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ONTARIO PROFESSIONAL SURVEYOR

VOLUME 63, No. 3 **Summer 2020**

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ON THE COVER ...

University of New Brunswick (UNB) Professor Shabnam Jabari is shown at Kings Landing Historical Settlement in Prince William, New Brunswick. She is using a DJI Phantom 4 Pro Version 2.0 drone to gather mapping data for her fall courses. The Geodesy and Geomatics Engineering Department at UNB is celebrating its 60th Anniversary in September. See the article in The Last Word on page 40.

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President's Page

By Andrew S. Mantha, O.L.S.

Well, what can I say? It does look like we have been blessed to "live in interesting times".

Despite the recent COVID-19 crisis and in spite of the limitations imposed by "social distancing", I am proud to say that both your AOLS Council and the staff at 1043 have risen to the challenge by coming up with sufficient work-arounds and embracing the technology needed to keep our ship on course and, if not functioning at 100%, we are getting the work done. The staff at 1043 McNicoll have mostly been working at home, but we do have someone at the office daily to collect the mail and handle pieces of business that require an actual physical presence. So far things seem to be working.

We have completed the transfer of our CPD monitoring to the GeoEd platform. I have personally loaded my formal and professional hours, and if I can do it, anyone can. Work is still continuing on our new website. We have made real progress in getting a final version ready for the members and public to use. I am hoping by the time I write a fall report, this issue will be but a distant memory.

Council initiatives remain the same as last year. We continue to work on implementing a risk-management philosophy for the administration of our Committees and Task Forces. Executive Director Brian is developing a Dashboard portal for our website that will allow us to see regular reports from our committees and task forces and help us to better identify what support they need from Council and when they need it. One of the key elements of risk-management is the need for open communication and regular feedback from our committees. We see the Dashboard as being a key link to accomplishing this.

By the time you read this, we will have completed two full Council meetings via GoToMeeting. While not the best forum to handle business, I am happy to say everyone has cooperated with the new format and understood the need to work together to keep our meetings on track.

I am sure everyone recalls that Past President Al hosted the signing of a MOU between the various provincial regulatory bodies at our AGM in Huntsville. While we had hoped to get moving on this straight away, the COVID-19 situation seems to have derailed some of our momentum. In our conversation at our last Presidents' Roundtable however, all attendees were keen to get this back on track.

Our immediate issues of concern involve streamlining our education programs, identifying duplication of services, and seeing how we can better share resources. We have also been sharing ideas on how to carry on business in these trying times. I note that I have been attending various online AGM's hosted by our fellow Associations. I would also like to add that as we have progressed through the cycle, I've seen that various Councils have learned to be more efficient and technically savvy to manage to complete their business within a 2-3 hour time frame. Kudos to Saskatchewan for instituting a "Quick Poll" system that allows for the fast handling of voting during teleconferences.

Obviously, this is a worst-case scenario, but we need to be prepared should there be a second wave of COVID-19 into the fall and next winter. Our 2021 AGM in London may seem far away, but a lot of planning goes into these events and we certainly want to avoid any last-minute scrambling.

While this was not the year we planned, this was the year we got. I wish to commend all our members who have managed to keep their professional standards high throughout this crisis. To those who have been hit by construction stoppages but who still managed to limp along; to those who have had to sideline staff but did so in a respectful and sensitive manner; and to those who have had to learn new ways to do their business, here is hoping for a brighter future ahead.

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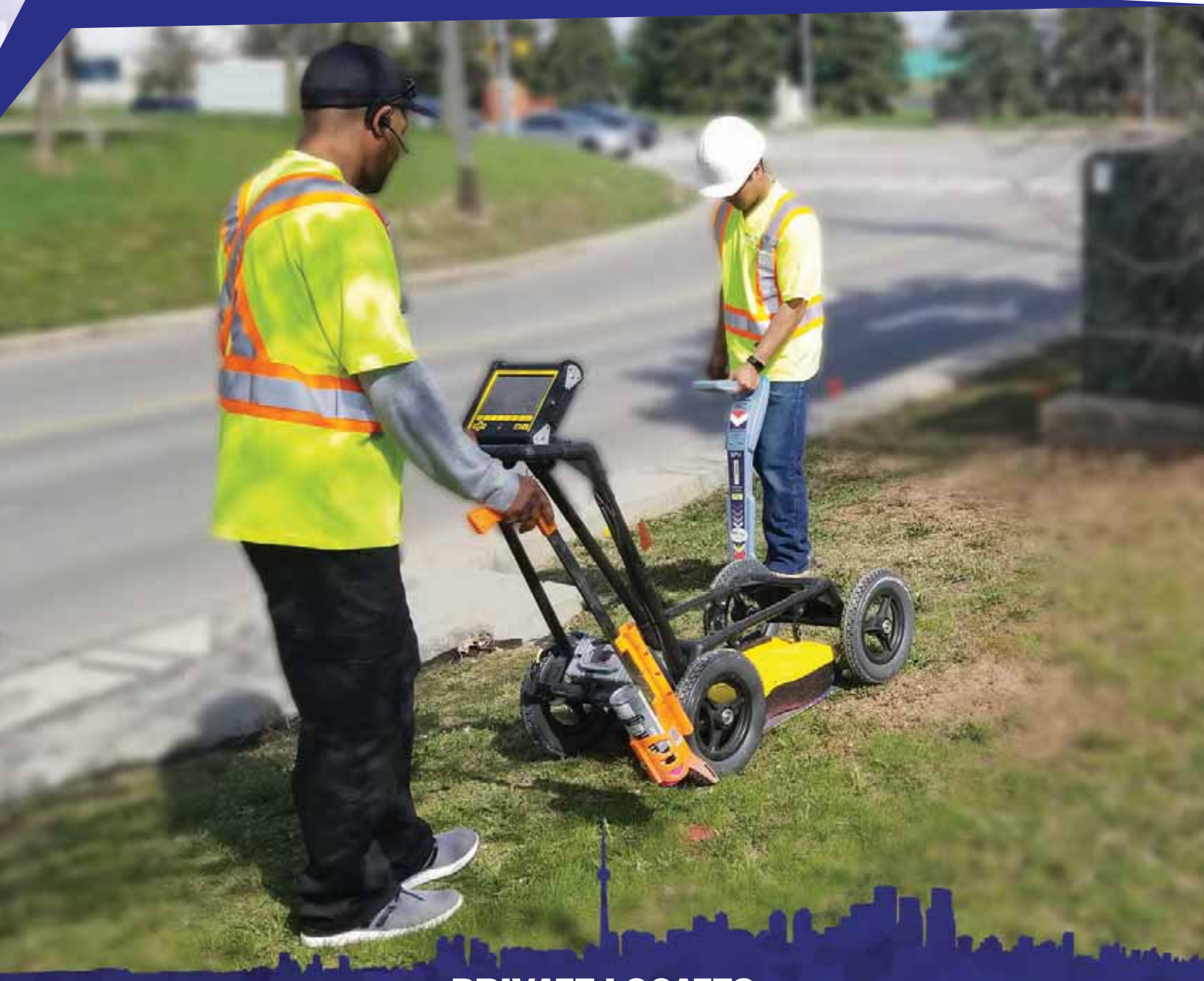

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Executive Director's Notes

By Brian Maloney

The AOLS's Role

During the recent COVID-19 pandemic, I have spent more time thinking about the role of the Association of Ontario Land Surveyors. We have been reminded by multiple regulatory reviews across Canada that our primary responsibility is to act as a regulator. Our mandate is clearly described in the *Surveyors Act*. The simplified version is that we exist to protect the public, but the details of how we go about that are not always as clear.

The Regulations requiring the closure of places of non-essential businesses due to COVID-19 under the *Emergency Management and Civil Protection Act* provides an interesting example. When the initial list of essential services was put out by the Province, some members asked AOLS staff if they were included. It seemed logical to provide some direction to members since the answer seemed straightforward. When the next update to the list of essential services was released, the role of surveyors, with respect to essential services, became a support role and was not as clear. I received a call from a member concerning another firm which was taking on work that would not likely be considered an essential service for a very sizeable project. It raised ethical issues for me and spurred me to put together another note for Council approval. I approached three government departments trying to get increased clarity to help advise members who were interpreting the essential services differently but failed to get any further specificity. I was reminded by several members that they could perform surveys safely despite the essential services list. It did lead me to have some conversations with government officials about the economic benefits of surveyors on society as a whole and their ability to work safely. Towards the latter part of May, Phase 1 of the Provinces Framework for Reopening explicitly mentioned land surveyors, which removed many concerns for the AOLS.

Several members sent me a variety of informative articles and links that may have been useful for the members; some were sanctioned by government and others were opinion pieces from experts. Was this an AOLS responsibility to make this information available?

Our role was tested in many ways. What level of communication was appropriate between the leaders of the AOLS and its members? Should we have avoided wading into this and let our members find their own way? Should we have encouraged members to approach the Ministry of Labour or local enforcement organizations on their own to address potential breaches in essential services practice? Should we have played a smaller or larger role in advocating for surveyors and their ability to carry on their practices? Should we have taken on a larger role in helping surveyors set best practices for physical distancing? You could argue that a larger role for the AOLS could be viewed as protecting the public, so where do we draw the line?

Our first communication piece was about providing advice and could be considered a member service. You could certainly argue that it was in the public's interest that surveyors all knew their responsibilities. As we became aware of some members potentially breaching the Code of Ethics by virtue of acting in contravention of the essential services regulation, we could have been reactive and waited for a complaint to arise or proactive and try and make members aware of their obligations. We obviously chose to be proactive with our regulatory role in mind. We chose to share little in the way of health information and allowed the experts and our Public Health organizations to disseminate health and safety protocols. Had we shared more, that could have been considered as a public good in helping to protect surveyors, staff and the public. It could also be considered a member service that was beyond our mandate and potentially might have interfered with the clear directions that were evolving from public health organizations. We chose to stay out of this activity. Would my conversations with government officials regarding the role of surveyors be considered advocacy on behalf of surveyors or would it be considered in the public interest to have government officials fully informed of the important economic role of surveyors?

As I consider our actions over the last couple of months, I believe we acted appropriately in the public's interest, however I am certain that some members will feel we were too involved or did too little. We clearly have to focus on our regulatory role, especially given our limited resources, but there may be times when a perceived member service aligns with that role. The advocacy role is a much finer line. Although one could argue that the AOLS should support the profession, since a healthy profession is required to serve the public, we need to avoid any conflict of interest by acting in the interest of the membership instead of the public. On this last note, I was disappointed to learn that Ontario has only around a dozen members (not counting CLS members) who belong to Professional Surveyors of Canada (PSC). PSC is properly positioned to take on the member services and advocacy roles that the AOLS cannot, but without support, it will not succeed or be able to function as a national body representing all of Canada's surveyors in any meaningful fashion. The AOLS must focus on its regulatory role to safeguard the public's interest so I believe that we need a body like PSC to represent our surveyors' interests.

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The Standard of Review and Professional Regulators - The Implications of Canada v. Yavilov for Discipline Committees

By Patricia Harper and Christopher Wirth

Most regulators of professions in Ontario have an established discipline committee, the role of which, at least in part, is to determine whether a member has violated their obligations and, if they have, to impose some form of discipline and/or sanction.

The governing legislation, by-laws and rules of regulators also usually contain a path to appeal or review of a decision of the discipline committee. This may include an appeal to an appeal committee, a right of appeal to Ontario's Divisional Court (the "Court"), or an ability to seek leave (i.e. get permission from the Court) for an appeal to be heard. The Court's review of the decision of a discipline committee is known as judicial review.

In the recent case of *Canada (Minister of Citizenship and Immigration) v. Vavilov* ("*Vavilov*"), 2019 SCC 65, the Supreme Court of Canada re-examined the principles of judicial review and, in so doing, made significant changes as to how courts will review the decisions of administrative tribunals. While the full implications of the decision in *Vavilov* remain to be seen, the Court's decision in *Schoelly v. College Massage Therapists of Ontario*, 2020 ONSC 1348 provides some guidance to regulators of professions with respect to how *Vavilov* will be interpreted and applied.

Background to Vavilov

The *Vavilov* decision centred around a young man ("V") who was born in Canada to parents who were posing as Canadians under assumed names. In reality, V's parents were Russian spies. In 2010, the parents were arrested in the United States and charged with espionage. They pled guilty and were returned to Russia.

In 2014, the Canadian Registrar of Citizenship canceled V's certificate of Canadian citizenship. V applied for judicial review of the Registrar's decision. The Federal Court upheld the decision, but the Federal Court of Appeal overturned it on the basis that it was unreasonable. The Minister of Citizenship and Immigration appealed to the Supreme Court of Canada, which prompted this re-examination of the principles of judicial review.

Decision of the Surpreme Court of Canada

The Court dismissed the appeal but in so doing, a majority of the Court confirmed that the standard of review which should apply to decisions of administrative tribunals will now begin with a presumption that the deferential "reasonableness" standard will apply in all cases. However, the presumption of a reasonableness standard of review can be rebutted in two types of situations:

1. Where the legislature indicates that a different standard will apply; and
2. Where the rule of law requires that the more stringent "correctness" standard be applied.

For the first situation, the majority explained that the legislature may indicate a different standard of review by specifying the applicable standard in the legislation itself, or by including a statutory right of appeal in the legislation.

Where there is a statutory right of appeal, the majority interpreted this to mean that the legislature has chosen to subject the administrative body to appellate oversight, and that it therefore expects the courts to scrutinize the administrative body's decisions on the appellate standard of review.

This means that where there is a statutory right of appeal, questions of law (e.g. questions regarding statutory interpretation or the scope of a decision-maker's authority) will be reviewed on the more stringent "correctness" standard, while questions of fact or of mixed fact and law will be reviewed on the more deferential standard of "palpable and overriding error".

As well, the majority explained that the rule of law will also require the "correctness" standard be applied in cases involving constitutional questions, general questions of law that are of central importance to the legal system as a whole, and questions related to the jurisdictional boundaries between two or more administrative bodies. In all of these circumstances, the rule of law requires consistency for which a final and determinate answer is necessary.

Where the presumption cannot be rebutted, the "reasonableness" standard will continue to apply. The Court sought to clarify how this standard is to be applied, emphasizing that the determination of what is "reasonable" in any given case will vary depending on the factual and legal context, the governing statutory scheme, other relevant statutes or common law, the principles of statutory interpretation, the facts and evidence before the decision-maker, the submissions of the parties, the past practices and decisions of the administrative tribunal, and

the potential impact of the decision on the individual to whom it applies.

Implications of the Vavilov Decision

Perhaps the most significant effect of the Court's decision in *Vavilov* in the professional discipline context will come from the majority's decision concerning statutory rights of appeal. Prior to *Vavilov*, courts may have applied the more deferential "reasonableness" standard to questions of law despite the existence of an appeal clause.

However, now that the majority in *Vavilov* has interpreted the existence of such clauses to be a determinative indicator of appellate standards of review, administrative tribunals with appeal clauses will now be subject to the more stringent "correctness" standard on questions of law, and the deferential "palpable and overriding error" standard on questions of fact or of mixed fact and law. This could potentially lead to the overturning of statutory interpretations that were previously upheld under the more deferential "reasonableness" standard.

The importation of appellate standards of review into an area formerly governed by administrative law principles exposes administrative tribunals to an entirely different body of case law on judicial review.

Divisional Court Applies the Appellate Standard of Review in the Professional Discipline Context

In *Schoelly v. College Massage Therapists of Ontario*, 2020 ONSC 1348 ("Schoelly") the Court applied the appellate standard of review to an appeal from a decision of the Discipline Committee of the College of Massage Therapist ("Discipline Committee") and in so doing, became one of the first decisions to consider the recent decision of the Supreme Court in Vavilov, in the Professional Discipline Context.

Background

Jose Schoelly ("Mr. Schoelly") was a registered massage therapist.

The Discipline Committee found that Mr. Schoelly had committed professional misconduct by committing sexual abuse by touching a patient's genitals and by breaching a draping procedure which exposed the patient's breasts during a twisting stretch.

The Discipline Committee's reasons for their decision, released in November 2018, were detailed and included a thorough credibility analysis which concluded that the patient was credible. The Discipline Committee accepted the patient's evidence over that of Mr. Schoelly. The Panel concluded that Mr. Schoelly had committed sexual abuse as defined by the *Code*.

At the Penalty Hearing of February 4, 2019, College Counsel submitted that revocation was mandatory when there is a finding of sexual abuse and referred to subparagraph 51(5)3vi of the *Code*. The Discipline Committee accepted those submissions and imposed revocation as part of the penalty. Costs of $49,750.00 were also ordered.

Mr. Schoelly appealed both the finding of misconduct with

cont'd on page 8

respect to sexual abuse and the penalty, as well as the costs ordered.

Section 70 of the *Health Professions Procedural Code* ("*Code*"), provides that an appeal from a decision of the Discipline Committee lies to the Court on a question of law or fact or both.

Divisional Court Decision

There were three issues before the Court on the appeal:

1. Did the Discipline Committee err in concluding that deliberate sexual touching occurred?
2. Did the Discipline Committee's Decision give rise to a reasonable apprehension of bias?
3. Did the Discipline Committee err is its decisions on penalty and costs?

In rendering its decision the Court specifically referenced the *Vavilov* case and applied the appellate standards of review confirmed by it.

As to the first issue of whether the Panel erred by concluding that deliberate sexual touching occurred, Mr. Schoelly's argument was that, contrary to the finding of the Panel, he was more credible than the patient.

The Court concluded there was evidence to support the findings of fact by the Discipline Committee. In doing so, it applied the standard of overriding and palpable error applicable in appellate review and found there was no such error on the part of the Discipline Committee. As a result, the Court upheld the Discipline Committee's findings of misconduct.

The Court also rejected Mr. Schoelly's claim of reasonable apprehension of bias, finding that no such bias had been proven.

The third issue before the Court on the Appeal was an issue in two parts (a) the costs the Member was ordered to pay and (b) the penalty imposed by the Discipline Committee.

(a) As to costs, the College had filed evidence in support of its request for costs and no evidence was filed on behalf of Mr. Schoelly with respect to his inability to pay. As a result, the Court found there was no basis to interfere with the Discipline Committee's exercise of discretion with respect to its order on costs.

(b) As to penalty, during the Appeal, counsel for the College acknowledged that revocation was not in fact mandatory in the circumstances of sexual touching in this case, as had been argued by College Counsel before the Discipline Committee.

The legislative changes mandating revocation for the type of sexual touching at issue took effect in 2017 and were not retrospective. Given that the incidents at issue took place in 2014, the legislative changes did not apply to them and so revocation was not in fact a mandatory penalty.

However, College Counsel argued that the Discipline Committee would have ordered revocation in any event. The Court did not accept this argument and was not persuaded that if revocation had not been mandatory it would have been imposed.

In the result, the Court found that the revocation was unreasonable and substituted the Discipline Committee's decision on penalty with its own, which was a suspension which would be lifted on the date the Court's Decision was released, as Mr. Schoelly had been suspended since September 2017, and so in effect he had already been suspended for two years and six months from September 2017 to March 2020.

In substituting the Discipline Committee's decision on penalty with its own, the Court reiterated the principle that only in rare and unusual circumstances will the Court interfere with the decision of a discipline committee on the question of penalty. In this case, however, the penalty Decision was based on an error of law to which the appellate standard of review of correctness applied.

Takeaways from Vavilov and Schoelly

The *Schoelly* case serves as a reminder that, following the Supreme Court's decision in *Vavilov*, the appellate standard of review will now apply to decisions of discipline committees where there is a statutory right of appeal. Deference will be granted to findings of fact, which are subject to the standard of review of palpable and overriding error. Questions of law however, will attract the more stringent correctness standard.

Accordingly, administrative tribunals in the professional discipline context should review their governing legislation to determine if their decisions are subject to a statutory right of appeal. If they are, this could result in courts showing less deference to their decisions and even overturning statutory interpretations from previous cases that were upheld under the "reasonableness" standard.

Discipline committees of professional regulators must be mindful of these standards in making their decisions and crafting their reasons.

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Upgrading Parliament Hill's Control Network

By Judith Marie Beaudoin, M.A., a.-g. (QLS), Alain Jacob, a.-g. (QLS), CLS, and Ewart D. Bowlby, OLS, OLIP, ASCT

A French version of this article was submitted for publication in the Ordre des Arpenteurs-Géomètre du Québec's 'Géomatique' journal, Volume 47, No. 1, Spring-Summer 2020.

Parliament Hill

On February 17, 1858, by royal decree, Ottawa officially became the capital of the United Province of Canada. This new political reality would slowly transform the "sub-arctic lumber village"[1] into a world-class capital city. The Department of Public Works was put in charge of overseeing the construction and layout of the new parliamentary buildings and adjoining park. At the time, the total space occupied by the new buildings was estimated to be 10,200 square metres on 10 hectares of land. This site, located on a headland at the junction of the Ottawa River and the Rideau Canal, is now commonly known as "The Hill."

Parliament Hill is the physical expression of Canadians' commitment to democracy. More than just the setting for the work of Parliamentarians and their staff, it is also a "gathering place for public expression and celebration"[2], and a symbol of Canadian history. Despite the construction, expansion, reconstruction and renovation work carried out over the centuries, Public Services and Procurement Canada, formerly the Department of Public Works, has noted that since the early 2000s the Parliament Buildings have started showing their age. The facilities are outdated and the built heritage is slowly but surely deteriorating.

It was around those years that the Government of Canada developed a comprehensive rehabilitation strategy for the Parliamentary Precinct, called the *Long Term Vision and Plan*. The objective of this large-scale project, spanning decades, is to preserve and restore the Parliament Buildings, built in the 19th century, and to upgrade the facilities to 21st-century standards, while ensuring the continuity of parliamentary activities and public access. The winter 2019 relocation of the House of Commons to the West Block and of the Senate to the Senate of Canada Building (Ottawa's old central train station), both recently rehabilitated, marked the beginning of a major phase of the Long Term Vision and Plan, namely the rehabilitation of Centre Block.

Surveyors on "The Hill"

Whether it concerns the monitoring of property boundaries, building information modelling (BIM), or preventing damage to underground infrastructure, the Geomatics Services staff of Public Services and Procurement Canada's Real Property Services Branch have participated in and supported the work carried out on Parliament Hill as part of the Long Term Vision and Plan. One of the tasks of Geomatics Services is to upgrade, densify and maintain an integrated network of high-precision control points on the grounds and inside the main buildings. The following paragraphs describe a project carried out in 2015 and 2016 to upgrade the control network on Parliament Hill. Information is also provided with respect to previous work carried out, potential uses of the network, and projected future work.

Previous Work

In the spring of 1998, the firm Fairhall Moffatt & Woodland Limited (FMW), Ontario Land Surveyors, was contracted by Public Services and Procurement Canada (PSPC) to establish a three-dimensional control network inside the Centre Block. This network, which consisted of about 100 points, covers the building's six floors and the basement. The horizontal coordinates were referenced to a local system in addition to the NAD27 (MTM zone 9) system. The elevations in both systems were referenced to Geodetic Datum CGVD28.

In 2004, a control network was established in the East Block employing similar criteria used in the Centre Block. The interior control points, for the most part, are 16-mm flat-head assembly bolts discreetly inserted into the joints of the floor tiles or directly into the cement, under carpets, for example. Special care was taken to avoid damaging the materials and to minimize any visual impacts in these heritage buildings.

In the fall of 1998, the firm Webster & Simmonds Surveying Limited, Ontario Land Surveyors, was contracted by PSPC to establish the first separate horizontal and vertical control networks specifically covering the grounds of the Parliamentary Precinct and the Judicial Precinct, and the cliff path overlooking the Ottawa River. The networks were made up of 22 third order horizontal control points and 16 second order bench marks. The horizontal coordinates were georeferenced in the NAD27 and NAD83 (original) (MTM zone 9) systems. The elevations in both systems were referenced to Geodetic Datum CGVD28. A number of these monuments were destroyed in the following years.

[1] John McQuarrie, *The Hill / La Colline: Canada 150 Edition*, Ottawa, Magic Light Publishing, 2015, p. 4.

[2] Follow the rehabilitation of the parliamentary buildings – Canada's Parliamentary Precinct – PSPC, https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentary-precinct/rehabilitation/index-eng.html

Upgrading the Control Network on Parliament Hill

More than 15 years after they were set up, the control networks installed on Parliament Hill, while of excellent quality, have some limitations: they are isolated, scattered, and installed in various spatial referencing systems that are outdated. As the Parliament Hill rehabilitation work picks up speed, the need for unified and accessible control points that are compatible with modern spatial technologies has become apparent. In 2015, the Geomatics Services team undertook a project to upgrade and densify the existing control network on Parliament Hill and to integrate the existing interior control networks in the Parliament Buildings.

Upgrading the networks has four objectives: to transition from separate horizontal/vertical networks to an integrated three-dimensional control network; to adopt the modern version of the Canadian Spatial Reference System (CSRS); to connect Parliament Hill's control network to other nearby networks; and to explore technical solutions for reducing the risk of destroying monuments. This last objective arises from the need to maintain the control points while the rehabilitation work progresses, despite the numerous excavation activities planned for the coming years. In addition, a relative accuracy of 5 mm, at the 95% confidence interval, was required for future users of the control network.

The Parliament Hill control network upgrading project was carried out from July 2015 to January 2016 under the supervision of a land surveyor from Geomatics Services. Given the numerous site constraints and the relative accuracy required, Geomatics Services quickly realized that the observations could only be carried out using a combination of Global Navigation Satellite System (GNSS) observations and conventional survey observations. The project's overall methodology was to: carry out a reconnaissance of the site and select locations for the monuments; obtain approvals and install the monuments; carry out high-precision GNSS control surveys and data processing; conduct high-precision conventional terrestrial observations and finally, perform the various least squares adjustments. However, some of the project's specific characteristics should be mentioned because they had an influence on the workload and how the work was carried out, particularly, the ongoing construction activities, the establishment of a hybrid network of monuments, and the collaboration and coordination of several internal and external partners.

The Parliament Hill construction site is an active, large-scale and long-duration construction site. Sometimes the daily site changes have complicated and restricted the ability of the surveying teams to work on the control network. Fairhall Moffatt & Woodland Limited (FMW), Ontario Land Surveyors, and Geomatics Services staff have had to adapt to the site's changing configuration, varying degrees of visibility between points on the site, and limited access to some areas throughout the project.

Very early in the project it was realized that a major challenge would be ensuring that the points that were installed in the ground remained for the long term. Taking into account this uncertainty for the longevity of the new control points, FMW and Geomatics Services surveyors came up with a solution that would result in a network of hybrid monuments, made up of monuments installed in the ground and prisms mounted on the walls of the buildings. It was felt that the wall-mounted prisms, like those used for monitoring surveys, would permit a more stable installation and prevent solely relying on the traditional ground-installed monuments. Using the wall-mounted prisms would increase the network's service life and make it more flexible for users. In fact, the wall-mounted prisms would allow for very accurate resection solutions over a large portion of the site and would greatly improve the usefulness of the control network.

Another special characteristic of the project was the pooling of expertise of the various partners. In fact, the project's success was due to a combination of essential and complementary skills of the employees of Public Services and Procurement Canada (PSPC), Natural Resources Canada and private-sector (Fairhall Moffatt & Woodland Limited, Ontario Land Surveyors). In addition, several service lines of Real Property Services Branch (Technical Services, Property and Facility Management, National Capital Area Project Delivery) and of Science and Parliamentary Infrastructure Branch from PSPC contributed to the project. This large team created a considerable coor-

Figure 1: The control network is made up of monuments on the ground and prisms mounted on the walls of the buildings. Here, there are two points near the East Block. Some points, including 2015004, were installed to connect the existing interior networks of the Parliament Buildings to the new geodetic network.

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dination task for the Geomatics Services project manager.

Carrying out site reconnaissance and selecting locations for monuments

Site reconnaissance was carried out jointly by Geomatics Services and FMW surveying teams. The following had to be considered when selecting locations for the new control points: connection to existing networks; accessibility and sustainability of the monuments; intervisibility between adjacent monuments; ability to carry out GNSS observations; and mitigation of the visual impact of the monuments on built heritage. In addition, the control network had to cover the entire grounds, with the exception of the westerly sector, which was under construction. Site reconnaissance and proper placement of new control points made it possible to integrate three points from the 1998 control network.

Obtaining approvals and installing monuments

Obtaining approvals from the various building managers was essential to ensuring the monuments' long-term sustainability, particularly for the wall-mounted prisms. A new unknown building façade element, mounted without approval of the building manager, could have raised suspicions and been considered a national security issue. This is a very real concern that was raised by the building managers during a meeting concerning the Office of the Prime Minister and Privy Council building. Obtaining approval, while relatively simple, proved to be particularly time-consuming for the Geomatics Services team.

Three types of ground-mounted monuments were used in this project: brass-capped markers for "permanent" points and brass plugs or iron bars for "temporary" points. All points located in future construction areas were deemed to having a limited service life, hence were considered temporary points. Each brass-capped marker and brass plug had unique engraved numbers. Iron bars were not engraved. The brass-capped markers and plugs were installed by staff from PSPC under the supervision of FMW.

Figure 2: Installation of wall-mounted prisms on one of the East Block's facades by employees from PSPC. The prisms were aligned by the FMW surveying team using a theodolite.

Figure 3: GNSS survey session at point PPD2015 H20 in front of the West Block construction site.

The wall-mounted monuments were Leica GMP104 mini prisms. To achieve the best possible results, these prisms have to be perfectly aligned with the instrument within +/- 10° of both the horizontal and vertical axis of the prism. To offer the most flexibly and usefulness of these prisms, this was relaxed to +/- 20°. This could result in an error of about +/- 2mm being introduced by the eccentricity of the reflection centre. It was felt this small uncertainty would satisfy the accuracy requirements for the project. These prisms were installed by staff from PSPC under the supervision of FMW.

Surveying and data processing of high-precision GNSS control points

High-precision GNSS observations were necessary for producing the NAD83 (CSRS) values used to anchor the new control network to the Canadian Spatial Reference System. The Geomatics Services team carried out the GNSS observation sessions using Natural Resources Canada (NRCan) loaned geodetic receivers. Four monuments across the site were observed for four hours on two separate days.

The observations were constrained to two monuments from the Canadian Active Control System (CACS), namely NRC1–943020 and CAGS-962000. NRCan specialized staff processed the GNSS baselines and generated georeferenced coordinates in NAD83 (CSRS) 2010.0 epoch (MTM zone 9) spatial reference system and CGVD2013 geodetic datum. These coordinates were used by the FMW team during the network adjustments to generate the final coordinates of the control points.

Performing conventional terrestrial observations and network adjustments

The team of the firm Fairhall Moffatt & Woodland Limited (FMW), Ontario Land Surveyors was responsible for performing the conventional terrestrial observations and final adjustments to the network. Horizontal observations were carried out using a Leica TS15 robotic total station with an angular accuracy of 1 second of arc and a distance accuracy of 1 mm + 1.5 ppm. Based on atmospheric conditions during the observation program, between six and eight sets (face left, face right) of measurements were taken. Elevations were determined using a Leica DNA03 digital level in combination with a Leica GKNL4M bar code staff.

There were three first order bench marks from the Canadian Geodetic Survey (NRCan) inside or in close proximity to the project zone, and four bench marks from the control network created in 1998. The vertical survey and adjustment demonstrated that there were misclosures of up to 12 mm between points 63U3620, 50U886G and 63U3621 (NRCan). The survey also demonstrated that the elevations of the points from the 1998 vertical control network matched the published value for point 50U886G (CGVD28). This bench mark is located at the base of the Peace Tower, directly on Parliament Hill. The elevation of that point was therefore adopted in order to maintain consistency with previous work.

All network adjustments were carried out using the least squares adjustment software STAR*NET-PRO V6. With regard to the horizontal observations, an initial unconstrained adjustment was made to evaluate the network's relative precision. The conclusions arising from this exercise were that the internal consistency and quality of the data was very good (no systematic errors or blunders) and that the standard error estimates used for the measuring equipment were valid. Then, the FMW team performed two constrained adjustments. The first constrained adjustment was to generate the NAD83 (CSRS) 2010.0 epoch (MTM zone 9) coordinates and the second adjustment was to generate the NAD83 (original) (MTM zone 9) coordinates. Tables 1 and 2 show the residual errors at the control points.

Table 1: Residual error at control points – NAD83 (CSRS) 2010.0 epoch (MTM zone 9)

Point No.	Known Coordinates (GNSS)		Adjusted Coordinates		Difference	
	North	East	North	East	ΔN	ΔE
2015006	5031993.910	367524.893	5031993.905	367524.892	-0.005	-0.001
PPD H20	5031852.002	367541.749	5031851.999	367541.748	-0.003	-0.001
T08	5031999.553	367293.222	5031999.556	367293.223	0.003	0.001
T09	5031717.252	367199.866	5031717.257	367199.867	0.005	0.001

Table 2: Residual error at control points – NAD83 (original) (MTM zone 9)

Point No.	Known Coordinates (1998)		Adjusted Coordinates		Difference	
	North	East	North	East	ΔN	ΔE
PPD H09	5031641.295	367262.315	5031641.295	367262.315	0.000	0.000
PPD H17	5031929.456	367454.036	5031929.456	367454.038	0.000	0.002
PPD H20	5031852.374	367541.806	5031852.373	367541.802	-0.001	-0.004

All of the adjusted coordinates had a relative precision of less than 5 mm in NAD83 (CSRS) 2010.0 epoch (MTM zone 9) and less than 7 mm in NAD83 (original) (MTM zone 9) at the 95% confidence interval. It should be noted that the elevations were maintained during the adjustments and that the coordinates of the wall-mounted prisms were calculated from the adjusted coordinates of the points on the ground.

It should also be noted that the published coordinates for the City of Ottawa's control network, established for the

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Light Rail Transit (LRT) project, were not held during these network adjustments. The City coordinates were only available in NAD83 (CSRS) 1997.0 epoch, whereas the GNSS coordinates were calculated using the 2010.0 epoch (2010.0 epoch is the CSRS epoch that was officially adopted by the Ontario Ministry of Natural Resources and Forestry).

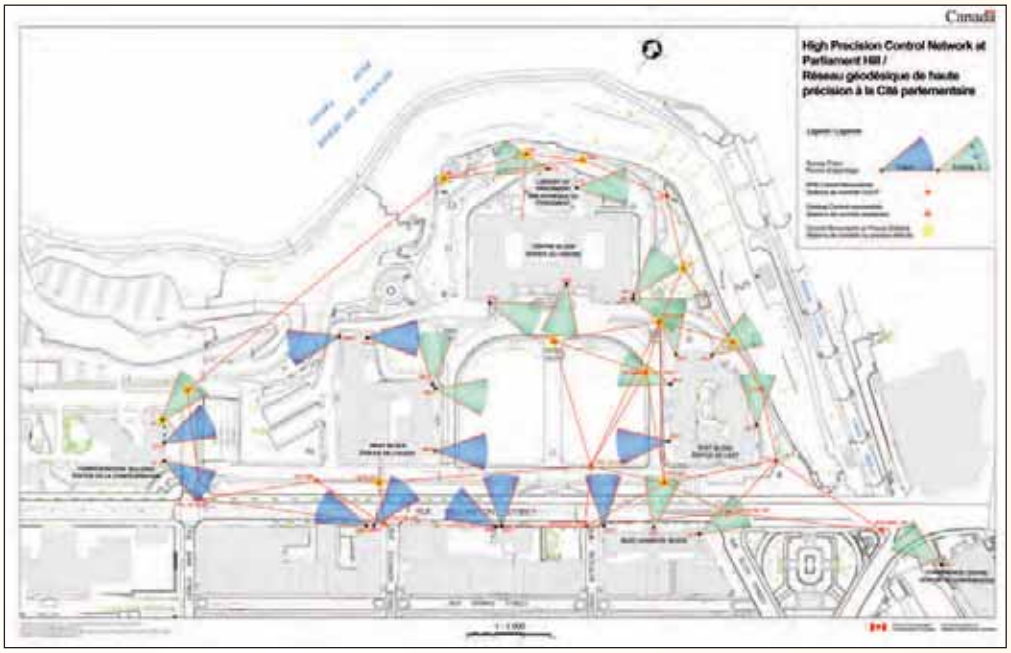

Figure 4: Sketch of the Parliamentary Precinct's high-precision geodetic network showing the control points as of February 2020.

Results

The project finally took shape with the creation of a control network made up of 37 exterior points: 14 new ground monuments, 16 new wall-mounted prisms, 4 control points from the City of Ottawa's network and 3 control points from the network created in 1998 (new values). The network's relative precision is satisfactory to meet users' needs. Also, it integrates the existing interior networks of the Parliament Buildings. All of the project objectives were achieved in the establishment of the new control network: transitioning from separate horizontal and vertical networks to an integrated three-dimensional control network; adopting the modern version of the Canadian Spatial Reference System; and connecting to the City of Ottawa's control network. Time will tell whether installing a hybrid network of monuments reduced the risk of destroying control points during the rehabilitation work.

Potential uses

Originally, the 2015 control network was established at the request of Public Services and Procurement Canada's Heritage Conservation Services in order to accurately document the built heritage using both terrestrial laser scanning and photogrammetry technologies. The integrated (interior/exterior) network allowed that team to generate georeferenced or locally referenced models of the buildings. The models are used by various working groups of the Long Term Vision and Plan, such as conservation engineers, conservation architects, the communications team and also by Canada's Dominion Sculptor. In 2019, Heritage Conservation Services requested that an interior network of control points, similar to those installed in 1998 and 2004, be established at each underground level of the new Visitor Welcome Centre (Phase I) and the West Block.

The control points are frequently used by surveying and engineering companies involved in various stages of the Long Term Vision and Plan. For instance, this network will form part of a monitoring system established to detect any movement of the Centre Block during the construction of Phase II of the Visitor Welcome Centre. Indeed, this phase involves a significant disturbance to Parliament Hill's underground area, and the project team wants to make sure that neighbouring buildings do not suffer any damage during the operation.

Future work

In 2019, the Parliament Hill construction site was radically transformed with the completion of the West Block rehabilitation work and Phase I of construction on the Visitor Welcome Centre, as well as the start of rehabilitation work on Centre Block. The Geomatics Services team used this transitional period to assess the condition of the control network established in 2015. They noted the disappearance of 10 control points on the ground and one wall-mounted prism, as well as the displacement of one ground control point. These findings confirmed the sustainability of the wall-mounted prisms, compared with the ground monuments, in the context of an active construction site. In order to preserve the network's integrity and continue supporting the activities of the Government of Canada's Long Term Vision and Plan, the lost monuments must be replaced or restored. In addition, access to the westerly sector of Parliament Hill will allow for the densification of that portion of the network. During the 2015 campaign, the extensive construction activity in that sector had limited the installation of monuments. Densifying the network in that sector will enable the extension of the control network towards the Judicial Precinct, to the west, in order to support the scheduled rehabilitation of the Supreme Court of Canada building over the next few years. The Judicial Precinct is located on land owned by the Government of Canada and is adjacent to Parliament Hill.

Conclusion

According to the managers of the Long Term Vision and

Plan, the project to rehabilitate the buildings on Parliament Hill and the Parliamentary Precinct is the largest rehabilitation project ever undertaken in the history of Canada. Surveyors from Ontario and Public Services and Procurement Canada (PSPC) have an opportunity to take part in this unique project that provides reliable, modern and accessible control points that can be used by the workers and professionals for the duration of the rehabilitation work and beyond. The PSPC's control network upgrading project achieved that objective in 2015 with the establishment of 37-points covering the 19.5 hectares of this outstanding site.

References

1. Adopted NAD83(CSRS) Epochs | Natural Resources Canada, https://www.nrcan.gc.ca/earth-sciences/geomatics/canadian-spatial-reference-system-csrs/adopted-nad83csrs-epochs/17908?_ga=2.187558702.762274643.1582727883-1179477702.1582727883 [consulted on January 24, 2020].
2. History of the Hill – Canada's Parliamentary Precinct – PWGSC, https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentaryprecinct/histoire-history/index-eng.html [consulted on January 24, 2020].
3. John McQuarrie, The Hill / La Colline: Canada 150 Edition, Ottawa, Magic Light Publishing, 2015, 112 pages.
4. HistoricPlaces.ca – HistoricPlaces.ca, https://www.historicplaces.ca/en/rep-reg/place-lieu.aspx?id=4675&pid=0 [consulted on January 24, 2020].
5. Follow the rehabilitation of the parliamentary buildings – Canada's Parliamentary Precinct – PSPC, https://www.tpsgc-pwgsc.gc.ca/citeparlementaire-parliamentary-precinct/rehabilitation/index-eng.html [consulted on January 24, 2020].

Judith Marie Beaudoin is a Quebec Land Surveyor. She has worked for the National Centre of Expertise of Geomatics Services in the Real Property Services Branch of Public Services and Procurement Canada since 2019. Ms. Beaudoin holds a bachelor's degree in Geomatics Sciences from Laval University and a Masters in "Muséomatique" also from Laval University.

Alain Jacob is a Quebec Land Surveyor and a Canada Lands Surveyor. He has been Manager of Survey and Land Information Management in the Real Property Services Branch of Public Services and Procurement Canada since 2013. Mr. Jacob has nearly 32 years of experience in project management in land surveying and land rights on federal properties.

Ewart Donald Bowlby is an Ontario Land Surveyor (Geodesy) and has been with the firm Fairhall Moffatt & Woodland Limited, Ontario Land Surveyors, since 1969. Mr. Bowlby has over 50 years of experience associated with a whole range of control-related surveys from photogrammetric control to high precision monitoring surveys.

NEWS FROM 1043

Changes to the Register

MEMBERS DECEASED
Robert A. Garden 917 Mar. 20, 2020

COFAS REVISED
Was: WSP Geomatics Ontario Limited
Now: GeoVerra (ON) Ltd.
Thornhill, Ontario, June 28, 2020

COFAS APPROVED
C. Wahba Surveying Ltd.
Woodbridge, Ontario
May 1, 2020

F.S. Surveying Inc.
North York, Ontario
June 1, 2020

RS Surveying Limited
Stouffville, Ontario
June 15, 2020

Surveyors in Transit

Matthew de Jager is now with **Van Harten Surveying Inc.** in Guelph, ON. **Jaro Legat** is now the Managing OLS at **Cunningham McConnell Limited i**n Milton, ON.

David Henrickson is no longer with **Holding Jones Vanderveen Inc.**

Philip Hofmann is no longer with **J.D. Barnes Limited.**

Danny P. Quinlan is no longer with the **City of Toronto.**

Chris Wahba is now the Managing OLS at **C. Wahba Surveying Ltd.** located at 571 Davos Road, Woodbridge, ON, L4H 0X4. Phone: 416-737-2909.

Farzad Salehi is now the Managing OLS at **F.S. Surveying Inc.** located at 7 Colwick Drive, North York, ON, M2K 2G2. Phone: 416-786-8080.

Shane Rajakulendran is now the Managing OLS at **RS Surveying Limited** located at 46 Ira Lane, Stouffville, ON, L4A 1S3. Phone: 905-554-1021.

Fereidoon Khosravirad is no longer with **Pearson and Pearson Surveying Ltd.**

Effective June 15, 2020, the temporary mailing address for **Sperling Surveying Inc.** will be P.O. Box 254, Mindon, ON, K0M 2K0.

Krcmar Surveyors Ltd. has a new office located at 1-661 Welham Road, Barrie, ON, L4N 0B7. Phone: 705-792-6780. **Tom Krcmar** is the Managing OLS.

Dino Astri Surveying Ltd. has moved to 1 Ridgewood Court, Oro-Medone, ON, L0L 2L0. Phone: 705-835-3710.

Robert Wannack is no longer with **Ivan B. Wallace Ontario Land Surveyor Ltd.** in Belleville. **Kerry Boehme** is now the Managing OLS at that location.

The field notes and records of **George Bracken Limited** are now with **Callon Dietz Inc.** in their new location at 19 Roe Street, Carleton Place, ON K7C 0N3. Phone: 613-253-6000. **George N. Bracken** is also now with **Callon Dietz Inc.** in Carleton Place.

The North Bay office of **Callon Dietz Inc.** is now located at Unit 10 – 191 Booth Road, North Bay, ON, P1A 4K3. Phone: 705 478-6699.

Tareyn Gardner is no longer with **J.D. Barnes Limited.**

Combined Scale Factors (CSF) for Ontario Cadastral Surveys

By Paul C. Wyman, O.L.S. (Ret)

In fulfilling the requirement to integrate surveys, surveyors normally publish a 'combined' scale factor' (CSF) on their plans along with the grid coordinates for a few survey corners. The distances on the plan are 'ground' or 'grid' values and the combined scale factor allows users of the plan to convert distances or compute coordinates for the remaining plan corners. I have noted that on some plans, this published CSF does not appear to be sufficiently accurate for that purpose. This is not to say that the coordinate values themselves are inaccurate. Coordinates are often obtained directly from commercial Global Navigation Satellite Systems (GNSS) real time network (RTN) processes or using precise point positioning (PPP) software. The scale factors shown on these plans are possibly the published CSF for the commercial base station or some other control monuments in the vicinity of the project. In some cases, these scale factors are not appropriate for the actual survey project site because of location or elevation differences.

Since the Ontario Regulation requiring the integration of surveys specifies the use of the 1983 North American Datum (NAD83), I limit this presentation to the use of the GRS80 ellipsoid and the Transverse Mercator projection – the 6° UTM projection (Universal Transverse Mercator projection) and the 3° MTM projection (Modified Transverse Mercator projection). Additionally, some of the information in this article is specific to Ontario, Canada. Information in this article does NOT apply to scale factors for the old NAD27 datum.

A note regarding the meaning of 'accuracy' or 'accurate' in this presentation. For a value to be 'accurate' to a precision of 'n' decimals, the value must be accurate within +/- 5 units in the n+1 decimal place. For example: 0.001 is 'accurate' if the value is correct to +/- 0.0005.

In this presentation, I use the term 'orthometric height' to mean the 'mean sea level' elevation that we use in our everyday work. In the Ontario COSINE monument data reports, this value is listed as the "o-elev". I use the term 'geodetic height' to mean the height of a point above the GRS80 ellipsoid. In the Ontario COSINE monument data reports, this value is listed as the "e-elev".

Transverse Mercator (TM) Zones

As a survey and mapping tool, the world is divided into the Universal Transverse Mercator (UTM) projection zone system. These zones are narrow, north/south zones - 6° of longitude wide and numbered Zone 1 to Zone 60. The zones are truncated at latitude 80°N and 84°S. The 'origin' for the grid coordinate system in each zone is the equator and the central meridian of longitude for the zone. In the northern hemisphere, the equator is given a northing value of 0.000 metres and the central meridian is given an easting value of 500,000.000 metres (to avoid negative numbers for points west of the central meridian). In the southern hemisphere, the equator is given a northing value of 10,000,000.000 metres and the central meridian is given an easting value of 500,000.000 metres. Points along the central meridian are given a grid scale factor of 0.9996 (this is the GRID scale factor, **not** the combined scale factor).

Since the same numeric value for a northing and easting can represent points in any one of 60 zones and in either the north or south hemisphere, it is necessary to make sure the hemisphere and zone are associated with the numeric values. One method is to state the zone and hemisphere along with the values. For example, a point in Zone 17 in the northern hemisphere would be: *17North 614,213.123E 4,567,789,321N.*

In Canada, there is also a Modified Transverse Mercator (MTM) system using 3° wide zones. The equator is given a northing value of 0.000 metres and the central meridian is given an easting value of 304,800.000 metres. Points along the central meridian are given a grid scale factor of 0.9999. The MTM zone number should always be associated with the coordinate values.

The formulae and processes to determine grid scale factors are similar for both 6° UTM and 3° MTM zones. Since both NAD83(Original) and NAD83(CSRS) use the same GRS80 ellipsoid, they will have the same scale factors for the same point.

GRS80 Ellipsoid

NAD83 uses the GRS80 ellipsoid which is a surface created by an ellipse rotated about its minor (polar) axis and has the following parameters that are needed to calculate scale factors:

Semi-major (equatorial) axis	= 6378137.0 (exact)	= symbol ' a '
Semi-minor (polar) axis	= 6356752.3141403474	= symbol ' b '
First Eccentricity Squared	= 0.006694380022903415 7	= symbol ' e^2 '
Second Eccentricity Squared	= 0.006739496775481621 9	= symbol ' e'^2 '

Combined Scale Factors (CSF)

In order to project (scale) distances measured on the earth's

surface onto the TM grid, two steps are necessary. The first step is to project the distance from the earth's surface onto the surface of the GRS80 ellipsoid. This ellipsoid surface is approximately at sea level. If the earth's surface is higher than the ellipsoid surface, the distance is projected down onto the ellipsoid and the distance will be slightly smaller. If lower than the ellipsoid, then the distance will project up onto the ellipsoid and the distance will be slightly larger. This scaling of distances resulting from the projection from the earth's surface onto the ellipsoid is generally referred to as the ELEVATION SCALE FACTOR (ESF). To compute the elevation scale factor at any point, it is necessary to determine the height of the earth's surface above (or below) the GRS80 ellipsoid and to know the ellipsoid radius of curvature at that point. The formula for the elevation scale factor at any point is:

$ESF = R / (R + h)$

where R = Ellipsoid Radius of Curvature

h = Height of the point relative to the ellipsoid (negative if below the ellipsoid surface)

The second step is to project the distance from the ellipsoid onto the TM grid. This scaling is generally referred to as the GRID SCALE FACTOR (GSF). At the central meridian for each zone, the UTM zone grid scale factor is equal to 0.9996 and for MTM zones it is 0.9999. Grid scale factors increase for points located away from the central meridian toward the zone boundaries (where they are often greater than 1.000).

An accurate calculation of the grid scale factor at any point is quite involved but approximations can be obtained from the formula: $GSF = k_0 (1 + a_8 |^2 + a_{10} |^4)$

where k_0 = Scale factor at Central Meridian (0.9996 for UTM zones or 0.9999 for MTM zones)

$|$ = longitude of the point – longitude of the central meridian **in radians**

$a_8 = 1/2 \, Cos^2(Lat) [1 + e'^2 \, Cos^2(Lat)]$

$a_{10} = 1/24 \, Cos^2(Lat) [-4 + (9 - 28e'^2) \, Cos^2(Lat) + 42e'^2 \, Cos^2(Lat)]$

(e'^2 is the second eccentricity squared – see above section GRS80 Ellipsoid)

The above formula will provide a GSF accurate to 7 decimals within +/- 3° 30′ of the zone central meridian.

There are formulae for computing the GSF from grid coordinates but any that I know of that provide reasonable accuracy also require the use of latitude. If latitude and longitude are known, then it is simpler to use the above formula for GSF.

The Elevation Scale Factor and the Grid Scale Factor are combined into the Combined Scale Factor (CSF) by simple multiplication:

CSF = ESF x GSF.

Ellipsoid Radius of Curvature

Various geodesy authorities differ on the definition of the radius to be used in the calculation of elevation scale factors. Various texts and authorities use a global average ellipsoid radius or an average for a defined area. Others use the radius of curvature in the prime vertical (represented by symbol N) or the radius of curvature in the meridian (represented by symbol M) at the latitude of the point. Others use the geometric mean (Gaussian Mean) or the harmonic mean of M and N.

Greater accuracy is achieved by using a specific radius for each point rather than using an average radius. It is my understanding that Ontario's COSINE and NRCan's Canadian Geodetic Survey use the geometric mean radius and for this article, I have used the geometric mean (R_{GM}) of the radius of curvature in the prime vertical (N) and the radius of curvature in the meridian (M) at the latitude of the point:

$\mathbf{R_{GM} = Sqrt(M \times N) = b / (1 - e^2 \, SIN^2(Lat))}$

(e^2 is the first eccentricity squared – see above section GRS80 Ellipsoid)

Factors Affecting Elevation Scale Factor Accuracy: ESF = R / (R + h)

The accuracy of the computed elevation scale factor (ESF) is dependent on the accuracy of the point's known height above the ellipsoid and the accuracy of the computed ellipsoid radius of curvature at that point.

The highest point in Ontario has an elevation of approximately 700 m. If we use this as a 'worst case' and if we use the ellipsoid radius for mid-Ontario at Latitude N46.5°, (R_{GM} = 6,379,222 m) the following can be calculated for the ESF (see the table below). (Note - *Accuracies for the Ellipsoid Radius decrease at elevations higher than 700 m.)*

Most of Ontario's population live between Pelee Island - latitude N41.5° (R_{GM} = 6,375,491.6) and Moosonee - latitude N51.5° (R_{GM} = 6,382,923.2). An average Ontario radius of 6,379,200 m varies by +/- 3.8 km between these latitudes thus is usable for ESF with 6 decimal accuracy. For 7 or 8 decimal ESF accuracy, it is necessary to calculate the ellipsoid radius for the point.

Geodetic Height Accuracy	Resulting ESF Accuracy	Ellipsoid Radius Accuracy	Resulting ESF Accuracy
+/- 32 metres	5 dec. (+/- 5 x10^{-6})	+/- 291 kilometres	5 dec. (+/- 5 x10^{-6})
+/- 3.2 metres	6 dec. (+/- 5 x10^{-7})	+/- 29.1 kilometres	6 dec. (+/- 5 x10^{-7})
+/- 0.32 metres	7 dec. (+/- 5 x10^{-8})	+/- 2.91 kilometres	7 dec. (+/- 5 x10^{-8})
+/- 32 millimetres	8 dec. (+/- 5 x10^{-9})	+/- 291 metres	8 dec. (+/- 5 x10^{-9})

Factors Affecting Grid Scale Factor Accuracy: GSF = $k_0 (1 + a_8 l^2 + a_{10} l^4)$

The accuracy of the computed grid scale factor is dependent on the accuracy of the point's latitude and longitude. The change in GSF with latitude is very slow. An error

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of +/- 11 seconds of latitude (more than 300 m) will result in a change of only +/- 0.00000005 (7 decimal accuracy) in the GSF at Ontario latitudes. The rate of change in GSF is greater for changes in longitude but an error of +/- 0.354 sec. (8 m at Ontario mid-latitude) in longitude results in a GSF accuracy of +/- 0.00000005 (7 decimal accuracy). The Ontario integration regulation requires a coordinate accuracy of 1 metre (remote areas) or better, thus the normal Cadastral survey requirements result in horizontal position accuracies sufficient to compute grid scale factors better than 7 decimal accuracy - the accuracy that will typically be obtained from the above noted formula.

Recommendations for Scale Factor Accuracy for Publication on Plans of Survey

The following are my personal recommendations and do not represent any AOLS regulation or guideline.

Published scale factors should be accurate enough that they will not introduce any appreciable error in information derived from the plan distances. Scale errors are systematic in nature and will affect every distance or every coordinate derived from plan distances. Ideally, the errors introduced by scale factor inaccuracy should be one to two orders of magnitude smaller than the residual errors from the field survey.

With modern survey technology, we should expect that, after adjustment, most plan distances will be accurate to +/- 5 mm + 1:20,000 (or better). For a 300 m distance, this works out to +/- 20 mm or an overall accuracy of 1:15,000. For a 300 m distance, a CSF accuracy of 1:100,000 (5 decimals) will have a maximum error of +/- 0.000005 x 300 m = +/- 1.5 mm. A CSF accuracy of 1:1,000,000 (6 decimals) will have a maximum error of +/- 0.15 mm in 300 m. A combined scale factor accuracy of 5 decimals is adequate but 6 decimal accuracy is desirable as it reduces the scale factor error to a negligible amount.

The combined scale factors for longer ties to control monuments, base stations, etc. that are part of the integration information should be at an accuracy of at least 6 decimals published for each individual point.

Higher accuracy control surveys should only use an individual CSF for each point at an accuracy of at least 7 decimals. All rigorous least squares software that I have used, compute individual scale factors to 8 decimals (for 3D survey adjustments). Ontario COSINE and NRCan PPP reports output scale factors to 8 decimals.

The 'weak link' in determining combined scale factors is the elevation scale factor component. As noted previously, we normally determine the horizontal position with more than enough accuracy to compute the grid scale factor to 7 or more decimals. However, to obtain elevation scale factors accurate to 7 decimals, geodetic heights must be accurate to +/- 3 decimetres.

The following table of CSF accuracies are my recommendations for Cadastral Surveys:

Recommended Accuracies for Combined Scale Factors and Related Data Accuracy					
CSF Type	CSF (decimals)	Radius (km)	h (m)	l** (seconds)	l (m)
Project Avg.*	5	+/- 278	+/- 32		
Individual (Cadastral)	6	+/- 29	+/- 3.2		
Individual (Control)	7	+/- 3	+/- 0.32	+/- 0.354	8

* project site average CSF should be at the site centroid and at the average site elevation.
The project site size should not exceed 1.4 km east / west or have elevations vary by more than 60 m.

** these values change with latitude, values provided are at Lat. N46.5° (mid Ontario)

CSF : combined scale factor

Radius : ellipsoid radius of curvature based on geometric (Gaussian) mean of M and N

h : height above the ellipsoid (geodetic height)

l : longitude difference of point from central meridian (. to radians for formula)

In much of Ontario the difference between geodetic heights (h) and orthometric heights (H) is in the range of 35 to 40 metres. To obtain combined scale factors to accuracies of 5 decimals or better, it is essential to use geodetic heights (not orthometric heights) in the calculation of scale factors.

The formulae provided in this presentation are for NAD83 UTM or MTM zones. If you are computing scale factors in 6° zones extended by more than 0.5° (approximately 38 km), you should use different and more accurate formulae.

Obtaining Geodetic Heights (h)

The formula to calculate the elevation scale factor (ESF) requires the elevation of the point on the earth's surface above (or below) the ellipsoid. This elevation is different than the orthometric height (the 'elevation above mean sea level') that we use in our everyday work. In many geodesy texts, the height above the ellipsoid (geodetic height) is represented by the letter 'h' and the height above the geoid (orthometric height) is 'H'. The difference between the two heights is represented by the letter 'N' such that h = H + N. Keep in mind that 'N' is a 'signed' quantity. In much of Ontario, "N" has a value between -35 m to -40 m so the geodetic height will be *smaller* than the orthometric height. NRCan - Canadian Geodetic Survey has created models of the separation of the geoid and the NAD83 (GRS80) ellipsoid. The separation 'N' can be calculated for any point in Canada from these models.

If you are using GNSS to determine the horizontal and

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vertical position of a point, the geodetic height (h) is directly determined by GNSS. Most commercial RTN GNSS systems contain one of the NRCan geoid / ellipsoid models and these systems compute an orthometric height (H) for output as this is what we usually desire. Some GNSS systems also output the height above the ellipsoid (h). If 'h' is available from the GNSS output then this is the value needed to calculate the elevation scale factor (ESF).

When only the orthometric height (H) is known for a point, 'h' can be calculated (h = H + N) by determining 'N' from adjacent control monuments. The separation (N) does not change rapidly with respect to horizontal position. The Ontario COSINE report for Ontario control monuments provides both the geodetic and orthometric heights for the monument. By subtracting the two, 'N' for that monument can be calculated (N = h – H). By examining the value of 'N' calculated for a few monuments around your survey site, you may find that 'N' only varies by a few decimeters. An average value of 'N' for these surrounding monuments can often be used at the survey site to compute 'h' and elevation scale factors of 5, 6 or 7 decimal accuracy.

Using several COSINE reports for monuments in a larger area (a County or Region), it is often possible to find an average value of 'N' that does not vary by more than a meter or two. This average value of 'N' can be used to convert orthometric heights to geodetic heights for scale factor accuracies of 5 or 6 decimals.

A more accurate method to obtain a geodetic height from an orthometric height is to download the NRCan - Canadian Geodetic Survey software called *'GPS-H'* (current version 3.4.2). You must register with NRCan, but this is easily and quickly done, and at no cost. This and other software are at the following Internet address: https://www.nrcan.gc.ca/maps-tools-publications/tools/geodetic-reference-systems-tools/tools-applications/10925

The GPS-H software will convert CGVD28 elevations to the new CGG2013a elevation datum and it also uses NRCan's models of the separation of the geoid and NAD83 (GRS80) ellipsoid to convert orthometric heights to geodetic heights. The software is quite easy to use. The big advantage of this software is that you can input either grid (N, E) or geographic (Lat., Long.) coordinates for the point. When using this software to obtain a geodetic height from an orthometric height there is a small 'check box' titled "h = H + N" that you must check to change the column headers and the software computation. It is located near the bottom of the screen. The default setting of the software expects you to enter geodetic heights.

NRCan TRX and PPP Software

NRCan - Canadian Geodetic Survey has another excellent free software called *'TRX'* that can be downloaded from their website. There is also an on-line version of this software, but I recommend installing the software on your computer if you intend to regularly use it. *The TRX software was recently revised and I recommend that you download the latest version (TRX 1.4.1).*

The TRX software performs transformations between grid and geographic coordinates, epochs and datums. It also calculates the combined scale factor and convergence for a point. The software is quite easy to use. Data for individual points can be typed in or batch processing of files is possible. As with GPS-H, the advantage of this software is that you can input either grid (N, E) or geographic (Lat., Long.) coordinates, however you must enter geodetic heights to obtain correct combined scale factors (CSF).

Please note that in the TRX software, you can change the column header from 'h' to 'H' and enter orthometric heights, but the software will calculate an **incorrect** CSF. When using this software to obtain combined scale factors, ONLY INPUT GEODETIC HEIGHTS.

Many surveyors will also be familiar with NRCan's Precise Point Positioning (PPP) software. Surveyors send to the NRCan website their single receiver GNSS data (in RINEX format) and the PPP application e-mails back a very thorough report that includes the coordinates of the point and the combined scale factor for the point. The longer the observation (up to 24 hours), the more accurate the results.

My own analysis indicates that the TRX or PPP generated combined scale factors are accurate to 8 decimals.

Conclusion

Adjusting your field survey data with a good least squares adjustment software will provide accurate scale factors for publication on your surveys. Collecting coordinates in the field data collector will not. Ultimately, it is the surveyor's responsibility to obtain and publish proper values. Developing an appropriate method or tools to obtain accurate scale factors may be difficult at first but with repetition, will become as simple as any other task in the field survey to plan process. While I recommend the use of the TRX software, if you choose to compute your own scale factors, test your method by using some COSINE control monument reports to see if your method is consistent with COSINE values.

A reminder regarding average combined scale factors (CSF) for an entire site. Simply averaging known scale factors for a few points around the site may not give a very good median value for the site. Too many of the points may be in one geographic area or close in elevation. Your site average CSF should be calculated for the site centroid and at the average of the lowest and highest site elevations. The average project CSF should be selected with some care.

One last suggestion. On your plans, publish the scale factors to either 5, 6 or 7 decimal places based on their actual accuracy so that the public and fellow professionals are better able to assess how to use these values for their purposes.

Paul C. Wyman became an Ontario Land Surveyor in 1973. He worked in private practice until 2001. From 2001 to retirement in 2014 he worked for the Geomatics Division of Public Works and Governments Services Canada. Paul would like to thank Professor Spiros Pagiatakis, York University and Brian Donahue, Team Leader, Surveyor General Branch, Natural Resources Canada for their assistance in the preparation of this article. Paul's previous article *Precision Equations for the UTM Projection – One TM Zone for Ontario?* can be found in the Ontario Professional Surveyor, Volume 61, No. 3, Summer 2018.

Know your History — Part 5

By Tom Bunker, O.L.S., C.L.S., P.Eng., C.P.A. (Ret)

The following article is Part 5 in series of historical articles by Tom Bunker. This article is not intended to be a comprehensive discussion of water boundaries, but to highlight the importance of "knowing your history" before coming to a decision.

AOLS Water Boundaries Working Group, 1984 – 1986, Revisited

It is acknowledged that the Association of Provincial Land Surveyors was first formed in 1886 "for the purpose of improving ourselves and maintaining and elevating the standard of our profession"[i] and incorporated as the Association of Ontario Land Surveyors (AOLS) in 1892. The archival records of the AOLS not only hold minutes of annual meetings and administrative council decisions, but technical reports and seminar material prepared by individuals and committees that were presented to annual and regional group meetings, realtors, engineers, lawyers, students and others. Our foundation on these documents should not be overlooked in building our understanding of the issues faced in the present operating environment.

One such endeavour was the deliberations of the AOLS Water Boundaries Working Group.

Background

Concerns about historical and current methods for surveying and illustrating water boundaries, that were raised by the North Eastern Regional Group and others, were taken to the AOLS Council in 1982 by newly elected Councilor, Tom Bunker.

A Water Boundaries Committee was struck under the Surveying Zone of the AOLS Council. Many of the issues related to members' research, field methods and plan standards and were accordingly referred to the concurrently formed Standards Task Force[ii]. A few of the considered issues related to contradictory policies and practices of the Ministry of Transportation (MTO), the Ministry of Natural Resources (MNR), and the Ministry of Consumer and Commercial Relations (MCCR) and were beyond the purview of the AOLS.

At the 1983 AOLS Annual General Meeting, a discussion was held between Tom Bunker, Surveyor General J. Hugh O'Donnell and Examiner of Surveys (MCCR) Tom Seawright to consider a forum to advance discussion of issues arising during interactions between private practice surveyors and their Ministries. It was agreed that a Water Boundaries Working Group[iii], including surveyors, a lawyer and administrator representation from the affected Ministries, sponsored by the AOLS, would meet regularly to address identified issues.

The initial meeting was held at the Board Room, Surveys and Mapping Branch, MNR, in Toronto on May 15, 1984 where particular questions with respect to descriptions/title

Larry Maughan at the front of the canoe portraying David Thompson with his crew in Muskoka in 1837, in a 2007 re-enactment.

of flooded lands and accreted/eroded lands were set out in a memo from Tom Seawright.

The adopted Terms of Reference can be characterized as follows:

1) To make general recommendations concerning **the boundaries** of lakes and rivers that existed at the time of Patent, and in particular, those where water levels have changed over time.
2) A series of 12 tasks that collectively focused on procedures to deal with:
   - Crown re-acquisition of flooded land
   - Title records for accreted and eroded land
   - Limits by agreement on the Great Lakes
   - Re-survey program funding and confirmation, including vertical extents
   - Determination of navigability
   - Development of bibliographies of decided cases by courts and the Boundaries Act tribunal

The minutes and research documents disclose the depth of discussion on these matters. The interim and final reports of the Working Group are found in the 1986 and 1987 AOLS Annual Reports. It is clear that some of the tasks were beyond the resources available to the group, but some concrete outcomes were achieved.

1) Discussion was intense about the MNR position that the ownership of land **artificially flooded** after survey but pre-Patent had been transferred to private ownership by the Patent. While there were dissenting opinions concerning the law, notably David Lambden[iv], it was a consensus that MNR knew what **their intention** was as Crown representative (Surveys and Lands Divisions). Accordingly, an MNR Policy Statement

was issued in August 1985[v] to clarify their position.

2) Draft legislation was prepared and submitted to legislative counsel to amend the Land Titles Act and Public Lands Act to permit descriptive changes to title records as a result of accretion and/or erosion.
3) A detailed report was prepared by Hannes Hietala, OLS (MNR) on the various descriptors used in Crown Instructions, correspondence, Patents, etc. to describe the boundary of land.
4) A brief was prepared outlining the considerations to be had when determining navigability.
5) A summary of Boundaries Act decisions that made reference to water boundaries was compiled for distribution[vi].

More than 30 years have now passed so where are we now?

During the Working Group's deliberations and since their reports were issued in 1987, a number of events have affected the evolution of surveyors' understanding of the issues. This understanding has been supported in particular by: post-secondary academic training primarily under the instruction of David Lambden; published case law decisions; and knowledge-gaining resources such as:

Texts

- Survey Law in Canada, Carswell, 1989
- Legal Aspects of Surveying Water Boundaries, Carswell, 1996
- Russell On Roads, 3RD Edition, Carswell, 2015
- Principles of Boundary Law in Canada, Four Point Learning, 2016

Seminars and reports

- Water Boundaries Seminar, AOLS, Toronto, 2002
- Article on common fallacies on which court decisions have been based; Dr. Brian Ballantyne, Ontario Professional Surveyor, Volume 56, No. 2, Spring 2013, page 8
- Waterfront Properties in Ontario, Best Practices for Resolving Title & Boundary Issues, Four Point Learning, 2018 Conference

What have we learned?

1) It is affirmed that the final determination of all boundary and/or title rests with the courts. The opinion of any single surveyor or lawyer is just that and may have no greater weight than another[vii].
2) Crown Patents that abut a navigable body of water create parcels that are riparian and extend to the water's edge unless there is express exception or reservation of a strip of land. The precedent case is Ontario (Attorney General) v Walker, affirmed by the Supreme Court in 1975.
3) The term "high water mark" has no legal significance as a water boundary in Ontario. Historical plans that have labelled such a feature are the root cause of many title/boundary problems.
4) The riparian boundary is ambulatory, incapable of being "true and unalterable" or fixed in place by statute. Accretion/erosion and dereliction cause additional problems to resolve, especially frontage allocations.
5) Boundaries Act applications may offer a solution but in complex cases are seldom satisfactory and are always subject to appeal[viii].
6) The actual amount of vertical change on many lakes is unknown because of historically poor record keeping and occasionally poor technical work.
7) Extensive and detailed documentary research is often required in order to offer an opinion, and reference to a court for determination and order may be required.
8) Shore Road Allowances laid out in the original township survey may be the same as those excepted by Patent but different from "reservations".
9) The location of the water boundary is dependent on the date of Patent, not the date of survey. This common law position makes allowance for the ambulatory nature of a natural boundary. The water body is where it physically existed at the date of Patent, not necessarily where it is illustrated on a survey plan.

An understanding of these earlier deliberations can aid us in our daily determinations of historical facts.

The consideration of navigability

Navigability is a determinant of ownership[ix] as the Beds of Navigable Waters Act (BNWA) exempts the bed from Crown Grant, unless explicitly included. In 50 years, I don't recall ever seeing an express grant of the bed. While a lower court held that "together with the woods and waters thereon" was a grant, other court decisions have been rendered holding that this phrase is too general to be an express grant, (e.g. together with the bed of named creek).

It was suggested in proposed AOLS Standards in 1984[x] that the surveyor should express an opinion on navigability, while Working Group member David Lambden argued that title based on navigability is to be solely determined in law, much like a determination of adverse possession, and surveyors are at risk if they express an opinion on the matter. The requirement for "opinion on navigability" was not carried to the AOLS Standards published February 1985 and much of the 1985 Standards material no longer appears in O. Reg 216/10.

An opinion of a boundary may require an opinion of navigability. While many water bodies are obviously navigable in fact, the determination of navigability of a water course in law is a Province-wide issue.

In Re: Coleman and Attorney General (Ontario)[xi], Henry J. held in a decision on Bronte Creek, that a stream is navigable in law if it is navigable in fact **and** is available for public use, not solely private use. "Navigability is essentially a factual question based upon an assessment of the capabilities of the waterway at the time of the Crown

cont'd on page 24

grant"[xii]. A further comment in Canoe Ontario v Julian Reed[xiii] confirmed the public use must be to connect from one point of public access to another such point.

The surveyor is the one on the ground making the real-time observation of the nature of the water body/water course and evaluating the capacity for historical and current navigation and a stream navigable in part may be non-navigable at other locations. An impediment, such as rapids or a waterfall that might be bypassed by a canal, would not render the river un-navigable at those points[xiv].

Aerial photo showing Muldrew Creek

A stream is shown on the original survey and referenced in the Patent

The original Township plan may show a stream with two lines, coloured or not, and be referenced in the Patent[xv] by a phrase such as "*reserving to the Crown the waters of the creek which passes through this lot*". My interpretation is that this is the opposite of an express grant but sufficient research is necessary to determine whether the water course meets the various physical navigability characteristics in order to be shown as Crown with a boundary at the water's edge.

Recall my Ontario Professional Surveyor article[xvi] that included comments about Muldrew (Leg Lake) Creek and its navigability. The creek is well known as the early route from the Severn River to Lake Muskoka. The related portages in Muskoka Township were used by PLS Rankin in 1857 and are shown on the 1870 township survey of the west part of Muskoka Township. David Thompson makes a reference to his investigation of the "carrying place" that leads to Matchedash (now Severn) River while in Lake Muskoka, August 16, 1837.

To shy away from an opinion on navigability would render many Ontario surveys indeterminate if each had to be taken to Court for a ruling.

It is important to recall that a surveyor's opinion is not the final determination of a boundary, that another surveyor could have a differing opinion on reasonably similar facts and a judge could rule them both valid opinions but neither a correct result. This requires us to carry out thorough and well-documented research and analysis to support our opinion should the result be ultimately challenged.

i pg 185, They Left Their Mark, John L. Ladell, 1993, Dundurn Press, Toronto
ii Report to the 1983 Annual Meeting, AOLS
iii Report to the 1985 Annual Meeting, AOLS
iv David Lambden, OLS, CLS, FIS Aust, was added to the Working Group as a representative of Erindale College
v MNR Policy LM 7.09.02 (rescinded in 2007 and not replaced)
vi See AOLS Practice Manual
vii Stark, J in Ontario (Attorney General) v Walker, [1971] 1 O.R. 151; affirmed [1975] S.C.R. 78
viii As an example Krull v. MacDonald and Irwin, Boundaries Act decision set aside by the Divisional Court, File 633/17 at Toronto, Nov 20, 2017
ix See MNRF Policy PL 2.02.02 issued Feb 26, 2007
x Letter to AOLS President Wayne Brubacher, Mar 15, 1984
xi Re: Coleman and the Attorney General (Ontario), 1983, 143 DLR(3d) 608 (Ont HC)
xii Middlesex Centre (Municipality) v MacMillan, 2016 ONCA 475.
xiii Canoe Ontario v Reed, 1989, 69 OR(2d) 494 (Ont HC)
xiv Re: Coleman and the Attorney General (Ontario), 1983, 143 DLR(3d) 608 (Ont HC)
xv Patent dated 1817 for Lot 7, Concession 2, Georgina Twp
xvi What Were They Thinking?, pg 8, Ontario Professional Surveyor, Vol 58, No 1, Winter 2015

Sites to See

Watching over our planet from space – A kit for kids!

https://bit.ly/2MWRkJE

A wonderful first look at the subject of "Remote Sensing", this education kit is intended for students 11 to 15 years of age. It contains an introduction to remote sensing, twelve hands-on activities and a supplemental reading section, all rich with satellite imagery, photography and illustration. Students will become aware of the nature of satellite imagery and how it can be used to monitor environmental issues such as oil spills, forest fires, flood damage, mine wastes, forest clearcutting and land use. Natural Resources Canada is the originator of this material.

DISCIPLINE DECISION Eric Salzer, O.L.S.

IN THE MATTER OF the Surveyors Act, R.S.O. 1990, Chapter S.29, as amended

AND IN THE MATTER OF Eric Salzer, O.L.S.

AND IN THE MATTER OF a Disciplinary Hearing of the Discipline Committee of the Association of Ontario Land Surveyors held in accordance with Sections 26 and 27 of the said Act

SUMMARY OF THE DECISION OF THE DISCIPLINE PANEL

A discipline hearing into allegations of misconduct by Eric Salzer, O.L.S., proceeded before a Panel of the Discipline Committee on January 27, 2020. The Association and Mr. Salzer jointly advised the Panel that Mr. Salzer was prepared to plead guilty to certain allegations; the parties had prepared an Agreed Statement of Facts as well as a Joint Submission on Order with respect to the penalty they proposed the Panel should accept.

The Statement of Facts provided facts regarding the complaint made by the Registrar, Kevin Wahba, O.L.S. Those facts can be summarized as follows.

The Facts

The allegations against Mr. Salzer arose out of the time it took to complete plans regarding changes to a condominium's exterior landscape and parking areas. This was a file accepted by Mr. Salzer's former partner against Mr. Salzer's advice. His partner retired without having completed the work and Mr. Salzer, for both professional and personal reasons struggled to complete the required work. Notwithstanding these circumstances, the delay was of about 6 years, which was unacceptable. Mr. Salzer pleaded guilty to the charge of professional misconduct arising out of this delay, and the AOLS withdrew an allegation of incompetence. The incompetence allegation was withdrawn because, by the time of the Hearing Mr. Salzer had completed every aspect of the work required by him and it was awaiting final approval for registration. There was an agreed statement of facts provided jointly by the parties to the Panel setting out these and other facts, and on the basis of those facts the Panel accepted Mr. Salzer's guilty plea to the allegations of professional misconduct. With respect to the appropriate penalty, the parties also provided the Panel with a Joint Submission on a proposed penalty.

Mr. Salzer's guilty plea

Mr. Salzer was found to have breached Sections 33(2)(a), 33(2)(b), 33(2)(e), 35(2), 35(3), 35(7), 35(18) and 35(21) of the Surveyors Act, R.R.O. 1990, Regulation 1026.

On the basis of the agreed facts the Panel accepted Mr. Salzer's guilty plea.

Penalty

The Panel accepted the Joint Submission after confirming that the parties would agree to a small clarification. The penalty imposed by the Panel including that clarification was:

- a reprimand by the Panel to be recorded in the register;
- a suspension of 6 months to be deferred provided Mr. Salzer complies with the remaining terms of the Order;
- the completion of any remaining work required to successfully register the plan;
- certain terms, conditions and limitations on Mr. Salzer's licence, being:
  - Mr. Salzer is to practice in consultation with a Monitor (a current or retired OLS accepted by the Registrar);
  - To cooperate fully with the Monitor;
  - To implement any reasonable (in the opinion of the Registrar) recommendations made by the Monitor;
  - To make best efforts to ensure that the Monitor provides monthly reports regarding Mr. Salzer's practice to the Registrar;
  - To reimburse the AOLS for the cost of the Monitor;
- Costs of the discipline hearing in the amount of $6,000 to be paid in no more than 12 equal monthly instalments;
- Publication of a summary of the decision and reasons in the Quarterly, in InSight, and on the AOLS website.

Discipline Panel Members

Richard Miller (Chair) Paul Edward Bruce Parker Paul Gregoire Patricia Meehan, LGA

Boundary Research in Land Registration Records

By J. Anne Cole, OLS, CLS and
Izaak de Rijcke, LLM, OLS

This article is an introduction to a larger resource and a Continuing Professional Development (CPD) initiative developed jointly by the AOLS and Four Point Learning on the topic of a surveyor's research in land registration records. It was kicked off with a presentation by the authors at the AOLS AGM in February 2020 at Deerhurst Resort (photo at right).

Why this topic? Why now?

Land surveyors who did research in the paper-based, pre-automation land registration system will soon be retiring. The historic information contained in the land registration records matters to surveyors seeking evidence regarding boundary location and retracement. In 1980 when Izaak wrote the reference book *Land Registry Office Title Searching for the Land Surveyor,*[1] surveyors visited a Land Registry Office in order to view paper abstract books, documents and plans. They literally searched to find title and survey information relevant to the survey work at hand. In contrast, a surveyor today starts by reviewing online property index maps and obtaining Property Registers (PINs) that in most cases provide a property description and names of owners of the land under survey and adjoiners.

An understanding of the historical context of land registration material and practices is necessary because it allows the surveyor to identify the event by which a boundary is created for the first time. So too is an understanding of the current records that exist in the context of administrative conversion from a registration of deeds system (*Registry Act*) to a title registration system *(Land Titles Act*). Also important are the practical implications of the automation of paper records into an electronic land registration system (ELRS). Now is the time to document the principles of researching land registration records in an automated system, and to highlight important links to the materials which pre-date automation but remain relevant to boundary retracement and location.

What is "Risk Management"?

Risk management does not equate to the complete and total elimination of risk – risk is everywhere - but as professionals, we must keep in mind our duties and take the steps we can to identify and to mitigate risk where it occurs. Professional misconduct and professional liability are easily identifiable as potential sources of risk and loss exposure. The focus here is on minimizing risk through due diligence, knowledge, and an awareness of best research practices.

What is "Professional Misconduct"?

Professional misconduct, as defined in R.R.O. 1990, Regulation 1026 under the *Surveyors Act*, includes failure to comply with and maintain the performance standards for the practice of professional surveying. Professional misconduct can be best avoided by adhering to best practices. Adopting a boundary retracement mindset that keeps us "curious" improves our research capabilities. Performance standards and guidelines require us to refer to the documentary evidence related to the boundary being surveyed and the land adjoining and includes a land registry office search.

What is "Professional Liability"?

We probably don't like being reminded of our liability, but it does form part of our risk management strategy. What does it include?

Surveyors must consider the potential liability of detrimental reliance made by third parties and which originated in the *Hedley Byrne*[2] decision. This was an English case on economic loss resulting from a negligent misstatement. *Hedley Byrne* introduced "assumption of responsibility."

As surveyors, we have liability in contract to parties immediately retaining us. The doctrine of privity of contract is a common law principle. The doctrine has proven problematic because of its implications for claims made by third parties who are unable to enforce the obligations of the contracting parties. An exploding area of risk exposure across Canada for all land surveyors is the emerging liability to our own clients' neighbours. (see *Burke v. Watson & Barnard*[3]). A surveyor owes a duty of care to adjoining property owners. This duty of care distinguishes the work of a land surveyor from that of a solicitor.

What has changed with the automation of the land registration records?

Beginning in the 1980s, Ontario undertook a grand modernization project to automate paper-based land registration records to electronic data, based on parcel mapping. This allowed for a change by legislation of many records from *Registry Act*[4] to *Land Titles Act*[5] through the enactment of the *Land Registration Reform Act*,[6] in 1984. These changes were necessary to enable title transacting, and also allowed for remote online access for registration and research. After this conversion by government from registry of deeds, individual property interests received a stated owner and the benefit of an assurance fund as a mechanism for a guarantee of title. There remained however no guarantee of boundaries and the records in the system remained relevant to research when retracing a boundary location.

The robust provincial survey fabric was an essential underlying component of the electronic land registration system (ELRS). Property index mapping is key to the function of the ELRS, providing geographical identification and spatial extent for the properties within the system.

The automation and conversion project was ambitious. The methods by which automation and conversion took place needed to take into account the state of records that had only existed in paper form. When the state of information about title and/or boundaries was sufficiently uncertain and confused the government did not convert to *Land Titles*, thereby leaving the property registered under the *Registry Act*.

For properties converted from *Registry* to *Land Titles*, it is important that the surveyor understand the meaning behind all of the title qualifiers, and in particular the implications of mature claims of adverse possession that may have existed at the time of conversion.

The automation of existing paper *Land Titles* parcel registers was a process of taking the current information, (not the historical ownership or parcel creation history) and "copy-typing" it into a digital record. This resulted in many instances where evidence relating to boundary creation exists only in the pre-automation LT Parcel Registers.

In order to accomplish this massive task, the historical vagaries of language and references to geographics had to be standardized and abbreviated. The electronic parcel register now includes a field that states who is the owner or, the "guaranteed" owner. The property descriptions were "built" from the existing descriptions and surveys. The process did not include an assessment of boundary issues, nor did it include surveying.

What is a surveyor searching for?

The answer lies at the core of what defines the professional activity of cadastral surveyors: a surveyor is looking for evidence of the "boundary-creating event" – that is, evidence of the timing, the players, the authority and documentation thereof. This evidence may be in both the electronic parcel records and in the historical records. Knowing only the current owner and the current parcel description may not be enough evidence of the boundary being retraced.

How does the surveyor match the records to the land and *vice versa*?

A survey project usually starts with obtaining all of the current information from the ELRS for the subject and adjoining lands. This includes the Property Record (the Property Identification Number (PIN) printouts), all of the documents and plans mentioned in the Property Description (the thumbnail), and the applicable documents in the document pool. It will reveal the current owners (if the lands are under the *Land Titles Act*), a brief description of the properties, what qualifiers affect ownership (LT absolute, LTCQ, etc.), and what encumbrances, such as easements, are applicable to the subject and adjoining lands. Field work will trigger the melding of documentary evidence with the assessment of evidence found on the ground. Prudent practice includes using an iterative process with your research extending to material from records pre-dating the current information – including checking inactive ELRS records and working backwards in time through the paper documents, books, and plans. The goal is to obtain evidence from the boundary-creating event in order to allow for evaluation of that evidence to be possible. In some instances, it may be necessary for this research process to extend back historically to the initial patents from the Crown, if in fact the boundary-creating event points to the first alienation from the Crown, or to review any reservations in the patent relevant to boundaries.

What are the "Red Flags"?

Red flags are indicators that iterative research between the historical records and evidence in the field will be required to meet our standards of practice and minimize risk of liability in the preparation of a boundary survey. Some obvious red flags include *Registry* non-convert properties, undefined boundary notices, inability to determine when the boundary was created, whether or not the current descriptions match one another, whether the current description is "modern," and the fit or match between the documentary evidence and what is found on the ground.

Assessment of evidence of the location of boundaries requires a consideration of documentary evidence together with evidence found on the ground; both are required to form an opinion. An iterative research process between the records and the field will minimize risk, and best practices should include ways to keep curious and stay alert to the red flags and indicators for further research.

What are the best approaches and tools for research?

Working backwards from the current PIN to the Crown patent may not be required in all cases, but if you do have to

cont'd on page 28

go "behind the PIN", do you know how to do that? How a surveyor learns about these research tools and skills may be *ad hoc* and learned as required, but a thorough understanding of what is possible is necessary to be able to know when the research has been "completed."

Can risk be minimized?

We can minimize risk by meeting professional standards of practice and by understanding our professional liability. Understanding the relationship between the evidence of the creation of the boundary and the retracement of the boundary is essential to our professional role. The boundaries being surveyed implicitly involve a survey of our client's and all our client's neighbouring boundaries. Using an iterative approach to the connection between documentary evidence and the ground will result in knowing when you most likely have all the relevant information available.

Want to know more?

The in-person seminar at the AGM at Deerhurst was a first piece in a larger resource being assembled for the delivery of CPD intended for land surveyors and their staff in conducting boundary research in Ontario's land registration records. There had already existed a number of publications, seminar products and examples to assist surveyors in "title searching" but these have never been consolidated or updated. AOLS and Four Point Learning have committed to the task of making access to these resources possible for surveyors, thereby making the development of further CPD products possible. The completely revised, on-line seminar, "*Risk Management in Searching for Boundary Evidence*" is now available as a 3-hour CPD Formal Activity learning opportunity that is free to OLSs. Refer to the brochure: https://4pointlearning.ca/4PL/CPD-Research_RiskMgt.pdf for more details.

Questions?

If you have any questions for the authors, please contact Izaak de Rijcke at **izaak@4pointlearning.ca**

[1] de Rijcke, Izaak, *Land Registry Office Title Searching for the Land Surveyor,* 1980, AOLS.
[2] *Hedley Byrne & Co Ltd v Heller & Partners Ltd.*, [1964] AC 465.
[3] *Burke v. Watson & Barnard*, 2016 BCCA 439. See also cases cited therein and further decisions on this point in Canada.
[4] *Registry Act*, R.S.O. 1990, c. R.20.
[5] *Land Titles Act*, R.S.O. 1990, c. L.5.
[6] *Land Registration Reform Act*, R.S.O. 1990, c. L.4.

DISCIPLINE DECISION Guido Consoli, O.L.S.

IN THE MATTER OF the Surveyors Act, R.S.O. 1990, Chapter S.29, as amended

AND IN THE MATTER OF Guido Consoli, O.L.S.

AND IN THE MATTER OF a Disciplinary Hearing of the Discipline Committee of the Association of Ontario Land Surveyors held in accordance with Sections 26 and 27 of the said Act

SUMMARY OF THE DECISION OF THE DISCIPLINE PANEL

A discipline hearing into allegations of misconduct by Guido Consoli, O.L.S., proceeded before a Panel of the Discipline Committee on January 27, 2020. The Association and Mr. Consoli jointly advised the Panel that Mr. Consoli was prepared to plead guilty to certain allegations; the parties had prepared an Agreed Statement of Facts as well as a Joint Submission on Order with respect to the penalty they proposed the Panel should accept.

The Statement of Facts provided facts regarding the complaint made by the Registrar, Kevin Wahba, O.L.S. Those facts can be summarized as follows.

The Facts

The allegations against Mr. Consoli raised concerns about a conflict of interest. Mr. Consoli had sold his surveying practice to another surveyor after which he became an employee of his former firm. He asked his employer to prepare a draft reference plan for a property in which he and his son had an interest. He then had involvement in the preparation of the plan. The draft reference plan was completed by his employer's firm and an invoice was issued to Mr. Consoli. It was not paid. Thereafter, Mr. Consoli became employed by a different surveying firm and deposited a reference plan on title, which reference plan was compiled using the draft reference plan prepared by his former employer. His former employer complained to the AOLS. Mr. Consoli was also involved in the development of two adjacent properties including providing advice on surveying and development needs and in negotiating the scope and costs of surveying work on his own behalf and on behalf of other owners or agents of owners: in summary he acted as facilitator, planner, and land agent with respect to these properties at the same time that he was an employee of the surveyor/complainant. Mr. Consoli made a number of disparaging comments about his former employer as the relationship between them worsened.

Mr. Consoli entered a guilty plea to various subsections of professional misconduct as set out in Regulation 1026 and specified in the allegations. The Panel was provided with an agreed statement of facts and heard submissions from both parties setting out the facts as summarized above. It found insufficient evidence to make a finding of guilt with respect to two subsections of Regulation 1026 and those two subsections were withdrawn by the AOLS. The Panel was satisfied that on the facts provided Mr. Consoli was guilty of the remaining subsections of that Regulation as set out in the allegations and accepted his guilty plea on those allegations. (He was found guilty of contravening sections 33(2)(a), 35(1)(3)(10)(11) and (21) of Regulation 1026.)

Mr. Consoli's guilty plea

Mr. Consoli was found to have breached Sections 33(2)(a), 35(1)(3)(10)(11) and (21) of the Surveyors Act, R.R.O. 1990, Regulation 1026.

On the basis of the agreed facts the Panel accepted Mr. Consoli's guilty plea.

Penalty

The Panel was then provided with a Joint Submission setting out the penalty the parties jointly proposed to the Panel. The Panel accepted the terms of the Joint Submission. The penalty imposed by the Panel was:

- A reprimand, to be recorded in the register;
- A suspension of 6 months, to be deferred provided Mr. Consoli complies fully with all provisions ordered as set out in the Joint Submission and provided Mr. Consoli is not the subject of another finding by the Discipline Committee in respect of conduct that occurs within the next 12 months;
- Mr. Consoli shall successfully complete the York University course on professional ethics for professional engineers (or an alternative approved by the Registrar) at his own cost by Jan. 15, 2021;
- Costs of the discipline hearing in the amount of $8,000 to be paid in no more than 8 equal instalments;
- Publication of a summary of the decision and reasons in the Quarterly, in InSight, and on the AOLS website.

Discipline Panel Members

Richard Miller (Chair) Paul Edward Bruce Parker Paul Gregoire Patricia Meehan, LGA

On Being Sergeant-at-Arms

By Graham Bowden, O.L.S. (Ret), Sergeant-at-Arms (Ret)

At the 2020 AGM, I performed the role of Sergeant–at-Arms. When I asked the Registrar and the Executive Director about the task, no one could direct me to a statute or by-law that defined the position or how extraordinary an experience it would be.

To all of you who attended the recent AGM or wish you had, here are my suggestions as to why you should volunteer to be a Sergeant-at-Arms.

1. You may have been hesitating, hoping that someone would ask you. No need to hesitate, just mention your interest to anyone at the AOLS.
2. What character will you be assigned? Well, you are welcome to make your own suggestion as I did. But, if you are short on ideas, someone on the AGM committee will provide a suggestion or two to help you.
3. What are the duties? You will be given an AGM itinerary of where to be, when to be there and what to do. However, you may not get a final copy until the morning of Day One.
4. Is the task onerous? Can you ring a bell? Yes? There you go, you will be an excellent Sergeant-at-Arms. And there are a few perks…
5. You get to meet everyone at the AGM, and I mean everyone.
6. The Association takes good care of you, although Brian failed to clear the snow off my car as he had promised.
7. If you find yourself in the wrong place at the wrong time, Lena will mysteriously appear at your side and guide you to your assigned post.
8. Some members may buy you a beverage or two, even more if you can stay up late enough.
9. And you get your photo on the cover of the OPS magazine.

Now a photo on the cover of the OPS may not seem like much but I can tell you as great as the AGM was, the best part was when I showed the OPS cover photo to my grandchildren and the wide-eyed six-year old exclaimed, "Granda, are you famous?" Fame can be fleeting, so take it when you can.

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Survey Review Department Forum – Educational Corner *"Stones"* – Field Examinations Revisited

By Tom Packowski, O.L.S., Survey Review Department Manager

The following was reprinted from the Spring 1997 issue of the *Ontario Land Surveyor 'Quarterly'*, now the *Ontario Professional Surveyor*. The article was written by Michael E. Marlatt, B. Sc., O.L.S. and is as timely now as it was when it first appeared. The article has been amended to reflect the current process and applicable changes in technology. The essay is not an exact word for word transcription of Mr. Marlatt's original article and any errors that may have crept into it are strictly the fault of the current SRD Manager.

THE SURVEY REVIEW DEPARTMENT (SRD) FIELD EXAMINATION

One important component of the Survey Review Department Comprehensive Review process for a firm or government agency are field examinations of two or more of the reviewed surveys.

During the SRD staff's cursory review of the submitted file materials, individual surveys will be selected on a random basis, if no particular issues are identified. However, when questions or uncertainties about individual surveys are observed by the reviewer; such as a contradiction between the field notes and the survey over setting of final monuments, or substantial variation of the surveyed boundary from occupational evidence, or matters of interest noted from Google Maps™ this concern will be brought to the attention of the field staff and Survey Review Consultants.

As an aside, the street views available on today's mapping technologies such as Google Maps™ are used as an additional tool for checking the completeness of a survey. They allow us to check for such things as the existence of fences, overhead wires, and occupational evidence, such as eaves very close to or on the boundary.

When all materials for an area under review have been received and assembled, the location of the selected surveys for field examination are plotted on a map to allow for organized and efficient travel throughout the area. If all goes well, then the field inspections take place as planned. Occasionally there are variations to the planned visits, where for example, an occupant objects to the field staff attending on site or, in the rare instances where substantial compliance issues are observed, such as the absence of monuments. In these instances, the field crew have back-up plans they can resort to.

THE SITE VISIT WITH OWNER/OCCUPANT

In all instances, the survey Firms are advised by the SRD that field examinations are scheduled to take place in their area approximately a week before the field crew arrives. The SRD encourages the Firms to notify their clients of the upcoming field visits. The letter to the Firm states, in part, "As part of the Comprehensive Review process, a selected group of the surveys are field inspected by an O.L.S. and technical assistant representing the Survey Review Department. The field examinations for your Review group are scheduled to commence during the **week of MM DD, YYYY.** As such, you may wish to apprise your clients of our potential attendance to their property." Where an owner or occupant is at the site, the examiner identifies himself/herself and the assistant as representatives from the AOLS, and outlines the process by providing the following factual statements:

- As a self-governing profession, we are self-monitoring;
- All survey firms in the Province are subject to review of their work;
- Generally, on a five-year rotational basis, survey files are requisitioned for review to ensure compliance with Standards and Regulations for surveys;
- As part of the process, some of the files are selected, on a random basis, for a field examination.

Field examinations involve the examiner's attendance at the property corners and along the boundary to confirm that what is shown on the plan conforms with what is found on the ground, and to ensure adherence to required standard practices.

The examiner has a copy of the plan under review during the site discussion to assist in explaining the process and, to assure the owner/occupant that the plan was legitimately acquired. Also, the examiner openly carries a camera so that picture taking is to be expected.

Generally, the information provided above is sufficient to inform the owner/occupant; however, the responses

provided to the questions that occasionally arise are as follows:

- The examiner is not conducting an independent survey, and has no opinion about agreement or disagreement with the survey;
- Any observations or concerns that the examiner may have about the survey being reviewed will be directed to the attention of the survey firm that completed the survey for explanation or clarification;
- A summary of findings or opinion is not provided to the owner/occupant;
- While the examiner may mark, uncover, or show the owner/occupant one or more of the monuments that they, the owner/occupant could not find themselves, the examiner is not expressing an opinion either way about the validity of the monuments; merely that their surveyor has shown it on the plan in relation to his/her opinion.

With few exceptions, the examiner provides a standard letter from the Department, either directly to the owner/occupant at the site or by placing the letter in the mailbox or door. Similar to the verbal presentation, the letter outlines the Department's authority and responsibility to conduct a Peer Competence Review of all survey firms within the Province, together with assurances that the selection of the survey is not indicative of any concern with the firm that completed the survey.

The field examiners see themselves as ambassadors on behalf of the surveying profession as well as representatives of the Association. In almost all instances, once the owner/occupant understands the purpose and self-governance principle behind the site visit, most are generally quite impressed and happy to cooperate with the field staff.

THE GENERAL EXAMINATION

General field examination observations are made at each site, to ensure that:

- All monumentation shown on the plan is in the ground, or to identify specific reasons to account for its removal since the survey;
- The plan is an accurate representation of field conditions;
- No other evidence that should have been located or shown is extant;
- There are no unregistered easements apparent on the ground that should have been located and shown on the plan.

THE SPECIFIC EXAMINATION

As previously mentioned, the initial staff review may indicate items of specific concern to be addressed during the field examination, or the examiner may identify particular issues at the site that are not apparent from the review of the plan or field notes. Such issues include, but are not limited to, the following:

- Identification of overlapping eaves, and troughs for the surveyed or adjacent buildings;
- Identification of markings from monumentation shown as "origin unknown" on the plan and field notes under review;
- Where front corner monumentation was not set for an SRPR, or monumentation, including type and location required under O. Reg. 525/91, determine whether it could have been set;
- Surveyed lines that run through buildings, or are in conflict with well-settled occupation limits;
- Natural boundaries monumented and illustrated in accordance with a theoretical or prior location, in conflict with the actual current location, and which may have resulted from natural or artificial causes.

THE FIELD EXAMINATION REPORT

The field examiner makes specific notations on the "Field examination" copy of the plan and includes a report of the position and location of the photographs taken, as well as other notes as necessary to clarify any findings and concerns noted. The photographs, notes and reports are prepared for each Comprehensive Review and form part of the Consultant's package of materials. A copy of the template for the field examiner's report is available for viewing on the AOLS website, under the Survey Review tab, Survey Review Resources, 'Sample Survey Review Report'.

SRD Field Examiner Al Worobec, seen in the shadow, takes photos at each field examination site. SRD Plan Coordinator Herman Bernardo, who assists Al, is seen in this photo identifying the location of a monument in downtown Toronto.

In conclusion, the field examination provides the connection to the ground that the Comprehensive Review requires to help identify inadequate or problematic field procedures.

A Dream Comes True

By David Coombs

This is David Coombs' 7th article for the Ontario Professional Surveyor.

I stood in the field. It was 6:30 AM. I was very excited. I had waited 26 years to improve the 2.6 km rough bush road that traverses the south east quadrant of our property. I was itching to get started as was my wife Sarah. She had heard enough about the tortuous, rock infested, overgrown, eroded road.

The crew arrived on time at 7:30 accompanied by a skid steer loader, an excavator, backhoe, large pickup, plus a single axle and one tri axle dump truck. Brandon, Jordan and Mark, the owner of MWS Construction, appeared versatile, experienced, and pleasant.

I quizzed Mark and tried to keep track of how he would employ the machines. I was lost after two minutes as I could not keep straight which was the skid steer and which was the excavator. A little voice, reinforced by Sarah's parting comment that morning, told me to simply nod, keep quiet and STAY OUT OF THE WAY!

I did offer to drive ahead of the crew to measure road sections so the guys could judge their progress and varying needs. After all, it is prudent to know when one is about to encounter a partly submerged beaver dam that comprises the northern boundary of a beaver pond. The road was likely to be a bit soft at that point.

Mark, exacting a promise that I would stay ahead of the gang and realizing that my desire to be involved had to be dealt with upfront, gave me the green light. I set out armed with an axe and a chainsaw. As an experienced loop driver, I knew trees cared not where they fell. I had plenty of gas, my water bottle, sunscreen, and hat. I know how to plan.

Once I passed the pond, I stopped to record the distance from the open field which was base camp and home to the gravel dump. Everyone can and does make a mistake from time to time. I made two. I had no paper and no pen. I did have chain oil in the saw and improvised by dipping my finger into the oil and marking 4 on my right arm, thus recording 400 meters from base camp to the pond. The next section took me to the first planned turnaround and I duly marked 6 recording the distance from the pond.

This was great fun. I took several swigs of water, navigated around rock outcroppings, and proceeded to the one spur off to the left of the loop that I had dubbed the Eastern Arm. I painted a 5 on my arm and decided to drive along the spur to the next planned turnaround.

Here I got into trouble. I was able to saw through the 25-meter-long white pine that straddled the spur and I did, with great effort, limb the behemoth, haul away the branches and roll the trunk sections off the road. A nifty 7-point turn got me facing towards the loop. It was very hot and humid, and I had frequently used my arm to wipe away the sweat covering my face.

You guessed it. I was about to unscrew the oil cap when I noticed my arm. The red smear revealed no numbers. I looked in the mirror and sighed. My face was covered in chain oil. My contribution to the project was not going well. I am a realist. I could not retrace my path as I would encounter the lads. It would be difficult to drive around them and impossible to explain my face, so I drove back to the loop, turned left and headed for base camp, hoping all were employed on the loop. Luckily, they were. Unluckily, Sarah was home and greeted me with a look of shock and awe.

I retreated to the shower, stayed in the bedroom until lunch and planned my defence. Sarah, after 40 years of marriage, was not interested. Having worked on my stained clothes and made lunch, she quietly said, "Let the men do their jobs."

I heartily agreed, but that evening I casually asked if she would like to join me on a drive along the first section to the pond. She declined. I insisted and we headed out after dinner, one of us eager, the other subdued.

Sarah was impressed by the gravel mound which had grown substantially during the day. One quarter of the 714 tons had been delivered via the tri axle dump truck. I pondered climbing the mound to prove I could do it but common sense, reinforced by my good shoes, dress pants, sport shirt and Sarah's presence, dissuaded me.

We left the field and entered the poplar and beech forest. The road soon descended sharply towards the infamous beaver pond. Even Sarah gasped when it came into sight. The refurbished road stretched before us hugging the old dam and pond before heading gradually uphill toward the first turnaround. It was a magnificent view.

We parked, got out and walked along the smooth wide surface. I pointed to some large rocks pushed into the bush. One measured more than two meters long, in excess of one meter in width, and about a meter thick. It had taken Brandon on the skid steer, and Jordan operating the excavator, to dig, pry and roll the monster out and off the road.

The boys had done their job well. I explained that the excavator led the parade removing overhanging limbs, encroaching trunks and troublesome rocks. The skid steer followed using fill from the roadside to fill the holes left by the rocks and moving vegetation and limbs aside. Back at the field, the backhoe loaded the single axle dump truck,

which deposited the gravel along the cleared road. The skid steer then spread the gravel and smoothed the new road surface. Periodically either the excavator or the skid steer ploughed into the bush to provide rough turnarounds for the gravel truck.

Sarah was pleased and I beamed in no small part because she was satisfied. She smiled because I was happy. When we returned home, she hit the kitchen and baked a large batch of chocolate chip cookies.

I rose early each of the next 4 days. I knew the fellows would arrive no later than 7:30 but getting on site by 7 gave me time to take in the magnitude of the project. It was great fun to watch and participate, albeit in a limited way. I did bring them the cookies. The project went well, and I was thrilled with the results.

Of course, I had expected nothing less from Wally Simpson's (OLS 1518) son Mark.

David Coombs has a Ph.D. in Canadian history. After his retirement as a stockbroker in 2004, he began to write. His articles have appeared in The Country Connection, the Toronto Star and the Globe and Mail. He is also the author of "The Beckoning Land" which is an historical novel set in his home town of Barry's Bay during the Depression and WWII. A copy of his book is available for purchase at **www.lulu.com** (https://bit.ly/2IpjDkl)

Registrar's Review

By Kevin Wahba, B.Eng., LL.B., O.L.S., Barrister & Solicitor

COVID-19 has had an impact on several aspects of our lives, and the impact has certainly been apparent throughout the surveying profession. The AOLS, and the operations of its committees, has not been immune to the effects of the pandemic.

As Registrar, I am involved with many of the statutory committees of the Association including the AERC, Complaints Committee, Registration Committee, Fees Mediation Committee, and to perhaps a lesser extent, Council and the Discipline Committee. These committees, among others, were impacted by the pandemic. They have had to adjust to the current norm in order to discharge their duties in an effective way, while still ensuring that they adhere to the government restrictions arising from the Emergency Order in Ontario.

As a result, many of the operations of these committees have moved into a digital format. Meetings are held through electronic means, correspondence is now primarily accepted in digital format, and policies are currently being developed to introduce formal acceptance of digital communications without the need for prior consent.

A particular area of concern involves the professional exams for entrance into the profession. Due to COVID-19, and the restrictions put in place by the provincial government, the May 2020 exams were cancelled. Much time and research has been given to implementing a new format for the professional exams if the restrictions continue to affect their delivery in November. The AERC is confident that if a change to the format of the exam is necessary, they will be in a position to implement the change this November.

The Discipline Committee also considered the impact of COVID-19 and recognized that convening a discipline hearing in person would be impractical, if even possible, under the current physical distancing restrictions within the province. In response, the Committee considered convening hearings electronically. In early June, the Committee proceeded with its first electronic hearing, which was implemented under section 9.2 of Appendix A to the Manual of Procedures for the Discipline Committee of the Association of Ontario Land Surveyors and section 5.2 of the *Statutory Powers Procedures Act*. As one can appreciate, convening the hearing through electronic means saved time and costs on the part of everyone involved in the hearing, while providing an effective means of deliberating on a disciplinary issue. Although minor technical issues arose during the hearing, the matter was dealt with effectively and expeditiously. Electronic hearings certainly have significant benefits for those involved and should be considered as the primary method of convening these hearings beyond the COVID-19 era.

The pandemic has created changes within the practice of surveying as well as at the AOLS. It has allowed the Association to adopt further means of electronic communication and implement a policy which will create more opportunities to take advantage of some of the digital communications that are available. There are many advantages to utilizing electronic software and I think it should be considered as part of our normal practice beyond the context of COVID-19.

Sites to See

Allan I. Carswell Astronomical Observatory

https://observatory.info.yorku.ca

Located in Toronto, Canada, the observatory is an invaluable hands-on teaching facility in support of all undergraduate and graduate astronomy courses at York University that also encourages public interest in astronomy and enthusiastically promotes this field to those who are interested. We invite you to look around our website to learn more about what we do and to participate in any of the programs we offer, including public viewing sessions, group tours, our online radio show, online public viewing, and more!

Online Virtual Events

August 31 to September 2, 2020
XXIV ISPRS Congress
http://www.isprs2020-nice.com/

September 7 to 11, 2020
3DGeoInfo Conference 2020
https://www.ucl.ac.uk/3dgeoinfo/

September 15 to 17, 2020
Commercial UAV Expo
https://www.expouav.com/

October 13 to 15, 2020
InterGEO
https://www.intergeo.de/intergeo-en/

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EDUCATIONAL FOUNDATION NEWS

Congratulations to our 2019/2020 Award Winners

York University – Lassonde School of Engineering: Brianna Wilson was the recipient of a Women in Geomatics Engineering Award for her good academic standing in high school and demonstrating leadership qualities**. Sasha Latchaev** and **Yousaf Ijaz** were the recipients of the Geomatics Engineering Entrance Awards for their good academic standing in high school. In addition, awards for high academic standing were received by the following Geomatics Engineering students: **Andrew Robertson** and **Evan Rueb** for LE/ESSE 4670 Survey Law, **Alexander McGillis** and **Jared Yen** for 2nd Year Highest Aggregate GPA, **Felipe Gonzalez** and **Daniela Krcmar** for 3rd Year Highest Aggregate GPA, and **Alexander McGillis** for the Hubert J. Reinthaler Award.

Support for our Post-secondary Geomatics Students

In this unprecedented time of COVID-19 we have all had to come together to support one another as individuals and as a part of our community. Many business owners have had to work very hard to help their employees and keep their businesses afloat. Now that the Ontario government has lifted restrictions and has allowed surveying businesses to continue their day-to-day activities, under strict guidelines of course, we hope that things will get back to "normal" soon. Our university and college students, however, will not have the same opportunities to work this summer as they have in the past. This makes our Foundation awards program even more important. I hope that current members and future members of the Educational Foundation will keep that in mind and support the students with donations. Winning just one award may make the difference for a student to able to continue his/her academic journey.

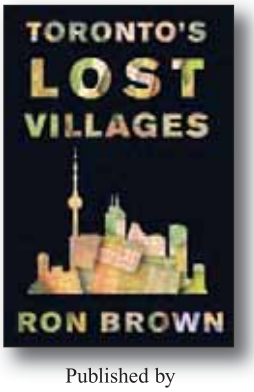
Please support our students, our future surveyors, and send in a donation.

The Educational Foundation would like to recognize with thanks a donation made in the memory of Bob Garden.

BOOK REVIEWS

Toronto's Lost Villages

By Ron Brown



Published by
Dundurn

ISBN 978-1-4597-4657-2

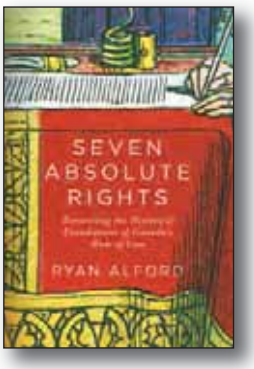
Explore the vestiges of the hamlets and villages that have been swallowed up by Toronto's relentless growth.

Over more than two centuries, Toronto has ballooned from a muddy collection of huts on a swampy waterfront to Canada's largest and most diverse city. Amid (and sometimes underneath) this urban agglomeration are the remains of many small communities that once dotted the region now known as Toronto and the GTA. Before European settlers arrived, there were Indigenous Peoples' villages on the shore of Lake Ontario. With the arrival of the English, a host of farm hamlets, tollgate stopovers, mill towns, and, later, railway and cottage communities sprang up. Vestiges of some are still preserved, while others have disappeared forever. Some are remembered though many have been forgotten. In *Toronto's Lost Villages*, all their stories are brought back to life.

Information taken from the back cover.

Seven Absolute Rights
Recovering the Historical Foundations of Canada's Rule of Law

By Ryan Alford



Published by
McGill-Queen's University
Press

ISBN 978-0-2280-0078-5

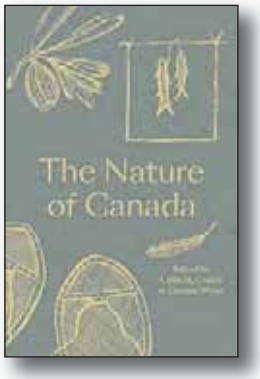
Seven Absolute Rights surveys the historical foundations of Canada's rule of law and the ways they reinforce the constitution. Ryan Alford provides a gripping narrative of constitutional history, beginning with the medieval and early modern context of Magna Carta, the Petition of Right, and the constitutional settlement of the Glorious Revolution. His reconstruction ends with a detailed examination of two pre-Confederation crises: the rebellions of 1837-38 and the riots of 1849, which, as he demonstrates, provide the missing constitutionalist context to the framing of the British North America Act. Through this accessible exploration of key events and legal precedents, Alford offers a distinct perspective on the substantive principles of the rule of law embedded in the Constitution of Canada.

In bringing constitutional history to life, *Seven Absolute Rights* reveals the history and meaning of these long-forgotten protections and shows why they remain fundamental to our freedom in the twenty-first century.

Information taken from the back cover.

The Nature of Canada

Edited by Colin M. Coates and Graeme Wynn



Published by UBC Press

ISBN 978-0-7748-9036-6

Tracing a path from the Ice Age to the Anthropocene, some of the foremost stars in the field of environmental history reflect on, how we as a nation, have idolized and found inspiration in nature even as fishers, fur traders, farmers, foresters, miners, and city planners have commodified it and tried to tame it. They also travel lesser-known routes, revealing how Indigenous people listened to glaciers and what they have to tell us; how the weather is not what we must endure but what we make of it; and how even the nature we can't see – the smallest pathogens – has served the interest of some while threatening the very existence of others.

The Nature of Canada will make you think differently not only about Canada and its past but quite possibly about Canada and its future. Its insights are just what we need as Canada attempts to reconcile the opposing goals of prosperity and preservation.

Information taken from the publisher.

The Last Word

Celebrating 60 Years of Geodesy and Geomatics Engineering at UNB

By Peter Dare, PhD, Chair, Department of Geodesy and Geomatics Engineering

This year for the first time, the Department of Geodesy and Geomatics Engineering at UNB, is teaching a majority of its geomatics courses remotely, rather than face-to-face, due to the impact of COVID-19. Over five days in March 2020, we had to quickly learn how to deliver courses remotely, adjust to working from home, and for most people learn two "new" words, "Teams" and "Zoom". To be able to deliver all our courses from home, we are going to have to rethink how we run our surveying courses, including our survey camps, and how we deliver these courses. We may be asking members of the AOLS, and instrument manufacturers, to take on a significant role in this. This will be a monumental change. But changing how we deliver our degrees for the better is not new – it is what we have been doing since 1960, which makes 2020 our 60th anniversary!

In 1959 Willis Roberts (then Director of Surveys for New Brunswick), and a group of his friends, had the idea of a creating a surveying engineering department at UNB and in 1960 the department was born. Since 1961, more than 1000 students from over 55 countries have chosen the University of New Brunswick as their place to learn about geomatics.

The Department changed its name to Geodesy and Geomatics Engineering on January 1, 1994 to better reflect the interdisciplinary nature of its activities. The Department was no longer teaching and researching just surveying, but the disciplines of positioning by satellites, remote sensing, GIS, and ocean mapping, etc. Since then, we have had to continuously change to remain in touch with new trends, instrumentation, and techniques. The subject of "Big Data" is one of the newest areas of geomatics and it is in its correct home due to the enormous size of the data-sets generated by new technology, such as terrestrial laser scanners and LiDAR.

And now to today. Monumental changes are being made in a very short time, and totally unpredicted. The COVID-19 virus is forcing us to change the way we teach our classes, as mentioned at the beginning of this article. But we intend to make changes to make the degrees better. By being online, we can deliver a degree to almost any location in the world. With the help of survey companies and instrument manufacturers, we plan to be able to do what UNB wants… delivery of on-line degrees. We hope we will be able to work with our surveying suppliers and licensed surveyors to provide an improved learning experience for our students.

The path ahead looks daunting, but together it will be an exciting time.

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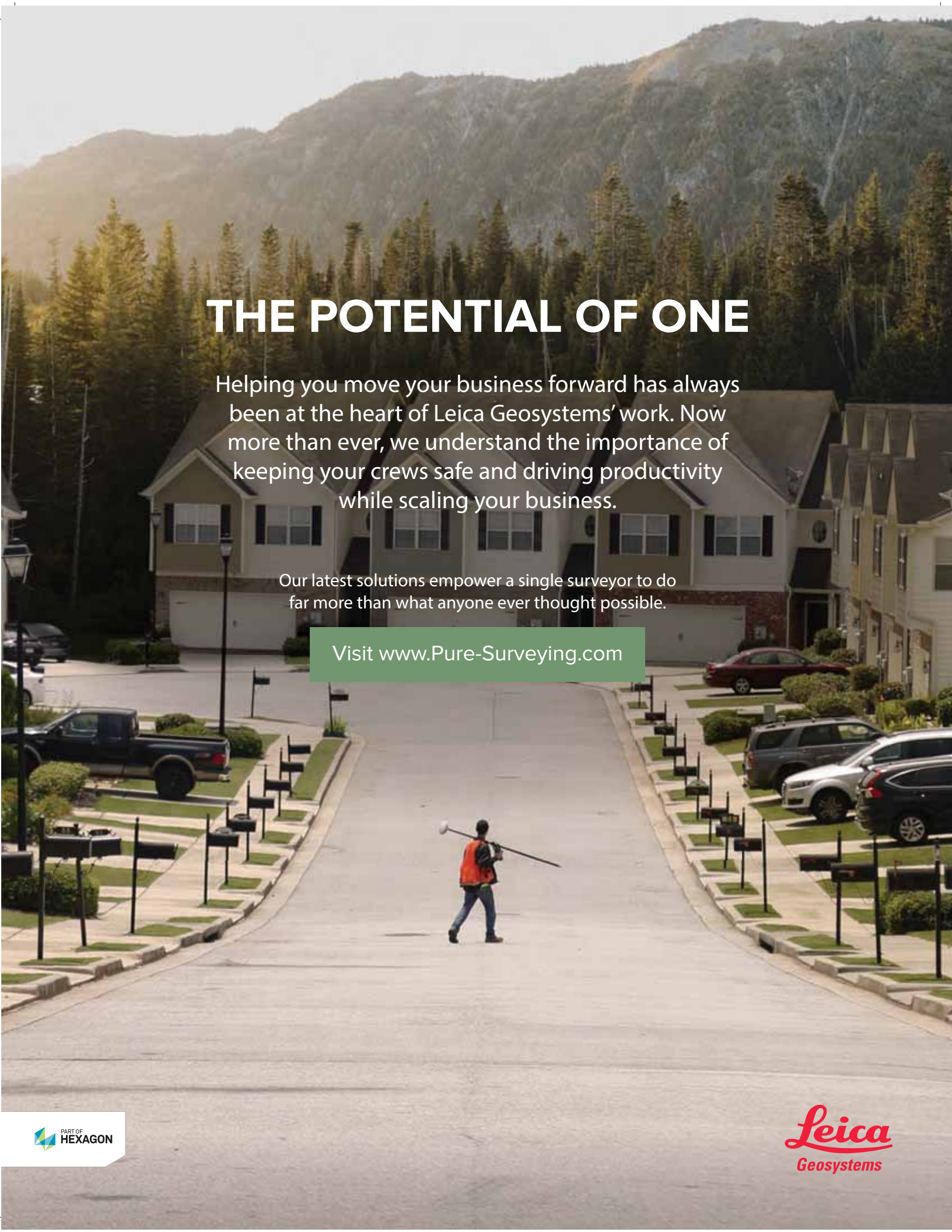
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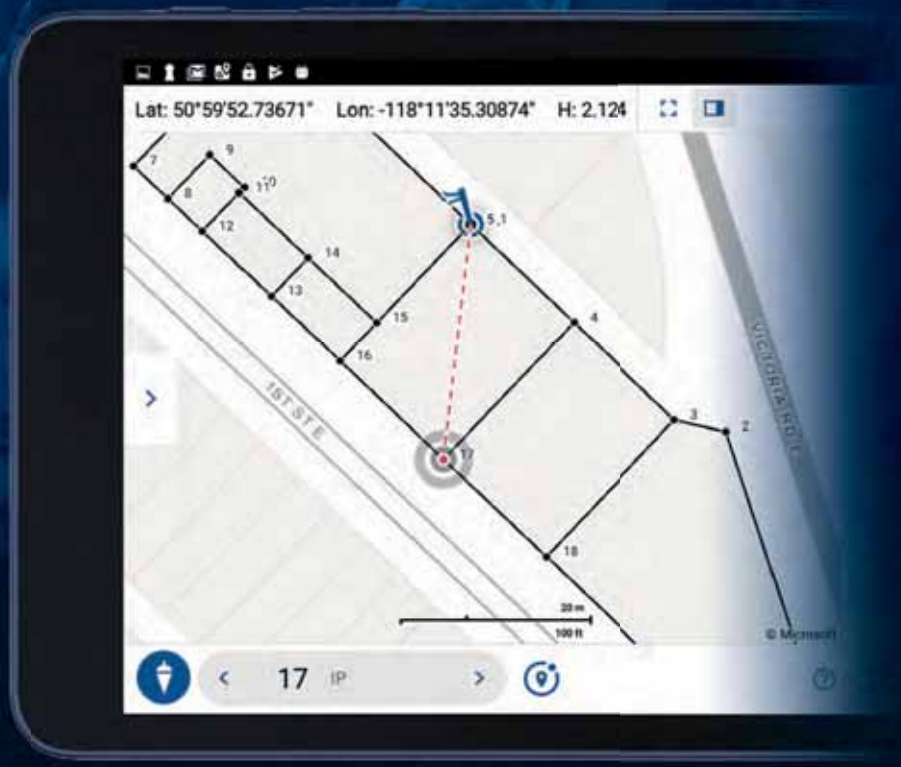

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