New ASTM Standard Guide for Estimating Natural Attenuation Rates for NAPL in the Subsurface

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A common goal amongst the industry, regulators, academics and consultants alike is the more efficient and sustainable management of NAPL sites worldwide. Experts from varied backgrounds and perspectives have worked together in the last year to provide a standardized approach for the estimation of the natural attenuation rates, including natural source zone depletion (NSZD) rates. This effort is aimed to bridge the gap between recent advances in the field of NSZD rate estimates, define and standardize terminology, and broaden the monitoring of natural attenuation (MNA) to include the vadose zone processes and measurement techniques, beyond the conventional or historical use of groundwater-focused MNA.

The overarching goal is to support the remedial decision-making process and the transitions from relatively more engineered to more nature-based remediation. Data collection and interpretation techniques for the methods described in the standard augment the site conceptual model in ways that support the natural and/or enhanced attenuation of NAPL for remediation. In addition, the estimated rates serve as baseline remediation metrics through this systematic approach and refinement in data collection and interpretation for quantifying the spatially and temporally variable rates. Over the decades, a number of technologies have been employed from monitoring of groundwater and soil gas data at the Bemidji crude oil spill site in the 1990s, to surface CO2 flux measurements and temperature monitoring, and more recently the changes in NAPL composition over time.

A high subsurface complexity, varying land and local weather conditions strongly impact contaminant fate and transport to make each site unique, requiring careful selection of technique(s) for estimating natural attenuation rates of NAPL in the subsurface. The ASTM standard guide provides a standardized approach for screening and selection of technologies that are categorized into five general methods: 1. CO2 Efflux; 2. Temperature Gradient; 3. Soil Gas Gradient; 4. Groundwater Monitoring; and 5. NAPL Composition. The description of the process-based methods that support the CSM along with case studies for the application of each method are designed to support the sustainable management of NAPL sites.

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Parisa Jourabchi (Ph.D., P.Eng.) is the founder and principal of ARIS Environmental Ltd. who brings a multidisciplinary and collaborative approach to site investigation and remediation. Parisa holds a bachelor of engineering physics and masters in geophysics from UBC, and PhD in geochemistry from Utrecht University, The Netherlands. Parisa conducts applied research on projects that include assessment of natural source zone depletion (NSZD) rates at petroleum hydrocarbon sites, vapour intrusion, and the development of toolkits for the evaluation of monitored natural attenuation (MNA), NZSD, remedial technologies and sustainability. Parisa has extensive experience in the application of numerical and analytical models to vapour intrusion, methane migration, MNA, and NSZD and actively participates in guidance development.