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## editorial

## The More Things Change...

opefully, you should be able to finish the statement above. The same is true here at the magazine. I'm pleased to announce that Jason Foose will assume the role of editor. I will still be heavily involved in my new role as Emeritus, but after 24 years of survey magazine publishing, my health is such that it's difficult for me to travel. Enter Jason. If you've been following, he has traveled all over the country to write about important industry events and more. And I shouldn't have to remind you that Jason's skills as a boundary surveyor are excellent and he has been banging that drum nonstop.

In an era when we are watching what always required a surveyor slip away, it's critical that the drum we bang with the public reminds them that we are the keepers of the cadastral quilt and that we help protect what is usually their largest single investment. Mark Contino from Topcon told us long ago that every

#### ...we are the keepers of the cadastral quilt..."

ten years or so, pundits predict the death of surveying. Yet here we still are. While it's true that non-surveyors are rapidly taking over topographic surveying with drones, there's still a vital place for us in data assurance. The stories we hear about amateurs taking a stab at datums and coordinate systems will ensure this. This, and boundary surveying, is our area of expertise to lose.

Another sea change in our society is the end of "free stuff." I'm sure many of you can remember the days when you could buy a USGS quad sheet for \$1.25. Now, you don't even have to buy them, but you do have to print them yourself. Likewise with magazines. We don't yet know what the future holds for *The American Surveyor* as to whether it will remain free, but one thing's for sure, the magazine will continue to bring you all aspects of surveying, including application articles. It will also include articles pertaining to history and legal aspects, as well as other subjects surveyors are interested in.

Again, I am not going away, but I've found that events and company visits have provided most of the grist for what I've written, and Jason will continue that tradition. I want to thank all of you who have supported me—and you know who you are—at the magazines I have edited. Without your support none of it would have been possible. I have no doubt that I have achieved my goals: to inform, educate and celebrate surveying.

In closing, I would like to give Jason an opportunity to say a few words: "American Surveyors are historical anomalies. We are the rugged and practical men and women that have forged the greatest nation in history from backwoods cabins and taken it all the way to the moon. Our divine function is neither scientific nor academic. We are the noble guardians of a free society where the land ownership rights are free of caste or feudalism. You the reader are part of that elite corps and *American Surveyor Magazine* is your mouthpiece. We are committed to our endearing bond with you as our partners to delivering empowering educational content. Our contributors lay down the straight dope on implementing the industry's latest and greatest tech in the real world. The professional and legal contributors continue to deliver personal education content to your doorstep every month. Rest assured that we will continue to bear and wave the flag of our beloved profession through the media of *The American Surveyor*."



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## decided guidance: case examinations

## Checovich v Cochran

e are in for a special treat this month. Our case takes us to Section 2, Township 10, Range

7 of old T-Jeff's original s.w.a.g. at peddling simultaneous title tiles. Yeah, "that" Range Seven as in the First Seven Ranges. Now before you "PLSSers" get too puppy humpy here, I gotta put on the daddy pants and spoil the party. There's nothing rectangular about these parcels. In fact, they are indiscriminate metes and bounds tracts. But wait, that's not all! The manual of instructions adopted by the court was neither blue nor federal. It is the Minimum Standards for Boundary Surveys provided by the Ohio State Board of Registration for Professional Engineers and Surveyors and encompassed in Ohio Administrative Code Chapter 4733-37. So now I quote with tongue in cheek from last month's trip to Colorado in Gaines v. Sterling "that no state can make any rule or law providing for apportionment contrary to Acts of The Congress... except where Steelers and Bengals fans commingle, then all bets are off, per T-Jeff."

First things first. We are reading an appellate level case. I believe there's still one more step up to the Ohio Supreme Court. So don't banty this thing around the chicken yard until you understand the difference.

I think the defendant started to offer a good test of law. He was first in line at the recorder's desk and the description does not appear to have any patent errors. I'll break his argument down with some color commentary from yours truly. "(Cochran) argued the court should only consider the most senior conveyance from the parent parcel in order to fix the boundary..." Solid gold baby and we all know senior rights are senior, right? You can stop right there Cochran, we get your point. Oh, wait, you have something to add? Continue on please "...and should not consider an iron pin placed by Neitzelt..." Well, I guess we might not if your senior right controls and the pin was set with the junior survey, but carry on anyway "...as monuments should only be relied upon when deeds have been analyzed and do not resolve the conflict." Ummmm, would the defense consul care to climb back into its flying saucer and return to whatever the hell planet you came from? Honestly, I am not qualified to say if that legally helps or hurts but it sure does sound a little buck toothed and bow legged to be the prom queen at my high school. The argument is rounded out with Cochran urging the court "...to adopt the "senior rights theory" adopted in other states, including Michigan, Kentucky, and Maryland." Really? Ohio houses twelve cadastral systems that are dependent on both sequential and simultaneous conveyances. I find it mystifying that from 1803 until 2016 there was no judicial recognition of a "senior rights" theory in Ohio. Especially considering that a large chunk of the state was indiscriminately subdivided by Virginians in colonial fashion. I'm not sure why Cochran felt the need to go "outa state" to prove his point but he did, so que sera sera. Here's what the court threw back at the appellant and mind you I've rolled these all up into one bundle and used a triple asterisk as a delimiter. "As stated by the Ohio Supreme Court, it is well settled that monuments are of prime importance in settling boundary disputes... \*\*\*Further, generally, in determining boundaries, natural and permanent monuments are the most satisfactory evidence and control all other means of description, in the absence of which the following calls are resorted to, and generally in the order stated: first, natural boundaries; second, artificial marks; third, adjacent boundaries;

fourth, course and distance...\*\*\*In Sellman, the (court) held that where (a survey) has been made by a certified surveyor and a plat is made and duly recorded, the boundary lines determined by original monuments will determine the boundaries of the respective lots irrespective of deviation from the course or distance as set forth in the plat...holding where a survey of a parcel of land has been made by a certified surveyor and a plat is made and duly recorded, the monuments placed or ascertained, and boundary lines established by such monuments in the survey, are thereafter controlling...\*\*\*In making a resurvey it is the surveyor's duty to relocate the original lines and corners at the places actually established and not to run independent new lines, even though the original lines were full of errors." Oh, okay now I see why one might creatively look outside the box and play the millennial's "Yeah but we're special" card. And another thing, Michigan? C'mon, really? You know Chief Justice Cooley and Bo Schembechler are lurking in a corn field just north of Toledo waiting to kick this argument's ass back across the state line.

Okay the devil is in the details here and both the common pleas/appellate courts did a fantastic job sorting out the actual boundary. The bottom line is that the original survey was for both parcels and conducted by the same surveyor at the same time under the authority of the same grantor. Physical evidence of the original grantor's intent was readily identified by the same original monumentation. The court observed "In this case, the Neitzelt survey, made by a certified surveyor, established the boundaries of the properties via an original monument, an iron pin. The parties do not dispute the iron pin was placed on the boundary line by Neitzelt or that these boundaries have been followed



since Neitzelt's original survey. Thus, the boundary lines determined by the original monument, the iron pin, will determine the boundaries of the respective lots and it is the duty of a re-surveyor to relocate the original lines and corners at the places actually established and not to run independent new lines. Both the Taylor and Hamilton (1996) resurveys are in line with Ohio Administrative Code Section 4733-37-02, the well-established Ohio case law. "

Jack Hamilton P.S. retraced these descriptions a mere four years (1996) after the original Neitzelt 1992 survey. Apparently Hamilton readily surveyed through the deed ambiguity between adjoining descriptions and held the original Neitzelt monument. Taylor revisited the scene a decade plus later in 2008 and did the same. Life's all green and groovy from that side of the fence. Sailing did his survey for Cochran in 2016. Sailing fully disclosed the original Neitzelt line and called out both Hamilton's and Taylor's reliance on that line. He also held the deed description which reflects the conflict at hand. In contrast Taylor showed no conflict with Cochran's deed description despite his call for the adjoining deed on the plat. Hamilton did call out the 200' discrepancy between measured and record in 1996, so there was no secret about it when Taylor showed up. Honestly, let's assign blame where the blame lies. Neitzelt simply had a bad day in 1992 and pushed some bum paper to his client. His field work stood but unfortunately his written bust was promulgated all the way through a recorded conveyance which was supported by his closure and matching acreage.

I don't agree with Sailing's opinion but I do respect his obligation to support his client's otherwise valid deed. It's apparent that Sailing had both prior retracement surveys. He was fully aware of the discrepancy in 2016 and wasn't just blindly deed staking by the numbers. Unfortunately the recordation of Neitzelt's blunder in 1992 created a legacy of ambiguity on Cochran's side of the line and raised some really good questions. Why didn't Neitzelt call out the iron pin in the senior deed? Why wasn't a corrective deed recorded if there was an error found in 1996? Cochran is holding a senior deed that closes on its calls with an area that matches exactly. Best I can tell nobody reached out to Cochran's predecessor's at discovery to resolve the conflict. Hamilton barely noted it and Taylor ignored it whereas both were employed by the opposing interest. In hindsight those circumstances look very lopsided and are ripe for the common pleas court of Guernsey County to settle the confusion.

There's a necessary role with a surveyor supporting Cochran's claim and I'm getting a vibe that the court confused the minimum standards with a difference of professional opinion. Sailing showed the monuments, recorded surveys, deeds, and further went on to clarify the disputed area. His work seemed to effectively convey the evidence in court. If it was flawed shouldn't it have been barred from evidence? Hmmmm? According to my tally Sailing's map is the only one that defines the extent of the conflict. So I'm not sure why the court felt compelled

to knock the snot of him over his opinion. There was a genuine ambiguity here and the authoritative evidence led him to an alternate conclusion. Interestingly the court cited Ohio Administrative Code 4733-37-02(B), "after all necessary written documents have been analyzed, the survey shall be based on a field investigation of the property. The surveyor shall make a thorough search for physical monuments, analyze evidence of occupation and confer with the owner(s) of the property being surveyed. In addition, the surveyor shall, when necessary, confer with the owner(s) of the adjoining property and take statements." I saw no evidence of Hamilton conferring with Cochran's predecessor when the error was discovered in 1996. I don't see evidence of Taylor tripping over this conflict in his research on his map either. On the contrary Sailing's survey reflects both owners' interests in the conflict. This storm was brewing since 1992 and the owners found the opportunity to get it settled in 2016. Everybody needed Sailing's survey to iron things out.

What about the attorneys who defended Cochran's platform in court? Yeah, I was pretty cynical earlier but there's not a peep from the court about any sort of substandard defense is there? Of course not and that's out of respect for the defendant's rights and the process. That's why this case is intriguing. The defendant's surveyor did a complete survey and followed the evidence through a reasonable but alternate construction. The historic evidence was shown and considered on his map. The ambiguity was subjectively identified in previous surveys but the owners were apparently not included in a formal agreement or remedy. The defendant's survey was the first to detail the defendant's long overlooked concern. Despite the court's implications regarding Sailing's effort I am affording him the same respect as those attorneys get in recognition of due process. Feel free to contact me at *rls43185@gmail.com* with your thoughts and opinions.

Jason Foose is the County Surveyor of Mohave County Arizona. He originally hails from the Connecticut Western Reserve Township 3, range XIV West of Ellicott's Line Surveyed in 1785 but now resides in Township 21 North, Range 17 West of the Gila & Salt River Base Line and Meridian.

## OF REMOTE SURVEYING

>> MICHAEL BRUNO

Phil Richards stands on a drill pad and prepares to collect drill collar measurements at one of the 2019 prospect sites. The grey material is drilling spoils. PHIL RICHARDS

ustralia's largest state, Western Australia (WA), occupies an entire third of Australia, a land mass that totals the combined land area of the three largest US states: Alaska, Texas and California. Considered the resource-rich engine room of Australia, WA contributes an estimated 58 percent of Australia's Mineral and Energy Exports, according to the Department of Mines and Petroleum, and provided 25 percent of the world's iron ore extraction in 2012.

With 92 percent of its 2.6 million inhabitants living in the southwest corner, home to the state capital Perth, the rest of WA is reminiscent of the "Wild West"—sparsely populated towns with little infrastructure, rugged terrain and a kaleidoscope of reds,

#### A smart way to increase your profit line."

greens, coppers and browns that stretch into the horizon. In short, when someone pictures the Australian outback, they're picturing WA.

That same wild beauty and remoteness can also make surveying a less-thanbeautiful experience.

"The outback of WA is a real test on my adaptability and logistics skills," says Phil Richards, a professional surveyor and associate director with Perth-based RM Surveys. "It can take 1.5 days to get to your first site and once there, you're totally isolated with no resources—and climate conditions that can range from 0 to 50 degrees Celsius. The sparse, rugged road systems make navigating anywhere a long journey. And if the weather turns bad on your job and you didn't plan well, you could be completely stranded."

In addition to the natural unpredictability of the outback, there are significant technological challenges that add to the complexity: limited mobile phone service, time-consuming RTK base station set ups,

inconsistent RTK cellular or radio communication, and geodetic control points that are difficult to access.

Advances in precise point positioning (PPP) technology, however, have been helping to resolve these obstacles and enable surveyors to optimize their real-time productivity without sacrificing accuracy. For Richards, who specializes in remote surveying work, this modern GNSS enhancement has helped bring a little tameness to the wilds of WA, enabling him to increase data collection efficiencies, reduce costs and boost the company's bottom line.

#### THE CASE FOR A NEW APPROACH

With his aptitude for remote surveying, much of Richards' project work in WA has been in support of heavily active mining companies. For example, for the past 15 years, one iron ore producer has contracted him to travel more than 600 km from Perth to measure exploratory drill hole collars. Drill collars, the remnants of drilling

🕲: Trimble.

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Drill collar numbers and recorded RTX 3D positions are saved in a Trimble TSC3 controller. PHIL RICHARDS



A chunk of banded iron stone. Western Australia has some of the biggest deposits of banded iron formations in the world.

activity, are 3-mm-thick segments of PVC, about 150 mm in diameter, which protrude about 300 mm out of the ground at typically a 60-degree angle. Measuring the center of that above-surface collar is a crucial stage in the exploration process to enable the client to develop a geological model of their mineral resource underground. Managing ten prospect sites across 300 km, the number of drill holes could vary from year to year, but often they would have up to 100 holes spread out over a few prospects at a time. Since 2007, Richards has been using Trimble<sup>®</sup> R8 and, more recently, Trimble R10 GNSS receivers and RTK technology to acquire the drill collar measurements.

On average, each prospect is 5 km by 2 km and has its own coordinate network. Depending on the number of collars and distance to each, Richards would set up an array of RTK base stations (between two and nine) on known control points to set project control. Using his Trimble GNSS receiver, he'd either drive or walk to each drill collar, set the foot of the range pole on the center of the collar at ground level, take a reading and record the measurement in Trimble Access™ field software on a Trimble TSC3 controller. Although the need for multiple base stations had added hours onto the projects, the RTK method consistently provided the needed accuracy.

#### X HITS THE SPOT

In 2015, the iron ore company restructured its mineral exploration program. Rather than drill large numbers of exploratory holes across a few prospects, the new focus was to drill a fewer number spread over the entire project area. That was going to be problematic for Richards' traditional RTK routine.

Holding the Trimble R10 and Trimble TSC3 controller, Phil Richards captures an RTX 3D position of a drill collar for the 2019 campaign. PHIL RICHARDS A typical road in the WA outback. Given the rough terrain, even short distances can take hours.

"Previously, when it was predominantly surveying and less traveling, the RTK approach worked well for the project, even though setting up base stations is time consuming," says Richards. "But when that switched to less surveying and more traveling, continuing with RTK was going to increase costs because each time I have to set up my base station, that's an extra hour. If I have 10 drill-collar zones, that's 10 hours. And if my base station is 10 minutes away, it adds more time and expense if I have a problem with it, or I can't get a reliable signal, and I have to travel back to it to fix it or move it. The reduced number of collars and the increased distances between them required a more efficient method to make the project profitable."

Richards's ideal solution was one that would enable him to use a single GNSS receiver system, much like working within the VRS networks available in the more populated areas of Australia. The approach would give him mobility and flexibility in the field and consistent real-time GNSS measurements.

He began testing other solutions, including Trimble's CenterPoint® RTX correction service. CenterPoint RTX is built on a

> Camp chef Phil Richards prepares breakfast. Phil Richards



Phil Richards carefully removes the Trimble R10 GNSS receiver from his truck. Richards would use the drive time to the site to initialize the CenterPoint RTX positioning solution. PHIL RICHARDS. network of GNSS tracking stations around the world that stream multi-frequency, multi-constellation data to the company's network control centers. Advanced data processing algorithms analyze the three main error sources: satellite orbits, clock offsets and atmospheric effects and develop models and correction data. This information is delivered to GNSS rovers via L-band satellite communications. The rover combines the correction data with its own satellite observations to produce accurate positions.

Richards ran five trials in conjunction with varied exploration surveys to test the reliability, efficiency and accuracy of the RTX approach as a viable alternative





With the CenterPoint RTX solution ready, Phil Richards uses the Trimble R10 GNSS and Trimble TSC3 controller to calibrate project control with existing control. PHIL RICHARDS

#### INTO THE OUTBACK

Secured in time for the 2015 drill collar project, the R10 and CenterPoint RTX technology have been Richards' core technology for each campaign since.

"With Trimble RTX, I can get right to work as soon as I reach my first drill collar site," says Richards. "I don't need to spend time with a base station so I'm much more mobile and that alone can save me a whole day's work. I'm not limited by distance or the base station's signal. It's a brilliant tool and it's a game changer for remote surveying."

In 2017, Richards was contracted to survey 40 drill collar holes dotted around all ten of the client's prospects. Richards and his colleague mounted the R10 GNSS receiver on their vehicle and set out for the first site at sunrise on a September morning. About 30 minutes from arriving on site, they activated the CenterPoint RTX and monitored the initialization via Bluetooth from inside the cab. With the RTX solution initialized and ready to go, Richards carefully dismounted the R10 and set the range pole onto a control point he previously established to calibrate site control. He navigated to the first stake indicating a collar, verified the collar number given, set the R10 on the center of the collar and via the TSC3's Trimble Access software he entered the collar number and recorded the RTX 3D position. He then moved on to the next stake and followed the same routine, repeating it 39 times over 2.5 days.

"With the distances involved and the large area we're working in, the RTX really comes into its own for this project," Richards says.

to RTK. Choosing different test sites across 1,000 km of terrain, he took RTX measurements of survey control points with his R10 and compared them to the same positions acquired with RTK. Although the CenterPoint RTX can take up to 15 minutes to reach sub-2 cm horizontal accuracy in WA, Richards says the technology regularly delivered on performance. Most importantly, this technique would enable him to work without a base station and obtain real-time GNSS positions with centimeter accuracy anywhere—even in isolated WA.

Based on the trial results, he adopted Trimble's CenterPoint RTX technology to integrate into his survey workflows.



"If I had had to use an RTK approach, and set up multiple base stations 10 different times, it would've added at least another day to the job. If you take all the driving out of it, we reduced 10 hours work of actual surveying time to one hour. That savings not only pays for my yearly CenterPoint RTX subscription, it's a smart way to increase your profit line."

They processed the data back in their office in Perth. The measurements were verified and input into a spreadsheet for the client.

For the 2019 campaign, Richards and a colleague were contracted to acquire accurate 3D positions for 13 drill collar holes stretched across two major prospects that are about 150 km apart. Their area of interest (AOI) was about 700 km northeast of Perth.

Starting from the small WA town of Cue, they drove to the first prospect about 60 km away, using the travel time to initialize the CenterPoint RTX positioning solution. Within the 15-km-wide area, they had to acquire measurements for eight drill collar holes. They calibrated the R10 receiver to the nearest control point to tie into the site's coordinate system and moved through the area, methodically recording positions of each collar hole. Despite the relatively few collars to measure, it took Richards and his colleague about five hours to collect the data because the rough terrain made the site difficult to navigate.



A road sign indicates the way to Cue, a small town 700 km northwest of Perth and the starting base for the 2019 campaign.

PHIL RICHARDS

With daylight still in their favor, they drove to the next prospect, which contained five holes at significant distances apart. By the time they reached the site, they could only complete one hole, so they camped out on site and measured the remaining four holes the next day. All told, they finished both prospect sites in 1.5 days—a project that would have taken 2.5 days had they used RTK.

"Given the project format, with so much travel time and less surveying time, RTX is really the only way to do it," says Richards. "It's far quicker than setting up base stations—I saved 50 percent of the time using RTX on this campaign. I am more efficient; I'm able to keep costs down; and I have the confidence in the system that I know I'll deliver on accuracy. It's hard to justify using any other method."

Indeed, while there is little Richards can do to reduce travel times in the remote areas of WA, venturing into the wild with a proven and cost-efficient tool that can produce real-time, centimeter-accuracy positions in seconds is a reassuring advantage for staying competitive.

Editor's note: According to Richards, there have been no adverse effects of the bushfires in this area to date.

**Michael Bruno** is the Market Manager for Trimble Advanced Positioning.

The desolate, dusty road to a prospect site 200 km down the track.

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HE HOODTSTEPS DF THE CENTRAL PACIFIC SURVEYORS

>>> C. BARTON CRATTIE, PS

#### The Survey—it was a charmed life for the time.

nma Ferona Pierce Judah penned these words in a recollection of her husband, Theodore Dehone Judah, some 26 years after his death. Because of his surveys through the Sierra Nevada mountains in the late 1850's and his untiring efforts in
 Washington, DC, our country was joined from the Atlantic to the Pacific by two thin ribbons of parallel steel. (See American Surveyor; Vol. 9, No. 5; 2012; Pacific Railroad Crazy). "Of the many competing ideas for the Transcontinental Railroad, a clear path was created in the early 1860's through the vision and advocacy of two prominent figures: Theodore Judah and Abraham Lincoln" (display in the Utah state Capital building June, 2019, celebrating the 150th anniversary of the golden spike). Don't forget Ted Judah and Abe Lincoln were both surveyors.

The story begins with the author on the campus of the University of California—Berkeley seeking information on the Judah's. On the uphill walk to the Bancroft Library (September 11, 2019), a group of students was encountered. One, a young lady, was wearing a U.S. Army t-shirt. All carried small American flags that were being placed in the ground in a geometric pattern. Wow! At U.C. Berkeley? One cannot do a Judah pilgrimage without a visit to Berkeley and the Bancroft.

The actual Beginning Point of the Central Pacific Railroad (CPRR), though, was on the levee at Front Street in Sacramento, California (January, 1863). Sacramento is also the Capital of the state and the venue of the California State Library. More research.

From Sacramento, the road (and me) effortlessly headed eastward, following the line surveyed by T.D. Judah. The line then hit the mountains. The genius of Judah was mastering



The phantom of a road, once there, follows the tines laid by the surveyors. So close to Promontory, Crocker and Strobridge (CPRR) made the 10 mile bet, knowing that Durant and Casement (UPRR) had "not enough room . . . for them to outdo me."



The Summit of the Sierra. "Our line is carried down along the side hill of the spur... immediately above the lake with a grade of 105 feet per mile." T.D. Judah. Judah's grade is at picture right. I-80 is to the left.

the grade of the road. At the time, 100-110 feet per mile was accepted as a maximum grade. Judah's challenge was to route a road, climbing 7000 feet with the distance from base to summit being 81 miles. Judah's grade never exceeded 105 feet to the mile. This was accomplished by some remarkable engineering feats for the time.

Leaving Sacramento, on Interstate Highway 80, I made the trip to Auburn, California and an interesting feature within a seemingly normal suburban neighborhood. Here, once hailed as the eighth "Wonder of the World," is the Bloomer Cut. By today's standards, at 68 feet deep and 800 feet in length, it is not so impressive. However, it was this location that the CPRR realizes and appreciates the importance of the contributions of the Chinese workers on the road. The cut remains virtually unchanged and is in use daily by the railroad 154 years following completion.

Next stop, the Red Frog Lounge in Colfax (formerly Illinoistown), where I enjoyed a cold one on an expansive deck gazing at Cape Horn. Cape Horn is an amazing instance of railroad surveying and engineering. Take a bunch of ice cream cones and turn them upside down. Now, build a railroad through them. Cape Horn is a road having a curve with a delta angle of nearly 180 degrees, winding around a cut bluff 1200 feet above the American River. A second line was tunneled and the road widened over the years. Other than that, very few changes have been made from Judah's original survey.

It is at the summit of the Sierras, above Donner Lake (yes, those hungry Donners), that Judah's choice of line proved practi-



Drilled and blasted February, 1864 to May, 1865, the Bloomer Cut, a major construction feat for the time, is still used today, nearly identical to its original appearance.



Excavated by nature, the Palisades served as a natural cut for the Pacific Railroad survey location parties. Here the Humboldt River has carved a natural route through some major Nevada mountains near Elko.

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HRMS	0.005ft	95%	0.015ft	95%	0.025	
VRMS	0.007ft	90%	0.012ft	90%	0.0231	
GPS	7.6	85%	0.010ft	85%	0.0191	
GLNS	6.1	80%	0.009ft	80%	0.016	
Per Point	1534.01 sec	75%	0.008ft	75%	0.015	
		68%	0.008ft	68%	0.013	
		50%	0.006ft	50%	0.010	

#### John Evers "Awesome Precision" "All shots are comprised of 7 engine resets for phase 1, 180 seconds phase two, no

validation. open sky T3 base and LS rover. 85% within 0.01' horizontal, and 0.02' vertical. I have never seen anything like this when using my T2 base."

#### Darren Clemons "big ole tree"

"5'+ across white oak - the LS is within about 2" of being flush with the trunk got a fully validated, verified shot and a check within about 8 minutes...."

The new TLS2TLS and more features see inside >>



学业 教学 准 保 人

## Total Solution Bridge to RTK



J-Mate is a bridge between RTK and areas that GNSS signal is not available.

Direct up to 300 feet

 Remote (Robotic) up to 150 feet

## **TLS2TLS**



You can send and receive text messages and files from and to other TRIUMPH-LS units. In the Main screen click TLS2TLS and then in the "Compose" screen, click and

enter names and serial numbers of the TRIUMPH-LS units that you want to communicate with. You

can attach Projects, Screenshots, Images, Audio, GNSS RAW files to your text messages and send to the selected TRIUMPH-LS units.

The received messages are shown in the first screen. You can "Import" the attached files, if any, to your local unit. Click "Reply" to reply to a message.

You can reply to received messages by clicking the "Reply" (only to sender) or "ReplyAll" (to all recipients) buttons.

You may receive "Public" messages from JAVAD GNSS team. You do not to reply to them.

### **Connecting the TRIUMPH-LS to the J-Mate**

Let's set the record straight: J-Mate is not a totalstation. J-Mate and TRIUMPH-LS together make the "Total Solution" which is a combination of GNSS, RTK, camera, angle encoders and laser range measurements that together do, conveniently and cost-effectively, a lot more than a total station. For long distances, you use GNSS and for short distances (maximum of 300 feet in Direct mode and 100 feet in Remote/Robotic mode), you use the J-Mate along with the TRIUMPH-LS. Together they provide RTK level accuracy (few centimeters) in ranges from zero to infinity.

TRIUMPH-LS communicates with the J-Mate through Wi-Fi. Turn on both the TRIUMPH-LS and the J-Mate.

Click the Setup icon on the TRIUMPH-LS Home screen and click "J-Mate" to connect to J-Mate.

The J-Mate SSID will be in JMatexxxxx format, where

xxxxx is your J-Mate's serial number. After Wi-Fi connection is established, click the "Collect" or "Stake" icons according to your job.

As with the TRIUMPH-LS, with the J-Mate we also provide software improvement updates regularly and free of charge. Download the J-Mate update in your TRIUMPH-LS and then inject it to the J-Mate.



Recall / Manage				
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Recall / Manage	Create	🔲 Copy As		
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#### Your Own Complete RTK & Optical

Setup TRIUMPH-3 on top of J-Mate. Set up TRIUMPH-LS on top of the Zebra rod.

TRIUMPH-3 is the RTK base station and TRIUMPH-LS the RTK rover. J-Mate is the optical base station and the Zebra rod is the optical rover.

Now RTK and optical solutions are available simultaneously and can verify each other's solutions. They also can cover each other, when one is not available.

RTK has six engines. We treat the J-Mate solution as the seventh engine of the system.

The system is self-sufficient for all jobs. No need to pay RTN service providers for RTK base stations and no need to pay communication service providers. The communications are done via integrated and included Bluetooth, UHF, and Wi-Fi embedded in the system.

Another major advantage is that because your own RTK base station is not far from your rover, RTK solutions will be provided much faster and more reliably.

We added the "Aim" option for stake-out. In this mode J-Mate points to the selected stake

00:00:01 2ep \* Disconnect Stop Base 1s Rover:Triumph-LS 9DT\_00383 ок 🗳  $\overline{\mathbb{Y}}$ оĸ Base ID: ---Base:TRIUMPH3 00002 Default Setup [Auto] Base29 Default Setup Base ID: 459 Ref. Frame: WGS84(ITRF2008) Format: RTCM 3.0 MSM4 ... Period: 1 Sec Frequency: 462.12500 MHz Mod.,Band.: DQPSK, 25.0 KHz Out. Power: 50/17 mW/dBm Guards: 50/MG, 5°, 5cm 55°47'54.86328"N 037°31'14.87028"E 426.4078m WGS84(ITRF2008) @2018.5000 2D Delta:4.26 m ∆ H:2.65 m Azimuth:272.85 Ant.Height:0.0 m Vertical DPOS From Base To Base Recall Done



point and you follow the laser to reach the intended point. This is in addition to the robotic mode which J-Mate follows your Zebra pole.

At TRIUMPH-LS = 2.13 kg (4.40 lb), TRIUMPH-3 = 1.26 Kg (2.20lb), and J-Mate = 2.17 kg (4.41 lb), the total package of 5.6 kg (11.02 lb), weighs less than one conventional optical total station alone.

J-Mate does have complete geodetically encoded scanning (3 points per second) and robotic features too.

#### J-Field, the Embedded Controller

J-Field is the embedded application program of TRIUMPH-LS. It has the following unique features for each point surveyed:

• Six parallel RTK engines to maximize solution availability.

• Automatic Engines Resets, verification and validation strategy.

• Several graphical and numerical confidence reports and documentation.

• Voice-to-text conversion for hands free operation and documentation.

- Lift & Tilt and automatic shots for hands free operation.
- Visual Stakeout (Virtual Reality).

• "DPOS it" or "Reverse Shift it" features. The most advanced RTK verification.

• Photogrammetry and angle measurements with embedded cameras.

- Automatic or manual photo documentation.
- Automatic screen shots documentation.
- Audio files for documentation.
- Automatic tilt correction.
- Scanner feature.
- Find objects by their shape, by laser or optical.
- Comprehensive HTML and PDF reports.
- Comprehensive codes, tags and drawing tools.
- Status of all GNSS signals and their quality.
- Over 3,000 Coordinate Systems.
- Automatic and free software update via Internet.



#### Take Backsight with a Single Shot



To calibrate the J-Mate, take few seconds of RTK at the Backsight point, and click "Backsight" button. There is no need to locate Occupation Point and the Backsight point, because Occupation point is the RTK Base station and one point is enough to determine the azimuth to calibrate the J-Mate angular encoders.

J-Target		J-Target Custom	0	Triumph-LS O	Search Tul	beO	Target Setup			
Measure	0	Corner	0	SNAP O	SCAN	0	Target Type	Zebra	Codemark Size	113.5 mm
Tube		(			(		Zebra Diameter	47.0 mm	Zebra Stripe Height	26.1 mm
J-Target set	J-Target settings details:						Zebra White stripes C	Count 3		
Side Flaps		Top Flaps		Bottom Flaps	Verify size					
Width 0.	166 m	Height 0.	166 m	Wing Span 0.226 m	Wing Dept	<b>h</b> .025 m				
Esc			Sa	ve		ок *	Esc			ок

#### **Backsight with Auto SunSeek**



2 Deg

Logging ... stage 5

Dea

Don't forget the Sun filter. Take Occupation Point for backsight Take Backsight Point, use Occupation Point J-Mate is at Base. Take Backsight Point **Ocupation Point by Resect** Take Sun-Seek for calibration

Take Compass for test

Esc

Scan Right

Test Log Stop

2.5 Deg



Click a button and after

a few seconds Backsight

will be calibrated with the

Sun AUTOMATICALLY.

> >

>

> >

>

See details at www.javad.com

Scan Left

Test Log Start

2.5 Deg

Back

JM: 21:08:16:863

#### **Light Weight, Low Cost**

#### Costs 1/2, Weighs 1/2 and works much better than conventional total stations and RTK systems.

Complete RTK Base & Rover. Complete controller and software. Complete optical system. Free updates. Robotic & Scanner... ...all under \$40K



#### And it all fits in a small carrying bag.

#### **Six RTK Engines Auto VERIFY**



Smart assignment of satellite signals to different engines.

This vigorous, automated approach to verifying the fixed ambiguities determined by TRIUMPH-LS gives the user confidence in his results and saves considerable time compared to the methods required to obtain minimal confidence in the fixed ambiguity solutions of other RTK rovers and data col-

lectors on the market today. The methods required by other systems are not nearly so automated, often requiring the user to manually reset the single engine of his rover, storing another point representing the original point and then manually comparing the two by inverse, all to achieve a single check on the accuracy of the fixed ambiguities. Acquiring more confidence requires manually storing and manually evaluating more points. Conversely, J-Field automatically performs this test, resetting the multiple engines, multiple times (as defined by user), provides an instant graphic display of the test results, and produces one single point upon completion.





## **TRIUMPH-3**

The new TRIUMPH-3 receiver inherits the best features of our famous TRIUMPH-1M.

Based on our new third generation TRIUMPH chip enclosed in a rugged magnesium alloy housing.



The TRIUMPH-3 receiver can operate as a portable base station for Real-time Kinematic (RTK) applications or as a receiver for post-processing, and as a scientific station collecting information for individual studies, such as ionosphere monitoring and the like.

It includes options for all of the software and hardware features required to perform a wide variety of tasks.

- UHF/Spread Spectrum Radio
- 4G/LTE module
- Wi-Fi 5 GHz and 2.4 GHz (802.11 a, b, g, n, d, e, i)
- Dual-mode Bluetooth and Bluetooth LE
- Full-duplex 10BASE-T/100Base-TX Ethernet port
- High Speed USB 2.0 Host (480 Mbps)
- High Speed USB 2.0 Device (480 Mbps)
- High Capacity microSD Card (microSDHC) up to 128GB Class 10;
- "Lift & Tilt"
- J-Mobile interface



#### Ideal as a base station





Most probably the greatest surveying achievement for the CPRR crews, The Summit Tunnel. Surveyors, using equipment of the time set line and grade from each end and then sank a central vertical shaft to begin lines in both directions toward each end, at grade.

cable. A pharmacist and part time surveyor, Doc Daniel Strong, presented this route to Judah. After their initial survey, Judah and Strong realized they had finally found a route that would bind New York and San

Francisco as close neighbors. A route over the Sierras was now, indeed, practicable.

Off I-80, take the Soda Springs exit. Pull into the Donner Summit Resort parking lot on the left. Walk across the highway and enter into the splendor of the Chinese laborers' efforts in 19<sup>th</sup> century tunneling.



T.D. Judah's compass displayed in Sacramento, the California hometown of Ted and Anna. COURTESY OF THE CALIFORNIA STATE RAILROAD MUSEUM

CPRR tunnels 6, 7 and 8 (numbered from the west) are open to the public. Tunnel 6 is the "Summit Tunnel", 1659 feet long, the longest on the line. It was bored and blasted through solid granite. The "Associates" in Sacramento were unhappy with the lack of progress. A shaft was dug from above and excavation began in four directions. A locomotive named the "Sacramento" was disassembled and hauled to the summit to remove the tailings from the center tunneling efforts. The "Sacramento" was renamed the "Black Plucked Goose." Bolts used to secure the engine are still in place and the shaft is now covered with a steel plate.

further difficulty of location ceases . . . with a uniform decline, not exceeding 40 feet per mile." Judah died from malaria (it's a long story) in 1863 at the age of 37. Samuel S. Montague, Judah's assistant, became the Chief Engineer of the CPRR. Judah never witnessed rails on the summit or racing along in the high desert of Nevada.

It is truly a joyous experience to walk

the summit overwhelmed with the view of

Donner Lake one thousand feet below and

second summit of the Sierra and the Truckee.

Judah writes

(1861) "Our line

is carried down

of the spur or

along the side-hill

ravine immediately

above the lake . .

. with a grade of

105 feet per mile

this to 88 feet on

the summit. The

Truckee (River)

thus reached, all

(Montague reduced

the final road) from

then gazing into Nevada to the east, the

Right around 50 miles east of the summit, into Nevada, is the spot every man and woman rejoiced and celebrated following their dreams west in the mid-19<sup>th</sup> century. Truckee Meadows equaled succor, sustenance and salvation. clean water. good pasture. The horrible desert was now behind. Time to replenish and fatten

#### FROM T.D. JUDAH'S **PRACTICAL PLAN** (JANUARY, 1857) (EDITED)

upon which it is proposed to construct a line, and carefully examines the ground with reference to the proposed location. He notes its character, water-courses, ravines, undulations of the ground, crossing points for rivers and decides the general course of the line. This done, he organizes a party, composed of what is usually termed a transit and leveling party.

The business of the transit party is to run a line over the route indicated, measuring distances with a chain, and taking courses or direction of the line by compass or goneometer (a transit with two telescopes mounted above one and the other on the same axis to enable measuring the angle twice for a check), leaving stakes every one hundred feet . . . as guides for the leveling party. The results are put on paper and gives . . . a correct representation of the line, showing curves, tangents, the crossing of roads, rivers, farms, townships, names of land owners and all points of interest along the line.

The leveling party follows the transit party, and runs, with the utmost accuracy, a line of levels, touching upon each stake, taking observations of the undulation of the ground. . . This plotted gives what is called a profile . . .

A topographer is also furnished, whose business will be to sketch topography, taking notes of every feature presenting itself.

Another leveling party is provided for the purpose of running a test level. The consequences of an error . . . on so long a line of surveys would be so annoying ...

... the Engineer ... knows that ... this will be over level, open country, offering no obstacles, and that an ordinary party, on preliminary surveys, will make three miles per day without difficulty ...

**HE ENGINEER** in charge of the survey goes over the country



One of the many remaining wooden culverts from the original road. Nick Montoya and Maybe Baby make the same traverse over the same trestle that many a CPRR train made prior to the Second World War and the Lucin Cutoff over Salt Lake.

up the livestock. The Meadows are now called Reno. There, I met up with Ray and Mary Root, two exceptionally fine Virginia surveyors. Ray is a former Vice-President of the Surveyors Historical Society (SHS) and Mary is the editor and soul behind "Backsights", the venerable journal of SHS. There, they joined me, following the Truckee and the Humboldt on our way to Utah and the Golden Spike.

With the summit conquered, surveying became much less difficult. no more mountains to cut, fill, trestle or tunnel. Surveying got easy, but not the same for railroading. For 500 desert miles, look around. A locomotive must be fed. It consumes wood or coal. A steam locomotive perspired thousands of gallons of water in a hundred miles. A cross-tie is made of wood. For 500 miles of desert, none of these materials are available. The CPRR had mastered the Sierras and were constructing a road on relatively flat terrain but water, rails, cross-ties, fuel and food for the workers had to be carried over the summit into the desert. Water alone could be a nightmare for a dispatcher. Cars with horizontal cylindrical tanks (like an aspirin) were constructed. Car after car full of cord wood climbed the Sierras, feeding the iron beasts on their eastward route.

Leaving Reno, the Truckee River heads north to Pyramid Lake. Between there and Humboldt Sink, there is no water, only alkaline. The Humboldt River had water that would foul a boiler and kill the livestock if they could even consume it. The eastern traveler in the mid 19<sup>th</sup> century crossed (endured) what was known as the 40 mile desert, usually traveling at night and resting during the daylight hours. An 1850 survey made on this 40 mile stretch noted 1061 dead mules, almost 5000 dead horses, 3750 cattle and 953 graves. A railroad would alleviate these tragedies. On open ground, a well supplied surveying crew could cover some ground though.

Leaving Reno, our first memorable stop was Wadsworth. Here on the original grade of the road is a beautiful through-truss (1907) bridge, no longer in use but usable. In places, the original grade is obvious (cuts and fills) and in others, even a practiced eye can miss it. I-80 through Nevada, seen on a modern day map, resembles a sin curve. The highway generally follows the route of the CPRR chosen by Montague, ambling north and south, avoiding the many mountain ranges dotting that state. In good company with fellow surveyors, we spent two days on the 410 miles across Nevada.

Off I-80, to the south, take the first left past the school. Beowawe, Nevada, a few run-down buildings and a major railroad crossing. In about 40 miles of driving, a number of times we appreciated my choice of a four wheel drive rental Jeep. This road was not on a map or on the GPS receiver. Twice, we annoyed a cowboy, driving a small herd of cattle down the mountain, I guess to winter pasturage. Once, we had to open a gate to go down into a valley to cross another through-truss bridge decked with fairly rotten 2 x 12's, crossing the Humboldt and paralleling another steel bridge carrying



The massive memorial to Judah is found in the old town of Sacramento. It was near this location that Judah introduced the plan for a cross country railroad to Stanford, Huntington, Hopkins and Crocker, later, the "Associates".

the tracks of the road. It was a ride never to be forgotten, especially in the end. The Palisades. What an amazing geologic feature. Sheer bluffs rising above the winding Humboldt River and the now two sets of rails of the Pacific Railroad. With reluctance, we left the Palisades and headed to Elko.

Elko is home to Great Basin College. Great Basin has probably the largest enrollment in a Surveying and Geomatics program than any other University in the country. At last count, I was told they had 140 surveying students, mostly on line. Here, we met up with surveying student Nick Montoya and his wife, Emily. We had



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Produced by Diversified Communications

a hearty family style dinner at a Basque restaurant, named The Star. Leaving the restaurant, Emily pointed out, just down the road and over on the next block, two legal bordellos. This ain't Georgia.

#### FROM CAB TO CABOOSE (JANUARY, 1857) (EDITED)

full size surveying party in open country ordinarily consisted of from thirteen to sixteen men. Their function was to produce a map and profile of the line, together with topographic information. We lived in tents. I never knew a cook who didn't sleep in the cook tent. Maybe it was warmer . . . or possibly he had lost confidence in humanity. The cooks on these parties were generally pretty good and the food was plentiful. Most of the camp cooks could turn out good meals, but it was exceptional to find one who didn't have an irascible disposition. Whatever caused it, they were, as a class, hard to get along with. One morning during the cold winter . . . one of the chainmen burst into my tent and demanded, "Say Noble, can we get along without a cook?" I stopped lacing my boots. "I guess I didn't understand you. What did you say?" He repeated the question. I said, "Of course not. What brought this up?". "Well," he said, "my feet were pretty cold when I got up so I went to the cookstove, and was warming my feet and lacing my boots when Franklin began cursing me and yelling for me to get out of his kitchen. What he said to me I won't take from anybody and if it will not inconvenience you. I'll just kill the bastard." He was dead serious, so I said, "It would inconvenience me considerably. We are fifty miles from a town or railroad, in the middle of a blizzard, and have fifteen men to feed. Let's go talk to Franklin."

—Joseph A. Noble; "From Cab to Caboose"; University of Oklahoma Press; 1964 Very early next morning, Nick and his pooch "Maybe Girl" followed us eastward into Utah. At Oasis, we left I-80. Nick brought his drone, a DJI Mavic Pro, and man, did we get some great pictures of a wye that was not discernable from our ground level vantage point. A drawback on this route was that about 90% of it was in military restricted airspace. No pics there.

Once again, at Montello, we were on gravel headed for Lucin, Utah. Lucin is where the railroad split in 1904 and headed southeast to cross the Salt Lake. The original route, our route, winds north of the Lake. During the Second World War, the rails were pulled. Our road is now the "Central Pacific Railroad Trail Scenic Backway". For ninety miles, we rode the grade and for a full ninety miles there was nothing to see but desert and sky. I think it was the first 17 miles that was a tangent. Not much of a challenge for a surveyor.

On the "Backway" one travels on the grade of Montague's original road and is detoured from the wooden culverts that still stand at creek crossings. Mind you, this is a desert but there are a number of these wooden culverts, most in pretty good shape. At one time, there were at least 23 thriving towns between Lucin and Promontory. Now, there's nothing. Each place there was a siding or wye, a town grew. Now, there are only foundations, trash or dump sites and grave yards. One forgotten town, Watercress, had a pond with cattails. The water actually was flowing from a pipe routed from the mountains far off to the north. What an amazing 19<sup>th</sup> century site in this desert.

Ever eastward, we passed the old town sites, catching glimpses of the Great Salt Lake to the south. Flat deserts and all tangents, Monument Rock is a must. From Lucin to Promontory, there is only one major cut. We drove the ten mile grade that Strobridge's crew laid the rails upon in one day, winning a bet that was never paid. Here, the remaining culverts are stone. Also here, are the notorious parallel grades the Union and Central Pacific railroads built, taking the taxpayers' dollars, both being paid by the mile of grade constructed, not rails laid. Suddenly, we found ourselves at Promontory. T.D. Judah wasn't there for the driving of the golden spike (1869), having died six years earlier. His name was never even mentioned during the ceremony. The spike was driven on May 10, Anna and Ted's wedding anniversary. We drove through Promontory, on to Salt Lake City.

There, the Surveyors Historical Society were holding the 21'st annual Rendezvous. My duty was to present a paper. The subject? Nobody other than Theodore Dehone Judah, the *raison d'être* behind this fantastic journey of beauty, fellowship and surveying history.

**C. Barton (Bart) Crattie, LS, CFS, CFM** is winding it down dragging chains and carrying transits. Next: maybe some more writing, teaching and carrying the Certified Floodplain Surveyor program nationwide. Please write if you are interested.



Following the footsteps of the CPRR surveyors. A trek from Sacramento to Salt Lake City, joined here and there by great friends. (L to R) Mary and Ray Root, both LS's, both from Virginia; Bart Crattie, LS, Georgia and Nick Montoya, working on that LS, Elko, Nevada. Oh yeah, Maybe Baby too.





### A MORE EFFICIENT WAY TO MAP

Crafton Tull employed both the mdLiDAR1000 and mdMapper1000DG to map a seven-mile corridor and save a customer more than 50 percent in the process.

Professionals responsible for geospatial data collection should consider mdLiDAR and mdMapper for the following tasks.

- · Corridor mapping
- · Mining (volume calculation)
- · Construction site monitoring
- · Environmental changes (time series)
- · Forestry
- · Contour mapping
- · Leveling/Excavation
- $\cdot$  Highway construction

"We've worked with other UAVs in the past but what we're seeing with the Microdrones integrated system is superior. Since we've been using the mdLiDAR1000 we've gained several new customers and clients who are giving us repeat business. The investment has definitely been worth it."

JEFF DAVIS, UAV SURVEY COORDINATOR, CRAFTON TULL



Complete this easy online form to start a conversation with us: lp.microdrones.com/webinar-drone-based-lidar-replay



he numbers are pretty impressive: in the U.S. alone, it takes more than 200,000 miles of high voltage transmission lines (eight times the circumference of the Earth) and 5.5 million miles of local distribution lines (24 trips to the moon and back) to power our daily lives. On a project in Sonoma county for PG&E, James Neill, one of Surefire's newest QA/QC line inspectors, uses a total station to conduct a line sagging operation.

The lines are seemingly everywhere, and maintaining that grid—which includes everything from stringing new line to repairing existing ones to periodic measurement of key components—can be a herculean task. The measurement and documentation components of that list are two of Surefire Consulting's key specialties and, by embracing the use of robotic total stations, the company has streamlined that process, improved on-site safety and dramatically raised the accuracy of the product it presents its customers. Guaranteed: that is no line.

#### Surefire Startup

Based out of Temecula, Calif., Surefire Consulting is the brainchild of Frank Flores who, along Chad Lueck, Randy Allred and Mark Ramos, was working as an inspector on a project called DPV2 when inspiration to strike out on his own hit him.

"The full name of that job was Devers/Palos Verdes Circuit 2 and it involved construction of more than 180 miles of new transmission line," said Ramos, one of Surefire's current principals. "Even though each of the

#### >> LARRY TROJAK

At a substation for Los Angeles Dept. of Water & Power, Surefire's preliminary surveying efforts establish distance measurements to calculate the length of line needed to reach from one of the towers into the substation.

**Inset:** A view through the sight of the Topcon IS-3 on a sagging operation in the California desert in which an original line was being reconductored.

Right out of the gate, we were able to generate a product that showed contractors that we were far different from anyone else they might have worked with in the past."

four of us had different roles in that project, we all had a similar drive, shared the same vision for where we wanted our careers to go, etc. It didn't happen immediately, but in 2006 when Frank called to say he was starting his own company, we committed without hesitation. It was obvious to us all that he understood the hoops we had to jump through working under these large contract managers and, just as importantly, knew what needed to be done better."

To be clear, the functions each of the men performed differed, but included work measuring sag on the transmission lines themselves, effects upon the tower structures, placement of the foundations, etc. Collectively, however, it was all done in support of a contract manager—or managers—who, in turn, worked for the utility. "Frank saw the potential we all had to do the job better and acted on it," said Ramos. "I, personally, could not pass up the chance to get in on the ground floor of something this exciting—obviously Chad and Randy felt the same way."

#### Looking to Grow

Fast forward to the present and the Surefire Consulting of 2019 is an established, minority-owned, fully-integrated construction management and technical service company. With specialties in providing quality control and quality assurance (QA/QC) inspection for utilities throughout the state, the company currently has nine employees and is poised for additional growth.

"We are actively looking to hire at least two or three additional personnel and feel that is just the start," said Ramos. "There are some very big names in California power distribution-some of whom we are already doing work for in a different capacity-who are interested in what we do and how we do it. Because we are still a relatively small company, that could be a huge step for us."

Small size notwithstanding, Surefire benefits from being a union shop working through locals in both southern and northern California—and being certified as both a Small Business Enterprise and a Minority Business Enterprise.

#### Have Gun, Will Travel

While the Surefire crew knew the things they needed to do differently with their newlyformed company, they also embraced what had worked for them in the past. Using total stations for asset measurement easily topped that list. Working through Chad Dickey and TopoElement, the local Topcon dealer, Flores, Ramos, et al, upped that performance capability with Topcon robotic total stations, FC-2500 field controllers and the software to gather their data. Doing so, said Ramos, truly separated them from the pack.

"Right out of the gate, we were able to generate a product that showed contractors that we were far different from anyone else they might have worked with in the past," said Ramos. "Chad Dickey was able to help us hit the ground running and, to this day, has provided outstanding support to us. Most of the jobs we focus on are still, to a large extent, either being done using outdated manual techniques or using equipment that is lacking in precision. Using our Topcon guns we are able to offer a level of quality and precision that definitely turned heads."

He added that each of the four men involved in the startup already had a familiarity with the Topcon line, having used non-robotic models with their previous company on some line sagging work. However, they quickly discovered that the newer robotic solutions far outperformed even those units.

#### **Confidence Booster**

In a perfect world, we would be able to compare similar products head to head to objectively decide if we'd made the right purchase decision. Ramos said they've had several opportunities to do just that to prove the advantages the newer Topcon

James Neill in the Napa Valley forest area on a sagging operation for PG&E. Using the total station, he is able to verify whether or not minimum phase-toground clearances are being maintained in order to be compliant with federal regs. solutions bring to a jobsite and have not been disappointed.

"We were working alongside a crew that was using a different total station in a sagging operation," said Ramos. "The contractor, apparently lacking total confidence in them, asked us to double check their work. So I went out and met with that crew and saw that they were having trouble catching the conductor to get the shot. We set up the IS-3 and were able to nail every shot—with far greater accuracy—every time. We presented our work to the customer who looked at our numbers and promptly told us to finish out the job."

The solution used on that project, the Topcon IS-3, is a robotic total station that provides Surefire with the power, accuracy, and speed of a total station, and then supplements that with the auto-scanning capabilities of a laser scanner. In applications like the one described above, Topcon's IS-3 provides a powerful and cost effective alternative to laser scanning.

"The methods used by many others in this business can be precise but their results



Surefire's Juan Rivera (left) and James Neill (right). Rivera is a journeyman lineman who, despite a proven specialty in the construction of steel towers, has shown an interest in learning the surveying aspect of the job.

are based on the user and their eye," added Ramos. "By comparison, the Topcon system we use—and the software that drives it—gives us a level of precision that's just absolutely beyond compare."

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In preparation for installation of marker balls — plastic spheres installed on power lines to improve their visibility to aircraft — Rivera gets instruction from Ramos on the use of the Topcon data collector and total station.

#### **Deflecting Doubt**

Surefire's ability to accurately record such details has paid off in other areas as well. In the case of measuring tower deflection (the movement of an object away from its normal position), it has particularly excelled. According to Ramos, a recent project to replace wooden poles with steel ones is a perfect case in point.

"We were at Camp Pendleton in San Diego County working with a contractor who was "fire-hardening" the site so that, in case of wildfires, the poles wouldn't burn and the conductors would be safe. The new poles had to be reset within a level of 1.96% deflection, so each pole had to be almost perfectly plumb."

The contractor in charge of the Camp Pendleton project was particularly concerned about a number of poles that had already been re-set using a different system and asked Surefire's crew to re-check them.

"We went out, did our deflection checks and found that, when the sun would shine on the metal poles, one side would heat but the other wouldn't, resulting in expansion/ contraction and movement of the pole. The utility initially doubted our numbers, but I set up the IS-3 and tracked the pole's movement for an entire day. When I showed them the numbers indicating how it would go from in-tolerance, to slightly out, then back in later in the evening, they believed it—and they believed in us. We simply couldn't have proved that without the Topcon solution."

#### **Disaster Response**

While most of Surefire Consulting's work remains unseen by the general public, occasionally a high-profile project comes about. The Oroville Dam rerouting was one of those. In 2017, when heavy rains and the resultant flooding damaged the main spillway at the dam, plans were set in place, first to ensure the safety of area residents, then to make certain that electric power to the area-including Sacramento-was not disrupted. Working with contractor Barnard Construction. Surefire's crew helped with construction of 22 new towers and the re-routing of 13,500 linear feet of line from the base of the dam across the Feather River (several times) before rejoining existing lines.

"Those original lines ran directly across the spillway, so it was critical that the integrity of the system remained intact," said Ramos. "Barnard first set up a temporary line away from areas that were threatened by erosion from water leaving the spillway, and then set to work on construction of the rerouted permanent line. Everything was obviously fast-tracked and the Topcon solutions we brought to the table helped streamline the QA/QC facts of the job."

Surefire's work included placement of footings for the towers being constructed. Each tower consisted of footings set up in four separate quadrants. To ensure placement accuracy, the Surefire crew set up the Topcon total station, took a shot to a reference point and was able to tell with absolute precision, the distance to each of the four corners.

"The tolerances on these structures are extremely tight— anywhere from .1 to .05—so you need an instrument that can give you that level of accuracy and precision each and every time. That's exactly what we bring. We were proud to have worked on a high-profile project like Oroville and know that we played a role in helping deal with an extremely serious situation. The solutions—and results—we bring to a project like that speak for themselves; the agencies for which we work have learned that we can provide the goods."

#### Path to Growth

The team at Surefire agrees that steady growth is the way to go, provided they are able to maintain the level of quality they are providing now. So, with an eye toward a controlled increase in business, they are enhancing their status with contractors and major utilities—throughout the state.

"We all love what we do and are excited to be part of a business that proves its value every day," said Ramos. "Topcon is a big part of what we do, and Chad Dickey and TopoElement are a key part of the support system, so we are covered in that area, for sure. The work we do can be challenging, but we have already seen that we have the people and the technology we need to take Surefire forward. When asked what Surefire does, I sometimes struggle to accurately describe it. But a contractor we worked for might have summed it up best when he said: 'You guys are cheap insurance to me.' He saw the work we did as a way of ensuring there were no surprises—we can live with that description."

Larry Trojak of Minnesota-based Trojak Communications is a freelance marketing content specialist. He writes extensively for the geopositioning, utility, aggregate processing, recycling, construction, and demolition markets. DON'T MISS THE NATION'S PREMIER GEOSPATIAL INTELLIGENCE EVENT



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**Dave Lindell**, PS, retired after 36 1/2 years with the City of Los Angeles. He keeps surveying part time to stay busy and keep out of trouble. Dave can be reached at *dllindell@msn.com*.





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After more than 15 years of research and writing, the Landsat Legacy Project Team is about to publish, in collaboration with the American Society for Photogrammetry and Remote Sensing (ASPRS), a seminal work on the nearly half-century of monitoring the Earth's lands with Landsat. Born of technologies that evolved from the Second World War, Landsat not only pioneered global land monitoring but in the process drove innovation in digital imaging technologies and encouraged development of global imagery archives. Access to this imagery led to early breakthroughs in natural resources assessments, particularly for agriculture, forestry, and geology. The technical Landsat remote sensing revolution was not simple or straightforward. Early conflicts between civilian and defense satellite remote sensing users gave way to disagreements over whether the Landsat system should be a public service or a private enterprise. The failed attempts to privatize Landsat nearly led to its demise. Only the combined engagement of civilian and defense organizations ultimately saved this pioneer satellite land monitoring program. With the emergence of 21st century Earth system science research, the full value of the Landsat concept and its continuous 45-year global archive has been recognized and embraced. Discussion of Landsat's future continues but its heritage will not be forgotten.

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Landsat Legacy Project Team Samuel N. Goward, Darrel L. Williams, Terry Arvidson, Laura E. P. Rocchio, James R. Irons, Carol A. Russell, and Shaida S. Johnston

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## **Notorious Once Again**

ack in February 2018 I introduced readers to a Philadelphian who had argued that his use of a parcel and the City's failure to stop him for the statutory period of time favored his claim of adverse possession ("Fighting City Hall Over Land"). Frank Galdo had been using a tract across the street from his house since 1989 that the City had acquired in 1974 for a highway project but had let lie neglected and dormant when that parcel wasn't needed. Although considering selling this particular tract along with other land to an investment company in the mid-2000s (after Galdo's occupation for more than Pennsylvania's required 21 years), it wasn't until 2013 that Philadelphia woke up to Galdo's use and began trying to eject him.

Readers were updated on what is known locally as The Notorious Galdo Parcel in July 2018 ("The 'Little Guy' Fights Back (and Sometimes Wins)"): the appellate court had decided that while the Commonwealth of Pennsylvania is immune against adverse claims, municipalities and counties (Philadelphia is both) are not, so that the trial court had erred in dismissing Galdo's claim of adverse possession.

Galdo reached another milestone September 26, 2019, when the Pennsylvania Supreme Court ruled in his favor: he deserves a hearing in trial court to weigh the merits of his adverse claim against Philadelphia. This particular development offers lessons in how the court system works, sending cases both up and down the ladder, as we follow its trajectory through the initial trial through various appeals and now the vacation of prior judgments to finally hear arguments to support the adverse claim.

It also tells us that not every snowball's chance must be automatic condemnation to melt in that fiery place below. The single most repeated support for such snowballs is that sovereign immunity requires (1) actual occupation of the property for a public use, one that would benefit the public (Galdo mentions a public park as one such beneficial use) or (2) a legal obligation for the sovereign to hold the property for a public use. The PA Supreme Court notes that "what constitutes a public use is highly fact dependent", and that the condemnation in 1974 was meant for a public use that no longer exists. Therefore the "abandoned property" (the court's language) "offers no benefit to the public..., the public is not occupying the property in any away, no tax dollars are being received... [and the surrounding neighborhoods] risk the threat of becoming blighted. This scenario constitutes the opposite of devoting property to a public use..."

The affirmation of Commonwealth Court's decision to vacate the trial court's ruling of sovereign immunity allows Galdo another day in court to show if he has satisfied the requisites of open, notorious, hostile, and continuous possession for the statutory period of time to support his adverse claim. In upholding the appellate court reasoning, the Supreme Court wrote: "...the 'City does not [present any] obligation imposed by law or evidence of any public use of the [Parcel] to justify holding and neglecting it for decades.' ... the City was not immune from Galdo's adverse possession claim because it did not hold the Parcel pursuant to a legal obligation, or for public use."

For those believing Galdo's snowball is an anomaly, consider that at least two other states have judgments running along the same lines, with similar outcomes. In *Devins v. Borough of Bogota (592 A.2d 199,* Supreme Court of NJ, 1991), Devins (like Galdo) used a municipally-owned lot for "parking, cookouts, lounging, and other recreational purposes." New Jersey's highest court affirmed that "municipally-owned property neither dedicated to nor used for a public purpose is subject to acquisition by adverse possession", sending the case back down to Chancery court for review of whether the possession was open, notorious, and continuous enough to quiet title in Devins by adverse claim.

In Siejack v. Mayor and City Council of Baltimore (313 A.2d 843, Court of Appeals of MD, 1974), Baltimore only woke up to the Siejacks' long-time use (a commercial dump site) when condemnation for Interstate Route 95 meant there were dollars to be awarded. The lower court judge first stated, "...the evidence clearly indicates to me that the City ... has been divested of that title by adverse possession on the part of Siejack." Somehow, on appeal by the City, "[t]he learned judge was persuaded to change his mind" and his second oral opinion favored the City. The higher court returned the verdict to the Siejacks, who had paid taxes on the parcel, paid the City for costs of extinguishing a fire on the parcel, and sold a piece of it to Baltimore. "[The Siejacks'] successive possessions were actual, open, visible, notorious, exclusive, hostile, and under color of title. Indeed, one would be hard pressed to find a case in which all of the elements of adverse possession so clearly appear... The history of parcel 4N seems to us sufficient to rebut any notion that the City had ever devoted it to public use and that it is unlikely it ever intends to do so."

To read the latest decision (City of Philadelphia v. Francis Galdo): https://bit.ly/30kltZn

Wendy Lathrop is licensed as a Professional Land Surveyor in NJ, PA, DE, and MD, and has been involved since 1974 in surveying projects ranging from construction to boundary to environmental land use disputes. She is a Professional Planner in NJ, and a Certified Floodplain Manager through ASFPM.

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