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JULY 1977

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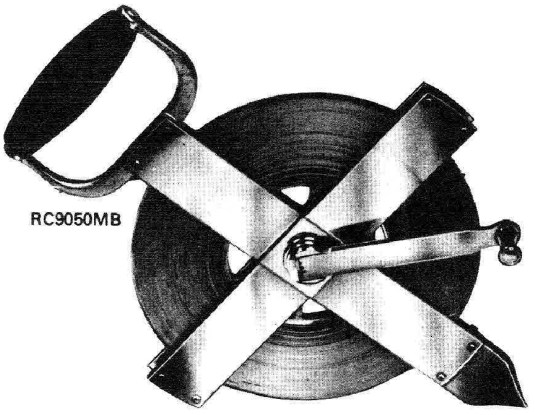

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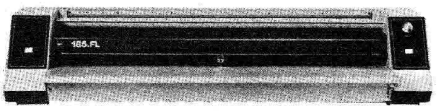

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THE NOVA SCOTIAN SURVEYOR

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** C O N T E N T S **

Views, expressed in articles appearing in this publication, are those of the authors and not necessarily those of the Association.

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** PRESIDENT'S PEN **

The first six months of my term as President are now history and I would like to take this opportunity to address you on some of the more important events that have happened within the Association during the past few months.

The first item of concern, which is probably uppermost in everyone's mind, is the status of the new Land Surveyors Act. This proposed revision has been a long 2 1/2 years in the preparation and finally on May 18, 1977, Bill 128, an Act to revise Chapter 243 of the Revised Statutes, 1967, the Nova Scotia Land Surveyors Act, was given Royal Assent. The Bill was presented as a Government Bill by the Honourable Vincent J. MacLean, Minister of Lands and Forests and was passed with very few changes being made. Official copies of the Bill will be distributed by the Association to all its members as soon as they are available from the Queen's Printer.

The new Act is substantially different than the Act of 1967. You are urged to read the Act carefully and pay particular attention to that portion of the Act which deals with Corporations, in particular Section 22. The professional liability associated with Limited Surveying Companies has taken on a new dimension and although this was not part of the submission that was presented by the Association, the majority members of the General Assembly present and voting when the Act was given third reading, saw fit to include Section 22, even after considering a letter of opposition presented by the Association's solicitor to the Law Amendments Committee.

The Regulations and By-laws made under the authority of the Revised Statutes, 1967, the Nova Scotia Land Surveyors Act, will remain in force until such time as they are annulled or others made in their stead. Sections 21 to 23 inclusive of the Interpretation Act allows for this situation, in so far as the Regulations and By-laws are not inconsistent with the substituted enactment.

That brings up a second important item; the availability and acquisition of Professional Liability Insurance (P.L.I.) for practicing members. The Canadian Council of Land Surveyors presently have a Committee established and investigating P.L.I. on a national basis. If arrangements can be made at this level, and we have no reason to believe otherwise, it is expected that the Country will be divided into several regions, of which one will comprise the four Atlantic Provinces. Initially the cost of P.L.I. is expected to be relatively high, due mainly to the lack of controls that are associated with the present land registration system we have in Atlantic Canada. We are hoping the negotiation procedures will not be too exhaustive or time-consuming; yet strong enough to secure an insurance package that will be attractive to all surveying companies and land surveyors so affected. The matter has been turned over to the Private Practice Committee and we expect that additional details will be forthcoming from them as soon as they have something further to report.

Some surveying companies may be well advised to consult their solicitor regarding the implication Sections 19 and 22 may have on their present corporate structure. Section 19(3)(a) may have cause to delay the issuing of a Certificate of Authorization to some firms if, after August 18th, they are operating in contravention to the Act.

The Committees working toward the presentation of the new Regulations and By-laws are expected to have their packages completed and ready for presentation to the membership early in the fall. A special general meeting may have to be called for that purpose, however, if it is felt that both items can be accommodated during the Annual Meeting, then the program will be arranged accordingly.

On a sadder note, I regret to advise that Brian D. Peel, one of our faithful Councillors, respected surveyors and good friend of many, passed away on May 18th, after a lengthy illness. Brian's contribution to the surveying community, especially in the Annapolis Valley, will be greatly missed by all.

Members of the Western Region should take note that on a request from Council, James B. Gillis, Middleton, has consented to complete Brian's term as Councillor for that area.

The anticipated volume of Association business during the next six months is expected to be tremendously high and on behalf of Council, I would like to solicit your interest and cooperation in helping with the implementation of the new Act and the proposed Regulations and By-laws.

A pleasant and prosperous summer to all.

K. P. AuCoin, President.

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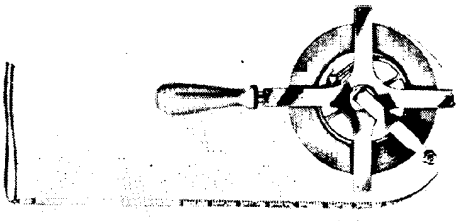

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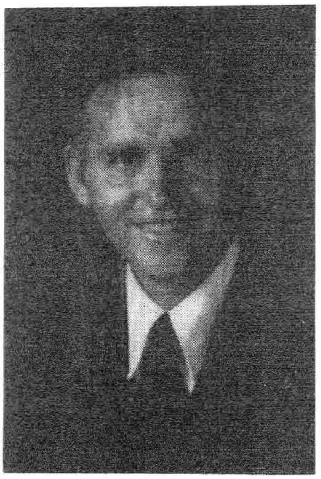

The death of Brian David Peel, Black Rock, occurred, Wednesday, May 18, 1977, after a lengthy illness. He was born in Berwick, November 6, 1940, a son of the late Frank and Gladys (Binns) Peel.

Brian graduated from West Kings High School, Auburn in 1959 and graduated from Nova Scotia Land Survey Institute in May 1962. He received his Certificate of Qualification as a Nova Scotia Land Surveyor in May 1964, and became Association Member number 309.

He worked for the Hydrographic Section of B.I.O. during the summers while attending Survey School and for two years following graduation. He then worked one year for Stevens and Fiske Construction followed by two years with the City of Dartmouth in the Engineering Department.

At this point, Brian returned to the Annapolis Valley where he was employed with the newly formed Kings Assessment Region. He worked as Assessor for four years during which time he successfully completed a course on Assessment Principles and Practices from Dalhousie University.

In 1971 Brian went into full-time legal survey work in the Kings County area continuing in this field until his death.

Brian was keenly interested in the Association of Nova Scotia Land Surveyors and in 1975 he was elected Association Councillor for Western Nova Scotia and served on the Discipline Committee. He was also a member of the Canadian Institute of Surveying since 1970.

He served on various Committees of Black Rock Baptist Church and was Secretary of the Central Kings Advisory Committee to the Kings County Amalgamated School Board.

As well as enjoying music, Brian had a great love of the outdoors enjoying camping and canoeing.

He is survived by his wife, Elaine (Graves), two sons, Frank and Derek, and a brother, Colin. He was predeceased by a sister, Noreen.

Funeral services were conducted at the Black Rock Baptist Church by Reverend Harold Beaumont assisted by Reverend L.B. Esterbrooks. The pallbearers, all members of the Association of Nova Scotia Land Surveyors were: Ivan Macdonald, Al Wallace, Murray Banks, John MacInnis, Jack Osmond, Keith AuCoin, Errol Hebb, Don Rix and Jack Kaulback.

> He has achieved success, who has lived well,
> laughed often and loved much; who has never
> lacked appreciation of earth's beauty, or
> failed to express it; who has always looked
> for the best in others and given the best he
> had; whose life was an inspiration and whose
> memory a benediction.

To the Editor:

Sir: - My son Timothy, being rather a raw young country lad, and wishing to have a lot of land laid off, I thought it my duty to see that he was dealt fairly by; and, accordingly, I requested of the Deputy Surveyor of our place to make just allowance in the good old way for swamps, lakes, rivers and roads. He replied by way of answer, that the New Surveyor General wished to have things done on the reform system, and referred me to his Little Book of Instructions, issued 22nd June, 1831, from the Surveyor General's Office, to his Deputies, (Signed) John Spry Morris, Surveyor General.

Item 11th, as follows:- "In running out lines of original Surveys made preparatory to a grant, no allowance is to be made, but for slack chains, except in hilly broken ground, in that case such an allowance may be made, as will bring you to the beginning bounds, and to close the figure for compliment so that the figure shall contain exactly the number of acres intended to be granted, strict measure without any allowance for lakes, rivers, sunken lands or roads."

This to me is much like spinning out land for location, and that quantity is the thing for fees, not quality. I, therefore, advise Timothy to have nothing to do with the land, and that it was all a hum, and throwing away money, and that he could never grow wheat on a lake, sunken bog, river, or highway. So this ended the affair, until my neighbour and myself wished to have our lines raised, and then the Deputy Surveyor referred me to his Little Book again.

Item 13, as follows:- "Every Deputy Surveyor, before he proceeds upon a survey, shall ask and demand the sum of five shillings, being for the Surveyor General's precept; except when the parties have paid the Surveyor General for an order for survey, in such case it will be returned to the parties who apply to have their lines run out, and the Surveyor is not to proceed upon any survey, without being paid this survey, or in cases where merely a division line is to be run, one-half of the amount may be accepted; such sum, received as the Surveyor General's fees to be remitted quarterly by post whenever it shall amount to twenty shillings."

Now, sir, you must know that my dandriff was not a little raised when I discovered that Timothy and myself, were each to be let into the secret. I have insisted on the Deputy doing his duty, and I will allow him what he formerly received, and no more, until I know from what authority the Surveyor General is entitled to claim, what he calls a precept of___? and what authority he has to charge what he calls half the former precept for raising bound on land, that the Crown has nothing to do with, independent of the enormous charges that are made by Deputy Surveyors.

As I am not much acquainted with the rules of public Offices, I therefore, in this case should like to know if there is an act of the Province to that effect, or if it is a discretional thing with the Surveyor to make what charge he thinks proper, for I certainly shall consider it as an imposition on the public until an explanation takes place, as the demand has heretofore never been exacted by a Surveyor.

Yours, etc.

A Novascotia Farmer.

This letter was originally sent to Joseph Howe, editor of the Novascotian, and published August 31, 1831 on page 278.

** SURVEY ACCURACY AND COORDINATE CONTROL **

by A. E. Peterson

This paper will address the topic of survey accuracy and the use of coordinate control as they affect the practising surveying. The existing control established in the cities and towns of Nova Scotia is commonly called second order. What does this mean in azimuth and length reliability between survey stations? An analysis has been made of two segments of control traversing to illustrate the typical reliability of the control and to indicate the magnitude of misclosures that the surveyor might expect.

Why consider Survey Accuracy?

One might ask - why worry about survey accuracy when with the modern equipment available, most of us are producing optimum results? Obviously, however, in spite of very precise and sophisticated equipment available today, the way in which the equipment is used and the survey configuration itself greatly affects the reliability of the end results. Such considerations as the number of measurements made, forced centering (or lack of it), atmospheric affects, etc., all contribute to the end accuracy of a survey. The modern surveyor has an obligation to his client, his fellow surveyors and the public to quantify the reliability of his surveys. It is not implied here that boundary re-establishment is totally dependent on measurements rather than evidence, however, the situation is tending that way with the advent of coordinate control areas where boundaries may well be defined in terms of coordinates. It will then be important to ask how well the original surveyor determined the mathematical position of certain boundary points and how accurately the present surveyor will have to survey in order to re-establish the points realistically. In the future, maximum tolerances will undoubtedly be prescribed by the state. These may be of the order of ± 5 cm in urban core areas, ± 10 cm in residential areas and ± 50 cm in rural areas[5]. The surveyor should be able to present an analysis showing that his work meets the specified tolerances. This verification would be in the form of a realistic analysis based on the error sources and their propogation through the survey network. Interested readers are referred to a series of articles prepared by Adam Chrzanowski of the University of New Brunswick and published in "Northpoint"[1]. The material assumes only an elementary knowledge of statistics and differential calculus approximately at the level given at the Nova Scotia Land Survey Institute. The referenced articles are recommended reading for all practising surveyors in Nova Scotia as coordinate control areas and monitoring of survey returns will soon be upon us. Possibly the editorial committee could arrange for a reprint of these articles in this magazine.

At this point the reader is cautioned that no adjustment, no matter how well conceived, can remedy poorly designed and executed surveys. While statistical error analysis will indicate weaknesses in survey configurations, it cannot cope with blunders or unrealistic assumptions as to accuracy of the measurements. It is mandatory that surveys be conducted following well established and common sense ground rules. These fundamental principles are well enunciated in most standard texts on elementary surveying.

Survey Errors [1, 2]

Survey errors arise from many sources, some of which are difficult for the surveyor to control. Atmospheric effects on angle and distance measurements and on levelling fall into this class and usually all that can be done is to use measuring procedures that tend to minimize these effects. On more precise surveys, attempts are made to measure several times under different atmospheric conditions but such approaches are generally uneconomical for small scale surveys. The surveyor can control to a large degree, errors arising from centering and from instrumental limitations by the appropriate choice of instrumentation and technique employed. Once the surveyor has chosen his instruments and procedures he can then estimate the accuracy

that he is likely to obtain. This is done by utilizing the formulae for error propogation as outlined in the references assuming that the only significant remaining error source is from random sources which are distributed according to the normal law of error [2, 3]. To do this, the surveyor must estimate the angular accuracy for each angle keeping in mind the effect of centering errors, pointing accuracy and least count of his instrument. For distances, he must estimate the accuracy of the instrument used as a constant plus atmospheric uncertainty as well as the accuracy in his data reduction techniques, i.e., slope, temperature, etc.

The accuracy estimates referred to should either be the standard deviation (error that is expected to be exceeded only 32 per cent of the time) or some convenient multiple of this, such as 3 times the standard deviation which error can be taken as the error that will be seldom exceeded. Manufacturer's accuracy quotations are usually in terms of standard deviation. Some suggested values to use (standard deviation) are as follows:

(1) angles by 20" theodolite (left and right face) - standard deviation of angles is of the order of 15 seconds,

(2) distances measured by E.D.M. (electronic distance measuring) devices - typical standard deviations are 5 mm to 10 mm plus 4 ppm,

(3) carefully taped distances when corrections are made for slope, sag, temperature, calibration, etc. - typical standard deviation is of the order of 1 mm to 3 mm for a 30 metre tape length.

Coordinate Control and the Practising Surveyor

Coordinate control has been in use by practising surveyors to a large extent for the last six years, particularly in metropolitan areas such as Halifax-Dartmouth. Aside from being a convenient datum on which to base and coordinate surveys it has brought certain problems to the surveyor. Changing of datum values has been a problem but his is essentially only one of bookkeeping - knowing which datum the coordinate values are based on. The significant problem has been in determining how to handle misclosures of new surveys on the existing control. The control surveys themselves have error and this should be considered before too much check surveying is conducted to search for suspected blunders in new work.

The reliability of the control surveys is quite good in bearing - seldom are bearings in conflict by more than 10 seconds. Bearing discrepancies larger than these are often related to monument disturbance. It is postulated that the coordinate control has high integrity of azimuth because of the forced - centering techniques used for precise angle measurements. Position misclosures of 10 cms between non-interconnected stations are not uncommon and these lead to difficult decisions for the surveyor to make on how to distribute his closing error. He quite often feels that his own work is of "unquestionably" higher accuracy. Adjusting subsequent traverses to distorted control will inevitably lead to compounded distortion as subsidiary traversing is built up in much the same manner that the sequential computational procedures distorted the primary geodetic frameworks[4]. In many cases then, it is preferable for the surveyor to transform his traverse by scale and rotation rather than to balance it by the compass or other rule or to adjust it by least squares. Another alternative would be to use only one control point and one bearing on which to base the survey. This, however, would introduce many new independent datums thus defeating the concept of coordinate uniqueness in a coordinate control area. This latter course should be avoided.

Survey Classification [3]

Survey networks are classified according to the size of the maximum axis of the 95% confidence ellipse or uncertainty area between the weakest connection in a survey network. In order for a network to be classed as second-order, no two stations, connected or otherwise, can have a relative accuracy of less than 50 ppm. This is

a very stringent tolerance, especially on networks having short lines. Mr. H.E. Jones of the Legal Surveys Directorate of the Department of Energy, Mines and Resources has proposed (personal communication) a more realistic classification for networks with shorter lines being:

$$C = \frac{r}{(d + 0.2)}$$

where - r is the semi-major axis of the 95% confidence ellipse between the two stations considered in cms.

- d is the distance between the two stations in kilometers.

- C is the classification factor.

A network is classified as second-order if the largest C-factor in the network is between 2 and 5 or as third-order if the largest C-factor is between 5 and 12. This classification scheme approaches equivalency with the present E.M. & R. specification on lines over 5 km in length.

Accuracy Simulation for Sample Traverse Networks

Two segments of the Halifax-Dartmouth control network were selected for computer simulation. These are shown schematically in figures 1 and 2. The segments were selected at random with no attempt being made to pick exceptionally weak or strong areas of the network. The networks were chosen to be about 20 stations in size simply because this was the capacity of the available computer program for least squares adjustment with full error analysis. The constraints applied to the networks were somewhat arbitrary but the analysis gives results indicative of the magnitude of errors that one could expect from the control.

The control survey network was assumed to have been measured by eight angle sets with one second theodolites and by electronic distance measuring equipment. The distances were assumed measured to an accuracy of about 1 cm + 3 ppm. As the distances are typically less than 500 metres, the 1 cm portion dominates the distance accuracy. For the computer simulation then, it was assumed that the lengths had a standard deviation of 1 cm and theodolite directions a standard deviation of 1.5 seconds (allowing for pointing, centering and unknown refraction effects). Constraining azimuths were assumed to have a standard deviation of 2.5 seconds.

The accuracy simulation shows sample network 1 (figure 1) to be of third-order standard according to the more lenient (H. E. Jones) classification standard. The C-factors between stations 10 to 11 and 15 to 16 are over 7. Similarly in sample network 2 (figure 2) the classification would be third-order on the basis of lines 10 to 11, 9 to 11, 12 to 16 having C-factors over 7. A third-order classification is probably the most that can be expected of urban control networks such as these.

What does this all mean to the practising surveyor? The C-factors indicate the maximum errors he can expect to be confronted with. Equally important to him, however, is a knowledge of the reliability, distance and bearing-wise, between stations. This is only obtained by extensive error analysis. The error analysis based on the 95% relative error ellipses of the sample networks show the following:

- the distance reliability between any two stations, connected or otherwise, is 2.5 cm or less (statistically there is only about 1 1/2% chance of being worse than this),

- azimuth reliability on connected lines is better than 7 seconds.

- azimuths on the other hand are weak between non-interconnected stations such as lines 10 to 11 or 15 to 16 in sample net 1 where the indicated azimuth accuracy drops to 43 seconds; however, as would be expected, the accuracy is proportionately better on the longer non-interconnected lines.

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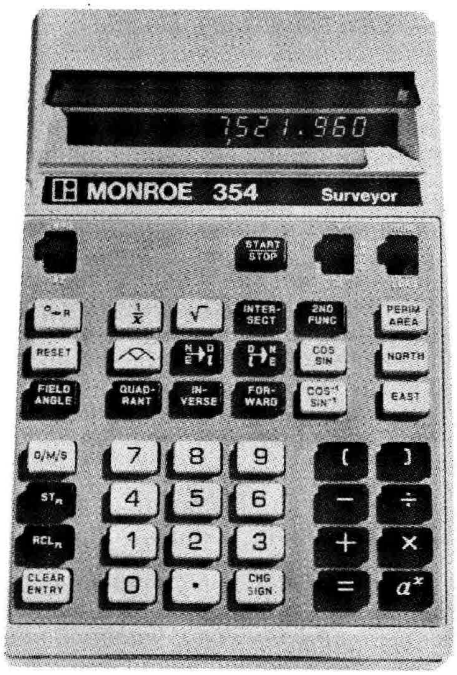

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The preceding suggests that the surveyor should always be wary of orienting his surveys on the basis of a computed azimuth between control stations that had not been previously inter-connected. In fact, it is advisable to always orient surveys on the longest control lines available in order to minimize the effect of centering errors in the azimuth recovery. The surveyor should ensure that the high azimuth accuracy indicated on surveyed lines resulting from forced-centering accurately reflects the field condition. One must guard against accuracy computations based on azimuths at the level of the theodolite and targets which are significantly different to that actually existing between the ground marks because of the errors in centering over the ground marks.

As an illustration of what is to be expected when surveying between previously unconnected control points, four short traverses were simulated. These are traverses A and B in sample network 2 and traverse C and D in sample network 1. These are illustrated in figures 3 and 4. The traverses were assumed to have been run with 20 second theodolites and E.D.M. For the simulation the directions were assumed to have a standard deviation of 10 seconds (14.14 seconds per angle) and distances, a standard deviation of 6 mm (.02 ft.). Table 1 gives a summary of the potential misclosures that one could expect in the absence of blunders. Inspection of the table shows that the discrepancy of new traversing with the control has a 98.5% chance of being 35 mm or less radially and 57 mm tangentially for the weakest traverse. In the unlikely event that these would occur simultaneously the vector displacement would be 67 mm (0.2 ft.). This illustrates that fairly large discrepancies with control can arise but they are quite unlikely. The tabulation indicates that the larger error contribution is from the subsidiary traversing and not from the control. Forcing adjustment of misclosures less than 67 mm to the control values should not lead to unacceptable distortions. For larger misclosures with these particular traverses, one would have to expect blunders either in the control or the new traversing.

For those who wonder why no closing angles are shown in the traverse simulations, the reason is that the closing angle will not affect the position misclosure as the situation prior to adjustment is being considered. As a matter of interest, traverse A was extended to include a closing angle in the simulation. The resulting radial or distance uncertainty remained the same whereas the tangential component was reduced to 34".2, equivalent to a displacement of 26 mm. It must be remembered that angle balancing is a form of adjustment which frequently improves closures.

Summary

Traversing between existing control stations in urban control survey areas can lead to fairly large closing discrepancies as demonstrated by the simulation results. For the examples illustrated, misclosures greater than 67 mm are quite unlikely. Other traverse configurations would lead to different probable misclosures and each case should be analysed on its own using the principles of error propogation. Balancing of traverses for large misclosures should be done only after careful deliberation on what effect the distortion may have on future connecting surveys.

The unwary surveyor could find himself in trouble by orienting his surveys on short control lines or between non-interconnected control stations. Publication of error ellipse data or azimuth and distance tolerances by LRIS would be most helpful to the practising surveyor in analysing his subsidiary traversing between control monuments.

Table I. Traverse Simulation Between Selected Control Stations

2.45 x Standard Deviation *

Net	Line	Distance Uncertainty (mm)			Bearing Uncertainty			
		Control	Traverse	Combined	Control	Traverse	Combined	
							Arc	Tangential Displacement
2	11 - 10	24	22	33	28".3	49".6	57".1	43 mm
2	12 - 16	24	25	34	14".2	56".9	58".6	44 mm
1	7 - 14	23	26	35	16".9	42".2	45".5	57 mm
1	10 - 11	16	25	30	42".0	73".0	84".2	42 mm

* Errors should be less than these quantities in 98.5% of the cases

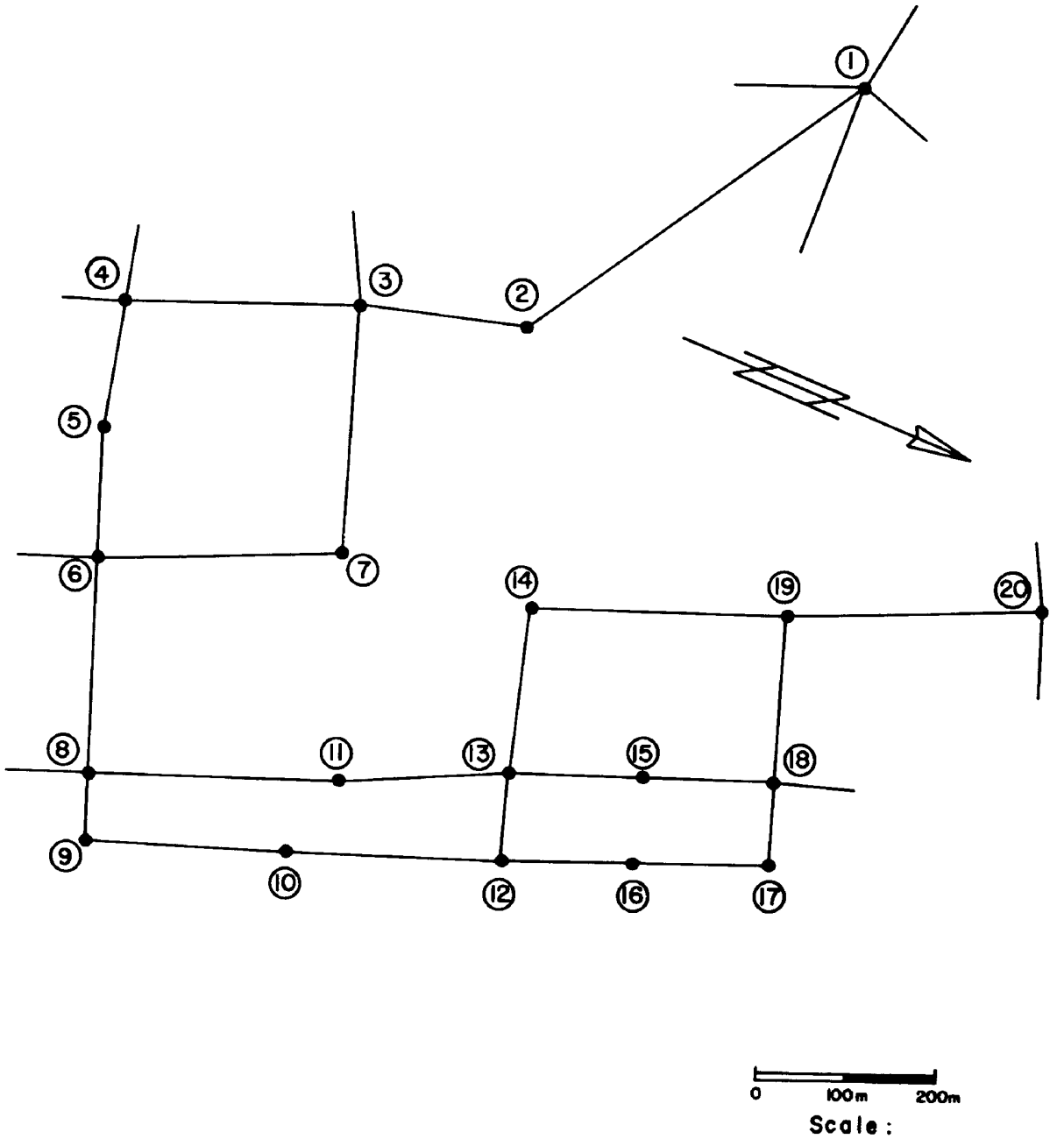

Figure 1 : Sample Network 1.

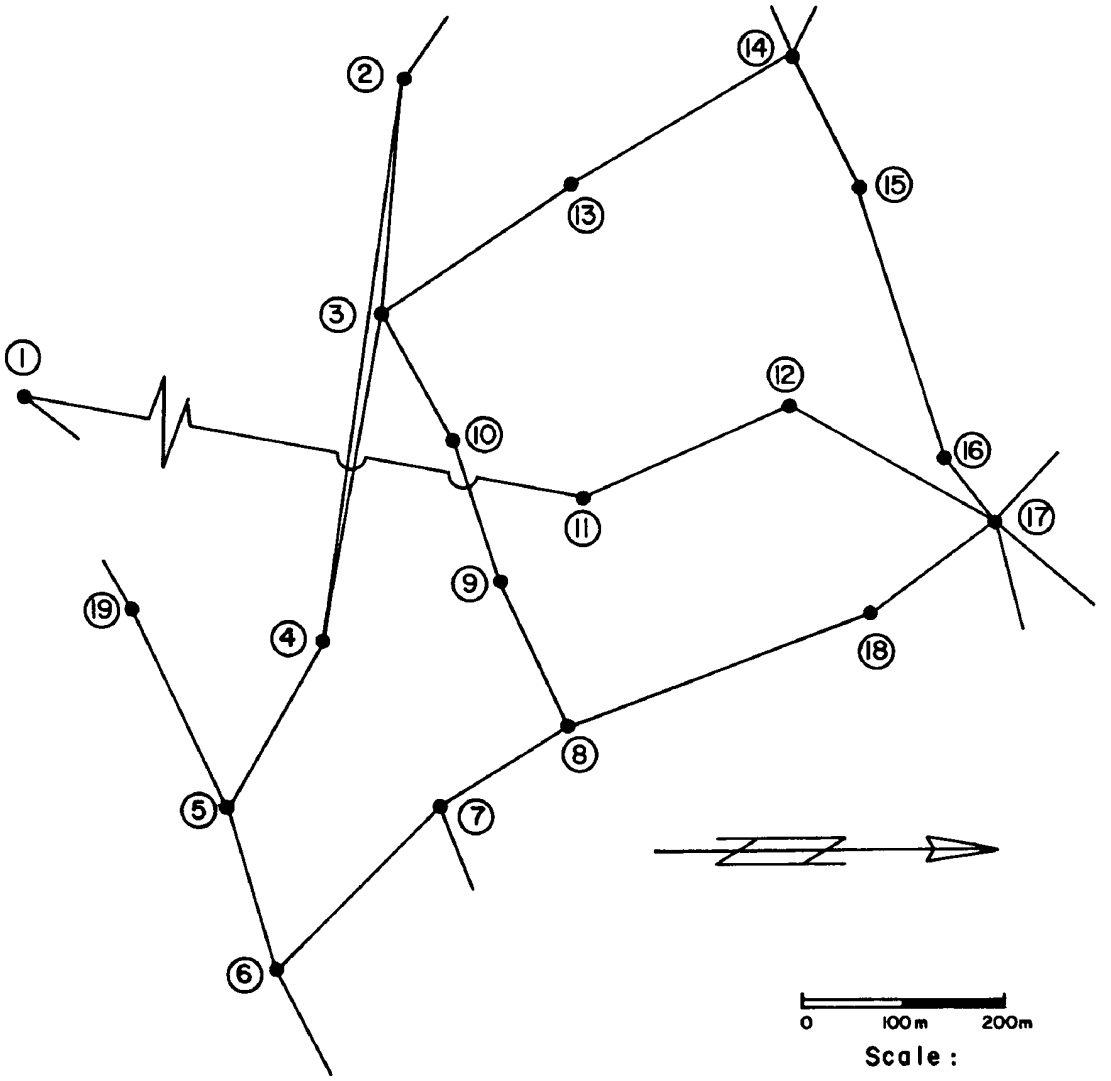

Figure 2: Sample Network 2.

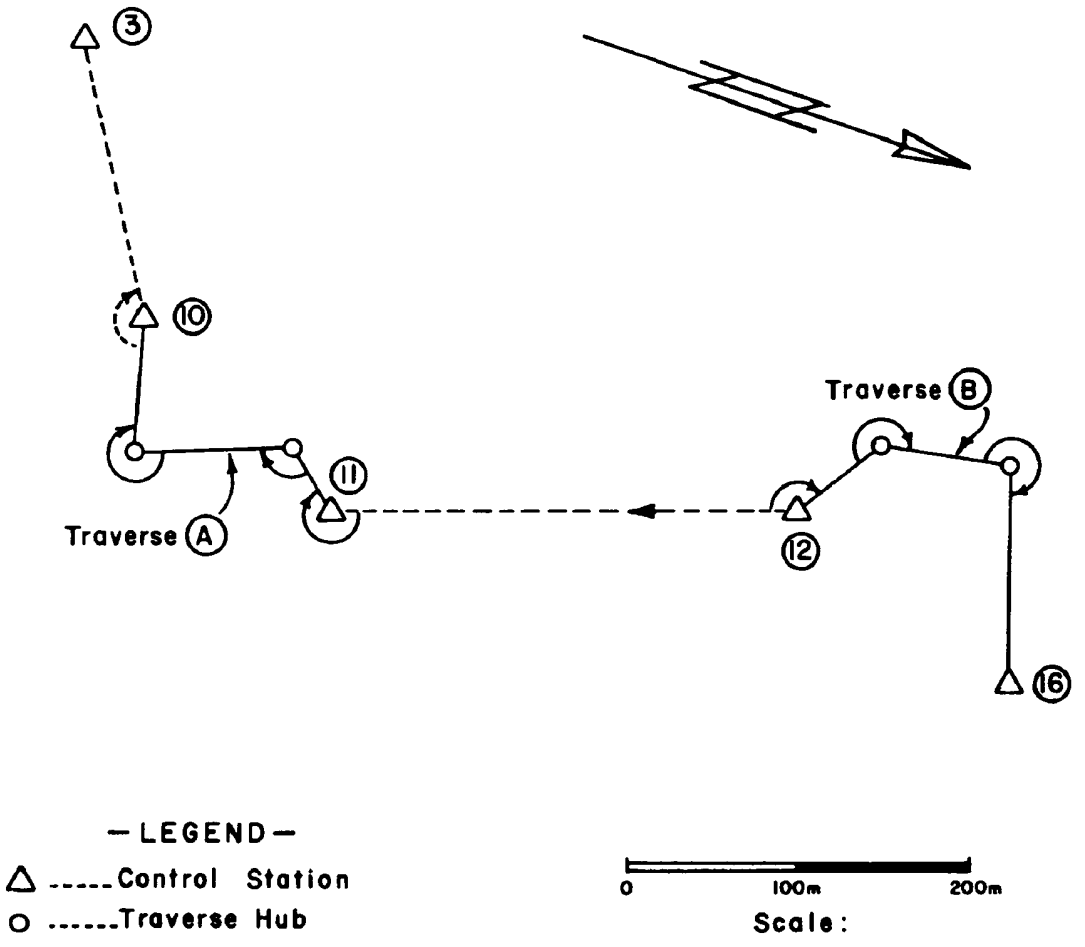

Figure 3: Simulated Traverse Connections
In Sample Network 2.

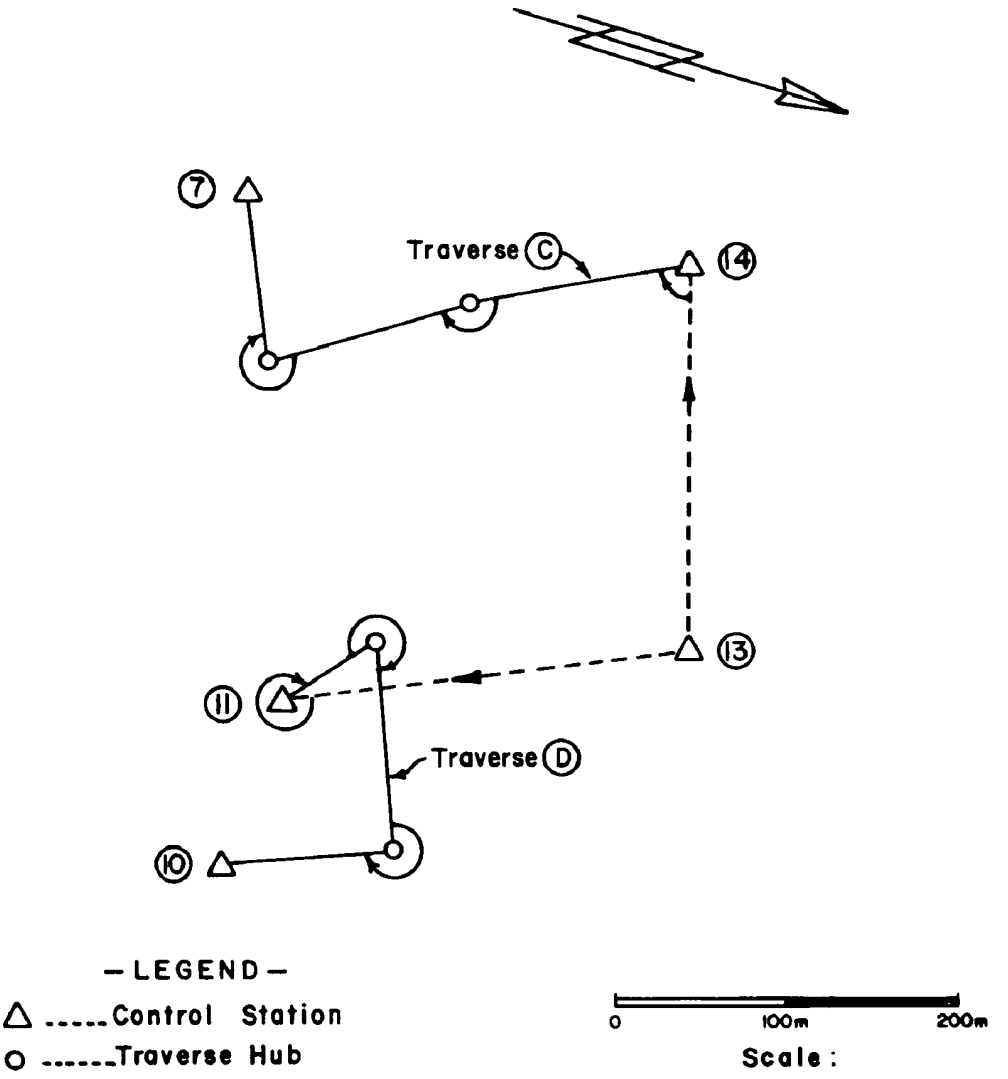

Figure 4: Simulated Traverse Connections
In Sample Network I.

** R E F E R E N C E S **

(1) CHRZANOWSKI, Adam — 'Pre-Analysis and Design of Surveying Projects', Northpoint (issues No. 1, 1974 and later), Association of Certified Survey Technicians and Technologists of Ontario.

(2) RAINSFORD, Hume F. — 'Survey Adjustments and Least Squares', Constable & Co. Ltd., London.

(3) (- -) — 'Specifications and Recommendations for Control surveys and Survey Markers', Surveys and Mapping Branch, Department of Energy, Mines and Resources, Ottawa, August 1973.

(4) KRAKIWSKY, E. and KONECNY, G. — 'Analysis of the Primary and Secondary Control Networks of New Brunswick - Implications for a Readjustment to Satellite Control', The Canadian Surveyor, Vol. 25, No. 2, June 1971.

(5) U.N.B, Department of Survey Engineering — 'Maritime Cadastral Accuracy Study', LRIS, March, 1977.

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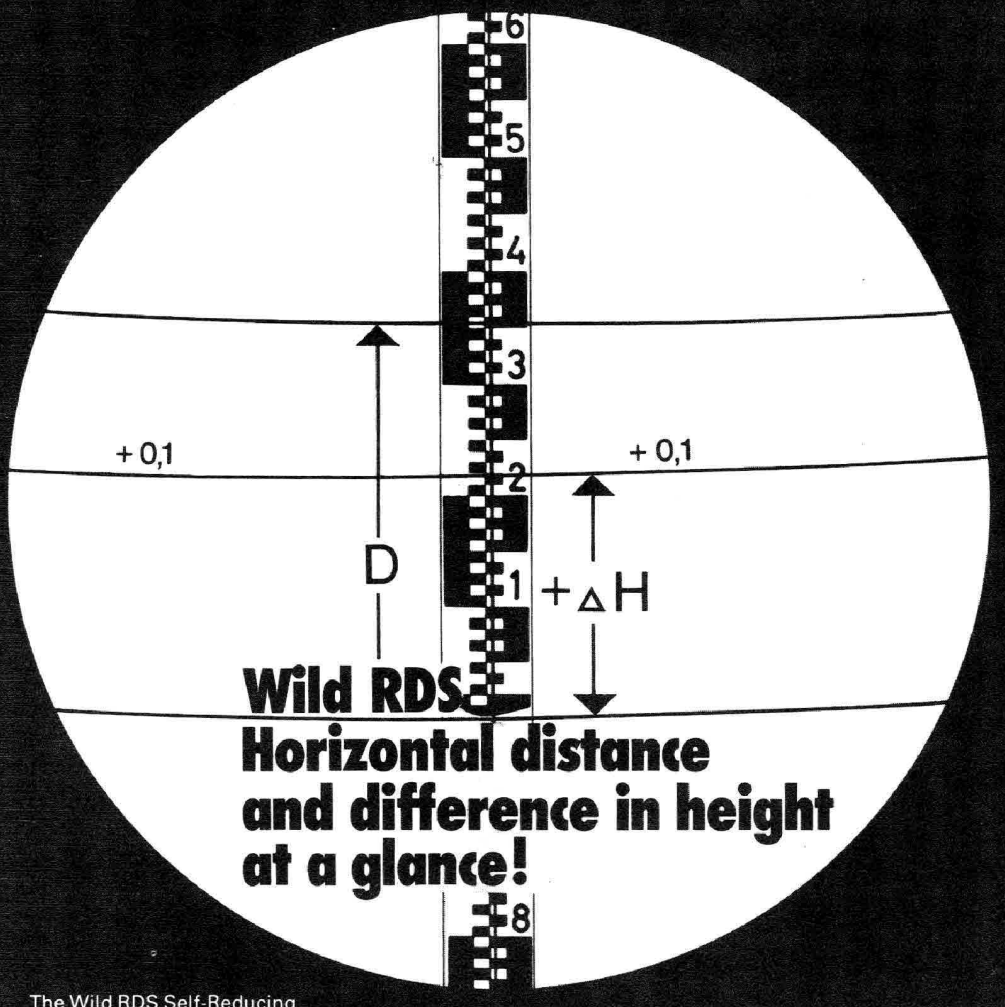

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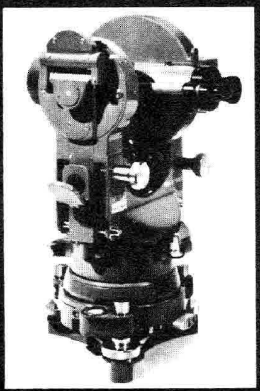

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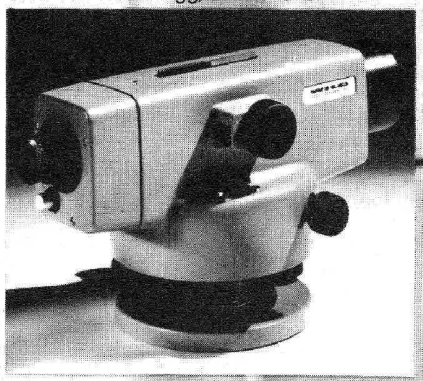

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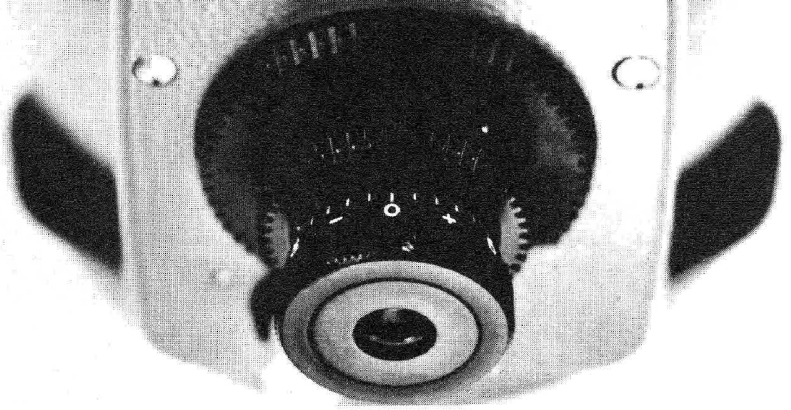

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** COUNCIL MEETING **

The following is a summary of the discussions held at the Council Meeting on January 15, 1977, at the Association Board Room in Halifax.

The Secretary-Treasurer's report stated that as of December 31, 1976 there were 252 paid up members and the Associate, Junior and Non Practicing members totalled 42.

The total membership billing for 1977 will equal $38,635.00.

Financial Position:

Debentures	$ 2,600.00
Current Account	1,785.61
Bonus Savings Account	7,306.85
Cheques for Deposit	2,355.00
Petty Cash	180.00
	$14,227.46
Bills Outstanding	475.00
Balance	$13,752.46.

The Secretary-Treasurer informed Council of the appointment of Mr. A. B. Grant to the position of Executive Secretary for the Association of Nova Scotia Land Surveyors, replacing Mr. A. C. Krasemann.

Murray Banks gave the report from the Committee Co-Ordinator and presented a chart and report on the proposed Committee structure. After some minor amendments, the report on the organizational structure was accepted.

It was moved and seconded that Section 9 of the By-laws of the Nova Scotia Land Surveyors' Act (Chapter 243 - 1967, amended by Chapter 49 - 1968 be given the interpretation that: "Honourary Membership" is the highest level of esteem that can be accorded a member of our Association, and that: "outstanding contributions to the advancement of surveying", include above average contributions to the development and advancement of the Association or the Board of Examiners.

The motion was carried.

Mr. E. P. Rice resigned as Director to the Canadian Council of Land Surveyors due to pressures of business and I. P. Macdonald was approved as his replacement.

The C.C.L.S. requested an increase in dues to $6.00 per member, this was approved by Council.

A donation of $125.00 to the 9th National Surveying Teachers' Conference to be held at U.N.B. and a grant of $150.00 to the Association of Certified Survey Technicians and Technologists by the Association of Nova Scotia Land Surveyors was approved by Council.

Council approved a request for $1,100.00 to cover expenses for attendance to the Atlantic Provinces Certification Standards Implementation Committee, also a request for a budget of $100.00 for the Liaison Committee to cover incidentals. This brings the total budget for the Liaison Committee to $1,300.00.

The resignation of A. B. Grant as Councillor for Halifax County, due to his new position as Executive Secretary for the Association of Nova Scotia Land Surveyors, was accepted and the approval of Lee Johnston to fill the remaining term was approved.

** COUNCIL MEETING **

March 19, 1977

D. Lee Johnston has been appointed to Council to fill the vacancy created by the resignation of Allison B. Grant.

Council will be forwarding the names of five of our Senior Members to the 1977 Annual Meeting with the recommendation that they be awarded Life Membership in the Association.

The 1977 Convention will be held at the Holiday Inn in Halifax on November 3, 4 and 5, 1977.

Al Wallace reported that the Surveyor/Barristers' Liaison Committee has been very active and that the Barristers' Society is generous in offering their support to this Committee.

Alan R. Eaton and Gordon S. P. Isaacs have been placed on the Non Practicing list. James Francis AuCoin and William Duncan Harnish have been accepted as Senior Members. Michael Joseph Astephen and Michael Greene have been accepted as Junior Members.

Council agreed to set a policy regarding the paying of travelling and lodging expenses for Councillors and Members who are requested to attend meetings away from their home town.

The Sydney area will host a Council Meeting in Sydney, June 4, 1977. There will be a Regional Meeting in Sydney, Friday evening, June 3rd.

White's

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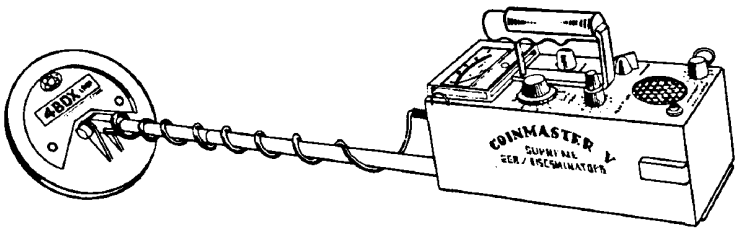

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** COUNCIL MEETING **

June 4, 1977

The third Council Meeting of the year was held at the Wandlyn Motor Inn in Sydney, on June 4, 1977.

A Cape Breton Regional Meeting was held on the previous evening and, although some Councillors arrived late or, in fact did not arrive at all due to the travel conditions, nevertheless, it is hoped that the Cape Breton Surveyors did get some answers from the Councillors on specific items of interest.

At the Council Meeting several items were added to the agenda and consequently the meeting went on until 6:00 p.m.

The new Act, Bill 128, or more properly Chapter 13, Acts of 1977, came into play and, in some cases complicated or delayed action on many of the Council's deliberations.

By now, thanks to a motion by Athol C. Grant, the Supplementary Roll of Members should be in the hands of all Councillors. Twelve members were reinstated since the Roll of Members was printed.

Garry S. Parker, Peter A. Murray and Robert S. Redden were accepted for membership in the Association. Elliot M. Robertson was reinstated. William J. Probert was granted a Non Practicing Membership.

The membership at this time consists of 251 Senior, 6 members being proposed for Life Membership, 22 Non Practicing Members, 3 Associate Members and 12 Junior Members.

The Executive Secretary gave a report on the recent deliberations of the Executive Committee which primarily consisted of negotiating for larger office space, some part-time assistance and purchase of necessary furniture and filing cabinets, in anticipation of a larger volume of correspondence and filing which is expected to follow in the wake of the new Act being given Royal Assent.

It was suggested that the charge-out fees across the Province should be included in the Salary Review. This Review, however, is already in the mail. It was suggested that the Private Practice Committee be asked to follow up on this matter.

Murray Banks reported on the Workshop which was held in April at Lawrencetown and on the activities of the various Committees which come under his jurisdiction.

The letter to be forwarded to members of A.P.E.N.S. and Grandfathers was approved, along with a pro-rated fee of $75.00 for this year.

The fee to be charged corporations for the issuance of a "Certificate of Authorization" is to be set at administrative costs and not to exceed $25.00 for the year 1977.

The Action recommended by the Discipline Committee against two members of the Association was approved by Council and the appropriate measures were to be taken.

Jim Gillis was appointed to fill the vacancy on Council.

A motion was carried that a Committee be formed to investigate the reinstatement procedures to be used with reference to one member who is under suspension at this time.

The matter of non-qualified persons practising land surveying was given lengthy discussion.

A motion that the Executive Committee draw up and have published advertisements that only Nova Scotia Land Surveyors are legally certified to carry out boundary surveys was carried.

The matter regarding the standing of and the fees charged to Non Practicing Members was discussed but was deferred until the September meeting due to ramifications of the new Act.

The subdivision regulations in the Counties of Cumberland and Colchester were discussed at some length. One Councillor will make a written submission pointing out the problems associated with these regulations and, the matter is to be pursued by the Executive Committee.

Murray Banks gave a summation of a meeting with our solicitor in regard to Section 22 of Bill 128 referring to the Liability Clause. It was moved that the matter be turned over to the Private Practice Committee asking them to report with their recommendations to the next meeting of Council.

Murray Banks moved that "The Association of Nova Scotia Land Surveyors set up a Scholarship Fund in the name of the Association providing for a sum of $200.00 to be payable to the top Nova Scotia Student completing the First Year Diploma Course in Land Surveying at the Nova Scotia Land Survey Institute, with the proviso that the student must commence the Second Year term to become totally eligible for the Scholarship." The motion was carried.

The Executive Committee was asked to investigate the possibility of setting up a Trust Fund in the name of the late Brian D. Peel at the earliest opportune time.

The tentative date for the next Council Meeting is September 24, 1977, in Halifax.

Many thanks is extended to John and Lynne Pope for their gracious hospitality following the Council Meeting.

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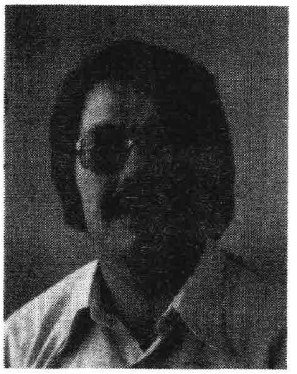
** KENNETH P. SMY **



The Nova Scotia Land Survey Institute is pleased to announce the appointment of Kenneth P. Smy as an Instructor in the Survey Department. His particular responsibilities will be in the area of improving the quality of drafting on survey plans and in field note keeping.

He graduated from High School, Gosport, England in 1956.

His career in surveying has been "technology" oriented and he has had a very comprehensive exposure to practical surveying and drafting.

He started his career with the Ordinance Survey, England, as a Cartographic Surveyor. The first four years were spent establishing 2nd and 3rd Order control surveys for air photo control and subsequent large scale mapping. In 1960 he transferred to the Detail Survey Section which is responsible for final topographic survey and the presentation of survey results involving very high drafting standards.

In 1966 he emigrated to Canada and joined the survey section of the Metropolitan Toronto Department of Roads. His experience in control surveys was applied and two years were spent establishing 3rd Order Control, preparing data for computations and preparing plans to represent the final results. Toward the end of the 2nd year, his prime responsibility was checking and verifying private surveyors' returns in control work.

In 1968 he joined the firm of W.S. Gibson and Sons Limited, Ontario Land Surveyors. Initially his experience of checking control survey returns was reversed to preparing the returns for a consultant. Responsibilities soon developed into technical supervision of cadastral surveys, topographic surveys, engineering surveys, control surveys and the general drafting office as the situation demanded. Complex subdivision calculations and calculations of integrated street line surveys formed a major part of his work.

Although much of the years immediately past have been supervisory work, exposure to the use of survey instruments was always in the forefront, especially with respect to the very high precision equipment used in optical metrology. Situations frequently occurred that required precise surveying techniques. The use of survey instruments equipped with optical micrometers with resolution of $\pm 0.0001"$ and theodolites with resolution of $\pm 0.1"$ of arc were normally employed in such cases.

In 1967 he was certified as a Survey Technologist with the Association of Certified Survey Technicians and Technologists of Ontario. He served as Vice-Chairman of the Central Group 1975-76.

Ken is a member of the Canadian Institute of Surveying.

Provincial Crown Lands Record Centre,
Bryant Building, 1599 Hollis Street,
P. O. Box 2345,
Halifax, N. S.
B3J 3C8.

Mr. A. Grant, Executive Secretary,
Association of Nova Scotia Land Surveyors,
P. O. Box 1541,
Halifax, N. S.
B3J 2Y3.

Dear Mr. Grant:

As you may be aware, the Premier's Policy Bulletin 10 P-38 stated the objectives and purposes of the Provincial Crown Lands Record Centre, namely a centralized service to Provincial Government Departments, Agencies, Boards and Commissions.

Lately, as more organizations have become aware of the Centre's existence and the mapping system reflects a more current picture, various agencies and private surveyors have approached the Centre for information related to Provincially-owned land.

However, due to the limitations placed by the Policy Bulletin we have previously been unable to comply with legitimate requests for information to be used in the various organizational land planning processes.

Therefore, I am pleased to inform your Association that the Premier of Nova Scotia has authorized and signed a revision to the Policy Bulletin allowing us, where possible, to assist the public sector including members of your Association.

I have enclosed a copy of the revised Policy Bulletin for your perusal and retention. If so desired, I would be pleased to arrange a tour of our facilities for yourself and interested members of the Association of Nova Scotia Land Surveyors.

Yours truly,

(Sgd.) Ronald S. Dunn, Manager.

* * * * *

EXCERPTS FROM
POLICY STATEMENT (BULLETIN NO. 10 P. 38)
PROVINCIAL CROWN LANDS RECORD CENTRE

1. INTRODUCTION

1.1 Effective April 1, 1975 the Provincial Crown Lands Record Centre was esta' lished as a centralized service to all Government Departments and Agencie (including boards, corporations and commissions) to co-ordinate and consol- idate information related to all provincial land holdings.

1.2 It is the responsibility of all Government Departments and Agencies who acquire or dispose of land holdings to provide documentation and advice to the Provincial Crown Lands Record Centre as required.

2. PURPOSE OF THE CENTRE

2.1 The purpose of the Provincial Crown Lands Record Centre is to provide centralized services pertaining to land holding information, including visual display and statistical data, to Government Departments and Agencies for the orderly development of co-ordinated acquisition, disposal and land use policies and plans.

2.2 The Provincial Crown Lands Record Centre may also provide upon request, such statistical data and visual display material to the public and Departments or Agencies of Federal or Municipal Governments as deemed appropriate. The provision of this information shall not present a conflict of interests or in any way compromise the Record Centre in its responsibilities to the Provincial Government.

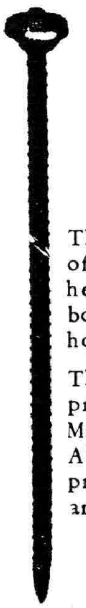
. . .

5. PAYMENT FOR SERVICES

5.1 Recipients of services provided by the Provincial Crown Lands Record Centre shall be charged fees appropriate to the service.

5.2 The Manager of the Centre shall ensure that a fee schedule is clearly displayed for the use of those concerned.

* * * * *



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THE IMPACT OF MODERN CADASTRAL SYSTEMS ON ATLANTIC CANADA

by

John McLaughlin, N.B.L.S.,
Department of Surveying Engineering
The University of New Brunswick
Fredericton, E3B 5A3

The second in series of articles
prepared for the Nova Scotian Surveyor

P R E F A C E

In the first of this series of articles I suggested that it is becoming increasingly apparent that many of North America's environmental, social, legal and political maladies are inextricably linked to the manner in which our society has dealt with the ownership and use of the land. There has been a lack of sensitivity as to the importance of the land as our fundamental resource, particularly in the public sector, which has precipated a dearth of accessible and reliable information about the tenure, topography and use of the land.

In this article, I would like to look at the emerging role for the surveying profession in responding to these problems. Particular attention is given to recent developments in the cadastral systems area.

1. Responding to the Problems: The Challenge

In a message presented to the twelfth International Congress of Surveyors held in London in 1968, H.R.H. Prince Philip stated that:

> Modern technology and science based techniques have made it possible for mankind to do almost anything with the face of the earth. To a very large extent it is Surveyors who will decide what the new face of the earth will look like; it is Surveyors who will exert a great influence on the quality of human existence in the future. This is a daunting prospect, and a responsibility which cannot be undertaken lightly or without a sympathetic understanding and respect for the old and natural face of the earth.[1]

Prince Philip was addressing a very broad surveying audience, but his message seems particularly apt for those who must confront the cadastral challenges enunciated earlier. For in essence much of man's activities on the face of the earth must in some fashion take account of the land tenure fabric. And our understanding of the tenure fabric will be in large measure dependent upon the quality of the cadastral arrangements.

This has, perhaps, been best understood in Europe where the intensity and complexity of the man-land arrangements have long taxed the service capabilities of the cadastral facilities. In Sweden, for example, the value of a land survey system as the basis for land registers was recognized in the middle ages. Land surveyors were given civil service status as early as 1628 and were responsible not only for determining the nature and extent of the tenure arrangements, but also for determining the various land use categories, the texture and productive quality of the soil, the carrying capacity of the pastures, and the composition and stand of the woodlands. Similar roles for the surveying community were forged throughout Europe, supported in turn by extensive geodetic and mapping programs.

Even in Europe, however, where long standing efforts have been made to establish complex cadastral arrangements, serious problems have evolved. Sweden may once be cited for illustrative purposes. H. Wallner, Director of the Swedish Central Board for Real Estate Data, has noted that the methods of registering data in Sweden proved:

> Unsatisfactory because the technical and organizational design is inefficient, registration is split into a multitude of register systems, most registers are incomplete, registration by administrative area hampers efficient planning later when different areas are to be considered at one time, and there is considerable duplication.[2]

In 1964 a cadastre review committee was appointed by the Swedish Minister of Justice to investigate possible measures for reforming the existing system. Partly as a result of the efforts of this committee, the Swedish Central board for Real Estate Data was established in 1968. This Board, which is centrally funded and administered by the Ministry of Justice, is responsible for the long range development of a computer based multi-purpose cadastre designed ultimately to mate all the landed and personal registry systems in Sweden.

Reform measures in North America, with some very important exceptions, have been much more limited. The focus has usually been on introducing new technology, or on responding to very specific information needs; however, beginning with a conference held in Cincinnati[3] in 1966, and at subsequent meetings in MacKinac Island, Michigan[4], Fredericton[5], Atlanta, Georgia[6], Ottawa[7], and in Washington[8], the problems associated with the existing cadastral arrangements have been exposed and proposals for modernization of these arrangements have been presented. Two important schools of thought have emerged as to how modernization should be effected: what might be described as the mechanistic approach and the institutional approach to reform.

The mechanistic approach to reform is perhaps best exemplified by the CULDATA model proposal of professor Robert Cook. Cook envisages the development of computer based multi-purpose land registry systems. CULDATA, which is a prototype for this approach, has the following distinctive characteristics:

> Land title records are indexed by parcels as well as by owners; there is a unique code number for each parcel, indicative of its location; the same parcel code number is used for each parcel of land for title, taxation, land use, and land-planning records; land descriptions are based on coordinates in a plane rectangular system tied to the national control network; there are large-scale maps of an accuracy sufficient to provide the benefits of photogrammetry, keyed to the same plane coordinate system as the land description; a national system of code numbers identified persons, corporations and organizations and, finally, there is coordination of local, state and federal activities in the collection, storage, retrieval and use of land data.[9]

A computerized land registry system, based largely on the CULDATA concept, is presently being developed in Forsyth County, North Carolina under the direction of Mrs. Eunice Ayers, the Register of Deeds.[10] The thrust of the CULDATA approach to modernizing the existing cadastral arrangements lies in its emphasis on modern technology, including not only computer technology but also recent developments in surveying and photogrammetry, and in automated cartography. Proponents hope that technological improvements to the existing registry and land survey systems will prove sufficient for land transfer purposes, and will also prove useful as a base for providing land information services. The concept is an attractive one and is advocated by many of the leaders in the surveying and legal professions.

The second approach to modernizing the existing cadastral arrangements envisages the coupling of technological improvements with broad institutional reforms. The concept of the integrated multi-purpose cadastre provides a model for this second approach. As with the CULDATA concept, it will require a significant influx of modern

computer and surveying technology; however, the multi-purpose cadastre approach will also require reforms in the existing real property and survey law, fundamental changes in the procedures for registering and transferring land, and significant changes in the roles of the professions (particularly within the surveying and legal professions). Proponents of this approach argue that the nature and extent of these institutional reforms will prove to be the most significant element in the long term effort to modernize the cadastral arrangements. It is this approach with which I am most familiar, and the one I would like to explore in more detail.

2. The Multi-Purpose Cadastre Concept

The cadastre has been earlier defined as a record of interest in land, encompassing both the nature and extent of these interests. An interest in land may be narrowly constructed as a legal right subject to ownership but, as has been shown, it is perhaps more appropriately considered as any uniquely recognized relationship amongst men with regard to the use and enjoyment of the land. Not all records of interest in land, however, can be defined as cadastres; and it is, therefore, necessary to further develop this concept. For our purpose, a record of interests in land may be defined as a cadastre if and only if it has the following attributes:

a) it is a public record;

b) it encompasses without exception all the legally recognized proprietary interests in land within the community;

c) it is based upon legally recognized and maintained cadastral parcels;

d) it constantly maintains a cadastral record for every parcel of land.

In the first instance the cadastre is a public record. As such it is a fundamental component of the public land tenure system. Various functions may be delegated to professional bodies which are privately incorporated. For example, the legal and surveying professions have major roles to play in a modern cadastral system. But the control over the development and management of the system vests at all times in the public. Private title insurance companies, although they play an important role in the American land transfer process, do not meet this public criteria and would not be defined as cadastral systems. Secondly, the cadastre maintains a record of all public and private interests in land within its area of jurisdiction. Selective records, such as files on public land holdings or on non-resident ownership, would not in themselves contain sufficient information to be considered as cadastral records. Furthermore, within the cadastral jurisdiction records must be maintained of all subjacent and superjacent interests (such as mineral and air space rights), as well as surface interests, in order for the records to be strictly viewed as part of a cadastre. Thirdly, the cadastre must be based upon legally recognized cadastral parcels. A cadastral parcel is an unambiguously defined unit of land within which unique tenure interests are recognized. For example, a tract of land held in fee simple by one or more individuals would be a cadastral parcel. Because the cadastre must have the capacity for recognizing subjacent and superjacent interests, the cadastral parcels must be capable of being spatially defined in both a horizontal and a vertical plane. Finally, the cadastre must constantly maintain a record of interests in all cadastral parcels. The cadastre must have the capability of detecting changes in the parcels and/or interests, and of updating its records to accommodate these changes.

Within this context three basic elements in a cadastral system can be identified: the cadastral parcel, the cadastral record, and the parcel code. The cadastral parcel is a unit of land within which unique tenure interests are recognized. The parcel envelops a continuous area of land and a continuous interest in the land. The cadastral parcel may include all that land encompassed by a complete bundle of rights or only that land encompassed within a homogeneous bundle of rights. The

delineation of a cadastral parcel, together with its subsequent demarcation on the ground, is the function of the cadastral survey. A cadastral survey may be carried out both for the initial creation of the parcel and for any subsequent changes in the bounds of the parcel.

The cadastral record is a source of graphical or alpha-numeric information concerning the delineation of the cadastral parcel and the nature of the tenure interests related to each cadastral parcel. Three types of cadastral records may be distinguished: current interest records, explanatory records, historical records. Current interest records contain a listing of all outstanding interests recognized in the cadastral parcel, the party or parties holding these interest, parcel location indicators, warning flags where appropriate, and various administrative codes. Explanatory records contain the documentation necessary to amplify the nature and intent of the interests and warning flags specified in the current records. Historical records contain a chronological listing of all legal actions which have culminated in the currently recognized interests.

The parcel code is an index relating cadastral records of specific cadastral parcels. Three significant forms of parcel code may be distinguished: the name index, the record index, the location index. In the name index, cadastral records are identified with the party or parties claiming an interest to the land. In the record index, cadastral records are uniquely identified with a specific cadastral parcel. In the location index, cadastral records are uniquely and geographically identified with a specific cadastral parcel.

Finally, there may be different types of cadastres or cadastral systems, classified according to the purpose or purposes for which they have been primarily created. At least three major types of cadastres may be recognized: the fiscal cadastre, the judicial cadastre, the multi-purpose cadastre. The purpose of the fiscal cadastre is to provide an information base for the equitable and efficient assessment of real property. The purpose of the judicial cadastre is to provide information about the legally recognized interests in a parcel of land, and to provide a means for legally transferring these interests. The purpose of the multi-purpose cadastre is to provide a variety of land tenure registration and information services, as dictated by the needs of the community.

The multi-purpose cadastre may be subdivided into three major components: the cadastral survey base, the positive registration system, the multi-purpose information system. The cadastral survey base consists of a spatial control framework which allows for the unique delimitation of all cadastral parcels, and a graphical base which permits the compilation and dissemination of spatial information. The positive registration system provides for the compulsory registration, examination and warranting of all cadastral parcel boundaries and interests. The multi-purpose information system maintains and disseminates information concerning the current public and private tenure interests in the land, the historical development and formal recognition of these interests, and such other information as may be advantageously provided.

This then is a skeletal introduction to cadastral systems theory. In the next article we will look at some recent endeavours in this area, giving particular attention to the Maritime Provinces program.

- TO BE CONTINUED -

- REFERENCES -

1. Philip, H.R.H. Prince; "A Message"; Archives of the Twelfth International Congress of Surveyors; London; 1968.

2. Wallner, H.; "The Cadastre as the Basis of an Environmental Data System"; The Canadian Surveyor; Vol. XXIII, No. 2, 1969.

3. Cook, R. and J. Kennedy; Proceedings of the CULDATA Conference; Chicago: American Bar Foundation, 1967.

4. White, James (Ed); Proceedings of a Workshop on Problems of Improving the U.S. System of Land Titles; Indianapolis: Indianapolis Law School, 1968.

5. Konecny, G.; Proceedings of the Symposium on Land Registration and Data Banks, Ottawa: Canadian Institute of Surveying, 1969.

6. Moyer, D. David and K. Fisher; Land Parcel Identifiers for Information Systems.

7. Blachut, T.J. (Ch.); "Concepts of Modern Cadastre"; The Canadian Surveyor; Vol. XXIX, No. 1, 1975.

8. Philips, Captain John (Ch.); Proceedings of the North American Conference on the Modernization of Land Data Systems; Washington, 1975.

9. Cook, Robert N.; in G. Konecny; Op. Cit.: p. 120.

10. Ayers, Eunice, Malchus Watlington and Michael McMahan; Forsyth County Land Records Information System; Winston Salem, N.C.: County Publication, Feb. 1974.

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The case reported in this issue has been edited by Vernon G. Oliver, N.S.L.S. The emphasis by underscoring are those of Mr. Oliver."

SPENCER ET AL. V. BENJAMIN 11 N.S.R. (2d)

Nova Scotia Supreme Court, Appeal Division
MacKeigan, C.J.N.S., Cooper and Macdonald, JJ.A.
January 30, 1975

. . . . This case arose out of a dispute over the boundary between the plaintiff's land and the defendant's land. The boundary was located in woodland. The defendant just prior to his purchase of his property accompanied the seller and the plaintiff to examine the location of the boundary. The defendant's predecessor in title used the land in question for logging operations for over 20 years. The Trial Division dismissed the plaintiff's action and held that the defendant established possessory title to the land in question. . . .

On appeal to the Appeal Division of the Nova Scotia Supreme Court the appeal was dismissed and the location of the boundary as determined by the Trial Division was affirmed. The Appeal Division stated that the boundary was agreed to by the plaintiff at the time the land was purchased by the defendant. The Appeal Division stated that the defendant acted to his detriment when the defendant relied on the plaintiff's representation with respect to the boundary and such a reliance precluded the plaintiff from claiming a mistake - see paragraphs 16 and 17.

. . .

STATUTES JUDICIALLY NOTICED:

Limitation of Actions Act, R.S.N.S. 1967, c. 168, s. 9.

. . .

The judgment of the Appeal Division was delivered by Macdonald, J.A.

(1) Macdonald, J. A.: The matter in dispute in these proceedings in a broad sense is 70 acres of woodland located at Londonderry in the County of Colchester. Both the appellant Allen Spencer and the respondent Frank Benjamin claim ownership of these lands.

(2) The appellants Dennis and Lyle Spencer are grandsons of the appellant Allen Spencer and had, or have, an oral agreement with their grandfather to purchase his lands at a price of $10.00 an acre. It is because of this oral agreement that they are parties in the action.

(3) By warranty deed dated February 8, 1947 and registered at the office of the registrar of deeds for Colchester County on May 18, 1972, Thomas R. Black and Harry K. Johnson and their wives conveyed to the appellant Allen Spencer certain lands located in Londonderry, Colchester County. The deed described the lands as comprising 238 acres more or less. In 1973 these lands were surveyed by George E. Hingley, a Nova Scotia Land Surveyor, who testified that the lands as calculated from the deed description would comprise approximately 175 acres. His survey plan of the lands shows an area of 183.4 acres.

(4) On November 22, 1968, William Cochrane and his wife conveyed to the respondent by quit claim deed certain lands situate at Londonderry containing, according to the description, 70 acres, more or less, save 8 acres previously conveyed to Charles Stewart. This deed was registered at the office of the registrar of deeds for Colchester County on November 27, 1968. It is this 70 acre piece of land that is the subject matter in dispute. More particularly, the issue really is the location or position of the southern boundary of the lands of the appellant Allen Spencer.

(5) In the spring months of 1973, the respondent commenced logging operations on the 70 acre tract of land. It is patently clear that such activity triggered these proceedings.

(6) On May 7, 1973 the appellants commenced an action against the respondent, claiming:

1) a declaration that Allen Spencer was entitled to possession of the 238 acres, more or less, described in the conveyance to him from Black and Johnson,

2) damages for trespass,

3) an injunction restraining the respondent from carrying on his logging operations,

4) an order for ejectment.

(7) This action was defended by the respondent on the grounds that:

1) the respondent was the owner of 70 acres, more or less, as conveyed to him by William Cochrane and that this lot did not form part of the lands of the appellant Allen Spencer,

2) that in any event the respondent had established possessory title by adverse possession of the 70 acre lot,

3) that Section 17 of the Registry Act, Chap. 265 R.S.N.S. 1967 prevailed against the defendant.

(8) The plaintiff, Allen Spencer, identified his lot on Exhibit number one which is a plan of the survey conducted of his lands by the aforementioned George E. Hingley. This plan shows the lands of the appellant Allen Spencer as comprising 183.4 acres and lying to the east of and abutting the Cumberland Road. This plan also shows the relation of such lands to others adjacent and adjoining. The respondent introduced Exhibit number nine which is a plan or sketch of the location of the 70 acre piece of land as prepared for the respondent by Emerson C. Keen, a Nova Scotia Land Surveyor. Exhibit number one is dated June 29, 1973 and exhibit number nine bears the following inscription:

Plan showing findings of May 31, 1973, Frank Benjamin survey.....

(9) There is some question as to whether exhibit number nine can be truly called a survey plan; in view, however, of what I consider to be the pivotal issue in this appeal, namely the existence or non-existence of a conventional line, I do not consider it necessary to resolve such question.

(10) Exhibit number nine shows the lands of the respondent as lying to the east of and abutting the Cumberland Road. This plan also shows the "lands claimed by Spencer" as lying to the north of those of the respondent. In between what is shown as "lands of Frank Benjamin" and "lands claimed by Spencer" and abutting both, is a strip of land marked "claimed by Benjamin". This strip extends eastwardly from the Cumberland Road and bears a southern boundary measurement of 2339.6 feet and an eastern boundary measurement of 830 feet. The northern boundary of this piece of land is entitled "Found old blazed line claimed by Benjamin". It is this line that

the respondent says is the northern boundary of his lands and the southern boundary of those of the appellant Allen Spencer. The latter says that it is the *Southern* boundary of the "claimed by Frank Benjamin" lot as shown on exhibit number nine that is the *Northern* boundary of the respondent's lands and thus the southern boundary of those of the appellant Allen Spencer. The evidence of the surveyor, Emerson C. Keen, is to the effect that the 70 acre lot of land is made up of those lots he has shown on exhibit number nine as being "lands of Frank Benjamin" and "claimed by Frank Benjamin".

(11) The evidence is clear that before the respondent purchased the 70 acre lot of land from William Cochrane he visited the lands on two occasions, once with the appellant Allen Spencer, with whom he was previously acquainted, and a day later with Allen Spencer and Mr. Cochrane. The respondent contends that the purpose of these visits was to acquaint him with the location of the northern boundary of the Cochrane land which would also be the southern boundary of the lands of the appellant Allen Spencer. The respondent says such boundary was identified to him as being what is shown on exhibit number nine as "found old blazed line claimed by Benjamin". As to his aspect of the matter the learned trial judge made the following finding of fact:

> Prior to buying, he travelled the lines on two occasions, once with the plaintiff and later with the plaintiff and Cochrane. On each occasion the northern boundary travelled was a blazed line, as indicated in Exhibit 9 and marked 'Found Old Blazed line claimed by Benjamin'. (Editor's note - "this was his downfall".)
>
> Having heard their evidence and observed their demeanour on the witness stand, I accept the version of the defendant and the witness Cochrane where it conflicts with that of the plaintiff. I find that these witnesses travelled the line marked on Exhibit 9, marked as 'Found Old Blazed line claimed by Benjamin' and that this line is the defendant's northern boundary. (Editor's note - "as it so often is; the defendant gained a creditability status with the court.")

(12) It is difficult, if not impossible, to accurately determine from the evidence of the two surveyors the exact location of either the southern boundary of the Spencer lands, or the northern boundary of those claimed by the respondent. This being so, it would appear to me that the learned trial judge in that portion of his decision just quoted, was really making a finding that a conventional line existed; therefore, the evidence of the various witnesses as to what exactly occurred on the two occasions the respondent visited the area in question with the appellant Allen Spencer must be carefully scrutinized to see if it supports a finding that the northern boundary of the lands claimed by the respondent, and thus the southern boundary line of the lands of the appellant Allen Spencer, has been established by means of a conventional line as being shown on exhibit number nine as "found old blazed line claimed by Benjamin".

. . .

(13) In my opinion the evidence coupled with the finding of fact made by the learned trial judge favors the interpretation that the purpose of the visit to the woods was to show the respondent where the north line of the Cochrane property and the south line of the Spencer property was. There is evidence to support a finding that the line so shown was that marked on exhibit number nine as "found old blazed line claimed by Benjamin", and indeed, this is the finding in effect made by the learned trial judge.

(14) The Supreme Court of Canada in *GRASSETT V. CARTER* (1884), 10 S.C.R. 105, per Henry, J., at pp. 129-130 said:

> There is no doubt in my mind on the evidence, that that line was agreed upon. The law applicable to conventional lines, I take to be, that if a line is agreed upon and one party acts upon it and erects a house or an

> expensive fence, or holds and improves the land, the other party is estopped from saying that the line is not the right one. If, however, nothing is done on the land, and there is no change of position in any way, it is, I take it, within the power of one party or the other to prove that a mistake was made in the running of the lines or the adoption of them. In this case, before the house was put up by Dr. Temple, the defendant might have been authorized to show that the line was not the correct one. (Editor's note - "if you don't agree then the onus is on you to prove the contrary".)

(15) In *SUTHERLAND V. CAMPBELL* (1923), 25 O.W.N. 409, Hodgin, J. A., speaking for the first divisional court in Ontario, said:

> When it is asserted that a line between the lands of two persons has become a conventional line superseding the true line, some situation making it inequitable and improper that the true line should be the measure of the right of the so-called trespasser must be shown. This may be an agreement for consideration or a standing-by while the other party changes his position.

(16) I am of the opinion that there was evidence in support of the findings of fact made by the learned trial judge. In addition, based on the findings of fact of the learned trial judge and the evidence I am of the opinion that the appellant Allen Spencer, by words and actions, led the respondent to believe that the line marked "found old blazed line claimed by Benjamin" as shown on exhibit number nine, was the southern boundary of his lands and the northern boundary of the lands then allegedly owned by William Cochrane. It is true that when such representation was made the respondent was not then the owner of the 70 acre tract of land; however, Mr. Cochrane, the then purported owner of the lands, was there and the appellant Allen Spencer knew that the respondent was contemplating purchasing such lands. Whether or not the appellant Allen Spencer made an honest mistake in making such representation as to the position of the line is no longer material because at the time he made such representation he obviously intended it to be acted and relied on; and the respondent has acted upon such representation to his detriment, not only in purchasing the lands from Cochrane, but in going to the trouble and expense of starting a logging operation thereon.

(17) Even if the true southern boundary line of the lands of the appellant Allen J. Spencer is south of that alleged by the respondent, I am of the opinion that it would now be inequitable and improper to confirm or recognize such line for the reasons given above. I am, therefore, of the opinion that the line marked on exhibit number nine as "found old blazed line claimed by Benjamin" is now a conventional line marking the southern boundary of the lands of the appellant Allen J. Spencer, and as found by the learned trial judge, the northern boundary of the lands of the respondent. It follows that the respondent is entitled to a declaration to that effect. In view of such opinion I feel it is not necessary to consider the issue of possessory title by adverse possession as alleged by the respondent because such can now no longer be an issue between the parties herein.

(18) The respondent has cross-appealed against the dismissal of the appellants' action without costs. He contends that costs should have been awarded to him. The learned trial judge said:

> As this trial was necessary to determine the plaintiff's southern boundary, I choose to exercise my discretion in not allowing costs to either party.

(19) Although technically it might be said that the action was necessary to determine such boundary, in actual fact it was framed as one for damages for trespass; for an injunction to restrain the defendant from carrying on his logging operation; for a declaration as to possession of lands and for an order for ejectment. These were the issues the respondent had to meet.

(20) It is true that costs are in the discretion of the trial judge. It is also true that costs normally follow the event. In the present case the learned trial judge gave as his reason for refusing costs to the respondent the fact that the action was necessary to determine the southern boundary of the appellants' land. As I am of the opinion that he was in error in so finding I would allow the cross-appeal of the respondent.

(21) In the result the appeal is dismissed and the cross-appeal is allowed and a declaration granted to the respondent as hereinbefore set forth. The respondent shall have his costs both on appeal and on trial.

Appeal dismissed.

** N O T I C E **

FROM

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CORRECTION to 1977 "Altitude and Azimuth of the Pole Star" Table.

In the table headed "Correction to Convert Greenwich Mean Time to Greenwich Sidereal Time for 1977" the value for November should be 02 36 43.6.

* * * * *

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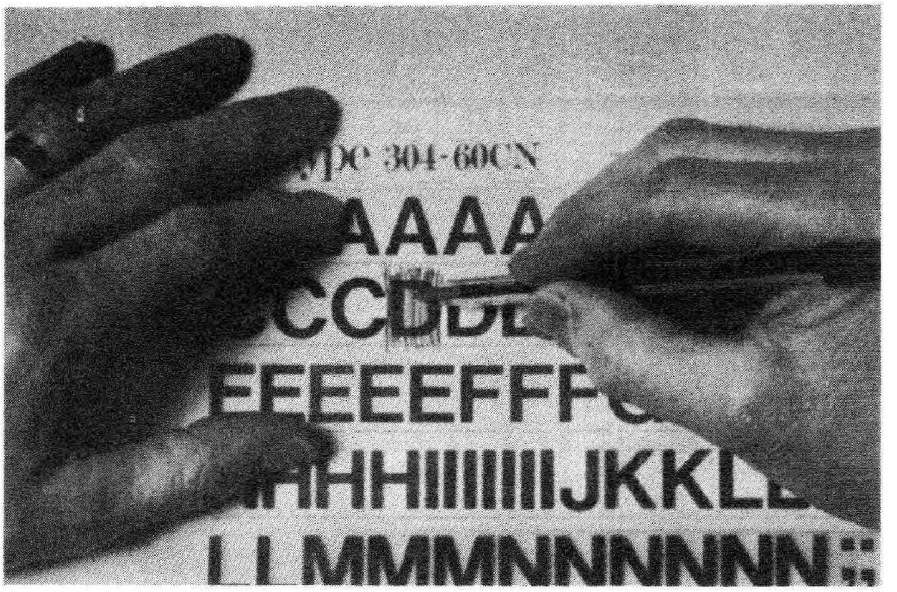

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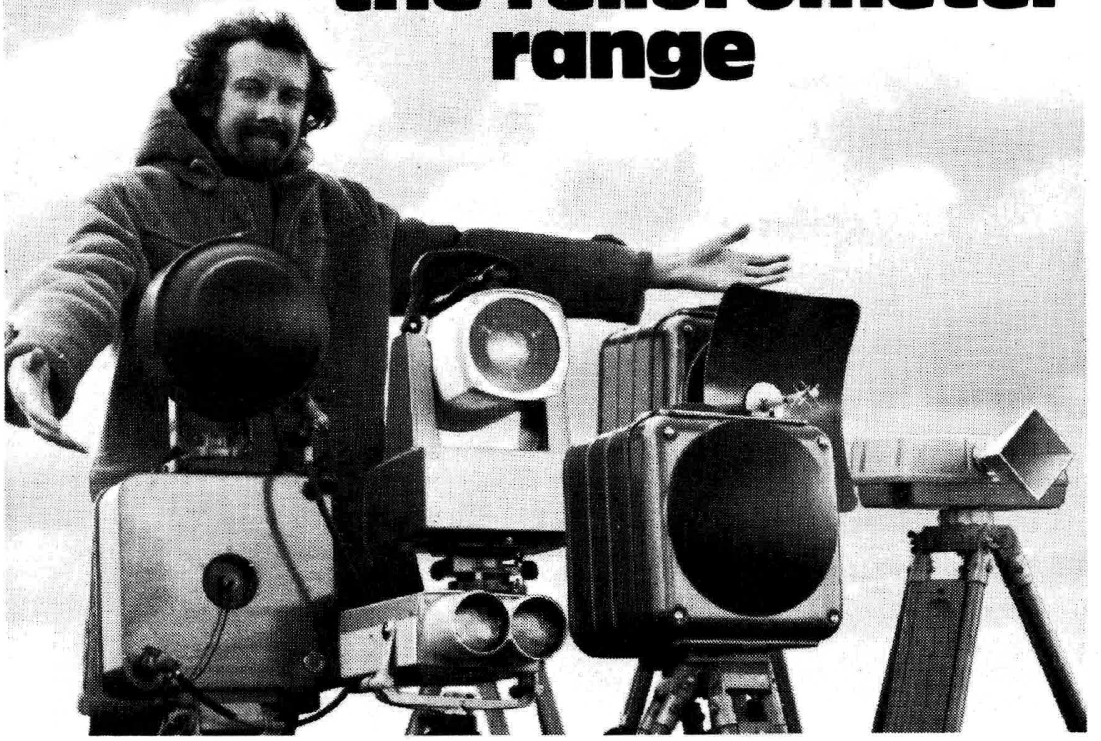

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