Expanding the Organic Waste Recovery Program in Orange County: A Feasibility Study

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Organics Recovery in Orange County

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This paper represents work done by a UNC-Chapel Hill undergraduate student team. It is not a formal report of the Institute for the Environment, nor is it the work of UNC-Chapel Hill faculty.

ENST/ENVR 698—Environmental Capstone 2 University of North Carolina at Chapel Hill
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I. Executive Summary

Introduction and Background
Municipal solid waste management poses a problem in Orange County, North Carolina. Since the Orange County Landfill was closed in July, 2013, Orange County must send its trash to waste transfer facilities in Durham, North Carolina, from where it is trucked at least ninety miles to disposal sites, thus exporting its waste to other areas of the state. Orange County can reduce both its dependence on landfills and its environmental impact by reducing the amount of waste it produces. One way to divert waste from the landfill would be to expand the county’s composting efforts by increasing organic waste collection. The county already works with Brooks Contractors to run a commercial organic waste collection program in which thirty-two food businesses and three schools already participate. In addition to simply reducing overall waste disposed, concentration on reducing organic wastes has the added benefits of reducing uncontrolled methane production and potentially reducing acidity of landfill leachate.

This capstone was tasked by Orange County Solid Waste Management to assess the feasibility of expanding Orange County’s non-residential organic waste recovery program. The group sought to collect data assessing: 1) what kinds of businesses already participate in the program and whether they are satisfied with the services they receive, and 2) what barriers keep other businesses from participating in the program, and how those barriers could be alleviated.

Methods
The capstone team began by collecting background information on organic waste and composting and the history of solid waste in Orange County, and by visiting the Orange County landfill and recycling facility. The group then created and distributed two surveys: one for food businesses...
already participating in the organic waste recovery program, and one for food businesses not participating in the program. They distributed the surveys to about two hundred businesses in Chapel Hill, Carrboro, and Hillsborough and received sixteen total responses. Then they created a map depicting the potential for organic waste collection, which included the location of current participants, restaurants in the county that had indicated interest in the program, and target collection areas that would keep transport costs low. Finally, the group developed marketing and best practice materials for Orange County to distribute to future participants in the program.

**Findings**

Results of the survey indicated that current participants are satisfied with the program, but would like to see different collection containers with a greater awareness of kitchen design in mind, as well as more publicity for the program. Results also showed that the majority of businesses that responded to the survey are interested in participating in the county’s organic waste collection program as long as it is not any more expensive what they currently pay for trash pickup. Concerns that business owners and managers shared include space for storage of organic waste, attraction of pests and vermin, and time required for staff training. The team also found that the amount of money businesses will either save or spend on organic waste collection depends on the percentage of their waste that is organic, the size of their dumpster, and the frequency of their waste collection.

**Recommendations**

The team proposes three main recommendations to facilitate the expansion of Orange County’s organic waste recovery program. First, the county should standardize its operating procedures and cost estimates. Orange County should address concerns about odor, waste separation, and limited space, and will also have to keep costs the same for overall waste pickup. Second, the county should unify its brand and make it more recognizable, potentially using the window cling that the team designed. Orange County Solid Waste Management needs to increase community awareness of the program through unified and recognizable branding. Finally, if the organic waste collection program is to expand, the team recommends that the county examine the feasibility of building an internal composting facility, and explore the capacity of Brooks Contractors to accept a larger volume of organic waste.
II. Introduction and Background Information

a. The Problem of Solid Waste

Collection and disposal of municipal solid waste, the collection of items we use and discard every day, is becoming a major problem in the United States. As the population continues to rise and more people move to cities, solid waste becomes more concentrated and problematic because it has to be managed in a more urban system (Allen & Taylor, 2006). In 2012, Americans produced 251 million tons of trash, 87 million tons of which were recycled or composted (US EPA “Municipal Solid Waste,” 2014).

Municipal solid waste disposal also poses a local problem to Orange County, North Carolina. On July 1, 2013, the Orange County Landfill, located on Eubanks Road, was closed before it was full (Orange County “Orange County Landfill,” 2014). The landfill’s closing was a result of community consensus that low-income, minority neighborhoods had long been burdened by proximity to the landfill due to attendant odors, traffic, and potential negative environmental and public health impacts. As a result of this decision, Orange County decided to ship solid waste that would previously have entered the county’s landfill to waste transfer facilities in Durham, North Carolina. From Durham, the waste travels in tractor-trailers, twenty tons at a time, to landfills up to one hundred miles further away, requiring the county to export the waste created in Orange County to other areas of the state (Orange County “Orange County Landfill,” 2014).

b. Organic Waste Recovery as a Solution

Orange County can reduce both its dependence on landfills as well as its environmental impact by reducing the amount of waste it produces. There are many ways to reduce waste production, such
as source reduction, recycling, incineration, reuse, repurposing, reclamation, salvage, and composting.

Composting is the process during which organic material, or material from plants and animals, decomposes. Composting happens on its own in nature, but can be accelerated and improved for human use. The goal of a composting system is to speed up the natural process of decay in which complex organic material is broken down into simpler substances by creating optimal conditions under which decomposition can occur (e.g., warm temperature and high moisture; Stanley & Turner, 2010). The result of composting is a stable organic product called compost that can be used as a soil additive (US EPA “Composting for Facilities Basic,” 2013). Composting is an effective method to reduce municipal solid waste, as individuals and facilities are able to divert organic waste from the landfill and benefit their backyard or large-scale gardens. For more information on the science of composting and how it works, see Appendix B.

In Orange County, organic waste from commercial, residential, and industrial sources accounts for up to 20% of waste sent to landfills (Orange County “Home Composting,” 2012). The county already has a non-residential organics collection and composting program available, and is now hoping to expand that program. Expansion of this program would significantly decrease the amount of organic matter in the county’s waste, the amount of waste exported to other counties, and the transportation costs it incurs from exporting its waste. Many other cities in the United States have successfully implemented organic waste recovery programs. For example, San Jose, California; Charleston, South Carolina; and the state of Massachusetts all have interesting ways of encouraging organic waste collection and composting. See below for different components of their organic waste collection programs.
The Benefits of Organic Waste Recovery and Composting

There are many potential benefits of organic waste collection, with positive impacts not only on the environment, but also on the economy and on social equity. Using the final product of a composting system results in many environmental benefits, as it significantly improves the quality of the soil to which it is added. Soil that includes compost experiences less erosion and runoff, holds more water, contains fewer pathogens, has a more stable pH, and degrades pollutants more easily (US EPA “Composting for Facilities Basic,” 2013). Therefore, using compost as a soil additive in gardens and on fields reduces the need for chemical fertilizers and pesticides, which are both harmful to the land, air, and water. Compost also reduces the need for water, which is becoming more and more rare and precious (US EPA “Composting for Facilities Basic,” 2013).

Furthermore, the process of composting diverts organic waste from landfills (US EPA “Composting for Facilities Basic,” 2013). In landfills, organic waste is decomposed via anaerobic decomposition, leading to the creation of methane gas (Orange County “Home Composting,” 2012). Anaerobic decomposition of organic waste in landfills is the top contributor of methane gas emissions in the United States, and is known to contribute significantly to global climate change.
change (Orange County “Home Composting,” 2012). Reducing the organic waste stream in landfills, therefore, lessens their direct environmental impact as well as their contribution to climate change.

In addition, the composting process results in several economic benefits. Composting benefits businesses because diverting organic waste from landfills may lower their waste disposal costs, which saves them financial resources (US EPA “Food Waste Basics,” 2014). Composting benefits consumers because it is cheaper to buy compost than it is to buy fertilizer, as compost generally has to travel less distance to get to the consumer than fertilizer does (Kansas Organization of Recyclers, 2012). Composting benefits the county where it takes place because it is cheaper to process compost than it is to bury waste in landfills (Daigneau, 2012). Finally, composting promotes social equity because it diverts waste from traditional landfills. It also means that, over time, less landfill capacity is needed, which benefits vulnerable populations near whom landfills are often located. Diverting waste from landfills improves the public health, sanitation, safety, and comfort of citizens because landfills release toxic gases into the surrounding air, and because landfills are ugly and release harsh odors (US EPA “Public Health, Safety, and the Environment,” 2014). Composting also promotes social equity because it provides jobs for community members –composting provides four times as many jobs as landfilling does (Californians Against Waste, 2013).

**ii. Whole Foods: A Case Study**

Whole Foods in Chapel Hill is one food business that already participates in organic waste recovery through Orange County. Organic waste collection is one aspect of the company’s attempt to become a zero waste company, which requires 90% of waste to be diverted from the landfill to other uses, such as recycling, composting or even feeding people. The company has an...
organized system of waste collection and separation. Whole Foods separates its waste into five streams: landfill, mixed recycling, compost, soft plastic recycling, and “up-cycling” (through remanufacturing or repurposing) through the company TerraCycle. The Green Mission Representative provides employees with a poster that shows what goes into each of the five waste streams (Laura Cloak, Whole Foods representative, personal communication, March 24, 2014).

The company has found organic waste recovery to be a successful means of diverting waste from the landfill. Whole Foods employee teams routinely conduct monthly waste audits – each team has one team trainer in charge of educating all team members on the process and making sure that no waste streams are contaminated. Waste audits conducted from September of 2013 through February of 2014 demonstrated that the food business was able to recover an average of 48.5% of its waste as organic waste each month (Laura Cloak, personal communication, March 24, 2014).

This case study of Whole Foods in Chapel Hill demonstrates the success of organic waste collection. Whole Foods has implemented an organized system of waste recovery, and has been able to divert 50% of its waste from the landfill through composting. See Appendix C for the data collected during the waste audits performed September of 2013 through February of 2014.

c. Organic Waste Collection and Composting in Orange County

There is a lot of support and existing infrastructure for organic waste collection and composting in Orange County. Orange County already works with Brooks Contractors to run a commercial organic waste recovery program, which the county hopes to expand. Thirty-two food businesses participate in this commercial organic waste recovery program, along with UNC-Chapel Hill, and three public schools, the latter paid for by the public school district, with collection using the
same routes as Orange County compostibles. Organic waste that Orange County collects from businesses is transferred to Brooks Contractor’s compost facility in Goldston, NC for processing into topsoil. Once there, it undergoes an intensive process to turn the waste into a commercially valuable product. First, wet and dry organic material like food waste, manure, etc., is dumped into a pit and mixed with animal bedding and cardboard (Books Contractor “Environmental Heroes,” 2009). It is then left to dry and piled for three months, where temperatures can increase to 140 degrees. Piles are turned every week to keep temperatures down and to aerate the piles. After ten to fourteen months of decomposing in a curing pile, it is dumped onto a “screener” that sifts out chunks. The fine material is then sold as topsoil. Brooks sells three types of soil. BR-1 is Grade-A compost, which includes eggshells, leaves, clean wood and other materials. BR-2 is a sandy blend. Finally, BR-4 is their most popular blend – the “landscapers topsoil,” consisting of an equal mix of compost and topsoil (Brooks Contractor “Compost & Topsoil Blends,” 2013).

In addition to this commercial composting program that the county hopes to expand, Orange County also supports residential composting. The county advocates for home composting, and provides bins at cost to interested citizens. Orange County also incorporates free training, information sessions, and compost demonstrations. Additionally, all three municipalities, Carrboro, Chapel Hill and Hillsborough, provide curbside yard waste collection to residents (Town of Chapel Hill, 2014). The collected yard waste is delivered to the Orange County landfill for grinding into mulch for sale, which the county has found to be a profitable venture. The University of North Carolina participates in composting as well. Carolina Dining Services collects food scraps from the Lenoir and Rams Head dining halls, as well as the Beach Cafe, Alpine Bagel, Wendy’s and the Friday Center (UNC Division of Waste Reduction and Recycling, 2014). Food waste from the university is also picked up and composted by Brook’s Contractors in Goldston, NC (UNC Division of Waste Reduction and Recycling, 2014).
The county seeks to make organic waste collection convenient. Orange County has five solid waste convenience centers, located on Bradshaw Quarry Road, Eubanks Road, Ferguson Road, Walnut Grove Church Road, and High Rock Road. These centers accept yard waste and have salvage sheds, but only one, Walnut Grove Church Road, accepts food waste. There are already plans in place to expand the Eubanks Road center within the next year, at which time it will also accept food waste. Twenty-four-hour recycling drop-off sites are publicized on the Orange County website, with several locations listed; however, there is no collection of organic waste from the unstaffed drop-off sites.

The EPA states that up to 70% of solid waste is made of organic material including paper, food, yard waste, and textiles (US EPA “Composting for Facilities Basics,” 2013). Orange County Solid Waste Management Education and Outreach Services strives to reduce that percentage by encouraging businesses and individuals to “starve the landfill and feed the soil” by composting their organic wastes (Orange County “Solid Waste Management Department”, 2014). There are two outdoor composting demonstration sites: Orange County Solid Waste Management Administrative Office at 1207 Eubanks Road, and the Chapel Hill Community Center on South Estes Drive. County staff offer periodic composting education classes at these sites, and the individuals working here help interested schools, businesses, and organizations set up outdoor composting functions (Orange County “Solid Waste Management Department”, 2014).

Successful expansion of the commercial organic waste recovery program seems to be possible based on existing organic waste collection infrastructure in Orange County. A commercial organic waste collection already exists – expansion is the next step for composting in the county. There is also support for residential composting, educational resources, and community outreach. While not directly related to commercial composting, it shows that the county is invested in sustainable waste management and waste diversion.
III. Methods

The capstone team wanted to assess what kinds of businesses are already participating in the commercial organic waste recovery program and determine whether they are satisfied with the program and what improvements could be made. The team also wanted to survey other businesses in Orange County to gauge interest in the program, as well as find what barriers have kept them from participating. The team wanted to present the client with a map showing businesses that already participate in organic waste collection along with those that are interested to show potential collection routes that could be developed. Other deliverables include a window sticker to advertise businesses’ participation in the program, a table depicting various cost estimates for participation in the program, and a document with waste recovery best practices to ease the implementation process of composting in non-residential facilities.

a. The Project

i. Topic Choice

In January, the capstone group was presented with the task of carrying out a feasibility study for the expansion of the organic waste collection program for Orange County Solid Waste Management. The underlying question that the group initially faced was “What would a successful organics recovery program look like for Orange County?” In the first several weeks of meeting, the group narrowed down the topic to focus on commercial, non-residential collection of organic waste in Orange County, specifically locations in Chapel Hill, Carrboro, and Hillsborough. The goal of this project was to create a design off of which Orange County Solid Waste Management can build a successful, sustainable organic waste collection program.
ii. The Client

The client for this capstone project was Orange County Solid Waste Management, represented by Blair Pollock, a solid waste planner at the Orange County Solid Waste Department. Pollock, a graduate of the Masters program in City and Regional Planning at The University of North Carolina at Chapel Hill, started the recycling program for Orange County in 1987. The group met with Pollock twice in the beginning stages of the project. Pollock provided background information on waste management in Orange County and its relationship with Brooks Contractors, and discussed his hopes for a commercial food-waste collection program, including which types of restaurants and stores with which he hopes to work. Pollock was supportive of the group during the semester, as he made himself available for consults about the group’s research activities, the survey sample and instrument, and general project questions.

b. Getting Started

i. The Work Plan

In January, the capstone team composed a work plan that served as the guideline of the project, and enumerated key steps and milestones. The original work plan called for completing background research on composting, obtaining Institutional Review Board (IRB) approval, touring the Orange County Landfill, touring Brooks Contractors, completing waste audits of both businesses that already participate in organic waste collection and those that do not, sending businesses a survey about their interest in organic waste collection, producing a map showing areas with great potential for organic waste collection, and developing marketing materials for businesses that participate in composting. The work plan was revised throughout the semester to
account for scheduling changes related to weather, availability of tour dates, and other logistics, as well as to reflect the advice from the client.

ii. Landfill Tour

The team visited the Orange County landfill on Eubanks Road (Chapel Hill), which stopped accepting municipal solid waste in 2013, in order to get an understanding of where most waste ends up (see photos in Appendix K). The property contains two landfills, one on either side of the road; both have built earth walls to hold all the waste. The vast size of the landfill was in itself a surprising sight to see. Even for a college town in North Carolina, the amount of land needed to accommodate all the waste generated is daunting, with a 208-acre site containing a closed 45-acre unlined landfill, a closed 26-acre lined landfill, a closed 11-acre construction waste landfill, and an active 13-acre construction waste landfill. This tour highlighted the need for organic waste collection in order to help prevent the negative environmental effects of landfills. The trip also shed light on the social equity concerns that often arise from landfills. The landfill on Eubanks Road raises equity questions, surrounded as it by historically African-American and low-income neighborhoods. Residents have voiced their concerns for many years over negative impacts, including offensive odors that make it hard to breathe, and concerns over water quality. Touring the landfill emphasized for the team the reality of how waste has been handled for many decades, and demonstrated a clear need for an organic waste recovery program.

c. Survey and Data Collection

The capstone team surveyed food businesses in Chapel Hill, Carrboro, and Hillsborough to investigate their awareness of the existing organic waste collection program, willingness to
participate, and barriers to their participation. The team’s intention was to provide a more robust set of information for Orange County to see areas of improvement and analyze the feasibility for the growth of the program. Team members drafted a survey that was edited by Bianca Lopez, Dr. Elizabeth Shay, and Blair Pollock. The team sought approval from the Institutional Review Board (IRB), which generated a decision that the planned work was exempt from further review. The team then used information from the Orange County Health Department to generate a list of food businesses to contact. See Appendices D and E for the survey that was sent to the food businesses.

After completing the survey and working with IRB, the capstone team moved on to data collection. The group found that the most feasible option for carrying out the survey was through an online survey forum. The group chose the online survey site Insightify for its capability to provide anonymous responses, graphic representation of collected data, and options for open-ended responses. One survey was created online for current participants in the organic waste collection program and one survey was created for businesses previously identified as possible future participants in the program. Upon creation of the two online surveys, they were sent out to the businesses through email. The team gathered contact information for the businesses. Each student was responsible for gathering up-to-date email contacts for approximately forty businesses, and Pollock provided the contact information for current participants. On March 31, each business that provided an email contact received the online organics survey. See Appendix F for the list of food businesses to which the team reached out. The capstone team gave the selected businesses approximately five days to complete the survey in order to give students ample time to conduct a follow-up survey if necessary and to analyze the collected data.
d. Data Analysis

The survey response rate for the two hundred businesses contacted was low. Three current participants in the organics collection program in Orange County responded to the survey. However, the responses for businesses contacted that represented potential participants was higher, with thirteen responses. The intention was to provide a more robust set of information for Orange County to identify areas of improvement and analyze the feasibility for the growth of the program. Despite the low response rate, the surveys will aid in reaching those goals. The data establishes a concrete foundation regarding which establishments are interested in participating in the organics collection program, what aspects of the program are working well, and suggestions for improvements.

Of the three surveyed businesses currently participating in the Orange County organics collection program, two responded anonymously and one identified itself as Hillsborough BBQ Company. All three respondents identified their business types as “casual dining” restaurants. All of the participants have been involved for less than ten years, two of which were approached about participating by Pollock and one of which learned of the program from another participating business. Two of the participants claimed their reasoning behind participation stemmed from environmental responsibility while the third surveyor said it was due to weekly cost savings. None of the responses indicated strong opinion of the difficulty of organics separation, and all three surveyed believed training employees for organics separation was fairly easy. When questioned about the amount of money saved by participating in the program, if any, one business indicated that it has saved $120 per month. Responses also showed that there is no real worry by businesses concerning inconvenience, pest problems, or offensive odors. Current
participants would like to see different collection containers with a greater awareness of kitchen
design in mind, as well as more publicity for the program.

Despite the changes the businesses might like to see, the three surveys specified that the
organics program does a good job with frequency of collection, sanitizing the containers upon
collection, and involving staff in organics collection. Although responses varied widely about
customers valuing businesses’ participation in the organics program, 100% of the businesses said
they would like to publicize their participation by using a window decal, web sticker, and/or
becoming part of an online participation list. The capstone team wanted to see what other
sustainable practices the businesses were a part of by asking about recycling practices and
possible participation in Piedmont Biofuels collection. Each of the businesses are involved in
recycling programs, either with the county or a private company; however they tend to only use
the services for recycling of some plastics, glass bottles, and mixed paper for the most part. All
three participants are also working with Piedmont Biofuels to collect and remanufacture their fats
and oils into biodiesel transportation fuel. See the table on the following page for how the three
respondents feel about the ease of the program’s aspects, and see Appendix G for the complete
responses from the three program participants.

The survey data collected from potential participants in the organics collection program is
slightly more diverse. Because the number of responses was greater, the data varied widely as
well. Not all of the questions were mandatory, so many of the questions do not have thirteen
complete responses. Of the thirteen businesses that completed the survey, nine provided contact
information and four responded anonymously. Seven were casual dining establishments, one was
a fine dining restaurant, and one was a grocery store. The businesses were split almost evenly in
their previous knowledge of the organics waste collection program. Only two of the businesses
have been approached by Orange County about their participation in the program, potentially
indicating the need for greater publicity and outreach for the program. Barriers for their participation in the past varied anywhere from fear of the unknown to concerns about odors or vermin, to worries of staff participation and issues with space. Two of the businesses surveyed believed they might not generate enough waste to make the collection worthwhile.

The survey was able to get more current and concrete data on the interested businesses’ waste disposal methods, size of waste containers, frequency of waste collection, and method of cooking. With this type of information, Orange County can determine if the organics collection is fundamentally and economically feasible for certain businesses. Twelve out of thirteen respondents indicated that they were interested in participating in organics waste collection in the future. However, when asked for information for a follow-up interview, only nine of the twelve interested in the program provided the necessary information. The businesses that provided contact information were Crooks Corner, Elements Restaurant + Wine Bar, Market Street Coffee, Sandwhich, Glasshalfull, Milltown, Southern Rail, Weathervane, and Open Eye Café.
The survey also asked what would make them more interested in the program. Most of the respondents said they would like more information, training for their staff, and to see possible savings on normal trash pickup. However, each of the respondents had reservations in some capacity, either due to space, staff time, or staff training. As seen in the survey responses from the current participants, these respondents overwhelmingly said they would like to publicize their participation in the program and indicated that they believe their customers would strongly value their participation as well.

Of the thirteen non-participant survey respondents, nine of the businesses indicated they were willing to speak with members of the capstone in a face-to-face follow-up interview. However, due to scheduling constraints, the group was only able to speak with two of the businesses in person. One business is a “white tablecloth” restaurant that identified as operating with mostly scratch cooking, producing over 90% organic waste, and using traditional waste collection. This business creates such a large volume of organic waste that staff voiced concerns.
about having enough space for the collection bins as well as their normal dumpster that they share with two other restaurants. The chef with whom the team spoke was aware of the resources that could be utilized from his kitchen and at one time allowed a local farmer to pick up organic food waste once a week.

The largest barrier other than space is simply the lack of awareness about the program. Before the team contacted the restaurant, those in charge had no knowledge of the program’s existence or how it operates. Pollock has been in touch with this particular establishment since the original survey was conducted and they are currently considering implementing the program. The second business is a casual dining establishment that operates with mostly scratch cooking, which produces about 30% organic waste; they and use a traditional waste collection dumpster that is shared with neighboring businesses. The owner was in touch with Pollock a few years ago about their participation in the organics collection program but unfortunately nothing came of it. The chef is still interested in participating, but also had concerns with space and how they would begin to incorporate the organics diversion process into their kitchen operations. During the interview the tight-knit relationship between the restaurant and the customers was apparent. Their possible participation is self-motivated, but the interests of the customers weigh heavily on the restaurant’s decisions as well. The follow-up conversations with these companies allowed for more individualized, detailed information to be gathered that can be used by Orange County to know more specifically what can be done to attract new participants to the program. See the three tables below for how the potential participants currently have their waste collected and disposed, and their interest in the organic waste recovery program. See Appendices H and I for the complete responses from the thirteen potential program participants.

The capstone team believes that the data collected through the online survey will be able to provide enough information for Orange County to begin making changes to accommodate
current participants’ needs as well as alter portions of their operations and outreach to better serve new businesses in the future. It is clear that the current participants are happy with the operations of the organics collection program, but have been able to provide valuable feedback that will aid in improving the program overall by indicating potential barriers that Orange County can address moving forward. Expansion of the program to new businesses seems to depend on increasing outreach efforts, providing more information about the program, and facilitating on-site employee training which is not currently being offered at this time. Overall, the collected survey data laid a firm foundation for Orange County to build upon in the future in growing their organics collection program.

e. Products

i. “Food Businesses Participating in or Interested in Organic Waste Collection” Map

The map “Food Businesses Participating in or Interested in Organic Waste Collection” visually depicts both the restaurants in Chapel Hill, Carrboro, and Hillsboro that are already composting with the county, using data provided by Pollock, as well as restaurants in the county that indicated interest in the county’s organics collection program. The map will allow Orange County Solid Waste Management to identify the location of businesses that either already participate in the organics collection program or are interested in the participating in the program. A visual product will help the department to calculate the most efficient method of organic waste collection and will help to alleviate the costs of the program. Furthermore, the map will also help Orange County Solid Waste Management to identify certain areas with more interested businesses. The department could then look to increase program participation in certain locations in order to maximize efficiency.
Food Businesses Participating in or Interested in Organic Waste Collection:

Legend

Tons
- 0 - 8
- 9 - 21
- 22 - 35
- 36 - 100
- 101 - 302

Potential Restaurants
Non-Residential
Food Stands
Restaurants

Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo and the GIS User Community
ii. Window Sticker

The team designed a window sticker that can be displayed in the windows of businesses that participate in organic waste collection and will provided by Orange County Solid Waste Department. The intent of the window sticker is to allow customers to make informed decisions about where they choose to eat. In the survey that was sent out to non-participants, 100% of businesses indicated that they would want to be able to publicize participation in the county’s organics collection program with a visible sticker, window cling, or certificate. The window cling, which indicates that the business participates in organic waste diversion efforts through Orange County, would be valuable in recruiting businesses to participate in the program.
iii. Scenario Table

The team created a scenario table that depicts the costs that food businesses would either spend or save while participating in the organic waste recovery program per year. The scenario table takes into account several different variables involved with businesses’ food waste patterns based on the results of the survey responses that the team received. The first main variable is the current volume of waste that restaurants collect: 55.56% of those who responded to the survey said their waste is currently collected in a dumpster that holds eight cubic yards of waste, and 33.3% of respondents said their waste is collected in a dumpster that holds four cubic yards. The second main variable is the approximate percentage of organic waste that restaurants produce: 30.7% of respondents claim that 50% of their business’ waste is organic, 23.8% of respondents claim that 30% of their business’ waste is organic, and one business with which the group followed up claims that 90% of its waste is organic. The third main variable is the number of times restaurants’ waste is collected: 53.8% of respondents claim their business’ waste is collected once per week, and 23.8% of respondents claim their business’ waste is collected twice per week.

While not directly involved in the cost calculations, the table also depicts the business type: 70% of survey respondents describe their restaurant as casual dining, and 20% of respondents describe their restaurant as fine dining.

Based on the restaurants’ current volume of waste and number of collection times per week, the calculator determines how much money would be saved by removing the organic waste from dumpsters, and how much would be spent on organic waste collection. The team calculated how much additional money the restaurants would need to spend (depicted in red), or how much money restaurants would save per year once starting to recover organic waste. Calculations were performed based on the estimation that one cubic yard of trash weighs between one and two hundred pounds (150 pounds was used) (“Waste Disposal and Treatment”, 2008). Rates for trash
pick up in Chapel Hill were collected online, although collection rates in Carrboro are a bit higher than those in Chapel Hill (Town of Chapel Hill, 2014). Below is a sample calculation for expenditures for Scenario 1:

\[(4\text{yd}^3/1\text{week}) \times (150\text{lbs/1yd}^3) \times (1\text{ton}/2,000\text{lbs}) \times ($80/\text{1ton}) \times (52\text{weeks/1year}) = $1,248\]

Estimated Savings: $1,250 – ($900 + $1,248) = $-898

<table>
<thead>
<tr>
<th>Business Type:</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
<th>Scenario 3</th>
<th>Scenario 4</th>
<th>Scenario 5</th>
<th>Scenario 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current volume of waste:</td>
<td>Casual Dining 8 cubic yard dumpster</td>
<td>Fine Dining 8 cubic yard dumpster</td>
<td>Casual Dining 4 cubic yard dumpster</td>
<td>Fine Dining 4 cubic yard dumpster</td>
<td>Casual Dining 8 cubic yard dumpster</td>
<td>Fine Dining 8 cubic yard dumpster</td>
</tr>
<tr>
<td>Approximate % of organic waste:</td>
<td>50%</td>
<td>50%</td>
<td>30%</td>
<td>30%</td>
<td>90%</td>
<td>90%</td>
</tr>
<tr>
<td># of collection times per week:</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total volume minus % organic:</td>
<td>4 cubic yards</td>
<td>4 cubic yards</td>
<td>2.8 cubic yards</td>
<td>2.8 cubic yards</td>
<td>1.8 cubic yards</td>
<td>1.8 cubic yards</td>
</tr>
<tr>
<td>Rate for volume category (annual rate)*:</td>
<td>$1,250</td>
<td>$900</td>
<td>$900</td>
<td>$550</td>
<td>$1,250</td>
<td>$900</td>
</tr>
<tr>
<td>Recommendation for Suggested Decrease Estimated Expenditure (+) or Saving (-) Per Year**</td>
<td>Reduce collections/ week</td>
<td>Reduce dumpster size</td>
<td>Reduce collections/ week</td>
<td>N/A</td>
<td>Reduce collections/ week</td>
<td>Reduce dumpster size</td>
</tr>
<tr>
<td></td>
<td>+$898</td>
<td>+$898</td>
<td>+$24</td>
<td>+$374</td>
<td>-$312.80</td>
<td>-$312.80</td>
</tr>
</tbody>
</table>

*based on data found on Town of Chapel Hill’s website; for illustrative purposes only, as data may change

**based on Pollock’s rate of $80/ton of organic waste collected only; for illustrative purposes, as data may change

This table demonstrates that separate organic waste collection does not always financially benefit the business. Doing so most significantly benefits restaurants that collect a large volume of waste, of which a large percentage is organic.
iv. Non-residential Composting Guidelines and Best Practices

The following best practices are a suggestion to ease the implementation process of composting in non-residential facilities. The goal is full participation and cooperation of all parties – property and business managers, collection service providers, janitorial service companies, as well as tenants – to effectively employ source separation techniques in order to reduce the stream of organic waste to landfill. These best practices are modeled after the commercial composting program in San Francisco, California (San Francisco Department of the Environment, 2014).

In this section, you will find:

Roles of primary participants

Best practices for composting program

PARTICIPANTS

Successful separation of organic waste from other solid waste within commercial businesses requires integrated efforts of the building management, tenants and/or janitorial staff. Property management companies should be responsible for signing up with collection service providers, enforcing education and training. Tenants should be responsible for separation of waste into appropriate receptacles.

BEST PRACTICES

This section contains the best common practices for effective implementation of recycling and composting programs, and applies to the model programs described below.

a. **Clearly define staff responsibilities.** This information includes what materials to collect, container locations, frequencies of collection, equipment used, and also
feedback systems to report contamination.

b. **Label and color-code containers.** Use signs with images to further identify acceptable materials (see Appendix J).

c. **Locate centralized containers together for recycling, composting and trash.** No trash container should be without both recycling and composting. Avoiding isolated trash containers and reducing total number of trash containers makes separation of materials more intuitive and easier to distinguish all three waste streams.

d. **Provide containers for recyclables and dry trash without plastic liners.** Not using liners saves time and material costs, unless liquids from recyclable or trash beverage containers make it necessary to clean the bins regularly.

e. **Collect paper towels from restrooms for composting.** Ladies restroom stalls should continue to have receptacles for feminine hygiene products. Diaper changing tables should have their own, lined trash can to keep separate from paper towels.

f. **Educate tenants and janitorial staff with easy-to-understand and informative materials.** Training for new tenants and staff in addition to ongoing reminders for current staff includes what is acceptable for each of the three containers. They should be made aware that improperly sorted recyclables or compostables might end up sent to landfill due to contamination. For example, white paper with food or oil stains cannot be recycled into new paper, but can be composted. Training should also properly convey the motivation to separate organic waste, including the value in the material and the environmental effects of organic material decomposition in landfills.
IV. Recommendations

Results of the semester-long capstone project indicate that area restaurants and other food-related, non-residential entities would be willing to separate organic waste to be composted if the cost would not be greater than the current trash bill and if the negative associations with composting would not affect restaurant image. It is also necessary to create a brand identity for those who participate in the organics waste program for better community exposure and adoption. Orange County Solid Waste Management should consider the following elements in the expansion of the current organics collection program:

1. Standardization of Operating Procedures and Cost Estimates
2. Brand Unification & Recognition
3. Further Analysis of Outsourcing to Third-Party Contractors

STANDARDIZATION OF OPERATING PROCEDURES AND COST ESTIMATES

1. Survey results indicated that the primary concern of most potential participants was the odor and/or attraction of vermin. Secondary concerns included the worry about effective separation of waste and limited space. Conventional trash bins attract pests just as much as a composting bin would; realistically, separation and pickup of organic waste might reduce the prevalence of odor and pests in traditional landfill trash.

2. Another qualifier expressed by potential participants was that they would gladly take on the separation if their overall trash bill would not increase or increase relatively minimally. By having a standardized cost calculation tool or table rather than just providing case-by-case estimation, potential participants have the more information to make financial decisions.
3. By providing standard training and operational procedures, OCSWM can help reduce perceived risk of these negative associations and ease the worries of potential participants.

4. Deliverables include: spatial analysis map, window sticker, cost scenario table, and best practices.

**BRAND UNIFICATION AND RECOGNITION**

1. Building trust in OCSWM as a consistent and reliable program as well as creating desirability in separating food waste via composting as a way to use the brand as a social mechanism for behavioral change. Increasing community awareness of the program through a decal posted on participating businesses’ doors will encourage further participation.

2. Making it a top priority that OCSWM provides consistent quality in composting collection services so that participating businesses become loyal customers, inadvertently improving brand perception and overall perception of food waste (via ‘word of mouth’ for example).

3. Allowing brand decal and overall brand unification to attract the attention of the local community, in hopes that citizens will become curious and adopt food waste separation as an environmentally and economically feasible practice.

4. The main deliverable is the brand decal sticker, which will tangibly enforce the brand unification effect and promote recognition of the brand.

**FURTHER ANALYSIS OF OUTSOURCING TO THIRD PARTY CONTRACTORS**

1. The final recommendation for OCSWM would be to evaluate the current contract with Brooks Contractors and consider the feasibility of insourcing composting capabilities.
2. Throughout the course of the project, Brooks Contractors was difficult to reach to obtain concrete information. Their ability to handle increased capacity through expansion of the OCSWM program is unknown. Additionally, even if upfront costs could be met through local grant money, the team is unable to ascertain that a composting facility owned by OCSWM would generate a sustainable revenue stream through sale of compost.

3. A concrete recommendation to proceed with outsourcing is beyond scope of this capstone project, but should be carefully considered in the event of program expansion.
V. Alternatives, Risks, and Assumptions

While implementing the recommended practices for expansion of the organics waste program, Orange County Solid Waste Management should take into account the alternatives to the proposed program, the risks associated with the program, and assumptions made while structuring the program. The important parameters to consider are listed below:

Alternatives: (1) Continue traditional means of waste disposal and not separating food waste, (2) Consider storing food waste and donating food waste independently (a practice already underway informally, for example, with breweries, restaurants and farmers), and (3) Businesses avoiding blatant acknowledgement of composting services.

Risks: (1) Food waste bins create greater negative effects than expected in terms of odor and pests, (2) Adoption of food waste separation is slower than expected, and (3) Brooks Contractor is a monopolistic operator for the Orange County organic waste collection market.

Assumptions: (1) Brooks Contractor will be able to handle the influx of organic waste once businesses join the program, (2) Tax increases or increases in cost to the already existing Orange County Solid Waste Management program will be relatively minimal to citizens, and (3) Brand unification through usage of composting decal will create pride in separating food waste and allow for community curiosity and engagement in composting.
VI. Acknowledgements

The capstone team would like to acknowledge Dr. Elizabeth Shay of the Institute for the Environment and Bianca Lopez of the Curriculum for the Environment and Ecology at UNC Chapel Hill for their instruction, guidance, and wisdom during the research process. Their attendance at team meetings, reading of multiple drafts of this report, general advice on how to effectively conduct research, and dedication to students are greatly appreciated. The team would also like to acknowledge Laura Cloak, the Green Mission Representative at Whole Foods in Chapel Hill, for sharing her insight into the organic waste collection program at Whole Foods and Muriel Williman, the Solid Waste Education and Outreach Coordinator at Orange County Solid Waste Management, for sharing her insight into the organic waste collection efforts of the county. The team recognizes all of the commercial food businesses in Orange County that participated in the survey, and those that were willing to follow up. Finally, the team wishes to thank Blair Pollock, solid waste planner of Orange County, for his time, his willingness to work with the group, and his commitment to sustainable waste management.
VII. Appendix

A. The Massachusetts Example

Solid waste disposal bans are becoming more prevalent as the move towards sustainable waste management rises. An example of this movement can be observed in Massachusetts (MA). The Massachusetts Department of Environmental Protection has established a solid waste disposal ban that would apply to businesses and institutions disposing of one ton or more of food waste per week. This ban will be effective October 1, 2014. Luckily, hundreds of businesses and institutions have already taken steps to reduce food waste from disposal to relying on different options. In this process, they have been able to reduce their disposal cost as well as purchasing cost. Below is the Food Estimation Guide provided by MassDEP (RecyclingWorks Massachussets “Options,” 2014).

To reduce and divert food waste, MassDEP has highlighted three steps: reduce, donate, and process. Reducing the total volume of food waste generated includes tracking where and how food is wasted, reducing the number of menu items, discounting items close to expiration at supermarkets, and utilizing proper food storage techniques. Donating unused food to people through food banks, soup kitchens, and shelters is another option. Processing includes on site

---

What is Commercial Organic Material as defined by the waste ban?

**Food Material**
Includes but is not limited to: fruits, vegetables, grains, fish, and animal products and byproducts.

**Vegetative Material**
Plant material

1 Leaf and yard waste is covered under a separate existing waste ban.

**General Conversions**
- 1 ton = 2,000 lbs
- **Commercial-Industrial waste**
  - 1 yd³ (cubic yard) = 300 to 600 lbs
- **Food scraps**
  - 55 gallons = 200 to 450 lbs

Based on EPA’s standard volume-to-weight conversions.
options (to save money in hauling fees) and off site options (anaerobic digesters, animal feed, compost, and industrial uses). RecyclingWorks heads the organic waste ban logistics in MA so businesses and institutions can identify where and how they can mitigate their waste.

RecyclingWorks helped Worcester State University set up a successful off site composting program to comply with the commercial organics waste ban -- this movement diverts sixty tons of food waste each year! This organic waste ban program is not intended to save money at the forefront, but instead save money indirectly in the future. Stated benefits of this new program include increased opportunities to create energy by anaerobic digestion, create fertilizers and other soil additives through composting, and a greater ability to generate power at farms, wastewater plants, and other locations. The cost of composting or hauling waste to an anaerobic digester is usually equivalent to the cost of paying to haul away trash. Massachusetts has decided to focus on larger food waste generators to spur the development of cost effective infrastructure for collection and processing of organic waste (RecyclingWorks “Options,” 2014). The state has published a guide to reducing food waste, which highlights action steps and resources for any size business to implement the necessary changes (RecyclingWorks Massachusetts “How to Estimate Food Waste,” 2014). They are as follows:

1. Conduct a food waste audit for your business so you have a baseline (O’Connor, 2013)
2. Change your ordering/purchasing process to prevent food surplus (O’Connor, 2013)
3. Donate food to organizations that pick up and deliver food to shelters and soup kitchens (O’Connor, 2013)
4. Donate to farmers or zoos for animal feed (O’Connor, 2013)
5. Check into composting companies, like Bootstrap Compost and Save the Stuff, who haul waste for you and match your cost to haul trash (O’Connor, 2013)
Total costs for MSW Disposal equals local residential collection, plus hauling from towns to disposal facilities, plus tipping fee at disposal facility. Total greenhouse gas emissions equals total emissions to transport MSW (truck or rail), plus total emissions from disposal site (landfill or waste-to-energy), minus avoided emissions for electricity generation. A study in Hingham, MA that stated a decrease of 502 tons in 2012 (as compared to 2011) showed a savings of $41,000 in waste disposal cost. MassDEP has also implemented waste bans on certain hazardous, recyclable, and compostable materials in an effort to reduce the volume and toxicity of trash disposed of in MA. The restrictions/bans on disposal began in 1990, with additions to this policy continually added over time to eliminate the most prevalent materials in the waste stream for which there are viable alternatives to disposal (Hingham Town Hall).
B. The Science of Composting

The two largest factors that affect composting are oxygen content and moisture (Epstein, 1996). Composting is an aerobic process, so oxygen is essential (Epstein, 1996). To ensure that the compost receives an adequate amount of air, it is important that the compost pile be porous, as a more porous pile will allow air to flow through more freely (Stanley & Turner, 2010). It is also important for compost piles to maintain the proper moisture content (Stanley & Turner, 2010). Too little moisture slows the process of decomposition, while too much moisture prohibits aeration from occurring (Stanley & Turner, 2010).

Carbon and nitrogen are also vital to the composting process (Epstein). The microbes that decompose the organic matter use carbon as an energy source, and use nitrogen in order to synthesize proteins (Stanley & Turner, 2010). “Green” organic materials, which include grass trimmings, food scraps, and manure, are rich in nitrogen. “Brown” organic materials, however, include dry leaves, wood chips and branches, and contain large amounts of carbon. (“Composting for Facilities Basic,” 2013). In addition to the presence of plentiful carbon and nitrogen, it is critical that there is also a suitable carbon to nitrogen (C:N) ratio in composting systems in order to create quality compost (US EPA “Composting for Facilities Basic,” 2013). The ideal C:N ratio for commercial composting is 30 parts carbon to every 1 part nitrogen (Stanley & Turner, 2010). For residential composting, however, the C:N ratio should be slightly lower with 25 to 30 parts carbon to every 1 part nitrogen (Stanley & Turner, 2010).
C. Waste Audit Data from September 2013 – February 2014 at Whole Foods

“GMWasteTracking-1”

(all weights expressed in pounds)

<table>
<thead>
<tr>
<th>MUNICIPAL SOLID WASTE</th>
<th>FY 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>September</td>
</tr>
<tr>
<td>Landfill</td>
<td>49700</td>
</tr>
<tr>
<td>COMPOSTS</td>
<td></td>
</tr>
<tr>
<td>Compost</td>
<td>72750</td>
</tr>
<tr>
<td>Wood</td>
<td>38216</td>
</tr>
<tr>
<td>Oil</td>
<td>1092</td>
</tr>
<tr>
<td>Food Donations (food scraps)</td>
<td>9242</td>
</tr>
<tr>
<td>RECYCLING</td>
<td></td>
</tr>
<tr>
<td>Mixed Recycling</td>
<td>2420</td>
</tr>
<tr>
<td>Soft Plastics</td>
<td>1816</td>
</tr>
<tr>
<td>Corrugated</td>
<td>61650</td>
</tr>
<tr>
<td>Paper</td>
<td>5362</td>
</tr>
<tr>
<td>Terrecycle</td>
<td>8</td>
</tr>
<tr>
<td>ELECTRONICS</td>
<td></td>
</tr>
<tr>
<td>Batteries</td>
<td>300</td>
</tr>
<tr>
<td>Cell Phones</td>
<td></td>
</tr>
<tr>
<td>Cork (other 4)</td>
<td>0</td>
</tr>
<tr>
<td>UNFI Totes (other 5)</td>
<td>0</td>
</tr>
</tbody>
</table>

(Laura Cloak, personal communication, March 30, 2014)
D. Survey for Present Participants in Organic Waste Recovery Program

Survey for Present Participants in Orange County Food Scrap Collection Program

The survey has been created by a team of undergraduate students at UNC Chapel Hill who are working closely with Orange County Solid Waste Management Department to assess the potential of expanding the operations of their current Organics Recycling Program. By taking a few minutes to tell us about your experience working with the program thus far, your responses will provide the necessary information for Orange County to better serve you in the future and potentially expand this program to effectively serve more businesses. We ensure complete confidentiality, as specified by our research plan, which was approved by UNC-Chapel Hill’s Institutional Review Board. Participation in this questionnaire is completely voluntary, so if you feel at any time you do not want to continue your participation you may do so without consequence. Most of the questions are brief and objective, but we welcome the opportunity to do a follow-up interview with interested individuals. Thank you in advance for allowing us insight into your experience working with Orange County’s Organics Waste Collection.

Customer Type: ____Grocery _____Casual Dining _____Fine Dining
_____Institution _____Other (please specify) ____________________

Indicate when your organization began participating in organic waste collection:
___Less than 2 years ___2-5 years ___5-10 years ___10+ years

How did you learn about Orange County’s Organics Recycling Program?
___Orange County Solid Waste Management website _____Other participants
_____Blair Pollock _____Other (please specify) __________________________

What is your motivation for participating in the organics waste collection program?
_____Cost savings from weekly waste pickup _____Environmental responsibility
_____Marketing Purposes _____No particular reason
_____Other (please specify) _____________

Organics collection information: (check all that apply)

Indicate response on a scale from 1 to 5 (1 being extremely easy and 5 extremely difficult).

Process of separating food and organic scraps for collection:
1  2  3  4  5

Difficulty of properly separating food and other compostable scraps from ‘true waste’
1  2  3  4  5

Training employees for organics separation
1  2  3  4  5

Pick whichever best applies:
___I save money on waste disposal from separating organics
   (Provide an estimate of savings per month or year) __________________________
I pay the same for waste disposal whether I separate food waste or not

It costs me more in labor time to separate than when I mix all waste together

(Provide an estimate of extra labor costs) ___________________________

I don’t know

Indicate answer that best applies:

Causing offensive odor:
Always    Frequently    Rarely    Never

Causing pest problems:
Always    Frequently    Rarely    Never

Causing inconvenience:
Always    Frequently    Rarely    Never

What would you like to see done differently? (Check all that apply)

More frequent collection
Different type of container(s)
More training by Brooks or Orange County for the staff
Kitchen designed with separation in mind
Orange County should publicize the program more
No changes needed
Other (please specify) ___________________________

What parts of the organic waste collection program work well? (Check all that apply)

Frequency of collection
Container sanitization
Staff participation
Other (please specify) ___________________________

How much do your customers value your participation in organic waste collection? (Scale from 1-5 with 1 being ‘do not value at all’ and 5 being ‘highly value’)

1    2    3    4    5

Would you be interested in support for publicizing your participation?

Yes (Check all that apply): ___________________________
No

Window Decal
Web Sticker
Online participant list
Other

Do you receive recycling services from Orange County Solid Waste Management for bottles, cans, and paper?

Yes    No (if no please indicate which of the following):

We take recyclables to a drop-off site
We use a private recycling company
We do not recycle cans, bottles, and paper
What items do you recycle through Orange County programs?

___Plastics    ____Glass bottles    ____Metal cans    ____Mixed paper
    ____Corrugated cardboard    ____Plastic cups, tubs, and buckets #2, 4, and 5
___Other (please specify) ___________________________

How frequently do you use Orange County’s other disposal programs for:

- Hazardous waste recovery (paint, pesticides, fluorescent bulbs, etc.)
  - Frequently    __Sometimes    __Rarely    __Never
- Electronics recycling for computers, televisions, cell phones, etc.
  - Frequently    __Sometimes    __Rarely    __Never
- Drop-off sites for cans, bottles, and cardboard
  - Frequently    __Sometimes    __Rarely    __Never

Are you actively involved in collection of waste fats, oils and grease with Piedmont Biofuels?

___Yes    __No

On behalf of Orange County’s Organics Recycling Program, we appreciate your participation in this anonymous survey. If you would like a formal analysis of the results we will be more than happy to provide them to you when the report is complete.
If you would be willing to participate in a follow-up interview for more detailed feedback, please provide contact information:

Contact Name: ____________________________________________

Contact Phone Number and Email: ________________________________

Ideal Form of Contact: __________________________________________

Organization Address: __________________________________________
E. Survey for Potential Participants in Organic Waste Recovery Program

Survey for Potential Participants in Orange County Food Scrap Collection Program

This survey has been created by a team of undergraduate students at UNC-Chapel Hill who are working closely with Orange County Solid Waste Management to assess the potential of expanding the operations of their current Organics Recycling Program. Your responses will help us in our assessment of the feasibility of expanding the organics collection program and how best to go about doing so. We ensure complete confidentiality, as specified by our research plan, which has been approved by UNC-Chapel Hill’s Institutional Review Board. Participation in this questionnaire is completely voluntary, so if you feel at any time you do not want to continue your participation you may do so without consequence. Most of the questions are brief and objective, but we welcome the opportunity to do a follow-up interview with interested individuals. Thank you in advance for allowing us insight into your experience working with Orange County’s Organics Waste Collection.

Customer Type: ___Grocery ______ Casual Dining _____ Fine Dining
____ Institution ______ Other (please specify) _______________________

Awareness of the existence of Orange County Organic Waste Collection program previously:
___Yes ______ No
   If yes, how did you become aware of the program?
   ___Orange County staff called on me
   ___Heard from other participants
   ___Read about it
   ___Other (please specify) ________________________________
   ___Unsure of how I became aware

Have you attempted to participate previously and could not due to certain barriers? (Please specify)
   ___Fear of the unknown
   ___Concerns about odors or vermin in or around the outdoor container
   ___Too much effort
   ___Staff will not be able to effectively separate
   ___Not enough space
   ___We don’t generate enough organic waste to make it worthwhile
   ___Food waste is already collected by someone else (please specify) ________________

How is your waste currently collected?
Dumpster: 2 cubic yards    4 cubic yards    6 cubic yards    8 cubic yards
How often is the waste collected each week? 1    2    3    4    5    6
___Overflowing    ___Full
___About ¾ full    ___Halfway full    ___Less than halfway full

Approximately, what percentage your weekly waste could be classified as organic material including food scraps, wet paper, and flowers?
10% 20% 30% 40% 50% >50%
How do you currently dispose of organic waste?  
____ Donations to food banks  
____ Traditional Trash Collection  
____ Private organic collectors (i.e. community gardens)  
____ Other

What is the nature of the method of cooking?  
____ Mostly by scratch  
____ Half Scratch Half prepackaged  
____ Mostly Prepackaged  
____ Other

Would you be interested in participating in organic waste collection?  
____ Yes  
____ No

If yes, then provide your information at the end of the survey so we may contact you with more information in the future.

If no, what would make you more interested in participating in the program?  
____ Knowing more about it  
____ If I save on trash hauling costs  
____ Training for my staff

How willing would you be to make operational changes to make organic waste feasible?  
____ Dedicating space  
____ Designating staff time  
____ Designating staff person(s) responsible  
____ Providing training  
____ Other

What would you hope to achieve from participating in Orange County’s Organic Waste Collection Program? (Rank in order to most influential to least)  
____ Make my business greener, more sustainable, less wasteful  
____ Save on waste hauling costs  
____ Reduce odors in my trash by separating food scraps  
____ Good community relations  
____ Other (please specify ranking)

How much do your customers value your participation in organic waste collection? (Scale from 1-5 with 1 being ‘do not value at all’ and 5 being ‘highly value’)

1 2 3 4 5

Would you be interested in support for publicizing your participation?  
____ Yes (Check all that apply):  
____ No

____ Window Decal  
____ Web Sticker  
____ Online participant list  
____ Other

Do you receive recycling services from Orange County Solid Waste Management for bottles, cans, and paper?  
____ Yes  
____ No (if no please indicate which of the following):  
____ We take recyclables to a drop-off site  
____ We use a private recycling company  
____ We do not recycle cans, bottles, and paper

What items do you recycle through Orange County programs?
Organics Recovery in Orange County

___Plastic  ___Glass bottles  ___Metal cans  ___Mixed paper
 ___Corrugated cardboard  ___Plastic cups, tubs, and buckets #2, 4, and 5
 ___Other (please specify) ________________________________

How frequently do you use Orange County’s other programs for:
- Hazardous waste recovery (paint, pesticides, fluorescent bulbs, etc.)
  - Frequently  Sometimes  Rarely  Never
- Electronics recycling for computers, televisions, cell phones, etc.
  - Frequently  Sometimes  Rarely  Never
- Drop-off sites for cans, bottles, and cardboard
  - Frequently  Sometimes  Rarely  Never

Are you actively involved in collection of waste fats, oils and grease with Piedmont Biofuels?

On behalf of Orange County’s Organics Recycling Program, we appreciate your participation in this anonymous survey. If you would like a formal analysis of the results we will be more than happy to provide them to you when the report is complete.
If you would be willing to participate in a follow-up interview for more detailed feedback, please provide contact information:

Please provide the following information for a follow-up interview:
Contact Name: ________________________________________________________________
Contact Phone Number and Email: _________________________________________________
Preferred Way of Contact: ________________________________________________________
Organization Address: ___________________________________________________________
F. Food Business Contact List

Note: This report was generated for internal purposes, so this appendix was removed from the capstone team’s public report, although it was shared with Orange County Solid Waste Management.

Names and addresses of local food businesses are publicly available.
## G. Survey Responses from Program Participants

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>PARTICIPANTS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Type</strong></td>
<td></td>
</tr>
<tr>
<td>Began Participating in Organics Collection</td>
<td></td>
</tr>
<tr>
<td><strong>How did you become aware</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Motivation for Participation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicate on a scale of difficulty (1-5)</strong></td>
<td></td>
</tr>
<tr>
<td><strong>a.) Process of separating organic scraps</strong></td>
<td></td>
</tr>
<tr>
<td><strong>b.) Properly separating organics from &quot;true waste&quot;</strong></td>
<td></td>
</tr>
<tr>
<td><strong>c.) Training of employees</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicate best response</strong></td>
<td></td>
</tr>
<tr>
<td><strong>If applicable, indicate $ savings</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Indicate responses for organic waste collection</strong></td>
<td></td>
</tr>
<tr>
<td><strong>a.) Causes offensive odor</strong></td>
<td></td>
</tr>
<tr>
<td><strong>b.) Causes pest problems</strong></td>
<td></td>
</tr>
<tr>
<td><strong>c.) Causes an inconvenience</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Like to see done differently</strong></td>
<td></td>
</tr>
<tr>
<td><strong>What works well</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Customers value your participation</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Interest in publicizing your participation</strong></td>
<td></td>
</tr>
</tbody>
</table>

1. Casual Dining
2. Casual Dining
3. Casual Dining

5-10 years ago
2-5 years ago
<2 years ago

Blair Pollock
Other Participants
Blair Pollock

Environmental responsibility
Environmental Responsibility
Cost savings from weekly pickup

I pay same for waste disposal, separating or not
I don't know
I save money on waste by separating organics

I don't know

----

$120/month

Rarely
Rarely
Rarely

Frequently
Rarely

Rarely

Frequency of collection

Different containers
Staff participation;
container sanitation;
frequency of collection

Different containers
Staff participation;
container sanitation;
frequency of collection

Different containers
Staff participation;
container sanitation;
frequency of collection

O.C. should publicize program more
Staff participation;
container sanitation;
frequency of collection

Different containers
Staff participation;
container sanitation;
frequency of collection

O.C. should publicize program more
Staff participation;
container sanitation;
frequency of collection

2
3
5

Yes
Yes
Yes
<table>
<thead>
<tr>
<th>What types of publicity would you like</th>
<th>Window Decal, online list, web sticker</th>
<th>Window decal</th>
<th>Window decal, online list, web sticker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive recycling from OCSWM If no, indicate the following</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Window decal</td>
<td>n/a</td>
<td>Glass bottles; mixed paper; plastics; corrugated cardboard</td>
<td>Glass bottles; mixed paper; plastics; metal cans</td>
</tr>
<tr>
<td>What items do you recycle through OC</td>
<td>Spent grain</td>
<td>Glass bottles; mixed paper; plastics; corrugated cardboard</td>
<td>Glass bottles; mixed paper; plastics; metal cans</td>
</tr>
<tr>
<td>How frequently do you use OC for the following a.) Hazardous waste recovery</td>
<td>Sometimes</td>
<td>Rarely</td>
<td>Never</td>
</tr>
<tr>
<td>b.) Electronics recycling</td>
<td>Sometimes</td>
<td>Never</td>
<td>Rarely</td>
</tr>
<tr>
<td>c.) Drop-off sites for cans, bottles, cardboard</td>
<td>Sometimes</td>
<td>Frequently</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Involved with Piedmont Biofuels</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### H. Survey Responses from Potential Program Participants 1-6

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Business Type</strong></td>
<td>Casual Dining</td>
</tr>
<tr>
<td><strong>Awareness of Program</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>How you became aware</strong></td>
<td>Orange County Contact</td>
</tr>
<tr>
<td><strong>Barriers to Previous Participation</strong></td>
<td>Unable to separate</td>
</tr>
<tr>
<td><strong>Amount of Waste Currently Collected</strong></td>
<td>2 cubic yds</td>
</tr>
<tr>
<td><strong>How Often Collected</strong></td>
<td>Once/week</td>
</tr>
<tr>
<td><strong>Fullness of Containers</strong></td>
<td>3/4 full</td>
</tr>
<tr>
<td><strong>% of Waste as Organics</strong></td>
<td>40%</td>
</tr>
<tr>
<td><strong>Method of disposal of Organics</strong></td>
<td>Traditional Collection</td>
</tr>
<tr>
<td><strong>Method of Cooking</strong></td>
<td>Half/Half</td>
</tr>
<tr>
<td><strong>Interest in Collection Program</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>What would make you more interested</strong></td>
<td>Knowing more, Training</td>
</tr>
<tr>
<td><strong>Operational changes</strong></td>
<td>Dedicated space</td>
</tr>
<tr>
<td><strong>Ranking of Influence</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Features</strong></td>
<td><strong>Rating</strong></td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>------------</td>
</tr>
<tr>
<td>a.) Making business “green”</td>
<td>n/a</td>
</tr>
<tr>
<td>b.) Save on waste hauling costs</td>
<td>4</td>
</tr>
<tr>
<td>c.) Reduce odors in trash by separation</td>
<td>2</td>
</tr>
<tr>
<td>d.) Good community relations</td>
<td>4</td>
</tr>
<tr>
<td>Customer value participation</td>
<td>4</td>
</tr>
<tr>
<td>Interest in Publicizing</td>
<td>Yes</td>
</tr>
<tr>
<td>If yes, what forms of publicity</td>
<td>Online list, decal, Online list, web sticker, decal, Online list, web sticker, decal, Online list, web sticker, decal, Decal, Online list, web sticker, decal</td>
</tr>
<tr>
<td>Receive recycling services from OCWSM</td>
<td>No</td>
</tr>
<tr>
<td>If no, why</td>
<td>Private company, ----, ----, ----, ----, ----, Plastic, glass, mixed paper, cardboard, metal cans, All</td>
</tr>
<tr>
<td>Items you recycle</td>
<td>Private company, All, plastic, glass, cardboard, plastic #s, Plastic, glass, mixed paper, All</td>
</tr>
<tr>
<td>Frequency of OC’s other programs</td>
<td>Rarely, Never, Never, Never, Never, Sometimes</td>
</tr>
<tr>
<td>a.) Hazardous waste</td>
<td>Never, Never, Never, Never, Never, Sometimes</td>
</tr>
<tr>
<td>b.) Electronics recycling</td>
<td>Never, Never, Never, Never, never, Sometimes</td>
</tr>
<tr>
<td>c.) Drop of sites for recyclables</td>
<td>Never, Never, Never, Rarely, Never, Sometimes</td>
</tr>
<tr>
<td>Biofuels</td>
<td>Involved with Piedmont Biofuels</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
</tr>
</tbody>
</table>
I. Survey Responses from Potential Program Participants 7-13

<table>
<thead>
<tr>
<th>QUESTIONS</th>
<th>7 Fine Dining</th>
<th>8 Casual Dining</th>
<th>9 Grocery</th>
<th>10 Casual Dining</th>
<th>11 Causal Dining</th>
<th>12 Grocery/Casual Dining</th>
<th>13 Café</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Type</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Awareness of Program</td>
<td>Contact</td>
<td>Unsure</td>
<td>No</td>
<td>----</td>
<td>-----</td>
<td>Unsure</td>
<td>Unsure</td>
</tr>
<tr>
<td>How you became aware</td>
<td>Odors/vermin</td>
<td>Odors/vermin,</td>
<td>No</td>
<td>----</td>
<td>-----</td>
<td>Odors/vermin</td>
<td>Mostly coffee grounds collected by farmers</td>
</tr>
<tr>
<td></td>
<td>8 cubic yds</td>
<td>no space</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barriers to Previous Participation</td>
<td>8 cubic yds</td>
<td>8 cubic yds</td>
<td>8 cubic yds</td>
<td>8 cubic yds</td>
<td>8 cubic yds</td>
<td>30 cubic yds</td>
<td>5 gallon buckets</td>
</tr>
<tr>
<td>Amount of Waste Currently Collected</td>
<td>Twice/week</td>
<td>Twice/week</td>
<td>Once/week</td>
<td>Once/week</td>
<td>Once/week</td>
<td>Twice/week</td>
<td>3 times/week</td>
</tr>
<tr>
<td>How Often Collected</td>
<td>Overfilling</td>
<td>Full</td>
<td>1/2 full</td>
<td>Full</td>
<td>3/4 full</td>
<td>Full</td>
<td>3/4 full</td>
</tr>
<tr>
<td>Fullness of Containers</td>
<td>50% Traditional</td>
<td>10%</td>
<td>40%</td>
<td>30%</td>
<td>10%</td>
<td>40%</td>
<td>20%</td>
</tr>
<tr>
<td>% of Waste as Organics</td>
<td>Traditional Collection; donate to food banks</td>
<td>Traditional Collection</td>
<td>Traditional Collection</td>
<td>Pig Farm</td>
<td>Traditional Collection</td>
<td>Private Organic Collectors; Farmers</td>
<td></td>
</tr>
<tr>
<td>Method of disposal of Organics</td>
<td>Mostly Scratch</td>
<td>Mostly Scratch</td>
<td>Mostly Scratch</td>
<td>Mostly Scratch</td>
<td>Mostly Scratch</td>
<td>Mostly Scratch</td>
<td>Wholesale, Unpackaged</td>
</tr>
<tr>
<td>Cooking</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Interest in Collection</td>
<td>Training staff</td>
<td>----</td>
<td>Knowing More</td>
<td>Knowing More</td>
<td>----</td>
<td>Training Staff</td>
<td>If I save on Hauling</td>
</tr>
<tr>
<td>Program</td>
<td>Space</td>
<td>Space</td>
<td>Staff time, designating staff</td>
<td>All the above</td>
<td>----</td>
<td>Staff time, training</td>
<td>Already do this</td>
</tr>
<tr>
<td>What would make you more interested in operational changes</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Ranking of Influences</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>a.) Making business &quot;greener&quot;</td>
<td>3</td>
<td>n/a</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>b.) Save on waste hauling costs</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.) Reduce odors in trash by separation</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>d.) Good community relations</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Customer value participation</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Interest in Publicizing</td>
<td>Online List, decal</td>
<td>Online list,</td>
<td>Decal</td>
<td>Online List, web sticker, decal</td>
<td>----</td>
<td>Online List, Web sticker</td>
<td>Online list</td>
</tr>
<tr>
<td>If yes, what forms of publicity</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Receive recycling services from</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
</tbody>
</table>
### OCWSM

<table>
<thead>
<tr>
<th>If no, why items you recycle</th>
<th>All</th>
<th>Plastic, glass, cardboard, mixed paper, metal cans</th>
<th>Plastic, glass, mixed paper, metal cans, #2,4,5</th>
<th>Plastic, glass, mixed paper, metal cans</th>
<th>All</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency of OC’s other programs</td>
<td>Sometimes</td>
<td>Never</td>
<td>Never</td>
<td>----</td>
<td>Sometimes</td>
<td>Never</td>
</tr>
<tr>
<td>a.) Hazardous waste</td>
<td>Never</td>
<td>N/A</td>
<td>Never</td>
<td>----</td>
<td>Sometimes</td>
<td>Never</td>
</tr>
<tr>
<td>b.) Electronics recycling</td>
<td>Never</td>
<td>Never</td>
<td>Never</td>
<td>----</td>
<td>Sometimes</td>
<td>Never</td>
</tr>
<tr>
<td>c.) Drop of sites for recyclables</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Involved with Piedmont Biofuels

<table>
<thead>
<tr>
<th>Follow up Interview</th>
<th>N/A</th>
<th>N/A</th>
<th>Milltown</th>
<th>Southern Rail</th>
<th>The Weathervane</th>
<th>Open Eye Café</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chad Hardin</td>
<td>Nicholas Stroud</td>
<td>Spencer Carter</td>
<td>Scott Conary</td>
<td>101 S. Greensboro Street</td>
<td>919.968.9410</td>
<td>307 E. Main Street</td>
</tr>
</tbody>
</table>
J. Sample Letter to New Participants – San Francisco

SAMPLE LETTER TO NEW PARTICIPANTS – SAN FRANCISCO

To: Building Tenants

From: XX, Property Manager

Date: XX/XX/XXXX

Re: New Recycling and Composting Program

San Francisco has adopted nation-leading goals of 75% landfill diversion by 2010 and Zero Waste by 2020. To help the City meet its goals and to be in compliance with the Mandatory Recycling and Composting Ordinance, Your Property is implementing a new recycling and composting program.

Our building typically generates approximately 60% recyclable paper, bottles and cans, 30% compostables and only 5-10% materials that actually belong in the garbage. Our goal is to make recycling and composting easy for you and increase the amount we divert from the landfill. Recycling more helps our environment by reducing energy use and pollution, and conserving natural resources.

Here is how the program will work:
Desk-side Collection:

Choose the option that best describes your building's desk-side collection system:

1. There will be no desk-side collection of trash, compostables or recyclables. Please deposit trash, compostables, and recyclables in the separate containers located in the kitchen area, conference room, and other central areas.

-or-

2. Recyclables will be collected from each desk. Please deposit trash and compostables in the separate containers located in the kitchen area, conference room, and other central areas.

-or-

3. Recyclables and trash will be collected from each desk. Please deposit compostables in the central containers located in the kitchen area, conference room, and other central areas.

-or-

4. Recyclables, compostables, and trash will be collected from each desk.

Central Collection:

Most properties offer centralized collection containers for recyclables, compostables, and trash. Indicate if your property offers these containers and where they are located, using the text below as a template.

Containers for the collection of trash, recyclables and compostables are located in the kitchen area, conference room, and other central areas. Please keep your materials separate; see details below about what goes in each container. The three containers will be emptied daily.

What Goes in Each Container?

Recyclables

All clean office paper, glass bottles and jars, aluminum foil and cans, steel/tin cans, and almost all plastics (no soft plastics like bags and wrappers) belong in the blue containers. Please empty food or liquid from recyclables before depositing in blue recycling container.

All recyclable material is sent to San Francisco’s Pier 96 for sorting into separate commodities, which are then sold to recyclers and made into other products.

Compostables

Most of the material that used to go in the trash, can now be composted including paper take-out containers, paper coffee cups, used napkins, used tissues, used paper towels, milk cartons, left-over food, and compostable plastics. Remember composting is not just for food scraps but also for soiled paper and paper food packaging- think coffee cups, napkins, and to-go boxes!

All compostable material is sent to Jepson Prairie Organics in Vacaville where it is turned into compost, a nutrient for local, organic agriculture.
Garbage

Very few items actually belong in the trash. Garbage items include: **Styrofoam**, candy or chip wrappers, plastic wrap, plastic bags, and aseptic packaging (juice boxes/Tetrapaks).

*Any material put in the garbage will be sent to landfill.*

We hope that you are excited to contribute to the greening of our building and our city. Full building participation is crucial for this program to be successful! **Our target start date will be July 1, watch for additional communication as the date approaches.**

Please feel free to contact X at XXX-XXXX should you have any questions.

(San Francisco Department of Environment, 2014)
K. Photos from the Orange County Landfill Tour

Client Blair Pollock in front of the electronic waste drop-off site:

Electronic waste processing site:
UNC’s Landfill Gas Recovery Project:

The capstone group in front of the closed landfill:
VIII. Works Cited


