Report to Civic Works Committee

To: **Chair and Members**
Civic Works Committee
From: **Kelly Scherr, P.Eng., MBA, FEC**
Managing Director, Environmental & Engineering Services, City Engineer
Subject: **Update on Resource Recovery Strategy Including Mixed Waste Processing**
Date: **April 20, 2021**

Recommendation

That, on the recommendation of the Managing Director, Environmental & Engineering Services and City Engineer the following actions **BE TAKEN:**

a) this report **BE RECEIVED** for information;

b) the Civic Administration **BE DIRECTED** to take no further action on the Unsolicited Proposal dealing with mixed waste processing; and

c) the Civic Administration **BE DIRECTED** to develop details and a background business engagement document to initiate a two-step public procurement process (Request for Qualifications followed by a Request for Proposals) for a resource recovery facility or facilities (including mixed waste processing, mechanical-biological treatment and waste conversion technologies), pilot project or commercial scale, and report back to Civic Works Committee by December 2021 with details on how the process will occur; it being noted that Civic Administration already have direction to examine the potential for small scale, demonstration facilities for resource recovery facilities as part of the London Waste to Resources Innovation Centre, subject to Municipal Council approval.

Executive Summary

The City of London has four major waste management projects underway:
1. Long-term Resource Recovery Strategy
2. 60% Waste Diversion Action Plan
3. Residual Waste Disposal Strategy
4. Transition to Extended Producer Responsibility Programs

This report focuses on updates as part of the development of the long-term Resource Recovery Strategy. A review of file information, reports and on-line sources suggest that there are a very limited number of mixed waste or partially mixed waste processing and advanced resource recovery facilities operating in Canada and the United States at this time. These kinds of facilities are much more common in Europe. In North America there have been a number of closures of first-generation facilities. However, in recent years there are a few that are establishing a longer track record in the business. The track record and experience in Europe is much longer and with better results.

Interest in advanced technologies in Ontario, other parts of Canada and parts of the United States remain high. Further research coupled with facility innovation at a few locations is providing the opportunity to build a stronger track record of success and a better appreciation of the risks, costs and benefits.

An Unsolicited Proposal for mixed waste processing was received by the City of London (Purchasing and Supply) on November 22, 2020. The unsolicited proposal was reviewed and staff are recommending no action be taken. Supporting this decision is information contained in this report including these summary details:

- The City has several public reports that highlight its interests in this area and ongoing research, information collection and review including progress in Ontario;
- In 2018, as part of a public Request for Information (RFI), the City received submissions from 26 vendors with technologies or access to technologies for mixed waste processing and advanced resource recovery;
- The City has set aside land beside the W12A Landfill Site for resource recovery facilities and related industries (Waste Management Resource Recovery Area and the potential development of Eco-Industrial Parks, as per The London Plan);
- The City established the concept of the London Waste to Resources Innovation Centre in 2015 and entered a five year program with Western University in 2019 to continue to examine opportunities to create more resources from materials traditionally sent to landfill;
- The City has not completed its long-term Resource Recovery Strategy including approved budgets;
- Provincial policy, technical direction and standards on mixed waste processing facilities and advanced resource recovery facilities is limited at this time;
- The Canada-European Union Comprehensive Economic and Trade Agreement (CETA), signed May 2017, has created numerous opportunities for both parties to enhance economic opportunities and trade; and
- The City is involved with a comprehensive Environmental Assessment for the expansion of the W12A Landfill. This is a priority project for the City.

City staff are recommending that details and a background business engagement document be prepared to initiate a two-step public procurement process (Request for Qualifications followed by a Request for Proposals) for a resource recovery facility, pilot project or commercial scale. A report to Civic Works Committee and Council to receive further direction is proposed for December 2021.

Linkage to the Corporate Strategic Plan

Municipal Council continues to recognize the importance of solid waste management and the need for a more sustainable and resilient city in the development of its 2019-2023 Strategic Plan for the City of London. Specifically, London's efforts in solid waste management address the three following areas of focus: Building a Sustainable City; Growing our Economy; and Leading in Public Service.

On April 23, 2019, the following was approved by Municipal Council with respect to climate change:

> *Therefore, a climate emergency be declared by the City of London for the purposes of naming, framing, and deepening our commitment to protecting our economy, our ecosystems, and our community from climate change.*

The developing Resource Recovery Strategy, including the implementation of the 60% Waste Diversion Action Plan (and the Green Bin program), addresses various aspects of climate change mitigation within the waste management services area including greenhouse gas (GHG) reduction.

Analysis

1.0 Background Information

1.1 Previous Reports Related to this Matter

Some relevant reports that can be found at www.london.ca under Council and Committee meetings include:

- Case #10: Revised Implementation (Case #1, 2020 Budget) - 60% Waste Diversion Action Plan (January 12, 2021 meeting of Council)

- Updates – 60% Waste Diversion Action Plan Including the Green Bin Program (November 17, 2020 meeting of the Civic Works Committee (CWC), Item #2.2)
- Business Case 1 – 60% Waste Diversion Action Plan – 2020-2023 Multi -Year Budget (January 30, 2020 meeting of the Strategic Priorities & Policy Committee (SPPC), Item #4.12a)
- Current and Proposed Actions for Reducing and Managing Plastics I the Residential Sector and the Role for the Hefty® EnergyBag® Pilot Project (July 23, 2019 meeting of the CWC, Item #2.5)
- Update and Next Steps for the London Waste to Resources Innovation Centre (April 16, 2019 meeting of the CWC, Item #2.4)
- Memorandum of Understanding with Green Shields Energy as Part of the London Waste to Resources Innovation Centre (April 16, 2019 meeting of the CWC, Item #2.5)
- 60% Waste Diversion Action Plan – Updated Community Feedback (September 25, 2018 meeting of the CWC, Item #3.2)
- Public Participation Meeting 60% Waste Diversion Action Plan – Additional Information (September 25, 2018 meeting of the CWC, Item #3.2)
- 60% Waste Diversion Action Plan (July 17, 2018 meeting of the CWC, Item #3.1)

1.2 Context

The City of London has four major waste management projects underway:

1. Long-term Resource Recovery Strategy - involves the development of a plan to maximize waste reduction, reuse, recycling, resource recovery, energy recovery and/or waste conversion in an economically viable and environmentally responsible manner. Resource Recovery strategies (i.e., which includes waste diversion strategies) are developed and approved at the local government level. Technologies are subject to approvals and regulations from the Provincial government. Appendix A contains previously released information (60% Waste Diversion Action Plan report, 2018) that helps define mixed waste processing and related advanced resource recovery technologies. The 60% Waste Diversion Action Plan is a major step for the long-term Resource Recovery Strategy.

2. 60% Waste Diversion Action Plan - proposes a set of 21 actions to achieve 60% diversion of residential waste by the end of 2022. The budget for the multi-year implementation (2020-2023 Multi-Year Budget Business Case #1) was approved March 2, 2020. Shortly after this date, the COVID-19 state of emergency was declared provincially on March 17, 2020, and locally March 20, 2020. A revised implementation plan and budget was approved by Municipal Council on January 12, 2021 that includes the implementation of a Green Bin program.

3. Residual Waste Disposal Strategy - involves the development of a long-term plan to manage residual waste (generally waste after diversion and resource recovery initiatives) and involves completion of an Individual Environmental Assessment (EA) for the expansion of the W12A Landfill as prescribed by the Ministry of the Environment, Parks & Conservation (MECP). The Individual EA requires approval by the Minister of the Environment, Parks & Conservation and Cabinet.

4. Transition to Extended Producer Responsibility Programs - for several years, a number of materials that have been traditionally managed by municipalities have been transitioning to new management systems whereby industry has taken greater administrative and financial responsibility for the materials it creates (Table 1).

Table 1: Status of Programs Transitioning to Extended Producer Responsibility

Material	Transition Status	Transition (Proposed) Date	How does the City get Involved?
Used Tires	Complete	January 1, 2019	Accept at EnviroDepots on behalf of industry producers

Material	Transition Status	Transition (Proposed) Date	How does the City get Involved?
Batteries	Complete	July 1, 2020	Accept at EnviroDepots on behalf of industry producers
Electronics	Complete	January 1, 2021	Accept at EnviroDepots on behalf of industry producers
Municipal Hazard and Special Waste (HSW)	Draft Regulation	Proposed July 1, 2021	Currently accepted at W12A HSW Building
Blue Box Materials	Draft Regulation	Proposed Jan. 1, 2023 to Dec. 31, 2025	Part of the Core Team participating in regulation and process development

This report deals primarily with the first of four projects and includes several updates and the next steps regarding mixed waste processing, advanced resource recovery and the long-term Resource Recovery Strategy.

2.0 Discussion and Considerations

This section (and Appendices B and C) contains details on mixed waste processing and related technologies in the following areas:

2.1 Overview of Recent History on Mixed Waste Processing and Related Technologies in Canada, United States and Europe (and Appendix B)
2.2 Current Experience in Ontario (and Appendix C)
2.3 Current Experience in London
2.4 Review of Unsolicited Proposal
2.5 Next Steps

2.1 Recent History on Mixed Waste Processing and Related Technologies in Canada, United States and Europe (and Appendix B)

[The following details are a work in progress and will be updated as new information is shared with or obtained by City staff.]

A review of file information, reports and on-line sources suggest that there are a very limited number of mixed waste or partially mixed waste processing facilities operating in Canada at this time. Available details (Appendix B) suggest that at least 10 facilities have either closed or were re-engineered away from mixed waste processing. Many of these facilities were older, first generation facilities.

The Halifax Regional Municipality has recently proposed to close (December 2020) the Front End Processor/Waste Stabilization Facility (FEP/WSF) that has been in operation since 1995. It remains in operation, but its future is uncertain. The City of Edmonton is operating a facility to create refuse derived fuel from mixed waste to send to the Enerkem gasification system. In Nova Scotia, Sustane Technologies (pyrolysis technology) has been processing mixed waste since 2019. These are likely the only three facilities managing a mixed waste stream in operation in Canada. This does not include technologies that combust waste, with and without energy recovery.

Experience in the United States is very similar (Appendix B). Most first-generation, mixed waste processing and composting facilities have closed or have been re-engineered to meet newer program needs (e.g., acceptable lower diversion and recovery rates, more stringent end product quality, etc.). A few, newer facilities have been established in the last five years and are developing a proven track record. However, a few newer facilities have also been closed or re-engineered as the original design was not meeting performance or contractual requirements.

Experience in Europe and a few other countries with large scale mixed waste processing and resource recovery facilities indicate that these facilities can meet local requirements. For example, a 2017 report identified 570 Mechanical Biological Treatment (MBT) facilities operating in Europe. The challenge for Canadian municipalities is understanding the local conditions in which European MBT facilities operate, contractual requirements, how risks are shared or assumed, operating and capital costs, etc. There is also emerging information that suggests that some countries in Europe may be moving away from mixed waste processing and MBT facilities in favour of source separation systems for recycling and organics. For example, MBT will no longer count towards EU recycling targets after 2026. Starting January 1, 2027, the Waste Framework Directive requires that only separately collected and processed organics will be counted as diversion and meet the requirements of the Directive.

Further work is underway to understand the European Directives with respect to source separation programs for organics and the role of mixed waste processing and MBT facilities. A recent blog posting by the Swedish Environmental Protection Agency (Appendix B) further confirms more analysis is required on the future direction of MBT facilities in Europe.

2.2 Current Experience and Direction in Ontario

The Ministry of the Environment and Climate Change (now the Ministry of Environment, Conservation and Parks - MECP) issued the Food and Organic Waste Policy Statement on April 30, 2018. The document establishes the following targets and timelines for organics management in Ontario:

- larger municipalities that currently do not have a Green Bin program need to implement an organics management program that will achieve at least a 70 per cent waste reduction and resource recovery of food and organic waste generated by single-family dwellings by 2025.

- multi-residential buildings need to implement an organics management program that will achieve at least a 50 per cent waste reduction and resource recovery of food and organic waste by 2025.

The document states the:

> "*collection of source separated food and organics waste is the preferred method of servicing single family dwellings*" but notes that "*alternatives to the collection of source separated food and organics waste may be used if it is demonstrated that provincial waste reduction and resource recovery targets can be achieved efficiently and effectively*".

The rules and regulations around mixed waste processing are evolving as current regulations do not explicitly address mixed waste processing or the use of products produced (e.g., compost, digestate, solid recovered fuel, etc.). There are no operating mixed waste processing facilities in Ontario. All facilities have closed or were re-engineered as noted in Appendix B.

Through the Regional Public Works Commissioners of Ontario (RPWCO) Waste Subcommittee, mixed waste processing and advanced resource recovery (e.g., waste conversion technologies) initiatives and actions are shared quarterly among the 20 member municipalities. The most active municipalities are Region of Durham, Region of Peel, City of Toronto and the City of London (section 2.3). Appendix C contains updates from Durham, Peel and Toronto. Research has also been undertaken in the Region of York and the Region of Niagara. The County of Oxford, not a member of RPWCO, was very active with advanced resource recovery facilities until 2019 when it stopped its procurement process.

2.3 Current Experience and Direction in London

In addition to ongoing work through RPWCO, the City of London currently has a number of activities underway with respect to mixed waste processing and advanced resource recovery initiatives:

- As part of the 60% Waste Diversion Action Plan, Municipal Council approved the direction to proceed with a pilot project for mixed waste processing for waste collected from a portion of London's multi-residential buildings. City staff are currently working on current opportunities and alternative plans for Council's consideration.

- Research at the London Waste to Resources Innovation Centre including the NSERC Industrial Research Chair Thermochemical Conversion of Biomass and Waste to Bioindustrial Resources administered by Western University (2019), has been under way since 2015. Academic research, laboratory and bench scale testing, and field work ranges from feedstock handling to material quality through to technologies and end market products (e.g., mechanical recycling, chemical recycling, material conversion, alternative low carbon fuel, solid recover fuel, etc.).

- As part of the the London Waste to Resources Innovation Centre, the City has a non-binding Memorandum of Understanding (MoU) with Green Shields Energy - GSE (until December 31, 2022). The MoU sets out the short-term objective of collaboration between the City and GSE to undertake testing and develop data/information on the viability of Hydrogen Reduction technology to manage various non-hazardous waste streams including household garbage. This research has the potential to move to constructing and operating a demonstration scale facility containing a Hydrogen Reduction unit designed for demonstrating the effectiveness of the process on the conversion of various non-hazardous wastes.

  A provisional patent was issued for the technology on February 2021 for Canada and USA. The Intellectual Property (IP) is fully protected. The final patent is pending. Discussions are ongoing with MECP on the required approvals process for the technology under a demonstration Environmental Compliance Approval. Financial and operating arrangements are being developed and will be subject of a future report to Committee and Council.

- London's Hefty® EnergyBag® Pilot Project (for hard-to-recycle plastic items that are currently placed in the garbage), launched in late 2019 and proceeded as planned until March 2020. A number of adjustments have been made to address operating through the pandemic including delaying measurement studies and postponing expansion until a clearer picture is available. Revisions will be launched in May 2021. This project includes working with a number end markets and advanced resource recovery technologies.

2.4 Review of Unsolicited Proposal for Mixed Waste Processing

The City of London welcomes unsolicited proposals from individuals and organizations that could benefit London. The City will consider proposals that:

- Satisfy a City of London need or problem
- Are innovative or unique opportunities to improve service delivery
- Demonstrate significant value or saving, or mitigate risks
- Have significant revenue generation or economic development potential

Unsolicited proposals are subject to the City of London's Procurement of Goods and Services Policy as per section 21.2.

21.2 Direct Solicitation

a. Unsolicited proposals received by the City shall be referred to the Manager of Purchasing and Supply for review.

b. Any procurement activity resulting from the receipt of an unsolicited proposal shall comply with the provisions of this Policy.
c. A contract resulting from an unsolicited proposal shall be awarded on a non-competitive basis only when the procurement complies with the requirements of a non-competitive procurement, as detailed in Section 14.

An unsolicited proposal for mixed waste processing was received by Purchasing and Supply on November 22, 2020. The City of London currently collects about 90,000 tonnes of residential waste including about 3,000 tonnes of bulky waste (e.g., mattresses, couches, etc.) from homes with curbside service.

City Staff - Summary Comments:

The unsolicited proposal contains preliminary information that demonstrates at a high level what mixed waste processing could achieve in London. The basic information is supported by proven experience at a smaller mixed waste processing facility in Europe. There is no similar facility operating in North America at this time.

It is not possible to conduct a thorough review of this unsolicited proposal as it essentially a starting point for a negotiation for a project and not a complete proposal that can be reviewed on its own merits.

In consultation with staff from Purchasing and Supply and Finance Services, it was determined that additional details on the unsolicited proposal should not be obtained as there are likely many competitive suppliers of this service that would have interest in an opportunity to build, operate and showcase their technology, if the opportunity was made available. Supporting this decision are the following:

- The City has public reports that highlight its interests in a future where mixed waste processing and/or advanced resource recovery facilities could be located near the W12A Landfill.

- In 2018, as part of a public Request for Information (RFI), the City received submissions from 26 vendors with technologies or access to technologies for mixed waste processing and advanced resource recovery. Of the 26 submission, 20 vendors included a form of mixed waste processing (i.e., different levels of processing) as the front end to the overall technology solution.

- The City has set aside land beside the W12A Landfill Site for resource recovery facilities and related industries (Waste Management Resource Recovery Area and the potential development of Eco-Industrial Parks, as per of The London Plan).

- The City established the London Waste to Resources Innovation Centre in 2015, and expanded in collaboration with Western University and many business partners (April 2019), and has been working with a number of different new, emerging and next generation technologies for turning waste materials into resources.

- The City has not completed its long-term Resource Recovery Strategy, has not prepared long-term operating and capital budget costs and potential savings (e.g., prepare a business case), greenhouse gas (GHG) reduction benefits, and has not received Council direction in this regard.

- Provincial policy and technical direction on mixed waste processing facilities and advanced resource recovery facilities is limited at this time. The Province has expressed strong support for further progress in these areas; however specific standards, guidelines and operating practices do not exist. These will be developed as experience is gained with technologies. At this point in time, the Provincial government has not expressed any new financial support for innovative projects of this nature.

- The Canada-European Union Comprehensive Economic and Trade Agreement (CETA), signed May 2017, has created numerous opportunities for both parties to enhance economic and trade. With respect to mixed waste processing and/or advanced resource recovery technologies, companies that traditionally may not pay attention to the Canadian marketplace, may now look at it as an entry point to North American opportunities and partnerships.

- As noted in Section 1.2, the City is involved with a comprehensive Environmental Assessment for the expansion of the W12A Landfill. This is a priority project for the City and is following a prescribed process for Individual Environmental Assessments. The Draft Environmental Assessment Study Report was submitted to CWC on March 30, 2021 and to Council on April 13, 2021. The timetable for the current priority activities, which has bearing on all future activities near the landfill, is found on Table 2.

Table 2: W12A Landfill Draft Environmental Assessment Study Timetable

Date	Step
April 20 to May 19, 2021	• Circulate Draft EASR to GRT and other stakeholders. Place Draft EASR on-line and at City Hall for review.
Late June/Early July, 2021	• Review of EASR by Waste Management working Group (WMWG).
July 27, 2021 (tentative)	• CWC to hold public participation meeting for EASR. • CWC to consider recommending submission to MECP.
August 10, 2021	• Council approval of CWC recommendation.
August 19, 2021	• Formal submission of Proposed EASR to MECP (includes notice to all stakeholders).
August 19, 2021 to Mid-March 2022 or later	• MECP provides a seven week review period for stakeholders to provide comments to the MECP. • MECP evaluates EASR submission and makes recommendation to the Minister. • Minister makes Decision to Approve or Reject.

The above details have led to staff's determination that no further action be taken on the unsolicited proposal. Furthermore, the Procurement of Goods and Services Policy section 6.3 is very clear regarding Prohibitions:

> 6.3 Official Point of Purchasing Contact and Lobbying Prohibition
>
> a. The City is committed to the highest standards of integrity with respect to the purchase of goods and/or services and managing the processes by which goods and/or services are acquired. The official point of purchasing contact shall be a member of the Purchasing and Supply Team. Should it be necessary or desirable to have a contact person to respond to technical issues that person shall be named in the competitive bid documents. All communications will be made by these individuals and during the procurement process, no bidder or person acting on behalf of the bidder or group of bidders shall contact any elected official, consultant or any employee of the City to attempt to seek information or to influence the award of the contract. Any activity designed to influence the decision process, including, but not limited to, contacting any elected official, consultant or employee of the City for such purposes as meetings of introduction, social events, meals or meetings related to the selection process, shall result in disqualification of the bidder for the project to which the influential activity is deemed to be directed.
>
> - Notwithstanding the foregoing, this prohibition does not apply to meetings specifically scheduled by the City Purchasing and Supply group for

presentations or negotiations. Any bidder found to be in breach of this Policy shall be subject to immediate disqualification from the procurement process and may be prohibited from future opportunities at the discretion of City Council.

b. In addition, no bidder who has been awarded the contract shall engage in any contact or activities in an attempt to influence any elected official or any employee of the City with respect to the purchase of additional enhancements, options, or modules. However, a contractor may communicate with the appropriate member of the Purchasing and Supply Team, the Manager of Purchasing and Supply or the City Treasurer for purposes of administration of the contract during the term of the contract.

c. The determination of what constitutes influential activity is in the sole discretion of the Manager of Purchasing and Supply, acting reasonably, and not subject to appeal.

d. Contract award decisions shall be based on clear, transparent and objective criteria that is applied free from political considerations or political interference.

2.5 Next Steps

The following are the proposed next steps to engage the marketplace and complete the long-term Resource Recovery Strategy (Table 3).

Table 3: Tentative Timetable for Marketplace Engagement and Completion of the Resource Recovery Strategy

Tentative Timeframe	Step
May to September 2021	Hold discussions and reviews of procurement processes in Region of Durham and Peel for mixed waste processing and related technologies. Check in with other municipalities via RPWCO.
July to December 2021	Finalize draft guiding principles, framework and processes for the long-term Resource Recovery Strategy including the role for the London Waste to Resources Innovation Centre and emerging economic development opportunities for the circular economy. Report to CWC and Council to receive direction.
July to December 2021	Prepare details and a background business engagement document to initiate a two-step public procurement process (Request for Qualifications followed by a Request for Proposals) for a resource recovery facility or facilities (including mixed waste processing, mechanical-biological treatment and waste conversion technologies), pilot project or commercial scale. This includes examining opportunities for funding from senior government, Federation of Canadian Municipalities (FCM) Green Fund and other technical support and investment agencies. Report to CWC and Council to receive further direction.
Q1 to Q3 2022	Subject to Council approval, initiate a Request for Qualifications process followed by a Request for Proposals.
Q3/Q4 2022	Complete final draft of long-term Resource Recovery Strategy and initiate a community engagement process.
Q3 2022 to Q2 2023	Very tentative – bring the above activities to completion and Council approval.

3.0 Financial Impact/Considerations

There are no financial impacts or considerations with this report. The report does refer to estimated capital and operating costs obtained from articles, reports, documents including technical documents completed for the Region of Durham, Region of Peel and City of Toronto.

Subject to Council direction, the next steps would include developing more details on preliminary cost estimates, landfill cost savings, economic development opportunities, GHG reduction benefits, and potential financing and funding opportunities for inclusion in the Resource Recovery Strategy. Upon completion and approval of the Strategy, any financial impacts would be brought forward for Council's consideration through a future budget process.

Conclusion

Mixed waste processing and advanced resource recovery technologies have had a challenging past in Canada and United States. Successes in Europe highlight the potential of these alternatives to landfill. However, the changing situation in Europe also needs to be better understood in Canada.

Interest in Ontario among a number of municipalities continues to grow as municipalities look at their long-term waste management systems. The City of London is well positioned for future opportunities using continuous improvement thinking and a systematic approach that addresses financing, social responsibility, the environment and climate change.

Provincial and Federal government legislation, regulation and policies will continue shape waste elimination, reduction and reuse, waste diversion, resource recovery and final disposal. Senior levels of government have a very important role to play in the advancement of technologies.

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Appendix A Definitions of Mixed Waste Processing and Advanced Resource Recovery Technologies

Appendix B Additional Information - Recent History on Mixed Waste Processing and Related Technologies in Canada, United States and Europe

Appendix C Current Experience in Ontario

Appendix A
Definitions of Mixed Waste Processing and Advanced Resource Recovery Technologies

The details below were first printed in 60% Waste Diversion Action Plan, July 2018. This section contains information in the following areas:

1. Background - Traditional Waste Diversion and Waste Management Technologies and Practices
2. Resource Recovery and Resource Recovery Systems
3. Integrated Solid Waste Management
4. Advanced Resource Recovery Technologies and Practices
   a) Anaerobic Digestion (AD - Biogas)
   b) Mixed Waste Processing (MWP)
   c) Mechanical/Biological Treatment (MBT)
   d) Waste Conversion Technologies (WCT)
   e) Energy from Waste (EFW)

1. Background - Traditional Waste Diversion and Waste Management Technologies and Practices

Generally, in Ontario, waste management systems include variations on the following practices to reach higher levels of waste diversion:

- Waste avoidance/prevention/minimization (not created in the first place)
- Reuse/refurbish/repurpose (for use again)
- Source separated recyclables (to be collected, processed, marketed and re-manufactured)
- Source separated leaf and yard waste (to be collected, processed and marketed)
- Source separated organics (food and other organics wastes) (to be collected, processed and marketed). Processing technologies generally include aerobic composting and anaerobic digestion (AD) technologies
- Energy from waste (EFW) through combustion
- Landfill

To go beyond 60% waste diversion will require the use of more advanced waste diversion and resource recovery technologies and practices.

The field of solid waste management has a plethora of definitions that fall into different categories including:

- Regulatory definitions usually defined by the Province of Ontario although some are defined at the Federal Government;

- By-law definitions usually defined by municipalities (and not always consistent from one municipality to the next); and

- Definitions created by waste management, recycling and other related organizations that have no legal foundation; however, they are often used by the members and adopted by others.

Some definitions often have a historical basis and have not been modernized; although the technologies within the definition are different than in the past. The inconsistency in legal definitions can be problematic when different provinces are compared. In addition, different technologies can be lumped together in some definitions with little understanding as to why that is the case. The section highlights a number of terms and some different definitions.

2. Resource Recovery and Resource Recovery Systems

"Resource recovery means the extraction of useful materials or other resources from things that might otherwise be waste, including through reuse, recycling, reintegration, regeneration or other activities. This includes the collection, handling, and processing of food and organic waste for beneficial uses. Although energy from waste and alternative fuels are permitted as waste management options, these methods are not considered resource recovery. The recovery of nutrients, such as digestate from anaerobic digestion, is considered resource recovery.

Resource recovery system means any part of a waste management system that collects, handles, transports, stores or processes waste for resource recovery purposes, but does not include disposal."

Source – Ministry of the Environment & Climate Change, Food and Organic Waste Policy Statement, April 2018, https://www.ontario.ca/page/food-and-organic-waste-framework

3. Integrated Solid Waste Management

"Integrated Solid Waste Management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal program which works cohesively to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. ISWM considers local needs and conditions, and then applies the most appropriate combination of waste management approaches for that situation. The major components of ISWM activities are waste prevention, recycling and composting, resource recovery, and, disposal in properly designed, constructed, and managed landfills."

Sources - based on the EPA definition noting that determining a date of this definition is difficult because many current documents are now archived on the USEPA website. Environment Canada and the Ministry of the Environment & Climate Change do not have specific definitions; however, many municipalities in Ontario and across Canada have created definitions to meet their needs.

4. Advanced Resource Recovery Technologies and Practices

Generally, advanced resource recovery technologies and practices fall under one of these categories:

a) Anaerobic Digestion (AD - Biogas)
b) Mixed Waste Processing (MWP)
c) Mechanical/Biological Treatment (MBT)
d) Waste Conversion Technologies (WCT)
e) Energy from Waste (EFW)

The literature does not contain consistent definitions for these technologies and sometimes groups of technologies may be classified under a single heading.

a) Anaerobic Digestion (AD - Biogas)

AD facilities can be listed under both traditional (as noted above because it is a proven technology in Ontario) and advanced in the case of Ontario as most AD experience has been associated with farm operations. With respect to AD as part of Mechanical-Biological Treatment (MBT) or as part of a mixed waste processing (MWP) system, this would be considered advanced and belongs in this section.

"Anaerobic digestion means the decomposition of organic matter by bacteria in an oxygen-limiting environment (as defined in Regulation 347 under the Environmental Protection Act). The biogas generated through anaerobic digestion can be used to fuel electrical generators, or it can be further processed into renewable natural gas. The digestate may also be used as a soil amendment that is most commonly used in agricultural operations."

Source – Ministry of the Environment & Climate Change, Food and Organic Waste Policy Statement, April 2018, https://www.ontario.ca/page/food-and-organic-waste-framework

"What is Biogas? Biogas is a renewable source of methane, the main ingredient in natural gas. It can be used for heating and cooling, or to generate electricity that can be used on-site or fed into the distribution grid. It can be refined into renewable natural gas that can be injected into gas pipelines or compressed and used as a vehicle fuel. The entire system, including the energy generating components, is typically referred to as a biogas facility or a biogas plant.

Biogas is produced when organic materials — anything from municipal organic wastes or bio-solids, food processing by-products, or agricultural manure and crop residues — break down in an oxygen-free environment. The process is called anaerobic digestion (AD) and usually occurs in a specialized tank or vessel – the anaerobic digester. AD is also the process that generates biogas or landfill gas (LFG) within landfills.

Anaerobic digesters have a number of end products, including digestate, a nutrient-rich slurry that can be applied directly on agricultural land, or material that is composted and then used for a range of purposes. Digester solids are materials from after de-watering that can be composted, and are well suited to be mixed with leaf and yard waste."

Source - Canadian Biogas Association, Municipal Guide to Biogas, March 2015 https://www.biogasassociation.ca/

b) Mixed Waste Processing

"Mixed-waste processing involves no generator separation of waste, with all waste processed at what's been called a "dirty" material recovery facility (MRF).[1] Recyclables are then pulled out at the MRF through a combination of manual and mechanical sorting. The sorted recyclable materials may undergo further processing required to meet technical specifications established by end-markets while the balance of the mixed waste stream is sent to a disposal facility such as a waste-to-energy facility or landfill".[2]

* Source(s)
[1] Waste 360 http://www.waste360.com/mrfs/10-points-explain-mixed-waste-processing
[2] Wikipedia https://en.wikipedia.org/wiki/Materials_recovery_facility

"Mixed waste processing means resource recovery processes that recover food waste or organic waste from waste streams where food and organic waste is co-mingled with other wastes."

Source – Ministry of the Environment & Climate Change, Food and Organic Waste Policy Statement, April 2018, https://www.ontario.ca/page/food-and-organic-waste-framework

c) Mechanical/Biological Treatment (MBT)

"Mechanical Biological Treatment (MBT) technologies are pre-treatment technologies which contribute to the diversion of MSW from landfill when operated as part of a wider integrated approach involving additional treatment stages. Mechanical Biological Treatment (MBT) is a generic term for an integration of several mechanical processes commonly found in other waste management facilities such as Materials Recovery Facilities (MRFs), composting or Anaerobic Digestion plant. MBT plants can incorporate a number of different processes in a variety of combinations. MBT therefore compliments, but does not replace, other waste management technologies such as recycling and composting as part of an integrated waste management system. MBT plants include the:

- *Pre-treatment of waste going to landfill;*
- *Diversion of non-biodegradable and biodegradable MSW going to landfill through the mechanical sorting of MSW into materials for recycling and/or energy recovery as refuse derived fuel (RDF);*

- *Diversion of biodegradable MSW going to landfill by:*
- *Reducing the dry mass of MSW prior to landfill;*
- *Reducing the biodegradability of MSW prior to landfill;*
- *Stabilization into a compost-like output (CLO) for use on land;*
- *Conversion into a combustible biogas for energy recovery; and/or*
- *Drying materials to produce a high calorific organic rich fraction for use as RDF."*

Source - Mechanical Biological Treatment of Municipal Solid Waste, February 2013, Dept. of Environment, Food and Rural Affairs, www.defra.gov.uk

d) Waste Conversion Technologies (WCT)

Waste Conversion Technologies (WCT) include the broad range of technologies which are applied to recover the inherent stored resource value of targeted waste feedstocks and/or MSW and to make these resources available for use rather than for disposal.

"There are a large number of technologies on the market at the moment and the use of many terms and definitions, with often different meaning. This reduces the possibility of comparing the different options. This chapter lists the most important concepts used in this field alphabetically.

- *Gasification is the thermal breakdown of waste under oxygen starved conditions (oxygen content in the conversion gas stream is lower than needed for combustion), thus creating a syngas (e.g. the conversion of coal into city gas).*
- *Plasma gasification is the treatment of waste through a very high intensity electron arc, leading to temperatures of > 2,000°C. Within such a plasma, gasifying conditions break the waste down into a vitrified slag and syngas.*
- *Pyrolysis is the thermal breakdown of waste in the absence of air, to produce char, pyrolysis oil and syngas (e.g. the conversion of wood into charcoal)."*

Source - International Solid Waste Association (ISWA), Alternative Waste Conversion Technologies, 2013

"New technologies to convert municipal and other waste streams into fuels and chemical commodities, termed conversion technologies, are rapidly developing. Conversion technologies are garnering increasing interest and demand due primarily to alternative energy initiatives. These technologies have the potential to serve multiple functions, such as diverting waste from landfills, reducing dependence on fossil fuels, and lowering the environmental footprint for waste management. Conversion technologies are particularly difficult to define because their market is in development and many of their design and operational features are not openly communicated by vendors. EPA's Office of Research and Development conducted research to evaluate and develop a "State of Practice" report for State and local decision-makers on the suite of emerging waste conversion technologies."

Source - USEPA State of Practice for Emerging Waste Conversion Technologies, 2012 https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=305250

e) Energy-from-Waste (EFW)

EFW is "A facility that generates steam and/or electricity through the combustion of municipal solid waste."

Source – Canadian Resource Recovery Council, http://www.resourcerecovery.ca/info/glossary/

"Energy-from-Waste is any technology, which recovers energy from the management/processing of waste materials. This includes Anaerobic Digestion, Mass Burn, Gasification, Plasma Gasification, and Landfill Gas Recovery.

Waste Derived Fuel is any technology designed to turn waste materials into a fuel product with the recovery of recyclables materials as part of the fuel development process."

Source – Ontario Waste Management Association, Guiding Principles Integrated Solid Waste Resource Recovery and Utilization (OWMA EFW/WDF Committee, November 2011) https://www.owma.org/articles/guiding-principles-on-integrated-solid-waste-recovery-and-utilization

Energy can be recovered from waste by various (very different) technologies. It is important that recyclable material is removed first, and that energy is recovered from what remains, i.e. from the residual waste. Energy from waste (EFW) technologies include:

- *Combustion in which the residual waste burns at 850°C and the energy is recovered as electricity or heat*
- *Gasification and pyrolysis, where the fuel is heated with little or no oxygen to produce "syngas" which can be used to generate energy or as a feedstock for producing methane, chemicals, biofuels, or hydrogen (see also landfill gas and sewage gas)*
- *Anaerobic digestion, which uses microorganisms to convert organic waste into a methane-rich biogas that can be combusted to generate electricity and heat or converted to biomethane. This technology is most suitable for wet organic wastes or food waste. The other output is a biofertilizer.*

Source – Renewable Energy Association, United Kingdom https://www.r-e-a.net/renewable-technologies/energy-from-waste

Energy recovery from waste is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolization, anaerobic digestion and landfill gas recovery. This process is often called waste to energy (WTE).

Source - US EPA website, no date provided https://www.epa.gov/smm/energy-recovery-combustion-municipal-solid-waste-msw

Appendix B
Additional Information - Recent History of Mixed Waste Processing and Related Technologies in Canada, United States and Europe

Canadian Experience

There is limited experience with mixed waste processing and advanced resource recovery technologies for mixed waste in Canada. Past and current experience ranges from being positive and leading-edge to a number of facility closures, legal issues and facility re-engineering.

Newer information, knowledge and technical studies, more applicable to Ontario, is being produced and shared by companies such as Organic Waste Systems (OWS), 3Wayste North America, Anaergia Inc., Canada Fibers Ltd/GFL Environmental Inc. (CFL/GFL), Enerkem, Sustane Technologies Inc., Bradam Energies, Miller Waste Systems, and others. These are important contributions to furthering knowledge, understanding, complexities, benefits and risks associated with these technologies.

Status of many facilities (not including combustion facilities) in Canada is listed below on Table B-1. It is important to recognize that many facilities and technologies are designed for local and regional solutions, that circumstances and needs change, and facility closures often have multiple reasons behind decisions (e.g., financial, social, environmental, competing technologies, etc.). Any facility or technology that closes or is re-engineered has important learnings for municipal governments that contemplate investment and/or use of these new, emerging and next generation technologies.

Table B-1: Status of Mixed Waste Processing and Advanced Resource Recovery Facilities in Canada

Facility Name	Location	Year Opened (approx.)	Year Closed/ Changes to Technology (approx.)
TCR Environmental	Aylmer, Ontario	1991	1999
Conporec Integrated Waste Management & Composting	Sorel-Tracy, Quebec	1992	Status unknown; likely closed
City of Guelph Wet/Dry Recycling & Processing	Guelph, Ontario	1995	2001; re-engineered to meet new needs
Otter Lake Waste Facility	Halifax, Nova Scotia	1996	Operating; assessment to close is being reviewed
City of Moncton Wet/Dry Recycling & Processing	Moncton, New Brunswick	1999	2016
Super Blue Box Recycling Corp. (SUBBOR)	Guelph, Ontario	2000	2002
City of Edmonton Mixed Waste Processing and Composting	Edmonton, Ontario	2000	2018
City of Edmonton Integrated Processing and Transfer Facility	Edmonton, Ontario	2000	2018; re-engineered to improve feedstock quality to Enerkem
Enerkem Biofuels and Chemicals	Edmonton, Ontario	2014	Operating

Facility Name	Location	Year Opened (approx.)	Year Closed/ Changes to Technology (approx.)
Dongara Pellet Plant	Vaughan, Ontario	2008	2013; sold in 2016
Plasco Energy Group	Ottawa, Ontario	2008	2015
CFL/GFL High Diversion Material Recovery Facility (former Dongara Pellet Plant)	Vaughan, Ontario	2016	Status unknown; likely being re-engineered
Sustane Technologies	Chester, Nova Scotia	2019	Operating

United States Experience

[Note: Information contained in this section and the next section includes contributions from Dr. Paul van der Werf, Senior Consultant, AET Group, in addition to details from City of London staff.]

Starting in the 1980s, mixed waste processing and mixed waste composting have been a small part of organic waste diversion in the United States. Essentially, organic materials and in some cases recyclable materials are removed from mixed solid waste, using mechanical means. First generation plants used shredding during pre-preprocessing although this was often blamed for poor compost quality. Second-generation plants started moving towards using rotary drums and other technological innovations to better separate out organic waste and improve compost quality. [a]

As reported in 2005, there were 16 mixed waste composting plants in the U.S. They appeared to serve a specific niche "servicing rural areas and/or tourist destinations where the existing landfills have limited capacity and siting a new landfill isn't environmentally or economically feasible." [a] At that time there were about nine source separated composting programs and facilities and facilities servicing them. [b]

By 2007, this had declined to 13 mixed waste composting plants, as some of these plants started receiving source separated organics for composting, while there were 42 source separated composting programs and facilities and facilities servicing them. [c d]

By 2011 this had declined to 11 mixed waste composting plants, with one of them transitioning to the product of refuse derived fuel (RDF) (i.e., fuel for combustion and energy recovery). For each of the municipalities that used this approach it helped solve a unique challenge(s) and processing a single stream made the most sense economically and logistically. [e]

Table B-2 depicts the 11 mixed waste composting facilities that were open in 2011 and current status, where available. A little more than one-half continue to operate in one way or another.

The number of mixed waste composting facilities has remained steady and as of 2017 there continued to be 11[f] but by 2019 there were only six. [g] By early 2012 there were 150 source separated organics programs and facilities servicing them [h] and this has increased to 185 full-scale food waste composting facilities by 2019.[i]

The initial interest in mixed waste composting in the 1980s and 1990s has, over time, contracted, while source separated composting has grown exponentially. By 2019, 18% of the 4,713 US compost facilities accepted source separated organics and other organic feedstocks (approximately 850) while mixed waste composting accounted for 0.2% (6-10).[g]

Table B-2: Mixed Waste Composting Facilities Open in 2011 and Current Status

Facility Name	Location	Estimated Capacity (tonnes/year) (as reported in 2011)	Current Status Year Closed/ Changes to Operations (approximate)
Z-Best Compost Facility	New Gilroy, California	100,000	Open
Mariposa County Landfill, Compost Facility and Recycling Center	Mariposa County, California	-	Unknown
Marlborough Composting Facility	Marlborough, Massachusetts	40,000	Appears to be Closed
Nantucket Landfill, MRF and MSW Composting Facility	Nantucket, Massachusetts	-	Open
Prairieland Compost Facility	Truman, Minnesota	-	Appears to be Closed
West Yellowstone Composting facility	West Yellowstone, Montana	-	Closed 2015 and replaced with source separated facility
Delaware County Composting Facility	Delaware County, New York	23,000	Open
Medina County Solid Waste District Waste Management Facility	Medina, Ohio	140,000	Closed. New smaller mixed waste composting facility opened in 2020
Rapid City solid waste composting facility	Rapid City, South Dakota	45,000	Open (as of 2018)
Sevier County's MSW composting facility	Sevierville, Tennessee	69,000	Open
Columbia County Recycling and Waste Processing Facility	Columbia County, Washington	14,000	Unknown

The key reason for the growth of source separated organics program and lack of growth and contracting of mixed waste composting generally relates directly to final compost quality. Using source separation to keep contaminants out of the composting or anaerobic digestion streams results in cleaner end products. Even though mixed waste composting and processing technologies have vastly improved over time, their end products (particularly compost) continue to be of lower quality compared to facilities processing source separated organics. It would be difficult for these products to meet Ontario's strict contamination requirements.

Finally, some US mixed waste processing facilities are producing solid recovered fuel for use in the cement industry, other large consumers of coal, for the direct replacement of other fossil fuel sources and the production of renewable natural gas (RNG). Three facilities are identified below noting that one facility is currently closed and one re-opened in 2018 after being closed:

- The first fully operational mixed waste HEBioT™ facility, operated by Entsorga West Virginia, is located in Martinsburg, West Virginia (about 150 kilometres west of Baltimore, Maryland). It opened in 2019 at a cost of about $45 million ($33 million US). It is designed to process 100,000 tonnes of mixed waste and produce

approximately 40,000 tonnes of high-calorific value SRF for the cement industry. Organics are left in the waste stream that is used as feedstock to create SRF where they are essentially stabilized (pre-treatment) through aeration channels, moisture is removed and the stabilized stream is processed with other materials to create SRF. Other materials include recyclables extracted from the mixed waste.

- Coastal Resources of Maine (CRM) opened a $120 million ($90 million US) MBT facility in Hampden, Maine using Fiberight's proprietary suite of technologies. The facility opened n in 2019 and is designed to handle 135,000 tonnes per year. The facility closed in May 2020 for a variety of technical, financial and end-market challenges. The goal was to recover recyclables, create a number of value-added resources (e.g., pulp moulded products), electricity, renewable natural gas and bio-fuels. CRM is in negotiation with a potential new facility operator, Delta Thermo Energy, and hopes to reopen in 2021.

- Phase one of a $50 million ($37 million US) mixed waste processing facility called Infinitus Renewable Energy Park (IREP), was opened in the City of Montgomery, Alabama in May 2014. The ultimate design was for 200,000 tonnes per year and future phase would include investment for SRF. Due to end market and financial challenges, it closed in October 2015. The City purchased the assets and re-opened the facility in late 2018 with a new operator, RePower South. An additional $16 million $12 million (US) was invested in the facility. The facility is currently open.

European Experience

The European Union (EU) Landfill Directive [j] compelled member states to reduce the amount of biodegradable wastes going to landfill to no more than 35%, by 2016-2020 (there is some variation between countries), than what was disposed in 1995.

To assist in this process most EU member states have imposed some sort of landfill tax ($3 to $120 US, in 2019[k]) to incent alternatives to landfill disposal.

An important solution used to achieve the above noted target has been mechanical biological treatment (MBT), where inbound municipal solid waste (MSW) is collected and received at a facility, where it is pre-processed, using various mechanical and in some cases optical sorting equipment to separate out biodegradable waste, recyclables, a fuel product and remaining waste. The biodegradable waste is subject to further biological treatment (e.g., composting or anaerobic digestion). The remaining waste may be landfilled although there has been a clear focus on preparing this waste as refuse derived fuel (RDF, a cleaning product for direct combustion or further processing) or as solid waste recovered fuel (SRF, and engineered fuel product).

As of 2017, Europe has about 570 active MBT facilities, with an annual capacity of approximately 50 million tonnes.[k] The number of facilities continue to increase in Europe. From 2012 to 2017 about 25 new MBT facilities were constructed and about 2 million tonnes/year of new capacity came online.[k] Further, it was estimated that from 2017-2025 another 120 facilities will be constructed and commissioned, and provide an additional 10 million tonnes of capacity. [l m]

There are concerns about the compost or compost-like products produced from MBT, primarily that it remains too contaminated with heavy metals and non-biodegradable contaminants such as plastic, metal and glass. [n] There has been a push for source separation of organic waste to facilitate the production of compost, which can be gainfully used as a soil amendment.

At the same time, additional work on pre-sorting organics from the incoming stream continues and technology suppliers are highlighting advancements with proprietary technology components.

A recent blog posting by the Swedish Environmental Protection Agency (Figure 1) further confirms more analysis is required on the future direction of MBT facilities in Europe.

Figure 1: Swedish Environmental Protection Agency Mechanical Biological Treatment Plant Experience Blog Posting

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Swedish Experience of Mechanical Biological Treatment Plants (MBT plants)

In the 80's Sweden made investments in MBT plants that were eventually shut down in favor of waste separation at source.

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In the 1970s, almost 60 percent of the household waste in Sweden was deposited on landfills, which is a big contrast compared to the current situation where only about 0.7 percent of the household waste goes to landfills. In this journey of shifting waste flows from landfills to material, energy and biological recycling, Sweden has tested various technologies and systems in order to fulfil the waste management hierarchy. One of the first steps taken in Sweden to increase material and biological recycling was to establish mechanical and biological treatment (MBT) plants in the early 1980s. However, it was soon realized that such plants did not create enough added value during the treatment of waste and therefore all the MBT plants in Sweden were eventually shut down.

What is s Mechanical Biological Treatment plant?

An MBT plant, also known as a material recovery facility (MRF), utilizes mechanical sorting in order to separate and recover the different materials present in mixed waste such as metals and combustible materials, and includes further processing of biological material to produce compost for use in the agricultural sector. The major output fractions are recovered metals, refuse derived fuel (RDF) made up of the combustible material in waste, and compost.

The estimated investment cost of an MBT plant was around SEK 100 million in the 1980s. During that period, the Swedish Environmental Protection Agency (EPA) provided grants of between 25-50 percent in order to cover the initial investment of the plant.

From mechanical sorting to source separation

The reasons for the closure of MBT plants in Sweden could be classified into two categories: operational issues and poor product quality. Realizing the problems with MBT plants, the Swedish municipalities started to shift focus to source separation of waste in the 1990s. Over time municipalities gradually invested in source separation of household waste. During the same time Extended Producer Responsibility was introduced for several product groups where source separation and household participation became key components to the EPR infrastructure.

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Environmental objective

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Extended Producers Responsibility

Swedish waste management

Municipal waste management

Swedish Experience of Mechanical Biological Treatment Plants

As reported by the European Composting Network, the EU Fertilising Product Regulation COMM (2016) 157, came into force in July 2019. It defines input materials as source separated biowaste but no MBT or biosolids material are allowed.[o p]

European MBT facilities appear to work well at reducing the amount of waste sent to landfill for disposal. In particular, they appear to be able to produce SRF and RDF which can be directed to combustion. For the most part, they currently do not appear able to produce a compost product that can be gainfully applied as a soil amendment. There are some that do meet compost and land application requirements and research and application continues.

With superior pre-processing of MSW, the compost and compost-like produced from MBT may be able to meet Ontario's maximum allowable metal concentration for A or possibly AA compost, the ability to meet the very stringent foreign matter requirements will be much more challenging. This area require much more research in Ontario, Canada and the United States to demonstrate standards can be met and/or create approved applications where compost of a lesser quality can be used.

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[p] European Fertilising Product Regulation is published, European Compost Network, June 27, 2019 https://www.compostnetwork.info/european-fertilising-product-regulation-is-published/

Appendix C
Current Experience in Ontario

Through the Regional Public Works Commissioners of Ontario (RPWCO) Waste Subcommittee, mixed waste processing and advanced resource recovery initiatives are shared quarterly among the 20 member municipalities. The most active municipalities are Region of Durham, Region of Peel, City of Toronto and the City of London (details provided in section 2.3). Several other member municipalities are tracking and reporting details as requested (e.g., Region of Niagara, Region of York) and a number have direct experience with these technologies operating in their municipality (e.g., City of Ottawa) or consideration of these technologies (e.g., City of Hamilton, Region of Waterloo). Further details are provided below for Durham, Peel and Toronto are below:

Municipality	Status

Region of Durham	• In June 2019, Council approved to proceed with construction of a mixed-waste transfer and pre-sort facility and an anaerobic digester (AD. The facility would process the remaining waste. The Blue Box Program and Green Bin Program would continue to operate.
	• The pre-sort facility would accept all residential residual garbage (about 160,000 tonnes per year) and separate out any organic and recyclables.
	• The recyclables would be sent to market, while the organics would be processed at the AD facility, along with Green Bin organics, and converted into energy and fertilizer (facility sized for about 110,000 tonnes per year).
	• The AD facility is anticipated to divert approximately 30,000 tonnes of organics annually from the pre-sort facility and an additional 30,000 tonnes would come from the source separated organics program making the initial volume being processed at treated approximately 60,000 tonnes per year.
	• The remaining residue garbage would be sent to the Durham York Energy Centre (DYEC, an energy-from-waste facility).
	• The upfront capital costs to build both facilities were estimated (2019) to be approximately $164 million, including land ($42.3 million for the Pre-sort facility; $116.3 million for the AD facility; $4.8 million for land).
	• The estimated operating and maintenance costs for both facilities during the first year of operations would be $19.3 million.
	• Costs could increase by an additional $15 million to $26 million per year for debenture financing costs to finance the initial capital investment. The estimated debt financing costs would be $20.5 million.
	• Durham Region issued a Request for Pre-Qualifications for a Mixed Waste Presort and Wet Anaerobic Digestion Organics Processing Facility on August 20, 2020 and closed on December 1, 2020 (RFP 1062-2020):
	  • 50 downloads of the document (plan takers) including at least 20 technology providers
	  • 4 responses submitted:
	  • Alberici Constructors, Ltd.
	  • Maple Reinders Constructors Ltd.
	  • Peel West Organics Solutions
	  • Sacyr Environment USA LLC
	• No further details available at this time.

Municipality	Status
Region of Peel	• In 2018, the Region of Peel completed a Mixed Waste Processing Feasibility Study that estimated the cost of a 250,000 tonnes per year facility at $250 million (excluding land). The estimated operating cost was $190 per tonne excluding the revenues from the sale of recyclables, renewable natural gas or low-carbon fuel. • Region of Peel Council directed staff as follows on June 18, 2020: Resolution Number 2020-474 *That staff be directed to report back to a future Waste Management Strategic Advisory Committee meeting with further information related to a mixed waste pilot for multi-residential garbage, including information on how a pilot fits into the Region of Peel's long-term waste management strategy, including timing, scope, costs, risks, outcomes, and options for procurement.* • Peel Region issued a Request for Information and Expression of Interest for a Pilot Project for a Mixed Waste Processing Facility on December 24, 2020 and closed on February 8, 2021. • 40 downloads of the document (plan takers) including at least 15 technology providers • 11 responses submitted: • 2124946 Ontario Ltd. • 3Wayste North America • AET Group Inc. • Anaergia Inc. • Bio-En Power Inc. • Bradam Canada Inc • CCI Bioenergy Inc. • EPCOR Utilities Inc. • GFL Environmental Inc. • Miller Waste Systems Inc. • Sacyr Canada Inc. • No further details available at this time.
City of Toronto	Over the years, the City of Toronto has looked at a wide variety of mixed waste processing and advanced resource recovery technologies. In February 2020, Toronto staff provided an update report to Committee and Council that indicated that the $310 million initially anticipated as the cost for a mixed waste facility in the City's Long Term Waste Management Strategy is sufficient for a facility with a capacity of 270,000 tonnes per year. This assessment was derived from a rough order-of-magnitude costing exercise for a facility that includes a front-end sorting component for separation and capture of recycling and organic fractions, followed by organics contaminant removal and an anaerobic digester to process the organic fraction. The operating cost was estimated at $16.9 million per year or about $63 per tonne. This does not include revenues from the sale of materials or renewable natural gas (RNG). These costing estimates were derived using industry-standard costs. Further analysis will be necessary to determine specific technology costs and to refine the estimate for effective planning. City Council on September 30, October 1 and 2, 2020, adopted the following: *1. City Council direct the General Manager, Solid Waste Management Services to consider future work on the development of a mixed waste processing facility, with or without a thermal treatment process, where*

Municipality	Status
	the overarching goals are maximizing resource recovery through reduce, reuse, recycle, energy recovery then residual disposal, minimizing the dependence on long term landfill use all while ensuring the financial sustainability of the Solid Waste Management Services program. *2. City Council direct the General Manager, Solid Waste Management Services to report back to the Infrastructure and Environment Committee no later than the end of 2023 with a business case, including a triple bottom line analysis (environment, social and financial) and a utility rate impact assessment on the mixed waste processing of waste with and without thermal processing compared to increased reduction and diversion and traditional landfilling.* *3. City Council direct the General Manager, Solid Waste Management Services to pursue potentially applicable Federal Government, Provincial Government, and non-profit organization funding opportunities to assist in implementing Parts 1 and 2 above and to negotiate and enter into all necessary agreements to receive any available funding in a form satisfactory to the City Solicitor.*