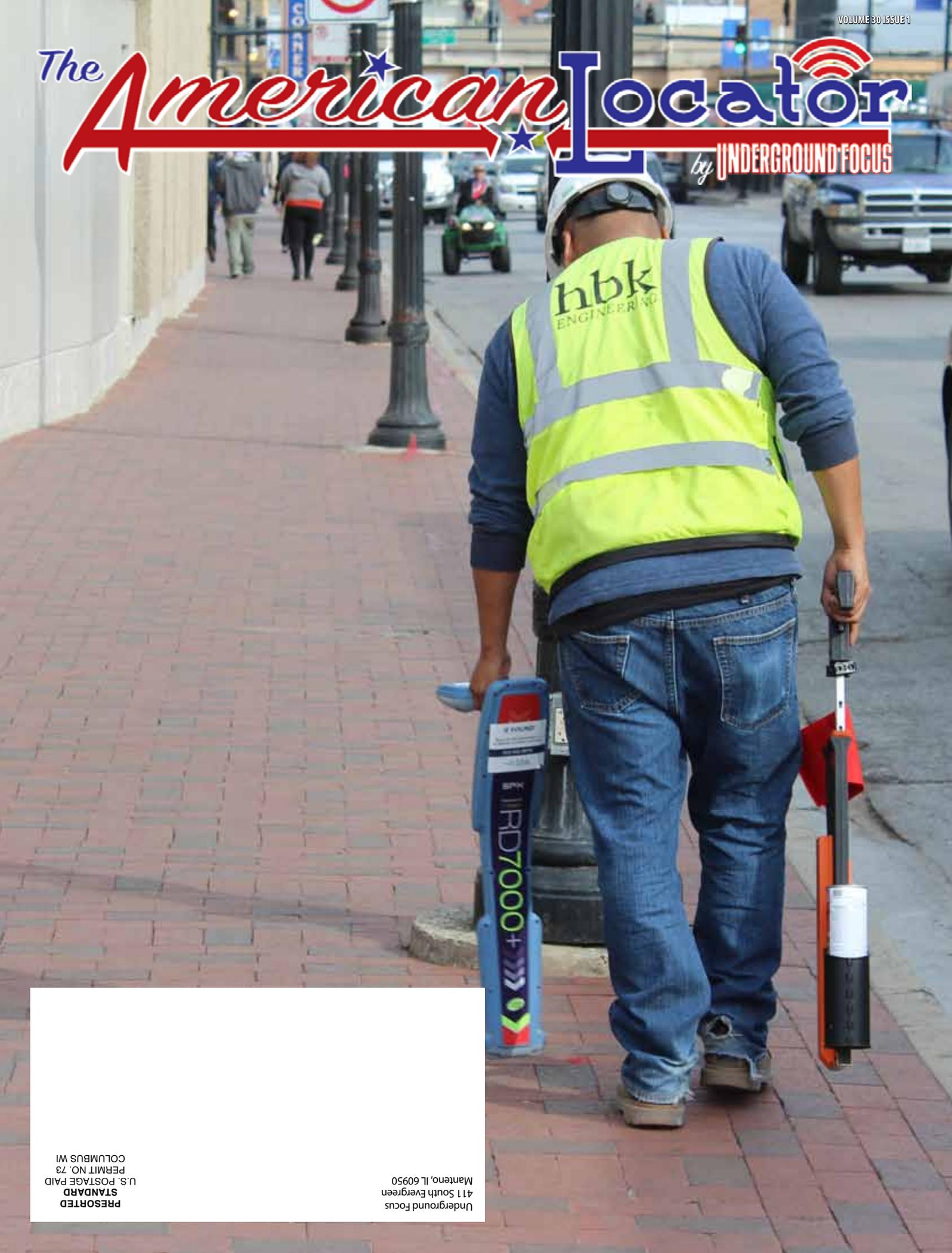


# The American Locator

by UNDERGROUND FOCUS



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# The American Locator

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Straight Talk About Straight Bars

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**M**y good friend John Foster once said, "You really start learning once you start teaching." And I've found that I completely agree with that statement: that the more you learn, the more you realize you don't know.



I am fairly knowledgeable in the area of training people to use electromagnetic locating instruments. I also occasionally get paid to travel and provide expert opinions in legal matters involving underground utility damage. They pay me because I am considered an "expert" in the field of damage prevention. But the truth is, when it comes to certain aspects of damage prevention, I am about as clueless as they come. As the old cliché goes, an expert is someone who is "from out of town", and I certainly meet that requirement.



How does one get the "expert" label? I suppose it's a matter of being both properly trained and properly educated. For example, to become a one-call locator you are trained to use a locating instrument. But to be a really good one-call locator, you must also become educated in the field of excavation. The road traveled to become an expert is paved with education.

It is essentially impossible to be trained in all aspects of damage prevention. It begins with effective underground utility design and ends with the gathering and collection of precise underground utility location information. And then with this exact location information, design becomes even more effective the next time. Damage prevention is not a straight line, it is a circle. The more you know about what happens along the circle, the more educated you can become.



I only know about what happens along part of that circle, but I want to learn more, and I know that there are a lot of people in the underground utility business that want to learn



interviewing an underground utility crew pulling in two 6" electric conduits. This early April shoot was the second in a series of three site visits with the same crews spanning a period of several months. The photos you see within this spread portray a variety of tasks involved with placing side-by-side conduits for a length of 550' at a 10' depth in an underground utility-rich environment.



Turn the page to the following article and you'll read about our early March shoot with these crews. You'll also be introduced to our new editor, Matt Streets, who chronicles his first experience with underground utility construction. I think it's good to learn through the eyes of people who are new to the business as well as those who have been around for a long time.

I hope you enjoy the first issue of the "new" magazine. As the name implies, we will feature stories about locating, but also focus all the other sorts of people who locate underground utilities. Each time an excavator hand digs or uses a vacuum excavator they do so to locate underground lines. The world of locating is larger than meets the eye, and with the advent of Planet Underground TV, we'll have another way to meet your eyes. Let the new journey begin.

more too. So that's why my partner Phil Gojia and I have decided to go into the television business, the most powerful of all media platforms.

After 30 years of publishing under the name of *Underground Focus*, we are now called *The American Locator*. We have recalibrated the magazine's purpose to be one of support for our television product, Planet Underground TV. What you see in *The American Locator* will be what you see on Planet Underground TV. The stories we produce on the television side will be engaging and educational. Simply put, the underground utility business is too large not to have its own television show and now it's going to have one. Earlier this week Phil and I spent time filming and in-





*The American Excavator*

## My First Dig: A Day Spent with Intren Crews



**H**eading out to my very first excavation site on this gloomy, snowy morning, I wondered what I was getting myself into. I was feeling a bit nervous and apprehensive, but also intrigued and filled with that slight childlike excitement at seeing big machines tear in the earth. Would I be completely lost in the weeds (literally and metaphorically), or would I gain a new understanding of the vital, yet dangerous work that excavators like these do every day? Having no prior experience at a professional dig site, I wasn't sure what exactly to expect. I guess I just assumed that the workers showed up and started doing their thing, having done it a million times before, and that it would seem old hat to these guys. But I was surprised and impressed by the amount of preparation and communication that Intren put into every step of the excavation process.



Dig crew members Joe Seng and Chand Balmer hand digging along the conduit path, to physically be able to see the bore as it comes through. Intren believes in these added double and triple checks to maintain the highest safety standards on every job site.

At Intren, safety comes first and foremost, and before a single shovel hit the ground, the preliminary daily safety report was delivered to us. Like a platoon sergeant laying out a complicated mission, or a quarterback in the huddle, the crew leader gathered around all of the workers and went through the procedures for the day. Every step of the dig was precisely laid out. All safety measures were explicitly explained and double checked, and everyone had to initial the report to acknowledge compliance.

The tickets had been submitted to the one call center, and the utilities had sent out locators to mark their pipes. But leaving nothing to chance, Intren had done their own locates and found some of the marks to be off. After some careful hand digging to verify the pipe locations, Intren brought in their own vacuum excavation truck to bore three holes along the pipe line and get an exact locate. I asked the crew leader whether they used air or water to excavate the holes, and he explained that because of the hard, wet soil that is found in this area, that water is almost exclusively used in these situations. I was again surprised to see that working the vacuum truck was a two man job. I had assumed that the main pipe coming out from the truck served dual purposes of shooting the water in the hole

AND sucking it back up into the truck. I didn't realize that one worker held the vacuum while another one worked a high-pressure water nozzle to carefully slurry the soil up for the suction hose. Again, safety came first, and the crew leader went around making sure everyone had ear plugs before the noisy vac truck rumbled to life.

At the second site I got to witness a HDD line borer in action, as the crews prepared to lay down about 300 ft. of electrical conduit in a joint trench along a ditch in a residential neighborhood. Again, the Intren guys were completely professional in their work and executed the boring with perfect precision, sort of like shooting an arrow through a drain pipe across a football field, except that you can't see the target. The crew leader explained to me that even though all utilities had been previously marked, and double checked by the Intren locators, they still used hand-digging to visually verify the location of the pipes along the bore path. Hand dug holes along the dig path allowed for visual confirmation of the bore, and I got to witness the birth of the drill bit coming through the mud, a strangely awesome sight! We were also treated to a locating demonstration by Intren's in-house locating guys.

Hooking up to a nearby cable box, the locator did a sweep of a lawn and showed us where the cables were located, spray painting and flagging marks along the way.

By the time we got to the third site the snow had picked up dramatically, blowing icy flakes right into your face and numbing hands to the bone. This site was also right beside a well-travelled residential street, and multiple times we had to watch out as cars came racing around the corner with total disregard for the workers in the road. These rough conditions and all details of the dig were again laid out and explained to all the workers by the crew leader, before any digging started. The crews then proceeded as planned, also working the line borer to lay down the conduit in a joint trench with other utilities. A tricky situation arose where the bore was going to cross a number of gas services branching off perpendicularly from the central gas main. Previous locating and hand digging had exposed the gas service, and the Intren crew leader showed us how they deal with this problem. A plank of wood was placed in the hole on top of the gas line to protect it from the drill coming across it. We watched as the bore head popped through the hole and safely crossed the gas line over the plank, all within a range of about six inches, again showing the precision and workmanship of these crews.

Spending the day with the excavators of Intren gave me a whole new appreciation for what many might see as a completely thankless job. The professionalism of these crews



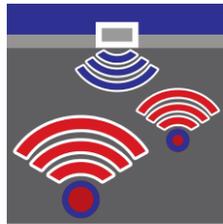
Crew members Humberto Trujillo and Francisco Aguilera man the vac truck, with a high-pressure water nozzle needed to blast away the thick wet clay common in Midwest areas.



HDD bore operator Jim Wright makes precise adjustments based on commands from workers further down the line who are visually confirming the drill bit from previously dug holes.

was evident throughout, from their total commitment to safety, to the high level of efficiency and communication passed down from the managers to the crew leaders to the excavators themselves. They knew exactly what to do at every moment, and were friendly, informative and patient with us whenever we had questions. What I also found refreshing is that these guys took pride in their work, and realized the importance of what they were doing. Thanks to everyone at Intren for allowing us to take a glimpse inside your world!





Locating Technology

## Must Be the Season of the Witch

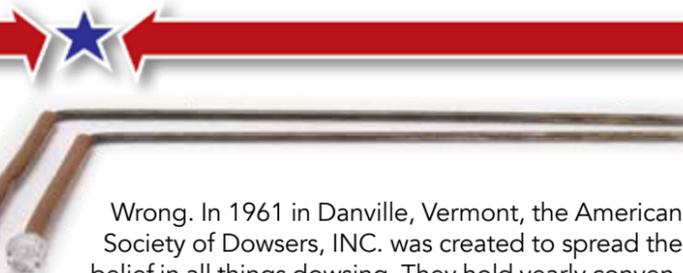
If you could travel back in time to the Old West of the 19th Century, you might find a farmer or homesteader slowly crisscrossing his land with a forked witch hazel branch held in front of him. What is he doing? He was dowsing, or water witching, using the branch to find underground water wells. Supposedly when you walk over an underground water source, the end of the branch will start to rotate, or dive downwards towards the source of the water. Despite the fact that numerous scientific studies over the years have declared dowsing results to be no better than random chance, this practice is still used today to find buried materials, by everyone from armchair backyard engineers to drought stricken farmers, to professional excavators and construction workers out in the field.

While water witching usually uses a forked tree branch, other types of witching as we know it today typically involves using two L-shaped metal or copper rods held out in front of a locator. As they walk across the land, the rods will eventually come toward each other in either an X formation or even a straight line to indicate underground pipes or cables.

The scientific community has almost unanimously debunked and discredited all claims of witching and dowsing as an accurate method of locating underground materials. Famous magician and skeptic James Randi founded the James Randi Educational Foundation (JREF) in 1996 to disprove any and all paranormal claims in a controlled scientific environment. In a double-blind study in Germany, Randi offered \$10,000 to anyone who could successfully tell, through witching, if water was running through a series of buried pipes. The locating results from the dowsers were no better than random chance, so no one claimed the prize. Another test in Munich by German scientist Hans Dieter-Betz of 500 dowsers showed some promising results for the pro-witching camp, but these figures were later debunked by the Committee for Skeptical Inquiry as mere "statistical fluctuations" that showed no better results than random chance.

Even the United States Geographical Survey got into the discussion, releasing an official statement on water witching: "The natural explanation of 'successful' water dowsing is that in many areas, water would be hard to miss." They go on to note that large water aquifers can be found almost everywhere under the Earth, which explains why some dowsers appear to be correct in their claims.

So if this practice is so widely discredited as being mere hokum, then that means no one is still practicing it, correct?



Wrong. In 1961 in Danville, Vermont, the American Society of Dowzers, INC. was created to spread the belief in all things dowsing. They hold yearly conventions, offer instructional classes in water witching, publish a quarterly digest, and claim over 2,000 active members across the world. And a quick online search will also confirm the prevalence of belief in this practice. Numerous websites offer online courses on dowsing, while YouTube videos abound of people purporting witching successes in locating underground objects.

Meanwhile farmers in the Central Valley of California are suffering through the worst drought in decades, due to the lack of snow runoff from the Sierra Nevada Mountains. As desperation has set in, they've turned to local water witchers to help them find much need underground water wells for their crops.

Water witching has been a subject of much controversy and debate for hundreds of years, and it appears to show no sign of slowing down. Is there actual truth to the claims of dowzers and witchers, that they can find underground objects simply by waving sticks and rods over the ground? Is it magic, or the effect of magnetic fields, or simply dumb luck? We at the American Locator of course recommend calling your local one call center before making any dig, and using professional locators and/or locating equipment to find any underground objects. But whether this is enough to dissuade the practice of witching remains to be seen.



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Excavation Safety

## Digging Dangers: Exposed!

**F**iercy explosions, huge plumes of black smoke, and the squawking chatter of emergency responders are just a few of the vivid sights and sounds that open this latest installment of the *Digging Dangers* series of videos. This chapter stresses the need for vacuum excavating to physically locate all underground pipes and cables before any digging proceeds.

Senior Construction Risk Engineer for XL Catlin Fred LeSage urges vacuum excavation in conjunction with any digging around tolerance zones, which most state laws define as being 18' to 24" on either side of a located pipe. He states that the "major reason why clearly marked lines are hit by excavation equipment is that someone digs within the safety buffer". It's gotten so bad that municipalities have started hiring their own vacuum excavator teams to locate pipes at construction sites, because they are worried about potential damages to their water mains.

The video also stresses the dangers of pre scooping a dig site in order to make hand-digging easier for workers. As the narrator states: "There is no standard depth for burying cable or pipes". Another danger that excavators face is running across abandoned utility lines. It is far too common to see the markings on the ground and incorrectly locate the dead pipe, only to move over and hit the active one.



But are there better solutions on the horizon? Dennis Jarnecke, Research and Development Manager for GIT seems to think so: "Vacuum excavating has come a long way over the last decade. It was a challenge to find a vacuum excavator out on a utility excavation site, where today I would venture to say probably half of those sites have the presence of a vacuum excavator."

Buffered by classic clips from the *Digging Dangers* Video Archives, this latest chapter is sure to open some eyes about the importance of vacuum excavating, and hopefully lead to an increase in safety and damage prevention in all areas of locating.



Want your equipment or your crews in a customized *Digging Dangers: Exposed!*?  
[www.diggingdangersvideos.com](http://www.diggingdangersvideos.com)

# Digging Dangers

Videos

presents

## Digging Dangers 26

2 Videos

GHOST IN THE MACHINE

and

FAST AND FURIOUS



**T**he American Locator was lucky enough to speak with Damian Taylor, a Senior Utility Surveyor and Manager with over 18 years of experience in the locating field. Damian was kind enough to take time out of his busy schedule to illuminate us on the finer points of utility locating, his personal choice of locating gear, and the fascinating differences between locating here and in the UK and Australia.

**OK Damian, could you give us some background on your career? How did you get into the locating business and how long have you been doing this?**

I started out as an assistant/trainee land surveyor straight out of school at the age of 16. Ten years later, as a senior member of staff within the company I left and joined Site Vision Surveys LTD. At the time SVS were a utility mapping company without land survey or geo-referencing capabilities. My role was to set up and run the survey and geo-referencing department within the company, working alongside utility surveyors mapping the sites.

It was not until I moved to Sydney, Australia that I actually took up utility locating. Australia is where I learned how not only to locate but to locate accurately. Working for a Vacuum Excavation company (Vac Group) I had a very different exposure to learning than most locators in the UK, as pretty much everything that I was locating was being excavated and proven using vacuum excavation. This proved to be a



great way to learn and understand locating safely. If my locate was off, it could still be found and then I could reassess the locate and make the necessary changes to improve my accuracy. Whilst in Australia I also had the benefit of completing the Staking University program, educating me in the advanced theory of electromagnetic locating. The Staking program teaches about how electromagnetic transmitters and receivers work and the importance of assessing the magnetic fields during locating at all times. This ensures that the signal is well received and the field is round, and tells you what to do if the field is not round to ensure accuracy is maintained. By combining the advanced theory of accurate locating and then having my work proven, you build up a great confidence and appreciation in your ability to locate services accurately.

**What company do you work for, and where are they headquartered? How long have they been in business?**

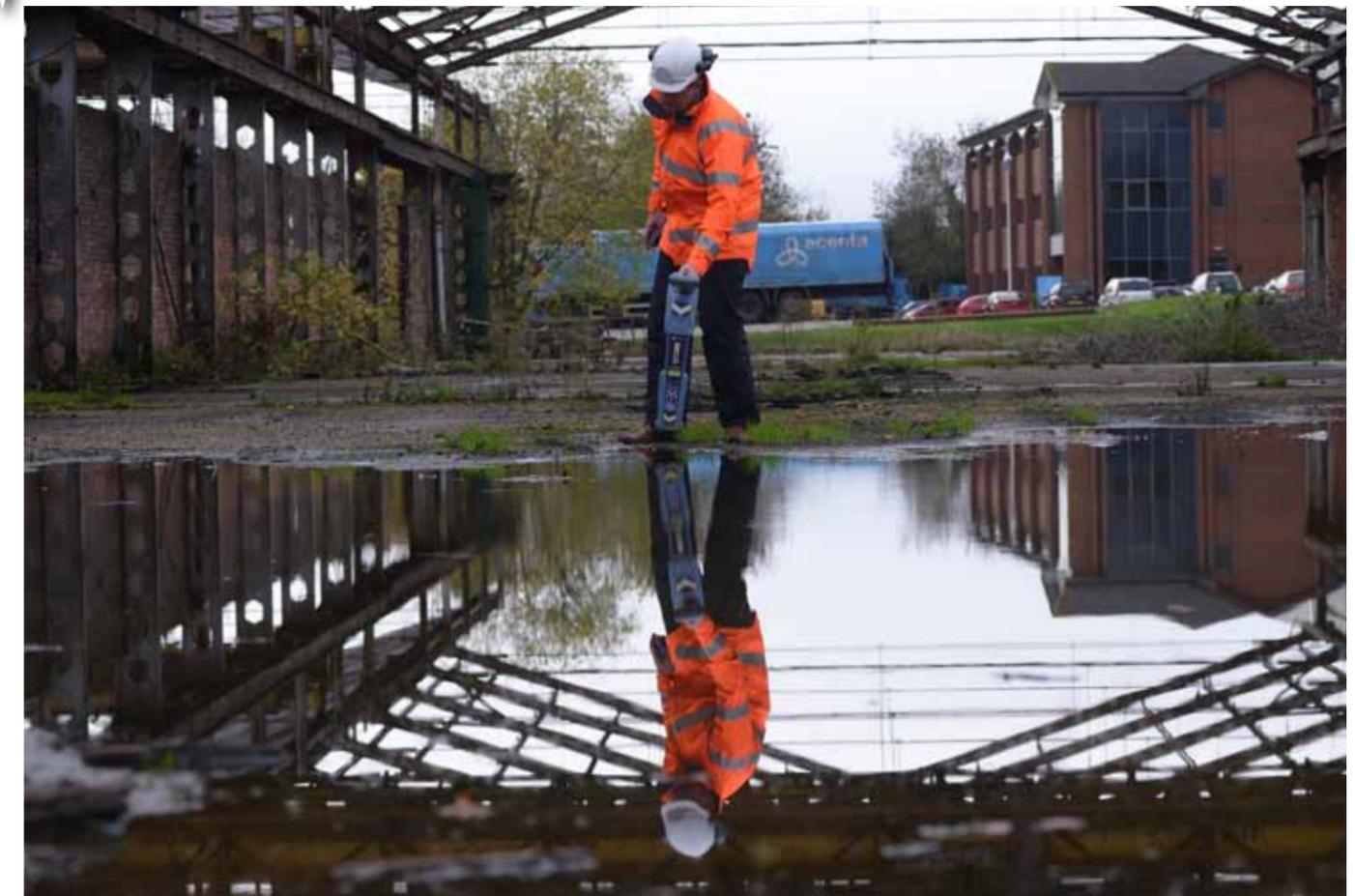
Following my time in Australia I moved back to the UK with my employer Site Vision Surveys Ltd. as a Senior Utility Surveyor and Manager, and have now served 18 years within the survey industry. Site Vision Surveys LTD were founded in 2003 and are based out of Rugby in central England. SVS are a utility mapping and topographical survey consultancy specializing in accurate utility locating and mapping for highways, rail, construction and civil engineering projects throughout the UK and Europe.

**What different types of locating do you perform?**

Locating techniques I deploy are Electromagnetic Locating, Ground Penetrating Radar, Vacuum Excavation and safe excavation practices, all in conjunction with a good problem solving mentality and thorough process driven attitude. These techniques are performed on a wide range of specifications from small service avoidance projects to utility mapping large extensive sites and utility networks in accordance with the UK specification of Subsurface Utility Engineering PAS128.

**Could you tell us a little about your experiences with Subsurface Utility Engineering (SUE), and how that differs from other types of locating?**

My first experience with SUE was in Australia working in accordance with AS5488 Subsurface Utility Information. Being able to sub categorize your locates based on the technique and accuracy of your locate has great advantages to both



design and safety, as the end user can make educated decisions on how best to use the information and where to investigate further if required. The UK's version PAS128:2014 is more complex within the Survey type B quality level designation. A quality level B has four sub categories based on the techniques used and the quality of the locate, with B1 being most accurate and B4 the least. The survey company issuing the quality levels also openly declares design tolerances to assist design and safety around the services. A B1 quality level must be accurately located by EML and GPR and holds a design tolerance of +/- 150 mm horizontally and +/- 15% on depth. B2 is accurately located by either EML or GPR but only one method has been achieved, allowing +/- 250mm horizontally and +/- 40% on depth. B3 is used for a poor locate such as a non-round field in EML or poor GPR reflection holding +/- 500mm horizontally and no depth is given. B4 holds no design tolerance as this covers unlocatable utilities that would normally be associated with Assumed Routes or Utilities shown from record information that cannot be found. These specifications of utility surveying differ from others in the time taken to geo-reference and

survey the locations on site to ensure the accuracy is kept from the site, all the way through to drawing production, as openly declaring design tolerances requires accuracy at all stages. Other survey location types such as service avoidance and utility mapping surveys deploy more traditional tape measure, road wheel and hand scale drawing techniques in the drawing production, however this technique does not meet the required accuracy and tolerances cannot be achieved.

**What do you feel is the best equipment for utility locating these days?**

I currently use an RD8000 PXL receiver and TX10 transmitter, the RD's are very user friendly and allow for easy magnetic field assessment at all times. They both have a broad frequency range for problem solving and variation as "different frequencies can and will do different things". In addition to the RD, while in Australia I used the high frequency Pipehorn receiver and transmitter, which was great for problem locating and problem solving. On many occasions, once



higher conductivity services had been located they could easily be nulled out and the lesser conductive service found. Unfortunately the Pipehorn is not available in the UK. For GPR I currently use the latest IDS opera duo, it is very user friendly in being able to switch between high and low frequency antennas for different surfaces and locating different utilities at varied depths. The software display also allows for easy interpretation and the radar is great for capturing and post processing data away from site.

**Do you have a preferred method of locating when out in the field? Is there a certain way that you've seen give better results than others?**

I consider myself to be a very thorough and process driven surveyor exhausting all possibilities until the required accuracy is achieved. I have no favored way of locating as I believe all methods and techniques are just another tool in my box. My preferred process involves lifting covers and mapping drainage first, then deploying EML starting with the higher conductivity services first such as electricity and communications, then moving on to lesser conductive services such as water and gas pipes. Passive checks and induction sweeps or box drops are used to locate any unknown conductive services. GPR is then deployed to confirm already located services and look for any non-conductive services that may be present. All GPR findings outside of the EM locates are induced to make sure they are non-conductive. All services are then mapped with land survey measurement techniques and processed.

**What are the biggest obstacles facing locators today? With booms in the construction and telecommunications industries, do you foresee difficult times for locators in the future?**

Without a doubt the installation of plastic pipes and fiber optic cables proves its own problems in being able to accurately locate them, because in the UK they do not install tracer wires to assist and tend to lock comms pits or block fiber optic ducts with insulation foam. Technology around locating plastic pipes needs to improve or asset owners need to invest more in to how they can easily find their asset once it has been installed. Even if they georeferenced the service upon installation, then issued coordinates to stake out the position, this would be good especially for higher risk services such as high pressure gas and fuel lines.

**How well do you think that Call 811 and Call Before You Dig programs work towards utility damage prevention? Is there anything they could improve on that would make your life easier as a locator?**



I think a one call system is a great thing if it is stipulated as a legal requirement on all projects. Australia's dial before you dig system is brilliant in the fact you only have to make one inquiry and the information is given to you within 48 hours. Most companies stipulate that plans must be on site at all times and no older than 3 months old. The UK has a system however where you have to contact all asset owners individually for a response, and some asset owners will charge a cost even to say they don't have any plant in the survey area and can take up to 2 weeks to comply. This causes issues with urgent sites and sometimes we have to return to site to investigate findings different to a delayed record drawing. Another problem in the UK is the variation in plan quality from one asset owner to the next. Some have great plans that are full of information such as pipe sizes, materials and dates laid while others are really poor old hand drawings that are difficult to read. A standardization of these plans would be a great thing.

**Seeing as you are based out of the U.K., I'm sure our North American readers would love to know the current state of utility locating over there. We've talked a bit about it already, but what are the major differences between the continents in terms of locating?**

The UK locating market is making great strides in moving forward following the recent creation of the PAS128:2014 document, which is their version of Subsurface Utility Engineering. In addition to this the UK market is now insisting on well trained, competent and qualified staff. There has always been a problem that off the shelf locating and survey equipment is readily available and people can easily claim to be experts and carry out the same job at a fraction of the cost. Unfortunately, until the work is done and problems are found there is no way of knowing if they are competent and able to do their job. The UK now has training programs and nationally recognized qualifications in place that deem surveyors competent based on their training and skill sets. Construction Skills Training Academy (CSTA) have done a great job in providing the training programs and assessment to provide these qualifications. They've also recently taken on the Staking University program that I undertook whilst in Australia, which I would highly recommend any serious utility locators out there to attend, as it really does open your eyes to the world of Electromagnetic locating. I have also carried out service avoidance works throughout France and their attitude towards utility location is very different, there is no national standard or publication. Their process involves an existing records search and consulta-



tion with the property owner regarding their knowledge of the service locations, where a CAT scan takes place then a location is hand dug to 1.2m. There is no knowledge of service tracing or locating. Working with one of our clients in the UK we are hoping to change that mindset and create awareness not only about service locating but the health and safety risks associated with not carrying out locating.

**What do you see for the future of the locating industry? What changes and improvements do you think could be made to better the damage prevention industry?**

Because there will always be a requirement for services and the need to keep areas pretty and tidy, it means they will have to be buried underground so there will always be a need for service locating. The technology has to change and adapt to the latest materials that these services are made of and laid within. I believe the main thing with regards to damage prevention is generating awareness in not only what we do, but what we can achieve and create that will help to manage both the risk to design and safety.





How Things Work

# Omnidirectional Receivers: Getting A Comprehensive View Underground

The need for accurate and comprehensive utility locating services and data has never been greater. Aging infrastructure, increased construction activity, and the expansion of existing facilities ensure that the need for utility locating expertise will continue to grow as more utilities are buried underground and require maintenance.

Actionable high-quality information is the most valuable asset for utility locating professionals, and technology plays a critical role in enabling utility locators to gather useful information about what they cannot see. Locating professionals need instruments that provide fast, accessible, and actionable feedback for their locates.

Omnidirectional receivers are a distinct type of receiver capable of quickly gathering comprehensive and high quality information about a signal. Built on years of research in electromagnetism, subsurface utility engineering, and real-world problems that utility locators confront daily, omnidirectional receivers provide locating professionals with what they need to know, when they need to know it.

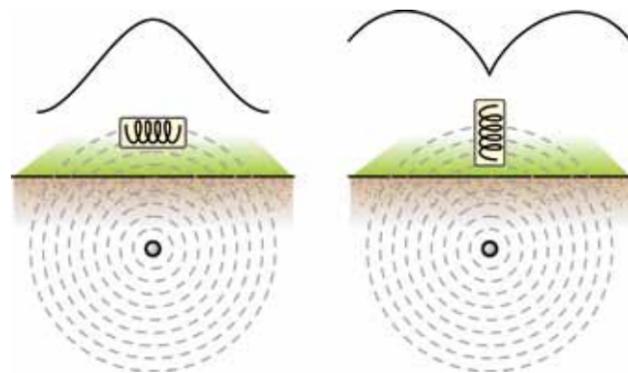
Omnidirectional receivers use a pair of antenna arrays to analyze an electromagnetic signal, providing a more thorough look at what's happening underground and real-time feedback on signal characteristics.

## Antennas

Utility locating receivers have improved greatly over the years, but the majority of receivers share one thing in common: their antennas. In general, receivers use what are known as *directional* antennas, named for how they detect electromagnetic signal. The direction in which these receivers are oriented with respect to the signal determines the strength of the signal readings. Typical antenna configuration in these receivers consists of two stacked horizontal antennas (relative to the ground) and one vertical antenna. Orient a receiver with directional antennas one way relative to the signal and your receiver will pick up a strong signal reading. Orient it another way and it might not pick up any signal at all. With a series of tests, a combination of horizontal antennas and vertical antennas can help an operator determine whether the signal is cylindrical. Cylindrical signals make successful locating easier, so knowing the signal's shape is invaluable in any locate.



An omnidirectional receiver uses twin omnidirectional antenna arrays to gather comprehensive information from a signal, including signal strength, depth, and orientation.



When the signal is cylindrical, a horizontal antenna (left) detects maximum signal strength when centered over the signal, while a vertical antenna (right) detects no signal in the same location. These readings correspond to peak and null readings, respectively.

## Omnidirectional Antennas

Omnidirectional receivers are different from most receivers in their underlying design and construction. They detect signal from any direction and analyze its full shape, which lets you know immediately whether the field is distorted and provides you with measured signal strength, depth, and orientation. And because it doesn't matter which way an omnidirectional receiver is oriented relative to the signal, you can orient one in any direction at the same point in space and be confident that you are getting more accurate readings.

## Hula-Hoop in Water and Full-Field Locating

Magnetic flux, or the flow of magnetism, is comparable to the flow of water. As an analogy, imagine you're trying to measure the amount of water flow in a river. You have a hula-hoop equipped with special sensors to detect the amount of water passing through it. If you submerge the hoop facing the flow of water with the opening of the hoop facing the flow of water, the hula-hoop will be able to detect the amount of flow.

However, if you turn the hula-hoop 90° such that current is flowing directly into the hoop's plastic edge (parallel to the current), the hoop won't detect any water flow—despite the fact that it's there. Likewise, if you hold the hula-hoop at an angle that's diagonal to the current flow, the strength of the water flow readings will only be a fraction of what is actually present.

The single hula-hoop is comparable to a directional antenna. If it's oriented perpendicular to the water flow, it will detect all of the flow within that particular area. If not, it will

intercept a smaller volume of water flow and therefore read a smaller amount.

Now imagine that a second hula-hoop is placed within the first hula-hoop and that the two rings are both still vertical in the water but at 90° to each other. Then imagine that a third hula-hoop is positioned within the first two hula-hoops. The hula-hoop structure can be placed at any orientation beneath the water's surface and read the same amount of flow.

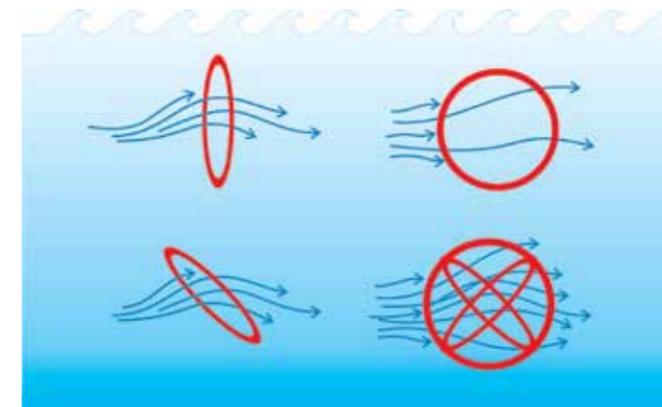
This is the design concept that omnidirectional locators are built on. The coils in the antenna arrays work together to read magnetic signal from any direction, providing immediate and actionable feedback on the things you need to know about a signal.

## Detecting a Signal with Omnidirectional Receivers

Omnidirectional receivers use a pair of stacked antenna arrays to detect and analyze a signal. Each array consists of at least three identical antenna coils that are positioned around a shared center. The arrays enable the receiver to measure the direction that the signal is moving, its strength, and depth at the same time and from a single point in space, meaning you see what you need to know with every step you take. For greater accuracy, the receiver compares readings between the top and bottom antenna arrays. Most importantly, the instrument is able to measure the signal's shape: again, an invaluable piece of information for the locating professional.



A cut-away of an omnidirectional antenna array showing the coil arrangement.





## Distortion and Feedback

In the locating world, cylindrical signals provide more accurate receiver readings. Because of this, it is critical to know as soon as possible if you're working with a distorted (non-cylindrical) signal. When signal bleeds over to a nearby non-target utility, the signal radiated by the non-target utility can interfere with the target utility's signal, causing the signal shape to be distorted. This not-uncommon scenario can make locating more difficult.

Receivers using directional antennas work best when operators can take the time to perform various tests to verify signal shape. Omnidirectional receivers do not require any tests to alert you that the signal is distorted, saving you

time during a locate. With a pair of omnidirectional antennas, the receiver can estimate the degree of distortion from anywhere near the target utility, cutting down on time spent verifying that your signal is cylindrical.

If the antenna measurements indicate a cylindrical field, the receiver's display shows a clean line over the estimated position of the signal. This line moves and reorients as the receiver is moved in response to the changing signal features, making tracing a utility through sections like elbows and tees much easier. If it is not cylindrical, the display shows a fuzzy line. The cleaner the line, the more confident you can be that you have a cylindrical field.



Omnidirectional receivers can indicate degrees of signal distortion. The fuzzier the tracing line is on the display, the more distorted the signal.

Whether signal distortion arises from site conditions or signal interference, omnidirectional receivers provide immediate feedback to alert you of a distorted signal shape. The real-time feedback is dynamic, meaning when the receiver is moved, you see a visual representation of the signal's position, direction, and degree of distortion. If you've determined that the signal is distorted, you can manipulate the signal to try to make it cylindrical in a number of ways, such as moving the transmitter or switching frequencies.

## Utility Orientation: Comparing Omnidirectional Receivers and Compasses

Some receivers that employ directional antennas use a compass to display an estimated direction of the target utility compared to the direction the receiver is facing. When using peak (horizontal) antennas, the display on these receivers shows a visual indication of the target utility's estimated direction. The estimated direction is based on signal readings that are most accurate when the receiver is centered directly over the signal.

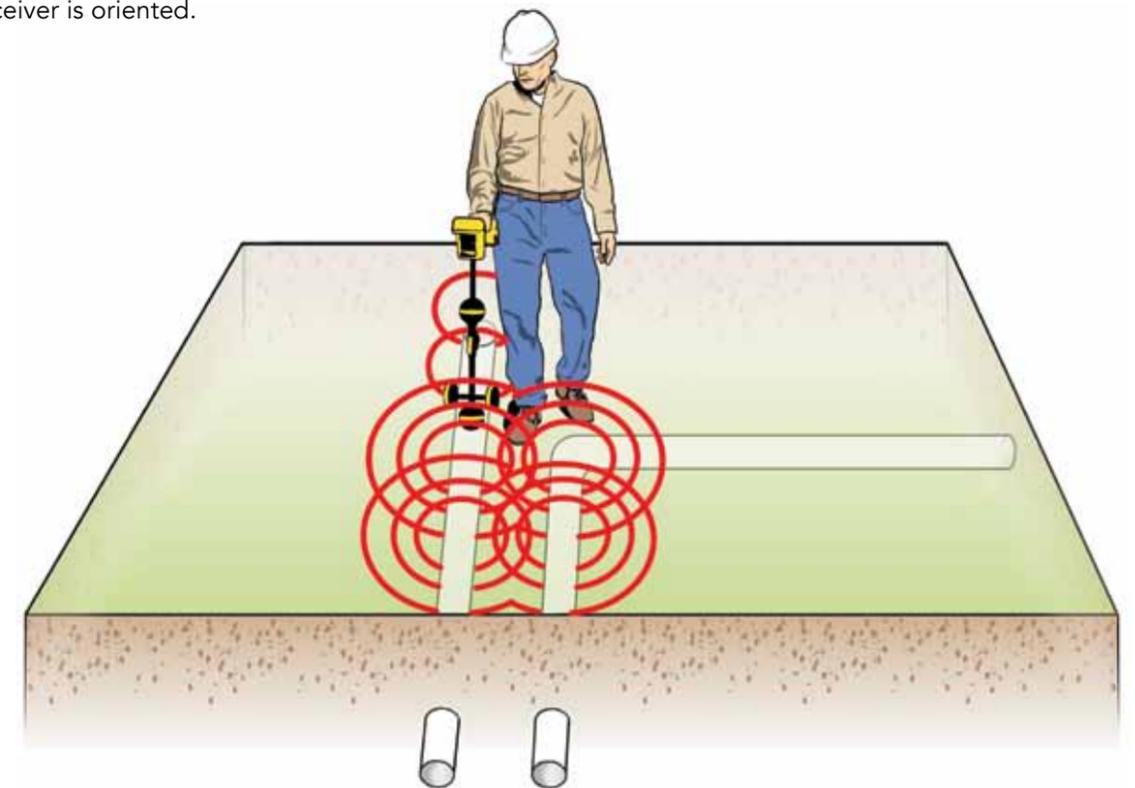
Because they perform true full-field locating, signal measurements provided by stacked omnidirectional antenna arrays gather more information about signal orientation, or which direction the signal is moving through space. This provides a better predictor of utility direction regardless of how the receiver is oriented.

With an omnidirectional receiver, you don't need to walk on top of the utility in order to locate effectively. The display shows you the estimated signal position and orientation at all times. This is especially advantageous for blind sweeps, where you can walk around the area, find a signal within range of the receiver using the line display, and trace it.

## Real-World Application: Locating on a Busy Street

When it comes to working with underground infrastructure, safety is paramount. Consider this common locating scenario: there is a utility running in the street, parallel to the sidewalk and 2' off the curb. Because an omnidirectional receiver analyzes the signal from any point in space within range, a locating professional can walk down a sidewalk, point the receiver at the target utility, and trace the utility without having to walk in the street. Even though the professional might need to paint in the street, the receiver reduces the overall time spent exposed to traffic.

Without having to continuously reposition and reorient the receiver over the signal, locating with omnidirectional receivers can make locates faster, less complicated, and safer.





## Looking Ahead

The future of utility locating will be built upon technology that gives locating professionals ever-improving visibility into the underground. By analyzing a signal in ways beyond what was previously possible, omnidirectional receivers conquer common locating obstacles, helping you get the job done confidently.



Locating challenges continue to rise in an increasingly complex underground environment, and the responsibilities of promoting safety and protecting the bottom line will surely remain top priorities. The industry has already taken steps to address these challenges, but more can and should be done. The development of new technologies is crucial, and omnidirectional receivers prove that there is significant potential for job-changing innovations in the not-so-distant future.

American manufacturer SeeScan, Inc., wanted to invent a receiver that would push past common locating barriers and set up locating professionals for success. In 2001, they introduced the first omnidirectional receiver and have been making them since.

For over twenty years SeeScan has engineered and manufactured a range of the most reliable diagnostic and utility locating technology on the market, including the SeekTech® line of utility locating receivers and transmitters and SeeSnake® pipe inspection equipment, sold under the RIDGID® brand through a partnership with the Ridge Tool Company. Visit [www.seektech.com](http://www.seektech.com) to view information on SeekTech® utility locating equipment.

SeeScan continues to leverage its significant experience developing omnidirectional technology to create the next generation of utility locating equipment. For more information, visit [www.seescan.com](http://www.seescan.com).

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## The American Locator Smart and Lucky: Searching for Spiny Lobsters, the Titanic and Safer Methods of Locating with Mark Olsson

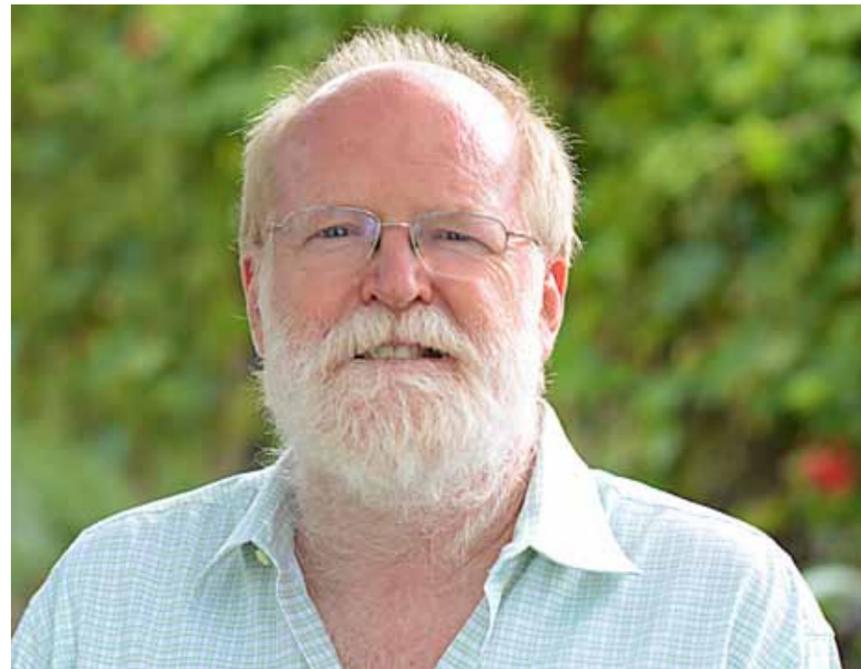


**D**eep sea diver, innovator, inventor, marine biologist, mechanical engineer and successful businessman are just a few of titles that could be applied to Mark Olsson, founder and CEO of SeeScan Inc., one of the world leaders in utility location and plumbing diagnostic products today. Mark was kind enough to spend some time with *The American Locator* and share his personal history, his philosophies on running a business, and his thoughts on the locating and damage prevention industry.

Though Mark grew up in Arizona, he ended up moving to Mexico when he was in 8th grade, because his father worked at Motorola. "It changed my whole world view, living in another country, learning another language and understanding that people see the world differently." He had always wanted to be an oceanographer since he was a child, though after four years of college at University of California in San Diego, he ended up with an undergraduate degree in mechanical engineering. Mark then enrolled as a grad student at the Scripps Institution of Oceanography, where he performed scuba diving research while studying the California Spiny Lobster, published papers, and ultimately invented a product still in use today: the SeaBattery.

Realizing that there were no reliable, water proof power solutions for underwater lights, he and fellow scientist Ray Merewether created the SeaBattery, and not wanting to get bogged down in the politics of academia and grant proposals, Mark then created his own company DeepSea Power & Light to focus on making these products. This led to exploring the darkest recesses of the ocean, from the Marianas Trench to working on locating the wreckage of the Titanic. This allowed them to develop underwater lights and cameras that were used for the IMAX *Titanica* movie, which inspired director James Cameron to make his smash hit film *Titanic*.

As time went on, Mark and his crew refined their products, making them smaller, more durable, and easier to use. "We started making these little tiny cameras with lights built into them, mainly for underwater stuff, and we focused on seeing how small we could make things. That ended up with



people putting some of our cameras with lights into sewer pipes, and then coming to us and asking if we made sewer cameras. And my thinking at the time was: there's probably a lot more plumbers in the world than oceanographers." Thus in 1994 the SeeSnake was born, a revolutionary sewer camera that changed the plumbing industry forever and is still used today. A year later they partnered with the Ridge Tool Company for global distribution, and have maintained a close working relationship with them for over 20 years.

The success of the SeeSnake led to another problem that needed a solution: people wanted to know where their camera was inside the pipe, as well as the location of the pipe itself. "We did really well in the plumbing market, but wanted to get more into the utility locating market. We did our first locator in 2001, which was still plumbing-centric, but it anticipated this mapping concept we were working on. It was the first locator to draw a map, showing a line on the screen that was the line in the ground. At that point, I realized that we really needed to make a mapping locator, and this is the problem we've been working on since 2005". This natural progression from the SeeSnake to locators came from the need to put a beacon in the camera system, creating a unique type of sonde locating, and yielding the popular NaviTrack™ and Seek Tech® brand locators.



In 2013, Mark renamed the company SeeScan, and today they employ 220 people at their corporate headquarters in San Diego. As Mark explains, these days larger group projects and bigger picture problems are what interests him the most. "I like building communities of people here now, and it's probably the thing that gives me more satisfaction than anything else. I used to want to build the widgets, and I would focus on that as an engineering project, now the thing I find most interesting is to build the thing that builds the widgets. It's the organizational aspects of it that are fascinating to me."

Recently SeeScan added over \$1 million worth of in house equipment to their facilities, most of which went to a new larger molding machine and injection mold making capabilities. "It's a little bit of a dying art here in this country, but we have a core group of injection molders and a full time mold designer. The mold making capability lets us go faster, it lets us explore other possibilities that if we were just outsourcing this to China, we wouldn't even be able to imagine them. We live in a world of outsourcing, people just want to outsource everything to somebody else, but people are making a catastrophic mistake in not keeping manufacturing and design together." Mark believes that true innovation and creativity comes from having these processes in the same place, and that it ultimately leads to better, more efficient and more affordable products. "Part of designing and building useful products is that you can design something, but the design has to be connected in some sense to the manufacturing process. The different types of manufacturing processes are the things that enable the possibilities, they're the things that let you make it stronger and lighter and better and cheaper. When those things are disconnected, it becomes slower and less optimal. A lot of innovation comes from imagining not only better ways of designing things, but better ways of building things."

SeeScan also places a high premium on Research and Development by rolling a significant portion of their profits back into research, though keeping on the bleeding edge of this industry can be tricky for a smaller company. "It's challenging to keep up, but that's the fun part, that's what makes it interesting, all of the new possibilities of new chips and capabilities, new software techniques and displays." Other difficulties can more geographical. "Trying to get parts that are only made in Asia in moderately small quantities is a real problem if you're not Apple or someone like that. That's probably one of the biggest headaches, is the disadvantage of not being in China, in terms of trying to make things."

We asked Mark about his thoughts on problems in the locating industry and the state of damage prevention today, and he was very forthcoming with insightful ideas and opinions. "I think probably the biggest issue in damage prevention in this country is that we look at this as a locating problem, rather than an avoidance problem. People are sort of stuck in their ways of, 'we've always done it this way, so that's the way we do things'." Mark sees utility mapping as a potential answer to some of these problems, but it seems to require a sea change in thinking industrywide. "I think the big problem is that we look at this as liability avoidance problem, figuring out whose fault it's going to be if something bad is going to happen, as opposed to figuring out how to not have it happen in the first place. If you know where everything is, you can more efficiently maintain it, and design how it goes into the ground, rather than creating this rat's nest of things that go over and around and under each other." But as with many aspects of the locating industry, nothing is ever that easy. "One of the things that is going to get in the way of mapping, is that people don't want to share information. They want to keep the location of their pipelines secret, which is quite foolish. You have to balance the value of knowing where they are and avoiding them, versus the extremely unlikely event that someone is going to attack and sabotage them. We seem to get all worked up over the potential for terrorist attacks, and it tends to warp the discussions."



Mark Olsson gets a project update from a colleague.



The SeeScan campus has multiple testing environments for developing new products. Here, Mark and Ray energize some tracer wires to test locating equipment.

Other information that is being withheld from locators and excavators is the depth of the buried pipes. Again, this secretive attitude is hampering accurate locating and leading to some dangerous situations. "This whole thing about not indicating depth is problematic, there's a much higher incidence of accidents because depth information isn't provided to the excavators. It's disrespectful and irresponsible at some level, to tell excavators that 'we don't trust you to use depth information intelligently and responsibly'. Therefore, they will deprive them of this information that's going to make (the job) vastly more dangerous and expensive, and it's going to result in more harm."

Mark stresses that changing long-held perspectives about locating, and opening up discussions about new and different ideas, is the key to preventing utility damages. "The entire psyche in the way we do things needs to be changed, all of these decisions are made in the mindset of liability avoidance, rather than damage avoidance. If you can't get people to think about the problem differently, if the very best solutions are by definition off limits, you're sort of screwed going out the gate. Oftentimes the way we conceptualize problems may exclude the very best possible solution."

So what does Mark see for the future of the locating industry, and what do he and the folks at SeeScan plan to do about it? The answer, as we've already mentioned, appears simple: sharing. "If you're needing to put in a new fiber optic line someplace, and if you have really high quality information on where all the other utilities are, you'd be able to put it in for a fraction of the cost. You can then also put these pipes in the ground more efficiently and co-trench and not have to rip up the street twelve times before you're done. It's insane that week after week, month after month, people are having to relocate the same intersection over and over again. And then not to collect and save and aggregate (this information) and not grow from it is ridiculous." But once again, intractable attitudes seem to be the enemy. "One of the things that is going to make this mapping problem hard to solve is that not everyone is going to want to share this information. The big opportunity is putting this info into the common sphere, very much like Google Maps or Google Earth. Big telecom companies like Verizon are laying fiber all over the country, but currently none of it is getting mapped effectively, it's all been incredibly sloppy and inefficient."



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Mark wants to take some of the human element, and by proxy, human error, out of the equation. "One of the messages I've been trying to get across is that you ultimately have to take where the utilities are on a map away from a human walking around with an instrument making decisions about where they are, based on interpreting real time information." Not denigrating the locators in any way, Mark will be the first to admit how tricky utility locating can be. "Locating is difficult, there's a lot of time pressure on it, and the paint marks you see on the ground are often wrong. Painting isn't going away anytime soon, but the process of surveying, which is expensive and inefficient, needs to change. Our first challenge here is to build an instrument where the data it produces and records can determine where the utilities are, independent of the operator's interpretation. In some sense, the instrument needs to know where the utilities are, not the operator carrying the instrument, and that allows you to automate the entire process. Now, that doesn't mean that the operator isn't exquisitely important, just that his role will change."

But Mark is optimistic for the future: "The problem that we are working so hard to solve, is that you need to take the data that is in that instrument and use it to draw the utilities on a map. It turns out that it is a very difficult and challenging problem, but I believe it is a very solvable problem, and I am utterly convinced that we're in the process of solving it. We've spent some huge amounts of money and time since about the year 2000 imagining how to change this world, and it's been a very long, technical journey. Over the last five years, we've begun to accelerate it with a vengeance, and I now can see my way to making all this work."

Mark's passion, ingenuity and thoughtfulness about this industry are beneficial for everyone, from the homeowner digging in his backyard, to the excavators out in the streets, to the high rolling CEOs of the biggest telecom corporations. But he is humble about his success, and sees that his important work may still lie ahead of him, though having a little good fortune never hurts. "It's great to be smart, but it's even better to be lucky."



SeeSnake camera reels on the production floor going through a final QA test before shipping out to customers

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## An Interview with J.D. Maniscalco

**J.D.** Maniscalco has served as an internationally renowned expert in utility damage prevention for nearly 25 years. Apart from being a founding member of the Common Ground Alliance (CGA) Data Collection & Evaluation Committee, and acting as the Chairman of the One Call Systems Data Collection Committee, he has served as the Executive Director of the Colorado 811 One Call Center since 1993. Recently, J.D. talked with *The American Locator* about everything from web based ticket entries, to the exploding housing market in Colorado, to the threat of cyber-terrorism against one call centers.

### Could you tell us a little bit about your background, and how you came to be involved in the damage prevention industry?

Well, my educational background is in music, and I went to school at the University of Northern Colorado on a scholarship. I was a professional jazz drummer and had some success with jazz and fusion groups in the early 1980s and 90's, but it was pretty clear that it was going to be hard to make it in the music industry, so I started to get involved in computer science and information technology. I partnered with a friend of mine and we started our own business in the IT sector, setting up local area networks to connect district attorney's offices with police departments and county court systems throughout the state of Colorado. I ended up managing that company for five years, and then around 1990 I met the executive director of the Colorado one call center and they were in need of assistance to migrate to a new computer system. Acting as a provider of IT services was my introduction to the one call center and I was successful at making that migration and assisting them with their needs. They offered me a full time position in 1991 as assistant manager, and then I became the executive director in 1994.

### How long has the Colorado 811 one call center been open and how many employees do you have?



We currently have 53 employees, which grows some in the springtime as we do hire some seasonal staff. Colorado is known for drastic changes in climate, unlike some states that have slight changes in their seasons. Their incoming ticket volumes are pretty consistent year round, while ours escalate in the spring and summer, and then decrease in the autumn and winter. Our operation has been in existence since 1987, so 2017 will mark our 30th year of operation.

### Approximately how many locate tickets do you process per day at your location?

I would say that Monday through Friday we're processing about 1350 incoming notifications a day,

and roughly 50% of those are through Web Ticket Entry. In total last year we processed about 732,861 Inbound notifications.

Our ratio of outgoing transmissions to incoming requests is 7:1. You'll see some states that have a higher outgoing transmission ratio and that may be attributed to more facility owners and operators that are members. Texas, for instance, that has a significantly larger number of gas pipelines, or California that has a higher population. Also, you can have mapping and member efficiencies that may give an indication of how members are narrowing down that corridor of notification. Enhanced mapping allows our contact center to improve our outbound transmissions to serve better our members when they are choosing to redefine their service area.

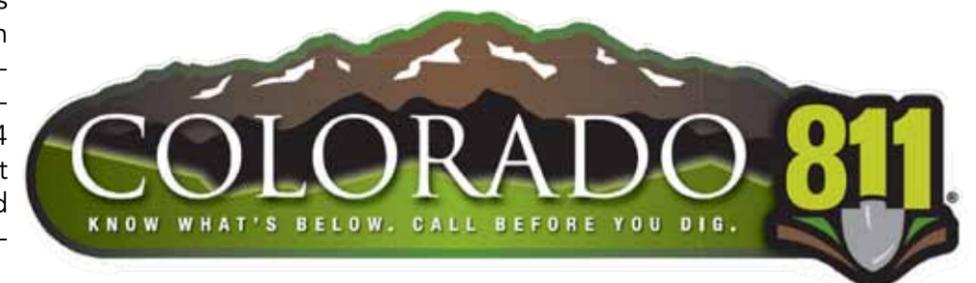
### Could you give us a quick rundown of some of the web based services that Colorado 811 offers on it's website, and tell us how you think these innovations have changed the one-call industry?

We have multiple online offerings of ticket entry for the excavating community. For the professional excavator we have Web Ticket Entry, which mirrors our Damage Prevention Agents' (DPA) functionality. Additionally, we have Ticket Express, which is designed specifically for the consumer or homeowner. This application allows the user to get onto the website, give their address and the location of excavation and submit their request to be processed. Then finally, there is Update Lite, allowing the user to make modifications to an existing ticket without speaking to a DPA. These three types of services that we offer to the excavating community serve as a way to offset the usage and demand that is put on the contact center on a daily basis. Online processing saves us valuable resources by providing excavators 24 hours access. At the contact center, our experienced and skilled DPA's can better ad-

dress those more complicated requests efficiently, which improves our service to our calling customers. Our online services allow our DPA's to have more time to address the trickier locate requests because some of the more mundane and routine requests are being processed online. Some contact centers are modifying existing procedures that will only allow excavators to call in single notification requests, leaving those with multiple notifications to the web.

### Talk to us about the damage prevention seminars that your facility offers to excavators and how it helps raise awareness of 811 and damage prevention in general.

We have a full-time Damage Prevention Department running safety and educational programs. This Department consists of a Director of Damage Prevention and five Damage Prevention Liaisons in the field. They work in particular geographical locations that are segmented by service area, but an important facet of their job is each liaison lives in the area in which they serve, this is more efficient than our previous methods. These individuals all have vehicles with 811 messaging that are targeted specifically to homeowners as opposed to our past messaging aimed at the professional excavating community. They're out in the field promoting damage prevention metrics, which looks at the number of tickets being generated in a particular county and the number of damages being reported to DIRT. They also perform outreach to the excavating community and part of their mission is to develop and establish damage prevention councils in the area that they live, then come up with





initiatives to help educate contractors in one-on-one sessions and empower these councils to take on similar endeavors. By having these councils take on a more active and a dynamic approach to communicating methods of damage prevention, it eases the burden of 811 and our liaisons to reach everyone statewide. The Colorado 811 board has tremendously supported this endeavor. The liaisons are highly educated individuals that understand the industry and have a unique skill set of public relations and damage prevention, they are also very motivated and outgoing. Also, we can now tailor our curriculum by region, because what may work in a mountain community area might not necessarily work in a populated area.

**Would you say that sending these damage prevention specialists out in the field works better than billboards and radio spots and other forms of advertising in**

#### terms of spreading the word about 811?

Absolutely, it's part of a comprehensive, multi-faceted damage prevention program. You can't just look it and say "I'm doing my advertising and promotion, and that's all that I need," there are so many different aspects of damage prevention that need to be addressed. The advertising that we do with the Colorado Broadcasters Association, in conjunction with the boots on the ground, gives us a very diverse approach to raising public awareness of damage prevention.

**With the economy stabilizing somewhat, we've seen a resurgence in the housing and construction markets, as well as the continued explosion of the telecommunications industry. Have you seen any rise in ticket requests because of this, and what**

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**consequences do you think it will have on one call centers?**

The housing market in Colorado has been one of the hottest in the country over the last few years, so we've definitely seen an increase in call volume. We're running at a rate of about a 4% increase over last year, which reflects that trend. In the last few years, however, we have not seen the big telecommunication companies like Verizon or Google expanding in Colorado like you've seen in some other states like North Carolina. Where we experienced a large influx of notifications are in the number of natural gas requirements for an improved infrastructure of pipeline construction and maintenance. This has been a federal mandate that the Department of Transportation has been mandating through the Pipeline and Hazardous Material Administration (PHMSA), and this rebuild has impacted us more than any telecommunications company.

**Do you think that stricter enforcement of digging violations can lead to better damage prevention, and what, if any, role do one call centers have in increasing this enforcement?**

Well, we will play a part in enforcement, but I don't see us taking on the full responsibility of that role. Currently in this state, there are discussions being made about Colorado 811 being made that enforcement mechanism. I don't think there is any other one call centers that do have that responsibility, as it usually falls on the Public Utilities Commission. Nevertheless, many of our members are feeling the pushback from the PUC which they don't want, so we are discussing the possibility of a separate board or entity to take on that responsibility. But unfortunately, that puts us at odds with our excavators and our facility owners, and really that is not our

duty; our role is more of a provider of information with an eye towards communication and coordination. It would most likely negatively change the dynamics of utility locating if Colorado decided to move in this direction.

**What are some of the emerging trends and technologies that you are seeing in the one call industry, and what would you like to see for the future of one call centers?**

Well I think in the next five years or so, we are going to see internet usage for our locate requests climb into the 80-90 percentile range. And I think that mapping, and providing those higher levels of services to our members as it relates to GIS work, will improve our ability to serve and add value to our membership. Our goals in damage prevention will be more easily met by our ability to regionalize call centers and share resources amongst ourselves. Also the threat of cyber terrorism, and the possibility of harm being done to us means that we need to step up the protection of our networks. While they may be streamlining these networks and making them more regional, accessibility and security need to be paramount. Security and convenience are mutually exclusive of one another, so I think it's imperative to continue to build our networks, but at the same time have adamant security measures in place that only allow access to that information to individuals that need it. For instance, our involvement with the FBI's InfraGard program makes it possible to stay up on the current technologies and understand what cyber criminals are attempting to do. Our stakeholders have done an excellent job of decreasing damages over the last 30 years, but we need to continue to work to protect not only our physical assets but our digital ones as well. These are areas where we need to focus our efforts as leaders of damage prevention in this industry.

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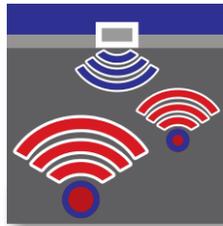
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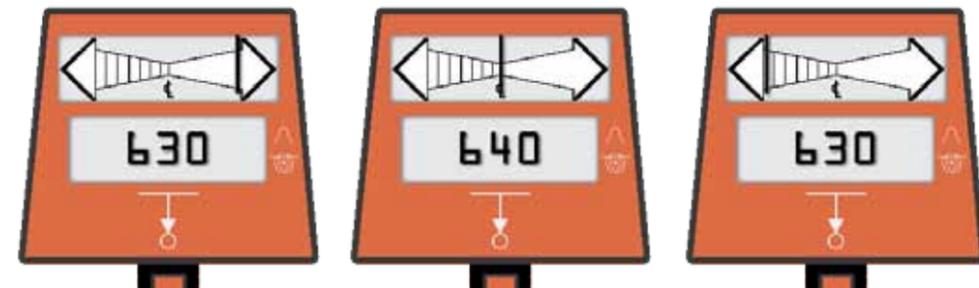


## Locating Technology Changing the Game: The History of the 810 Locator

When inventor Earl Peterman submitted a claim to the US Patent Office on July 31st, 1980 for an "Apparatus For Determining the Distance to a Concealed Conductive Object Which Is Radiating an Alternating Current Signal", he probably didn't realize that he would be changing the face of the utility locating industry forever by creating the 810 locator, a device still in use today over 30 years later.

Peterman saw the need for the 810 after witnessing locators relying solely on the null method, and receiving incorrect locations as a result. Nulls can be quite helpful, but as he explains, "are deadly inaccurate if there's another conductor around". Which there almost always are, as other conductors can come from everywhere, whether they are other pipes in the ground, or even above ground things like railroad tracks and fences. What was previously a "clean", circular electromagnetic reading now would get bowed outwards towards another conductor, meaning the interference signals coming from these conductors would easily lead to inaccurate readings and locates.

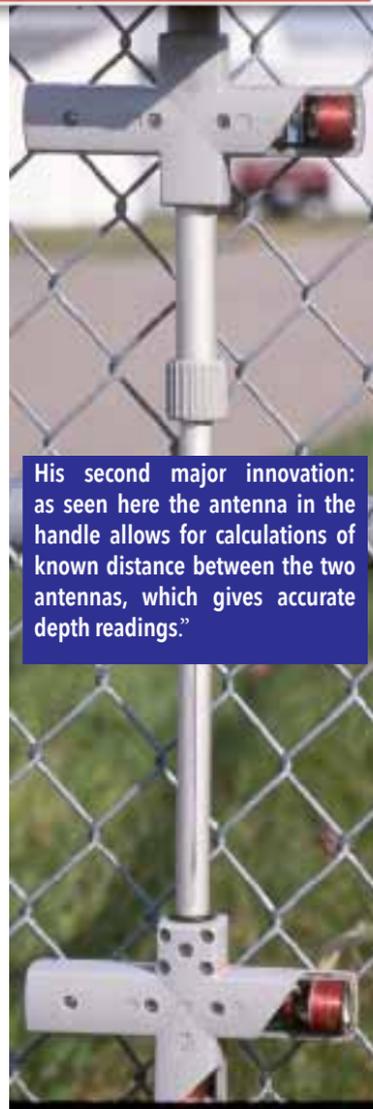
So by creating the 810, Peterman created two breakthroughs in the locating industry. First, he provided locators with the first ever electromagnetic instrument that gave both peak AND null readings at the same time. He did this by adding extra maximum antennas to the instrument in the classic "tires to the road" alignment. These extra horizontally-positioned antennas work in tandem to give automatic left/right needle readings, eliminating the need for manual gain control, and giving a clearer "center needle" reading. This also allowed locators to attain more accurate readings



Peterman's first innovation illustrated here, the extra antenna in the base of the instrument allows for left/right digital gain control.

because they no longer were able to rely only on true null readings, which can be notoriously inaccurate in certain situations.

The second industry-first feature that Peterman added was digital depth estimates. By adding an antenna in the top of the instrument directly above a partner antenna in the bottom of the instrument, the depth of the buried utility could now be automatically calculated by comparing the signal strength information of these two individual partner antennas. Because the strength of the electromagnetic wave emanating from the energized buried pipe or cable weakens over distance at a known rate, and the distance between the bottom antenna and the top antenna is also known, the depth estimate is produced by determining the distance from the bottom antenna to the center of the two circular fields received by the partner antennas. This one button digital depth reading was immensely helpful in that it eliminated the human error inherent in other methods of depth estimation which required moving the receiver.



His second major innovation: as seen here the antenna in the handle allows for calculations of known distance between the two antennas, which gives accurate depth readings."



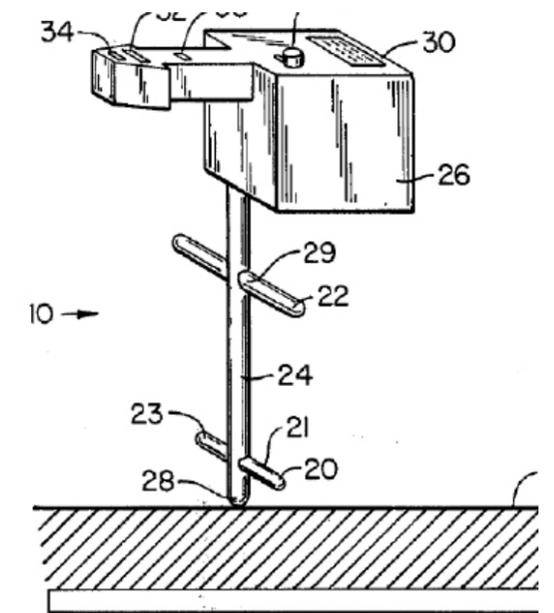
A cutaway look at the 810, here you can see the right side antenna in the cross, and the bottom maximum antenna for peak readings.



The 810 locator in use, still the most popular type of locating instrument in use today."

Peterman's concepts have been so influential and game-changing that there has been little need to improve on his basic ideas over 30 years later, even with vast leaps in engineering and technological acumen. Vivax-Metrotech is continuing Peterman's legacy by creating state-of-the-art locating equipment based on his original designs, making them one of the most popular type of locators around the world today!

Earl Peterman himself will tell the story of how he imagined the concept of the 810 in one of our first episodes of Planet Underground TV. We'll broadcast segments of a never-before-seen 1991 presentation Earl gave in suburban Minneapolis at Underground Focus magazine's Locating Technology Seminar to show his thought processes behind the revolutionary ideas for the 810. These archival videos are a can't-miss event that shed light on the fascinating history of the locating industry, so be sure to tune in!



"Peterman's original patent design. Though the design has been streamlined somewhat over the years, the principal ideas involved haven't changed at all!"



## Filling a Need: The Pipeline Association For Public Awareness (PAPA)



There are hundreds of pipeline companies across the United States with many responsibilities to carry out every day: pipe integrity and maintenance, development of emergency and employee safety procedures, damage prevention and public awareness activities among others. Pipeline operators have made a commitment to ensure that the highest levels of public safety will be reached in every aspect of their business, and educating the public remains a priority.

Established in 2004, the Pipeline Association for Public Awareness (PAPA) was created to provide pipeline operators with an affordable and thorough option to aid in accomplishing public awareness initiatives. They develop safety and emergency preparedness information for pipeline companies that is then delivered to residents, businesses, farmers, excavators, emergency responders and public officials. This non-profit group creates high-quality and informative materials relating to pipelines in print, online and video formats. Their methods are cost effective and comply

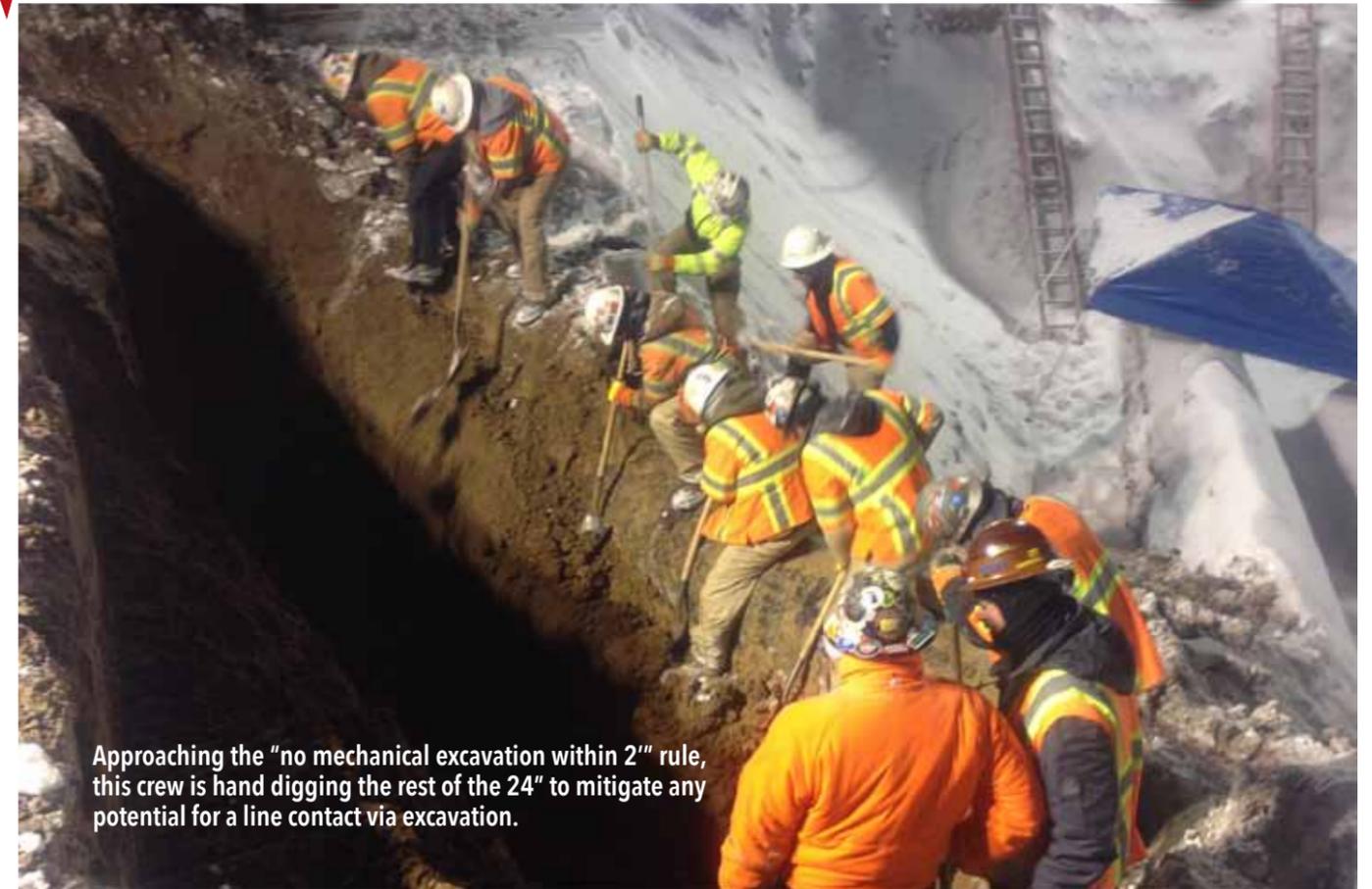
with government public awareness regulations, while also relying heavily on industry input.

The resources developed by the PAPA organization are sponsored by the pipeline operators and are free to the public. The excavator program supplies the *Excavation Safety Guide – Pipeline Edition* which contains messaging that is federally required for delivery from pipeline operators. In 2015, this direct-mail magazine was delivered to 522,000 excavators across 36 states, while 12 states (CA, CO, HI, ID, MT, ND, NV, SD, UT, WA, WI, and WY) achieved complete state-wide coverage.

Pipeline operators who are members of PAPA strive to ensure that excavators receive consistent and relevant messaging about pipeline safety and damage prevention. Imagine if each operator statewide sent excavators similar reading material, with the same messages and content. For example, an excavator working in Harris County, Texas, where Houston is located, could expect to receive



Here a "dummy pipe" is used to support a live line that is being excavated, and has suffered deteriorating land support due to sloughing from excessive rainfall.



Approaching the "no mechanical excavation within 2'" rule, this crew is hand digging the rest of the 24" to mitigate any potential for a line contact via excavation.

public awareness direct mail pieces from 3 dozen pipeline operators every year!

This collaborative effort brings industry folks together to work as one unit, and creates streamlining of pipeline and excavation safety related information that is provided in a coordinated and effective manner of communication, putting it into the hands of the people that need it most. The pipeline members' support of safe excavation practices will hopefully lessen damages to their underground utilities.

Safety is the number one priority for everyone, including pipeline employees and the people who excavate around them. Operators promote pipeline awareness and damage prevention by emphasizing the potential dangers of living and working around pipelines, while the PAPA collaboration is doing their part to enhance safety through their public awareness efforts. Together, we strive to safely deliver our nation's vast energy resources while keeping the American people and our environment protected and secure.

The PAPA website ([www.pipelineawareness.org](http://www.pipelineawareness.org)) shares links to their publications and includes supplementary on-line information and training.



Here are three exposed live lines sharing a corridor that were excavated along a trench line so a new pipe can be installed underneath them.



*The American Excavator*

## Straight Talk About Straight Bars: Bolstering Hazard Assessments at Dig Sites

By Justin Maloney,  
President, Patriot Pipeline Safety Corp.

**S**traight bars, also known as sissy bars are commonly used on excavator buckets to reduce the potential for puncturing many underground utilities. The scope of work and a thorough hazard assessment should be conducted when implementing straight bars on buckets in an attempt to reduce punctures when the utility is contacted. Straight bar buckets will receive resistance in frozen and rocky ground and should receive approval from an excavation specialist before being removed. Using straight bars on all excavator buckets should be considered for accepted best practice by all utility owners when constructing, repairing, or maintaining utilities in house or by a third-party contractor.

Let's begin with the scope of the work: many excavations require digging around utilities. While calling your local one-call (811) is effective and required, they are only responsible for notifying locators about publically owned utilities. This leaves thousands of privately owned or operated utilities, and decommissioned, abandoned, or ceramic utilities that are often not located. Thus begins the need for understanding the scope of work. One-call systems promote safe digging and offer great tools for exercising safe digging practices, but it is a combination of pro-active thinking, experience, and engineering practices that complete the 811 objective. This makes safe digging a joint effort and must be considered in the entire scope of work for all excavators. It is a must because there are unknowns that can be encountered and must be planned for and expected. Once the scope of work is discussed, a plan for an excavation should be discussed between the operator and a DESIGNATED spotter. This plan goes into the specific of a hazard assessment.

The hazard assessment involves many common cautions described in 811 best practices. However, excavators need to know more in order to anticipate a worst case scenario. Understanding your work location and region are key to this hazard assessment. Common questions that should be asked include: Is there a potential cathodic anode ground bed that was not located? Are their hidden structures that

could be abandoned facilities? Do you see a company sign not listed on the one-call ticket? Is there melted snow or low crop height in a uniformed pattern? Is the dig site in an old shale play that may have abandoned salt water, flow, or gathering lines (H2S)? What are the specific cross bore hazards and do the locate markings match my drill profile and hydro-vacuumed utilities? Is the site in a congested area that could benefit from a "Joint Meet" to clarify scope of work and better communication with affiliated utilities? These are just a few of the questions to ask before breaking ground.

Breaking ground then involves a good understanding of equipment, experience, and communication. Equipment has grown more powerful with the advancements of hydraulic technology. This has made equipment easier to operate and requires less experience to be efficient with it, causing a loss in feel and comfort level with the machines that is priceless in the world of excavations. With experience dwindling, many contractors now implement straight bars on their buckets as an extra cautionary method when digging. The straight bar is designed to distribute hydraulic force across a utility if one is contacted instead of puncturing it. A line contact is the worst thing that could happen to any excavator, and the straight bar is intended to mitigate damage to a utility should a hit take place, as the bar may only dent or scratch a utility. Although this is very bad for any excavator, it is better than a rupture which can cause life loss and millions in environmental damage. A rupture could involve a complete shutdown of a pipeline, versus repairs made under reduced pressure and flow which still allows for revenue, contract satisfaction, and no media attention.

Straight bars should be installed to fully cover the front of the excavator bucket and should have the ends rounded off and in a good transition to the end teeth of the bucket. Paddle teeth are designed with the same idea as a straight bucket. Clients and owner operators often require the spacing between the paddle teeth to be filled in to offer a straight consis-



**Without a straight bar attachment, the paddle teeth on this bucket can easily rupture or puncture a utility line.**

tent connection, ultimately forming a straight bar in the end. When digging with a straight bar, it is still crucial to dig with a DESIGNATED spotter. This spotter helps the operator by understanding different soils, identifying predisturbed soil, difference in rock, clay, and metal if contacted, and shadows while excavating. The straight bar is simply a failsafe in the event there is a breakdown in communication between the operator and designated spotter. While straight bars are a good practice for excavating, they should never take the place for safety as a failsafe to human error. They are simply meant to reduce contact damage in the event a utility is contacted, though it does NOT guarantee that an improperly installed straight bar or even a properly installed straight bar cannot still puncture a utility.

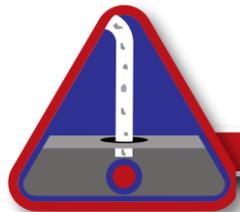
Straight bars on excavator buckets can become worn and jagged from typical use or digging in hard materials. These buckets should be maintained through daily inspection and repaired as needed. A defective straight bar defeats the purpose of using one and should be repaired or removed immediately from use. Straight bars should also be discussed for familiarity during damage prevention or ground disturbance



**Having the straight bar attached distributes the force of a hit across the utility line, causing dents or scratches instead of punctures, mitigating huge potential damages and losses.**

trainings, as newer employees to excavation related industries can then identify their integrity and intended use. An experienced excavator may think they do not need a straight bar or dislike using one due to lost productivity in rocky areas or frozen soil/clay, but this cannot interfere with the decision to implement them because utility locates are not a guarantee to identifying everything that is underground. People retire, maps are lost, companies switch owners, resources get misplaced during transitions, markets change, and dangerous residuals stay un-located. An excavator cannot predict these circumstances which can alter the safety of the job and the lives of his or her crew. While straight bars cannot prevent line contacts or ruptures, they are an added tool and practice to help execute safer excavations when considering foreign working environments, communication barriers, and learning curves for employees new to excavation industries.

## A Model for the Future?



Soon to be a major energy hub, the state of Pennsylvania is planning to develop more pipeline capacity in order to increase their oil and gas production. Currently there's more supply than demand and it will take years to build the tens of thousands of miles of proposed pipeline. The thousands of wells require these pipelines to transport the valuable oil and gas that is being produced. When the large amount of construction eventually commences, the potential for damages will skyrocket, as existing pipelines and underground cables could be damaged, workers could be injured or killed, and future lines could be wrongly installed.

Foreseeing these possible problems, Governor Tom Wolf enlisted the Department of Environmental Protection (DEP), along with 50 of its members, to develop the Pipeline Infrastructure Task Force (PITF). This reputable group of people are working to devise strategies and standards that will keep the people and the environment of Pennsylvania safe through the permitting, construction, operations and maintenance activities of pipelines and utilities. The task force was announced in April of 2015 to guide responsible pipeline development across Pennsylvania. The group is charged with the development of a series of best practices for the planning and siting of pipelines, while avoiding environmental and community impacts. They are promoting public education and transparency related to all facets of pipeline infrastructure and undertakings.

The PITF is made up of industry leaders, government officials, environmentalists, advocates and a wide

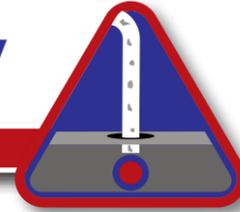


variety of subject matter experts. Their 12 workgroups under the PITF have developed and recently released to the public a draft report outlining a list of 184 recommendations relating to damage prevention, pipeline safety, emergency preparedness and public education. The final report was delivered to the governor in February, and at that point the task force will determine the feasibility and implementation strategies for their numerous proposals.

Pennsylvania could become the model for other states across the country in their efforts to develop a world-class pipeline infrastructure system. Alongside the preparation for large growth in pipeline infrastructure, the commonwealth intends to improve utility safety and decrease damages to their underground networks.

One of the key recommendations by the PITF's Conservation & Natural Resources committee is to "Develop Public Access to Pipeline GIS Information." By providing accurate maps and locations of current and proposed pipelines, government, contractor and public representatives could knowledgeably work

## Pennsylvania Gets Proactive with Pipeline Safety



around those locations in their planning and excavation actions. To provide justification for the detailed mapping system, the report affirms that pipeline locations are already available to the public in various online ways such as Google Maps and the U.S. Geological Survey (USGS) topographic maps.

The task force's County Government Workgroup suggests that pipeline operators should make their GIS mapping data available to counties and municipalities. The oversight for government to ensure pipeline operators are using accurate maps would bring on state and/or federal legislation. Should the task force effectively acquire detailed mapping data on the pipelines across the state, they would then plan to develop a Public Pipeline Portal (PPP) which could possibly be housed in the PA One-Call center. This approach brings about more beneficial use of the One-Call center by giving them more functionality and authority.

The Pennsylvania DEP has existing online tools and mapping for oil and gas wells so perhaps the PITF's efforts won't be as daunting as expected. The issue around costs for all of the proposed changes to Pennsylvania laws and operations will need to be addressed as well. Gathering pipeline locations will continue to be a challenge, as they frequently change ownership and are not regulated like transmission pipelines.

Members of the pipeline industry have consistently pushed back on the idea of sharing detailed GIS data on their systems. There is a concern that public use of highly detailed infrastructure mapping would discourage people from using the PA One-Call system. If excavators solely relied upon maps, it would increase the potential for third party damage to pipelines and utilities. This could lead to pipeline operators being reluctant to change and attempting to hinder the PITF's plans.

In the end, the efforts of the PITF will shed light on the entire pipeline industry. Their changes will impact pipeline safety and utility damage prevention, and the group's enhanced programs will prove beneficial by keeping the public and environment in Pennsylvania safe and secure. The expected reduction in utility damages and injuries should save companies money by avoiding costly repairs and legal ramifications from unintended damages.



By Mike Parilac, Publisher

I always enjoyed the TV show "The Sportswriters," which ran for approximately fifteen years in the Chicago market. Three sportswriters sat around an illuminated circular table in a dark room and talked about the Cubs, Bulls, Bears, Sox, Blackhawks and anything else that came to their minds. There was no agenda, no script, and it was always entertaining.

In December of 2013, *Digging Dangers Videos* borrowed the "Sportswriters" format and applied it to damage prevention. The Roundtable features three people from the industry offering up their ideas and commentary regarding past, current and future damage prevention initiatives. In December of 2015, a mix of contractor, utility, locating, research, regulatory, insurance, manufacturing and one-call personnel met in Manteno, Illinois to talk in front of the cameras. What follows are a few lines of conversation from two panels discussing aspects of contract locating.

**Panel 1**

**Joe:** I see the disconnect between utility companies and the contract locators. There is an adversarial relationship; there's no partnership. Somehow, best practices need to be involved in getting these two to be partners and try to prevent damages.

**Ted:** It's not the "gotcha" moment that is important. If we can do something in order to educate, or train, that young contract locator of the error of his or her ways, we're all going to benefit by it. I think the owner of the underground facility has to commit to putting resources out there in order to be able to verify critical facilities, for instance, or to be able to call the contract locator and say, "Hey, what were you thinking? Show me where you hooked up and let me show you where I hooked up. I'll show you why I found the signal over here as opposed to over there."



Ted Andersen, North Shore Gas and Dennis Jarnecke, Gas Technology Institute



Joseph Geraghty, PULS, Inc.

**Dennis:** I think that's a great practice but I would venture to guess this probably never happens. Neither side has the time it takes to go that extra step.

**Ted:** Well, never is a long time. I can tell you that we empower our seasoned employees to do that because we do view damage prevention in such a regard.

**Dennis:** But take that one step further to the contract locators. Do the contract locators have the time that they can take away from locating to come in and learn more about the missed locate. What was the situation here, where were they off? I do agree. We all learn from our mistakes.

**Panel 2**



James Johnston, ElectricCom, Inc.

**Bill:** Hopefully, there will be a lot more working together with the contract locator as far as trying to plan for the number of locates that are going to be coming next summer. A lot of the work that's being done out there is being driven by the utilities. If they can give their contract locator an idea of the kind of work they're going to be doing the next year, that will give them (the contract locator) a better opportunity to plan for the number of locators that are needed.

**Vip:** I think we're doing some of that already. We're working with our Greater Chicago Damage Prevention Council—where we actually reach out to a lot of utilities—and we bring up the amount of infrastructure improvement work that's going to be done. We put some numbers out there to give to our locating contractors. We also work with some of the bigger



Bill Riley, Illinois Commerce Commission

*Bill Riley disclaimer: "The views I present are mine alone and do not necessarily represent those of the Illinois Commerce Commission."*

excavating companies to get schedules from them upfront so that we can locate some of their work ahead of time and then double-check to make sure that it is completed in the proper manner.

**James:** That has been very effective for us as an excavator. If we're doing a fiber to the home project in a small town, working with both the town and the local facility operators makes a huge difference in being able to excavate on time—it alleviates a lot of the frustrations.

**Vip:** It has driven damages down. By working with our large excavators we're down almost 30% this year for second-party and third-party hits.



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