TORONTO STAFF REPORT

August 29, 2005

To: Works Committee

From: Angelos Bacopoulos, General Manager, Solid Waste Management Services

Subject: Use of In-Sink Food Waste Disposers ("Garburators") for Organic Material Diversion

Purpose:

The purpose of this report is to assess the potential use of in-sink food waste disposers ("garburators") for diversion of organic material from households in multi-residential buildings.

Financial Implications and Impact Statement:

There are no financial implications arising from this report.

Recommendations:

It is recommended that this report be received for information.

Background:

At its meeting held on November 30, December 1 and 2, 2004, Council received for information Clause 11 of consolidated Report No. 10 of the Works Committee. In that report Works Committee had requested that the Acting Commissioner of Works and Emergency Services report back to the Works Committee on the use of garburators and food waste disposers, in multi-residential buildings.

Food wastes and other putrescible organic waste materials generated by residents have traditionally been managed by the municipality's solid waste management system, either as a component of a mixed waste stream, or as a source separated organic material stream. Garburators, or food waste disposers (FWD), are promoted by manufacturers as an alternative to diversion of food waste through the solid waste management system, particularly for multi-residential buildings where separation and on-site storage of an organic material stream prior to collection is a new practice.

A household FWD is an appliance installed beneath the kitchen sink to grind food wastes into small particles which are then, with the aid of treated drinking water, discharged into the sewer system. In this manner, a FWD is an interface between the solid waste management system and the wastewater treatment system which manages residential wastewater from toilets, showers, kitchen sinks and appliances (e.g., dishwasher, laundry etc.).

Use of FWD diverts food waste from the solid waste management system into the wastewater system and thereby increases the loading on that system, measured in terms of hydraulic load (i.e., water flow) and solids loading which is expressed in terms of biochemical oxygen demand (BOD), total suspended solids (TSS) and other common environmental parameters. FWD also increase the demands on the City's water treatment and supply system, measured as cubic metres of water treated and distributed, since FWDs use drinking water to flush organic material down the drain. With FWD use there is a corresponding decrease in the loading on the solid waste management system measured as a reduction in the tonnage of organic materials collected, transferred, hauled and processed or disposed.

Solid Waste Management Services Division is planning the implementation of a source separated organic material (SSO) diversion program for multi-residential buildings beginning with 30 pilot projects to commence in 2005. The objectives of the pilot project include evaluation of methods for on-site storage and collection of SSO and collection of data on SSO generation and composition. The multi-family SSO program is described in Solid Waste Management Services 2005 multi-year business plan.

When fully implemented, the multi-family SSO program is expected to divert approximately 39,000 tonnes of organic materials, which is equivalent to 75 kg per household annually for the 523,000 multi-family households expected to exist in the City by 2010, as shown in Table 1.

Table 1: Number of Households in the City of Toronto, 2003 and 2010[1]

Sector	2003	2010
No. Single-family Households	497,000	531,000
No. Multi-family Households	462,000	523,000
No. Total Households	959,000	1,054,000

Note 1. From "Flashforward: Projecting Population and Employment to 2031 in a Mature Urban Area", Toronto Planning Division, Policy and Research

The City is currently undertaking to procure consulting services to plan for an expanded public SSO processing system, as directed by Works Committee. The scope of the planning study includes the total quantity of SSO expected from the City's multi-family residences. The public SSO processing system study is described in a separate report entitled "Request for Qualifications No. 9121-05-7134 Planning Study for and Expanded Public SSO Processing System", submitted to the June 29 meeting of the Works Committee.

The City's sewer use bylaw (Chapter 681 of the City's Municipal Code) prohibits the use of garburators where the effluent will discharge into a storm or combined sewer system. Industrial, commercial or institutional properties are only allowed to use garburators if the resulting effluent complies with the concentration limits for sanitary sewer discharges. For areas not served by combined sewers, the City has an unrestricted use policy where the use of FWDs is neither encouraged nor discouraged.

The current number of FWDs in use in Toronto is unknown.

Combined sewers use one pipe for storm and sanitary sewage and constitute approximately 23% of the City's total sewer network. Combined sewers are predominately located in the area bound by Eglinton Avenue to the north, Midland Avenue to the east and the Humber River to the west. Chapter 681-10 of the City of Toronto's Sewer Use By-law prohibits the use of garbage grinders for domestic purposes where the effluent will discharge directly or indirectly into a storm or combined sewer system. The rational for prohibiting the discharge of FWD directly or indirectly into storm or combined sewers is to prevent the untreated wastewater from overflowing into receiving waters during heavy rainfall events.

The number of multi-residential households serviced by combined sewers can be conservatively estimated to be at least 106,260 in 2003, or approximately 23 per cent of the total. This estimate however assumes that these types of multi-residential households are evenly distributed across the City and does not take into account the high density of multi-residential developments in the older and downtown area of the City which are predominantly serviced by combined sewers.

According to findings of the Waste Diversion Task Force 2010 Report, the use of FWD units was not supported. This was due to the resulting additional loading on the City's wastewater treatment facilities which would reduce the ability to treat existing flows. Instead the Task Force report recommended implementation of SSO collection programs City-wide for the single and multi-family residential sectors, which was adopted by Council at its June 26-28, 2001 meeting.

Toronto Water has also developed a comprehensive Water Efficiency Plan (WEP) that aims to reduce current water use and subsequently the cost of infrastructure expansion. The plan, which will be implemented City-wide over the next 10 years, contains a detailed schedule with a set of sector specific water efficiency measures to help reduce water use, water loss, and reduce wastewater flows. Such measures include the execution of low flow toilet and washing machine rebate programs. FWD units require the use of treated drinking water to flush the organic food waste into the sewer system as a means of conveyance. This additional use of treated water is contradictory to the intent and mandate of the WEP.

During the preparation of this report staff contacted several municipalities to learn of their policies regarding FWD use. The selected municipalities were thought to represent the spectrum of municipal policy options: mandatory or encouraged use; passive use; and, discouraged or prohibited use. The results of this exercise are summarized in the following paragraphs.

- Mandatory or Encouraged Use Policy, i.e., policies either require residences to be equipped with a FWD or offer incentives for FWD installation.

    Representatives of the FWD manufacturing industry provided a list of over 80 US municipalities which they claimed mandate FWD use. City staff contacted three listed municipalities; Columbus Ohio, Boulder Colorado and Detroit Michigan.

    Prior to 2002, the City of Columbus OH required all residences to be equipped with food waste disposers. Mandatory FWD was an attempt to reduce vermin problems in alley-way waste receptacles. However installing FWDs in existing homes became overly expensive as it was discovered that most kitchen cupboards did not provide sufficient space and were not equipped with an electric outlet. Homeowners and landlords complained that the FWDs required frequent and expensive maintenance, particularly in rental units, college dormitories and homes for the aged. Currently Columbus permits, but does not require, FWD use.

    Staff at the Cities of Boulder Colorado and Detroit Michigan both stated that FWD is not currently mandated by any municipal policy or program. Both municipalities have an unrestricted use policy for FWD use.

- Unrestricted Use Policy: i.e., FWD use at discretion of residents and businesses. Some restrictions may apply.

    The Cities of Vancouver, Calgary and Edmonton do not restrict use of FWDs.
    Vancouver reports a FWD saturation of 33 percent of all households (single- and multi-family). However, only approximately 60% of the FWDs are reported to be in continuous use meaning that approximately 20% of households use a FWD.

- Discouraged or Prohibited Use Policy: i.e., pollution prevention programs or bans.

    The Halifax Regional Municipality (HRM) has a source separated organic waste collection program similar to Toronto's green bin program. The HRM is also working to provide secondary treatment of all wastewater discharged into Halifax harbour (the "Harbour Solutions Project"). Complementing this initiative is an aggressive pollution prevention program supported by a new sewer bylaw. An objective of the pollution control program and bylaw is the elimination of food waste discharges such as are produced by FWDs. The HRM is actively discouraging FWD installation in new residential developments. FWDs could be banned in the future if the pollution prevention program does not achieve the desired results.

> In 1990 the City of Kelowna, BC passed a bylaw prohibiting residential and commercial use of FWDs. The City decided to minimize its costs and decided in favour of landfilling foodwaste directly (as part of the mixed municipal waste stream) instead of treating food waste at the wastewater treatment plant and then landfilling the resulting biosolids. Kelowna does not vigorously enforce the bylaw and it is believed that a small proportion of residents continue to use FWDs.

From this modest survey of municipal policies regarding FWD use it is apparent that no general rule applies. However, of the municipalities contacted, none had policies requiring or encouraging FWD use. Municipalities set, and change, policies based on factors unique to themselves. These factors include the capacity and costs of wastewater treatment, effluent discharge standards, biosolids management programs, availability of other food waste management options, and the requirements and costs of installing, operating, maintaining and replacing the FWD units.

A limited amount of published information on FWDs is available. Many of the published studies either involved or were sponsored by the FWD manufacturers and related industries. Published studies report on the impacts of FWD on wastewater collection and treatment systems or provide some form of life-cycle comparison of food waste management by the wastewater system (i.e., FWD) vs management by the solid waste stream (i.e., collection + composting or collection + disposal). The life-cycle studies compare food waste management system options on the basis of cost, environmental impact, health risks and social impacts.

Only two of the five reviewed studies report the results of pilot project studies of FWD use, and these studies were small-scale and of short duration. Typical reported results for household FWD use are:

- an increase of 1.2 – 4.4 per cent in total household water use, equivalent to 3 – 6.6 L per capita per day (equivalent to 6 to 13 litres per household per day);
- an increase of 23 – 57 percent in household BOD discharge; and,
- an increase of 30 – 52 percent in household suspended solid discharge.

None of the pilot studies reviewed thus far report on the waste diversion potential of FWDs.

The remaining three life-cycle analysis studies rely on published information and assumed key system parameters including water consumption rates for FWD use and the quantity of food waste diverted to the FWD, where values ranging from 100 to 180 kg per household per year are assumed.

All studies are reported in the context of passive municipal policies toward residential FWD use, i.e., where residents decide whether or not to install or use a FWD (some restrictions may be applied). In municipalities with passive policies the saturation rate is typically less than 25 percent of the total number of households. At saturation rates of less than 25 percent FWDs are reported to have no or minimal impact on sewers, i.e., no clogging or deterioration, or on wastewater treatment operations, i.e., no significant increase on hydraulic or solids loading or treatment costs.

At saturation rates in excess of approximately 50 percent, considered to be the upper limit for passive programs, studies caution that capital investment in additional wastewater treatment capacity may be required. At saturation rates approaching approximately 70 percent or greater, consistent with a mandatory FWD program intended to divert significant quantities of residential food waste, increased clogging and deterioration of the sewerage system could also be expected.

The life-cycle studies report the FWD approach to be, in the general case, the most expensive of the food waste management options considered. The largest cost component of this approach is the installation and maintenance of the FWD units themselves. Local factors, such as the capacity and cost of existing waste disposal, could change the relative cost ranking of options.

Detailed information of the life-cycle environmental impacts of the food waste management options in the general case is provided but no conclusions are reported. As is the case for relative system costs, local factors determine the relative environmental impact of the food waste management options.

Where social impacts of FWD are considered, the studies generally report a high degree of user satisfaction with the FWD units. Users also tend to prefer the convenience of a FWD to separating and storing a source separated organic material stream for collection by the solid waste management system.

Comments:

Staff of the City’s Solid Waste Management and Toronto Water’s Wastewater Treatment divisions have completed a preliminary comparison of FWD versus SSO collection program approaches for diverting organic materials from multi-family residences. The two approaches have been compared on the basis of:

- food waste diversion potential;
- costs and implementation and maintenance issues;
- wastewater collection and treatment system impacts;
- water treatment and distribution system impacts; and,
- solid waste management system impacts.

The FWD and SSO collection approaches are discussed in the following sections.

FWD Approach

Food Waste Diversion Potential

As discussed, past pilot studies of FWD were undertaken primarily to investigate impacts on the sewerage and wastewater treatment systems. These studies did not produce quantitative estimates of the impacts on solid waste generation resulting from FWD use. Therefore it is not possible to estimate the food waste diversion potential of FWD from previous pilot project results.

For the purpose of this report, the quantity of food waste that could potentially be diverted from disposal using a FWD approach was calculated from estimates of the:

- number of multi-family residential housing units in areas not served by combined sewers;
- proportion of multi-family residences with an installed FWD, i.e., the saturation rate;
- quantity of food waste suitable for processing in a FWD;
- proportion of installed FWD units in use, and the proportion of available food waste processed, i.e., the recovery rate;
- quantity of biosolids produced from wastewater treatment operations; and,
- the proportion of biosolids beneficially used vs. disposed.

The City studied waste generation at two multi-family residential buildings in the fall of 2003. The study results were used to estimate the average quantity of food waste generated annually by households in MF residences that is suitable for disposal in a FWD. Estimated average annual generation is presented in Table 2.

Table 2: Estimated Average Annual Per Household Generation Rate of FWD Suitable Materials

Suitable Materials	Estimated Average Generation (kg per household per year)
Food waste only. Many types of food waste are unsuitable, e.g., bones, shells, very fibrous plant materials, coffee grounds etc. Items must be smaller than sink drain opening.	125

Table 3 presents estimates of annual diversion for FWD saturation rates reflecting different municipal policies towards residential FWD use, as follows:

- 25 percent saturation rate reflecting a passive municipal policy towards FWD use;
- 50 percent saturation rate reflecting encouragement of FWD use; and,
- 75 percent saturation rate reflecting enforced mandatory FWD use.

For the purpose of this comparison it is assumed that the City's current prohibition of FWD use in areas served by combined sewers is continued. Therefore, the above saturation rates apply only to multi-family residences in those areas of the City not served by combined sewers.

A recovery rate of 70 percent was assumed for suitable food waste materials in households with FWD for all saturation rates. The capture rate reflects the facts that householders will not use the FWD perfectly, i.e., that the FWD will not be used or that suitable materials will missed, and that some FWD units will not be operating.

Food waste disposed through a FWD is treated at a wastewater treatment plant and biosolids are produced. The estimated biosolids generation rate is 150 kg of biosolids per tonne of food waste processed, equivalent to a rate of 15 per cent. This estimate is based on current City wastewater treatment operations including anaerobic digestion of wastewater sludge followed by dewatering to produce a biosolids cake with a total solids content of 28 to 30 percent. Biosolids management options currently employed by the City include beneficial use and disposal.

Table 3: Estimated Annual Diversion of Food Waste by FWD Saturation Rate

Saturation Rate (percent)	No. MF Households w/FWDs[1]	Food Waste Diversion (tonnes diverted per year)	
		High Estimate[2]	Low Estimate[3]
25	100,750	8,800	7,500
50	201,500	17,600	15,000
75	302,250	26,500	22,500

Notes:

1. Assumes 403,000 multi-family residences in areas not served by combined sewers in 2010 (i.e., a total of 523,000 multi-family residences less 120,000 residences in combined sewer areas).
2. Assumes all biosolids are beneficially used.
3. Assumes all biosolids are disposed.

Implementation and Costs

The installed cost (purchase and installation) of a typical household FWD unit are estimated to be within the range of $500 to $700 per unit. This assumes a simple installation that can be completed by a plumbing contractor only. FWDs require an under-sink electrical supply which many households do not possess. Installation of an under-sink electrical outlet would add to the cost of the FWD installation. Also, in some households the vertical space beneath the kitchen sink is insufficient for a FWD installation. In these cases, the cost of a FWD installation would be many times greater than that of a simple installation.

The estimated capital costs of a FWD program for 50 and 75 percent levels of saturation are presented in Table 4. Capital cost estimates assume a total of 403,000 multi-family residential households in areas not served by combined sewers in 2010, and a estimated current FWD saturation rate of 25% (based on reported saturation rates for municipalities with permissive FWD policies), and simple installation costs ($500 to $700 per installation).

Operational costs of FWD include electricity and periodic maintenance both of which would vary with use. Previous studies contain no quantitative information on either cost on which local estimates can be based.

Table 4: Estimated Capital Cost of FWD Installation by Saturation Rate

Saturation Rate (percent)	No. of New FWD Installations	Estimated Capital Cost for FWD Installation	
		Low Estimate	High Estimate
50	100,750	$50,375,000	$70,525,000
75	201,500	$100,750,000	$141,050,000

A FWD system for food waste diversion could be implemented through either of two approaches: (1) an active, City lead FWD installation program; and, (2) a passive program requiring FWDs in new residential developments. A City lead installation program could conceivably achieve a high saturation rate within a decade but the City would incur installation costs directly. The passive program option would allow the City to avoid the direct expense of FWD installation, but may take several decades to achieve the desired saturation rate.

Dividing the cost of the simple installation by the estimated total quantity of food waste processed through a FWD during its service life (estimated to be 125 kg per year for 10 years) gives a result of $400 to $560 per tonne of food waste processed. Additional costs would then accrue to the resident for electricity and maintenance, and to the municipality to transport and treat the food waste via the sewerage and wastewater treatment systems.

Wastewater Collection and Treatment System Impacts

Additional flow of wastewater from the use of FWD units would have the greatest impact on the treatment capacity at the Ashbridges Bay Treatment Plant. ABTP receives liquid biosolids from the North Toronto and the Humber Treatment Plant that is then retreated and co-managed with ABTP biosolids. The additional flow received from FWDs would reduce treatment capacity and may increase the likelihood of treatment bypasses during heavy rainfall events since plants receive wastewater from combined sewers.

If the City were to impose a mandatory FWD program for multi-residential buildings, Toronto Water estimates that by 2010, biosolids generation would increase by approximately 10-15%. This would cause significant capital and operational expenditures as the increased strain on the treatment system would have to be taken into consideration. Additional strains on the sewer infrastructure network are also an area of concern. Anticipated increases in oil and grease build-up can be expected as well as increased hydrogen sulphide (rotten egg smell) generation, causing subsequent odour issues and complaints as well as amplified maintenance costs.

ABTP is the largest of four treatment plants, has an intended 100% biosolids beneficial use program. Approximately 50% of the material is intended to be applied to agricultural land in cake form and 50% is intended to be further processed by thermal drying into pellets. Due to a fire at the pelletizer, which occurred in August 2003, and reduced amounts being land applied due to various challenges, the City is currently employing its contingency plan which is the delivery of biosolids to landfill in Michigan. In 2003 and 2004, over 90% of the total amount of biosolids generated at ABTP was sent to landfill in Michigan.

Toronto Water also operates the Highland Creek Treatment Plant (HCTP) in the east end of the City. The HCTP employs incineration of its biosolids as its primary solids management. In 2003, the HCTP incinerated one quarter of the total amount of biosolids generated in the City.

Although Toronto Water intends to manage biosolids in a beneficial way the current contingency method of landfill disposal at ABTP, and incineration at HCTP, do not offer viable diversion options for additional biosolids which would be generated if a FWD program was implemented for multi-residential households.

Estimated incremental wastewater treatment costs for different FWD saturation rates are presented in Table 5. Cost estimates are based on food waste quantities, on commonly accepted factors to convert food waste quantity into wastewater treatment system loading (i.e., BOD, TSS) and the City’s current costs for BOD and TSS removal. Biosolids management expenditure in general is attributed to approximately 25% of the total wastewater treatment plants operating budget.

Water Treatment and Distribution System Impacts

Also presented in Table 5 is an estimation of the increase in treated water consumption from the use of FWD's at different saturation rates. Treated drinking water is required to flush the organic waste into the sewage system and such and increase of consumption would correspond to significant water treatment and supply expenditure for additional usage and capacity.

Table 5: Estimated Incremental Wastewater Treatment Costs by Saturation Rate

Saturation Rate	No. of New FWDs Installations[1]	Food Waste Processed by FWD[2]	Increase in Water Consumption[3]	Increase in Wastewater Treatment Operational Costs[4]	Increase in Wastewater Treatment Capital Costs[5]
(percent)		(tonnes per year)	ML per day	($ per year)	($ per year)
50	100,750	8,800	1.2	$3,500,000	unknown
75	201,500	17,600	2.4	$7,100,000	unknown

Notes:

1. In areas not served by combined sewers only. Assumes pre-existing saturation rate of 25 percent and installations based on housing forecasts to 2010.
2. Assumes a FWD suitable material generation rate of 125 kg per household per year and a capture rate of 70 percent (i.e., 70 percent of FWDs material is suitable for disposal in sink units).
3. Assumes 6 L per capita per day and two persons per multi-residential household.
4. Assumes 1 kg of food waste results in 0.3 kg suspended solids and 0.2 kg BOD. Treatment operational costs are based on 2003 weighted average of all plants operational cost data. Represents the relative increase in current operating cost components assuming no capital upgrades.
5. Capital expenditure intended to recover part of the capital cost of treatment and plant upgrades are unknown at this time. The draft Biosolids and Residuals Master Plan (BRMP) is currently under public review and sets out an implementation strategy and capital cost estimates for management of biosolids at all plants up until 2025.

Solid Waste Management System Impacts

Loading on the solid waste management system would be reduced by the quantity of food waste processed by the FWD units, as presented in Table 2. Avoided collection and disposal costs would amount to $30 and $52.50 per tonne respectively.

Even if FWD saturation rates of 70 percent or better were achieved in areas not served by combined sewers, and if households with FWDs captured 70 percent of the suitable food materials, a significant quantity of organic materials, including diapers, pet waste and litter and soiled paper food packaging, would remain in the waste stream generated by these residents.

No organic materials would be diverted from multi-family residences in areas served by combined sewers – where FWDs would continue to be prohibited.

In order to divert the remaining organic materials the City would have to either implement a multi-family residential SSO collection program or process the mixed multi-family waste stream using mechanical – biological treatment with the objective of making a marketable compost product.

Because FWD use would reduce the quantity of organic materials available for collection a multi-family SSO collection program operated in parallel with a FWD approach would be less efficient, and more costly on a per tonne basis, than the SSO collection program currently planned. Also, the challenge of producing a marketable compost product from a mixed waste stream increases as the proportion of organic material in the waste stream decreases (i.e., contaminant removal becomes increasingly difficult).

SSO Collection System Approach

Food Waste Diversion Potential

More materials are solicited for, and found in, the SSO material stream than are suitable for FWDs. Therefore the estimated annual per household generation rate is greater for SSO suitable materials than for FWD suitable materials. Table 6 summarizes the list of SSO suitable materials and presents the estimated per household generation rate.

Table 6: Estimated Average Annual Generation Rate for SSO Materials

SSO Material Stream	Estimated Average Generation (kg per household per year)
The SSO material stream is comprised of 3 components: 1. Solicited Organic Materials All food waste, including bones, shells etc. Tissues, towelling and soiled paper food packaging. Diapers and sanitary products. Animal waste and bedding materials. 2. Film Plastic (bin liner) 3. Contaminant Materials	Solicited Organic Materials = 185 Film Plastic + Contaminant Materials = 25 Total = 210

Based on current and previous studies of waste generation by multi-family residential households, and assumed participation and material capture rates, it was estimated that approximately 44,000 tonnes per year of SSO material will be collected from multi-family residences when the program is fully implemented based on an average recovery rate of 85 kg per household per year. However, examples of multi-residential SSO programs of the scale planned by the City do not exist anywhere at present. The systems and methods of collecting multi-family SSO that will achieve planning estimates of recovery rate and material collection have yet to be confirmed.

Of the 44,000 tonnes per year total multi-residential SSO collection, approximately 39,000 tonnes per year will be diverted with the difference being the quantity of solid residue generated by processing operations (removal of film plastic and contaminant materials). This assumes that the compost or other product(s) derived from the SSO material will satisfy the regulatory and market quality requirements for use as an unrestricted use product.

Implementation

The 30 multi-family SSO pilot projects planned to commence in 2005 will provide new information on the effectiveness and costs of collection system options. Following successful completion of the pilot projects, the multi-family residential SSO collection program will be implemented one district at a time until complete. The multi-family SSO collection program would be supported by a pre-existing multi-unit waste reduction levy, as described in the Solid Waste Management Services 2005 multi-year business plan.

The estimated capital implementation cost of the multi-residential SSO collection program is $10,494,910 (as presented in the multi-year business plan).

Wastewater Collection and Treatment System Impacts

Diversion of food waste from multi-family residences through a SSO collection system approach is assumed to have no net impact on the wastewater collection and treatment systems.

Water Treatment and Distribution System Impacts

Diversion of food waste from multi-family residences through a SSO collection system approach is assumed to have no net impact on the water treatment and distribution systems.

Solid Waste Management System Impacts

When fully implemented, the multi-family collection program is expected to collect approximately 44,000 tonnes per year of SSO, of which approximately 39,000 tonnes will be diverted. Processing capacity for the total quantity of SSO expected from a fully implemented multi-family residential SSO program is included in the scope of the plan for an expanded public SSO processing system.

The estimated per tonne operating (i.e., collection and processing) cost of the multi-residential SSO collection program is $200 (as presented in the multi-year business plan). This cost is net of the avoided disposal cost.

Conclusions:

Summary of Published Information

- Limited information exists on the impact of FWD use on wastewater collection and treatment systems. Pilot project results suggest that wastewater collection and treatment system impacts are minimal at FWD saturation rates below 25%, which is reported as a typical rate for municipalities with passive policies towards FWD use. At saturation rates of 50%, considered to be an upper limit for encouraged FWD use, and beyond, capital expenditure for additional wastewater treatment capacity could be expected. At saturation rates of 70% and beyond wastewater collection system impacts such as increased odours, clogging and deterioration could also be expected.
- Studies comparing life-cycle impacts generally report the FWD approach to be more expensive than the SSO collection approach. The largest cost component of the FWD approach is the cost of the FWD units.
- No studies reporting the food waste diversion potential of FWD could be found.

Survey of Other Municipalities

- Municipal policies for FWD use reflect local circumstances. Municipalities contacted by staff have either passive FWD use policies or discourage or prohibit FWD use. No municipalities contacted currently encourage or require FWD use.

Comparison of Food Waste Diversion Potential

- The estimated quantity of organic material that is suitable for recovery from a typical multi-family residence via a SSO material collection program is greater than the quantity that can be processed through a FWD unit: 185 vs. 125 kg per household per year respectively.
- The multi-family SSO program is expected to divert approximately 39,000 tonnes per year when fully implemented. In theory, a similar quantity of food waste could be diverted through a FWD approach only if a saturation rate of 70% or better were achieved in all areas not served by combined sewers.
- FWD saturation rates of 70% or better can only be achieved through an enforced policy of mandatory FWD use.

Comparison of Implementation Issues, System Impacts and Costs

FWD Approach

- There are no current examples of a mandatory FWD system of the scale and intensity needed to achieve Toronto's organic material diversion goals for multi-family residences.
- Implementing a FWD approach to divert approximately 40,000 tonnes per year of food waste (similar to the expected multi-family SSO collection program diversion) would require the installation of approximately 200,000 FWD units (based on an estimated 403,000 multi-family residences in areas not served by combined sewers). The estimated total installation cost is in the range of $100 to $150 million (see Table 4).
- An active City lead and funded installation program could conceivably complete a significant portion of the FWD installations over a decade. A passive program requiring FWD installation in new developments could be implemented at no direct cost to the City but would be unlikely to achieve the desired saturation rate for several decades.
- A FWD saturation rate of 70 percent or better would result in significant additional loading on the wastewater treatment system. The additional flows would consume the available treatment capacity and would increase the likelihood of treatment by-passes during heavy rainfall events since all plants receive wastewater from combined sewers.
- Additional capital expenditure to increase treatment capacity would be required. The greatest capacity impact would be at the Ashbridges Bay Treatment Plant (ABTP).
- Additional strains on the sewer infrastructure network are also an area of concern. It is anticipated that problems of oil and grease build-up, causing flow restrictions and blockages, and hydrogen sulphide generation, and associated odour issues, would be exacerbated. Increased sewer maintenance costs would result.
- A FWD saturation rate of 70 percent or better would increase biosolids generation by approximately 10-15%. The ABTP generates 75 percent of the total quantity of biosolids generated by the City. It is intended that all ABTP biosolids be beneficially utilize; 50% to be applied to agricultural land in cake form and 50% to be further processed by thermal drying into pellets. However, in 2003 and 2004, of the total amount of biosolids generated at ABTP over 90% was shipped to landfill in Michigan as a contingency measure.
- Toronto Water also operates the Highland Creek Treatment Plant (HCTP) in the east end of the City. The HCTP employs incineration of its biosolids as its primary solids management. In 2003 the HCTP incinerated one quarter of the total amount of biosolids generated in the City.
- The estimated incremental costs of wastewater treatment operations resulting from FWD saturation rates of 50 percent or better are equivalent to approximately $400 per tonne of food waste processed. Capital expenditures may also be required to provide the necessary treatment capacity. This is an increase of $318 per tonne above current multi-family waste collection and disposal costs, and an increase of $118 per tonne above the expected costs (collection and processing) of the multi-family SSO program (both net of current disposal costs).

SSO Collection System Approach

- There are no current examples a SSO collection program of the scale needed to achieve Toronto's organic material diversion goals for multi-family residences.
- The estimated capital implementation cost of the multi-residential SSO program is $10.5 million. Pilot projects are to being in 2005. Upon successful completion of the pilot projects the multi-residential SSO program would be implemented district by district until complete, by or around 2010.
- The estimated per tonne operating cost (collection and processing) of the multi-residential SSO collection program is $200, net of avoided disposal cost.

Summary

- Use of FWD for food waste diversion is inconsistent with relevant existing City policies and goals.
- The FWD approach does not offer the potential of significant additional organic material diversion relative to current plans for a multi-residential SSO collection program.
- For approximately equivalent quantities of organic material diverted, the costs of implementing and operating a FWD system to divert food waste from multi-family residences are expected to greatly exceed those of a SSO collection system. The largest cost component of the FWD approach is the cost of the FWD units.
- Wastewater collection and treatment system impacts are expected at high FWD saturation rates, but cannot be quantified or costed since no published information is available.
- A significant increase in drinking water consumption is expected at high FWD saturation rates. Additional expenditure for water treatment and supply capacity may be required but cannot be quantified without additional information.

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