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Questioning the Effectiveness and Sustainability of Treating Pb-Contaminated Soils and Sediments with Phosphates

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Soil contamination is a precursor of all surface and ground water contamination. This in turn, given the current and projected increased scarcity of untainted water resources, makes soil contamination one of the most significant problems our world is facing today. Several countries have issued laws and regulations that assign liability of soil contamination, impose remediation measures and determine clean-up standards and soil quality criteria. Liable parties are required to remediate contaminated sites in a way that is protective of the human health and the environment, usually judged by compliance with regulatory limits and tests. However, no guidelines exist with regard to the environmental sustainability of the treatment approaches adopted to reach these regulatory objectives.

Lead (Pb) is a heavy metal of well established toxicity that is heavily regulated. Firing range soils are the second most important source of Pb contamination. Remediation of contaminated firing range soils and Best Management Practices (BMPs) are therefore required to reduce existing and future Pb contamination of the environment. Phosphate addition has emerged in the last decade as a widely accepted remediation technique and is also proposed by the US Environmental Protection Agency (USEPA) as a BMP to control Pb contamination in firing range soils.

Interestingly, the use of phosphate has significant treatment performance and sustain-

ability issues, as demonstrated in the pertinent literature. Mining of phosphate rock, the common source ingredient used, has adverse impacts on the environment, such as landscape degradation and pollutant emissions. Processing of phosphate rock is a material intensive activity, requiring high consumption of acid and generating increased amounts of waste, such as phosphogypsum, slimes, slags and carbon monoxide. Furthermore, treatment-induced leaching of both Pb and phosphorus (P), a leading cause of eutrophication, into groundwater and surface waters has not been adequately considered. It therefore remains doubtful, whether the overall protection of the environment is promoted by using phosphate as an additive for Pb contaminated soils. Under these circumstances, the USEPA should refrain from recommending its use as a BMP until further research adequately addresses phosphate treatment performance and environmental sustainability.