Roaring Brook News

Winter 2004

ENGINEERING A BETTER FUTURE

New Ways To Protect The Environment

New techniques for handling environmental problems are being developed every day. We recently had the opportunity to present some new concepts in environmental protection and remediation to two groups of business people in Milan, Italy and Rome, Italy.

Working in conjunction with our colleagues at Euroconsulting Group Engineering S.r.l. and Professor Frank Falcone of Villanova University, Roaring Brook Consultants hosted technical seminars at the U. S. Consulate facility in Milan and the U. S. Embassy in Rome. We arranged these seminars through the U. S. Department of Commerce Commercial Service.

The two topics discussed were emerging technologies for remediation of subsurface contamination and emerging technologies in stormwater management. Some specific technologies discussed were horizontal remediation wells, pressure pulse technology for removal of subsurface contaminants, porous pavements for infiltration of rainwater and rooftop gardens for controlling stormwater runoff in urban areas.

Participants in the seminars were engineers and managers from Italian companies representing a wide range of industries.

Prof. Falcone Addresses The Milan Seminar

If you have an environmental problem, we would be happy to discuss your specific needs. In fact, with the constantly changing state of technology it may be prudent to take a look at old environmental problems that previously were not treated effectively or that were too costly to treat. New technologies might yield new solutions, or more cost effective solutions that previously were unavailable, now possible to attain.

Protecting the environment is good business and makes good sense. If we can help you, please give us a call.

Roaring Brook Consultants
Crane Inspection Services News

Paul E. Serrano, P.E., has been granted "Approved Surveyor" status by OSHA under 29 CFR Part 1919. In this capacity Paul is authorized to inspect maritime cargo handling devices.

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BIOREMEDIATION

What is Bioremediation?

Bioremediation is the natural process of using microorganisms, generally bacteria, to destroy and/or reduce the toxicity of hazardous contaminants in the environment.

In order to operate, the microorganisms require the availability of a variety of materials to generate the energy and nutrients necessary for reproduction. In some cases the natural conditions at the contaminated site provide all the essential materials in large enough quantities that bioremediation can occur without human interventionóa process called *intrinsic bioremediation.*

More often bioremediation requires the construction of engineered systems to supply microbe-stimulating materials -- a process called *engineered bioremediation.* Engineered bioremediation accelerates the biodegradation process by establishing and maintaining a controlled environment that encourages the growth of the organisms.

When is Bio-Remediation Appropriate?

The first and most important question when considering bioremediation is, "Can the contaminants at the site be biodegraded, either by the organisms at the site or by organisms that could be successfully added to the site?" Some contaminate compounds are more easily degraded than others. In general, petroleum hydrocarbons are the most easily degraded.

A contaminant should have a relatively high potential of biodegradability in order to be a candidate for bioremediation.

Conditions that affect Bioremediation

In addition to the contaminant's biodegradability, the suitability of a site for bioremediation depends on the site's geology and the contaminant's chemical characteristics. For intrinsic bioremediation, the key site characteristics include consistent groundwater flow throughout the seasons; pH stability; and high concentrations of oxygen, nitrate, sulfate, and/or ferric iron. For engineered bioremediation, the key site characteristics are permeability of the subsurface, uniformity of the subsurface, and relatively low concentrations of nonaqueous-phase contaminants. No single set of site characteristics will favor bioremediation of all contaminants. Some compounds can only be degraded when oxygen is absent, but destruction of others requires that oxygen be present. How the bioremediation system may perform under variable and not perfectly known conditions must also be considered.

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Engineered Bioremediation

The employment of bioremediation technology is at least 20 years old. The first bioremediation systems were used to mitigate petroleum spills, and bioremediation is still best used in cleaning up easily degraded petroleum products. What is new is the use of bioremediation on a commercial scale to treat compounds other than easily degraded petroleum products.

Engineered bioremediation is a more rapid contamination remedy than intrinsic bioremediation. Engineered bioremediation manipulates, and therefore accelerates, biodegradation reaction rates, thus requiring less time than intrinsic bioremediation. The shorter remediation time can reduce the costs required to maintain and monitor the site.

Oxygen is an important factor in bioremediation. Because most petroleum hydrocarbons require oxygen for degradation, the emphasis of engineered bioremediation systems has been in delivering oxygen to the contamination source. However, bioremediation of other contaminants, such as chlorinated solvents, will not necessarily be controlled by oxygen.

Bioremediation systems for soil above the water table (the vadose zone) may consist of soil vapor extraction. Bioremediation systems for soil and groundwater below the water table may consist of a set of air injection and recovery wells used to circulate oxygen and nutrients dissolved in water.

Bioremediation with other Technologies

In general, bioremediation is best employed after free phase contamination is removed. When soil is heavily contaminated, bioremediation is best implemented after excavating soils near the contaminant source. This sequencing reduces the demand on the bioremediation system and avoids the migration of the contaminant to the groundwater. Similarly, bioremediation is best employed after a groundwater pump-and-treat system is implemented for sites with floating product at the top of the groundwater table. Bioremediation may also be combined with a vapor recovery system to extract volatile contaminants from soils. It is possible to follow engineered bioremediation, which cleans up most of the contamination, with intrinsic bioremediation, which may be used for final polishing and contaminant containment. This approach is generally referred to as natural attenuation.

In the next issue of Roaring Brook News we will explore how to evaluate your bioremediation project and provide information regarding specific projects Roaring Brook Consultants is involved in.

Roaring Brook Consultants
Environmental Services Include:

ïPhase I and II Site Assessments
ï Soil and Groundwater Remediation
ï Human Health Risk Assessment
ï Environmental Field Services

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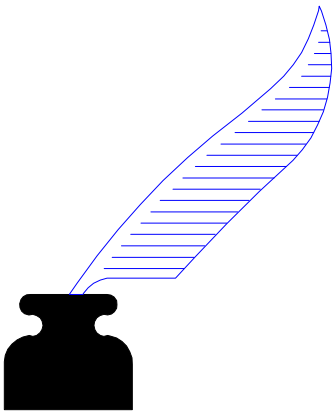

We Welcome Your Comments

If you have thoughts, opinions or suggestions that you would like to share with us, please contact us using any of the methods or addresses listed below. We want to serve our customers better and look forward to hearing from you.

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