Organics Program Design – Research and RFI Findings

Background

The 2016 Waste Characterization Study showed on average that a single-family household puts 15.6 kg of waste in their black cart each week, 58% of this is organics (81% of which was food waste). Less waste was generated during winter months and the heaviest season for waste-generation was spring. The following table details the largest categories of waste (by weight) in the black cart that could be diverted through organics composting, as found in the study.

	Winter	Summer	Fall	Average	Composition of Total Compostable Waste
Food Waste	44%	18%	50%	38%	44%
Yard Waste	1%	45%	1%	16%	47%
Pet Waste	8%	4%	10%	7%	9%
Total Compostable Waste	53%	67%	61%	61%	100%

Program Design Considerations

<u>Cart Size and Frequency</u>
Considerations in selecting what size of cart(s) to provide to curbside residential properties include the amount of organic waste being generated, collection frequency, cart storage requirements, and the physical demands associated with rolling carts out for collection. Preliminary research indicates that a 240 L (65 gal) cart is anticipated to provide adequate capacity for what most Saskatoon residential properties require and can mitigate a number of safety and maneuverability concerns.

While biweekly collection of organics is feasible from the perspective of organic waste volumes, food waste is usually collected on a weekly basis due to real and perceived hygiene issues associated with storing food waste, the potential for attracting animals and generating odours. The longer organics are stored in bin prior to collection, the more time moulds have to grow and spores have to disperse. Longer collection intervals will also increase the weight of material to be handled, making it more challenging for residents. Providing weekly collection during the warmer months of the year, and biweekly collection during the colder winter months, is also a viable and popular strategy in Canada's colder climate. Moulds and spores do not survive the freezing temperatures and organic waste volumes are significantly lower.

From the engagement results, more than half of the online survey participants indicated an interest in weekly organics collection depending on the cart size and the season. The majority were interested in a larger cart capacity as well, though many requested a size smaller than the current 360L subscription carts. An evaluation of properties to be

served by the new program found that 75% are large and have been assumed to be generating significant yard waste.

A Request for Information (RFI) was sent out earlier this year to gain an understanding of industry capacity and interest to provide services related to the collection and processing of organics for a city-wide (mandatory) curbside residential organics program. Among those respondents that provided information regarding collection frequency and bin size, all respondents recommended the following:

Recommended Organics Cart Size	Organics Collection Frequency, Summer	Organics Collection Frequency, Winter	Recommended Garbage Cart Size	Recommended Garbage Collection Frequency
240 L (65 gal)	Weekly	Bi-weekly	240 L (65 gal)	Bi-weekly

The switch to biweekly garbage service after the introduction of an organics collection program has been successfully implemented in most municipalities. Downsides to bi-weekly garbage collection include the potential for a month long interval between garbage collection if a regular collection is missed, and the odour from materials such as sanitary products and diapers. In an effort to relieve this issue, the City of Ottawa offers a subscription for the collection of dirty diapers and incontinence products on weeks when garbage isn't collected, at no extra cost. Roughly 2% of homes subscribed to this program in 2013. Complaints of odours have reduced drastically since this service has been offered, and Ottawa continues to offer a bi-weekly service, year-round.

Winter Freezing

A common concern is the potential for waste or organic materials to freeze to the carts during winter months, disabling material removal and subsequent collection. Through community engagement, frozen material in green carts was identified as a potential risk that would reduce convenience for residents. Concerns about convenience, including freezing materials, were the second highest concerns after cleanliness.

While freezing is certainly a reality, the Administration's research has identified several jurisdictions where this issue is successfully managed. For example, cart-based collection programs have been operated in below-freezing conditions by the cities of Calgary, St. Albert, and Winnipeg, and in the Ottawa Valley region.

Program education is one tactic that can be employed to address winter freezing. Examples include encouraging residents to line and/or layer organics carts with newspaper or cardboard, soiled cardboard/paper products (e.g. pizza boxes), and dry organic materials. Encouraging residents to ensure that the cart is presented for pickup even if it is only partially full should also reduce freezing issues.

Allowing material to be bagged also mitigates freezing issues. A number of programs allow the use of compostable and kraft paper bags as winter freezing mitigation options. Administration researched the potential to utilize specialized carts to respond to winter freezing concerns, however this approach appears to be in its initial stages. Calgary has purchased a carts for their organics program that has a rounded bottom that may

help with the removal of material (like an ice cube tray). The cart is also made with a more flexible plastic that responds better to colder temperatures with less cracking. Calgary has found in their first year, however, that the design has also been harder for the truck arm to consistently lift without the cart slipping into the hopper or becoming offset. The Administration continues to research the latest innovations in organics cart design.

Odours

There are numerous odour mitigation strategies, including the same lining/layering strategies that work to help with winter freezing. Other strategies include the use of baking soda, rinsing out the cart on periodic intervals, and ensuring that the cart is presented for pickup even if it is only partially full. Allowing the use of compostable bags and kraft-paper bags are also odour mitigation options.

Bagging Considerations

Curbside engagement about implementing an organics program identified cleanliness as the top concern for most participants. Bags are used in some municipalities as a strategy for dealing with the "ick" factor as well as helping with freezing and overall participation in the program.

Certified compostable bags are increasingly becoming more available, however, the use of compostable bags has had mixed results. Experience at some processing sites has shown that they do not completely break down in the normal timeline of composting operations (e.g. 4 to 8 weeks) and they affect processing equipment (requiring a pre-processing stage to remove the bags). There are also concerns that residents who may not wish to spend extra money on compostable bags will instead use regular (durable) plastic bags that may still look acceptable for pickup. Residents may also not understand which types of bags meet compostable certification levels and inadvertently use bags that are not compostable (e.g. bags that are labelled as being "green" but are still simply a durable plastic bag).

Large kraft-paper bags are used as an alternative (or in addition) to plastic-bags in many municipalities. These bags have the benefit that they can be incorporated into many processing operations without the risk of damaging equipment or affecting product quality. For example, in a typical outdoor windrow composting operation, there is no need to open bags or otherwise preprocess the feedstocks as the bags will rip open during the windrow turning. Paper bags may also rip open for residents and be more susceptible to spillage than plastic bags. This is mitigated in the context of Saskatoon as the bags would be placed in carts for single-family households. Kraft bags, however, are also opaque, enabling the "hiding" of contaminants. Allowing, but not mandating, kraft bags allows for people to use kraft bags if they choose to purchase them, a strategy that may reduce contamination risk.

Large kraft-paper bags typically cost in the range of $0.50/bag whereas compostable and plastic bags are on the order of $0.20-$1.30/bag depending on bag quality. Purchase volumes also impact pricing. Availability of large kraft-paper bags may be an issue at retail stores until the program is launched and retail stores have time to respond to market demand.

Through engagement, some participants noted that they did not want bags for their organics collection, especially bags made of plastic materials.

Responses from private companies through the RFI varied with regards to the use of bags with some indicating that they would not advocate for a program that allowed compostable bags without strict controls to reduce contamination, others suggesting that even with significant education and awareness efforts the use of compostable bags results in high levels of plastic contamination for a relatively small amount of incremental diversion of organic materials, and one respondent indicating that permitting compostable bags significantly increases diversion rates over kraft bags.

The Administration has also begun researching the practices in other Canadian cities. A table summarizing the current status of research is provided later in this attachment.

Ongoing Need for Compost Drop-Off Sites

Curbside collection programs are not suited to collection of bulky or heavy waste due to the limitations of carts, collection trucks and other factors. Bulky materials are often banned from collection programs or limitations are put in place. In the case of organics, this often means that items such as sod, large tree limbs, logs, and stumps are banned from cart collection, and there are limits on smaller limbs and brush (e.g. maximum diameter and length of tree limbs). It is common practice to provide residents with options for dealing with heavy or bulky yard waste materials such as at least one controlled centralized drop-off location (like the compost depots provided in Saskatoon today). While a curbside collection program will likely capture the majority of organic materials from single-family households, a compost drop-off site(s) is still required for oversized or excess organic materials.

Banning large tree limbs and branches from curbside programs has an additional benefit in that this material can be collected separately from wetter materials such as food waste, leaves, grass and garden debris. The segregated limbs and branches can be ground and used as a bulking agent for the wetter materials and mixed into the process in a controlled manner.

Kitchen Receptacles

At community engagement events, staff demonstrated sample kitchen catchers. Participants were very interested in having the City provide food waste receptacles for residences. Providing kitchen receptacles is a common practice with many municipalities providing small, 4-L collection pails to each household as part of the launch of their program. Kitchen receptacles (or catchers) provide several benefits including easy, convenient kitchen waste storage and incentive for residents to participate in program; special lids help minimize odours and fruit flies as compared to an open pail/bucket; and catchers provide an opportunity to provide education (e.g. with stickers) about what materials and bags are acceptable in the program.

Materials to Accept

Contamination is a significant concern as removal of contaminants is challenging in an organics processing facility. Organic materials are wet, heavy, unpleasant to handle

manually, and it is expensive to remove contaminants using equipment. The following are a few comments taken from the RFI responses:

- Most companies would not recommend accepting diapers, pet waste or personal hygiene products as many of these items contain plastic and it is common for people to dispose of them in durable plastic bags. Some companies could not process these materials at all.
- Most would not advocate for a program that allowed compostable bags, containers, or cups without strict controls to reduce contamination.

According to the 2016 waste characterization study, pet waste makes up approximately 7% of the materials in the black cart. Pet waste is a challenging material to accept because the end product may not meet the fecal coliform standards required by the Canadian Council of Ministers of the Environment (CCME) for Grade A compost (i.e. ensuring there are no greater than 1000 MPN/g of total solids calculated on a dry weight basis). Pet waste can also be challenging to process because it is often bagged, which can lead to plastic bag contamination if residents are not diligent in using compostable bags. Public perception of using a compost product that contained pet waste can also be negative. However, some composting facilities that process pet waste have done so successfully without these related issues.

If the City were to decide to include materials such as pet waste and diapers in the acceptable list for the Saskatoon program, odors can become a more significant issue. Within the subset of respondents to the RFI that provided recommendations regarding acceptable materials, respondents proposing an anaerobic digestion[1] solution indicated a willingness to accept pet waste and diapers, while only one aerated static pile[2] composting solution offered to accept diapers and pet waste.

The following table presents the current status of Administration's research into practices in other Canadian cities and includes specifics on use of bags and challenging to divert materials such as diapers and pet waste.

[1] Anaerobic digestion: The process of biodegrading organic material using micro-organisms in the absence of oxygen to produce nutrient-rich digester solids (which can be composted) and biogas (which can be used for heat and/or power)

[2] Aerated static pile composting: The process of biodegrading organic material using micro-organisms in the presence of oxygen by placing in piles along perforated piping that provide controlled aeration and require no manipulation of the pile. These piles can be covered or not, and will produce a finished compost that can be used as a soil amendment.

City	Prov	Plastic Bags Permitted?	Diapers?	Pet waste?	Diversion rate	Other Information
Burnaby	BC	No	No	No	59% (2017)	41% participation, 3% contamination
Port Moody	BC	No	No	No	75%	Has a dog waste diversion program (red bins at parks)
Richmond	BC	No	No	No	74%	54% participation rate
Surrey	BC	No	No	No	50.1% (2011)	
Vancouver	BC	No	No	No	62% (2015)	Has a dog waste diversion pilot program (at 5 parks)
Victoria	BC	Only certified compostable bags	No	No	36.5% (2014)	Sells compostable bags, 90 for $10
Calgary	AB	Only certified compostable bags	No	Yes (compostable bag)	30% (2015)	Organics program started in 2017, Participation rate 75%, 30% higher than predicted. 37-49% decrease in black cart waste since 2016
Edmonton	AB	Yes	Yes	Yes	35.7% (2016)	Separated from garbage at facility
St. Albert	AB	Only certified compostable bags	No	No	67% (2016)	Issues with plastic bag contamination
Lloydminster	AB/ SK	Biodegradable bags	No	Yes		75.5% organics capture rate, 13% residual
Aurora	ON	Yes, plastic	Yes	Yes	62% (2016)	85% participation rate, 65% organics capture rate, 15% residue
Durham	ON	Only certified compostable bags	No	No	54% (2018)	70% participation rate, 2% residue
Hamilton	ON	No	No	No		49% residual garbage, 80% participation rate, 50% - 65% organics capture rate, 5% residue
City	**Prov**	**Plastic Bags Permitted?**	**Diapers?**	**Pet waste?**	**Diversion rate**	**Other Information**
Markham	ON	Yes	Yes	Yes	72% (2011)	
Niagara	ON	Only certified compostable bags	No	Yes	52% (2014)	11.4% contamination rate in 2014, down to 3.8% in 2016
Ottawa	ON	Yes, Plastic (Effective mid-2019)	No	Kitty Litter only	44% (2016)	Originally did not allow plastic and Council changed program to allow plastic (participation rate is 45-50%). Current residue is 2%

Peel Region	ON	Only certified compostable bags	No	No	49% (2017)	35% participation rate, 27% organics capture rate, 5% - 10% residue
Simcoe	ON	Only certified compostable bags	No	No	60.7 % (2016)	65% participation rate
Toronto	ON	Yes	Yes	Yes	53% (2017)	17% of feedstock is residue (mostly film plastic)
Vaughan	ON	Only certified compostable bags	Yes	Yes		80% participation
Waterloo	ON	Only certified compostable bags	No	Yes (compostable bag)	52.5 (2012)	
Gatineau	QC	Only certified compostable bags	No	No	48% (2014)	
Montreal	QC	No	No	No		20% capture rate
Halifax	NS	No	No	No	52% (2013)	70% participation rate, 7% residue

Processing RFP Considerations

Contract Length

Respondents to the RFI were asked their opinion on the preferred length for contracted services. The minimum contract length indicated by the RFI respondents was 5 years, but not all respondents were willing to accept a contract term this short. Other respondents suggested 7, 10, 15, and 20 years where the longer contract lengths correlated to the significant capital investment associated with more sophisticated (and expensive) processing technologies such as anaerobic digestion.

Generalized Costs Associated with Processing Technologies

There are a wide range of technologies that can be employed to process organic waste into valuable products.

The 2014 work by the consultant included a financial model and the following table provides a high level summary from the model as well as information gathered through the RFI, with all costs associated with collections removed. The processing costs assume only 50% of the available tonnes of organic material is collected through the green cart program (approximately 26,000 tonnes).

Processing Scenario	**Capital Cost Estimate [$]**	**Operating Cost Estimate [$/tonne]**
Aerated static pile (ASP) composting method	$8 to $33 M	$45 to $140
Dry anaerobic digestion to generate heat, electricity and/or biogas with ASP to create compost with remaining solid materials	$20 to $39 M	$50 to $150

Out of respect for industry, this report does not explicitly state the price estimates obtained from the RFI. In the 2014 consultant model the capital costs are based on constructing facilities only for use by the City's organics program and are allocated only against the tonnes available from the program. In contrast, respondents to the RFP may attract additional tonnes from sources other than the City and may also be able to utilize existing infrastructure to reduce the necessary capital investment. Research has also shown that greater technological maturity has driven down capital costs since 2014. The 2014 model also amortizes capital costs over 15 years whereas the private sector would likely amortize over a shorter period.