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A Comparison between Extractant Solvents in the Quantitative Analysis of Total Petroleum Hydrocarbons in Soil Samples

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Any given method for the analysis of semi-volatile total petroleum hydrocarbons (TPH, C_{10}-C_{36}) in contaminated soil is made up of a number of procedures, each of which may be subject to improvement or optimization. One such procedure involves the extraction of TPH from soil samples using an appropriate solvent. A solvent that is widely used is dichloromethane (DCM). Ideally, the chosen solvent should represent the best compromise between factors such as cost, extraction efficiency and occupational health and safety concerns. We have initiated a search for alternatives to neat DCM which are equally efficient at solubilising TPH over a range of soil types, but which are less expensive to purchase and dispose of, and which are less toxic. Two studies were carried out involving the analysis of TPH levels in a total of 78 field samples, from a number of contaminated sites. For **Study 1**, TPH levels were determined for 36 samples (from five different sites), comparing the use of neat DCM *versus* 50%v/v DCM/acetone as extractant solvents. For **Study 2**, TPH levels were determined for 42 samples (from one site), comparing the use of 50%v/v DCM/acetone *versus* neat 2-propanol as extractant solvents. Apart from varying the extractant solvent, all other aspects of the method were kept constant. The soils were characterized for all samples, and the six sites were found to have similar moisture content and soil type distributions. Levels of TPH in the extracts were determined by gas chromatography with flame ionization detection (GC/FID) and, using the paired t-test, were statistically compared between each of the two pairs of extractant solvents used. These

investigations suggest that for routine field samples, and for sites of the type represented here, 50%v/v DCM/acetone may be confidently substituted for neat DCM as an extractant solvent. However, 2-propanol is not recommended as a substitute for either 50% DCM/acetone or DCM.

Keywords: Total petroleum hydrocarbon, Contaminated soil, Extractant solvent, Dichloromethane, Acetone, 2-Propanol

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