



Demonstration Bulletin

Envirobond™ Process

Rocky Mountain Remediation Services

Technology Description: Envirobond™ is a proprietary process that binds with metals in contaminated soils and other wastes. Rocky Mountain Remediation Services, L.L.C. (RMRS), claims that the treatment process effectively prevents metals leaching and can be used with mechanical compaction to reduce the overall volume of contaminated media by 30 to 50 percent. The process is designed to treat soils in situ, thereby reducing handling, transportation, and disposal costs associated with secondary wastes generated by many conventional technologies.

Envirobond™ consists of a mixture of additives containing oxygen, sulfur, nitrogen, and phosphorous; each additive has an affinity for a specific class of metals. RMRS claims that the Envirobond™ process converts each metal contaminant from its leachable form to an insoluble, stable, nonhazardous metallic complex. RMRS claims that, by effectively binding the metals, the process reduces the waste stream's Resource Conservation and Recovery Act (RCRA) Toxicity Characteristic Leaching Procedure (TCLP) test results to less than the RCRA-regulated levels, subsequently reducing the risks posed to human health and the environment.

Waste Applicability: RMRS claims metals that can be stabilized with Envirobond™ include arsenic, barium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and zinc. However, the process is less effective in media containing more than 30 percent by weight of metals such as aluminum, magnesium, calcium, and manganese. These metals may reduce the number of chelating sites available by preferentially binding with the Envirobond™ agent.

Evaluation Approach: The Ohio Environmental Protection Agency (Ohio EPA) and U.S. EPA, through a cooperative agreement, evaluated the Envirobond™ process at the Crooksville/Roseville Pottery Area of Concern (CRPAC) in Roseville, Ohio. The Envirobond™ process was evaluated at CRPAC to determine its ability to reduce the amount of leachable lead in industrial soils and in residential soils,

as determined by the TCLP. Envirobond™ was concurrently evaluated for its ability to reduce the relative percent of bioavailable lead in residential soils by a minimum of 25 percent, as determined by a Physiological-based Extraction Test (PBET).

The evaluation consisted of treating 10 experimental units in a residential area, and one experimental unit in an industrial area. The experimental units in the residential area measured 5 feet long by 5 feet wide. The experimental unit at the industrial site measured 6 feet long by 3 feet wide. After the sod was removed from all of the experimental units, the contaminated soil was mechanically mixed to a depth of 6 inches. Soil samples were collected before the treatment process was applied. The experimental units were treated with Envirobond™ by applying the proprietary mixture to the surface of the tilled soil using a fertilizer spreader. The soil pH was adjusted to approximately 7.0 after the application of Envirobond™, and the experimental unit was tilled.

Some of the experimental units were resampled 24 hours after application of the Envirobond™ process for TCLP lead. The original sod cover was returned to nine of the experimental units; one residential unit was seeded with fescue to evaluate whether plant uptake of contaminants occurs following treatment. Lysimeters were installed to a depth of 6 inches in one unit at the residential site and in the unit at the industrial site. The water collected in the lysimeters will be analyzed on a quarterly basis for lead to evaluate the long-term effectiveness of the treatment.

Preliminary Results: Results of the pre- and post-treatment TCLP lead analysis from the industrial soils are presented in Table 1. Results of the TCLP lead analyses for the residential soils are presented in Table 2. Key findings from the demonstration, including complete analytical results and a cost analysis, will be published in a Technology Capsule and an Innovative Technology Evaluation Report.

Table 1. TCLP Lead Results in Industrial Soils

Sampling Location	Pretreatment TCLP Lead Concentration (mg/L)	Post-treatment TCLP Lead Concentration (mg/L)
V1	421	2.0
V2	563	1.5
V3	320	1.4
V4	247	<0.50
V5	358	1.5
V6	N/A	2.1
V7	N/A	0.94
V8	N/A	1.7
V9	N/A	1.5

Note:

N/A Statistical design of the experiment only required five pretreatment samples for TCLP analysis.

Table 2. TCLP Lead Results in Residential Soils

Experimental Unit	Pretreatment % TCLP Lead Concentration (mg/L)	Post-treatment TCLP Lead Concentration (mg/L)
B	ND	ND
J	0.67	ND
P	0.97	ND

Note:

ND Not detected at the reporting limit of 0.50 mg/L.

For Further Information:

EPA SITE Program:

Ed Barth, Project Manager
U.S. Environmental Protection Agency
Office of Research and Development
National Risk Management Research Laboratory
26 Martin Luther King Drive
Cincinnati, OH 45268
(513) 569-7669; FAX: (513) 569-7571
E-mail: barth.ed@epamail.epa.gov

United States
Environmental Protection Agency
Center for Environmental Research Information
Cincinnati, Ohio 45268

Official Business
Penalty for Private Use
\$300

EPA/540/MR-99/502

BULK RATE
POSTAGE & FEES PAID
EPA
PERMIT No. G-35