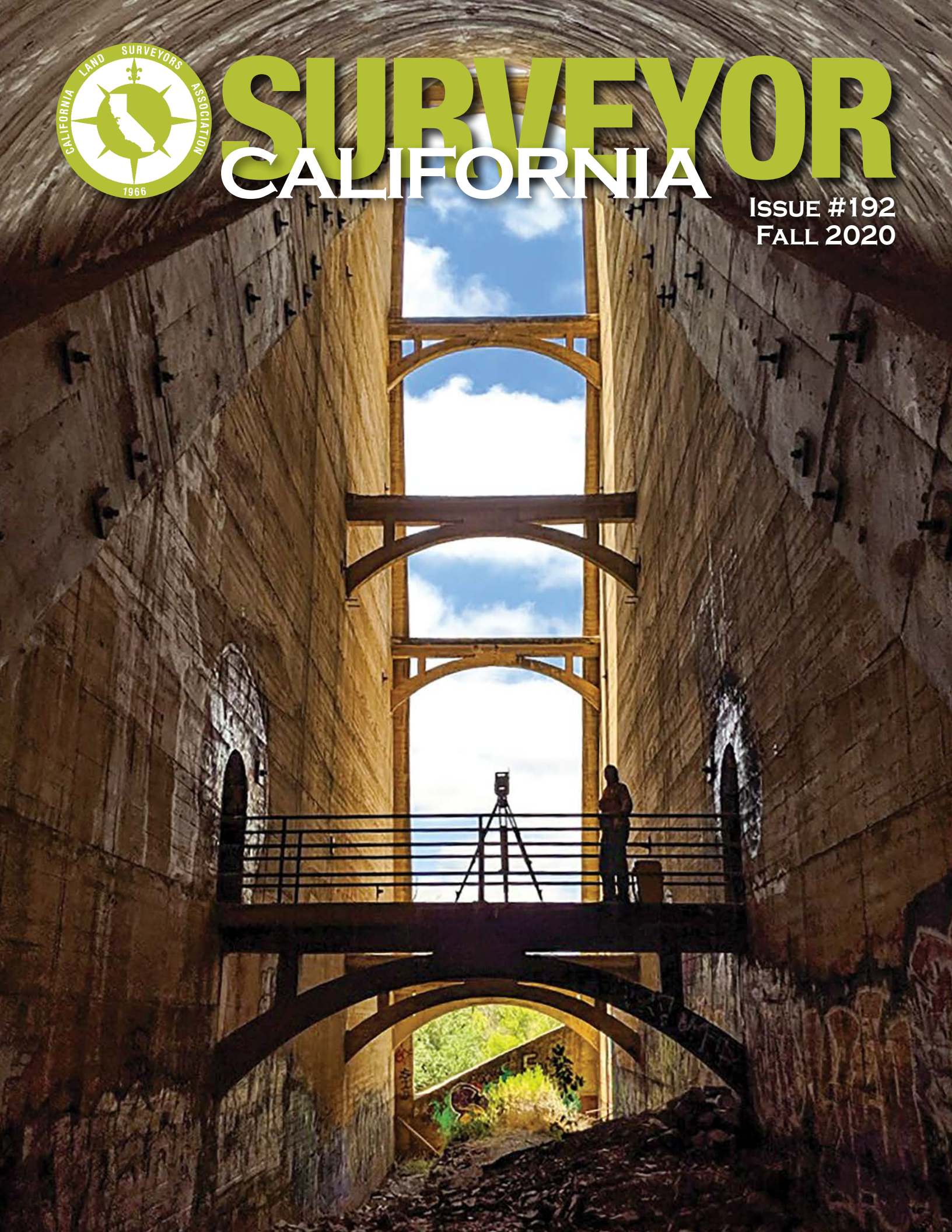
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1966
SURVEYOR
CALIFORNIA
ISSUE #192
FALL 2020

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CALIFORNIA SURVEYOR

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The *California Surveyor* is a bi-annual publication of the **California Land Surveyors Association, Inc.** and is published as a service to the land surveying profession of California. It is mailed to all members of the **California Land Surveyors Association, Inc.** The *California Surveyor* is an open forum for all Surveyors, with an editorial policy predicated on the preamble to the Articles of Incorporation of the **California Land Surveyors Association, Inc.** and its stated aims and objectives, which read:

Recognizing that the true merit of a profession is determined by the value of its services to society, the **California Land Surveyors Association** does hereby dedicate itself to the promotion and protection of the profession of land surveying as a social and economic influence vital to the welfare of society, community, and state.

The purpose of this organization is to promote the common good and welfare of its members in their activities in the profession of land surveying, to promote and maintain the highest possible standards of professional ethics and practices, to promote professional uniformity, to promote public faith and dependence in Land Surveyors and their work.

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Advertising

Commercial advertising is accepted by The *California Surveyor.* Advertising rates and information can be obtained on the CLSA website at *www.californiasurveyors.org/calsurv.html,* or by contacting Kim Oreno at *kim@californiasurveyors.org* or 916-239-4083. Circulation: 2,000.

Editorial Material

All articles, reports, letters, and other contributions are accepted and will be considered for publication regardless of the author's affiliation with the **California Land Surveyors Association, Inc.** Contributions should be e-mailed to Paul Mabry at *paul@landsurveylaw.com.*

Material Deadline Dates

Spring: March 1
Fall: September 1

Articles, reports, letters, etc., received after the above mentioned date will be considered for the next edition.

Opinions expressed by the editor or individual writers are not necessarily endorsed by the **California Land Surveyors Association** Officers or its Board of Directors. Original articles may be reprinted with due credit given to the source and written notification to the **California Land Surveyors Association,** unless otherwise noted.

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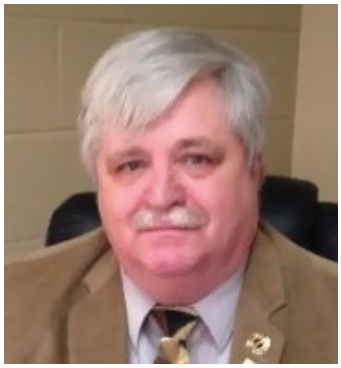

PRESIDENT'S MESSAGE

Keith W. Spencer
CLSA 2020 President

Virtual Seminars and Mentoring Mondays

We are entering our last quarter of 2020. It has been a tumultuous year so far. We have had to adapt to a new paradigm for transacting our business.

Our 2020 Conference moved from March to August and was transformed from live to virtual. Please visit our virtual exhibit hall: *https://view.publitas.com/connectmii-communications/acn-virtual-exhibit-hall/page/1*.

We would like to thank our sponsors that stayed with us to provide much appreciated support. We encourage you to schedule a video visit with them through the end of the year (sometimes longer) at *https://view.publitas.com/connectmii-communications/acn-virtual-exhibit-hall/page/3*.

One of the major benefits of having a virtual conference is the ability to go back and attend the sessions you could not attend live. I can say that I have found this to be extremely beneficial and am still using this feature. The conference recordings are all posted to the conference app. They will be available for viewing by conference attendees until December 31, 2020.

The networking we expect from a conference was somewhat accomplished by having virtual meetings during our breaks and at the end of the day. These were well attended and sometimes quite lively. However, I really missed the one-on-one chats that happen so often. This was one of the major drawbacks to holding a virtual conference and I am looking forward to resuming in-person conferences when it is safe to do so.

Earlier this year the CLSA Board of Directors committed to joining with NALS for a live conference in Reno next year. To be determined is whether this commits us to another joint virtual conference if the decision is made not to go live because of the COVID issues.

Our chapters have also had to adapt. Some are doing better than others. Channel Islands Chapter increased their membership and added a director (congratulations). Chapter leadership has a responsibility to its members to provide them with the benefits that have been provided in the past. Meetings still need to be held. Speakers must be presented. Those that have provided training classes need to keep them going. Sacramento Chapter has successfully converted their review class to virtual and it starts next year on Tuesday, January 5, 2021. Our future Land Surveyors are depending on us to deliver the mentorship we have always provided, whether in Chapter meetings, review classes or webinars.

Our webinars this year have been current and extremely informative, including a record setting presentation by Michael J. Pallamary. If you missed any of these, take the time to watch them in the members portion of our website.

Additionally, we have the meeting software available to provide virtual meetings. Contact Central office if you need assistance.

Finally, Trent Keenan and Rob McMillan teamed up to establish Mentoring Mondays for the Land Surveying Profession: *https://www.facebook.com/MentoringMondaysfortheLandSurveyingProfession* or *https://www.linkedin.com/company/mentoringmondaysfortheland surveyingprofession/* They meet every Monday at 4:00 PM Pacific time to provide career guidance, exam strategy, and general land surveying information to others.

Be safe and take care of yourself and each other.

EDITOR'S MESSAGE

Paul Mabry
***California Surveyor* Editor**

In Propria Persona Is Irreplaceable

At the breakfast table this morning, my youngest son asked me if I had Sago Mini video games when I was a kid. I replied that when I was little, we didn't have computers or video games. With a mixed look of surprise and consternation, he responded, "Then how could you live without electricity!" I laughed aloud at this apparent non-sequitur and realized that to his six-year old mind, video games and electricity are basically the same. After all, you plug in the iPad and the games are there and when the batteries die, the games stop! If only things were so simple....

Equating virtual communications with in-person meetings is another non-sequitur. Despite the efficiency of virtual meetings, they just don't replace the interaction with real humans. *In propria persona* is irreplaceable. A firm handshake, a warm smile, a slap on the back. For disease control, we can delay but not replace the essential human touch. I for one am looking forward to the next real, live, conference. Nevertheless, there are some benefits in virtual. No travel time is required. Many are offered for free or at reduced cost. At this year's conference, Gavin Schrock opened the conference with a sometimes funny, always engaging virtual talk about the future of land surveying. I could not help thinking about the irony of a virtual talk about the future. Nevertheless, his message was reinforced by the circumstances. The future of surveying will be radically different, and surveyors should anticipate those changes.

In addition to our own joint conference with NALS and APLS, several other virtual conferences of note this year were:

FIG Work From Home Week (May) where over 80 technical papers are archived online.

ESRI User Conference (July) where all the proceedings are available for free viewing. I recommend the "ArcGIS Parcel Fabric: An Introduction." Surveyors can learn about a popular application increasingly used by cadastral data managers and tax assessors (and related to one of the articles herein).

Intergeo Digital 2020 Conference (October) had a large array of technical presentations and vendors. I enjoyed the live (virtual) entertainment and caught up on some of the latest surveying gear.

The Autodesk User Conference (November) I did not attend but noticed several interesting sessions that are on my to-watch list.

And that brings up two more benefits of virtual presentations – archives of past and connections to future conversations. Nearly all conferences are now archived for later viewing. Our own conference classes are available to paid attendees through the end of the year. And sometimes, follow-up meetings result from the conferences. I subscribed to a Meetup after the ESRI conference that was extremely informative, and I know of others as well. Both benefits excel at delivering information, if lacking in the human touch.

Flowing from our own conference this year, we have two articles written by presenters. Laura Ledbetter shares information related to rising business cyber-crime (it's a real thing) and Elly and Elaine Ball share their story of starting a children's education organization focused on land surveying. We have re-printed their first cartoon series with the hopes you will provide us with feedback from your youngest associates (school age kids or grandkids).

In addition, we have a smorgasbord of other articles to satisfy our adult audience. Technical tips, ethics in business, geoid updates, water rights and augmented reality are all served up surveyor style. Bill Schroeder inspires us with "the Archive" in Marin County and explains how surveyors can foster support and good will with a community effort to preserve public access to survey records. The pandemic has delayed this issue, but I am delighted to share the outpouring of creativity these authors contribute! I hope you each crack a smile reading this issue and wish you the warmest of holiday greetings.

P.S. This magazine is best enjoyed in hardcopy, but the electronic version (available online) has active hyperlinks for those of you who want to spend more time on the internet.

— On the Cover —

A view from inside one of several arches supporting the Lake Hodges Dam located just north of San Diego. This dam is an example of multiple arch concrete construction from the early 20th century. Photo taken and submitted by **Jeff Rush**, PLS. Pictured is **Joseph Melchior**, both are surveying here for Michael Baker International. Submit your California surveying related photograph today for a chance to be featured on the next cover!

LEGISLATIVE REPORT

Michael Belote
CLSA Legislative Advocate

Difficult Legislative Session Ends

Midnight, August 31 marked the end of the 2019-2020 two-year legislative session in Sacramento, as mandated by the state constitution. There have been occasions in the distant past when circumstances required dramatic alteration of legislative functions, such as flooding of Sacramento in the 1800's, but nothing like this pandemic in modern times. COVID-19 involved re-thinking fundamental notions of public participation in government and how legislators cast votes on bills.

All told, the California Assembly and Senate were sent home for roughly three of the seven months they would normally be in Sacramento. And even while "in session," the Capitol was effectively closed to the public and most legislative staff. This made virtually everything more difficult, including passing the 2020-2021 state budget, routine committee hearings on bills, testimony by lobbyists and the public, and much more.

In a typical year, the legislature sends 1200-1400 bills to the governor for signature or veto, approximately half of all bills introduced. In recent years, governors have vetoed perhaps 10-15% of the bills they consider, meaning that approximately 1000 new laws are enacted every year. For better or worse, that number is going to be much lower when the governor completes his review of the bills reaching his desk. It now appears that the number of new laws created this year might be as low as 400-450.

For their parts, legislators were asked to reduce their bills to those which were COVID-critical, or urgent for some other reason. Examples of the latter category include bills relating to housing, wildfires, police misconduct, and independent contractors. Of course, whether a given bill was "critical" was sometimes in the eye of the beholder, but by and large most members tried in good faith to reduce their bill loads.

Lobbying was incredibly difficult this year. With virtually everyone from the Capitol working from home, it was necessary to leave messages on Capitol phones, or more often, call members and staff on their cell phones. Fortunately we have cell numbers for most members; again, they were mostly good-natured about receiving calls on their personal phones.

In terms of hearings, lobbyists and the public were very strongly encouraged not to enter the Capitol to testify. On particularly important bills, we showed up in person, which required being escorted personally by Capitol security to the hearing room, and escorted back out of the Capitol when done. There was no ability to walk from office to office, and no one to talk to even if you could walk around. Everything required a conference call, Zoom call, etc.; lobbying is certainly one activity that is more efficiently performed in person!

Of the big issues, the legislature addressed several but left some hanging for next year. On housing, for example, major bills including SB 1210 by Senator Toni Atkins ran out of time and were not enacted. This bill would have dramatically altered local zoning to encourage multi-family housing. The bill literally was approved by the Assembly at 11:57 on the last night of session, with no possibility to return the bill to the Senate for the required concurrence vote in Assembly amendments prior to the midnight deadline. This resulted in acrimony between the Assembly and Senate.

On independent contractors, the legislature passed AB 2257 (Gonzalez), which was immediately approved by Governor Newsom. While a small number of new exemptions were added for specific industries, land surveyors were not included. On the other hand, the more general "B2B" exemption was modified in a way that may make the exemption more usable in appropriate circumstances for surveyors and other professions. On October 9, CLSA conducted a Zoom call for members on AB 2257 as well as a number of other bills of interest, including those imposing new obligations on employers relating to COVID.

A number of CLSA members have inquired about the effect of passing Proposition 22 on the question of independent contractor law. The initiative related only to gig workers in app.-based businesses, so it is difficult to imagine any impact on surveying. And contrary to some speculation, Proposition 22 does not signal a broad-based return to the *Borello* standard which existed prior to *Dynamex*. AB 5/AB 2257 will be with us for years to come.

Following the November general elections, the new legislature will be sworn into office on Monday, December 7, 2020. The session will commence in earnest on the first Monday in January. Expect to see lots of the bills which were dropped this year to be reintroduced next year, with an emphasis on housing and taxation.

Until then, let's all light a candle that an effective vaccine will be widely available, so that 2021 does not look like 2020!

CENTRAL OFFICE REPORT

Kim Oreno, CAE
CLSA Executive Director

The Work Goes On, Thanks to You

Greetings CLSA Members! I hope you enjoy this issue of the *California Surveyor* magazine. I'd like to thank Paul Mabry (Editor), David Kendall, Joey Waltz, Landon Blake, Seth Doherty and Rob McMillan for their hard work putting this issue together. Developing interesting and relevant content for a magazine is no easy task and this group is doing an outstanding job. CLSA is lucky to benefit from their efforts.

As the pandemic continues, CLSA staff continue to work from home most of the time but day to day operations continue with no interruption. I am proud of and lucky to work with my co-workers who work hard every day for CLSA members to ensure that association operations continue, uninterrupted. Our web team is putting the finishing touches on the new website and we expect it to launch very soon. Please be sure to check it out and send us your feedback.

I saw that many of you attended our very first virtual conference, held jointly with the Nevada Association of Land Surveyors and the Arizona Professional Land Surveyors Association. Thank you very much for your support. I hope you found value in the conference and I welcome your feedback as we start planning the 2021 conference. At this time, a decision has not been finalized regarding what the 2021 conference will look like, but we'll let you all know as soon as possible, and I hope to see you all there, regardless of the format.

This year has been difficult, to say the least, but I'm so lucky to work with such a dedicated group of volunteers who, despite a global pandemic, continued to put the land surveying profession and service to their association near the top of their priority lists. Your Board of Directors pivoted (how I've grown to hate that word, but ... it fits here) to holding their board meetings virtually for April, July and November and I've been so impressed by their level of engagement and dedication. Spending six hours on a Zoom meeting, on a Saturday is impressive! The CLSA's Legislative Committee, chaired by CLSA's Past President, Michael Butcher also persevered and continued to track bills and participate in discussions on how potential legislation could benefit the profession. Landon Blake, as Chair of the Continuing Education Committee, worked hard to secure speakers for webinars every month as soon as it became apparent that in person events would not be taking place. Hundreds of members took advantage of those free webinars and recordings are available in the members only section of the website.

The CLSA's Education Foundation has refused let a pandemic get in the way of supporting surveying students across the state. They'll be meeting in January to determine scholarship distribution to deserving students. The Foundation's fundraising efforts have suffered this year because we were unable to hold the annual live and silent auctions. Please consider sending a donation through the CLSA website. It is much needed and appreciated. The Foundation continues to accept donated items that will be up for grabs at the next in person conference. That will be an auction unlike we've ever seen as our inventory continues to grow so be sure not to miss it.

As 2020 comes to a close, it seems natural to reflect on the year and give thanks. I'm so thankful that you have chosen to maintain your membership with the California Land Surveyors Association. I'm thankful for the e-mails I receive from you all and always welcome your feedback and inquiries. Thank you for staying engaged and dedicating your time to making this association great. I'm thankful and proud to be a part of CLSA.

— Welcome New Members! —

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Annie Maher
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E. Tenell Matlovsky
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Louie Mercurio
Raul Moreno
Magnolia Morris
Parker Muller
Juan F. Munoz
Michael Mussari
Katrina Olsen
Daniel Lloyd Ortega
Julian Padilla
Roger Allen Peterson
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Andrew Robinson
Sean Robison
Rogelio Rodriguez
Kevin Romero
David B. Ron
Christopher Royak
Christopher Scott Sanatar
Zachary Schwarz
Tanya Shadoan
Rosemarie Ann Silva
Donald Mackenzie Stivers
Gilberto Suarez
Christopher Szewczyk
Rodney Dean Unema
Mario Vasquez
Adrian L. VerHagen
Stuart Von Lewis
Douglas B. Webber
Peter Weilbacher
James Wilson
Brian P. Wiseman

Boundary Lines in Augmented Reality

By Dennis McKay

Augmented Reality (AR) is here. TV sports fans experience it as an imaginary line superimposed onto a football field indicating where the ball needs to advance to get a first down. Glass™ by Google is a small wearable computer in the form of conventional glasses with a transparent display that allows workers to view information hands-free. And while AR glasses have a see-through computer display for lenses, other forms of AR use conventional LED screens with a live camera feed. For instance, many recent land surveying instruments allow mapped points and lines to be superimposed over real time video feeds on data collectors for field staking or other surveying tasks. The benefits are obvious: an operator can see the real world with augmented visual data superimposed onto the display. Surveyors are already using augmented reality for quick access to digital data, but AR glasses are evolving, opening up even more possibilities. Even new smartphones have stereo cameras and 3-D scanners built in to accommodate graphics rendering that appears to project images upon the surfaces in our surroundings. From Pokémon to monsters emerging from your living room wall, smart phones support a variety of virtual or augmented reality games. And coming soon, we will be able to see what that IKEA dining room set looks like superimposed in our homes before ever visiting a showroom. Commerce and gaming will continue to drive the rapid evolution of these technologies.

continued on page 8

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Figure 1: Example of how Augmented Reality might appear to a lay person in the near future.

But what happens when parcel boundaries, published in digital map form by government agencies, appear as augmented reality, superimposed upon the physical world a lay person witnessing? The figure above is a mockup of how that might appear. AR technologies already help surveyors in corner searching and could help hunters or other outdoors persons know when they pass to/from areas of differing jurisdictions. Before looking at the great potential benefits AR offers for survey field operations and for lay users of parcel data such as hunters, campers or appraisers, let us first examine some of the pitfalls.

If you jumped ahead of me, you are concerned that the Internet's idea of a parcel corner's location (coordinates) causes the corner to be superimposed over the ground in the "wrong" spot. Admittedly, the superimposed line will never be "exactly" where the boundary exists.[1] There will always be some level of error or uncertainty in the measurements used to create the data as visualized. We see this using any GIS or CAD application to view existing parcel boundaries layered over satellite imagery. The closer we zoom in, the more evident it becomes that the parcel lines are not aligned with the fences and road centerlines seen in the image. Similarly, AR promises to let us see a survey monument superimposed on the surroundings at our feet, yet inherent in that scene will be some agency's idea (and error) of where the property lines are. This mismatch between reality and digital will be more evident and potentially more misleading with AR than with previous GIS technologies.

Surveyors are the true Measurement Scientists. Imperfection and Uncertainty is our wheelhouse:

The true position of a legal point may never be measured exactly and a measured bearing and distance between two points is never perfect.[2] But, once we can conceptualize and accept that **exact distances, angles and coordinates are never perfectly locatable**, we can focus on the real value that surveyors bring to the public: recognizing, evaluating and estimating the uncertainty of measurement values. This is not nitpicking! It is a perspective fundamental to our focus on the **always-inexact nature of measurements between monuments.** The conveyance of that information is critical in creating digitally published parcel locations.

Prior to my retirement from the Bureau of Land Management (BLM), I spent many years working with the Geographic Coordinate Database (GCDB). One of the most important concepts I learned is that digital parcel data is most trusted when derived from record survey measurements, properly analyzed by seasoned surveyors, integrating all data of various vintages and thereby deriving the best estimates of positional values. Rigorous network analyses through properly weighted least squares adjustments best accomplishes estimated coordinate values, as well as **predicting the amount of uncertainty expected for each derived coordinate pair.** The GCDB (see Figure 2 below) was created using this optimal approach. A simplified version of GCDB, boiled down for usage by the general public, has been formatted in an accepted national standard for parcel data. This standard is properly known as the Publication Standard of the Cadastral Theme of the Federal Geographic Data Committee (FGDC) National Data Spatial Infrastructure (NSDI), commonly referred to as the CadNSDI. This data can be found at *https://nationalcad.org/download/PLSS-CadNSDI-Data-Set-Availability.pdf*. However, this national standard does not include any measurement data for surveyors to analyze or inspect. It has parcel polygons that are attributed with legal land descriptions and a bare minimum of attributes such as official acreage. For surveyors, it is useful to zoom and pan or otherwise navigate to parcels in an area of interest [and thereby access any openly published measurement data]. Notably, there is a point entity in the CadNSDI at every vertex of each parcel polygon which includes a unique defensible value predicting the reliability of each coordinate value.

Within the GCDB, the range of point uncertainty can be dramatic. In modern surveys the uncertainty may be less than an inch. However, for a few corner coordinate values in remote areas, the uncertainty is over a quarter of a mile. This is most often due to misclosing measurements in the ancient-but-best-available survey plats and the lack of nearby control points. My point is that this variation in uncertainty must be clearly (and preferably graphically) communicated to the end user, especially if the end use is some form of augmented reality.

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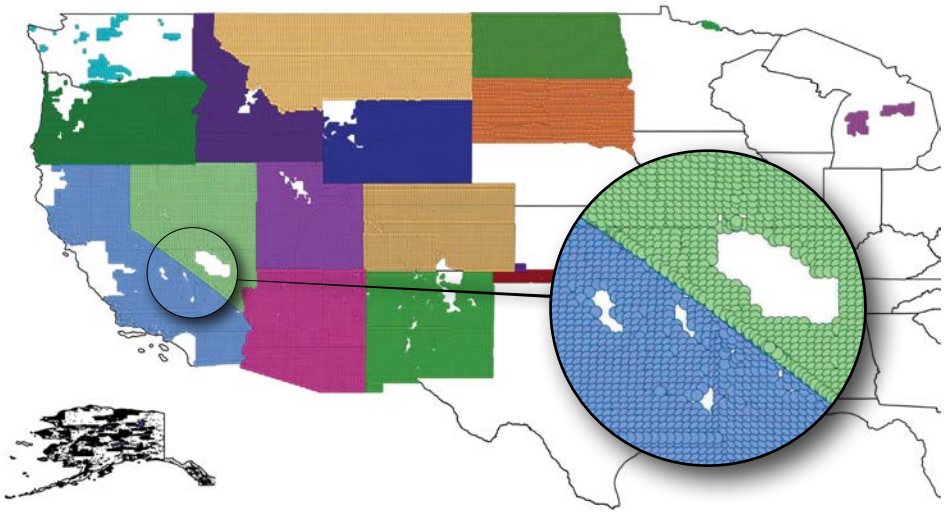

Figure 2 – BLM's GCDB coverage as of 2012-2017 (varies by state). Each dot represents a township. The data breaks down sections at least to the 40 acre parcel level. Private land holdings are not included in this particular data unless they were or are fully bounded by federal land.

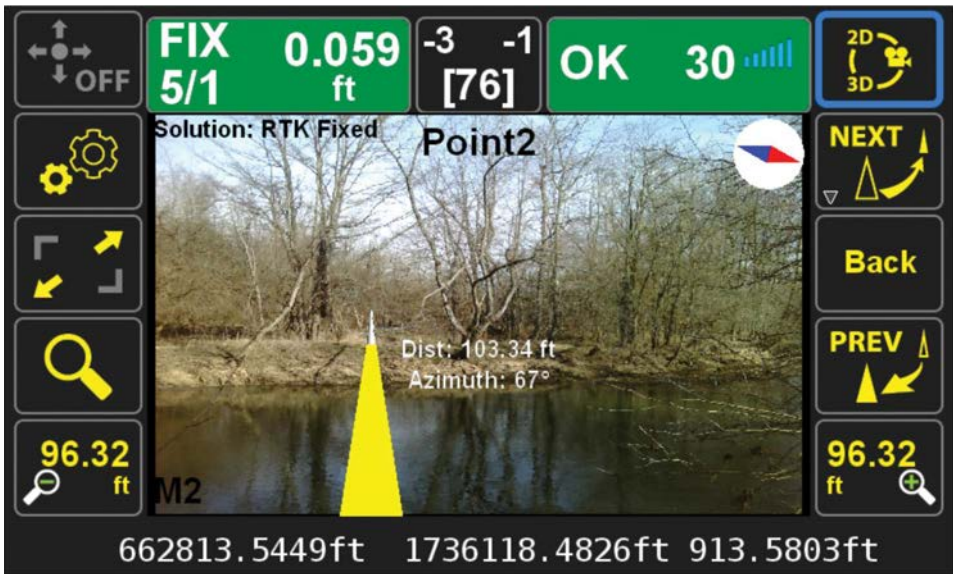

Figure 3 – Example of AR displayed on the screen of a Javad Triumph LS GNSS receiver. Surveying instruments increasingly have the capability to overlay real time video feed with point staking information – a form of augmented reality.

Transitioning to the advantages of AR, just imagine looking for a quarter section corner in a remote area. The GCDB or CadNSDI should already have best-guess coordinates for the corner monument and uncertainty indicators. Presently you can be guided to the search area by any GPS device, but in the near future this guidance will include a corner symbol projected onto the landscape within your AR display. In a corner recovery, surveyors would normally drive a stake in the ground at the published coordinates and start searching, bearing in mind the x, y uncertainty attributes in GCDB for this point may be a large ellipse representing a 95% chance that the true corner point falls within that ellipse. With augmented reality however, the stake would already appear on your screen as a symbol and the uncertainty ellipse would be superimposed, at scale, upon the ground. Ideally, the AR software would also superimpose the connected boundary lines as a wide line, similarly scaled and tangent with the ellipse. Perhaps the AR app could be trained to "paint in" all the ground a person covered during a search so that he or she could avoid overlap. And, if survey plat images were indexed by geographic location it would be a simple matter to layer relevant plats on the AR display based on where you stand, as well as toggling the AR boundary line labels with the different published bearings and distances.

Returning to the use by a lay person, consider the difficulty of hunters wandering in the woods. The AR glasses could make good use of uncertainty indicators. The jurisdictional lines defining the different hunting zones could be projected onto the ground. A clearly shaded dividing line, perhaps ninety-feet-wide at one corner of a plot and tapering down to seventy-feet-wide at the other endpoint, would graphically represent an area of uncertainty. A pop-up information window would inform the user that AR boundary lines have uncertainty and therefor to rely on physical fencing and posting in that zone. Once inside a jurisdictional area, such as a non-wilderness US Forest Service, a pop-up display could also display other geo-attributes such as the designation for that area along with a list of the rules which the hunter or visitor must obey. The same functionality would be useful for law enforcement personnel. Similarly, real estate agents or property appraisers could better understand and communicate the extent of land for sale and avoid mistakenly placing too much confidence in digital data.

As Augmented Reality software makes it increasingly easy to access the parcel geometry theme of a city or county, any landowner can potentially see and be misled by land boundaries projected onto the ground as a line or a wall on their smartphone's AR display or AR glasses. There MUST be a way to communicate the inexactness of these displays whether it is boundary lines with a width of the uncertainty or with some other method. Perhaps in this situation, a pop-up display with a message like: "CAUTION: DATA UNCERTAINTY MAKES LOCATION IN THIS AREA UNRELIABLE!" Otherwise confusion will reign as a landowner fails to see or misunderstands the boundary line going down their property fence or wall. Based on the uncertainty we know exists in most

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GIS data, such visualization may mistakenly go through a house or indicate a violation of setback rules. **It is a disservice to publish digital parcel lines and points as static, exact features.** As surveyors, we know this error is foreseeable but preventable. We should actively promote solutions, not passively wait to say "told you so."

Digital parcel boundaries created without the rigorous network data analysis used by Bureau of Land Management, likely lack indicia of positional uncertainty and so it is hard to defend the practice as presently served up on many GIS and government websites. See the above figure for a typical example of assessor data overlaid on aerial photography. Note, some aerial mapping providers do attempt to provide uncertainty indices in their data measurement tools. But reliability is unknown because many vendors of imagery products do not publish accuracy statements or employ a professional surveyor who, in California, is the only qualified profession to make accuracy assessments of measured data. Most agencies of course defend their practice by disclaimers and assert their data is good enough for their purposes. As we all know, any measurement may be good enough for something, but for what? Zoning decisions? Appraisals? Road maps? Unfortunately, these decisions are often made with a large amount of latent positional uncertainty.

Might the same misleading parcel geometry data foster decisions in property disputes erroneously arising from inaccurate displays? How useful is the superimposed information to supporting facility management such as underground utility improvements that improperly appear to be correlated to parcel corners? When the uncertainty of parcel boundaries is not visualized, how does a user know if it is sufficient to support certain decisions? And if uncertainty is quantified, what is the most effective (and economical) approach to communicating such information? Hint: hidden deep inside a nearly incomprehensible metadata attribute table is not the solution. As professionals, we could throw up our arms and declare the situation a mess. On the other hand, we could also consider the situation an opportunity and communicate persuasively to resolve these upcoming difficulties.

For surveyors to assert themselves into the maintenance of digital parcel boundaries will, for some, be an introduction to new concepts. For example:

1) A parcel corner or a parcel boundary measurements (coordinates, bearing or distance) of known reliability and uncertainty must published in such a way that others can easily access and adopt the information. This means using an open data concept and having a standardized, consistent data format.

2) National standards should be adopted for parcel lines as well as parcel boundary measurement dimensions. A parcel line may have redundant measurement values over time. All should be available and be properly weighted in correspondence with their relative accuracy.[3] I proposed such a standard in the May 2018 issue of Surveying and Land Information Science.

3) National standards should be adopted for parcel corner point control measurement data. An example of this is the Multistate Control Point Database in use by the States of Idaho and Montana.[4]

4) Network error analysis is essential in properly weighting survey measurements to arrive at the most likely coordinate values as well as a defensible indication of positional uncertainty. The key technology is a full parametric least squares analysis/adjustment. Statistical uncertainty information provided by surveyors is an extremely useful service for public usage only if and when presented in an understandable visualization.

Augmented Reality survey technology exists and will improve immensely. Surveyors have a peek at this technology in their present instruments. It is only a matter of time until consumer grade devices can access mapping data such as soil type, vegetation type, historic topo maps and parcel boundaries. When these parcel boundaries are projected true scale through smartphone screens or AR glasses they will not be projected onto their exact locations. Without some visualization of positional uncertainty, these AR boundaries will cause misinterpretations and confusion. The advantages of using AR glasses for survey fieldwork also will continue to grow. For all these reasons, it is prudent for surveyors to anticipate these AR problems and benefits. A committee of leading professional surveyors should develop a narrative to best frame the problem to the public as well as formulate an approach to organizing current and future digital data. Surveyors can seize the opportunity to create and maintain properly published parcel geometries which include positional uncertainties and to work with software engineers to effectively render visualizations of these uncertainties through augmented and virtual reality platforms.

Endnotes

1 For more on this, see this video where I explain that boundary points (dimensionless) and boundary lines (no width) are invisible abstractions: *https://tinyurl.com/y57faz7z*

2 In this video I explain the fallacy of exact measurements: *https://tinyurl.com/y5delov4*

3 I proposed just such a standard in the May 2018 issue of Surveying and Land Information Science. See also *http://edac.unm.edu/projects/surveypage*

4 See link to example ESRI application at *https://tinyurl.com/y2ro5d9w*

Dennis McKay

Dennis McKay is a retired land surveyor who worked for decades with the Bureau of Land Management in Arizona and New Mexico, much of the time closely involved in developing and improving the Geographic Coordinate DataBase. He lives in southern California with his wife. They are presently enjoying an extended camping trip through the western states. Dennis can be reached for comment at *denniskmckay@yahoo.com*.

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BREAK NEW GROUND

Water Right Surveying

By Dr. Peter Scott Geissler, PhD, PE, PLS

This is an introduction to water right surveying from a professional land surveyor's perspective. Just as with land boundary matters, there are many legal principles that apply in analyzing water rights. While these legal principles are not my focus, I will mention them where relevant. And, as a caveat, a practitioner in water right surveying should be alert to that gray area where law blends with fact. By the way, the term "water right" is generally used in the singular, not the plural. It is this convention I follow herein.

As population grows, so do our demands for water. And, while most of us think primarily of drinking water, domestic water use constitutes less than 10% of the total water used for all human purposes. By far, the biggest use of water is for power generation and agriculture. About 80% of all water is used for these purposes. As might be expected, the laws related to water use are a reflection of the big historic users of water–farms, industry, and mining. There are two types of water rights historically recognized at common law: Riparian rights and appropriative rights.

Riparian rights might be the more obvious type of water rights known to the layperson. Riparian rights exist only for the owner whose land touches a body of water, such as at the bank of a river or lake. A riparian owner shares the right to the water with all other riparian owners up and down a stream, river, lake, or other body of water.

Appropriative rights are quite different from riparian rights. Under appropriative rights, the first person historically to divert water from a body of water and put it to beneficial use acquired the right to that water. So, a gold miner could build a dam and channel water a long distance away to support a mining claim located nowhere near the source water body. Similarly, a municipal corporation could divert water from a stream or lake to supply water to a city hundreds of miles away.

These appropriations of water were the historic drivers of development in the west. Examples of this type of appropriative right exist everywhere in California and more broadly in the western states. In the eastern states, riparian rights are more typical. The reason for this is a product of history. Because western states were settled and developed later in time, at a time when mining was an important factor in their development, most of the western states adopted appropriative water rights instead of riparian water rights. Unlike appropriative rights, a riparian right owner cannot pipe water far away to another non-riparian property he or she owns. And property, once divided from a riparian parent parcel, not only loses the riparian water rights but also generally cannot regain them even if the property is merged back with the parent parcel at a later time. Thus, the adoption of appropriative water rights encouraged industry and development in the West, on lands that would otherwise have been without water.

The reason I have briefly explained these two types of water rights is to underscore the potential confusion a water right in California may cause. California recognizes both types of water rights – riparian and appropriative – unlike almost every other western state. This makes analyzing and researching a water right in California especially interesting. And, not mentioned as a water right per se is groundwater access. Groundwater is yet another source of water; however, a discussion of groundwater issues is beyond the scope of this article. Also not included herein is any discussion of federal water rights and pueblo water rights.

For purposes of this article, I am focused on appropriative rights of record, which generally bring rise to more complex issues than riparian rights bring. So, while a water right could be riparian, such a right is likely incidental to a property's physical character and location. Riparian rights are not being examined here.

Professional qualifications to examine a water right vary by state. I am a licensed professional land surveyor and professional engineer in several western states. Some states require specific, additional licensure while others do not. For example, in Nevada, I am a State Water Right Surveyor and represent clients in adjudication proceedings before the State Engineer. In Idaho, in contrast, I am a Certified Water Right Title Examiner. Other states, such as Oregon, permit licensure as a Water Right Examiner only to existing licensed surveyors, engineers, or geologists.

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California requires no specific licensure, but still requires engineers or surveyors to practice competently under their respective ethical responsibilities.

My typical work product is a Water Right Title Report, which is analogous to a Real Estate Title Report. I charge a fixed fee that represents up to 40 hours of records research for an experienced Certified Water Right Title Examiner, Licensed Professional Land Surveyor, or Licensed Professional Engineer. The Water Right Title Report contains a summary of the water right(s) being identified, the property and property owner details, and a description of the record and history of the water right(s). A real estate title report will not contain these water-related details.

Most title insurance companies exclude coverage of water rights and there is no affirmative endorsement for water rights available. A typical insurer will not pay costs, attorney fees, or expenses arising from water rights, claims, or title to water, regardless of whether they are shown by the public records.

Mostly, the work in preparing a Water Right Title Report is comprised of records research at the State Water Resources Control Board (SWRCB), but there are many instances when a practitioner must field verify the locations of water wells, pipelines, irrigation ditches, diversion dams, stormwater water retention basins, etc. Once the research and field inspections are completed, the work product is prepared for the client and produced as a Water Right Title Report for the requesting party. The requesting party may be an owner, attorney, prospective owner, or lender.

The crux of water right surveying is this:

Before 1914, water rights were considered property rights. In other words, when one acquired real property rights, water rights were likely included, be they appropriative or riparian. Then, in 1914, the California legislature, along with the voters through Proposition 6, created the State Water Commission to regulate appropriative water rights. The Water Commission (now the State Water Resources Control Board or SWRCB) subsequently appropriated water to users by means of permits (later licenses) it issued by it or the State Engineer.

What prompted this change in water policy? The answer, of course, is growth of cities throughout the arid, western states. "Water wars" increasingly brought conflict between riparian (often agricultural) users and appropriative users. Sounds simple, right? Well, what might have been simple, turned out to be quite complex. The problem is that a "grandfather" clause in the Water Commission Act of 1913 allowed pre-1914 water users to keep their appropriative water rights without having to record water right surveys or otherwise document their pre-1914 water resources and beneficial uses. That was a mistake, which resulted in a spotty chain of records to document appropriative rights.

Certainly, there remain many undocumented appropriative water rights waiting to be proved. For over 100 years, farmers and growers have enjoyed their pre-1914 water rights and have not necessarily notified the State Engineer/SWRCB of their use. Without that formal documentation process, those rights may or may not still exist. In any case, these appropriative water rights almost certainly will not show up on a Water Right Title Report. Because the 1914 law calls for a loss of pre-1914 water rights in the event of abandonment, cessation, change in water resources (water diversion, water wells, irrigation ditches), or change in beneficial use, the records analysis I perform during title research is critical to an owner evaluating the value and future plans he or she may have on a piece of property.

The law changed again in 1976, when voters approved Proposition 14, approving a constitutional amendment that added Article X (Water) to the California Constitution. Of the seven sections in Article X, Section 2 now requires all water use to be both "reasonable and beneficial."

The current application of the Water Code rules is generally: (i) all water users must apply for appropriation from the State Engineer/SWRCB, and (ii) in the near future (neighboring Nevada sets a hard date of 31 December 2027), there shall be no recognition (whatsoever) of any pre-1914 riparian right. With continuing

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debates over water sales, water wheeling, and the increasing need for water in arid regions, I expect the appropriative water rights to be ever more difficult to acquire and even to retain.

Today, there are many farmers and growers in California who must submit petitions for appropriation from the State Engineer/SWRCB despite the fact they may have developed and used water resources for many years. This is a condition of the permitting process that many find onerous and time consuming. The failure to comply, however, has serious consequences, including the loss of the appropriative right. Sadly, the potential loss of the appropriative water right is even more likely because, most often, water resources are already overdrafted. Ultimately, a new applicant for appropriative rights has little incentive even to apply.

How best to proceed in preparing a Water Right Title Report? I rely upon materials developed by state bar associations, so I do not overlook important issues. A good example of such a document is "Water Rights Outline and Checklist" (pp. 29-41) by Ruben R. Barrera, Esq. (2001), for legal practitioners in Texas.

LINK: *http://www.texasbarcle.com/Materials/Events/2114/13955_01.pdf*

In California, useful resources are practice guides such as (i) Slater, California Water Law and Policy (LexisNexis 2019); and (ii) Littleworth & Garner, California Water III (3d ed Solano Press 2019).

There is no standardized format for Water Right Title Reports at this time.

I estimate that there are over 10,000 farmers and growers in California who must eventually prove they have rights to the water they have been using. Therein lies the business opportunity for professional land surveyors. Once again, we appreciate the wise remark about water in the West, which is sometimes attributed to Mark Twain: "Whiskey is for drinking; water is for fighting over." It has never been truer than now.

Peter Geissler, PhD, PE, PLS

Dr. Geissler is a professional land surveyor and professional engineer (civil, structural, mechanical) in multiple states in the USA. He also holds professional licenses in several other countries including Ireland, Italy and Malta. Dr. Geissler resides in Belvedere, California and Rome, Italy.

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Historian Livingston shows a file to world famous map collector, David Rumsey.

Build an Archive, Build a Legacy

By William "Bill" Schroeder

On a sunny Thursday afternoon in Marin County, California, a first time visitor makes her way to "the Archive." It's the one afternoon each week when the physical plant containing 150 years of survey records is open for in-person viewing. Let's call her "Mollie" for convenience. Mollie has already checked the extensive online catalogs and indexes and is excited to finally see the original hardcopy of the 1896 subdivision where she is working. The official name of the Archive is the Annex of the Anne T. Kent Room of the Marin County Free Library. It is a

gleaming 4,000 sq. ft. facility with museum grade flat files and cabinets. Historic maps and photographs line the walls. It's a bustling place on Thursday afternoons: Laurie Thompson, the librarian of the Anne T. Kent Room, will be there along with Dewey Livingston, the preeminent Marin historian. There are three or more

Seven surveyors doing research in the archive.

volunteers cataloging and indexing the life's work of 11 of Marin County's most prominent surveyors. Another surveyor will likely be there researching, and Mollie shouldn't be surprised to also meet historians, investigators or cultural researchers. She will enjoy a real camaraderie among the people there and will get the help she needs to search through the thousands of historic survey maps and contemporaneous field note books.

Of course, it wasn't always that way. For 27 years, I was the proud owner of these records. I was the latest, and last, private surveyor to own them after purchasing them from the previous surveyor in a long chain of ownership. Several years ago, as I began to think about my transition away from full time surveying I faced a dilemma. While lucrative, I felt that yet another sale to a private surveyor was not in the best interest of the whole community and would perpetuate a sense of unfairness in access. With this conviction, I began to explore ways to transfer the collection to some form of distributed ownership. That was the beginning of two years of dreaming, discussing, and cajoling others to bring together the wonderful community enterprise that has resulted.

The author doing research in the archive.

When the Marin County Free Library came forward with the permanent office space and library management personnel, the last puzzle piece fell into place. We had achieved our goal! Of the financial donors, the Marin County Monument Preservation fund contributed 60% of the purchase price, the Marin chapter of the California Land Surveyors Association contributed 20%,

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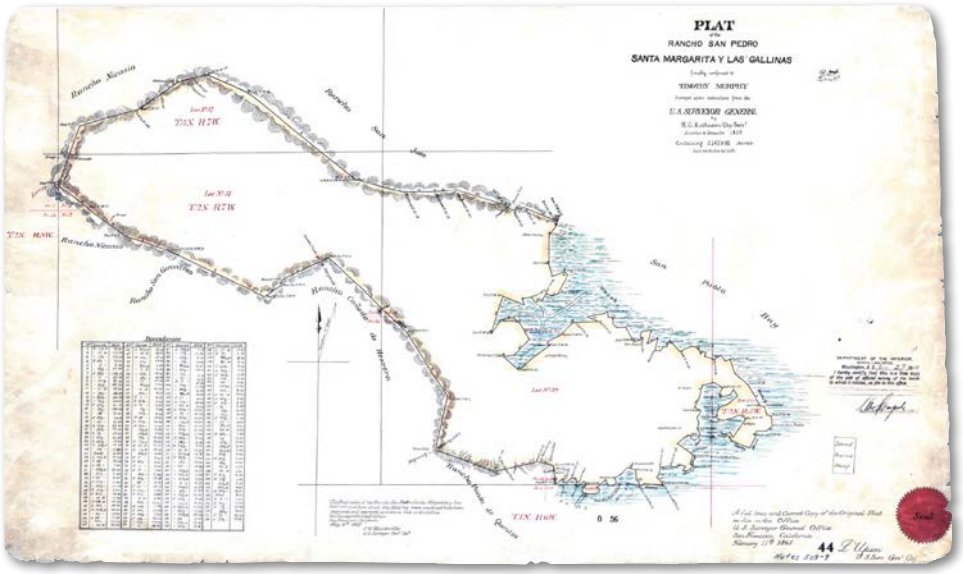
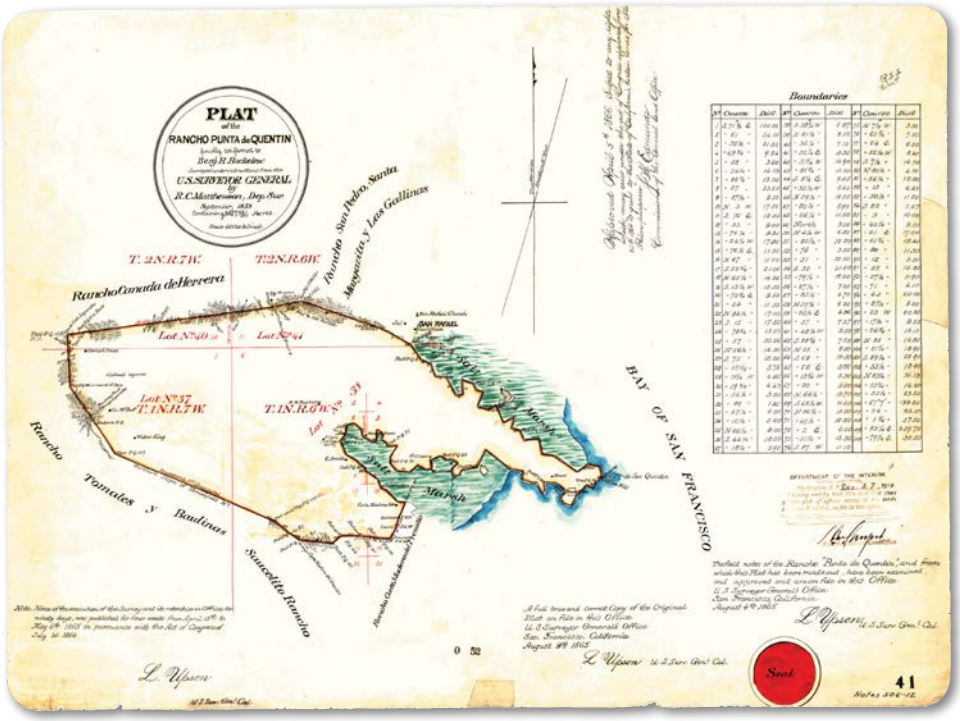
and individual surveyors contributed the remaining 20%. I was happy with what I hope no one will argue was a less than market price, and I have spent the last five years volunteering and educating the staff and users about the esoteric files of the surveyors who divided and mapped much of Marin County. Having so many parties with "skin in the game" really helped getting the project through to a successful completion.

ARCHIVE CONTENTS

Of these eleven historic surveyors, the Archive begins with the life's work of Hiram Austin who laid out the principal roads of the county and the townsite of the county seat in the 1860's. Next came George Dodge and George Richardson, LS 206, who subdivided many of the original large parcels circa 1880's to 1910's. Austin and Dodge were both engineers practicing before surveyors were licensed in California.



Then, C.H. Towle, LS 389, in the 1920's. In 1928, John C. Oglesby, LS 1106, RE 3230, began his career and acquired the records of the four previously mentioned. All five of these gentlemen held the office of County Surveyor (up until 19xx, an elected position). Oglesby practiced until 1963, producing an astonishing 19,000+ surveys. He was not only the County Surveyor, but also the Town Engineer for most the towns of Marin County! The many thousands of his ink-on-linen plats and his 1,200+ field books are indispensable in retracing boundaries in Marin county. Gordon Voorhies, LS 2135, was a contemporary of Oglesby and produced 5,000+ surveys with a similar style of ink-on-linen plats. He was also notable for his work supporting the construction of the Golden Gate Bridge. Oglesby acquired the Voorhies records and ultimately sold his business and the combined records in 1963 to engineer Don Jacobs. Jacobs carried on with the firm known as Engineering Field Services, ultimately headed by George Colson, LS 2654. Those records were sold to Joseph Grippi, LS 3775, in 1974. Grippi in turn produced another 1,700+ more surveys, and sold the entire collection to me in 1988. I and many other surveyors in the area used, indexed and supplemented the collection up until the time the Archive was opened to the public.



MARIN COUNTY SURVEYING

Marin County is a suburban county opening from the north end of the Golden Gate Bridge. 85% of the land is National, State, or County parks, or conserved under open space easements. Very nearly 100% of the county was divided into Ranchos, Mexican Land Grants, with only small areas in remote parts of the county included in the sectionalized public land system. Consequently, local surveyors have virtually no experience surveying sections, but do have expertise in retracing a peculiar surveying history. Some of the earliest subdivisions after the ranchos were done by firms in San Francisco.

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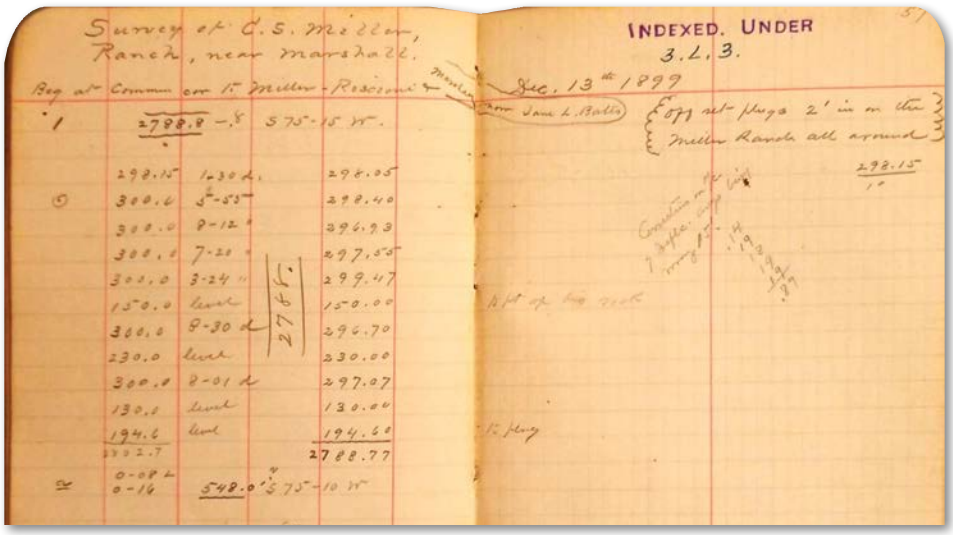
They had what could be described as a "gold rush mentality": Land was cheap and things moved fast and so, the maps often created lots without adequately defining them. These maps were often not legible, sometimes lacked bearings on lines, and frequently failed to mention on the ground monumentation. At least one map I recall appeared to have been drawn with a French curve, and no curve data was given. Keep in mind these maps covered what are now some of the most expensive zip codes in the country.

The first local surveyors in it for the long haul, Austin, Dodge & Richardson did better work, but there were still a number of subdivision maps recorded with no bearings on the lines (more on that later). I don't want to infer these surveyors were doing something shady in that regard. It was simply that if someone in that era needed something surveyed in a Dodge subdivision you would call him – telephone number 24 – and he would know what to do. I don't hold quite as generous an opinion when it came to J.C. Oglesby during the 30's, 40's and 50's. He was Town Engineer for most towns, County Surveyor, and in private practice – all at the same time. He could, and did, approve his own subdivisions of lands. And, in the development frenzy after World War II, many lots were pre-sold by metes and bounds descriptions before the subdivision recorded (which had the not insignificant benefit of making them exempt from the covenants, conditions and restrictions created with the map). There were also more than a few unrecorded subdivisions. For these, the paper hardcopy for the subdivision was kept in Oglesby's office with copies at the title company; a typical deed of this sort has for instance a preamble reading, "... being Lot 12 of the Unrecorded Map of Santa Venetia."

With that understanding, a surveyor in Marin County today may expect to find a barely legible, incomplete subdivision map with no original monuments noted, lot lines that have been changed more than once by deed, and evidence that multiple unrecorded lot surveys exist in the near vicinity. This situation epitomizes the professional duty that surveyors work within their area of expertise. In past years that meant knowing who (the historic surveyor) worked in your neighborhood, who (the present surveyor) has their records, and how those records are accessed. Without this local knowledge there was no way to reliably retrace and thereby create a proper survey in many parts of the county. It was this situation that we strove to rectify with the creation of the public archive of so much of Marin surveying history. Today, surveyors have free access to a near complete historical record, including the fore mentioned paper hardcopies for unrecorded subdivisions.

RECORDS PRESERVATION IS MONUMENT PRESERVATION

Now that I've recounted how Marin came to have such a large body of off-record surveys, I must emphasize that Marin is not unique in that regard. As I recall when I left the employ of the City of San Francisco in 1978, recorded surveys (not subdivisions or official surveys), were almost non-existent. Perhaps you have also heard tales of defacto policies to not record surveys elsewhere in this state. That attitude has changed fortunately and Marin has changed as well. Perhaps your area does not share a similar history but survey standards in all areas have tightened considerably for a variety of reasons. Local governments today are more active in managing land use, property is much more valuable, and litigation is more common. Because of this, the era of filing incomplete maps, or no map at all, is largely over. And if we focus on original (irreplaceable) surveys, we must acknowledge the body of work that is in private archives is finite. And it's not growing, it's shrinking! The trend now to scan and digitize is dangerous for old paper maps. Title companies have cleaned out their entire back rooms – in some cases tossing their collections in the dumpster. Private owners of records bear the cost to keep aging paper and linen properly heated, conditioned, indexed and stored. And frankly, it is difficult to reconcile sharing them and one's time with other (competing) surveyors. But, because they are finite and instructive, even essential, for doing good survey work, I believe every jurisdiction should strive to make them a community resource – a community shared expense and a community benefit. Consider that many of these maps show monuments that are not shown on any other map. That critical information, if you can find them and add them to a recorded survey perpetuates a priceless bit of history (and perhaps a pricey bit of property). Even if a historic monument isn't found, the ties to its location on an old map can provide great evidence supporting a boundary survey. As another example, in Marin County we have a number of recorded subdivisions with unprotected iron pipes as centerline monuments. The county works to preserve them, but the cost of constructing a monument well around even one pipe is quite high. This is why investing money in preserving old maps which memorialize the location of



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monuments, or of monuments already gone, is such a prudent use of monument preservation funds. Again, there are a finite number of these maps and now is the time to preserve them. I honestly believe that monument preservation funds invested in preserving old maps goes further than when spent preserving physical monuments one by one. Of course physical preservation is vital, but where available, old records are essential in the preservation, or re-establishment of monuments. Their loss is irreparable, foreseeable and preventable.

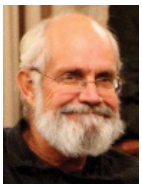
CREATING AN ARCHIVE

Something I wasn't as keenly aware of while owning my collection was the tremendous value they have apart from their use in land surveying. For instance, some of the very old Austin and Dodge maps showed the location of Indian middens, long-gone piers and wharfs, and some of the earliest private dams and water works. These features, easily overlooked by modern surveyors, are of great interest to cultural groups, historians, and scientists. We once had the pleasure of making the day of a forensic hydrologist (how's that for a job title), by finding the "smoking gun" map which showed that, yes, the railroad company did move San Anselmo Creek! The expert gasped audibly when she saw the beautiful hand-scribed map showing both before and after alignments confirming her suspicions.

So why you might ask should these other uses of old maps matter to land surveyors? Because, with the interest of other groups comes their support. At the Archive, we were able to attract a group of five volunteers who have been faithfully working one afternoon a week for the last five years. Additionally, a local philanthropist who loves Marin County and its history has contributed funds for the purchase of all new cabinetry for the records and sleeves for the old maps. Funds have also been donated to scan the old records. A good portion, including all of the indexes, has been completed to date and put online. Historians and other cultural groups visit the Archive and give talks nearly every month with sometimes as many as 100 attendees. And all of this community good will is contagious; upon his retirement, Civil Engineer and Land Surveyor Warren Nute donated his plentiful records to the Archive. It is our hope that over time, much of the remaining historical survey records in private hands will find its way into the Archive. On behalf of all the contributors, we hope our legacy which preserves survey records, and which demonstrates the vital role of land surveying to our civic and cultural history, will inspire similar projects elsewhere. We stand ready and willing to assist any group wishing to do the same.

Librarian Laurie Thompson and Historian Dewey Livingston presentation to the public in the archive.

Returning to Mollie, our first time visitor. With the 124-year-old Dodge map and dusty field book in front of her, she is swept back in time. The creak of the binding and the swish of each page turned takes her back through the traverse notes in the field book. She pauses to examine a smudge of ink on the manila hardcopy as her finger traces along the fine red ink line of his traverse which is now the centerline of the streets. With a sense of triumph, she sees that he offset those centerlines in pencil to form the right of way lines of the streets, and then protracted lots by drawing lines from a centerline angle point on one street to a centerline angle point on the next street. She has that "a-ha" moment as she sees that the recorded subdivision map is a tracing of the hardcopy map but without the centerline of the streets and so the lot sidelines appear to end at the right of way angle points. But now she has evidence of something she never suspected before: the lot lines run to the centerline angle points, which changes their bearings. Mystery solved! This gives her new locations for her lot sideline calculations. Looking at the old leather bound fieldbook, Mollie is drawn back to land surveying and engineering in the 19th century. Dodge would have traveled to the site by horseback with pack animals carrying the surveying and camping equipment. Walking the land and game trails, he would have determined where to run the roads and utilities – a remarkable example of the mind of a surveyor/engineer conceiving the design of a subdivision without the aid of topographic maps or modern computers. Almost reluctantly, she closes the books and drawers and steps back into her own time. She leaves the archive with a indescribably deeper understanding of the work of the early surveyors whose footsteps she follows, and the great appreciation she feels would not be possible except for the community that preserved it and allowed her to truly peer into the mind of the original creator of those footsteps.



William "Bill" Schroeder

County Surveyor of Marin William "Bill" Schroeder is semi-retired from a career in land surveying that spans nearly five decades, with 32 years of private practice in Marin County. He began surveying as a fan of Henry David Thoreau, and now like him, he surveys a little and walks around outdoors a lot and writes about it.

Get Kids into Survey: An Introduction to the Future

By Elaine Ball and Elly Ball

Get Kids into Survey is an organization set up by Elaine Ball in 2017. Elaine runs a technical marketing consultancy specialising in the geospatial industry. In October 2017, Elaine was asked to provide material for some free packs given out at The Survey Association (TSA) conference in the United Kingdom. Instead of creating some promotional material about her marketing workshops, Elaine thought it would be more fun and rewarding to do something good for the industry. And so, with help from some of her friends in the industry to provide support for the cost of artwork and printing, Elaine created a poster for the surveyors attending the conference that they could take home to their kids. Through the poster the surveyors could teach their kids what they do at work thus also combating the issue of recruitment we face in the industry. It was a success.

First poster, produced November 2017.

After the initial 500 posters were printed, Elaine then went on to produce the Antarctica poster. The interest skyrocketed and went beyond anything we imagined. In 2018 Timothy Burch of NSPS went out of his way to visit Elaine in Florida where she was attending a conference for her client TopoDOT. It was then that the NSPS took on the distribution of the posters for the Americas. With that, we went into a more regular production of posters and other educational resources.

Fast forward to 2019. With the incredible momentum of the interest in the posters, Elaine decided it was time to put a real focus on the GKiS initiative and make it into its own enterprise, rather than just something she did in her spare time. In February 2019 Elly, Elaine's younger sister, took over the day to day running of Get Kids into Survey.

In the last year we have gained two more distributors: The Chartered Institution for Civil Engineering Surveyors (CICES) in the UK for UK and Europe and more recently, The NSW Taskforce in Australia for Oceania who help us to distribute our posters to their region as well as promote and support us. Additionally, 37 Brand Ambassadors (and growing) now represent

continued on page 22

Get Kids into Survey – *continued from page 21*

You can view our Brand Ambassadors on our website: *www.getkidsintosurvey.com/directory.*

us in 8 different countries who go above and beyond to share our free resources as well as take part in career fairs and presentations in schools.

Since 2017 we have gained more than 65 sponsors over 15 posters who each support our mission and help us to produce not only posters, but comic strips, colouring in sheets, activity pages and lesson plans. For this next year, our focus is to collaborate with more educational organisations globally to get our material in the classroom as part of school projects and used in amongst the curriculum. In 2021, we will also be producing a full comic book complete with activities supported by our sponsors as well as a teaching curriculum that complements it. Our plan is for kids not only to enjoy the comic book for fun, but that it can be used in the classroom or as a homeschooling resource.

To preview the comic series, the *California Surveyor* is printing the first chapter for us on the following pages. Share with your kids and enjoy! You can find chapter 2 on our website and chapter 3 is currently being published in POB Magazine monthly.

To help us with our mission to educate and excite the next generation of surveyors and geospatial experts, please get in touch.

hello@getkidsintosurvey.com

www.getkidsintosurvey.com

continued on page 23

40 PAGE COMIC BOOK + SCHOOL RESOURCES COMING SOON!
SIGN UP TO OUR LATEST GREATEST NEWS AT WWW.GETKIDSINTOSURVEY.COM

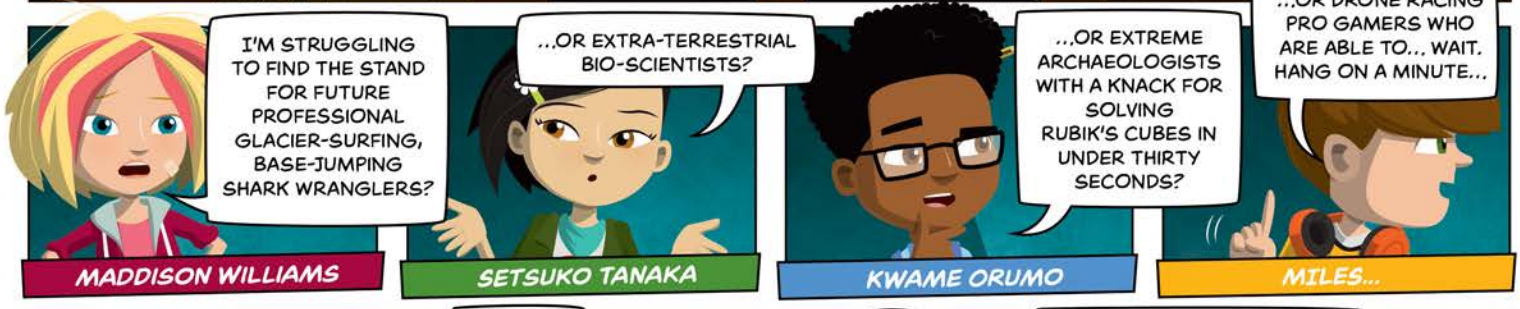
GET KIDS INTO SURVEY

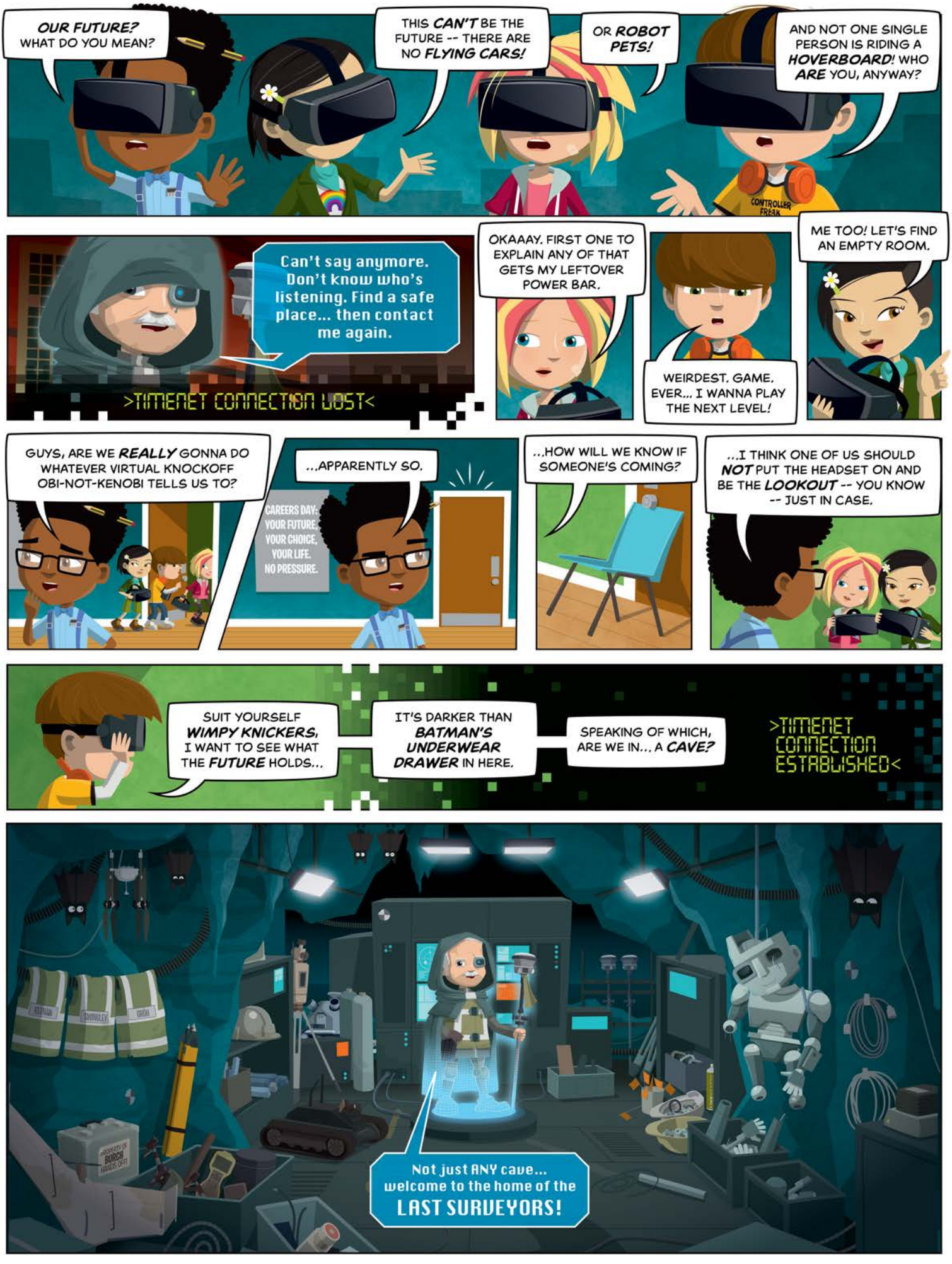
COMICS

...a team for today - fighting to save tomorrow!

CHAPTER ONE

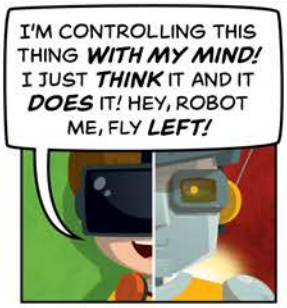
WEST PARK HIGH SCHOOL, MIDDLETOWN, PRESENT DAY...

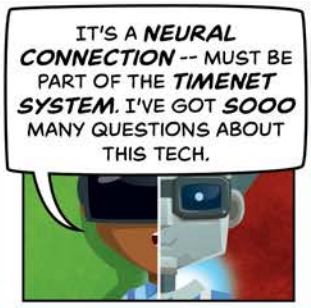



OUR FUTURE? WHAT DO YOU MEAN?
THIS CAN'T BE THE FUTURE -- THERE ARE NO FLYING CARS!
OR ROBOT PETS!
AND NOT ONE SINGLE PERSON IS RIDING A HOVERBOARD! WHO ARE YOU, ANYWAY?
CONTROLLER FREAK
Can't say anymore. Don't know who's listening. Find a safe place... then contact me again.
>TIMENET CONNECTION LOST<
OKAAAY. FIRST ONE TO EXPLAIN ANY OF THAT GETS MY LEFTOVER POWER BAR.
WEIRDEST. GAME. EVER... I WANNA PLAY THE NEXT LEVEL!
ME TOO! LET'S FIND AN EMPTY ROOM.
GUYS, ARE WE REALLY GONNA DO WHATEVER VIRTUAL KNOCKOFF OBI-NOT-KENOBI TELLS US TO?
...APPARENTLY SO.
CAREERS DAY: YOUR FUTURE, YOUR CHOICE, YOUR LIFE. NO PRESSURE.
..HOW WILL WE KNOW IF SOMEONE'S COMING?
...I THINK ONE OF US SHOULD NOT PUT THE HEADSET ON AND BE THE LOOKOUT -- YOU KNOW -- JUST IN CASE.
SUIT YOURSELF WIMPY KNICKERS, I WANT TO SEE WHAT THE FUTURE HOLDS...
IT'S DARKER THAN BATMAN'S UNDERWEAR DRAWER IN HERE.
SPEAKING OF WHICH, ARE WE IN... A CAVE?
>TIMENET CONNECTION ESTABLISHED<
Not just ANY cave... welcome to the home of the LAST SURVEYORS!

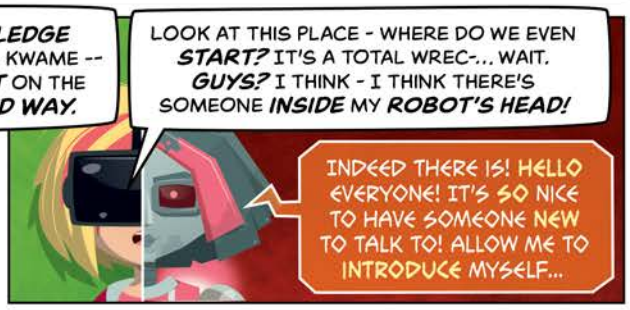

THIS IS SOMEONE'S HOME?
It WAS. It was the SURVEYOR'S SANCTUARY - the one place we were SAFE.
WHO'S WE?
SAFE FROM WHAT?
AND WHAT THE HECK IS A SURVEYOR? START THAT MOUSTACHE DANCING AND EXPLAIN ALL THIS!
CONTROLLER
Surveyors were EXPLORERS, PROBLEM-SOLVERS and MASTERS OF TECHNOLOGY. They were the MAPPERS OF EVERYTHING, and the SAFEKEEPERS of cities.
Eratosthenes mapped the world with lines of longitude and latitude in 276BC.
Dr Robert Ballard, in his submarine named 'Alvin', discovered the wreck of the Titanic in 1985.
Bradford Washburn's team planted a GPS receptor on the peak of Mount Everest in 1999 to measure its size.
Every one of these awe-inspiring buildings is the result, first and foremost, of the careful work of surveyors.
SO WHERE WERE ALL THE SURVEYORS WHEN OUR CITY GOT WRECKED? IT LOOKS LIKE IT WAS BUILT BY AN ANGRY TODDLER!
GREED took over. reckless developers put up DANGEROUS buildings wherever they PLEASED.
$ $
Surveyors PROTESTED - but were SILENCED - until only I remained. I had to take ACTION...
GREED WON'T SUCCEED
READ THE SIGNS!
SAFETY FIRST
I'm so worried I made a sign
POLICE
Using the TECHNOLOGY of the SURVEYORS...
...I started to build four, very special MACHINES.
I wrote a computer program to reach back in DATATIME...
I = WORDARRAY.
& (I-<=LENGTH)
WHILE (40!=
IF (WORDARRAY>0!
PHRASEARC_16
I++
EXECUTE_TIMENET;
I called it the TIMENET - a ground-breaking method of VIRTUAL TIMETRAVEL
I built a vast supercomputer, hidden deep in this cave...
...and as my final human act, I uploaded my intelligence to the mainframe.
My digital consciousness scoured the timenet...
...searching for four bright minds with the potential to SAVE THEIR OWN FUTURE.
Today, I FOUND my four. You have the TALENT - I have the TOOLS...
...So - are you ready to SAVE THE FUTURE?


Well... that took less convincing than I anticipated.
VOOM!


I'M CONTROLLING THIS THING WITH MY MIND! I JUST THINK IT AND IT DOES IT! HEY, ROBOT ME, FLY LEFT!


IT'S A NEURAL CONNECTION -- MUST BE PART OF THE TIMENET SYSTEM. I'VE GOT SOOO MANY QUESTIONS ABOUT THIS TECH.


YOUR NERDY KNOWLEDGE HUNT WILL HAVE TO WAIT, KWAME -- WE'RE COMING UP FAST ON THE CITY... AND IT'S IN A BAD WAY.


LOOK AT THIS PLACE - WHERE DO WE EVEN START? IT'S A TOTAL WREC-... WAIT. GUYS? I THINK - I THINK THERE'S SOMEONE INSIDE MY ROBOT'S HEAD!
INDEED THERE IS! HELLO EVERYONE! IT'S SO NICE TO HAVE SOMEONE NEW TO TALK TO! ALLOW ME TO INTRODUCE MYSELF...


MY NAME IS G.E.O G.I.N.G.E.R - GENERAL EXPERT ON GLOBALLY INTEGRATED NETWORKED GEOGRAPHICAL ELECTRONIC RESOURCES. I AM YOUR VIRTUAL ASSISTANT. VERY PLEASED TO MEET YOU ALL!


SO. MANY. QUESTIONS.
IS ONE OF THEM 'WHY'S OUR VIRTUAL ASSISTANT'S NAME SO VERY LONG?' BECAUSE IF IT ISN'T, IT SHOULD BE.

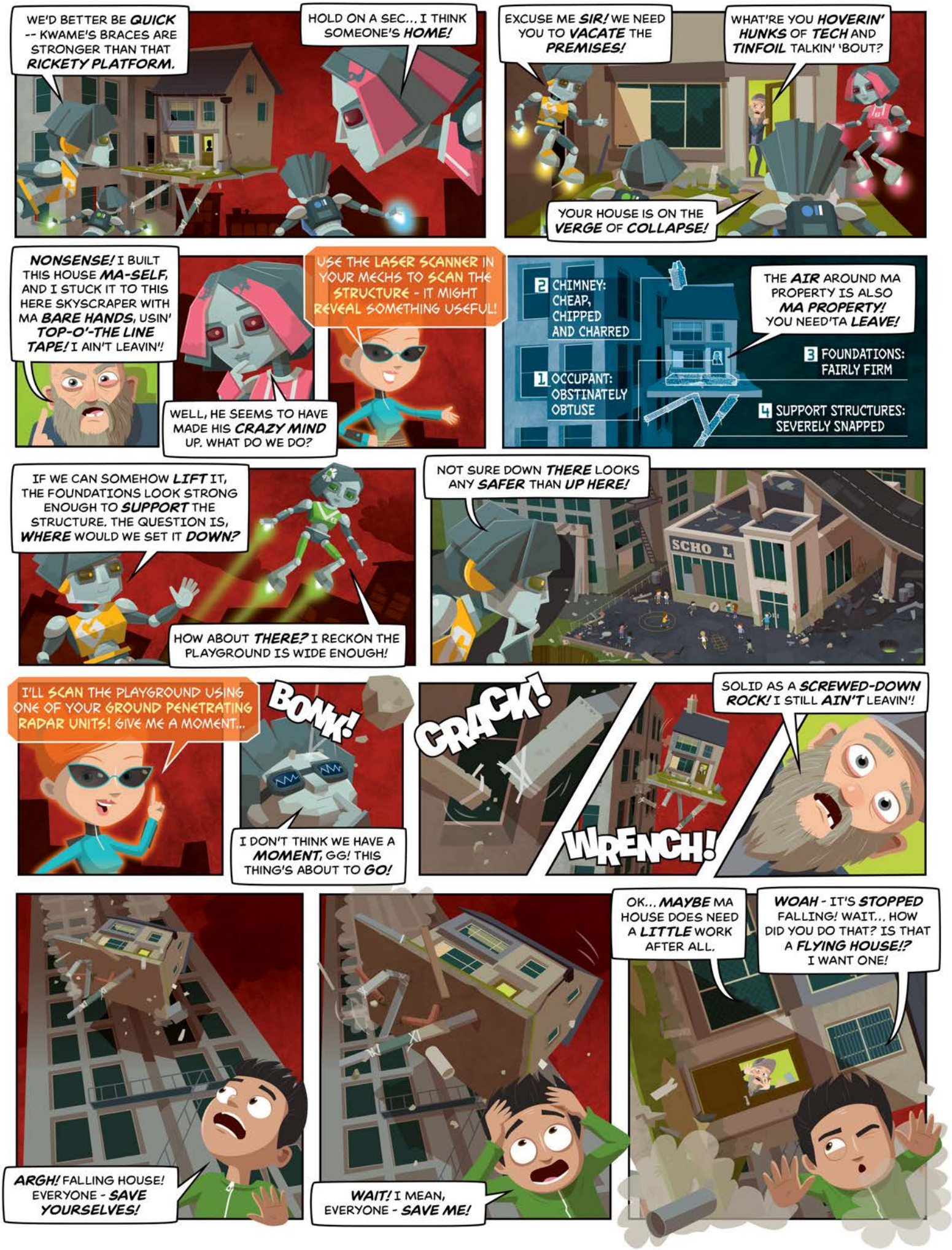

SO GEO-JARVIS - WHICH PART OF THE CITY THAT'S FALLING APART DO YOU THINK WE SHOULD HEAD TO FIRST?
I HAVE PERFORMED A FULL SCAN USING THE LIDAR TECH INSIDE YOUR MECHS. I'LL PROJECT THE RESULTS ONTO THE CITY THROUGH YOUR MIXED REALITY LENS.


1 EXTREME EXTENSION - PROBABILITY OF COLLAPSE: 86%
2 DRUNK TOWER - HANGING ON BY A FRAYED THREAD
3 BLACK HOLE TUNNEL: SITE OF 23 ACCIDENTS... THIS WEEK
4 CONCRETE CHASM. HIGH RISK OF TURNING PEDESTRIANS INTO STREET MEAT
5 WEDGE ON A LEDGE. POTENTIALLY CATASTROPHIC OVERHANG
6 HOUSE HAZARD - STUCK ON WITH PVA GLUE AND GAFFER TAPE
7 HIGHWAY TO HECK - SUPPORTED ENTIRELY BY FAULTY BEAMS
8 BUS-TED - NO-ONE HAS EVER CAUGHT A BUS AT THIS STOP.
HOTEL


HOW DID THINGS GET THIS BAD? AND HOW DO WE START TO FIX IT?


WELL - YOU COULD START BY SAVING YOUR SCHOOL - THAT HANGING HOUSE IS ABOUT TO FALL... RIGHT ON TOP OF IT.


WE'RE ON IT!


WE'D BETTER BE QUICK -- KWAME'S BRACES ARE STRONGER THAN THAT RICKETY PLATFORM.
HOLD ON A SEC... I THINK SOMEONE'S HOME!
EXCUSE ME SIR! WE NEED YOU TO VACATE THE PREMISES!
WHAT'RE YOU HOVERIN' HUNKS OF TECH AND TINFOIL TALKIN' 'BOUT?
YOUR HOUSE IS ON THE VERGE OF COLLAPSE!
NONSENSE! I BUILT THIS HOUSE MA-SELF, AND I STUCK IT TO THIS HERE SKYSCRAPER WITH MA BARE HANDS, USIN' TOP-O'-THE LINE TAPE! I AIN'T LEAVIN'!
WELL, HE SEEMS TO HAVE MADE HIS CRAZY MIND UP. WHAT DO WE DO?
USE THE LASER SCANNER IN YOUR MECHS TO SCAN THE STRUCTURE - IT MIGHT REVEAL SOMETHING USEFUL!
2 CHIMNEY: CHEAP, CHIPPED AND CHARRED
1 OCCUPANT: OBSTINATELY OBTUSE
THE AIR AROUND MA PROPERTY IS ALSO MA PROPERTY! YOU NEED'TA LEAVE!
3 FOUNDATIONS: FAIRLY FIRM
4 SUPPORT STRUCTURES: SEVERELY SNAPPED
IF WE CAN SOMEHOW LIFT IT, THE FOUNDATIONS LOOK STRONG ENOUGH TO SUPPORT THE STRUCTURE. THE QUESTION IS, WHERE WOULD WE SET IT DOWN?
HOW ABOUT THERE? I RECKON THE PLAYGROUND IS WIDE ENOUGH!
NOT SURE DOWN THERE LOOKS ANY SAFER THAN UP HERE!
SCHO L
I'LL SCAN THE PLAYGROUND USING ONE OF YOUR GROUND PENETRATING RADAR UNITS! GIVE ME A MOMENT...
BONK!
I DON'T THINK WE HAVE A MOMENT, GG! THIS THING'S ABOUT TO GO!
CRACK!
WRENCH!
SOLID AS A SCREWED-DOWN ROCK! I STILL AIN'T LEAVIN'!
ARGH! FALLING HOUSE! EVERYONE - SAVE YOURSELVES!
WAIT! I MEAN, EVERYONE - SAVE ME!
OK... MAYBE MA HOUSE DOES NEED A LITTLE WORK AFTER ALL.
WOAH - IT'S STOPPED FALLING! WAIT... HOW DID YOU DO THAT? IS THAT A FLYING HOUSE!? I WANT ONE!


I THINK THESE ROBOTS HAVE BEEN WORKING OUT!
WITH GREAT MIGHT, COMES GREAT PUBLIC DELIGHT!
YOU SAVED OUR SCHOOL!
Instapics
Dunnatron25
TFW a house almost falls on your head! #MysteryMetalHeroes
myFace
Mrs Whiskers
Like and share to show love to these awesome bots!
cluck
ItWasAllAMeme
Amazing scenes. Let the meme wars commence...
ONE DOES NOT SIMPLY ALLOW A HOUSE TO CRUSH A SCHOOL
Almost died - still living my best life
Peachy
These mechs saved our school!
That's awesome!
Wait... does that mean we still have to go in tomorrow?
WHAT... WHO... WHO ARE YOU?
WE'RE THE GEO SQUAD!
AND WE'RE HERE TO SURVEY, SAVE, AND SET THINGS RIGHT!
ERR... WHAT'S SURVEY? CAN I DO IT?
IT'S SOMETHING THAT'S BEEN MISSING ROUND HERE FOR WAY TOO LONG. WE'RE BRINGING IT BACK.
WE'RE GONNA SAVE THIS CITY-- AND WE WON'T STOP THERE!
A TEAM OF SUPER-BOTS RESCUED STUDENTS FROM A SEVERELY SQUISHY FATE TODAY...
FAUX NEWS
HOUSING MARKET FALLS FOLLOWING FALLING HOUSE
...AND THEN THESE CYBERNETIC SURVEYORS VOWED TO CLEAN UP THE ENTIRE CITY!
...DID THEY NOW? I DEALT WITH THE SURVEYORS A LONG TIME AGO. THESE TIN-PLATED TROUBLE-CAUSERS AREN'T GOING TO MESS UP MY PLANS...
WHAT ARE THESE GOGGLE-WEARING WEIRDOS DOING? I'LL GO AND ASK THEM... WITH MY FISTS.
TO BE CONTINUED, IN THE PRESENT AND THE FUTURE...

SPOT THE DIFFERENCE

Find the answers at:
www.getkidsintosurvey.com/comic

WELCOME TO THE *LAST SURVEYOR'S CAVE!* DEPENDING ON WHICH TIMENET PATH YOU TOOK, THERE ARE *TEN* DIFFERENCES BETWEEN THESE TWO SCENES. CAN YOU SPOT THEM ALL? KEEP AN EYE OUT FOR THE SPECIAL *SURVEY EQUIPMENT* DOTTED AROUND TOO...

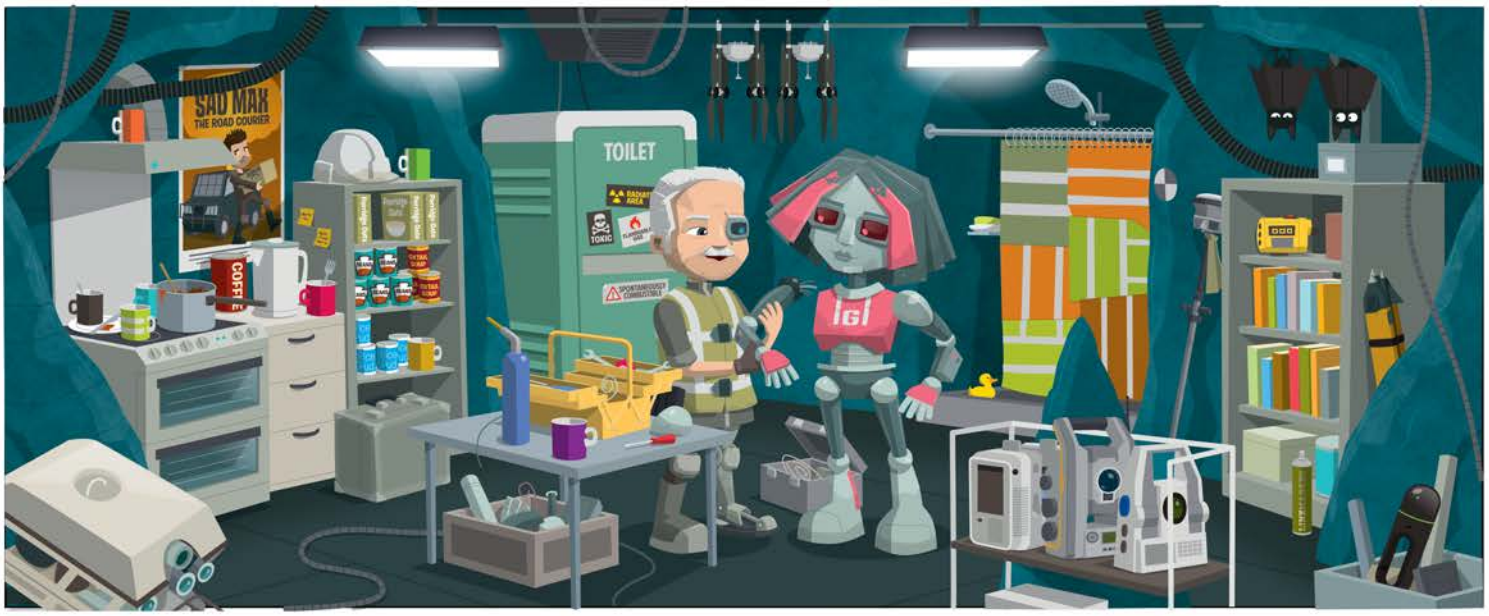

Handheld Laser Scanner

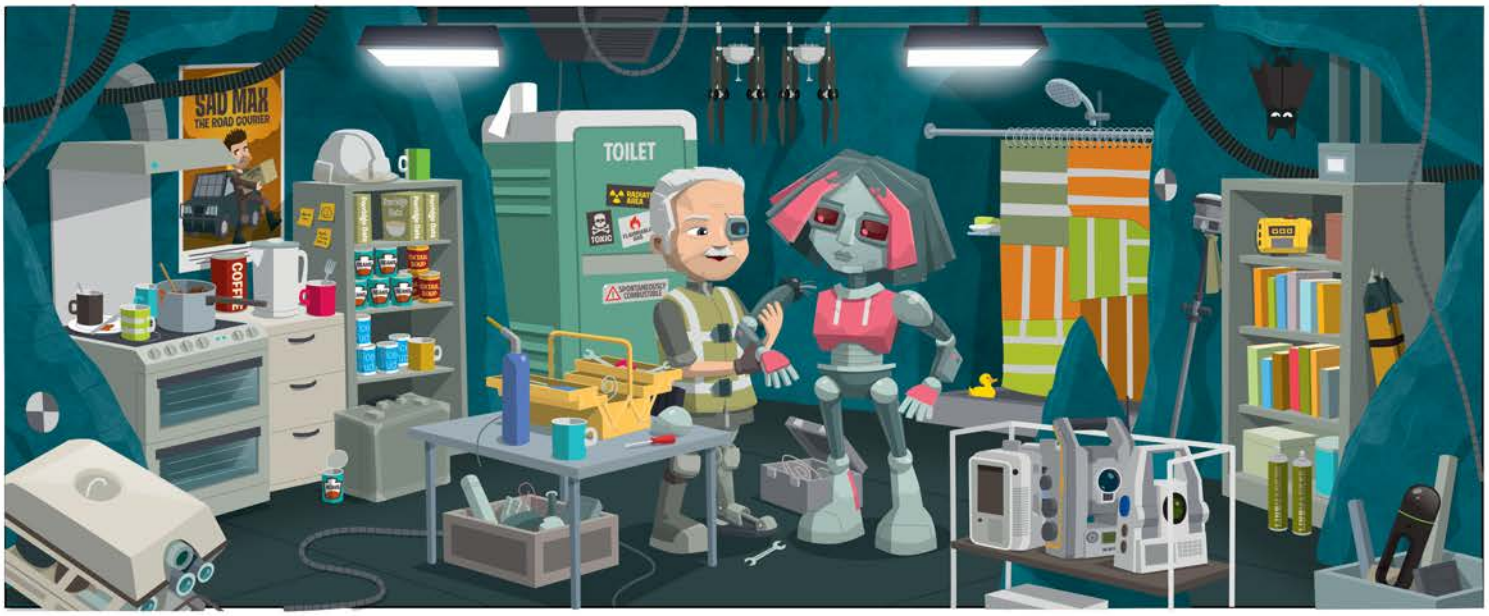

Total Station


Laser Range Finder


Fold-up Drone


Underwater ROV





A special thank you to our lovely sponsors for supporting our Comic Book initiative for getting it off the ground. A special mention goes to **Class of Your Own** and **TopoDOT** for sponsoring Chapter One.

Thank you to our **Brand Ambassadors** for proof reading the comic with your survey know how.

And finally, and this is a big one! Thank you to our Creative Team **Mathew Sullivan** and **Marek Jagucki** for producing the brilliant writing and artwork behind the whole project. You are the dream team and we couldn't have produced something so brilliant without you.

www.getkidsintosurvey.com

GET KIDS INTO SURVEY®

The Business Ethics Field Guide - part 2

Challenge 1: Standing Up to Power

By Brad Yarbrough

This series features 13 articles from Brad Agle, Aaron Miller and Bill O'Rourke, coauthors of *The Business Ethics Field Guide*. Each article will focus on a common work dilemma and provide real life examples and insightful solutions.

This edition's column features an ethics challenge common to all who work in our industry. I particularly remember an occasion when, as Vice President of a newly established company, I was asked by its President to hire an inexperienced, unqualified family member for a key position. Having just completed its public stock offering, the company was being closely watched by its shareholders and analysts. This demanded a heightened need for smart decision-making. This request presented a huge ethical dilemma made more difficult because the President was my father. How do you stand up to such pressure? The following article offers some great advice.

A common ethical dilemma occurs when an authority figure asks you to do something that is clearly understood as unethical. Would your actions be okay because the boss is asking you to do it or should you stand up to power?

Personal Experience

I was once asked by the CEO to report to a newly-hired Chief Information Officer (CIO). The CEO thought I could introduce her to the company and let her know I'd be available to explain the company culture, its processes and procedures. I met my new boss in New York City and while walking down Madison Avenue, she asked me to buy an expensive purse she saw in a store window. Moreover, she asked that I use the company credit card and list it on my expense account for her subsequent approval.

Having significant clout in the company, I could have emphatically told her that what she was asking was wrong and that we don't put personal expenses on the corporate expense account. Cleverly, I replied, "This must be a test and I'm not falling for it. Nice try, but I know that's wrong." The less threatening comeback succeeded in her flatly dropping the unethical request.

> **"... these dilemmas can create considerable discomfort, but it's best to face them head-on. These are opportunities to let others know what you stand for."**

However, what about a similar situation happening to an employee who feels insecure in the organization and who really needs the job to meet family and financial obligations? It would be more difficult to stand up to their boss and risk being put in the "dog house" for a long time. Even so, an employee cannot participate in unethical conduct. In this case, the "I know this is a test and I'm not falling for it" technique is a good tactic.

A second option is to repeat the request back in a slow, exaggerated way. This might cause the boss to take accountability for the action and rescind the request. Remember that the excuse "I was just following orders" is never acceptable.

Another time I was ordered to drag payables to 60 days despite contractual terms that required a 45-day payment. In this dilemma, I met with suppliers and renegotiated the contract. Some agreed to the 15-day drag. Some raised their price to cover the cost of the delay. Others needed a swing loan and I assisted by providing their bank with confirmation of a long-term contract to support the loan. Dragging the payables from 45 to 60 days without interaction with the suppliers

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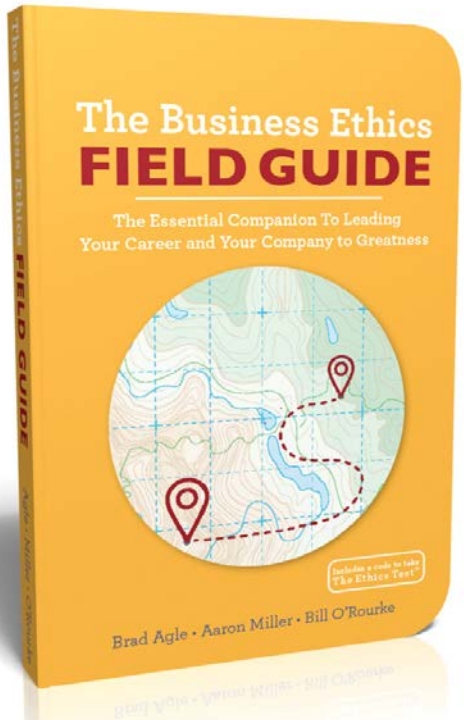

would be unethical, but I was able to find an appropriate way to satisfy the request and honor commitments.

Peer Pressure

What if an inappropriate request comes from a peer, not a boss? There can still be perceived pressure to help them. A student told me about such an experience. On her way to a class that required students to sign in, she received a friend's text asking that she sign her in at the class. She decided to pretend not to receive the text until after class was over.

After hearing about the dilemma, I suggested that she should not run and hide from ethical issues. Sure, these dilemmas can create considerable discomfort, but it's best to face them head-on. These are opportunities to let others know what you stand for. She could have responded immediately to her friend saying, "No, that's wrong. Don't ask me to do that. I would never ask you to do something wrong." My guess is that her so-called friend would never ask her to do that again.

When You're the Boss

There's another aspect to the standing up to power dilemma. It's when you are the power. First, don't make unethical requests of your employees. Period. As the boss, your employees might give more deference than you deserve. Obviously, pleasing the boss is important and in that zeal, they can misinterpret questions as orders.

Once, while touring a manufacturing plant which I supervised, I asked why a wrapping machine wasn't located closer to the shipping department since wrapping immediately preceded product shipping. I merely asked out of ignorance, but when I returned six months later, the wrapping machine was in the shipping department. I asked why and was told, "You said to move it." I learned an important rule of communication: ask the recipient to tell you what they heard. That double communication can avoid a lot of misunderstandings.

In Summary

Most organizations have ethics resources to whom you can turn to when you are asked to do something wrong. Use them. Use the Compliance Line if you cannot find the needed help elsewhere. Progressive organizations have integrity champions scattered throughout the organization. Learn who they are and meet with them.

A final word of advice is to plan ahead for the day when you are faced with this dilemma. Build friendships throughout the organization. Strong relationships are always helpful and the social capital is very helpful when standing up to power. Be ethical in little things. Habitual ethical conduct will eventually manifest itself in the big issues as well. Build a reputation for character and integrity. Attend the ethics training. Offer to teach it. Become an integrity resource for others. Your company and the entire industry will be better because of your effort.

Brad Yarbrough

Brad Yarbrough is the Owner and CEO of Pilgrim Land Services, a right of way services company in Oklahoma City. With over 35 years experience in oil and gas, he has clients nationwide and an extensive network of landmen and agents.

13 ETHICAL DILEMMAS

Upcoming articles in this series will take a closer look at each dilemma.

1. **STANDING UP TO POWER**
   Someone in power is asking you to do something unethical.
2. **MADE A PROMISE**
   Conflicting commitments force you to choose.
3. **INTERVENTION**
   You see something wrong. How do you proceed?
4. **CONFLICTS OF INTEREST**
   Multiple roles put you at cross purposes.
5. **SUSPICIONS WITHOUT ENOUGH EVIDENCE**
   You believe something is going on, but you're not sure.
6. **PLAYING DIRTY**
   Achieving justice but by doing something unethical.
7. **SKIRTING THE RULES**
   Bending a rule for a better outcome.
8. **DISSEMBLANCE**
   Misrepresenting the truth for better outcome.
9. **LOYALTY**
   Giving up ethical stance to protect valued relationship.
10. **SACRIFICING PERSONAL VALUES**
    Living ethically might put burden on others.
11. **UNFAIR ADVANTAGE**
    When opportunity exists to wield an unfair upper hand.
12. **REPAIR**
    When you are responsible for a mistake.
13. **SHOWING MERCY**
    You could grant forgiveness, but you don't know if you should.

Software Tips and Tricks

By Joseph Waltz, PLS

We live in an age of immense computing power and information availability. The USB *charger* for a modern mobile phone has more computational capacity than the Apollo 11 moon lander. And the amount of information published on the internet is immense, with over 4 million hours of video posted on You Tube *every day*. And although accounting for much of it, that's not all cat videos.

This is intended to be a series of articles aimed at general software and internet tips and tricks. I intend to dig only a few inches down for each of these, for you to explore on your own. The rabbit holes you can dig into online are endless.

AutoLisp

CIVIL 3D has a programming language called AutoLisp built in, which is the AutoDesk version of LISP. LISP stands for LISt Processor, and is the second oldest high-level programming language, introduced in 1958. It uses Polish Notation for math; you can try it out today in CIVIL 3D.

The command line recognizes any open parentheses as the beginning of a LISP command. To calculate a 2% slope over 515 feet, try typing "(* 0.02 515)," no quotes. LISP interprets this and multiplies the numbers 0.02 and 515, and returns the answer in the command line.

From there the possibilities are endless. Autodesk published a 178 page AutoLisp developers Guide (PDF download here: *https://tinyurl.com/c5xxv8p*), and there are video tutorial sites online.

AutoLisp is a full scripting language so it can also call up AutoCad commands. Many companies have used it to automate some of their rote drafting tasks.

```
(defun c:pointlabel ( / pnt )
    (if (setq pnt (getpoint "\nSpecify point: "))
        (progn
            (entmake
                (list
                   '(0 . "POINT")
                    (cons 10 (trans pnt 1 0))
                )
            )
            (entmake
                (list
                   '(0 . "TEXT")
                    (cons 10 (trans (cons (+ (car pnt) 0.6) (cdr pnt)) 1 0))
                    (cons 40 (getvar 'textsize))
                    (cons  1 (strcat "X:" (rtos (car pnt)) " Y:" (rtos (cadr pnt))))
                )
            )
        )
    )
    (princ)
)
```

Fig. 1: Simple AutoLisp program to create and label points.

Convert Case

Convertcase.net is a handy little website to switch text from upper case to lower case and vice versa. It's a great tool to use when you don't feel like retyping a bunch of stuff that came to you in one case or another. It even has a capitalize sentences function to automatically capitalize the first word of sentences.

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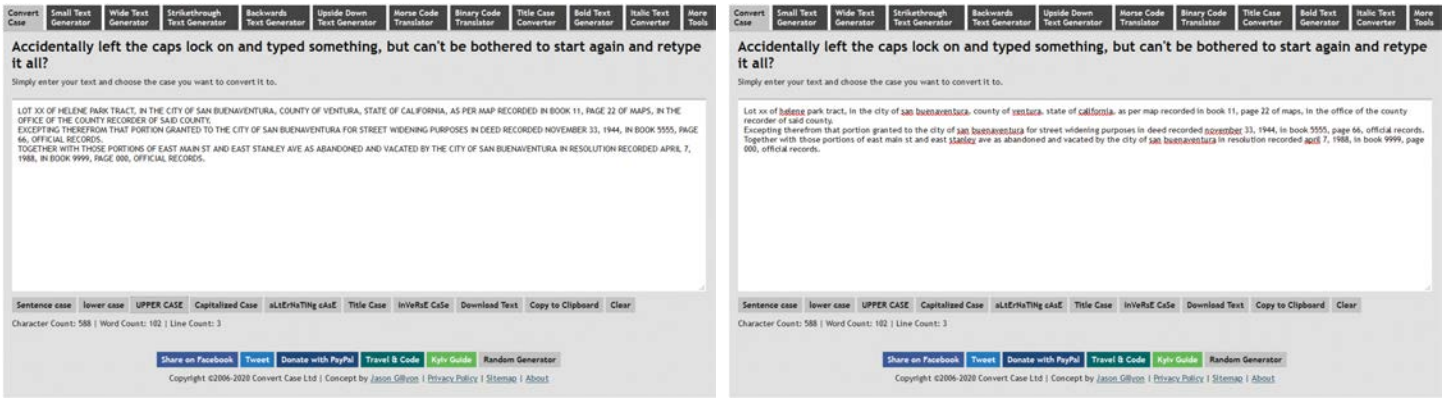


Fig. 2: ConvertCase.net in Action, using "Sentence Case" tool.

!Bangs

Although "Google" has become a verb, there are alternative search engines. My default search engine is DuckDuckGo, as it has the option to use !Bangs. A !Bang is a command to utilize a website's search tool. They can save you tons of time and there are over 13,000 bangs. Some examples are:

- !W: Search Wikipedia:
If you put in "!W list of California counties," no quotes, into the *duckduckgo.com* search bar, it takes your search term, searches Wikipedia, and takes you directly to the Wikipedia page of the list of counties.

- !WA: Wolfram Alpha:
Wolfram alpha is a mathematical engine that is online and free. If you don't trust your AutoLISP answer from earlier, you can type in "!WA 2% rise at 515 feet," it will return the wolfram alpha page with the answer and the option to show the formula and unit options.

- !GM: Google Maps:
"!GM Valencia Blvd and Rockwell Canyon Rd" drops a pin at an intersection in Santa Clarita, and you can use Google maps to explore around that area, and perhaps discover a local community college that offers an Associate Degree in Land Surveying.

!Bangs can also directly search Ebay (!E), news sites (eg. !CNN), Google Scholar (!Scholar), Amazon (!A), Project Gutenberg (!Gutenberg), etc. They can be very powerful. The full list is available here: *https://duckduckgo.com/bang*.

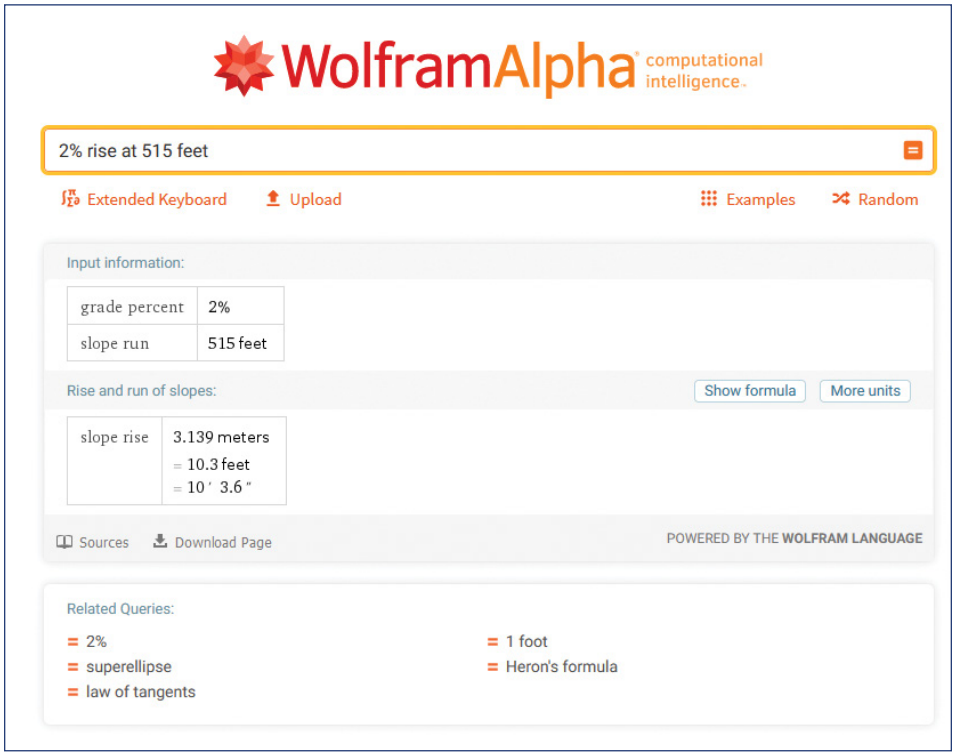
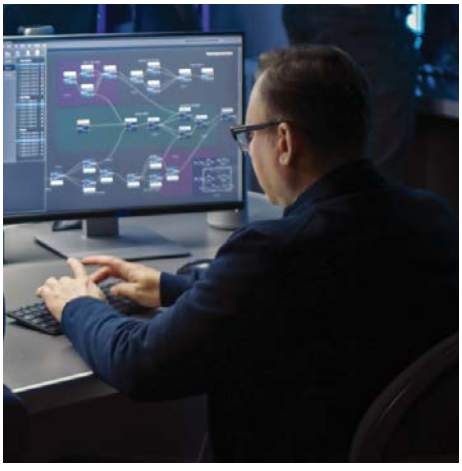


Fig. 3: Wolfram Alpha Results Page.

Do you have any internet or software tips and tricks that would help other surveyors? Share them with me and I can include them in the next issue!

Joseph Waltz, PLS

Joseph Waltz is the City Surveyor for the City of Ventura, and Vice President for the Channel Islands Chapter. He is also an instructor for the newly created GNSS course series at College of the Canyons. When he's not surveying or teaching he enjoys working on old VW's, writing, and scuba diving.



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Improve Your Security: Protect Your Firm from Cyber Crime

By Laura Ledbetter, CIC

COVID-19 has led to drastic changes in our work environments and perhaps surprisingly, has increased Cyber Crime and the risks that Surveying and Engineering firms face. The shift to work from home and away from the central offices, carefully configured by IT professionals, has resulted in Cyber Criminals capitalizing and monetizing on these pandemic induced vulnerabilities. This article will address seven common sense steps your firm can take to improve security and decrease risk.

Disable Remote Desktop Protocol (RDP)

While the convenience of RDP allows a user to access their network remotely and from anywhere in the world, when not configured behind a Virtual Private Network (VPN) with Two Factor Authentication (2FA), Remote Desktop creates an immense security exposure to your firm. With RDP credentials being sold on underground markets, Cyber Criminals located anywhere in the world can potentially access your data. Most importantly, if a Cyber Criminal takes advantage of this vulnerability, it is as if they are sitting at your desk, with complete access to everything on your system. Do not let this happen to you!

Enable Multi Factor or Two-Factor Authentication (2FA)

2FA is available and free to enable. It is worth repeating: Check your settings and enable 2FA! Multi Factor Authentication is a security measure in which a user is granted access only after presenting more than one form of authentication. There are three categories of authentication factors: Things you possess, Things you know, and Things you are. A familiar example is your bank card and your PIN number. You possess the bank card and you know the PIN number. When successfully implemented, only the intended user can access their account.

2FA should be implemented on all systems and software that allow it; From your VPN as mentioned above to your personal e-mail accounts. Doing this drastically decreases the likelihood that you will be a victim of Cyber Crime as criminals generally move on to less secure targets. As one of our Cyber liability insurance carriers, Coalition, explains it: Imagine a board with 100 nails. 95 of them are hammered flush with the surface of the board but five protrude from the surface. These five nails stand out for all the wrong reasons. If you are a Cyber Criminal scanning a hundred computers for vulnerabilities and you find five that stand out due to their lack of security, these five immediately become priority targets of opportunity for exploitation. In this example, firms without multi-factor authentication are akin to one of those five nails. They have not hammered down their security and therefore present as a more visible target.

Passwords Hygiene

Usernames and passwords continue to be stolen and sold on the dark web. In risk assessment scans I review from our Cyber Insurers, the lists of compromised credentials seem never ending. As such, good password hygiene is imperative. Once a hacker has your username and passwords, they can log in as you and access other information – potentially including other passwords to other sites. Don't make their jobs easy; insist that everyone on your team practice good password hygiene. Using strong passwords and not duplicating any of them is essential. Note that the ideal strong password is randomly generated and utilizes characters, numbers, and letters. Or consider using a random passphrase, stringing together words you would not normally pair such as "doorclipowldrawers." A strong password is NOT the name of your pet with a zero in place of an "o." How do you remember all these random phrases or generations? Setup an encrypted password manager such as Lastpass, 1Password or Keeper.

Train and Test Your Team

Don't allow a weak link to jeopardize an entire organization. One of the best lines of defense is a uniformly empowered and educated team. The more your team knows, the safer your firm will be. It is imperative to train each member of your team and provide them with content in multiple, recurring ways. Then periodically test them, assess their knowledge, and provide continuing training. There are many providers of these types of services available in today's market. Further, some Cyber Liability carriers provide a limited number of free licenses to access security training to their policyholders. This is an excellent way to get some additional "bang for your buck" when purchasing Cyber Liability Insurance.

Verify Any New or Changed Financial Information

Cyber criminals are skilled at replicating tone and cadence of speech in e-mails, making it increasingly difficult for even trained eyes to find discrepancies. As such, it is imperative that persons responsible for making financial transfers within your firm

continued on page 37

adopt a process of verification of the data. This should include (but is not limited to) payment transfers and payroll. One of the best practices that can occur is a call back to the last known number on file when a payment request demonstrating a change in information is received. An example of this would be a payment request from a "vendor" who has recently updated their banking information. It is imperative to not call the phone number shown on the e-mail but to instead use the contact information you have on file, then call and verify the details to confirm its legitimacy.

Backup Your Data, Often

If your system is breached and incurs ransomware, a virus, or crashes, a clean and reliable backup that is not connected to your computer system can be a business lifesaver. And, because fires, floods and physical break-ins can happen too, it is also recommended to have an air gapped / off-site version of your backup data as well.

Consider a Cyber Liability Insurance Policy

Accidents happen. Click fatigue occurs. Ransomware infiltrates systems. Phishing scams occur. Hidden malware and viruses impair systems. These are daily occurrences which impact Surveyors and Engineers in today's world. When these events occur, one of the best assets available to a business is a Breach Response team. The Breach Response team is there to share their expertise and get your company through the event. From negotiating ransom to remitting crypto-currency, an effective Breach Response team is there from point A to point Z to ensure that your systems get back up and running quickly, minimizing impact on your operations. Today's market remains competitive and attractively priced. It is our recommendation to consider insuring against both Cyber Liability and Cyber Crime.

COVID-19 has changed the landscape of our world in many ways. Vulnerabilities from this novel work-from- home era have resulted in an increase in frequency and severity of Cyber claims. Implementation of the above items will improve your security posture and decrease your risk. But, with that said, no one is immune – risks will remain. To insure against this risk and the ongoing battle against Cyber-crime, it is recommended that land surveyors and allied professionals review their business insurance options, especially Cyber Crime and Cyber Liability policies.

Laura Ledbetter

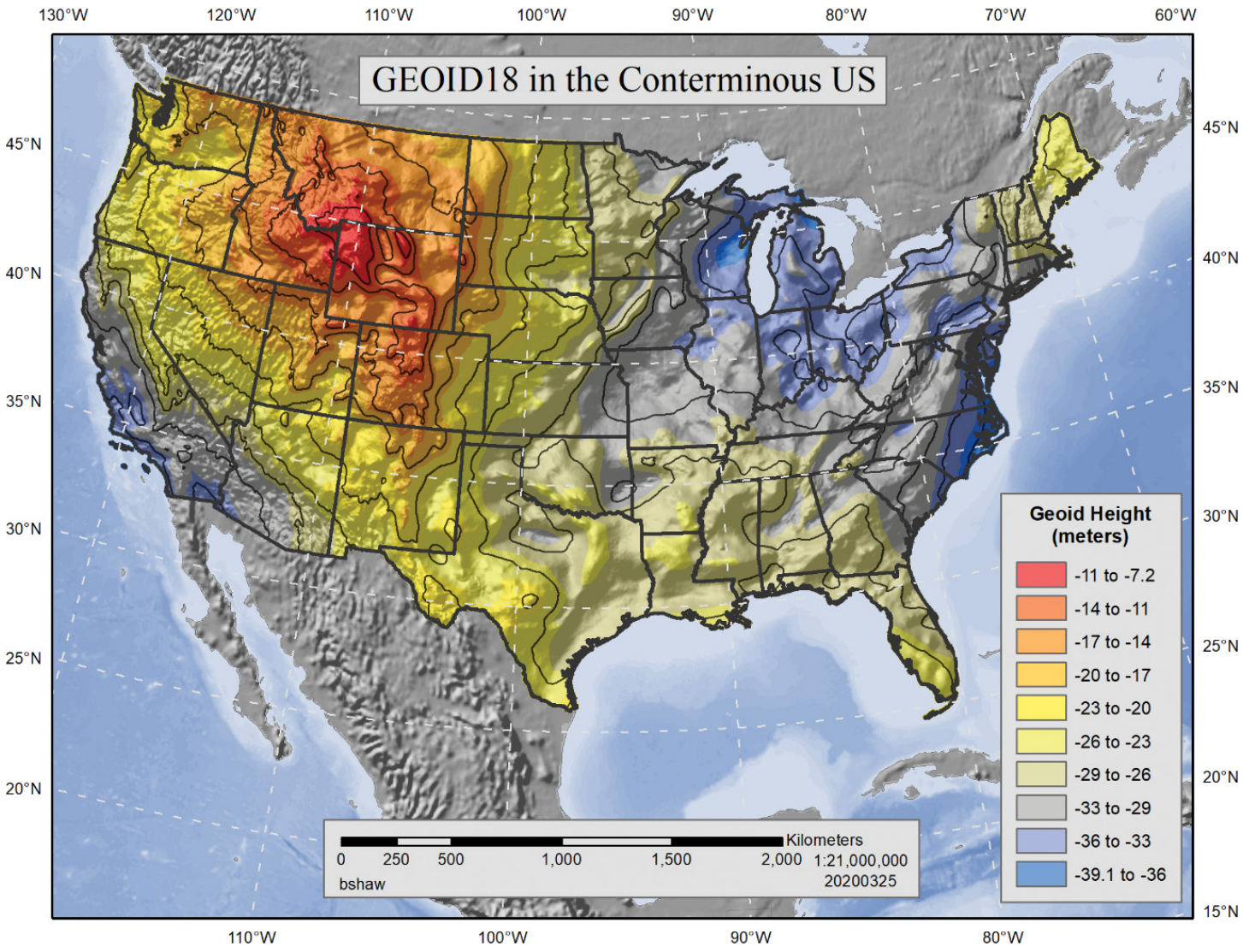
Laura Ledbetter, CIC, is a Commercial Insurance Broker at AssuredPartners | Design Professionals. This article is an abbreviated version of a seminar she gave at this years' annual conference. She specializes in assisting Surveying and Engineering firms address their risks by creating competitive insurance portfolios and proactive risk management controls. Laura may be reached by phone at (360) 598-5030 or e-mail at *Laura.Ledbetter@AssuredPartners.com*

GEOID18 Is Here!

By Steve Martin

In case you missed it, NGS transitioned GEOID18 to production, and it is no longer in Beta testing. The final release notice was issued without much fanfare through the "NGS NEWS" back on September 17, 2019. Today, you can find out more, as the final report for GEOID18, NOAA Technical Report NOS NGS 72, was released in June of 2020 and is available on the NGS website at: *https://geodesy.noaa.gov/library/pdfs/NOAA_TR_NOS_NGS_0072.pdf.*

continued on page 39



To visually interact with, and investigate GEOID18 further, check out the cool "Exploratory Web Map" at: *https://www.ngs.noaa.gov/GEOID/GEOID18/map-gallery.shtml.*

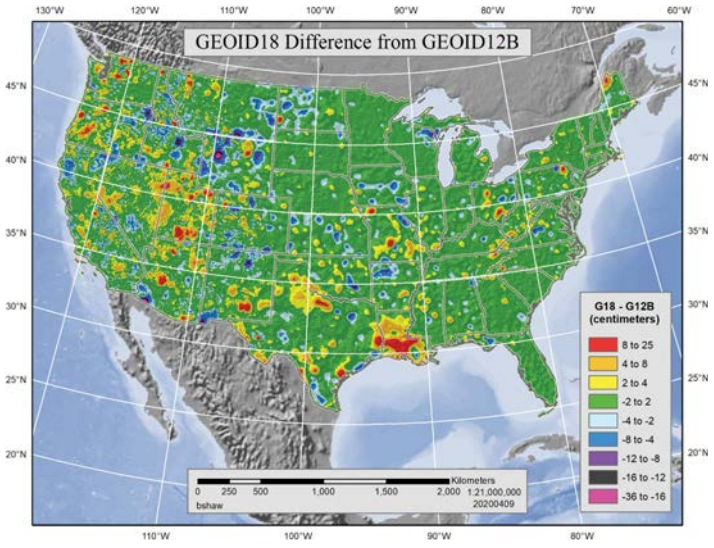
GEOID18 is the last hybrid geoid model that NGS will release before the replacement of the current vertical datum by the North American-Pacific Geopotential Datum of 2022 (NAPGD2022).

A hybrid geoid model is a modified gravimetric geoid model designed to work with a specific realization of NAD83. In the case of GEOID18, it is designed to work with NAD83(2011)epoch 2010.00. To create the hybrid GEOID18 model, the gravimetric geoid model, (xGEOID19B, Li, et al., 2019), created from a number of terrestrial, airborne, and space-based gravimetric datasets, is compared with and adjusted to best fit a network of passive bench marks (GPSBM18, Ahlgren, et al., 2020), where both the ellipsoid height from GPS and the orthometric height from geodetic leveling have been observed. The "GPS on Benchmarks" campaign is a big source of these ellipsoid height measurements on existing leveled benchmarks.

Like GEOID18's predecessor, GEOID12B, was also optimized for use with NAD83(2011) epoch 2010.00, GEOID18 shows significant improvement, demonstrating an 18% smaller overall standard deviation (1.39 cm versus 1.7 cm) for the CONUS region. This improvement is the result of 29% more GPS on Benchmarks (32,000+ vs. 24,900+), more airborne and space-based gravity data, along with significant software improvements in modeling.

Users should avoid mixing orthometric heights derived from different geoid models, such as GEOID18 and GEOID12B, as several centimeter differences have been observed.[1]

Unlike prior NGS hybrid geoids, GEOID18 does not cover Alaska or the Pacific Islands, its coverage is limited to the Coterminous United States (CONUS), Puerto Rico and the Virgin Islands.



NGS continues to produce experimental GEOID models incorporating the latest in satellite and airborne gravity data. Available on the NGS website is xGEOID19, a gravimetric geoid that incorporates 15 new GRAV-D blocks for a total of 53 GRAV-D blocks. Experimental GEOID models are intended to give stakeholders a perpetually improving and converging view of what the final geoid model will look like when NAVD88 is replaced in 2022-2025.

Footnotes:

1) "Geoid Schmeoid – Hybrid Geoid Height Models" Scott Martin XYHT Magazine *https://www.xyht.com/surveying/geoid-schmeoid-hybrid-geoid-height-models/.*

Steven J. Martin

Steven J. Martin is the Survey Supervisor for the East Bay Municipal Utility District headquartered in Oakland, CA. He has been a Director for CLSA for almost 15 years, a past Chairman of the CLSA Education Foundation, a past member of the CSRC Executive Committee, and the past CLSA-CSRC Liaison.

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