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You Get What You Measure: Emerging Concepts and Philosophies for the Quantification, Interpretation, and Application of LNAPL Transmissivity

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Background/Objectives. Human nature is such that people tend to focus on performance to the metrics by which we are measured, and systems are optimized to the metrics measured and calculated for those systems. Thus it is imperative that we define the correct metrics to be measured and we ensure our ability to accurately quantify and trend such metrics, particularly in the arena of environmental remediation. Usually it is relatively easy to identify the correct metrics to be measured, but only if we have first defined the contextual framework within which such metrics must be evaluated, and the types of thresholds against which these metrics are to be compared. The most difficult aspect of LNAPL remediation is not the science or engineering complexities associated with LNAPL distribution and recoverability in a heterogeneous geological world. Rather, it is definition and attainment of the undefined artificial construct known as “recovery of LNAPL to the maximum extent practicable” or “MEP.” LNAPL transmissivity is a robust and universal physical metric that can be used in part to define “MEP.” However, as we have gained experience quantifying, interpreting and applying LNAPL transmissivity, we are recognizing challenges to all three of those tasks.

Approach/Activities. Based on over a decade of calculating and applying LNAPL transmissivity in a variety of regulatory jurisdictions, under a variety of hydrogeologic conditions, across a broad spectrum of geologic and hydrogeologic regimes, with a wide range of LNAPL types, and using every estimation method identified in the ASTM Guide for Estimation of LNAPL Transmissivity; in conjunction with a nationwide study we conducted of LNAPL transmissivity values from 2003 to 2014; informed by multiple national and local training sessions we conducted on LNAPL transmissivity; and augmented with surveys of regulatory agencies across the United States to determine how LNAPL transmissivity is being accepted within the regulatory community; we have developed a keen appreciation for numerous complexities associated with accurate quantification, reliable interpretation, and meaningful application of LNAPL transmissivity throughout the LCSM and LNAPL remedy process. Thoughtful consideration of both scientific and “human” drivers informed multiple LNAPL management programs incorporating LNAPL transmissivity in a variety of ways and jurisdictions.

Results/Lessons Learned. There is a right, and a wrong, way to measure, interpret and apply LNAPL transmissivity. But there is also a great deal of overlap associated with this metric. Critical issues to consider include a recognition that relatively little recoverable LNAPL remains in the USA compared to historical quantities. Research suggests that 95% of all LNAPL transmissivity values are below 5 ft2/d, and 70% are below the ITRC proposed LNAPL transmissivity limit for LNAPL recoverability. While encouraging, this situation creates new complexities – how to accurately quantify LNAPL transmissivity at low levels in complex geologic and hydrogeologic environments. The confounding complexity is not limited to spatial heterogeneities that abound in geology, but also includes temporal variation that can vastly complicate both the quantification and interpretation of LNAPL transmissivity, thus limiting its application. Perhaps most importantly, what is the correct threshold for LNAPL transmissivity as a decision point metric? Can we craft a RBCA style tiered system of comparison values? Can we apply it to fracture and karst systems? And at the end of the day, can we use LNAPL transmissivity to finally establish a meaningful and universal definition of “MEP?”