Medium and Long Term Strategy

DRAFT SOLID WASTE MANAGEMENT STRATEGY

April 2021

Halton REGION

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Halton REGION

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1.0 Introduction

In 2017, the Region of Halton (Region) began developing a 30-year Solid Waste Management Strategy (SWMS). The Strategy provides recommendations to enhance the current waste management system for the 30-year planning period. Based on timing to implement the recommendations, the Region separated the SWMS into two parts: Short Term and Medium-Long Term with the short term starting in Year 1 (1-3 years), medium term starting in Year 4 (4-10 years) and long term starting in Year 11 (11+ years). ***Figure 1*** displays the process followed to complete the SWMS.

Vision Statement

Building on the strengths of our Region, provide a sustainable, equitable and responsible waste management service that efficiently serves our community , protects our environment and is responsive to change.

Halton Regional Council approved the Short Term SWMS in 2018 (Report No. PW-12-18). The Short Term SWMS recommended ten options for the Region to implement that included developing strategies to reduce food waste, increasing textile recycling and reuse opportunities, staying current on ways to inform and educate the public, and increasing diversion from apartments and condominium buildings.

This Solid Waste Management Strategy document outlines recommended options to be implemented in the Medium-Long term planning period (starting in 2022). Identifying options that align with the Strategy's Vision Statement and Objectives and evaluating the potential environmental, social and financial impacts of each option was completed. The implementation of these options will directly benefit the Region by extending the life of a major asset – the landfill located at the Halton Waste Management Site (HWMS).

The first few tasks in developing the SWMS involved understanding the existing waste management system, establishing a long term vision statement and guiding principles to set the direction over the next 30-years and considering the evolving trends and needs of the future waste management system. With this understanding in place, a long list of potential recommendations (referred to as "options") to enhance and/or improve the Region's waste management system was developed. The process followed to identify the list of potential options for the medium and long term planning periods is presented in ***Appendix A – Medium and Long Term Options Identification Memo***. The options were further placed into the following categories:

- Waste Diversion and Policy (WDP);
- Collections (C);
- Drop-off and Transfer (DT);
- Residual Processing and Disposal (RD); and,
- Processing (P).

This document is the continuation of the SWMS. The summaries of each medium and long term option, the results of their evaluation, and recommendations with the proposed implementation timelines are documented in this Medium-Long Term SWMS. In addition, this document discusses the changes and updates in waste management since the Short Term SWMS was prepared, including municipal program changes, and new Regional strategies, Provincial and Federal legislative and policy updates, which has been quite active in 2020, and the global COVID-19 pandemic. Waste quantity data is updated using 2019 data and given the impacts of COVID-19 on waste management, additional data is presented up to July 2020.

Figure 1: Process Timeline

Since the submission of the Short Term Strategy in 2018, the Region has been working on several new strategies and initiatives (discussed in ***Section 2.3***), including:

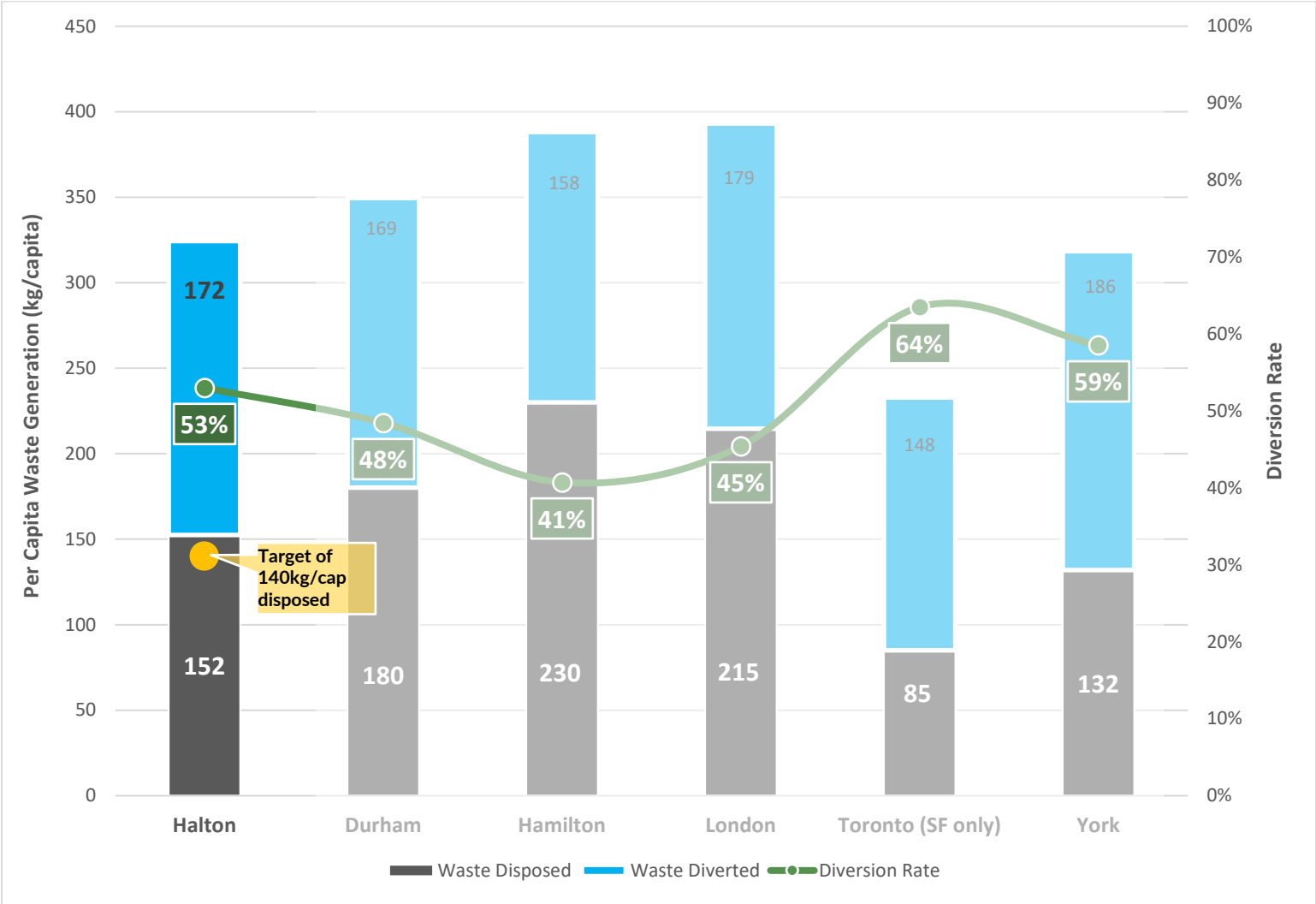
- Climate Change;
- Food Strategy;
- Biosolids Master Plan; and,
- Conservation and Demand Management (CDM) Plan.

The Region has also made some changes to its waste management programs since the development of the Short Term SWMS. They have awarded new processing contracts for both recycling and organics collection. With the new recycling contracts, residents are now able to place recyclable materials in clear/transparent plastic bags which can help reduce litter from Blue Boxes on windy days within the Region. The Region continues to perform at a high level in terms of waste diversion with an overall diversion rate of 57% in 2019.

The Region participates in and submits data to the Municipal Benchmarking Network Canada (MBNC) for the waste management service area. ***Figure 2*** provides a comparison to other municipalities within the Greater Toronto area that also participate in the annual MBNC reporting. The Region is among the top performers in terms of overall waste diversion rate, but also has a very high waste generation rate. In 2019, the Region generated almost 325 kg/capita of waste with 152 kg/capita being disposed in landfill achieving a diversion rate of 53%[1]. The Region is striving to reduce the amount of garbage produced and through the Strategic Business Plan has set a target to achieve a waste disposal rate of 140 kg/capita. The SWMS proposes several new initiatives to reduce and divert more waste from landfill to help achieve that target.

[1] It is noted that the methodology used by MBNC to estimate diversion rates differs from how the Region estimates and reports diversion rate in that the Region includes the total waste collected through diversion programs and MBNC removes the residue portion of the waste collected from diversion programs. In 2019, the Region estimated the diversion rate to be 57% and the MBNC calculation yielded a diversion rate of 53%.

Figure 2: Municipal Comparison (2019)



Source: 2019 Municipal Benchmarking Network Canada, Data Tables Report – Waste Management

2.0 Current Waste Management Profile

Where are we?

A review of the current waste management system was undertaken using historical data up to 2016 to understand the baseline conditions in order to develop potential options to be considered in the SWMS. The Current Waste Management Profile, 2017 is included as Appendix A to the Short Term SWMS.

The Region's waste management system has undergone a few changes since the Current Waste Management Profile was finalized in August 2017. ***Section 2.1*** of the Medium-Long Term SWMS provides an update on the relevant components of the Region's solid waste management system using data up to 2019. ***Section 2.2*** discusses the major program changes the Region made. ***Section 2.3*** provides an overview of new strategies and initiatives from the Region that align with SWMS. ***Section 2.4*** provides an update on draft provincial and federal regulations, policies and legislation that could impact the Region's waste management system. Finally, ***Section 2.5*** compares the impacts on waste quantities and traffic at the Container Station due to the global COVID-19 pandemic on the Region's waste management programs and facilities from January to June 2020 to previous years.

2.1 Update on Current Waste Management Profile

2.1.1 Waste Quantities

The number of low, medium and high density households serviced by the Region in 2019 was approximately 212,200 and in 2020 was approximately 217,800. The Region's population grew by about 2% between 2019 and 2020. The Region continues to implement the Green Bin program in multi-residential buildings. Currently there 335 multi-residential buildings (approximately 30,700 units) that have access to the Green Bin program.

Figure 3 shows the updated historical quantities of garbage, Blue Box (BB) recyclables and Green Cart (GC) organics that the Region managed between 1997 and 2019. The figure also shows the diversion rate achieved, which is defined as the total amount of waste diverted from disposal divided by the total waste managed (including garbage sent to landfill). The dashed vertical line represents the year (2016) that was used to develop the baseline conditions.

Since 2016, the quantities of garbage and organic waste streams have increased while the quantity of recyclables has decreased. The residential diversion rate has steadied at just under 60% after achieving that diversion rate in 2014.

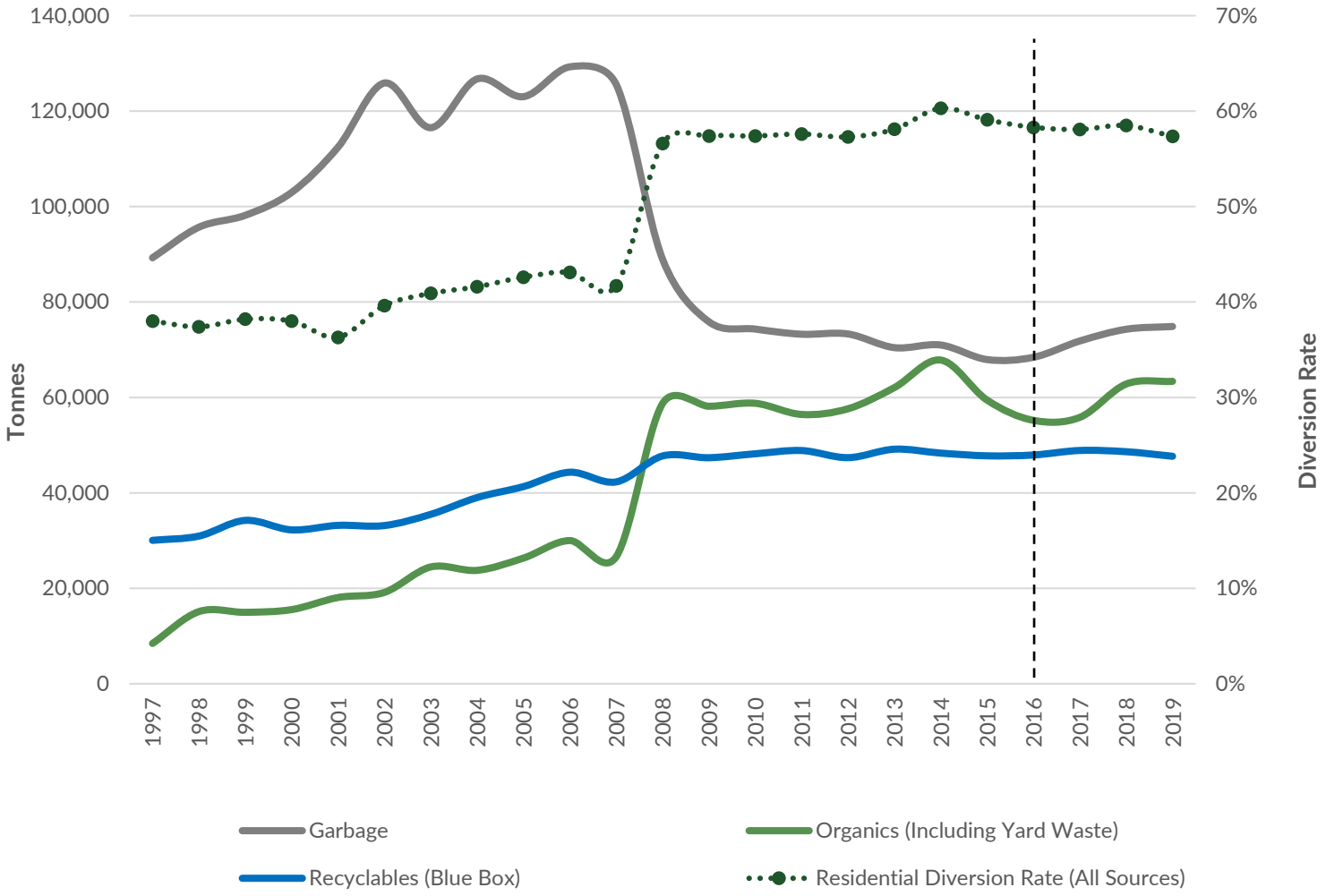


Figure 3: Historical Waste Quantities Managed by the Region (1997- 2019)

2.1.2 Landfill Capacity

The Region's landfill has been in operation since 1992 and is approved for 7.96 million cubic meters (Mm^3) of residual waste. The HWMS handles approximately 250 tonnes of solid non-hazardous waste per day. When it was approved, the landfill was estimated to have a projected life of 20 years and reach its capacity in 2012. As reported in the Short Term Strategy, the estimated landfill life anticipated an additional 26 years (2046) at the current fill rates. As a result of improved residential diversion programs and various operational programs, the projected landfill life was extended to 2044-2048 based on the latest estimates. It is noted that in 2020, the HWMS disposed of almost 78,500 tonnes of garbage which is almost 4,000 tonnes more landfilled compared to 2019 and the highest quantity since 2008. The increase in attributed to the global pandemic and if this trend continues, the landfill lifespan will be shortened.

2.1.3 Contracts

The Region owns the HWMS and contracts out most services, aside from maintenance and landfill operations. Waste collection and processing services are contracted to private companies. Curbside waste collection is contracted out and materials are delivered to one of three transfer stations (one is owned by the Region at the HWMS and two are privately owned). In 2007, Regional Council awarded the Residential Waste Collection Contract to Miller Waste for a six year term with an option to extend for two additional years. The Region decided to extend the contract using the additional years to 2016. After the contract expired, a competitive procurement process by the Region, once again awarded their collection contract to Miller Waste. This new contract covers a period of eight years which began in 2016. The contract includes an option to extend by two additional one-year periods however, it is anticipated to expire in 2025 when the Region transitions the Blue Box program to full producer responsibility.

The Region entered into a five-year contract with Canada Fibres (now owned and operated by GFL Environmental) to process Blue Box recyclables at their Materials Recovery Facility (MRF) in Toronto. The contract began in April 2018 for a period of five years with an option to extend five additional one-year periods. Similar to the collection contract, the MRF processing contract is anticipated to expire in 2025 when the Region transitions the Blue Box program to producers. The Region entered into a contract with StormFisher Environmental to process the Green Cart organic material at its anaerobic digestion facility in London in January 2021. The contract expires at the end of 2025 and includes two options to extend the contract by one year. Garbage is disposed of at the Region's landfill located at the HWMS. ***Table 1***

summarizes the contracts awarded since the Current State Report was completed in 2017 as well as the collection contracts awarded in 2016.

Table 1: Waste Management Contracts Awarded by the Region of Halton

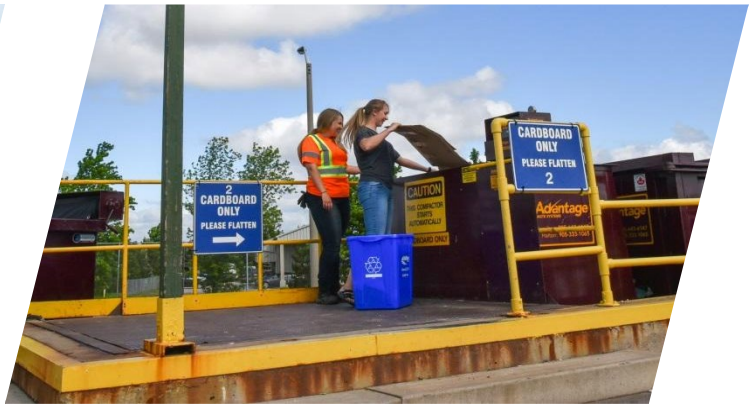
Customer / Waste Type	Collection Contract Description
IC&I	Front-End Solid Waste Collection Services (Advantage Waste) Automated Blue and Black Cart Collection (Miller Waste)
Multi-Residential	Front End (FE) Solid Waste Collection Garbage (Advantage Waste) Automated Blue, Green and Black Cart Collection (Miller Waste)
Single-Family Residential (garbage, organics and recycling)	Residential Solid Waste Collection (Miller Waste)

Customer / Waste Type	Processing Contract Description
Green cart organics	Processing & Disposal of Source Separated Organics (SSO) Material (StormFisher)
Blue box recycling	Processing of Recyclable Material (GFL Environmental)

Customer / Waste Type	Transfer Contract Description
Receiving of materials at Leferink Transfer Station and transfer to processing facilities (recycling and organics)	Receipt (Leferink Transfer) and Transfer of BB/GC Material (LK Trucking)
HWMS Transfer Station operations and transfer of materials to processing facility (organics)	HWMS Transfer Station Operation and Transfer of Organics (Miller Waste), Transfer of Recycling (LK Trucking)
Receiving of Materials at Norjohn Transfer Station and transfer to processing facilities (recycling and organics)	Receipt (Norjohn Transfer)and Transfer of BB/GC Material (Walker's Environmental)

2.2 Major Program Changes

The Region has added more materials to its Blue Box program for collection in 2013 and 2018 (e.g. mixed plastics, empty paint cans, metal pots and pans). In April of 2018, all residential and Industrial, Commercial and Institutional (ICI) customers can recycle plastic bags (e.g., grocery bags, newspaper bags) and plastic overwrap (e.g. packaging on cases of pop or bathroom tissue). Additionally, residents in single family households can now place recyclables in clear plastic bags, continue to use the Blue Box only, or use both. The addition of plastic bags to hold recyclables will help mitigate litter issues, particularly on windy days, which was a common complaint from residents.



2.3 New Strategies

The Region has started work on several new strategies and initiatives that focus on climate change, food waste reduction, and energy recovery and energy management. Some of the options in the SWMS align with the goals and objectives of the new strategies and initiatives.

2.3.1 Climate Change Emergency

The Region's Council declared a Climate Emergency on September 11, 2019, which acknowledges that climate change exists and that the Region must develop initiatives to reduce its impact on Greenhouse Gas (GHG) emissions. Following the approved motion, Council directed Region staff to bring a report to Regional Council that includes the following:

- Identify proposed short and long-term climate change goals for the Region, including but not limited to:
    - Reduction in Regional GHG emissions;
    - Develop an Energy Management Strategy;
    - Review strategies for energy conservation, greening operations and renewable energy technologies;
    - Provide strategies to increase the Region's waste diversion rate; and
    - Determine a strategy for green fleet operations.
- Outline how Halton Region will work towards achieving the remaining four milestones of the Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP) program;
- Outline opportunities to manage growth and development to address climate change with an update to the Region's Official Plan;
- Develop corporate sustainability and climate change policies and apply a climate lens to the Region's infrastructure and operations;
- Identify performance metrics to track progress and timelines; and
- Partner with local municipalities and community organizations to engage and inform residents on community action for climate change.

Since the declaration of a climate emergency, the Region has begun working on several initiatives to address climate change. A Climate Change Response Update was reported to Regional Council on February 17, 2021. Common themes with the action plans are Sustainable/Green Building Standards and working with community organizations and supporting them to encourage behavioural change. The following is an outline of the tasks and goals:

- 2019-2022 Strategic Business Plan;
    - Supports United Nations Sustainable Development Goals;
    - Community Well Being: develop a Food Strategy;
    - Environmental Sustainability and Climate Change;
- Finalize Energy Management Strategy;
- Implement Programs to Maximize Waste Diversion;
- Decrease garbage generated per capita to 140 kg;
- 60% waste diversion;
- Increase diversion in multi-residential waste;
- Deliver an updated Solid Waste Management Strategy;

- Increase promotion and education of diversion and reuse programs;
- Litter containment in Blue Box; and,
- Increase access to and participation in the Green Cart program in multi-residential buildings to increase diversion.

Additionally, the local municipalities have also declared Climate Emergencies and have begun preparing action plans and goals to address climate change. Several of these goals and initiatives overlap with the SWMS. All of the options presented in the both the Short Term and Medium-Long Term SWMS were evaluated through a triple bottom line analysis that focused on environmental, social and financial impacts. With respect to the environment and climate change, the evaluation answered questions for each option:

- Will it minimize the amount of waste to be disposed?
- What will the impact be on the environment?
- How much energy is required?

2.3.2 Food Strategy

As an Action of the Strategic Plan, the Region was developing a Food Strategy looking at the whole food system (from growing to waste). With the need to divert resources to the management and containment of COVID-19, the Region has suspended its work on the Food Strategy. Previous to the suspension, the Region had developed some draft actions that were aligned with the food-related options from the Short Term SWMS, including promotion and education (P&E) initiatives on food waste reduction, organics processing, and implementing the Green Cart program in the multi-residential sector.

2.3.3 Biosolids Master Plan

In 2009, the Region initiated a Master Plan to determine the future management of biosolids generated by the seven wastewater treatment plants (WWTPs) in the Region. The study's purpose was to develop a long-term plan that responded to current and future challenges in a sustainable, reliable, cost-effective and environmentally conscious manner. The Strategy was to ensure the program's long term sustainability to the year 2031. The Biosolids Master Plan recommended several initiatives for the Region to undertake before an update, including an assessment of available land, determining future quantities of biosolids available, and evaluating materials that could be mixed in with biosolids such as yard waste and kitchen organics. The Master Plan will be reviewed and updated every five years and opportunities to integrate with the recommendations from the Medium-Long Term SWMS will be explored.

2.3.4 Conservation and Demand Management (CDM) Plan

In 2014, the Region introduced its first Conservation and Demand Management (CDM) Plan. From 2013 to 2018, the Region implemented several initiatives across all facilities, water and wastewater process operations and street lighting on Regional roads. The Region tracked the program's results during this period and found that they had achieved:

- 2% reduction in energy consumption;
- Reduction of over 168 tonnes of greenhouse gases; and,
- Almost $900,000 in annual energy cost savings.

In July 2019, the Region released its 2019 to 2023 CDM Plan, which aligned with the Region declaring a climate emergency and intending to build off early successes and introduce new targets and initiatives further to reduce the Region's current and future carbon footprint. These targets and initiatives include:

- 5% reduction in greenhouse gas emissions related to Regional services;
- 5% reduction in the hydro consumption/megalitre of wastewater treated;
- 5% reduction in the hydro consumption/megalitre of water treated;
- 10% reduction in the hydro consumption required for Regional street lights; and,
- 5% reduction in the hydro and heating consumption per square foot in corporate facilities.

The Halton Waste Management Site converts landfill gas to electricity that is fed back into the local electricity grid

In addition to the initiatives listed above, the CDM also calls for future plans, including an organics processing facility that could manage SSO, yard waste and biosolids. The CDM notes that this future plan requires an investigative study, which would align with the Biosolids Master Plan and the Medium-Long Term SWMS option previously mentioned (P2: Alternative Technologies for Organic Waste), which looks at using alternative technologies and feedstocks such as biosolids and yard waste as a means to recover energy.

The HWMS collects landfill gas (LFG), which began in December 2006. The Region contracts out the operation and maintenance (O&M) of the LFG collection system and has an agreement to provide the landfill gas to Oakville Hydro Energy Services Inc. The contract expires in 2029 and has an option for a 10-year renewal. LFG is collected through 39 vertical wells placed in the landfill cells. The amount of landfill gas

collected in 2016 was 143,382,560 ft^3. The LFG fired electricity generation facility has a rating of up to 4.2 megawatts consisting of identical engine-generator sets. Oakville Hydro provides this electricity as green energy (2.1 megawatts) that can power up to 1,500 households.

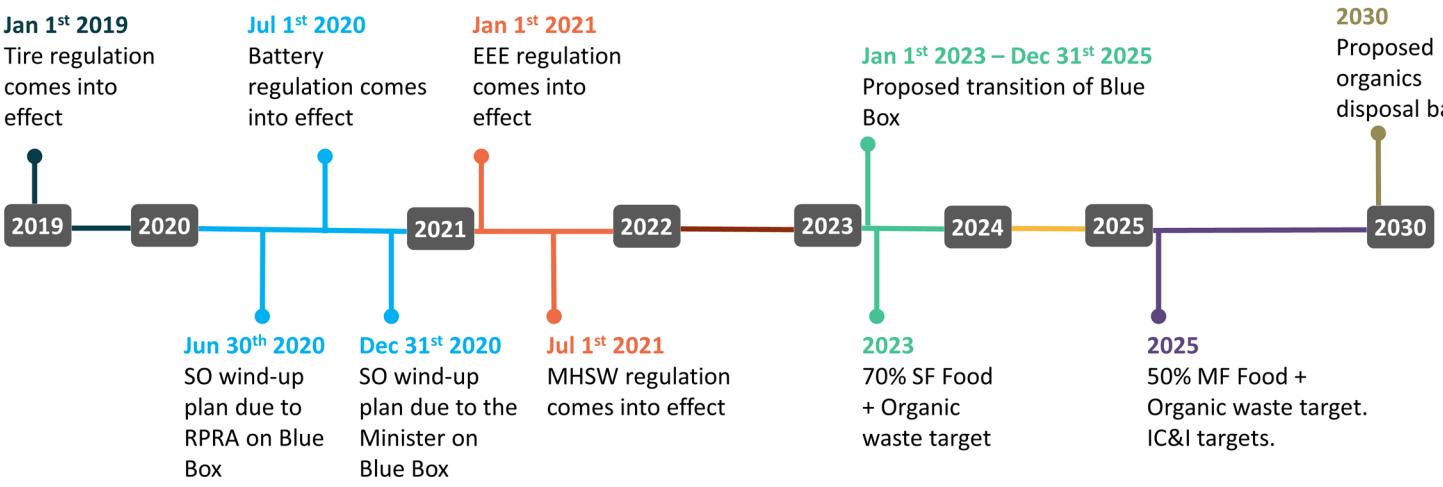
2.4 Legislative Updates

There has been a period of significant policy, program and legislative development across Canada in the solid waste area in general, and waste reduction and waste diversion in particular in the last few years. Both the provincial and federal governments have been very active in the field. There has also been a growing interest and concerns about the greenhouse gas impacts of current waste management programs and practices and the challenges and opportunities for waste related greenhouse gas (GHG) mitigation at all levels of government, businesses, households and communities.

On November 29, 2018, the Ministry of Environment, Conservation and Parks (MECP) released **Preserving and Protecting our Environment for Future Generations: A Made-in-Ontario Environmental Plan** to help protect and conserve our air, land and water, address litter and reduce waste, increase our resilience to climate change and help all of us do our part to reduce greenhouse gas emissions. The Made-in-Ontario Environment Plan outlined a number of commitments, including:

- Reducing and diverting food and organic waste from households and businesses;
- Reducing plastic waste;
- Reducing litter in our neighbourhoods and parks; and,
- Increasing opportunities for the people of Ontario to participate in waste reduction efforts.

There are number of legislative changes happening in Ontario to support this Plan. ***Figure 4*** presents an overview of the anticipated timelines for the transitions of Ontario's waste diversion programs with descriptions following summarizing the key changes since the Short Term SWMS was prepared. ***Section 2.4.3*** discusses proposed changes by the federal government concerning single-use plastics.



Acronyms: EEE (Electrical and Electronic Equipment), SO (Stewardship Ontario), RPRA (Resource Productivity & Recovery Authority), MHSW (Municipal Hazardous or Special Waste), SF (Single-family), MF (Multi-family),

Figure 4: Timeline for the Transition of Ontario's Waste Diversion Programs

2.4.1 Individual Producer Responsibility

2.4.1.1 Blue Box Program

Under a full individual producer responsibility (IPR) program, industry would pay the full cost of municipal Blue Box programs, instead of the approximate 50% that is currently paid by industry in the form of funding distributed to municipalities based on recycling program costs and performance. Moving to an IPR program also includes taking operational responsibility for recycling and making sure materials are recycled. Also included in this new program will be the onus on industry producers to make packaging decisions that deliver better environmental outcomes.

On June 7, 2019, the MECP appointed Mr. David Lindsay as Special Advisor on recycling and plastic waste and facilitated a discussion on transitioning the Blue Box Program to full producer responsibility.

Stewardship Ontario (the association that represents the producers of Blue Box waste materials) was directed by the Minister to develop a windup plan for the current Blue Box funding program. They submitted the wind up Plan that was approved with conditions by Resource Productivity & Recovery Authority (RPRA) in December 2020.

The timeline for when municipalities can transition to an IPR system is between January 1, 2023 and December 31, 2025. Municipalities will not transition all at once but rather over the period of three years depending on a variety of factors including operational strategies of industry stewards. In the Spring of 2020, The Region of Halton submitted to the Association of Municipalities of Ontario their requested Blue Box transition year to be 2025 (which is what the draft Blue Box regulation states will be the transition year for Halton Region).

On October 19, 2020 the MECP announced a proposed IPR regulation for the Blue Box Program under the Resource Recovery and Circular Economy Act (RRCEA). The proposed regulation makes producers responsible for providing collection services to local communities, managing blue box materials, establishing targets to increase diversion rates, tackling plastic waste and protecting the environment. The MECP is consulting with stakeholders and accepting feedback before finalizing the regulations in spring 2021.

The proposed Blue Box regulation identifies responsible producers for the scope of blue box materials that must be diverted and enable them to contract with producer responsibility organizations (PROs) to meet their regulatory requirements. The proposed regulation would include printed paper, packaging, and non-alcoholic beverage containers accepted in the current Blue Box program, and expand collection requirements to include additional materials commonly put in blue boxes by residents:

- Unprinted paper;
- Single-use packaging-like products, such as foils, wraps, trays, boxes, bags; and,
- Single-use items relating to food and beverage products such as straws, cutlery, plates, stir sticks.

The proposed regulation under the RRCEA would:

- Maintain or improve existing blue box services, including creating one common curbside blue box collection system across Ontario;
- Expand blue box services to:
    - Communities outside the Far North, regardless of their population;
    - Additional sources, such as multi-unit residential buildings, schools, retirement homes, long-term care homes and some public spaces; and,

- Make producers responsible for meeting management requirements for blue box materials, such as diversion targets.

The proposed regulation would not:

- Impact existing deposit return initiatives operated for alcohol beverage containers; and,
- Require producers to provide blue box services in the industrial, commercial, and institutional sectors (beyond additional sources mentioned above).

Industrial, Commercial and Institutional (IC&I) sector

The Ontario government intends to move forward to reform the IC&I waste framework in the coming months. This would be separate from the proposed blue box regulation. Where possible, the reformed IC&I waste framework would align with the types of materials collected for recycling proposed in the blue box regulation. The goals could include:

- Maintain provincial direction to IC&I establishments to reduce and divert waste;
- Improve overall diversion in the IC&I sector;
- Reduce and minimize burden to IC&I establishments; and,
- Support verified outcomes and modernized compliance.

A full consultation will take place for the IC&I waste framework over the coming months. One of the SWMS options proposes to provide promotion, education and technical support to the ICI sector on implementing their own waste diversion programs to meet any upcoming provincial and federal requirements.

2.4.1.2 Other Provincial Diversion Programs

In Ontario, **used tires** were the first material under the new legislation to move to IPR on January 1, 2019.

As of January 1, 2021, following the wind up of the Waste Electrical and Electronic Equipment Program operated by the industry funding organization Ontario Electronic Stewardship on December 31, 2020, **Electrical and Electronic Equipment** (EEE) producers are individually accountable and financially responsible for collecting and reusing, refurbishing or recycling their products when consumers discard them. There are no registration and reporting requirements for First Nations, municipalities or other EEE collectors under the new EEE Regulation.

On December 11, 2018, the MECP amended the timelines associated with the wind up of the **Municipal Hazardous or Special Waste (MHSW)** Program. In July 2019, the Minister directed Stewardship Ontario to

wind up the MHSW Program by June 30, 2021. The draft regulations for MHSW were released on February 11, 2021 and the public consultation period ends March 28, 2021. The new regulation would require producers to establish free collection networks for customers; manage all collected material properly for recycling or disposal, provide promotion and education, to register, report, provided sales data and keep records and to be transparent about any charges that are intended to be passed on to consumers. The new regulation is expected to be in effect on July 1, 2021. As per the Minister's direction, the program for **single-use batteries** operated by Stewardship Ontario was wound up on June 30, 2020.

This IPR approach has widespread support amongst policymakers as one of the most effective tools to ensure that the producers of products consider post-consumer treatment and/or proper disposal of their products.

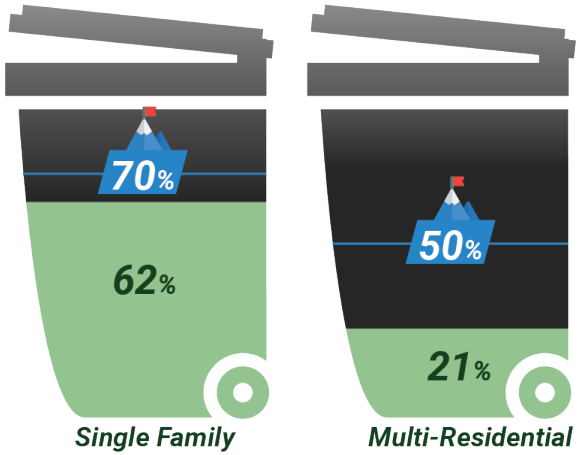
2.4.2 Food and Organics

Food and organic waste has also been a focus for the Province, both for the significant and negative effect methane produced when this material anaerobically degrades in a landfill, has on climate change and the fact that proper disposal and processing of this waste can turn waste into a usable resource. In 2018, the Province of Ontario introduced the **Food and Organic Waste Framework** and **Policy Statement**. The Framework includes actions and policies that seek to prevent and reduce food and organic waste, expand green bin usage across the Province, ban food waste from landfills, rescue surplus food, collect and recover food and organic waste, expand outreach efforts and support the beneficial use of recovered organic resources. The Policy Statement sets a target of 70% waste reduction and resource recovery of food and organic waste generated by single-family dwellings in urban settlement areas by 2023 and 50% waste reduction and resource recovery of food and organic waste generated at multi-residential buildings by 2025. In late November 2020, the Province released their next set of priorities to implement the Made-in-Ontario Environment Plan which includes a move to phase out food and organic waste send to landfill by 2030.

> Target: 70% waste reduction and resource recovery of food and organic waste generated by single-family dwellings in urban settlement areas by 2023.

On September 30, 2020, the MECP announced it is moving forward with its plan to reduce the amount of food waste going to landfills by proposing changes to its **Food and Organic Waste Policy Statement**. The proposed changes are to encourage municipalities, businesses, institutions and processing facilities to continue taking action to meet their targets beyond 2023 and 2025. Based on the most recent waste audit data conducted for the Region, the single-family Green Cart program is capturing

62% of organics generated and the multi-residential Green Cart program is capturing 21% of organics generated[2]. The Region is in a good position to meet the province's single-family target however more effort will be required to meet the multi-residential building target.



To increase transparency and accountability around waste reduction, as part of the updated policy statement, the MECP is developing guidance to help municipalities and IC&I generators. Progress on meeting those targets, as a province, will be reported every five years. The Province is also working with the federal government to develop a path forward for compostables so that emerging and innovative products and packaging can be managed appropriately.

The Policy Statement proposed changes would clarify the types of food and organic waste are included in resource recovery efforts.

To meet targets under the Policy Statement:

- Efforts **shall** be made with respect to food waste, inedible parts of plants and animals resulting from food preparation and pet food waste;
- Efforts **should** also be made with respect to several types of organic wastes, such as soiled paper and food packaging, coffee filters, tea bags, compostable coffee pods and compostable bags; and,
- Efforts are **encouraged** to be made with respect to several types of harder to manage organic wastes, such as diapers and pet waste.

To make the Policy Statement more effective it will support effective management of compostable products and packaging by:

- Encouraging municipalities, organic waste processers and the compost packaging industry to support the use of **pilot projects** and research on the processing of compostable products and packaging to maximize recovery and minimize contamination;
- Encouraging municipalities and organic waste processors to examine the feasibility of **updating existing technology** to process compostable products and packaging; and,

[2] Data provided by the Region in March 2021 which based on summer and fall waste composition studies completed in 2019.

- Encouraging municipalities and organic waste processors to consider adopting technology to collect and process compostable products and packaging in their systems when they are **planning for new technology**.

2.4.3 Single-Use Plastics

Not included in the provincial timeline above, is the federal government's proposed ban on single-use plastics. On June 10, 2019, the federal government announced its intent to pursue a ban on single-use plastics, which would largely mirror the ban currently being implemented by the jurisdictions in the European Union.

On October 7, 2020, Environment and Climate Change Canada (ECCC) announced the next steps in the Government of Canada's plan to achieve zero plastic waste by 2030. A key part of the plan is a ban on harmful single-use plastic items where there is evidence that they are found in the environment, are often not recycled and have readily available alternatives. There are several components to the plan including a focus on on-going federal provincial collaboration, increased funding for Canadian-led plastics reduction initiatives and the expectation that the country can reduce 1.8 million tonnes of greenhouse gas emissions each year and create about 42,000 jobs by pursuing a zero plastic waste plan. Listing plastics as toxic under Schedule 1 of CEPA will provide the government with the authority to regulate and limit certain products.

The government's plan was open to public comments and feedback until December 9, 2020. The plan includes specific questions regarding the issues of managing single-use plastics, establishing performance standards (e.g. for recycled content requirements) and ensuring end-of-life responsibility.

Three Cornerstones to the New Federal Plan

1

Six items were identified for proposed banning by 2021. They are: plastic checkout bags, straws, stir sticks, six-pack rings, cutlery and food ware made from hard-to-recycle plastics (i.e. foam plastic, black plastic, PVC, oxo-degradable plastic or composite plastics).

2

Establish recycled content requirements for products and packaging. This is intended to drive investment in the recycling infrastructure and spur innovation in technology and product design to extend the life of plastic materials.

3

Strengthen existing programs and increase Canada's capacity to reuse and recover more plastics. This suggests a strong role for extended producer responsibility programs to help meet future targets.

It is also worth noting that these potential plastic bans align with the efforts of the Canadian Council of Ministers of the Environment's (CCME) **Strategy on Zero Plastic Waste** and the **National Zero Waste Council**'s focus on Product Design and Packaging. Both leading national organizations are also committed to supporting a Canada-wide shift from a "take-make-dispose" economy to a circular economy. Also emerging are formations of plastic industry bodies including a new national, industry-led collaboration (called the **Canada Plastics Pact**) based on global leadership by the UK based Ellen McArthur Foundation and its **New Plastics Economy Global Commitment**; and the emergence of the national Chemistry Industry Association of Canada (**CIAC**) as the lead spokes-agent through its new **Plastics Division**, for the key elements of the plastics industry regarding waste/environmental issues in Canada.

2.4.4 Summary of Potential Legislative Impacts

The legislative changes will impact how Ontario municipalities manage materials in the waste stream, particularly Blue Box materials. It is likely that the Region will continue to manage residential garbage and organics in the new waste system, however, the proposed legislation provides opportunities for the Region to examine and consider the extent to which it is involved in management of other materials in the waste stream such as Blue Box materials.

Over the next five years in particular, as the shape of the Waste-Free Ontario Act and the role of municipalities in the proposed new waste system becomes clearer, performance measures will need to be re-examined and revised to reflect the evolving role of the Region in some aspects of the solid waste management system. In addition, municipalities will move from being the primary service provider for all waste management programs to providing service for some waste management programs (i.e., less the Blue Box program and other extended producer responsibility programs).

The legislative changes were proposed in 2016, before the Region initiated the SWMS, therefore some of the options proposed for the Strategy were developed with the legislation in mind. Decisions about how Halton Region delivers waste management services will need to reflect the potential changes to this regulatory environment.

2.5 Impacts of COVID-19

The coronavirus (COVID-19) pandemic led to a significant disruption of waste management services. On March 17th, 2020, the Ontario government declared a state of emergency in Ontario, which ordered non-essential business closure, including schools, daycares, bars and restaurants and theatres. Many municipalities in Ontario decided to reduce waste services and close waste management sites to prevent the spread of COVID-19. The Region of Halton continued to provide curbside collection programs, with the exception of a temporary suspension of bulk waste collection, and kept the certain components of the HWMS open with new procedures and policies to ensure employees' and customers' safety.

Between 2016 and 2018, the average annual increase in quantities of waste collected was 0.8% with 2017 and 2018 having a decline in waste quantities collected compared to preceding years. The increase in waste collected between January through June for 2019 and 2020 was more than 6%, over the annual average between 2016 and 2019, which would indicate a significant rise in collected tonnes for 2020. ***Figure 5*** shows the waste streams collected curbside by the Region between January and June for 2019 and 2020, for comparison purposes. A significant factor in the increase was leaf and yard waste (LYW) collected during April, highlighting a 55% increase for April and a 12% increase over the six-month timeframe. Another key highlight is that single family waste quantities increased from 2019 to 2020 by approximately 4% whereas waste collected from publicly funded schools and Regional/Municipal facilities decreased by 7% due to closures caused by the pandemic (which is collected with multi-residential waste).

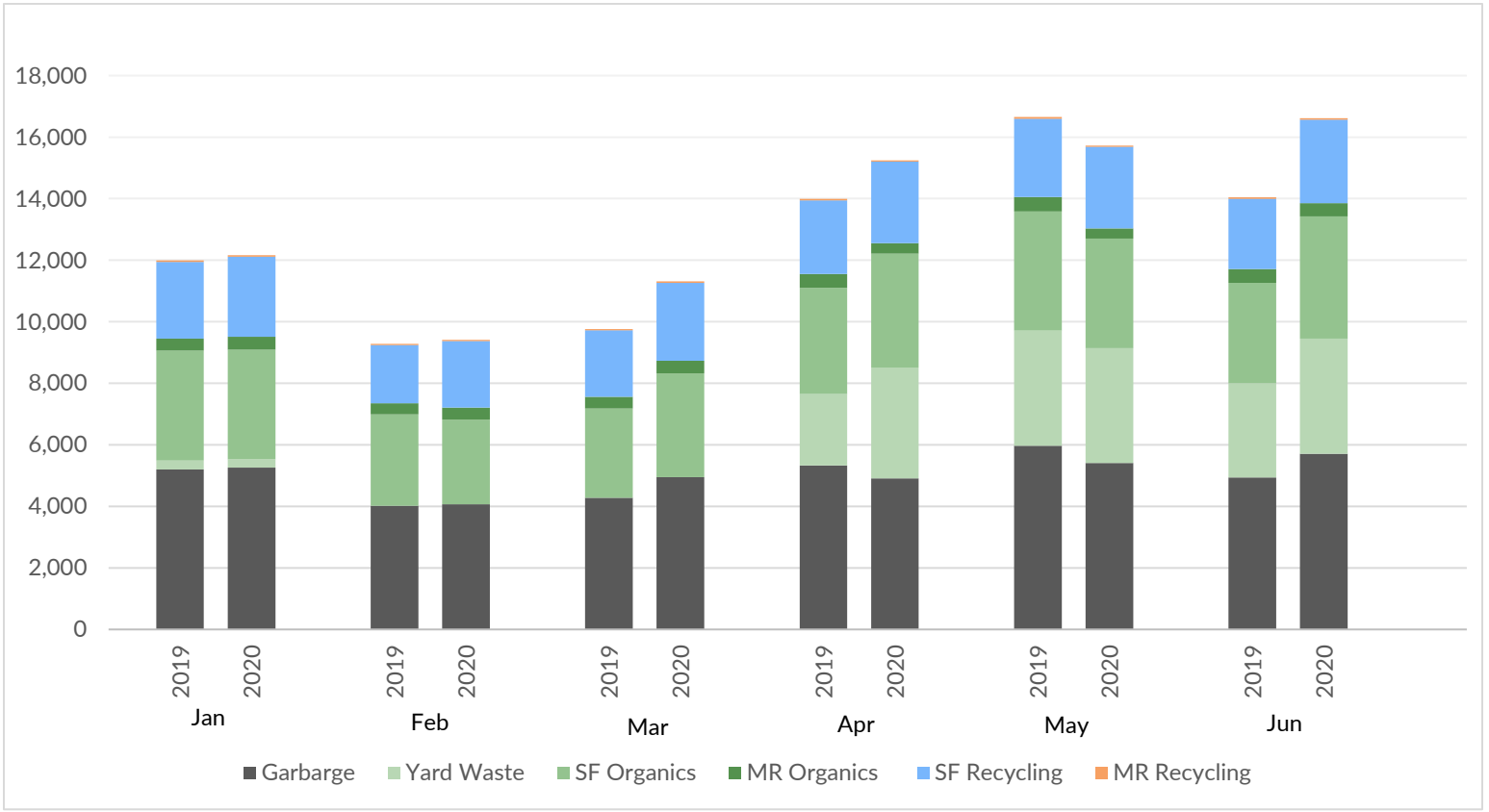


Figure 5: Curbside Collected Tonnes (January through June, 2019-2020)

Figure 6 and *Figure 7* highlight the impacts on waste quantities and traffic at the Container Station, respectively, between 2019 and 2020. *Figure 6* shows the number of customer visits, in terms of traffic counts, to the Container Station. The percent markers on the graph represent the increase in the number of customers visiting the Container Station from January to July in 2020 compared to 2019. The Container Station saw an overall increase of 19% for on-site traffic in 2020 compared to the same time frame in 2019, with June and July showing large increases. *Figure 7* shows a comparison of the total quantities of waste managed at the Container Station between January and July, for both 2019 and 2020. The Region experienced a 17% increase in waste quantities received in 2020 compared to 2019. This correlates with the increase of roughly 19% of customer drop-offs recorded at the Container Station.

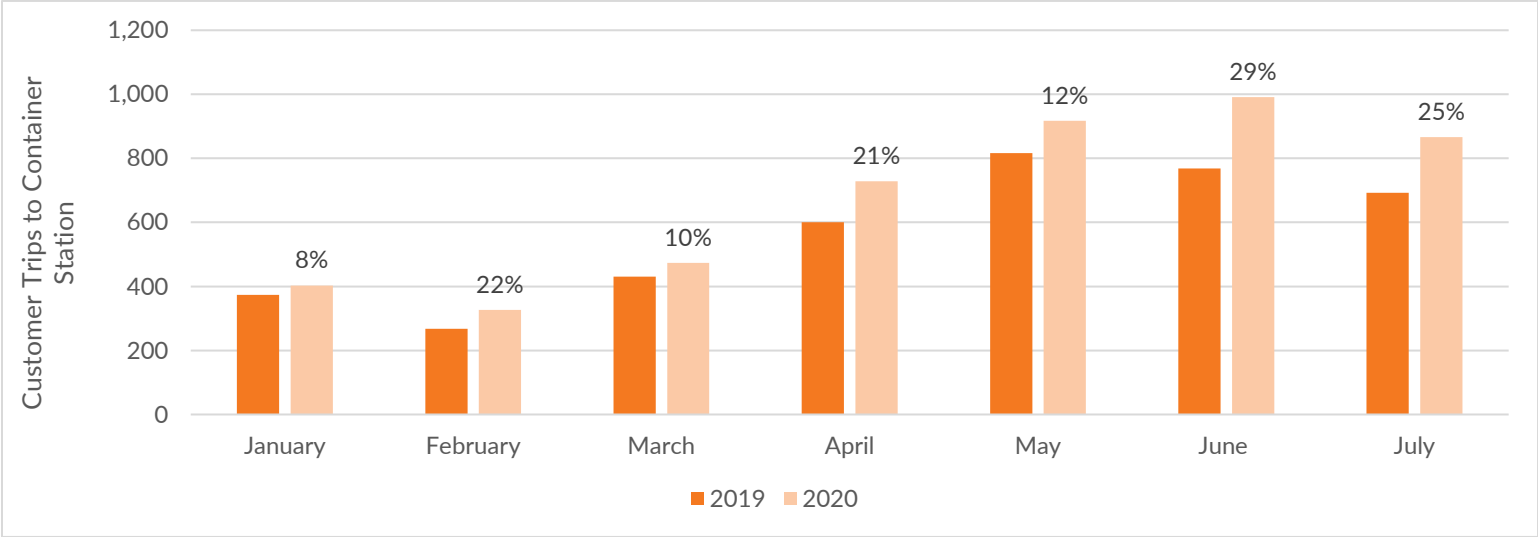


Figure 6: Comparison of Traffic at HWMS between March and June (2019 vs 2020)

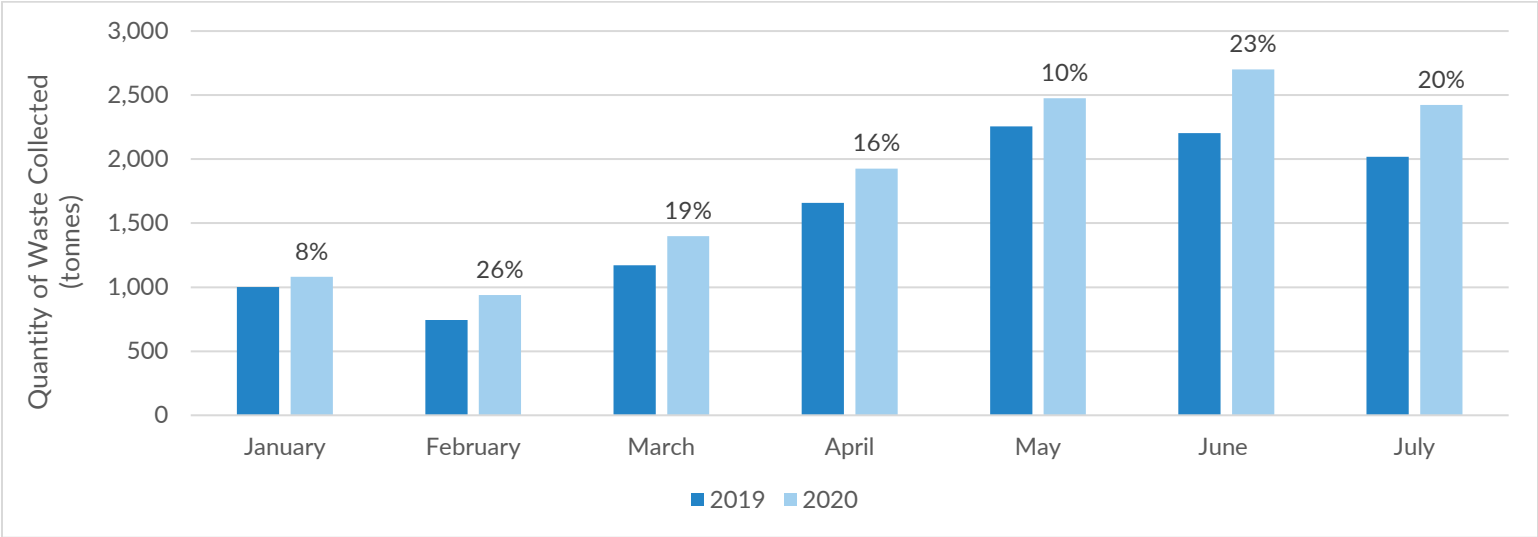


Figure 7: Comparison of Waste Collected at HWMS between March and June (2019 vs 2020)

Halton REGION

April 2021

3.0 Needs Assessment

Where do we want to go?

The Needs Assessment Report (Appendix B to the Short Term SWMS) was finalized in 2018 which took the findings from the Current Profile report to identify where improvements and/or additions to the Region's waste management system could be made to meet future needs and align with the SWMS **Vision Statement**, **Objectives** and **Key Performance Indicators**. Additionally, the assessment included population and waste projections to estimate the program requirements for the next 30 years and commentary on the impacts on the waste management system of housing trends, changes in waste materials, Regional initiatives and provincial and federal legislation. Lastly, the Needs Assessment documented the strengths, weaknesses, opportunities and threats in the Region's waste management system.

OBJECTIVES

- Enhancing diversion programs and developing innovative new waste solutions;
- Ensure the waste management system is accessible and equal for all users, with a focus on customer service, convenience, and efficiency;
- Financially and environmentally sustainable, with flexibility and resilience to changes in technology, policy and legislation, waste streams, and the community; and
- Working in partnerships and supporting public engagement, outreach, and collaboration.

KEY PERFORMANCE INDICATORS

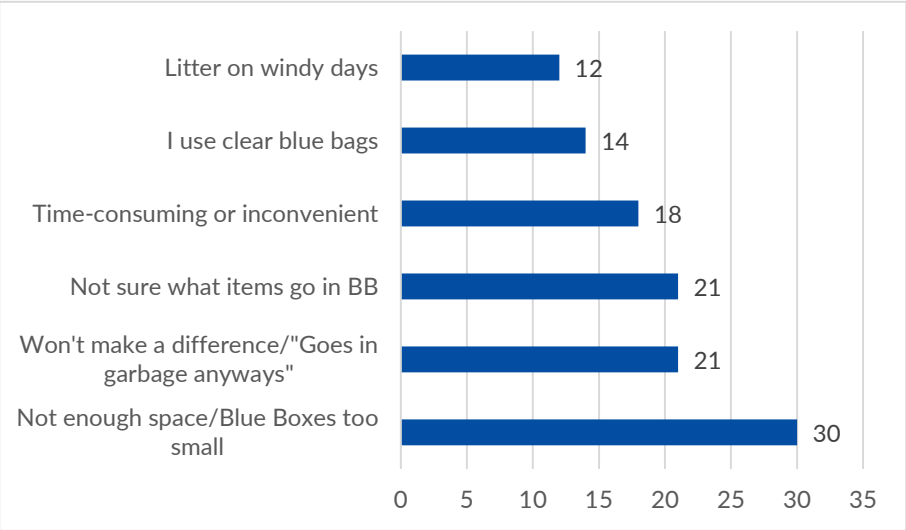
- Per capita statistics, including waste generated, diverted, and disposed, in kg/capita and by housing type (single family, multi-residential etc.);
- Percentage of waste diverted by material streams;
- Greenhouse gas emissions in kilograms of CO_2 equivalents (kg CO_2e);
- Cost per tonne and cost per household for waste management services;
- Landfill lifespan; and
- Customer wait times at HWMS.

4.0 Public Survey

In 2019, the Region of Halton released an online survey on the Region's waste and diversion programs currently used by residents. The survey received over 3,800 responses from the public, with the majority of respondents living in single-family dwellings (81%) in an urban area (94%).

Overall, 98% of respondents stated that they regularly use the Blue Box program. *Figure* 8: *7* displays reasons why a respondent does not use the Blue Box, with the common reason being 'not enough space'. The Green Cart also has a strong participation rate, with 84% of all respondents claiming to use the program regularly. *Figure* shows the reasons why a respondent doesn't use the Green Cart, with 'odour issues' being the most common reason.

When asked which waste collection services respondents regularly used, overall, those living in single-family housing had higher participation rates in all three programs, with 10.1%, 43.2%, and 38.3% more participation in the blue box, green cart and bulk waste programs, respectively, compared to respondents living in multi-residential dwellings (*Table 2)*.



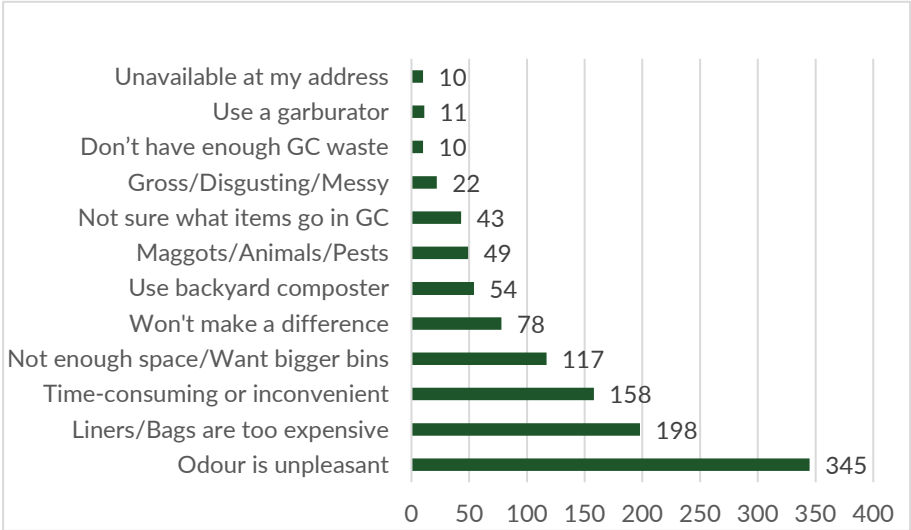


Figure 8: Respondents Reasons for Not Participating in Green Cart Program

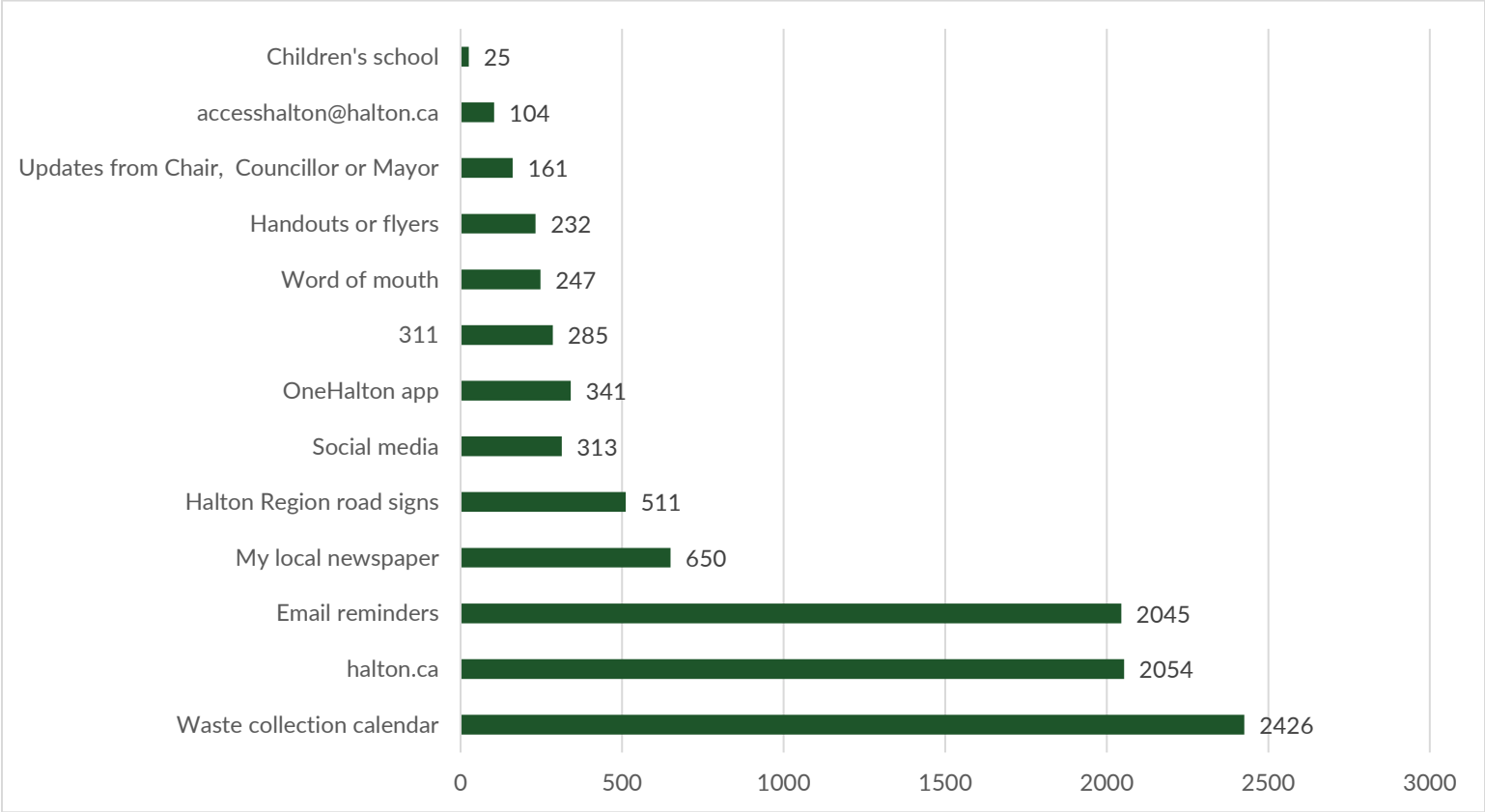
Table 2: Program Participation Rates by Dwelling Type

Dwelling Type	Blue Box	Green Cart	Bulk Waste
Single Family	99.7%	86.1%	66.9%
Multi-Residential	89.6%	42.9%	28.6%

The Region also asked questions about where the public turns to get information on waste management information and the results are presented in ***Figure 9***.

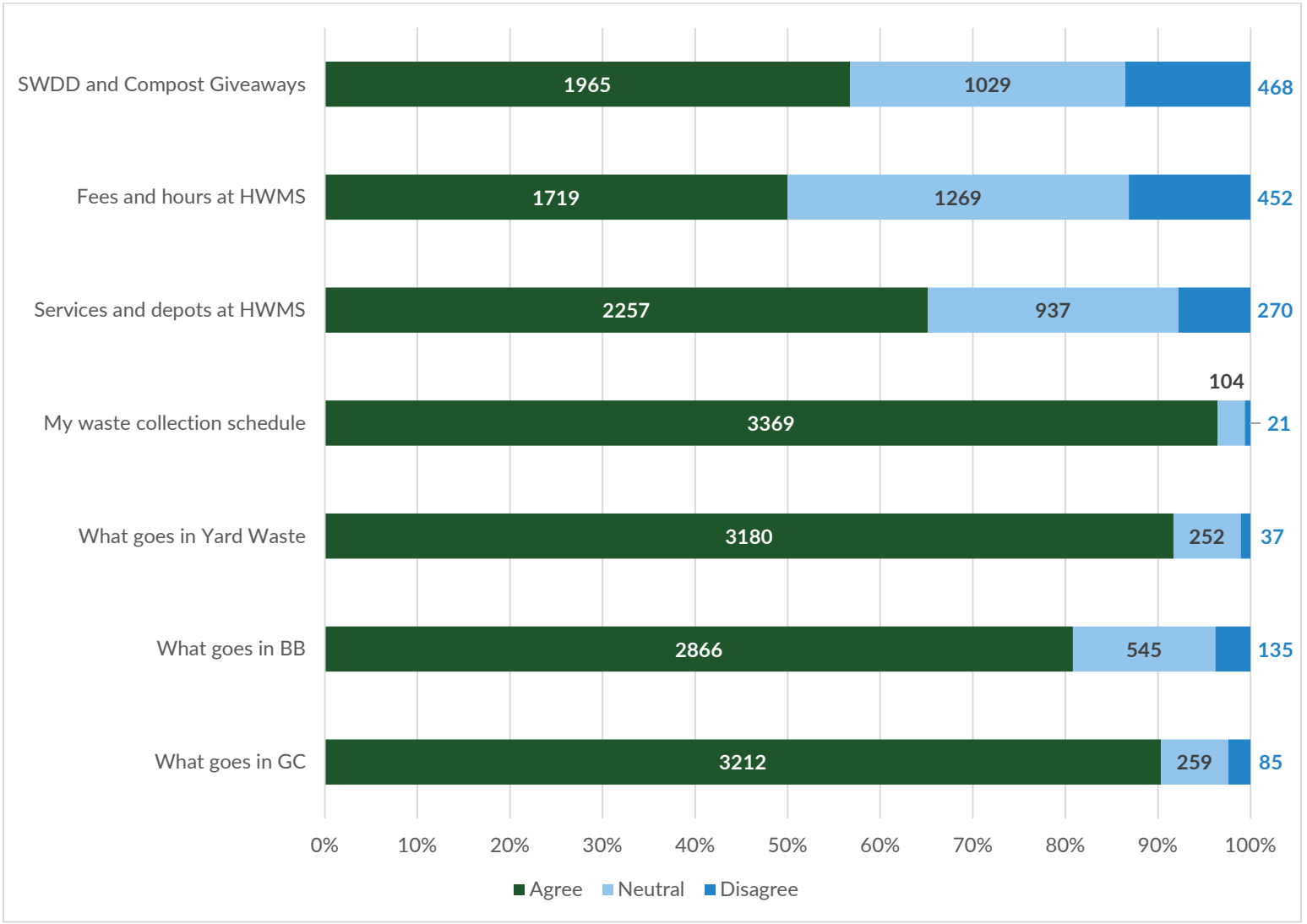
Figure 9: Sources of Waste Information

Figure 7: Respondents Reasons for Not Participating in Blue Box Program



When it comes to how informed respondents felt about various aspects of the Region's solid waste management programs, most felt they were well-informed (*Figure 10*).

Figure 10: Response to "Overall, I feel well-informed about the following"



It is anticipated that additional public consultation will occur in 2021 to get input on the draft Medium-Long Term SWMS. The information provided above on how best to reach the public will be considered in the consultation plan for the SWMS.

5.0 Options Identification and Evaluation Results

How do we get there?

Municipal waste management systems are large and complex integrated systems that consist of policies, programs, initiatives and infrastructure. After developing an understanding of the current system and future needs, a long list of potential recommendations (referred to as "options") to enhance and/or improve the Region's waste management system was developed. The process followed to identify the list of potential options is documented in Appendix C to the Short Term SWMS. The options were divided into short term (1-3 years), medium term (4-10 years), and long term (11+ years) implementation timelines and categorized into the following waste system functions:

- Waste Diversion and Policy (WDP);
- Collection (C);
- Drop-off and Transfer (DT);
- Processing (P); and,
- Residual Processing and Disposal (RD).

The types of options included programs to reduce waste generation and increase participation in reuse programs and services, techniques to capture more waste for diversion, waste technologies to process waste, alternative disposal options, and long-term management plans for the HWMS. The ultimate goal is to extend the life of the Region's landfill.

5.1 Overview of Medium and Long Term Options

The most recent waste audit data from 2014 and 2017 showed that 51% of the single-family residential garbage stream consisted of materials that could be diverted through the Region's current waste programs, however, a significant amount of waste still needs to be managed, whether it be through alternative technologies and/or landfill disposal. The Region is in a fortunate position to own its own disposal facility that has potential to be expanded, given the provincial disposal capacity is anticipated to be depleted by 2032[3]. While the Region's landfill is anticipated to last until 2044-2048 at current disposal rates, there are opportunities to extract valuable resources and energy from the residual waste stream and further extend the life of the landfill site.

There were 33 medium and long term options identified in the original long list of options that strive to address future needs and opportunities of the Region's waste management system. The original long list of options was developed in 2017 and since then some of the medium and long term options have been modified, combined with other options or removed. As a result 28 medium and long term options were carried forward for evaluation.

Detailed descriptions of each option, including explanations of changes made, is provided in ***Appendix A – Medium and Long Term Options Identification Memo***.

[3] Ontario Waste Management Association. (2019). State of Waste in Ontario: Landfill Report (December 2019).

5.2 Evaluation Results

An evaluation approach was developed as part of the Short Term SWMS that involved an objectives-based method instead of traditional comparative analysis, given that many of the proposed options could not be compared directly to each other. The objectives-based approach consists of asking the necessary questions to conduct a triple bottom line evaluation (Environmental, Social, Financial) for each option.

A customized evaluation tool was developed that produced numerical score results based on the relative weightings and ranking applied for each criterion for each option. The evaluation approach was first used for the short term options and eight options were recommended. The same evaluation approach was used to score the medium and long term options. The high-level results from the evaluation of medium and long-term options are included in this section and further detailed in ***Appendix B – Medium and Long Term Option Criteria and Evaluation Memo***. It is being recommended to carry forward 16 of the 28 options as part of the draft Medium-Long Term SWMS. ***Table 3*** provides a summary of the options that were evaluated and the results of the evaluation.

Table 3: Summary of Options Evaluated and Results

Option Code	Option Title	Option Description	Carried Forward?	Rationale
WDP 4	Support the Circular Economy	Provide support for local innovators and/or organizations that design for the environment and/or reduce, reuse and reclaim waste.	✓	
WDP 6	Support the Sharing Economy	Promote the sharing economy (e.g., repair cafes, tool libraries) through supporting, partnering and/or partially funding organizations involved in this area.	✓	
WDP 7	Alternatives to By-law Enforcement	Conduct targeted outreach to households to improve compliance with the Region's waste management by-laws.	✓	
WDP 8	IC&I Waste Diversion Promotion and Education	Provide P&E to small and medium sized businesses through a waste diversion campaign and a dedicated webpage. Evaluate impact of SUP ban on sector.	✓	
WDP 11	Enhanced Contractor Collection Services	Conduct compliance blitzes to increase proper residential set outs	✓	
WDP 12	Review Event Diversion Program	Train and coordinate volunteers to deliver waste diversion services at community events.	✗	Combined with WDP 4.

Option Code	Option Title	Option Description	Carried Forward?	Rationale
WDP 13	Decrease Garbage Bag Limits	Decrease garbage bag limits in phases with Phase 1 reducing to 2 bags and Phase 1 reducing to 1 bag.	✓	
WDP 14	Promotion & Education for Diversion	Continue to find new ways to promote and educate waste management programs in order to increase program participation (e.g., face-to-face interactions, pop-up events, market research, social media).	✓	
WDP 15	Waste Management Improvements	Improve multi-residential building waste diversion performance through increased and targeted promotion and education.	✓	
C 4	Construction & Demolition (C&D) Recycling	Consider potential reuse and recycling opportunities for shingles that are currently being landfilled.	✗	The Region does not receive enough of this material for this option to be feasible.
C 5	Bulk Waste Diversion	Work with a social enterprise to collect mattresses from the HWMS for recycling.	✗	Combined with WDP 4.
C 6	Automated Collection Study	Conduct a feasibility study to move to a cart-based collection program.	✓	
C 7	"Smart City" Technology	Conduct a feasibility study for the use of underground waste collection and weight tracking per multi-residential unit.	✓	
C 10	Expand Existing Collection Services	Expand collection program to align with future Provincially-designated materials.	✓	
C 11	Track Waste Containers	Optimize use of existing Radio-frequency identification (RFID) tags in MR containers to enhance collection and reporting of waste diversion.	✓	
C 13	Extend Curbside Yard Waste Collection	Look at options to extend the collection of leaf and yard waste year-round.	✗	Region extended the program and can further extend, if needed.
C 14	Review Non-Residential Customer Base	Review other programs and policies associated with providing collection services to non-residential customers.	✗	Will be revisited once new regulations for IC&I waste are released.
C 15	Alternatives to Petroleum-Based Fuels for Waste Management Vehicles	Use alternative fuels for waste collection vehicles and onsite equipment.	✓	
DT 6	Additional Public Waste Drop-Off Depots	Conduct a feasibility and siting study first to provide two additional permanent locations for residents to	✓	

Option Code	Option Title	Option Description	Carried Forward?	Rationale
		drop-off excess curbside collected and non-curbside waste.		
DT 7	Optimize Use of HWMS	Consider opportunities to optimize the use of the available and unused lands available within and/or on adjacent owned lands surrounding the HWMS.	✗	Deferred until currently approved study on HWMS optimization is completed.
DT 8	TS for Curbside Collection Vehicles	Determine if the Region should continue contracting transfer station capacity with private facilities or enlarge capacity at HWMS.	✗	Separate study is in progress.
P 1	Service Delivery Approaches	Review service delivery approaches for organics and recycling processing.	✗	No changes proposed at this time.
P 2	Alternative Technologies for Organic Waste	Consider alternative technologies to recover energy and divert more organics through collection (e.g., diapers, sanitary, pet waste).	✗	High degree of risk and cost associated with implementation. To be reviewed again in the future.
RD 1	Optimize Landfill Operations (Phase 2)	Optimize landfill operations to increase the remaining capacity and/or extend the site life of the landfill.	✗	Combined with RD3.
RD 2	Alternative Technologies for Residual Waste	Conduct a feasibility study to confirm the best available and appropriate technology for the Region and partnership opportunities.	✗	Combined with RD3
RD 3	Extend Landfill Capacity	Continue to revisit timing for when the HWMS could be expanded (current lifespan is until 2044). Conduct an Environmental Assessment and expand the landfill.	✓	
RD 4	Optimize Utilization of Landfill Gas	Review existing contract agreement. Conduct a study to modify/enhance the utilization of landfill gas at the HWMS. Conduct a Cost Benefit Analysis (CBA) to review and evaluate potential LFG use options and identify a preferred alternative.	✓	
RD 5	Disposal Bans	Consider the use of expanded disposal bans at the Halton Region Landfill.	✗	High level of resources and associated costs required. However, if any level of government proposes a ban on certain materials, the Region will comply.

There are several options noted above that are recommended to first conduct a feasibility study or business case given the high capital and/or operating costs that are carried once implemented (C6, C7, DT6, RD3, RD4). These studies will be conducted within the next five-year planning timeline which will serve to: 1) review the most innovative and proven technologies and/or approaches at that time and 2) conduct more detailed analysis on the costs, risks and other considerations associated with the option.

The SWMS provides recommended options that will benefit single-family and multi-residential households, businesses, the community as a whole and the Region's solid waste management system. Options were developed and evaluated with the waste hierarchy in mind placing emphasis on reducing, reusing, and recycling waste first, followed by recovery of materials and/or energy and lastly, residuals management. Reduction is the highest ranked category (the most desirable), with residuals management being the last or least desirable option. The ultimate goal is to reduce the amount of waste that is sent for landfill thereby further extending the life of the Region's landfill. The following provides an overview of the recommended options proposed in this draft SWMS grouped with the sector that each option will provide a benefit. The estimated impacts on waste diversion, cost and greenhouse gas emission reductions is also included.

Recommendations for the Halton Region Community

Recommendations for the Community

Impact on Diversion Rate (%)	One-Time Cost	Ongoing Annual Cost	Capital Costs	GHG Reductions (tonnes/year)[2]
2.5% - 5%	$ 150,000	$ 3,320,000	$ 39,100,000	3,220

Support the Circular Economy
Provide support for local innovators and/or organizations that design for the environment and/or reduce, reuse and reclaim waste.

Support the Sharing Economy
Promote the sharing economy (e.g., repair cafes) through supporting, partnering and/or partially funding organizations involved in this area.

Enhanced Contractor Collection Services
Conduct compliance 'blitzes' to increase proper residential set outs.

Expand Existing Collection Services
Expand collection program to align with future Provincially-designated materials.

Additional Public Waste Drop-Off Depots
Provide two additional permanent locations for residents to drop-off excess curbside collected and non-curbside waste. Additional studies will be completed before a site(s) is selected.

Promotion and Education for Diversion
Continue to find new ways to promote and educate waste management programs (e.g., pop-up events, market research, social media).

The SWMS considered a number of initiatives that would benefit the community at large. Continued improvements in ways to increase effective participation in waste reduction and diversion programs will be implemented.

With a priority on reducing waste generation, it is proposed the Region expand its Waste Diversion Fund to include several of the options in this sector. The Fund will target local innovators and/or organizations that could reduce, reuse and reclaim materials that would otherwise be disposed. The Region is open to considering partnerships with non-profit community groups to adopt/support and assist in the promotion and education within the community regarding overall waste minimization.

The sharing economy is a concept that aims to increase the reuse of materials and it is recommended that the Region support organizations that strive to do this through repair cafes and tool sharing libraries, as examples. The Region already provides recycling services to community events, however it proposed to support organizations to reach the next level of the hierarchy, waste reduction, to strive for zero waste events.

The Region currently has one public drop-off depot (HWMS) that is located in Milton. In an effort to increase access and convenience for residents to drop-off excess curbside collected and non-curbside collected waste, it is recommended to develop two additional permanent public drop-off depots in the urban areas of the Region. Specific sites are not known at this time and will be recommended as part of a feasibility study.

Recommendations for Single-Family Households

In recent waste composition studies, it was found that the average bag of garbage contains 14% of blue box recyclable materials and 31% of organic materials. This means that almost half of what is currently being landfilled could have been diverted. With the ultimate goal of reducing the amount of waste each Halton Region resident sends to landfill disposal, it is recommended to decrease the garbage bag limits. This is an economically efficient approach to achieving the desired behavioural change of increasing participation in waste diversion programs.

It is proposed that the decrease in garbage bag limits is conducted in two phases: the first phase reducing from the current 3-bag limit to a 2-bag limit in 2023 and the second phase reducing the garbage limit to 1-bag in 2031. In a 2020 participation study, the Region found that approximately 80% of households put out two bags or less of garbage on collection day and 97% are setting out three bags or less so it is anticipated that the first phase will be achievable. It is estimated that the Region could achieve an additional 1% increase in overall waste diversion with Phase 1 and an additional 2% diversion with the implementation of Phase 2 (i.e., total of 3% additional diversion).

Decreasing garbage bag limits is a big change for residents and as such, it must be supported through sufficient promotion, education and enforcement in order for its success. There are several tactics recommended in the SWMS to achieve this.

The use of automated carts will be further explored through a feasibility study. Carts can be easier for residents to manoeuver and can improve waste collection operations in terms of efficiency and improvements to worker safety with the use of automated collection vehicles. The Region currently has

Recommendations for Single-Family

Impact on Diversion Rate (%)	One-Time Cost	Ongoing Annual Cost	Capital Costs	GHG Reductions (tonnes/year)[2]
2%-4%	$ 250,000	$ 100,000	0	2,940

Decrease Garbage Bag Limits

Decrease garbage bag limits in two phases (2 bags, 1 bag).

Automated Collection

Conduct a feasibility study to move to a cart-based collection program.

Alternatives to By-Law Enforcement

Conduct targeted outreach to households to improve compliance with the Region's waste management

approximately 176,000 single-family homes. It is estimated that the average cost per cart is $55[4] (noting there are different sizes of carts available) which would require a capital investment of almost $10 million with the transition of one waste collection program to a cart-based program.

Recommendations for Multi-Residential Households

Recommendations for Multi-Residential Households

Impact on Diversion Rate (%)	One-Time Cost	Ongoing Annual Cost	Capital Costs	GHG Reductions (tonnes/year)[2]
0.75% - 1.5%	$ 62,000	$ 30,000	0	870

Track Waste Containers

Use radio-frequency ID tags to enhance collection and reporting of waste diversion.

Waste Management Improvements

Improve waste diversion performance through increased and targeted promotion and education.

"Smart City" Technology

Conduct a feasibility study for the use of underground waste collection and weight tracking per multi-residential unit.

Multi-residential household waste audit data completed in 2014 and 2017 indicated that almost 60% of what was landfilled could have been diverted. The Region continues to onboard multi-residential buildings to the Green Bin program and currently 335 buildings (with approximately 30,700 units) have access to the program.

There are unique challenges to waste collection programs in multi-residential buildings. For example, some older buildings have garbage chutes located on each floor whereas blue box and/or green cart materials must be taken to central collection areas (usually outside or in an underground parking area) which makes throwing garbage out more convenient than participating in diversion programs.

In an effort to promote the reduction of garbage sent to landfill, the recommended approaches for multi-residential households considers ways to make it easier to participate in waste diversion programs, increase promotion and education, acquire data on individual buildings for reporting purposes and introduce technology to track waste quantities by building/unit to prepare for a future partial pay-as-you-throw system. Use of RFID tags for bins as part of the next contract will enable the Region to consider a demonstration project or operationally investigate the framework to implement a partial user pay system for multi-residential garbage going to landfill. Housing intensification will continue to meet the provincial Greater Golden Horseshoe Growth Plan targets, making efforts to improve diversion from multi-residential households increasingly important in extending landfill capacity.

[4] Based on data gathered in 2021 from Canadian municipalities by Dillon Consulting Limited.

Recommendation for Businesses

Impact on Diversion Rate (%)	One-Time Cost	Ongoing Annual Cost	Capital Costs	GHG Reductions (tonnes/year)[2]
0.25% - 0.5%	$30,000	$15,000	0	290

IC&I Waste Diversion Promotion and Education
Provide promotion and education to small and medium sized businesses through a waste diversion campaign and a dedicated webpage.

Recommendations for Businesses

There is uncertainty in what future Provincial regulations will look like for the non-residential sector and when the changes will occur. In the interim, it is proposed that the Region provide promotion and education services to small and medium sized businesses to help implement or improve waste diversion efforts and to support during regulatory changes.

Recommendations for the Region's Solid Waste Management System

Extending the Region's landfill is a top priority and as such there are several recommendations related specifically to this asset.

Recommendations for the Region's Solid Waste System

Impact on Diversion Rate (%)	One-Time Cost	Ongoing Annual Cost	Capital Costs	GHG Reductions (tonnes/year)[2]
0%	$ -	$ -	$ 500,000	5,700

Optimize Utilization of Landfill Gas

Modify/enhance the utilization of landfill gas at the HWMS. Conduct a cost benefit analysis on how best to use landfill gas.

Alternatives to Petroleum-Based Fuels for Waste Management Vehicles

Use alternative fuels for waste collection vehicles and onsite equipment.

Extend Landfill Capacity

Review ways to optimize landfill operations, use technology to reduce the volume of waste requiring landfill and revisit the need to expand the HWMS landfill.

The first relates to continuing researching new ways to optimize landfill operation, which is an ongoing initiative at the Region. Reducing the volume of waste sent to landfill through the use of alternative technologies such as energy from waste (e.g., thermal treatment, gasification) and mixed waste processing (e.g., extracting divertables from the garbage stream) is recommended to be explored within the next five years. This will allow time to see the impact of the recommended options being implemented as well as be completed well before the landfill is anticipated to reach capacity. It is proposed to undertake a study to review the above (i.e., optimize operations, review alternative technologies and explore expansion of the existing landfill) in 2026 and initiate an Environmental Assessment in 2030 noting that it can take up to 10 years to obtain the necessary approvals and permits.

Currently, waste collection vehicles consume, on average, 125 litres of diesel fuel each day. The Region's contractor uses 65 collection vehicles which would amount to using over 2.1 million litres of diesel fuel each year which equates to about 5,700 tonnes of CO_2 emissions each year. Switching waste management vehicles from the use of diesel fuel to a non-petroleum based fuel will contribute to Regional GHG reduction goals.

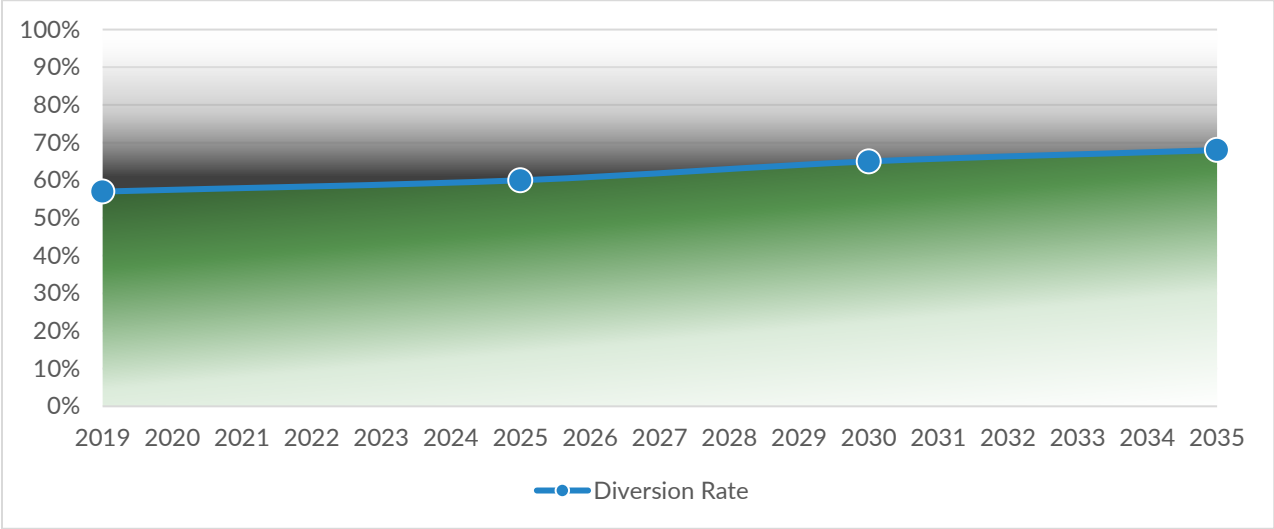
The HWMS consists of many facilities and services however there are still vacant lands that could be developed to suit future needs. The Region will be pursuing a study to optimize the use of the HWMS which could include new facilities such as an education centre, HHW and Reuse Depot, expanded compost pad, landfill expansion and installation of solar energy panels.

5.3 Impact of Recommended Options

The ultimate goal of the SWMS is to extend the life of the Region's landfill by reducing the amount of waste requiring disposal. The impact of implementing the options described above on additional diversion that could be achieved was estimated in order to then estimate the impact on landfill life. The diversion potential for each relevant option was estimated and it was assumed that the majority of options would take five years to reach the diversion potential. The exception was with the option to phase in reduction in garbage bag limits. For this option, it was assumed that in each of the two phases, it would take two years to reach the target diversion potential given the immediate impact the option has on the household.

The cumulative diversion potential that the Region could achieve through implementation of the Medium-Long Term options is estimated to range from 2% in 2024 to 10% in 2033 until the end of the planning period which brings the Region to a 60% diversion rate in 2025, 65% in 2030 and 68% in 2035 (***Figure 11***). It is noted that there are many different factors that affect the success of waste management programs, initiatives and facilities and would therefore impact the ability to achieve the full diversion potential of the SWMS options. It is also noted that given the Region's current high diversion rate, achieving further increases in diversion tends to be more costly and the results may be minor.

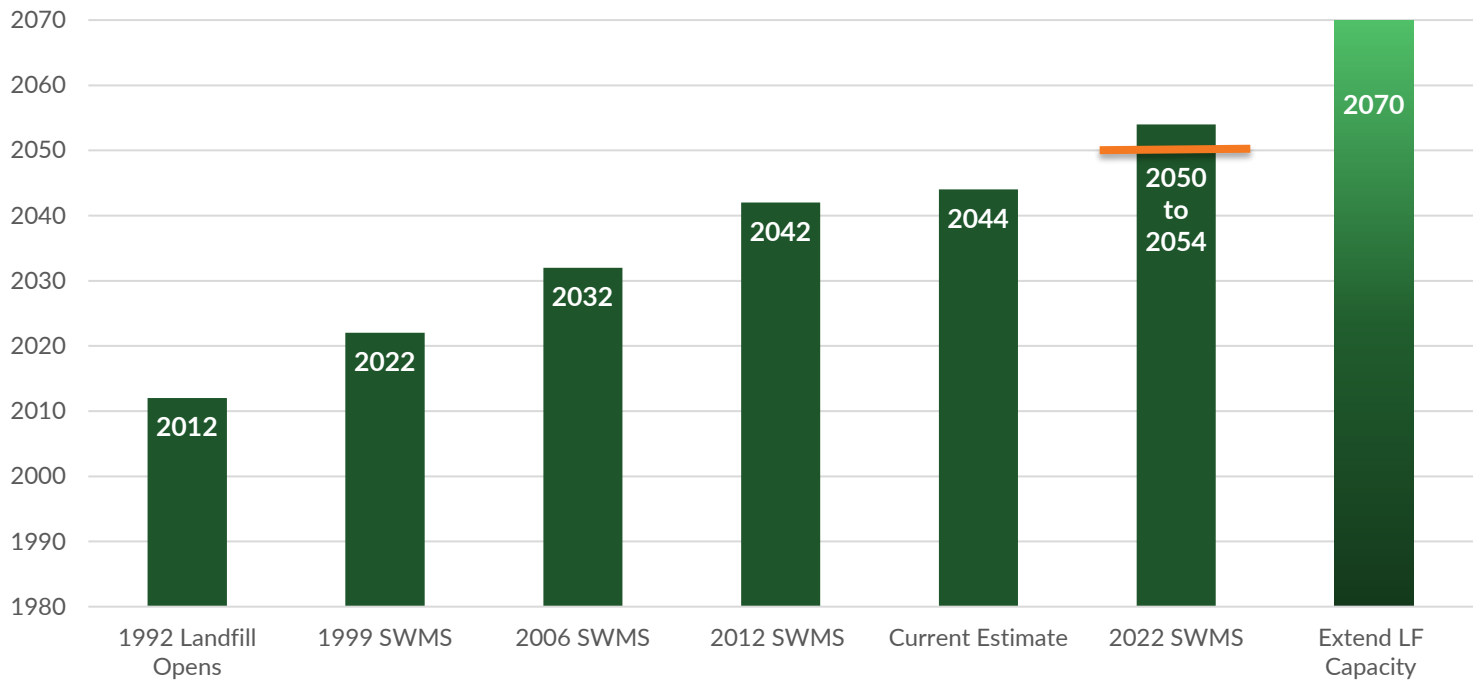
Figure 11: Estimated Diversion Rate Increase Over the Planning Period



The Short Term SWMS estimated the future quantities of waste that would be generated assuming an annual waste generation growth rate of 1% over the planning period. Assuming the diversion potential above is achieved and held until the end of the planning period, it is estimated that this could extend the life of the HWMS landfill by an additional 10 years or until approximately 2054-2056, if the Region is able to implement all of the initiatives and maximize full capture rate of the targeted materials. A realistic target based on partial implementation and moderate capture rates is 2050.

The Region intends to conduct an update to the SWMS in five years which will include a re-evaluation of the impact on landfill site life. The impact of past Strategies and this proposed SWMS on the extension of landfill life is illustrated in ***Figure 12***. It is anticipated that implementing the recommendations coming out of the SWMS option Extend Landfill Capacity will offer the biggest impact on extending the life of the landfill by increasing the capacity of the HWMS. This potential impact is also shown in ***Figure 12.***

Figure 12: Halton Landfill Life Estimate



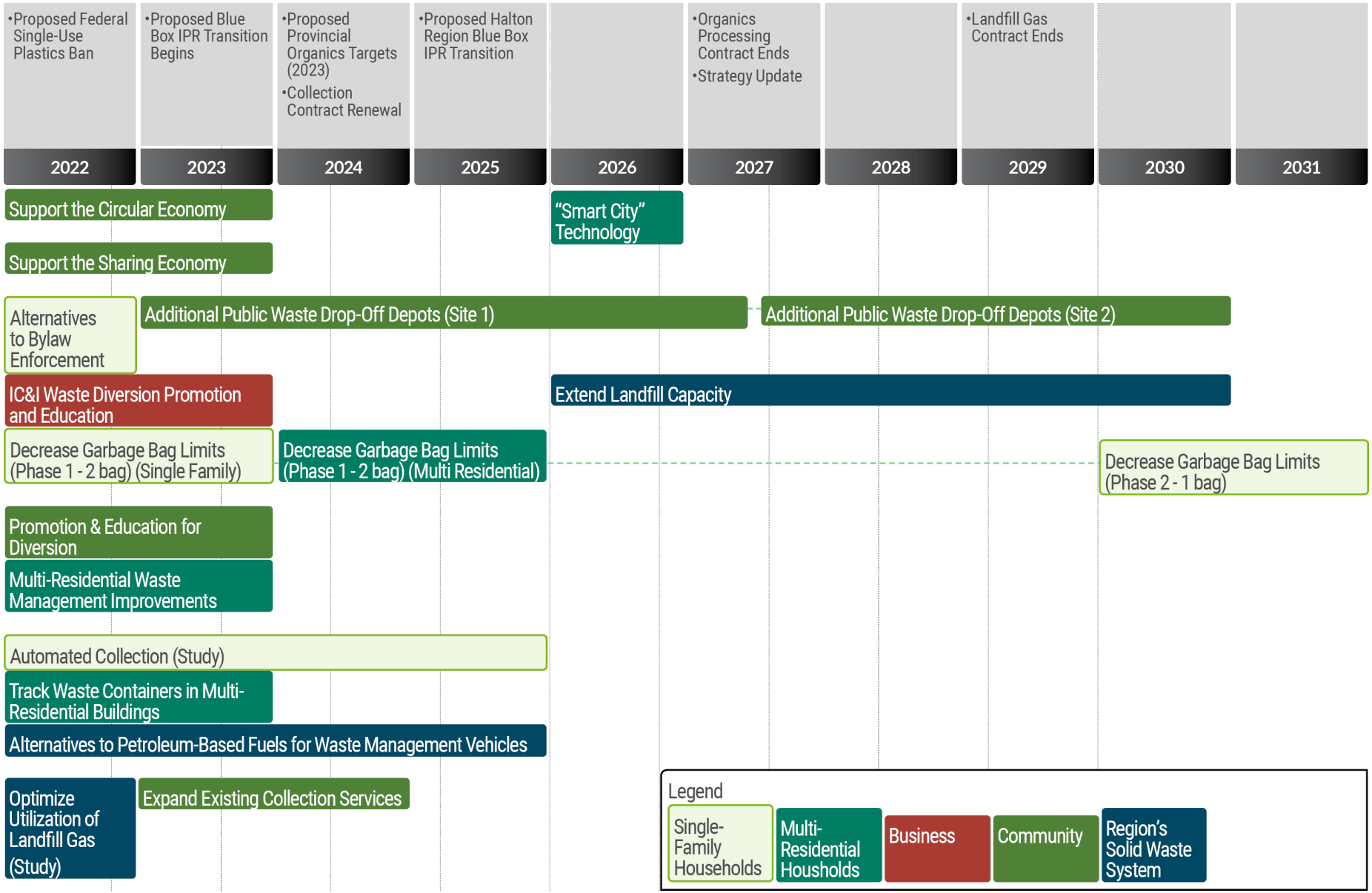
6.0 Implementation Plan

The Short Term SWMS, approved in 2018, included options to be implemented in the first three years of the SWMS (2018-2021). This Medium-Long Term SWMS proposes to implement options from Year 4 onwards (i.e., 2022+). The recommended Strategy sets a direction for the Region to embark on and follow. ***Figure 13*** provides the proposed timing for when the recommended options will begin planning and when it will be implemented (noted that some options will be planned and implemented within the same year).

The options are colour-coded based on who/what is affected (i.e., single-family households, multi-residential households, businesses, the community and the Region's solid waste system). The options that have been identified are designed to be specific, measurable, achievable, and relevant. Through the continued monitoring of system performance, additional opportunities for enhancement in the future will be easier to identify and will result in an even more effective and efficient waste management system.

Waste regulations, technology, trends and composition will change over time and given all the changes happening in the industry, it is recommended to conduct a SWMS review every five years. As such, the next update is proposed to be initiated in 2025.

Figure 13: Medium and Long Term SWMS Implementation Plan



7.0 Financial Analysis

This section summarizes the annual incremental costs of the recommended options for the Region. The cost impact of the options was compared to the 2020 Operating Budget for the Region's Solid Waste Management division. Of the 16 recommended options, 10 had new costs associated with them that have been incorporated into the financial forecast to 2040. The 2020 Operating Budget ($52.2M) has been used as the baseline for all future years of analysis. The 2022-2040 operating budget forecast includes the incremental one-time and operating costs as well as necessary reserve contributions to fund the associated capital costs for the recommended options. The incremental operating budget impacts are shown in ***Figure 15*** and represent an average cost increase of approximately $4.6 million over the forecast period for the recommended options. The incremental increases result in an estimated average annual cost increase of $20.56 per household. The incremental cost per household impacts by year is shown in ***Figure 17***. Detailed information on the financial assessment is available in ***Appendix C – Financial Analysis of Recommended Options***.

7.1 Annual Incremental Cost Impact

This section identifies the annual incremental cost to the Region's Solid Waste Management Operating Budget from the implementation of the recommended options. The annual incremental costs include the incremental capital costs required to implement the options beyond what has been previously identified in the capital program and the associated operating costs, required for both implementation and ongoing operations. These costs have been added to the current 2020 budget. Region staff have indicated that the recommended options would be funded through capital reserves. This would require drawdowns on the current capital reserve. In order to fund the reserve, the capital cost of the recommended options will be paid as reserve contributions over the 10 years following implementation. The net reserve contributions have been captured in the incremental costs provided below. Annualizing the cost over a 10-year period ensures that no major costs occur in any one year and therefore the incremental option costs are relatively consistent year over year.

A breakdown of the incremental costs is provided in Figure 14: Option Incremental Cost***Figure 14***, separating incremental capital reserve contributions costs, implementation costs, and operating costs.

Figure 14: Option Incremental Cost

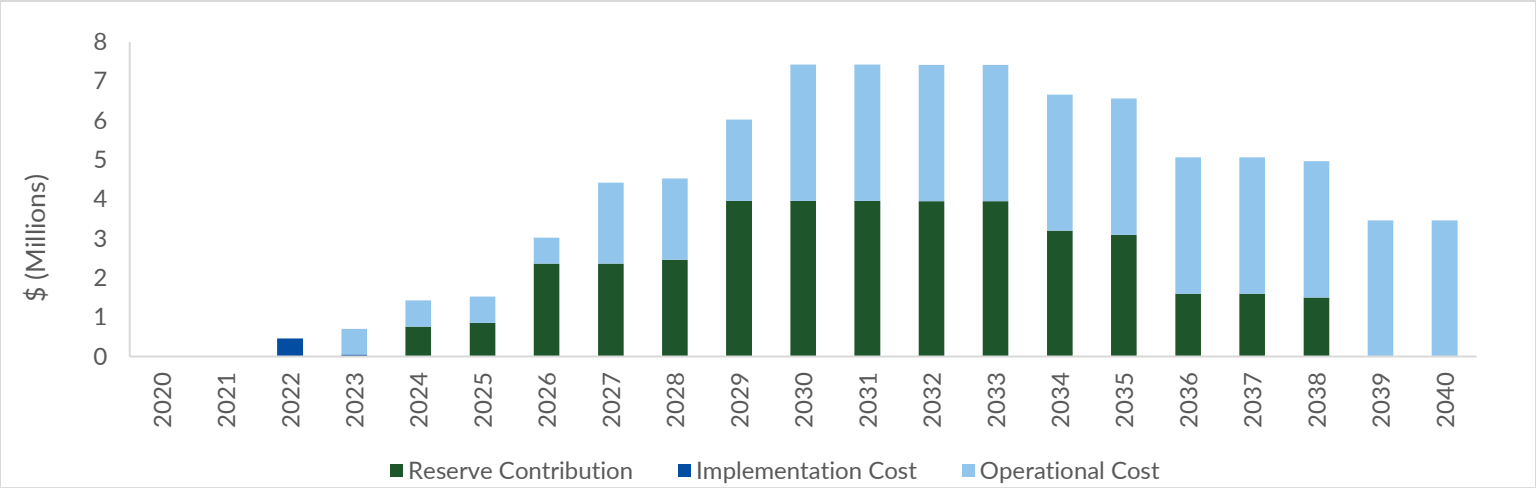
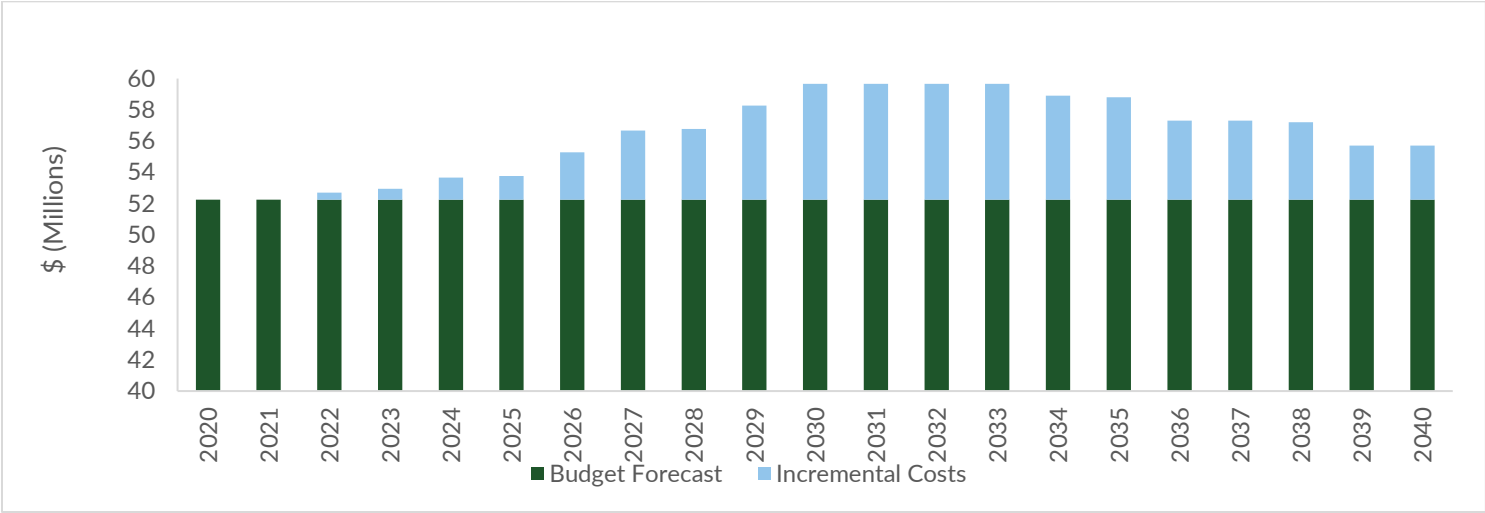


Figure 15 shows the annual incremental cost of implementing the recommended options on the 2020 budget. For the purposes of an equivalent analysis, the budget has been held constant and no cost escalation has been included for the budget or cost of options. The annual cost increase over the forecast period related to the implementation of the new options ranges from a minimum of $457,000 (in 2022) to a maximum of $7,425,000 (in 2030/2031). The average cost increase over the forecast period (2022 – 2040) for the recommended options is approximately $4.6 million which represents 8.8% of the 2020 operating budget.

Figure 15: Incremental Costs and Operating Budget Estimates



7.2 Cost Impact Per Household and Per Tonne

Figure 16 shows the incremental cost per household for the Region from 2020 to 2040. The average annual cost increase is $20.56 per household in this time period. The incremental cost peaks in 2030 and 2031 at $33.32 per household with the majority of these costs are attributable to option DT 6 - Additional Public Waste Drop-Off Depots. In 2030, both drop-off depots will be fully operational, resulting in a $2.8 million annual operating cost increase related only to the operations of the facility.

Figure 16: Net Incremental Cost Per Household

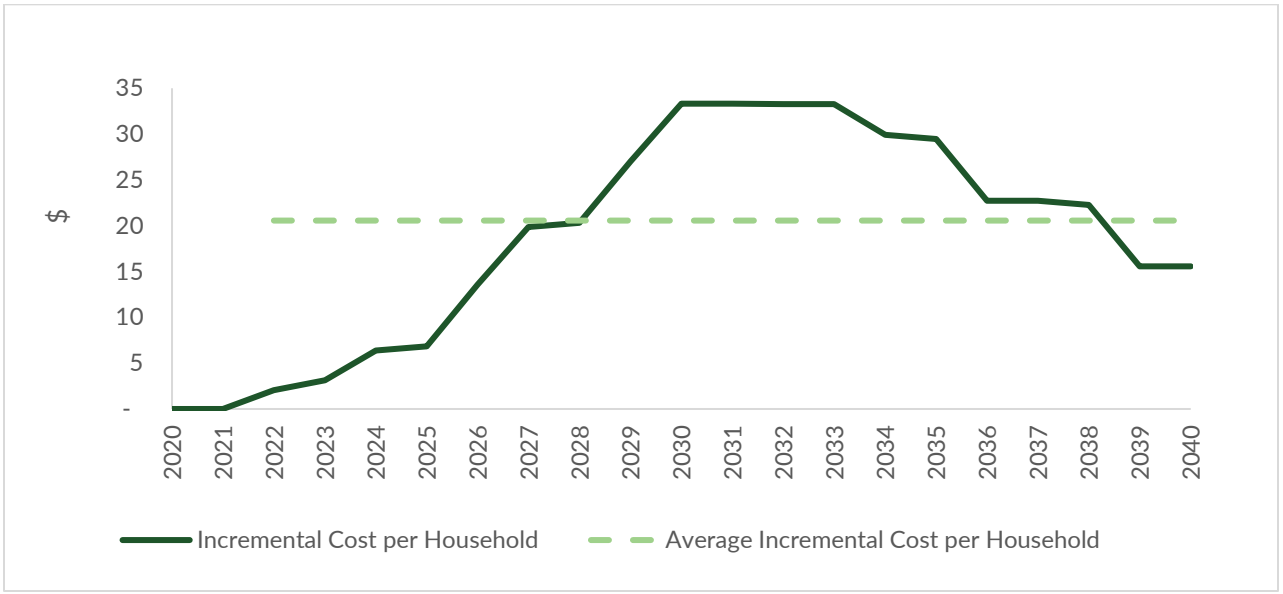
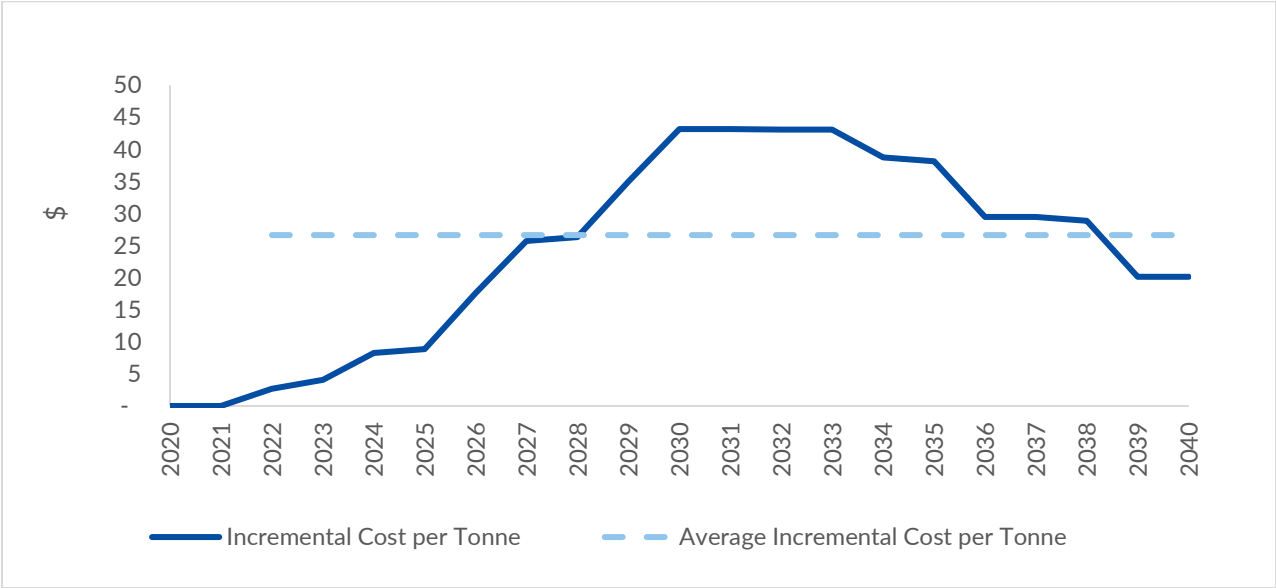


Figure 17 shows the incremental cost per tonne for the Region from 2020 to 2040. The average annual cost increase is $26.64 per tonne in this time period. The incremental cost peaks in 2030 and 2031 at $43.17 per tonne.

Figure 17: Net Incremental Cost Per Tonne



7.3 Refinement of Financial Estimates

The estimates for operating and capital cost impacts were developed by Region staff and Dillon and have been developed based on a number of assumptions. The capital cost and timing information was provided by the Region and Dillon based on estimated costs and scheduling. The cost information used to develop these estimates should be continually reviewed as new information becomes available. Many options are at an early stage of planning, with the full scope of implementation not yet defined. As some of the costs estimated for this analysis occur several years in the future, the costs could be impacted by a number of factors such as regulatory changes, economic factors, demographics, or technological advances. The Region should also explore potential revenue opportunities that could arise from the recommended options.

7.4 Blue Box Transition to Individual Producer Responsibility (IPR)

The transition of the blue box program to an IPR operated system is expected to have a significant impact on the Region's waste management system. The IPR transition in Ontario is scheduled to begin in 2023, with Halton currently scheduled to transition in 2025. Areas of impact will include recycling collections, transfer,

haulage, and processing. In the transition to IPR, there will be significant impacts to the operational requirements of the Region. This will result in changes to costs and revenues of the Region's waste management systems. The Region should continue to analyze the potential cost impact of a transition to IPR and incorporate that into the financial analysis of the various options.

8.0 Conclusions and Next Steps

The recommended options in the SWMS are expected to achieve 65% diversion from landfill and extend landfill capacity by approximately 10 years to 2054, if the Region is able to implement all of the initiatives and maximize full capture rate of the targeted materials. The HWMS is an essential asset in the Region's integrated solid waste management system, which will not be possible to replace given the development that has occurred since the site was approved in the early 1990s. The recommended options will allow continued progress toward diverting waste from landfill while feasibility studies are undertaken in preparation for the next review of the SWMS which will be conducted in five years.

A summary of the recommended options, the diversion impact, estimated costs and the potential to reduce greenhouse gases are provided in ***Appendix D – Summary of Environmental and Financial Impacts for Recommended Options***.

Achieving a 70% diversion rate or higher will require a significant capital investment in infrastructure and technology to further extend capacity of the site beyond 2054. Some potential ways to achieve a 70% diversion rate could include:

- Decrease the garbage bag limit to one bag sooner;
- Enforce the by-law by applying fines;
- Implement further landfill bans of materials;
- Partner with other municipalities on a mixed waste processing facility (e.g., Peel Region is currently exploring this and looking for partners) to further extract recyclables and organic waste from the garbage stream;

These approaches to achieve 70% diversion will be considered in the next SWMS Update after assessing the findings from the studies and implementation of the recommended options. This will allow the Region to remain current on development and emerging trends in the waste management industry and to implement enhanced services in a timely manner.

Appendix A

Medium/Long Term Options Identification Memo

Memo

To: Halton Region Waste Management Services

From: Betsy Varghese, Dillon Consulting Limited

Date: April 29, 2021

Subject: Identification of Options to Address Needs, Goals and Objectives

Our File: 17-5605

In 2018, Dillon prepared an Options Identification memo that was included in Appendix C to the Short Term Solid Waste Management Strategy (Short Term SWMS). The memo documented the approach taken to develop a long list of options to consider in the SWMS as well as brief descriptions of the proposed short term options. The following provides a brief overview of the steps completed to create the long list of potential options and descriptions of the medium and long term options that will be included in the Medium and Long Term SWMS.

Development of the Long-List of Potential Options

The following steps were taken in order to develop the long list of options:

- Obtain an understanding of the existing waste management system (documented in *Appendix A – Current Waste Management Profile*, Short Term SWMS, 2018);
- Receive input through a workshop with Regional staff on the Strengths, Weaknesses, Opportunities and Threats (SWOTs) of the existing and future waste management systems;
- Review evolving trends and estimate future population and waste forecasts over the 30-year planning period (documented in *Appendix B – Needs Assessment Report*, Short Term SWMS, 2018);
- Review background information provided by Region staff on operational issues, common customer complaints and findings from the 2016 Halton Waste Management Site (HWMS) survey;
- Brainstorming exercise with the consulting team to identify almost 50 potential optionsfor the Region to consider over the planning period;
- Presentation of the draft long list to Region staff in July 2017 where feedback and additional background information was provided and options were screened and/or refined based on consistency with the draft Vision and Guiding Principles. Options were categorized into Short (1 – 3 years), Medium (4 – 10 years) and Long (10+ years) term implementation timeline. A total of 44 potential options were identified to be carried forward for consideration in the SWMS; and
- Presentation of the draft long list of options to the following three stakeholder committees in September 2017: the Older Adults Advisory Committee, the Joint Regional/Municipal Waste Management Advisory Committee and the HWMS Advisory Committee. Feedback was received during and following the meeting.

It is important to note that the list of potential options is meant to be extensive to ensure that the Strategy does not overlook opportunities that although may not be feasible at the present time (e.g.,

limited legislation to support the change) but may be possible within the span of the Strategy's planning horizon of 30 years. The list also includes and further expands on initiatives or programs that are already in place with the objective to re-examine or further look for ways to enhance or improve the approach to better address an identified gap/challenge.

Long List of Options

Options were fit into one of the following five categories:

- Waste Diversion and Policy;
- Collection;
- Drop-off and Transfer;
- Processing; and
- Residual Processing and Disposal.

Descriptions of the five categories are provided below.

Waste Diversion and Policy (WDP)

This category is the broadest and includes waste reduction and reuse efforts, promotion and education, regulations and policy that governs waste management (e.g., provincial regulations, disposal bans, by-laws, development standards, etc.), financial management tools and approaches and support of waste management initiatives (e.g., supporting the Industrial, Commercial and Institutional (IC&I) sector, developers, event organizers).

Collections (C)

The Collections category includes review of collection contracts, alternative methods of collection, options to service multi-residential buildings, efforts to capture more materials for diversion, and managing increased quantities of waste and possibly new material streams if markets become available and/or through the Waste Free Ontario Act (WFOA) designation of new materials.

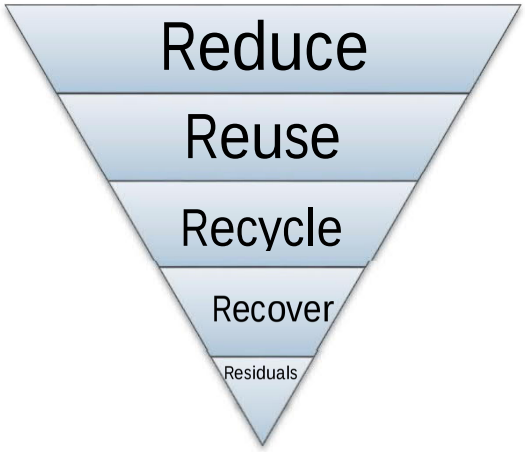
Drop-off and Transfer (DT)

This category includes potential changes to the layout of the HWMS to increase efficiency, optimize the use of land and reduce wait times, considering additional options to collect non-curbside collected waste, providing an additional location(s) to drop off both excess curbside collected and non-curbside collected waste and looking at options for transfer station services.

Processing (P)

This category includes reviewing alternative service delivery approaches, alternative technologies and approaches to processing Blue Box recyclables and Green Cart organics that could handle potentially new material types (e.g., diapers, sanitary products, plastic film).

Residual Processing and Disposal (RD)



The Residual Processing and Disposal category includes options to extend the life of the Region's landfill through optimizing current operations, expansion, alternative technologies to process residual waste such as mechanical, biological and/or thermal treatment facilities and banning more materials from disposal.

Some of the options fit into more than one of the five categories and were allocated to a category based on its primary function. Each option was also allocated into waste hierarchy categories (Reduce, Reuse, Recycle, Recover, Residuals). A description of the option was summarized and the rationale and/or source of the option was documented.

Table 1 presents the screened list of potential options being considered by category. Potential options in bold will be considered in the Medium/Long Term SWMS. Note that some of the medium and long term option descriptions have been further refined since the Short Term SWMS and/or some options have been removed from further consideration, which are noted below in italics.

Table 1: Long List of Options Being Considered in the SWMS

Option Name	Option Description	Waste Hierarchy
Waste Diversion and Policy (WDP)		
WDP 1 Promotion and Education for Diversion Programs	Develop specific campaigns that support strategy recommendations.	Reduce Reuse Recycle
WDP 2 Increased Promotion of Reuse Opportunities	New approaches to promote locations to bring materials for reuse (e.g., HWMS Reuse Depot).	Reuse
WDP 3 Development Guidelines	Review existing development guidelines to accommodate and be flexible to future waste management programs.	Recycle

Option Name	Option Description	Waste Hierarchy
WDP 4 Support the Circular Economy	Provide support for local innovators and/or organizations that design for the environment and/or reduce, reuse and reclaim waste.	Reduce Reuse Recycle
WDP 5 Food Waste Reduction	Develop a strategy to promote and reduce food waste. Consider partnerships with municipalities and/or non-governmental organizations (e.g., Halton Food Council) to implement actions.	Reduce
WDP 6 Support the Sharing Economy	Promote the sharing economy through supporting, partnering and/or partially funding organizations involved in this area.	Reuse Reduce
WDP 7 Alternatives to By-law Enforcement	Explore different methods that can be employed to encourage compliance with the Region's waste management by-laws.	Recycle Residuals
WDP 8 Provide Waste Diversion P&E to the IC&I Sector	With the Waste-Free Ontario Act (WFOA) and diversion expectations from the Province for the non-residential sector, provide information and education support to assist this sector with implementing diversion programs.	Recycle Reuse
WDP 9 Financial Sustainability	Develop a sustainable financing model to fund existing and future capital infrastructure requirements (e.g., reserve, user pay). Note: this option was modified and completed as a separate task (Refer to Section 7 of the Medium-Long Term Strategy).	Reduce Recycle Residuals
WDP 10 Financial Incentives	Provide financial incentives/disincentives to support policies and corresponding performance targets (e.g., reduce bag limits, increase tipping fees). Note: this option was originally included in the medium-long term list but was cancelled due to overlap with WDP 13 and Option DT 3.	Reduce Residuals

Option Name	Option Description	Waste Hierarchy
WDP 11 Enhanced Contractor Collection Services	Expand service levels in collection contracts for multi-residential and non-residential customers to provide better compliance and data collection (e.g., enforcement, tracking/issuing notices, promotion and education, weighing lifts).	Recycle Residuals
WDP 12 Review Event Diversion Program	Enhance existing community event diversion programs by looking at opportunities such as partnering with non-governmental organizations (NGOs) to coordinate volunteers and/or providing NGOs with funding to deliver waste diversion services at events, providing more Region staff support during the event, and more waste diversion tools and materials.	Recycle
WDP 13 Pay As You Throw	Consider implementing a partial pay-as-you-throw program through the use of bag limits, bag tag fees and implementation to the multi-residential sector. Note: the title of this option changed to "Decrease Garbage Bag Limits" in the Medium-Long Term SWMS.	Reduce Residuals
WDP 14 Promotion & Education for Diversion	Explore alternative strategies for promotion and education of waste management programs in order to increase participation and effective capture including face-to-face interactions.	Recycle
WDP 15 MR Waste Management Improvements	Improve waste diversion performance of the multi-residential sector after the Green Cart program has been implemented through increased and targeted promotion and education.	Recycle
Collection (C)		
C 1 Textile Diversion	Explore options to collect textiles either through the Region and/or through partnerships with NGOs.	Reuse Recycle
C 2 Containment of Blue Box Recyclables	Consider modifications or changes to the Blue Box (e.g. use of large plastic bags, carts, lid).	Recycle

Option Name	Option Description	Waste Hierarchy
C 3 Increase Capture of Green Cart Organic Materials	Review alternative methods that can increase the capture of source separate organic materials in the Green Cart program.	Recycle
C 4 Construction & Demolition (C&D) Recycling	Consider potential reuse and recycling opportunities for Construction and Demolition materials that are currently being landfilled (e.g., shingles, wood chips).	Reuse Recycle
C 5 Bulk Waste Diversion	Find opportunities to modify the existing bulk waste collection to enhance reuse and/or recycling of the collected materials (e.g., furniture, mattresses, and plastic household items).	Reuse Recycle
C 6 Automated Collection	Consider moving to a cart-based collection program with automated collection vehicles.	Recycle Residuals
C 7 "Smart City" for New Multi-Residential Development	Research possible designs and technologies to determine the feasibility of implementing a “Smart City” approach to support waste diversion programs in Halton Region.	Recycle
C 8 Franchise Agreements	Reduce multiple collection vehicles in the same area and associated greenhouse gas impacts through franchising waste collection. Consider requiring for mixed use of small commercial and residential above. Note: this option was cancelled since it would not be feasible to do this in Canada due to Competition Regulations. Halton Region does not have the legal authority to dictate this.	Recycle Residuals
C9 Multi-Residential Waste Management Improvements	Provide a similar level of service to the multi-residential sector as the single-family sector and performance expectations. Note: this option was originally on the medium to long term list but was removed and combined with WDP 15.	Recycle

Option Name	Option Description	Waste Hierarchy
C 10 Expand Existing Collection Services	Review if there are other curbside collection programs the Region can provide. Note: this option originally included the review of alternative fuels for waste collection however; a new option (C 15) was created to focus on this.	Recycle
C 11 Track Waste Containers in Multi-Residential Buildings	Optimize use of existing Radio-frequency identification (RFID) tags in multi-residential waste carts.	Recycle Residuals
C 12 Alternatives to Front End Collection	With the anticipated shift to densification of housing and multi-residential developments, smaller collection vehicles may be required to access waste containers. Look at different approaches to waste collection (e.g., contractual requirements, development standards). Note: This option was not considered further, as it was determined to be not feasible to efficiently collect waste from the multi-residential sector with smaller vehicles.	Recycle Residuals
C 13 Extend Curbside Yard Waste Collection	Look at options to extend the collection of leaf and yard waste year-round.	Recycle
C 14 Review Current Non-Residential Customer Base	Review other programs and policies associated with providing collection services to non-residential customers, including those that were grandfathered in from previous local municipal agreements.	Recycle Residuals
C 15 Fuel Options for Waste Management Vehicles	Consider the use of alternative fuels and/or energy sources to reduce GHG emissions (e.g., CNG, electric) for waste collection vehicles and onsite equipment. Note: this option was added after the Short Term SWMS and was originally included as part of C10.	Recover

Option Name	Option Description	Waste Hierarchy
Drop-Off and Transfer (DT)		
DT 1 Express Bypass Lane at the Halton Waste Management Site (HWMS)*	Install an express "bypass" lane for customers paying by load that don't need to use scales at the HWMS.	Recycle
DT 2 Wait Times at HWMS*	Consider options to reduce wait times at scales at HWMS.	Recycle Residuals
DT 3 Fee Structure at HWMS	Review and streamline fees for customers using the HWMS or differential tipping fees	Residuals Recycle
DT 4 Extended HWMS Hours*	Extend weekday hours of operation at HWMS from May through October	Recycle Residuals
DT 5 Increased access to drop-off locations for non-curbside waste (e.g., Household Hazardous Waste, Waste Electronics and Electrical Equipment)	Explore additional approaches from Special Waste Drop-Off Days and HWMS to collect non- curbside waste (e.g., mobile events, use of large bins, multi-residential building collection).	Recycle
DT 6 Additional Waste Depot Option(s) for Residents	Provide additional permanent locations for residents to drop-off excess curbside collected (e.g., residual waste, leaf and yard waste) and non-curbside waste (e.g., household hazardous waste).	Recycle Residuals
DT 7 Optimize Use of HWMS	Consider opportunities to optimize the use of the available and unused lands available within and/or on adjacent owned lands surrounding the HWMS.	Recycle Recover
DT 8 Transfer Station for Curbside Collection Trucks	Determine if the Region should continue contracting transfer station capacity with private facilities or enlarge capacity at the HWMS.	Recycle
Processing (P)		
P 1 Service Delivery Approaches	Review service delivery approaches for organics and recycling processing and use of private sector transfer stations.	Recycle

Option Name	Option Description	Waste Hierarchy
P 2 Alternative Technologies for Organic Waste	Consider alternative technologies to recover energy and divert more organics through collection (e.g., diapers, sanitary, pet waste).	Recover Recycle
Residual Processing and Disposal (RD)		
RD 1 Optimize Landfill Operations	Identify new approaches to optimize landfill operations, increase the remaining capacity and/or extend the site life of the landfill. Note: this option was broken out into two phases. Phase 1 considered options in the short term and Phase 2 considers options in the medium and long terms.	Residuals
RD 2 Alternative Technologies for Residual Waste	Consider alternative technologies to recover energy, generate electricity and reduce residual waste sent to landfill.	Recover Residuals
RD 3 Extend Landfill Capacity	Explore potential options to extend landfill capacity by implementing vertical and/or horizontal expansion at the landfill.	Residuals
RD 4 Optimize Utilization of Landfill Gas	Review methods of modifying/enhancing the utilization of landfill gas at the HWMS. Note: This is a new option that was added since he Short Term SWMS. The previous RD4 (Landfill Mining) was removed as it is not considered to be feasible during the planning period of this Strategy.	Recover
RD 5 Disposal Bans	Consider the use of expanded disposal bans at the Halton Region Landfill.	Residuals Recycle

* Note that Express Bypass Lane at HWMS, Wait Times at HWMS, and Extended HWMS Hours were considered in the Preliminary Design Report.

Documentation of Potential Options

For each of the options identified above, option overview sheets were created to have sufficient and comparable information for the future evaluation of options. For each option, the following information was provided:

- Option name and number;
- Description of the option;
- Category(ies) the option falls into (i.e., Waste Diversion and Policy, Collection, Drop-Off and Transfer, Processing and Residual Processing and Disposal);
- Timeline for implementation (i.e., short, medium or long term);
- Rationale and/or source of option (e.g., feedback from Region customers, input received from Region staff, consulting team recommendations);
- Halton Region experience in providing some elements considered in proposed option either by the Region itself, the local municipalities or other local organizations;
- Demonstrated experience of the option being implemented elsewhere in Canada or around the world (based on consulting team research); and
- Considerations on the potential impacts of implementing the proposed option.

Medium and Long Term Options

The following provides brief overviews of the potential options to consider implementing in the medium and long term through the SWMS. The initial research covered broad topics within each option with the intention of focusing on a specific approach to implementing the option during the evaluation stage of the SWMS development. The detailed option overview sheets are provided in Attachment B.

WDP 4 Support the Circular Economy

Provide support towards a circular economy through partnerships with existing not for profit organizations and engaging with local/regional/provincial business and social entrepreneurs in new circular economy initiatives. The focus of the initiatives would be finding ways to minimize the use of raw resources, maximize the useful life of materials and minimize waste generated at the end-of-life of products and packaging.

WDP 6 Support the Sharing Economy

Sharing resource hubs are rapidly increasing in popularity, growing in number and location. Local governments, businesses and non-profit organizations initiating these sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving energy and resources (required to manufacture virgin materials), and providing options to extend the use of an item

amongst multiple users. This option looks at the Region promoting sharing through supporting, partnering with and/or partially funding organizations involved in this area.

WDP 7 Alternatives to By-law Enforcement

This option explores the different methods that can be employed to encourage compliance with the Region's waste by-laws. Alternative methods usually require that adequate staff and measures are in place to ensure an effective monitoring system. This option looks at employing an outreach team to monitor waste set out and provide education and communication materials to households that are not in compliance with the waste collection by-law.

WDP 8 Provide Waste Diversion P&E to the IC&I Sector

The Ministry of Environment, Conservation and Parks (MECP) released its Made-in-Ontario Environment Plan in November 2018 that indicated the MECP will be exploring additional opportunities to reduce and recycle waste in businesses and institutions. Many small and medium commercial establishments lack the resources, space and budget to implement a food waste and recycling program that targets waste diversion needs. This option looks at how the Region can be involved in providing technical, training and educational support to small, medium and larger IC&I establishments during these regulatory transition periods.

WD9 Financial Sustainability

Once the medium and long term option evaluations are complete and a preliminary implementation plan is developed, a sustainable financing model will be prepared to fund existing and future capital infrastructure requirements.

WDP 11 Enhanced Contractor Collection Services

All waste collection services are contracted out to private sector waste management companies. However with the emergence of RFID tags, garbage collectors can offer more services than just collection. Jurisdictions employing RFID tags in garbage bins are able to track issues and reduce pickups for commercial or multi residential buildings to only when the bins are full. These tags are also capable of weighing lifts for these customers and keeping a dataset of bin weights and number of lifts. This option looks at expanding collection contracts to include enforcement, tracking/issuing notices, promotion and education, weighing lifts from multi-residential and non-residential customers.

WDP 12 Review Event Diversion Program

This option looks at enhancing the existing community event diversion program by looking at opportunities such as partnering with NGOs to coordinate volunteers and/or providing NGOs with funding to deliver waste diversion services at events, providing more Region staff support during the event, and more waste diversion tools and materials.

WDP 13 Pay As You Throw

Pay-as-you-throw (PAYT) policies (also referred as user pay) require customers, including single family households, multi-residential building owners and commercial establishments, to pay for garbage set out for collection. This approach acts as a financial disincentive to generating garbage and encourages residents to reduce waste and use available waste diversion programs to minimize the amount of garbage requiring disposal. This option looks at implementing partial PAYT programs through use of bag limits, bag tag fees and implementation to the multi-residential sector.

WDP 14 Promotion & Education for Diversion

Waste diversion promotion and education (P&E) strategies have been used to achieve a variety of goals from promoting higher participation in a Green Cart program to modifying improper behaviour, such as wishful recycling leading to high contamination rates in the Blue Box program. This option looks at ways to combine P&E techniques with the use of innovative approaches in order to achieve the benefits of outreach strategies.

WDP 15 MR Waste Management Improvements

Multi-residential waste diversion performance has traditionally not achieved the same performance levels as the single family residential sector. Best waste diversion practices can be determined for those targeted buildings to elicit behavior change and improve waste diversion performance. This option looks at targeting buildings to understand the waste diversion performance, after the Green Cart program has been implemented, and provide tailored support to improve performance.

C 4 Construction & Demolition (C&D) Recycling

Halton Region is currently managing a number of source-separated C&D materials at the HWMS. There are still C&D waste materials that are being landfilled rather than separated for reuse/recycling. This option considers potential reuse and recycling opportunities for shingles and wood chips and promoting donations to NGOs that accept C&D materials.

C 5 Bulky Waste Diversion

Bulk waste collection has been provided by the Region since it assumed responsibility for waste collection in the mid-1990s. Region staff have noted that furniture that seems to be in good condition is set out for collection as it is more convenient than taking them to reuse stores. This option looks at ways to modify the existing bulk waste collection to enhance the reuse and recycling of the collected materials.

C6 Automated Collection

This option explores the experiences of multiple jurisdictions that have converted to automated cart collection for waste and recycling services. This option also explores some costing considerations as well as experienced benefits and issues surrounding the strategy.

C 7 "Smart City" for New Multi-Residential Development

The “Smart City” approach uses technology and creative approaches to move cities towards sustainable living and economic development. This new way of thinking is starting to be used to help improve waste diversion. The Smart City concept combines forward thinking urban design and new digital technology to create sustainable communities. This option looks at researching possible designs and technologies to determine the feasibility of implementation and how to foster the development of Smart City design to support multi-residential waste diversion in Halton Region.

C 10 Expand Existing Collection Services

The Region currently provides single-family curbside collection services for blue box, green cart, seasonal leaf and yard waste and garbage, along with some additional services such as bulk waste collection, brush call-in and scrap metal collection. Multi-residential buildings have access to blue box, garbage, green cart (continues to be phased in) and bulk waste (available twice a year upon request). Some of the IC&I establishments such as publicly funded schools, Town/City Halls and libraries receive some collection services. This option looks at reviewing and assessing if there are other curbside collection programs that the Region could provide (e.g. textile recycling, batteries, small household metals).

C 11 Track Waste Containers in Multi-Residential Buildings

RFID tags are currently installed on all multi-residential (MR) wheeled carts for organics and recycling and front end bins for garbage and recycling in the Region. However, the RFID tags are not used to their potential in data collection or assessment. Through additional software and analysis of available data, tracking MR containers can help target and monitor low performing buildings which will need support when the Blue Box program transitions to EPR and will expect lower contamination rates.

C 13 Extend Curbside Yard Waste

The Region provides bi-weekly curbside collection of yard waste to urban areas which extends from the first week of April until the second week of December. The length of the LYW collection season is related to the length of the growing season and weather which will vary year to year and as such are looking at efficiencies of altering the collection service to all year.

C 14 Review Current Non-Residential Customer Base

This option looks at other programs and policies associated with providing collection services to non-residential customers to help the Region address the non-residential customer base, especially those that were grandfathered in from previous local municipality agreements. Selected customers may include non-residential commercial establishments located within new multi-residential buildings. This option also considers the use of a Pay-As-You-Throw fee structure to the non-residential customers.

C 15 Fuel Options for Waste Management Vehicles

Since 2004, Halton Region has been greening its fleet by incorporating the use of bio-diesel and purchasing a few hybrid vehicles. This option looks at reviewing and assessing requirement considerations for the use of alternative fuels (e.g. Compressed Natural Gas - CNG) for waste collection vehicles and onsite equipment.

DT 6 Additional Waste Depot Option(s) for Residents

A public drop-off container station located at the HWMS in Milton provides a centrally located and convenient one stop location for recycling and proper waste disposal for Halton residents. However, the HWMS is not accessible to the entire Region and with greater population densities in the southern part of the Region there is a need to consider expanding access to such a depot(s) that reduces the distance some residents have to travel.

DT 7 Optimize Use of HWMS

The HWMS is approximately 126 ha in size, of which 53 ha is approved for landfilling. The Region has also purchased an additional 200 acres of land to the south. Currently, the Region is using the additional lands as buffer zone and some of the land is rented out for agricultural use. This option explores opportunities to optimize the use of the available and unused lands available within and/or on adjacent owned lands surrounding the HWMS.

DT 8 Transfer Station for Curbside Collection Trucks

The HWMS includes the Region's transfer station that is approved to receive a combined total of 299 tonnes per day of Green Cart organics and Blue Box recyclables. However, the building size is not able to accommodate the full amount and is currently effectively accommodating approximately 200 tonnes per week while private transfer stations are also used by the Region to accommodate the remaining materials. This option looks at having all curbside collection trucks deposit Blue Box and Green Cart material at an expanded transfer station located at the HWMS or the optimum mix of private transfer station and Region owned transfer station capacity in the system.

P 1 Service Delivery Approaches

The Region currently uses a mix of delivery approaches for the different waste management services. The Region owns the HWMS, but contracts out the majority of services aside from some services related to maintenance and landfill operations. Waste collection and processing services are contracted to private companies. This option looks at service delivery approaches for Green Cart organics, Leaf and Yard Waste (LYW) and Blue Box processing and the use of private sector transfer stations.

P 2 Alternative Technologies for Organic Waste

This option looks at organic waste processing technologies to consider the most feasible way to divert this material from landfill. Various technologies are available that combine different organic feedstocks to produce an end product. Anaerobic digestion systems can accept additional organic waste, such as pet waste, diapers, sanitary waste, and biosolids while generating energy as an output.

Leaf and Yard Waste (LYW) is processed at an open windrow composting facility at the HWMS and operated by a contractor. There have been no issues with the current operations, however a potential option for the future may include combining leaf and yard waste as a feedstock with other Region organic material, such as SSO, for organic processing.

RD1 Phase 2 Optimize Landfill Operations

This option looks at different ways to optimize landfill operations, increase the remaining capacity and/or extend the site life of the landfill. Options were broken out into two phases: short term (included in the Short Term Strategy) and medium/long term (included in Medium and Long Term Strategy).

RD 2 Alternative Technologies for Residual Waste

The amount of waste generated within Halton Region, which was disposed at the Regional landfill in 2016 was approximately 68,400 tonnes, an increase of 1% from 2015. The projected landfill life is estimated at 30 years (to 2046) at current disposal rates. The most recent waste audit data from 2014 and 2017 showed that 49% of the single family residential garbage stream consisted of materials which cannot be currently diverted through Regional reuse, recycling or recovery programs. This option looks at the feasibility of alternative technologies to recover energy, generate electricity and reduce garbage disposed in landfill.

RD 3 Extend Landfill Capacity

The Regional landfill has been in operation since 1992. It has an approved footprint area of 53 hectares and is approved for 7.96 million cubic meters (Mm^3) of residual waste. When it was approved, the landfill was estimated to have a projected life of 20 years and to reach its capacity in 2012. This option looks at extending landfill capacity by horizontally expansion. The current approved contours contemplated a site end use for agricultural purposes. This option considers the technical design requirements, approvals and costs to recommend how the landfill capacity should be expanded. A

timeline will be provided of when the Region should initiate the planning and approval process for these expansions.

RD 4 Optimize Utilization of Landfill Gas

The Region has been collecting Landfill Gas (LFG) at the HWMS since December 2006. The Region contracts out the operation and maintenance of the LFG collection system and has an agreement to provide the landfill gas to Oakville Hydro Energy Services Inc. (OHESI). The Region has a 25-year agreement for LFG to electricity utilization and this contract will be expiring in 2029 with an option for 10 year renewals. This option looks at making modifications/enhancements to the utilization of LFG at the HWMS. It considers the LFG utilization agreement to recommend options when the current agreement expires, and whether other technologies should be considered to optimize the gas utilization and energy production.

RD 5 Disposal Bans

Under the Resource Recovery and Circular Economy Act (RRCEA), a Strategy for a Waste-Free Ontario was released in 2017. The Strategy serves as a Roadmap to help shift Ontario towards the goals of a circular economy, zero waste and zero greenhouse gas emission from the waste industry. The Strategy proposes the use of disposal bans to encourage diversion of targeted materials, beginning implementing by 2021 and a possible organic ban by 2022. This option considers the use of expanded disposal bans for the Halton Region landfill.

Attachment A

Stakeholder Meeting Minutes

MEETING MINUTES

Subject: Joint Regional/Municipal Waste Management Advisory Committee and Halton Waste Management Site Advisory Committee Meeting

Date and Time: September 13, 2017, 6:30 – 8:30

Location: Regional Municipality of Halton Headquarters 1151 Bronte Rd, Oakville, ON L6M 3L1

Our File: 17-5605

Attendees Joint Regional/Municipal Waste Management Advisory Committee Halton Waste Management Site Advisory Committee

Region of Halton: Rob Rivers, Shirley McLean, David Miles, Nicole Levie, Gerrit Buitenhuis, Art Mercer

Dillon: Bill Allison, Betsy Varghese, Clayton Gionet, Klaryssa Lawrie

Notes

Item Discussion

1. Overview of the Solid Waste Management Strategy

- Strategy Development Process
  - Particular strategy is looking to develop a master plan for the next 30 years; previous strategies have been to improve waste diversion. A main goal of the strategy is to increase customer service experience with focuses on curbside collection, convenience and accessibility. When a customer comes to the Halton Waste Management Site it is a goal to have that experience be a good one while providing excellent service.

2. Background on Halton's Waste Management System

- Provided background on collection programs, customers, facilities, waste composition and historical waste quantities and diversion rates. The following provides comments and/or questions asked by the Committees and responses provided by the Strategy team:
  - Noted that recycling annual tonnages are not increasing because materials are becoming lighter and the temporary peak of leaf and yard waste quantities in 2014 is from the ice storm.
  - Question: Is there a way to break down tonnages by local municipalities? Response: The Region does track tonnages collected curbside by each local municipality. Tonnages collected at the HWMS and HHW event days are consolidated so it is not possible to attribute the generator to their local municipality.
- Waste Generated by Sector (2016)
  - Question: Where does waste from small commercial [residual waste] bins go and does it get sorted? Response: Privately collected waste likely does not get sorted and is sent to private landfills for disposal. The tip fees at HWMS are too high for the private sector.
- Residential Diversion Rate

- Question: What is the potential to increase diversion with the Green Cart (GC) program when implemented in all the apartment buildings? Response: The Region has implemented the GC program to approximately half of the apartment buildings and received positively among residents. Will be looking at increasing capture of GC organics in the Strategy.

3. Draft List of Options (Options to Consider)

- Noted that the draft list of options is being considered and upon evaluation all may not be implemented.

Draft List of Waste Diversion and Policy Options (13)

User Pay

- Question: What alternatives are you looking at?
  - Current Halton policy is to pay for bag tags after three bags have been used per collection day
  - In Toronto residents select what size of waste bin they want and pay per size, smallest cart receives a rebate
  - Provided example of volume-based rate structure in Toronto.
  - Noted that some options may increase the cost to residents
  - Currently the ICI sector tax assessment includes a portion of the residential waste management services that the Region provides

Reuse Promotion

- Perfectly good materials are being thrown out. People aren't aware of all the places they can drop off their old stuff.
- Promotion and education to donate furniture in good condition
- Suggestion to increase reuse activity at the HWMS, such as partnerships with Habitat for Humanity or a call in service to pick up items in good condition for reuse. ***Action: Dillon to consider organizations like HfH to partner with at Reuse Centre.***

Organics Ban

- Consider a ban organics from the landfill
- Promotion and education that compostable paper products are accepted in the Green Cart program
- Region noted the participation rate is 60 – 70% for the Green Cart program, however the Blue Box participation rate is around 97%.

Education

- Suggestion for education programs for schools and newcomers to Canada workshops. Region described current outreach efforts.
- Collection calendar isn't reaching all people; consider other options of delivering this information.
- Website and online presence by the Region is quite good, but the website should be promoted more.

- Residents aren't aware of what can go into the Green Cart. Additional promotion and education is needed on this program.
- Provide stickers on what is accepted in each bin that can be applied directly on the bins.
- More promotion on donating items in good condition for reuse

Draft List of Collection Options (14)

Bulky Waste Collection/Reuse Collection

- The stores that sell reusable items have received fewer donations due to high frequency of bulky waste collection; consider an option of reducing bulky waste collection.
- Suggestion to have call-in service for bulky waste collection where customer can be asked if item is reusable. A separate truck(s) could collect from households. This program would be especially good for older adults. Suggested looking at Guelph's program as a guide.

Draft List of Processing Options (4)

Pet Waste

- Question on collecting animal waste. Responded saying we will look at this in the Strategy and gave example of Toronto's program that uses a different technology and generates energy; Halton's Green Cart materials form compost end product.

Organics Processing

- Observation that Burlington is growing up and not out as MF building development will increase significantly. Suggestion for Halton to consider having their own organics facility, instead of shipping to Hamilton. Noted that this option will be looked at in the Strategy.
- Consider using biosolids in composting, Region did pilot a few years ago at the HWMS that produced a grade A compost product

4. Draft Evaluation Approach

Explained the triple bottom line approach: Environment, Financial and Social considerations and sought feedback on draft evaluation questions.

Any discussion on health benefits due to changes in air quality and/or Greenhouse Gas emissions?

Will be considered under environmental

Will the community be accepting of it?

Asked if this will include community participation? Noted that participation is also covered in another question.

How much will it save/cost the taxpayers?

- Suggestion to look at it from the taxation classes perspective.
- Question: Are we looking at a cost benefit analysis over the long term to recognize options that can save money now, but cost a lot in the future. Response: The evaluation will acknowledge the benefits associated with each of the options and the costs will look at both up front capital and annual operating and maintenance costs.

5. Next Steps

- Finalize evaluation criteria, evaluate short term options, and document and submit short term strategy.
- The Region will review input received and options will be evaluated. Will seek input from the two committees (likely a joint meeting again in the late winter/early spring) and then will go to Council for approval of the short term strategy.
- Noted that Committee meetings are allowed to continue during the election.

6. Discussion

When the Region decreased bag limits from 6 bags to 3 bags, then added bag tags, has that been affective in waste diversion, has the program worked? Additionally, is there a breakdown by local municipalities?

When the Region began selling bag tags in 2013, a slight increase in waste diverted, however, it didn't actually impact the general population because most already set out less than 3 bags. Currently, sales in bag tags are decreasing.

There is an issue with illegal dumping, people are dropping off bags onto country roads, or public bins at a school are overflowing with household waste, is there an option to address this?

Illegal dumping has always been an issue that is sporadic. Some Councillors are receiving complaints regarding illegal dumping of household waste in undeveloped areas that lead to animal nuisances. The Region hasn't seen a significant increase in illegal dumping. However the potential for increases in illegal dumping, if changes are made to collection programs, will be considered as a potential consequence in the Strategy.

Is there an option to perform a field inspection, as a lot of garbage is found in agriculture; can the Region audit the garbage to identify common materials in order to finesse programs towards eradicating that type of material dumping?

Many resources have and can be put towards this issue, but people are dumping in random locations and are largely unaffected by the consequences. The process to take an illegal dumping case to the full extent of prosecution is very costly and ineffective, as it is very difficult to prove illegal dumping unless someone is caught in the act. Unfortunately when it's dumped on private property, the responsibility falls to that individual to clean up and their own expense. The Region

had looked into this previously and found a majority of illegal dumping was from residents of other regions.

Are new multi residence buildings designed to source separate material?

The Region has development design guidelines for multi residential buildings with the overarching theme that all three waste streams are equally convenient. For older buildings, the Region has to look at each building individually because they are all unique in terms of space availability and access. Developers aren't obligated to follow the guidelines however, the Region will not provide collection service if the new buildings do not conform to the guidelines.

Stores used to collect lightbulbs and batteries, is there an option to bring those programs back? There should be an option for older adults that cannot reach the site or event days.

Big box stores used to collect those materials however it became too big a financial burden. Setting up a program equivalent to how the Beer Store accepts returns can be very costly with licensing, approvals, financial risks, added staff, new facilities. The Strategy will consider putting in more drop off locations to increase accessibility.

How big an issue is it cost-wise to transfer Green Cart materials and truck it to two places [transfer station, Hamilton composting facility]?

Transfer costs are minimal compared to curbside collection costs.

In the contract with Hamilton is there a lot of warning if they have to cut us off?

The facility has enough space to handle both materials, and the Region's agreement with Hamilton is until 2020. There is no clause stating that Hamilton can cut the Region off, but in any event, the Region does have a contingency plan. Additionally, the Strategy will look at the option of Halton processing organics.

Have there been any examples of other landfill sites that have been turned back to agriculture uses?

The Region wants to keep the HWMS landfill operating as long as they can and as the landfill nears capacity they will have to decide what to do. Several options that could be considered are expansion at the HWMS, building an energy from waste facility, partnering with other municipalities for disposal capacity, or close the HWMS landfill (and consider use for closed landfill) and build a new landfill.

Would there be an effect if the IC&I sector started using the HWMS for disposal?

The Region made the conscience decision to raise the tip fees to discourage IC&I customers. However, other municipalities have lowered their tip fees to encourage IC&I customers as part of their business plan. If the Region lowered their rates, there would be a significant increase in IC&I customers. The United States also provides tip fees at lower costs that the Region cannot compete with (nor wants to compete). Numerous private landfills across the province are permitted to take

IC&I waste.

Errors and/or Omissions

These minutes were prepared by Clayton Gionet who should be notified of any errors and/or omissions.

Attachment B – Overviews of Medium and Long Term Options

Option Number and Name: WPD 4 – Support the Circular Economy

Description of Option:

With the move towards a circular economy, this option looks at providing support for local innovators and/or organizations that design for the environment and /or reduce, reuse and reclaim waste. This could be accomplished both by partnering with existing (not for profit) organizations within the Region (i.e., expanding its current efforts to engage local organizations) and by seeking to engage local/regional/provincial businesses and social entrepreneurs in new circular economy/zero waste initiatives. The idea behind circular economy thinking and actions is to maximize value and eliminate waste by improving the design of materials, products and business models. This means finding ways to minimize the use of raw resources, maximize the useful life of materials and minimize waste generated at the end-of-life of products and packaging.

On November 29, 2019 the Ontario Ministry of the Environment, Conservation and Parks released its "Preserving and Protecting our Environment for Future Generations A Made-in-Ontario Environment Plan". Although the plan does not use "circular economy" language directly, the over-arching goal ("an Ontario where we strive to decrease the amount of waste going to landfill, increase the province's overall diversion rate and reduce greenhouse gases from the waste sector"[1]) is very consistent with circular economy principles and approaches elsewhere in Canada and globally.

Category(ies) of Option: Waste Diversion and Policy

Timeline: Medium

Rationale and/or Source of Option:
Consulting team observation and case studies in Canada and internationally.

Halton Region Experience:

- The public drop-off Container Station provides bins for small items such as eye glasses, natural corks and hockey sticks that are collected or used by local charities, businesses and artists. Bikes in good condition are also accepted for refurbishing by a local charity.
- Halton provides a waste diversion fund to compensate and support not for profit organizations that divert waste from the HWMS by operating reuse centres (thus supporting community, social and environmental benefits). In 2016, the Region provided $240,530 (50% of the tipping fee) in funding to eight non-profits that diverted 3,279 tonnes from landfill.
- Halton was the first Region in Canada to adopt (in 2010) local food procurement practices for its municipal food services.
- The City of Burlington's procurement policy requires that the City "endeavour to acquire goods and services that minimize impacts on the environment" where feasible (e.g., durable and reusable as opposed to single use or disposable items, made from recycled materials, minimal packaging, reusable shipping packaging, etc.).
- The City of Oakville also has a "Sustainable Purchasing Procedure and Guide" whereby " all purchasing decisions shall consider the efficient use of natural resources, minimizing waste and toxicity, preference for high quality materials that can be upgraded or repaired, recycled or reused…". Two notable features of the Oakville program are that the program encourages on-going staff training/continuous improvement and requires regular reporting back to Council on progress.
- Zero waste – In 1999, both Burlington and Oakville passed policies and programs to guide "waste

1

Option Number and Name: WPD 4 – Support the Circular Economy

reduction practices". In both cases the focus was specifically on Town facilities. Both Cities include restrictions on the use of bottled water as examples of zero waste measures they have implemented.

- Halton Hills Green Meeting and Event Policy - The policy was approved by Council in Sept. 2010. The Office of Sustainability developed a comprehensive "Green Meeting and Event Policy" to elevate the sustainability of the Town's internal corporate operations by embedding environmentally responsible practices throughout all stages of planning and hosting all meetings and events at all town facilities.

Demonstrated Experience:

- As part of the Long Term Waste Management Strategy, the **City of Toronto** is working towards an aspirational goal of zero waste and a Circular Economy. A Circular Economy aims to reduce waste and maximize resources by moving away from the linear take-make-and-dispose approach to an innovative system that focuses on product longevity, renewability, reuse and repair. To drive innovation and the growth of a Circular Economy in Toronto, the City has established a Unit for Research, Innovation & a Circular Economy within the Solid Waste Management Services Division. The Unit is involved in research and planning as well as incorporating Circular Economy principles into new programs, policies, procurement and processes. The overarching goal of the unit is to make Toronto the first municipality in Ontario with a Circular Economy. A newly announced "Circular Economy Advisory Board" is being created in Toronto and the city has been recognized as Runner Up in the Public Sector Category of the global 2019 Circulars awards.[2]

- Zero Waste South **Australia** (a green industry leader in that country) has re-branded itself as Green Industries SA with a mission to be the "first mover in the collaborative economy because it avoids waste, guides social change and supports sustainable consumption"[3]. One of their first projects was to design and manage Australia's first government supported and citizen driven free platform for mapping and supporting the Sharing/Collaborative economy (i.e., including mapping materials and resources for sharing, a skills exchange and "offers and need" marketplace to encourage sustainable business development across the state.

- **Metro Vancouver** partnered with the Canadian Federation of Municipalities to launch the National Zero Waste Council[4] to develop (among many other measures) a national food waste reduction education program/campaign and to produce a "Circular Economy Business Toolkit" to support local businesses in applying circular economy concepts in their operations. In 2015, Metro Vancouver diverted almost 250,000 tonnes of materials through its array of EPR programs, achieving 74% overall diversion from landfill (including organics and C&D waste diversion and landfill bans as well). Halton Region has joined as a Supporter of the Council.

- The **City of San Francisco** is the leader in its work towards Zero Waste in North America, recently passing the 80% diversion mark.[5] The City's 3-bin system is aggressively supported through active, multi-lingual and multi-media resident (and business) outreach and education. A City by-law prohibits the sale of all single use plastic bags and food service ware and packing materials made from Polystyrene foam. The City manages Zero Waste Grants to non-profit organizations of about $360,000 (US) per year to support community-based zero waste initiatives.

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[1]MOECP; Preserving and Protecting our Environment for Future Generations; Nov 29, 2019; p.3

2https://thecirculars.org/

[3] http://www.greenindustries.gov.au

[4] http://www.nwzc.ca

[5] http://sfenvironment.org/zero-waste-by-2020

Option Number and Name: WPD 4 – Support the Circular Economy

- **Oxford County** Council (in Ontario) recently announced a program to achieve two significant long term sustainability goals: achievement of 100% renewable energy by 2050 and achievement of 100% Zero Waste (as per its September 2016 Zero waste Plan).[6] Local circular economy job creation opportunities was a driving factor in the Council's first-of-its-kind joint commitment.

- The Ellen MacArthur Foundation [7]is a UK based environmental research and advocacy organization and the global leader on circular economy thinking and action in general, and circular plastics in particular. On March 13 this year, they published (in collaboration with UN Environment) a 200+ page report called the "New Plastics Economy Global Commitment Report". The report presents a compelling vision for circular plastics. Over 350 organisations have endorsed one common vision of a circular economy for plastics, where plastics never become waste. They recognise this vision offers a root cause solution to plastic pollution with profound economic, environmental, and societal benefits.

Considerations:

- Further engaging local charities in expanded or new waste diversion activities brings additional social and environmental benefits to the Halton Region community.
- Seeking to also engage local businesses/ entrepreneurs in "circular economy" waste recovery ideas could lead to new diversion opportunities.
- Selecting"winners" for a possible new/expanded waste diversion grants program (that also supports local business, not just non-profits) would be difficult to manage and could be controversial.
- Collaborating with other area local/regional governments (e.g. Toronto) on "best practice" ideas for local engagement/partnership projects could expand the impact of this area of activity.
- The additional waste diversion impacts of expanded funding/support are likely to be small – i.e. the low hanging fruit has already been identified/pursued.
- As new materials are designated for diversion by the province, new not-for-profit opportunities may be identified – e.g., in areas such as carpets, mattresses and C&D diversion initiatives.
- Some jurisdictions have worked with local colleges and business support organizations (e.g. in York Region as part of its master planning process) to host interactive workshops to explore the latest trends in collaboration, social innovation and sustainability.
- Developing a broad Repair and Reuse Strategy (both York Region and City of Toronto did this as part of their recent long term master planning processes) might help to identify new ideas/possible uses of the HWMS and other municipal facilities as pilot locations for new diversion initiatives.

[66] http://oxfordcounty.ca/Zero%20Waste/Draft%Zero%20Waste%20Plan%20216

[7] Ellen McArthur Foundation; New Plastics Economy Project: *A Vision of a Circular Economy for Plastics*

Option Number and Name: WDP 6 - Support the Sharing Economy

Description of Option:

Sharing resource hubs are rapidly increasing in popularity, growing in number and location. Whether it's repeated trading on a website, app, or an actual physical 'library' where residents can borrow an item (e.g. tools, sporting gear, and toys), these centres and online platforms often require no currency, and allow for the reduction in the amount of manufactured items.

The governments, businesses and non-profit organizations initiating these sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving energy and resources (required to manufacture virgin materials), and providing options to extend the use of an item amongst multiple users.

This option looks at the Region promoting sharing through supporting, partnering with and/or partially funding organizations involved in this area. Examples of such organizations for consideration are provided below.

The Region could support sharing initiatives as follows:

- Identify safe trading zones at municipal facilities
- Facilitate setting up lending areas, sewing and tool centres, repair cafes in multi-residential buildings and community centres
- Promote existing sharing options in Halton.
- Provide funding through the Waste Diversion Fund.

Category(ies) of Option: Waste Diversion and Policy

Timeline: Medium

Rationale and/or Source of Option: Consulting team.

Halton Region Experience:

- Halton supports several reuse opportunities, however does not currently support sharing opportunities. This would be a new program area for Halton Region.
- When a resident uses the Region's waste sorting tool, Put Waste In its Place (entering an item to determine 'where it goes') - and enters items such as 'clothes', 'tools' or 'toys' the first visual response is "Reuse Centres" and lists the closest organizations that accept items for reuse along with a map of the locations (user enters in their address). The Reuse Depot at the Halton Waste Management Site (HWMS) is also provided as an option if it's close to the users address. Garbage is noted at the bottom of the screen with a note "Put this item in your garbage" accompanied by a small garbage can icon. **[1]**
- The HWMS provides different opportunities for reuse. Items in good condition and fit for resale (e.g., clothing, electronics, furniture) can be taken to the Reuse Depot free of charge. Restrictions apply to certain items which are typically unwanted or have safety concerns (tires, carpeting, car seats, used mattresses). The Paint and Stain Reuse Depot provides an opportunity for residents to pick up and/or drop-off usable paint and stain, free of charge. Lastly, the Region provides drop-off space at the Container Station for certain materials that local businesses use for reuse (e.g., eye glasses, natural bottle corks, hockey sticks). **[2]**

Option Number and Name: WDP 6 - Support the Sharing Economy

Demonstrated Experience:

- **Bunz App** – The Bunz Trading Zone, an invite-only Facebook group started as a Toronto Facebook trade group for the exchange of goods and services. **[3]** The group now believes their app is the key to their future. The Facebook group, which numbers nearly 60,000, will no longer be accepting new members. Since the Bunz app was first released in January 2016 for iPhone and Android phones, 100,000 users have signed up. **[4]** An investor came forward to make the app possible and ensure a trading platform was accessible to all of Toronto. Bunz is looking for community leaders to expand their program into new jurisdictions. Hundreds of trades happen daily on this site, and participants can swap pretty much anything, as long as it isn't true cash (transit tokens and gift cards *are* accepted). In a move some users dislike, the company recently introduced a digital - or cryptocurrency - known as BTZ. Each new and existing user of the app receives 1,000 units of BTZ, which is currently equal to approximately three coffees. It is not yet actual currency and many members are objecting to the idea in principal (the site was supposed to remain cash-free) **[5]**. The site allows residents to search over one million items for trade, liking itself to a massively popular 'Facebook flea market'. They state over 50% of their users are in Toronto proper with more stretching across the GTA.
- **Institute for a Resource-Based Economy (IRBE) –** This organization operates physical depots and 'libraries' for sharing and lending. **[6]** These include The Sharing Depot - Canada's First Library of Things, where residents can come and borrow camping gear, sports equipment, children's toys, house party supplies, and board games at a small annual fee. They also run four Tool Library locations, a 'local hub for swapping, repairing and learning' **[7]**. They have loaned over 65,000 items since 2013, having an inventory of over 5,000 tools available for their 2,500 members to borrow. **[8]** Products are for loan, not for sale and borrowers save both money and space. **[9]** Membership and volunteer driven, IRBE is constantly evolving, recently opening the Kitchen Library. Similar non-IRBE groups are opening other trading locations like the Musical Instrument Lending Library. Annual membership fees to the Tool Library and Sharing Depot range from $55 - $110 (varies based on location, access to one or both libraries and if there are fees or renewals allowed). Items must be returned within seven days, and late fees apply, just like at a book library. They have reported an almost 100% return rate.

Considerations:

- There is a stigma around second-hand goods, they are less desirable or less functional once used a few times by another person. The co-founders of IRBE feel that *"If the city came out in full support of these projects, it would show people it is okay.".*
- The Region's density makes sharing easier. More people equates to more items and less travel time to trade/collect, potentially creating an increased sense of community.
- Should meet with stakeholders to determine how the Region can support them, what do they need to get started and operate successfully?

References:

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2. *http://www.halton.ca/cms/One.aspx?pageId=151236*
3. *https://bunz.com/*
4. *http://www.cbc.ca/news/technology/bunz-trading-zone-facebook-new-app-growth-1.3966996*
5. *http://business.financialpost.com/technology/blockchain/canadian-online-bartering-community-bunz-launches-digital-currency*

6. *http://www.irbe.org/*
7. *https://torontotoollibrary.com/*
8. *https://torontotoollibrary.com/keep-the-tool-library-alive/*
9. *https://nowtoronto.com/news/free-at-last-sharing-is-caring-toronto/*

Option Number and Name: WDP 7 – Alternatives to Bylaw Enforcement

Description of Option:

Increasingly, communities are recognizing the importance of compliance with waste diversion and garbage set out requirements, however would prefer to work collaboratively with residents rather than use punitive methods. Communities are also realizing that employing enforcement officers to monitor and enforce the by-laws is a challenging endeavour in large urban centres and, therefore, communities are examining alternative approaches to bylaw enforcement. This option explores the different methods that can be employed to encourage compliance with the Region's waste by-laws. Alternative methods usually require that adequate staff and measures are in place to ensure an effective monitoring system. This option looks at employing an outreach team to monitor waste set out and provide education and communication materials to households that are not in compliance with the waste collection by-law.

Category(ies) of Option: *Waste Diversion and Policy*

Timeline: Medium

Rationale and/or Source of Option: Consulting team

Halton Region Experience:

- Waste collection is governed with Bylaw No.123-12.
- If a household sets out waste material that does not comply with the By-law, the waste collection contractor may leave the material at the curb with a notice of why it was not collected. If the resident phones the Region regarding the non-collection, Region staff will work with the resident to educate them on compliance with the By-law.
- For households that are repeatedly not complying with the By-law, the current practice involves the Region delivering a notice to inform the household that the bylaw was infracted. If the infractions are not corrected, the Region may suspend services. Services will be reinstated if the resident calls in to confirm corrective actions have been taken.
- The most common bylaw infractions include contaminants in the waste stream, set out of non-collectable material, early set out and exceeding bag limits.
- To date the Region has not issued fines for infractions. The Region issues warning letters and works collaboratively on by-law compliance.

Demonstrated Experience:

- **City of Edmonton**: The City's Community Relations' Social Marketing Group, and the GIS/Mapping group have partnered on a project called One Household at a Time initiative. Launched in 2014, staff use GIS-equipped computer tablets to record addresses where residents have set out five or more bags of garbage. Within a few hours of collection, trained canvassers visit targeted households, providing immediate feedback on the problem encountered. During the visit, canvassers work with residents to develop a waste reduction approach that helps the resident reduce their waste and participate in the City's waste diversion services. GIS software in the field provides a seamless transition between morning identification and evening canvassing. The program runs twice a year and uses the commitment strategy by getting residents to commit to adapt their behaviour, ""We know people are more likely to adopt a new behaviour if they've made a commitment, and our staff are able to get commitments from 80% of residents in a brief five-minute conversation!" (Thibaudeau, Feb. 17, 2018). Since 2014, canvassers have spoken with 4,000 residents and visited

7,000 homes. Follow-up has shown that 69% reduced their garbage set out after the visits.

- **State of Florida**: Florida has launched a new education campaign called "Rethink, Reset, Recycle" intended to reduce contamination which asks residents to go back to the basics of recycling by focussing on aluminum and steel cans, plastic bottles and jugs and cardboard and newsprint. The campaign was funded in part by Waste Management Inc. in an effort to reduce contamination rates.
- The Florida Senate has passed a bill that would require municipalities to address contamination of recyclables in contracts and identify strategies and obligations of the municipality and the collector to reduce the amount of contaminated recyclable material being collected and establish procedures for identifying, documenting, managing, and rejecting residential recycling containers that contain contaminated recyclable material. The bill initially set the contamination limit at 15% but eliminated the limit after receiving complaints from municipalities and counties who felt they could not reach the target.[1] Municipalities and counties must work with the contractor to develop the strategies. The Bill[2] requires that:
    - The residential recycling company and material recycling facility may not be required to collect/process/transport contaminated recyclable material that exceeds the contractual agreement established between it and the community. The contract must define "contaminated recyclable material" and applies to all contracts established between a municipality or county and a private sector collection company providing resident recycling collection services or material recycling facility after July 1, 2018. Each contract must address:
        - Strategies and obligations to reduce contamination
        - Procedures for identifying, documenting, managing and rejecting containers containing contaminated recyclable materials
        - Remedies to be used in addressing containers containing contaminated recyclable materials
        - Education and enforcement measures to reduce contamination

    The bill did not pass into legislation due to complications with another part of the bill dealing with wastewater. It is expected to be presented again to legislature as a separate bill.[3]
- **City of Hamilton**: The City has won awards for its waste diversion outreach programs, e.g. the Green Bin program, which emphasizes outreach programs involving student "Green Teams" who went door-to-door providing P&E information to residents and answering questions. In 2017, the City launched the Green Your Routine campaign asking people to take a 30 day pledge (on-line or at events) to participate in the Green Bin program. When people took the pledge at events, they received a mini bin. As part of the pledge, participants agree to complete a survey after 30 days and accept a curbside visual audit. Staff would later visit the homes of those who made a pledge and conduct a visual audit on the materials set out at the curb for collection. If staff saw a low contamination rate in the green bin and low amount of food waste in the garbage then the resident received a special sticker to put on their green bin. In total 1,772 made a pledge on-line or at an event with 1,344 (76%) agreeing to be audited. The campaign ran from June to November 2017 and will begin again in spring 2018.
- **Halifax Regional Municipality (HRM):** HRM has hired four educators who work with enforcement staff to

[1] Florida Association of Counties. County Lobbyist Call - Monday, February 12, 2018 at http://fl-counties.com/sites/default/files/2018-02/CL%20Notes-February%2012%2C%202018.pdf

[2] Florida Senate - 2018 Bill No. CS for SB 1308 at https://www.flsenate.gov/Session/Bill/2018/1308/Amendment/200016/PDF

[3] Conversation with Suzanne Boroff, Waste Reduction and Recycling Section of the Florida Department of Environmental Protection on August 28, 2018.

Option Number and Name: WDP 7 – Alternatives to Bylaw Enforcement
identify multi-residential building owners that are experiencing problems and help them develop waste diversion programs. • **Simcoe County**: County Council has agreed to fund a $200,000 educational campaign. Solid Waste staff noted in a recent report to the Committee of the Whole that "These types of measures, restricting garbage collection in order to motivate green bin usage, are considered best practices and utilized in communities which have successful organics programs as it is extremely difficult to change resident's behaviour through promotion and education alone." (Simcoe County, March 13, 2018)
Considerations: • Engaging in outreach programs can be high cost but have been shown to provide positive results. • Options such as refusing to collect garbage without blue box and/or green bin set out will likely meet with resistance by residents.

References:

- *Toronto blue bins will be sifted through to see who's putting in the wrong items. November 12, 2017. Toronto Star.*
- *County of Simcoe wants to spend $200K to promote green bin use. March 13, 2018. CTV Barrie*
- *New Organics Campaign. March 13, 2018. Report to Simcoe County Committee of the Whole at https://simcoe.civicweb.net/document/41742/CCW%2018-088.pdf?handle=AF56BD2CD118418292C7DE9148DD5C02*
- *Simcoe County proposal would see garbage left behind if green bin isn't curbside.* September 22, 2016. *Barrie at CTV news at barrie.ctvnews.ca/simcoe-county-proposal-would-see-garbage-left-behind-if-green-bin-isn-t-curbside-1.3084620*
- *Thibaudea, Danielle. An Excellent Waste of Time. February 15, 2017 at https://transformingedmonton.ca/an-excellent-waste-of-time/*
- *Macdonald, Alex. Alley to front door: recycling message hits home. September 21, 2015 at https://transformingedmonton.ca/alley-to-front-door-recycling-message-hits-home/*
- *Florida DEP Announces New Statewide Recycling Education Campaign - Rethink*Reset*Recycle. Nov. 15, 2017 At http://www.cityofedgewater.org/es/page/florida-dep-announces-new-statewide-recycling-education-campaign-rethinkresetrecycle*
- *Rethink, Reset, Recycle campaign. Florida Recycles Organization at http://floridarecycles.org/*
- *Green Your Routine - Communications with Ruta Morkunas, City of Hamilton, March 22, 2018*
- *In house files*
- *The City of Calgary Industrial, Commercial and Institutional Waste Diversion Strategy Analysis. April 23, 2014*
- *Recycling Works Massachusetts website at https://recyclingworksma.com*
- *Characterization and Management of Organic Waste – Foundational Report. December 2017. Commission on Environmental Cooperation (CEC)*

Option Number and Name: WDP8 – Provide Waste Diversion P&E to the IC&I Sector

Description of Option:

In February, 2017, under the Resource Recovery and Circular Economy Act (RRCEA), the Minister of Environment and Climate Change (MOECC) released a Strategy for a Waste-Free Ontario, which serves as a Roadmap to help shift Ontario towards the goals of a circular economy, zero waste and zero greenhouse gas emission from the waste industry. The Strategy outlines how the Government intends to foster greater responsibility for waste diversion, including in the ICI sector. The Strategy sets a target to begin implementing amendments to the existing ICI waste diversion regulations in 2019 (i.e. to better address industrial, commercial & institutional - ICI - waste).The existing regulations have not been effective in achieving the intended waste diversion in the ICI sector.

According to Statistics Canada, 87% of businesses in Ontario have fewer than 20 employees and 68% have fewer than 5 employees. In 2016, 45% of Ontario grocery stores employed fewer than 20 employees. In terms of convenience stores, 92% employed fewer than 10 staff and 67% employed fewer than 5 staff. The Ontario food service industry is mostly represented by independent businesses (60% of businesses are classified as independent) with almost 60% hiring fewer than 20 employees (Statistics Canada, 2016).

Within the ICI sector, grocery stores and food service businesses (also referred as consumer-facing businesses) generate the majority of food waste and recyclable paper products and packaging. According to a recent US study, It is estimated that 40% of food waste occurs in customer-facing businesses like restaurants, grocery stores and hotels.1 Health and safety policies have resulted in food being tossed because it exceeds best before dates (e.g. grocery stores) or has been prepared but not used/eaten (e.g. food service businesses). Over the past few years, however, the consumer-facing food industry has begun to address the issue of reducing food waste, recognizing that not only is reducing food waste good for the environment but it is good for business profits; for example, in 2011, the Grocery Manufacturers Association and Food Marketing Institute joined the National Restaurant Association to create the Food Waste Reduction Alliance, which is helping companies find ways to cut food waste.

Many small and medium commercial establishments lack the resources, space and budget to implement a food waste and recycling program that targets waste diversion needs. This option looks at how the Region can be involved in providing technical, training and educational support to small, medium and larger ICI establishments during these transition periods. The Region will determine the feasibility of implementing the Green Cart program in the BIAs.

Category(ies) of Option: Waste Diversion and Policy

Timeline: Medium

Rationale and/or Source of Option: Consulting team observation.

Halton Region Experience:

- Halton Region provides waste management services (including recycling and garbage collection with wheeled carts) to eight Business Improvement Areas (BIAs) and small commercial businesses on existing collection routes that had been receiving service from the local municipalities. BIAs receive collection twice per week on Tuesdays and Fridays. Depending on the BIA size, each business should have: one 360-litre or one 240-litre or two 120-litre black wheeled carts for garbage, and one 360-

[1] Roadmap to Reduce US Food Waste by 20 Percent. 2016. ReFED, A www. refed.com.

Option Number and Name: WDP8 – Provide Waste Diversion P&E to the IC&I Sector

litre or one 240-litre or two 120-litre blue wheeled carts for recyclable material.

- Halton Region provides green cart and blue box collection to libraries, Town/City Halls, and 158 publicly funded schools and blue box collection to arenas and community centres.
- Halton Region has an active education program for schools to teach children about waste reduction and diversion.
- Most businesses do not use the Regional landfill, Halton Waste Management Site (HWMS), for the disposal of ICI waste as the tip fee is higher than privately owned disposal options.
- The Region's Waste Management Services offers workshops for businesses to promote waste diversion practices within their organizations.
- In 2016, 109 tonnes of SSO from the commercial sector were diverted.

Demonstrated Experience:

- A few Ontario communities that offer Green Bin service to residents also offer limited Green Bin service to commercial and institutional establishments, which receive their collection services, including cities of Toronto, Hamilton, Sudbury (schools), Guelph, Markham and Simcoe County.
- **New York City's Department of Sanitation:** The City's Foundation for New York's Strongest launched a Microgrant Program for city businesses looking to address food waste in their operations. The grants, worth up to $15,000, aim to help New York City businesses prevent, recycle or recover their food waste.
- **Alameda County, CA:** The County has its The StopWaste Revolving Loan Fund in which it provides low interest loans for businesses and non-profits to encourage the growth of a robust reuse and recycling based economy by helping fund entrepreneurial activities that utilize recycled, composted or reused materials.
- **Halifax Regional Municipality (HRM), NS**: HRM has implemented a Source Separation Bylaw (By-Law S-600) which requiring that all commercial properties engage in source separation programs for garbage, recyclables and organic materials. The by-law also instructs that property owners of commercial establishments must provide adequate bins and signage. A similar requirement has been enacted in New York City with its Commercial Organics Diversion Mandate.
- **Metro Vancouver, BC**: has developed a Food Scraps Recycling Campaign for small businesses featuring a social marketing and education plan, including business guides and other outreach programs to inform and educate businesses on waste reduction opportunities. Metro Vancouver conducted pilot programs and developed new resource guides on food scraps reduction and recycling for businesses. Informed 1,200 small businesses directly on the food scraps regulation through a program to recruit small businesses for a pilot study on food scraps recycling. Informed small business through their Business Improvement Areas (BIAs), Chambers of Commerce and Associations. Worked directly with 12 food businesses (bakery, restaurant and grocer) to initiate food scraps recycling, and capture their experiences to develop case studies as a demonstration to others.
- **City of Calgary, AB**: The City developed an ICI Waste Diversion Strategy in 2014 targeting offices, stores, schools, hospitals, malls, restaurants, hotels, manufacturers, factories, warehouses and other businesses and organizations. The Strategy includes plans to ban business paper and cardboard at City landfills by 2018 and features the establishment of an ICI working group to help in developing the ICI Waste Diversion Strategy. Another part of Calgary's strategy is to work with the private sector to develop a separate strategy for managing, monitoring and reporting ICI waste. As of Nov. 1, 2017, businesses and organizations are required to separate food and yard waste from the garbage for composting or diversion. Calgary staff conducted multi- stakeholder engagement discussing varying program options including, voluntary, economic and regulatory approaches.
- **City of Los Angeles, CA**: Established in 2014, the Los Angeles Green Business Program and Certification encourages businesses in Los Angeles to apply for Green Business certification by meeting a set of green business standards including implementing waste reduction and green purchasing activities. Training workshops are provided. Certification allows businesses to display window decals and promotional materials in their business and use the Green Business logo in advertisements. Alameda County has a similar program.

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- **Seattle's Business Waste Assessment**: is a do-it-yourself Microsoft Excel assessment tool to help businesses easily understand waste reduction and diversion opportunities.
- **RecyclingWorks, Massachusetts**: RecyclingWorks is an assistance program, designed to help businesses and institutions start a recycling or composting program or maximize reuse opportunities. RecyclingWorks provides information (e.g., materials guidance) and tools (e.g., a searchable database of recycling haulers/processors), as well as expert technical assistance and opportunities to connect with and learn from other organizations (e.g., events and workshops). The program is funded by the Massachusetts Department of Environmental Protection (MassDEP) and supported by the Center for EcoTechnology. Between July 2016 and June 2017, the dedicated website experienced over73,000 visits and staff helped (through the hotline or emails) almost 1,000 businesses in that time period.
- **State of Vermont**: Vermont has implemented a phased in food waste separation requirement for large ICI generators of food waste. To ensure fair access and pricing of food waste diversion, composting facilities are offering tip fees lower than landfill fees. For example, Green Mountain Compost collects a US$41/ton tipping fee from commercial haulers who bring food scraps and other compostable material to its facility. These fees are lower than the range of US$70/ton to US$80/ton, associated with landfilling this material.

Considerations:

- Halton provides waste management and diversion services to BIAs and a small proportion of the ICI sector.
- Increasing the services and support will require a commitment of funds and resources.
- With the Province proposing an organics ban from disposal, small ICI establishments will need help to develop waste diversion services. Halton Region is in a good position to provide technical and support services.
- Halton Region should develop an ICI database similar to its multi-residential database to help it maintain information and records on adoption, support and waste diversion progress in the ICI sector within the Region. This information can be used for future planning purposes.
- Halton Region may need to provide composting support to the small business sector, which lacks resources and access to adequate composting infrastructure.
- Halton Region may need to explore a cost recovery approach that is affordable to small business owners and helps to fund a technical assistance program.

References:

- *Halifax S-600 at by law - http://www.halifax.ca/legislation/bylaws/hrm/documents/By-LawS-600_000.pdf*
- *Los Angeles Green Business Program at https://www.lacitysan.org/san/faces/home/portal/s-lsh-es/s-lsh-es-si/s-lsh-es-si-gbc;jsessionid=p67ilpQfsvFICDwFGqv1Kvp9OkMXiwihJlsOohLieUpK_Bq9sU!2065689741!1446895198?_afrLoop=761773669134297&_afrWindowMode=0&_afrWindowId=null#!%40%40%3F_afrWindowId%3Dnull%26_afrLoop%3D761773669134297%26_afrWindowMode%3D0%26_adf.ctrl-state%3Dfwouue4ga_4*
- *Metro Vancouver Zero Waste Committee meeting notes. Nov 15, 2015*
- *Statistics Canada, Canadian business counts, location counts with employees, by employment size and North American Industry Classification System (NAICS), Canada and provinces, December 2016. At http://www.statcan.gc.ca/daily-quotidien/170215/dq170215e-cansim-eng.htm*
- *Nicoleta Uzea, M. G. Developing an Industry Led Approach to Addressing Food Waste in Canada. 2014. Guelph: Provision Coalition.*
- *Agriculture and Agri Food Canada. (April 2015). An Overview of the Canadian Agriculture and Agri-Food System 2015. Ottawa: Agriculture and Agri Food Canada.*
- *Industrial, Commercial and Institutional (ICI) Organics Waste Diversion Strategy. March 5th, 2015. City of Calgary. Presentation at Compost Council of Canada workshop*

- *The City of Calgary Industrial, Commercial and Institutional Waste Diversion Strategy Analysis. April 23, 2014*
- *Recycling Works Massachusetts website at https://recyclingworksma.com*
- *Characterization and Management of Organic Waste – Foundational Report. December 2017. Commission on Environmental Cooperation (CEC)*

Option Number and Name: WDP 11 – Enhanced Contractor Collection Services

Description of Option:

All waste collection services are contracted out to private sector waste management companies. However with the emergence of RFID tags, garbage collectors can offer more services than just collection. Cities employing RFID tags in garbage bins are able to track issues and reduce pickups for commercial or multi residential buildings to only when the bins are full. These tags are also capable of weighing lifts for these customers and keeping a dataset of bin weights and number of lifts.

This option looks at requiring collection contractors to provide more services including enforcement, tracking/issuing notices, promotion and education, weighing lifts from MF and ICI customers

Category(ies) of Option: Waste Diversion and Policy

Timeline: Medium

Rationale and/or Source of Option:

- SWOT and Visioning workshop with Region staff.

Halton Region Experience: (review for accuracy)

The Region of Halton provides various collection services for approximately 150,000 SF and 40,000 units in 450 apartment buildings, some commercial customers including Business Improvement Areas, almost 160 publicly-funded schools, roadside litter containers, Town/City Halls, community centres/arenas and libraries in the Region.

- The collection services provided for urban areas in the Region include: weekly blue box, weekly green cart, seasonal biweekly collection of leaf and yard waste (April to December), bi-weekly garbage, brush call ins for Oakville, bulk waste collection and call in metal collection. For rural residents the services included are: weekly blue box, weekly green cart, bi-weekly garbage, , and bulk waste collection (Burlington and Milton). All single family waste is collected at curbside using manual vehicles.
- All multi residential buildings are serviced for garbage, recycling, and as of 2015 the Region began implementing a Green Cart program. As of May 2018, there are approximately 220 apartment buildings on the Green Cart program, while an additional one to two buildings are being assessed and added to the collection program each week with the Region planning to have the remaining buildings serviced by the year 2019. The recycling carts have RFID tags and the information has been recorded in a database, however a monitoring system has not been implemented.
- All of the existing collection contracts expire in the spring of 2024.
- In terms of enforcement, contractors will leave unacceptable material at the curb with a “sorry” sticker explaining why the waste was left behind; the most common cause is contaminated waste.

Demonstrated Experience:

- **The City of Guelph**: The City uses carts that have radio-frequency identification (RFID) tags attached that monitor the carts. All the collection vehicles are equipped with RFID readers and have been in use since December of 2012. Additionally, all collection vehicles have GPS and cameras which allows the operators to verify the collection of the carts and map out their route. Using their monitoring equipment the operators can mark locations that have cart obstruction, contamination issues and any other concerns, this way a compliance staff can follow up and report if required. The RFID reader in the vehicles detect the RFID tags on the carts and can verify when a lift has been completed and report that information in real time to a database[1]. The City also provides a Cart Assistance Program for residents that have limited mobility. Residents that are a part of the program receive assistance from staff that will collect and return their carts on collection day, rather then the resident bringing

[1] https://swana.org/Portals/0/awards/2016/winners/CityofGuelph_CollectionSystem.pdf

Option Number and Name: WDP 11 – Enhanced Contractor Collection Services

the carts curbside.

- **City of Barrie**: Waste collectors for the City of Barrie use GeoTab, a GPS fleet tracking and management system, which is used to track external behaviour of residents. Trucks are equipped with a panel that houses three buttons, these buttons are colour coded for specific infractions and are pressed when the collector notices an issue. If a bin is not placed out the green button is pushed, white for a contaminated bin and red if a bin is over limit. Once a driver notices the issue at the curb they will push the corresponding button and the GPS system will link the issue to an address. This information is uploaded to staff at the City of Barrie after each collection event to provide feedback on public behaviours. If the issue is persistent it is documented and may include a follow up with City Staff.[2]
- **Bluewater Recycling Association (BRA)**: BRA uses a combination of an intelligent collection system, driver intervention and a follow up to promote and educate residents of proper sorting of recyclables. BRA employs RFID s and On Board Communication (OBC) to deliver real time data on issues related to curbside collection. All BRA vehicles are equipped with OBC, which allows operators to report locations that have broken carts, cart obstruction, contamination issues, no carts set out and operators can manually add notes or take a picture as evidence of the issue they noted. All vehicles have an interactive on-board display screen which is used if an operator notices an issue. The operator will select the specific issue(s) they observe and the data will be sent on a database. If there are numerous instances of the same issue at one location, a "bin team", a team of BRA workers, will go to the location and leave a sticker explaining the issue with a warning to "correct this (issue) because we may not collect next time. This program focuses on promotion and education rather than enforcement.[2]
- **University of British Columbia (UBC):** The firm, eleven-X Inc. has launched a "smart campus" pilot program with the UBC. The program is aimed at improving waste collection efficiencies through the optimization of route planning and pick-ups which will aim to lower costs by reducing scheduled pickups to just as needed and eliminate the need for emergency call-outs. Waste bins on campus will be equipped with sensors and these sensors will be able to communicate real-time the fill-levels of each of the bins. The maintenance staff of UBC will be able to track levels through a dashboard and determine optimized routes and pick-ups.[3]
- **Sydney, Australia**: Residents in Sydney's Inner West area have collection bins equipped with RFID tags. With each lift, the lifting mechanism weighs each bin and counts the lift. As the information is tied directly to the unique RFID tag the waste contractor instantly knows what household the bin belongs to.[4] The operator can use this information to track resident behaviour as well as identify the number of lifts.
- **Strathcona County, AB:** Waste collectors will not collect waste and place an "oops" sticker with instructions on how to properly place out waste if they notice an infraction. Strathcona County waste collectors will place a sticker if any of the following errors occur[5]:
    - carts were placed too close to each other or to another object;
    - waste was incorrectly separated;
    - incorrect cart was placed out for collection (i.e. organics cart was out during a waste

[2] Ontario Recycler Workshop (May 2, 2018)
[3] http://eleven-x.com/eleven-x-and-ubc-announce-2nd-smart-campus-project-smart-waste-bin-monitoring/
[4] http://www.news.com.au/technology/online/security/council-bins-are-quietly-being-fitted-with-tracking-technology-revealing-all-your-dirty-secrets/news-story/7a607ba9800ac7439bfcba50f532ac51
[5] https://www.strathcona.ca/your-property-utilities/garbage-and-recycling/collection-schedules/my-waste-collection-was-missed-or-stickered/

Option Number and Name: WDP 11 – Enhanced Contractor Collection Services

collection week);
- recyclables were incorrectly packaged; and/or
- cart lid did not close properly because the cart was overfilled.

Considerations:

- RFID tags can provide building-specific data on waste management performance (e.g., quantities collected, building specific performance rates) and increase the accessibility for on-demand billing information;
- RFID's would allow the Region to monitor waste material generation. As a result the Region may be able to geographically target education campaigns and/or provide building managers with access to data on their building performance;
- Reduction in collection costs (less trucks, fuel, labour) and traffic congestion associated with standard waste collection routes and schedules); and
- Real-time optimized collection routes that collect from only containers that are full. Capital costs to purchase, distribute and place technology on collection containers (e.g., RFID tags/chips, GPS geo-coding positioning, sensors);
- Capital costs for equipment and distribution on waste collection vehicles (or make as a requirement in a collection contract);
- Installation/start-up costs to implement the program;
- Operating costs for maintenance and any subscription fees for sensors;
- The technology is still relatively new;
- There is reliance on external cloud-based platform to manage data and automatic collection routing;
- Utility rates will need to be monitored as they may be impacted by decreased waste set out;
- Procurement of technology will need to be completed together with corporate information and technology;

References:

- https://swana.org/Portals/0/awards/2016/winners/CityofGuelph_CollectionSystem.pdf
- Ontario Recycler Workshop (May 2, 2018)
- http://eleven-x.com/eleven-x-and-ubc-announce-2nd-smart-campus-project-smart-waste-bin-monitoring/

Option Number and Name: WDP 12 - Review Event Diversion Program

Description of Option:

This option looks at enhancing the existing community event diversion program by looking at opportunities such as partnering with NGOs to co-ordinate volunteers and/or providing NGOs with funding to deliver waste diversion services at events, providing more Region staff support during the event, and more waste diversion tools and materials.

Category(ies) of Option: Waste Diversion and Policy

Timeline: *Medium*

Rationale and/or Source of Option:

- Consulting Team

Halton Region Experience:

Halton Region receives requests to provide waste collection services at public community events throughout the year. In 2016, the Region provided services for almost 50 events. Estimates on attendees at past events range from as low as 50 to as high as 200,000. Although community event waste is not typically considered the responsibility of the Region, in order to promote waste diversion in the community, Regional staff provides waste collection tools and assistance to divert blue box and green cart materials generated at the event from landfill. The Region provides waste diversion containers, signage and training to event staff (many of whom are volunteers). However the Regions event organizers have had difficulties with retaining volunteers.

- An application process is available online and event coordinators can request services at least six weeks in advance of the event.
- Event organizers must submit a waste diversion plan that demonstrates how diversion will be achieved and contamination will be minimized.
- For events where food and drinks are sold, the Region encourages organizers to use food and drink packaging products that are accepted in the Blue Box and Green Cart programs.

Demonstrated Experience:

- **City of Richmond:** The City, through their Environmental Programs Department, runs a youth outreach program, Richmond Green Ambassadors (RGA) that partners with the Richmond School District. The program aims to recruit students who are required to complete a minimum of 30 hours of community service. The RGA trains students and has them participate at special events with setting up waste stations, monitoring contamination levels and help educate event goers on proper waste sorting. The program is funded as part of the City of Richmond's Community Outreach budget and each volunteer is given a lunch voucher for the event. In 2014 the RGAs operated recycling stations at eight different events and achieved diversion rates in the 90% range[1].
- **City of Portland, Oregon:** The City has a Master Recyclers (MR) Group, a paid waste-reduction training and community outreach program. The Bureau of Planning and Sustainability oversees the program that train residents over eight weeks to be certified MRs. The City encourages special event organizers to include MRs in development of the waste reduction plan. The MRs also work with organizers and waste haulers to determine the required number of recycling stations. The program was initiated in 1991 and the City uses funding from Metro Portland and the City of Portland. Over

[1] http://richmondsustainableevent.ca/wp-content/uploads/2015/09/SSET-Case-Study-Green-Ambassadors.pdf

Option Number and Name: WDP 12 - Review Event Diversion Program

1,350 MRs have graduated from the program. In 2013, MRs contributed 3,309 hours of community outreach (exceeding the 900 hours required for graduation).[2]

- **GoodWork:** Founded in 2001, GoodWork helps organizations find environmentally minded staff, interns and volunteers. GoodWork is operated by Canadian environmentalists and conservationists, with no corporate or government sponsorship. Their website operates as a job posting site where individuals can find jobs or volunteer positions with an environmental focus. Their website includes a volunteer section where people can search volunteer positions by province and allows organizations to post volunteer positions they have available.[3]
- **City of Markham:** The City of Markham uses the software Better Impact to build a volunteer base and to promote volunteer positions. Better Impact allows municipalities and organizations to engage local residents to volunteer. Organizations can create an individual online application form that includes their logo and colours. The City of Markham website volunteer section links to Better Impact's webpage where potential volunteers can fill in their personalized application and apply for various volunteer positions. Applicants create a profile on Better Impact and fills in the City of Markham's application form, the City can then review all applicants and offer volunteer positions. Better Impact allows organizations to schedule, communicate with, and manage applicants as well as provide reports on time being given by volunteers. [4]

Considerations:

- Encourages young students to get involved in waste diversion and offers credits towards volunteer requirements for High School graduation.
- Targeting students will give them experience and employability/life skills, and be beneficial to the community and to the student.
- Organizing and funding volunteer programs can reduce difficulties of finding volunteers.
- Volunteers can act as a liaison between event organizers, vendors and haulers.
- Increased volunteer opportunities can help to develop a sense of pride for their Region.
- Staff time required to promote the program and volunteering opportunities with the Region.
- A tailored volunteer program can provide a clear volunteer job description which will better align expectations from both volunteers and the Region.
- Providing funding to volunteers can help to motivate and keep volunteers participating at Regional events.
- Training on proper waste practices benefits everyone inside and out of the special events.
- Cost effective community based endorsement

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2 https://sustain.ubc.ca/sites/sustain.ubc.ca/files/GCS/FINAL_ANGIE_AN_GCScholar_Report_2014_Zero_Waste_Volunteers_Events.pdf

3 https://www.goodwork.ca/jobs.php?level=vol&prov=ON

4 http://www.markham.ca/wps/portal/Markham/RecreationCulture/Volunteering/BecomeAVolunteer/!ut/p/a1/jc89D4IwEMbxj9SnKeVlLBXL8RLsAGIX04mQKDoYP79gWBxEb7vk90_umGM9c5N_joN_jLfJX5bdheeCoLkqUeCwl1BJ12TSGoGYz-A0A21UHkQVgNbsQJFN26YuBSj8r8eXUfjVH5n7JEbImdRZQkkuUl4GKwgao3XVxdYuJVGuJNUCWvIVbP3wBhtH3q9tj5GGF2g0A_Q!/dl5/d5/L2dBISEvZ0FBIS9nQSEh/

Option Number and Name: WDP 13 – Pay As You Throw (PAYT)

Description of Option:

Bag limits restrict the number of garbage bags that can be placed out for collection at any time. The bag limit encourages residents to use other means, such as available waste diversion programs, to reduce their garbage set out. Set out monitoring audits reveal that residents typically place one to two bags of garbage per week for collection. In order for bag limits to work, they must be set at a limit that is below or at the average garbage set out rate (e.g. two bag limit) in order to encourage diversion. Bag limits are often coupled with Pay-as-you-throw policies.

Pay-as-you-throw (PAYT) policies (also referred as user pay) require customers, including single family households, multi-residential building owners and commercial establishments, to pay for garbage set out for collection. This approach acts as a financial disincentive to generating garbage and encourages residents to use available waste diversion programs to minimize the amount of garbage requiring disposal. Some communities permit residents to place a set number of bags of garbage for collection before requiring residents to purchase tags and affixing them to the bags, which is referred to as a partial PAYT program. Other communities require residents pay for all garbage bags set out for collection by purchasing tags and affixing them to the bags, which is referred as a full PAYT program. While more popular in the United States, some larger urban centres including the Cities of Toronto and Vancouver, offer variable sizes of carts for garbage, recycling and organics and charge a variable fee based on the size of the garbage carts (and organic carts in the case of Vancouver). The fees cover all or part of the cost of waste diversion services.

This option looks at implementing partial PAYT programs through use of bag limits, bag tag fees and implementing to the multi-residential sector.

Category(ies) of Option: *Waste Diversion and Policy*

Timeline: *Medium*

Rationale and/or Source of Option:
Consulting team observation

Halton Region Experience:

- Halton Region offers bi-weekly garbage collection service with a partial PAYT program which permits residents to place up to three bags of garbage at the curb without requiring tags. After that, residents must purchase tags. Garbage bag tags are available for purchase (sold in packs of five for $10) at municipal outlets such as the HWMS, community centres, libraries, town halls, as well as in retail outlets, and online.
- Residents can place up to three tagged bags curbside in addition to their three untagged bags.
- In 2016, the Region sold 15,862 garbage bag tags. The Region allows additional tags to be distributed at no cost for homes with diaper waste (e.g., young families) and healthcare needs in all areas aside from two collection zones in rural Halton Hills that do not receive garbage collection. The tags permit households to exceed the 3-bag limit and dispose of diaper and healthcare waste at the HWMS and two private transfer stations at no additional cost.
- In 2016, the Region received 1,280 requests to join the Diaper Bag Tag program and distributed 51,200 additional bag tags. The Region received 74 requests to join the Healthcare Bag Tag program and distributed 2,960 bag tags. In 2016, 59,035 tonnes of garbage was collected from single family households.

Demonstrated Experience:

- **Bulky Waste Collection** – The City of Guelph offers a call-in service in which residents can schedule bulky waste collection and are charged $33 for one item and $27 for each additional item. Simcoe County also has a call-in service in which residents can schedule a bulky waste collection and are

Option Number and Name: WDP 13 – Pay As You Throw (PAYT)

charged $40 for up to 5 items. When items are collected, they are sorted in the cube van into reuseable, recyclable and non-recyclable areas. This approach results in about 50% of bulky items being diverted.

- **City of Toronto**: offers a front end bin collection system for multi-residential buildings based on a levy system in which each cubic yard of garbage collected is charged a fee. A compacted bin is charged $29.31/yd3 and an uncompacted is charged $14.65/yd3. All waste diversion programs, such as blue box recycling, organics, bulky waste, HHW and waste electronic collection are covered in the garbage fee and provided at no additional charge.
- **City of Kingston**: In 2012, the City reduced its two-bag PAYT program (weekly collection) to a one-bag limit to encourage better participation in the green bin program and increase their diversion rate. By reducing garbage bag limits, the City experienced 3% less garbage collected and a 13% increase in green bin materials collected.
- **Cities of Sudbury and Ottawa**: both Cities have introduced a PAYT program for small commercial customers who must purchase city issued yellow bags for their garbage. In the case of Sudbury, businesses that produce fewer than three bags of garbage per week can join the City's Biz Bag Commercial Garbage Program by registering with the City and paying a $100 registration fee. Qualified businesses must be located on a residential garbage collection route to participate in the program. Approved businesses must purchase yellow garbage bags (at $3.00 each) with the City logo to participate in the program.
- **Various large urban communities**: The Cities of Toronto, Vancouver, San Francisco and Seattle have introduce variable cart programs in which residents pay a different fee based on the size of the garbage cart (and other streams). Each of the mentioned communities has adopted a different fee approach. The City of Toronto bundles all waste management and waste diversion costs into the variable garbage fees; the City of Vancouver charges variable fees for both the garbage cart and the organic cart (recycling is provided by RecycleBC); the City of San Francisco charges a monthly base fee to all residents and also charges a variable fee for garbage carts, recycling carts and organic carts; and the City of Seattle charges a variable fee for garbage carts and organic carts with the garbage fee covering recycling costs.

Considerations:

- The Region will incur costs to advertise and promote any changes to garbage bag limits or set out requirements
- The variable cart program has been shown to result in higher blue cart and green bin contamination rates as residents try to reduce the fee/size of their garbage carts and use the other streams for extra garbage disposal

References:

- *City of Sudbury's Review - Garbage Collection Policies. January 20, 2016. At https://agendasonline.greatersudbury.ca/index.cfm?pg=feed&action=file&agenda=report&itemid=2&id=998*
- *Commercial Garbage Collection Program in Sudbury at https://www.greatersudbury.ca/live/garbage-and-recycling/garbage-collection/commercial-garbage/*
- *Communications with Wilma Bureau, Manager of Contracts and Operations. Simcoe County, November 2016*
- *Changes at the Curb – Impact on Waste Tonnages. October 27, 2015. Halifax Regional Council at http://legacycontent.halifax.ca/council/agendasc/documents/151027cai04.pdf*
- *City of Toronto Apartment, Condo's and Co-op waste website at https://www.toronto.ca/services-payments/recycling-organics-garbage/apartments-condos-co-ops/*

- *City trying to get Torontonians to stop filling recycling bins with garbage. June 01, 2017. CBC news at http://www.cbc.ca/news/canada/toronto/recycling-toronto-garbage-1.4141579*

Option Number and Name: WDP14 – Promotion and Education for Diversion – Medium/Long Term

Description of Option:

Waste diversion promotion and education (P&E) strategies have been used to achieve a variety of goals from promoting higher participation in a Green Cart program to modifying improper behaviour, such as wishful recycling leading to high contamination rates in the Blue Box program.

While promotion and education programs remain a key component of successful waste diversion programs, staff often face restricted P&E funds that require them to examine effective best practices. Dr. Calvin Lakhan examines these best practices in his report to the Continuous Improvement Fund, "Review of CIF Funded Projects and Key Learnings" Final Report: June 28th, 2017 – "Broadly speaking, direct engagement strategies (face to face interactions, community events etc.) yield the greatest immediate change in recycling behavior. However, these types of initiatives can be resource and time intensive.

Conversely, P&E advertisements communicated in local newspapers, is the least effective. However, given its low cost and broad outreach, opting for newspaper campaigns is an easy fall back for municipalities who want to do "something". [1]

With this in mind, some communities have attempted to combine P&E outreach techniques with the use of innovative approaches in order to achieve the benefits of outreach strategies at a lower cost. The Region's social media platforms provide an opportunity to develop a campaign to promote waste diversion to residents at a low cost.

Category(ies) of Option: Waste Diversion and Policy

Timeline: Medium

Rationale and/or Source of Option:
Recommendation from staff.

Halton Region Experience:

- Halton Region has an award-winning waste diversion education program that reaches out to schools, community groups, multi-residential buildings, and businesses. This program aims to teach about Halton's waste management programs and the HWMS. Regional staff attend various community events throughout the year to provide on the spot education and promotion.
- Halton Region has a very active social and electronic media for waste diversion programs
- Halton has an on-line tool called "Put Waste in its Place" to enable residents to search for waste diversion solutions and a waste collection calendar that allows residents to establish set out reminders by email, phone or twitter.

Demonstrated Experience:

- Founded in 2014, Zerocycle has developed an outreach approach that uses waste management data available from a community (such as weigh tickets and routing information) to develop Resident Engagement Reports (RER), which are customized to each community's needs and features full-colour maps and neighbourhood rankings. The reports help to foster friendly neighbourhood competition and generate awareness of the household's waste diversion efforts (compared with other neighbourhoods). The company has also developed a tool called the Recycling Analytics Dashboard (RAD), which can be embedded on a city's official website to provide visual displays of each neighborhood-specific waste diversion metrics. This approach not only keeps residents/public informed and engaged, but it can be used by staff to identify areas that are experiencing challenges and successes.
- The City of Buffalo has employed Zerocycle to pilot the Residential Engagement Report (RER) outreach program as well as employ the Recycling Analytics Dashboard (RAD). The RER pilot resulted in a doubling the rate of increase of its recycling program and, due to its success, the City of Buffalo has expanded the project to other neighbourhoods. In addition, the City has employed the RAD

[1] Review of CIF Funded Projects and Key Learnings" Final Report: June 28th, 2017. Pg. 27

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approach, which the public can access through the City's recycling webpage. The webpage states "Do you want to see how your neighborhood is doing with its curbside recycling? Check out this link that was created for the City of Buffalo by Zerocycle Inc. The City uses this information to target specific neighborhoods that need extra help to boost the recycling! http://reports.zerocycle.co/buffalo/index.html"

- In 2016, the City of Fremont conducted pilots in five neighbourhoods to test three outreach approaches on almost 2,000 households with the goal to influence green bin behaviour using community based social marketing principles. The pilot groups were compared with a control group, that received no outreach. The three pilots involved:
  1. Mailed Composting Report (Zerocycle) involving a graphical "composting meter" comparison of the targetted neighborhood's composting rate to nearby neighborhoods (to create feedback and awareness of their diversion efforts from their neighbours), testimonials from residents, and instructional and graphical information on green bin recycling
  2. Hangtags placed on trash bins with instructional and graphical information on green bin recycling and a prompt to participate
  3. Kitchen Pail (to increase convenience of collecting food scraps) with instructional and graphic information on green bin recycling; and 30 BPI certified bio bags

  The City also conducted pre- and post- waste audits on 100 households with the following results:
  - Each of the three communication strategies significantly reduced the amount of trash: countertop pails (13%), hangtags (34%), and composting reports (13%) and no significant change in control group.
  - Each of the outreach strategies significantly reduced the amount of compostable material in the trash with the largest difference observed for the hangtags (42% reduction), followed by the composting reports (28%), and finally the countertop pails (24%) compared with 20% increase in compostables in the garbage with the control group.
  - Each of the interventions produced a significant reduction in the amount of food scraps in the trash. The largest reduction came from the hangtags (45% reduction), followed by the composting reports (41% reduction), and the countertop pails (40% reduction) with the control group experiencing a 23% increase.
- In 2014, the City of Edmonton implemented the Large Volume Set Out (LVSO) outreach program, which combines waste collection reporting with social marketing outreach. In the morning of a garbage collection route, a staff member walks with the garbage truck identifying households that are setting out five or more bags of garbage. The houses are flagged using Geographic Information System (GIS) technology and the information is sent to a team of Social Marketing Coordinators (through an ipad) who visit the targeted households in the evening to talk with the householders about reducing their waste. The program operates on average twice a year – from late fall until just before the holiday season, and again from January to early spring. Since 2014, the coordinators have visited almost 7,000 households and have spoken with over 4,000 residents. The results have been positive - an evaluation conducted in 2016 showed that 69% of targeted households responded with fewer bag set outs and 41% reduced their garbage set out by two or more bags.

Considerations:

- The Region has been a strong supporter of innovative P&E and outreach programs and has won numerous awards for its P&E
- These approaches rely on well-organized and reliable data collection and management techniques, which can be costly to establish
- Requires support to "try something new"
- Can be used to target different waste diversion challenges and easily modified according to need

References:

- *Review of CIF Funded Projects and Key Learnings Final Report (CIF #762). June 28th, 2017.*
- *Prepared for the Resource Productivity and Recovery Authority Continuous Improvement Fun by Dr. Calvin Lahkan, York University at http://thecif.ca/wp-content/uploads/2016/09/762-York_Univ_Final_Report.pdf*
- *Pilot Program: StopWaste City of Fremont Residential Food Scrap Recycling. November 2016. Report prepared for StopWaste by Action Research at https://storage.googleapis.com/zerocycle_fremont_pilot_results/Pilot_Program_StopWaste_City_of_Fremont_Residential_Food_Scrap_Recycling.pdf*
- *Zerocycle Engagement Initiatives Boost Recycling Rates for Buffalo & Cincinnati. March 28, 2018. Waste Management World at https://waste-management-world.com/a/zerocycle-engagement-initiatives-boost-recycling-rates-for-buffalo-cincinnati*
- *Zerocycle's New Recycling Analytics Dashboard "RAD" Visually Displays a City's Neighborhood-Specific Recycling Metrics. February 26, 2018. PRweb at https://www.prweb.com/releases/2018/02/prweb15235370.htm*
- *City of Buffalo Recycles webpage at https://buffalorecycles.org/*
- *An Excellent Waste of Time. February 15, 2017. Transforming Edmonton at https://transformingedmonton.ca/an-excellent-waste-of-time/*
- *One Household at a Time video at https://vimeo.com/206628133*

Option Number and Name: WDP15 - Multi-Residential Waste Management Improvements

Description of Option:

Multi-residential waste diversion performance has traditionally not achieved the same performance indicators as the single family residential sector.

This option looks at the waste diversion performance of the multi-residential sector after the Green Cart program has been implemented in all multi-residential buildings. The Region shall use waste audit results to determine the percentage and type of divertible materials still being disposed in the multi-residential waste stream and identify buildings that are under performing in comparison to their peers based on the waste audit results. Best waste diversion practices can be determined for those targeted buildings to elicit behaviour change and improve waste diversion performance. A Best Practices Tool Kit can be created to assist low performing buildings to increase their waste diversion performance.

A Best Practices Tool Kit along with other support systems will help low performing multi-residential buildings. Options include:

- Providing additional signage in several languages;
- Distributing P&E material door to door;
- Frequently changing P&E material to capture attention ;
- Conducting resident surveys and workshops;
- Asking residents to make a recycling pledge;
- Launching a waste diversion ambassador program;
- Providing additional recycling bags always available on site;
- Establishing waste diversion performance targets with information showing progress in each building; and
- Conducting more follow up with superintendents on the building's waste diversion performance and providing technical support to improve performance.

The Region could also investigate the feasibility to improve waste diversion performance in buildings by limiting garbage collection volumes and providing collection services of other recyclable materials such as electronics or municipal household hazardous waste.

Category of Option: Collection

Timeline: Medium

Rationale and/or Source of Option: Consulting team

Halton Region Experience:

The Region started to implement the Green Cart collection program to multi-residential buildings in 2014. As of May 2017, 50% of multi-residential units have the Green Cart program.

- Halton Region By-law 123-12 governing waste collection services stipulates "THAT an Occupier/Owner of a Residential Unit or a Multi-Residential Complex shall separate all Organic Waste, Recyclable Materials, Yard Waste, Bulk Waste and Metal Items and Appliances from Garbage where the Region provides such Waste collection service. Those Occupiers/Owners who do not separate Waste as described in this By-law shall not receive Waste collection services until their Waste is separated in accordance with this By-law." [1]
- The March 2017 waste characterization audit, conducted on five multi-residential buildings with both Blue Box and Green Cart collection service, showed a diversion rate of 36% (this compares with the single family sector waste audit that showed a 57% diversion rate). Without the Green Cart service, the diversion rate for the multi-residential buildings was 23%. This audit showed that the Green Cart collection service increased diversion by 13 percentage points in the sampled multi-residential buildings. [2]

Option Number and Name: WDP15 - Multi-Residential Waste Management Improvements

- The multi-residential waste audits also revealed that many divertible materials are still found in the multi-residential waste stream including: municipal household hazardous waste (i.e. batteries, compact fluorescent lights), waste electronics, personal medical waste, textiles, furniture and scrap metal. The Region does not provide collection services for these materials to the multi-residential sector, requiring them to be dropped off at a designated depot.
- Halton Region does not currently produce a collection calendar for the multi-residential sector. Only the single family sector is supplied with an annual recycling calendar. Instead, a guide is available for multi-residential residents and superintendents/property managers with or without Green Cart service. [3]
- Waste Diversion Guides (with or without Green Cart info) have been developed for apartment superintendents, The Region keeps a database of multi-residential buildings that contains information on building size, waste collection set up in the building, contact information for owners, superintendents and property managers, significant interactions with the building. This database is used to facilitate the roll out of the Green Cart collection program.
- The implementation of the Green Cart collection program starts with a site visit to the building by Halton staff to gather background information and photos and to establish a date for the program to begin. A letter is hand delivered to all the residents to inform them when the program is starting. On the start date, the Region delivers carts to the building, a new Blue Bag to each unit that contains a kitchen catcher, sample compostable bags and P&E materials. An open house is held in the building on the same day that the material is delivered to all of the units. The Region provides information for developers on their website through the Development Design Guidelines for Source Separation of Solid Waste. The purpose of the Guideline is to:
  - Clarify the requirements for receiving waste collection services from Halton Region;
  - Outline and illustrate the criteria used to review development applications with respect to the management and storage of solid waste on the site; and
  - Establish procedures for applying for waste collection services from Halton Region.
- If a multi-residential location sets out waste material that does not comply with the By-law, the waste collection contractor may leave the material and will notify the Region of why it was not collected. Region staff will work with the location to educate them on compliance with the By-law.
- To date the Region has not issued fines for By-law infractions. The Region issues warning letters and works collaboratively on by-law compliance.

Demonstrated Experience:

- **City of San Diego, California**: San Diego offers a variety of resources on its website to help improve waste diversion in multi-residential buildings such as providing P&E materials in different languages and featuring multi-residential waste diversion success stories. The success story showcases the building by providing a description of the successes of the program and information on the amount of waste diverted as well as amount of money saved. The buildings are identified during compliance inspections. A Code Compliance Officer visits multi-residential properties unannounced to see if the buildings are 100% in compliance with the City of San Diego's Recycling Ordinance. If the building is complying then it may be featured as a success story and a "Recycling Champion Award" will be given to building staff that are responsible for the successful program. Those buildings that are not in compliance receive a notice of violation describing what needs to be done along with another inspection date. Buildings that continue to defy the Recycling Ordinance can be fined. [5]
- **Arlington County, Virginia**: The County has over 65% of its residents living in apartments and estimates that two-thirds of its waste is generated by multi-family properties and businesses. In 2016, the County Code was amended to require every business and multi-family property provide a recycling bin next to

Option Number and Name: WDP15 - Multi-Residential Waste Management Improvements

trash containers. Nearly 60% of buildings inspected in 2017 were in full compliance. The County has a Zero Waste goal by 2038. [6]

- **Metro Vancouver, BC:** In 2010, Metro Vancouver launched an outreach pilot program in which residents at a multi-residential building in Metro Vancouver were asked to sign a pledge to always recycle and then were asked to put a "We Recycle!" sticker on their apartment door for their neighbours to see – a social norm tactic. The demonstration achieved a very high participation rate with 66% of tenants signing the pledge and placing "We Recycle!" stickers on their doors. [7] Waste audits conducted in 2017 revealed that buildings with better signage, lighting and clarity of streams in their recycling rooms experienced 30-50% lower contamination rates than buildings without these features. [8] Metro Vancouver also provides an online Multi-Family Recycling Toolkit that helps building owners and interested residents to improve recycling in their buildings. The Toolkit involves estimates on the number of diversion bins required based on the local municipality and number of units, provides P&E materials based on the way the different waste streams are managed within the building and provides guidance and templates to implement P&E and diversion programs. [9]
- **City of Toronto, ON**: The City produces an annual recycling calendar for the multi-family sector. Each unit receives a calendar in January delivered by mail. Recycling information educates residents on how to sort waste, how to reduce waste and information on Community Environment Days. Sections of each page are translated into six languages. [10] The City also has the 3Rs Ambassador program that encourages residents to become waste diversion experts in their buildings and to help other tenants learn to recycle properly. New ambassadors must attend three hours of training provided by City staff. The City also permits buildings to collect and store waste electronics and household hazardous waste and when a specific amount has been collected, the building management can schedule a pick up from the city or set out for special collection. [11]
- **City of Toronto, ON**: The City's Mayor's Towering Challenge motivates building Property Managers, Superintendents, Owners, Boards, 3Rs Ambassadors and residents to improve waste diversion in all types of multi residential buildings. To date, 143 buildings have registered. Winning buildings receive recognition at a special event hosted by the Mayor. [12]

Considerations

- Halton Region's multi-residential sector is growing at a faster annual rate than its single family, over the next 30 years, it is estimated that 100,000 tonnes of waste will be produced annually from the multi-family sector. [14]
- Improving waste diversion participation in the multi residential sector will require an investment of resources and funds. Outreach programs can be very time intensive with variable results. There is no simple solution to the challenge of improving waste diversion in this sector.
- Multi-residential buildings provide a unique challenge as residents aren't directly responsible for their waste management and diversion behaviours and there is no easy solution to make them more directly responsible.
- Having the ability to measure and monitor individual building waste management and diversion activity is an important key to better understanding the needs and challenges in each building and being able to respond to those challenges.

References:

1. The Regional Municipality Of Halton By-Law No. 123-12 - A By-Law To Govern The Collection Of Waste In The Regional Municipality Of Halton And To Repeal And Replace By-Law No. 30-96, As Amended.
2. Halton Region, Waste Audit Data (March 2017)
3. Halton Region's multi-residential webpages at www.halton.ca/apartment

4. City of Seattle Subtitle III - Solid Waste Chapter 21.36 – Solid Waste Collection sections 21.36.082 and 21.36.083 at http://www.seattle.gov/util/MyServices/Garbage/HouseResidentsGarbage/FoodWasteRequirements/index.htm
5. San Diego, CA Multi-Family/Commercial Successful Recycling Program at https://www.sandiego.gov/environmental-services/recycling/ro/residential/success
6. Zero Waste in Action – Community Case Study #1 – Arlington, VA Convenient Services for Everyone, Everywhere. Fall 2017 at http://ecocyclesolutionshub.org/wp-content/uploads/2017/11/Arlington_Zero_Waste_Case_Study_Eco-Cycle-final.pdf
7. Multi-Family Waste Reduction Pilot Results and Next Steps. Waste Management Committee Meeting September 30, 2010
8. Multi-family Waste Composition Findings. Metro Vancouver Zero Waste Committee meeting notes. February 18, 2018
9. Metro Vancouver Multi-Family Recycling Tooklit, http://www.metrovancouver.org/services/solid-waste/apartments-condos/Pages/default.aspx
10. City of Toronto, "2018 Waste Management Guide Apartment Buildings and Condominiums" calendar.
11. City of Toronto 3R Ambassador Program at https://www.toronto.ca/services-payments/recycling-organics-garbage/apartments-condos-co-ops/3rs-ambassador-program/
12. City of Toronto's Tower Renewal Program at https://www.toronto.ca/community-people/get-involved/community/tower-renewal/
13. Ontario Recyclers Workshop, CIF, "How to Use Technology to Measure Diversion Performance –RFID Integration with Onboard Weigh Scales" June 4, 2015.
14. Halton Region, Short Term Solid Waste Management Strategy, Needs Assessment (January 2018)

Option Number and Name: C4 Enhance opportunities for reuse/recycling of construction & demolition waste

Description of Option:

This option considers the following potential reuse and recycling opportunities for Construction & Demolition (C&D) materials that are currently being landfilled:

- Increased recycling of shingles and wood chips.
- Promoting donation to non-governmental organizations that accept C&D materials.

Category(ies) of Option: Collection, Drop off and Transfer, Processing, Reuse and Recycle

Timeline: Medium

Rationale and/or Source of Option: Feedback received from Region staff.

Halton Region Experience:

Halton Region is currently managing a number of source separated C&Dmaterials at the Halton Waste Management Site (HWMS). From both residential and commercial customers the Region received approximately 5,500 tonnes of concrete and brick, less than 100 tonnes of roofing shingles, 600 tonnes of drywall, and approximately 3,700 tonnes of wood waste at the HWMS in 2016.

Approximately 56% of the C&D materials come from residential sources. Wood makes up 59% of total C&D materials received in 2016. From commercial customers, concrete and brick make up the majority of the C&D waste coming (95% of total C&D materials received in 2016). C&D materials such as drywall, scrap metal and inert materials (brick, concrete and asphalt) are banned from landfill disposal as per Section 4.0, Schedule A of by-law 223-92 (Waste Management Facilities).

There are still C&D waste materials that are being landfilled rather than separated for reuse/recycling or energy recovery. Residential garbage from single family households contains 3.5% construction material and multi residential garbage contains 2.9% construction material[1]. There is no waste data available for C&D waste materials from the ICI sector.

- The Region currently reuses or recycles some of the C&D materials as follows:
    - Asphalt grindings, brick and rubble can be used for constructing on-site roads, pads or cover potholes in the drop off areas.
    - Drywall is sent for recycling at a facility in Oakville.
    - Metal is sent to a processor for recycling.
    - Wood waste is separated (e.g. shelves, tables, chairs, skids, etc.) at the HWMS. A grinder is used to shred the wood, which can be used on-site as a moisture absorber for the heavy equipment roadways in the regional landfill or as alternative daily cover. Wood chips cannot be composted because they typically contain pressure treated and painted wood. About 22% of the processed wood material is used for alternative daily cover and compactor road material. The remainder of the wood waste is sold as fuel.
- **ReStore, Habitat for Humanity** – There are two (2) ReStore & Donation Centre locations in Halton Region, located in Burlington and Milton. While not tied to the Region's waste management operations, the Donation Centres accept new and gently used furniture, building materials, appliances, cabinetry, sinks, countertops, household and décor items, and lighting. The ReStore sells the donated items to the public at a reduced cost, typically 30-70% less than the original retail value. Habitat for Humanity offers a free curbside pickup program for residents. A

[1] 2017 single family and multi-family waste audit data – excel file

Option Number and Name: C4 Enhance opportunities for reuse/recycling of construction & demolition waste

free kitchen salvage program is also offered to homeowners where volunteer and staff help homeowners by reviewing the renovation project to identify items that can be donated and then collected. These free services are offered throughout Halton Region.

- **Shingles** – All roofing shingles received at the HWMS are landfilled (less than 100 tonnes in 2016).
- **Tipping Fees for C&D Waste** – The fee structure to dispose of mixed solid waste, drywall, scrap metal, shingles, and wood at the HWMS is currently the same for all materials[1]. Customers are required to sort their loads so that any recyclable material is properly diverted from landfill.

Demonstrated Experience:

- **Promoting donation to Habitat for Humanity** – Undertaken by multiple communities across Canada. Habitat for Humanity has approximately 100 ReStore locations across Canada. Many communities and regional governments promote home renovation donations for reuse to Habitat to Humanity through their public education and outreach efforts online and at events. Municipalities and Habitat for Humanity partner in the building of new habitat homes such as the donation of land by the municipality.
- **Shingles Diversion** – Undertaken by multiple communities across Canada**.** Examples of communities that accept shingles for recycling (collected material is sent to a third party processor) include:
    - **City of Barrie, ON** – The City of Barrie accepts shingles at the Barrie Environmental Centre (landfill site) for recycling by a private company (Try Recycling)[2].
    - **City of Calgary, AB** – The City of Calgary accepts shingles for recycling at their three landfill sites. The shingles were previously sent to Alberta Waste and Recycling or Lafarge for processing and use in municipal road construction. However, the City of Calgary Roads Business Unit recently made the decision to stop accepting recycled asphalt shingles in road construction. The impact on landfill operations is yet to be determined[2].
    - **City of Lethbridge, AB** – The City of Lethbridge accepts clean asphalt shingles for recycling at the landfill in a separate collection area. The asphalt shingles are currently being stockpiled and are not being used. The City is planning on grinding the shingles and using the pellets in landfill road construction and other landfill operations. The City has investigated opportunities to use the pellets in municipal road construction, and in bike and walking path construction. The City also collect mixed garbage loads containing shingles (contaminated loads) and uses the shingles as landfill cover[3].

There are several third party processors that can demonstrate that it is currently possible to recycle used asphalt shingles including:

- **Synchor Recycling in Calgary, AB** – There is a variable tipping fee charged for shingles depending on if they are a clean load or a mixed load containing other materials such as plastics. The rate for clean asphalt shingles is $70/tonne and the rate for contaminated loads is $120/tonne[3]. The shingles are pelletized and sold to market where they are used in hot mix asphalt, cold patches, alternative fuel, temporary roads and driveways, aggregate road bases, and as a dust control agent with gravel or other recycled aggregates.
- **Eco Depot in Rosslyn, ON** – The rate for clean asphalt shingles is $55/tonne[4]. Shingles are pelletized and sold to market where they are used for various construction purposes including asphalt and aggregate for road construction. The ground shingles must meet specifications to be sold as an additive in asphalt paving mixtures.

[2] Telephone correspondence with Alberta Waste and Recycling, April 2018.

[3] Telephone correspondence with City of Lethbridge, April 2018

Option Number and Name: C4 Enhance opportunities for reuse/recycling of construction & demolition waste

- **Wood Waste Diversion**
  - **City of Winnipeg, MB** – The City of Winnipeg uses non-treated/non-painted cutoffs and pallets in their composting operations at the Brady Road Resource Management Facility[5].

- **Differential Tipping Fees for C&D Waste**
  - **City of Barrie, ON** – The City of Barrie charges $285/tonne for mixed waste loads and there is no charge for organics and scrap metal. Mixed loads are defined as containing more than 10% recyclable, compostable, or separable items accepted in current waste diversion programs[6].
  - **City of Vancouver, BC** – The tipping fee for mixed C&D waste received at the City's Landfill is $90/tonne, and the fee for wood waste is $70/tonne. Clean wood waste is separated from finished/treated wood[7]. Metro Vancouver and member municipalities introduced the new Clean Wood Disposal Ban in 2015.

- **C&D Project Permitting**
  - Several cities in California, such as the City of San Diego, have C&D recycling ordinances which require C&D projects to divert a certain percentage of the total waste generated from the project. The City of San Diego has a 65% diversion requirement, determined by the weight of the total C&D waste generated.
  - **City of Vancouver, BC** – The City requires that a Recycling and Reuse Plan be prepared as part of a building or development permit application. A Recycling and Reuse Compliance Form is required to be submitted to the City when demolition is complete. There is no required reuse or recycling rate, but the intent of the Plan is to encourage reuse and recycling of the material as much as possible.

Considerations:

- The Region could contact organizations like Habitat for Humanity to explore partnership opportunities especially at their two local stores and/or at the HWMS.
- Promoting and educating residents about the services offered by organizations like Habitat for Humanity could be added to the Region's public education and outreach material including providing it as a first option in the Put Waste in its Place online sorting tool.
- Shingle grinders can be rented or purchased, and could be used at the HWMS to grind any received shingles into a pellet form. The asphalt pellets could then be sold to market, or used in landfill operations. An example of a manufacturer of asphalt grinders is Rotochopper, who specialize in manufacturing grinders for various feedstocks including C&D and wood waste. Using chipped asphalt shingles as fuel in cement kilns as a form of energy recovery has been shown to be feasible[8]. The practice is common in the US, Japan, and Europe but is less established in Canada.
- A shingles drop-off area can be established at the Container Station for residential and commercial customers once a processor/end use has been identified.
- The Region could implement a sorting process before the wood waste is ground on-site. Salvageable and re-usable materials, such as furniture, can be separated for re-use. The quality of the wood waste stream being received at the HWMS will determine the feasibility of this option.

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5. *http://winnipeg.ca/waterandwaste/recycle/4rdepots/acceptedMaterial.stm*
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Option Number and Name: C5 Bulk Waste Diversion

Description of Option:

This option looks at ways to modify existing bulk waste collection to enhance the reuse and recycling of the collected materials. Potential approaches include:

- Increase reuse activity at the HWMS to divert furniture and household items in good condition through partnerships with non-profits organizations, such as Habitat for Humanity (also refer to option overview C4 Enhance Opportunities for Reuse/Recycling of Construction & Demolition waste).
- Encourage residents to donate bulk items that are still in good condition to reuse stores.
- Research and monitor mattress recycling capacity in the GTA.
- Support the Province's Strategy for Waste-Free Ontario in the designation of bulk wastes (e.g., mattresses, carpet, and furniture).
- Implement a disposal ban on end-of-life mattresses and other bulk furniture, once local recycling capacity has been established.

Category(ies) of Option: Collection, Drop off and Transfer

Timeline: Medium

Rationale and/or Source of Option:

- Observation from Landfill Operations staff that mattresses and furniture end up in landfill and cause operational issues (e.g. potential puncture hazards for equipment and difficult to compact).

Halton Region Experience:

Bulk waste collection has been provided by the Region since it assumed responsibility for waste collection in the mid-1990s. The collection frequency varied to a few collections per year. In 2008, a monthly bulk waste collection was established with a 3-item limit and in 2016 the Region increased the frequency to coincide with garbage collection (bi-weekly) while maintaining the 3-item limit. Bulk waste is defined as a household item that weighs over 23 kg or will not fit into a closed garbage bag or can (e.g., furniture, toilets, wood). Multi-residential locations can request two bulk collections per year. The contractor delivers a roll-off bin for a specified date to the location and residents are informed that they can place large items in the bin.

The most common bulk materials collected are household items (up to 24% of the items collected, depending on the time of the year), carpets (up to 17%), mattresses (up to 8%), wood (up to 11%), chairs (up to 13%) and miscellaneous construction and demolition waste (up to 14%)[i]. All the collected bulky materials are currently landfilled. Mattresses, couches and chairs cause problems in the landfill because they do not compact well.

Staff have noted that furniture that seems to be in good condition is set out for collection as it is more convenient than taking them to reuse stores.

- The Halton Waste Management Site accepts items such as furniture at the Reuse Depot that could be in good condition and fit for resale.
- The Region's website maps out alternative locations to drop off reuse centres and provides contact information and acceptable materials[ii]. The Region's online sorting tool (Put Waste In Its Place) also provides direction on how to set out bulk waste and then lists Reuse Centres (e.g., Habitat for Humanity, Salvation Army) by local municipality with a map, acceptable material and contact information.

Option Number and Name: C5 Bulk Waste Diversion

Demonstrated Experience:

- **City of Surrey, BC** - The City of Surrey offers a large item pick-up program for all single-family households that receive curbside collection. Each one can have up to four large items picked up by appointment at any time throughout the calendar year. Each year, the item count starts from zero[iii].
- **Metro Vancouver, BC** - A disposal ban of mattresses was implemented across Metro Vancouver, B.C., in 2011 when sufficient recycling capacity was confirmed. In 2016, there were approximately 165,000 mattresses collected within Metro Vancouver for recycling. The Metro Vancouver transfer stations charge a $15 per unit fee to cover the cost of recycling the mattresses. This fee reflects the cost currently imposed on the generator to recycle the mattress[iv]. There are currently two large-scale mattress recyclers in BC, both located in Metro Vancouver, however one recently had a large fire and is relocating[v].
- **City of Edmonton, AB** - The City of Edmonton charges $15 per mattress at their Eco Stations (mattresses not accepted curbside). There are no specific requirements on the mattresses collected at the Eco Stations. The mattresses are sent to a not-for-profit organization (Redemptive Developments (RD)) for recycling. The City pays RD $15 for each mattress that is recycled[vi]. Approximately 85% of the mattress material (foam, meatal, and wood) is recycled by RD. Foam is sent to a processor in Calgary where it is used in manufacturing carpet underlay and metal is sent to a foundry in Edmonton where it is melted and used for various purposes.
- **City of Winnipeg, MB** – In Winnipeg, Mother Earth Recycling and IKEA have formed a partnership backed with more than $250,000 of provincial money and the support of Take Pride Winnipeg, to recycle used mattresses while training young workers for their first job[vii]. Take Pride Winnipeg is a charity that employs four full time staff as well as seasonal staff with the mission: *"… to inspire community pride, raise public awareness and promote citizen responsibility…"*. The organization is funded by the City of Winnipeg, the Province of Manitoba, and various private donors[viii]. Mother Earth Recycling (MER) is the only mattress recycling facility in Winnipeg. The majority of the mattress materials are sent to secondary markets for recycling. Foam is recycled into carpet underlay, metal is recycled into cans, and wood is used in crafts or fire wood. The remaining plastic and zippers are landfilled. MER charges $15 per mattress and offers a pickup service for residents[ix].
- **City of Winnipeg, MB** – The City of Winnipeg had separate contracts for regular garbage collection and bulk item collection. Residents are required to schedule a pick-up by calling the City at least three days in advance of the desired collection day. The City currently charges $10.30 per large item (e.g., furniture, mattresses), up to a maximum of ten total items per collection[x].
- **Metro Vancouver, BC** - Metro Vancouver sent a letter to the BC Minister of Environment on behalf of all member municipalities (July 18, 2016) requesting an amendment to the B.C. Recycling Regulation to require the implementation of an Extended Producer Responsibility (EPR) program for mattresses and other bulky furniture[xi].
- **City of Chilliwack, BC** – Some municipalities have experienced difficulties in establishing mattress recycling. For example, the City of Chilliwack conducted a two month pilot program for recycling mattress on site (mid-November, 2013 – mid-January, 2014). All non-recyclable materials were stripped and landfilled, and the wood frames with the attached coil springs were transported to the City's scrap metal recycler. After the pilot period, the scrap metal company no longer wanted the metals from the mattresses, as the excessive amounts of wood and residual fabric attached to the coil springs had the potential to jam their shredder. The recycling program subsequently ended. This demonstrates that the dismantling of mattresses needs to be undertaken to a level that is acceptable to scrap metal dealers and other recyclers. There is a potential need for specialized equipment and indications that this may not be an appropriate solution for every municipality[6].

Considerations:

Option Number and Name: C5 Bulk Waste Diversion

- The Region could assess potential partnership opportunities with reuse organizations to promote donations and investigate options to create additional incentives for residents to use their services.
- Some Canadian municipalities, such as Winnipeg, charge residents a fee per bulk item collected. However this adds significant administration to the program.
- According to Canadian Mattress Recycling, one of the challenges with furniture recycling is that many of the component materials (e.g., leather, vinyl, polyester filling) are not recovered in enough volume to be marketable. With a lack of drivers to encourage furniture recycling (e.g., landfill bans, EPR program), it takes a long time for a furniture recycler to collect enough of a material to send a load of recyclable product to markets for secondary processing. Currently, many of the furniture materials are not financially viable to stockpile until a load is large enough, and with a lot of effort many are reused by distributing them throughout the community as part of charity work. This is time consuming and costly[1].
- Mattresses and furniture that has been exposed to weather or that potentially could be infested with bugs causes issues for reuse and recycling.
- The market value of the materials salvaged from mattresses recycling is generally low. The market value for all individual component materials from one mattress ranges significantly depending on market conditions. When markets are depressed, the recycling of one mattress is in fact costing the recycler $0.30 per mattress ($11 per tonne) since the recycler is still having to pay tipping fees for waste materials. When markets are favourable, the revenue is at most $4.55 per mattress ($169 per tonne) [10].

References:

1. Bulk Waste Data Excel file provided by Halton Region, April 2018.
2. http://www.halton.ca/cms/One.aspx?portalId=8310&pageId=151236
3. http://www.surrey.ca/city-services/4550.aspx
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Option Number and Name: C 6 – Automated Collection

Description of Option:
This option explores the experiences of multiple jurisdictions that have converted to automated cart collection for waste and recycling services. This option also explores some costing considerations as well as experienced benefits and issues surrounding the strategy.

Category of Option: Collection

Timeline: Long

Rationale and/or Source of Option: Consulting team observations

Halton Region Experience:

The Region currently allows single family household garbage to be placed in bags/cans. There is a 3 bag/can limit and residents can place an additional three bags/cans with a garbage tag (total of six bags/cans maximum). Single stream recyclables can be placed in a Blue Box (maximum of 85 L) or in a transparent plastic bag. Green Cart organics are placed in 80 L carts and leaf and yard waste can be placed in paper bags or open rigid containers with a label on it.

The Region of Halton currently sub-contracts all curbside collection to a private waste management company with a contract end date of April 2024. Current collection methods for these services are rear load collection trucks with 2-person crews. Garbage trucks are rear packers and recycling/organics are collected in split rear loaders (70/30).

Multi-residential recycling and organics collection is serviced in a cart-based program and garbage is collected with front-end containers. A few multi-residential and all commercial/BIA locations receive cart collection for garbage. These are primarily locations that previously placed garbage in a common pile for collection. The current collection method uses automated side load vehicles which is done by a private waste management company with a contract end date of April 2024.

Demonstrated Experience:

- **Middlesex Centre, ON** – Middlesex uses automated split side loader vehicles to service waste and recyclables on a weekly basis. This is a user pay system for garbage and recycling collection and residents have three size choices for garbage (small, medium, large) and two size choices for recycling bins (medium, large). Current fees are $100, $185, or $270 per year for the 120 L (small), 240 L (medium) and 360 L (large) bins respectively. The co-collection automated system has been operating since 1996. **[1]**

- **City of Denver, Colorado**- The City of Denver uses automated side load vehicles for the collection of residual waste (weekly), single stream recycling (bi-weekly) and green bin (weekly). The City began the conversion to cart collection in 2014 and continued thru 2017. The green cart program is a "user pay" program and is continuing to be rolled out as the customer base grows. **[2]**

- **City of Guelph, ON** – The City uses automated side load vehicles for the collection of garbage, single stream recyclables and green bin. Waste Diversion Ontario's (WDO) Continuous Improvement Fund (CIF) committed funding to the City to convert from a plastic bag based collection system to a fully automated cart based collection system for the recyclables, organics and garbage streams. With the new automated collection system, all three waste streams are collected using automated trucks which replaced manual collection vehicles. The collection frequency of recyclables also changed from weekly to biweekly, such that recycling and garbage carts could be collected bi-weekly on alternate weeks using the same truck with organics continuing to be collected weekly. All carts (blue, green and grey) were provided to residents at no cost. **[3]** The City of Guelph has converted from a manual

Option Number and Name: C 6 – Automated Collection

bag-based collection system to a fully automatic cart-based collection system for the organics, recyclables and garbage streams. This transition fulfills the Solid Waste Management Master Plan's recommendation to increase waste diversion rates and create operational efficiencies. The cart-based collection was phased in over a three year period from 2012 to 2014. Stakeholder support and adoption was essential to the success of the program. A survey of Guelph households revealed 80% of residents using waste carts were satisfied with the City's automated collection system when compared to the previous system. The City also achieved the highest waste diversion rate in Ontario at 69% in 2013. The program successfully reduced the collection fleet by four trucks which resulted in operational savings of over $460,000 per year through reduced capital replacement costs, maintenance, fuel costs, and injury and labour costs.

System Merits And Improvements To Previous System

» Complies with best management practices as identified by Waste Diversion Ontario (WDO), Ontario Waste Management Association (OWMA) and Solid Waste Association of North America (SWANA).

» Reduces the waste collection fleet from 19 to 15 trucks, allowing an annual operating savings of $460,000.

» Allows residents to top up their organic cart with yard waste each week, which helps satisfy public requests for more frequent yard waste collection based on a survey completed in 2008.

» Automated collection also allows for other methods of efficiency without the constraints placed on staff by physically lifting and tipping containers, such as operating four day, ten hours per day workweeks.

» Allows for a more diverse workforce (e.g. physical ability, gender, age).

» The size of the recycling and organic carts allows for new materials to be added to the collection streams in the future without disruption to the collection process and allows for changes in the recycling stream mixture as a result of consumer and seasonable changes. The cart size also allows for collection of seasonal fluctuations in generation rates.

» Curbside collection efficiency may be increased by eliminating the collection of multiple smaller containers (e.g. compared to using blue boxes or bags). The sizes of carts enable adequate space to accommodate collection needs from households.

» Improves customer satisfaction. Residents no longer need to purchase bags for collection. All materials can be placed loosely into one of the three carts thereby reducing the cost to the residents.

» Carts also reduce the Solid Waste's department time and cost in dealing with issues related to bag collection on snow banks, as the automated arm has the ability to collect and return the carts to the top of a snow bank. In the past, bags that were buried by snow were not collected resulting in customer complaints and requiring sending additional staff out to collect.

» The automated collection program reduces costs related to replacement labour associated with staff injuries, illness rates, and modified job duties, as well as, reduces Workplace Safety and Insurance Board costs (e.g. minimizes repetitive strain injuries to shoulder, knees, back; minimizes physical fatigue for collection staff; and minimizes exposure to traffic risks while working at the side and rear of the collection vehicles). The reduction in physical activity and disagreeable conditions may also have a positive financial effect on the inputs for job compensation and lower labour costs. Additionally, our trucks are operated on the right hand side allowing the driver an unobstructed view of pedestrians on the side walk.

» Facilitates the transition for collecting multi-residential properties by acquiring collection equipment appropriate for this sector. For multi-residential complexes where space is very limited (i.e. no garages, no backyards, small porches) an individual set of blue, green and grey carts is not always feasible. In these cases, the City recommends communal carts. Communal carts allow residents to bring waste to one or several central cart locations, shared by other residents in their complex. In-unit recycling containers and kitchen scraps containers are provided to facilitate the

Option Number and Name: C 6 – Automated Collection

transfer of material to these communal locations. Larger containers and more frequent collection also facilitate a reduced number of containers and help with storage issues.

Automated collection ensures that the City of Guelph's recycling collection program is competitive under full Extended Producer Responsibility (EPR), if recycling collection responsibility was required to be assumed by Producers. If Producers chose alternate collection service providers, it will allow the City to continue for co-collection of organics and garbage. **[4]**

- **Region of Peel, ON** – The Region uses automated side load vehicles for the collection of garbage (bi-weekly), single stream recyclables (bi-weekly) and green bin organics (weekly). **[5]** As per a Regional report, "Residents in our cart-based pilot area continue to express their contentment with the new cart collection system and encourage staff to share the benefits with all residents of Peel. The reduction of litter and odours, especially on collection days, as well as the ease of manoeuvering the carts are still the biggest benefits to the residents. From the perspective of value, the annual estimated amortized cost of carts (approximately $5 per cart per year) is less than the annual cost of bags (approximately $20-30 per year)." **[6]**
- **City of Toronto** – The City uses automated side load vehicles for the collection of garbage, single stream recyclables and green bin organics. **[7]** Fully automated vehicles cost approximately $73,000 more per vehicle than semi-automated vehicles. With Toronto's collection frequency, garbage (bi-weekly), single stream recyclables (bi-weekly) and green bin organics (weekly), collection operations was able to achieve an overall efficiency of two staff reductions for every two routes amounting to a savings of $1,425,000 annually. To purchase 46 fully automated vehicles cost $3,358,000 more than purchasing 46 semi-automated vehicles, thus with the staff savings of $1,425,000 annually, the payback is a period of 2.4 years. Repair and maintenance costs were modestly higher for fully automated vehicles, whereas fuel costs were less. The most significant saving, however, was realized due to reductions in staff. Since the introduction of automated vehicles in 2011, there has been a steady decrease in ergonomic related injuries in Q3 and Q4. This validates the overall ergonomic injury risk reducing benefits of automated vehicles. As Solid Waste Management Services replaces collection vehicles in its fleet, fully automated vehicles will replace semi-automated vehicles in those areas of the City where fully automated vehicles can be used. Older areas of the city closer to the downtown core will stay on semi-automated collection due to collection challenges such as narrow streets, on-street permit parking, one-way streets, and alley and rear laneway collection. **[8]**

Considerations:

- Automated collection can reduce labour headcount to one from two per vehicle allowing for operating cost savings.
- Automated collection reduces instances of worker injuries because drivers maintain their positions in the cab of the truck which minimizes exposure to known injury causes (i.e. containers, traffic, ice etc.).
- Being able to close lids on containers helps to contain material and minimize waste and recyclables blowing onto streets prior to service.
- Some municipalities report a significant increase in contamination, especially medical waste, by moving to a cart-based recycling program since collection operators can't see all the contents before dumping and therefore can't enforce any bylaw infractions. This reduces the value of the recyclable material, increasing the costs to sort the material at the MRF and reducing the revenue received for the material.

Option Number and Name: C 6 – Automated Collection
• Delivering a new system of carts Region-wide requires a significant one-time cost for additional customer service staff, delivery and communications. • A cart replacement system would need to be implemented and administered. • Operating efficiencies are gained through “thrower fatigue” elimination as collection is mechanical

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(3) Guelph Automated Waste Cart Collection System Curbside Collection Performance and Monitoring Report Quarterly Report No.4 Final Report
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(5) http://www.peelregion.ca/waste/collection-schedules
(6) Region of Peel, Commissioner of Public Works in Report “Implementation Plan for Cart-Based Garbage and Recycling Collection”, October 2013.
(7) https://www.toronto.ca/services-payments/recycling-organics-garbage/houses
(8) http://thecif.ca/projects/documents/548.11-Toronto_Final_Report.pdf

Option Number and Name: C7 – Smart City Technology

Description of Option:
The "Smart City" approach uses technology and creative approaches to move cities towards sustainable living and economic development. The University of Waterloo's Smart Cities Initiative defines a Smart City as one that "uses technology and data to improve livability and opportunities for the city and its people."[1] This new way of thinking is starting to be used to help improve waste diversion. The Smart City concept combines forward thinking urban design and new digital technology to create sustainable communities.

This option looks at researching possible designs and technologies to determine the feasibility of implementation and how to foster the development of Smart City design to support waste diversion in Halton Region.

Category(ies) of Option: Collection

Timeline: Medium

Rationale and/or Source of Option: Consulting team observation.

Halton Region Experience:

- Halton Region provides different collection services to single family households than multi residential buildings due to their design and waste management need.
- Halton Region currently services 454 multi residential buildings, of those 166 buildings have a chute system that is either a single or tri-sorter.
- There are many challenges with achieving waste diversion in the multi-residential sector.
- In its Official Plan, Halton Region "Adopts the following housing targets:
  a) that at least 50% of new housing units produced annually in Halton be in the form of townhouses or multi-storey buildings" (Approved 2013-10-21)[2]
- It is estimated that the percentage of new residents occupying high density housing will increase by 36% between 2018 and 2021, 32% between 2022 and 2031 and 40% between 2032 and 2048[3].
- A technical report examining growth in the Greater Golden Horseshoe projects that Halton Region will experience a 55% increase in the development of multi-residential units compared with 44% increase in development of single family households between 2011 and 2041 (not including row houses and semis)[4]
- The Growth Plan for the Greater Golden Horseshoe, 2017 came into effect on July 1, 2017, replacing the Growth Plan for the Greater Golden Horseshoe, 2006. This growth plan replaces the requirement that 40% of the new housing units occurring between 2015 and 2031 be in built up areas with a requirement that "By the year 2031, and for each year thereafter, a minimum of 60% of all residential development occurring annually within each upper or single-tier municipality will be within the delineated built-up area".[5] This should further increase the number of high density housing in the Region.

Demonstrated Experience:

- **The Envac System**: A series of underground pipes are used to connect waste (e.g. garbage, recyclables and organics) collection points (e.g. stations, chutes). These collection points connect to a central station to which the materials are sucked by a vacuum system to the centralized station. Since the system is underground, there is no need for collection vehicles, noise, emissions and no concerns about smell, weather or insects. There are a couple of examples of Envac systems operating in the United States

1 Definition provided at http://www.waterloo.ca/en/government/smart-city-initiatives.asp
2 Halton Region Official Plan [2009]. December 16, 2009. As Adopted by Regional Council. Pg.44
3 Needs Assessment Report, Halton Region Solid Waste Management Strategy. Pg. 20.
4 Greater Golden Horseshoe Forecasts to 2014. Technical Report. November 2012. Hemson Consulting Ltd.
5 Growth Plan for the Greater Golden Horseshoe (2017). May 2017. Government of Ontario. Pg.15

Option Number and Name: C7 – Smart City Technology

including Roosevelt Island in New York City and Disney World in Florida. The Roosevelt Island vacuum system was installed in 1975 to handle garbage deposited down a chute from the island's 16 apartment complexes. The Disney system also handles only garbage. Other examples in Europe including Stockholm, Sweden and Bergen, Norway collect different streams of materials through the different designated collection points but do not operate in buildings (only outdoors).

- **Combining three stream collection with weight based tracking:** Only recently has the Envac system been installed in high rise buildings with three chutes representing garbage, recyclables and organics. A three stream Envac system was installed in a residential, retail and office complex in Doha, Qatar. The Envac system not only collects 3 streams from the development but also tracks the amount of waste generated by each tenant thus allowing for a weight based charging system to be implemented. This is the first installation in the Middle East that will use access card readers and a weighing mechanism incorporated into the chutes, which can track who deposited the waste and how much for payment purposes. A similar system is being developed in Seoul, Korea in which a 100 acre sustainable development is being constructed.
- **City of Toronto and Google:** The City has partnered with Google to develop Sidewalk Toronto which will represent North America's leading example of the smart city approach focusing on innovative technology and data. The Sidewalk Toronto project will use a section of Toronto's eastern waterfront, called Quayside, to establish a community for living and working. It will feature public transportation, low/no emission transportation, green buildings, green public space. It will promote mixed use housing and economy that works to improve quality of living. At the same time, this project will explore innovative technologies to improve energy efficiency, water efficiency and waste reduction/diversion. In multi residential buildings, the waste management system features:
    a) An organic disposal unit in each kitchen that grind and dilute the organics and sends the material down a pipe (separate from the sink) to an organic container (e.g. 8 cubic yard bins on wheels also called wagons) in the "utility channels" that link the basements of each building.
    b) a "smart" chute for garbage and recyclables that uses digital technology to sense the difference between garbage and recyclables and implement a pay-as-you-throw system for the garbage. The materials deposited in the chute will flow to "utility channels" in the basement.
    c) Industrial "autonomous" robots (wagons) will transport the garbage and recyclables through the underground "utility channels" (corridors) to centralized recovery centres, such as a community anaerobic digester for the organic materials and transfer stations for recyclables and garbage.

  The system is expected to achieve 90% waste diversion rate from the multi residential buildings. While the project initially identified an underground vacuum system as a promising solution, the creators realized that developing underground "utility channels" offered greater flexibility for accommodating other uses.[6]
- **New York City's Sanitation Department:** The City has established a contest to find new ideas to improve waste diversion in a multi residential public housing complex with nearly 3,300 residents. Through the NYCx Co-Lab Challenge, the city will award up to $20,000 in funding for each winning teams to implement their innovative pilot solutions. The teams will be chosen in spring 2018.
- **Uzer, France:** This French company has designed a scanner called Eugene that attaches to the wall and reads the barcodes on packaging to determine how it needs to be managed. A similar trash receptacle for the kitchen is being designed to read the barcode on a package when placed under the scanner and tell which receptacle to place the package.

Considerations:

Most multi residential buildings have lower participation in waste diversion programs due to a number of factors including a lack of convenience and accessibility, high tenant turnover, lack of resident accountability, language barriers, and lack of property management/ superintendent support. Often high rise buildings provide convenient access to garbage disposal chutes on every floor without providing equally convenient access to waste diversion services (often located in the basement or parking lot) which fosters a sense that

[6] Sidewalk Toronto – Vision sections of RFP Submission at https://sidewalktoronto.ca/wp-content/uploads/2017/10/Sidewalk-Labs-Vision-Sections-of-RFP-Submission.pdf

Option Number and Name: C7 – Smart City Technology
waste diversion isn't as important. Sometimes the owner of a multi-residential building or complex does not want to pay for the operation of the waste technology that has been built or designed for the building. For example, some buildings have been designed with tri-sorting chutes that allow residents to place garbage, recycling and organics down one chute on their floor, however the building owner does not want to operate the system and only allows residents to put garbage down the chutes. • One of the disadvantages of the Envac system is its single purpose and associated high costs, which "must cover all of its costs based on waste-related savings alone"[7]. Consequently, the system has limited application in individual multi residential buildings and is most feasible when used in large multi residential complexes. • The Envac system using an access card for tracking the user and weight of the garbage is still in the early stages of development and has not been fully proven to date.

References:

- *Sidewalk Lab Toronto at https://sidewalktoronto.ca/#documents and Sidewalk Lab Toronto proposal at http://www.passivehousecanada.com/wp-content/uploads/2017/12/TO-Sidewalk-Labs-Vision-Sections-of-RFP-Submission-sm.pdf*
- *Tomorrow's cities: Google's Toronto city built 'from the internet up. May 27, 2018. BBC News at https://www.bbc.com/news/technology-41414872*
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- *Google's Sidewalk Labs signs deal for 'smart city' makeover of Toronto's waterfront. October 17, 2017. The Globe and Mail*
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- *Underground Solutions for Urban Waste Management: Status and Perspectives. January 2013. ISWA – the International Solid Waste Association*
- *Heart of Doha - Msheireb Properties (Envac) at http://www.envacgroup.com/references/pdf_preview/pdf_preview_2?*
- *Envac to feature in 100-acre sustainable development in Seoul at http://www.envacgroup.com/news-and-media_1/news/envac-to-feature-in-100-acre-sustainable-development-in-seoul-gangnam-gu*
- *NYC offering $20K for 'creative' multi-unit recycling pilots. Nov. 14, 2017. Waste Dive at https://www.wastedive.com/news/nyc-offering-20k-for-creative-multi-unit-recycling-ideas/510777/*
- *Eugene at https://www.uzer.eu/eugene/. Accessed February 23, 2017*

[7] Sidewalk Toronto – Vision sections of RFP Submission, pg. 25 at https://sidewalktoronto.ca/wp-content/uploads/2017/10/Sidewalk-Labs-Vision-Sections-of-RFP-Submission.pdf

Option Number and Name: C10 – Expand Existing Collection Services

Description of Option:
This option looks at reviewing and assessing if there are other curbside collection programs that the Region could provide (e.g. textile recycling, batteries, small household metals).

Category(ies) of Option: Collection, Processing

Timeline: Medium

Rationale and/or Source of Option: SWOT and Visioning workshop with Region staff.

Halton Region Experience:

- The Region currently provides single family curbside collection services for blue box, green cart, seasonal leaf and yard waste and garbage. Urban areas have access to a call-in scrap metal collection service. Urban areas and rural areas in Burlington and Milton also receive bulk waste collection. Bulk Brush call-in service is available in the Town of Oakville. **[1]**
- Multi residential buildings have access to blue box, garbage, green cart (continues to be phased in) and bulk waste (available twice a year upon request).
- Some of the Industrial, Commercial and Institutional (IC&I) establishments receive collection services as follows: small commercial customers and Business Improvement Areas (BIAs) receive blue box recycling and garbage collection; publicly-funded schools, Town/City Halls and libraries receive weekly blue box and green cart collection and community centres and arenas receive blue box collection. **[1]**
- Metal pots, pans and baking sheets have been added as acceptable items to the Blue Box program.

Demonstrated Experience:

- **City of London, ON:** In November 2017, the City of London held resident open houses to identify opportunities to achieve 60% waste diversion from landfill by 2022. The City presented options to divert "Other Recyclables" which included the following materials: Carpet, Mattresses & Box Springs, Wooden Furniture, Electrical Equipment & Metal, Textiles and Bulky Plastics. Analysis was done on the impact of diversion, annual costs and avoided greenhouse gases looking at two different collection approaches: at an Enviro Depot or semi-annual collection with an Enviro Depot program. Of these six, the options with the highest impact on the diversion rate were mattresses & box spring diversion options at 0.3 % to 0.5% and the textiles diversion option (a close second) at 0.2% to 0.5%. **[2]**

- **City of Benicia, CA:** The City has one private waste management company that is the exclusive local franchise collector for residential waste (multi-stream) and commercial garbage. In addition to weekly garbage (volume based pay-as-you-throw system, ranging from $25 to $50 per month depending on container size), weekly recycling and bi-weekly collection of green waste, the City offers residents the following additional curbside collection services **[3]**:
    - Used motor oil and oil filters; (place in a clear sealed plastic container beside recycling cart)
    - Household batteries*;
    - Cellphones/PDA's*;
    - Compact fluorescent light bulbs*;
    - Small scrap and cast aluminum (not exceeding 40 pounds);
    - Four (4) free call-in collections of additional green waste and/or additional bundled cardboard;
    - Three (3) free call-in collections of additional garbage per year
    - Three (3) free curbside bulky item pickups (couch, water heater, mattress, etc.) per year

Option Number and Name: C10 – Expand Existing Collection Services

* Place in plastic bag outside of recycling cart

The City offers a Curbside Household Hazardous Waste Program. Residents are to call to book an appointment and special packaging for the material will be mailed to them.

- **City of San Francisco, CA:** In 2016 San Francisco conducted a pilot testing four textile collection approaches including:
    1. Enhanced P&E for textile collection with bulky waste (Enhanced bulky collection)
    2. Textiles collected in recycling cart (Bag in bin)
    3. Textiles collected beside recycling cart (Next to bin)
    4. Textile collection in multi-residential buildings (MR collection)

  Placing textiles next to the recycling cart - Approach 3 – experienced the highest recover rates but also resulted in the highest collection cost per pound. The City has decided to adopt Approach 2 which allows residents to place textiles in the recycling cart because it proved least costly to operate but it also resulted in half the recovery rate compared with Approach 3 Option #2 was contemplating the use of an additional truck to service the textiles. **[4]**

- **Prince Edward Island:** Residential customers can have their metal items collected with their blue bags as part of the recycling stream or drop them off for free on Saturday mornings at their local Waste Watch Drop-Off Centre. Small, clean, dry items containing more than 50% metal will be accepted in Blue Bag #2 along with plastic, glass and can items. Examples of items containing more than 50% metal include pots and pans, baking sheets, metal cutlery, small tools, and small appliances such as toasters, kettles, and irons. Only metal items smaller than 1.2 metres in length or less than 22 kilograms can be placed curbside on blue bag collection day and multiple items must be securely bundled and tied. **[5]**

- **Simcoe County, ON:** The County has a call-in service for bulky waste collection. The program uses a ticketing system and staff will collect up to 5 items for a fee of $35 (which is expected to increase by $5 next year). Staff collects the material with a rental truck and sort the bulky materials in the truck into recyclables (scrap metal, bulky plastics, mattresses, electronics, wood, window panes), reusables and garbage. At the transfer station staff removes recyclables (scrap metal, bulky plastics, mattresses, electronics, wood, window panes) and reusables (some go to the Salvation Army trailer). On average, 50% of the material collected is diverted. **[6]**

Considerations:

- Halton Region's current collection contract expires in April 2024. With so much uncertainty associated with the amended Blue Box Program Plan, the Region could consider making no changes at the present time. New contracts in light of transitioning EPR for Blue Box could have exit clauses should full EPR be approved in Ontario before the end of the next contract.
- Textile recycling by curbside collection at a peak time of the year (during Waste Reduction Week, April Spring cleaning, post Dec. holidays, Sept. back to school) could be an added service for residents who do not make it to the textile donation bins or drop off depot.

References:

[1] Halton Region, August 2017, Current Waste Management Profile (Section 4.2).

[2] https://getinvolved.london.ca/WhyWasteResource/virtual-open-house-resource-recovery-strategy

[3] City of Benicia website, http://www.ci.benicia.ca.us/index.asp?SEC=062081F8-224D-4655-986F-278EBB6E3DF2&DE=0AE07AED-79F2-45BF-A245-A4B96204556A (Accessed May 2018)

[4] San Francisco Textile Recovery Program Summary Results. September 7, 2016. Presented to the San Francisco Department of the Environment by Recology San Francisco
[5] PEI's Waste Watch Program – 2010 Annual Report at https://www.iwmc.pe.ca/pdfs/IWMCWasteWatchProgram2010.pdf
[6] Conversation with Wilma Bureau, Manager Solid Waste. Simcoe County. 2017

Option Number and Name: C11 Track Waste Containers in Multi-Residential Buildings

Description of Option: Radio frequency identification (RFID) tags are currently installed on all multi residential (multi-residential) wheeled carts for organics and front end bins for garbage and recycling in the Region. Front end collection vehicles can weigh and identify the location of carts that are lifted but the data is currently not used. Halton Region is able to capture the following information for each cart: location, contact information, units/floors, collection information, receptacle information, P&E records, site visits and calls, documents and pictures.

This option focuses on multi-residential approaches that include tracking the number and weight of lifts for a potential future user pay system (also discussed in option WDP 13) or to support waste diversion performance monitoring for multi-residential locations (discussed in option C9).

Category(ies) of Option: Collection

Timeline: Medium

Rationale and/or Source of Option:

- Identified at SWOT and visioning workshop with Region staff.
- Consulting team observations.

Halton Region Experience:

- All multi-residential buildings (454 apartment buildings with a total of 39,674 units) are serviced for garbage and recycling. As of May 2018, almost 50% of multi-residential buildings (220 apartment buildings) are on the Green Cart program.
- The Region has two contracts for multi-residential waste collection. One provides front-end collection of garbage and recycling, as well as roll-off bin collection of bulk waste. Another delivers automated wheeled cart collection to schools and multi-residential (recycling and organics), commercial areas (recycling and garbage), and Business Improvement Areas (BIAs) (recycling and garbage). Miller Waste Systems also collects Green Carts from multi-residential buildings.
- The Region records multi-residential carts using RFID tags numbers in the multi-residential database, however is not currently tracking information for performance monitoring purposes.

Demonstrated Experience:

- **Region of Peel, ON** - The Region of Peel conducted a five-month pilot for the use of weigh scales onboard of collection trucks to measure waste generation on a per multi-residential building basis. Weights of garbage and recycling were tracked by building and diversion rates were calculated. Due to the success of the pilot, the Region required the installation of onboard scales to the entire front-end collection fleet as part of a new collection contract. In 2016, the Region introduced a multi-residential RFID tracking system and report card. The system is capable of generating a "Report Card" that can be sent to each building which summarizes the collection services provided and recycling performance. The intent is to provide more transparency to building owners and managers regarding the waste management services provided. With increased awareness of their recycling performance, it is hoped that building staff will become more engaged and work with residents to increase recycling rates. The system will also have the capability to integrate with a billing system should this direction be deemed desirable in the future.[i,ii]
- **City of Markham, ON** – As part of contract negotiations in 2016, the City of Markham worked with their contractor to integrate RFID technology into their multi-residential collection program[iii]. They use the "Fleetmind Systems" for all multi-residential collection services, which was implemented at no additional cost to Markham. Fleetmind Systems provides software solutions and technical services to private and municipal clients including installation of the equipment in the cab, detailed progress reports and driver training. The Fleetmind Systems provided for Markham includes all hard-

Option Number and Name: C11 Track Waste Containers in Multi-Residential Buildings
and software required to record data from all garbage and diversion containers collected at each location, including time, date, property information, and material weights for each individual pick-up. All recycling and organics carts are equipped with RFID tags. All data is transferred in real time to a web site developed by Fleetmind, the contractor, and Markham's ITS Department. The Fleetmind Systems allows for tracking of waste generation rates (kg/unit/week) and weight of material collected, which can be used to calculate diversion rates and generate a building specific report card.
Considerations: • The use of RFID technology can enable the municipality to charge multi-residential locations for the weight of garbage they generate, as measured by collection crews during curbside pickup. This service is precise and it requires collection vehicles outfitted with at least semi-automated collection technology, and wireless communication modules (e.g. RFID) on both the vehicle and customer bins[iv]. • Consider how the results/data will be used once collected and any additional training required to analyze/interpret the data • Both contracts for front end and roll-off bin collection, and for automated wheeled cart collection end in 2024 and can be extended for two additional years to 2026.

References:

1. http://www.peelregion.ca/council/agendas/2016/2016-06-16-wmsac-agenda.pdf
2. http://thecif.ca/projects/documents/566.4-Peel_Final_Report.pdf
3. https://www2.markham.ca/markham/ccbs/indexfile/html/general/gc140203.htm
4. http://www.seas.columbia.edu/earth/wtert/sofos/Abrashkin_Thesis.pdf

Option Number and Name: C13 – Extend Curbside Yard Waste Collection

Description of Option:

This option looks at extending collection all year. It is acknowledged that the length of the LYW collection season is related to the length of the growing season and weather which will vary year to year and as such are looking at efficiencies of altering the collection service to all year. The Region would continue with dedicated LYW collection trucks during peak collection times and at other low volume times of the year, LYW could be collected by the Green Cart collection vehicle. This will increase the level of service to residents and will be easier to communicate to residents. It should have a minimal impact to the Green Cart collection and processing contracts.

Category(ies) of Option: *Collection*

Timeline: *Medium*

Rationale and/or Source of Option:

- Consulting Team
- Input received from Region staff
- Feedback from public

Halton Region Experience:

- The Region provides every other week curbside collection of LYW to urban areas which extends from the first week of April until the second week of December. Leaves, sticks, twigs, tree trimmings, decorative cornstalks, fallen fruit from trees, yard and garden trimmings, and pumpkins are accepted in the program. Grass is banned from yard waste and garbage collection.
- The Region provides a call-in bulk brush collection program in Oakville.
- In 2016, 18,968 tonnes of leaf and yard waste, and 350 tonnes of Christmas trees were collected curbside.

The Town of Oakville and City of Burlington provides loose leaf collection in the fall where residents rake leaves to the shoulder/boulevard and a vacuum truck collects it.

In the past the Region has extended yard waste collection upon request from residents. For example, in 2017 the Region provided an extra week of collection to extend into December.

- LYW is accepted at the HWMS for a fee of $5 per load.
- LYW collection is included in the waste collection contract, which expires in 2024 with two 1-year renewal periods.

Demonstrated Experience:

- **City of Barrie, ON:** The City provides weekly LYW collection for April to November and January, bi weekly collection for July, August and December and offers no collection for February and March.[1]
- **City of Hamilton, ON:** Yard waste is picked up every week all year round in the City. Residents are allowed to set out an unlimited amount of yard waste for collection.[2]
- **City of Winnipeg, MB:** In 2017, due to forecasted warm weather, the City initiated their curbside waste collection program a week earlier than announced. [3]
- **City of Robbinsdale, Minnesota:** The City informs their residents that due to uncertainties with the weather, these dates are subject to change.[4]
- **Region of Waterloo, ON:** The Region collects yard waste on a bi-weekly basis, from approximately the end of March to the end of November (total of 36 weeks), and their contract with the hauler stipulates that collection begins on the week as determined by the Region.[5]

[1] https://www.barrie.ca/Living/GarbageAndRecycling/Documents/R-WasteFacts-yardWaste.pdf
[2] https://www.hamilton.ca/garbage-recycling/yard-waste/yard-waste
[3] http://winnipeg.ca/cao/media/news/nr_2017/nr_20170407.stm
[4] http://www.robbinsdalemn.com/services/utility-billing/residential-solid-waste-yardwaste

Option Number and Name: C13 – Extend Curbside Yard Waste Collection
• **City of Vancouver, BC:** The City allows residents to put yard waste in its green cart or drop off at depot. Leaves collected monthly in the fall but prohibits residents to rake or blow leaves onto the street or any catch basin, which can result in a fine up to $10,000. Residents can order from four different sizes of green carts ranging from 120 litre to 360 litres and pay a variable fee depending on the size of the green cart. The green cart is collected weekly. [6] • **Niagara Region, ON:** The collection contract requires the contractor to collect yard waste separately during peak season – six times in the spring and six times in the fall. This yard waste is sent for windrow composting. The remaining times of the year, residents are allowed to set out yard waste or top up their green bin and it is collected and composted along with the green bin material.[7]
Considerations: • Would be harder to advertise flexible days, some residents may miss out on collection opportunities. Strict dates are usually mutually beneficial because of the advertising the municipality would do a full year in advance to communicate the dates of these types of events, and the hauler plans and bids according to the specific timeframes identified in the tender and ensures they have adequate trucks and drivers for those services. • Communicating to residents that they can place LYW curbside all year while directing LYW to the Green Cart collection vehicle during low volume times such as December, February and March, results is an increased level of service to residents with more certainty and minimal impact for the communications, and collection and processing contracts.

References:

1. https://www.barrie.ca/Living/GarbageAndRecycling/Documents/R-WasteFacts-yardWaste.pdf
2. https://www.hamilton.ca/garbage-recycling/yard-waste/yard-waste
3. http://winnipeg.ca/cao/media/news/nr_2017/nr_20170407.stm
4. http://www.robbinsdalemn.com/services/utility-billing/residential-solid-waste-yardwaste
5. Region of Waterloo – Tender T2015-*217 Collection of Garbage, Organics, Bulky and Larger Metal Items, Recycling, Yard Waste and Christmas Trees Within the Region of Waterloo* (Section 3.2.4, Paragraph 3)
6. City of Vancouver's Green Cart and yard waste program at http://vancouver.ca/home-property-development/seasonal-leaf-collection.aspx and http://vancouver.ca/home-property-development/flat-rates.aspx
7. Conversation with Andrew Pollock, former Director of Waste Management at Niagara Region, May 14, 2018.

[5] Region of Waterloo – Tender T2015-*217 Collection of Garbage, Organics, Bulky and Larger Metal Items, Recycling, Yard Waste and Christmas Trees Within the Region of Waterloo* (Section 3.2.4, Paragraph 3)

[6] City of Vancouver's Green Cart and yard waste program at http://vancouver.ca/home-property-development/seasonal-leaf-collection.aspx and http://vancouver.ca/home-property-development/flat-rates.aspx

[7] Conversation with Andrew Pollock, former Director of Waste Management at Niagara Region, May 14, 2018.

Option Number and Name: C14 - Review Current Non-Residential Customer Base

Description of Option:

This option looks at other programs and policies associated with providing collection services to non-residential customers to help the Region address the non-residential customer base, especially those that were grandfathered in from previous local municipality agreements. Selected customers may include non-residential commercial establishments located within new multi-residential buildings. This option also considers the use of a Pay-As-You-Throw fee structure to the non-residential customers.

Category of Option: Collection

Timeline: Medium

Rationale and/or Source of Option: Input received from Region staff

Halton Region Experience:

- The local municipalities (Burlington, Milton, Oakville, Halton Hills) were collecting waste from non-residential customers before the Region assumed waste management responsibility in 1996. These non-residential customers were grandfathered into the Region's current waste collection program. Most of the businesses are located along main arterial roads or in Business Improvement Areas (BIAs). Three are seven BIAs located in Halton Region including:
    - Acton BIA
    - Aldershot Business Community
    - Burlington Downtown BIA
    - Georgetown BIA
    - Milton Downtown BIA
    - Bronte BIA
    - Downtown Oakville BIA
    - Kerr Village BIA
- To minimize litter and improve collection efficiency, Halton Region implemented a Cart Collection program in May 2016 for garbage and recycling for BIAs and commercial units across Halton. Today, all Halton serviced commercial establishments receive the following services:
    - BIAs receive collection twice per week on Tuesdays and Fridays. Each business should have: One 360-litre or one 240-litre or two 120-litre black wheeled carts for garbage, and one 360-litre or one 240-litre or two 120-litre blue wheeled carts for recyclable material
    - Commercial units not associated with BIAs receive collection once per week on their designated collection day. A collection calendar for each collection day is provided on the Region's website. Both garbage and recycling are collected once per week. Each location has: two 360-litre black wheeled carts for garbage and one 360-litre blue wheeled cart for recyclable material.
- Halton Region replaces lost or damaged Wheeled Carts free of charge.
- The Region does not provide organics collection services to its commercial customers.
- Businesses may share their carts with residents or other units attached to their business (e.g. apartment over a store).
- The Region's Waste Management Services offers workshops for businesses to promote waste diversion practices within their organizations.

Demonstrated Experience:

- **City of Toronto, ON**: The City currently provides collection service to about 19,000 small commercial customers. Commercial customers registered on-line to receive City collection services and must pay for Garbage Tags in order to receive waste collection. All garbage must have a yellow tag attached to the bag in order to be collected. Each tag costs $5.11/tag that covers the cost of garbage collection and allows for weekly Green Bin and Blue Bin service at no additional cost. In 2017, Toronto City Council approved a new annual base fee ($273.52 flat fee in 2018), which applies to City of Toronto commercial yellow tag customers to help defray the cost of the diversion programs, such as Blue Bin recycling and Green Bin

Option Number and Name: C14 - Review Current Non-Residential Customer Base

organics. In addition, commercial establishments can pay variable fees for premium commercial organics collection, e.g. two times per week, five times per week and six times per week premium organics service collection. Where the City provides yellow tag collection service, customer diversion rates are high as there is a strong financial incentive to minimize garbage, which has a fee, compared Green Bin and Blue Bin collection, which are both free. Businesses must make their own arrangements for disposal or recycling of large furniture, appliances, electronic waste, yard waste and any hazardous waste. Note: Toronto switched from using yellow bags to using yellow tags due to challenges with supply and counterfeit bags.

- **Region of Niagara, ON**: The Region provides both a basic and optional "enhanced" collection service to select commercial customers that are located along residential routes, in BIAs or in the downtown cores of its 12 area municipalities. These two optional services are provided on a fee for service basis. Mixed-use buildings with a residential component outside the Designated Business Area are only eligible for curbside garbage collection if not using private containerized garbage collection and are able to stay within the garbage set-out limits of 6 bags or cans.
- **City of San Jose, CA**: City businesses receive garbage service using a franchise approach in which one company services all businesses within the City. Republic Services has an agreement with the City to collect garbage, recyclables, and organics from all businesses. Their service rates vary according to bin size and type. Businesses receive "Wet" collection service for organics, such as food waste, and "Dry" collection service for recyclables and everything else. If the wet organic stream contains less than 20% contamination it can be delivered directly to the Organic Processing Anaerobic Digester. The remaining dry stream or contaminated wet stream is sent to Republic's advanced materials recovery facility, the Newby Island Resource Recovery Park (NIRRP) for further processing. This process has nearly tripled the business recycling rate – from less than 25% to over 70% since it started in 2012. Under the Agreement with the City, the franchisee (Republic Services) is responsible for diverting from disposal a minimum of 80% by weight of all material collected from Commercial Premises, beginning January 1, 2014.
- **Strathcona BIA, Vancouver, BC:** The BIA currently coordinates an extended waste pick-up service for its members called *Recycle in Strathcona,*[1] which was launched in November 2015. The service is offered through a community preferred service agreement between the BIA members and two local companies - Recycling Alternative (a large local hauler), and Shift Delivery (a bicycle-powered low emissions cargo delivery company). This services small to medium sized businesses by providing recycling pickup services at a reduced rate. The Strathcona BIA in Vancouver is supporting a trial of shared waste bins for neighbouring sites on parallel blocks that share an alley in order to reduce hauling costs and alley clutter. Other BIAs in Vancouver are exploring this shared bin idea.
- **Duke Heights BIA, Toronto, ON:** The BIA located in North Toronto is partnering with the Compost Council of Canada to create and test a new model for an "organic", bottom-up approach to greening waste management activities in all types of businesses and institutions[2]. The pilot will involve working with 25 – 30 businesses to develop tailor-made, cost-effective, GHG beneficial, waste diversion programs. Partnering businesses will participate in a program to work with Compost Council of Canada teams to assess their current waste management practices and opportunities for added diversion and potential cost savings. This program is supported by Partners in Climate Action.
- **City of Calgary, AB:** The City offers commercial front end and cart garbage, recycling, and food and yard waste collection services for Calgary businesses and organizations. The City does not require the business to enter into long term contracts but, instead, offers flexible services. Fees are based on the size of the container, the stream collected and the frequency of collection. Since Nov. 1, 2016, businesses and organizations are required to recycle the same materials as the residential sector as well as any materials specific to commercial waste such as scrap metal, clear plastic film, and raw and unprocessed wood.

[1] http://www.recyclingalternative.com/what-we-recycle/recycle-in-strathcona/

[2] http://www.dukeheights.ca/greening-waste-management-bottom/

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Businesses and organizations must provide signage on all collection containers and provide educational information to tenants at least once per year.
Considerations: • Currently, the carts size for garbage and recycling are the same size – either 240 Litres or 340 Litres – which offers equal capacity for both garbage and recycling. The size of the cart does restrict the volume of garbage placed out for collection. . • For new mixed-use developments (with ground floor commercial businesses and multi-residential units above), a new policy for a fee based collection system could provide efficient collection services by reducing the number of collection trips and driving waste diversion. Collection could be provided by the Region with businesses paying a fee based on the volume of waste required for collection. This would drive diversion in the commercial business since maximizing recycling and composting will reduce the amount for waste and thus lower their fees. • By continuing the Blue Box collection program for schools on residential routes and BIAs, the collected tonnes count towards residential diversion tonnage in the current annual RPRA Datacall reporting and Blue Box funding (for specific ICI including schools and BIAs along a residential collection route). The added Blue Box materials contribute to revenue from market sales of the baled materials. • The level of IC&I collection service provided by municipality varies from municipality to municipality. Many provide some level of service to Business Improvement Areas (BIAs) or selected smaller businesses in the downtown core partly to ensure that streets remain clean. • In Ontario, municipalities do not have a legal obligation to collect and manage waste from the IC&I marketplace. • Under the *Waste-Free Ontario Act*, organics diversion has been identified as a key initiative that will target all sectors. The MOECC has released its final Organics and Food Waste Framework and Policy that sets organic recovery targets for IC&I establishments and identifies a goal to introduce an organics disposal ban beginning in 2022. • Halton Region currently does not provide organic collection service to non-residential customers. There will be added costs to the Region to add organics waste collection to these customers and will have implications for the Region's waste management staffing, operating costs, management etc.

References:

1. *http://www.halton.ca/living_in_halton/recycling_waste/business_improvement_areas BIA and_commercial/*
2. *City of Toronto Long Term Waste Management Strategy 2016 and https://www.toronto.ca/311/knowledgebase/kb/docs/articles/solid-waste-management-services/collections-operations/non-residential-yellow-bag-program-program-information-registration-eligibility-requirements-billing-cancellation.html.*
3. *Commercial Solid Waste And Recyclable Materials Collection Franchises Agreement Between The City Of San Jose And Allied Waste Services Of North America, Llc, Dba allied Waste Services Of Santa Clara County. 2011 at http://www.sanjoseca.gov/ArchiveCenter/ViewFile/Item/2835*
4. *San Jose's Business Recycling and Garbage Service at http://www.sanjoseca.gov/index.aspx?nid=1527*
5. *http://local.republicservices.com/site/santa-clara-ca/san-jose/rates-schedules*
6. *Improving Waste Management in Non-Market Housing. A. Martin. Greenest City Scholar, City of Vancouver, August 2016.*
7. *Recycle in Strathcona at http://www.recyclingalternative.com/what-we-recycle/recycle-in-strathcona/*

8. *Greening Waste Management from the Bottom Up at http://www.dukeheights.ca/greening-waste-management-bottom/*
9. *Greening Business Waste-Management Systems from the Bottom-Up Project Summary. 2018 at http://www.compost.org/English/PDF/Project%20Proposal%20Summary%20for%20CCC%20and%20DUKE%20HEIGHTS%20BIA.pdf*
10. *City offers funding to help businesses start recycling programs at austintexas.gov/news/city-offers-funding-help-businesses-start-recycling-programs*
11. *City of Calgary Commercial Waste Services at http://www.calgary.ca/UEP/WRS/Pages/Garbage-collection-information/Commercial-services/Commercial-multifamily-waste-collection.aspx*
12. *Ontario's Food and Organic Waste Framework. April 2018. at https://www.ontario.ca/page/food-and-organic-waste-framework*
13. *Ontario's Food and Organic Waste Policy Statement. April 2018 at https://www.ontario.ca/page/food-and-organic-waste-policy-statement*

Option Number and Name: C15 –Fuel Options for WM Vehicles

Description of Option:
This option looks at reviewing and assessing requirement considerations for the use of alternative fuels (e.g. Compressed Natural Gas - CNG) for waste collection vehicles and onsite equipment.

Category(ies) of Option: Collection, Processing

Timeline: Medium

Rationale and/or Source of Option: SWOT and Visioning workshop with Region staff.

Halton Region Experience:

- **Halton Region's Green Fleet Initiatives**: Since 2004, Halton Region has been greening its fleet by incorporating the use of bio-diesel and purchasing a few hybrid vehicles. In 2009, Halton became a member of the E3 Fleet (Energy, Environment, Excellence) Rating Program, which is designed to evaluate and recognize green fleet (energy and GHG emissions) performance based on a rating of Bronze, Silver or Gold level of performance. The Region earned an E3 Fleet Bronze Rating in 2014 by implementing an anti-idling policy, an equipment use and procurement policy and a Smart Commute program for staff. Environmental practices have been incorporated into fleet vehicle operations, maintenance and end-of-life management.

- **Area Municipal Green Fleet Strategies:**
  - In 2008, Burlington Council approved the Green Fleet Transition Strategy to help reduce air pollutants and greenhouse gas emissions. Actions are listed where the City can make further improvements. In 2017 fleet staff engaged Fleet Carma to provide technology in various city vehicles to assess the possibility of replacing them with partially electric or fully electric vehicles. **[1]**
  - Oakville's Sustainable Green Fleet Strategy and Guide outlines actions into the future to guide fleet greening to assist with the Town's greenhouse gas emission reduction goals, reduction of the use of non-renewable resources and to improve fuel efficiency. All actions and decisions related to fleet management need to consider promoting and encouraging sustainable green fleet practices including: replacing vehicles with fuel efficient, low emission and/or hybrid alternatives, green fleet maintenance, driver training and management practices, implementing innovative carbon reduction strategies and monitoring current and upcoming green fleet operations and planning.

Demonstrated Experience (Alternative Fuel Options):

- **City of Palo Alto, CA:** In November 2017, the first all-electric automated side loader refuse truck from vehicle manufacturer BYD Heavy Industries was presented to the City and GreenWaste (Palo Alto's waste hauler service provider). The BYD electric refuse truck uses its batteries for propulsion, as well as to power the hydraulic system for the body. The electric refuse truck has 76 miles of range (122 km) and requires only two to three hours maximum to fully charge. The truck will operate on a variety of service routes in the community from urban to residential neighborhoods including streets with steep inclines. The City estimates that the electric vehicles will save 72 metric tons of GHG emissions each year and help to meet the City's goal of an 80% reduction in GHG emissions by 2030. BYD estimates that City will save more than $16,000 US per year due to the truck's efficient electric motors and controls and the less maintenance that is required for the propulsion systems. GreenWaste will monitor and collect data from the electric refuse truck's routes to determine if additional electric refuse trucks can be purchased in the future to replace its entire diesel truck fleet. **[2]**

- **Ontario's Waste Industry**: The Ontario market is showing significant interest in return-to-base fleets. Ontario's waste management industry have converted collection trucks from diesel to CNG **[3]**, including:
  - Waste Connections of Canada has nearly 150 NGVs on the road including a fleet (converted to CNG in 2013) in Simcoe County.

Option Number and Name: C15 –Fuel Options for WM Vehicles

- In June 2015, Waste Management began servicing the Region of Waterloo, Guelph and surrounding areas with 28 new CNG waste trucks.
- Emterra Group has deployed over 100 CNG trucks for the Region of Peel collection contract.

- **Surrey, BC's Closed Loop System:** The City has developed a closed loop system whereby organic material collected from the residential organics program (commingled household organics and leaf and yard waste) is sent to Surrey's Biofuel Facility, which is an anaerobic digester. The feedstock is transformed into biogas through the anaerobic digestion process and the methane is upgraded to compressed natural gas (CNG) that is then used as an alternative renewable fuel source to power the waste collection trucks used to collect the green bin material. Switching from diesel fuel to CNG has helped to reduce greenhouse gas (GHG) emissions in Surrey, which is equivalent to taking an estimated 475 cars off the road each year. **[4]**

- **Waste Management Inc.:** In 2017, Waste Management Inc. opened its 100th natural gas fueling station and achieved a milestone of operating 6,000 natural gas trucks, which is the largest heavy-duty fleet of its kind in North America. For every diesel truck replaced with natural gas, the company reduces its use of diesel fuel by an average of 8,000 gallons per year along with a reduction of 14 metric tons of greenhouse gas emissions per year (the equivalent of a 15 percent emissions reduction per truck). **[5]**

- **Emterra Environmental:** Emterra has CNG stations and CNG fleets in Winnipeg, MB, Capital Regional District and Fraser Valley Regional District in BC which included developing the CNG collection trucks to be capable of operating in extreme cold weather climate. As of May 2017, 35% of Emterra's 550 trucks operate on CNG. Since 2011, Emterra's fleet of 70 collection trucks has been running on biodiesel. **[6]**

Considerations:

- Halton Region's current collection contract expires in April 2024. The Region could consider fuel options as a consideration for the next contract. Opening the contract to address replacing existing diesel collection trucks with CNG trucks could open the Region to high costs and additional challenges by the contractor. Halton could explore some CNG options with the contractor without committing to opening the contract. With so much uncertainty associated the amended Blue Box Program Plan, the Region should consider doing nothing at the present time.
- In the meantime, Halton Region could consider the installation of a Region fueling site for the use of all Halton owned vehicles and sub contractor equipment that has been converted to CNG or will be in the future.
- A recent study by ICF International shows that by converting heavy duty vehicles to natural gas, Canada could reduce GHG emissions by approximately 25 per cent by 2030. **[6]**

References:

[1] Halton Region, Best Sustainable Practices, Halton Municipalities and Elsewhere (2010), http://www.halton.ca/common/pages/UserFile.aspx?fileId=64354 (accessed April 2018).
[2] https://www.greenfleetmagazine.com/channel/electric/news/story/2017/11/byd-delivers-first-all-electric-side-loader-refuse-truck.aspx
[3] http://members.questline.com/Article.aspx?articleID=30554&accountID=1863&nl=17407
[4] Surrey's Waste Collection Fleet. November 23, 2016. Surrey, BC website at http://www.surreybiofuel.ca/news-media/blog/waste-collection-fleet
[5] http://www.greenfleetmagazine.com/channel/natural-gas/news/story/2017/08/waste-management-opens-100th-station.aspx
[6] http://myemterrask.ca/emterra-environmental-honored-business-leadership-greater-victoria-chamber-commerce-2016-business-0

Option Number and Name: DT6 Additional Waste Depot option(s) for residents

Description of Option: A public drop-off container station located at the Halton Waste Management Site (HWMS) in Milton provides a centrally located and convenient one stop location for recycling and proper waste disposal for Halton residents. However, the HWMS is not accessible to the entire Region and with greater population densities in the southern part of the Region there is a need to consider expanding access to such a depot(s) that reduces the distance some residents have to travel.

This options looks at two alternatives that include:

- Providing three additional permanent and staffed collection depots in each local municipality (City of Burlington, Town of Oakville and Town of Halton Hills).
- Providing one additional permanent and staffed collection depot.

For either option, the additional depot(s) should be similar to the public drop-off container station and must have the capacity to accept materials from residents including excess curbside materials (recyclables and leaf and yard waste) and non-curbside waste (e.g., household hazardous waste).

Category(ies) of Option: Drop off and Transfer

Timeline: *Medium/Long*

Rationale and/or Source of Option: Consulting Team

Halton Region Experience:

- The Region has one public drop-off facility (Halton Waste Management Site (HWMS)) located in the geographic centre of the Region. The HWMS was established in 1992. As the HWMS is most accessible by car and is located north of the more populated components of the Region (i.e., Oakville, Burlington), the Region has received comments about the distance to the HWMS.
- The public drop-off area at the HWMS includes a Container Station, Household Hazardous Waste Depot, Reuse Depot, Bulk Yard Waste, Brick and Rubble , Blue and Orange Box and Green Cart distribution.
- Materials accepted at the Container Station include wood, scrap metal, drywall, appliances, electronics, Blue Box and Green Cart material, tires, bikes, eyeglasses, natural corks, and hockey sticks.
- The Container Station bin haulage and material processing is operated by a contractor at an annual cost of approximately $315,000. In 2016, garbage and recyclables collected was 6,610 tonnes and 6,783 tonnes respectively. The number of weighed in loads received at site in 2016 was 129,983. The busiest months were May, June and July which recorded between 13,031 (May) to 14,093 (June) weighed in loads. February was the slowest month with 6,431 weighed in loads[1].
- The Region previously had unstaffed recycling depots to service the rural areas, that had resulted in illegal dumping, vandalism, contamination and fires. These depots were closed in 2004 and replaced with Blue Box collection in the rural areas.

Demonstrated Experience:

- **City of Edmonton, AB** - The City of Edmonton operates four staffed “Eco Stations” that accept

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Option Number and Name: DT6 Additional Waste Depot option(s) for residents

garbage and recyclables from residents and the ICI sector[1]. The Eco Stations are located in four different geographic locations across the City in order to service different areas of the City[2]. The City also manages 20 unstaffed recycling depots that accept paper, boxes, cardboard, plastic bags, and all recyclable containers, cans and bottles. The unstaffed recycling depots do not accept large items such as furniture, mattresses, and appliances. These items are only accepted at the four staffed Eco Stations and the Edmonton Waste Management Centre (EWMC). The recycling depots are remotely monitored for illegal dumping and offenders are fined $250. The contamination levels of the collected recyclables are unknown.

- **City of Winnipeg, MB** - The City of Winnipeg operates three staffed recycling depots for residential customers only[3]. One depot is located at the waste management centre/landfill which accepts both divertable materials and garbage. The two other depots are located across the City and accept materials for recycling and reuse only. All three recycling depots are owned and operated by the City. The City also has three 4Rs Depots that accept a wide range of materials for free (e.g., Blue Cart recyclables, leaf and yard waste, HHW, scrap metal, non-treated wood, rubble and masonry). The Brady 4Rs Depot is located at the landfill approximately 15 km outside the city centre. The Pacific 4R depot is located in the city centre. In 2018, the new Panet 4R depot was opened in the northeastern area of Winnipeg, east of the Red River. The new depot is expected to provide residents within St. Boniface and the northeast Winnipeg with more convenient recycling options[3].
- **Region of Peel, ON** - The Region of Peel operates six Community Recycling Centres (CRCs) for disposal of residential waste, recyclable/reusable items, and household hazardous waste[4]. There are two CRCs in Brampton, two in Caledon, and two in Mississauga. All CRCs are staffed and are closed on statutory holidays. Similar to the HWMS, some of the CRCs have partnerships with third party organizations (ex. Salvation Army) to accept other reusable items and clothes.
- Region of York, Ontario: York Region provides several convenient public drop-off depots where residents can bring Blue Box recyclables, electronic waste, household hazardous waste, scrap metals/metal appliances, yard waste, and household waste for recycling and disposal. There are four locations spread throughout the Region that accept BBR as well as other materials [6].
    - Georgina Waste Transfer Station, Household Hazardous Waste and Recycling Depot located in the Town of Georgina accepts Blue Box recyclables, electronic waste, household hazardous waste, scrap metals/metal appliances, and household waste.
    - McCleary Court Community Environmental Centre located in the City of Vaughn accepts Blue Box recyclables, electronic waste, household hazardous waste, scrap metals/metal appliances, and household waste.
    - Elgin Mills Community Environmental Centre located in the town of Richmond Hill accepts Blue Box recyclables, electronic waste, scrap metals/metal appliances, and household waste.
    - East Gwillimbury Household Hazardous Waste and Recycling Depot located in the Town of East Gwillimbury accepts Blue Box recyclables, electronic waste, household hazardous waste, and scrap metals/metal appliances.

Considerations:

- A public survey may be a useful tool to obtain feedback from residents on potential depot locations, hours of operation, etc. The results would also be useful to assess public interest and understand how the new depots might be used by residents (e.g., primarily for specific recyclables, primarily for garbage, primarily for yard waste, etc.).

[2] https://www.edmonton.ca/programs_services/garbage_waste/garbage-drop-off-facilities.aspx

[3] https://www.manitobapost.com/manitoba-news/another-4r-winnipeg-depot-opens-on-panet-road-113444

Option Number and Name: DT6 Additional Waste Depot option(s) for residents
• Additional waste depots could be staffed by regional staff rather than contracted staff which may provide greater flexibility to accept additional materials and offer additional services. A regionally staffed depot may also provide greater opportunities for public education and outreach at the depot. • Alternatively, if operations are contracted out, then the contract should have the flexibility to accommodate potentially new and designated material streams during the contract period and/or provide public education and outreach activities. • The additional depots are expected to distribute Green Carts and Blue Boxes and should therefore have enough space to store these items. • A feasibility study should be done in the medium term timeframe to recommend the details for implementing a depot in the long term timeframe.

References:

1. *https://www.edmonton.ca/programs_services/garbage_waste/eco-stations.aspx*
2. *http://www.calgary.ca/UEP/WRS/Pages/Recycling-information/Residential-services/Recycling-depots/Recycling-Depots.aspx*
3. *http://www.winnipeg.ca/waterandwaste/recycle/4rdepots/default.stm*
4. *http://www.peelregion.ca/waste/community-recycling-centres*

Option Number and Name: DT7 – Optimize Use of HWMS

Description of Option:

The Halton Waste Management Site (HWMS) is located at 5400 Regional Road 25 in the Town of Milton, between Britannia Road and Lower Baseline Road. The site is approximately 126 ha in size, 53 ha of which is approved for landfilling **[1].** The Region has purchased land around the permitted site as a buffer from other land uses, including a 200 acre parcel to the south. The Region is considering purchasing approximately 11 ha of vacant land located North of the site when it becomes available. The HWMS is serviced with hydro-electricity, municipal water and sanitary sewer systems. There are also weigh scales, a scalehouse, a landfilling area, a public container station, a household hazardous waste depot, a re-use facility; a transfer station, a leaf and yard waste processing facility, brick and rubble/bulk brush pad and a wood processing pad at the site. There are administration, maintenance and storage buildings on the site, as well as a stormwater management system and a landfill gas utilization plant. Residents can receive and/or replace Blue Boxes, Green Carts, Orange Boxes and/or backyard composters at the HWMS as well **[2].**

This option looks at the following opportunities to optimize the use of the available and unused lands available within and/or on adjacent owned lands surrounding the HWMS:

- Maintain the unused land as additional buffer area due to residential housing along Britannia Rd.
- Continue to monitor and consider purchasing surrounding land as it becomes available
- Consider construction an Education Centre
- Designate land for future landfill development, waste management functions and services
- Consider green alternative energy technologies or other temporary use on land currently not in use until it is required for waste management functions

The Halton Waste Management Site Optimization Study that was completed as part of the Short Term Strategy should be reviewed in five years to determine the effectiveness of the infrastructure and services that will be implemented and to further develop the Long Term initiatives that were mentioned in the study and that are recommended as part of this option.

Category(ies) of Option: Drop-off and Transfer (DT)

Timeline: Medium

Rationale and/or Source of Option:

SWOT (Strengths, Weaknesses, Opportunities and Threats analysis) and Visioning workshop with Region staff.

Halton Region Experience:

- Currently the Region is using the additional lands as buffer zones.
- Some of the land is rented out for agricultural use.

Demonstrated Experience:

- **Sudbury, Ontario**: the Sudbury landfill has a Reuse Store where the site operator pulls out reusable items that can be purchased for reasonable rates. Items include: children's toys, lawn furniture, sporting goods, luggage, lawn mowers, bicycles, counter tops, sinks, doors and more.
- **City of Guelph, Ontario**: a Waste Diversion Education Centre suited for approximate groups of 25 people provides guided tours on how visitors can reduce the amount of waste at home by

Option Number and Name: DT7 – Optimize Use of HWMS

sorting it the right way, learn about composting, touch and feel recycled materials at different stages in the recycling process, learn more about the City's waste diversion programs and as a knowledge Solid Waste Resources employee questions about solid waste management.

- **Region of Waterloo, Ontario:** the Region offers free environmental education programs to local schools and community groups at their Waterloo site. The program includes a lesson and activities at the Environmental Education Centre located at the Waterloo Waste Management Site, and tours of the Nyle Ludolph Materials Recycling Centre, landfill and transfer station.
- **City of Barrie, Ontario:** in 2015, the City of Barrie applied for an MOECC permit to allow PowerStream (now Electra utilities) to install ground-mounted solar panels at the Sandy Hollow Landfill site. It is estimated that at a rate of 10 cents per kilowatt hour, the City could net $5,000 a year in revenue from the sun shining over the garbage. The solar panels provide electricity to the education centre located within the site.
- **The City of Saskatoon:** The City of Saskatoon and several partners (Saskatchewan Polytechnic, the Saskatchewan Environmental Society (SES) and the SES Solar Co-operative Ltd.) have installed 92 solar photovoltaic panels to produce energy to help power the nearby landfill gas generation facility. The solar panels are expected to produce about 40,000 kilowatt-hours per year, enough to provide 40 per cent of the power for the landfill gas facility. The panels are adjustable so they can be moved to capture more sunlight at different times of the year.
- **Oahu, Hawaii, US:** the Hawaiian Electric Company signed an agreement in August 2011 to purchase power generated by a 1MW PV plant at the Kapolei Sustainable Energy Park, a former industrial disposal site. The plant will use more than 4,200 PV panels mounted on a sealed 12-acre industrial waste site where dumping was halted in 1986 and the property deemed unusable by the federal EPA.
- **Springfield, Massachusetts:** the Western Massachusetts Electric Company is turning a local landfill into a 4.2MW solar facility by installing about 17,000 PV panels, making it New England's largest solar facility.
- **East Brunswick, New Jersey**: in November 2011, China-based ENN Solar Energy announced it had partnered with National Energy Renewable Corporation to turn the East Brunswick landfill into a 4.3MW solar site using thin-film PVs that will "float" on the landfill cap without puncturing it and releasing the flammable methane gas that has the built-up over the years. The installation of these large modules utilized a new "floating" architecture that securely anchors the solar panels to the landfill surface with no needs to penetrate the landfill cap that would increase the leaking risk of flammable methane gas **[3].**

Considerations:

- Establishing an Education Centre to allow visitors and schools to gain a better understanding of how Halton Region's organics, recyclables and garbage are collected and processed, and how to minimize and divert the amount of garbage disposed at the landfill.
- Constructing solar farms on the vacant lands or closed landfill areas to generate clean energy to be able to connect to the power grid. This will be another source of energy to be considered by Oakville

Option Number and Name: DT7 – Optimize Use of HWMS
Hydro Energy Services.

References:

1. *Dillon Consulting Limited (2017), Regional Municipality of Halton, Current Waste Management Profile, Solid Waste Management Strategy, August 2017*
2. *Dillon Consulting Limited (2018), Regional Municipality of Halton, Halton Waste Management Site, Preliminary Design and Report, May 2018*
3. *Excerpt from http://www.ennsolar.com*

Option Number and Name: DT8 – Transfer Station for curbside collection trucks

Description of Option:

This option looks at having all curbside collection trucks dispose of Blue Box and Green Cart material at an expanded Transfer Station located at the HWMS or another location or the optimum mix of private transfer station and Region owned transfer station capacity in the system. A feasibility study will be conducted to determine the optimum transfer station capacity and location.

Category(ies) of Option: Drop-off and Transfer (DT)

Timeline: Medium

Rationale and/or Source of Option:

Consulting Team

Input received from Region staff

Halton Region Experience:

- An Interim Transfer Station (ITS) is a prefabricated building 30.5 m long by 21.3 m wide located south of the maintenance building and landfill gas utilization facility **[1].** The ITS is approved to receive a combined total of 299 tonnes of Source Separated Organics (SSO) and Blue Box Recyclables (BBR) per day (tpd) to a maximum of 52,000 tonnes per year **[2]**. However the building size is not able to accommodate the full amount and is currently effectively accommodating approximately 200 tonnes per week.
- Blue Box and Green Cart materials that are collected curbside are delivered to the Halton ITS and two other private transfer stations by collection vehicles contracted by the Region. **[3].**
- The ITS was constructed within the future landfill Cell 4 so that the existing infrastructure (weigh scales, roads, services, etc.) could be used to minimize potential impacts and reduce construction and operating costs. The ITS design and materials were chosen to reduce costs and be able to move when the land is required for landfill development.
- The Region has contracts with privately owned transfer stations in Burlington (15 kms from HWMS) and in Georgetown (28 kms from HWMS). Based on 2016 waste collection data, of the 75,743 tonnes of total Blue Box and Green Cart material was collected, a total of 61,445 tonnes (81.1%) were transferred to Burlington and 5,204 tonnes (6.9%) were transferred to Georgetown. This minimizes the time the collection trucks are off route to empty the material they have collected.
- Unexpected incidents at the privately owned transfer and processing facilities can result in their inability to receive the Region's material, requiring the Region to quickly find alternative options.
- The ITS is approved to receive a combined total of 299 tonnes of Source Separated Organics (SSO) and Blue Box Recyclables (BBR) per day (tpd) to a maximum of 52,000 tonnes per year. Based on 2016 waste collection data, 5,544 tonnes of Blue Box material were received at the ITS. A total of 3,621 tonnes of Green Cart material were transferred to the ITS.

Demonstrated Experience:

- **Vancouver South Transfer Station (VSTS):** The Vancouver South Transfer Station is for commercial and residential customers to dispose of garbage, and to drop off select recyclable materials. In October 2016, Recycle BC (a non-profit organization responsible for residential recycling in British Columbia) took on full responsibility (100% EPR) for Vancouver's recycling program. Council approved a contract award for site improvements providing the following benefits: improved traffic flow and reduced queuing, increased safety and reduced GHG emissions from idling vehicles,

Option Number and Name: DT8 – Transfer Station for curbside collection trucks

improved customer service with the receipt of additional materials for recycling, decreased illegal dumping around the VSTS; and greater operational flexibility to add more materials for recycling as opportunities become available **[4].**

- **City of Hamilton, Ontario:** the city has three transfer stations strategically located throughout the City. The transfer stations were designed to accept solid waste, top-load it into transfer trailers and transport it to the City's landfill for final disposal. At each of the sites, the physical space allowed for the new CRCs to become integrated into the existing transfer stations. Each of the new larger sites was divided into two separate components: the original transfer station, which contained the physical building and the new CRC. The transfer station was dedicated to servicing municipal collection vehicles and most commercial customers while the CRC included a container station for waste and recyclable material disposal and a household hazardous waste depot. The Mountain CRC also contained a Reuse Centre which allow residents the opportunity to drop-off reusable items and/or shop for reusable items. Approximately 44,500 tonnes of BBR and 42,140 tonnes of SSO were collected and disposed during 2017 **[5].**
- **Region of Durham, Ontario:** The region uses a combination of its own transfer stations and as well as contracts with the private sector. The Blue Box materials collected are estimated to be around 47,000 tonnes per year and diverted to the Whitby and Pickering Material Recycling facilities owned and operated by a private contractor. The Green Bin tonnes are transported to the Pickering location for composting.

Considerations:

- The Region is currently landfilling in Cell 3 (total of five Cells) of the landfill. As part of the development of Cell 4, the ITS will need to be relocated.
- Currently the Region is contracting with third parties the collection, transfer and processing of Blue Box and Green Cart materials. The expansion of the ITS to handle the transfer of all the material will require a significant capital budget which could be recovered by avoiding the third party contracts.
- The current 650 m^2 ITS facility needs to be expanded to accommodate all of the collected Blue Box and Green Cart material. For the medium term plan (2028) the transfer station will need to be expanded to 1,900 m^2 to allow handling the additional materials. For the long term plan (2048) the ITS will need to have an area of approximately 3,800 m^2.
- Unexpected incidents at the private transfer stations and processing facilities can result in the Region not being able to take the collected material to these facilities. A larger Region owned transfer station at the HWMS would provide the Region more flexibility to manage the material during these incidents.
- A combination of private transfer stations with a larger Region owned transfer station should be determined to minimize system costs while providing the Region with operational flexibility during unexpected incidents.
- Identify appropriate location at HWMS to accommodate a larger transfer station considering impacts to customer traffic onsite, other future uses and facilities on site and potential nuisance impacts such as odours off site.
- System audits have discovered contamination occurring at the privately operated transfer stations. The Region lacks control of the design and operations of these facilities.
- A transfer station could be combined with an additional public depot drop-off.

References:

1. *Dillon Consulting Limited (2017), Regional Municipality of Halton, Current Waste Management Profile, Solid Waste Management Strategy, August 2017*

2. *Dillon Consulting Limited (2018), Regional Municipality of Halton, Halton Waste Management Site, Preliminary Design and Report, March 2018*
3. *Urban and Environmental Management Inc. (2009), Interim Transfer Station at the Halton Waste Management Site, Operation and Maintenance Manual, Procedure Manual for the Handling and Processing of Waste*
4. *City of Vancouver (2016), Administrative Report, Contract Award for the Vancouver South Transfer Station Site Improvements*
5. *City of Hamilton, Public Works Department (Environmental Services Division), extracted October 2017.* https://www.hamilton.ca/city-initiatives/citizen-dashboard/collection-tonnage-all-waste-streams.
6. *Excerpt from http://www.york.ca/wps/portal/yorkhome/environment/yr/garbageandrecycling/wastedepots*

Option Number and Name: P1 Service Delivery Approaches

Description of Option: The Region currently uses a mix of delivery approaches for the different waste management services. The Region owns the HWMS, but contracts out the majority of services aside from some services related to maintenance and landfill operations. Waste collection and processing services are contracted to private companies.

This option looks at service delivery approaches for source separated organics (SSO), Leaf and Yard Waste (LYW) processing and recycling processing and the use of private sector transfer stations. Potential approaches include:

- Delivering services in-house with the facilities owned by the Region;
- Contracting out services; or
- Using a mix of service delivery approaches (as they are currently).

The option reviews infrastructure risks (e.g., impact of losing private sector infrastructure). Option P2 considers looking at alternative technologies for organic waste processing. This option considers whether the Region should develop their own organics processing facility at the HWMS or another location or contract out to a privately owned facility.

Category(ies) of Option: Processing and Drop off and Transfer

Timeline: Medium

Rationale and/or Source of Option:

- Input from Region staff. There is a heavy reliance on third party service providers and the service becomes restricted to the materials the service providers can process and effectively market.
- The Region is reliant on the private contractors for the delivery of the service. If the contractor experiences a disruption in their service delivery, this impacts the Region's ability to deliver the service as well and may require to quickly find another service provider.
- Pending potential disposal ban on organics in 2023 from the Provincial Food and Organic Waste Framework

Halton Region Experience:

- Collected Blue Box and Green Cart material is delivered to one of three transfer stations in the Region: two that are privately owned and operated (located in Burlington and Georgetown) and one that is owned by the Region and operated by a contractor at the HWMS. Approximately 88% of all Blue Box and Green Cart material collected by Halton is received at one of the two private transfer stations (majority goes to Burlington location).
- The Region currently sends Green Cart material to the City of Hamilton's Centralized Composting Facility. Leaf and yard waste is collected separately from food waste and this material is processed at an open windrow yard waste composting facility at the HWMS which is operated by a contractor.
- The Region has signed a new contract with a private company for Blue Box processing that started in April 2018.
- The Region contracts out waste collection, hauling, and the majority of processing. Waste collection contracts expire in 2024 with options to extend for two years. The processing of Green Cart materials expires on December 31, 2020, processing of yard waste at the HWMS expires in March 2020, and processing of Blue Box materials expires in April 2023. The contracts with the two private transfer
- stations expire in March 2024 (Burlington) and March 2020 (Georgetown) and the contract to

- Option Number and Name: P1 Service Delivery Approaches

- operate the HWMS interim transfer stations expires in March 2024.
- The HWMS currently has contracts for the operation and maintenance of the following facilities/services: Container Station bin haulage and material processing, environmental monitoring, landfill gas collection system monitoring and maintenance, yard waste composting, household hazardous waste depot, equipment rentals and heavy equipment services, bird management and traffic control. Contracts are set to expire between 2018 and 2020.

Demonstrated Experience:

- **City of Burnaby, BC** - The City of Burnaby provides waste collection and transfer services in-house with their municipal collection fleet. Processing is completed by third parties. Disposal is managed by the regional government (Metro Vancouver) and the City of Vancouver.
- **City of Calgary, AB** - The City of Calgary provides collection and waste disposal at three regional landfills using in-house City resources. Recyclable processing is completed by a third party. A new organic processing facility opened in 2018 which is owned by the City with contracted operations to process the materials collected through the City's organics collection which was implemented in 2017.

  The City of Calgary accepts both food waste and LYW in their Green Cart program. The organics are processed at an in-vessel composting facility which can process up to 145,000 tonnes of food waste, LYW and dewatered biosolids[1]. The City also accepts LYW (leaves, branches, plants, and glass clippings) self-hauled from residential and commercial customers at their three landfills. At the Spyhill and East Calgary landfill sites, the yard waste is taken directly to outdoor composting pads at both facilities[2]. The compost pads cannot process food waste and sod. Residents are encouraged to put food waste and sod in their green carts. Some larger yard waste branches are chipped into mulch at the Spyhill and East Calgary Landfills. The mulch is available to residents free of charge. The new composting facility is located adjacent to the Shepard Landfill.
- **City of Winnipeg, MB** - The City of Winnipeg contracts collection of all waste streams and processing of recyclables and organics. Operation and ownership of the landfill are primarily municipal operations, however some landfill operations, such as landfill gas management, are contracted services.

Option Number and Name: P1 Service Delivery Approaches

- **City of Toronto, ON** - The City of Toronto has a mixed service delivery model as summarized below:
    - Residential curbside and multi-residential waste collection is delivered through a combination of city collection services and contracted collection services.
    - The City owns one landfill that is operated by a private contractor.
    - The City owns and operates seven transfer stations.
    - Processing of Blue Bin recycling is contracted to a private Material Recovery Facility (MRF).
    - Processing of Green Bin organics is completed at two City-owned anaerobic digestion facilities with a combined processing capacity of 130,000 tonnes per year. The operation of these facilities is contracted out. In addition to the two City-owned facilities, the City has contingency processing contracts with three private sector operators that can handle 85,000 tonnes per year[4].

  The City of Toronto collects separate food waste and LYW. Food waste is collected every week while LYW is collected every other week from mid-March to mid-December. Food waste that is collected through the Green Bin program is sent to the Regional AD Processing Facilities. The City accepts residential LYW at all seven Drop-Off Depots located across the City. Both the LYW that is collected curbside and the LYW that is collected at the drop-off depots is sent to third party contractors who process the LYW using windrow technology[5].

- The **London (Ontario)** Composting Facility is an enclosed aerated static pile tunnel composting system which accepts both LYW and food waste, is estimated to cost approximately $61/tonne to operate[6]. The London Composting Facility has a capacity of 150,000 tonnes per year.

Considerations:

- Halton Region procures solid waste management services based on individual operation functions (i.e. collection, transfer, processing and disposal are all contracted on their own). Procuring waste management services with alternate contract terms may facilitate more efficient and cost effective service delivery from private sector contractors. This may include combining services under one contract which have historically been treated separately. Alternative contract terms may include a longer contract period to provide the private sector with additional flexibility for developing or providing infrastructure requiring significant investment of capital and financing. Alternate contract terms may introduce higher risk to the Region, but may result in a more efficient service delivery model.
- Potential benefits associated with moving to an in-house delivery model are listed below, based on operational functions:
    - Waste Collection Services
        - More robust monitoring and enforcement with potential organics disposal ban
        - Greater flexibility to increase the number of customers receiving service in the future
        - Better coordination of waste collection with public education and outreach initiatives, which may result in greater potential for customer participation in diversion programs as well as customer satisfaction
        - Greater flexibility to modify services in the future
        - Improved coordination between the collection from residential, multi-residential, and ICI customers
        - Potentially better opportunities to track safety data and more confidence in reporting of safety data
        - Potentially greater control over quality of waste material entering facilities achieved through enforcement at the curb, including recyclables and organics.
    - Transfer Stations
        - Opportunities to share staffing and equipment resources between waste management facilities
        - Greater flexibility to modify services in the future to accept additional waste

Option Number and Name: P1 Service Delivery Approaches

materials/streams or expand services at the facility
- Potential additional use as storage area
- Greater flexibility to expand transfer station network/facilities in the future based on changing customers or waste streams

- Processing
  - Potential to own and operate a regional organics processing facility in the future
    - Potential for collaboration with neighbouring communities and cost sharing opportunities.
    - Greater flexibility to find end markets for compost material --> potential uses within regional operations
    - Opportunities to work with local municipalities and other outside communities for additional feedstock or markets for compost
    - Opportunities for energy recovery
    - Opportunities to incorporate biosolids
    - Greater control over operations to mitigate risks

- Potential risks associated with transitioning to an in-house delivery model:
  - High initial capital investment to cover building and equipment capital
  - Additional staff required – greater risk due to labour market conditions and availability
  - Greater risk to changing market conditions
  - Greater risk to changing waste stream tonnages and composition
  - Exposure to greater liability through additional high risk operations
  - Safety considerations and risks associated with collection, transfer, and processing
  - Potential for higher operating/annual costs (staffing, maintenance, etc.)
  - Potential for higher administrative, management, coordination costs compared to current contracted delivery model due to additional staff and resources managed
- Consider blended service delivery approach by transitioning more of the contracted services to in-house (balanced risk management approach). Potential services to be delivered in-house include:
  - HWMS operations such as landfill gas and environmental monitoring
  - Additional transfer stations or public drop-off depots
  - New organics processing facility

Leaf and yard Waste

- Based on the annual cost of the operations contract, this is a relatively low cost to process organics, and in general much lower than the cost to process LYW and food waste combined in an enclosed facility. Consideration should be given to maintaining separate collection and processing/composting of LYW.
- If the Region wishes to move away from the in-house processing of LYW, then the following options could be considered:
  - The woodchips generated from the processed LYW could be used as a bulking agent for a future regional organics processing facility.
  - The LYW could be incorporated as bulking agent into the feedstock for a future regional organics processing facility. This may also be cost effective if the Regional facility has a shortage of bulking material and does not charge full cost (i.e. over $30 per tonne) to accept it.

Consider sending the LYW collected curbside to a third party processor. This would significantly reduce the amount of LYW processed at the site. Depending on the need for this material by third parties as bulking agent, there may be cost savings; or potentially cost increases if it is treated as any other organic material co-mingled with food waste. There would still be some LYW that would need to be managed at the HWMS from residential and commercial self-haul customers.

References:

1. *http://www.calgary.ca/UEP/WRS/Pages/Recycling-information/Residential-services/Green-cart/Green-Cart-organics-composting-facility.aspx#*
2. *http://www.calgary.ca/UEP/WRS/Pages/Recycling-information/Residential-services/Organics-recycling/Spring-yard-waste-drop-off.aspx*
3. *http://www.biorem.biz/?portfolio=region-of-peel-compost-facility*
4. *https://www.toronto.ca/wp-content/uploads/2017/10/8eaf-Waste-Strategy-Highlightsbackgroundfile-94038.pdf*
5. *https://www.toronto.ca/311/knowledgebase/kb/docs/articles/solid-waste-management-services/processing-and-resource-management/processing-recycling/leaf-compost-yard-waste-processing.html*
6. *Morrison Hershfield reference project*

Option Number and Name: P2 Alternative Technologies for Organic Waste

Description of Option:
This option looks at organic waste processing technologies to consider the most feasible way to divert this material from the landfill based on the triple bottom line evaluation criteria of environmental, social and financial impacts. Various technologies are available that combine different organic feedstocks to produce an end product. Anaerobic digestion systems can accept additional organic waste, such as pet waste, diapers, sanitary waste, and biosolids while generating energy as an output. Anaerobic digestion is the process by which organic matter is broken down to produce biogas and biofertiliser. This process happens in the absence of oxygen in a sealed, oxygen-free tank called an anaerobic digester.

There are various aerobic (with oxygen) composting technologies from open windrow systems to covered static piles and enclosed in-vessel systems that require air and water to be added to maintain optimum conditions. An organics processing facility can also provide the opportunity to integrate biosolids from waste water treatment plants as a feedstock.

Leaf and Yard Waste (LYW) is processed at an open windrow composting facility at the HWMS and operated by a contractor. There have been no issues with the current operations, however a potential option for the future may include combining leaf and yard waste as a feedstock with other Region organic material, such as SSO, for organic processing.

Category(ies) of Option: Collection and Processing

Timeline: *Medium*

Rationale and/or Source of Option: Consulting team and staff input.

Halton Region Experience:

- The Region currently provides weekly curbside collection of organic waste through the Green Cart program. All food waste, paper products including: paper rolls, paper plates and cups, paper towels and tissues, and other items including flowers and wooden chopsticks are allowed for Green Cart collection. Green Cart materials are processed at the City of Hamilton's Centralized Composting Facility (an in-vessel aerobic system) and the contract expires on December 31, 2020. The collection contracts expire in 2024.
- The Region provides bi-weekly curbside collection of LYW to urban areas which extends from the first week of April until the second week of December. Leaves, sticks, twigs, tree trimmings, decorative cornstalks, fallen fruit from trees, yard and garden trimmings, and pumpkins are accepted in the program. Grass is banned from LYW collection except for Burlington. The collected material is processed at an open windrow yard waste composting facility at the Halton Waste Management Site, which is operated by a contractor. The collection contract ends in 2024, while the contract for processing ends in December 2020. In 2016, approximately 27,500 tonnes of LYW was processed (including LYW dropped off at the HWMS)1.
- The open windrow yard waste composting facility located at the HWMS is operated by a contractor, Gro-Bark (Ontario) Ltd. The facility processes mixed LYW (brush and leaves) from residential and commercial sources. This organic waste is composted using windrow piles. The bulk brush is ground to produce woodchips that are used on-site or composted. The composting contract has a 3 year term with the option to extend for an additional 2 years. The composting contract is valued at approximately $790,000 per year, and expires on March 31, 2020.
- Based on the Region's waste composition results from 2014 and 2017, the addition of materials such as diapers, sanitary products and pet waste could divert another 11,000 tonnes per year from single

[1] Region of Halton, Short Term SWMS, Current Waste Management Profile – Page 12.

Option Number and Name: P2 Alternative Technologies for Organic Waste

family and multi-residential garbage streams.

- It should also be noted that there is still a significant portion of organic waste in the residential garbage (both single family and multi residential). Based on the average garbage audit results from 2014 and 2017, approximately 22,000 tonnes of Green Cart organic waste and leaf and yard waste is collected in the garbage and landfilled.
- In 2012, the Region approved a Biosolids Master Plan that recommended investigating biosolids composting opportunities.
- Starting in August 2013, Halton Region conducted a Biosolids Composting Pilot Project at the LYW composting facility at the HWMS. The study was conducted for one year with the results finding that co-composting biosolids with LYW produced compost that meets the Ontario Compost Quality Standard Category A, which is exempt from transportation and end use regulations.
- The Region is conducting a Biosolids Composting Feasibility Study to identify technology alternatives and the optimum allocation of biosolids with LYW material to produce a marketable end product.
- The Region has also been developing an Energy and Resource Management Strategy that recommends further study on the feasibility of optimizing organics processing of the various organics material that the Region manages with energy use and production.

Demonstrated Experience:

- **City of Toronto, ON** - The City of Toronto collects separate food waste and LYW. Food waste is collected every week while LYW is collected every other week from mid-March to mid-December. Food waste that is collected through the Green Bin program is sent to the Regional AD Processing Facilities. The City accepts residential LYW at all seven Drop-Off Depots located across the City. Both the LYW that is collected curbside and the LYW that is collected at the drop-off depots is sent to third party contractors who process the LYW using windrow technology[2].Processing of Green Bin organics is completed through two anaerobic digestion (AD) facilities owned by the City of Toronto with a combined processing capacity of 130,000 tonnes per year. One facility was constructed in 2014, and one facility is being expanded and expected to be operational in 2018. The City's Green Bin program accepts food waste, soiled paper products, pet waste, diapers, and sanitary waste that can be placed in regular plastic bags. Based on the current two city owned facilities and contingency contracts with private facilities, the City is not expected to have sufficient organics processing capacity to manage its projected needs starting in 2020 and are therefore exploring their options. LYW is collected and processed separately.
- **Region of Peel, ON** - The Region of Peel currently collects food waste separate from LYW. Food waste is collected weekly from all areas. Yard waste is collected seasonally and either weekly or bi-weekly depending on the area. The food waste and yard waste is mixed in equal parts at the Regional compost facility[3]. The Region of Peel currently processes source separated organics at two region-owned, privately operated composting facilities. Both facilities use in-vessel (tunnel) compost technology. One facility has a design capacity of 12,000 tonnes and the other facility has a design capacity of 60,000 tonnes. The Region accepts food waste, soiled paper products and house plants that can be placed in compostable bags. Diapers, sanitary products, pet waste and regular plastic bags are not accepted in the program. The immature compost is processed at a curing facility at the regional waste management facility[4]. The Region is in the process of developing an AD facility that will be designed, built, operated and maintained by the private sector. A site located in north-west Mississauga was acquired and the capacity of the AD facility will be 90,000 tonnes per year. The new facility will be able to accommodate diapers, sanitary products and pet waste and permit the use of

[2] https://www.toronto.ca/311/knowledgebase/kb/docs/articles/solid-waste-management-services/processing-and-resource-management/processing-recycling/leaf-compost-yard-waste-processing.html
[3] http://www.biorem.biz/?portfolio=region-of-peel-compost-facility
[4] http://www.compost.org/conf2012/Closing_Plenary/Cities_Feed_Farm_Soils_L_Conrad_Region_of_Peel.pdf

Option Number and Name: P2 Alternative Technologies for Organic Waste

regular plastic bags. Biogas produced will be refined to renewable natural gas. The facility is anticipated to begin operations in 2023[5].

- **City of Surrey, BC** -The City of Surrey owns an organic waste biofuel processing facility that is expected to be able to process up to 115,000 tonnes of co-mingled organics (food and LYW) from the City. The majority of this waste will come from Surrey's residential curbside collection program; however, commercial organic waste will also be processed at the facility. The facility uses in-vessel compost tunnels to process the organics. The City of Surrey's curbside organic collection program accepts co-mingled organics but does not accept plastic bags, diapers, pet waste, or sanitary products. The project is partially funded through a P3 Canada Fund.
- **City of Calgary, AB** – – The City of Calgary accepts both food waste and LYW in their Green Cart program. The City also accepts LYW (leaves, branches, plants, and glass clippings) self-hauled from residential and commercial customers at their three landfills. At the Spyhill and East Calgary landfill sites, the yard waste is taken directly to outdoor composting pads at both facilities[6]. The compost pads cannot process food waste and sod. To support The City of Calgary's city-wide organics collection, which was fully implemented in 2017, a new organic processing facility was constructed and became operational in 2018 (owned by the City with contracted operations). The facility has capacity to process up to 145,500 tonnes of residential food and yard waste and dewatered biosolids every year[7]. The in-vessel (tunnel) composting facility receives material from the residential Green Cart program (combined food and LYW) including pet waste and dewatered biosolids. Items that are not accepted include plastic, diapers, and sanitary products. Biosolids material and Green Cart food and L&Y waste are kept separate during the process. The facility produces two varieties of Category A compost. One made with the Green Cart organics and one with the de-watered biosolids.
- **City of New York, NY** – As part of a pilot project with National Grid (private company that supplies New York with electricity and natural gas) that began in 2014, the City of New York sends pre-processed food waste (from the residential and commercial sector) to the Newtown Creek Wastewater Treatment Plant to create additional biogas for conversion to renewable natural gas[8]. Waste Management is responsible for pre-processing the food waste which involves their facility blending the food waste into a consistent bio slurry. The food waste is added to waste water sludge to increase the production of biogas. The Newtown Creek Wastewater Treatment Plant has capacity to treat 1.2 billion litres of waste water per day.[9]
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Considerations:

- Increasing organics processing capacity supports the Province's recent Food and Organic Waste Framework (April 2018) where an action is to amend the 3Rs Regulations to include food and organic waste and increase resource recovery in the IC&I and multi-residential sector and another action is to ban food and organic waste from disposal (phased-in and beginning in 2022).
- The Framework sets a target of 70 per cent reduction and recovery of food and organic waste by 2023 for municipalities that already have collection programs in place.
- As part of the planning process for a new organics processing facility, an assessment should be

Option Number and Name: P2 Alternative Technologies for Organic Waste

completed to identify potential compost end markets and the feedstocks and technologies that would provide a compost product that meets the market requirements..

- The processing technology selected for a new Regional organics processing facility will determine any required changes to the Green Cart collection program. The collection contract is structured so that material can be shifted from the garbage to the Green Cart without any repercussions to the contract.
- An anaerobic digestion (AD) facility may be able to accept a co-mingled waste stream which includes food waste, L&YW, pet waste, diapers, sanitary waste, and biosolids.
- Based on the annual cost of the operations contract for LYW, this is a relatively low cost to process LYW organics, and in general much lower than the cost to process LYW and food waste combined in an enclosed facility. Consideration should be given to maintaining separate collection and processing/composting of LYW.
- There may be an opportunity to use separated L&Y waste and clean wood chips as a bulking agent for a future Regional organics processing facility.
- Odour generation and mitigation is a serious issue that all organics processing facilities need to plan for in the design of the technology, system, feedstock and end products. Odour complaints from facility neighbours have caused operating disruptions for many composting facilities in Ontario.

References:

[5] Region of Peel, Waste Management Strategic Advisory Committee Report on "Strategic Terms for the Anaerobic Digestion Facility Project", November 2017.

[6] http://www.calgary.ca/UEP/WRS/Pages/Recycling-information/Residential-services/Organics-recycling/Spring-yard-waste-drop-off.aspx

[7] http://www.calgary.ca/UEP/WRS/Pages/Recycling-information/Residential-services/Green-cart/Green-Cart-organics-composting-facility.aspx

[8] http://www.nyc.gov/html/dep/html/press_releases/13-121pr.shtml#.Ws06I8KWyUk

[9] https://www.nytimes.com/2017/06/02/nyregion/compost-organic-recycling-new-york-city.html, https://www.theweathernetwork.com/us/news/articles/new-york-city-turns-organic-waste-into-green-energy/84786/

Option Number and Name: RD 2 Alternative Technologies for Residual Waste

Description of Option: This option looks at the feasibility of alternative technologies to recover energy, generate electricity and reduce garbage sent to landfill. The technology must be suitable for the volumes and types of waste available after recycling and composting. The alternatives include:

- Conventional combustion technology;
- Gasification or pyrolysis;
- Mixed waste processing;
- Refuse Derived Fuel from Mechanical Separation; and
- Refuse Derived Fuel from Biodrying.

Energy from Waste (EFW) and alternative fuels are permitted as waste management options under Waste-Free Ontario, however the landfill diversion resulting from these methods do not count towards diversion in Ontario[1]. However, it should be noted that the recovery of nutrients, such as digestate from anaerobic digestion (AD), is considered diversion[1].

The amount of waste generated within Halton Region, which was disposed at the Regional landfill in 2016 was 68,418 tonnes, an increase of 1% from 2015. The projected landfill life is estimated at 30 years (to 2046) at current disposal rates.

The most recent waste audit data from 2014 and 2017 showed that 49% of the single family residential garbage stream consisted of materials which cannot be currently diverted through Regional reuse, recycling or recovery programs. While several programs can be implemented as part of the Strategy to further reduce this portion of the garbage stream, there will be some residuals in the waste stream that will require disposal.

Category(ies) of Option: Processing, Residual Processing and Disposal

Timeline: Long

Rationale and/or Source of Option:

- Feedback received from the SWOT and Visioning workshop with Region staff.

Halton Region Experience:

- The Conditions of Approval for the HWMS direct the Region to make reasonable efforts to comply with a Strategy for the implementation of an EFW facility within 8 years of the first receipt of waste at the landfill site. Since the Region significantly decreased the amount of garbage being landfilled with the implementation of waste reduction and recycling programs, the landfill lifespan has increased well beyond the initial projection of 20 years. The Region has applied and received approval from the Province to defer this Condition to a future date.
- In 2007, Halton Region staff prepared a business case and technology overview to assess the feasibility of developing an EFW facility in the Region. Region Council reviewed the report and approved a Recommendation to not consider the Region being a proponent of an EFW facility for a period of five years.
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Demonstrated Experience:

- **City of Edmonton, AB** – The Enerkem Alberta Biofuels facility was designed to accept post-sorted municipal solid waste (i.e. residual waste after source separation of recyclables and organics) and produce methanol and ethanol. The facility has capacity to accept up to 100,000 tonnes per year of residual waste, and has a biofuel production capacity of 38 million litres per year. The facility officially opened in 2014. The facility is expected to be fully operational by the end of 2018. Delays in becoming fully operational are apparently due to acquiring operational results from running a small scale facility in another province before scaling up to the larger facility in Edmonton. Enerkem's production technology is the first application in Canada, and is relatively untested around the world.

Option Number and Name: RD 2 Alternative Technologies for Residual Waste

- **Metro Vancouver, BC** – Metro Vancouver's Waste-to-Energy Facility has operated in Burnaby, BC since 1988 and handles about 260,000 tonnes of garbage per year[6]. It is a mass-burn facility that converts waste into electricity and recovers about 7,000 tonnes of metal annually. Metro Vancouver annually earns about $8 million from the sale of electricity and $300,000 from the sale of recycled metal to a company that produces reinforcing steel. The facility is operated and maintained by Covanta.
- **Halifax, NS** – Sustane Technologies is constructing a waste-to-biofuel facility at the landfill site in Chester, NS. The facility is expected to open in the summer of 2018. The facility has a design capacity of 70,000 tonnes per year, however is expected to initially accept between 45,000 to 50,000 tonnes per year of garbage from the region. The input waste stream undergoes a proprietary material separation and pre-processing stage before using the separated organics to create biomass pellets and pyrolysis to convert plastics into synthetic diesel. This is the first facility Sustane has constructed in North America[7]. They have one other facility currently operating in Spain.
- **Regions of Durham and York, ON** –Covanta operates the Durham York Energy Centre, a municipally owned EFW facility in in Clarington, Ontario[8]. The facility can process up to 140,000 tonnes of municipal solid waste per year from the Regions of Durham and York, and can produce up to 17.5 megawatts of renewable energy. The technology used is a traditional thermal mass-burn process. The facility has been fully operational since 2016.
- **Region of Peel, ON** – The Emerald EFW facility (previously Algonquin EFW is located in Brampton, ON and started operating in 1992. The facility uses a two-stage combustion process followed by a waste heat boiler to generate steam, which is then converted to electricity[9]. From 1992 to 2012, the Region of Peel had a contract with Algonquin Power to send a portion of the Region's garbage to this facility for disposal. The Region of Peel initiated the planning process to construct a regional EFW facility in 2013, but plans to proceed with the proposed EFW facility were cancelled by Regional Council in 2015.
- **Metro Vancouver, BC** – In 2013, Metro Vancouver reviewed four mixed waste material recovery facilities (MWMRF) in California[10]. Staff from Metro Vancouver toured the Sunnyvale SMaRT Station (Sunnyvale), Western Placer Waste Management Authority Material Recovery Facility (Placer County), Greenwaste Recovery (San Jose), and Newby Island Resource Recovery Park (San Jose). The facilities process in the range of 150,000 to 250,000 tonnes of mixed waste per year. One facility receives waste after source separation and another facility accepts waste from a community where no source separation programs exist. Reported recyclables recovery rates were in the range of 10-15%. All facilities reported having to landfill potentially recyclable material due to increased quality standards in the Chinese recycling markets. The Sunnyvale SMaRT Station reported operating costs of $130/tonne, which included operating the MWMRF and landfill disposal of residuals. The Metro Vancouver staff report concludes that "*mixed waste processing facilities visited were found to be high cost and recover limited recyclables*" [10].

Considerations:

- Conventional mass-burn combustion technology is the most common and proven in Canada and worldwide. The level of energy production is dependent on the actual design, however, as a rule of thumb one tonne of waste generates 2 MWh steam (heat) and ⅔ MWh electricity. The steam can be used for district heating or an industrial process. The optimal distance for usage of the district heating depends on the local situation. Normally district heating is optimal in a distance of up to 10 km, but examples are found with distances up to more than 30 km from the facility[4].If there is no market for steam (heat) utilization, the production of electricity can be optimised.
- The landfill gas utilization system at the HWMS could be expanded to produce electricity from other sources such as an EFW facility.
- The cost of EFW needs to be assessed long term. While it should be compared to the status quo cost of continuing to dispose of waste at the HWMS in the short term, it should also be compared with the cost to replace the landfill and dispose of waste when the HWMS landfill has reached capacity.

Option Number and Name: RD 2 Alternative Technologies for Residual Waste

- If RDF is being considered for the recovery of energy in the garbage stream, it is important to establish markets for the RDF before building a facility. Potential markets for RDF include cement kilns, lime plants, and industrial boilers. Cement plants are less sensitive to these concerns and there are several concrete manufacturers in Halton Region. Approvals will be required for these uses.
- RDF can be made by biodrying the collected waste so that they can be used as a substitute fuel and replace fossil fuel in industrial boilers and also cement kilns. Biodrying involves the same technology as composting, but at a lower cost. It is popular in Europe in places where there are insufficient markets for compost. Several compost system suppliers now offer their technology for either composting or bio-drying.
- Halton's EFW business case developed in 2007 recommended proceeding to public consultation with the scenario where the EFW facility was located at the HWMS. The advantages and disadvantages of siting a potential EFW facility in an alternate location should be reviewed.
- Consideration could be given to exporting garbage to existing EFW facilities, e.g. Durham. In general, EFW facilities benefit from economies of scale and need to run at full capacity. Cost-efficient long term contracts may be possible, especially if the Durham EFW facility is expanded in the future, which it is designed for.
- Wood waste from construction and demolition waste can be handled by a mass-burn EFW facility, but has more benefits and value when converted to an RDF and used to offset coal or natural gas at a cement kiln, or other industrial facility.
- With regards to mixed waste processing of residuals, it appears the maximum achievable recovery rates for recyclables range from 10-15%. The relatively high capital and operating costs to establish a MWMRF should be compared to the additional costs and benefits of improving existing source separation programs.
- Bottom and fly ash quantities from mass-burn EFW facilities are typically in the range of 15-20% of the incoming waste by weight, or approximately 10% by volume. The bottom and fly ash generated from an EFW facility would need to be landfilled. The ash could be landfilled at the HWMS in a dedicated landfill disposal cell. The life of the landfill would be significantly extended if it was only accepting/managing bottom and fly ash from an EFW facility.
- Timing for the implementation of an EFW facility should allow for the use of the HWMS landfill to dispose of the ash.

References:

1. *https://files.ontario.ca/finalstrategywastefreeont_eng_aoda1_final-s.pdf*
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6. *http://www.metrovancouver.org/services/solid-waste/SolidWastePublications/WTEFactSheet.pdf*
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8. *https://www.durhamyorkwaste.ca/Home/Home.aspx*
9. *https://www.partnersinprojectgreen.com/wp-content/uploads/2015/04/Algonquin_WastetoEnergy.pdf*
10. *http://www.metrovancouver.org/services/solid-waste/about/wte/Correspondence/ReportReviewofMixedWasteMaterialRecoveryFacilitiesbyPaulHendersonforZeroWasteCommittee.pdf*

Option Number and Name: RD 3 – Extend Landfill Capacity

Description of Option:

The Regional landfill has been in operation since 1992. It has an approved footprint area of 53 hectares and is approved for 7.96 million cubic meters (Mm^3) of residual waste. When it was approved, the landfill was estimated to have a projected life of 20 years and to reach its capacity in 2012. As a result of improved diversion programs and implementation of various operational programs, the landfill is projected to reach the approved capacity in 2044-46, at current fill rates [1].

This option looks at extending landfill capacity by implementing vertical and/or horizontal expansion to the current approved contours. This option will consider the technical design requirements, approvals and costs to recommend how the landfill capacity should be expanded. A timeline will be provided of when the Region should initiate the planning and approval process for these expansions.

Category(ies) of Option: Residual Processing and Disposal (RD)

Timeline: Long

Rationale and/or Source of Option:

Consulting team and input received from Region staff

Halton Region Experience:

The HWMS handles approximately 250 tonnes of solid non-hazardous waste per day. The amount of waste received and landfilled in 2016 was 68,418 tonnes, an increase of 1% from 2015. The landfill is equipped with a leachate collection system, a landfill gas collection and energy generating system [1].

- **Horizontal Layout:** The Site is bounded on the west by First Line and on the east by Regional Road 25 (Bronte Rd). A number of properties located north and south of the site are bounded by Lower Base Line on the south and Britannia Road on the north. The landfill is designed with five cells, ranging in size from 9.5 ha to 12.1 ha, that are built in halves as needed. Cell 3 East is the current active disposal area, with Cell 4 estimated to be required in the next 5 to 8 years.
- **Vertical Layout (slopes)**: According to the Design and Operation (D&O) report, the approved top elevation of the landfill is limited to 15 m above existing elevation based on the visual impact analysis. The maximum elevation is about 204 m above sea level (mASL) in the south part of Cell 2 and the side slopes are approximately 4:1. The landfill side slopes were reduced from 4:1 to 8:1 along the critical areas of the site to allow future access for agricultural equipment for the approved after use.
- **Landfill final use**: As proposed in the D&O report the landfill end use is for agricultural land. Therefore, the top slopes range from 1.1 to 2.9% to aid in future agricultural uses.
- **Final cover**: The designed final cover consists of 0.3 m of topsoil and 1.2 m of subsoil for a total thickness of 1.5 m [2].
- **Base liner**: The base excavation depth was designed to ensure the hydraulic trap in all the proposed cells of the Site. It means that the hydraulic head of the landfill is kept less than the surrounding environment hydraulic head preventing leachate from migration off-site. The designed base contours of the developed cells range from 179.5 m ASL in Cell 1 to 178.0 m ASL in Cell 3. The excavation depths range from 1.9 below existing ground elevation at the west end of Cell 4 to about 7.0 m at the east end of Cell 3. The average depth of cut over the entire landfill site is approximately 3.8 m. The typical cross section of the base liner, from top to bottom, consists of:

Option Number and Name: RD 3 – Extend Landfill Capacity

- 150 mm thick protective gravel layer,
- geotextile,
- 300 m clear stone with 200 mm perforated leachate collection pipes,
- geotextile,
- 1.2 m thick remolded clay layer,
- geotextile,
- 300 mm thick sub-liner contingency base (20 mm clear stone), and
- Geotextile.

Demonstrated Experience:

Vertical expansion:

- **Clean Harbors Lambton Landfill:** To provide additional disposal capacity for commercial hazardous waste disposal of 4.5 – 5.0 Mm^3 to extend the site projected lifespan by approximately 25 years. In December 2010, the Minister of the Environment approved the Terms of Reference and the EA was approved on July 2015.

Humberstone Landfill, Niagara Region (EA submitted in June 2015): Additional 2.4 million m^3 disposal capacity for solid non-hazardous waste in order to meet residual waste disposal needs of south Niagara for a period of approximately 25 years or more. An Environmental Assessment was performed and it took about 2.5 years to be completed from the Minister's Terms of Reference approval to Minister's approval of the Environmental Assessment Report. *Horizontal expansion:*

- **Brighton Landfill, County of Northumberland**: To provide additional disposal capacity to allow the County to continue to operate the landfill through the year 2023. An expansion of approximately 500,000 m^3 of disposal capacity is anticipated. The EA process started on June 2010 and was approved by the Ministry by February 2015.
- **Twin Creeks Landfill, Waste Management:** Approved to dispose of 750,000 tonnes per year of residential and IC&I waste generated in Ontario for a period of approximately 25 years. The approved undertaking occurred on lands owned by the proponent adjacent to the existing landfill site. An Environmental Screening Process was initiated early 2016 and approval was granted by March 2017.
- **Ottawa Waste Management Landfill (Carp Landfill), Waste Management**: To expand the landfill by 38 hectares for a disposal capacity of 6.5 Mm^3 and disposal rate of 400,000 tonnes per year. The EA terms of reference were approved on November 2010 and the EA was approved on September 2013.
- **Cache Creek Landfill, Wastech, BC**: To increase the site by 42 hectares and 12.6 million tonnes of disposal capacity to Cache Creek landfill. It would also add 17 to 25 years to the site operating life.

Considerations:

- **Vertical expansion:**
  - Burlington Executive Airport, founded in 1962, is located at 5300 Bell School Line, Burlington, approximately 4.2 km southwest of the HWMS. Aerodrome Standards and Recommended Practices, Obstacle Limitation Surface Section, limits the height of the outer surface obstacle to 45 m in a 4,000 m radius [4]. This limitation would not apply to the landfill height since the HWMS is located more than 4,000 m away from the airport.

Option Number and Name: RD 3 – Extend Landfill Capacity

- It is feasible to apply for approval to expand the height of the landfill design above the current 15 m.
- The high thickness of the final cover was proposed based on the After Use Report (as mentioned in the D&O Report) to rehabilitate back the site to a viable agricultural use upon completion of the filling. Due to the changes in the neighbourhood's land use and development since the preliminary design of the landfill was issued, the final cover thickness could be adjusted considering the landfill regulations, infiltration rate through the final cover and its ability to capture landfill gas. This will require an amendment to the landfill approvals to change the final design for the after use of the site.
- Since cells 4 and 5 have not been designed and constructed yet, an ECA amendment could be obtained to expand the final contours so that they can be incorporated when the cells are designed and constructed, rather than going back after the cells have reached capacity.
- Increasing the side slops from 8:1 to 4:1 on Cells 1 and 2, as well as, increasing the side slope from 5:1 to 4:1 on Cells 4 and 5 increased the landfill capacity without affecting its footprint. Also, 2 m difference between the final elevation of Cells 2 and 3 (204 m) and Cells 4 and 5 (202 m) can be revised and by increasing the final elevations of Cells 4 and 5 to 204 m to have a uniform cover and enhance surface water runoff. These changes would affect the waste load of the landfill requiring to confirm if the current base liner design can handle the additional waste loads.
- The base liner design of future Cells 4 and 5 have the potential to be modified. Introducing a combination of high density polyethylene (HDPE) geomembrane (GMB), geosynthetic clay liner (GCL), and compacted clay liner (CCL) as composite liner can increase the landfill capacity and service life. Any changes in the final cover or final elevation would affect the waste load in the landfill and should be considered in the base liner design.

- **Horizontal expansion:** The lands south of the HWMS are owned by the Region and could be considered for a possible horizontal expansion. Environmental and municipal approvals will be required to be able to expand the landfill in this area. Due to residential development north of Britannia road, the Region is not contemplating expanding the landfill to the north.

References:

1. Dillon Consulting Limited (2017), The Regional Municipality of Halton, Current Waste Management Profile, Solid Waste Management Strategy, August 2017
2. Hydrology Consultants Division of Trow Ltd (1986), The Regional Municipality of Halton , Design and Operation Report for Site 'D', Halton Region Landfill Technical Study, September 1986
3. MOECC (2017), Amended Environmental Compliance Approval, The regional Municipality of Halton, Number 8110-APTH2K, Issued Date 1 August, 2017
4. Transport Canada (2005), Air Navigation System Requirements Branch, Aerodorme Standards and Recommended Practices, 4th Edition, March 1993, revised March 2005
5. Dillon Consulting Limited (2016), Memo: Steinbach Landfill Closure Study: Closure Turf Application Review , August 2016
6. Dillon Consulting Limited (2015), Green Lane Landfill Expansion Options Overview

Option Number and Name: RD 4 - Optimize Utilization of Landfill Gas

Description of Option:

This option looks at making modifications/enhancements to the utilization of Landfill Gas (LFG) at the Halton Waste Management Site. It considers the LFG utilization terms of agreement, alternative agreements, whether other technologies should be considered and the use of energy.

Category(ies) of Option: Residual Processing and Disposal

Timeline: Medium /Long

Rationale and/or Source of Option: Halton Region staff (added April 2018).

Halton Region Experience:

- The collection of LFG at the HWMS began in December 2006.
- LFG is collected through vertical wells placed in the landfill cells. Landfill gas collected in 2016 was 143,382,560 ft^3 which was 4 % lower compared to 2015.
- The Region contracts out the operation and maintenance (O&M) of the LFG collection system and has an agreement to provide the landfill gas to Oakville Hydro Energy Services Inc. (OHESI), **[1]**
- The latest O&M contract of the LFG collection and flaring system was up for renewal October 31, 2018. **[2]**
- OHESI is responsible for the capital and operational costs of the Gas Utilization System (GUS). OHESI takes ownership of the LFG once it enters their system and is responsible for all contamination and waste from the GUS. Net profits (after operating costs, loans, equity repayment) are shared between OHESI and the Region with 40% to OHESI and 60% to the Region. The GUS is into the 10^{th} year of operation now. Revenue to the Region is expected in the 18^{th} year of operations. **[3]**
- The Region's agreement with OHESI allows for the system to be expanded to collect gas from an organic anaerobic digestion facility or EFW facility.
- The LFG fired electricity generation facility has a rating of up to 4.2 megawatts consisting of identical engine-generator sets. Each gen-set combusts up to 576 (standard) m^3/s of LFG (which operates under ECA No. 8511-6YNKN5). **[4]**

Demonstrated Experience:

- **City of London, ON**: The City was starting a new LFG utilization as 0.5 MW FIT project in 2018. Their Feed-In Tarrif (FIT) agreement attained in October 2017 was to purchase the electricity generated for the next 20 years at a fixed price of 18 cents per kilowatt hour. Electricity generation would use approximately 20% of their LFG supply. For this agreement, there was no difference in electricity prices during peak or off peak hours. A contractor would be retained to provide operation and maintenance of the LFG power plant. There was consideration to use the remaining LFG for Renewable Natural Gas (RNG) in the future. The RNG would be fed into a utility pipeline near their W12A landfill.
- **Lachenaie Landfill, QC**: Waste Connections of Canada (WCC) built and operates a large-scale biogas facility at its Lachenaie Landfill in Quebec. This facility converts landfill gas to pipeline quality gas. **[6]**
- **Niagara Landfill, ON:** Walker Industries is taking a similar approach to WCC at its Niagara landfill. General Motors of Canada (GM) and Integrated Gas Recovery Services Inc. (IGRS) will take landfill gas from the Walker Environmental disposal facility in Niagara Falls, process it and transport it through a dedicated pipeline to GM's plant in St. Catharines. Landfill gas will be used to generate electricity and reduce natural gas consumption, making the plant one of GM's lowest GHG emission facilities globally. The project will allow GM to reduce both their base-load electrical demand and simultaneously their fossil-fuel based emissions by 5,500 tCO_2e per year. **[7]**
- **City of Hamilton:** The City constructed and is operating a 3.2 MW (megawatt) Landfill Gas to

Option Number and Name: RD 4 - Optimize Utilization of Landfill Gas

Energy (LFGTE) Facility at the Glanbrook Landfill site. The $10.3 million LFGTE Facility has been operating since November 2008 with more than 95% availability. The rate the City is receiving is either 11 cents per KWHr, or 14 cents per KWHr depending on the time of day. The Glanbrook LFGTE Facility had aggressive operational objectives and a projected payback of 4-5 years. **[8]**

- **Eastern Ontario Waste Handling Facility, Moose Creek**: Beginning in December 2012, Integrated Gas Recovery Services Inc. (IGRS) concluded the construction of a wellfield and buried HDPE pipe network which now conveys LFG from one hundred and eight (108) vertical wells to an onsite LFG to energy facility. The LFG is filtered and then combusted in four combustion engines. The electricity generation supplies the local distribution system owned by Hydro One Networks Inc. IGRS reported that approximately 24,500,000 (standard) m^3 of LFG was collected in 2016. Prior to the construction of the energy facility the majority of this LFG was flared.

Considerations:

Contracts/Agreements

- Methane production rates from LFG will be decreased by the increase of organic diversion from landfills. The economics of LFG to energy projects are typically based on a projected minimum daily rate of gas. The current LFG production forecast, projected out 20 years, may sustain 2 more LFG gensets.
- The price of electricity in the current agreement with OHESI may not be sustained in a new agreement. More recent FIT agreements were for 20 years at a fixed price of 18 cents per kwh and capital payback at 6-8 years.

Renewable Natural Gas (RNG)

- An alternative use for LFG is as RNG. The conversion of methane from landfills to electricity or natural gas is a proven technology. Companies with landfill operations have been increasingly switching from generating electricity to developing pipeline quality gas, specifically as a direct substitute or offsetting the use of natural gas or electricity at industrial facilities (e.g. automotive, pulp and paper and cement manufacturers). Today, landfill operators are moving towards supplying pipelines with RNG as pipeline companies are seeking to receive as much RNG as possible (ONEIA). **[6]**
- In this case, the LFG would require further cleaning treatment to produce a higher quality gas free from contaminants. This RNG would be injected into the natural gas pipelines under operation by a gas utility company(ies). The high quality RNG would be purchased by the utilities companies. The RNG cleaning can be provided as a paid service by the utility as an option, or the Region could purchase and operate its own LFG cleaning process equipment. The Region would have to build a connection pipeline to the nearest utility pipeline at their own cost.
- Provided there is adequate forecast LFG production, surplus to the demand of the Gas Utilization System (GUS), then a feasibility study is justified to look at the revenues and return on investment to install and operate a conditioning and connection facility to the nearest acceptable natural gas line.

Combined Heat and Power (CHP)

- Use of the LFG can be directly used on site at the landfill to produce low pressure steam energy for heating buildings and or water.
- Future considerations may include heat recovery for a local thermal host. Potential thermal hosts are: a future greenhouse building heating for any buildings close by, and process heat if any sewage treatment or other future processing (biosolids/sludge drying, Anaerobic Digestion of organics) will be near the area.

Option Number and Name: RD 4 - Optimize Utilization of Landfill Gas

- Note that a greenhouse could also use the heat recovery and CO_2 from the LFG and offset additional GHG from the site. A greenhouse could also be a consumer of compost produced at the site, thus supporting a Circular Economy practice. The greenhouse could produce pollinator plants for use at the site, buffer land areas or at other Regional parks and landscaping areas.
- The current GUS does not appear to capture the heat produced by the two engines. This heat could be captured and used to heat local buildings or supply a nearby industrial facility.
- If there is surplus LFG, then an option may be to install a small LFG fueled CHP plant that would supply heat for the uses listed above and use the electricity to reduce the peak site load and consumption from the grid.

Funding and Partnerships

- The Government of Canada's $2 billion Low Carbon Economy Fund is a part of the Pan-Canadian Framework on Clean Growth and Climate Change. The Low Carbon Economy Fund will be available for the Low Carbon Economy Challenge. The Low Carbon Economy Challenge launched in the fall of 2017 supports ambitious projects that can be submitted by all provinces and territories, as well as municipalities, Indigenous governments and organizations, businesses and both not-for-profit and for-profit organizations. Funded projects will leverage Canadian ingenuity across the country to reduce emissions and generate clean growth in support of the Pan-Canadian Framework on Clean Growth and Climate Change. **[10]**
- Coordination with Halton Region Community Energy Plans (CEP): In 2013 the Ministry of Energy launched the Municipal Energy Plan program, funding municipalities to develop Community Energy Plans (CEP). These plans are to assist communities conserve energy, reduce carbon footprint, develop a sustainable and secure supply of energy, and improve energy resilience. These type of initial Plans generally cost about $100,000 to $300,000 to develop. This is done at the municipal level rather than the Regional level. For Halton Region, the development of these plans is as follows:
    - Burlington – Comprehensive Plan completed in 2014 and under review.
    - Halton Hills – Comprehensive Plan completed in 2015.
    - Oakville – Plan development work started in 2017.
    - Milton – No separate CEP in place, but they have related environmental, conservation and demand management plans.

    None of these plans appear to address the Halton Region Waste Management site or the utilization of the landfill gas at that site. This is an avenue for potential energy partnership projects between the Region and its municipalities.

    - Due to the changing policy, regulatory and technology development in the field of renewable energy, the Region should conduct a feasibility study prior to the end of the contract with OHESI to determine if the contract should be renewed, enter into a new agreement with another electricity generator, or find an alternative use for the landfill gas.

References:

1. *Excerpt from https://www.oecorp.ca/oec-management-team/*
2. *Excerpt from Halton Region contract agreement with Comcor for operation and maintenance of LFG utilization.*
3. *Excerpt from Halton Region contract agreement with OHESI for LFG electricity generation.*
4. *Ontario Ministry of Environment and Climate Change,* ECA No. 8511-6YNKN5
5. *Excerpt from https://www.oakville.ca/townhall/nr-07july11.html*

6. *Excerpt from ONEIA response to MOECC proposed LFG offset protocol, June 18, 2017: http://www.oneia.ca/resources/Pictures/ONEIA Response To LFG Offsets.pdf*
7. *Excerpt from https://swana.org/Portals/0/Awards/2009Noms/LFGU-Gold.pdf*
8. *Walkers Industries: http://www.walkerind.com/walker-environmental-and-igrs-partner-with-large-industrial-emitters-to-reduce-greenhouse-gases/*
9. *The Green Ontario Fund: a not-for-profit provincial agency that invests proceeds from Ontario's carbon market into climate actions that help people and businesses reduce greenhouse gas emissions and use cleaner technology to power their homes and workplaces. https://www.greenon.ca*
10. *Low Carbon Economy Fund, Environment and Climate Change Canada* https://www.canada.ca/en/environment-climate-change/news/2018/02/low-carbon-economy-fund.html

Option Number and Name: RD5 Disposal Bans

Description of Option:

Under the Resource Recovery and Circular Economy Act (RRCEA), a Strategy for a Waste-Free Ontario was released on February 28, 2017. The Strategy serves as a Roadmap to help shift Ontario towards the goals of a circular economy, zero waste and zero greenhouse gas emission from the waste industry. The Strategy proposes the use of disposal bans to encourage diversion of targeted materials, beginning implementing by 2021 and a possible organic ban by 2022.

A Food and Organic Waste Framework was released by the Province in April 2018 which introduces food waste diversion targets for the residential and the ICI sectors, identifies plans to amend the 3R regulations to include food waste across the ICI sector and further explores food waste disposal bans (first proposed in the Strategy).

A disposal ban is different from a curbside ban (e.g., banning of textiles in garbage set out at the curb by the City of Markham) or a mandated source separation program (e.g. City of New York's commercial food waste diversion mandate). Each approach has its own strengths, weaknesses, benefits and challenges. This option considers the use of expanded disposal bans for the Halton Region landfill.

Category(ies) of Option:

Timeline: Medium

Rationale and/or Source of Option: Consulting team observation.

Halton Region Experience:

- Section 4.0, Schedule A of by-law No. 223-92 (Waste Management Facilities) provides the following listing of Unacceptable Waste for landfilling:
    - Hazardous Waste;
    - Household Hazardous Waste;
    - Recyclable materials (e.g., Blue Box materials, drywall, scrap metals);
    - Pathological Waste, including blood, sharps, needles and pharmaceuticals;
    - Drums or barrels unless emptied and flattened;
    - Empty fuel and compressed gas containers;
    - Inert materials usable as fill including soil, brick, concrete and asphalt;
    - Dead animals;
    - Tires; and
    - Any item larger than 2.5 metres in diameter.
- This by-law is currently being revised and additional unacceptable items for landfilling are being proposed including divertable waste (defined as recyclable, compostable and reusable), radioactive waste, Freon containers, animal waste, ashes (unless cold), yard waste, automotive parts, batteries, septic waste or sewage, liquids and, electronics.

Demonstrated Experience:

- **Metro Vancouver, BC:** Metro Vancouver has implemented several other disposal bans including: yard waste and clean wood waste, blue box materials, cardboard, recyclable paper, and mattresses. In 2015, the Metro Vancouver Regional District implemented a food waste and wood waste ban. There were several key strategies used to designing and implementing the organic ban (as well as the wood waste ban). Metro Vancouver staff consulted with affected stakeholders prior to the bans being implemented and phased in enforcement of the ban. The food waste and clean wood disposal bans were introduced within a six month educational period (between January and June). Customers disposing food waste and clean wood above the threshold received an educational notice during this period but starting July 1st inspectors began to issue surcharge notices (to haulers). Metro Vancouver enforces the bans by implementing a 50% surcharge on targeted materials found in the garbage stream above a specified threshold - 5% threshold on beverage containers, other recyclable plastic,

Option Number and Name: RD5 Disposal Bans

glass, and metal containers, corrugated cardboard, recyclable paper, green waste - 10% threshold on clean wood and 25% threshold on food waste. Metro Vancouver also ensured that there was adequate processing capacity and markets available for the banned materials.

- **Metro Vancouver, Nova Scotia and City of Markham:** Several communities have explored textile disposal bans including Metro Vancouver and Nova Scotia. In the case of Metro Vancouver, it is currently exploring a textile disposal ban. In the case of Nova Scotia, in 2015, textiles were identified as a potential addition to the list of materials banned from landfill disposal; however, no action has been taken to date on this initiative by Nova Scotia Environment. In April 2017, the City of Markham became the first municipality in North America to implement a ban on textiles in garbage placed at the curb.
- **United States Food Waste Ban:** In the United States there are currently four states with food waste disposal bans including Vermont, Massachusetts, Connecticut and Rhode Island. Two states are featured here – Vermont and Massachusetts. While most bans primarily target the ICI sector, they vary in terms of the types of food waste generators (i.e., businesses, institutions, households), the minimum amount of organic waste a generator must produce in order to be covered by the ban and the availability/distance to the nearest composting facility.
    - **Vermont:** Businesses and institutions that produce large amounts of food waste (such as supermarkets, college campuses, and restaurants) must comply with Vermont's Universal Recycling Law which imposes a phased in approach to organics diversion and a landfill ban on food scraps. This phased-in approach is intended to create demand for food scrap collection and support development of a collection infrastructure. By July 2017 food waste generators of greater than 18 tons/year (1/3 ton/week) must divert material to any certified composting facility within 20 miles from the establishment's location. By July 2018 all waste haulers must offer food waste collection services to residential and ICI establishments and all food waste will be banned from landfill. The Vermont Food Bank saw food donations increase by 40% after Vermont implemented the ban.
    - **Massachusetts**: In October 2014, the Massachusetts Department of Environmental Protection (MassDEP) established a food waste disposal ban that applies to businesses and institutions disposing of "at least one ton of organic material per week to donate or re-purpose useable food" and requires that any remaining food waste be sent for composting, animal feeding operations, or to anaerobic digestion (Government of Massachusetts, 2016). The ban applies regardless of the targeted business' and institution's proximity to a composting facility. It is estimated that ban impacts about 25% food businesses. Massachusetts had already implemented a voluntary supermarket recycling certification program in the early 1990's so it had decades of experience and information to draw upon from stakeholder groups in designing the organic ban legislation. The legislation places the onus of enforcement on the haulers who are required to track down, inform and correct unacceptable customer behavior or receive noncompliance letters and potential fines.

Considerations:

- Need to ensure that end markets are available before implementing the bans.
- The Province of Ontario has acknowledged the need to examine disposal bans at the provincial level. Halton Region should ensure that any initiative to implement disposal bans on designated materials within its borders complements future provincial initiatives.
- Halton Region only has control at its Regional Landfill to enforce a disposal ban, which will impact mostly its residential sector.
- A disposal ban is different from a curbside ban (e.g. banning of textiles in garbage set out at the curb by the City of Markham) or a mandated source separation program (e.g. City of New York's commercial food waste diversion mandate) in the administration, regulatory requirements, enforcement and participation rate.

References:

1. *Options to Reduce Textiles in the Landfill. November 14, 2017. Halifax Regional Council at https://www.halifax.ca/sites/default/files/documents/city-hall/boards-committees-commissions/171102ESSC1211.pdf*
2. *Scotland plans to ban plastic straws by end of 2019. February 12th, 2018, the Independent at https://www.independent.co.uk/environment/scotland-plastic-straw-ban-pollution-2019-cotton-buds-a8206636.html*
3. *Moving Food Waste Forward -Policy Recommendations for Next Steps in Pennsylvania. September 2017. Prepared by the Harvard Law School Food Law and Policy Clinic*
4. *Vermont's Universal Recycling Law Status Report. December 2016. Vermont Department of Conservation*
5. *A Growing List of Food Waste Bans Across America. December 9, 2016. At http://blog.spoileralert.com/food-waste-bans*
6. *Assessing Organics Processing Capacity In Massachusetts. October 2014. Biocycle*
7. *2015 Disposal Ban Inspection Program Update, April 14, 2016 Greater Vancouver Regional District Zero Waste Committee.*
8. *Creating A Single-Use Item Reduction Strategy – Consultation Paper. September 2017. City of Vancouver*

Appendix B

Medium/Long Term Options Evaluation and Criteria Overview Memo

Memo

To: Waste Management Services, Halton Region

From: Betsy Varghese, Dillon Consulting Limited

Lori Andrews, Dillon Consulting Limited

Date: April 30, 2021

Subject: Option Evaluation and Criteria Overview

Our File: 17-5605

In 2018, Dillon prepared an Options Evaluation and Criteria Overview memo that was included in Appendix D of the Short Term Solid Waste Management Strategy (Short Term SWMS). The memo documented the approach to the evaluation including alignment of criteria with guiding principles and the development of objectives-based evaluation criteria and the evaluation tool. The memo also included the results of the evaluation of potential short term options to include in the Short Term SWMS. The following provides a brief overview on how the evaluation approach was developed, what the evaluation approach is and the results of the evaluation of potential medium and long term options to include in the Medium and Long Term SWMS.

Approach to Evaluation

The evaluation approach involves evaluation questions, criteria, indicators and relative weightings. The approach was first drafted by Dillon and presented to Regional staff in September 2017 in a workshop. At this workshop, the SWMS Vision and Guiding Principles were reviewed, each Guiding Principle was aligned with one or more of the three main evaluation criteria groups (Environment, Social, Financial) and rationale on the key evaluation questions to be asked (and answered) was brought forward. The evaluation approach was refined and then presented to three stakeholder committees in mid-September 2017 for their input (Older Adults Advisory Committee, Joint Regional/Municipal Waste Management Advisory Committee, Halton Waste Management Site Advisory Committee). The evaluation approach was further refined. In November 2017, Dillon held a workshop with Regional staff to get input on the relative weightings to apply to each of the 17 criteria and overall weightings to apply to the triple bottom line categories in the event of a tie between comparative options and finalized with the Region.

Objectives-Based Evaluation Questions

The evaluation used an objectives-based approach as opposed to a comparative analysis given that many of the proposed options would not be compared to each other and that the evaluation would need to be conducted to confirm the option is suitable for the Region. That said, the proposed evaluation approach still can accommodate a comparative analysis for options that could be compared to each other. The objectives-based approach involved asking the necessary questions to conduct a

triple bottom line evaluation (Environmental, Social and Financial) and then allocating a score based on how the question is answered.

A customized evaluation tool was developed for this task. The tool produced numerical score results based on the relative weightings and ranking applied for each criterion for each option. The evaluation approach has remained consistent for all options (short, medium and long term) and this memo includes the findings from the evaluation of medium/long term options. More comprehensive details regarding the evaluation approach can be found in the 2018 Short Term SWMS provided in Appendix D – Options Evaluation and Criteria Overview Memo.

Dillon established an evaluation tool template designed to generate an overall score for each option. The tool is set up to evaluate each option under the three triple bottom line evaluation categories. Each category has evaluation questions and associated criteria (eight criteria for environmental, six for social and three for financial). Each evaluation question has the following considerations: Criteria, Rank (score of either 1 to 3 or 1 to 4, depending on the question, with 1 being the most favourable and high scores being least favourable), Weight (%), Key Performance Indicator, Score and Rationale. Options were evaluated based on how it was defined in the Major Assumptions section of the option evaluation sheets. Initially, when the option overviews were completed, it contained broader information as to what the Region could consider. Through best practice research/case studies, review of considerations for each option overview and discussion/review with Region staff, each option was further defined for the purpose of evaluation and inclusion in the SWMS. Evaluators confirmed the major assumptions associated with implementing the proposed option, assigned a score and provided an explanation or rationale for the score. All scores for each option are linked to a summary results sheet. Results in the summary sheet cannot be edited by evaluators in order to prevent errors. Entries can only be edited in the individual options.

The final questions used in the evaluation of options, the associated criteria, weighting and how the criteria will be evaluated (Key Performance Indicators – either qualitative or quantitative) are provided in Table 1.

Table 1: Final Questions Used in Evaluation of Options

Evaluation Question	Criteria	Weighting	KPI
Environmental		100	
Will it minimize the amount of waste to be disposed?	o waste reduced/diverted	50	kg/cap disposed, % diverted
		35 (Overall)	
	o air quality impact	10	qualitative
	o land requirements	30	m^2

Evaluation Question	Criteria	Weighting	KPI
What will the impact be on the environment?	o water/wastewater requirements	5	qualitative
	o impact to ground/surface water	30	qualitative
	o nuisance impacts	15	qualitative
	o climate change impacts	10	kg CO_2 eq
How much energy is required?	o energy	35	qualitative
Social		100	
Is it an established practice?	o proven/not proven	15	qualitative
Is there a risk to community and/or public safety?	o community and safety	20	qualitative
How easy is it to participate in or access?	o accessibility and convenience	20	qualitative
Does it benefit everyone?	o equity	15	qualitative
Will the community be accepting of it?	o perception	20	qualitative
Does it allow us to work/partner with others?	o collaboration	10	qualitative
Financial		100	
How much will it save/cost the Region?	o capital costs and operating costs	35	$
How much will it save/cost the taxpayers?	o cost per household	35	$/household
What are the risks?	o risk	30	qualitative

Medium/Long Term Options Evaluation Results

The 28 medium/long term options that were evaluated under the five (5) categories as part of the Medium/Long Term SWMS include:

Waste Diversion and Policy (WDP)

- WDP 4 - Support the Circular Economy
- WDP 6 - Support the Sharing Economy
- WDP 7 - Alternatives to Bylaw Enforcement
- WDP 8 - Support IC&I Sector
- WDP 11 - Enhanced Contractor Collection Services
- WDP 12 - Review Event Diversion Program
- WDP 13 - Pay As You Throw
- WDP 14 - Promotion & Education for Diversion
- WDP 15 - Multi-Residential Waste Management Improvements

Collection (C)

- C 4 - Enhance Opportunities for Reuse/Recycling of Construction & Demolition Waste
- C 5 - Bulk Waste Diversion
- C 6 - Automated Collection
- C 7 - "Smart City" Technology
- C 10 - Expand Existing Collection Services
- C 11 - Track Waste Containers in Multi-Residential Buildings
- C 13 - Extend Curbside Yard Waste Collection
- C 14 - Review Current Non-Residential Customer Base
- C 15 - Fuel Options for Waste Management Vehicles

Drop-off and Transfer (DT)

- DT 6 - Additional Waste Depot Option(s) for Residents
- DT 7 - Optimize Use of the Halton Waste Management Site (HWMS)
- DT 8 - Transfer Station for Curbside Collection Trucks

Processing (P)

- P 1 - Service Delivery Approaches
- P 2 - Alternative Technologies for Organic Waste

Residual Processing and Disposal (RD)

- RD 1 (Phase 2) - Optimize Landfill Operations

- RD 2 - Alternative Technologies for Residual Waste
- RD 3 - Extend Landfill Capacity
- RD 4 - Optimize Utilization of Landfill Gas
- RD 5 - Disposal Bans

Description of Medium and Long Term Options Evaluated

After research was conducted on different ways an option could be developed (documented in the Option Overview sheets), the consulting team narrowed down each option to be specific for implementation at the Region for the purposes of evaluation and costing. In the Identification of Options to Address Needs, Goals and Objectives Memo (July 15, 2020), broad descriptions of each medium and long term option considered were provided. The following provides the focused description of each option evaluated for the Medium and Long Term SWMS under each of the five categories. More detail on the specific option evaluation is provided in the individual option evaluation sheets (see Attachment A) under Major Assumptions.

Waste Diversion and Policy (WDP)

WDP 4 Support the Circular Economy

This option looks at providing support for local innovators and/or organizations that design for the environment and /or reduce reuse and reclaim waste. The option evaluation was based on continuing and expanding the Region's Waste Diversion Fund (funding given to non-profit organizations to divert materials that would otherwise be disposed) and developing a long term (10 year) Waste Reduction, Repair and Reuse strategy. This strategy will help the Region build partnerships with local organizations, support widespread public engagement in the Region's waste diversion activities and bring positive economic and environmental benefits.

WDP 6 Support the Sharing Economy

Sharing resource hubs are rapidly increasing in popularity, growing in number and location. Whether it's repeated trading on a website, app, or an actual physical 'library' where residents can borrow an item (e.g. tools, sporting gear, and toys), these centres and online platforms often require no currency, and allow for the reduction in the amount of manufactured items.

The governments, businesses and non-profit organizations initiating these sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving energy and resources (required to manufacture virgin materials), and providing options to extend the use of an item amongst multiple users.

This option looks at the Region promoting sharing through supporting, partnering with and/or partially funding organizations involved in this area.

The Region could support sharing initiatives as follows:

- Identify safe trading zones at municipal facilities;
- Facilitate setting up lending areas, sewing and tool centres, repair cafes in multi-residential buildings and community centres;
- Promote existing sharing options in Halton; and,
- Provide funding through the Waste Diversion Fund.

WDP 7 Alternatives to By-law Enforcement

This option explores the different methods that can be employed to encourage compliance with the Region's waste by-laws. The option evaluation was based on the Region conducting a set out outreach program targeting households that did not set out Green Carts, had contaminates in Blue Boxes or large garbage set outs. The program will involve hiring part-time staff to monitor set outs and canvass households for four months during the spring/summer.

WDP 8 Provide Waste Diversion Promotion and Education to the IC&I Sector

This option looks at how the Region can be involved in providing technical, training and educational support to small, medium and larger IC&I establishments. The option evaluation was based on the Region developing and implementing a waste diversion campaign, targeting both BIA establishments and small and medium-sized businesses in the Region. The Region will develop a dedicated webpage with case studies, promotional materials, signage and handbooks. Staff to provide technical assistance to businesses wanting to implement or improve waste diversion programs. This option also supports initiatives discussed in option WDP 4.

WDP 11 Enhanced Contractor Collection Services

This option looks at expanding service levels in collection contracts for multi-residential and non-residential customers to provide better compliance and data collection (e.g., enforcement, tracking/issuing notices, promotion and education and weighing lifts). The option evaluation was based on contractors conducting compliance 'blitzes' to increase proper set outs through notices and promotion and education (P&E). The blitzes will occur over two consecutive collection weeks in both the spring and fall to select single-family households and multi-residential buildings. The blitzes to single-family houses and multi-residential buildings will not be concurrent; therefore, the Region will perform four total blitzes over eight weeks.

WDP 12 Review Event Diversion Program

This option looks at enhancing the existing community event diversion program. The option evaluation was based on recruiting high school students looking to obtain the required 40 hours of community service as volunteers to promote diversion at local events. Volunteers will assist local event staff with

setting up waste stations, visually monitoring contamination levels, and educating event goers at the waste bins.

WDP 13 Pay As You Throw (option title changed to "Decrease Garbage Bag Limits" in SWMS)

This option looks at implementing partial PAYT programs through the use of bag limits and bag tag fees. The option evaluation was based on Halton transitioning from their current three bag PAYT program to a full PAYT program using a phased in approach for the single-family sector. The first phase will see single-family households starting with a two bag PAYT program introduced in year three, phase two will be a one bag PAYT program in year six before moving to a full PAYT in year nine. It is estimated that a 10% increase in Green Cart capture rate resulting from a more stringent PAYT program which will result in a 2% increase in Halton's diversion rate.

WDP 14 Promotion and Education for Diversion

This option looks at developing a promotion and education program for residential diversion. The option evaluation was based on hiring a company to develop a social media campaign that provides weekly tips, information, messaging and feedback. Also, the Region will attend pop-up events at local events and coordinate pop-up events in high traffic areas to provide packages of information (e.g., fridge magnets, brochures, kitchen catchers, compostable bags, etc.) and interact with the residents. The planning, preparation and attendance of the pop-up events will be coordinated through two co-op students, working full time and year-round.

WDP 15 Multi-Residential Waste Management Improvements

This option looks at the waste diversion performance of the multi-residential sector after the implementation of the Green Cart program in all multi-residential buildings. The option evaluation was based on developing an outreach team for multi-residential buildings, developing an enhanced multi-residential building Toolkit, maintaining a multi-residential building database for performance monitoring and waste audits for measurement. Outreach will be carried out continually to address the large turnover of multi-residential tenants, targeting approximately 100 buildings annually (which represents approximately 20% of existing multi-residential buildings in the Region).

Collection (C)

C 4 Enhance Opportunities for Reuse/Recycling of Construction & Demolition Waste

This option considers potential reuse and recycling opportunities to increase the recycling of shingles that are currently being landfilled. The option evaluation was based on shingles recycling being the most viable option. Source-separated shingles would be collected in a new bunker at the HWMS, where a contractor will collect, transport and process off-site. Staff will monitor the tonnages and results of the program, update P&E materials and maintain the shingles pile.

C 5 Bulk Waste Diversion

This option looks at ways to modify existing bulk waste items collection to enhance the reuse and recycling of those materials. The option evaluation was based on the Region providing funding for a social enterprise to collect mattresses from the HWMS, haul and recycle them at a remote site managed by the enterprise. The collection will accept and recover used mattresses collected via the bulky waste collection and mattresses dropped off directly at the HWMS.

C 6 Automated Collection

This option looks at the costing considerations and experiences of multiple jurisdictions that have converted to automated cart collection for waste and recycling services. The option evaluation looked at using fully automated collection for the single-family curbside collection services with the Region purchasing 365 L carts for residual waste and blue box materials, vehicles using diesel fuel and ongoing annual repair and replacement costs for carts at 5% of the total initial capital costs.

C 7 "Smart City" Technology

This option looks at researching possible designs and technologies to determine the feasibility of implementation and how to foster the development of Smart City design to support multi-residential waste diversion in the Region. The option evaluation was based on all newly constructed buildings being constructed with 3-chute systems. Smart cards will track the amount of waste generated by each tenant, allowing for a weight-based charging system to be implemented. The data collected will help staff monitor the amount, type of waste and frequency with which the residents use the chute system and can use the information to focus P&E campaigns.

C 10 Expand Existing Collection Services

This option looks at reviewing and assessing if there are other curbside collection programs that the Region could provide (e.g., textile recycling, batteries, small household metals). The option evaluation was based on initially adding textile collection to the contractor's collection contract, which will require one additional vehicle per route. This service will initially be offered once per month to single-family homes in urban areas as a pilot program. Potential future materials to be collected curbside includes: battery collection, electronic waste, carpet and mattresses.

C 11 Track Waste Containers in Multi-Residential Buildings

This option focuses on multi-residential approaches that include tracking the number and weight of lifts for a potential future user pay system (discussed in option WDP 13) or to support waste diversion performance monitoring for multi-residential building locations (presented in option C9). The option evaluation was based on the Region using the existing Radio-frequency identification (RFID) tags on all multi-residential carts for organics and recycling and front end bins for garbage and recycling in the Region to collect and analyze data. Tracking multi-residential containers will help target and monitor low

performing buildings, which will need support when the Blue Box program transitions to extended producer responsibility (EPR).

C 13 Extend Curbside Yard Waste Collection

This option looks at extending yard waste collection all year. The option evaluation was based on keeping bi-weekly yard waste collection during the peak season (April through November) and adding one collection day per month during the off-peak season (December - March). The Region will also explore the option of allowing residents to top up their Green Cart with yard waste during off-peak season (and remove off-peak collection), which would require discussions with the processor(s) regarding the increase in incoming yard waste.

C 14 Review Current Non-Residential Customer Base

This option looks at other programs and policies associated with providing collection services to non-residential customers to help the Region address the non-residential customer base, especially those that were grandfathered in from previous local municipality agreements. The option evaluation was based on conducting a study to identify municipal collection best practices, fee structure, by-law best practices, amended guidelines for collection and impact to current and future collection contracts for the IC&I sector. Based on the study results, the by-law and waste collection guidelines for new non-residential customers will be updated IC&I customers receiving Regional collection would have 3-stream collection and there would be no option to opt out of recycling and/or Green Cart service. All 900 current customers would receive new Green Carts and keep their black and blue wheeled carts.

C 15 Fuel Options for Waste Management Vehicles

This option looks at reviewing and assessing requirement considerations for the use of alternative fuels (e.g., Compressed Natural Gas (CNG), electric, etc.) for waste collection vehicles and onsite equipment. The option evaluation was based on the Region promoting the use of alternative fuels for proposed fleets for waste collection vehicles.

Drop-off and Transfer (DT)

DT 6 Additional Waste Depot Option(s) for Residents

This option looks at providing additional waste depot options for residents. The evaluation was based on providing two additional depots to service the southern and east parts of the Region to improve service levels in Burlington and Oakville. Operating costs, hauling, contracts and staffing assumptions are based on Halton's experience with the existing HWMS. The services include public drop-off for recyclables and garbage, a Household Hazardous Waste (HHW) drop-off area, a re-use facility, a drop-off area for brick and rubble, leaf and yard waste, a Blue Box and Green Cart distribution area and a transfer station.

DT 7 Optimize Use of HWMS

This option explores opportunities to optimize the use of the available and unused lands within the HWMS or on adjacent owned areas surrounding the HWMS. The option evaluation was based on constructing a prefabricated building for use as an onsite education centre, placing solar panels on the south buffer lands, west berm and on the roof of the Administration Building and constructing a new and combined HHW and Reuse Depot.

DT 8 Transfer Station for Curbside Collection Trucks

This option looks at either having all curbside collection trucks deposit Blue Box and Green Cart material at an expanded Transfer Station located at the HWMS or using a mix of public and private transfer station capacity. The option evaluation was based on constructing a new Transfer Station at the HWMS site along the southeast area. The new facility will be capable of handling a combined quantity of 120,300 tonnes per year of Blue Box and Green Cart material, which will require a building with a footprint of about 2,400 m^2.

Processing (P)

P 1 Service Delivery Approaches

This option looks at service delivery approaches for Green Cart organics, Leaf and Yard Waste (LYW) and recycling and the use of private sector transfer stations. After reviewing the existing contracts and confirming that most appear to be competitive, no changes proposed. The option evaluation proposed combining the collection of the Green Cart organics with LYW into one contract. Combining the collection of LYW and Green Cart waste can save on collection costs but may not save processing costs since source-separated LYW is significantly cheaper to process. This option relates to Option P2 - Alternative Technologies for Organic Waste and whether the Region decides to establish its own processing facility in the future.

P 2 Alternative Technologies for Organic Waste

This option considered feasible approaches to divert organic waste (Green Cart and LYW) through organic waste processing technologies. The option evaluation was based on an Anaerobic Digestion facility with energy recovery to process materials currently included in the Green Cart, located within the Region (siting costs and a specific location are not known). The facility capacity is assumed to accept a similar feedstock as today (i.e., no pet waste, diapers, sanitary products) with the exception of considering LYW (see P 1) and is expected to accommodate 58,000 tonnes per year (tpy) by 2033 and 96,000 tpy by 2048.

Residual Processing and Disposal (RD)

RD 1 (Phase 2) Optimize Landfill Operations

This option looks at different ways to optimize the HWMS landfill operations and was broken into two phases for the short term SWMS and the medium and long term SWMS. The option evaluation was based on a third party conducting a feasibility study that will review best practices and proven approaches in optimization techniques and procedures for landfills of similar size and condition and recommend landfill optimization operations for the Region, including costs and an implementation plan.

RD 2 Alternative Technologies for Residual Waste

This option looks at the feasibility of alternative technologies to recover energy, generate electricity and reduce residual waste sent to landfill. Different technologies were considered and the option evaluation focused on the best option for the Region which was a mixed-waste processing facility that could recover organic waste for anaerobic digestion, separate out recyclables where markets exist and produce a refuse-derived fuel (RDF). The location of the future facility was assumed to be within the Region and potentially could be located at the HWMS. The residual waste stream is currently approximately 70,000 tonnes per year (tpy), and it is projected to reach nearly 170,000 tpy by 2048.

It is assumed that a third party will conduct a cost benefit assessment of different technologies in the medium term, to confirm this approach based on existing conditions, advances in technologies and any new regulations. It is noted that the Region will exhaust all measures to maximize the HWMS landfill capacity and optimize efficiencies before considering the development of an alternative technology facility.

RD 3 Extend Landfill Capacity

This option considers extending the HWMS landfill capacity by expanding the landfill site and the associated technical design requirements, approvals and costs. The option evaluation was based on horizontal expansion into the southwest land, the completion of an Environmental Assessment (EA) which can take up to 10 years considering all the environmental studies, stakeholder and public consultations. The need for expansion will be revisited annually as new diversion programs are implemented.

RD 4 Optimize Utilization of Landfill Gas

This option looks at making modifications/enhancements to the utilization of Landfill Gas (LFG) at the HWMS. The option evaluation was based on the Region conducting a review of the existing contract agreement to provide recommendations to the Region going forward in considering renewal of the LFG-to-electricity utilization contract agreement. A cost-benefit analysis will be carried out by a third party to evaluate alternative LFG utilization options, contractual options, long term impacts and potential returns on investment. The review will be completed at least 5-6 years before the contract end date and will

consider available funding mechanisms and other options for LFG use, such as providing heat or power to the HWMS.

RD 5 Disposal Bans

This option considers the use of expanded disposal bans for the HWMS landfill. The option evaluation was based on an organics ban at the landfill in line with future provincial regulations and eventually over time adding new materials such as textiles and designated bulky waste (as EPR programs for these materials are implemented). Enforcement staff will be required, to monitor resident's set outs, which will be needed for the first three years of the ban. Ongoing communications about the ban will also be required and will be coordinated with other promotion and education efforts outlined in WDP 7, 8, 14 and 15.

Medium/Long Term Options Evaluation Results

The weighted scores in the Environmental, Social and Financial categories for each of the medium and long term options are shown in Figure 1, Figure 2 and Figure 3, respectively.

The final score results are presented graphically in Figure 4. The full evaluation results for each medium and long term option are provided in Attachment A. As previously mentioned, low scores are most favourable and high scores are least favourable.

Figure 1: Weighted Score for Environmental Medium and Long Term Options

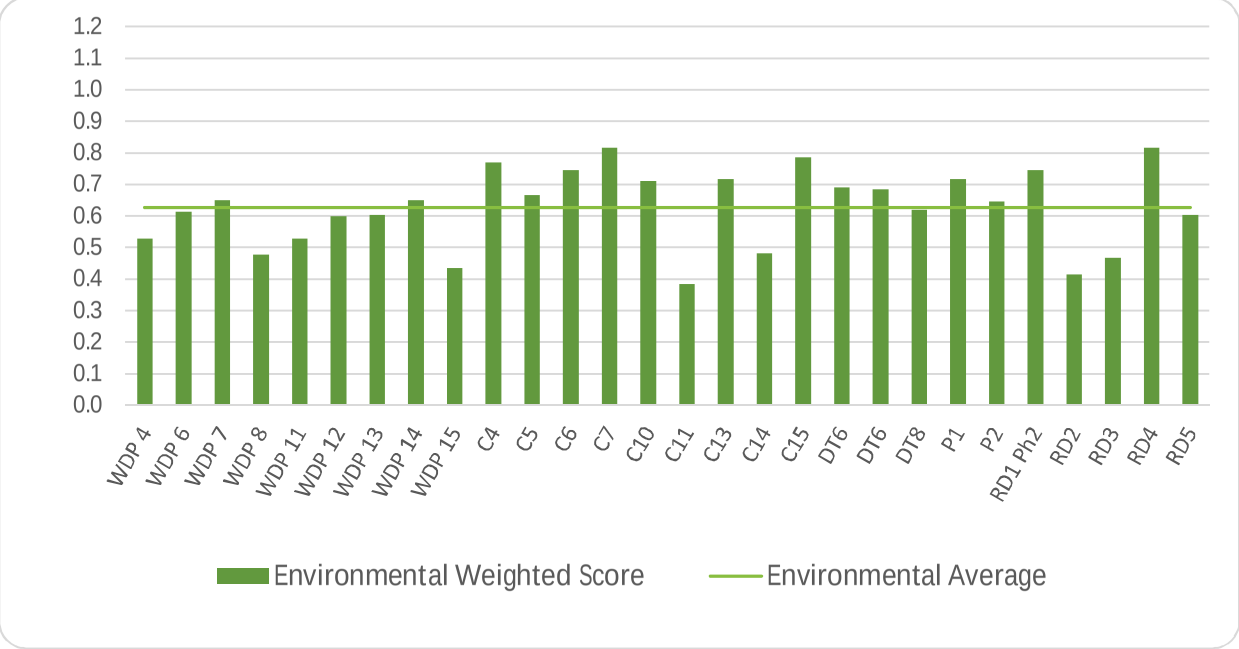

Figure 2: Weighted Score for Social Medium and Long Term Options

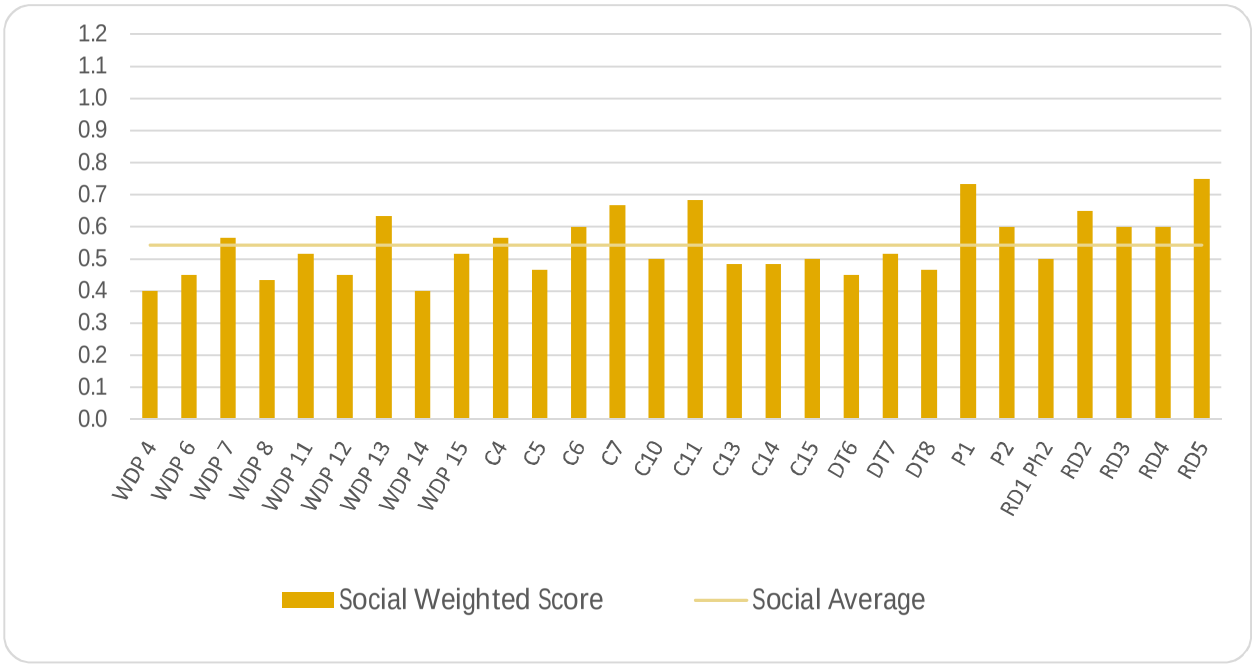

Figure 3: Weighted Score for Financial Medium and Long Term Options

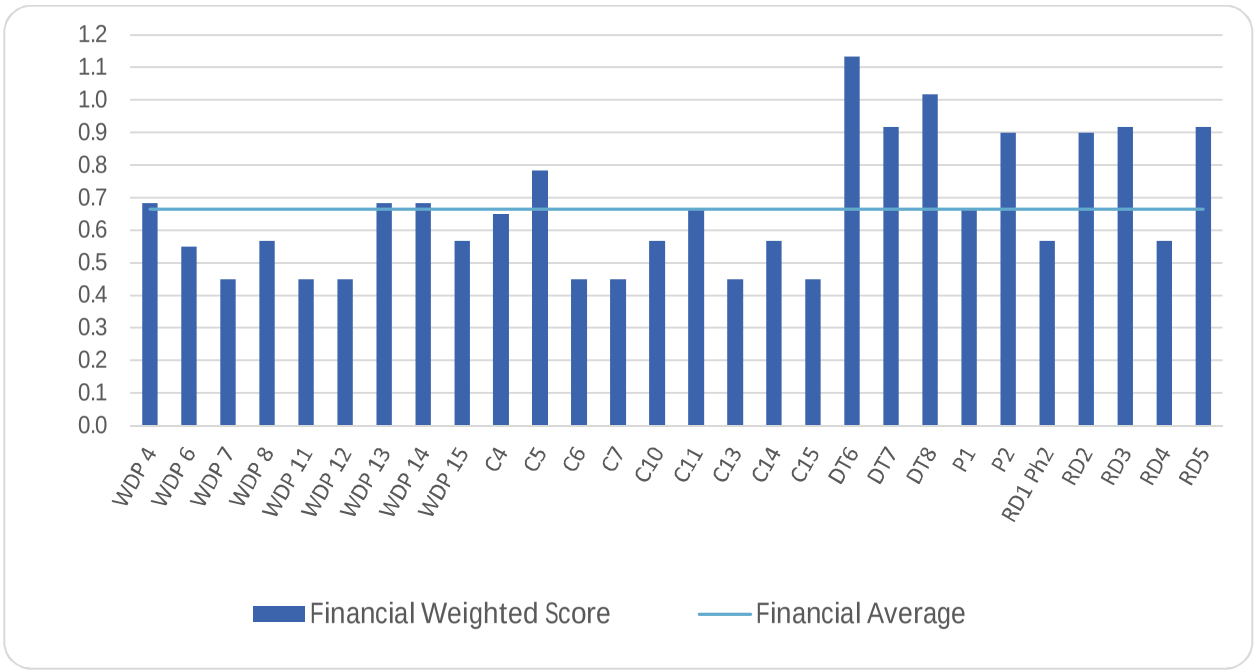

Figure 4 and Table 2 show the overall weighted score for all medium and long term options. The total score is the sum of the individual environmental, social and financial criteria scores with each category weighted equally (i.e., 33.3%).

Figure 4: Total Weighted Score for all Medium and Long Term Options

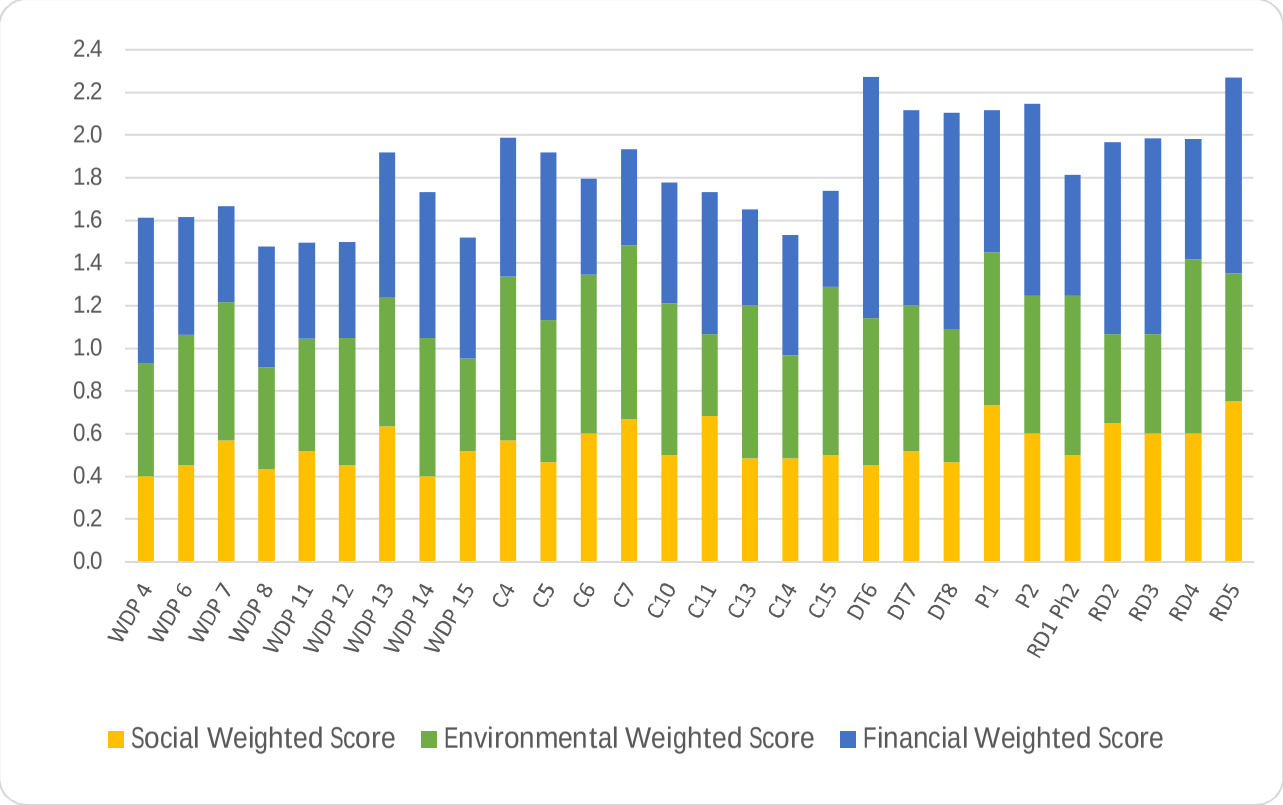

Table 2: Weighted Scores for all Categories

Option	Environmental Weighted Score	Social Weighted Score	Financial Weighted Score	Total Weighted Score
WDP 4	0.53	0.40	0.68	1.61
WDP 6	0.61	0.45	0.55	1.61
WDP 7	0.65	0.57	0.45	1.67
WDP 8	0.48	0.43	0.57	1.48
WDP 11	0.53	0.52	0.45	1.50
WDP 12	0.60	0.45	0.45	1.50
WDP 13	0.60	0.63	0.68	1.92
WDP 14	0.65	0.40	0.68	1.73
WDP 15	0.44	0.52	0.57	1.52

Option	Environmental Weighted Score	Social Weighted Score	Financial Weighted Score	Total Weighted Score
C4	0.77	0.57	0.65	1.99
C5	0.67	0.47	0.78	1.92
C6	0.75	0.60	0.45	1.80
C7	0.82	0.67	0.45	1.93
C10	0.71	0.50	0.57	1.78
C11	0.38	0.68	0.67	1.73
C13	0.72	0.48	0.45	1.65
C14	0.48	0.48	0.57	1.53
C15	0.79	0.50	0.45	1.74
DT6	0.69	0.45	1.13	2.27
DT7	0.68	0.52	0.92	2.12
DT8	0.62	0.47	1.02	2.10
P1	0.72	0.73	0.67	2.12
P2	0.65	0.60	0.90	2.15
RD1 Ph2	0.75	0.50	0.57	1.81
RD2	0.42	0.65	0.90	1.97
RD3	0.47	0.60	0.92	1.98
RD4	0.82	0.60	0.57	1.98
RD5	0.60	0.75	0.92	2.27

Attachment A – Evaluation Tool Template

Group	Question	Indicators	Rank	Guiding Principles	KPI
Environme	Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap TBD)	1. Protect our environment. 2. Provide an equitable, accessible and fair waste management system to our customers. 5. Engage and educate our community to reduce waste disposed. 6. Optimize our assets and operations. 7. Collaborate with external partners to achieve commongoals. 8. Provide efficient services and ensure fiscal sustainability.	kg/cap waste disposed % waste diverted
			2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap TBD)		
			3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap TBD)		
	What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	1. Protect our environment. 6. Optimize our assets and operations.	Qualitative discussion
			2. Some release of emissions to atmosphere		
			3. Significant release of emissions to atmosphere		
		Land Requirements	1. Optimize existing asset	1. Protect our environment. 6. Optimize our assets and operations.	Estimate of land required (m^2)
			2. Use of existing site/building and/or potential to make land available.		
			3. Minimal to no additional land required.		
			4. Additional land required.		
		Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1. Protect our environment. 6. Optimize our assets and operations.	
			2. Some potential to impact Region's water/wastewater systems		
			3. High potential to impact Region's water/wastewater systems		
		Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminates to groundwater and/or surface water	1. Protect our environment. 6. Optimize our assets and operations.	Qualitative discussion
			2. Some potential to contaminate groundwater and/or surface water		
			3. High potential to contaminate groundwater and/or surface water		
		Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	1. Protect our environment. 3. Continue to provide unparalleled customer service. 6. Optimize our assets and operations.	Qualitative discussion
			2. Minimal to no change to nuisances		
			3. Will increase nuisance impacts		
		Climate Change Impacts	1. Anticipated reduction in GHG emissions	1. Protect our environment. 6. Optimize our assets and operations.	$kgCO_{2eq}$
			2. Anticipated there will be no change in GHG emissions		
			3. Anticipated increase in GHG emissions		
			1. Will lead to a net gain of energy production	1. Protect our environment.	

	How much energy is required?	Energy	2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	4. Be responsive to change, creativity and innovation 5. Engage and educate our community to reduce waste disposed. 6. Optimize our assets and operations. 7. Collaborate with external partners to achieve commongoals.	Qualitative discussion
Group	Question	Indicators	Rank	Guiding Principles	KPI
Soc	Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	1. Protect our environment. 2. Provide an equitable, accessible and fair waste management system to our customers. 3. Continue to provide unparalleled customer service. 4. Be responsive to change, creativity and innovation. 5. Engage and educate our community to reduce waste disposed. 6. Optimize our assets and operations. 7. Collaborate with external partners to achieve commongoals. 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion
	Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	1. Protect our environment. 2. Provide an equitable, accessible and fair waste management system to our customers. 3. Continue to provide unparalleled customer service.	Qualitative discussion
	How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	1. Protect our environment. 2. Provide an equitable, accessible and fair waste management system to our customers. 3. Continue to provide unparalleled customer service. 6. Optimize our assets and operations 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion
	Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	2. Provide an equitable, accessible and fair waste management system to our customers. 4. Be responsive to change, creativity and innovation. 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion
	Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	1. Protect our environment. 2. Provide an equitable, accessible and fair waste management system to our customers. 3. Continue to provide unparalleled customer service. 4. Be responsive to change, creativity and innovation. 6. Optimize our assets and operations. 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion

	Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	4. Be responsive to change, creativity and innovation. 5. Engage and educate our community to reduce waste disposed. 7. Collaborate with external partners to achieve commongoals. 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion
Group	Question	Indicators	Rank	Guiding Principles	KPI
Financial	How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually 4. $500,000 or greater capital cost or $500,000 or greater annually	4. Be responsive to change, creativity and innovation. 6. Optimize our assets and operations 7. Collaborate with external partners to achieve commongoals. 8. Provide efficient services and ensure fiscal sustainability.	$
	How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	2. Provide an equitable, accessible and fair waste management system to our customers. 3. Continue to provide unparalleled customer service. 4. Be responsive to change, creativity and innovation. 5. Engage and educate our community to reduce waste disposed. 7. Collaborate with external partners to achieve commongoals. 8. Provide efficient services and ensure fiscal sustainability.	$/hh
	What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues 2. Results may vary. May have potential for liability or environmental risk 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks	1. Protect our environment. 4. Be responsive to change, creativity and innovation. 8. Provide efficient services and ensure fiscal sustainability.	Qualitative discussion

Attachment B – Medium/Long Term Options Evaluation Results

WDP 4 Support the Circular Economy

With the move towards a circular economy, this option looks at providing support for local innovators and/or organizations that design for the environment and /or reduce, reuse and reclaim waste. This could be accomplished both by partnering with existing (not for profit) organizations within the Region (i.e., expanding its current efforts to engage local organizations) and by seeking to engage local/regional/provincial businesses and social entrepreneurs in new circular economy/zero waste initiatives. The idea behind circular economy thinking and actions (as defined in the Waste Free Ontario Strategy and Act) is to maximize value and eliminate waste by improving the design of materials, products and business models. This means finding ways to minimize the use of raw resources, maximize the useful life of materials and minimize waste generated at the end-of-life of products and packaging.

On November 29, 2018 the Ontario Ministry of the Environment, Conservation and Parks released its "Preserving and Protecting our Environment for Future Generations A Made-in-Ontario Environment Plan". Although the plan does not use "circular economy" language directly, the overarching goal ("an Ontario where we strive to decrease the amount of waste going to landfill, increase the province's overall diversion rate and reduce greenhouse gases from the waste sector") is very consistent with circular economy principles and approaches elsewhere in Canada and globally.

Major Assumptions:
- Supporting Circular Economy policies and programs is a policy position for Waste Management that will guide Halton Region when advocating with all stakeholders.
- The Region continues its waste diversion funding each year (through 2019 and 2020 and beyond) to non-profits @ 50% of the tipping fee for priority materials selected by the region (e.g. $250K was granted to 8 non-profit organizations to divert about 3,500 tonnes from landfill in 2018). New diversion initiatives by non- profit organizations/social enterprises are encouraged (e.g. for textiles, mattresses, carpets, small and large appliances, furniture, etc.) in response to new locally inspired waste diversion opportunities and/or provincially regulated Extended Producer Responsibility (EPR) programs.
- A long term (10 year) Waste Reduction, Repair and Reuse strategy will help Halton Region build positive and significant partnerships with local organizations, support widespread public engagement in the Region's mix of waste diversion activities and bring positive economic and environmental benefits (i.e. increased waste diversion and extended future landfill capacity).
- The provincial EPR regulation is anticipated to be released by Dec. 31, 2020 and may impact this option.
- The Region is developing Climate Action and Food strategies. Both of these strategies can support future Circular Economy type initiatives.

Environmental						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	Circular Economy and Zero waste initiatives aim to reduce, reuse and recycle. The greater impact will be in the reduce, reuse and reclaim activities and will need a metrics system implemented to measure its impact. Recycling already has a measurement system in place for the residential sector. In 2016, Halton residents had a disposal rate of 124 /capita. A 5% reduction in disposal would result in 118 kg/cap of disposed waste.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Focus is on policy, behaviour change and CE business models. Do not anticipate air quality impact.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	1	None; focus is on policy, behavioural change and CE business models. Additional land use is not anticipated.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on policy, behaviour change and CE business models. Additional water and or treatment is not anticipated.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on policy, behaviour change and CE business models. Do not anticipate impact to ground and surface water.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	Focus is on policy, behaviour change and CE business models. Do not anticipate any major change to nuisances.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	CE policies will reduce GHG impact due to the reuse and reduction of material. The goal is to design products to last longer, be repairable and use less raw materials.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	1	While the implementation of CE policies will not require additional energy, new CE policies will reduce energy use across the region due to the reuse and reduction of raw material. Goal is to design products to last longer, be repairable and use less raw material. This will lead to less energy needs for primary manufacturing and transportation.

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	CE and Zero Waste policies have been established and proven to be successful in other jurisdictions including North America (Vancouver, San Francisco, Waste Free Ontario Act).
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	CE policies will not increase community risks. CE policies will improve the environment and reduce environmental risks.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	CE will promote and increase accessibility to more services that reuse, repair and recycle products and materials.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	CE will benefit the broad community by providing services and activities that the community at large can access. For example, the community can participate in share and swap programs that extend the end of life of products they no longer use.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	When CE policies and programs are easy to use and convenient, residents will be more accepting of them. When the benefits to the resident and community are promoted and reinforced, residents are more likely to participate.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	CE works best when there is an interchange of services and products among partners and other organizations. A mapping or central database of services, products and materials available for reuse throughout the community is a tool to assist new partnerships.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	3	Operating costs include refocus of the Waste Diversion Fund to $250,000 annually to include CE initiatives and Regional staff to manage the Fund ($4,000). In subsequent years, a Reduce, Repair and Reuse Strategy to be developed ($25,000 capital) in addition to maintenance of Waste Diversion Fund ($300,000) and staff to manage the Fund ($7,000).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal cost increase anticipated.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	No anticipated high risks. Good policy development, implementation, and promotion and education will increase probability of expected results. The worst case scenario is not meeting their Circular Economy targets.

WDP 6 Support the Sharing Economy

Sharing resource hubs are rapidly increasing in popularity, growing in number and location. Whether it's repeated trading on a website, app, or an actual physical 'library' where residents can borrow an item (e.g. tools, sporting gear, and toys), these centres and online platforms often require no currency, and allow for the reduction in the amount of manufactured items.

The governments, businesses and non-profit organizations initiating these sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving energy and resources (required to manufacture virgin materials), and providing options to extend the use of an item amongst multiple users.

This option looks at the Region promoting sharing through supporting, partnering with and/or partially funding organizations involved in this area. Examples of such organizations for consideration are provided below.

The Region could support sharing initiatives as follows:

- Identify safe trading zones at municipal facilities.
- Facilitate setting up lending areas, sewing and tool centres, repair cafes in multi-residential buildings and community centres.
- Promote existing sharing options in Halton.
- Provide funding through the Waste Diversion Fund.

Major Assumptions:

- Option considers the Region promoting repair cafes/sharing hub located at corporate facilities.
- Four repair cafes per year (seasonally). Region can later assess whether to increase frequency.
- No cost to Region for use of corporate owned facilities' rooms/space.
- Connect/utilize volunteer resources (e.g. Recycling Society or Seniors Activity Centres) to act as Experienced Volunteers to assist/give advice on repairs (fix broken bicycles, stuffed toys, toasters).
- Request on Municipal website for both volunteers and tool and material donation to allow for repair (bike patches, wire cutters, pliers, sewing kits, etc.).
- Once repair cafes are accepted (Year 2), potentially divide space to allow for item/tool trade or rental AND/OR seek out existing organizations, developing partnerships with lending libraries which could be supported through the existing Waste Diversion Fund.
- Halton IT/PR staff able to promote/update Regional website content (assume 20 hours initially, then 4 hours per event assuming 4 times a year).

Environmental						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	As residents take advantage of the opportunity to borrow an item from a sharing hub (e.g. tools, sporting equipment, toys), there is an anticipated reduction in new purchase acquirement. This is ultimately reflected in less items requiring end-of-use disposal.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Focus is on policy, behaviour change and sharing hub creation/promotion. Do not anticipate air quality impact.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	2	Focus is on policy, behaviour change and sharing hub creation/promotion. Websites, apps and sharing hubs already in place. Assume use of existing Region facilities.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on policy, behaviour change and sharing hub creation/promotion. Additional water and or treatment is not anticipated.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on policy, behaviour change and sharing hub creation/promotion. Do not anticipate impact to ground and surface water.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	Focus is on policy, behaviour change and sharing hub creation/promotion. Do not anticipate any major change to nuisances.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	Community centres are located in central locations. Anticipate minimal changes to GHG emissions. At the broader scale, sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving resources (required to manufacture virgin materials). The goal is to repair items to continually be able to share.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	Minimal energy is required to have repair cafes / sharing hubs at Region-owned facilities. At the broader scale, sharing opportunities help keep materials out of the waste stream and landfill, protecting the environment by conserving energy required to manufacture virgin materials.

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	The Bunz app, Tool (and other) 'Libraries' and other sharing hubs operating as physical depots and online platforms are readily available in and in close proximity to Halton Region.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Increasing access to shared goods should have no bearing on community or public safety. It can be compared with equipment/tool rentals or a library.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Improving access to goods which may be out of price range for some (tools, sporting equipment) will promote and increase accessibility and convenience for the overall community.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Sharing hubs will benefit the broad community by providing items that the community at large can access. For example, the community can participate in share and swap programs that extend the end of life of products they no longer use.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	There is a stigma around second-hand goods: they are less desirable or less functional once used a few times by another person. It is anticipated that if the Region supports these programs and hubs, it will show people it is okay and be accepted by the broad community.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Anticipate increased collaboration with similarly-minded local organizations for volunteer support.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	Anticipate capital costs to be low. Some renovation of existing sites or facilities to accommodate sharing libraries or spaces. Estimate approximately $50,000 for some facility renovations, smartphone applications, or website enhancements to coincide with P&E campaigns. Ongoing staff operational time estimated at $22,000 annually.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	1	Cost per household minimal for website promotion, smartphone apps and adaptation of spaces for sharing hubs/libraries. By sharing high ticket items in particular (tools, sporting equipment) taxpayers will save money by reusing products and by consuming less overall.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Anticipate some risk with loaning tools and equipment such as an injury, resident not satisfied, or not returning an item.

WDP 7 Alternatives to By-law Enforcement

Increasingly, communities are recognizing the importance of compliance with waste diversion and garbage set out requirements, however would prefer to work collaboratively with residents rather than use punitive methods. Communities are also realizing that employing enforcement officers to monitor and enforce the by-laws is a challenging endeavour in large urban centres and, therefore, communities are examining alternative approaches to bylaw enforcement. This option explores the different methods that can be employed to encourage compliance with the Region's waste by-laws. Alternative methods usually require that adequate staff and measures are in place to ensure an effective monitoring system. This option looks at employing an outreach team to monitor waste set out and provide education and communication materials to households that are not in compliance with the waste collection by-law.

Major Assumptions:
- Halton to conduct setout outreach program targeting households with no Green Cart set out, contaminated blue boxes or large garbage set outs.
- Halton staff will work with contractor to develop program and purchase/rent equipment including GIS licenses, tablets, lease/rent cars and train canvassers.
- Program will involve hiring staff to conduct set out monitoring and canvass households (one student) part time for 4 months during the summer over three years. Lessons learned from each year will be integrated into future monitoring and canvassing programs.
- Workers will monitor set outs in the morning and identify problematic set outs on a GIS program loaded on to a tablet. That evening the canvassers will visit the households and provide information about proper set out and address concerns/questions.
- Blue Box transition to EPR will likely impact the contamination threshold expected by producers for Blue Box recycling. Once the new regulation is enacted, accepted materials for Blue Box recycling will be standardized and contamination targets will be expected to be decreased.
- This option will be implemented if the Region makes a major change to how collection is done within the Region (e.g., move to automated carts with full user-pay system).

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	Programs have demonstrated that direct one-on-one outreach can have very positive results in reducing contamination and encouraging participation in Blue Box and Green Cart programs and other waste diversion initiatives. In general, P&E alone will not result in major behaviour change; P&E needs to be coupled with direct outreach.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	While the focus is on behaviour change the canvassers and monitors will need cars to reach their destinations. Emphasis will be placed on renting fuel efficient cars and organizing canvassing to minimize transportation.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	3	Focus is on behaviour change. No land requirements expected.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on behaviour change. No water/wastewater impacts expected.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on behaviour change. No groundwater or surface water impacts expected.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Emphasis will be placed on renting fuel efficient cars and organizing canvassing to minimize transportation. No additional nuisance impacts are expected.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	2	Minimal change in GHG emissions expected unless major increase in organic source separation and set out achieved. The 2017 waste audits indicate that 46% of organics materials (excluding L&Y) is being placed in the garbage or Blue Box. Removing the organics from the garbage could result in greater GHG reduction from reduction of methane generation (assuming not all is captured through landfill methane recovery technology).
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	No energy required in outreach activity.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	Communities that have engaged in alternative enforcement programs have experienced some success in changing residents perceptions and behaviours. Regulations mandating source separation of organics and blue box recyclables must be well promoted in order to be effective. Due to the higher cost associated with outreach programs, many communities have launched short-term or small pilots. Many outreach programs target individuals and not the entire community so although the success rate with the individuals is good, the overall impacts can be small.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Safety procedures are followed to ensure that canvassers and residents remain safe.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Most residents will not experience any change in accessibility or convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Depending on the approach, some residents may feel some benefits from the interaction with outreach canvassers and help understanding the program. Mandatory regulations ensure equity to the community but not necessarily increased benefits.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	This option should receive approval from the community as it will be seen as an alternative to bylaw enforcement.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	This option could lead to collaboration with non-profit and community groups that could potentially help deliver the outreach program.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	The estimated planning and implementation time for staff and capital cost to develop the program and promotional materials, purchase tablets, acquire GIS licenses, train canvassers will be under $30,000. The ongoing operational costs assume each monitor (2) and canvasser (3) works 7 hours a day @ $25/hour (assume students are hired) for 6 months (May to October). The canvassers/monitors share a car (2 persons per car) and it is leased for 6 months. Along with other incidental costs (e.g., transportation, gas), the annual capital cost is estimated at under $60,000 annually.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	The focus is on behaviour change so no liability or environmental risks expected

WDP 8 Provide Waste Diversion P&E to the IC&I Sector

According to Statistics Canada, 87% of businesses in Ontario have fewer than 20 employees and 68% have fewer than 5 employees. In 2016, 45% of Ontario grocery stores employed fewer than 20 employees. In terms of convenience stores, 92% employed fewer than 10 staff and 67% employed fewer than 5 staff. The Ontario food service industry is mostly represented by independent businesses (60% of businesses are classified as independent) with almost 60% hiring fewer than 20 employees (Statistics Canada, 2016). Grocery stores and food services generate the lion share of food waste and recyclable paper products and packaging; however, according to the Provision Coalition "Food waste is not a high priority for many businesses. The primary reason for this is that most businesses do not know the amount of food that they waste and its real impact on profitability". (Nicoleta Uzea, 2014).

Many small and medium commercial establishments lack the resources, space and budget to implement a food waste and recycling program that targets back of store and front of store waste diversion needs. It is likely that regional and local governments will need to be involved in providing technical, training and educational support to small, medium and larger ICI establishments during these transition periods.

Under the Resource Recovery and Circular Economy Act (RRCEA), the MOECC was required to develop a strategy for a waste-free Ontario. On February 28, 2017, the Minister released the final Strategy for a Waste-Free Ontario, which was to serve as a Roadmap to help shift Ontario towards the goals of a circular economy, zero waste and zero greenhouse gas emission from the waste industry. The Strategy provided an outline on how the MOECC intended to foster greater responsibility for waste diversion in the ICI sector by establishing a target of 2019 to amending the 3Rs regulations (i.e. to better address industrial, commercial & institutional - ICI - waste).

Under the new government, the ICI waste diversion initiatives have been put on hold while the new Ministry of Environment, Conservation and Parks (MECP) consults on what should be down to address the ICI waste stream. Recognizing that businesses dispose 83% of the waste generated and divert only 17%, the MECP has addressed the need to "Explore additional opportunities to reduce and recycle waste in our businesses and institutions" in its document "A Made-in-Ontario Environment Plan", released November 2018.

Major Assumptions:
- Under C14 option (review non-residential customer base), the 170 BIA customers serviced by the Region for waste services will receive 3-stream collection services. These customers currently have black and blue wheeled carts and new organics carts are required (capital costs included in C14). There would be no option for a customer to opt out of recycling and/or organics collection.
- To support this program, Halton Region would develop and implement a waste diversion campaign, targeting not only BIA establishments, but aimed at supporting small & medium sized businesses in Halton Region.
- As part of the campaign, the Region would develop a dedicated webpage containing case studies, promotional materials, signage, handbooks.
- The Region would hire one part time staff to provide technical assistance to businesses wanting to implement or improve waste diversion programs.
- The campaign and webpage would continue to be supported by the workshops and talks provided to businesses to promote waste diversion practices.
- Option includes Region staff conducting an evaluation of the impact of a single-use plastic ban targeting the ICI sector.
- The Region would partner with the Economic Development Department in supporting its ICI customers and waste management needs.
- Until the Blue Box Program Plan is finalized (anticipated to be in Jan. 2021), we will not know if elements of the ICI sector will be included or defined in the new plan, and whether ICI collected on residential routes (schools) will need need more support.
- This option also supports initiatives in option WDP 4 - Support the Circular Economy

Environmental						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	While waste diversion support to the ICI sector could result in high potential for waste reduction/diversion, it will not necessarily be reflected in Halton Region's municipal waste diversion rates. Halton Region already provides recycling and composting to schools and Regional facilities so the additional diversion rates from introducing other measures are not expected to be substantive.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Not expected to have any impacts on emissions to the atmosphere.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	3	Not expected to impact Halton Region's land use requirements.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	2	Diverting organic waste (including fats, oils and grease) from the sewers could have benefits to the Regions wastewater system.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Not expected to impact the groundwater or surface water.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Not expected to have any nuisance impacts.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	Most ICI establishments do not divert their organic waste through composting programs; therefore, the organic waste ends up in landfills that may or may not have methane recovery technology in place. It is more likely that materials diverted through composting or recycling programs will travel fewer kilometers to be processed than garbage that is sent to landfills (e.g. in U.S. states).
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	Not expected to have any impacts on energy requirements.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	3	Until very recently, there has been very little interest in Canada (especially Ontario) to have municipalities take an active role in promoting waste diversion in ICI establishments within their boundaries. This has resulted in few municipal initiatives to support waste diversion activities in the ICI sector.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	1	This should have no impact on community or public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	This should provide the public with greater access to waste diversion programs within ICI establishments and participate in waste collection programs as done at home.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Any waste diversion activity will have broad reaching benefits to the community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	This option should experience strong community support as there is increasing awareness and disapproval about the ICI sector's lack of progress in implementing waste diversion programs.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	There should be opportunities to engage with other groups to help provide waste diversion support to ICI establishments.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	Initial costs associated with planning and implementing includes time for staff and third parties and costs for printing materials (estimated at $125,000). The ongoing operating and capital costs, which include maintaining and updating the waste diversion campaign/webpage and retaining one part time position is estimated to cost $33,000 per year.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal potential increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	This initiative is expected to have very little risk associated with it.

WDP 11 Enhanced Contractor Collection Services

All waste collection services are contracted out to private sector waste management companies. However with the emergence of RFID tags, garbage collectors can offer more services than just collection. Jurisdictions employing RFID tags in garbage bins are able to track issues and reduce pickups for commercial or multi residential buildings to only when the bins are full. These tags are also capable of weighing lifts for these customers and keeping a dataset of bin weights and number of lifts.

This option looks at expanding service levels in collection contracts for multi-residential and non-residential customers to provide better compliance and data collection (e.g., enforcement, tracking/issuing notices, promotion and education, weighing lifts).

Major Assumptions:
- This option looks at collection contractors conducting compliance 'blitzes' to increase proper set outs through notices and P&E. The blitz will occur two consecutive collection weeks in each the spring and fall to select single-family households and to multi-residential buildings twice per year (four weeks each for SF and MF, eight weeks total).
- Staff will work with contractors to identify which households will participate in the blitz and it is proposed to do the same for households/buildings over two consecutive collection weeks. Waste collection program(s) to target will be determined by Region staff.
- During the blitz, contractors would only collect waste from compliant households/buildings (i.e., leave carts behind), enter data into a network database noting the address and compliance issue(s) and leave a notice and/or additional P&E materials to address the issue(s).
- Data will be tracked using RFID tags in MF building bins (outlined in Option C11). RFID tags will allow the Region to monitor data on MF waste generation. As a result the Region may be able to geographically target education campaigns and/or provide building managers with access to data on their building performance.
- Set outs that have the right materials and are placed correctly get a positive tag/notice; non-compliant set outs get a negative tag/notice with information on how to correct behaviour. Notices and P&E material will be developed by a third party with the Region's communication and waste staff and printed by external vendor.
- Potential increase in customer service calls due to blitz. Staff time to receive calls is included.
- Option ties to WDP 14 where research is conducted on appropriate terminology that resonates with residents to use for P&E materials and with C 11 and gathering data from the MF sector through RFID.
- Due to the expectation for reduced Blue Box contamination in the new Blue Box Program Plan regulation, contractor collection services will need to provide options to the Region in tracking and monitoring contamination to its sources.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	The addition of a curbside blitz, tracking and issuing notices and P&E has the potential to increase diversion due to enforcing proper green cart/blue bin practices, issuing notices for contamination and allowing the drivers to leave P&E packets to help inform the customer.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Focus is on increased education during regular collection services. Do not anticipate air quality impact.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	1	Focus is on increased education during regular collection services. Additional land use is not required.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Additional impact to water and/or wastewater systems is not anticipated.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Do not anticipate impact to groundwater and surface water.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	No change to collection service. No change to nuisances expected.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	2	Collection times per stop will be slightly increased to allow drivers to place educational materials on bins. Minimal change in GHG expected.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	Do not anticipate any impact to energy production.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Use of RFID tags in multi-residential buildings to gather feedback on performance and issues is done in multiple jurisdictions. Developing enforcement and P&E materials to targeted single family households has been shown to increase diversion and participation. There are several Canadian municipalities that have employed blizes that have been proven successful when coupled with P&E.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Minimal to no anticipated changes to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Monitoring of households and buildings will provide focused and tailored enforcement and education which will increase convenience in terms of delivery of P&E materials.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Option will benefit segments of the community that participate in the blitzes.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	2	Option will generally be accepted/encouraged by the community as it will increase awareness on effective participation in waste collection programs and gather data in multi-residential buildings. There may be some negative feedback if personalized P&E is implemented with stickers or warnings regarding improper set outs and carts/bins are not collected and there is a potential increase in customer service calls due to blitzes.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Potential to increase collaboration between the contractor and Region. The chosen contractor may be able to expand or suggest other options to help increase effective participation and diversion and promote proper sorting.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	It is assumed that it will take 80 hours to plan the Blitz program and 40 hours to update P&E materials. Communication material (e.g., flyers, brochures, pamplets),notices and tags will be designed by a third party and printed by a vendor ($25,000). The initial costs are approximately $35,000. The ongoing operational costs assume Region staff will oversee the program, coordinate with contractors during blitzes, analyse data and report on findings. A vendor will print updated communication materials. Due to potential increase in customer service calls, one additional staff member will be required to receive calls during the blitz. The ongoing costs are estimated to be $20,000 annually.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	No anticipated high risks. Good policy development, implementation, and promotion and education will increase probability of expected results and targets.

[1] 3 http://itak.iaitam.org/simple-cost-analysis-for-rfid-options-choice-must-fit-the-organizations-needs-and-budget/

WDP 12 Review Event Diversion Program
This option looks at enhancing the existing community event diversion program by looking at opportunities such as partnering with NGOs to coordinate volunteers and/or providing NGOs with funding to deliver waste diversion services at events, providing more Region staff support during the event, and more waste diversion tools and materials.
Major Assumptions: - Region will continue to review requests and provide waste diversion containers and signage for events and conduct training (budget assumed to be included in existing Region budgets). - Volunteers will be sought through recruiting high school students to help them achieve their minimum of 40 hours of community service to graduate and interested NGOs. Postings for volunteer posting will be placed on websites such as GoodWord. - Volunteers will assist with setting up waste stations, visually monitor contamination levels, educate event goers at the waste bins, etc. - Volunteer intake form and event diversion form will be modified to include languages spoken by volunteers and potential ethnicities in attendance at events to remove communication barriers. - Volunteers will receive training on proper waste practices. - Method of training to be reviewed by Region staff and to consider options such as development of an online training and testing, consolidating training to a set time and host in-person or live webinar (e.g., once a month in non-busy periods, twice a month in busy periods). Focus will be on removing barriers to encourage more volunteers to participate and adjust to different demographics of volunteers. - Region staff will run and maintain the program at an average of 1 day a week per year. - Region staff time will be required to promote the program and volunteering opportunities with the Region. Software will be purchased to register and schedule volunteers. - High level post event audits will be conducted four events per year with volunteer support to evaluate effectiveness of diversion programs and identify what can be improved or changed in the future. - Diversion of Blue Box materials generated at municipal parks are under consideration in the draft regulation to be the responsibility of producers (anticipated to be finalized by January 2021)

Environmental						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	The Waste Diversion Program aims to reduce the amount of waste generated at local events and divert as much material that is generated from being landfilled. Much of the material used at these events are often single use and recyclable items. Successful programs in Richmond have resulted in diversion rates exceeding 90%. While programs like Richmond, Portland, and Markham have helped increase diversion rates, the tonnages diverted from these events are not significant to cause an increase larger than 5% in the overall diversion rate of the Region.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Focus is on Event Diversion Program and proper waste management at events. Air quality impacts are not anticipated.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	3	Event space will be used to accommodate waste bins and signage. No additional land required.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on Event Diversion Program and proper waste management at events. Additional water and or treatment is not anticipated.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on Event Diversion Program and proper waste management at events. Impacts to ground and surface water are not anticipated.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	With effective planning and waste management program at events, minimal to no change to nuisances anticipated.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	2	No change in GHG emissions is anticipated.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	No change to energy requirements.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	The Region already runs a Event Diversions Program serving over 40 events per year. The Region provides waste diversion containers, signage and training to event staff (many of whom are volunteers). However the Regions event organizers have had difficulties with retaining volunteers. Programs in place in Richmond, Portland, and Markham have been proven to be successful at training and retaining volunteers. Particularly in Richmond where the program has aimed to recruit high school students looking to fulfill their requirement for community service.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Focus is changing policy of the Event Diversion Program. There are no anticipated changes to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	The Event Diversion Program offers volunteers to go to events within the Region and help event goers with proper recycling information and man recycling stations. The increased level of recycling opportunities will increase accessibility and convenience of proper sorting at Region events which will also help with sorting practices at home.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	The Event Diversion Program will affect event goers in the community, which will increase benefits to segments of the community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Diversion Event volunteers will deliver waste diversion services at events, providing more Region staff support during the event, and more waste diversion tools and materials. When the benefits to the resident and community are promoted and reinforced, residents are more likely to participate.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	This option looks at enhancing the existing community event diversion program by looking at opportunities such as partnering with local schools and NGOs to coordinate volunteers. A local partnership can lead to more focused P&E campaigns and help diversion at schools and at home.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	Software to register and schedule volunteers is estimated to be a $10,000 capital cost. Planning, implementation and ongoing maintenance of the program involves staff seeking volunteers and review and provide training to volunteers. Development of an audit and tracking protocol and ongoing operational efforts to review and report on results will be completed. The initial costs are estimated at $30,000. Annual operating costs plus printing of communication materials are anticipated to be $33,000.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	No anticipated high risks. Good policy development, implementation, and promotion and education will increase probability of expected results. The worst case scenario is not attracting more volunteers to the program.

WDP 13 Pay As You Throw (PAYT)

Bag limits restrict the number of garbage bags that can be placed out for collection at any time. The bag limit encourages residents to use other means, such as available waste diversion programs, to reduce their garbage set out. Set out monitoring audits reveal that residents typically place one to two bags of garbage per week for collection. In order for bag limits to work, they must be set at a limit that is below or at the average garbage set out rate (e.g. two bag limit) in order to encourage diversion. Bag limits are often coupled with Pay-as-you-throw policies.

Pay-as-you-throw (PAYT) policies (also referred as user pay) require customers, including single family households, multi-residential building owners and commercial establishments, to pay for garbage set out for collection. This approach acts as a financial disincentive to generating garbage and encourages residents to reduce waste and use available waste diversion programs to minimize the amount of garbage requiring disposal. Some communities permit residents to place a set number of bags of garbage for collection before requiring residents to purchase tags and affixing them to the bags, which is referred to as a partial PAYT program. Other communities require residents pay for all garbage bags set out for collection by purchasing tags and affixing them to the bags, which is referred as a full PAYT program. While more popular in the United States, some larger urban centres including the Cities of Toronto and Vancouver, offer variable sizes of carts for garbage, recycling and organics and charge a variable fee based on the size of the garbage carts (and organic carts in the case of Vancouver). The fees cover all or part of the cost of waste diversion services.

This option looks at developing partial PAYT programs through use of bag limits, bag tag fees and implementation to the multi-residential sector over a long term phased timeline.

Major Assumptions:
- Halton Region has a partial PAYT program, which allows single-family households (SFHs) to set out 3 garbage bags bi-weekly without requiring a tag. Additional bags require a $2 tag.
- This option assumes that Halton will transition from the three bag PAYT program for SFHs to a full PAYT program implemented over three phases starting initially with a 2 bag PAYT program introduced in year 3 (Phase 1) then moving to a 1 bag PAYT program in year 6 (Phase 2) and finally moving to full PAYT in year 9 (Phase 2). Significant P&E efforts will be required through each transition period.
- Any modification to the existing PAYT program is not expected to result in significant reductions in GHGs from SFH unless it significantly drives an increase in Green Cart participation which is currently at 55% participation rate and 60% capture rate
- It is estimated that a 10% increase in Green Cart capture rate resulting from a more stringent PAYT program will result in a 2% increase in Halton's diversion rate. A 20% increase in GC capture rate will result in a 4% increase in the diversion rate.
- As explored in Option C14, Halton will implement a PAYT fee structure targeting BIA and commercial customers. An analysis of the Region's BIA and commercial customer base could determine the proposed fee rate structure for Halton Region. The PAYT program would be based on a variable cart approach in which Halton Region could supply one free cart and apply a fee for additional carts or additional garbage bags per location.
- At the same time, Halton staff will evaluate other PAYT approaches including a volume based levy system for multi-residential buildings serviced by Halton Region which involves charging per cubic yard of garbage collected by the Region. This approach which is used by the City of Toronto incentivizes property management to invest in the necessary tools to increase participation in Toronto recycling and green bin programs in order to reduce the fees associated with waste disposal.

Environmental						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	A more robust PAYT program could help to increase organics and Blue Box diversion. Currently, Halton is realizing ~60% capture rate for its green cart materials and ~75% capture rate for its Blue Box recyclables (based on the 2017 SF waste audits). While the capture rate for the Blue Box is good, the capture rate for the Green Cart program is quite a bit lower. Moving to a more robust partial PAYT program could be expected to increase participation in and capture rate for the Green Cart program.It is estimated that a 10% increase in Green Bin capture rate resulting from a more stringent PAYT program will result in a 2% increase in Halton's diversion rate. A 20% increase in Green Cart capture rate will result in a 4% increase in the diversion rate.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	This is a policy that is not expected to impact air emissions.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	2	This is a policy that is not expected to impact land requirements.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	This is a policy that is not expected to impact water/wastewater systems.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	This is a policy that is not expected to impact groundwater.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	This policy should cause minimal nuisances.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	Some reduction in GHG emissions are anticipated with increased capture of Green Cart organics.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	Minimal energy required for this policy.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	PAYT is widely used by communities throughout Ontario and Canada. Partial PAYT has been implemented in urban areas such as Durham Region (4 bags bi-weekly, $2.50/tag), Region of Waterloo (4 bags bi-weekly, $2/tag), City of Kingston (1 bag weekly, $2/tag), Dufferin County (1 bag weekly, $2/tag), Niagara Region (1 bag weekly, $2/tag), Wellington County (full PAYT, $2/large bag and $1.5 for small bag), City of Stratford (full PAYT, $2.60/tag)
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Not expected to be a risk to community and/or public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Residents may complain about the inconvenience of source separating their organics and blue box recyclables as a result of an expanded PAYT policy but it has no real impact on convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Waste diversion has overall benefits to the broad community and a robust PAYT policy promotes waste diversion.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	There is the potential for public opposition to an enhanced PAYT program. G48:G53
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No change in collaboration is anticipated.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	3	It is estimated that $500,000 would be needed for P&E efforts for transition to a full PAYT program and half ($250,000) would be needed to transition to a 2 bag PAYT and then to a 1 bag PAYT program during the planning and implementation phase. Program planning and implementation would cost close to $1 million for P&E for all three transitions combined. This would be spread out over the long term in three phases with Phase 1 starting in Year 3, Phase 2 starting in Year 9 and Phase 3 starting in Year 9. Staff would be involved in developing and implementing the program initially as well as hiring 1 extra staff to operate the 311 call centre for a 2-month period during the transitions to a 2 bag PAYT and a 1 bag PAYT program and would require 2 extra staff to operate 311 service over a three month period to transition to a full PAYT program. Staffing time is estimated at $30,000 for Phases 1 and 2 and $64,000 for Phase 3. On-going operational costs for the transition to a 2-bag PAYT and 1-bag PAYT are anticipated to be minimal (under $25,000) for staff to manage the current program and further reduced once at full PAYT ($13,000). Costs for Region to print bag tags based on 2016 participation rates from waste audit study, estimates on percentage of households requiring tags for each of the three phases and a unit bag tag cost of $0.04. Estimate costs at $31,000 for Phase 1, $62,000 for Phase 2, and $75,000 for Phase 3.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	The ongoing annual cost to household is anticipated to be minimal.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	PAYT has a proven track record with good results.

WDP 14 Promotion and Education for Diversion – Medium/Long Term

Waste diversion promotion and education (P&E) strategies have been used to achieve a variety of goals from promoting higher participation in a Green Cart program to modifying improper behaviour, such as wishful recycling leading to high contamination rates in the Blue Box program.

While promotion and education programs remain a key component of successful waste diversion programs, staff often face restricted P&E budgets that require them to examine effective best practices. Dr. Calvin Lakhan examines these best practices in his report to the Continuous Improvement Fund, "Review of CIF Funded Projects and Key Learnings" Final Report: June 28th, 2017 – "Broadly speaking, direct engagement strategies (face to face interactions, community events etc.) yield the greatest immediate change in recycling behavior. However, these types of initiatives can be resource and time intensive.

Conversely, P&E advertisements communicated in local newspapers, is the least effective. Given its cost and broad outreach, opting for newspaper campaigns is an expensive fall back for municipalities who want to do "something". Note that Halton Region has at least four local papers they must advertise in to reach all its residents. With this in mind, some communities have attempted to combine P&E outreach techniques with the use of innovative approaches in order to achieve the benefits of outreach strategies at a lower cost. The Region's social media platforms provide an opportunity to develop a campaign to promote waste diversion to residents at a low cost.

Major Assumptions:
- Develop a social media campaign using Twitter, Facebook, Instagram, etc. which provides weekly tips, information, messaging, feedback (keep messaging positive, using images, employing simple non-technical language, and incorporating humour as possible, etc). Halton would hire company to develop and manage the campaign
- P&E initiatives are an ongoing annual capital cost throughout the long term strategy
- Conduct research (involving focus groups and surveys) into waste management and diversion terminology: for example recent research conducted by Region of Peel shows that residents don't understand the term contamination, organics and material recycling facility. This research could help Halton ensure that the terminology used in social marketing, etc. is understood and effective in relaying the intended information - involves focus groups, surveys, etc. - this project could tie in with the door-to-door project discussed below.
- Create an information booth for pop-up events at both Region events and at high traffic areas (e.g. community and recreation centres, shopping centres, grocery stores). Staff planning and working at the pop-up events will be co-op students working full time.
- It is assumed different P&E materials (e.g fridge magnets, brochures, kitchen catchers, compostable bags,etc.) will be provided to visitors at the pop-up events and that information booth attendants would answer questions/concerns and explain how to divert waste properly.
- Anticipate the Region having some involvement of informing residents of new Blue Box program (e.g., new materials) before transition thus, P&E will have to be updated.

Environmental						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	In general, P&E alone will not result in major behaviour change; P&E needs to be coupled with outreach. However, programs have demonstrated that direct one-on-one outreach can have very positive results in reducing contamination and encouraging participation in Blue Box and Green Cart programs.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	While the focus is on behaviour change the pop-up event monitors will need cars to reach their destinations. Emphasis will be placed on renting fuel efficient cars and organizing events to minimize transportation.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	3	Focus is on behaviour change. No land requirements expected.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on behaviour change. No water/wastewater impacts expected.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on behaviour change. No groundwater impacts expected.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	Emphasis will be placed on renting fuel efficient cars and pop-up events to minimize transportation. No additional nuisance impacts are expected.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	Minimal change in GHG emissions expected unless major increase in organic source separation and set out achieved. The 2017 waste audits indicate that 46% of organics materials (excluding L&Y) is being placed in the garbage or Blue Box. Removing the organics from the garbage could result in greater GHG reduction from reduction of methane generation (assuming not all is captured through landfill methane recovery technology).
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	No energy required in outreach activity.

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Communities that have engaged in outreach programs have experienced some success in changing residents perceptions and behaviours. Due to the higher cost associated with outreach programs, many communities have launched short-term or small pilots. Many outreach programs target individuals and not the entire community so although the success rate with the individuals is good, the overall impacts can be incremental over time.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Safety procedures are followed to ensure that canvassers and residents remain safe.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Anticipated increase in accessibility and convenience with additional promotion and educational efforts.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Efforts will be ongoing each year. Those members of the community that are targeted with a pop-up event could experience the benefits of a better understanding of how to recycle and compost, which in turns reduces frustration and misunderstandings concerning contamination, as well as benefit from any tools provided to help them.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	This option should receive approval from the community as it supports Halton's strong P&E and outreach approach and benefits residential understanding and expectations of the diversion programs and can reduce misunderstandings and frustrations.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	This option could lead to collaboration with non-profit and community groups that could potentially help deliver the outreach program

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	3	Planning and implementation costs include hiring a third party(ies) to design and implement the social marketing campaign and conduct terminology research along with staff time which is estimated to be almost $150,000. Capital costs include purchase of a new Region vehicle, third party to design campaign and materials, printing of promotional materials and purchase of smartphones for use at events ($170,000). Ongoing operational costs to manage, run and two students to attend the pop-up events is estimated at $112,000. Ongoing capital costs for P&E related initiatives throghout the long term strategy is estimated at $500,000.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	P&E efforts will be spread out over the planning period and as such, the potential increase in annual cost to household is anticipated to be minimal.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	The focus is on behaviour change so no liability or environmental risks expected.

Reference:

Sacramento County: www.wastedive.com/news/sacramento-county-california-recycling-without-raising-rates/521142. Published April 12, 2018.
A request has been made to confirm the budget for the City of Edmonton's "Large Volume Set Out Initiative."

WDP 15 Multi-Residential Waste Management Improvements

Multi-residential waste diversion performance has traditionally not achieved the same performance levels as the single family residential sector.

This option looks at the waste diversion performance of the multi-residential sector after the Green Cart program has been implemented in all multi-residential buildings. The Region shall use waste audit results to determine the percentage and type of divertible materials still being disposed in the multi-residential waste stream and identify buildings that are under performing in comparison to their peers based on the waste audit results. Best waste diversion practices can be determined for those targeted buildings to elicit behaviour change and improve waste diversion performance. A Best Practices Tool Kit can be created to assist low performing buildings to increase their waste diversion performance.

A Best Practices Toolkit along with other support systems will help low performing multi-residential buildings. Options include:

- Providing additional signage in several languages;
- Distributing P&E material door to door;
- Frequently changing P&E material to capture attention;
- Conducting resident surveys and workshops;
- Asking residents to make a recycling pledge;
- Launching a waste diversion ambassador volunteer program with perks;
- Providing additional recycling bags, containers and organics kitchen catchers so they are always available on site for new tenants;
- Establishing waste diversion performance targets with information showing progress in each building; and
- Conducting more follow up with superintendents on the building's waste diversion performance and providing technical support to improve performance.

The Region could also investigate the feasibility to improve waste diversion performance in buildings applying fees on volumes of garbage and providing collection services of other recyclable materials such as electronics or municipal household hazardous waste.

As discussed in WPD13, Halton Region could implement a volume based levy system for multi-residential buildings serviced by Halton Region. This approach which is used by the City of Toronto incentivizes property management to invest in the necessary tools to increase participation in recycling and Green Cart programs in order to reduce the fees associated with waste disposal.

Major Assumptions:

- This option consists of an outreach team for multi-residential buildings, development of an enhanced MR Tool kit, a MR building database for performance monitoring and waste audits for measurement.
- An outreach team would consist of one Halton Region staff member, a MR building operations staff member and MR building volunteers (ideally 2 or more per building, depending on its size).
- Outreach would be carried out on a continual basis to address the large turnover of MR tenants and would target approximately 100 buildings annually.
- High level and visual waste audits for MR buildings would be carried out by the outreach team with results being maintained in a database to report progress over a year for each building targeted.
- There is a database for apartment buildings that is currently being transferred into a new platform.The building database would be maintained by the Region's outreach manager. Data should be kept current and in a useable format.
- Ongoing building data will monitor contamination issues, high garbage volumes, outreach efforts, waste audit monitoring, mitigation efforts, management interest, tenant interest, participation and performance report cards.
- Effective use of all diversion opportunities and programs currently existing in the Region would be targeted by outreach to low diversion performing buildings.
- An updated and improved Toolkit, potentially containing a tiered approach in terms of level of support needed by MR building, is to be developed by a third party marketing consultant and distributed to MR buildings with follow-up by the outreach team.
- In 2015, the Green Cart program continued to be implemented at multi residential locations. A total of 85 apartment buildings were on the program at the end of 2015 with additional buildings being added each week, including all new apartment buildings.
- This option is related to options C11 Track Waste Containers in Multi-residential Buildings and WDP 13 Pay As You Throw. Data through RFID tags by collection truck software would provide performance data for each building for progress monitoring and reporting and fees if PAYT is implemented in the future.
- Blue Box transition to EPR will likely impact the contamination threshold allowable for residential Blue Box recycling. Once the new regulation is enacted, accepted materials for recycling are anticipated to be standardized and contamination targets are expected to be decreased.

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Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	Multi-residential buildings typically have lower diversion performance than single family households. There is potential for increased diversion rates if an outreach program is implemented targeting low performing buildings identified by large garbage collection volumes. Enhanced outreach engages the building tenants and property management to participate more.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	There is no direct impact to air quality for MR diversion improvements. However a reduction in GHG would be achieved through increased organic waste volumes.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	2	Existing land would be optimized for increased diversion from MR participation.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impact to water or wastewater.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	No impact to groundwater or surface water.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	A managed Green Cart program provides containment of all organics in one bin as opposed to being mixed with garbage. Proper containment of organics in a Green Cart program can reduce the leakage of garbage bins and reduce the attraction of vermin to garbage bins and dumpsters on the property.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	A reduction in GHG would be achieved through increased organic waste volumes from MR building improvements. Green Cart programs divert organics from landfill disposal thus reducing methane production from the landfill.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	No additional energy required.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	The implementation of MR building recycling ambassadors is a proven success for the City of Toronto. The volunteer program provides training and acknowledgement to their ambassadors and provides them with materials for tenant outreach and education.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	No perceived risk to the community or public safety by implementing this option.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	By implementing improved MR recycling through best practices for identified low performance buildings, tenants will have increased convenience and awareness on how to reduce contamination and improve the diversion programs offered by their building. Best practices can enhance the recycling participation and convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Focusing efforts on MR buildings with low diversion rates is an increased benefit to those buildings. However it is a benefit to the community at large as well since the diversion rate of the Region improves if these targeted buildings diversion efforts are improved.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	2	Building tenants may be accepting of behaviour changes required for best practices due to the inherent environmental benefit. Other tenants may be opposed. Some tenants may not want to participate in the Green Cart program due to inconvenience of the Green Cart location which may be located outside for some buildings. Some may not participate due to the perceived "yuck" factor of Green Cart organics programs.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Implementation of improved diversion programs may allow for increased collaboration with the multi-family building community, building management and building volunteer programs to promote recycling and diversion.

Financial						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	Implementation and planning staffing costs are estimated at $34,000. Capital costs would include the design, production and printing of Toolkit material by a third party and completing the MR database upgrades for future ongoing monitoring ($45,000). Ongoing operational costs would include management of program, continued connection with outreach teams, completion of high level visual audits at MF buildings and an annual volunteer appreciation event (under $200,000) and capital costs would involve a third party to conduct visual waste audits, provision of in-unit containers/bags to deal with tenant turnover and printing of Toolkit materials ($18,000).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	With focused outreach to MR buildings, increased diversion can be achieved. There is a high probability of results if the outreach is implemented and maintained. There is low environmental risk or liability.

C 4 Enhance Opportunities for Reuse/Recycling of Construction & Demolition Waste

This option considers the following potential reuse and recycling opportunities for Construction & Demolition (C&D) materials that are currently being landfilled:

- Increased recycling of shingles.
- Promoting donation to non-governmental organizations that accept C&D materials.

Major Assumptions:

- The option evaluation was narrowed down to shingles recycling, as it is the most viable option at the time of evaluation, to be able to cost and evaluate a specific option.
- Previous discussions with the Region led to the focus on shingles recycling for this option.
- The cost estimate assumes that source-separated shingles will be collected in a new bunker with lock blocks at the Container Station at the HWMS, and will be collected/transported and processed off-site by a contractor.
- The shingles will be sent to a private facility for grinding and marketing of end product (assumed to be at an existing facility in London, ON).
- Staff time to review tonnages and results, arrange for a processor, update P&E materials and maintain the shingles pile are included as part of initial operating expenses.
- Ongoing operating costs include contractor fees, maintaining the shingles pile and updating P&E materials.
- Based on data from 2016, a total of 100 tonnes of shingles was assumed to be available to send to a contractor.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	From both residential and commercial customers the Region received less than 100 tonnes of roofing shingles. A total of 100 tonnes of shingles diverted was assumed in the evaluation. There is no information of the amount of shingles being disposed of as part of general construction waste. Residential garbage from single family households contains 3.5% construction material and multi residential garbage contains 2.9% construction material . There is no waste data available for C&D waste materials from the ICI sector. In 2016 about 68,000 tonnes were landfilled. The recycling of shingles is likely to have less than 1% waste diversion from landfill.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Processing will take place at contractor's facility. Minimal anticipated release of emissions from the drop-off of source-separated shingles at the HWMS.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	2	It is assumed that the shingles will be received at one of the Container Station bunkers. No additional space is required at the HWMS.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	No additional water / wastewater requirements.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Minimal impacts to groundwater and surface water are anticipated.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Traffic associated with receiving shingles at the HWMS and the contractor hauling material to their facility are anticipated to be minimal.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	The beneficial use of shingles is likely to offset GHG emissions resulting from diverting the material. The contractor grinds the shingles and mixes with recycled asphalt to make a road base product. Recycled product is used in parking lots, walking trails/paths, side roads, and driveways.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	Minimal additional energy requirements at the HWMS.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Undertaken by multiple communities across Canada, some in Ontario (e.g. City of Barrie)
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Minimal risk to the public by employing best management practices at the HWMS Container Station.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	No change in service for the residents. Roofing shingles are currently source separated and this initiative would not change anything from the customer's perspective.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	3	No specific changes to benefits to the community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Likely to be seen as a good diversion initiatives with few negative impacts to the community if the material can be diverted from landfill.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Option will increase collaboration with a contractor for grinding and marketing of end product. Benefits circular economy. Recycled product can be used in the Region.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	The estimated capital costs for constructing the drop-off bunker and printing P&E materials is approximately $26,000. Initial operating costs include staff time to review quantities, arrange processor, prepare and update P&E materials and operate the shingles pile. Primary annual operating costs will be contractor costs to collect and process material. The per tonne costs for collection and processing are estimated at $130 (approximately $13,000 annually). Total estimated initial costs are $30,000. Ongoing operating costs include contractor costs, staff to operate the shingles pile and ongoing P&E efforts (approximately $20,000).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	3	The success relies on the existence of end markets for the shingles. Finding end markets will be the responsibility of the contractor. It appears that stable markets exist based on discussions with TRY Recycling.

C5 Bulk Waste Diversion

This option looks at ways to modify the existing bulk waste collection to enhance the reuse and recycling of the collected materials. Potential approaches include:

- Increase reuse activity at the HWMS to divert furniture and household items in good condition through partnerships with non-profits organizations, such as Habitat for Humanity (also refer to option overview C4 Enhance Opportunities for Reuse/Recycling of C&D waste).
- Encourage residents to donate bulk items that are still in good condition to reuse stores.
- Research and monitor mattress recycling capacity in the GTA.
- Support the Province's Strategy for Waste-Free Ontario in the designation of bulk wastes (e.g., mattresses, carpet, and furniture).
- Implement a disposal ban on end-of-life mattresses and other bulk furniture, once local recycling capacity has been established.

Major Assumptions:

- The option involves the Region engaging a social enterprise to collect mattresses from the HWMS, haul and process (recycle) the mattresses at a remote site managed by the social enterprise.
- The Region provides approximately 25% in funding the social enterprises operating costs on an annual basis.
- The collection will accept and recover used mattresses collected via the bulky collection and dropped off directly at the HWMS.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	Mattresses make up 8% of the bulky materials collected from households. In 2011 a total of 3,740 bulky items were collected. We estimate that mattresses would make up 299 of these with a total weight of 163 tonnes. This is less than 1% of the landfilled waste in 2016 (68,000 tonnes). Each mattress is assumed to weigh 54.4 kg (Source: CalRecycle, Mattress and Box Spring Case Study - The Potential Impacts of Extended Producer Responsibility in California on Global Greenhouse Gas (GHG) Emissions, prepared by Geyer et al., University of California at Santa Barbara for Cal Recycle, 2012).
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	No release if the enterprise disassembles the mattresses inside a facility.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	1	Mattresses would only need to be stored for the social enterprise to pick up. Available space is assumed at existing transfer stations that currently accept Bulky Waste Collection items prior to disposal. The drop-off is assumed to have the footprint of a 55 cubic yard roll off bin. Its dimensions are 22' (length) x 8' (width) x 101" in height.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	No water is required for the recycling of mattresses.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	No impact is anticipated on ground-or surface water from the dismantling of mattresses.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	1	No impact assuming the-social enterprise operates in a facility with adequate measures to minimize nuisances.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	The recycling of mattresses is estimated to save 2.2 GHGs in kg CO2E/tonne mattresses (Source: CalRecycle, Mattress and Box Spring Case Study - The Potential Impacts of Extended Producer Responsibility in California on Global Greenhouse Gas (GHG) Emissions, Table 9, 2012).
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	The recycling of mattresses is estimated to save 27.2 GJ/tonne mattresses (Source: CalRecycle, Mattress and Box Spring Case Study - The Potential Impacts of Extended Producer Responsibility in California on Global Greenhouse Gas (GHG) Emissions, Table 9, 2012). Energy production gains are likely to result from recycling and energy recovery from non-recyclable materials.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Mattress recycling is successfully undertaken in many municipalities in Canada.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Small risks from mattress recycling as long as the social enterprise operates at a facility with the adequate measures in place to manage fire risks.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Since the bulk waste collection is already provided, the recycling of the collected mattresses will not increase accessibility or influence the perception of convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Recycling of the collected mattresses benefits the community based on GHG reductions and the support of a circular economy.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Mattress recycling is often seen as positive since it diverts waste from landfill and creates local jobs.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Potential for non-profit organizations to take on the mattress recycling and support a more circular economy.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	3	Capital and operating costs for the printing of communication material and construction of the bunker plus the initial planning and implementation of the new material collection are estimated to be $60,000. Waste diversion fund to support the operating costs of the social enterprise to be 25% of total cost (or $250,000) annually. Ongoing operating costs are $18,000 plus $250,000 in funding. There are no anticipated ongoing capital costs.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Mattresses are difficult to manage at a landfill and due to their bulky nature. The recycling of mattresses can save GHG emissions and create jobs. There is liability if the contractor does not address fire safety at the mattress dismantling site.

C6 Automated Collection

This option explores the experiences of multiple jurisdictions that have converted to automated cart collection for waste and recycling services. This option also explores some costing considerations as well as experienced benefits and issues surrounding the strategy.

Major Assumptions:
- The option consists of conducting a feasibility study of moving to automated collection and provision of carts prior to the preparing the next waste collection contract and once changes to the Blue Box Program are understood and/or implemented. The study would look at impacts for all streams using automated carts.
- Potential for this option to be impacted by the new Blue Box Program Plan (anticipated to be released in January 2021) with potential direction on who will be responsible for the Blue Box program. Halton Region is anticipated to transition in 2025, in alignment with the collection contract dates.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	Focus is on waste collection study. No significant change in waste reduction/diversion is expected.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	No impact as option is conducting a study.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	1	Focus is on residential waste collection study. No changes to current land requirements are associated with this option.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	Focus is on residential waste collection study. No water/wastewater impacts are expected.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Focus is on residential waste collection study. No potential release of contaminants to groundwater and/or surface is expected.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	Focus is on residential waste collection study. No impact is expected.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	Focus is on residential waste collection study. No impact is expected.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	Focus is on residential waste collection study. No impact is expected.

Social						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Carrying out studies prior to making major changes to waste collection programs is a best practice.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Conducting a study will have no impact to the community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Conducting a study will have no impact to the accessibility and convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	3	Conducting a study will have no change to benefits to the community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Conducting a study prior to implementing a major change will be an accepted approach by the community.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No potential for collaboration is anticipated.

Financial						
Question	Criteria	Rank	**Weight**	**KPI**	**Score**	**Rationale**
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	The study is estimated to cost $50,000. The study is anticipated to consider financial impacts such as labour costs, collection route efficiency and capital costs (e.g., carts).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/HH	2	There is no anticipated cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Low environmental risks and liability is anticipated with this collection study.

C 7 Smart City Technology

The “Smart City” approach uses technology and creative approaches to move cities towards sustainable living and economic development. The University of Waterloo’s Smart Cities Initiative defines a Smart City as one that “uses technology and data to improve livability and opportunities for the city and its people.”1 This new way of thinking is starting to be used to help improve waste diversion. The Smart City concept combines forward thinking urban design and new digital technology to create sustainable communities.

This option looks at researching possible designs and technologies to determine the feasibility of implementation and how to foster the development of Smart City design to support multi-residential waste diversion in Halton Region.

Major Assumptions:
- All newly constructed multi-residential buildings will be constructed with 3-chute systems and technology that tracks the amount of waste generated by each tenant thus allowing for a weight based charging system to be implemented. Smart cards are used to track weight.
- Where multiple complexes are located close by, then the material can travel through an underground tube system to a centralized collection centre thus removing collection trucks from the streets which would reduce nuisances associated with organics and recyclables stored in bins outside the multi-residential buildings.
- The data collected will help staff monitor the amount, type of waste and frequency with which the residents use the chute system and can use the information to focus P&E campaigns and assistance to multi-residential buildings that need help.
- The waste statistics can be made available to residents with potential incentives built in to high performing residents
- The evaluation provides rationale to the smart city concept however, the first recommended step is to conduct a tour of City of Quebec Envac system and feasibility study.
- The evaluation score is based on this first step however, commentary on the technology and approach is provided in italics.
- The Smart City technology may support the Region in meeting the performance expectations of the new Blue Box regulations which is anticipated to be released by the end of 2020.
- Anticipate partnering with the Region's Information Technology department.

Environmental						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	The initial step to conduct a tour and feasibility study will not have an impact on diversion. The smart city technology offers a convenient way for residents in multi-residential buildings to participate in waste diversion programs by making waste diversion as convenient as garbage disposal for multi-residential buildings with chute systems for garbage. This convenience factor is expected to result in significantly greater participation and capture rates for Blue Box recyclables and Green Cart organic materials helping theses multi-residential buildings achieve waste diversion rates similar to the single family sector. It should be noted that less than 40% of multi-residential buildings receiving Halton Region waste services are reported to have chutes. With a projected 55% growth in multi residential units in the future, ensuring that waste diversion remains as convenient as garbage disposal will be critical to achieving Halton Region's waste diversion goals.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Minimal to no release of emissions to the atmosphere with the initial tour and study. The smart technology should not significantly increase emissions.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	3	No additional land required. Central collection centre would be required but it is assumed that this would be factored into planning and design of new multi-residential buildings.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impact to water/wastewater systems. This system is not expected to impact water/wastewater systems.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	No potential release to groundwater and/or surface water. Minimal impact on groundwater or surface water expected.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Study and tour only - no nuisance impacts. The smart technology could reduce nuisances associated with organics and recyclables stored in bins outside the multi-residential buildings. This assumes that the collection system is conducted using underground tubes that takes the materials to a centralized collection facility.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	2	No change to GHG emissions. Depending on the smart technology, an underground vacuum system would eliminate the need for collection vehicles to collect from multi-residential buildings resulting in a reduction in GHG emissions - this applies to new multi-residential complexes. Other smart technology should have nominal GHG benefits.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	An underground vacuum system could result in a net increase in energy consumption for the new multi-residential complexes that have installed the system. Other smart technology should have nominal impacts on energy consumption.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Feasibility studies on this concept has been completed. Most smart technology identified has not been demonstrated in a multi-residential setting in North America. It has been successfully demonstrated in European and Asian communities.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	No risk to public or community safety. Depends on the smart technology. An underground vacuum system would eliminate the need for collection vehicles to collect from multi-residential buildings resulting in improved community and public safety; however, this would only apply to new multi-residential complexes that have installed the system. Other smart technology should have nominal impacts on community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Not applicable. Smart technology is meant to increase convenience and accessibility to services. Underground waste collection systems and coloured bag systems could improve access and convenience to waste diversion services.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	3	Not applicable. Underground waste collection systems and coloured bag system can increase the benefits to those living in multi-residential buildings with the system in place.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	2	Conducting tours and a feasibility is a good first step considering the potential capital investments the option would have if implemented. The underground waste collection system is a very expensive option and should incur public opposition if taxpayers are expected to pay for the system; however, the concept of making waste diversion as convenient as garbage disposal should be well accepted and endorsed by the community.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No change in collaboration anticipated. Public/private partnership opportunity is anticipated.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	It is proposed that staff would begin with a tour of the City of Quebec's La Cité Verte project and the City of Montreal's downtown Entertainment project following by the completion of a feasibility study (total cost $50,000) In 2004, an Envac system was costed for Toronto's redesigned/rebuilt Regent Park neigbourhood. It was estimated that the central vacuum waste collection system for Regent Park would incur $18 million in capital cost ($23 million in 2019 $) with an annual operating cost of $300,000/year ($400,000 in 2019 $). Other proposals (Toronto Sidewalk Labs, Montreal's Entertainment District and City of Quebec's La Cite Verte project range is estimated cost from $6 million to $10 million) with Toronto Sidewalk Labs estimated at $10 million (for two areas), City of Quebec's La Cité Verte project estimated at $5.6 million (in 2019 $) and the City of Montreal's downtown Entertainment project estimated at ($9.2 million in 2019 $)
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	There is no potential increase in cost to household to explore this technology further.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Little risk of liability or environmental issues anticipated for a feasibility study of potential Smart City technology implementations. Results may vary for implementation of an underground waste collection system.

References:

https://www.smartcitiesdive.com/

C10 Expand Existing Collection Services

This option looks at reviewing and assessing if there are other curbside collection programs that the Region could provide (e.g. textile recycling, batteries, small household metals).

Major Assumptions:
- This option initially focuses on the curbside collection of textiles which will be added to the contractors collection contract (2025).
- Anticipate additional resources will likely be required to collect this new material stream to the curbside collection program.
- Textiles will be handled by a third party organization / charity who will be responsible for the end marketing of the collected textiles.
- Collection services would be provided to single-family homes in Urban areas as a pilot program.
- Community partners / charities could assist in rural and less densified areas through use of collection outlets (included as part of Option C1).
- Other potential future materials to be collected curbside include battery collection, electronic waste, carpet and mattresses.
- The province may designate additional materials through EPR. The Blue Box regulations are anticipated to be released by the end of 2020.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	Recycling Council of Ontario states that the average resident generates 37 kg per year of textile waste. 2017 single family audits in the Region estimates 14 kg of textile waste set out per household per year.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Textile collection would require one additional fully routed truck to service the projected volumes as above. Minimal release of emissions to the atmosphere.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	3	Assumed that collected textiles are taken to organizations / charities for processing and shipment to markets. No additional land is required.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	No anticipated impact to water / wastewater requirements.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	No anticipated impact to groundwater and surface water.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	One additional collection vehicle per month is anticipated to cause minimal changes to potential nuisance impacts.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	3	With one additional truck on collection routes each month, there will be nominal increase in GHG emissions.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	3	Minimal additional energy required with the addition of one additional collection vehicle per route per month.

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	Textile recycling at the curbside has been implemented in some jurisdictions.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	The addition of one collection vehicle per route per month would cause minimal potential change to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Provision of new curbside collection program will increase accessibility and convenience to all single family households.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	It is anticipated that all single family residents would be able to effectively participate in a curbside textile recycling program.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Option would provide an increase level of service and therefore the community is anticipated to be accepting.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Partnership with textile recyclers and potentially charitable organizations is anticipated.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$250,000	2	Estimate the annual operating cost for collection resources $250,000 per year. This cost may be reflected to some degree in the next collection contract.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	No expectations of any change of liability or environmental issues.

C11 Track Waste Containers in Multi-Residential Buildings

Halton Region is able to capture the useful information for the MF residential buildings using the RFID associated with each collection cart. All the bins currently have RFID tags installed. However the RFID tags are not used to their potential in data collection or assessment. Current front-end collection trucks do however have on-board scales. A contract change would have to be implemented for this initiative. Current contracts expire in 2024.

Major Assumptions:
- RFID tags are currently installed on all multi residential (MR) wheeled carts for organics and recycling and front end bins for garbage and recycling in the Region.
- Front end collection vehicles can weigh and identify the location of carts. The onboard weigh scales are assumed to meet Canada Weights and Measures requirements.
- This option is based on the effort involved to review and set up the system, communicate with collection drivers, use of the software, development of a reporting tempate, P&E materials and analysis of results.
- Tracking MR containers can help target and monitor low performing buildings which will need support when the Blue Box program transitions to EPR and will expect lower contamination rates.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	No example of recorded diversion from weight based user pay system, however a volume based user pay system put in place in Toronto resulted in an increase of 2% in diversion the first year and then an additional 2% diversion year 2 (Renee Dello, Waste Management Planning, City of Toronto, information obtained May 7, 2019). Based on tonnages collected from MR customers, the overall waste diversion potential is <1 %. See calculations in the Cost Spreadsheet.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	This initiative has no impact on air quality.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	1	The existing asset would be optimized.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	This initiative has no impact on water/wastewater.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	This initiative has no impact on ground or surface water
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	1	This initiative causes no additional nuisances.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	No anticipated GHG reduction is assumed.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	No energy production is involved.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	In Ontario the use of weight based charging systems is still being piloted and is not used for trade. Peel Region stated that it is difficult to get scales that are certified for trade. Peter Kalogerakos, Peel Region (May 13, 2019) communicated that although weight-based fees are probably more equitable than a volume-based system - because our costs are per tonne - there are no onboard scales that are certified to provide measurements that can be used for financial transaction . There are other examples of Ontario has volume based charging system. The collector, Bluewater, reports (May 7, 2019) potential issues with the accuracy of weighing if collection bins are exposed to rain/ snow.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	The initiative has no impact on safety
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	The customer would see no change from this initiative.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Pay as you throw systems (user pay) makes the polluter pay and this has increased benefits to the broad community since the overall costs to all customers can be kept lower.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	Toronto lost a substantial number of customers (around 700 buildings) when it first introduced the volume based user pay program.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	The change would not increase collaboration. It would be done through an existing collection contractor.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	Operational costs include staff time to implement and analyse RFID data, communications and messaging to MR residents and MR management, and maintaining the license and software for RFID data. The total initial operating costs are $22,000. Initial capital costs include purchasing the software and printing communications material is $17,000. Ongoing costs for software and staff time to analyse and prepare reports is estimated at $100,000.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Based on information from Bluewater Recycling Association (May 2019), scales on Front End trucks are prone to failure. They are typically used to get a rough idea on the weight of the waste from week to week to make sure the commercial account is paying the right per lift fee to reflect their waste generation. In the case of recyclables, the bin itself often weighs more than the contents. The weigh is seriously affected by precipitation (rain or snow).

C 13 Extend Curbside Yard Waste Collection

This option looks at extending yard waste collection all year. It is acknowledged that the length of the LYW collection season is related to the length of the growing season and weather which will vary year to year and as such are looking at efficiencies of altering the collection service to all year. The Region would continue with dedicated LYW collection trucks during peak collection times and at other low volume times of the year, LYW could be collected by the Green Cart collection vehicle. This will increase the level of service to residents and will be easier to communicate to residents. It should have a minimal impact to the Green Cart collection and processing contracts.

Major Assumptions:
- Option proposes to keep bi-weekly yard waste collection during peak season (April through November) and add one collection day per month during off-peak season (December - March). This helps for communication and promotion via waste collection calendar which is printed on an annual basis.
- Would require renegotiation of LYW collection contract (contract ends 2024) and it is expected to have minimal cost impacts on new collection contract to add three more collections during the off-peak season.
- No changes to the Christmas tree collection program.
- 71% of LYW processed at compost pad come from curbside collection.
- Region to explore option of topping up Green Cart with LYW during off-peak season (and remove off-peak collection) which would require discussions with processor(s) regarding the increase in incoming LYW (tied to Options P1 and P2). It is noted that the Region's current contract price to process Green Cart materials is about $74 per tonne and the cost to process Green Cart materials mixed with LYW is almost $92 per tonne. The Region receives approximately 30 tonnes of LYW during the off-peak season at the Container Station.

Environmental						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	LYW accounted for almost 27,000 tonnes in 2016 which is approximately 13% of the total waste generated in the Region. Of those 27,000 tonnes generated, approximately 18,000 or 71% were collected curbside. The amount of non-private LYW brought to the container station was less than 2% of the LYW generated in the Region. Adding additional LYW collection days will increase the tonnes collected but not it is not expected to cause a significant increase in diversion.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	This option is assuming four extra days of leaf and yard waste collection in the year for single family households. Minimal release of emissions to atmosphere are anticipated.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	1	Additional quantities of LYW is anticipated to be processed at existing site (HWMS).
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impact to water/wastewater systems anticipated.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Continued operating practices at the leaf and yard compost pad anticipated and therefore minimal potential for release of contaminants to groundwater and surface water are anticipated.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	1	Minimal to no changes to potential nuisances given additional LYW will be collected with Green Cart.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	Adding curbside collection of LYW in the non-peak season is anticipated to reduce residential traffic at the HWMS.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	No changes to energy production are anticipated.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Several cities have extended LYW collection such as: City of Barrie, ON, City of Hamilton, ON, City of Winnipeg, MB, City of Robbinsdale, Minnesota.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Extending LYW collection all year will have minimal to no potential change to community and public safety
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Increasing level of service for LYW collection which will increase accessibility and convenience to single family households.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Extending LYW collection all year will increase the level of service to all residents and will benefit single family households.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Extending LYW will be encouraged by the broader community since it is an increase in level of service.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	This option looks at extending collection all year. Changes to collaborations are not anticipated.

Financial						
Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	Region's cost to make initial changes to LYW collection is anticipated to be $5,000 for LYW calendar updates and collection contract management. It is anticipated that there will be minimal ongoing costs to maintain this program. The Region currently collects LYW biweekly for 8 months (April to November), which equals 18 collection days. The addition of an extra collection day for 4 months during off-peak season (December - March) will have small impact on overall collection contract and are not accounted for in the option cost estimate. It is noted that should the Region decide to allow residents to top up their Green Carts with LYW during the off-peak season, the additional processing cost would be under $3,000.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal to no additional cost increase anticipated.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	No anticipated high risks as option looks to expand existing and well-established collection program.

C 14 Review Current Non-Residential Customer Base
This option looks at other programs and policies associated with providing collection services to non-residential customers to help the Region address the non-residential customer base, especially those that were grandfathered in from previous local municipality agreements. Selected customers may include non-residential commercial establishments located within new multi-residential buildings. This option also considers the use of a Pay-As-You-Throw fee structure to the non-residential customers.
Major Assumptions: - This option evaluates the completion of a study and a by-law amendment. - A study will be completed to identify municipal collection best practices, fee structure, by-law best practices, amended guidelines for collection and impact to current and future collection contracts for the IC&I sector. - Based on the study's recommendation, an update to the By-law and waste collection guidelines will be conducted to include the commercial customers going forward (noting that the current by-law specifies office-type waste for the non-residential sector). - This evaluation is focused on the eight grandfathered BIA's (Business Improvement Areas) before the municipalities amalgamated into the Region of Halton and the 900 IC&I customers that will receive 3-stream collection services. These customers currently have black and blue wheeled carts and it is anticipated that each customers (i.e., 900) would be provided with new Green Carts. - There would be no option for a customer to opt out of recycling and/or organics Regional collection. - WDP 9 and WDP 13 look at proposed funding models and a Pay-as-you-throw fee structure, respectively for this sector. - The fees and garbage tag total cost to the ICI customer would have to be competitive with private hauler charges for the same services. - Note that currently Halton Region residential garbage bag tags are available for purchase (sold in packs of five for $10) at municipal outlets such as the HWMS, community centres, libraries, town halls, as well as in retail outlets, and online. The City of Toronto offers a flat fee via annual utility billing for recycling and organics collection ($287.74 per year) and customers must purchase their own garbage bag tags (5 tags for $26.90) for collection service. - The defined fee based program could potentially be used to offer waste collection services to more non-residential customers (not included in this option). -The Blue Box new regulations will impact the quality of Blue Box material accepted for recycling. If IC&I collection is mixed with residential then there will be a need for mitigating Blue Box contamination.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	Successful programs in San Jose, CA (that include organics) have nearly tripled the recycling rate of commercial customers. With the inclusion of SSO collection, it is assumed waste diversion rates would increase by more than 5%.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Minimal impacts to air quality are anticipated as option continues provision of waste collection with the addition of Green Cart organics.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	3	Minimal additional space required as similar amounts of waste will be generated but stored in new Green Cart.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Impacts on water/wastewater requirements are not anticipated.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Impacts on groundwater and surface water are not anticipated.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	There will likely be another vehicle for organics collection required per route, but it is not anticipated that this will have a significant impact on nuisances.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	2	No anticipated changes to GHG emissions. The GHG decrease due to additional diversion of organics from the ICI grandfathered customers will balance out the added vehicle emissions.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	The Region's energy requirements would be similar to current consumption. Energy for ICI grandfathered customers will be included in the collection contractor's bid.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Many cities have proven success with non-residential customers. A couple of examples include: - City of Toronto - Provides collection to 19,000 small commercial customers. Customers pay a $287.74 flat fee, annually for recycling and organics collection which are unlimited which incentivises these programs. Garbage fees are paid through bag tags. - City of San Jose, CA - Collection process for non-residential clients has tripled the recycling rate since 2012 (from less than 25% to over 70%).
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	No anticipated changes to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	Enhancing the existing program to include organics and potentially change to pay-as-you-throw will increase accessibility and convenience to some customers.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Will increase the level of service to these non-residential customers and allow them to have more waste diversion options with the added organics collection.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Since the existing non-residential customers already participate in waste diversion programs it is assumed there will be acceptance for the addition of organics diversion.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No anticipated changes to collaboration and partnering.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	The initial costs involve Region staff management and support of a third party study to be completed on recommended approaches to service existing non-residential customers ($100,000).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal increase in cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Option relates to change in how customer receives collection service. Little risk of liability or environmental issues.

References:

Collection data from WDO 2016 households served: 150,000 Single-family, 40,000 Multi-family and 170 ICI (Ref: Guelph Service Review summary)
ICI is currently 0.06% of total stops
Bag tags cost 7 cents each (Ref: https://www.theatlantic.com/magazine/archive/2015/07/future-of-trash/395279/)
See Option WDP13 Pay as You Throw for residential references.

Notes:

There are 8 BIA's in the Region. The contractor charges a flat rate per BIA.
The Region does not know how many customers are located in each BIA.
There are 900 ICI customers that receive the Black and Blue Cart collection from the Region

C15 Fuel Options for Waste Management Vehicles

This option looks at reviewing and assessing requirement considerations for the use of alternative fuels (e.g. Compressed Natural Gas - CNG, electric vehicles etc.) for waste collection vehicles and onsite equipment.

Major Assumptions:
- Option considers approach to encourage contractors to use alternative fuels (such as CNG, electric, hybrid vehicles) for single-family waste collection vehicles.
- Staff will retain a third party to assist in developing terms and conditions in the next collection contract whereby contractors can demonstrate how their fleet can be run using the best available alternative fuels.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	No change anticipated to current waste volumes as option relates to development of a collection RFP with options for alternative fuels.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	No change anticipated to air quality as option relates to development of a collection RFP.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	3	No land requirements for the development of the RFP.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impacts anticipated noting that the option is for the development of an RFP.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	No impacts anticipated noting that the option is for the development of an RFP.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	1	No nuisance impacts anticipated for the development of the RFP.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	1	No impacts anticipated noting that the option is for the development of an RFP.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	Energy requirements would be equivalent to current consumption.

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Development of RFPs for waste collection contracts where contractors are encouraged to be innovative in responding to the client's need is a proven approach.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	No anticipated change to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Option focuses on the development of the RFP. No change anticipated to accessibility and convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	The RFP development would benefit the Region overall in terms of waste collection.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	RFP development that improves the impacts on the environment are anticipated to be encouraged by the community.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No change anticipated to collaboration opportunities.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	1	Capital costs ($40,000) include a third party to assist in developing technical terms and conditions in the Terms of Reference for the next collection contract based on best practices that promote the use of the best available alternative fuels. Staff time to manage and provide support for the project is estimated at $10,000. The financial implications can only be truly realized following the competitive bidding process.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/HH	2	No additional costs anticipated.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Development of the waste collection RFP is anticipated to have high probability of expected result. Little risk to the Region in terms of liability or environmental issues.

DT 6 Additional Waste Depot Option(s) for residents

A public drop-off container station located at the Halton Waste Management Site (HWMS) in Milton provides a centrally located and convenient one stop location for recycling and proper waste disposal for Halton residents. However, the HWMS is not accessible to the entire Region and with greater population densities in the southern part of the Region there is a need to consider expanding access to such a depot(s) that reduces the distance some residents have to travel. This options looks at two alternatives that include:

- Providing three additional permanent and staffed collection depots in each local municipality (City of Burlington, Town of Oakville and Town of Halton Hills).
- Providing one additional permanent and staffed collection depot.

For either option, the additional depot(s) should be similar to the public drop-off container station and must have the capacity to accept materials from residents including excess curbside materials (recyclables and leaf and yard waste) and non-curbside waste (e.g., household hazardous waste).

Major Assumptions:

- This assumes two additional depots to service the southern and east Regions to improve service levels in Burlington and Oakville. The specific location is not known. Approximately 3.5 ha is required for each depot. Region staff provided the estimated cost per hectare.
- Costs, hauling, contracts and staffing assumptions are based on Halton's experience with the existing HWMS. Costs were developed at a high-level and are not intended to be site specific.
- Costs provided include: land acquisition, depot infrastructure, hauling contracts, wood chipping, HHW contract, misc. contracts, staffing and corporate chargebacks.
- The services include public drop-off for recyclables, a HHW drop-off area, a re-use facility, a drop-off area for leaf and yard waste and a blue box and green cart distribution area.
- The new Blue Box Program Plan may dictate a "basket of goods" for the province. It may require that some materials be accepted only at depots eg., glass, styrofoam and film to preserve the quality and recyclability of Blue Box materials collected.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	The existing curbside collection already services the majority of residents. An additional depot would only improve the accessibility to collection services for non-curbside recyclable materials, such as extra yard waste (quantities not collected at curb), household special waste, electronics, C&D waste and textiles. The 2017 waste audit these materials currently make up approximately 10.5% of SF garbage and 7.0% of MF waste. The majority of waste managed by Halton is residential waste. There is no waste audit data for ICI waste. A conservative assessment of the waste reduction/diversion potential is likely between 2 to 5 % due to the lack of regional control of ICI waste.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Driving distances will be shortened for residents who previously travelled to the HWMS.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	4	There is not a suitable Halton-owned site available for an additional depot. Based on area needs from similar facilities in Peel Region's, site requirements will range from 3.29 hectares (Fewster depot with a LYW transfer station onsite, queuing space and designed in such a way that it can have special events on for residents without interfering with other operations) to the largest depot of 19.9 hectares (Caledon Community Recycling Centre, which includes a yard waste processing and transfer site). We have assumed a space requirements of 3.29 hectares.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Depots typically have low water and wastewater requirements.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Depots do not discharge contamination to groundwater or surface water assuming the site is operated in accordance to best management practices.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	3	A depot will increase traffic and potentially noise levels. These can be mitigated through design and operations.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	Anticipated reduction in GHG emissions associated with shortened driving distances for residents who previously used the HWMS.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	2	Anticipated minimal to no energy required to operate depot.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Increased accessibility to depot services has been proven to increase waste diversion.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Minimal changes to community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	An additional depot will increase accessibility and convenience for residents to manage non-curbside collection waste.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Increased benefits mainly for residents and waste generators in the proximity of the new depot.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Option assumed to be accepted assuming that the depot siting is minimizing impacts on residential areas and residents appreciate having a closer location to drop-off non-curbside collected waste.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Opportunity for collaboration between the Region, an operator and potentially not for-profit organizations that can enhance services at the depot (reuse it/ share shed).

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	The capital costs to construct and acquire land within the Region are estimated at approximately $20 million for each depot based on constructon costs from similar facilities in the GTA of a footprint and services and the Region's estimated land acquisition costs. The estimated cost to conduct a site selection study is $100,000. Based on information relating to annual operational costs from the HWMS Depot and anticipated traffic flow through the three depots (two new plus HWMS), the operational costs are estimated at $2 million per year for each depot.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	4	The option is anticipated to cost taxpayers an additional $12 per household annually.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Operating a brand new facility may have some new risks to both safety and environmental.

DT 7 Optimize Use of the HWMS

The Halton Waste Management Site (HWMS) is located at 5400 Regional Road 25 in the Town of Milton, between Britannia Road and Lower Baseline Road. The site is approximately 126 ha in size, 53 ha of which is approved for landfilling [1]. The Region has purchased land around the permitted site as a buffer from other land uses, including a 200 acre parcel to the south and the Region will continue to look at purchasing buffer lands. The HWMS is serviced with hydro-electricity, municipal water and sanitary sewer systems. There are also weigh scales, a scalehouse, a landfilling area, a public container station, a household hazardous waste depot, a re-use facility; a transfer station, a leaf and yard waste processing facility, brick and rubble/bulk brush pad and a wood processing pad at the site. There are administration, maintenance and storage buildings on the site, as well as a stormwater management system and a landfill gas utilization plant. Residents can receive and/or replace Blue Boxes, Green Carts, Orange Boxes and/or backyard composters at the HWMS as well.

This option looks at the following opportunities to optimize the use of the available and unused lands available within and/or on adjacent owned lands surrounding the HWMS:

- Maintain the unused land as additional buffer area due to residential housing along Britannia Road.
- Continue to monitor and consider purchasing surrounding land as it becomes available
- Consider constructing an Education Centre
- Designate land for future landfill development, waste management functions and services
- Consider green alternative energy technologies or other temporary use on land currently not in use until it is required for waste management functions

The HWMS Optimization Study that was completed as part of the Short Term Strategy should be reviewed in five years to determine the effectiveness of the infrastructure and services that will be implemented and to further develop the Long Term initiatives that were mentioned in the study and that are recommended as part of this option.

Major Assumptions:
- Construct a 4,000 square foot prefabricated building for use as an education centre onsite.
- Education center will include: private offices, a conference room and staff facilities, education space to enlighten visitors on best practices in waste management.
- Place solar panels on 50% of the south buffer lands and the roof of the Maintenance Building which would have the potential to generate 25 MW (estimated area is 100 acres).
- Solar photovoltaic system to meet 71.5 kWh/m2 as required by the New Building Institute's Zero Net Energy criteria to provide power to new buildings.
- Construct a new and combined HHW and Reuse Depot of about 1,600 square feet to accommodate the HHW, reuse depot, green and blue carts distribution.

Environmental

Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	Green technologies (e.g., solar panels) will not have any impact on the amount of waste to be disposed. The Education Center might have a nominal impact on the waste reduction/diversion rate in the medium / long term by increasing public knowledge on proper ways of recycling material and method of generating less household waste.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	1	Education Centre and green technologies (e.g., solar panels) will have minimal release of emissions to the atmosphere.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	1	Green technologies (e.g., solar panels) will require no additional land since they can be placed on buffer lands located along the south and west boundaries and also on the Administration Building rooftop. The Education Center can be placed on the buffer lands owned by the Region.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Education Centre and green technologies (e.g., solar panels) will have minimal impact to Region's water/wastewater systems.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	Education Centre and green technologies (e.g., solar panels) will have minimal impact on groundwater and surface water quality.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Green technologies (e.g., solar panels) will cause minimal change to nuisance but the Education Center will slightly increase the traffic at the HWMS.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	Green technologies (e.g., solar panels) are anticipated to reduce GHG emissions.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	Green technologies (e.g., solar panels) will lead to a net gain of energy and the Education Centre will slightly increase the energy consumption at the HWMS.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Both Education Centre and green technologies (e.g., solar panels) have been tried at other waste facilities and have been successful.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Education Centre and green technologies (e.g., solar panels) will have no impact on community and public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Education Centre and green technologies (e.g., solar panels) will have no impact on accessibility and convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Green technologies (e.g., solar panels) will benefit parts of the community and the Education Centre will benefit visitors that come to the HWMS.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	The public will likely be accepting the implementation of green technologies and the establishment of an Education Centre at the site.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Education Centre will increase the collaboration among communities and institutional agencies such as schools, colleges and universities. Green technologies (e.g., solar panels) will increase the collaboration with utility companies (e.,g . Oakville Hydro, Milton Hydro, Enbridge Gas).

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	Capital cost for the construction of an Education Centre is estimated at $1.8M based on a 4,000 sq-ft. building. Estimated solar panels supply and installation costs are approximately $100 M based on $4/watt assuming an area of 100 acres (4 acres produce 1 MW). Some of the capital costs for green technologies can be offset by having an agreement with an utility company and acquiring federal government grants. The new HHW and Reuse Building estimated cost over $2M. Ongoing operation costs for HHW, transfer station and new staff for the education centre is estimated to be under $2M.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	3	Some of the ongoing operational costs for the solar panels may be offset by revenue receiving through utility agreements.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	These options will have low liability risk or environmental issues.

DT 8 Transfer Station for Curbside Collection Trucks

This option looks at having all curbside collection trucks deposit Blue Box and Green Cart material at an expanded Transfer Station located at the HWMS or the optimum mix of private transfer station and Region owned transfer station capacity in the system. A feasibility study will be conducted to determine the optimum transfer station capacity and location.

Major Assumptions:
- A new Transfer Station is constructed at the HWMS site along the southeast area.
- The HWMS ECA will be amended.
- The current Interim Transfer Station is approved to receive 52,000 tonnes per year within a 905 m2 footprint building.
- The needs assessment estimated by 2033 that quantities collected from single family houses, Blue Box (BB) recyclables will be about 70,000 tonnes and Green Cart (GC) organics to be around 80,000 tonnes for a total of 150,000 tonnes per year. Based on 2017 waste audit data, BB capture rate is 85% (72,250 tonnes) and GC capture rate is 60% (48,000 tonnes) for a total of 120,250 tonnes to be generated by 2033.
- It is proposed the new facility will be capable of handling 120,300 tonnes per year of BB and GC material which will require a building with a footprint of about 2,400 m2, assuming a 50 T/m2 which is representative of similar type of facilities.
- A draft version of the new Blue Box Program Plan suggested a regional collection and processing approach to support a provincial economy of scale. Until the final plan is released (anticipated in Jan 2021), the need for a transfer station to handle BB recyclables is unknown.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	The transfer station serves as an integral component in the Region's waste management system and achievement of diversion goals.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Increase emissions associated to traffic in/out of the expanded transfer station.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	2	The new Transfer Station can be located at the HWMS within the land available along the south side.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	2	The relocation and expansion of the ITS will likely impact water/wastewater systems depending on the location and size.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Minimal impact on groundwater and surface water quantity.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	It will have a minimal impact on the truck traffic.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	Transfer station relocation will have minimal impact on GHG emissions.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	Transfer station relocation will have minimal impact on energy consumption.

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	The expansion of the transfer station is a common practice by municipalities and private disposal companies to gain additional waste processing capacity.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	1	The expansion and relocation of the ITS will likely benefit the community by allowing separate access roads for commercial and residential traffic.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	1	The new location of the ITS will take into considering the accessibility and convenience for commercial trucks and minimize disruptions for residential vehicles accessing the site.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	3	Benefits to the community will no change since the new ITS will remain at the current site.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Opposition is not anticipated for the relocation and construction of a new transfer station within the current site.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	The Region might look into having a private company collaborating with the expansion and operation of the expanded transfer station however, minimal change in collaboration than what is currently in place.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	The capital cost for a new TS including approvals and engineering fees is estimated to be about $14M. Ongoing operating costs associated with a private sector company operating the transfer station plus haulage to processing facilities (approximately $800,000 per year).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	3	Ongoing operational costs are anticipated to cost taxpayers an additional $3.50 annually.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Low risk of liability or environmental issues if the transfer station is relocated within the current site.

P 1 Service Delivery Approaches
The Region currently uses a mix of delivery approaches for the different waste management services. The Region owns the HWMS, but contracts out the majority of services aside from some services related to maintenance and landfill operations. Waste collection and processing services are contracted to private companies. This option looks at service delivery approaches for source separated organics (SSO), Leaf and Yard Waste (LYW) and Blue Box recycling processing and the use of private sector transfer stations. Potential approaches include: • Delivering services in-house with the facilities owned by the Region; • Contracting out services; or • Using a mix of service delivery approaches (as they are currently). The option reviews infrastructure risks (e.g., impact of losing private sector infrastructure). Option P2 considers looking at alternative technologies for organic waste processing. This option considers whether the Region should develop their own organics processing facility at the HWMS or another location or contract out to a privately owned facility.
Major Assumptions: - Many of the existing contracts appear to be competitive with no need for amalgamation at this time. Therefore it was determined to recommend the status quo with the existing delivery approach. - A preliminary analysis was conducted to determine the viability of various delivery approaches and considered combining the collection of Green Cart organics and LYW. These two streams are now collected and processed separately at different sites. - Combining collection of LYW and Green Cart waste can save collection costs but may not save processing costs since source-separated LYW is significantly cheaper to process. - This option is tied to Option P2 - Alternative Technologies for Organic Waste and whether the Region decides to establish its own processing facility (e.g. via dry Anaerobic digestion) in the future and Option C13 (extending LYW collection). - A new facility to process co-mingled organics would have high capital and operating costs, unless a facility already exists. Consideration of an organics processing facility are not included in this option.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	The frequency of service will stay the same. No change to waste diversion is anticipated.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Improvement to air quality can be expected from a reduced number of trucks on the roads.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	1	This option assumes no land requirement for the combined collection of all organic wastes.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impact to water/wastewater systems.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Minimal to no potential release to groundwater and/or surface water.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	1	Less collection trucks on the roads within the region will reduce nuisance to residents.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	1	Less collection trucks within the region will reduce associated GHG emissions.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	No energy production is involved.

Social

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	It is common practice to collect commingled organics in some jurisdictions (e.g., BC and Halifax) but not in Ontario.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Likely to have little impact on community safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Some residents may find it more convenient to put all organics into one bin. Still collecting same materials so minimal change anticipated.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	2	Collecting commingled organics will benefit the single family residential sector.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	Changing from separate organics collection to co-mingled would require significant public education. There may be varying perceptions on the change.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	Minimal to no change in collaboration opportunities expected.

Financial

Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	A contract for the collection of LYW and the Green Cart waste has the potential to reduce operational costs. If the processing of the two streams are located on the same site (assuming within the Region) it would reduce transfer and hauling costs. Based on current operational costs and quantities of materials to collect (approximately 50,000 tonnes per year), it is anticipated there will be a reduction in collection cost from current costs. No further cost breakdown was done as this is a high-level option with many uncertainties that can influence costs (e.g. contract costs for amalgamated organics stream, logistics of collection, requirement if all organics can be combined or if the two streams must be kept separate when received at the site where processing takes place).
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	No additional cost increase is anticipated.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Common practice to combine organics in BC. However poses a risk associated with increased contamination of waste stream compared to status quo. Residents are used to separating LYW from Green Cart organics.

P 2 Alternative Technologies for Organic Waste

This option looks at organic waste processing technologies to consider the most feasible way to divert this material from the landfill based on the triple bottom line evaluation criteria of environmental, social and financial impacts. Various technologies are available that combine different organic feedstocks to produce an end product. Anaerobic digestion systems can accept additional organic waste, such as pet waste, diapers, sanitary waste, and biosolids while generating energy as an output. Anaerobic digestion is the process by which organic matter is broken down to produce biogas and biofertilizer. This process happens in the absence of oxygen in a sealed, oxygen-free tank called an anaerobic digester.

There are various aerobic (with oxygen) composting technologies from open windrow systems to covered static piles and enclosed in-vessel systems that require air and water to be added to maintain optimum conditions. An organics processing facility can also provide the opportunity to integrate biosolids from wastewater treatment plants as a feedstock.

Leaf and Yard Waste (LYW) is processed at an open windrow composting facility at the HWMS and operated by a contractor. There have been no issues with the current operations, however a potential option for the future may include combining leaf and yard waste as a feedstock with other Region organic material, such as SSO, for organic processing.

Major Assumptions:
- Current costs to contract out the processing of Green Cart organics is $134 per tonne (2019 budget $3.7 million to process 27,600 tonnes of Green Cart material). The majority of Green Cart material is currently processed at Renewi (formerly Orgaworld) in London (85%), which is using a traditional composting process (no AD). This was compared to the typical costs for advanced AD technologies with energy recovery.
- Option to be implemented in 2 phases: Phase 1 - conduct a detailed study that recommends the preferred processing option (with capital costs) and seek Council approval. Phase 2 is the implementation of an organics processing facility (assumptions for facility provided below).
- A future organics processing facility is assumed to be located within the Region. A siting study will need to be completed (not included in this option). Land purchase costs have been estimated but a specific location is not included in this option.
- Costs, hauling, contracts and staffing assumptions are based on experience with preliminary design costs for AD for a similar scale project. Costs were developed at a high-level and are not intended to be site specific.
- The AD facility will be designed using a technology that is modular and can be easily expanded. Green Cart organics is assumed to be processed at a AD facility and the leaf and yard waste will continue to be processed at the existing compost facility at the HWMS.
- This option does not cover the collection of the organic materials.
- Feedstock quantities are estimated to grow to about 80,000 tpy for SF and 17,000 for MF in 2033 and then to 123,000 for SF and 37,000 tpy. With an assumed capture rate of 60% for Green Cart organics, the combined feedstock could be 58,000 tpy for 2033 and 96,000 tpy for 2048.
- Pet waste, diapers and sanitary waste materials were assumed to not be accepted for processing. The City of Toronto is still collecting data and re-evaluating the success of processing of these materials.
- This Option is to be co-ordinated and aligned with the Public Works Energy Management Strategy and the Region's Biosolids Management Strategy.
- This option is tied to P1 should the Region consider co-collecting LYW and food waste together in the Green Cart program in the future.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	This facility will be an integral component of the Region's waste management system to increase diversion of waste from landfill.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	No release if the AD facility and all odour generating processes are well-contained and mitigated. It was assumed that an AD facility is designed and operated using best practices and meets environmental regulations.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	4	Additional land will be required. Based on typical area needs for AD (minimum capacity of 30,000 tpy) site requirements are 1 - 1.5 ha for receipt, pre-processing, AD and composting of digestate. A 100,000 tpy facility requires approximately 4 ha.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	2	Utility requirements are dependent on which technology is chosen (wet AD uses more water than dry AD). The requirements are still moderate for both.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	No impact on ground- or surface water assuming the organic process is well-contained and contact with stormwater is minimized. It was assumed that an AD facility is designed and operated using best practices.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	3	The establishment of a new AD facility will increase noise and traffic surrounding the site and potentially generate some odours. The facility is assumed to be designed and operated using best practice and meet environmental regulations.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	1	The processing of SSO in an AD facility will result in GHG reduction. AD with energy recovery/ gas utilization has a lower GHG footprint than current practice (traditional composting without energy recovery). Some GHG reduction will also result from reduced hauling of organic waste out of region.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	1	The processing of SSO in an AD facility will result in energy recovery. Current practice (traditional composting) has no energy recovery.

Social

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	AD is gaining popularity across Canada. Peel Region is constructing an AD facility.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Organics processing at a facility owned by the Region or at a facility owned by a contractor would have similar risks that are anticipated to be minimal.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	From a resident's perspective, the use of a facility owned by Halton region is the same as the use of an out-of region AD facility and will not change accessibility to the collection service.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	The benefits from local green energy production, owned by the wider community, will result in increased benefits to the broad community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	The concept of a regional AD facility is assumed to be encouraged by the community since it will showcase modern technology which bring benefits to the community (green energy production). It is noted that there may be concerns during a siting study as is typical for waste management facilities. An AD facility would be able to accept more materials which has the potential to increase diversion. All composting facilities have experienced upsets and operating issues that have caused odour issues.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	There is opportunity for a P3 delivery model with increased collaboration.

Financial

Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	Phase 1: Conduct a feasibility study to confirm the recommended technology, facility and approach ($100,000). Phase 2: Costs for an organics processing facility can range signficantly depending on technology type, feedstock and quantities managed. Capital costs is estimated to range between $40M and $60M dpeending on technology type Assuming an AD facility with a capacity of approximately 30,000 tonnes per year, the capital costs typically range between $10 to 40 million. Land acquisition costs are estimated at $3.7 million. The size of the facility has a major bearing on the capital costs. As examples, a facility of 30,000 tonnes per year has capital costs range between $333 per tonne (using technology by Renewi) and $1,307 (using technology by Urbaser) per tonne of annual installed capacity. This assumes a modular technology that can be expanded as feedstock quantities increase. It is assumed the facility will be located within the Region. A siting study will need to be completed (not included). Siting costs are not included. As the LYW will continue to be processed at the existing compost facility and these costs are unchanged, costs were only estimated for the AD process.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal additional cost anticipated to conduct a feasibility study.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Potential risks associated with not selling end products (compost and energy) and operating risks (odour).

RD 1 Phase 2 Optimize Landfill Operations

The Region's landfill has been in operation since 1992 and is approved for 7.96 million cubic meters (Mm3) of residual waste. When it was approved, the landfill was estimated to have a projected life of 20 years and to reach its capacity in 2012. As a result of improved residential diversion programs and implementation of various operational programs, the projected landfill life was extended to an anticipated 30 years (2046), at current fill rates. The HWMS handles approximately 250 tonnes of solid non-hazardous waste per day. The amount of waste received and landfilled in 2016 was 68,418 tonnes. The landfill is equipped with a leachate collection system, a landfill gas collection and energy generating system.

This option looks at different ways to optimize landfill operations that were broken out into two phases: short term (included in the Short Term Strategy) and medium/long term (included in Medium and Long Term Strategy) after a meeting with Regional staff in January 2018. The different ways to optimize landfill operations, increase the remaining capacity and/or extend the site life of the landfill include leachate recirculation, baling residual waste and shredding residual waste.

Major Assumptions:
- The Region is currently considering shredding and baling technologies. This option will consist of completing a feasibility study contracted out to a third party that will review new approaches to optimize landfill operations at the time of implementing this option.
- The study will review best practices and proven approaches in optimization techniques and procedures for landfills of similar size and conditions and provide recommended landfill optimization operations for the Region including costs and an implementation plan.
- In addition, it is recommended to place waste in multiple 3 m lifts for Cells 4 and 5 and possibly Cell 3, increasing the operational capacity and reducing the frequency for daily cover placement.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	Minimal to no impact on the amount of waste disposed.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	Minimal to no adverse impact on air quality is anticipated.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	1	The measures impacting current and future cells will reduce the volume consumed therefore will optimize the existing landfill.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	No impacts to water/wastewater systems is anticipated.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	Minimal to no adverse impact to groundwater and surface water is anticipated.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	Minimal to no change to nuisances expected.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	Minimal change in GHG emission is expected.
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	Minimal to no additional energy required.

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Feasibility study which seeks to determine the best and proven practices at the time the study is conducted.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	No risk to community and/or public safety is anticipated.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	No change to accessibility and convenience is anticipated.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Increased benefit to the broad community by researching approaches to extend landfill site life.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	Public is anticipated to support measures to optimize the Region's biggest solid waste management asset especially since it will not directly impact the public.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	Do not anticipate any opportunities for collaboration.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	The feasibility study is estimated to cost $50,000. The costs for the recommended capital and operating optimization costs would be provided in the study's results.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	Minimal to no additional cost to household anticipated to conduct the feasibility study.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Desktop feasibility study poses little risk of liability or environmental issues.

RD2 Alternative Technologies for Residual Waste

This option looks at the feasibility of alternative technologies to recover energy, generate electricity and reduce garbage sent to landfill. The technology must be suitable for the volumes and types of waste available after recycling and composting. The alternatives include:
· Conventional combustion technology;
· Gasification or pyrolysis;
· Mixed waste processing;
· Refuse Derived Fuel from Mechanical Separation; and
· Refuse Derived Fuel from Biodrying.

Energy from Waste (EFW) and alternative fuels are permitted as waste management options under Waste-Free Ontario, however the landfill diversion resulting from these methods do not count towards diversion in Ontario. However, it should be noted that the recovery of nutrients, such as digestate from anaerobic digestion (AD), is considered diversion. The amount of waste generated within Halton Region, which was disposed at the Regional landfill in 2016 was 68,418 tonnes, an increase of 1% from 2015. The projected landfill life is estimated at 30 years (to 2046) at current disposal rates. The most recent waste audit data from 2014 and 2017 showed that 49% of the single family residential garbage stream consisted of materials which cannot be currently diverted through Regional reuse, recycling or recovery programs. While several programs can be implemented as part of the Strategy to further reduce this portion of the garbage stream, there will be some residuals in the waste stream that will require disposal.

There are various aerobic (with oxygen) composting technologies from open windrow systems to covered static piles and enclosed in-vessel systems that require air and water to be added to maintain optimum conditions. An organics processing facility can also provide the opportunity to integrate biosolids from wastewater treatment plants as a feedstock. Leaf and Yard Waste (LYW) is processed at an open windrow composting facility at the HWMS and operated by a contractor. There have been no issues with the current operations, however a potential option for the future may include combining leaf and yard waste as a feedstock with other Region organic material, such as SSO, for organic processing.

Major Assumptions:
- An initial assessment of viable options for the Region was completed and it was determined that the recommended technology approach was a Mixed Waste Processing (MWP) facility with AD and production of a Refuse-Derived Fuel (RDF). The costs associated with an AD facility are included in Option P2. MWP is preferred given the typical negative public perception of combustion of waste and the lack of proven full scale municipal gasification facilities and the potential for a MWP to develop a RDF for cement kilns and could assist the Region in meeting potential food and organic waste diversion targets.
- This option is broken into three phases: Phase 1 involves a feasibility study to reconfirm the appropriate technology and Phase 2 is the planning and construction of a residual waste processing facility (assumptions provided below). Phase 3 is the ongoing operations of the facility.
- It is recommended that in the medium term, a cost benefit assessment of different technologies under consideration is conducted by a third party to reconfirm/reassess which technology the Region should implement based on existing conditions, latest technology advances and any new regulations. The study is estimated to cost $65,000. The recommended technology is assumed to have a capital cost in the multi millions of dollars. An estimated ten years will be needed for full planning.
- The landfill will have 10-15 years capacity remaining by 2030. All measure will be exhausted first to maximize the landfill's capacity and optimize efficiencies before considering the development of a new alternative technology facility.
- The residual waste stream is currently approximately 70,000 tonnes per year (tpy) and it is projected to reach approximately 170,000 tpy by 2048 (based on a 1% growth in waste generation each year as assumed in the waste projections for this project).
- The waste characterization was based on audits performed in 2017. This characterization was assumed unchanged over the planning period (until 2048).
- A future facility was assumed to be located within Halton Region. The specific location within the Region has not been determined.
- The HWMS is a potential site for a future facility and adjacent land may need to be purchased.
- The facility will produce a refuse-derived fuel (RDF), which can be sent to a third party as a fuel or used by the Region if applicable.The RDF prepared could either be used within an energy recovery facility or exported to an alternative energy recovery facility in Ontario.
- The only waste going to landfill would be the residual waste (MSW) input, and this landfilled material would consist mostly of inert materials.
- As an example, the space required for a MWP facility is between 1.5-3 ha. A MWP could recover organic waste (for anaerobic digestion, AD), and metals and fibres for recycling and plastics for either recycling (if markets exist) or for bio-oil production (currently piloted in Canada).
- Recovered organic waste from a MWP is assumed to be sent to an existing AD facility in or near Halton Region. Costs were estimated for a MWP facility and the feasibility study, not the AD facility (part of Option P2). Costs are not intended to be site specific.

Environmental						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	This configuration of technologies (MWP with organic waste being used in an AD facility) diverts as much of the organic material as possible. In addition, recyclable materials not captured by source separation programs can be removed from the mixed waste. It is expected that this combination of MWP and AD will result in a 55% to 90% diversion of the waste stream currently going to landfill. This is over and above what is currently being recovered by at-source separation for recycling. The only waste going to landfill would be the residual waste (MSW) input, and this landfilled material would consist mostly of inert materials that cannot be processed into RDF (e.g. some construction waste).
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	2	Some release of air emissions from an Alternative Technology facility. It was assumed that the facility is designed and operated using best practice and meet environmental regulations.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	2	There is suitable Halton-owned land at the HWMS available for an Alternative Technology facility. Based on typical area needs for a MWP (minimum capacity of 70,000 tpy) site requirements are 1.5 ha, but to allow for an expansion to manage 170,000 tpy, the site would need to be approximately 3 ha (based on known space requirements for MWP proposed in BC).
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	1	Minimal water requirements for MWP technologies.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	1	No impact on ground- or surface water assuming the process is well-contained and contact with stormwater is minimized.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	3	The establishment of a new MWP facility will increase noise and traffic at the selected site, but the traffic to the Region's landfill will decrease. There will be a net increase due to construction of a MWP, the transport of organics to a AD and the RDF to a third party energy recovery site.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	1	The recovery of additional recyclables, processing of organics in an AD facility and the use of RDF in an energy recovery process will result in GHG reductions compared to landfilling.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	The processing of organics at an AD facility and the RDF in an energy recovery facility will result in energy production.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	Alternative technologies are gaining popularity in Europe and across Canada. Nova Scotia is constructing an MWP facility with bio-oil productions from plastics separated at the MWP facility.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	There are some risks to the community from impacts of odour if the organic waste materials are not managed adequately. A facility and its management protocols are assumed to follow best practices for odour management.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	From a resident's perspective, the use of an alternative technology facility will not change accessibility to the collection service.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	The benefits from increased local green energy production (both from increased organics going to an AD facility, and RDF displacing fossil fuel at a third party facility), will result in increased benefits to the broad community.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	A regional alternative technology for residual waste is assumed to be encouraged by some parts of the community since it will showcase modern technology and reduce landfilling needs. However, there may be opposition to certain technologies that involve RDF.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	There is opportunity for a P3 delivery model with increased collaboration. Also circular economy opportunities for the use of RDF by a third party.

Financial

Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	In the medium term, a cost benefit study (Phase 1) will be conducted by a third party to confirm/reassess which technology the Region should implement based on existing conditions and any new regulations. The study would cost $65,000. The recommended technology/facility will have a multi-million dollar capital cost (Phase 2). The ongoing operational cost of that technology/facility would also be in the millon dollar range and depend on the selected technology (Phase 3). For example, if a MWP facility with a capacity of approximately 70,000 tonnes per year was recommended, the capital costs are estimated to range between $30 and $40 million based on confidential information from a private developer of MWP facilities. The ongoing operational costs $1.8 to $3.4 million per year.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	The study itself will result in no additional cost to household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	2	Risks of technology not performing as promised by vendors and risk of not selling end products (recyclables, compost and RDF).

RD 3 Extend Landfill Capacity

The Regional landfill has been in operation since 1992. It has an approved footprint area of 53 hectares and is approved for 7.96 million cubic meters (Mm3) of residual waste. When it was approved, the landfill was estimated to have a projected life of 20 years and to reach its capacity in 2012. As a result of improved diversion programs and implementation of various operational programs, the landfill is projected to reach the approved capacity in 2044-46, at current fill rates.

This option looks at extending landfill capacity by implementing horizontal expansion towards the southwest buffer land. This option will consider the technical design requirements, approvals and costs to recommend how the landfill capacity should be expanded. A timeline will be provided of when the Region should initiate the planning and approval process for this southwest horizontal expansion.

Major Assumptions:

- This option assumes that the western half of the south lands is horizontally expansed based on the preliminary subsurface investigation report undertaken by AECOM in 2011. Additional subsurface investigation and feasibility study will be required to confirm the suitability for the horizontal expansion and base liner requirements.
- An Environmental Assessment (EA) will be required for the horizontal expansion which can take up to 10 years considering all the environmental studies, stakeholder and public consultations. Once the EA is approved, the site Environmental Compliance Approval requires to be amended as part of the detail design. Staff time will be required to oversee this process.
- The need for expansion should be revisited annually as new diversion programs are implemented.
- For the existing cells 3, 4 and 5, the vertical expansion can be contemplated (not included in this option) but will require modeling to assess the performance of the hydraulic trap based on the updated final elevations. The residential housing proximity along the north boundary of the site can be a limitation to allow a vertical expansion in the north cells (Cells 1 and 2).

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	1	Option looks at managing the residual waste portion of the landfill. Waste reduction/diversion efforts will impact the timing for expanding the landfill.
		2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap)				
		3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)				
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere	3.50%	Qualitative discussion	2	Construction and operation of bigger landfill cells will have some impact on air quality.
		2. Some release of emissions to atmosphere				
		3. Significant release of emissions to atmosphere				
	Land Requirements	1. Optimize existing asset	10.50%	estimate of land required (m2)	2	Vertical expansion will not require any additional land at the HWMS. Horizontal expansion would be within the current southeast land owned at the HWMS.
		2. Use of existing site/building and/or potential to make land available.				
		3. Minimal to no additional land required.				
		4. Additional land required.				
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems	1.75%	Qualitative discussion	3	Increasing the amount of waste disposed will increase the amount of leachate produced that needs to be collected and treated.
		2. Some potential to impact Region's water/wastewater systems				
		3. High potential to impact Region's water/wastewater systems				
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water	10.50%	Qualitative discussion	2	More waste will produce more leachate and will increase the potential of contaminating groundwater and/ or surface water.
		2. Some potential to contaminate groundwater and/or surface water				
		3. High potential to contaminate groundwater and/or surface water				
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts	5.25%	Qualitative discussion	2	Landfilling operations will remain consistent with current practices.
		2. Minimal to no change to nuisances				
		3. Will increase nuisance impacts				
	Climate Change Impacts	1. Anticipated reduction in GHG emissions	3.50%	kg CO2eq	3	Extending landfill capacity and disposing more waste will increase GHG production.
		2. Anticipated there will be no change in GHG emissions				
		3. Anticipated increase in GHG emissions				
How much energy is required?	Energy	1. Will lead to a net gain of energy production	15.00%	Qualitative discussion	1	Landfilling more waste will likely generate more landfill gas which will allow to produce more energy.
		2. Minimal to no energy required				
		3. Will lead to a net increase in energy consumption				

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	Landfill expansion have been implemented in many existing landfills.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	Community risks will remain the same as per current landfill operations.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	Landfill expansion will not have any impact on accessibility and convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	Expanding the landfill will be beneficial for the community since they will be able to maintain reasonable tipping fees in comparison of having to establish a new landfill or hauling the waste to another facility.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	Expanding the landfill will require public consultations as part of the approval process which could result in some opposition from nearby neighbours.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	1	Due to the limited available remaining capacity of the current active landfill sites in Ontario, there is potential for other municipalities or private waste disposal companies to collaborate with the landfill expansion.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	A horizontal expansion into the southeast land would require additional subsurface investigation work as well as going through an individual EA process that can cost over $10M. Capital costs associated with a horizontal expansion (34 Ha) is assumed to include a hydraulic trap design which is estimated to be between $35 to $40M (2019 CDN). Based on this available area, three cells can be constructed of around 11 ha. The operational cost will be extended for the active life of the landfill.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	3	Ongoing operational costs are anticipated to be extended for the active life of the landfill at a cost of approximately $8 per household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Low risk since the landfill is constructed in accordance to an engineered design and approved environmental permit and in areas that are in close proximity with the existing landfill site.

RD 4 Optimize Utilization of Landfill Gas

This option looks at making modifications/enhancements to the utilization of Landfill Gas (LFG) at the Halton Waste Management Site. It considers the LFG utilization agreement to recommend options when the current agreement expires, and whether other technologies should be considered to optimize the gas utilization and energy production. This option looks at conducting a contract review as well as a Cost Benefit Analysis (CBA) to review and evaluate potential LFG use options and identify a preferred alternative. The preferred alternative should include a balanced contract that mutually benefits the Region and service provider. The Region currently contracts out the O&M of the LFG collection system. The Region has a 25 year agreement for LFG to electricity utilization. This contract will be expiring 2029 with an option for 10 year renewals. Alternatives to LFG electricity production are the production of LFG to CNG for vehicle operations onsite at HWMS, gas heating of HWMS buildings, LFG energy to local industry, RNG production for input into the natural gas pipeline or LFG to flare.

Major Assumptions:
- A review of the existing contract agreement will be carried out to provide recommendations to the Region going forward in considering renewal of the LFG to electricity utilization contract.
- A Cost Benefit Analysis (CBA) will be carried out by a third party to evaluate alternative LFG utilization options, contractual options, long term impacts and potential returns on investment. The review will be completed at least 5-6 years before the contract end date to allow time for approvals, funding, tendering etc.
- The study will consider other options for LFG such as providing heat or power to the HWMS.
- The review and CBA should consider available funding mechanisms (e.g., Canadian Green Fund, FCM's Green Municipal Fund (GMF)).
- The option to collect biogas from biosolids and or future AD facilities is already written into existing contract. This may tie in with Option P2 should an AD facility be considered for organics processing. Currently 99% of the LFG is used to generate electricity onsite. Should the landfill be expanded (Option RD4), more LFG would be produced in the long term.
- Option evaluation notes benefits of potential changes in italic text .

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	3	No additional waste is anticipated to be reduced as a result of the two desktop studies for this option.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	This option focuses on conducting two desktop studies to determine next steps. No changes to emissions are anticipated. Should the LFG utilization be considered for alternative uses such as CNG or RNG, it may replace fossil fuels. There would be less emissions released as a result.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	3	No additional land requirement will be required to conduct the studies. Some land requirement may be necessary for alternative uses of LFG such as scrubber or cleaners if the LFG is processed for supply into Enbridge gas pipelines. Land at HWMS could be used for this operation, or if necessary, expansion into neighbouring property depending on the gas piping locations and land availability on site.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	No water or wastewater will be required to conduct the desktop studies for this option. LFG cleaning removes vapour (water) from the LFG gas. This operation is already in place at HWMS for the electrical turbines currently on site that convert LFG to electricity. There should be no additional water nor wastewater requirements anticipated.
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	The desktop studies for this option will not impact groundwater or surface water. LFG cleaning removes vapour (water) from the LFG gas. This operation is already in place at HWMS for the electrical turbines currently on site that convert LFG to electricity.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	No nuisance impacts are anticipated due to the desktop studies of this proposed option. The switch from diesel engines to CNG engines produce less noise from the generator engines. The switch from electric turbine generation to a RNG gas supplier could reduce the noise generated from the turbines on site.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	2	No climate change impacts are anticipated from the desktop studies for this option. Should a facility be designed to process approximately 10,000 cubic feet per minute of incoming landfill gas, it has the equivalent of fueling 1,500 trucks for 20 years and the avoidance of greenhouse gas emissions of approximately 1.2 million tons of carbon dioxide over a 10-year period. [1]
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	No energy will be required to carry out the two desktop studies for this option. Minimal energy will be required to optimize LFG utilization. The processing of the LFG to a cleaner and drier state and associated pumps and compressors are the main energy requirements.

Social						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	1	The studies will produce recommendations based on proven engineering best practices and case studies. Trail Landfill owned by City of Ottawa and Moose Creek Landfill owned by GFL both capture LFG for production into RNG gas supply lines. Waste Connections landfill in Terrebonne, Quebec, near Montreal, is converting landfill gas to natural gas which is then delivered to the TransCanada pipeline network, via an injection point adjacent to the landfill site. They fuel their collection fleet with processed CNG captured from their landfill gas.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	The studies will have no anticipated change to safety of the community nor public.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	2	No anticipated change to accessibility nor convenience as this pertains to two desktop studies being completed.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	3	The studies will produce optimized recommendations for the use of LFG. but no change to benefits to the community. Maximized use of LFG is an overall benefit to the community at large due to the environmental GHG benefits (RNG production) and revenue in take for the Region.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	1	The studies will produce optimized recommendations for the use of LFG. Maximized use of LFG may be perceived as a positive environmental GHG benefits and revenue in take for the Region, and therefore the community would be accepting of the studies.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No changes to collaboration are anticipated.

Financial						
Question	Criteria	Rank	**Weight**	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	2	The cost for this option is for two external studies carried out by third parties. A review of the existing LFG Utilization agreement terms for potential renewal ($15,000) as well as a Cost Benefit Analysis ($65,000) of other LFG utilization options such HWMS onsite use or production of CNG or RNG options would be needed. The operating costs ($17,000) are for Halton staff to manage and participate in the reviews by third parties.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	2	There is minimal additional cost anticipated.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	Since each study for this option would be carried out by a professional consulting services corporation, there is low liability or environmental risk to the Region.

References

1. https://www.wasteconnectionscanada.com/our-services/renewable-energy-facilities

RD 5 Disposal Bans

Under the Resource Recovery and Circular Economy Act (RRCEA), a Strategy for a Waste-Free Ontario was released on February 28, 2017. The Strategy serves as a Roadmap to help shift Ontario towards the goals of a circular economy, zero waste and zero greenhouse gas emission from the waste industry. The Strategy proposes the use of disposal bans to encourage diversion of targeted materials, beginning implementing by 2021 and a possible organic ban by 2022.
A Food and Organic Waste Framework was released by the Province in April 2018 which introduces food waste diversion targets for the residential and the ICI sectors, identifies plans to amend the 3R regulations to include food waste across the ICI sector and further explores food waste disposal bans (first proposed in the Strategy).

The new Ministry of Environment, Conservation and Parks (MECP) established under the new Provincial Government has stated its support for Province-wide organics ban in its recently released A Made In Ontario Environmental Plan (2019) by stating that it would "Develop a proposal to ban food waste from landfill and consult with key partners such as municipalities, businesses and the waste industry".

A disposal ban is different from a curbside ban (e.g., banning of textiles in garbage set out at the curb by the City of Markham) or a mandated source separation program (e.g. City of New York's commercial food waste diversion mandate). Each approach has its own strengths, weaknesses, benefits and challenges.

This option considers the use of expanded disposal bans for the Halton Region landfill.

Major Assumptions:
- This option assumes that monitoring and enforcement is enhanced to enforce disposal bans. It is noted that to work most effectively the Region would need to move to clear bags for garbage collection prior to the bans taking effect - under this approach, the set out would be monitored by the collection crew, who would reject bags of garbage that contain a certain threshold the banned material (this contamination threshold can be gradually reduced over time using a phased approach).
- Halton Region will begin with an organics ban at the landfill in line with future provincial regulations, and over time add new materials such as textiles and designated bulky waste (as EPR programs for these materials are implemented).
- The operating budget associated with implementation of Metro Vancouver's Organics Disposal Ban was reported at $338,000 in the last quarter of 2014 and $180,000 in 2015. Therefore it is estimated that full implementation of a similar ban in Halton would cost $500,000 (population of Halton Region is less than Metro Vancouver).
- Funding was used for stakeholder engagement and the development of educational and training resources to support the organics diversion efforts of partners across the region.
- Ongoing communications will be required at $100,000 annually.
- The new Blue Box Program Plan may suggest a ban on some Blue Box materials from landfill in the near future such as cardboard and or paper fibre. It will require a recovery target of 75% of Blue Box materials overall.

Environmental

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Will it minimize the amount of waste to be disposed?	Waste Reduced/Diverted	1. High potential for waste reduction/diversion (5% or greater, kg/cap) 2. Some potential for waste reduction/diversion (2% to > 5%, kg/cap) 3. Minimal to no anticipated waste reduction/diversion (< 1%, kg/cap)	50.00%	kg/cap waste disposed % waste diverted	2	While a disposal ban sounds good in theory, it only works if it is enforced. A disposal ban may be more effective on select bulky items for which alternative diversion programs exist. Since the Halton Regional landfill only accepts residential waste (and small amounts of BIA waste), a ban will have no impact on ICI waste generation/diversion habits.
What will the impact be on the environment?	Air Quality Impact	1. Minimal to no release of emissions to atmosphere 2. Some release of emissions to atmosphere 3. Significant release of emissions to atmosphere	3.50%	Qualitative discussion	1	This policy will have no impact on emission to the atmosphere.
	Land Requirements	1. Optimize existing asset 2. Use of existing site/building and/or potential to make land available. 3. Minimal to no additional land required. 4. Additional land required.	10.50%	estimate of land required (m2)	2	While minimal additional land is expected to be required, there might be a need to provide alternative diversion services at the landfill for banned materials which may require land space.
	Water/Wastewater Requirements	1. Minimal to no impact to Region's water/wastewater systems 2. Some potential to impact Region's water/wastewater systems 3. High potential to impact Region's water/wastewater systems	1.75%	Qualitative discussion	1	This policy will have no impact on water/wastewater requirements
	Impact to Groundwater and Surface Water	1. Minimal to no potential release of contaminants to groundwater and/or surface water 2. Some potential to contaminate groundwater and/or surface water 3. High potential to contaminate groundwater and/or surface water	10.50%	Qualitative discussion	1	This policy will have no impact on groundwater or surface water.
	Nuisance Impacts (odour, noise, traffic)	1. Will reduce nuisance impacts 2. Minimal to no change to nuisances 3. Will increase nuisance impacts	5.25%	Qualitative discussion	2	This policy should have no impacts on nuisances.
	Climate Change Impacts	1. Anticipated reduction in GHG emissions 2. Anticipated there will be no change in GHG emissions 3. Anticipated increase in GHG emissions	3.50%	kg CO2eq	1	This policy is expected to have a positive impact on GHG emission reductions as it will significantly reduce the amount of food waste entering the landfill and converting to methane over time
How much energy is required?	Energy	1. Will lead to a net gain of energy production 2. Minimal to no energy required 3. Will lead to a net increase in energy consumption	15.00%	Qualitative discussion	2	This policy will have minimal energy requirements

Social

Question	Criteria	Rank	Weight	KPI	Score	Rationale
Is it an established practice?	Proven/Not Proven	1. Proven success in other areas / Best Practice. 2. Some success (e.g. pilot) in some areas of North America. 3. Unproven or untried or lower success rate	15%	Qualitative discussion	2	While disposal bans have been in place for decades, there is little follow up on the success of the bans and the enforcement required to ensure their success. Often a disposal ban will be coupled with other policies, such as clear bags, mandatory source separation by-laws that reinforce/enforce them. On their own, they have a lower success rate.
Is there a risk to community and/or public safety?	Community and Safety	1. Potential improvement to community and public safety 2. Minimal to no potential change to community and public safety 3. Potential increase in community and public safety risks	20%	Qualitative discussion	2	This policy has minimal impact on community or public safety.
How easy is it to participate in or access?	Accessibility and Convenience	1. Increase accessibility and convenience 2. Minimal to no change anticipated 3. Reduce accessibility and convenience	20%	Qualitative discussion	3	If enforced properly, a disposal ban could make the convenience of putting everything in the garbage unacceptable. Residents would need to properly sort and manage their wastes which could be considered reduced convenience.
Does it benefit everyone?	Equity	1. Increased benefits to broad community 2. Increased benefits to segments of community 3. No change to benefits to community 4. Negative impact to community	15%	Qualitative discussion	1	All members of the community are treated equally and must comply with the ban. The ban also benefits the broad community by keeping deleterious materials out of the landfill.
Will the community be accepting of it?	Perception	1. Option anticipated to be accepted/encouraged by the community 2. No public perception of the option 3. Potential for opposition to the option	20%	Qualitative discussion	3	Any initiatives that require enforcement have the potential for opposition.
Does it allow us to work/partner with others?	Collaboration	1. Option will lead to increase in collaboration 2. No change anticipated 3. Anticipated decrease, or hindrance to collaboration	10%	Qualitative discussion	2	No collaboration anticipated with this policy.

Financial

Question	Criteria	Rank	Weight	KPI	Score	Rationale
How much will it save/cost the Region?	Capital Costs Operating Cost	1. <$50,000 capital cost or <$50,000 annually 2. $50,000 to <$250,000 capital cost or $50,000 to <$250,000 annually. 3. $250,000 to <$500,000 capital cost or $250,000 to <$500,000 annually. 4. $500,000 or greater capital cost or $500,000 or greater annually.	35%	$	4	Enforcement and communications will be required to ensure the bans are successful. Implementation is estimated to cost $525,000 in pre-planning and stakeholder consultation.
How much will it save/cost taxpayers?	Cost/Household	1. Will save taxpayers money 2. Minimal to no potential increase in cost to household 3. Will cost taxpayers an additional $2-$10 per household 4. Will cost taxpayers >$10 or greater per household	35%	$/hh	3	Ongoing efforts to enforce is anticipated to cost an additional $2.30 per household.
What are the risks?	Risk	1. High probability of expected results. Little risk of liability or environmental issues. 2. Results may vary. May have potential for liability or environmental risk. 3. Region has little control – relies on other jurisdictions. Potential for market instability and environmental risks.	30%	Qualitative discussion	1	There is little risk for liability or environmental issues arising from this policy.

Appendix C

3. Financial Analysis of Recommended Options

Financial Analysis of Recommended Options

SOLID WASTE MANAGEMENT STRATEGY

April 2021

Halton REGION

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Tables

Figures

1 Introduction

1.1 Purpose of Analysis

In September 2017, Dillon Consulting Limited. (Dillon) was retained by the Regional Municipality of Halton (the "Region") to support the development of the Region's Solid Waste Management Strategy (the "Strategy" or "SWMS"). KPMG LLP ("KPMG") was retained by Dillon to analyze the financial impacts of the Medium-Long Term SWMS recommended options. The scope of this analysis has focused on the recommended options that were identified in **Section 5.2** of the Medium-Long Term SWMS.

1.2 Scope of Work

KPMG's scope of work included the review of background documents, coordination of meetings to discuss financial matters, the development of an annual cash flow model, and analysis of the capital and operating cost impact of the recommended options, outlined on a per household basis in **Section 4** of this document.

Review of Documents and Coordination of Meetings:

KPMG reviewed background documentation information provided by the Region and Dillon to support documentation of the Region's existing Solid Waste Management financial structure. The information reviewed included historical and forecasted data. This documentation included information related to operating and capital budgets, waste levies, reserve fund levels, descriptions of the medium and long term Strategy options, housing and population data, historical tonnage data, and collection contract summaries. Historical information was provided for 2018 and 2019. Forecasted information was provided for 2020-2030, where available.

KPMG also attended meetings with the Region and Dillon to confirm financial assumptions and to gather the necessary information to provide input to the financial analysis. Meetings were held to discuss financial assumptions, review the costs and implementation schedules associated with the shortlisted waste strategy options, receive insight on the potential financial implications of each option, review the Region's capital and operating budgets, clarify outstanding questions and receive additional feedback on the assumptions.

Development of an Annual Cash Flow Model:

Using information gathered from the document review and meetings, a cash flow model was developed for the periods 2018 to 2040. The model estimates the financial impact on the Region's operating budget and capital budget as a result of implementing the recommended options. For the purposes of reporting, the impact of capital and operational cost changes from the recommended options were divided by the number of households in the Region to determine the cost impact per household over time.

1.3 Limitations and Assumptions

This document has been prepared by KPMG for the Region (the "Client") pursuant to the terms of our Sub-Consultant agreement with Dillon dated June 27, 2017 (the "Engagement Agreement").

All information and data used in the development of the financial analysis was provided by Region staff as of April 13, 2021. The information was continuously reviewed and assessed by Region staff throughout the development of the Medium-Long Term SWMS.

The estimates for operating cost impacts, capital cost impacts and revenue impacts were developed by Region staff and Dillon and have been developed based on a number of assumptions provided by Region staff or Dillon. The reliability of the results of the financial analysis is dependent on the input information. The procedures we performed do not constitute an audit, examination or review in accordance with standards established by the Chartered Professional Accountants of Canada, and we have not otherwise verified the information we obtained or presented in this document. We express no opinion or any form of assurance on the information presented in this document, and make no representations concerning its accuracy or completeness.

We express no opinion or any form of assurance on potential revenue, cost or schedule estimates that the Client may realize should it decide to implement the opportunities or options contained within this document. Readers are cautioned that the estimates outlined in this document represent order of magnitude estimates only and are calculated based on the stated assumptions. Actual results achieved as a result of implementing opportunities are dependent upon Client decisions and actions, and variations may be material. The Client is responsible for its decisions to implement any opportunities/options and for considering their impact. Implementation will require the Client to plan and test any changes to ensure that the Client will realize satisfactory results.

2 Overview of Current System

The following sections provide information about the current costs and revenues associated with the Region's Solid Waste Management System. The current financial state of the Region's Solid Waste Management System will be used as the baseline for comparing the cost of implementing the various options approved for funding.

2.1 Overview of Current Cost Structure

2.1.1 Operating Costs

Table 1 presents a breakdown of the approved 2020 Operating Budget for the Region's Solid Waste Management System.

Table 1: Approved 2020 Operating Budget Allocation

Cost Category	2020 Budget Allocation ($)
Personnel Services	4,455,810
Materials & Supplies	1,257,155
Purchased Services	34,113,336
Total Financial & Rent Expenses	150,000
Grants & Assistance	266,400
Allocated Charges / Recoveries	326,087
Corporate Support	4,458,470
Transfers to Reserves-Operating	195,000

Cost Category	2020 Budget Allocation ($)
Transfers from Reserves-Operating	0
Transfers to Reserves-Capital	7,232,900
Transfers from Reserves-Capital	-208,414
Total	**52,246,744**

Figure 1 presents the 2020 Operating Budget for the Region's Solid Waste Management System in percentage terms.

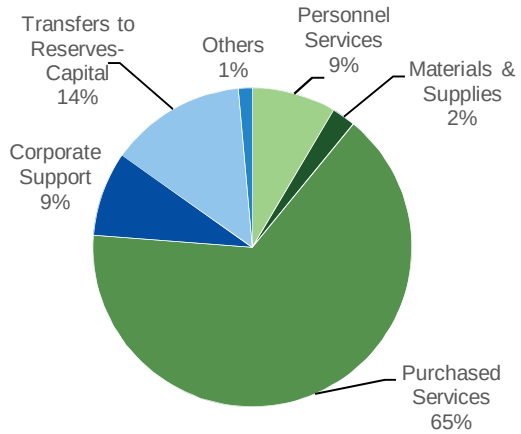

Figure 1: 2020 Planned Budget Allocation

The total operating budget for Solid Waste Management is $52.2 million in 2020. The most significant cost category relates to purchased services with 65% of budget allocation. These are services contracted out to private operators, such as collection of waste material (i.e., garbage, organics and recycling), transfer and haulage services and recycling processing. The next largest cost category is transfers to the capital reserve, which is used for funding the Region's capital plan. The Region's capital plan is outlined in **Section 2.1.2**.

Personnel services and corporate support collectively comprise 18% of the Region's operating costs. Personnel services is staff directly employed by the Region in the Solid Waste Management System. Corporate support is charges from other Region divisions for services provided to Solid Waste Management. Examples of these services include technology, phones, legal support, purchasing and procurement, and an administrative chargeback.

2.1.2 Capital Costs

Capital expenditures are funded through the Region's capital reserves. Reserve funds are used to finance the long-term investments in capital works and facilities needed to support the Solid Waste Management System, as well as to assist with stabilization of rates charged to the Region's four local municipalities. The operating budget includes annual reserve contributions to maintain the reserve fund balances.

The 2020 budgeted capital reserve contribution is $7.2 million. ***Table 2*** presents the 2022-2030 Halton Waste Management Capital Budget and Forecast. This is the existing capital program for previously approved or planned investments. This does not account for any incremental capital costs associated with the recommended options.

Table 2: Existing 2022- 2030 Capital Program

($, 000s)	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Capital Program	1,868	13,247	1,453	3,180	898	15,870	5,032	1,470	719	**43,737**

2.1.4 Revenues

The Region's revenues for solid waste programs are used to offset the cost of services. Solid waste is mostly funded through levies applied to the municipalities in the Region. A smaller portion of revenues are received from other sources, such as blue box, stewardship funding, container station fees, and other recoveries. ***Table 3*** shows the planned revenue for 2020 by category.

Table 3: 2020 Planned Revenue

Cost Category	2020 Planned Revenue ($)
Waste Levy – Burlington	14,978,823
Waste Levy – Halton Hills	4,908,573
Waste Levy – Milton	8,140,232
Waste Levy – Oakville	16,240,316
Total Levy Revenue	**44,267,994**
Other Fees	150,000
Container Station Fees	2,071,500
Waste Diversion Ontario (WDO) Blue Box	4,919,700
WDO Household Hazardous Waste (HHW)	211,000
WDO Waste Electrical and Electronic Equipment (WEEE)	70,000
Ext Recovery: Misc.	38,000
Recovery: Halton Board of Education	503,600
Other Revenue	15,000
Total Non-Levy Revenue	**7,978,800**
Total Levy and Non-Levy Revenue	**52,246,744**

The Region's revenue model recovers 100% of operating costs by setting the total waste levy from local municipalities to equal the operating cost less total non-levy revenue. The Region determines the portion of the waste levy that is allocated to each local municipality based on the proportion of tonnes collected in each municipality and the level of service provided to that municipality.

3 Overview of Strategy Options and Identified Costs

3.1 Overview of Options

The options created as part of the Strategy were identified by the Region to improve or build upon the existing waste management system. After developing an understanding of the current system and future needs, a long list of potential options to enhance and/or improve the Region's Solid Waste Management System was developed.

The short-term options were evaluated as part of the Short-Term SWMS, approved by Council in 2018. There were 28 medium- and long-term options identified in the long list of options. Through an evaluation process documented in **Section 5.2** of the Medium-Long Term SWMS, 16 options were identified to be carried forward. Of these 16 recommended options, 10 of the options have new costs associated with them while the other six do not have new costs associated with them. These new costs are not currently incorporated into the Region's budget or capital plans. The remaining six recommended options without new costs associated with them (WDP 11, C 6, C 7, C 10, C 15, RD 4) have already been included in the existing budget and are not expected to require additional funding beyond what is included in the existing budget. A summary of the recommended options with new costs for consideration are summarized in ***Table 4***.

The identified options have different implementation timelines. Certain options are considered short-term (1-3 years), some are considered medium-term (4-10 years), and others are considered long-term (11+ years). They are categorized into the following groups:

- Drop-Off and Transfer (DT)
- Waste Diversion and Policy (WDP)
- Residual Processing and Disposal (RD)
- Collection (C)
- Processing (P)

Table 4: Recommended Options with New Costs - Names and Descriptions

Option Code	Option Name	Description
WDP 4	Support the Circular Economy	Provide support for local innovators and/or organizations that design for the environment and/or reduce, reuse and reclaim waste.
WDP 6	Support the Sharing Economy	Promote the sharing economy (e.g., repair cafes, tool libraries) through supporting, partnering and/or partially funding organizations involved in this area.
WDP 7	Alternatives to By-law Enforcement	Conduct targeted outreach to households to improve compliance with the Region's waste management by-laws.
WDP 8	Provide Waste Diversion Promotion and Education to the IC&I Sector	Provide P&E to small and medium sized businesses through a waste diversion campaign and a dedicated webpage. Evaluate impact of SUP ban on sector.
WDP 13	Decrease Garbage Bag Limits	Decrease garbage bag limits in phases with Phase 1 reducing to 2 bags and Phase 1 reducing to 1 bag.
WDP 14	Promotion & Education for Diversion	Continue to find new ways to promote and educate waste management programs in order to increase program participation (e.g., face-to-face interactions, pop-up events, market research, social media).
WDP 15	Multi-Residential Waste Management Improvements	Improve multi-residential building waste diversion performance through increased and targeted promotion and education.
C11	Track Waste Containers in Multi-Residential Buildings	Optimize use of existing Radio-frequency identification (RFID) tags in MR containers to enhance collection and reporting of waste diversion.
DT 6	Additional Public Waste Drop-Off Depots	Conduct a feasibility and siting study first to provide two additional permanent locations for residents to drop-off excess curbside collected and non-curbside waste.
RD 3	Extend Landfill Capacity	Continue to revisit timing for when the HWMS could be expanded (current lifespan is until 2044). Conduct an Environmental Assessment and expand the landfill.

3.2 Operating and Capital Cost of Options

Table 5 displays the capital and operational costs and descriptions for the recommended options that have new costs associated with them. Capital costs are one-time costs that occur in the year identified, whereas operational costs occur annually. At the direction of the Region costs are presented in present day dollars and have not been escalated to the year in which they would be incurred. The capital cost and timing information was provided by the Region based on anticipated implementation timelines and costs. Ongoing operational costs have been considered until 2040 to account for the full payback period of the capital options. See **Section 4.1** for more information on the assumptions used in the financial analysis.

Costs associated with options DT 6 and RD 3 are related to preliminary studies. Through completing these preliminary studies the cost associated with the full implementation of the option will be determined. Cost information should be continually reviewed as new information becomes available, particularly because many options are at an early stage of planning, with the full scope of implementation not yet defined. As many of the costs occur several years in the future, they could be impacted by a number of factors such as regulatory changes, economic factors (such as cost escalation or foreign exchange), demographics or technological advances. The financial analysis assesses the incremental capital cost and the impact of operating costs of delivering these recommended options.

Table 5: Capital and Operational Costs for Recommended Options

Option Code	Option Name	Operating Impact: One-Time Cost	Operating Impact: Ongoing Annual Cost	Capital Cost
WDP 4	Support the Circular Economy	N/A	$300,000 for grants/subsidies (2023-2040)	N/A
WDP 6	Support the Sharing Economy	N/A	$1,000 for P&E (2023 – 2040)	N/A
WDP 7	Alternatives to By-law Enforcement	N/A	$10,000 for P&E (2023 – 2040)	N/A

Option Code	Option Name	Operating Impact: One-Time Cost	Operating Impact: Ongoing Annual Cost	Capital Cost
WDP 8	Provide Waste Diversion Promotion and Education to the IC&I Sector	$30,000 start-up costs for printing and toolkit design (2022)	$15,000 for P&E (2023 – 2040)	N/A
WDP 13	Decrease Garbage Bag Limits	$250,000 start-up costs for printing and P&E (2022)	$90,000 ongoing for printing, P&E (2023 – 2040)	N/A
WDP 14	Promotion & Education for Diversion	$150,000 for campaign development (2022)	$80,000 for promotional materials, $119,000 for 1 FTE Waste Diversion Education Coordinator, $20,000 for 2 Summer Students (2023 – 2040)	N/A
WDP 15	Multi-Residential Waste Management Improvements	$45,000 for new database development (2023)	$12,000 for position reclassification from level 4 - 5 (2023 – 2040) and $18,000 for P&E (2024 – 2040)	N/A
C11	Track Waste Containers in Multi-Residential Buildings	$17,000 to purchase tag reading devices and software (2022). Future operating costs to be determined.	N/A	N/A
DT 6	Additional Public Waste Drop-Off Depots	N/A	$1.4M per depot for 1 Team Lead, 1 Landfill Technician, 5.5 Operators, contracts to haul bins, wood chipping, HHW, utilities and maintenance. Operating estimate to be refined through study completed in 2022. (Depot 1: 2027 – 2040, Depot 2: 2030 - 2040)	$100,000 for a feasibility study (2020), $7,000,000 to purchase property (2024), $2,000,000 for design (2025, 2028), $30,000,000 for construction (2026, 2029)

Option Code	Option Name	Operating Impact: One-Time Cost	Operating Impact: Ongoing Annual Cost	Capital Cost
RD 3	Extend Landfill Capacity Study	N/A	N/A	$500,000 for conducting an Environmental Assessment related to landfill expansion (2024)

The capital costs associated with options DT 6 and RD 3 are for feasibility studies or environmental analysis. These items could have additional costs associated with them depending on the results of the studies. The three options that comprise the majority of the capital and operating costs are DT 6 – Additional Public Waste Drop-Off Depots, WDP 4 – Support the Circular Economy, and WDP 14 – Diversion Promotion and Education. These three options are summarized below.

The option with the most significant financial impact is DT 6 – Additional Public Waste Drop-Off Depots, which involves the development of two new permanent locations for residents to drop-off excessive curbside collected and non-curbside waste. The total capital costs are estimated at $39.1 million and include a feasibility study, property purchase, design, and construction. The capital costs associated with DT 6 represent 99% of the total capital costs of the recommended options. The ongoing annual operating and haulage costs are estimated at $1.4 million per depot for staffing, contracts, utilities, and maintenance. The ongoing costs are estimated to total $35.0 million in today's dollars between 2027 and 2040, representing 74% of the operational costs proposed in the recommended options.

Option WDP 4 – Support the Circular Economy sets aside financial support for local innovators / organizations that reduce, reuse, or reclaim waste. This grant program is proposed to begin in 2023 and allocate $300,000 per year to the fund. The ongoing cost for this option between 2023 and 2040 sums to $5.4 million in today's dollars which represents 11% of the operational costs associated with the recommended options. There is no capital cost associated with option WDP 4.

Option WDP 14 – Diversion Promotion and Education involves implementing new P&E strategies to promote a variety of diversion goals such as increased participation in a Green Cart program and reducing Blue Box contamination. The option includes a one-time operational cost of $150,000 in 2022 for the development of campaigns. An annual operational cost of $219,000 begins in 2023 and continues until 2040 for promotional materials and staffing. The total

cost equals $4.1 million and represents 9% of the operational costs of the recommended options. There is no capital cost association with option WDP 14.

4 Cost Impact for Recommended Options

This section identifies the annual incremental costs of the recommended options for the Region. The cost impact of the options was compared to the 2020 Operating Budget for the Region's Solid Waste Management division. The 2020 Operating Budget has been used as the baseline for all future years of analysis.

4.1 Annual Incremental Cost Impact

As discussed in **Section 2.1**, the Solid Waste Management planned operating budget for 2020 is $52.2 million. The Operating Budget captures the costs incurred by the Region in order to operate at their current level of service and does not account for the recommended options for implementation.

The annual incremental costs include the incremental capital costs required to implement the options beyond what has been previously identified in the capital program and the associated operating costs, required for both implementation and ongoing operations. These costs have been added to the current 2020 budget. Based on direction from the Region staff, it was determined that the capital cost of the recommended options would be funded through capital reserves. This would require drawdowns on the current capital reserve. In order to fund the reserve, the capital cost of the recommended options will be paid as reserve contributions over the 10 years following the implementation of the options. The incremental reserve contributions have been captured in the incremental costs in this analysis. Annualizing the cost over a 10-year period ensures that no major costs occur in any one year and therefore the incremental costs for the recommended options are relatively consistent year over year. In order to capture the full cost of implementing the capital options within this analysis, the analysis period extends until 2040.

A breakdown of the incremental costs is provided in ***Figure 2***, separating incremental capital reserve contributions costs, implementation costs, and operating costs.

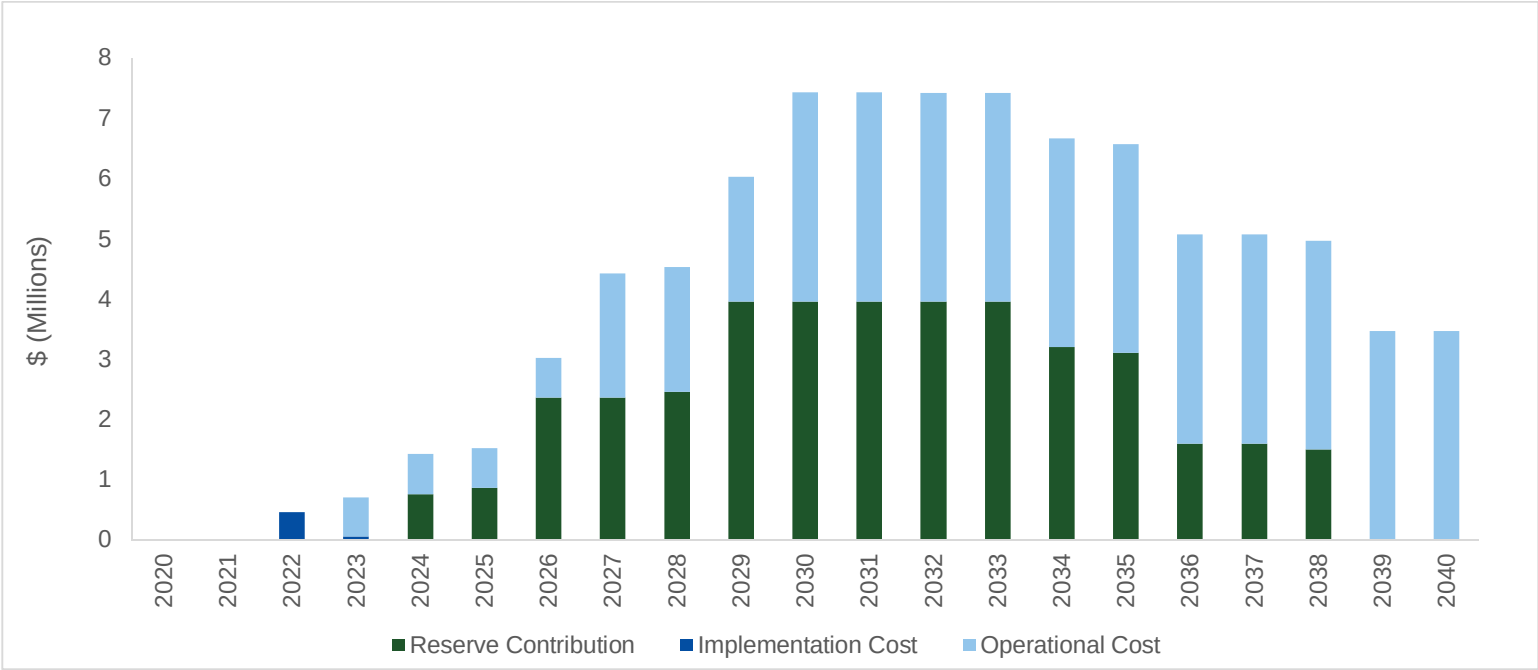

Figure 2: Option Incremental Cost

Figure 3 shows the annual incremental cost of implementing and operating the recommended options on the current budget. The incremental cost includes reserve contributions, implementation costs and operational costs. For the purposes of an equivalent analysis, the budget has been held constant and no cost escalation has been included for the budget or cost of options. The annual cost increase over the forecast period related to the implementation of the new options ranges from a minimum of $457,000 (in 2022) to a maximum of $7,425,000 (in 2030/2031). The average cost increase over the forecast period (2022 – 2040) for the recommended options is approximately $4.6 million which represents 8.8% of the 2020 operating budget.

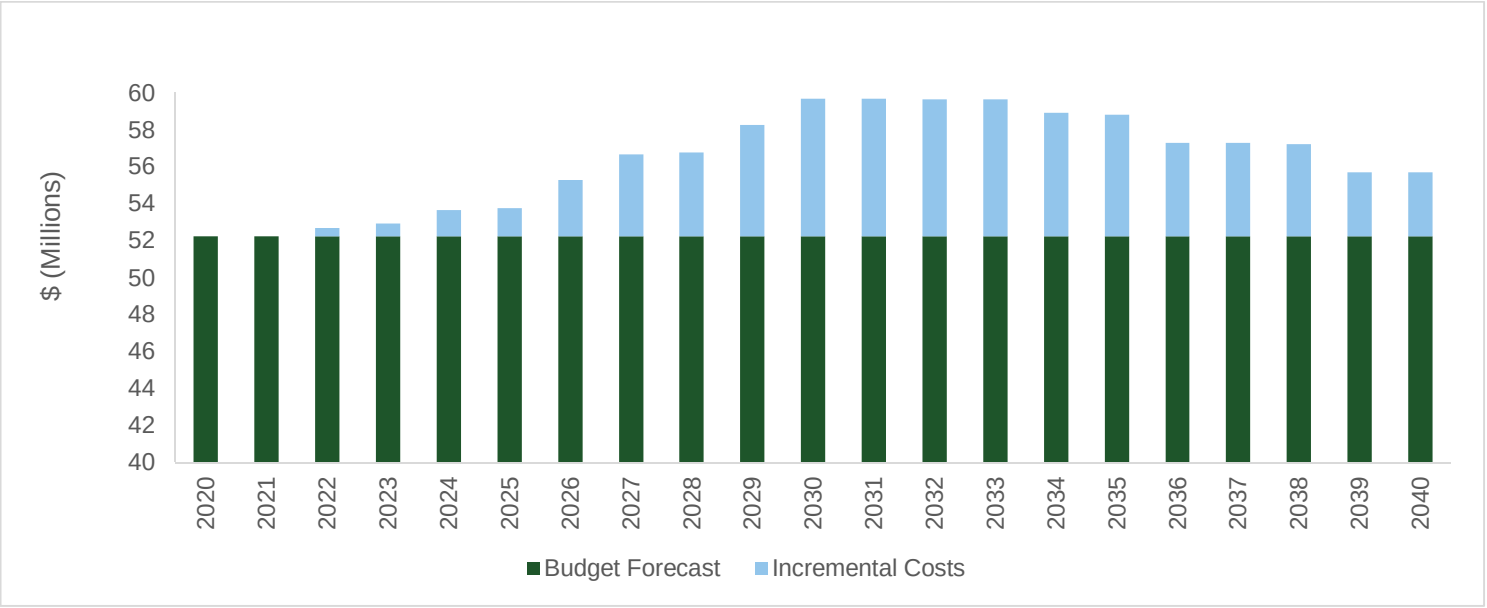

Figure 3: Incremental Costs and Operating Budget Estimates

4.2 Cost Impact Per Household and Per Tonne

Household data was provided by the Region (presented in ***Table 6***) to support the quantification of the cost impact for the recommended options on a per household basis. The numbers presented are the number of households in each municipality in 2019. It has been assumed that the number of households remains constant throughout the analysis.

Table 6: 2019 Household Data for Halton Region

City	# of Households
Oakville	76,530
Milton	39,561
Burlington	82,424
Halton Hills	24,342
Total	**222,857**

Tonnage data was provided by the Region (presented in ***Table 7***) to support the quantification of the cost impact for the recommended options on a per tonne basis. The numbers presented are the number of tonnes per material type in 2019. It has been assumed that the number of tonnes remains constant throughout the analysis.

Table 7: 2019 Tonnage Data for Halton Region

Material	# of Tonnes
Blue Box Curb	41,132
Blue Box Multi	5,044
Green Cart	28,971
Green Cart Multi	582
Yard Waste	22,713
Christmas Trees	292
Garbage Curb	60,039
Garbage Multi	13,222
Total	**171,996**

Figure 4 shows the incremental cost per household for the Region from 2020 to 2040. The average annual cost increase is $20.56 per household in this time period, as seen in ***Figure 4***. The incremental cost peaks in 2030 and 2031 at $33.32 per household. As discussed in **Section 3.2**, the majority of these costs are attributable to option DT 6 - Additional Public Waste Drop-Off Depots. In 2030, both drop-off depots will be fully operational, resulting in a $2.8 million annual operating cost increase related only to the operations of the facility.

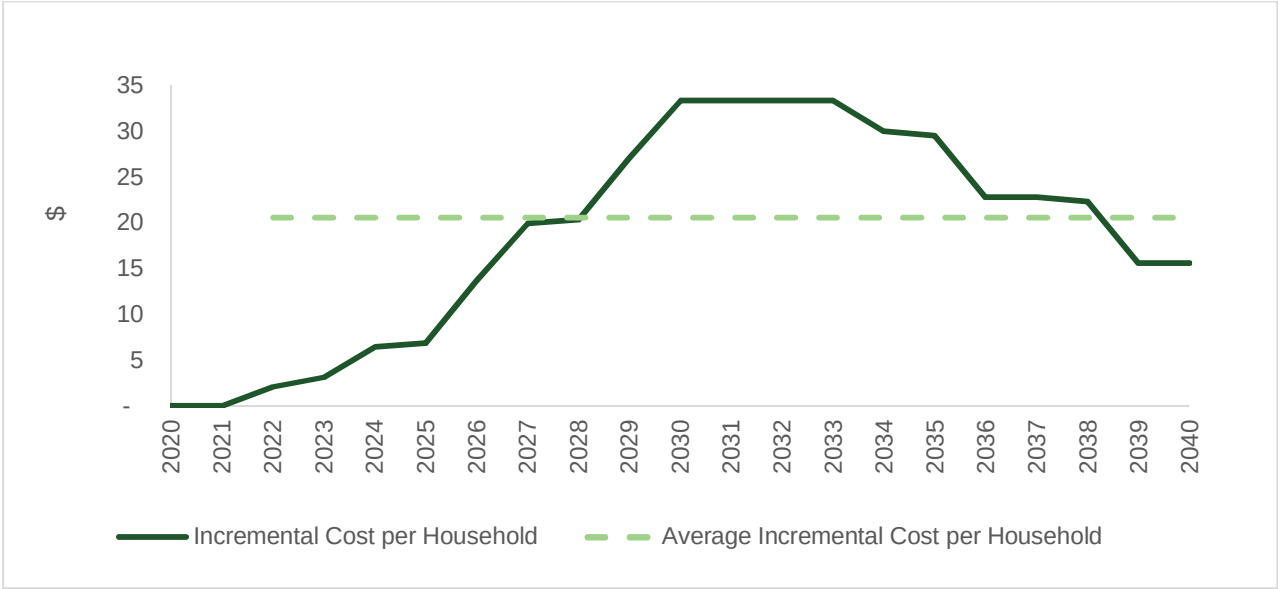

Figure 4: Net Incremental Cost Per Household

Figure 5 shows the incremental cost per tonne for the Region from 2020 to 2040. The average annual cost increase is $26.64 per tonne in this time period, as seen in ***Figure 5***. The incremental cost peaks in 2030 and 2031 at $43.17 per tonne.

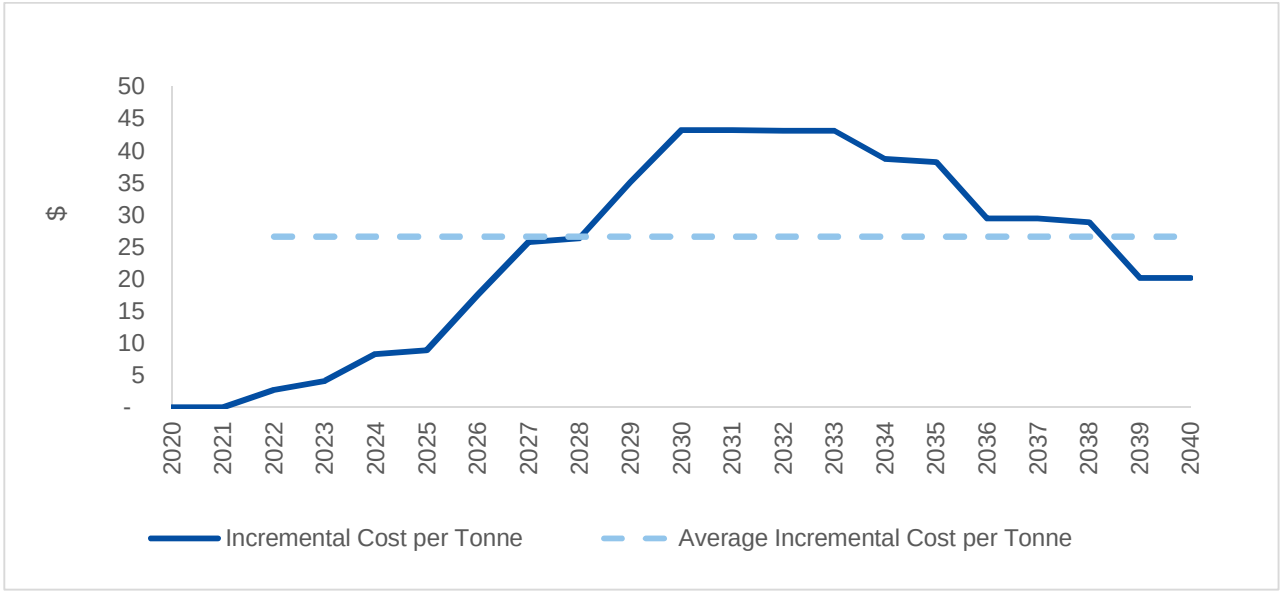

Figure 5: Net Incremental Cost Per Tonne

5 Next Steps

5.1 Refinement of Financial Estimates

The estimates for operating and capital cost impacts were developed by Region staff and Dillon and have been developed based on a number of identified in the Region's Solid Waste Management Strategy. The capital cost and timing information was provided by the Region and Dillon based on estimated costs and scheduling.

Based on the assumptions and analysis described, the recommended options would result in an incremental cost of approximately $20.56 per household per year until 2040. The cost information used to develop these estimates should be continually reviewed as new information becomes available. Many options are at an early stage of planning, with the full scope of implementation not yet defined. As some of the costs estimated for this analysis occur several years in the future, the costs could be impacted by a number of factors such as regulatory changes, economic factors, demographics, or technological advances. The Region should also explore potential revenue opportunities that could arise from the recommended options.

5.2 Blue Box Individual Producer Responsibility Considerations

Under a full individual producer responsibility (IPR) program, industry would pay the full cost of municipal Blue Box programs, instead of the approximate 50% that is currently paid by industry in the form of funding distributed to municipalities based on recycling program costs and performance and the remaining 50% being paid by municipalities. Moving to an IPR program also includes taking operational responsibility for recycling collection and processing and making sure materials are recycled. Also included in this new program will be the onus on industry stewards to make packaging decisions that deliver better environmental outcomes. The IPR transition in Ontario is scheduled to begin in 2023, with Halton currently scheduled to transition in 2025. Additional information on IPR is available in **Section 2.4.1 2** of the Medium-Long Term SWMS**.**

The transition to IPR is expected to have a significant impact on the Region's waste management system. Areas of impact will include recycling collections, transfer, haulage, and processing. In the transition to IPR, there will be significant impacts to the operational requirements of the Region. This will result in changes to costs and revenues of the Region's waste management systems. The Region should continue to analyze the potential cost impact of a transition to IPR and incorporate that into the financial analysis of the various options.

Appendix D

Summary of Environmental and Financial Impacts for Recommended Options

Appendix D: Summary of Recommended Options and Potential Impacts

Option Code	Option Name	Option Description	Implementation Year	Year Option Will Achieve Full Diversion Potential[1]	Impact on Diversion Rate (%)	Operating Budget Impacts		Capital Costs	GHG Reductions (tonnes/year)[2]
						One-Time Cost	Ongoing Annual Cost		
WDP 4	Support the Circular Economy	Provide support for local innovators and/or organizations that design for the environment and/or reduce, reuse and reclaim waste.	2023	2028	0.5		$300,000		292
WDP 6	Support the Sharing Economy	Promote the sharing economy (e.g., repair cafes, tool libraries) through supporting, partnering and/or partially funding organizations involved in this area.	2023	2028	0.5		$1,000		292
WDP 7	Alternatives to By-law Enforcement	Conduct targeted outreach to households to improve compliance with the Region's waste management by-laws.	2023	2028	1		$10,000		583
WDP 8	Provide Waste Diversion Promotion and Education to the IC&I Sector	Provide P&E to small and medium sized businesses through a waste diversion campaign and a dedicated webpage. Evaluate impact of SUP ban on sector.	2023	2028	0.5	$30,000	$15,000		292
WDP 11	Enhanced Contractor Collection	Conduct compliance blitzes to increase proper residential set outs.	2024	2029	1				600
WDP 13[3]	Decrease Garbage Bag Limits	Decrease garbage bag limits in phases with Phase 1 reducing to 2 bags and Phase 1 reducing to 1 bag.	2023 (Phase 1) 2031 (Phase 2)	2033	3	$250,000	$90,000		2,361
WDP 14	Promotion & Education for Diversion	Continue to find new ways to promote and educate waste management programs in order to increase program participation (e.g., face-to-face interactions, pop-up events, market research, social media).	2023	2028	0.5	$150,000	$219,000		292
WDP 15	Multi-Residential Waste Management Improvements	Improve multi-residential building waste diversion performance through increased and targeted promotion and education.	2023	2028	0.5	$45,000	$30,000		292
C 6	Automated Collection Study	Conduct a feasibility study to move to a cart-based collection program.	2022	N/A	0				N/A

Appendix D: Summary of Recommended Options and Potential Impacts

Option Code	Option Name	Option Description	Implementation Year	Year Option Will Achieve Full Diversion Potential[1]	Impact on Diversion Rate (%)	Operating Budget Impacts		Capital Costs	GHG Reductions (tonnes/year)[2]
						One-Time Cost	Ongoing Annual Cost		
C 7	"Smart City" for New Multi-Residential Development	Conduct a feasibility study for the use of underground waste collection and weight tracking per multi-residential unit.	2026	N/A	0				N/A
C 10	Expand Existing Collection Services	Expand collection program to align with future Provincially-designated materials.	2024	2029	0.5				300
C 11	Track Waste Containers in Multi-Residential Buildings	Optimize use of existing Radio-frequency identification (RFID) tags in MR containers to enhance collection and reporting of waste diversion.	2023	2028	1	$17,000			583
C 15	Alternatives to Petroleum-Based Fuels for Waste Management Vehicles	Use alternative fuels for waste collection vehicles and onsite equipment.	2025	N/A	0				5,700
DT 6[3,4]	Additional Public Waste Drop-Off Depots	Conduct a feasibility and siting study first to provide two additional permanent locations for residents to drop-off excess curbside collected and non-curbside waste.	2022 (Study) 2027 (Site 1) 2030 (Site 2)	2035	2		$2,800,000	$39,100,000	1,443
RD 3	Extend Landfill Capacity	Continue to revisit timing for when the HWMS could be expanded (current lifespan is until 2044). Conduct an Environmental Assessment and expand the landfill.	2023	N/A	0			$500,000	N/A
RD 4	Optimize Utilization of Landfill Gas	Review existing contract agreement. Conduct a study to modify/enhance the utilization of landfill gas at the HWMS. Conduct a Cost Benefit Analysis (CBA) to review and evaluate potential LFG use options and identify a preferred alternative.	N/A	N/A	0				N/A

Assumption

1. It will take between 2-5 years for the option to reach the ultimate diversion potential, depending on the option.
2. GHG estimate is based on the waste projections and the estimated annual tonnes diverted from landfill once the option achieves the ultimate waste diversion rate. GHG estimate for option C 15 is based on the average amount of diesel fuel current waste collection vehicles consume each year and assuming a non-petroleum based fuel replaces diesel fuel.
3. WDP 13 and DT6 will be implemented in two separate phases
4. GHG estimation for DT6 includes GHG impact based on trip distance reductions introduced by the additonal public depots in Oakville and Burlington assuming that 20% of existing customers at the HWMS come from Burlington and 20% come from Oakville.

Legend

	Waste Diversion Impacts
	Financial Impacts
	GHG Impacts