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IN SITU BIOSTIMULATION AND BIOAUGMENTATION TO REMOVE PHENOXY-ACIDS IN SUBSOIL

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ABSTRACT

Pesticide contamination of the groundwater in Denmark often originates from point sources emerging from concentrated spills of pesticide products that may have occurred in during storage, handling/cleaning or disposal of pesticides and spraying equipment. Phenoxy-acid pesticides are some of the most commonly found pesticides in Danish groundwater. Contamination from point sources, that can contain a relative large mass of pesticides in a small area, can be remediated within reasonable technical and economical means. Remediation of phenoxy-acid pesticides has conventionally involved containment of the resulting plume through pump and treat solutions or monitored natural attenuation. However, the latter has shown positive results namely at aerobic conditions. In the current project, a new approach was employed to deliver oxygen as well as phenoxy-acid degrading bacteria directly in the point source at 11 meter depth at a contaminated site (Skelstofte, Lolland). The groundwater is contaminated with high levels of dichlorprop and 4-CPP, approximately 100-150 µg/l in the shallow sandy aquifer – well above the groundwater criteria of 0,1 µg/l. The groundwater plume from the site threatens the local water supply, which is located ca. 2 km downstream the point source. The project aimed at evaluating if the oxygen and the degrader bacteria could stimulate aerobic biodegradation of especially dichlorprop. Hence, wells were established to deliver oxygen and bacteria at 11 m depth. Besides, monitoring wells were established at different distances from the delivery wells, to allow online monitoring of the groundwater oxygen concentration. During 6 month, water samples were taken and measured for pesticide concentration, fate of the introduced degrader strain, potential (14C)dichlorprop mineralization, genetic diversity of the microbial community, and presence of bacterial degrader genes by using next generation sequencing methodology