

**A Decision Framework for Applying Monitored Natural
Attenuation Processes to Metals and Radionuclides in Groundwater**

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**Prepared by
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Attenuation Processes for Metals and Radionuclides Team**

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EXECUTIVE SUMMARY

Many sites across the United States have groundwater contaminated with metals or radionuclides—often at low levels, but above standards. Most potential engineered remedies are too costly or otherwise impracticable. In contrast, attenuation-based remedies rely on natural processes to sequester the contaminants of concern and are therefore less aggressive, less invasive, and less costly. While attenuation of organic contaminants is being increasingly accepted as a remedy, attenuation of metals and radionuclides involves more complicated or interdependent sets of processes and has rarely been applied.

Because technical guidance specifically addressing the use of attenuation-based remedies for metals and radionuclides has only recently been available, the application of attenuation remedies for metals and radionuclides has been inconsistent. To facilitate the acceptance of attenuation-based remedies for metals and radionuclides, the Interstate Technology & Regulatory Council (ITRC) developed this technical and regulatory guidance document, which builds on the U.S. Environmental Protection Agency's three-volume document for monitored natural attenuation. This ITRC document is intended for anyone involved with investigating, managing, or overseeing a site with metal and/or radionuclide contaminants, including public stakeholders, site owners, commercial operators, regulators, site managers, and investigators at all levels, including state and federal agencies. To determine the specific approach of this document, ITRC conducted a Web-based survey of state regulators and stakeholders to determine the existing state of knowledge and acceptance regarding the application of attenuation processes as a remedy. The document addresses issues identified in the survey and provides paths forward for resolving them. The guidance also includes recommendations for evaluating attenuation-based remedies in a consistent and technically defensible manner. A decision framework guides users through a series of decisions that help determine whether relying on attenuation processes is feasible and can lead to successful implementation. Finally, case study summaries demonstrate application of attenuation-based remedies to real-world scenarios. Full case studies are provided in Appendix A.