THINKING OUTSIDE OF THE BLUE BOX

CONSIDERATION FOR CHANGING THE PROCESSING PROTOCOL FOR HAMILTON'S MATERIAL RECYCLING FACILITY

Submitted By: AmaLaTerra inc.(Love the Earth:It's not just our name; it's what we do!)
Submitted To: Public Works, City of Hamilton
Date: February 22,2019
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Relevant Background Information:

- City of Hamilton's current contract (C11-74-02) for the operation and maintenance of the City of Hamilton's Material Recycling Facility (MRF) expires March 31, 2020.
- Sorting equipment at MRF is reaching end of life and will need upgrading.
- Not all residents comply with the "Dual Stream" Blue Bin strategy for Hamilton when sorting recyclables
- Hamilton is facing a potential market collapse of recycled fibers and plastics
- City staff have reported the paper recycling market downturn will result in a $1.2 million decrease in revenue for 2018.
- Revenues from the sale of plastics have been significantly reduced due to China's implementation of new policies on the recycled plastics on imports.
- Hamilton was subsequently forced to ban items like Styrofoam, bottle caps, black plastics and coffee cup lids from its Blue Boxes and is now landfilling these items.
- China's new standards will cost the city an estimated $300,000 in lost revenue.

- The ban on foreign waste imports to China, previously the world's largest importer of plastic waste for recycling, has had a significant impact on Canada's exports of plastics.
- Municipalities across the country are scrambling to offload their plastics, while also finding ways to mitigate the dramatic decline in their revenues from recycling.
- Hamilton is no different in this regard, as city officials have communicated revenues decreased by approximately $1.5M in 2018.

City of Hamilton 2018 Revenue Projection

City of Hamilton - Current Earnings for Recycling					
Year	Contract Tipping Fee	Tonnes Per Year	Total Tipping Fee Paid to Canadian Fibers	Revenue from Sale of Recyclables	Total Earnings After Tipping Fee
2017	$ 107.75	44,200	$ 4,762,342.14	$ 5,800,000.00	$ 1,037,657.86
2018	$ 109.90	45,000	$ 4,945,509.14	$ 4,600,000.00	$ (345,509.14)

- Ontario Landfills, though heavily relied upon are maturing, and the acquisition of new landfills is costly and difficult

- Hamilton is now seeking alternative methods to divert, dispose of, and/or increase profit from the collection of recyclable fibers and plastics

As per Hamilton's 2017 Datacall Report, submitted to RPRA, the following data was gleaned:

- TOTAL RESIDENTIAL WASTE GENERATED = 227,723 TONNES
- TOTAL RESIDENTIAL WASTE DIVERTED= 100, 673 TONNES

- TOTAL RECYCLABLES DIVERTED=43.6%
- TOTAL ORGANICS DIVERTED=43.6%

- TOTAL MUNICIPAL GROUP WASTE DIVERSION AVERAGE=52.8%
- TOTAL HAMILTON WASTE DIVERSION=44.2% (OR 8.6 % BELOW AVERAGE)

Executive Summary:

AmaLaTerra Inc. proposes that the City of Hamilton transition to a new Processing Protocol, one where the City begins leading the Waste Diversion Movement. More specifically, we are proposing the City of Hamilton consider
the utilization of a 50,000 tonne per annum(tpa) Steam Reformation Processor, to eradicate all Plastic Waste (and all other forms of Waste the City deems viable) by transforming it into Green Syn Gas for Hydrogen and/or Energy production.

In addition to the many Environmental benefits arising from the reduction of Plastic and other Waste, the incorporation of the proposed Steam Reformation Process would also achieve many cost-avoidances, as well as potential future ancillary benefits including the extension of the life of the Glanbrook Landfill, by rendering it reusable. An example of a comparable initiative occurred in 2012 when the life of the landfill was extended by 8 years, saving the city a reported $64 million dollars.

AmaLaTerra Advantage

- Patented, Proven, Distinctive STEAM REFORMATION PROCESS (SRP) supported by many independent validations:

  - **Battelle-largest U.S. independent testing lab specializing in alternative energy**
  - **Lehder-world class air quality standards testing lab who found the SRP to emissions to be well below existing allowable levels in California, the EU and Ontario.**
  - **University of Toronto-Chemical Engineering Department**

- ❖ **Caterpillar and Toromont-endorsed the use of the syngas produced via SRP, in their gas turbines for production of electricity**

- No burn, toxins, odours or harmful emissions
- Converts all Organic Matter into Clean, Green Energy
- Transforms Waste from being a liability into a valuable Resource
- Significantly reduces Climate Change impact by removing methane from MSW
- All forms of Feedstock can be processed simultaneously without any sorting, drying, or decontaminating required
- Enclosed, self-looping system
- Effectively and efficiently resolves growing Global Waste Issues
- Assigned MOECC number and Emission testing results
- The missing link between "Managing" Waste Issues and "Solving" them

All Forms/Types of Plastics Processed

Utilizing the proposed SRP system, the most significant improvement for the City of Hamilton would be the ability to process all forms of plastics, including black coloured plastics, coffee cup lids, and polystyrenes. Hamiltonians would also be able to add anything made of plastic into their Blue Bins, including plastic bags. Even food containers, with residual waste remaining, would be acceptable.

The following image, from www.hamilton.ca, highlights the significant amount of Plastics deemed contaminated and therefore landfilled, under the City's current protocol.

With the SRP system, all Plastics would be acceptable. This could be viewed as an evolution of Hamilton's Dual Stream" Blue Bin recycling program. The present model of having one Blue Bin for fibers and a second for restricted plastics, could evolve into one Blue Bin for fibers and a second for all forms of plastics. Hamilton would be the first municipality in the world to implement such a visionary, environmentally responsible recycling program. Furthermore, Hamilton could set the standard for the World on Waste Solutions. This in turn could not only lend further credence to Hamilton's Renaissance and re-branding but, entice other local and international governments to follow the example led by our great City.

Increased Waste Diversion:

Expanding the list of acceptable plastics would not only increase landfill diversion, but further potential additional diversion by providing the public with more simplified Blue Box instructions. Because of the current confusion regarding which Plastics are accepted, frustrated citizens do not always take the required time to recycle accurately. These individuals either make very little effort, or in the worst case scenario, make no effort at all, and opt to dispose of everything in black garbage bags.

This is evidenced in Hamilton's curbside audits, recyclable contents within black bags increased by 27% between 2014 and 2016.

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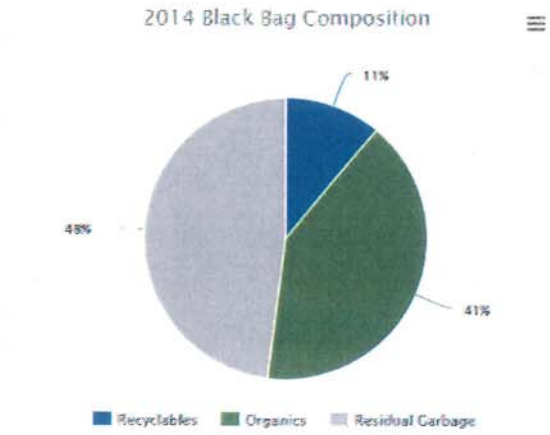
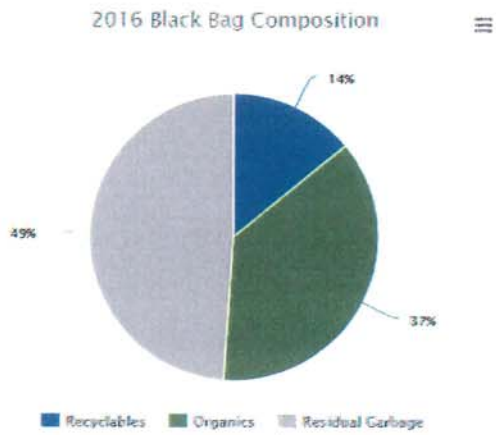


Source: 2014 Curbside Waste Composition Audit for single-family homes



Source: 2016 Curbside Waste Composition Audit for single-family homes

*Upon implementation of simplified recycling instructions (aka "All Plastics Accepted"), we believe residential recycling compliance in Hamilton could increase significantly. Plastic diversion from the Glanbrook landfill could also reset provincial standards while re-establishing a single-digit percentage for Recyclables, on future Black Bag Composition Audits.

Meets All Ontario Waste Management Plan Goals

By converting Blue Box, Green Bin, Hazardous, Household Waste into resources such as Hydrogen and/or Energy and/or Water while diverting it from Landfills, Hamilton would epitomize the term "Circular Economy" and serve as the Gold

Standard in solving Global Waste Issues.

Environmentally Responsible:

Eradicates waste without creating harmful emissions. Allows not only the majority of waste to be diverted from landfills but capable of processing majority of current landfilled waste, rendering the landfill reusable. In addition to significantly reducing Greenhouse Emissions, eradicated plastics are prevented from leaching into our waterways, including doing further damage to the Ocean and wildlife.

Socially Responsible

Hamiltonians would be able to take pride in being Global Waste Issue Leaders and could embrace and positively reinforce the change rather than suffer from the stigma of being judged for their recycling habits.

Financially Responsible and Viable:

AmaLaTerra 's perspective is that landfills, in addition to being harmful to the environment, are the equivalent of buried money and valuable resources. We look forward to the opportunity of transforming Hamilton's Trash into Treasure.

*(Please note that due to the impending RFP, it is inadvisable for us at this time, to include specific details about Revenue Projections. If given the opportunity to be considered for the bid, we are confident in the competitive edge that our Revenue Generating/Cost Savings Business Model offers.)

More Efficient:

Processing time is reduced considerably since all feedstock, including Hazardous Waste, can be processed simultaneously without any required prior sorting, drying or cleaning.

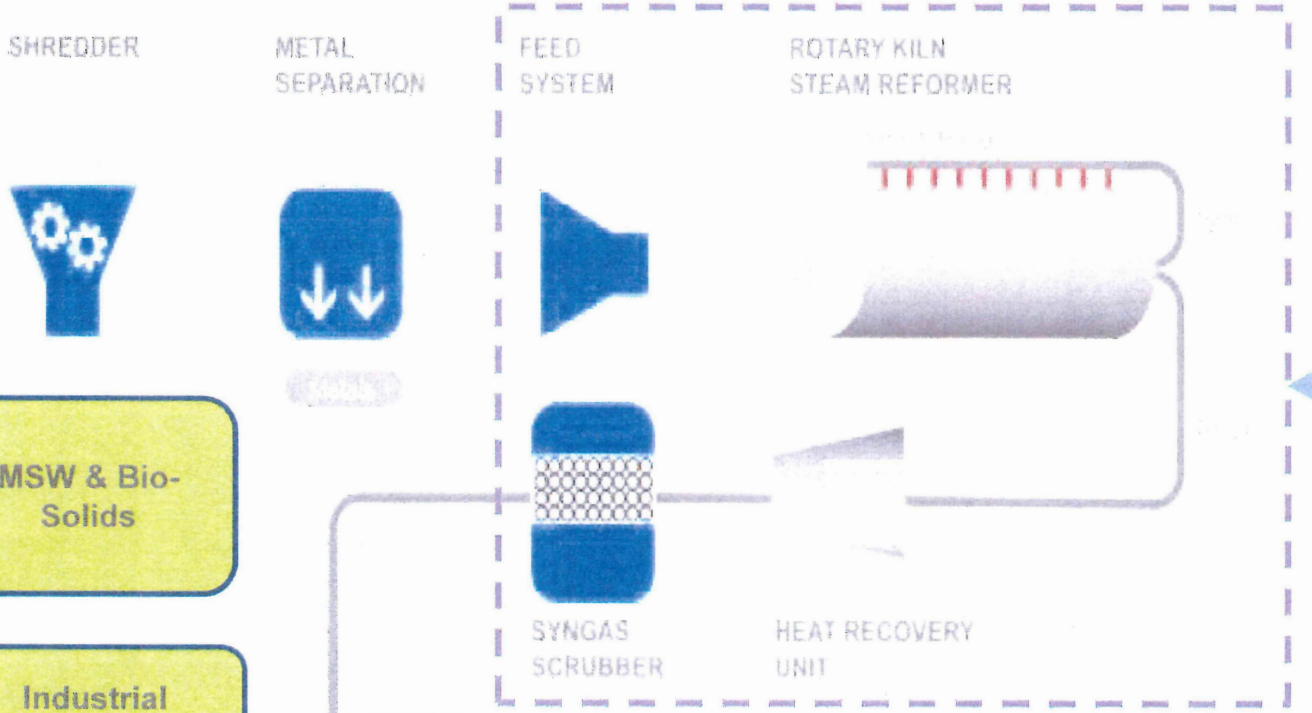
Suitable for Current MRF Processing Facility:

After a cursory review of the City's current Material Recovery Facility (MRF) located on Burlington Street, we believe this would be an ideal location for housing AmaLaTerra Inc.'s proposed Processing protocol. There is more than enough room within the existing rear building to house the equipment, although some modification to the height of the receiving bays may be required. Additionally, there would be significant cost savings (engineering, construction, electrical, etc) by using an existing building versus sourcing land and constructing new.

Rebranding:

As born and bred Hamiltonians, Michael and I share immense pride in our humble Immigrant beginnings. Those beginnings are directly tied to the Steel Manufacturing foundation upon which our great City was built. But a great deal of time, work and planning by City Council, City Staff and Citizens, has gone into making Hamilton an appealing destination for other attributes; like its restaurant and music scenes, along with our beautiful greenspace and waterfalls. Imagine how incredible it would to be to add World Leading Smart City with a truly Circular Economy to the list.

Technology Schematic



MSW & Bio-Solids

Industrial Waste

Syngas

Electricity (Exceeds stringent air emission requirements)

Heat
- Industrial & commercial use
- Central Heating

"Green"
- Hydrogen
- Liquide Fuels
- Chemicals

Syngas has a BTU value over 350/ft^3

BG's Patented Technology

U.S. Patent No. 7,794,689 "Method for Steam Reforming Carbonaceous Material"

A steam reformation process used to convert carbonaceous waste to clean syngas.

No combustion occurs and H_2O is used to create clean energy from waste.

Producing 1540 kWh of electricity from 1 t of MSW (Gross Production)

Exceeding Air Emission Standards

Ontario MOECC A-7 Test performed by:

LEHDER

Excellence in Industrial Air Quality Services

Global Standards Air Emission Standards

Parameter	Units	Ontario MOECC Guideline A-7 Limits	EU	California	INCINERATION	BRADAM Guideline A-7 Test
particulate matter (PM)	mg/Nm^3	14	9	16	9	0.34
cadmium	$\mu g/Nm^3$	7	46	10	7	0.04
lead	$\mu g/Nm^3$	60	n/a	140	50	0.63
mercury	$\mu g/Nm^3$	20	46	60	15	0.14
dioxins and furans	$\mu g/Nm^3$	0.08	0.092	9	0.06	0.002
hydrochloric acid (HCl)	mg/Nm^3	27	9	27	9	0.59
sulphur dioxide (SO2)	mg/Nm^3	56	46	56	35	8
nitrogen oxides (NOx)	mg/Nm^3	198	183	202	121	40*
organic matter	mg/Nm^3	56	9	n/a	33	1.214
Carbon Monoxide	mg/Nm3	40			40	2.5

*NOx as tested on Pilot Plant flare using a standard burner was 177. Design information from Caterpillar Gas Turbines using a low NOx burner confirms that NOx will be lower than 40 mg/Nm^3.

Concluding Comments:

Thank you for taking the time to review our Presentation. Given our understanding of your recycling efforts and challenges, we believe that AmaLaTerra Inc. would make a strong strategic partner for the City of Hamilton. We invite further discussion so that we may learn more about your current program and goals for the future.

At this time we respectfully request that the members of the Public Works Committee refer our Consideration for Change to Waste Management Director, Craig Murdoch,to be concurrently reviewed and considered, along with the other Organizations competing for the MRF Contract, once the RFP is out. At that point, AmaLaTerra will be able to confidentially share our entire vision for Hamilton's Waste Plan, including Projected Costs, Revenues and a complete Business Model.