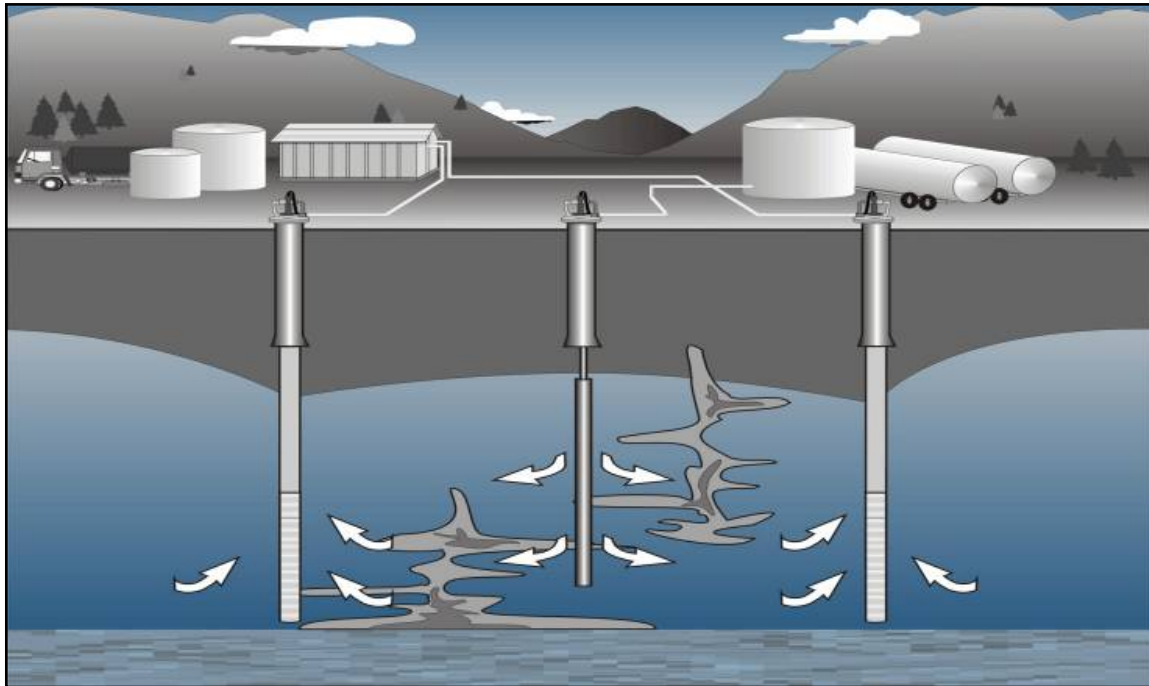


NAPL Characterization and Remediation Short Course



This short-course will provide regulators, consultants, and field applicators with a review of physicochemical properties of contaminants and how their solubility and sorption effect mobility in the aquifer as well as a review of field proven techniques for LNAPL and DNAPL remediation. Traditional methods as well as more recent advanced methods for remediation will be reviewed for technical understanding of application and operation. Case studies will be utilized to illustrate and communicate the equipment and methods employed as well as the results achieved at various site conditions.

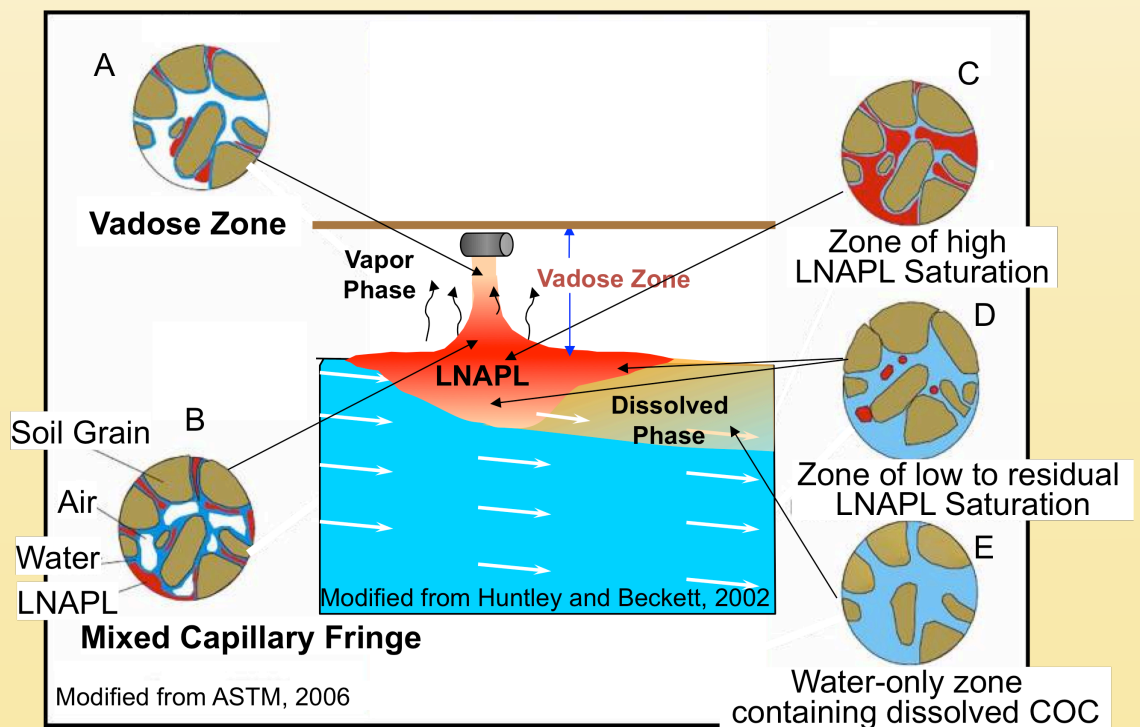
Overview:

This short course will review a set of principles regarding soil and groundwater contamination including the presence, distribution and migration of Non Aqueous Phase Liquids (NAPL). This is achieved through a visually driven and interactive hands-on presentation approach in which attendees learn: the affects contaminant solubility and transport, the role of contaminant sorption (i.e., absorption and adsorption) in soil and sediments, and in-situ and ex-situ remediation using skimmers, pumps, chemical oxidation and surfactant enhancements.

Cleaning up contaminated sites with light- or dense-non aqueous-phase liquids (LNAPLs or DNAPLs) present one of the biggest challenges in the environmental remediation field. There's an assumption, in some situations, that aquifer restoration is not feasible when NAPL is present or that it is a slow cleanup process. The issue of feasibility and arguments for and against remediating DNAPL source areas are the focus of a document entitled *DNAPL Source Reduction: Facing the Challenge* (ITRC, 2002).

The presentation will challenge common conceptual models of how water and NAPL contaminants interact, and provide some tools to predict their behavior in water, with each other, and within soil, sediment and fractured bedrock. In doing so, provide a better understanding of why some contaminants dissolve in water while others do not, and why some adsorb to soil while others do not, and why there are such differences in seasonal variations in NAPL observed during quarterly monitoring events.

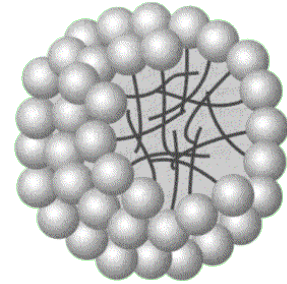
Attendees will learn a set of applied principles to improve their ability to predict the behavior of most LNAPL and DNAPL contaminants in soil, sediments, and groundwater, including their water solubility, sorption potential, and to better understand the design requirements for in-situ and ex-situ remediation at most sites.



Course handouts, case studies and related reference material are also provided.

Agenda:

1. Introduction and overview of workshop short course, with circulation of handouts, case studies and related reference materials.
2. Conceptual Site Model –Reevaluated with NAPL tinted lenses
 - Source Zone Delineation and Characterization
 - Properties of water and Non Aqueous Phase Liquids (NAPL).
 - Aquifer Properties Characterization
3. Remediation Technology Description and Overview
 - LNAPL pumps and skimmers (DGSI and QED)
 - Adsorbent socks
 - Surfactant enhancements
 - LNAPL
 - DNAPL
 - Surfactant Enhanced Oxidation
 - Benefits of combined remedy
4. Laboratory and Pilot Trials
 - Recovery rates and equipment sizing
 - Results Interpretation for design
 - Laboratory Studies and Product Selection
 - Surfactants only
 - Surfactant enhanced oxidation
5. Process Design and Implementation
 - Extraction System Issues
 - Mixing/Injection Issues



Surfactant Micelle

Administered by:

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Mr. Kessel is a Principal at Environmental Remediation Resources (ERR) Pty Ltd., specializing in the selection and application of advanced site characterization and remediation technologies. His practice experience is in complex hydrogeological and geotechnical investigations and environmental engineering and remediation having worked with large U.S. consulting firms as a consultant and with many other consulting firms large and small internationally as a technology representative and sub consultant. He is a registered professional geologist (PG) and registered environmental assessor (REA) in the U.S. and has designed and managed projects internationally. Mr. Kessel has earned a BS and MS in Geological Sciences from the University of California with research experience in hydrogeochemistry and geophysics.