

CALIFORNIA

Surveyor

issue #198
spring/summer 2024



NGS TRANSFORMATION TOOL PROGRAM WRAPPING UP



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CLSA CENTRAL OFFICE
 2520 Venture Oaks Way, Suite 150
 Sacramento, CA 95833
 Phone: 916-239-4083 • Fax: 916-924-7323
 Email: clsa@californiasurveyors.org
 Web: www.californiasurveyors.org

Director of Management Services: Jennifer Blevins, CMP
Executive Director: Kim Oreno, CAE
Editor: Warren D. Smith, PLS

PUBLISHED BY:



550 SW 2nd Avenue
 Gainesville, FL 32601
 Phone: (800) 369-6220
 Web: www.naylor.com

Publisher: Matt Fischer
Editor: Krystal Mohan

Cover & Layout Design: Pankaj Kumar Bharti

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PUBLISHED APRIL 2024/CLSAB0124

COVER IMAGE: CALIFORNIA LAND SURVEYORS ASSOCIATION

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Kim Oreno, CAE
Executive Director

Happy 2024 CLSA Members! I'm happy to report that we're well on our way to another productive year for the surveying profession and our members! Here are a few highlights:

First CLSA Board Meeting of 2024

The first Board meeting of 2024 was held in Oakland on Saturday, February 3. We installed new officers President Kevin Nehring, President-Elect Joseph Padilla, Secretary Kristie Achee and Treasurer Michael Pulley. We also elected two Members at Large to serve on the CLSA Executive Committee, Mikey Mueller and David Woolley.

2024 National Surveyors Week

National Surveyors Week has been recognized in California with House Resolution No. 77, introduced by Assembly Member Esmeralda Soria. Assembly Member Soria represents CLSA President Kevin Nehring's District, and we appreciate her support. As of the time of this article, we expect recognition to take place on the Assembly Floor on March 21.

2024 Western Regional Survey Conference

Hundreds of surveyors will gather at the Horseshoe Las Vegas from March 23-26, 2024. Education, networking and fun will be had, and we'll raise some funds for the Education Foundation. This is a not-to-miss event and should be saved in your calendar every year.

Student Chapter Events

We had the opportunity to have booths at both the Cal Poly Pomona Geomatics Conference in

September 2023 and the Fresno State Geomatics Conference in January 2024. Both organizations put on such great events. Anything you can do to support those programs and our future surveyors is much appreciated.

2024 Webinar Schedule

We've got webinars scheduled through June. Topics include Tracking Surveys with QGIS; Hacking Excel with Python; ALTA Surveys – Negotiating Final Notes; A Review of Carnahan v. Lewis. All CLSA webinars are free for CLSA members and \$50 for non-members. Visit the CLSA's website calendar to sign up.

New Members

Lastly, I'm pleased to announce new members who have joined since our last magazine was published. Thank you all for your support. Please share the word about the good work we're doing with your colleagues and encourage them to join as well. ●

NEW MEMBERS

Aaron G. Acord
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Rachel Alexander
Ethan Amezcua
Scott Ammann
Aaron Lee Ansell
Darlene M. Antiporda
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Jeremy Beck
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Michael Jason Butler
William S. Calkins
Joseph William Cardillo
Lester E. Carter
Ieva Jodelyte Cefola
Patrick Champion

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Farid Dadashi
Sargiz Shamoun
Darbroudi
Chad Allen Day
William L. Day
Amin Deghani
Kevin Diego Diaz
Ivan Diaz
Krysta Diaz
Lawrence Dibble
James Jason Douglas
John R. Duquette
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Mark Lawler
Raymond Lillibridge
Raymond Linares
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Travis C. Roberts
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Gilberto Jesus Valencia
Eric H. Vance
Jorge Villasenor
Stuart T. Von Lewis
R Brandon Walker
Zhen Wang
Benjamin Williams
Andrew A. Yamashita
Joseph A. Young
Steven Alan Zanetta
Alexander Zasso

MONUMENTS, SUNSET REVIEW ON TAP FOR 2024



Michael D. Belote
Legislative Advocate

Every year the California legislature introduces approximately 2500 new bills, covering just about every topic imaginable. This year's total of 2125 is a little lower, likely resulting from a combination of state budget deficits and the fact that this is the second year of the present 2023-2024 two-year session, and the bill totals tend to be front-loaded in the first year. Still, a mountain of proposed legislation affecting our lives!

Some of these bills spring from the fertile minds of legislators themselves, but a very significant percentage are known as "sponsored bills," meaning that some organization has requested the legislature to author a bill on a subject important to the organization; that "sponsor" takes the lead in seeking passage of the bill. Obviously, the bill literally belongs to the legislator, but sponsors customarily get a great deal of influence over its contents and strategy.

Nearly every year CLSA acts as the sponsor of one or more bills, typically to refine the very technical and scientific sections of the Public Resources Code relating to surveying or to amend the land surveying licensing statutes in the Business and Professions Code. Particularly on the Public Resources Code issues, legislators cannot possibly be expected to understand the nuances

of geodetic principles in surveying, so they rely on the expertise of CLSA and related organizations to craft the law correctly. This is not an example of undue influence over the legislative process, but rather exactly how the system works best to refine the law. But sponsored bills also are part of the reason there are so many bills!

For 2024, CLSA is sponsoring AB 3176 by Assembly Member Josh Hoover (R-Folsom). The bill amends Section 8773.3 of the Business and Professions Code, relating to monument preservation. The mission is to expand the circumstances under which a licensed land surveyor or registered civil engineer is required to reconstruct or rehabilitate a monument found in a condition that is less than permanent and durable. Where current law limits the rehabilitation to monuments used in corner records filed pursuant to Section 8773, the bill would apply to a surveyor or civil engineer using a monument or corner accessory as control in any survey.

Although AB 3176 has not yet been referred to a policy committee in the Assembly, the first hearing on the bill is likely to be held later in April, or the first week of May, prior to the policy committee deadline.

2024 will also feature the "sunset review" process for the Board of Professional Engineers, Land Surveyors and Geologists (BPELSG). The idea is for the legislature to review the performance of and issues

facing each licensing board in California, on a periodic basis. When new licensing laws are created, they are put through a "sunrise" process; similarly, review of the boards is referred to as "sunset." In practice, very rarely is a licensing law actually sunsetted, but these reviews, conducted by the Assembly and Senate Business and Professions committees, is an excellent opportunity to discuss areas of concern and emerging issues facing licensing boards.

CLSA has been collaborating with CELC, ACEC and others to refine our messaging for the sunset review process. Not surprisingly, enforcement against unlicensed activity was an issue identified for discussion by all three groups. Other issues which may be raised with the legislature include mandatory errors and omissions insurance and mandatory continuing education. Results from the sunset review hearings are typically included in a bill to make changes to the relevant licensing law. We will report progress on these discussions as they occur this spring.

All told, over 80 bills have been identified of potential interest to CLSA. These will be discussed first with the Legislative Committee, under the able leadership of Mike Butcher, and then with the Board. Housing continues to be the subject of dozens of bills and makes up a healthy percentage of the bills identified. ●

editor's *report*



Warren Smith
County Surveyor

This issue contains articles about monuments, underground utility mapping, post disaster monument preservation, filed records of survey, and mentoring.

These topics and more will be covered at this year's multi state surveyors conference in Las Vegas. The gathering of surveyors, presenters, and equipment demonstrations is always a worthwhile event. I attended my first conference

in Washington as an LSIT in the 1970s. As much as all my classwork and studies, the opportunity to chat with licensees after the seminars was highly beneficial. The 'war stories' and practical commentary about real life implementation of boundary theories brought many insights into areas with which I had struggled.

This is where true learning takes place. We become licensed in order to practice. It is an ongoing endeavor. ●

president's *report*

At the February 3 Board meeting in Oakland, President Kevin Hills presented the Board with the 2024 Executive Committee consisting of Mike Pulley (Humboldt), Treasurer; Kristie Achee (Bakersfield), Secretary; and Joe Padilla (Orange County), President Elect. He then passed the gavel to me and wished me well. In that moment, I found that gavel – and what it represents – to be a little heavier than I expected. That feeling was eerily similar to that when I obtained licensure: excitement followed by an immediate realization of minimal competency.

Along with licensure, holding the Office of President of this Association is not a responsibility I take lightly.

In 2023, as President Elect, I was privileged to visit with nearly all of the Chapters across this beautiful State of ours. Many topics were discussed. Everything from national issues to very local issues; technical issues to historic/archival issues; from why do we have so much gray hair to “how do we get our young field crews to attend without the need to bribe them with beer?” (#TrueStory).

One of the topics that garnered much discussion and easily the most positive response was that of Chapter Mentorship by the Executive Committee. As I shared my experience with the struggles I had as a Chapter President and as a new Director, I found that nearly all other Officers in every Chapter had (or has) the same struggles. Those common struggles include membership outreach and retention, Chapter reports, Chapter meetings and speakers, Director’s duties, and an often misunderstood relationship between the Chapters and the Board. Daunting tasks for many of us, and incredibly difficult to figure out on your own.

It shouldn’t be that way.

None of us obtained licensure on our own. We became the Surveyors we are with the help of the mentors we had, whether they were employers, other crew members or co-workers, or any of the other multitude of professional relationships we may have. As I have progressed through the Executive Committee Chairs, I have received and welcomed great counsel and mentorship

from many past Ex. Com. members, past and present Committee Chairs, and Kim at the Central Office. ALL of Past Presidents who have reached out to me want the Executive Committee to be the best it can be. They don’t want it for me; they want it for the Association. I want to pass that forward. That’s where Chapter Mentorship by the Executive Committee comes in.

In 2021, when I was first installed on the Executive Committee as the Treasurer, I brought up the idea of the Ex. Com. members working with the individual Chapters. (In the interest of full disclosure, this idea was floated to the Association by Past President Jay Seymour around 2015). 2021 President Rob McMillan divided up the Chapters into five groups and assigned an Ex. Com. member. Those groups remain virtually unchanged; the only significant change being that of the Ex. Com. mentor. By design, the Ex. Com. members will mentor the same four Chapters throughout their tenure on the Executive Committee. When the Past President is retired, the newly installed Treasurer will take on the duties as mentor for those Chapters.

It’s been slow getting started (I’ll blame Covid-19) but the Association is ready for this. The Executive Committee Members work at the behest of the Board, and ultimately, the Association membership.

We’re here for you.

By way of information, it’s not the duty of the Chapter Directors to mentor or represent the Chapters at the Board level. The Director’s duty is to manage the affairs of the Association, to the best interest of the Association as a whole. Mentorship of Chapter Officers needs to come from elsewhere, and the Association will be stronger with the Executive Committee working directly with the Chapters. The Ex. Com. members will be reaching out to the Chapter Presidents and Directors offering their assistance where it may be needed. Our goal is to make you a better Officer. Through you, your Chapter will be stronger, and in turn, the Association will be stronger.

If you, as a Chapter Officer, Director, or member, have questions about anything related to the Association, please contact the Executive Committee. We don’t want you to struggle.

For reference, the Chapter Mentors are listed below.



Kevin W. Nehring, PLS
CLSA President

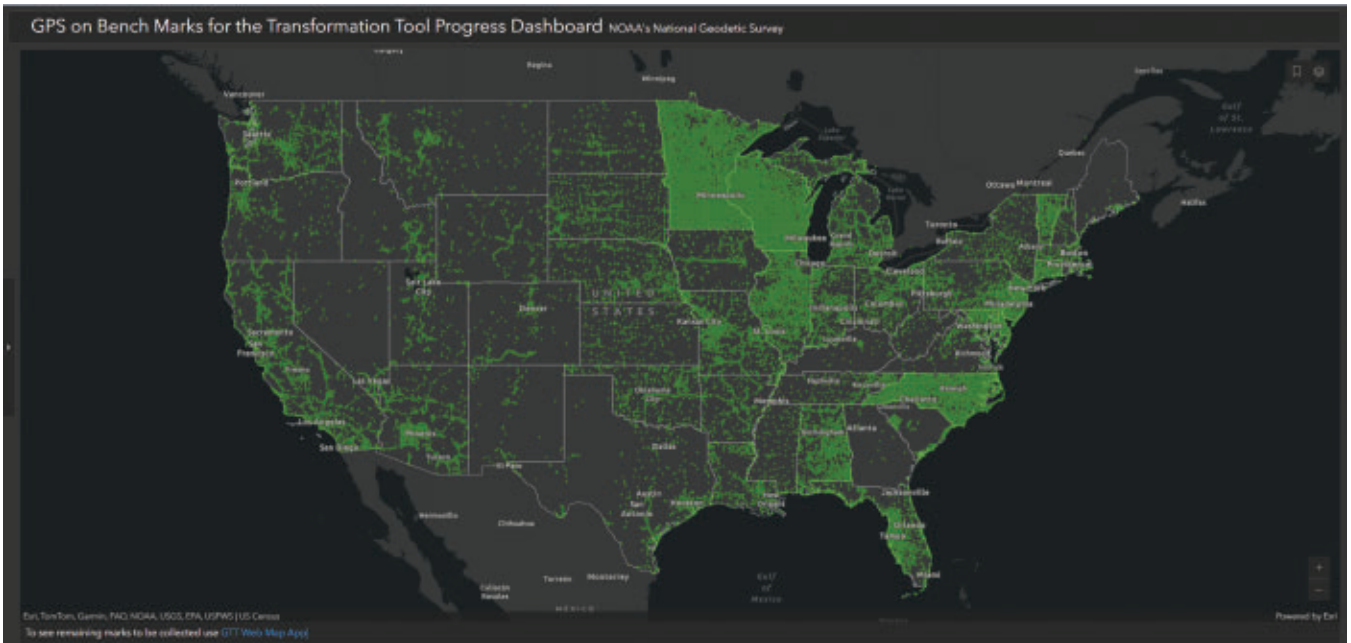
Chapter	Mentor
Bakersfield	Kevin Nehring
Cascade	Kristie Achee
Central Coast	Joe Padilla
Central Valley	Mike Pulley
Channel Islands	Kevin Hills
Desert	Joe Padilla
East Bay	Mike Pulley
Gold Country	Kevin Hills
Humboldt	Mike Pulley
Los Angeles	Joe Padilla
Marin	Kevin Nehring
Monterey Bay	Kristie Achee
Orange County	Kevin Nehring
Riverside/ San Bernardino	Kristie Achee
Sacramento	Mike Pulley
San Diego	Kevin Hills
San Francisco	Kevin Nehring
San Joaquin Valley	Joe Padilla
Santa Clara/San Mateo	Kristie Achee
Sonoma County	Kevin Hills
Student Chapters	
CSU Pomona	Mike Pulley
CSU Fresno	Kevin Nehring
CSU Monterey Bay	Kristie Achee
East LA	Joe Padilla
Santiago Canyon	Kevin Hills

More schools to be added soon!

I hope to see each of you at the Western Regional Survey Conference on March 23-26, 2024, at the Horseshoe Las Vegas (formerly Bally’s). This year’s Conference is sponsored by the Associations from Arizona (APLS), California (CLSA), Nevada (NALS), New Mexico (NMPS), Wyoming (PLSW), and the Western Federation of Professional Surveyors (WFPS) <http://plseducation.org/>. If you see me, please say hello. ●

CALIFORNIA'S EFFORTS IN NGS'S TRANSFORMATION TOOL CAMPAIGN

Steven J. Martin, LS7264



The Transformation Tool portion of the GPS on Benchmarks (GPSonBMs) program should be about wrapped up as this issue goes to press. I've been giving updates on the campaign through the California Surveyor magazine, CLSA News, and LinkedIn since I got involved in mid-2021, so this should come as no surprise.

To recap, GPSonBMs is submitting data to NGS through OPUS Share or OPUS Projects on existing marks in the NGS database with published NAVD88 elevations. There was a significant crowdsourced effort a few years ago for the GEOID18 hybrid geoid model campaign to collect (2) four+ hour observations on benchmarks with a published NAVD88 elevation

every 30km. The map was divided into 30km abutting hexagons and a priority mark from the database was selected by an algorithm. By having this GPSonBMs dataset, NGS was able to better optimize the geoid to work with NAVD88, that is a hybrid of the purely gravimetric geoid model was best fit to actual GPS observations on existing NAVD88 benchmarks.

The current push to densify the coverage of NAVD88 benchmarks with at least two GPS (or GNSS) observations in the NGS database is called the GPSonBMs Transformation Tool campaign. Once the dataset is pulled from the NGS database (likely in April), this data will be used to define the NAVD88 to the North American Geopotential Datum of 2022

(NAPGD2022) transformation, which will not be further refined. The goal set for this program was to have at least one NAVD88 benchmark with two GPS (or GNSS) observations every 10km (10km hexagons). This goal is nine times more than the 30km goal of the GEOID18 campaign. There are also 2km goals for urban and mountainous areas to give better spatial resolution to the Transformation Tool, should the users require it.

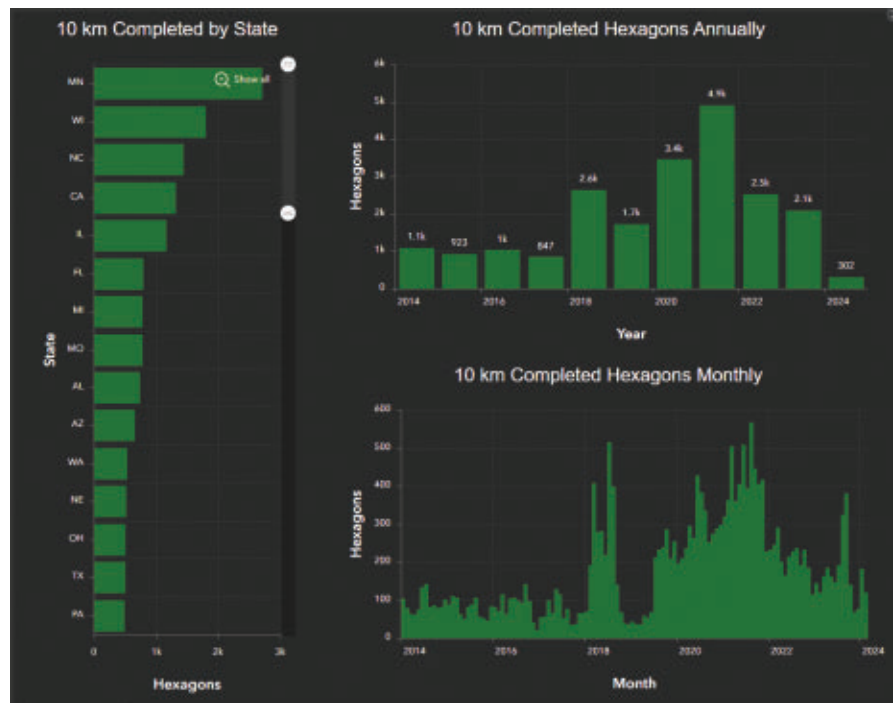
NGS announced that the last day to submit data to be included in the NAVD88 to NAPGD2022 Transformation Tool program was February 29, 2024. This is to give some time for the data to be checked and accepted before the working dataset is pulled from the NGS database.

As of this writing, California is at 58% complete on the 10km goals and 40% complete on the 2km hexagon goals. Considering that in January of 2021 when CLSA held a webinar on the GPSONBMs campaign, California was at 15% complete (10km hexagons), this is a pretty big accomplishment. California is one of the top five States in terms of OPUS Share submissions behind Minnesota and Wisconsin, two standout States in the GPSONBMs program, along with Florida and Illinois.

There are lots of surveyors up and down the State to thank for getting us to 58% complete. I'll start with Philip Melcher of Provost & Pritchard based in Visalia, CA. In the January 2021 CLSA webinar, it was noted that quite a few benchmarks and 10km hexagons in the Central Valley were already completed. This was thanks in large part to Philip who makes it a part of his regular work to recover and observe historic benchmarks. He started with the GEOID18 campaign and has kept it up for the last six years. He will set up one or more of his firm's older GPS units on benchmarks in the morning and then goes about his regular job for the day, picking the unit up on the way home (or to the hotel as he works all up and down the State). See the xyHt magazine article "Citizen Geodesist" for more on Philip's process (Citizen Geodesist – xyHt).

Los Angeles and Sacramento Counties were early participants in the program. The Central Coast Chapter of CLSA had a good volunteer program led by Tom Mastin, retired Cal Poly Survey Instructor. See the excellent Central Coast Chapter newsletter "Parallax" for more on their efforts (centralcoastclsa.org).

When I started on the GPSONBMs Transformation Tool campaign in mid-2021, I decided to focus on San Diego County, where I used to work over 15 years ago, because the State is too large for one person to cover



(unless you are Philip Melcher). I reached out to surveyors at the County of San Diego, the City of San Diego, Caltrans, and they were all in on the campaign. For some background on inter-agency cooperation in San Diego County see California Surveyor 167 – Fall 2011 "A Reflection on the San Diego County High Precision Geodetic Network and the Start of the Statewide HPGN Survey."

Kevin Maxwell and Anthony Leimeister of Caltrans District 11 were particularly productive in the campaign. Kevin Maxwell soon moved up to Caltrans HQ Office of Land Surveys as the geodetic coordinator for Caltrans. More on him later, Anthony Leimeister took over his position at District 11 and soon had completed most of the remaining 10km hexagons in San Diego County and all of Imperial County.

Kevin Maxwell, in his new role, has leveraged the GPSONBMs data in Southern California and the Bay Area, worked with several Counties and interested stakeholders to create several OPUS Projects. These projects

will result in NSRS2022 coordinates published in the NGS Datasheets which can be used to calibrate your survey, or to check your RTN solutions. By working with the various Caltrans Districts and Counties, Kevin has significantly increased the participation in the GPSONBMs program.

A few stand-out Caltrans Districts, besides District 11, have been: District 8 with Jose Alcantara coordinating their efforts; District 5 with Nicholas Pasquini coordinating efforts with the Central Coast Chapter of CLSA; District 1 with Marcus Houston coordinating; District 2 with Craig Turner and several Party Chiefs participating; District 10 submitted several; District 4 got a late start; however Stephen Sousa and team have made significant progress. Some of the County folks contributing to the OPUS Projects were Michael Dorroh (LACDPW), Kevin Martinez (OCPW), John Morris (Riverside County), Joseph DeChellis (VCPWA). Brad Beal of NGA also contributed observations.

Dave Murtha at the Port of Oakland submitted an OPUS Project which not



only will help with the Transformation Tool campaign, but it will also ensure the control network that his agency relies upon, gets updated along with the National Spatial Reference System (NSRS) Modernization that NGS is working on.

With so many participating in the campaign, I am bound to leave out some who deserve recognition. Just know that you helped maintain the geodetic infrastructure that we all rely upon. One such surveyor (or firm) is John Williams Land Surveying with quite a few observations submitted in the Eastern Sierras and along the highway 395 corridor.

While the push to get GPSONBMs data into NGS for the Transformation Tool campaign is about wrapped up, there is still a need to submit GNSS data on benchmarks that you would like to use to control future surveys. In 2021, I heard that 93% of the marks in the NGS database had zero GPS observations on them. Hopefully, this big push to build the Transformation Tool has lowered that number some, but the big takeaway is that it is highly suspect and possibly misleading to rely on elevations established 50 or more years ago.

This is particularly true in areas of subsidence due to ground-water withdrawal. By continuing to submit GPSONBMs, you will help improve NADCON and VERTCON as well as to maintain good coordinates on the marks (Reference Epoch Coordinates (REC) and Survey Epoch Coordinates (SEC)).

My own personal journey with the GPSONBMs program has been a rewarding one. It began with trying to make a difference in San Diego County where I used to work, and then expanded to Riverside/ San Bernardino Counties, and eventually included observations in 14 counties including two in Nevada. Aside from the part of surveying most of us love, that is getting out to places we have never been before and seeing a new country, I have enjoyed connecting with fellow surveyors and working together to achieve a common goal. I hope this Transformation Tool effort has brought awareness on the need to maintain the geodetic control network and motivates surveyors to keep submitting fresh information on the marks we hope to use in the future. ●

“While the push to get GPSONBMs data into NGS for the Transformation Tool campaign is about wrapped up, there is still a need to submit GNSS data on benchmarks that you would like to use to control future surveys.”

Steven J. Martin, LS7264

P.S. Many thanks to Jason Paris and the good folks at Leica of California for their support in my efforts.

Links

NGS GPSONBMs webpage: <https://geodesy.noaa.gov/GPSONBM/index.shtml>

California Surveyor #195 GPS on Benchmarks Spring 2022 Update: <https://www.californiasurveyors.org/Docs/SurveyorMag/CalSurv195.pdf>

January 2021 CLSA GPS on Benchmarks webinar (link in the member downloads section of the CLSA website): <https://www.youtube.com/watch?v=tvvc71rXoD4>

A MONUMENTAL QUESTION: DO YOU SET MONUMENTS OR MARKERS?

Robert J. Reese, LS

After a (successful) search for a 50-year-old marker on a very large parcel along the California coast, a discussion with my client prompted me to mull over some semantics that arose in our discussion. Perhaps, I thought, this might be of interest to our surveying community. It concerns the *things* we surveyors set as place identifiers, *physical objects* placed to mark infinitesimal points on the face of the earth, *places* to which we assiduously assign spatial addresses (coordinates) that have relative relationships with other such places. In particular I'm referring to those physical marks that (purportedly) identify legal boundaries or rights of way. These *things* we call MONUMENTS.

We land surveyors are legally and solely entitled to be the setters of these MONUMENTS. I know because it says so in the California Professional Land Surveyors Act (PLSA), pretty close to the beginning of the code.

It is unlawful for any person to practice, offer to practice, or represent himself or herself, as a land surveyor in this state, or to set, reset, replace or remove any survey monument on land in which he or she has no legal interest, unless he or she has been licensed or specifically exempted from licensing under this chapter. [emphasis added] (California Business and Professions Code §8725)

Also, the Nevada Revised Statutes (NRS) have a similar definition of land surveying and the privilege thereof.

A person who, in a private or public capacity, does or offers to do any one or more of the following practices land surveying: ... (c) Determines, by the use of the principles of land surveying, the position for any monument or reference point which marks a property line, boundary or corner, or sets, resets or replaces any such monument or reference point. [emphasis added] (Nevada Revised Statutes §625.040)

This thing called a MONUMENT is mentioned 36 times in the PLSA, and 25 times in the NRS, but not once with a definition of what this MONUMENT is or is supposed to be. Yes, it's

qualities – durable, sufficient in number, etc. – are noted, but it is left to the land surveyor (or individual licensed to perform land surveying, or individual exempted therefrom) to determine what a MONUMENT is and to statutorily mark it with her or his assigned license number.

We also set *things* that are NOT representative of property corners or lot corners. These things we call CONTROL POINTS. They, too, have spatial addresses and positions relative to other such CONTROL POINTS that assist us in determining the location of MONUMENTS. I've noticed that sometimes these things we surveyors set called CORNER MONUMENTS and CONTROL POINTS look awfully similar, sometimes virtually indistinguishable. So why don't we set CORNER POINTS or CONTROL MONUMENTS? Maybe you do and I just don't know about it?

And here in California there is even a program called MONUMENT PRESERVATION that purports to support the *preservation* of "monuments"! Not only are CORNER MONUMENTS targets for preservation, but so are CONTROL POINTS when they rise to a certain importance. (Govt. Code §§27584-27585)

So...I have some questions.

1. What is a MONUMENT anyway, and what does it mean to a lay person when we tell them we set MONUMENTS at their property corners?
2. Why this distinction of specie as to what is hammered into the ground, or scribed or set to mark a particular place?
3. What qualities raise a thing to a level worthy of the moniker "MONUMENT"?

Regarding question 1, perhaps Mr. Webster needs to jump in here.

monument (noun):

1 obsolete: a burial vault: sepulcher; 2: a written legal document or record: a treatise; 3a(1): a lasting evidence, reminder, or example of someone or something notable or great [emphasis added]; 3a(2): a distinguished person;

3b: a memorial stone or a building erected in remembrance of a person or event; 4 archaic: an identifying mark: evidence; also: portent, sign; 5 obsolete: a carved statue: effigy; 6: a boundary or position marker (such as a stone); 7 National Monument

(<https://www.merriam-webster.com/dictionary/monument>)

Ah, there it is, right there at 6: a boundary or position *marker*.

For a while now I have been referring to such things in conversation with clients and other surveyors as MARKERS. It seems there is little question in the mind of lay persons that when I put a thing at their property corner, it is a MARKER – it MARKS the location. I may tell them it is a 2" iron pipe with a small brass tag on it with a secret code number, or it is a 1" domed brass disk in the sidewalk, or...whatever. I have never had the label MARKER questioned or misunderstood. However, I have been queried by a client with a surprised look: "How big is the monument?" Thus the answer to question 1 above may be...confusing?

Question number two may be simply semantics – but only to us as a professional group. A CONTROL POINT is something that is *not* the other thing, a MONUMENT. OK, fair enough. The one inch iron pipe or No. 5 rebar I set, both having a plastic cap with the notation "CONTROL POINT" along with my business name is simply not a MONUMENT. (Some may question why not my LS number; reason to follow.) However, many times I

have had to explain to a property owner that colored plastic thing here that says "CONTROL POINT" is a CONTROL POINT, and that colored plastic thing over there with an LS number that someone else set is a MONUMENT, appearing to the uninitiated almost identical – plastic, about the same size, some bright color, with some writing on it. Perhaps the situation deserves reconsideration by our group.

And now to question number three. What makes a MARKER a MONUMENT? I have now arrived at the reason for this diatribe. We surveyors set all types of MARKERS: nails, nails with brass tags, bronze discs of varying diameter, stones, tree scribing, iron rods and pipes, car axles, the list is long. But my question is what do most people envision when they hear the word MONUMENT? Personally, I see the Washington Monument. I see the obelisks that mark the international border between the United States and Mexico. I see a number of markers of "lasting evidence of something notable or great." How do you see your surveys? Do you see them as something "notable and great," no matter how quotidian the endeavor is to you or how small the lot in the block? I submit that the property owner may attach more importance to your survey than you do.

As a case in point, and the incident that led to this writing, I offer this anecdote. I was retracing a survey done in the 1970's by an individual licensed to perform land surveying services. His was a pretty important survey I thought, and covered a large, valuable and pristine tract described along a part of the California coast that has spectacular views. That survey set 1/2" rebar and plastic caps. I found said rebar, bent, buried, without the benefit of the identifying cap, but in the expected position and it clearly had the hallmarks of a piece of steel in the ground for nearly half a century. What does the landowner for whom the survey was performed think of such a non-durable marker, one that says "My survey effort is worth an 18" piece of 1/2" rebar and a cheap plastic cap set to mark the corners of your valuable land." Now, in counterpoint, I have had the honor of retracing one County Surveyor who, in the early 1900's cast his own (impressive) bronze disks, 4" in diameter, with the name of the client, his name and the date of the survey cast into the marker and set them in a 2" iron pipe, buried in the ground. Talk about lasting evidence of something notable and great!

Think about what you set as a MONUMENT, that MARKER that represents your survey work, the product of your professional expertise and experience. How proud are you of your survey effort? What will your client think of their new property marker? How much more effort is it to set, say, an iron pipe with a bronze disc in concrete (which could easily outlast your lifetime and be relied upon by those following in your footsteps) than a 1/2" rebar and plastic cap, one which can be bent or removed with slightest effort by natural forces or by man?

That, my fellow surveyors, is a MONUMENTAL question. ●



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EMLID REACH RS2 GNSS RECEIVERS AND RELATED SOFTWARE

S. Landon Blake, Redefined Horizons

Introduction

In this article, I'll review the Reach RS2 Receivers from Emlid and the related software.

My company owns six (6) Emlid Reach GNSS receivers and have been using them for over a year. This review is based on that experience. Emlid didn't know I was preparing this review and I'm not being compensated for it. This is a technology review from the survey trenches.

The Hardware

What Is in the Box? We buy our Emlid Reach GNSS receivers in base/rover pairs. The approximate cost for a pair is \$5K. The units have an internal battery and internal RTK radio. The receivers come with RTK antennas. They don't come with a hard case or other accessories, and the soft cases shipped with the receivers don't last long in the field.

Capabilities: The receivers are multi-constellation, and can listen to GPS, QZSS, GLONASS, BeiDou, and Galileo. (I often have 30 to 45 birds in view while surveying with the receivers in Central California.) They can achieve positional precision of a few hundredths over short distances in RTK mode and over up to 40 miles in PPK or static surveying modes. The built-in RTK radio can broadcast a couple of miles

and is much less robust than an RTK system with a high-powered external radio. (It is super convenient and easy to use for RTK surveys on small sites.) RTK corrections can also be received via a cell connection using the built-in LTE modem, although I haven't tested that functionality.

Durability: The receiver housing is sturdy and the receivers are light weight. They withstood more than one drop or knock during my field surveys. The batteries last a really long time. We've never had them run out of juice before the end of a work day. They charge via a standard USB C connection.

Data Transfer: The receivers have an RS-232 port and USB C port. However, using these connections, I haven't found an easy way to transfer data files from the receivers to a desktop computer. Instead, data files are stored on the mobile device you use to connect to and operate the receivers. The mobile application is then used for data transfer. (More on this later in the article.)

The Software

Emlid Flow – The Mobile Application: I run Emlid Flow, the mobile application for the Reach RS2 receivers, on my Android mobile phone. The app installes easily right from the Google Play Store.

The app has two (2) main screens. The receiver screen let's you connect to and manage the settings in a Reach RS2 receiver. It is also the screen used to collect static GNSS data observations. You can use the receiver screen to view the visible satellites, receiver position, and battery life.

The survey screen presents basic data collection functionality. You can create simple data collection projects. Once created, you can assign a project both a coordinate reference system and a feature code library. The feature code support is limited when compared to more advanced mobile GIS data collection applications, but is sufficient for many surveyors. (It is comparable to what you would find on basic on-board total station software.) Static GNSS data and PPK GNSS data can be exported from Emlid Flow in RINEX format. RTK data can be exported in CSV, DXF, or Shapefile format. Automated linework isn't currently supported in the mobile app.

If you are like me, raw data processing is an important part of your workflow. RINEX data can be used to view raw GNSS vectors for static or PPK data collection performed with a Reach receiver, but at this time RTK raw data vector export from Emlid Flow is not

supported. I hope this functionality will be added with GVX export in the near future!

Emlid Studio – The Office

Software: Emlid Studio is the office processing software. It can be used to post process static GNSS vectors or PPK vectors collected with the Reach receivers. It is very limited, and is no comparison to a full-featured GNSS software package like Trimble

Business Center, Topcon Tools, or Geomatics Office. It uses an open source GNSS processing library and can be thought of as a simple OPUS processing tool for your desktop, although it works with your Emlid base receiver files. It doesn't allow you to inspect baseline processing results or perform network adjustments. At my company this isn't a problem, because we import static or PPK RINEX files from

our Reach receivers directly into Trimble Business Center.

Interoperability: As mentioned previously, Emlid Flow has no support for export of RTK vectors at this time. The export of RINEX files for static GNSS data is very simple. The PPK workflow took me a few days to figure out. (It wasn't well documented.) However, once I got the right switches flipped, PPK surveys worked well and allowed me to get raw GNSS vectors into Trimble Business Center without a full fast-static GNSS session.



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Customer Support

Emlid customer support has been fantastic. When we had a power supply issue with one of our receivers, they quickly shipped a replacement. With no questions asked and before we had even returned the defective unit. They regularly roll out firmware updates and are making consistent improvements to their software.

We did have an issue with data loss after a firmware upgrade, but the problem was corrected in 72 hours with a software patch.

Conclusion

My company starts almost every survey with fast static control observations on primary control points. The Emlid Reach receivers are ideally suited for this work. We can now deploy (for a very affordable investment) several receivers to the same job site for static surveys. In addition, for surveys where real-time coordinates aren't needed, the PPK workflow is a good fit. My company is currently investigating how we can help our clients and business partners take advantage of the Emlid technology stack for precise mobile GNSS data collection in good GNSS environments.

The Reach RS2 receivers aren't a drop in replacement for a high-end RTK system from Trimble, Topcon or Leica. But at a fraction of the price, they provide tremendous value. ●

DISASTER PREVENTION/RECOVERY AND MONUMENT PRESERVATION

Carl C.de Baca, PLS

The United States is beset with natural disasters. In the past 10 years we have seen numerous instances of near-catastrophic property damage and loss of life from hurricanes, tornadoes, floods and wildfires. It's not inconceivable that we could add earthquakes, tsunamis, volcanoes and deadly solar flares to that list in the coming years. *Well, thanks for that news, Dr. Buzzkill.*

The thing is, it's not just the past 10 years. We've been having these sorts of things for the past, oh I don't know, two hundred years of recorded history. While they may have increased in intensity and frequency, the reporting on such happenings has certainly outpaced the frequency, and alarmingly so. In some places we are naming our storms now. Not just hurricanes, but you know... storms, like with rain and wind and not much else. *That Bobby, he completely drenched my back yard yesterday, and the hail really pounded the azaleas. Not as bad as Lupe did last year, but still, I'm glad I listened to the news and parked the Tesla in the garage.*

It is awkward to say this: surveyors are often the beneficiary of these natural disasters. Every post-disaster cleanup involves some amount of rebuilding and every rebuilding effort involves some amount of surveying. No one should be cheering on the Furies as they swoop down with reckless abandon and lay waste to communities, which they do with some regularity these days. But we should keep our eyes open for opportunities to help our local communities recover from these disasters. Which brings me to my point. **Monument Preservation.** (*Huh? I thought this was going in a completely different direction.*)

We surveyors spend a lot of time thinking about how to preserve, recover and reestablish monuments that are critical for the accurate determination of property rights. And rightfully so, that is part of our job – no monuments, no land owner harmony. But I think we are mostly focused on the impacts of new construction on existing monuments. New roads and expanded street improvements have been proven monument killers for years. California law requires that the contractors constructing roadways and other such projects employ a surveyor to tie out the monuments, file corner records and then re-establish new monuments after the construction is complete. This is an excellent idea and I hope it becomes a nationwide trend. But even California has a blind spot: post-disaster recovery.

California is facing a cycle of wildfires unique in recent history. The teeter-tottering weather cycle of La Niña and El Niño that the west coast is now facing every year is more simply expressed as alternating flood and drought. The flood years stimulate growth of the grasses and underbrush, while the drought years slowly weaken the trees and dry out said grass and underbrush. Then lightning, or a downed powerline, or a truck dragging a loose chain down a highway turns hundreds of thousands of acres of weak trees and dry brush into a charred wasteland. Fire goes where the winds take it and if a community is downwind of a fast-moving fire, then that community is doomed.

From personal experience, (and lots of it), I can attest that wildfire does not generally destroy the monuments it encounters, it is the post-disaster cleanup that does the deed. One need only look at California's poster child for fire-borne tragedy, the Town of Paradise, to see

this phenomenon in action. Paradise lost nearly 95% of its homes. They are being rebuilt, slowly but surely. This story is devastating, moving and inspiring, all at once. A fire so hot that it obliterates a building will also guarantee that the remains of the foundation will need to be over-excavated, clean fill brought in, and a new foundation constructed. Essentially the entire lot gets scraped clean before reconstruction starts. Starting over with new foundation triggers a zoning requirement that it be tied to property corners. And, the corners were routinely scraped out in the clean-up phase. This is just one more expensive and time-consuming hurdle for the poor land owner to face.

Now, counties are starting to recognize that fire prevention strategies are of critical importance. There have been numerous RFPs released in the last year for fire prevention projects, up and down the state. This is an excellent development and with the requisite funding and follow-through, perhaps California communities can get in front of the epidemic of wildfires. No doubt, fire breaks and reduced fuel load, combined with undergrounding of electrical lines will all contribute to a safer California.

But with few exceptions, the need, or should I say absolute requirement, for pre-construction (for want of a more precise regulatory term) location, tie out and corner record preparation, is not explicit in these RFPs. You know, and I know, that a planned fire break, that would take out various monuments, leading to property rights chaos, requires monument preservation as outlined in §8771. But do the various county agencies leading fire prevention activities know this? Do the county board of supervisors know it? Does county counsel know it? Does the

contractor who gets the job of working on these fire breaks know it? Hardly.

For several years now, Mike Quartaroli, a surveyor and CLSA member from Manteca, has been leading a fight to protect property rights by educating public agencies as to their responsibilities under the law. He has developed a very well-reasoned white paper that discusses all of this in great detail. He has sent it to county surveyors far and wide. He's tried to get traction at the CLSA board with

an ad hoc committee. The committee is hoping for clarification of existing law or maybe new legislation to require that fire prevention and disaster recovery efforts be directly tied to monument preservation. From this observer's point of view, Mike's efforts are both a noble undertaking and an uphill battle. *A battle you say? What's he fighting?* Indifference. Indifference from the county agencies and indifference from CLSA. I'm just guessing here, but if you live and practice in a city, you probably

don't care much about the topic and if you haven't heard of Mike's campaign, it's hard to get behind it.

So please consider the foregoing to be a long-winded introduction to the topic of monument preservation in the face of disaster prevention and disaster recovery. The following paper is a recently distilled summary that Quartaroli is sending to county surveyors in the interest of starting the discussion. I encourage you to read it, adopt it and help advocate for it. ●

FUEL REDUCTION – FUEL BREAK PROJECTS

(Forest Restoration Projects & Prescribed Burns)

Mike Quartaroli, PLS, Quartaroli & Associates, Inc.

Fuel Reduction – Fuel Break Projects around wildfire vulnerable communities will be used more frequently in the future and on a much larger scale. Fuel Reduction – Fuel Break Projects are vital in disrupting fire behavior and slowing fire progression. Evidence of this is the overwhelming passage of Senate Bill 85 and signed into law April 12, 2021. Senate Bill 85 allocates \$536 million for a range of Wildfire prevention Projects. It is imperative that County Surveyors work closely with all Fuel Reduction – Fuel Break Project partners to promote and oversee the successful completion of survey monument preservation for these projects. The primary fundamental professional function and responsibility of County Surveyors, in their official capacity, is to ensure that property rights and public welfare are protected by providing survey monument preservation **oversight** for Projects that could put survey monuments in jeopardy of being disturbed or destroyed. It is incumbent on the County Surveyor to **advise** the Fuel Reduction – Fuel Break Project partners of their obligation to designate a licensed land surveyor to be in “responsible charge” of necessary land surveying services

and of survey monument preservation for the Fuel Reduction – Fuel Break Project areas. The designated land surveyor can evaluate the ground disturbing potential of the Project and determine which, if any, survey monuments are in jeopardy of being disturbed or destroyed, and must be referenced and preserved. Equally important, the designated land surveyor would also establish property lines and road right-of-way lines that limit and define the Fuel Reduction – Fuel Break Project.

Local agencies must keep lines of communication open with the “Wildfire and Forest Resilience Task Force” and all involved parties to monitor survey monument preservation opportunities and to provide general land surveying oversight.

With a vegetation removal permit or without a permit, vegetation control contractors are required to comply with Sec. 8771 Survey Monument Preservation if working in streets, highways, other right-of-ways, and easements and to comply with Sec. 8725 of the Business and Profession Code; Sec. 841 of the Civil Code; Sec. 605 of the California Penal Code; Sec. 732 of the Streets and Highway Code; Sec. 476 Code of Professional Conduct – Professional

Land Surveyor; and U.S. Code Title 18, Sec. 1858 “for all other locations.”

Establishing and identifying where the Fuel Reduction – Fuel Break Project begins and ends between public and private properties is needed by the vegetation removal contractors. Fuel Reduction – Fuel Break Projects on Federal and State lands are typically accomplished with the use of a “USFS Stewardship Landline Survey Agreement.” County Board of Supervisors have typically been approving Master Stewardship Agreements (MSA) with the USDA and the Forest Service. These Agreements give the County authority, for a period of time, to work with the USFS to conduct Fuel Reduction – Fuel Break and land surveying activities on the National Forest Lands within the County boundaries. These agreements include proven detailed survey specifications for identifying and marking the lines between public and private lands and to preserve survey monuments. These agreements have proven to be very effective.

The goal is for all agencies to work together so the results will be a safer community environment with survey monuments preserved and property rights respected. ●

SURVEY CONTROL FOR CONSTRUCTION – WHEN, HOW, AND WHO?

S. Landon Blake, Redefined Horizons

In this article, we discuss the problem of insufficient control for proper construction surveying. This problem usually happens at the start of construction. I base this article on a typical heavy civil infrastructure project. In this type of project, civil engineers prepare design plans after design surveys but before construction.

The Phone Call (Identifying the Problem)

If you perform surveys to support engineering design, you've gotten the call. It comes several months after you've completed the design surveys for a project. The call goes like this:

Contractor: "I'm from Get Er Done Construction. We are getting ready to break ground on the project. I need all of your survey control so I can set up my machine control."

Surveyor: "I'm sorry. I wasn't under contract to provide construction surveying services for this project. Please provide the name and contact information for the surveyor doing the construction layout. I'll provide them with the primary survey control used for the design surveys."

Contractor: "We bought a Trimble R12 GPS. We do our own construction surveying now. Please send the survey control information as soon as possible. You are delaying the start of construction."

Or, if you are the surveyor providing construction surveys, you may have a phone call like this at the start of construction:

Surveyor: "I'm working for Build It Right Construction Company. I'm the licensed surveyor in charge of construction layout. I'm calling to request the survey control information for the project."

Civil Engineer: "We have control survey information on the plans."

Surveyor: "I've carefully reviewed your plans. There is only information for a single benchmark on the plans. I searched for the benchmark, but the city destroyed it in a sidewalk repair last year. I need more control information to properly lay out the design."

Civil Engineer: "Every other surveyor we've worked with can lay out the design with a single benchmark. What is your problem?"

These two (2) example phone calls are opposite sides of the same problem: **There isn't enough**

survey control information on the approved civil engineering plans (or other contract documents) to perform the construction surveying needed to build a project correctly.

Why Do We Get the Phone Call (The Causes of the Problem)

What are the root causes of this problem? I've identified four (4) causes based on my experience as a licensed land surveyor:

The First Cause: Survey control monuments of poor quality are set during design surveys. These monuments become disturbed or destroyed before construction begins. (I recently worked on an infrastructure project spanning over 25 miles. The company performing the main design surveys set short magnetic nails in the dirt. We found very few of the nails less than a year later.)

The Second Cause: The surveyor performing design surveys uses sloppy methods to establish control coordinates. (For example: I recently retraced a survey of 1200 acres on a renewable energy project. The previous survey company set a handful of points using RTK GNSS with radial ties from a single base station.

“Often, civil engineering plans include only the description of a single benchmark. This benchmark often has an elevation value with no metadata. That doesn’t cut it for proper documentation of survey control.”

The Third Cause: The design surveyor doesn’t properly document the control survey—or doesn’t document it at all. (In contrast, I believe the project surveyor should provide a survey control report on every design survey. This report includes information on the project coordinate reference system. It also includes information on the control survey methods.) Often, civil engineering plans include only the description of a single benchmark. This benchmark often has an elevation value with no metadata. That doesn’t cut it for proper documentation of survey control.

The Fourth Cause: Survey control set for design surveys isn’t suitable for construction surveying. The design survey control may not be:

- 1) Dense enough for construction surveying
- 2) In the right locations for construction surveying
- 3) The right type of monument for construction surveying
- 4) Have imprecise coordinates for construction surveying

This fourth cause is often not the fault of the surveyor performing the design surveys. (See the sidebar “How Technology Is Making the Problem Worse.”)

When Should Survey Control for Construction Be Set? There are three (3) basic options:

During Design Surveys: Survey control for construction can be set during design surveys. There are a couple advantages to this approach.

The first is that survey control for construction is set by the same surveyor performing the design surveys. The second is the construction control should be well connected to the primary survey control for the design surveys. The third is the design surveyor can document the survey control on the civil engineering plans. There are two disadvantages of this approach. The first is the extra cost incurred during design surveys. The second is the risk that survey control will be destroyed or disturbed before construction.

Between Design and Construction: Survey control for construction can be set after design surveys are complete, but before construction. I most often see this with a good construction manager or savvy contractor. They use this approach to get in front of potential construction surveying problems. Hopefully, before the heavy equipment arrives.

Immediately Before and During Construction: Survey control can be set immediately before and during construction. This approach has a couple of advantages. The first is the lower cost of design surveys. (In this approach, the project owner is moving the construction surveying control cost to the construction phase of the project.) The second is the close connection in time between the placement of the control monuments and actual construction. This closeness reduces the risk that control monuments will be disturbed or destroyed before construction. There are couple disadvantages to

HOW TECHNOLOGY IS MAKING THE PROBLEM WORSE

Major improvements in measurement technology is making this problem worse. How?

First, technology enables the non-surveyor to perform more layout of design improvements during construction. Although not inherently evil, this layout by non-surveyors can cause major problems on the construction site. Many of the modern measurement technologies are black box. The non-surveyors using them for layout don’t understand how they work. They also don’t understand basic surveying principles.

Second, technology now allows a surveyor to complete design surveys with much less control than was needed even two (2) decades ago. This means there are fewer control monuments from the design surveys available for use during construction surveying. For example: I recently completed supplemental surveys on a project site for a major infrastructure project. On this site the only primary control point set by the initial surveyor was an active GNSS station several miles away.

Third, design teams are now trying to integrate disparate geospatial datasets. Many of these datasets are publicly available. Most lack good metadata and information on their coordinate reference system. Project teams can use good survey control to tie these disparate datasets together, during design and then during construction.

this approach. The first is the way this option hides the cost of survey control for construction from the project owner. (This results in the civil engineer, design surveyor, and contractor all

“As you move closer to the start of construction, the risk of an unqualified person setting the survey control increases.”

pointing fingers at each other.) The second is the way it often leads to the wrong person setting the survey control for construction.

None of the above options are always “right” or “always” wrong. The best approach will change depending on the project, design team members, and construction team members. But, each option has advantages and disadvantages. There are a set of trade-offs; major problems occur when the project owner, design team, and construction team don’t discuss these trade-offs. They should agree on the timing of survey control for construction in advance.

Who Should Set Survey Control for Construction?

As mentioned above, the choice of timing for establishing survey control for construction can lead to a problem: the wrong person doing the control survey. As you move closer to the start of construction, the risk of an unqualified person setting the survey control increases.

Who Shouldn’t Set the Survey Control for Construction? Here is a short list:

- 1) The civil engineer. (They usually aren’t qualified, but often think they are. It’s just math, right?)
- 2) The construction manager. (They aren’t qualified either.)
- 3) The contractor. (They aren’t qualified, but think they are after your survey equipment vendor sells them the stuff.)
- 4) The point-and-shoot construction surveyor. (This is especially true on large or complicated infrastructure projects.)

Who Should Set the Survey Control for Construction?

There are two (2) options:

- 1) The licensed surveyor responsible for the design surveys.
- 2) The licensed surveyor responsible for construction surveys.

Because technology is removing the second option from most construction teams, the first option may be the only option. That means establishment of survey control for construction likely needs to be in the design surveyor scope-of-services.

Conclusion

Project teams can avoid phone calls like the two (2) examples used to introduce this article. This requires up-front conversations

WHAT IS CONSTRUCTION SURVEYING?

In this article I use the term “construction surveying” to refer to all types of surveying that supports the construction of heavy infrastructure. This includes construction layout (staking), monitoring surveys, and as-builts.

about who, when, and how survey control for construction will be established. Everyone (including the project owner) loses when the project team avoids this conversation. All project team members should agree on what survey control will be provided, what it costs, and who pays for it. Good land surveyors can help enable these conversations.

In a future article, I’d like to talk about how civil engineers’ responsibilities for survey control support construction. ●

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POLICY PAPER

Micah Lee Paulk

SB 865 and ASCE 75-22

“Commencing January 1, 2023, all new subsurface installations, except for specified oil and gas flowlines 3 inches or less in diameter that are located within the administrative boundaries of an oil field, be mapped using a geographic information system and maintained as part of the permanent records of the operator”- Excerpt from Senate Bill 865 (2020).

Former State Senator Jerry Hill (D) introduced Senate Bill 865 (SB 865) in January 2020 to “Build upon my previous work to strengthen safe excavation practices in our state.” Mr. Hill served the San Bruno district, which was the site of a gas pipeline explosion, resulting in the loss of eight lives and injuring 58 other people, as well as, \$1.6 billion in damages and the loss of thirty-eight homes. This explosion resulted from “grossly inadequate,” infrastructure safety.

According to Sarah Magruger Lyle, President and CEO of Common Ground Alliance, (a non-profit organization dedicated to preventing damage to underground utility infrastructure) (CGA) “Underground utility damages have an estimated societal cost of \$30 billion each year. With increased excavation activity and significant investment in infrastructure on the horizon with the passage of the 2021 Infrastructure Investment and Jobs Act, it is critical that the industry commit to taking concrete actions to address the inefficiencies within our industry and reverse this trend in damages.” According to the CGA, there were over 215,000 damage events in 2021 in the United States. A damage event is defined as “any impact or exposure that results

in the need to repair an underground facility due to weakening or the partial or complete destruction of the facility, including, but not limited to, the protective coating, lateral support, cathodic protection, or housing for the line, device, or facility. There does not need to be a release of product” (CGA, 2022, p. 9). For years many excavators have relied on poorly drawn, spatially inaccurate data, facility maps, or the work of utility designators that use pipe and cable locators to identify buried utilities leading to costly damages, injuries, and fatalities.

SB 865 seeks to remedy these less reliable methods of buried utility investigation by putting these utilities into geographic information systems. The policy change outlined in SB 865 is intended to prevent utility damages that can cause loss of life, injury, and increased costs associated with excavations for construction. Beginning on January 1, 2023, “all new subsurface installations, except for specified oil and gas flowlines 3 inches or less in diameter that are located within the administrative boundaries of an oil field, be mapped using a geographic information system and maintained as part of the permanent records of the operator” (SB 865, 2020). The goal of this regulation would be to create a digital model of all newly constructed utilities. When a new construction project begins that requires excavation, the buried utilities can be located accurately based on the geographic information system (GIS) that the operator is now legally required to maintain.

In 2021 California experienced over 9,000 damage events. If appropriately implemented by the utility operators, there should be a decrease in these types of damages. Over half of the damages in

California last year resulted from excavation or locating practices. With a geospatially accurate GIS database to determine the real-world location (i.e., latitude/longitude, horizontal/vertical datums) of buried infrastructure, there should be fewer utility strikes. With fewer utility strikes, there is less potential for injury and loss of life. It would also potentially save millions in repairs.

The law is mute when it comes to defining a geographic information system. As well-intentioned as this proposal may seem, there are inherent deficiencies when viewing the statute through the lens of a geospatial professional (in California this would be a licensed land surveyor in most cases). Referring to the bill's original text as introduced, it becomes clear that the author does not understand the language of geotechnical practices. “Commencing January 1, 2021, all new subsurface installations shall be tagged with GIS coordinates and maintained as permanent records of the operator.” There is no such thing as “GIS coordinates.” Even with the updated language, there still lies a myriad of issues with this law's vagueness.

There is no definition of “geographic information system” or requirement for what data is to be collected, and there is a wide gap between best practices and being simply in compliance with the law as written. Google Earth is a geographic information system. Should a utility operator seek to minimize costs and remain in compliance with the law, they would only have to create lines, polylines, points, and polygons depicting where their newly installed subsurface infrastructure. The law says nothing of accuracy or type of GIS which could result in more damages, injuries, and loss of life.

California is moving. With this movement comes considerable problems relating to accurate positional data related to buried infrastructure. Coordinate systems also present significant problems for utility operators that will be required to comply with SB 865. Many geographic information systems utilize World Geodetic System 84 (WGS 84) coordinate systems to map data. Engineering and surveying use the North American Datum of 1983 (NAD 83). Both systems were created in the early 80s, and at the time, there was not much difference in the geospatial position between the two. Neither adequately accounts for the rate with which California on the Pacific Plate is moving along the San Andreas fault. The shift between the two systems is 3-5 feet for land on the North American Plate alone. There are 3-5 centimeters of movement along the San Andreas Fault to the northwest each year. Extrapolate that movement over decades. Without the proper documentation of what coordinate system was used to collect/store the data, there is an extraordinary potential for more utility strikes.

To account for the movement the mapping requirement is date stamped with "epochs" with the datum in use. To state which datum used is not enough for California utility operators to create an accurate GIS depiction of their buried assets. An epoch is used to determine position based on a date (Maher, 2020). This ensures that surveyors or engineers can account for the movement of California when building infrastructure or attempting to determine the position of a fixed object on the earth's surface. Differences in epochs can also vary by several feet. Feet matter when using this data to relocate buried utilities. There is greater danger in an excavator thinking they know where a utility is because coordinates indicate the location than for the excavator not to know.

The law makes no provision for capturing important data like datums and epochs or its storage in GIS. On large projects with several utilities, there runs a risk of segmentation of GIS data, several epochs and datums, and various data formats have the potential to create further confusion and

conflict. If the as-built of the exposed utility is collected in NAD 83 (1991.35) but a person attempts to relocate after the utility is buried but is in NAD 83 (2017.50), they have an error over 3 feet. There is the potential to create silos of data with disparate standards, accuracies, oversight, and dissemination.

Further refinement during the rulemaking process would refine and dictate the standards for the uniformity of the data collection. The California Underground Safety Board (CUSB), empowered by the Dig Safe Act of 2016, can create rules and regulations related to Government Code 4216 (the code that SB 865 augments to require GIS for newly constructed utilities). The CUSB should engage the community of licensed land surveying professionals to produce rules that detail the appropriate data collection process. Standards should be established to record the location of subsurface utility installations during construction. There also must be a clearly stated way to exchange data among various stakeholders to ensure the data's legitimacy, timeliness, and accuracy. A licensed land surveyor must oversee and verify the pedigree of the data collected, and the CUSB should require their license number to be included in the data recorded in the GIS as maintained by the utility operator. Including geospatial professionals in the rulemaking process will ensure that the best practices are transparent and well-defined.

The American Society of Civil Engineers (ASCE) recently released a standard to create reliable data for geographic information systems, ASCE 75-22 (ASCE, 2022). ASCE 75-22 Standard Guidelines for Recording and Exchanging Utility Infrastructure Data is a standard that the Underground Safety Board should adopt for creating a uniform approach to collecting, verifying, and housing utility information (subsurface or above ground). If this standard were to be used by every utility operator, then it would create a baseline for the attributes and features that would be collected every time an

as-built of a newly constructed utility is completed. ASCE 75-22 requires collecting data related to utility type, feature type, component, horizontal spatial reference, vertical reference, horizontal accuracy level, vertical accuracy level, etc. Included in 75-22 is an attribute named "Certification Summary," where the credentials of the licensed professional would attach their information. The Underground Safety Board should require all utility operators to use this standard when recording into GIS and exchanging utility infrastructure data. Coupling the standards set forth by ASCE 75-22 with existing land surveying practices would improve buried locating activities. Boundary surveying requires the setting of monuments, a permanent marker affixed to the earth in some fashion, to establish things such as property corners, right-of-way, centerlines of streets, etc. The surveyor then creates various instruments like maps, legal descriptions, and corner records describing or showing the location of these markers for future surveyors to follow in their footsteps. These datasets become public records and are often available through county GIS websites with similar attributes and feature data as indicated in ASCE 75-22.

Secondary markers are affixed in curbs when setting monuments in areas that are likely to be disturbed, like the centerline of a road. These are direct ties to the monuments that define the legal infrastructure of ownership. When a street improvement project begins, a land surveyor will determine the position of the centerline monument and the measured relation to existing ties. This data is recorded in a preconstruction corner record. Street improvements often remove centerline monuments. Land surveyors reinstall the centerline monument with the aid of the remaining ties and preconstruction corner record. These ties are paramount in preserving the right-of-way, easements, property lines, etc.

The Board should create a regulation that requires setting "utility monuments" that act similarly to centerline monument

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HOW TO CHOOSE A LAND SURVEYOR: THE \$1,200 LOT SURVEY THAT DID MORE HARM THAN GOOD

(Why You Need to Hire a Land Surveyor That Acts Like
a Professional and Understands Your Problem)

S. Landon Blake, Redefined Horizons

Author's Note

To protect privacy, the names of the people in this story have been changed, as have minor facts and details of the events that occurred.

Introduction

I've always told my friends and family to call me before they purchase real estate. For most people real estate is a huge investment, and a huge risk. I offer to check the land title report, vesting deed, survey records, and tax assessor data for problems, at not cost. People usually call me after the purchase when they've discovered a problem. They rarely call me beforehand.

The Request for Help

Cheri worked with me as a drafter at a civil engineering firm several years ago. Her mom Pat was purchasing a parcel up in Sonora, California, a town in the Sierra Nevada Foothills. Cheri

was different from most of my friends and family. She didn't wait until after the purchase of the real estate for her mom to call me for help. Cheri asked me to look over the title report for any problems before escrow closed on the purchase.

I told Cheri I would be happy to help. We obtained a copy of her vesting deed, reviewed it, looked over the title report she provided, and pulled all the filed survey maps at the County Surveyor in the parcel's neighborhood. We also pulled the tax assessor data and reviewed the tax assessor parcel lines over recent satellite photography in the GIS provided by one of our land title company partners.

Good News from the Survey Land Records

I was surprised at what the survey land records told us. The parcel had been surveyed in the last 30 years and the property corner monuments had all been set. The surveyed parcel matched

the tax assessor map, the vesting deed land description, and the insured land description in the land title report. It seemed like a low risk transaction, except for one problem revealed by the tax assessor parcel data.

Red Flag on the Tax Assessor Data

When we examined the GIS parcel data from the title company, we could see a large fence encroachment into the subject parcel from a northern neighbor. It looked like they also had a very expensive multi-bedroom residence that was within the building setback and quite possibly crossing the parcel boundary. GIS data like this is often inaccurate, but we needed to look closer at this potential problem before Cheri's mom closed escrow.

I called Cheri and told her about the potential problem. I asked her to call her mom's real estate agent to see if she was aware there might be a significant

“The real estate agent quickly dismissed a serious boundary surveying and land title problem when it was brought to her attention and tried to minimize its impact on the buyer.”

property line encroachment. I told Cheri that Pat should hold off on the purchase until we got things figured out.

First Conversations with the Real Estate Agent

Cheri called me a couple of days later about the results of her conversation with the real estate agent. The agent said she was aware that there was some type of fence encroachment on the north side of the subject parcel, but assured Cheri and Pat this was “no big deal” and shouldn’t hold up the sale. She said, “all the neighbors are aware the fence is in the wrong spot and they are all okay with it.”

I was shocked at the way the real estate agent dismissed the major problem with an encroachment over the parcel boundary. Especially when the encroachment could involve a structure worth hundreds of thousands of dollars. I pressed Cheri about the conversation: “Did your mom’s real estate agent talk to the seller’s real estate agent about the problem? What did the seller’s agent say?”

Cheri told me the real estate agent was representing both her mom and the seller.

Now things started to make more sense. The agent was acting in a dual agency role, and didn’t want to lose the sale on the parcel because of the problem we’d discovered. “Have your mom tell the agent she isn’t buying without a survey and resolution of the encroachment,” I told Cheri.

The \$1,200 Survey

After a few days, Cheri called me back. She told me the seller had agreed

to split the cost of a survey with Pat. The survey had been provided to the real estate agent, Pat, and Cheri. But Cheri was confused. She didn’t think the survey told her what she needed to know about the possible encroachments.

I asked her to send me the survey. It showed up in my inbox that afternoon. It was a one sheet survey prepared on letter size paper, by some land surveyor I’d never heard of. There was no company name on the survey. The survey showed a fence, but no distances from the fence to the property line. The survey didn’t show the footprint of the house at all. It also didn’t show the building setback on either side of the property line. I quickly called Cheri about the survey. “How much did your mom and the seller pay for this survey?” I asked.

Twelve hundred dollars. That was the cost of the survey. A survey that answered none of the important questions we needed to resolve before escrow closed.

I asked Cheri what the real estate agent said about the survey. “She thought it looked good and wanted to know if we were ready to close the sale,” Cheri said.

Now I was starting to get angry. I told Cheri to call back the real estate agent that afternoon. “Tell the real estate agent she cost you a week of time and wasted \$600 of your mom’s money on a worthless survey. Ask her to call me so we can talk about three (3) things. Figuring out if we have an encroachment. Figuring out how we fix the encroachment by removing it or adjusting the lot lines. Figuring out who pays for the fix.”

THE PROBLEM WITH DUAL AGENCY REAL ESTATE BROKERS

This article illustrates a common problem with dual agency real estate professionals (brokers or agents). Dual agency real estate professionals have a very difficult job; they must protect the interests of both buyer and seller without being affected by conflicts of interest. In my opinion this is almost impossible to do. In this case, the real estate agent was quick to downplay the impact of a very serious problem because it would interfere with her ability to close a deal for her seller. A real estate agent representing the buyer in this situation may have shown more concern about the problem.

I always recommend to my clients that they are represented by their own agent when buying real estate. This completely avoids the conflicts of interest and problems that come when a real estate agent is trying to uphold their duty to protect both sides of a real estate transaction.

The real estate agent never called me.

Cheri visited the subject parcel with her mom a couple of days later. She said the land surveyor had marked the approximate location of the north lot line on the fence using some strips of flagging (surveyor’s ribbon). He didn’t set any missing property corners, he didn’t mark the building setback lines, and he gave no indication of where the neighbors house was in relation to the north lot line.

A few days after that, Cheri called me to say her mom had decided not to purchase the parcel. There were other problems, it wasn’t just the encroachment on the north lot line.

The Real Estate Agent’s Failure

How did the real estate agent fail in this situation?

WHAT THE BOUNDARY SURVEY SHOULD HAVE SHOWN

The boundary survey prepared by the surveyor in this situation showed the following important elements:

- 1) The dimensions of the parcel.
- 2) The property corner monuments found during his survey.
- 3) The property corner monuments he searched for but didn't find during his survey.

Despite this, the boundary survey was missing very important information.

This included:

- 1) The distances from the encroaching fence to the north lot line.
- 2) The distances from the neighbor's house to the north lot line.
- 3) The building setback lines.
- 4) The location of the neighbor's house in relation to the building setback lines.
- 5) The area of the subject parcel enclosed by the encroaching fence.
- 6) The area of the subject parcel, if any, under the footprint of the neighbor's house.

This missing information was critical to identifying and solving the problems of encroachment. Without this information, the money and time spent on the survey was wasted and of no benefit.

The real estate agent failed in three (3) main ways:

- 1) She failed to honestly represent her buyer and work to meet her legal duty to protect the buyer from harm.
- 2) She quickly dismissed a serious boundary surveying and land title problem when it was brought to her attention and tried to minimize its impact on the buyer.
- 3) She hired a land surveyor without explaining the questions she was trying to solve or the problem she needed to fix. This wasted the buyers' time and money.

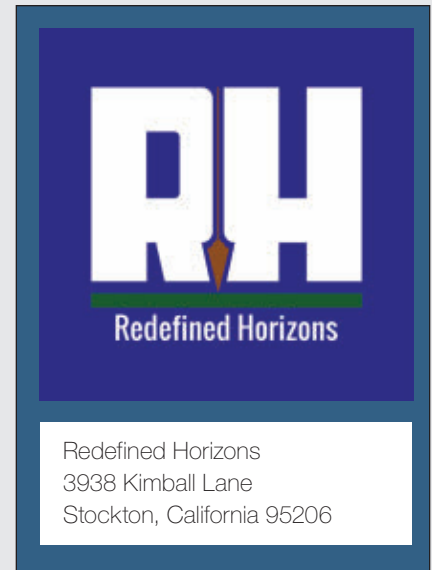
The Land Surveyor's Failure

How did the land surveyor fail in this situation?

The land surveyor also failed in three (3) important ways:

- 1) The land surveyor failed to ask the right questions. He didn't understand why he was being hired, or what problem his ultimate client (the buyer of the parcel) needed to solve.
- 2) He failed to show important information on this survey. This included the distance from the encroaching fence to the lot line, the distance from the neighbors house to the lot line, and the relationship

“The surveyor caused more harm in this situation than good. His survey provided all parties involved (the seller, the buyer and the real estate agent) that something beneficial had been done to address the encroachment problem. This provided a false confidence. In reality, the only thing the surveyor had done was spend his clients' time and money.”



of the fence and house with the building setbacks on each side of the lot line.

- 3) He didn't communicate possible fixes to his clients for the problem with the real estate. These fixes include removing the encroachment, performing a lot line adjustment, or granting a license or easement for the encroachment. He made the mistake many surveyors make by only discovering problems and not offering solutions.

I should mention the land surveyor wasn't negligent. He didn't do anything incorrect (as far as I could tell) when resolving the location of the subject parcel boundaries. He probably couldn't be disciplined in this situation by the state licensing board. However, he was incompetent at minimum and harmful to the buyer at worst. I'd also argue spending a client's money with no effort to actually solve their problem is unethical.

The surveyor caused more harm in this situation than good. His survey provided all parties involved (the seller, the buyer and the real estate agent) the impression that something beneficial had been done to address the encroachment problem. This provided a false confidence. In reality, the only thing the surveyor had done was spend his clients' time and money. He didn't identify the encroachment

THE CITY'S FAILURE

Before the neighbors large and expensive home was built, there was a failure on the part of the City of Sonora. As part of the building permit process, the City should have confirmed the home was being built inside both the lot lines and the building setback lines. How was the home constructed without this check? There could be several causes. The most likely cause is a failure by the City to require a survey on the site plan for the home prepared by the architect. Another likely cause is a failure by the City to confirm the foundation for the house was being built far enough from the lot lines during construction inspections it performed.

problem, he didn't describe it, and he didn't help solve it.

Lessons

What lessons do we learn from this story? How can this story protect future purchasers of real estate?

Here are the most important lessons:

- 1) When purchasing real estate, have a land surveyor you trust review the vesting deed, land title report, survey land records, and tax assessor data.

The surveyor may quickly identify a potential problem with the property that others miss.

- 2) Hire a real estate agent you know and trust, or one that is highly recommended to you. Pay the commission with a smile. A good real estate agent is worth that money.
- 3) Don't let your real estate agent represent both sides of the transaction. Find a real estate agent

“The surveyor... was incompetent at minimum and harmful to the buyer at worst. He also spent a client's money with no effort to actually solve the client's problem, which is incompetent, if not unethical.”

that will protect your interests and work as your advocate.

- 4) Hire a land surveyor that will ask the right questions and help you solve problems. If you don't, you can waste valuable time and money. ●

POLICY PAPER

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ties. When the installation of a new utility occurs, there must be documentation as outlined in ASCE 75-22 and an above-ground marker that is recorded as part of the permanent record of the utility operator. This monument will act as a tie to the buried utility with coordinates, datums, and epoch dates, all certified by a licensed land surveyor.

Trust, But Verify.

Future improvements that require excavation and the re-location of buried utilities will benefit from the surface utility monument. The cost barrier to acquiring high-accuracy global navigation satellite systems (GNSS) receivers has subsided significantly over the last five years. A field locator equipped with a GNSS receiver and coordinates from the various utility operators' GIS databases could “check” into the utility monument set during the installation process. If the position shows a discrepancy between the monument and what the GNSS receiver is indicating, the locator would know that there is an error somewhere in

the calculated position of the monument (maybe in the wrong datum). Of course, with standardization of data collection on the as-built side, there should be less chance of this occurring. Once the locating technician has successfully checked into the surface utility monument, they can confidently move to the buried utility position. The buried utility could be verified by utilizing geophysical equipment such as pipe and cable locators, ground penetrating radar, or potholing. This process would create a form of two-factor authorization to prevent future utility damage.

Senate Bill 865 has the potential to create positive outcomes when it comes to the future of utility damage prevention. Standards must be enacted that are overseen and qualified by licensed geospatial professionals. Horizontal and vertical datum shifts present a largely unaddressed problem with the changes to Government Code 4216 by SB 865. Fortunately, ASCE has created standards that can simplify and unify the execution of

creating a reliable geographic information system. The Underground Safety Board should embrace these standards and make them part of the Government Code to prevent future disasters related to improper locating or excavating practices. ●

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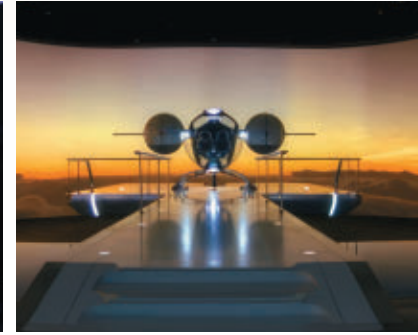
SURVEYING TECHNOLOGY IN THE FILM INDUSTRY

Mike Fink, Geomatics Engineering Student at Fresno State

Filmmaking is a costly and resource-intensive process that can involve hundreds of crew members over the course of months or years. A global army of Visual Effects (VFX) artists can recreate life-like worlds from their desktops, while a crew builds physical sets on a soundstage near the 405. The final production can be viewed by millions of people who will judge the quality of production with a critical eye. That one scene where Captain America's helmet has a tear in one scene but not in the very next can pull an audience member's attention out of the film and tarnish the movie-going experience. Surveying technology, perhaps unexpectedly, plays a key role in maintaining quality, realism, and continuity.

Many modern films employ a Set Surveyor to gather geospatial data for the pre-production and production phases, ensuring sets are built to "fit just right" and locations blend well with the film's altered environment. Working on the same film, VFX teams will employ LiDAR and photogrammetry to build digital sets and objects that will be added in post-production. Their use of surveying technology ensures that the film meets the viewers' expectations of quality.

During a film's pre-production phase, a Set Surveyor is likely to visit a location selected for filming to gather measurements and data useful for other crews. This can include site topography for set designers and VFX teams or spatial data on existing structures or features for lighting and camera crews. LiDAR data gathered on the



Figures 1 and 2 Soundstage projections used on the Mandalorian (left) and Oblivion (right). The use of photogrammetry and LiDAR can speed the process of creating immersive and detailed digital sets which will then be ready for soundstage projections.

FIGURE 1 TAKEN FROM [HTTPS://WWW.LUXMC.COM/OBLIVION/](https://www.luxmc.com/oblivion/) © LUX MACHINA.

FIGURE 2 TAKEN FROM [HTTPS://WWW.HOLLYWOODREPORTER.COM/BUSINESS/DIGITAL/VOLUME-HOUSE-OF-THE-DRAGON-STAGE-MANDALORIAN-1235244158/](https://www.hollywoodreporter.com/business/digital/volume-house-of-the-dragon-stage-mandalorian-1235244158/) © LUCASFILM LTD/DISNEY.

set will be sent to VFX houses to build digital set extensions.

In recent years, the VFX house Industrial Light and Magic has used LiDAR and photogrammetry data to digitize entire sets and project them in large soundstage projections, eliminating the need for traditional green screens and allowing the actors to better orient themselves in the film's imagined environment (Figures 1 and 2).

LiDAR and photogrammetry are also used by filmmakers to maintain continuity, another role the Set Surveyor may play during the production phase. Continuity is the purview of the Script Supervisor, and the Set Surveyor or a trained crew member assists the Script Supervisor by gathering location and orientation data on every item on a set—before filming and after filming a scene—to ensure nothing looks out of place when viewed by the audience.

In the 2019 film "Joker" by Todd Phillips, LiDAR was used to capture the geometry of an apartment set so digital elements could properly track on screen and the scene could be quickly



Figure 3: A LiDAR scan of the apartment in "Joker" was used to place digital elements so the actual set wouldn't be damaged and could be reset for later scheduled shots.

([HTTPS://BEFOREANDAFTERS.COM/2020/07/06/TALES-FROM-ON-SET-LIDAR-SCANNING-FOR-JOKER-AND-JOHN-WICK-3/](https://beforeandafters.com/2020/07/06/tales-from-on-set-lidar-scanning-for-joker-and-john-wick-3/)) © AURA FX.

"reset" to a pre-shooting layout for later filming. The film "John Wick: Chapter 3" by Chad Stahelski heavily utilized LiDAR and photogrammetry to digitize entire locations, preventing continuity errors filming challenging action scenes.

As television production is also increasingly "film-like" in production scope and quality, the need for professionals trained in surveying technology is increasing. What was previously an unexpected place to find surveyors may be your company's next project. ●

WHO (AND WHEN) IS THE INTENDED AUDIENCE FOR YOUR ROS?

Michael (Mikey) Mueller, California PLS 9076

A Record of Survey (RoS) is an amazing combination of a geometric proof, a treasure map and an op-ed essay. The ideal RoS includes all sufficient evidence to support clearly presented methodologies and can be easily and quickly understood by the viewer. And there is the rub. Who is the viewer? Records of Surveys are used by construction workers figuring out a setback, by lawyers to argue a point, by the homeowners walking their boundary, and finally by future surveyors trying to understand what was done to determine if it can be relied on. Trying to balance all of those perspectives is tough. However without defining the audience we will never reach a consensus on what should be included on a RoS. The ideal intended audience for a RoS should be an LSIT working 50 years in the future because of their uniquely defined position between a novice and a Licensed Land Surveyor.

The primary reason a surveyor prepares a Record of Survey is because someone needed to locate an uncertain boundary. As Curtis M. Brown wrote in his preface to the 2nd Edition of Boundary Control, "The Aim of the surveyor is first to know and second to appear to know." Putting the line in the right place satisfies the first aim, but it takes convincing the audience that it was done right to accomplish the second. At the end of the day, if a Record of Survey is not accepted by the

next surveyor, someone has not done their duty to their client, or profession.

Debates and discussions about what is too much or too little to be included on a RoS are predicated on the intended audience, but very rarely is it discussed and defined who the audience is. The debate about requiring a reasoning statement to be included on maps is a good example of what is really a debate about who is the audience.

Every surveyor believes that their RoS is sufficient for the reasons they consider important. Who thinks that they themselves prepare an insufficient map? Sufficiency is defined by the viewer however, so any discussion of sufficiency is really a discussion of audience.

On one end of the spectrum we can look to the PLS Act, which legally defines the audience in California to be "reasonable" per 8762(b)(3) and "intelligent" per 8764 (g). If the LS Act is correct, we can safely assume that only the most competent of a surveyor's peers are the audience of a RoS, so a couple lines with measured distances between a few found objects is sufficient. These competent peers know the area and each other's reputations and will understand what was left unsaid and why. If any questions arise, they will simply call up and ask.

Empirical evidence does not support that optimistic of a view about who is actually using the maps. Let's all go ask

Benson which sections he messed up and how.

On the other end of the spectrum is the homeowner who doesn't understand any acronyms, has no background in math or survey theory and has no experience reading maps, then the RoS would be required to explain everything. Every measured line would list all of the other record measurements with notes why they are different. There would be a thorough and complete legend that explains all terms and acronyms, like "BLM" or "chain." All steps in the logical process from evidence to solution would be laid out with references to the source laws and manuals for any boundary theory utilized. Every RoS would have multiple pages and cross references with a small essay explaining the thought process of the surveyor.

Budgets, tradition and common sense do not support this view either.

The two extremes above show the problem in trying to talk about sufficiency without first defining the audience. If the perfect amount of sufficiency in the RoS is not achieved then logically it is either over-sufficient, also known as redundant, or it is in-sufficient, also known as ambiguous. If adding an extra note increases the chance that someone will understand what was done, the negative costs of redundancy are small compared to the large benefit of sufficiency. While that

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FILE MANAGEMENT FOR SURVEY ORGANIZATIONS – BEST PRACTICES FOR A CLOUD FIRST APPROACH

S. Landon Blake, Redefined Horizons

Introduction

I started my small surveying business with two (2) part-time team members and two (2) computers. This was a month before COVID-19 shut down the US economy. The COVID-19 shutdown gave my baby enterprise one of its very first challenges:

How to enable access to company files and job files when I couldn't have my two (2) team members in an office.

Two (2) factors led me to solve this problem by taking a “cloud-first” approach to file management for my small surveying business. The first was my familiarity with tools like Google Drive and Dropbox from my personal life. The second was my frustration with the lack of flexible access to files I'd experienced at large engineering companies. (The IT

departments at these large engineering companies were definitely not focused on meeting the needs of mid-level managers like myself).

My small surveying business is nearing its fourth anniversary. Over that period, we've found the cloud-first file management approach forced on us by COVID-19 to be a great fit. It is very unlikely we will ever buy and maintain a traditional on-site file server.

In this article, I'd like to share six (6) best practices for taking a cloud-first approach to file management in small surveying businesses.

The Benefits of a Cloud-First Approach to File Management

Before we talk about the four best practices of a cloud-first approach to

DEFINITION OF CLOUD-FIRST FILE MANAGEMENT

What does “cloud-first file management” mean? In this article, I use the phrase to mean a system for creating, deleting, storing and accessing files where an external server managed by a third party (the cloud service provider) plays a major role. (Many of these services allow the team member to interact with the operating file system as if the cloud service was largely invisible.)

file management, I wanted to briefly list the benefits:

- 1) A cloud-first file management system tends to be more robust and convenient than a “sneaker drive system” (a sneaker drive is a USB thumb drive run around by a guy in sneakers to share files between computers). Ditto for a system that resides primarily on a single hard drive of the main desktop computer in a small business.
- 2) A cloud-first file management system is simpler and less expensive than a traditional on-site server. (This is because large companies with deep expertise and economies of scale are managing the file servers.)
- 3) A cloud-first file management system supports anywhere-anytime access to company files and job files. This makes a lot of sense for small surveying companies with hybrid workers or field surveyors that aren't always in a central office.

FEATURES OF CLOUD SERVICE PROVIDERS

There are several features of cloud service providers you should evaluate when selecting a solution for your cloud-first file management system:

- 1) Cost. Cost varies significantly from provider to provider, and between subscription packages offered by the same provider.
- 2) Reliability. Downtime from your cloud-service provider is very expensive for a small business with a cloud-first file management system. Know who you are purchasing from. Don't abuse a personal cloud service as a cloud service for your small business.
- 3) Versioning and backups. Not all cloud service providers have file versioning and back-up. Different subscription packages may offer a different level of versioning support. For example: The number of back-ups available or the length of time a back-up is made available.
- 4) Software integrations. There are cloud service providers that will integrate (almost) seamlessly with your computer operating system. Others can only be accessed in a web browser. Some will have support for access on mobile devices with dedicated apps, while others won't.
- 5) Complexity. The level of configuration and customization in a cloud service provider is usually directly tied to its complexity. Most surveying small businesses without a dedicated IT person should start simple with a “fully managed” service.

COMPANY FILES VERSUS JOB FILES

In this article I use the term “company files” to refer to files used to run your business that aren’t directly related to technical work on a job. For example: Files related to human resources, bookkeeping, or marketing. I use the term “job files” to refer to files used to accomplish the technical services that are part of a job. For example: CAD drawings or data collector files. Frequently, these two different types of files will need to be handled differently in your file management system.

Best Practices

Here are the six (6) best practices for a cloud-first approach to file management for small surveying businesses:

- 1) Carefully evaluate your choice of a cloud service provider. Don't just use the provider that you've been using for your personal life. It might not be a good fit for your business. Don't just focus on the bottom line monthly fee. Each cloud service provider has multiple subscription options with very different features. Take the time to be an educated business consumer.
- 2) Recognize you may need more than one type of cloud service provider for file management. For example: My company uses one service provider for internal file management. We use another service provider to allow large-file downloads for clients and business partners.
- 3) Create a plan for physical back-ups. Bad stuff happens, even to Microsoft and Google. Servers get hacked. Data centers catch on fire. Your four-year-old niece gets on your phone and deletes all your job folders. Enable swift recovery from these disasters with a regular physical data backup. At my company, we have a regular weekly schedule of backups to external hard drives. This means we never have more than a week of data at risk from a major disaster.
- 4) Help your team members understand how and when to access files. Not all team members will need the same type of access. For example: Field surveyors may need to access files on a mobile device while away from the office. Office surveyors may not. High-level managers may need access to business documents from home, but your CAD technicians may not. Develop a blueprint defining how each team member will access files on the cloud service, then teach them how to do that properly.
- 5) Talk to an IT professional. This doesn't have to cost \$20K. You can find qualified IT professionals online. Many of them will consult on your transition to a cloud-first approach for very reasonable fees. It is worth the money to talk to an expert. Don't be like the homeowner who tries to draw their own tentative land subdivision map.
- 6) Plan for sync issues and other gotchas. A cloud-first approach to file management isn't without tradeoffs or risks. We are still working on solutions to sync issues and other gotchas at my company, even after four (4) years. Things aren't going to work perfectly – especially at first. Consider a phased roll-out.

Conclusion

It has never been easier to enable robust, simple, and anytime-anywhere access to company files and job files. If implemented carefully, a cloud-first approach to file management can greatly improve the security, reliability, and productivity of your small surveying business.

In a future article, I hope to share more with you about the potential gotchas of a cloud-first approach to file management and their solutions. ●

WHO (AND WHEN)...

Continued from page 27

cost benefit ratio may not be as good as Pascal's Wager, it's a nice insurance policy on your reputation.

When a map is lacking the notes and reasoning that convince the audience it was done correctly, then the RoS becomes just a treasure map. Its only use will be to help the field crew create search points, and recover those monuments or calculate their position when they are obliterated in the future. The existence of such a treasure map is nice for the aid in monument recovery, but if it makes another surveyor feel obligated to file a new RoS, it does not satisfy the second aim by convincing those who follow in their footsteps.

When drafting your next RoS, imagine a LSIT working 50 years in the future and consider the merits for why that individual is the best intended audience. An LSIT has proven that they know basic geometry, common terms and surveying practices which sets the bar of sufficiency at a common national level, but it is below the level of a Licensed Land Surveyor. This means it is safe to use basic acronyms and not be misconstrued. If the map has sufficient information for the LSIT to understand the methodologies employed to resolve the boundary, then theoretically all licensed surveyors will understand the map. The future LSIT will be unable to

ask questions of the authoring surveyor and will only know their competence through hearsay or experience with their maps. This means the RoS can't rest on the inertia of a good reputation but must be sufficient unto itself. The LSIT will have access to mentors to ask about unusual situations or terms so not everything is required to be spelled out.

The RoS is at the pinnacle of our professional skill set and is often sold for thousands of dollars for a single new monument or one line. By leaving no question in the mind of those who come after us that we put that line in the right spot, we will have aimed correctly and hit the bullseye. ●

BUSINESS BOOK REVIEW – THE END OF COMPETITIVE ADVANTAGE

S. Landon Blake, Redefined Horizons

Introduction

I devour business books. I read them, I listen to them in audio form, I highlight them and make notes in the margin. It is a borderline obsession—why?

Because even the best land surveyors are usually horrible businesspeople. (The same principle applies to civil engineers.)

Running a successful surveying and mapping business (or organization) is a huge challenge. It is deeply complex with many facets. Several business books have fundamentally changed my approach to the business of land surveying – and even the way I think about the world around me.

In this article, I'll briefly review a business book I just finished listening to titled, "The End of Competitive Advantage."

About the Book

The book is written by Rita Gunther McGrath. She is an American strategic management scholar and [professor] (<https://www.wikiwand.com/en/Professor>) of [management] (<https://www.wikiwand.com/en/Management>) at the [Columbia Business School] (https://www.wikiwand.com/en/Columbia_Business_School). She is known for her work on strategy, innovation, and entrepreneurship, including the development of [discovery-driven planning] (https://www.wikiwand.com/en/Discovery-driven_planning).

McGrath is also the founder of the innovation platform [Valize] (<https://www.valize.com/>).

The book is published by Harvard Business Review Press.

The physical copy of the book I purchased is just over 200 pages. It is black and white, with a few charts and tables, but not pictures. It features assessments that you can use to evaluate your own business.

Table of Contents

The book has seven (7) chapters. In the first chapter, the key concept of the book is stated and explained. Chapter 2 explains how organizations need to continuously reconfigure. Chapter 3 talks about how to exit a line of business in a healthy way. Chapter 4 talks about improving the allocation of resources within a business. Chapter 5 talks about how to build innovation capabilities in your organization. Chapter 6 explains the mindset leaders need in a world of transient advantages. Chapter 7 discusses the impact of a world of transient advantages on individual careers.

The First Chapter

The first chapter of the book is the most important – and it provided me with the most value. It opens with the story of Kodak film company and its eventual bankruptcy. After this story, it explains the key concept of the book:

"The fundamental problem is that deeply ingrained structures and systems designed to extract maximum value from a competitive advantage become a liability when the environment requires instead the capacity to surf through waves of short-lived opportunities. To compete in these more volatile and uncertain environments, you need to do things differently."

Chapter 1 also contains two (2) key diagrams. The first diagram is a comparison between two different views of competition. The first view of competition is primarily between different players in the same industry. The second view of competition is primarily between a much wider group of companies in broad "arenas." The second diagram shows the different phases in a wave of transient advantage.

The chapter concludes with a set of questions you can use to evaluate your own business based on the key concept in the book.

Other Highlights of the Book

This book is like many other business books. It seems to be written in a way that benefits larger organizations more than small ones. Despite this, I found valuable nuggets or insights in every chapter. For the typical surveying and mapping organization, I'd most strongly recommend a careful read of these chapters:

Chapter 1: This chapter holds the key concept of the entire book. The information in this single chapter is worth the purchase price.

Chapter 2: Very few small businesses operate in a static marketplace. This chapter helps you think about ways you can enable your business to be more flexible.

Chapter 5: Most surveying businesses aren't like Google or Apple. But the most successful ones embrace technology and think about how to innovate for their clients. This chapter helps you think about how you can become better at innovation within your organization.

Chapter 6: Banks are conservative and stodgy. Software start-ups are fast and reckless. Surveying businesses need to be somewhere in between those two (2) extremes. This chapter helps leaders of surveying businesses identify where their mindset about competition may need to adapt to a more quickly changing competitive environment.

Conclusion

"The End of Competitive Advantage" wouldn't be in my list of the top three (3) most important business books for land surveyors, but I thoroughly enjoyed it. The book was well written by Rita. She is intelligent, thoughtful, and attempts to base her conclusions on careful research and study. She also fills her book with useful examples, both good and bad. If you believe running a surveying business will continue to rapidly change over the next decades, add this book to your reading list. ●

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