EXECUTIVE SUMMARY TO THE FINAL REPORT

to the

National Association of Plumbing-Heating-Cooling Contractors

LIFE-CYCLE COMPARISON OF FIVE ENGINEERED SYSTEMS FOR MANAGING FOOD WASTE

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ABSTRACT

A life-cycle inventory methodology was developed and used to quantify total system materials, energy, costs and flows to the environment from acquiring, using and decommissioning five systems currently used to manage food waste. The default system for food waste management is the municipal solid waste (MSW) system; the food waste disposer (FWD), an appliance installed in kitchen sinks, diverts food waste from MSW to wastewater systems. Because the FWD is part of the wastewater collection system, the total impacts of each system include impacts from both collection and treatment/disposal systems. The five systems inventoried are a rural wastewater system, the FWD and on-site system (FWD/OSS); a municipal wastewater system (FWD/POTW); and three MSW systems- MSW Collection/ Compost; MSW Collection/Waste-to-Energy (WTE); and MSW Collection/Landfill. Specific examples are inventoried for each system that are representative of current practices. Inventory parameters for MSW systems were prorated to 100 kg of food waste inputs; parameters for wastewater systems were prorated to 100 kg of food waste plus 1031 kg of associated FWD carrier water. For MSW systems, parameters attributable to 100 kg of food waste inputs were multiplied by the ratio of 100 kg of food waste to the total MSW through the system over its design life. For wastewater systems, parameters were multiplied by the ratio of 100 kg of food waste and carrier water to the total solids and wastewater through the system over its design life. The five systems were ranked simply from high (#5)to low (#1) for twelve inventory parameters per 100 kg of food waste- land, total system materials, water, total system energy, total system cost, air emissions, acid gases, greenhouse gases, wastewater, waterborne wastes, solid wastes, and system food waste byproducts (sludge,

septage, compost, ash, landfill residues). The overall ranking (FWD/OSS, MSW Collection/WTE, FWD/POTW, MSW Collection/Landfill, and MSW Collection/ Compost) agreed reasonably well with the ranking of the five systems by total system cost. The rural FWD/OSS ranked highest, in large part, because the 100 kg of food waste and associated carrier water represent a larger fraction of total solids and wastewater passing through this system over its design life than for any other system. The MSW Collection/WTE ranked second overall. Burning food waste yields little exportable energy if system energy losses are included, and the recycling of food waste through wastewater systems should be encouraged for communities with WTE facilities, just as the recycling of other materials with no heating value, such as metal or glass, is encouraged. The FWD/POTW system ranked third overall, first for food waste byproducts requiring management (sludge) but low for land, total system materials, total system energy, total air emissions, acid gases, greenhouse gases and solid waste. Adding food waste to carbon limited wastewater systems contributes to a net removal of nutrients from effluent as these nutrients are assimilated with carbon into biomass and removed from the system as sludge. The MSW Collection/Landfill system ranked second lowest overall and lowest for cost; it ranked low, as well, for water, wastewater, waterborne wastes, total air emissions, acid and greenhouse gases, and food waste byproducts (landfill residues). The MSW Collection/Compost system ranked lowest overall; but is a non-essential system. If food waste and carrier water contributions are subtracted out, total system materials and energy are similar for the FWD/POTW and MSW Collection/Landfill systems, the two systems essential and required for basic public health and sanitation.