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1,4-Dioxane Treatment Technologies: What's New and What's Proven

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Background/Objectives. The chlorinated solvent stabilizer 1,4-dioxane (DX) has become an unexpected and recalcitrant groundwater contaminant at many sites across the United States. Chemical characteristics of DX, such as miscibility and low sorption potential, enable it to migrate at least as far as the chlorinated solvent from which it often originates. This mobility and recalcitrance has challenged remediation professionals to redesign existing treatment systems and monitoring networks to accommodate widespread contamination. Furthermore, remediation technologies commonly applied to chlorinated solvents, such as extraction and air stripping or in situ enhanced reductive dechlorination, are relatively ineffective on DX removal. These difficulties in treatment have required the industry to identify, develop and demonstrate new and innovative technologies and approaches for both ex situ and in situ treatment of this emerging contaminant.

Approach/Activities. We reviewed industry and academic literature, as well as CH2M project successes and challenges, to compile a summary of treatment technologies for 1,4-dioxane in groundwater that are well demonstrated, as well as those that are innovative and in the early stages of validation. From this review, we extracted factors that affect the selection and successful implementation of these technologies to allow for more reliable execution in the future.

Results/Lessons Learned. The industry has made great strides over the past decade in the development and testing of remediation technologies for removal or destruction of DX in groundwater. This presentation briefly summarizes the fate and transport characteristics of DX that make it difficult to treat and presents technologies that demonstrated to be applicable to groundwater treatment at the field scale, as well as innovative technologies in the early stages of development.