Unseen Threats to the Environment

The importance of damage prevention for mitigating environmental impacts

Introduction

In the United States, there are tens of millions of miles of pipelines, cables, and wires buried just below the surface of the ground. These facilities carry energy resources, hazardous liquids and gases, water, power, and even information. In most years, the largest single cause of pipeline damage is third-party excavation damage from construction activity and digging. These damages can cause significant environmental harm, including the release of hazardous liquids, greenhouse gases, and other environmental issues.

Because the United States population continues to grow and economic activity remains dynamic, there is constant need for new construction, new infrastructure, and more buried facilities. This also means greater risk and higher likelihood of damage to the existing buried infrastructure network, which comes with multiple layers of environmental concern.

Problem

Every year, over 500,000 excavation incidents occur in which a pipe, cable, or wire is damaged or severed. This can lead to both direct and indirect impacts to the environment. At the most severe, hazardous materials leak into vulnerable ecosystems and waterways. More indirectly, the resulting damage leads to increased emissions from a host of stakeholder activities.

Moving through pipelines in the United States are millions of barrels of crude and refined petroleum as well as natural gas, carbon dioxide, and other hazardous liquids and gases. At any moment, one of these pipes may be struck by an excavator or other piece of construction equipment. This can release pressurized and flammable material, liquids that leach into the groundwater, or potent greenhouse gases directly into the atmosphere. According to the Pipeline and Hazardous Materials Safety Administration (PHMSA), at least 7,369 barrels of petroleum product were leaked in 2021 due to third-party excavation.[1] In 2020, that number was over 24,000 barres. Importantly, these leaks are only from the interstate pipelines under PHMSA jurisdiction and do not include other gaseous and intrastate pipeline leaks. Also of concern are leaks and disruption to sewage and water lines that may cause contamination and threaten local health and ecology.

An indirect environmental impact from responding to facility damages are tailpipe emissions. When a pipeline is damaged, in addition to the hazardous material spilling, numerous company vehicles are mobilized to the scene to redress the incident. This includes the "truck rolls" of immediate crews on scene, the remediation personnel, pipeline repair workers, inspectors, regulators, emergency responders, and more.[2] While pipelines may call to mind a rural setting,

[1] PHMSA. (2022). Pipeline Incidents By Cause. https://portal.phmsa.dot.gov/analytics/saw.dll?Go

[2] With very conservative estimates, if we assume the likely half million annual incidents each result in just three passenger-style vehicles visiting the site and driving ten miles round-trip, this would be an additional 13.2 million pounds of carbon dioxide generated from tailpipe emissions alone. (*see generally*, https://www.epa.gov/greenvehicles/greenhouse-gas-emissions-typical-passenger-vehicle)

this is all too common in densely populated urban environments, where natural gas distribution lines are highly concentrated. There, the tailpipe emissions include all of the personnel described above as well as increased emissions caused by greater traffic, idling, and additional driving caused by detours. Similarly, these increased emissions can be the result of a sewer line, water line, telephone line, or other underground infrastructure damaged during excavation.

Potential Improvement

The basic system of calling 811 to notify one-call centers about a pending excavation project is highly valuable. Within that system, excavators inform a one-call center about their upcoming excavation work and begin a loop of communication with the utility companies in the area of excavation. These companies then send locators to the dig site to locate and identify underground facility lines by marking the surface with color-coded spray paint and flags. From there, the excavator is able to dig while seeing a representation of any pipelines or other underground facilities on site and can avoid causing a natural gas leak that can lead to environmental harm.

While calling 811 puts the utility companies on notice that digging is taking 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. The enhancement of electronic white-lining (EWL), or pre-marking of the dig site on a virtual map, also 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. Use of web-entry tickets has been shown to reduce damages by half relative to notice made by phone, with the use of electronic white-lining further improving accuracy and lowering the risk of damage. And when it comes to environmental concerns, halving potential damages translates into lessening the chance of emissions and a lower environmental impact.

In addition to helping reduce damage, EWL is also associated with lower truck roll emissions. The improved precision and virtual access to proposed excavation site markings means excavators can avoid driving to the site and that utility companies can screen tickets for locations where they have no buried lines and reduce the number of trips to the site. A pilot program conducted by PHMSA and Virginia authorities found that EWL resulted in a 91.8 percent reduction in unclear marking instructions, an 89.42 percent reduction in the average area for locate requests, and an 8.04 percent reduction in locate tickets, among other findings.[3] Each of these reduces the need for repeated, unnecessary, or prolonged site visits by truck.

Another well-established technique that does not require systemic overhaul of the system is the use of enhanced positive response (EPR) by locators. When an excavator calls 811 (or enters a web ticket), utility companies receive a notice and send locate technicians to the site to identify the path of subsurface lines. *A positive response* is when the locator then passes along to the excavator information that their job is completed. An *enhanced positive response* follows this same process, but includes the locator sending the excavator additional information such as digital photographs of their completed site markings, ticket descriptions, manifests, and in some

[3] 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.

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 near their dig site. Enhanced positive response was found to reduce damage rates by upwards of 67 percent[4] in pilot projects validated by the Pipeline and Hazardous Materials Safety Administration under the U.S. Department of Transportation.

Through the use of EPR, gas utilities have demonstrated a direct proportionate reduction in methane emissions.[5] When this technological practice is used to locate gas lines, it can be expected to reduce methane emissions by as much as 67 percent.

Trade groups like the Common Ground Alliance and others explain that the ideal dig of the future[6] will feature electronic white-lining and enhanced positive response to help ensure no damage is done to underground facilities at a work site. As the nation moves increasingly toward electrification and new infrastructure build-outs, it is desirable to incorporate these proven technologies and best practices into the damage prevention process protecting the nations underground infrastructure.

Every excavation damage incident avoided means fewer potential leaks of greenhouse gases and hazardous materials and also fewer truck rolls and tailpipe emissions. The better the damage prevention process – utilizing more virtual and remote technology – the better chance to reduce damage to underground infrastructure thereby lessening the possibility of environmental harm.

Conclusion

The critical network of underground pipelines carries important but hazardous materials across millions of miles of the United States. Every excavation project risks striking one of these pipelines or tens of millions of miles of other pipes, cables, and wires. A strong system of damage prevention can not only save lives by reducing the risk of injury or death during excavation activity but can lower greenhouse gas emissions and hazardous material leaks. For those focused on environmental balance and improvement, looking below our feet is an important step.

[4] 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.
[5] Kelly, H. (2017). *Reducing Methane Release Through Effective Damage Prevention Programs.* Washington Gas. https://www.epa.gov/sites/default/files/2017-11/documents/10.kelly_2017aiw.pdf.
[6] Technology Advancements & Gaps in Underground Safety Volume 4. ©2021 Common Ground Alliance. https://commongroundalliance.com/Portals/0/2021%20Technology%20Report.pdf?ver=2021-05-27-165320-157.

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