TORONTO

# STAFF REPORT
# INFORMATION ONLY

# Vacuum Waste Collection Systems

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| **Date:** | March 19, 2008 |
| **To:** | Executive Committee |
| **From:** | Deputy City Manager |
| **Wards:** | All Wards |
| **Reference Number:** | P:\2008\Cluster B\PLN\ec080020 |

## SUMMARY

This report provides a general discussion of the feasibility and opportunities for automated vacuum waste collection and potential pilot demonstration projects. The report includes a general discussion of the system and some of the technical, governance, operational and financial considerations required for its operation. Waterfront Toronto was consulted in the preparation of this report regarding a potential pilot in the West Donlands precinct.

The fact that vacuum waste collection is new to Canada has raised questions around the feasibility, benefits, and risks of utilizing the technology. Underground vacuum waste collection is a technology that reduces manual handling and storage bins by transporting waste from buildings through an underground pipe network, connected to a central collection station. There are several examples of such systems in the U.S., Scandinavia, Europe and Asia but none in Canada.

Vacuum waste systems can be designed to accommodate up to four waste fractions and could collect the blue bin, green bin and residual waste fractions of Toronto's municipal solid waste ("MSW"). The systems cannot collect large items such as white goods, bulky waste and leaf and yard waste, and there are difficulties with glass and organics as well.

Benefits include fewer garbage trucks in the immediate vicinity of residential homes, which could result in less noise, pollution and greenhouse gas emissions. Disadvantages include potential cross-contamination if the materials are not in bags and complexity around ownership and operations of the piped infrastructure. There is also potential for noise, vibration and land use compatibility issues arising with central collection terminals located in residential neighbourhoods.

City staff has determined that vacuum waste collection is considerably more expensive than the current City costs for collection. It would require additional charges per residential unit for the system operation and maintenance, and for the City to pick up wastes that the vacuum system cannot handle.

The investigation into a possible pilot in the West Donlands found that there were no benefits from a cost perspective, as well as the area still requires streets suitable for emergency vehicle access and pickup of certain waste streams, such as bulky waste.

## FINANCIAL IMPACT

The information contained in this report has no financial impact.

## DECISION HISTORY

A letter was submitted for consideration by the Public Works and Infrastructure Committee, dated August 29, 2007, from Councillor Giambrone, regarding the Envac Automated Waste Collection system and a request for a staff report. At its meeting of September 6, 2007, the Committee referred the letter to the Chief Planner and Executive Director, City Planning and the General Manager, Solid Waste Management Services with a request that they meet and discuss the feasibility and opportunities for automated waste collection pilot projects, and further that the Toronto Waterfront Revitalization Corporation be consulted in the preparation of the report back to the Committee.

http://www.toronto.ca/legdocs/mmis/2007/pw/decisions/2007-09-06-pw08-dd.pdf

## ISSUE BACKGROUND

Council has approved, and staff is implementing, a plan to achieve 70% diversion from landfill by 2010. Included in the plan is a new solid waste rate structure, in which household fees for solid waste management services will be determined by the size of the new waste bin chosen and a multi-unit residential building fee will be determined by the volume of waste set out each month.

The current City collection system is proven, low cost, effective, flexible, well understood and provides a high level of service. The City's new, major program change includes implementation of a volume based user-fee system, distribution of new waste and recycling bins, and the use of fully automated truck based collection. Staff has considered the feasibility and opportunities for vacuum waste in this larger City wide context.

Vacuum waste technology is new to Canada. In the Toronto region, it has recently been considered for Pearson International Airport (Terminal 1), for the redevelopment of Regent Park and for the development of the Toronto Waterfront.

## COMMENTS

### Technology Description

The following technology description was provided by Envac, a vacuum waste system supplier. Although the claims have not been verified by staff, it provides a useful description and is therefore included for information.

"Vacuum waste collection systems have become increasingly prevalent around the globe. The fully enclosed, stationary and automated systems are known as pneumatic waste collection. They consist of a number of garbage receptacles (chutes) linked together by underground piping to a central collection station. Waste is deposited in inlets above ground (indoor or outdoor) where it is stored temporarily in the chute on top of a discharge valve. A preset control mechanism opens the valve in the chute and pulls the waste by gravity into the network of pipes where it is then sucked to the centralized collection station using fans and air inlet valves to create the vacuum suction. The waste is picked up by trucks from a central facility.

The system has residential and commercial applications. It can be applied in a single building but is best suited to serving a number of buildings in a district. It is suitable for *new* or *existing* developments, airports, historical city centres, office parks, hospitals, technology and amusement parks. Waste chutes in high-rise apartments or deposit chutes dispersed outside can link to the underground systems. The system is designed to handle regular waste streams through separate inlets e.g. garbage, organics, recyclables."

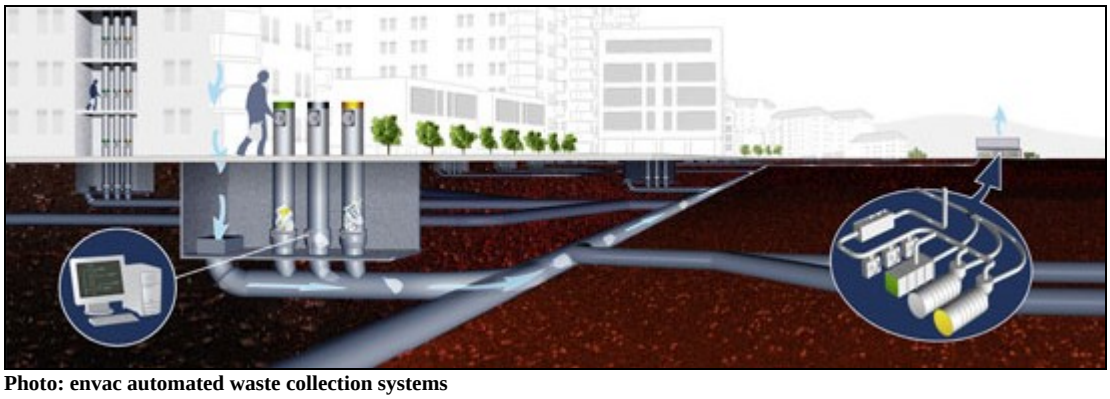

**Photo: envac automated waste collection systems**

Pipes are buried 1 to 1.5 metres below street level and can be installed below the water table.

In new developments, a series of inlets can be created at consolidated points connected to the underground pipes. In existing neighbourhoods, pipes can be added alongside sanitary sewers.

## Suitable Conditions for Vacuum Waste Applications

Vacuum waste systems are best suited in dense, urban areas as cost efficiencies are gained through the mass and volume of waste generated in the area. A general rule of thumb is to limit the length of piping from a central collection facility to two kilometres or a radius of 1.5 to 2 kilometres of piping served by one central terminal (Envac). Envac recommends a minimum density of 150 dwellings per hectare. They state that a minimum threshold for a cost effective system is 1000 to 2000 units for a small terminal while 2000 to 8500 units is ideal for a normal sized terminal.

The vacuum system is also suitable for space-constrained sites, pedestrian-oriented developments and areas where tourism is a focus and there is an emphasis on the public realm. While the piping can be installed in new or existing neighbourhoods, it is more cost-effective to pre-install the pipe in new development areas. Vacuum waste is suitable for areas targeted for higher diversion rates as waste volumes from buildings can readily be monitored and targeted. Small pilots may be possible if suitable sites are found.

## Technical Feasibility and Financial Implications

Staff reviewed information received from two vendors (Envac and Puzair Canada) and from Waterfront Toronto. Staff also spoke to the Operations Manager for the Roosevelt Island vacuum waste system in New York City. Staff's preliminary review considered the following:

- The global installations of vacuum waste systems along with availability of maintenance and support in Canada;
- The ability to collect Toronto's current and planned waste streams using vacuum waste systems;
- The ability to measure waste and recyclables on a building-by-building basis with vacuum collection systems in order to apply user fees and determine diversion performance;
- The financial implications and requirements of implementing vacuum waste collection.

Staff concluded that while vacuum waste systems reduce the need for garbage trucks, they do not eliminate it. Vacuum collection pipes are typically up to 600 mm in diameter so they cannot be used to collect large pieces of municipal waste such as white goods, bulky/durable goods or brush/yard waste. These municipal waste streams, which Toronto currently collects, would still have to be collected in trucks, and the City would need to

charge a fee for that collection, in addition to the fees that residents would pay to the vacuum waste system owner/operator for their building.

Vacuum waste systems are capable of collecting the blue bin, green bin and residual waste fractions of Toronto's MSW. A single vacuum system would collect all three streams by using timers to regulate the flow of materials. However, if the materials are not in bags, some cross contamination will occur. This would be problematic for Toronto where bags are not allowed for blue box recyclables nor recommended for green bin organics. Cross contamination issues could be overcome by installing multiple pipes but this increases the cost.

## Ownership and Operations of Vacuum Waste Systems

One of the main questions with respect to the vacuum waste system is who will own and operate the components that make up the system. Staff reviewed a number of international examples including:

1) Roosevelt Island, New York which is owned and operated by the Roosevelt Island Operating Corporation (RIOC), a state agency mandated to manage, develop and operate the system. RIOC owns the vacuum waste system and has an agreement with the City of New York Sanitation Department for operations and maintenance. RIOC is self sufficient through development revenues and can receive State financial appropriations for special large-scale projects.

2) The City of Barcelona uses an approach whereby developers pay for the capital installation of underground pipes, builders pay for the in-building connections and receptacles and the City pays for the central collection terminal. The residential property tax includes a waste collection fee and the City has a contract with a private vacuum waste company for operations and maintenance. Each building on the system pays annual maintenance fees to the City.

3) London, England (Wembley) follows a single owner operator model whereby a single developer provides the capital investment, owns the underground vacuum waste system, and finances operational costs through a property management fee.

4) Hammarby Sjostad in Stockholm, Sweden uses a consortium model whereby the developers formed a company with individual shares according to their unit holdings. The company owns the system including the pipes, terminal and equipment installed inside the buildings. When the developer sells the units, their shares are transferred to the housing association (building owners). The company provides the upfront capital investment and has a contract with a private vacuum waste company for operations and maintenance. The City of Stockholm has a

lower waste collection tariff for all neighbourhoods serviced by the underground waste system.

In reviewing these models, consideration must be given to the fact that vacuum waste piped infrastructure must be installed in City right-of-ways. City approval of the design and location of the piped infrastructure as well as the central collection terminal will be required. Legal agreements would be used to require building hook-ups and to address owner/operator access for operations and maintenance. City staff prefers not to own and operate a vacuum waste system as this would be inconsistent with our current practise whereby all waste management equipment and systems at multi-unit buildings are privately owned and maintained.

## Waterfront Toronto Consideration of Pilot Project

Waterfront Toronto has considered a pilot project based on vacuum waste technology for the waterfront, initially for the West Don Lands, for which the capital cost for construction would be an upfront investment from waterfront revitalization funds. For a district underground vacuum waste system that would service approximately 4,211 units, Waterfront Toronto indicates that the annual operation and maintenance cost is approximately $236,000, plus $112,000 annually toward the capital cost of long-term replacement of equipment. This results in an approximate $83 cost annually per residential unit for the vacuum waste system. There would be additional costs for collecting white goods, durable goods and brush/yard waste, and for hauling the collected material from the vacuum waste central collection station to a nearby transfer station in the Port Lands.

In discussions with Waterfront Toronto, the comparison of these costs with the significantly lower costs of the current City program identified the need for Waterfront Toronto to determine the true value added of a vacuum waste system.

The Waterfront Toronto pilot includes a vacuum waste central collection station, from which the City would pick up the waste. A central collection station as a use may be incompatible in a residential area and may require specific mitigation measures to address noise and vibration impacts. In addition, depending on its location, rezoning may be required.

At this time Waterfront Toronto has not presented an implementation model the City can support, one where the City is not the owner/operator after the pilot project is completed.

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## SIGNATURE

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