

# Dense non-aqueous phase liquids: Site remediation and redevelopment

## Key principles

This technical series, based on Interstate Technology and Regulatory Council (ITRC) guidance, was developed to provide an effective methodology to characterize DNAPL sites and to develop an appropriate strategy towards addressing DNAPL. The documents are technical in nature and are developed for use by experienced practitioners.

Further detail is explained on each website; however, the following principles are the fundamental keys to the DNAPL Technical Guidance Series:

- Develop a DNAPL site strategy (DSS) at the beginning of a site investigation as the conceptual site model (CSM) is created, though the concepts of DSS can be implemented at any time. The DSS should be iterative, flexible, adaptive, and identify contingencies when expectations are not met. Revise the DSS as new information becomes available.
- Iterative site characterization (ISC) is necessary to develop a proper CSM. The CSM needs to:
  - Define the extent and magnitude of contamination. Note: DNAPL can move along lower permeability horizons in a direction counter to groundwater flow.
  - Identify all areas of contaminant mass storage in the subsurface and associated concentrations of each contaminant compound.
  - Present an accurate understanding of subsurface conditions.
  - Continually be refined as new information is obtained.
- A highly refined site characterization may cost more initially, but the overall project costs are reduced by developing a more effective remedy. Conversely, a poorly characterized site frequently results in an ineffective and more expensive remedy.
- Use high-resolution site characterization and the [tools selection worksheet](#) in the ITRC Integrated DNAPL Site Characterization and Tools Section document to conduct appropriate investigations. Do not rely on PID bag headspace to determine where to collect samples.
- Aquitards and other low permeability zones may impede advective flow but do not prevent diffusion.
- Set SMART (specific, measureable, attainable, relevant, and time-bound) remedial objectives that protect human health and the environment. Remedial objectives also need to be clear, concise, and measureable. Re-evaluate the remedy and the CSM as treatment technologies are applied.
- Remedial approaches should incorporate multiple technologies that achieve remedial objectives as quickly and efficiently as possible. The remedial approach should be adaptive and allow for transition between technologies as site conditions evolve.
- Manage site uncertainty using TRIAD and Adaptive Site Management approaches.