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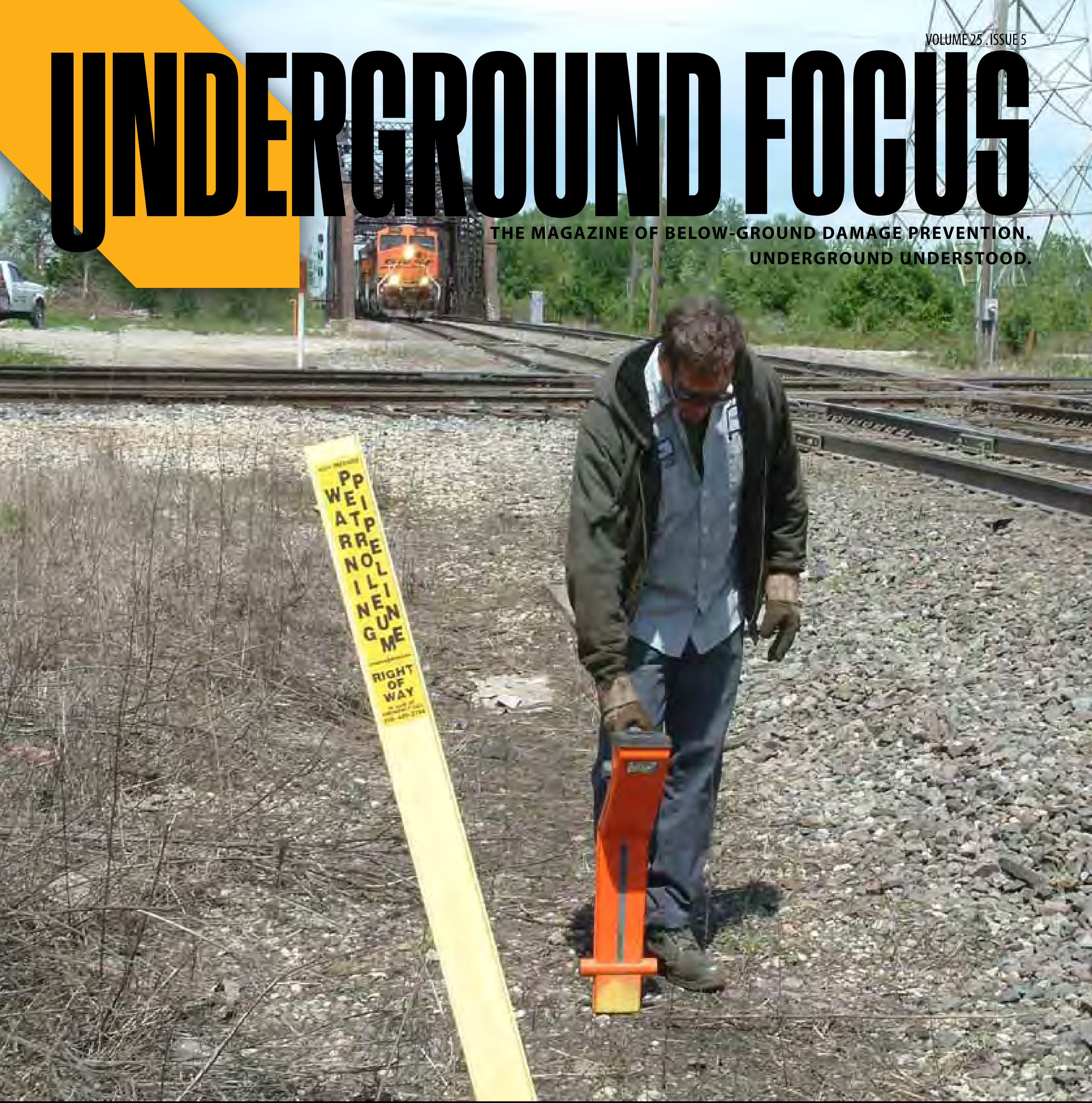
UNDERGROUND FOCUS

THE MAGAZINE OF BELOW-GROUND DAMAGE PREVENTION.
UNDERGROUND UNDERSTOOD.



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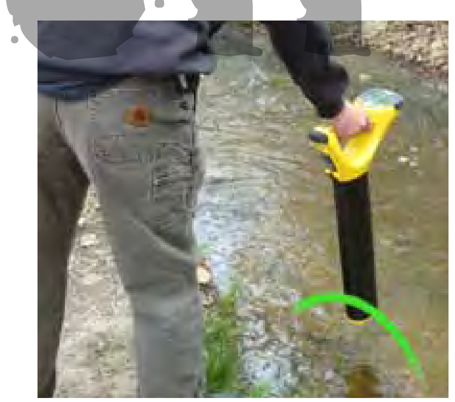

Planet Underground Media
Publisher

Adam Zeciri
Editor

Paula Miller
Business Manager

Sonya Larkin
Research Manager

Angie Parilac
Production Manager

Ron Rosencrans
Founder

BUSINESS OFFICE
815.468.7814

FAX
815.468.7644

EMAIL
mike@underspace.com

WEBSITE
www.underspace.com

ADVERTISING
Paula Miller 815.468.7814

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LOCATING UNLIMITED

Bleed-off is the boogieman of locating. If you bleed-off, you're locating the wrong line. Locate the wrong line and bad things may happen.

What is bleed-off? Bleed-off is induction. Within the locating world, we usually refer to induction as a means of transferring the transmitter's signal onto a target line though use of an **inductive transmitting antenna.** We "induce" when we are not using the transmitter conductively.

Inductive transmitting antennas

Early in their careers, locators are often told: "Don't induce. You will bleed-off onto everything." Hearing it put this way, the novice locator must think: "If I will bleed-off onto everything using induction, then I will never bleed-off onto anything if I locate conductively." This is the way locating myths get started. Like a myth of any other type, locating myths are hard to dispel.

As any new locator will soon find out, bleed-off does occur using conductive locating. "I must have bled-off from my target line to a non-target line." Naturally, it seems unlikely a locator would use the terms target line and non-target line. Instead, a locator would say something like this: "I must have bled-off from the gas line to the electric line."

In explaining a mismarked gas line, the statement, "I must have bled-off," can be said in such a way that bleed-off seems to pop out of nowhere and there's nothing a locator can do about it. Bleed-off is sort of like catching the flu.

But what does it mean to have "bled-off" and would induction only make this bleed-off thing worse? That's the type of question that we set out to answer in this issue. In addressing bleed-off, we use terms and phrases scattered throughout this issue that may need a bit of explanation. We'll place definitions in blue print on the pages where these terms and phrases are used.

The effects of bleed-off. Signal applied to a plastic gas line tracer wire ends up on an electric primary.

Naturally, we'll use a lot of photos to drive home our points. This photo goes a long way to answering the question, "What is bleed-off?"

There's only two ways for signal to bleed-off from the target line to a non-target line:

- Metal-to-metal bleed-off: The target line and a non-target line are metallically connected to each other.
- Non-metal-to-metal bleed-off: The target line and a non-target line are not metallically connected to each other.

The terms **metal-to-metal** and **non-metal-to-metal** provide a literal description of the universally-used terms **conductive** and **inductive**. Conductive and inductive are action terms describing the only two ways to place the transmitter's signal onto a pipe or cable for the purpose of locating. But these terms also aptly describe the only two ways signal can bleed-off from one underground line to another.

Bleed-off occurs at most locates. The degree of bleed-off, though, varies significantly. In our first scenario on the following pages, the degree of bleed-off is minimal—you wouldn't notice it unless you went looking for it. As we move forward, we'll address bleed-off in its various degrees as well as its various forms.

Bleed-off is sometimes boogieman, sometimes friend, but always a fact of life in locating. Myths aren't myths to the people who believe them. With our second edition of *Locating Unlimited*, we aim to present the truth about bleed-off and some other closely related topics.

Inductive transmitting antenna: a coil located in the transmitter whose purpose is to energize the pipe or cable without using a metal-to-metal connection.
Metal-to-metal: another term for the use of a conductive transmitting antenna.
Nonmetal-to-metal: another term for the use of an inductive transmitting antenna.
Conductive: transferring the transmitter's energy onto a pipe or cable by employing a metal-to-metal connection between the transmitter and the pipe or cable.
Inductive: transferring the transmitter's energy onto a pipe or cable without employing a metal-to-metal connection between the transmitter and the pipe or cable.

BLEED-OFF: THE TRANSFER OF SIGNAL FROM A TARGET LINE TO A NON-TARGET LINE

SOME OF OUR METHODS ...

A photo such as this would indicate that there is signal on both an electric line and a water line.

T This symbol indicates the position of the transmitter.

This symbol indicates that the transmitter is used conductively.

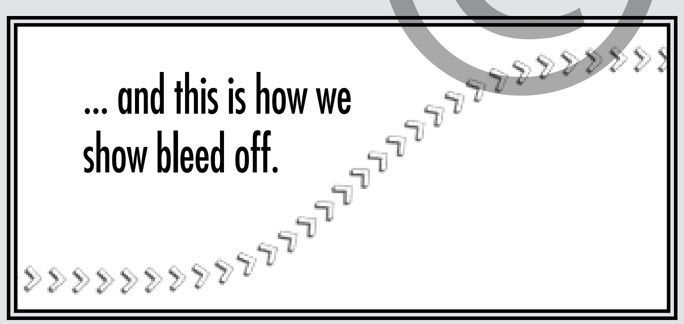
1 2 3 4

Look at the pictures in this order.

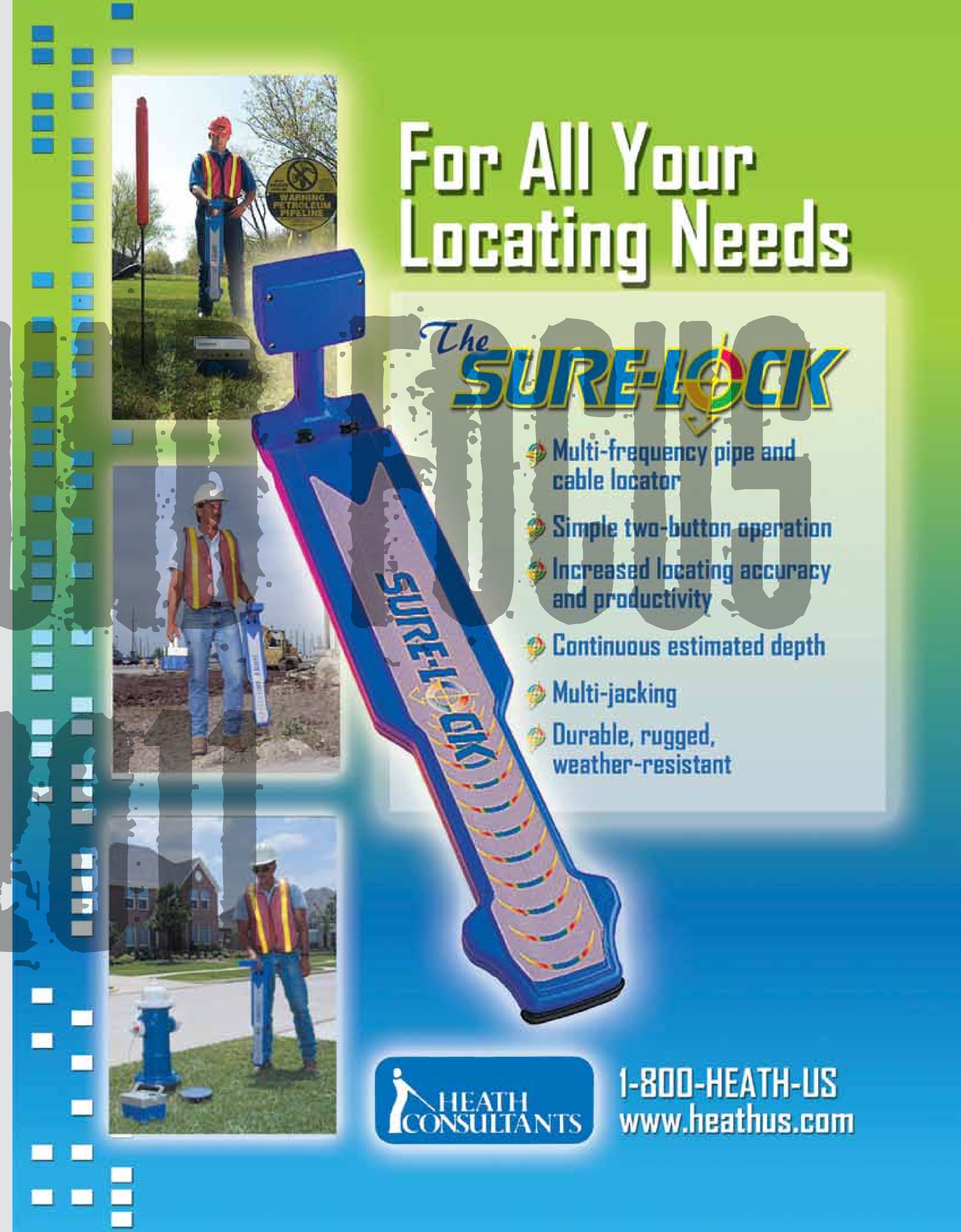
Grey is one transmitter frequency and green is another transmitter frequency.

Grey arrow =8 kHz
Green arrow = 65 kHz

This legend is used to identify the frequencies in the scenario...



This icon signifies a scenario that is featured at **www. locating-u.com**, our online locator training and certification product.



MYTH: YOU CANNOT BLEED-OFF WHEN USING THE TRANSMITTER CONDUCTIVELY

Question:

Is induction of the transmitter's **signal** onto a non-target line possible when using the conductive method to locate a target line?

The results:

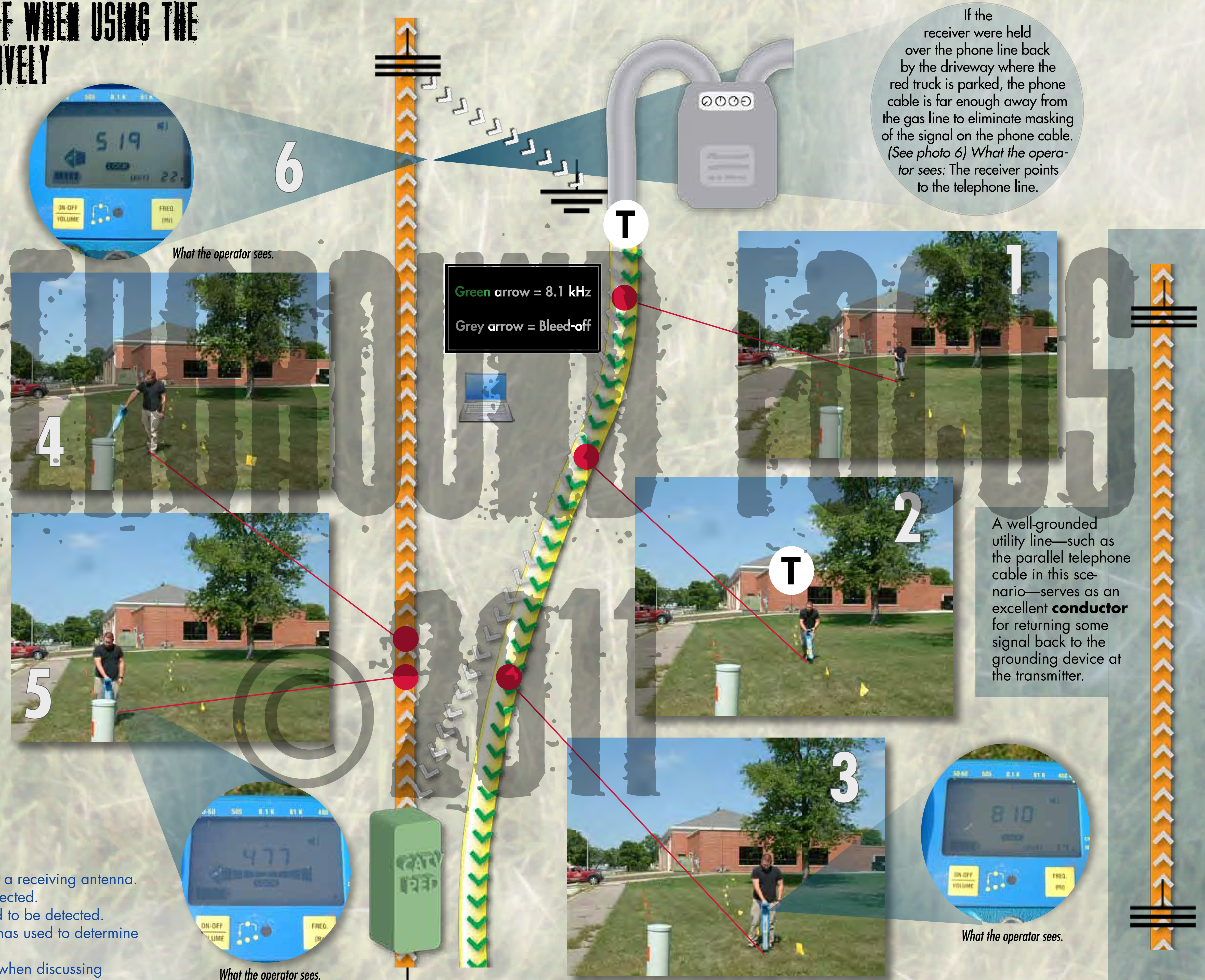
In this scenario the transmitter is set on 8 kHz and is conductively attached to a tracer wire at a gas meter. The tracer wire locates accurately and there is no perceptible signal on the telephone cable when the **receiver** is held over the cable. (*See photo 5*) *What the operator sees*: The receiver points to the gas line.

Apparent conclusion:

It appears bleed-off onto a **non-target** is not possible when using conductive to locate a **target line**.

Truth:

There is some signal on the phone cable. At the location where the receiver is held over the phone cable, the signal is so strong on the tracer wire that this signal masks the low level signal on the telephone cable. This creates the illusion that there is no signal on the phone cable.



If the receiver were held over the phone line back by the driveway where the red truck is parked, the phone cable is far enough away from the gas line to eliminate masking of the signal on the phone cable. *(See photo 6) What the operator sees:* The receiver points to the telephone line.

A well-grounded utility line—such as the parallel telephone cable in this scenario—serves as an excellent **conductor** for returning some signal back to the grounding device at the transmitter.

Signal: the part of a magnetic field that intersects a receiving antenna.
Target line: the pipe or cable intended to be detected.
Non-target line: any pipe or cable not intended to be detected.
Receiver: a handheld antenna or series of antennas used to determine the strength and location of a magnetic field.
Conductor: a name for a metallic pipe or cable when discussing electromagnetic theory.

SUPPORTING MATERIAL: WHAT MAKES DIFFERENT FREQUENCIES

This series of photographs depict a conductive attachment to a cable without a corresponding attachment to a **grounding device** in earth. The photos are arranged in ascending order of **frequency** with 8 kHz *(Photo 1)* the lowest frequency and 200 kHz *(Photo 5)* the highest.

Notice the **current flow reading** on each photo. When the transmitter is set on 8 kHz, the milliamp reading is zero. As the transmitter's frequency setting changes so does the milliamp reading. Higher frequencies register higher current flow readings.

Higher frequencies have higher amounts of induced current. Level of induced current is what makes one frequency different than another. While it's not entirely accurate to say that higher frequencies bleed-off more than lower frequencies, this statement serves as a foundation for a more in-depth look at bleed-off.

Grounding device: a piece of metal driven into earth so that the conductive transmitting antenna may be attached.
Frequency: the transmitter's energy as measured in hertz or kilohertz.
Current flow reading: a measurement on the transmitter of the amount of energy leaving the transmitter.

A SAMPLING OF TRANSMITTER FREQUENCIES....

Low-Low

High-Low

Low-High

High-High

Low-low frequency: any transmitting frequency one kilohertz or below.

High-low frequency: any transmitting frequency greater than 1 kilohertz up to 10 kilohertz.

Low-high frequency: any transmitting frequency less than 200 kilohertz but greater than 10 kilohertz.

High-high frequency: any transmitting frequency from 200 kilohertz or greater.

MYTH: WHEN LOCATING CONDUCTIVELY, LOW TRANSMITTER FREQUENCIES ALWAYS WORK BETTER THAN HIGH FREQUENCIES

Question:

If low frequencies bleed-off less than high frequencies, wouldn't it be best to always conductively locate using low frequencies in order to reduce bleed-off?

The results:

Only one of the two primary lines exiting the transformer locates when the conductively applied transmitter is set to a frequency of 8 kHz. When the frequency is changed to 65 kHz, both primary lines locate.

Apparent conclusion:

When applying the transmitter conductively to a location where the signal can travel onto more than one **line leg**, it is always best to use higher frequencies. At this location, **high frequency** clearly outperforms **low frequency**.

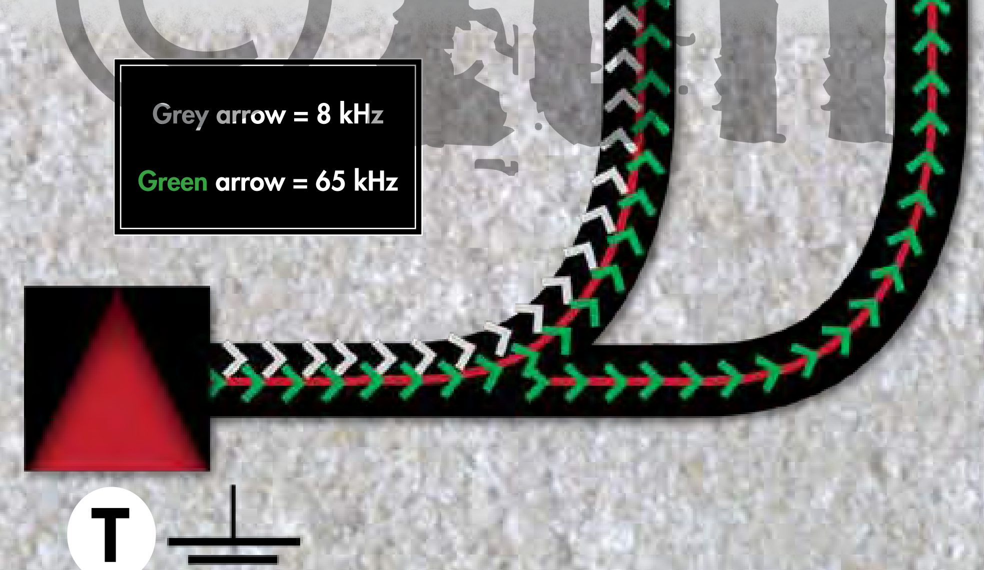
Truth:

No frequency is better than another and that's why it should never be said to always use a particular frequency when performing a certain type of locate. While it's certainly true that any and all frequencies may work well in any particular locating scenario, it's also true that in any particular locating scenario one frequency may clearly outperform another.

What creates the situation where one frequency clearly outperforms another? Well, there are several factors that influence locating results. These factors are:

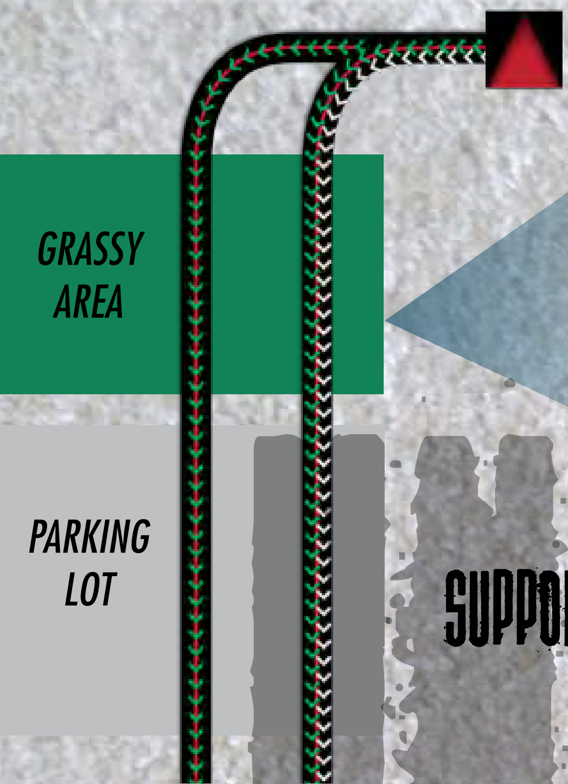
- The grounding or lack of grounding of a line leg both at the **close-end** and the **far-end** of the line leg.
- The condition of the insulation or the lack of insulation on a pipe or cable.
- The conductivity of the soil.

Which one of the factors was responsible for the failure of 8 kHz to locate both primaries? It's hard to rule any of the three factors out and it's possible that all of the factors contributed to the result. What is known is that 8 KHz followed the **path of least resistance** and that path mostly skipped over the second primary.



Line leg: a single-direction section of a pipe or cable that has metallic continuity.
High frequency: any transmitting frequency 10 kilohertz and above up to 480 kilohertz.
Low frequency: any transmitting frequency below 10 kilohertz.
Close-end: the end of a line leg where the transmitter is located.
Far-end: the end of a line leg opposite of the transmitter location.
Path of least resistance: the route the transmitter's energy follows in order to return to the transmitter.

The asphalt parking lot seen below is located just beyond the grassy area featured on the page 16.



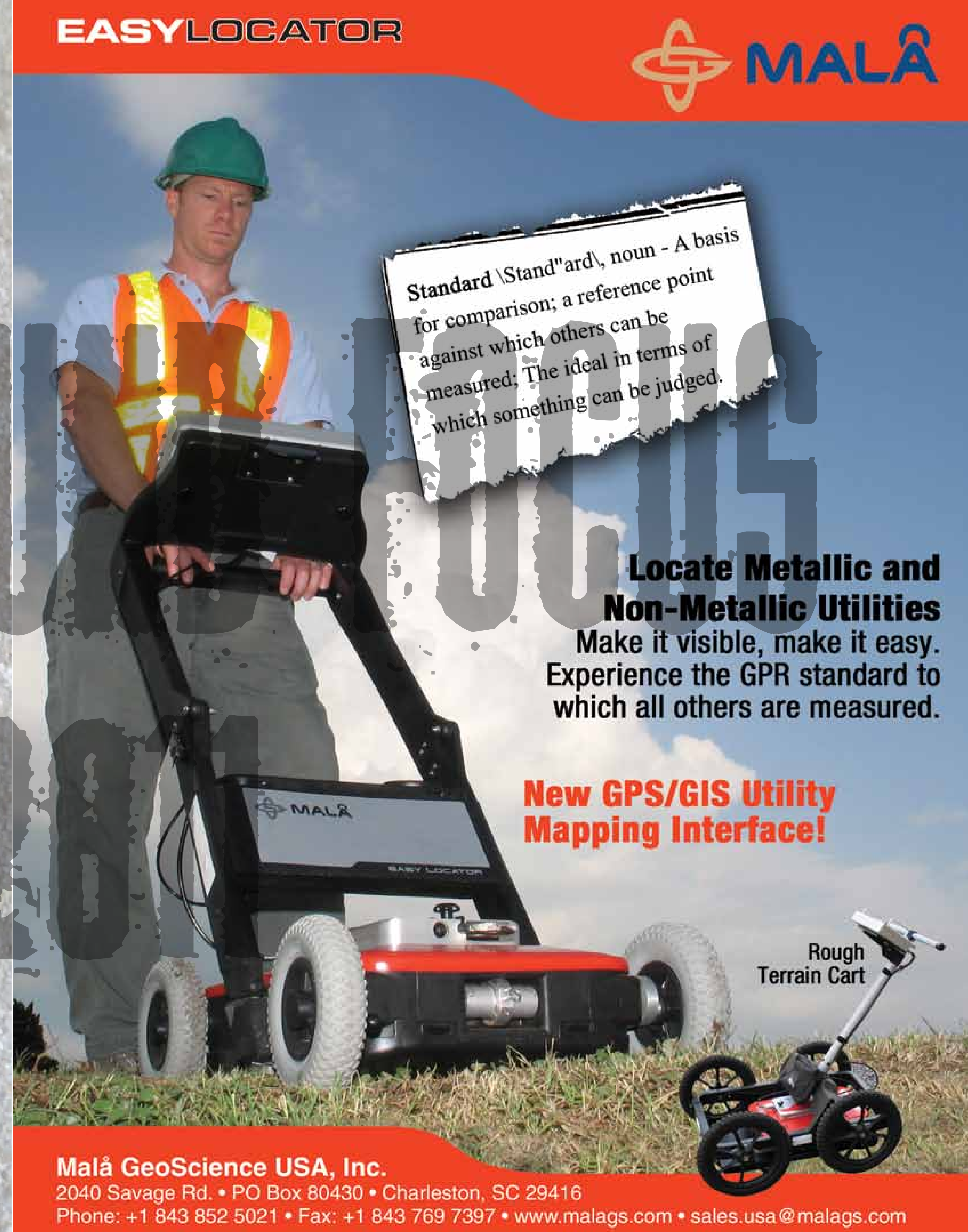
Supporting Material: A One Call Locator's Assumption and 6′ Mistake

This photo shows red "H" marks placed on the asphalt by a one-call locator in response to an excavator's request for locates. Only one primary cable is marked.

The freshly painted red lines appearing in the bottom photo are markings placed by *Underground Focus* weeks after the one-call locator failed to mark the second primary cable.

In all probability, the one-call locator utilized a conductive locate using low frequency at the transformer—the starting point for both primary cables—and one cable located while the other cable did not. Assuming the one-call locator knew there were two primary cables under the parking lot before painting the "H" marks, the locator likely assumed both cables occupied the same trench. That's an easy assumption to make when one cable carries signal and the other does not.

This formerly unmarked 12.8 kV primary cable runs parallel to the originally marked 12.8 kV primary cable. The use of a higher frequency at the transmitter and a scan of the parking lot by the one-call locator with the receiver would have easily spotted the missing primary.



MYTH: ALL BLEED-OFF IS BAD

Question:

Can or should all gas services connected to a main be located from one transmitter location?

The results:

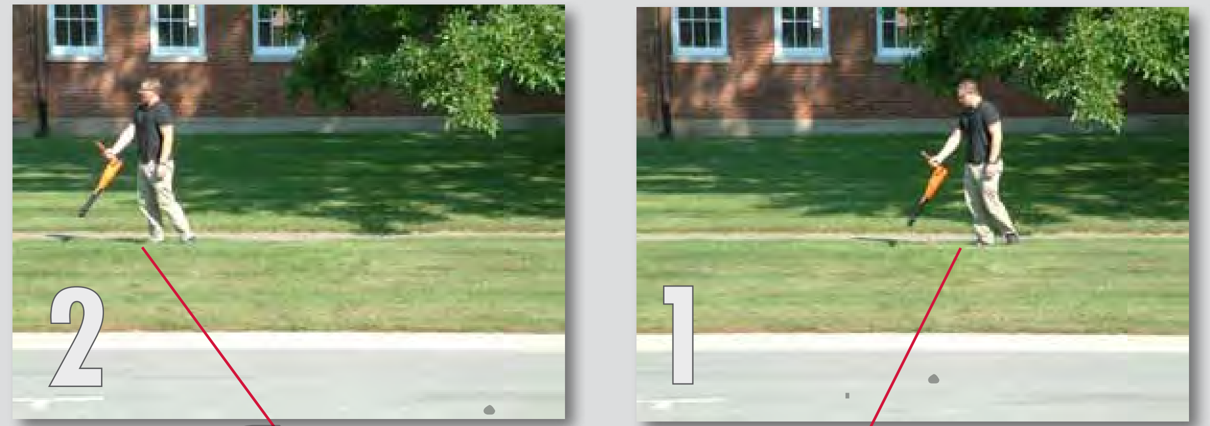
9.8 kHz applied to the gas main does not allow for the service to locate—the signal stays on the main. 82 kHz locates both the main and the service.

Apparent conclusion:

It could be stated that the low frequency (8 kHz) does not bleed-off from the main onto the service. Likewise, it could be stated that the high frequency (82 kHz) bleeds-off from the main onto the service.

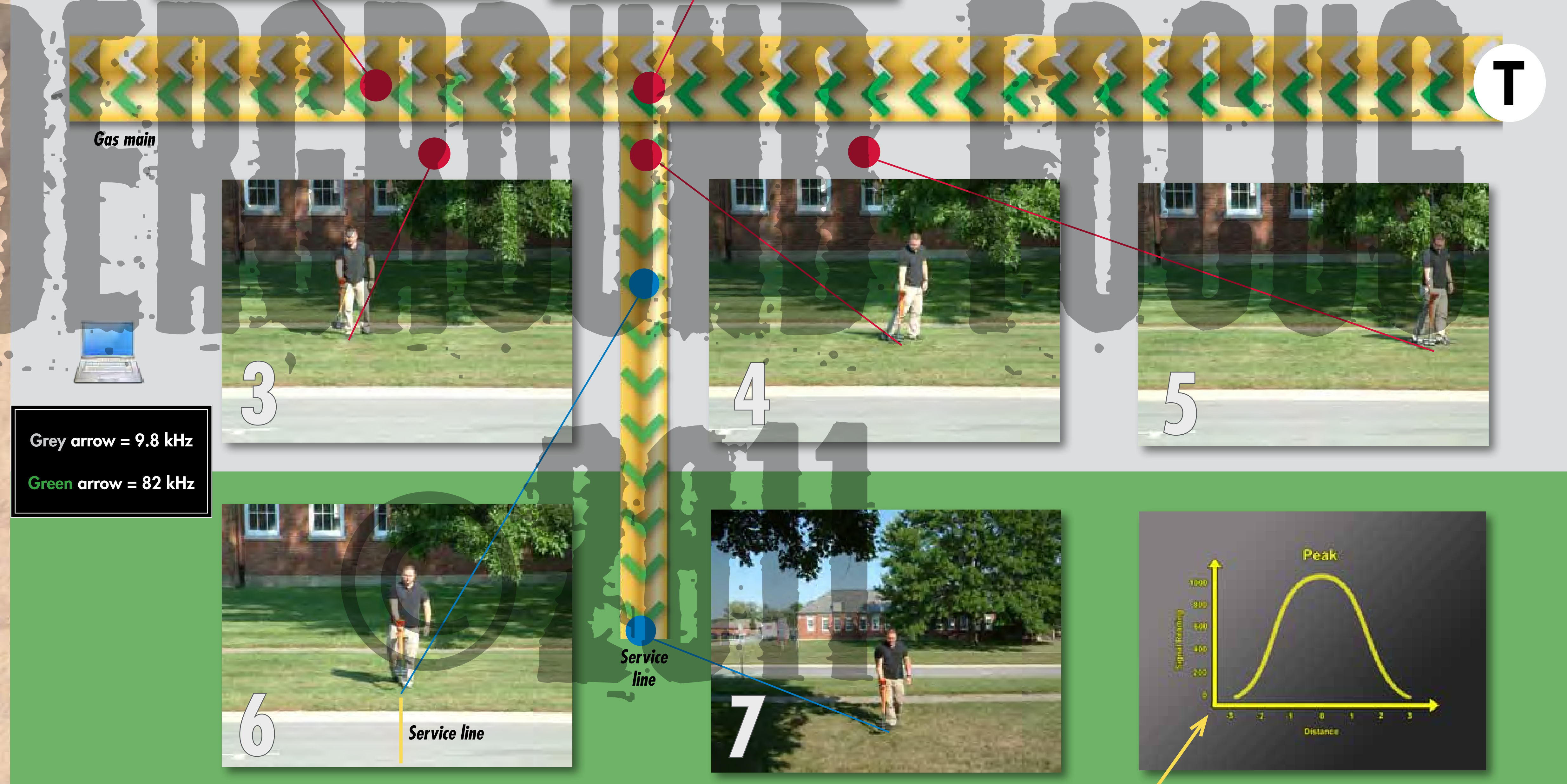
Truth:

This simple scenario involving a gas main and service line illustrates the tendency of low frequency to follow one direction when the signal could go two directions. This scenario also demonstrates higher frequency's ability to travel both directions.



Higher frequencies approaching **signal splits**, such as service taps on gas systems, may **energize** both the main and the service. Lower transmitter frequencies are less likely to energize all line legs found at signal splits, despite the **metallic continuity** between all of the line legs. This was aptly illustrated in the previous scenario, *A One-Call Locator's Assumption and 6′ Mistake. (Page 18)*

Good current is a prerequisite for marking a gas service using higher frequencies from a transmitter that is not conductively attached to the service. In addition, the shape of the **magnetic field** must also be round.



Signal splits: a location along the pipe or cable where the transmitter's energy can begin to travel on two or more new line legs.
Energize: to transfer the transmitter's energy to a pipe or cable.

Good current: with the receiver held stationary, a peak response that does not fluctuate.
Magnetic field: the product of alternating current flowing on a pipe or cable.

MYTH: CONDUCTIVE IS ALWAYS BETTER THAN INDUCTIVE

Question:

Doesn't using induction cause the signal to bleed-off on everything else in the ground?

The results:

When conductively applying the 83 kHz signal at a gas service connected to a steel main, the main initially locates well until the signal appears to transfer to a **parallel conductor**—an electric primary cable. Since much of the signal on the gas main transfers to the electric line, the gas line may be left unmarked due to its lower amount of signal compared to the electric primary cable.

Apparent conclusion:

You may never know when a line being located conductively is being mismarked as the signal bleeds-off to another line during the **trace.**

Parallel conductor: a conductor that has an optimum chance of being induced.

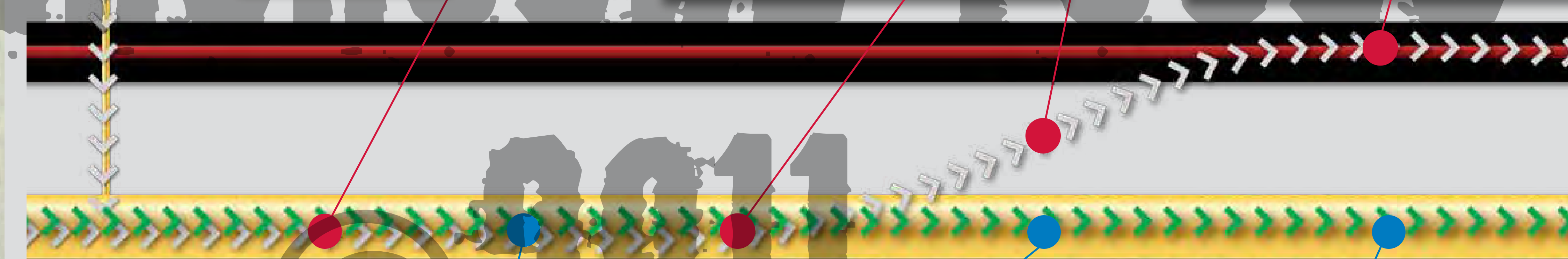
Trace: the entire section of a pipe or cable being located.

Access point: a bare metal spot on a pipe or cable whereby one end of the conductive transmitting antenna is attached.

Truth:

By looking at all information presented by the receiver, clues can often be spotted that indicate bleed-off onto a non-target line. Even if these clues go unnoticed, there's also a good chance to detect the bleed-off by walking the trace to a visual termination source. In this locate scenario, a trace ending at a transformer or a riser pole would confirm bleed-off from the gas main onto the electric primary cable.

Sometimes an inductive locate yields better results than a conductive locate. Whether or not signal bleeds-off onto a non-target is heavily influenced by where the signal is applied and less so by the way signal is applied. There are only a finite number of **access points** for conductive locating. There are an infinite number of locations where the transmitter may be placed for inductive locating.



With the signal applied at a different location, the path of least resistance changes thus changing the results of the locating. By changing from conductive locating to inductive locating, the gas line locates accurately. No bleed-off occurs using inductive locating.

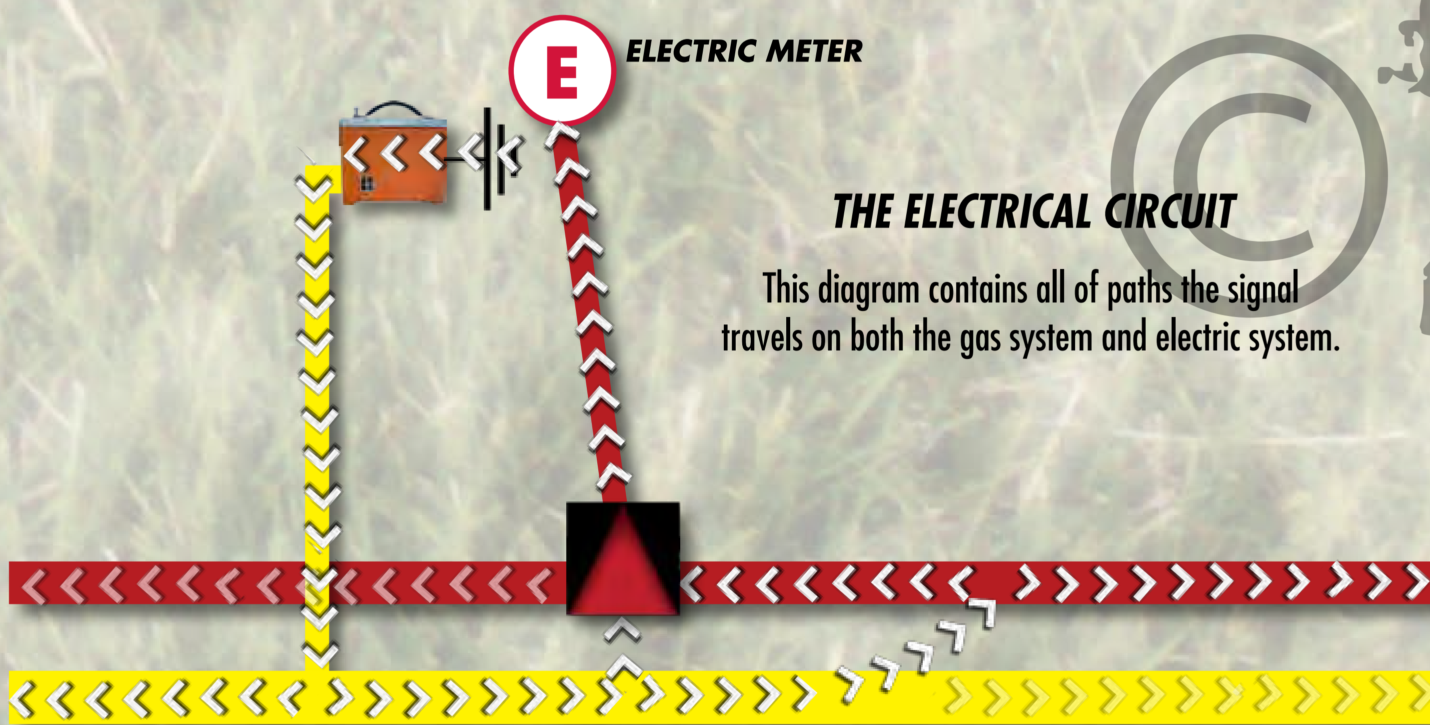
SUPPORTING MATERIAL: DISCOVERING EVIDENCE OF BLEED-OFF WITH THE RECEIVER

This photo gives us a closer look of the transmitter location from the scenario on page 22. Notice the location of the electric meter and also take note that the electric service runs somewhat parallel with the gas service. The transmitter's access point is at a gas meter hidden by the bushes. The transmitter's grounding device is placed in the soil beyond the landscaping rock.

It's certainly possible that some of the signal that ultimately ends up on the electric primary cable gets onto the electric service during the initial phase of this locate. With the **grounding device** positioned in the direction of the location of the electric service—as well as the close proximity of the electric primary and service cables to the gas main and service—it's logical that the 83 kHz signal may end up on the electric lines.

Whatever signal leaves this transmitter must come back to the transmitter. This is the nature of an electrical circuit. Our circuit here is comprised of the transmitter, a **conductive transmitting antenna** and a grounding device, along with the metallic gas pipe. Signal coming back to the transmitter can travel through earth in addition to following the very conductive and well-grounded electric system back to the transmitter.

Grounding device: a piece of metal driven into earth so that the conductive transmitting antenna may be attached.
Conductive transmitting antenna: a wire with two ends which connects the transmitter to 1) the pipe or cable and, 2) the earth.



THE ELECTRICAL CIRCUIT

This diagram contains all of paths the signal travels on both the gas system and electric system.

SUPPORTING MATERIAL: RECEIVER INDICATES SUBSTANTIAL BLEED-OFF

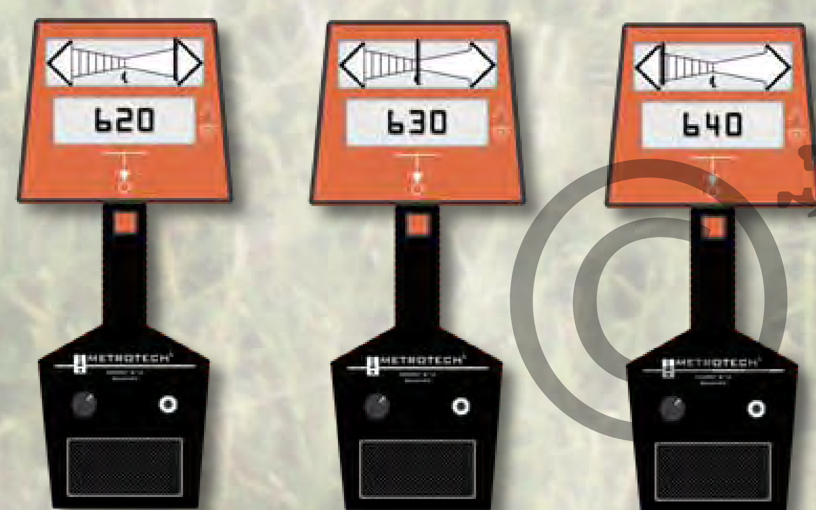
These five receiver readings are produced as the receiver is being moved in a perpendicular fashion across a target utility.

The "640" reading is received directly atop the target line, while the other readings are to one side of the target line or the other. The number on the display is the receiver's **peak** reading.

The black needle indicates the direction to the target line as well as the target line's relative distance. The receiver is over the target line when the needle is in the center of the receiver display. The needle response is known as an **electronic null.**

This series of five readings are typical of a **round field.** A round field is an indicator of an accurate locate.

These three receiver responses indicate a **not-round field** because the highest peak response (640) occurs without an accompanying centered black needle. This response indicates that more than one **conductor** is energized and the results should not be trusted. A not-round field is an indicator of an inaccurate locate.



Peak: a receiver response taken at the apex whereby the coil orientation is vertical, like a tire.
Electronic null: a receiver response whereby two symmetrically and horizontally positioned peak antennas record identical signal strengths.
Round field: a magnetic field that is not an **attracting** or **repelling field**.
Conductor: a name for a metallic pipe or cable when discussing electromagnetic theory.
Attracting field: a magnetic field whose energy moves toward another field; this field is not circular.
Repelling field: a magnetic field whose energy moves away from another field; this field is not circular.

MYTH: INDUCING WITH VERY HIGH FREQUENCIES IS A RECIPE FOR DISASTER

Question:

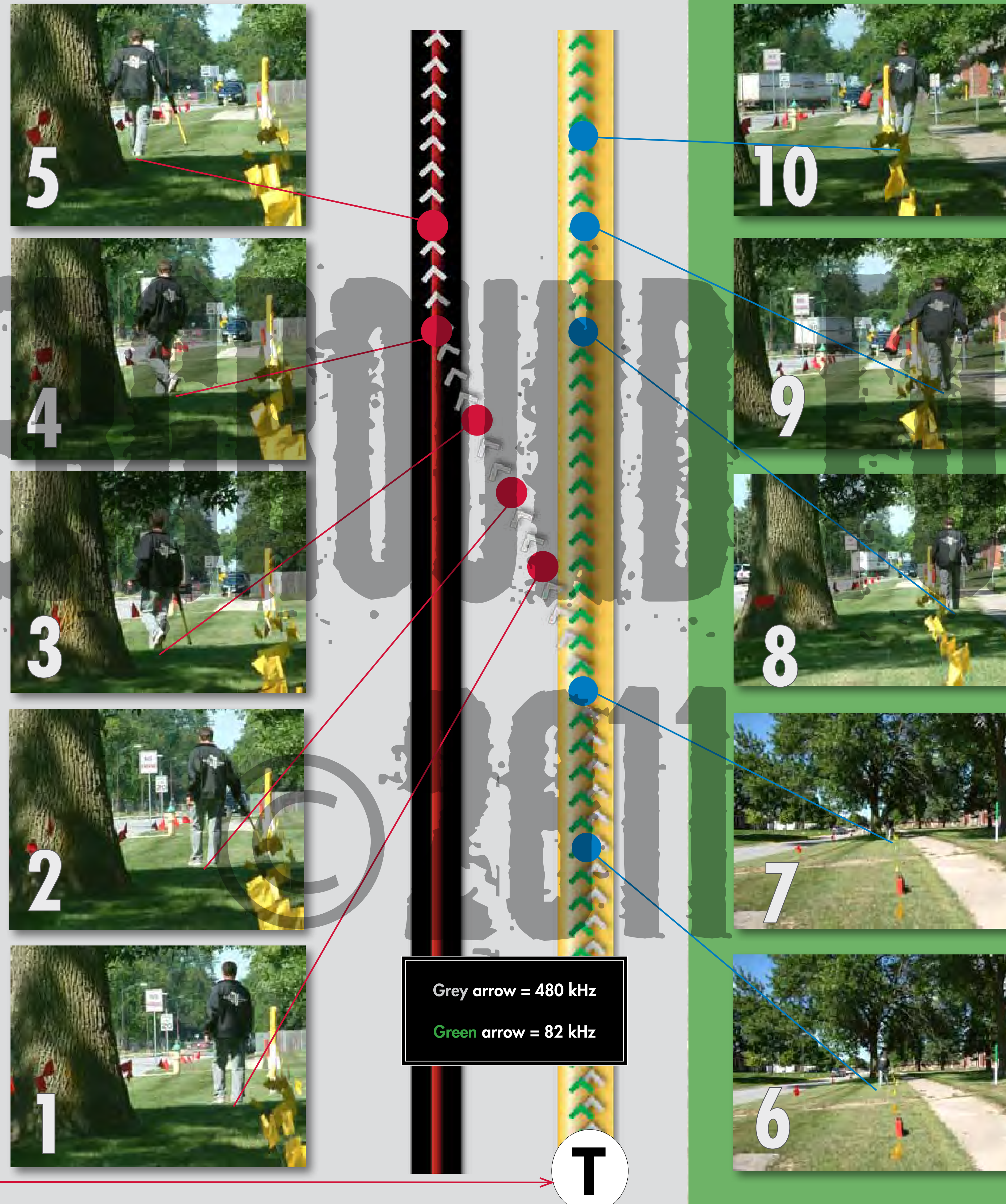
Even though there is a need to induce on occasion, why would you ever use very high frequencies over lower frequencies? Very high frequencies easily bleed-off onto nearby parallel conductors and you'll never know what you are locating. Locating with very high frequencies seems to be a recipe for disaster, isn't it?

The results:

Locating a steel gas main with 480 kHz, the signal veers away from the gas main and onto the electric line. When an 82 kHz transmitter is placed at the same location as was the 480 kHz transmitter, there is no bleed-off.

Apparent conclusion:

480 kHz is too high a frequency to use when non-target lines are nearby. You need to use a frequency no higher than 82 kHz in these situations to avoid bleed-off.



Truth:

While any frequency can bleed-off, it is generally true that higher frequencies bleed-off more than lower frequencies. What is not true is that higher frequencies ALWAYS bleed-off more than lower frequencies.

These photos show the scenario from page 22. Although 480 kHz is used to locate the steel gas main, there is no bleed-off onto the parallel conductor—the electric primary cable.

It is not just transmitter frequency that creates bleed-off. While inductive use of the transmitter at times is superior to conductive locating, utility line grounding, utility line insulation, length of target line, target line and non-target line **metallic continuity**, and proximity of non-target lines to target lines all may contribute to bleed-off.

Metallic continuity: a line leg that has no insulators or unarmored splices.

SUPPORTING MATERIAL: DETECTING SUBTLE BLEED-OFF

You've seen two locating scenarios where the signal veers off the target line at a diagonal and then bleeds onto a parallel non-target line. Recognizing bleed-off as a divergent path from the actual path of the target line is a sometimes difficult task. When bleed-off signal begins to leave the target, the signal path is often well-disguised as the target because often there is virtually no change in signal strength. The line appears to temporarily veer in a diagonal direction before regaining its original orientation.

One way to spot this subtle bleed-off is to stop and take note of peak readings at a stationary location along the diagonal path. These peak readings need to be taken at opposite angles to the apparent path of the target line. With the instrument planted on the ground, rotate the receiving instrument to the left and away from the target. Then return to the original position and rotate the instrument to the right and away from the target.


Rotated to the left

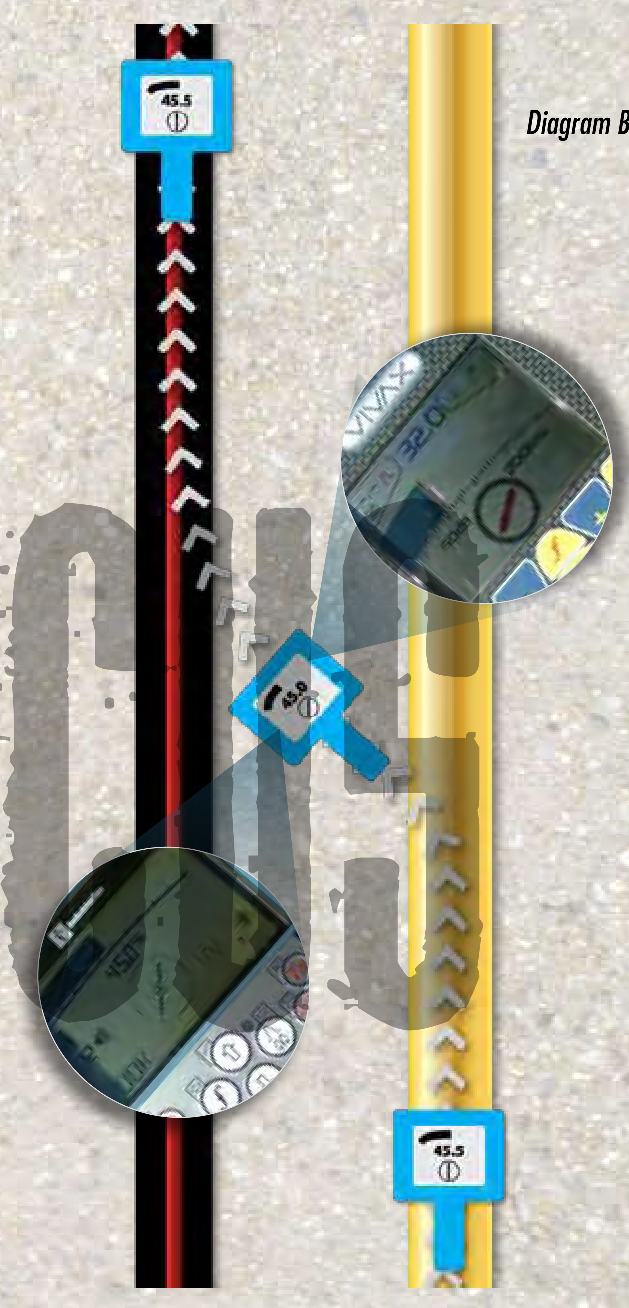

Over the line


Rotated to the right

There are two possible outcomes for the rotating of the receiving instrument at a stationary location:

- The highest **signal strength** is not obtained when the **receiving antenna** is in line (like a tire to the road) with the suspected path of the target. This indicates bleed-off is occurring.
- The highest signal strength is obtained when the receiving antenna is in line (like a tire to the road) with the suspected path of the target. This indicates that the target line actually does run in a diagonal direction.

A "compass" is a visual accessory on some receiving instruments. The compass is "always on" and alerts the operator to the likelihood of a divergence of target line direction and highest signal strength reading.



The compasses shown in Diagram A indicate that the target line's orientation has veered. The compasses shown in Diagram B indicate the location of signal bleeding-off from the gas line onto the electric line.

Receiving antenna: a symmetric metallic winding induced upon by a magnetic field.

Signal strength: measurement of the magnetic field with a **tire** coil orientation.

Tire: a vertical coil winding that provides a peak response; windings that are oriented to the pipe or cable like a "tire to the road."

MYTH: IT'S IMPOSSIBLE FOR A LOW FREQUENCY TO BLEED-OFF A TARGET LINE WHILE A HIGH FREQUENCY STAYS ON THAT SAME TARGET LINE

Question:

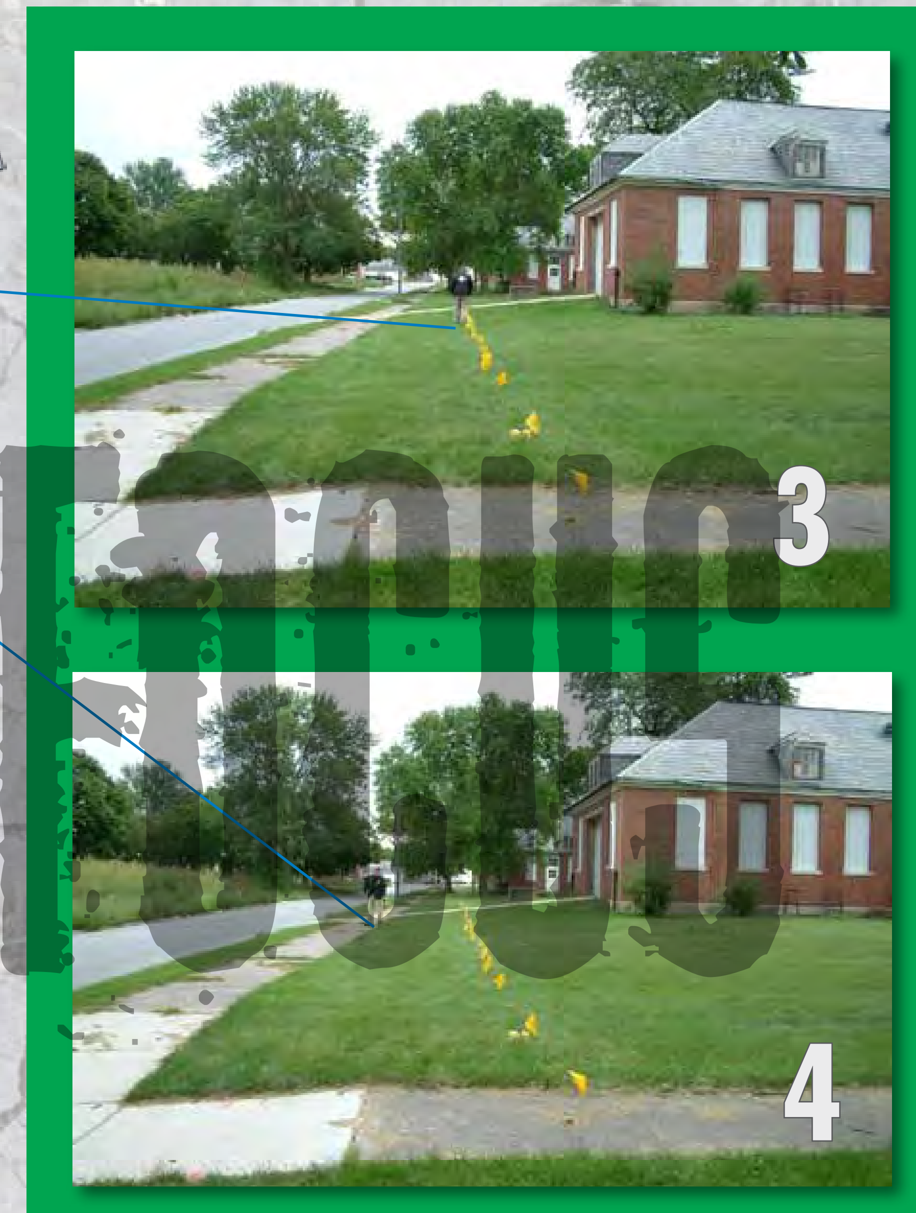
There are times that induction is necessary. If lower frequencies can energize the target, wouldn't they be preferred over higher frequencies in order to minimize bleed-off?

The results:

With the transmitter placed over a tracer wire and inducing on 33 kHz, the tracer wire does not locate but a parallel electric primary cable nearly ten feet away locates with ease.

Apparent conclusion:

"Don't induce. You will *bleed-off* onto everything." *Publisher's note: This statement pulled from our introduction.*



Truth:

If conductive locating could be used to locate all lines accurately, then conductive would be the only method used to energize lines. Conductive locating, however, sometimes locates lines inaccurately or not at all. It is in these instances that inductive locating must be utilized. Induction is the only way to solve locating problems that conductive locating cannot solve.

This scenario illustrates induction unable to energize the target line—the tracer wire—even though the transmitter is placed directly atop the tracer wire. This scenario also illustrates that in some inductive scenarios, a high transmitter frequency outperforms a much lower transmitter frequency. The 33 kHz frequency's failure is likely caused by the lack of far-end grounding on the target line and the well-grounded nature of the parallel non-target line.

Far-end: the end of a line leg opposite of the transmitter location.

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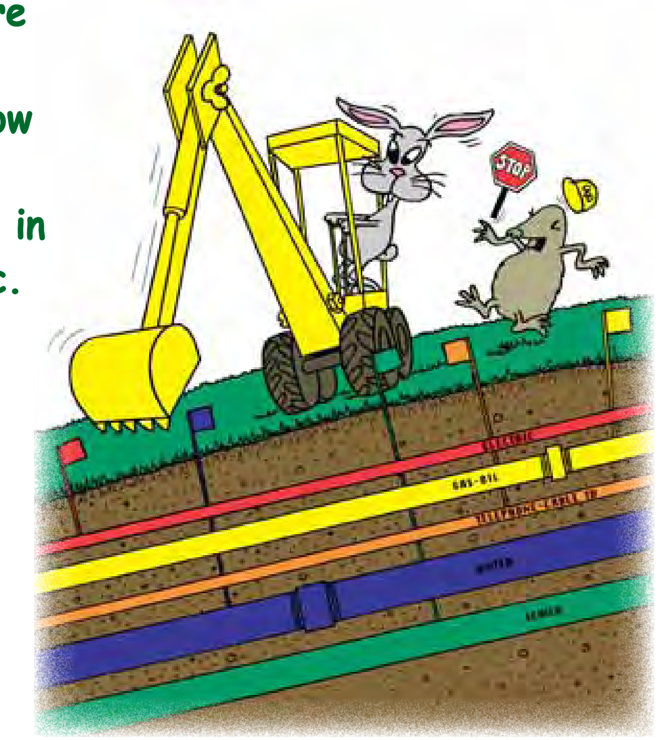

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Contractor Bets on a *SHORE THING*

Kinsel Industries, now a part of Insitu-Form, can't take any chances when it comes to the project constructed in Jacksonville, Florida. The contract with the city utility authority, J.E.A., is a five – year, $160 million contract that initially required the bursting and replacement of sewer pipeline at a rate of over 45,000 lf. PER WEEK. This includes the tie-in of utilities to the community.

A great deal of the work is done in tight conditions and back yards.

Kinsel Industries has a long history of putting safety to work, hand in hand with productivity.

The project required constant monitoring for hazardous atmospheres and protection of workers in the excavation.

The initial use of hydraulic shores proved to be too time consuming, slowing productivity and increasing costs. The decision was made to use the latest technology in aluminum trench shoring, **ultraSHORE ™** trench boxes manufactured in Denver, Colorado. The trench depths are less than 12 ft. deep and **ultraSHORE™** is well suited to the Florida sands. A variety of Mini-Excavators are used to handle the excavation and boxes, even though most **ultraSHORE™** shields are light enough for two men to handle.

The local rental dealer for **ultraSHORE™, Trench Shoring Services**, (TSS) was able to supply a wide selection of inventory to match the variety of applications that were encountered. **Carlos Zambrano** was one of the many foremen on this vast project. Carlos appreciated the fast and dependable service provided by Trench Shoring Services to meet the ever-changing ground conditions.

The Jacksonville TSS facility also provides steel trench boxes and road plates to the region. CPT training is available in English and Spanish to meet the needs of the growing workforce.

..most ultraSHORE™ shields are light enough for two men to handle

More stories at www.safetyinexcavation.com!

BLEED-OFF FACT: SLIGHT BLEED-OFF CAN BE HELPFUL

Question:

How can the receiver tell you about the location of another line while you are locating a target line?

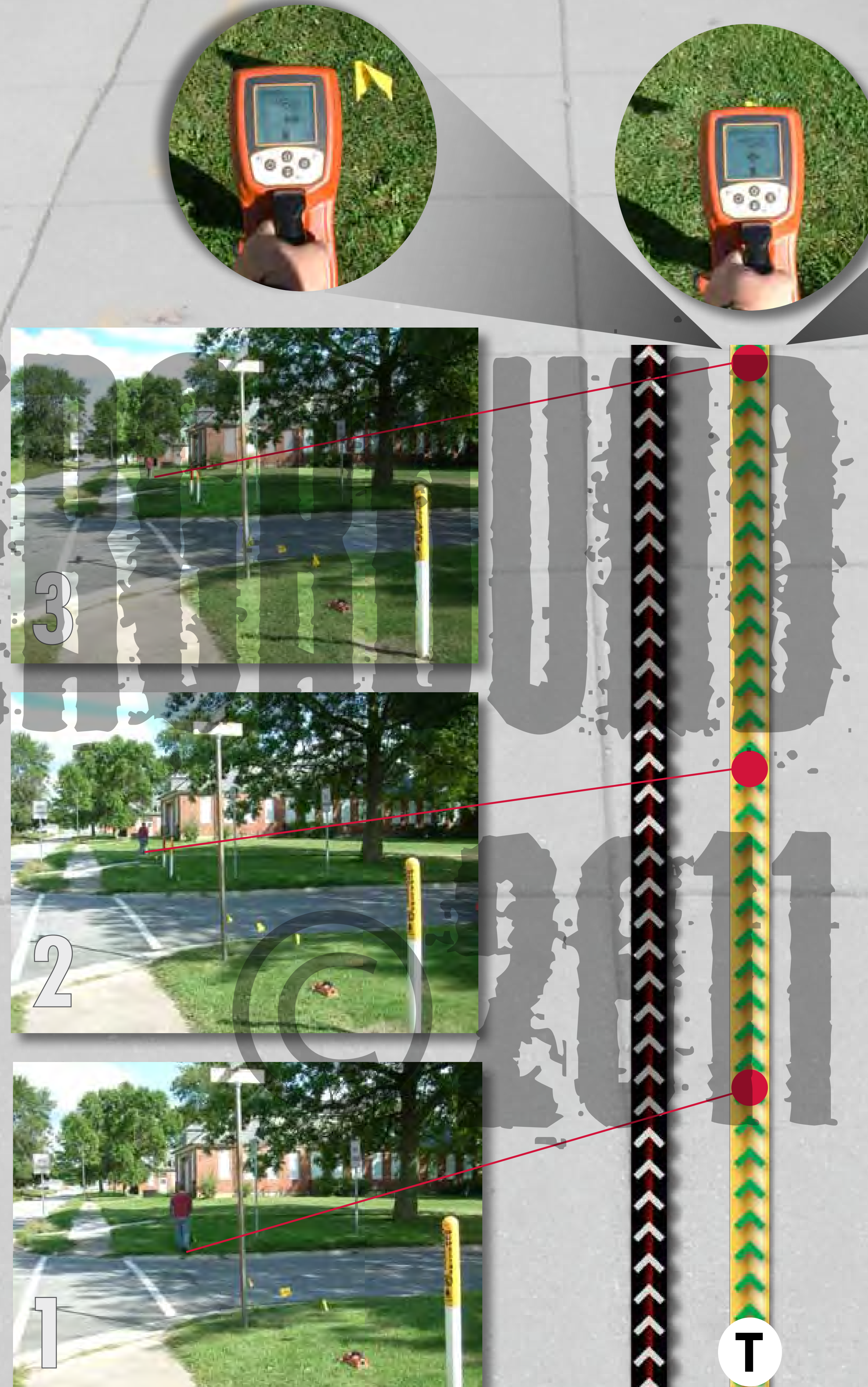
The results:

The highest peak number is located on the ground at the same location as the electronic null reading. When peak and electronic null readings agree, there's a high likelihood of an accurate locate. As the operator walks down the line, the instrument is swung to the left the same distance it is swung to the right. Although the left-right swing of the instrument covers the same distance on both sides of the target line, the peak numbers are higher on the left side of the target line than they are on the right side of the target line.

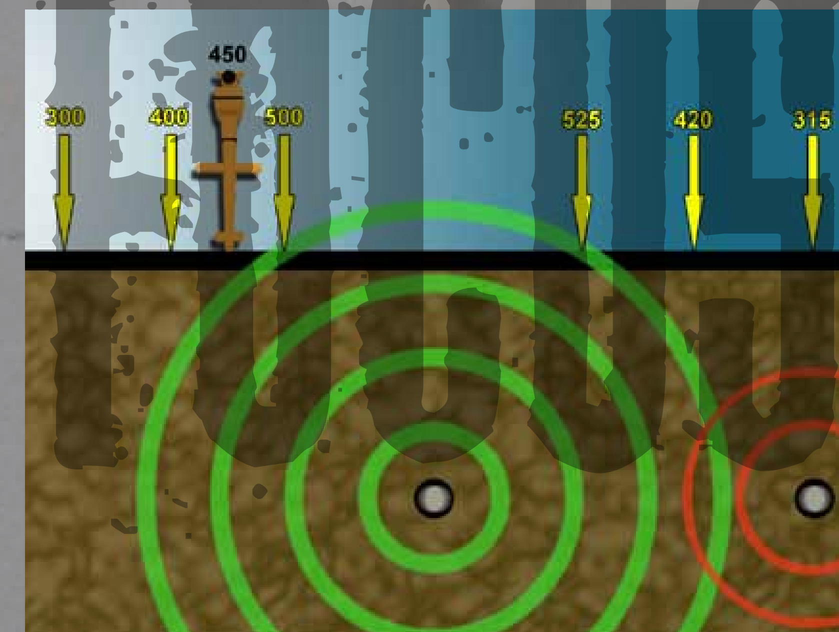
Conclusion:

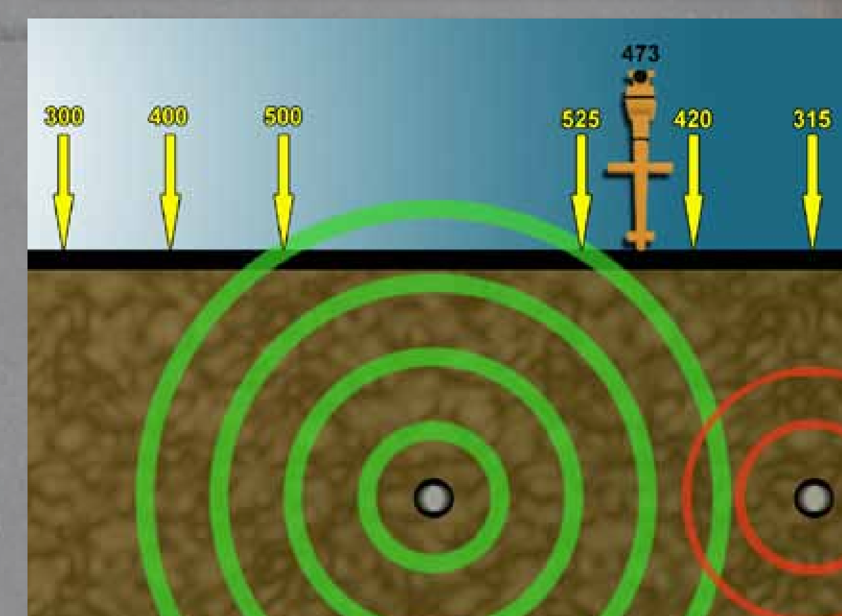
As he walks locating the target line, the operator becomes aware of a parallel non-target line. It is not always the case that the higher peak numbers on one side of the target indicate that the non-target is located in that direction. Lower peak numbers may be registered on the non-target side of the target, too.

If signal flows the same direction on each line—as is the case in this scenario due to the transmitter energizing both lines inductively—the higher number side is in the direction of the non-target. If signal flows in opposite directions on the two lines, the lower number side is in the direction of the non-target. This occurs when the non-target line acts as a return path for signal returning to the transmitter after it has left the target line. (*See diagram on page 24*)



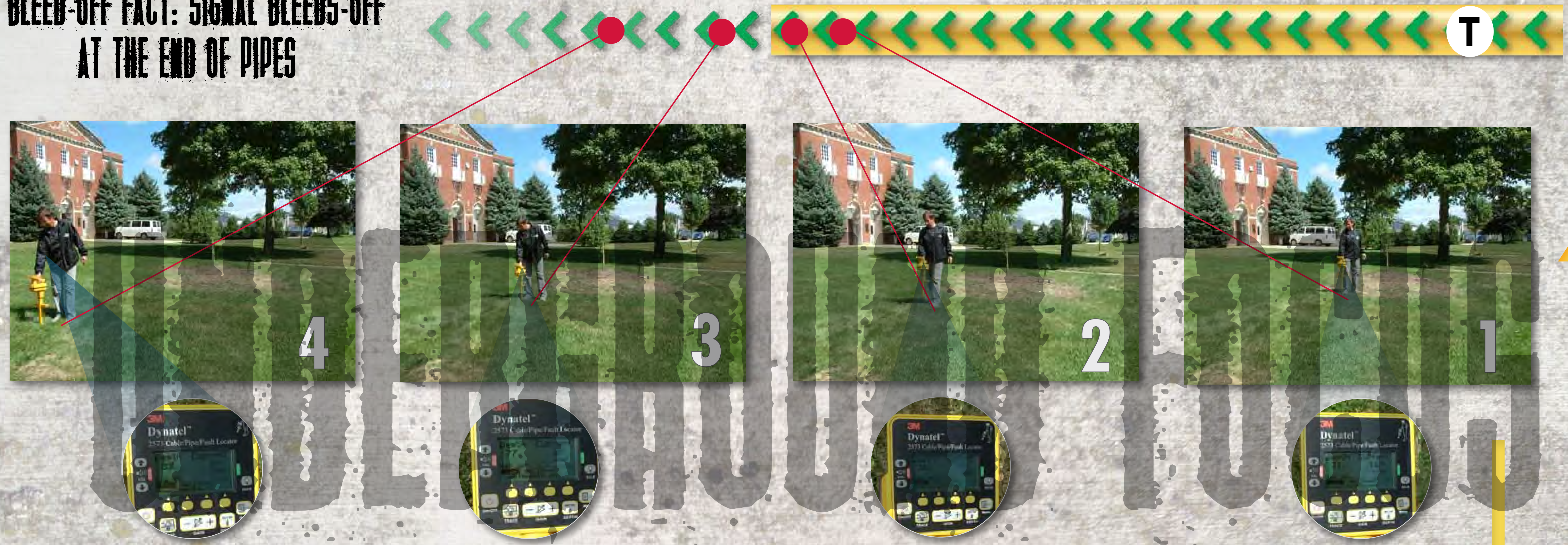
The receiver registers a 450 signal strength reading while positioned on the side of the target that is opposite the non-target.





The receiver registers a 473 signal strength reading while positioned on the non-target side of the target. The receiver's distance from the target line is the same on both sides of the target.

BLEED-OFF FACT: SIGNAL BLEEDS-OFF AT THE END OF PIPES



Question:

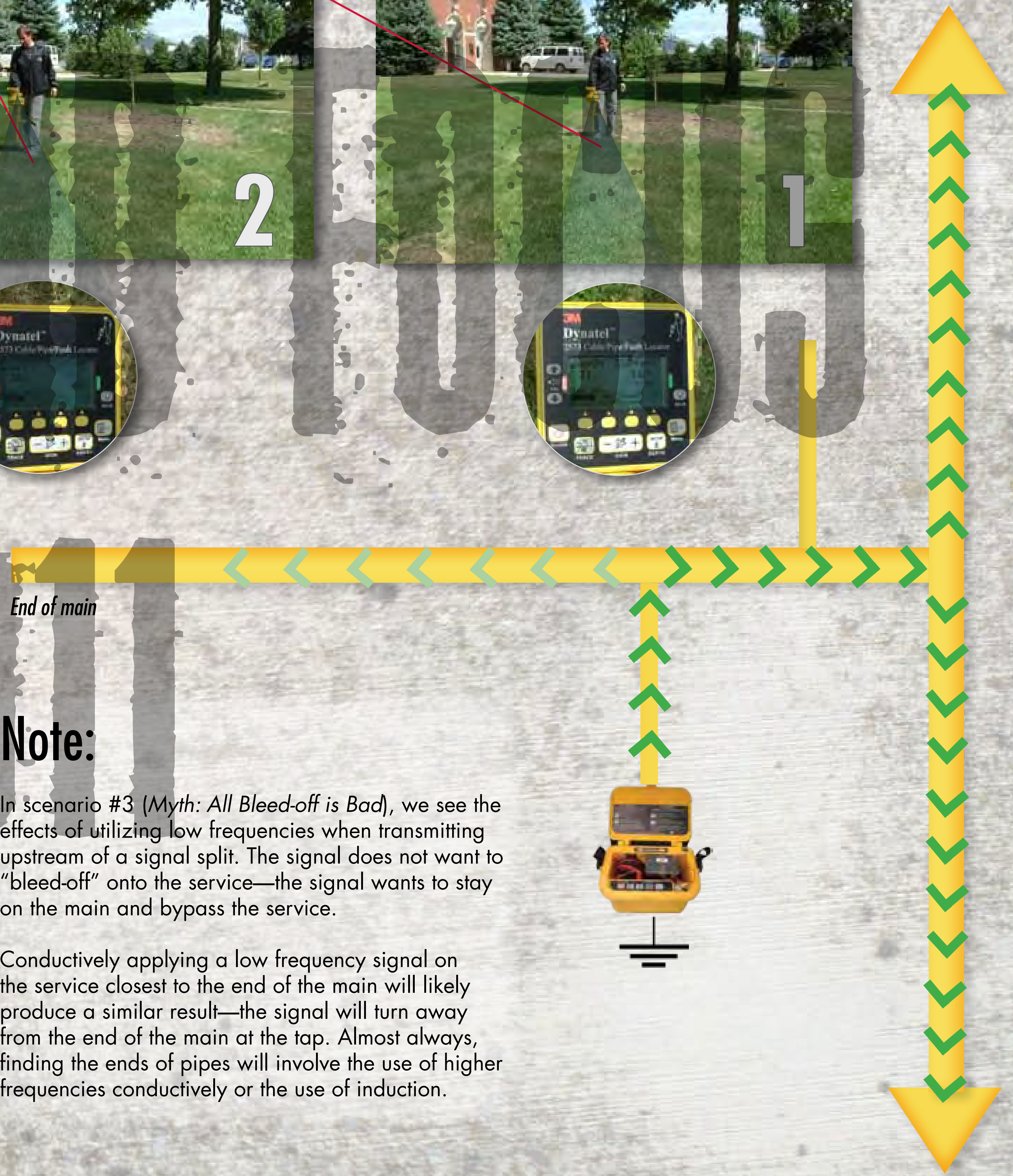
Is it possible to detect the exact end of steel gas pipes or iron water pipes?

The results:

Finding the exact end can be difficult because signal does not stop at the end of the pipe, it continues to bleed-off into the soil past the pipe. Compounding the problem, signal starts to fade before the end of the pipe and then tends to fade significantly only after passing the exact end of the pipe. Trying to find the exact end of a pipe using only signal strength readings is unlikely to work well.

Conclusion:

Using digital depth readings can help narrow the search for ends of pipes. Begin noting digital depth readings every five feet along the pipe upstream of the suspected end of the pipe. The initial depth readings should not vary much from each other. Once the receiver approaches the end of the pipe, each successive depth reading will become a bit deeper than the reading before. Once the receiving instrument passes the end of the pipe, the next depth reading should be significantly deeper than the previous depth reading.



Note:

In scenario #3 (*Myth: All Bleed-off is Bad*), we see the effects of utilizing low frequencies when transmitting upstream of a signal split. The signal does not want to "bleed-off" onto the service—the signal wants to stay on the main and bypass the service.

Conductively applying a low frequency signal on the service closest to the end of the main will likely produce a similar result—the signal will turn away from the end of the main at the tap. Almost always, finding the ends of pipes will involve the use of higher frequencies conductively or the use of induction.

BLEED-OFF FACT: FOR THE SAME REASON ENDS OF PIPES ARE HARD TO FIND, IT IS HARD TO FIND THE EXACT LOCATION OF AN INSULATOR ON A STEEL GAS MAIN

1. The operator begins locating the steel gas main approximately 40′ from the location of the pulsed, or "warble" tone transmitter.
2. The operator still receives a warble tone.
3. The warble tone is replaced by a solid tone. The operator has just passed the insulator.
4. The operator recognizes that he is beyond the 90-degree bend. His next move is to position himself 40′ from the solid tone transmitter and trace back the direction from which he first came to verify the exact location where the tones switch.

This transmitter is set to warble tone. To change to solid tone, the toggle switch would be returned to the center position.

Grey arrow = Warble 82 kHz

Green arrow = Solid 82 kHz

Question:

So if signal bleeds past an insulator, wouldn't signal reattach itself on the pipe beyond the insulator? That seems to make it harder to find an insulator than the end of a pipe.

2″ insulator

The results:

An insulator marks the end of metallic continuity of a run of steel pipe. It is easy to bleed-off past the insulator since a new run of steel pipe is situated within centimeters of the previous run of steel pipe. Ultimately, the solution involves the use of two transmitters set on the same high frequency.

Conclusion:

The use of a pulsed transmitter signal applied to one side of the suspected location of an insulator and a regular signal applied the other side of the suspected location of an insulator allows the operator to locate from one transmitter initially, then to locate from the other transmitter after passing the insulator.

Solid tone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