282d The Use of *Pisum Sativum* (Snow Pea) to Identify the Bioavailability of Lead in a Phosphate Stabilized Soil

Mark Bricka, Brian S. Baldwin, and Gene Fabian

The primary goal of the United States Military is to train and equip troops to maintain military readiness to defend the United States and its interests. Small arms range (SAR) training represents a major element in keeping the military ready to accomplish this mission.

Projectiles utilized as part of SAR training have accumulated in the soil at the SARs as a result of many years of use. These projectiles are composed of toxic metals. The projectiles, with weathering, change form allowing the metals to migrate to surface and ground water sources. Due to the toxicity associated with the metals, the SAR may pose a threat to humans and the environment. Current lead remediation techniques are costly and inefficient thus new cost effective remediation techniques must be developed and implemented.

Studies show that the treatment of the soil with phosphate-based binders may react with the metals, which results in lowering the solubility of the lead and other metals. The phosphate based-binders react with the metal ions, such as lead, to form insoluble metal phosphate complexes called pyromorphites as shown in equation 1.

$10M2+ + 6H2PO4- + 2OH- > M10(PO4)6(OH2) + 12H+$ Eq (1).

Several types of phosphate binders can be used to form the desired pyromorphites, however, the kinetics of the reaction depend on the phosphate complex. This may be due to the ability of the specific binder to mix efficiently in the contaminated soil or due to the reactive nature of the specific form of phosphate applied to the site.

This paper presents the results of a study to investigate the effect of phosphate additives on the lead contained by the soil. Pisum Satirum (Snow Pea) was use as a tool to access the bioavailability of the lead in the untreated and treated soils. This paper will discuss the effectiveness of a newly developed laboratory method to determine the treatment effectiveness. The untreated soil indicated that the Snow Pea could accumulate over 800 mg/kg of lead on a dry weight basis. Results of this test indicate that over 80% of the lead available for plant uptake can be reduced via phosphate treatment.