# EXECUTIVE SUMMARY

There are a number of options available to Local Governments for the collection and disposal of organic wastes – including putrescible wastes (kitchen food scraps) which make a significant contribution to the total organic waste currently going to landfill. All governments in Australia are aiming to reduce the total material going to landfill by 50%. Many of the current options proposed and endorsed by Local Governments for achieving these targets are not substantiated by reasonable scientific evidence.

This study was undertaken in an attempt to compare a number of alternatives and try to rank them. The results are summarised below:

## 1. Food Waste Disposers (FWD)

The principal arguments proposed against the use of these kitchen appliances have to do with the additional loads which they would present to the sewage treatment plants.

This study examined the impacts of food waste disposal units (FWD) and compost bins used in the Ashmore suburb of the Gold Coast City in Queensland. The calculations related to FWD units are based on a maximum 100% penetration of the market. This means that all households would have such devices installed, and all kitchen food scraps would be diverted from the normal waste management practice (Wheelie Bin/Landfill) to the sewer and sewage disposal plant.

Hydraulic Load. It was shown that the increase in flow would only amount to 0.4% of the existing flow. This must be considered to be trivial.

Solids Load. The increase in sludge production as a result of the installation of FWDs is more considerable, and would add 18.1% of the existing production.

Organic Carbon (BOD) Load. The increase of BOD was shown to be 16.5% of the existing load.

Effect on the Treatment System. Based on the most pessimistic circumstances (Plants presently at full load capacity) the aeration tanks would have to be increased in size by 16.5%.

Nutrient Removal (N&P). The incremental nutrient load resulting from 100% use of FWDs would amount to 3.0% total N, and 4.6% total P.

Water consumption would increase by approximately 4 litres/household/day and electricity consumption by less than 3 kWh/household/year (costing approximately $0.26/household/year).

**Summary**

| | |
|---|---|
| Hydraulic Load | + 0.4%, negligible |
| Sludge | + 18% |
| Activated Sludge | Zero to + 16.5% increase in aeration tank volume |
| Nutrient Removal | Very slight increase in load |

## 2. Compost Bins and Tumblers

Studies of different design home composting units included in the "Compostabin" design promoted by the Brisbane City Council, and 3191 "Sunshine tumblers".

These studies were instigated to evaluate the production of methane, carbon dioxide and leachate. These issues have not been addressed adequately before various councils have promoted compost bin use. The "Self Evident" value of these devices has not been subjected to any scientific scrutiny.

It is assumed that some of the composters will be properly managed in accordance with the manufacturers' instructions, but some will not. The study therefore examined the difference in performance of the same devices under "managed" and "unmanaged" circumstances. They were also tested with and without kitchen food scraps (highly putrescible).

## Volume Reduction

"Managed" or "unmanaged" tumblers or bins gave about the same reduction in waste volume.

## Leachate Production

**'Managed" tumblers** with food scraps added produced considerably more leachate than without food scraps.

With food scraps:

Total leachate production 2091 ml
Leachate production per kg compost 44 ml
BOD 101-2434 mg/l

Without food scraps:

Total leachate production 647 ml
Leachate production per kg compost 14 ml
BOD 202-1045 mg/l

Leachate production ceased after 5 days without food scraps but continued to day 16 with increasing strength right up to day 16 with the addition of food scraps.

**'Unmanaged" tumblers** with food scraps produced more leachate than without such scraps.

With food scraps:

Total leachate production 10,960 ml

Leachate production per kg compost 335 ml
BOD 586-4103 mg/l

Without food scraps:

Total leachate production 4,862 ml
Leachate production per kg compost 152 ml
BOD 947-2312 mg/l

**‘Managed”bins** with food scraps produced more leachate than without scraps.

With food scraps:

Total leachate production 19,980 ml
Leachate production per kg compost 330 ml
BOD 74-3188 mg/l

Without food scraps:

Total leachate production 6,114 ml
Leachate production per kg compost 94 ml
BOD 49-428 mg/l

**‘Unmanaged”bins** with food scraps produced much more leachate than without such scraps.

With food scraps:

Total leachate production 26,990 ml
Leachate production per kg compost 601 ml
BOD 374-6956 mg/l

Without food scraps:

Total leachate production 10,650 ml
Leachate production per kg of compost 214 ml

BOD 8-301 mg/l

In all cases, unmanaged composters produced much greater volumes of leachate than did the corresponding managed units.

Similarly, the “strength” of leachate as measured by BOD was higher for unmanaged composters than for the corresponding managed units (except for bins without food scraps).

## Temperatures

Temperatures of all the bins and tumblers, whether managed or unmanaged, with or without food scraps, showed an initial rise followed by a gradual drop in temperature indicating a reduction of biological activity over the period of the test.

## Gases

Carbon dioxide concentrations increased rapidly in both the tumblers, and the bins, either managed or unmanaged and after day 3 the rate of production gradually decreased to the end of the test. The test for the bins was extended for longer than 16 days for the gas production tests, and the carbon dioxide production continued to fall right up to 56 days. This indicates that aerobic conditions were prevalent, and the methane study substantiated this conclusion.

Methane concentrations were not readily detectable until the 16$^{th}$ day, and then only in those bins containing food scraps. Thereafter the “unmanaged” bin with food scraps produced higher concentration of methane (up to 70+ml/m$^3$) than the “managed” bin (only 9ml/m$^3$ on day 16). No estimate of the total methane produced can be derived from the experiments as a total gas collection and exchange system would be required to provide essential information on total gas volumes produced.

# CONCLUSIONS

The conclusions which may be drawn from the above data are as follows:

FWDs do not present an unmanageable load on the existing sewage treatment facilities.

Home Composting devices produce a considerable volume of high strength (measured as BOD) leachate when kitchen food scraps are present in the composters. There is no readily available mechanism for retrieving or managing these leachates. Also, the potential for an environmental impact from compost leachate is greater for unmanaged units than for those well managed.

There are two important points to note regarding gas generation. The first is that the amount of carbon dioxide ultimately produced per tonne of organic matter is the same irrespective of the process used. Only the rate of generation is affected by process considerations.

The second point relates to the production, under anaerobic conditions, of methane as an intermediary. Methane released to the atmosphere will eventually be converted to carbon dioxide. However while present, methane has a much greater greenhouse effect than the equivalent amount of carbon dioxide. Environmentally therefore, it is desirable to minimise methane release. There is no readily available mechanism for achieving this with household composting. Further, the data indicates that poorly managed compost units will produce methane. In contrast municipal facilities such as landfills and sewage treatment works can be constructed to maximise recovery of methane for use as a fuel prior to conversion to carbon dioxide.

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