

Fate of microplastics in three Australian wastewater treatment plants: The significance of primary screening

by Shima Ziajahromi | Peta Neale | Isabel Telles Silveira | Andrew Chua | Frederic Leusch | Griffith University | Griffith University | Water Corporation | Water Corporation | Griffith University

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Wastewater treatment plants (WWTPs) are an important pathway of microplastics (MPs) to the environment. Most studies have focused on wastewater effluent, but generally only a small fraction of MPs entering WWTPs are present in treated effluent. Instead, the majority of MPs are expected to be retained in the sludge phase. To date, there is limited information about MPs in treated sludge or biosolids from Australian WWTPs, despite around 75% of biosolids produced in Australia used for agriculture. The current study evaluated the abundance and fate of MPs throughout the treatment trains of three secondary WWTPs in Australia, using an audit approach. The highest MP concentrations were detected in the influent, with fibres the dominant MP form found (49-81%). The screening and grit removal stage prior to primary treatment removed between 69-79% of the total MPs entering the WWTPs, with these MPs transported to landfill. Only 0.2 to 2% of the total MPs were present in the final effluent, while 8 to 16% of the total MPs were retained in the sludge. This equates to between 864×10^6 to 1020×10^6 MPs per day retained in sludge. Fibres and fragments mainly composed of polyester, polyethylene and polypropylene were predominantly found across all wastewater and sludge samples. This study shows that landfill may be a significant sink (and ultimately source) of MPs, with the amount of MPs going to landfill up to one order of magnitude greater than biosolids and up to two orders of magnitude greater than wastewater effluent.