A Proposed Hartford Solid Waste Task Force Agenda for 2021

Summary

A three- pronged agenda is proposed for the SWTF to support the recently passed Council resolutions opposing continued waste disposal activities on MIRA property and endorsing a zero- waste strategy for the city.

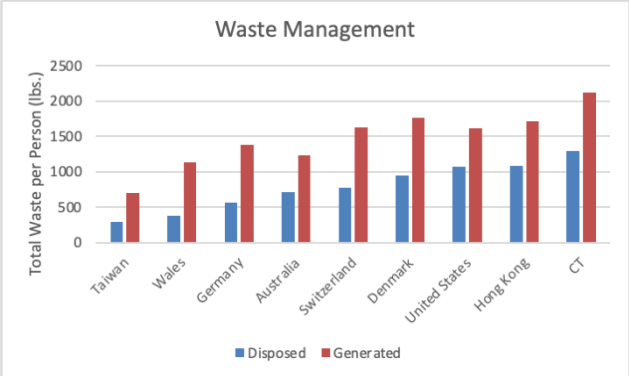
1. City efforts will depend on state- level decisions regarding how to replace the MIRA trash plant. The SWTF should advocate for a transition strategy based on a distributed network of smaller mixed waste processing facilities (MWPF) to recover organics and potentially recyclable materials to reduce the amount and environmental impact of any interim out- of- state landfill disposal.
2. The ultimate solution will require public policy reform to create financial incentives for processing recovered materials into more valuable products. Attracting manufacturers to CT to process materials can create jobs and grand list growth that can further help redress environmental injustices.
3. Hartford can do much to reduce the amount and toxicity of its waste stream to minimize the costs and health effects independent of the state decisions. However, goals should be set within the context of the vision of a more distributed system designed to maximize recovery of materials and minimize the amount of residue sent for final disposal.

A simple spreadsheet model was used to define reasonable targets for Hartford's zero- waste strategy. A survey of best practices informs a preliminary list of public policy reforms and zero- waste program elements for further consideration by the SWTF.

An environmental justice lens will necessarily guide task force actions and be an important topic for future meetings.

CT Waste Management Infrastructure

The first priority in any effort to address solid waste management is waste reduction. The CT Coalition for Sustainable Materials Management (CCSMM)[1] organized working groups to review organics diversion, recycling, extended producer responsibility, and unit- based pricing to develop recommendations for preferred ways to reduce and manage waste. A comparison of CT with the US average and other countries as reported in a recent study[2] highlights there is ample room for improvement. However, CCSMM did not address the need for investment in the basic waste management system infrastructure, and a zero- waste strategy- even a wildly successful one- will not eliminate the need for waste disposal. If CT were able to achieve the same performance as Germany, acknowledged as the world's leader, there would still be the need to dispose of ~ 1 million tons per year (TPY). There is a strong desire to eliminate reliance on waste- to- energy (WTE), aka incineration, to address environmental injustices, particularly in Hartford and



[1] https://portal.ct.gov/DEEP-CCSMM
[2] https://www.eunomia.co.uk/reports-tools/recycling-who-really-leads-the-world-issue-2/

Bridgeport. There is also a state goal to be self- sufficient in managing our waste. Thus, to avoid the need for additional capacity, the near- term goal is to reduce waste sent for disposal to < 1.5 million TPY (the capacity of Bridgeport, Bristol, Lisbon, and Preston.) The longer- term goal is to match Germany and reduce the capacity requirement to ~ 1 million TPY. This would allow four disposal facilities of ~ 250,000 TPY to manage state waste. There has been considerable advocacy for "zero- waste," but little discussion of practical steps to achieve the vision.

To develop a practical plan with measurable targets, we propose starting with an end goal of reducing waste sent to disposal from the current ~2.3 million TPY to ~ 1 million TPY over the next 10 years. A presentation[3] by Lisa Skumatz (Skumatz Economic Research Associates) indicated unit- based pricing typically delivers an 18% reduction in waste disposal, split evenly between reduced waste generation, increased recycling, and recovery of food waste. This would divert ~520,000 tons from waste, reducing the disposal capacity requirement to ~1.8 million tons. This is an aggressive, but reasonable 5- year target. The 2015 waste characterization study[4] was used as a baseline and a simple spreadsheet model was used to create conceptual pathways toward the target reduction. The 5-year target could be reached by reducing waste generation by 6% and capturing roughly 1/3 of the food waste and potentially recyclable plastics, paper, glass, and metal. It was assumed mixed paper and plastics were not recovered for recycling and remained in the waste disposal stream. Ten-year targets were based on a 12% reduction in waste generated and recovering 2/3 of recyclable materials and food waste (plus 1/3 of yard waste). Those efforts would reduce waste disposal to ~1.3 million tons. There are significant risks in achieving these goals and relying on out- of- state landfill to absorb any shortfall in capacity within CT over a ten- year period.

Combining a zero- waste strategy with investment in mixed waste processing facilities (MWPF) can help ensure goals of self- sufficiency and achieving a 60% diversion rate. MWPF are a well- established technology in Europe. Using data from a study[5] of commercial facilities suggests an additional 875,000 tons of material could be diverted from disposal, reducing the required disposal capacity to just under 1 million tons with the 5- year goals. Combining MWPFs with the 10- year goals could reduce disposal requirements to ~700,000 tons, or nearly matching the capacity of the three smaller WTE plants in Bristol, Lisbon, and Preston. (See Appendix A for details on calculations.) The MWPFs could also help address environmental justice concerns. The plants tend to be modular, with ~200,000 TPY a logical size. Larger capacity facilities would be achieved by building additional lines. A network of distributed, modular facilities would more fairly share the burden associated with managing our waste.

Adoption of mechanical separation and biologic treatment of recovered organics has been endorsed by Zero Waste Europe[6] as a bridging strategy from the current dependence on landfill and incineration to a more circular economy. The technology is more scalable and flexible, an important consideration in adapting to future changes in the waste stream. However, this strategy also has its risks. The MWPFs would have difficulty competing with cheaper landfill disposal. Recovering materials for resale into bulk commodity markets would not provide sufficient revenue to justify investment in separation. Public policy reform will be needed to make landfill disposal more expensive and recovered materials more valuable.

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[3] https://portal.ct.gov/-/media/DEEP/waste_management_and_disposal/CCSMM/UBP-Working-Group/Skumatz---UBP-Working-Group.pdf

[4] https://portal.ct.gov/DEEP/Waste-Management-and-Disposal/Solid-Waste/Solid-Waste-Characterization-Study

[5] https://plastics.americanchemistry.com/Education-Resources/Publications/The-Evolution-of-Mixed-Waste-Processing-Facilities.pdf

[6] https://zerowasteeurope.eu/library/building-a-bridge-strategy-for-residual-waste/

Careful design of policies, collection systems, MWPFs, and secondary manufacturing to process recovered materials will be required to create a more circular economy with the goal of achieving the absolute minimum of impact on the environment and public health.

Public Policy Reform

With the public announcement by MIRA that the trash incinerator will be shut down by July, 2022, it is clear that CT will be forced to offload some MSW to out- of- state landfills for some interim period of time. CT DEEP has organized a collaboration with some 71 towns - the CT Coalition for Sustainable Materials Management (CCSMM)[7]- to explore ways to reduce the amount of waste that is generated in our state, improve reuse, recycling, organics collection, and other innovative solutions. Recommendations by workgroups on unit- based pricing, increase recycling, food scraps/ organics collection and diversion, and extended producer responsibility were presented in December[8] and a final report will be issued in January. However, there has been little discussion of the need for investment in the fundamental waste management infrastructure to support state goals of 60% diversion and self- sufficiency.

There are common sense reforms that can improve recycling and reduce waste disposal. Modernizing the bottle bill to increase the deposit and handling fees and expanding the types of containers covered is necessary to recover high quality glass that can be efficiently recycled. Removing glass from the single stream bin will also improve the quality of recovered paper and plastic. Curbside collection of organics and expanded programs to capture and divert organics from commercial generators are a necessary element in achieving the state goal of 60% diversion. Removing organics from the waste stream can also make recovery of recyclable materials improperly disposed in MSW more efficient. However, attracting investment in processing the recovered organics will require long- term fixed price contracts for the resulting electricity and/or renewable fuels.

CCSMM also reviewed extended producer responsibility (EPR) programs as a potential mechanism to encourage improved product designs to minimize the costs and environmental impacts of end- of- life management of products. Gas cylinders and tires were identified for priority action in the 2021 legislative session, and packaging and household hazardous waste for later action. Unit- based pricing (UBP) or pay- as- you- throw (PAYT) was identified as the most significant near- term action and suggested immediate waste reductions on the order of 40%. DEEP projections suggested UBP alone could reduce waste disposal requirements to less than 1.5 million TPY, eliminating the need to replace the MIRA facility. UBP and source separation of organics promised a waste reduction of 1.176 million TPY.

The funding of sustainable materials management was addressed by considering revision of the current solid waste assessment. The fee applies only to in- state disposal, so in effect is an incentive for out- of- state landfill. The fee could be increased or expanded to cover all disposal, including construction and demolition debris. To move to a more sustainable waste management- or preferably strategic materials management- system, policies must be put in place to make landfill disposal more expensive. The European Union (EU) landfill directive mandates treatment of MSW to remove biodegradable organics. A variety of initiatives have been explored, such as mandating a specific limit on the fraction of MSW sent to landfill, limits on the methane potential or volatile solids, or on the energy content of landfill waste. However, there has been a tendency to interpret some of these policies as a mandate to move to

[7] https://portal.ct.gov/DEEP-CCSMM

[8] https://portal.ct.gov/-/media/DEEP/waste_management_and_disposal/CCSMM/December_CCSMM_Full_Coalition_Meeting.pdf

incineration (e.g. energy content of waste, or % disposed in landfill.) It will be important to avoid prescriptions that cause lock- in to specific technologies. There will need to be a flexible pathway that can move from the near- term focus on maximizing use of in- state incinerators and out- of- state landfill to a future system with maximum recovery of materials and minimum amounts of residues sent for disposal.

There are also other initiatives in- state that can inform the SWTF advocacy. CT is in the process of updating its climate action plan[9]. A workgroup on non- energy sources of greenhouse gases proposed the following recommendations for promoting a responsible and just materials management system for consideration by the Governor's Council on Climate Change (GC3). A draft report[10] of the GC3 recommendations included the following recommendations to promote a responsible and just materials management:

1. Waste management goals should be set to minimize the residues sent for final disposal rather than based on diversion rates.
2. Financial incentives should be provided to encourage manufacturers to process recovered materials into new products in support of a more circular economy.
3. A disposal tax based on an estimate of the greenhouse gas (GHG) emissions of the final disposal process to fund incentives for a more sustainable waste management system.
4. Develop a strategy designed to separate organics from municipal solid waste, increase quantity and quality of recyclables, and reduce residues sent for final disposal (waste-to- energy facility or landfill).
5. Mandate or incentivize diversion of organic materials from the disposal stream.
6. Create markets to support organics diversion.
7. Develop and implement food rescue and recovery programs.
8. Accelerate development of infrastructure to utilize diverted organic material.

These sources will provide a meaningful starting point for the SWTF in developing specific policy recommendations to ensure Hartford has access to a waste disposal system that protects the health of its residents, addresses current environmental injustices, and minimizes any environmental impacts.

Hartford Zero Waste Plan

It can be debated whether UBP and SSO can achieve sufficient waste reductions quickly enough to avoid investment in our waste management infrastructure. However, there is no debate that the City can take effective action immediately to reduce the costs and environmental impacts of waste management. The Hartford Court of Common Council adopted a resolution[11] to endorse the Zero Waste International Alliance (ZWIA) definition of zero waste, develop a plan, and to report back to the Council by February, 2021 with preliminary recommendations.

ZWIA lists principles and practices[12] that can move a community toward zero waste and that can guide our efforts to formulate recommendations for the Council. These criteria were used to create a draft scorecard for evaluating zero waste program elements. (See Appendix B.) The CCSMM recommendations

[9] https://portal.ct.gov/DEEP/Climate-Change/GC3/GC3-Working-group-reports
[10] https://portal.ct.gov/DEEP/Climate-Change/GC3/Governors-Council-on-Climate-Change
[11] https://www.meetinginfo.org/meetings/920
[12] http://zwia.org/zero-waste-community-principles/

overlap with many of the principles and practices of ZWIA and provide a shopping list of specific efforts that the task force could integrate into a zero- waste plan for Hartford.

A key initial step is to establish a baseline and a timeline to monitor progress toward goals. The FY 2019 annual municipal recycling report (CGS Sec 22a-220(h) was used to establish a baseline.

Waste Description	**Amount**(tons)	**Destination**
Waste Disposed		
MSW – DPW Curbside		MIRA
MSW – Commercial Haulers		MIRA
Total MSW	87,763	
Bulky Waste	5,346	CWPM, Plainville, CT
Total Waste Disposed	**93,109**	
Waste Recycled		
Residential single stream	5,887	MIRA
Commercial single stream	?	?
Scrap metal	150	Albert Bros., Waterbury, CT
Waste oil (6,000 gal * 6.4 lb/gal	19.2	Safety Kleen, Norwell, MA
Electronics	82	Electronics Recycling Intl, Holliston, MA
Leaves	2,659.5	Harvest Power, Farmington, CT
Yard waste	1,306.7	Harvest Power, Farmington, CT
Paint	4.5	PaintCare, Bristol, CT
Mattresses (1,916 * 60 lb/mattress	57.5	Greater Bridgeport Community Enterprises
Tires (14,950 *30 lb/ tire	224.3	Don Stevens Tire Co., Southington, CT
Construction & Demolition	387	
Total Waste Recycled	**10,778**	10.4% (missing comm'l single stream)

A key data gap is the recyclables collected by contract haulers. Waste delivered to MIRA is reported by MIRA. While it will be financially attractive to deliver waste to the trash incinerator, there is little incentive for commercial entities to deliver source separated recyclables which have value (such as cardboard) to MIRA's material recovery facility (MRF). Haulers are required to report data per CGS Sec 22a-220(d) that the municipality "requires to ensure the health and safety of its residents."

Review of MIRA tonnage reports revealed that Hartford has experienced a significant drop off in recyclable collected by DPW. FY 2020 data showed about a one- third reduction in recyclables deliver to MIRA. This trend was evident in July through December, 2019, before the full impacts of COVID-19. Data for July through November, 2020 was down an additional 40% compared to FY 2020 data, presumably due to the pandemic. Further review of data will be required to determine if the drop off is due to reduced collection or increased rejection of loads due to contamination. MIRA has been engaged in a legal dispute with Republic (the operator of the MRF) regarding contamination levels. A recent ruling held that MIRA has not met contract requirements and deliveries are now being held to a limit of no more than 5% contamination. Hartford has been self- screening its single stream loads, and many are now being delivered directly to the trash incinerator due to excessive contamination. Thus, a priority for action is to increase the amount and quality of single stream recyclables.

The need to improve recycling efforts is aligned with the ZWIA principle of engaging the community. There will need to be effective outreach and education to reduce contamination of the single stream recyclables

and to support any effort to establish curbside collection of organics. Other initiatives for consideration include:

- Participate in CT WRAP plastic film recycling.
- Consider a separate glass collection program.
- Use RecycleCT's educational and promotional resources.
- Develop school- based programs for diversion of organics and education.
- Strengthen school recycling programs and encourage schools to join CT Green Leaf Schools program.

While many waste management decisions and policies are implemented at the state level, there are actions to City can consider. The City could implement zero- waste procurement practices, building on state environmentally preferred purchasing guidelines. CCSMM has urged UBP as a key driver for waste reduction and increased recycling. However, UBP would be a challenge given the high level of poverty in the city. The City could itemize solid waste charges on tax bills to raise public awareness, or implement technology to report waste disposal by household to drive behavior changes. The City could also require commercial haulers to adopt a cart- based pricing structure that linearly tracks with cart capacity.

The transfer station on Liebert Road is a great resource- at least for those residents with a motor vehicle. The City should consider ways to bring the transfer station to the residents who lack vehicles- neighborhood collection days, drop off bins, etc. CCSMM promoted expanding transfer station operations to accept food scraps and other organic material. Swap shops and repair clinics were also recommended. While these may not scale sufficiently to make a significant reduction in Hartford's waste, there may be added value as a work force development opportunity.

Finally, there a number of local ordinances that could be considered to facilitate a zero- waste action plan.

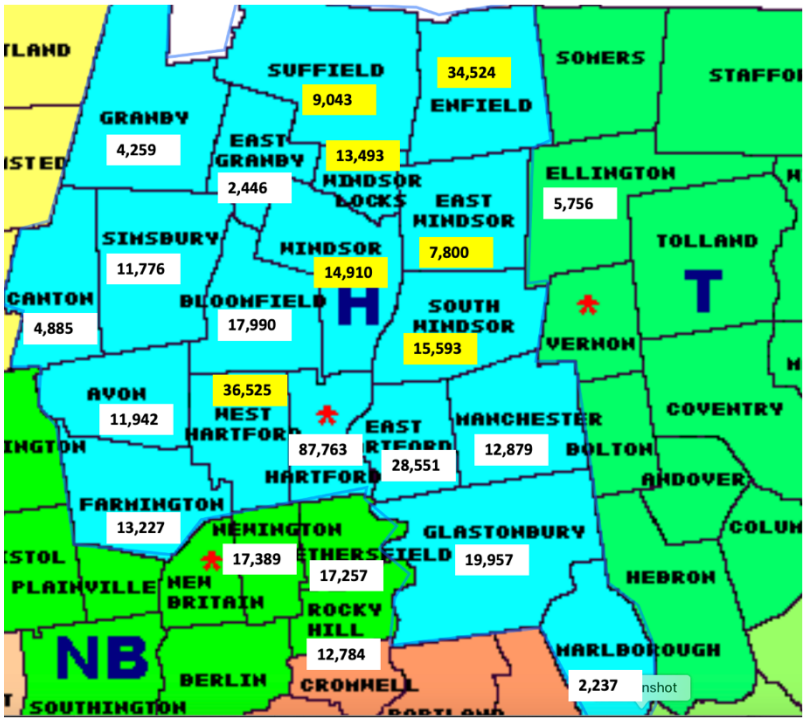
- Adopt ordinances to drive organics diversion or ban disposal or organics.
- Consider banning expanded polystyrene.
- Examine model ordinances developed by UPSTREAM[13] to reduce waste (e.g. ask- first for single- use accessories for takeout.)
- Express support for development of EPR legislation/ programs

Environmental Justice

A core consideration of task force recommendations is to redress the environmental injustices of the current waste system. The past focus has been on opposing any effort to redevelop the MIRA trash incinerator, and some advocates have argued in support of landfill disposal as an alternative to incineration. Framing the discussion as incinerator versus landfill as the only two choices is not a winning strategy. The task force has proposed a vision of a modular and distributed system of smaller facilities, starting with separation of MSW to recover organics and potentially recyclable materials. The task force suggested a 200,000 TPY MWPF would be a smart investment to help provide a transition pathway from the current reliance on incineration to a more sustainable system with increased recovery of value from MSW. The map below shows the geographic distribution of waste disposal by town for Hartford County (FY 2019 data). The 16 MIRA town disposed of ~271,000 tons and 7 non- MIRA towns disposed an additional ~131,000 tons, for a total of just over 400,000 tons. Using the scenarios described above, if the 5- year goals were achieved and evenly distributed, the 271,000 tons from MIRA towns would be reduced

[13] https://upstreamsolutions.org

to ~210,000 tons. If the 10-year goals were achieved, the total of 400,000 tons for all towns would be reduced to ~220,000 tons. By limiting the scale of the facility to 200,000 TPY, towns would still have strong incentives to reduce waste and increase source separation. There will be a necessary education and outreach component to build support for a facility we do want (or more accurately will accept) rather than waiting to protest proposals we do not want.



To build public support, there needs to be a robust and transparent process to evaluate the full range of social and environmental impacts associated with site selection of any waste infrastructure. There is a strong equity lens being applied by the state in updating the climate action plan. Although waste contributes only about 5% of the state's greenhouse gas inventory, waste operations are a significant environmental justice concern. The co- benefits of reducing criteria pollutants that are achieved by reducing incineration in favor of material recovery typically dominate the climate benefits. Consideration of various waste technologies and siting decisions should evaluate the full range of environmental and social impacts. The task force should consider developing a scorecard that could be used to help structure community outreach efforts in support of these decisions. Further, host community benefits should be commensurate with the imposed impacts. A project can only make financial sense (and be socially just) if these costs are internalized and paid by the waste generators.

A priority for 2021 for the task force is to reach out to the community to engage volunteers to help flesh out an environmental justice action plan to accompany task force action in developing a zero- waste plan for the City and advocating for state policy reform.

The 2015 waste characterization was assumed to be a reasonable description of the present waste stream.

2015 CT MSW Composition[1]							Waste Characteristics[2]			
			Residential		Comm'l & Indust.					
Waste Category	Tons	Total	Tons	Total	Tons	Total	% Moisture	Heating Value Btu/lb	Methane (l/kg)	Biogenic or Fossil
Paper		539,492		273,036		266,456				
Corrugate cardboard	109,600		28,551		81,049		5	6,900	152.3	B
High grade office paper	26,511		10,631		15,880		6	6,300	217.3	B
Magazines/ catalogs	18,902		12,206		6,696		6	5,400	84.4	B
Newsprint	32,276		26,157		6,119		6	7,500	74.3	B
Mixed paper	352,203		195,491		156712		6	6,800	103.7	B
Plastics		275,611		146,174		129,437				
PET	26,304		15,371		10,933		2	19,000	0	F
HDPE	17,027		9,269		7,758		2	19,000	0	F
Mixed plastics	232,280		121,534		110,746		2	14,000	0	F
Metal		82,442		40,027		42,415				
Fe	18,638		10,771		7,867		3	0	0	
Al	14,183		8,639		5,544		2	0	0	
Mixed	49,621		20,617		29,004		2	0	0	
Glass		58,512	38,526	38,526	19,986	19,986	2	84	0	
Food Waste		519,832	272,656	272,656	247,176	247,176	70	1,800	301	B
Other Organics		258,924		197,492		61,432				
Leaves and grass	100,548		79,262		21,286		60	2,600	107	B
Branches, stumps, trimmings	56,542		48,868		7,674		60	2,600	63	B
Other - diapers, etc	101,834		69,362		32,472					
C&D Debris		276,996		167,408		109,588				
Wood	172,116		104,031		68,085		70	6,600	0	B
Carpeting, Padding	35,908		28,944		6,964		2	10,000	0	F
Remaining	68,972		34,433		34,539		2	11,000	0	50-50
Household Hazardous Waste	16,943	16,943	10,487	10,487	6,456	6,456				
Electronics	11,906	11,906	5,417	5,417	6,489	6,489				
Other Wastes		291,940		211,339		80,601				
Textiles	131,904		101,413		30,491		2	7,700	0	B
Bulky itesm	37,941		29,310		8,631					
Bottom fines and dirt	70,709		47,332		23,377					
Misc	51,386		33,284		18,102					
Total Waste Disposed		**2,332,598**		**1,362,562**		**970,036**				
Btu/lb		5,297		5,128		5,534				

Notes: 1.) CT DEEP 2015 State-wide Municipal Solid Waste Composition and Characterization Study.
2.) Kaplan, P.O. et. al. (2009) Environ. Sci. Technol. 43, 1711-1717.

Waste reduction goals were applied to all waste categories. Recycling rates were applied to food waste, all paper categories except mixed paper, PET and HDPE plastics, metals, glass, and textiles. In the estimates for ten- year goals, some increased recovery of lawn and brush was included with the recyclables. The properties of various materials were taken from the literature and used to evaluate potential impacts on disposal of the residue.

Efficiency of MWPFs in recovering organics and potentially recyclable materials assumed the lower end of the range reported in a study[14] of commercial systems (see table below.)

[14] https://plastics.americanchemistry.com/Education-Resources/Publications/The-Evolution-of-Mixed-Waste-Processing-Facilities.pdf

Mixed Waste Processing Facility	
% Recovery of carboard	65%
% Recovery of Mixed Fiber	50%
% Recovery of PET	85%
% Recovery of HDPE	85%
% Recovery of Mixed Plastics	75%
% Recovery of Ferrous	90%
% Recovery of Aluminum	90%
% Recovery of Foodwaste, Yardwaste	80%
% Recovery Glass	70%

Because it was assumed mixed paper and plastic were not recovered by source separation, the analysis shows significant recovery of these materials at the MWPF. It makes no difference to the conclusions whether these materials are collected at the source or the MWPF on the amount of waste for final disposal. There would be obvious advantages regarding quality of recovered materials with source separation.

The results of the 5- year goals scenario (6% waste reduction & 1/3 of recyclables source separated) are shown in table below.

Waste Category			MWPF	
		Disposed	Recovered	Disposed
Paper				
	Corrugate cardboard	69,026	44,867	24,159
	High grade office paper	16,697	8,348	8,348
	Magazines/ catalogs	11,904	5,952	5,952
	Newsprint	20,327	10,164	10,164
	Mixed paper	331,071	165,535	165,535
Plastics				
	PET	16,566	14,081	2,485
	HDPE	10,724	9,115	1,609
	Mixed plastics	218,343	163,757	54,586
Metal				
	Fe	11,738	10,564	1,174
	Al	8,932	8,039	893
	Mixed	31,251	28,126	3,125
Glass		36,851	25,796	11,055
Food Waste		327,390	261,912	65,478
Other Organics				
	Leaves and grass	94,515	75,612	18,903
	Branches, stumps, trimmings	53,149	42,520	10,630
	Other - diapers, etc	95,724	0	95,724
C&D Debris				
	Wood	108,399	0	108,399
	Carpeting, Padding	22,615	0	22,615
	Remaining	64,834	0	64,834
Household Hazardous Waste		15,926	0	15,926
Electronics		11,192	0	11,192
Other Wastes				
	Textiles	83,073	0	83,073
	Bulky itesm	35,665	0	35,665
	Bottom fines and dirt	66,466	0	66,466
	Misc	48,303	0	48,303
	Total Waste Disposed	**1,810,682**	**874,390**	**936,293**
	% Diverted		**48%**	
	Btu/lb			**5,111**

These data indicate that with recovery of 1/3 of recyclables, there remains a significant amount of value in the disposed waste that would justify investment in MWPFs. There was only a small reduction in the heat content of the residue. Removal of paper and plastic was partially offset by removing the wet organics. The key message is that source separation can be effectively supplemented with the MWPF. The waste residue for disposal was reduced to less than 1 million tons, ensuring the existing capacity would be sufficient.

These result do assume some market for the recovered materials. That will require a coherent strategy to attract private capital to support processing the recovered materials.

The results of the 10- year goals scenario (12% waste reduction & 2/3 of recyclables source separated plus 1/3 of yard waste & brush) are shown in table below.

Waste Category			MWPF	
		Disposed	Recovered	Disposed
Paper				
	Corrugate cardboard	31,828	20,688	11,140
	High grade office paper	7,699	3,849	3,849
	Magazines/ catalogs	5,489	2,745	2,745
	Newsprint	9,373	4,686	4,686
	Mixed paper	309,939	154,969	154,969
Plastics				
	PET	7,639	6,493	1,146
	HDPE	4,945	4,203	742
	Mixed plastics	204,406	153,305	51,102
Metal				
	Fe	5,412	4,871	541
	Al	4,119	3,707	412
	Mixed	14,410	12,969	1,441
Glass		16,992	11,894	5,098
Food Waste		150,959	120,767	30,192
Other Organics				
	Leaves and grass	59,283	47,426	11,857
	Branches, stumps, trimmings	33,337	26,670	6,667
	Other - diapers, etc	89,614	0	89,614
C&D Debris				
	Wood	49,982	0	49,982
	Carpeting, Padding	10,428	0	10,428
	Remaining	60,695	0	60,695
Household Hazardous Waste		14,910	0	14,910
Electronics		10,477	0	10,477
Other Wastes				
	Textiles	38,305	0	38,305
	Bulky itesm	33,388	0	33,388
	Bottom fines and dirt	62,224	0	62,224
	Misc	45,220	0	45,220
	Total Waste Disposed	**1,281,073**	**579,243**	**701,829**
	% Diverted		**45%**	
	Btu/lb			**4,924**

Even with 2/3 of the organics recovered at the source, some 150,000 tons would remain in the waste stream. MWPFs could recover an additional ~580,000 tons of material. The heat content of the residue was reduced by about 7% to just over 4,900 Btu/lb. The reduction in combustion efficiency would help reduce any incentives to add incineration capacity.

The limits of this simple spreadsheet analysis need to be emphasized. The calculations are crude and are only meant to pose what-if consideration of various zero waste goals. One advantage of MWPFs is the flexibility to adapt to changing waste streams. The pandemic has provided a timely lesson in the fluidity of waste streams.

Going forward it will be necessary to consider source separation, collection, sorting and treatment as an integrated system. These crude calculations support investment in MWPFs as a complement to a robust zero waste strategy. A more distributed system can help reduce truck transport of waste and the associated emissions and mitigate the environmental injustices imposed by large, centralized incinerators.

Appendix B – Zero Waste Program Elements

Status	Zero Waste Program Element	
	Adopt ZWIA Zero Waste Definition - Council approved Zero waste resolution at 26 Oct. 2020 Regular meeting	
	Establish Goals and Timeline - Quantified targets for mid- term (within 10 years) and long- term (within 20 years)	
		Develop Zero Waste Plan
		Report recommendations for 30% reduction to City Council by Feb. 2021
	Report data annually to demonstrate progress in implementing Zero Waste Plan	
		Establish baseline (FY2019?) using Annual Municipal Recycling Report mandated by state – CGS Sec 22a-220(h)
	Adopt a commitment to implement residential collection programs for recyclables and organics	
		Residential collection of organics – 3rd bin; *Organix Solutions* co- collection; organics recovered from mixed waste
		Film plastics – *plasticfilmrecycling.org*
		Textiles – *Simple Recycling*
		Other materials?
	Conduct education and outreach	
		Establish a Zero Waste Advisory Board or multi-stakeholder process
		Advocate for expansion of bottle bill
		Improve quality (reduce contamination) of single stream recyclables
		Other?
	Implement Pay as You Throw (PAYT) – aka Unite Based Pricing (UBP) – or other financial incentives to encourage waste reduction and promote recycling	
	Oppose any kind of incineration (technologies that operate above 212° F) – Council passed No Incineration Resolution at 26 Oct. 2020 Regular meeting	
		Oppose construction of multi- modal transfer station
		Advocate for modular, distributed system incorporating mixed waste processing to maximize recovery of organics and potentially recyclable materials and minimize environmental and health effects of any residues sent for final disposal
		Develop EJ scorecard for evaluating waste management proposals?
	Extended Producer Responsibility	
		Mattresses
		Electronics
		Paint
	Conduct comprehensive composition studies of discarded materials at least every 10 years to analyze progress, assess what is left in discarded materials, define strategies and campaigns to achieve further improvements	