## Facing Remediation Challenges and Overcoming Engineering Limitations: A Plan for Change

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**Background/Objectives.** The best developed remediation projects can experience difficulties in attaining cleanup goals in a timeframe or at a pace acceptable to all stakeholders involved and so, it is not usual when regulations or changes in regulations impede the path to site closure. In addition, site conditions, remediation technologies, and stakeholder objectives also change over time. Therefore, quickly identifying change and flexing the approach toward cleanup is of extreme importance.

**Approach/Activities.** The decision to change course after extensive remediation planning and implementation requires cooperation of all stakeholders including responsible parties, regulators and the community involved. There must be an integrated change control plan in place to systematically address changes to: (1) the regulations (i.e., are there changes to the regulations which will support progress); (2) cleanup levels such as the possibility of developing site specific cleanup goals; and (3) remedial technologies that often incorporate alternate or hybrid approaches to accelerate cleanup. Two case studies will be used to demonstrate how an integrated change control plan was used to identity when change was necessary and the alternate approaches implemented to move the sites towards stakeholder objectives and/or closure.

In the first case study, we will discuss how an aging groundwater treatment system was evaluated regarding change identification and the alternate groundwater treatment strategy that was developed. The strategy included evaluating the groundwater plume under non-pumping conditions so that function of the treatment system was understood and so, could be optimized considering other remediation alternatives. In the second case study, we will present the results of an *in situ* groundwater remediation system, the process of change identification, and the adjustments to the regulatory approach that followed including an alternate path through risk assessment. Through the presentation of these two case studies, we will present the commonalities to change identification and how alternate strategies were developed to adjust to change through an evaluation of engineering limitations and alternate remediation technologies and strategies.

**Results/Lessons Learned.** The results from two case studies in North Carolina will be presented to demonstrate how change was identified and how the remediation approach was altered to adjust to change. As part of the case studies, we will also show how groundwater statistical analysis, modeling efforts and risk evaluations were used as justification for implementing change. Lessons learned include how to flex considering changing regulatory directives and stakeholder needs.