

# **Cafeteria Waste Assessment Katharine Lee Bates Elementary School Wellesley, MA**

Version 3  
August 9, 2016



## **Bates Cafeteria Waste Assessment Committee**

Nancy Braun  
Gretchen Hall  
Stephanie Hawkinson  
Marybeth Martello  
Alexa Plenge

### **Contact:**

Marybeth Martello  
Sustainable Energy Administrator, Town of Wellesley, MA  
[mmartello@wellesleyma.gov](mailto:mmartello@wellesleyma.gov)  
781-431-1019 X2229

## **Acknowledgments**

The Bates Cafeteria Waste Assessment Committee is indebted to a number of individuals who lent support during the assessment process. The Committee is exceptionally grateful to Principal Toni Jolley and the Bates community. Principal Jolley allowed the Committee to register Bates with the USEPA's programs and invade the Bates cafeteria for an entire week. Principal Jolley generously adjusted the school schedule and lunch format for the assessment and gave critical feedback in the planning process. Bates teachers, staff, students, and parent volunteers whole-heartedly pitched in and made sacrifices so that the Committee could collect data. The Committee is similarly grateful to the following:

- Bates Green Team
- Janet Bowen, United States Environmental Protection Agency
- Carolyn Dann, Municipal Assistance Coordinator, MA Department of Environmental Protection
- Matt Delaney, Director, Wellesley Food Services
- Michael D'Ortenzio, Jr., Wellesley School Committee and Sustainable Energy Committee
- Kathleen Garvey, Senior, Wellesley High School
- Megan Harrington, Senior, Wellesley High School
- Maureen Herzig, Secretary, Bates School
- Ellen Korpi, Sustainable Energy Committee
- Dr. David Lussier, Superintendent, Wellesley Public Schools
- Eric Magers, Director, Green Team, Manchester Essex Regional School District
- Al Martignetti, Custodian, Bates School
- Joe McDonough, Director, Wellesley Facilities Maintenance Department
- Sue Morris, Wellesley Green Schools
- Mike Pakstis, Director, Wellesley Public Works
- Brandon Schmitt, Director, Wellesley Natural Resources Commission
- Phyllis Theermann, Wellesley Green Schools
- Tammy Vallee, Elementary Assistant, Bates School
- Wellesley Green Schools
- Wellesley Recycling and Disposal Facility

The assessment was a team effort and the Committee looks forward to continued teamwork through the implementation and evaluation stages.

## **Executive Summary**

Growing interest in sustainable materials management has recently taken hold in Wellesley, Massachusetts. In spring 2016, Wellesley’s Katharine Lee Bates Elementary School (Bates School or Bates) decided to examine the generation and management of waste in its cafeteria. Bates became the first K-12 school in New England to join the United States Environmental Protection Agency’s (USEPA’s) Food Recovery Challenge (FRC). Bates also became a participant in USEPA’s WasteWise (WW) initiative. In order to participate in these programs, Bates School established a Bates Cafeteria Waste Assessment Committee (the Committee) and embarked on a three-phase process to (1) assess cafeteria waste, (2) implement a program to reduce and divert (from landfills) a certain percentage of this waste, and (3) evaluate the efficacy of the measures implemented in phase (2). This report summarizes the assessment methodology and findings of phase (1) and suggests measures to reduce and divert waste in phase (2). August 31, 2016, Bates will submit its FRC and WW goals to USEPA. For FRC and WW waste categories that overlap (e.g., waste prevention, donation, food recycling/composting), the goal that Bates sets will count for both programs. The Committee plans to set its goals in collaboration with relevant administrators and departments across Town. This report will, hopefully, serve as a catalyst for that collaborative effort.

### **FRC and WasteWise Waste Categories**

<b>Food Recovery Challenge Categories</b>	<b>WasteWise Categories</b>
Waste prevention	Waste prevention
Donation	Donation
Food Recycling	Composting
	Non-food Recycling

The assessment took place over twelve lunch periods during one week in April 2016. Upon finishing lunch, students (with help from the Committee, school staff, and other volunteers) sorted their waste into eight categories suggested, in part, by the USEPA Food Recovery Hierarchy (USEPA, 2016c): donation, liquid, animal feed, complex compost, simple compost, recyclables, trash, and napkin/utensil packets (for school lunch). USEPA approved of using a week-long assessment to extrapolate for yearly waste estimates (USEPA, 2014).

The assessment examined how waste varies with type of lunch and age of student. In particular, the study measured waste in all eight aforementioned categories and compared waste from home and school lunches as well as from kindergarten and fifth grade students. Key findings include the following:

- The Bates cafeteria generates a total of approximately 371 pounds of waste per week, which extrapolates to over 13,000 pounds per school year.
- Currently, 371 lbs. of waste per week (except for items on the recently established donations table) go to a landfill.

- School lunches generate approximately four times the waste (by weight, excluding liquid) compared to home lunches.
- There is no significant difference in the amount of waste generated by younger versus older students (K-5).
- There are a number of opportunities for improving waste management in the Bates cafeteria via both source reduction and diversion.

Of the 371 lbs. of waste generated during the assessment week, 344 lbs. of that waste (93%) could be diverted to more productive and less harmful endpoints. For example, the Bates cafeteria could:

- Donate 32 lbs. of food for hunger relief;
- Recycle 69 lbs. of food for animal feed;
- Recycle 107 lbs. of food for compost; and
- Recycle 42 lbs. of plastics, cardboard, etc. every week.

In addition, liquids (mostly milk and juice) comprise 25% (94 pounds) of the total weekly waste generated in the Bates cafeteria. Liquid waste currently heading to the landfill could, potentially, be collected and used for composting or diverted to the school's wastewater stream. Wellesley is part of the Massachusetts Water Resources Authority (MWRA), and thus Bates School's wastewater goes to the Deer Island Wastewater Treatment Facility. At Deer Island, the wastewater undergoes treatment processes that include sedimentation, activated sludge, and anaerobic digestion. The anaerobic digestion process generates heat, electricity, and digested sludge. At a Fore River facility, heat treatment of the digested sludge produces fertilizer (Town of Wellesley, 2016; MWRA, 2009).

Home lunches generate relatively low amounts, by weight (approximately 0.1 pounds), of waste per child per week. However, the volume of this waste can be significant, as it largely consists of low-density items such as juice boxes and chip bags. Because these items are not appropriate for conventional recycling, they head to the landfill. Consequently, any reductions in home lunch waste are beneficial, and families can make these reductions by using:

- Reusable containers for all lunch items;
- Cloth napkins;
- Stainless steel or other reusable utensils; and
- Reusable drink containers.

Families can further reduce waste by packing food their children like and in portion sizes they will finish.

School lunches generate an average of 0.4 pounds of waste (excluding liquids) per child per week. Ideas for reducing waste from school lunches include to:

- Use reusable trays or eliminate trays;
- Eliminate plastic, clamshell containers;

- Eliminate napkin packets and replace them with napkin dispensers and individual utensil dispensers;
- Use compostable utensils, if a compost program is established;
- Use condiment dispensers instead of individual packets;
- Use milk dispensers, instead of individual milk cartons;
- Analyze waste from school lunches; and
- Adjust menus to replace items that generate large amounts of waste, with menu items that generate less waste.

The feasibility of many of the above-mentioned waste reduction measures will depend, in large part, on cost, logistics, and regulations. The Committee would like to compare, for example, the cost of current practices with the cost of new practices suggested by the assessment data. The Committee, however, requires the assistance of town officials in obtaining certain types of cost information. Town officials could also be helpful in assisting the Committee in understanding logistical, regulatory, and other factors.

Reducing and diverting cafeteria waste at Bates School would also require altering long-held practices and modifying behavior, a type of change that can be difficult. But awareness-raising and education can be useful in smoothing the path to more sustainable practices. Bates School has already initiated food waste education initiatives in the form of a student-made video, school-wide assemblies, Student Council programs, and a cafeteria donation table. Future programming could include film screenings, student-led school and community outreach by Bates and Wellesley High School students, longer and more in-depth Student Council programs, guest speakers, and the use of public relations materials.

Cafeteria waste presents opportunities for Wellesley Public Schools (WPS), municipal departments, and community members to serve as leaders in the growing movement to address the urgent food waste problem and to promote sustainable materials management, generally. Setting and meeting waste management goals through the FRC and WW programs could enable Bates School to realize win-win financial and environmental opportunities, cultivate civically-minded students, raise awareness about sustainability, and generate experience and knowledge that can encourage and help other groups to act.

## **Introduction**

Most Americans would never throw empty chip bags onto a sidewalk or leave a pile of used soda cans in a picnic area. Littering is, generally, taboo in the United States (see Baldwin, 2014). Yet, few Americans think twice when they toss out restaurant leftovers, allow lettuce to go bad in the fridge, or discard expired bread without even checking its freshness. In fact, Americans waste between 31 and 40 percent of the U.S. food supply, approximately 133 billion pounds every year, with a major portion of this waste occurring at the consumer level (USDA, 2016a). The amount of food Americans waste in just one day could fill Rose Bowl Stadium (Bloom, 2011). In 2010, the U.S. population generated enough food waste to fill the Empire State Building 91 times (EndFoodWasteNow.org, 2013a). That same year, Americans tossed out an estimated \$161.6 billion worth of food, as reflected in retail prices (Buzby, 2014). Wasted food requires significant labor, water, and energy resources for growth, production, transportation, and disposal (USEPA, 2016a). Food waste represents approximately 35% of freshwater consumption, 31% of cropland use, 30% of fertilizer use, 2% of U.S. greenhouse gas emissions, and 21% of post-recycling municipal solid waste (Neff, 2015). So, food waste costs money, depletes resources, and harms the environment. Yet, while all this discarded food comprises America's biggest contribution to landfills, many Americans are going hungry. In 2014, 14% of American households were food insecure and 6% of American households had very low food security (FeedingAmerica.org, 2016).

Growing national interest in the food waste problem has recently taken hold in Wellesley, Massachusetts. In 2015, Wellesley's Reduce, Reuse, and Recycle (3R) Working Group began to examine what the Town could do to address food waste across sectors. Around this time, two of Wellesley's FIRST Lego League (FLL) teams started to explore the food waste issue. An FLL team comprised of fifth grade girls from the Katharine Lee Bates Elementary School (Bates) focused their 2015 FLL project on reducing school cafeteria waste. This team worked with the Bates fifth grade Student Council to develop a food waste video and implement a cafeteria donation table, allowing students to donate reusable food to fellow students in the cafeteria, Bates classrooms, and the Wellesley Food Pantry. Concurrently, a Wellesley FLL team comprised of sixth grade students (all former Bates students) similarly focused their project on cafeteria waste reduction. This team designed a smart trash receptacle to facilitate school cafeteria food waste reduction via data collection, improved communication, and student incentives. In developing their project, the sixth grade team interviewed and presented to several town officials (including a member of the 3R Working Group). In the fall of 2015, Bates Principal Toni Jolley and the FLL coaches discussed the possibility of launching a food waste pilot project at Bates School. At a meeting in early 2016, Principal Jolley, interested Bates parents, Bates Green Team representatives, Wellesley Food Services, the Bates custodian, and a representative from Wellesley's Natural Resources Commission (NRC) decided to make Bates the first K-12 school in New England to join the United States Environmental Protection Agency's (USEPA's) Food Recovery Challenge. The group also agreed to address cafeteria waste via a three-phase process, involving: assessment, implementation, and evaluation. Because Bates students generate non-food recycling in addition to food waste, Bates also became a participant in USEPA's WasteWise (WW) Program.

Both FRC and WW are part of the USEPA’s Sustainable Materials Management (SMM) Program. SMM endeavors to decrease the environmental effects of materials throughout their life cycle. Through FRC, organizations pledge to improve their sustainable food management practices and report their results. Via WW, organizations “demonstrate how they reduce waste, practice environmental stewardship, and incorporate sustainable materials management into their waste-handling processes” (USEPA, 2016b). USEPA awards outstanding achievements in these programs and publicly recognizes winning organizations as well as provides guidance and a number of learning and networking opportunities to organizations. Resources include webinars, newsletters, email updates, and publications. FRC and WW incentivize sustainable waste management, facilitate sharing across organizations, and lend legitimacy to programs. FRC and WW participants submit baseline data for the previous year and goals for the upcoming year. Goal-setting requires an understanding of current waste generation. Bates, therefore, established the Bates Cafeteria Waste Committee (the Committee) to carry out an assessment of cafeteria waste. This Committee includes:

- Nancy Braun, former Bates parent, member of Wellesley Green Schools
- Gretchen Hall, Chair, current Bates parent
- Stephanie Hawkinson, former Bates parent and Education and Outreach Coordinator for Wellesley’s Natural Resources Commission
- Marybeth Martello, current Bates parent, Wellesley’s Sustainable Energy Administrator
- Alexa Plenge, Chair, current Bates parent

Two seniors from Wellesley High School (Kathleen Garvey and Megan Harrington) participated in the assessment process, created a bulletin board at Bates to teach students about food waste, and developed a poster about the Bates food waste assessment.

Table 1 presents the FRC and WW waste categories.

**Table 1: FRC and WasteWise Waste Categories**

Food Recovery Challenge Categories	WasteWise Categories
Waste prevention	Waste prevention
Donation	Donation
Food Recycling	Composting
	Non-food Recycling

Before August 31, 2016, Bates will submit its FRC and WW goals to USEPA. These goals must reflect an improvement in waste generation and/or management (by December 31, 2016) in at least one FRC and one WW category as shown in the table below. For FRC and WW waste categories that overlap (e.g., waste prevention, donation, food recycling/composting), the goal that Bates sets may count for both programs. The Committee plans to set its goals in collaboration with relevant administrators and departments across Town. This report will, hopefully, serve as a catalyst for that collaborative effort. The following sections outline the waste assessment methodology, data analysis, and next steps for the Bates Cafeteria Waste Project.

## **Sorting and Measurement**

The goal of the Bates Cafeteria Waste Assessment was to understand the amount, type, and source of food and other waste generated in the Bates cafeteria, annually. The team approached the assessment with the following guiding principles:

- Complete a thorough analysis that accounts for variation (e.g., among age groups, home versus school lunches, school lunch menu offerings, etc.) which could impact daily waste generation;
- Ensure that students, teachers, and parents understand the waste sorting process, its purpose, and goals;
- Minimize any disruption to student schedules and academic activities;
- Rely on parents and community volunteers to help with waste sorting so that it does not adversely impact the school or custodial staff;
- Create opportunities to engage students in the process; and
- Extrapolate to annual values based on one week of waste data. During discussions with a Bates Committee member, the USEPA contact for this project verbally approved of using one-week of data to estimate annual values. USEPA publications similarly recommend this estimation method (USEPA, 2014). However, the Committee recognizes that weekly waste generation will vary with menu offerings, student attendance, etc.

With these principles in mind, the Committee designed a four-day assessment. Four days represents one week of cafeteria waste, as Wellesley elementary schools close at noon on Wednesdays and do not include a lunch period on those days. Each day the assessment duration spanned all three lunch periods listed in Table 2

**Table 2: Lunch Periods**

<b>Lunch Period</b>	<b>Grades</b>
Period 1	3 <sup>rd</sup> and 4 <sup>th</sup> graders
Period 2	1 <sup>st</sup> and 2 <sup>nd</sup> graders
Period 3	Kindergarteners and 5 <sup>th</sup> graders

The sorting system, described in Table 3, reflects the Committee’s interest in understanding:

1. How Bates cafeteria waste maps onto the USEPA’s Food Waste Hierarchy (see Figure 1);
2. What source reduction, recovery, and diversion options the waste data and Hierarchy suggest;
3. How waste generation differs by age group and among children who buy lunch at school and bring it from home; and
4. How differences in waste generation, according to age and lunch habits, could inform public education/engagement initiatives aimed at reducing the production of cafeteria waste.

The USEPA's Food Waste Hierarchy (Figure 1) reflects actions that organizations can take to prevent and divert food waste. The actions (e.g., source reduction and feeding hungry people) at the top of the inverted triangle are the most preferred actions. Actions at the bottom of the triangle (e.g., landfill and incineration) are least preferred.



Figure 1: USEPA Food Recovery Hierarchy (USEPA, 2016c)

**Table 3: Assessment Design**

	<b>Design Approach</b>	<b>Purpose</b>
Sorting / Measurement Method	Sort, weigh, and photograph waste after each lunch period	Provide the most detailed and accurate assessment of waste generated.
Duration	Three lunch periods/day Four days: Monday, April 25 <sup>th</sup> Thursday, April 28 <sup>th</sup> Friday, April 29 <sup>th</sup> Monday, May 2 <sup>nd</sup>	Provide data for a variety of school lunch menu items. Account for daily variability in attendance, etc.
Sorting Categories (also see Table 2)	Items for donation Liquid Animal feed Complex compost Recycling Trash Simple compost Napkin/utensil packet	Categories based on the USEPA Food Waste Hierarchy and knowledge of what materials local vendors accept.
Additional Sorting Categories	By age (K versus fifth grade) By home lunch vs. school lunch	The Committee hypothesized that age and lunch type would affect waste generation.
Sorting Facilitation	Sorting process was staffed with 7-10 volunteers each day	Volunteers, assigned to each of the sorting categories, helped children sort properly. Volunteers also assisted with photographing lunch tables, and weighing and photographing waste.

<b>Waste Category</b>	<b>Examples</b>
Items for Donation (Fig. 3)	Unopened yogurts, granola bars, bagged carrots, cheese sticks, etc.
Liquid	Milk, juice, water, etc.
Animal Feed (Fig. 4)	Fruit and vegetable scraps
Complex Compost (Fig. 5)	Bread, milk, and meat scraps, which are not suitable for animal feed
Recyclable Materials (Fig. 2)	Plastic containers, straws, empty milk cartons, etc.
Trash	Chip bags, juice cartons
Simple Compost (Fig. 6)	Food trays, napkins
Napkin/utensil packet	Napkin, fork, knife, and spoon in plastic wrapper



Figure 2: Recyclable Materials



Figure 3: Items for Donation



Figure 4: Animal Feed



Figure 5: Complex Compost



Figure 6: Simple Compost

For the duration of the assessment, volunteers arranged and labeled two rows of seven bins in the middle of the cafeteria, plus one bin for napkin packets. Upon finishing lunch, students would line up (Figure 8) and (with help from volunteers) sorted their waste into eight waste categories (see Table 3 and Figure 7): donation, liquid, animal feed, complex compost, recycling, trash, simple compost, napkin/utensil packets (for school lunch only). Having *two rows* of seven bins each allowed the Committee to measure differences in waste according to student age and lunch type. During Periods 1 and 2, for example, one row of seven bins contained waste from home lunches, while the other row of seven



Figure 8: Bates students line up to sort their food waste at the end of their lunch period.

bins contained waste from school lunches (plus one bin for napkin packets). During Period 3, one row contained waste from kindergartners, while the other row contained waste from fifth graders. Volunteers weighed, photographed, and labeled the waste from each bin. Volunteers also photographed each lunch table during each lunch period. Lunch table photos served as back-up records for checking number of students, menu items, number of home versus school lunches, etc.

Figure 7: Bins for eight waste categories were arranged in the center of the Bates cafeteria for students' use.



## Assessment Results

Over four assessment days, the Committee measured the following amounts of waste:

**Table 4: Pounds of Waste per Day**

Day	Weight
Day 1 (April 25 <sup>th</sup> )	84 pounds
Day 2 (April 28 <sup>th</sup> )	98 pounds
Day 3 (April 29 <sup>th</sup> )	95 pounds
Day 4 (May 2 <sup>nd</sup> )	94 pounds
<b>Total</b>	<b>371 pounds</b>
<b>Daily Average</b>	<b>93 pounds</b>

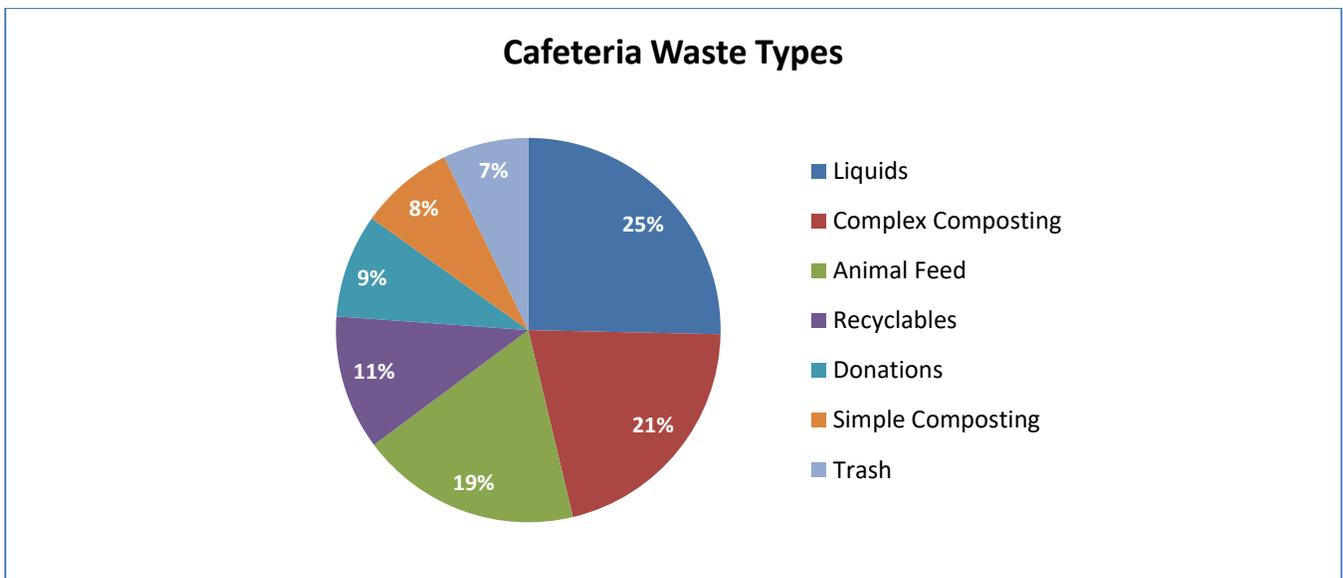
This amounts to **371** pounds per week (assuming 4 days of school lunches in a week in Wellesley elementary schools). Assuming that cafeteria waste is relatively constant each day, this weekly total translates to over **13,000** pounds of trash going to a landfill in a typical school year.

Table 5 and Figure 9 show the total amount of waste collected in each waste category during the assessment week.

**Table 5: Total Amount of Waste in Each Category During the Assessment Week**

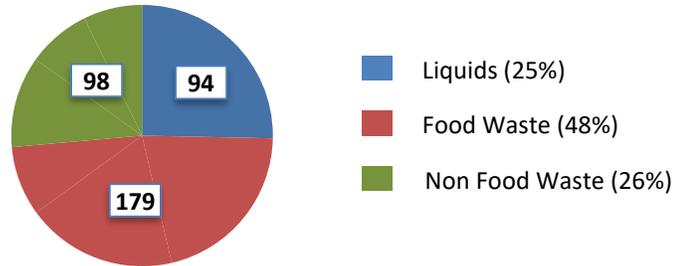
<u>Waste Category</u>	<u>Weight (lbs.)</u>
Liquid	94
Complex Compost	78
Animal Feed	69
Recyclables	42
Donations	32
Simple Compost	29
Trash	27

**Figure 9: Total Amount of Waste in Each Category by Percentage**



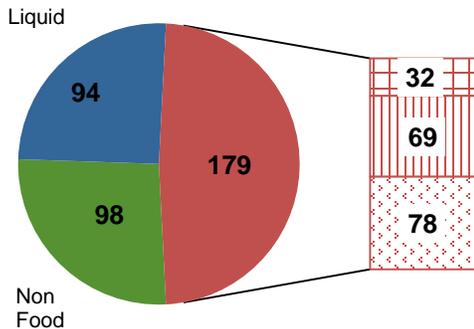
The total waste per week was further organized into food, non-food, and liquid categories and amounts were as follows (shown in Figure 10), with each category broken down further (shown in Figures 10A and 10B).

**Figure 10: Cafeteria Waste Categories**  
*in pounds per week*



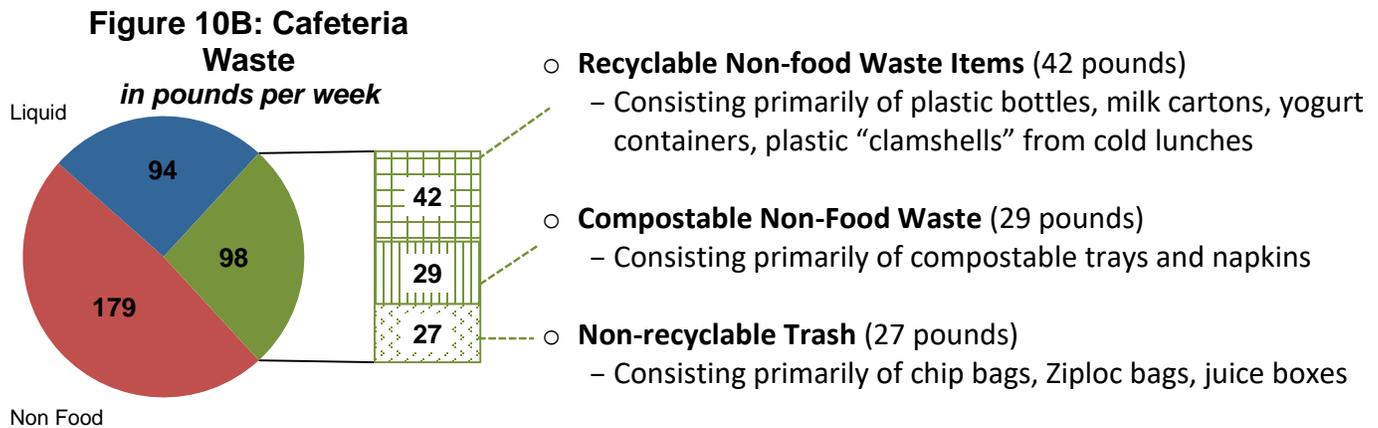
**FOOD WASTE:** Within the 179 pounds of food waste per week, there are three types of waste:

**Figure 10A: Cafeteria Waste**  
*in pounds per week*



- **Food for Donation** (32 pounds)
  - Consisting primarily of yogurt, string cheese, carrot bags, applesauce, condiments, and whole fruit
- **Animal Feed: Food Scraps for Animals** (69 pounds)
  - Including salad, corn, strawberries, apples, hash browns, garbanzo beans, broccoli, carrots, celery, potato wedges
- **Compostable Food: Food scraps not suitable for animals but compostable** (78 pounds)
  - Including pasta with meatballs, pancakes, sausage, eggs, pizza, chicken nuggets

**NON-FOOD WASTE:** Within the 98 pounds of non-food waste per week, there are three types of waste:



### Insights Regarding Age, Lunch Menu, and Lunch Origin

The Bates Cafeteria Waste Assessment yields insights into how waste generation varies with school versus home lunches. The audit also allows analysis of whether waste generation varies among children of different ages.

#### **Home vs. School Lunches**

School lunches consistently generate more waste than home lunches. During the assessment week, school lunches accounted for 133 pounds of waste and home lunches accounted for 61 pounds of waste (excluding liquid). School lunches generate waste in the form of compostable trays and plastic lunch containers. School lunches also generate more animal feed and compostable food waste, with a combined weight of 73 pounds per week (excluding liquid). Home lunches, meanwhile, produce 30 pounds (excluding liquid) in these two categories. In adjusting for differences in the total number of children who buy and bring lunch, the average student who purchases a lunch generates 0.4 pounds of total waste in a week (excluding liquid) and each student who brings a lunch creates 0.1 pounds of total waste per week (excluding liquid). School lunches also generate four times as much food waste (excluding liquid) and non-food waste per student than home lunches.

There are several possible explanations for why waste generation by school and home lunches differ:

- School lunches include a tray or plastic container which students dispose of at school. Most homemade lunches include reusable containers, which children bring home in their lunch boxes.
- Children who bring lunch from home often take home some or all of their food and non-food waste.

- Much of the waste from home lunches consists of low-weight items such as chip bags and juice boxes.
- School lunch serving size may exceed the appetite of some students. When packing homemade lunches, families adjust serving sizes according to their child’s appetite.
- For school lunches, kids may not like (and, therefore, do not eat) certain components of the daily lunch menu.
- Some parents may order lunch every day regardless of a child’s preference for the menu.

**Age: Kindergartener vs. Fifth Grade Student Waste**

A comparison of kindergartener and fifth grade waste amounts suggests that age is not as significant a factor as the Committee had anticipated. Overall, fifth graders and kindergarteners generate the same amount of waste per day on average. Both groups generated a little over 50 pounds of waste per week (52 pounds for fifth graders and 54 pounds for kindergarteners, excluding liquid). In adjusting for class sizes, on average both fifth graders and kindergarteners generated approximately .2 pounds of waste per week, excluding liquid. While weekly averages for most waste types were relatively comparable for kindergarteners and fifth graders, kindergarteners generated significantly more donation items than fifth graders.

**Lunch Menus**

Daily food waste volumes also vary depending on the school menu. Not surprisingly, some menus appear to be more popular than others (as reflected in a higher number of lunch orders). Assessment data revealed that on the day when students purchased the smallest number of school lunches, these lunches generated the largest amount of per-student food waste. On the day when school lunch purchases were highest, school waste per student was lowest. A summary of these data appears in Table 6:

**Table 6: School Lunch Purchases and School Lunch Waste per Student**

	<b>Number of School Lunches</b>	<b>School Lunch Food Waste per Student (donations, animal feed and complex compost)</b>	<b>School Lunch Menu</b>
4/25	81	0.32 pounds	Chicken meatballs over penne, with salad and strawberries
4/28	99	0.26 pounds	Pancakes, sausage, eggs, hash browns
4/29	90	0.25 pounds	Pizza with salad and strawberries
5/2	106	0.18 pounds	Chicken nuggets with potato wedges and fruit salad

These observations are interesting but based on very few data points. Further analysis is required to determine if these data reflect a robust relationship. The weights in Table 6 should also technically be

reported to the nearest tenth, not hundredth. Nevertheless, the difference in waste for the least popular menu and the most popular menu may suggest some possible conclusions:

- The least popular school lunches (fewest lunches purchased) generate more waste per student.
  - One could hypothesize that students who purchase less popular lunches consume less of those lunches.
  - However, one could also hypothesize that students may discard a similar volume of food each day, but the weights differ because some menu items are denser than others. The Bates assessment may have measured waste on days when the less popular food items from that day's menu were particularly dense.
- Some children may purchase a lunch and only eat components of it, while disposing of the rest.
- Some parents may routinely order lunch for children, even on days when the children don't like the menu and eat less of their food.

School lunches come with napkin packets containing a fork, knife, napkin, and straw. The assessment tracked unused and partially-used packets that students threw away. These packets totaled 236 at the end of the week.

## **Opportunities for Waste Reduction and Diversion**

The Bates Cafeteria Waste Assessment reveals a number of opportunities for reducing waste and diverting it from the landfill.

### ***Source Reduction***

Source reduction is the highest priority in any waste management program and has the potential to decrease waste across all waste categories. Research has found, for example, that children who have recess before lunch generate less food waste (EndFoodWasteNow.org, 2013b). Fortunately, Bates School already schedules recess before each lunch period. Below are source reduction ideas relevant to home and school lunches, which could reduce waste generation in the Bates cafeteria.

### **Home Lunches**

Home lunches generate relatively low amounts, by weight (approximately 0.1 pounds, excluding liquid) of waste per child per week. However, the volume of this waste can be significant, as it consists largely of low-density items such as juice boxes and chip bags. Because these items are not appropriate for conventional recycling, they head to the landfill. Consequently, any reductions in home lunch waste are beneficial. Families can reduce waste in home lunches by using:

- Reusable containers for all lunch items;
- Cloth napkins; and
- Stainless steel or other reusable utensils.

Families can further reduce waste by packing food their children like and in portion sizes they will finish.

### School Lunches

School lunches generate an average of .4 pounds of waste (excluding liquid) per child per week. Ideas for reducing waste from school lunches include:

- Use reusable trays or eliminate trays (however, managing food without trays can be challenging for young students);
- Eliminate plastic, clamshell containers;
- Eliminate napkin packets and replace with napkin dispensers and individual utensil dispensers;
- Use compostable utensils, if a compost program is established;
- Use condiment dispensers instead of individual packets;
- Encourage students to bring their reusable water bottles to lunch;
- Encourage students to use Bates' current refilling station, and possibly add one to the cafeteria;
- Use milk dispensers, instead of individual milk cartons;
- Analyze waste from school lunches, identify which menu items are most often discarded, and adjust the menu to replace frequently discarded items with more popular choices. An assessment is labor intensive. However, it could be possible to engage Wellesley High School students, as well as fourth and fifth graders, in a school lunch assessment project that will assist Wellesley Food Services in reducing post-consumer food waste. Students could carry out an analysis of particular school lunch menu items via, for example, general observation, photographs, etc.

**Of the total 371 pounds of waste in a given week, 344 pounds (over 12,000 pounds annually), or 93% of total waste, could be diverted from the landfill and reused or recycled in some productive way.**

### ***Feeding Hungry People***

As noted above, Bates School has established a donation table in the cafeteria. During lunch, students donate reusable/unopened (e.g. carrot bags, cheese sticks, yogurt) items to this table. Other students in the cafeteria can take those items (provided there are no allergy concerns). Donation table items that remain at the end of lunch periods are moved to the teacher's lounge refrigerator. Teachers have access to this food and may bring it to their classrooms and distribute to children who need extra snack. Each week a Bates parent brings any leftover donation table items to the Wellesley Food Pantry.

Bates can improve its donation efforts by:

- Engages more students to take ownership and help to run the donation table system;
- Increases visibility of the donation table through student-led public relations efforts, signage, announcements during lunch, etc.; and
- Establishes a PTO position or committee to take over responsibility for preserving donation table items and delivering them to the Wellesley Food Pantry.

### ***Feed Animals***

Each week Bates produces approximately 70 pounds of food waste that could go to feed animals. That amount translates into about 2,500 pounds of animal feed per year for just one of Wellesley's seven elementary schools. Some schools in Massachusetts (e.g., Dover Sherborn High School) provide animal feed to local farmers.

### ***Fuel Conversion***

Presently there are no local options for fuel conversion such as anaerobic digestion. In the spring of 2016, Wellesley's 3R Working Group partnered with a class at Olin College to explore the possibility of establishing a small-scale anaerobic digester to serve Wellesley's three colleges (Olin, Wellesley, and Babson College) and nearby communities. The research suggested that the capital and labor costs of running such a system would be prohibitive.

### ***Composting***

The Committee identified several school systems in Massachusetts that compost food waste. Some of these schools and their compost-related web links (where available) are listed below.

- Barbieri Elementary School, Framingham, MA
- Brackett Elementary (<http://brackettelementary.org/new-school-wide-compost-delivery-program>)
- Brookline (<http://brookline.wickedlocal.com/article/20160406/NEWS/160407566>)
- Georgetown (<http://www.patriotledger.com/article/20151118/NEWS/151115729>)
- Greenfield High School (<http://www.recorder.com/Compost-program-expands-to-Greenfield-High-School-1974111>); (<http://www.recorder.com/editorial-composting-GPS-2021999>)
- Hingham High
- Manchester Essex High School
- Needham (pilot)
- Quabbin (<http://www.qrsd.org/our-schools/high-school/extracurricular-activities/composting-and-organic-gardening/>)
- Westford Academy

Some Committee members visited Manchester Essex High School and learned about their composting and impressive Green Team program.

The Committee contacted two local composting companies (Bootstraps Composting and Black Earth Composting) who pick up compostable material. Further research is required. However, Bootstraps recommends a 64 gallon toter for simple and complex compost and would empty that toter once or twice per week (depending on outdoor temperature) for \$25 per visit. All material in the Bootstrap compost toter must be bagged to allow for transfer, and to prevent odor, vermin, and freezing in winter. Black Earth recommends two 64 lb. totes that they would empty once per week during cooler months and twice per week during summer months, at \$60 per visit. Two visits per week may be necessary in September and June if the weather is hot. Adding other Wellesley schools to the Black Earth route could decrease per-school cost. It is important to prevent contamination during the waste sorting process. E.L. Harvey also composts and the Committee is working with Town departments to learn more about E. L. Harvey's services and costs.

### ***Recycling of Non-Food Waste***

Non-food, recyclable waste constitutes approximately 42 pounds or 11% of total cafeteria waste. Each day the Bates cafeteria produces a sizeable volume of recyclable items such as milk cartons and plastic cold lunch containers.

While Bates School recycles non-food waste from classrooms, no recycling takes place in the cafeteria. Therefore, introducing recycling to the cafeteria would offer a tremendous improvement to current waste management practices.

E.L. Harvey, the current vendor who collects trash and recycling for WPS, provides single stream recycling services for the types of recyclables generated in the Bates cafeteria. Generally, a given weight of recyclable material is less costly to pick up than the same weight of trash.

### ***Liquid Waste***

At 94 pounds per week (25% of total waste), liquid constitute the single largest (by weight) component of waste generated in the cafeteria. Milk comprises most of the discarded liquid and constitutes a large contributor to methane gas emissions from landfills. Source reduction is the best way to address this form of waste. Some cafeterias, for example, use beverage dispensers to eliminate cartons and make it more likely that students will take only the amount of beverage that they will consume. There are opportunities to divert liquid from the trash and, therefore, from landfills. For example,

- Many liquids (including milk) are compostable and accepted by many composting companies.
- Manchester Essex High School includes milk cartons and leftover milk in their composting.
- Schools in Winchester, Andover, Waltham have "drain and drop" systems. Students empty leftover drinks into a liquid receptacle and place their empty containers into a recycling bin. Custodians pour the liquid waste down a wastewater drain.

In conversations with Carolyn Dann of the Massachusetts Department of Environment Protection (DEP), the Committee has learned that drain and drop systems have been highly successful. Students happily participate in the liquid draining process, and custodians much prefer to discard liquids down the drain rather than carry liquid in garbage bags that are prone to leaking. Custodians also find that separating out liquids decreases the number of times they need to empty the trash during lunch periods. Fewer trips to the dumpster also require fewer garbage bags. DEP recommends the use of Slim Jim containers for liquids and empty beverage containers. DEP recommends that custodians use dollies to transport the slim jims back and forth between recycling dumpsters, drains, and the cafeteria. Drain and drop programs in Andover, Waltham, and Winchester have gained easy approval from local health departments.

### ***Waste Management Options Summary***

Table 7 summarizes options for diverting Bates cafeteria waste streams from the landfill. The categories listed map onto the USEPA's Food Waste Hierarchy, with one addition: non-food recyclable material. There are many organizations in the Wellesley area that provide reuse and recycling services. Table 7 includes some examples.

**Table 7: Waste Diversion Options**

<b>Diversion Action</b>	<b>Pounds of Waste per Week</b>	<b>% of Waste per Week</b>	<b>Examples</b>	<b>Reuse / Recycle Services</b>	<b>Local Schools that Divert this Waste</b>	<b>Important Factors for Developing a Solution</b>
Feed Other People: Donation	32	9%	Cheese sticks Oranges Yogurt	Wellesley Food Pantry	Manchester Essex	Sorting Food storage Delivery Custodial tasks Health and safety
Feed Animals: Animal Feed	69	19%	Orange peels Bananas Vegetable scraps	Local pig farms	Dover Sherborn	Sorting Proximity to farms Cost Storage Transportation Custodial tasks Health and safety
Feed the Land: Compost	107	29%	Compostable trays Napkins Meat Sandwiches Chicken fingers Pastries and baked goods	Local composting companies such as Bootstrap, Black Earth, E.L. Harvey	Brackett Brookline Framingham Georgetown Greenfield Hingham MERSD Needham (pilot) Quabbin Westford	Sorting Cost Custodial tasks Truck traffic Health and safety
Recycle Non-food Waste	42	11%	Plastic containers milk cartons straws	E.L. Harvey	Andover Dover Sherborn MERSD	Sorting Cost Custodial tasks Truck traffic Health and safety
Liquid Diversion	94	25%	Milk, juice	Students and Custodian	Andover Waltham Winchester	Draining by students Custodial tasks Health and safety

## **Education Campaign**

The above suggestions for reducing and diverting cafeteria waste at Bates School require altering long-held practices and modifying behavior. This type of change can be difficult, but awareness-raising and education can be useful in smoothing the path to more sustainable practices. Bates School has already initiated food waste education for students. Student Council, for example, launched a cafeteria donation table and created a video about food waste that they presented to the student body. Wellesley High School seniors decorated a Bates hallway bulletin board with food waste facts. Bates also hosted two school-wide assemblies about food waste, and Bates students played a critical role in the Cafeteria Waste Assessment process. If Bates moves forward with future measures to address food waste, the school should consider promoting and underpinning that work with an awareness-raising and education campaign. Elements of that campaign could include the following:

- Opportunities for Bates students (perhaps with help from high school students) to take ownership over an education campaign pitched to students, staff, faculty, and families.
- PR materials from the Natural Resources Defense Council's (NRDC's) *Save the Food* campaign. The Committee has been in touch with an NRDC contact who can help to supply logos and other materials for use at Bates. *Save the Food* is also interested in partnering with Wellesley's municipal departments.
- A showing of the school version of the documentary film, *Just Eat It*.
- Opportunities for fifth grade Student Council members to take on sustainable waste management as a year-long or multi-year theme. Students could carry out further research, continually assess and suggest improvements to waste management practices, and educate the students and the wider Bates community.
- Food waste-themed bulletin boards and posters to remind students about reducing food waste.
- Guest speakers from the USEPA or Massachusetts Department of Environmental Protection to talk about food waste.

## **Benefits of a Bates Cafeteria Waste Program**

Cafeteria waste presents compelling opportunities for Wellesley's public schools, municipal departments, and community members to serve as leaders in the growing movement to address food waste and promote sustainable waste management. The Bates cafeteria produces a significant amount of food and non-food waste: approximately 371 pounds every week and over 13,000 pounds every year. The Committee estimates that about 344 pounds each week (13,000 yearly) can be diverted via well-established, waste management processes. By setting and meeting waste management goals through the FRC and WasteWise programs, Bates will:

- Divert significant amounts of waste away from landfills;
- Decrease the carbon footprint of Bates School;
- Reduce other adverse environmental impacts;
- Provide a model to help schools in Wellesley and beyond adopt more sustainable waste management;

- Cultivate, in students, a sense of civic responsibility;
- Educate and engage families in sustainable waste management and sustainability more generally;
- Generate experience and knowledge that can help other schools and organizations follow suit; and
- Realize win-win opportunities that yield environmental benefits and, perhaps, financial savings.

The Committee hopes that relevant groups and departments across Town will recognize and value these benefits.

### **Next Steps and Requests**

The Committee must submit FRC and WW goals to the USEPA in August 2016. To remain participants in FRC and WW, the Committee must set waste reduction goals in at least one waste category for FRC and for WW, respectively. The Committee believes, however, that much more ambitious goal-setting could be feasible. Before determining goals, the Committee plans to share a draft of this report with the following individuals and groups:

- Toni Jolley, Bates School Principal;
- Joe McDonough, Director, Wellesley Facilities and Maintenance Department
- Matt Delaney, Director, Wellesley Food Services;
- Sustainable Energy Committee and the 3R Working Group;
- Michael Pakstis, Director, Town of Wellesley Department of Public Works
- Jeff Azano-Brown, Superintendent, Wellesley Recycling and Disposal Facility
- Wellesley Health Department
- David Lussier, Superintendent of Wellesley Public Schools

Additional contacts include:

- Bates School Green Team
- Wellesley Green Schools

In order to set reasonable goals, the Committee would greatly appreciate assistance from Town officials in the form of:

- Feedback from school administrators, faculty, and staff about a possible education program, the appropriate complexity of waste sorting and management, and other facets of student engagement, logistics, and community outreach.
- Feedback from Wellesley Food Services about the feasibility of changing cafeteria practices, assessing wasted food across different menu options, and adjusting menu options with the goal of reducing this waste.
- Feedback from the Facilities Maintenance Department regarding costs, logistics, implications for custodial staff, etc.
- Feedback from the Wellesley Department Health about health-related requirements.

- Assistance in accessing information from the Town of Wellesley, E.L. Harvey and/or other waste management companies so that the Committee can compare the costs of trash, compost, and recycling pick-up.
- Input from the Bates Green Team and Wellesley Green Schools about implementation at Bates and about sharing assessment findings with other schools.

The Committee looks forward to sharing findings and discussing next steps with Town departments, WPS, and other interested parties across Wellesley. The Committee also hopes that its continuing work at Bates can help other institutions interested in identifying and implementing more sustainable waste management practices.

## References

- Baldwin, Grant. 2014. *Just Eat It: A Food Waste Story* (documentary film). Peg Leg Films.
- Buzby J.C., Wells H.F., Hyman J. 2014. "The estimated amount, value, and calories of postharvest food losses at the retail and consumer levels in the United States." *Economic Information Bulletin*. Washington, DC: United States Department of Agriculture, pp. ii-33.
- EndFoodWasteNow.org. 2013a. "End food waste now, facts." Retrieved from: <http://www.endfoodwastenow.org/index.php/resources/facts>.
- EndFoodWasteNow.org. 2013b. "End food waste now, schools." Retrieved from: <http://www.endfoodwastenow.org/index.php/issues/issues-schools>.
- FeedingAmerica.org. 2016. "Feeding America, hunger and poverty facts and statistics." Retrieved from <http://www.feedingamerica.org/hunger-in-america/impact-of-hunger/hunger-and-poverty/hunger-and-poverty-fact-sheet.html>
- Massachusetts Water Resources Authority (MWRA). 2009. "The Deer Island Sewage Treatment Plant." Retrieved from: <http://www.mwra.state.ma.us/03sewer/html/sewditp.htm>
- Neff, Roni A., Marie L. Spiker, and Patricia L. Truant. 2015 (June 10). "Wasted food: U.S. consumers' reported awareness, attitudes, and behaviors." *PLoS ONE* 10(6): e012788. Retrieved from <http://dx.doi.org/10.1371/journal.pone.0127881>
- Town of Wellesley, 2016. "Frequently Asked Questions: Water and Sewer." Retrieved from: <http://www.wellesleyma.gov/Pages/FOV1-0001FDB3/wat/faq>.
- United States Department of Agriculture (USDA). 2016 (May 12). "Loss-adjusted food availability documentation." Retrieved from [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system/loss-adjusted-food-availability-documentation.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-adjusted-food-availability-documentation.aspx)
- USEPA, 2014. *A Guide to Conducting and Analyzing a Food Waste Assessment*. EPA-530-F-15-003. Washington, DC: USEPA.
- USEPA. 2016a (April 25). "Sustainable management of food basics." Retrieved from <https://www.epa.gov/sustainable-management-food/sustainable-management-food-basics#what>
- USEPA. 2016b (April 25). "WasteWise." Retrieved from <https://www.epa.gov/smm/wastewise>.
- USEPA. 2016c (March 31). "Sustainable management of food, food recovery hierarchy." Retrieved from <https://www.epa.gov/sustainable-management-food/food-recovery-hierarchy>.

⋮