

Geohazard Risk Assessments: A Geomorphic Method

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Abstract

Pipelines transporting energy products intersect challenging landscapes that may negatively impact pipeline integrity. River systems, unstable slopes, and earthquakes are a few examples of environmental hazards to pipeline integrity. Collectively called GeoHazards, these risks can be effectively managed using geomorphology, the science of landscape evolution and function. Most natural processes affecting the earth's surface are studied and understood through geomorphology, providing a framework for understanding why a specific process is occurring in a given location.

Geohazards risks include flooding, excessive precipitation, slope failures, frost action, etc. Each risk category often has interacting effects that can exacerbate individual risks. For example, a flooded river channel can erode the toe of a slope, causing instability and failure. Add in human-induced risks (e.g. removing vegetation from a slope, installing rip rap on channel banks upstream of a pipeline water crossing), and these risks become even more complex to manage. At a minimum, a defensible geohazard risk management program should include five basic parts: identification, assessment, risk estimation, mitigation (if necessary), and long-term monitoring.

Recently, the Pipeline Hazardous Materials Safety Administration (PHSMA) has increased focus on managing environmental hazards to pipeline integrity, resulting in a number of Notice of Proposed Rulemakings, as well as completed rules requiring pipeline operators to incorporate geohazard risk assessments in their IM plans. Between 2003 and 2013, there were 85 reportable incidents in which natural forces (e.g. severe weather, landslides, floods) damaged pipelines resulting in failure. Statistically, ruptures and/or failures from geohazards typically result in costlier spills and longer service disruptions than pin-hole cracks and small holes. Additionally, failures resulting from geohazards are likely underreported by clean-up crews because they can be hard to identify in the field (Savigny, et al, 2005). Therefore, effectively managing geohazards is becoming a major focus for operators as well as regulators.

In this presentation, geomorphic assessments of river and slope crossings will be discussed. Additionally, incorporating these assessments into a comprehensive risk management program will be described.

¹WSB and Associates: Geohazard Risk Assessments

Jen Holmstadt, PMP, has 10 years of experience as an environmental consultant, specializing in geomorphic assessments of geohazards, contaminated site clean-up, and project management. Jen spent several years on the Marshall, Michigan oil spill response as a geomorphologist responsible for locating submerged oil deposits. Subsequently, Jen has focused on designing and implementing geohazard risk assessments for various infrastructure types, including energy pipelines. Jen has an M.S. degree in Geography from Michigan State University.