technical responsibilities is a reality in most contemporary land surveying operations. However, land surveyors must be cautioned not to delegate their *professional* responsibilities to technical staff.

The Land Surveyors Act details the means by which candidates qualify for membership in our profession. The Registration Committee and Council are the only bodies authorized to grant commissions to successful applicants. The power conferred by statute upon Alberta Land Surveyors to determine or establish, by survey, the boundaries of land does not confer on them the right to delegate such authority to others. Bruce McTaggart, BCLS states in a recent article in *The Link*, that, "*BC Land Surveyors should bear in mind that the ideal aimed at, by the law, is that surveys on which titles are to be based must be made only by men (women) whose competence is warranted by the Board's registration as Surveyors; it is not sufficient for the Surveyor to assert of his own belief or authority that So-and-So is a good enough instrument man (technologist) and I will sign his plans. Only the Board can say that, and no Surveyor can usurp this, its function.*"

The BCLS Board of Management has interpreted the statement "*under my personal supervision*" to mean that survey operations have been carried out under a practitioner's supervision and direction in such a manner that he/she is certain of their correct execution. A survey commission is not merely a license to sign plans and a professional certification must surely offer more to the public than a written assurance that a surveyor will take responsibility for the deficiencies in his work.

When a land surveyor takes an oath that his survey and plan is "true and correct," this implies that he

has some personal knowledge to that effect. It follows that a land surveyor must assume a personal role in the execution of each of his surveys. I have difficulty understanding how a practitioner can claim to have any personal knowledge of a survey's correctness if he has not at a minimum:

- evaluated the extent to which searches were made for governing evidence by his field staff,
- satisfied himself by personal examination of the field notes, that survey measurements were taken, recorded and verified in an appropriate fashion, and
- personally inspected the plan of survey he claims to author and to which he bears witness.

In my opinion, these functions constitute professional duties, responsibility for which should not be delegated to technical staff. This is not to say that technical personnel are unable to assist in each of these areas, but only that the land surveyor must have personal knowledge of their correct execution.

Having spent nearly three years on the Practice Review Board, it is apparent that many land surveyors in the general membership share my understanding of minimum levels of professional supervision, direction and control. It is also apparent that some do not. For that matter, there has been much deliberation on this issue among the individual members of the Practice Review Board. For a group that collectively delights in dissecting, analyzing and discussing in infinite detail, each article of our MSP and every re-establishment situation brought to its attention, nothing drops the cone of silence over one of our gatherings faster than the dreaded topic of personal supervision. Nevertheless, after grappling with it over time, the board has taken a pragmatic approach to this issue. If products reviewed in the external audit, substantially comply with the acts, regulations and Manual of Standard Practice, satisfactory levels of personal supervision are assumed to have been exercised. If not, the practitioner is requested to re-examine the effectiveness of his internal systems and implement any changes which will act to mini-

continued on page 36

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BCLS's Building Location Certificates

Copyrightable © and Freedom of Information

By Gordon M. Thomson, BCLS, Secretary, Victoria, BC, reprinted as seen in *The Link*, January 2000 issue.

Did you know that British Columbia Land Surveyors have been preparing what has been known over the years as Plot Plans, Mortgage Certificates, Building Location Surveys, Certificates of Non-encroachment and Certificates of Location, since the mid 1950's, the birth of the National Housing Act? Some can remember the Saturday morning work of doing ten to twenty - in a row - mortgage surveys on the post-war subdivisions which were being funded through the NHA and Central Mortgage and Housing. These surveys were usually plotted in the afternoon, signed, then printed and charged out on Monday or Tuesday by the firm for \$20 - \$25 per site. Junior earnings in 1956 were \$8 per day (+ lunch on Saturdays).

The houses all required a surveyors Plot Plan or a Surveyors Certificate of Non Encroachment. Were the 'certs' copyrighted? No! Were the plans ever used for other purposes? Probably. Was there ever a claim of liability for damages? Maybe, but certainly not reported. Now, BCLSs prepare a more sophisticated document known in British Columbia as a Building Location Certificate. Some other provinces have adopted a Real Property Report - a much more detailed boundary and physical status report dealing with all visible and titled issues. In British Columbia, the Building Location Survey or Building Location Certificate is still primarily prepared for a lender to show the location of prime structures in relation to boundaries; for some purpose such as financing and the approval of a mortgage; for a conveyance to assure the purchaser that, the purchase is on the lot of record, or to determine the structures are built to municipal setbacks and placement regulations.

Since June 1st, 1989, land surveyors have, under a practice by-law, claimed copyright to their plans of Building Location. These documents are only for a particular private transaction, and original BLC's are copyrightable work just as a book is to an author, the purchaser buys a copy. These surveys are stale dated the day after the location of structures or improvements and there is always a concern that some unscrupulous person may attempt to alter a copy of the document for some personal gain or improper third party use.

There have been three reported incidents, since this writer has been Secretary of the Corporation, on apparent alterations to British Columbia Land Surveyor's Certificates of Location. One involved a shed which was found wholly encroaching onto a neighbouring parcel. The encroachment was certified but also drafted onto a transparency of a proposed subdivision plan for review. A print of that plan, under the surveyor's signature, eventually made its way to the referred municipality and the BC Assessment office with the offending shed placed back on the property of interest at a clearance equal to the amount of original encroachment.

The print was dated and the land surveyor's initials forged to the document as if filing of an amendment. The shed had been paper moved by an almost undetectable cut and match to the plan; however at the time, the shed was still on lot next door. Although no charges were laid in this case (there were some sensitive public issues involving this parcel), the matter was directly resolved by the municipality and the British Columbia land surveyor. There was also a real estate situation where

a member's document had been altered to eliminate an encroachment in order to facilitate an easier sale.

Currently, there is a case, which will be heard in the Supreme Court of BC this fall, involving an alteration to a BC land surveyor's site plan which was initially prepared for an owner noting a garage foundation encroachment. That site plan was altered to show the garage clear; changed into a certificate representing a Building Location Survey including a date, with a signature of a pseudo BCLS and filed with a municipality in order to achieve inspection approval for continuation of a building permit. These alterations all have the appearance of being undertaken for fraudulent purposes and are always done on copies for an official presentation.

However, three reported cases of purposeful tampering, from the thousands of BLC's that have been prepared in the province, is minimal. The public and users of these surveys are honest. It is usually the unintentional misuse of a surveyor's certificate that causes thoughts of liability, even for the record keeping surveyor to be a third party is a concern. An altered document, would not in the normal case of affairs, stand up to scrutiny although there could be damages for someone. Any individual, knowingly using or distributing out of date and/or tampered data, would certainly be held responsible for any misinformation,

How do you go about protection from any subsequent misuse problems which may flow from the copying of a Building Location Certificate? The Board advised, in Circular Letter 5 of 1993, members to not re-issue stale dated Building Location Certificates; particularly for any fee. Unless at no charge, a copy is clearly denoted as a replacement only to an original client. This suggestion was that a particular site should be inspected for any additions to the structure and building(s) as well as to update the parcel description and/or to note new physical changes (right of way, etc.) to be shown on the certificate. It was also suggested that if a land surveyor were to re-issue an old certificate, that there should be written acknowledgment that the re-issue of a copy does not constitute any representation as to the state of the land at the time of re-issue. The only apparent reason that old copies would be requested is obviously to save the cost of a current survey and that an agent would be using an old BLC to represent to a third party that the land and premises are now as shown on the plan.

The above advice was of course issued only to members. The plans are however being released, even sold to the public, by others. The Commissioner of the Freedom of Information and Protection of Privacy Legislation in the Province had issued in, 1994, an 'okay to release subject to copyright notice' directive to municipalities on the issue of over-the-counter sale(s) of these (copyrighted) Certificates of Location.

A few municipalities, some charging marked-up photocopying fees, commenced stamping the following statement on copyright documents when requested: "This copy is provided from City files pursuant to the Copyright Act. Additional copies may be available from the originator of this document". The Corporation office, following its then unsuccessful bid to stop the open release of these plans had suggested that a notice should read - "*This document is provided under the Freedom of Information and Protection of Privacy legislation and is pursuant to the Copyright Act. Permission is required of the originator for any reproduction, or further submission to any other party.*"

Recently, the City surveyor's office of the City of Vancouver issued an opinion directive to the manager of Permits and Licensing on the matter of release of Building Location Certificates to the public. The directive reads in part as follows: "*These certificates are, except in the rarest of circumstances, subject to copyright. The City has no authority for their release to any party. It is our belief that the practice should be stopped. Individuals making inquiries should be provided with the name of the land surveyor or the firm that prepared the plan, along with the file or marginal number and advised to contact the land surveyor. It is up to the requesting individual to make whatever arrangements they can with the particular land surveyor or firm. By releasing these certificates (besides copyright infringement) the City takes on certain liability associated with the misuse of these plans. The certificates are prepared for a specific purpose in mind. That purpose whether it be to provide certainty to the City that the dwelling meets setback siting, i.e. conformity to an approved design, a floor space requirement or to reveal any encroachments, ends after preparation of the document. The longer between the time the plan is prepared and the release of it by the City the greater the risk the property has changed either through a dedication, subdivision, re-zoning or alterations to the building or to one of its neighbours. The attrac-*

tion of a potential liability to the City is of concern. It is our opinion that release of the certificates should be stopped, however, they can be made available for viewing so as to determine who prepared them, when and under what circumstances.

The District of Chilliwack has just now given notice that they will no longer be able to provide copies of site surveys to the sellers of a property due to copyright issues.

The opinion of the Board of Management of the Corporation of British Columbia Land Surveyors, and its counsel, is that "Survey Certificates" for private transactions, whether in written or plan form are copyrightable by British Columbia Land Surveyors. A claim is not only for future value or a record resource, but is protection for the rights holder as well as an initial client on the proper use of the particular document. Although Freedom of Information allows a restricted release of works which are subject to copyright, by a (government) third party, municipalities and BC cities respect the land surveyor's claim to copyright.

July 9, 1999

Where do we go from here?

It is time to be pro-active with certificates, as a standard of practice not as a bylaw, as well as to provide service enhancements, and a choice for each land surveyor to control the destiny or whereabouts of his or her copyrighted building location survey work.

The public are entitled to expect BCLS competency and protection in that regard through licensing. A service must include a fiduciary duty. But there must be a fair and trustful relationship from a client as well. How do we build this mutual respect - the real estate sector needs assistance to restore some confidence in the community. Can we provide additional services through the promotion of real estate awareness vs. the lack of awareness caused by title insurance, etc.? Can we direct this consultation to all participants in land use, particularly the home owner or purchaser of real estate? A corporation managed registry of BCLS firms and names of land surveyors who have prepared Building Location Certificates on alienated parcels in the province would greatly assist this contact. As well as provide the means of product control for

each land surveyor. The registry would have to be description oriented, i.e. district indexed, coded with a survey date, file number, the land surveyor and/or a firm. Clear identifiers at the time of survey would be necessary for the record and to facilitate ongoing maintenance and continual updating.

There could be archival value in listing land surveyors to contact for information about sites which may have since been redeveloped; particularly if initially a site survey was done on an industrial petroleum storage area or former commercial gas station. The record system of contact to a land surveyor only could provide a lead in for any contaminated site review to be undertaken.

A "BLC" Systems program would obviously require a substantial amount of initial research and of course the support of all members and participating firms in the province. There is the possibility of royalties or generating future fees for members. And perhaps a registry access return for the corporation, subject to Revenue Canada rules, to offset operations, practice standards and implementation costs. ▀



I. W. Tweddell Memorial Award

Dean F. Berruti (left), presented the I. W. Tweddell Memorial Award on behalf of the association to Mr. Brennan Wiens, at the University of Saskatchewan Awards Dinner on February 1, 2000.

Natural and Artificial Boundaries

continued from page 10

defined by the plan, are to be taken as part of the description, just as though an extended description to that effect was in words contained in the body of the deed itself. Grasett v. Carter (1884) S.C.R. 105, per Strong, J. at p. 114.

In that particular case, however, the only description of the land in question was by reference to an old subdivision plan. The description mentioned no distances, bearings, monuments or adjoiners.

Yet a written description may prevail over a plan to which it refers or is attached. Provided the description is clear, unambiguous and defines the parcel boundaries with sufficient certainty, it will not be affected by any inaccuracy in the plan. In an earlier age, courts regarded a written description as superior to a plan and gave it priority, even when the description referred to the plan. This judicial preference arose partly because of the uncertainty of proving the plan to be an original, and partly because the manual copying of a plan was thought to be more susceptible to error than the copying of a

written document. Even under a land Titles registration system, situations will occur where the plan conflicts with the description. The problem then becomes one of interpreting the words of the description to see whether or not they override, or are subject to, the information shown on the plan.

The presentations at a seminar on survey law held in Calgary in November 1981 included a paper on natural boundaries in which the author offered the following examples of descriptions containing a reference to a plan:

1. All those portions of Section 12, Township 4, Range 5, West of the 4th meridian, not covered by the waters of the Lethargic River, which river is shown upon that certain map or plan of survey, dated [etc.].
2. All those portions of section 12, Township 4, Range 5, West of the 4th Meridian, not shown upon that certain map or plan dated [etc.] as being covered by the waters of Despondent Lake.

continued on page 33



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The Surveyor in His Legal World

Rules For Land Surveyors

By W.G. Robillard, reprinted as seen in *The Treasure State Surveyor*, January 2000 issue.

Rule One

To avoid liability the surveyor should err on the side of safety. Always try to do a little more than an ordinarily prudent surveyor would do under the circumstances.

Rule Two

It is the land surveyor's duty to correctly locate and mark property lines as described in a deed furnished him and to relate lines of possession to title lines. The surveyor cannot and does not assume the responsibility of proving that a given deed is correct and legal; that is a function of an attorney or court of law.

Rule Three

Search and search well! If it is there, find it. If it isn't, be able to say with certainty that it isn't there.

Rule Four

Liability results when the surveyor fails to do correctly the thing that he purports to do.

Rule Five

The surveyor is a fact finder. He goes upon the land armed with all the documentary evidence that is available and searches for markers, monuments and other facts. After all the evidence, facts, measurements and observations are assembled, the surveyor must come to a conclusion from the facts.

Rule Six

Never set a corner in disagreement with improvements without first satisfying yourself that you are *not only right*, but that your "right" will prevail in court if necessary.

Rule Seven

Discovery of a County Surveyor's monument does not relieve the surveyor of the obligation to look further. The County monument is only proof in the event that superior evidence cannot be discovered. Therefore, the surveyor must seek all other evidence and use the official monuments as though they were the last resort.

Rule Eight

The conclusions that flow from the evidence may produce proof. Evidence in itself is not proof of a fact; a conclusion or inference that may be drawn from evidence is the proof. In coming to conclusions from evidence, the most important need of the surveyor is the ability to recognize and know what is the best evidence of that available.

Rule Nine

The best evidence of a monument's original position is a continuous chain of history by acceptable records, usually written and dating back to the time of the original monumentation. A found monument without a background history is of little value as evidence; and, a set monument is worthless if unidentifiable in the future.

Rule Ten

In civil cases having to do with land surveying and real property, it is only necessary to prove a "preponderance of evidence;" it is not necessary to prove "beyond a reasonable doubt" as in criminal cases.

Rule Eleven

It is of the utmost importance that a surveyor seek

continued on the next page

A Good Party Chief

Reprinted as seen in *The Treasure State Surveyor*, January 2000 issue.

1. **Make every effort** to be at work every day and arrive at work soon enough to get your materials and people ready to leave the office for field work by work time.
2. **Be always a little suspicious** of using the controls set by others. Always check them out. Always have a way to check your work to make sure it is correct.
3. **Try to put yourself** in the person's place that is going to use the notes. Can your notes be plotted? Is the sketch properly oriented?? Have you gotten enough information such as roads (names of roads), houses, poles, trees, etc.? If you are not sure about picking up an item, go ahead and get it anyway. It is better to have too much information than not enough.
4. **Always remember that the company** you work for must make a profit to survive. For you to survive, the company has to make a profit. The type, kind, and amount of services you perform determined your status with the company.
5. **Do everything you can** to improve yourself. Take the attitude that someone is just about

to pass you on the road to success.

6. **Do not take for granted** that others have gotten permission for you to survey on private property. In each case, assume that it has not been done, contact the owner, state your business, and ask for permission to survey.
7. **After you have gotten per mission** to survey, be extremely careful about cutting line in the owner's backyard. It will be more noticeable in the summer than in the winter.
8. **Do not be afraid to tackle a job** that is tough or requires more experience than you have. If you are not sure how to do the job or what is wanted, ask questions. Remember that others have been in the same position you are in, and they got the job done by getting a few pointers along the way.
9. **If you will, take the attitude** of always giving more than 100 percent on any job. There is a great demand for dependable, aggressive, and hard workers. This type of person will always have a job, and will have very little difficulty finding one if the need arises. ■

The Surveyor in His Legal World

continued from previous page

and find all of the evidence at the time of the initial survey, and this must be done irrespective of costs. The major cause of disagreement between surveyors relates to the lack of discovery of all available evidence. If every surveyor uncovered all of the evidence, differences would be reduced to a minimum, and their surveys would have a finality of location!

Rule Twelve

A surveyor may be able to compute, make drawings, use instruments and stake engineering projects, but, until he understands property line law and the law of evidence, he is not qualified to make property locations. ■

What are Surveyors Worth???

By Robert A. Daniels NSLS, CLS, reprinted as seen in *The Nova Scotian Surveyor*, Winter/Spring 2000 issue.

This is an age-old question. At least it has been around since I can remember and that's getting up there. What surveyors charge for their services can be looked at from two different perspectives. The client often thinks they are paying twice as much as the surveyor is worth, while the surveyor believes they are charging only half of what they are worth. But then, this can be said of many things.

There is little doubt that most surveyors would like to receive higher remuneration for their services. They would also like to "knock some sense into the heads of those who are believed to be charging too little". However, any discussion about fees or charge out rates is avoided like the plague at any survey meetings I have attended. This is undoubtedly due to a certain level of intimidation by the Federal Competition Bureau. There are still vivid memories of the Feds swooping down on other survey associations and survey companies trying to prove price fixing.

Surveyors must recognize that the services they provide are not usually eagerly sought after by the public. People do not save their money to have a survey done in the same way they save to buy a new car or go on a trip. It is doubtful if a land owner will brag with pride to the neighbours about the fine survey they just had completed or proudly show pictures of the cut line and survey markers as they would with their vacation photos. Surveyors must recognize that their services are a necessity, not a luxury. Statutes at all levels of government have requirements for surveys. Many other professional groups, such as architects, engineers, lawyers and lending institutions also have a need for surveys. Without proper survey information, these groups would have difficulty approving, designing, building or financing projects related to land.

Many surveyors blame their financial misfortune on their competitors or their client's unwillingness to pay. In too many instances surveyors are told how to do their job by the client which often results in clear violations of the regulations. Other profes-

sions have professional practice standards just like surveyors. They adhere to their professional standards and they tell their clients how it will be done. Can you imagine the response if you tell your accountant how to do your year end audit, your lawyer how to handle a legal issue or your doctor how to diagnose or treat an ailment? Each profession offers a specialty service and has a level of expertise only they can provide, land surveyors are no exception. True professionals do not let others dictate how they will provide services for which they are ultimately liable.

Do not listen to your clients when they tell you they cannot afford the cost of a survey. Anyone who is seeking the services of a land surveyor either owns land that is worth money, is buying land that means they have money or developing land which means they expect to make money. Virtually every survey results in a financial benefit for the client and is needed for one reason or another. If the client owns land and wants the boundaries surveyed it is probably because they are selling it for financial gain, planning to increase its value by adding improvements or are trying to avoid an expensive or unpleasant confrontation with their neighbour. If the client is buying land, the survey is necessary to confirm the size, shape and location of the property. The survey will be used to justify the purchase price or to allow mortgage funds to be released to the client. If development is the plan, the client expects to use the survey information to enable the development to proceed, resulting in substantial financial gain. Surveyors are much too sympathetic when listening to the financial problems of land owners or developers.

Consider what would happen if all surveyors offering services to the public took the last two or three weeks of July as vacation. There would be no location certificates issued, no building references set, no lot stakings to allow improvements to be added to lots, no subdivision plans submitted and no topo-

continued on page 36



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Accurate Elevations from GPS

By Mark E. Meade, PE, PLS, CP, is vice president of Photo Science in its Lexington, KY, office. Reprinted with permission from *Point of Beginning*, February 2000 issue. Article and illustrations copyright by Point of Beginning.

GPS is a powerful tool used in control surveying. The ability of GPS to provide accurate horizontal positioning is well-documented. There is considerable debate and misunderstanding, however, regarding the accuracy of elevations derived from GPS observations.

It is true that GPS elevations are less accurate than the horizontal positions gained from GPS. In fact, GPS elevations generally have two to three times the error of horizontal positions gained from GPS. Even so, there is a tremendous value to the elevations provided by precise, carrier-phase GPS observations. These elevations have many uses in the surveying, mapping and engineering arenas.

Technological Improvements

If GPS can serve as a useful tool in establishing control elevations, why is there so much debate about the issue? The accuracy of GPS elevations is dependent on a number of factors, including the:

- accuracy of the baselines gained from the GPS observations;
- accuracy of the geoid model used in the conversion to orthometric heights;
- accuracy of the antenna height measurement above observation points; and the
- number, accuracy and geometric location of vertical control points within the network.

Much of the debate arises from factors that influenced the accuracy of GPS elevations during the early years of the system. During these years, carrier-phase receivers were single frequency, the number of operational satellites was significantly less than the full complement of 27 that we have today, and the geoid models available were less accurate than today's models. Each of these factors has a significant impact on the accuracy of GPS elevations.



Control Survey are almost exclusively performed with precise, carrier phase GPS observations today. In this case, the network point also served as an aerial target.

Dual-frequency GPS receivers are common today. They have significant advantages over their single frequency counterparts. By tracking both GPS frequencies (L1 and L2), a receiver is able to accurately determine the atmospheric effects and remove their impact from the GPS signal. Additionally, many of today's receivers are equipped with improved technology including effective multipath rejection and the ability to track weak satellite signals. We benefit through increased accuracy.

The number of satellites tracked by the receiver is also an important factor impacting accuracy. GPS achieved a full constellation of 24 satellites in June 1993 and Initial Operation Capability was declared by the Department of Defense later that year. (Today we actually have 27 operational GPS satellites.)

Why is this important? Baseline accuracy improves as a receiver tracks more satellites.

GPS observations result in elevations referenced to a mathematically perfect ellipsoid surface. An elevation referenced to this ellipsoid is known as a height above ellipsoid, or HAE. Mapping and surveying professionals, however, require elevations referenced to the geoid surface. These elevations are technically known as "mean sea level" elevations.

Geoid modeling provides us with the ability to accurately convert from ellipsoid to orthometric heights. A geoid model describes the vertical difference between the ellipsoid and geoid surfaces. The National Geodetic Survey (NGS) recently released its latest model, GEOID99. Earlier models included GEOID96, GEOID93, etc. Each new model has provided improvements over earlier versions and, therefore, better accuracy for the orthometric elevations gained from GPS.

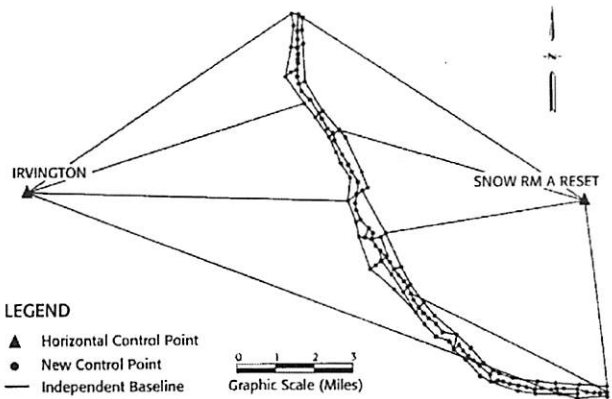


Figure 1. The network provided an ideal environment for testing the vertical accuracy of GPS. The differential elevations established at 60 of the network points (shown in red) were compared to the elevations provided by the GPS observations.

Accuracy Evaluation

One of the best ways to evaluate the accuracy of elevations derived from survey grade GPS observations is to examine the results from actual projects. In a recent control survey completed for the Kentucky Transportation Cabinet (KTC) in Meade County, Ky., the control was performed for the mapping of a section of new roadway. The GPS network encompassed an area extending approxi-

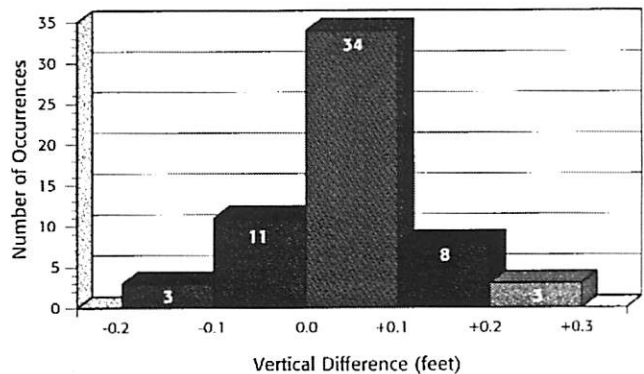


Figure 2. Distribution of vertical differences in minimally constrained adjustment.

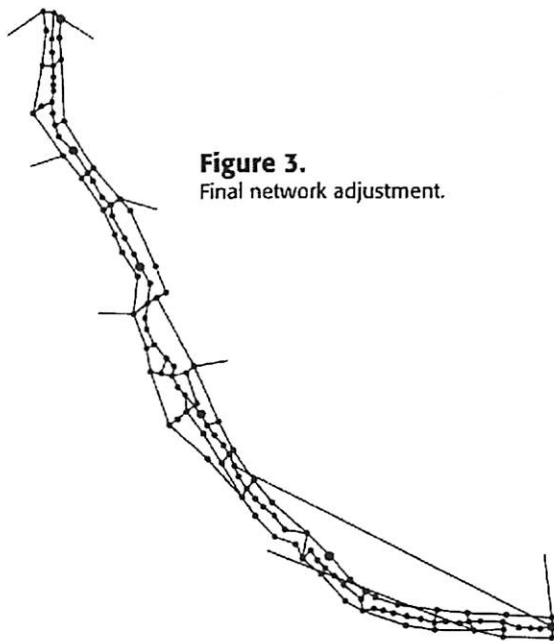


Figure 3. Final network adjustment.

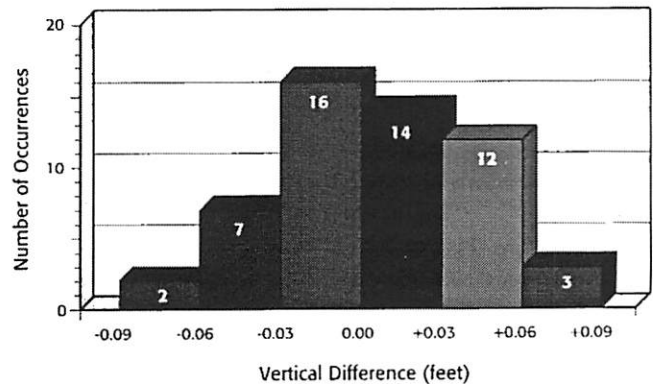


Figure 4. Distribution of vertical differences in final adjustment and evaluation.

mately 15 miles along the new roadway corridor. In addition to providing photo control positions for the mapping of the project area, the control points will be used for the design and construction surveys that follow.

The GPS network was established as a strong geometric figure with considerable redundancy (Figure 1, p. 25). Only independent baselines were processed with the GPS software. Dual frequency Trimble 4000 SSI receivers (Trimble Navigation Ltd., Sunnyvale, Calif.) were used. One-hour static observations were employed for the longer baselines. Rapid static sessions lasting 25 minutes were used for all remaining baselines.

At the same time, differential levels were used to establish precise elevations on 60 of the 126 network points.

A Leica NA2002 (Leica Geosystems Inc., Norcross, Ga.) digital level was used for all level runs. Third order procedures were used. Two NGS first order, Class 11 benchmarks provided the control for tile level runs.

The project environment was ideal for the comparison of differential versus GPS elevations since so many network points had elevations established by differential levels. In the initial analysis, only one of the 60 known vertical points was held in the network adjustment. For the final evaluation of the vertical accuracy, six of the 60 network points were held fixed within the GPS network. In both cases the remaining known vertical points were allowed to "float" within the final solution. The orthometric elevations derived from the GPS network for these points were then compared to the elevations gained from the differential level runs. The differences between the two sources of elevation data are detailed in the analysis.

Minimally Constrained Adjustment

The integrity and reliability of a GPS network can be evaluated by performing a minimally constrained adjustment and comparing the values of all known control points used in the network with their positions obtained from the GPS network. In a minimally constrained adjustment, only one horizontal and one vertical control point are held fixed. The position of all other network points is determined from the GPS observations.

In the case of the Meade County project, the horizontal position of a Kentucky High Accuracy Reference Network (HARN) point and the vertical position of one of the known vertical points lying near the center of the project were held fixed in the minimally constrained adjustment.

The minimally constrained adjustment proved the network would provide reliable position data. The vertical differences between the GPS elevations and the elevations derived from the differential level runs ranged from -0.13 to +0.21'. These results were very strong considering one point was used to control a network extending some 15 miles in length. The distribution of the vertical differences is shown in Figure 2 on page 25.

While these results are impressive, any control network must make use of more than one fixed horizontal and vertical control point. In fact, the Federal Geodetic Control Committee (FGCC) requires a minimum of two horizontal and four vertical control points in a final network adjustment for C-order (the lowest order) GPS control.

Final Adjustment and Evaluation

For the final evaluation, both known horizontal and six vertical control points were held fixed in the final network adjustment (Figure 3, p. 41). Since differential elevations were established at 60 network points, 54 points were used in the evaluation of the vertical accuracy.

Again the differences between the differential and GPS elevations were determined. As expected, these differences improved substantially from those found in the minimally constrained adjustment. The differences ranged from -0.08 to + 0.09' as shown in Figure 4 on page 25.

The standard deviation of the vertical differences was 0.04'. Theoretically, 68 percent of the differences will fall within plus or minus one standard deviation (this is known as the one sigma error). In other words, we should expect 68 percent of our GPS elevations to fall within 0.04' of their true elevation. The probability increases to 95 percent at the two sigma level (two standard deviations). In other words 95 percent of the GPS elevations should fall within 0.08' of their true elevation. In this example, only one of the GPS elevations differed by more than 0.08'.

continued on page 36

Checking Distances by Pacing

By Wesley G. Crawford, a professor of building construction management at Purdue University. Reprinted with permission from *Point of Beginning*, February 2000 issue. Article and illustrations copyright by Point of Beginning.

Since I began writing Back to Basics, I have debated whether to write an article on the most fundamental measuring method used by the field surveyor—pacing. But after hearing a few stories about layout mistakes that easily could have been caught by the simple pacing of a length, I decided it was time to discuss this important topic. Pacing seems so simple that one might wonder what could be said in more than a sentence that would be of any importance. I believe I have found a way.

Pacing may have been the first measurement method used by mankind to intentionally determine a distance. It was probably used as some part of our species' survival as we hunted and searched for food. As time passed and people began to grow crops, pacing was undoubtedly used to determine sizes of fields or the amount of wood needed for fences. People recognized that pacing wasn't accurate enough for their needs, and eventually measuring equipment evolved from ropes to chains, to tapes, etc. As they say, "The rest is history."

Using Pacing for Determining Location

With the wide use of total station equipment and the emergence of GPS, one might think that pacing would go by the wayside like the rope and chain. However, that is far from reality. Pacing may be used more now than ever for approximate distances and for checking layout. Pacing is not for precise and accurate work, of course, but for those times when rough determination of location or distance is sufficient. In total station surveying, when laying out points, pacing is often used on nearly every shot taken. 0

Pacing allows the rod person to be more efficient by getting reasonably close to where the

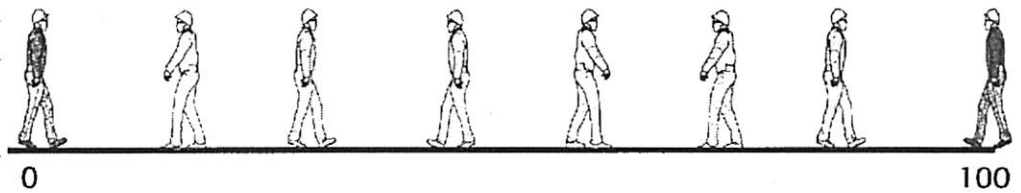


Figure 2. Determining the average pace length.

point will be located. If the rod person's pacing is relatively accurate the number of shots needed to set points will be decreased, thus saving time and money. In GPS surveying, pacing is also useful when walking from point to point and preparing for the next location.

Number of Paces Divided

$$\text{by Distance Paced} = \text{Length of Pace}$$

Using Pacing to Check Work

In addition to determining rough locations of points, pacing can be used to quickly check points that have been placed by high-tech surveying methods. After points have been located by the total station or GPS, it is good practice to "change technology" and measure known distances between the points

continued on page 30

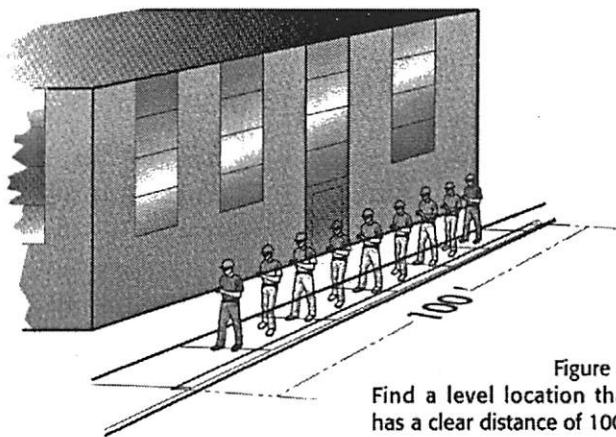


Figure 1. Find a level location that has a clear distance of 100'.

Test 1 = 38	→	Average = 38
Test 2 = 37.5	←	
Test 3 = 38.5	→	
Test 4 = 38	←	
		$\frac{100}{38} = 2.63'$ pace length

The Time Systems of Geodesy and Surveying

By James P. Reilly, Ph.D. who serves as head of the Department of Surveying at New Mexico State University, College of Engineering, in Las Cruces. Reprinted with permission from *Point of Beginning*, March 2000 issue. Article and illustrations copyright by Point of Beginning.

*"What, then, is time? If no one asks me,
I know what it is. If I wish to explain it to
him who asks me, I do not know.
-Saint Augustine*

Most of us, whether we admit it or not, have our lives run by the clock. We have to be at work at 8:00 a.m. and quit working at 5:00 p.m., usually with a lunch break from 12:00 to 1:00. My life is more complicated. I teach classes at a university where the start and stop times of each class are "firm." I also fly on airplanes more than the average person; planes wait for no one, and I have to change the time on my watch when I cross into another time zone.

In addition to my wrist watch, my home has five cuckoo clocks, five wall clocks, two mantel clocks, a clock radio, and clocks on the VCR, digital cable box, stove and microwave. All these clocks and the wristwatch are set to Mountain Standard Time at this time of the year, which is seven hours behind the time at the Greenwich meridian in England.

All my clocks, and yours, run on "Solar Time." The Earth rotates around the sun's North-south axis, making approximately one revolution every 24 hours of solar time. Note the word "approximately." We mentioned this in an earlier article, but it bears repeating: the general public expects the sun to be directly overhead at noon each day. That's impossible; people living in Philadelphia would have a different time on their clocks than people living just a short distance to the west in Harrisburg, Pa. Since the Earth rotates approximately 360 degrees every 24 hours of solar time, dividing 24 hours into 360 degrees gives the following:

$$\frac{360 \text{ degrees}}{24 \text{ hours}} + \frac{15 \text{ degrees}}{1 \text{ hour}}$$

To make timekeeping more convenient, the world time services developed Standard Time Zones, each approximately 15 degrees in width, where the time is the same everywhere in that zone. As you move further west and cross another time zone line, the time decreases by one hour. You can now travel from Philadelphia to western Indiana before a new time zone is encountered.

The origin of the time zone system is at the meridian that passes through the Greenwich Observatory in Greenwich, England. This meridian is zero degrees longitude. This is the central meridian of the Greenwich Time Zone; the zone extends from 7.5 degrees east longitude to 7.5 degrees west longitude.

Time in the Greenwich Time Zone has several names, the most common being Universal Time. It's also called Greenwich Mean Time and Zulu Time. As you travel east from Greenwich, the time zones increase their times by one hour for each 15-degree zone, and travelling west, the time is decreased one hour for each zone. The zones have names: Eastern Standard Time is centered on 75 degrees west longitude and is five hours behind Greenwich (-5^h). The Central Standard Time Zone is centered on 90 degrees west longitude (-6^h). At 180 degrees west longitude (180 degrees east longitude), is the International Date Line. The time in the zone just to the west of this line is one day ahead of a point in the time zone to the east of the line. Television watchers noticed this phenomena at midnight on Dec. 31, 1999. Sydney, Australia, (+ 10^h) celebrated the New Year before Tokyo, Japan, (+

9^h) and each hour later another area of the world joined the celebration. Fifteen hours after Sydney reached midnight, it was midnight in New York. The state of Hawaii (-10^h) celebrated the New Year 20 hours after Sydney.

Most time zones are not exactly 15 degrees in width. In the United States, time zones follow county lines. The International Date Line zigs and zags around the 180 degree meridian. The state of Alaska is covered by only one time zone, but at that high northern latitude, 15 degrees-of-arc isn't that great a distance. If you were watching the New Year's celebration on television, it was announced that some time zones change time by one-half hour. There are 30 time zones in the world, not 24. If you are interested, an excellent map showing all zones can be seen on the Web at http://aa.usno.navy.mil/AA/faq/docs/world_tzones.html.

After all this discussion about time, what time system described above is used for geodesy and surveying? None—except for a modified version of Universal Time. In the 1930s, it was discovered that the Earth does not rotate at a constant rate. More precise measures of time can be made by observing atomic or dynamic processes. There is now a family of time scales, with precise technical definitions, that replaces what was once simply called Universal Time.

International Atomic Time (TAI) was introduced to meet the requirements for an easy accessible and strictly uniform time scale. The definition of the second of the atomic time was worded by the 13th conference of the International Committee of Weights and Measures in Paris in 1967, as:

"The second is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the Cesium 133 atom." This is also the definition of the unit of time of the International System of Units (SI).

Terrestrial Dynamical Time (TDT) is the time

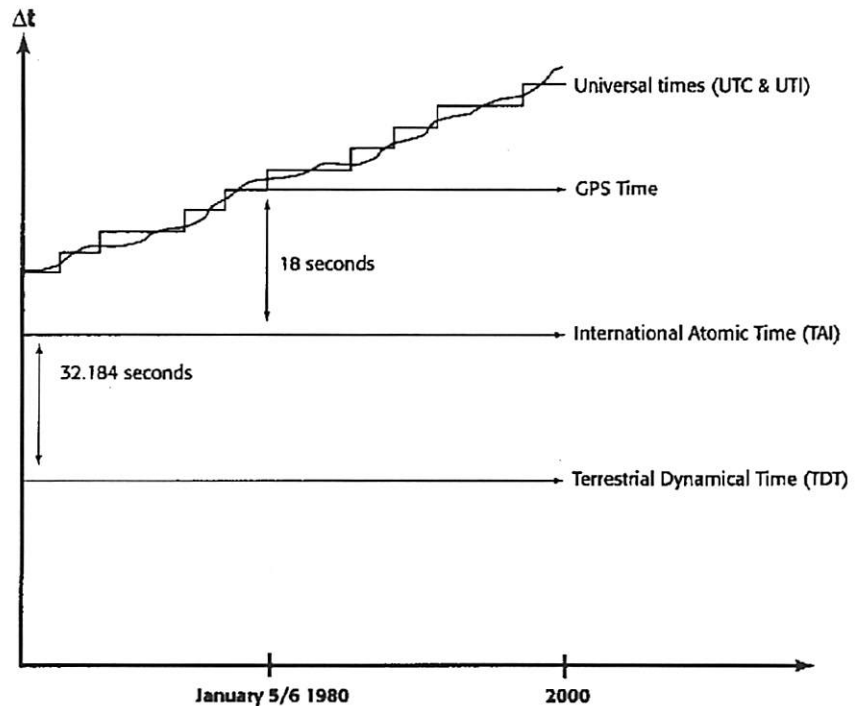


Figure 1. Times in Geodesy and Surveying. In this figure, Δt is decreasing in the direction of the arrow. TDT is 32.184 seconds.

scale that would be kept by an ideal clock on the geoid—approximately sea level on the surface of the Earth. Since its unit of time is the SI second, TDT is independent of the variable rotation of the Earth. In practice, TDT is derived from TAI a time scale kept by real clocks on the Earth's surface, by the relation $TDT = TAI + 32.184$ seconds. It is the time scale now used for the precise calculations of future astronomical events observable from Earth.

Universal Time 1 (UT1) is a time scale based on the rotation of the Earth. UT1 is related to TDT by the formula $UT1 = TDT - \Delta t$, where Δt is determined from astronomical observations. In current practice, UT1 is defined by its relationship to sidereal time, an observable quantity. Since we cannot accurately predict the future behavior of the Earth's rotation, there is always some uncertainty in extrapolating UT1 into the future. Because predictions of Δt are necessarily imprecise, UT1 cannot be used for high precision calculations for future dates.

Coordinated Universal Time (UTC) is transmitted by time services as the basis of international civil timekeeping. In the United States, UTC is broadcast by radio stations WWV in Fort Collins,

Colo., and WWVH in Hawaii at 2.5, 5, 10, 15, and 20Mhz. UTC, sometimes referred to as a compromise time scale, was introduced in 1972. It is a hybrid time scale; its rate is the same as that of International Atomic Time (TAI), but its epoch is occasionally adjusted in one-second leaps, called leap seconds, to keep it within 0.9 seconds of UT1. The leap seconds are added on June 30 or December 31, as needed.

Global Positioning System Time (GPS Time) is the time on the atomic clocks in the GPS satellites. It differs from UTC by an integer number of seconds. GPS time equated UTC at midnight Jan. 5/6, 1980. GPS time is not incremented by leap seconds, so the difference between the two times is increasing.

Figure 1 is a graph showing the times mentioned above. The leap seconds applied to UTC are due to the fact that the rotation rate of the Earth is slowing down.

Local Civil Time (LCT) has the same meaning as Universal Time, and is a form of Standard Time. Local Civil Time is the time at the meridian of the observer. This is the time needed by surveyors when making observations on the Sun or Polaris for the determination of azimuth. It can be calculated as follows:

Assume you are observing azimuth at a point whose longitude is 106° 15' west longitude, and at the time of observation, UTC is 8^h 15^m 00^s.

$$LCT = 8^h 15^m 00^s - \frac{106^\circ 15'}{15^\circ} = 8^h 15^m 00^s - 7^h 05^m = 1^h 10^m$$

Notice that the longitude divided by 15 degrees is expressed as units of time. In this case we are in the Mountain Standard Time Zone where MST is equal to UTC -7^h, which is 1^h 15^m.

What times are important?

For azimuth determination, it's LCT, which must be calculated for the meridian of your position. But you really need to find LCT from UT1 not UTC. UT1 can be calculated by the equation, $UT1 = UTC + DUT1$.

DUT1 is given by radio stations WWV and WWVH, but you have to listen for the value. When they are broadcasting, the announcer gives the time every minute as follows: "At the sound of the tone, the time is XX^h yy^m Coordinated Universal Time." There is a pause, then a loud beep indicating the time. You must listen carefully; if the value of DUT1 is positive (to be added to UTC), there will be "double ticks" starting at the one-second tone. Count these ticks; there can be no more than seven. Each tick is equal to 0.1 seconds of time. If there are four double ticks, $DUT1 = +0.4^s$. If DUT1 is a negative value to be subtracted from UTC, the double ticks start at the nine-second tone.

For GPS, UTC is the time basis. My experience with GPS is that the time displayed on the receiver is UTC, even though the satellite clocks are running on GPS time.

The only time I missed in this article was Sidereal Time, but most of the readers of this article have no need for that time in today's world. e

Checking Distances by Pacing

continued from page 27

by using a tape or pacing. If a building has been staked and a plan dimension of 200' has been laid out, pace the distance to be sure it is about 200' and not 210, 220 or 300, which would indicate a major mistake. Pacing will not determine small errors, but it will point out large mistakes.

$$\text{Length of Pace} \times \text{Average Pace} = \text{Distance}$$

Determining Your Pace Length - Walk Naturally

A person's average pace length can be determined by counting the paces necessary to walk a distance that has previously been measured more precisely (i.e., with a steel tape or total station). For most people, pacing is accomplished most satisfactorily when taking natural steps. Some others like to try to take paces of certain lengths (e.g., a length of 3'), but this method is tiring for long distances and usually gives results of lower precision.

As horizontal distances are necessary in construction, some adjustments should be made when pacing on a sloping ground. With a little practice, a

continued on page 36

Fixed Fees

By Jon Cowan, LS, reprinted as seen in *The Quarter Post*, Winter 2000 issue.

What we envy most about lawyers is not what they do for a living but the fact that they often make a good living at it. The law is all public domain information, so you'd think there would be more do-it-yourself activity. Over the years most people have realized that they are doing themselves a favour by having an expert handle their legal affairs, and the legal profession has capitalized on this by charging for the expertise. What is the difference between "expert" land surveyors and "expert" lawyers? Not a whole lot other than the fact that lawyers make it clear how and when they are going to get paid. The same is true of real estate agents, the first thing they do when accepting a listing is to get a contract signed that makes it clear that they take a percentage off the top of the sale.

The goals of a land survey do not necessarily include the sale of land or resolving legal issues but do definitely involve professional judgement and all-too-often strenuous exercise of both brain and brawn. Surveyors need an equitable method of compensation for those activities. We also need compensation for the very considerable expense of new technology and training to utilize it. Hourly fees that reflect the true cost of surveying tend to cause uncertainty, especially when we seldom know in advance how long a project will take. If we tell a client that we charge \$75 per hour and that his survey plans could be ready in two weeks, the client is likely to do a little quick math. The numbers might look something like this, 2 weeks x 40 hours = 80 hours: $80 \times \$75.00 = \6000.00 . They don't stop to think that you have a dozen other projects going at the same time. Meanwhile the surveyor is thinking, "This project is obviously very important to this potential client, I'll try and fit this job into the schedule somehow, but it will take two weeks and some luck to find the time to get it done. If all goes smoothly this survey should cost around \$2,000." If the surveyor utters the number that has just flashed into his mind, that is all he can get for

the work, so we have a problem. The client thinks the cost is too much without the surveyor even giving a quote, and the surveyor hasn't had time to think about it all.

The longer I've been at it, the more I like the idea providing a fixed fee cost for a survey. This strategy requires a fee consultation with the client and usually some time spent doing reconnaissance of the land in question. The consultation provides the surveyor with good opportunity to discuss why the survey is needed and point out what the difficulties might be. Often the client tells us how easy it is going to be, but if you start asking questions, they soon realize that there is much more to it than they thought. One good tactic is to always try to do the consultation at your office. When they see how burdened you are with other work, they should start realizing that it is a sellers market, and the amount they are going to have to pay is going to be considerably higher than they were thinking. While in your office they can start getting an idea of the capital outlay involved in land surveying. I give a mini tour showing them lots of neat gizmos that cost lots of money. Show them the CADD system, and let them know how hard it is to master. Tell them about total stations, and data collectors, and vague property descriptions. Let folks see that a larger part of our product is developed in the office.

It's important to resist giving a cost estimate during the initial consultation. We all need time to digest what a survey will require, instead offer to send a written quote. If you choose to take on the project, take time to consider all the time and expertise that will have to be brought to bear to complete it. My method, probably not the best, is to sit down with a pad of paper and a calculator and work out how many hours of time is likely to be used for each phase of the survey and which personnel will likely be involved. I then multiply the expected hours for each person by 2.5 times their salary to arrive

at a base figure. After reflecting on that figure and the apparent value of the work that will be done, I make adjustments. On a high value or high risk project I generally add a premium to the number arrived at based on hour estimates.

When sending out a proposal, I make the survey sound like a lot of hard work, because it will be. I also ask for 50% of the total cost in advance, as a retainer. If they don't send it, we don't do that job. If they do send it, we get going and eat the fee. The other rule is to get the balance due before the plans of final product is delivered. This isn't always possible, for example with construction stakeout, but it is with boundary surveys and subdivisions.

As a surveying business striving for professional standing, we should keep two things in mind. The first is that we need to deliver a professional service. The second is that we need to make money doing it. I give the highest quotes I can ask for. Some customers walk away from it, but if they don't need us, we don't need them. I'd rather spend a couple hours sitting at my desk writing up a proposal and have someone decline to send the retainer than spend hours trying to collect a fee after

the work has been done. Few things are more discouraging than to be working hard on a survey without adequate compensation when others are waiting to pay a fair price for those same efforts.

Giving high quotes has another benefit. If you have the budget to do a thorough and professional job, your risk level goes way down. Have you ever noticed that it is those quick and dirty surveys (read cheap) that come back to haunt everyone.

I saw Roger Thrall recently, he has severed his ties with land surveying by letting his licenses lapse and has landed a job with a firm that does railway planning. Roger says that it was surprising how well received he was during job interviews because of his experience as a self-employed land surveyor. To employers trying to fill executive positions, the land surveyor symbolizes a self-starter who can handle tough situations, watch the bottom line, unravel mysteries and get things done. It was slightly unnerving to hear him say that his starting salary is much higher than he ever made as a surveyor. If others value our skills so highly, then we should certainly collect on that. Just do it. Raise your fees, and start cashing in on your expertise. e

Things Are Tough All Over

Reprinted from *The Nova Scotian Surveyor*, March 1962, Volume 12, Number 30

In reply to your request to send a cheque for my dues, I wish to inform you that the present condition of my bank account makes it almost impossible. My shattered financial condition is due to Federal laws, State laws, county laws, city laws, corporation laws, liquor laws, mother-in-laws, brother-in-laws, sister-in-laws and outlaws.

Through these laws I am expected to pay a business tax, amusement tax, head tax, school tax, gas tax, food tax, furniture tax and excise tax and even my brains are taxed. I am required to get a business license, hunting and fishing license, car license and truck license, not to mention a marriage license and a dog license.

I am also required to contribute to every society and organization which the genius of man is capable of bringing to life: to Women's Relief, the Unemployment Relief and the Gold Diggers' Relief. Also to every hospital and charitable organization in the city.

For my own safety, I am required to carry life insurance, unemployment insurance, old age and fire insurance.

My business is so governed that it is no easy matter for me to find out who owns it. I am inspected, expected, disrespected, rejected, defected, examined, re-examined, informed, required, summoned, commanded and compelled until I provide an inexhaustible supply of money for every known need of the human race.

Simply because I refuse to donate to something or other, I am boycotted, talked about, lied about, held up, held down and robbed until I am almost ruined. The only reason I am clinging to life at all is to see what the hell is coming next!

I can tell you honestly that, except for a miracle that happened, I could not enclose this cheque. The wolf that comes to many doors nowadays just had pups in my kitchen. I sold them and here is the money. e

Natural and Artificial Boundaries

continued from page 19

In that author's opinion, the first example describes a natural boundary that may move over time. The second example, according to the author, describes a boundary on a plan which is a mere artificial line and not a natural boundary, even if the two were intended to be about the same. In the second example, therefore, the author believed that the artificial line on the plan governed the location of the boundary, regardless of any movement of the lake shore.

Although there are obvious grammatical differences between the wording of the two examples, those differences are too slight and subtle to support the author's assertion that in the second example the plan, not the actual location of the lake, fixes the boundary. The Privy Council in *Southern Centre of Theosophy* emphasized that the doctrine of accretion and erosion can be excluded only where the intention to do so is clearly shown. It is submitted that the second example lacks the clarity needed to support that intention.

Discrepancy between actual and plan acreage

The Alberta case of *Hextall v. Burns* (1911), 38 W.W.R. 422 is noteworthy.

First, because it represents a judicial recognition of a written description and the consequent rejection of a conflicting plan. Second, because the case went unreported for over 50 years.

Hextall's certificate of title showed him to be the registered owner of the part of the west half and the S.E. quarter of Sec. 35, Twp.24, Rge. 2, W 5, lying west of the right bank of the Bow River, "as shown on a plan of the township made by E. Deville, Surveyor General of Canada." According to this plan and other documents, Hextall owned 130 acres in the south half of the section.

The Registrar refused to accept Hextall's plan of subdivision because it placed the Bow River in a different location than that shown on the official township plan, thereby increasing the area of Hextall's land from 130 to 160 acres.

Mr. Justice Stuart of the Alberta Supreme Court found Deville's plan to be in error with respect to its location of the Bow River. Because the wording

of the grant to Hextall was unambiguous, it overrode the river's delineation on the plan. Hextall had occupied without question all the land in the west half and S.E. quarter of section 35 that lay west of the actual bank of the river. The court held him entitled to this land, notwithstanding the consequent alteration of recorded acreage. The court also ordered the reference to Deville's plan to be expunged from Hextall's certificate of title.

In reaching his decision, Mr. Justice Stuart cited with approval *Horne v. Struben*, [1902] A.C. 454, an appeal from the Supreme Court of the Cape of Good Hope heard by the Judicial Committee of the Privy Council. Lord Robertson, on behalf of the appellate court, said, at page 458, that where ... "*the diagram contradicts the unambiguous text of the title, it must give way to the text. The words in the grant which introduce the diagram are, 'as will further appear by the diagram framed by the surveyor' Now, as a matter of construction, this is merely an appeal to the diagram for further elucidation, and not a subordination of the text to the diagram.*"... Mr. Justice Stuart held that ... "*the boundary intended by the patents is quite evidently the actual bank of the river and the mere fact that a further elucidation is attempted by a reference to a plan admitted to have been incorrectly drawn is quite insufficient in my opinion to justify the court in interpreting the grants as really meaning and intending to convey the land, not according to the plan and definitely fixed physical boundary referred to, but according to an arbitrary line erroneously called the river bank, which is not, in fact, upon the ground a river bank at all.*"...

In *Hextall v. Burns*, no evidence was adduced to show that the Bow River had altered its course since the township plan was drawn, so no argument regarding the possibility of accretion was presented.

Physical and plan evidence

Rockland Holdings Ltd. v. 309458 Alberta Ltd. is a disturbing case heard by the Alberta Court of Queen's Bench in 1987. The case was not published in the law reports and a transcript of the proceedings is no longer available from the court reporters. Fortunately, the judgment delivered orally by Mr. Justice Hope has been preserved verbatim by G.K. Allred, ALS in ALS News, Summer 1990,
continued on the next page

Natural and Artificial Boundaries

continued from previous page

pp.20-21. The Rockland case bears some similarity to *Hextall v Burns*, for it also concerned a watercourse (Sheep Creek) that crossed a township section. A quarter section (NE22-20-29-4) was divided into two parcels held under different ownerships, the parcels being described respectively as lying north and south of Sheep Creek as shown on the township plan dated August 1, 1892.

Although the court found from the evidence that the township plan correctly represented the location of Sheep Creek at the points where it crossed the quarter section's east and west boundaries, the parties disputed the course of the creek between those boundaries. It appears from the judgment that the court, in emphasizing the principle of indefeasible title, expanded that principle to include extent of title. In the court's view, to grant either the plaintiffs' or the defendants' requests would destroy the indefeasible title principle, and require investigations behind the register that even included going to Ottawa to search archival records and surveyors' field notes. In Mr. Justice Hope's opinion, the township plan, drawn to scale, enabled a person to ascertain the true boundaries of the two parcels:

To preserve the indefeasible titles of the Torrens system the north boundary of the plaintiff property and the south boundary of the defendant's property is set by a readily available filed plan. Their property remains the same regardless of the movement of the river unless the principle of adverse possession applies. The judge went on to say that even if he were wrong in rejecting the application of accretion: I would find that the evidence presented here is so vague or nebulous as to site and time and as to delineating whether it is accretion or avulsion that it is not possible to give effect to these principles. Nor did the court find any evidence to support a claim of adverse possession to the disputed land. In cases of this kind, it is essential to adduce evidence to show whether a natural boundary has moved as the result of accretion or has remained unchanged because of avulsion. But *Rockland* is an unsatisfactory case, in which the court gave unwarranted priority to a township plan over an unambiguous description, mistook the principle of indefeasible title, failed to determine the probable cause of the creek's movement to its

present location if indeed it had moved, and ignored judicial precedent.

Conclusion

Perhaps to avoid the possibility of further confusion, the court in *Hextall v. Burns* ordered the reference to the township plan to be expunged from *Hextall's* certificate of title. Yet to identify a plan that facilitates the legal description of subdivided land is not necessarily redundant. Even when the description is clear, its accompanying plan can provide a useful illustration of a township layout, for example, particularly in instances where fractional or other irregular sections occur. A reference to the plan's date and the name of its approving authority also removes the uncertainty of identification in those situations where the official plan amended or replaced a previous plan.

Disputes concerning the interpretation of written descriptions and their conflict with accompanying plans may require settlement by the courts. But the land surveyor can offer expert opinion to clients or prospective litigants concerning the physical evidence of natural and artificial boundaries. In situations where the surveyor prepares a new written or graphical description of a natural water boundary, appropriate wording or notation should be used to make it clear whether the actual bank or shore, as it may move periodically, is intended to form the legal boundary, or whether the intention is to fix the boundary permanently in its artificial location on the plan.

The effect of accretion or erosion may mean that the description of a registered parcel no longer reflects the present location of a natural boundary.

In Alberta, the owner of a parcel with a natural boundary that adjoins land owned by the Crown, and who wishes to amend the description accordingly, may apply to the Registrar under section 90 of the Land Titles Act. Any such application must be accompanied by a plan of survey or by other evidence satisfactory to the Registrar. It also requires the consent of the registered owners of parcels that may be adversely affected by the amended description, and the consent of the Minister administering the adjoining land in cases where the Crown is not the applicant. e



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Under My Personal Delegation

continued from page 15

mize the recurrence of these shortcomings in the future. In plain English: exercise more personal supervision, direction and control over your staff.

In conclusion, I would urge all members of our Association to exercise their professional privilege; bleed a little red ink on those check plots; rescue your shovel from the garden shed and see if your field personnel are as good at locating evidence as you are; and finally, honestly answer the following question:

Are legal survey operations being carried out in my organization in such a manner that I am *certain* of their correct execution? ▢

What are Surveyors Worth???

continued from page 22

graphic plans prepared. This would have a serious impact on land development. Much of the business of lawyers, engineers, architects, realtors, construction companies, lending institutions would be delayed. Millions of dollars in financing would not be released causing financial losses for many. The services provided by surveyors have more impact on the economy than many realize.

If you are not making money it is not because your competitors are charging low fees, it is because you are not charging enough. Your income is a direct result of what you charge, not what your competitor charges. If your company is not making a profit, spend your time and energy improving how you do business, not fretting over what the competition is doing. You have control over what you do, you do not have control over what your competition does. There is no law that says you must take every survey job that comes your way. Be selective, spend your time on projects and with clients that will result in a reasonable profit. Leave the headache clients and the unprofitable jobs to those who wish to work for nothing. Clearly the financial constipation endured by many surveyors is a result of the actions of our own members and cannot be blamed on others.

In the words of Walt Kelly, creator of the Pogo comic strip, "We have met the enemy and he is us." ▢

Accurate Elevations from GPS

continued from page 26

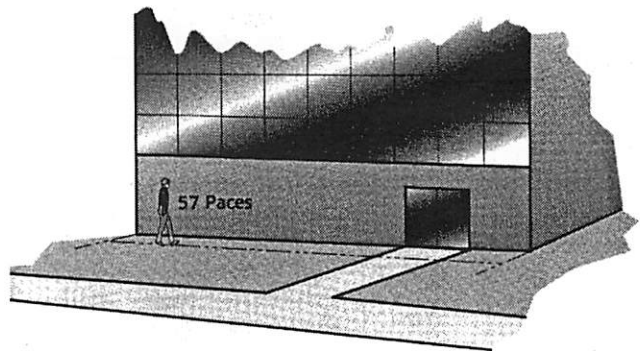
Conclusion

The results from this project were especially enlightening. Admittedly, these results are from a single project. They are, however, typical of many other precise GPS control networks that I have worked with using the same GPS planning and observation methodology. What conclusions can be drawn? Elevations derived from GPS observations are sufficiently accurate for even the most demanding photogrammetric mapping projects. Moreover, GPS elevations are appropriate for many other control applications in the surveying and engineering arenas.

Perry Semones, survey coordinator for the KTC, knows the value of GPS elevations. "We have a lot more confidence in vertical components obtained from GPS today," he said. "The results can be truly amazing when the technology is applied correctly." ▢

Checking Distances by Pacing

continued from page 30



57 x 2.63 = 150' Building

Figure 3. Calculating building dimensions.

person can pace distances with a precision of roughly 1:50 to 1:200 depending upon the ground conditions. I have seen exceptional persons who have paced at a precision of almost 1:500.

Select a location that is level and has a clear distance of 100'. (See Figure 1 on p. 27) Lay out a 100' cloth tape on the ground, or shoot the 100' distance with your total station.

continued on the next page

Checking Distances by Pacing

continued from the previous page

Some individuals count each step as a pace, and others count only their right or left footsteps. It really doesn't matter which method is used. Just be consistent: one pace counted for every right and left step taken or one pace counted every time the right foot steps down.

Walking naturally, pace between the end points of the chain at least four times. Record half- or even quarterpaces if it is possible to determine your pace that closely. Record this distance in your field book for future reference.

Determine the average number of paces and divide it into the 100' distance to determine a pace length. (See Figure 2 on p. 27)

Develop Confidence in Pacing

To gain confidence in your pacing ability, pace along the sides of a building and calculate the building dimensions by multiplying your pace length by the number of paces you recorded. (See Figure 3 on p. 34) Use a chain to measure the dimensions of the building to check your paced distance. Repeat by pacing lengths you can later measure. Continue this practice until you can pace distances to a precision of 1' in 50'. With some practice, you'll be able to pace quite accurately.

Have Fun Pacing

Commit your pace length when walking naturally to memory so you can use it anytime you need a quick check of a distance. Use it for checking your work regularly. Or, if you aren't in the field, often you will find it helpful for recreational activities. I use pacing all the time when hunting to check distances to targets. Knowing a distance within a pace while bow hunting can be the difference between a bull's eye and missing the target. Have fun pacing. ▀

Prefer a loss to a dishonest gain;
the one brings pain at the moment,
the other for all time.

- Chilton

Nickel-Cadmium & Nickel-Metal Hydride Cells

Can you Upgrade an Existing Battery?

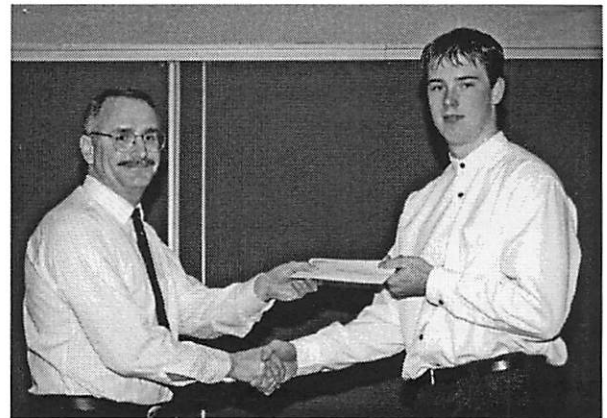
continued from page 13

If in doubt, don't do it, the overall cost may be more than the potential benefits. One further point: NEVER mix nickel-cadmium and nickel-metal hydride cells in the same battery. If the cells should vent, oxygen and hydrogen gasses would be released creating a potentially explosive situation.

For more in-depth information consult reference books on batteries such as the *Handbook of Batteries*, edited by David Linden, McGraw Hill publishers, ISBN 0-07-037921-1 or refer to our other battery articles. Also of interest are articles available through searches on the Internet. One such article is available at <http://www.byte.com/art/9506/sec9/art6.htm>.

As always if you have any questions or would like to contact us you may do so at: Ingenuity Inc. 1562 Linda Way Sparks, NV 89431 Voice (775) 359-6671, FAX (775) 359-6693 or email dcrook@ingenuityinc.com Website: <http://www.ingenuityinc.com>.

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The Saskatchewan Land Surveyors Association Award

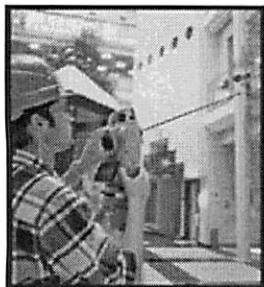
D. M. (Don) Williams made the award presentation to Mr. Shawn Gordon Link, of the Geomatics Engineering Technology program on December 1, 1999.

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SLSA Calendar

March to August 2000

March

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	

CIG AGM (March 8-10)
GIS 2000 - Toronto (March 15-17)

April

						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

ALSA AGM (April 13-15)
Good Friday (April 21)
Easter Sunday (April 23)
May 29 - June 2 GeoCanada 2000

May

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31					

Victoria Day (May 22)
SLSA AGM Waskesiu (May 30-31)

June

	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
16	17	18	19
20	21	22	23
24	25	26	27
28	29	30	

SLSA AGM Waskesiu (June 1-2)

July

				1	2
3	4	5	6	7	8
9	10	11	12	13	14
15	16	17	18	19	20
21	22	23	24	25	26
27	28	29	30	31	

Canada Day (July 1)
21 - 25: 22nd Canadian Symposium on Remote Sensing - Victoria

August

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31					

Civic Holiday (August 7)

90th

Annual General Meeting
Waskesiu Lake Lodge

Saskatchewan Land Surveyors

May 31st to June 2nd, 2000

WASKESIU



2000