

**ABSTRACT**

**The Evaluation, Characterization and Treatment of Heavy Metal Contaminated Soils in East Trinidad**

by

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Eight (8) heavy metal-contaminated sites were examined in East Trinidad. Extensive lead contamination was found at all the sites, which included heavily populated, agricultural, and wetland areas. Lead levels were as high as 74% by mass in some of the materials at the sites, and resulted in lead poisoning of numerous children at one particular site (Demerara Road), with one confirmed fatality to date. The main sources of contamination at the areas examined were battery wastes, smelter wastes, discarded battery components, or a combination of the above. To date, Demerara Road is still occupied by a large number of residents despite attempts at relocation by local authorities. The other sites remain largely unchanged.

Chemical characterization of materials and soils from the contaminated sites revealed a consistent occurrence of antimony and arsenic, which are commonly used in battery manufacture. Other elements, notably copper, cadmium, chromium, nickel and zinc were also present, but at significantly lower concentrations than lead, antimony or arsenic. Sequential speciation revealed a dominance of carbonate-bound and exchangeable lead, indicative of the high mobility of this metal. Speciation also identified the presence of three main types

of contaminants, namely slags, drosses, and battery fragments. Correlation studies and multivariate analyses revealed strong associations between the slags and drosses found on the contaminated sites and those from the lead smelter.

Contaminated material was treated with various cement / soil / water mixtures, and subjected to the USEPA's Toxicity Characteristic Leaching Procedures, after allowing the mixtures to set and cure. The treated material was physically strong and the levels of heavy metals leached were lower than the USEPA's acceptable limits for material extracted by TCLP. Successful immobilization of heavy metals in heavy metal-contaminated material was achieved, and provides the groundwork for more extensive studies.

**Keywords:** Heavy Metal Contamination, Lead Poisoning, Chemical Speciation, Sequential Speciation, Waste Treatment, Immobilization, Cementation.