Waste Audit: Roosevelt University, 425 South Wabash

Residence Floors

Team members:

Joshua Campbell: Trash Sorter, Editor
Maria Cancilla: Trash Sorter, Introduction, Background, Assumptions
Terry Cunningham: Data Collection, Procedures
Stephanie Eisner: Team Leader, Data Collection, Waste Stream Analysis
Lore Mmutle: Trash Sorter, Recommendations, Potential for Improvement
Christine Molinaro: Trash sorter
Scott Rogers: Photographer, Results

Introduction:

In October of 2012, two teams of students from the SUST 240 Waste Class conducted waste audits for Roosevelt University's new Wabash building. The first team examined and audited the waste produced on the office floors of the building on October 16. On October 17, our team examined and audited the waste produced on the dormitory floors of the building. The two audits were performed under the supervision of Sustainability Studies Lecturer, Suhail Barot. As the waste from each floor is collected and removed daily, the waste our team examined was discarded from one day. The waste was contained in two separate bins in the trash collection room on each floor. The two bins were for trash and mixed-stream recycling. The items found in each bin were kept separate and audited by two different teams of students.

The purpose behind our audit was to present solid data to Roosevelt University's building management staff. The University would like the Wabash building to have a landfill diversion rate of fifty percent. At the time of audit the diversion rate was closer to thirty percent. In order to identify the flaws in the waste collection/recycling system the University needed data concerning what was being placed in the trash bins and what was being placed in the recycle bins. The collection and processing of this data would allow for the system's flaws to be identified and for solutions to be devised and enacted. The following report contains the data collected, analysis of said data, observations of system flaw and potential solutions.

Background

The Roosevelt University Wabash building consists of 32 floors. This report focuses on the buildings residence floors – specifically, floors 15 through 31 – 17 floors, total. The building was recently completed in March of 2012, with the grand opening in May of 2012. Fall 2012, marks the first school year for the building. August was the first month residents lived in the dormitory.

Room stats: **171 Rooms Total**

- 356 Shared Spaces
- 255 Private Spaces
- 21 Staff Rooms
- 1 Studio Single Suite

Most suites have four students living in them. Each floor also has one five-student suite. There are shared rooms, which are double-occupancy rooms. There are also shared suites, which have two shared rooms (with four people, total). Finally, there are the private suites, which have four private bedrooms.

People living in the Wabash Building: **633 Residents Total with staff, 612 students**

- Floor 15: **26 people**
- Floor 16: **33 people**
- Floors 17-23, 26, 28-29 & 31: **38 people**
- Floors 24, 25, 27 & 30: **39 people**
- Average number per floor: **37 people**

(K. Denny, personal communication, November 15, 2012)

Each room is provided two 14-quart deskside bins: A black trash bin and a blue recycling bin. Similarly, the common area of each residence quad is provided two 41-quart bins: A black trash bin and a blue recycling bin (T. Shelton, personal communication, November 14, 2012). The purpose of the duel bins is to make the collection and sorting of trash and recyclable materials easier for the students. The students collect and sort their own waste in their dorm rooms; said waste is then disposed of in the trash room located on each floor. The floor's trash room contains two large, labeled bins, gray for trash and blue for recycling. (See figure 1.)

[Figure 1: Large bins in Trash Room, *Rogers*]

A small sign on the wall of the trash room lists the types of materials that can be recycled. (See figure 2.) Each student should also have a brochure in their room with the same recycling information contained on the sign (Shelton, personal communication).

[Figure 2: RU Recycling Program sign in Trash Room, *Rogers*]

Assumptions and Observations

- With the exception of the 21 staff rooms, the students do not have kitchen sinks in their rooms (B. Collier, personal communication, November 13, 2012), so it is impracticable for students to properly rinse out their plastic, aluminum or glass beverage containers. This can lead to missed recycling opportunities when students dispose of partially full containers (sometimes with the lid still on) into the trash bin, rather than rinsing the container and separating the lid (for landfill) and the clean, empty container (for recycling).
- There should be a slight variance in the amount of waste from floor to floor where the number of people also is varied. For example, floor 15 has 26 people living on it. Floor 30 has 39 people. It can be assumed that floor 30 will produce more waste than floor 15.

- The audit was performed on a Wednesday evening. We assume that the amount of waste we examined was typical for a week day and night on the dormitory floors, and therefore is a good sampling of what would be a “normal” amount of daily waste.
- Although the trash was held for the entire day, standard procedure is for the waste to be collected twice a day in this building.

Preparations

Our team was composed of eight team members plus one supervisor. We divided ourselves into two groups: Recycling and Trash. Each team had three sorters and one observer. The observer recorded the weights, non-quantifiable information and impressions of the data, which will be discussed throughout the paper.

The audit was performed in one evening with one day’s worth of waste from six residence floors. Our team focused on categorizing materials based on product type. The total weight of each category was measured in pounds. On two floors, the contents of the recycling and trash bins were sorted, categorized and then weighed. On the remaining four floors, time allowed only for the total weight of the materials in each bin (trash and recycling) to be measured.

[Figure 3: The sorting and categorizing process, *Rogers*]

Tarps were placed on the floor to keep the hallway carpet clean. The tarps allowed for the contents of each bin to be spread out, sorted, categorized and weighed. (See figure 3.)

The trash bin categories were:

- Plastic items
- Food contaminated items
- Food
- Miscellaneous

The recycle bin categories were:

- Contaminated cardboard
- Contaminated plastic
- Styrofoam
- Contaminated paper
- Food
- Aluminum
- Recyclable plastic
- Glass

For the recycle bin, we used a separate group of categories because the contents were more varied.

[Figure 4: Weighing the contents of each bin, *Rogers*

Procedure

1. The team recorded an initial weight measurement of the total contents found in trash and recycling bins. (See Figure 4.)
2. We unloaded the contents of each bin onto the tarps.
3. The contents of each small bag found in the bins were separated and categorized.
4. We separated each category of trash and recyclables into different plastic bags.
5. We took separate weight measurements for each category.
6. The same process was used for the waste materials found on floors 18 and 20.
7. The process ran more efficiently on floor 20, as a solid procedure was in place.
8. After the detailed analysis was complete on floors 18 and 20, the two groups headed to floors 16, 17, 19 and 21 to record the total weight for the contents of the recycle and trash bins on each floor.

Extrapolation

Wabash Building Material	Weight (LBS)
Total Waste Including Recyclable Material	24,238
Total Waste Excluding recyclable materials	69,598
Our Waste Audit	
Residential Floors 15-31	17 floors
Daily Average: Total Waste with Recycling	40.21 lbs
Daily average: Total Recycling	12.11 lbs

(average weight) x (17 floors) x (30.5 days)	
Monthly Average	
40.21lbs x 17 floors x 30.5 days	20,848.885 lbs
12.11lbs x 17 floors x 30.5 days	6,279.035 lbs
Academic Yearly Average	
20,848.885 lbs x 9 months*	187,639.965 lbs
6,279.035 lbs x 9 months*	56,511.315 lbs

* Note: 9-month extrapolation for residence floors, rather than 12 months, since students don't live in the building in the summer months.

Waste Stream Analysis

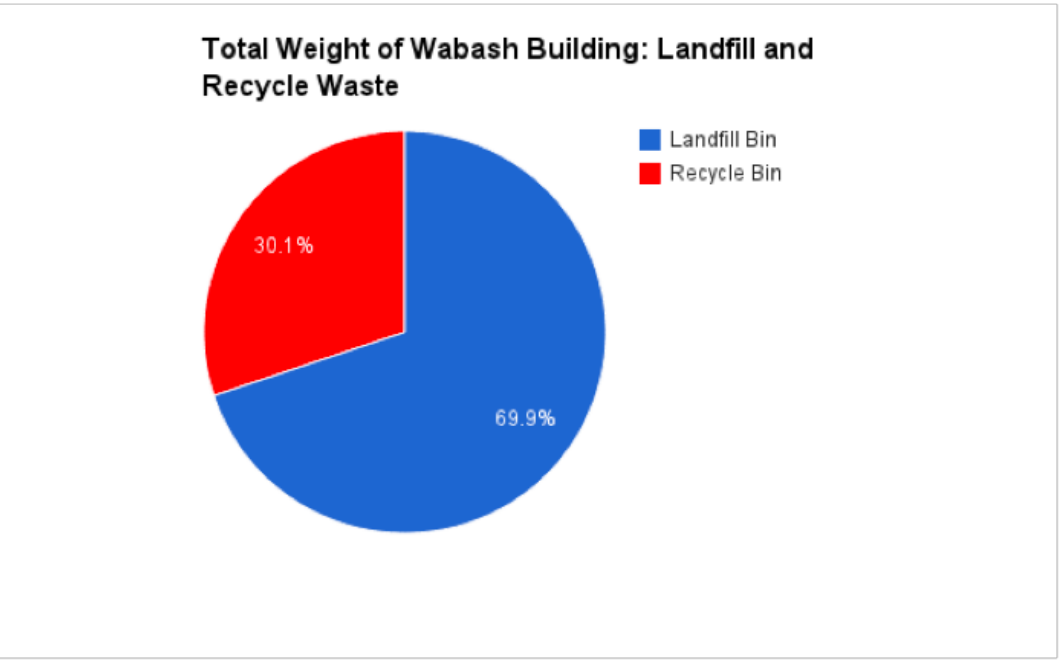
The 17th-31st floors of the Wabash Building are residential living quarters. Students live, work, study, play, and especially eat here. There is something to be said about the daily activities of the students that are responsible for generating 241.28 pounds of waste amongst the 17 floors for only one day. If waste were generated at this rate it would be expected that the building would produce a monthly average of 20,848.89 lbs of waste.

Not only does the trash enlighten us on the students' activities, but also it indicates habits and perceptions of recyclables and landfill waste. After a waste audit, this team found similarities and differences of waste products in both the recyclable bins and the landfill bins. These trash rooms serve as a centralized location to drop off residents' built up trash. Because these are centralized locations, and then being sorted into recognizable recyclables or trash, cross contamination is a major issue.

Actual Diversion Rate

The diversion rate, the percentage in which is the being recycled to the total weight of waste generated, is roughly 30%. However, this number reflects what is in the recycle bin, which in reality may not be recyclable, such as food. The finding of this

waste audit indicates the majority of waste in the recycling bin is, in fact, not recyclable because of cross-contamination.



[Figure 5. Total weight of Wabash Building, *Rogers*]

Landfill Waste Stream

Waste excluding recyclables generated the most amount of waste. Roughly 168.62 lbs of waste from all the floors was sent to the landfill. This weight was a mixture of food, plastic items, food contaminated items and miscellaneous or unrecognizable goods. Landfill waste is problematic because it becomes an issue of greenhouse gases, and air, water and soil pollution. These are all issues that will carry on with the waste after it leaves the Wabash building.

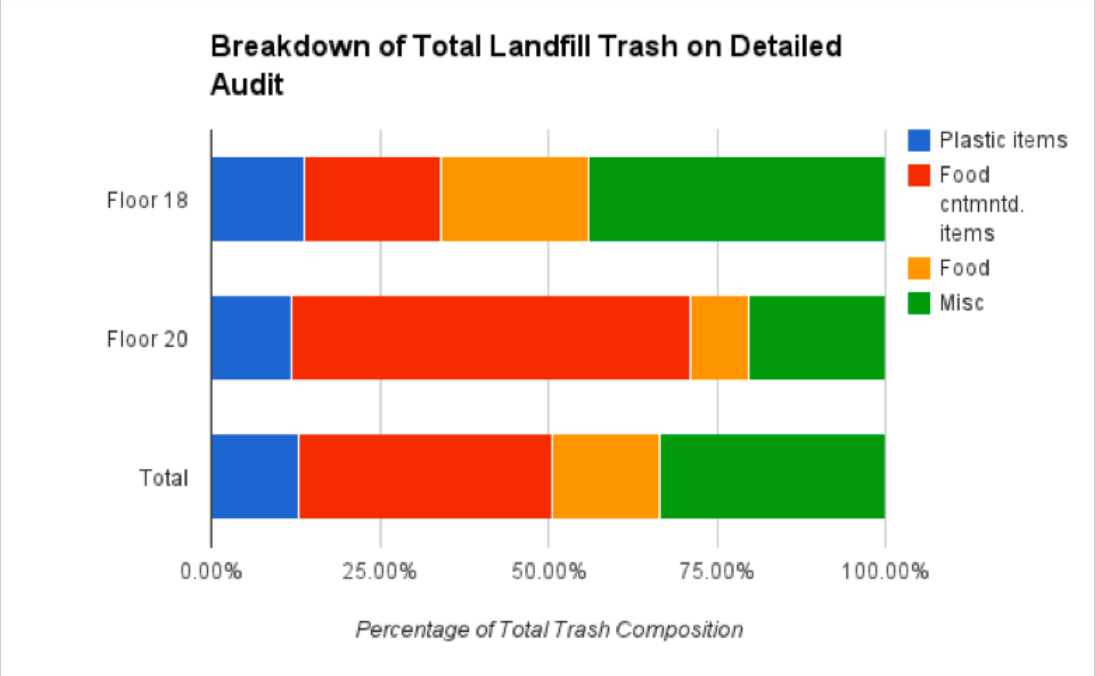


Figure 6 represents, as percentages, generating landfill waste by floor broken down by product type.

Miscellaneous products was about 33% of the total landfill weights from the two floors. This equates to about 13.1 lbs from floor 18 and 4.85 lbs from floor 20. Miscellaneous waste is considered unrecognizable waste or waste that did not fit into the other categories. For example, much of this waste was Kleenex or bathroom waste. These types of products have a strong relationship with individual people. Meaning, if a person is sick, or on their menstrual cycle she would produce more bathroom waste. Other such products were cleaning wipes, which are disposable cloths soaked in bleach or other disinfectants, and packaging material, which is a combination of cardboard, paper and other materials. These are products that people use not out of necessity, but out of preference or for personal comfort. Also, these products have very short life spans, most of which are one-time use. This indicates that people in residency dorms are limited in the types of products they can use, and will choose disposable and convenient types of products. Another factor to consider is the fact that the waste audit for floor 18 was done before floor 20; therefore, the audit on floor 20 could have been more accurate since we had a better understanding of our procedure.

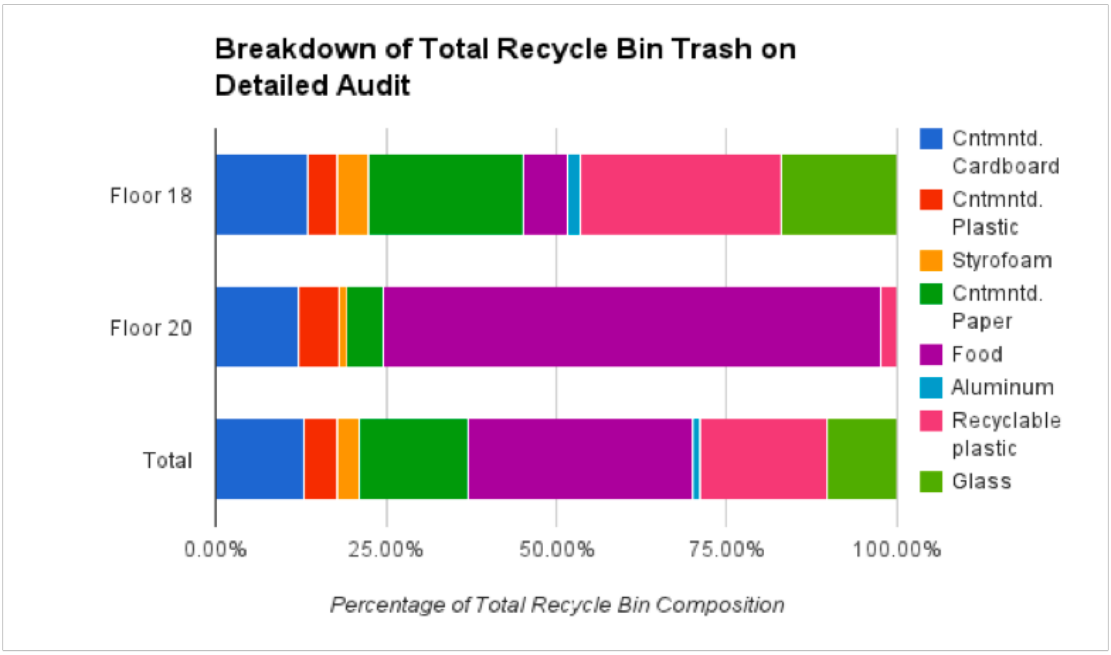
Food waste from floors 18 and 20 weighed a total 8.6lbs. Between the two floors food waste was about 16.06% of the total landfill weight. Food waste can be generated because of numerous reasons. Firstly, portion sizes could be too large. Because of the small space in residential dorm rooms it could be difficult to save food for future use. The food that is being disposed of is also food that has a significant decrease in quality, taste and preference if reheated. For example, there was a significant amount of French fries and salads, both are difficult to save and reheat.

Food containers are another product that holds a lot of weight in the landfill bin. There was a total of 20.1 lbs just of food containers, about 37.53% of the total landfill waste. These are products such as to-go containers or plates or forks. Most of these products could have been recycled if properly rinsed and dried. Students are more likely to want disposable containers and utensils, over reusable, because of convenience. Students also have limited access to sinks or washing/sanitizing stations in the residential dorms, which makes it extremely difficult to reuse such products.

Lastly, there was roughly 6.91 lbs of plastic items in the landfill bins. These were mostly beverage bottles. Again, similar to the food containers, most of these items were not properly cleaned. Many bottles were still filled with the original contents, making them non-recyclable.

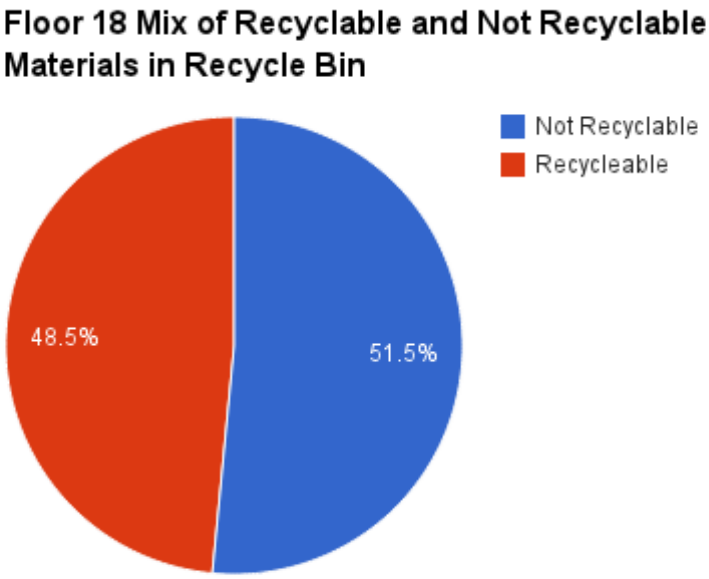
Recyclable Waste Stream

Recycling is a much better way to deal with waste. Yet, issue can arise when non-recyclable materials end up in the recycle bin. Overall, the building produced about 72.66 lbs of recyclable waste, which was roughly 30% of the total waste. This was composed of contaminated cardboard (3.48 lbs), contaminated plastic (1.33 lbs), Styrofoam (0.8 lbs), contaminated paper (4.23 lbs), food (8.9 lbs), aluminum (0.31 lbs), recyclable plastic (5.02 lbs) and glass (2.73 lbs). Note there are many more categories in the recycle bin because recyclables are based on material. We found many of the same issues, as in the landfill bins, with food waste and food contaminated goods.

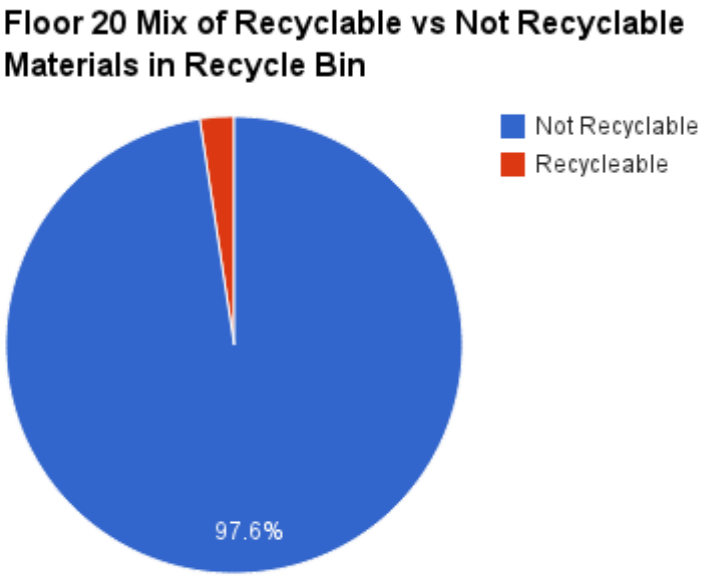


[Figure 7 Percentage of contents in the total recycle bin, *Rogers*]

This is a breakdown of floors of the different materials we find. There seems to be inconsistency between floors of the amount, yet the same type of material was seen throughout.



[Figure 8, Floor 18 Percentage of non-recyclable to recyclable, *Rogers*]



[Figure 9, Floor 20, Percentage of non recyclable to recycleable, *Rogers*]

Cross Contamination

Cross-contamination is a major issue. Recyclable products were found in the landfill bin and vice versa. As stated earlier, the trash rooms are central locations with two bins: one for the recyclable and one for landfill, and this image is mirrored in each door room. Therefore, it would be assumed that there should not be an issue of cross contamination yet there is.

As also stated earlier the actual diversion rate was roughly 30%. This represents the total building's waste. For just these two floors, we see slightly different results. The actual diversion rate is 33.29% for floors 18 and 20. However, after we conducted the waste audit because of cross contamination only about 18% of the waste could truly be recycled.

One plausible answer for this is the students lack of education or knowledge. Yes, the university has signs listing recyclable products versus non-recyclable, but students still may be confused regarding food contaminated containers. For example, we found many cardboard containers in the recycle bin. Yes, cardboard is recyclable, but not when food is still in it. Typical recycling systems have a zero tolerance for food waste.

Current Emissions

According to the EPA's WARM model, a generator that estimates how much greenhouse gases are emitted, based on the data we collected, the building produces about 16 MTCO2E per day. This number only reflects the two floors in which we sorted the trash. By simply finding the average and multiplying by the number of floods, we can assume that on average about 136 MTCO2E is emitted daily, which would roughly be 4,148 MT of greenhouse gases per month.

Potential for Improvement

GHG Emissions Analysis — Summary Report

Analysis of GHG Emissions from Waste Management for Roosevelt University

Prepared by Wabash Building: Residency

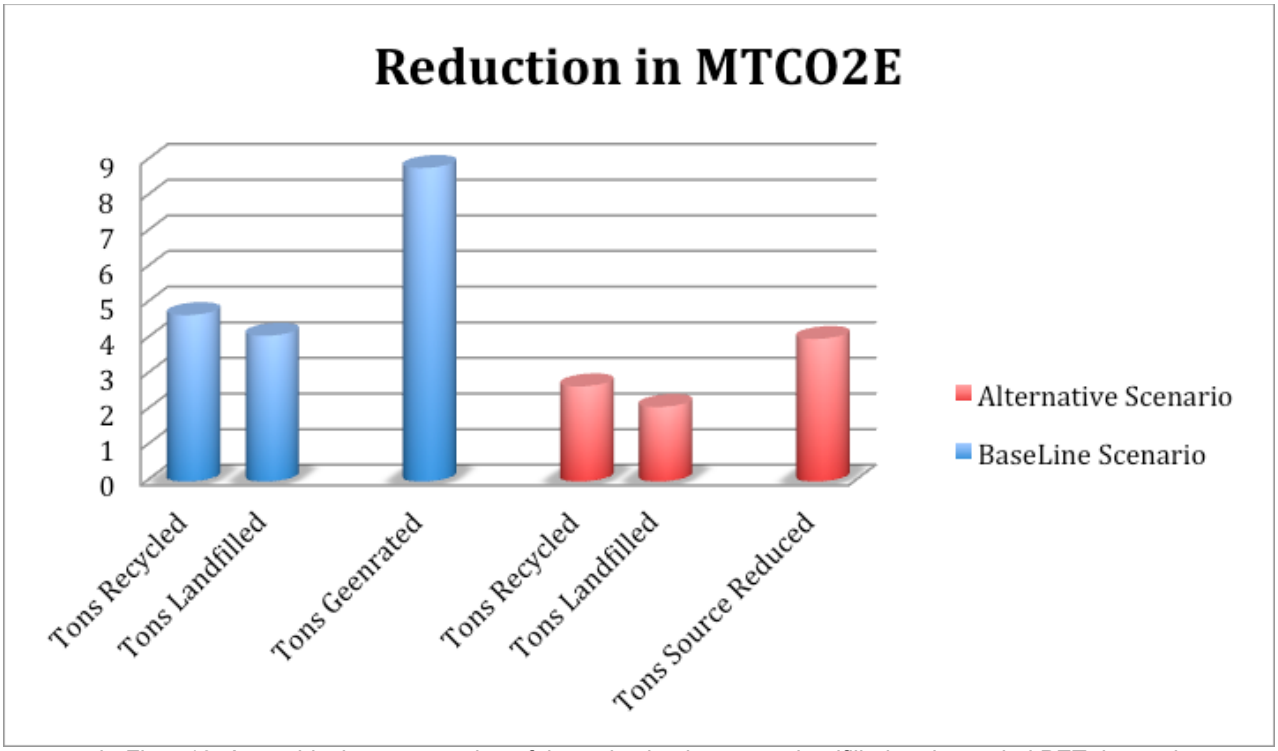
GHG Emissions from Baseline Waste Management	-5

Scenario (MTCO2E):	
GHG Emissions from Alternative Waste Management Scenario (MTCO2E):	-12
Total Change in GHG Emissions: (MTCO2E):	-7

	Baseline Scenario					Alternative Scenario						
Material	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total MTCO2E	Tons Source Reduced	Tons Recycled	Tons Landfilled	Tons Combusted	Tons Composted	Total MTCO2E	Change (Alt - Base) MTCO2E
PET	5	4	0	N/A	-5	4	3	2	0	N/A	-12	-7

a. Floor 18. Metric Tons of Carbon Dioxide. Units measured in tons for example; read as lbs.

The 18th floor of the Wabash building is currently creating 5 tons of recycled beverage bottles and landfilling 4 tons. The sum total of said waste is 9 tons leaving a an MTCO2E rate of -5 for the baseline management scenario. One of the ways that the university can improve its overall recycling is to have a recycling orientation for all the students that live in the dorms. If Roosevelt University can effectively teach students how and what can be recycled it would vastly reduce that amount of cross contamination; thus, vastly increasing what can actually be recycled by the school. Along with encouraging students to have better recycling habits, Roosevelt could give out reusable drinking containers at the beginning of each school year in an effort to reduce how waste is created, be it recyclable or not. If the students can reuse said bottles for water, soda or juice, that would greatly reduce how much PET gets wasted as a result. The second scenario calls for the university to reduce 2 metric ton from their overall recyclable PET containers as well as 2 metric tons from their PET's that end up in landfills.



b. Floor 18. A graphical representation of the reduction in source, landfilled and recycled PET due to the new reusable bottle initiative at Roosevelt University.

If Roosevelt University can manage to divert roughly half of the sum total of metric tons from its original numbers, effectively reducing their MTCO2E to a staggering -12. This a total change in GHG emission of -7, vastly reducing the amount of carbon dioxide emissions.

To be able to fully understand and take advantage of any improvements, the university must first gain a clear understanding of the residence hall diversion rates. T= trash, R= recycling, C= compost and G= total generation. Here are the diversion rates for floors 16-21 in the Wabash Building that the university is currently creating. That data was taken to analyze the diversion rates is in pounds. In order to calculate the diversion rate one must first find the sum of total generation:

$$T+R+C=G.$$

Once the the sum of total generation has been discovered you may begin to calculate the diversion rate:

$$C+R/G= \text{Diversion Rate.}$$

Floor 16: 20.77+0+0=20.77

0/20.77=0

A diversion rate of 0.

Floor 17: 31.31+20.55+0= 51.86

20.55/51.86= .39

A diversion rate of 39%

Floor 18: 30.3+16.09+0= 46.12

16.09/46.12= .34

A diversion rate of 34%

Floor 19: 35.14+14.24+0= 49.43

14.24/49.43= .28

A diversion rate of 28%

Floor 20: 23.85+10.8+0= 34.65

10.8/34.65= .31

A diversion rate of 31%

Floor 21: 27.47+10.98+0= 38.45

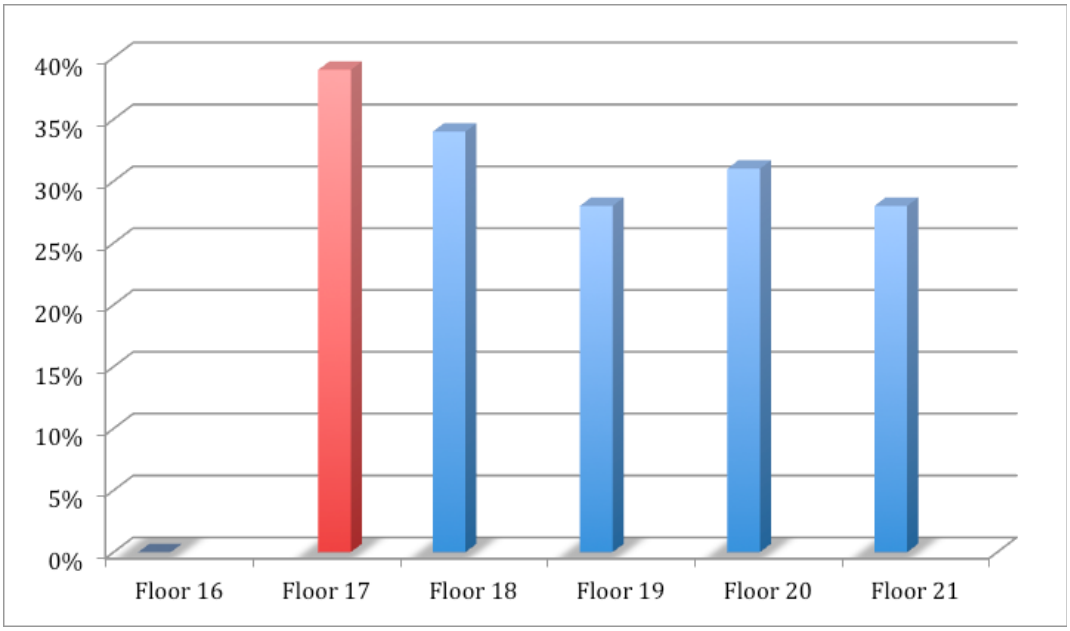
10.98/38.45= .28

A diversion rate of 28%

Floors 16-21 combined: 168.62+72.66+0=241.28

72.66/241.28=.30

A total diversion rate of roughly 30%



c. Graph Illustrating the diversion rates of floors 16-21; Wabash Building.

The only plausible question that can be asked is what can the school do to improve these rates?

Recommendations

1. Paste super simple pictures on recycle bins (and possibly trash bins, too) to show exactly what can go in there: an aluminum can, a plastic bottle, a glass bottle, clean paper. Use these pictures on bins in rooms as well as on the Trash Room bins.
2. Possible signs that ask: is your container clean? And show what this would look like. Again, super simple, easy to read and follow.
3. Possibly add a separate container for food scraps and food waste – if it can be added to the scraps that are put through the food pulper in the cafeteria and are composted. Switch to-go containers to biodegradable containers that can also be composted.
4. Offer a small discount for students to eat in the cafeteria, rather than carrying food containers to their rooms. This could reduce food-contaminated waste going to the landfill. (Assuming those who dine in will be able to use washable dishes

and silverware, and their food waste can be put through the pulper.)

5. Discourage individual plastic grocery bags in recycle bins in rooms. Students can just bring their bin directly to the trash bin and dump their recycling in the larger bin. This will cut down on plastic waste.

If the agenda is aggressive and attempts to increase the number of recycled waste by nearly 5 pounds on floors 16-21, the diversion rates will tell a completely new story. Here are the hypothetically adjusted rates:

Floor 16: 15.77+5+0= 20.77

5/20.77= .24

An improved diversion rate of 24%

Floor 17: 26.3+25.55+0= 51.86

25.55/51.86= .49

An improved diversion rate of 49%

Floor 18: 25.3+21.09+0= 46.12

21.09/46.12= .45

An improved diversion rate of 45%

Floor 19: 30.14+19.24+0= 49.43

19.24/49.43= .38

An improved diversion rate of 38%

Floor 20: 18.85+15.8+0=34.65

15.8/34.65= .45

An improved diversion rate of 45%

Floor 21: 22.47+15.8+0= 38.45

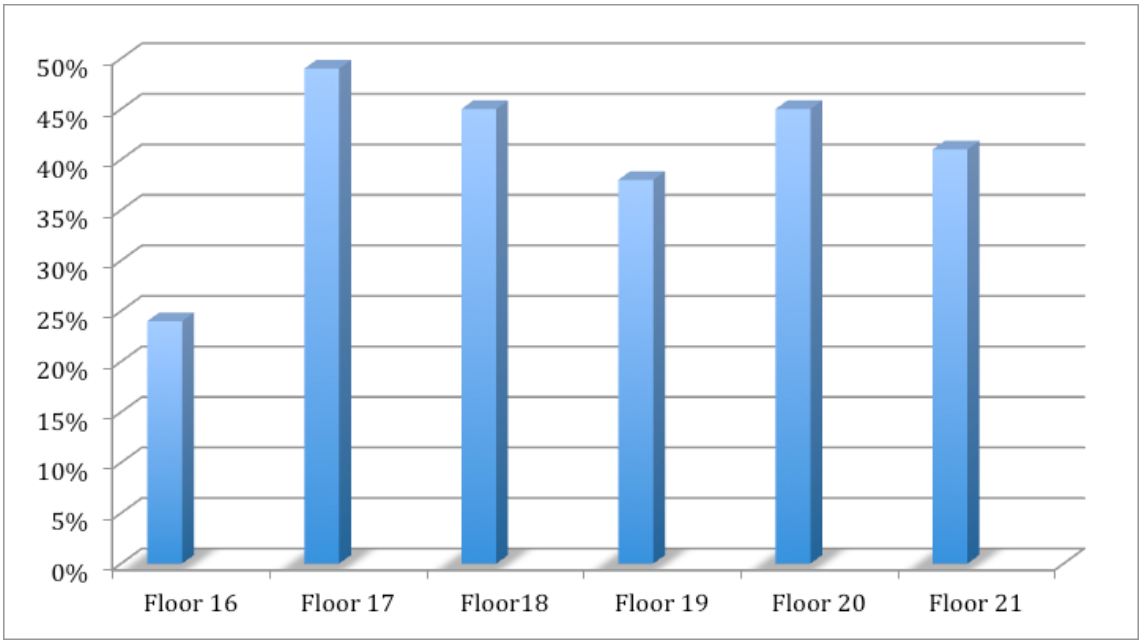
15.8/38.45= .41

An improved diversion rate of 41%

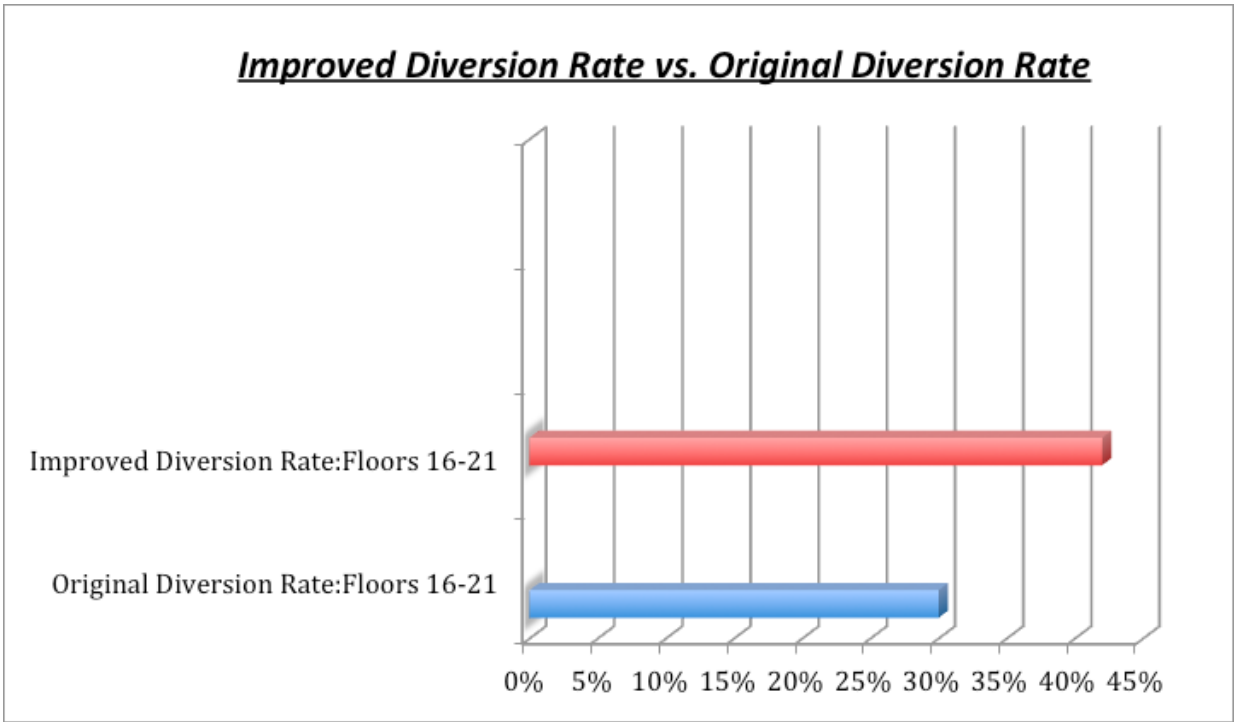
Floors 16-21 combined: 138.83+102.86+0= 241

102.86/241= .42

An overall improved diversion rate of 42%



d. graph illustrating improved diversion rates for floors 16-21; Wabash Building.



e. Graph illustrates the improved diversion rates over the original diversion rates; Wabash Building.

Roosevelt University could also conduct surveys in the residence halls in the Wabash Building. These survey would be used to gather data, learn and identify what the students know about recycling and their perceived recycling habits vs. the actual amount of recycling that is be done. Most importantly the student bodies impression of the recycling agenda. If the students do not deem the recycling agenda to be important that drastically reduces the likelihood of them participating in the programs. Though this might seem painstaking and tiresome, it is great way to analyze the residents actually knowledge of what can be recycled versus trash as well as comparing the data received from the surveyed recycling habits versus what is actually being recycled. This survey would be a great tool in analyzing what is being said and what is actually occurring regarding recycling and trash in the residence hall.With all this being said, it is in my opinion that the greatest way to improve the recycling in the Wabash Building is to educate its residents about proper recycling habits. Not only with orientations at the beginning of the semester, but with signs, charts and boards that clearly indicate, in simple terms, what can be recycled and what cannot be recycled. If Roosevelt University wants the students to improve their recycling habits and vastly increase their diversion rate, they must first equip the students with proper recycling education as well as implement an aggressive strategy to increase recycling by 5 lbs per floor. The potential for

improvement is vast; yet, outstanding improvement can be accomplished with a few simple ideas.

Appendix.

Pictures


Wheat Thins
Oatmeal Squares

The Raw Data Table

Total Weight by Floor: Waste & Recyclable				
	Weight of waste (only landfill) (LBS)	**Weight of waste only Recyclable (LBS)**	**Total Weight of waste (landfill and recyclables) (LBS)**	
Floor 16	**20.77**	**0**	**20.77**	
Floor 17	**31.31**	**20.55**	**51.86**	
Floor 18	**30.03**	**16.09**	**46.12**	
Floor 19	**35.19**	**14.24**	**49.43**	

Floor 20	**23.85**	**10.8**	**34.65**	
Floor 21	**27.47**	**10.98**	**38.45**	
Total	**168.62**	**72.66**	**241.28**	
Trash Data				
Product Type	**Weights from floor 18 (lbs)**	**Weights from floor 20 (lbs)**	**Total of the two floors (lbs)**	
Plastic Items	**4.09**	**2.82**	**6.91**	
Food contaminated items	**5.99**	**14.11**	**20.1**	
Food	**6.53**	**2.07**	**8.6**	
Misc	**13.1**	**4.85**	**17.95**	
Total	**29.71**	**23.85**	**53.56**	
Recycling				

Materials	Weight from floor 18 (lbs)	Weights from floor 20 (lbs)	Total of the two floors (lbs)	
1. Food Contaminated Cardboard	2.16	1.32	3.48	
2. Food Contaminated Plastic	0.71	0.62	1.33	
3. Styrofoam	0.75	0.13	0.88	
4. Food contaminated Paper	3.66	0.57	4.23	
5. Food	1.01	7.89	8.9	
6. Aluminum	0.31	0	0.31	
7. Recyclable Plastic	4.76	0.26	5.02	
8. Glass	2.73	0	2.73	
Total	16.09	10.79	26.88	