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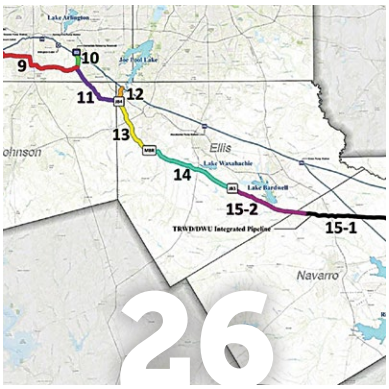
ON THE COVER

Only honey bees and humans use maps and convey spatial information.



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Map Idolatry

Are we putting too much stock in "the map" and not enough in "the information"? We seem to do that with the earliest petroglyphs through more contemporary Mylar surveys and the digital recording of thirty seconds ago. What is the point of every map? I come up with two functions. Memorializing information and instructing folks where to recover that information. After a successful treasure map leads you to the gold nary a rich pirate will argue whether it was 20 paces or 25 paces by map. At your next chapter meeting ask why we rely on the numbers from the GLO plat to fervently proclaim every other bonafide survey is inferior but we adamantly deny the validity of any distances and directions compiled in the GIS. They are both just maps, right? After you pull the arrows out of your chest then ask what is the basis of your local GIS PLSS layer? There's a good chance it's the original GLO plats and their exact dimensions, oohhh but that can't be trusted. We can have our fun with that heaven and hell irony but seriously and for those who don't know better, heed that GIS disclaimer and respect our authoritative plats.

Somewhere between the first scribbles on rock and the latest Core i7 processor, mankind, nay "surveykind" adopted a theology of false idolatry with maps. Ironically the same surveyor that claims GIS is the antichrist will dwell on some sort of vestal virginity of a GLO plat. In reality neither reveals a useable precision much better than 1 part per "about here". However both are jam packed and jelly tight full of information related to a particular spot on the ground. The plat of course has the magic of "authority" behind it. Enough authority for us to forgive its shortcomings and stretch its numbers to fit the ground with barely a second thought. Conversely rubber sheeting in GIS is the God's honest end to humanity according to some. In a true bounds system there are no overlaps. Nor, theoretically, in a simultaneous subdivision. It's not until somebody tries to force an imaginary line on the ground that things get sideways. The false idolatry of a plat comes into play when a surveyor feels that prescribed methods are the sole notice of lines described in grants. Some folks even speculate that a platted illusion never marked on the ground during the original survey somehow served invisible notice and the owners were prohibited from adopting a position to make a grant work. The courts say otherwise.

If GIS has only done one favor to mankind it's showing that our historic cadastral accounting methods yield a low order of precision in gross. GIS PLSS layers start at some initial point and accumulate every allowable tolerance in every chain from east jesus to your clients back yard. Local surveys are cobbled together considering nothing more than the immediate adjoiners. Every bastardization of projected coordinates has been tossed in the stew as well. Then we cram them down to sea level and have the nerve to put this plastic fruit in front of a starving public. What's missing from this rant thus far? Reality! I'm inclined to believe that the best representation of the ground might just be the ground itself. The aerial backdrop reveals the visible evidence of the public's silent and collective representation of ***their*** boundary lines. We know that boundaries happen on the ground and plats merely represent those actions. The purpose of the paper is just to pass the message.■

Jason Foose is a Professional Surveyor licensed in multiple jurisdictions.

the American Surveyor

amerisurv.com

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Al Banks - Director/Senior Site Engineer at Banks Engineering And Management Ltd. United Kingdom

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History of the HOLLYWOOD Sign

The General Land Office is pleased to bring you the original survey plat for T1N R14W of the San Bernardino Meridian which is where the Hollywood sign is located. This plat was approved August 14th, 1876. The land where the sign is located was deemed unsurveyable by the original surveyors.

Before the glitz and glamour of Hollywood, southern California was comprised of farms, bandits, and undeveloped land. However, due to it's mild, warm, and consistent weather, the real estate market began to explode in the late 1800s. Soon after in the early 1900s, the area also became the ideal destination for early film studios that had previously struggled with filming in more variable climates.

The Hollwood sign was first erected in 1923, 47 years after the land was surveyed. The sign is located on Mt. Lee, just north of Griffith Park, and initially said "Hollywoodland." Complete with 4,000 lights, the sign would blink at night, flashing the words "Holly," "wood," and "land" consecutively. The "land" would eventually be removed in the 1940's.

In the next 50 years, after world wars and the urban exodus to the San Fernando Valley, crime rose and the Hollywood sign began to decay. The top of the "D," along with the third "O," fell off the sign and an arsonist set fire to an "L."

It wasn't until the late 1970s when the sign would be fully repaired. Fleetwood Mac, Alice Cooper, Gene Autry, and other famous celebrities either hosted or attended charity events to help raise funds to repair the letters. In August of 1978, the original letters were taken down and replaced three months later by the current sign that can be seen today.

If you zoomed out on the plat, you may have seen an unsurveyed area that was called "Rancho Providencia." Ranchos were first granted to Spanish missions as a "use" permit, where Spain owned the land but the mission was allowed to use it for mission purposes. After Mexico's independence, Mexico passed laws to grant title to the recipient. Rancho Providencia, the rancho depicted on the GLO survey plat here was granted to Vincente de la Osa in 1843 during Mexican rule.

A few years later Mexico ceded control of California, Nevada, and parts of Wyoming, Colorado, New Mexico and Arizona to the United States. This ended the rancho period, putting the remaining lands not already granted as ranchos into the public domain. The Land Act of 1851 allowed for owners of ranchos to file a claim with the Public Land Commission who could recognize title granted from a prior sovereign and eventually recommend that a patent be issued to the owner(s). ■

Note: An 8.2Mb MrSID file of the complete plat of the original survey of Township 1 North, Range 14 West can be found at *https://bit.ly/2MRDbyD*

BUREAU OF LAND MANAGEMENT/ GENERAL LAND OFFICE

decided **guidance: case examinations**

Richardson v. Register

The Richardson case is a realization that local customs and standards cannot be packaged up in a single definition and handed out in a national curriculum. South Carolina's enduring effort to maintain a cadastre includes the scars of General Sherman's misconduct coupled with the devastating effects of hurricanes and the general mishandling that no county is exempt from in our less than perfect world.

This is a case where a retracement surveyor just could not have determined a true boundary without firsthand knowledge of an unwritten agreement. It took evidence discovered in the judicial arena to effectively measure this boundary. The Court skillfully employed two local surveyors to reconstruct a boundary line that the owners willfully neglected at the time of the grant. Using the documents provided by Tim Davis we will break this case down to some relevant concepts. For the record I believe the court got this one right.

Richardson's Chain of title

The Original Legal Description

Okay, the thirteen colonies, Kentucky, Ohio, Tennessee, and Texas, take five, and go get a soda from the vending machine. You PLSS'ers listen up very closely here. Life ain't always square and legal descriptions don't always come in tidy packages. The written legal description is a starting point and some serious assembly may be required. Let's look at the deed recorded in Book MM, page 232. The first two calls establish the intent to split and convey 50 acres of land. Right up front here we see a local practice of limiting the boundary to only what the grantor was previously conveyed. That is an expression of intent and our invitation to examine that vesting deed's description. After the grantor generalizes the limits, then he gets into the bounding calls. But first let's side track a minute. Bounds descriptions are the mark of nobility. A cadastre of bounds descriptions goes like this "I own to you and you own to me, there are no gaps or overlaps, and when we are uncertain about our line we will settle the dispute peacefully under law". That's it and it's worked for at least four centuries on this continent. Retracement requires a detailed investigation of bounds descriptions and there's not a 495 page blue book on laying out rectangles from a maypole. Okay 'nuf said, continuing on we see bounding calls to the southwest, east, north, and west. Okay, some geometry is forming. The last part of the description offers some linear calls but not necessarily any metes. We have the same number of linear calls as bounds and a P.O.B that we indeed return to. This is a perfect legal closure folks and worthy of respect! We have a known legal position, calls for monuments, calls for controlling features, calls to bounds, a call to an agreed line and a return to the POB. Incidentally the grantor put us on notice that more digging is required to determine the agreed line. Not a big deal. We PLSS'ers can compare this to "incorporation by reference" and do the same thing when we recover the original survey notes, dig up local plats or confer with the old surveyor

1

DEED

A. R. Singleton)
to)
F. A. Todd)

Dated February 26, 1897
Filed December 23, 1901
Book MM, page 232
Consideration $10.00
Title Fee simple
Dower renounced

DESCRIPTION

All that tract of land, being a part of a tract of land that was granted to A. R. Singleton in 1897. This being a piece of same tract I do gives his Fannie A. Todd Fifty (50) acres, more or less do gives to her heirs and assigns forever, it being a piece of the tract that was granted A. R. Singleton 1879 lying in the South west corner of the tract. Bound by land on the South West by Marion F. Johnson and on the East by the same; on the North by land of Anny Janes Johnson and on the West by land of J. R. E. Johnson. Beginning at a lidred stake in the South West corner and running a strate line to the Mill dam to a lidred corner and from the mill dam thence agreed line back to J. R. E. Johnson land to a lidred corner and the said line to beginning containing 50 acres, more or less. This is your part of my land.

2

DEED

F. A. Todd)
to)
Mary E. Williams)

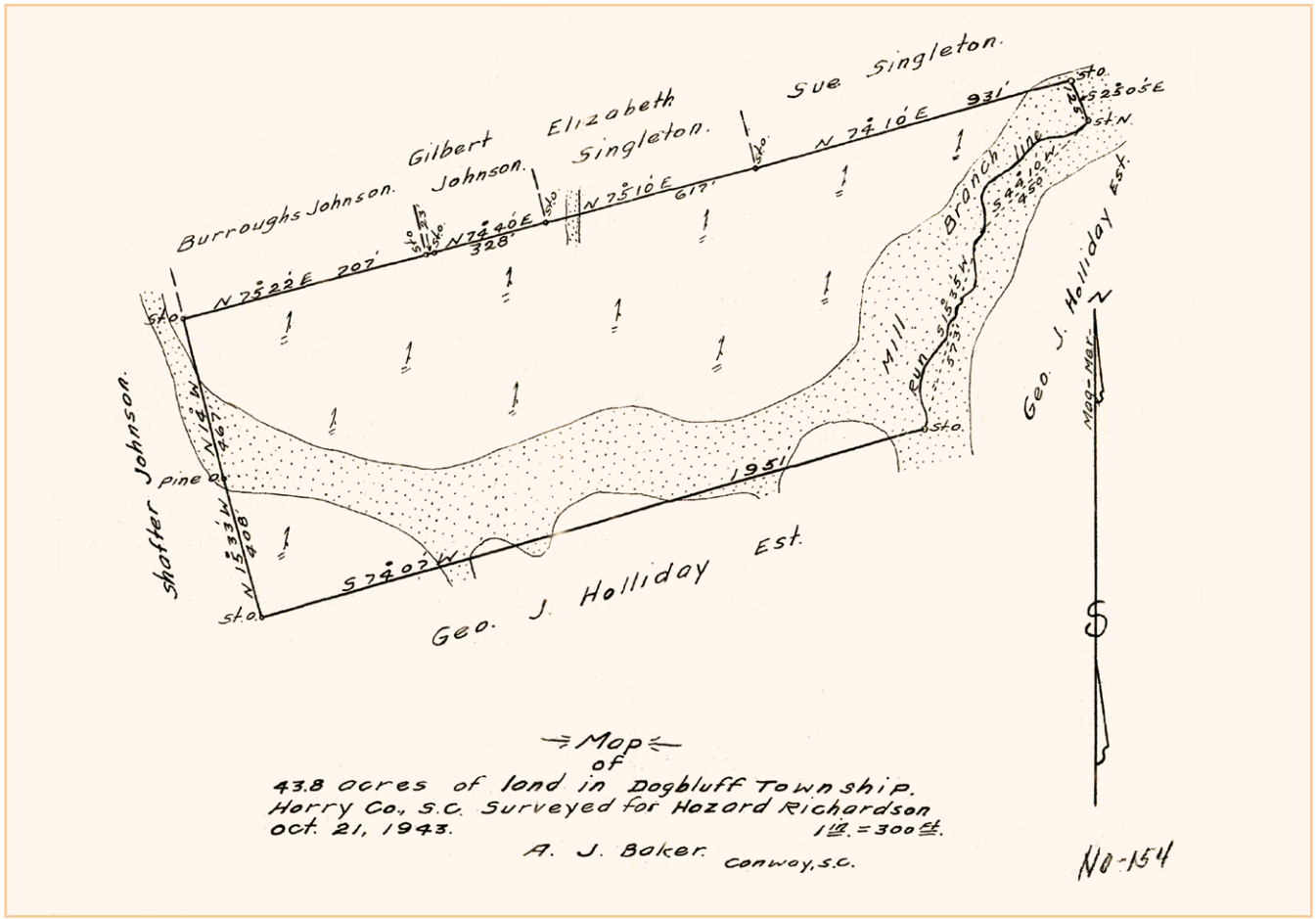
Dated 1901
Filed 1901
Book MM, Page 233
Consideration $200.00
Title fee simple
Dower none

DESCRIPTION

50 acres, more or less, Dog Bluff Township and on Spring Mill Branch. Being a portion of a tract of land conveyed to me by A. R. Singleton by his deed February 24, 1897 and bounded as follows:

On the South by lands of Marion Johnson; on the East by lands of Marion Johnson; on the North by lands of A. J. Johnson and on the West by lands of J. R. E. Johnson.

Beginning at a lightwood Stake in South West corner running a striaght line to Mill dam to a lightwood corner from thence agreed line to J. R. E. Johnson land to lightwood stake; thence said line to beginning containing fifty acres, more or less.



on the block. Same drill but in this case you may have to collect some extrinsic evidence. Finally the description calls out the acreage and says "This is your part of my land" in a bold expression of intent. This is an original grant and the original subdivision of this tract. We'll see that a subsequent deed was filed immediately afterward and years later the wording was slightly modified by a subsequent grantor.

The First Subsequent Deed (FSD)

The FSD was executed four years after the original deed and filed immediately after it at page 233. It calls out 50 acres and references the previous deed and split. Four bounding calls are given by cardinal direction. The bounding owners appear to be the same. The linear description also matches the original grant with the exception of the noted monuments. The latter replaces the former

3

DEED

Mary E. Capps

to

George J. Holliday

Dated September 3, 1906
Filed September 3, 1906
Deed Book YY at Page 143
Consideration $300.00
Title Fee simple
Dower none

DESCRIPTION

50 acres, more or less, Dog Bluff Township and lying and being on Spring Mill Branch. Bounded as follows to-wit: North by lands of Annie J. Johnson; East and South by lands of Marion Johnson and on the West by lands of J. R. E. Johnson. With line as follows: Commencing at a stake corner on the J. R. E. Johnson line, in the South West corner of this tract and running a straight blazed line to corner on Mill dam. Thence an agreed line to the J. R. E. Johnson ling to beginning corner. It being the identical tract conveyed to Fannie A. Todd by A. R. Singleton February 26, 1897 in Book MM, Page 232, and from said Fannie A. Todd to myself December 14, 1901 Book MM, Page 233.

4

DEED

Jospeh W. Holliday, et al.

to

Johnnie Register

Dated October 15, 1947
Filed October 21, 1947
Book 50 at Page 280
Consideration $7,000.00

DESCRIPTION

Tract of land in Dog Bluff Township, 49 acres, more or less, (one acre having been sold to Townsend Register) and described as follows in deed from W. E. Brown and W. L. Brown to Geo. J. Holliday December 30, 1913, Book XXX, page 309. Bounded as follows:

North by lands of Annie J. Johnson; East by lands of Marion Johnson; South by lands of Marion Johnson and West by lands of J. R. E. Johnson.

Being the identical tract conveyed us by Geo. J. Holliday. One acre at the South West corner having been sold to Townsend Register, the present boundaries are: North by Hazard Richardson; East by Holliday Brothers (A. R. Singleton lands) South by Townsend Register and West by L. B. Register and Shafter Johnson.

term "lidred" with "lightwood". The grantor was a witness to the recent original grant. All other things being harmonious I don't see this as much more than a clarification of the monument properties or perhaps they re-staked it. Regardless, the intent of this deed is clear. It is to pass title to the same 50 acres that was given to the grantor four years prior. I had to google "lidred" and found that it means wood used for kindling especially coniferous wood abounding in pitch.

The description begins to erode

The third grant in this chain of title was dated and filed September 3, 1906 in Book YY page 143. For whatever reason, the third deed in the chain picked up some noise in the legal description. We still see our cardinal bounding calls. However the linear calls in this deed start to degrade from the original verbiage. This doesn't negate the conveyance nor mean that there is no evidentiary value. Valuable calls to the adjoiners and for a stake, a blazed line, the Mill dam, and the agreed line are identified. Once again the intent is chiseled in stone by the colloquial call "*It being the identical tract conveyed to Fannie A. Todd by A.R. Singleton February 26, 1897 in Book MM, Page 232 and from said Fannie A. Todd to myself December 14,1901 Book MM Page 233.*" I'm not getting excited about the grantor's modulation of the linear calls in the presence of her clear intent.

Two World Wars and a Great Depression later

Richardson takes title on November 16, 1943 with the October 21, 1943 Baker survey in hand. The court record recites the description including the customary final call "*This is the same tract of land which was owned by Annie J. Johnson and then by W.T. Johnson at the time of their deaths and conveyed to the grantor by the other heirs of the said persons.*" Once again this is the intent of the deed. The accompanying survey accurately calls the Geo. Holliday tract to the south but does not reference the tentative agreement. More on that topic later.

Register's Deed

The Register grant of the opposing tract was dated October 15, 1947 and filed October 21, 1947. The description stays true to the colloquial form in the previous deeds. However our boundaries and chain of title are mildly distressed by this time. The grantor

> "Bounds descriptions are the mark of nobility... 'I own to you and you own to me, there are no gaps or overlaps, and when we are uncertain about our line we will settle the dispute peacefully under law'."

announces that one acre had been previously sold off leaving 49 acres for this conveyance. There's a reference to a preceding deed in Book XXX, page 309, that the grantor is instructing us to go get. Once again we see the value of summarizing the intent. The grantor states "*Being the identical tract conveyed us by Geo. J. Holliday.*" This might point to Book YY Page 143 but we need to approach that assumption with care if not skepticism. Geo. J. Holliday may have owned many tracts. The summary continues on with "*One acre at the South West corner having been sold to Townsend Register, the present boundaries are: North by Hazzard Richardson; East by Holliday Brothers (A.R. Singleton lands) South by Townsend Register and West by L.B. Register and Shafter Johnson.*"

Pulling it all together

There is a lot of name dropping in bounds descriptions and as we see here different folks shared the same name. How do you sort that mess out? Retracing bounds descriptions can be who's who game and may require a good deal of title research. That charge comes with the responsibility of examining the baggage of the heirs, successors, assigns as well as the adjoining grants. Extrinsic evidence may be required to get a clear picture of a boundary as well.

All of these grants are presumably legal and happened willfully under the authority of the owners. We have to accept them for what they are. Tim Davis indicated that it was customary to walk the boundaries and agree on the location then have a plat drawn to that agreement. Sometimes the local church deacon would be present to serve as a witness and other times a deed for the corrected line may not have been used. We clearly see in Richardson that the force of a retracement survey made under the direction of the subsequent owners was limited to only as much weight as the owners afforded it. The numbers were not even parlayed to the record but rather relegated to an unauthoritative map of a tentative line and buried in a surveyor's cabinet. In fact, it's the first time we see any math or metes of this tract and it's a half century later plus four conveyances after the original grant.

There's no doubt in my mind that our rope stretchers on the eastern seaboard and in the Appalachian fringe are masters of retracement if for no other reason than sheer necessity. The newer PLSS states might look eastward at the colonials and the Lone Star State to harvest this experience. I've said it before and I'll say it again. Every day that passes is one day farther away from the Manual of Instruction. As the original PLSS degrades and folks subdivide their land as they see fit, the squares ain't gonna be so square. The legal descriptions in Richardson v. Register offer strong model language that reinforces intent in the absence of plat math. The lesson is that the legal force and accuracy of a description lies more in it words than its numbers. ■

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.

Special Thanks

I wish to thank Tim Davis of Davis Land Surveying in Horry County, South Carolina for sharing his records with TAS and providing me with some much needed local supervision on this case. Visit Davis at *www.timothydavispls.com*

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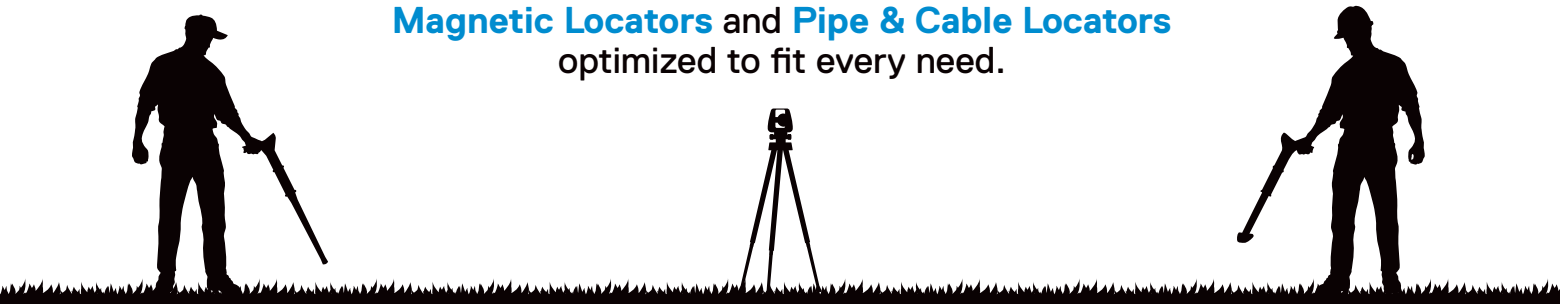

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A Zoological Datum

How Honey Bees Use Datums for Mapping and Navigation

Human beings and honey bees (and a few closely related bee species) are the only animals on Earth that create maps and use symbolic communication to convey spatial information. To do it, both rely on sensors to measure light, gravity, and electromagnetic fields. One comes naturally equipped while the other relies on manufactured items.

Perhaps more remarkably, both creatures converged on the same *method*. They both locate real-world objects in reference to imaginary geometric figures. In other words, they both use datums. Bee datums are the only zoological datums known to exist.

Despite mankind's long association with honey bees, nobody realized they used datums until Austrian scientist Karl von Frisch published his theory in the 1940's. Before him, other thinkers as far back as Aristotle had suspected that bees were communicating with each other via their "dances," but it was he who realized they were using abstract entities, datums, for spatial referencing.

His discovery seized the public imagination. People were astonished by the bee's complex behavior. They were equally amazed that a man was able to peer into a crowded hive and decipher their movements. As a result of his epiphany, von Frisch gained international fame. His theory was so far ahead of the current scientific thinking that it took many years for it to be completely accepted by his fellow scientists in the emerging field of ethology (animal behaviorism).

» JOHN HOXENG, PLS

In the following paragraph, von Frisch explains how honey bees use datums. This paragraph, and the figures below it, are from his 1973 Nobel Prize acceptance speech. (The prize was shared with fellow ethologists Niko Tinbergen and Konrad Lorenz.) Due to his advanced age—he was 86—the text was delivered by his son, Professor Otto von Frisch.

> *Those hours at the observation hive when the bees revealed this secret to me remain unforgettable. The fascinating thing is that the angle between the position of the sun and the dancer's path to the goal is expressed by the dancer in the darkness of the hive, on the vertical surface of the comb, as an angular deflection from the vertical. The bee thus transposes the angle to a different area of sense perception. Figure 3 shows the key to the transposition. If the goal lies in the direction of the sun, the tail-wagging dance points upward. If the goal is located 40º to the left of the sun's position, the dancer shifts the straight run 40º to the left of the vertical, and so forth. On the comb, members of the hive move after the dancer and maintain close contact with her, especially during the tail-wagging runs, and take in the information offered. Can they follow it and with what accuracy?*

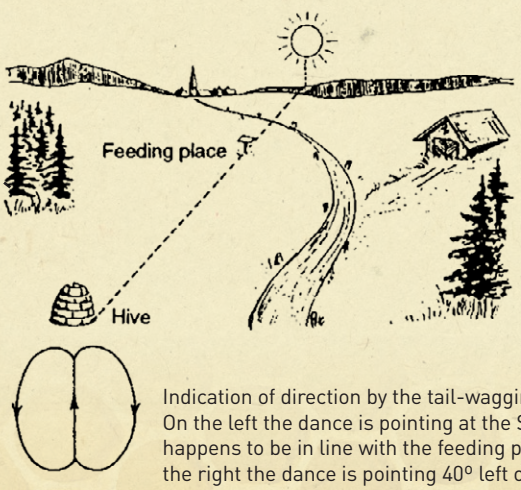
In the figures below, the honey bee's datum is the imaginary line extending from the hive to the sun. Because the sun is always in motion, the datum swings around the hive like a rope attached to a tetherball.

Beekeepers and ethologists refer to the dance as the waggle dance, but sometimes it is called the figure 8 dance due to the path followed by the bee. The straight run between the two loops is called the waggle run. This portion of the dance is essentially a re-enactment of her flight. After the bee finishes a waggle run, she returns to her starting position by alternating between the left and right return loops.

The bee performs her dance on a vertical wax comb inside the dark hive. Her audience crowds in and watches closely. The dancer's movements cause microscopic deflections in the watchers' antennae. They register these movements with their Johnston's organs, a sensitive organ near the base. Such precise communication is vital since the foragers routinely travel three miles from the hive and in times of scarcity will travel as far as six.

Tilt sensors. Like a survey instrument, a honey bee needs to know the direction of gravity to keep precisely oriented in space. To do this, her head is mounted on a pendulum-like neck, which is surrounded by a ring of sensory cells. The feedback from these cells, and from her antennae, provide her with the tilt information she needs.

Occasionally a summer rainstorm keeps a forager trapped in the hive for a few hours. While she's stuck indoors, the sun continues to circle the horizon at approximately 15 degrees per hour. In two hours, one might expect the azimuth of her dance to be off by 30 degrees. Not to worry. Although it is dark in the hive and she can't see the sun, she knows where it is and compensates accordingly. The rule is that the "up"



Indication of direction by the tail-wagging dance. On the left the dance is pointing at the Sun which happens to be in line with the feeding place. On the right the dance is pointing 40º left of the Sun.

On-board Compass

When a bee can't see the sun or its polarization waves, she resorts to her magnetic compass to determine directions.

Here's what Karl von Frisch had to say about it. This is also from his Nobel acceptance speech.

> *When a swarm of bees builds its combs in a hive furnished to them by the beekeeper, their position in space is prescribed by the small suspended wooden frames. In the natural habitat of the bee, perhaps in the hollow of a tree, there are no wooden frames present. Nevertheless, thousands of bees labor together and in the course of one night achieve an orderly structure of parallel combs; the individual animal works here and there without getting instructions from a superintendent. They orient themselves by the earth's magnetic field and uniformly have in mind the comb position which they knew from the parent colony.*

Advanced Optics

Using bees, von Frisch was the first to show that animals use polarized vision for navigation.

Here is an excerpt from von Frisch's Nobel acceptance speech:

Thus, bees are able to perceive polarized light. The sky, which to our eyes is a uniform blue, is distinctly patterned to them (13, 15). They use this extensively and, in their orientation, guide themselves not only by the sun's position but also by the resulting polarization patterns of the blue sky. They also continue to recognize the sun's position after it has set or when it is obscured by a mountain. Once again the bees appear to us miraculous. But it is now clear that ants and other insects, crayfish, spiders, and even octopuses perceive polarized light and use it for orientation and that among all these animals the human being is the unendowed one, together with many other vertebrates. In one respect, however, bees remain singular: Only they use polarized light not only for their own orientation but also to communicate to their colonies the direction to a distant goal (6).

In her 2016 biography of Karl von Frisch: *The Dancing Bees, Karl von Frisch and the Discovery of the Honeybee Language,* author Tania Munz recounts how the founder of the Polaroid Company, Edwin Land, had given Karl von Frisch several sheets of the newly invented polarized foil. Once back in Germany, the ingenious scientist cut the foil into triangles with a pair of scissors and re-assembled the pieces into a model of a compound eye capable of using polarization waves to determine azimuth. Subsequent experiments showed that the model was fundamentally correct.

direction on the comb always represents the *current* position of the sun; and so the dancer constantly reorients the figure 8 to keep it properly angled to the ever-rotating reference line. A geodesist would call this a dynamic datum. A honey bee calls it business as usual.

Under a different light, the waggle dance can be interpreted as pair of polar coordinates. Following this analogy, the angular ordinate is given by the orientation of the figure 8, and the radial ordinate (the distance) is given by the duration of the waggle run. The greater the distance—the more time she spends waggling. It varies from hive to hive but the generally accepted equation is that one second of tail waggling equals approximately 750 to 1000 meters of distance.

If you'd like to see a honey bee perform a waggle dance, you can find a video on the internet. Better yet, there's a good chance you can witness it first-hand. Just go to a county or state fair and find an observation hive. Watch the bees through the clear plastic and look for the characteristic figure 8 pattern.

We underestimate honey bee intelligence. Their neuroplastic brains are densely packed with gray matter and are much larger and more highly structured than other insects. Newcastle University researchers Melissa Bateson and Jeri Wright performed an experiment in which they periodically shook bee hives with a mechanical device. They showed that bees show symptoms of depression and become lethargic when they are overstressed. Do honey bees have emotions? Nobody knows, but the results of their experiment give one pause.

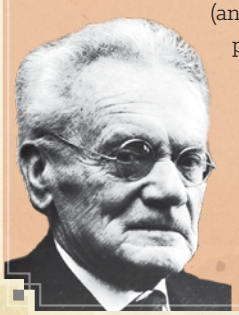
Honey bees have a simple retirement plan: They work themselves to death. One day the worker will leave the hive on a foraging mission and when she tries to return with a full load of nectar, her worn and shredded wings won't provide the necessary lift. Eventually she will fall to the ground where she will become an easy meal for a passing predator. Thence she will return to her true point of beginning.

Over her lifetime our worker will have collected enough nectar to produce 1/12th of one tablespoon of honey. It doesn't sound like much, but if they all do their share, she and her sisters will have gathered enough food to sustain the colony through the winter and pass it off to the next generation. ■

"The bee's life is like a magic well: the more you draw from it, the more it fills with water."
—Karl von Frisch, Bees: Their Vision, Chemical Senses and Language

John Hoxeng is the Managing Member of Hoxco Survey, PLLC in Bellingham, Washington. He is a longtime member of the Land Surveyors' Association of Washington and serves on the Advisory Committee for the Civil and Geomatics Program at Bellingham Technical College. In a former life, John was a juggy on a seismic crew. He figures he's rolled out enough cable to reach from Bellingham to the Florida Keys.

Karl von Frisch



It's notable that much of von Frisch's work was done under difficult conditions in wartime Germany. Because his maternal grandmother was born into the Jewish faith (and only later converted to Christianity), Nazi party members successfully campaigned to have him removed from his position as the head of zoology at Munich University. Due to the importance of his work and the intervention of his colleagues, this decision was reversed. He also weathered attacks for hiring Jewish and female assistants to work in his lab.

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NEW VERTICAL CONSTRUCTION TECHNOLOGY

Scanning robotic total station combines two functions

In the 1950s, Ace Books began publishing Ace Doubles, which were two separate novels combined in a single volume. For example, a reader could read "Secret Agent of Terra" which ends at about the middle of the book. The reader could then close the book; do a head-to-toe flip of the volume; and there would be the cover of the second book, "The Rim of Space."

The reader is happy because they get a twofer—two separate novels for the price of one (which was 40¢ back then). The two-novels-in-one book concept clearly provided great value to the avid reader.

That same kind of twofer value proposition can also be seen in a new product for the vertical construction market. Available from Topcon Positioning Systems, Livermore, Calif., the GTL-1000 is a compact scanner integrated with a fully-featured robotic total station, offering a site manager a dual-function instrument designed to complete a layout and scan on a single set-up. The data can be processed, mapped, and provide construction verification.

» JEFF WINKE

The system is designed so the user can initiate a scan with the press of a single button. A full-dome 360-degree scan can be created in a few minutes.

The GTL-1000 allows the technician to survey and scan within the same workflow.

"The key benefit that got me most excited by combining layout and laser scanning into one device is placing that device in the right person's hands," stated Taylor Cupp, technologist with M. A. Mortenson Company, Minneapolis, Minn. "On our projects, that is the layout professional—now we can empower them to not only do layout, but also capture what is built for quality control. It's very beneficial because the person that knows how they've set up the job in terms of control points and those kinds of things can be the one to do that capture and get it as accurate as possible with one device."

Topcon describes it as a first in the industry, that all work-flow components are integrated and provide users with a live, 'as built' model of projects, allowing the contractor to identify and rectify any discrepancies.

"Our field engineering team has expressed interest in a product like the GTL-1000 for many years—a product that allows them to survey and scan within the same workflow and not have to spend time in the office registering scan data," stated Paulina Acosta, senior applied technology specialist with Rogers-O'Brien Construction, Dallas, Texas. "Each point cloud is geo-located before you leave the field. This makes them feel confident that the point clouds will be correctly positioned to our 3D models, without the need for visual alignment or the need to return to the field to acquire more data in order to make the registration work."

Nick Salmons, principal laser scanning surveyor at Balfour Beatty Construction, London, UK said: "The new Topcon robotic scanning solution will increase productivity on site by accelerating the construction process and identifying design challenges more efficiently than traditional methods."

Salmons also said it will benefit the industry as a whole by "reducing cost and program duration, for both clients and contractors alike."

The system is designed so the user can initiate a scan with the press of a single button. A full-dome 360-degree scan can be created in a few minutes, according to Ray Kerwin, Topcon director of global product planning. "More traditional systems and methods take considerably longer," Kerwin said. "So, depending on the job site conditions, a contractor can get in and out quicker and thus minimizes safety concerns."

A benefit Acosta likes: "We liked the ability to take individual as-built points with the GTL-1000 after it completes a full scan. This is helpful when you are trying to ensure that you captured the center point of a sleeve or a structural connection. These points appear in the point cloud after they are processed and eliminate the time spent by our 3D modelers trying to determine the positioning of specific items in a point cloud."

The scanner is used in combination with ClearEdge3D Verity, a software tool designed to automate construction verification.

"The seamless integration of the GTL-1000 and Verity creates a complete package that is perfect for construction verification using 3D modelling techniques," Kerwin stated. "The result is a system that offers full-dome scanning which can quickly capture duct work, columns, beams, girders, flaps, penetrations, and structural steel. It helps to improve quality assurance,

Where Have You Been with Your TRIUMPH-LS Lately?

Clay Davidson

“The LS really is really tough. When I 1st got mine I flipped my 4 wheeler. The 4 wheeler flipped down a hill 9x. It rolled over the LS twice and the LS was still going.

Also I replaced my 4 wheeler with a side by side and one day the LS fell out while I was driving. The LS is still working. Never had any trouble except I try to be careful. However accidents happen.

I personally vouch for the LS being the toughest GPS rover I have ever used in 15 years of using GPS.”

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You can easily switch between GNSS and J-Mate measurements ›

JAVAD

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Adam Plumley, PLS

I probably won't be carrying a sh*t stick with me anymore. Notice the red dot on top of the pipe.

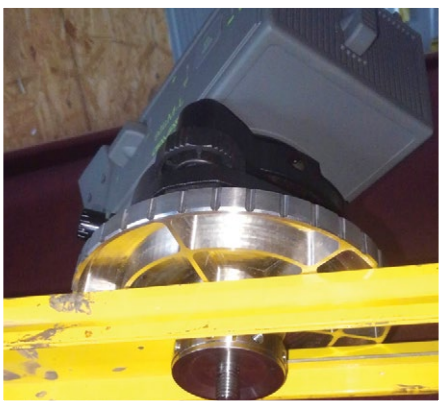
Javad gets a Blue Ribbon for best invert measuring device I've ever used.

No total Station I've seen can do this the way the JMate does. The offset camera/vertical action hasn't been done before and I see huge advantages.

I've measured many inverts in my career. Anyone who says they can measure them to the hundreths with a sh*t stick (pipe mic or not) (handheld laser or not) is full of it. Today I measured the most accurate inverts I ever have. Relative accuracy of a mm or two at most on elevation. Yes the inverts were recessed. I'm embarrassed to tell you folks what I measured with the sh*t stick a few weeks ago and thought it was good. It wasnt, matter a fact it put the sh*t flowing uphill. A tenth or two, sometimes it matters , sometimes it doesn't. JMate gets an A+ plus for this task.

This is the setup I should have used today.

Aluminum 4 ft level, the Jmate top plate and 3/8 3/8 adapter. Quick and Easy. I would have had a better view too.



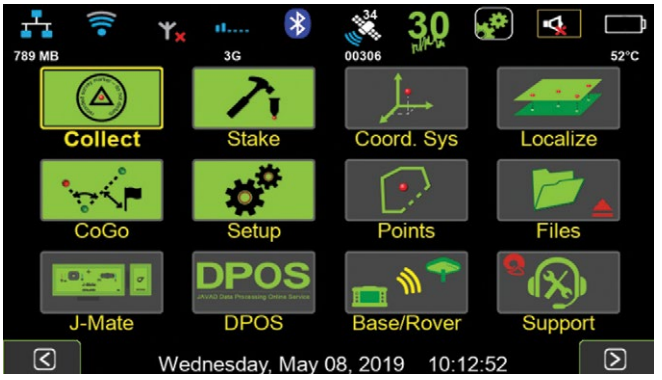
Introduction to J-Mate

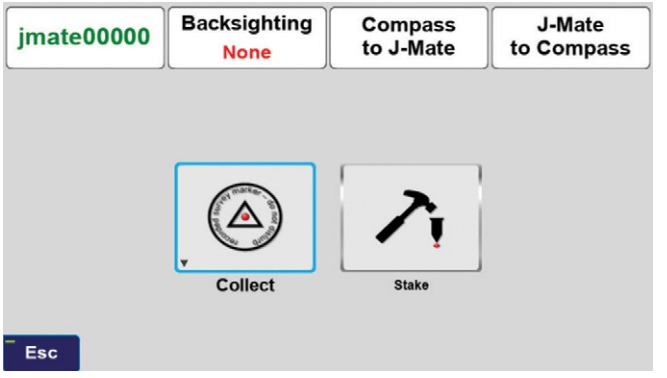
Let's set the record straight: J-Mate is not a total-station. **J-Mate and TRIUMPH-LS together** make the **"Total Solution"** which is a combination of GNSS, encoder and laser range measurements that **together do a lot more than a total station**. For long distances you use GNSS and for short distances (maximum of 100 meters) you use the J-Mate along with the TRIUMPH-LS. Together they provide RTK level accuracy (few centimeters) in ranges **from zero to infinity**.

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. The J-Mate SSID will be in this format JMatexxx, where xxx is your J-Mate's serial number. After a Wi-Fi connection is established, click the J-Mate icon and then click Setup. When you are prompted to connect to the J-Mate, click yes and then follow the remaining prompts.

Connecting the TRIUMPH-LS to the J-Mate

TRIUMPH-LS communicates with the J-Mate through Wi-Fi. Turn on both the TRIUMPH-LS and the J-Mate. Click the Wi-Fi icon on the TRIUMPH-LS Home screen to connect to the J-Mate, much the same way as you connect TRIUMPH-LS to your Wi-Fi access point.





After connection, click the J-Mate icon on the TRIUMPH-LS Home screen and then J-Mate/ Collect/Next to get familiar with the Main J-Mate screen.

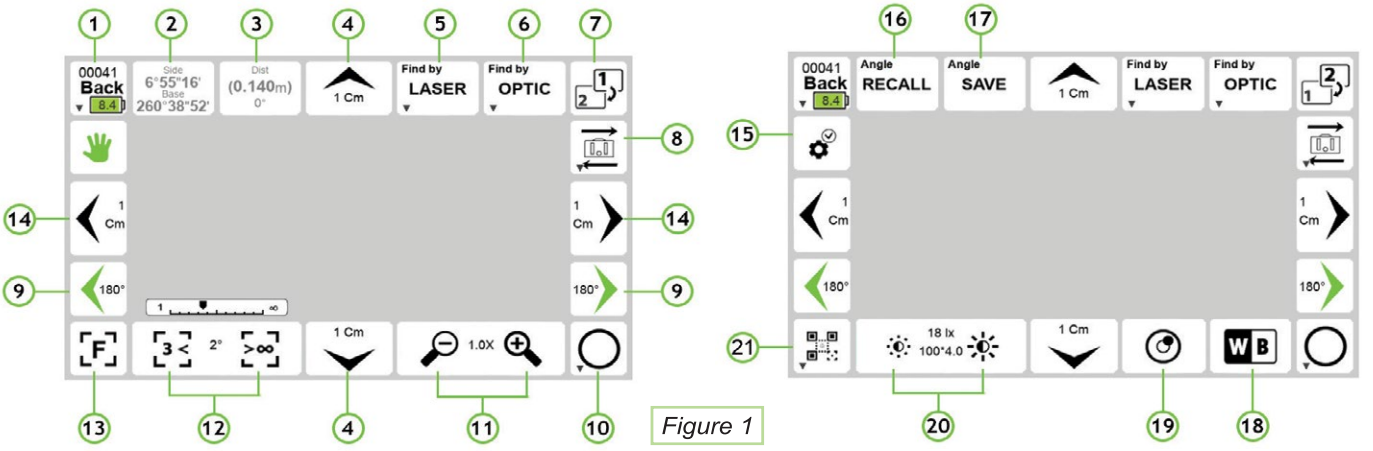
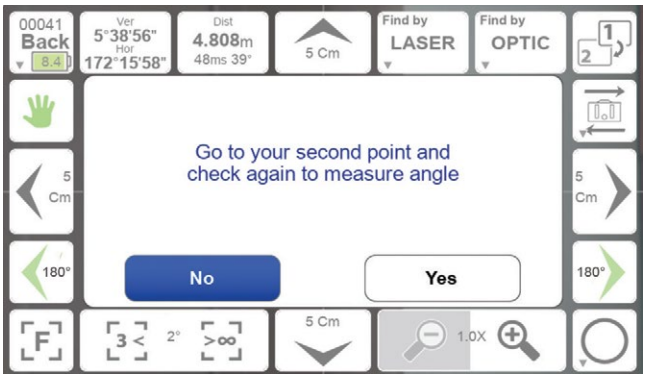


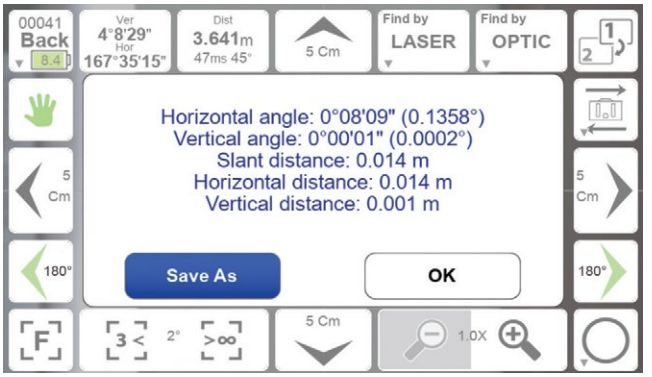
Figure 1

Measure angles between two points:

Aim at the first point and click button **“2”** of Fig. 1. Then Aim to the second point and click this button again. You will see the horizontal angles between the two points. You can save the measured angles in clip boards and use it elsewhere when you need.



Taking a point



Aim at your target and click **“10”**. J-Mate will take 10 readings and average them. The average, RMS and spread of the ten readings are shown. Optionally, you can specify four points around the target point to be measured too, to ensure that you have aimed at the desired target. To specify the distance of the four points around the target, hold **“10”**.

Instantaneous angular and range measurements are shown in boxes **“2”** and **“3”** in Fig. 1.

Camera operation and settings

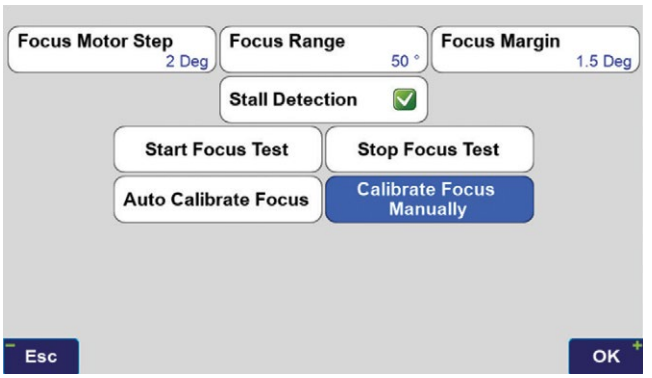
White balancing the J-Mate camera when the light setting changes: 1)Put a white paper in front of the J-Mate camera about few meters away, such that it covers at least half of the viewing angle of the camera. 2) Click **“18”** to start white balancing. It will take about 10 seconds to finish.

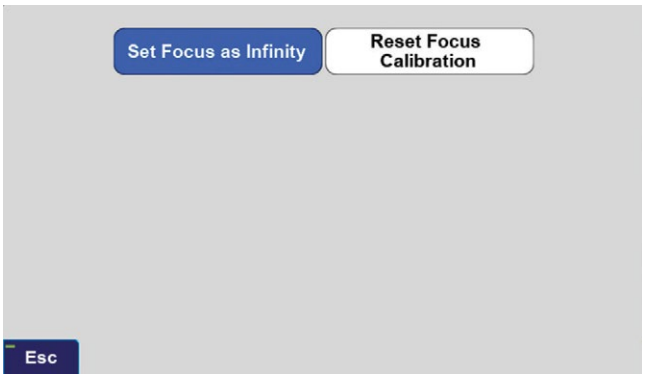
Zoom buttons: **“11”**

Contrast/Brightness buttons: **“20”**

Focus: use buttons **“12”** to focus manually. Click **“13”** for autofocus on the subject.

Occasionally you may need to calibrate the Focus motor. Click Setup **“15”** → “Focus” → “Auto Calibrate Focus” or “Calibrate Focus Manually”. In Manual focus, 1)click “Rest Focus Calibration”, 2) using **“12”** buttons, focus to infinity, 3) Click “Set Focus as Infinity”.





Searching and finding objects by laser and Object types

Hold the Laser button (**"5"**) to see the setup screen for laser target selection and parameters. If you know the approximate distance to the target, click the check box and enter the distance and accuracy percentage. This will help J-Mate to ignore targets that are outside the range.

Horizontal and Vertical Limits are the limits that J-Mate will search around the starting point to find targets. In this example is 15 degrees on left and right, and 15 degrees up and down.

"Keep Fixed Height" check box, scans horizontally on fixed target height. You may rarely need to use this feature. It will reduce the scanning speed by a factor of 2.

In Target Selection screen, the following targets are defined:

- **J-Target** is a printed pattern glued to 166x166 mm plywood of about 25 mm thick. It can be attached to a 226x226 mm plywood of 10 mm which provides flaps around the pattern. Select check boxes related to Sides, Top and Bottom flaps, if they exist and you want J-Mate to consider the depth of the flap (about 25 mm).

- If the J-Target is not sitting on another object and its bottom boundary is clear, then check the box Measure to Bottom. If not checked, J-Mate will measure to the top and will come down half of the height to aim at center. This feature applies to other target types too.

- In laser scanning and finding, the pattern on the J-Target has no effect.

J-Target Custom: This option allows you to build your custom J-Target type.

TRIUMPH-LS Back: searching for an object similar to the back of TRIUMPH-LS.

Search Tube: Searches to find a tube with given diameter and height. If Measure to Bottom is not checked, it will go to the top of the tube and then come down half of the specified height, irrespective of the actual height of the tube.

Measure Tube: Searches for a tube that has the given width and then it measures the tube depth.

Corner identifies an abrupt change on a flat surface.

Snap: scans with the resolution given in "Step" and stops when range changes by "Edge Depth".

Scan: Scans according with the resolution given in "Step" and saves the scanned files if the box is checked. The scanned files can be viewed in the Main screen / Collected by User .

Selected objects and their parameters can be saved and recalled by **"Save"** button on this and **"Recall"** button of the previous screen.

Aiming at targets manually

You can find targets manually or automatically.

Backsight point and the Sun

Similar to using conventional total station, to use the J-Mate you need to first establish its accurate position and calibrate its vertical and horizontal encoders. Then proceed to shoot the unknown points. This is similar to using any total station, but we have improved and automated the process.

With J-Mate you can do these in three different ways as shown in the J-Mate screen of the TRIUMPH-LS. Via the J-Mate Backsight; One Point, Resect, and Astro-Seek icons.

If GNSS signals are available at the site, click the One Point icon.

This screen appears which guides you to determine the accurate positions of the Occupation Point and a Backsight Point to establish an azimuth and calibrate the J-Mate angular encoders.

The tripod is setup at the “Occupation Point” (OP). The J-Mate is secured on top of the tripod.

Next, TRIUMPH-LS is put on top of the J-Mate with its legs registered to the matching features on the J-Mate.

Next Use the RTK Survey feature of the TRIUMPH-LS to quickly determine the accurate location of the Occupation Point. You can use your own base station or any public RTN.

Next, slide the J-Target on top of the TRIUMPH-LS, lift it from the J-Mate and move to the “Backsight Point” (BP). The camera of the J-Mate will search the J-Target. The camera’s view is visible from the TRIUMPH-LS screen, which mostly focuses on this J-Target. When at the Backsight Point, its accurate position is determined by the TRIUMPH-LS, and the Azimuth from the Occupation Point to the Backsight Point is determined, and the J-Mate is calibrated and ready for use.

After this calibration is complete, if the tripod is disturbed, the red LED on the front of the J-Mate will blink to show that re-calibration is required.

We can now replace the TRIUMPH-LS on top of the J-Mate at the Occupation Point and proceed to shooting as many “Target Points” as the job requires. From now on TRIUMPH-LS is used as a controller and you can hold in your hand too, but it is more convenient to put it on its place to have free hands.

If GNSS signals are not available at the Occupation Point, click the “Resect” icon to shoot two known points to establish its accurate position and calibrate its encoders. Then continue to shoot the unknown points.

Astro-Seek feature: Sun as the Backsight point!

We have added a new innovative feature to the J-Mate that it can automatically calibrate itself via its automatic Sun Seeking feature.

Attach the Sun filter to the camera of the J-Mate, click the “Astro-Seek” icon, set Occupation Point, and click the “Sun” icon in the screen which appears and J-Mate will scan and find the Sun, and use its position to calibrate the angular encoders automatically.

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

providing clear visual indication of construction-quality heat maps to minimize the effects of mistakes before they become expensive problems."

The system is designed to build upon proven prism tracking and accuracy that allows operators to establish points in most construction environments. The product includes on-board MAGNET Collage field software designed to process the data and offer real-time field-to-office connectivity.

A key productivity benefit of the GTL-1000 scanning robotic total station is that the site engineer requires no additional training and does not need to rely on outside scanning services. The new system is designed to take what was previously a rather lengthy, specialty process and compresses all the steps, reducing the overall verification time.

The GTL-1000 was originally tested in the field by the infrastructure group Balfour Beatty.

"In our use and testing, we have found that the new Topcon robotic scanning solution will increase productivity on site by accelerating the construction process and identifying design challenges more efficiently than traditional methods," Salmons said. "We are delighted to have collaborated with Topcon over the last 12 months to trial this new tool, which will significantly benefit the industry as a whole; reducing cost and program duration, for both clients and contractors alike."

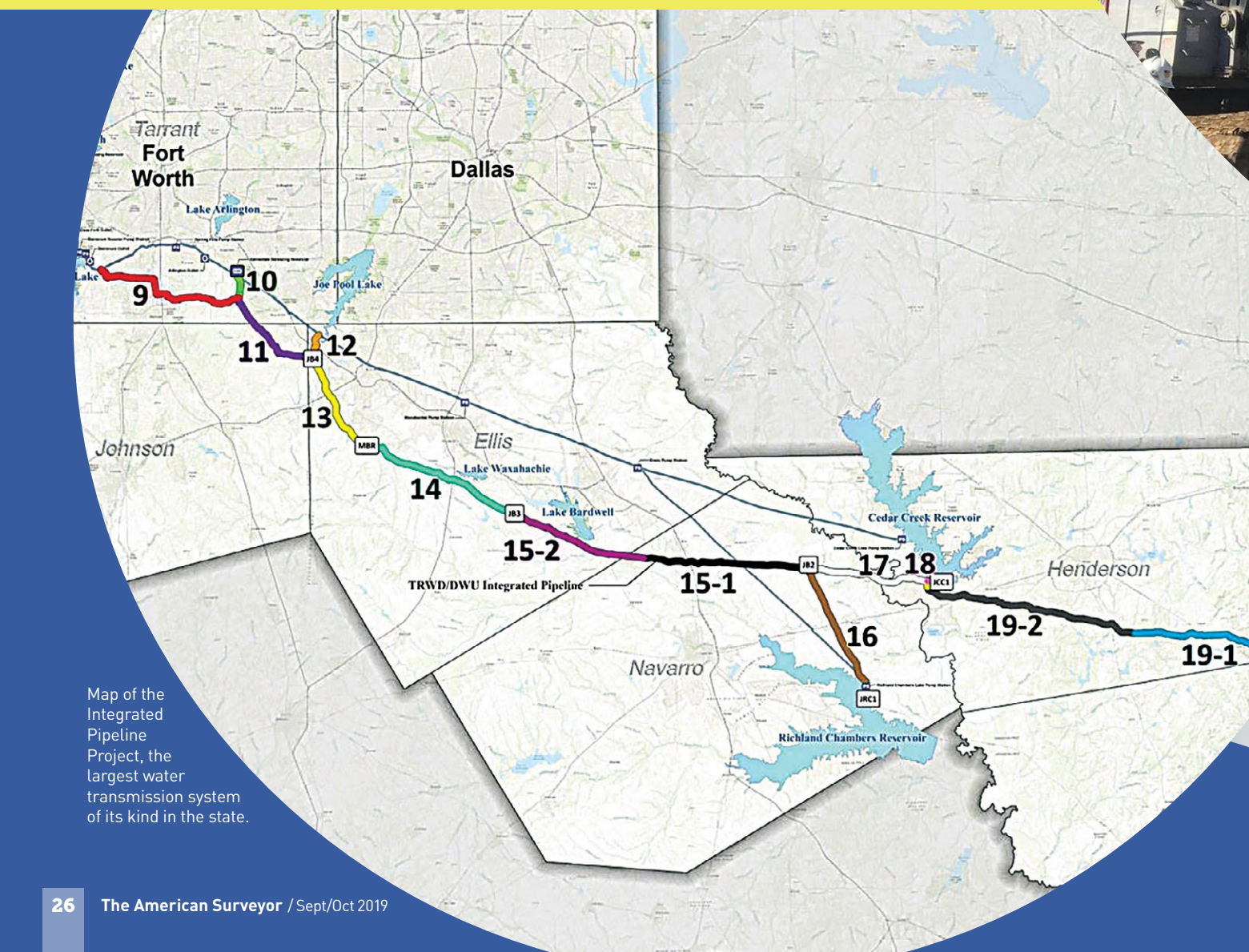
The benefits of the combined scanning robotic total station are also said to extend to sub-contractors, who can share the verification data, meaning all parties are working from the same construction-quality heat maps. For example, the first electrical ducts and conduits can often cause problems, as alterations can often occur that go unnoticed. With Topcon's new system, the speed at which everybody working on the job can understand mistakes means the effects can hopefully be minimized before they become expensive problems.

As efficiency becomes increasingly important in the market, time cannot be wasted and mistakes cannot be tolerated. Clearly, the demand for quick construction verification is on the rise, which supports the need for new technologies that can help. ■

Jeff Winke is a business and construction writer based in Milwaukee. He can be reached at jeff_winke@yahoo.com.

The GTL-1000 scanning robotic total station is built upon proven prism tracking and accuracy that allows operators to establish points in most construction environments.

Bringing the FIELD into the Office in Real Time



Map of the Integrated Pipeline Project, the largest water transmission system of its kind in the state.

A pipeline component hangs at the ready. When phase one of the IPL is finished in Spring 2019, crews will have laid 70 miles of 84-inch to 108-in pipeline.

Sometimes a project comes along that changes everything. For the Tarrant Regional Water District (TRWD), in Fort Worth, Texas, that project was the Integrated Pipeline Project (IPL), the largest water transmission system of its kind in the state.

Built in partnership with the City of Dallas Water Utilities (DWU), the IPL will consist of 150 miles of pipeline, three new lake pump stations, and three new booster pump stations built to deliver a required capacity of 350 million gallons per day (MGD) of raw water to North Central Texas.

Although pipelines, reservoirs and floodways have been a natural part of TRWD's business for 90 years, the IPL would redefine business as usual—particularly for the geospatial services group.

» MARY JO WAGNER

The Dallas skyline. The IPL is being built in partnership with the City of Dallas Water Utilities.

In the past, the group required extensive time to integrate accurate as-built data from pipeline construction projects into their water transmission GIS model. Given the scope of the IPL, they wanted to be able to collect and integrate survey-grade as-built data into their central GIS in near real time to enable crews, managers and stakeholders to monitor multiple pockets of construction, identify any issues that arose and immediately respond to them. The issue was how to do it.

"We had the high-precision survey technology and we had the GIS," adds Mark McGuire, manager of TRWD's geospatial services group. "We knew they wouldn't be the problem. The bottleneck was the real-time interoperability."

However, by connecting a bit of ingenuity with creative customization, TRWD broke through its information bottleneck with the development of its real-time as-built program (RTAB). A deceptively simple solution to a complex problem, the RTAB not only integrates survey data into TRWD's GIS in real time, it parallels the field activities outside so managers inside can monitor construction as it's happening, ensuring both the horizontal and vertical accuracy of the assets being placed and the real-time responsiveness to any issues needing attention. Four years into the IPL construction, the new system is providing a perspective they've never had before, a level of information they've never had before, and it's changing the business of pipeline construction for them.

The IPL will consist of 150 miles of pipeline, three new lake pump stations, and three new booster pump stations. It will deliver a required capacity of 350 million gallons per day of raw water to North Central Texas.

Rich Haynes, a pipeline resident representative with TRWD, uses a Trimble R8 GNSS unit and a Trimble Yuma 2 tablet to collect as-built measurements of an installed conduit for the IPL project. With RTAB, that data is available in near real-time back in the office.

What If...

RTAB started from a spontaneous question that was a little radical at the time. It was 2010 and managers were highlighting the need for more efficient data processing and sharing of GIS-based construction information. They needed to ensure all infrastructure assets were being placed according to design specifications, and with the magnitude of the IPL, they couldn't afford even a single day delay in as-built data. That's when Eddie Weaver, TRWD's IPL deputy program director, asked, "What if we could get the as-built survey data into the enterprise GIS in real time?"

"Historically, as-builts have been an afterthought on construction projects," says Weaver. "They often weren't collected, and if they were, they were hand-drawn on paper and weren't always accurate or complete. But as-built data is critical to ensuring quality control on the IPL design and for giving us a detailed inventory of our installed assets. That made me wonder, 'Can we develop the technical capability to collect as-built data ourselves, and tie it in to our existing GIS and asset management systems, to give us a real-time record of what we installed, where it was installed and when it was installed?'."

No one had an immediate answer.

At the time, they were not familiar with any technological options for that kind of seamless, real-time interoperability. And they knew of very few, if any, organizations that were routinely integrating high-precision as-built information into their GIS.

Initially they focused on assembling the survey technology that would meet their high-accuracy data requirements. As long-term users of Trimble technology, they chose a collection of Trimble® R8 and R8s GNSS receivers to acquire Real-Time-Kinematic (RTK) survey data and a set of Trimble Yuma® 2 rugged tablets to store and export the field data. The Yuma tablets would be particularly beneficial because they offer Trimble Access™ survey field software, a user-friendly operating system and mobile communication technology.

In addition, the geospatial services group created and set up for each data collector a detailed data dictionary template for acquiring 30 pipeline assets and attributes and outfitted all crews with a standard operating procedure (SOP) document that clearly instructs what features to collect and how to collect them. Standardizing the survey process with uniform hardware and software, a data dictionary and an SOP ensured teams would collect all required IPL assets at the required sub-decimeter accuracy and reduce user error.

With the survey and GIS elements set, TRWD focused on the most challenging piece: finding a solution to bring the GNSS data automatically into their Esri® Enterprise GIS. In 2013, TRWD gave that puzzle to engineering consulting firm Halff Associates to solve.

Halff, based in Richardson, Tex., first capitalized on the existing mobile technology of the Yuma tablet and installed a cloud-based file sharing software. With this

approach, crews could transfer the field data to the office via a cellular connection. The Halff team also took advantage of Esri ArcGIS Server's REST services, which allowed them to create the Web-based framework to automatically process and move the Trimble survey data into the GIS. From there, they developed a customized "listener" tool that would detect new IPL-related files uploaded to the cloud, quickly analyze them and using the pre-defined ArcGIS REST services, automatically move the information into the correct data layers and attribute fields in the GIS.

Readied for the field in January 2014, the RTAB program would run on a combination of seven Trimble R8s and R8 receivers and Yuma tablets for the IPL project.

"For the IPL, we'll have 150 miles of pipeline, 99 percent of which will be underground," says McGuire. "Our survey technology provides the precise as-built data we need and the RTAB program ensures that we can monitor and verify that every pipeline segment and asset is being placed according to the design in near real time. In terms of efficiency and potential cost savings, that is priceless."

Crews use a Trimble R8 GNSS receiver to collect as-built data on an installed pipeline joint.

As-builts in real time

The IPL is being constructed in five distinct phases. Phase one construction began in May 2014 and was completed in the spring of 2019. Crews laid 70 miles of 84-inch to 108-in pipeline, built a 350 MGD booster pump station and constructed a 450-MG balancing reservoir and ancillary facilities. When the entire IPL is built, it will give DWU and TRWD an added 350 MGD of water supply to serve both its nearly 4.5 million existing customers and to meet the estimated population growth of the region.

Since phase one began five years ago, TRWD field teams have been collecting sub-decimeter horizontal and elevation data of features as crews build the required infrastructure. Although the need for survey-grade as-builts has depended on construction, at least two TRWD teams have been routinely on site for pipeline construction, with up to nine crews at peak times.

With the Trimble R8 and R8s receivers, crews use a combination of Trimble VRS (Virtual Reference Stations) technology, hosted by AllTerra, to provide RTK GNSS corrections to meet their sub-decimeter accuracy requirements.

As each pipe segment is set, TRWD pipeline inspectors follow the specific SOP to collect all required asset and attribute data such as pipe-segment joints, valves, centers of manways and pipeline centerlines. Once a pipeline section has been buried, teams return to collect as-builts of surface feature assets like fences and crossings.

"Typically we only have a half-day or a one-day window before a pipe segment is buried," says McGuire. "With this real-time system, we can determine immediately if a pipeline alignment is deviating from engineered plans, or if assets are not located in the original design locations. We can then alert crews to the error and rapidly 'course-correct,' saving the project from wasteful downtime and the unnecessary redo of pipeline construction."

One System.
Dual Use.
Yes, You Can Do Both!

Designed to easliy move from a UAV to a ground vehicle. Optimize your ROI.
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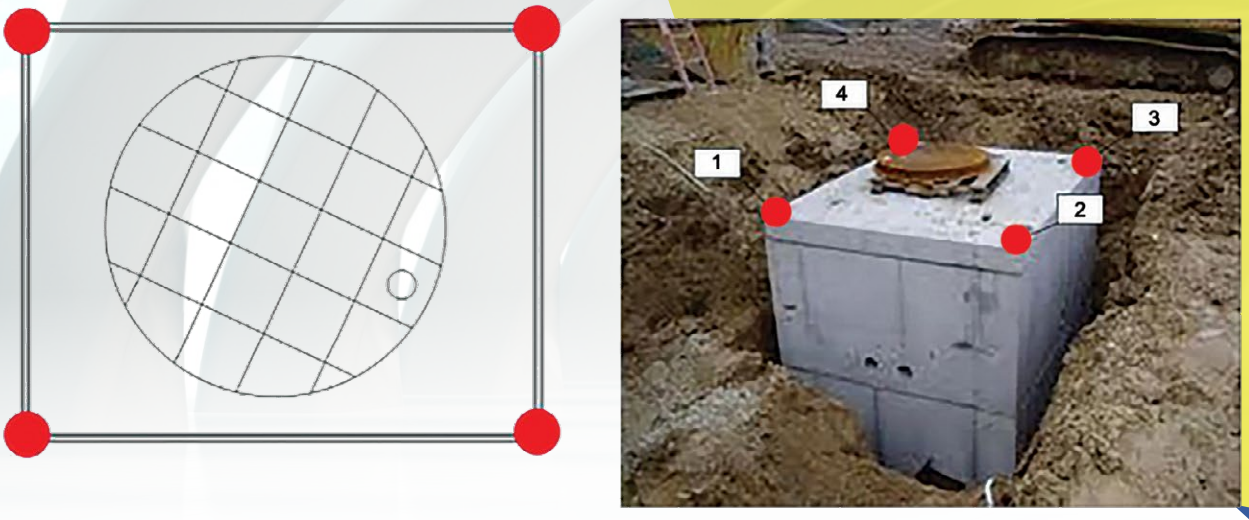

TRWD's geospatial services group outfitted all crews with a standard operating procedure document that clearly instructs what features to collect and how to collect them. This diagram details what data points to collect on a fiber vault.

Once the pipeline assets have been acquired, the team uses the Yuma tablet's Trimble Access software to export their data as a standard CSV file to the cloud. When the RTAB listener tool detects the new file, it parses it and automatically distributes the information into the relevant IPL datasets in TRWD's GIS. Personnel in the geospatial services group then review and verify the accuracy of the newly acquired data, either flagging it for further review or accepting it and making it available for immediate viewing across the organization. To date, TRWD teams have collected nearly 22,153 data points on the IPL project.

"The moment we hit that sync button, the data is live and available to us and all the stakeholders so key decisions can be made in real time," says McGuire. "In the past, it would take days to weeks to integrate our survey and GIS data, delaying our ability to make informed decisions. Now we can look at it live across multiple devices. It's completely transformed our work patterns on the IPL and has begun to change how we support other divisions across TRWD."

Indeed, based on the success of the RTAB system during phase one of the IPL, TRWD will continue to use its survey technology and RTAB for phase two construction, which will begin in early 2020 and aims to add 40 more miles of pipeline to the IPL.

In addition to the IPL, TRWD has expanded the program to support traditional and real-time surveying efforts including flood-control management, existing pipeline infrastructure, floodways and utilities. And it completed an internal pipe-data collection project. Teams collected around 600 features (manways, valves, and a point at each pipe segment) of about 7 miles of continuous pipe using the Trimble SX10.

Similar to the IPL process, geospatial services staff use Trimble SX10 and R8s GNSS units with Yuma tablets to collect a host of location and as-built data on critical infrastructure assets. They then export the data in real-time and the RTAB listener identifies to which particular project the data corresponds and populates the relevant GIS datasets in the enterprise GIS.

According to Rachel Ickert, TRWD's water resources engineering director, the geospatial services group has used this data to develop a GIS-based hydraulics model, incorporating elevations of pressure readings and meters to allow them to better calibrate real-world field information with their planning models.

In addition to the significant operational benefits TRWD is gleaning from seamlessly linking the as-built data to its existing GIS, the integration of the RTAB program into TRWD's asset management system (AMS) is also providing levels of insight and management opportunities that they've never had before.

"Connecting RTAB with our AMS is so powerful," says Wesley Cleveland, TRWD's integrated pipeline director. "Because we collect so much attribute data we can better monitor and maintain assets as they degrade or if something breaks down. Now our field guys can accurately navigate to an asset in the field, access the system, isolate the specific asset in question and have all the relevant attribute data in seconds. Once they've completed their work, they can capture an as-built, update any relevant attribute data and it's immediately saved to both the GIS and AMS. This is far and away better than our paper drawings of the past. We will be using this system on anything we put in the ground."

It appears then that the "integrated" part of the IPL is not only integrating infrastructure to keep sufficient water flowing to residents, it has helped bring data integration to TRWD in a completely new way. Fostering real-time monitoring, reporting, accountability and decision-making, TRWD's RTAB is creating a geospatial data pipeline across its organization that is as fluid as the water it provides. In McGuire's words, that is priceless. ■

Mary Jo Wagner is a freelance writer who has covered the geospatial industry for 25 years. Email: mj_wagner@shaw.ca.

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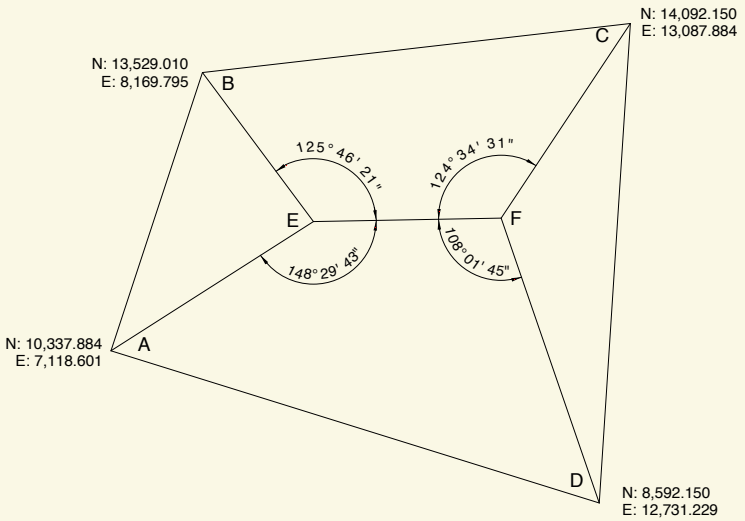
Dave Lindell, PS, retired after 36 1/2 years with the City of Los Angeles. He keeps surveying part time to stay busy and keep out of trouble. Dave can be reached at *dllindell@msn.com*.



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Lathrop, *continued from page 40*

to revise their ordinances, statutes, and construction procedures as a result of the *Knick* ruling. Government entities proffering offers that are rejected may already have set up escrow accounts covering assessed values while the just compensation hearings - and the project – proceed. But condemnees may have been advised not to take an unacceptable offer while waiting for their day in court, as that might undermine their claims and be construed as acceptance. So development, redevelopment, and construction projects will need to wait for adjudication and payment of full compensation before moving ahead.

Related to this, the second negative result of this decision is that federal courts could be deluged by claims relating to land use and state laws. Because of the "nearly infinite variety of ways" that regulations affect property interests, it is not possible to know how or whether the implementation of land use regulations will result in a taking, or even whose property could be affected. Quoting the dissent:

> "Now, when a government undertakes land-use regulation (and what government doesn't?), the responsible employees will almost inescapably become constitutional malefactors. That is not a fair position in which to place persons carrying out their governmental duties."

The third negative is the upheaval of all we thought we knew about relying on legal precedent or *stare decisis*. When we are accustomed to relying on what we have learned from past experiences, to have that past thrown away leaves us in a state of flux and confusion. Justice Kagin writes:

> "… the entire idea of *stare decisis* is that judges do not get to reverse a decision just because they never liked it in the first instance. Once again, they need a reason *other than* the idea 'that the precedent was wrongly decided.' *[citation omitted]* For it is hard to overstate the value, in a country like ours, of stability in the law." ■

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.

For those who want to investigate more deeply:

The SCOTUS blog, including links to the final opinion (under "Judgment" near the top), the 21 Amicus Curiae briefs filed on both sides, petitions, briefs, and motions, plus various reviews written as the case unfolded:
https://bit.ly/2KpUUeN

For a clean PDF of the decision, concurring opinion, and dissent:
https://bit.ly/2TjyyyH

The primary federal case relied upon by the state courts in denying Knick's claims but rejected by the current SCOTUS majority: *Williamson County Regional Planning Commission v. Hamilton Bank of Johnson City*, 473 U.S. 172, 1985:
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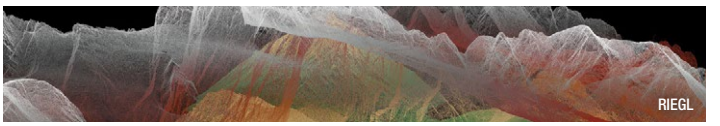

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Take Two: SCOTUS Upends What We Thought We Knew

Just about a year ago, I wrote about Rose Mary Knick's suit against Scott Township in Pennsylvania ("Taking on a Dead Issue," August 2018). Ms. Knick contested the right of her municipality to pass an ordinance mandating public access during daylight hours to a cemetery on private land. The effect of this local rule would force her to allow entry from the nearest public road to a reputed burial area on her land, the existence of which she doubted despite historic research by one Robert Vail.

Claiming the ordinance amounted to a taking of her private rights, but not inverse condemnation, Ms. Knick turned to the Pennsylvania court system to pursue her arguments. Scott Township withdrew its violation notices against her and dropped any enforcement actions. As a result, the Pennsylvania court said Ms. Knick no longer could show she had suffered irreparable harm and refused to rule on her request for equitable relief from the ordinance.

Next stop: Federal District and Third Circuit Courts, both of which dismissed her case, relying on *Williamson County Regional Planning Commission v. Hamilton Bank of Johnson City* (473 U.S. 172). In that 1985 case, the Supreme Court of the United States (SCOTUS) found that the applicant had not shown that all possible variances had been exhausted, so the case was not "ripe" for adjudication. Just compensation had to be sought under state laws in the state courts before it could be argued in the federal courts as a takings claim. From the *Williamson* case:

> "Viewing a regulation that 'goes too far' as an invalid exercise of the police power, rather than as a 'taking' for which just compensation must be paid, does not resolve the difficult problem of how to define 'too far,' that is, how to distinguish the point at which regulation becomes so onerous that it has the same effect as an appropriation of the property through eminent domain or physical possession." (473 U.S. 172 at 199)

> "The language of the... decision is easier to grasp than the ripples in the legal system that the decision... will cause."

Having exhausted Pennsylvania's inverse condemnation procedures, Ms. Knick won her place in line to be heard by SCOTUS for a determination of how many hoops one must leap through to have a "ripe" claim. She is now celebrating her win, but the rest of us may be a bit dizzy from the changes the decision may bring.

The language of the 5-4 majority decision is easier to grasp than the ripples in the legal system that the decision and its reasoning will cause. The short version is that allegations of local government violations of the "Takings Clause" in the Fifth Amendment to the US Constitution may be brought directly to federal court without going through the state court system first. Before going further into this part of the discussion, here is the referenced "Takings Clause":

> "... nor shall private property be taken for public use, without just compensation."

Now we start into the murky side of things. Chief Justice John Roberts, writing for the SCOTUS majority, says: "[The "Takings Clause'] does not say: 'Nor shall private property be taken for public use, without an available procedure that will result in compensation.'" The deprivation of private rights secured by our Constitution serves as the basis for a suit and entitlement to just compensation as soon as property has been taken, no matter what eventual later remedies may be available through the legal system. This means that compensation for a taking is due concurrently with the taking or a constitutional violation results, and there is no erasure of that wrong. Quoting the SCOTUS majority again:

> "A bank robber might give the loot back, but he still robbed the bank... In sum, because a taking without compensation violates the self-executing Fifth Amendment at the time of the taking, the property owner can bring a federal suit at that time."

Justice Clarence Thomas, in his concurring opinion underscores the majority by saying that "the 'sue me' approach to the Takings Clause is untenable."

Now for the sticky part. The dissenting opinion, penned by Justice Elena Kagan, points out (often in blistering terms) three major negative consequences of the majority decision. The first is that the ruling "will inevitably turn even well-meaning government officials into lawbreakers." From my experiences, many local and state governments may need

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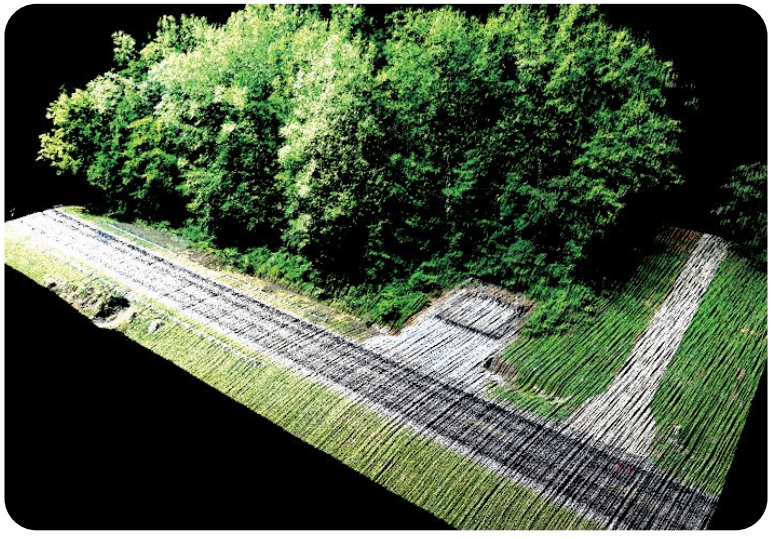

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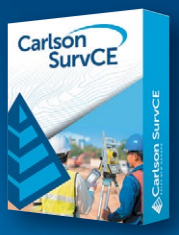

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