

Unseen Threats to Public Safety

The importance of damage prevention for protecting lives

Introduction

When people think about public safety, they may imagine police officers or traffic signals. With infrastructure in mind, they may think about railroad crossing gates or orange cones on a roadway. These highly visible public safety components are important, but another threat hides under our feet: the safety of our buried infrastructure.

The underground infrastructure is not a threat in itself – pipelines safely move over 99.999 percent of their products without incident, while electrical and telecommunication lines quietly provide power and information services with no risk to pedestrians. But when homeowners or construction crews put a shovel or power tool into the ground, these unseen facilities create significant public safety risks. Fortunately, these risks can be managed – and incidents avoided – but it requires adherence to laws and best practices. However, damage incidents are trending upward, and those very laws may need reform to ensure enduring public safety.

Problem

Every year, over 500,000 incidents occur in which a pipe, cable, or wire is damaged or severed during excavation work. While these incidents can often be a mere nuisance, like striking a homeowners internet cable, they can turn deadly in an instant if a natural gas pipeline is damaged.

Nationally, telecommunication lines have been the most commonly damaged facility. However, for the latest available data, natural gas lines emerged as the top reported facility to experience excavation damage.¹ In California, gas lines are reported as the most impacted in each of the last four years.² When these lines are struck, they are liable to leak methane. This can lead to a risk of asphyxiation if leaked into an enclosed space like a basement or home, but also create a risk of fire and explosion. Methane is highly flammable, and pipeline strikes can easily result in sparks and release of pressure. An explosion of this nature can level a home or business and lead to serious injury and death.

According to the Pipeline and Hazardous Materials Safety Administration (PHMSA), since 2010, excavation incident impacting pipelines have led to approximately 200 deaths and injuries nationwide.³ That number is limited to the pipelines under PHMSA jurisdiction – and does not account for the costs, injuries, and death from striking the pipelines outside PHMSA’s oversight nor millions of miles of non-pipeline facilities including phone lines, Internet cables, electrical wires, water lines, sewage, and more.

¹ Common Ground Alliance. *Damage Information Reporting Tool*. DIRT Explorer. <https://commongroundalliance.com/DIRT-Dashboard>.

² *Id.*

³ Pipeline and Hazardous Materials Safety Administration. (2023). *ALL REPORTED INCIDENT 20 YEAR TREND*. U.S. Department of Transportation. <https://www.phmsa.dot.gov/data-and-statistics/pipeline/pipeline-incident-20-year-trends>.

Other risks to safety include electrocution from power lines or environmental contamination if sewage lines are disrupted. The victims of these incidents are very often the excavator – who may be an independent contractor or a homeowner. These incidents can also threaten communities and bystanders when larger accidents occur.

A final risk from the current system primarily impacts utility locating technicians. These are professionals who visit a prospective dig site to locate and mark the site with spray paint and flags to designate buried infrastructure. Among locators – as well as excavators – the most common injuries result from slips, trips, and falls. Visiting dozens of worksites each day, workers are constantly exposed to roadway safety concerns when driving to sites, roadside risks when locating along roadways, and may injure themselves on site depending on the terrain. Far from trivial, these incidents can lead to deaths and serious injury as well as minor sprains for thousands of individuals within the enormous construction and locate sectors. Fewer visits to an excavation site or reducing the size of the site to mark should help reduce these types of injuries.

Potential Improvement

The basic system of calling 811 to notify one-call centers about a pending excavation project is critically important. When this system is utilized, excavation damage incidents are estimated to be reduced by 99 percent. But every year, hundreds of thousands of small to large-scale projects break ground and many do not call 811 – or notice is provided but damage results anyway. Even when 811 is notified and pipeline or utility damage is avoided, there are often still many roadway and pedestrian injuries.

The needed improvements will need to accomplish two things: (1) move as much of the process from physical to virtual as possible to avoid repeated and unnecessary site visits and to narrow the scope of those visits, and (2) provide as much comprehensive site information as possible to ensure the presence and location of any buried facilities is accurately noted and understood by all parties before excavation begins.

While calling 811 puts utility companies on notice that digging is expected to take place near their infrastructure, it still leaves opportunities for miscommunication and error. Notification made directly on the one-call center website – rather than by phone through the middleman of a one-call center – may help improve the precision of excavation notices. Web-entry tickets have been shown to reduce damages by half relative to notice made by phone when excavators are able to draw their dig site on a map.⁴ And when it comes to public safety, halving potential damages translates into fewer injuries and death.

In addition to the needed shift toward web-entry tickets, the process of electronic white-lining, or pre-marking of the dig site on a virtual map is an important public safety measure that is not subject to universal use. Electronic white-lining gives excavators the opportunity to draw the exact parameters of their project on a visual representation of the site rather than describing it over the phone. This not only helps narrow the size of the dig site to be marked and leads to reduction in damages but reduces the need for both excavators and locators to make multiple and

⁴ Dierker, B. (2022). *Safer Digging Part 2: Click don't Call*. Alliance for Innovation and Infrastructure. <https://www.aii.org/safer-digging-part-2-click-dont-call/>.

unnecessary site visits.⁵ This will directly reduce the most common types of injury⁶ while making strides to reduce the most critical risk – such as natural gas pipeline strikes.

This led state and federal authorities evaluating electronic white-lining to conclude that “every stakeholder benefits at least indirectly from each and every benefit accrued to individual stakeholder groups. **The universal benefits come from improved safety** and reliability of vital underground infrastructure.” (Emphasis added)

Another well-established technique that does not require systemic overhaul of the system is improved information sharing by locators. When an excavator calls 811 (or enters a web ticket), facility owners receive a notice and send locate technicians to the site to identify and spray paint the path of subsurface facilities. A *positive response* is when the locator then passes along to the excavator information that their job is completed. An *enhanced positive response* (EPR) follows this same process but includes the locator sending the excavator digital photographs of their completed site markings, ticket descriptions, manifests, and in some cases, facility maps so that the excavator has a more robust set of resources to ensure that as they dig, they can cross reference information to avoid striking pipes, cables, and wires that may be below the surface. Enhanced positive response was found to reduce damage rates by upwards of 67 percent⁷ in pilot projects validated by the Pipeline and Hazardous Materials Safety Administration under the U.S. Department of Transportation.

In addition to a demonstrated reduction of damage by 67 percent, users further validated the safety power through survey responses. Feedback included that 93 percent of excavators and 88 percent of facility owners recognize that EPR helps prevent damage and make the jobsite safer.^{8,9}

Trade groups like the Common Ground Alliance and others have commented that the ideal dig of the future will feature electronic white-lining and enhanced positive response to help ensure no damage is done to underground facilities at a work site. The best way to ensure public safety is to require the incorporation of proven technologies and best practices into the damage prevention process so that homeowners, excavators, and locators do not face unnecessary risks.

⁵ Pipeline and Hazardous Materials Safety Administration. (2007). *Virginia Pilot Project for Incorporating GPS Technology to Enhance One-Call Damage Prevention Phase I – Electronic White Lining*.

https://primis.phmsa.dot.gov/comm/publications/Virginia_Pilot_Project_Report_Phase_I.pdf

⁶ *Id.* Consider, three among other findings: (1) “[electronic white-lining] Reduced threats to public safety and the environment.” (2) “Improve personnel safety by allocating more time to perform locates.” And (3) “[this] means less exposure time to locating crews, thus improving personnel safety and affording more time to perform accurate locates. As smaller, more accurate areas are identified for excavation, it is less likely that existing underground facilities will be affected or more likely that fewer facilities will be affected.”

⁷ Pipeline and Hazardous Materials Safety Administration. (2017). *Report to Congress on Improving Damage Prevention Technology*. U.S. Department of Transportation. <https://www.phmsa.dot.gov/news/report-congress-improving-damage-prevention-technology>.

⁸ Brown, S., Fordham, T., Crawford, D., & Peterson, R. (2014). *Enhanced Positive Response Pilot*. Washington Gas, UtiliQuest. https://commongroundalliance.com/sites/default/files/EnhancedPositiveResponsePilot_June2014.pdf

⁹ Smith, T. (2017). *Introduction of Enhanced Positive Response*. U.S. Environmental Protection Agency, UtiliQuest, Washington Gas. https://www.epa.gov/sites/default/files/2017-05/documents/introduction_epr.pdf.

Conclusion

Despite being unseen, a growing risk to public safety comes from the risk of excavation damage to underground infrastructure. While these pipes, cables, and wires quietly provide the power and services that facilitate modern life as people go about their days, when a homeowner or construction worker puts a shovel into the ground, risk to public safety immediately arises. These risks can be mitigated and avoided by utilizing the 811 system, but reforms are needed to improve that system and to ensure public safety. The solutions include industry adherence to best practices as well as public policy reforms to ensure the latest available, proven technology is incorporated into the damage prevention process.



Author

Benjamin Dierker, JD, MPA
Executive Director, Alliance for Innovation and Infrastructure

*For more information or inquiries on this report, please contact the Aii
Media Coordinator at info@aii.org*

Recommended Citation for this report

Dierker, B. (April, 2023). *Unseen Threats to Public Safety: The importance of damage prevention for protecting lives*. Alliance for Innovation and Infrastructure.

About Aii

The Alliance for Innovation and Infrastructure (Aii) is an independent, national research and educational organization that explores the intersection of economics, law, and public policy in the areas of climate, damage prevention, energy, infrastructure, innovation, technology, and transportation.

The Alliance is a think tank consisting of two non-profits: the National Infrastructure Safety Foundation (NISF), a 501(c)(4) social welfare organization, and the Public Institute for Facility Safety (PIFS), a 501(c)(3) educational organization. Both non-profits are legally governed by volunteer boards of directors. These work in conjunction with the Alliance's own volunteer Advisory Council.

Board of Directors

Mandy Gunasekara, Director

Scott Harper, Director

Chris Kilgore, Director

Brigham McCown, Founder, Chairman

Jack Reape, Director

Robert Sumwalt, Director

David Venable, Director, Senior Cybersecurity Fellow