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Quantification of Extent of Pollution from Total Lead in the Shooting Ranges Found in Southern and Central Botswana: A Pioneering Study

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Abstract : The extent of Pb contamination of shooting range soils has never been ascertained in Botswana, this was the first attempt in evaluating the deposition of Pb into the soils emanating from munitions. A total of 8 military shooting ranges were used for this study. Soil samples were collected at each of the 8 shooting ranges at the berm (stop butt), target line, 50 and 100 m from the berm. In all of the shooting ranges investigated the highest concentrations were found in the berm soils. The highest Pb concentrations of 38 406.87 mg/Kg were found in the berm soils of Thebephatshwa shooting range which is enclosed within a military camp with staff residential dwelling only a kilometre away. Most of the shooting ranges soils contained elevated levels of Pb in the ranges above 2000 mg/kg far exceeding the United States Environmental Protection Agency (USEPA) critical value of 400 mg/Kg. Mobilization of lead at high pH is attributed to low organic matter and such was the case with Thebephatshwa shooting range with a percept organic matter of 0.35±0.08. The predominant weathering products in these shooting ranges were cerussite (PbCO3), hydrocerussite (Pb(CO3)2(OH)2 and massicot (PbO). The detailed examination and characterization of the extent of pollution will help in the development and implementation of scientifically sound remediation and restoration of shooting ranges soils.

Keywords : ammunition, Botswana, Pb, pollution, soil
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