

## **Technologies, Methodologies, Best Practices for Distribution of Liquid and Solid Amendments for Chlorinated Solvent Remediation**

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**Background/Objectives.** Everyone agrees that contact of amendments with contaminants for a long enough period of time for complete destruction is critical to meeting remediation expectations. Based on over 15 years of injection and emplacement experience, Cascade has developed a matrix of site and amendment characteristics to help select delivery approaches and amendment dosing specifications.

**Approach/Activities.** Delivery approaches including direct push injection, hydraulic and pneumatic fracturing, injection wells and shallow mixing will be discussed. These technologies will be aligned to site considerations related to amendment physical characteristics, lithology, and depth of target interval. Additionally, parameters critical to contact through dosing include injection flow rates, pressures, injection volumes and concentrations, persistence and kinetics, radius of influence basis will be addressed in relation to site considerations as well.

**Results/Lessons Learned.** Results from hundreds sites have been condensed into a matrix of delivery applications versus site conditions and multiple amendments. Additionally, lessons learned will be shared which should eliminate uncertainty in delivery specification and design parameters for distribution resulting in better industry performance. phase and perhaps provide a consistent data collection methodology for these types of sites.