CITY OF LEAVENWORTH

Food Waste Collection & Hauling Feasibility Study

JUNE 2021

PREPARED BY:

WASTE LOOP

AUTHORS: ARIAHNA JONES & HELEENE TAMBET

Executive Summary

In response to a growing awareness about negative impacts associated with sending organic waste to the landfill, this study aims to assess the potential for and feasibility of a commercial food collection program in Leavenworth, WA. A tourist town in the Central Cascades, Leavenworth has seen increasing amounts of waste over years, while so far the surrounding Wenatchee Valley has no facility for composting, neither for residential or commercial customers. The study examines the feasibility of implementing a pilot program to collect & haul food waste generated by the City of Leavenworth, recognizing the importance of understanding current data as a starting point to develop plans to reduce and divert food waste.

The study first describes waste management practices within the City, and assesses the current situation with a focus on food waste. To do so, six waste audits were conducted: two looking at the composition of the City's commercial waste stream, and four surveying waste at individual restaurants to assess the prevalence of organic waste in food service businesses specifically. The City-wide audit determined that 49.4% of the commercial waste stream is compostable, including 13.8% of compostable paper products, and 35.6% food and other organic waste. Meanwhile, the restaurant audits found that for all four businesses, the share of compost in total waste was higher than 76%, and collectively, the businesses could have diverted over 69,500 lbs. of waste in 2019 alone if composting had been an option.

Next, the study gives an overview of the best practices for collection and hauling of food waste, and the important differences that the latter has with management of municipal solid waste: collection of organic waste is often done by small-scale operators, and the end product is ideally put into productive use within the community itself. The best practices for commercial programs include customized organic waste management plans, and provision of training, signage and educational materials for municipalities' businesses. The businesses are also more likely to be on board if they are motivated with personal statistics, a starting package with any of the necessary supplies, and an accompanying PR campaign.

Finally, an overview of potential waste collection options in Leavenworth is given. Importantly, by the end of 2021, a new commercial composting facility, Winton MFG, is slated to open near the City, creating a very feasible opportunity for the Leavenworth community to divert food waste out of the landfill and back into local soil as compost. The study thus compares possible waste collectors and haulers, and discusses the need for outreach and educational partnerships as the next steps in the process of building a compost program within the City.

Table of Contents

Background & Introduction

Each year close to two million tourists visit the Bavarian themed town of Leavenworth, WA. This influx of population creates an increased strain on existing infrastructure and waste management practices. Although local management plans strive for waste reduction, opportunities for waste diversion are often dependent on availability of recycling markets and facilities in the region. The lack of a commercial composting facility in the region has kept commercial food waste collection a challenge for Leavenworth and the surrounding Wenatchee Valley. However, a new commercial composting facility, Winton MFG, located just 15 miles from Leavenworth, is slated to open by the end of 2021. The opening of this facility will create an incredible opportunity for the Leavenworth community to divert food waste out of the landfill and back into local soil as compost, thereby creating a regenerative circular economy.

With this opportunity on the horizon, Waste Loop, a local 501c3 nonprofit has worked closely with Winton MFG to ensure the acceptance of food waste at the facility and connect food waste generators with the facility and in turn with local farms. These efforts fall directly within Waste Loop's mission and current programs. Waste Loop has been in contract with the City of Leavenworth to manage the Leavenworth Recycling Center since May of 2020. One of the goals in this partnership is to expand operations and opportunities in regards to waste diversion and recycling.

This study examines the feasibility of implementing a pilot program to collect & haul food waste generated by the City of Leavenworth. In partnership and through contract with the City of Leavenworth, Waste Loop began research into the food waste market in Leavenworth in March of 2021. This study and preliminary steps towards the implementation of commercial food waste collection & hauling was made possible through the Washington State Department of Ecology's Recycling Development Center Grant.

This undertaking recognizes the importance of understanding current data as a starting point to develop and implement plans to reduce and divert food waste moving forward. To gain insight into the current waste diversion challenges & opportunities, the study was divided into the following three tasks:

1. Assessment of the current waste management practices within the City of Leavenworth with a focus on food waste.
2. Best practices overview for comparable size operations with a focus on collection and hauling of food waste.
3. Outreach & market analysis to inform the path forward.

The Big Picture of Food Waste

Worldwide, food waste is one of the greatest challenges of our time, with significant environmental, social and economic impacts. In 2015, the EPA announced the first ever domestic goal to reduce food loss and waste by half by the year 2030 which aligns with the international 'Target 12.3' of the UN Sustainable Development Goals. Following suit, the Washington State Legislature passed ESHB 1114 in 2019 (now known as the Food Waste Reduction Act RCW70A.205.715) to address food waste and establish a statewide goal of reducing the amount of food waste generated annually by 2030.

Reducing food waste by half would have a significant impact on the amount of waste currently being sent to the landfill. According to a 2015-2016 Washington State Waste Characterization Study, organics (food & yard waste) make up the largest material class by weight in the overall waste stream with 1,330,965 tons per year or 29% of the total (Cascadia Consulting Group, 2018). In addition, Chelan & Grant Counties showed the highest percentage of organic waste (36.6%) relative to the rest of the state.

Existing Management Plans

The 2017 Chelan County Solid Waste Management Plan (SWMP) includes recommendations to reduce waste through organics management and diversion (Chelan County Public Works, 2017). The SWMP recognizes that less-populated areas have greater barriers to cost-effective diversion opportunities and additional support and incentives are needed to move the needle in waste reduction. The 2017 SWMP objectives used to meet the organics goals include the following:

- Maintain and encourage public education/information programs.
- Encourage convenient and cost-effective opportunities for all households, institutions and businesses to divert organics.
- Promote private sector involvement.

In response to the Washington Legislature (ESHB 1114) passed in 2019, the Washington Department of Ecology was tasked with the development and implementation of a food waste reduction plan, now titled the Use Food Well Washington Plan (UFWW Plan). The UFWW Plan focuses on three key strategies; prevention, rescue and recovery. The goal of the Plan is to reduce the amount of food waste generated annually in the state of Washington by 50 percent relative to 2015 levels (Monroe and Harrington, 2020). The strategy of recovery through composting is focused on in this report.

City of Leavenworth Food Waste Assessment

Assessment of Current Operations

The City of Leavenworth stopped hauling residential waste in February 2019. Since that time the City has collected municipal solid waste from 159 accounts. A City contract with Waste Management covers the residential operations within the City limits and the surrounding county. Each business account has a 300 or 64 gallon waste tote & 300 gallon cardboard tote that is picked up 1 - 6 times a week. Garbage is picked up every day but Thursday. Two routes are covered per day (downtown alleyways & highway 2 corridor) with a trip to the transfer station depending on how much waste is picked up on the first downtown alleyway round. The amount of waste ranges seasonally, but on average, 2 trips to the transfer station are taken per day.

The Dryden Transfer Station is operated by Chelan County but the tipping fees are governed by Waste Management. As the operator, Waste Management increases the rates at the landfill every year which in turn increases the tipping fee at the transfer station. The increase is based on the current price index or inflation (generally 1% - 3.5% per year). However, the latest change from January 2020 ($88/ton) to the current rate ($95/ton) is a 7.95% increase. This shows the variability of the inflation rate and warrants concern about the cost of municipal solid waste disposal into the future.

Methodology

The goal of the assessment undertaken was, primarily, to estimate the share of organic waste within Leavenworth's commercial waste stream, and secondarily, to assess other diversion potential for City's waste.

To achieve this, two separate data collection activities were carried out. First, two audits of City's commercial waste stream were conducted, both based on random sampling strategies and a separation between waste from the downtown commercial district and from the rest of the City's commercial accounts. During the City-wide audits, commercial waste was sorted into a total of 15 categories and a share of annual waste in each was estimated. Secondly, Waste Loop conducted individual waste audits at four of the downtown restaurants. The goal of these audits was to assess the share of compostable waste in food service businesses specifically.

Sampling strategy

The City-wide audits utilized modified random sampling for surveying a segment of waste generated by City's commercial accounts. If simple random sampling would have been used, each unit of waste coming from all accounts would have had an equal chance of being surveyed, independently from respective business' location or service type. However, given that accounts

have different pick-up schedules and it is not feasible to audit a full week's waste, it was necessary to modify the approach by making the assumption that the composition of the waste stream (share of waste in different categories) is similar regardless of which businesses' waste is picked up on a given day.

Stratification

A standard practice for waste audits is to divide the sample into strata by their geographic location (e.g. zip code), to then randomly select or otherwise choose units that are going to be surveyed within each stratum. The results can then be extrapolated within this stratum, the goal being higher accuracy and ideally lower number of needed samples. In our case, it was preferable to categorize by different account types: it could be expected that the downtown area that has the majority of City's restaurants would have a different waste composition than the rest of the commercial waste accounts in other parts of the town (hotels, schools). Previous audits of other cities' waste have shown the disproportionately high role that food services play in food waste generation (NRDC, 2017). We thus divided the town into two—downtown (Front St, Commercial St, and crossing streets), and all other areas—and drew the random samples from both strata separately.

Timing

Since the goal was not to measure the overall amount of waste, which can be assessed through the City records—and given the assumption above about the waste stream composition being similar throughout the week—it was not necessary to audit both a weekday and a weekend day. For logistical reasons, it was thus easier to audit waste from a weekend day, as due to high volume full truckloads can be collected separately from the downtown area and from elsewhere. The audit days for the two strata were two Mondays—the first Monday for the commercial district and the second one for other areas of town serviced by the City.

Sample size

To balance statistical best practices on one hand, and labor/resource constraints on the other, the sample size was the maximum number of samples that could be audited per day given the constraints, and also taking into consideration the following:

- A standard weight of a sample is 200 lbs. (NRDC, 2017; EPA, 2020; Green Solutions, 2020).
- Based on literature and previous experience, a person could audit 100-200 lbs. a day depending on working hours and intensity, which means that the eventual number of 200 lbs. samples will be determined by labor availability.
- The goal of choosing samples from a truckload should be representativeness —theoretically, each segment of waste should have the same chance of being surveyed. However, known sampling strategies (e.g. "Coning and Quartering", the one proposed by Green Solutions in 2019) would require a dedicated person and a front loader (Strasma,

1990), which is why random samples were pulled manually at random from the pile dumped by the truck.

Sorting categories

The sorting categories were determined based on the primary focus of the audit, composting potential, and the secondary focus, other diversion potential for future developments. Given this, the organics sub-categories were revised from what Green Solutions included in December 2019. The specific categories can be seen in Table 1. Compostable items were classified based on composting capacity of Winton MFG, and thus include meat and bones, biodegradable packaging, untreated wood, newspapers, and other eligible paper products.

Restaurant audits

In order to get a better idea of organic waste being generated in food service businesses specifically, individual audits at four of downtown restaurants were conducted. The restaurants were chosen based on business owners' interest to participate in the study.

The staff of Waste Loop spent a day collecting, sorting, weighing, and recording waste at two of the four participating restaurants, while the other two sorted and weighed their day's worth of waste themselves, sharing the data with Waste Loop afterwards. Since the focus here was compostables specifically, only the shares of organic versus other waste were recorded. The estimated annual amount of compost was then extrapolated from the observations from the audit day. To do so, restaurants' annual sales figures were compared to the sales figures from the audit day, the latter was divided by the former, and the resulting scale multiplier was applied to the amount of compost observed on the audit day to estimate the total annual amount.

Results & Observations

Logistics of City audits

The City audits were conducted on two Mondays, May 24 and June 7, 2021, when the majority of previous weekends' waste came in. The audits took place in the Dryden Transfer Station after City's garbage truck had dropped off their respective load. The first audit was conducted by five people and lasted 4 hours, while the second one had 13 people participating, most of them on volunteer basis and in 2-hour shifts.

As described above, the first audit surveyed waste from the commercial accounts that are located in other areas than the main downtown business district, while the second audit surveyed waste from the downtown district (that is, waste bins located in downtown alleyways). The final weight of all waste surveyed over the two audits was 2386.1 lbs. (see Table 1).

Estimation

At both audits, weight of waste in each of the 15 categories was recorded, and the share of waste in each category was calculated. Averages over the shares from the two audits were taken to estimate the final annual shares of waste in each category. This method assumes that across the year, there's roughly a similar amount of waste coming from commercial clients in the downtown area, and from commercial clients elsewhere, as the average is taken over the two audits with no weights assigned based on the actual distribution of annual waste poundage. From anecdotal evidence there's a reason to believe that in reality, more waste is collected from downtown alleyways than from other commercial accounts, in which case the results here underestimate the relative importance of waste from downtown businesses. That is, if indeed more waste comes from downtown, and downtown businesses produce relatively more organic waste (as the restaurant audits show; see below), the share of organic waste in Leavenworth waste stream is currently a conservative, lower-bound estimate.

Results

The results from the two audits, as well as aggregate estimates, can be found in Table 1; column 7 shows the average of the two audits, also reported in Figure 1. In terms of final average shares observed, organic waste is by far the largest component of the waste stream with 35.6% of the total, followed by glass (17.1%), other residual waste (16.9%), and compostable paper and packaging (13.8%).

Figure 1. Average share of waste estimated for each category.

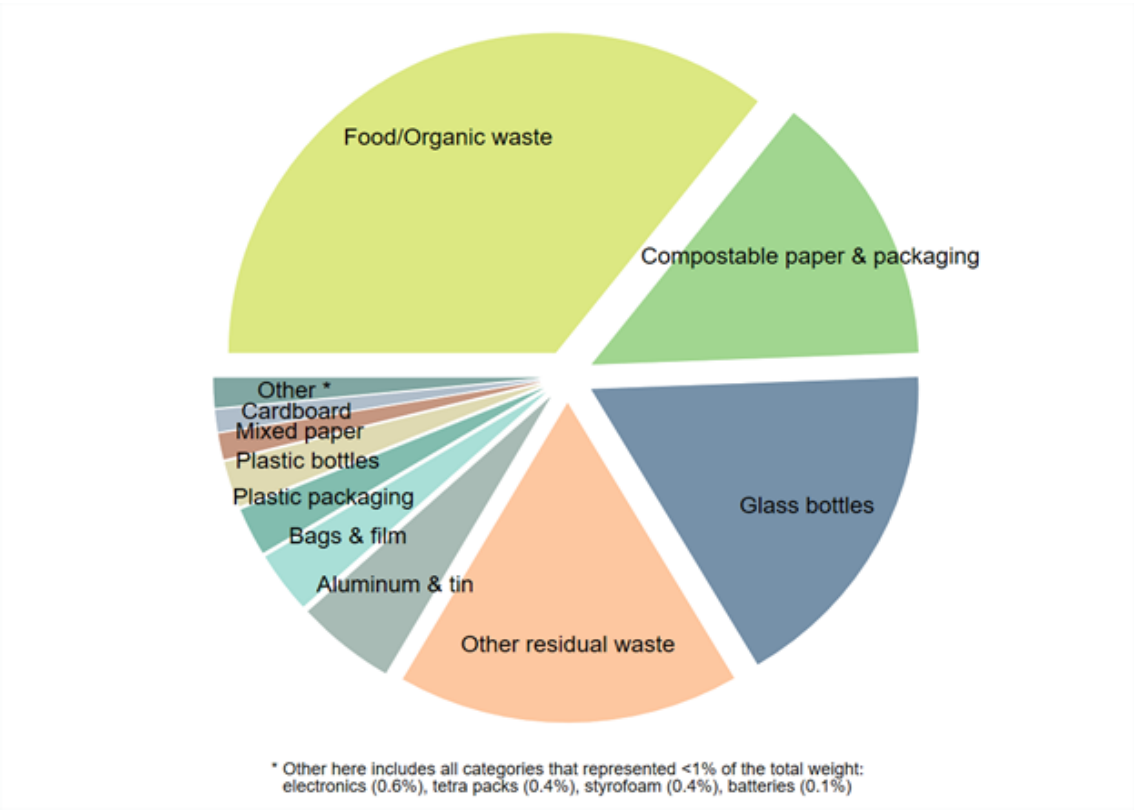


Table 1. Results from the two audits of City's commercial waste.

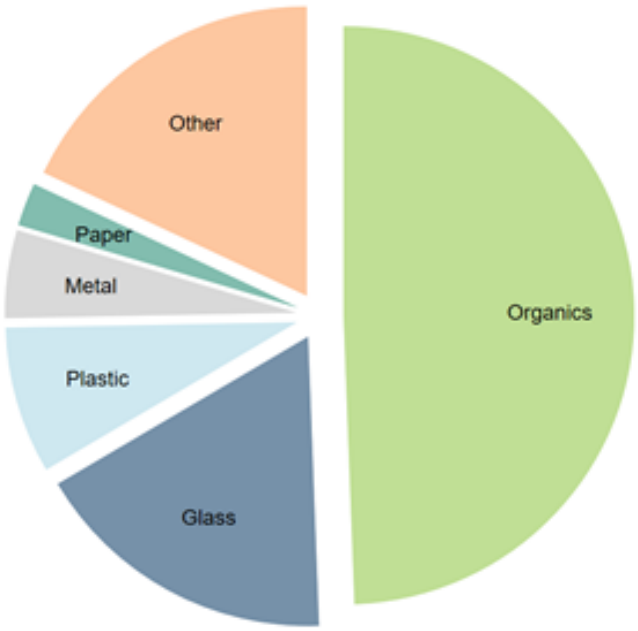
		Audit #1 - 5/24/21 - Other areas		Audit #2 - 6/07/21 - Downtown		Average share
	Category	Weight (lbs.)	% of total	Weight (lbs.)	% of total	% of total
PLASTIC	Plastic Bottles	26.4	2.7%	25.9	1.8%	2.3%
	Other Plastic Packaging	28.5	2.9%	27.3	1.9%	2.4%
	Bags & Film	22.1	2.3%	54.9	3.9%	3.1%
	Styrofoam	1.5	0.2%	8	0.6%	0.4%
PAPER	Cardboard	10.7	1.1%	16.6	1.2%	1.1%
	Mixed Paper	10.8	1.1%	20.8	1.5%	1.3%
METAL	Aluminum & Tin	74.5	7.7%	29.1	2.1%	4.9%
	Scrap Metal	0.8	0.1%	0	0.0%	0.0%
GLASS	Glass Bottles	185.4	19.1%	213.9	15.1%	17.1%
COMPOST	Food/Organic Waste	329.6	33.9%	527.6	37.3%	35.6%
	Compostable Paper & Packaging	92.3	9.5%	256	18.1%	13.8%
OTHER	Batteries	1.3	0.1%	0	0.0%	0.1%
	Tetra packs	6.3	0.6%	2.8	0.2%	0.4%
	Electronics	12.4	1.3%	0	0.0%	0.6%
	Other Residual Waste	169.2	17.4%	231.6	16.4%	16.9%
	Total Weight	971.9	100.0%	1414.5	100.0%	100.0%

In Table 1, column 4 presents the share of weight in each waste category observed at the first audit (non-downtown areas) and column 6 shows the same for the second audit (downtown area). There were some expected, although not dramatic differences between the downtown area (with a higher concentration of restaurants), and the rest of the town. For the latter, a higher share of most types of packaging—plastic bottles, other plastic packaging, glass bottles, and aluminum cans—was observed. Meanwhile, the second audit had a higher share of compostable paper and packaging (18.1% vs 9.5%) and organic waste (37.3% vs 33.9%).

Diversion potential

We further aggregated the results in three ways. First, Figure 2 shows the overall coarser categories observed in the commercial waste stream: organic waste, glass, plastic, paper, metal, and the rest. With 49.4%, organic waste represents by far the most prevalent material category.

Figure 2. Coarser material categories observed between the two audits.



Categories are aggregated as: organics (food/organic waste, compostable paper & packaging), paper (cardboard, mixed paper), glass (glass bottles), plastic (plastic bottles, plastic packaging, bags & film, styrofoam), metal (aluminim & tin), other (all residual waste, electronics, tetra packs, batteries)

Secondly, we looked at the diversion potential in City's commercial waste stream; these results can be seen in Table 2 and Figure 3. For organic waste, the categorization is straightforward, and we can say that in ideal conditions, nearly 50% (49.4%) of City's commercial waste could be diverted, if composting infrastructure was in place and the clients sufficiently invested.

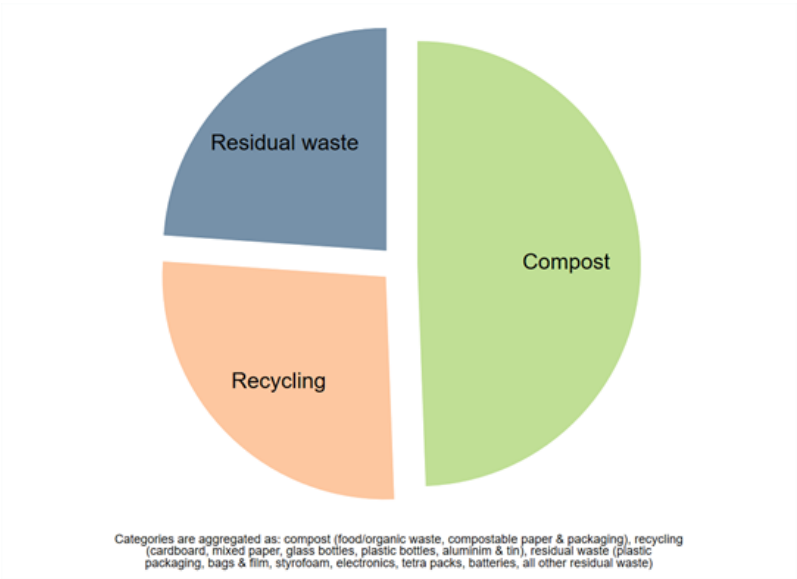


Figure 3. Waste diversion opportunities in Leavenworth commercial waste stream (with the definition of 'recyclability' based on what is currently accepted as recycling in the area)

In terms of diverting potential of recycling, there are two different categorizations we followed. First, we looked at what could be diverted as recyclables following what Waste Management is currently able to recycle in the area. Based on these categories (plastic bottles, cardboard, mixed paper, aluminum and tin, glass), 26.7% of the waste stream could be diverted (see Table 2, Column 2, and Figure 3). On the other hand, following "hypothetical recyclability", categorization of items based on what is possible in other parts of the country, 33.7% of waste is recyclable (see Table 2, Column 3).

Table 2: Total share of potentially compostable or recyclable waste in Leavenworth's commercial waste stream.

All categories	Recyclable in Leavenworth	Recyclable hypothetically
Plastic Bottles	X	X
Other Plastic Packaging		X
Bags & Film		X
Styrofoam		X
Cardboard	X	X
Mixed Paper	X	X
Aluminum & Tin	X	X
Scrap Metal		X
Glass Bottles	X	X
Food/Organic Waste		
Compostable Paper & Packaging		
Batteries		X
Tetra packs		X
Electronics		X
Other Residual Waste		
Total compostables	49.4%	49.4%
Total recyclables	26.7%	33.7%
Total diversion potential	76.1%	83.1%

Adding these categories up, and following the "current recyclability" approach, 76.1% of the City's commercial waste stream could be diverted, with 49.4% of it as compost.

Comparisons and Limitations

Comparisons with other audits

First, the results were compared to those recorded by Green Solutions in their December 2019 audit of Leavenworth's commercial waste stream. The shares observed in each category are relatively similar, despite the different seasons (summer vs winter) and different audit times (weekday vs weekend). Green Solutions observed the share of compost to be 39.9% (a combination of organics, 35.5%, compostable paper, 4.4%, and compostable plastic, 0.1%). However, the main difference between the 2019 audit and the recent audits is the area separation: the 2021 audits specifically separated waste coming from downtown and non-downtown areas, with the goal to specifically not miss the downtown area food service businesses as likely important contributors to the overall commercial waste stream.

In terms of other cities, it is difficult to find estimates of organic waste in commercial waste streams specifically, as most studies done up to date look at the municipal waste stream as a whole. According to the EPA, in 2018 22% of total municipal solid waste generation in the nation was food waste (EPA, 2019). The Natural Resources Defense Council reports that it is observed that individual municipalities that have analyzed their waste stream have observed 18% to 35% of their municipal waste to be food waste (NRDC, 2019).

As these measures are strictly about food waste (that is, not organics waste overall), they wouldn't involve compostable paper and packaging, and often also commercially compostable items like bones. For example, EPA also reports that in the same year, 23% of waste was paper, also including napkins, newspaper, and other compostable items. Therefore these estimates align with the shares observed in audits from Leavenworth, an economy that is reliant on tourism and thus dining, and therefore more likely to observe high rates of compostables.

Study limitation

As every study, the assessment has its limitations. As documented in the methodology section, it wasn't possible to make sure that all businesses' waste had a chance to be represented as it wasn't possible to conduct an audit each day. The audited waste was already cross-contaminated, meaning that residual waste was already wet due to organics, and thus potentially heavier, and some items had to be separated from the packages, which couldn't just be categorized as organics. Overall, the audit represents the 'ideal scenario' of how much of the City's waste could be diverted if the infrastructure was in place, but also if the businesses were sufficiently motivated, their staff trained, and visitors had the incentives to do their part, among others.

Restaurant audits

Logistics

Individual audits were conducted in four restaurants located in downtown Leavenworth: München Haus, Yodelin Broth Company, Whistlepunk Ice Cream Co., and Icicle Brewing Company. While these businesses differ significantly in terms of their food service, they were all willing to participate and thus fall on the rather environmentally conscious side. The audits were conducted in April and May of 2021 when a large part of Leavenworth's tourism sector had resumed its activities post-pandemic, and each of them looked at a day's worth of waste. Two of the audits (München Haus and Icicle Brewing) were conducted by Waste Loop's staff, while the other two businesses (Whistlepunk and Yodelin) recorded the waste figures themselves. At each audit, waste was measured both by weight and by volume.

Results

Table 3 reports the aggregated results from the four business audits. The total weight audited ranged from 25 to 172 lbs., and the total volume from 30 to 230 gal. The shares of waste observed by volume and by weight were, however, relatively similar across businesses. By weight, the figure ranges from 77% (Icicle, a brewery) to 97% (Yodelin, a broth and salad restaurant), and by volume, from 50% to 75%. The fact that shares of compost as measured by volume are significantly lower point to the high poundage of organic waste as compared to other types of waste—something that has to be factored in when designing the City's compost collecting and hauling infrastructure.

Table 3: Results from the restaurant audits.

		München Haus	Yodelin Broth Company	Whistle-punk Ice Cream	Icicle Brewing	**AVERAGE**
WASTE BY WEIGHT	Total weight (lbs.)	172.2	231.1	35.2	24.8	
	% compost	79.8%	97.0%	81.3%	76.6%	83.7%
	% trash	20.2%	3.0%	18.7%	23.4%	16.3%
WASTE BY VOLUME	Total volume (gal)	230	120	30	36	
	% compost	60.0%	75.0%	50.0%	66.7%	62.9%
	% trash	40.0%	25.0%	50.0%	33.3%	37.1%
2019 PROJECTIONS	Total weight (lbs.)	43,251	31,514	N/A	5,893	
	Compost weight (lbs.)	34,510	30,559	N/A	4,515	
	Trash weight (lbs.)	8,741	955	N/A	1,378	
2019 PROJECTIONS	Total volume (gal)	57,768	16,364	N/A	8,555	
	Compost volume (gal)	34,661	12,273	N/A	5,703	
	Trash volume (gal)	23,107	4,091	N/A	2,852	

On average across the four businesses, 83.7% of all waste could be composted, if measured by weight, and 62.9%, if measured by volume. As documented in the methodology section, these results were then used to estimate how much organic waste could have potentially been diverted in 2019 if composting would have been an option. For that, each business' sales data was used to compare the audit day to the annual sales volume (with the exception of Whistlepunk whose sales data is not available). The bottom panel of Table 3 shows the results: for example, München Haus, the largest of the businesses, could have prevented 34,510 lbs., or 15.6 tons of waste from going to the landfill if it could have been composted.

A lesson that was also learnt during the restaurant audits was the relative contribution of small items, such as rubber gloves. That specific observation was confirmed by the City-wide audit that recorded 7.8 lbs. gloves, or 3.4% of all residual waste. Secondly, a lot of waste could be avoided by finding alternatives to small packets of mayonnaise or cream cheese, and to little plastic containers that hold sauces and other condiments.

Food Waste Collection & Hauling Best Practices

As more businesses, municipalities and states roll out sustainability initiatives, the negative impacts associated with sending organic waste to the landfill has caused diversion mandates to gain momentum. Beginning in 2011 with Connecticut, six states & seven municipalities including Seattle, WA have passed organic waste bans or mandatory organics recycling laws (Waste Today, 2020). Legislation paired with a growing awareness of the environmental, social and economic challenges with organic waste have spurred tremendous growth in the business of collection and hauling.

Municipal solid waste collection and hauling is generally operated by a handful of large corporations in each state. However, organic waste collection & hauling is an exception in the market due to the importance of source separation and contamination reduction. Across the United States, there are over 200 food waste haulers ranging in size from a two bicycle operation to businesses that service multiple counties. The term 'micro-hauling' is often used to represent the growing niche of food waste haulers that have stepped up to the plate in providing a service that many large corporate haulers are unwilling to navigate (Biocycle, 2020).

Unlike municipal solid waste, the end product of food waste diversion creates a nutrient rich compost that can in-turn be used to grow food in a circular regenerative economy. The quality of the end product matters immensely to local farmers and the communities that utilize the compost as a soil amendment. If the compost is contaminated, it loses value and is essentially creating a wide-spread microtrash problem. Contamination is an ongoing challenge for facilities. Of the material collected for organics processing in King County in 2018, 3.9% by weight was

contamination (Cascadia Consulting Group, 2019). With these high stakes, attentive education and outreach programs that nest each collection and hauling operation are imperative to their success.

Micro-haulers of food waste are able to build the relationships necessary to gain participation, keep operations easy for businesses and reduce contamination for compost facilities. The network of micro-haulers across the U.S. are not only filling a niche with growing operations, they are building community both locally and nationally. Waste Loop had correspondence with over 20 micro-haulers through their research and received valuable insight and advice from passionate entrepreneurs that truly care about their work.

A review of successful commercial food waste collection programs across the nation provides strong support for the following recommendations:

- A customized organic waste management plan for each business that includes a site visit encourages participation and lays the foundation for communication across parties.
- Staff training & orientation are a necessity in reducing contamination in the separation of organic waste. Training not only covers the logistics of waste diversion, it covers the 'big picture' of the importance of organic waste diversion in relation to circular economies, regenerative agriculture and climate change.
- The provision of free signs & educational material for each business creates a visual reminder for staff and an incentive/marketing tool for customers that want to support sustainable business practices.
- Supplying both the primary 'kitchen' container and the secondary larger tote container with compostable bags is an effective tool for program roll-out. A good secondary container (rolling toter carts) that are easy to use and "engineered" (i.e. venting, locking) also helps increase participation. A key to success is keeping bins clean and manageable.
- Personalized organic waste diversion statistics for each business helps to emphasize the tremendous diversion/waste reduction opportunity that comes with organics recovery. This helps businesses know they are making a difference and can be used for business promotion and marketing.
- Reciprocal promotions for participating businesses help to increase participation and raise awareness in the greater community.

Outreach & Market Analysis

Globally, the food waste collection service industry has grown over the past five years and is projected to continue to grow in response to a rising awareness & concern over the environmental, social and economical impact of food waste (Technavio, 2021). Locally, the municipal waste collection service industry reflects a national growth trend in volumes of waste due to an ongoing increase in population and tourism. The coronavirus pandemic brought a drop in the market in 2020 due to business closures that in turn lowered the overall volume of waste generated. This

trend is expected to reverse nationally in 2021 and locally has already begun to shift, as seen in Table 4. In 2019, each month the City hauled 189 tons of waste on average, paying nearly $17,000 a month in tipping fees.

Table 4: City of Leavenworth Monthly Waste by Ton and Cost

	2019 Net Tons	2019 Total Cost	2020 Net Tons	2020 Total Cost
January	264.41	$23,479.00	210.03	$18,652.00
February	159.40	$14,158.00	156.33	$13,881.00
March	134.80	$11,965.00	113.21	$10,050.00
April	167.44	$14,867.00	62.57	$5,557.00
May	167.48	$14,873.00	88.89	$7,895.00
June	171.26	$15,210.00	94.72	$8,410.00
July	219.32	$19,475.00	169.46	$15,051.00
August	217.42	$19,310.00	212.77	$18,891.00
September	149.84	$13,304.00	72.41	$6,431.00
October	206.43	$18,331.00	189.63	$16,837.00
November	147.90	$13,133.00	160.45	$15,037.00
December	265.29	$23,557.00	222.18	$20,997.00
TOTAL	**2270.99**	**$201,662.00**	**1752.65**	**$157,689.00**

The food waste market opportunity in Washington State is expected to grow as more municipalities adopt sustainability initiatives in support of the 2019 Food Waste Reduction Act. As the food waste market opportunities increase, the market also expands for additional collection and hauling services. Currently, the majority of composting facilities are in Western WA where the top ten (by size) facilities are located, and produce 80% of the state's finished compost (Waste 2 Resources, 2016).

Food Waste Collection Options & Recommendations

Currently there is no food waste collection service in Leavenworth or the Wenatchee Valley. This creates a gap in service opportunities with the emergence of the Winton MFG commercial composting facility. The options for collection and hauling services in the City of Leavenworth are threefold; the City Public Works Department, Waste Management, or a private organization. Table 5 provides a snapshot comparison of the primary factors in consideration to fulfill the food waste collection service gap for the City of Leavenworth.

Table 5: Food Waste Collection Service Provider Overview

	City of Leavenworth	Waste Management	Private Business / Org.
Capital Cost: Truck or trailer	est. $40-$60k for an additional dump truck. Financial designation would need to be approved by the City Council	est. $400k for a new dump truck designated for the area. Approx. 2 years out	Between $50-$125k for a trailer, truck, lift combination.
Capital Cost: Totes	Could repurpose many 'City of Cashmere' totes currently being stored	Various sizes available through corporation	Could repurpose totes and/or purchase food waste specific totes
Staff: Collection & Hauling	Potentially utilize current number of employees	New position for designated area	New position
Staff: Education & Outreach	Additional position within the City / Public Works would need to be created	Education & Outreach is spread across the nation with the closest person in Spokane, WA	Education & Outreach is a core component of services offered

Education and Outreach

As seen in the table above, education and outreach is a key facet in any food waste collection service. In fact, education and outreach is an important component when considering implementing any sort of waste reduction or diversion program, especially when introducing a program into an area that historically has lacked the respective services. In a study conducted by an Oregon State University researcher, the primary barrier to composting in Corvallis was found to be lack of knowledge - both in regard to how to go about composting and what can be composted (Boudet, 2015). While education and outreach is an attainable goal, it is also complex and multi-faceted, typically relies on many hours of labor to be an effective tool, and will vary considerably based on the target audience.

Many of the food waste hauling recommendations mentioned earlier in this report will also be key elements of a successful outreach and education plan for businesses in Leavenworth. This includes personalized outreach with individual business owners and managers to design food waste diversion practices that work for their business. It cannot be a 'one size fits all' mold. Involving the Leavenworth Chamber of Commerce could be another step to promote communication and idea sharing amongst and between businesses on topics related to waste reduction and diversion

strategies. The creation of a program recognizing and rewarding waste diversion practices and sharing statistics could provide participating partners with marketing material - which then in turn could serve as a secondary form of outreach to the broader community.

Outside of the business community, target audiences for outreach and education include residences (both permanent and vacation rentals) and schools. Waste Loop has already begun partnering with the local Cascade School District in a limited capacity to work with students to brainstorm ideas surrounding waste reduction in their school and broader community. Educating and empowering the youngest generation of residents is a vital step in any community outreach plan. The development of age appropriate curriculum around food waste reduction and diversion, the science of composting and soil, and sustainable and regenerative agriculture will involve partnering with local teachers and volunteers - several of whom have already begun this process. There are a lot of exciting avenues that outreach to the broader community could take. Partnerships with other nonprofits such as the Leavenworth Farmers Market will be vital to help communicate composting and waste diversion strategies and updates to residents. The creation of educational literature in both English and Spanish (the two dominant languages spoken in the Wenatchee Valley) will be very important to involve all members of the community. As the covid-19 pandemic fades as a public health emergency more opportunities will emerge for workshops, info booths at festivals, and other in person educational events.

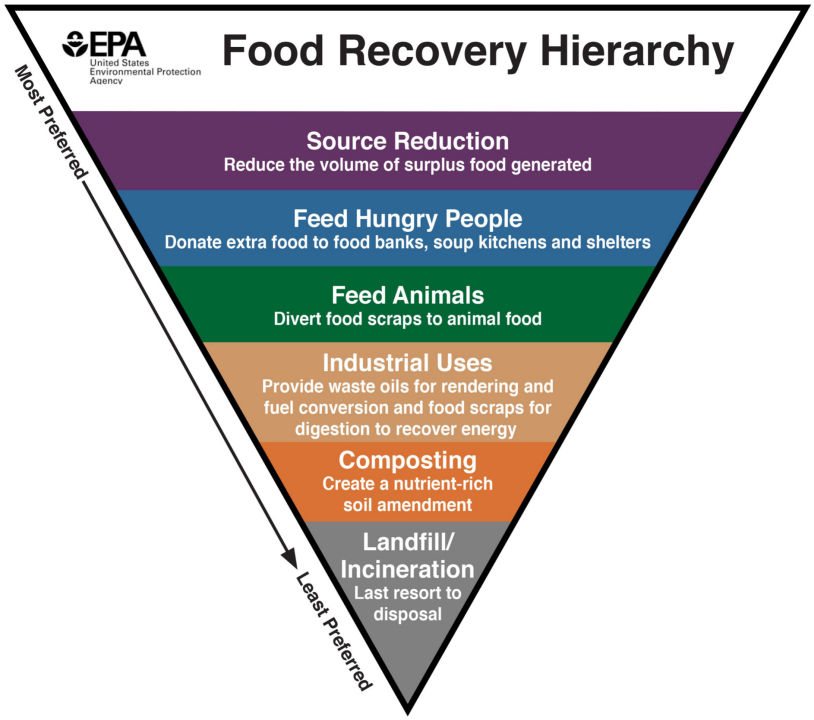
Conclusion and Future Research Recommendations

Over the past several months, Waste Loop and the City of Leavenworth have worked to meet the goals stated in this project's proposal. Two commercial and four restaurant specific waste audits were conducted using scientifically reputable sampling techniques. The results of these audits clearly demonstrate that food waste is a large contributor to the City's overall waste stream. This finding, while expected due to the tourism-centered economy of Leavenworth, is valuable as it shows that there is a great opportunity for diversion of waste, and organic waste in particular. The next step in the project was targeted research into food waste collection and hauling systems across the country. This review, which included internet research and interviews with twenty plus similar size operations, has given Waste Loop and the City valuable insight into potential next steps. With the expected opening of Winton MFG by the end of 2021, the City of Leavenworth is faced with a choice to begin diverting food waste and compostable packaging to this facility. As Waste Management is increasing tipping fees for disposal of commericial waste at the Dryden Transfer Station every year, diverting compostable waste could make economic as well as environmental sense. The compost generated at this site will further boost the local economy by providing local farms with a high quality and nutrient rich soil amendment.

Research and development of residential and school specific diversion and educational programing is one potential next step to this study. Collection on the residential scale is significantly different both in volume (of food waste) and scope (number of individual customers and geographical area covered) than the commercial and downtown district of Leavenworth, and therefore there will need to be additional research conducted before implementation. Another recommended next step is the creation of a survey that could be sent to each business owner in the City to gain insight into their needs related to implementing waste diversion strategies. This survey should also aim to identify any potential barriers to participation by businesses before the collection and hauling begins.

Overall, the scope of this study focused on food waste 'recovery' through commercial composting. In accordance with the EPA's Food Recovery Hierarchy as seen in Figure 4, future research should focus on the prevention and rescue of food waste. Between 30-40% of food is wasted annually in the United States, much of it before it reaches the hands of consumers (USDA, 2021). Greater efforts placed at distributing this food to people equitably would decrease the amount of food waste and reduce nationwide hunger. Greater research at the community level should be conducted in partnerships with other similarly focused nonprofit groups, such as Upper Valley Mend in the Leavenworth area.

Figure 4: Food Recovery Hierarchy



References

BioCycle. (2020). Microhauling Organics in NYC. Retrieved from BioCycle: https://www.biocycle.net/microhauling-organics-nyc

Boudet, Hilary. (2015). *Composting Barrier and Benefit Research*. Retrieved from: https://cbsm.com/forum_posts/25221-composting-barrier-benefit-research

Cascadia Consulting Group. (2019). *King County LinkUp: Organic Materials Management in King County.* King County Solid Waste Division.

Cascadia Consulting Group. (2018). *WA Department of Ecology 2015-2016 Washington Statewide Waste Characterization Study.*

Chelan County Public Works. (2017). *Chelan County Solid Waste Management Plan*.
EPA. (2021). *Sustainable Management of Food*. Retrieved from: https://www.epa.gov/sustainable-management-food

Environmental Protection Agency (EPA). (2019). "National Overview: Facts and Figures on Materials, Wastes and Recycling". Retrieved from: https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#main-content

Environmental Protection Agency (EPA). (2020). *Technical Methodology for the U.S. EPA Wasted Food Opportunities Map.* Retrieved from: https://www.epa.gov/sites/production/files/2020-04/documents/efom_v2.1_technical_methodology-clean_v2.pdf

Monroe, Jade; Harrington, Mary. (2020). *Focus on: Food Waste Prevention.* Publication 20-07-029.

Natural Resources Defence Council (NRDC). (2017). *Estimating Quantities and Types of Food Waste at the City Level*. Retrieved from: https://www.nrdc.org/sites/default/files/food-waste-city-level-report.pdf

Natural Resources Defence Council (NRDC). (2019). *Tackling Food Waste in Cities: A Policy and Program Toolkit*. Retrieved from: https://www.nrdc.org/sites/default/files/food-waste-cities-policy-toolkit-report.pdf

USDA. (2021). *Food Waste FAQs.* Retrieved from: https://www.usda.gov/foodwaste/faqs

Strasma, John. (1990). *Methods of Extracting Representative Samples of Municipal Solid Waste for Waste Characterization Studies. No. 1800-2016-142411*.

Technavio. (2021). *Food Waste Management Market By Disposal Method and Geography - Forecast and Analysis.*

Waste 2 Resources. (2016). *Advancing Organics Management in Washington State: The Waste to Fuels Technology Partnership.* Olympia, Washington: WA Department of Ecology and Washington State University.

Waste Today. (2020). *Organic Waste Legislative Update*. Retrieved from Waste Today: https://www.wastetodaymagazine.com/article/organic-waste-legislative-update-food