

BENCH TESTING

Bench testing offers insight into site-specific conditions in a controlled laboratory setting. The purpose of bench testing is to evaluate and optimize conditions in the laboratory.



Microcosm bench tests are performed to evaluate subsurface conditions

Laboratory Monitoring of iSOC Bioremediation Enhancement

Laboratory monitoring of microbiological parameters validate iSOC bioremediation enhancement in the field. Both aerobic and anaerobic biodegradation processes can be characterized and followed over time to document changes in dissolved gas concentrations, macronutrients, and total bacterial populations as well as contaminant-degrading subpopulations of naturally occurring bacteria. Although there can be significant variations in groundwater elevations and concentrations over the full hydrologic cycle, the indirect geochemical indicators will aid in evaluating the enhanced bioremediation progress by examining other factors than just target chemical concentration.

Aerobic Microbial Parameter Profiling (Groundwater)

Aerobic biodegradation can be used effectively for hydrocarbon compounds including TPH-g, TPH-d, TPH-mo, TPH-k, BTEX and MTBE contamination. In addition, vinyl chloride, a chlorinated solvent is degraded using the aerobic pathway with oxygen.

Indirect indicators provide a view into the biological and geochemical conditions at a particular point in time. Bacterial enumeration for total aerobic heterotrophic bacteria, contaminant-degrading bacteria (e.g., gasoline/BTEX, diesel, oil, MTBE), macronutrients (ammonia nitrogen, o-phosphate), alkalinity (speciated), biological oxygen demand, chemical oxygen demand, total inorganic carbon, total organic carbon, total dissolved solids, sulfate, and nitrate.

A microbial parameter profiling test prior to treatment is used to obtain a background level. Once that is done, the indirect indicators could be analyzed in 6 to 12 months, or if problems develop. The number of wells varies, but in general, it is useful to have 2 or 3 wells within the core of the plume and 1 well upgradient (background) 1 cross gradient. A sample downgradient of the core of the plume in the low or noncontaminated zone sometimes provides information regarding the leading edge of the plume.

Some field parameters use field meters (DO, ORP, pH, temperature, conductivity) or field kits (total iron and ferrous iron). These analyses must be performed in the field.

Anaerobic Microbial Parameter Profiling (Groundwater)

For compounds that break down using an anaerobic or co-metabolic pathway, such as TCE, PCE, nitrates, perchlorate, 1,4-dioxane, other gases (propane, butane, hydrogen, methane) can be used for biodegradation. For these compounds, the analyses listed above are performed in addition to dissolved methane, manganese (II), and specific chlorinated solvent degraders.

Aerobic and Anaerobic Microcosm Studies for Contaminant Biodegradation

Bench tests are performed to document the biodegradation of a variety of contaminants. Bench tests consist of sample groundwater enhanced with essential macronutrients, pH buffer and oxygen in sealed glass serum bottles. Microcosm bench tests are uniformly spiked with target contaminants and then sacrificed at time zero and an endpoint (e.g., 1 week) for GC-MS analysis of the target chemicals before vs. after enhanced bioremediation. Includes concurrent negative (abiotic) and positive controls. These studies are not recommended for routine chemicals. The biodegradation of TPH-g, TPH-d, BTEX, MTBE are already well studied and documented in the literature. A bench test is generally not recommended for these compounds, unless specific site conditions inhibit microbial growth. For more recalcitrant or less well known compounds such as perchlorate, arsenic, chromium, PCE, TCE, 1,4-dioxane, PCBs, nitrate or others, bench tests are a way to optimize conditions in the laboratory and try out various pH settings, gases or liquid additions, or other variables. Includes concurrent negative (abiotic) control.

Custom Laboratory Services:

Custom in-situ delivery and microcosm studies and other specialized research projects can be designed to provide value to an enhanced bioremediation project. For example, designing a site-specific nutrient addition mixture might be appropriate for sites where the ammonia as nitrogen or ortho-phosphate is below required values.

For any questions, please contact:

James A. Jacobs, R.G., C.H.G.
Hydrogeologist

Environmental Bio-Systems, Inc.
707 View Point Road
Mill Valley, CA 94941 USA
Tel: 415-381-5195; Fax: 415-381-5816
Email: augerpro@sbcglobal.net
Web site: www.EBSinfo.com

Environmental Bio-Systems, Inc., www.EBSinfo.com; email: augerpro@sbcglobal.net
Tel: 415-381-5195; Fax: 415-381-5816 Since 1989