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Legacy Pipelines

What to do about aging and abandoned energy infrastructure.

By Tom Burns and Tan Hoang, AICP

Owning a home is a dream for many Americans. The last thing a home owner expects to find is a small river of crude oil flowing through the yard. But that is exactly what happened in a residential subdivision in Mayflower, Arkansas, in March 2013, when more than 5,000 barrels (210,000 gallons) of crude oil spilled from ExxonMobil's Pegasus Pipeline. The pipeline was built in the 1940s, and the initial spill investigation appears to be focused on pipeline operations, maintenance, and integrity management.

According to the U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration, more than 299,000 miles of natural gas transmission pipelines and more than 183,000 miles of hazardous liquid pipelines are moving energy products throughout the U.S. every day. There are abandoned pipelines, too, but neither PHMSA nor state pipeline regulatory agencies have counted them.

With so much pipeline infrastructure in place, what can municipal planners do to help avoid or plan for situations like the Pegasus Pipeline spill?



Defining terms — and problems

Oil and gas were originally discovered in the northeastern U.S. in the mid-1800s. Then exploration and production spread across the country, along with the laying of pipelines. Some of those pipelines are still in use; others have been abandoned.

Collectively, these older pipelines are referred to as legacy pipelines. No federal regulatory framework or asset management systems were in place at the time they were built, and current federal regulations are silent on the issues of abandoned legacy pipeline ownership, maintenance, or responsibility. That information is usually contained within original easement agreements between the lessor and lessee, documents that in some cases date to the late 19th century.

As a result, the exact locations and extent of legacy pipelines are typically unclear at best. Records (easement agreements, deeds, quitclaims) and maps associated with abandoned pipelines are unorganized, fragmented, or simply lost, exacerbated by ownership changes, mergers, and acquisitions in the U.S. energy community.

Active legacy pipelines typically have more complete records and maps, but the existence and locations of these pipelines are generally not well understood by municipal planners or the general public. As a result, the human health and environmental hazards can be difficult to predict.

This situation will become more of a planning management challenge as the once-rural areas where pipelines were originally located become increasingly urbanized. Planning conflicts will continue to bring risks, including remnant contamination and associated health risks, accidental spills, improper removal of abandoned pipelines, and associated liability for past and future landowners.

Safety regulations

Active pipelines in the U.S. are collectively regulated by PHMSA and the federal Office of Pipeline Safety. Active pipelines and pipeline abandonment are regulated under the Code of Federal Regulations Title 49 Parts 190–199, which defines an abandoned pipeline as one that has been physically and permanently separated from its source of oil or gas. With the exception of offshore pipelines and pipelines that transect commercially navigable waterways, there are no regulatory requirements regarding pipeline facilities once they have been abandoned.

Since 2002, PHMSA has required pipeline operators to submit information for active pipelines and for abandoned pipelines that are offshore or that cross commercially navigable waterways to the publicly available National Pipeline Mapping system (www.npms.phmsa.dot.gov). PHMSA encourages operators to submit abandoned pipeline information unrelated to offshore and navigable waterways into the NPMS, but submittals are voluntary. According to the U.S. Department of Transportation, the NPMS national layer has more than 500,000 miles of pipelines, comprised of over 300,000 miles of gas transmission pipelines and almost 200,000 miles of hazardous liquid pipelines.

Before the middle of the 20th century national codes and standards for welding were not well established. Pipe manufacturing, welding, testing, and quality control processes have improved greatly since then. In the early days, pipeline integrity monitoring usually consisted of visual inspection and hydro-testing for leaks. According to PHMSA, the predominant causes of oil and gas pipeline failure are corrosion, material or weld failures, and excavation damage.

PHMSA requires each operator of an active pipeline to establish an integrity management program — a structured process for identifying safety situations specific to each system, looking for threats to the pipeline's integrity and the locations where a leak or rupture could do the most harm to public safety and the environment. These spots are called high consequence areas, or HCA.

Evaluated risk factors include pipeline age, corrosion rate, soil type, an arid or wet environment, chemical properties of the material being transported within the pipeline, welding technology used, the age of the weld, and pipe wall thickness.

PHMSA has overall regulatory responsibility for the safety of gas and hazardous liquid pipelines. When certified by PHMSA, state pipeline safety agencies assume inspection and enforcement responsibilities and may write additional safety regulations for intrastate pipelines. They may also inspect interstate pipelines if the states involved agree.

California created such an agency when it adopted its 1981 Hazardous Liquid Pipeline Safety Act. As a result of this law, the Office of the State Fire Marshal was given the authority to apply for certification from PHMSA.

The OSFM also exercises exclusive safety regulatory and enforcement authority over an estimated 4,500 miles of intrastate oil pipelines. Intrastate natural gas pipelines are regulated by a separate entity, the California Public Utilities Commission.



Dangers

More than 482,000 miles of combined oil and gas pipelines are active within the U.S. today. Such pipelines generally operate under pressure and have the potential to spill large volumes of liquid or gas. Abandoned pipelines are no longer under pressure, but the location and extent of any historical releases are typically unknown.

High-volume gas pipeline leaks are more likely to be explosive, although abandoned gas pipelines generally do not pose the same potential environmental risks as abandoned petroleum pipelines. Further, abandoned pipelines are unregulated, badly documented, and often improperly or inadequately researched by land developers. In contrast, spills associated with active pipelines are documented, responded to, and remediated relatively quickly.

What risks do oil and gas pipeline failures pose? According to PHMSA, 2.4 million barrels — equal to 100.8 million gallons — of hazardous materials spilled from a combination of oil and gas pipelines between 1993 and 2012. The result: 367 fatalities, 1,465 injuries, and \$6.4 billion in property damage throughout the U.S. Environmental damage can include ecologically sensitive areas, waterways, drinking water sources, endangered species, and air quality.

A recent example occurred on September 9, 2010, when a Pacific Gas & Electric natural gas transmission line failed in a residential area of San Bruno, California. A 30-inch-diameter natural gas transmission pipeline ruptured and exploded, resulting in eight deaths, 51 injuries, and 38 destroyed homes. The economic losses from the rupture were estimated at more than \$220 million.

This pipeline segment was installed around 1956. Its rupture was attributed to substandard seam welding — something that no one knew about because of an inadequate pipeline integrity management system.

Another example: a legacy oil pipeline failure in Avila Beach, California, discovered in the 1980s after decades of leaks. The pipeline built there more than a century ago had sluiced petroleum into the water for so long that significant damage was done to soil, ground water, the beach, numerous private properties, and the Pacific Ocean.

The total spill volume was estimated at about 10,000 barrels (420,000 gallons). Slow leakage over a long period of time and inadequate pipeline oversight were the likely causes. Several buildings covering nine acres were torn down for remediation activities, and the rebuilding of the Avila Beach community is still in progress today. Total cleanup costs were estimated to be upwards of \$200 million, which did not include an additional \$18 million in penalties to local and state agencies and environmental groups.

"It's a big problem because what you've got is a very antiquated infrastructure of pipelines in California, and they're not holding," Steve Sawyer, an attorney with the California Office of Spill Prevention and Response told the Los Angeles Times. "We're dealing with pipes that have been buried for 40 or 50 years. After a while, corrosion sets in and you get breaks."

What can be done?

Could pipeline-centric land-use planning strategies have mitigated or avoided these disasters?

Steven Chu, currently a professor at Stanford University and formerly U.S. Secretary of Energy under President Barack Obama, noted in an e-mail to our firm that "while one cannot guarantee that there will never again be an accident such as the San Bruno, California, explosion . . . there are steps that should be taken to lessen the chances of it happening again."

Land development near active and legacy pipelines increases the likelihood of damage to pipelines — and to the surrounding community. In addition, development can impede access for pipeline operators that seek to safely operate and maintain their facilities, and for emergency services trying to respond to pipeline failures. The situation can be compounded with abandoned legacy pipelines because no one knows where they are.

Local governments do not have the regulatory and enforcement authority to prescribe safety standards for pipeline transportation and for existing pipeline facilities; however, they can use their land-use and development authority to implement mitigation measures and reduce the risks associated with development. This is particularly important in older communities where aging pipelines and new development may collide.

California requires its local governments to adopt general plans (better known as comprehensive plans in other states), which include mandatory elements (or discussion topics) such as land use, circulation, and safety. An effective approach to pipeline risk management would be to embed information about active and legacy pipelines into comprehensive plans or similar documents.

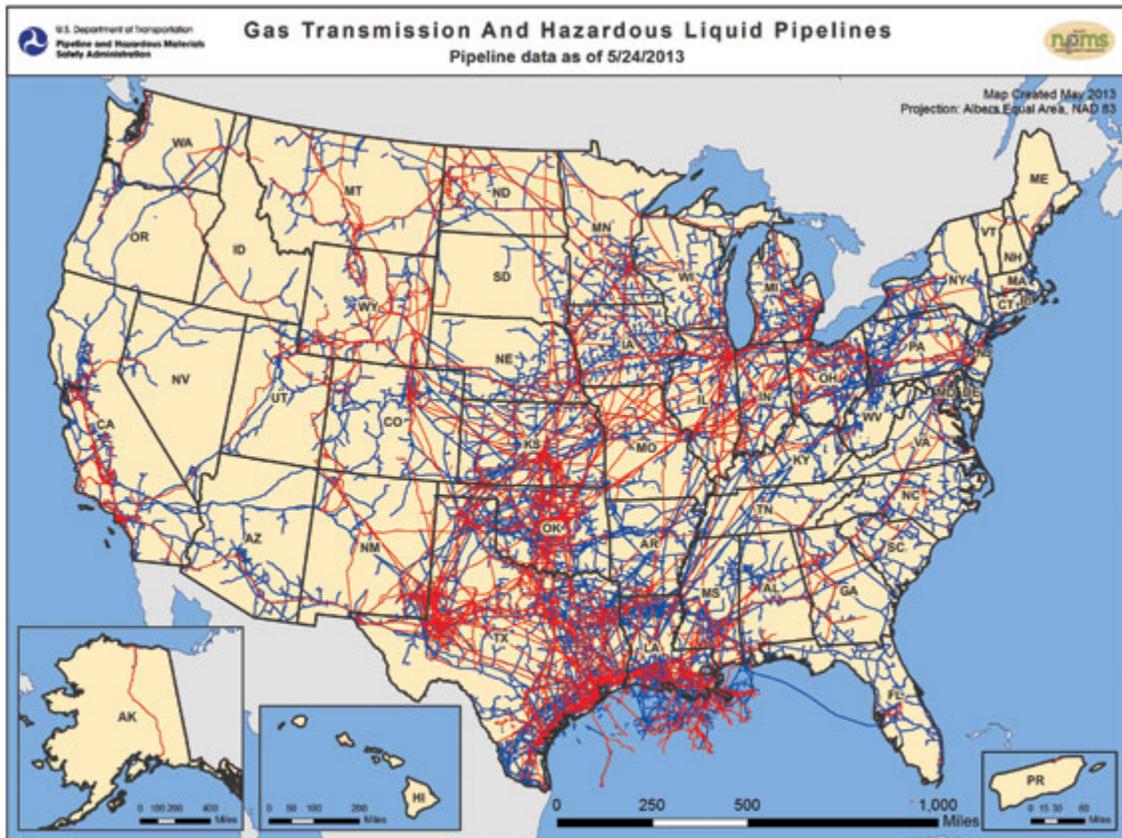
Phil Dunsmore, AICP, a senior planner with the city of San Luis Obispo, California, agrees with this approach, saying that legacy and active pipelines are a "missing component" in most comprehensive plans, including the general plan of his own city. If the topic were to be addressed within a general plan, Dunsmore told us, the best place to include that information would be within the safety element.

Our recent review of a sample of adopted general plans across California indicated that communities rarely describe abandoned or active pipelines. A few communities addressed pipelines and similar facilities in their separate, stand-alone utilities elements (considered optional). Some refer to the issue in circulation or transportation elements, while others in safety. Still others describe them in community facilities or community resources elements.

Ultimately, it is up to individual states and municipalities to determine how to incorporate active and legacy pipeline information into their respective planning processes. Washington and Texas

are the only states known to have land-use regulations that specifically address active and abandoned pipelines.

In the absence of pipeline-specific state and local regulations, compliance with other environmental laws may help identify and mitigate the possible impacts of active and abandoned pipelines. In situations that involve compliance with the National Environmental Policy Act or state-mandated environmental laws, this process would be more transparent and comprehensive because of the public scoping and environmental review requirements.



Legislative efforts

One outcome of the San Bruno natural gas pipeline explosion was California Assembly Bill-1511 (AB-1511). The bill requires all contracts for the sale of residential real property on or after July 1, 2013, to contain a notice pertaining to nearby oil and gas pipelines. Although this bill does not require planners to include these requirements within community planning processes, it is certainly a step in the right direction.

According to Julie Halliday, senior program manager with PHMSA, Washington is one of the few states that has established ordinances and regulations directly related to land-use planning near oil and gas pipelines. In response to a 1999 Bellingham pipeline explosion, Washington State planners began coordinating with the Pipeline Safety Trust, a pipeline safety advocacy group, to develop planning strategies and polices to address the risks associated with pipelines within developed areas.

The Association of Washington Cities then applied for and received a PHMSA technical assistance grant. A model ordinance adopted by various Washington counties, Ordinance No. 474 Platting and Subdivisions, requires property owners to consult with the owner or operator of a pipeline located within 150 feet of a hazardous product transmission pipeline. Another example is Ordinance No. O201110010 Pipeline Safety, which requires working with pipeline operators for development within pipeline consultation areas.

PHMSA grants have recently gone out to other communities as well. Brookings County, South Dakota; Montgomery County, Virginia; and Fort Worth, Texas, all used their technical assistance grants to establish or upgrade their geographic information system pipeline mapping capabilities.

Innovation and best practices

In an effort to identify planning best practices for active pipelines, PHMSA in 2010 brought together more than 130 stakeholders to form the Pipelines and Informed Planning Alliance. PIPA's mission is to develop recommended practices on land use and development near transmission pipelines — with the goal of reducing the risk associated with pipeline failures.

PIPA then recommends practices and actions that can be implemented by planners and stakeholders when changes in land use or new development are proposed next to existing oil and gas pipelines. Although PIPA focuses on active pipelines, many of the best practices and recommendations they provide can be used for abandoned legacy pipelines as well.

PHMSA will soon publish its own primer, Hazard Mitigation: Hazardous Liquid and Gas Transmission Pipelines, for state and local governments to use within their hazard mitigation planning processes.

Halliday sees the hazard mitigation process as a valuable way to build planning capacity. "Planners and emergency managers can create skilled collaborative teams for addressing mitigation of pipeline hazards," she says. "Emergency managers are often more familiar with locations of existing pipelines and pipeline risks than land-use planners. In contrast, land-use planners are more familiar with potential land management strategies that can address development encroachment on existing and legacy pipelines."

Collaboration between these two groups can help build community resilience to pipeline hazards, Halliday adds.

At state, regional, and local levels, planners can implement measures to minimize the risks that oil and gas pipelines potentially pose to their communities, including:

- Codifying pipeline regulations for planning purposes and collaborating with other municipal departments; one option is a policy to develop an enterprise-level comprehensive pipeline risk management approach
- Developing enterprise GIS that includes current and proposed land uses and all active and legacy pipelines
- Encouraging proactive, not reactive, policy-driven departmental action
- Establishing pipeline consultation areas or zones as opposed to relying on fixed stance pipeline right-of-way setbacks
- Requiring consideration of oil and gas pipeline facilities in design review, and adding pipeline research-related tasks to project review checklists
- Using and promoting the NPMS during the planning process for project reviews and comprehensive plan updates
- Reviewing elements of oil and gas pipeline easement agreements and quitclaims
- Recording all oil and gas pipeline easements on development plans and final plats
- Submitting active and legacy oil and gas pipelines that transect populated and sensitive areas into the One-Call system

Municipal planners are in an excellent position to inform local residents of the potential risks associated with active and legacy pipelines and to understand and implement measures to reduce these risks

Steven Chu reinforces the point that "the costs of dealing with disasters are almost always higher than the cost of sensible risk mitigation."

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Resources

Images: Top — The rupture and explosion of a natural gas transmission pipeline in San Bruno, California, killed eight people and destroyed more than 38 homes, damaging many more. The pipeline dated from 1956. Photo by Jim Wilson/The New York Times. Middle — Before and after aerial photos of land use within the vicinity of a unnamed transmission pipeline segment in Washington State. Photos courtesy Pipeline Safety Trust/Washington Utilities and Transportation Commission. Bottom — Red lines represent gas transmission, blue are hazardous liquid pipeline as of May 24, 2013. Map courtesy U.S. Department of Transportation, Pipeline & hazardous Materials Safety Administration.

PIPA has published a series of key documents, which include *Partnering to Further Enhance Pipeline Safety In Communities Through Risk-Informed Land Use Planning* (November 2010); *Building Safe Communities: Pipeline Risk and its Application to Local Development Decisions* (October 2010); and "Land Use and Development Near Transmission Pipelines: Checklist for Planning, Design, Communication, Permitting, and Site Plan Review" (May 2012). Find them here: <http://primis.phmsa.dot.gov/comm/publications/PIPA/PIPA-PipelineRiskReport-Final-20101021.pdf>.

PHMSA's publication, *Land Use Planning and Transmission Pipelines*, is available here: www.pipa-info.com.

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