



RSE USA

Sustainable Product Solutions

Town of Natick, Massachusetts

2018 Residential Waste and Recycling Audit

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1. Introduction

The Town of Natick (Town) has realized cost savings through its single-family home residential recycling program compared to disposal for a number of years. Natick expects this to change due to changes to worldwide recycling markets in 2018. This also has resulted in E.L. Harvey, the Town's recyclables processor, like most U.S. processors, to become more sensitive to contamination in recyclables.

At the same time, the amount of food waste per capita has grown and the Massachusetts Department of Environmental Protection has taken action to reduce it. Thirty-four Massachusetts communities, including the Town, through its pilot program, offer curbside collection or drop-off solutions for food waste.

In response to these changes, the Town is working to establish a long-range plan for its solid waste and recycling services that will seek to maximize materials recovery and minimize costs. The results of this Residential Waste and Recycling Audit, which was conducted by RSE USA, will inform this long-range plan and support negotiations with E.L. Harvey.

2. Methodology Overview

The approach to gathering data on waste and recyclables composition included:

- Collecting the entire setout of waste and recyclables each day from 50 randomly selected homes from the Town's Tuesday collection routes, Wednesday collection routes, and Thursday collection routes, for a total of 150 homes targeted,¹ drawn from the recycling truck 101 route areas, which the Town believes are representative of the average of the Town. Because recycling is collected every other week, setout materials were collected over a period of two weeks from the same 150 homes in both weeks to account for a complete generation cycle. Bags of waste and recyclables from homes whose recycling collection day was the first week were kept separate from bags of waste and recyclables from homes whose recycling collection day was the second week so that an assessment could be made of whether recyclables disposal in waste was impacted by the recycling collection schedule. Collected materials from individual homes were combined with those of other homes and not sorted on an individual home basis.
- Homes participating in the curbside household organics collection pilot study were excluded.
- Waste and recyclables that were collected were sorted each day into 18 categories of interest to the Town.
- The results were analyzed, averaged to an annual per-home basis, and included in this report.
- Separate bulky waste item collection, organics collection, leaf collection, and household hazardous waste collected through the Town's program were not sampled in this methodology. Similarly, pink "Simple Recycle" bags were not included in the study. Commercial and multi-family waste were similarly not part of the scope of this study.

3. Results

Table 1 presents the results of the study, with quantities provided on a pounds-per-household-per-year basis. The recovery rate is also presented, which is defined as the quantity in the recycling stream divided by the total amount generated (i.e., found in both waste and recycling). Recovery rate in this study can also be referred to as the recycling collection rate or capture rate. The recovery rate is a function of (1) the percentage of households that participate in recycling; and (2) the degree to which all individuals in households that do recycle understand which materials are recyclable, and are motivated to place all of those materials in the recycling cart/container all of the time. Some categories of materials are not accepted in the recycling cart, such as textiles and other waste, yet were placed in the cart anyway, either:

- Hoping that the items would be recycled (believing them to be recyclable, yet knowing that they are not

¹ We actually collected samples from 152 homes, or two more than targeted).

supposed to place them in the cart);

- Out of confusion regarding how to recycle them; and/or
- Deliberately to avoid paying for disposal through the Town's pay-as-you-throw program.

Table 1 – Single Family Home Trash, Recycling, and Recovery Rates

Material Category	In Trash (lbs/hh/yr)		In Recycling (lbs/hh/yr)		Total (lbs/hh/yr)	Recovery Rate (%)
Paper						
Corrugated containers	4.78	0.6%	77.07	12.0%	81.84	94.2%
Aseptic and gable top cartons	1.35	0.2%	5.26	0.8%	6.62	79.5%
Retail paper bags	5.06	0.6%	29.75	4.6%	34.81	85.5%
Recyclable mixed paper	43.97	5.1%	235.95	36.6%	279.92	84.3%
Plastics						
PET bottles	6.66	0.8%	23.56	3.7%	30.22	78.0%
HDPE bottles	4.40	0.5%	15.86	2.5%	20.26	78.3%
PP bottles	0.15	<0.1%	0.75	0.1%	0.90	83.7%
Other plastic bottles	0.15	<0.1%	0.19	<0.1%	0.35	55.4%
Plastic containers and trays 1-7	14.52	1.7%	27.01	4.2%	41.53	65.0%
Aluminum cans, pie plates and foil	6.13	0.7%	7.28	1.1%	13.41	54.3%
Steel cans	2.08	0.2%	5.46	0.8%	7.54	72.4%
Glass containers	15.34	1.8%	125.11	19.4%	140.45	89.1%
Subtotal targeted recyclables	104.60	12.2%	553.24	85.8%	657.83	84.1%
Organics						
Meat and dairy	35.05	4.1%	0.24	<0.1%	35.29	0.7%
Vegetative	231.22	26.9%	7.42	1.2%	238.64	3.1%
Compostable paper	87.91	10.2%	4.47	0.7%	92.38	4.8%
Textiles	14.56	1.7%	3.60	0.6%	18.16	19.8%
Household hazardous waste	0.00	0.0%	1.85	0.3%	1.85	100.0%
All other material	386.47	44.9%	73.88	11.5%	460.35	16.0%
Total discards	859.81	100.0%	644.69	100.0%	1,504.50	42.9%

The figures in the table above are only for single-family home bagged waste and containerized recycling and exclude separate bulky waste item collection, organics collection, leaf collection, and household hazardous waste collected through the Town's program, as well as Simple Recycle textile recycling. Appendix A contains definitions for the categories in Table 1. Appendix B provides the same type of information shown in Table 1 above, except broken out into the Tuesday route sample, Wednesday route sample, and Thursday route sample.

It should be noted that the pounds-per-household-per-year figures are based on the number of homes that were picked at random to be audited and the number of homes was not adjusted downward for homes that appeared to be vacant due to no waste or recyclables being set out over the two weeks of the study. This means the results correspond to "homes on route," versus occupied homes, which is a standard way to present data from generation and capture/recovery studies and makes the results of this study directly comparable to data from other studies that also present data on a pounds-per-home-per-year collection route basis. Any pounds per home per year value in this report (i.e., generated quantities and recycled quantities), therefore, contains an implicit vacancy rate factor. We observed six homes with no waste or recycling setout over the two week course of the study, and if they were vacant and not simply saving material until their waste bags or recycling carts were full, would represent a 3.9 percent apparent vacancy rate.

Following is additional results of analyzing the data in Table 1 above.

- We observed an 86 percent setout rate for recycling, excluding the 6 homes that potentially were vacant. Recycling participation may be even higher than this figure if some homes generate few

recyclables and only need to roll out their recycling cart monthly. This is a very high recycling setout/participation rate. Note – This setout rate is relatively high – The Recycling Partnership sees a 75 percent participation rate (set out at least once monthly) as a goal. Natick's is likely above 86 percent, as this was the setout rate for one day.

- The projected pounds per household per year recycled is 645 lbs. This is significantly higher than the average per household recycled for the state of Massachusetts, at 406 lbs. per household (The Recycling Partnership, [The 2016 State of Curbside Recycling](#)). This is also significantly higher than the national average for single-stream collection of recyclables, which is 364 pounds per household per year.
- Recovery rates for targeted recyclables are much higher in the Town than in other jurisdictions where RSE USA has conducted recovery rate studies, with 84.1 percent of targeted recyclables captured in the Town. The category with the highest recovery rate was corrugated containers. The category with the lowest recovery rate was aluminum. This is mostly due to aluminum foil not being captured, vs. aluminum cans. Residents may not fully understand that aluminum foil can be recycled, or they may not want to spend the time to empty foil of food contamination.
- Materials targeted for recycling compose 44 percent of generated household waste, and 84.1 percent of those targeted materials were recovered, for an actual recycling rate of 36.8 percent (excluding contamination); however, these figures are incomplete as they do not include other materials disposed or recycled through bulky item collection, other collection programs, or the Town's recycling center. Contamination in the recycling cart makes the apparent recycling rate 42.9 percent (total of what is in the recycling cart, including contamination, divided by the sum of recycling cart contents plus bagged waste).
- The contamination rate of the recyclables was found to be 14.3 percent by weight. Contamination included film plastics, other household plastics such as toys, expanded polystyrene, small electronics including one computer, non-recyclable glass, mixed material items, pet waste, and other household waste.
- Some 19.8 percent of textile discards were found in the recycling cart. Some residents donate an unknown amount of textiles to charities. The Town contracts with Simple Recycling, a private service provider, to collect used clothing, household textiles and shoes via pink bags that are supposed to be set outside of the recycling carts on the same day as recycling – these quantities also are not included in the figures in this report. The textiles found in the recycling carts were not in pink bags. While textiles only comprised 4 percent of the contamination by weight, it appears that some residents believe that it is acceptable to place them in the recycling cart instead of in the pink bags from Simple Recycling.
- The Town instructs its citizens to bring “batteries” to the Natick Recycling Center. Some 16.6 percent of alkaline batteries generated were placed in the recycling cart and the remainder was disposed. No small rechargeable batteries were found in the materials sampled, but one large lead-acid motorcycle battery was found and it was in the recycling stream. No other household hazardous waste was found.
- Compostable organics comprised 41.2 percent of trash by weight.
- Because full recycling carts could result in some households placing overflow recyclables in disposed waste bags, a comparison was made of the percentage of recyclables in disposed waste on the week that recyclables were collected and carts could potentially be full, and the percentage of recyclables in disposed waste the week when recycling was not collected. Recyclables comprised 12.5 percent of disposed waste during the recycling week, and 11.6 percent of disposed waste on the non-recycling week. This could indicate some recyclables are lost when the recycling carts are full (i.e., an additional 1.4 percent of targeted recyclables were potentially lost), but it is difficult to know with certainty, and the apparent difference could simply be random statistical sampling error. The Town could check waste collection truck weights to confirm whether more waste is set out on recycling days than non-recycling days. A detailed comparison of compositions on recycling weeks versus non-recycling weeks is in Appendix C.
- With respect to the size of pay-as-you-throw waste bags, we observed equal amounts of each size (based on counting the number of bags) – 27.5 large bags per-household-per-year and 27.5 small bags per-household-per-year. This corresponds to each home setting out approximately one bag of waste per week, with homes that use large bags being approximately equal to the number of homes that use small

bags.

4. Recommendations

- Work to reduce the contamination level of recyclables.
 - It appears there needs to be more education and outreach regarding the Simple Recycling program
 - Clarification is needed regarding how to recycle batteries and electronics – i.e., to be delivered to the Natick Recycling Center rather than placing materials in carts. In addition, clarification is needed regarding how to manage large plastic goods and expanded polystyrene.
 - Residents need to be reminded that plastic film cannot be recycled in the recycling cart, and that it can only be recycled through retail takeback programs.
 - Continue to provide feedback to households that set out contaminated recyclables.
 - Having a relatively low contamination rate may provide help the town save in MRF processing costs.
- Consider collecting data on homes that do not participate in recycling by setting out their recycling cart. Targeted information on the importance of participating in recycling can be directed to these households.
- Consider expanding the food waste curbside compost program and/or encouraging residents to backyard compost. Organics comprise 41 percent of trash, by weight. If food waste were eliminated from the disposal stream, the Town could save on disposal costs. If desired, the Town might be able to eventually have bi-weekly trash collection and weekly collection of recyclables and/or organics, including food scraps. Note: curbside food scrap collection programs generally yield far greater diversion results than backyard composting programs.
- Consider updating the recycling guide to:
 - Ensure residents understand paper can be recycled even if it includes adhesives (e.g., envelopes), staples and plastic address windows, and that colored paper is acceptable.
 - Under metals, replace the word “tin” with “aluminum” and include an image of aluminum foil and/or an aluminum tray or pan.
 - Include information and images about including plastic takeout containers, if they are accepted at your MRF.
 - Include information about plastic film recycling.
- Set waste reduction and recycling goals.
 - Set per-capita and/or per-household pounds-per-capita-per year disposed goals, and track both pounds-per-capita (and/or household) per year and pounds-per-capita (and/or household) per year recycled. Note: per capita is generally the ideal, to the extent that good data is available regarding population served, as household sizes can change and impact generation. Tracking both may be helpful in terms of allowing the town to broadly make comparisons to national (The Recycling Partnership) and other local data.
 - Although Natick is doing well in terms of recovery rate, and in terms of generating less waste, on average, than most U.S. households, it is recommended that the Town establish goals that set the Town on a path of continuous improvement, and make the public aware of progress toward achieving these goals.

Appendices



Appendix A – Audit Material Categories

Table 2 – Audit Material Categories

	Material Category	Description / Examples	Exceptions
	Paper		
1	Corrugated Containers		No food soiled pizza boxes
2	Aseptic and Gable Top Cartons		
3	Retail Paper Bags	Carryout sacks from retail grocery and merchandise purchases.	Excludes lunch sacks and takeout meal bags
4	Recyclable Mixed Paper	Magazines, newspaper, catalogs, junk mail, gift wrap, soft covered books.	No foil wrapping paper or food soiled paper
	Plastics		
5	PET bottles		
6	HDPE bottles		No motor oil containers
7	PP bottles		
8	Other plastic bottles		
9	Plastic Containers and Trays 1-7	Rigid plastic containers and single-use beverage cups	No EPS
10	Aluminum cans, pie plates and foil	Beverage and food cans, pie pans, clean foil	No aerosol cans; Less than 5% food residue
11	Steel Cans		No aerosol cans No paint
12	Glass Containers		No other colored glass No light bulbs, plate glass, ceramics
	Organics		
13	Meat and dairy		
14	Vegetative		
15	Compostable paper	Paper towels, facial tissues, paper plates, fast food drink trays, and heavily soiled food papers	
16	Textiles		
17	Household Hazardous Waste	Cleaners, stains, varnishes, rechargeable batteries, automotive fluids, pesticides, herbicides, free flowing paints, hypodermic needles.	
18	All Other Material	All other materials, including exceptions listed above.	

Appendix B – Comparison of Tuesday, Wednesday, and Thursday Route Sample Results

Table 3 – Tuesday Route Single Family Home Trash, Recycling, and Recovery Rates

Material Category	In Trash (lbs/hh/yr)		In Recycling (lbs/hh/yr)		Total (lbs/hh/yr)	Recovery Rate (%)
Paper						
Corrugated containers	3.36	0.3%	71.85	9.5%	75.21	95.5%
Aseptic and gable top cartons	1.33	0.1%	4.69	0.6%	6.02	77.8%
Retail paper bags	7.47	0.7%	35.46	4.7%	42.93	82.6%
Recyclable mixed paper	51.44	4.8%	311.61	41.1%	363.05	85.8%
Plastics						
PET bottles	8.47	0.8%	24.94	3.3%	33.42	74.6%
HDPE bottles	5.47	0.5%	14.70	1.9%	20.17	72.9%
PP bottles	0.25	<0.1%	0.87	0.1%	1.12	77.8%
Other plastic bottles	0.13	<0.1%	0.26	<0.1%	0.38	67.1%
Plastic containers and trays 1-7	20.28	1.9%	26.52	3.5%	46.80	56.7%
Aluminum cans, pie plates and foil	5.18	0.5%	6.38	0.8%	11.57	55.2%
Steel cans	3.56	0.3%	6.32	0.8%	9.87	64.0%
Glass containers	26.32	2.5%	173.76	22.9%	200.08	86.8%
Subtotal targeted recyclables	133.26	12.5%	677.35	89.3%	810.62	83.6%
Organics						
Meat and dairy	45.18	4.2%	0.19	<0.1%	45.37	0.4%
Vegetative	280.54	26.3%	7.50	1.0%	288.04	2.6%
Compostable paper	101.50	9.5%	4.93	0.6%	106.43	4.6%
Textiles	18.51	1.7%	3.70	0.5%	22.21	16.7%
Household hazardous waste	0.00	0.0%	0.00	0.0%	0.00	n/a
All other material	489.41	45.8%	65.14	8.6%	554.55	11.7%
Total discards	1,068.40	100.0%	758.81	100.0%	1,827.22	41.5%

Table 4 – Wednesday Route Single Family Home Trash, Recycling, and Recovery Rates

Material Category	In Trash (lbs/hh/yr)		In Recycling (lbs/hh/yr)		Total (lbs/hh/yr)	Recovery Rate (%)
Paper						
Corrugated containers	4.17	0.6%	74.30	13.3%	78.47	94.7%
Aseptic and gable top cartons	1.79	0.2%	5.20	0.9%	6.99	74.3%
Retail paper bags	3.73	0.5%	25.59	4.6%	29.32	87.3%
Recyclable mixed paper	27.49	3.8%	179.53	32.2%	207.02	86.7%
Plastics						
PET bottles	6.45	0.9%	22.63	4.1%	29.08	77.8%
HDPE bottles	4.67	0.6%	15.63	2.8%	20.30	77.0%
PP bottles	0.12	<0.1%	0.55	0.1%	0.68	81.6%
Other plastic bottles	0.30	<0.1%	0.32	0.1%	0.62	52.2%
Plastic containers and trays 1-7	12.14	1.7%	25.70	4.6%	37.83	67.9%
Aluminum cans, pie plates and foil	7.21	1.0%	8.27	1.5%	15.49	53.4%
Steel cans	1.48	0.2%	4.37	0.8%	5.85	74.6%
Glass containers	12.26	1.7%	112.30	20.1%	124.55	90.2%
Subtotal targeted recyclables	81.81	11.4%	474.38	85.0%	556.19	85.3%
Organics						
Meat and dairy	36.78	5.1%	0.17	<0.1%	36.95	0.5%
Vegetative	199.53	27.7%	2.14	0.4%	201.67	1.1%
Compostable paper	68.02	9.5%	4.07	0.7%	72.09	5.6%
Textiles	17.80	2.5%	2.45	0.4%	20.25	12.1%
Household hazardous waste	0.00	0.0%	5.55	1.0%	5.55	100.0%
All other material	315.21	43.8%	69.10	12.4%	384.31	18.0%
Total discards	719.15	100%	557.85	100%	1,277.01	43.7%

Table 5 – Thursday Route Single Family Home Trash, Recycling, and Recovery Rates

Material Category	In Trash (lbs/hh/yr)		In Recycling (lbs/hh/yr)		Total (lbs/hh/yr)	Recovery Rate (%)
Paper						
Corrugated containers	6.80	0.9%	85.06	13.8%	91.86	92.6%
Aseptic and gable top cartons	0.94	0.1%	5.91	1.0%	6.84	86.3%
Retail paper bags	3.98	0.5%	28.20	4.6%	32.18	87.6%
Recyclable mixed paper	52.99	6.7%	216.71	35.1%	269.71	80.4%
Plastics						
PET bottles	5.05	0.6%	23.10	3.7%	28.15	82.0%
HDPE bottles	3.06	0.4%	17.24	2.8%	20.30	84.9%
PP bottles	0.07	<0.1%	0.82	0.1%	0.89	92.7%
Other plastic bottles	0.04	<0.1%	0.00	0.0%	0.04	<0.1%
Plastic containers and trays 1-7	11.14	1.4%	28.81	4.7%	39.95	72.1%
Aluminum cans, pie plates and foil	6.01	0.8%	7.17	1.2%	13.18	54.4%
Steel cans	1.21	0.2%	5.69	0.9%	6.90	82.5%
Glass containers	7.43	0.9%	89.27	14.5%	96.70	92.3%
Subtotal targeted recyclables	98.71	12.5%	507.98	82.3%	606.69	83.7%
Organics						
Meat and dairy	23.20	2.9%	0.35	0.1%	23.55	1.5%
Vegetative	213.59	27.0%	12.63	2.0%	226.22	5.6%
Compostable paper	94.21	11.9%	4.41	0.7%	98.62	4.5%
Textiles	7.36	0.9%	4.65	0.8%	12.01	38.8%
Household hazardous waste	0.00	0.0%	0.00	0.0%	0.00	n/a
All other material	354.80	44.8%	87.38	14.2%	442.19	19.8%
Total discards	791.88	100%	617.40	100%	1,409.28	43.8%

Appendix C – Comparison of Recycling Week and Non-recycling Week Trash Data

Table 6 – Comparison of Recycling Week and Non-recycling Week Trash Data

Material Category	In Trash Recycle Week (lbs/hh/yr)		In Trash Non- recycle week (lbs/hh/yr)	
Paper				
Corrugated containers	5.69	0.6%	3.86	0.5%
Aseptic and gable top cartons	1.60	0.2%	1.11	0.1%
Retail paper bags	5.69	0.6%	4.44	0.6%
Recyclable mixed paper	50.75	5.5%	37.20	4.7%
Plastics				
PET bottles	7.12	0.8%	6.20	0.8%
HDPE bottles	5.69	0.6%	3.10	0.4%
PP bottles	0.17	<0.1%	0.13	<0.1%
Other plastic bottles	0.16	<0.1%	0.15	<0.1%
Plastic containers and trays 1-7	13.48	1.5%	15.56	1.9%
Aluminum cans, pie plates and foil	5.75	0.6%	6.51	0.8%
Steel cans	1.42	0.2%	2.74	0.3%
Glass containers	18.53	2.0%	12.14	1.5%
Subtotal targeted recyclables	116.05	12.6%	93.14	11.7%
Organics				
Meat and dairy	34.56	3.8%	35.55	4.4%
Vegetative	256.81	27.9%	205.63	25.7%
Compostable paper	82.87	9.0%	92.95	11.6%
Textiles	18.47	2.0%	10.64	1.3%
Household hazardous waste	0.00	0.0%	0.00	0.0%
All other material	411.99	44.7%	360.95	45.2%
Total discards	920.75	100.0%	798.87	100.0%