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Environmental Characterization of Ash from the Combustion of Wood and Tires for Beneficial Use in Florida

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INTRODUCTION

Non-hazardous industrial solid wastes are frequently proposed for beneficial use rather than being disposed in MSW landfills. An example of such an industrial waste is waste-to-energy (WTE) ash. Proposed beneficial use projects for WTE ash often involve some form of land application. Prior to the land application of any solid waste, the possible risk to human health and the environment should be assessed. The Florida Department of Environmental Protection (FDEP) has developed a beneficial use guidance document that provides WTE ash generators with the testing requirements that must be demonstrated before a particular beneficial use scenario is determined appropriate (FDEP 2001). For WTE ash to be deemed safe for land application, the risk associated with two separate pathways should be assessed: direct human exposure and the contamination of groundwater via leaching. While organic pollutants (e.g. dioxins) might be a concern, heavy metals are typically the pollutants that most limit the potential for reuse; heavy metals are the focus of the discussion in this paper.

Direct human exposure is typically addressed by measuring the total concentration of various heavy metals of concern (mg/kg) and comparing the results to risk-based target concentrations. In Florida, the risk-based target concentrations used are FDEP's soil cleanup target levels (SCTLs; units = mg/kg). The direct exposure SCTLs are based on assumed exposure scenarios, toxicological information and acceptable risk. The potential risk of ground water contamination as a result of leaching is evaluated in one of several methods. The first method is to compare the total concentration (mg/kg) and to a SCTL derived specifically for leaching (units = mg/kg). The leaching SCTL is derived from an assumed value for "leachability" of the metal from a solid matrix (partition coefficient or k_d; typically derived for a soil). It represents the theoretical amount of metal that would have to be present (mg/kg) to result in a pore water concentration equal to the groundwater standard or target level (mg/L). A dilution factor is often incorporated into the leaching SCTL to account for potential dilution and attenuation that might occur between the contaminated media (soil, ash) and the point of interest in the groundwater. The second method for evaluating the potential risk to groundwater from a land applied ash is to produce a leachate from the ash and to compare the concentration of metals in the leachate (mg/L) to a risk-based groundwater target concentration. The FDEP has developed a set of groundwater cleanup target levels (GWCTL; unit = mg/L). The most common procedure is to produce the ash leachate is to conduct a batch leaching test. The US EPA's synthetic precipitation leaching procedure (SPLP) is one that would commonly be used as it simulates the leaching that results from an acid rainfall. Other batch leaching tests that professionals in the WTE community might be more familiar with are the Toxicity Characteristic Leaching Procedure (TCLP) and California's Waste Extraction Test (WET). Both of these tests are designed to simulate leaching within a municipal solid waste landfill.

This paper reports the results of research conducted to characterize WTE ash from the combustion of wood waste and tires. Analyses that would typically be required for a beneficial use demonstration in Florida were conducted. This work was not intended to be an actual beneficial demonstration, so the required number for samples needed for such a characterization was not analyzed. The results were compared to Florida's risk-based target levels. In addition to characterizing this particular ash for reuse potential, a special focus was paid to evaluate the best method for simulating ash leachate and its potential impact