Terramend® Exceeds Canadian Council of Ministries Criteria

Bioremediation of Polycyclic Aromatic Hydrocarbon Polycyclic & Pentachlorophenol

Site Overview

Site: Domtar Wood Preserving Site: Trenton Ontario, Canada

Purpose: In an independent study for the US EPA Superfund Innovative Technology Evaluation (SITE) program, soils impacted with polycyclic aromatic hydrocarbon(PAH) and pentachlorophenol were treated at *in situ* and *ex situ*. The *in situ* treatment plot's initial mean PAH concentration was 118.0 mg/kg. Chlorophenol was not evaluated in the *in situ* plot due to a very low initial mean concentration of 1.61 mg/kg. The *ex situ* treatment plot's initial mean PAH concentration was 1,774.4 mg/kg, and the chlorophenol initial mean concentration was 182.8 mg/kg.

Remedial goals for PAHs and chlorophenols were established by the Canadian Council of Ministers of the Environment (CCME) in 1991 (Table 1). To reach these criteria, (e.g., PCP = 5 mg/kg, Benzo(a)pyrene = 10 mg/kg, etc.) removal efficiencies as high as 99% were required in some sampling zones for some compounds.

1. Canadian Council of Ministers of the Environment Interim Soil Quality Criteria (1991).

2. Values in parenthesis indicate the method detection limit for samples reported as less than the method detection limit.

	Concentration (mg/kg)				
	Ex Situ (batch 1)		***Ex Situ*** (batch 2)		**Guideline**
PAH	Initial	251 days	Initial	209 days	(CCME)1
Naphthalene	3	2	2	1	40
Acenaphthylene	3	1	4	(0.2)2	- -
Acenaphthene	9	1	28	0.2	- -
Flourene	3	1	23	(0.2)	- -
Phenanthrene	15	7	104	0.4	40
Anthracene	20	6	35	(0.2)	- -
Flouranthene	206	12	428	2	40
Pyrene	153	10	370	4	40
Benzo(a)anthracene	35	5	60	2	40
Chrysene	58	5	162	1	- -
Benzo(b+K)flouranthene	60	12	140	13	- -
Benzo(a)pyrene	22	6	33	4	10
Indeno(1,2,3-c,d)pyrene	15	5	21	4	- -
Dibenzo(a,h)anthracene	13	1	14	(0.2)	9
Benzo(g,h,i)perylene	12	5	20	4	40
Total PAHs	619	79	1,442	36	- -

Table 1. Terramend® Reagent for treatment of PAHs at a former wood preserving facility.

Environmental Solutions

Terramend® Reagent
Case Study

Solution

Terramend® reagent was applied *ex situ* in two treatment cells (plots) and *in situ* in one treatment plot. The treatment cells were enclosed within a greenhouse enclosure to extend the length of the effective treatment season. Terramend® reagent was applied to the soil surface and incorporated to a depth of 2 ft. with a specialized deep rotary tiller. Mixing also aerated and homogenized the soil. Water was then applied to increase and maintain the soil moisture content to 50%-60% of the soil water holding capacity.

Results

Treatment required 209 days in one treatment cell, 259 days in the other, and 308 days *in situ*.

- PAH concentrations within the *ex situ* plot were reduced by 95% (1,774.4 mg/kg to 95.2 mg/kg).
- Chlorophenol concentrations within the *ex situ* plot were reduced by 98% (182.8 mg/kg to 3.3 mg/kg).
- PAH levels within the *in situ* plot was reduced by 47% (118.0 mg/kg to 62.6 mg/kg).

Summary

Terramend® reagent supported efficient removal of all target compounds in soil at the Domtar Wood Preserving Site to levels below the CCME criteria.

This project was evaluated by the US EPA under its SITE program and was determined to be among the most effective bioremediation technologies available for use on soils impacted with wood preserving chemicals.